

Memorandum

TO: All Bidders of Record

FROM: William H. Wilkens *William H. Wilkens*

DATE: June 1, 1994

SUBJECT: Town of Huntington
Suffolk County, NY
Contract Documents and Specifications
Contract No. ENV94-01/0-C
Interim Remedial Program
Huntington/East Northport Landfill
Addendum No. 1

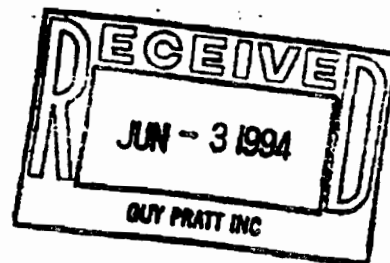


Transmitted herewith is Addendum No. 1 to the Contract Documents and Specifications for the Interim Remedial Program, Huntington/East Northport Landfill

The addendum substantially includes a revised bid opening date, an extension to time of completion for the project, modification and additions to requests for additional information and inclusion of a missing page from the technical specifications to the original Contract Documents and Specifications.

This addendum shall be included as part of the Contract Documents and Specifications for the Interim Remedial Program, Huntington/East Northport Landfill as provided in the Information for Bidders.

(s1/whw)



Camp Dresser & McKee
100 Crossways Park West
Woodbury, NY 11757

Date of Issued: June 1, 1994

TO: All Bidders of Record

RE: Town of Huntington
Suffolk County, NY
Contract Documents and Specifications
Contract No. ENV94-01/0-C
Interim Remedial Program
Huntington/East Northport Landfill
Addendum No. 1

ADDENDUM NO. 1

This Addendum shall be part of the Contract Documents and Specifications for the Interim Remedial Program, Huntington/East Northport Landfill as provided in the Information for Bidders.

Acknowledge receipt of this Addendum by inserting its number and date on page 16. Failure to do so may subject the Bidder to disqualification.

ADVERTISEMENT FOR BIDS/NOTICE TO BIDDERS

1. Page 1, first paragraph, third line, change "June 9, 1994" to "June 29, 1994".

TIME OF COMPLETION

1. Page 14, change "300" to "390".

SECTION 01047 - SPECIAL CONSTRUCTION CONDITIONS

1. Page 01047-5, paragraph 1.08, second line, delete "Curtis F. Velsor, Jr." and insert "William H. Wilkens".
2. Page 01047-5, paragraph 1.08, at end of the first sentence add the following: ", at least twelve days before the date herein set for opening of bids".

3. Page 01047-5, paragraph 1.08, add the following two subparagraphs after subparagraph 1.08A:

"B Written clarifications or interpretations will be issued by Addenda not later than five days excluding Saturdays, Sundays, and legal holidays; before the bid opening date. Only questions answered by formal written Addenda will be binding. Oral and other clarifications or interpretations will be without legal effect. Addenda will be mailed via certified mail, with return receipt requested, or by express mail service to all parties recorded as having received the Contract Documents.

C Each Bidder shall be responsible for determining that he has received all Addenda issued."

SECTION 02200 - EARTHWORK

1. Page 02200-3, insert this missing page, which is attached and shall be included in the Contract Documents and Specifications, between pages 02200-2 and 02200-4.

Attachment

(s2/toh)

1. At all times during construction provide and maintain proper equipment and facilities to remove all water entering excavations and keep such excavations dry so as to obtain a satisfactory undisturbed subgrade foundation condition until the fills, structures or pipes to be built thereon have been completed to such extent that they will not be floated or otherwise damaged by allowing water levels to return to natural levels. The Contractor shall engage a Geotechnical Engineer, to design the dewatering system. The Contractor shall submit with the Construction Schedule to the Engineer for review the design of the dewatering systems prior to commencing work.
2. Dewatering shall at all times be conducted in such a manner as to preserve the undisturbed bearing capacity of the subgrade soils at proposed bottom of excavation. Well or sump installations shall be constructed with proper sand filters to prevent drawing of finer grained soil from the surrounding ground.
3. Water entering the excavation from surface runoff shall be collected in shallow ditches around the perimeter of the excavation, drained to sumps and pumped from the excavation to maintain a bottom free from standing water.
4. Take all additional precautions to prevent uplift of any structure during construction.
5. All dewatering liquids generated as a result of construction activities shall be disposed of by the Contractor in a designated area on top of the landfill as indicated on the Drawings.
6. Flotation shall be prevented by maintaining a positive and continuous operation of the dewatering system. The Contractor shall be fully responsible and liable for all damages which may result from failure of this system.
7. Remove the dewatering equipment after the system is no longer required.
8. Take all necessary precautions to preclude the accidental discharge of fuel, oil, etc in order to prevent adverse effects on groundwater quality.

1.04 SOIL TESTING

- A Previous to the general placement of the fill and during such placement, the Engineer may select areas within the limits of the fill for testing the degree of compaction obtained. The Contractor shall cooperate fully in obtaining the information desired.
- B Payment for testing will be made from the allowance fund in accordance with Section 01410. If test results are unsatisfactory, all costs involved in correcting deficiencies in compacted materials to the satisfaction of the Engineer, will be borne by the Contractor.

PART 2: PRODUCTS

DOWNEY

Memorandum

TO: All Bidders of Record

FROM: William H. Wilkens *whw*

DATE: June 13, 1994

SUBJECT: Town of Huntington
Suffolk County, NY
Contract Documents and Specifications
Contract No. ENV94-01/0-C
Interim Remedial Program
Huntington/East Northport Landfill
Addendum No. 2



Transmitted herewith is Addendum No. 2 to the Contract Documents and Specifications for the Interim Remedial Program, Huntington/East Northport Landfill

The addendum substantially includes the addition of an Alternate Capping Design and miscellaneous revisions and clarifications to the original Contract Documents and Specifications.

Attention of Bidders is particularly called to a second PRE-BID MEETING to be held in the Town of Huntington, 100 Main Street, Huntington, New York, Room 114, at 10:00 a.m. on June 22, 1994. Attendance is mandatory as a condition of acceptability of the Bid for all Bidders who did NOT attend the first PRE-BID MEETING. It is, however, recommended that all Bidders attend this meeting since questions on the Base Bid and Alternate Capping Design Bid will be discussed.

This addendum shall be included as part of the Contract Documents and Specifications for the Interim Remedial Program, Huntington/East Northport Landfill as provided in the Information for Bidders.

(s1/whw)

Camp Dresser & McKee
100 Crossways Park West
Woodbury, NY 11757

Date of Issued: June 13, 1994

TO: All Bidders of Record

RE: Town of Huntington
Suffolk County, NY
Contract Documents and Specifications
Contract No. ENV94-01/0-C
Interim Remedial Program
Huntington/East Northport Landfill
Addendum No. 2

ADDENDUM NO. 2

This Addendum shall be part of the Contract Documents and Specifications for the Interim Remedial Program, Huntington/East Northport Landfill as provided in the Information for Bidders.

Acknowledge receipt of this Addendum by inserting its number and date on page 16. Failure to do so may subject the Bidder to disqualification.

ADVERTISEMENT FOR BIDS/NOTICE TO BIDDERS

1. Page 1, sixth paragraph, delete this paragraph in its entirety and replace with the following:

"The Bidder will submit the "FORM OF BID", pages 13dR and 13e, which will define his Bid for the Contract. Bids will be evaluated on the Total Contract Price amount for the Base Bid and the Alternate Capping Design Bid."
2. Page 2, after the second paragraph add the following paragraph:

"Attention of Bidders is particularly called to a second PRE-BID MEETING to be held in the Town of Huntington, 100 Main Street, Huntington, New York, Room 114, at 10:00 a.m. on June 22, 1994. Attendance is mandatory as a condition of acceptability of the Bid for all Bidders who did NOT attend the first PRE-BID MEETING. It is, however, recommended that all Bidders attend this meeting since questions on the Base Bid and Alternate Capping Design Bid will be discussed."

INFORMATION FOR BIDDERS

1. Page 3. Item 2. Award of Contract: first paragraph, add the following at the end of first sentence:

- "and will based upon whichever Total Contract Price amount (Base Bid or Alternate Capping Design Bid) is in the best interest of the Owner."
2. Page 3. Item 2. Award of Contract: first paragraph, twelfth line, change "triplicate" to "sextuplet".
 3. Page 3. Item 2. Award of Contract: second paragraph, first line, insert the word "Faithful" between the words "Agreement," and "Performance".
 4. Page 4. Item 3. Required Bonds: fourth paragraph, third line, change "(page 10)", to "(page 8,)"
 5. Page 4. Item 6. Bid Submission: At the end of the first paragraph add the following:

"Bidders are required to submit Bids for both the Base Bid and the Alternate Capping Design Bid."
 6. Page 4. Item 6. Bid Submission: In the list of items and forms add the following after Form of Bid:

"Base Bid (page 13dR) and Alternate Capping Design Bid (page 13e)"
 7. Page 6. Delete item 15. Health and Safety Plan in its entirety and replace with the following:

~~"15. Health and Safety Plan: the successful bidder will be required to submit a Health and Safety Plan in accordance with the requirements of Specification Section 01111 - Safety, Health, and Emergency Response Requirements."~~
 8. Page 6. Delete Item 16. Quality Assurance/Quality Control Plan in its entirety and replace with the following:

"16. Quality Control Plan: The successful bidder will be required to submit a Quality Control Plan in accordance with the requirements of Specification Section 01400 - Contractor Quality Control and as further described in Appendix A - Construction Quality Assurance and Quality Control Plan."

BID PROPOSAL

1. On the six (6) blue printed itemized bid pages, at the heading of each page, insert the following after the words Landfill Closure:

"-BASE BID"
2. Page 13d. Form of Bid. Delete this page in its entirety and insert page 13dR.
3. Page 13e. Form of Bid. Add this new page.

SECTION 00800 - SUPPLEMENTARY CONDITIONS

1. Page 00800-2, Paragraph SC - 1.36, second line, between the words "Division 3" and "of the project" insert the following: "and Appendix A - Construction Quality Assurance and Quality Control Plan"
2. Page 00800-2, Paragraph SC - 1.36, third and fourth lines, delete the words "Landfill Gas Interim Remedial Program" and insert the following:

"WC-2 Perimeter Landfill Gas Collection System".
3. Page 00800-7, Paragraph 6.3.2, at the end of this paragraph, add the following:

"Engineer's maximum hourly rate shall be calculated at \$120.00/hour per individual on overtime work."
4. Page 00800-15, Paragraph 1.4 Conflict of Interest, delete the third paragraph in its entirety and insert the following:

"The Contractor agrees that if an actual, apparent or potential organizational conflict of interest is discovered at any time after award, whether before or during performance, the Contractor will immediately make a full disclosure in writing to the Municipality and the State Department of Environmental Conservation. This disclosure shall include a description of actions which the Contractor has taken or proposes to take, after consultation with the Municipality, to avoid, mitigate, or minimize the actual or potential conflict."
5. Page 00800-15, Paragraph 1.4, Conflict of Interest, fourth paragraph, third line, between the words "organizational" and "conflict" add the following: "or personnel".
6. Page 00800-15, Paragraph 1.4 Conflict of Interest, after the fifth paragraph add the following subparagraphs:

- "(a) In addition to the requirements of the above clauses with respect to "Organizational Conflicts of Interest", the following provision with regard to employee personnel performing under this contract shall apply until the earlier of the termination date of the affected employee(s) or the duration of the contract.

The Contractor agrees to notify the Department and the Municipality immediately of any actual, apparent or potential personal conflict of interest with regard to any employee, subcontractor employee, or consultant working on or having access to information regarding this contract, as soon as the Contractor becomes aware of such conflict. A personal conflict of interest is defined as a relationship of an employee, subcontractor employee, or consultant with an entity that may impair or appear to impair the objectivity of the employee, subcontractor employee, or consultant in performing the contract work. The Municipality will notify the Contractor of the appropriate action to be taken.

- b) To the extent that the work under this contract requires access to proprietary or confidential business or financial data of other companies, and as long as such data remains proprietary or confidential, the Contractor shall protect such data from unauthorized use and disclosure and agrees not to use it to compete with such companies.
- (c) The Contractor shall certify annually that, to the best of the Contractor's knowledge and belief, all actual, apparent or potential conflicts of interest, both personal and organizational, have been reported to the Department and the Municipality. Such certification must be signed by a senior executive of the Contractor and submitted in accordance with instructions provided by the Municipality. Along with the annual certification, the Contractor shall also submit an update of any changes in the conflict of interest plan submitted with its proposal for this contract. The initial certification shall cover the one-year period from the date of contract award, and all subsequent certifications shall cover successive annual periods thereafter. The certification is to be submitted no later than 45 days after the close of the previous certification period covered.
- (d) The Contractor recognizes that employees in performing this contract may have access to data, either provided by the Department of Municipality or first generated during contract performance, of a sensitive nature which should not be released without Department/Municipality approval. Therefore, the Contractor agrees to obtain confidentiality agreements from all employees working on requirements under this contract including subcontractors and consultants. Such agreements shall contain provision which stipulate that each employee agrees that the employee will not disclose, either in whole or in part, to any entity external to the Department, Department of Health or the New York State Department of Law, any information or data provided by the Department or first generated by the Contractor under this contract, any site-specific cost information, or any enforcement strategy without first obtaining the written permission of the Municipality. If a Contractor, through an employee or otherwise, is subpoenaed to testify or produce documents, which could result in such disclosure, the contractor must provide immediate advance notification to the Municipality/Department so that the Department can authorize such disclosure or have the opportunity to take action to prevent such disclosure. Such agreements shall be effective for the life of the contract and for a period of five (5) years after completion of the contract.
- (e) The Contractor agrees to insert in each subcontract or consultant agreement placed hereunder (except for subcontracts or consultant agreements for well drilling, fence erecting, plumbing, utility hookups, security guard services, or electrical services) provisions which shall conform substantially to the language of this clause, including this paragraph (e), unless otherwise authorized by the Municipality.

If this is a contract for work related to action at an inactive hazardous waste site, the following paragraph shall apply:

- (f) Due to the scope and nature of this contract, the Contractor shall observe the

following restrictions on future hazardous waste site contracting for the duration of the contract.

- (1) The Contractor will be ineligible to enter into a contract for remedial action projects for which the Contractor has developed the statement of work or the solicitation package.
- (2) The Contractor, during the life of the work assignment and for a period of five (5) years after the completion of the work assignment, agrees not to enter into a contract with or to represent any party with respect to any work relating to remedial activities or work pertaining to a site where the Contractor previously performed work for the Department and/or Municipality under this contract without the prior written approval of the Department.
- (3) The Contractor agrees in advance that if any bids/proposals are submitted for any work for a third party that would require written approval of the Municipality/Department prior to entering into a contract because of the restrictions of this clause, then the bids/proposals are submitted at the Contractor's own risk, and no claim shall be made against the Municipality/Department to recover bid/proposal costs as a direct cost whether the request for authorization to enter into the contract is denied or approved."

Page 00800-15, Paragraph 1.5 Affirmative Action, delete paragraph (a) in its entirety and insert the following:

"(a) The Contractor agrees to be bound by the provisions of New York State Executive Law Article 15-A, Sections 312, 313, and 316.

The Contractor is required to make good faith efforts to solicit the meaningful participation of minority and women owned business enterprise identified in the Directory of Certified Businesses provided by the New York State Department of Economic Development's Division of Minority and Women's Business Development."

8. Page 00800-16, Paragraph 1.5 Affirmative Action, paragraph (b), eighth line, delete "\$25,000" and insert "\$100,000".
9. Page 00800-16, Paragraph 1.5 Affirmative Action, paragraph (b), twelfth line, delete the word "the" and insert "a state".
10. Page 00800-16, Paragraph 1.5 Affirmative Action, paragraph (c), ninth line, delete the word "or" and insert "job".
11. Page 00800-16, Paragraph 1.5 Affirmative Action, paragraph (f), fifth line, after the words "requirements of the" insert the followings "Minority/Women Business Enterprise Equal Employment (M/WBE - EEO)."

TECHNICAL SPECIFICATIONS: WC-1 LANDFILL CLOSURE

SECTION 01010 - SUMMARY OF WORK

1. Page 01010-1, Paragraph 1.02E. Delete subparagraph E in its entirety and replace it with the following:

"E Except for the operation of the Maintenance Garage by the Owner, the operation of the existing or new gas extraction system (wells, piping, generator, etc.) by Wheran Envirotech, and the operation of the existing or new Perimeter Landfill Gas Collection System by the Owner, there will be no other ongoing operations on the site. The Contractor shall coordinate operations with the Owner, Wheran Envirotech, and Owner's Subcontractors working at the site."

2. Page 01010-2, Paragraph 1.02F. Add the following at the end of Item 7 of this paragraph:

"except that the active gas transmission line piping, fittings, and appurtenances will be supplied by others and installed as part of the Work."

3. Page 01010-2, Paragraph 1.02F. Delete Item 8 of this paragraph in its entirety and replace it with the following:

"8. Furnishing and installation of final cover system, including the following components:

a. BASE BID

- (1) Geotextiles
- (2) Sand layer
- (3) Geocomposite and CSPE membranes
- (4) Select fill
- (5) Geogrids
- (6) Geonets
- (7) Topsoil
- (8) Erosion control mat

b. ALTERNATE CAPPING DESIGN BID

- (1) Geonet composite
- (2) Textured VLDPE membrane
- (3) Select fill
- (4) Geogrids
- (5) Topsoil
- (6) Erosion control mat"

4. Page 01010-2, Paragraph 1.02F. Delete item 10 in its entirety and replace it with the

following:

"10. All work as described under WC-2 Perimeter Landfill Gas Collection System".

5. Page 01010-2, Paragraph 1.02F. Add the following items after item 10:

"11. Unloading, storing, protecting and installing HDPE pipe, fittings and accessories for the active gas transmission system, furnished by others, as specified in Section 02715.

12. Coordination and relocation of temporary gas transmission lines installed by Wehran Envirotech. Contractor shall notify Owner when his operations have proceeded to the point where relocation of temporary piping is to take place. Relocation shall take place only under the supervision of Wehran Envirotech."

SECTION 01014 - CONSTRUCTION SEQUENCE

1. Page 01014-1, Paragraph, 1.02A2., third line, delete the following: "equipment storage, office trailers and toilet facilities,"

2. Page 01014-2, Paragraph 1.03B. Delete items 1, 2, and 3 and replace them with the following:

"1. Construction activity can begin in areas 1, 2, 4, and 5 at any time. Town activities at the maintenance garage will be suspended during construction in Area 2; however, access to the landfill gas recovery facility must be maintained daily. At the Contractor's option, a portion of Area 4 may be used as a partial staging area. This area; however, may not suffice as a staging area for the entire project."

3. Page 01014-2, Paragraph 1.03B. Change item "4" to "2".

SECTION 01025 - MEASUREMENT AND PAYMENT

1. Page 01025-1, Paragraph 1.01A, add the following at the end of this subparagraph:

"for the Base Bid."

SECTION 01050 - FIELD ENGINEERING

1. Page 01050-1, Paragraph 1.02B. At the end of the line change "00800" to "01047".

SECTION 01111 - SAFETY, HEALTH AND EMERGENCY RESPONSE REQUIREMENTS

1. Page 01111-2, Paragraph 1.03A, first line, change "with the bid package" to "at or prior to the Pre-Work Conference".

SECTION 01170 - SPECIAL PROVISIONS

- Page 01170-2, Paragraph 1.04A, third line, delete the work "blasting".

SECTION 01410 - TESTING LABORATORY SERVICES

1. Page 01410-1, Paragraph 1.02I. Change "Contract WC-2" to "WC-2 Perimeter Landfill Gas Collection System."

SECTION 01500 - TEMPORARY FACILITIES

1. Page 01500-1, Paragraph 1.01A, delete the fourth sentence of this paragraph.

SECTION 01580 - PROJECT SIGNS

1. On the sign included at the end of this Section delete "Commissioner Thomas Jorling" and insert "Acting Commissioner Langdon Marsh".

SECTION 02050 - DEMOLITION AND MODIFICATIONS

1. Page 02050-1, Paragraph 1.01D, delete item 5 in this subparagraph in its entirety.
2. Page 02050-1, Paragraph 1.01D. Change item "6" to "5".

SECTION 02100 - SITE PREPARATION

1. Page 02100-1, Paragraph 1.01B. Delete subparagraph B in its entirety and replace it with the following:

"B All vegetated areas to be covered by final cover or disturbed during the performance of the Work shall be cleared, grubbed, and stripped."
2. Page 02100-1, Paragraph 3.01A, second and third line, delete "where shown on the drawings or" and insert "as".
3. Page 02100-1, Paragraph 3.01B, first line, delete "designated on the Drawings or".
4. Page 02100-1, Paragraph 3.02A. Delete subparagraph A in its entirety and replace it with the following:

"A Except as otherwise directed, strip topsoil from all disturbed areas and strip at least the upper four (4) inches of the vegetated intermediate cover."
5. Page 02100-1, Paragraph 3.02. Add the following subparagraph after subparagraph 3.02B:

"C Clean topsoil as determined by the Engineer, may be stockpiled in a clean area, and reused as directed by the Engineer."
6. Page 02100-2, Paragraph 3.04A, first line, delete "designated on the Drawings or".

SECTION 02200 - EARTHWORK

1. Page 02200-5, Paragraph 3.01A, fourth line, insert the words "compacted select fill", between the words "structural fill" and "or other material".
2. Page 02200-5, Paragraph 3.01B, seventh line, insert the words "compacted select fill" between the words "compacted structural fill" and "or other approved material".
3. Page 02200-7, Paragraph 3.03I, delete the piping systems listed and replace them with the following:

" HDPE Pipe (Drainage)	Section 02620
Corrugated Metal pipe	Section 02621
PVC Pipe	Section 02749
HDPE Pipe (Gas Vents)	Section 02748
HDPE Pipe (Gas Transmission)	Section 02715"

SECTION 02231 - FINAL COVER SELECT FILL

1. Page 02231-1, Paragraph 1.02, at the end of subparagraphs H, I and J add the following:
"for the Base Bid."
2. Page 02231-1, Paragraph 1.02, add the following subparagraphs after subparagraph K:

"L **Very** low density polyethylene (VLDPE) geomembrane liner is included in Section 02271 for the Alternate Capping Design Bid.

M Geonet composite is included in Section 02278 for the Alternate Capping Design Bid.

N **Final** cover construction is included in Section 02280 for the Alternate Capping Design Bid."
3. Page 02231-3, Paragraph 3.02A, add the following at the end of this paragraph:
"or Section 02271."
4. Page 02231-4, Paragraph 3.02J, item 1, add the following at the end of this item,"
"for the Base Bid and 9-inches for the Alternate Capping Design Bid."
5. Page 02231-4, Paragraph 3.02J, item 4, add the following at the end of this item:
"for the Base Bid and 9-inches for the Alternate Capping Design Bid."
6. Page 02231-5, Paragraph 3.02K, second line, between the words" fill lift" and "at 100" insert the following:

"for the Base Bid and on every 9-inch compacted fill lift for the Alternate Capping

Design Bid"

SECTION 02274 - GEOGRID COMPOSITE

1. Page 02274-1, Paragraph 1.02, at the end of subparagraphs B,C and D add the following:
"for the Base Bid."
2. Page 02274-1, Paragraph 1.02, add the following subparagraphs after subparagraph D:
"E Very low density polyethylene (VLDPE) geomembrane liner is included in Section 02271 for the Alternate Capping Design Bid.
F Final cover construction is included in Section 02280 for the Alternate Capping Design Bid."
3. Page 02274-4, Paragraph 1.09B, first line, change the words "geocomposite membrane" to "geogrid composite."
4. Page 02274-5, Paragraph 2.01A, third line, add the following after Type 80/30-10:
"for the Base Bid and shall be Enkamat S Type 55/30-20 for the Alternate Capping Design Bid"
5. Page 02274-5, Paragraph 2.01A, item 1., delete the second sentence in its entirety.
6. Page 02274-5, Paragraph 2.01A, item 1., add the following at the end of the third sentence:
"for the Base Bid and Table 1A for the Alternate Capping Design Bid."
7. Page 02274-5, Paragraph 2.01A, item 2., fifth line, between the words "Table 2" and "at the" insert the following:
"for the Base Bid and properties listed in Table 2A for the Alternate Capping Design Bid"
8. Page 02274-5, Paragraph 2.01D, second line, between the words "Table 3" and "at the" insert the following:
"for the Base Bid and Table 1A, Table 2A and Table 3A for the Alternate Capping Design Bid"
9. Page 02274-7, Paragraph 2.02A, item 4, second line, between the words "Table 3" and "at the" insert the following:
"for the Base Bid and Table 1A, Table 2A and Table 3A for the Alternate Capping Design Bid"

10. Page 02274-12, Table 1. Change the words "Table 1" to "Table 1- Base Bid."
11. Page 02274-13, Table 2. Change the words "Table 2" to "Table 2 - Base Bid."
12. Page 02274-14, Table 3. Change the words "Table 3" to "Table 3 - Base Bid."

SECTION 02930 - LOAMING, HYDROSEEDING, AND EROSION CONTROL

1. Page 02930-4, Paragraph 3.02C, third line, insert the words "May 31" between the words "March 15" and "or August 15".

NEW SPECIFICATION SECTIONS

The following new specification pages or sections which are attached shall be included in the Contract Documents:

- * 1. Form of Bid page 13dR
 - ** 2. Form of Bid page 13e
 - ** 3. BID PROPOSAL, Landfill Closure - Alternate Capping Design Bid (six itemized bid pages)
 - ** 4. Section 01026 - Measurement and Payment
 - ** 5. Section 02271 - Very Low Density Polyethylene (VLDPE) Geomembrane Liner
 - ** 6. Section 02274 - Table 1A page 02274-15
Table 2A page 02274-16
Table 3A page 02274-17
 - ** 7. Section 02278 - Geonet Composite
 - ** 8. Section 02280 - Final Cover Construction
 - *** 9. Section 02715 - HDPE Pipe, Fittings and Accessories
- * These pages or sections replace existing pages or sections
- ** These pages or sections are for the Alternate Capping Design Bid ONLY
- *** These pages or sections pertain to both the Base Bid and Alternate Capping Design Bid.

(s2/toh3)

DRAWINGS: WC-1 LANDFILL CLOSURE

<u>SHEET NO.</u>	<u>DESCRIPTION OF CHANGE</u>
C-8	1. Section 11/C-4. Delete the elevation 111.00 at station 0+68 (East Road)
C-9	1. Section 12A/C-4. Revise as indicated in SK-C1.
C-12	1. Section 22A/C-5. Revise as indicated in SK-C2.
C-14	1. Centerline Channel "J" profile. Reverse the callouts for channel J2 and J1 from that shown such that Channel J1 limits are from Section 19E to Section 22A and Channel J2 limits are from Section 13E to Section 19A.
C-15	1. Centerline Drainageway "V" profile. Revise as indicated in SK-C3.
C-16	1. Centerline West Drain profile. Revise as indicated in SK-C4. 2. Centerline East Drain profile. Revise as indicated in SK-C5. 3. Centerline Downdrain Z profile. Correct the spelling of the word "AS" to read "GAS" in note Perimeter... Inv. 102.50.
C-18	1. Centerline East Road profile. Revise elevation at Station 7+15 to 108.90 and at Station 8+90 to 108.38.
C-21	1. Passive Gas Vent Conversion to Active Vent. Correct the spelling of the word "PVF" to "PVC" in the note 6"... Assembly, and the word "Post" to "Port" in the note 3/8" Test Post.
C-22	1. Typical Toe of Landfill Detail for Sections 12 and 10 East (At Catch Basin). Revise as indicated in SK-C6. 2. Typical Toe of Landfill Detail for Sections 20, 21, and 22 East (At Gas Manholes). Revise as indicated in SK-C7. 3. Typical Toe of Landfill Detail for Sections 20, 21, and 22 East (No Gas Manholes). Revise as indicated in SK-C8. 4. Typical Toe of Landfill Detail for Sections 9 and 9A (At Gas Manholes). Revise as indicated in SK-C9. 5. Typical Toe of Landfill Detail for Sections 1, 2 and 3 North. Revise as indicated in SK-C10. 6. Typical Headwall Detail and Recharge Basins. Revise as indicated in SK-C 11A and SK-C11B.

C-23

1. Typical Toe of Landfill Detail for Section 12A (At Catch Basin). Revise as indicated in SK-C12.
2. Typical Toe of Landfill Detail for Section 12A (No Catch Basin). Revise as indicated in SK-C13.
3. Add the Details and Notes as indicated in SK-C14.

C-25

1. Section a Trench. Revise as indicated in SK-C15.
2. Downdrain Cleanout Detail. Correct the spelling of the word "CONNEC" to read "CONNECT" in note Special Metal Pipes.

SKETCH REVISIONS: WC-1 LANDFILL CLOSURE

The following sketches which provide revisions to the Contract Drawings shall be included in the Contract Documents.

1. Sketch No. SK-C1
2. Sketch No. SK-C2
3. Sketch No. SK-C3
4. Sketch No. SK-C4
5. Sketch No. SK-C5
6. Sketch No. SK-C6
7. Sketch No. SK-C7
8. Sketch No. SK-C8
9. Sketch No. SK-C9
10. Sketch No. SK-C10
11. Sketch No. SK-C11A
12. Sketch No. SK-C11B
13. Sketch No. SK-C12
14. Sketch No. SK-C13
15. Sketch No. SK-C14
16. Sketch No. SK-C15

DRAWING ADDITIONS: WC-1 LANDFILL CLOSURE

The following list of drawings, which are attached, are for the Alternate Capping Design Bid and shall be included in the Contract Documents.

- | | |
|-------|--|
| C-19A | Details I - Alternate Capping Design |
| C-20A | Details II - Alternate Capping Design |
| C-21A | Details III - Alternate Capping Design |
| C-22A | Details IV - Alternate Capping Design |
| C-23A | Details V - Alternate Capping Design |

(s2/draw1)

RESPONSES TO QUESTIONS RAISED AT THE PRE-BID CONFERENCE HELD ON MAY 20, 1994

1. Time of Completion - See Addendum No. 1
2. Overtime Costs for Additional Engineering and/or Inspection Costs. See Addendum No. 2
3. Pollution Liability Insurance - No change or waiver is permitted.
4. Existing Site Conditions as described in Item 11 of Information for Bidders. Site is not on Superfund list. Do not expect Contractor to encounter any hazardous materials - Modified Level D site.
5. What will be basis of award for Base Bid vs. Alternate Capping Design Bid - See Addendum No. 2.
6. Where has the capping membrane been used before - Hackensack Meadowlands.

(s2/ques)

FORM OF BID

THIS FORM TO BE USED FOR PROJECT BASE BID

FOR THE CONSTRUCTION OF THE HUNTINGTON/EAST NORTHPORT LANDFILL
INTERIM REMEDIAL PROGRAM, IN EAST NORTHPORT, NEW YORK, COMPLETE AS
SPECIFIED IN THE SPECIFICATIONS AND AS SHOWN IN THE DRAWINGS.

WORK SPECIALTY WC-1: LANDFILL CLOSURE

BID IN FIGURES _____

BID IN WORDS _____

WORK SPECIALTY WC-2: PERIMETER LANDFILL GAS COLLECTION SYSTEM

BID IN FIGURES _____

BID IN WORDS _____

TOTAL CONTRACT PRICE - BASE BID (COMBINED WC-1 AND WC-2):

TOTAL BID IN FIGURES _____

TOTAL BID IN WORDS _____

LEGAL NAME OF PERSON, FIRM OR CORPORATION MAKING THIS BID:

(Seal)

SIGNATURE: _____

TITLE: _____

DATE: _____

(S2/BID)

FORM OF BID

THIS FORM TO BE USED FOR PROJECT ALTERNATE CAPPING DESIGN BID

FOR THE CONSTRUCTION OF THE HUNTINGTON/EAST NORTHPORT LANDFILL
INTERIM REMEDIAL PROGRAM, IN EAST NORTHPORT, NEW YORK, COMPLETE AS
SPECIFIED IN THE SPECIFICATIONS AND AS SHOWN IN THE DRAWINGS.

WORK SPECIALTY WC-1: LANDFILL CLOSURE

BID IN FIGURES _____

BID IN WORDS _____

WORK SPECIALTY WC-2: PERIMETER LANDFILL GAS COLLECTION SYSTEM

BID IN FIGURES _____

BID IN WORDS _____

TOTAL CONTRACT PRICE - ALTERNATE CAPPING DESIGN BID (COMBINED WC-1
AND WC-2):

TOTAL BID IN FIGURES _____

TOTAL BID IN WORDS _____

LEGAL NAME OF PERSON, FIRM OR CORPORATION MAKING THIS BID:

(Seal)

SIGNATURE: _____

TITLE: _____

DATE: _____

(S2/BID1)

HUNTINGTON/EAST NORTHPORT LANDFILL
INTERIM REMEDIAL PROGRAM
LANDFILL CLOSURE - ALTERNATE CAPPING DESIGN BID

ITEM NO.	DESCRIPTION	BID PRICE/UNIT PRICE	ESTIMATED QUANTITIES	COMPUTED ITEM TOTAL
1	Field engineering including aerial and field survey	Lump sum of _____ dollars and _____ cents (\$ _____) per lump sum	L.S.	
2	Fenceline remediation - excavation and disposal of solid waste on top of landfill	Unit Price of _____ dollars and _____ cents (\$ _____) per cubic yard	8,000 C.Y.	
3	Miscellaneous cut for final cover construction	Unit Price of _____ dollars and _____ cents (\$ _____) per cubic yard	75,000 C.Y.	
4	Removal of scales	Lump sum of _____ dollars and _____ cents (\$ _____) per lump sum	L.S.	
5	Removal of buried structures	Lump sum of _____ dollars and _____ cents (\$ _____) per lump sum	L.S.	
6	Common fill	Unit Price of _____ dollars and _____ cents (\$ _____) per cubic yard	40,000 C.Y.	
7	Select fill	Unit Price of _____ dollars and _____ cents (\$ _____) per cubic yard	180,000 C.Y.	

WINTINGTON/EAST NORTHPORT LANDFILL
INTERIM REMEDIAL PROGRAM
LANDFILL CLOSURE - ALTERNATE CAPPING DESIGN BID

ITEM NO.	DESCRIPTION	BID PRICE/UNIT PRICE	ESTIMATED QUANTITIES	COMPUTED ITEM TOTAL
8	Topsoil	Unit Price of _____ dollars and _____ cents (\$ _____) per cubic yard	40,000 C.Y.	
9	Crushed stone	Unit Price of _____ dollars and _____ cents (\$ _____) per cubic yard	7,500 C.Y.	
10	Riprap	Unit Price of _____ dollars and _____ cents (\$ _____) per cubic yard	1,800 C.Y.	
11	Gabion	Unit Price of _____ dollars and _____ cents (\$ _____) per cubic yard	340 C.Y.	
12	Asphalt pavement (all courses)	Unit Price of _____ dollars and _____ cents (\$ _____) per square yard	5,600 S.Y.	
13	Guide rail	Unit Price of _____ dollars and _____ cents (\$ _____) per linear foot	340 L.F.	
14	6" slotted corrugated HDPE pipe	Unit Price of _____ dollars and _____ cents (\$ _____) per linear foot	16,000 L.F.	

HUNTINGTON/EAST NORTHPORT LANDFILL
INTERIM REMEDIAL PROGRAM
LANDFILL CLOSURE – ALTERNATE CAPPING DESIGN BID

ITEM NO.	DESCRIPTION	BID PRICE/UNIT PRICE	ESTIMATED QUANTITIES	COMPUTED ITEM TOTAL
15	24" corrugated HDPE pipe	Unit Price of _____ dollars and _____ cents (\$ _____) per linear foot	1,100 L.F.	
16	36" corrugated HDPE pipe	Unit Price of _____ dollars and _____ cents (\$ _____) per linear foot	3,250 L.F.	
17	48" corrugated metal pipe	Unit Price of _____ dollars and _____ cents (\$ _____) per linear foot	575 L.F.	
18	Active gas transmission piping and valving – 2" through 12" diameter (installation only – to be furnished by others)	Unit Price of _____ dollars and _____ cents (\$ _____) per linear foot	4,500 L.F.	
19	Catch basin/manhole	Unit Price of _____ dollars and _____ cents (\$ _____) per basin/manhole	22 ea.	
20	Precast concrete structures	Lump sum of _____ dollars and _____ cents (\$ _____) per lump sum	L.S.	
21	Reinforced concrete headwalls and trench drains	Lump sum of _____ dollars and _____ cents (\$ _____) per lump sum	L.S.	

HUNTINGTON/EAST NORTHPORT LANDFILL
INTERIM REMEDIAL PROGRAM
LANDFILL CLOSURE - ALTERNATE CAPPING DESIGN BID

ITEM NO.	DESCRIPTION	BID PRICE/UNIT PRICE	ESTIMATED QUANTITIES	COMPUTED ITEM TOTAL
22	Geotextile	Unit price of _____ dollars and _____ cents (\$ _____) per square foot	15,000 S.F.	
23	Geonet Composite	Unit price of _____ dollars and _____ cents (\$ _____) per square foot	2,095,000 S.F.	
24	VLDPE membrane	Unit price of _____ dollars and _____ cents (\$ _____) per square foot	2,095,000 S.F.	
25	Geogrid composite	Unit price of _____ dollars and _____ cents (\$ _____) per square foot	1,650,000 S.F.	
26	Erosion control matting	Unit price of _____ dollars and _____ cents (\$ _____) per square foot	1,650,000 S.F.	
27	Materials testing allowance	Lump sum of Two Hundred and Forty Thousand dollars and Zero cents (\$240,000.00) per lump sum	L.S.	\$240,000.00
28	Gas vent - Type 1	Unit Price of _____ dollars and _____ cents (\$ _____) per gas vent	48 ea.	

HUNTINGTON/EAST NORTHPORT LANDFILL
INTERIM REMEDIAL PROGRAM
LANDFILL CLOSURE – ALTERNATE CAPPING DESIGN BID

ITEM NO.	DESCRIPTION	BID PRICE/UNIT PRICE	ESTIMATED QUANTITIES	COMPUTED ITEM TOTAL
29	Gas vent – Type 2	Unit Price of _____ dollars and _____ cents (\$ _____) per gas vent	16 ea.	
30	Chain link fence and gates	Unit Price of _____ dollars and _____ cents (\$ _____) per linear foot	7,375 L.F.	
31	Temporary erosion control	Lump sum of _____ dollars and _____ cents (\$ _____) per lump sum	L.S.	
32	Hydroseeding	Unit Price of _____ dollars and _____ cents (\$ _____) per acre	48 acres	
33	Landscaping	Lump sum of _____ dollars and _____ cents (\$ _____) per lump sum	L.S.	
34	Miscellaneous work	Lump sum of _____ dollars and _____ cents (\$ _____) per lump sum	L.S.	
35	General liability insurance	Lump sum of _____ dollars and _____ cents (\$ _____) per lump sum	L.S.	

JTINGTON/EAST NORTHPORT LANDFILL
 INTERIM REMEDIAL PROGRAM
 LANDFILL CLOSURE - ALTERNATE CAPPING DESIGN BID

ITEM NO.	DESCRIPTION	BID PRICE/UNIT PRICE	ESTIMATED QUANTITIES	COMPUTED ITEM TOTAL
36	Mobilization and demobilization	Lump sum of _____ dollars and _____ cents (\$ _____) per lump sum	L.S.	

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SECTION 01026

MEASUREMENT AND PAYMENT

PART 1: GENERAL

1.01 BID

- A The work covered by this Bid shall include the furnishing of all labor, materials, equipment and incidentals required to construct the work in its entirety as shown on the Drawings and specified in the Project Manual for the Alternate Capping Design Bid.

1.02 FIELD ENGINEERING INCLUDING AERIAL AND FIELD SURVEY (ITEM 1)

A Measurement

- 1. Measurement for payment under Item 1 on the Bid Form will be on a lump sum basis for the completed work as specified in Section 01050.

B Payment

- 1. Payment for field engineering including aerial and field survey will be made at the lump sum price bid for Item 1, which price and payment shall be full compensation for, but shall not be limited to, aerial survey, field survey, horizontal and vertical control of construction, maintain accurate location of all buried piping; civil, structural or other professional engineering services required.

1.03 FENCELINE REMEDIATION (ITEM 2)

A Measurement

- 1. Measurement for payment under Item 2 on the Bid Form will be on a cubic yard basis measured in place.

B Payment

- 1. Payment for Item 2 will be made for the quantity determined above at the unit price bid per cubic yard which price and payment shall be full compensation for, but shall not be limited to; excavation of all solid waste and soil to the limits shown on the drawings, and to the depths determined in the field by the Engineer; hauling of excavated material to the top of landfill; placement and compaction of excavated material; on top of landfill in designated areas as directed by the Engineer.

1.04 MISCELLANEOUS CUTS FOR FINAL COVER CONSTRUCTION (ITEM 3)

A Measurement

- 1. Measurement for payment under Item 3 on the Bid Form will be on a

cubic yard basis measured in place, for the excavated volume within the limits of the Work.

B Payment

1. Payment for excavating earth and solid waste to a depth of one foot below the gas venting layer will be made at the unit price bid per cubic yard, which price and payment shall be full compensation for, but shall not be limited to, excavation of all waste and soil, hauling, placement and compaction of excavated material, on sideslopes or top of landfill at the locations designated by the Engineer. Payment shall also include any required clearing and grubbing within the work limit, and any other items not covered specifically in other bid items but shown on the plans and/or required in the specifications.

1.05 REMOVAL OF SCALES (ITEM 4)

A Measurement

1. Measurement for payment under Item 4 on the Bid Form will be on a lump sum basis for the completed work.

B Payment

1. Payment for removal of scales will be made at the lump sum price bid for Item 4, which price and payment shall be full compensation for, but shall not be limited to, the dismantling of equipment and transferring the equipment to a storage area in the Town of Huntington, designated by the Owner; demolishing of all concrete and masonry support structures to a depth of two feet below the proposed geomembrane liner; hauling of demolished material to the top of landfill; placement of demolished material on top of landfill in designated areas as directed by the Engineer.

1.06 REMOVAL OF BURIED STRUCTURES (ITEM 5)

A Measurement

1. Measurement for payment under Item 5 on the Bid Form will be on a lump sum basis for the completed work.

B Payment

1. Payment for removal of buried structures will be made at the lump sum price bid for Item 5, which price and payment shall be full compensation for, but shall not be limited to, demolishing manholes or structures designated for removal, to a depth of two feet below the proposed geomembrane liner; hauling of demolished material to the top of landfill; placement of demolished material on top of landfill in designated areas as directed by the Engineer.

1.07 COMMON FILL (ITEM 6)

A Measurement

1. Measurement for payment under Item 6 on the Bid Form will be on a cubic yard basis measured in place after compaction.

B Payment

1. Payment for Item 6 will be made for the quantity determined above at the unit price bid per cubic yard which price and payment shall be full compensation for, but shall not be limited to, furnishing and placing the common fill material, submittals, processing, compaction, finish grading, moisture adjustment, and any other work necessary to complete the installation of the common fill layer.

1.08 SELECT FILL (ITEM 7)

A Measurement

1. Measurement for payment under Item 7 on the Bid Form will be at a cubic yard basis measured in place, after compaction, to the depth shown on the Drawings.

B Payment

1. Payment for Item 7 will be made for the quantity determined above at the unit price bid per cubic yard which price and payment shall be full compensation for, but shall not be limited to, furnishing and placing the select fill material to the required thickness as shown on the Drawings, submittals, processing, compaction, finish grading, moisture adjustment, and any other work necessary to complete the installation of the select fill layer.

1.09 TOPSOIL (ITEM 8)

A Measurement

1. Measurement for payment under Item 8 on the Bid Form will be at a cubic yard basis measured in place as shown on the Drawings.

B Payment

1. Payment for Item 8 will be made for the quantity determined above at the unit price bid per cubic yard which price and payment shall be full compensation for, but shall not be limited to, furnishing and placing topsoil to the required thickness as shown on the Drawings, submittals, processing, finish grading, application of lime and fertilizer, and any other work necessary to complete the installation of topsoil.

1.10 CRUSHED STONE (ITEM 9)

A Measurement

1. Measurement for payment under Item 9 on the Bid Form will be at a cubic yard basis measured in place, after compaction, to the depth shown on the Drawings.

B Payment

1. Payment for Item 9 will be made for the quantity determined above at the unit price bid per cubic yard which price and payment shall be full compensation for, but shall not be limited to, furnishing and placing the crushed stone material to the required thickness as shown on the Drawings, submittals, processing, compaction, finish grading, and any other work necessary to complete the installation of the crushed stone layer.

1.11 RIPRAP (ITEM 10)

A Measurement

1. Measurement for payment under Item 10 on the Bid Form will be at a cubic yard basis measured in place, to the depth shown on the Drawings.

B Payment

1. Payment for Item 10 will be made for the quantity determined above at the unit price bid per cubic yard which price and payment shall be full compensation for, but shall not be limited to, furnishing and placing riprap to the required thickness as shown on the Drawings, submittals, processing, and any other work necessary to complete the installation of the riprap.

1.12 GABION (ITEM 11)

A Measurement

1. Measurement for payment under Item 11 on the Bid form will be on a cubic yard basis measured in place, to the depth shown on the Drawings.

B Payment

1. Payment for Item 11 will be made for the quantity determined above at the unit price bid per cubic yard which price and payment shall be full compensation for, but shall not be limited to, furnishing and placing the gabion to the required thickness as shown on the Drawings, submittals, processing, and any other work necessary to complete the installation of the gabion.

1.13 ASPHALT PAVEMENT (ITEM 12)

A Measurement

1. Measurement for payment under Item 12 on the Bid Form will be at a square yard basis measured in place based on the constructed plan view area to the depth shown on the Drawings, with no

allowance for slope corrections.

B Payment

1. Payment for Item 12 will be made for the quantity determined above at the unit price bid per square yard which price and payment shall be full compensation for, but shall not be limited to, furnishing and placing bituminous surface course, bituminous base course and gravel subbase course to the required thickness as shown on the Drawings; submittals, processing, compaction and any other work necessary to complete the installation of asphalt pavement.

1.14 GUIDE RAIL (ITEM 13)

A Measurement

1. Measurement for payment under Item 13 on the Bid Form, will be on a linear foot basis as measured in place.

B Payment

1. Payment for Item 13 will be made for the quantity determined above at the unit price bid per linear foot which price payment shall be full compensation for, but shall not be limited to, furnishing and installing guide rail complete as shown on the Drawings and specified.

1.15 6" SLOTTED CORRUGATED HDPE PIPE (ITEM 14)

A Measurement

1. Measurement for payment under Item 14 on the Bid Form will be on a linear foot basis as measured in place along the laying length of pipe.

B Payment

1. Payment for Item 14 will be made for the quantities determined above at the respective unit price bid per linear foot which price and payment shall be full compensation for furnishing, installing, and jointing the channel underdrain and horizontal gas collector pipes, complete with all fittings and other appurtenances; furnishing, placing and compacting bedding materials; and any other related materials or work for which payment is not specifically provided in other bid items, but as shown on the Drawings.

1.16 24" CORRUGATED HDPE PIPE (ITEM 15)

A Measurement

1. Measurement for Item 15 on the Bid Form will be on a linear foot basis measured installed in place along the laying length of the pipe.

B Payment

1. Payment for Item 15 will be made for the quantities determined above at the respective unit price bid per linear foot which price and payment shall be full compensation for furnishing, installing, and jointing the pipes complete with all fittings, flared end sections, and other appurtenances; furnishing, placing and compacting bedding materials; and any other related materials or work for which payment is not specifically provided in other bid items, but as shown on the Drawings.

1.17 36" CORRUGATED HDPE PIPE (ITEM 16)

A Measurement

1. Measurement for Item 16 on the Bid Form will be on a linear foot basis measured installed in place along the laying length of the pipe.

B Payment

1. Payment for Item 16 will be made for the quantities determined above at the respective unit price bid per linear foot which price and payment shall be full compensation for furnishing, installing and jointing the pipes complete with all fittings, flared end sections, and other appurtenances; furnishing, placing and compacting bedding materials; and any other related materials or work for which payment is not specifically provided in other bid items, but as shown on the Drawings.

1.18 48" CORRUGATED METAL PIPE (ITEM 17)

A Measurement

1. Measurement for Item 17 on the Bid Form will be on a linear foot basis measured installed in place along the laying length of the pipe.

B Payment

1. Payment for Item 17 will be made for the quantities determined above at the respective unit price bid per linear foot which price and payment shall be full compensation for furnishing, installing and jointing the pipes complete with all fittings and other appurtenances; furnishing, placing and compacting bedding materials; and any other related materials or work for which payment is not specifically provided in other bid items, but as shown on the Drawings.

1.19 ACTIVE GAS TRANSMISSION PIPING AND VALVING (ITEM 18)

A Measurement

1. Measurement for Item 18 on the Bid Form will be on a linear foot

basis measured installed in place along the laying length of the pipe.

B Payment

1. Payment for Item 18 will be made for the quantities determined above at the respective unit price bid per linear foot which price and payment shall be full compensation for installing, jointing and testing the pipes complete with all fittings, valves and other appurtenances; furnishing, placing and compacting bedding materials; and any other related materials or work for which payment is not specifically provided in other bid items, but as shown on the Drawings. The piping, valving and appurtenances will be furnished by others.

1.20 CATCH BASIN/MANHOLE (ITEM 19)

A Measurement

1. Measurement for payment under Item 19 on the Bid Form will be at a unit price basis for each catch basin and manhole installed, complete as shown on the Drawings.

B Payment

1. Payment under Item 19 will be made for the quantity determined above at the unit price bid which price and payment shall be full compensation for furnishing and installing the catch basin or manhole complete, including excavation; rung, frame, grate, cover, screened gravel, structural fill, testing; backfill; and any other work necessary to install the catch basin or manhole complete as shown on the Drawings.

1.21 PRECAST CONCRETE STRUCTURES (ITEM 20)

A Measurement

1. Measurement for payment under Item 20 on the Bid Form will be on a Lump Sum Basis for the total of all precast concrete structures shown on the Drawings and installed in place.

B Payment

1. Payment under Item 20 will be made for the quantity determined above at the lump sum price bid which price and payment shall be full compensation for furnishing and installing the precast concrete structures complete including excavation; rung, frame, cover, screened gravel, structural fill, testing; backfill; and any other work necessary to install the structure complete as shown on the Drawings.

1.22 REINFORCED CONCRETE HEADWALLS AND TRENCH DRAINS (ITEM 21)

A Measurement

1. Measurement for payment under Item 21 on the Bid Form will be on a Lump Sum Basis for the total of all reinforced concrete headwalls and trench drains shown on the Drawings and installed in place.

B Payment

1. Payment under Item 21 will be made for the quantity determined above at the lump sum price bid which price and payment shall be full compensation for furnishing and installing the headwalls and trench drains complete including excavation; formwork, concrete, reinforcing steel, frame, cover, structural fill, testing; backfill; and any other work necessary to install the headwalls and trench drains complete as shown on the Drawings.

1.23 GEOTEXTILE (ITEM 22)

A Measurement

1. Measurement for payment under Item 22 on the Bid Form will be on a square foot basis for the furnishing and installation of geotextile. Measurement will be performed in place based on plan view area of the completed work with no allowances for slope correction.

B Payment

1. Payment for Item 22 will be made for the quantity determined above at the unit price bid per square foot which price and payment shall be full compensation for furnishing and installing the geotextile material to the lines and grades shown on the Drawings including material required in the anchor trenches under ripraps, gabions, or other areas shown on the Drawings. No payment will be made for overlapping material. Payment for Item 22 shall also include construction of anchor trenches, all submittals, on site representatives, tie in connections, and all other items necessary to complete the geotextile installation.

1.24 GEONET COMPOSITE (ITEM 23)

A Measurement

1. Measurement for payment under Item 23 on the Bid Form will be on a square foot basis for the furnishing and installation of a geonet composite. Measurement will be performed in place based on plan view area of the completed geonet composite, with no allowances for slope correction.

B Payment

1. Payment for Item 23 will be made for the quantity determined above at the unit price bid per square foot which price and payment shall be full compensation for furnishing and installing the geonet to the lines and grades shown on the Drawings. No payment will be made for overlapping material. Payment for Item

23 shall also include all submittals, on site representatives, tie in connections, and all other items necessary to complete the geonet installation.

1.25 VLDPE MEMBRANE (ITEM 24)

A Measurement

1. Measurement for payment under Item 24 on the Bid Form will be on a square foot basis for the furnishing and installation of a VLDPE membrane. Measurement will be performed in place based on plan view area of the completed liner, with no allowances for slope correction.

B Payment

1. Payment for Item 24 will be made for the quantity determined above at the unit price bid per square foot which price and payment shall be full compensation for furnishing and installing the liner to the lines and grades shown on the Drawings including material required in the anchor trenches. No payment will be made for overlapping material along the seams. Payment for Item 24 shall also include construction of anchor trenches, all submittals, on site representatives, penetrations, boots, quality control/quality assurance, tie in connections, and all other items necessary to complete the liner installation.

1.26 GEOGRID COMPOSITE (ITEM 25)

A Measurement

1. Measurement for payment under Item 25 on the Bid Form will be on a square foot basis for the furnishing and installation of geogrid composite. Measurement will be performed in place based on plan view area of the completed work with no allowances for slope correction.

B Payment

1. Payment for Item 25 will be made for the quantity determined above at the unit price bid per square foot which price and payment shall be full compensation for furnishing and installing the geogrid composite to the lines and grades shown on the Drawings including material required in the anchor trenches. No payment will be made for overlapping material. Payment for Item 25 shall also include construction of anchor trenches, all submittals, on site representatives, tie in connections, and all other items necessary to complete the geogrid composite installation.

1.27 EROSION CONTROL MATTING (ITEM 26)

A Measurement

1. Measurement for payment under Item 26 on the Bid Form will be on

a square foot basis for the furnishing and installation of erosion control matting. Measurement will be performed in place based on plan view area of the completed liner, with no allowances for slope correction.

B Payment

1. Payment for Item 26 will be made for the quantity determined above at the unit price bid per square foot which price and payment shall be full compensation for furnishing and installing the matting to the lines and grades shown on the Drawings. No payment will be made for overlapping material and check slots. Payment for Item 26 shall also include all submittals, on site representatives, tie in connections, and all other items necessary to complete the matting installation.

1.28 MATERIALS TESTING ALLOWANCE (ITEM 27)

A Measurement

1. When directed by the Engineer, soil testing will be performed as specified.

B Payment

1. The Contractor will be reimbursed only for the amount of each invoice submitted to, and approved by the Engineer. The cost of these services will be deducted from the allocated allowance. Any monies not expended from the allowance will revert to the Owner.

1.29 GAS VENT - TYPE 1 (ITEM 28)

A Measurement

1. Measurement for payment under Item 28 on the Bid Form will be at a unit price basis for each Type 1 gas vent installed, complete as shown on the Drawings.

B Payment

1. Payment under Item 28 will be made for the quantity determined above at the unit price bid per gas vent which price and payment shall be full compensation for furnishing and installing the gas vents complete including excavation; pipes, fittings, flange, blind flange, pipe boot welded to geomembrane; pea gravel stone, and any other work necessary to install the gas vents complete as shown on the Drawings.

1.30 GAS VENT - TYPE 2 (ITEM 29)

A Measurement

1. Measurement for payment under Item 29 on the Bid Form will be at a unit price basis for each Type 2 gas vent installed, complete

as shown on the Drawings.

B Payment

1. Payment under Item 29 will be made for the quantity determined above at the unit price bid per gas vent which price and payment shall be full compensation for furnishing and installing the gas vents complete including excavation; pipes, fittings, flange, blind flange, pipe boot welded to geomembrane; and any other work necessary to install the gas vents complete as shown on the Drawings.

1.31 CHAIN LINK FENCE AND GATES (ITEM 30)

A Measurement

1. Measurement for payment under Item 30 will be on a linear foot basis as measured in place.

B Payment

1. Payment under Item 30 will be made for the quantity determined above at the unit price bid per linear foot which price payment shall be full compensation for furnishing and installing chain link fence and gates complete as shown on the Drawings and specified.

1.32 TEMPORARY EROSION CONTROL (ITEM 31)

A Measurement

1. Measurement for payment under Item 31 on the Bid Form will be on a lump sum basis for the temporary erosion control during construction.

B Payment

1. Payment for Item 31 will be made at the lump sum price bid which price and payment shall be full compensation for all labor, equipment and materials required including stabilized construction entrances, silt fences, hay bales, mulching, and all other work necessary to provide temporary soil erosion control during construction.

1.33 HYDROSEEDING (ITEM 32)

A Measurement

1. Measurement for payment under Item 32 on the Bid Form will be on an acre basis for hydroseeding within the limits of the Project as shown on the Drawings. Measurement will be performed in place, based on plan view area, with no allowances for slope correction.

B Payment

1. Payment for Item 32 will be made for the quantity determined above at the unit price bid per acre which price and payment shall be full compensation for all labor, equipment materials, and seeds required for hydroseeding.

1.34 LANDSCAPING (ITEM 33)

A Measurement

1. Measurement for payment under Item 33 on the Bid Form will be on a lump sum basis for the completed work.

B Payment

1. Payment for Item 33 shall be at the lump sum price bid which price and payment shall be full compensation for all labor, equipment, and materials required to landscape the site as detailed on the drawings.

1.35 MISCELLANEOUS WORK (ITEM 34)

A Measurement

1. Measurement for payment under Item 34 on the Bid Form will be on a lump sum basis.

B Payment

1. Payment for Item 34 shall be at the lump sum price bid which price and payment shall be full compensation for work for which separate payment is not provided under other Items.

1.36 GENERAL LIABILITY INSURANCE (ITEM 35)

A Measurement

1. Measurement for payment under Item 35 on the Bid Form will be on a lump sum basis for general liability insurance during the performance of the work.

B Payment

1. Payment for Item 35 shall be at the lump sum price bid which price and payment shall be full compensation for general liability insurance.

1.37 MOBILIZATION AND DEMOBILIZATION (ITEM 36)

A Measurement

1. Measurement for payment under Item 36 on the Bid Form will be on a lump sum basis for Contractor's mobilization and demobilization during the performance of the Work.

B Payment

1. Payment for Item 36 shall be at the lump sum price bid which price and payment shall be full compensation for mobilization of Contractor's personnel and accessing the site; all temporary facilities and utilities, demobilization and final site cleanup. Price shall not exceed one percent of the total Bid.

(dtwp/5999)

SECTION 02271

VERY LOW DENSITY POLYETHYLENE (VLDPE)

GEOMEMBRANE LINER

PART 1: GENERAL

1.01 SCOPE OF WORK

- A Furnish all labor, materials, tools, supervision, transportation, installation equipment, necessary for the manufacturing, fabrication, delivery, storage, installation, and testing of the textured very low density polyethylene (VLDPE) membrane liner of the final cover, as shown on the Drawings and as specified herein for the Alternate Capping Design Bid.
- B The installation of the membrane shall be performed in conjunction with the site preparation and placement of cover materials.

1.02 RELATED WORK

- A Construction Quality Assurance/Quality Control Plan is included in Appendix "A".
- B Contractor Quality Control is included in Section 01400.
- C Testing Laboratory Services are included in Section 01410.
- D Final cover select fill is included in Section 02231.
- E Geotextile is included in Section 02272.
- F Geonet composite is included in Section 02278.
- G Final cover construction is included in Section 02280.

1.03 MATERIAL WARRANTY

- A The membrane manufacturer shall warrant the material against manufacturing defects and material degradation in the outdoor exposure for a period of twenty years from the date of installation. The manufacturer shall replace at no expense any material which fails from the above causes within the warranty period. The manufacturer shall furnish a written warranty covering the requirements of this paragraph.

1.04 INSTALLATION AND WORKMANSHIP WARRANTY

- A The Contractor shall warrant the membrane against defects in installation and workmanship for the period of two years commencing with the date of final acceptance. The warranty shall include the services of qualified service technicians and all materials required for the repairs at no expense to the Owner. The Contractor shall furnish a written warranty covering the requirements of this

paragraph.

1.05 QUALITY ASSURANCE

- A All materials, procedures, operations, and methods shall be in strict conformance with the Drawings and Specifications and shall be subjected to strict quality control monitoring as detailed herein, and in the Construction Quality Assurance/Quality Control Plan prepared for this project. The installed system shall conform to the Drawings and Specifications, except as noted herein or otherwise authorized in writing by the Owner.
- B In the event that the manufacturer or installer specifications differ from these specifications the more stringent of the two, as determined by the Engineer, shall apply to this project.
- C In the event that the Construction Quality Assurance/Quality Control Plan differ from the requirements specified herein the more stringent of the two, as determined by the Engineer, shall apply to this project.

1.06 LEVEL OF EXPERIENCE

- A The Contractor shall provide the services of Manufacturers, Fabricators, and Installers of VLDPE membranes. All Subcontractors must possess an adequate level of experience for their portion of the work as specified herein.
- B All Subcontractors and Manufacturers shall be well established firms with more than two years experience for their portion of the work.
- C All Subcontractors and Manufacturers shall be able to provide sufficient production capacity and qualified personnel to meet the demands of the project.

1.07 DEFINITIONS

- A Manufacturer: Responsible for the production of the membrane and delivery of products to the factory for fabrication, or to the site.
- B Installer: Responsible for field handling, storing, deploying, anchoring, welding, temporary restraining (against wind), and other site aspects of the material. The Installer may also be responsible for transportation of these materials to the site. In addition the installer shall be trained and qualified to install VLDPE membranes and shall be approved and/or licensed by the VLDPE membrane Manufacturer and/or Fabricator. A common installer may be used for the installation of all VLDPE membranes. The Installer's qualifications will require the Engineer's approval.

1.08 SUBCONTRACTOR'S QUALIFICATIONS SUBMITTALS

- A VLDPE Membrane Manufacturer

Prior to the production of any membrane materials, and in accordance

with Section 01300, the Contractor shall submit the following information to the Engineer.

1. Corporate background and information.
2. Manufacturing capabilities including:
 - a. Information on plant size, equipment, personnel, number of shifts per day, and capacity per shift.
 - b. Daily production quantity available for this contract.
 - c. Quality control procedures for manufacturing.
 - d. List of material properties including certified test results, to which membrane samples are attached.
3. A list of at least five completed facilities, totaling a minimum of 200,000 m², (2,000,000 ft².), for which the Manufacturer has manufactured VLDPE membrane material. For each facility, the following information shall be provided:
 - a. Name and purpose of facility, its location, and date of installation.
 - b. Name of Owner, Project Manager, Designer, Fabricator (if any), and Installer.
 - c. Thicknesses of material and surface area of material manufactured.
 - d. Available information on the performance of the lining system and the facility.
4. Origin (resin suppliers name, and resin product plant) and identification (brand name, and identification number) of the resins.

B Installer

1. Copy of Installer's letter of approval or license by the Manufacturer and/or Fabricator.
2. Corporate background and information.
3. Description of installation capabilities, including:
 - a. Information on equipment and welding personnel.
 - b. Average daily production anticipated.
 - c. Quality control procedures.
 - d. Samples of field welds and list of certified minimum values of weld properties and test methods employed.

4. A list of at least five completed facilities, totaling a minimum of 200,000 m² (2,000,000 ft.²) for which the Installer has installed material of the types to be used for this project. For each installation, the following information shall be provided:
 - a. Name and purpose of facility, its location, and date of installation.
 - b. Name of Owner, Project Manager, Designer, Manufacturer, Fabricator, if any, and name of contact at the facility who can discuss the project.
 - c. Name and qualifications of the supervisor(s) of the Installer's crew(s).
 - d. Thickness of membrane and surface area of the installed material.
 - e. Type of welding and type of welding apparatus used.
 - f. Duration of installation.
 - g. Available information on the performance of the lining system and the facility.
 5. Resume of the welding foreman to be assigned to this project, including dates and duration of employment. This individual shall have experience welding a minimum of 2,000,000 ft² of membrane of the type used for this project, using the same type of apparatus as used for this project.
 6. Resume of the field representative or installation supervisor to be assigned to this project, including dates and duration of employment.
 7. A list of personnel performing field welding operations, along with pertinent experience information. All personnel performing welding operation shall be qualified by experience. Any proposed welding personnel deemed insufficiently experienced by the Engineer will not be permitted to work on this project.
 8. Identification of one representative who shall serve as the Installer's Superintendent, who shall represent the Installer at all site meetings and be responsible for acting as the Installer's spokesman on site. The Superintendent shall be pre-qualified for this role, on the basis of experience, management ability, and authority.
- C Submit additional information as may be requested by the Owner, Engineer or as may be required in the Construction Quality Assurance/Quality Control Plan.

1.09 INSTALLATION SUBMITTALS

- A It is the Contractor's responsibility to forward all submittals

listed below to the Engineer for review and approval.

- B Prior to the shipment of the membrane, submit the following in accordance with Section 01300.
 - 1. Copy of factory quality control certificates issued by the manufacturer for materials shipped to the site.
 - 2. Production date(s) of the membranes.
 - 3. Reports on tests conducted to verify the quality of the resin used to manufacture the membranes assigned to the project.
 - 4. Certification statement that the material properties shall meet the minimum requirements as outlined in Table 1 of this section.
- C Prior to commencement of the membrane installation, the Installer shall submit the following in accordance with Section 01300.
 - 1. A drawing showing the installation layout identifying field welds as well as any variance or additional details which deviate from the Drawings. The layout shall be adequate for use as a construction plan and shall include dimensions, details, etc.
 - 2. Details of welding the membrane, anchoring, connections, penetrations and other construction details, including details of boot installation.
 - 3. Installation schedule, including a detailed schedule for covering the membrane.
- D During the membrane installation, the Installer shall be responsible for the timely submission of quality control documentation. Such documentation will be reviewed with the project QC coordinator.
- E Upon completion of the membrane installation, the Installer shall submit the following in accordance with Section 01300:
 - 1. Installation certification with the requirements of standards specified herein for the membrane installation.
 - 2. The installation warranty.
 - 3. Maintenance and repair requirements.
- F Submit additional information as may be requested by the Owner, Engineer, or as may be required in the Construction Quality Assurance/Quality Control Plan.

1.10 EXTRA STOCK

- A The following shall be furnished to the Owner:
 - 1. One thousand (1000) square feet of membrane identical to that installed under this section.

2. Enough weldings rods to weld 3,000 linear feet of welds.

- B The Contractor shall provide the Engineer with written step-by-step instructions on the proper method of repairing any tears that may occur.

PART 2: PRODUCTS

2.01 MATERIALS

A General

1. The geomembrane shall be manufactured of new virgin resin, prime first-quality products designed and manufactured specifically for the purpose of liquid capping landfills and chemically resistant to leachate.
2. The geomembrane material shall be so produced as to be free of holes, blisters, undispersed raw materials, or any sign of contamination by foreign matter.
3. The sheets shall be manufactured in a minimum 15-ft seamless width. Labels on the roll shall identify the thickness, length, width, and manufacturer's lot number.

B Properties

1. The geomembrane shall be 40 mil thick, textured VLDPE membrane, and shall meet the minimum properties listed in Table 1 at the end of this Section.

C Other Materials

1. Extradite welding rods shall be of the same compound as the geomembrane and supplied by the manufacturer and shall be delivered in the original sealed containers. Each container shall have a label bearing the brand name, manufacturer's lot number, and complete directions as to proper storage.

2.02 MANUFACTURING QUALITY CONTROL AND TESTING

A VLDPE Membrane:

1. Raw Material: Testing shall be carried out by the membrane Manufacturer at his expense, to demonstrate that the resins meet the specifications. The Manufacturer shall certify in writing that the resins meet the specifications, and shall be held liable for any noncompliance. Any material manufactured from noncomplying resin will be rejected.
2. The membrane shall be continuously monitored during the manufacturing process for inclusions, bubbles, or other defects, and no material shall be accepted which exhibits any defects. The thickness shall also be monitored continuously during the manufacturing process and no material shall be accepted which

fails to meet the specified minimum thickness.

3. The manufacturer shall submit a description of the quality control program to evaluate the pertinent characteristics for quality control including membrane stress-deformation characteristics. If the program is acceptable to the Engineer, then the manufacturer shall submit quality control data and information as required under paragraph 2.02, A.5. ~~If the manufacturer does not have an in-house quality control program, or if the program is not acceptable to the Engineer, then the material shall be tested, at a minimum, once every 40,000 ft².~~ This testing shall be performed by the Manufacturer at the Manufacturer's expense. Samples not satisfying the specifications shall result in the rejection of the applicable rolls. In the case of a failure, subsequent testing shall be performed on products from the same resin batch to determine if material produced from the entire batch shall be regarded as unsatisfactory. At the Manufacturer's discretion and expense, additional testing of individual rolls may be performed to more closely identify the non-complying panels/rolls and/or qualify individual panels/rolls.
4. A listing of the minimum material properties can be found in Table 1 at the end of this Section.
5. In addition, the Manufacturer shall certify the quality of the rolls. As a minimum, the Manufacturer shall provide quality control certificates for each lot of resin and each shift's production of membrane. These quality control certificates shall be signed by responsible parties employed by the Manufacturer (such as the production manager), notarized, and supplied to the Engineer. The quality control certificate shall include:
 - a. Roll numbers and identification.
 - b. Sampling procedures.
 - c. Results of quality control tests, including description of test methods used.
6. The Manufacturer shall agree to allow the Owner and the Engineer to visit the manufacturing plant for a project specific visit. If possible, this visit shall be prior to or during the manufacturing of the membrane panels or rolls for the specific project. The Engineer shall review the quality control, laboratory facilities, and testing procedures.
7. During the project specific plant visit, those reviewing will also:
 - a. Verify that properties guaranteed by the Manufacturer meet these specifications.
 - b. Verify that the measurements of properties by the Manufacturer are properly documented and test methods used are acceptable.

- c. Spot inspect the rolls and verify that they are free of holes, blisters, or any sign of contamination by foreign matter.
 - d. Review packaging and transportation procedures to verify that these procedures are not damaging the membrane material.
 - e. Verify that panel and roll packages have a label indicating the name of the manufacturer, type of membrane sheet thickness, and roll number.
8. Panel Certification: Prior to shipment of the factory panels to the site, the Fabricator shall provide the Engineer with quality control certification for each shift's production of factory panels. The quality control certification shall be signed by a responsible party employed by the Fabricator such as the production manager, and shall be notarized. The quality control certification shall include:
- a. Factory panel numbers and identification.
 - b. Results of quality control tests including sampling procedures.
 - c. Documentation of repairs and non-destructive testing of repairs.

2.03 LABELING

- A Each roll or panel shall be identified with the following minimum information.
- 1) Name of manufacturer/fabricator,
 - 2) product type,
 - 3) product thickness,
 - 4) manufacturing lot code,
 - 5) date of manufacture,
 - 6) physical dimensions (length and width),
 - 7) panel or roll number per design layout pattern, and
 - 8) direction for unrolling panel or roll.
- B Panels or rolls that are not clearly labeled will be rejected.
- C Contractor shall inspect each roll or panel to ensure compliance with these Specifications and maintain a record of all roll and panel identification tags.

2.04 DELIVERY AND STORAGE

- A All membrane material delivered to the job site shall be stored off the ground and protected with a covering that protects the panels or rolls from physical damage, contamination by dirt, dust or water, and from extreme heat caused by direct sunlight.
- B Store, handle and transport material in strict conformance with the

Manufacturer's instructions.

- C Transportation of materials is the responsibility of the Contractor. The Contractor shall be liable for all damages to the materials incurred prior to and during transportation to the site.
- D Handling, storage, and care of materials prior to and following installation at the site, is the responsibility of the Contractor. The Contractor shall be liable for all damages to the materials incurred prior to final acceptance of the lining system by the Owner.
- E Material shall be stored in such a way that it is protected from prolonged exposure to ultraviolet radiation.

PART 3: EXECUTION

3.01 INSTALLATION OF VLDPE MEMBRANE

A Earthwork:

1. Conform to requirements set forth in Sections 02231 and 02278 of these Specifications.
2. Surface Preparations: The Contractor shall be responsible for preparing the supporting subgrade as specified in Section 02280. The Contractor shall inspect the site prior to the installation of the membrane to ensure that the surface is free of all foreign materials that could damage the material and that proper compaction of the subgrade has been achieved. Special care should be taken to maintain the prepared subgrade surfaces. Any damage to the subgrade caused by installation activities shall be repaired at the Contractor's expense.
3. Crest Anchorage System: The anchor trench, if any, shall be excavated prior to membrane placement to the lines grades and configuration shown on the Drawings. No loose soil shall be allowed beneath the membrane. The anchor trench shall be backfilled and compacted. Care shall be taken when backfilling the trenches to prevent any damage to the membrane. Slightly rounded corners shall be provided in the trench where the material adjoins the trench so as to avoid sharp bends in the membrane.

B Membrane Deployment:

1. Layout Drawings: The Contractor shall provide layout drawings prior to membrane deployment. These drawings shall indicate the panel configuration and location of welds. Field welds shall be differentiated from factory welds (if any). The layout drawings must be approved by the Engineer prior to the installation and manufacture of any panels. The layout drawings shall include dimensions, details, etc. The layout drawings, as modified and/or approved by the Engineer shall become part of these Specifications.

2. **Panel Identification:** A field panel is the unit area of membrane which is to be welded in the field. Each field panel must be given an "identification code" (number or letter-number) consistent with the layout plan. This identification code shall be agreed upon by the Engineer and Contractor. The field panel identification code shall be related through a table or chart, to the original resin, and the constituent rolls and factory panels.
3. **Field Panel Placement:**
 - a. **Location:** Field panels shall be installed as approved or modified, at the location and positions indicated in the layout drawings. Only those rolls of membrane that can be placed, field welded and inspected that day shall be unpackaged. The protective plastic layer which is on the weld area, if any, of the VLDPE shall not be removed until immediately before installation. Instructions on the boxes or wrapping containing the materials shall be followed to assure that the panels are unrolled in the proper direction for welding.
 - b. **Weather Conditions:** Membrane placement shall not proceed at an ambient temperature below 40 °F or above 104°F unless otherwise authorized, in writing, by the Engineer. Membrane placement shall not be done during any precipitation, in the presence of excessive moisture (e.g., fog, dew), in an area of ponded water, or in the presence of excessive winds.
 - c. **Method of Placement:** The Contractor shall ensure that:
 - (1) No equipment used shall damage the membrane by handling, trafficking, leakage of hydrocarbons, or other means.
 - (2) No personnel working on the membrane shall smoke, wear damaging shoes, or engage in other activities which could damage the material.
 - (3) The method used to unroll the panels shall not cause scratches or crimps in the material and shall not damage the supporting soil.
 - (4) The prepared surface underlying the membrane must not be allowed to deteriorate after acceptance and must remain acceptable up to the time of membrane placement.
 - (5) The method used to place the panels shall minimize wrinkles (especially differential wrinkles between adjacent panels).
 - (6) Adequate temporary loading and/or anchoring (e.g., sand bags, tires), not likely to damage the membrane, shall be placed to prevent uplift by wind (in case of high winds, continuous loading is recommended along edges of panels to minimize risk of wind flow under the panels).

- d. Damage: Any field panel or portion thereof which becomes seriously damaged (torn, twisted or crimped) shall be replaced at no additional cost to the Owner. Less serious damage may be repaired at the Owner's option. Damaged panels or portions of damaged panels which have been rejected shall be removed from the work area, and replaced at the Contractor's expense.

C Liner Boots

1. VLDPE boots or shrouds shall be furnished and installed where indicated on the Drawings. The boots shall be of the same material as the geomembrane.
2. The geomembrane end of the boots shall terminate in a skirt section suitable for welding to the geomembrane. The overlap between the boot and the geomembrane shall be approximately 18-in. The boot shall be welded to the geomembrane and shall be fastened by a stainless steel clamp.
3. Boots and shrouds shall fit snugly around the pipe. Prefabricated material shall be designed to fit the site specific condition for the intended slope and size of pipe.

D Field Welding:

1. Weld (Seam) Layout: In general, welds shall be oriented parallel to the line of maximum slope, i.e., oriented along, not across, the slope. In corners and odd-shaped geometric locations, the number of field welds shall be minimized. Horizontal welds shall not terminate at the toe of the slope but shall run out for a minimum distance of 5 feet. No welds shall be located in the areas of potential stress concentrations. Overall field weld length shall be minimized.
2. Requirements of Personnel: All personnel performing welding operations shall be qualified as previously indicated.
3. The welding foreman shall provide direct supervision, as required, over less experienced welders. No welding shall be carried out without the welding foreman being present.
4. Weld Preparation:
 - a. Prior to welding, the weld area shall be clean and free of moisture, dust, dirt, debris of any kind, and foreign material.
 - b. Welds shall be aligned with the fewest possible number of wrinkles and "fishmouths".
5. Individual panels of geomembrane shall be laid out and overlapped by a minimum of 3-in to 5-in prior to welding. The area to be welded shall be cleaned and prepared in accordance with the quality control welding procedures.

6. Single or double track hot wedge fusion welder shall be used as a primary welding method.
7. Extrusion welder shall be used for cross seam tees, patches and repairs.
8. The welding equipment used shall be equipped with legible temperature gage and capable of continuously monitoring and controlling the temperatures in the zone of contact where the machine is actually fusing the geomembrane material so as to ensure that changes in environmental conditions will not affect the integrity of the weld.
9. Any fillet weld that is terminated long enough (could be less than three minutes - depending on temperature) for the extradite to "set up" (harden) is considered a start-stop weld and must be ground prior to restarting (i.e., starting approximately two inches from the termination point. The weld is feathered to a point.
10. No "fish mouths" will be allowed within the weld area. Where "fish mouths" occur, the material shall be cut, overlapped and a fusion welded patch shall be applied. All welds upon completion of the work shall be tightly bonded. Any geomembrane area showing injury due to excessive scuffing, puncture, or distress from any cause shall be replaced or repaired with an additional piece of geomembrane. The number of patches per 100-ft length shall not exceed five. If more than five patches per 100-ft length are necessary, then the entire 100-ft length of weld shall be removed. Further welding will cease at this time and the Engineer shall be notified.
11. All welds shall have a weld number that corresponds with the panel layout numbers. The numbering system shall be used in the development of the record drawings. Weld numbers shall be derived from the combination of the two panel numbers that are to be welded together.
12. All fusion welded "T" seams (i.e., the result of the geomembrane panels placed perpendicular to each other) shall be double welded where possible. The extrusion process shall be used for the second weld.
13. All extradite shall be free of dirt, dry and protected from damage.
14. If an extrusion welder is stopped for longer than one minute, it shall be purged to remove heat-degraded extradite. All purged extradite shall be placed on a sacrificial sheet and disposed of.
15. To prevent moisture buildup during fusion welding, it may be necessary to place a movable protective layer of plastic directly below each overlap of geomembrane that is to be welded.
16. If required, a firm substrate shall be provided by using a flat

board, slip sheet or similar hard surface directly under the weld overlap to achieve proper support.

17. All welds shall extend into the anchor trench.

18. All factory welds, field welds, and repair welds shall meet weld strength requirements specified in Table 1.

E Normal Weather Conditions for Welding:

1. The normal required weather conditions for seaming are:

- a. Ambient temperature higher than 40 degrees F and lower than 104 degrees F.
- b. No precipitation or other excessive moisture, such as fog or dew.
- c. No excessive winds.
- d. These weather conditions shall be fulfilled during seaming process.

F Cold Weather Conditions for Welding:

1. If the ambient temperature is below 40 degrees F, the following conditions shall be met to ensure quality seaming process:
 - a. Preheating the surface of the geomembrane to achieve normal temperature range.
 - b. Preheating may be waived by the Engineer if the installer demonstrates that satisfactory welds of equivalent quality may be obtained without preheating at the expected temperature of installation.
 - c. Preheating devices shall be approved by the manufacturer.
 - d. Care shall be taken to assure that surface temperatures are not lowered below the minimum required surface temperature for welding due to winds.
 - e. Test seams, as described in Paragraph 21, shall be performed under the same ambient temperature conditions as the actual seams.
 - f. Additional destructive tests samples shall be taken at the discretion of the Engineer.

G Warm Weather Conditions for Welding:

1. If the ambient temperature is above 104 degrees F, no welding of geomembrane shall be permitted unless the installer can demonstrate to the satisfaction of the Engineer that geomembrane weld quality is not adversely impacted.

2. Test welds shall be performed under the same ambient temperature conditions as the actual welds
3. Additional destructive tests shall be taken at the discretion of the Engineer.

H Start-up Weld Testing

1. A test weld 3-ft long from each welding machine shall be run upon the beginning of each shift and every four hours thereafter, under the same conditions as exist for the geomembrane welding. The test weld shall be marked with date, ambient temperature and welding machine number. A tensiometer, supplied by the installer, shall be required to be on-site before and during geomembrane installation for the purpose of testing samples. Specimens of weld 1-in wide shall be cut from the test weld and tested on site for shear and peel strength in accordance with Table 1. No welder may start work until the sample weld has been approved by the Engineer.
2. Test welds shall be performed under the same conditions as the actual welds and shall be at least 3-ft long, 1-ft wide after welding. Samples for welding tests shall be cut out of the geomembrane rolls

I Nondestructive Weld Testing

1. The installer shall perform nondestructive test on all field welds over their full length. The purpose of this test is to assure continuity and integrity of the welds. Vacuum and air pressure tests shall be used for nondestructive testing. The vacuum test shall be used for extrusion welds and single track hot wedge welds. The air pressure test shall be used for double track hot wedge welds.

2. Vacuum Testing

- a. Equipment for testing single wedge fusion welds and extrusion welds shall be comprised of the following:
 - (1) A vacuum box assembly consisting of a rigid housing, a transparent viewing window, a soft rubber gasket attached to the bottom, port hole or valve assembly and a vacuum gage.
 - (2) A vacuum tank and pump assembly equipped with a pressure controller and pipe connections.
 - (3) A rubber pressure/vacuum hose with fittings and connections.
 - (4) A plastic bucket and wide paint brush.
 - (5) A soapy solution.

b. The following procedures shall be followed by the installer.

- (1) Excess sheet overlap shall be trimmed away.
- (2) Clean the window, gasket surfaces and check for leaks.
- (3) Energize the vacuum pump and reduce the tank pressure to approximately 5 psi.
- (4) Wet a strip of geomembrane approximately 12-in by 48-in (length of box) with the soapy solution.
- (5) Place the box over the wetted area and compress.
- (6) Close the bleed valve and open the vacuum valve.
- (7) Ensure that a leak-tight seal is created.
- (8) For a minimum period of ten seconds, examine the geomembrane through the viewing window for the presence of soap bubbles.
- (9) If no bubbles appear after ten seconds, close the vacuum valve and open the bleed valve, move the box over the next adjoining area with a minimum of 3-in overlap and repeat the process.
- (10) All areas where soap bubbles appear shall be marked and repaired in accordance with Paragraph 3.07F and then retested.

c. If the weld cannot be tested prior to final installation, the welding operations shall be observed by the Engineer for uniformity and completeness.

3. Air Pressure Testing (for double track fusion welds only).

a. The following procedures are applicable to those processes which produce a double weld with an enclosed space.

b. Equipment for testing double wedge fusion welds shall be comprised of the following:

- (1) An air pump equipped with pressure gage capable of generating and sustaining a pressure between 25 and 30 psi and mounted on a cushion to protect the geomembrane.
- (2) A manometer equipped with a sharp hollow needle, or other approved pressure feed device.

c. The following procedures shall be followed by the installer.

- (1) Seal both ends of the weld to be tested.
- (2) Insert needle or other approved pressure feed device into

4. A list of at least five completed facilities, totaling a minimum of 200,000 m² (2,000,000 ft.²) for which the Installer has installed material of the types to be used for this project. For each installation, the following information shall be provided:
 - a. Name and purpose of facility, its location, and date of installation.
 - b. Name of Owner, Project Manager, Designer, Manufacturer, Fabricator, if any, and name of contact at the facility who can discuss the project.
 - c. Name and qualifications of the supervisor(s) of the Installer's crew(s).
 - d. Thickness of membrane and surface area of the installed material.
 - e. Type of welding and type of welding apparatus used.
 - f. Duration of installation.
 - g. Available information on the performance of the lining system and the facility.
 5. Resume of the welding foreman to be assigned to this project, including dates and duration of employment. This individual shall have experience welding a minimum of 2,000,000 ft² of membrane of the type used for this project, using the same type of apparatus as used for this project.
 6. Resume of the field representative or installation supervisor to be assigned to this project, including dates and duration of employment.
 7. A list of personnel performing field welding operations, along with pertinent experience information. All personnel performing welding operation shall be qualified by experience. Any proposed welding personnel deemed insufficiently experienced by the Engineer will not be permitted to work on this project.
 8. Identification of one representative who shall serve as the Installer's Superintendent, who shall represent the Installer at all site meetings and be responsible for acting as the Installer's spokesman on site. The Superintendent shall be pre-qualified for this role, on the basis of experience, management ability, and authority.
- C Submit additional information as may be requested by the Owner, Engineer or as may be required in the Construction Quality Assurance/Quality Control Plan.

1.09 INSTALLATION SUBMITTALS

- A It is the Contractor's responsibility to forward all submittals

listed below to the Engineer for review and approval.

- B Prior to the shipment of the membrane, submit the following in accordance with Section 01300.
 - 1. Copy of factory quality control certificates issued by the manufacturer for materials shipped to the site.
 - 2. Production date(s) of the membranes.
 - 3. Reports on tests conducted to verify the quality of the resin used to manufacture the membranes assigned to the project.
 - 4. Certification statement that the material properties shall meet the minimum requirements as outlined in Table 1 of this section.
- C Prior to commencement of the membrane installation, the Installer shall submit the following in accordance with Section 01300.
 - 1. A drawing showing the installation layout identifying field welds as well as any variance or additional details which deviate from the Drawings. The layout shall be adequate for use as a construction plan and shall include dimensions, details, etc.
 - 2. Details of welding the membrane, anchoring, connections, penetrations and other construction details, including details of boot installation.
 - 3. Installation schedule, including a detailed schedule for covering the membrane.
- D During the membrane installation, the Installer shall be responsible for the timely submission of quality control documentation. Such documentation will be reviewed with the project QC coordinator.
- E Upon completion of the membrane installation, the Installer shall submit the following in accordance with Section 01300:
 - 1. Installation certification with the requirements of standards specified herein for the membrane installation.
 - 2. The installation warranty.
 - 3. Maintenance and repair requirements.
- F Submit additional information as may be requested by the Owner, Engineer, or as may be required in the Construction Quality Assurance/Quality Control Plan.

1.10 EXTRA STOCK

- A The following shall be furnished to the Owner:
 - 1. One thousand (1000) square feet of membrane identical to that installed under this section.

2. Enough weldings rods to weld 3,000 linear feet of welds.

- B The Contractor shall provide the Engineer with written step-by-step instructions on the proper method of repairing any tears that may occur.

PART 2: PRODUCTS

2.01 MATERIALS

A General

1. The geomembrane shall be manufactured of new virgin resin, prime first-quality products designed and manufactured specifically for the purpose of liquid capping landfills and chemically resistant to leachate.
2. The geomembrane material shall be so produced as to be free of holes, blisters, undispersed raw materials, or any sign of contamination by foreign matter.
3. The sheets shall be manufactured in a minimum 15-ft seamless width. Labels on the roll shall identify the thickness, length, width, and manufacturer's lot number.

B Properties

1. The geomembrane shall be 40 mil thick, textured VLDPE membrane, and shall meet the minimum properties listed in Table 1 at the end of this Section.

C Other Materials

1. Extradite welding rods shall be of the same compound as the geomembrane and supplied by the manufacturer and shall be delivered in the original sealed containers. Each container shall have a label bearing the brand name, manufacturer's lot number, and complete directions as to proper storage.

2.02 MANUFACTURING QUALITY CONTROL AND TESTING

A VLDPE Membrane:

1. Raw Material: Testing shall be carried out by the membrane Manufacturer at his expense, to demonstrate that the resins meet the specifications. The Manufacturer shall certify in writing that the resins meet the specifications, and shall be held liable for any noncompliance. Any material manufactured from noncomplying resin will be rejected.
2. The membrane shall be continuously monitored during the manufacturing process for inclusions, bubbles, or other defects, and no material shall be accepted which exhibits any defects. The thickness shall also be monitored continuously during the manufacturing process and no material shall be accepted which

fails to meet the specified minimum thickness.

3. The manufacturer shall submit a description of the quality control program to evaluate the pertinent characteristics for quality control including membrane stress-deformation characteristics. If the program is acceptable to the Engineer, then the manufacturer shall submit quality control data and information as required under paragraph 2.02, A.5. ~~If the manufacturer does not have an in-house quality control program, or if the program is not acceptable to the Engineer, then the material shall be tested, at a minimum, once every 40,000 ft².~~ This testing shall be performed by the Manufacturer at the Manufacturer's expense. Samples not satisfying the specifications shall result in the rejection of the applicable rolls. In the case of a failure, subsequent testing shall be performed on products from the same resin batch to determine if material produced from the entire batch shall be regarded as unsatisfactory. At the Manufacturer's discretion and expense, additional testing of individual rolls may be performed to more closely identify the non-complying panels/rolls and/or qualify individual panels/rolls.
4. A listing of the minimum material properties can be found in Table 1 at the end of this Section.
5. In addition, the Manufacturer shall certify the quality of the rolls. As a minimum, the Manufacturer shall provide quality control certificates for each lot of resin and each shift's production of membrane. These quality control certificates shall be signed by responsible parties employed by the Manufacturer (such as the production manager), notarized, and supplied to the Engineer. The quality control certificate shall include:
 - a. Roll numbers and identification.
 - b. Sampling procedures.
 - c. Results of quality control tests, including description of test methods used.
6. The Manufacturer shall agree to allow the Owner and the Engineer to visit the manufacturing plant for a project specific visit. If possible, this visit shall be prior to or during the manufacturing of the membrane panels or rolls for the specific project. The Engineer shall review the quality control, laboratory facilities, and testing procedures.
7. During the project specific plant visit, those reviewing will also:
 - a. Verify that properties guaranteed by the Manufacturer meet these specifications.
 - b. Verify that the measurements of properties by the Manufacturer are properly documented and test methods used are acceptable.

- c. Spot inspect the rolls and verify that they are free of holes, blisters, or any sign of contamination by foreign matter.
 - d. Review packaging and transportation procedures to verify that these procedures are not damaging the membrane material.
 - e. Verify that panel and roll packages have a label indicating the name of the manufacturer, type of membrane sheet thickness, and roll number.
8. Panel Certification: Prior to shipment of the factory panels to the site, the Fabricator shall provide the Engineer with quality control certification for each shift's production of factory panels. The quality control certification shall be signed by a responsible party employed by the Fabricator such as the production manager, and shall be notarized. The quality control certification shall include:
- a. Factory panel numbers and identification.
 - b. Results of quality control tests including sampling procedures.
 - c. Documentation of repairs and non-destructive testing of repairs.

2.03 LABELING

- A Each roll or panel shall be identified with the following minimum information.
- 1) Name of manufacturer/fabricator,
 - 2) product type,
 - 3) product thickness,
 - 4) manufacturing lot code,
 - 5) date of manufacture,
 - 6) physical dimensions (length and width),
 - 7) panel or roll number per design layout pattern, and
 - 8) direction for unrolling panel or roll.
- B Panels or rolls that are not clearly labeled will be rejected.
- C Contractor shall inspect each roll or panel to ensure compliance with these Specifications and maintain a record of all roll and panel identification tags.

2.04 DELIVERY AND STORAGE

- A All membrane material delivered to the job site shall be stored off the ground and protected with a covering that protects the panels or rolls from physical damage, contamination by dirt, dust or water, and from extreme heat caused by direct sunlight.
- B Store, handle and transport material in strict conformance with the

Manufacturer's instructions.

- C Transportation of materials is the responsibility of the Contractor. The Contractor shall be liable for all damages to the materials incurred prior to and during transportation to the site.
- D Handling, storage, and care of materials prior to and following installation at the site, is the responsibility of the Contractor. The Contractor shall be liable for all damages to the materials incurred prior to final acceptance of the lining system by the Owner.
- E Material shall be stored in such a way that it is protected from prolonged exposure to ultraviolet radiation.

PART 3: EXECUTION

3.01 INSTALLATION OF VLDPE MEMBRANE

A Earthwork:

1. Conform to requirements set forth in Sections 02231 and 02278 of these Specifications.
2. Surface Preparations: The Contractor shall be responsible for preparing the supporting subgrade as specified in Section 02280. The Contractor shall inspect the site prior to the installation of the membrane to ensure that the surface is free of all foreign materials that could damage the material and that proper compaction of the subgrade has been achieved. Special care should be taken to maintain the prepared subgrade surfaces. Any damage to the subgrade caused by installation activities shall be repaired at the Contractor's expense.
3. Crest Anchorage System: The anchor trench, if any, shall be excavated prior to membrane placement to the lines grades and configuration shown on the Drawings. No loose soil shall be allowed beneath the membrane. The anchor trench shall be backfilled and compacted. Care shall be taken when backfilling the trenches to prevent any damage to the membrane. Slightly rounded corners shall be provided in the trench where the material adjoins the trench so as to avoid sharp bends in the membrane.

B Membrane Deployment:

1. Layout Drawings: The Contractor shall provide layout drawings prior to membrane deployment. These drawings shall indicate the panel configuration and location of welds. Field welds shall be differentiated from factory welds (if any). The layout drawings must be approved by the Engineer prior to the installation and manufacture of any panels. The layout drawings shall include dimensions, details, etc. The layout drawings, as modified and/or approved by the Engineer shall become part of these Specifications.

2. **Panel Identification:** A field panel is the unit area of membrane which is to be welded in the field. Each field panel must be given an "identification code" (number or letter-number) consistent with the layout plan. This identification code shall be agreed upon by the Engineer and Contractor. The field panel identification code shall be related through a table or chart, to the original resin, and the constituent rolls and factory panels.
3. **Field Panel Placement:**
 - a. **Location:** Field panels shall be installed as approved or modified, at the location and positions indicated in the layout drawings. Only those rolls of membrane that can be placed, field welded and inspected that day shall be unpackaged. The protective plastic layer which is on the weld area, if any, of the VLDPE shall not be removed until immediately before installation. Instructions on the boxes or wrapping containing the materials shall be followed to assure that the panels are unrolled in the proper direction for welding.
 - b. **Weather Conditions:** Membrane placement shall not proceed at an ambient temperature below 40 °F or above 104°F unless otherwise authorized, in writing, by the Engineer. Membrane placement shall not be done during any precipitation, in the presence of excessive moisture (e.g., fog, dew), in an area of ponded water, or in the presence of excessive winds.
 - c. **Method of Placement:** The Contractor shall ensure that:
 - (1) No equipment used shall damage the membrane by handling, trafficking, leakage of hydrocarbons, or other means.
 - (2) No personnel working on the membrane shall smoke, wear damaging shoes, or engage in other activities which could damage the material.
 - (3) The method used to unroll the panels shall not cause scratches or crimps in the material and shall not damage the supporting soil.
 - (4) The prepared surface underlying the membrane must not be allowed to deteriorate after acceptance and must remain acceptable up to the time of membrane placement.
 - (5) The method used to place the panels shall minimize wrinkles (especially differential wrinkles between adjacent panels).
 - (6) Adequate temporary loading and/or anchoring (e.g., sand bags, tires), not likely to damage the membrane, shall be placed to prevent uplift by wind (in case of high winds, continuous loading is recommended along edges of panels to minimize risk of wind flow under the panels).

- d. Damage: Any field panel or portion thereof which becomes seriously damaged (torn, twisted or crimped) shall be replaced at no additional cost to the Owner. Less serious damage may be repaired at the Owner's option. Damaged panels or portions of damaged panels which have been rejected shall be removed from the work area, and replaced at the Contractor's expense.

C Liner Boots

1. VLDPE boots or shrouds shall be furnished and installed where indicated on the Drawings. The boots shall be of the same material as the geomembrane.
2. The geomembrane end of the boots shall terminate in a skirt section suitable for welding to the geomembrane. The overlap between the boot and the geomembrane shall be approximately 18-in. The boot shall be welded to the geomembrane and shall be fastened by a stainless steel clamp.
3. Boots and shrouds shall fit snugly around the pipe. Prefabricated material shall be designed to fit the site specific condition for the intended slope and size of pipe.

D Field Welding:

1. Weld (Seam) Layout: In general, welds shall be oriented parallel to the line of maximum slope, i.e., oriented along, not across, the slope. In corners and odd-shaped geometric locations, the number of field welds shall be minimized. Horizontal welds shall not terminate at the toe of the slope but shall run out for a minimum distance of 5 feet. No welds shall be located in the areas of potential stress concentrations. Overall field weld length shall be minimized.
2. Requirements of Personnel: All personnel performing welding operations shall be qualified as previously indicated.
3. The welding foreman shall provide direct supervision, as required, over less experienced welders. No welding shall be carried out without the welding foreman being present.
4. Weld Preparation:
 - a. Prior to welding, the weld area shall be clean and free of moisture, dust, dirt, debris of any kind, and foreign material.
 - b. Welds shall be aligned with the fewest possible number of wrinkles and "fishmouths".
5. Individual panels of geomembrane shall be laid out and overlapped by a minimum of 3-in to 5-in prior to welding. The area to be welded shall be cleaned and prepared in accordance with the quality control welding procedures.

6. Single or double track hot wedge fusion welder shall be used as a primary welding method.
7. Extrusion welder shall be used for cross seam tees, patches and repairs.
8. The welding equipment used shall be equipped with legible temperature gage and capable of continuously monitoring and controlling the temperatures in the zone of contact where the machine is actually fusing the geomembrane material so as to ensure that changes in environmental conditions will not affect the integrity of the weld.
9. Any fillet weld that is terminated long enough (could be less than three minutes - depending on temperature) for the extradite to "set up" (harden) is considered a start-stop weld and must be ground prior to restarting (i.e., starting approximately two inches from the termination point. The weld is feathered to a point.
10. No "fish mouths" will be allowed within the weld area. Where "fish mouths" occur, the material shall be cut, overlapped and a fusion welded patch shall be applied. All welds upon completion of the work shall be tightly bonded. Any geomembrane area showing injury due to excessive scuffing, puncture, or distress from any cause shall be replaced or repaired with an additional piece of geomembrane. The number of patches per 100-ft length shall not exceed five. If more than five patches per 100-ft length are necessary, then the entire 100-ft length of weld shall be removed. Further welding will cease at this time and the Engineer shall be notified.
11. All welds shall have a weld number that corresponds with the panel layout numbers. The numbering system shall be used in the development of the record drawings. Weld numbers shall be derived from the combination of the two panel numbers that are to be welded together.
12. All fusion welded "T" seams (i.e., the result of the geomembrane panels placed perpendicular to each other) shall be double welded where possible. The extrusion process shall be used for the second weld.
13. All extradite shall be free of dirt, dry and protected from damage.
14. If an extrusion welder is stopped for longer than one minute, it shall be purged to remove heat-degraded extradite. All purged extradite shall be placed on a sacrificial sheet and disposed of.
15. To prevent moisture buildup during fusion welding, it may be necessary to place a movable protective layer of plastic directly below each overlap of geomembrane that is to be welded.
16. If required, a firm substrate shall be provided by using a flat

board, slip sheet or similar hard surface directly under the weld overlap to achieve proper support.

17. All welds shall extend into the anchor trench.
18. All factory welds, field welds, and repair welds shall meet weld strength requirements specified in Table 1.

E Normal Weather Conditions for Welding:

1. The normal required weather conditions for seaming are:
 - a. Ambient temperature higher than 40 degrees F and lower than 104 degrees F.
 - b. No precipitation or other excessive moisture, such as fog or dew.
 - c. No excessive winds.
 - d. These weather conditions shall be fulfilled during seaming process.

F Cold Weather Conditions for Welding:

1. If the ambient temperature is below 40 degrees F, the following conditions shall be met to ensure quality seaming process:
 - a. Preheating the surface of the geomembrane to achieve normal temperature range.
 - b. Preheating may be waived by the Engineer if the installer demonstrates that satisfactory welds of equivalent quality may be obtained without preheating at the expected temperature of installation.
 - c. Preheating devices shall be approved by the manufacturer.
 - d. Care shall be taken to assure that surface temperatures are not lowered below the minimum required surface temperature for welding due to winds.
 - e. Test seams, as described in Paragraph 21, shall be performed under the same ambient temperature conditions as the actual seams.
 - f. Additional destructive tests samples shall be taken at the discretion of the Engineer.

G Warm Weather Conditions for Welding:

1. If the ambient temperature is above 104 degrees F, no welding of geomembrane shall be permitted unless the installer can demonstrate to the satisfaction of the Engineer that geomembrane weld quality is not adversely impacted.

2. Test welds shall be performed under the same ambient temperature conditions as the actual welds
3. Additional destructive tests shall be taken at the discretion of the Engineer.

H Start-up Weld Testing

1. A test weld 3-ft long from each welding machine shall be run upon the beginning of each shift and every four hours thereafter, under the same conditions as exist for the geomembrane welding. The test weld shall be marked with date, ambient temperature and welding machine number. A tensiometer, supplied by the installer, shall be required to be on-site before and during geomembrane installation for the purpose of testing samples. Specimens of weld 1-in wide shall be cut from the test weld and tested on site for shear and peel strength in accordance with Table 1. No welder may start work until the sample weld has been approved by the Engineer.
2. Test welds shall be performed under the same conditions as the actual welds and shall be at least 3-ft long, 1-ft wide after welding. Samples for welding tests shall be cut out of the geomembrane rolls

I Nondestructive Weld Testing

1. The installer shall perform nondestructive test on all field welds over their full length. The purpose of this test is to assure continuity and integrity of the welds. Vacuum and air pressure tests shall be used for nondestructive testing. The vacuum test shall be used for extrusion welds and single track hot wedge welds. The air pressure test shall be used for double track hot wedge welds.

2. Vacuum Testing

- a. Equipment for testing single wedge fusion welds and extrusion welds shall be comprised of the following:
 - (1) A vacuum box assembly consisting of a rigid housing, a transparent viewing window, a soft rubber gasket attached to the bottom, port hole or valve assembly and a vacuum gage.
 - (2) A vacuum tank and pump assembly equipped with a pressure controller and pipe connections.
 - (3) A rubber pressure/vacuum hose with fittings and connections.
 - (4) A plastic bucket and wide paint brush.
 - (5) A soapy solution.

- b. The following procedures shall be followed by the installer.
 - (1) Excess sheet overlap shall be trimmed away.
 - (2) Clean the window, gasket surfaces and check for leaks.
 - (3) Energize the vacuum pump and reduce the tank pressure to approximately 5 psi.
 - (4) Wet a strip of geomembrane approximately 12-in by 48-in (length of box) with the soapy solution.
 - (5) Place the box over the wetted area and compress.
 - (6) Close the bleed valve and open the vacuum valve.
 - (7) Ensure that a leak-tight seal is created.
 - (8) For a minimum period of ten seconds, examine the geomembrane through the viewing window for the presence of soap bubbles.
 - (9) If no bubbles appear after ten seconds, close the vacuum valve and open the bleed valve, move the box over the next adjoining area with a minimum of 3-in overlap and repeat the process.
 - (10) All areas where soap bubbles appear shall be marked and repaired in accordance with Paragraph 3.07F and then retested.
- c. If the weld cannot be tested prior to final installation, the welding operations shall be observed by the Engineer for uniformity and completeness.

3. Air Pressure Testing (for double track fusion welds only).

- a. The following procedures are applicable to those processes which produce a double weld with an enclosed space.
- b. Equipment for testing double wedge fusion welds shall be comprised of the following:
 - (1) An air pump equipped with pressure gage capable of generating and sustaining a pressure between 25 and 30 psi and mounted on a cushion to protect the geomembrane.
 - (2) A manometer equipped with a sharp hollow needle, or other approved pressure feed device.
- c. The following procedures shall be followed by the installer.
 - (1) Seal both ends of the weld to be tested.
 - (2) Insert needle or other approved pressure feed device into

the tunnel created by the double wedge fusion weld.

- (3) Energize the air pump to a pressure between 25 and 30 psi, close valve and sustain pressure for at least five minutes.
- (4) If loss of pressure exceeds 4 psi, or pressure does not stabilize, locate faulty area, repair in accordance with Paragraph 3.01M and retest.
- (5) Remove needle or other approved pressure feed device and seal.

d. Destructive weld testing shall be performed in accordance with Paragraph 3.01J.

J Destructive Weld Testing

1. The purpose of the destructive testing is to evaluate weld strength properties. A minimum of one test sample shall be obtained per 500 feet of performed weld length or one sample per crew per day whichever produces the maximum number of samples. The location of samples shall be determined by the Engineer. Selection of such locations may be prompted by suspicion of overheating, contamination, or other potential cause that may adversely impact the welds. Field samples shall be taken by the installer. The Owner, at the recommendation of the Engineer, reserves the right to increase the frequency in accordance with actual performance results of samples taken. Additional sampling and testing will be paid according to Section 01410.

a. Sampling Procedures

- (1) Samples shall be cut by the installer at locations chosen by the Engineer as the welding progresses.
- (2) The welds shall not be covered by another material before they have been tested and accepted by the Engineer.
- (3) Upon obtaining each sample, the Engineer shall assign a number to the sample and mark it accordingly.
- (4) Record sample location on layout drawing.
- (5) Record purpose of the sample, statistical routine or suspicious weld area.
- (6) Holes in the geomembrane resulting from destructive seam testing shall be immediately repaired in accordance with Paragraph 3.01M.

2. Size and Disposition of Samples

- b. The sample for laboratory testing shall be located between the samples for field testing. The sample for laboratory testing

shall be 12-in wide by 36-in long with the seam centered lengthwise. The sample shall be cut into three parts and distributed as follows:

- (1) One portion to the Contractor for optional laboratory testing, at Contractor's expense, 12-in by 12-in.
- (2) One portion for the Quality Assurance Laboratory for Testing, 12-in by 12-in.
- (3) One portion to the Owner for archive storage, 12-in by 12-in.

K ~~Quality Assurance Laboratory Test~~

1. The following shall be performed by the Quality Assurance Laboratory.
 - a. The installer shall package and ship distinctive test samples to the Quality Assurance Laboratory to be tested for shear and peel strength, in accordance with the criteria set in Table 1.
 - b. The laboratory shall test five specimens for shear seam strength and five for peel strength. Four out of the five replicate test specimens shall pass for the seam to be acceptable.
 - c. Any specimen that fails through the weld or fusion at the weld sheet interface is a non-FTB (Film Tearing Bond) break and shall be considered a failure.
 - d. The laboratory shall provide verbal test results to the Engineer ~~no later than 24 hours after they receive the samples.~~ The Engineer shall review the laboratory results as soon as they become available.

L Procedures for Destructive Test Failure

1. The following procedures shall apply whenever a sample fails a destructive test. The installer has two options.
 - a. The installer can repair the seam between any two passing test locations.
 - b. The installer can retrace the welding path by obtaining two additional samples 10-ft on either side of the failed sample location. The additional samples shall be tested in the field. If the samples pass the field test, the installer shall repair the weld bounded by the additional passing samples. If the samples fail, the installer shall obtain an additional sample 10-ft away from the side of the failed sample for testing. This process shall be repeated to establish the failure zone bounded by two passing samples for repair. Failed welds shall be repaired in accordance with Paragraph 3.01N.

2. All acceptable repaired welds shall be bound by two locations from which samples passing laboratory destructive tests have been taken. In cases where repaired weld exceeds 150-ft, a sample taken from the zone in which the weld has been repaired must pass destructive testing. Repairs shall be made in accordance with Paragraph 3.01M.

M Repair Procedures

1. Any portion of the geomembrane exhibiting signs of defect, failing a destructive or a nondestructive test shall be repaired. Several procedure exist for the repair of these areas. The final decision as to the appropriate repair procedure shall be made by the Engineer.
2. The repair procedures available include:
 - a. Patching is used to repair large holes, tears, undispersed raw materials and contamination by foreign matter.
 - b. Spot welding or seaming is used to repair small tears, pinholes, or other minor, localized defects.
 - c. Capping (12-in minimum width) is used to repair large lengths of failed welds
 - d. Removing bad weld and replace with a strip of new material welded in place.
3. For any repair method, the following provisions shall be satisfied:
 - a. Surfaces of the geomembrane which are to be repaired using extrusion methods shall be abraded immediately prior to the repair.
 - b. All surfaces shall be clean and dry at the time of the repair.

N Repair Verification

1. Each repair shall be nondestructively tested using the vacuum box testing method described in Paragraph 3.01I. Repairs which pass the nondestructive test shall be taken as an indication of an adequate repair. Repairs more than 150-ft long may be of sufficient length to require destructive test sampling, at the discretion of the Engineer. Failed test indicate that the repair shall be redone and retested until a passing test results are achieved. All retesting expenses shall be borne by the Contractor.
- 0 Large Wrinkles: When welding of the membrane is completed and prior to placing overlying materials, the Engineer shall identify all excessive wrinkles. The Contractor shall cut and reweld all wrinkles so identified. The weld thus produced shall be tested like any other weld.

3.02 VLDPE MEMBRANE ACCEPTANCE

- A The Contractor shall retain all ownership and responsibility for membrane material in the final cover system until acceptance by the Owner.
- B The membrane shall be accepted by the Owner when:
 - 1. The installation is completed and accepted by the Engineer.
 - 2. All documentation of installation is completed.
 - 3. Verification of the adequacy of all field welds and repairs, including associated testing, is complete.
 - 4. Written certification documents, including record drawings, signed and sealed by a Registered Professional Engineer in the State of New York have been received by the Owner.

(dtwp/5998)

TABLE 1

MATERIAL PROPERTIES OF TEXTURED VLDPE MEMBRANE

<u>Property</u>	<u>Value</u>
Thickness (mils) (ASTM D1593)	40 nominal 40 minimum average ¹
Density (g/cc), maximum (ASTM D1505)	0.930
Melt Index (g/10 minute), maximum (ASTM D1238, Condition E)	0.6
Carbon Black Content (ASTM D1603)	2% - 3%
Carbon Black Dispersion (ASTM D3015)	A1, A2 and B1
Tensile Strength At Break (lbs/inch width) (ASTM D638, Type IV Specimen at 20 inches/minute)	80
Elongation At Break (ASTM D638, Type IV Specimen at 20 inches/minute)	350%
Tear Strength (lbs) (ASTM D1004)	18
Puncture Resistance (lbs) (FTMS ² 101 C 2065)	55
Low Temperature Brittleness (°F) (ASTM D746)	<94
Dimensional Stability (% change maximum) (ASTM D1204, 212°F, 15 minutes)	+1.0
Environmental Stress Crack Resistance (hrs) (ASTM D1693, Condition B, Modified NSF54)	More than 2000
Seam Shear Strength (lbs/inch), minimum (ASTM D4437, Modified NSF 54-91)	30
Seam Peel Strength (lbs/inch), minimum (ASTM D4437, Modified NSF 54-91)	20 FTB ³

Notes:

1. Minimum average value is the lowest average test value of all specimens taken from any roll.

2. FTMS - Federal Test Method Standards
3. FTB - Film Tear Bond as defined in NSF 54-1991.
4. All values, except where specified as minimum or maximum, represent average lot values.

END OF SECTION

(dtwp/5998)

TABLE 1A- ALTERNATE CAPPING DESIGN BID
MATERIAL PROPERTIES OF GEOGRID COMPOSITE
(GEOGRID COMPONENT)

PROPERTY	VALUE
Weight, oz/sq. yd. (ASTM D-3776)	11.5
Thickness, mils (ASTM D1777)	
at Rib	70
at Junction	120
Aperture Size, inch	.9 x .9
Open Area, %	85+
Wide Width Tensile Strength, lbs/ft (ASTM D-4595)	
at Ultimate Warp	3700
Fill	2020
at 5% Strain Warp	1500
Fill	820
at 2% Strain Warp	850
Fill	450
Elongation at Break, % (ASTM D-4595)	11
Factor of Safety for Creep	1.67
Secant Modulus of Warp, lbs/ft	
at 5% Strain	28,000
at 2% Strain	42,500
Long-Term Allowable Design Load Warp Direction, lbs/ft.	
100+ Yrs (.6 Creep Reduction Factor)	1650
50-100 Yrs (.7 Creep Reduction Factor)	1950
5-50 Yrs. (.75 Creep Reduction Factor)	2125
< 5 Yrs (.8 Creep Reduction Factor)	2200
Coefficient of Interaction between Geogrid and Soil	
Gravel, Sand and Gravel (GW, GP, GM, GC, SW)	.90
Sand, Silty sand (SP, SM, SC)	.85
Silts and Clays (ML, CL)	.75

TABLE 2A- ALTERNATE CAPPING DESIGN BID
MATERIAL PROPERTIES OF GEOGRID COMPOSITE
(MATTING COMPONENT)

PROPERTY	VALUE
Porosity	95%
Material Type	Nylon 6 plus a minimum, content of 2 percent by weight of Carbon Black
Nominal Filament Diameter, inches	.016
Weight, oz/sq.yd (ASTM D-3776)	16
Thickness, inches (ASTM D-1777)	0.75
Tensile Properties (ASTM D-1682 modified)	
Strength, lbs/ft	
Length direction	250, minimum
Width direction	120, minimum
Elongation, %	
Length Direction	75, maximum
Width Direction	75, maximum
Shear Stress, lbs/sq.ft.	8
Resiliency, %	
30 Minute Recovery (3 cycles @ 100 psi)	80, minimum
Soil Holding Capacity, cu.in./sq.yd Plane of Matrix	923, minimum

TABLE 3A- ALTERNATE CAPPING DESIGN BID
MATERIAL PROPERTIES OF GEOGRID COMPOSITE
(GEOGRID AND MATTING)

PROPERTY	VALUE
Total Composite Weight, oz/sq.yd. (ASTM D-3776)	27.5
Composite Thickness, inches (ASTM D-1777)	0.75
Soil Holding Capacity, cu.in./sq.yd. (6014)	895

1.05 QUALITY ASSURANCE

- A All materials, procedures, operations, and methods shall be in strict conformance with the Drawings and Specifications. The installed system shall conform to the Drawings and Specifications, except as noted herein or otherwise authorized in writing by the Owner.
- B In the event that the manufacturer or installer specifications differ from these specifications the more stringent of the two, as determined by the Engineer, shall apply to this project.

1.06 LEVELS OF EXPERIENCE

- A The Contractor shall provide the services of Manufacturers and Installers of geonet composites. All Subcontractors must possess an adequate level of experience for their portion of the work as specified herein.
- B All Subcontractors and Manufacturers shall be well established firms with more than two years experience for their portion of the work.
- C All Subcontractors and Manufacturers shall be able to provide sufficient production capacity and qualified personnel to meet the demands of the project.

1.07 DEFINITIONS

- A Manufacturer: Responsible for the production of the material and delivery of products to the factory for fabrication, or to the site.
- B Installer: Responsible for field handling, storing, deploying, anchoring, temporary restraining (against wind), and other site aspects of the material. The Installer may also be responsible for transportation of these materials to the site. In addition the installer shall be trained and qualified to install geonet composite and shall be approved and/or licensed by the geonet composite Manufacturer and/or Fabricator. A common installer may be used for the installation of all geonet composite. The Installer's qualifications will require the Engineer's approval.

1.08 SUBCONTRACTOR'S QUALIFICATIONS SUBMITTALS

- A Geonet Composite Manufacturer

Prior to the production of any geonet composite materials, and in accordance with Section 01300, the Contractor shall submit the following information to the Engineer.

1. Corporate background and information.

2. Manufacturing capabilities including:
 - a. Information on plant size, equipment, personnel, number of shifts per day, and capacity per shift.
 - b. Daily production quantity available for this contract.
 - c. Quality control procedures for manufacturing.
 - d. List of material properties including certified test results, to which geonet composite samples are attached.
3. A list of at least five completed facilities, totaling a minimum of 200,000 m², (2,000,000 ft².), for which the Manufacturer has manufactured geonet composite. For each facility, the following information shall be provided:
 - a. Name and purpose of facility, its location, and date of installation.
 - b. Name of Owner, Project Manager, Designer, Fabricator (if any), and Installer.
 - c. Type of geonet composite material and surface area of material manufactured.
 - d. Available information on the performance of the geonet composite system and the facility.
4. Origin (resin suppliers name, and resin product plant) and identification (brand name, and identification number) of the resins.

B Installer

1. Copy of Installer's letter of approval or license by the Manufacturer and/or Fabricator.
2. Corporate background and information.
3. Description of installation capabilities, including:
 - a. Information on equipment and personnel.
 - b. Average daily installation
 - c. Quality control procedures.
4. A list of at least five completed facilities, totaling a minimum of 200,000 m² (2,000,000 ft.²) for which the Installer has installed geonet composite of the types for this project. For each

installation, the following information shall be provided:

- a. Name and purpose of facility, its location, and date of installation.
 - b. Name of Owner, Project Manager, Designer, Manufacturer, Fabricator, if any, and name of contact at the facility who can discuss the project.
 - c. Name and qualifications of the supervisor(s) of the Installer's crew(s).
 - d. Type of geonet composite and surface area of the installed material.
 - e. Duration of installation.
 - f. Available information on the performance of the geogrid composite system and the facility.
5. Resume of the field representative or installation supervisor to be assigned to this project, including dates and duration of employment.
 6. Identification of one representative who shall serve as the Installer's Superintendent, who shall represent the Installer at all site meetings and be responsible for acting as the Installer's spokesman on site. The Superintendent shall be pre-qualified for this role, on the basis of experience, management ability, and authority.
- D Submit additional information as may be requested by the Owner, or Engineer.

1.09 INSTALLATION SUBMITTALS

- A It is the Contractor's responsibility to forward all submittals listed below to the Engineer for review and approval.
- B Prior to the shipment of the geonet composite, submit the following in accordance with Section 01300.
1. Copy of factory quality control certificates issued by the manufacturer for materials shipped to the site.
 2. Production date(s) of the geonet composite.
 3. Reports on tests conducted to verify the quality of the resin used to manufacture the geogrid composites assigned to the project.

4. Certification statement that the geonet composite material properties shall meet the minimum requirements as outlined in this section.

C Prior to commencement of the geonet composite installation, the Installer shall submit the following in accordance with Section 01300.

1. A drawing showing the installation layout indicating the direction of the axis of the geonet composite, as well as any variance or additional details which deviate from the Drawings. The layout shall be adequate for use as a construction plan and shall include dimensions, details, etc.
2. Details of anchoring, overlapping and connecting and other construction details.
3. Installation schedule, including a detailed schedule for covering the geonet composite.

D During the geonet composite installation, the Installer shall be responsible for the timely submission of quality control documentation.

E Upon completion of the geonet composite installation, the Installer shall submit the following in accordance with Section 01300:

1. Installation certification with the requirements of standards specified herein for the geonet composite installation.
2. The installation warranty.
3. Maintenance and repair requirements.

F Submit additional information as may be requested by the Owner, or Engineer.

1.10 EXTRA STOCK

A The following shall be furnished to the Owner:

1. Two thousand (2,000) square feet of geonet composite identical to that installed under this Section.

PART 2: PRODUCTS

2.01 GEONET COMPOSITE

A The geonet composite shall be a three-dimensional geonet structure of entangled core polymer extrusions of black high density polyethylene (HDPE) monofilaments melt-bonded at their intersections, forming a

stable net of suitable weight and configuration. The geonet shall be crush-resistant, pliable, resilient, water-permeable, and highly resistant to chemicals and environmental degradation. Both sides of the geonet shall be machine-stitched with synthetic yarn to a nonwoven polypropylene geotextile fabric not to exceed 12" between lines of stitching. Fabric shall be free of oil, grease and other foreign materials to prevent migration of soils into the core of the geonet. The geonet composite shall be Enkanet Type 4010 as manufactured by AKZO Industrial Systems Company, Asheville, North Carolina, or equal.

- B The geonet composite shall conform to the following standard dimensions, weights, and minimum roll values:

Dimensions and Weights

Core width (in)	78
Roll length (ft)	240
Roll diameter (in)	48
Roll gross wt (lbs)	213
Area/Roll (yds ²)	173
Thickness (in)	0.4
Core weight (oz/yd ²)	12.8
Geotextile weight (oz/yd ²)	4.0
Total weight (oz/yd ²) w/fabric both sides	20.8

- C The geonet shall have carbon black for ultra violet stabilization and be manufactured in accordance with the following values:

<u>Property</u>	<u>Test Method</u>	<u>Required Value</u>	<u>Units</u>
Polymer Density	ASTM D792	0.92 - 0.96	g/cc
Carbon Content	ASTM D1603	Greater >	0.5%

- D The materials supplied under these specifications shall be first quality products designed and manufactured specifically for the purposes of this project, and which have been satisfactorily demonstrated by prior use to be suitable and durable for use in landfill final covers.
- E The geonet composite shall be packaged in a protective wrap to protect the product during shipment and on-site storage. All product identification shall be marked on both the geonet composite and the outer wrap and shall include direction of unrolling, roll number, width and length dimensions and style.
- F The netting and stitched geotextile shall have a nominal transmissivity of 5.5×10^{-3} m/sec per foot of width at a hydraulic gradient of .03 and a normal load of 500 psf.

- G No glues or other materials shall be used to attach the geotextile to the netting.
- H The polypropylene fabric shall conform to the following minimum physical properties when tested in accordance with the ASTM procedures listed below:

<u>Property</u>	<u>Test Method</u>	<u>Minimum Roll Average Value</u>	<u>Typical Value</u>
Grab Tensile, lbs	ASTM-D-4632	120	156
Grab Elongation, %	ASTM-D-4632	50	57
Mullen Burst, psi	ASTM-D-3786	300	310
Puncture, lbs	ASTM-D-4833 (Modi)	90	94
Trapezoid Tear, lbs	ASTM-D-4533	45	63
U.V. Resistance, %* (Strength retained)	ASTM-D-4355	70	85
Flow Rate - gpm/ft.	ASTM-D-4491	75	140
Coefficient of Perme- ability (cm/sec)	ASTM-D-4491	.2	.3
AOS (Sieve size)	ASTM-D-4751	70	70
Fabric Weight (oz/yd)	ASTM-D-3776	4.0	5.0
Permittivity (sec)	ASTM-D-4491	1.4	2.1

*Percent of minimum grab tensile after conditioning.

2.02 MANUFACTURING QUALITY CONTROL AND TESTING

A Geonet Composite:

1. **Raw Material:** Testing shall be carried out by the geonet composite Manufacturer at his expense, to demonstrate that the product meets the specifications. The Manufacturer shall certify in writing that the resins meet the specifications, and shall be held liable for any noncompliance. Any material manufactured from noncomplying resin will be rejected.
2. The material shall be continuously monitored during the manufacturing process and no material shall be accepted which exhibits any defects. The thickness shall also be monitored during the manufacturing process and no material shall be accepted which fails to meet the specified minimum thickness.
3. The manufacturer shall submit a description of the quality control program to evaluate the pertinent characteristics for quality control including stress-deformation characteristics. If the program is acceptable to the Engineer, then the manufacturer shall submit quality control data and information as required under paragraph 2.02, A.4. If the manufacturer does not have an in-house quality control program, or if the program is not

acceptable to the Engineer, then the material shall be tested, at a minimum, once every 40,000 ft². This testing shall be performed by the Manufacturer at the Manufacturer's expense. Samples not satisfying the specifications shall result in the rejection of the applicable rolls. In the case of a failure, subsequent testing shall be performed on products from the same resin batch to determine if material produced from the entire batch shall be regarded as unsatisfactory. At the Manufacturer's discretion and expense, additional testing of individual rolls may be performed to more closely identify the non-complying rolls and/or qualify individual rolls.

4. In addition, the Manufacturer shall certify the quality of the rolls. As a minimum, the Manufacturer shall provide quality control certificates for each batch of resin and each shift's production of geonet component material. These quality control certificates shall be signed by responsible parties employed by the Manufacturer (such as the production manager), notarized, and supplied to the Engineer. The quality control certificate shall include:
 - (a) Roll numbers and identification.
 - (b) Sampling procedures.
 - (c) Results of quality control tests, including description of test methods used.
5. The Manufacturer (Fabricator, if applicable) shall agree to allow the Owner and the Engineer to visit the manufacturing plant for a project specific visit. If possible, this visit shall be prior to or during the manufacturing of the rolls for the specific project. The Engineer shall review the quality control, laboratory facilities, and testing procedures.
6. During the project specific plant visit, those reviewing will also:
 - (a) Verify that properties guaranteed by the Manufacturer meet these specifications.
 - (b) Verify that the measurements of properties by the Manufacturer are properly documented and test methods used are acceptable.
 - (c) Spot inspect the rolls and verify that they are free of holes, blisters, or any sign of contamination by foreign matter.
 - (d) Review packaging and transportation procedures to verify that these procedures are not damaging the composite material.

- (e) Verify that roll packages have a label indicating the name of the manufacturer, type of material, sheet thickness, and roll number.

2.03 LABELING

- A Each roll or panel shall be identified with the following minimum information.
 - 1) Name of manufacturer/fabricator,
 - 2) product type,
 - 3) manufacturing batch code,
 - 4) date of manufacture,
 - 5) physical dimensions (length and width),
 - 6) roll number per design layout pattern, and
 - 7) direction for unrolling roll.
- B Rolls that are not clearly labeled will be rejected.
- C Contractor shall inspect each roll to ensure compliance with these Specifications and maintain a record of all roll identification tags.

2.04 DELIVERY AND STORAGE

- A All geonet composite delivered to the job site shall be stored off the ground and protected with a covering that protects the rolls from physical damage, contamination by dirt, dust or water, and from extreme heat caused by direct sunlight.
- B Store, handle and transport material in strict conformance with the Manufacturer's instructions.
- C Transportation of materials is the responsibility of the Contractor. The Contractor shall be liable for all damages to the materials incurred prior to and during transportation to the site.
- D Handling, storage, and care of materials prior to and following installation at the site, is the responsibility of the Contractor. The Contractor shall be liable for all damages to the materials incurred prior to final acceptance of the system by the Owner.
- E Material shall be stored in such a way that it is protected from prolonged exposure to ultraviolet radiation.

PART 3: EXECUTION

3.01 INSTALLATION OF GEONET COMPOSITE

- A Earthwork:

1. Conform to requirements set forth in Section 02231 of these Specifications.
2. Surface Preparations: The Contractor shall be responsible for preparing the supporting soil layer. The Contractor shall inspect the site prior to the installation of the geonet composite to ensure that the surface is free of all foreign materials that could damage the geonet composite and that proper compaction of the soil layer has been achieved. Special care should be taken to maintain the prepared soil surfaces. Any damage to the soil supporting layer caused by installation activities shall be repaired at the Contractor's expense.
3. Crest Anchorage System: The anchor trench shall be excavated prior to geonet composite placement to the lines, grades and configuration shown on the Drawings. No loose soil shall be allowed beneath the geonet composite. The anchor trench shall be backfilled and compacted. Care shall be taken when backfilling the trenches to prevent any damage to the geonet composite. Slightly rounded corners shall be provided in the trench where the geonet composite material adjoins the trench so as to avoid sharp bends in the geonet composite.

B The Contractor shall ensure that:

1. No equipment used shall damage the geonet composite by handling, trafficking, leakage of hydrocarbons, or other means.
2. No personnel working on the geonet composite shall smoke, wear damaging shoes, or engage in other activities which could damage the material.
3. The method used to unroll the material shall not cause scratches or crimps in the material and shall not damage the supporting soil.
4. The prepared surface underlying the geonet composite must not be allowed to deteriorate after acceptance and must remain acceptable up to the time of material placement.
5. The geonet composite shall be placed in accordance with the manufacturer's recommendations.
6. Materials, equipment or other items shall not be dragged across the surface of the geonet composite or be allowed to slide down slopes onto the material.
7. Tracked vehicles shall not traverse directly on the geonet composite.

8. All overlapping geonet composite shall be inspected to ensure all overlaps are secured as specified by the manufacturer.
9. Care shall be taken to assure that stones, mud, dirt, etc, are not entrapped in the geonet composite during placement.
10. The geonet composite shall be placed with the length of the material laid adjacent to each other.
11. The glue used for the seams shall be 3M-3792 hot stick glue. Application will be with a heavy duty hot stick glue gun (source of the 3M-3792 stick glue and gun is 3M in West Caldwell, NJ). Method of glue application will be, after rolls of net are in place with fabric overlaps extending over edge of adjacent rolls, to place a 3" glue bead in length parallel to edge of fabric and in the center of the overlap approximately every 2 feet. Apply immediate pressure at location of 3" bead bonding the two fabric edges together. Estimated curing time for this glue is 20-25 sec.
12. Any field roll or portion thereof which becomes seriously damaged (torn, twisted or crimped) shall be replaced at no additional cost to the Owner. Less serious damage may be repaired at the Owner's option. Damaged rolls or portions of damaged rolls which have been rejected shall be removed from the work area, and replaced at the Contractor's expense.

3.02 SYSTEM ACCEPTANCE

- A The Contractor shall retain all ownership and responsibility for geonet composite material in the final cover system until acceptance by the Owner.
- B The geonet composite shall be accepted by the Owner when:
 1. The installation is completed and accepted by the Engineer.
 2. All documentation of installation is completed.
 3. Verification of the adequacy of all connections is complete.
 4. Written certification documents, including record drawings, signed and sealed by a Registered Professional Engineer in the State of New York have been received by the Owner.

END OF SECTION

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SECTION 02280

FINAL COVER CONSTRUCTION

PART 1: GENERAL

1.01 SCOPE OF WORK

- A This section includes requirements for the furnishing of all soil and geosynthetics materials, installation and testing of materials specified for the final cover, as shown on the Drawings and as specified herein for the Alternate Capping Design Bid.
- B Unless shown otherwise on the drawings, the final cover shall consist of the following material, in ascending order:
 - o Intermediate cover (6 to 12-inches)
 - o Gas collection geonet composite
 - o Textured VLDPE membrane (40-mil)
 - o Select fill (depth varies, minimum 18-inches); a high-friction geogrid composite element embedded in the select fill layer.
 - o Topsoil (6-inches)
 - o Erosion control matting
- C On 33% and flatter slopes, high-friction geogrid composites and erosion control matting will not be required.
- D Where shown on the Drawings, pavement, gravel roads or riprap will be placed over the select fill layer.

1.02 RELATED WORK

- A Construction Quality Assurance/Quality Control Plan is included in Appendix "A".
- B Contractor Quality Control is included in Section 01400.
- C Testing laboratory services are included in Section 01410.
- D Earthwork is included in Section 02200.
- E Final cover select fill is included in Section 02231.
- F Textured VLDPE membrane is included in Section 02271.
- G Geotextile is included in Section 02272.
- H Erosion control matting is included in Section 02273.
- I Geogrid composite is included in Section 02274.
- J Geonet composite is included in Section 02278.
- K Topsoil is included in Section 02930.

1.03 QUALITY ASSURANCE

- A All materials, procedures, operations, and methods shall be in strict conformance with the Drawings and Specifications and shall be subjected to strict quality control monitoring as detailed herein, and in the Construction Quality Assurance/Quality Control Plan prepared for this project. The installed system shall conform to the Drawings and Specifications, except as noted herein or otherwise authorized in writing by the Owner.
- B The Construction Quality Assurance/Quality Control requirements of the Final Cover materials as specified in this Section shall take precedence over any other QA/QC requirements when these materials are used in the Final Cover construction, unless specifically stated otherwise in this section.
- C The laboratory will be responsible for conducting tests on samples of soil and geosynthetic material.

1.04 REQUIRED TESTS

- A ~~The Construction Quality Assurance/Quality Control testing shall be performed on a schedule outlined in Table 1.~~
- B Final cover select fill testing requirements shall be as specified in ~~Section 02231.~~
- C ~~VLDPE membrane testing requirements shall be as specified in Section 02272.~~
- D ~~Interface friction angle testing between soil and geosynthetic material shall be conducted using ASTM D 5321, as described in paragraph 1.05 of this Section. The minimum saturated interface friction angle of geonet composite and select fill shall be 27 degrees (geonet composite on top of select fill). The minimum saturated interface friction angle of textured VLDPE membrane and geonet composite shall be 27 degrees (membrane on top of geonet composite). The minimum saturated interface friction angle of select fill and textured VLDPE membrane shall be 27 degrees (select fill on top of membrane).~~

1.05 INTERFACE FRICTION ANGLE TESTING

- A To verify the sideslope stability of the landfill, interface friction angle testing between soil and geosynthetic material shall be performed. Only production line samples of geosynthetic material shall be used for testing. The use of laboratory prepared samples will not be allowed for quality control testing.
- B The interface friction angle testing shall be conducted using ASTM D-5321 to be in general accordance with the following requirements and is intended to indicate the performance of the various components by attempting to model the field conditions:
 1. The test shall be performed for a minimum of three normal stresses

(2, 4, and 8 psi) applied to the geosynthetic to bracket the normal stresses defined above, as required to define the failure plane friction angle. The peak and residual shear stresses shall be recorded and plotted against the normal compressive stresses used. A best fit straight line shall be constructed for each test series.

2. The direction of shear for each interface shall be in the direction of manufacture (machine direction) for each geosynthetic sample.

PART 2: PRODUCTS

Products are specified in related sections.

PART 3: EXECUTION

3.01 SUBGRADE PREPARATION

- A Subgrade is defined as the supporting grade beneath the geotextile, placed under the gas venting layer.
- B The existing subgrade consists of approximately 12-inches of soil material (intermediate cover) overlying the solid waste, which was placed previously by the Owner. In portions of the existing landfill cover, the intermediate cover is less than 12-inches. The Contractor shall ensure that upon the completion of the subgrade preparation, there is a minimum 6-inch thickness of existing intermediate cover and a minimum 12-inch thickness of intermediate cover placed during the performance of this contract.
- C All subgrade areas shall be dry, free of all trash, stumps, rocks, roots, debris, or other objects that might prevent placement of final cover.
- D Remove all grasses or other vegetation from subgrade. If a soil sterilant is used to inhibit vegetative growth it shall be one approved for use by the U.S. Environmental Protection Agency. Application shall be in accordance with manufacturer's recommendation.
- E Grading in preparation for placing final cover shall be performed at all places that are indicated on the Drawings, to the lines, grades, and elevations shown and otherwise as directed by the Engineer. All areas below the subgrade surface shall be filled with common fill in layers having a maximum thickness of 12-inches and shall then be compacted by at least two complete passes of a 10-ton roller. All solid waste encountered during grading, of whatever nature, within the limits indicated, shall be removed to a depth of 12-inches below the subgrade elevation, and shall be hauled by the Contractor and disposed of on sideslopes or the top of landfill, as directed by the Engineer. The above 12-inch over-excavated areas shall be backfilled with common fill and compacted by at least two complete passes of a 10-ton roller.

3.02 SOIL COVER AND VEGETATION

- A Final cover select fill shall be placed on top of the textured VLDPE membrane, as specified in Section 02231. The thickness shall be

18-inches and greater, as shown on the drawings.

- B On slopes steeper than 33%, a geogrid composite element shall be embedded in the final cover select fill layer, as specified in Section 02231 and Section 02274.
- C In areas to be vegetated, a 6-inch thick topsoil shall be placed on top of the select fill layer, and shall be seeded as specified in Section 02930.
- D On slopes steeper than 33%, an erosion control matting shall be placed on top of the topsoil, as specified in Section 02273.

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TABLE 1

FINAL COVER CONSTRUCTION QA/QC TESTING

Test Description	Lab Test	Field Test	Frequency
<u>Select Fill</u>			
Moisture-Density ASTM D 1557	x		Every 1000 cy
Grain Size ASTM D 422	x		Every 1000 cy
Internal Friction Angle ASTM D 3080	x		Every 1000 cy
Moisture-Density ASTM D 3017 and D 2922		x	100-ft Grid every 9-inches of fill
<u>VLDPE Membrane</u>			
Non-Destructive Testing		x	All field seams
Destructive Testing Seam Strength, ASTM D 751 Peel Adhesion, ASTM D 413	x		Every 500-ft of seam length
<u>Interface-Friction Angle</u>			
Geonet Composite/Select Fill ASTM D 5321	x		Every acre of sideslope
VLDPE Membrane/Geonet Composite ASTM D 5321	x		Every acre of sideslope
Select Fill/VLDPE Membrane ASTM D 5321	x		Every acre of sideslope

END OF SECTION

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SECTION 02715

HDPE PIPE, FITTINGS, AND ACCESSORIES

PART 1: GENERAL

1.01 SCOPE OF WORK

- A Work covered by this Section includes the requirements, materials, and methods for installing HDPE piping, fittings, and accessories for the active gas transmission system.
- B The Contractor shall install the various pipelines and appurtenant work as shown on the Drawings and as specified herein, or as reasonably required to produce a complete, proper, and functional installation in accordance with the intent of these Specifications.
- C The various pipelines, fittings, and accessories will be furnished by others.

1.02 RELATED WORK

- A Final cover select fill is included in Section 02231.
- B Final cover construction is included in Section 002279.
- C Concrete is included in Section 03301.

1.03 QUALITY ASSURANCE

- A Pipe installation shall be performed by skilled workers. Each pipe laying crew shall have a pipe laying foreman.
- B Pipe shall be accurately installed to the lines and grades shown on the Drawings, or as approved by the Engineer, so that inverts are smooth.
- C Deflections in horizontal alignment at joints are not permitted.
- D When requested by the Engineer, a qualified field representative of the manufacturer shall be present at the job site for the first day of pipe laying and during leakage testing to assure that proper procedures are followed.
- E The Engineer shall be notified in advance wherever an existing pipeline, utility, structure, etc., location conflicts with the proposed locations of the Work.
- F Pipe and fittings of the same type shall be the products of a single manufacturer.

- G Pipe Adaptors - Join pipes of different materials with adaptors furnished by others, specifically manufactured for that purpose and as approved by the Engineer.
- H All piping shall be of the type and size as shown on the Drawings and described in this section of the Specifications.
- I Valves shall be of ample strength to withstand and operate satisfactorily under the service conditions. Valve body and flanges shall have a pressure rating at least equal to that of the pipeline in which they are installed.
- J All similar types of valves shall be of one manufacturer and similar sizes shall be identical and the parts shall be interchangeable.

1.04 DELIVERY, STORAGE, AND HANDLING

- A All pipes, fittings, and accessories will be delivered to Wehran Envirotech in the presence of the Contractor. After acceptance by Wehran Envirotech, the material shall be unloaded and stored by the Contractor. All pipes, fittings, and accessories shall be carefully handled when unloading. Lift by hoists or lower on skidways in a manner to avoid shock.
- B Where required, due to weight of material and for the safety and protection of workmen, materials, equipment, property, and the work, use derricks, ropes, or other suitable equipment for lowering pipe into trenches. Take particular care to avoid damaging the pipe.
- C For convenience of handling, HDPE pipe shall be protected from sunlight exposure (unless restrained in racks) to prevent possible bowing of the pipe as a result of expansion and contraction caused by uneven heating. Such protection shall consist of canvas covering, or other material as recommended by the manufacturer. Plastic sheets shall not be used which may allow excessive temperatures to develop where the pipe is stored.
- D The manufacturer's instructions for pipe stacking shall be followed. When pipe is stacked for storage, the heaviest series of pipe shall be placed at the bottom.
- E HDPE pipe and fittings shall be protected from damage by sharp objects through all phases of work.
- F Deliver all valves and auxiliary equipment to the site in the manufacturer's original packaging with labels legible and intact.
- G Store and handle all valves and accessories in such a manner as to prevent damage or contamination.
- H During delivery, storage, and handling, keep valves tightly closed to prevent foreign

matter from damaging surfaces.

PART 2: PRODUCTS

2.01 GENERAL

- A All pipes, fittings, and accessories shall be furnished by others. The purpose of Part 2 is to provide information to the Contractor as to the type of material to be used in the gas transmission system.

2.02 HIGH-DENSITY POLYETHYLENE (HDPE) PIPE AND FITTINGS

- A All HDPE pipe and fittings shall be manufactured from virgin polyethylene resin, Type III, Class C, Category 5, Grade P34 compound or approved equal, and shall conform to ASTM D1248 and ASTM 2513, latest editions.
- B All polyethylene fittings shall have a pressure rating equal to or higher than the pressure rating of the pipe.
- C HDPE pipe and fittings which do not meet the requirements of this Specification or of ASTM D2513 shall be rejected.
- D All flanged connections shall have ANSI Class 150 stainless steel backing rings.
- E All pipe and fittings shall be, at a minimum, SDR 17 rated at 100 psi, and shall be Phillips Driscopipe 6400 or approved equal.

2.03 UNDERGROUND WARNING TAPE

- A All underground HDPE pipe shall be marked with a 2-inch, metallic-lined, warning tape as manufactured by Seton or approved equal. Tape shall be yellow with the words "Caution, Gas Line Buried Below" stated in black letters.

2.04 PROTECTIVE COVERS

- A The protective covers to be used for buried valves shall be standard meter boxes manufactured from Superflexon material (polyolefin and fibrous inorganic components). All covers shall have double channel stiffeners, external buttresses and acetal snaplocks. Three snaplock unlocking tools shall be provided. Covers shall be manufactured by Ametek Part No. 190106 or an approved equal.

2.05 VALVES

- A Operative valves shall open to the left or counterclockwise and should be marked with manufacturer's name.

B Butterfly Valves (Plastic) (4" and larger)

1. Valves shall be manufactured of PVC Type 1, Grade 1 molding compound. The compound must meet the requirements for ASTM D1784.
2. The valves shall be butterfly valves, wafer style, PVC body, lever-type, with polypropylene disc, and Viton seats and seals, as manufactured by Hayward Industrial Products, Inc., or an approved equal. Butterfly valves shall carry a pressure rating of 150 psi C.W.P. at 73 degrees F.
3. Valves shall be tight closing providing leakproof shutoff against flow in either direction at a pressure of 150 psi.

C Ball Valves (3" max)

1. Valves shall be manufactured of PVC Type 1, Grade 1 molding compound. The compound must meet the requirements for ASTM D1784.
2. The valves shall be flanged on both ends with two-way blocking capability. All PVC ball valves shall have Teflon seats with elastomeric backing cushions of the same material as the valve seals, as manufactured by Haywood Industrial Products, Inc., Asahi/American, or approved equal.
3. Valves shall be tight closing leakproof shutoff against flow in either direction at a pressure of 150 psi.

D Test Ports

1. Valves shall be manufactured of PVC Type 1, Grade 1 molding compound. The compound must meet the requirements for ASTM D1784.
2. The valves shall be 1/4-inch lab cock, male thread by hose, with PVC body, EPDM seats and seals as manufactured by Asahi or an approved equal.

2.06 FLEXIBLE HOSE

- A All flexible hose shall be as manufactured by Kamaflex Corporation, Compton, California, Series 101-PS, or equal.
- B All fasteners for flexible hose shall be Kamaflex 101-PS power lock clamps, or equal.

PART 3: EXECUTION

3.01 INSPECTION - GENERAL

- A Each length of pipe and each fitting shall be carefully inspected prior to lowering into

trench. All material not meeting the requirements of these Specifications, or otherwise found defective or unsatisfactory by the Engineer, shall be rejected and immediately marked and removed from the jobsite by the Contractor on the same working day as so discovered.

- B Bedding, sub-bedding, and other trench conditions shall be carefully inspected prior to laying pipe in each stretch of open trench. All conditions shall be made available to the Engineer for inspection purposes, and the Engineer shall be further advised where, in the Contractor's opinion, unstable or otherwise deleterious conditions exist.
- C Each stretch of completed pipeline shall be inspected prior to backfilling. Backfilling operations shall not be initiated prior to inspection by the Engineer.
- D If any defective pipe is discovered after being placed, removal, and replacement with sound pipe will be required.

3.02 PREPARATION

- A Pipe and fitting interiors, joint surfaces, and gaskets shall be thoroughly cleaned prior to installation. Pipes and fittings shall be maintained clean. For HDPE pipe, a clean cotton cloth shall be employed for cleaning; polyester-type materials shall not be used as they may melt during fusion procedures and stick to the heater.

3.03 PIPE INSTALLATION

- A Pipes and fittings shall be carefully lowered into the trench. Fused segments of pipe shall be handled so as to avoid damage to the pipe. When lifting fused sections of pipe, chains or cable type, chokers must be avoided. Nylon slings are preferred. Spreader bars are recommended when lifting long fused sections. Care must be exercised to avoid cutting or gouging the pipe.
- B Sections polyethylene pipe shall be joined into continuous lengths on the jobsite aboveground. The joining method shall be the butt fusion method and shall be performed in strict accordance with the pipe manufacturer's recommendations. The butt fusion equipment used in the joining procedures shall be capable of meeting all conditions recommended by the pipe manufacturer, including but not limited to, temperature requirements, alignment and fusion pressures.
- C Polyethylene pipe shall be connected to systems or fittings of other materials by means of transition fittings, or mechanical compression couplings furnished by others. When mechanical compression couplings are used, polyethylene pipes shall be reinforced by a stiffener in the pipe bore. Stiffeners shall be properly sized for the size and SDR of polyethylene pipe being joined. Mechanical couplings shall be installed in accordance with the manufacturer's recommended procedure.
- D Piping shall be installed in final cover select fill material as specified in Section 02231.

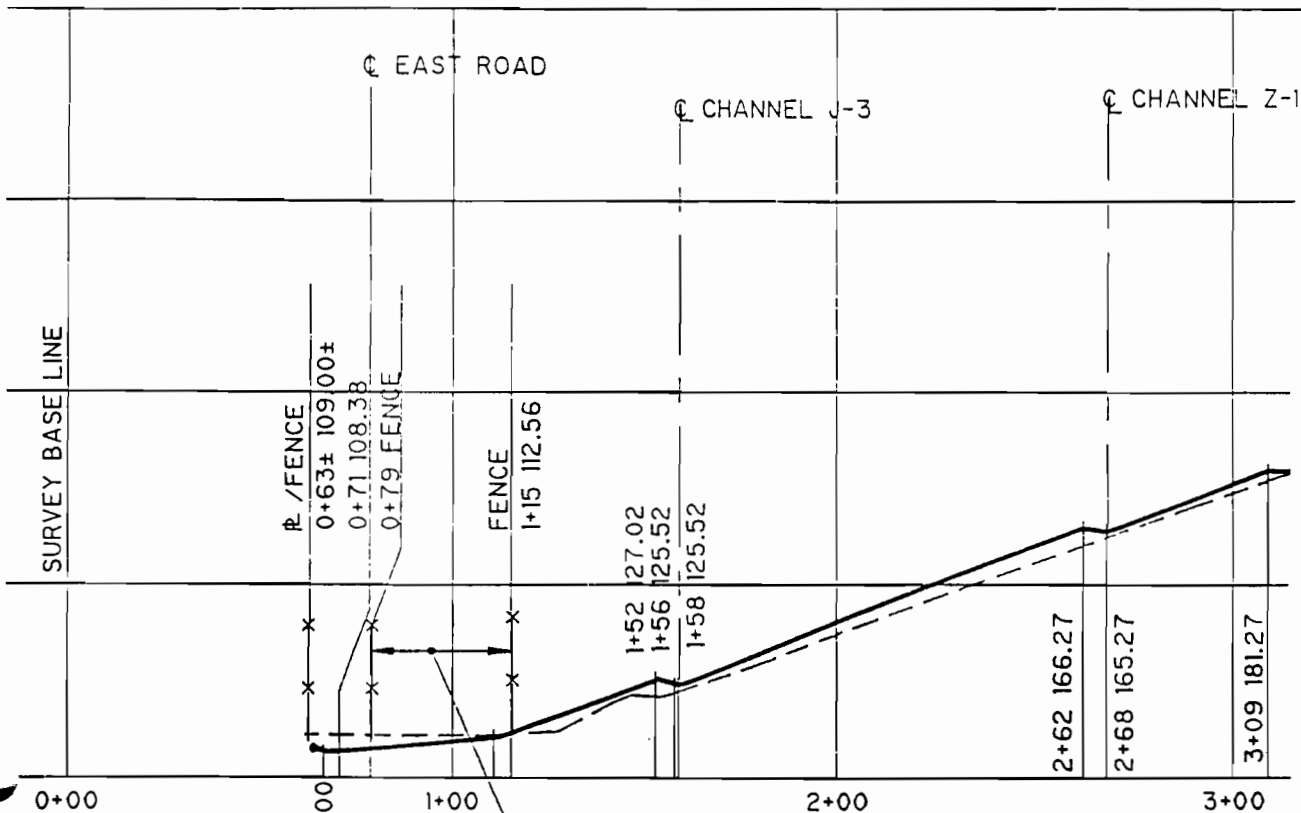
- E Pipe and fittings shall be installed so that there will be no deviation at the joints and so that inverts present a smooth surface. Pipe and fittings which do not fit together to form a tight fitting joint are not permitted.
- F Pipes shall be installed in the locations and to the required lines and grades as shown on the Drawings and provided in these Specifications, using an approved method of control. The Engineer has the authority to order the removal or relaying of all pipe laid contrary to the Specifications, his instructions, or during his absence.
- G Excavations shall be maintained free of water during the progress of the Work. No pipes shall be laid in water nor shall there be any joints made up in water. All slides or cave-ins of the trenches or cuts shall be remedied to the satisfaction of the Engineer.
- H Cleanliness of installed pipe and fitting interiors shall be maintained throughout the Work.
- I All adjustments to the line and grade of the pipe laid on select fill foundation shall be done by removal or filling of the bedding under the pipe, and not by blocking or wedging.
- J Fittings shall be installed as required and in accordance with the Drawings and Specifications. The installation of fittings after the pipeline has been laid will not be permitted without the written approval of the Engineer. In such cases, complete details pertaining to the proposed type of fittings and the installation procedure shall be submitted by the Contractor to the Engineer for review before approval will be considered.
- K Approval by the Engineer is required prior to changing the location of any of the work due to field conditions. Changes in pipe sizes are prohibited without a written consent from the Engineer.
- L All installed piping shall form completely connected systems including connections to valves and appurtenances specified in other paragraphs to result in a satisfactorily operating installation.
- M HDPE pipe shall be joined by butt-fusion methods, having a completely uniform and monolithic pipe interior according to the fusion joining procedures as instructed by the manufacturer, and as shown on the Drawings.
- N Each individual performing fusion joining shall have at least one year of experience in the use of fusion procedure.
- O All persons performing fusion joining shall meet the qualification requirements as specified in Title 49 of the Code of Federal Regulations, Part 192.

- P No person may make fusion joints unless that person has appropriate training and experience in the fusion procedure and been qualified under the fusion method as defined above and summarized herein:
1. The individual must make a sample joint that passes the following inspections and tests:
 - a. The joint must be visually examined during and after joining and found to have the same appearance as a photograph or sample of an acceptable joint that was joined in accordance with the procedure.
 - b. The joint must be tested or examined by one of the following methods:
 - 1) Pressure and tensile test as described in 49 CFR Section 192.283.
 - 2) Ultrasonic inspection and found to be free of flaws that would cause failure.
 - 3) Cut into at least three longitudinal straps, each of which is:
 - Visually examined and found to be free of voids or unbonded areas on the cut surface of the joint.
 - Deformed by bending, torque, or impact and if failure occurs, it must not initiate in the joint area.
- Q A person must be requalified under an applicable procedure, if during any 12-month period he:
1. Does not make any joints under the procedure.
 2. Has three joints or three percent of the joints he has made whichever is greater, that are found unacceptable by testing under 49 CFR Section 192.513.
- R The inspection of joints shall be performed by a person who has been qualified by training or experience to evaluate the acceptability of HDPE joints made under the applicable joining procedure.
- S Each joint shall be inspected and approved by the Engineer prior to placement and backfilling.
- T Join pipe sections at ground level to a length recommended by the manufacturer such that maximum allowable stress, when pulling the pipe into position alongside the trench, is not exceeded. Use appropriate materials and equipment, as recommended by the HDPE pipe manufacturer, when pulling butt-fused pipe sections alongside the trench to prevent pipe damage.

- U For summertime installations it may be necessary to provide a slightly longer length of HDPE pipe when connections are to be made between two fixed points or structures to compensate for contraction of the pipe in a cooler trench bottom. The additional pipe length requirements shall be in accordance with the HDPE pipe manufacturer's instructions.
- V Inspect each valve for freedom of movement of all working parts, internal or otherwise, such that valve may operate properly and completely without hinderance.
- W Verify that valves shall operate satisfactorily at the locations indicated on the Drawings without interference with other items to be furnished or constructed.
- X Notify the Engineer of any possible installation or operational difficulties. No installation work is to proceed until all potential difficulties are resolved to the satisfaction of the Engineer.
- Y Operate valves over full range to ensure smooth, easy, and proper operation. This must be done prior to installation and again checked after installation.
- Z Replace all valves which are defective, do not operate properly, or are in non-compliance with the Specifications.

END OF SECTION

(s2/02715)



SECTION

HORIZ. & VERT. 1"=50'

12A

C-4

CAMP DRESSER & McKEE

100 Crossways Park West
Woodbury, New York 11797

CDM

environmental engineers, scientists,
planners & management consultants

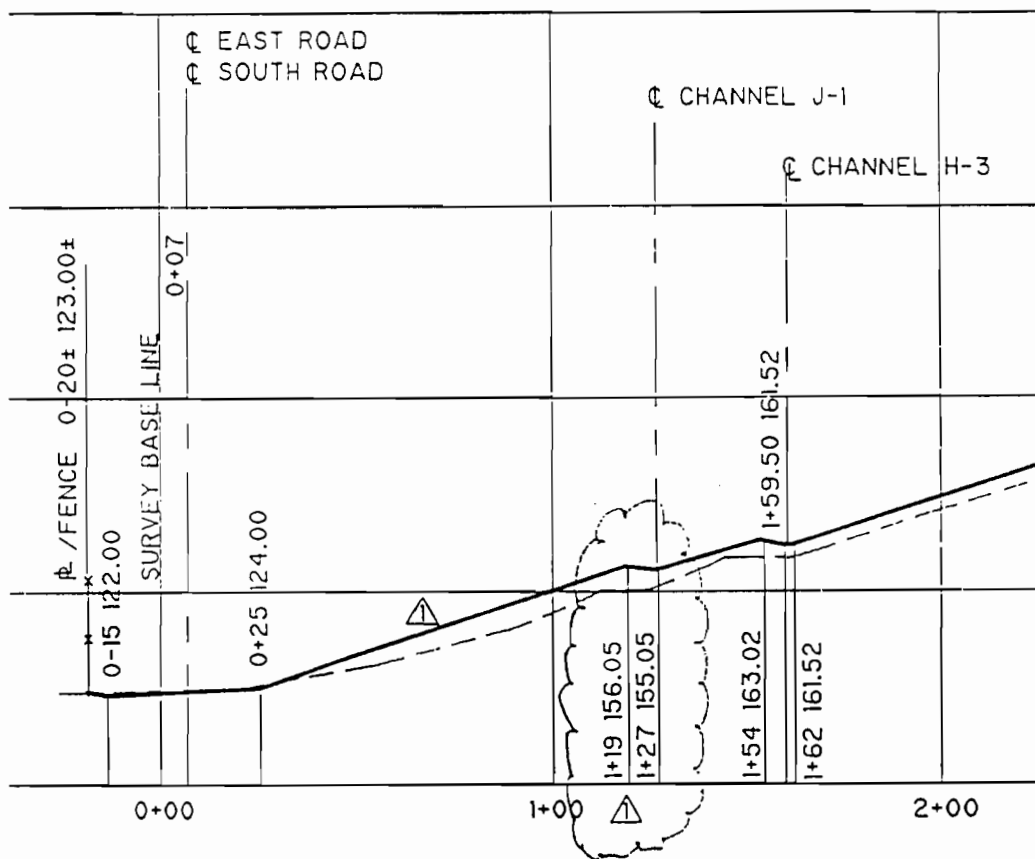
Huntington/East Northport Landfill
Contract No. ENV 94-01/O-C

Addendum No. 2

Added Note

REF.
DWG. C-9

SHEET SK-C1



SECTION

HORIZ. & VERT. 1"=50'

22A

C-5

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CDM

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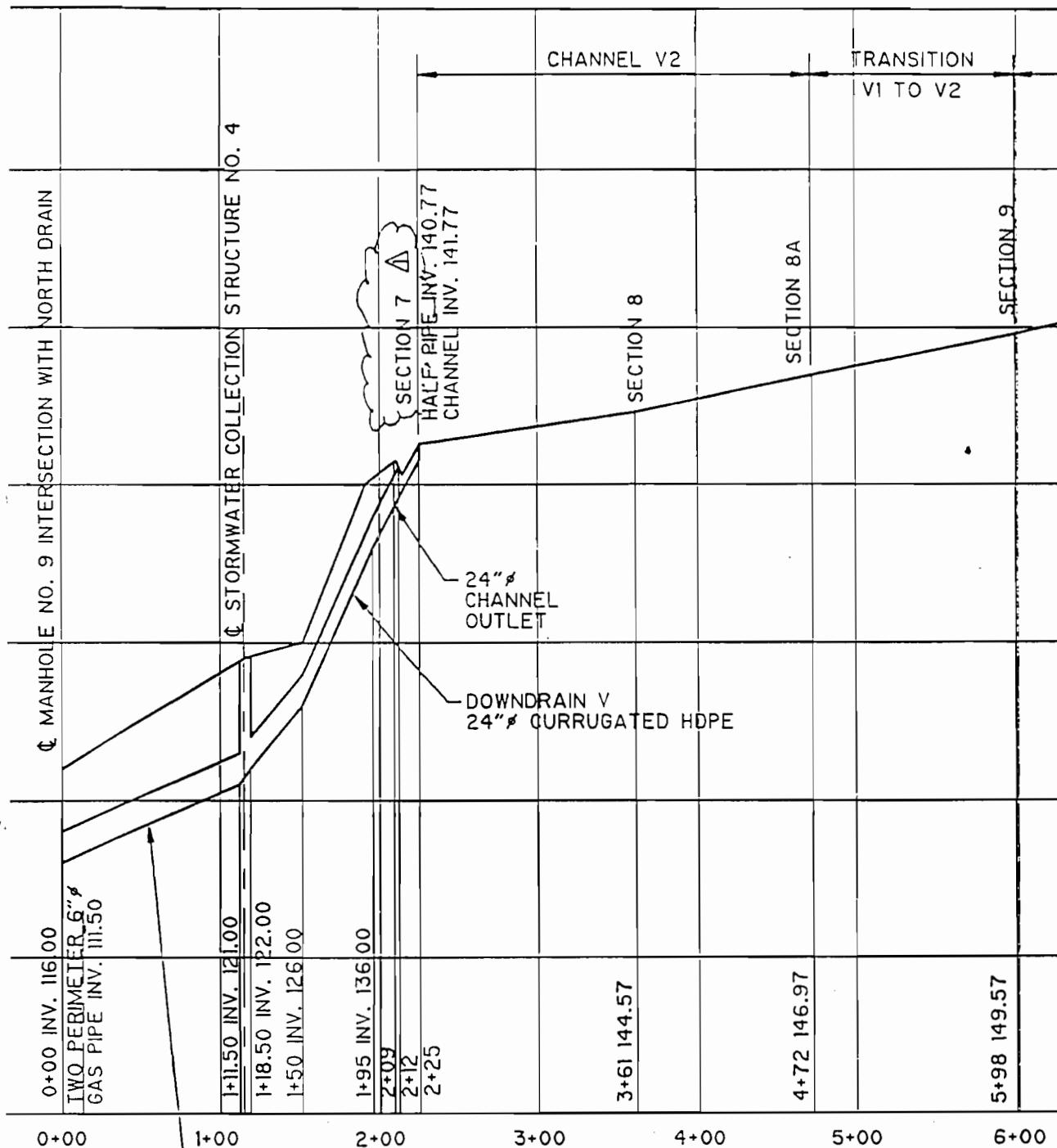
Huntington/East Northport Landfill
 Contract No. ENV 94-01/O-C

Addendum No. 2

Stationing and Grade

REF.
 DWG. C-12

SHEET SK-C2



DRAIN V
24" CORRUGATED
HDPE

CENTERLINE DRAINAGEWAY "V"

SCALE VERT 1" = 10'
HORIZ. 1" = 100'

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Contract No. ENV 94-01/O-C

1 Crossways Park West
Woodbury, New York 11797

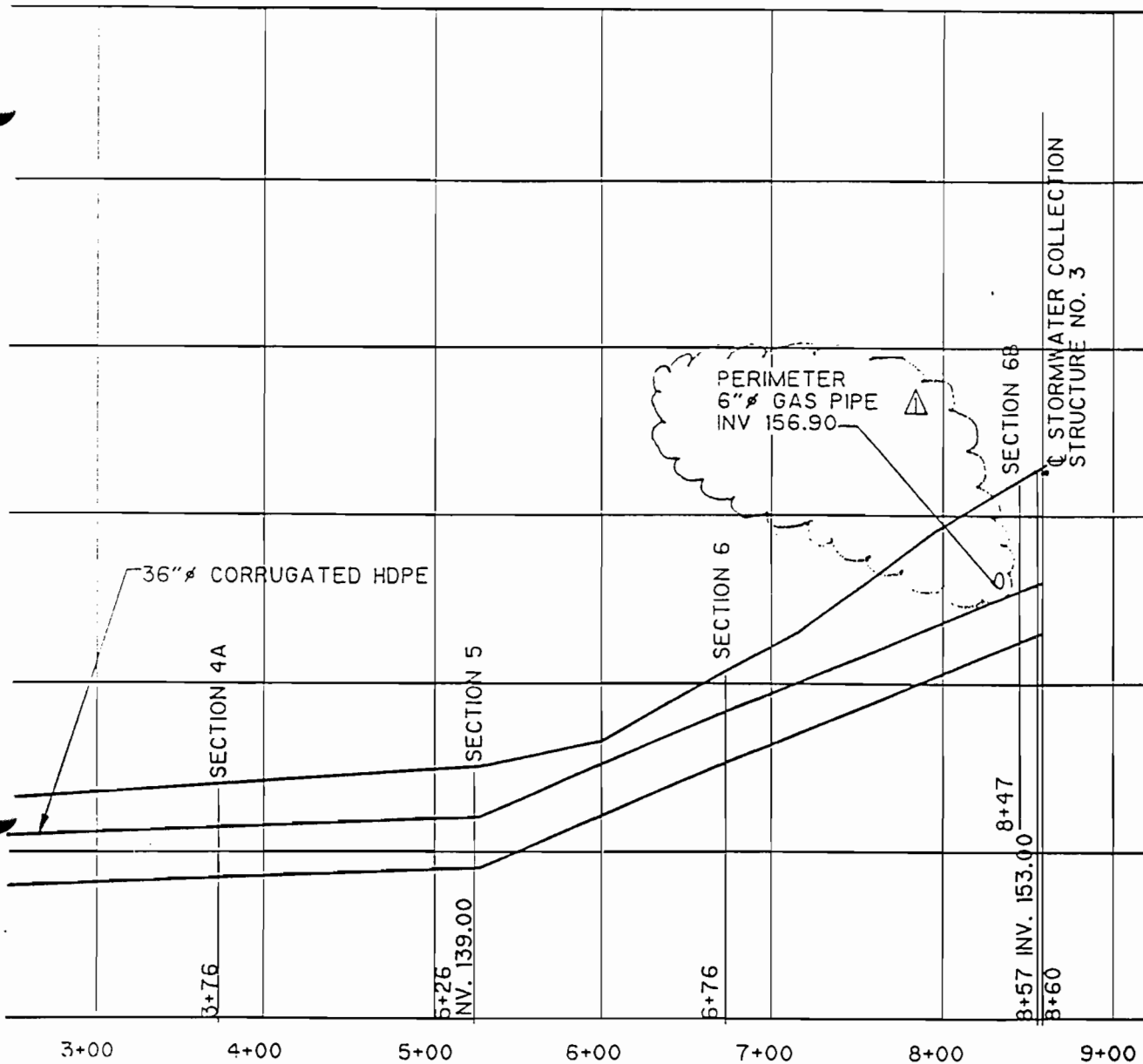
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Addendum No. 2

REF.
DWG. C-15

Added Note

SHEET SK-C3



CENTERLINE WEST DRAIN

SCALE VERT 1" = 10'
HORIZ. 1" = 100'

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Woodbury, New York 11797

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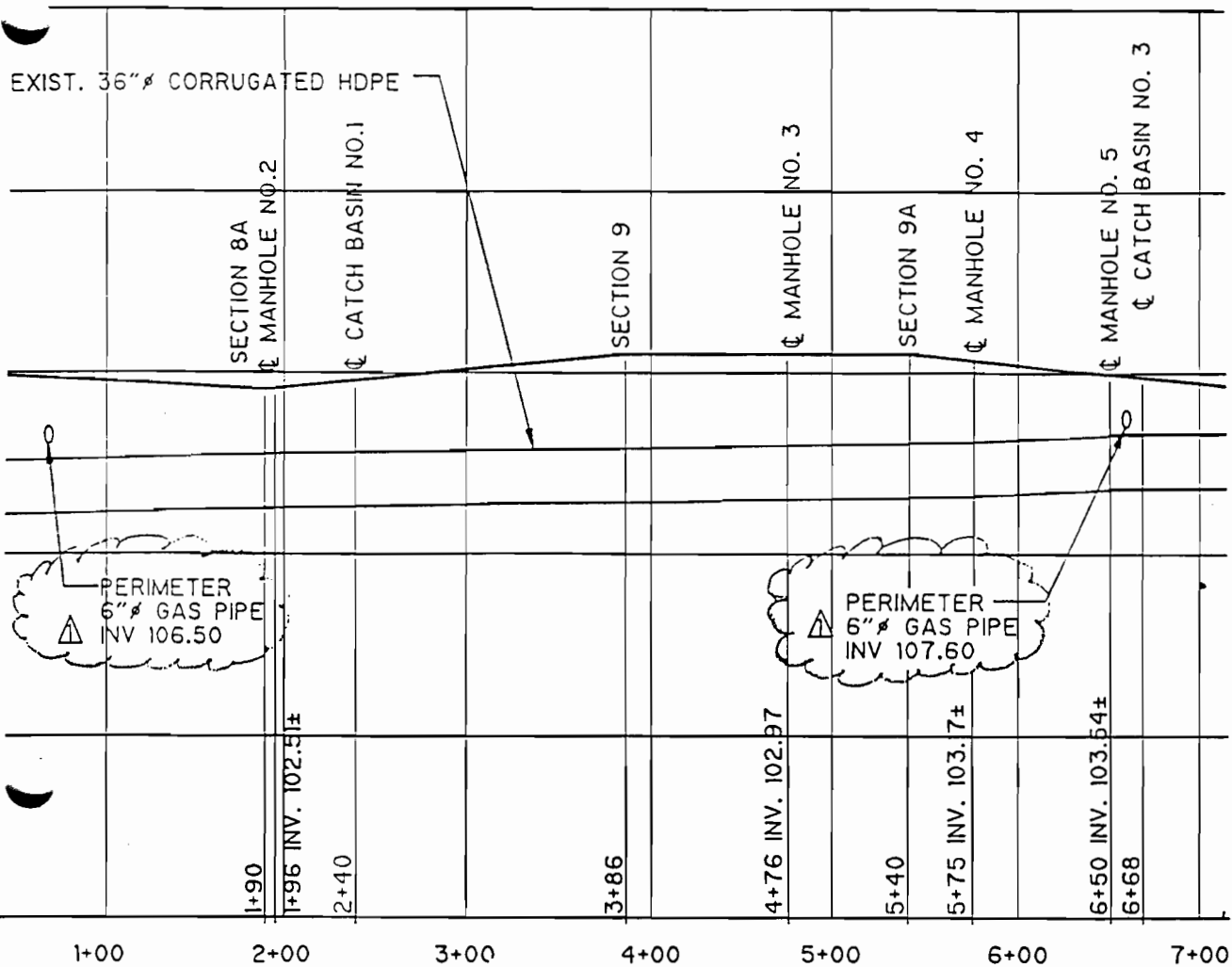
Huntington/East Northport Landfill
Contract No. ENV 94-01/O-C

Addendum No. 2

REF.
DWG. C-16

Added Note Leader & Pipe

SHEET SK-C4



CENTERLINE EAST DRAIN

SCALE VERT 1" = 10'
HORIZ. 1" = 100'

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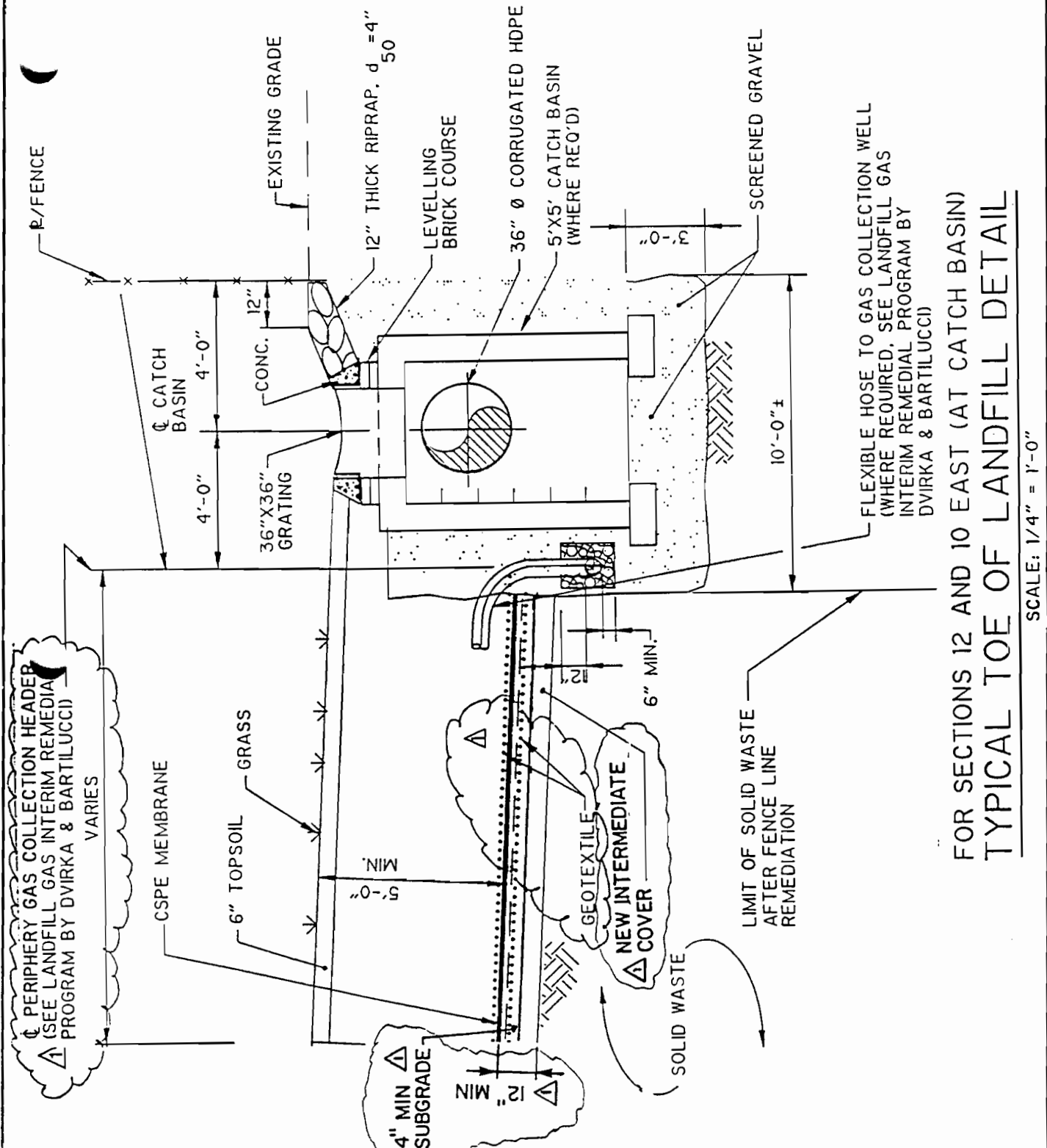
Huntington/East Northport Landfill
Contract No. ENV 94-01/O-C

Addendum No. 2

REF.
DWG. C-16

Invent and Pipe

SHEET SK-C5



FOR SECTIONS 12 AND 10 EAST (AT CATCH BASIN)
TYPICAL TOE OF LANDFILL DETAIL

SCALE: 1/4" = 1'-0"

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CDM

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 Woodbury, New York 11797

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 planners & management consultants

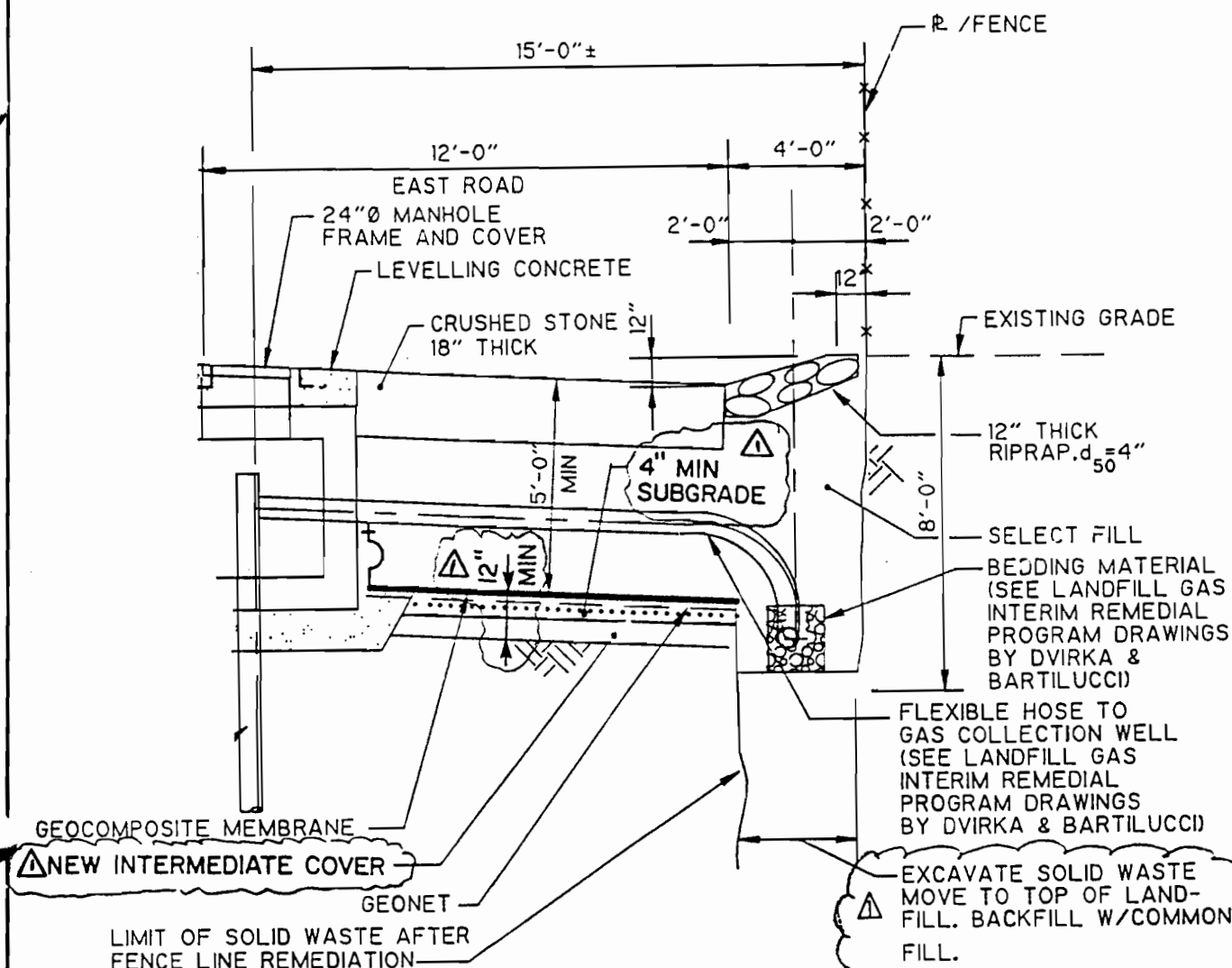
Huntington/East Northport Landfill
 Contract No. ENV 94-01/O-C

Addendum No. 2

Added Notes

REF. DWG. **C-22**

SHEET **SK-C6**



FOR SECTIONS 20, 21 AND 22 EAST (AT GAS MANHOLES)
TYPICAL TOE OF LANDFILL DETAIL

SACLE: 1/4" = 1'-0"

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CDM

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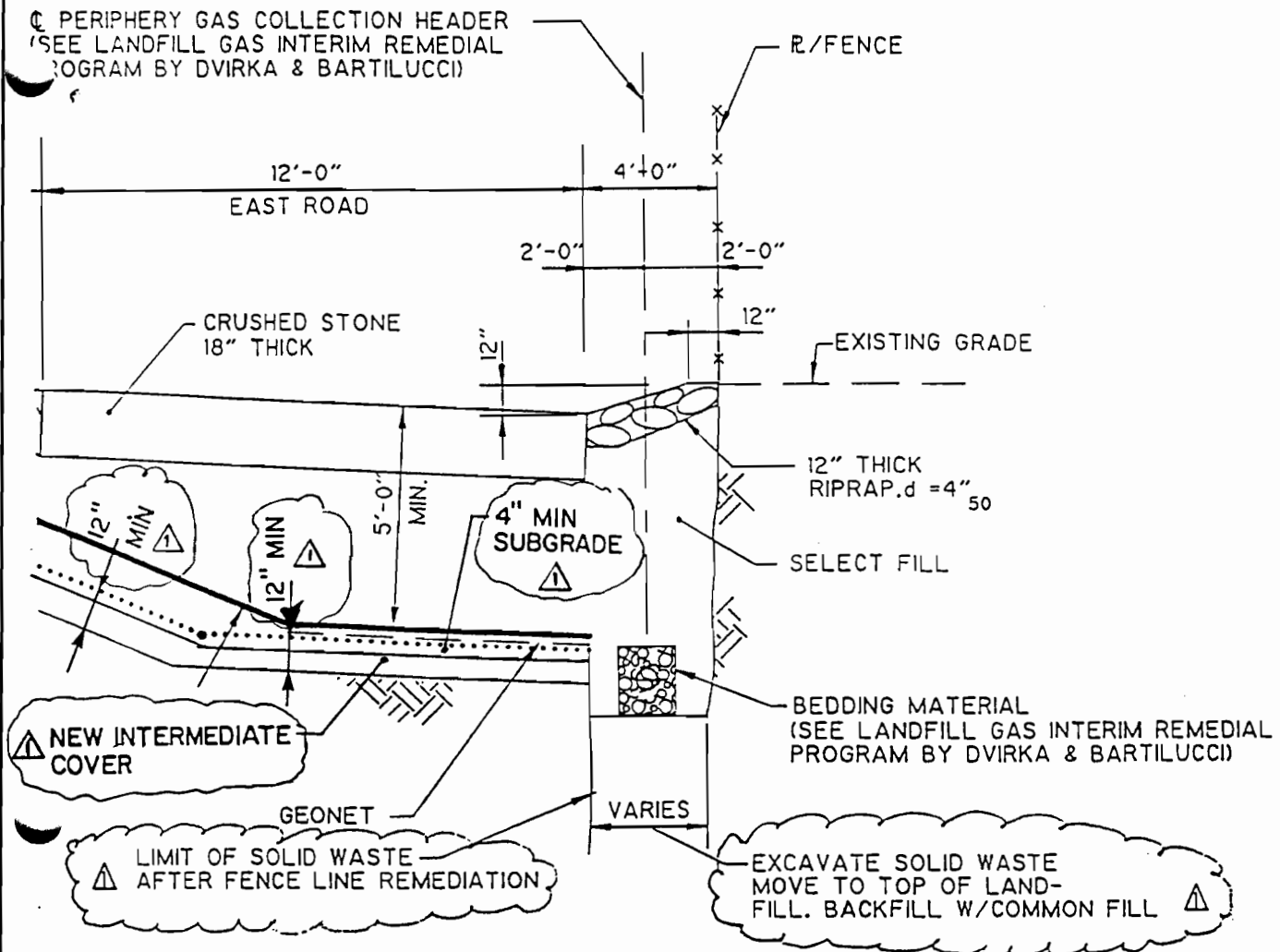
Huntington/East Northport Landfill
 Contract No. ENV 94-01/O-C

Addendum No. 2

REF.
 DWG. · C-22

Note Corrected

SHEET 5K-C7



FOR SECTIONS 20, 21 AND 22 EAST (NO GAS MANHOLES)

TYPICAL TOE OF LANDFILL DETAIL

SCALE: 1/4" = 1'-0"

CAMP DRESSER & McKEE

CDM

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Great Neck, New York 11079

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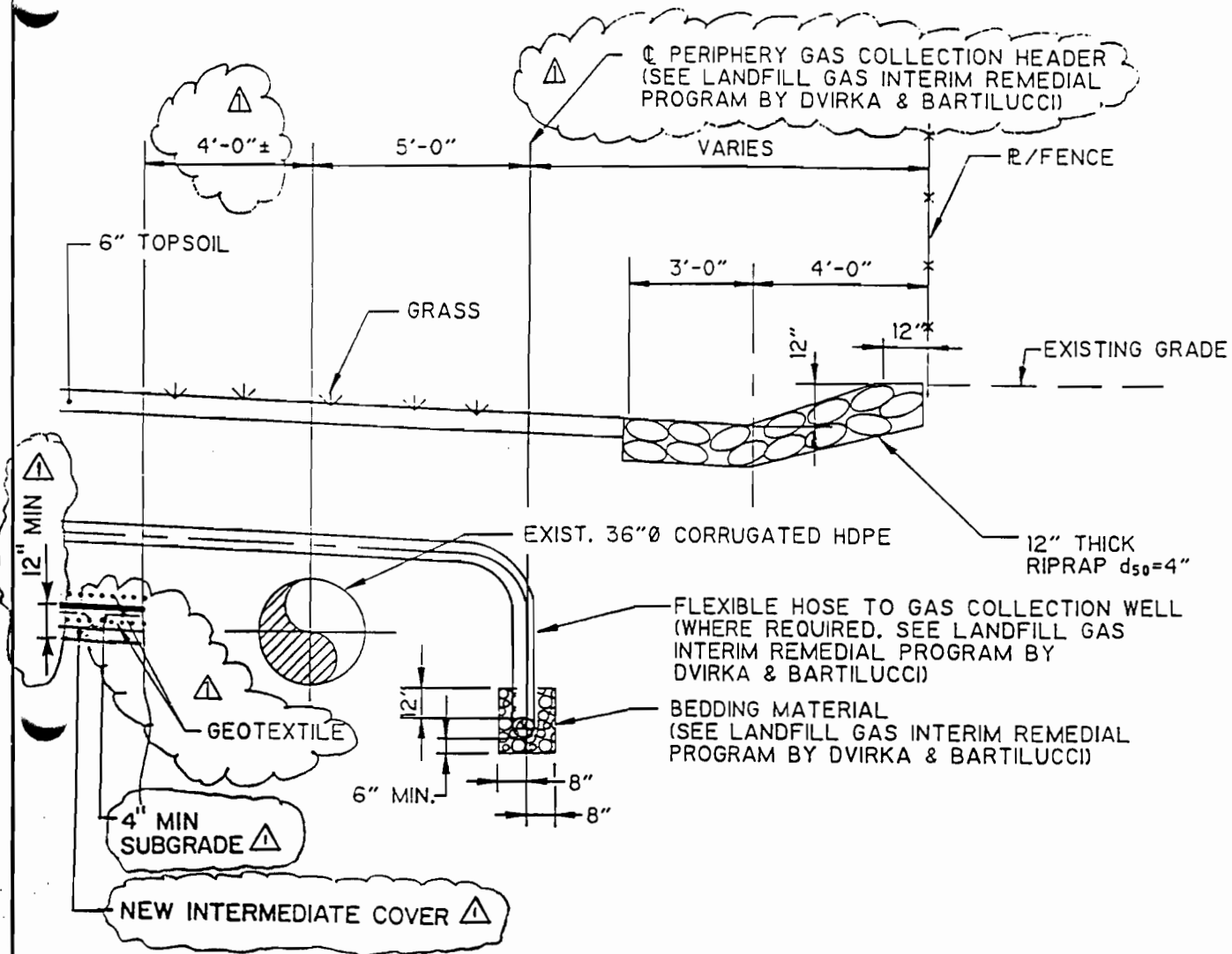
Huntington/East Northport Landfill
Contract No. ENV 94-01/O-C

Addendum No. 2

REF.
DWG. - C-22

Notes Corrected

SHEET. SK-CB



FOR SECTIONS 9 AND 9A (AT GAS MANHOLES)
TYPICAL TOE OF LANDFILL DETAIL

SCALE: 1/4" = 1'-0"

CAMP DRESSER & McKEE

CDM

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 Goshen, New York 11797

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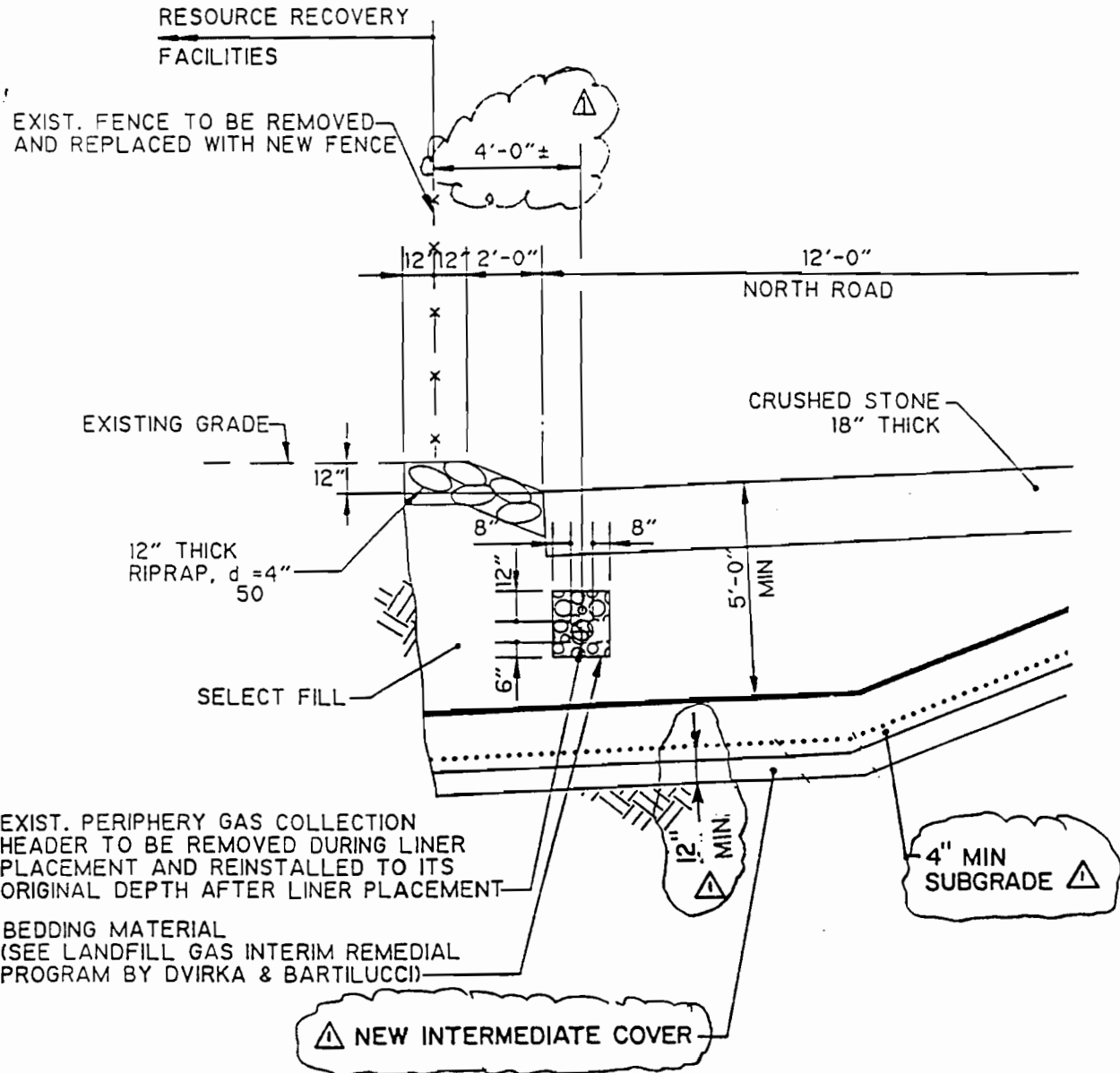
Huntington/East Northport Landfill
 Contract No. ENV 94-01/O-C

Addendum No. 2

REF.
 DWG. C-22

Notes Corrected

SHEET SK-C9



FOR SECTIONS 1, 2 AND 3 NORTH

TYPICAL TOE OF LANDFILL DETAIL

SCALE: 1/4" = 1'-0"

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Contract No. ENV 94-01/O-C

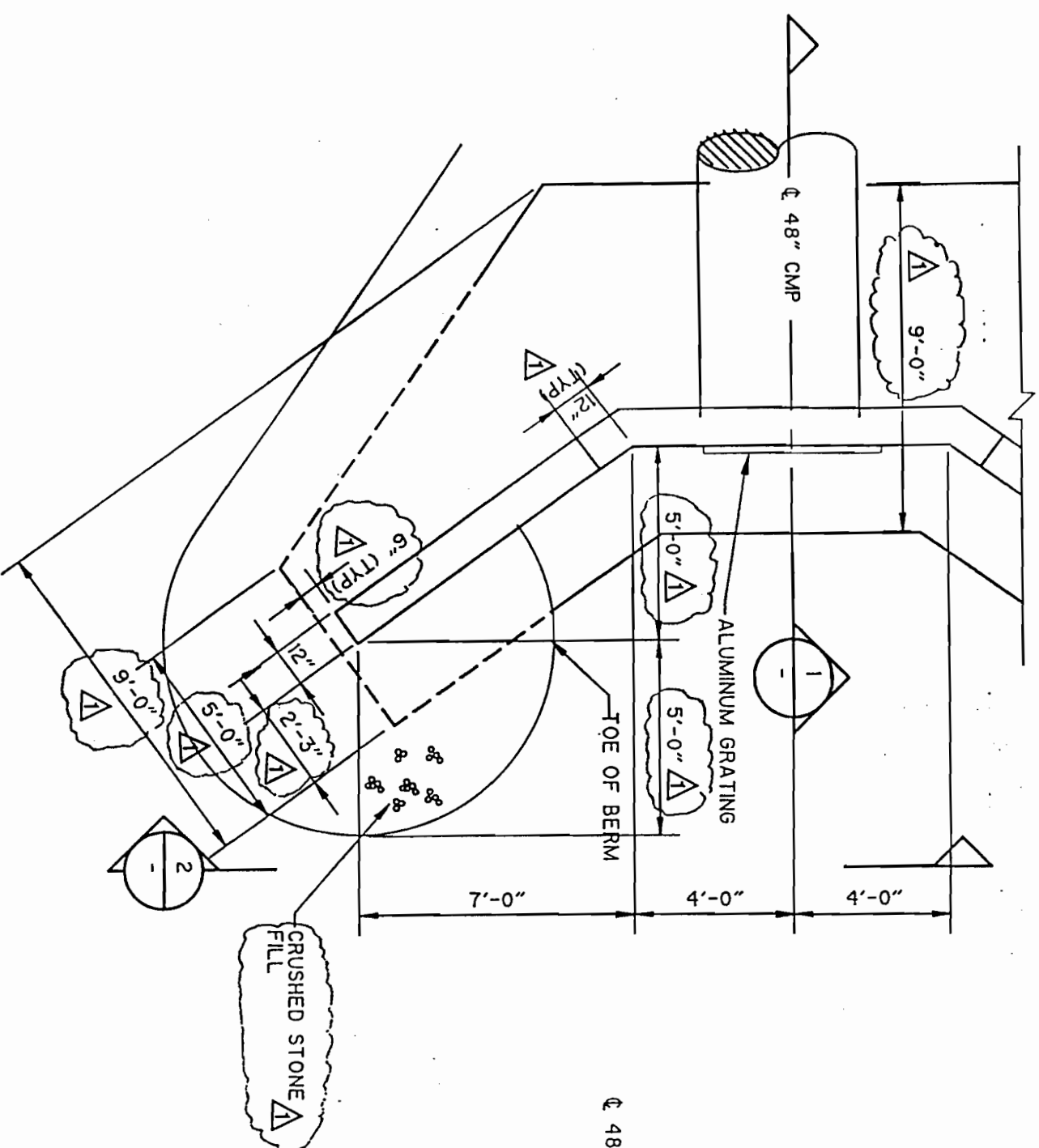
Addendum No. 2

Dimension

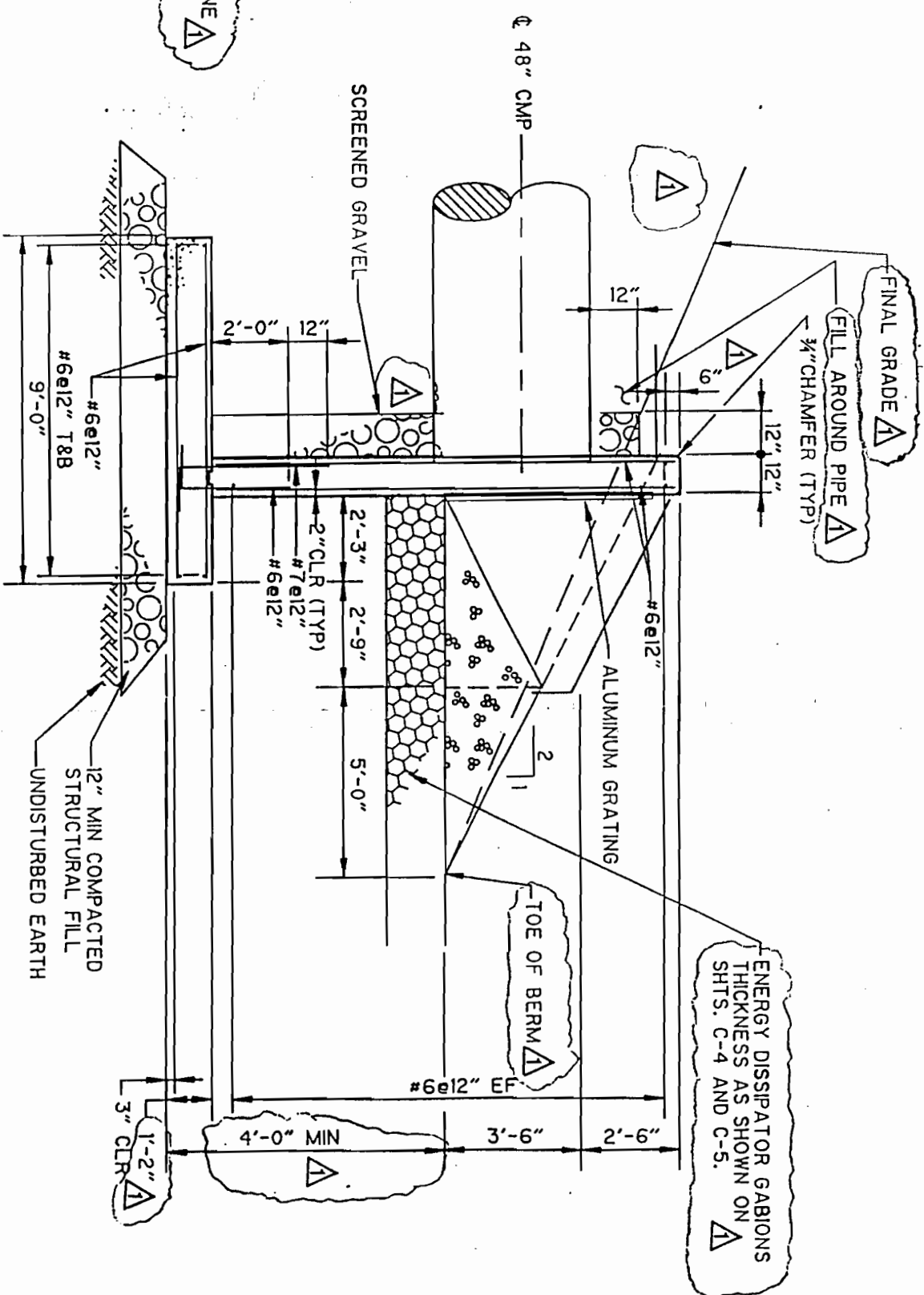
REF.
DWG. C-22

SHEET SK-C10

PLAN



SECTION



Δ TYPICAL HEADWALL DETAIL @ RECHARGE BASINS

SCALE: 1/4" = 1'-0"

4'-6" x 4'-6" ALUMINUM
GRATE, SEE NOTES Δ

3" x 3" x 1/4" x 0'-3" LG ALUMINUM ANGLE
WELDED TO ALUMINUM BAR
w/ 1/4" S.S. EXPANSION ANCHOR
(TYP) WITH 5" MINIMUM EMBEDMENT.
EXPANSION ANCHORS SHALL BE HILT
"KWIK-BOLT II" OR EQUAL. Δ

1/4" x 1/2" ALUMINUM CROSS BAR Δ

48" DIA. CMP Δ

2 1/2" x 1/2" ALUM.
GRID BAR AT
3" OPNGS. (TYP) Δ

- NOTES:
1. ALUMINUM SHALL BE TYPE 6061 T6.
 2. WELDING SHALL BE IN ACCORDANCE WITH THE REQUIREMENTS OF THE AWS CODE.
 3. WHERE ALUMINUM CONTACTS CONCRETE, APPLY A HEAVY COAT OF APPROVED ALKALI RESISTANT PAINT TO THE CONCRETE.

2

SECTION

CAMP DRESSER & MCKEE

CDM

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Woodbury, New York 11797

environmental engineers, scientists,
planners & management consultants

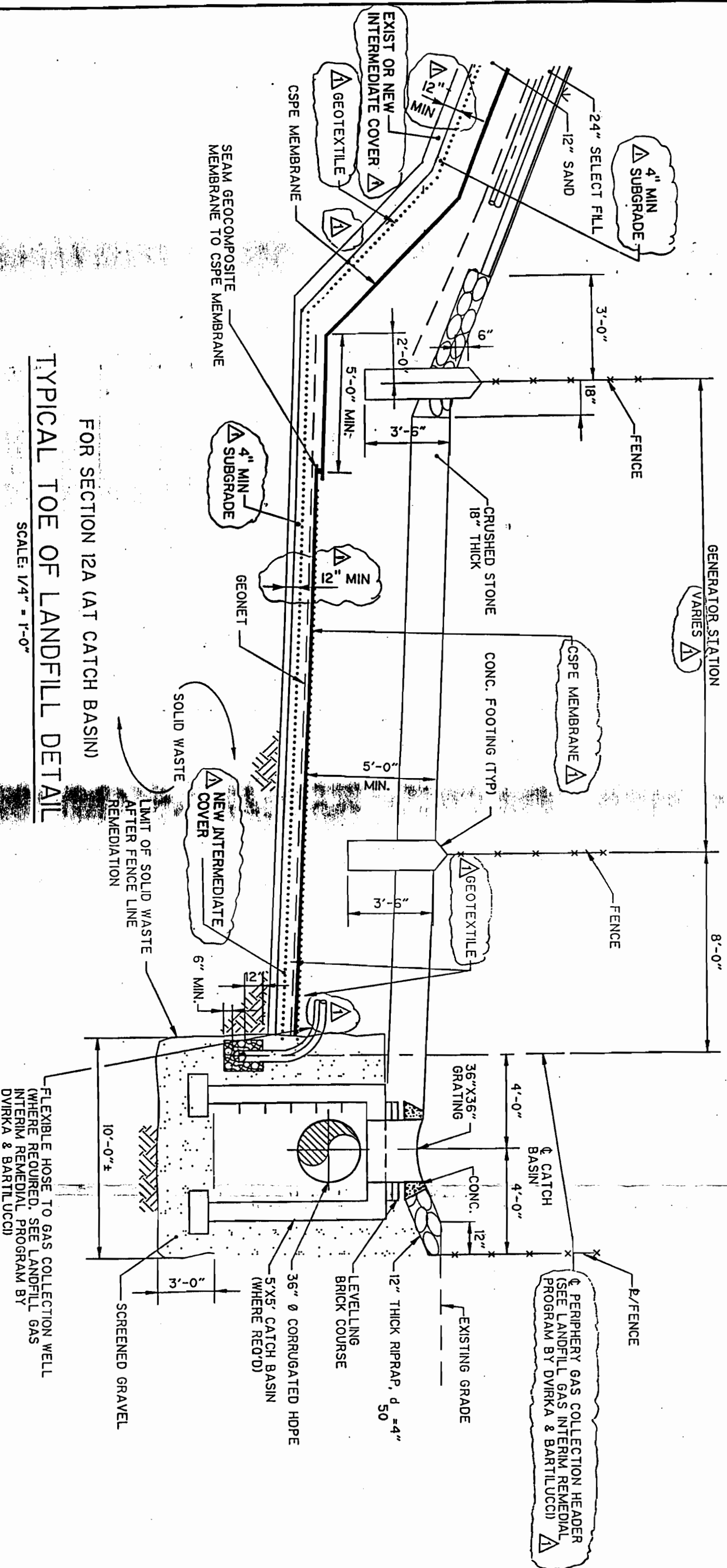
Huntington/East Northport Landfill
Contract No. ENV 94-01/O-C

Addendum No. 2

REF.
DWG. - C-22

Notes Added & Corrected

SHEET 5K-C11B



TYPICAL TOE OF LANDFILL DETAIL

SCALE: 1/4" = 1'-0"

FOR SECTION 12A (AT CATCH BASIN)

CAMP DRESSER & MCKEE

CDM

100 Crossways Park West
Woodbury, New York 11797

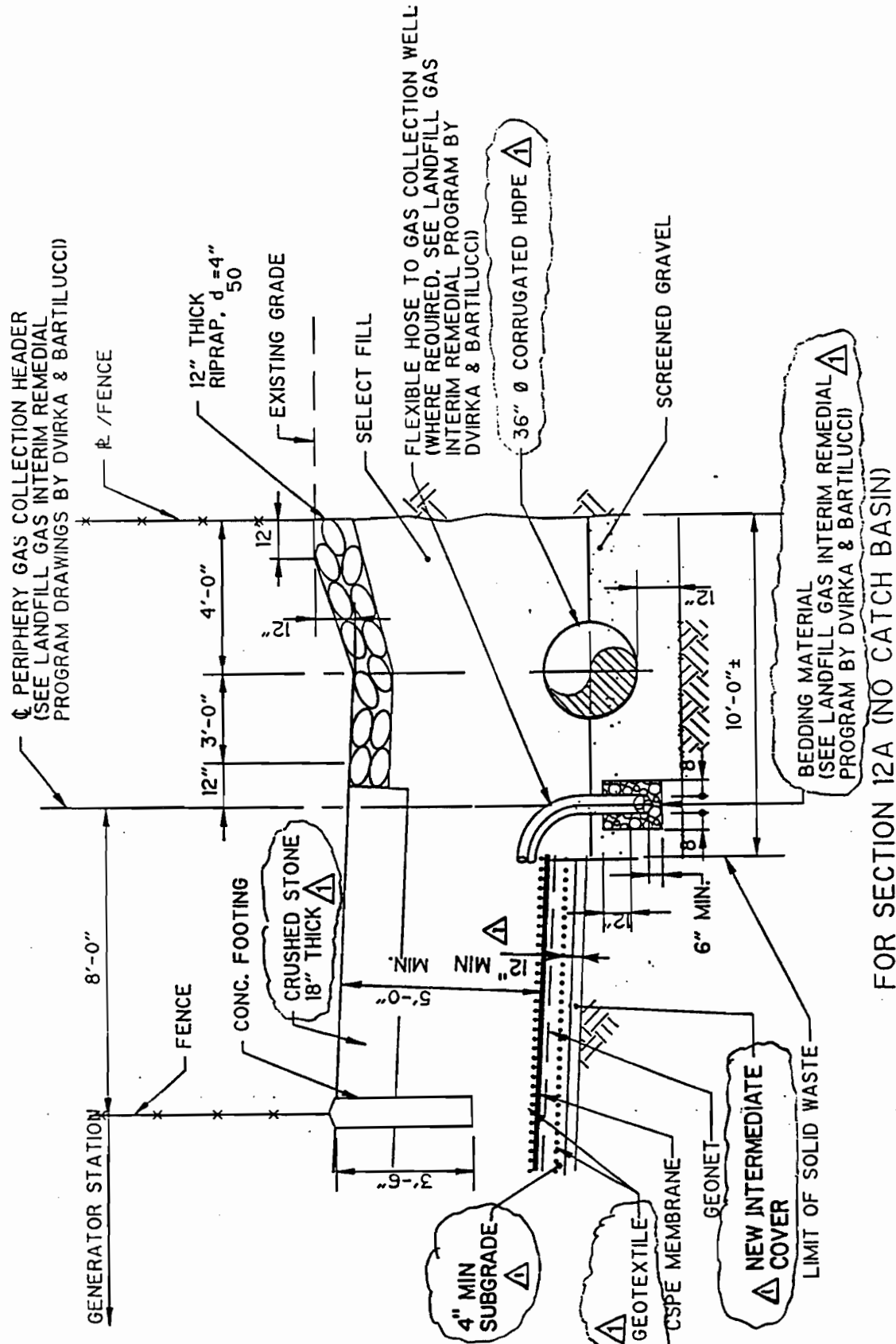
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Huntington/East Northport Landfill
Contract No. ENV 94-01/O-C

Addendum No. 2

REF.
DWG. C-23

Notes Added & Corrected SHEET 5K-C12



TYPICAL TOE OF LANDFILL DETAIL

SACLE: 1/4" = 1'-0"

FOR SECTION 12A (NO CATCH BASIN)

CAMP DRESSER & McKEE

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Woodbury, New York 11797

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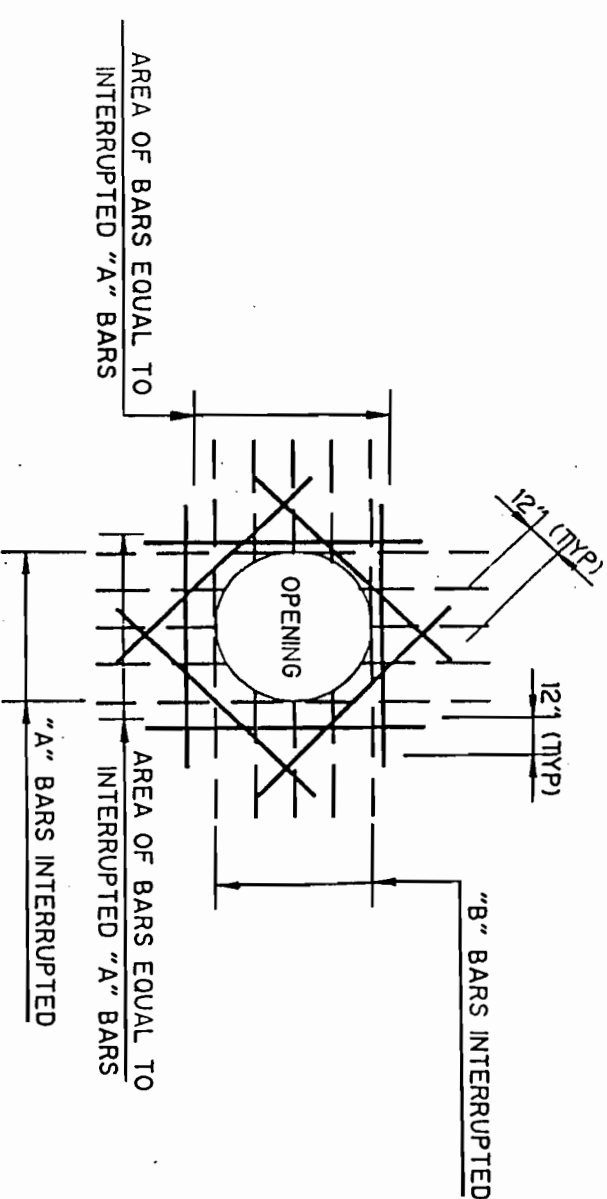
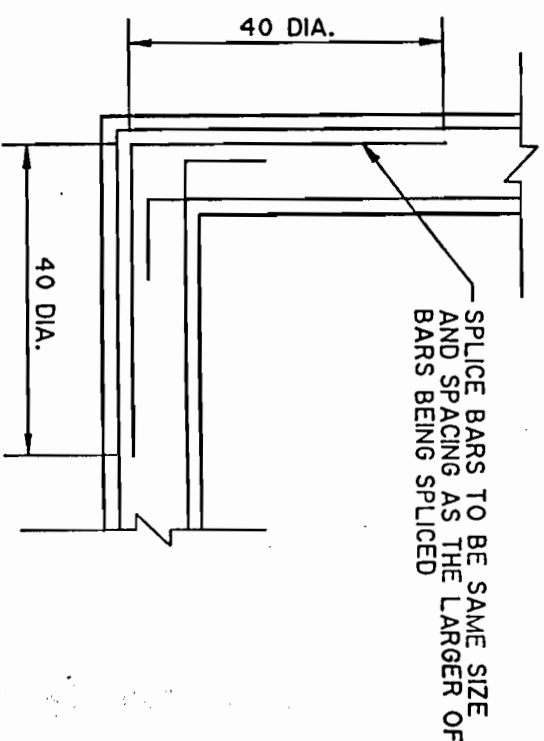
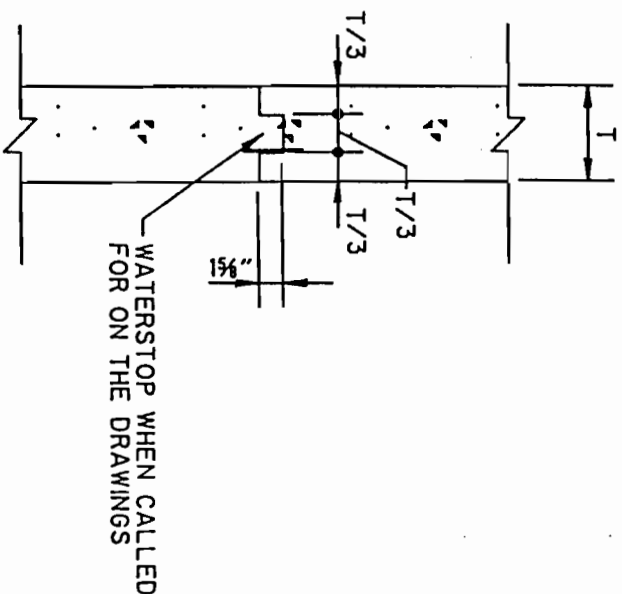
Huntington/East Northport Landfill
Contract No. ENV 94-01/O-C

Addendum No. 2

REF.
DWG. -C-23

Notes Added & Corrected

SHEET . SK-C13



CONCRETE KEY

NTS

WALL REINFORCEMENT DETAIL

NTS

REINFORCEMENT AT ROUND OPENINGS

NTS

NOTE:
1. DETAIL IS FOR OPENINGS 15" OR LARGER. SPREAD
NORMAL REINFORCEMENT AT SMALLER OPENINGS.

CONCRETE NOTES:

1. REINFORCED CONCRETE SHALL CONFORM TO THE ACI SPECIFICATION 318-89 AND THE LATEST ACI-350.
2. MINIMUM CONCRETE STRENGTH AT 28 DAYS:
STRUCTURAL CONCRETE $f'c = 3500$ psi
CONCRETE TOPPING $f'c = 3500$ psi
CONCRETE FILL $f'c = 2500$ psi
3. REINFORCING STEEL SHALL BE NEW BILLET STEEL CONFORMING TO ASTM SPECIFICATION A615 GRADE 60.
4. REINFORCING STEEL FABRICATION SHALL BE IN ACCORDANCE WITH THE CRSI CODE OF STANDARD PRACTICE.
5. REINFORCING STEEL SHALL HAVE THE FOLLOWING CLEAR CONCRETE COVER UNLESS OTHERWISE NOTED:
CONCRETE CAST AGAINST AND PERMANENTLY EXPOSED TO EARTH 3 IN.
SLABS ON GRADE 2 IN.
CONCRETE SURFACES IN CONTACT WITH SOIL, WATER, WASTEWATER OR EXPOSED TO WEATHER 2 IN.
6. SPLICED BARS SHALL HAVE A MINIMUM LAP OF 40 BAR DIAMETERS UNLESS OTHERWISE NOTED.
7. CONSTRUCTION JOINTS SHALL NOT BE PLACED AT LOCATIONS OTHER THAN SHOWN ON THE DRAWINGS UNLESS APPROVED BY THE ENGINEER.
8. ALL EXPOSED CORNERS OF CONCRETE TO HAVE $\frac{3}{4}$ " MINIMUM CHAMFER UNLESS OTHERWISE NOTED.
9. REINFORCING BARS TO EXTEND 12 BAR DIAMETERS BUT NOT LESS THAN 12" BEYOND BEND UNLESS OTHERWISE NOTED.

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Woodbury, New York 11797

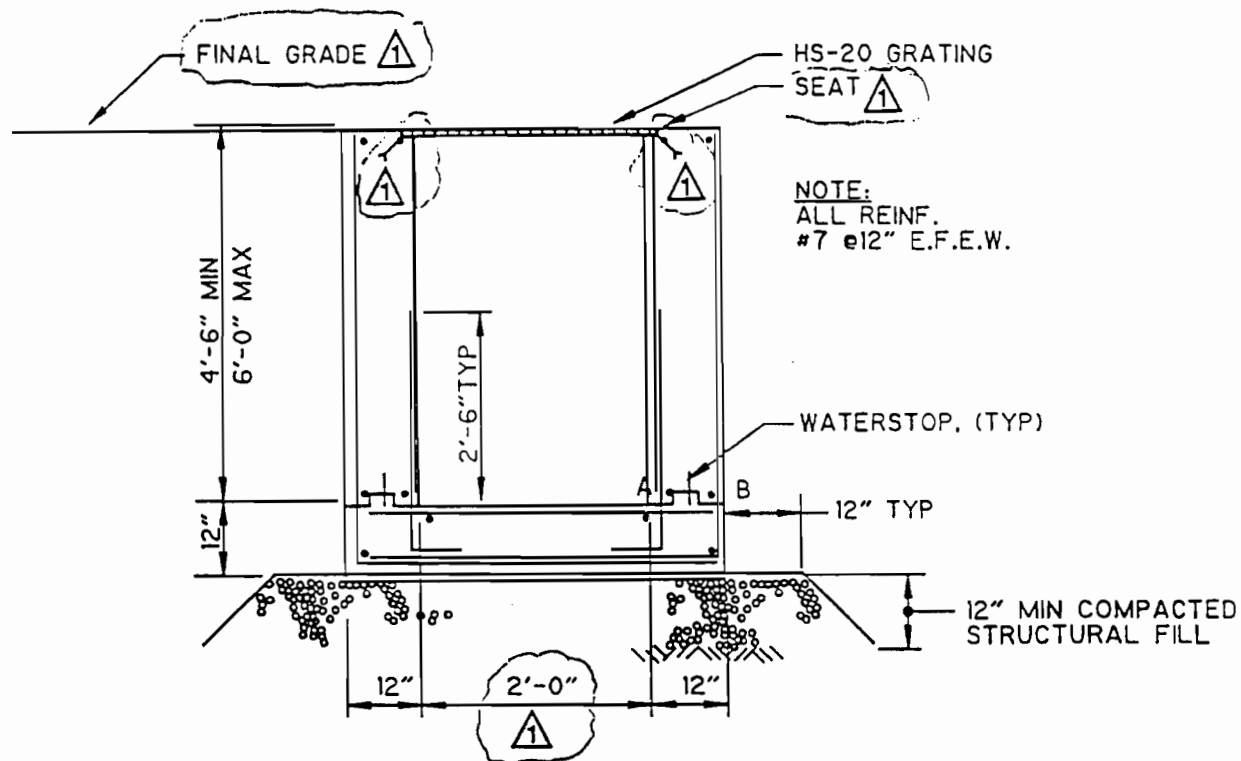
environmental engineers, scientists,
planners & management consultants

Huntington/East Northport Landfill
Contract No. ENV 94-01/O-C

Addendum No. 2

Added Details & Notes

REF. C-23
DWG. SHEET SK-C14



SECTION @ TRENCH DRAIN Δ
NTS

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Huntington/East Northport Landfill
Contract No. ENV 94-01/O-C

Addendum No. 2

REF.
DWG. C-25

Dimension & Notes

SHEET 514-C15

**ADDENDUM TO WC-2
REFER TO
TECHNICAL SPECIFICATIONS AND DRAWINGS
FOR THE
PERIMETER LANDFILL GAS COLLECTION SYSTEM
(russet color pages)**

This section of ADDENDUM No. 2 is applicable to the Technical Specifications and Drawings for the Interim Remedial Program - Perimeter Landfill Gas Collection System (WC-2) and consists of four (4) pages.

All Bidders shall make the following changes to all pertinent sheets, pages and paragraphs of the Technical Specifications and Drawings for the Perimeter Landfill Gas Collection System, and shall take same into full consideration in arriving at the Bid Price.

A) CLARIFICATION

1. All references made to "remediated soils" in these Technical Specifications and Drawings shall be as specified and performed in WC-1.

B) TECHNICAL SPECIFICATIONS, SECTION 15060 - PIPE AND PIPE FITTINGS

1. Page 15060-1, PART 2: PRODUCTS - SECTION 2.01 PVC PIPE AND PIPE FITTINGS, a new paragraph L shall be added and shall read:

"L. All Socket Saddle Tees shall be Schedule 80 PVC. Each Socket Saddle Tee shall be supplied complete with two (2) stainless steel bands sized in accordance with manufacturer's recommendations and supplied by Plastic Pipe & Supply, Inc. or an approved equal."

2. Page 15060-2, PART 4: INSTALLATION - SECTION 4.01 PVC PIPE AND PIPE FITTINGS, a new paragraph N shall be added and shall read:

"N. The Contractor shall apply a coating of primer to the entire interior surface of each Socket Saddle Tee and to an equivalent area on the exterior of the header pipe prior to applying solvent cement. Two (2) stainless steel bands shall be used to attach all Socket Saddle Tees in accordance with the manufacturers recommendations."

C) CONTRACT DRAWING 10 OF 16

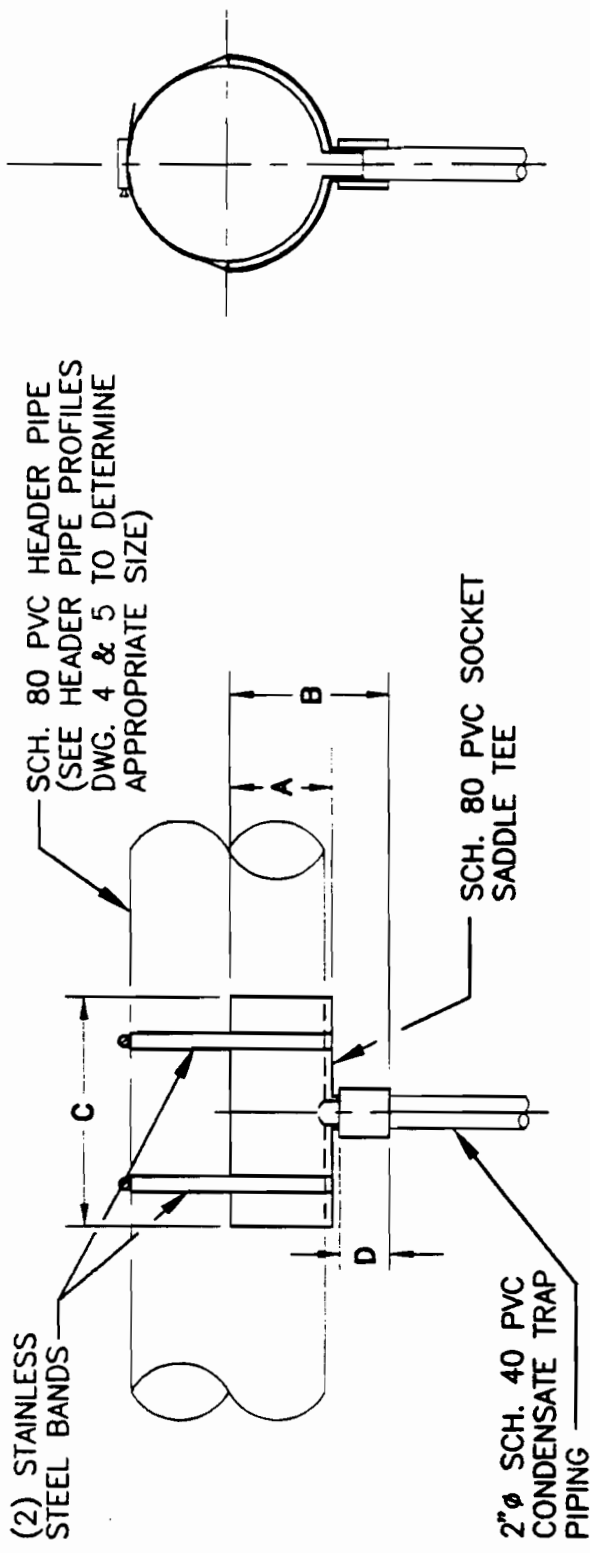
1. Add new detail "SOCKET SADDLE TEE DETAIL" as shown on attached Sketch 1.
2. Revise CONDENSATE TRAP AND ISOLATION VALVE MANHOLE CD-1,3,4, AND 5 DETAIL as shown on attached Sketch 2.



Seal

June 13, 1994


William C. Miller, Jr., P.E.



SOCKET SADDLE TEE DETAIL
N.T.S.

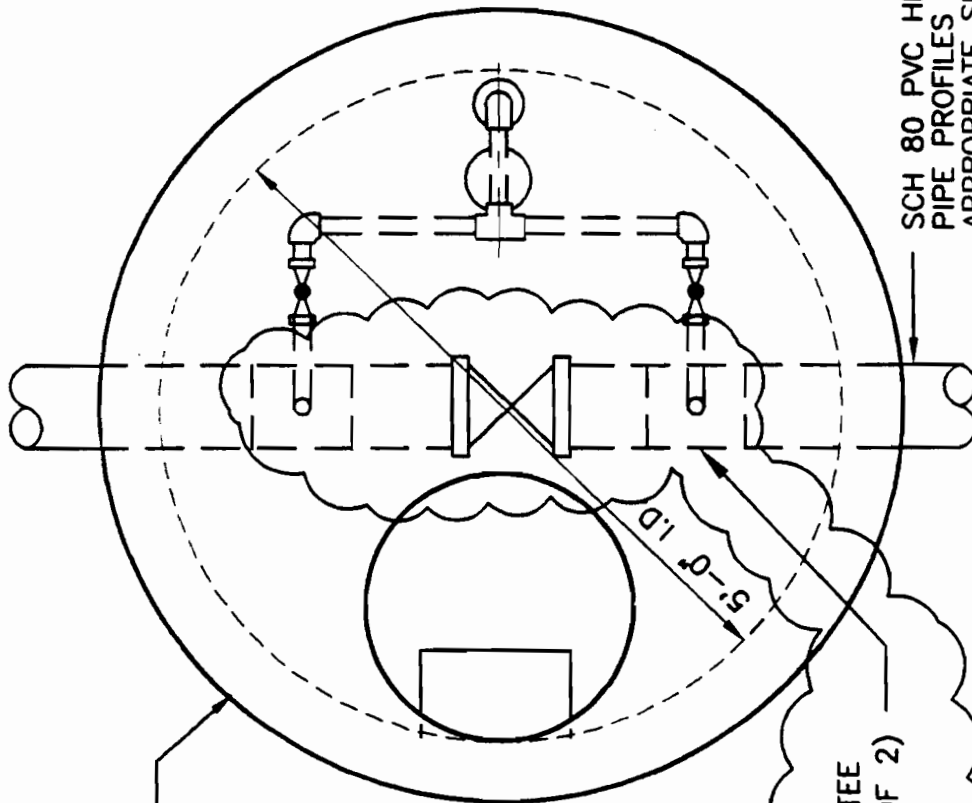
DIMENSION	6" HEADER	12" HEADER	14" HEADER
A	3-5/16"	6-3/8"	7"
B	7"	10-1/16"	10-11/16"
C	8-3/8"	14-3/8"	16-3/8"
D	3-3/16"	3-3/16"	3-3/16"

SKETCH NO.1

DATE: JMS-6-10-94 FILE: 1122-A1 10 OF 18	REVISION 1. JMS 2. JMS	PROJECT NO. 1122 DATE MARCH 1993 DRAWING 10 OF 18	NEW CONDENSATE TRAP, ISOLATION VALVE AND MANHOLE DETAILS
	EAST NORTHPORT LANDFILL TOWN OF HUNTERDON, NY LANDFILL GAS INTERIM REMEDIAL PROGRAM		
DYWIDAG AND BARTOLUCCI CONSULTING ENGINEERS			

2'-0" ϕ MANHOLE COVER OPENING
SEE NOTE 2 THIS DWG.

AREA OF ADDENDUM NO. 1



PLAN
N.T.S.

SKETCH NO.2

NEW CONDENSATE TRAP, ISOLATION VALVE
AND MANHOLE DETAILS

EAST HARTFORD LANDFILL
TOWN OF HARTFORD, CT

LANDFILL GAS
INTERIM REMEDIAL PROGRAM

db

DIPIERRO AND BARTOLUCCI
CONSULTING ENGINEERS

NO.	DATE	REVISION	BY	CHKD.
1	1/93	REDESIGN INSECT COMMENTS		
2	5/94	ADDENDUM NO. 1		

PROJECT NO.	1133
DATE	MARCH 1993
SCALE	AS NOTED

10
DRAWING
10 OF 16

REMEDIED SOIL

EXIST. SCALE

EXIST. SCALE
FOUNDATION

EXIST. 6" DENSE
MIX

PIPE BEDDING MATERIAL COMPACTED
IN 2'-0" (LOOSE) LAYERS AND
TESTED PER ASTM 698



NEW 36" HDPE NORTH DRAIN PIPE
(REFER TO WC-1)

NEW 6" DIA. SCH 80 PVC HEADER
PIPE INV. EL. \pm 103.25

EXIST. GEOTRIDS

EXIST. 3/4" CRUSHED
STONE

HEADER PIPE SECTION 8
1/6
N.T.S.

SKETCH NO.3

DATE: AFB-5/16/94 FILE: 1122-45		PROJECT NO. 1122		DATE: MARCH 1993		DRAWING NO. 8 OF 14	
REVISION		EAST HARTFORD LANDFILL TOWN OF HARTFORD, CT		HEADER PIPE SECTIONS			
1	1/23						
2	5/24						
DINELA AND BARTOLUCCI CONSULTING ENGINEERS		LANDFILL GAS INTERIM REMEDIAL PROGRAM					

DOUTNEY

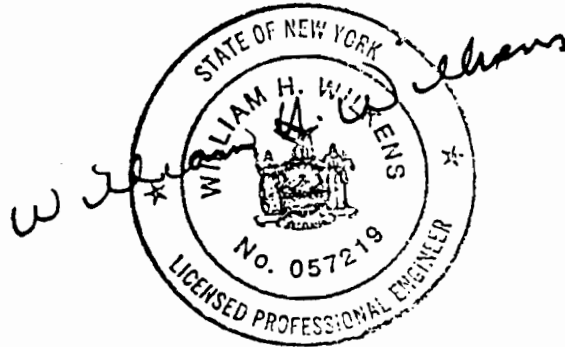
Memorandum

TO: All Bidders of Record

FROM: William H. Wilkens *W H Wilkens*

DATE: June 20, 1994

SUBJECT: Town of Huntington
Suffolk County, NY
Contract Documents and Specifications
Contract No. ENV94-01/0-C
Interim Remedial Program
Huntington/East Northport Landfill
Addendum No. 3



Transmitted herewith is Addendum No. 3 to the Contract Documents and Specifications for the Interim Remedial Program, Huntington/East Northport Landfill.

The addendum substantially includes a field test pad for both Bids, a new Geogrid specification for the Alternate Capping Design Bid ONLY in lieu of Geogrid Composite, deletion of the removal of scales, revised paving limits along easterly property line, extraction wells and related piping modifications and miscellaneous revisions and clarifications to the original Contract Documents and Specifications.

This addendum shall be included as part of the Contract Documents and Specifications for the Interim Remedial Program, Huntington/East Northport Landfill as provided in the Information for Bidders.

nfr

(nr1/membid)

Camp Dresser & McKee
100 Crossways Park West
Woodbury, NY 11757

Date issued: June 20, 1994

TO: All Bidders of Record

RE: Town of Huntington
Suffolk County, NY
Contract Documents and Specifications
Contract No. ENV94-01/0-C
Interim Remedial Program
Huntington/East Northport Landfill
Addendum No. 3

ADDENDUM NO. 3

This Addendum shall be part of the Contract Documents and Specifications for the Interim Remedial Program, Huntington/East Northport Landfill as provided in the Information for Bidders.

Acknowledge receipt of this Addendum by inserting its number and date on page 16.
Failure to do so may subject the Bidder to disqualification.

ADDENDUM NO. 2 CHANGES

1. Pages 10 and 11 of 14. SECTION 02274 - GEOGRID COMPOSITE. Delete all changes (1 to 12) in their entirety.
2. Page 11 of 14. NEW SPECIFICATION SECTIONS. Delete item 6 in its entirety.

GENERAL CHANGE TO SPECIFICATIONS. DRAWINGS AND SKETCHES ISSUED (REVISED AND REISSUED) UNDER ADDENDUM NO. 2 AND ADDENDUM NO. 3

1. Alternate Capping Design. In all of the above, wherever the words "Geogrid Composite" appears change to read "Geogrid."
2. A new specification section, "SECTION 02282 - GEOGRID" is included in this Addendum which shall be the referenced specification in all specification sections, drawings and sketches for the Alternate Capping Design Bid ONLY.

TABLE OF CONTENTS

1. Delete pages TC-1, TC-2, and TC-3 in their entirety and replace them with the attached revised pages TC-1R, TC-2R, and TC-3R.

BID PROPOSAL

1. Delete the six (6), blue printed, itemized bid pages for Landfill Closure - Base Bid and replace with the revised pages which are attached.
2. Delete the six (6) itemized bid pages for Landfill Closure - Alternate Capping Design Bid and replace with the revised pages which are attached.

TECHNICAL SPECIFICATIONS: WC-1 LANDFILL CLOSURE

SECTION 01010- SUMMARY OF WORK

1. Page 01010-2, Paragraph 1.02 F, item 9, first line, delete "landscaping".

SECTION 01025 - MEASUREMENT AND PAYMENT

1. Page 01025-2, Paragraph 1.05, Removal of Scales (Item 4). Delete this paragraph in its entirety and replace it with the following:

"1.05 HORIZONTAL GAS COLLECTORS (ITEM 4)

A Measurement

1. Measurement for payment under Item 4 on the Bid Form will be on a linear foot basis as measured in place.

B Payment

1. Payment for Item 4 will be made for the quantity determined above at the unit price bid per linear foot which price and payment shall be full compensation for, but shall not be limited to, furnishing, installing, and jointing the 6 inch slotted horizontal gas collector pipes, complete with all fittings and other appurtenances; furnishing and placing pea gravel and sand; and any other related materials or work for which payment is not specifically provided in other bid items, but as shown in the Drawings."
2. Page 01025-5, Paragraph 1.16. Change title of this paragraph to read as follows: "1.16 Slotted Corrugated HDPE Underdrain Pipe (Item 15)".
3. Page 01025-6, Paragraph 1.16 B, item 1, fourth and fifth lines, delete "and horizontal gas collector".
4. Page 01025-12, Paragraph 1.36, Landscaping (Item 35). Delete this paragraph in its entirety and replace it with the following:

"1.36 FIELD TEST PAD (ITEM 35)

A. Measurement

1. Measurement for payment under Item 35 on the Bid Form will be on a lump sum basis for the field pad testing.

B. Payment

1. Payment for Item 35 shall be at the lump sum price bid which price and payment shall be full compensation for furnishing all labor, materials equipment, installation and testing of the field test pad.

SECTION 01026 - MEASUREMENT AND PAYMENT

1. Page 01026-2, Paragraph 1.05, Removal of Scales (Item 4). Delete this paragraph in its entirety and replace it with the following:

"1.05 HORIZONTAL GAS COLLECTORS (ITEM 4)

A Measurement

1. Measurement for payment under Item 4 on the Bid Form will be on a linear foot basis as measured in place.

B Payment

1. Payment for Item 4 will be made for the quantity determined above at the unit price bid per linear foot which price and payment shall be full compensation for, but shall not be limited to, furnishings, installing, and jointing the 6 inch slotted horizontal gas collector pipes, complete with all fittings and other appurtenances; furnishing and placing pea gravel and sand; and any other related materials or work for which payment is not specifically provided in other bid items, but as shown on the Drawings."

2. Page 01026-5, Paragraph 1.15. Change title of this paragraph to read as follows:

"1.15 Slotted Corrugated HDPE Underdrain Pipe (Item 14)"

3. Page 01026-5, Paragraph 1.15 B, item 1, fourth and fifth lines, delete "and horizontal gas collector".
4. Page 01026-9, Paragraph 1.26. Delete this paragraph in its entirety and replace it with the following:

"1.26 GEOGRID (ITEM 25)

A Measurement

1. Measurement for payment under Item 25 on the Bid Form will be on a square foot basis for the furnishing and installation of geogrid. Measurement will be performed in place based on plan view area of the completed work with no allowances for slope correction.

B Payment

1. Payment for Item 25 will be made for the quantity determined above at the unit price bid per square foot which price and payment shall be full compensation for furnishing and installing the geogrid to the lines and grades shown on the Drawings including material required in the anchor trenches. No payment will be made for overlapping material. Payment for Item 25 shall also include construction of anchor trenches, all submittals, on site representatives, tie in connections, and all other items necessary to complete the geogrid installation."

5. Page 01026-12, Paragraph 1.34, Landscaping (Item 33). Delete this paragraph in its entirety and replace it with the following:

"1.34 FIELD TEST PAD (ITEM 33)

A. Measurement

1. Measurement for payment under Item 33 on the Bid Form will be on a lump sum basis for the field pad testing.

B. Payment

1. Payment for Item 33 shall be at the lump sum price bid which price and payment shall be full compensation for furnishing all labor, materials equipment, installation and testing of the field test pad.

SECTION 01047 - SPECIAL CONSTRUCTION CONDITIONS

1. Page 01047-4, Paragraph 1.04 C, item 1, first line, change "200" to "300".

SECTION 01050 - FIELD ENGINEERING

1. Page 01050-1, Paragraph 1.02, add the following subparagraph after subparagraph 1.02B:

"C Appendix B - Lockwood, Kessler, and Bartlett, Inc. Topographical Aerial Survey, May 1994."

SECTION 01500 - TEMPORARY FACILITIES

1. Page 01500-3, Paragraph 1.05 A, first line, between the words "and power" and "including 220 volt" insert the following:

"to all temporary facilities"
2. Page 01500-4, Paragraph 1.06 A, first line, between the words "Provide" and "all heat" insert the following:

"heat to temporary facilities and"
3. Page 01500-4, Paragraph 1.08 A, first line, between the words "and water" and ",including" insert the following:

"to all temporary facilities"

SECTION 02200 - EARTHWORK

1. Page 02200-8, Paragraph 3.05 C, second line, change "92" to "90".
2. Page 02200-10, Paragraph 3.11. Add the following subparagraph after subparagraph B:

"C The primary approach to controlling odors where solid wastes are cut and filled, shall be to cover the waste as quickly as possible with temporary geosynthetic material manufactured specifically for landfill odor control, or with intermediate cover where appropriate. Daily soil cover material shall not be used, unless directed by the Engineer. Should unacceptable odors occur, the Contractor shall modify his operations to the satisfaction of the Engineer."

SECTION 02231 - FINAL COVER SELECT FILL

1. Page 02231-2&3, Paragraph 2.02 A, delete the particle size grading in its entirety and replace with the following:

<u>"Sieve Size</u>	<u>Percent Finer by Weight</u>
3/8-in	100
No. 4	80-95
No. 40	25-45
No. 100	5-15
No. 200	0-8"

2. Page 02231-3, Paragraph 2.02 B. Delete this subparagraph in its entirety.

SECTION 02271 - VERY LOW DENSITY POLYETHYLENE (VLDPE) GEOMEMBRANE LINER

1. Page 02271-1, Paragraph 1.03 A, fourth line, between the words "at no expense" and "any material" insert the following:

"(including installation costs)"

2. Page 02271-1, Paragraph 1.03 A. Add the following at the end of this paragraph:

"The written warranty shall meet all of the Owner's requirements. All materials supplied shall meet the express and implied warranties of the Uniform Commercial Code (UCC) and any other applicable laws, rules, and ordinances."

3. Page 02271-1, Paragraph 1.04. Change the title of this paragraph to read as follows:

"1.04 Installation And Workmanship Warranty And Guarantee"

4. Page 02271-1, Paragraph 1.04 A, first line, between the words "shall warrant" and "the material" insert the following:

"and guarantee"

5. Page 02271-1, Paragraph 1.04 A, third line, between the words "The warranty" and "shall include the" insert the following:

"and guarantee"

6. Page 02271-6, Paragraph 2.01 B1. Delete this paragraph in its entirety and replace it with the following:

"1. The geomembrane shall be 40 mil thick, textured VLDPE membrane, as manufactured by Poly-Flex or equal, and shall meet the minimum properties listed in Table 1 at the end of this Section."

7. Page 02271-20, Table 1, Tensile Strength at Break, change "(lbs/inch width)" to "(lbs/inch width)".

8. Page 02271-20, Table 1, Elongation At Break, change "(ASTM D638, Type IV Specimen at 20 inches/minute)" to "(ASTM D638, Type IV Specimen at 20 inches/minute)".

SECTION 02272 - GEOTEXTILE FABRIC

1. Page 02272-1, Paragraph 1.03. Change the title of this paragraph to read as follows:

"1.03 Installation And Workmanship Warranty And Guarantee"

2. Page 02272-1, Paragraph 1.03 A, first line, between the words "shall warrant" and "the geotextile" insert the following:

"and guarantee"

3. Page 02272-1, Paragraph 1-03 A, third line, between the words "The warranty" and "shall include the" insert the following:

"and guarantee"

SECTION 02273 - EROSION CONTROL MATTING

1. Page 02273-1, Paragraph 1.03. Change the title of this paragraph to read as follows:

"1.03 Installation And Workmanship Warranty And Guarantee"

2. Page 02273-1, Paragraph 1.03 A, first line, between the words "shall warrant" and "the erosion" insert the following:

"and guarantee"

3. Page 02273-1, Paragraph 1.03 A, third line, between the words "The warranty" and "shall" insert the following:

"and guarantee"

SECTION 02274 - GEOGRID COMPOSITE

1. Page 02274-1, Paragraph 1.03 A, fourth line, between the words "at no expense" and "any material" insert the following:

"(including installation costs)"

2. Page 02274-1, Paragraph 1.03 A. Add the following at the end of this paragraph:

"The written warranty shall meet all of the Owner's requirements. All materials supplied shall meet the express and implied warranties of the Uniform Commercial Code (UCC) and any other applicable laws, rules, and ordinances."

3. Page 02274-1, Paragraph 1.04. Change the title of this paragraph to read as follows:

"1.04 Installation And Workmanship Warranty And Guarantee"

4. Page 02274-1, Paragraph 1.04 A, first line, between the words "shall warrant" and "the geogrid" insert the following:

"and guarantee"
5. Page 02274-1, Paragraph 1.04 A, third line, between the words "The warranty" and "shall include the" insert the following:

"and guarantee"

SECTION 02275 - GEOCOMPOSITE MEMBRANE

1. Page 02275-1, Paragraph 1.03 A, fourth line, between the words "at no expense" and "any material" insert the following:

"(including installation costs)"
2. Page 02275-1, Paragraph 1.03 A. Add the following at the end of this paragraph:

"The written warranty shall meet all of the Owner's requirements. All materials supplied shall meet the express and implied warranties of the Uniform Commercial Code (UCC) and any other applicable laws, rules and ordinances."
3. Page 02275-2, Paragraph 1.04. Change the title of this paragraph to read as follows:

"1.04 Installation And Workmanship Warranty And Guarantee"
4. Page 02275-2, Paragraph 1.04 A, first line, between the words "shall warrant" and "the geocomposite" insert the following:

"and guarantee"
5. Page 02275-1, Paragraph 1.04 A, third line, between the words "The warranty" and "shall" insert the following:

"and guarantee"

SECTION 02276 - CSPE MEMBRANE

1. Page 02276-1, Paragraph 1.03 A, fourth line, between the words "at no expense" and "any material" insert the following:

"(including installation costs)"

2. Page 02276-1, Paragraph 1.03 A. Add the following at the end of this paragraph:

"The written warranty shall meet all of the Owner's requirements. All materials supplied shall meet the express and implied warranties of the Uniform Commercial Code (UCC) and any other applicable laws, rules, and ordinances."

3. Page 02276-1, Paragraph 1.04. Change the title of this paragraph to read as follows:

"1.04 Installation And Workmanship Warranty And Guarantee."

4. Page 02276-1, Paragraph 1.04 A, first line, between the words "shall warrant" and "the membrane" insert the following:

"and guarantee"

5. Page 02276-1, Paragraph 1.04 A, third line, between the words "The warranty" and "shall include the " insert the following:

"and guarantee"

SECTION 02277 - GEONET

1. Page 02277-1, Paragraph 1.03. Change the title of this paragraph to read as follows:

"1.03 Installation And Workmanship Warranty And Guarantee"

2. Page 02277-1, Paragraph 1.03 A, first line, between the words "shall warrant" and "the geonet" insert the following:

"and guarantee"

3. Page 02277-1, Paragraph 1.03 A, third line, between the words "The warranty" and "shall include the" insert the following:

"and guarantee"

SECTION 02278 - GEONET COMPOSITE

1. Page 02278-1, Paragraph 1.03 A, fourth line, between the words "at no expense" and "any material" insert the following:

"(including installation costs)"

2. Page 02278-1, Paragraph 1.03 A. Add the following at the end of this paragraph:

"The written warranty shall meet all of the Owner's requirements. All materials supplied shall meet the express and implied warranties of the Uniform Commercial Code (UCC) and any other applicable laws, rules, and ordinances."

3. Page 02278-1, Paragraph 1.04. Change the title of this paragraph to read as follows:
"1.04 Installation And Workmanship Warranty And Guarantee"
4. Page 02278-1, Paragraph 1.04 A, first line, between the words "shall warrant" and "the geogrid" insert the following:
"and guarantee"
5. Page 02278-1, Paragraph 1.04 A, third line, between the words "The warranty" and "shall include the" insert the following:
"and guarantee"

SECTION 02749 - LANDFILL GAS VENTS

1. Page 02749-4, Paragraph 2.01. Change title of this paragraph to read as follows:
"PVC Gas Vent"
2. Page 02749-4, Paragraph 2.01. Add the following subparagraphs after subparagraph B:
 - "C Fittings shall be flush coupled, square threaded in accordance with ASTM D2467 and shall be compatible with the pipe when installed.
 - D The slotted vertical pipe, as shown on the Drawings, shall be new, unplasticized, Schedule 80, PVC as manufactured by Celanese Piping Systems, Chemical Division, Cabot Company or equal.
 - E Each pipe length shall be marked with the manufacturer's name or trademark, size, material code and pressure class.
 - F All PVC pipe and fittings shall meet the requirements of Type 1, Grade 1, Polyvinyl Chloride as outlined in ASTM D1784."
3. Page 02749-4, Paragraph 2.02. Delete this paragraph in its entirety and replace it with the following:
"2.02 HDPE GAS COLLECTOR
 - A Gas collectors shall be 6-inch diameter corrugated slotted HDPE and shall conform with requirements of Type III, Category 4 or 5. Grade P33, Class C or Grade P34, Class C as defined in ASTM D1248. Width of the slots shall not exceed 1/8-inch. The length of individual slots shall not exceed 10% of the pipe inside nominal circumference. Slots shall be centered in the valleys of the corrugations. The inlet shall be a minimum of one square inch per linear foot of pipe. The slotted pipe shall have a minimum pipe stiffness of 35 psi at 5%

deflection. All fittings and couplings shall be of the same material and manufacturer as the pipe.

4. Page 02749-5, Paragraph 2.03. Delete this paragraph in its entirety and replace it with the following:

"2.03 BOOTS AND STAINLESS STEEL CLAMPS

A An approved 45-mil CSPE boot shall be used for the Base Bid and an approved 40-mil VLDPE boot shall be used for the Alternate Capping Design Bid; for each gas vent.

B A stainless steel clamp shall be used to secure each boot to each vent."

5. Page 02749-6, Paragraph 3.01 D. Add the following at the end of this subparagraph:

"for the Base Bid."

6. Page 02749-6, Paragraph 3.01. Change subparagraph "E" to "F" and subparagraph "F" to "G" and add the following subparagraph after subparagraph D:

"E A 40 mil VLDPE boot shall be placed around the non-screened portion of the casing on top of the VLDPE membrane. The boot shall be seamed to the membrane and shall be fastened by a stainless steel clamp, as shown on the Drawings, for the Alternate Capping Design Bid."

SECTION 02279- FINAL COVER CONSTRUCTION

1. Page 02279-3, Paragraph 3.01A. Add the following at the end of this subparagraph:

"and shall consist of a minimum of four (4) inches of compacted final cover select fill. Compaction shall be accomplished by two complete passes of a ten (10) ton roller." 4

2. Page 02279-3, Paragraph 3.01B. Delete subparagraph B in its entirety and replace it with the following:

"B The existing intermediate cover consists of approximately six (6) to twelve (12) inches of soil material overlying the solid waste, which was previously placed by the Owner. The Contractor shall remove all grass, roots, and other vegetation by stripping to a depth of at least four (4) inches below existing grade. The Contractor shall insure, that upon completion of the subgrade preparation, there is a minimum six (6)-inch thickness of a soil cover; otherwise additional subgrade material shall be placed to increase the soil cover thickness to at least six (6) inches." 4

3. Page 02279-3. Paragraph 3.01D. Delete the first sentence of this subparagraph.

4. Page 02279-4, Paragraph 3.01E. Delete subparagraph E in its entirety and replace it with the following:

"E Grading in preparation for placing final cover shall be performed at all places that are indicated on the Drawings, to the lines, grades, and elevations shown and otherwise as directed by the Engineer."

5. Page 02279-4, Paragraph 3.01. Add the following subparagraphs after subparagraph 3.01E.

"F In cut areas, the Contractor shall remove the existing intermediate cover and all solid waste encountered during grading, of whatever nature, to a depth of six (6) inches below the top of subgrade elevation and shall haul and place this material on sideslopes or the top of the landfill as directed by the Engineer. These over excavated areas shall be backfilled with eight (8) inches of new intermediate cover and four (4) inches of subgrade material and shall be compacted by at least two complete passes of a ten (10) ton roller.

G In fill areas, the Contractor shall strip and remove all grasses, roots, and other vegetation to a depth of four (4) inches from the top of existing grade and place fill material to a depth of twelve (12) inches below the top of subgrade elevation. The fill material shall consist primarily of newly excavated material, solid waste and stripped vegetated soil, and shall be spread in layers not exceeding two (2) feet in thickness and compacted with at least five (5) complete passes of a medium weight bulldozer. In the event that there is insufficient excavated material available, then common fill shall be used for fill material and shall be placed in twelve (12) inch layers and compacted with at least two complete passes of a ten (10) ton roller. The remaining twelve (12) inches shall consist of eight (8) inches of new intermediate cover and four (4) inches of subgrade material and shall be compacted by at least two complete passes of a ten (10) ton roller.

H Each complete compaction pass shall consist of one forward pass and one backward pass."

SECTION 02280 - FINAL COVER CONSTRUCTION

1. Page 02280-3, Paragraph 3.01A. Add the following at the end of this subparagraph:

"and shall consist of a minimum of four (4) inches of compacted final cover select fill. Compaction shall be accomplished by two complete passes of a ten (10) ton roller."

2. Page 02280-3, Paragraph 3.01B. Delete subparagraph B in its entirety and replace it with the following:

"B The existing intermediate cover consists of approximately six (6) to twelve (12) inches of soil material overlying the solid waste, which was previously placed by the Owner. The Contractor shall remove all grass, roots, and other vegetation by stripping to a depth of at least four (4) inches below existing grade. The Contractor shall insure, that upon the completion of the subgrade preparation, there is a minimum six (6)-inch

thickness of soil cover; otherwise additional subgrade material shall be placed to increase the soil cover thickness to at least six (6) inches.

3. Page 02280-3, Paragraph 3.01D. Delete the first sentence of this subparagraph.
4. Page 02280-3, Paragraph 3.01E. Delete subparagraph E in its entirety and replace it with the following:

"E Grading in preparation for placing final cover shall be performed at all places that are indicated on the Drawings, to the lines, grades, and elevations shown and otherwise as directed by Engineer."

5. Page 02280-3, Paragraph 3.01. Add the following subparagraphs after subparagraph 3.01E.

"F In cut areas, the Contractor shall remove the existing intermediate cover and all solid waste encountered during grading, of whatever nature, to a depth of six (6) inches below the top of subgrade elevation and shall haul and place this material on sideslopes or the top of the landfill as directed by the Engineer. These over excavated areas shall be backfilled with eight (8) inches of new intermediate cover and four (4) inches of subgrade material and shall be compacted by at least two complete passes of a ten (10) ton roller.

G In fill areas, the Contractor shall strip and remove all grasses, roots, and other vegetation to a depth of four (4) inches from the top of existing grade and place fill material to a depth of twelve (12) inches below the top of subgrade elevation. The fill material shall consist primarily of newly excavated material, solid waste and stripped vegetated soil, and shall be spread in layers not exceeding two (2) feet in thickness and compacted with at least five (5) complete passes of a medium weight bulldozer. In the event that there is insufficient excavated material available then common fill shall be used for fill material and shall be placed in twelve (12) inch layers and compacted with at least two complete passes of a ten (10) ton roller. The remaining twelve (12) inches shall consist of eight (8) inches of new intermediate cover and four (4) inches of subgrade material and shall be compacted by at least two complete passes of a ten (10) ton roller.

H Each complete compaction pass shall consist of one forward pass and one backward pass."

SECTION 02930 - LOAMING, HYDROSEEDING AND EROSION CONTROL

1. Page 02930-2, Paragraph 2.01B. Delete this paragraph in its entirety and replace it with the following:

"B Fertilizer shall be commercial mixed free flowing granules or pelleted fertilizer, 18-24-6 (N-P205-K20). Fertilizer shall be delivered to the site in original unopened containers each showing the manufacturer's guaranteed analysis conforming to

applicable state fertilizer laws. At least 40 to 50 percent of the nitrogen in the fertilizer used shall be in slowly available (natural organic) form."

2. Page 02930-2, Paragraph 2.01D1. In the seed mix table change "Medium Red Clover¹ 15 pounds per acre" to "Medium Red Clover¹ 10 pounds per acre."
3. Page 02930-3, Paragraph 2.01D. Add the following item after item 2.

"3. Tree and shrub seed mix shall be placed with the Fescue seed mix as shown on the drawings and shall be seeded at a rate and with a mixture conforming to the following mix:

Arrowood Viburnum (Viburnum dentatum)	5 pounds per acre
Silby Dogwood (Cornus amomum)	5 pounds per acre
Black Locust (Robinia pseudoacacia)	3 pounds per acre"
4. Page 02930-4, Paragraph 3.01 B2, first line, change "(10-20-10)" to "(18-24-6)".
5. Page 02930-4, Paragraph 3.01 B3., first line, change "175" to "200."
6. Page 02930-4, Paragraph 3.01 B3, second line, change "200" to "220."
7. Page 02930-4, Paragraph 3.02 C. Delete this paragraph in its entirety and replace it with the following:

"C Schedules for seeding and fertilizing must be submitted to the Engineer for approval prior to the work. Seeding as specified herein shall be accomplished between the period of April 1 to May 31 or August 15 to October 15. Seeding during the period from June 1 to August 14 shall only be performed if irrigation is provided."
8. Page 02930-4 and 5, Paragraph 3.02, change subparagraph "D" to "E", "E" to "F", "F" to "G", "G" to "H" and "H" to "I" and insert the following subparagraph:

"D. Tree and shrub seed mix shall be added to the hydroseed mixture not sooner than one hour before hydroseeding to avoid swelling, softening and potential seed damage."
9. Page 02930-4, Paragraph 3.02. In changed subparagraph E, first line, change "ten" to "five"
10. Page 02930-5, Paragraph 3.02. In changed subparagraph I, third line, change "good sod is established" to "sod acceptable to the Engineer is established."

NEW SPECIFICATION SECTIONS

The following new specification pages or sections which are attached shall be included in the Contract Documents:

- * 1. Table of Contents, page TC-1R, TC-2R and TC-3R.
- * 2. BID PROPOSAL, Landfill Closure - Base Bid (six pages)
- * 3. BID PROPOSAL, Landfill Closure - Alternate Capping Design Bid (six pages)
- *** 4. Section 02281 - Field Test Pad
- ** 5. Section 02282 - Geogrid
- * These pages or sections replace existing pages or sections.
- ** These pages or sections are for the Alternating Capping Design Bid ONLY.
- *** These pages or sections pertain to both the Base Bid and Alternate Capping Design Bid.

DRAWINGS: WC-1 LANDFILL CLOSURE

SHEET NO DESCRIPTION OF CHANGE

C-19A 1. Typical Detail North Edge of Paved Area. Revise as indicated in SK-C16.

2. Add the following note to the drawing:

"12" min thickness shown for the combined subgrade and exist or new intermediate cover refers to cut and fill conditions required during landfill grading. 6" min cover is required when fine grading is required (See Specifications Section 02280 Paragraph 3.01 B)"

C-20A 1. Section 1/- . Revise as indicated in SK-C17.

2. Add the following note to the drawing:

" 12" min thickness shown for the combined subgrade and exist or new intermediate cover refers to cut and fill conditions required during landfill grading. 6" min cover is required when fine grading is required (See Specification Section 02280 Paragraph 3.01B)"

C-21A 1. Typical Gas Vent - Type 1. Revise as indicated in SK-C18.

2. Typical Boot Installation At All Extraction Wells. Change the vertical dimension shown for the VLDPE Boot from "6" min" to "12" min".

3. Typical Gas Vent- Type 2 and Horizontal Gas Collector Detail. Revise as indicated in SK-C19.

4. Detail callout - "Passive Gas Vent Conversion To Active Vent" change to "Passive Gas Vent Connection To Active Vent".

5. Add the following note to the drawing:

" 12" min thickness shown for the combined subgrade and exist or new intermediate cover refers to cut and fill conditions required during landfill grading. 6" min cover is required when fine grading is required (See Specifications Section 02280 Paragraph 3.01B)"

C-22A 1. Typical Toe of Landfill Detail for Sections 20, 21, and 22 East (At Gas Manholes). Change the note "For Membrane To Conc Attachment Detail See Sheet C-21" to "For Membrane To Conc Attachment Detail See Sheet C-21A."

2. Typical Toe of Landfill Detail for Sections 12 and 10 East (At Catch Basins).Revise as indicated in SK-C20.

3. Typical Toe of Landfill Detail for Sections 9 and 9A (At Gas Manhole). Revise as indicated in SK-C21.
4. Typical Toe of Landfill Detail for Sections 1, 2 and 3 North. Delete the above the ____ dimension 4'-0"±.
5. Add the following note to the drawing:

"12" min thickness shown for the combined subgrade and exist or new intermediate cover refers to cut and fill conditions required during landfill grading. 6" min cover is required when fine grading is required (See Specifications Section 02280 Paragraph 3.01 B)"

- C-23A 1. Typical Toe of Landfill Detail for Sections 12, 13, and 10 East (No Catch Basin). Revise as indicated in SK-C22.

2. Add the following note to the drawing:

"12" min thickness shown for the combined subgrade and exist or new intermediate cover refers to cut and fill conditions required during landfill grading. 6" min cover is required when fine grading is required (See Specifications Section 02280 Paragraph 3.01 B)"

- C-22 1. Typical Toe of Landfill Detail for Sections 12 and 10 East (At Catch Basin). Delete SK-C6 issued under Addendum No 2 and replace it with SK-C23.

2. Typical Toe of Landfill Detail for Sections 9 and 9A (At Gas Manholes). Delete SK-C9 issued under Addendum No 2 and replace it with SK-C24.

3. Add the following note to the drawing:

"12" min thickness shown for the combined subgrade and exist or new intermediate cover refers to cut and fill conditions required during landfill grading. 6" min cover is required when fine grading is required (See Specifications Section 02279 Paragraph 3.01 B)"

- C-23 1. Typical Toe of Landfill Detail for Sections 4 through 6 West. Revise as indicated in SK-C25.

2. Typical Toe of Landfill Detail for Sections 12, 13, and 10 East (No Catch Basin). Revise as indicated in SK-C26.

3. Add the following note to the drawing:

"12" min thickness shown for the combined subgrade and exist or new intermediate cover refers to cut and fill conditions required during landfill grading. 6" min cover is required when fine grading is required (See Specifications Section 02279 Paragraph 3.01 B)"

SKETCH REVISIONS: WC-1 LANDFILL CLOSURE

The following sketches which provide revisions to the Contract Drawings shall be included in the Contract Documents.

1. Sketch No. SK-C16
2. Sketch No. SK-C17
3. Sketch No. SK-C18
4. Sketch No. SK-C19
5. Sketch No. SK-C20
6. Sketch No. SK-C21
7. Sketch No. SK-C22
- *8. Sketch No. SK-C23
- *9. Sketch No. SK-C24
10. Sketch No. SK-C25
11. Sketch No. SK-C26

* These sketches replace sketches issued under Addendum No 2.

DRAWING REVISIONS: WC-1 LANDFILL CLOSURE

Delete the following drawings and replace them with the attached revised drawings:

<u>Delete</u>	<u>Replace with</u>
G-1	G-1R
C-1	C-1R
C-2	C-2R
C-3	C-3R
C-4	C-4R
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HUNTINGTON/EAST NORTHPORT LANDFILL
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(WPS1313)

HUNTINGTON/EAST NORTHPORT LANDFILL
INTERIM REMEDIAL PROGRAM
LANDFILL CLOSURE - BASE BID

ADDENDUM No. 3

ITEM NO.	DESCRIPTION	BID PRICE/UNIT PRICE	ESTIMATED QUANTITIES	COMPUTED ITEM TOTAL
1	Field engineering including aerial and field survey	Lump sum of _____ dollars and _____ cents (\$ _____) per lump sum	L.S.	
2	Fenceline remediation - excavation and disposal of solid waste on top of landfill	Unit Price of _____ dollars and _____ cents (\$ _____) per cubic yard	10,000 C.Y.	
3	Miscellaneous cut for final cover construction	Unit Price of _____ dollars and _____ cents (\$ _____) per cubic yard	110,000 C.Y.	
4	Horizontal gas collection	Unit price of _____ dollars and _____ cents (\$ _____) per linear foot	4,000 L.F.	
5	Removal of buried structures	Lump sum of _____ dollars and _____ cents (\$ _____) per lump sum	L.S.	
6	Common fill	Unit Price of _____ dollars and _____ cents (\$ _____) per cubic yard	40,000 C.Y.	
7	Select fill	Unit Price of _____ dollars and _____ cents (\$ _____) per cubic yard	215,000 C.Y.	

HUNTINGTON/EAST NORTHPORT LANDFILL
INTERIM REMEDIAL PROGRAM
LANDFILL CLOSURE - BASE BID

ADDENDUM No. 3

ITEM NO.	DESCRIPTION	BID PRICE/UNIT PRICE	ESTIMATED QUANTITIES	COMPUTED ITEM TOTAL
8	Sand gas venting layer	Unit Price of _____ dollars and _____ cents (\$ _____) per cubic yard	75,000 C.Y.	
9	Topsoil	Unit Price of _____ dollars and _____ cents (\$ _____) per cubic yard	40,000 C.Y.	
10	Crushed stone	Unit Price of _____ dollars and _____ cents (\$ _____) per cubic yard	7,000 C.Y.	
11	Riprap	Unit Price of _____ dollars and _____ cents (\$ _____) per cubic yard	1,800 C.Y.	
12	Gablon	Unit Price of _____ dollars and _____ cents (\$ _____) per cubic yard	340 C.Y.	
13	Asphalt pavement (all courses)	Unit Price of _____ dollars and _____ cents (\$ _____) per square yard	7,750 S.Y.	
14	Guide rail	Unit Price of _____ dollars and _____ cents (\$ _____) per linear foot	220 L.F.	

HUNTINGTON/EAST NORTHPORT LANDFILL
INTERIM REMEDIAL PROGRAM
LANDFILL CLOSURE - BASE BID

ADDENDUM No. 3

ITEM NO.	DESCRIPTION	BID PRICE/UNIT PRICE	ESTIMATED QUANTITIES	COMPUTED ITEM TOTAL
15	Slotted corrugated HDPE underdrain pipe	Unit Price of _____ dollars and _____ cents (\$ _____) per linear foot	13,000 L.F.	
16	24" corrugated HDPE pipe	Unit Price of _____ dollars and _____ cents (\$ _____) per linear foot	1,100 L.F.	
17	36" corrugated HDPE pipe	Unit Price of _____ dollars and _____ cents (\$ _____) per linear foot	3,250 L.F.	
18	48" corrugated metal pipe	Unit Price of _____ dollars and _____ cents (\$ _____) per linear foot	575 L.F.	
19	Active gas transmission piping and valving - 2" through 10" diameter (Installation only - to be furnished by others)	Unit Price of _____ dollars and _____ cents (\$ _____) per linear foot	4,500 L.F.	
20	Catch basin/manhole	Unit Price of _____ dollars and _____ cents (\$ _____) per basin/manhole	22 ea.	
21	Precast concrete structures	Lump sum of _____ dollars and _____ cents (\$ _____) per lump sum	L.S.	

JANTINGTON/EAST NORTHPORT LANDFILL
 INTERIM REMEDIAL PROGRAM
 LANDFILL CLOSURE - BASE BID

ADDENDUM No. 3

ITEM NO.	DESCRIPTION	BID PRICE/UNIT PRICE	ESTIMATED QUANTITIES	COMPUTED ITEM TOTAL
22	Reinforced concrete headwalls and trench drains	Lump sum of _____ dollars and _____ cents (\$ _____) per lump sum	L.S.	
23	Geotextile	Unit price of _____ dollars and _____ cents (\$ _____) per square foot	2,400,000 S.F.	
24	Geonet	Unit price of _____ dollars and _____ cents (\$ _____) per square foot	185,000 S.F.	
25	Geocomposite membrane	Unit price of _____ dollars and _____ cents (\$ _____) per square foot	1,850,000 S.F.	
26	CSPE membrane	Unit price of _____ dollars and _____ cents (\$ _____) per square foot	245,000 S.F.	
27	Geogrid composite	Unit price of _____ dollars and _____ cents (\$ _____) per square foot	1,650,000 S.F.	
28	Erosion control matting	Unit price of _____ dollars and _____ cents (\$ _____) per square foot	1,650,000 S.F.	

HUNTINGTON/EAST NORTHPORT LANDFILL
INTERIM REMEDIAL PROGRAM
LANDFILL CLOSURE - BASE BID

ADDENDUM No. 3

ITEM NO.	DESCRIPTION	BID PRICE/UNIT PRICE	ESTIMATED QUANTITIES	COMPUTED ITEM TOTAL
29	Materials testing allowance	Lump sum of Two Hundred and Forty Thousand dollars and Zero cents (\$240,000.00) per lump sum	L.S.	\$240,000.00
30	Gas vent - Type 1	Unit Price of _____ dollars and _____ cents (\$ _____) per gas vent	49 ea.	
31	Gas vent - Type 2	Unit Price of _____ dollars and _____ cents (\$ _____) per gas vent	15 ea.	
32	Chain link fence and gates	Unit Price of _____ dollars and _____ cents (\$ _____) per linear foot	7,375 L.F.	
33	Temporary erosion control	Lump sum of _____ dollars and _____ cents (\$ _____) per lump sum	L.S.	
34	Hydroseeding	Unit Price of _____ dollars and _____ cents (\$ _____) per acre	48 acres	
35	Field test pad	Lump sum of _____ dollars and _____ cents (\$ _____) per lump sum	L.S.	

HUNTINGTON/EAST NORTHPORT LANDFILL
INTERIM REMEDIAL PROGRAM
LANDFILL CLOSURE - BASE BID

ADDENDUM No. 3

ITEM NO.	DESCRIPTION	BID PRICE/UNIT PRICE	ESTIMATED QUANTITIES	COMPUTED ITEM TOTAL
36	Miscellaneous work	Lump sum of _____ dollars and _____ cents (\$ _____) per lump sum	L.S.	
37	General liability insurance	Lump sum of _____ dollars and _____ cents (\$ _____) per lump sum	L.S.	
38	Mobilization and demobilization	Lump sum of _____ dollars and _____ cents (\$ _____) per lump sum	L.S.	

HUNTINGTON/EAST NORTHPORT LANDFILL
INTERIM REMEDIAL PROGRAM
LANDFILL CLOSURE - ALTERNATE CAPPING DESIGN BID

ADDENDUM No. 3

ITEM NO.	DESCRIPTION	BID PRICE/UNIT PRICE	ESTIMATED QUANTITIES	COMPUTED ITEM TOTAL
1	Field engineering including aerial and field survey	Lump sum of _____ dollars and _____ cents (\$ _____) per lump sum	L.S.	
2	Fenceline remediation - excavation and disposal of solid waste on top of landfill	Unit Price of _____ dollars and _____ cents (\$ _____) per cubic yard	10,000 C.Y.	
3	Miscellaneous cut for final cover construction	Unit Price of _____ dollars and _____ cents (\$ _____) per cubic yard	75,000 C.Y.	
4	Horizontal gas collection	Unit Price of _____ dollars and _____ cents (\$ _____) per linear foot	4,000 L.F.	
5	Removal of buried structures	Lump sum of _____ dollars and _____ cents (\$ _____) per lump sum	L.S.	
6	Common fill	Unit Price of _____ dollars and _____ cents (\$ _____) per cubic yard	40,000 C.Y.	
7	Select fill	Unit Price of _____ dollars and _____ cents (\$ _____) per cubic yard	180,000 C.Y.	

JNTINGTON/EAST NORTHPORT LANDFILL
INTERIM REMEDIAL PROGRAM
LANDFILL CLOSURE - ALTERNATE CAPPING DESIGN BID

ADDENDUM No. 3

ITEM NO.	DESCRIPTION	BID PRICE/UNIT PRICE	ESTIMATED QUANTITIES	COMPUTED ITEM TOTAL
8	Topsoil	Unit Price of _____ dollars and _____ cents (\$ _____) per cubic yard	40,000 C.Y.	
9	Crushed stone	Unit Price of _____ dollars and _____ cents (\$ _____) per cubic yard	7,000 C.Y.	
10	Riprap	Unit Price of _____ dollars and _____ cents (\$ _____) per cubic yard	1,800 C.Y.	
11	Gabion	Unit Price of _____ dollars and _____ cents (\$ _____) per cubic yard	340 C.Y.	
12	Asphalt pavement (all courses)	Unit Price of _____ dollars and _____ cents (\$ _____) per square yard	7,750 S.Y.	
13	Guide rail	Unit Price of _____ dollars and _____ cents (\$ _____) per linear foot	220 L.F.	
14	Slotted corrugated HDPE underdrain pipe	Unit Price of _____ dollars and _____ cents (\$ _____) per linear foot	13,000 L.F.	

HUNTINGTON/EAST NORTHPORT LANDFILL
INTERIM REMEDIAL PROGRAM
LANDFILL CLOSURE – ALTERNATE CAPPING DESIGN BID

ADDENDUM No. 3

ITEM NO.	DESCRIPTION	BID PRICE/UNIT PRICE	ESTIMATED QUANTITIES	COMPUTED ITEM TOTAL
15	24" corrugated HDPE pipe	Unit Price of _____ dollars and _____ cents (\$ _____) per linear foot	1,100 L.F.	
16	36" corrugated HDPE pipe	Unit Price of _____ dollars and _____ cents (\$ _____) per linear foot	3,250 L.F.	
17	48" corrugated metal pipe	Unit Price of _____ dollars and _____ cents (\$ _____) per linear foot	575 L.F.	
18	Active gas transmission piping and valving – 2" through 10" diameter (installation only – to be furnished by others)	Unit Price of _____ dollars and _____ cents (\$ _____) per linear foot	4,500 L.F.	
19	Catch basin/manhole	Unit Price of _____ dollars and _____ cents (\$ _____) per basin/manhole	22 ea.	
20	Precast concrete structures	Lump sum of _____ dollars and _____ cents (\$ _____) per lump sum	L.S.	
21	Reinforced concrete headwalls and trench drains	Lump sum of _____ dollars and _____ cents (\$ _____) per lump sum	L.S.	

HUNTINGTON/EAST NORTHPORT LANDFILL
INTERIM REMEDIAL PROGRAM
LANDFILL CLOSURE - ALTERNATE CAPPING DESIGN BID

ADDENDUM No. 3

ITEM NO.	DESCRIPTION	BID PRICE/UNIT PRICE	ESTIMATED QUANTITIES	COMPUTED ITEM TOTAL
22	Geotextile	Unit price of _____ dollars and _____ cents (\$ _____) per square foot	15,000 S.F.	
23	Geonet Composite	Unit price of _____ dollars and _____ cents (\$ _____) per square foot	2,095,000 S.F.	
24	VLDPE membrane	Unit price of _____ dollars and _____ cents (\$ _____) per square foot	2,095,000 S.F.	
25	Geogrid	Unit price of _____ dollars and _____ cents (\$ _____) per square foot	1,650,000 S.F.	
26	Erosion control matting	Unit price of _____ dollars and _____ cents (\$ _____) per square foot	1,650,000 S.F.	
27	Materials testing allowance	Lump sum of Two Hundred and Forty Thousand dollars and Zero cents (\$240,000.00) per lump sum <i>165,000</i>	L.S.	\$165,000.00
28	Gas vent - Type 1	Unit Price of _____ dollars and _____ cents (\$ _____) per gas vent	49 ea.	

HUNTINGTON/EAST NORTHPORT LANDFILL
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LANDFILL CLOSURE - ALTERNATE CAPPING DESIGN BID

ADDENDUM No. 3

ITEM NO.	DESCRIPTION	BID PRICE/UNIT PRICE	ESTIMATED QUANTITIES	COMPUTED ITEM TOTAL
29	Gas vent - Type 2	Unit Price of _____ dollars and _____ cents (\$ _____) per gas vent	15 ea.	
30	Chain link fence and gates	Unit Price of _____ dollars and _____ cents (\$ _____) per linear foot	7,375 L.F.	
31	Temporary erosion control	Lump sum of _____ dollars and _____ cents (\$ _____) per lump sum	L.S.	
32	Hydroseeding	Unit Price of _____ dollars and _____ cents (\$ _____) per acre	48 acres	
33	Field test pad	Lump sum of _____ dollars and _____ cents (\$ _____) per lump sum	L.S.	
34	Miscellaneous work	Lump sum of _____ dollars and _____ cents (\$ _____) per lump sum	L.S.	
35	General liability insurance	Lump sum of _____ dollars and _____ cents (\$ _____) per lump sum	L.S.	

HUNTINGTON/EAST NORTHPORT LANDFILL
 INTERIM REMEDIAL PROGRAM
 LANDFILL CLOSURE – ALTERNATE CAPPING DESIGN BID

ADDENDUM No. 3

ITEM NO.	DESCRIPTION	BID PRICE/UNIT PRICE	ESTIMATED QUANTITIES	COMPUTED ITEM TOTAL
36	Mobilization and demobilization	Lump sum of _____ dollars and _____ cents (\$ _____) per lump sum	L.S.	

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SECTION 02281
FIELD TEST PAD

PART 1: PRODUCTS

1.01 SCOPE OF WORK

- A. The Contractor shall furnish all labor, materials, tools, equipment and incidentals required for the placement of a complete field test pad which shall include all the components required for a 2.5H : 1 V final cover cap, as indicated on the Drawings and as specified herein.
- B. The purpose of the field test pad will be to determine the proper and most effective method for placing and compacting the final cover components prior to commencing with complete mobilization for construction of the final cover. Of primary importance will be the determination of the degree of compaction for the select fill, dimensional analysis (thickness control) for the select fill material and other components as well as evaluation of material damage during placement. The placement and compaction methods approved by the Engineer, during the Test, shall be used for placement and compaction of the final cover select fill.
- C. For bidding purposes, the Contractor shall assume that the field test pad will be incorporated into the final cover system.

1.02 RELATED WORK

- A. Construction Quality Assurance and Quality Control Plan is included in Appendix A.
- B. Submittals are included in Section 01300.
- C. Contractor Quality Control is included in Section 01400.
- D. Testing laboratory services are included in Section 01410.
- E. Site preparation is included in Section 02100.
- F. Earthwork is included in Section 02200.
- G. Final cover select fill is included in Section 02231.
- H. Sand bedding is included in Section 02232.
- I. Textured VLDPE is included in Section 02271.

- J. Geotextile fabric is included in Section 02272.
- K. Erosion control matting is included in Section 02273.
- L. Geogrid composite is included in Section 02274.
- M. Geocomposite membrane is included in Section 02275.
- N. CSPE membrane is included in Section 02276.
- O. Geonet composite is included in Section 02278.
- P. Final cover construction is included in Section 02279 (Base Bid).
- Q. Final cover construction is included in Section 02280 (Alternate Capping Design Bid).
- R. Geogrid is included in Section 02282.

1.03 QUALITY ASSURANCE

- A. Placing of final cover components shall be done only by personnel experienced in this type of work.
 - 1. Before placement, the materials list shall be submitted by the Contractor, for the Engineer's approval.
 - 2. The Contractor shall perform all required tests as described in the sections listed in Paragraph 1.02 of this Section.
 - 3. Notification. The Contractor must begin the work of this Section within 30 days of the Award of Contract and shall notify the Engineer in writing at least 5 days in advance of intention to perform the work of this Section. The notice shall state the source of material to be used, the equipment to be used, the date and time that filling operations will start, and the name of the person who will be in charge of the operations in the field.

1.04 PRODUCT HANDLING

- A. Use all means necessary to protect the field test pad during and after installation.
- B. In the event of damage, immediately make all repairs and replacements necessary to the satisfaction of the Engineer and at no additional cost to the Owner.

PART 2: PRODUCTS

2.01 GENERAL

- A. All final cover component materials as listed in Paragraph 1.02 of this Section.

PART 3: EXECUTION

3.01 GENERAL

A. Familiarization:

Prior to all work of this Section, become thoroughly familiar with the site, the site conditions, and all portions of the work pertaining to this Section of the Specifications.

3.02 Placement

- A. In the area bounded by Sections 13E and 13A; and between channels J-2 and H-1, a 100-foot wide field test pad shall be constructed as follows:
1. Strip 4 inches of vegetated soil.
 2. Regrade the slope where required so that a 2.5:1 slope is provided.
 3. Place 4 inches of compacted select fill (subgrade).
 4. Construct final cover components except topsoil, grass and erosion control matting.
 5. Anchor the geosynthetics in accordance with the Drawings in the channel H-1 terrace.
 6. Construct a portion of channel J-2 located at the toe of the test pad. Install toe drain.
 7. Extend toe drains installed in channels H-1 and J-2 to daylight.
 8. Provide transitions upstream and downstream of constructed channels H-1 and J-2 so that runoff can flow in from the non constructed portion of these channels, and can flow out through smooth transitions.
 9. The test pad area shall be divided in two 50-ft wide sections. The select fill in one section shall be compacted using a self propelled steel drum vibratory compactor with ten (10) ton pneumatic tires, and the

other section shall be compacted by a towed steel drum vibratory compactor with a minimum dead weight of four (4) tons.

10. Perform all the Quality Assurance/Quality Control tests, as specified elsewhere in the specifications.
 11. Perform the following additional tests on a thirty (30) foot grid pattern of the select fill subgrade and the first and second lift of the final cover select fill:
 - a. Field density using both nuclear density (ASTM D2922), and pushed cylinder method (ASTM D2937).
 - b. Thickness of layer using either penetrometer or elevation survey.
 - c. Collect in place samples for gradation analyses in accordance with ASTM D 422.
 - d. A minimum of six (6) test pits shall be excavated, after the completion of the second lift of select fill, when directed by the Engineer.
 - e. After the second lift of the select fill has been placed, a minimum of six (6) test pits shall be excavated across the pad area in order to examine the condition of both the geogrid and geomembrane. The geogrid shall be neatly cut before the excavation continues below the geogrid, and the cut area shall be repaired before the test pit is backfilled. Any damages to the geogrid or geomembrane occurring due to these test pit excavations shall be repaired in accordance with the Manufacturer's recommendations, and as specified elsewhere in the specifications. The Contractor shall backfill the test pits with select fill material and compact to the satisfaction of the Engineer.
- B. A twenty (20)-foot wide section of the field test pad shall be uniformly saturated with water using sprayers or other means, at a rate of 3,000 gallons per hour. The saturation plan must be approved by the Engineer, and shall be conducted in such a way as to prevent surface erosion. The saturation will be complete when a steady flow is noted in the toe drain, as determined by the Engineer.
- C. The Contractor shall include in his schedule a 30-day duration for the performance of the field test pad.

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- D. After the successful completion of the field test pad, the Contractor shall place topsoil on top of the select fill, seed the topsoil and place the erosion control matting in accordance with the Specifications.
- E. The performance of the test pad will be monitored during the duration of the project.
- F. Work on the final cover construction cannot commence prior to the successful completion of all field tests on the field test pad, as determined by the Engineer. However, the Contractor can proceed with the landfill regrading work, or other work on the site during the test period. Shop drawings shall be submitted for review but final cover material shall not be ordered prior to the successful completion of the field test pad.

END OF SECTION

(nr1/sec02281)

SECTION 02282

GEOGRID

PART 1: GENERAL

1.01 SCOPE OF WORK

- A Furnish all labor, materials, tools, supervision, transportation, installation equipment, necessary for the manufacturing, fabrication, delivery, storage, installation, and testing of the geogrid as shown on the Drawings and as specified herein for the Alternate Capping Design Bid.
- B The geogrid shall consist of a high tenacity polyester or HDPE material.
- C The installation of the geogrid shall be performed in conjunction with the site preparation and placement of cover materials.

1.02 RELATED WORK

- A Final cover select fill is included in Section 02231.
- B Textured VLDPE membrane is included in Section 02271.
- C Final cover construction is included in Section 02280 (Alternate Capping Design Bid).

1.03 MATERIAL WARRANTY

- A The geogrid manufacturer shall warrant the material against manufacturing defects and material degradation in the outdoor exposure for a period of twenty years from the date of installation. The manufacturer shall replace at no expense (including installation costs) any material which fails from the above causes within the warranty period. The manufacturer shall furnish a written warranty covering the requirements of this paragraph. The written warranty shall meet all of the Owner's requirements. All materials supplied shall meet the express and implied warranties of the Uniform Commercial Code (UCC) and any other applicable law, rules and ordinances.

1.04 INSTALLATION AND WORKMANSHIP WARRANTY AND GUARANTEE

- A The Contractor shall warrant and guarantee the geogrid against defects in installation and workmanship for the period of two years commencing with the date of final acceptance. The warranty and guarantee shall include the services of qualified service technicians and all materials required for the repairs at no expense to the Owner. The Contractor shall furnish a written warranty covering the

requirements of this paragraph.

1.05 QUALITY ASSURANCE

- A All materials, procedures, operations, and methods shall be in strict conformance with the Drawings and Specifications. The installed system shall conform to the Drawings and Specifications, except as noted herein or otherwise authorized in writing by the Owner.
- B In the event that the manufacturer or installer specifications differ from these specifications the more stringent of the two, as determined by the Engineer, shall apply to this project.

1.06 LEVELS OF EXPERIENCE

- A The Contractor shall provide the services of Manufacturers, Fabricators, and Installers of geogrids. All Subcontractors must possess an adequate level of experience for their portion of the work as specified herein.
- B All Subcontractors and Manufacturers shall be well established firms with more than two years experience for their portion of the work.
- C All Subcontractors and Manufacturers shall be able to provide sufficient production capacity and qualified personnel to meet the demands of the project.

1.07 DEFINITIONS

- A Manufacturer: Responsible for the production of the material and delivery of products to the factory for fabrication, or to the site.
- B Installer: Responsible for field handling, storing, deploying, anchoring, temporary restraining (against wind), and other site aspects of the material. The Installer may also be responsible for transportation of these materials to the site. In addition the installer shall be trained and qualified to install geogrid and shall be approved and/or licensed by the geogrid Manufacturer and/or Fabricator. A common installer may be used for the installation of all geogrid. The Installer's qualifications will require the Engineer's approval.

1.08 SUBCONTRACTOR'S QUALIFICATIONS SUBMITTALS

- A Geogrid Manufacturer

Prior to the production of any geogrid materials, and in accordance with Section 01300, the Contractor shall submit the following information to the Engineer.

1. Corporate background and information.

2. Manufacturing capabilities including:
 - a. Information on plant size, equipment, personnel, number of shifts per day, and capacity per shift.
 - b. Daily production quantity available for this contract.
 - c. Quality control procedures for manufacturing.
 - d. List of material properties including certified test results, to which geogrid samples are attached.
3. A list of at least five completed facilities, totaling a minimum of 200,000 m², (2,000,000 ft².), for which the Manufacturer has manufactured soil reinforcement material. For each facility, the following information shall be provided:
 - a. Name and purpose of facility, its location, and date of installation.
 - b. Name of Owner, Project Manager, Designer, Fabricator (if any), and Installer.
 - c. Type of geogrid material and surface area of material manufactured.
 - d. Available information on the performance of the geogrid system and the facility.
4. Origin (resin suppliers name, and resin product plant) and identification (brand name, and identification number) of the resins.

B Installer

1. Copy of Installer's letter of approval or license by the Manufacturer and/or Fabricator.
2. Corporate background and information.
3. Description of installation capabilities, including:
 - a. Information on equipment and personnel.
 - b. Average daily installation
 - c. Quality control procedures.
4. A list of at least five completed facilities, totaling a minimum of 200,000 m² (2,000,000 ft².) for which the Installer has installed geogrid of the types for this project. For each installation, the following information shall be provided:

- a. Name and purpose of facility, its location, and date of installation.
 - b. Name of Owner, Project Manager, Designer, Manufacturer, Fabricator, if any, and name of contact at the facility who can discuss the project.
 - c. Name and qualifications of the supervisor(s) of the Installer's crew(s).
 - d. Type of geogrid and surface area of the installed material.
 - e. Duration of installation.
 - f. Available information on the performance of the geogrid system and the facility.
5. Resume of the field representative or installation supervisor to be assigned to this project, including dates and duration of employment.
 6. Identification of one representative who shall serve as the Installer's Superintendent, who shall represent the Installer at all site meetings and be responsible for acting as the Installer's spokesman on site. The Superintendent shall be pre-qualified for this role, on the basis of experience, management ability, and authority.
- D Submit additional information as may be requested by the Owner, or Engineer.

1.09 INSTALLATION SUBMITTALS

- A It is the Contractor's responsibility to forward all submittals listed below to the Engineer for review and approval.
- B Prior to the shipment of the geogrid, submit the following in accordance with Section 01300.
1. Copy of factory quality control certificates issued by the manufacturer for materials shipped to the site.
 2. Production date(s) of the geogrid.
 3. Reports on tests conducted to verify the quality of the resin used to manufacture the geogrid assigned to the project.
 4. Certification statement that the geogrid material properties shall meet the minimum requirements as outlined in Table 1 of this section.

C Prior to commencement of the geogrid installation, the Installer shall submit the following in accordance with Section 01300.

1. A drawing showing the installation layout indicating the direction of the axis of the geogrid, as well as any variance or additional details which deviate from the Drawings. The layout shall be adequate for use as a construction plan and shall include dimensions, details, etc.
2. Details of anchoring, overlapping and connecting and other construction details.
3. Installation schedule, including a detailed schedule for covering the geogrid.

D During the geogrid installation, the Installer shall be responsible for the timely submission of quality control documentation.

E Upon completion of the geogrid installation, the Installer shall submit the following in accordance with Section 01300:

1. Installation certification with the requirements of standards specified herein for the geogrid installation.
2. The installation warranty.
3. Maintenance and repair requirements.

F Submit additional information as may be requested by the Owner, or Engineer.

1.10 EXTRA STOCK

A The following shall be furnished to the Owner:

1. Two thousand (2,000) square feet of geogrid identical to that installed under this Section.

PART 2: PRODUCTS

2.01 GEOGRID

A The geogrid shall be produced from polyester (PET), polypropylene (PP) or polyethylene (PE). The geogrid shall be Fortrac 80/30-20 manufactured by AKZO/HUESKER, Miragrid 10T manufactured by Mirafi/Nicolon, UX1500 manufactured by Tensar FX-5500 manufactured by Carthage Mills, MX-60, manufactured by Reinforced Earth Co., or equal.

B The materials supplied under these specifications shall be first quality products designed and manufactured specifically for the purposes of this project, and which have been satisfactorily

demonstrated by prior use to be suitable and durable for use in landfill final covers.

- C The rolls shall be packaged in a protective wrap to protect the product during shipment and on-site storage. All product identification shall be marked on both the geogrid and the outer wrap and shall include direction of unrolling, roll number, width and length dimensions and style.
- D The Contractor shall furnish geogrid that shall meet or exceed the criteria listed in Table 1 at the end of this section.

2.02 MANUFACTURING QUALITY CONTROL AND TESTING

A Geogrid:

1. Raw Material: Testing shall be carried out by the geogrid Manufacturer at his expense, to demonstrate that the product meets the specifications. The Manufacturer shall certify in writing that the resins meet the specifications, and shall be held liable for any noncompliance. Any material manufactured from noncomplying resin will be rejected.
2. The material shall be continuously monitored during the manufacturing process and no material shall be accepted which exhibits any defects. The thickness shall also be monitored during the manufacturing process and no material shall be accepted which fails to meet the specified minimum thickness.
3. The manufacturer shall submit a description of the quality control program to evaluate the pertinent characteristics for quality control including stress-deformation characteristics. If the program is acceptable to the Engineer, then the manufacturer shall submit quality control data and information as required under paragraph 2.02, A.5. If the manufacturer does not have an in-house quality control program, or if the program is not acceptable to the Engineer, then the material shall be tested, at a minimum, once every 40,000 ft². This testing shall be performed by the Manufacturer at the Manufacturer's expense. Samples not satisfying the specifications shall result in the rejection of the applicable rolls. In the case of a failure, subsequent testing shall be performed on products from the same resin batch to determine if material produced from the entire batch shall be regarded as unsatisfactory. At the Manufacturer's discretion and expense, additional testing of individual rolls may be performed to more closely identify the non-complying rolls and/or qualify individual rolls.
4. A listing of the minimum material properties can be found in Table 1 at the end of this Section.
5. In addition, the Manufacturer shall certify the quality of the

rolls. As a minimum, the Manufacturer shall provide quality control certificates for each batch of resin and each shift's production of geogrid. These quality control certificates shall be signed by responsible parties employed by the Manufacturer (such as the production manager), notarized, and supplied to the Engineer. The quality control certificate shall include:

- (a) Roll numbers and identification.
 - (b) Sampling procedures.
 - (c) Results of quality control tests, including description of test methods used.
6. The Manufacturer (Fabricator, if applicable) shall agree to allow the Owner and the Engineer to visit the manufacturing plant for a project specific visit. If possible, this visit shall be prior to or during the manufacturing of the rolls for the specific project. The Engineer shall review the quality control, laboratory facilities, and testing procedures.
7. During the project specific plant visit, those reviewing will also:
- (a) Verify that properties guaranteed by the Manufacturer meet these specifications.
 - (b) Verify that the measurements of properties by the Manufacturer are properly documented and test methods used are acceptable.
 - (c) Spot inspect the rolls and verify that they are free of holes, blisters, or any sign of contamination by foreign matter.
 - (d) Review packaging and transportation procedures to verify that these procedures are not damaging the material.
 - (e) Verify that roll packages have a label indicating the name of the manufacturer, type of material, sheet thickness, and roll number.

2.03 LABELING

- A Each roll or panel shall be identified with the following minimum information.
- 1) Name of manufacturer/fabricator,
 - 2) product type,
 - 3) manufacturing batch code,
 - 4) date of manufacture,

- 5) physical dimensions (length and width),
- 6) roll number per design layout pattern, and
- 7) direction for unrolling roll.

- B Rolls that are not clearly labeled will be rejected.
- C Contractor shall inspect each roll to ensure compliance with these Specifications and maintain a record of all roll identification tags.

2.04 DELIVERY AND STORAGE

- A All geogrid delivered to the job site shall be stored off the ground and protected with a covering that protects the rolls from physical damage, contamination by dirt, dust or water, and from extreme heat caused by direct sunlight.
- B Store, handle and transport material in strict conformance with the Manufacturer's instructions.
- C Transportation of materials is the responsibility of the Contractor. The Contractor shall be liable for all damages to the materials incurred prior to and during transportation to the site.
- D Handling, storage, and care of materials prior to and following installation at the site, is the responsibility of the Contractor. The Contractor shall be liable for all damages to the materials incurred prior to final acceptance of the system by the Owner.
- E Material shall be stored in such a way that it is protected from prolonged exposure to ultraviolet radiation.

PART 3: EXECUTION

3.01 INSTALLATION OF GEOGRID COMPOSITE

- A Earthwork:
 - 1. Conform to requirements set forth in Section 02231 of these Specifications.
 - 2. Surface Preparations: The Contractor shall be responsible for preparing the supporting soil layer. The Contractor shall inspect the site prior to the installation of the geogrid to ensure that the surface is free of all foreign materials that could damage the geogrid and that proper compaction of the soil layer has been achieved. Special care should be taken to maintain the prepared soil surfaces. Any damage to the soil supporting layer caused by installation activities shall be repaired at the Contractor's expense.
 - 3. Crest Anchorage System: The anchor trench shall be excavated prior to geogrid placement to the lines, grades and configuration

shown on the Drawings. No loose soil shall be allowed beneath the geogrid. The anchor trench shall be backfilled and compacted. Care shall be taken when backfilling the trenches to prevent any damage to the geogrid. Slightly rounded corners shall be provided in the trench where the geogrid material adjoins the trench so as to avoid sharp bends in the geogrid.

B Geogrid Deployment:

1. Layout Drawings: The Contractor shall provide layout drawings prior to geogrid deployment. These drawings shall indicate the panel configuration and location of connections. The layout drawings must be approved by the Engineer prior to the installation and manufacture of any rolls. The layout drawings shall include dimensions, details, etc. The layout drawings, as modified and/or approved by the Engineer shall become part of these Specifications.
2. Roll Identification: Each roll must be given an "identification code" (number or letter-number) consistent with the layout plan. This identification code shall be agreed upon by the Engineer and Contractor. The roll identification code shall be related through a table or chart, to the original resin, and the constituent rolls.
3. Geogrid Placement:
 - a. Location: Rolls shall be installed as approved or modified, at the location and positions indicated in the layout drawings. Only those rolls that can be placed and inspected that day shall be unpackaged. Instructions on the boxes or wrapping containing the geogrid materials shall be followed to assure that the rolls are unrolled in the proper direction.
 - b. If the geogrid is not clean before installation, it shall be washed by the Contractor just prior to installation.
 - c. Method of Placement: The Contractor shall ensure that:
 - (1) No equipment used shall damage the geogrid by handling, trafficking, leakage of hydrocarbons, or other means.
 - (2) No personnel working on the geogrid shall smoke, wear damaging shoes, or engage in other activities which could damage the material.
 - (3) The method used to unroll the material shall not cause scratches or crimps in the material and shall not damage the supporting soil and the membrane underlying the supporting soil.

- (4) The prepared surface underlying the geogrid must not be allowed to deteriorate after acceptance and must remain acceptable up to the time of material placement.
 - (5) The geogrid shall be placed as shown on the Drawings or as directed by the Engineer. The material shall be unrolled in its warp direction across the area to be covered. The rolls shall be of such lengths and widths and shall be placed in such a manner as to minimize field connections.
 - (6) Adjacent rolls shall be overlapped as shown on the layout drawings or as directed by the Engineer. Plastic ties shall be white or other bright color to allow easy inspection. Metallic ties shall not be allowed. There shall be no slack in the geogrid. Adjoining rolls shall be connected as specified by the Manufacturer or as directed by the Engineer.
 - (7) In the corners of the side slopes where there is a gap between overlapping rolls of the geogrid, an extra layer of material shall be installed from the top to the bottom of the slope.
 - (8) Materials, equipment or other items shall not be dragged across the surface of the geogrid or be allowed to slide down slopes onto the material.
 - (9) The Contractor shall place all cover materials in such a manner as to ensure the geogrid is not damaged. Tracked vehicles shall not traverse directly on the geogrid unless it is covered with a minimum of six (6) inches of soil. Rubber tired equipment may pass over the geogrid at less than 10 MPH. Turning and braking shall be minimized.
 - (10) All overlapping geogrid shall be inspected to ensure all overlaps are secured as specified by the manufacturer.
 - (11) The geogrid shall be continuous from the anchorage to the toe of slope.
- d. Damage: Any field roll or portion thereof which becomes seriously damaged (torn, twisted or crimped) shall be replaced at no additional cost to the Owner. Less serious damage may be repaired at the Owner's option. Damaged rolls or portions of damaged rolls which have been rejected shall be removed from the work area, and replaced at the Contractor's expense.

3.02 SYSTEM ACCEPTANCE

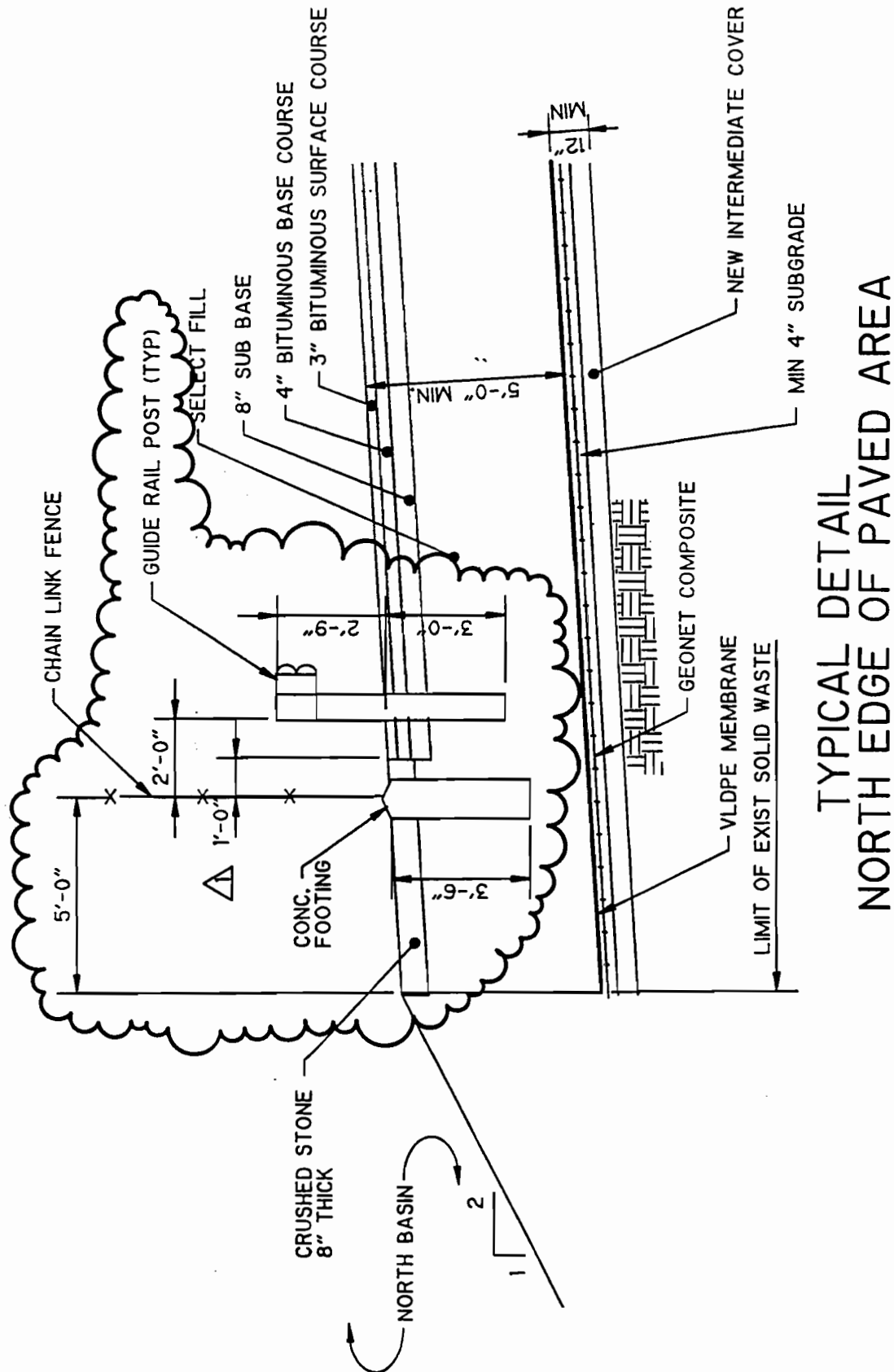
- A The Contractor shall retain all ownership and responsibility for geogrid material in the final cover system until acceptance by the Owner.
- B The geogrid shall be accepted by the Owner when:
 - 1. The installation is completed and accepted by the Engineer.
 - 2. All documentation of installation is completed.
 - 3. Verification of the adequacy of all connections is complete.
 - 4. Written certification documents, including record drawings, signed and sealed by a Registered Professional Engineer in the State of New York have been received by the Owner.

(1316)

TABLE 1
MATERIAL PROPERTIES OF GEOGRID

<u>Property</u>	<u>Value</u>
Wide Width Tensile Strength, lbs/ft (ASTM D-4595)	
at Ultimate Warp	5200
at 5% Strain Warp	1650
Long-Term Strength	2200
(lbs/ft) by GRI, GG4	
Coefficient of Interaction between Geogrid and Soil (Min)	
o Gravel, Sand and Gravel (GW, GP, GM, GC, SW)	.90
o Sand, Silty Sand (SP, SM, SC)	.85

END OF SECTION



CAMP DRESSER & McKEE

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Woodbury, New York 11797

CDM

environmental engineers, scientists,
planners & management consultants

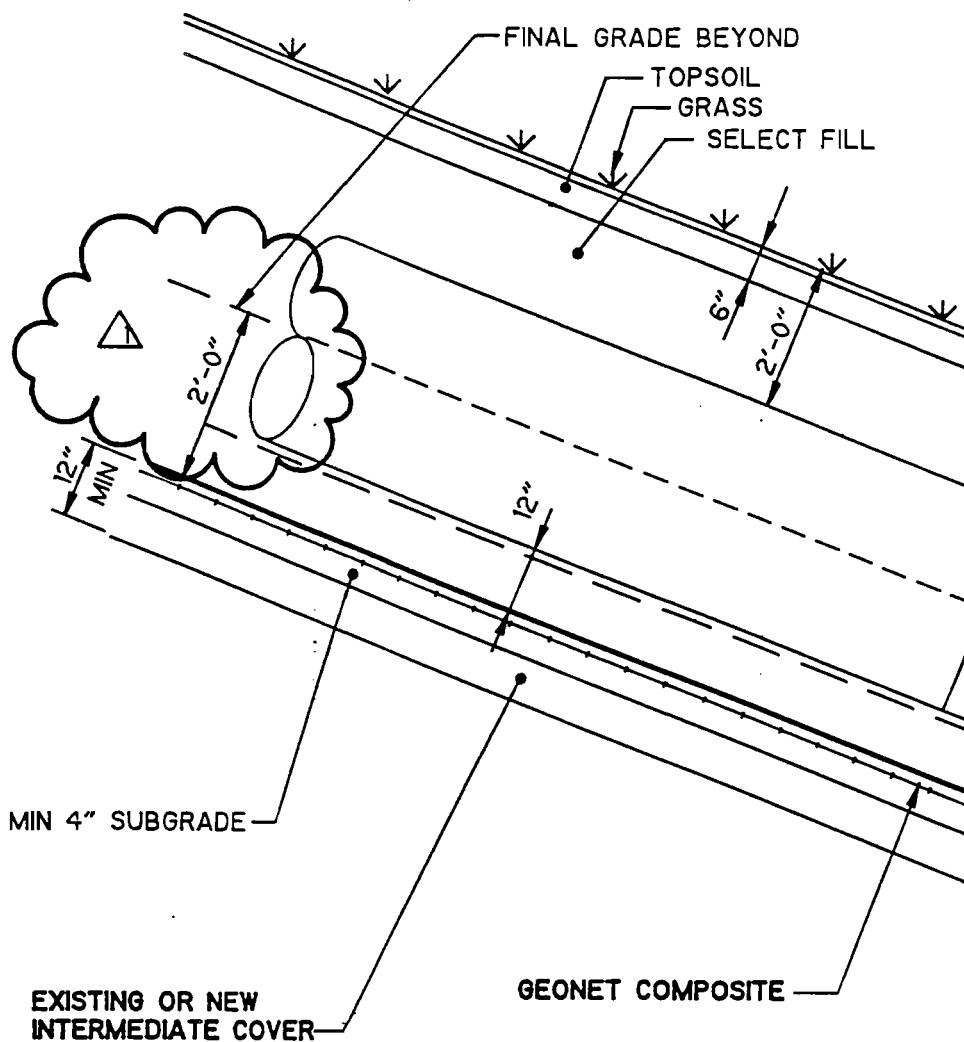
Huntington/East Northport Landfill
Contract No. ENV 94-01/O-C

Addendum No. 3

ADDED DIMENSIONS

REF.
DWG. C-19A

SHEET SK-C16



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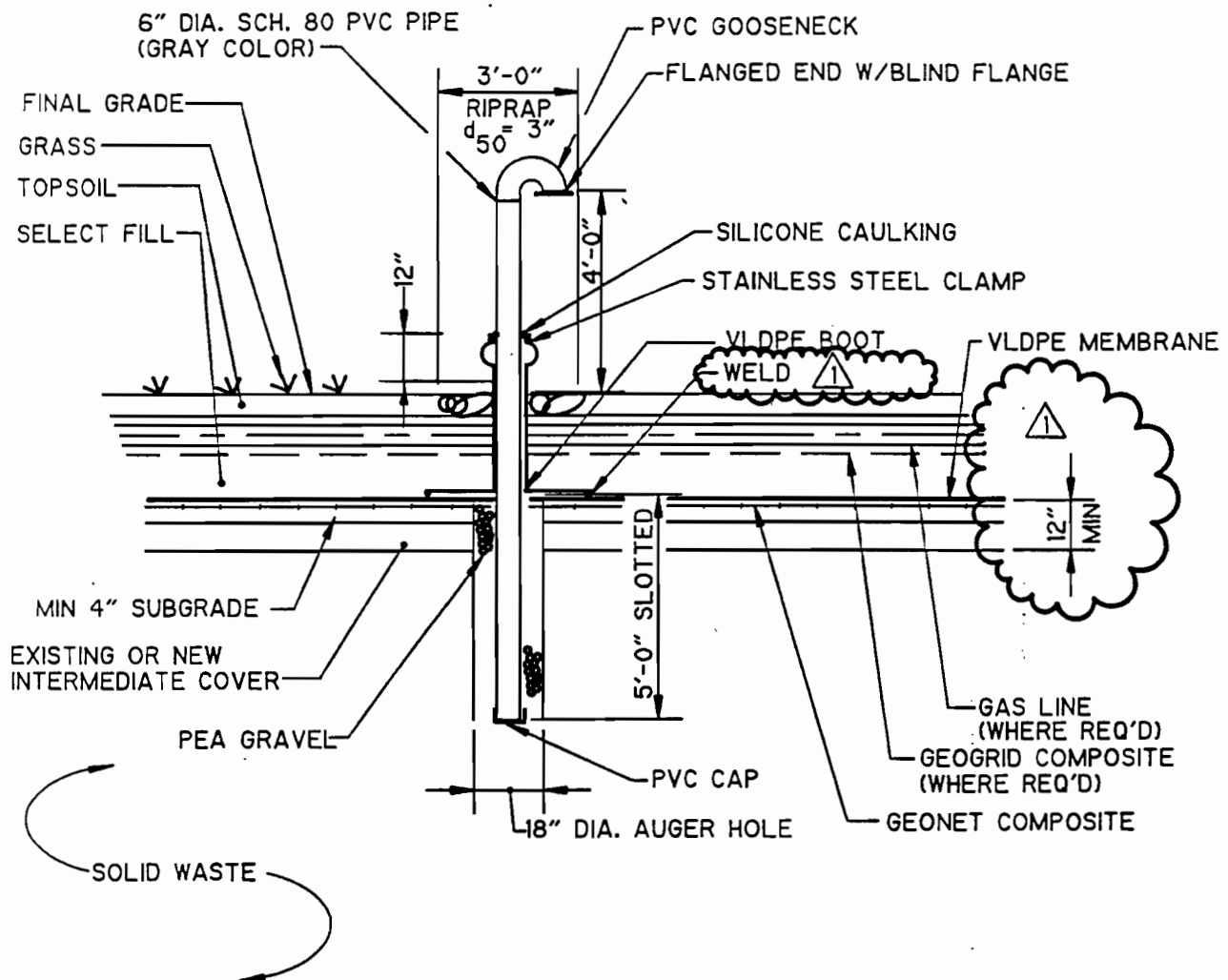
Huntington/East Northport Landfill
Contract No. ENV 94-01/O-C

Addendum No. 3

ADDED DIMENSION

REF.
DWG. C-20A

SHEET SK-C17



TYPICAL GAS VENT - TYPE I

NTS

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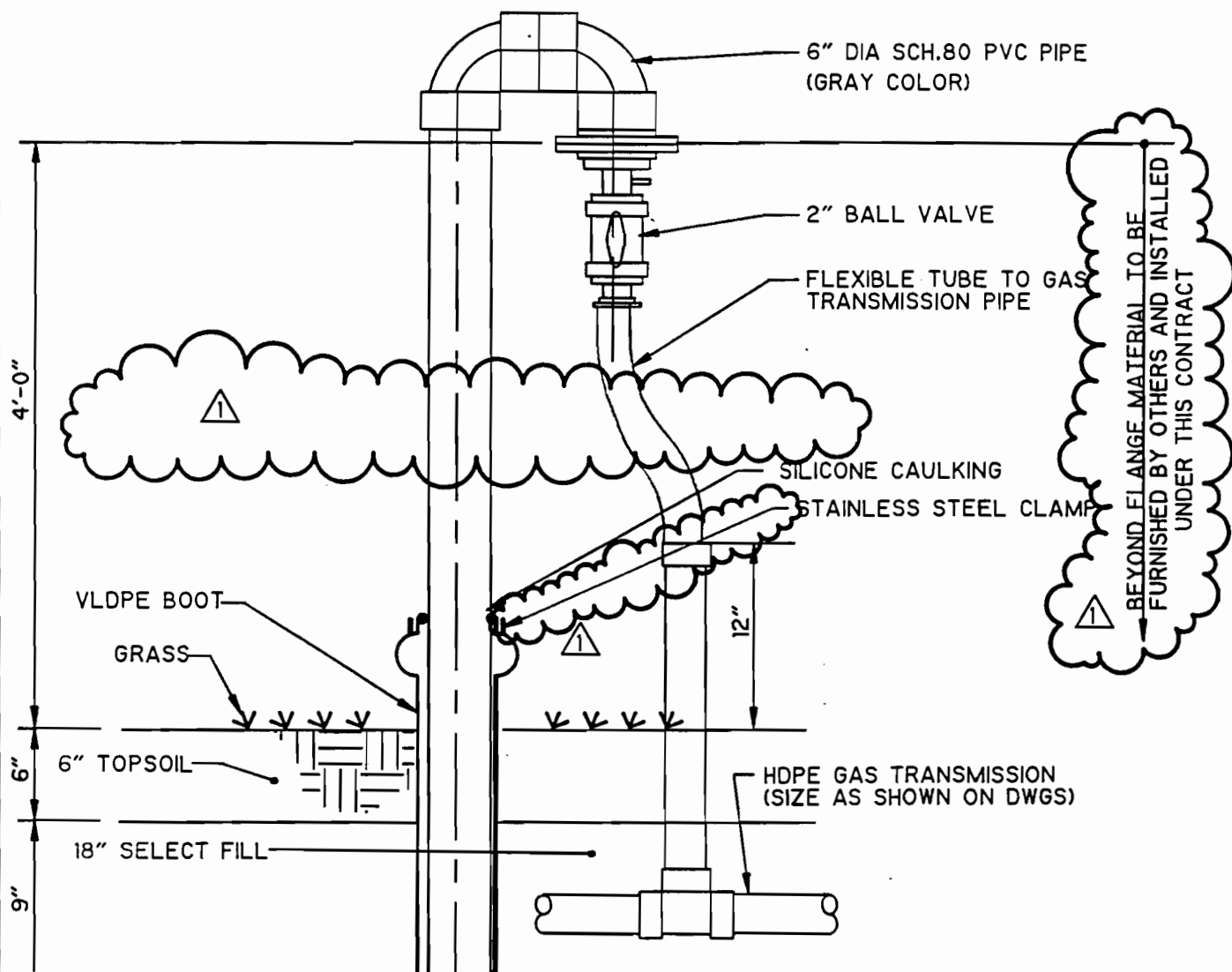
Huntington/East Northport Landfill
Contract No. ENV 94-01/O-C

Addendum No. 3

REF.
DWG. - C-21A

ADDED NOTES

SHEET - SK-C18



TYPICAL GAS VENT-TYPE 2 AND HORIZONTAL GAS COLLECTOR HEADER

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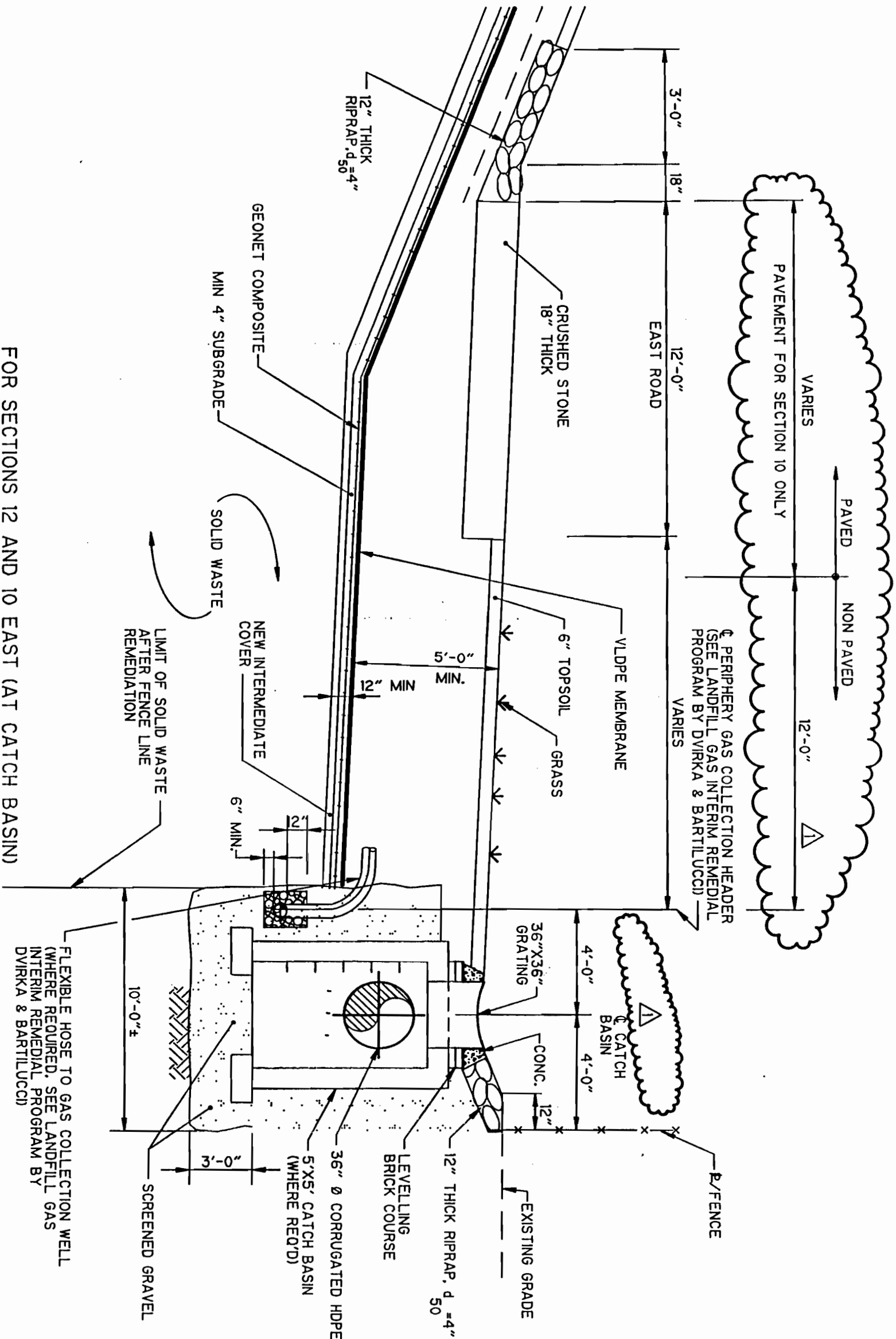
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Addendum No. 3

ADDED NOTES

REF.
DWG. C-21A

SHEET SK-C19

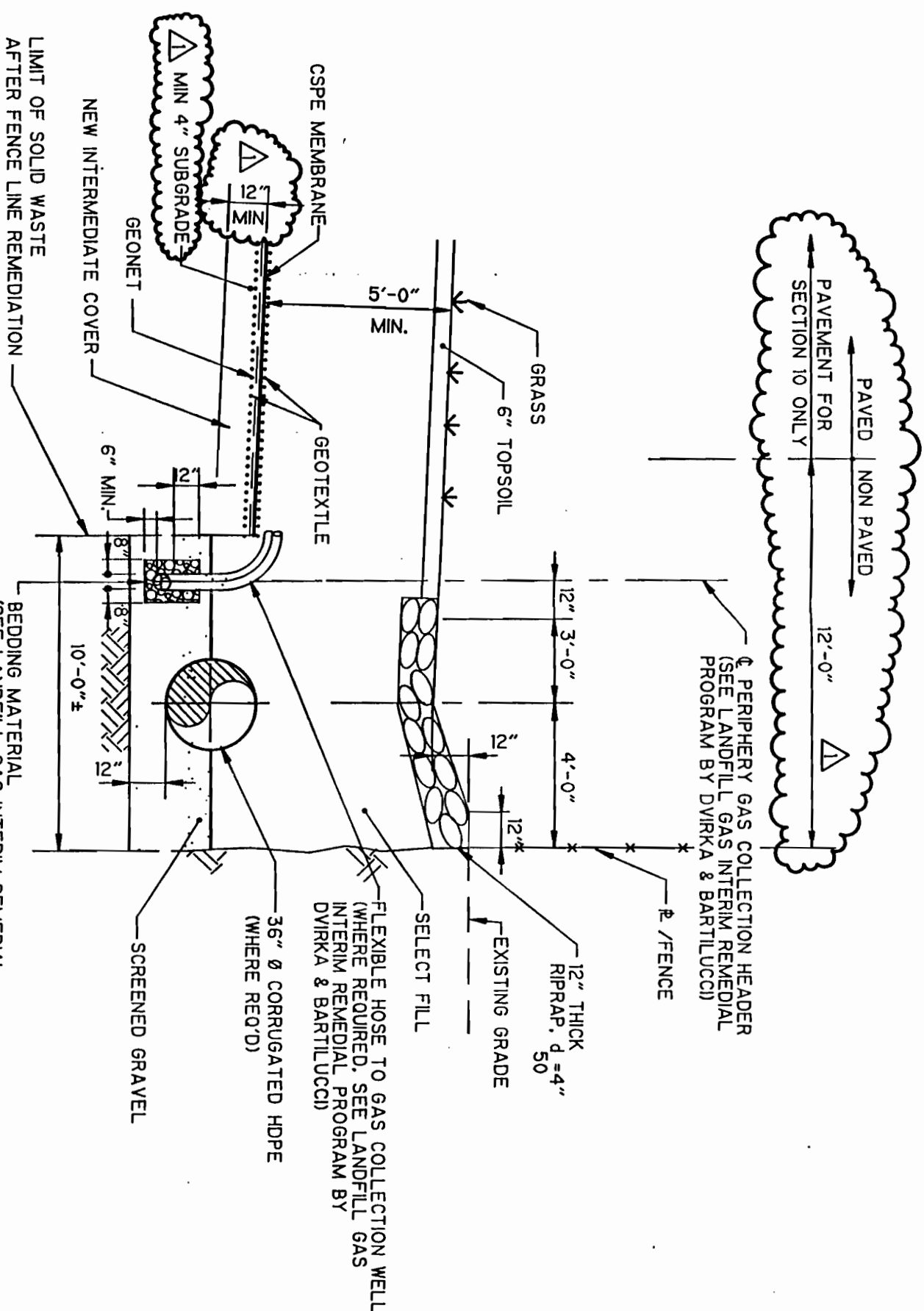


FOR SECTIONS 12 AND 10 EAST (AT CATCH BASIN)
 TYPICAL TOE OF LANDFILL DETAIL

SCALE: 1/4" = 1'-0"



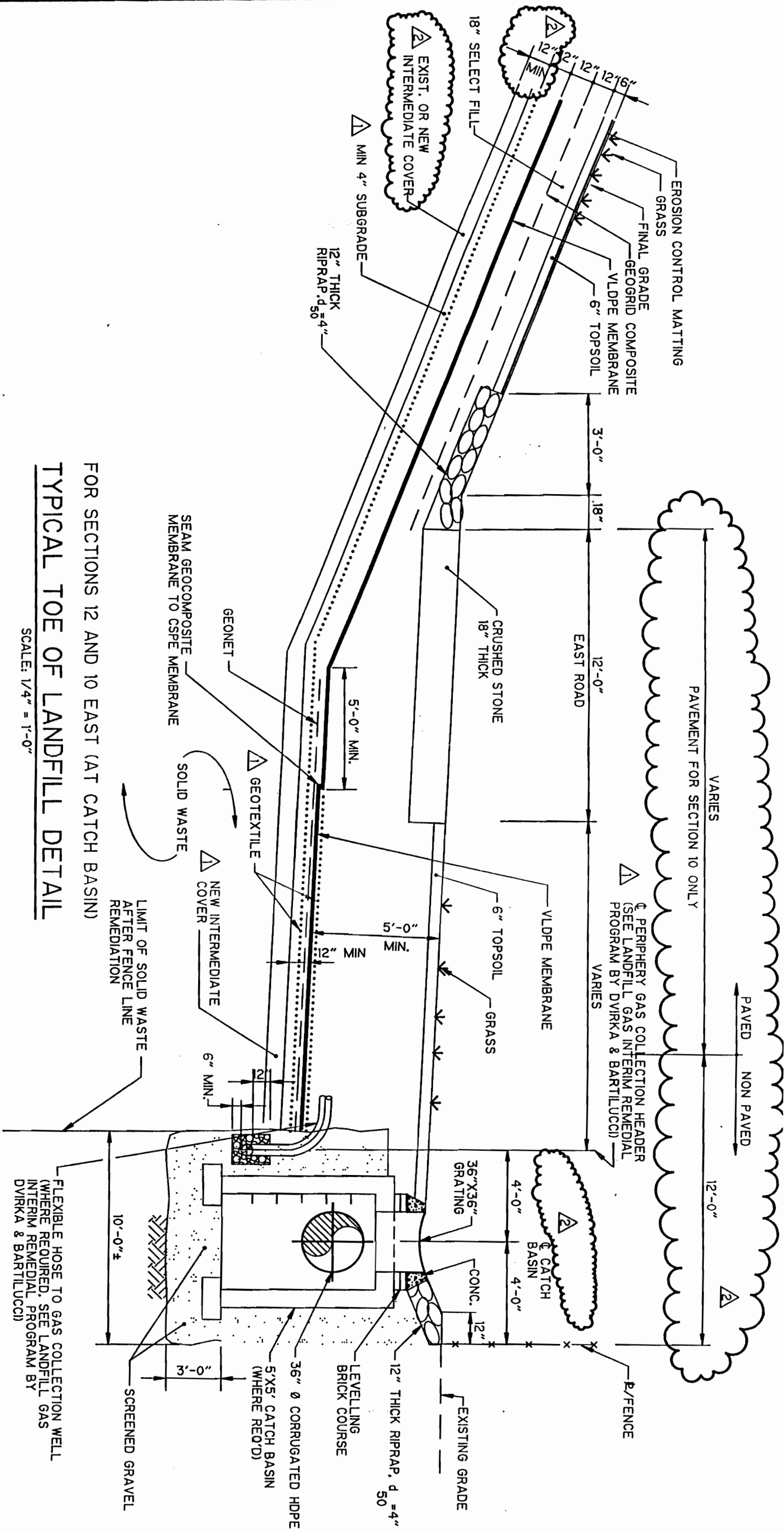
SCALE: 1/4" = 1'-0"



FOR SECTIONS 12, 13 AND 10 EAST (NO CATCH BASIN)

TYPICAL TOE OF LANDFILL DETAIL

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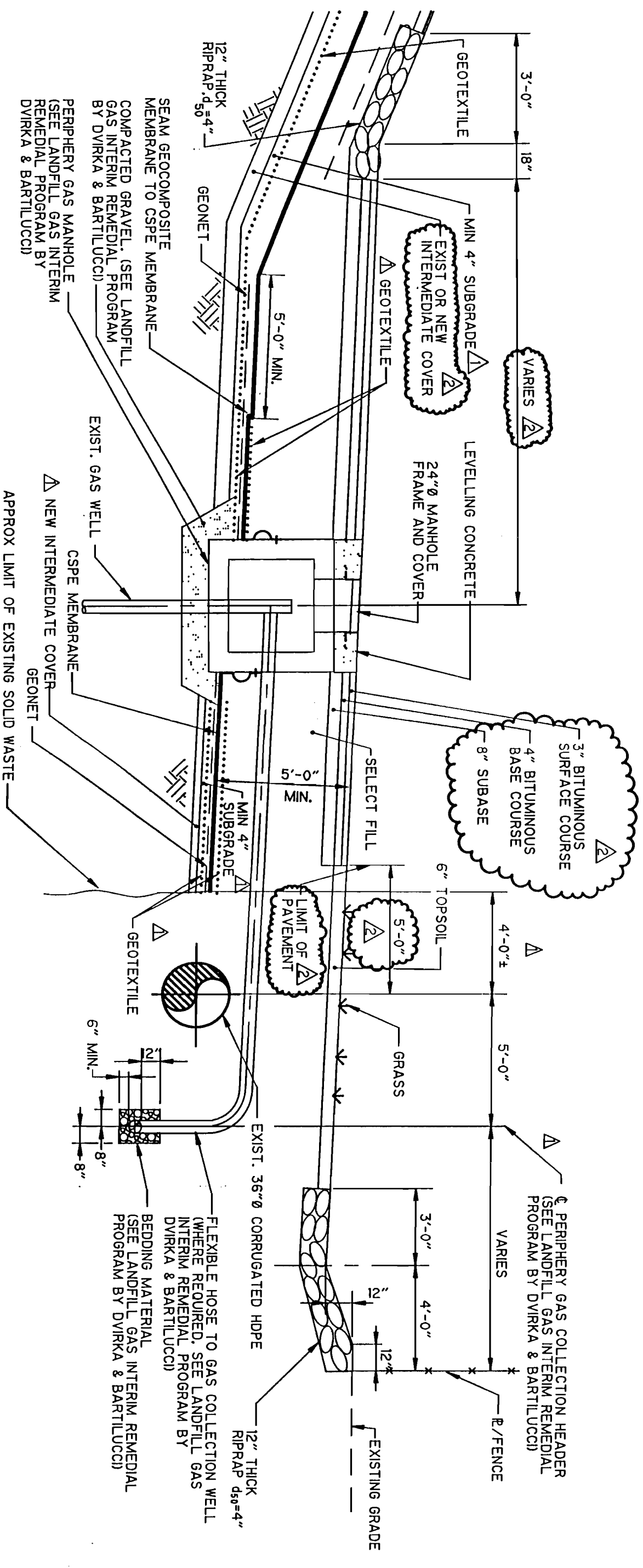


FOR SECTIONS 12 AND 10 EAST (AT CATCH BASIN)
TYPICAL TOE OF LANDFILL DETAIL
SCALE: 1/4" = 1'-0"

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Huntington/East Northport Landfill		
Contract No. ENV 94-01/O-C		
Addendum No. 3	REF. DWG.	C-22
REPLACES SK-C6	SHEET	SK-C23

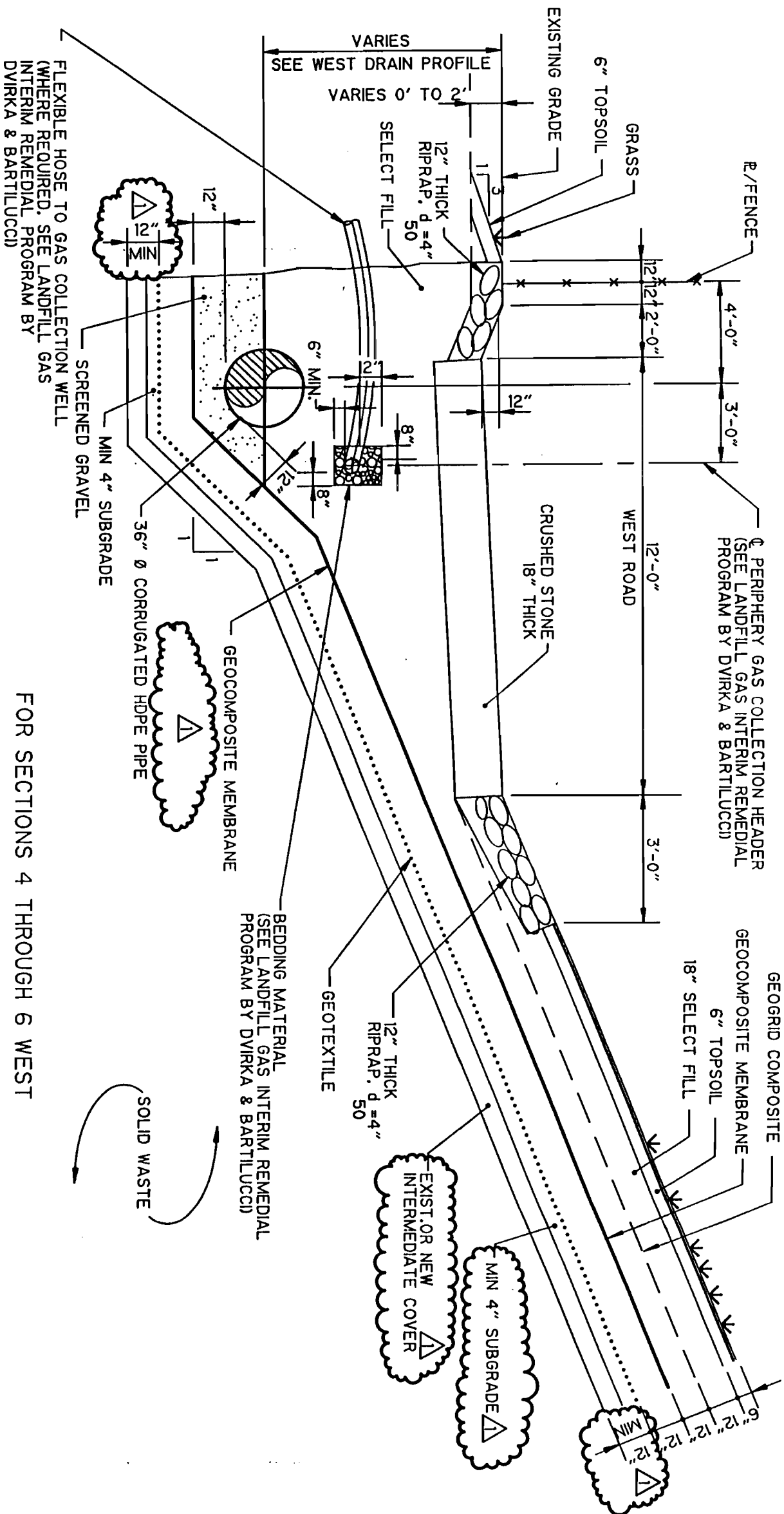


FOR SECTIONS 9 AND 9A (AT GAS MANHOLES)
TYPICAL TOE OF LANDFILL DETAIL

SCALE: 1/4" = 1'-0"

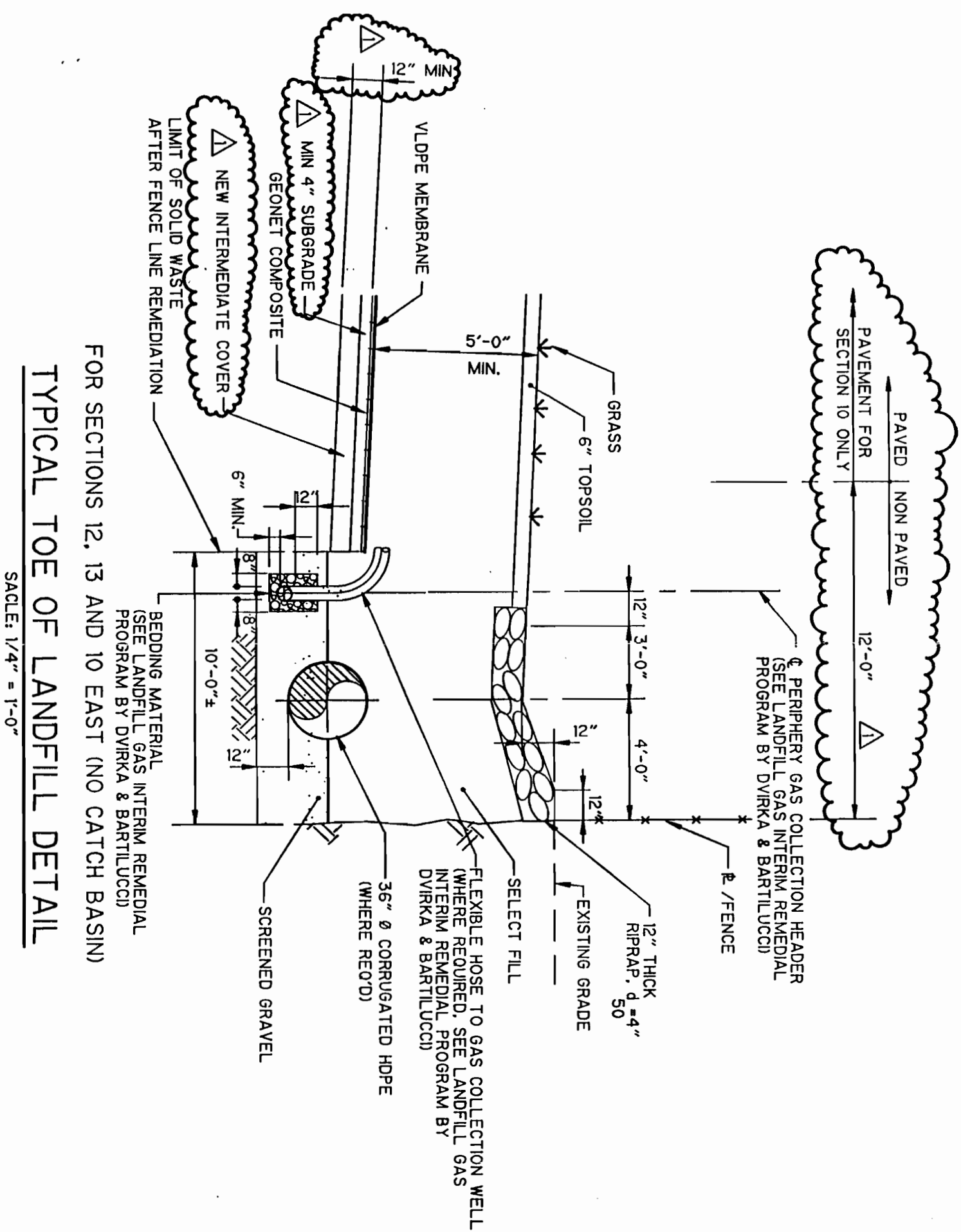
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FOR SECTIONS 4 THROUGH 6 WEST
TYPICAL TOE OF LANDFILL DETAIL
SCALE : 1/4" = 1'-0"

Huntington/East Northport Landfill	
Contract No. ENV 94-01/O-C	
Addendum No. 3	REF. DWG. C-23
ADDED NOTES	SHEET SK-C25



FOR SECTIONS 12, 13 AND 10 EAST (NO CATCH BASIN)

TYPICAL TOE OF LANDFILL DETAIL

SACLE: 1/4" = 1'-0"

**ADDENDUM TO WC-2
REFER TO
TECHNICAL SPECIFICATIONS AND DRAWINGS
FOR THE
PERIMETER LANDFILL GAS COLLECTION SYSTEM
(russet color pages)**

This section of ADDENDUM No. 3 is applicable to the Technical Specifications and Drawings for the Interim Remedial Program - Perimeter Landfill Gas Collection System (WC-2) and consists of four (4) pages.

All Bidders shall make the following changes to all pertinent sheets, pages and paragraphs of the Technical Specifications and Drawings for the Perimeter Landfill Gas Collection System, and shall take same into full consideration in arriving at the Bid Price.

A) ITEMIZED BID SHEETS (russet color)

1. PERIMETER LANDFILL GAS COLLECTION SYSTEM, Bid Item No. 11g, Header Piping - Six (6) inch diameter, the estimated quantities shall be 1,380 L.F.

B) CONTRACT DRAWING 1 OF 16

1. Sta. 0 + 4970' to Sta. 0 + 5440' shall be revised as shown on attached Sketch No. 1.

C) CONTRACT DRAWING 5 OF 16

1. Sta. 0 + 4970' to Sta. 0 + 5440' shall be revised as shown on attached Sketch No. 2.

D) CONTRACT DRAWING 6 OF 16

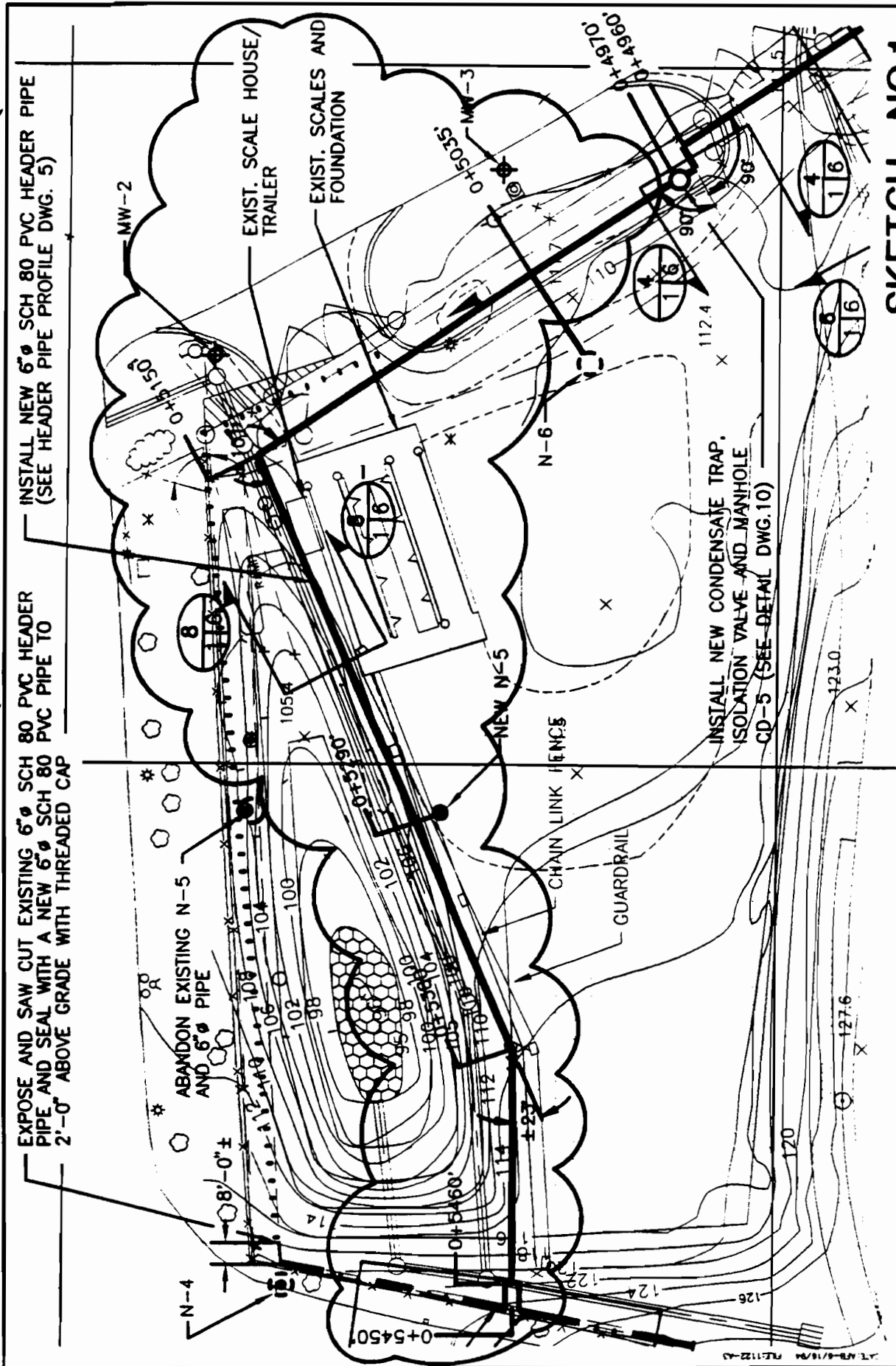
1. Add new detail "HEADER PIPE SECTION 8" as shown on attached Sketch No. 3.



Seal

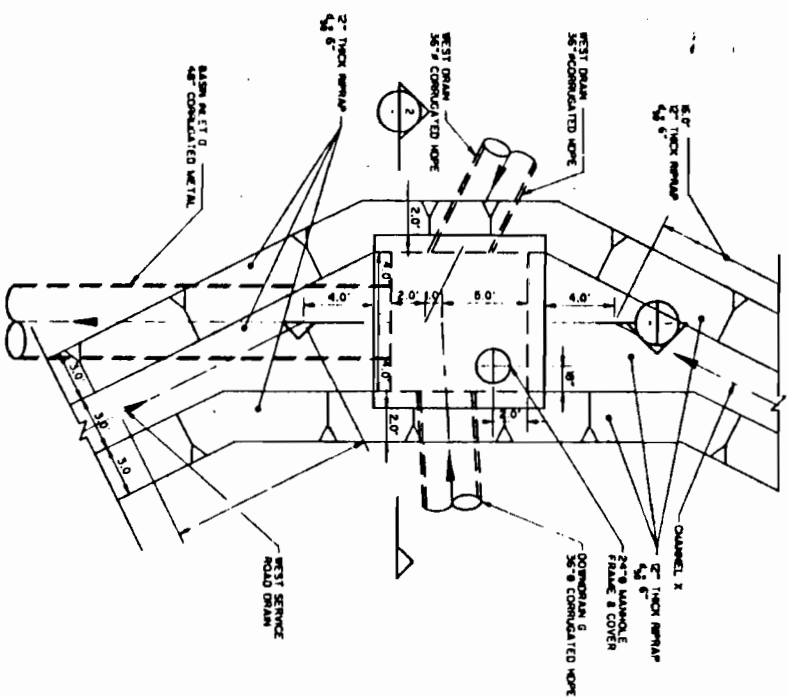
A handwritten signature in black ink that reads "William C. Miller, Jr." with a stylized flourish at the end.

William C. Miller, Jr., P.E.

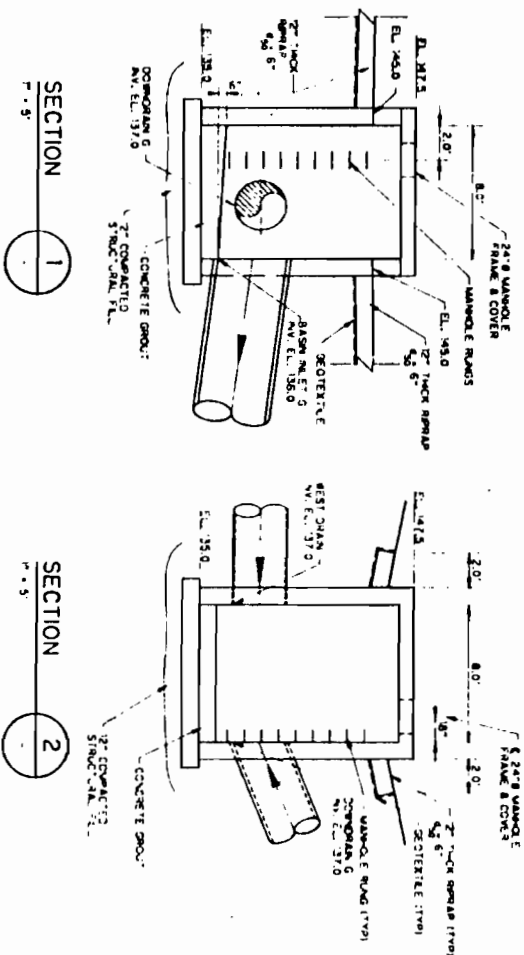


SKETCH NO.1

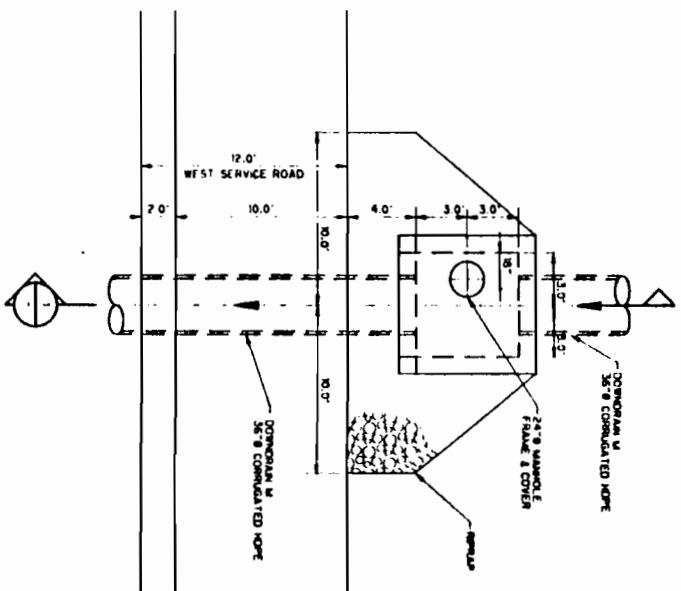
**PLAN OF LANDFILL GAS COLLECTION SYSTEM
(NORTHERN SECTION)**



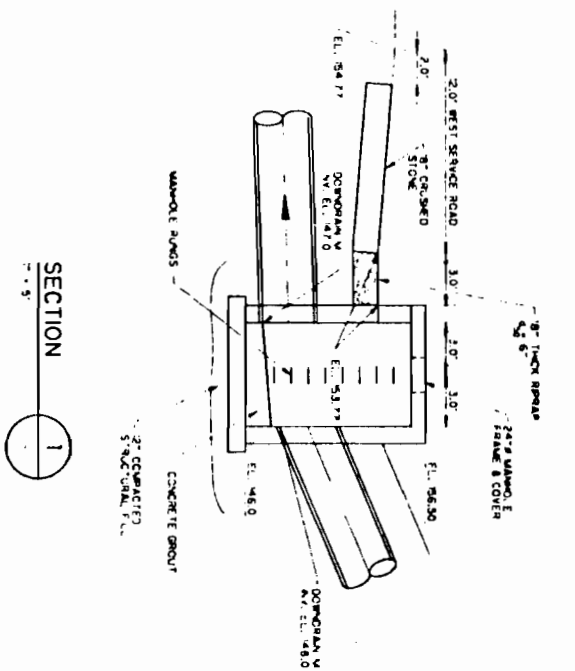
PLAN
1" = 5'



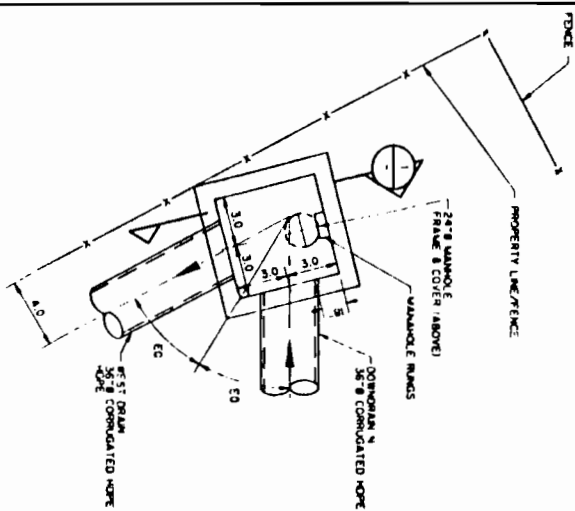
STORMWATER COLLECTION STRUCTURE 1



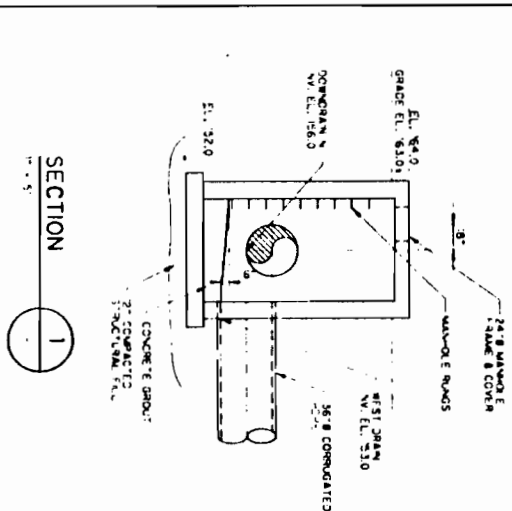
PLAN
1" = 5'



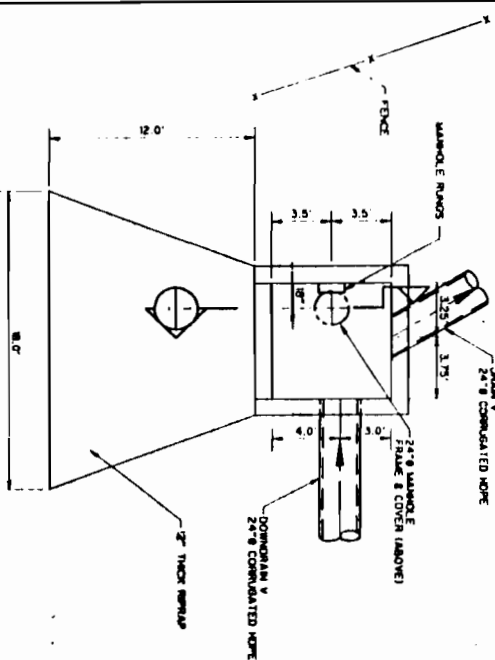
STORMWATER COLLECTION STRUCTURE 2



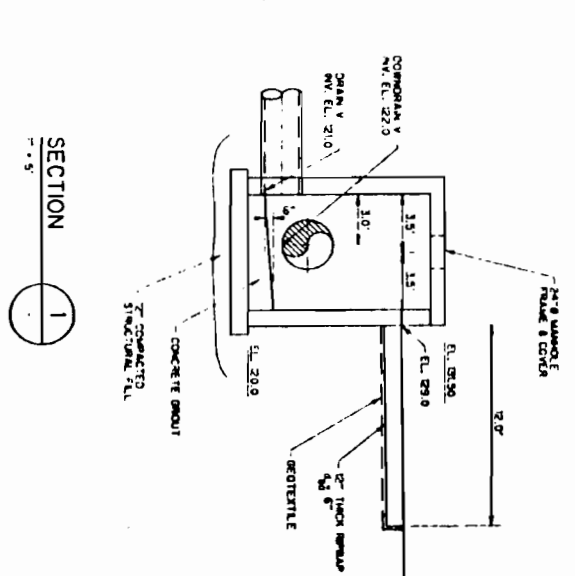
PLAN
1" = 5'



STORMWATER COLLECTION STRUCTURE 3



PLAN
1" = 5'



STORMWATER COLLECTION STRUCTURE 4

STORM WATER COLLECTION DETAILS

APPENDIX G

BLOWER SYSTEM OPERATING PROCEDURES

Following procedures shall be implemented in operating the blower system at the Huntington/ East Northport landfill. The blower system consists of two blowers and six butterfly valves located as shown below. The valve position corresponds to the valve sequencing and to the operation based on which blower is operating.

Following is chart indicating the Valve Position of various valves associated with methane blowers.

VALVING CHART

VALVE NUMBER						
BLOWER	1	2	3	4	5	6
#1 IN USE	OPEN	CLOSED	OPEN	CLOSED	CLOSED	OPEN
#2 IN USE	OPEN	OPEN	CLOSED	CLOSED	OPEN	CLOSED
#1 & #2 IN Parallel	OPEN	OPEN	OPEN	CLOSED	OPEN	OPEN
#1 & #2 IN Series	OPEN	OPEN	CLOSED	OPEN	CLOSED	OPEN

PROCEDURES FOR OPERATING THE METHANE BLOWERS.

Operation of Blower #1 only including initial start-up.

1. Before starting the blowers, make sure that the collection well valves are adjusted to the approximate valve position as determined previously.
2. Make sure that the blowers are greased according to the manufacturer's recommendations.
3. Drain the blower housing of any condensate present or collected in the impeller casing.
4. Remove any loose objects from the motor housing.
5. Follow the valve chart to make sure that the valve positions correspond to the chart.
6. Start blower #1 and observe the blower until the motor attains the designed RPM.

7. **Adjust the discharge valve #6 opening according to the manufacturer's recommendation.**
8. **Routinely adjust the discharge valve #6 of blower number 1 based on the atmospheric conditions and collection well methane collection requirements.**

Operation of Blower #2 only including initial start-up.

1. **Before starting the blowers, make sure that the collection well valves are adjusted to the approximate valve position as determined previously.**
2. **Make sure that the blowers are greased according to the manufacturer's recommendations.**
3. **Drain the blower housing of any condensate present or collected in the impeller casing.**
4. **Remove any loose objects from the motor housing.**
5. **Follow the valve chart to make sure that the valve positions correspond to the chart.**
6. **Start blower #2 and observe the blower until the motor attains the designed RPM.**
7. **Adjust the discharge valve #5 opening according to the manufacturer's recommendation.**
8. **Routinely adjust the discharge valve #5 of blower number 2 based on the atmospheric conditions and collection well methane collection requirements.**

Operation of Blower #1 and Blower #2 in parallel.

1. **Before starting the blowers, make sure that the collection well valves are adjusted to the approximate valve position as determined previously.**
2. **Make sure that the blowers are greased according to the manufacturer's recommendations.**
3. **Drain the blower housing of any condensate present or collected in the impeller casing.**
4. **Remove any loose objects from the motor housing.**
5. **Follow the valve chart to make sure that the valve positions correspond to the chart.**
6. **Start Blower #1 first and then start Blower #2 and observe the blowers until the motors attain the designed RPM.**
7. **Adjust discharge valves #5 and #6 opening according to the manufacturer's recommendation.**
8. **Routinely adjust the discharge valves #5 and #6 of blowers based on the atmospheric conditions and collection well methane collection requirements.**

Operation of Blower #1 and Blower #2 in series.

1. **Before starting the blowers, make sure that the collection well valves are adjusted to the approximate valve position as determined previously.**
2. **Make sure that the blowers are greased according to the manufacturer's recommendations.**
3. **Drain the blower housing of any condensate present or collected in the impeller casing.**

4. Remove any loose objects from the motor housing.
5. Follow the valve chart to make sure that the valve positions correspond to the chart.
6. Start blower #1 first and then start Blower #2 and observe the blowers until the motors attain the designed RPM.
7. Adjust discharge valves #5 and #6 opening according the manufacturer's recommendation.
8. Routinely adjust the discharge valve #5 and #6 of blowers based on the atmospheric conditions and collection well methane collection requirements.

BLOWER SYSTEM OPERATION SEQUENCE

1. Blower Operating Sequence:

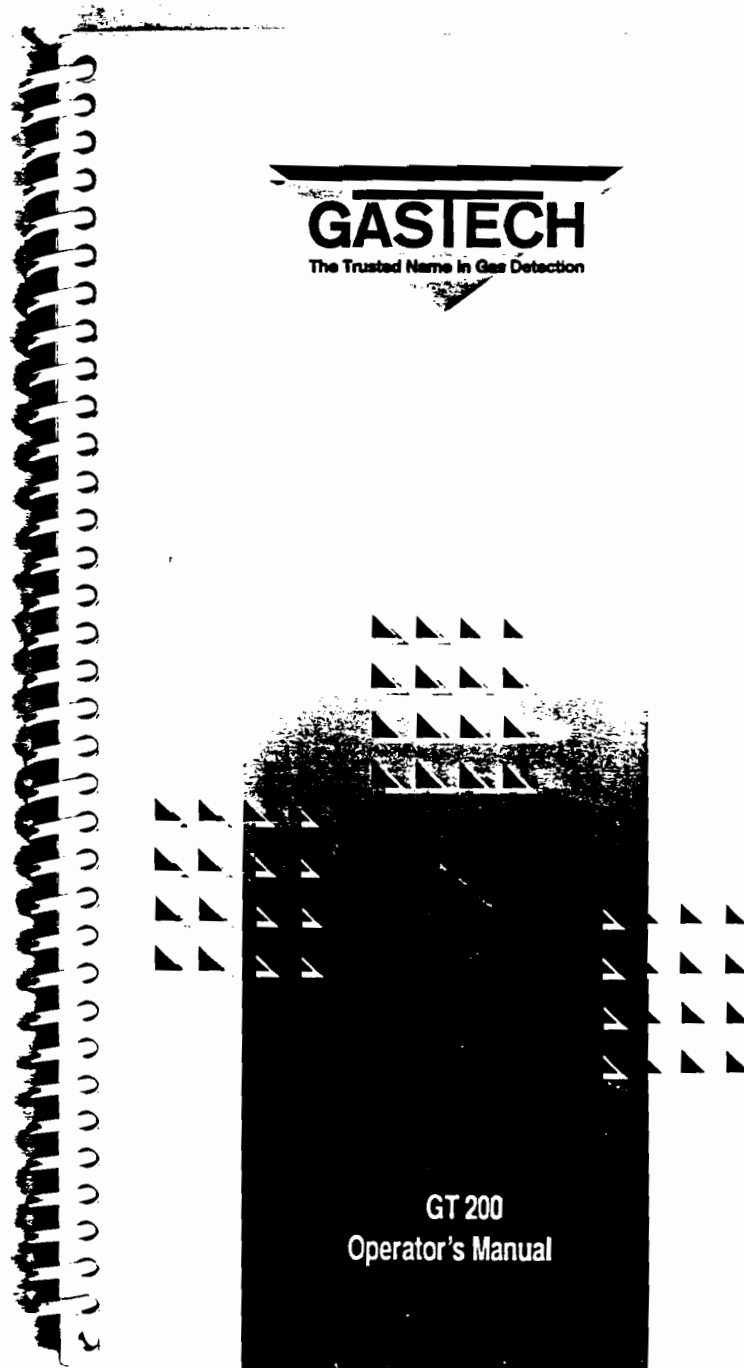
Blower # <u>System</u>	Run <u>Continuously</u>	<u>Off</u>
1	even month	odd month
2	odd month	even month

Schedule of manual switching should avoid conflict with holidays and weekends.

2. Blower switch over sequence:

- a. Valve down and close suction valve of operating blower.
- b. Valve down and close exhaust valve of operating blower.
- c. Shut down operating blower turning power switch to off.
- d. Open exhaust valve of alternating blower.
- e. Start alternate blower turning power switch to on.
- f. Open suction valve of alternate blower.

APPENDIX G



STANDARD WARRANTY GAS DETECTION INSTRUMENTS

Gas Tech, Inc. warrants gas alarm equipment manufactured and sold by us to be free from defects in materials and workmanship for a period of one year from date of shipment from Gas Tech, Inc. Any parts found defective within that period will be repaired or replaced, at our option, free of charge, f.o.b. factory. This warranty does not apply to those items which by their nature are subject to deterioration or consumption in normal service, and which must be cleaned, repaired, or replaced on a routine basis. Such items may include:

- a) Lamp bulbs and fuses
- b) Pump diaphragms and valves
- c) Absorbent cartridges
- d) Filter elements
- e) Batteries
- f) Most catalytic and electrochemical sensors are covered by a separate warranty of 12 or 24 months.

Warranty is voided by abuse including rough handling, mechanical damage, operation, alteration, or repair procedures not in accordance with the instruction manual. This warranty indicates the full extent of our liability, and we are not responsible for removal or replacement costs, local repair costs, transportation costs, or contingent expenses incurred without our prior approval.

Gas Tech, Inc.'s obligation under this warranty shall be limited to repairing or replacing, and returning any product which Gas Tech, Inc. Material Review Board examination shall disclose to its satisfaction to have been defective. To receive warranty consideration, all products must be returned to Gas Tech, Inc. at its manufacturing facilities with transportation charges prepaid.

THIS WARRANTY IS EXPRESSLY IN LIEU OF ANY AND ALL OTHER WARRANTIES AND REPRESENTATIONS, EXPRESSED OR IMPLIED, AND ALL OTHER OBLIGATIONS OR LIABILITIES ON THE PART OF GAS TECH, INC. INCLUDING, BUT NOT LIMITED TO, THE WARRANTY OF MERCHANTABILITY OR FITNESS FOR A PARTICULAR PURPOSE. IN NO EVENT SHALL GAS TECH, INC. BE LIABLE FOR INDIRECT, INCIDENTAL OR CONSEQUENTIAL LOSS OR DAMAGE OF ANY KIND CONNECTED WITH THE USE OF ITS PRODUCTS OR FAILURE OF ITS PRODUCT TO FUNCTION OR OPERATE PROPERLY.

This warranty covers instruments and parts sold (to users) only by authorized distributors, dealers, and representatives as appointed by Gas Tech, Inc.

Sl/Eng Rev. 11/92

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Chapter 1

INTRODUCTION

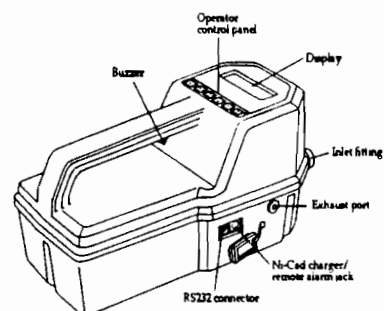
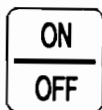


Figure 1-1 Exterior of the GT Series Gas Monitor

OPERATOR CONTROL PANEL

The Operator Control Panel is on the top of the monitor. The panel consists of six embossed control buttons. The functions of each button are described below. Specific uses of the buttons during calibration and operation of your monitor are explained where appropriate.

ON/OFF



ON/OFF is a push-button that turns the monitor on or off when pressed. Press the button to turn on the monitor. Press and hold for at least five seconds to turn the GT off.

RESET



The **RESET** button serves many purposes. It is used to reset latching alarms, and is also used to restart the pump if it shuts down due to a low flow condition, or to exit or go to previous screens in function menus.

FUNC./+



The **FUNC./+** button is used to scroll through various options or set-up parameters. The "+" function of the button, when active, is used to increase the setting during calibration, and is also used as a "YES" button during other operations.

BACK LITE/-



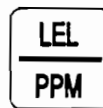
When the **BACK LITE/-** button is pressed during normal operation, the display remains illuminated for 60 seconds. The "-" function of the button, when active, is used to decrease the setting during calibration, and is also used as a "NO" button during other operations.

ADJUST/ENTER



The **ADJUST/ENTER** button is used to adjust the monitor to "fresh air" readings. The **ENTER** function of the button is used to accept calibration or other parameters, when the GT is in the mode for these adjustments.

LEL/PPM



The **LEL/PPM** button is used for switching between LEL and hydrocarbon ppm readings on models that have the catalytic (LEL) sensor.

LOWER HALF

The lower half of your GT has the following primary external components:

- Inlet Fitting (including hose and probe)
- RS-232 mini-DIN Data Connector
- Ni-Cd Battery Charger Jack
- Exhaust Fitting with Restrictor
- Float-Probe Switch Jack

These components are described in the following paragraphs.

Inlet Fitting

The inlet fitting is the point of connection for the external hose. The hose and probe are described under this section, since these are commonly used with the GT.

Hose

The GT Series gas monitor is supplied with a standard 5-foot polyurethane hose that includes quick disconnect fittings. When sampling from a deeper source, longer lengths of hose (up to a maximum of 50 feet) are available.

The polyurethane-lined hose is satisfactory for most samples, such as natural gas, propane, hydrogen, and gasoline vapors. Some complex hydrocarbons, like styrene, tend to be absorbed into the walls of the standard hose. If sampling such compounds, your response may be slower. This is a sign that the sample has been partially absorbed into the hose. Allow sufficient sampling time for the reading to stabilize if sampling these types of compounds.

The GT 202 is supplied with a dedicated sample hose. This hose is a single unit consisting of a float-probe and sample hose carrying wires that connect the float-probe with a cutoff switch inside the instrument. These wires terminate in a float-probe plug, which is inserted in a float-probe jack just to the right of the sample hose inlet. The inlet end of the dedicated sample hose is equipped with the dilution fitting (see Figure 1-2, Dedicated Sample Hose and Fittings).

Probe

The standard probe for the GT Series gas monitor is 10 inches long. It includes a hydrophobic filter that prevents liquid water from being drawn into the monitor, even if the probe is immersed. The probe has a cavity in the inlet body for a hydrophobic filter. Inspect the filter frequently. Replace it periodically or when it becomes discolored.

An optional 30-inch probe is available for frequent testing at ground level, in maintenance holes, or in tanks.

The float-probe incorporated in the dedicated sample hose used with the GT 202 is designed to prevent the intrusion of liquids into the sample system. When the probe is immersed in at least 3/4 of an inch of liquid, the rising float causes the pump to shut off and also triggers low-flow alarms. The dedicated sample probe has a 50/50 air dilution fitting which adds ambient oxygen to a sample in order to accurately register hydrocarbon vapor levels in tanks that have been inerted with CO₂ or nitrogen.

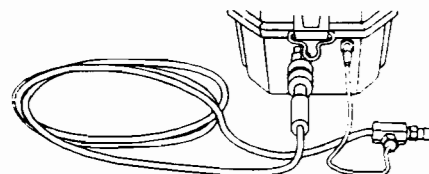


Figure 1-2 Dedicated Sample Hose and Fittings

SPECIFICATIONS

Table 1-1 lists specifications for the 200 Series of GT gas monitors.

Table 1-1 Specifications for the GT 200 Series Monitor

Gases Detected	Oxygen (0-30.0% VOL in 0.1% increments) PPM Hydrocarbons (0-10,000 ppm in 20 ppm increments) Combustibles (0-100% LEL in 1% increments)
Sensor	Oxygen: Electrochemical Combustibles: Catalytic compensated
Intrinsic Safety Rating	Class I, Division 1, Groups A, B, C, and D
Sampling Method	Sample-drawing
Response Time	Initial: 5 seconds average (with 5 foot hose) 90% complete within 20 seconds
Accuracy	LEL/ppm: $\pm 10\%$ of full scale reading; O ₂ : $\pm 0.5\%$ by volume.
Repeatability	LEL: $\pm 2\%$ of full scale reading; O ₂ : $\pm 0.2\%$ by volume.
Operating Temperature	-4°F (-20°C) to 113°F (45°C)
Humidity	0 to 95% relative humidity (RH), non-condensing
Regulatory Approvals	UL Classified CSA Certified (pending)
Alarms	Audible/visible, coded for gas and trouble. Also a comfort beep that can be turned off.
Alarm Actions	Low flow, low battery, rising combustible reading, rising or falling O ₂ reading, sensor failure.
Alarm Functions	Alarm levels are software-selectable by user.

Table 1-1 Specifications for the GT 200 Series Monitor (Continued)

Display	Digital liquid crystal display (LCD). Displays up to four different gases at a time. A back light is available on demand.
Power Source	Four "D" size alkaline or Ni-Cd batteries.
Battery Life	10 hours (20°C) (Due to the nature of alkaline cells, battery life is greatly reduced at low temperatures, and may be less than 2 hours at -15°C. Ni-Cd batteries are recommended for low temperature applications.)
Controls	ON/OFF (power) button, RESET button, FUNC./+ display option button, BACK LITE/- display option button, ADJUST/ENTER button, and LEL/PPM readout button.
Dimensions	10 in. L x 5 in. W x 6 in. H
Weight	Approximately 5 pounds
Case	High-impact, chemical and RF-resistant polycarbonate-polyester plastic
Standard Accessories	Carrying strap, hose, probe (with hydrophobic filter), dedicated sample hose with float-probe (GT 202 only), operator's manual(s)/quick reference card.
Optional Accessories	Confined space kit (CSK), dilution fitting, carrying case, extra length hose, 30 in. probe, battery chargers (220V AC, 115V AC), auxiliary hydrophobic filter, and data retrieval package (5.25 and 3.50 in. diskettes, operator's manual, and associated cable).

FACTORY-SET ALARM LEVELS

You can set the various alarm levels of your GT anywhere within the useful range of each channel (refer to Table 1-2). However, the following are considered "standard" settings for each channel of the GT Gas Alarm.

Table 1-2 GT Series Factory-set Alarm Levels

C H A N N E L	G A S	R A N G E	W A R N	A L A R M	R I S E / F A L L	L A T C H / R E S E T
1	LEL	0-100%	10%	50%	Rise	Reset
1	ppm	0-10,000	1000	5000	Rise	Reset
2	O ₂	0-30.0	23.5%	—	Rise	Reset
2	O ₂	0-30.0	—	19.5%	Fall	Reset

Chapter 2

FAMILIARIZATION

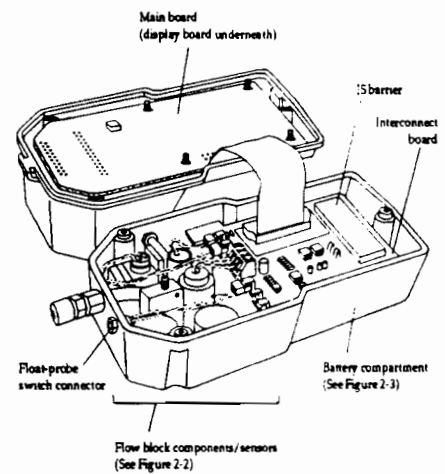


Figure 2-1 Interior of the GT 200 Series Gas Monitor

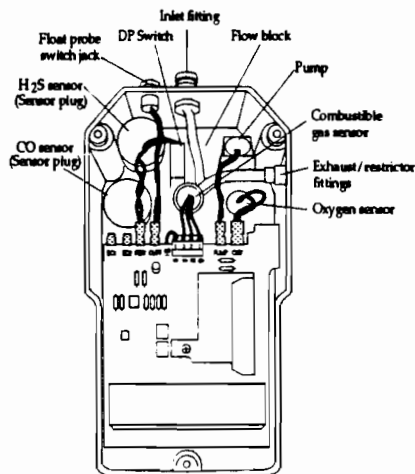


Figure 2-2 GT Flow Block Components and Sensor Locations

BATTERY COMPARTMENT

The battery compartment is at the bottom rear of the monitor (refer to Figure 2-3). It is accessed by removing the cover door on the bottom using a large flat blade screwdriver or a coin. A rectangular neoprene gasket seals the compartment and internal components from outside elements.

Your GT requires four "D" size cells (Ni-Cd or alkaline). Use only fully-charged Ni-Cd or fresh alkaline batteries in your GT. Using weak batteries may not allow the monitor to be used for an entire workday. Refer to Chapter 5, Maintenance, for replacement instructions.



WARNING

Be aware that only Ni-Cd batteries are rechargeable. Attempting to recharge an alkaline battery can cause the battery to rupture, in turn causing damage to the monitor or injury to the person.

Within the battery compartment is a slide switch labeled **ALK** and **NI-CAD**. Ensure that this switch is set to the proper setting whenever replacing batteries, or whenever switching between battery types.

Alkaline/Ni-Cad
battery switch

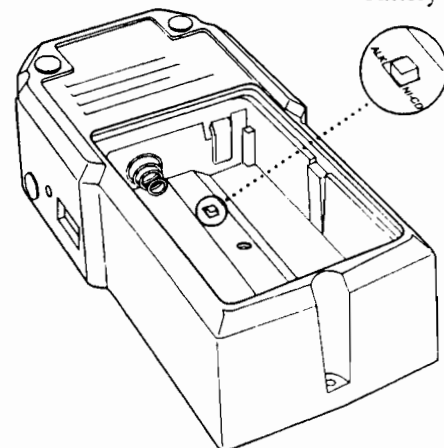


Figure 2-3 GT Gas Monitor Battery Compartment



CAUTION

For Ni-Cd monitors, the slide switch must always be at the "Ni-Cad" setting, or you will be unable to recharge the batteries. Also, never mix Ni-Cd and alkaline batteries, because the voltage curves are not the same. This can cause incorrect battery power readings, or may result in the batteries failing too soon. It may also affect the proper operation of the monitor. Recharge your GT in a "fresh air" environment only.

Chapter

3

START UP

Introduction of the GT Series gas monitor into the operating environment is discussed in this chapter. Areas covered include wiring, start up, and shut off procedures.

WIRING

All internal wiring connections are performed at the Gas Tech factory before the unit is shipped. The GT Series gas monitor is supplied with power from batteries, which need to be installed. It does not require external connections except when Ni-Cd batteries are being recharged in the instrument.

START UP

Preparation

1. Install four "D" size batteries. Place the GT upside down, turn the large screw counterclockwise until it is loose in its socket, pull up on it and remove the battery compartment cover.

If you are using alkaline batteries, make sure the slide switch at the bottom of the battery compartment is set to **ALK** (refer to Figure 2-3).

If you are using Ni-Cd batteries, make sure the slide switch is set to **NI-CAD**.

Install the batteries according to the diagram engraved in the bottom of the battery compartment. Make sure that the battery polarities are correctly oriented.

Replace the battery compartment cover and turn the screw clockwise to tighten it.

2. Ensure that the hydrophobic filter is in good condition, and is installed in the probe body.
3. Attach the probe to the female disconnect coupler fitting on the sample hose.
4. Attach the other end of the hose to the female disconnect coupler fitting on the front of the instrument. When using the GT 202 with the dedicated float-probe, insert the float switch plug into the float switch jack.

Start Up

Perform the following steps to start up your GT and adjust internal circuits to "fresh air" readings (also known as "demand zero" - steps 2 and 3, below). Please read this entire section before turning on your GT.

When starting up the GT 202 equipped with the float-probe, please be sure you refer to the section titled "Monitoring for Gases" in Chapter 4, Operation.



WARNING

Perform the following start up procedures in "fresh air" only (known to be free of toxic gases, combustible gases, and of normal oxygen content).

1. Press the **ON/OFF** button once, then release. The display temporarily shows the software version of your monitor and the number of data logging hours that remain in memory. During the warm-up period, installed sensor readings stabilize. The operation of the pump is heard, and the words **WARMING UP** are displayed. The red LED blinks slowly during warm-up. Allow one minute for the display to stabilize, and the LED to stop blinking. The GT sounds a periodic beep, and the display shows the words **WARMUP COMPLETE**. The GT has completed initial warm-up.



WARNING

In the next step, do not perform the demand zero function in the monitoring area. This can place you in potential danger if hazardous conditions exist.

2. Perform the demand zero function by carrying out the following steps: observe the display, and press and hold down the **ADJUST/ENTER** button in order to allow the internal circuits to adjust the monitor to "fresh air" readings. Once the display reads **DONE**, **THANK YOU**, release the button.
3. Verify that the display reads **000** in the %LEL/PPM field and **20.9** in the % OXY field.
4. Confirm the normal operation of the oxygen detection section. Breathe out through your mouth over the inlet of the probe, as you watch the display. The display reading lowers until it reaches the **19.5%** level, activating the alarm while displaying **ALRM** on the LCD. Continue to breathe over the probe until you hear the alarm. The % OXY reading blinks until it is back to **20.9**.



NOTE

If you calibrated your GT 202 without the dilution fitting in place, double the observed hydrocarbon reading when the dilution port is open.

This completes the start up procedure. Refer to Chapter 4, Operation, for the GT 200 Series response to environmental conditions.

SHUT OFF

To turn your monitor off, press the **ON/OFF** button in, and hold it down while the GT sounds five audible beeps. The monitor automatically shuts off. Release the button.

If applicable to your monitor, rechargeable Ni-Cd batteries must be fully charged before each workday use. When using alkaline batteries with your monitor, for best possible operation you may choose to install fresh batteries before each workday use.

Refer to Chapter 5, Maintenance, for battery recharging information and procedures.

Chapter

4

OPERATION

This chapter describes the GT 200 Series gas monitor in normal operation, after installation or calibration has been performed.

This chapter also shows the GT in warn, alarm, and other operations that can occur during use, how these situations are shown on the GT, and describes your required responses to these conditions.



CAUTION

Always follow established procedures for an alarm situation. If such procedures do not exist, please establish an appropriate plan of action for your application.

Information and procedures to use the Instrument Setup, Function, and Channel Setup programs are included in Appendix B, GT Configuration.

NORMAL OPERATION

Normal operation is any time the start up procedures explained in Chapter 3, Start Up, have been completed, the monitor is sampling as designed, no abnormal indications are on the display, and no audible alarms are occurring.

During normal operation, your GT 200 Series monitor simultaneously detects both combustible gas and oxygen content.

Monitoring for Gases

To monitor for combustible gas or O_2 , expose the probe to the area to be monitored. The GT can be left monitoring for an entire workday. All applicable gas conditions are monitored and displayed at the same time.

When using the GT 202 in tanks and vessels, perform the following steps to test whether or not you need to open the dilution port when monitoring for hydrocarbons.

1. Connect the dedicated sample hose and the float switch plug to the GT 202 and switch the instrument on (refer to Figure 4-1).

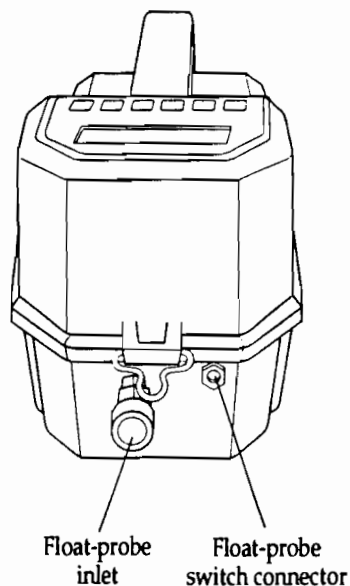


Figure 4-1 Location of Float Switch Jack

2. Perform an oxygen test by **slowly** lowering the hose and float-probe into the tank or vessel. **Do not lower the probe quickly or you may defeat the float switch.** Then hold your finger over the port in the dilution fitting and observe the % OXY reading.
3. If the reading falls below 10%, you must leave the dilution port open to acquire an accurate hydrocarbon reading.

NOTE

If you calibrated your GT 202 without the dilution fitting in place, double the observed hydrocarbon reading when the dilution port is open.

Comfort Beep

The GT periodically sounds a short beeping tone. This "comfort beep" is simply an indication that the monitor is functioning normally. Refer to Appendix B, GT Configuration, for information on setting the "comfort beep" to off.

Figure 4-2 shows the main display screen during normal operation. Note that the GT 200 Series displays only % LEL/PPM and % OXY values.

%LEL/PPM	% OXY
000	20.9

Figure 4-2 GT Normal Operation Display

OPERATOR INDICATIONS

When a warn, alarm, or other condition causes your GT to reach any of its preset levels, the monitor senses the condition. During these situations, the GT alerts you with visual and audible alarms. Warn, alarm, and other possible operator indications, the probable cause(s), and your recommended actions are described in this section.

Warn Indication

A warn indication occurs when a preset warn level is reached.

Visual Indications: As shown in Figure 4-3, the reading of the channel in warn condition blinks, and the word **WARN** is shown on the display. The red LED blinks in a steady pattern.

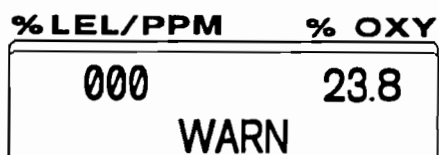


Figure 4-3 GT Warn Display

Audible Indication: The buzzer sounds in an even, slow pulsing pattern.

Recommended actions: As long as the alarms continue, follow the established procedures for a warn condition. The GT has a self-reset or latching alarm function. In the self-reset mode, when the reading of the gas channel in alarm returns to the normal level, the GT automatically stops and resets its alarms. In the latching mode, the alarm continues until you press the **RESET** button, even though the reading may have returned to zero.

Always determine the cause of any warning situation you may encounter.

Alarm Indication

An alarm indication occurs when a preset alarm level is reached.

Visual Indications: As shown in Figure 4-4, the reading of the channel in alarm mode blinks, and the word **ALRM** is shown on the display. The red LED blinks in a steady pattern.

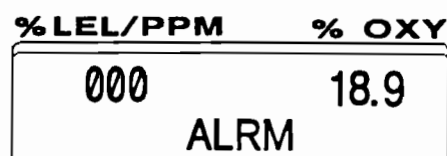


Figure 4-4 GT Alarm Display

Audible Indication: The buzzer sounds at a rapid rate.

Recommended actions: As long as the alarms continue (self-reset or latching mode), follow the established procedures for an alarm condition.

Always determine the cause of any alarm situation you may encounter.

Float-Probe Related Alarms (GT 202)

If the float switch detects the presence of liquid, the visual indicator **PUMP OFF PRESS RESET** is displayed and a steady audible alarm sounds.



NOTE

After raising the float-probe, you must press the **RESET** button to restart the pump. You may also need to perform other troubleshooting procedures. See the following section on Low Flow Indication.

Fail Indication

A fail indication (shown in Figure 4-5) occurs when a sensor or other circuitry in the GT no longer functions normally.

Visual Indications: The word **FAIL** is shown on the display. The red LED is steady.

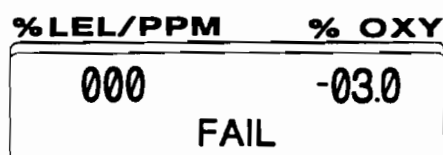


Figure 4-5 GT Fail Display

Audible Indication: The buzzer sounds continuously.

Probable cause: Any of the following situations may have occurred:

- Missing or bad sensor(s)
- Missing or bad sensor connection
- Downscale reading (-10% of each full-scale or more)
- Internal circuit fault

Recommended actions: Remove the GT from the monitoring environment. Refer to the troubleshooting information in Chapter 5, Maintenance.

Low Flow Indication

A low flow indication occurs when the normal, measured flow of the sample is interrupted. The GT's pump automatically shuts off in a low flow situation.

Visual Indications: The display alternates between two screens. As shown in Figure 4-6, the first screen shows the words **PUMP OFF PRESS RESET**. The main display is then shown. The red LED turns on, and remains on.

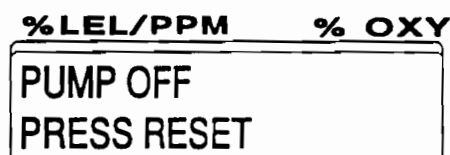


Figure 4-6 GT Low Flow Display

Audible Indication: The buzzer sounds in a long, pulsing tone.

Probable cause: Any of the following situations may have occurred:

- Liquid has been drawn into the probe
- An obstruction has been drawn into the probe, hose, or internal flow system
- Internal circuit fault
- A sensor or plug is not installed properly within its cavity in the flow block
- The pump is defective

Recommended actions: Clear away any visible obstruction, then press **RESET** in order to restart the pump. If the pump restarts, and the monitor functions normally, the problem was momentary. If the indications remain, turn the monitor off, then investigate the probe, hose, or internal flow system for obstructions or a dirty filter.

Low Battery Indication

A low battery indication occurs if the battery voltage drops below the battery alarm threshold.

Visual indication: The **LOW BATTERY** display shown in Figure 4-7 alternates with the main display. The red LED turns on, and remains on. You cannot clear this display.

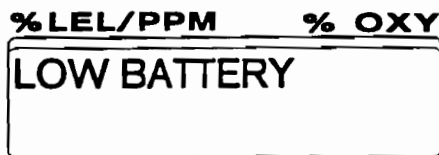


Figure 4-7 GT Low Battery Display

Audible indication: The buzzer sounds in a steady tone.

Probable cause: The batteries have reached the end of useful life.

Recommended action: You must replace the alkaline or recharge the Ni-Cd batteries within your monitor before putting it back into operation. Refer to Chapter 5, Maintenance, for procedures to replace or recharge your batteries.



WARNING

Always replace or recharge batteries in a non-hazardous environment, free of combustible or toxic gas content (consisting of normal oxygen content).

Chapter 5

MAINTENANCE

This chapter contains maintenance information to ensure proper operation and reliability of your GT Series gas monitor.



WARNING

Perform all maintenance in a non-hazardous environment free of combustible or toxic gas content (consisting of normal oxygen content).

PREVENTIVE MAINTENANCE

The following are daily, monthly, quarterly, and "as required" preventive maintenance suggestions to ensure the reliability of your GT Series gas monitor.



NOTE

In instances where the GT is in continual or everyday use, Gas Tech recommends that preventive maintenance procedures be performed more often than suggested in the following sections.

Daily

Batteries

Your GT should always contain fully-charged Ni-Cd batteries or sufficiently powered alkaline batteries before each day's use. You can verify the capacity of the batteries using the Function program. Perform the following steps:

1. Check that the slide switch in the battery compartment is at the proper **NI-CAD** or **ALK** setting for the type of batteries in your monitor.
2. Press the **FUNC./+** button, hold it down for four beeps to put the GT into the Function program, then release. If the display shows less than three bars, recharge your Ni-Cd or replace your alkaline batteries. Battery recharging and replacement information is located in this chapter. Press the **FUNC./+** button once more to return to the main display.

Calibration

For optimum efficiency of the monitor, calibrate your GT **before** and **after** each use. If multiple calibrations over a period of days indicate that only a minimum of adjustments are required, the frequency of calibration can be changed to weekly or monthly, depending on how often the monitor is used, and how demanding the monitoring environment is.



NOTE

*At the very least, "challenge" the normal operation of the oxygen detection section before every use. To do this, breathe out through your mouth over the probe as you watch the meter. The oxygen reading should decrease until it falls below **19.5%**, activating the alarm. This confirms normal operation of the oxygen section and the sample flow system.*

Sample-draw Subcomponents

Verify the proper operation of the flow alarm circuit by holding your finger over the inlet of the probe for a few seconds. The pump shuts off, the **PUMP OFF PRESS RESET** message appears on the display, and the audible alarm sounds.

Monthly/Quarterly

Calibration

Check the calibration of all sections of your GT at least every one to three months, depending on the frequency of use and also the environmental conditions under which the monitor is used. This is easily done using the optional test kit. The test kit contains all accessories needed to check and calibrate your GT. Instructions are in Chapter 6, Calibration.

As Required

Alarm Circuits

Periodically verify that all visual and audible alarms function properly.



WARNING

Verify alarm circuits in a "fresh air" environment only.

To verify alarm circuits, use a concentration of the proper test sample that is greater than preset warn or alarm levels to force a **WARN** or **ALRM** reading on the display and the audible alarm to sound. Also verify that the respective display reading in alarm blinks during the alarm sequence.

Sample-draw Subcomponents

Periodically check the probe, hoses, and internal tubing for obstructions that can accumulate over time. This is especially important if your GT is used in a dusty or very dirty environment.

TROUBLESHOOTING



NOTE

Troubleshooting information for any of the various alarm indications that you may encounter while the monitor is in normal use is provided in Chapter 4, Operation. Look under the heading "Operator Indications."

The following troubleshooting guide describes possible symptoms you may encounter with batteries or when attempting to calibrate the monitor, probable (or possible) cause(s), and recommended action to be taken.

Unable to sufficiently recharge Ni-Cd batteries

Symptom: There is no indication that a charge is being received during the recharging process, or a sufficient voltage is not available after a recharging has been completed.

Possible causes: The batteries may be defective, the battery charger may be defective, or the slide switch may be set to **ALK**.

Recommended action: Refer to the information under the heading "Recharging Ni-Cd Batteries" in this chapter.

Unable to use battery charger as a continuous operation adapter

Symptoms: The monitor cannot be operated, and the display reads **DISCONNECT CHARGER**.

Possible causes: The charger is supplying a voltage that is too high, or the batteries may be defective (or not installed). The batteries may be alkalines, the charger may be defective, or the battery selector switch may be set to **ALK**.

Recommended action: Install Ni-Cd batteries if the charger is to be used as a continuous operation adapter. If the charger is to be used as a continuous operation adapter for longer than an 8-hour period, briefly disconnect and then reconnect the charger to restart the 8-hour timer. Make sure the battery selector switch is set to **NI-CAD**.

Unable to calibrate the LEL (combustibles) section

Symptoms: The LEL (% LEL/PPM) display cannot be set to zero, or cannot be set to match the value of the calibration gas during the calibration process.

Possible causes: The entire plug-in combustibles detector, or the element within is defective.

Recommended action: Replace the LEL sensor. Refer to "Sensor Replacement," later in this chapter.

Unable to zero the oxygen (O₂) section

Symptoms: The O₂ (% OXY) display cannot be set to zero during the calibration process, or the normal setting of **20.9** cannot be attained.

Possible causes: The oxygen sensor is defective or expired.

Recommended action: Replace the oxygen sensor. Refer to "Sensor Replacement," later in this chapter.

RECHARGING NI-Cd BATTERIES

Check NI-Cd battery capacity often by using the Function program (described under "Preventive Maintenance" in this chapter). Perform the following steps to recharge weak or spent NI-Cd batteries using the Gas Tech battery charger.

1. Verify that the voltage listed on the battery charger is the same as the AC outlet (115V or 220V). Plug the charger into the outlet.
2. If recharging batteries within the GT, plug the other end of the charger into the **CHGR** jack at the side of your GT. Verify that a charge is actually entering the batteries by observing the amber light on the charger. It is on only when current is entering the batteries. Make sure the battery switch is set to **NI-CAD**.
3. The charging process requires *at least 8 hours* to fully charge a set of depleted batteries. Once the batteries are fully charged, a green light comes on. A full charge allows the batteries to be used for a full workday before another charging is required.



NOTE

The charger drops to a sustaining rate after 8 hours. If the charging cycle is interrupted and restarted, the fast rate runs for another 8 hours. In general, do not allow the charging period to last more than 40 hours.

REPLACING DEFECTIVE COMPONENTS

The following paragraphs contain step-by-step instructions to remove and replace the sensors, alkaline batteries, and pump. Refer to Figures 5-1 and 5-2, where appropriate, when performing the following procedures.

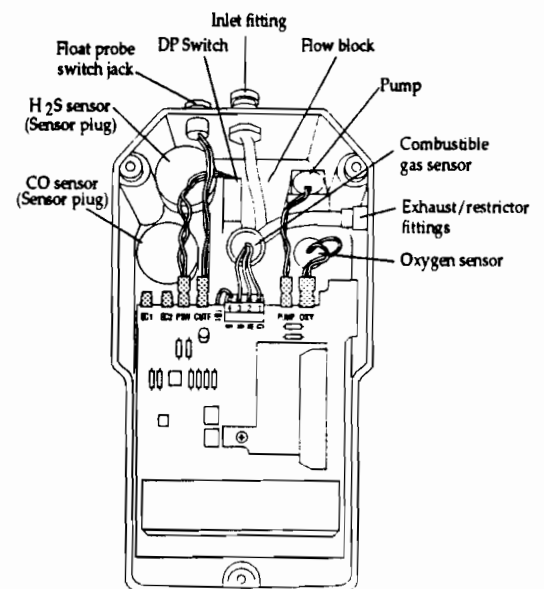


Figure 5-1 GT Sensor Locations and Connection Assignments

Sensor Replacement

Turn off your GT, open the monitor, and separate the two halves. Perform the following procedures to remove and replace a sensor (refer to Figures 5-1 and 5-2).

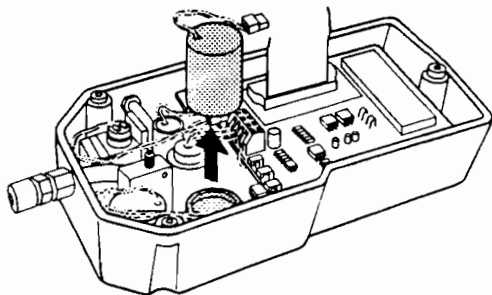


Figure 5-2 GT 200 Series Gas Alarm Sensor Removal



WARNING

Recalibrate your GT whenever you replace a sensor. Refer to Chapter 6, Calibration.

If applicable, please follow all federal, state, or local regulations regarding the disposal of electrochemical sensors. The O₂ sensor contains an alkali solution.

Oxygen Sensor Replacement

Perform the following steps to replace the oxygen sensor.

1. Locate the oxygen sensor in the flow block.
2. Unplug the sensor wire connector from the interconnect PCB socket labeled **OXY**. Using your fingers, tilt the sensor slightly to loosen it, then pull it straight out of its flow block cavity.
3. Insert the new O₂ sensor into the cavity, then apply downward pressure onto the top of the sensor until it is firmly seated within the cavity. Connect the sensor wire connector into the socket labeled **OXY**.
4. Close your monitor, then recalibrate before using it again.

Combustibles Sensor Replacement

Perform the following steps to replace the combustibles sensor.

1. Locate the combustibles sensor in the flow block.
2. Using a small flat-blade screwdriver, open the small screws on the terminal block (TB1) labeled 1, 2, and 3, and remove the purple, white, and red wires, respectively. Do not remove the black wire routing to terminal screw 4.
3. Using your fingers, tilt the sensor from side to side to loosen it, then pull it straight out. Install the new combustibles sensor into the cavity. Apply downward pressure onto the top of the sensor until it is firmly seated.
4. Reconnect the purple, white, and red wires to the proper terminals (**P, W, R**) on the interconnect PCB.
5. Close your monitor, then recalibrate before using it again.

Alkaline or Ni-Cd Battery Replacement



CAUTION

Gas Tech recommends use of heavy duty batteries only. Use of other types of batteries may result in shorter operating time. When replacing Ni-Cd batteries, use only the batteries supplied by Gas Tech (refer to Appendix A, Parts List). They are a special, high capacity type.

To maintain the CSA (Canadian Standards Association) certification of your GT Series gas monitor, only replace the batteries with the batteries specified below:

- Duracell (PC 1300)
- Duracell (MN 1300)
- Eveready (EN 95)
- SAFT (VEDCFG)

To remove the batteries refer to Figure 5-3 and perform the following:

1. Turn off the monitor (if applicable) by pressing and holding the **ON/OFF** button while the GT sounds five beeps.
2. Turn the screw at the middle of the battery compartment door counterclockwise, using a large, flat-blade screwdriver or a coin. The screw remains captive in the compartment door.
3. Check that the **ALK/NI-CAD** slide switch is set to the proper setting when performing Step 4.
4. Remove all four spent batteries, then observing the proper polarity, install new batteries. The battery compartment has a raised picture of proper battery orientation. **Never** replace less than four batteries at a time.



CAUTION

Replace batteries only in a "fresh air" environment. Never mix Ni-Cd batteries together with alkaline cells. This can cause internal damage to the monitor. If applicable, please follow all federal, state, or local regulations regarding the disposal of alkaline or Ni-Cd batteries.

It takes approximately 1 hour for the bias to stabilize on the toxic sensor. Plan to not use the instrument during this time, because the readings will be unstable.

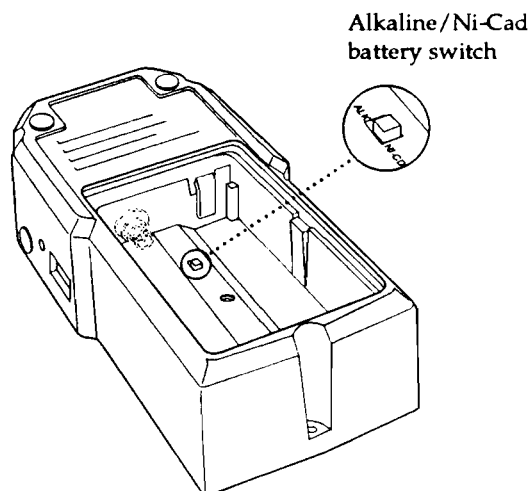


Figure 5-3 GT Gas Monitor Battery Compartment

Pump Replacement

Turn off your GT, open the monitor, and separate the two halves. Perform the following procedure to replace the pump.

1. Locate the pump in the flow block (refer to Figure 5-1).
2. Disconnect the pump wire connector from the interconnect PCB socket labeled **PUMP**.
3. Remove the nut that secures the pump bracket to the pump, then remove the bracket.
4. Remove the pump from the flow block, then insert the new pump into the flow block.



CAUTION

When you insert the new pump, do not place pressure on the pump motor. The pump motor is the dark-colored circular component at the top of the pump.

5. Place the pump bracket in its previous position, then secure the bracket to the pump with the nut you removed in Step 3.
6. Reconnect the pump wire connector to the interconnect PCB socket labeled **PUMP**, then close and secure the monitor.

Chapter 6

CALIBRATION

This chapter contains instructions to calibrate GT 201 and GT 202 gas monitors. Calibration procedures begin with a description of the optional test kit for GT Series 200 Instruments, followed by step-by-step procedures to use the kit to calibrate the instrument.



WARNING

Accurate calibration of your GT series gas monitor is essential to ensure correct readings of gas and oxygen concentrations. An incorrect or improper calibration can impair the performance of the instrument, placing you in potential danger if hazardous conditions exist.

PREPARATION OF TEST KIT



CAUTION

Calibration must be performed in a "fresh air" environment (known to be of normal oxygen content, and free of toxic or combustible gases). Do not begin calibration procedures unless you can verify that you are in a "fresh air" environment.

Perform the following steps to prepare GT 200 series test kits to begin the complete calibration of your GT 201 and GT 202 instruments. Figure 6-1 shows the test kit after all of the following connections have been made. For GT 200 series test kit preparations, perform the following steps.



WARNING

LEL response will vary for different gases. For best accuracy, LEL calibration should be done using the gas intended to be detected. (Expected relative combustible responses, listed in Appendix C, are not verified by UL.)

1. Ensure that the calibrating area contains a level surface to set the GT and test kit accessories upon.
2. Ensure that Ni-Cd batteries within the GT are fully charged. If using alkaline batteries, use new batteries.
3. Verify that the flow control knob on the dispensing valve is closed. **DO NOT CLOSE IT TOO TIGHTLY, OR YOU MAY DAMAGE THE VALVE.**
4. Carefully screw the threaded end of the dispensing valve onto the 100% nitrogen cylinder. Turn clockwise to tighten the connection.
5. If this is the first use of the kit, cut the tubing into two halves.
6. Thread one end of a piece of the tubing that will go to the GT just through the clamp, then attach the end closest to the clamp onto the "Y" connector.
7. Insert the bottom of the "Y" connector into the gas collection bag.
8. Attach tubing from the other end of the "Y" connector to the barbed nipple of the dispensing valve. Check that all tubing connections are tight and secure.

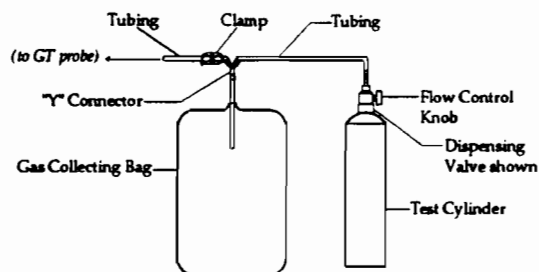


Figure 6-1 Typical Calibration Test Kit Connections

CALIBRATION

The order of the following calibration procedures follows the sequence presented on the GT's display while in calibration mode.

Calibrating the GT 201



NOTE

The first channel of the GT 201 (LEL/ppm) is zeroed in "fresh air." The 100% nitrogen cylinder is not used until you zero the O₂ channel.

During a zeroing operation, an exclamation point (!) may appear at the beginning of the second line of the display reading when the reading has centered in the zero range. Once the ! appears, the correct reading has been reached.

The first channel of the GT 202 (LEL/ppm) is zeroed in "fresh air." The 100% nitrogen cylinder is not used until you zero the O₂ channel.

The procedure for calibrating the GT 202 is identical to that for calibrating the GT 201 with one exception: use the 40% LEL hexane test cylinder instead of the 2.5% natural gas test cylinder. Be sure you use the 5-foot hose with the standard probe. Do not calibrate the instrument with the float probe connected.

1. Connect the 5-foot hose to the inlet fitting, and connect the probe to the end of the hose. Turn on your GT by pressing the **ON/OFF** button on the operator control panel. Allow at least a minute for the GT to stabilize. The GT is stabilized once the red LED stops blinking, and the display reads **WARMUP COMPLETE**. Press **ADJUST/ENTER** once. The display shows the main screen.
2. To enter calibration mode, press the **RESET** and **BACK LITE/-** buttons together three times. The display shows the initial calibration mode field:

**Version N.NN
Calibrate**

3. Press **ADJUST/ENTER** to begin calibration procedures. The first field is for zeroing the PPM COMB channel. The GT displays:

**Zero Gas
NNNN PPM COMB**

NOTE

The ppm reading of the combustibles channel is shown, even if the original display reading was a %LEL reading, because a zeroing of the ppm reading is more accurate than a zeroing of a %LEL reading.

4. Use either the **FUNC./+** or the **BACK LITE/-** buttons to bring the display reading to **0000 PPM COMB**.

NOTE

The PPM COMB reading may change by up to 300 ppm per single press of the button. It is recommended that once you are nearing the zero mark, you observe the reading fluctuations after each single press of the button. Do not hold the button down, as the reading will proceed past zero too quickly.

Once zeroing is completed, press the **ADJUST/ENTER** button to save the zero setting. The GT now displays:

**Zero Gas
NN.N %VOL OXY**

5. Make sure the nitrogen cylinder is installed on the dispensing valve, as described in the previous section. Connect the clamped tube leading from the "Y" connector to the end of the probe. Make sure that the clamp is open (that is, the latch is pushed forward).
6. Allow the GT's pumping action to draw out the air within the gas collecting bag until the bag is flat, then close the clamp onto the tube by squeezing the parallel faces together until they are tight and latched. Disconnect the probe quickly. If you remove the probe slowly, the low flow situation may develop, shutting off the pump. If this occurs, press the **RESET** button to restart the pump.
7. Open the flow control knob on the dispensing valve. Once the gas collecting bag has expanded, open the clamp on the tube to allow the 100% nitrogen sample to flow to the GT, then connect the probe to the tube. **MAKE SURE THAT THE BAG REMAINS PARTIALLY EXPANDED THROUGHOUT THIS STEP.** Allow at least 1 minute, then use either the **FUNC./+** or the **BACK LITE/-** buttons to bring the display reading to **00.0 %VOL OXY**. Once zeroing is completed, press the **ADJUST/ENTER** button to save the zero setting. The GT now displays:

**Span Gas
NNN %LEL COMB**

8. Close the flow control knob on the dispensing valve. **DO NOT CLOSE IT TOO TIGHTLY OR YOU MAY DAMAGE THE VALVE.** Allow the gas collecting bag to empty, then disconnect the probe from the tube and close the clamp.

9. Carefully screw the dispensing valve onto the 2.5% natural gas cylinder. Turn clockwise to tighten the connection.
10. Open the flow control knob on the dispensing valve. Once the gas collecting bag begins to expand, open the clamp on the tube to the GT. Connect it to the probe and allow the sample to flow to the GT. Make sure that the dispensing valve is open enough to keep the gas collecting bag about 3/4 full. Allow time for the display to stabilize.
11. Press the **FUNC./+** or the **BACK LITE/-** buttons to bring the display to read **50 %LEL COMB** (or to the value marked on the cylinder if other than 50). Once this is complete, press the **ADJUST/ENTER** button to save the span setting.
12. Remove the tube from the GT's probe, and close the flow control knob on the dispensing valve by turning it clockwise. Allow the GT to sample fresh air for 90 seconds.
13. Using either the **FUNC./+** or the **BACK LITE/-** buttons, bring the display reading to **20.9 %VOL OXY**. Once this is completed, press the **ADJUST/ENTER** button to save the span setting.

Calibration is now complete. The GT displays:

Exit

Press any Key...

14. Press any button to exit calibration mode. Unscrew the dispensing valve from the 2.5% natural gas cylinder.
15. Store the components of the test kit in the storage case. You may leave the test kit tubing and the gas collecting bag connected to the "Y" connector for convenience.

Your GT 201 is now ready for normal operation, and will function as described in Chapter 4, Operation.

APPENDIX H
Town of Huntington
East Northport Landfill

Groundwater Monitoring Well Operating & Maintenance Procedures

Operating Components: The basic components of the leachate management system for the East Northport Landfill are the groundwater monitoring wells. These wells serve several purposes in groundwater study. They provide a facility for water samplings at a known fixed point as wells as providing a means to determine hydrogeologic properties and plume movement monitoring. The well locations define the limits and concentration levels of the groundwater contaminants and should always be noted during sampling procedures. Varying depths are also critical for sampling analysis to determine vertical flow of the plume and therefore depths should also be recorded during any groundwater monitoring procedures. Monitoring well sampling procedures can be found on the Table of Groundwater Monitoring Well Sampling Procedures in this Appendix. The monitoring wells designated "EN-1M" and "UW-1" are situated upgradient of the plume and provide ambient environmental data. The samples from these wells should provide local groundwater quality data without contamination from the landfill waste. These upgradient samples shall also provide a baseline to check all other samples against. The remaining monitoring wells have a multitude of designations (depending upon the program they were installed under) such as "CW", "EA", "EN", "F", "I", "MW" and various numbered designations as shown on Table 2-1. These wells are located at varying depths downgradient of the plume and provide actual contamination results. In addition to the monitoring wells associated with the East Northport Landfill, samples shall also be taken from other points to monitor water contamination. Samples shall be taken at the Suffolk County Water Authority public water supply wells, "S", to monitor public drinking water contamination. Sampling will also be required at the local storm water recharge basins shown on figure 2-1 (should surface water be present) and at the Sunken Meadow Creek to monitor storm runoff surface water contamination.

The monitoring wells are typically constructed of polyvinylchloride (PVC) casings with PVC and stainless steel screens. The screens are slotted or perforated casing sections typically below the solid casing which permit groundwater to flow through the well for sampling. The letters "S", "M", and "D" following the well identification numbers represent the well screen depths as "shallow", "medium" and "deep" depths within the Upper Glacial aquifer. The upgradient wells have multiple screens at varying depths to permit ambient samples from multiple depths.

Maintenance Requirements: The monitoring wells to be maintained by the TOHDEC for the East Northport Landfill should require little maintenance. Due to the vast number of wells and numerous locations, all maintenance requirements and repairs should be corrected during sampling procedures if possible. Monitoring well casings and screens should be washed with environmentally safe detergent and rinsed thoroughly with clean water directly after the sampling procedures to allow the detergent residue sufficient time to pass through the screen prior to the next scheduled sampling. Should a well cover become lost or damaged, it should be replaced with similar type as soon as possible so as not to introduce outside elements into the well casing.

Monitoring wells having above ground level damage such as casing cracks or chips should be repaired with repair material which will bond the casing together without introducing chemicals (such as PVC cement) which could bleed or seep into the groundwater and may alter sample results. Should a well become clogged or damaged beneath the ground surface at a level that cannot be reached to remove debris or make corrective repairs, the well should be permanently sealed and considered "abandoned" and noted as such on the sampling report for future reference. The monitoring program within this O & M Plan currently does not include provisions for additional wells or replacement installations for monitoring wells no longer in use or damaged and abandoned. The TOHDEC shall determine if additional or replacement monitoring wells are needed and will initiate and coordinate by independent contract any necessary drilling methods and installation procedures.

Appendix H
Town of Huntington
East Northport Landfill
Table of Groundwater Monitoring Well
Sampling Procedures

Pre-sampling Preparation

It is recommended that any equipment which may come in contact with the samples be primarily of Teflon, polypropylene or polyethylene material. These materials are resistant to corrosion and should not absorb or leach chemicals that could lead to false results. It is for this reason that equipment made of these materials are recommended over such as materials as carbon or galvanized steel, neoprene, PVC, silicon, tygon, or viton.

All documentation including field notes, sample containers and sample labels must be present and in order to efficiently record results.

Latex rubber gloves must be used to avoid contaminating samples during handling.

All sampling equipment and instrumentation should be clean, decontaminated and calibrated prior to sampling procedures.

Field Procedures

Sampling should be performed on days of no precipitation or "dry days" which are preceded by several dry days.

Remove well casing cover. Using a stainless steel electric submersible pump and hose of recommended material, insert the pump and hose into the well casing.

Turn on pump and begin purging the groundwater within the well. An adequate amount of water must be removed to ensure that the stagnant water is gone prior to sampling, and a representative sample from the aquifer can be obtained.

During pumping operations, pH, conductivity, temperature, turbidity, and dissolved oxygen must be recorded periodically in the field notes.

Appendix H
Town of Huntington
East Northport Landfill
Table of Groundwater Monitoring Well
Sampling Procedures

Field Procedures (Continued)

Approximately, three to five well volumes should be purged or until pH, conductivity and temperature readings are stabilized. Note the volume of water removed from the well within the field notes. This can be obtained by measuring the water level depth within the casing. Subtracting this depth to water level from the total casing height will provide the total water column height. Using the equation below will result in obtaining the well volume.

$$(0.041)d^2h = V$$

Where, d = well casing diameter in inches, h = water height in column feet and V = volume in gallons.

Sufficient time should be permitted between the purging period and sampling procedures to ensure that samples should be representative of the aquifer. Samples should be taken within 6 hours of purging.

Following purging procedures, remove pumping equipment and lower the Teflon hand bailer down the well casing on a secured line of Teflon or stainless steel. The top of the bailer is open and the bottom of the bailer contains a glass marble ball and seat check valve, which remains open to permit flow through the bailer during the bailer's descent in the well casing.

Stop lowering the bailer at the desired sampling depth, and begin raising the bailer. As the bailer is lifted, the weight of the water inside the bailer will close the valve and the water sample will be contained within the bailer.

Once the bailer reaches the surface, transfer the sample from the bailer to the sample labeled bottle and record the sample in the field notes. Place the cover back on the well casing.

Appendix H
Town of Huntington
East Northport Landfill
Table of Groundwater Monitoring Well
Sampling Procedures

Field Procedures for Surface Water Sampling

Sampling of surface water such as lakes, ponds, rivers and streams will require different procedures than the groundwater monitoring well procedures above. Sampling should also be performed on days of no precipitation. A technique called "grab" sampling shall be used on surface waters, which require monitoring.

Slowly submerging the sample container directly into the surface water, allowing the water to flow into the container. Invert the bottle, keeping the neck of the bottle upright and pointing in the direction of the water flow. A pole-mounted flask may be used to take samples from shore, bridge or boat if necessary. Once filled, quickly return the bottle to the surface and pour a few millimeters of water out of the bottle to permit room for the preservative. Cap and label the bottle.

Record the sample information on both the container label and in the field notes. Specify the location that the "grab" sample was taken at with reference to a fixed landmark for future monitoring procedures.

Add the necessary preservatives within 15 minutes of sampling.

GROUNDWATER MONITORING WELL DECOMMISSIONING PROCEDURES

October 1996



Prepared for:

**New York State Department
of Environmental Conservation**

Division of Environmental Remediation

Prepared by:

Malcolm Pirnie, Inc.

DECOMMISSIONING PROCEDURES

**NYS SUPERFUND STANDBY CONTRACT
WORK ASSIGNMENT D002852-10**

NPL SITE MONITORING WELL DECOMMISSIONING

**NEW YORK STATE DEPARTMENT
OF ENVIRONMENTAL CONSERVATION**

**MAY 1995
Revised October 1996**

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DISCLAIMER

October 21, 1996

RE: New York State Department of Environmental Conservation
Division of Environmental Remediation
Monitoring Well Decommissioning Procedures

Per your request, the enclosed referenced document is being made available to you for informational purposes. These procedures may be used as a guidance when decommissioning a monitoring well. Please note that this document does not address some site specific special situations that may be encountered in the field. These procedures have not been adopted by the Department of Environmental Conservation. Compliance with the procedures set forth in this document does not relieve any party of the obligation to successfully and satisfactorily decommission a well.

If you have any questions, please contact Ben Lored, of my staff, at (518) 457-0927.

Sincerely,



Gerald J. Rider, Jr., P.E.
Chief, Operation, Maintenance and Support Section
Bureau of Hazardous Site Control
Division of Environmental Remediation
New York State Department of Environmental Conservation

Enclosure

INTRODUCTION

Malcolm Pirnie, Inc. has developed hazardous waste site monitoring well decommissioning procedures for the New York State Department of Environmental Conservation (NYSDEC) under the New York State Superfund Standby Contract, Work Assignment No. DOO2852-10. These procedures have been established as a guide for successful decommissioning of wells that are no longer used for monitoring at select National Priorities List (NPL) sites in New York State. A well is successfully decommissioned when:

- Migration of existing or future contaminants into an aquifer or between aquifers cannot occur.
- Migration of existing or future contaminants in the vadose zone cannot occur.
- The potential for vertical or horizontal migration of fluids in the well or adjacent to the well is minimized.
- Aquifer yield and hydrostatic head are conserved

The decommissioning procedures are based on NYSDEC-approved methods originally developed by Malcolm Pirnie which entailed an extensive literature search and consultations with industrial and NYSDEC officials. The literature search included sources from the National Ground Water Association, American Society for Testing and Materials (A.S.T.M.), State and EPA guidance documents, Malcolm Pirnie decommissioning procedures, and various other technical sources. A complete listing of sources is included at the end of these procedures. The industry officials consulted include drilling contractors, equipment suppliers and manufacturers, and A.S.T.M. members on Soil and Rock (D-18) and Water (D-19) committees.

These decommissioning procedures describe criteria for a satisfactorily decommissioning a monitoring well. Selection of a preferred decommissioning method will be dependent on site-specific and location-specific conditions such as the type of aquifer, the nature of the contamination, geological conditions and the type of well construction. Prior to initiating field work, the available site and location-specific data will be collected and

reviewed, and a pre-construction inspection of the monitoring well will be conducted to assist in determining the best-suited decommissioning method.

For maximum protection of human health and the environment, any material brought to the surface during the decommissioning process will be treated as a hazardous waste unless sample data indicates otherwise. The selection of disposal methods for these materials will depend on information reported in site investigation reports and analytical characterization of the retrieved materials for hazardous characteristics (see Sections 4.1.3 through 4.1.4). An appropriate procedure will be followed for the physical and hydrologic setting of the well that best protects the environment.

The following sections describe the procedures that will be implemented to properly decommission a well, including the procedure for selecting which decommissioning method will be used. There are eleven elements to be addressed in decommissioning a monitoring well at a hazardous waste site:

- 1) Reviewing Site Data
- 2) Selecting the Well Decommissioning Method
- 3) Preparing a Site-Specific Health and Safety Plan
- 4) Preparing a Materials Handling and Disposal Plan
- 5) Establishing Decontamination Procedures
- 6) Locating and Setting-Up on the Well
- 7) Removing the Protective Casing
- 8) Decommissioning of Screen and Riser
- 9) Selecting, Mixing, and Placing Grout
- 10) Backfilling and Site Restoration
- 11) Quality Assurance/Quality Control (QA/QC) Procedures

The proper well decommissioning methods and selection process are presented on the flow chart presented as Plate 1. For each decommissioning method, the specific procedures are determined by (1) geology, (2) contaminants, and (3) well design. For example, decommissioning a well that penetrates a confining layer may require a different approach than decommissioning an unconfined water table well.



1.0 REVIEWING SITE DATA

The first step in selecting the well decommissioning process consists of reviewing all pertinent site information; boring and well logs, field inspection sheets, and laboratory analytical results performed on site soil and groundwater samples. This site information will form the basis for decisions throughout the decommissioning process. Field inspection of the wells prior to decommissioning is also recommended to verify the characteristics and conditions of the wells. Special conditions such as access problems, well extensions through capped and covered landfills, and cap conditions due to seasonal weather patterns should be assessed. At well locations that have been extended, the burial of a previous concrete pad may require the excavation of soil to the top of the concrete pad to remove the well. Decommissioning work requiring the use of heavy vehicular equipment on RCRA landfill caps should be scheduled during dry weather if possible so as to minimize damage to the cover. If work must be performed during the Spring, Winter or inclement weather, special measures such as placement of plywood to reduce ruts should be employed to maintain the integrity of the completed landfill cover system. A sample Monitoring Well Field Inspection Log indicating the minimum information to be collected during field verification activities is included as Figure 1.

2.0 SELECTING THE WELL DECOMMISSIONING METHOD

The primary rationale for well decommissioning is to prevent contaminant migration along the disturbed construction zone created by the original well boring. This requires selection of a decommissioning procedure that takes into account factors such as:

- The hydrogeological conditions at the well site.
- The presence or absence of contamination in the groundwater.
- The original well construction details.

This section presents a summary of the well decommissioning methods and the selection process, which is illustrated in the flow chart presented as Plate 1. The primary well decommissioning procedures consist of:

- Casing pulling.
- Overdrilling.
- Grouting the casing in-place.
- Perforating the casing followed by grouting in-place.

A general discussion of each decommissioning procedure is presented in Sections 2.1 through 2.4.

2.1 CASING PULLING

In general, casing pulling is the preferred method for decommissioning wells where: no contamination is present; contamination is present but the well does not penetrate a confining layer; and when both contamination and a confining layer are present but the contamination cannot cross the confining layer. Additionally, the well construction materials and well depth must be such that pulling can be effected without breaking the riser.

Casing pulling involves removing the well casing by lifting. The procedure for removing the casing must allow grout to be added during pulling. The grout will fill the space once occupied by the material being withdrawn. Grout mixing and placement must be performed according to the procedures in Section 9.0.

An acceptable procedure to remove casing involves puncturing the bottom of the casing, flushing with water to remove sand (if necessary to mitigate lock-up of the casing during pulling), filling the casing with grout tremied from the bottom of the well, using jacks to free casing from the hole, and lifting the casing out by using a drill rig, backhoe, crane, or other suitable equipment. Additional grout must be added to the casing as it is withdrawn. In wells or wellpoints in which the bottom cannot be punctured, the casing or screened interval will be perforated prior to being filled with grout. This procedure should be followed for wells installed in collapsible formations or for highly contaminated wells. At site locations in which the borehole does not collapse it may not be necessary to perforate the well casing prior to pulling the well (i.e., grouting the borehole can be completed after the well materials have been removed). However, measurements of the borehole depth must

SITE NAME:

MONITORING WELL FIELD INSPECTION LOG
NYSDEC WELL DECOMMISSIONING PROGRAM

SITE ID.:

INSPECTOR:

DATE/TIME:

WELL ID.:

YES	NO
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WELL VISIBLE? (If not, provide directions below)

WELL I.D. VISIBLE?

WELL LOCATION MATCH SITE MAP? (if not, sketch actual location on back).....

YES	NO
-----	----

WELL I.D. AS IT APPEARS ON PROTECTIVE CASING OR WELL:

SURFACE SEAL PRESENT?

SURFACE SEAL COMPETENT? (If cracked, heaved etc., describe below)

PROTECTIVE CASING IN GOOD CONDITION? (If damaged, describe below)

YES	NO
-----	----

HEADSPACE READING (ppm) AND INSTRUMENT USED.....

TYPE OF PROTECTIVE CASING AND HEIGHT OF STICKUP IN FEET (If applicable)

PROTECTIVE CASING MATERIAL TYPE:

MEASURE PROTECTIVE CASING INSIDE DIAMETER (Inches):

LOCK PRESENT?

LOCK FUNCTIONAL?

DID YOU REPLACE THE LOCK?

IS THERE EVIDENCE THAT THE WELL IS DOUBLE CASED? (If yes, describe below)

WELL MEASURING POINT VISIBLE?

MEASURE WELL DEPTH FROM MEASURING POINT (Feet):

MEASURE DEPTH TO WATER FROM MEASURING POINT (Feet):

MEASURE WELL DIAMETER (Inches):

WELL CASING MATERIAL:

PHYSICAL CONDITION OF VISIBLE WELL CASING:

ATTACH ID MARKER (if well ID is confirmed) and IDENTIFY MARKER TYPE

PROXIMITY TO UNDERGROUND OR OVERHEAD UTILITIES.....

DESCRIBE ACCESS TO WELL: (Include accessibility to truck mounted rig, natural obstructions, overhead power lines, proximity to permanent structures, etc.); ADD SKETCH OF LOCATION ON BACK, IF NECESSARY.

DESCRIBE WELL SETTING (For example, located in a field, in a playground, on pavement, in a garden, etc.)
AND ASSESS THE TYPE OF RESTORATION REQUIRED.

IDENTIFY ANY NEARBY POTENTIAL SOURCES OF CONTAMINATION, IF PRESENT
(e.g. Gas station, salt pile, etc.):

REMARKS:



be taken before and after the well is pulled to ensure that no collapse of well construction or formation materials occurred.

In the event that the casing or well screen is severed during casing pulling or if borehole collapse occurs, the remaining materials can be removed by overdrilling using the conventional augering method described in Section 2.2. In situations where well materials such as PVC screens and risers are suspected to sever, and removal of all well materials is required (i.e., at wells that are contaminated or those that penetrate an aquiclude), the contractor should install rods inside the well so that the rods would serve as a steel guide pipe for advancing augers during overdrilling.

At sites in which well casings have been grouted into a rock socket the casing pulling procedure may not be feasible. An alternative procedure involving overdrilling into the bedrock, pulling the casing, and subsequently grouting the openhole interval may be employed. For uncontaminated wells or wells with low levels of contamination, overdrilling, grinding on the rock, and grouting inside and outside of the well should be acceptable if the casing cannot be pulled. When this procedure is not acceptable and the casing must be pulled from a contaminated well, a spin and flush drilling technique may be used to advance flushpoint casing equipped with a diamond cutting shoe to the bottom of the casing socket. Water used during the spin and flush casing advancement will be controlled by the use of oversized casing, a coupling and a drilling tee. Drilling water will be containerized and disposed of in accordance with the site specific Material Handling and Disposal Plan.

2.2 OVERDRILLING

Overdrilling is used where casing pulling is determined to be unfeasible, or where installation of a temporary casing is necessary to prevent cross-contamination, such as when a confining layer is present and contamination in the deeper aquifer could migrate to the upper aquifer as the well was pulled (see Section 2.5). The overdrilling method should:

- Follow the original well bore.
- Create a borehole of the same or greater diameter than the original boring.
- Remove all of the well construction materials.

Acceptable methods for overdrilling include the following:

- Using conventional augering (i.e., a hollow stem auger fitted with a plug). The plug cutter will grind the well construction materials, which will be brought to the well surface by the auger.
- Using a conventional cable tool rig to advance casing having a larger diameter than the original boring. The cable tool kit is advanced within the casing to grind the well construction materials and soils, which are periodically removed with large diameter bailer. This method is not applicable to bedrock wells.
- Using an over-reaming tool with a pilot bit nearly the same size as the inside diameter of the casing and a reaming bit slightly larger than the original borehole diameter. This method can be used for wells with steel casings.
- Using a hollow-stem auger with outward facing carbide cutting teeth having a diameter two to four inches larger than the casing. Outward-facing cutting teeth will prevent severing the casing and drifting off center.
- Using a hollow-stem auger with a steel guide pipe inside. The casing guides the cutter head and remains inside the auger. The guide pipe should be firmly attached to the inside of the casing by use of a packer or other type of expansion or friction device.

Prior to overdrilling, an expandable J-plug or other suitable well cap will be used to prevent the introduction of soil or cuttings into the well, thereby ensuring a continuous grout column for wells that are grouted in place.

In all cases above, overdrilling should advance through the original bore depth by a distance of 0.5 feet to ensure complete removal of the construction materials. When the overdrilling is complete, the casing and screen can be retrieved from the center of the auger (American Society for Testing and Materials, Standard D 5299-92, 1992), if one of the hollow stem auger methods described above is employed. Subsequent to overdrilling at flush mount well locations where it may be impractical to remove well materials from inside the augers, a 1-2 foot deep area should be excavated by hand around the flush-mount well to facilitate a conventional well removal while tremie-grouting inside the well. Alterna-

tively, the soil within the annular space may be removed by raising the augers to allow the soil to fall out and re-advance the augers to the original target depth. Grout should then be tremied within the annular space between the augers and well casings. The grout level in the borehole should be maintained as the drilling equipment and well materials are sequentially removed. After overdrilling is completed, the borehole must be grouted according to the procedures in Section 9.0 and the upper five feet of borehole must be restored according to the procedures in Section 10.0.

2.3 GROUTING IN-PLACE

Grouting in-place is the simplest decommissioning procedure, but offers the least long-term protection of all the methods. As discussed in Section 2.5, however, this method is preferred for the bedrock portion of bedrock wells, and is used for decommissioning cased wells in certain situations. For cased wells, the procedure involves filling the casing with grout to a level of five feet below the land surface, cutting the well casing at the five-foot depth, and removing the top portion of the casing and associated well materials from the ground. The casing must be grouted according to the procedures in Section 9.0. In addition, the upper five feet of the borehole is filled to land surface and restored according to the procedures described in Section 10.0.

For wells installed in bedrock, the procedure involves filling the casing (or open hole) with grout to the top of rock according to the procedures in Section 9.0. The grout mix, however, will vary according to the hydrogeological conditions as discussed in Section 2.5.

It should be noted that for wells located on landfills regulated under 6NYCRR Part 360, the screened interval of the well must be sealed separately and hydrostatically tested to ensure its adequacy before sealing the remaining borehole. The Standard Operating Procedure (SOP) for the hydrostatic test has been included under Appendix D.

2.4 CASING PERFORATION/GROUTING IN-PLACE

At this time, casing perforation is the preferred method for wells with four-inch or larger inside diameter which are designated to be grouted in-place in accordance with the selection flow chart. The procedure involves perforating the well casing and screen then grouting the well. A wide variety of commercial equipment is available for perforating casings and screens in wells with four-inch or larger inside diameters. Due to the diversity of application, experienced contractors must recommend a specific technique based on site-specific conditions. A minimum of four rows of perforations several inches long and a minimum of five perforations per linear foot of casing or screen is recommended (American Society for Testing and Materials, Standard D 5299-92, 1992).

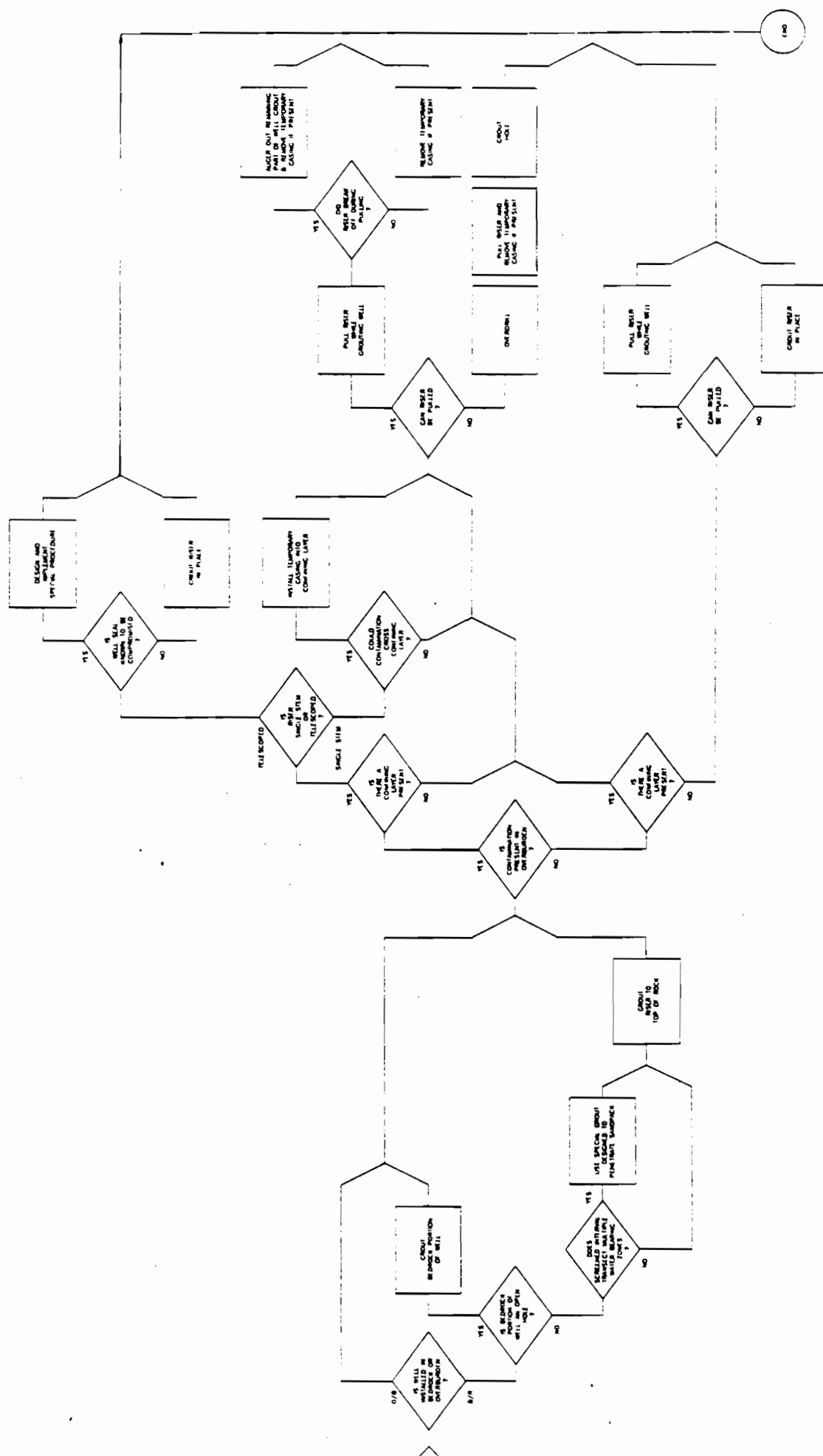
After perforating is complete, the borehole must be grouted according to the procedures in Section 9.0 and the upper five feet of borehole must be restored according to the procedures in Section 10.0.

2.5 SELECTION PROCESS AND IMPLEMENTATION

Selection of the decommissioning method is governed by the flow chart presented as Plate 1. A discussion of the selection criteria and decommissioning methodology is presented below.

2.5.1 Contaminated Monitoring Wells/Piezometers

For wells and piezometers suspected or known to be contaminated with NAPL or DNAPL product, measurement of the product volume will be determined using a weighted cotton string or by using an interface probe. Subsequent to calculation of the product volume, the NAPL/DNAPL product will be removed from inside the well. Removal of the contaminant product will be accomplished by bailing, pumping or installing an absorbent passive recovery system. Subsequent to product recovery, all contaminated materials will



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be disposed of in accordance with the segregation and containment procedures described in Section 4.1.2.

2.5.2 Bedrock Wells

As illustrated on Plate 1, if the well is constructed within a bedrock formation, the screened or the open hole portion of the well is grouted to the top of the bedrock. Prior to initiating any grouting procedure, the depth of the well will be measured to determine if any silt or debris infilling has plugged the well. If plugging has occurred, the well will be flushed with an appropriately sized roller bit or drill rods to remove or suspend the obstruction in the water column. The borehole will then be tremie grouted from the bottom of the well to the top of bedrock to insure a continuous grout column. Note that if the bedrock well is cased, the screen should be perforated to the top of the rock if the inside diameter of the casing is 4-inches or larger. Furthermore, if the screened interval transects multiple water bearing zones the special grout mix discussed in Section 9.1.3 should be used to ensure penetration of the sand pack.

After the rock hole is grouted, the overburden portion of the well is decommissioned in accordance with the following sections. If the borehole extends to the surface, no further decommissioning procedures are required; however, the boring should only be filled to within 5-feet of the ground surface and site restoration should be completed in accordance with Section 10.0.

2.5.3 Uncontaminated Overburden Wells

For overburden wells and the overburden portion of bedrock wells, the first decision point in determining the decommissioning method considers whether the overburden portion of the well exhibits evidence of contamination, as determined through historical groundwater and/or soil sampling results. If the overburden portion of the well is uncontaminated, the next criteria considers whether the well penetrates a confining layer. In the case that the overburden portion of the well does not penetrate a confining layer, the casing should be pulled (and tremie-grouted) if possible. As a general rule, PVC wells greater than 25-feet deep should not be pulled unless site-specific conditions or other factors indicate that the

well can be pulled without breaking. If the well cannot be pulled, such as in the case that a bedrock portion of the well has already been grouted in place, or if the well materials and depth prohibit pulling or will likely result in breakage, the well should be grouted in-place as accordance with Section 2.3 (if the casing is less than 4-inch in diameter) or Section 2.4 (if the casing diameter is 4-inches or larger).

If the overburden portion of the well penetrates a confining layer, the casing should be removed by pulling (if possible) in accordance with Section 2.1. If the casing cannot be removed by pulling, the well should be removed by overdrilling. The overdrilling method used will depend on the site-specific conditions and requirements. If pulling is attempted and fails (i.e., a portion of the riser breaks) the remaining portion of the well should be removed by using the conventional augering procedure identified in Section 2.2. In all cases, after the well construction materials have been removed, the borehole will be grouted in accordance with Section 9.0 and the upper five feet will be restored in accordance with Section 10.0.

2.5.4 Contaminated Overburden Wells

If an overburden well or the overburden portion of a bedrock well is contaminated as evidenced by historical sampling results, the first decision point in selecting a decommissioning procedure is whether the well penetrates a confining layer. If the well does not penetrate a confining layer, the selection process follows the same pathway as for uncontaminated wells that penetrate a confining layer (i.e., the casing is pulled, if possible; otherwise the well is overdrilled - see Section 2.5.3). Plastic sheeting should be placed around the well surface to contain contaminated materials displaced during removal of the well.

For overburden wells that are contaminated and which penetrate a confining layer, the next selection criteria is whether the well riser is a single stem or is telescoped inside one or more outer casings. The procedures to be followed in determining the decommissioning method are presented for both situations below.

2.5.4.1 Single Stem Riser

If the riser is a single stem, the potential for cross-contamination between confining layers must be addressed. In particular, if the lower confining unit is contaminated, there is a potential that the contamination may be transferred to the upper unit as the well construction materials are removed to the ground surface. In this event, it will be necessary to install a temporary casing having a diameter larger than the original borehole into the top of the confining layer. This may be accomplished using a hollow stem auger or by employing a spin and flush technique to advance the casing. If the confining layer is less than 5 feet thick, the casing should be installed to the top of the confining layer. Otherwise, it is installed to a depth of 2 feet below the top of the confining layer. After the temporary casing has been set, the well can be removed and grouted through pulling (if possible) or through overdrilling if pulling is not feasible. Plastic sheeting should be placed around the well surface to contain contaminated materials displaced during removal of the well. As an alternative to installation of a temporary casing, the hollow-stem auger could serve the same purpose in that it would prevent the contamination from migrating to the upper unit. The hollow-stem auger would be advanced into the confining layer until the joint between the uppermost sections was nearly flush with the ground surface, and the sections would be disconnected to expose the riser prior to pulling or overdrilling.

After the casing and screen are removed and the well is grouted, the temporary casing (if used) is removed and the casing and/or hollow stem auger can be decontaminated for reuse. The upper 5 feet of the well surface should then be restored in accordance with Section 10.0.

2.5.4.2 Telescoped Riser

If the riser is telescoped in one or more outer casings, the decommissioning approach is dependent on the integrity of the well seal. For the purpose of the monitoring well decommissioning procedures, the well seal is defined as the bentonite seal above the sand pack. Although it is not possible to visually inspect or otherwise test the well seal to assess its condition, an indication of the well seal integrity may be obtained through review of the

boring logs and/or a comparison of groundwater elevations if the well is part of a cluster. Any problems noted on the boring logs pertaining to the well seal, such as bridging of bentonite pellets or running sands, or disparities between field notes (if available) and the well log would indicate the potential for a poor well seal. Alternatively, if the well is part of a cluster a comparison of groundwater elevations between the shallow and deep wells should also be performed. By observing trends at other clusters it may be possible to identify inconsistencies in groundwater elevations at the well slated for decommissioning, thereby indicating a poor well seal.

If there is no evidence that the well seal integrity is compromised, the riser should be grouted in-place in accordance with Section 2.3 or 2.4, depending on the diameter of the well casing, and the upper 5 feet of the well surface should be restored in accordance with Section 10.0. If indications are that the well seal is not competent, it will be necessary to design and implement a special procedure to remove the well construction materials, as the presence and configuration of the outer casing(s) will be specific in the individual wells and will be a key factor in the decommissioning approach. The special procedure should be designed to mitigate the potential for cross-contamination during removal of the well construction materials, and should be designed prior to initiating field work.

3.0 PREPARATION OF A SITE-SPECIFIC HEALTH AND SAFETY PLAN

Prior to initiating decommissioning activities at a site, it is necessary to prepare a site-specific health and safety plan (HASP) in accordance with the requirements of 29 CFR 1910.120. Accordingly, the HASP should include:

- The names of key personnel responsible for site health and safety, including an appointed site health and safety officer.
- A safety and health risk analysis for each site task and operation.
- Employee training requirements.
- Personal protective equipment (PPE) to be used by employees for each of the site tasks and operations being conducted.

- Medical surveillance requirements.
- Frequency and types of air monitoring, personnel monitoring and environmental sampling techniques and instrumentation to be used.
- Site control measures.
- Decontamination procedures.
- Site standard operating procedures.
- A contingency plan for responses to emergencies.
- Confined space entry procedures.

An example of a health and safety plan is attached as Appendix A. This document provides a general framework for preparing a HASP. Examples of site-specific information, such as names of responsible personnel, contaminant data, and other information which must be developed to meet the OSHA requirements discussed above are included in Appendix A but will need to be modified in the site-specific HASP.

4.0 PREPARATION OF A MATERIALS HANDLING AND DISPOSAL PLAN

Materials handling and disposal procedures for each of the wells slated for decommissioning should be identified in a site-specific materials handling and disposal plan. This plan will be used as a guideline to ensure safe and efficient control of contaminated materials, and will promote conformance with the applicable regulatory requirements for storage, characterization, labeling, transportation and disposal of materials prior to off-site transport.

4.1 MATERIALS HANDLING PROCEDURES

The materials anticipated to be generated during well decommissioning activities include decontamination fluids, disposable safety equipment (including personal protective

equipment), drill cuttings, groundwater, well construction materials (PVC and/or stainless steel casings, well screens, sand, bentonite/grout mixtures, etc.), and any spill-contaminated materials. Proper handling of these materials is effected through a series of steps, including: identification/pre-characterization of the waste materials; segregation/containment of the wastes including storage in proper containers; characterization of the waste materials through analytical testing to determine the absence/presence or nature of the contamination, and proper labeling in accordance with 49 CFR Part 172. Each of these steps is described in the following sections.

4.1.1 Identification/Pre-characterization

Prior to initiating well decommissioning activities at a site, the site history, most importantly historical analytical data from the monitoring wells, must be reviewed as well as the monitoring well construction details: number, type (overburden, bedrock), depth, diameter, and construction materials. This knowledge will aid in estimating the nature and quantities of waste materials which potentially may be generated as a result of decommissioning activities and will also assist in pre-determining the number of roll-off boxes, 55-gallon drums, and any other containers necessary to contain the wastes generated at each respective site.

4.1.2 Segregation and Containment

During well decommissioning activities, generated waste materials must be contained and segregated according to the nature of the suspected contamination. Well materials generated from decommissioning those wells with known contamination will be segregated from materials generated from those wells with little to no contamination (based on historical results). Contaminated materials will be further segregated according to contaminant type (e.g., well materials suspected of containing volatile organic contamination will be segregated from materials suspected of containing Polychlorinated Biphenyl (PCB) contamination).

For wells exhibiting contamination, all materials brought to the surface must either be decontaminated, disposed of at an appropriate Treatment, Storage and Disposal Facility

(TSDF), or properly containerized in a secure area for disposal by others. For all uncontaminated wells, the materials (except the casings) can be left at the surface near the former well unless the surrounding land use prohibits this disposal (e.g., if the well is located in an area where people could be exposed to the materials left on the surface; or if recovered decommissioning materials would not be consistent with the intended use of the land). In this case, the materials must be disposed of in a 6NYCRR Part 360 landfill. For contaminated wells, PVC and/or steel casing materials may be decontaminated for disposal in a Part 360 landfill, provided that the decontamination effort is thorough and cost effective. Requirements for characterization and disposal of contaminated materials are discussed in Sections 4.1.3 through 4.1.5.

Containment methods will be based on the estimated quantity of materials anticipated to be generated at each respective site. Solid waste materials (i.e., well construction materials, soils, drill cuttings, PPE), will typically be contained in roll-off boxes or 55-gallon drums. Since federal DOT regulations (49 CFR Part 177) generally limit the combined truck and cargo weight to 80,000 lbs, most hazardous waste transporters will limit the roll-off box capacity to 20 tons of hazardous waste per shipment. Thus, if the materials are to be transported off-site to a treatment, storage and disposal facility (TSDF) that accepts bulk waste, and if the anticipated quantity of waste will be large (greater than 5 tons), water-tight roll-off containers may be more practical and cost-effective for temporarily containing and transporting the waste in lieu or in combination with 55-gallon drums (e.g., 55-gallon drums may still be used for personal protective equipment or other articles not directly derived from the abandoned well). The roll-off containers should be lined with disposable HDPE liners to prevent contact with the container, and will be initially labeled according to the source(s) of the contained waste materials. Likewise, if drums are used they will be lined with a protective plastic sleeve, filled and the drum initially labeled according to the source of the contaminated materials. After the contents of the roll-offs and drums have been characterized, they should be labeled in accordance with 49 CFR Part 172. Roll-off containers will be covered with polyethylene covers and tarps with bows during temporary storage and transportation, and all drums will be sealed.

Fluids generated during the decommissioning program will generally be contained in 55-gallon drums unless extremely large volumes are expected; in this case 5,000-gallon tankers or other suitable temporary storage may be used. All drums will be initially labeled according to the wastewater source(s) and will be assumed to contain the same contaminants as the groundwater measured by the particular monitoring well being decommissioned. All 55-gallon drums containing fluids should be sealed and temporarily stored at the decontamination pad until final off-site disposal at an approved treatment facility.

4.1.3 Characterization

Hazardous waste characterization is necessary to determine the nature of the waste materials, to verify whether the materials are hazardous, and to determine proper disposition. Characterization of waste materials will be conducted at each of the sites to determine the appropriate disposal requirements. The decision as to the number, location and types of samples to be collected will be site specific and will depend on factors such as the quantity of waste generated and type of containers used, the nature of the waste, and the distribution of contaminant types across the site with respect to the origin of the waste materials. In general, the sample collection program will be designed to ensure that analytical data representative of all the materials to be disposed will be generated from the minimal number of samples. This may be accomplished by means such as:

- collection of composite samples for contaminants such as metals and PCBs (compositing is not typically acceptable for volatile organic compound analyses).
- collection of grab samples from select drums/containers suspected of elevated contaminant concentrations based on visual observation (e.g., soil staining, liquid sheen or non-aqueous product) or PID screening

Sample analysis will be based on site history and the requirements of the disposal facility. At a minimum, the samples should be analyzed for the parameters of concern indicated by past monitoring well analytical results, as well as the hazardous waste

characteristic parameters: toxicity by TCLP; ignitability; reactivity; and corrosivity in accordance with 40 CFR Part 261.

4.1.4 Labeling

Depending on the nature of the materials, proper labeling of the storage containers (roll-offs and/or drums) must be completed according to 49 CFR Part 172.

4.1.5 Disposal

Disposal of waste materials will depend on whether the waste has been characterized as hazardous or non-hazardous. Non-hazardous waste will be disposed of on-site in accordance with NYSDEC TAGM #4032 with the prior consent of the owner and the Department, or may be landfilled at a permitted 6NYCRR Part 360 facility.

For wastes that exhibit contamination, the requirements for disposal or treatment will be dependent on the waste characteristics. To determine these requirements the following procedure should be followed upon receipt of the waste characterization results:

- 1) Determine if the waste is characteristically hazardous (by failure of any of the criteria for toxicity, corrosivity, reactivity, or ignitability) or if it is a listed hazardous waste per the classifications identified in 40 CFR Part 261.
- 2) Determine the EPA hazardous waste code(s) for the applicable waste classification(s) listed in 40 CFR Part 261.
- 3) Determine any treatment standards for the hazardous waste code(s) per 40 CFR Part 268. Depending on the waste classification, treatment standards may be based on final concentration in the waste/waste extract or may require a specific treatment technology (e.g., incineration).
- 4) If the hazardous waste contains other constituents that are not listed in the treatment standards, and if landfilling is a disposal option, it should be determined if the waste is a California List waste per the criteria in 40 CFR Part 268.32 (e.g., under these regulations, nonliquid wastes must not contain total halogenated organics at or in excess of 1,000 ppm).
- 5) If the hazardous waste meets all treatment standards including the California List Standards (if applicable), it may be disposed of at a permitted hazardous

waste land disposal facility. For each shipment the generator is required to provide the following manifest information:

- Hazardous Waste Code(s)
- Corresponding concentration-based or technology-based treatment standards.
- Manifest number.
- Waste analysis data.
- Certification Statement per 40 CFR 268.7(a)(2)(D)(ii).

In addition, the generator is required to maintain the records specified in 40 CFR Part 268.7(a)(7) for a minimum of 5 years.

- 6) If the waste fails to meet any of the treatment standards listed in 40 CFR Part 268, it must be sent to a treatment, storage, or recycling facility. If the waste's treatment standard is technology-based, it must be treated in accordance with the specified method. Land disposal is not allowable unless the waste is eligible for a National Capacity Variance (40 CFR Subpart C) and meets the California List standards. In all cases, the notification and recordkeeping requirements identified above must be fulfilled by the generator.

The hazardous waste will be transported in accordance with DOT regulations (49 CFR Parts 172-173) to either a secure hazardous waste landfill or TSDF, as appropriate. The contractor will be responsible for arranging for proper transportation and the disposal of the wastes. The Engineer will sign a hazardous waste manifest, as an agent of the Owner.

5.0 EQUIPMENT DECONTAMINATION REQUIREMENTS

Since the monitoring well decommissioning will involve multiple wells, there is a possibility of contamination from one well location to another. To avoid cross-contamination, procedures have been established for decontamination after operations at each well location is complete. The procedures for decontamination of personnel at the site will be specified in the site-specific Health and Safety Plan. Decontamination of equipment will

follow established equipment cleaning protocols which are written in accordance with the Engineer's corporate policies and OSHA regulations.

The drilling and excavation equipment (i.e., drill rigs, cutting bits, and associated equipment) will be cleaned at a constructed decontamination facility. In general, the decontamination facility (i.e., decon pad or wash pad) will consist of plywood placed over a heavy synthetic liner. The pad will slope down to a sump that will collect all liquids. A detailed description and drawing of the decontamination facility that will be constructed is included in Appendix B as Item 1.

The drilling and excavation equipment will be prepared before it is brought to the decontamination facility and then cleaned at the facility. The preceding preparation includes removing gross soil/rock from the equipment to minimize losses during movement to the decon pad. At the decontamination facility, the equipment will be rinsed with low-volume water or steam, washed with phosphate-free detergent, and rinsed again with pressurized low-volume water or steam. The equipment will be inspected by the Engineer's field representative after cleaning. The detailed cleaning procedures are included in Appendix B as Item 2.

In the event that sampling equipment must be used, the decontamination guidelines included in Appendix B as Item 3 will be followed. In general, these guidelines describe cleaning with non-phosphate detergent, then performing rinsing cycles with water and acid. After the equipment is air-dried, it must be wrapped in aluminum foil to avoid accidental contamination after cleaning.

After all equipment is decontaminated, the solutions produced must be properly containerized and disposed of. All other disposable contaminated supplies/equipment such as disposable safety and sampling equipment will also need to be properly disposed of. Unless characterization of the decon fluids and disposable equipment is performed in accordance with Section 4.0, these materials will be handled in the same manner as the drill cuttings/fluids from the well locations. All materials must be temporarily stored in a secure area such as the fenced decon pad.

If sampling is necessary, the Engineer's personnel will be responsible for the decontamination of the sampling equipment. The decontamination of drilling and excavation

equipment is the responsibility of the Contractor(s). The Engineer's field representative will make daily inspections to insure that decontamination procedures are being followed.

6.0 LOCATING AND SETTING-UP ON THE WELL

The following tasks shall be performed to locate the well to be decommissioned:

- Notify property owner and/or other interested parties including the governing regulatory agency prior to site mobilization whenever possible.
- Review information about the well contained in the site file. This information may include one or more of the following: the site map, well boring log, well construction diagram, field inspection log, well photograph, and proposed well decommissioning procedure.
- Verify the well location and identification by locating the identifying marker.
- Verify the depth of the well in the well construction log by sounding with a weighted tape.

After the well has been located, the decommissioning procedure should be selected in accordance with Section 2.0 based on the available boring and sampling data. The rig must be set up prior to initiating drilling to ensure proper alignment with the well (i.e., the drill string must be aligned with the monitoring well).

7.0 REMOVING THE PROTECTIVE CASING

7.1 GENERAL

Removal of the protective casing of a well must not interfere with or compromise the integrity of decommissioning activities performed at the well.

The procedure for removing the protective casing of a well depends upon the decommissioning method used. When a well is decommissioned by the overdrilling or casing pulling method, the protective casing may be removed either before or after the casing is removed. When the decommissioning procedure requires casing perforation or grouting

in-place, the protective casing should be removed after grout is added to the well. The protective casing handling and disposal must be consistent with the methods used for the well materials, unless an alternate disposal method can be employed (e.g., steam cleaning followed by disposal as nonhazardous waste).

7.2 PRIOR TO SEALING THE WELL BORE

When overdrilling, the protective casing must be removed first, unless the drilling tools have an inside diameter larger than the protective casing. The variety of protective casings available preclude developing a specific removal procedure. In all cases, however, the specific procedure used must minimize the risk of:

- breaking the well casing off below ground and
- allowing foreign material to enter the well casing.

If the decommissioning method used is casing pulling, the decision of when to remove the protective casing is not critical.

An acceptable protective casing removal method involves breaking up the concrete seal surrounding the casing and jacking or hoisting the casing out of the ground. A check should be made during pulling to insure that the inner well casing is not being hoisted with the protective casing. If this occurs, the well casing should be cut off after the base of the protective casing is lifted above the land surface.

7.3 AFTER SEALING THE WELL

If the decommissioning method used allows well casing to remain in the ground, the protective casing should be removed after the well has been properly filled with grout. This will insure that the well is properly sealed regardless of problems with protective casing removal. During grouting in-place, the well casing must be removed to a depth of five feet below the land surface. The upper five feet of casing and the protective casing can be removed in one operation if a casing cutter is used. If the height of the protective casing

makes working conditions at the well awkward, the casing can be cut off at a lower level. However, the inner well casing must remain aboveground and cannot be damaged in any way that prevents the well from being filled with grout.

8.0 DECOMMISSIONING OF SCREEN AND RISER

After setting up on the well and removing the protective casing (if necessary), the well screen and riser are decommissioned in accordance with the appropriate procedure and methodology as discussed in Section 2.0 (i.e., if the wells are overdrilled or pulled, the casing and riser are removed. Otherwise, they are perforated and/or grouted in-place). During the decommissioning activities the requirements of the site-specific health and safety plan, materials handling and disposal plan and equipment decontamination plan will be followed to ensure maximum protection of human health and the environment.

9.0 SELECTING, MIXING, AND PLACING GROUT

9.1 SELECTING GROUT MIXTURE

There are two types of grout mixes that may be used to seal wells: a standard mix and a special mix. Both mixes use Type 1 Portland cement and four percent bentonite by weight. However, the special mix uses a smaller volume of water and is used in situations where excessive loss of the standard grout mix is possible (e.g. highly-fractured bedrock or coarse gravels).

9.1.1 Standard Grout Mixture

For most boreholes, the following standard mixture will be used:

- One 94-pound bag Type I Portland cement
- 3.9 pounds powdered bentonite
- 7.8 gallons potable water

This mixture results in a grout with a bentonite content of four percent by weight, and will be used in all cases except in boreholes where excessive use of grout is anticipated. In these cases a special mixture will be used (see Section 9.1.2).

See Section 9.2 for grout mixing procedures.

9.1.2 Special Mixture

In cases where excessive use of grout is anticipated, such as high permeability formations and highly fractured or cavernous bedrock formations, the following special mixture will be used:

- One 94-pound bag type I Portland cement
- 3.9 pounds powdered bentonite
- 1 pound calcium chloride
- 6.0-7.8 gallons potable water (depending on desired thickness)

The special mixture results in a grout with a bentonite content of four percent by weight. It is thicker than the standard mixture because it contains less water. This grout is expected to set faster than the Standard Grout Mixture. The least amount of water that can be added for the mixture to be readily pumpable is six gallons per 94-pound bag of cement.

See Section 9.2 for grout mixing procedures.

9.1.3 Alternate Special Grout

In cases where the penetration of the sandpack is critical, such as bedrock wells with screens that transect multiple water-bearing zones, the following alternate mixture will be used:

- One 94 pound bag Type III Portland Cement.
- 3.9 pounds powdered bentonite.
- 7.8 gallons potable water.

Refer to Section 9.2 for grout mixing procedures. It should be noted that this grout is expected to set faster than the standard grout mixture.

9.2 GROUT MIXING PROCEDURE

To begin the grout-mixing procedure, calculate the volume of grout required to fill the borehole. If possible, the mixing basin should be large enough to hold all of the grout necessary for the borehole. Tall cylindrical and long shallow basins should not be used as it is difficult to obtain a homogeneous mixture in these types of basins.

Mix grout until a smooth, homogeneous mixture is achieved. No lumps or dry clots should be present. Grout can be mixed manually or with a mechanized mixer. One acceptable type of mixer is a vertical paddle grout mixer. Colloidal mixers should not be used as they tend to excessively decrease the thickness of the grout for the above recipes.

9.3 GROUT PLACEMENT

Grout will be placed in the borehole from the bottom to the top using a tremie pipe of not less than 1-inch diameter. Grout will then be pumped into the borehole until the grout appears at the land surface (when grouting open holes in bedrock, the grout level only needs to reach above the bedrock surface). Any groundwater displaced during grout placement will be pumped via suction lift to a 55-gallon drum for proper disposal.

At this time the rate of settling should be observed. When the grout level stabilizes, casing or augers will be removed from the hole. As each section is removed, grout will be added to keep the level between 0-feet and 5-feet below land surface. If the grout level drops below the land surface to an excessive degree, an alternate grouting method must be used. One possibility is to grout in stages; i.e., the first batch of grout is allowed to partially cure before a second batch of grout is added.

Upon completion of grouting, insure that the final grout level is approximately five feet below land surface. A ferrous metal marker will be embedded in the top of the grout to indicate the location of the former monitoring well.

10.0 BACKFILLING AND SITE RESTORATION

The uppermost five feet of the borehole at the land surface will be filled with a material appropriate to the intended use of the land. The materials will be physically similar to the natural soils. No materials will be used that limit the use of the property in any way. The surface of the borehole will be restored to the condition of the area surrounding the borehole. For example, concrete or asphalt will be patched with concrete or asphalt of the same type and thickness, grassed areas will be seeded, and topsoil will be used in other areas. All solid waste materials generated during the decommissioning process will be disposed of properly.

11.0 QUALITY ASSURANCE/QUALITY CONTROL (QA/QC) PROCEDURES

This section describes the quality control/quality assurance (QA/QC) procedures necessary for monitoring and ensuring the Contractor's adherence to the Monitoring Well Decommissioning Project procedures, plans and specifications, prepared by the Engineer. This section will discuss the minimum inspection and documentation requirements necessary to facilitate proper well decommissioning procedures and also will:

- Review the general requirements specified in the Contract Documents.
- Define roles and responsibilities of all parties.
- Establish the key tasks to be monitored by the on-site construction inspector and the appropriate inspector forms and logs to be used for recording the Contractor's activities.
- Establish procedures for communicating change orders, field modifications and variations from the Contract Documents to the Owner.
- Establish scheduled meetings and briefings during the construction phase.

The overall goal of the project QA/QC program is to ensure that proper well decommissioning techniques and procedures are used in accordance with the requirements

of the Contract Documents. The QA/QC procedures herein should be followed by QA personnel including: Construction Contractor personnel, the Contractor's subcontracted laboratory and field personnel, and the Engineer's on-site construction inspector.

11.1 RESPONSIBILITY AND AUTHORITY

The principal organizations involved in developing, designing and conducting well decommissioning activities are the Owner, Engineer, and the Construction Contractor.

11.1.1 Owner

The Owner will be responsible for reviewing the well decommissioning procedures to determine whether the documents meet their requirements, and to obtain approval of the procedures from the appropriate regulatory agencies. The Owner will have the responsibility and authority to review and accept or reject any design or procedural revisions or requests. The Owner also has the responsibility and authority to review and approve the Construction Monitoring Report and all QA documentation collected during well decommissioning activities.

11.1.2 Engineer

The Engineer will be responsible for reviewing and approving any engineering design changes, construction monitoring and quality assurance in accordance with this QA Plan. The Engineer will inform all parties involved with construction of their responsibilities, lines of communication, lines of authority, and QA/QC procedures. The Engineer's construction inspector (QA Engineer) will monitor decommissioning activities and will be assigned specific responsibilities and tasks. Most of the waste sample collection and testing will be conducted by the contractor at a frequency and manner specified in the site specific Materials Handling and Disposal Plan.

The person filling the construction inspector (QA Engineer) position will be trained and certified to operate an HNu organic vapor photoionization detector (PID), will be OSHA 40-hour Hazardous Waste Worker trained and will have a working knowledge of documents

pertaining to well decommissioning activities, including this plan. The Engineer's field personnel will be instructed to contact the construction inspector (QA Engineer) in the event well decommissioning requirements are not being met, QA procedures are not being implemented, or construction problems have been encountered.

11.1.3 Construction Contractor

In addition to performing the monitoring well decommissioning in accordance with the design documents, the Contractor will be required to obtain the services of a qualified testing laboratory to perform the analytical testing of the waste materials and will also be responsible for procuring transportation and disposal/treatment services.

11.2 PROJECT MEETINGS

The Engineer's management of the monitoring well decommissioning project will include conducting periodic project meetings as described below:

11.2.1 Pre-construction Meeting

The Engineer will schedule and attend one (1) pre-construction meeting for the purpose of discussing the project approach and answering contractor questions. The Engineer will also prepare and distribute meeting minutes. The meeting will also:

- Provide each party (organization) with relevant QA documents and supporting information.
- Familiarize each organization with the QA Plan and its role relative to the well decommissioning criteria and construction documents.
- Review the responsibilities of each organization and review the lines of authority and communication for each organization.
- Discuss the established procedures for observations and tests including waste sampling.

- Discuss the established procedures for handling construction deficiencies, repairs, and/or retesting.
- Review methods for documenting and reporting inspection data.

11.2.2 Monthly Progress Meetings

Monthly project meetings will be held during the course of the work to discuss the project schedule and work performed to date, and to address and resolve any existing or anticipated problems.

A special meeting will be held when and if a major QA problem or deficiency is present or likely to occur. At a minimum, the meeting shall be attended by the Construction Contractor and the Engineer's on-site inspector (QA Engineer). The purpose of the meeting will be to define and resolve the problem(s) or deficiencies encountered. The meeting minutes will be documented by the Engineer.

11.3 KEY TASKS

The key tasks that the Engineer will conduct during the well decommissioning project are briefly summarized below.

11.3.1 Review of Contractor Submissions

Prior to well decommissioning activities, all written submissions required by the contract documents will be evaluated and forwarded to the Owner, together with written submissions regarding their suitability. The Engineer will also obtain and review all necessary shop drawings, material tests and as-built drawings submitted throughout the construction and will make recommendations for acceptance/rejection to the Owner. The contractor's progress will be continuously monitored during the construction period, and Owner will be informed of the schedule and any corrective measures planned or implemented.

Throughout the project, payment requests by the contractor will be reviewed for accuracy and completeness prior to making recommendations relative to payment. Review

will involve comparing actual notes of field personnel to items contained in the payment request. Discrepancies will be discussed with the contractor and will be amended if necessary.

11.3.2 Construction Inspection

The Engineer will provide full-time inspection of the contractor during all critical well decommissioning activities at each of the sites. This will be accomplished by providing an experienced on-site inspector(s) to document the contractor's adherence to the contract specifications and monitoring the contractor's progress. The Engineer will notify the Owner in the event that the contractor fails to perform the decommissioning work as specified in the contract and recommend to the Owner the acceptance, conditional approval/disapproval or rejection of the contractor's work. The Engineer will issue instructions, field orders, interpretations and clarification of contract language to the contractor as required. In the event that a change order is necessary, the Engineer will submit the change order with a detailed cost estimate to the Owner. The Engineer will also document, evaluate and recommend a course of action for all disputes and claims with the contractor.

In addition, the Engineer will inspect, evaluate and document the monitoring well condition after the well has been removed.

11.4 DOCUMENTATION

The Engineer's on-site construction inspector will document all monitoring well decommissioning activities. Such documentation will include, at a minimum, daily reports of construction activities, photographs, and sketches as necessary. Field investigation reports will be completed by the construction inspector when major questions arise at the site. Forms to be used for this purpose are presented in Appendix C.

The Engineer will maintain complete and detailed records associated with all construction and related activities during the duration of the project. These records will be maintained at the Engineer's office(s) and will include but not be limited to the following:

- Daily work completed and important conversations.
- Contractor's daily use of personnel, material and equipment.
- Records documenting the contractor's deviation from work as specified in the contract documents, and any instructions issued regarding deviations.
- Unusual circumstances (weather conditions, labor disputes, environmental problems, health and safety hazards encountered, etc.).
- General files including correspondence and other documentation related to the project.
- Job meeting minutes with documentation on resolution of issues raised.
- Records of contractor's submittals including shop drawings, modifications/change orders, soil tests, material tests and action taken (e.g., Owner approval/disapproval, further information needed).
- Construction photos.
- Telephone conversation

In addition, the Engineer will submit monthly Project Summary Reports to the Owner. These reports will identify the work which has been accomplished and will document the status of each monitoring well at each site where decommissioning work has occurred.

Upon substantial completion of the decommissioning activities at each site, the Engineer will prepare a detailed list of any work remaining unfinished. The Engineer will then prepare and submit a written notice to the Owner which will include a determination as to whether the completed work meets the requirements of the contract documents. Following satisfactory completion of the work, the Engineer will perform a final inspection of the site and submit a notice to the Owner that decommissioning activities were performed in accordance with the contract documents as revised by any approved change orders or modifications to the scope of work.

Documentation on the condition of the removed wells with respect to the impacts of hazardous waste, minerals and other pertinent environmental factors, or discernable through

direct observation, will be presented to Owner along with any recommendations for future well installation techniques and materials.

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EXAMPLE

APPENDIX A
HEALTH AND SAFETY PLAN

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EXAMPLE

**HEALTH AND SAFETY PLAN FOR
MULTIPLE NPL SITES MONITORING WELL DECOMMISSIONING**

**NEW YORK STATE DEPT. OF ENVIRONMENTAL CONSERVATION
DIVISION OF HAZARDOUS WASTE REMEDIATION**

AUGUST 1994
REVISED NOVEMBER 1994
REVISED MARCH 1995

Site Health and Safety Officer

Project Manager

Corporate Health & Safety Manager

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EXAMPLE

We, the undersigned, being employed by Consultant, have read in full and understand this Health and Safety Plan:

_____ Signature	_____ Print	_____ Date
_____ Signature	_____ Print	_____ Date
_____ Signature	_____ Print	_____ Date
_____ Signature	_____ Print	_____ Date
_____ Signature	_____ Print	_____ Date
_____ Signature	_____ Print	_____ Date
_____ Signature	_____ Print	_____ Date
_____ Signature	_____ Print	_____ Date
_____ Signature	_____ Print	_____ Date
_____ Signature	_____ Print	_____ Date
_____ Signature	_____ Print	_____ Date

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**HEALTH AND SAFETY PLAN
FOR
MULTIPLE NPL SITES MONITORING WELL DECOMMISSIONING**

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1.0 INTRODUCTION

1.1 GENERAL

In accordance with Consultant corporate policies and OSHA regulations, this Health and Safety Plan (HASP) describes specific health and safety practices and procedures to be used during Monitoring Well Decommissioning activities at the _____ Site, located in _____, New York. The HASP covers Consultant employees and activities, and is not intended to cover the activities of other employers on the site. This general Health and Safety Plan will be modified for each monitoring well-decommissioning assignment with site-specific data including site-specific contaminant and emergency response information, identification of hazards associated with the individual contaminants or categories of contaminants known to be present at the site, a hospital route, and identification of task-specific personal protective equipment (PPE). Consultant accepts no responsibility for the Health and Safety of subcontractor personnel. This HASP presents information on known site health and safety hazards and includes the equipment, materials and procedures that will be used to eliminate or control these hazards and is based on an assessment of potential health and safety hazards at the site using available historical information. Environmental monitoring will be performed during the course of field activities to provide real-time data for an on-going assessment of potential physical and chemical hazards. Personal detector tubes will be utilized in conjunction with an HNu photoionization detector to determine the extent of exposure to chemical hazards.

All Consultant personnel involved with site inspection, environmental sampling, and other monitoring well decommissioning activities will be required to comply with this Health and Safety Plan. Tasks on this site will be completed using methods that meet the requirements set forth in the OSHA Health and Safety regulations contained in 29 CFR 1910 and 1926. Construction subcontractor(s) conducting drilling and excavating operations are required to provide their own Health and Safety Plans.

1.2 ORGANIZATION

The Consultant Project Manager, the Health and Safety Officer and the Site Health and Safety Coordinator (or his designee) identified below will determine and enforce compliance.

- **PROJECT MANAGER**

Name:
Telephone: Office:
 Home:

- **CORPORATE HEALTH AND SAFETY MANAGER:**

Name:
Telephone: Office:
 Home:

- **SITE HEALTH AND SAFETY OFFICER**

Name:
Telephone: Office:
 Home:

- **SITE HEALTH AND SAFETY COORDINATOR**

Name:
Telephone: Office:
 Home:

The following roles have been identified for consultant project personnel:

Project Manager - The Project Manager has full responsibility for implementing and executing an effective program of employee protection and accident prevention. He may delegate authority to expedite and facilitate any application of the program.

Health and Safety Manager - The Health and Safety Manager serves as the administrator of the corporation's health and safety program. He is responsible for ensuring that consultant field personnel are properly trained, that they have obtained medical clearance to wear respiratory protection (per 29 CFR Part 1910.134(b)(10)), and that they are properly trained in the selection, use and maintenance of personal protective equipment, including qualitative respirator fit testing.

The Health and Safety Manager will also serve as scientific advisor for the duration of the project, providing guidance on data interpretation and the determination of appropriate levels of worker protection.

Site Health and Safety Officer - The Site Health and Safety Officer is knowledgeable in safety and worker protection techniques as they relate to the project. Responsibilities include the development of the specific provisions of this HASP, including the level of personnel protection to be employed, identification of emergency procedures, and personnel/equipment decontamination procedures. This individual will provide technical assistance to project management on problems relating to industrial hygiene and work site safety.

Any health and safety briefings required during the course of the project will be conducted by the Site Health and Safety Officer. Examples of briefings might include accident prevention, respirator refresher courses or current issues. The frequency of safety briefings will be based upon the potential hazards specific to the designated work tasks and any new information relative to such hazards which are discovered during the project.

Site Health and Safety Coordinator - Consultant's Site Health and Safety Coordinator or his/her designee will be responsible for enforcement of this HASP for consultant employees at the site and for monitoring the personal exposures of employees to hazardous substances contained in air, soil or water. This will consist of spot checking workplace air sampling performed by the Subcontractor such as organic vapor monitoring and the documentation of such data. Consultant's Site Health and Safety Coordinator or his/her designee will communicate directly with consultant's Site Health and Safety Officer on a regular basis to advise him/her of monitoring results and any unexpected conditions found at the site. As data are received and evaluated, the Site Health and Safety Officer will adapt this Health and Safety Plan to fit the current consultant employee protection needs at the site. All affected consultant employees and the Subcontractor's designated Site Health and Safety Officer will be informed of the air sampling results.

When unsafe work conditions are identified, the Site Health and Safety Coordinator or his/her designee is authorized to order consultant personnel to stop work. Resolution of all on-site health and safety problems will be coordinated through the Project Manager with assistance from the Health and Safety Manager and Site Health and Safety Officer as well as the Subcontractor's designated Health and Safety personnel.

2.0 HAZARD EVALUATION

2.1 SUMMARY OF PROJECTED RISKS

Due to the variety of potential contaminants at the site, the possibility exists that workers will be exposed to hazardous substances during field activities (see Table 2-1). The principal points of exposure would be through direct contact with contaminated fill/soils and groundwater, through the inhalation of contaminated particles or vapors. In addition, the use of drill rigs and backhoes on-site will present conditions for potential physical injury to workers. Further, since work will be performed during summer/winter time periods, the potential exists for heat/cold stress to impact workers especially those wearing protective equipment and clothing. The specific tasks involved in well decommissioning have been delineated in the July 1994 Work Plan for Multiple NPL Sites Monitoring Well Decommissioning, and in the February 1995 NPL Site Monitoring Well Decommissioning Procedures prepared by Consultant.

Although no work can be considered completely risk-free, logical and reasonable precautions will be implemented to provide an adequate level of protection for workers. The integration of medical evaluations, worker training relative to chemical hazards, safe work practices, proper personal protection, environmental monitoring, work zones and site control, appropriate decontamination procedures and contingency planning into the project approach will minimize the chance of unnecessary exposures and physical injuries.

2.2 PHYSICAL HAZARDS

Well decommissioning and sampling activities at the _____ Site may present the following physical hazards:

- The potential for physical injury during heavy construction equipment use, such as drill rigs and backhoes.
- The potential for heat/cold stress to employees during the summer/winter months (see Section 8.0).
- The potential for slip-and-fall injuries due to rough, uneven terrain.

- The potential for injury due to fire/explosion if methane gas is released during drilling operations and/or excavations (see Sections 5.0 and 11.0).

2.3 BIOLOGICAL HAZARDS

■ Poison Ivy (Rhus Radicans)

Poison ivy may be found at the site. It is highly recommended that all personnel entering into an area with poison wear a minimum of a paper Tyvek to avoid skin contact.

Contact with poisonous plants:

Characteristic Reactions:

The majority of skin reactions following contact with offending plants are allergic in nature and characterized by:

- general symptoms of headache and fever
- itching
- redness
- a rash

Some of the most common and most severe allergic reactions result from contact with plants of the poison ivy group, including poison oak and poison sumac. Such plants produce severe rash characterized by redness, blisters, swelling, and intense burning and itching. The victim may develop a high fever and feel very ill. Ordinarily, the rash begins within a few hours after exposure, but may be delayed 24 to 48 hours.

Distinguishing Features of Poison Ivy Group Plants:

The most distinctive features of poison ivy and poison oak are their leaves, which are composed of three leaflets each. Both plants have greenish-white flowers and berries that grow in clusters.

First Aid:

- a. Remove contaminated clothing; wash all exposed areas thoroughly with soap and water, followed by rubbing alcohol.
- b. Apply calamine or other soothing lotion if rash is mild.
- c. Seek medical advice if a severe reaction occurs, or if there is a known history of previous sensitivity.

■ Ticks

Heavily vegetated areas of a site may have ticks. It is highly recommended that all personnel walking through such areas wear a minimum of a paper Tyvek and latex boot covers. The ticks will stand out against the light colors. A tick repellent or insect repellent containing DEET is also suggested.

Ticks can transmit several diseases, including Rocky Mountain spotted fever, a disease that occurs in the eastern portion of the United States as well as the western portion, and Lyme disease. Ticks adhere tenaciously to the skin or scalp. There is some evidence that the longer an infected tick remains attached, the greater is the chance that it will transmit disease.

First Aid:

- a. Cover the tick with heavy oil (mineral, salad, or machine) to close its breathing pores. The tick may disengage at once; if not, allow oil to remain in place for a half hour. Carefully (slowly and gently) remove the tick with tweezers, taking care that all parts are removed.
- b. With soap and water, thoroughly, but gently, scrub the area from which the tick has been removed, because disease germs may be present on the skin; also wipe the bite area with an antiseptic. Although use of tweezers for the removal of the tick and application of heat to the tick's body often have been attempted, these methods may leave tick parts in the wound or may injure the skin.
- c. If you have been bitten, place the tick in a jar labeled with the date, location of the bite, and the location acquired. If any symptom appears, such as an expanding red rash, contact a physician immediately.

■ Lyme Disease

Lyme disease may cause a number of medical conditions, including arthritis, that can be treated if you recognize the symptoms early and see your doctor. Early signs may include a flu-like illness, an expanding skin rash, and joint pain. If left untreated, Lyme disease can cause serious nerve and heart problems as well as a disabling type of arthritis.

You are more likely to spot early signs of Lyme disease rather than see the tick or its bite. This is because the tick is so small (about the size of the head of a common pin or a period on this page and a little larger after they fill with blood), you may miss it or signs of a bite. However, it is also easy to miss the early symptoms of Lyme disease.

In its early stage, Lyme disease may be a mild illness with symptoms like the flu. It can include a stiff neck, chills, fever, sore throat, headache, fatigue, and joint

pain. But this flu-like illness is usually out of season, commonly happening between May and October when ticks bite.

Most people develop a large, expanding skin rash around the area of the bite. Some people may get more than one rash. The rash may feel hot to the touch and may be painful. Rashes vary in size, shape, and color, but often look like a red ring with a clear center. The outer edges expand in size. It's easy to miss the rash and the connection between the rash and the tick bite. The rash develops from three days to as long as a month after the tick bite. Almost one-third of those with Lyme disease never get the rash.

Joint or muscle pain may be another early sign of Lyme disease. These aches and pains may be easy to confuse with the pain that comes from other types of arthritis. However, unlike many other types of arthritis, this pain seems to move or travel from joint to joint.

In later stages, Lyme disease may be confused with other medical problems. These problems can develop months to years after the first tick bite.

Early treatment of Lyme disease symptoms with antibiotics can prevent the more serious medical problems of later stages. If you suspect that you have symptoms of Lyme disease, contact your doctor.

Lyme disease can cause problems with the nervous system that look like diseases. These include symptoms of stiff neck, severe headache, and fatigue usually linked to meningitis. They may also include pain and drooping of the muscles on the face, called Bell's Palsy. Lyme disease can also mimic symptoms of multiple sclerosis or other types of paralysis.

Lyme disease can also cause serious but reversible heart problems, such as irregular heart beat. Finally, Lyme disease can result in a disabling, chronic type of arthritis that most often affects the knees. Treatment is more difficult and less successful in later stages. Researchers think these more serious problems may be linked to how the body's defense or immune system responds to the infection.

2.4 NOISE

Hearing protection is required for workers operating or working near heavy equipment where the noise level is greater than 85 dBA (TWA). The SSHO will determine the need for and appropriate testing procedures; i.e., sound level meter and/or dosimeter for noise measurement.

2.5 CHEMICAL HAZARDS

This section presents an example of a chemical Hazards Summary for a site characterized by trichloroethylene (TCE) contamination. Similar information will need to be provided on a site-by-site basis for all chemicals that may be encountered during the well decommissioning work.

Table 2-1 presents the potential chemicals that may be encountered during well decommissioning work at the _____ Site. The information presented in Table 2-1 is based on the available analytical data for the wells to be decommissioned. A summary of the exposure hazards for these chemicals is presented below.

- **Trichloroethylene (TCE)** is a common industrial solvent used primarily in dry cleaning and metal degreasing. Trichloroethylene exposure at vapor levels of 200 ppm has been associated with mild behavioral and psychomotor effects, including vertigo, fatigue, and headache. TCE is a suspected human carcinogen. The principal routes of potential personnel exposure to TCE are through inhalation of volatilized TCE and direct skin contact.

3.0 MEDICAL SURVEILLANCE

Medical monitoring, including initial employment, annual and employment termination examinations will be provided to Consultant employees whose work may result in potential chemical exposure or present unusual physical demands. Medical evaluations will be performed by an occupational physician designated by Consultant. The medical evaluations will be conducted according to the Consultant Medical Monitoring Program and include an evaluation of the workers' ability to use respirator protective equipment (as per 29 CFR 1910). The examination will include:

- Occupational history;
- Medical history;
- Medical review;
- Medical surveillance examination with emphasis on organ systems potentially affected by toxic substances identified in the work environment;
- Medical certification of physical requirements (sight, hearing, musculoskeletal, cardiovascular) for safe job performance; and
- Laboratory testing to include a complete blood count, white cell differential count, serum multiphasic screening and urinalysis.

The purposes of the medical evaluation are to: (1) determine fitness for duty on hazardous waste sites (such an evaluation is based upon the employee's occupational and medical history, a comprehensive physical examination and an evaluation of the ability to work while wearing protective equipment); and (2) establish baseline medical data.

Supplemental examinations may be performed whenever there is an actual or suspected excessive exposure to chemical contaminants or upon experience of exposure symptoms, or following injuries or temperature stresses.

In conformance with OSHA regulations, Consultant will maintain and preserve medical records for a period of 30 years following termination of employment. Employees have access to the results of medical testing and to full medical records and analyses.

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EXAMPLE

<p>TABLE 2-1</p> <p>HEALTH AND SAFETY PLAN FOR _____ SITE</p> <p>MONITORING WELL DECOMMISSIONING</p> <p>POTENTIAL CONTAMINANTS AND CONCENTRATIONS</p>					
Chemical	Affected Media	Maximum Concentration	Location of Max.	TWA ⁽¹⁾	
				mg/m ³	ppm
Trichloroethylene (TCE)	Groundwater	1,500 ug/l	MW-1	269	50
<p><i>Note (1): Time-weighted average per 1994 ACGIH Threshold Limit Values.</i></p>					

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4.0 EMPLOYEE TRAINING PROGRAM

All employees who may be exposed to hazardous substances, health hazards, or safety hazards shall be adequately trained prior to engaging in any on-site work activities. At a minimum, such training shall include an initial 40-hour Hazardous Waste Site Worker Protection Course, an 8-hour Annual Refresher Course subsequent to the initial 40-hour training, and 3 days of actual field experience under the direct supervision of a trained, experienced supervisor (i.e., the Health and Safety Coordinator or his/her designee). This training shall be conducted by a qualified instructor and shall be specifically designed to meet the requirements of OSHA Standard 29 CFR 1910.120(e)(2). At a minimum, the initial 40-hour training course will include the following:

TOPICS

- OSHA/SARA/EPA/RCRA/HCS Requirements
- Decontamination of Personnel & Equipment
- Fire, Explosion & Accident Prevention
- Respiratory Protection Selection & Use
- Preparation of Health & Safety Plans
- Emergency Preparedness & Escape
- Protective Clothing Use & Selection
- Air Monitoring & Surveillance
- Work Practices to Minimize Risk
- Waste Site Safety
- Hazard Recognition
- Medical Surveillance
- Cold & Heat Stress
- Site Entry & Set-Up
- Permissible Exposure Limits
- Site Control & Work Zones
- Chemical & Physical Hazards
- Confined Space Entry

WORKSHOPS/EXERCISES

- Self-Contained Breathing Apparatus
- Air Monitoring Equipment Workshop
- Air Purifying Respirator Workshop
- Decontamination
- Qualitative/Quantitative Fit Test
- Level A/B Field Exercise
- Level B/C Field Exercise
- Air Tank Refilling Workshop

Records and certifications received from the course instructor documenting each employee's successful completion of the training identified above will be maintained on file in Consultant's

corporate headquarters offices. Subcontractor(s) will be required to provide similar documentation of training for all their personnel who will be involved in on-site work activities.

Any employee who has not received adequate training and has been so certified shall be prohibited from engaging in on-site work activities that may involve exposure to hazardous substances, health hazards or safety hazards. All individuals functioning in a supervisory capacity shall have had a minimum of 8 hours of Hazardous Waste Site Supervisor Training.

Prior to commencing work at a hazardous waste site, all Consultant employees will participate in an initial health and safety briefing conducted by the Site Health and Safety Officer to discuss site-specific hazards, PPE requirements, and emergency response procedures. In addition, periodic health and safety briefings will be conducted by Consultant's Site Health and Safety Officer for Consultant employees on an as-needed basis. Problems relative to respiratory protection, inclement weather, heat/cold stress or the interpretation of newly-available environmental monitoring data are examples of topics which might be covered during these briefings.

5.0 SAFE WORK PRACTICES

All Consultant employees shall obey the following safety rules during on-site work activities conducted within the exclusion and support zones:

General:

- Eating, drinking, chewing gum or tobacco, smoking, or any practice which increases the probability of hand-to-mouth transfer of contaminated material is strictly prohibited;
- The hands and face must be thoroughly washed upon leaving the work area and prior to engaging in any activity indicated above.
- Any required respiratory protective equipment and clothing must be worn by all personnel going on-site. Excessive facial hair (i.e., beards, long mustaches or sideburns), which interferes with the satisfactory respirator-to-face seal is prohibited;
- Contact with surfaces/materials either suspected or known to be contaminated will be avoided to minimize the potential for transfer to personnel, crosscontamination and need for decontamination;
- Medicine and alcohol can potentiate the effects of exposure to toxic chemicals. Due to possible contraindications, use of prescribed drugs should be reviewed with the consultant occupational physician. Alcoholic beverage and illegal drug intake are strictly forbidden during site work activities;
- All personnel shall be familiar with standard operating safety procedures and additional instructions contained in this Health and Safety Plan;
- On-site personnel shall use the "buddy" system. No one may work alone, i.e., out of earshot or visual contact with other workers in the exclusion zone;
- Personnel and equipment in the contaminated area shall be minimized, consistent with effective site operations;
- All employees have the obligation to correct or report unsafe work conditions;
- Use of contact lenses on-site will not be permitted. Spectacle kits for insertion into full-face respirators will be provided for Consultant employees, as required.

The recommended general safety practices for working around the drilling Contractor's and/or backhoe operator's equipment (i.e. drill rigs and backhoes) are as follows:

Contractor's Duties:

- The drilling Contractor is responsible for the condition of his equipment and its safe operation on the site. Consultant personnel are responsible for their own safety when working around this equipment. The inspector will include a check for obvious structural damage, loose nuts and bolts, loose or missing guards, cable guides or protective covers, fluid leaks, damaged hoses, cables, pressure gauges or pressure relief valves, and damaged drilling tools and equipment. The equipment should also have a fire extinguisher. The project manager will notify all subcontractors that they are expected to conduct daily inspections of their equipment and report any potential problems to the Consultant Site Health and Safety Coordinator or his/her designee. If the condition of the equipment is considered to be unsafe based on the Contractor's inspection, and/or the Consultant Site Health and Safety Coordinator's inspection, have the Contractor make the necessary repairs prior to beginning construction. If the Contractor refuses to fix the equipment or is not operating the equipment safely, the job site will be closed down and the Project Manager contacted for additional instructions.
- Drilling/excavation will not be initiated without first clearing underground services such as; gas, water, telephone, sewer, hydrogen, steam, and cable T.V.
- Drill rigs and backhoes should not be operated within 20 feet of overhead wires. This distance may be increased if windy conditions are anticipated. The site should also be clear to ensure the project staff can move around the heavy machinery safely.
- Slippage is one of the most common causes of accidents around drill rigs and test pits. Drainage should be provided to divert mud and water away from the construction site.
- The Contractor should keep the construction site tidy. This will prevent personnel from tripping and will allow for fast emergency exit from the site.
- A drill rig must not be moved from site to site with the drill mast in the raised position.
- Proper lighting will be provided if drilling/excavating at night.
- Drilling/excavation will be discontinued during an electrical storm.

Consultant's Duties:

- Hard hats and safety boots must be worn at all times in the vicinity of the drill rig and/or backhoe. Hearing protection is also recommended. Safety glasses are necessary.
- The presence of combustible gases should be checked before igniting any open flame (e.g., during welding).
- Consultant personnel shall stand upwind of any drilling/excavating operation when not immediately involved in sampling/logging activities.
- Consultant personnel will not enter trenches unless the trenches are shored or back sloped according to OSHA 29CFR 1926.652.
- Consultant personnel will not approach the edge of an unsecured trench closer than 2 feet.

6.0 PERSONAL PROTECTIVE EQUIPMENT

This section presents an example of personal protective equipment requirements for an unspecified site. Similar information will need to be provided on a site-by-site basis for all tasks that will be undertaken as part of the well decommissioning work.

6.1 PROTECTION LEVELS

Personnel must wear protective equipment when work activities involve known or suspected atmospheric contamination; when vapors, gases, or particulates may be generated; or when direct contact with dermal-active substances may occur. Full-face respirators will be used to protect the lungs, the gastrointestinal tract, and the eyes against air toxicants. Chemical-resistant clothing will be used to protect the skin from contact with skin-destructive and skin-absorbable chemicals. All personal protective equipment shall be maintained and stored as specified by the manufacturers. Good personal hygiene and safe work practices, as identified in Section 5.0, are also necessary to limit or prevent the ingestion of potentially harmful substances.

Based upon current information regarding both the contaminants suspected to be present at the _____ Site and the various tasks that are included in the well decommissioning program, the minimum required levels of protection shall be as identified in Table 6-1. The Site Health and Safety office will monitor the use of PPE during extreme temperature conditions.

EXAMPLE**TABLE 6-1****HEALTH AND SAFETY PLAN FOR _____ SITE
MONITORING WELL DECOMMISSIONING****REQUIRED LEVELS OF PROTECTION**

Activity	Respiratory*	Clothing⁽²⁾	Gloves	Boots	Other Modifications⁽³⁾
Field Reconnaissance	D/C	T	—	L	Safety Glasses
Well Decommissioning Inspection	D/C	T	L/N	L	Hard Hat, Safety Glasses

Notes:

- (1) T = Tyvek; L/N = Latex Inner Glove, Nitrile Outer Glove; L = Latex Outer Boot
- (2) Tyvek uniforms will be worn when Level C conditions are present (mandatory) or when Level D conditions are present (optional).
- (3) At the discretion of the Site Health and Safety Officer, respirators will be donned whenever potentially contaminated airborne particulate (i.e., dust) are generated in significant amounts in the breathing zone.
 - * Respiratory protection shall correspond to guidelines presented in Section 7.2. The Level C requirement is an air-purifying cartridge respirator equipped with Organic Compound/Acid Gases/Dust cartridges.

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7.0 ENVIRONMENTAL MONITORING

7.1 GENERAL APPROACH

7.1.1 On-Site Monitoring

Modifications to the level of protection established for consultant employees for each task will be based upon measurements of the contaminants present in the work environment. Tasks and activities proposed for each site along with the estimated potential of exposure to contaminants known to be present in the groundwater and soil at each site will be used to determine the minimum required levels of personal protection and will be described in the Site-Specific Health and Safety Plans. Based upon the existing data base, a release of organic vapors is anticipated during both intrusive investigations and sampling activities. Ambient breathing zone concentrations may, at times, exceed the permissible exposure limits (PEL) established by OSHA for the individual compounds (see Table ____). Respiratory and dermal protection may be modified (upgraded or downgraded) based upon real-time field monitoring data.

Contaminated soil and groundwater are most likely to be encountered during over drilling, excavation, sampling and other monitoring well decommissioning activities. The air monitoring program to be implemented by Consultant will monitor volatile contaminants as well as the presence of respirable dust when the soil is physically disturbed by drilling equipment and backhoes. A combustible gas meter and total organic vapor analyzer (HNU) shall be utilized by Consultant personnel to verify field conditions during drilling/excavating operations. Real time monitoring will be performed by consultant personnel on a periodic basis during other on-site activities such as sample collection and reconnaissance surveys. Drager detector-type tubes will be used to measure chemical specific concentrations in air. The level of respiratory and dermal protection in use will be based upon an evaluation of general and chemical specific air monitoring data.

Monitoring instruments will be protected from surface contamination during use to allow for easy decontamination. When not in use, the monitoring instruments will be placed on plastic sheeting to avoid surface contact. Additional monitoring instruments may be required if the situations or conditions change.

During drilling/excavating and soil examination operations, the work area surrounding the borehole will be monitored at regular intervals using an HNu photoionization detector, (or similar organic vapor monitoring device) as well as an explosimeter and a particulate meter. Observed values will then be recorded and maintained as part of the permanent field record. Breathing zone monitoring with an HNu will be performed at two-hour intervals during drilling and continuously during test pit work. The actual frequency of breathing zone monitoring will be dependent primarily upon values generated by screening the cuttings and the proximity of the worker's breathing zones to the source of contamination. Contaminant values which are in excess of established action levels appropriate for the prescribed level of protection will be immediately addressed.

Any split-spoon samples which are collected will be surveyed with the HNu, or similar equipment as each sample is retrieved. These values will be recorded with the respective sample number and will assist in the determination of the adequacy of employee protective equipment. In addition, to minimize dermal contact with potentially contaminated fill/soils, long-handled spoons and knives shall be used during split-spoon sampling and examination of the soil-core sample by the hydrogeologist.

7.2 MONITORING ACTION LEVELS

7.2.1 On-Site Levels

The HNu or other appropriate instrument(s) will be used by either Consultant personnel or the Contractor to monitor organic vapor concentrations as specified in this plan and in the Contractor's Health and Safety Plan. Methane gas will be monitored with the "combustible gas" option on the explosimeter/tritector or other appropriate instrument(s) in accordance with the drilling Contractor's Health and Safety Plan. In addition, fugitive dust/particulate concentrations will be monitored using a real-time particulate monitor, as specified in this plan and in the Contractor's Health and Safety Plan. Readings obtained in the breathing zone may be interpreted (with regard to other site conditions) as follows for on-site Consultant personnel:

- Total atmospheric concentrations of unidentified vapors or gases ranging from 0 to background on the Hnu - Continue Operations Under Level D (see Attachment 1).

- Total atmospheric concentrations of unidentified vapors or gases yielding sustained readings above background to 5 ppm on the Hnu (vapors not suspected of containing high levels of chemicals toxic to the skin) - Continue Operations Under Level C (see Attachment 1).
- Total atmospheric concentrations of unidentified vapors or gases yielding sustained readings of 5 to 50 ppm above background on the Hnu - continue operations under Level B (see Attachment 1), re-evaluate and alter (if possible) Work Plan to achieve lower vapor concentrations.
- Total atmospheric concentrations of unidentified vapors or gases above 50 ppm on the Hnu - discontinue engineering operations and exit the work zone immediately.

The explosimeter will be used to monitor levels of both combustible gases and oxygen during site activities. Action levels based on the instrument readings shall be as follows:

- Less than 10% LEL - Continue engineering operations with caution;
- 10-25% LEL - Continuous monitoring with extreme caution, determine source/cause of elevated reading;
- Greater than 25% LEL - Explosion hazard, evaluate source and leave the Work Zone;
- Less than 19.5% oxygen - leave Work Zone immediately;
- 19.5-25% oxygen - Continue engineering operations with caution; and
- Greater than 25% oxygen - Fire hazard potential, leave Work Zone immediately.

The particulate monitor will be used to monitor respirable dust concentrations during all intrusive activities. Action levels based on the instrument readings shall be as follows:

- Less than 150 ug/m³ - Continue field operations
- Greater than 150 ug/m³ - Don dust/particulate mask or equivalent. Initiate engineering controls (viz. wetting of excavated soils or tools at discretion of Site Health and Safety Officer).

Readings with the explosimeter, particulate monitor and organic vapor analyzer will be recorded and documented in the Health and Safety logbook. All instruments will be maintained

according to the manufacturer's specifications and calibrated before use and the procedure will be documented in the Health and Safety logbook.

7.2.2 Community Air Monitoring

Real-time air monitoring for volatile compounds and particulate levels will be performed at the perimeter of the work area. Volatile compounds will be measured using an HNu or similar device. Drager detector-type tubes which are compound-specific will be used to monitor the perimeter of the work area. For purposes of this monitoring activity the perimeter of the work areas are determined to be 50 feet from the outside edge of the excavation or boring. Air monitoring will occur as follows:

- Volatile organic compounds will be monitored at the downwind perimeter of the work area daily at 2-hour intervals. If total organic vapor levels exceed 5 ppm above background, work activities must be halted and monitoring continued under the provisions of a Vapor Emission Response Plan. Readings will be recorded and be available for State (DEC and DOH) personnel to review.
- Particulates should be continuously monitored upwind, downwind, and within the work area at temporary particulate monitoring stations. If the downwind particulate level is 150 ug/m³ greater than the upwind particulate level, then dust suppression techniques must be employed. Readings will be recorded and be available for State (DEC and DOH) personnel to review.

7.2.2.1 Vapor Emission Response Plan

If the ambient air concentration of organic vapors exceeds 5 ppm above background at the perimeter of the work area, activities will be halted and monitoring continued. The exclusion zone shall be extended to include the area in which the organic vapors exceed 5 ppm above the background. If the organic vapor level decreases below 5 ppm above background, work activities can resume but more frequent intervals of monitoring, as directed by the Safety Officer, must be conducted. If the organic vapor levels are greater than 5 ppm over background, but less than 25 ppm over background at the perimeter of the work area, activities can resume, provided:

- the organic vapor level 200 feet downwind of the work area or half the distance to the nearest residential or commercial structure, whichever is less, is below 5 ppm over background, and
- more frequent intervals of monitoring, as directed by the Safety Officer, are conducted.

If the organic vapor level is above 25 ppm at the perimeter of the work area, activities must be shut down. When work shutdown occurs, downwind air monitoring as directed by the Safety officer will be implemented to ensure that vapor emission does not impact the nearest residential or commercial structure at levels exceeding those specified in the Major Vapor Emission section.

7.2.2.2 Major Vapor Emission

If any organic levels greater than 5 ppm over background are identified 200 feet downwind from the work area or half the distance to the nearest residential or commercial property, whichever is less, all work activities must be halted.

If, following the cessation of the work activities or as the result of an emergency, organic levels persist for more than 30 minutes above 5 ppm above background 200 feet downwind or half the distance to the nearest residential or commercial property from the work area, then the air quality must be monitored within 20 feet of the perimeter of the nearest residential or commercial structure (20-Foot Zone).

If efforts to abate the emission source are unsuccessful and if any of the following levels persist for more than 30 minutes in the 20-Foot Zone, then the Major Vapor Emission Response Plan shall automatically be placed into effect if organic vapor levels are approaching 5 ppm above background. However, the Major Vapor Emission Response Plan shall be immediately placed into effect if organic vapor levels are greater than 10 ppm above background.

7.2.2.3 Major Vapor Emission Response Plan

Upon activation, the following activities will be undertaken:

1. All Emergency Response Contacts as listed in the Health and Safety Plan of the Work Plan will go into effect.
2. The local police authorities will immediately be contacted by the Safety Officer and advised of the situation.
3. Frequent air monitoring will be conducted at 30-minute intervals within the 20-Foot Zone. If two successive readings below action levels are measured, air monitoring may be halted or modified by the Safety Officer.

8.0 HEAT/COLD STRESS MONITORING

Since some of the work activities at the Monitoring Well Decommissioning Sites will be scheduled for both the summer and winter months, measures will be taken to minimize heat/cold stress to Consultant employees. Consultant's Site Health and Safety Coordinator or his/her designee will be responsible for monitoring Consultant employees for symptoms of heat/cold stress.

8.1 HEAT STRESS MONITORING

Personal protective equipment may place an employee at risk of developing heat stress, probably one of the most common (and potentially serious) illnesses encountered at hazardous waste disposal sites. The potential for heat stress is dependent on a number of factors, including environmental conditions, clothing, workload, physical conditioning and age. Personal protective equipment may severely reduce the body's normal ability to maintain equilibrium (via evaporation, convection and radiation), and by its bulk and weight increases energy expenditure.

The signs and symptoms of heat stress are as follows:

- Heat rash may result from continuous exposure to heat or humid air.
- Heat cramps are caused by heavy sweating with inadequate electrolyte replacement. Signs and symptoms include:
 - muscle spasms
 - pain in the hands, feet and abdomen
- Heat exhaustion occurs from increased stress on various body organs including inadequate blood circulation due to cardiovascular insufficiency or dehydration. Signs and symptoms include:
 - pale, cool, moist skin
 - heavy sweating
 - dizziness
 - nausea
 - fainting
- Heat stroke is the most serious form of heat stress. Temperature regulation fails and the body temperature rises to critical levels. Immediate action must be taken

to cool the body before serious injury and death occur. Competent medical help must be obtained. Signs and symptoms are:

- red, hot, usually dry skin
- lack of or reduced perspiration
- nausea
- dizziness and confusion
- strong, rapid pulse
- coma

The monitoring of personnel wearing protective clothing should commence when the ambient temperature is 70 degrees Fahrenheit or above. For monitoring the body's recuperative ability to excess heat, one or more of the following techniques should be used as a screening mechanism.

- Heart rate may be measured by the radial pulse for 30 seconds as early as possible in the resting period. The rate at the beginning of the rest period should not exceed 110 beats per minute. If the rate is higher, the next work period should be shortened by 10 minutes (or 33%), while the length of the rest period stays the same. If the pulse rate is 100 beats per minute at the beginning of the next rest period, the following work cycle should be further shortened by 33%.
- Body temperature may be measured orally with a clinical thermometer as early as possible in the resting period. Oral temperature at the beginning of the rest period should not exceed 99.6 degrees Fahrenheit. If it does, the next work period should be shortened by 10 minutes (or 33%), while the length of the rest period stays the same. However, if the oral temperature exceeds 99.6 degrees Fahrenheit at the beginning of the next period, the following work cycle may be further shortened by 33%. Oral temperature should be measured again at the end of the rest period to make sure that it has dropped below 99.6 degrees Fahrenheit. No consultant employee will be permitted to continue wearing semipermeable or impermeable garments when his/her oral temperature exceeds 100.6° Fahrenheit.

8.1 COLD STRESS MONITORING

Exposure to cold conditions may result in frostbite or hypothermia, each of which progresses in stages as shown below.

- **Frostbite** occurs when body tissue (usually on the extremities) begins to freeze. The three states of frostbite are:
 - 1) **Frostnip**- This is the first stage of the freezing process. It is characterized by a whitened area of skin, along with a slight burning or painful sensation.

Treatment consists of removing the victim from the cold conditions, removal of boots and gloves, soaking the injured part in warm water (102-108°F) and drinking a warm beverage.

- 2) **Superficial Frostbite** - This is the second stage of the freezing process. It is characterized by a whitish-grey area of tissue which will be firm to the touch but will yield little pain. Treatment is identical to that for Frostnip.
 - 3) **Deep Frostbite** - In this final stage of the freezing process the affected tissue will be cold, numb and hard, and will yield little to no pain. Treatment is identical to that for Frostnip.
- **Hypothermia** occurs when the body loses heat faster than it can produce it. The stages of hypothermia (which may not be clearly defined or visible at first) are the following:
 - 1) Shivering
 - 2) Apathy (a change to a disagreeable mood)
 - 3) Unconsciousness
 - 4) Bodily freezing
 - 5) Death (if untreated)

Treatment of hypothermia is given below:

- Remove the victim from the cold environment and remove wet or frozen clothing. (Do this carefully as frostbite may have started.)
- Perform active re-warming with hot liquids for drinking (Note: do not give the victim any liquid containing alcohol or caffeine in this case) and a warm water bath (102-108°F)
- Perform passive re-warming with a blanket or jacket wrapped around the victim.

In any potential cold stress situation, it is the responsibility of the Site Health and Safety Officer to encourage the following:

- Workers should dress warmly, with more layers of thin clothing as opposed to one thick layer.
- Personnel should remain active and keep moving.
- Personnel should be allowed to take shelter in a heated area, as necessary.
- Personnel should drink warm liquids (no caffeine or alcohol if frostbite has set in).

9.0 WORK ZONES AND SITE CONTROL

Work zones around the areas designated for drilling, test pit excavation, sample collection, and monitoring well installation will be established by the Contractor on a daily basis and communicated to all employees and other site users by the Contractor's Site Health and Safety Officer. It shall be the Contractor's Site Health and Safety Officer's responsibility to ensure that all site workers are aware of the work zone boundaries and to enforce proper procedures in each area. The zones will include:

- **Exclusion Zone ("Hot Zone")** - the area where contaminated materials may be exposed, excavated or handled and all areas where contaminated equipment or personnel may travel. The zone will be delineated by flagging tape. All personnel entering the Exclusion Zone must wear the prescribed level of personal protective equipment identified in Section 7.0;
- **Contamination Reduction Zone** - the zone where decontamination of personnel and equipment takes place. Any potentially contaminated clothing, equipment and samples must remain in the Contamination Reduction Zone until decontaminated;
- **Support Zone** - the part of the site which is considered non-contaminated or "clean". Support equipment will be located in this zone, and personnel may wear normal work clothes within this zone.

During drilling operations, Consultant personnel will establish a second exclusion zone immediately upwind of the borehole. Split-spoons shall be brought into this zone to Consultant personnel by the Contractor(s). Sample collection and logging of soil-core samples will be completed in this zone.

Access of non-essential personnel to the Exclusion and Contamination Reduction Zones will be strictly controlled by the Contractor. Only personnel who are essential to the completion of the task will be allowed access to these areas and only if they are wearing the prescribed level of protection. Entrance of all personnel must be approved by the Contractor's Site Health and Safety Officer.

A log containing the names of workers and their level of protection will be maintained by the Contractor(s).

The zone boundaries may be changed by the Site Health and Safety Officer as environmental conditions warrant, and to respond to the necessary changes in work locations on-site.

10.0 DECONTAMINATION PROCEDURES

10.1 PERSONAL DECONTAMINATION FOR MPI EMPLOYEES

The degree of decontamination required is a function of both a particular task and the physical environment within which it takes place. The following decontamination procedure, although somewhat specific to the tasks described herein, will remain flexible, thereby allowing the decontamination crew to respond appropriately to the changing environmental conditions which may arise at the site. The procedure shall be followed by all Consultant personnel who are on the site.

- | | |
|---|---|
| Station 1: Equipment Drop | 1. Deposit Equipment used on-site (tools, containers, monitoring instruments, radios, clipboards, etc.) on plastic drop cloths. Segregation at the drop reduces the probability of cross contamination. |
| Station 2: Boots and Gloves Wash and Rinse | 2. Scrub outer boots and outer gloves with decon solution or detergent water. Rinse off using copious amounts of water. |
| Station 3: Tape, Outer Boot and Glove Removal | 3. Remove tape, outer boots and gloves. Deposit tape and gloves in container provided by Contractor. |
| Station 4: Canister or Mask Change | 4. If worker leaves exclusive zone to change canister (or mask), this is the last step in the decontamination procedure. Worker's canister is exchanged, new outer gloves and boot covers donned, and worker returns to duty. |
| Station 5: Outer Garment Removal | 5. Protective suit removed and deposited in separate container provided by Contractor(s). |
| Station 6: Face Piece, Hard Hat, Safety Goggles Removal | 6. Face piece or safety glasses removed (if used). Avoid touching face with fingers. Facepiece and/or safety glasses deposited on plastic sheet. Hard hat removed and placed on plastic sheet. |

Station 7: Inner Glove Removal

7. Inner gloves are the last personal protective equipment to be removed. Avoid touching the outside of the gloves with bare fingers. Dispose of these gloves in container provided by Contractor.

10.2 DECONTAMINATION FOR MEDICAL EMERGENCIES

In the event of a minor, non-life threatening injury, personnel should follow the decontamination procedures as defined, and then administer first-aid.

In the event of a major injury or other serious medical concern (i.e., heat stroke), immediate first-aid is to be administered and the victim transported to the hospital in lieu of further decontamination efforts unless exposure to a site contaminant would be considered "Immediately Dangerous to Life or Health."

10.3 DECONTAMINATION OF FIELD EQUIPMENT

Decontamination of heavy equipment will be conducted by the Contractor(s) in accordance with his approved Health and Safety Plan in the Contamination Reduction Zone. Heavy equipment and tools utilized during drilling/excavating and monitoring well decommissioning activities will be placed on a decontamination pad and cleaned with high-pressure water followed by steam. Decontamination water will be prevented from moving outside the decontamination pad and will be transferred to a holding tank. The Contractor(s) Health and Safety Officer will make daily inspections to determine that this procedure is being followed. All hazardous chemicals (eg., decon fluids) brought to the site will be properly labeled and their Material Safety Data Sheets will be maintained on-site in accordance with the requirements of 29 CFR 1910-1200.

Decontamination of all tools used for sample collection purposes will be conducted by Consultant personnel. Decontamination fluids will remain within the confines of the deco pad area. Spent fluids will be containerized and prepared for proper off-site disposal. Decontamination of all bailers, split-spoons, spatula knives, and other tools used for multi-media environmental sampling and examination shall be as follows:

- disassemble the equipment;
- water wash to remove all visible foreign matter;
- wash with detergent;

- rinse all parts with distilled-deionized water;
- allow to air dry; and
- wrap all parts in aluminum foil or polyethylene to prevent contamination of clean equipment.

11.0 FIRE PREVENTION AND PROTECTION

11.1 GENERAL APPROACH

Recommended practices and standards of the National Fire Protection Association (NFPA) and other applicable regulations will be followed in the development and application of Project Fire Protection Programs. When required by regulatory (DEC) authorities, the Contractor will prepare and submit a Fire Protection Plan for the approval of the contracting officers, authorized representative or other designated official. Essential considerations for the Fire Protection Plan will include:

- Proper site preparation and safe storage of combustible and flammable materials;
- Availability of coordination with private and public fire authorities;
- Adequate job-site fire protection and inspections for fire prevention; and
- Adequate indoctrination and training of employees.

11.2 EQUIPMENT AND REQUIREMENTS

- Fire extinguishers will be provided by the Contractor(s);
- Fire extinguishers will be inspected, serviced, and maintained in accordance with the manufacturer's instructions. As a minimum, all extinguishers shall be checked monthly and weighed semi-annually, and recharged if necessary; and
- Immediately after each use, fire extinguishers will be either recharged or replaced.

11.3 FLAMMABLE AND COMBUSTIBLE SUBSTANCES

- All storage, handling or use of flammable and combustible substances will be under the supervision of qualified persons; and
- All tanks, containers and pumping equipment, whether portable or stationary, which are used for the storage and handling of flammable and combustible liquids, will meet the recommendations of the National Fire Protection Association.
- If the LEL exceeds 10% for any compound, fans will be used to dissipate volatile/ combustible gases and to minimize the explosion hazard during drilling/excavation activities. In addition, % O₂/explosive gas monitoring will be conducted throughout the drilling/excavation operations.

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ATTACHMENT 1
PROTECTION ENSEMBLES

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ATTACHMENT 1
PROTECTION ENSEMBLES

Equipment designed to protect the body against contact with known or anticipated chemical hazards have been divided into four categories according to the degree of protection afforded:

- Level A: Should be selected when the highest level of respiratory, skin and eye protection is needed.
- Level B: Should be selected when the highest level of respiratory protection is needed, but a lesser level of skin protection is required; Level B protection is the minimum level recommended on initial site entries until the hazards have been further defined by on-site studies.
- Level C: Should be selected when the types of airborne substances are known, the concentrations have been measured and the criteria for using air-purifying respirators are met. In atmospheres where no airborne contaminants are present, Level C provides dermal protection only.
- Level D: Should not be worn on any site with respiratory or skin hazards. This is primarily a work uniform providing minimal protection.

The level of protection selected is based primarily on:

- Types and measured concentrations of the chemical substances in the ambient atmosphere and their associated toxicity; and
- Potential or measured exposure to substances in air, splashes of liquids or other indirect contact with material due to the task being performed.

In situations where the types of chemicals, concentrations, and possibilities of contact are not known, the appropriate level of protection must be selected based on professional experience and judgement until the hazards may be further characterized. The individual components of clothing and equipment must be assembled into a full protective ensemble to protect the worker from site-specific hazards, while at the same time minimizing hazards and drawbacks of the personal protective gear itself. Ensemble components based on the widely used USEPA Levels of Protection are detailed below for levels B, C, and D protection.

Level B Protection Ensemble

Recommended

- Pressure-demand, full-facepiece self-contained breathing apparatus (MSHA/NIOSH approved) or pressure-demand supplied-air respirator with escape SCBA;
- Saranex chemical-resistant clothing (overalls and long-sleeved jacket; hooded one- or two-piece chemical splash suit; disposable chemical-resistant one-piece suit); disposable chemical-resistant one-piece suit);
- Inner and outer chemical resistant gloves (silver shell);
- Chemical-resistant latex safety boots/shoes; and
- Hard hat.

Optional

- Coveralls.
- Disposable boot covers.
- Face shield.
- Long cotton underwear.

Meeting any one of the following criteria warrant the use of Level B protection:

The types and atmospheric concentrations of toxic substances have been identified and require the highest level of respiratory protection, but a lower level of skin and eye protection. These would be atmospheres:

- with concentrations Immediately Dangerous to Life and Health (IDLH)
- exceeding limits of protection afforded by a full-face air-purifying mask;
- containing substances for which air-purifying canisters do not exist or have low removal efficiency;
- containing substances requiring air-supplied equipment, but substances and/or concentrations do not represent a serious skin hazard;
- containing less than 19.5% oxygen; or

- with evidence of incompletely identified vapors or gases as indicated by direct reading organic vapor detection instrument, but those vapors and gases are not suspected of containing high levels of chemicals harmful to skin or capable of being absorbed through the intact skin.

Level B equipment provides a high level of protection to the respiratory tract, but a somewhat lower level of protection to skin. The chemical-resistant clothing required in Level B is available in a wide variety of styles, materials, construction detail and permeability. These factors all affect the degree of protection afforded. Therefore, a specialist should select the most effective, chemical-resistant clothing based on the known or anticipated hazards and task. Level B skin protection is selected by:

- Comparing the concentrations of identified substances in the air with skin toxicity data;
- Assessing the effect of the substance (at its measured air concentrations or splash potential) on the small area of the head and neck unprotected by chemical-resistant clothing.

Level C Protection Ensemble Recommended

- Full-facepiece, air-purifying respirator equipped with MSHA and NIOSH approved organic vapor/acid gas/dust/mist combination cartridges or as designated by the Health and Safety Manager;
- Chemical-resistant clothing (polycoated Tyvek overalls and long-sleeved jacket, hooded, one- or two-piece chemical splash suit or disposable chemical-resistant one-piece suit);
- Inner and outer chemical-resistant gloves (butyl/nitrile);
- Chemical-resistant latex safety boots/shoes; and
- Hardhat.

Optional

- Coveralls;
- Disposal boot covers;
- Face shield;
- Escape mask;
- Long cotton underwear.

The use of Level C protection is permissible upon satisfaction of these criteria:

- Measured air concentrations of identified substances will be reduced by the respirator to below the substance's permissible exposure limit (PEL), threshold limit value (TLV), and/or the concentration is within the service limit of the cartridge;
- Atmospheric contaminant concentrations do not exceed IDLH levels; and
- Atmospheric contaminants, liquid splashes or other direct contact will not adversely affect the small area of skin left unprotected by chemical-resistant clothing.

Level C protection is distinguished from Level B by the equipment used to protect the respiratory system, assuming the same type of chemical-resistant clothing is used. The main selection criterion for Level C is that conditions permit wearing an air-purifying device. The device (when required) must be an air purifying respirator (MSHA/NIOSH approved) equipped with filter cartridges. Cartridges must be able to remove the substances encountered. Respiratory protection will be used only with proper fitting, training and the approval of a qualified individual. In addition, an air-purifying respirator can be used only if:

- Oxygen content of the atmosphere is at least 19.5% in volume;
- Substances are identified and concentrations measured;
- Substances have adequate warning properties;
- Individual passes a qualitative fit-test for the mask; and
- Appropriate cartridge/canister is used, and its service limit concentration is not exceeded.

An air monitoring program is part of all response operations when atmospheric contamination is known or suspected. It is particularly important that the air be monitored thoroughly when personnel are wearing air-purifying respirators. Continual surveillance using direct-reading instruments is needed to detect any changes in air quality necessitating a higher level of respiratory protection.

Level D Protection Ensemble

Recommended

- Tyvek coveralls;
- Safety boots/shoes;
- Safety glasses or chemical splash goggles;

- Hardhat;
- Latex gloves.

Optional

- Gloves;
- Escape mask;
- Face shield.

The use of Level D protection is permissible upon satisfaction of these criteria:

- No hazardous air pollutants have been measured; and
- Work functions preclude splashes, immersion or the potential for unexpected inhalation of any chemicals; and
- Atmospheric contains at least 19.5% oxygen.

Level D protection is primarily a work uniform. It can be worn in areas where only boots can be contaminated, or where there are no inhalable toxic substances.

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ATTACHMENT 2
CONTINGENCY PLAN AND HOSPITAL ROUTE
(to be developed on a site-specific basis)



ATTACHMENT 2

This attachment presents an example of an emergency response plan for a site in the Love Canal, NY area. A similar plan will need to be developed for each site where well decommissioning activities are to be performed.

Personnel Exposure

- Skin contact: Use copious amounts of soap and water. Wash/rinse affected area for at least 15 minutes. Decontaminate and provide medical attention. Eyewash stations will be provided on site. If necessary, transport to Niagara Falls Memorial Hospital.
- Inhalation: Move to fresh air and, if necessary, transport to Niagara Falls Memorial Hospital.
- Ingestion: Decontaminate and transport to Niagara Falls Memorial Hospital.

Personal Injury

Minor first-aid will be applied on-site as deemed necessary. In the event of a life threatening injury, the individual should be transported to Niagara Falls Memorial Hospital via ambulance. The Consultant and Subcontractor Health and Safety Officers will supply available chemical-specific information to appropriate medical personnel as requested.

The consultant or subcontractor first aid kits will conform to Red Cross and other applicable good health standards, and shall consist of a weatherproof container with individually-sealed packages for each type of item. First aid kits will be fully equipped before being sent out on each job and will be checked weekly by the On-Site Health and Safety Coordinator to ensure that the expended items are replaced.

Communications

Internal emergency communication systems are used to alert workers to danger, convey safety information, and maintain site control. Any effective system can be employed. Hand signals and air-horn blasts are also commonly used. It shall be the responsibility of the Subcontractor's Site Health and Safety Officer to ensure that an adequate method of internal communication is understood by all personnel entering the site. Unless all personnel are otherwise informed, the following signals shall be used.

- 1) Emergency signals by portable air horn, siren, or whistle: two short blasts, personal injury; continuous blast, emergency requiring site excavation.
- 2) Visual signals: hand gripping throat, out of air/cannot breathe; hands on top of head, need assistance; thumbs up, affirmative/ everything is OK; thumbs down, no/negative; grip partner's wrist or waist, leave area immediately.

Evacuation

In the event that an area must be evacuated due to an emergency, such as a chemical spill or a fire, workers shall exit upwind, if possible. Since work conditions and work zones within the site may be changing on daily basis, it shall be the responsibility of the Subcontractor's Site Health and Safety Officer to review evacuation routes and procedures as necessary and to inform all site workers of any charges.

Adverse Weather Conditions

In the event of adverse weather conditions, the Consultant's Site Health and Safety Coordinator in conjunction with the Consultant's Health and Safety Officer will determine if engineering operations can continue without sacrificing the health and safety of the Consultants employees. Some of the items to be considered prior to determining if work should continue are:

- Potential for heat/cold stress;
- Inclement weather - related working conditions;
- Limited visibility; and
- Potential for electrical storms.

Emergency Telephone Numbers

PROJECT MANAGER:

CORPORATE HEALTH AND SAFETY MANAGER:

SITE HEALTH AND SAFETY OFFICER:

SITE HEALTH AND SAFETY COORDINATOR:

NIAGARA FALLS MEMORIAL HOSPITAL:	(716) 278-4000
FIRE	911 (Local) 285-1234
AMBULANCE	911 or 285-3663
POLICE	911 (Local) 286-4711
ON-SITE CELLULAR TELEPHONE	(716) 866-4367

The site location is:
Love Canal Site
Military Road
Niagara Falls, New York

Nearest Trauma Center:
Children's Hospital of Buffalo
219 Bryant Street
Buffalo, New York
Dr. James Allen

(716) 878-7953

Directions to Hospital

The following directions describe the most efficient route to Niagara Falls Memorial Hospital (see Figure A-1):

- (1) From the Site, turn right onto Military Rd. and proceed north to Pine Ave.
- (2) Turn left (west) onto Pine Avenue and proceed to 10th Street.
- (3) Turn left (south) onto 10th St. and proceed for approximately one-tenth (1/10) mile.
- (4) Hospital is on the left side of road (601 10th St.)

Records and Reporting

It shall be the responsibility of each employer to establish and assure adequate records of all:

- Occupational injuries and illnesses;
- Accident investigations;
- Reports to insurance carrier or State compensation agencies;
- Reports required by client;
- Records and reports required by local, state, federal and/or international agencies;
- Property or equipment damage;
- Third party injury or damage claims;
- Environmental testing logs;
- Explosive and hazardous substances inventories and records;





APPENDIX B
EQUIPMENT DECONTAMINATION SOPs



Appendix 3: Item 1 - DECONTAMINATION FACILITY CONSTRUCTION

Applicability: GENERAL Revision No.: Date:

Prepared By: NWT Date: 02/02/90 Approved By: GHF Date: 02/02/90

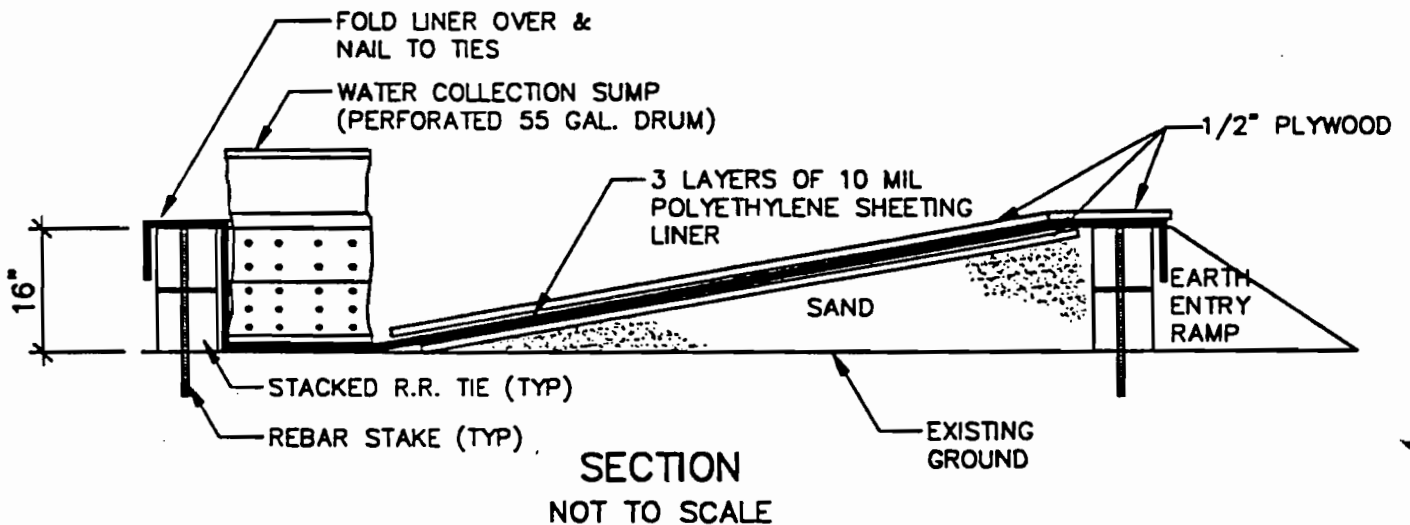
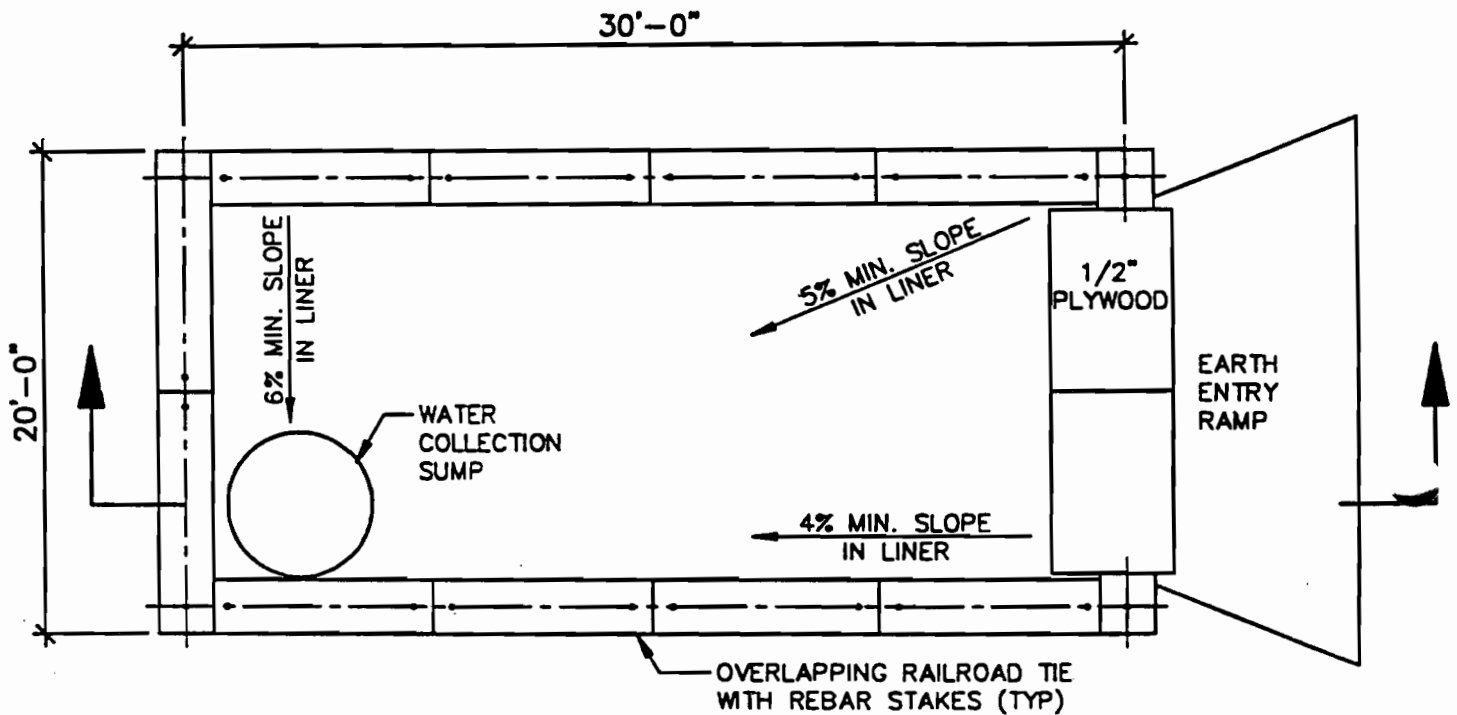
1.0 INTRODUCTION

This guideline presents the construction details for a decontamination facility (i.e., decon pad or wash pad) to be used for the decontamination of drilling and excavation equipment (i.e., drill rigs, backhoes, augers, cutting bits, drill steel, buckets, and associated equipment). A synthetic liner will be installed under the pad for leak and spill protection. In addition, the pad will be constructed with an integral sump to allow for removal of collected liquids. The surface of the liner will be sloped to direct gravity drainage towards a sump. Liquids collected in the sump will be pumped out as necessary and stored in containers until final disposition according to State and Federal regulations. In addition, the decon pad will be covered by a tarp to preclude the collection of precipitation in the sump.

APPENDIX B : ITEM 1 - DECONTAMINATION FACILITY CONSTRUCTION

APPLICABILITY: GENERAL REVISION NO.: DATE:

PREPARED BY: DATE: APPROVED BY: DATE:



Appendix 9 : Item 2 - DRILLING/EXCAVATION EQUIPMENT

DECONTAMINATION PROTOCOLS

Applicability: GENERAL Revision No.: 1 Date: 10/8/90

Prepared By: NWT Date: 12/20/89 Approved By: GHE Date: 02/02/90

1.0 INTRODUCTION

This guideline presents a method for the decontamination of drilling and excavation equipment (i.e., drill rigs, backhoes, augers, cutting bits, drill steel, buckets, and associated equipment) used during a subsurface investigation. Equipment will be decontaminated at an established and clearly demarcated decontamination facility (see appropriate guideline) prior to initiating surface penetration of each boring/excavation (drill equipment cleaning is not required between wells of the same nest). This will prevent cross-contamination from the previous drilling/excavation location.

2.0 METHODOLOGY

1. Remove all soil/rock material from the equipment at the survey site.
2. Wrap augers, tools, plywood, and other reusable items with a plastic cover prior to transport from the survey site to the decontamination facility.
3. Transport equipment to the decontamination facility.
4. Wash equipment thoroughly with pressurized low-volume water or steam (power washer or steam jenny) using a wire brush to remove visible soils/etc. adhering to the equipment.
5. Use phosphate-free detergent (e.g., Alconox) to remove any oils, grease, and/or hydraulic fluids adhering to the equipment.
6. Rinse with pressurized low-volume water or steam.

Appendix B: Item 2 - DRILLING/EXCAVATION EQUIPMENT

DECONTAMINATION PROTOCOLS

Applicability: GENERAL Revision No.: 1 Date: 10/8/90

Prepared By: NWT Date: 12/20/89 Approved By: GHE Date: 02/02/90

7. Allow equipment to air dry.
8. Wrap with clean plastic or aluminum foil, if appropriate, to prevent contamination if equipment is going to be stored or transported.
9. Fluids used for decontamination will not be recycled. Store all wash water, rinse water, and decontamination fluids in containers until final disposal requirements are determined.
10. Following final rinse, inspect openings to verify they are free of soil/etc. particulates which may contribute to possible cross-contamination.

3.0 REFERENCES

- (a) USEPA Region IV Engineering Support Branch. 1986. Standard Operating Procedures and Quality Assurance Manual.

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Appendix B: Item 3 - SAMPLING EQUIPMENT DECONTAMINATION
PROTOCOLS

Applicability: NYSDEC-SPECIFICATION Revision No.: 3 Date: 10/9/90
Prepared By: AJM Date: 10/31/89 Approved By: KLB Date: 12/12/89

1.0 INTRODUCTION

This guideline presents a method for the decontamination of sampling equipment used in the collection of environmental samples.

2.0 HEALTH AND SAFETY

Nitric acid is a strong oxidizing agent as well as being extremely corrosive to the skin and eyes. Solvents such as acetone, methanol, hexane, and isopropanol are flammable liquids. Limited contact with skin can cause irritation, while prolonged contact may result in dermatitis. Eye contact with the solvents may cause irritation or temporary corneal damage. Safety glasses with protective side shields, neoprene or nitrile gloves, and long-sleeve protective clothing must be worn whenever acids and solvents are being used.

3.0 METHODOLOGY

1. All equipment used in sampling must be clean and free from residue of any previous samples. To accomplish this, the following procedures are to be followed:
 - a. wash equipment thoroughly with non-phosphate detergent and tap water⁽¹⁾ using a brush to remove any particulate matter or surface film;
 - b. rinse with tap water⁽¹⁾;
 - c. rinse with a 10% HNO₃ solution⁽²⁾;

Appendix B: Item 3 - SAMPLING EQUIPMENT DECONTAMINATION

PROTOCOLS

Applicability: NYSDEC-SPECIFICATION Revision No.: 3 Date: 10/9/90

Prepared By: AJM Date: 10/31/89 Approved By: KLB Date: 12/12/89

- d. rinse with tap water⁽¹⁾;
 - e. rinse with deionized water (demonstrated-analyte-free)⁽³⁾;
 - f. air dry; and
 - g. wrap in aluminum foil (shiny side out)
2. Well evacuation equipment, such as submersible pumps and bailers, which are put into the borehole must be decontaminated following the procedures listed above. All evacuation tubing must be dedicated to individual wells, (i.e., tubing cannot be reused).
3. Bailer cord must be cleaned with non-phosphate detergent and demonstrated analyte-free deionized water before use. Cord can be reused; it is not necessary to dedicate it to individual wells. If a ten (10) foot or greater length leader is being used, only the leader need be cleaned (assumes bailer cord is not allowed to contact water).
4. All unused sample bottles and sampling equipment must be maintained in such a manner that there is no possibility of casual contamination.

Appendix B: Item 3 - SAMPLING EQUIPMENT DECONTAMINATION

PROTOCOLS

Applicability: NYSDEC-SPECIFICATION Revision No.: 3 Date: 10/9/90

Prepared By: AJM Date: 10/31/89 Approved By: KLB Date: 12/12/89

4.0 EQUIPMENT REQUIREMENTS

- personal protective garment and gear
- brush, buckets, and wash basins
- squirt bottles
- supply of solvents and water
- aluminum foil

5.0 REFERENCES

New York State Department of Environmental Conservation, Division of Hazardous Substances Regulation, August 1989, RCRA Quality Assurance Project Plan Guidance.

Engineering Support Branch Standard Operating Procedures and Quality Assurance Manual, April 1, 1986. USEPA Region IV.

NOTES

- (1) Tap water may be used from any municipal water treatment system. The use of an untreated potable water supply is not an acceptable substitute.
- (2) Omit this step if metals are not being analyzed. For carbon steel split spoon samplers, a 1% rather than 10% HNO₃ solution should be used.

Appendix B: Item 3 - SAMPLING EQUIPMENT DECONTAMINATION

PROTOCOLS

Applicability: NYSDEC-SPECIFICATION Revision No.: 3 Date: 10/9/90

Prepared By: AJM Date: 10/31/89 Approved By: KLB Date: 12/12/89

- (3) Deionized water must be demonstrated to be analyte-free water. The criteria for analyte-free water are the Method Detection Limits (MDLs) for the analytes. Specifically for the common laboratory contaminants listed below, the allowable limits are set at three times the respective MDLs determined by the most sensitive analytical method:

1. Methylene Chloride
2. Acetone
3. Toluene
4. 2-Butanone
5. Phthalates

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APPENDIX C
CONSTRUCTION INSPECTION FORMS



Inspector's Daily Report

CONTRACTOR:
ADDRESS:

TELEPHONE:

LOCATION

WEATHER

FROM

TO

TEMP

A.M.

P.M.

DATE

CONTRACTOR'S WORK FORCE AND EQUIPMENT

DESCRIPTION	H	#	DESCRIPTION	H	#	DESCRIPTION	H	#	DESCRIPTION	H	#
Field Engineer						Equipment			Front Loader Ton		
Superintendent			Ironworker			Generators			Bulldozer		
						Welding Equip.					
Laborer-Foreman			Carpenter								
Laborer									Backhoe		
Operating Engineer			Concrete Finisher								
Carpenter						Paving Equip. & Roller					
						Air Compressor					

SEE REVERSE SIDE FOR SKETCH ☐ YES ☐ NO

WORK PERFORMED:

PAY ITEMS:

CONTRACT		STA		DESCRIPTION	QUANTITY	REMARKS
NO.	ITEM	FROM	TO			

TEST PERFORMED:

PICTURES TAKEN:

VISITORS:

QA PERSONNEL

SIGNATURE

REPORT NO.

SHEET of

[illegible]

SAMPLE NUMBER: _____

APPROXIMATE LOCATION OF STOCKPILE: _____

NUMBER OF STOCKPILE: _____

DATE OF COLLECTION: _____

CLIMATOLOGIC CONDITIONS: _____

FIELD OBSERVATION: _____

PROBLEM IDENTIFICATION REPORT

FORM H

Project _____ Job No. _____
 Contractor _____
 Subject _____

DATE _____

DAY

S	M	T	W	T	F	S
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WEATHER	Clear	Overcast	Rain	Snow
TEMP.	10-32	32-64	65-70	70-85
WIND	Light	Strong	Heavy	Storm
HUMIDITY	Dry	Moist	Humid	Wet

PROBLEM DESCRIPTION (Reference Daily Report No.): _____

PROBLEM LOCATION - REFERENCE TEST RESULTS AND LOCATION (Note: Use sketches on back of form as appropriate): _____

PROBABLE CAUSES: _____

SUGGESTED CORRECTIVE MEASURES: _____

APPROVALS:

QA ENGINEER: _____

PROJECT MANAGER: _____

DISTRIBUTION: 1. Proj. Mgr.
 2. Field Office
 3. File
 4. Owner

QA Personnel
 Signature _____

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Project _____ Job No. _____

Contractor _____

Subject _____

DATE _____

DAY

S	M	T	W	Th	F	S
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WEATHER

TEMP.

WIND

HUMIDITY

Temp F/C	Cloud	Overcast	Rain	Notes
10-22 11-25	25-75	25-75	75-85	OK
Sea	Shower	High	Report No.	
Dry	Shower	Humid		

CORRECTIVE MEASURES UNDERTAKEN (Reference Problem Identification Report No.): _____

RETESTING LOCATION: _____

SUGGESTED METHOD OF MINIMIZING RE-OCCURRENCE: _____

APPROVALS:

QA ENGINEER: _____

PROJECT MANAGER: _____

DISTRIBUTION: 1. Proj. Mgr.
2. Field Office
3. File
4. Owner

QA Personnel
Signature _____



WELL DECOMMISSIONING RECORD

NYSDEC NPL Sites

Site Name:

Well I.D.:

Site Location:

Driller:

Drilling Co.:

Inspector:

Date:

DECOMMISSIONING DATA

(Fill in all that apply)

WELL SCHEMATIC*

Depth
(feet)

OVERDRILLING

Interval Drilled
Drilling Method(s)
Borehole Dia. (in.)
Temporary Casing Installed? (y/n)
Depth temporary casing installed
Casing type/dia. (in.)
Method of installing

CASING PULLING

Method employed
Casing retrieved (feet)
Casing type/dia. (in)

CASING PERFORATING

Equipment used
Number of perforations/foot
Size of perforations
Interval perforated

GROUTING

Interval grouted (FBLs)
of batches prepared
For each batch record:
Quantity of water used (gal.)
Quantity of cement used (lbs.)
Cement type
Quantity of bentonite used (lbs.)
Quantity of calcium chloride used (lbs.)
Volume of grout prepared (gal.)
Volume of grout used (gal.)

COMMENTS:

* Sketch in all relevant decommissioning data, including:
interval overdrilled, interval grouted, casing left in hole,
well stickup, etc.

Drilling Contractor

Department Representative

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APPENDIX D
HYDRAULIC PRESSURE TESTING SOP

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Appendix D: Item 1 - HYDRAULIC PRESSURE TESTING OF SCREENED
INTERVAL

Applicability: HAZARDOUS WASTE Revision No.: Date:

Prepared By: BGP Date: 4/28/95 Approved By: Date:

1.0 INTRODUCTION

This guideline presents a method for evaluating the integrity of a grout seal in the screened interval of a well being decommissioned by grouting in place.

2.0 METHODOLOGY

1. Grout the screened interval of the well using a tremie pipe, up to a level of one to two feet above the screened section.
2. Allow the grout to set for a period of not less than 24 hours and not greater than 72 hours before pressure testing of the grouted interval is begun.
3. Place a pneumatic packer at a maximum of four and one half feet above the top of the screened section of the well casing.
4. Apply an inflation pressure to the packer, not exceeding the pressure rating of the well casing material. If the interval between the top of the grout and the bottom of the packer is not saturated, use potable water to fill the interval.
5. Apply a gauge pressure of 5 psig at the well head to the interval for a period of 5 minutes to allow for temperature stabilization. After 5 minutes maintain the pressure at 5 psig for 30 minutes.
6. The grout seal shall be considered acceptable if the total loss of water to the seal does not exceed 0.5 gallons over a 30-minute period.
7. If the grout seal is determined to be unacceptable, an additional 5 feet of grout will be added to the well casing with a tremie pipe. The interval will be retested as described above.

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