

**SANTA FE SOLID WASTE  
MANAGEMENT AGENCY**

**REQUEST FOR BIDS**

**BID NO. '19/19/B**



**CONTRACT DOCUMENTS  
AND SPECIFICATIONS**

**FOR**

**CAJA DEL RIO LANDFILL  
CELLS 6B AND 6A WEDGE  
LINER SYSTEM CONSTRUCTION**

**June 10, 2019**

**BIDS DUE:**

**JUNE 10, 2019 at 2:00 P.M.**

**PURCHASING OFFICE**

**CITY OF SANTA FE**

**2651 SIRINGO ROAD – BUILDING H**

**SANTA FE, NEW MEXICO 87505**

**CAJA DEL RIO LANDFILL  
CELLS 6B AND 6A WEDGE LINER SYSTEM CONSTRUCTION  
BID NO. '19/19/B**

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# **Section 1**

## **Invitation to Bid**

**SANTA FE SOLID WASTE MANAGEMENT AGENCY  
ADVERTISEMENT FOR BIDS**

INVITATION TO BID NO.:     **‘19/19/B**

SEALED BID FOR:             Santa Fe Solid Waste Management Agency (SFSWMA)  
Caja del Rio Landfill  
Cells 6B and 6A Wedge Liner System Construction

BID SCHEDULE                Advertisement: May 10, 2019  
Issuance of Bid Packages: May 10, 2019  
Pre-Bid Conference: May 20, 2019 @ 10:00 a.m.  
Bid Opening: June 10, 2019 @ 2:00 p.m.  
Bid Award (Joint Powers Board): June 20, 2019  
Notice to Proceed: July 15, 2019 (Estimated)

TO BE OPENED AT:           City Purchasing Office  
City of Santa Fe  
200 Lincoln Ave Room 122  
Santa Fe, NM 87501

TIME:                         2:00 p.m. Local Prevailing Time

DATE:                         June 10, 2019

ADDRESSED TO:             Ms. Shirley Rodriguez  
Purchasing Officer  
City of Santa Fe  
200 Lincoln Ave Room 122  
Santa Fe, NM 87501

**PRE-BID CONFERENCE:** A non-mandatory pre-bid conference will be held at 10:00 a.m. on May 20, 2019, at the Nancy Rodriguez Community Center in the Traditional Village of Agua Fria, 1 Prairie Dog Loop, Santa Fe, NM 87507. The pre-bid conference will provide significant aspects of the project and address any potential bidder questions. Immediately after the pre-bid conference, bidders may participate in an optional site visit of the liner construction project at the Caja del Rio Landfill with representatives from CDM Smith Inc. (Engineer) and Santa Fe Solid Waste Management Agency (Owner).

The work to be performed for this project consists of furnishing all equipment, labor and materials for the construction of the Caja del Rio Landfill Cells 6B and 6A Wedge Liner System Construction Plans, Specifications, and other Contract Documents ("Work").

Bids will be received until the above time, then opened publicly at the City of Santa Fe Purchasing Office, 200 Lincoln Ave Room 122, Santa Fe, New Mexico and read aloud. Bids received after the above time will be returned unopened.



Contract Documents may be reviewed at the following address:

Santa Fe Solid Waste Management Agency  
Attn: Rosalie Cardenas  
149 Wildlife Way  
Santa Fe, NM 87506  
(505) 424-1850  
Email: rcardenas@sfswma.org

OBTAINING COPIES OF CONTRACT DOCUMENTS: Construction plans, specifications and other contract documents ("Contract Documents") may be obtained at the following address:

Academy Reprographics  
8900-N San Mateo Blvd NE  
Albuquerque, NM 87113  
Phone: (505) 821-6666  
Email: plot@acadrepro.com

Prospective bidders may go directly to Academy Reprographics' web site ([www.acadrepro.com](http://www.acadrepro.com)) to review or obtain (for a fee) a complete set of the Contract Documents, including construction plans and specifications. Bidders are advised that the cost of the CD and/or any costs to reproduce hard copies of the Contract Documents or portions thereof are non-refundable. Bidders may also view the Contract Documents at <http://www.santafenm.gov/bids.aspx>.

Bids for the project will be presented in the form of a unit price or lump sum bid as indicated on the **Bid Form**. The bidder shall bid all items listed. Each bidder must conform to the conditions specified in the section entitled **Instructions for Bidders**.

**BID GUARANTEE:** Each bid shall be accompanied by an acceptable form of bid Guarantee (Bid Security) in an amount equal to at least five percent (5%) of the amount of the bid payable to the Santa Fe Solid Waste Management Agency as a guarantee that if the bid is accepted, the Bidder will execute the Contract and file acceptable **Performance and Labor and Material Payment Bonds** within fifteen (15) days after the award of the Contract.

The bid shall also include a signed **Non-Collusion Affidavit of Prime Bidder**, a signed **Certificate of Bidder Regarding Equal Employment Opportunity**, **Certificate of Nonsegregated Facilities**, and **Acknowledgement for Receipt of Addenda**. The successful Bidder shall, upon notice of award of Contract, secure from each of its subcontractors a signed **Non-Collusion Affidavit of Subcontractor**. Bidders must possess an applicable license to perform the Work under the Contract, provided for in the New Mexico Construction Industries Rules and Regulations.

**The Work shall be complete within ninety (90) calendar days following issuance of a notice-to-proceed to the successful Bidder. Following the ninety (90) calendar day contract time, SFSWMA will impose liquidated damages for failure to comply with this time limit, as specified in the Contract Documents.**

**Performance Bond and Labor & Material Payment Bond**, each 100% of the Contract sum, will be required of the successful Bidder entering into the construction Contract.

Bidders agree to hold their bid prices for sixty (60) days subject to action by the Owner.

**OWNERS RIGHTS RESERVED:** The Santa Fe Solid Waste Management Agency, herein referred to as the Owner, reserves the right to reject any or all bids and to waive any formality or technicality in any bid in the best interest of the Owner.

Wages paid on this project shall not be less than the minimum prevailing wage rates listed in the Contract Documents.

To receive a resident or resident veteran business preference pursuant to Section 13-4-2 NMSA 1978, a resident or resident veteran contractor shall submit with its bid a copy of a valid resident or resident veteran business certificate issued by the New Mexico Taxation and Revenue Department pursuant to Section 13-1-22 NMSA 1978.

**EQUAL OPPORTUNITY IN EMPLOYMENT:** All qualified applicants will receive consideration for employment without regard to race, color, religion, sex, sexual orientation, or national origin. Bidders on this work will be required to comply with the Presidents Executive Order No. 11246 as amended.

**ATTEST:**

**Shirley Rodriguez** Digitally signed by Shirley Rodriguez  
Date: 2019.05.13 10:35:30 -06'00'  
Shirley Rodriguez, Purchasing Officer

Received by the Santa Fe New Mexican on: May 8, 2019  
To be published on: May 10, 2019

Received by the Albuquerque Journal on: May 8, 2019  
To be published on: May 10, 2019

## **Section 2**

# **Instructions to Bidders**

## **INSTRUCTIONS FOR BIDDERS**

Bids are requested by the Santa Fe Solid Waste Management Agency for construction of the Caja del Rio Landfill Cells 6B and 6A Wedge Liner System in accordance with the construction plans, specifications and contract documents.

1. **LOCATION AND DESCRIPTION OF WORK:** The Work under this Contract shall be performed on-site at the Caja del Rio Landfill, 149 Wildlife Way, Santa Fe, New Mexico 87506. The Work consists of construction for Cells 6B and 6A wedge, including earthwork, berms, subgrade, geosynthetic clay liner, geomembrane, geotextile, in-cell piping, drainage layer, as shown and specified in the Contract Documents.
2. **TIME AND PLACE OF RECEIVING AND OPENING BIDS:** This information will be found in the "Advertisement for Bids" form attached hereto. A bid received after the specified time will not be considered and will be returned to the bidder unopened.
3. **SPECIFICATIONS:** The construction of this project will be in accordance with the General and Supplemental Conditions, Construction Plans and Technical Specifications contained in the Contract Documents.
4. **CONTRACT DOCUMENT DEPOSIT:** Prospective bidders may go directly to Academy Reprographics' web site ([www.acadrep.com](http://www.acadrep.com)) to review or obtain (for a fee) a complete set of the Contract Documents, including construction plans and specifications. Bidders are advised that the cost of the CD and/or any costs to reproduce hard copies of the Contract Documents or portions thereof are non-refundable.
5. **DEFINED TERMS:** Terms used in these Instructions to bidders have the meanings assigned to them in this Request for Bids.
6. **EXAMINATION OF CONTRACT DOCUMENTS AND SITE:** Before submitting the bid, each bidder must (a) examine the Contract Documents thoroughly, (b) visit the site to familiarize itself with local conditions that may in any manner affect performance of the Work, (c) become familiar with Federal, State and local laws, ordinances, rules and regulations affecting performance of the Work; and (d) carefully correlate the bidder's observations with the requirements of the Contract Documents. The submission of a bid constitutes representation by Bidder that Bidder has complied with every requirement of this section and that the Contract Documents are sufficient in scope to indicate and convey understanding of all terms and conditions for performance of the Work.
7. **THE COMPLETE CONTRACT DOCUMENTS CONTAIN THE FOLLOWING:** Everything that is contained herein, as well as General and Supplemental Conditions, Construction Plans and Technical Specifications referenced herein.
8. **INTERPRETATIONS, ADDENDA AND AMENDMENTS:** Any prospective bidder who desires to receive notice of interpretations, addenda, or amendments to this Request for Bids shall provide contact information to the Owner. All questions about the meaning or intent of the Contract Documents shall be submitted to the Owner in writing or e-mailed to Doug Williams, [williamsd2@cdmsmith.com](mailto:williamsd2@cdmsmith.com). Replies will be issued by Addenda mailed, emailed, or faxed to all parties recorded by the Owner as having provided their contact information at least two (2) days before the Addenda is sent. Questions received less than five (5) days prior to the date for opening of bids will not be answered. Only questions answered by formal written Addenda will be binding. Oral and other interpretations or clarifications will be

without legal effect. The Owner reserves the right to amend these time frames if a critical Addendum is required or if the proposal deadline needs to be extended in the best interest of the Owner.

9. **BID SECURITY:** Bid Security (bid guarantee) in the amount of 5% of the amount of the bid shall accompany the Bid Form and must be in the form of a certified or bank cashier's check made payable to the Owner or a bid bond issued by a surety licensed to conduct business in the State of New Mexico, or otherwise supplied in a form satisfactory to the Owner. The Bid Security of the successful Bidder will be retained until the Bidder has executed the Construction Agreement and furnished the required Contract Security (Performance and Labor and Material Payment Bonds), whereupon it will be returned. If the Bidder fails to execute and deliver the Construction Agreement and furnish the required Contract Security within ten (10) days of the Notice of Award, the Owner may annul the Notice of Award and the Bid Security of that Bidder will be forfeited. The Bid Security of any Bidder whom the Owner believes to have a reasonable chance of receiving the award may be retained by the Owner until either the seventh (7) day after the executed Construction Agreement is delivered by the Owner to Contractor and the required Contract Security is furnished; or the sixty-first (61) day after the bid opening, whichever is earlier. Bid Security of other Bidders will be returned within fifteen (15) days of the bid opening, or sooner.

**10. RESIDENT BUSINESS PREFERENCE:**

**INTENT AND POLICY:** The Owner recognizes that the intent of the state resident preference statute is to give New Mexico businesses and contractors an advantage over those businesses, manufacturers and contractors from outside the State of New Mexico. The underlying policy is to give a preference to those persons and companies who contribute to the economy of the State of New Mexico by maintaining plants and other facilities within the State and giving employment to residents of the State (1969 OP. Attorney. Gen. No. 6942).

**APPLICATION:** With acknowledgement of this intent and policy, the resident preference will only be applied when bids are received from in state businesses, manufacturers and contractors that are within five (5) percent of low bids received from out-of-state businesses, manufacturers and contractors (NMSA 1978, §§ 13-1-21 and 13-4-2).

To be considered a resident for application of the preference, the in-state Bidder must include a valid resident business certificate or resident contractor certificate with the submitted bid.

**NON-APPLICATION OF RESIDENT BUSINESS PREFERENCES:**

If the lowest responsive bid and the next responsive bids within five (5) percent of the lowest bid are all from bidders who have submitted a resident business certificate or a resident contractor certificate, then the resident preference will not be applied.

Preferences shall not be applied when expenditures of Federal funds designated for a specific contract is involved.

**NEW MEXICO RESIDENT VETERAN BUSINESS PREFERENCE:** New Mexico law, NMSA 1978, § 13-1-22, provides a preference in the award of a public works contract for a "resident veteran business." Certification by the NM Department of Taxation and Revenue for the resident veteran business requires the Offeror to provide evidence of annual revenue and other evidence of veteran status.

To receive a Resident Veteran Business Preference the Bidder must submit with its bid, a

copy of a valid Resident Veteran Business certificate issued by the New Mexico Department of Taxation and Revenue.

If an Offeror submits a copy of their Resident Veteran Business Preference certificate with its proposal, the preference points is ten percent (10%).

Certification by the New Mexico Department of Taxation and Revenue for the resident veteran business requires the Bidder to provide evidence including, but not limited to, of gross revenues of up to three million dollars (\$3,000,000) in the preceding tax year.

A resident veteran business shall not benefit from the preference pursuant to this section for more than ten consecutive years. A person that is an owner of a business that is a resident veteran business shall not benefit from the preference pursuant to this section for more than ten consecutive years. A person shall not benefit from the provisions of this section based on more than one business concurrently.

The resident business preference is not cumulative with the resident veteran business preference.

11. **CONTRACT TIME:** The number of days for the completion of Work (the Contract Time) is ninety (90) calendar days as set forth in the Bid Proposal and will be included in the executed Construction Agreement.

12. **SUBCONTRACTORS, SUPPLIERS AND OTHERS:**

- A. Contractor, in the bid documents, must identify in writing to the Owner those portions of the Work that are proposed to be subcontracted and after the Notice of Award, may only subcontract other portions of the work with the Owner's written consent.
- B. Contractor shall list all Subcontractor names, addresses and type of work to be performed.
- C. The Subcontractor threshold amount for this project is \$5,000. Contractor must list all subcontractors who will perform work in excess of this threshold. Only one Subcontractor may be listed for each category of work as defined by Contractor. The Subcontractors Fair Practices Act (13-4-31 through 14-3-43 NMSA 1988) shall apply.
- D. **EXEMPTION:** In accordance with the "SUBCONTRACTOR'S FAIR PRACTICES ACT", Section 13-4-35, Contractor shall not be required to submit a Subcontractor's Listing form with the bid for contracts for construction, improvement or repair of streets or highways, including bridges, underground utilities within easements, including but not limited to waterlines, sewer lines and storm sewer lines. The SUBCONTRACTOR'S FAIR PRACTICES ACT shall apply, however, to that portion of contracts for construction, improvement or repair of streets or highways which covers street lighting and traffic signals.
- E. The Bidder shall list the Subcontractor(s) or material supplier(s) proposed to be used for all trades or items on the Subcontractor Listing Form attached to the Bid Form. The listing must include Subcontractors specifically identified in Paragraph D above. If awarded the contract, the Bidder shall use the firm listed, or itself if "General Contractor" has been listed, unless a request for a change or substitution is approved by the Owner of any reason as outlined herein.
- F. For subcontract work involving the application of the "SUBCONTRACTORS FAIR PRACTICES ACT," NMSA 1988 §§13-4-31thru 13-4-42 the following provisions, shall

apply:

1. Contractor may not substitute any Subcontractor listed, unless the Owner approves, in writing, the substitution based on the following situations:
  - a. The Subcontractor fails or refuses to execute a contract due to bankruptcy or insolvency;
  - b. The Subcontractor fails or refuses to perform;
  - c. Contractor demonstrates to the Owner that the listed Subcontractor was due to an inadvertent clerical error;
  - d. Acceptance of an alternate by the Owner causes the original Subcontractor's bid not to be low;
  - e. Contractor can substantiate to the Owner that a Subcontractor's bid is incomplete, or;
  - f. The Subcontractor fails or refuses to meet bond requirements of Contractor.
2. Prior to approval of Contractor's request for substitution, the Owner shall give notice to the listed Subcontractor by certified mail. The Subcontractor shall have five (5) working days to submit written objections to the Owner. Failure to respond shall constitute Subcontractor's consent to the substitution. If written objections are received, the Owner shall give five (5) working days of a notice of a hearing.
3. No other substitution of Subcontractors may be permitted by Contractor, other than for requested change orders to the Work or unless Contractor can show that no bids were received.
4. It shall be the responsibility of the Subcontractor to be prepared to submit performance or payment bonds if requested by Contractor. If the Subcontractor does not furnish such requested bonding, Contractor may substitute another Subcontractor, as per the provisions of item 1 above. (The requirement of such bonding must be included in Contractor's written or published request for Subcontract bids.)
5. If Contractor does not specify a Subcontractor, Contractor represents that Contractor shall perform the work.
6. If Contractor is claiming an inadvertent clerical error, notice shall be given to the Owner and to the involved Subcontractor within two (2) working days of the bid opening. The Subcontractor shall have six (6) working days from the bid opening to submit written objections. Failure to respond shall constitute Subcontractor's agreement that an error was made.
7. If determined to be an emergency, upon written finding, subcontracting may be permitted although not originally designated in the bid.
8. Violation of this Act may allow the Owner to cancel the Contract or assess Contractor a penalty up to ten (10) percent of the subcontract involved, but in no case less than the difference between the amount of the listed Subcontractor and the Subcontractor used. Contractor shall be entitled a hearing after the notice of intent to assess a penalty.
9. If a hearing is held, the dispute shall be stated in writing and the Owner shall evaluate the issues of both sides and render a determination within ten (10) days of the hearing

and provide the parties with a written copy of the decision by certified mail. The Owner may also refer the matter to arbitration.

13. BID FORM:

- A. The Bid Form is included in the Contract Documents.
- B. The Bid Form must be completed in either ink or typewritten. The bid price of each item on the form must be stated in numerals and written words; in case of an error in extensions in the unit price schedule, the unit price shown in written words shall govern.
- C. Bids by corporations must be executed in the corporate name by the president or a vice president (or other corporate officer accompanied by evidence of authority to sign). The corporate address and state of incorporation shall be shown below the signature.
- D. Bids by partnerships must be executed in the partnership name and signed by a partner, and the title must appear under its signature and the official address of the partnership must be shown below the signature.
- E. All names must be typed or printed below the signature.
- F. The bid shall contain an acknowledgement of receipt of all Addenda (the numbers of which shall be filled in on the Bid Form).

14. QUALIFICATION OF BIDS: All Bidders must have a valid New Mexico Contractor's License appropriate to the Work herein specified.

15. SUBMISSION OF BIDS: Bids shall be submitted at the time and place indicated in the Advertisement for Bids and shall be enclosed in an opaque sealed envelope, marked with the project title, name and address of the Bidder, N.M. License Number, and accompanied by the Bid Security, list of subcontractors and other required documents. The Bid Form shall not be detached from the bound set of Contract Documents. All blanks must be filled in. Conditional bids will not be considered. The envelope shall be addressed to:

Ms. Shirley Rodriguez  
Purchasing Officer  
200 Lincoln Ave Room 122  
Santa Fe, NM 87501

16. MODIFICATION AND WITHDRAWAL OF BIDS: Bids may be modified or withdrawn by an appropriate document duly executed and delivered to the place where bids are to be submitted at any time prior to the opening of bids.

17. BID OPENING PROCEDURE: The person or persons opening the bids shall verify the following bid components are included:

- A. Bid Proposal;
- B. Bid Form and Completed Bid Schedule - Name of Bidder and Bidder's New Mexico Contractor's License with a check for proper signatures, subcontractor/material listing, and acknowledgement of Addenda, if any;
- C. Bid Bond or Check for Bid Security;
- D. Non-Collusion Affidavit of Prime Bidder;



- E. Non-Collusion Affidavit of Subcontractor(s);
  - F. Certification of Nonsegregated Facilities;
  - G. Certification of Bidder regarding Equal Employment Opportunity;
  - H. Certification of Subcontractor regarding Equal Employment Opportunity; and
  - I. Resident Veteran Contractor / Resident Contractor, if any.
18. BIDS TO REMAIN OPEN: If a Contract is to be awarded, it will be awarded to the lowest responsible base bid whose evaluation indicates to the Owner that the award will be in the best interests of the project and the Owner. All bids shall remain open for sixty (60) days after the day of the bid opening, but the Owner may, in its sole discretion, release any bid and return the Bid Security prior to that date.
19. AWARD OF CONTRACT:
- A. The Owner reserves the right to reject any and all bids and waive any and all informalities or technicalities and the right to disregard all nonconforming or conditional bids or counter bids.
  - B. If a Contract is to be awarded, it will be awarded to the lowest responsible base bid whose evaluation indicates to the Owner that the award will be in the best interests of the project and the Owner. Additive Alternatives may be added in total or in part, based on available funding or timing to be exercised by the Owner at its discretion. If Alternatives are to be awarded, the Owner will award the Contract to the responsible Bidder submitting the low base bid, excluding NMGRT, including any combination of any Additive Alternates or Deductive Alternates.
  - C. Simultaneously with delivery of the executed counterparts of the Agreement to the Owner, Contractor shall deliver to the Owner the required Contract Bonds.
  - D. If a Contract is to be awarded, the Owner will give the apparent successful Bidder a Notice of Award within thirty (30) days after the day of the bid opening.
  - E. If the lowest responsible Bidder has otherwise qualified, the lowest Bidder may negotiate with the Owner for a lower bid if the lowest bid is within ten percent over budgeted project funds. No change in the original scope of the terms or terms and conditions will be allowed. Terms and conditions refer to the Contract requirements, warranties, and bonds. Negotiation may be permitted with product, materials, and equipment alternatives as determined to be in the best interest of the Owner.
20. WAGE RATES: The Bidder's attention is directed to the fact that wages to be paid on this project shall not be less than the prevailing wage rates as listed by the New Mexico State Labor and Industrial Commission. It shall be the successful Bidder's responsibility to inform itself thoroughly of all state, federal and local laws and statutes pertaining to the employment of labor, the freedom of organization and the conditions of employment and shall strictly adhere to such laws and regulations as are applicable. There shall be no discrimination because of race, creed, color, national origin or legal political affiliation in the employment of persons qualified by training and experience for work under this contract.
21. REQUIRED SUBMITTALS:
- A. Bid Proposal;

- B. Bid Form and Completed Bid Schedule - Name of Bidder and Bidder's New Mexico Contractor's License with proper signatures, subcontractor/material listing, and acknowledgement of Addenda, if any;
- C. Bid Bond or Check for Bid Security;
- D. Non-Collusion Affidavit of Prime Bidder;
- E. Non-Collusion Affidavit of Subcontractor(s);
- F. Certification of Nonsegregated Facilities;
- G. Certification of Bidder regarding Equal Employment Opportunity;
- H. Certification of Subcontractor regarding Equal Employment Opportunity; and
- I. Resident Veteran Contractor / Resident Contractor / ~~Local Contractor Certification~~ (where applicable).

If any of the above requirements have not been met, the bid shall not be read.

- 22. SUBSTITUTIONS: The bid shall not be qualified by the bid of substitutions for specified materials or equipment.
- 23. OWNER PREFERENCES: In the construction of this project, the Owner has no preference for any process, type of equipment, or kind of material, but will consider all processes, types of equipment or kinds of material offered on a usual competitive basis if they are in fact the equal to that specified and will accomplish the purpose intended. The Owner reserves the right to be the sole judge as to whether or not a different process, type of equipment or kind of material offered is in fact equal to that specified.
- 24. LICENSE OR ROYALTY FEES: Licenses and/or royalty fees for products or for processes must be paid for directly by Contractor.
- 25. PERFORMANCE BOND AND LABOR AND MATERIAL PAYMENT BOND: Contractor will be required to furnish surety bonds in an amount at least equal to one hundred percent (100%) each of the total Contract price as security for faithful performance of the Contract and payment for all labor and materials. The surety company must be authorized to do business in the State of New Mexico and must be acceptable to the Owner.
- 26. ADDENDUM: Each Addendum shall be made a part of the Contract Documents to the same extent as though contained in the original Documents and itemized listing thereof. Each Bidder shall acknowledge receipt of each Addendum in the space provided on the Bid Form.
- 27. COLLUSION: No Bidder shall be interested in more than one bid. Collusion among Bidders or the submission of more than one bid under different names by any firms or individual shall be cause for rejection of all bids in question without consideration.
- 28. QUANTITIES: The quantities set forth in the Bid Form are estimated quantities on which bids will be compared and which will be the basis for Award of Contract. Payment will be made for the Work actually performed.
- 29. UTILITY INSPECTION: All work done on the existing Owner owned utilities shall be inspected by a representative of the Owner before backfilling.
- 30. POWER OF ATTORNEY: Attorneys in fact who sign bonds must attach certified effective

copies of their Power of Attorney to all bonds.

31. **PRE-BID CONFERENCE:** A non-mandatory pre-bid conference will be held at 10:00 a.m. on May 20, 2019, at the Nancy Rodriguez Community Center in the Traditional Village of Agua Fria, 1 Prairie Dog Loop, Santa Fe, NM 87507, as specified in the Advertisement for Bids.
32. **PROTEST PROCEDURE:** Any Bidder or Contractor who is aggrieved in connection with the procurement may protest to the City Purchasing Director. The protest must be in writing and be submitted within fifteen (15) days after the facts or occurrences.

The complete procedures and requirements regarding protests and resolution of protests are available from the Purchasing Office upon request.

**33. CONSIDERATION OF BIDS:**

**33.1 RECEIPT, OPENING AND RECORDING**

Bids received on time will be opened publicly and will be read aloud, and an abstract of the amounts of the Base Bids and Alternates or Bid Items, if any, will be made available to the Bidders. Each Bid shall be open to public inspection.

**33.2 BID EVALUATION AND AWARD**

33.2.1 It is the intent of the Owner to award a contract to the lowest responsible base bid, provided the bid has been submitted in accordance with the requirements of the Contract Documents. The unreasonable failure of a Bidder to promptly supply information in connection with an inquiry with respect to responsibility is grounds for a determination that the Bidder is not a responsible Bidder. Post-bid information that may be required of a Contractor as to qualifications can include, but not be limited to those items listed in paragraph 33.

33.2.2 If the Base Bid is within the amount of funds available to finance the construction Contract, Contract award will be made to the responsible Bidder submitting the low Base Bid, excluding New Mexico gross receipts tax (NMGRT). If alternatives are to be awarded, the Owner will award the Contract to the responsible Bidder submitting the low Base Bid, excluding NMGRT, including any combination of any Additive Alternates or Deductive Alternates.

33.2.3 Discrepancies in the Bid Form between words and figures will be resolved in favor of words. Discrepancies between the indicated sum of any column of figures and the correct sum thereof will be resolved in favor of the correct sum.

**33.3 COMPETITIVE SEALED BIDS**

Contracts solicited by competitive sealed bids shall require that the bid amount exclude applicable New Mexico Gross Receipts Taxes or applicable local option taxes, but that the Owner shall be required to pay the applicable taxes, including any increase in the applicable tax which becomes effective after the date the Contract is entered into. The applicable Gross Receipts Tax shall be computed and shown as a separate amount on the Bid Form and on each request for payment

made under the Contract.

33.4 NOTICE OF AWARD

A written Notice of Award shall be issued by the Owner after review and approval of the bid and related documents by the SFSWMA Joint Powers Board, with reasonable promptness.

33.5 IDENTICAL BIDS

When two or more of the bids submitted are identical in price and are the low bid, the Owner may:

- A. Award pursuant to the multiple source award provisions of the Procurement Code;
- B. Award to a resident business if the identical low bids are submitted by a resident business and a nonresident business;
- C. Award to a resident manufacturer if the identical low bids are submitted by a resident manufacturer and a non-resident manufacturer;
- D. Award to one of the identical low Bidders;
- E. Reject all bids and re-solicit bids for the required services, construction, or items of tangible personal property.

33.6 CANCELLATION OF AWARD

When in the best interest of the public, the Owner may cancel the award of any contract at any time before the execution of said contract by all parties without any liability against the Owner.

34. POST-BID INFORMATION

34.1 RETURN OF BID SECURITY

All Bid Security in the form of checks, except those retained by the owner per paragraph 8.0 of this Instruction to Bidders will be returned within fifteen (15) days following the bid opening. The retained Bid Security of the Successful Bidder(s), if in the form of a check, will be returned after satisfactory Contract Bonds have been furnished and the Contract has been executed as stated in the above referenced paragraph 8.0. Bid Securities in the form of Bid Bonds will be returned only upon the request of the unsuccessful Bidder, but will be released by the Owner after the Notice of Award is sent by the Owner.

34.2 NOTICE TO PROCEED

The Owner will issue a written Notice to Proceed to Contractor stipulating the date from which Contract Time will be charged and the date Contract Time is to expire, subject to valid modifications of the Contract authorized by Change Order.

34.3 FAILURE TO EXECUTE CONTRACT

Failure to return the signed Contract with acceptable Contract Bonds and Certificate of Insurance within ten (10) calendar days after the date of the Notice of Award shall be just cause for the cancellation of the Award and the forfeiture of the Bid Security, which shall become payable to Owner damages sustained.

Award may then be made to the next lowest responsible Bidder, or the work may be re-advertised and constructed under contract or otherwise, as the Owner may decide.

34.4      **CONTRACTOR'S QUALIFICATION STATEMENT**

Bidder to whom award of a Contract is under consideration shall submit, upon request, information and data to prove that their financial resources, production or service facilities, personnel, and service reputation and experience are adequate to make satisfactory delivery of the services, construction, or items of personal property described in the Contract Documents and the form of submittal shall be a Statement of Bidder's Qualifications.

34.5      **CONTRACT BONDS REQUIREMENTS**

The Successful Bidder, where the Contract Price exceeds twenty-five thousand dollars (\$25,000), shall post a one hundred (100) percent Performance Bond and one hundred (100) percent Labor and Material Payment Bond. Bonds shall be executed on Performance Bond and Labor and Material Payment Bond forms attached hereto, with amount payable conforming to the terms of the Contract. Surety shall be a company licensed to do business in the State of New Mexico and acceptable to the Owner.

34.6      **INSURANCE REQUIREMENTS**

34.6.1 Contractor shall carry insurance to protect the Owner from and against all claims, demands, actions, judgments, costs, expenses and liabilities which may arise or result directly or indirectly from or by reasons of loss, injury or damage related to the Project. Contractor shall file with the Owner current certificates evidencing public liability insurance with limits as provided in the New Mexico Tort Claims Act, Section 41-4-19 NMSA 1978, and as that section or successors section may be amended from time to time. Contractor shall also carry such insurance as it deems necessary to protect it from all claims under any workmen's compensation law in effect that may be applicable to Contractor. All insurance required by the Contract shall be kept and remain in full force and effect for the entire life of the Contract.

34.6.2 The insurance coverage shall include worker's compensation, employer's liability, comprehensive general liability (Premises-Operations, independent contractors, products and completed operations, broad form property damage, contractual liability, explosion and collapse hazard, underground hazard, personal injury) comprehensive automobile liability (owned and hired), excess liability (umbrella form), and all-risk builder's risk.

34.6.3 All insurance coverage must be maintained for the entire term of the Contract. Products and completed operations coverage shall be maintained for a minimum period of one (1) year after final payment.

34.6.4 A valid certificate of insurance must be submitted to the Owner prior to issuance of a Notice-to-Proceed.

### 35. MINIMUM WAGE RATES

Any Contract entered into in excess of sixty thousand dollars (\$60,000) for construction, alteration, demolition, or repair, or any combination of these, including painting and decorating of public buildings or public works, is subject to the minimum wage rate determination issued by the New Mexico State Labor and Industrial Commission for this project. Federal Funded Contracts in excess of two thousand dollars (\$2,000) are subject to Federal Labor Standards Requirements of Davis Bacon Act. The Bidder shall ensure that, in submitting the bid, the minimum wage rate determination, included herein, has been utilized in preparing the bid.

## **Section 3 Bid Proposal**

**BID PROPOSAL  
BID No. '19/19/B  
CAJA DEL RIO LANDFILL  
CELLS 6B AND 6A WEDGE LINER SYSTEM CONSTRUCTION**

CONTRACTOR NAME \_\_\_\_\_

ADDRESS \_\_\_\_\_

To Santa Fe Solid Waste Management Agency, State of New Mexico (Owner):

The undersigned proposes to furnish and deliver all the material and to do all the work and labor required in the construction of "Cells 6B and 6A Wedge Liner System Construction" at the Caja del Rio Landfill in City of Santa Fe, State of New Mexico, according to the Construction Plans and Specifications at the prices named and shown on the Bid Form.

The undersigned declares that the only person or parties interested in the bid as principals are those named herein; that the bid is made without collusion with any person, firm or corporation; that the specifications have been carefully examined, including General and Supplemental Conditions, if any, and that the undersigned has made a personal examination of the site of the work has been made, that all the necessary machinery, tools, apparatus and other means of construction will be furnished and will do all the work and finish all the materials specified in the manner and the time prescribed; that the undersigned understands that the quantities are approximate only and subject to increase or decrease, and that the undersigned is willing to perform any increased or decreased quantities of work at the unit price bid.

The undersigned hereby agrees to execute and deliver the Contract Construction Agreement and required bonds within ten (10) days, or such further time as may be allowed in writing by the Owner after receiving notification of the acceptance of this bid, and it is hereby mutually understood and agreed that in case we do not, we forfeit the accompanying check or bid bond to the Owner as liquidated damages, and the said Owner may proceed to award the Contract to others.

The undersigned hereby agrees to commence the Work within ten (10) days, or such further time as may be allowed in writing by the after notification to proceed, and to complete the Work within ninety (90) calendar days, as outlined in the Contract Documents.

The undersigned proposes to furnish Labor and Material Payment Bond and Performance Bond in the amount of one hundred (100%) percent of the Contract Amount each as surety conditioned for the full complete and faithful performance of this contract, and to indemnify and save harmless the Owner from any damage or loss of which the Owner may become liable by the default of said Contractor, or by reason of any neglect or carelessness on the part of said Contractor, its agents or employees, or by or on account of any act or omission of said Contractor, its servants, agents or employees, in performance of this contract.

\_\_\_\_\_  
Signature

\_\_\_\_\_  
Date



## **Section 4 Bid Form**

**BID FORM  
SANTA FE SOLID WASTE MANAGEMENT AGENCY  
CAJA DEL RIO LANDFILL  
CELLS 6B AND 6A WEDGE LINER SYSTEM CONSTRUCTION  
CONTRACTING AGENCY AND OWNER**

NAME: \_\_\_\_\_

ADDRESS: \_\_\_\_\_

Hereinafter called Bidder.

TO: Ms. Shirley Rodriguez  
Purchasing Officer  
City of Santa Fe  
200 Lincoln Ave Room 122  
Santa Fe, NM 87501

Hereinafter called Owner,

**BID FOR: CAJA DEL RIO LANDFILL  
CELLS 6B AND 6A WEDGE LINER SYSTEM CONSTRUCTION**

Santa Fe Solid Waste Management Agency: Bid No. '19/19/B

1. The Bidder has familiarized itself with the existing conditions on the Project area affecting the cost of the Work and with the Contract Documents which includes:
  - a. Advertisement for Bids
  - b. Instructions for Bidders
  - c. Bid Proposal
  - d. Bid Form
  - e. Supplemental Bid Forms
  - f. Construction Agreement
  - g. Performance Bond
  - h. Labor and Material Payment Bond
  - i. General and Supplemental Conditions
  - j. Technical Specifications
  - k. Construction Plans.

The Bidder hereby proposes to furnish all supervision, technical personnel, labor, materials, tools, appurtenances, equipment, and services (including all utility and transportation services) required to construct and complete the improvements, all in accordance with the above listed Documents.

2. Bidder agrees to perform all work to construct the Tipping Floor Rehabilitation and General Structural Repairs described in the Specifications and shown on the Construction Plans for the following unit prices provided in the Bid Schedule (Unit Prices) below.

Amounts are to be shown in both words and figures. In case of discrepancy, the amount shown in words will govern.

**BID SCHEDULE (UNIT PRICES)**  
**BID NO. '19/19/B**

| <b>Item No.</b> | <b>Estimated Quantity</b> | <b>Brief Description of Item With<br/>Unit Bid Price in Words</b>                                 | <b>Unit Bid Price<br/>In Figures</b> |
|-----------------|---------------------------|---------------------------------------------------------------------------------------------------|--------------------------------------|
| 1.              | L.S.                      | Mobilization and Demobilization.<br><br>_____<br>Dollars and Cents per lump sum.                  | \$                                   |
| 2.              | Allowance                 | Tunnel Curb Modification<br><br>Twenty-five Thousand<br>_____<br>Dollars and Cents per allowance. | \$25,000.00                          |
| 3.              | L.S.                      | Construction Staking and Surveying<br><br>_____<br>Dollars and Cents per lump sum.                | \$                                   |
| 4.              | L.S.                      | Subgrade Preparation<br><br>_____<br>Dollars and Cents per lump sum.                              | \$                                   |
| 5.              | 1,750 L.F.                | Existing Edge of Liner System Tie-In<br><br>_____<br>Dollars and Cents per linear foot.           | \$                                   |
| 6.              | 568,700 S.F.              | Geosynthetic Clay Liner<br><br>_____<br>Dollars and Cents per square foot.                        | \$                                   |

| <b>Item No.</b> | <b>Estimated Quantity</b> | <b>Brief Description of Item With Unit Bid Price in Words</b>                           | <b>Unit Bid Price In Figures</b> |
|-----------------|---------------------------|-----------------------------------------------------------------------------------------|----------------------------------|
| 7.              | 568,700 S.F.              | 60 mil Textured HDPE Liner<br><br>Dollars and Cents per square foot.                    | \$                               |
| 8.              | 568,700 S.F.              | 10 oz/yd <sup>2</sup> Non-Woven Geotextile<br><br>Dollars and Cents per square foot.    |                                  |
| 9.              | 39,300 C.Y.               | Drainage Layer Material, Crushed Basalt<br><br>Dollars and Cents per cubic yard.        | \$                               |
| 10.             | 1,200 C.Y.                | Drainage Layer Material, Glass Cullet<br><br>Dollars and Cents per cubic yard.          | \$                               |
| 11.             | 800 L.F.                  | Leachate Collection Piping, Perforated<br><br>Dollars and Cents per linear foot.        | \$                               |
| 12.             | 170 L.F.                  | Leachate Collection Piping, Solid<br><br>Dollars and Cents per linear foot.             | \$                               |
| 13.             | 2,100 L.F.                | Excavate, Backfill, and Compact Anchor Trench<br><br>Dollars and Cents per linear foot. | \$                               |

SUBTOTAL - BASE BID AMOUNT FOR ITEMS 1-13: \$ \_\_\_\_\_

NEW MEXICO GROSS RECEIPTS TAX @ 7.1250% \$ \_\_\_\_\_

TOTAL – BASE BID PLUS NM GROSS RECEIPTS TAX \$ \_\_\_\_\_

**TWO COMPLETE COPIES OF THE BID SUBMITTAL IS REQUIRED**

3. In submitting this bid, the Bidder understands that the right is reserved by the Owner to reject any irregular or all bids, waive any technicalities in the bids, and accept the bid deemed to be in the best interest of the SFSWMA and that the Owner intends to award one contract (if at all) for the items bid. If written notice of the acceptance of this bid is mailed, telegraphed or otherwise delivered to the undersigned within sixty (60) days after the opening thereof or at any time thereafter before this bid is withdrawn, the undersigned agrees to execute and deliver.
4. All Addenda pertaining to this project shall be acknowledged by the Bidder in the spaces provided below (Indicate none if no Addenda have been issued):

| Addendum |      | Acknowledged by Bidder or its Authorized Representative | Date Acknowledged |
|----------|------|---------------------------------------------------------|-------------------|
| No.      | Date |                                                         |                   |
|          |      |                                                         |                   |
|          |      |                                                         |                   |
|          |      |                                                         |                   |
|          |      |                                                         |                   |
|          |      |                                                         |                   |
|          |      |                                                         |                   |
|          |      |                                                         |                   |
|          |      |                                                         |                   |
|          |      |                                                         |                   |
|          |      |                                                         |                   |

Failure to acknowledge receipt, as provided above, may be considered sufficient grounds for disqualification of the Bidder and rejection of the bid. A record of all Addenda and copies of same will be available to all qualified bidders from SFSWMA, 149 Wildlife Way, Santa Fe, NM, 87506, after 3:00 p.m., two (2) days prior to the letting. It shall be the bidder's responsibility to become fully advised of all Addenda prior to submitting their bid.

5. The Bidder agrees to commence work under this Contract within ten (10) days after a date to be specified in a written Notice to Proceed (NTP) from the Owner or its authorized agents, and fully complete construction of Cells 6B and 6A Wedge Liner System Construction within ninety (90) calendar days. Bidder further agrees to substantially complete the Work or to pay liquidated damages as provided in the Contract Documents.

6. Security in the sum of five (5) percent of the amount of the bid in form of (check one):

\_\_\_\_\_ Bid Bond \_\_\_\_\_ Certified Check

is attached hereto in accordance with the "Instructions for Bidders".

7. This Bid Form contains the following:

A. Bid Proposal;

- B. Bid Form, subcontractor/material list, and acknowledgement of Addenda, if any;
- C. Bid Bond or Check for Bid Security;
- D. Non-Collusion Affidavit of Prime Bidder;
- E. Non-Collusion Affidavit of Subcontractor(s);
- F. Certification of Nonsegregated Facilities;
- G. Certification of Bidder regarding Equal Employment Opportunity;
- H. Certification of Subcontractor regarding Equal Employment Opportunity; and
- I. Resident Veteran Business / Resident Business (if applicable).

**TWO COMPLETE COPIES OF THE BID SUBMITTAL IS REQUIRED**

Respectfully Submitted:

Name of Bidder \_\_\_\_\_

By: \_\_\_\_\_  
(Signature)

Title: \_\_\_\_\_

Date: \_\_\_\_\_

Official Address: \_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_

Telephone No.: \_\_\_\_\_

New Mexico Contractor's License Number and Types:

Contractor's CRS Number: \_\_\_\_\_

Federal Tax ID No. (EIN): \_\_\_\_\_

Resident Business Preference Certification Number

if any: \_\_\_\_\_

Resident Veteran Business/Contractor Preference Certification Number

if any: \_\_\_\_\_





## **Section 5 Bid Bond**

**BID BOND**

- A. KNOW ALL MEN BY THESE PRESENTS, THAT WE \_\_\_\_\_, hereinafter called the PRINCIPAL, and the \_\_\_\_\_, of \_\_\_\_\_ a Corporation duly organized under the laws of the State of \_\_\_\_\_, and, authorized to do business in the State of New Mexico, hereinafter called the SURETY, as SURETY are held and firmly bound unto the Santa Fe Solid Waste Management Agency, hereinafter called the OBLIGEE, in the sum of \_\_\_\_\_ dollars (\$\_\_\_\_\_) for the payment of which sum well and truly to be made, the said Principal and the said Surety, bind ourselves, our heirs, executors, administrators, successors and assigns, jointly and severally, firmly by these presents.

WHEREAS, the Principal has submitted the accompanying bid, dated \_\_\_\_\_, 2019, (Bid No.'19/19/B) for the construction of the Santa Fe Solid Waste Management Agency, Caja del Rio Landfill Cells 6B and 6A Wedge Liner System Construction, 149 Wildlife Way, Santa Fe, NM 87506.

- B. NOW, THEREFORE, if the Obligee shall accept the bid of the Principal and the Principal shall enter into a Contract with the Obligee in accordance with the terms of such bid, and give such bond or bonds as may be specified in the bidding or Contract Documents with good and sufficient surety for the faithful performance of such Contract and for the prompt payment of labor and material furnished in the prosecution thereof or in the event of the failure of the Principal to enter such contract and give such bond or bonds, if the Principal shall pay to the Obligee the difference not to exceed the penalty hereof between the amount specified in said bid and such larger amount for which the Obligee may in good faith contract with another party to perform the work covered by said bid, then this obligation shall be null and void, otherwise to remain in full force and effect.
- C. SIGNED AND SEALED THIS \_\_\_\_\_ DAY OF \_\_\_\_\_, 2019.

\_\_\_\_\_  
BIDDER

\_\_\_\_\_  
WITNESS

By: \_\_\_\_\_ (SEAL)  
PRINCIPAL

\_\_\_\_\_  
WITNESS

By: \_\_\_\_\_  
SURETY

\_\_\_\_\_  
TITLE

## **Section 6 Supplemental Bid Forms**

**SUPPLEMENTAL BID FORMS**

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| Non-Collusion Affidavit of Subcontractor(s) .....                           | 6-5                |
| Certification of Non-Segregated Facilities .....                            | 6-6                |
| Certification of Bidder Regarding Equal Employment Opportunity .....        | 6-7                |
| Certification of Subcontractor Regarding Equal Employment Opportunity ..... | 6-8                |

**NON-COLLUSION AFFIDAVIT OF PRIME BIDDER**

STATE OF NEW MEXICO

COUNTY OF \_\_\_\_\_

\_\_\_\_\_ being first duly sworn, deposes and says that:

- (1) The undersigned is the \_\_\_\_\_ of \_\_\_\_\_ the Bidder that has submitted the attached Bid Proposal;
- (2) The undersigned is fully informed respecting the preparation and contents of the attached Bid Proposal and of all pertinent circumstances respecting such bid;
- (3) Such bid is genuine and is not a collusive or sham bid;
- (4) Neither the said Bidder nor any of its officers, partners, owners, agents, representatives, employees or parties in interest, including this affidavit, has in any way colluded, conspired, connived or agreed, directly or indirectly with any other Bidder, firm or person to submit a collusive or sham bid in connection with the Contract for which the attached bid has been submitted or to refrain from bidding in connection with such Contract, or has in any manner, directly or indirectly, sought by agreement or collusion or communications or conference with any other Bidder, or to secure through any collusion, conspiracy, connivance or unlawful agreement any advantage against the Contracting Agency or any person interested in the proposed Contract; and
- (5) The price or prices quoted in the attached bid are fair and proper and are not tainted by any collusion, conspiracy, connivance or unlawful agreement on the part of the Bidder or any of its agents, representatives, owners, employees, or parties in interest, including this affidavit.

(SIGNED) \_\_\_\_\_

TITLE \_\_\_\_\_

SUBSCRIBED AND SWORN to before me this \_\_\_\_\_ day of \_\_\_\_\_ 2019.

\_\_\_\_\_  
NOTARY PUBLIC

My Commission Expires \_\_\_\_\_

## SUBCONTRACTS

- A. Contractor shall not execute an agreement with any subcontractor or permit any Subcontractor to perform any work included in this contract until Contractor has submitted a Non-Collusion Affidavit from the Subcontractor, which is in substantially the form that follows page 6-5 and has received written approval of such Subcontractor from the Owner.
- B. No proposed Subcontractor shall be disapproved by the Owner except for cause.
- C. Contractor shall be as fully responsible to the Owner for the acts and omissions of the Subcontractors and of persons either directly or indirectly employed by them, as Contractor is for the acts and omissions of persons directly employed by Contractor.
- D. Contractor shall cause appropriate provision to be inserted in all subcontracts relative to the work to require compliance by each Subcontractor with the applicable provisions of the Contract for the improvements embraced.
- E. Nothing contained in the Contract shall create any contractual relation between any Subcontractor and the Owner.

**NON-COLLUSION AFFIDAVIT OF SUBCONTRACTOR**

STATE OF NEW MEXICO

COUNTY OF \_\_\_\_\_

\_\_\_\_\_ being first duly sworn, deposes and says that:

- (1) The undersigned is the \_\_\_\_\_ of \_\_\_\_\_, hereinafter referred to as "Subcontractor".
- (2) The undersigned is fully informed respecting the preparation and contents of the Subcontractor's proposal submitted by Subcontractor to \_\_\_\_\_, Contractor, for certain work in connection with the \_\_\_\_\_ contract pertaining to the project in \_\_\_\_\_.
- (3) Such Subcontractors proposal is genuine and is not a collusive or sham proposal.
- (4) Neither Subcontractor nor any of its officers, partners, owners, agents, representatives, employees or parties in interest, including this affidavit, has in any way colluded, conspired, connived or agreed, directly or indirectly with any other Bidder, firm or person to submit a collusive or sham bid in connection with the Contract for which the attached bid has been submitted or to refrain from bidding in connection with such Contract, or has in any manner, directly or indirectly, sought by agreement or collusion or communications or conference with any other Bidder, or to secure through any collusion, conspiracy, connivance or unlawful agreement any advantage against the Contracting Agency or any person interested in the proposed Contract; and
- (5) The price or prices quoted in Subcontractor's proposal are fair and proper and are, not tainted by any collusion, conspiracy, connivance or unlawful agreement on the part of the Bidder or any of its agents, representatives, owners, employees, or parties in interest, including this affidavit.

(SIGNED) \_\_\_\_\_

(PRINT NAME) \_\_\_\_\_

TITLE \_\_\_\_\_

SUBSCRIBED AND SWORN to before me this \_\_\_\_\_ day of \_\_\_\_\_ 2019.

\_\_\_\_\_  
NOTARY PUBLIC

My Commission Expires \_\_\_\_\_

**CERTIFICATION OF NON-SEGREGATED FACILITIES**

(Applicable to construction contracts and related subcontracts exceeding \$10,000 which are not exempt from the Equal Opportunity Clause).

The construction Contractor certifies that Contractor does not maintain or provide for its employees any segregated facilities at any of its establishments, and does not permit its employees to perform their services at any location, under its control, where segregated facilities are maintained. The construction Contractor certifies further that Contractor will not maintain or provide for its employees any segregated facilities at any of its establishments, and that Contractor will not permit its employees to perform their services at any location, under its control, where segregated facilities are maintained. The construction Contractor agrees that a breach of this certification is a violation of the Equal Opportunity Clause in this contract. As used in this certification, the term "segregated facilities" means any waiting room, work areas, rest rooms and wash rooms, restaurants and other eating areas, time clock, locker rooms and other storage or dressing areas, parking lots, drinking fountains, recreating or entertainment areas, transportation, and housing facilities provided for employees which are segregated by explicit directive or are in fact segregated on the basis of race, creed, color, or national origin, because of habit, local custom, or otherwise. The construction Contractor agrees that (except where Contractor has obtained identical certifications from proposed subcontractors for specific time periods) Contractor will obtain identical certifications from proposed SUBCONTRACTORS prior to the award of subcontracts exceeding \$10,000 which are not exempt from the provisions of the Equal Opportunity Clause and that Contractor will retain such certifications in its files.

(SIGNED) \_\_\_\_\_

PRINT NAME \_\_\_\_\_

TITLE \_\_\_\_\_

SUBSCRIBED AND SWORN to before me this \_\_\_\_\_ day of \_\_\_\_\_ 2019.

\_\_\_\_\_  
NOTARY PUBLIC

My Commission Expires \_\_\_\_\_



**CERTIFICATION OF BIDDER REGARDING  
EQUAL EMPLOYMENT OPPORTUNITY**

**INSTRUCTIONS**

This certification is required pursuant to Executive Order 11246 (30 F. R. 12319-25). The implementing rules and regulations provide that any bidder or prospective contractor, or any of their proposed subcontractors, shall state as an initial part of the bid or negotiations of the contract or subcontract whether it has participated in any previous contract or subcontract subject to the equal opportunity clause; and, if so, whether it has filed all compliance reports due under applicable instructions.

Where the certification indicates that the bidder has not filed a compliance report due under applicable instructions, such bidder shall be required to submit a compliance report within seven (7) calendar days after bid opening. No contract shall be awarded unless such report is submitted.

---

**CERTIFICATION OF BIDDER**

Bidder's Name: \_\_\_\_\_

Address: \_\_\_\_\_

1. Bidder has participated in a previous contract or subcontract subject to the Equal Opportunity Clause.

Yes \_\_\_\_\_ No \_\_\_\_\_

2. Compliance reports were required to be filed in connection with such contract or subcontract.

Yes \_\_\_\_\_ No \_\_\_\_\_

---

Certification: The information above is true and complete to the best of my knowledge and belief.

---

NAME AND TITLE OF SIGNER (PLEASE TYPE)

---

SIGNATURE

---

DATE

**CERTIFICATION OF SUBCONTRACTOR REGARDING  
EQUAL EMPLOYMENT OPPORTUNITY**

**INSTRUCTIONS**

This certification is required pursuant to Executive Order 11246 (30 F. R. 12319-25). The implementing rules and regulations provide that any bidder or perspective contractor, or any of their proposed subcontractors, shall state as an initial part of the bid or negotiations of the contract or subcontract whether it has participated in any previous contract or subcontract subject to the equal opportunity clause; and, if so, whether it has filed all compliance reports due under applicable instructions.

Where the certification indicates that the bidder has not filed a compliance report due under applicable instructions, such bidder shall be required to submit a compliance report within seven (7) calendar days after bid opening. No contract shall be awarded unless such report is submitted.

---

**CERTIFICATION OF SUBCONTRACTOR**

Subcontractor's Name: \_\_\_\_\_

Address: \_\_\_\_\_

\_\_\_\_\_

1. Subcontractor has participated in a previous contract or subcontract subject to the Equal Opportunity Clause.

Yes \_\_\_\_\_ No \_\_\_\_\_

2. Compliance reports were required to be filed in connection with such contract or subcontract.

Yes \_\_\_\_\_ No \_\_\_\_\_

---

Certification: The information above is true and complete to the best of my knowledge and belief.

---

NAME AND TITLE OF SIGNER (PLEASE TYPE)

---

SIGNATURE

---

DATE

## **Section 7**

# **Agreement between Owner and Contractor**

**SANTA FE SOLID WASTE MANAGEMENT AGENCY**

**AGREEMENT BETWEEN  
OWNER AND CONTRACTOR**

**CAJA DEL RIO LANDFILL  
CELLS 6B AND 6A WEDGE LINER SYSTEM CONSTRUCTION**

This Agreement, entered into this \_\_\_\_ day of \_\_\_\_\_, 2019, by and between the **SANTA FE SOLID WASTE MANAGEMENT AGENCY**, herein known as the Owner, and \_\_\_\_\_, herein known as Contractor for the following:

PROJECT: Caja del Rio Landfill  
Cells 6B and 6A Wedge Liner System Construction

PROJECT No.: '19/19/B

ENGINEER OF RECORD: CDM Smith Inc.  
6001 Indian School Rd NE, Suite 310  
Albuquerque, NM 87110

**DISTRIBUTION:**

OWNER SANTA FE SOLID WASTE MANAGEMENT AGENCY

CONTRACTOR \_\_\_\_\_

ENGINEER CDM SMITH INC.

USER AGENCY \_\_\_\_\_

OTHER \_\_\_\_\_

## **RECITALS**

WHEREAS, the Owner, through its Solid Waste Joint Powers Board, is authorized to enter into a construction contract for the project; and

WHEREAS, the Owner, has let this contract according to the established State and Local Purchasing procedures for contracts of the type and amount let; and

WHEREAS, the Solid Waste Joint Powers Board approved this contract at its meeting of \_\_\_\_\_, 2019.

The OWNER and Contractor agree:

## **ARTICLE 1** **THE CONTRACT DOCUMENTS**

The Contract Documents consist of this Agreement, the Conditions of the Contract (General, Supplementary, and other Conditions), the Construction Plans, the Specifications, all Addenda issued prior to and all Modifications issued after execution of this Agreement. These documents form the Contract, and all are as fully a part of the Contract as if attached to this Agreement or repeated herein.

## **ARTICLE 2** **THE WORK**

Contractor shall perform all the Work required by the Contract Documents for SFSWMA, Caja del Rio Landfill Cells 6B and 6A Wedge Liner System Construction, 149 Wildlife Way, Santa Fe, NM 87506.

## **ARTICLE 3** **TIME OF COMMENCEMENT AND SUBSTANTIAL COMPLETION**

The work to be performed under this Contract shall be commenced not later than ten (10) consecutive calendar days after the date of written Notice to Proceed. Substantial Completion for the Bid Work shall be achieved within ninety (90) calendar days after the date of written Notice to Proceed [the Contract Time] except as hereafter extended by valid written Change Order by the Owner.

## **ARTICLE 4** **CONTRACT SUM**

The Owner shall pay Contractor in current funds for the performance of the Work, subject to additions and deductions by Change Order as provided in the Contract Documents, the Contract Sum of \_\_\_\_\_ dollars (\$\_\_\_\_\_).

The Contract Sum is determined as follows:

|                       |          |
|-----------------------|----------|
| Base Bid Work         | \$ _____ |
| NM Gross Receipts Tax | \$ _____ |
| TOTAL                 | \$ _____ |

**ARTICLE 5**  
**PROGRESS PAYMENTS**

Based upon Application for Payment submitted to the Owner by Contractor and Certificates for Payment issued by the Owner, the Owner shall make progress payments on account of the Contract Sum to Contractor as provided in the Contract Documents for the period ending the last day of the month as follows:

Not later than thirty (30) days following the end of the period covered by the Application for Payment, ninety five percent (95%) of the portion of the Contract sum properly allocable to labor, materials, and equipment incorporated in the work and ninety five percent (95%) of the portion of the Contract sum properly allocable to materials and equipment suitably stored at the site or some other location agreed upon in writing for the period covered by the Application for Payment, less the aggregate of previous payments made by the Owner; and upon substantial completion of the entire work, a sum sufficient to increase the total payments to ninety-eight percent (98%) of the Contract Sum, less such amounts as the Owner shall determine for all incomplete work and unsettled claims as provided in the Contract Documents.

**ARTICLE 6**  
**LIQUIDATED DAMAGES**

Should Contractor neglect, refuse, or otherwise fail to complete the work within the Contract Period of ninety (90) calendar days or any extension in the Contract thereof, Contractor agrees to pay to the Owner the amount of one thousand dollars (\$1,000) per consecutive calendar day of delay until the work is completed and accepted or until voided pursuant to the provisions of the General Conditions of the Contract, not as a penalty, but as liquidated damages for such breach of the Contract.

**ARTICLE 7**  
**FINAL PAYMENT**

Final payment, constituting the entire unpaid balance of the Contract Sum, shall be paid by the Owner to Contractor within twenty-one (21) calendar days after all deficiencies to the Contract document that were noted during the Substantial Completion Inspection and listed on the attachment to the Certificate of Substantial Completion have been corrected, and provided the Contract has been fully performed and a final Certificate for Payment has been issued by the Owner. In addition, Contractor shall provide to the Owner a certified statement of Release of Lien (AIA Document G706A or approved form), Consent of Surety, Warranty from Prime Contractor, Warranties from Suppliers and Manufacturers, training sessions, equipment/operating manuals, and as-built drawings.

**ARTICLE 8**  
**SCHEDULE**

Contractor shall, within five (5) working days after the effective date of Notice to Proceed, prepare and submit five (5) copies of a progress schedule covering project operations for the Contract Period of ninety (90) calendar days for the Work. This progress schedule shall be of the type generally referred to as a Critical Path Method (CPM), Critical Path Schedule (CPS), and Critical Path Analysis (CPA), and other similar designations. The CPM shall be used to control the timing and sequences of the project. All work shall be done in accordance with the CPM Planning and Scheduling. A written statement of explanation shall be submitted with the

progress schedule. All costs incurred by Contractor to implement the CPM shall be borne by Contractor, and are part of their contract.

## **ARTICLE 9**

### **GENERAL AND SPECIAL PROVISIONS**

- 9.1 This Agreement shall be governed exclusively by the provisions hereof and by the laws of the State of New Mexico as the same from time to time exist.
- 9.2 Terms used in this agreement which are defined in the Conditions of the Contract shall have the meanings designated in those Conditions.
- 9.3 Contractor shall defend, indemnify, and hold harmless the Owner against any and all injury, loss, or damage, including, without limitation, cost of defense, court costs and attorney's fees arising out of the acts, errors, or omissions of Contractor.
- 9.4 An enumeration of Contractor's Liability Insurance requirements appears in the General Conditions of the Contract for construction. Insurance requirements are also described in the Instructions to the Bidder section of the Project Manual. Contractor shall maintain adequate insurance in at least the aggregate maximum amounts which the Owner could be liable under the New Mexico Tort Claims Act and shall provide proof of such insurance coverage to the SFWMA. It is the sole responsibility of Contractor to be in compliance with the law.
- 9.5 This Agreement shall not become effective until: (1) approved by the SFSWMA signed by all parties required to sign this Agreement.
- 9.6 Contractor and Contractor's agents and employees are independent contractors performing professional and technical services for the Owner and are not employees of the Owner. Contractor and Contractor's agents and employees shall not accrue leave, retirement, insurance, bonding, use of Owner's vehicles, or any other benefits afforded to employees of the Owner as a result of this Agreement.
- 9.7 Contractor shall not subcontract any portion of the services to be performed under this Agreement without the prior written approval of the Owner.
- 9.8 Contractor shall maintain detailed time records, which indicate the date, time and nature of services rendered. These records shall be subject to inspection by the Owner, the Department of Finance and Administration and the State Auditor. The Owner shall have the right to audit the billing both before and after payment; payment under this Agreement shall not foreclose the right of the Owner to recover excessive illegal payments.
- 9.9 The terms of this Agreement are contingent upon sufficient appropriations and authorization being made by the Owner for the performance of this Agreement. If sufficient appropriations and authorization are not made by the Owner, this Agreement shall terminate upon written notice being given by the Owner to Contractor. The Owner's decision as to whether sufficient appropriations are available shall be accepted by Contractor and shall be final.
- 9.10 Contractor warrants that Contractor presently has no interest and shall not acquire any interest, direct or indirect, which would conflict in any manner or degree with the performance or services required under this Agreement.

- 9.11 Contractor hereby warrants that Contractor is in compliance with the Americans with Disabilities Act, 29 CFR 1630.
- 9.12 Contractor, upon final payment of the amounts due under this Agreement, releases the Owner, the Owner's officers and employees, and SFSWMA from all liabilities and obligations arising from or under this Agreement, including, without limitation, to all damages, losses, costs, liability, and expenses, including, without limitation, to attorney's fees and costs of litigation that Contractor may have.
- 9.13 Contractor agrees not to purport to bind the Owner to any obligation not assumed herein by the Owner, unless Contractor has express written authority to do so, and then only within the strict limits of that authority.
- 9.14 Notices. Any and all notices provided for hereunder shall be in writing and shall be deemed delivered, given and received when (i) personally delivered, or (ii) five (5) days after the same are deposited in the United States mail, postage prepaid, registered or certified mail, return receipt requested, addressed to the applicable party at the address indicated below for such party, or at such other address as may be designated by either party in a written notice to the other party.

**OWNER:**

Santa Fe Solid Waste Management Agency  
Attn: Mr. Randall Kippenbrock, P.E., Executive Director  
149 Wildlife Way  
Santa Fe, NM 87506

**CONTRACTOR:**

\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_

New Mexico Contractor License No. \_\_\_\_\_

- 9.15 Gender, Singular/Plural. Words of any gender used in this Agreement shall be held and construed to include any other gender, and words in the singular number shall be held to include the plural, unless the context otherwise requires.
- 9.16 Captions and Section Headings. The captions and section headings contained in this Agreement are for convenience of reference only, and in no way limit, define, or enlarge the terms, scope and conditions of this Agreement.
- 9.17 This document shall be executed in no less than five (5) counterparts, each of which shall be deemed an original.
- 9.18 Certificates and Documents Incorporated. All certificates and documentation required by the provisions of the Agreement shall be attached to this Agreement at the time of execution, and are hereby incorporated by reference as though set forth in full in this Agreement to the extent they are consistent with its conditions and terms.
- 9.19 Separability. If any clause or provision of this Agreement is illegal, invalid or



unenforceable under present or future laws effective during the term of this Agreement, then and in that event, it is the intention of the parties hereto that the remainder of this Agreement shall not be affected thereby.

- 9.20 Waiver. No provision of this Agreement shall be deemed to have been waived by either party unless such waiver be in writing signed by the party making the waiver and addressed to the other party; nor shall any custom or practice which may evolve between the parties in the administration of the terms hereof be construed to waive or lessen the right of either party to insist upon the performance by the other party in strict accordance with the terms hereof. Further, the waiver by any party of breach by the other party of any term, covenant, or condition hereof shall not operate as a waiver of any subsequent breach of the same or any other term, covenant, or condition thereof.
- 9.21 Entire Agreement. This Agreement represents the entire Contract between the parties and, except as otherwise provided herein, may not be amended, changed, modified, or altered without the written consent of the parties hereto. This Agreement incorporates all of the conditions, agreements, and understandings between the parties concerning the subject matter of this Contract, and all such conditions, understandings, and agreements have been merged into this written Agreement. No prior conditions, agreements, or understandings, verbal or otherwise, of the parties or their agents shall be valid or enforceable unless embodied in this written Agreement.
- 9.22 Interchangeable Terms. For purposes of all provisions within this Agreement and all attachments hereto, the terms "Agreement" and "Contract" shall have the same meaning and shall be interchangeable.
- 9.23 Words and Phrases. Words, phrases, and abbreviations which have well-known technical or trade meanings used in the Contract documents shall be used according to such recognized meaning. In the event of a conflict, the more stringent meaning shall govern.
- 9.24 Relationship of Contract Documents. The Contract Documents are complementary, and any requirement of one contract document shall be as binding as if required by all.
- 9.25 Pursuant to Section 13-1-191, NMSA 1978, reference is hereby made to the Criminal Laws of New Mexico (including Sections 30-14-1, 30-24-2, and 30-41-1 through 30-41-3, NMSA 1978) which prohibit bribes, kickbacks, and gratuities, the violation of which constitutes a felony. Further, the Procurement Code (Sections 13-1-28 through 13-1-199, NMSA 1978) imposes civil and criminal penalties for its violation.
- 9.26 By entering into this Agreement, the parties do not intend to create any right, title or interest in or for the benefit of any person other than the Owner and Contractor. No person shall claim any right, title of interest under this Agreement or seek to enforce this Agreement as a third-party beneficiary of this Agreement.

9.27 This Agreement is entered into as of the day and year first written above.

**SANTA FE SOLID WASTE MANAGEMENT AGENCY - JOINT POWERS BOARD**

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RENEE VILLARREAL  
CHAIRPERSON

**ATTEST:**

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YOLANDA Y. VIGIL  
SANTA FE CITY CLERK

**CONTRACTOR:**

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**APPROVED AS TO FORM:**

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NANCY R. LONG  
SFSWMA ATTORNEY

## **Section 8**

# **Performance Bond**

## **PERFORMANCE BOND**

A. KNOW ALL MEN BY THESE PRESENTS, that \_\_\_\_\_ (here insert the name and address or legal title of Contractor) as Principal, hereinafter called Contractor, and \_\_\_\_\_ (here insert the legal title of Surety) as Surety, hereinafter called Surety, are held firmly bound unto the Santa Fe Solid Waste Management Agency as Obligee, hereinafter called Owner, in the amount of \_\_\_\_\_ DOLLARS (\$ \_\_\_\_\_) for the payment whereof Contractor and Surety bind themselves, their heirs, executors, administrators, successors and assigns, jointly and severally, firmly by these presents.

B. WHEREAS, Contractor has by written agreement dated, \_\_\_\_\_, 2019, entered into a Contract with the Santa Fe Solid Waste Management for the \_\_\_\_\_ in accordance with Construction Plans and Specifications prepared by the Owner which Contract is by reference made a part hereof, and is hereinafter referred to as the Contract.

C. NOW, THEREFORE, THE CONDITION OF THIS OBLIGATION is such that, if Contractor shall promptly and faithfully perform said Contract, then this obligation shall be null and void; otherwise it shall remain in full force and effect.

1. The Surety hereby waives notice of any alteration or extension of time made by the Owner.
2. Whenever Contractor shall be, and declared by the Owner to be in default under the Contract, the Owner having performed Owner's obligations thereunder, the Surety may promptly remedy the default or shall promptly:
  - a. Complete the Contract in accordance with its terms and conditions or
  - b. Obtain a bid or bids for submission to Owner for completing the Contract in accordance with its terms and conditions, and upon determination by Owner and Surety of the lowest responsible bidder, arrange for a contract between such bidder and Owner, and make available as work progresses (even though there should be a default or a secession of defaults under the contract or contracts of completion arranged under this paragraph) sufficient funds to pay the cost of completion less the balance of the contract price, but not exceeding, including other costs and damages for which the surety may be liable hereunder, the amount set forth in the first paragraph hereof. The term "balance of the Contract price" as used in this paragraph, shall mean the total amount payable by Owner to Contractor under the Contract and any amendments thereto, less the amount properly paid by Owner to Contractor.
3. Any suit under this bond must be instituted before the expiration of two (2) years

from the date on which final payment under the contract falls due.

4. No right of action shall accrue on this bond to or for the use of any person or corporation other than the Owner named herein or the heirs, executors, administrators or successors of the Owner.

(SIGNED) \_\_\_\_\_

TITLE \_\_\_\_\_

SUBSCRIBED AND SWORN to before me this \_\_\_\_\_ day of \_\_\_\_\_, 2019.

---

**NOTARY PUBLIC**

My Commission Expires \_\_\_\_\_

---

**CONTRACTOR- PRINCIPAL**

By: \_\_\_\_\_

Title: \_\_\_\_\_

Approved as to form:

**SURETY**

Title: \_\_\_\_\_

Countersigned: \_\_\_\_\_

Surety's Authorized New Mexico Agent

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## **Section 9**

# **Labor and Material Payment Bond**

## **LABOR AND MATERIAL PAYMENT BOND**

**A. KNOW ALL MEN BY THESE PRESENTS THAT**

(HERE INSERT THE NAME AND ADDRESS OR LEGAL TITLE OF CONTRACTOR) as Principal, hereinafter called Principal, and \_\_\_\_\_

(HERE INSERT THE LEGAL TITLE OF SURETY)

As Surety, hereinafter called Surety, are held and firmly bound unto the Santa Fe Solid Waste Management Agency as Obligee, hereinafter called Owner, for the use and benefits of claimants as herein below defined, in the amount of \_\_\_\_\_

DOLLARS, (\$\_\_\_\_\_) for the payment whereof Principal and Surety bind themselves, their heirs, executors, administrators, successors and assigns, jointly and severally, firmly by these presents.

**B. WHEREAS,** Principal has by written agreement dated \_\_\_\_\_, 2019 entered into a contract with the Santa Fe Solid Waste Management Agency for the

\_\_\_\_\_ in accordance with Construction Plans and Specifications prepared by the Santa Fe Solid Waste Management Agency, which contract is by reference made a part hereof, and is hereinafter referred to as the Contract.

**C. NOW, THEREFORE, THE CONDITION OF THIS OBLIGATION** is such that if the Principal shall promptly make payment to all claimants as hereinafter defined, for all labor and material used or reasonably required for use in the performance of the Contract, than this obligation shall be void; otherwise, it shall remain in full force, subject, however, to the following conditions.

1. A claimant is defined as one having a direct contract with the principal or with a subcontractor of the principal for labor, material, or both, used or reasonably required for use in the performance of the Contract, labor and material being construed to include that part of water, gas, power, light, heat, oil, gasoline, telephone service or rental of equipment directly applicable to the Contract.
2. The above-named Principal and Surety hereby jointly and severally agree with the Owner that every claimant as herein defined, who has not been paid in full before the expiration of a period of ninety (90) days after the date on which the last of such claimant's work or labor was done or performed, or materials were furnished by such claimant, prosecute the suit to final judgment for such sum or sums as may be justly due claimant, and have execution thereon. The Owner shall not be liable for payment of any cost or expenses of any such suit.
3. No suit or action shall be commenced hereunder by any claimant:
  - a. Unless claimant, or other than one having a direct contract with the principal, shall have written notice to any two of the following: the Principal, the Owner, or the Surety above named, within ninety (90) days after such said claim is made, stating



- with substantial accuracy the amount claimed and the name of the party to whom the materials were furnished, or for whom the work or labor was done or performed.
- b. Such notice shall be served by mailing the same by registered mail or certified mail, postage prepaid, in an envelope addressed to the Principal, Owner or Surety, at any place where an office is regularly maintained for the transaction of business, or revised in any manner in which legal process may be served in the state in which the aforesaid project is located, save that such services need not be made by a public officer.
  - c. After the expiration of one (1) year following the date on which Principal ceased work on said Contract, it being understood, however, that if any limitation embodied in this bond is prohibited by any law controlling the construction hereof, such limitation shall be deemed to be amended so as to be equal to the minimum period of limitation permitted by such law.
  - d. Other than in a state court of competent jurisdiction in and for the Owner or other political subdivision of the state in which the project, or any part thereof, is situated, or in the United States District Court for the district in which the project, or any part thereof, is situated, and not elsewhere.
4. The amount of this bond shall not be reduced by and to the extent of any payments made in good faith hereunder, inclusive of the payment by Surety of mechanics liens which may be filed of record against said improvement, whether or not claim for the amount of such lien be presented under and against this bond.

SIGNED AND SEALED on \_\_\_\_\_ , 2019

In the presence of:

\_\_\_\_\_  
**NOTARY PUBLIC**

My Commission Expires: \_\_\_\_\_

\_\_\_\_\_  
**NAME OF COMPANY**

By: \_\_\_\_\_

Title: \_\_\_\_\_

\_\_\_\_\_  
**SURETY**

By: \_\_\_\_\_

Title: \_\_\_\_\_

Countersigned:

\_\_\_\_\_  
Surety's Authorized New Mexico Agent

This bond is issued simultaneously with performance bond in favor of contracting agency for the faithful performance of the contract.

## **Section 10**

# **General Conditions**

## **NOTICE**

This document has been prepared by the staff of the Owner for use in construction projects.

DOCUMENT - SECTION 00710

GENERAL CONDITIONS OF THE CONTRACT FOR CONSTRUCTION

**NOTE: THIS DOCUMENT HAS IMPORTANT LEGAL CONSEQUENCES; CONSULTATION WITH AN ATTORNEY IS ENCOURAGED WITH RESPECT TO ITS COMPLETION OR MODIFICATION.**

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## **ARTICLE 1**

### **CONTRACT DOCUMENTS**

#### **1.1 DEFINITIONS**

##### **1.1.1 THE CONTRACT DOCUMENTS**

The Contract Documents consist of the Owner-Contractor Agreement, the Conditions of the Contract (General, Supplementary, and Other Conditions), the Construction Plans, the Specifications, and all Addenda issued prior to and all Modifications issued after execution of the Contract. A Modification is (1) a written amendment to the Contract signed by both parties, (2) a Change Order, (3) a written interpretation issued by the Engineer pursuant to Subparagraph 2.2.6, or (4) a written order for a minor change in the work issued by the Engineer pursuant to Paragraph 12.4. The Contract Documents do not include Bidding Documents such as the Advertisement or Invitation to Bid, the Instructions to Bidders, sample forms, Contractor's bid, or portions of Addenda relating to any of these, or any other documents, unless specifically enumerated in the Owner-Contractor Agreement.

##### **1.1.2 THE CONTRACT**

The Contract Documents form the Contract for Construction. This Contract represents the entire and integrated agreement between the parties hereto and supersedes all prior negotiations, representations, or agreements, either written or oral. The Contract may be amended or modified only by a Modification as defined in Subparagraph 1.1.1. The Contract Documents shall not be construed to create any contractual relationship of any kind between the Engineer and Contractor, but the Engineer shall be entitled to performance of obligations intended for its benefit, and to enforcement thereof. Nothing contained in the Contract Documents shall create any contractual relationship between the Owner or the Engineer and any Subcontractor or Sub-subcontractor.

##### **1.1.3 THE WORK**

The Work comprises the design and completed construction required by the Contract Documents, and includes design specifications, and all labor necessary to produce such construction, and all materials and equipment incorporated or to be incorporated in such construction.

##### **1.1.4 THE PROJECT**

The Project is the total design and construction of which the work performed under the Contract Documents may be the whole or a part.

#### **1.2 EXECUTION, CORRELATION AND INTENT**

1.2.1 No fewer than five (5) copies of the Contract Documents shall be signed by the Owner and Contractor. If either the Owner or Contractor or both do not sign the Conditions of the Contract, Construction Plans, Specifications, or any of the other Contract Documents, the Engineer shall identify such Documents.

1.2.2 By executing the Contract, Contractor represents that Contractor has visited the site, familiarized itself with the local conditions under which the work is to be performed, and correlated its observations with the requirements of the Contract Documents.

1.2.3 The intent of the Contract Documents is to include all items necessary for the proper execution and completion of the work. The Contract Documents are complementary, and what is required by any one shall be as binding as if required by all work not covered in the Contract Documents will not be required unless it is consistent therewith and is reasonably inferable therefrom as being

necessary to produce the intended results. Words and abbreviations which have well-known technical or trade meanings are used in the Contract Documents in accordance with such recognized meanings. In the event of a conflict between the Contract Documents, the more stringent requirements shall govern.

- 1.2.4 The organization of the Specifications into divisions, sections and articles, and the arrangement of Construction Plans shall not control Contractor in dividing the work among Subcontractors or in establishing the extent of work to be performed by any trade.

### **1.3 OWNERSHIP AND USE OF DOCUMENTS**

- 1.3.1 All designs, construction plans, technical specifications, notes, and other work developed in the performance of this Contract shall be and remains the sole property of the Owner and may be used on any other work without additional compensation to the Engineer. With respect thereto, the Engineer agrees not to assert any rights and not to establish any claims under the design patent or copyright laws.

## **ARTICLE 2**

### **ENGINEER/ OWNER**

#### **2.1 DEFINITION**

- 2.1.1 The Engineer is the person lawfully licensed to practice Engineering, or an entity lawfully practicing Engineering identified as such in the Owner-Contractor Agreement, and is referred to throughout the Contract Documents as if singular in number and masculine in gender. The term "Engineer" means the Owner or authorized representative.

#### **2.2 ADMINISTRATION OF THE CONTRACT**

- 2.2.1 The Engineer will provide administration of the Contract as hereinafter described.
- 2.2.2 The Engineer will be the Owner's representative during construction and until final payment is due. The Engineer will advise and consult with the Owner. The Owner's instructions to Contractor shall be forwarded through the Engineer. The Engineer shall have the authority to act on behalf of the Owner only to the extent provided in the Contract Documents, unless otherwise modified by written instrument in accordance with Subparagraph 2.2.17.
- 2.2.3 The Engineer shall submit to the Owner, for approval, a list of critical inspection points based upon the construction schedule furnished by the Contractor (Paragraph 4.11.1). The Engineer and its staff (including the on-site representative, if agreed upon) shall make visits to the site at those critical points and at other times as the Engineer deems appropriate during the progress of the work. Additionally, the Engineer shall familiarize itself with the progress and quality of the work and determine if the work is proceeding in accordance with the Contract Documents. On the basis of on-site observations, as an Engineer, it shall guard the Owner against defects and deficiencies in the construction. Should the Engineer determine that any portion of the work varies from the intent of the Contract Documents it shall immediately notify Contractor and the Owner of the non-compliance and the nature of the work required to correct such non-compliance. The Engineer shall recommend to the Owner, in writing, to issue a "stop work order" for any portion of the work that does not substantially comply with the intent of the Contract Documents, except as follows.
- 2.2.4 The Engineer shall not be responsible for construction means, methods, techniques, sequences, or procedures, or for safety precautions and programs in connection with the work. Additionally, the Engineer shall not be responsible for Contractor's failure to carry out the work in accordance with the Contract Documents. The Engineer shall reject work which does not meet or exceed the

standards established by the Contract Documents. Whenever, in Engineer's reasonable opinion, it considers it necessary or advisable to ensure the proper implementation of the intent of the Contract Documents, it will have authority to require special inspection or testing of any work in accordance with the provisions of the Contract Documents whether or not such work be then fabricated, installed or completed.

- 2.2.5 The Engineer shall at all times have access to the work wherever it is in preparation and progress. Contractor shall provide facilities for such access so the Engineer may perform its functions under the Contract Documents.
- 2.2.6 Based on the Engineer's observations and an evaluation of Contractor's Application for Payment, the Engineer will determine the amounts owing to Contractor and will issue Certificates for Payment in such amounts, as provided in Paragraph 9.4.
- 2.2.7 The Engineer will be the interpreter of the requirements of the Contract Documents and the judge of the performance there under by both the Owner and Contractor.
- 2.2.8 The Engineer will render interpretations necessary for the proper execution or progress of the work, with reasonable promptness and in accordance with any time limit agreed upon. Either party to the Contract may make written request to the Engineer for such interpretations.
- 2.2.9 Claims, disputes, and other matters in question between Contractor and the Owner relating to the execution or progress of the work or the interpretation of the Contract Documents shall be referred to the Engineer for decision which it will render in writing within a reasonable time.
- 2.2.10 All interpretations and decisions of the Engineer shall be consistent with the intent of and reasonably inferable from the Contract Documents and will be in writing or in the form of Construction Plans. In its capacity as interpreter and judge, it will endeavor to secure faithful performance by both the Owner and Contractor, will not show partiality to either, and will not be liable for the result of any interpretation or decision rendered in good faith in such capacity.
- 2.2.11 The Engineer's decisions in matters relating to artistic effect may be final if consistent with the intent of the Contract Documents.
- 2.2.12 The Engineer will have authority to reject work which does not conform to the Contract Documents. Whenever, in its opinion, it considers it necessary or advisable for the implementation of the intent of the Contract Documents, it will have authority to require special inspection or testing of the work in accordance with Subparagraph 7.7.2 whether or not such work be fabricated, installed or completed. However, neither the Engineer's authority to act under this Subparagraph 2.2.12, nor any decision made by Engineer in good faith either to exercise or not to exercise such authority, shall give rise to any duty or responsibility of the Engineer to Contractor, any Subcontractor, any of their agents or employees, or any other person performing any of the work.
- 2.2.13 The Engineer will review and approve or take other appropriate action upon Contractor's submittals such as Shop Drawings, Product Data and samples, but only for conformance with the design concept of the work and with the information given in the Contract Documents. Such action shall be taken with reasonable promptness so as to cause no delay. The Engineer's approval of a specific item shall not indicate approval of an assembly of which the time is a component.
- 2.2.14 The Engineer will prepare Change Orders in accordance will Article 12 and will have authority to order minor changes in the work as provided in Subparagraph 12.4.1.
- 2.2.15 The Engineer will conduct inspections to determine the dates of Substantial Completion and Final Completion and forward the dates to the Owner for the Owner's review of written warranties and related documents required by the Contract and assembled by Contractor and will issue a final

Certificate of payment upon compliance with the requirements of Paragraph 9.9

- 2.2.16 If the Owner and Engineer agree, the Engineer will provide one or more Project Representatives to assist the Engineer in carrying out its responsibilities at the site. The duties, responsibilities and limitations of authority of any such Project Representative shall be as set forth in an exhibit to be incorporated in the Contract Documents.
- 2.2.17 The duties, responsibilities and limitations of authority of the Engineer as the Owner's representative during construction as set for in the Contract Documents will not be modified or extended without written consent of the Owner, Contractor and the Engineer.
- 2.2.18 In case of the termination of the employment of the Engineer, the Owner shall appoint an Engineer whose status under the Contract Documents shall be that of the former Engineer.

### **ARTICLE 3**

#### **OWNER**

#### **3.1 DEFINITION**

- 3.1.1 The Owner is the person or entity identified as such in the Owner-Contractor Agreement and is referred to throughout the Contract Documents as if singular in number and masculine in gender. The term "Owner" means the Owner or its authorized representative.

#### **3.2 INFORMATION AND SERVICES REQUIRED OF THE OWNER**

- 3.2.1 The Owner shall, at the request of Contractor, at the time of execution of the Owner-Contractor Agreement, furnish to Contractor reasonable evidence that it had made financial arrangements to fulfill its obligations under the Contract. Unless such reasonable evidence is furnished, Contractor is not required to execute the Owner-Contractor Agreement or to commence the work.
- 3.2.2 The Owner shall furnish all surveys describing the physical characteristics, legal limitation and utility locations for the site for the Project, and a legal description of the site.
- 3.2.3 Except as provided in Subparagraph 4.7.1, the Owner shall secure and pay for necessary approvals, easements, assessments, and charges required for the construction, use or occupancy of permanent structures or for permanent changes in existing facilities.
- 3.2.4 Information or services under the Owner's control shall be furnished by the Owner with reasonable promptness to avoid delay in the orderly progress of the work.
- 3.2.5 Unless otherwise provided in the Contract Documents, Contractor will be furnished, free of charge, all copies of Construction Plans and Specifications reasonable necessary for the execution of the work.
- 3.2.6 The Owner shall forward all instructions to Contractor through the Engineer.
- 3.2.7 The foregoing is in addition to other duties and responsibilities of the Owner enumerated herein and especially those in respect to work by Owner or by Separate Contractors, Payments and Completion, and Insurance in Articles 6, 9 and 11 respectively.

#### **3.3 OWNER'S RIGHT TO STOP THE WORK**

- 3.3.1 If Contractor fails to correct defective work as required by Paragraph 13.2 or persistently fails to carry out the work in accordance with the Contract Documents, the Owner, by a written order



signed personally or by an agent specifically so empowered by the Owner in writing, may order Contractor to stop the work, or any portion thereof, until the cause of such order has been eliminated; however, this right of the Owner to stop the work shall not give rise to any duty on the part of the Owner to exercise this right for the benefit of Contractor or any other person or entity, except to the extent required by Subparagraph 6.1.3.

### **3.4 OWNER'S RIGHT TO CARRY OUT THE WORK**

- 3.4.1 If Contractor defaults or neglects to carry out the work in accordance with the Contract Documents and fails within seven (7) days after receipt of written notice from the Owner to commence and continue correction of such default or neglect with diligence and promptness, the Owner may, after seven (7) days following receipt by Contractor of an additional written notice and without prejudice to any other remedy it may have, make good such deficiencies. In such case, an appropriate Change Order shall be issued deducting from the payments then or thereafter due Contractor the cost of correcting such deficiencies, including compensation for the Engineer additional services made necessary by such default, neglect or failure. Such action by the Owner and the amount charged to Contractor are both subject to the prior approval of the Engineer. If the payments then or thereafter due to Contractor are not sufficient to cover such amount, Contractor shall pay the difference to the Owner.

## **ARTICLE 4**

### **CONTRACTOR**

#### **4.1 DEFINITION**

- 4.1.1 Contractor is the person or entity identified as such in the Owner-Contractor Agreement and is referred to throughout the Contract Documents as if singular in number and masculine in gender. The term "Contractor" means Contractor or its authorized representative.

#### **4.2 REVIEW OF CONTRACT DOCUMENTS**

- 4.2.1 Contractor shall carefully study and compare the Contract Documents and shall at once report to the Engineer any error, inconsistency or omission it may discover. Contractor shall not be liable to the Owner or the Engineer for any damage resulting from any such errors, inconsistencies or omissions in the Contract Documents. Contractor shall perform no portion of the work at any time without Contract Documents or, where required, approved Shop Drawings, Product Data or Samples for such portion of the work.

#### **4.3 SUPERVISION AND CONSTRUCTION PROCEDURES**

- 4.3.1 Contractor shall supervise and direct the work, using its best skill and attention. Contractor shall be solely responsible for all construction means, methods, techniques, sequences and procedures and for coordinating all portions of the work under the contract.
- 4.3.2 Contractor shall be responsible to the Owner for the acts and omissions of its employees, Subcontractors and their agents and employees, and other persons performing any of the work under a contract with Contractor.
- 4.3.3 Contractor shall not be relieved from its obligations to perform the work in accordance with the Contract Documents either by the activities or duties of the Engineer in its administration of the Contract, or by inspections, tests or approvals required or performed under Paragraph 7.8 by persons other than Contractor.

#### **4.4 LABOR AND MATERIALS**

- 4.4.1 Unless otherwise provided in the Contract Documents, Contractor shall provide and pay for all labor, materials, equipment, tools, construction equipment and machinery, water, heat, utilities, transportation, and other facilities and services necessary for the proper execution and completion of the work, whether or not incorporated or to be incorporated in the work.
- 4.4.2 Contractor shall at all times enforce strict discipline and good order among its employees and shall not employ on the work any unfit person or anyone not skilled in the task assigned to Contractor.

#### **4.5 WARRANTY**

- 4.5.1 Contractor warrants to the Owner and Engineer that all materials and equipment furnished under this Contract will be new unless otherwise specified, and that all work will be of good quality, free from faults and conforming to these requirements, including substitutions not properly approved and authorized, may be considered defective. If required by the Engineer, Contractor shall furnish satisfactory evidence as to the kind and quality of materials and equipment. This warranty is not limited by the provisions in Paragraph 13.2.
- 4.5.2 Contractor shall and hereby does warrant and guarantee all workmanship, labor, and materials performed and supplied by Contractor or its Subcontractors for a period of one (1) year from the date of completion as evidenced by the date of the Engineer's Final Certificate of Payment of this Contract. This also included all labor required for replacing materials or equipment found to be defective with the one (1) year period. All guarantees for a longer period of time required by the work sections of these specifications shall be secured by Contractor from Subcontractors and delivered to the Engineer and are hereby warranted by Contractor as much as if countersigned by Contractor.

#### **4.6 TAXES**

- 4.6.1 Contractor shall pay all sales, consumer gross receipts tax, use and other similar taxes for the work or portions thereof provided by Contractor which are legally enacted at the time bids are received, whether or not yet effective.

#### **4.7 PERMITS, FEES AND NOTICES**

- 4.7.1 Unless otherwise provided in the Contract Documents, Contractor shall secure and pay for the building permit and for all other permits and governmental fees, licenses and inspections necessary for the proper execution and completion of the work which are customarily secured after execution of the Contract and which are legally required at the time the bids are received.
- 4.7.2 Contractor shall give all notices and comply with all laws, ordinances, rules, regulations and lawful orders of any public authority bearing on the performance of the work.
- 4.7.3 It is not the responsibility of Contractor to make certain that the Contract Documents are in accordance with applicable laws, statutes, building codes and regulations. If Contractor observes that any of the Contract Documents are at variance therewith in any respect, Contractor shall promptly notify the Engineer in writing, and any necessary changes shall be accomplished by appropriate Modification.
- 4.7.4 If Contractor performs any work knowing it to be contrary to such laws, ordinances, rules and regulations, and without such notice to the Engineer, Contractor shall assume full responsibility therefore and shall in turn notify the Owner's Representative of such action.

#### **4.8 ALLOWANCES**

- 4.8.1 Contractor shall include in the Contract Sum all allowances stated in the Contract Documents. Items covered by these allowances shall be supplied for such amounts and by these allowances shall be supplied for such amounts and by such persons as the Owner may direct, but Contractor will not be required to employ persons against whom Contractor makes a reasonable objection.
- 4.8.2 Unless otherwise provided in the Contract Documents:
- A. These allowances shall cover the cost to Contractor, less any applicable trade, discount of the materials and equipment required by the allowance delivered at the site, and all applicable taxes;
  - B. Contractor's costs for unloading and handling on the site, labor, installations costs, overhead, profit and other expenses contemplated for the original allowance shall be included in the Contract Sum and not in this allowance;
  - C. Whenever the cost is more than or less than the allowance, the Contract Sum shall be adjusted accordingly by Change Order, the amount of which will recognize changes, if any, in handling costs on the site, labor, installation costs, overhead, profit and other expenses.

#### **4.9 SUPERINTENDENT**

- 4.9.1 Contractor shall employ a competent Superintendent and necessary assistants who shall be in attendance at the project site during the progress of the work. The Superintendent shall represent Contractor, and all communications given to the Superintendent shall be as binding as if given to Contractor. Important communications shall be confirmed in writing. Other communications shall be so confirmed on written request in each case.

#### **4.10 PROGRESS SCHEDULES**

- 4.10.1 Contractor shall, within five (5) working days after the effective date of Notice to Proceed, furnish five copies of a preliminary progress schedule covering its operations for the first ninety (90) days. The preliminary progress schedule shall be a bar graph or an arrow diagram showing the items Contractor intends to commence and complete the various work stages, operations, and contract means planned to be started during the first ninety (90) days.
- 4.10.2 Unless otherwise specified in the Special Provisions, Contractor shall submit for approval by the Engineer, within five (5) working days after the effective date of Notice to Proceed, five copies of a critical-path-type analysis. The critical-path-type analysis shall include as a minimum; a graphic network diagram; a computer printout or list of activities; and a brief written explanation of the proposed schedule.
- 4.10.3 The graphic network diagram shall consist of an arrow diagram or a geometric figure and connector diagram which clearly depicts the major subdivisions of the work, the order and interdependencies of activities planned by Contractor, as well as, activities by others which affect Contractor's planning. The intended time for starting and completing each activity, the associated float time and the quantity and kinds of major equipment to be used shall be shown for each construction operation. For those activities lasting more than thirty (30) days, either the estimated time for 25-50 and 75 percent completion or other significant milestones in the course of the activity, shall be shown. In addition to the actual construction operations, the network diagram shall show such items as submittal of samples and Shop Drawings, delivery of materials and equipment, construction in the area by other forces, traffic detour controls, and other significant items related to the progress of construction. The graphic network diagram shall be printed or neatly and legibly drawn to a linear scale.

- 4.10.4 Activities shown shall be coordinated insofar as possible with the Contract Bid items, types of work and maximum number of activities of each type.
- 4.10.5 The computer printout or list of activities shall show for each activity the estimated duration, the earliest starting and finishing dates, the latest starting and finishing dates, and float or slack time. Activities which constitute the critical sequence shall be identified showing total job duration equal to the Contract Time.
- 4.10.6 The written explanation shall contain sufficient information to describe the construction methods to be used and to enable the Engineer to evaluate the schedule and supporting analysis for validity and practicability. If the schedule or written explanation is not accepted by the Owner, Contractor shall resubmit the rejected items within ten (10) days after rejection.
- 4.10.7 The analysis may employ the use of an electric computer or may consist of a non-computer analysis if the latter is suitable to analyze the number of activities required. The adequacy of the system selected shall be acceptable to the Engineer.
- 4.10.8 Contractor shall submit to the Engineer monthly progress status reports on dates directed by the Engineer. Such reports shall list those uncompleted activities which have less than thirty (30) days float and which are either in progress or scheduled to be started within the next reporting period. For each of the listed activities, the following shall be shown:
  - A. Starting date scheduled in last critical-path-analysis.
  - B. Actual or intended starting date.
  - C. Revised activity duration, if any.

If the noted starting dates or duration delay the scheduled project completion date, the delay shall be named. Reasons for the delay shall be given with an explanation of Contractor's proposed corrective action. The Contract shall also note each activity completed during the report period.

- 4.10.9 A revised critical-path-type analysis shall be submitted when one or more of the following conditions occur:
  - A. When an approved change Order significantly affects the contract completion date, or the sequence of activities.
  - B. When progress of any critical activity falls significantly behind the scheduled progress.
  - C. When delay on a non-critical activity is of such magnitude as to change the course of the critical path.
  - D. At any time Contractor elects to change any sequence of activities affecting the critical path.

The revised analysis shall be made in the same form and detail as the original submittal and shall be accompanied by an explanation of the reasons for the revisions.

- 4.10.10 Contractor shall prosecute the work in accordance with the latest critical path type analysis. Deviations therefrom shall be submitted to the Engineer for review. In the event that the progress of items along the critical path is delayed, Contractor shall revise its planning to include additional forces, equipment, shifts or hours necessary to meet the contract completion date. All additional cost resulting therefrom will not be borne by the Owner.

#### **4.11 DOCUMENTS AND SAMPLES AT THE SITE**

- 4.11.1 Contractor shall maintain at the site, for the Owner, one record copy of all Construction Plans, Specifications, Addenda, Change Orders and other Modifications, in good order and marked currently to record all changes made during construction, and approved Shop Drawings, Product Data and Samples. These shall be available to the Owner upon completion of the work.

#### **4.12 SHOP DRAWINGS, PRODUCT DATA AND SAMPLES**

- 4.12.1 Shop Drawings are drawings, diagrams, schedules and other data specially prepared for the work by Contractor or any Subcontractor, manufacturer, supplier or distributor to illustrate some portion of the work.
- 4.12.2 Product Data are illustrations, standard schedules, performance charts, instructions, brochures, diagrams and other information furnished by Contractor to illustrate a material, product or system for some portion of the work.
- 4.12.3 Samples are physical examples which illustrate materials, equipment or workmanship and establish standards by which the work will be judged.
- 4.12.4 Contractor shall review, approve and submit, with reasonable promptness and in such sequence as to cause no delay in the work or in the work of the Owner of any separate Contractor, all Shop Drawings, Product Data and Sample required by the Contract Documents.
- 4.12.5 By approving and submitting Shop Drawings, Product Data and Samples, Contractor represents that it has determined and verified all materials, field measurements, and field construction criteria related thereto, or will do so, and that it has checked and coordinated the information contained within such submittals with the requirements of the work and of the Contract Documents.
- 4.12.6 Contractor shall not be relieved of responsibility for any deviation from the requirements of the Contract Documents by the Engineer's approval of Shop Drawings, Product Data or Samples under Subparagraph 2.2.13 unless Contractor has specifically informed the Engineer in writing of such deviation at the time of submission and the Engineer has given written approval to the specific deviation. Contractor shall not be relieved from responsibility for errors or omissions in the Shop Drawings, Product Data or Samples by the Engineer approval thereof.
- 4.12.7 Contractor shall direct specific attention, in writing or on resubmitted Shop Drawings, Product Data or Samples, to revisions other than those requested by the Engineer on previous submittals.
- 4.12.8 No portion of the work requiring submission of a Shop Drawing, Product Data or Sample shall be commenced until the submittal has been approved by the Engineer as provided in Subparagraph 2.2.13. All such portions of the work shall be in accordance with approved submittals.

#### **4.13 USE OF SITE**

- 4.13.1 Contractor shall confine operations at the site to areas permitted by law, ordinances, permits and the Contract Documents and shall not reasonably encumber the site with any materials or equipment.
- 4.13.2 Contractor shall hold and save the Owner free and harmless from liability of any nature or kind arising from use, trespass or damage occasioned by third persons.

#### **4.14 CUTTING AND PATCHING OF WORK**

- 4.14.1 Contractor shall be responsible for all cutting, fitting or patching that may be required to complete the work or to make its several parts fit together properly.

- 4.14.2 Contractor shall not damage or endanger any portion of the work or the work of the Owner or any separate contracts by cutting, patching or otherwise altering any work, or by excavation. Contractor shall not cut or otherwise alter the work of the Owner or any separate Contractor except with the written consent of the Owner and of such separate Contractor. Contractor shall not unreasonably withhold from the Owner any separate Contractor its consent to cutting or otherwise altering the work.

#### **4.15 CLEANING UP**

- 4.15.1 Contractor at all times shall keep the premises free from accumulation of waste materials (e.g., concrete), trash or debris caused by its operations. At the completion of the work, Contractor shall remove all its waste materials, trash and debris from and about the Project as well as all its tools, construction equipment, machinery and surplus materials.
- 4.15.2 If Contractor fails to clean up at the completion of the work, the Owner may do so as provided in Paragraph 3.4, and the cost thereof shall be charged to Contractor.
- 4.15.3 Contractor shall be solely responsible for performance of the following clean up as they apply:
- A. Debris: Regardless of the nature of the debris, it shall be immediately cleared from the work area. Each trade shall cooperate with other trades in the removal of debris and in keeping a clean job throughout.

#### **4.16 COMMUNICATIONS**

- 4.16.1 Contractor shall forward all communications to the Owner through the Engineer.

#### **4.17 ROYALTIES AND PATENTS**

- 4.17.1 Contractor shall pay all royalties and license fees. Contractor shall defend all suits or claims for infringement of any patent rights and shall save the Owner harmless from loss on account thereof, except that the Owner shall be responsible for all such loss when a particular design, process or the product of a particular manufacturer or manufacturers is specified; but if Contractor has reason to believe that the design, process or product specified is an infringement of a patent, Contractor shall be responsible for such loss unless it promptly gives such information to the Engineer.

#### **4.18 INDEMNIFICATION**

- 4.18.1 To the fullest extent permitted by law, Contractor shall indemnify and hold harmless the Owner and the Engineer and their agents and employees from and against all claims, damages, losses and expenses, including but not limited to attorneys' fees arising out of or resulting from the performance of the work, provided that any such claim, damage, loss or expense (1) is attributable to bodily injury, sickness, disease or death, or to injury to or destruction of tangible property (other than the work itself), including the loss of use resulting therefrom, and (2) is caused in whole or in part by any negligent act or omission on Contractor, any Subcontractor, anyone directly or indirectly employed by any of them, or anyone for whose acts any of them may be liable, regardless of whether or not it is caused in part by a party indemnified hereunder. Such negligent shall not be construed to negate, abridge, or otherwise reduce any other right or obligation of indemnify which would otherwise exist as to any party or person described in this Paragraph 4.18.
- 4.18.2 In any and all claims against the Owner or the Engineer or any of their agents or employees by an employee of Contractor, any Subcontractor, anyone directly or indirectly employed by any of them or anyone for whose acts any of them may be liable, the indemnification obligation under this Paragraph 4.18 shall not be limited in any way by any limitation on the amount or type of damages, compensation or benefits payable by or for Contractor or any Subcontractor under

workers' or workmen's compensation acts, disability benefit acts or other employee benefit acts.

- 4.18.3 The obligation of Contractor under this Paragraph 4.18 shall not extend to the liability of the Engineer, its agents or employees, arising out of (1) the preparation or approval of maps, drawings, opinions, reports, surveys, change orders, designs, or specifications, or (2) the giving of or the failure to give directions by the Engineer, its agents or employees, provided such giving or failure to give is the primary cause of the injury or damage.

## **ARTICLE 5**

### **SUBCONTRACTOR**

#### **5.1 DEFINITION**

- 5.1.1 A Subcontractor is a person or entity who has a direct contract with Contractor to perform any of the work at the site. The term "Subcontractor" is referred to throughout the Contract Documents as if singular in number and masculine in gender and means a Subcontractor or its authorized representative. The term "Subcontractor" does not include any separate Contractor or its Subcontractors.
- 5.1.2 A Sub-subcontractor is a person or entity who has a direct or indirect contract with a Subcontractor to perform any of the work at the Site.

#### **5.2 AWARD OF SUBCONTRACTS AND OTHER CONTRACTS FOR PORTIONS OF THE WORK**

- 5.2.1 Unless otherwise required by the Contract Documents of the Bidding Documents, Contractor, as soon as practicable after the award of the Contract, shall furnish to the Owner and the Engineer in writing the names of the persons or entities (including those who are to furnish materials or equipment fabricated to a special design) proposed for each of the principal portions of the work. The Engineer will promptly reply to Contractor in writing stating whether or not the Owner or the Engineer, after due investigation, has reasonable objection to any such proposed person or entity. Failure of the Owner or the Engineer to reply promptly shall constitute notice of no reasonable objection.
- 5.2.2 Contractor shall not contract with any such proposed person or entity to whom the Owner or the Engineer has made reasonable objection under the provisions of Subparagraph 5.2.1. Contractor shall not be required to contract with anyone to whom it has a reasonable objection.

#### **5.3 SUBCONTRACTUAL RELATION**

- 5.3.1 By an appropriate written agreement, Contractor shall require each Subcontractor, to the extent of the work to be performed by the Subcontractor, to be bound to Contractor by the terms of the Contract Documents, and to assume toward Contractor all the obligations and responsibilities which Contractor, by these Documents, assumes toward the Owner and the Engineer. Said agreement shall preserve and protect the rights of the Owner and the Engineer under the Contract Documents with respect to the work to be performed by the Subcontractor so that the subcontracting thereof will not prejudice such rights, and shall allow to the Subcontractor, unless specifically provided otherwise in Contractor-Subcontractor agreement, the benefit of all rights, remedies and redress against Contractor that Contractor, by these Documents, has against the Owner. Where appropriate, Contractor shall require each Subcontractor to enter into similar agreements with its Sub-subcontractors. Contractor shall make available to each proposed Subcontractor, prior to the execution of the Subcontract, copies of the Contract Documents to which the Subcontractor will be bound by this Paragraph 5.3, and identify the Subcontractor any terms and conditions of the proposed Subcontract which may be at variance with the Contract Documents. Each Subcontractor shall similarly make copies of such Documents available to its



Subcontractors.

## **ARTICLE 6**

### **WORK BY OWNER OR BY SEPARATE CONTRACTORS**

#### **6.1 OWNER'S RIGHT TO PERFORM WORK AND TO AWARD SEPARATE CONTRACTS**

- 6.1.1 The Owner reserves the right to perform work related to the Project with its own forces, and to award separate contracts in connection with other portions of the Project or other work on the site under these or similar Conditions of the Contract. If Contractor claims that delay or additional cost is involved because of such action by the Owner, it shall make such claim as provided elsewhere in the Contract Documents.
- 6.1.2 When separate contracts are awarded for different portions of the Project or other work on the site, the term "Contractor" in the Contract Documents in each case shall mean Contractor who executes each separate Owner-Contractor Agreement.
- 6.1.3 The Owner will provide for the coordination of the work of its own forces and of each separate Contractor with the work of Contractor, who shall cooperate therewith as provided in paragraph 6.2.

#### **6.2 MUTUAL RESPONSIBILITY**

- 6.2.1 Contractor shall afford the Owner and the Separate Contractors reasonable opportunity for the introduction and storage of their materials and equipment and the execution of their work, and shall connect and coordinate its work with theirs as required by the Contract Documents.
- 6.2.2 If any part of Contractor's work depends for proper execution or results upon the work of the Owner or any separate Contractor, Contractor shall, prior to proceeding with the work, promptly report to the Engineer any apparent discrepancies or defects in such other work that render it unsuitable for such proper execution and results. Failure of Contractor so to report shall constitute an acceptance of the Owner's or the separate Contractor's work as fit and proper to receive its work, except as to defects which may subsequently become apparent in such work by others.
- 6.2.3 Any costs caused by defective or ill-timed work shall be borne by the party responsible thereof.
- 6.2.4 Should Contractor wrongfully cause damage to the work or property of the Owner or to other work on the site, Contractor shall promptly remedy such damage as provided in Subparagraph 10.2.5.
- 6.2.5 Should Contractor wrongfully cause damage to the work or property of any separate Contractor, Contractor shall upon due notice promptly attempt to settle with such other Contractor by agreement, or otherwise to resolve the dispute. If such separate Contractor sues or initiates an arbitration proceeding against the Owner on account of any damage alleged to have been caused by Contractor, the Owner shall notify Contractor, who shall defend such proceedings at the Owner's expense, and if any judgment or award against the Owner arises therefrom, Contractor shall pay or satisfy it and shall reimburse the Owner for all attorneys' fees and court or arbitration costs which the Owner has incurred.

#### **6.3 OWNER'S RIGHT TO CLEAN UP**

- 6.3.1 If a dispute arises between Contractors and separate Contractors as to their responsibility for cleaning up as required by Paragraph 4.15, the Owner may clean up and charge the cost thereof to Contractors responsible therefor as the Engineer shall determine to be just.



## **ARTICLE 7**

### **MISCELLANEOUS PROVISIONS**

#### **7.1 GOVERNING LAW**

- 7.1.1 The Contract shall be governed by the law of the State of New Mexico.
- 7.1.2 The Owner and Contractor each binds itself, its partners, successors, assigns and legal representatives to the other party hereto and to the partners, successors, assigns and legal representatives of such other party in respect to all covenants, agreements, and obligations contained in the Contract Documents. Neither part to the Contract shall assign the Contract or sublet it as a whole without the written consent of the other, nor shall Contractor assign any moneys due or to become due to Contractor thereunder, without the previous written consent of the Owner.

#### **7.2 WRITTEN NOTICE**

- 7.2.1 Written notice shall be deemed to have dully served if delivered in person to the individual or member of the firm or entity or to an officer of the corporation for whom it was intended, or if delivered at or sent by registered or certified mail to the last business address known to it who gives the notice.

#### **7.3 CLAIMS FOR DAMAGES**

- 7.3.1 Should either party to the Contract suffer injury or damage to person or property because of any act or omission of the other party or of any of its employees, agents or others for whose acts it is legally liable, claim shall be made in writing to such other party within a reasonable time after the first observance of such injury or damage.

#### **7.4 PERFORMANCE BOND AND LABOR AND MATERIAL PAYMENT BOND**

- 7.4.1 Contractor to whom the Contract is awarded shall furnish and pay for reputable and approved Performance and Labor and Material Payment Bonds, each for the full amount of the Contract Sum. Bonds shall be executed on standard AIA forms.

#### **7.5 RIGHTS AND REMEDIES**

- 7.5.1 The duties and obligations imposed by the Contract Documents and the rights and remedies available thereunder shall be in addition to and not a limitation of any duties, obligations, rights and remedies otherwise imposed or available by law.
- 7.5.2 No action or failure to act by the Owner, the Engineer, or Contractor shall constitute a waiver of any right or duty afforded any of them under the Contract, nor shall any such action or failure to act constitute an approval of or acquiescence in any breach thereunder, except as may be specifically agreed in writing.

#### **7.6 TESTS**

- 7.6.1 If the Contract Document, laws, ordinances, rules, regulations or orders of any public authority having jurisdiction require any portion of the work to be inspected, tested or approved, Contractor shall give the Engineer timely notice of its readiness so the Engineer may observe such inspection, testing or approval. Contractor shall bear all costs of such inspections, tests or approvals. Tests specifically called for by specifications shall be made by a professional testing laboratory acceptable to the Engineer, and Contractor shall employ same and pay all charges in connection

therewith. Records of tests shall be delivered to the Engineer in duplicate on acceptable forms.

- 7.6.2 If the Engineer determines that any work requires special inspection, testing, or approval which Subparagraph 7.6.1 does not include, it will, upon written authorization from the Owner, instruct Contractor to order such special inspection, testing or approval, and Contractor shall give notice as provided in Subparagraph 7.6.1. If such special inspection or testing reveals a failure of the work to comply with the requirements of the Contract Documents, Contractor shall bear all costs thereof, including compensation for the Engineer's additional services made necessary by such failure; otherwise the Owner shall bear such costs, and an appropriate Change Order shall be issued.

## **7.7 INTEREST**

- 7.7.1 The Owner will not pay interest on payments due and unpaid under the Contract Document.

# **ARTICLE 8**

## **TIME**

## **8.1 DEFINITIONS**

- 8.1.1 Unless otherwise provided, the Contract Time is the period of time allotted in the Contract Documents for Substantial Completion of the work as defined in Subparagraph 8.1.3, including authorized adjustments thereto.
- 8.1.2 The date of commencement of the work is the date established in a Notice to Proceed. If there is no Notice to Proceed, it shall be the date of the Owner-Contractor Agreement or such other date as may be established therein.
- 8.1.3 The Date of Substantial Completion of the work or designated portion thereof is the Date certified by the Engineer and approved by the Owner when construction is deficiently complete, in accordance with the Contract Documents, so the Owner can occupy or utilize the work or designated portion thereof for the use for which it is intended.
- 8.1.4 The term "day" as used in the Contract Document shall mean calendar day unless otherwise specifically designated.

## **8.2 PROGRESS AND COMPLETION**

- 8.2.1 All time limits stated in the Contract Documents are the essence of the Contract.
- 8.2.2 Contractor shall begin the work on the date of commencement as defined in Subparagraph
- 8.2.3 Contractor shall carry the work forward expeditiously with adequate forces and shall achieve Substantial Completion within the Contract Time.

## **8.3 DELAYS AND EXTENSIONS OF TIME**

- 8.3.1 If Contractor is delayed at any time in the progress of the work by any act or neglect of the Owner or the Engineer or by any employees of either, or by any separate Contractor employed by the Owner or by changes ordered in the work, or by labor disputes, fire, unusual delay in unavoidable casualties, or any causes beyond Contractor's control or by delay authorized by the Owner pending arbitration, or by any other cause which the Engineer determines may justify the delay, then the Contract Time shall be extended by Change Order for such reasonable time as the

Engineer may determine.

- 8.3.2 Any claim for extension of time shall be made in writing to the Engineer not more than twenty (20) days after the commencement of the delay; otherwise it shall be waived. In the case of a continuing delay, only one claim is necessary. Contractor shall provide an estimate of the probable effect of such delay on the progress of the work.
- 8.3.3 If written agreement is made stating the dates upon which interpretations as provided in Subparagraph 2.28 shall be furnished, then no claim for delay shall be allowed on account of failure to furnish such interpretations until fifteen (15) days after written request is made for them, and not then unless such claim is reasonable.
- 8.3.4 This Paragraph 8.3 does not exclude the recovery of damages for delay by either party under other provisions of the Contract Documents.

## **ARTICLE 9**

### **PAYMENTS AND COMPLETION**

#### **9.1 CONTRACT SUM**

- 9.1.1 The Contract Sum is stated in the Owner-Contractor Agreement and including authorized adjustments thereto, is the total amount payable by the Owner to Contractor for the performance of the work under the Contract Documents.

#### **9.2 SCHEDULE OF VALUES**

- 9.2.1 Before the first Application for Payment, Contractor shall submit to the Engineer a schedule of values allocated to the various portion of the work, prepared in such form and supported by such data to substantiate its accuracy as the Engineer may require. This schedule, unless objected to by the Engineer, shall be used only as a basis for Contractor's Applications for payment.

#### **9.3 APPLICATIONS FOR PAYMENT**

- 9.3.1 At least ten (10) days before the date for each progress payment established in the Owner-Contractor Agreement, Contractor shall submit to the Engineer an itemized Application for Payment, notarized if required, supported by such data substantiating Contractor's right to payment.
- 9.3.2 Unless otherwise provided in the Contract Documents, payments will be made on account of materials or equipment not incorporated in the work but delivered and suitably stored at the site; and, if approved in advance by the Owner payments may similarly be made for materials or equipment suitably stored at some other location agreed upon in writing. Payments for materials or equipment stored on or off the site shall be conditioned upon submission by Contractor of bills of sale or such other procedures satisfactory to the Owner to establish the Owner's title to such materials or equipment or otherwise protect the Owner's interest, including applicable insurance and transportation to the site for those materials and equipment stored off the site.
- 9.3.3 Contractor warrants that title to all work, materials and equipment covered by an Application for Payment will pass to the Owner either by incorporation in the construction or upon the receipt of payment by Contractor, whichever occurs first, free and clear of all liens, claims, security interest or encumbrances hereinafter referred to in this Article 9 as "liens"; and that no work, materials or equipment covered by an Application for Payment will have been acquired by Contractor, or by any other person performing work at the site or furnishing materials or equipment for the Project, subject to an agreement under which an interest therein or an encumbrance thereon is retained by the seller or otherwise imposed by Contractor or such other person.

#### **9.4 CERTIFICATES FOR PAYMENT**

- 9.4.1 The Engineer will within seven (7) days after the receipt of the Contract's Application for Payment, either issue a Certificate for Payment to the Owner with a copy to Contractor for such amount as the Engineer determines is properly due, or notify Contractor in writing of its reasons for withholding a Certificate as provided in Subparagraph 9.6.1.
- 9.4.2 The issuance of Certificate for Payment will constitute a representation by the Engineer to the Owner, based on its observations at the site as provided in Subparagraph 2.2.3 and the data comprising the Application for Payment, that the work has progressed to the point indicated; that, to the best of its knowledge, information and belief, the quality of the work is in accordance with the Contract Documents (subject to an evaluation of the work for conformance with the Contract Documents upon Substantial Completion, to the results of any subsequent tests required by or performed under the Contract Documents correctable prior to completion, and to any specific qualifications stated in its Certificate); and that Contractor is entitled to payment in the amount certified. However, by issuing a Certificate for Payment, the Engineer shall not thereby be deemed to represent that it has made exhaustive or continuous on-site inspections to check the quality or quantity of the work or that it has reviewed the construction means, methods, techniques, sequences or procedures, or that it has made any examination to ascertain how or for what purpose Contractor has used the moneys previously paid on account of the Contract Sum.

#### **9.5 PROGRESS PAYMENTS**

- 9.5.1 After the Engineer has issued a Certificate for Payment, the Owner shall make payment in the manner and within the time provided in the Contract Documents.
- 9.5.2 Contractor shall promptly pay each Subcontractor upon receipt of payment from the Owner, out of the amount paid to Contractor on account of such Subcontractor's work, the amount to which said Subcontractor is entitled, reflecting the percentage actually retained, if any, from payments to Contractor on account of such Subcontractor's work. Contractor shall, by an appropriate agreement with each Subcontractor, require each Subcontractor to make payment to its Subcontractors in similar manner.
- 9.5.3 The Engineer may, on request and at its discretion, furnish to any Subcontractor, if practicable, information regarding the percentages of completion or the amounts applied for by Contractor on the action taken thereon by the Engineer on account of work done by such Subcontractor.
- 9.5.4 Neither the Owner nor the Engineer shall have any obligation to pay or to see to the payment of any monies to any Subcontractor except as may otherwise be required by law.
- 9.5.5 No Certificate for progress payment, no progress payment, nor any partial or entire use of occupancy of the Project by the Owner shall constitute an acceptance of any work not in accordance with the Contract Documents.

#### **9.6 PAYMENT WITHHELD**

- 9.6.1 The Engineer may decline to certify payment and may withhold its Certificate in whole or in part, to the extent necessary to reasonably protect the Owner, if in its opinion it is unable to make representations to the Owner as provided in Subparagraph 9.4.2.
- 9.6.2 If the Engineer is unable to make representations to the Owner, as provided in Subparagraph 9.4.2 and to certify payment in the amount of the Application, it will notify Contractor as provided in Subparagraph 9.4.1. If Contractor and Engineer cannot agree on a revised amount, the Engineer will promptly issue a Certificate for Payment for the amount for which it is able to make such

representations to the Owner. The Engineer may also decline to certify payment, or because of subsequently discovered evidence or subsequent observations, it may nullify the whole or any part of any Certificate for Payment previously issued, to such extent as may be necessary in its opinion to protect the Owner from loss because of:

- A. Defective work not remedied;
- B. Third party claims filed or reasonable evidence indicating probable filing of such claims;
- C. Failure of Contractor or make payments properly to Subcontractors or for labor, materials or equipment;
- D. Reasonable evidence that the work cannot be completed for the unpaid balance of the Contract Sum;
- E. Damage to the work of another Contractor;
- F. Reasonable evidence that the work will not be completed within the Contract Time; or,
- G. Failure to carry out the work in accordance with the Contract Documents.

9.6.2 When the above grounds in Subparagraph 9.6.1 removed, payment shall be made for amounts withheld because of them.

## **9.7 FAILURE OF PAYMENT**

9.7.1 If the Engineer does not issue a Certificate for Payment, through no fault of Contractor, within seven (7) days after receipt of Contractor's Application for Payment, or if the Owner does not pay Contractor within seven (7) days after the date established in the Contract Documents any amount certified by the Engineer, then Contractor may, upon seven (7) additional days' written notice to the Owner and the Engineer, stop the work until payment of the amount owing has been received. The Contract Sum shall be increased by the amount of Contractor's reasonable costs of shut-down, delay and start-up, which shall be effected by appropriate Change Order in accordance with Paragraph 12.3.

## **9.8 SUBSTANTIAL COMPLETION**

9.8.1 When Contractor considers that the work, or a designated portion thereof which is acceptable to the Owner, is substantially complete as defined in Subparagraph 8.1.3, Contractor shall prepare for submission to the Engineer a list of items to be completed or corrected. The failure to include any items on such list does not alter the responsibility of Contractor to complete all work in accordance with the Contract Documents. When the Engineer, with the Owner, on the basis of an inspection determines that the work or designated portion thereof is substantially complete, Contractor will then prepare a Certificate of Substantial Completion Form, AIA Document G704-1978, which shall establish the Date of Substantial Completion, shall state the responsibilities of the Owner and Contractor for security, maintenance within which Contractor shall complete the items listed therein. Warranties required by the Contract Document shall commence on the date of Final Completion of the work or designated portion thereof unless otherwise provided in the Certificate of Substantial Completion. The Certificate of Substantial Completion shall be submitted to Contractor and the Owner for their written acceptance of the responsibilities assigned to them in such Certificate.

9.8.2 Upon Substantial Completion of the work or designated portion thereof and upon application by Contractor and certification by the Engineer, the Owner shall make payment, reflecting adjustment in retainage, if any, for such work or portion thereof, as provided in the Contract Documents.

## **9.9 FINAL COMPLETION AND FINAL PAYMENT**

- 9.9.1 Upon receipt of written notice that the work is ready for final inspection and acceptance and upon receipt of a final Application for Payment, the Engineer will promptly make such inspection and, if Engineer finds the work acceptable under the Contract Documents and the Contract fully performed, Engineer will promptly issue final Certificate for Payment stating that, to the best of its observations and inspections, the work has been completed in accordance with the terms and conditions of the Contract Documents and that the entire balance found to be due Contractor and noted in said Final Certificate, is due and payable. The Engineer's Final Certificate of payment will constitute a further representation that the conditions precedent to Contractor's being entitled to final payment as set forth in Subparagraph 9.9.2 have been fulfilled.
- 9.9.2 Neither the final payment nor the remaining retained percentage shall become due until Contractor submits to the Engineer (1) an affidavit that all payrolls, bills for materials and equipment, and other indebtedness connected with the work for which the Owner or its property might in any way be responsible have been paid or otherwise satisfied, (2) consent of surety, if any, to final payment, and (3) if required by the Owner, other data establishing payment or satisfaction of all such obligations, such as receipts, releases and waivers of liens arising out of the Contract, to the extent and in such form as may be designed by the Owner. If any Subcontractor refuses to furnish a release or waiver required by the Owner Contractor may furnish a bond satisfactory to the Owner to indemnify itself against any such lien. If any such lien remains unsatisfied after all payments are made, Contractor shall refund to the Owner all moneys that the latter may be compelled to pay in discharging such lien, including all costs and reasonable attorneys' fees.
- 9.9.3 If, after Substantial Completion of the work, final completion thereof is materially delayed through no fault of Contractor or by the issuance of Change Orders affecting final completion, and the Engineer so confirms, the Owner shall, upon application by Contractor and certification by the Engineer and without terminating the Contract, make payment of the balance for that portion of the work fully completed and accepted. If the remaining balance for work not fully completed or corrected is less than the retainage stipulated in the Contract Document, and if bonds have been furnished as provided in Paragraph 7.5, the written consent of the surety to the payment of the balance due for that portion of the work fully completed and accepted shall be submitted by Contractor to the Engineer prior to certification of such payment. Such payment shall be made under the terms and conditions governing final payment, except that it shall not constitute a waiver of claims.
- 9.9.4 The making of final payment shall constitute a waiver of all claims by the Owner except those arising from:
- A. Unsettled liens;
  - B. Faulty or defective work appearing after Substantial Completion;
  - C. Failure of the work to comply with the requirements of the Contract Documents; and
  - D. Terms of any special warranties required by the Contract Documents.
- 9.9.5 The acceptance of final payment shall constitute a waiver of all claims by Contractor except those previously made in writing and identified by Contractor as unsettled at the time of the final Application for Payment.

## **ARTICLE 10**

### **PROTECTION OF PERSONS AND PROPERTY**

#### **10.1 SAFETY PRECAUTIONS AND PROGRAMS**

- 10.1.1 Contractor shall be responsible in initiating, maintaining and supervising all safety precautions and programs in connection with the work.

#### **10.2 SAFETY OF PERSONS AND PROPERTY**

- 10.2.1 Contractor shall take all reasonable precautions for the safety of, and shall provide all reasonable protection to prevent damage, injury or loss to:
- A. All employees on the work and all other persons who may be affected thereby;
  - B. All the work and all materials and equipment to be incorporated therein, whether in storage on or off the site, under the care, custody or control of Contractor or any of its Subcontractors or Sub-subcontractors; and
  - C. Other property at the site or adjacent thereto, including trees, shrubs, lawns, walks, pavements, roadways, structures and utilities no designated for removal, relocation or replacement in the course of construction.
- 10.2.2 Contractor shall give all notices and comply with all applicable laws, ordinances, rules, regulations, and lawful orders of any public authority bearing on the safety of persons or property or their protection from damage, injury or loss.
- 10.2.3 Contractor shall erect and maintain, as required by existing conditions and progress of the work, all reasonable safeguards for safety and protection, including posting danger signs and other warnings against hazards, promulgating safety regulations and notifying Owners and users of adjacent utilities.
- 10.2.4 When the use of storage of explosives or other hazardous materials or equipment is necessary for the execution of the work, Contractor shall exercise the utmost care and shall carry on such activities under the supervision of properly qualified personnel.
- 10.2.5 Contractor shall promptly remedy all damage or loss (other than damage of loss insured under paragraph 11.3) to any property referred to in Clauses 10.2.1.2 and 10.2.1.3 caused in whole or in part by Contractor, any Subcontractor or anyone directly or indirectly employed by any of them, or by anyone for whose acts any of them may be liable and for which Contractor is responsible under clauses 10.2.1.2 and 10.2.1.3, except damage or loss attributable to the acts or omissions of the Owner or the Engineer or anyone directly or indirectly employed by either of them, or by anyone for whose acts either of them may be liable, and no attributable to the fault or negligence of Contractor. The foregoing obligations of Contractor are in addition to its obligations under Paragraph 4.18.
- 10.2.6 Contractor shall designate a responsible member of its organization at the site whose duty shall be the prevention of accidents. This person shall be Contractor's Superintendent unless otherwise designated by Contractor in writing to the Owner and the Engineer.
- 10.2.7 Contractor shall not load or permit any part of the work to be loaded so as to endanger its safety.

#### **10.3 EMERGENCIES**

- 10.3.1 In any emergency affecting the safety of persons or property, Contractor shall act, at its reasonable



discretion, to prevent threatened damage, injury or loss. Any additional compensation or extension of time claimed by Contractor on account of emergency work shall; be determined as provided in Article 12 for Changes in the work.

## **ARTICLE 11**

### **INSURANCE**

#### **11.1 CONTRACTOR'S LIABILITY INSURANCE**

11.1.1 Contractor shall maintain in effect, and shall require all Subcontractors and others performing any portion of this Contract to maintain in effect, insurance of the types and respective minimum limits set for in Article 11. Such insurance shall cover all operations under this Contract. Maintenance of such insurance in at least the specified minimum amounts shall not relieve Contractor or liability for loss in excess of the limits of liability specified herein or otherwise not covered by the coverage's required herein. Contractor shall bear the cost of such insurance and include its costs in the bid. The following limits of insurance shall be maintained, unless otherwise listed in the Certificate of Insurance.

##### **Type of Required Coverage**

Workman's Compensation - including accident and occupational disease coverage. Statutory Employer's Liability

Comprehensive General Liability - including endorsements providing broad form property damage coverage, personal injury coverage, and contractual assumption of liability coverage for all liability Contractor has assumed under its Contract.

Auto Liability - including non-owned auto coverage.

##### **Minimum Limits of Liability**

Carry such insurance as it deems necessary to protect it from all claims under any workman's compensation law in effect that may be applicable to Contractor.

With limits of coverage in the maximum amount which the Owner could be held liable under the New Mexico Tort Claims Act for each person injured and for each accident resulting in damage to property.

Same limits as General Liability.

11.1.2 Certificates of Insurance acceptable to the Owner shall be filed with the Owner prior to commencement of the work. These Certificates shall contain a provision that coverage afforded under the policies will not be canceled until at least thirty (30) days; prior written notice has been given to the Owner. Contractor shall furnish one (1) copy of each of the Certificates of insurance herein required for each copy of the contract.

#### **11.2 OWNER'S LIABILITY INSURANCE**

11.2.1 The Owner shall be responsible for purchasing and maintaining its own liability insurance and, at its option, may purchase and maintain such insurance as will protect itself against all claims which may arise from operations under the Contract.

#### **11.3 PROPERTY INSURANCE**

11.3.1 Contractor shall maintain builder's risk property insurance or self insurance, or a combination of insurance and self insurance, upon the work at the site for at least the actual cash value thereof. The builder's risk insurance shall cover the interests of the Owner, Contractor, Subcontractors, and Sub-subcontractors in the work. The insurance shall insure against at least the following perils: fire extended coverage, vandalism, and malicious mischief. Contractor shall bear the cost of such insurance and include its cost in the bid.

11.3.2 Any loss insured or self insured under Subparagraph 11.3.1 is to be adjusted with the Owner and



made payable to the Owner as trustee for the insured, as their interests may appear subject to the requirements of any applicable mortgage clause. The Owner shall deposit the proceeds in a separate account and shall distribute them in accordance with such agreement as the parties in interest, including the Owner, may reach. Contractor shall pay each Subcontractor a just share of any insurance proceeds which Contractor receives and shall require by written agreement signed by the Subcontractor that the Subcontractor will make payments to its Sub-subcontractors in a similar manner. If after such loss no other special agreement is made, replacement of damaged work shall be covered by an appropriate order.

- 11.3.3 To the extent permitted under their respective property insurance policies, the Owner and Contractor hereby waive all rights, each against the other, for damages caused by fire or other perils to the extent covered by Insurance obtained pursuant to this Article 11 or any other property insurance applicable to the work, except such rights as they may have to the proceeds of such Insurance held by the Owner as trustee. The Owner or Contractor, as appropriate, shall require the Engineer, other Contractors, Subcontractors, and Sub-subcontractors to similarly waive rights of subrogation or property insurers.
- 11.3.4 If the Owner finds it necessary to occupy use of any portion of the work prior to Substantial Completion, such occupancy or use shall not commence prior to the time mutually agreed to by the Owner and Contractor and, if required by the applicable insurance or self insurance coverage not prior to the time the builder's risk property insurer has consented to such occupancy or use. Contractor's consent to such occupancy or use shall not be unreasonably withheld.

#### **11.4 LOSS OF USE INSURANCE**

- 11.4.1 The Owner, at its option, may purchase and maintain such insurance as will insure itself against loss of use of its property due to fire or other hazards, however caused.

### **ARTICLE 12**

#### **CHANGES IN THE WORK**

#### **12.1 CHANGE ORDERS**

- 12.1.1 A Change Order is a written order to Contractor signed by the Engineer and Contractor and approved in writing by the Owner. A Change Order may be issued only after the execution of the Contract and shall be the only means used to order changes in the work for which Contractor requires additional compensation, changes to the Contract Time, or changes to the Contract Sum. Minor changes in the work for which Contractor requires no additional compensation or time shall be executed in accordance with the provision of Subparagraph 12.4.1.
- 12.1.2 The Owner, without invalidating the Contract, may order changes in the work within the general scope of Contractor consisting of additions, deletions or other revisions, the Contract Sum and the Contract Time being adjusted accordingly. All such changes in the work shall be authorized by Change Order and shall be performed under the applicable conditions of the Contract Documents.
- 12.1.3 The cost or credit to the Owner resulting from a change in the work shall be determined in one or more of the following ways:
- A. By mutual acceptance of a lump sum properly itemized and supported by sufficient substantiating data to permit evaluation;
  - B. By unit prices stated in the Contract Documents or subsequently agreed upon;
  - C. By cost to be determined in a manner agreed upon by the parties and a mutually acceptable fixed or percentage fee; or

D. By the method provided in Subparagraph 12.1.4.

12.1.4 If none of the methods set forth in Clauses 12.1.2., 12.1.3. or 12.1.3. is agreed upon, Contractor, provided Contractor receives a written order signed by the Owner, shall promptly proceed with the work involved. The cost of such work shall be determined by the Engineer on the basis of the reasonable expenditures and savings of those performing the work attributable to the change, including, in the case of an increase in the Contract Sum, a reasonable allowance for overhead and profit. In such case, Contractor shall keep and present, in such form as the Engineer may prescribe, an itemized accounting together with appropriate supporting data for inclusion in a Change Order. Unless otherwise provided in the Contract Documents, cost shall be limited to the following: cost of materials, including sales tax and cost of delivery; cost of labor, including social security, old age and unemployment insurance, and fringe benefits, required by agreement or custom, workers' or workmen's compensation insurance; bond premiums; rental value of equipment and machinery; and the additional costs of supervision and field office personnel directly attributable to the change. Pending final determination of cost to the Owner payments on account shall be made on the Engineer's Certificate for payment. The amount of credit to be allowed by Contractor to the Owner for any deletion or change which results in a net decrease in the Contract Sum will be the amount of the actual net cost as confirmed by the Engineer. When both additions and credits covering related work or substitutions are involved in any one change, the allowance for overhead and profit shall be figured on the basis of the net increase, if any, with respect to that change.

12.1.5 If unit prices are stated in the Contract Documents or subsequently agreed upon, and if the quantities originally contemplated are so changed in a proposed Change Order that application of the agreed unit prices to the quantities of work proposed will cause substantial inequity to the Owner or Contractor, the applicable unit prices shall be equitably adjusted.

12.1.6 By submission of a bid, Contractor agrees and binds itself to the following method of calculating Change Order costs. The Owner also agrees to the following method of calculating the cost of any changes to the Contract. With each proposal for a change in the amount of the Contract, Contractor shall submit an itemized breakdown of all increases or decreases in the cost of Contractor's and all Subcontractor's and Sub-subcontractor's work to include at least the following detail in the general order listed:

- A. Material quantities and unit costs;
- B. Labor amounts and hourly rates (identified with specific items of material to be placed or operation to be performed);
- C. Costs inherent in use of Contractor/Sub-subcontractor owned equipment;
- D. Equipment rental, if any;
- E. Workmen's compensation and public liability insurance;
- F. General administration, overhead, supervision, project insurance and profit, based on the following schedule:

| <b><u>Subtotal before Applying the Percentage Shown</u></b> | <b><u>\$500 &amp; Less</u></b> | <b><u>Over \$500</u></b> |
|-------------------------------------------------------------|--------------------------------|--------------------------|
| Contractor for work performed by its own forces             | 22%                            | 19%                      |
| Contractor for work performed by Subcontractor              | 10%                            | 8%                       |
| Subcontractor for work performed by its own forces          | 18%                            | 15%                      |

|                                                        |     |     |
|--------------------------------------------------------|-----|-----|
| Subcontractor for work performed by Sub-subcontractor  | 10% | 8%  |
| Sub-subcontractor for work performed by its own forces | 18% | 15% |

G. Employment taxes under FICA and FUTA; and

H. State gross receipts tax (Contractor only).

12.1.7 The quotation for work under a Change Order shall be binding for sixty (60) days from the date submitted by Contractor.

## **12.2 CONCEALED CONDITIONS**

12.2.1 Should concealed conditions encountered in the performance of the work below the surface of the ground or should concealed or unknown conditions in an existing structure be at variance with the conditions indicated by the Contract Documents, or should unknown physical conditions below the surface of the ground or should concealed or unknown conditions in an existing structure of an unusual nature differing materially from those ordinarily encountered and generally recognized as inherent in work of the Character provided for in this Contract, be encountered, the Contract Sum shall be equitably adjusted by change Order upon verified claim by either party made within twenty (20) days after the first observance of the conditions.

12.2.2 If Contractor wishes to make a claim for an increase in the Contract Sum, Contractor shall give the Engineer written notice thereof within twenty (20) days after the occurrence of the event giving rise to such claim. This notice shall be given by Contractor before proceeding to execute the work, except in an emergency endangering life or property, in which case Contractor shall proceed in accordance with Paragraph 10.3. No such claim shall be valid unless so made. If such claims are justified and the Owner authorizes an increase in the Contract Sum, the Owner and Contractor shall proceed to negotiate the amount of the adjustment in the Contract Sum. If the Owner and Contractor cannot agree on the amount of the adjustment in the Contract Sum, it shall be determined by the Engineer. Any change in the Contract Sum resulting from such claim shall be authorized by Change Order.

12.2.3 If Contractor claims that additional cost is involved because of, but not limited to, (1) any written interpretation pursuant to Subparagraph 2.2.8, (2) any order by the Owner to stop the work pursuant to Paragraph 3.3 where Contractor was not at fault, (3) any written order for a minor change in the work issued pursuant to Paragraph 12.4, or (4) failure of payment by the Owner pursuant to Paragraph 9.7, Contractor shall make such claims provided in Subparagraph 12.3.1.

## **12.3 MINOR CHANGES IN THE WORK**

12.3.1 The Engineer will have authority to order minor changes in the work not involving an adjustment in the Contract Sum or an extension of the Contract Time and not inconsistent with the intent of the Contract Documents. Such changes shall be effected by written order and shall be binding on the Owner and Contractor. Contractor shall carry out such written orders promptly.

# **ARTICLE 13**

## **UNCOVERING AND CORRECTION OF WORK**

### **13.1 UNCOVERING OF WORK**

13.1.1 If any portion of the work should be covered contrary to the request of the Engineer or to requirements specifically expressed in the Contract Documents, it must, if required in writing by the Engineer, be uncovered for its observation and shall be replaced at Contractor's expense.

- 13.1.2 If any portion of the work has been covered which the Engineer has not specifically requested to observe prior to begin covered, the Engineer may request to see such work and it shall be uncovered by Contractor. If such work be found in accordance with the Contract Documents, the cost of uncovering and replacement shall, by appropriate Change Order, be charged to the Owner. If such work be found not in accordance with the Contract Documents, Contractor shall pay such costs unless it be found that this condition was caused by the Owner or a separate Contractor as provided in Article 6, in which even the Owner shall be responsible for the payment of such costs.

## **13.2 CORRECTION OF WORK**

- 13.2.1 Contractor shall promptly correct all work rejected by the Engineer as defective or as failing to conform to the Contract Documents whether observed before or after Substantial completion and whether or not fabricated, installed or completed. Contractor shall bear all costs of correcting such rejected work, including compensation for the Engineer's additional services made necessary thereby.
- 13.2.2 If, within one year after the Date of Substantial Completion of the work or designated portion thereof or within one year after acceptance by the Owner of designated equipment or within such longer period of time as may be prescribed by law or by the terms of any applicable special warranty required by the Contract Documents, any of the work is found to be defective or not in accordance with the Contract Documents, Contractor shall correct it promptly after receipt of a written notice from the Owner to do so unless the Owner has previously given Contractor a specific written acceptance of such condition. This obligation shall survive termination of the Contract. The Owner shall give such notice promptly after discovery of the condition.
- 13.2.3 Contractor shall remove from the site all portions of the work which are defective or non-conforming and which have not been corrected under Subparagraphs 4.5, 13.2.1 and 13.2.2, unless removal is specifically waived in writing by the Owner.
- 13.2.4 If Contractor fails to correct defective or non-conforming work as provided in Subparagraph 4.5.1, 13.2.1 and 13.2.2, the Owner may correct it in accordance with Paragraph 3.4.
- 13.2.5 If Contractor does not proceed with the correction of such defective or non-conforming work within a reasonable time fixed by written notice from the Engineer, the Owner may remove it and may store the materials or equipment at the expense of Contractor. If Contractor does not pay the cost of such removal and storage within ten (10) days thereafter, the Owner may upon ten (10) additional days' written notice sell such work at auction or at private sale and shall account for the net proceeds thereof, after deducting all the costs that should have been borne by Contractor including compensation for the Engineer's additional services made necessary thereby. If such proceeds of sale do not cover all costs which Contractor should have borne, the difference shall be charged to Contractor and an appropriate Change Order shall be issued. If the payments then or thereafter due Contractor are not sufficient to cover such amount, Contractor shall pay the difference to the Owner.
- 13.2.6 Contractor shall bear the cost of making good all work of the Owner or separate Contractors destroyed or damaged by such correction or removal.
- 13.2.7 Nothing contained in this Paragraph 13.2 shall be construed to establish a period of limitation with respect to any other obligation which Contractor might have under the Contract Documents, including Paragraph 4.5 hereof. The establishment of the time period of one year after the Date of Substantial Completion or such longer period of time as may be prescribed by law or by the terms of any warranty required by the Contract Documents relates only to Contractor to correct the work and has no relationship to the time within which its obligation to comply with the Contract Documents may be sought to be enforced, nor to the time within which proceedings may be commenced to establish Contractor's liability with respect to its obligations other than specifically to correct the work.

### **13.3 ACCEPTANCE OF DEFECTIVE OR NON-CONFORMING WORK**

- 13.3.1 If the Owner prefers to accept defective or non-conforming work, it may do so instead of requiring its removal and correction, in which case a Change Order will be issued to reflect a reduction in the Contract Sum where appropriate and equitable. Such adjustment shall be effective whether or not final payment has been made.

## **ARTICLE 14**

### **TERMINATION OF THE CONTRACT**

#### **14.1 TERMINATION BY CONTRACTOR**

- 14.1.1 If the work is stopped for a period of thirty (30) days under an order of court or other public authority having jurisdiction, or as a result of an act of government, such as a declaration of a national emergency making materials unavailable, through no act or fault of Contractor or a Sub-contractor or their agents or employees or any other persons performing any of the work under a contract with Contractor because the Engineer has not issued a Certificate for payment as provided in Paragraph 9.7 or because the Owner has not made payment thereon as provided in paragraph 9.7, then Contractor may, upon seven (7) additional days' written notice to the Owner and the Engineer, terminate the Contract and recover from the Owner payment for all work executed and for any proven loss sustained upon any materials, equipment, tools, construction equipment and machinery, including reasonable profit and damages.

#### **14.2 TERMINATION BY THE OWNER**

- 14.2.1 If Contractor is adjudged bankrupt, or if Contractor makes a general assignment for the benefit of its creditors, or if a receiver is appointed on account of its insolvency, or if Contractor persistently or repeatedly refuses or fails, except in cases for which extension of time is provided, to supply enough properly skilled workmen or proper materials, or if Contractor fails to make prompt payment to Subcontractors for material of labor, or persistently disregards laws, ordinances, rules, regulations, or orders of any public authority having jurisdiction, or otherwise is guilty of a substantial violation of a provision of the Contract Documents, then the Owner, upon certification by the Engineer that sufficient cause exists to justify such action, may without prejudice to any right or remedy and after giving Contractor and its surety, if any, seven (7) days written notice, terminate the employment of Contractor and take possession of the site and of all material, tools, construction equipment and machinery thereon owned by Contractor and may finish the work by whatever method Contractor may deem expedient. In such case, Contractor shall not be entitled to receive any further payment until the work is finished.
- 14.2.2 If the unpaid balance of the Contract Sum exceeds the costs of finishing the work, including compensation for the Engineer's additional services made necessary thereby, and any damages sustained by the Owner as a result of Contractor's breach, such excess shall be paid to Contractor. If such costs exceed the unpaid balance, Contractor shall pay the difference to the Owner. The amount to be paid to Contractor or to the Owner, as the case may be, shall be certified by the Engineer upon application, in the manner provided in paragraph 9.4 and this obligation or to the Owner, as the case may be, shall be certified by the Engineer upon application, in the manner provided in Paragraph 9.4 and this obligation for payment shall survive the termination of the Contract.
- 14.2.3 In the event that the Project is abandoned by the Owner, the Owner may terminate this contract at any time by giving at least five (5) working days' notice to Contractor. In the event of termination, all work completed shall become the property of the Owner. Contractor shall be entitled to receive compensation for actual work satisfactorily completed hereunder, including reimbursable expense authorized by the Owner, which is then due.

- 14.2.4 In the event Contractor fails to perform the work in accordance with the Contract Documents, the Owner may terminate the Contract after giving Contractor five (5) working days notice.

## **ARTICLE 15**

### **EQUAL OPPORTUNITY**

**15.1 Contractor shall maintain policies of employment as follows:**

- 15.1.1 Contractor, all Subcontractors, and all Sub-subcontractors shall not discriminate against any employee or applicant for employment because of race, religion, color, sex or national origin. Contractor shall take affirmative action to ensure that applicants are employed and that employees are treated during employment, upgrading, demotion, or transfer; recruitment or recruitment advertising; layoff or termination; rates of pay or other forms of compensation; and selection for training, including apprenticeship. Contractor agrees to post in conspicuous place, available to employees and applicants for employment, notices setting forth the policies of non-discrimination.
- 15.1.2 The Contract, all Subcontractors, and all Sub-subcontractors shall, in all solicitation or advertisements for employees placed by them or on their behalf, state that all qualified applicant will receive consideration for employment without regard to race, religion, color, sex, or national origin.

## **ARTICLE 16**

### **MINIMUM WAGE RATES / REGISTRATION**

- 16.1 Contractor warrants and agrees that Contractor and all Subcontractors and Sub-subcontractors shall comply with all applicable provisions of the New Mexico Public Works Minimum Wage Act as outlined in the Contract Documents. Wage rates are not applicable to projects costing less than \$60,000.00.
- 16.2 A General Contractor or subcontractor that submits a bid valued at more than fifty thousand dollars (\$50,000) is subject to the Public Works Minimum Wage Act (13-4-10 NMSA 1978) and shall be required to be registered with the Labor and Industrial Division of the NM Labor Department. The Registration Number shall be provided in the spaces provided in the Bid Form and on the Subcontractor's Listing for subcontracts valued at \$50,000 or more. After the Bid Opening, the registration numbers will be verified and the bid will be considered unresponsive and disqualified if the registration numbers are not valid and if Contractor or subcontractor cannot provide proof of the required registration. It is the responsibility of Contractor and subcontractors to ensure that the registration is completed prior to the Bid Opening.

# **Section 11**

## **Supplementary Conditions**

**SUPPLEMENTARY CONDITIONS  
(Section 00800)**

Document is intended to be used in conjunction with the General Conditions of the Contract.

**ADDITIONAL CONDITIONS**

**1.0 DEFINITIONS** - The following definitions shall apply through the Bidding Documents or Contract Documents unless otherwise specified.

- 1.1 **ADDENDUM:** Written or graphic instrument issued prior to the execution of the Contract which modifies or interpret the Bidding Documents, including Construction Plans and Specifications, by additions, deletions, clarifications, or corrections. Addenda will become part of the Contract Documents when the Construction Contract is executed. Plural: **ADDENDA**
- 1.2 **ADDITIVE OR DEDUCTIVE ALTERNATE BID:** Amount stated in the Bid to be added or deducted from the amount of the Base Bid if the corresponding change in project scope or alternate materials and/or methods of construction is accepted.
- 1.3 **BASE BID:** Amount of money stated in the Bid as the sum for which the Bidder offers to perform the work, not including that work for which Alternate Bids are also submitted.
- 1.4 **BID:** A complete and properly signed proposal to do the work or designated portion thereof for the sums stipulated therein, supported by data called for by the Bidding Documents.
- 1.5 **BID LOT:** A major item of work for which a separate quotation or proposal is requested.
- 1.6 **BIDDER:** One who submits a bid for a Prime contract with the Owner, as distinct from a Subcontractor, who submits a bid to a Bidder. Technically, a Bidder is not a Contractor on a specific project until a contract exists between Contractor and the Owner.
- 1.7 **BIDDING DOCUMENT:** Documents that include the Invitation for Bid, Instructions to Bidders, the Bid Form, other sample bidding and contract forms, and the proposed Contract Documents, including any Addenda issued prior to receipt of bids. The Contract Documents proposed for the work consist of the Owner-Contractor Agreement, the Conditions of the Construction Contract (General, Supplementary, and Other Conditions), the Construction Plans, the Specifications, and all Addenda issued prior to and all Modifications issued after execution of the Contract.



- 1.8 LANDFILL: Caja del Rio Landfill.
- 1.9 DAY: Calendar day, which is every day shown on the calendar, beginning and ending at midnight. However, due to the Work being performed at an active transfer station, Contractor will not be limited to performing work during facility hours of operation. Contractor shall submit a request for approval of workday hours to Owner.
- 1.10 CENTRAL PURCHASING OFFICE: The Central Purchasing Office is the City of Santa Fe Purchasing Department.
- 1.11 GOVERNING AUTHORITY: The Joint Powers Board of the execution of construction contracts is the Chairperson or Executive Director.
- 1.12 INVITATION FOR BID: The Bidding Documents utilized for soliciting sealed bids. "Invitation to Bid" shall have the same meaning as "Advertisement for Bid".
- 1.13 OWNER: Santa Fe Solid Waste Management Authority, Santa Fe, New Mexico.
- 1.14 PROCUREMENT OFFICER: The Director of the Purchasing Division, or a designee authorized to enter into or administer contracts and make written determination with respect thereto.
- 1.15 RESPONSIBLE BIDDER: A Bidder who submits a responsive bid and who has furnished, when required, information and data to prove that its financial resources, production or service facilities, personnel, service reputation, and experience are adequate to make satisfactory delivery of the services, construction, or items of tangible personal property described in the Bidding Documents (13-1-82, NMSA 1978).
- 1.16 SFSWMA: Santa Fe Solid Waste Management Agency.
- 1.17 SUCCESSFUL BIDDER: The lowest qualified and responsible Bidder to whom the Owner, on the basis of the Owner's evaluation, makes an award.
- 1.18 UNIT PRICES: Amounts stated in the Contract as prices per unit of measurement for materials or services as described in the Contract Documents.
- 1.19 USER: The Santa Fe Solid Waste Management Authority, agencies, or designated entity for whose use the Project is being constructed.

## **2.0 CONTRACT AUDIT**

The Owner shall be entitled to audit the books and records of a Contractor or any Subcontractor under any negotiated contract or subcontract other than a firm fixed-price contract to the extent that such books and records relate to the performance of such contract or subcontract. Such

books and records shall be maintained by Contractor for a period of three (3) years from the date of final payment under the prime contract and by the Subcontractor for a period of three (3) years from the date of final payment under the subcontract unless a shorter period is otherwise authorized in writing.

### **3.0 DEBARRED OR SUSPENDED CONTRACTORS**

A business (Contractor, Subcontractor, or Supplier) that has either been debarred or suspended pursuant to the requirements of the City of Santa Fe Purchasing Manual shall not be permitted to do business with the Owner and shall not be considered for award of contract during the period for which it is debarred or suspended.

### **4.0 BRIBES, GRATUITIES, AND KICK-BACKS**

- 4.1 It is illegal in the State of New Mexico for any public employee to solicit or accept anything of value in connection with award of this bid and for any person to offer or pay anything of value to any such public employee (30-24-1 through 30-24-2, NMSA 1978).
- 4.2 Pursuant to Section 13-1-191, NMSA 1978, reference is hereby made to the Criminal Laws of New Mexico (including 30-24-1, 30-23-2, and 30-41-1 through 30-41-3, NMSA 1978), which prohibit bribes, kick-backs, and gratuities and violation of which constitutes a felon. Further, the Procurement Code (13-1-28 through 13-1-199, NMSA 1978), imposes civil and criminal penalties for its violation

### **5.0 PROTESTS (CITY OF SANTA FE PURCHASING MANUAL)**

- 5.1 Any Contractor who is aggrieved in connection with a procurement may protest to the City of Santa Fe Purchasing Agent and the Owner. The protest should be made in writing within twenty-four (24) hours after the facts or occurrences; giving rise thereto, but in no case, less than fifteen (15) calendar days after the facts or occurrences giving rise thereto.
- 5.2 In the event of a timely protest under Section 5.1 the City of Santa Fe Purchasing Agent and the Owner shall not proceed further with the procurement unless the Owner makes a determination that the award of contract is necessary to protect substantial interests of the Owner.
- 5.3 The City of Santa Fe Purchasing Agent or its designee shall have the authority to take any action reasonably necessary to resolve a protest of an aggrieved Contractor concerning a procurement.
- 5.4 This authority shall be exercised in accordance with adopted regulations, but shall not include the authority to award money damages or attorneys' fees.

- 5.4 The City of Santa Fe Purchasing Agent or its designee shall promptly issue a determination relating to the protest. The determination shall:
  - A. State the reasons for the action taken; and,
  - B. Inform the protestant of the right to judicial review of the determination.
- 5.6 A copy of the determination issued shall be mailed immediately to the protestant.

## **6.0 CONTRACT BOND REQUIREMENTS**

- 6.1 The Successful Bidder, where the Contract Price exceeds five hundred dollars (\$500), shall post a one hundred percent (100%) Performance Bond and a one hundred percent (100%) Labor and Material Payment Bond. Bonds shall be executed on Performance Bond and Labor and Material Payment Bond forms attached hereto, with amount payable conforming to the terms of the contract. Surety shall be a company licensed to do business in the State of New Mexico and acceptable to the Owner.
- 6.2 Personal sureties may be accepted if the Owner so determines in advance, but in such case the amount of the Bond shall be the full Contract Price, and the sureties shall justify under oath in amounts above liabilities and exemptions aggregating double the amount of the Bond.
- 6.3 Special attention of Bidders is called to the requirements of Section 13-4-18 through 13-4-20, NMSA 1978 regarding a Contractor who does not have its principal place of business in the State of New Mexico for all taxes due arising out of construction services rendered under the Contract.
  - 6.3.1 The right to sue on this Bond accrues only to the Owner and the parties to whom Sections 13-4-18 through 13-4-20, NMSA 1978 grant such right; and any such right shall be exercised only in accordance with the provisions and limitations of said statutes.

## **7.0 NON-RESIDENT CONTRACTOR'S REQUIREMENTS REGARDING GROSS RECEIPTS TAX SURETY BOND**

- 7.1 Section 7-1-55A, NMSA 1978 provides that any person (as defined in Section 7-1-3, NMSA 1978) engaged in the construction business who does not have its principal place of business in New Mexico and enters into a prime construction contract to be performed in this State shall, at the time such contract is entered into, furnish the Director of the Revenue Division, Taxation and Revenue Department, or its delegate with a surety bond or other acceptable security in a sum equivalent to the gross receipts to be paid under the contract multiplied by the applicable rate of the gross receipts tax imposed by Section 7-9-4, NMSA 1978 to secure payment of the tax imposed on the gross receipts from the

contract, and shall obtain a certificate from the Director of the Revenue Division, Taxation and Revenue Department, or its delegate that the requirements of this paragraph have been met.

- 7.2 If the total sum to be paid under the contract is changed by ten percent or more after the date the surety bond or other acceptable security is furnished, to the Director or its delegate, such person shall increase or decrease, as the case may be, the amount of the bond or security within fourteen (14) days after the change (7-1-55B, NMSA 1978).
- 7.3 In addition to the above requirements, Contractor will be subject to all the requirements of the City Procurement Code.

## **8.0 CONTRACTOR'S GROSS RECEIPTS TAX REGISTRATION**

- 8.1 Section 7-10-4, NMSA 1978 provides that any person (as defined in Section 7-10-3, NMSA 1978) performing services for the Owner, as those terms are used in the Gross Receipts and Compensating Tax Act (Section 7-10-1 to 7-10-5, NMSA 1978), must be registered and be issued a CRS identification number with the Revenue Division of the Taxation and Revenue Department to pay the gross receipts tax.

- 8.2 The CRS identification number is needed to properly complete the approval process of the contract; therefore, so as to cause no delay in the processing, Contractor must register with the State of New Mexico, Taxation and Revenue Department. For information contact:

Revenue Division  
Taxation and Revenue Department  
Manual Lujan Building  
1200 St. Francis Drive  
Santa Fe, New Mexico 87503  
(505) 988-2290

- 8.3 If any person who performs services for the Owner is not registered to pay the gross receipts tax, the Owner shall withhold payment of the amount due until the person has presented evidence of registration with the Revenue Department to pay the gross receipts tax.

## **9.0 CONTRACT WITH NONRESIDENT PERSON OR PARTNERSHIPS OR UNADMITTED FOREIGN CORPORATIONS; AGENT FOR SERVICE OF PROCESS**

- 9.1 Special attention of Bidders is called to requirements of Sections 13-4-21 through 13-4-24, NMSA 1978, whereby a public works contract with a nonresident person or partnership or foreign corporation not authorized to do business in the State

shall contain a specific provision designating an agent resident within the State, and its address, upon whom process and writs in any action or proceeding against such business may be served in any action arising out of such contract.

## **10.0 STATE ALLOWANCES**

- 10.1 Contractor shall purchase the “Allowed Materials” as directed by the Owner through the Engineer on the basis of the lowest and the best bid of at least three competitive bids. If the actual price for purchasing the “Allowed materials” is more or less than the “Cash Allowance,” the Contract Price shall be adjusted accordingly. The adjustment in Contract Price made on the basis of the purchase price without additional charges for overhead, profit, insurance, or any other incidental expenses. The cost of installation of the “Allowed Materials” shall be included in the applicable section of the Specifications covering the work.

## **11.0 MINIMUM WAGE RATES**

- 11.1 This project is subject to the Minimum Wage Rates as determined by the New Mexico State Labor & Industrial Commission pursuant to Chapter 13, Section 13-14-11, NMSA 1978. The Minimum Wage Rates to be paid by Contractor and any Subcontractors to their employees on this project are as listed in the New Mexico State Labor and Industrial Commission Minimum Wage Rate Decision. A copy of this decision is bound in these documents immediately following this page.
- 11.2 All Contractors and Subcontractors shall submit one (1) certified copy of the project weekly payroll to the Santa Fe Solid Waste Management Agency, 149 Wildlife Way, Santa Fe, NM 87506, c/o Mr. Randall Kippenbrock, Executive Director and one (1) copy also certified directly to the New Mexico State Labor Commission – Public Works Division, Aspen Building, 1596 Pacheco Street, Santa Fe, New Mexico 87501, not later than five (5) working days after the close of each payroll period. The prime Contractor shall be responsible for the submission of copies of payrolls of all subcontractors.
- 11.3 Before using apprentices on this project, Contractor shall present to the Contracting Officer written evidence of registration of such employees with the U.S. Department of Labor, Bureau of Apprenticeship and Training, Western Bank Building (Room 1414), 505 Marquette Avenue, N.W., Albuquerque, New Mexico 87102, Telephone 766-2398. If the apprenticeship is not registered in a bona fide apprenticeship program as mentioned above, the journeyman’s wage rate for that particular classification in which Contractor is working is applicable.

## **12.0 FORM OF CHANGE ORDER AND CHANGE ORDER NOTICE TO PROCEED**

- 12.1 The following forms issued by the Owner are to be utilized by Contractor, Engineer, and the Owner pursuant to the requirements of the General Conditions.

**13.0 STATE OF NEW MEXICO STATE CONSTRUCTION INDUSTRIES DIVISION**

- 13.1 Contractor, at its own expense, shall secure any required construction permits from the State CID for this Project. Contractor shall adhere to the requirements established for inspections.

**14.0 DISPOSAL REQUIREMENTS**

- 14.1 Contractor shall be responsible for the disposal of all rubble, excess materials, etc. at an approved disposal facility.

## **Section 12**

# **State of New Mexico Wage Rates Determination**

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STATE OF NEW MEXICO  
NEW MEXICO DEPARTMENT OF  
WORKFORCE SOLUTIONS  
Labor Relations Division,  
121 Tijeras Ave NE, Suite 3000  
Albuquerque, NM 87102  
www.dws.state.nm.us

## Wage Decision Approval Summary

1) Project Title: Caja del Rio Landfill Cells 6B and 6A Wedge Liner System Construction  
Requested Date: 04/29/2019  
Approved Date: 04/30/2019  
Approved Wage Decision Number: SF-19-0811-A

### Wage Decision Expiration Date for Bids: 08/28/2019

2) Physical Location of Jobsite for Project:  
Job Site Address: 149 Wildlife Way  
Job Site City: Santa Fe  
Job Site County: Santa Fe

3) Contracting Agency Name (Department or Bureau): CITY OF SANTA FE  
Contracting Agency Contact's Name: Randall Kippenbrock  
Contracting Agency Contact's Phone: (505) 424-1850 Ext. 100

4) Estimated Contract Award Date: 07/15/2019

5) Estimated total project cost: \$1,700,000.00  
a. Are any federal funds involved?: No  
b. Does this project involve a building?: No  
c. Is this part of a larger plan for construction on or appurtenant to the property that is subject to this project?: No  
d. Are there any other Public Works Wage Decisions related to this project?: No  
e. What is the ultimate purpose or functional use of the construction once it is completed?: Geosynthetic lining of two cells for waste disposal.

6) Classifications of Construction:

| Classification Type<br>and Cost Total                       | Description                                                                                                                                                                                                                                                                                                                                                                                                                                    |
|-------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Highway/Utilities (A)</b><br><b>Cost: \$1,700,000.00</b> | A 12.4 acre landfill liner construction project including subgrade preparation, geosynthetic liner installation, protective cover/drainage layer installation, leachate piping installation, surveying and mobilization/demobilization. This is a 90-day project. The project includes the cost for all geosynthetic liner materials. It does not include the cost of protective cover/drainage layer material (crushed basalt/crushed glass). |

# TYPE "A" - STREET, HIGHWAY, UTILITY & LIGHT ENGINEERING

Effective January 1, 2019

| Trade Classification             | Base Rate | Fringe Rate |
|----------------------------------|-----------|-------------|
| Bricklayer/Blocklayer/Stonemason | 23.78     | 9.08        |
| Carpenter/Lather                 | 24.08     | 10.84       |
| Cement Mason                     | 17.42     | 6.61        |
| Ironworker                       | 26.50     | 16.20       |
| Painter (Brush/Roller/Spray)     | 17.00     | 6.78        |
| Plumber/Pipefitter               | 29.45     | 12.37       |
| <b>Electricians (outside)</b>    |           |             |
| Groundman                        | 22.81     | 11.93       |
| Equipment Operator               | 32.73     | 14.51       |
| Lineman/Wireman or Tech          | 38.51     | 16.02       |
| Cable Splicer                    | 42.36     | 17.01       |
| <b>Laborers</b>                  |           |             |
| Group I                          | 11.81     | 5.88        |
| Group II                         | 12.11     | 5.88        |
| Group III                        | 12.51     | 5.88        |
| Group IV                         | 12.76     | 5.88        |
| <b>Operators</b>                 |           |             |
| Group I                          | 18.60     | 5.94        |
| Group II                         | 19.52     | 5.94        |
| Group III                        | 19.62     | 5.94        |
| Group IV                         | 19.73     | 5.94        |
| Group V                          | 19.83     | 5.94        |
| Group VI                         | 20.01     | 5.94        |
| Group VII                        | 20.17     | 5.94        |
| Group VIII                       | 20.46     | 5.94        |
| Group IX                         | 27.88     | 5.94        |
| Group X                          | 31.10     | 5.94        |
| <b>Truck Drivers</b>             |           |             |
| Group I                          | 16.15     | 7.52        |
| Group II                         | 16.15     | 7.52        |
| Group III                        | 16.15     | 7.52        |
| Group IV                         | 16.15     | 7.52        |
| Group V                          | 16.15     | 7.52        |
| Group VI                         | 16.15     | 7.52        |
| Group VII                        | 16.15     | 7.52        |
| Group VIII                       | 16.21     | 7.52        |
| Group IX                         | 18.15     | 7.52        |

**NOTE:** All contractors are required to pay **SUBSISTENCE, ZONE AND INCENTIVE PAY** according to the particular trade. Details are located in a PDF attachment at [WWW.DWS.STATE.NM.US](http://WWW.DWS.STATE.NM.US). Search Labor Relations/Labor Information/Public Works/Prevailing Wage Rates.

## **Section 13**

# **Technical Specifications**

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SECTION 01010  
SUMMARY OF WORK

PART 1 GENERAL

1.01 LOCATION OF WORK

- A. The work of this Contract is located at the Caja del Rio Landfill in Santa Fe, New Mexico.

1.02 SCOPE OF WORK

- A. Furnish all labor, materials, equipment and incidentals required and construct the the Caja del Rio Landfill Cells 6B and 6A Wedge in its entirety as shown on the Drawings and as specified herein.
- B. The Work includes, but is not necessarily limited to, the following:
  - 1. Mobilization and demobilization.
  - 2. Earthwork and subgrade preparation.
  - 3. Construction of Cell 6B and 6A Wedge liner system consisting of geosynthetic clay liner, high density polyethylene (HDPE) geomembrane, geotextile, and drainage layer.
  - 4. Construction of leachate collection system.

1.03 WORK SEQUENCE

- A. Perform Work in sequence listed below to accommodate Owner's occupancy during the construction period and to ensure completion of the Work in the Contract Time. Completion dates of the various stages shall be as specified below.
  - 1. Caja del Rio Landfill Cells 6B and 6A Wedge – 90 Calendar Days

1.04 SUBSTANTIAL COMPLETION

- A. The following items are required to be completed to achieve Substantial Completion:
  - 1. Complete construction of Cells 6B and 6A Wedge, ready for Certification of Construction Completion to be submitted by Engineer and Owner to NMED.
  - 2. Submit all field conformance testing results.
  - 3. Submit electronic as-built survey for:
    - a. Prepared subgrade.
    - b. Constructed liner.
    - c. Leachate collection piping.
    - d. Constructed drainage layer.
  - 4. Submit final, certified site survey (refer to Section 01050).
  - 5. Submit Project Record Drawings (refer to Section 01720).

1.05 FINAL ACCEPTANCE

- A. The following items are required to be completed to achieve Final Acceptance:
  - 1. Completion and Engineer's approval of punch list items.
  - 2. Engineer's recommendation of Contractor's proposal for a final change order, if applicable.
  - 3. Engineer's recommendation of Contractor's request for final payment and Owner's acceptance of final invoice.

1.06 CONTRACTOR'S USE OF PREMISES

- A. Contractor shall limit the use of the premises for his/her Work and for storage to allow for:
  - 1. Work by other contractors.
  - 2. Owner occupancy
  - 3. Public use.
- B. Coordinate use of premises with Owner.
- C. Contractor shall assume full responsibility for security of all his/her and his/her subcontractors materials and equipment stored on the site.
- D. If directed by the Owner, move any stored items which interfere with operations of Owner or other contractors.
- E. Obtain and pay for use of additional storage or work areas if needed to perform the Work.

1.07 OWNER OCCUPANCY

- A. Owner will occupy premises during performance of the work for the conduct of his/her normal operations. Coordinate all construction operations with Owner to minimize conflict and to facilitate Owner usage.
  - 1. Site access.
  - 2. Parking.
  - 3. Fill stand operation.

1.08 OWNER-FURNISHED PRODUCTS

- A. The Owner will furnish and pay for the following items:
  - 1. Drainage Layer Granular Fill Material: Section 02230
- B. Owner's Responsibilities

1. Arrange for and deliver necessary shop drawings, product data and samples to Contractor.
2. Arrange and pay for delivery of item to site. Coordinate delivery with Contractor.
3. Deliver supplier's bill of materials to Contractor.
4. Inspect delivery jointly with Contractor.
5. Submit claims for transportation damages.
6. Arrange for replacement of damaged, defective, or missing items.
7. Arrange for manufacturer's warranties, bonds, service and inspections as required.

C. Contractor's Responsibilities

1. Coordinate delivery date for each pre-purchased item with Owner.
2. Review shop drawings, product data and samples. Notify Owner and Engineer of any discrepancies or problems anticipated with use of pre-purchased item.
3. Receive and unload items at site.
4. Inspect items jointly with Owner and record any shortages, damaged or defective items.
5. Assume responsibility for items, including insurance, upon acceptance of items at site.
6. Handle items at site, including uncrating and storage. Protect items from exposure to elements and damage.
7. Assemble, install, connect and finish products and provide warranty for Contractor furnished materials and workmanship as specified.
8. Repair or replace items damaged as a result of Contractor's work.

END OF SECTION

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SECTION 01020  
ALLOWANCES

PART 1 GENERAL

1.01 REQUIREMENTS INCLUDED

- A. Costs in Contract Price other than in Allowances.
- B. Procedure for administration of Allowances.
- C. Payment of field conformance testing laboratory services completed by Owner.

1.02 RELATED WORK

- A. Submittals are included in Section 01300.
- B. Testing and Testing Laboratory Services are included in Section 01410.
- C. Granular Fill Materials are included in Section 02230.
- D. High Density Polyethylene (HDPE) Geomembrane is included in Section 02776.

1.03 CONTRACTOR'S USE OF ALLOWANCES

- A. Contractor shall include in Contract Price all allowances named in Contract Documents and shall cause Work so covered to be done by such Subcontractors, manufacturers, fabricators, suppliers, or distributors and for such sums within limit of allowances as may be acceptable to Owner. Upon final payment, the Contract Price shall be adjusted as required to reflect actual costs of the items for which allowances are specified, and appropriate Change Order issued. Contractor agrees that original Contract Price includes all costs and profit on account of cash allowances. No demand for additional cost or profit in connection therewith will be valid.

1.04 SCHEDULE OF ALLOWANCES

- A. Allow the lump sum of twenty-five thousand dollars (\$25,000) for payment of the following to be performed under this allowance:
  - 1. Quality assurance laboratory testing for HDPE geomembrane destructive test seam samples and related shipping costs.
  - 2. Field quality control testing for drainage layer granular fill material.

1.05 CONTRACTOR COSTS INCLUDED IN ALLOWANCES

- A. Cost of product or service to Contractor or Subcontractor, less applicable trade discounts.
- B. Labor required under allowance, only when labor is specified to be included.

1.06 CONTRACTOR COSTS INCLUDED IN CONTRACT SUM, BUT NOT INCLUDED IN ALLOWANCES

- A. For conformance testing, costs of testing laboratory services for all materials obtained from off-site services as required by the Contract Documents. Incidental labor and facilities required for testing services shall be included in the Contract sum, but not included in the allowance.
- B. Costs of testing laboratory services required by Contractor beyond Contract Document requirement.
- C. Contractor's markups, overhead, and profits.

1.07 CONTRACTOR RESPONSIBILITIES

- A. On notification of selection, execute purchase agreement with Owner-approved testing laboratory.

1.08 PAYMENT PROCEDURES

- A. List amount of each allowance invoice, purchased or rented equipment costs, and costs at hourly rates with other items on each application for payment, and submit one copy of invoice with each copy of application.
- B. Payment for testing will only be made for passing tests.**
- C. Pay invoice on approval of City.

PART 2 PRODUCTS (NOT USED)

PART 3 EXECUTION (NOT USED)

END OF SECTION

SECTION 01025  
MEASUREMENT AND PAYMENT

PART 1 GENERAL

1.01 REQUIREMENTS INCLUDED

- A. Measurement and payment shall be as specified in this Section.
- B. Work to be performed under this contract will be paid for on a Unit Price or Lump Sum basis under the appropriate Bid Items in the Bid Schedule. All costs for Work shown on Drawings or described in Specifications shall be incidental to the Contract and shall be included in the Contract Price. A claim by the Contractor for extra compensation for an item shown on the Drawings or described in the Specifications will not be considered for any reason including but not limited to the claim that it does not fall within the scope of one of the Bid Items. All work covered under the Standard Specifications shall be paid as outlined in this Section, NOT as indicated in the Standard Specifications.
- C. Contractor shall, within 15 days of receipt of Notice to Proceed, submit a schedule of values in accordance with Section 01370 for all lump sum bid items.
- D. General scope of work under each bid item includes all labor and materials required for construction of completely functional and operational facilities as shown on the Drawings and in these Specifications.
- E. GENERAL. The total base bid price shall cover all work required by the contract documents for construction of a completely functional and operational facility. All costs in connection with the proper and successful completion of the work, including furnishing all materials, equipment, supplies, and appurtenances; providing all construction plans, equipment, and tools; and performing all necessary labor and supervision to fully complete the work in accordance with these contract documents, shall be included in the unit and lump sum prices bid. All work not specifically set forth as a pay item in the bid proposal shall be considered a subsidiary obligation of Contractor and as such, all costs in connection therewith shall be included in the bid prices.
- F. ESTIMATED QUANTITIES. All estimated quantities for unit price bid items stipulated in the bid proposal are approximate and are to be used only (a) as a basis for estimating the probable cost of the work and (b) for the purpose of comparing the bids submitted for the work. The actual amounts of work done and materials furnished under unit price items may differ from the estimated quantities. The basis of payment for work and materials will be the actual amount of work done and materials furnished.
- G. MEASUREMENT AND PAYMENT. All measurements and payments will be based on completed work performed in strict accordance with the Drawings and Specifications and in accordance with contract-unit prices and schedule of values. Incidental work and items not listed in the contract-unit price schedule will not be paid for separately, but will be included in the payment for the listed item or items to which such incidental work applies. Measurement and payment for lump sum items shall be full compensation for all labor, equipment, materials, testing and incidentals necessary to perform the work in accordance with these contract documents, and shall include all else incidental thereto for which separate payment is not

provided under other items. Measurement and payment for unit price items will be for actual work performed as measured by quantities from completed as-built surveys.

## 1.02 BASE BID ITEM DESCRIPTION

- A. General: The Base Bid item numbers shown below are consistent with numbers in the Unit Price Bid Proposal. Estimated quantities stipulated in the Unit Price Bid Proposal are approximate and are to be used only as a basis for estimating the probable cost of the Work and for the purpose of comparing the bids submitted for the Work. The actual amounts of the Work done and materials furnished under unit price items may differ from the estimated quantities.

### Item No. 1 - Mobilization/Demobilization

Shall include all costs for Contractor's mobilization and demobilization, insurance and bond, construction permits and fees, job trailers, site administration expenses, and utilities for the entire project. Shall include all costs for contract closeout, site cleanup, and all costs associated with Contractor's demobilization from the site. Payment for mobilization and demobilization shall be on a Lump Sum basis as noted in the Bid Form.

### Item No. 2 - Quality Control/Quality Assurance Testing Allowance

Shall include all labor, materials, equipment and incidentals required and performing testing of materials and equipment before and/or after installation as required by the specifications for the entire project. Payment for Quality Control/Quality Assurance Testing will be in accordance with Section 01020 – Allowances.

### Item No. 3 – Construction Staking and Surveying

Shall include all labor, materials, equipment, and incidentals required for construction related surveying and staking per the requirements of Section 01050 of these Specifications. Staking and surveying shall be performed to locate existing edge of liner system, locate leachate collection lines, locate anchor trenches, verify thickness of prepared subgrade layer by survey once per acre on a grid, prepared subgrade as-built survey, liner as-built survey per the requirements of Section 02776 of these Specifications, leachate collection pipe as-built survey, verify thickness of completed drainage layer five times per acre on a grid by survey, as-built survey of the completed drainage layer, and all else incidental to staking and surveying required for completion of Work. Payment for construction staking and surveying shall be on a Lump Sum basis as noted on the Bid Form.

### Item No. 4 – Subgrade Preparation

Shall include all labor, equipment and incidentals required for clearing and grubbing, mucking, excavation, borrow, embankment, and installation of subgrade over the Cell No. 6B and 6A Wedge landfill area and as shown on the Drawings. Item No. 3 shall also include all labor, materials, equipment and incidentals for excavation, haul, placement and grading of material, and compaction of materials for the unpaved access road adjacent to anchor trenches. The subgrade layer shall be a minimum six (6) inch thick layer of in-situ soil or select fill compacted to 90 percent standard Proctor density. Subgrade preparation shall include all labor, materials, equipment and incidentals for excavation, haul, placement and grading of material, water haul and placement if required, compaction of materials excavated from an borrow site that is approved by the Engineer, and testing in accordance with the Specifications and Caja del Rio CQA Plan. Payment for the Subgrade Preparation shall be on a Lump Sum basis as noted in the Bid Form.

Item No. 5 – Existing Edge of Liner System Tie-In

Shall include all labor, materials, equipment and incidentals required to locate and uncover the existing edge of liner including excavation, loading, hauling, removal and disposal of existing plywood covering, and all else incidental to exposing and preparing the existing edge of liner for tie-in (seaming) with new liner system for Cell 6B and 6A Wedge landfill area complete-in-place as shown on the Drawings and specified herein. Measurement for payment of Existing Edge of Liner System Tie-In shall be based on the actual quantity of existing edge of liner system exposed verified by the as-built survey. Payment shall be on a per Linear Foot basis as noted in the Bid Form.

Item No. 6 - Geosynthetic Clay Liner

Shall include all labor, materials, equipment and incidentals required for the installation of the geosynthetic clay liner (GCL) system for the landfill cell including liner installation, seaming, tie-in seaming with existing liner, and testing complete-in-place as shown on the Drawings and specified herein. Measurement for payment for installation of GCL shall be based on the actual quantity installed verified by the as-built survey and shall not include the area of GCL overlaps for seam construction and five feet of GCL along the cell perimeter for construction of anchor trench and horizontal runout. Payment shall be on a per Square Foot basis as noted in the Bid Form.

Item No. 7 – 60 mil Textured HDPE Liner

Shall include all labor, materials, equipment and incidentals required for the installation of the 60-mil, white, double-sided textured HDPE liner, including liner installation, seaming, tie-in seaming with existing liner, edge of liner marker posts, and testing complete-in-place as shown on the Drawings and specified herein. Measurement for payment of 60-mil Textured HDPE Liner shall be based on the actual quantity installed verified by the as-built survey and shall not include the area of liner overlaps for seam construction and five feet of liner along the cell perimeter for construction of anchor trench and horizontal runout. Payment shall be on a per Square Foot basis as noted in the Bid Form.

Item No. 8 – 10 oz/yd<sup>2</sup> Non-Woven Geotextile

Shall include all labor, materials, equipment, testing, and incidentals required for the installation of the 10 oz/yd<sup>2</sup> non-woven geotextile over the textured HDPE liner complete-in-place as shown on the Drawings and specified herein. Measurement for payment 10 oz/yd<sup>2</sup> Non-Woven Geotextile shall be for the actual quantity installed verified by as-built survey and shall not include geotextile overlaps for seam construction and five feet of geotextile along the cell perimeter for construction of anchor trench and horizontal runout. Payment for the installation of the geotextile shall be on a per Square Foot basis as noted in the Bid Form.

Item No. 9 – Drainage Layer Material, Crushed Basalt

Shall include all labor, testing, equipment, and incidentals required for the installation of drainage layer material over the Cell No. 6B and 6A Wedge lined landfill area complete-in-place as shown on the Drawings and specified herein. The drainage material layer shall be a minimum of two-feet thick and thickness shall be measured by survey five times per acre on a grid. Drainage Layer Material shall include all labor, equipment and incidentals for excavation, loading, haul, placement and grading of material, water haul and placement if required, and all else incidental to completion of the two-feet thick drainage layer. Measurement for payment

will be for the actual quantity of material installed based on the as-built survey. Payment shall be on a per Cubic Yard basis as noted in the Bid Schedule.

Item No. 10 – Drainage Layer Material, Glass Cullet

Shall include all labor, testing, equipment, and incidentals required for the installation of drainage layer material over the Cell No. 6B and 6A Wedge lined landfill area complete-in-place as shown on the Drawings and specified herein. The drainage material layer shall be a minimum of two-feet thick and thickness shall be measured by survey five times per acre on a grid. Drainage Layer Material shall include all labor, equipment and incidentals for excavation, loading, haul, placement and grading of material, water haul and placement if required, thoroughly mixing glass cullet with basalt material at a ratio of 1:1, and all else incidental to completion of the two-feet thick drainage layer. Measurement for payment will be for the actual quantity of material installed based on the as-built survey. Payment shall be on a per Cubic Yard basis as noted in the Bid Schedule.

Item No. 11 – Leachate Collection Piping, Perforated

Shall include all labor, materials, equipment, and incidentals required to supply, install and test perforated leachate collection pipe, including HDPE SDR 11 perforated pipe, fittings, washed gravel material, geotextile, cleanout, jet washing, and video inspection, complete-in-place as shown on the Drawings and specified herein. Measurement for payment will be based on the actual quantity of perforated leachate collection system piping installed verified by as-built survey. Payment for the Perforated Leachate Collection Piping shall be on a per Linear Foot basis as noted in the Bid Form.

Item No. 12 – Leachate Collection Piping, Solid

Shall include all labor, materials, equipment, and incidentals required to supply, install and test solid leachate collection pipe, including HDPE SDR 11 solid pipe, fittings, riser pipe cap, cleanout, bollards, jet washing, and video inspection complete-in-place as shown on the Drawings and specified herein. Measurement for payment will be based on the actual quantity of solid leachate collection system piping installed verified by as-built survey. Payment for Solid Leachate Collection System shall be on a per Linear Foot basis as noted in the Bid Form.

Item No. 13 – Excavate, Backfill, and Compact Anchor Trench

Shall include all labor, materials, equipment and incidentals required to excavate, backfill, compact, quality control testing, complete-in-place as shown on the Drawings. Measurement for payment for Excavate, Backfill, and Compact shall be based on the actual quantity of completed anchor trench verified by as-built survey. Payment for Excavate, Backfill, and Compact shall be on a per Linear Foot basis as noted in the Bid Form.

PART 2 PRODUCTS (NOT USED)

PART 3 EXECUTION (NOT USED)

END OF SECTION

SECTION 01026  
APPLICATION FOR PAYMENT

PART 1 GENERAL

1.01 REQUIREMENTS INCLUDED

- A. Submit Applications for Payment to the Engineer in accordance with the schedule established by Conditions of the Contract and Agreement between Owner and Contractor.
- B. The accepted Schedule of Values, Section 01370, shall be used as the basis for the Contractor's Application for Payment.

1.02 RELATED WORK

- A. Submittals are included in Section 01300.
- B. Schedule of Values are included in Section 01370.
- C. Contract Closeout is included in Section 01700.

1.03 SUBMITTALS

- A. Submit, in accordance with Section 01300, applications typed on forms provided by the Owner, Application for Payment, with itemized data typed on 8-1/2-in by 11-in or 8-1/2-in by 14-in white paper continuation sheets.
  - 1. Pending no Owner provided forms, use AIA Document G732 and AIA Document G703, EJCDC Document C-620, or other forms accepted by Engineer prior to initial submittal of schedule of values.
- B. Provide itemized data on continuation sheet.
  - 1. Format, schedules, line items and values: Those of the Schedule of Values accepted by the Engineer.
- C. Provide construction photographs.

1.04 PREPARATION OF APPLICATION FOR EACH PROGRESS PAYMENT

- A. Application Form
  - 1. Fill in required information, including that for Change Orders executed prior to date of submittal of application.
  - 2. Fill in summary of dollar values to agree with respective totals indicated on continuation sheets.
  - 3. Execute certification with signature of a responsible officer of Contract firm.
- B. Continuation Sheets

1. Fill in total list of all scheduled component items of Work, with item number and scheduled dollar value for each item.
2. Fill in dollar value in each column for each scheduled line item when work has been performed or products stored.
  - a. Round off values to nearest dollar, or as specified for Schedule of Values.
3. List each Change Order executed prior to date of submission, at the end of the continuation sheets.
  - a. List by Change Order Number and description, as for an original component item of work.
4. To receive approval for payment on component material stored on site, submit copies of the original paid invoices with the application for payment.

1.05 SUBSTANTIATING DATA FOR PROGRESS PAYMENTS

- A. When the Owner or the Engineer requires substantiating data, submit suitable information, with a cover letter identifying.
  1. Project.
  2. Application number and date.
  3. Detailed list of enclosures.
  4. For stored products:
    - a. Item number and identification as shown on application.
    - b. Description of specific material.
- B. Submit one copy of data and cover letter for each copy of application.
- C. As a prerequisite for payment, submit a "Surety Acknowledgement of Payment Request" letter showing amount of progress payment which the Contractor is requesting.
- D. Maintain an updated set of drawings to be used as record drawings in accordance with Section 01700. As a prerequisite for monthly progress payments, exhibit the updated record drawings for review by the Owner and the Engineer.

1.06 PREPARATION OF APPLICATION FOR FINAL PAYMENT

- A. Fill in Application form as specified for progress payments.
- B. Use continuation sheet for presenting the final statement of accounting as specified in Section 01700.
- C. Submit all Project Record Documents in accordance with Section 01700.

1.07 SUBMITTAL PROCEDURE

- A. Submit Applications for Payment to the Engineer at the times stipulated in the Agreement.



- B. Number: Five hard copies of each Application or one electronic copy in portable document format (PDF).
- C. When the Engineer finds Application properly completed and correct, he/she will transmit certificate for payment to Owner, with copy to Contractor.

PART 2 PRODUCTS (NOT USED)

PART 3 EXECUTION (NOT USED)

END OF SECTION

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SECTION 01040  
PROJECT COORDINATION

PART 1 GENERAL

1.01 SCOPE OF WORK

A. This section specifies requirements for project coordination including:

1. Coordination.
2. Administrative and supervisory personnel.
3. General installation provisions.
4. Cleaning and protection.

1.02 COORDINATION

A. Coordinate activities included in various Sections to assure efficient and orderly installation of each component. Coordinate operations included under different Sections that are dependent on each other for proper installation and operation.

1. Where installation of one component depends on installation of other components before or after its own installation, schedule activities in the sequence required to obtain the best results.
2. Where space is limited, coordinate installation of different components to assure maximum accessibility for maintenance, service and repair.
3. Make provisions to accommodate items scheduled for later installation.

B. Prepare memoranda for distribution to each party involved outlining required coordination procedures. Include required notices, reports and attendance at meeting.

1. Prepare similar memoranda for the Owner and separate Contractors where coordination of their Work is required.

1.03 ADMINISTRATIVE PROCEDURES

A. Coordinate scheduling and timing of administrative procedures with other activities to avoid conflicts and ensure orderly progress. Such activities include:

1. Preparation of schedules.
2. Installation and removal of temporary facilities.
3. Delivery and processing of submittals.
4. Progress meetings.
5. Project closeout activities.

#### 1.04 STAFF NAMES

- A. Within 15 days of Notice to Proceed, submit a list of Contractor's staff assignments, including Superintendent and personnel at the site; identify individuals, their duties and responsibilities and telephone numbers.

#### 1.05 INSPECTION OF CONDITIONS

- A. The Installer of each component shall inspect the substrate and conditions under which Work is performed. Do not proceed until unsatisfactory conditions have been corrected.

#### 1.06 MANUFACTURER'S INSTRUCTIONS

- A. Comply with manufacturer's installation instructions and recommendations, to the extent that they are more stringent than requirements in Contract Documents.
- B. Inspect material immediately upon delivery and again prior to installation. Reject damaged and defective items.

#### 1.07 VISUAL EFFECTS

- A. Provide uniform joint widths in exposed Work. Arrange joints to obtain the best effect. Refer questionable choices to the Engineer for decision.
- B. Recheck measurements and dimensions, before starting installation.
- C. Install each component during weather conditions and project status that will ensure the best results. Isolate each part from incompatible material as necessary to prevent deterioration.

#### 1.08 CLEANING AND PROTECTION

- A. During handling and installation, clean and protect construction in progress and adjoining materials in place. Apply protective covering where required to ensure protection from damage or deterioration at Substantial Completion.
  - 1. Clean and maintain completed construction as often as necessary through the construction period. Adjust and lubricate operable components to ensure operability without damaging effects.
  - 2. Limiting Exposure: Supervise operations to ensure that no part of construction, completed or in progress, is subject to harmful or deleterious exposure. Such exposures include:
    - a. Excessive static or dynamic loading.
    - b. Excessive internal or external pressures.
    - c. Excessive weathering.
    - d. Excessively high or low temperatures or humidity.
    - e. Air contamination or pollution.
    - f. Water or ice.
    - g. Chemicals or solvents.
    - h. Heavy traffic, soiling, staining and corrosion.
    - i. Rodent and insect infestation.

- j. Unusual wear or other misuse.
- k. Contact between incompatible materials.
- l. Theft or vandalism.

PART 2 PRODUCTS (NOT USED)

PART 3 EXECUTION (NOT USED)

END OF SECTION

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SECTION 01046  
CONTROL OF WORK

PART 1 GENERAL

1.01 SITE

- A. Furnish materials and equipment which will be efficient, appropriate and large enough to secure a satisfactory quality of work and a rate of progress which will ensure the completion of the work within the Contract Time. If at any time such operations appear to the Engineer to be inefficient, inappropriate or insufficient for securing the quality of work required or for producing the rate of progress aforesaid, Engineer may order the Contractor to increase the efficiency, change the character or increase the equipment and/or materials, the Contractor shall conform to such order. Failure of the Engineer to give such order shall in no way relieve the Contractor of his/her obligations to secure the quality of the work and rate of progress required.

1.02 PRIVATE LAND

- A. Do not enter or occupy private land outside of easements, except by permission of the land owner.

1.03 PIPE LOCATIONS

- A. Locate pipelines substantially as indicated on the Drawings. The Engineer reserves the right to make such modifications in locations as may be found desirable to avoid interference with existing structures or for other reasons. Where fittings are noted on the Drawings, such notation is for the Contractor's convenience and does not relieve him from laying and jointing different or additional items where required.

1.04 OPEN EXCAVATIONS

- A. Adequately safeguard all open excavations by providing temporary barricades, caution signs, lights and other means to prevent accidents to persons and damage to property. The Contractor shall, at his/her own expense, provide suitable and safe bridges and other crossings for accommodating travel by pedestrians and workmen. Bridges provided for access during construction shall be removed when no longer required. The length or size of excavation will be controlled by the particular surrounding conditions, but shall always be confined to the limits prescribed by the Engineer. If the excavation becomes a hazard, or if it excessively restricts traffic at any point, the Engineer may require special construction procedures such as limiting the length of the open trench, prohibiting stacking excavated material in the street and requiring that the trench shall not remain open overnight.
- B. Take precautions to prevent injury to the public due to open trenches. Provide adequate light at all trenches, excavated material, equipment, or other obstacles which could be dangerous to the public at night.

1.05 TEST PITS

- A. Excavate test pits, at the direction of the Engineer, to locate underground pipelines or structures in advance of the construction. Backfill test pits immediately after their purpose has been satisfied and restore and maintain the surface in a manner satisfactory to the Engineer.

1.06 MAINTENANCE OF TRAFFIC

- A. Unless permission to close a street is received in writing from the proper authority, place all excavated material so that vehicular and pedestrian traffic may be maintained at all times. If the construction operations cause traffic hazards, repair the road surface, provide temporary ways, erect wheel guards or fences, or take other measures for safety satisfactory to the Engineer.
- B. Detours around construction will be subject to the approval of the Owner and the Engineer. Where detours are permitted, provide all necessary barricades and signs as required to divert the flow of traffic. Expedite construction operations while traffic is detoured. Periods when traffic is being detoured will be strictly controlled by the Owner.
- C. Take precautions to prevent injury to the public due to open trenches. Night watchmen may be required where special hazards exist, or police protection provided for traffic while work is in progress. Be fully responsible for damage or injuries whether or not police protection has been provided.

1.07 CARE AND PROTECTION OF PROPERTY

- A. The Contractor shall be responsible for the preservation of all public and private property and use every precaution necessary to prevent damage thereto. If any direct or indirect damage is done to public or private property by or on account of any act, omission, neglect, or misconduct in the execution of the work on the part of the Contractor, such property shall be restored by the Contractor, at his/her expense, to a condition similar or equal to that existing before the damage was done, or he/she shall make good the damage in other manner acceptable to the Engineer.

1.08 PROTECTION AND RELOCATION OF EXISTING STRUCTURES AND UTILITIES

- A. The Contractor shall assume full responsibility for the protection of all buildings, structures, and utilities, public or private, including poles, signs, services to buildings, utilities in the street, gas pipes, water pipes, hydrants, sewers, drains and electric and telephone cables, whether or not they are shown on the Drawings. Carefully support and protect all such structures and utilities from injury of any kind. Any damage resulting from the Contractor's operations shall be repaired by him/her at his/her expense.
- B. Assistance will be given the Contractor in determining the location of existing services. The Contractor, however, shall bear full responsibility for obtaining all locations of underground structures and utilities (including existing water services, drain lines and sewers). Maintain services to buildings and pay costs or charges resulting from damage thereto.
- C. Protection of existing utilities and structures as described in this Section shall be a part of the work under the Contract and all costs in connection therewith shall be included in the Total Price Bid in the Bid Form.
- D. If, in the opinion of the Engineer, permanent relocation of an existing utility is required, he/she may direct the Contractor, in writing, to perform the work. Work so ordered will be paid for at the Contract unit prices, if applicable, or as extra work. If relocation of a privately owned utility is required, the Owner will notify the Utility to perform the work as expeditiously as possible. The Contractor shall cooperate with the Owner and Utility. Notify all utility companies in writing at least 48 hours (excluding Saturdays, Sundays and Legal holidays) before excavating



in any public way. Also notify New Mexico One Call, telephone 811 or 1-800-321-2537 at least 48 hours prior to start of work.

#### 1.09 WATER FOR CONSTRUCTION PURPOSES

- A. The Owner receives treated effluent wastewater (reclaimed wastewater) from the City of Santa Fe Wastewater Treatment Plant (WWTP) via Marty Sanchez Golf Course. The Owner operates and monitors the use of Class 1B reclaimed wastewater under NMED Discharge permit number DP-1120. Contractor may use reclaimed wastewater for cell construction at no charge if the appropriate usage log(s) are maintained and coordinated with the Owner.

If reclaimed wastewater is not available on site for the Contractor, then the Contractor shall be responsible for purchasing reclaimed wastewater from the City of Santa Fe WWTP and transporting to the construction area. Contractor shall charge the Owner for the purchase of reclaimed wastewater at fifty percent (50%) of the rate for potable water as set forth in the City of Santa Fe Sanitary Sewer Rate, Fee and Penalty Schedule (Chapter XXV SFCC 1987)."

#### 1.10 MAINTENANCE OF FLOW

- A. Provide for the flow of sewers, drains and water courses interrupted during the progress of the work, and immediately cart away and remove all offensive matter. Discuss the entire procedure of maintaining existing flow with the Engineer well in advance of the interruption of any flow.

#### 1.11 COOPERATION WITHIN THIS CONTRACT

- A. All firms or persons authorized to perform any work under this Contract shall cooperate with the Contractor and his/her Subcontractors or trades and shall assist in incorporating the work of other trades where necessary or required.
- B. Cutting and patching, drilling and fitting shall be carried out where required by the trade or subcontractor having jurisdiction, unless otherwise indicated herein or directed by the Engineer.

#### 1.12 CLEANUP AND DISPOSAL OF EXCESS MATERIAL

- A. During the course of the work, keep the site of operations as clean and neat as possible. Contractor may dispose of construction materials at the Caja del Rio Landfill at the current disposal rates. Dispose of all residue resulting from the construction work and, at the conclusion of the work, remove and haul away any surplus excavation, broken pavement, lumber, equipment, temporary structures and any other refuse remaining from the construction operations and leave the entire site of the work in a neat and orderly condition.
- B. In order to prevent environmental pollution arising from the construction activities related to the performance of this Contract, the Contractor and his/her subcontractors shall comply with all applicable Federal, State and local laws and regulations concerning waste material disposal, as well as the specific requirements stated in this Section and in other related sections.
- C. Disposal of excess excavated material in wetlands, stream corridors and plains is strictly prohibited even if the permission of the property owner is obtained. Any violation of this restriction by the Contractor or any person employed by him will be brought to the immediate attention of the responsible regulatory agencies, with a request that appropriate action be taken

against the offending parties. The Contractor will be required to remove the fill and restore the area impacted at no increase in the Contract Price.

END OF SECTION

SECTION 01050  
PROJECT CONTROLS (SURVEYING)

PART 1 GENERAL

1.01 SCOPE OF WORK

- A. The CONTRACTOR shall provide and pay for field engineering services required for project; including but not limited to:
  - 1. Survey work required for project controls and layout.
  - 2. Certified as-built surveys including liner subgrade, geosynthetic clay liner (GCL), high density polyethylene (HDPE) geomembrane liner, Cell 5B and Cell 6A tie-in seam, geotextile, leachate collection piping and risers, and bottom and top of 2-ft thick drainage layer (5 locations per acre).
  - 3. Civil, structural or other professional engineering services specified, or required to execute CONTRACTOR's construction methods.
- B. Retain the services of a registered land surveyor licensed in the state of the project location to:
  - 1. Identify existing control points and property line corners indicated on the Drawings, as required.
  - 2. Verify and record all existing structure locations in the vicinity of, or adjacent to, the proposed Work; and, the locations of all proposed structures and facilities.
  - 3. Maintain an accurate record of locations of all new buried piping and existing buried piping and other buried existing facilities (piping, conduits, and structures) encountered and/or relocated during construction of the new Work.

1.02 RELATED WORK

- A. Summary of Work is included in Section 01010.
- B. Contract Closeout Section 01700.
- C. Record Drawings Section 01720.

1.03 SUBMITTALS

- A. Submit, to the Engineer, the name, address and state registration and license number of proposed registered land surveyor.
- B. On request of the Engineer, submit documentation to verify accuracy of field engineering work.
- C. Submit certificate signed by registered engineer or land surveyor certifying that elevations and locations of improvements are in conformance, or non-conformance, with Contract Documents.

- D. At substantial completion, submit certified as-built survey drawings (signed and sealed by registered land Surveyor with the Surveyor's title block) of the items listed below. All surveys shall be tied to the applicable Grid System and shall indicate all pre-existing and new project benchmarks. Vertical Control shall conform to the project elevation datum designated on the plans.
1. Certified site survey of items noted in 1.06 of this Section.
  2. Certified site survey, drawn to the same scale as the Engineer's drawings and submitted on 24-inch by 36-inch sized sheets and in digital format, showing the location of all above ground structures, drainage control structures, ditches, and ponds within the project site.
  3. Certified site survey, drawn to the same scale as the Engineer's drawings and submitted on 24-inch by 36-inch sized sheets and in digital format, showing the locations, lines and grades in plan and profile views of all below-grade lines (piping and concrete-encased electrical ducts) and other buried facilities (e.g., valves, tanks, etc). This requirement includes all utilities installed as a part of the scope of this project, as well as existing lines encountered during the installation of the new work.
  4. Certified site survey, drawn to the same scale as the Engineer's drawings and submitted on 24-inch by 36-inch sized sheets and in digital format, indicating lines, grades, elevations and stationing at 100-ft increments, changes in alignment or grade. Provide elevations of structure inverts, pipe invert(s) and rim elevations on all flow structures.
  5. Certified site topographic survey for the constructed areas. Spot elevations shall be shown at a minimum 50-foot rectangular grid sufficient to show all important topographic features with a minimum 1-foot contour at a scale of 1 inch equals 100 feet by a registered land surveyor. The above surveys shall also be delivered in AutoCAD Release 2012 to the ENGINEER with topographic information in xml format and points in AutoCAD Civil 3D or a format that is easily converted to AutoCAD Civil 3D (i.e. Excel csv file, Land Desktop).
  6. Certified site survey to verify layer thickness of the prepared subgrade layer. Bottom and top of subgrade layer shall be surveyed once per acre on a grid.
  7. Certified site survey to verify layer thickness of the completed drainage layer. Bottom and top of drainage layer shall be surveyed five (5) times per acre on a grid.

#### 1.04 QUALIFICATIONS OF SURVEYOR

- A. Registered land surveyor, licensed in the state of the project location.

#### 1.05 SURVEY REFERENCE POINTS

- A. Existing basic horizontal and vertical control points for the project are those designated on Drawings.
- B. Locate and protect control points prior to starting site work and preserve all permanent reference points during construction.

1. Make no changes or relocations without prior written notice to and approval by the Engineer.
2. Report to the Engineer when any reference point is lost or destroyed, or requires relocation because of necessary changes in grades or locations.
3. Require the surveyor to correctly replace project control points which may be lost or destroyed. Establish replacements based on original survey control.

#### 1.06 PROJECT SURVEY REQUIREMENTS

- A. The local landfill coordinate system shall be used; refer to the Drawings.
- B. Establish lines and levels; locate and lay out:
  1. Site improvements.
    - a. Stakes for grading, fill and topsoil placement at the following minimum elevations and frequency:
      - 1) Elevations
        - a) Top of "subgrade".
        - b) Leachate collection top of pipe.
        - c) Top of drainage layer material.
      - 2) Frequency
        - a) Every 50 ft along low points and high points of cells "saw tooth" configuration.
        - b) Every 50 ft and any changes in grade along sump areas.
        - c) Every 50 ft along piping.
        - d) Every 50 ft along all other breaks of grade interior or exterior to cell.
    - b. Utility slopes and invert elevations.
    - c. Sidewalks, pavement, fencing, storm drainage facilities, and other finish surface work.
  - C. If lines, levels or layouts are lost or destroyed, or if required by the Owner or Engineer, verify layouts by same methods.

#### PART 2 PRODUCTS (NOT USED)

#### PART 3 EXECUTION

##### 3.01 RECORDS

- A. Maintain a complete, accurate log of all control and survey work as it progresses.
- B. Update the project as-built survey on a monthly basis, based on the work performed during the month. Submit one copy of up to date as-built documentation with Contractor's monthly applications for payment.
- C. Maintain an accurate record of new and existing piping, conduit and structure changes, revisions, relocations, and modifications.

END OF SECTION

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SECTION 01110  
ENVIRONMENTAL PROTECTION PROCEDURES

PART 1 GENERAL

1.01 SCOPE OF WORK

- A. Furnish all labor, materials and equipment and perform all work required for the prevention of environmental pollution in conformance with applicable laws and regulations, during and as the result of construction operations under this Contract. For the purpose of this Section, environmental pollution is defined as the presence of chemical, physical, or biological elements or agents which adversely affect human health or welfare; unfavorably alter ecological balances of importance to human life; affect other species of importance to man; or degrade the utility of the environment for aesthetic and/or recreational purposes.
- B. The control of environmental pollution requires consideration of air, water and land, and involves management of noise and solid waste, as well as other pollutants.
- C. Schedule and conduct all work in a manner that will minimize the erosion of soils in the area of the work. Provide erosion control measures such as diversion channels, sedimentation or filtration systems, berms, staked hay bales, seeding, mulching or other special surface treatments as are required to prevent silting and muddying of streams, rivers, impoundments, lakes, etc. All erosion control measures shall be in place in an area prior to any construction activity in that area.
- D. This Section is intended to ensure that construction is achieved with a minimum of disturbance to the existing ecological balance between a water resource and its surroundings. These are general guidelines. It is the Contractor's responsibility to determine the specific construction techniques to meet these guidelines.
- E. All phases of sedimentation and erosion control shall comply with and be subject to the approval of the New Mexico Environmental Department. Prepare sedimentation and erosion control drawings meeting the requirements for approval by that agency. Upon approval, furnish two copies of the approved Drawing to the Engineer.

1.02 APPLICABLE REGULATIONS

- A. Comply with all applicable Federal, State and local laws and regulations concerning environmental pollution control and abatement.

1.03 NOTIFICATIONS

- A. The Engineer will notify the Contractor in writing of any non-compliance with the foregoing provisions or of any environmentally objectionable acts and corrective action to be taken. State or local agencies responsible for verification of certain aspects of the environmental protection requirements shall notify the Contractor in writing, through the Engineer, of any non-compliance with State or local requirements. After receipt of such notice from the Engineer or from the regulatory agency through the Engineer, immediately take corrective action. Such notice, when delivered to the Contractor or his authorized representative at the site of the work, shall be deemed sufficient for the purpose. If the Contractor fails or refuses to comply promptly, the Owner may issue an order stopping all or part of the work until satisfactory corrective action

has been taken. No part of the time lost due to any such stop orders shall be made the subject of a claim for extension of time or for excess costs or damages by the Contractor unless it is later determined that the Contractor was in compliance.

#### 1.04 IMPLEMENTATION

- A. Prior to commencement of the work, meet with the Engineer and Owner to develop mutual understandings relative to compliance with these provisions and administration of the environmental pollution control program.
- B. Remove temporary environmental control features, when approved by the Engineer and incorporate permanent control features into the project at the earliest practicable time.

#### PART 2 PRODUCTS (NOT USED)

#### PART 3 EXECUTION

##### 3.01 EROSION CONTROL

- A. Provide positive means of erosion control such as shallow ditches around construction to carry off surface water. Erosion control measures, such as siltation basins, hay check dams, mulching, jute netting and other equivalent techniques, shall be used as appropriate. Flow of surface water into excavated areas shall be prevented. Ditches around construction area shall also be used to carry away water resulting from dewatering of excavated areas. At the completion of the work, ditches shall be backfilled and the ground surface restored to original condition.

##### 3.02 PROTECTION OF STREAMS AND SURFACE WATERS

- A. Take all precautions to prevent, or reduce to a minimum, any damage to any stream or surface water from pollution by debris, sediment or other material, or from the manipulation of equipment and/or materials in or near such streams. Water that has been used for washing or processing, that contains oils or sediments that will reduce the quality of the water in the stream, shall not be directly returned to the stream. Divert such waters through a settling basin or filter before being directed into streams or surface waters.
- B. Do not discharge water from dewatering operations directly into any live or intermittent stream, channel, wetlands, surface water or any storm sewer. Water from dewatering operations shall be treated by filtration, settling basins, or other approved method to reduce the amount of sediment contained in the water to allowable levels.
- C. Take all preventative measures to avoid spillage of leachate, petroleum products, and other pollutants. In the event of any spillage, prompt remedial action shall be taken in accordance with a contingency action plan approved by the New Mexico Environmental Department. Submit two copies of approved contingency plans to the Engineer.

##### 3.03 PROTECTION OF LAND RESOURCES

- A. Restore land resources within the project boundaries and outside the limits of permanent work to a condition, after completion of construction that will appear to be natural and not detract from the appearance of the project. Confine all construction activities to areas shown on the Drawings.



- B. Outside of areas requiring earthwork for the construction of the new facilities, do not deface, injure, or destroy trees or shrubs, nor remove or cut them without prior approval. No ropes, cables, or guys shall be fastened to or attached to any existing nearby trees for anchorage unless specifically authorized by the Engineer. Where such special emergency use is permitted, first wrap the trunk with a sufficient thickness of burlap or rags over which softwood cleats shall be tied before any rope, cable, or wire is placed. The Contractor shall in any event be responsible for any damage resulting from such use.
- C. Before beginning operations near them, protect trees that may possibly be defaced, bruised, injured, or otherwise damaged by the construction equipment, dumping or other operations, by placing boards, planks, or poles around them. Monuments and markers shall be protected similarly.
- D. Any trees or other landscape features scarred or damaged by the Contractor's equipment or operations shall be restored as nearly as possible to their original condition. The Engineer will decide the method of restoration to be used and whether damaged trees shall be treated and healed or removed and disposed of.
  - 1. All scars made on trees by equipment, construction operations, or by the removal of limbs larger than 1-in in diameter shall be coated as soon as possible with an approved tree wound dressing. All trimming or pruning shall be performed in an approved manner by experienced workmen with saws or pruning shears. Tree trimming with axes will not be permitted.
  - 2. Climbing ropes shall be used where necessary for safety. Trees that are to remain, either within or outside established clearing limits, that are subsequently damaged by the Contractor and are beyond saving in the opinion of the Engineer, shall be immediately removed and replaced.
- E. The locations of the Contractor's storage and other construction buildings required temporarily in the performance of the work, shall be cleared portions of the job site or areas to be cleared as shown on the Drawings and approved by the Engineer and shall not be within wetlands or floodplains. The preservation of the landscape shall be an imperative consideration in the selection of all sites and in the construction of buildings. Drawings showing storage facilities shall be submitted for approval of the Engineer.
- F. If the Contractor proposes to construct temporary roads or embankments and excavations for plant and/or work areas, he shall submit the following for approval at least ten days prior to scheduled start of such temporary work.
  - 1. A layout of all temporary roads, excavations, embankments and drainage to be constructed within the work area.
  - 2. Details of temporary road construction.
  - 3. Drawings and cross sections of proposed embankments and their foundations, including a description of proposed materials.
  - 4. A landscaping drawing showing the proposed restoration of the area. Indicate the proposed removal of any trees and shrubs outside the limits of existing clearing area. Indicate locations of guard posts or barriers required to control vehicular traffic and protect trees

and shrubs to be maintained undamaged. The Drawing shall provide for the obliteration of construction scars as such and shall provide for a natural appearing final condition of the area. Modification of the Contractor's approved drawings shall be made only with the written approval of the Engineer. No unauthorized road construction, excavation or embankment construction including disposal areas will be permitted.

- G. Remove all signs of temporary construction facilities such as haul roads, work areas, structures, foundations of temporary structures, stockpiles of excess of waste materials, or any other vestiges of construction as directed by the Engineer. It is anticipated that excavation, filling and plowing of roadways will be required to restore the area to near natural conditions which will permit the growth of vegetation thereon.
- H. All debris and excess material will be disposed of outside wetland or floodplain areas in an environmentally sound manner.

### 3.04 PROTECTION OF AIR QUALITY

- A. Burning - The use of burning at the project site for the disposal of refuse and debris will not be permitted.
- B. Dust Control - Maintain all excavations, embankment, stockpiles, access roads, plant sites, waste areas, borrow areas and all other work areas within or without the project boundaries free from dust which could cause the standards for air pollution to be exceeded and which would cause a hazard or nuisance to others.
- C. An approved method of stabilization consisting of sprinkling or other similar methods will be permitted to control dust. The use of petroleum products is prohibited. The use of chlorides may be permitted with approval from the Engineer.
- D. Sprinkling, to be approved, must be repeated at such intervals as to keep all parts of the disturbed area at least damp at all times, and the Contractor shall have sufficient competent equipment on the job to accomplish this. Dust control shall be performed as the work proceeds and whenever a dust nuisance or hazard occurs, as determined by the Engineer.

### 3.05 NOISE CONTROL

- A. Make every effort to minimize noises caused by the construction operations. Equipment shall be equipped with silencers or mufflers designed to operate with the least possible noise in compliance with Federal and State regulations.

### 3.06 MAINTENANCE OF POLLUTION CONTROL FACILITIES DURING CONSTRUCTION

- A. Maintain all facilities constructed for pollution control as long as the operations creating the particular pollutant are being carried out or until the material concerned has become stabilized to the extent that pollution is no longer being created.

END OF SECTION

## SECTION 01140

### WORK RESTRICTIONS

#### PART 1 GENERAL

##### 1.01 DESCRIPTION OF REQUIREMENTS

- A. Project Description: The project will be constructed at an occupied facility. The Caja del Rio Landfill receives waste six (6) days per week, Monday through Saturday, and will maintain operations 7:00 a.m. to 5:00 p.m. during the duration of the Contract. The Contractor shall verify project conditions prior to submission of bid.
- B. Related General Requirement Specifications
  - 1. Section 01110 - Summary of Work
  - 2. Section 01040 - Project Coordination

##### 1.02 ACCESS TO SITE

- A. Contractor personnel and vehicles which are necessary for completion of the Work will be provided access to the project area.
- B. The Contractor shall provide the Owner with a list of persons he wishes to enter upon the Owner's premises. This list shall be kept up to date at all times and any changes, deletions, or additions may only be made by the Contractor or his designated representative.

##### 1.03 USE OF PREMISES

- A. General: Contractor shall have limited use of project site for execution of the Work. Confine operations at project site to area permitted by law, permit and Contract Documents. Limit use of premises and project site to construction activities and allow for use, occupancy and operations of Owner. Do not encumber project site with products and construction equipment. Contractor shall not use any site facilities without prior Owner consent.
- B. Operations: Conduct operations so as to minimize inconvenience and conflict with overall construction operations and to facilitate complete usage of facilities and operations of Owner.
  - 1. Confine operations to areas within Contract limits. Portions of premises beyond areas in which construction operations are required, are not to be disturbed.
  - 2. Conduct operations to ensure no unreasonable inconvenience, or unsafe or unhealthy condition to Owner and general public.
  - 3. Existing utility facilities and services shall remain in uninterrupted service, except as otherwise required.
  - 4. Limit construction operations to methods and procedures which will not adversely affect environment of project site including, but not limited to, noise, dirt, dust, odors, air, water

or soil pollution, ambient discomfort, inadequate lighting, safety and health hazards, and other undesirable effects and conditions.

- C. Storage: Owner will provide an on-site area for storage of products, materials, and equipment. Contractor shall assume full responsibility for protection and safe-keeping of products and materials under Contract, stored on project site or at areas separate from project site as approved by Owner.
1. Relocation: Move any stored products which interfere with operations of the Owner.
  2. Additional Space: Obtain and pay for use of additional off-site storage or work areas needed for operations as acceptable to Owner, including any associated insurance, transportation, loading and unloading costs.
  3. Loadings: Do not load structures with weights which will endanger structures.

PART 2 PRODUCTS (NOT USED)

PART 3 EXECUTION (NOT USED)

END OF SECTION

SECTION 01200  
PROJECT MEETINGS

PART 1 GENERAL

1.01 REQUIREMENTS INCLUDED

- A. The Engineer shall schedule and administer pre-construction meeting, periodic progress meetings and specially called meetings throughout progress of the work.
  - 1. Prepare agenda for meetings.
  - 2. Make physical arrangements for meetings.
  - 3. Preside at meetings.
  - 4. Record the minutes; include significant proceedings and decisions.
  - 5. Reproduce and distribute copies of minutes within 15 working days after each meeting.
    - a. To participants in the meeting.
    - b. To parties affected by decisions made at the meeting.
- B. Representatives of Contractors, subcontractors and suppliers attending meetings shall be qualified and authorized to act on behalf of the entity each represents.
- C. Attend meetings to ascertain that work is expedited consistent with Contract Documents and construction schedules.

1.02 RELATED REQUIREMENTS

- A. Construction Schedules are included in Section 01310.
- B. Shop Drawings, Working Drawings and Samples are included in Section 01300.
- C. Project Record Documents are included in Section 01720.

1.03 PRE-CONSTRUCTION MEETING

- A. Schedule a preconstruction meeting no later than 15 days after date of Notice to Proceed.
- B. Location: A central site, convenient for all parties, designated by the Owner.
- C. Attendance
  - 1. Owner's Representative.
  - 2. Engineer and his/her professional consultants.
  - 3. Resident Project Representative.
  - 4. Contractor's Superintendent.

5. Major Subcontractors.
6. Major suppliers.
7. Utilities
8. Others as appropriate.

D. Suggested Agenda

1. Distribution and discussion of:
  - a. List of major subcontractors and suppliers.
  - b. Projected Construction Schedules.
2. Critical work sequencing.
3. Major equipment deliveries and priorities.
4. Project Coordination.
  - a. Designation of responsible personnel.
5. Procedures and processing of:
  - a. Field decisions.
  - b. Proposal requests.
  - c. Submittals.
  - d. Change Orders.
  - e. Applications for Payment.
6. Adequacy of distribution of Contract Documents.
7. Procedures for maintaining Record Documents.
8. Use of premises:
  - a. Office, work and storage areas.
  - b. Owner's requirements.
9. Construction facilities, controls and construction aids.
10. Temporary utilities.
11. Housekeeping procedures.

1.04 PROGRESS MEETINGS

- A. Schedule regular periodic meetings. The progress meetings will be held every 30 days with the first meeting 30 days after the pre-construction meeting or 30 days after the date of Notice to Proceed.
- B. Hold called meetings as required by progress of the work.
- C. Location of the meetings: Project field office of Contractor or Engineer.

D. Attendance

1. Engineer and his/her professional consultants as needed.
2. Subcontractors as appropriate to the agenda.
3. Suppliers as appropriate to the agenda.
4. Others as appropriate.

E. Suggested Agenda

1. Review, approval of minutes of previous meeting.
2. Review of work progress since previous meeting.
3. Field observations, problems and conflicts.
4. Problems which impede Construction Schedule.
5. Review of off-site fabrication, delivery schedules.
6. Corrective measures and procedures to regain projected schedule.
7. Revisions to Construction Schedule.
8. Progress, schedule, during succeeding work period.
9. Coordination of schedules.
10. Review submittal schedules; expedite as required.
11. Maintenance of quality standards.
12. Pending changes and substitutions.
13. Review proposed changes for:
  - a. Effect on Construction Schedule and on completion date.
  - b. Effect on other contracts of the project.
14. Other business.
15. Construction schedule.
16. Critical/long lead items.

F. Attend progress meetings and is to study previous meeting minutes and current agenda items, in order to be prepared to discuss pertinent topics such as deliveries of materials and equipment, progress of the work, etc.

G. Provide a current submittal log at each progress meeting in accordance with Section 01300.

PART 2 PRODUCTS (NOT USED)

PART 3 EXECUTION (NOT USED)

END OF SECTION



SECTION 01300  
SUBMITTALS

PART 1 GENERAL

1.01 SCOPE OF WORK

- A. This Section includes the requirements for compiling, processing and transmitting submittals required for execution of the project.
- B. Submittals are categorized into two types: Action Submittals and Informational Submittals, as follows:
  - 1. Action Submittal: Written and graphic information submitted by the Contractor that requires the Engineer's approval. The following are examples of action submittals:
    - a. Shop drawings (including working drawings and product data)
    - b. Samples
    - c. Operation & maintenance manuals
    - d. Site Usage Plan (Contractor's staging - including trailer siting and material laydown area)
    - e. Schedule of values
    - f. Payment application format
  - 2. Informational Submittal: Information submitted by the Contractor that does not require the Engineer's approval. The following are examples of informational submittals:
    - a. Shop Drawing Schedule
    - b. Construction Schedule
    - c. Statements of Qualifications
    - d. Health and Safety Plans
    - e. Construction Photography and Videography
    - f. Work Plans
    - g. Maintenance of Traffic Plans
    - h. Outage Requests
    - i. Proposed Testing Procedures
    - j. Test Records and Reports
    - k. Vendor Training Outlines/Plans
    - l. Test and Start-Up Reports
    - m. Certifications
    - n. Record Drawings
    - o. Record Shop Drawings
    - p. Submittals required by laws, regulations and governing agencies
    - q. Submittals required by funding agencies
    - r. Other requirements found within the technical specifications
    - s. Warranties and Bonds
    - t. As-Built Surveys
    - u. Contract Close-out Documents

1.02 RELATED WORK

- A. Additional requirements may be specified in the General Conditions for the Contract.

- B. Additional submittal requirements may be specified in the respective technical Specification Sections.
- C. Contract closeout submittals are included in Section 01700.
- D. Warranties and Bonds are included in Section 01740.
- E. Applications for Payment are included in Section 01026.
- F. Construction Schedules are included in Section 01310.
- G. Project Controls (Surveying) 01050.
- H. Project Record Documents are included in Section 01720.

### 1.03 CONTRACTOR'S RESPONSIBILITIES

- A. All submittals shall be clearly identified as follows:
  - 1. Date of Submission.
  - 2. Project Number.
  - 3. Project Name.
  - 4. Contractor Identification.
    - a. Contractor.
    - b. Supplier.
    - c. Manufacturer.
    - d. Manufacturer or supplier representative.
  - 5. Identification of the Product.
  - 6. Reference to Contract Drawing.
  - 7. Reference to specification section number, page and paragraph(s).
  - 8. Reference to applicable standards, such as ASTM or Federal Standards numbers.
  - 9. Indication of Contractor's approval.
  - 10. Contractor's Certification statement.
  - 11. Identification of deviations from the Contract Documents, if any.
  - 12. Reference to previous submittal (for resubmittals).
  - 13. Made in America (when required by the Contract).
- B. Submittals shall be clear and legible, and of sufficient size for legibility and clarity of the presented data.

- C. Submittal Log. Maintain a log of all submittals. The submittal log shall be kept accurate and up to date. This log should include the following items (as applicable):
1. Description.
  2. Submittal Number.
  3. Date transmitted to the Engineer.
  4. Date returned to Contractor (from Engineer).
  5. Status of Submittal (Approved/Not Approved/etc.).
  6. Date of Resubmittal to Engineer and Return from Engineer (if applicable and repeat as necessary).
  7. Date material released for fabrication.
  8. Projected (or actual) delivery date .
- D. Numbering System. Utilize the following submittal identification numbering system:
1. The first character shall be a D, S, M or I which represents Shop Drawing (including working drawings and product data), Sample, Manual (Operating & Maintenance) or Informational, respectively.
  2. The next five digits shall be the applicable Section Number.
  3. The next three digits shall be the sequential number of each separate item or drawing submitted under each Specification Section, in the chronological order submitted, starting at 001.
  4. The last character shall be a letter, A to Z, indicating the submission (or resubmission) of the same submittal, i.e., "A" = 1st submission, "B" = 2nd submission, "C" = 3rd submission, etc. A typical submittal number would be as follows:
    - a. D-03300-008-B.
    - b. D = Shop Drawing03300 = Section for Concrete.
    - c. 008 = the eighth different submittal under this Section.
    - d. B = the second submission (first resubmission) of that particular shop drawing.
- E. Variances
1. Notify the Engineer in writing, at the time of submittal, of any deviations in the submittals from the requirements of the Contract Documents.
  2. Notify the Engineer in writing, at the time of re-submittal (resubmission), of all deviations from previous submissions of that particular shop drawing, except those deviations which are the specific result of prior comments from the Engineer.
- F. Action Submittals

1. Shop Drawings, Working Drawings, Product Data and Samples.
  - a. Shop Drawings.
    - 1) Shop drawings as defined in the General Conditions, and as specified in individual Sections may include, but are not necessarily limited to, custom prepared data such as fabrication and erection/installation (working) drawings, scheduled information, setting diagrams, actual shop work manufacturing instructions, custom templates, valve schedules, wiring diagrams, coordination drawings, equipment inspection and test reports, and performance curves and certifications, as applicable to the work.
    - 2) Contractor shall verify all field measurements, field construction criteria, materials, dimensions, catalog numbers and similar data, and coordinate each item with other related shop drawings and the Contract requirements.
    - 3) All details on shop drawings shall clearly show the relation of the various parts to the main members and lines of the structure and where correct fabrication of the work depends upon field measurements, such measurements shall be made and noted on the drawings before being submitted.
    - 4) All shop drawings submitted by subcontractors and vendors shall be reviewed by the Contractor. Contractor shall confirm, materials, dimensions, catalog numbers, technical data and performance criteria; and shall coordinate with other related shop drawings and the Contract requirements. In addition, Contractor shall confirm existing field conditions and dimensions and assure that the submittal is coordinated and compatible with existing conditions. Submittals directly from subcontractors or vendors will not be accepted by the Engineer.
    - 5) The Contractor shall be responsible for the accuracy of the subcontractor's or vendor's submittal; and, for their submission in a timely manner to support the requirements of the Contractor's construction schedule. Shop drawings found to be inaccurate or otherwise in error shall be returned to the subcontractor or vendor to correct, before submission to the Engineer. All shop Drawings shall be approved by the Contractor.
    - 6) Delays to construction due to the untimely submission of submittals will constitute inexcusable delays, for which Contractor shall not be eligible for additional cost nor additional contract time. Inexcusable delays consist of any delay within the Contractor's control.
  - b. Working Drawings
    - 1) Detailed installation drawings (sewers, equipment, piping, electrical conduits and controls, HVAC work, and plumbing, etc.) shall be prepared and submitted for review and approval by the Engineer prior to installing such work. Installation drawings shall be to-scale and shall be fully dimensioned.
    - 2) Piping working drawings shall show the laying dimensions of all pipes, fittings, valves, as well as the equipment to which it is being connected. In addition, all pipe supports shall be shown.
    - 3) Equipment working drawings shall show all equipment dimensions, anchor bolts, support pads, piping connections and electrical connections. In addition, show clearances required around such equipment for maintenance of the equipment.
    - 4) Electrical working drawings shall show conduits, junction boxes, disconnects, control devices, lighting fixtures, support details, control panels, lighting and power panels, and Motor Control Centers. Coordinate all locations with the Contract Documents and the Contractor's other working drawings.
  - c. Product Data
    - 1) Product data, as specified in individual Specification Sections, include, but are not limited to, the manufacturer's standard prepared data for manufactured

products (catalog data), such as the product specifications, installation instructions, availability of colors and patterns, rough-in diagrams and templates, product photographs (or diagrams), wiring diagrams, performance curves, quality control inspection and reports, certifications of compliance (as specified or otherwise required), mill reports, product operating and maintenance instructions, recommended spare parts and product warranties, as applicable.

d. Samples

- 1) Furnish, samples required by the Contract Documents for the Engineer's approval. Samples shall be delivered to the Engineer as specified or directed. Unless specified otherwise, provide at least two samples of each required item. Materials or equipment for which samples are required shall not be used in the work unless and until approved by the Engineer.
- 2) Samples specified in individual Specification Sections, include, but are not limited to: physical examples of the work (such as sections of manufactured or fabricated work), small cuts or containers of materials, complete units of repetitively-used products, color/texture/pattern swatches and range sets, specimens for coordination of visual effect, graphic symbols, and other specified units of work.
- 3) Approval of a sample shall be only for the characteristics or use named in such approval and shall not be construed to change or modify and Contract Requirements.
- 4) Approved samples not destroyed in testing shall be sent to the Engineer or stored at the site of the work. Approved samples of the hardware in good condition will be marked for identification and may be used in the work. Materials and equipment incorporated in work shall match the approved samples. Samples which fail testing or are not approved will be returned to the Contractor at his expense, if so requested at time of submission.

e. Professional Engineer (P.E.) Certification Form

- 1) If specifically required in any of the technical Specification Sections, submit a Professional Engineer (P.E.) Certification for each item required, using the form appended to this Section.

2. Contractor's Certification

- a. Each shop drawing, working drawings, product data, and sample shall have affixed to it the following Certification Statement:
  - 1) "Certification Statement: by this submittal, I hereby represent that I have determined and verified all field measurements, field construction criteria, materials, dimensions, catalog numbers and similar data and I have checked and coordinated each item with other applicable approved shop drawings and all Contract requirements."
- b. Shop drawings, working drawings, and product data sheets 11-in x 17-in and smaller shall be bound together in an orderly fashion and bear the above Certification Statement on the cover sheet. The transmittal cover sheet for each identified shop drawing shall fully describe the packaged data and include a listing of all items within the package.

3. The review and approval of shop drawings, working drawings, product data, or samples by the Engineer shall not relieve the Contractor from the responsibility for the fulfillment of the terms of the Contract. All risks of error and omission are assumed by the Contractor and the Engineer will have no responsibility therefor.

4. Project work, materials, fabrication, and installation shall conform to approved shop drawings (including working drawings and product data) and applicable samples.
5. No portion of the work requiring a shop drawing (including working drawings and product data) or sample shall be started, nor shall any materials be fabricated or installed before approval of such item. Procurement, fabrication, delivery or installation of products or materials that do not conform to approved shop drawings shall be at the Contractor's risk. Furthermore, such products or materials delivered or installed without approved shop drawings, or in non-conformance with the approved shop drawings will not be eligible for progress payment until such time as the product or material is approved or brought into compliance with approved shop drawings. Neither the Owner nor Engineer will be liable for any expense or delay due to corrections or remedies required to accomplish conformity.
6. Operation and Maintenance Data
  - a. Operation and maintenance data shall be submitted in assembled manuals as specified. Such manuals shall include detailed instructions for Owner personnel on safe operation procedures, controls, start-up, shut-down, emergency procedures, storage, protection, lubrication, testing, trouble-shooting, adjustments, repair procedures, and other maintenance requirements.
7. Schedule of Values
  - a. On projects consisting of lump sums (in whole or in part) submit a proposed schedule of values providing a breakdown of lump sum items into reasonably small components – generally disaggregated by building, area, and/or discipline. The purpose of the schedule of values is for processing partial payment applications. If requested by the Engineer, provide sufficient substantiation for all or some items as necessary to determine the proposed schedule of values is a reasonable representation of the true cost breakdown of the Work. The schedule of values shall not be unbalanced to achieve early payment or over-payment in excess of the value of work or any other mis-distribution of the costs. If, in the opinion of the Engineer, the schedule of values is unbalanced, Contractor shall reallocate components to achieve a balanced schedule acceptable to Engineer.
8. Payment Application Format
  - a. If an application form is included in the Contract Documents, use that form unless otherwise approved by the Engineer and Owner. If an application form is not included in the Contract Documents, Contractor may propose a form for approval.
9. Site Usage
  - a. Submit a proposed site staging plan, including but not limited to the location of office trailers, storage trailers and material laydown. Such plan shall be a graphic presentation (drawing) of the proposed locations; and, shall include on-site traffic modifications, and temporary utilities, as may be applicable.

G. Informational Submittals

1. Shop Drawing Schedule
  - a. Prepare and submit a schedule indicating when shop drawings are required to be submitted to support the as-planned construction schedule. The submittal schedule shall allow sufficient time for preparation and submittal, review and approval, and fabrication and delivery to support the construction schedule.

2. Construction Schedule
  - a. Prepare and submit construction schedules and monthly status reports as specified.
3. Statements of Qualifications
  - a. Provide evidence of qualification, certification, or registration, as required in the Contract Documents, to verify qualifications of licensed land surveyor, professional engineer, materials testing laboratory, specialty subcontractor, technical specialist, consultant, specialty installer, and other professionals.
  - b. Health and Safety Plans
    - 1) When specified, prepare and submit a general company Health and Safety Plan (HSP), modified or supplemented to include job-specific considerations.
4. Construction Photography and Videography
  - a. Provide periodic construction photographs and videography as specified – including but not limited to preconstruction photographs and/or video, monthly progress photos and/or video and post-construction photographs and/or video.
5. Work Plans
  - a. Prepare and submit copies of all work plans needed to demonstrate to the Owner that Contractor has adequately thought-out the means and methods of construction and their interface with existing facilities.
6. Maintenance of Traffic Plans
  - a. Prepare maintenance of traffic plans where and when required by the Contract Documents and by local ordinances or regulations. If Contractor is not already knowledgeable about local ordinances and regulations regarding maintenance of traffic requirements, become familiar with such requirements and include all costs for preparation and submittal of traffic management plans and all associated costs for permits and fees to implement the traffic management plan, in the bid amount. In addition, unless a supplemental payment provision is provided in the bid form, include the cost of police attendance, when required.
7. Outage Requests
  - a. Provide sufficient notification of any outages required (electrical, flow processes, etc.) as may be required to tie-in new work into existing facilities. Unless specified otherwise elsewhere, a minimum of seven calendar days' notice shall be provided.
8. Proposed Testing Procedures
  - a. Prepare and submit testing procedures it proposes to use to perform testing required by the various technical specifications.
9. Test Records and Reports
  - a. Provide copies of all test records and reports as specified in the various technical specifications.
10. Vendor Training Outlines/Plans
  - a. At least two weeks before scheduled training of Owner's personnel, provide lesson plans for vendor training in accordance with the specification for O&M manuals.
11. Test and Start-up Reports

- a. Manufacture shall perform all pre-start-up installation inspection, calibrations, alignments, and performance testing as specified in the respective Specification Section. Provide copies of all such test and start-up reports.
12. Certifications
  - a. Provide various certifications as required by the technical specifications. Such certifications shall be signed by an officer (of the firm) or other individual authorized to sign documents on behalf of that entity.
  - b. Certifications may include, but are not limited to:
    - 1) Welding certifications and welders' qualifications
    - 2) Certifications of Installation, Testing and Training for all equipment
    - 3) Material Testing reports furnished by an independent testing firm
    - 4) Certifications from manufacturer(s) for specified factory testing
    - 5) Certifications required to indicate compliance with any sustainability or LEEDS accreditation requirements indicated in the Contract Documents
13. Record Drawings
  - a. No later than Substantial Completion, submit a record of all changes during construction not already incorporated into drawings – in accordance with specification on Project Record Documents.
14. Record Shop Drawings
  - a. Before final payment is made, furnish one set of record shop drawings to the Engineer. These record shop drawings shall be in conformance with the approved documents and should show any field conditions which may affect their accuracy.
  - b. Submittals required by laws, regulations and governing agencies
    - 1) Prepare and submit all documentation required by state or local law, regulation or government agency directly to the applicable agency. This includes, but is not limited to, notifications, reports, certifications, certified payroll (for projects subject to wage requirements) and other documentation required to satisfy all requirements. Provide to Engineer one copy of each submittal made in accordance with this paragraph.
  - c. Submittals required by funding agencies
    - 1) Prepare and submit all documentation required by funding agencies. This includes, but is not limited to segregated pay applications and change orders when required to properly allocate funds to different funding sources; and certified payrolls for projects subject to wage requirements. Provide one copy of each submittal made in accordance with this paragraph to the Engineer.
15. Other requirements of the technical Specification Sections
  - a. Comply with all other requirements of the technical specifications.
16. Warranties and Bonds
  - a. Assemble a booklet or binder of all warranties and bonds as specified in the various technical specifications and in accordance with the specification on Warranties and Bonds; and provide two originals to the Engineer.
17. As-Built Surveys
  - a. Engage the services of a licensed land surveyor in accordance with the Project Controls (Surveying) specification. Prior to Final Completion, provide an as-built survey of the constructed facility, as specified.



18. Contract Close-Out Documents

- a. Submit Contract documentation as indicated in the specification for Contract Close-out.

PART 2 PRODUCTS (NOT USED)

PART 3 EXECUTION

3.01 SUBMITTAL SCHEDULE

- A. Provide an initial submittal schedule at the pre-construction meeting for review by Owner and Engineer. Incorporate comments from Owner or Engineer into a revised submittal schedule.
- B. Maintain the submittal schedule and provide sufficient copies for review by Owner and Engineer. An up-to-date submittal schedule shall be provided at each project progress meeting.

3.02 TRANSMITTALS

- A. Prepare separate transmittal sheets for each submittal. Each transmittal sheet shall include at least the following: the Contractor's name and address, Owner's name, project name, project number, submittal number, description of submittal and number of copies submitted.
- B. Submittals shall be transmitted or delivered directly to the office of the Engineer, as indicated in the Contract Documents or as otherwise directed by the Engineer.
- C. Provide copies of transmittals forms or cover letters (without attachments) directly to the Resident Project Representative.

3.03 PROCEDURES

A. Action Submittals

1. Contractor's Responsibilities

- a. Coordination of Submittal Times: Prepare and transmit each submittal sufficiently in advance of performing the related work or other applicable activities, or within the time specified in the individual work of other related Sections, so that the installation will not be delayed by processing times including disapproval and resubmittal (if required). Coordinate with other submittals, testing, purchasing, fabrication, delivery and similar sequenced activities. Extensions to the Contract Time will not be approved for the Contractor's failure to transmit submittals sufficiently in advance of the Work.
- b. The submittals of all shop drawings (including working drawings and product data) shall be sufficiently in advance of construction requirements to allow for possible need of re-submittals, including the specified review time for the Engineer.
- c. No less than 14 calendar days will be required for Engineer's review time for shop drawings and O&M manuals involving only one engineering discipline. No less than 30 calendar days will be required for Engineer's review time for shop drawings and O&M manuals that require review by more than one engineering discipline. Resubmittals will be subject to the same review time.
- d. Submittals of operation and maintenance data shall be provided within 30 days of approval of the related shop drawing(s).
- e. Before submission to the Engineer, review shop drawings as follows:

- 1) make corrections and add field measurements, as required
    - 2) use any color for its notations except red (reserved for the Engineer's notations) and black (to be able to distinguish notations on black and white documents)
    - 3) identify and describe each and every deviation or variation from Contract documents or from previous submissions, except those specifically resulting from a comment from the Engineer on a previous submission
    - 4) include the required Contractor's Certification statement
    - 5) provide field measurements (as needed)
    - 6) coordinate with other submittals
    - 7) indicate relationships to other features of the Work
    - 8) highlight information applicable to the Work and/or delete information not applicable to the Work
  - f. Submit the following number of copies:
    - 1) Shop drawings (including working drawings and product data) – Submit no fewer than six, and no more than nine; five of which will be retained by the Engineer.
    - 2) Samples – three
    - 3) Site Usage Plan – three copies
    - 4) Schedule of values – four copies
    - 5) Payment application format – four copies
  - g. If Contractor considers any correction indicated on the shop drawings to constitute a change to the Contract Documents, provide written notice thereof to the Engineer immediately; and do not release for manufacture before such notice has been received by the Engineer.
  - h. When the shop drawings have been completed to the satisfaction of the Engineer, carry out the construction in accordance therewith; and make no further changes therein except upon written instructions from the Engineer.
2. Engineer's Responsibilities
  - a. Engineer will not review shop drawings (including working drawings and product data) that do not include the Contractor's approval stamp and required certification statement. Such submittals will be returned to the Contractor, without action, for correction.
  - b. Partial shop drawings (including working drawings and product data) will not be reviewed. If, in the opinion of the Engineer, a submittal is incomplete, that submittal will be returned to the Contractor for completion. Such submittals may be returned with comments from Engineer indicating the deficiencies requiring correction.
  - c. If shop drawings (including working drawings and product data) meet the submittal requirements, Engineer will forward copies to appropriate reviewer(s). Otherwise, noncompliant submittals will be returned to the Contractor without action - with the Engineer retaining one copy.
  - d. Submittals which are transmitted in accordance with the specified requirements will be reviewed by the Engineer within the time specified herein. The time for review will commence upon receipt of submittal by Engineer.
3. Review of Shop Drawings (Including Working Drawings and Product Data) and Samples
  - a. The review of shop drawings, working drawings, data and samples will be for general conformance with the design concept and Contract Documents. They shall not be construed:
    - 1) as permitting any departure from the Contract requirements

- 2) as relieving the Contractor of responsibility for any errors, including details, dimensions, and materials
- 3) as approving departures from details furnished by the Engineer, except as otherwise provided herein
- b. The Contractor remains responsible for details and accuracy, for coordinating the work with all other associated work and trades, for selecting fabrication processes, for techniques of assembly, and for performing work in a safe manner.
- c. If the shop drawings (including working drawings and product data) or samples as submitted describe variations and indicate a deviation from the Contract requirements that, in the opinion of the Engineer are in the interest of the Owner and are so minor as not to involve a change in Contract Price or Contract Time, the Engineer may return the reviewed drawings without noting an exception.
- d. Only the Engineer will utilize the color "RED" in marking submittals.
- e. Shop drawings will be returned to the Contractor with one of the following codes.
  - 1) "APPROVED" - This code is assigned when there are no notations or comments on the submittal. When returned under this code the Contractor may release the equipment and/or material for manufacture.
  - 2) "APPROVED AS NOTED" - This code is assigned when a confirmation of the notations and comments IS NOT required by the Contractor. The Contractor may release the equipment or material for manufacture; however, all notations and comments must be incorporated into the final product.
  - 3) "APPROVED AS NOTED/CONFIRM" - This combination of codes is assigned when a confirmation of the notations and comments is required by the Contractor. The Contractor may release the equipment or material for manufacture; however, all notations and comments must be incorporated into the final product. This confirmation shall specifically address each omission and nonconforming item that was noted. Confirmation is to be received by the Engineer within 15 calendar days of the date of the Engineer's transmittal requiring the confirmation.
  - 4) "APPROVED AS NOTED/RESUBMIT" - This combination of codes is assigned when notations and comments are extensive enough to require a resubmittal of the entire package. This resubmittal is to address all comments, omissions and non-conforming items that were noted. Resubmittal is to be received by the Engineer within 30 calendar days of the date of the Engineer's transmittal requiring the resubmittal.
  - 5) "NOT APPROVED" - This code is assigned when the submittal does not meet the intent of the contract documents. The Contractor must resubmit the entire package revised to bring the submittal into conformance. It may be necessary to resubmit using a different manufacturer/vendor to meet the requirements of the contract documents.
  - 6) "COMMENTS ATTACHED" - This code is assigned where there are comments attached to the returned submittal, which provide additional data to aid the Contractor.
  - 7) "RECEIPT ACKNOWLEDGED (Not subject to Engineer's Review or Approval)" - This code is assigned to acknowledge receipt of a submittal that is not subject to the Engineer's review and approval, and is being filed for informational purposes only. This code is generally used in acknowledging receipt of means and methods of construction work plans, field conformance test reports, and health and safety plans.
- f. Repetitive Reviews: Shop drawings, O&M manuals and other submittals will be reviewed no more than twice at the Owner's expense. All subsequent reviews will be

performed at the Contractor's expense. Reimburse the Owner for all costs invoiced by Engineer for the third and subsequent reviews.

4. Electronic Transmission
  - a. Action Submittals may be transmitted by electronic means provided the following conditions are met:
    - 1) The above-specified transmittal form is included.
    - 2) All other requirements specified above have been met including, but not limited to, coordination by the Contractor, review and approval by the Contractor, and the Contractor's Certification.
    - 3) The submittal contains no pages or sheets large than 11 x 17 inches.
    - 4) With the exception of the transmittal sheet, the entire submittal is included in a single file.
    - 5) The electronic files are PDF format (with printing enabled).
    - 6) In addition, transmit three hard-copy (paper) originals to the Engineer.
    - 7) The Engineer's review time will commence upon receipt of the hard copies of the submittal.
    - 8) For Submittals that require certification, corporate seal, or professional embossment (i.e., P.E.s, Surveyors, etc.) transmit at least two hard-copy originals to the Engineer. In addition, provide additional photocopied or scanned copies, as specified above, showing the required certification, corporate seal, or professional seal.

B. Informational Submittals

1. Contractor's Responsibilities
  - a. Number of copies: Submit three copies, unless otherwise indicated in individual Specification sections
  - b. Refer to individual technical Specification Sections for specific submittal requirements.
2. Engineer's Responsibilities
  - a. The Engineer will review each informational submittal within 14 days. If the informational submittal complies with the Contract requirements, Engineer will file for the project record and transmit a copy to the Owner. Engineer may elect not to respond to Contractor regarding informational submittals meeting the Contract requirements.
  - b. If an informational submittal does not comply with the Contract requirements, Engineer will respond accordingly to the Contractor within 14 days. Thereafter, the Contractor shall perform the required corrective action, including retesting, if needed, until the submittal, in the opinion of the Engineer, is in conformance with the Contract Documents.
3. Electronic Transmission
  - a. Informational submittals may be transmitted by electronic means providing all of the following conditions are met:
    - 1) The above-specified transmittal form is included.
    - 2) The submittal contains no pages or sheets larger than 11 x 17 inches.
    - 3) With the exception of the transmittal sheet, the entire submittal is included in a single file.
    - 4) The electronic files are PDF format (with printing enabled).

- 5) For Submittals that require certification, corporate seal, or professional embossment (i.e., P.E.s, Surveyors, etc.)) transmit two hard-copy originals to the Engineer.

END OF SECTION

P.E. CERTIFICATION FORM

The undersigned hereby certifies that he/she is a professional engineer registered in the State of New Mexico and that he/she has been employed by

\_\_\_\_\_ to design  
(Company Name)

\_\_\_\_\_  
(Insert P.E. Responsibilities)

In accordance with Specification Section \_\_\_\_\_ for the  
\_\_\_\_\_.  
(Name of Project)

The undersigned further certifies that he/she has performed the said design in conformance with all applicable local, state and federal codes, rules and regulations; and, that his/her signature and P.E. stamp have been affixed to all calculations and drawings used in, and resulting from, the design.

The undersigned hereby agrees to make all original design drawings and calculations available to the  
\_\_\_\_\_  
(Insert Name of Owner)

or Owner's representative within seven days following written request therefor by the Owner.

\_\_\_\_\_  
P.E. Name

\_\_\_\_\_  
Company Name

\_\_\_\_\_  
Signature

\_\_\_\_\_  
Signature

\_\_\_\_\_  
P.E. Registration Number

\_\_\_\_\_  
Title

\_\_\_\_\_  
Address

\_\_\_\_\_  
Address

SECTION 01301  
DEFINITIONS AND EXPLANATIONS

PART 1 GENERAL

1.01 LIMITATION OF SCOPE

- A. The definitions and explanations of this Section are not necessarily either complete or exclusive, but are general for the Work to the extent such definitions or explanations are not stated more explicitly in another provision of the Contract Documents.

1.02 DEFINITIONS

A. General

- 1. A substantial amount of the Contract Documents Specification language constitutes specific definitions for terms found in the other Contract Documents, including the drawings which must be recognized as diagrammatic in nature and not completely descriptive of the requirements indicated thereon. Certain terms used repeatedly in the Contract Documents are defined generally in this Section.
- 2. The Specifications are abbreviated type and include incomplete sentences. Omissions of words and phrases such as “a”, “an”, “the”, “all”, “The Contractor shall”, “in conformity with”, “by the Owner”, etc., is by intent. Omitted words and phrases shall be supplied by inference.

B. Terms

- 1. Approved Equal: The term “approved equal” or a similar expression is used in the Specification or drawings. It is intended to the Contractor to allow the optional use of materials of other Manufacturers than those specifically mentioned, but it shall be understood that such substitutions can be made only after the written consent of the Owner has been obtained.
- 2. Contract: The written agreement between the Owner and the Contractor setting forth the obligations of the parties thereto including, but not limited to, the performance of the Work, the furnishing of labor and materials, and the basis of payment.
- 3. Contract Documents: The term “Contract Documents” means the contract, all applicable drawings, bid specifications and any other writings which are specifically incorporated herein.
- 4. Contractor: The individual, partnership, firm, corporation or combination of same contracting with the Owner for performance of prescribed work in these specifications.
- 5. Engineer: The “Engineer” is the individual and/or firm responsible for preparation of the total design, including plans and specifications for construction of the Project.
- 6. Furnish: The term “furnish” means supply and deliver to the Project site, ready for unloading, unpacking, assembly, installation, and similar operations.

7. Indicated: The term “indicated” is a cross-reference to details, notes or schedules on the drawings, other paragraphs or schedules in the Contract Documents. Where terms such as “shown”, “noted”, “scheduled”, and “specified” are used in lieu of “indicated”, it is for the purpose of helping the reader locate the cross-reference, and no limitation of location is intended except specifically noted.
8. Installer: The entity (person or firm) engaged by the Contractor or its subcontractor for the performance of a particular unit of work at the Project site, including installation, erection, application and similar required operations. It is a general requirement that such entities (Installers) be expert in the operations they are engaged to perform.
9. Manufacturer: The Manufacturer is the firm or corporation responsible for production or fabrication of geosynthetic materials to be used in the Project. The Manufacturer is responsible for the condition of the geosynthetic material until the material is accepted by the Owner upon delivery. The Manufacturer shall produce a consistent product meeting the project specification, and shall provide quality control documentation for its products as specified for the project specified herein.
10. Owner: The Owner is the organization that will own or operate the constructed facility. The Owner is responsible for the design, construction and operation of the facility. This responsibility includes complying with the requirements of the regulatory agency and the submission of construction quality assurance documentation.
11. Engineer’s Field Representative (also referred to as the Owner’s Field Representative or Site CQA Manager): The “Engineer’s Field Representative” is a qualified individual assigned by the Engineer on behalf of the Owner to oversee construction activities as specified in the design. The Engineer’s Field Representative is responsible for, but is not limited to, inspections, verifications, audits, and evaluations of materials and workmanship necessary to determine and document the quality of the Work on behalf of the Engineer and Owner.
12. Refer: Used to indicate that the subject is defined or specified in further detail at another location in the Contract Documents, or elsewhere as indicated. Except as otherwise noted, “refer” does not imply that the Contractor must purchase or subcontract the subject work in any special manner.
13. Subcontractor: The term “Subcontractor” as used herein refers to the entity (person or firm) contracting directly with the Contractor, and not with the Owner, to perform or furnish the work stipulated in the Specifications.
14. Work: The term “Work” and “Project” are use interchangeably herein and in Contract Documents and understood to mean and include any and all labor, supervision, services, materials, machinery, equipment, tools, supplies and facilities as called for by the Contract.

#### 1.03 SPECIFICATION EXPLANATION

- A. General: This series of explanations is provided to assist the user of these Specifications and associated Contract Documents to more readily understand the format, language, implied requirements, and similar conventions of the content. None of these explanations will be interpreted to modify the substance of the requirement.



- B. Overlapping and Conflicting Requirements: Where compliance with two or more industry standards or sets of requirements is specified, and overlapping of those different standards or requirements establishes 2 different or conflicting minimums of levels of quality, the most stringent requirements (which is usually recognized to be also the most costly) is intended and will be enforced, unless specifically detailed language written into the Contract Documents (not by way of reference to an industry standard), clearly indicates that the less stringent requirement is to be fulfilled. Refer apparently-equal-but-different requirements and uncertainties as to which level of quality is the more stringent to the Engineer for a decision before proceeding.
- C. Format Explanation: The format of principal portions of these Technical Specifications can be described as follows (please note that some portions may not fully comply and no particular significance will be attached to such compliance or non-compliance):
  - 1. Sections and Divisions: For convenience, the basic unit of Specification text is a "Section", each unit of which is named and numbered. These are organized into "Divisions", which are recognized as organizing and sequencing specifications. The Section title is not intended to be fully descriptive of the requirements specified therein, nor to be an integral part of the text.
  - 2. Each Section of the Specifications has been subdivided into 3 (or less) "Parts": Part 1 - General, Part 2 - Products, and Part 3 - Execution. These do not limit the meaning of, and are not an integral part of, the text which specifies requirements.
- D. Imperative language is used generally in the Specifications. Except as otherwise specified, requirements expressed imperatively are to be performed by the Contractor. For clarity of reading at certain locations, contrasting subjective language is used to describe the responsibilities which must be fulfilled by the Contractor or, when so noted, by others.
- E. Trade names: Except as otherwise indicated, the use of trade titles (such as "carpentry") in specification text implies neither that the work must be performed by an accredited or unionized tradesman of the corresponding generic name (such as "carpenter"), nor that the specified requirements apply exclusively to work by tradesmen of that corresponding generic name.

PART 2 PRODUCTS (NOT USED)

PART 3 EXECUTION (NOT USED)

END OF SECTION

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SECTION 01305  
PROJECT ORGANIZATION AND RESPONSIBILITIES

PART 1 GENERAL

1.01 SUMMARY

- A. The parties discussed in this section are associated with the ownership, design, manufacture, transportation, installation, and quality assurance of the Project. The definitions, qualifications, and responsibilities of these parties are outlined in the subsections below.

1.02 CONTRACTOR

- A. Definition: The Contractor is the firm(s) or corporation(s) with which the Owner has entered into agreement to construct the project.
- B. Responsibilities: The Contractor is responsible for all submittals by the Manufacturer, subcontractor(s), and Installer as required by the specifications. The Contractor is also responsible for scheduling and coordination of the required Work with the Manufacturer, subcontractor(s), and Installer to complete the Project. The Contractor shall provide a representative at all times during any construction activity on-site. The Contractor is responsible for furnishing as-built drawings and a copy of the completed record documentation for the Project. The Contractor is also responsible for daily updating of the design drawings on-site and for any and all deviations for these drawings. All deviations must be initialed as approved by the Owner's Field Representative.
- C. Qualifications: The Contractor shall be qualified to perform all aspects of Work required to successfully construct the Project. The Contractor shall be licensed in the state where the Project is located and shall demonstrate prior related experience as required by the Technical Specifications.

1.03 CONTRACTOR'S REPRESENTATIVE

- A. Definition: The Contractor's Representative is a qualified individual assigned by the Contractor to represent him/her on-site at all times during all construction activity.
- B. Responsibilities: The Contractor's Representative is responsible for coordinating and supervising his crew and subcontractors' work site. The Contractor's Representative is responsible for making sure that the construction activities are conducted in accordance with the Plans and Specifications. The Contractor's Representative is responsible for pointing out to the Owner's Field Representative any discrepancies between the Plans and Specifications and the field conditions. The Contractor's Representative is responsible for attending all meetings held on the Project. The Contractor's Representative is responsible for keeping a daily log of all construction activities on-site. The Contractor's Representative is responsible for proposing alternate methods, where necessary, to the Owner's Field Representative for approval, and signature.

If the Contractor's Representative encounters conditions on-site that are (1) subsurface or otherwise concealed physical conditions which differ materially from those indicated in the Contract Documents or (2) unknown physical conditions which differ materially from those ordinarily found to exist and generally recognized as inherent in construction activities of the

character provided for in the Contract Documents, then notice by the Contractor's Representative shall be given to the Engineer promptly before conditions are disturbed and in no event later than 21 days after first observance of the conditions. The Engineer will promptly investigate such conditions and, if they differ materially and cause an increase or decrease in the Contractor's cost of, or time required for, performance of any part of the Work, will recommend an equitable adjustment in the Contract Sum or Contract Time, or both. If the Engineer determines that the conditions at the site are not materially different from those indicated in the Contract Documents and that no change in the terms of the Contract is justified, the Engineer shall notify the Owner and Contractor in writing, stating the reasons. Claims by either party in opposition to such determination must be made within 21 days after the Engineer has given notice of the decision. If the Owner and Contractor cannot agree on an adjustment in the Contract Sum or Contract time, the adjustment shall be referred to the Engineer for initial determination.

- C. Qualifications: The Contractor's Representative shall be a qualified individual who is able to perform all the tasks associated with the construction activities. The Contractor's Representative shall demonstrate prior experience in this type of construction. The Contractor's Field Representative shall have the authority to direct and instruct their crew and their subcontractors.

#### 1.04 ENGINEER

- A. Definition: The Engineer is the individual and/or firm responsible for the preparation of the total site design, including Drawings, Plans and Specifications for the project.
- B. Responsibilities: The Engineer is responsible for performing the engineering design and preparing the associated drawings and Specifications for the project. The Engineer is responsible for resolving quantity discrepancies, approving all design and Specification changes and making design clarifications necessitated during construction of the project. The Engineer is responsible for reviewing and approving shop drawings submitted by the Contractor.
- C. Qualifications: The Engineer is a registered professional engineer in the State of New Mexico. The Engineer is familiar with landfill design and operations (including detailed geosynthetic design methods and procedures) and all applicable regulatory requirements.

#### 1.05 OWNER'S FIELD REPRESENTATIVE

- A. Definitions: The Owner's Field Representative (also referred to as site CQA Manager) will be responsible for observing and documenting activities related to the quality assurance of the construction of the Project. In the scope of this document, the term "Owner's Field Representative" applies to a qualified individual assigned by the Owner to oversee construction activities.
- B. Responsibilities: The Owner's Field Representative is responsible for observing and documenting activities related to the quality assurance of the production, handling, storage, and construction of the Project including coordination of field testing and surveys. The Owner's Field Representative is responsible for implementation of the site's CQA Plan and coordination with site operations. The Owner may authorize, through the Owner's Field Representative minor changes in the Work not involving an adjustment in the Contract Price or the Contract Time and which are consistent with the overall intent of the Contract Documents. These may be accomplished by a Field Order and shall be binding on the Owner and Contractor, who shall

perform the change promptly. If the Contractor believes that a Field Order justifies an increase in the Contract Price or Contract Time, the Contractor may make a claim as provided in the specifications.

PART 2 PRODUCTS (NOT USED)

PART 3 EXECUTION (NOT USED)

END OF SECTION

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SECTION 01310  
CONSTRUCTION SCHEDULING

PART 1 GENERAL

1.01 PROGRAM DESCRIPTION

- A. A Critical Path Method (CPM) construction schedule shall be used to control the Work and to provide a basis for determining job progress. The construction schedule shall be prepared and maintained by the Contractor. All work shall be done in accordance with the established CPM schedule. The Contractor and all subcontractors shall cooperate fully in developing the construction schedule and in executing the work in accordance with the CPM schedule.
- B. The construction schedule shall consist of a computerized CPM network (diagram of activities) presented in a time-scaled graphic (print-out) with reports, as specified herein.

1.02 QUALIFICATIONS

- A. The Contractor shall have the capability of preparing and utilizing the specified CPM schedule, or engage the services of a specialized scheduling professional to do so. Within seven days of the award of contract, provide a résumé or qualifications statement for the individual within the Contractor's organization, or the outside consultant, who is being proposed as the responsible party for development and maintenance of the CPM schedule. The résumé or qualifications statement shall demonstrate that the proposed responsible party has successfully developed and maintained CPM schedules for at least three construction projects of the same size or greater than this project. The proposed responsible party for the CPM schedule is subject to approval by the Engineer and Owner. If the proposed responsible party for the CPM schedule is not approved by the Engineer and/or Owner, Contractor shall resubmit a more-appropriate candidate for approval.

1.03 SUBMITTALS

- A. Contractor shall submit Interim, Preliminary, Baseline (also known as "as-planned") CPM schedules, revisions, and Monthly Status Reports, all including graphics, reports, and narratives, and an as-built schedule, as specified herein.

PART 2 PRODUCTS

2.01 SOFTWARE

- A. Unless otherwise approved by the Engineer, the computer-based schedule shall be generated using Oracle-Primavera Contractor, or P6 Professional Project Management Software.

2.02 NETWORK REQUIREMENTS

- A. Each schedule submittal shall contain the following identifying information:
  - 1. Project Title, Owner's Contract Number, and the Engineer's Project Number
  - 2. Contractor's name

3. All Contract milestones, as specified
  4. The project calendar(s) (including work week and holidays)
  5. Type of submittal (e.g., Interim, Preliminary, Baseline or Monthly Status Report)
  6. A summary contract milestones
  7. Data date and run (print) date
- B. The network of activities shall show the order and inter-dependence of activities; and, show the sequence in which the work is to be accomplished, as planned by the Contractor. The basic concept of a network analysis diagram shall be followed to show how each activity is dependent on preceding activities (predecessors) and following activities (successors).
- C. Detailed network activities shall include, but are not limited to,:
1. mobilization activities,
  2. procurement activities (submittals, review and approval, fabrication, and delivery),
  3. permitting and regulatory activities,
  4. right-of-way activities (including utility agreements that require others to relocate existing utilities that affect the project),
  5. construction activities (including demolition, rehabilitation, new construction and testing),
  6. maintenance of existing facilities,
  7. test and start-up activities (including testing, start-up, training, performance testing, and commissioning),
  8. contract milestones (fixed and floating),
  9. specified sequences, outages and coordination activities, and
  10. any other activities needed to properly identify the scope of work and contract requirements.
- D. All activities shall be sufficiently identified and/or described so that the scope of work of each activity is clear. All work tasks shall be broken down into appropriate scopes and durations to facilitate monitoring progress. Unless otherwise approved by the Engineer, no activities shall have durations of more than one month; except for off-site activities such as procurement and delivery of materials and equipment - or administrative or management activities that span the project duration that do not reflect earned progress.
- E. Network activities shall be organized (grouped) by phases (or stages), physical areas, buildings, elevations, or other portions of the project.



- F. Separate network activities shall be provided for each significant identifiable function in each trade area in each facility. Separate network activities shall be provided for subcontractors.
- G. The number of network activities, sufficiency of description, and level of breakdown shall be subject to the Engineer's review and approval to confirm conformance with the specified requirements.
- H. The format of the schedule network graphic shall be a time-scaled logic diagram - with a list of network activities and the specified data fields presented adjacent to the graphic display.
- I. The following general requirements also apply to the network diagram.
  - 1. The Critical Path (the sequence of project network activities that add up to the longest overall duration and thereby determines the shortest time possible to complete the project) shall be identified - preferably in 'red'.
  - 2. Unless otherwise approved by the Engineer the Contractor's work schedule shall be based on 'normal work week' as defined in the Contract Documents – (typically 40 hours per week, consisting of five 8-hour days).
  - 3. The graphics shall indicate the calendar(s) on which activity durations are based (i.e., 5-day workweek or 7 calendar day week). When multiple calendars or work weeks are used, the graphics shall clearly indicate which calendars are used where.
  - 4. The project calendar shall include exclusions for holidays observed by the Contractor and those indicated in the Contract Documents.
- J. Each network activity shall have the following information (fields) listed alongside the activity on the graphic display.
  - 1. Activity ID – a manually assigned designation (numeric or alphanumeric). The Contractor should use a logical approach to assigning identification to network activities to facilitate grouping (sorting) of activities.
  - 2. Activity Description
  - 3. Original Duration – including allowances for adverse weather interruptions – normal for the project location. Normal weather shall mean seasonally average weather conditions, as recorded by NOAA.
  - 4. Percent complete – the Contractor's estimated percent complete for each network activity as of the data date for the respective report.
  - 5. Remaining Duration - a calculated value based on Original Duration of each network activity and the estimated percent of completion for each activity.
  - 6. Early Start Date
  - 7. Early Finish Date
  - 8. Late Start Date

9. Latest Finish Date

10. Total Float

## 2.03 SUBMITTAL REQUIREMENTS

A. Each schedule submittal shall include the following elements:

1. Graphics – unless otherwise approved by the Engineer, the network graphics shall be printed on 24-inch by 36-inch sheets; including a list of activities and the specified data fields.
2. Narrative
  - a. The Narrative shall consist of a written report by the Contractor providing an overview of the schedule – specific to each submittal.
  - b. The Narratives for developmental submittals, i.e., Interim and Preliminary, shall describe the Contractor's approach to executing the project Work.
  - c. The Narrative for the Baseline Schedule shall:
    - 1) Explain key activities and assumptions on which the schedule is based;
    - 2) Describe the Critical Path;
    - 3) Discuss key deliveries that might adversely affect the project schedule; and,
    - 4) Explain the Contractor's approach to adverse weather interruptions – normal for the project location. Normal weather shall mean seasonally average weather conditions, as recorded by NOAA.
  - d. The Narratives provided with Monthly Status Reports (updates) shall also identify:
    - 1) Any changes the Contractor has made to the CPM logic (including any added, modified or deleted activities,
    - 2) Any delays that have been encountered, and
    - 3) Remedial actions or recovery steps the Contractor will employ to arrest and/or recover from such delays.

B. Reports

1. The following reports are required to be submitted with Baseline Schedule, when a major revision is made to the schedule, and when requested by the Engineer.
  - a. Activity – a report listing all network activities, sorted by activity ID
  - b. Early Start – a report listing all network activities, sorted by Early Start date
  - c. Total Float – a report listing all network activities, sorted by Total Float (ascending from low to high).
  - d. Predecessor/Successor – a report of all activities, sorted by Activity ID that lists all predecessor and successor activities for each network activity.

## 2.04 ACCEPTABILITY

- A. The Contractor shall submit the CPM schedule submittals, as specified, and resubmit as needed, until they are in compliance with Contract requirements.
- B. The Engineer's review of the Contractor's construction schedule submittals will only be for conformance with the Contract requirements – including but not limited to contract time and work sequences specified in the contract documents. The Engineer's review of the schedule shall not include the Contractor's means and methods of construction or safety. The Engineer's

concurrence, acceptance, or approval of the Contractor's schedule submittals will not relieve the Contractor from responsibility for complying with the Contract Scope, Contract Time or any other contract requirement. Any indication of concurrence, acceptance, or approval of the Contractor's schedule will only indicate a general conformance with the Contract Requirements.

- C. Engineer's review of the Contractor's construction schedule submittals shall not relieve the Contractor from responsibility for any deviations from the Contract Documents unless the Contractor has in writing called Engineer's attention to such deviations at the time of submission and Engineer has given written concurrence to the specific deviations, nor shall any concurrence by the Engineer relieve Contractor from responsibility for errors and omissions in the submittals. Concurrence of the CPM Activity Network by the Engineer is advisory only and shall not relieve the Contractor of responsibility for accomplishing the Work within the Contract completion date(s).
- D. Concurrence, acceptance, or approval of the Contractor's CPM schedule by the Engineer in no way makes the Engineer an insurer of the CPM schedule's success, nor liable for time or cost overruns resulting therefrom.
- E. Failure to include any element of work required for the performance of this Contract will not excuse the Contractor from completing all Work required within the Contract completion date(s), notwithstanding the review of the network by the Engineer.
- F. CPM schedules that contain activities with negative float, or which extend beyond the contract completion date, will not be acceptable.
- G. Except where earlier completions are specified, CPM schedules which show completion of all work prior to the contract completion date may be indicated; however, in no event shall they constitute a basis for claim for delay by the Contractor.

### PART 3 EXECUTION

#### 3.01 IMPLEMENTATION SCHEDULE

##### A. Interim Schedule

- 1. Within 15 days following the receipt of the Notice to Proceed, submit an Interim Schedule indicating the planned operations during the first 60 calendar days after Notice to Proceed. In addition, the Contractor shall indicate its general approach for the balance of the project.
- 2. While the Preliminary schedule is being developed, the Contractor shall update the Interim schedule on a monthly basis – indicating actual progress - until the Preliminary schedule is submitted.

##### B. Preliminary Schedule

- 1. Within 15 days following the receipt of Notice to Proceed, submit a proposed Preliminary Schedule to the Engineer. The Preliminary Schedule shall consist of a draft computer-generated CPM-schedule showing the entire Scope of Work. The Preliminary Schedule shall not include any actual progress earned during development of the schedule (i.e., statused as of the Notice to Proceed).

2. Within 15 days of submittal of the Preliminary Schedule (i.e., within 15 days of receipt of the Notice to Proceed), meet with the Engineer to discuss the review comments.
3. Once the Preliminary Schedule is submitted, Contractor shall discontinue updating the Interim Schedule. Provide monthly updates of the Preliminary Schedule until concurrence, acceptance, or approval of the Baseline Schedule.

C. Baseline (as-planned) Schedule

1. Within 10 days of the review meeting on the Preliminary Schedule submittal, the Contractor shall incorporate the Engineer's comments into the network and submit a Baseline Schedule. Resubmit the Baseline Schedule, as required until it is deemed acceptable as stated in paragraph 2.04, above.
2. Upon concurrence, acceptance, or approval of the Contractor's initial Baseline Schedule, statused as of the Notice to Proceed date, it shall be recognized as the basis against which the Contractor's progress shall be measured.

D. Monthly Status Reports

1. Monthly Status Reports shall include updated graphics and a narrative. In addition, if requested by the Engineer, Contractor shall provide copies of one or more of the standard reports listed in 2.03.B.
2. The Contractor shall provide Monthly Status Reports (schedule updates) commencing approximately 30 days after submission of the Interim Schedule. Unless approved otherwise by the Engineer, the Monthly Status Reports shall be statused as of the end of each calendar month.
3. While the Preliminary Schedule is being developed, the Contractor shall update the Interim schedule on a monthly basis – indicating actual progress - until the Preliminary Schedule is submitted.
4. While the Baseline Schedule is being developed, the Contractor shall update the Preliminary Schedule on a monthly basis – indicating actual progress - until concurrence, acceptance, or approval of the Baseline Schedule.
5. Once the initial Baseline Schedule is complete, Monthly Status Reports shall be based on the Baseline Schedule.

E. As-Built Schedule

1. Upon achieving Substantial Completion, the Contractor shall submit an as-built schedule, showing all activities from the Notice to Proceed through Substantial Completion. In addition, provide the reports listed in 2.03.B. A Narrative is not required.

3.02 DELIVERABLES

- A. Unless approved otherwise by the Engineer, all schedule submittals shall be printed in color on sheets 11-in by 17-in and may be divided into as many separate sheets as required.

- B. Interim Schedule: Submit three copies to the Engineer.
- C. Preliminary Schedule: Submit three hard (paper) copies to the Engineer.
- D. Baseline Schedule: Submit three hard (paper) copies, one electronic copy (PDF), and a copy of the program files to the Engineer.
- E. Monthly Status Reports: Submit three copies and one electronic copy on CD to the Engineer; and if requested, an electronic copy of the program files for the respective update.
- F. As-Built Schedule: Submit one hard copy; one electronic (PDF), and, if requested, an electronic copy of the program files.

### 3.03 PROGRESS REPORTING

- A. Progress under the approved CPM schedule shall be reported monthly by the Contractor by submitting a Monthly Status Report. Unless otherwise approved by the Engineer, not less than seven days prior to the due date of the Monthly Status Report, the Contractor shall meet with the Engineer's representative to jointly evaluate the status of each network activity. Each activity shall be updated to reflect the actual progress (percent complete) and the actual dates activities were started and completed, as applicable.
- B. The Monthly Status Report shall include an update of the computer-generated network graphics and a Narrative report. The Narrative shall include:
  - 1. A description of the progress during the reporting period in terms of completed activities
  - 2. A summary of the Critical Path
  - 3. A description or explanation of each delays to network activities
  - 4. A description of problem areas, current and anticipated delaying factors and their anticipated effect on the performance of other activities and completion dates
  - 5. An explanation of corrective action taken or proposed.
  - 6. This report, as well as the CPM Status Report, will be discussed at each progress meeting.

### 3.04 RESPONSIBILITY FOR SCHEDULE COMPLIANCE

- A. Whenever it becomes apparent from the current CPM schedule and CPM Status Report that delays to the critical path have resulted and the contract completion date will not be met, or when so directed by the Engineer take some or all of the following actions at no additional cost to the Owner. Submit to the Engineer for approval, a written statement of the steps intended to take to remove or arrest the delay to the critical path in the approved schedule.
  - 1. Increase construction manpower in such quantities and crafts,
  - 2. Increase the number of working hours per shift, shifts per day, working days per week,
  - 3. Increase the amount of construction equipment, and/or

4. Reschedule activities to maximize the concurrence of activities and comply with the revised schedule.

- B. If when so requested by the Engineer, failure to submit a written statement of the steps intended to take or should fail to take such steps as approved by the Engineer, the Engineer may direct the Contractor to increase the level of effort in man-power (trades), equipment and work schedule (overtime, weekend and holiday work, etc) to be employed by the Contractor in order to remove or arrest the delay to the critical path in the approved schedule and the Contractor shall promptly provide such level of effort at no additional cost to the Owner.

### 3.05 ADJUSTMENT OF CONTRACT SCHEDULE AND COMPLETION TIME

- A. If the Contractor wants or needs to make changes in his/her execution of the construction schedule that would affect the approved CPM schedule, he/she shall notify the Engineer in writing stating what changes are proposed and the reasons for the changes. If the Engineer approves such changes, the Contractor shall revise and submit a revised schedule for approval - without additional cost to the Owner. The CPM schedule shall be adjusted by the Contractor only after prior approval of his/her proposed changes. Adjustments may consist of changing portions of the activity sequence, activity durations, division of approved activities, or other adjustments as may be approved by the Engineer; however, the addition of extraneous, non-working activities and activities that add unapproved restraints to the CPM schedule will not be allowed.
- B. Shop drawings that are not approved on the first submittal will require the addition of network activities for the resubmittals.
- C. Equipment that does not pass the specified tests will require the addition of network activities for the retesting.
- D. The contract completion time will be adjusted only for causes specified in this Contract. In the event the Contractor requests an extension of any contract completion date, he/she shall furnish such justification and supporting evidence as the Engineer may deem necessary to determine whether the Contractor is entitled to an extension of time under the provisions of this Contract. After receipt of such justification and supporting evidence, the Engineer shall perform an assessment or evaluation of the appropriate change in contract time based upon the currently approved CPM schedule and on all data relevant to the extension. Inexcusable delays (attributable to the Contractor) and non-critical delays (delays to activities which, according to the CPM schedule, do not affect any contract completion date shown by the Critical Path) shall not be the basis for a change in contract time. The Engineer will provide a written recommendation to the Owner based on its assessment, with a copy to the Contractor. The Contractor shall not change any fixed contract milestones or required completion dates without the approval of the Owner, evidenced by the execution of a contract change order. However, the Contractor should make note of such requests for changes in contract time in the narrative of monthly schedule status reports.
- E. Each request for change in any contract completion date shall be submitted by the Contractor to the Engineer in accordance with the notification requirements stipulated in the form of contract or general conditions. No time extension will be granted for requests that are not submitted in accordance with the Contract requirements.

- F. Total float in the approved CPM network belongs to the project; i.e., either the Owner or Contractor may take advantage of available total float on a first-come, first-served basis. Therefore, without obligation to extend either the overall completion date, or any intermediate completion dates set out in the CPM network, the Owner may initiate changes to the work or delay work that absorb available total float existing at the time of the change or delay. Owner initiated changes or delays that affect the Critical Path on the approved CPM network shall be the sole grounds for extending (or contracting) contract completion dates or fixed milestones.

END OF SECTION

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SECTION 01370  
SCHEDULE OF VALUES

PART 1 GENERAL

1.01 REQUIREMENTS INCLUDED

- A. Submit a Schedule of Values (a breakdown of the bid) allocated to the various portions of the work, within 15 days of receipt of the Notice to Proceed.
- B. Upon request of the Engineer, support the values with data which will substantiate their correctness.
- C. The accepted Schedule of Values shall be used only as the basis for the Contractor's Applications for Payment.

1.02 RELATED REQUIREMENTS

- A. Standard General Conditions of the Construction Contract are included in Section 00700.
  - 1. Application for Payment is included in Section 01026.

1.03 FORM AND CONTENT OF SCHEDULE OF VALUES

- A. Type schedule on an 8-1/2-in by 11-in or 8-1/2-in by 14-in white paper furnished by the Owner; Contractor's standard forms and automated printout will be considered for approval by the Engineer upon Contractor's request. Identify schedule with:
  - 1. Title of Project and location.
  - 2. Engineer and Project number.
  - 3. Name and Address of Contractor.
  - 4. Contract designation.
  - 5. Date of submission.
- B. Schedule shall list the installed value of the component parts of the work in sufficient detail to serve as a basis for computing values for progress payments during construction.
- C. Identify each line item with the number and title of the respective Section.
- D. For each major line item list sub-values of major products or operations under the item.
- E. For the various portions of the work:
  - 1. Each item shall include a directly proportional amount of the Contractor's overhead and profit.

2. For items on which progress payments will be requested for stored materials, break down the value into:
  - a. The cost of the materials, delivered and unloaded, with taxes paid. Paid invoices are required for materials upon request by the Engineer.
  - b. The total installed value.

F. The sum of all values listed in the schedule shall equal the total Contract Sum.

#### 1.04 SUBSCHEDULE OF UNIT MATERIAL VALUES

- A. Submit a sub-schedule of unit costs and quantities for:
  1. Products on which progress payments will be requested for stored products.
- B. The form of submittal shall parallel that of the Schedule of Values, with each item identified the same as the line item in the Schedule of Values.
- C. The unit quantity for bulk materials shall include an allowance for normal waste.
- D. The unit values for the materials shall be broken down into:
  1. Cost of the material, delivered and unloaded at the site, with taxes paid.
  2. Copies of invoices for component material shall be included with the payment request in which the material first appears.
  3. Paid invoices shall be provided with the second payment request in which the material appears or no payment shall be allowed and/or may be deleted from the request.
- E. The installed unit value multiplied by the quantity listed shall equal the cost of that item in the Schedule of Values.

PART 2 PRODUCTS (NOT USED)

PART 3 EXECUTION (NOT USED)

END OF SECTION

SECTION 01410  
TESTING AND TESTING LABORATORY SERVICES

PART 1 GENERAL

1.01 REQUIREMENTS INCLUDED

- A. Contractor shall be responsible for quality control/quality assurance (QA/QC) testing of materials prior to and during installation as required by the specifications. Payment for QA/QC testing is incidental to the Contractor. Contractor is responsible for all costs relating to submission to Engineer of Certificates of Compliance for all materials provided in this Contract.
- B. If requested by the Owner or Engineer, the Contractor shall have an inspector on-site to sample and/or perform field conformance testing for drainage material. Payment for these services shall be in accordance with Section 01020 – Allowances.
- C. If requested by the Owner, field quality assurance testing, including permeabilities and proctors, may be performed by the Owner and/or Engineer at an approved laboratory. Payment for these services shall be in accordance with Section 01020 - Allowances.
- D. HDPE Geomembrane Quality Assurance Laboratory Testing shall be performed by the Contractor at an independent, certified testing laboratory. Payment for these services will be in accordance with Section 01020 – Allowances.

1.02 RELATED REQUIREMENTS

- A. Conditions of the Contract: Inspections and testing required by laws, ordinances, rules, regulations, orders or approvals of public authorities.
- B. Respective Sections: Certification of products.
- C. Each Section listed: Laboratory tests required and standards for testing.
- D. Allowances are included in Section 01020.
- E. Testing Laboratory inspection, sampling and testing is required for but not limited to the following:
  - 1. Earthwork is included in Section 02200.
  - 2. Granular Fill Materials are included in Section 02230.
  - 3. Geotextile Fabric is included in Section 02272.
  - 4. Geosynthetic Clay Liner is included in Section 02275.
  - 5. HDPE Pipe is included in Section 02623.
  - 6. HDPE Geomembrane is included in Section 02776.

1.03 LIMITATIONS OF AUTHORITY OF TESTING LABORATORY

- A. Laboratory is not authorized to:
  - 1. Release, revoke, alter or enlarge on requirements of Contract Documents.
  - 2. Approve or accept any portion of the work.
  - 3. Perform any duties of the Contractor.

1.04 CONTRACTOR'S RESPONSIBILITIES

- A. Cooperate with laboratory personnel, provide access to work, to manufacturer's operations.
- B. Secure and deliver to the laboratory adequate quantities of representational samples of materials proposed to be used and which require testing.
- C. Provide to the laboratory the preliminary design mix proposed to be used for concrete and other materials mixes which require control by the testing laboratory.
- D. Materials and equipment used in the performance of work under this Contract are subject to inspection and testing at the point of manufacture or fabrication. Standard requirements for quality and workmanship are indicated in the Contract Documents. The Engineer may require the Contractor to provide statements or certificates from the manufacturers and fabricators that the materials and equipment provided by them are manufactured or fabricated in full accordance with the standard specifications for quality and workmanship indicated in the Contract Documents. All costs of this testing and providing statements and certificates shall be a subsidiary obligation of the Contractor, and no extra charge to the Owner shall be allowed on account of such testing and certification.
- E. Furnish incidental labor and facilities:
  - 1. To provide access to work to be tested.
  - 2. To obtain and handle samples at the project site or at the source of the product to be tested.
  - 3. To facilitate inspections and tests.
  - 4. For storage and curing of test samples.
- F. Notify laboratory sufficiently in advance of operations to allow for laboratory assignment of personnel and scheduling of tests.
  - 1. When tests or inspections cannot be performed after such notice, reimburse Owner for laboratory personnel and travel expenses incurred due to Contractor's negligence.
- G. Employ and pay for the services of the same or a separate, equally qualified independent testing laboratory to perform additional inspections, sampling and testing required for the Contractor's convenience.

PART 2 PRODUCTS (NOT USED)

PART 3 EXECUTION (NOT USED)

END OF SECTION

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SECTION 01415  
REGULATORY REQUIREMENTS

PART 1 GENERAL

1.01 SUMMARY

- A. This section lists certain standards, codes, rules, regulations, and other general requirements for the Work.
- B. Listing of regulatory requirements may not be complete, but must comply with all laws, rules, and regulations bearing on the performance of the Work.
- C. The Contractor shall comply with the regulatory requirements and reference standards in effect as of the effective date of the Contract Documents.

1.02 QUALITY ASSURANCE

A. Regulatory Requirements

- 1. When Contractor observes that Contract Documents are at a variance with specified codes, notify Owner in writing immediately. Owner will issue clarifications in accordance with Contract Documents.
- 2. When Contractor performs any work knowing or having reason to know that the work is contrary to such laws, rules, and regulations and fails to notify Owner, Contractor shall pay all costs arising therefrom. However, it will not be Contractor's primary responsibility to make certain that Contract Documents are in accordance with such rules and regulations.
- 3. Perform and complete the Work to meet requirements of regulatory requirements, except to extent more detailed or stringent requirements are required by the Contract Documents.
- 4. Where two (2) or more regulatory requirements apply to same requirement for Work, Contractor shall meet the more stringent requirement. Refer uncertain instances to Owner in writing for clarification before proceeding.

B. Reference Standards

- 1. Perform and complete the Work to meet requirements of reference standards, specifications, or like publications of technical societies, trade associations, governmental agencies, or other recognized standards or organizations as indicated in Contract Documents, except to the extent more detailed or stringent requirements are required by Contract Documents.
- 2. Where two (2) or more reference standards apply to same requirement for Work, the Contractor shall meet the more stringent requirement. Refer uncertain instances to Owner in writing for clarification before proceeding.

### 1.03 SCHEDULE OF REGULATORY REQUIREMENTS

A. Listing of regulatory requirements may not be complete, but comply with all laws, rules, and regulations bearing on the performance of the Work.

1. City of Santa Fe.
2. County of Santa Fe.
3. State of New Mexico.
  - a. Department of Labor - Regulations and standards.
  - b. State Fire Marshall - Regulations and standards.
  - c. New Mexico Environment Department (NMED) Regulations and standards.
  - d. Department of Nuclear Safety - License regulations and standards.
4. United States of America.
  - a. OSHA 29 CFR 1919.
  - b. USEPA.
5. Others
  - a. Caja del Rio Landfill NMED Solid Waste Bureau Solid Waste Facility Permit; NMED permit application, permit conditions; and permit documents.

PART 2 PRODUCTS (NOT USED)

PART 3 EXECUTION (NOT USED)

END OF SECTION



SECTION 01450  
QUALITY CONTROL

PART 1 GENERAL

1.01 SUMMARY

- A. Related Documents: Provisions of the Contract, including General and Supplemental General Conditions of the Contract, Drawings, and other General Requirements of the Specification, apply to this Section
- B. General: Quality control is a planned system of inspections whose purpose is to provide a continuing evaluation and control of the quality of a construction project, initiating corrective action when necessary. It is applicable to both the manufactured product and its field installation.
- C. Related Work Specified Elsewhere:
  - 1. Section 01455 – Quality Assurance.

1.02 DEFINITIONS

- A. Manufacturing Quality Control (MQC): A planned system of inspections that is used to directly monitor and control the manufacture of a material which is factory originated. MQC is normally performed by the Manufacturer of geosynthetic materials and necessary to ensure minimum (or maximum) specified values in the manufactured product. MQC refers to measures taken by the Manufacturer to determine compliance with the requirements for materials and workmanship as stated in certification documents and contract plans for the Project.
- B. Construction Quality Control (CQC): A planned system of inspections that is used to directly monitor and control the quality of a construction project. CQC is normally performed by the geosynthetics Installer, or, for natural soil materials, by the earthwork Contractor, and is necessary to achieve quality in the constructed or installed system. CQC refers to measures taken by the Installer or Contractor to determine compliance with the requirements for materials and workmanship as stated in the Plans and Specifications for the Project.

1.03 GENERAL

- A. Organization and System: Contractor shall provide a quality control organization and system to perform sampling, inspections, test observations, reviews, evaluations and like functions, and retesting in the event of failure of any items of Work, including that of subcontractors, to assure the Work meets requirements of the Contract Documents. Quality control shall be established for all Work, except where specific provisions of the Contract Documents provide quality control furnished by Owner. Contractor quality control system shall include, but not be limited to, inspections and tests required for specific products and Work indicated in sequence of occurrence under each Specification section and shall cover all Work operations, including both on-site and off-site fabrication.
- B. Quality Control (QC) Representative: Contractor shall provide a QC representative, supplemented as necessary by additional personnel, who shall be on the Work at all times

during progress, with complete authority to take any action necessary to assure the Work meets requirements of Contract Documents. QC representative shall report directly to an officer of Contractor firm. QC representative shall have no project related responsibilities other than quality control.

#### 1.04 QUALITY CONTROL PLAN

- A. General: Contractor shall have a written quality control plan which details procedures, instructions, and reports to be used to assure the Work meets requirements of Contract Documents. Plan shall include, at a minimum, each item specified in this Article. Unless otherwise authorized in writing by Owner, no Work shall be started until acceptance by Owner of quality control plan.
1. Organization Chart: Quality control organization in chart form, showing relationship of quality control organization to other elements of Contractor firm.
  2. Personnel Qualifications: Names and qualifications of personnel in quality control organization.
  3. Individual Responsibilities: Area of responsibility and authority of each individual in quality control organization.
  4. Organizations: Listing of outside organizations, such as testing laboratories, that will be employed by the Contractor, and a description of services each firm will provide.
  5. Submittal Reviews: Procedures for reviewing submittals and similar items, assuring Work meets requirements of Contract Documents, including name of person authorized to approve submittals for Contractor, as meeting requirements of Contract Documents.
  6. Inspection Schedule: An inspection schedule, keyed to construction schedule and following order of Specification sections, indicating what inspections and tests, names of persons responsible for inspection and testing for each segment of Work, and time schedule for each inspection and test.
  7. Operation Documentation: Procedures for documenting quality control operation, inspection, and testing, with a copy of all forms and reports to be used for this purpose. Include a submittal schedule listing all submittals required by Contract Documents and stating action required by Contractor and Owner, and name of persons authorized to review submittals.

#### 1.05 TOLERANCES

- A. Monitor tolerance control of installed Products to produce acceptable Work. Do not permit tolerances to accumulate and variances shall be compensated. For materials that have minimum thicknesses specified (i.e., soil liner and liner protective material), the minimum thicknesses shall be satisfied.
- B. Comply with Manufacturers' tolerances. Should Manufacturers' tolerances conflict with Contract Documents, request clarification from Owner's Representative before proceeding.

- C. Tolerance control for individual components of Work shall be in accordance with the applicable section of the Specification.

#### 1.06 SUBMITTALS

- A. Quality Control Plan: Submit Contractor quality control plan to Engineer for review and acceptance.

#### 1.07 INSPECTION PROCEDURES

- A. Preparatory Inspection: Preparatory inspection shall be performed before the beginning of Work and, in addition, before beginning each segment of Work. Preparatory inspection shall include a review of the Contract Documents requirements, review and approval of submittals and similar items, a check to assure that the required quality control testing will be provided, a physical examination to assure that the materials and equipment meet final submittals or similar items, and a check to assure that the required preliminary Work has been completed.
- B. Meeting: At least five (5) days after quality control plan is submitted, but before construction operations are started, Contractor shall meet with the Owner's Representative to discuss quality control requirements. Purpose of the meeting shall be to develop a mutual understanding relative to details of quality control system, including forms to be used for recording quality control operations, inspections, tests, approvals, certifications, administration of system, and Owner surveillance. This meeting shall also develop a schedule for future Contractor quality control meetings and shall establish procedures for submission of reports and other records and documents.
- C. Test Results: Test results provided shall cite requirements of the Contract Documents, test or analysis procedures used, and actual test results. Include a statement that item tested or analyzed either meets or fails to meet requirements of the Contract Documents. Test reports shall be signed by a testing laboratory representative authorized to sign certified test reports. Contractor shall arrange for immediate and direct delivery of signed original of reports, certification, and other documentation to Owner.
- D. Submittal Approvals: Submittals and similar items, unless otherwise noted, shall be approved and certified by Contractor as attesting Work covered by such documents meets requirements of Contract Documents.

#### PART 2 PRODUCTS (NOT USED)

#### PART 3 EXECUTION (NOT USED)

END OF SECTION

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SECTION 01455  
QUALITY ASSURANCE

PART 1 GENERAL

1.01 SUMMARY

- A. Related Documents: Provisions of the Contract, including General and Supplemental General Conditions of the Contract, Drawings and other General Requirements of the Specification, apply to this Section.
- B. General: Quality assurance is a planned system of activities whose purpose is to provide a continuing evaluation of the quality control program, initiating corrective action when necessary. It is applicable to both the manufactured product and its field installation.
- C. Related Work Specified Elsewhere:
  - 1. Section 01450 – Quality Control

1.02 DEFINITIONS

- A. Manufacturing Quality Assurance (MQA): A planned system of activities that provides assurance that the materials were constructed as specified in the certification documents and contract plans. MQA includes manufacturing facility inspections, verifications, audits and evaluation of the raw materials and geosynthetic products to assess the quality of the manufactured materials. MQA refers to measures taken by the MQA organization to determine if the manufacturer is in compliance with the product certification and Contract plans for the Project.
- B. Construction Quality Assurance (CQA): A planned system of activities that provides the Owner and permitting agency assurance that the facility was constructed as specified in the design. Construction quality assurance includes inspection, verifications, audits and evaluations of materials and workmanship necessary to determine and document the quality of the constructed facility.

1.03 GENERAL

- A. Organization and System: Owner shall provide a quality assurance organization and system to perform inspections, test observations, reviews, evaluations and like functions, and retesting in the event of failure of any items of Work, including that of subcontractors, to assure the Work meets requirements of the Contract Documents. Quality assurance shall be established for all Work. Quality assurance system shall include, but not be limited to, inspections and tests required for specific products, documentation of the daily activities and Work indicated in sequence of occurrence under each Specification section and shall cover all Work operations.

1.04 QUALITY ASSURANCE PLAN

- A. General: The Contractor shall comply with the permitted Construction Quality Assurance (CQA) Plan (included as Attachment A to the Specifications), which details procedures, instructions, and reports to be used to assure the Work meets requirements of Contract Documents and the Caja del Rio Landfill Solid Waste Permit. The CQA Plan is part of the Caja

del Rio Landfill Solid Waste Permit and any deviation is a violation. The CQA Plan includes, at a minimum, each of the following items:

1. Preparatory Inspection: The preparatory inspection performed by the Owner, shall include a review of Contract requirements, an assurance that materials and equipment have been approved, and an assurance that the required control tests will be provided by appropriate parties. This inspection shall also include examination of the Work area for actual completion of preliminary Work, mandatory subgrade inspections, physical check of materials and equipment for conformance to Plans, Specifications, and approved shop drawings or submitted data, and determination that required materials are on hand and properly stored. The Contractor shall be notified at least twenty-four (24) hours in advance of each preparatory inspection. Preparatory inspections will be conducted by the Owner or Site CQA Manager and shall be in accordance with the permitted CQA Plan.
  2. Surveillance Inspections: Surveillance inspections shall be performed daily by the Owner or Site CQA Manager to document continuous Contract compliance, including control tests, throughout the Work. These inspections shall include an examination of workmanship quality, a review of the control tests results for Contract compliance, and a notation as to defective or damaged materials, omissions, and compliance with dimensional requirements. Results of these inspections shall be recorded on the daily summary reports.
  3. Completion Inspection: At the completion of the Work, the Owner or Site CQA Manager shall conduct a completion inspection with the Contractor. The Work shall be inspected, quality control records shall be reviewed, and a list shall be developed of Work not conforming to Plans and Specifications. This list shall be included in the quality control documentation with an estimated date for correction of each deficiency. A final inspection shall be made to check that deficiencies have been corrected and the Contractor notified prior to the specified completion date.
- B. The Supplemental Technical Specifications have been prepared from the CQA Plan and as such every effort has been made to make the requirements of the Supplemental Technical Specifications equal to or greater than the requirements in the CQA Plan. In the event the Supplemental Technical Specifications differ from the CQA Plan the more conservative guidance will prevail at the direction of the Engineer.

## PART 2 PRODUCTS (NOT USED)

## PART 3 EXECUTION

### 3.01 SITE CONSTRUCTION QUALITY ASSURANCE (CQA) SERVICES FOR LANDFILL CONSTRUCTION

- A. Contractor shall retain and pay for all field related conformance testing for geosynthetics per the frequencies stated in the Specifications and the CQA Plan. Geosynthetics conformance testing laboratory shall be approved by the Owner.
- B. Contractor shall retain and pay for all field related geotechnical testing for subgrade and drainage layer per the frequencies stated in the Specifications and the CQA Plan.
- C. HDPE geomembrane quality assurance laboratory testing shall be performed per the frequencies stated in the Specifications and the CQA Plan. Payment for these services shall be in accordance with Section 01020 – Allowances.

- D. Owner shall retain and pay for Professional Engineering Services for verification of testing services related to new cell construction at the Caja del Rio Landfill.

END OF SECTION

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SECTION 01600  
PRODUCT REQUIREMENTS

PART 1 GENERAL

1.01 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary General Conditions and other technical sections included in the Specifications, apply to this Section.

1.02 SUMMARY

- A. This Section includes administrative and procedural requirements governing the Contractor's selection of products for use in the Project.

1.03 DEFINITIONS

- A. Definitions used in this Article are not intended to change the meaning of other terms used in the Contract Documents, such as "specialties," "systems," "structure," "finishes," "accessories," and other similar terms. Such terms are self-explanatory and have well-recognized meanings in the construction industry.
  - 1. "Products" are items purchased for incorporation in the Work, whether purchased for the Project or taken from previously purchased stock. The term "product" includes the terms "material," "equipment," "system," and terms of similar intent.
  - 2. "Named Products" are items identified by the Manufacturer's published product literature, that is current as of the effective date of the Contract Documents.

1.04 QUALITY ASSURANCE

- A. Source Limitations: To the fullest extent possible, provide products of the same kind from a single source.
- B. Compatibility of Options: When the Contractor is given the option of selecting between two (2) or more products for use on the Project, the product selected shall be compatible with products previously selected, even if previously selected products were also options.

1.05 PRODUCT DELIVERY, STORAGE, AND HANDLING

- A. Deliver, store, and handle products according to the Manufacturer's recommendations, using means and methods that will prevent damage, deterioration, and loss, including theft.
  - 1. Schedule delivery to minimize long-term storage at the site and to prevent overcrowding of construction spaces.
  - 2. Coordinate delivery with installation time to assure minimum holding time for items that are flammable, hazardous, easily damaged, or sensitive to deterioration, theft, and other losses.

3. Deliver products to the site in an undamaged condition in the Manufacturer's original sealed container or other packaging system, complete with labels and instructions for handling, storing, unpacking, protecting, and installing.
4. Inspect products upon delivery to ensure that products are undamaged and properly protected.
5. Store products at the site in a manner that will facilitate inspection and measurement of quantity or counting of units.
6. Store products subject to damage by the elements above ground, under cover in a weathertight enclosure, with ventilation adequate to prevent condensation. Maintain temperature and humidity within range required by Manufacturer's instructions.

## PART 2 PRODUCTS

### 2.01 PRODUCT SELECTION

- A. General Product Requirements: Provide products that comply with the Contract Documents, that are undamaged and, unless otherwise indicated, new at the time of installation.
- B. Product Selection Procedures: The Contract Documents and governing regulations govern product selection. Procedures governing product selection include the following:
  1. Proprietary Specification Requirements: Where Specifications name only a single product or manufacturer, provide the product indicated. No substitutions will be permitted.
  2. Semiproprietary Specification Requirement: Where Specifications specify products or Manufacturers by name, accompanied by the term "or equal" or "or approved equal," comply with the Contract Document provisions concerning "substitutions" to obtain approval for use of an unnamed product.
  3. Nonproprietary Specifications: When Specifications list products or Manufacturers that are available and may be incorporated in the Work, but do not restrict the Contractor to use of these products only, the Contractor may propose any available product that complies with Contract requirements. Comply with Contract Document provisions concerning "substitutions" to obtain approval for use of an unnamed product.
  4. Descriptive Specification Requirements: Where Specifications describe a product or assembly, listing exact characteristics required, with or without use of a brand or trade name, provide a product or assembly that provides the characteristics and otherwise complies with Contract requirements.
  5. Performance Specification Requirements: Where Specifications require compliance with performance requirements, provide products that comply with these requirements and are recommended by the manufacturer for the application indicated. Include manufacturer's certification of performance.

## PART 3 EXECUTION

### 3.01 INSTALLATION OF PRODUCTS

- A. Comply with Manufacturer's instructions and recommendations for installation of products in the applications indicated. Anchor each product securely in place, accurately located and aligned with other Work.
- B. Clean exposed surfaces and protect as necessary to ensure freedom from damage and deterioration at time of Substantial Completion.

END OF SECTION

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SECTION 01700  
CONTRACT CLOSEOUT

PART 1 GENERAL

1.01 SCOPE OF WORK

- A. This Section specifies administrative, verification and procedural requirements for project closeout, including but not limited to:
  - 1. Final cleaning Section 01710.
  - 2. Project Record Documents Section 01720.
  - 3. Warranties and Bonds Section 01740 and applicable Sections in Technical Division 2.
  - 4. Reconciliation of final accounting, final change order, final payment application (Section 01026 and General Conditions) and Contractor's releases.
  - 5. Permit close-outs including Certificate of Occupancy or Certificate of Completion.

1.02 RELATED WORK

- A. Certified Surveyor documentation submittals Section 01050.

1.03 CLOSEOUT PROCEDURES

- A. Provide all deliverables as specified, prior to submitting the final payment application.
- B. Provide submittals to Engineer that are required by governing or other authorities having applicable jurisdiction including but not limited to permit close out information, certificates of occupancy, etc.
- C. Submit Application for Final Payment identifying total adjusted Contract Sum, previous payments and sum remaining due, following submittal and approval of Record Documents and Record Drawings.
- D. Submit Contractor's Final Release and Release of Liens with final payment application.

1.04 FINAL CLEANING

- A. Contractor to complete final cleaning prior to submittal of the final application for payment.
- B. Contractor to comply with requirements as specified in Section 01710.

PART 2 PRODUCTS (NOT USED)

PART 3 EXECUTION (NOT USED)

END OF SECTION

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SECTION 01710  
CLEANING

PART 1 GENERAL

1.01 REQUIREMENTS INCLUDED

- A. Contractor shall execute cleaning, during progress of the Work, and at completion of the Work.

1.02 DISPOSAL AND CLEANING

- A. Conduct cleaning and disposal operations to comply with codes, ordinances, regulations, and anti-pollution laws.

PART 2 PRODUCTS (NOT USED)

PART 3 EXECUTION

3.01 DURING CONSTRUCTION

- A. Execute daily cleaning to keep the Work, the site and adjacent properties free from accumulations of waste materials, rubbish and windblown debris, resulting from construction operations.
- B. Provide onsite containers for the collection of waste materials, debris and rubbish. All waste materials including containers, food debris and other miscellaneous materials must be disposed of daily in onsite containers.
- C. Waste materials, debris and rubbish from the construction site shall be separated and stored on site in an approved area.

3.02 FINAL CLEANING

- A. Employ skilled workmen for final cleaning.
- B. Broom clean exterior paved surfaces; rake clean other surfaces of the grounds.
- C. Prior to substantial completion, or Owner acceptance, Contractor shall conduct an inspection of sight-exposed interior and exterior surfaces, and all work areas, to verify that the entire Work is clean.

END OF SECTION

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SECTION 01720  
PROJECT RECORD DOCUMENTS

PART 1 GENERAL

1.01 SCOPE

- A. The Contractor shall keep and maintain, at the job site, a copy of contract documents, marked up to indicate all changes made during the course of a project, as specified herein.

1.02 RELATED REQUIREMENTS

- A. Contract close-out submittals are included in Section 01700.
- B. Warranties and bonds are included in Section 01740.
- C. As-built construction schedules are included in Section 01310.
- D. As-built surveys are included in Section 01050.
- E. Record shop drawings are included in Section 01300.

1.03 REQUIREMENTS INCLUDED

- A. Contractor shall maintain a record copy of the following documents, marked up to indicate all changes made during the course of a project:
  - 1. Contract Drawings
  - 2. Specifications
- B. Contractor shall assemble copies of the following documents for turnover to the Engineer at the end of the project, as specified.
  - 1. Field Orders, Change Orders, Design Modifications, and RFIs
  - 2. Field Test records
  - 3. Permits and permit close-outs (final approvals)
  - 4. Certificate of Occupancy or Certificate of Completion, as applicable
  - 5. Laboratory test reports (e.g., bacteriological and primary & secondary water quality)
  - 6. Certificates of Compliance for materials and equipment
  - 7. Record Shop Drawings
  - 8. Samples
- C. RECORD DRAWINGS

1. The Contractor shall annotate (mark-up) the Contract Drawings to indicate all project conditions, locations, configurations, and any other changes or deviations that vary from the original Contract Drawings. This requirement includes, but is not limited to, buried or concealed construction, and utility features that are revealed during the course of construction. Special attention shall be given to recording the locations (horizontal and vertical) and material of all buried utilities that are encountered during construction – whether or not they were indicated on the Contract Drawings. The record information added to the drawings may be supplemented by detailed sketches, if necessary, clearly indicating, the Work, as constructed.
2. These annotated Contract Drawings constitute The Contractor's Record Drawings and are actual representations of as-built conditions, including all revisions made necessary by change orders, design modifications, requests for information and field orders.
3. Record drawings shall be accessible to the Owner and Engineer at all times during the construction period.

## PART 2 – PRODUCTS (NOT USED)

## PART 3 – EXECUTION

### 3.01 MAINTENANCE OF RECORD DOCUMENTS AND SAMPLES

- A. Store documents and samples in Contractor's field office apart from documents used for construction.
  1. Provide files and racks for storage of the record documents.
  2. Provide locked cabinet(s) or secure storage space for storage of samples.
- B. File documents and samples in accordance with Construction Specifications Institute (CSI) format.
- C. Maintain documents in a clean, dry, legible, condition and in good order. Do not use record documents for construction purposes.
- D. Make documents and samples available for inspection by the Engineer or Owner at all times.
- E. Up-to-date Record Drawings may be a prerequisite of processing periodic monthly pay applications, if so specified under the section for progress payments.

### 3.02 MARKING METHOD

- A. Use the color Red (indelible ink) to record information on the Drawings and Specifications,
- B. Label each document "PROJECT RECORD" in neat large printed letters.
- C. Unless otherwise specified elsewhere, notations shall be affixed to hardcopies of documents.
- D. Record information contemporaneously with construction progress.

E. Legibly mark drawings with as-built information:

1. Elevations and dimensions of structures and structural elements.
2. All underground utilities (piping and electrical), structures, and appurtenances
  - a. Changes to existing structure, piping and appurtenance locations.
  - b. Record horizontal and vertical locations of underground structures, piping, utilities and appurtenances, referenced to permanent surface improvements.
  - c. Record actual installed pipe material, class, size, joint type, etc

3.03 RECORD INFORMATION COMPILATION

- A. Do not conceal any work until the required information is acquired.
- B. Items to be recorded include, but are not limited to:
  1. Location of internal utilities and appurtenances concealed in the construction – referenced to visible and accessible features.
  2. Field changes of dimensions and/or details
    - a. Interior equipment and piping relocations.
    - b. Architectural and structural changes, including relocation of doors, windows, etc.
    - c. Architectural schedule changes.
- C. Changes made by Field Order, Change Order, design modification, and RFI.
- D. Details not indicated on the original Contract Drawings.

3.04 SUBMITTAL

- A. If specified under the section for progress payments, monthly applications for payment will be contingent upon up-to-date Record Drawings. If requested by the Engineer or Owner, Contractor shall provide a copy of the Record Drawings, or present them for review prior to processing monthly applications for payment.
- B. Upon substantial completion of the Work and prior to final acceptance, the Contractor shall finalize and deliver a complete set of Record Drawings to the Engineer conforming to the construction records of the Contractor. The set of drawings shall consist of corrected and annotated drawings showing the recorded location(s) of the Work. Unless specified otherwise elsewhere, Record Drawings shall be in the form of a set of prints with annotations carefully and neatly superimposed on the drawings in red.
- C. Upon substantial completion of the Work and prior to final acceptance, the Contractor shall finalize and deliver a complete set of Record Documents to the Engineer conforming to the construction records of the Contractor. The set of documents shall consist of corrected and annotated documents showing the as-installed equipment and all other as-built conditions not indicated on the Record Drawings.
- D. The information submitted by the Contractor into the Record Drawings and Record Documents will be assumed to be correct, and the Contractor shall be responsible for the accuracy of such information, and shall bear the costs resulting from the correction of incorrect data.

- E. Delivery of Record Drawings and Record Documents to the Engineer will be a prerequisite to Final Payment.
- F. The Contractor shall maintain a copy of all books, records, and documents pertinent to the performance under this Agreement for a period of five years following completion of the contract.

END OF SECTION

SECTION 01740  
WARRANTIES AND BONDS

PART 1 GENERAL

1.01 SCOPE OF WORK

- A. This Section specifies general administrative and procedural requirements for warranties and bonds required by the Contract Documents, including manufacturer's standard warranties on products and special warranties.

1.02 RELATED WORK

- A. Refer to Conditions of Contract for the general requirements relating to warranties and bonds.
- B. General closeout requirements are included in Section 01700 Contract Closeout.
- C. Specific requirements for warranties for the work and products and installations that are specified to be warranted are included in the individual Sections.

1.03 SUBMITTALS

- A. Submit written warranties to the Owner prior to the date fixed by the Engineer for Substantial Completion. If the Certificate of Substantial Completion designates a commencement date for warranties other than the date of Substantial Completion for the work, or a designated portion of the work, submit written warranties upon request of the Owner.
- B. When a designated portion of the work is completed and occupied or used by the Owner, by separate agreement with the Contractor during the construction period, submit properly executed warranties to the Owner within 15 days of completion of that designated portion of the Work.
- C. When a special warranty is required to be executed by the Contractor, or the Contractor and a subcontractor, supplier or manufacturer, prepare a written document that contains appropriate terms and identification, ready for execution by the required parties. Submit a draft to the Owner for approval prior to final execution.
- D. Refer to individual Sections for specific content requirements, and particular requirements for submittal of special warranties.
- E. At Final Completion compile two copies of each required warranty and bond properly executed by the Contractor, or by the subcontractor, supplier, or manufacturer. Organize the warranty documents into an orderly sequence based on the table of contents of the Project Manual.
- F. Bind warranties and bonds in heavy-duty, commercial quality, durable 3-ring vinyl covered loose-leaf binders, thickness as necessary to accommodate contents and sized to receive 8-1/2-in by 11-in paper.
- G. Table of Contents: Neatly typed, in the sequence of the Table of Contents of the Project Manual, with each item identified with the number and title of the Section in which specified and the name of the product or work item.

- H. Provide heavy paper dividers with celluloid covered tabs for each separate warranty. Mark the tab to identify the product or installation. Provide a typed description of the product or installation, including the name of the product and the name, address and telephone number of the installer, supplier and manufacturer.
- I. Identify each binder on the front and the spine with the typed or printed title "WARRANTIES AND BONDS", the project title or name and the name, address and telephone number of the equipment supplier.

#### 1.04 WARRANTY REQUIREMENT

- A. Related Damages and Losses: When correcting warranted work that has failed, remove and replace other work that has been damaged as a result of such failure or that must be removed and replaced to provide access for correction of warranted work.
- B. Reinstatement of Warranty: When work covered by a warranty has failed and been corrected by replacement or rebuilding, reinstate the warranty by written endorsement. The reinstated warranty shall be equal to the original warranty with an equitable adjustment for depreciation.
- C. Replacement Cost: Upon determination that work covered by a warranty has failed, replace or rebuild the work to an acceptable condition complying with requirements of Contract Documents. The Contractor is responsible for the cost of replacing or rebuilding defective work regardless of whether the Owner has benefited from use of the work through a portion of its anticipated useful service life.
- D. Owner's Recourse: Written warranties made to the Owner are in addition to implied warranties, and shall not limit the duties, obligations, rights and remedies otherwise available under the law, nor shall warranty periods be interpreted as limitations on time in which the Owner can enforce such other duties, obligations, rights, or remedies.
- E. Rejection of Warranties: The Owner reserves the right to reject warranties and to limit selections to products with warranties not in conflict with requirements of the contract Documents.
- F. Disclaimers and Limitations: Manufacturer's disclaimers and limitations on product warranties do not relieve the Contractor of the warranty on the work that incorporates the products, nor does it relieve suppliers, manufacturers and subcontractors required to countersign special warranties with the Contractor.

#### 1.05 MANUFACTURERS CERTIFICATIONS

- A. Where required, the Contractor shall supply evidence, satisfactory to the Engineer, that the Contractor can obtain manufacturers' certifications as to the Contractor's installation of equipment.

#### 1.06 DEFINITIONS

- A. Standard Product Warranties are preprinted written warranties published by individual manufacturers for particular products and are specifically endorsed by the manufacturer to the Owner.

- B. Special Warranties are written warranties required by or incorporated in the Contract Documents, either to extend time limits provided by standard warranties or to provide greater rights for the Owner.

PART 2 PRODUCTS (NOT USED)

PART 3 EXECUTION (NOT USED)

END OF SECTION

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SECTION 02200  
EARTHWORK

PART 1 GENERAL

1.01 SCOPE OF WORK

- A. Furnish all labor, materials, equipment and incidentals required and perform all earthwork, which includes clearing and stripping, procurement of fill material (on-site and imported), excavating, placing, and compacting fill and backfill, structural excavating and backfilling, transportation and storage of excess earthwork materials; disposal of unsuitable, waste and surplus materials, restoration of excavation and trench surfaces, and all subsidiary work necessary to complete the grading of the developed areas to conform with the lines, grades, and slopes as shown on the Drawings and as specified herein.
- B. The work shall include, but not necessarily be limited to; excavation; embankments; grading; and all related work such as sheeting, bracing and dewatering.
- C. Provide the services of a licensed professional engineer registered in the State of New Mexico, to prepare temporary excavation support system, and dewatering system designs and submittals.
- D. Furnish and install temporary excavation support systems, including sheeting, shoring and bracing, to insure the safety of personnel and protect adjacent structures, piping, etc, in accordance with Federal, State and local laws, regulations and requirements.
- E. Furnish and install temporary dewatering and surface water control systems and operate to dewater and maintain excavations in a dry condition. Control drainage into excavations and remove seepage water and rainwater.
- F. Examine the site and review the available geotechnical report prior to submitting their proposal, taking into consideration all conditions that may affect his work. The Owner and Design Engineer do not assume responsibility for variations of subsurface conditions at locations other than places shown and at the time the investigations were made.
- G. No extra work shall be initiated without notification to the Engineer and Owner in writing and the written approval of the Owner in response.
- H. Protect existing structures and utilities to remain.
- I. Rock and clay, if any, excavated under this Section shall be stockpiled at an approved area on site by the Contractor and shall belong to the Owner, or be used for construction as directed by the Engineer.

1.02 RELATED WORK

- A. Submittals are included in Section 01300.
- B. Testing and Testing Laboratory Services is included in Section 01410.
- C. Drainage Layer Granular Materials are included in Section 02230.

- D. Geosynthetic clay liner (GCL) is included in Section 02275.
- E. High density polyethylene (HDPE) geomembrane liner is included in Section 02776.

### 1.03 SUBMITTALS

- A. Submit, in accordance with Section 01300, the proposed methods of construction, including earthwork operations, excavation limits, slopes, fill material moisture conditioning and handling, compaction equipment, excavation support systems designs, backfilling and filling and compaction for the various portions of the work, and material sources for the various portions of the work. Excavation support system designs shall be prepared by a licensed professional engineer, registered in the State of New Mexico, having a minimum of 5 years of professional experience in the design and construction of excavation support systems. Review will be for information only. Contractor shall remain responsible for adequacy and safety of construction means, methods, and techniques.
- B. Submit, in accordance with Section 01300, and within 30 calendar days following the Notice to Proceed and before furnishing and installing the select aggregate material the following information:
  - 1. Identification of the select aggregate supplier.
  - 2. A signed certification from the supplier, listing permits (including types and permit numbers) demonstrating that the select aggregate source is in full compliance with applicable standards and regulations.
  - 3. A description of the installation procedure for leachate collection system; a schedule to include subgrade preparation, drainage layer, and leachate collection system and a list of installation equipment.
  - 4. A Quality Control/Quality Assurance Plan for the drainage layer installation.
  - 5. Three 10 lb samples for laboratory testing from each select aggregate source to be used in this project.
- C. Submit a temporary excavation slope stability evaluation prepared by a professional engineer licensed in the State of New Mexico for all temporary slopes over 20 ft in height or where existing or proposed facilities or property limits are located at the top of the slope and within a distance from the top of the slope equal to the slope height.
- D. Site characterization of all off-site borrow sources: the following information shall be submitted to the engineer for review at least three (3) weeks prior to use as an off-site borrow source. No soil or crushed stone shall be brought to the site without approval by the engineer.
  - 1. Site Characterization Data: Information regarding the off-site source and material, as follows:
    - a. Location of site;
    - b. Present and past usage of the source site and material;
    - c. Any previously existing report(s) associated with an assessment of the source site as it relates to the presence of oil or hazardous materials;
    - d. Location within the site from which the material will be obtained.

E. Quality Control Testing for Off-site Borrow Materials:

1. In the event that site characterization of off-site borrow sources indicates that soils are acceptable for use, the chemical testing will not be required. It is not anticipated that chemical testing would be required for customarily utilized commercial borrow sources. However, if the site characterization data or materials are suspected of being contaminated, chemical testing will be required as directed by the Engineer. The chemical testing shall be performed by the Contractor at no additional cost to the Owner.
2. Chemical Test Data: Each material source requiring testing shall be sampled by a person experienced in sample collection who is a registered professional engineer in the State of New Mexico, registered professional geologist, certified groundwater or environmental professional, or duly authorized representative thereof. Samples of each proposed material shall be submitted to a chemical analytical laboratory, certified by the (governing agency), for the following analyses:
  - a. Volatile Organic Compounds, (EPA 8240 plus Hazardous Substance List (HSL) Parameters).
  - b. Acid and Base Neutral Extractable Organic Compounds (EPA 8270).
  - c. Pesticides/PCBs (EPA 8080).
  - d. Total Petroleum Hydrocarbons (Infrared Method) (EPA 9071/418.1).
  - e. Thirteen Priority Pollutant Metals (EPA 7000 Series)
  - f. Total Cyanide (EPA 9012).
3. Off-site borrow samples shall be obtained and tested in accordance with criteria established by the Engineer and results submitted for review and approval prior to use on site.

F. Furnish the Engineer a representative sample weighing approximately 50 pounds of each fill material, filter sand and crushed stone contained in sealed 5-gallon containers, at least 30 calendar days prior to the date of anticipated use of such material for approval.

G. Submit laboratory test results for all fill materials (maximum density, gradation, Atterberg limits, sand equivalent, etc., as applicable) at least 72 hours prior to importing or placing any fill. Each submittal shall include the name of the material and the intended use and location of placement.

H. Submit copies of field daily reports by the soil technician at the end of each work day while earthwork and grading operations are underway. Daily field reports shall report the test results of each field density test, the specified compaction density to be achieved, the actual density achieved, and shall include a drawing showing the designation and location of each test performed.

I. Upon completion of earthwork and grading operations, submit an as-graded map showing the density test numbers and locations, a table of all density test results and depths, and a certification of compliance by the geotechnical engineer in charge.

1.04 REFERENCE STANDARDS

A. ASTM International:

1. ASTM D698 - Standard Test Methods for Laboratory Compaction Characteristics of Soil Using Standard Effort (12 400 ft-lbf/ft<sup>3</sup> (600 kN-m/m<sup>3</sup>)).

2. ASTM D1557 - Standard Test Methods for Laboratory Compaction Characteristics of Soil Using Modified Effort (56,000 ft-lbf/ft<sup>3</sup> (2,700 kN-m/m<sup>3</sup>)).
  3. ASTM D2487 - Standard Practice Test Method for Classification of Soils for Engineering Purposes (Unified Soil Classification System).
  4. ASTM D2488 - Standard Practice for Description and Identification of Soils (Visual-Manual Procedure).
  5. ASTM D2974 - Standard Test Methods for Moisture, Ash, and Organic Matter of Peat and Other Organic Soils (Method C).
  6. ASTM D3740 - Standard Practice for Minimum Requirements for Agencies Engaged in Testing and/or Inspection of Soil and Rock as Used in Engineering Design and Construction.
  7. ASTM D4318 - Standard Test Methods for Liquid Limit, Plastic Limit, and Plasticity Index of Soils.
  8. ASTM D6913 - Standard Test Methods for Particle-Size Distribution (Gradation) of Soils Using Sieve Analysis.
  9. ASTM D6938 - Standard Test Methods for In-Place Density and Water Content of Soil and Soil-Aggregate by Nuclear Methods (Shallow Depth).
- B. United States Department of Labor – Occupational Safety and Health Administration (OSHA):
1. OSHA 29 CFR Part 1926 Subpart P.
- C. United States Environmental Protection Agency (EPA):
1. EPA 8240 plus Hazardous Substance List (HSL) Parameters.
  2. EPA 8270.
  3. EPA 8080.
  4. EPA 9071/418.1.
  5. EPA 7000 Series.
  6. EPA 9012.
- D. Where reference is made to one of the above standards, the revision in effect at the time of bid opening shall apply.

#### 1.05 DEFINITIONS

- A. Percent Compaction: Required in-place dry density of the material, expressed as a percentage of the maximum dry density of the same material, as determined in the laboratory by ASTM Test Method D698 or D1557.

- B. Optimum Moisture Content: Moisture content (percent by dry weight) corresponding to the maximum dry density of the same material as determined by ASTM Test Method D698 or D1557.
- C. Moisture-Sensitive Soil: On-site soil containing more than 5 percent fines (silt- or clay-sized particles) based on the fraction passing the 3/4-inch sieve.
- D. In-the-Dry: An excavation subgrade where the groundwater level has been lowered to at least 2 feet below the lowest level of the excavation, is stable with no ponded water, mud, or muck and shall be able to support construction equipment without rutting or disturbance and shall be suitable for the placement and compaction of fill material, pipe or concrete foundations.
- E. Structures: Buildings, wet wells, manholes and below grade vaults, pipelines and utilities, pavements, and slabs-on-grade both above and below ground.
- F. Unsuitable Soil: Includes existing fill materials, organic soils, weak native soils, or clays with a plasticity index of greater than 30.
- G. Objectionable Material: Includes topsoil, organic matter, contaminated soil, construction debris, perishable materials, snow, ice, frozen earth, and rocks or lumps of cemented soils over 6 inches in maximum dimension.
- H. Overexcavation: Removal of Unsuitable Soil or Objectionable Material at or below the normal grade of the excavation or subgrade as indicated on the Drawings.
- I. Subgrade: Required surface of subsoil, borrow fill or compacted fill. This surface is immediately beneath site improvements, especially dimensioned fill, liner system, or other surfacing material.
- J. Finished Grade: Required final grade elevation indicated on the Drawings. Spot elevations shall be precedent over proposed contours.
- K. Coverage: Pass of compaction equipment over the complete surface area of exposed lift or subgrade to receive compaction.

#### 1.06 STATUTORY REQUIREMENTS

- A. All excavation, trenching, sheeting, bracing, etc. shall comply with the requirements of OSHA excavation safety standards (29 CFR Part 1926 Subpart P), State and local requirements. Where conflict between OSHA, State and local regulations exists, the most stringent requirements shall apply.
- B. The CONTRACTOR shall notify New Mexico One Call (811 or 1-800-321-2537) at least two business days in advance of any excavation or any work which would otherwise interfere with above-ground or underground utilities. The locations of existing underground utilities obtained from the OWNER and respective utility companies are shown without express or implied representation, assurance, or guarantee that they are complete or correct or that they represent a true picture of underground piping to be encountered.

1.07 PROTECTION

- A. All existing facilities which include but are not limited to structures, utilities, pavements, sidewalks, curbing, driveway aprons, fencing, landscaping and other improvements in the vicinity of the Contractor's operations shall be adequately protected. If necessary, curbing, driveway aprons and fencing shall be removed and restored or replaced after backfilling. All existing facilities damaged by the construction shall be replaced with material fully equal to that existing prior to construction to the satisfaction of the Owner.
- B. Excavations within the zone of influence of any existing structures or utility will require the use of excavation support system. The zone of influence is defined as a line extending at least 2 feet beyond of edge of the foundation, then outward and downward at a slope of 1 horizontal to 1 vertical. No excavation below the foundation of existing structures is allowed.
- C. Excavations below the level of the base of any adjacent foundation or retaining wall shall not be permitted unless the design of the excavation and bracing includes an analysis of the stability of the structure supported by the foundation and as necessary, incorporates required bracing / underpinning of the foundation.

1.08 QUALITY ASSURANCE

- A. At all structures, prior to the placement of bedding material, concrete work mats, structural fill or structural concrete, coordinate with Soils Testing Laboratory to verify the suitability of the existing subgrade soil.
- B. Prior to and during the placement of backfill and fill coordinate with Soils Testing Laboratory to perform in-place soil density tests to verify that the backfill/fill material has been placed and compacted in accordance with the compaction requirements specified elsewhere. At least 48 hours notice shall be provided prior to placement of backfill and fill.
- C. Subgrades shall not be covered with fill nor fill placed without the observation, testing, and approval by Soils Testing Laboratory. Earthwork activities performed without properly scheduled inspection are subject to removal and replacement or additional testing as directed by the Engineer at no expense to the Owner.
- D. Materials will be tested and observed as described in the following paragraphs. Cooperate by allowing free access to the work for selection of test materials and observations.
  - 1. Materials to be used in the work shall be tested by a certified independent laboratory, engaged by the Contractor and acceptable to the Engineer, to demonstrate conformance with the requirements of these Specifications. Such testing will be paid for by the Contractor. Deliver test reports and material certifications to the Engineer before using any material in the work.
  - 2. If field test results are not in conformance with the requirements of these Specifications, all costs involved in correcting deficiencies in compacted materials to the satisfaction of the Engineer and costs of re-testing after correction of deficiencies shall be borne by the Contractor.

3. Earthwork activities performed without properly scheduled inspection are subject to removal and replacement or additional testing as directed by the Engineer at no expense to the Owner.
  4. Testing methods shall comply with the latest applicable ASTM or equivalent AASHTO Standards specified.
  5. During the placement of bedding, backfill and fill, the Contractor shall perform in-place soil density testing to confirm that fill material has been compacted in accordance with the requirements of this Section. The Engineer may designate areas to be tested. Contractor shall notify Engineer at least 72 hours in advance of scheduled compaction testing. In place soil density tests on backfill/fill material shall be as required by City, State, or Federal Codes, the project geotechnical report, but in no instance shall less than those listed below:
    - a. Structures and Embankments. At least one density and moisture content test for each 2,500 square feet of surface area for each lift of fill at embankment, structure and manhole locations.
    - b. Prepared Liner Subgrade. At least four (4) density and moisture content tests for each acre and for each lift of prepared subgrade for geosynthetics.
    - c. Anchor Trench Excavations. At least one nuclear density and moisture content test shall be conducted at a maximum of 150-ft intervals for each lift of fill placed or as directed by the Engineer.
    - d. The Engineer may designate additional areas to be tested.
  6. During the placement of backfill and fill, the in-place thickness of the prepared subgrade layer and drainage layer shall be measured as follows:
    - a. The prepared subgrade layer shall be measured for thickness once every acre (survey on grid) in accordance with Section 01050.
    - b. The drainage layer shall be measured for thickness five (5) times every acre (survey on grid) in accordance with Section 01050.
  7. Materials which have been previously tested may be subjected to further testing from time to time and may be rejected if it is determined that they do not conform to the requirements of these Specifications. Rejected materials shall be removed from the work immediately when so directed by the Engineer, notwithstanding the results of previous testing.
- E. The Engineer or Owner may conduct additional soil testing. Cooperate fully in obtaining the information desired and allowing free access to the work.

#### 1.09 CONSTRUCTION CONTROL

- A. The Contractor is responsible for all construction layout and reference staking necessary for the proper control and satisfactory completion of all structures, cutting, filling, grading, drainage, fencing, embankment improvements, curbing, and all other appurtenances required for the completion of the construction work and acceptance of the Contract as specified and as shown on the Drawings.
- B. All construction layout and staking shall be performed by a professional land surveyor or professional engineer registered by the State of New Mexico, experienced and skilled in construction layout and staking of the type required under this Contract, and acceptable to the Engineer and Owner.

## PART 2 PRODUCTS

### 2.01 MATERIALS

#### A. General

1. Materials for use as fill shall be as described below.
2. The supplier shall show evidence of an adequate supply of material which is relatively homogenous within a designated mine area which is properly permitted by the appropriate Federal, State, and local agencies.
3. Disposal of unsuitable material is specified in this Section, Paragraph 3.08.

#### B. Fill

1. Drainage Layer Material is specified in Section 02230.
2. Common Fill: Common fill for rough grading landfill cells, embankments or other general fill requirements specified other than those listed below shall consist of mineral soils substantially free of clay, organic material, loam, wood, trash, and other objectionable material that may be compressible, degradable or which cannot be compacted properly. Common fill shall not contain stones or chunks larger than 6-inches in any dimension, broken concrete, masonry, rubble, or similar materials. It shall not contain fines passing the No. 200 sieve) greater than 35%. It shall have physical properties such that it can be readily spread and compacted during filling. In general, common fill shall consist of sand, sand with gravel, sand with silt, sand with clay, silty sand, or clayey sand, classified as SP, SW, SP-SM, SP-SC, SW-SM, SW-SC, SM, or SC in accordance with the United Soil Classification System, ASTM D2487. Soils containing more than five percent by weight of organic materials (ASTM D2974), a Plasticity Index (ASTM D4318) greater than 10%, or a Liquid Limit (ASTM D4318) greater than 40% shall not be used. Common fill shall have a particle size gradation (ASTM D422) within the following limits:

| <u>Sieve Size</u> | <u>Percent Passing by Weight</u> |
|-------------------|----------------------------------|
| 6-in              | 100                              |
| No. 4             | 70-100                           |
| No. 40            | 5-100                            |
| No. 200           | 0-35                             |

3. Select Fill: Select fill for the prepared subgrade shall consist of soil free from organic materials, loam, wood, trash, or other objectionable materials which may be unstable or which cannot be properly compacted. It shall contain no stones larger than ½ inch and shall have a maximum liquid limit of 40%, and a maximum plasticity index of 10%. Select fill shall have a particle gradation within the following limits:



| <u>Sieve Size</u> | <u>Percent Passing by Weight</u> |
|-------------------|----------------------------------|
| 1/2-in            | 100                              |
| No. 200           | 0-35                             |

4. Select Aggregate: Washed select aggregate shall be used for bedding material around the leachate collection pipes, wrapped with geotextile as shown on the Drawings and as specified herein. The select aggregate shall be sound, hard, durable, non-carbonate, resistant to weathering and shall be free of overburden, spoil, shale, limestone, and organic material. Select aggregate shall have a carbonate content of no more than 1% (ASTM D4373). The select aggregate shall be sub-rounded to rounded particles as defined by ASTM D2488 and shall have particle size gradation (ASTM D422) within the following limits:

| <u>Sieve Size</u> | <u>Percent Passing by Weight</u> |
|-------------------|----------------------------------|
| 2-in              | 100                              |
| 1 1/2-in          | 90-100                           |
| 1-in              | 20-55                            |
| 3/4-in            | 0-15                             |
| 3/8-in            | 0-5                              |
| No. 16            | 0                                |

## 2.02 CONFORMANCE TESTING

### A. Liner System Subgrade:

1. Conformance testing shall be performed the Soils Testing Laboratory on samples from each source of subgrade material (select fill) to assure compliance with this Section. The following tests shall be performed on the samples:
  - a. Sieve Analysis (ASTM D422) every 5,000 cy.
  - b. Standard Proctor (ASTM D698) every 5,000 cy.

### B. Select Aggregate:

1. Conformance testing shall be performed by the Soils Testing Laboratory on samples from each source of select aggregate material to assure compliance with this Section. The following tests shall be performed on at least one sample per 100 ton of select aggregate:
  - a. Sieve Analysis (ASTM D422) every 100 tons.
  - b. Carbonate Content (ASTM D4373) every 100 tons.
  - c. Particle Shape (ASTM D2488) every 100 tons.

### PART 3 EXECUTION

#### 3.01 PREPARATION

A. Test Pits:

1. Perform exploratory excavation work (test pits) for the purpose of verifying the location of underground utilities and structures and to check for unknown utilities and structures, prior to commencing excavation work.
2. Test pits shall be backfilled and compacted as soon as the desired information has been obtained. Backfilled surfaces shall be stabilized in accordance with approved erosion and sedimentation control plans.

- B. Clearing and Stripping. The ground surface beneath all planned Structures and in all areas requiring excavation or filling shall initially be cleared and stripped of all organic material and debris. These materials shall not be reused as On-Site Fill Material; they shall be removed from the site and disposed of.

#### 3.02 DEWATERING AND DRAINAGE

- A. Runoff or groundwater seepage that would interfere with the contractor's work shall be controlled during construction. Control may consist of temporary drainage ditches or subsurface drains. Installation of such measures shall be the Contractor's responsibility.
- B. Temporary dewatering and drainage systems shall be in place and operational prior to commencing excavation work.
- C. Dewatering shall be accomplished by methods which preserve the undisturbed state of subgrade soils. Dewatering shall be such as to prevent boiling, detrimental under-seepage, or disturbance at the base of the excavation.

#### 3.03 SUPPORT OF EXCAVATION

- A. Support of excavation shall be installed in accordance with the approved shop drawings prior to beginning excavation work.
- B. Excavation supports that are required to remain in place, if applicable, are indicated on the Drawings or as required by approved shop drawings.
- C. The Owner or Engineer may direct that certain excavation supports remain in place or be cut off at any specific elevation. If the Contractor believes that such a directive increases Contractor's cost and would thereby entitle Contractor to a change in contract cost, Contractor shall notify the Engineer in accordance with the applicable article(s) in the General Conditions pertaining to changes in the work.
- D. The right of the Owner or Engineer to direct that certain excavation supports remain in place shall not be construed as creating any obligation on the Owner or Engineer to give such direction, nor shall failure to give such direction relieve the Contractor from liability for damages to persons or property occurring from or upon the work occasioned by negligence or

otherwise, growing out of a failure on the part of the Contractor to leave in place sufficient excavation supports to prevent any movement of the ground or damage to adjacent structures.

- E. Temporary excavation slopes shall be constructed in accordance with the requirements of OSHA excavation safety standards and approved shop drawings.
- F. Excavation supports shall be carefully removed in such manner so as not to endanger the Work or other adjacent structures, utilities, or property. All voids left or caused by withdrawal of supports shall be immediately filled with sand and compacted.

### 3.04 EXCAVATION

- A. Excavation shall include material of every description and of whatever substance encountered. Pavement shall be cut with a saw, wheel or pneumatic chisel along straight lines before excavating.
- B. In general, the on-site soils can be excavated using standard earthmoving equipment. Excavation in dense soil or rock may require special equipment. In no case shall the earth be ploughed, scraped, or dug with machinery so near to the finished subgrade as to result in excavation of, or disturbance of material below grade.
- C. Excavations shall be made to the grade indicated on the Drawings and in widths sufficient for laying the pipe, construction of the structure, bracing and for dewatering and drainage facilities. Excavations for structures shall be suitably wide for construction of the structures, including excavation supports, dewatering and drainage systems and working clearances.
- D. Excavation shall be performed in-the-dry and shall be accomplished by methods which preserve the natural undisturbed condition of the subgrade soils.
- E. Moisture Sensitive Soils are particularly susceptible to disturbance due to construction operations. When excavation is to end in such soils, use a smooth-edge bucket to excavate the last one foot of depth.
- F. If the bottom of any excavation is taken out below the limits shown on the Drawings, specified, or directed by the Engineer, it shall be refilled at no additional cost to the Owner with structural fill or other material satisfactory to the Engineer.
- G. When excavation has reached prescribed depths, the Engineer shall be notified and will observe the conditions. If materials and conditions are not satisfactory to the Engineer, the Engineer will issue instructions as to the procedures. The Engineer will be the sole judge as to whether the work has been accomplished satisfactorily.
- H. Subgrade soils that have become soft, loose, "quick", or otherwise unsatisfactory as a result of inadequate excavation, dewatering or other construction methods, in the opinion of the Engineer, shall be removed and replaced with structural fill as acceptable to the Engineer at the Contractor's expense.
- I. Exposed subgrades in large open areas, for foundations shall be proof rolled with at least two overlapping coverages of a vibratory drum roller with a minimum of a 10-ton static drum weight. Proofrolling in confined areas may be accomplished with hand operated vibratory equipment approved by the Engineer. Proofrolling shall be conducted in the presence of the

Engineer. The Engineer shall waive this requirement if, in his/her opinion, the subgrade will be rendered unsuitable by such proofrolling.

- J. Perform overexcavation at the request of the Engineer to remove Unsuitable Soil, Objectionable Material, or other materials as determined by the Engineer to such depth and width as the Engineer may direct and shall be replaced with suitable material as directed by the Engineer.
- K. Excavation for all pipe lines beneath structures and excavation for all footings shall be carried out with the excavating equipment operating from the subgrade for the structure. The excavation shall be carried out "in-the-dry" and in a manner which will preserve the undisturbed state of the subgrade soils.
- L. When excavations have reached the required subgrade, including any allowances for working mats or base materials, prior to the placement of working mats or base materials, notify the soils testing laboratory to verify the suitability of the existing subgrade soils for the anticipated foundation and structural loadings. If the existing subgrade soils are determined to be unsuitable, direction will be provided by the Engineer regarding removal and replacement with suitable materials. If Contractor believes that such direction would increase Contractor's cost and would thereby entitle Contractor to a change in Contract cost, Contractor shall notify the Engineer in accordance with the applicable article(s) in the General Conditions pertaining to changes in the work.
- M. Over-excavation beyond the limits and depths required by the Contract Documents shall be replaced at no additional cost to the Owner by structural fill or other approved material subject to the prior approval of the Engineer.

### 3.05 SUBGRADE PREPARATION

- A. Maintain the excavated subgrade "in-the-dry".
- B. Prior to placement of fill, remove all objectionable material which shall include but not be limited to pavement, topsoil, organic matter, contaminated soil, construction debris, perishable materials, snow, ice, frozen earth, and rocks or lumps of cemented soils over 6 inches in maximum dimension.
- C. For subgrades consisting of granular soils, proof compact the final subgrade using at least four coverages of a vibrator plate compactor.
- D. Soft subgrades or unusable material shall be removed and replaced with compacted structural fill.
- E. During wet or freezing weather, or in areas where the exposed subgrade consists of Moisture-Sensitive Soils, the contractor shall take measures to protect foundation excavations once they have been approved by the Engineer. These measures shall include, but are not limited to, placing insulation blankets, placing a layer of pea gravel, crushed rock, or lean concrete on the exposed subgrade, or covering the exposed subgrade with a plastic tent. If additional overexcavation is required because the subgrade was not protected against wet or freezing weather, the cost of such additional work shall be borne by the Contractor.

- F. Notify the Engineer to observe the subgrade following subgrade preparation and prior to fill placement. If the existing subgrade soils are determined to be unsuitable, direction will be provided by the Engineer regarding removal and replacement with suitable materials.

### 3.06 FILLING PLACEMENT AND COMPACTION PROCEDURES

- A. Fill and backfill materials shall be placed in lifts to suit the specified compaction requirements to the lines and grades required, making allowances for settlement and placement of cover materials (i.e., topsoil, sod, etc). Soft spots or uncompacted areas shall be corrected.
- B. Fill and backfill shall not be placed and compacted when the materials are too wet to properly compact (i.e., the in-place moisture content of the soil at that time is no more than three percentage points above the optimum moisture content of that soil as determined by the laboratory test of the moisture-density relation appropriate to the specified level of compaction).
- C. Fill shall be constructed to the lines and grades required, making allowances for settlement and placement of cover materials (i.e. topsoil, sod, etc). Soft spots or uncompacted areas shall be corrected.
- D. Fill materials shall not be placed on frozen surfaces, or surfaces covered by snow or ice. Fill material shall be free of snow, ice and frozen earth.
- E. All structure water-tightness tests and dampproofing/waterproofing shall be completed prior to placing fill or backfill around structures.
- F. If the subgrade slopes more than 10%, the subgrade shall be stepped to produce a stable, horizontal surface for the placement of fill materials. The existing subgrade slope shall then be scarified to a depth of at least 6-inches.
- G. Fill slopes should be compacted by slope rolling and trimming or should be overfilled and trimmed back to plan grade to expose a firm, smooth surface free of loose material.
- H. Fill lifts shall not contain stones with a dimension larger than 2/3 the specified loose measure lift thickness.
- I. Compaction in open areas may be accomplished by any of the following methods: compaction equipment, fully loaded ten-wheel trucks or front end loaders, tractor dozers weighing at least 30,000 lbs or heavy vibratory rollers. Compaction in confined areas (including areas within a 45-degree angle extending upward and outward from the base of a wall) and in areas where the use of large equipment is impractical, shall be accomplished by hand operated vibratory equipment or mechanical tampers. Lift thickness shall not exceed 6-in (measured before compaction) when hand operated equipment is used.
- J. On-Site Fill Material shall be moisture conditioned prior to placement unless the Contractor demonstrates to Engineer in-place moisture conditioning methods that can achieve the required moisture content.
- K. Compaction of each specified lift of fill materials shall be conducted by a minimum of four (4) complete coverages with acceptable compaction equipment to a specified density which is expressed as a percentage of the maximum dry density as determined by ASTM D698, unless specified otherwise.

- L. Fill required beneath foundations or slabs on grade (except sidewalks) shall be select fill. Place and compact select fill in even lifts having a maximum thickness (measured before compaction) of 8-in.
- M. Fill and backfill material placed immediately adjacent to and within 10-ft of all structures shall be select fill. All structure water-tightness tests and dampproofing / waterproofing shall be completed prior to placing fill or backfill around structures. Place and compact select fill in even lifts having a maximum thickness (measured before compaction) of 8-in uniformly around the structure.
- N. Common fill may be used in areas beyond those designated for select fill unless shown or specified otherwise. Common fill shall be placed in even lifts having a maximum thickness (measured before compaction) of 8-in.

### 3.07 COMPACTION REQUIREMENTS

- A. Select fill subgrade material placement below the geosynthetic clay liner shall be placed in one lift, and compacted to 90% of the maximum density as determined by ASTM D698. Thickness of the subbase shall be measured and recorded in accordance with Section 01050. Nuclear Density and Moisture Content per ASTM D6938 shall be measured four (4) times every acre of each lift for the subgrade layer.
- B. Perform in place testing of compacted fill lifts to measure in-place density and water content (ASTM D6938).
- C. The bottom geosynthetic layer shall be placed on a prepared subgrade consisting of, at a minimum, a 6-inch layer of in-situ soil or select fill compacted to 90 percent Standard Proctor density (ASTM D698) at or near its optimum moisture content (minus 2 to plus 3 percent).
- D. Beneath foundations and slabs on grade (except sidewalks): Compact the top 12-in of existing subgrade (and each layer of fill if applicable) to a minimum of 95 percent maximum dry density (ASTM D1557) at or near its optimum moisture content (minus 2 to plus 3 percent).
- E. 10-ft around structures: Compact each layer of fill or backfill to a minimum of 95 percent maximum dry density (ASTM D1557) at or near its optimum moisture content (minus 2 to plus 3 percent).
- F. Embankments (except under roadways and earth dam structures), lawn or unimproved areas: Compact each layer of fill or backfill to a minimum of 90 percent maximum dry density (ASTM D1557) at or near its optimum moisture content (minus 1 to plus 4 percent).
- G. Roads, paved areas and roadway embankments: Compact each layer of fill or backfill to a minimum of 95 percent maximum dry density (ASTM D1557) at or near its optimum moisture content (minus 2 to plus 3 percent).

### 3.08 DISPOSAL OF UNSUITABLE, WASTE AND/OR SURPLUS EXCAVATED MATERIAL

- A. Unsuitable Soil, Objectionable Material, and waste and surplus excavated material shall be permanently stockpiled in the area designated by the Owner. Materials may be temporarily stockpiled in an area within the limits of construction that does not disrupt construction activities, create any nuisances or safety hazards, or otherwise restrict access to the work site.

- B. Topsoil or loam, if any, excavated under this Section may be salvaged by the Contractor for his/her own convenience for use, as approved by the Engineer.

### 3.09 GRADING

- A. Grading shall be performed to the lines and grades shown on the Drawings. All objectionable material encountered within the limits indicated shall be removed and disposed of. Subgrades shall be completely and continuously drained and dewatered throughout the grading process. Install temporary drains, drainage ditches, etc, to intercept or divert surface water which may affect the execution or condition of grading work.
- B. If at the time of grading it is not possible to place any material in its proper section of the Work, it shall be stockpiled in approved areas for later use. No extra payment will be made for the stockpiling or double handling of excavated material.
- C. In cut areas, all loose or protruding rocks in slopes shall be removed to line or finished grade of the slope. All cut and fill slopes shall be uniformly dressed to the slope, cross-section and alignment shown on the Drawings unless otherwise directed by the Engineer.

### 3.10 FIELD QUALITY CONTROL

- A. Layer thickness shall be measured periodically throughout the day in accordance with Section 01050 during construction to confirm that the thickness of the installed material is in accordance with the Drawings.
  - 1. Subgrade layer thickness shall be measured once every acre on a grid.
  - 2. Drainage layer thickness shall be measured five (5) times every acre on a grid.
- B. Nuclear Density and Moisture Content per ASTM D6938 shall be measured four (4) times every acre of each lift for the subgrade layer.
- C. Any sample or area tested shall be rejected, removed and replaced if it does not meet the requirements of the technical specifications. Reconstructed areas shall have feathered, overlapping edges that tie into adjacent fill material.
- D. Field quality control testing shall include the following:
  - 1. Drainage Layer:
    - a. Sieve Analysis (ASTM D422) performed for every 1,500 cy installed.
    - b. Hydraulic Conductivity (ASTM 5084) performed for every 2 acres installed.
    - c. Organic Content (ASTM D2974) performed for every 2,500 cy installed.
  - 2. Field quality control testing for drainage layer granular fill shall be paid for in accordance with Section 01020 – Allowances.

END OF SECTION

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SECTION 02230  
DRAINAGE LAYER GRANULAR MATERIALS

PART 1 GENERAL

1.01 SCOPE OF WORK

- A. Furnish all labor, equipment and incidentals required and install granular fill materials as shown on the Drawings and as specified herein. Drainage layer granular fill material shall be provided by Owner. Associated work includes testing, sample collection, excavation, loading, shipping, delivering, stockpiling, placement and installation of granular fill materials.

1.02 RELATED WORK

- A. Earthwork is included in Section 02200.
- B. Nonwoven Geotextile is included in Section 02272.
- C. Geosynthetic Clay Liner is included in Section 02275.
- D. High Density Polyethylene (HDPE) Liner is included in Section 02776.

1.03 SUBMITTALS

- A. Submit, in accordance with Section 01300, and within 30 calendar days following the Notice to Proceed and before installing the granular fill material the following information:
  - 1. A description of the installation procedure for leachate collection system; a schedule to include drainage layer installation and a list of installation equipment.
  - 2. A Quality Control/Quality Assurance Plan for the drainage layer installation.
  - 3. Documentation and related past experience in accordance with Paragraph 1.06 below.
- B. Submit in accordance with Section 01300:
  - 1. Field quality control documentation and testing results in accordance with Paragraph 3.02 below.

1.04 REFERENCE STANDARDS

- A. ASTM International (ASTM):
  - 1. ASTM D422 - Standard Test Method for Particle-Size Analysis of Soils.
  - 2. ASTM D698 - Standard Test Methods for Laboratory Compaction Characteristics of Soil Using Standard Effort (12,400 ft-lbf/ft<sup>3</sup> (600 kN-m/m<sup>3</sup>)).
  - 3. ASTM D854 - Standard Test Method for Specific Gravity of Soils Solids by Water Pycnometer.

4. ASTM D1556 - Standard Test Method for Density and Unit Weight of Soil in Place by Sand-Cone Method.
  5. ASTM D1557 - Standard Test Methods for Laboratory Compaction Characteristics of Soil Using Modified Effort (56,000 ft-lbf/ft<sup>3</sup> (2,700 kN-m/m<sup>3</sup>)).
  6. ASTM D2216 - Standard Test Methods for Laboratory Determination of Water (Moisture) Content of Soil and Rock by Mass.
  7. ASTM D2434 - Standard Test Method for Permeability of Granular Soils (Constant Head).
  8. ASTM D2487 - Classification of Soils for Engineering Purposes (Unified Soil Classification System).
  9. ASTM D2488 - Standard Practice for Description and Identification of Soils (Visual-Manual Procedure).
  10. ASTM D2937 - Standard Test Method for Density of Soil in Place by the Drive-Cylinder Method.
  11. ASTM D2974 - Standard Test Methods for Moisture, Ash, and Organic Matter of Peat and Other Organic Soils.
  12. ASTM D6938 - Standard Test Method for In-Place Density and Water Content of Soil and Soil-Aggregate by Nuclear Methods (Shallow Depth).
  13. ASTM C136 - Standard Test Method for Sieve Analysis of Fine and Coarse Aggregates.
  14. ASTM C289 - Standard Test Method for Potential Alkali-Silica Reactivity of Aggregates (Chemical Method).
  15. ASTM D75 - Standard Practice for Sampling Aggregates.
  16. ASTM D3042 - Standard Test Method for Insoluble Residue in Carbonate Aggregates.
  17. 18ASTM D4373 - Standard Test Method for Rapid Determination of Carbonate Content of Soils.
- B. Where reference is made to one of the above standards, the revision in effect at the time of bid opening shall apply.

1.05 QUALITY ASSURANCE

- A. The Quality Control and Quality Assurance consists of laboratory conformance testing of samples supplied from each granular fill and coarse aggregate source and quality control during installation.
- B. The Contractor will retain an independent laboratory (QAL) that has adequate equipment to perform permeability tests and provide results in a timely manner in accordance with this Section. Coordinate and schedule all tests as required by the Drawings and as specified herein.

- C. Conformance testing requirements are specified in Paragraph 2.02 below. The purpose of conformance testing is to assure that the supplied drainage layer materials from each source conform to this Section and specified permeability.
- D. Field quality control requirements are specified in Paragraph 3.02 below. The purpose of field quality control procedures is to assure that the lateral drainage layer has been installed in accordance with this Section meeting the specified hydraulic conductivity.

#### 1.06 QUALIFICATIONS

- A. The work shall be performed by a firm that has experience in processing and installation of drainage layers and protective soil cover on top of synthetic liners. The firm shall demonstrate proven experience by providing a minimum of five similar completed projects with the following information:
  - 1. Type and thickness of installed material.
  - 2. Name and purpose of facility, its location and date of installation.
  - 3. Name of Owner and design engineer. Name and telephone number of contact at the facility who can discuss the project.

#### 1.07 DELIVERY, STORAGE AND HANDLING

- A. If drainage layer materials are delivered to the site prior to placement approval, materials shall be stockpiled on site in areas as directed. Provision shall be implemented to minimize surface water impact on the stockpile. Removal and placement of drainage layer materials shall be done in a manner to minimize intrusion of soils adjacent to and beneath the stockpile.

### PART 2 PRODUCTS

#### 2.01 MATERIAL

- A. Drainage Layer Granular Fill (Basalt Rock Material)

- 1. The drainage layer material shall consist of processed and screened basalt rock material provided by Owner. Processed and screened material shall conform to the following gradation requirements.

| <b>Sieve Size</b> | <b>Percent Passing By Weight</b> |
|-------------------|----------------------------------|
| 1/2 inch          | 100                              |
| 200               | <15                              |

- 2. The drainage layer material shall be well-graded noncalcareous material, free from organic substance (<5%) and other deleterious matter with a minimum hydraulic conductivity of  $1 \times 10^{-4}$  cm/sec.
  - 3. Uniformity coefficient (Cu) shall be less than 6 where Cu is defined as D60/D10.
  - 4. Material to be used for construction of the prepared Drainage Layer (Basalt Rock Material) shall be obtained from on-site stockpile areas shown in the Drawings.

B. Drainage Layer Granular Fill (Glass Cullet)

1. The drainage layer material shall consist of crushed glass cullet provided by the Owner, which shall be used on the cell floor. Glass cullet drainage layer material shall conform to the following gradation requirements:

| Sieve Size | Percent Passing By Weight |
|------------|---------------------------|
| 1/2 inch   | 100                       |
| 200        | <5                        |

2. The drainage layer material shall be well-graded, free from organic substance and other deleterious matter with a minimum hydraulic conductivity of  $1 \times 10^{-4}$  cm/sec.
3. Material to be used for construction of the Drainage Layer shall be obtained from on-site stockpile areas as shown in the Drawings. Glass cullet shall be thoroughly mixed with basalt rock material at a ratio of 1:1 using a loader prior to placement of Drainage Layer.

PART 3 EXECUTION

3.01 DRAINAGE LAYER PLACEMENT

- A. After installation completion and acceptance of the liner system and related work activities, place the drainage layer material to thickness and in areas shown on the Drawings.
- B. During the placement of the drainage layer material above the nonwoven geotextile, no construction vehicles or equipment shall be allowed directly on the geomembrane, or geotextile, and any damage shall be repaired immediately in accordance with Sections 02776 and 02272. Contractor shall maintain the minimum thickness of cover as specified herein and as shown in the Drawings when using spreading, grading, or compaction equipment.
- C. Soil cover shall be brought to the work area with earth-carrying equipment, deposited on the previously spread soil cover, and then pushed onto the uncovered portion of the geotextile. This operation shall be repeated until the total area is covered.
- D. Care shall be taken to protect the geomembrane and geotextile. Drainage layer ramps shall be provided at down slopes and in other heavily traveled areas. A 4-ft thick traffic surface consisting of drainage layer material shall be constructed to support haul trucks traveling over the liner system. Only large radius turns by the loader and other equipment shall be permitted as sharp turns may damage the liner system.
- E. Drainage layer materials shall not be placed over a fold in the geomembrane or geotextile.
- F. The drainage layer above the geosynthetics shall be carefully spread to a minimum thickness of 24 inches with a low ground pressure (10 psi maximum) dozer.
- G. Drainage layer material shall be placed on the side slopes starting at the toe of the slope and working upward toward the crest.
- H. Drainage layer material can only be spread when the geomembrane is taut or stretched evenly over the base of the landfill. The drainage layer material shall not be spread when the

geomembrane is elongated due to higher daytime temperatures and exposure to sun. Provisions must be made to cover the geomembrane under non-elongated conditions.

- I. No drainage layer material shall be placed, spread, or compacted while the ground or material is frozen or thawing or during unfavorable weather conditions. The drainage layer surface must be made smooth and free from ruts or indentations at the end of any working day.
- J. Trenches for the leachate collection pipes shall be excavated within the drainage layer where shown on the Drawings. Exercise special care not to disturb or damage the geomembrane or geotextile. If a backhoe is used to construct the trench, a rubber modification section shall be installed on the bucket to protect the geosynthetics. All areas of the liner damaged shall be immediately repaired as directed by the Engineer.
- K. Following construction of the leachate collection system, the drainage layer material shall be brought to final grade and compacted as specified herein.

### 3.02 FIELD QUALITY CONTROL

- A. Layer thickness shall be measured periodically throughout the day in accordance with Section 01050 during construction to confirm that the thickness of the installed material is in accordance with the Drawings.
  - 1. Drainage layer thickness shall be measured five (5) times every acre on a grid.
- B. Any sample or area tested shall be rejected, removed and replaced if it does not meet the requirements of the technical specifications. Reconstructed areas shall have feathered, overlapping edges that tie into adjacent fill material.
- C. Field quality control testing shall include the following:
  - 1. Drainage Layer:
    - a. Sieve Analysis (ASTM D422) performed for every 1,500 cy installed.
    - b. Hydraulic Conductivity (ASTM 5084) performed for every 2 acres installed.
    - c. Organic Content (ASTM D2974) performed for every 2,500 cy installed.
  - 2. Field quality control testing for drainage layer shall be paid for in accordance with Section 01020 – Allowances.

END OF SECTION

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SECTION 02272  
NONWOVEN GEOTEXTILE

PART 1 GENERAL

1.01 SCOPE OF WORK

- A. Furnish all labor, materials, equipment and incidentals required to install nonwoven geotextile complete as shown on the Drawings and as specified herein.

1.02 RELATED WORK

- A. Earthwork is included in Section 02200.
- B. Drainage Layer Granular Materials are included in Section 02230.
- C. Geosynthetic Clay Liner is included in Section 02275.
- D. High Density Polyethylene (HDPE) Pipe is included in Section 02623.
- E. High Density Polyethylene (HDPE) Liner is included in Section 02776.

1.03 SUBMITTALS

- A. Within thirty calendar days following the Effective Date of the Agreement, submit the following information in accordance with Section 01300:
  - 1. Manufacturer's background information.
  - 2. Information on factory size, equipment, personnel, number of shifts per day and production capacity per shift.
  - 3. List of material properties and samples of geotextile with attached certified test results.
  - 4. Manufacturer's quality control program and manual including description of laboratory facilities.
  - 5. A list of ten completed facilities where the geotextile is used including:
    - a. Name and purpose of facility, its location and date of installation.
    - b. Name of Owner, project manager, design engineer and installer.
    - c. Geotextile thickness, surface area, and use.
    - d. Information on performance of the facility.
  - 6. Shop Drawing, including details of overlap and seaming of the geotextile, anchoring, connections and other construction details any variance or additional details that deviate from the Drawings.
  - 7. Installation schedule.
  - 8. A manual that specifically defines the quality control and quality assurance program during installation including Manufacturer's installation instructions.

9. Copy of quality control certificates in conformance with Paragraph 2.03 below.

B. Submit the following in accordance with Section 01300:

1. Conformance testing results in accordance with Paragraph 2.04 below.

1.04 REFERENCE STANDARDS

A. ASTM International:

1. ASTM D4355 - Deterioration of Geotextiles by Exposure to Light, Moisture and Heat in a Xenon Arc Type Apparatus.
2. ASTM D4491 - Test Method for Water Permeability of Geotextiles by Permittivity.
3. ASTM D4533 - Standard Test Method for Trapezoid Tearing Strength of Geotextiles.
4. ASTM D4632 - Standard Test Method for Grab Breaking Load and Elongation of Geotextiles.
5. ASTM D4751 - Standard Test Method for Determining Apparent Opening Size of a Geotextile.
6. ASTM D4759 - Standard Practice for Determining the Specification Conformance of Geosynthetics
7. ASTM D4833 - Standard Test Method for Index Puncture Resistance of Geomembranes and Related Products.
8. ASTM D4873 - Standard Guide for Identification, Storage and Handling of Geosynthetic Rolls and Samples.
9. ASTM D5199 - Standard Test Method for Measuring Nominal Thickness of Geosynthetics.
10. ASTM D5261 - Standard Test Method for Mass Per Unit Area of Geotextiles.
11. ASTM D6241 - Standard Test Method for the Static Puncture Strength of Geotextiles and Geotextile-Related Products Using a 50-mm Probe.

- B. Where reference is made to one of the above standards, the revision in effect at the time of bid opening shall apply.

1.05 APPLICATIONS

- A. The nonwoven geotextile is to be used as liner puncture protection from drainage layer material.

1.06 QUALITY ASSURANCE

- A. The quality control and quality assurance consists of conformance testing of the material delivered to the site and field quality control during installation.



- B. Conformance testing requirements are discussed in Paragraph 2.04 below. The purpose of conformance testing is to assure that the supplied material conforms to this Section and to the Manufacturer's quality control certificates.
- C. Field quality control requirements are discussed in Paragraph 3.03 below. The purpose of field quality control procedures is to assure that the geotextile material has been installed in accordance with this Section and Manufacturer's recommendations.

1.07 DELIVERY, STORAGE AND HANDLING

- A. Geotextile labeling, shipment and storage shall follow ASTM D4873.
- B. Product labels shall clearly show the Manufacturer or supplier name, style name and roll number.
- C. Each shipping document shall include a notation certifying that the material is in accordance with the Manufacturer's certificate.
- D. Each geotextile roll shall be wrapped with a material that will protect the geotextile from damage due to shipment, water, sunlight and contaminants.
- E. The protective wrapping shall be maintained during periods of shipment and storage. If the wrapping is damaged prior to installation, the outer wrap(s) of geotextile material must be discarded before installation.
- F. During storage, geotextile rolls shall be elevated off the ground (a minimum of 3-inch) and adequately covered to protect them from the following: site construction damage, extended exposure to ultraviolet (UV) radiation, precipitation, chemicals that are strong acids or strong bases, flames, sparks, temperature in excess of 71 degrees C (160 degrees F) and any other environmental condition that might damage the geotextile.

1.08 MATERIAL WARRANTY

- A. The Contractor shall furnish the Owner a written warranty from the geotextile Manufacturer that shall warrant the material, on a prorated basis, against manufacturing defect and material degradation for a period of five years from the date of installation.
- B. Should a defect occur, which is covered under warranty, the Warrantor shall bear all costs for the repair and/or relocation and replacement of the geotextile material.

1.09 GUARANTEE

- A. The Contractor shall guarantee the geotextile against defects in installation and workmanship for the period of two years commencing with the date of Final Acceptance. The guarantee shall include the services of qualified service technicians and all materials and labor required for the repairs at no expense to the Owner.

## PART 2 PRODUCTS

### 2.01 GENERAL

- A. The use of a Manufacturer's name and model or catalog number is for the purpose of establishing the standard of quality and general configuration.

### 2.02 MATERIALS

A. Nonwoven Geotextile:

1. The geotextile shall be a nonwoven needle punched material consisting of filaments formed into a stable network. The material shall be nonbiodegradable, nonreactive within a pH range of three to eleven, resistant to ultraviolet light exposure, and resistance to insects and rodents. Test results from any sampled roll in the lot, when tested in accordance with ASTM D4759, shall meet or exceed the values listed in Table 1.

**TABLE 1: NONWOVEN GEOTEXTILE MINIMUM AVERAGE ROLL VALUES**

| PROPERTIES                  | TEST METHOD      | UNIT                | 10 oz        |
|-----------------------------|------------------|---------------------|--------------|
| Mass per Unit Area          | ASTM D5261       | oz/yd2              | 10           |
| Thickness                   | ASTM D5199       | Mils                | 108          |
| Grab Strength               | ASTM D4632       | lbs                 | 260          |
| Grab Elongation             | ASTM D4632       | percent             | 50           |
| Trapezoid Tear Strength     | ASTM D4533       | lbs                 | 100          |
| Puncture Strength           | ASTM D4833/D6241 | lbs                 | 725          |
| Water Flow Rate             | ASTM D4491       | gpm/ft2             | 75           |
| Permittivity                | ASTM D4491       | sec-1               | 1.0          |
| Apparent Opening Size (Max) | ASTM D4751       | mm sieve            | 0.150<br>100 |
| UV Resistance               | ASTM D4355       | % Strength Retained | 70           |

2. All strength values are in the weaker principal direction.
3. Nonwoven geotextile shall be manufactured by GSE, SKAPS Industries, Agru America, TenCate, Propex, or by an approved Manufacturer meeting the above physical properties.

### 2.03 QUALITY CONTROL DOCUMENTATION

- A. Prior to installation commencement of any geotextile material, provide to the Owner the following information certified by the Manufacturer for the delivered geotextile:
1. Each roll delivered to the site shall have the following identification information:
    - a. Manufacturer's name.
    - b. Product identification.
    - c. Lot number.
    - d. Thickness.

- e. Roll number.
  - f. Roll dimensions.
  - g. Gross roll weight.
2. Quality control certificates, signed by the Manufacturer's quality assurance manager. Each certificate shall have roll identification number, testing procedures, and frequency and test results. At a minimum the following test results shall be provided every 100,000 sq ft, or as otherwise noted, of manufactured geotextile in accordance with test requirements specified in Paragraph 2.02 above:
  - a. Thickness.
  - b. Mass per unit area.
  - c. Trapezoid Tear Strength.
  - d. Puncture Strength.
  - e. Grab Strength.
  - f. Grab Elongation
  - g. Flow Rate (every 540,000 sf).
  - h. Apparent Opening Size (every 540,000 sf).

#### 2.04 CONFORMANCE TESTING

- A. Conformance testing shall be performed by an independent GRI accredited Quality Assurance Laboratory (QAL) approved by the Owner and provided and paid for by the Contractor. A certified technician shall obtain samples from the delivered material, mark the machine direction, lot number and roll identification number. One sample shall be taken per 100,000 sq ft, or one sample per lot, whichever results in the greater number of conformance tests. A lot shall be defined as a group of consecutively numbered rolls from the same manufacturing line. This sampling frequency may be increased as deemed necessary by the Engineer. The samples shall be taken across the entire roll width and shall not include the first 3-ft. The following conformance tests shall be conducted at the laboratory:
  1. Mass per unit area (ASTM D5261).
  2. Puncture Strength (ASTM D4833/D6241).
  3. Grab tensile (ASTM D4632).
  4. Flow Rate (ASTM D4491).
  5. Permittivity (ASTM D4491).
  6. Apparent opening size (ASTM D4751).
- B. These conformance tests shall be performed in accordance with test requirements Paragraph 2.02.
- C. All conformance test results shall be reviewed by the Engineer and accepted or rejected, prior to the deployment of the geotextile. All test results shall meet, or exceed, the property values listed in Paragraph 2.02 above.
- D. The Contractor may request that other samples be tested by the QAL with the Manufacturer's technical representative during testing procedures. This retesting shall be paid for by the

Contractor. The Manufacturer may obtain additional samples from rolls immediately before and after the failing roll or as directed by the Engineer and have them tested by the QAL at his/her own expense. If these rolls pass then only the failing roll will be rejected. If they fail, then the entire lot will be rejected.

- E. If the geotextile fails the initial material conformance tests, the Contractor shall pay for the cost of subsequent conformance testing until all conformance tests are passed and the geotextile is accepted by the Engineer.

### PART 3 EXECUTION

#### 3.01 PREPARATION

##### A. General:

- 1. Geomembrane installation shall be in accordance with Section 02776.

#### 3.02 INSTALLATION

##### A. Geotextile Placement:

- 1. The geotextile shall be installed as shown on the Drawings and in accordance with the Manufacturer's recommendations and approved shop drawings.
- 2. Vehicular traffic across the geotextile shall not be allowed except as identified herein. Use of a low ground pressure All-Terrain Vehicle (ATV) that exerts a maximum of 6 psi may be allowed as standard operating procedure for deployment of geosynthetics, if endorsed by the Manufacturer in writing and approved by the Engineer. Vehicles, machinery, and equipment shall be operated to avoid abrupt stops, starts, or turns.
- 3. Drainage layer materials shall be installed in accordance with Section 02230.
- 4. HDPE Pipe shall be installed in accordance with Section 02623.
- 5. Damage (including: tears, punctures, thinly stretched section or defects not previously identified) to the geotextile occurring during the placement of soil cover shall be repaired immediately at no additional expense to the Owner. Repair shall be made by overlaying another layer of geotextile over the damaged area with a 12-inch overlap all around. The patch shall be sewn/thermally bonded to the geotextile in accordance with Section 3.02.B.1.
- 6. The geotextile shall be cut with approved tools.
- 7. Geotextile must be anchored when deployed on slopes.
- 8. Geotextile shall be covered as soon as possible after installation and approval. The geotextile shall not be left exposed for more than 14 days after installation.

##### B. Field Seaming:

1. The geotextile panels shall be sewn together or thermally bonded as recommended by the Manufacturer and approved by the Engineer. The thread used to sew the panels shall be of the same composition as the geotextile and as recommended by the Manufacturer. All seams shall be continuous. Seams shall be oriented down slopes perpendicular to grading contours unless otherwise specified. For thermal bonding, fusion welding techniques, recommendations by the Manufacturer shall be used. If thermal bonding is used, care shall be taken to avoid burn through of the geotextile. The area welded shall be clean and dry. The amount of overlap and type of stitch used to join geotextile panels shall be as recommended by the Manufacturer and approved by the Engineer.

### 3.03 FIELD QUALITY CONTROL

- A. Prior to placement of the soil cover, the geotextile installation and related work shall be inspected by the Engineer. All work in the system therein being inspected shall be complete, clean and ready for use. All work shall meet the requirements as to line, grade, cleanliness and workmanship, as determined by the Engineer.
- B. All discrepancies shall be noted and repaired at no additional cost. Final acceptance of the system shall be contingent upon the approval of the Engineer.

### 3.04 DISPOSAL OF WASTE MATERIAL

- A. Upon completion of installation, the Contractor shall remove and dispose, in a proper manner approved by the Engineer, of all trash, waste material and equipment used in connection with the performed work and shall leave the premises in a neat and acceptable condition.

END OF SECTION

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SECTION 02273  
WOVEN GEOTEXTILE

PART 1 GENERAL

1.01 SCOPE OF WORK

- A. Furnish all labor, materials, equipment and incidentals required to install woven geotextile complete as shown on the Drawings and as specified herein.

1.02 RELATED WORK

- A. Earthwork is included in Section 02200.
- B. Drainage Layer Granular Materials are included in Section 02230.
- C. High Density Polyethylene (HDPE) Pipe is included in Section 02623.
- D. High Density Polyethylene (HDPE) Liner is included in Section 02776.

1.03 SUBMITTALS

- A. Within 30 calendar days following the Effective Date of the Agreement, submit the following information in accordance with Section 01300:
  - 1. Manufacturer's background information.
  - 2. Information on factory size, equipment, personnel, number of shifts per day and production capacity per shift.
  - 3. List of material properties and samples of woven geotextile with attached certified test results.
  - 4. Manufacturer's quality control program and manual including description of laboratory facilities.
  - 5. A list of ten completed facilities where the woven geotextile is used including:
    - a. Name and purpose of facility, its location and date of installation.
    - b. Name of Owner, project manager, design Engineer and Installer.
    - c. Geotextile thickness, surface area, and use.
    - d. Information on performance of the facility.
  - 6. Shop Drawing, including details of overlap, seaming, anchoring, connections and other construction details.
  - 7. Installation schedule.
  - 8. A manual that specifically defines the quality control and quality assurance program during installation including Manufacturer's installation instructions.
  - 9. Copy of quality control certificates in conformance with Paragraph 2.02.

#### 1.04 REFERENCE STANDARDS

##### A. ASTM International

1. ASTM D4355 - Standard Test Method for Deterioration of Geotextiles by Exposure to Light, Moisture and Heat in a Xenon Arc Type Apparatus.
2. ASTM D4491 - Standard Test Methods for Water Permeability of Geotextiles by Permittivity.
3. ASTM D4533 - Standard Test Method for Trapezoid Tearing Strength of Geotextiles.
4. ASTM D4595 - Standard Test Method for Tensile Properties of Geotextiles by the Wide-Width Strip Method
5. ASTM D4632 - Standard Test Method for Grab Breaking Load and Elongation of Geotextiles.
6. ASTM D4751 - Standard Test Method for Determining Apparent Opening Size of a Geotextile.
7. ASTM D4759 - Standard Practice for Determining the Specification Conformance of Geosynthetics
8. ASTM D4873 - Standard Guide for Identification, Storage and Handling of Geosynthetic Rolls and Samples.
9. ASTM D5261 - Standard Test Methods for Mass per Unit Area of Geotextiles.
10. ASTM D6241 - Standard Test Method for the Static Puncture Strength of Geotextiles and Geotextile-Related Products Using a 50-mm Probe.

##### B. United States Army Corps of Engineers

1. CW 02215 - Civil Works Construction Guide Specification for Plastic Filter Fabric

##### C. Where reference is made to one of the above standards, the revision in effect at the time of bid opening shall apply.

#### 1.05 APPLICATIONS

- ##### A. The woven geotextile is to be used as filtration for leachate collection systems.

#### 1.06 QUALITY ASSURANCE

- ##### A. The quality control and quality assurance consists of conformance testing of the material delivered to the site and field quality control during installation.
- ##### B. Conformance testing requirements are discussed in Paragraph 2.04 below. The purpose of conformance testing is to assure that the supplied material conforms to this Section and to the manufacturer's quality control certificates.



- C. Field quality control requirements are discussed in Paragraph 3.03 below. The purpose of field quality control procedures is to assure that the geotextile material has been installed in accordance with this Section and manufacturer's recommendations.

#### 1.07 DELIVERY, STORAGE AND HANDLING

- A. Geotextile labeling, shipment and storage shall follow ASTM D4873.
- B. Product labels shall clearly show the manufacturer or supplier name, style name and roll number.
- C. Each shipping document shall include a notation certifying that the material is in accordance with the manufacturer's certificate.
- D. Each woven geotextile roll shall be wrapped with a material that will protect the geotextile from damage due to shipment, water, sunlight, and contaminants.
- E. The protective wrapping shall be maintained during periods of shipment and storage. If the wrapping is damaged prior to installation, the outer wrap of woven fabric material must be discarded before installation.
- F. During storage, woven geotextile rolls shall be elevated off the ground (a minimum of 3-in) and adequately covered to protect them from the following: Site construction damage, extended exposure to ultraviolet (UV) radiation, precipitation, chemicals that are strong acids or strong bases, flames, sparks, temperature in excess of 71 deg C (160 deg F) and any other environmental condition that might damage the woven geotextile.

#### 1.08 MATERIAL WARRANTY

- A. The Contractor shall furnish the Owner a written warranty from the geotextile manufacturer that shall warrant the material, on a prorated basis, against manufacturing defect and material degradation for a period of five (5) years from the date of installation.
- B. Should a defect occur, which is covered under warranty, the Warrantor shall bear all costs for the repair and/or relocation and replacement of the geotextile material.

#### 1.09 GUARANTEE

- A. The Contractor shall guarantee the woven geotextile against defects in installation and workmanship for the period of two (2) years commencing with the date of Final Acceptance. The guarantee shall include the services of qualified service technicians and all materials required for the repairs at no expense to the Owner.

### PART 2 PRODUCTS

#### 2.01 GENERAL

- A. The use of a manufacturer's name and model or catalog number is for the purpose of establishing the standard of quality and general configuration.

## 2.02 MATERIALS

### A. Woven Monofilament Geotextile

1. All geotextile shall be a woven monofilament polypropylene fabric consisting of filaments formed into a stable network, such as Mirafi FW404, US Fabrics US 830, or approved equal.
2. The geotextile shall be a woven monofilament material consisting of polypropylene formed into a stable network such that the filament retains their relative position to each other. The material shall be non-biodegradable, nonreactive within a pH range of three to eleven, resistant to ultraviolet light exposure, and resistant to insects and rodents. Test results from any sampled roll in the lot, when tested in accordance with ASTM D4759, shall meet or exceed the values listed in Table 1.

TABLE 1: WOVEN GEOTEXTILE MINIMUM AVERAGE ROLL VALUES  
FOR WOVEN FABRICS

| PROPERTIES                  | TEST METHOD   | UNIT                | MINIMUM AVERAGE ROLL VALUES |                      |
|-----------------------------|---------------|---------------------|-----------------------------|----------------------|
|                             |               |                     | Machine Direction (MD)      | Cross Direction (CD) |
| Wide Width Tensile Strength | ASTM D4595    | lbs/in              | 270                         | 270                  |
| Grab Strength               | ASTM D4632    | lb                  | 400                         | 315                  |
| Grab Elongation             | ASTM D4632    | %                   | 15                          | 15                   |
| Trapezoid Tear Strength     | ASTM D4533    | lbs                 | 150                         | 165                  |
| Mass per Unit Area          | ASTM D5261    | oz/yd2              | 8.8                         |                      |
| Puncture Strength           | ASTM D6241    | lb                  | 1150                        |                      |
| UV Resistance               | ASTM D4355    | % Strength Retained | 90                          |                      |
| Apparent Opening Size (Max) | ASTM D4751    | US Std. Sieve       | 40                          |                      |
| Percent Open Area (POA)     | CW-02215 Mod. | %                   | 1                           |                      |
| Permittivity                | ASTM D4491    | sec-1               | 0.9                         |                      |
| Water Flow Rate             | ASTM D4491    | gpm/ft2             | 70                          |                      |

3. All strength values are in the weaker principal direction.

## 2.03 QUALITY CONTROL DOCUMENTATION

- ### A. Prior to installation, the Contractor shall provide to the Owner the following information certified by the Manufacturer for the delivered geotextile.

1. Each roll delivered to the Project site shall have the following identification information:
  - a. Manufacturer's name
  - b. Product identification
  - c. Lot number
  - d. Thickness

- e. Roll number
  - f. Roll dimensions
  - g. Gross roll weight
2. Quality control certificates, signed by the manufacturer's quality assurance manager. Each certificate shall have roll identification number, testing procedures and test results. At a minimum the following test results shall be provided every 100,000 sq ft, or as otherwise noted, of manufactured geotextile in accordance with test requirements specified in Paragraph 2.02 above.
  - a. Mass per unit area
  - b. Trapezoid Tear Strength
  - c. Puncture Strength
  - d. Grab Strength
  - e. Grab Elongation
  - f. Flow Rate (every 540,000 sf)
  - g. Apparent Opening Size (every 540,000 sf)
  - h. Wide Width Tensile Strength

#### 2.04 CONFORMANCE TESTING

- A. At the discretion of the OWNER, conformance testing shall be performed by a GRI accredited independent Quality Assurance Laboratory (QAL) approved by the Owner and provided and paid for by the Contractor. Engineer shall obtain samples from the delivered material, mark the machine direction and identification number. One sample shall be taken per 100,000 square feet, or one sample per lot, whichever results in the greater number of conformance tests. A lot shall be defined as a group of consecutively numbered rolls from the same manufacturing line. This sampling frequency may be increased as deemed necessary by the Engineer. The samples shall be taken across the entire roll width and shall not include the first 3-ft. The following conformance tests shall be conducted at the laboratory:
  1. Mass per unit area (ASTM D5261)
  2. Puncture Strength (ASTM D6241)
  3. Grab tensile (ASTM D4632)
  4. Flow Rate (ASTM D4491)
  5. Permittivity (ASTM D4491)
  6. Apparent opening size (ASTM D4751)
- B. These conformance tests shall be performed in accordance with test requirements in Paragraph 2.02.
- C. All conformance test results shall be reviewed by the Engineer and accepted, prior to the deployment of the geotextile. All test results shall meet, or exceed, the property values listed in Paragraph 2.02.
- D. The Contractor may request that other samples be tested by the QAL with the manufacturer's technical representative during testing procedures. This retesting shall be paid for by the

Contractor. The manufacturer may obtain additional samples from rolls immediately before and after the failing roll or as directed by the Engineer and have them tested by the QAL at his/her own expense. If these rolls pass then only the failing roll will be rejected. If they fail, then the entire lot will be rejected.

- E. If the geotextile fails the initial material conformance tests, the Contractor shall pay for the cost of subsequent conformance testing until all conformance tests are passed and the geotextile is accepted by the Engineer.

### PART 3 EXECUTION

#### 3.01 PREPARATION

##### A. General

1. Preparation of the subgrade shall be in accordance with Sections 02275 and 02230.
2. The subgrade shall be inspected by the Engineer prior to installation of the geotextile.

#### 3.02 INSTALLATION

##### A. Geotextile Placement

1. The woven geotextile shall be installed as shown on the Drawings and in accordance with the manufacturer's recommendations and approved shop drawings.
2. Vehicular traffic across the geotextile shall not be allowed except as identified herein. Use of a low ground pressure All-Terrain Vehicle (ATV) that exerts a maximum of 6 psi may be allowed as standard operating procedure for deployment of geosynthetics, if endorsed by the manufacturer in writing and approved by the Engineer. Vehicles, machinery, and equipment shall be operated to avoid abrupt stops, starts, or turns.
3. Select aggregate materials shall be installed in accordance with Section 02200.
4. HDPE Pipe shall be installed in accordance with Section 02623.
5. Damage (including: tears, punctures, thinly stretched section or defects not previously identified) to the geotextile occurring during the placement of soil cover shall be repaired immediately at no additional expense to the Owner. Repair shall be made by overlaying another layer of geotextile over the damaged area with a 12-inch overlap all around. The patch shall be sewn/thermally bonded to the geotextile in accordance with Paragraph 3.01 B.1.
6. The geotextile shall be cut with approved tools.
7. Geotextile must be anchored when deployed on slopes.
8. Geotextile shall be covered as soon as possible after installation and approval. The geotextile shall not be left exposed for more than 14 days after installation.

##### B. Field Seaming

1. The geotextile panels shall be sewn together or thermally bonded as recommended by the manufacturer and approved by the Engineer. The thread used to sew the panels shall be of the same composition as the geotextile and as recommended by the manufacturer. All seams shall be continuous. Seams shall be oriented down slopes perpendicular to grading contours unless otherwise specified. For thermal bonding, fusion welding techniques, recommendations by the manufacturer shall be used. If thermal bonding is used, care shall be taken to avoid burn through of the geotextile. The area welded shall be clean and dry. The amount of overlap and type of stitch used to join geotextile panels shall be as recommended by the manufacturer and approved by the Engineer.

### 3.03 FIELD QUALITY CONTROL

- A. Prior to completion of the leachate collection system, the woven geotextile installation and related work shall be inspected by the Engineer. All work in the system therein being inspected shall be complete, clean and ready for use. All work shall meet the requirements as to line, grade, cleanliness and workmanship, as determined by the Engineer.
- B. All discrepancies shall be noted and repaired at no additional expense. Final acceptance of the system shall be contingent upon the approval of the Engineer.

### 3.04 DISPOSAL OF WASTE MATERIAL

- A. Upon completion of installation, the Contractor shall remove and dispose, in a proper manner approved by the Engineer, of all trash, waste material and equipment used in connection with the performed work and shall leave the premises in a neat and acceptable condition.

END OF SECTION

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SECTION 02275  
GEOSYNTHETIC CLAY LINER (GCL)

PART 1 GENERAL

1.01 SCOPE OF WORK

- A. Furnish all labor, materials, equipment, and incidentals required to install Geosynthetic Clay Liner (GCL) as shown on the Drawings and as specified herein. The work shall include unloading, storing placement, seaming, and anchoring of the GCL, field quality control, and all other work as shown on the Drawings and as specified herein.
- B. Sufficient material and accessory bentonite shall be furnished to cover all areas as shown on the Drawings, including overlaps at field seams.

1.02 RELATED WORK

- A. Earthwork is included in Section 02200.
- B. High Density Polyethylene (HDPE) Geomembrane Liner is included in Section 02776.

1.03 SUBMITTALS

- A. Within 30 calendar days following the Effective Date of the Agreement, submit the following information:
  - 1. Submittals relating to liner manufacturer and liner:
    - a. Corporate Background.
    - b. Manufacturing capabilities:
      - 1) Information on factory size, equipment, personnel, number of shifts per day and production capacity per shift.
      - 2) List of material properties and samples of liner with attached certified test results.
      - 3) Manufacturer's quality control program and manual including description of laboratory facilities.
      - 4) A list of ten similarly completed facilities totaling a minimum of ten million square feet, for which the manufacturer has manufactured a GCL. The following information shall be provided for each facility:
        - a) Name and purpose of facility, its location and date of installation.
        - b) Name of Owner, project manager, design engineer and installer.
        - c) GCL surface area.
        - d) Information on performance of the facility.
    - c. The origin of the bentonite and geotextiles to be used in the manufacturing of the GCL including the suppliers name and production plant, as well as brand name and number.
    - d. Manufacturer's literature including:
      - 1) Material samples.
      - 2) Technical data including Minimum Average Roll Values (MARVs) for the items listed in Appendix A of this Section.
      - 3) Material Warranty covering materials and workmanship of the GCL, including batch identifications and associated roll numbers.
      - 4) Certificate of permeability and bentonite content per square foot of mat.

- 5) Copy of quality control certificates in conformance with Paragraphs 2.01 and 2.02.
  - 6) Field installation quality control manual.
2. Submittals relating to installing Contractor:
  - a. Background Information.
  - b. Contractor shall submit a list of at least five similar projects for which the Contractor has installed GCL. Contractor shall have installed a minimum of two million square feet of GCL materials. The following information shall be provided for each facility:
    - 1) Name and purpose of facility, its location and date of installation.
    - 2) Name of Owner, project manager, design engineer and installer.
    - 3) GCL surface area.
    - 4) Information on performance of the facility.
  - c. Installation capabilities:
    - 1) Information on equipment and personnel.
    - 2) Anticipated average daily production.
  - d. Shop drawings, including:
    - 1) A proposed plan detailing GCL storage location and methods.
    - 2) A proposed plan for placement and a proposed panel layout showing the installation layout identifying field seams as well as any variance or additional details which deviate from the Drawings.
    - 3) Details of seaming the GCL, anchoring, connections, penetrations, and other construction details.
    - 4) The Contractor shall perform and submit the analytical testing results for the GCL at the frequencies specified in Appendix A of this Section.
  - e. Installation schedule.
  - f. A quality control manual that specifically defines the quality control program during installation. The manual shall include daily procedures, installation techniques, field testing procedures, lab testing procedures, specific steps that are to be taken in the event of a failure or defect, personnel requirements, levels of authority and all other information necessary to ensure a high quality GCL installation.
  - g. Resume of the Supervisor to be assigned to the Project.
  - h. A list of personnel performing field seaming operations along with pertinent experience information.
3. Material Testing Requirements:
  - a. Contractor shall submit for approval results of direct shear testing on the bentonite mats, on the interface between the GCL and the HDPE geomembrane, and the interface between the GCL and the underlying fill material in accordance with ASTM D6243 and ASTM D5321. The tests shall consist of at least 3 separate shear tests run at normal stresses of 1, 50 and 100 psi.
  - b. The tests shall be performed on both reinforced and non- or low-reinforced GCL samples hydrated a minimum of 48 hours under the normal stress at which the sample is to be sheared. Shearing shall occur at horizontal displacement rates no greater than 0.004 in/min to ensure that drained conditions are established everywhere on the shear plane during shearing. Results of shear tests shall also include determination of the internal shear strength of the GCL. GCL shall meet the following minimum requirements:



| <b><u>Interface</u></b>                      | <b><u>Minimum Peak Friction Angle</u></b> |
|----------------------------------------------|-------------------------------------------|
| 1) GCL (nonwoven side)/Textured Geomembrane: | 23.0 deg.                                 |
| 2) GCL (woven side)/Subgrade Layer Material: | 23.0 deg                                  |
| 3) Reinforced GCL Internal Shear Strength:   | 23.0 deg.                                 |

B. Submit the following in accordance with Section 01300:

1. Copy of quality control documentation in accordance with Paragraph 2.02 below.
2. Conformance testing results in accordance with Paragraph 2.03 below.

#### 1.04 REFERENCE STANDARDS

A. ASTM International:

1. ASTM D421 - Standard Practice for Dry Preparation of Soil Samples for Particle-Size Analysis and Determination of Soil Constants.
2. ASTM D1557 - Standard Test Methods for Laboratory Compaction Characteristics of Soil Using Modified Effort (56,000-ft-lbf/ft<sup>3</sup>(2,700 kN-m/m<sup>3</sup>)).
3. ASTM D2216 - Standard Test Methods for Laboratory Determination of Water (Moisture) Content of Soil and Rock by Mass.
4. ASTM D5261 - Standard Test Method for Measuring the Mass per Unit Area of Geotextiles.
5. ASTM D5321 - Standard Test for Determining the Coefficient of Soil and Geosynthetic or Geosynthetic and Geosynthetic Friction by the Direct Shear Method.
6. ASTM D5887 - Standard Test Method for Measurement of Index Flux Through Saturated Geosynthetic Clay Liner Specimens Using a Flexible Wall Permeameter.
7. ASTM D5888 - Standard Guide for Storage and Handling of Geosynthetic Clay Liners.
8. ASTM D5890 - Standard Test Method for Swell Index of Clay Mineral Component of Geosynthetic Clay Liners.
9. ASTM D5891 - Standard Test Method for Fluid Loss of Clay Component of Geosynthetic Clay Liners.
10. ASTM D5993 - Standard Test Method for Measuring Mass Per Unit of Geosynthetic Clay Liners.
11. ASTM D6102-06 - Standard Guide for Installation of Geosynthetic Clay Liners.
12. ASTM D6243 - Standard Test Method for Determining the Internal and Interface Shear Resistance of Geosynthetic Clay Liner by the Direct Shear Method.
13. ASTM D6496 - Test Method for Determining Average Bonding Peel Strength Between the Top and Bottom Layers of Needle-Punched Geosynthetic Clay Liners.

14. ASTM D6766 - Test Method for Evaluation of Hydraulic Properties of Geosynthetic Clay Liners Permeated with Potentially Incompatible Liquids.

15. ASTM D6768 - Test Method for Tensile Strength of Geosynthetic Clay Liners.

B. Geosynthetic Research Institute (GRI):

1. GCL3 - Test Methods, Required Properties, and Testing Frequencies of Geosynthetic Clay Liners (GCLs).

C. Where reference is made to one of the above standards, the revision in effect at the time of bid opening shall apply.

#### 1.05 QUALITY ASSURANCE

A. In addition to the manufacturer and installer requirements for qualifications and certification specified in Paragraph 1.03, the quality assurance consists of conformance testing of the material delivered to the site and field quality control during installation.

B. Conformance testing requirements are specified in Paragraph 2.03. The purpose of conformance testing is to assure that the supplied material conforms to the Specifications and to the manufacturer's quality control certificates.

C. Field quality control requirements are specified in Paragraph 3.06. The purpose of field quality control procedures is to assure that the GCL has been installed in accordance with the Specifications and manufacturer's recommendations.

D. Quality Control Plan:

1. The forms for GCL quality control documentation, included in Appendix B, shall be used for field installation documentation. Alternative forms may be used for documentation as approved by the CQA Manager.

E. GCL Quality Control Documentation:

1. Prior to commencing work, a pre-installation conference shall be held and the following Project personnel shall be identified by name and recorded in the Project files:

- a. Engineer.
- b. Contractor's Representative.
- c. Resident Project Representative.
- d. CQA Manager.
- e. Installation Supervisor.
- f. Quality Assurance Laboratory.
- g. Quality Assurance Technician (QAT).

2. Two duplicate project files shall be maintained. One shall be maintained by the CQA Manager and the other shall be maintained by the Installation Supervisor. At the end of each work day (no later than noon the following day) the files shall be updated and checked to assure that copies of all pertinent project information are included in each file.

3. Blank copies of the following four project forms shall be available onsite throughout the duration of the project:

| <u>Form No.</u> | <u>Title</u>              |
|-----------------|---------------------------|
| 1               | Subgrade Surface Approval |
| 2               | Daily Panel Placement Log |
| 3               | Daily CQC Report          |
| 4               | Material Receiving Log    |

F. Drawings:

1. Furnish field sketch drawing of panel placement and a copy of complete documentation for final installation of the GCL within 14 days of completing installation of each layer of GCL. Sketch shall detail the GCL panel Roll Number, Lot Number, and orientation in the liner system.

1.06 QUALIFICATIONS

A. Manufacturer:

1. The manufacturer of the GCL described hereunder shall have previously demonstrated his/her ability to produce this GCL by having at least two years continuous experience in the manufacturing of GCLs and successfully manufactured a minimum of 10 million square feet of GCL material.

B. Installer:

1. The installer shall be the manufacturer or an installer certified by the manufacturer to install the GCL. Installation shall be performed under the constant direction of a single installation supervisor who shall remain on site and be in responsible charge, throughout the GCL installation, for GCL layout, seaming, patching, testing, repairs and all other activities required by the installer:
  - a. GCL Installer shall either have installed GCL on at least 5 projects and at least 2 million square feet of GCL, or shall provide to the Engineer satisfactory evidence, through similar experience in the installation of other types of geosynthetics, that the GCL will be installed in a competent, professional manner.

1.07 DELIVERY, STORAGE, AND HANDLING

- A. The bentonite mat rolls shall be packaged and shipped by appropriate means to prevent damage of the bentonite mat rolls. The manufacturer shall ensure that proper methods of securing and fastening the rolls of GCL during shipping will be implemented. The CQA staff will inspect the liner material as it arrives on site for any damage to the liner. Straps securing the liner during shipping shall not cut into the liner material. Rolls that appear damaged as a result of tight fastening, or otherwise, may be rejected at the discretion of the Engineer. The Contractor shall be responsible for replacing all damaged or unacceptable material at no cost to the Owner.
- B. Handling and storage of materials shall be in accordance with manufacturer's recommendations and ASTM D5888 Guidance and is the responsibility of the Contractor.

- C. Materials shall be protected from UV and rain during storage and shall be kept dry before and during periods of rain. An additional tarpaulin or plastic sheet shall be used over the stacked rolls to provide extra protection for GCL material stored outdoors.
- D. No off-loading shall be performed unless the CQA Manager is present. Damage during off-loading shall be documented by the CQA Manager and Contractor. All damaged rolls must be separated from the undamaged rolls until the proper disposition of that material has been determined by the CQA Manager.
- E. The GCL rolls shall be stored so as to be protected from puncture, dirt, grease, water, moisture, mud, mechanical abrasions, excessive heat, and UV that may damage the GCL material. The rolls shall be stored on a prepared surface and shall not be stacked more than three rolls high. Rolls shall be at higher ground elevations or elevated above ground surface (a minimum of 3 inches) to protect the GCL from standing water.
- F. The GCL shall be wound around a cardboard core 4 inches in diameter to facilitate handling. The core is not intended to support the roll for lifting but should be sufficiently strong to prevent collapse during transit.

#### 1.08 WARRANTY

- A. The Contractor shall furnish the Owner a written warranty from the GCL manufacturer that shall warrant the material, on a prorated basis, against manufacturing defects and material degradation for a period of 5 years from the date of installation.
- B. Should a defect occur, which is covered under warranty, the Warrantor shall bear all costs for the repair and/or relocation and replacement of the GCL.

#### 1.09 GUARANTEE

- A. The Contractor shall guarantee the GCL against defects in installation and workmanship for the period of 2 years commencing with the date of Final Acceptance. The guarantee shall include the services of qualified service technicians and all materials required for the repairs at no expense to the Owner.

#### 1.10 DEFINITIONS AND RESPONSIBILITIES

##### A. Manufacturer:

- 1. The manufacturer is the firm or corporation responsible for production of the GCL material to be used in the Project. The manufacturer is responsible for any damage to the GCL until the material is accepted by the Engineer or his/her field representative upon delivery. The manufacturer shall produce a consistent product meeting the Specifications and shall provide quality control documentation for the product specified herein.

##### B. Installer:

- 1. The installer is the firm responsible for installation of the GCL. The installer shall be the manufacturer or an approved installer by the manufacturer to install the manufacturer's GCL. The installer shall provide an Installation Supervisor responsible for the installation field crew. The installer shall be responsible for field handling, storing, placing, seaming

and all other aspects of the GCL installation. The Contractor is ultimately responsible for installation of the GCL and final acceptance of the project by the Owner.

## PART 2 PRODUCTS

### 2.01 MATERIALS

#### A. General:

1. The GCL shall be formulated and manufactured from polypropylene geotextiles and high swelling sodium bentonite.
2. The reinforced GCL material shall be:
  - a. BentoLiner NSL as manufactured by GSE;
  - b. Bentomat ST as manufactured by CETCO;
  - c. Or an approved equal. Approved equal will be tested by an accredited Geosynthetic Accreditation Institute – Laboratory Accreditation Program testing firm with a resulting hydraulic conductivity of not more than  $5 \times 10^{-9}$  cm/sec under 5 psi confining pressure for a minimum of 30-day testing period.
3. Reinforced GCL shall be used on the sideslopes and bottom of the cell. The materials shall be manufactured by the mechanical bonding of the needle punch process to enhance the friction characteristics of the liner and to maintain the integrity of the liner under hydration. Needle punched bentonite geocomposites are those which, by the process of a needling board (similar to that used in the manufacture of standard non-woven geotextiles) have fibers of a non-woven geotextile pushed through the bentonite clay core and integrated into a woven or non-woven geotextile without the use of any chemical binders or adhesives.
4. No disassociation of geotextile components from the bentonite core shall occur under any conditions.
5. The GCL shall be manufactured in accordance with GRI-GCL3. The bentonite shall meet the base mineralogical composition as listed in GRI-GCL3.
6. Rolls shall be manufactured a minimum of 12 feet wide and 100 feet long. All rolls shall be labeled and bagged in packaging that is resistant to photodegradation by ultraviolet (UV) light.
7. The non-woven component of the geocomposite shall meet the requirements in Appendix A and GRI-GCL3. The non-woven fabric shall be inspected by the manufacturer for broken needles by permanently installed on-line metal detectors at the production facility. The manufacturer shall have an aggressive, thorough and effective means for ensuring that needles are detected and removed from all non-woven fabric produced. If the Engineer determines that the manufacturer's quality assurance program is inadequate, the material may be rejected.
8. The woven component of the geocomposite shall meet the requirements in Appendix A and GRI-GCL3.

9. The accessory granular bentonite shall be similar to that used in the liner or as recommended by the manufacturer for site specific use. Accessory granular Bentonite shall conform to the requirements listed in Appendix A.

B. Properties:

1. The GCL(s) shall meet the minimum average properties listed in Appendix A and GRI GCL3.

2.02 QUALITY CONTROL DOCUMENTATION

- A. Prior to installation commencement of any GCL material, the Contractor shall provide to the Owner the following information certified by the manufacturer for the delivered GCL:
  1. Origin, identification, and production of the Bentonite (supplier's name, brand name and production plant).
  2. Copies of quality control certificates issued by the Bentonite supplier.
  3. Each roll delivered to the Project site shall have the following identification information:
    - a. Manufacturer's name.
    - b. Product identification.
    - c. GCL roll weight.
    - d. Roll number.
    - e. Lot number.
    - f. Roll dimensions.
  4. Quality control certificates, signed by the manufacturer's quality assurance manager. Each certificate shall have roll identification number, sampling procedures, frequency, and test results. At a minimum, the test results shall be in accordance with certified requirements specified in Appendix A.

2.03 CONFORMANCE TESTING

- A. Conformance testing shall be performed by an independent GRI accredited Quality Assurance Laboratory (QAL) approved by the Owner and provided and paid for by the Contractor. A Quality Assurance Technician (QAT) from the QAL shall obtain the samples from the roll, and mark the sample with an appropriate identification number.
- B. These conformance tests shall be performed in accordance with Appendix A of the Specifications.
  1. Bentonite:
    - a. Swell Index
    - b. Fluid Loss
    - c. Moisture Content
    - d. Particle Size Distribution
  2. Woven Geotextile:
    - a. Mass per Unit Area

3. Non-Woven Geotextile:
    - a. Mass per Unit Area
  4. GCL:
    - a. Hydraulic Conductivity
    - b. Tensile Strength
    - c. Peel Strength
    - d. Mass per Unit Area
    - e. Index Flux
- C. All conformance test results shall be reviewed by the CQA Manager and accepted or rejected, prior to the placement of the GCL. All test results shall meet, or exceed, the property values listed in Appendix A and the latest version of GRI GCL3. The course of action implemented for failing tests shall be approved by the CQA Manager. In case of failing test results, the manufacturer may request that another sample be retested by the QAL with manufacturer's technical representative present during the testing procedures. This retesting shall be paid for by the manufacturer. The manufacturer may also have the sample retested at two different laboratories approved by the Engineer. If both laboratories report passing results, the material shall be accepted. If both laboratories do not report passing results, all GCL material from the lot representing the failing sample will be considered out of specification and rejected. The Manufacturer reserves the right to obtain additional samples from rolls immediately before and after the failing roll or as directed by the QAT and test it by the QAL at his/her own expense. If these rolls pass, then only the failing roll will be rejected. If they fail, then the entire lot will be rejected.

### PART 3 EXECUTION

#### 3.01 SUBGRADE PREPARATION

- A. Preparation of the liner system subgrade shall be as shown in the Drawings and as specified in Section 02200 and herein.
- B. The surface shall be smooth, uniform, free from sudden changes in grade (such as vehicular ruts), rocks, stones, debris, and deleterious materials. During actual placing and seaming, the subgrade shall be kept free of all standing water. If the subgrade below the GCL becomes wet and unstable, it shall be removed and replaced.
- C. Before the GCL installation begins, the Contractor and installer shall verify in writing and submit to the Engineer:
  1. Lines and grades are in conformance with the Drawings and Specifications.
  2. The subgrade has been properly installed and approved by the Engineer.
  3. The surface area to be lined has been rolled and compacted, free of irregularities and abrupt changes in grade.
  4. The surface is free from any objectionable material capable of damaging geosynthetics.
- D. If the Contractor proceeds with installation of materials that cover the GCL prior to providing the appropriate documentation and test results verifying installation of the GCL, the Contractor

will do so at his/her own risk. If the GCL is covered and failing tests are identified, the Contractor will be required to remove overlying liner system layers, repair the deficient GCL area(s) and reinstall the liner system in accordance with project specification requirements. Any liner system materials damaged during the repair work shall be replaced with new material. All costs associated with such actions will be paid for entirely by the Contractor including, but not limited to, labor, additional liner system material, testing, labor and material costs incurred by the Engineer to perform additional inspection services.

- E. Contractor shall use all necessary means to control impacts from stormwater runoff/runon and protect the subgrade from erosion. Contractor shall construct diversion berms and other structures as required to direct stormwater away from the work area.

### 3.02 ANCHOR TRENCH

- A. The anchor trench shall be constructed as shown on the Drawings and as specified herein.
- B. Slightly rounded corners shall be provided in the trench to avoid sharp bends in the GCL.
- C. The anchor trench shall be adequately drained to prevent water ponding and softening to adjacent soils. The anchor trench shall be backfilled with common fill and compacted to 90 percent of standard proctor density, ASTM D698.
- D. The amount of trench open at any time shall be limited to one day of GCL installation capacity. The anchor trench shall be backfilled and compacted at the end of each day in accordance with the Specifications.

### 3.03 GCL PLACEMENT

- A. Weather Conditions:
  - 1. GCL placement shall not proceed during precipitation, excessive moisture, in an area of ponded water, or excessive winds.
- B. Method of Placement:
  - 1. Placement of the GCL shall be conducted in accordance with the manufacturer's recommendations and in accordance with ASTM D6102 guidelines. All deviations from these procedures must be pre-approved by the Engineer.
  - 2. Each panel of the GCL shall be rolled out and installed in accordance with the approved shop drawings prepared by the Contractor. The layout shall be designed to keep field joining of the GCL to a minimum and consistent with proper methods of GCL installation.
  - 3. GCL rolls shall be placed using proper spreader and rolling bars with chain or cloth slings. If a sheet must be replaced a distance greater than its width, a slip or rub sheet shall be used.
  - 4. The Contractor and CQA monitors shall inspect each panel, after placement and prior to seaming, for damage and/or defects. Defective or damaged panels shall be replaced or repaired, as approved by the Engineer.



5. The installer shall avoid dragging the GCL sheets.
6. All GCL shall be anchored as shown on the Drawings and consistent with manufacturer's recommendations. Seams shall be perpendicular to the toe of slope at all times.
7. The GCL shall be properly weighted, if needed, to avoid uplift due to wind.
8. Vehicular traffic across the GCL shall not be allowed except as identified herein. Use of a low ground pressure All-Terrain Vehicle (ATV) that exerts a maximum of 6 psi may be allowed as standard operating procedure for deployment of geosynthetics, if the GCL is dry, if endorsed by the manufacturer in writing and approved by the Engineer. Vehicles, machinery, and equipment shall be operated to avoid abrupt stops, starts, or turns.
9. All damage shall be recorded and located in the record drawings.
10. The GCL shall be kept free of debris, unnecessary tools and materials. In general, the GCL area shall remain neat in appearance.
11. Equipment necessary to perform the installation (generators, compressors, etc) shall have a scrap GCL sheet placed underneath to protect the installed GCL from possible damage.
12. In the opinion of the CQA Manager, any seam, or edge of GCL material exposed for more than 24 hours or considered partially hydrated when seaming occurs shall receive a 3-foot overlap (rainlap) from the adjoining GCL panel.
13. The Contractor shall only work on an area that can be completed in one working day. Completion shall be defined as the full installation and anchoring of the GCL liner and placement of the specified liners or cover soils. Upon completing placement of bentonite panels in any area, the geomembrane shall be immediately installed over bentonite panels as detailed in Section 02776. Under no circumstances will the Engineer allow the GCL mat to be exposed to the elements overnight.
14. The minimum allowable size for a GCL "panel" shall be 100 feet in length, unless approved by the Engineer.
15. The GCL shall not get wet before or during installation. The GCL mat shall not be installed during periods of any precipitation or in standing water. If a precipitation event occurs after the installation of a bentonite mat panel, but prior to covering with geomembrane, thin film plastic sheeting may be used to cover and temporarily protect the bentonite mat from moisture, if approved by the Engineer.
16. GCL material that appears hydrated prior to or during installation will not be accepted by the CQA Manager. GCL material, which has been hydrated prior to placement of confining stress greater than 0.75 psi, shall be removed and replaced at the Contractor's expense. Hydrated GCL is defined as material which has become soft as determined by squeezing the material with finger pressure, material which has exhibited visible swelling, or material which has a moisture content greater than 30 percent, or manufacturer's recommendation, as determined by ASTM D2216.
17. GCL panels shall be placed with the non-woven geotextile side facing up to maximize the shear strength characteristics. On sloped areas exceeding a steepness of 4H:1V, the long

dimension of all panels shall be oriented parallel to the slope. Panels should be placed from the highest elevation to the lowest within the area to be lined, to facilitate drainage in the event of precipitation. Panels shall be placed free of tension or stress yet without wrinkles or folds. It is not permissible to stretch the GCL in order to fit a designated area. Panels shall not be dragged across the subgrade into position except where necessary to obtain the correct overlap for adjacent panels.

18. When covering GCL installed on sloped areas steeper than 4H:1V, the cover material shall be pushed upslope to minimize tension on the GCL.
19. All leading edges of panels left uncovered shall be protected at the end of the working day with a waterproof sheet, which is adequately secured with sandbags and other ballast.
20. Reinforced GCL panels on sideslopes shall extend a minimum of 10-ft beyond the toe of slope.

C. Liner Penetrations:

1. GCL aprons or shrouds shall be furnished and installed where indicated on the Drawings. The aprons shall be of the same material as the GCL.
2. Aprons and shrouds shall fit snugly around the pipe.
3. For any penetrations or structures the mat will contact, a small notch (approximately 3 inches wide and 8 inches deep) shall be cut against the edge of the subgrade area. The mat shall be brought up to the edge of the structure and trimmed to fit into the notch. The Contractor shall then hand-apply a pure bead of bentonite into half the notch. The mat shall then be inserted into the notch, with the remaining volume of the notch refilled with the pure bentonite and compacted.

3.04 FIELD SEAMS

- A. Individual panels of GCL shall be laid out and overlapped by a minimum of 24 inches for end seams and a minimum of 6 inches for side seams prior to seaming. The area to be seamed shall be cleaned and prepared prior to placement of granular bentonite.
- B. All seams shall have a seam number that corresponds with the panel layout numbers. The numbering system shall be used in the development of the record drawings. Seam numbers shall be derived from the combination of the two panel numbers that are to be seamed.
- C. Seam areas or runs shall also be flat and clear of any large rocks, debris, or ruts. Contacting surfaces shall be clean and clear of dirt or native soil with all edges pulled tight to maximize contact and to smooth out any wrinkles or creases. Overlaps shall be verified by CQA monitors.
- D. Seams shall be augmented with granular bentonite to ensure seam integrity. Granular bentonite shall be dispersed evenly from the panel edge to the lap line at a minimum rate of 1/4 pound per lineal foot continuously along all seams or overlap areas.
- E. On gently sloping areas (gentler than 4H:1V) where seams may be placed across the slope, overlaps should be "shingled" so as to prevent flow into the seam.

3.05 DISPOSAL OF WASTE MATERIAL

- A. Upon completion of installation, the Contractor shall dispose of all trash, waste material and equipment used in connection with the performed work and shall leave the premises in a neat and acceptable condition.

3.06 FIELD QUALITY CONTROL

- A. Repair Procedures:
  - 1. All portions of the GCL exhibiting signs of defect shall be repaired. The following procedure shall be used to repair these areas. The final decision as to the appropriate repair procedure shall be made by the Engineer.
  - 2. Large rips or tears shall be repaired by completely exposing the affected area, removing all foreign objects or soil, and by then placing a patch over the damage, with a minimum overlap of 12 inches on all edges. Accessory bentonite shall be placed between the patch and the repaired material at a rate of 1/4 pound per lineal foot of edge, spread in a 6-inch width. The above procedures shall also be implemented if a rip or tear occurs on a sloped surface. In this instance, the edges of the patch shall be fastened to the repaired liner with construction adhesive, in addition to the bentonite-enhanced seam.

END OF SECTION  
(*appendices follow*)

**APPENDIX A**  
**TABLE A: GEOSYNTHETIC CLAY LINER ANALYTICAL TESTING FREQUENCY**

| MATERIAL                          | TEST                                            | METHOD <sup>1,2,3</sup> | MIN. ACCEPTABLE VALUE <sup>9</sup> (REINFORCED)                 | TEST FREQUENCY        | COMMENTS        |
|-----------------------------------|-------------------------------------------------|-------------------------|-----------------------------------------------------------------|-----------------------|-----------------|
| BENTONITE <sup>6</sup>            | Swell Index                                     | ASTM D5890              | 24 mL/2g                                                        | Every 100,000 lb      | by Manufacturer |
|                                   | Fluid Loss                                      | ASTM D5891              | 18 mL (max.)                                                    | Every 100,000 lb      | by Manufacturer |
|                                   | Moisture Content                                | ASTM D5993              | 35% (max.)                                                      | Every 100,000 lb      | by Manufacturer |
|                                   | Particle Size Distribution (Granular Bentonite) | ASTM D421               | Submit Test Results                                             | Every 100,000 lb      | by Manufacturer |
| WOVEN GEOTEXTILE                  | Mass per unit area                              | ASTM D5261              | 3.0 oz./sy                                                      | Every 200,000 sq. ft. | by Manufacturer |
| NON-WOVEN GEOTEXTILE <sup>5</sup> | Mass per unit area                              | ASTM D5261              | 5.8 oz./sy                                                      | Every 200,000 sq. ft. | by Manufacturer |
| GCL                               | Hydraulic Conductivity <sup>8</sup>             | ASTM D5887              | $5 \times 10^{-9}$ cm/sec (max.)                                | Every week            | by Manufacturer |
|                                   | Tensile Strength <sup>4</sup>                   | ASTM D6768              | 23 lb./in.                                                      | Every 200,000 sq. ft. | by Manufacturer |
|                                   | Peel Strength                                   | ASTM D6496              | 2.1 lb./in.                                                     | Every 40,000 sq. ft.  | by Manufacturer |
|                                   | Mass per unit area <sup>7</sup>                 | ASTM D5993              | 0.81 lb/sf                                                      | Every 40,000 sq. ft.  | field sample    |
|                                   | Index Flux                                      | ASTM D5887              | $1 \times 10^{-8}$ cm <sup>3</sup> /cm <sup>2</sup> /sec (max.) | Every Lot             | field sample    |

Explanatory Notes for Table A-1:

1. Testing methods and values shall be in accordance with GRI-GCL3\* document.
2. ASTM procedures modified as necessary to utilize three test specimens across the roll width. Results are reported as the average of these three values. Size of test specimens may also differ slightly from those indicated in ASTM methods.
3. All required values listed are minimum average roll values (MARVs) unless otherwise indicated.
4. All tensile testing on the geotextiles and on the GCL is performed with the test specimens oriented in the machine direction.
5. The values listed represent the non-woven geotextile before being needle punched into the GCL. The actual tensile strength of the non-woven may be higher but cannot be accurately measured due to difficulties in separating it from the woven geotextile.
6. These parameters are for the bentonite as delivered to the GCL MANUFACTURER, not for the bentonite in the finished product.
7. Mass of the GCL is measured after oven drying per the stated test method.
8. Permeability testing is performed with a 5-psi confining pressure and a 2-psi head pressure.
9. Hydraulic Conductivity, Index Flux, and Fluid Loss are maximum values.

## **APPENDIX B**

The following forms are included and shall be completed by the responsible party as shown on the forms:

| Form No.  | Title                       |
|-----------|-----------------------------|
| CQC – 101 | Subgrade Surface Acceptance |
| CQC – 102 | Daily Panel Placement Log   |
| CQC – 103 | Daily CQC Report            |
| CQC – 104 | Material Receiving Log      |

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**FORM CQC - 101**  
**SUBGRADE SURFACE ACCEPTANCE**  
(one sheet per Day of GCL Deployment)

Surface for GCL placement accepted, covered by panel numbers: \_\_\_\_\_

Approximate size of area: \_\_\_\_\_

**CERTIFICATE OF ACCEPTANCE OF SUBGRADE SOIL LINER BY INSTALLER**

I the undersigned, duly authorized representative of \_\_\_\_\_  
do hereby accept the soil liner surface as being acceptable for the placement of GCL.

\_\_\_\_\_  
Name

\_\_\_\_\_  
Signature

\_\_\_\_\_  
Title

\_\_\_\_\_  
Date

Certificate Accepted by Inspector - Company: \_\_\_\_\_

\_\_\_\_\_  
Name

\_\_\_\_\_  
Signature

\_\_\_\_\_  
Title

\_\_\_\_\_  
Date

QC INSPECTOR: \_\_\_\_\_

SITE SUPERVISOR: \_\_\_\_\_

INSTALLING SUPERVISOR: \_\_\_\_\_

COMMENTS:

\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_

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## DAILY CQC REPORT

PROJECT: \_\_\_\_\_

DATE: \_\_\_\_\_ WEATHER: \_\_\_\_\_ TEMP.: AM\_\_PM\_\_

CONTRACTOR: \_\_\_\_\_

Log: \_\_\_\_\_

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Deficiencies and Corrective

Actions: \_\_\_\_\_

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Outstanding

Items: \_\_\_\_\_

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Attachments: \_\_\_\_\_

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QA/QC MANAGER: \_\_\_\_\_

DATE: \_\_\_\_\_

MATERIAL RECEIVING LOG

PROJECT NAME: \_\_\_\_\_

DATE: \_\_\_\_\_ PROJECT NO.: \_\_\_\_\_ MATERIAL TYPE: \_\_\_\_\_

| BATCH/<br>LOT NO. | FACTORY<br>ROLL NO. | LENGTH | WIDTH | COMMENTS |
|-------------------|---------------------|--------|-------|----------|
|                   |                     |        |       |          |
|                   |                     |        |       |          |
|                   |                     |        |       |          |
|                   |                     |        |       |          |
|                   |                     |        |       |          |
|                   |                     |        |       |          |
|                   |                     |        |       |          |
|                   |                     |        |       |          |
|                   |                     |        |       |          |
|                   |                     |        |       |          |

NOTE: BILLS OF LADING/SHIPPING STATEMENTS ATTACHED

SECTION 02623  
HIGH DENSITY POLYETHYLENE (HDPE) PIPE  
FOR LEACHATE COLLECTION SYSTEMS

PART 1 GENERAL

1.01 SCOPE OF WORK

- A. Furnish all labor, materials, equipment and incidentals required and install high density polyethylene leachate and landfill gas pipe, fittings and appurtenances as shown on the Drawings and as specified herein.

1.02 RELATED WORK

- A. Drainage Layer Granular Materials are included in Section 02230.
- B. Woven Geotextile is included in Section 02273.
- C. High Density Polyethylene (HDPE) Geomembrane is included in Section 02776.

1.03 SUBMITTALS

- A. Submit, in accordance with Section 01300, and within thirty (30) days following the Effective Date of the Agreement, the following:
  - 1. List of materials to be furnished, the names of the suppliers and the date of delivery of materials to the site.
  - 2. The origin of the resin to be used in the manufacturing of the pipe including the suppliers name and production plant, as well as brand name and number.
  - 3. Documentation from the resin's manufacturer showing results of the following tests for resin identification:
    - a. Melt Flow Index      ASTM D1238.
    - b. Density                ASTM D1505.
  - 4. Manufacturer quality control manual describing implementation of quality control procedures during pipe manufacturing process.
  - 5. Pipe manufacturer's certification of compliance with these Specifications.
  - 6. Complete, detailed shop drawings of all polyethylene pipe, including the location of all fittings, joints and connections to structures.
  - 7. Manufacturer's recommendations for handling, storing and installing pipe and fittings.
  - 8. For each shipment of pipe a manufacturer's certification that the pipe was manufactured from the same resin identified in Paragraph 1.03A3.
  - 9. Certification demonstrating that the joining technician was trained by the pipe manufacturer and is qualified to perform heat fusion welding.

10. Cleaning and Video Inspection Contractor qualifications for all leachate piping that complies with Paragraphs 3.03 and 3.04.

#### 1.04 REFERENCE STANDARDS

##### A. ASTM International:

1. ASTM D1238 - Standard Test Method for Melt Flow Rates of Thermoplastics by Extrusion Plastometer.
2. ASTM D1505 - Standard Test Method for Density of Plastics by the Density-Gradient Technique.
3. ASTM D1603 - Standard Test Method for Carbon Black Content in Olefin Plastics.
4. ASTM F2164 – Standard Practice for Field Leak Testing of Polyethylene (PE) Pressure Piping Systems Using Hydrostatic Pressure.
5. ASTM F2620 Standard Practice for Heat Fusion of Polyethylene Pipe and Fittings.
6. ASTM D2837 - Standard Test Method for Obtaining Hydrostatic Design Basis for Thermoplastic Pipe Materials or Pressure Design Basis for Thermoplastic Pipe Products.
7. ASTM D3350 - Standard Specification for Polyethylene Plastic Pipe and Fittings Materials.
8. ASTM F714 - Standard Specification for Polyethylene (PE) Plastic Pipe (SDR-PR) Based on Outside Diameter.
9. ASTM F1055 - Standard Specification for Electrofusion Type Polyethylene Fittings for Outside Diameter Controlled Polyethylene and Crosslinked Polyethylene (PEX) Pipe and Tubing.

##### B. Plastic Pipe Institute (PPI):

1. Handbook of Polyethylene Pipe.

##### C. American National Standards Institute (ANSI):

1. ANSI B16.1 - Cast Iron Flanges and Flanged Fittings.
2. ANSI B16.21 - Nonmetallic Flat Gaskets for Pipe Flanges.

##### D. Where reference is made to one of the above standards, the revision in effect at the time of bid opening shall apply.

#### 1.05 QUALITY ASSURANCE

##### A. Resin Evaluation:

1. All incoming resin shall be sampled for conformance testing against test results supplied by the resin manufacturer. Samples shall be taken from the top and bottom of each

compartment from every hopper car received. The following conformance tests shall be performed on the sampler:

- a. Melt Flow Index ASTM D1238.
- b. Density ASTM D1505.
- c. The results of these tests shall become part of the manufacturer's permanent quality control records.

B. Finished Product Evaluation:

1. Each length of pipe produced shall be checked by production staff for the items listed below. The results of all measurements shall be recorded on production sheets which become part of the manufacturer's permanent records:
  - a. Pipe in process shall be checked visually, inside and out for cosmetic defects (grooves, pits, hollows, etc).
  - b. Pipe outside diameter shall be measured using a suitable periphery tape to ensure conformance with ASTM F714.
  - c. Pipe wall thickness shall be measured at twelve equally spaced locations around the circumference at both ends of the pipe to ensure conformance with ASTM F714.
  - d. Pipe length shall be measured.
  - e. Pipe marking shall be examined and checked for accuracy.
  - f. Pipe ends shall be checked to ensure they are cut square and clean.
  - g. Subject inside surface to a "reverse bend test" to ensure the pipe is free of oxidation (brittleness).

C. Stress Regression Testing:

1. The polyethylene pipe manufacturer shall provide certification that stress regression testing has been performed on the specific polyethylene resin being utilized in the manufacture of this product. This stress regression testing shall have been done in accordance with ASTM D2837 and the manufacturer shall provide a product supplying a minimum Hydrostatic Design Basis (HDB) of 1600 psi as determined in accordance with ASTM D2837.

1.06 WARRANTY

- A. The Contractor shall furnish the Owner a written warranty from the manufacturer. The manufacturer shall warrant that the pipe shall be of merchantable quality (as defined by the Uniform Commercial Code) for a period of 1 year. The manufacturer shall guarantee that the pipe furnished is suitable for the purpose intended and free from defects of material and workmanship. In the event the pipe fails to perform as specified, the pipe manufacturer shall promptly replace defective pipe without any cost to the Owner.
- B. Should a defect occur, which is covered under warranty, the Warrantor shall bear all costs for the repair and/or relocation and replacement.

1.07 GUARANTEE

- A. The Contractor shall guarantee the HDPE pipe against defects in installation and workmanship for the period of 2 years commencing with the date of Final Acceptance. The guarantee shall include the services of qualified service technicians and all materials required for the repairs at no expense to the Owner.

## PART 2 PRODUCTS

### 2.01 HIGH DENSITY POLYETHYLENE (HDPE) PIPE

- A. High Density Polyethylene (HDPE) Pipe resins shall be high molecular weight, high density polyethylene with a cell classification number of 345464C in accordance with ASTM D3350 and a minimum density of 0.955 in accordance with ASTM D1505.
- B. The pipes shall have the nominal dimensions shown on the Drawings and shall meet the requirements of IPS Standard Dimension Ratio (SDR) 11 for the leachate collection system, as specified on the Drawings.
- C. All polyethylene pipe shall meet the requirements of ASTM F714.
- D. The pipe shall be joined with butt, heat fusion joints. All joints shall be made in strict compliance with the manufacturer's recommendations. Contractor shall remove the internal bead on all crosses and sweep bends.
- E. Where required, flange connections, mechanical joint connections and butt connections using bolted mechanical couplers shall be provided from a pipe stub with a polyethylene and steel stiffener. Flanged connections shall be provided from a pipe stub and a steel back-up flanged. Back-up flanges shall be primed and painted in a corrosion protected paint recommended and supplied by the manufacturer. All bolts, nuts and hardware shall be Type 316 stainless steel.
- F. Pipe shall be furnished in standard laying lengths not exceeding 50-ft.
- G. All high-density polyethylene pipe and fittings shall be made from the same resin. If rework compounds are required, only those generated in the manufacturer's own plant from resin compounds of the same class and type from the same raw material supplier shall be used.
- H. The polyethylene compound shall be suitably protected against degradation by ultraviolet light as required by ASTM D1603.

### 2.02 PIPE IDENTIFICATION

- A. The following shall be continuously indent printed on the pipe or spaced at intervals not exceeding 5-ft per ASTM F714:
  - 1. Name and/or trademark of the pipe manufacturer.
  - 2. Nominal pipe size (outside diameter) in accordance with ASTM F714.
  - 3. Dimension ratio (DR) and pressure rating per ASTM F714.
  - 4. The letters PE followed by the polyethylene grade in accordance with ASTM D3350, (e.g., PE 345464C). Where applicable, the standard thermoplastic pipe materials designation code may be used as an alternative marking, e.g. PE 3608.
  - 5. Manufacturing standard reference, e.g., ASTM F714.
  - 6. A production code from which the date and place of manufacture can be determined.

## 2.03 PERFORATIONS

- A. The leachate collection pipes inside the lined area, as shown on the Drawings, shall be perforated. The perforations shall be drilled into the pipe at the factory after manufacturing, as shown on the Drawings. The perforated pipe shall have four rows of holes, 1/2-inch in diameter on six-inch centers, with allowable tolerances 1/16-inch on the diameter plus 1/4-inch on the spacing and the rows shall be parallel to the axis of the pipe and 90 degrees (plus or minus 5 degrees) apart.
- B. The perforation shall be covered with tape compatible to the pipe material upon delivery to prevent soil material from entering the pipe prior to installation.

## PART 3 EXECUTION

### 3.01 INSTALLATION

- A. High Density Polyethylene (HDPE) Pipe shall be installed in accordance with the instruction of the manufacturer, as shown on the Drawings and as specified herein. All heat fusion joints shall be done by a factory qualified joining technician as designated by the pipe manufacturer.
- B. Pipe shall be laid to lines and grade shown on the Drawings with bedding and backfill as shown on the Drawings. The tape covering the perforations shall be removed during installation. The pipe shall be installed such that perforations face the bottom of trench.
- C. When laying is not in progress, including lunchtime, the open ends of the pipe shall be closed by caps or fabricated plugs, or by other approved means. All plugs shall be OD fitting type plugs. No plugs will be allowed that require insertion of the plug into pipe, unless approved by the Engineer.
- D. Pipe shall be stored on clean level ground to prevent undue scratching or gouging. The handling of the pipe shall be in such a manner that the pipe is not damaged by dragging it over sharp and cutting objects. The maximum allowable depth of cuts, scratches or gouges on the exterior of the pipe is 10 percent of wall thickness. The interior pipe surface shall be free of cuts, gouges or scratches.
- E. Sections of pipe with cuts, scratches or gouges deeper than allowed shall be removed completely and the ends of the pipeline rejoined.
- F. The pipe shall be joined by the method of thermal butt fusion, as outlined in ASTM F2620, or as recommended by the manufacturer. All joints shall be made in strict compliance with the manufacturer's recommendations. In tight locations in which the butt fusion equipment cannot be set up, a thermal coupling such as Central Electrofusion Systems, or equal, may be used. The pipe shall be joined as outlined in ASTM F1055:
  - 1. All fusion welds/beads shall be ground down inside the leachate collection pipes.
- G. Mechanical connections of the polyethylene pipe to auxiliary equipment such as valves, pumps and tanks shall be through flanged connections which shall consist of the following:
  - 1. A stainless steel back-up, polyethylene flange shall be thermally butt-fused to the stub end of the pipe.

2. A Type 316 stainless steel back up ring conforming to ANSI B16.1 on both sides of the connection shall be used as approved by the Engineer.
  3. Corrosion resistant bolts and nuts of Type 316 stainless steel as specified in ASTM A276 and ASTM A307. Bolts shall be tightened alternatively and evenly to the manufacturer's specified torques. After installation bolts and nuts shall be encapsulated using wax sealing tape per AWWA Standard C217.
- H. Flange connections shall be provided with a full-face neoprene gasket conforming to ANSI B16.21.
- I. All HDPE pipe must be at the temperature of the surrounding soil at the time of backfilling and compaction.
- J. Installation of pipe shall be observed and accepted by the Engineer prior to backfilling.

### 3.02 CLEANING

- A. As pipe laying progresses, and at the conclusion of the work, thoroughly clean all of the new pipelines to remove all dirt, stones, pieces of wood or other material which may have entered during the construction period. Debris cleaned from the lines shall be removed from the job site. If, after this cleaning, any obstructions remain, they shall be removed.
- B. Prior to substantial completion of the project, thoroughly clean, by means of high-pressure water jetting, all of the proposed leachate collection and header pipe lines to remove all dirt, stones, pieces of wood or other material which may have entered during the construction period. If, after this cleaning, any obstructions remain, they shall be removed. Cleaning of the leachate collection and header pipes shall be conducted by a qualified Contractor experienced in working within landfill environments. All proposed and existing leachate pipes shall be completely cleaned as a requirement for substantial completion.

### 3.03 VIDEO INSPECTIONS

- A. Prior to substantial completion, all proposed leachate collection, leak detection, and header pipes shall be subject to video camera inspection by the Contractor under the observation of the Engineer. It is the intent to video leachate pipes to locate pipe defects, deviations to gradient, and clogs. When this inspection is performed, the Contractor shall be responsible for preparing the pipes for inspection and furnishing labor as required at no expense to the Owner. Video inspections of the leachate collection and header pipes shall be conducted by a qualified Contractor experienced in working within landfill environments. Color video recordings, in digital format (DVD), of the leachate pipes shall be provided to the Owner as a permanent record. Each video recording shall have an audio and written log of that video recording's contents.
- B. Video camera system shall be capable of accessing the leachate collection, leak detection, and header lines from the proposed and existing cleanouts. Video camera equipment utilized to inspect the existing leachate pipes must comply with the requirements of Class 1, Division 1 Groups C&D of the National Electrical Code Section NFPA 70.
- C. The recordings shall be properly exposed, and the camera shall be in proper focus so that good, clear recordings showing detail are produced. Recordings shall be identified on the audio track



noting the leachate pipe, any leaks, cracks, or pipe defects. Video recordings, in digital format (DVD) (original and one copy) of the completed leachate pipes shall be delivered to the Owner. The Contractor shall provide any assistance required by the Owner to assist the Owner with visual inspections.

END OF SECTION

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SECTION 02776  
WHITE TEXTURED HIGH-DENSITY POLYETHYLENE (HDPE)  
GEOMEMBRANE LINER

PART 1 GENERAL

1.01 SCOPE OF WORK

- A. The Contractor shall furnish all labor, materials, equipment and incidentals required and install High Density Polyethylene (HDPE) geomembrane as shown on the Drawings and as specified herein.

1.02 RELATED WORK

- A. Related Work includes, but is not limited to, the following:
  - 1. Earthwork is included in Section 02200.
  - 2. Drainage Layer Granular Materials are included in Section 02230.
  - 3. Nonwoven Geotextile is included in Section 02272.
  - 4. Geosynthetic Clay Liner is included in Section 02275.

1.03 SUBMITTALS

- A. Submit, in accordance with Section 01300, and within 30 calendar days from the Notice to Proceed, submit the following information:
  - 1. Submittals relating to geomembrane Manufacturer and geomembrane:
    - a. Corporate Background.
    - b. Manufacturing capabilities:
      - 1) Information on factory size, equipment, personnel, number of shifts per day and production capacity per shift.
      - 2) List of material performance properties and samples of the liner formulation with attached certified test results.
        - a) Stress Crack Resistance (ASTM D 5397, App. A).
        - b) High Pressure OIT (ASTM D 5885).
        - c) Oven Aging @ 85 degrees C (ASTM D 5721) with High Pressure OIT (ASTM D 5885) percent retained after 90 days.
        - d) UV Resistance (ASTM D 7238) with High Pressure OIT (ASTM D 5885) percent retained after 1,600 hours.
        - e) Interface Shear (ASTM D 5321) per Section 02275, Paragraph 1.03.A.3.
      - 3) Manufacturer's Quality Control program and manual including use of spark testing and description of laboratory facilities including GAI-LAP and ISO 9001 or compatible; 2008 Certifications.
      - 4) A list of ten completed facilities totaling a minimum of ten million square feet, for which the Manufacturer has manufactured HDPE geomembrane. The following information shall be provided for each facility:
        - a) Name and purpose of facility, its location and date of installation.
        - b) Name of Owner, project manager, design engineer and Installer.

- c) Geomembrane thickness and surface area.
      - d) Information on performance of the facility.
    - c. The origin of the resin to be used in the manufacturing of geomembrane including the suppliers name and production plant, as well as brand name and number.  
Manufacturer to provide statement certifying that no recycled polymer and no more than 2 percent rework of the same type of material is added to the resin.
    - d. Copy of Quality Control certificates in conformance with Paragraphs 2.01 and 2.02.
    - e. Certification that the HDPE geomembrane and extrudate produced for this project have the same properties.
    - f. A "Sample Warranty" in accordance with Paragraph 1.08A.
    - g. Manufacturer's field installation quality control manual.
  - 2. Submittals relating to the Installer:
    - a. Background Information. Please indicate if applicable Approved Installation Contractor (AIC) status documentation or membership in the International Association of Geosynthetic Installers.
    - b. Installation capabilities:
      - 1) Information on equipment (including tensiometer) and personnel.
      - 2) Anticipated average daily production (complete including QC measures).
      - 3) A list of minimum values for seam properties.
    - c. Installer shall submit a list of at least five similar completed projects. Installer shall have installed a minimum of two million square feet of HDPE geomembrane. The following information shall be provided for each facility:
      - 1) Name and purpose of facility, its location and date of installation.
      - 2) Name of Owner, design engineer, Manufacturer and name and telephone number of contact at the facility who can discuss the project.
      - 3) Thickness of geomembrane and surface area of the installed geomembrane.
      - 4) Type of seaming, patching and tacking equipment.
      - 5) A copy of the Manufacturer's certification or approval letter.
  - 3. Submittals relating to the Electrical Leak Location Survey Contractor:
    - a. Company Background.
    - b. Electrical leak location capabilities.
    - c. Contractor shall submit a list of at least five similar completed projects:
      - 1) Name and purpose of facility, its location and date of installation.
      - 2) Name of Owner, design engineer, Manufacturer and name and telephone number of contact at the facility who can discuss the project.
      - 3) Thickness of geomembrane and surface area of the electrical leak location survey.
- B. Within 45 days prior to liner installation submit the following:
- 1. Shop Drawings:
    - a. Proposed panel layout showing the installation layout identifying field seams as well as any variance or additional details which deviate from the Drawings.
    - b. Details of seaming the geomembrane, anchoring, connections, penetrations and other construction details.
    - c. Electrical Leak Location Survey Plan per paragraph 3.08 A. including electrode design and placement.
  - 2. Installation Schedule.

3. Quality Control Manual:
  - a. A Quality Control manual that specifically defines the quality assurance program during installation. The manual shall include daily procedures, welding techniques, field testing procedures, lab testing procedures, specific steps that are to be taken in the event of a failure or defect, personnel requirements, levels of authority and all other information necessary to ensure a high-quality geomembrane installation.
4. Field Personnel Information:
  - a. Resume of the installation supervisor to be assigned to the project. The installation supervisor shall have installed or supervised the installation and seaming of a minimum of two million square feet of HDPE geomembrane liner.
  - b. Resume of the master seamer to be assigned to the project. Master seamer must have completed a minimum of one million square feet of geomembrane seaming using the type of seaming apparatus proposed for use on this project.
  - c. Resume of the quality control personnel to be assigned to the Project along with pertinent experience information.
  - d. A list of personnel performing field seaming operations along with pertinent experience information.
- C. Submit the following in accordance with Section 01300 and prior to installation:
  1. Quality control documentation in accordance with Paragraph 2.02 below.
  2. Conformance testing results in accordance with Paragraph 2.03 below.
- D. Submit report documenting electrical leak location surveys within 14 days of the completion of each leak survey in accordance with Section 01300 and Paragraph 3.08 below.

#### 1.04 REFERENCE STANDARDS

- A. ASTM International:
  1. ASTM D792 - Specific Gravity (Relative Density) and Density of Plastics by Displacement.
  2. ASTM D1004 - Test Method for Initial Tear Resistance of Plastics Film and Sheeting.
  3. ASTM D1238 - Test Method for Flow Rates of Thermoplastics by Extrusion Plastometer.
  4. ASTM D1505 - Test Method for Density of Plastics by the Density-Gradient Technique.
  5. ASTM D1603 - Test Method for Carbon Black in Olefin Plastics.
  6. ASTM D3895 - Test Method for Oxidative Induction Time of Polyolefins by Thermal Analysis.
  7. ASTM D4218 - Test Method for Determination of Carbon Black Content in Polyethylene Compounds by the Muffle-Furnace Technique.

8. ASTM D4833 - Test Method for Index Puncture Resistance of Geotextiles, Geomembranes and Related Products.
  9. ASTM D5199 - Test Method for Measuring Nominal Thickness of Geotextiles and Geomembranes.
  10. ASTM D5321 - Standard Test for Determining the Coefficient of Soil and Geosynthetic or Geosynthetic and Geosynthetic Friction by the Direct Shear Method.
  11. ASTM D5397 - Procedure to Perform a Single Point Notched Constat Tensile Load - Appendix (SP-NCTL) Test.
  12. ASTM D5596 - Test Method for Microscopic Evaluation of the Dispersion of Carbon Black in Polyolefin Geosynthetics.
  13. ASTM D5721 - Practice for Air-Oven Aging of Polyolefin Geomembranes.
  14. ASTM D5885 - Test Method for Oxidative Induction Time of Polyolefin Geosynthetics by High Pressure Differential Scanning Calorimetry.
  15. ASTM D5994 - Test Method for Measuring the Core Thickness of Textured Geomembranes.
  16. ASTM D6392 - Test Method for Determining the Integrity of Nonreinforced Geomembrane Seams Produced Using Thermo-Fusion Methods.
  17. ASTM D6693 - Test Method for Determining Tensile Properties of Nonreinforced Polyethylene and Nonreinforced Flexible Polypropylene Geomembranes.
  18. ASTM D7007-09 - Standard Practices for Electrical Methods for Locating Leaks in Geomembranes Covered with Water or Earth Materials.
  19. ASTM D7238 - Test Method for Effect of Exposure of Unreinforced Polyolefin Geomembrane Using Fluorescent UV Condensation Apparatus.
  20. ASTM D7466 - Standard Test Method for Measuring the Asperity Height of Textured Geomembrane.
- B. Geosynthetic Research Institute (GRI):
1. GM10 Specification for the Stress Crack Resistance of Geomembrane Sheet.
  2. GM13 Test Methods, Test Properties and Testing Frequency for High Density Polyethylene (HDPE) Smooth and Textured Geomembranes.
  3. GM19 Seam Strength and Related Properties of Thermally Bonded Polyolefin Geomembranes.
- C. Where reference is made to one of the above standards, the revision in effect at the time of bid opening shall apply.

1.05 QUALITY ASSURANCE

- A. In addition to Manufacturer and Installer requirements for qualifications and certification specified in Paragraph 1.03 the Quality Assurance consists of conformance testing of the material delivered to the site and field quality control during installation.
- B. Conformance testing requirements are specified in Paragraph 2.03. The purpose of conformance testing is to assure that the supplied material conforms to this Section and to the Manufacturer's Quality Control certificates. The Contractor shall submit the results of all geosynthetic conformance tests to the Engineer prior to shipping the materials to the project site.
- C. Field quality control requirements are specified in Paragraph 3.06. The purpose of field quality control procedures is to assure that the geomembrane has been installed in accordance with the specifications and Manufacturer's recommendations.
- D. Quality Control Plan:
  - 1. The forms in Appendix B shall be used for field installation documentation. Alternative forms may be used for documentation as approved by the Resident Project Representative (RPR).
- E. Geomembrane Quality Control Documentation:
  - 1. Pre-installation Conference:
    - a. Prior to commencing work, a pre-installation conference shall be held and the following project personnel shall be identified by name and recorded in the project files:
      - 1) Owner's Representative.
      - 2) Contractor's Representative.
      - 3) Resident Project Representative.
      - 4) Installation Supervisor.
      - 5) Master Seamer.
      - 6) Quality Assurance Laboratory.
      - 7) Quality Assurance Technician.
    - b. Two duplicate project files shall be maintained. One shall be maintained by the Resident Project Representative (RPR) and the other shall be maintained by the Installer's QC Technician. The Installer shall provide the RPR with daily documentation by the end of the following work day. At the end of each work week the files shall be updated and checked to assure that copies of all pertinent project information is included in each file.
    - c. Blank copies of the following project forms shall be available onsite throughout the duration of the project:

| <u>Form No.</u> | <u>Title</u>                          |
|-----------------|---------------------------------------|
| 1.              | Subgrade Surface Acceptance           |
| 2.              | Daily QC Report                       |
| 3.              | Material Receiving Log                |
| 4.              | Daily Panel Placement Log             |
| 5.              | Trial Weld Log                        |
| 6.              | Daily Seaming Log                     |
| 7.              | Seam Inspection Log-Air Pressure Test |

| <u>Form No.</u> | <u>Title</u>                    |
|-----------------|---------------------------------|
| 8.              | Seam Inspection Log-Vacuum Test |
| 9.              | Destructive Sample Log          |

#### 1.06 QUALIFICATIONS

##### A. Manufacturer:

1. The Manufacturer of the lining material described hereunder shall have previously demonstrated his/her ability to produce this geomembrane by having at least 5 years continuous experience in the manufacturing of HDPE geomembrane and successfully manufactured a minimum of 50 million square feet of similar liner material for hydraulic lining installations.

##### B. Installer:

1. The Installer shall be the Contractor or an approved Installer trained and certified to install the Manufacturer's geomembrane. The Installer shall have current AIC status. Installation shall be performed under the constant direction of a single field installation supervisor who shall remain on site and be in responsible charge, through the geomembrane installation, for geomembrane layout, seaming, patching, testing, repairs and all other activities required by the Installer. The field installation supervisor shall have installed or supervised the installation and seaming of a minimum of two million square feet of HDPE geomembrane liner.

#### 1.07 DELIVERY, STORAGE AND HANDLING

- A. The geomembrane rolls shall be packaged and shipped by appropriate means to prevent damage of the geomembrane rolls. Off-loading and storage of the geomembrane is the responsibility of the Contractor. The Contractor shall be responsible for replacing any damaged or unacceptable material at no additional cost to the Owner.
- B. No off-loading shall be performed unless the RPR is present. Damage during off-loading shall be documented by the RPR. All damaged rolls must be separated from the undamaged rolls until the proper disposition of that material has been determined by the RPR.
- C. The geomembrane rolls shall be stored so as to be protected from puncture, dirt, grease, water, moisture, mud, mechanical abrasions and excessive heat that may damage the geomembrane material. The rolls shall be stored on a prepared surface (not wooden pallets) and shall not be stacked more than two rolls high.

#### 1.08 MATERIAL WARRANTY

- A. The Contractor shall furnish the Owner a written warranty from the geomembrane Manufacturer that shall warrant the material, on a prorated basis, against manufacturing defects and material degradation for a period of twenty years from the date of installation.
- B. Should a defect occur, which is covered under warranty, the Warrantor shall bear all costs for the repair and/or relocation and replacement of the geomembrane.



1.09 GUARANTEE

- A. The Contractor shall guarantee the HDPE geomembrane against defects in installation and workmanship for the period of two years commencing with the date of Final Acceptance. The guarantee shall include the services of qualified service technicians and all materials required for the repairs at no expense to the Owner.

1.10 DEFINITIONS AND RESPONSIBILITIES

A. Contractor:

- 1. The Contractor is the firm or corporation with whom the Owner has entered into agreement to construct the project. The Contractor is responsible for all submittals by the Manufacturer and the Installer as required by the Specifications. The Contractor is also responsible for scheduling and coordination of the required work with the Manufacturer and the Installer to complete the project. The Contractor is responsible for furnishing an electronic as-built survey and a copy of the complete documentation of the geomembrane system. The Contractor is also responsible for daily updating of the design drawings onsite and for any and all deviations from these Drawings. All deviations must be initialed and approved by the Resident Project Representative onsite.

B. Manufacturer:

- 1. The Manufacturer is the firm or corporation responsible for production of the geomembrane material to be used in the project. The Manufacturer shall produce a consistent product meeting the project specifications and shall provide Quality Control documentation for the product specified herein. The Manufacturer is responsible for the condition of the geosynthetic until the material is accepted by the Resident Project Representative upon delivery and installation. The Manufacturer shall produce a product that consistently meets the Project Specifications.

C. Installer:

- 1. The Installer is the firm or corporation responsible for installation of the geomembrane. The Installer shall be the Contractor or an approved Installer trained and certified to install the Manufacturer's geomembrane. The Installer shall be responsible for field handling, storing, placing, seaming and all other aspects of the geomembrane installation.

PART 2 PRODUCTS

2.01 MATERIALS

A. General:

- 1. The geomembrane shall be:
  - a. White Textured Geomembrane as manufactured by GSE;
  - b. Black/White Microspike Geomembrane as manufactured by AGRU America, Inc.; or
  - c. An approved equal.

2. The resin from which the geomembrane is made shall be in the density range of 0.932 g/ml or higher, and have a melt index value per ASTM D1238 of less than 1.0 g/10 min. Formulated sheet density shall be 0.940 g/ml or higher.
3. The blended resin shall contain two to three percent carbon black, anti-oxidants, and heat stabilizer, but no fillers or extenders. The resin shall be virgin material, with no more than two percent rework. If rework is used, it must be of the same formulation as the parent material. No post-consumer resin of any type shall be added to the formulation.
4. 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. Continuous spark testing by the manufacturer at the factory shall be performed and no defects shall be found.
5. The sheets shall be manufactured in a minimum 20-ft seamless width. Labels on the roll shall identify the thickness, length, width and manufacturer's roll and lot number.

B. Properties:

1. The geomembrane rolls shall be 60-mil HDPE and shall meet the specified physical, mechanical, and chemical property requirements listed in Appendix A, Table A1 and GRI GM13 Test Methods, Test Properties and Testing Frequency for High Density Polyethylene (HDPE) Smooth and Textured Geomembranes.
2. Surface texturing shall be of the same type of polymer and formulation as the base sheet polymer and its formulation.
3. The geomembrane shall have a light-reflective white top surface and be textured on both sides.

C. Other Materials:

1. Extrudate 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. Boots and shrouds for pipe penetration shall fit snugly around the pipe. Prefabricated material shall be designed to fit site specific conditions for the intended slope and size of pipe.

2.02 QUALITY CONTROL DOCUMENTATION

- A. Prior to installation commencement of any geomembrane material, the Contractor shall provide the following information certified by the Manufacturer for the delivered geomembrane material:
1. Origin, identification and production of the resin (supplier's name, brand name and production plant).
  2. Copies of Quality Control certificates issued by the resin supplier.

3. Manufacturer's certification verifying that the quality of the resin used to manufacture the geomembrane meets the requirements specified in Paragraph 2.01.
4. Each roll delivered to the project site shall have the following identification information:
  - a. Manufacturer's name.
  - b. Product identification.
  - c. Thickness.
  - d. Roll number.
  - e. Roll dimensions.
  - f. Lot Number.
5. Quality Control certificates, signed by the Manufacturer's quality assurance manager, shall be submitted for each roll delivered to the site. Each certificate shall have roll identification number, sampling procedures, frequency and test results. At a minimum, test results shall be provided for each roll delivered to the site in accordance with test requirements specified in Appendix A, Table A1 and GRI GM13.

## 2.03 CONFORMANCE TESTING

- A. Conformance testing shall be performed by a GRI accredited independent Quality Assurance Laboratory (QAL) provided and paid for by the Contractor. A qualified technician from the QAL shall obtain the samples from the roll, mark the machine direction and identification number. The following conformance tests shall be conducted at the laboratory in accordance with GRI GM13:
  1. Thickness.
  2. Asperity Height.
  3. Density.
  4. Tensile properties.
  5. Tear resistance.
  6. Carbon black content.
  7. Carbon black dispersion.
  8. Puncture resistance.
- B. These conformance tests shall be performed in accordance with Table A1, at a frequency of one sample per lot or one sample per 100,000 square feet, whichever results in the greater number of conformance tests. Oven Aging (ASTM D 5721) and UV Resistance (ASTM D 7238) shall be tested once per formulation as noted in Table A1. A lot number is defined as a continuous production process without changes to raw material or manufacturing methods. For every change in lot number, the Contractor shall perform conformance testing on the initial roll. This sampling frequency may be increased as deemed necessary by the Engineer. All costs for conformance testing will be paid for by the Contractor.

- C. All conformance test results shall be reviewed by the Engineer and accepted or rejected, prior to the placement of the geomembrane. All test result shall meet, or exceed, the property values listed in Appendix A and the latest version of GRI GM13. The course of action implemented for retesting failing tests shall be approved by the Engineer. In case of failing test results, the Manufacturer may request that another sample be retested by the independent laboratory with Manufacturer's technical representative present during the testing procedures. This retesting shall be paid for by the Contractor. The Manufacturer may also have the sample retested at two different laboratories approved by the Engineer. If both laboratories report passing results, the material shall be accepted. If both laboratories do not report passing results, all geomembrane material from the lot representing the failing sample will be considered out of specification and rejected.

### PART 3 EXECUTION

#### 3.01 SUBGRADE PREPARATION

- A. Preparation of the liner subgrade shall be as specified in drawings and Specification Section(s) 02200 and 02275.

#### 3.02 ANCHOR TRENCH

- A. The anchor trench shall be constructed as shown on the Drawings and as specified herein.
- B. The anchor trench shall be adequately drained to prevent water ponding and softening to adjacent soils. The anchor trench shall be backfilled with fill materials as shown on the Drawings and compacted to at least 90 percent of the Modified Proctor maximum dry density, as determined by ASTM D1557.
- C. The amount of trench open at any time shall be limited to one day of geomembrane installation capacity. Geosynthetic material in the anchor trench shall be temporary anchored with sandbags or other suitable materials.
- D. Backfilling of the anchor trench shall be conducted when the geomembrane is in its most contracted (taut) state.
- E. Care shall be taken when backfilling and compacting the trenches to prevent any damage to the lining materials.

#### 3.03 GEOMEMBRANE PLACEMENT

- A. Weather Conditions:
  - 1. Geomembrane placement shall not proceed at an ambient temperature below 32 degrees F or above 104 degrees F unless otherwise authorized, in writing, by the ENGINEER or his/her field representative. Geomembrane placement shall not be performed during precipitation, excessive moisture, in an area of ponded water, or excessive winds that adversely affect the geomembrane placement.
- B. Method of Placement:

1. Each panel of the geomembrane shall be rolled out and installed in accordance with the approved shop drawings prepared by the Contractor. The layout shall be designed to keep field seams of the HDPE geomembrane liner to a minimum and consistent with proper methods of HDPE geomembrane installation.
2. For geomembrane placed on 4 horizontal to 1 vertical (4H:1V) or steeper slopes, the seams shall be oriented in the direction of the slope (i.e., perpendicular to top of slope). Horizontal seams across the slope are not permitted, unless approved by the Engineer.
3. The rolled geomembrane shall have the white surface texture facing up. Each geomembrane panel shall be identified by panel number, roll number, and date of deployment. The geomembrane panel number shall be placed on the ends of each panel.
4. The equipment used to deploy the geomembrane shall not cause damage to the subgrade layer. If damage occurs, the Contractor shall suspend all geomembrane placement activities and repair the damages and immediately employ an alternative method for geomembrane deployment. Geomembrane rolls shall be placed using proper spreader and rolling bars so that the geomembrane would not be stretched during deployment. If a sheet must be replaced a distance greater than its width, a slip sheet shall be used.
5. The RPR shall inspect each panel, after placement and prior to seaming, for damage and/or defects. Defective or damaged panels shall be replaced or repaired, in accordance with Paragraph 3.07G.
6. The Installer shall avoid dragging the geomembrane sheets on rough soil subbase.
7. All geomembrane shall be anchored as shown on the Drawings and consistent with Manufacturer's recommendations.
8. Personnel working on the geomembrane shall not smoke, wear damaging shoes or involve themselves in any activity that may damage the geomembrane.
9. All edges of the geomembrane shall be properly weighted to avoid uplift due to wind.
10. Vehicular traffic across the geomembrane shall not be allowed, except as specified herein. Rubber-tired ATV's and trucks are acceptable if wheel contact is less than 6 psi. Any vehicle used prior to or after liner placement shall be first approved by the RPR. All vehicles are restricted from traveling on the liner material unless a temporary access is constructed. Vehicles, machinery, and equipment shall be operated to avoid abrupt stops, starts, or turns.
11. All damaged areas and destructive sample locations shall be recorded and located on the electronic as-built survey.
12. When tying into existing geomembrane, all excavation of previously installed liner shall be performed by hand to prevent damage.
13. The geomembrane shall be kept free of debris, unnecessary tools and materials. In general, the geomembrane area shall remain neat in appearance.

14. Equipment necessary to perform the installation (generators, compressors, etc) shall have a scrap geomembrane sheet placed underneath to protect the installed geomembrane from possible damage.
15. No welder or testing equipment shall be allowed to remain on top of the installed geomembrane overnight. All equipment must be removed and stored away from the installed geomembrane.
16. No fueling of Installer's equipment will be allowed on top of the installed geomembrane. No fuel containers shall be allowed on the geomembrane.

C. Liner Boots (Pipe Penetrations):

1. HDPE 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. One end of the boots shall terminate in a skirt section suitable for welding to the geomembrane liner. The overlap between the boot and the geomembrane shall be approximately 18 inches. The boot shall be welded to the geomembrane as previously specified herein.
3. Boots and shrouds shall fit snugly around the pipe. Prefabricated material shall be designed to fit site specific condition, for the intended slope and size of pipe.
4. A Neoprene rubber gasket shall be used between the boot and the pipe with a stainless steel clamp to provide an airtight seal. An HDPE sacrificial sheet shall be used between the boot or shroud and the clamp for protection.
5. For pipes larger than 4-inch diameter, a second clamp shall be used. The fastener of the second clamp shall be located on the opposite side of the pipe from the first clamp, to compensate for uneven pressure and elongation.

3.04 FIELD SEAMS

- A. Individual panels of geomembrane shall be laid out and overlapped by a minimum of 4 inches prior to welding. The area to be welded shall be cleaned and prepared in accordance with the quality control welding procedures approved by the RPR.
- B. Double track hot wedge fusion welds shall be used for straight welding. Care shall be taken during welding to prevent damage the underlying layer(s).
- C. Extrusion welds shall be used for patches, repairs and penetration boots, and detailed work.
- D. If requested by the RPR, the repairs and patches will have the black surface of the geomembrane facing up so that the final product is a white geomembrane with black patches.
- E. The welding equipment used shall be 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.

- F. No "fish mouths" will be allowed within the seam area. Where "fish mouths" occur, the material shall be cut, overlapped and a patch extrusion weld 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 seam shall be removed. Further welding will cease at this time and the Engineer shall be notified.
- G. All seams shall have a seam number that corresponds with the panel layout numbers. The numbering system shall be used in the development of the electronic as-built survey. Seam numbers shall be derived from the combination of the two panel numbers that are to be welded together.
- H. 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.
- I. All extrudate shall be free of dirt, dry and protected from damage.
- J. If an extrusion welder is stopped for longer than one minute, it shall be purged to remove heat-degraded extrudate. All purged extrudate shall be placed on a sacrificial sheet and disposed of.
- K. In general, seams should be oriented parallel to the line of maximum slope. In corners and odd-shaped geometric locations, the number of seams should be minimized. No horizontal seam should be less than 5 feet from the toe or crest of the slope, or from areas of potential stress concentrations, unless otherwise authorized by the Engineer. Horizontal seams shall be offset in adjacent panels by at least one panel width and seams shall be "shingled" downhill.
- L. All panels placed on sloped surfaces shall extend 10-ft inward (on the flat) from the toe of slope or edge of trench.
- M. All end seams shall be staggered a minimum of 5-ft in length between contiguous panels. No end seams are allowed on slopes 25 percent (4 horizontal and 1 vertical) or greater, unless otherwise approved by the Engineer.
- N. To prevent moisture buildup during fusion welding, it may be necessary to place a movable protective layer of plastic (skid sheet) directly below each overlap of geomembrane that is to be seamed.
- O. If required, a firm substrate shall be provided by using a flat board or similar hard surface directly under the seam overlap to achieve proper support.
- P. All seam welds shall extend the full extent into the anchor trench.
- Q. All factory seams, field seams and repair welds shall meet seam strength requirements specified in Appendix A, Table A2 and GRI GM19.

### 3.05 SEAMING WEATHER CONDITIONS

- A. Normal Weather Conditions:

1. The normal required weather conditions for seaming are:
  - a. Ambient temperature higher than 32 degrees F and lower than 104 degrees F.
  - b. No precipitation or other excessive moisture, such as fog or dew.
  - c. No excessive winds.
2. These weather conditions shall be fulfilled during seaming process.

B. Cold Weather Conditions:

1. If the ambient air temperature is below 32 degrees F, the following procedures shall be implemented:
  - a. Preheating the surface of the geomembrane to achieve normal temperature range.
  - b. Preheating may be waived by the RPR 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. Additional destructive tests samples shall be taken at the discretion of the RPR.
  - f. Test seams, as described in Paragraph 3.06A, shall be performed under the same ambient temperature conditions as the actual seams.

C. Warm Weather Conditions:

1. If the ambient air temperature is above 104 degrees F, no seaming of geomembrane shall be permitted unless the Installer can demonstrate to the satisfaction of the RPR that geomembrane seam quality is not adversely impacted.
2. Test seams shall be performed under the same ambient air temperature conditions as the actual seams.
3. Additional destructive tests shall be taken at the discretion of the RPR.

3.06 FIELD QUALITY CONTROL

A. Start-up 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, time of day, Seamer's initials, temperature and speed settings (for fusion welds) or temperature and preheat settings (for extrusion welds), and machine number. A tensiometer shall be required to be on-site before and during geomembrane installation for the purpose of testing samples. Six 1-inch wide specimens shall be cut from the test weld and tested on-site in the presence of the RPR for shear and peel strength (3 each) in accordance with Appendix A, Table A2 and GRI GM19. No welder may start work until the sample weld has been approved by the RPR.
2. Test seams shall be performed under the same conditions as the actual seams and shall be at least 3-ft long and 1-ft wide after seaming. Material for test seams shall be cut out of the approved geomembrane rolls.



B. Nondestructive Seam Testing:

1. The Installer shall perform nondestructive test on all field seams over their full length. The purpose of this test is to assure continuity and integrity of the seams. Vacuum and air pressure tests shall be used for nondestructive testing. The vacuum test shall be used for extrusion welds. The air pressure test shall be used for double track hot wedge welds.
2. Vacuum Testing:
  - a. Equipment for testing single wedge fusion seams and extrusion seams 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 gauge.
    - 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-inch by 48-inch (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 10 seconds, examine the geomembrane through the viewing window for the presence of soap bubbles.
    - 9) If no bubbles appear after 10 seconds, close the vacuum valve and open the bleed valve, move the box over the next adjoining area with a minimum of 3-inch overlap and repeat the process.
    - 10) All areas where soap bubbles appear shall be marked and repaired in accordance with Paragraph 3.07G and then retested.
    - 11) All test locations which have passed vacuum testing shall be marked with the test date and individual performing the test.
  - c. If the seam is not accessible to vacuum box equipment cannot be tested prior to final installation, the seaming operations shall be observed by the RPR for uniformity and completeness.
3. Air Pressure Testing (for double track fusion seams only):
  - a. The following procedures are applicable to those processes which produce a double seam with an enclosed space.
  - b. Equipment for testing double fusion seams shall be comprised of the following:
    - 1) An air pump equipped with pressure gauge 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 seam to be tested. The length of seam shall not exceed 500-ft without approval by the RPR.
  - 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. After allowing two minutes for relaxation, the pressure shall be monitored over a test period not less than five minutes.
  - 4) If the loss of pressure exceeds 4 psi, or the pressure does not stabilize, the weld shall be considered faulty (unless the Installer can demonstrate that monitoring for an additional five minutes does not cause an additional loss in pressure in excess of 1 psi, and that the pressure stabilizes within the second monitoring period). Locate the faulty area, repair in accordance with Paragraph 3.07G and retest.
  - 5) If the faulty area cannot be isolated and repaired, the length of seam which cannot be tested shall be capped with geomembrane strip, extrusion welded and vacuum tested. The seam shall be documented as a failed seam indicating the corrective measure.
  - 6) If the pressure loss is less than 2 psi after five minutes, cut the air channel on the opposite end the pressure device to confirm there is no blockage and verify the length of the seam tested. Remove needle of other approved pressured feed device and seal with an extrusion weld.
  - 7) Remove needle or other approved pressure feed device and seal.
  - 8) All test locations which have passed air pressure testing shall be marked with the test date and individual performing the test.
- d. Destructive seam testing shall be performed in accordance with Paragraph 3.07 below.

### 3.07 DESTRUCTIVE SEAM TESTING

- A. The purpose of the destructive testing is to evaluate seam strength properties. Unless otherwise approved by the Engineer, a minimum of one destructive test sample shall be obtained per 500-ft of performed seam length or one sample per crew per day, whichever yields the largest number of samples. The location of samples shall be determined by the RPR. Selection of such locations may be prompted by suspicion of overheating, contamination, or other potential cause that may adversely impact the welds. Location at samples shall not be revealed to Installer in advance. Sampling shall be performed by the Installer. Testing of field samples shall be performed by Installer's qualified technicians.
- B. Sampling Procedures:
1. Samples shall be cut by the Installer at locations chosen by the RPR as the seaming progresses.
  2. The seams shall not be covered by another material before they have been tested and accepted by RPR.
  3. Upon obtaining each sample, 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 3.07G.

C. Size and Disposition of Samples:

1. Two samples shall be cut with a 1-inch wide die, with the seam centered parallel to the width. The distance between these two samples shall be no less than 36 inches. If the samples pass the field test described in Paragraph 3.07D, a sample for laboratory testing shall be taken.
2. The sample for laboratory testing shall be located between the samples for field testing. The sample for laboratory testing shall be 12-inch wide by 36-inch long with the seam centered lengthwise. The sample shall be cut into three parts and distributed as follows:
  - a. One portion to the Installer for optional field testing, 12-inch by 12-inch.
  - b. One portion for geosynthetic laboratory quality assurance testing, 12-inch by 12-inch.
  - c. One portion to the Engineer for archive storage, 12-inch by 12-inch.

D. Field Testing:

1. The following shall be performed by the Installer's qualified technician in the presence of the RPR:
  - a. The Installer shall cut six 1-inch wide replicate specimens from the field testing samples to be tested for shear and peel strength, in accordance with the criteria set in Appendix A, Table A2 and GRI GM19.
  - b. The Installer shall test three specimens for shear seam strength and three for peel strength. All replicate test specimens shall pass for the seam to be acceptable.
  - c. Samples shall be tested with a tensiometer equipped with a drive/pull apparatus adjusted to a pull rate of 2-inch per minute for both peel and shear testing. Each sample shall be tested until film tearing bond (FTB) is achieved. At a minimum, the required pass criteria for peel shall be as specified in Appendix A, Table A2 and GRI GM19.
  - d. Any specimen that fails through the weld or through the fusion at the weld sheet interface is a non-FTB (Film Tearing Bond) break and shall be considered a failure even if it achieves the acceptable strengths.

E. Quality Assurance Laboratory Test:

1. The Contractor shall package and ship destructive test samples to the GRI accredited independent Quality Assurance Laboratory (QAL) approved by the Engineer by overnight delivery service. The cost for shipping and testing are to be paid for in accordance with Section 01020 – Allowances.
2. Laboratory test shall include shear and peel strength tests performed in accordance with ASTM D6392. The minimum acceptable values obtained in these tests shall be in accordance with Appendix A, Table A2 and GRI GM19.
3. At least five specimens shall be tested each for shear and peel strength. A passing test shall meet the minimum required values in all five specimens tested for each method.

4. The QAL shall provide verbal test results to the RPR no more than 24 hours after they receive the samples. The RPR shall review the laboratory results as soon as they become available.

F. Procedures for Destructive Test Failure:

1. The following procedures shall apply whenever a sample fails a destructive test, whether that test is conducted in the field or by the QAL. The Installer has two options:
  - a. The Installer can repair the seam between any two passing test locations in accordance with Paragraph 3.07G.
  - b. The Installer can retrace the welding path to an intermediate location a minimum of 10-ft on each side of the failed sample. The sample shall be tested in the field. Subsequent failure of test samples shall cause the testing to move further down the seam until the extent of faulty seam has been determined. Costs for shipping and retesting destructive samples shall be borne by the Contractor.
  - c. In the event the whole seam is determined to be faulty the Engineer may request samples to be taken from the previous seam welded by the same machine and welder, until two passing tests are obtained.
2. All acceptable repaired seams shall be bound by two consecutive passing locations on each side of the original sample. In cases where repaired seam exceeds 150-ft, a sample taken from the zone in which the seam has been repaired must pass destructive testing. Repairs shall be made in accordance with Paragraph 3.07G.
3. The RPR shall document all actions taken in conjunction with destructive test failures.

G. Repair Procedures:

1. Any portion of the geomembrane exhibiting signs of any kind of defect, or failing a destructive or a nondestructive test, shall be repaired. Several procedures exist for the repair of these areas. The final decision as to the appropriate repair procedure shall be made by the RPR.
2. The repair procedures available include:
  - a. Patching, used to repair large holes, tears, undispersed raw materials and contamination by foreign matter.
  - b. Spot welding or seaming used to repair small tears, pinholes, or other minor, localized defects.
  - c. Capping is used to repair large lengths of failed seams.
  - d. Removing bad seam and replacing with a strip of new material welded in place.
  - e. For small lengths of failed seam (less than 3 feet), extrusion welding can be used to repair provided there is sufficient overlap between the two geomembrane panels.
  - f. Extrusion welding the flap of a fusion welded seam is not an acceptable repair procedure.
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 no more than one hour prior to the repair.
  - b. All surfaces shall be clean and dry at the time of the repair.
  - c. All seaming equipment used in repairing procedures shall be qualified.
  - d. All patches and caps shall extend at least 4 inches beyond the edge of the defect.

- e. All patches shall have rounded corners.

H. Repair Verification:

- 1. Each repair shall be numbered and logged by the Installer. Each repair shall be nondestructively tested using the methods described in Paragraph 3.06 as appropriate. 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 RPR. Failed test of the repaired section indicates that the repair shall be redone and retested until a passing test results are achieved. The RPR shall observe all nondestructive testing of repairs. The Installer shall record the number of each repair, date and test outcome.

I. Wrinkles:

- 1. Large wrinkles that remain in the sheet as result of temperature expansion or uneven surface preparation may need removal as determined by the RPR in consideration of applied loads on the wrinkle. Should the wrinkle need removing, the lower down-slope edge of the wrinkle shall be cut, overlapped and repaired as described in Paragraph 3.07G. Both ends of the wrinkle repair shall be patched. Caution must be taken in removing any wrinkles. Wrinkles are needed to allow for future contraction of the geomembrane liner, especially in cold weather.

J. Construction Equipment:

- 1. Vehicular traffic across the geomembrane shall not be allowed, except as specified herein. Rubber-tired ATV's and trucks are acceptable if wheel contact is less than 6 psi. Any vehicle used prior to or after liner placement shall be first approved by the RPR. All vehicles are restricted from traveling on the liner material unless a temporary access is constructed. Vehicles, machinery, and equipment shall be operated to avoid abrupt stops, starts, or turns.
- 2. Construction equipment or vehicles with steel tracks shall not be permitted on the geomembrane.
- 3. Other equipment such as portable generators and power centers shall be permitted if the support apparatus is protected from damaging the liner, and if care is taken to prevent leaking lubricants from damaging the geomembrane.

3.08 DISPOSAL OF WASTE MATERIAL

- A. Upon completion of installation, the Contractor shall properly remove and dispose of all trash, waste material and equipment used in connection with the performed work and shall leave the premises in a neat and acceptable condition.

3.09 LINER AS-BUILT SURVEY

- A. The Installer shall prepare and submit to the Engineer an electronic as-built survey reflecting the actual installation of geomembrane liner, including the location of all seams, the location of destructive samples, and the location of all repair work. The electronic as-built survey shall be

submitted to the Engineer within twenty-one days of job completion. In addition, a copy of the complete documentation package will accompany the electronic as-built survey.

END OF SECTION  
(*appendices follow*)

## **APPENDIX A**

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**TABLE A1 - MATERIAL PROPERTIES**  
**HIGH DENSITY POLYETHYLENE (HDPE) GEOMEMBRANE - TEXTURED SHEET**

|                               |                           |              |                         | <b>Specified Thickness (mil)</b> | <b>Min. Testing Frequency</b> |
|-------------------------------|---------------------------|--------------|-------------------------|----------------------------------|-------------------------------|
| <b>Property</b>               | <b>Unit</b>               | <b>Value</b> | <b>Test Method</b>      | <b>60</b>                        |                               |
| Thickness                     | Mil                       | min. ave.    | ASTM D5994              |                                  |                               |
| -Minimum Average              | Mil                       |              |                         | 57                               | per roll                      |
| -Lowest Individual            | Mil                       |              |                         | 54                               |                               |
| -Asperity Height <sup>2</sup> | Mil                       | min. ave.    | ASTM D7466              | 18                               | per roll                      |
| Density                       | g/ml                      | min.         | ASTM D1505/D792         | 0.940                            | 200,000 lb                    |
| Tensile Properties            | lb/in                     | min. ave.    | ASTM D6693<br>Type IV   |                                  | 20,000 lb                     |
| -Yield Stress                 | lb/in                     |              |                         | 126                              |                               |
| -Break Stress                 | lb/in                     |              |                         | 90                               |                               |
| -Yield Elongation             | %                         |              |                         | 12                               |                               |
| -Break Elongation             | %                         |              |                         | 100                              |                               |
| Tear Resistance               | lb                        | min. ave.    | ASTM D1004              | 42                               | 45,000 lb                     |
| Puncture Resistance           | lb                        | min. ave.    | ASTM D4833              | 90                               | 45,000 lb                     |
| Stress Crack Resistance       | Hr.                       | min.         | ASTM D5397 (APP. A)     | 300                              | per GRI-GM10                  |
| Carbon Black Content          | %                         | range        | ASTM 4218<br>ASTM D1603 | 2-3                              | 20,000 lb                     |
| Carbon Black Dispersion       |                           | category     | ASTM D5596              | 9 in 1 or 2,<br>≤ 1 in 3         | 45,000 lb                     |
| Oxidative Induction Time      |                           |              |                         |                                  |                               |
| -Standard OIT, or             | Minutes                   | min. ave.    | ASTM D3895              | 100                              | 200,000 lb                    |
| -High Pressure OIT            | Minutes                   | min. ave.    | ASTM D5885              | 400                              | 200,000 lb                    |
| Oven Aging @ 85C              |                           |              | ASTM D5721              |                                  |                               |
| -Standard OIT, or             | % retained after 90 days  | min. ave.    | ASTM D3895              | 55                               | per formulation               |
| -High Pressure OIT            | % retained after 90 days  | min. ave.    | ASTM D5885              | 80                               | per formulation               |
| UV Resistance                 |                           |              | ASTM D7238              |                                  |                               |
| -High Pressure OIT            | % retained after 1600 hrs | min ave.     | ASTM D5885              | 50                               | per formulation               |

<sup>1</sup>Testing methods and procedures shall be in accordance with GRI, GM13 document.

<sup>2</sup>Material with a higher asperity height may be used to obtain the minimum peak friction angles specified in Section 02275 1.03A.3.

**TABLE A2  
FACTORY AND FIELD SEAMS PROPERTIES  
HIGH DENSITY POLYETHYLENE (HDPE) GEOMEMBRANE**

| PROPERTY       | UNIT  | VALUE | TEST METHOD <sup>1</sup> | SPECIFIED THICKNESS (mil) |
|----------------|-------|-------|--------------------------|---------------------------|
|                |       |       |                          | 60                        |
| Shear Strength |       |       |                          |                           |
| Fusion         | lb/in | min.  | ASTM D6392               | 120                       |
| Extrusion      | lb/in | min.  | ASTM D6392               | 120                       |
|                |       |       |                          |                           |
| Peel Strength  |       |       |                          |                           |
| Fusion         | lb/in | min.  | ASTM D6392               | 91                        |
| Extrusion      | lb/in | min.  | ASTM D6392               | 78                        |

<sup>1</sup>Testing methods and procedures shall be in accordance with ASTM D6392 and GRI, GM19 document.

**END OF APPENDIX A**

## **APPENDIX B**

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## **APPENDIX B**

The following forms are included and shall be completed by the responsible party as shown on the forms.

| Form No. | Title                                      |
|----------|--------------------------------------------|
| 1.       | Subgrade Surface Acceptance                |
| 2.       | Daily CQC Report                           |
| 3.       | Trial Weld Log                             |
| 4.       | Material Receiving Log                     |
| 5.       | Daily Panel Placement Log                  |
| 6.       | Daily Seaming Log                          |
| 7.       | Seam Inspection Log - Air Pressure Testing |
| 8.       | Seam Inspection Log - Vacuum Testing       |
| 9.       | Destructive Sample Log                     |

## SUBGRADE SURFACE ACCEPTANCE

DATE: \_\_\_\_\_ PROJECT NUMBER: \_\_\_\_\_

PROJECT NAME: \_\_\_\_\_

EARTH CONTRACTOR: \_\_\_\_\_

ADDRESS: \_\_\_\_\_

CITY: \_\_\_\_\_ STATE: \_\_\_\_\_ ZIP: \_\_\_\_\_

SUPERINTENDENT OF PROJECT: \_\_\_\_\_ PHONE: \_\_\_\_\_

GEOMEMBRANE INSTALLER: \_\_\_\_\_

ADDRESS: \_\_\_\_\_

CITY: \_\_\_\_\_ STATE: \_\_\_\_\_ ZIP: \_\_\_\_\_

SUPERINTENDENT OF PROJECT: \_\_\_\_\_ PHONE: \_\_\_\_\_

## CERTIFICATE OF ACCEPTANCE OF SUBGRADE SOIL BY INSTALLER

I the undersigned, duly authorize representative of

\_\_\_\_\_

do hereby accept the soil surface as being acceptable for placement of a geomembrane liner.

| Name | Signature | Title | Date |
|------|-----------|-------|------|
|------|-----------|-------|------|

Certificate Accepted by Inspector-Company: \_\_\_\_\_

| Name | Signature | Title | Date |
|------|-----------|-------|------|
|------|-----------|-------|------|

EFR: \_\_\_\_\_

CONTRACTOR'S REPRESENTATIVE: \_\_\_\_\_

INSTALLING SUPERVISOR: \_\_\_\_\_

*Use back for comments.*

## DAILY CQC REPORT

PROJECT:

DATE:\_\_\_\_\_ WEATHER:\_\_\_\_\_ TEMP.: AM\_\_PM\_\_

CONTRACTOR:\_\_\_\_\_

Log:\_\_\_\_\_

---

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---

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---

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Deficiencies and Corrective

Actions:\_\_\_\_\_

---

---

Outstanding

Items:\_\_\_\_\_

---

Attachments:\_\_\_\_\_

---

---

QA/QC MANAGER:\_\_\_\_\_

DATE:\_\_\_\_\_

**MATERIAL RECEIVING LOG 1 of 7**

**PROJECT NAME:** \_\_\_\_\_

**DATE:** \_\_\_\_\_ **PROJECT NO.:** \_\_\_\_\_ **MATERIAL TYPE:** \_\_\_\_\_

| <b>BATCH/<br/>LOT NO.</b> | <b>FACTORY<br/>ROLL NO.</b> | <b>LENGTH</b> | <b>WIDTH</b> | <b>COMMENTS</b> |
|---------------------------|-----------------------------|---------------|--------------|-----------------|
|                           |                             |               |              |                 |
|                           |                             |               |              |                 |
|                           |                             |               |              |                 |
|                           |                             |               |              |                 |
|                           |                             |               |              |                 |
|                           |                             |               |              |                 |
|                           |                             |               |              |                 |
|                           |                             |               |              |                 |
|                           |                             |               |              |                 |
|                           |                             |               |              |                 |

NOTE: BILLS OF LADING/SHIPPING STATEMENTS ATTACHED



**DAILY PANEL PLACEMENT LOG 2 of 7**

**PROJECT NAME:** \_\_\_\_\_

**DATE:** \_\_\_\_\_ **PROJECT NO.:** \_\_\_\_\_ **MATERIAL TYPE:** \_\_\_\_\_

| <b>PANEL NO.</b> | <b>FACTORY<br/>ROLL NO.</b> | <b>LENGTH</b> | <b>WIDTH</b> | <b>COMMENTS</b> |
|------------------|-----------------------------|---------------|--------------|-----------------|
|                  |                             |               |              |                 |
|                  |                             |               |              |                 |
|                  |                             |               |              |                 |
|                  |                             |               |              |                 |
|                  |                             |               |              |                 |
|                  |                             |               |              |                 |
|                  |                             |               |              |                 |

**TOTAL SO. FT. DEPLOYED TODAY:**

\_\_\_\_\_

# TRIAL WELD LOG 3 of 7

PROJECT NAME: \_\_\_\_\_

DATE: \_\_\_\_\_

PROJECT NO.: \_\_\_\_\_

MATERIAL TYPE: \_\_\_\_\_

| SEAMER I.D. | MACHINE<br>NUMBER | AMBIENT<br>TEMPERATURE | AM/<br>PM | EXTRUSION WELDS<br>MACHINE<br>TEMP/PREHEAT TEMP | FUSION WELDS<br>WEDGE<br>TEMP/SPEED SET | PEEL VALUES<br>LBS/INCH | SHEAR<br>VALUES<br>LBS/INCH |
|-------------|-------------------|------------------------|-----------|-------------------------------------------------|-----------------------------------------|-------------------------|-----------------------------|
|             |                   |                        |           |                                                 |                                         |                         |                             |
|             |                   |                        |           |                                                 |                                         |                         |                             |
|             |                   |                        |           |                                                 |                                         |                         |                             |
|             |                   |                        |           |                                                 |                                         |                         |                             |
|             |                   |                        |           |                                                 |                                         |                         |                             |
|             |                   |                        |           |                                                 |                                         |                         |                             |
|             |                   |                        |           |                                                 |                                         |                         |                             |
|             |                   |                        |           |                                                 |                                         |                         |                             |
|             |                   |                        |           |                                                 |                                         |                         |                             |
|             |                   |                        |           |                                                 |                                         |                         |                             |

DAILY SEAMING LOG 4 of 7

PROJECT NAME: \_\_\_\_\_

DATE: \_\_\_\_\_ PROJECT NO.: \_\_\_\_\_ MATERIAL TYPE: \_\_\_\_\_

| SEAMER I.D.                                  | SEAM LENGTH | AM/PM | COMMENTS |
|----------------------------------------------|-------------|-------|----------|
|                                              |             |       |          |
|                                              |             |       |          |
|                                              |             |       |          |
|                                              |             |       |          |
|                                              |             |       |          |
|                                              |             |       |          |
|                                              |             |       |          |
|                                              |             |       |          |
|                                              |             |       |          |
|                                              |             |       |          |
|                                              |             |       |          |
|                                              |             |       |          |
|                                              |             |       |          |
|                                              |             |       |          |
| TOTAL LINEAL FEET WELDED:                    |             |       |          |
| TODAY _____ FUSION WELD _____ EXTRUSION WELD |             |       |          |

SEAM INSPECTION LOG 5 of 7 - FUSION WELD

AIR PRESSURE TESTING

PROJECT NAME: \_\_\_\_\_

DATE: \_\_\_\_\_ PROJECT NO.: \_\_\_\_\_ MATERIAL TYPE: \_\_\_\_\_

| SEAMER<br>I.D. NO. | START<br>TIME | END<br>TIME | START<br>PRESSURE | END<br>PRESSURE | +/- | LENGTH<br>TESTED | COMMENTS |
|--------------------|---------------|-------------|-------------------|-----------------|-----|------------------|----------|
|                    |               |             |                   |                 |     |                  |          |
|                    |               |             |                   |                 |     |                  |          |
|                    |               |             |                   |                 |     |                  |          |
|                    |               |             |                   |                 |     |                  |          |
|                    |               |             |                   |                 |     |                  |          |
|                    |               |             |                   |                 |     |                  |          |
|                    |               |             |                   |                 |     |                  |          |
|                    |               |             |                   |                 |     |                  |          |
|                    |               |             |                   |                 |     |                  |          |
|                    |               |             |                   |                 |     |                  |          |

## SEAM INSPECTION LOG 6 of 7 - EXTRUSION WELD

## VACUUM TESTING

PROJECT NAME: \_\_\_\_\_

PRIMARY/SECONDARY: \_\_\_\_\_ PROJECT NO: \_\_\_\_\_ MATERIAL TYPE: \_\_\_\_\_

[illegible]

## DESTRUCTIVE SAMPLE LOG 7 of 7

**PROJECT NAME:** \_\_\_\_\_

**DATE:**\_\_\_\_\_ **PROJECT NO.:**\_\_\_\_\_ **MATERIAL NO.:**\_\_\_\_\_

[illegible]

ATTACHMENT A

Caja del Rio Landfill Construction Quality Assurance Plan

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# VOLUME IV EXHIBIT 17

## **Caja del Rio Landfill** Construction Quality Assurance Plan (CQAP) - Liner and Cover Construction

\*This exhibit will be incorporated into  
the Landfill Operations Manual

Santa Fe Solid Waste  
Management Agency

July 2015



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# Section 1

## Introduction

This Construction Quality Assurance (CQA) Plan, in accordance with *New Mexico Environment Department (NMED) Testing and Quality Control for Liners and Final Covers*, is provided to supplement the project specifications. *New Mexico Administrative Code (NMAC) 20.9.4.14*, requires that a site-specific CQA Plan be submitted and approved by the NMED prior to commencement of any construction activities. Adherence to the procedures and policies of this CQA Plan will ensure that the completed work will have been constructed to meet or exceed all design criteria plans and specifications.

At least 14 days prior to the start of solid waste facility construction, the owner or operator shall provide the department with a major milestone schedule.

### 1.1 Document Purpose

This CQA Plan is for construction activities at the Caja del Rio Landfill as contracted by Santa Fe Solid Waste Management Agency (SFSWMA). The Plan objective is to ensure that construction requirements are properly implemented and that the design and performance standards are achieved.

This plan includes four elements. These are:

1. Responsibility and Authority
2. Personnel Qualifications
3. Inspection Activities
4. Documentation

This CQA Plan provides guidance and requirements to determine that:

- Critical materials specified in the contract documents are supplied and installed in accordance with the source, design, and performance criteria in order to meet the overall intent of the construction.
- CQA reports, samples, and test results are substantiated and maintained as proof to the quality of construction in accordance with the approved design criteria for each site.
- Each party involved has a clear understanding of what is required for each component of the construction therefore decreasing the possibility for confusion over the minimum acceptable requirements during construction.

## 1.2 Document Users

Use of this document will be required of the following companies and agencies participating in the construction.

- New Mexico Environment Department Solid Waste Bureau
- SFSWMA
- Consulting Engineer
- Construction Quality Assurance Personnel
- Contractor & Subcontractors
- Approved Testing Laboratories

Any other subcontractor, subconsultant, or laboratory which eventually becomes a participant in the project will be required to implement the provisions of this document.

## 1.3 Concepts of Construction Quality Control/Assurance

The management of construction quality assurance is the responsibility of the Engineer. This function involves the use of appropriate scientific and engineering principles and practices to confirm that the specific landfill components have been constructed to meet or exceed the intent of the design criteria, plans, and specifications. To accomplish this, construction quality control activities will be performed by the Supervising Contractor and provided to the CQA Certifying Engineer for approval and incorporation into a final construction completion report. Construction quality control is a planned system of inspections that is used to directly monitor and control the quality of the construction process. The construction quality assurance will be performed by the Construction Quality Assurance Personnel. Therefore, the quality assurance will be performed independently of the parties engaged in direct construction activities. Quality assurance will include the inspections, verifications, audits, and evaluations of materials and workmanship detailed in this plan, necessary to determine and document the quality of construction for the facility.

## 1.4 Scope of Quality Control and Quality Assurance

The scope of this CQA Plan includes full-time quality assurance of the construction activities.

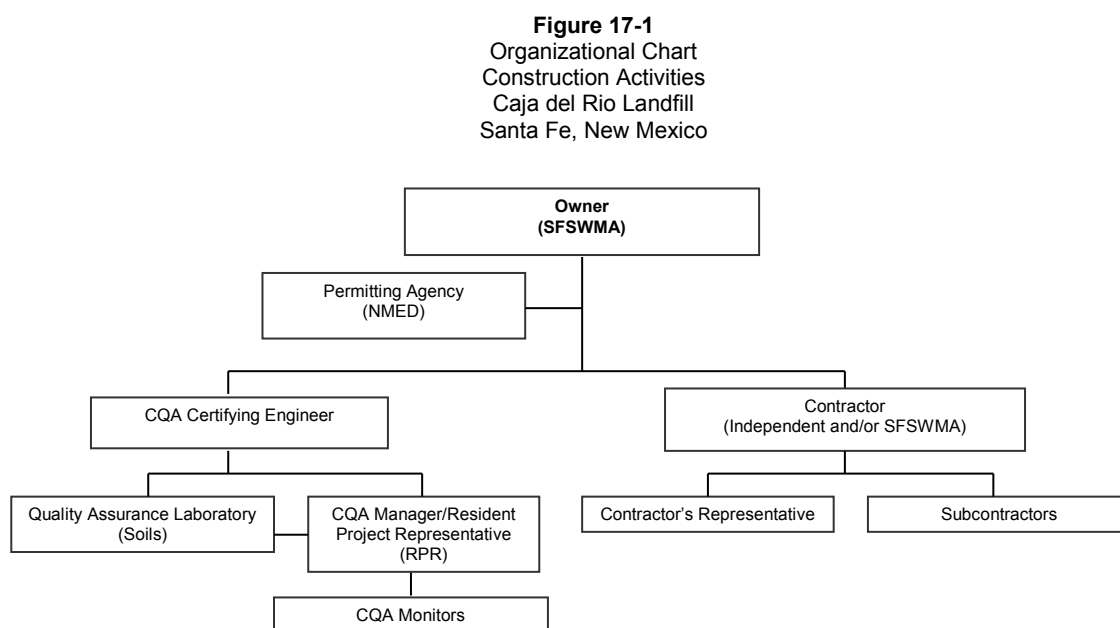
## 1.5 References

The CQA Plan includes references to test procedures of the American Society for Testing and Materials (ASTM). Recognizing the changing nature of the above standards, this CQA Plan is subject to periodic revision.

## Section 2

# Definitions, Responsibilities of Parties, and Qualifications

The parties discussed in this section are associated with the design, transportation, execution, and quality assurance of the construction activities at the landfill. The definitions, qualifications, and responsibilities of these parties are outlined in the following subsections. **Figure 17-1** provides an organizational layout of the parties.



All CQA personnel will be employed by an organization that operates independently of the Owner and Contractor. However, SFSWMA may be involved in CQA activities under the direct supervision of the CQA Certifying Engineer and/or CQA Manager.

### 2.1 Owner

SFSWMA is the Owner for the design, construction, and final closure of the landfill facility. This responsibility includes complying with the requirements of the permitting agency, New Mexico Environment Department (NMED), and reviewing the submitted CQA documentation to ensure that the landfill improvements were constructed as specified in the design. SFSWMA has the authority to select and dismiss organizations charged with design, CQA, and construction activities. SFSWMA also has the authority to accept or reject design plans and specifications, CQA plans, reports and recommendations of the CQA Manager/Resident Project Representative (RPR), and the materials and workmanship of the Contractor (when not acting as the Contractor).

## 2.2 Contractor

### 2.2.1 Responsibilities

The Contractor is the principal contractor retained by SFSWMA to perform the construction activities, unless SFSWMA self-performs the construction. In this event, SFSWMA will take on the responsibilities of the Contractor during CQA activities. The Contractor is responsible for scheduling and coordination of the required work with subcontractors (as necessary) to complete the project. The Contractor shall provide a representative at all times during any construction activity onsite. The Contractor is responsible for furnishing as-built drawings and a copy of complete documentation for the construction. The Contractor is also responsible for updating all design drawings onsite daily for all deviations from the contract drawings. All deviations must be initialed and approved by the responsible CQA Manager/RPR onsite.

### 2.2.2 Qualifications

The Contractor shall be qualified to perform all aspects of work required to successfully construct the project. The Contractor shall be licensed in the State of New Mexico and shall demonstrate prior related experience. If SFSWMA self-performs the construction, it shall be exempt from these qualifications.

## 2.3 Contractor's Representative

### 2.3.1 Responsibilities

The Contractor's Representative is responsible for coordinating and supervising his crew and subcontractors' work onsite. In the event that SFSWMA self-performs the construction efforts, SFSWMA will take on the responsibilities of the Contractor's Representative. The Contractor's Representative is responsible for making sure that the construction activities are conducted in accordance with the plans and specifications. The Contractor's Representative is responsible for properly labeling, packaging, and shipping all of the laboratory test samples. The Contractor's Representative is responsible for pointing out to the CQA Manager/RPR any discrepancies between the plans and specifications and the field conditions. The Contractor's Representative is responsible for attending all meetings held related to the project. The Contractor's Representative is responsible for keeping a log of all construction activities onsite. The Contractor's Representative is responsible for proposing alternative methods, where necessary, to the CQA Manager/RPR for approval and signature as required per the specifications.

### 2.3.2 Qualifications

The Contractor's Representative shall be a qualified individual who is able to perform all the tasks associated with the construction activities. The Contractor's Representative shall demonstrate prior and similar experience to the CQA Manager/RPR. The Contractor's Representative shall have the authority to direct and instruct his crew and his subcontractors (as necessary).

## 2.4 CQA Certifying Engineer

### 2.4.1 Responsibilities

The CQA Certifying Engineer is responsible for all CQA activities being performed during construction. The CQA Certifying Engineer may have also performed the engineering design and prepared the associated drawings and specifications for the construction activities, however, this role may be performed by others. The CQA Certifying Engineer is responsible for approving all design and specification changes and making design clarifications necessitated during the construction activities. The CQA Certifying Engineer is responsible for reviewing and approving shop drawings submitted by the Contractor, as required by the contract documents. The CQA Certification Engineer is responsible for certifying all testing and evaluation of liners prior to the placement of the protective cover. The CQA Certification Engineer is also responsible for submitting the final record drawings and certification report to the Supervising Authority/Contract Owner and the NMED. The CQA Certifying Engineer will be employed by an organization that operates independently of the Owner and Contractor. The Site CQA Manager shall maintain records, on appropriate CQA forms, of quality control operations, inspections and tests performed relative to the work of Suppliers and Contractors.

### 2.4.2 Qualifications

The CQA Certifying Engineer shall be licensed by the New Mexico State Board of Licensure for Professional Engineers and Surveyors. The CQA Certifying Engineer shall be familiar with all applicable regulatory requirements.

## 2.5 CQA Manager/Resident Project Representative (RPR)

### 2.5.1 Responsibilities

The CQA Manager/RPR is responsible for observing and documenting activities related to the construction on behalf of the Owner. This position may be occupied by one person or two individuals: one acting as the CQA Manager, while the other acts as the RPR. In the scope of this document, the term CQA Manager/RPR applies to a qualified individual(s) assigned by the CQA Certifying Engineer to oversee construction activities.

The specific duties of the CQA Manager/RPR personnel are as follows:

1. Develops a site-specific addendum for the quality assurance plan (if necessary) with the assistance of the CQA Certifying Engineer.
2. Reviews all Manufacturer and Installer certifications and documentation and makes appropriate recommendations, as required by the contract documents.
3. Reviews Liner Installer personnel qualifications for conformance with those qualifications pre-approved for work onsite.
4. Reviews design criteria, plans, and specifications for clarity and completeness so that the CQA Plan can be implemented.

5. Prepares a summary of the quantities of materials installed and tested.
6. Prepares summaries of the cover system quality assurance activities.
7. Oversees the marking, packaging and shipping of all laboratory test samples.
8. Reviews the result of laboratory testing and makes appropriate recommendations.
9. Reports any unapproved deviations from the CQA Plan to the CQA Certifying Engineer.
10. Prepares the final certification report.
11. Monitors the following operations for all cover system material:
  - a. Material delivery
  - b. Unloading and onsite transport and storage
  - c. Sampling for conformance testing
  - d. Deployment operations
  - e. Visual inspection by walkover
  - f. Repair operations
12. Documents any onsite activities that could result in damage to the cover system. Any problems noted shall be reported as soon as possible to the CQA Certifying Engineer.
13. Identification of work to the CQA Certifying Engineer that the CQA Manager/RPR believes should be accepted, rejected, or uncovered for observation, or that may require special testing, inspection, or approval.
14. Rejection of defective work and verification that corrective measures are implemented.
15. Reviewing design criteria, plans, and specifications for clarity and completeness so that the CQA plan can be implemented.
16. Educating CQA inspection personnel on CQA requirements and procedures, as necessary.
17. Scheduling and coordinating CQA inspection activities.
18. Provides copies of any logs, summary reports, or other documentation requested by the CQA Certifying Engineer.

### 2.5.2 Qualifications

The CQA Manager/RPR should possess formal training, be qualified by experience, and have an in-depth familiarity with the project and knowledge regarding all aspects of landfill construction.

## 2.6 Construction Quality Assurance Monitors

### 2.6.1 Responsibilities

The term “CQA Monitor” applies to any qualified individuals working under the CQA Manager/RPR to implement the CQA Plan, as deemed appropriate based upon the burden of inspection, sampling, and documentation necessary during construction activities. The overall responsibility of CQA Monitors is to perform the activities specified in this plan (e.g., inspection, sampling, documentation). CQA Monitors will be onsite during installation of all critical components of the production and installation of the geosynthetic system, final cover, leachate collection system and stormwater control system.

The specific responsibilities and authority of each of these individuals, as amended by the CQA Manager/RPR, are defined as follows:

1. Reviews all design drawings and specifications.
2. Reviews other site-specific documentation, including proposed layouts, and manufacturer and installer literature.
3. Reviews all changes to design drawings and specifications as issued by the CQA Certifying Engineer.
4. Acts as an onsite representative of the Owner.
5. Attends all quality assurance related meetings.
6. Participates in the preparation of the record drawings.
7. Reviews all reports, logs, and photographs.
8. Notes any onsite activities that could result in damage to the lining and/or cover systems.
9. Monitors the following operations for all lining system materials:
  - a. Material delivery
  - b. Unloading and on-site transport and storage
  - c. Sampling for conformance testing
  - d. Deployment operations
  - e. Joining and/or seaming operations

- f. Condition of panels as placed
  - g. Visual inspection by walkover
  - h. Repair operations
10. Monitors and documents the geomembrane seaming operations, including:
- a. Trial seams
  - b. Seam preparation
  - c. Seaming
  - d. Nondestructive seam testing
  - e. Sampling for destructive seam testing
  - f. Photographs of all destructive seam testing with clear identification mark.
  - g. Appropriate log for seaming and patching destructive testing (Completes Forms 1-10 included in **Appendix 17C** of this document with supplemental information from the Contractor).
  - h. Field tensiometer testing
  - i. Laboratory sample marking
  - j. Repair operations
11. Monitors and documents the geosynthetic clay liner activities:
- a. Material delivery
  - b. Preparation of subgrade
  - c. Weather conditions (rain)
  - d. Conformance testing
  - e. Bentonite seaming
  - d. Repair operations
12. Monitors and documents the leachate collection system installation and testing including:
- a. Material delivery
  - b. Unloading and on-site transport and storage



- c. Material is as specified in engineering documents
  - d. Installation
  - e. Condition of leachate collection system materials as placed
  - f. Visual inspection by walkover
  - g. Repair operations
13. Monitors and documents the geonet and geotextile installation and testing.
- a. Material delivery
  - b. Unloading and on-site transport and storage
  - c. Sampling for conformance testing
  - d. Deployment operations
  - e. Joining and/or seaming operations
  - f. Condition of panels as placed
  - g. Visual inspection by walkover
  - h. Repair operations
14. Prepares a daily summary of the quantities of geosynthetics and/or cover material installed each day.
15. Prepares the weekly summary of the liner and/or cover system quality assurance activities.
16. Reports to the CQA Manager/RPR, and logs in any reports and relevant observations.
17. Prepares his own summary reports.
18. Oversees the monitoring and documentation (including photographic) of all installation operations. Photographs shall be taken routinely and in critical areas of the installation sequence.

### 2.6.2 Qualifications

CQA Monitors shall be familiar with all aspects of landfill construction and have sufficient practical, technical, and administrative experience to execute and record inspection activities.

## 2.7 Field Liner Installation Manager

### 2.7.1 Responsibilities

The Field Liner Installation Manager is the individual provided and assigned by the Installer (Contractor) to be his field representative, and to provide supervision and guidance to the installation crew. Depending on the size and type of the job, the Field Liner Installation Manager can be the same as the Installing Supervisor, Superintendent or Field Site Manager. The Field Liner Installation Manager is responsible for providing guidance and supervision to the installation crew to ensure that the geosynthetic products are installed in accordance with the manufacturer guidelines and the project plans and specifications. The Field Liner Installation Manager is responsible for conducting all the required field testing and coordinating and reporting all conflicts to the Contractor's Representative and the CQA Monitor. The Field Liner Installation Manager is responsible for attending all related project meetings.

### 2.7.2 Qualifications

The Field Liner Installation Manager must be qualified based on previously demonstrated experience, management ability, and authority. The Field Liner Installation Manager shall have previously managed the installation of at least a total of 2,000,000 square feet of geosynthetic products using the same type of seaming apparatus to be used at the site.

## 2.8 Liner Installation Supervisor

### 2.8.1 Responsibilities

The Liner Installation Supervisor is the individual provided and assigned by the installer to be his field representative to provide supervision and guidance to the geosynthetic products installation crew. The Installation Supervisor is responsible for coordinating the seaming and installation of the geosynthetic products. The Liner Installation Supervisor is responsible for providing supervision and guidance to the installation crew. The Liner Installation Supervisor is responsible for obtaining samples for field testing and for coordinating testing activities with the CQA Manager/RPR and CQA Monitor. The Liner Installation Supervisor is responsible for keeping a daily log of all activities related to geosynthetic products installation and testing and for attending all related project meetings.

### 2.8.2 Qualifications

The Liner Installation Supervisor must be qualified based on previously demonstrated experience, management ability, and authority. The Liner Installation Supervisor shall have previously managed the installation of at least a total of 2,000,000 square feet of geosynthetic products using the same type of seaming apparatus to be used at the site.

## 2.9 Liner Installer

### 2.9.1 Responsibilities

The Liner Installer is the firm responsible for installation of the geosynthetic products. In the context of this plan, the Liner Installer is the Manufacturer or an approved installer trained and certified to install the Manufacturer's geosynthetic clay liner and geomembrane. The Liner Installer shall be responsible for field handling, storing, deploying, seaming, temporary restraining and all other aspects of the geosynthetics installation. The Liner Installer shall be responsible for submittal of the documentation listed in Section 2.9.3 of this exhibit.

### 2.9.2 Qualifications

The Liner Installer shall be certified to install the manufacturer's geosynthetic clay liner, geomembrane material, geonet and geotextile. The Liner Installer shall be pre-qualified and approved by the Owner's Representative. The Liner Installer shall be able to provide qualified personnel to meet the demands of the project. The Liner Installer may be required to provide a Field Liner Installation Manager, Liner Installation Supervisor, and a Master Seamer as described below.

### 2.9.3 Submittal

#### 2.9.3.1 Pre-Qualification

To be considered for pre-qualification, the Liner Installer shall submit the following information:

1. Corporate background and information
2. Description of installation capabilities:
  - a. Information on equipment (numbers and types), and personnel (number of site managers number of crews).
  - b. Average daily production anticipated.
  - c. A minimum of three samples of field geomembrane seams and a list of minimum values for geomembrane seam properties.
3. A list of at least five completed facilities, totaling a minimum of 2,000,000 ft<sup>2</sup> for which the Liner Installer has installed geosynthetics. 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, design engineer, manufacturer, and name of contact at the facility who can discuss the project.
  - c. Type and thickness of geomembrane and surface area of the installed geosynthetic clay liner and geomembrane.

- d. Type of seaming, patching and tacking equipment used.
  - e. A copy of the manufacturer's certification or approval letter.
  - f. Resume of the qualifications of the Liner Installation Supervisor and Master Seamer to be assigned to this project.
4. The Liner Installer's quality control manual.
  5. A copy of letter(s) of recommendation supplied by the geomembrane, geosynthetic clay liner, geonet and geotextile manufacturers.
  6. Five letters of reference from clients/owners who have worked with the proposed superintendent attesting to Liner Installer's quality of work, date performed, adherence to project schedule, and responsiveness to quality control deficiencies.

### **2.9.3.2 Pre-Installation**

Prior to commencement of the installation, the Liner Installer must submit to the CQA Monitor:

1. Resume of the Superintendent to be assigned to this project, including dates and duration of employment.
2. Resume of the Master Seamer to be assigned to this project, including dates and duration of employment.
3. A panel layout drawing showing the installation layout identifying field seams as well as any variance or additional details which deviate from the engineering drawings. The layout shall be adequate for use as a construction plan and shall include dimensions, details, etc.
4. Installation schedule.
5. A list of personnel performing field seaming operations along with pertinent experience information.
6. All geosynthetic quality control certificates as required by this CQA Plan (unless submitted directly to the CQA Monitor by the Manufacturer).
7. Certification that extrudate to be used is comprised of the same resin as the geomembrane to be used.
8. Documentation that bentonite to be used for seaming of the geosynthetic clay liner is the same type as in the liner and is recommended by the manufacturer.

This documentation shall be reviewed by the CQA Monitor as outlined in Section 2.6 of this CQA Plan, before installation of the geosynthetic can begin.

### 2.9.3.3 Installation

During the installation, the Liner Installer shall be responsible for the submission of:

1. Quality control documentation (Forms 1-10 included in **Appendix 17C** of this document) recorded during installation.
2. Subgrade surface acceptance certificates for each area to be covered by the lining system, signed by the Liner Installer.

### 2.9.3.4 Completion

Upon completion of the installation, the Liner Installer shall submit:

1. The warranty obtained from the Manufacturer.
2. The installation warranty.

## 2.10 Manufacturer

### 2.10.1 Responsibilities

The Manufacturer is the firm or corporation responsible for production of the geosynthetic material to be used in the project. The Manufacturer is responsible for the condition of the geosynthetic until the material is accepted by the Owner or CQA Monitor upon delivery. The Manufacturer shall produce a consistent product meeting the project specifications, and shall provide quality control documentation for the project specified herein. Each Manufacturer is responsible for the production of its geosynthetic product. In addition, each Manufacturer is responsible for the condition of the geosynthetic until the material is accepted by the CQA Manager/RPR or CQA Monitor upon delivery. Each Manufacturer shall produce a consistent product meeting the project specifications. Each Manufacturer shall provide quality control documentation for its product as specified in this CQA Plan.

### 2.10.2 Qualifications

Prior to shipment of any material, each Manufacturer shall be pre-qualified by the CQA Manager/RPR. Each Manufacturer shall provide sufficient production capacity and qualified personnel to meet the demands of the project as identified in the project specifications. Each Manufacturer shall have an internal quality control program for its product that meets the specified requirements.

#### 2.10.2.1 Pre-Qualification

Each Manufacturer shall meet the following requirements and submit the following information to be considered for pre-qualification:

1. Corporate background and information
2. Manufacturing capabilities:

- a. Information on plant size, equipment, personnel, number of shifts per day, and capacity per shift.
- b. A list of material properties and samples of liner with attached including certified test results.
- c. A list of at least 10 completed facilities totaling a minimum of 3,000,000 square feet for which the Manufacturer has manufactured a geosynthetic product. For each facility, the following information shall be provided:
  - 1) Name and purpose of facility, its location and date of installation.
  - 2) Name of owner, project manager, design engineer, and installer.
  - 3) Type and thickness of geosynthetic, and the surface area of installed geosynthetic.
  - 4) Available information on the performance of the lining system and the facility.
3. The Manufacturer's quality control manual, including a description of the quality control laboratory facilities.
4. The Manufacturer's Field Installation Quality Control Manual. As a minimum, the manual shall contain procedures and recommendations for the following:
  - a. Geomembrane deployment
  - b. Field panel placement
  - c. Geomembrane field seaming
  - d. Seam testing (destructive, non-destructive for field and laboratory settings)
  - e. Repair of defects
5. The origin (supplier's name and production plant) and identification (brand name and number) of resin used to manufacture the product.
6. A fingerprint of the Manufacturer's geosynthetic product (for polyethylene-based geosynthetics) in accordance with fingerprinting protocol listed in **Appendix 17A, Table 17A-1** of this CQA Plan.
7. Manufacturer's NSF certification.

### 2.10.2.2 Pre-Installation

Prior to the installation of any geosynthetic material, each Manufacturer must submit to the CQA Manager/RPR all quality control documentation required by the appropriate section of

this CQA Plan. This documentation shall be reviewed and approved by the CQA Manager/RPR before installation can begin.

## 2.11 Master Seamer

### 2.11.1 Responsibilities

The Master Seamer is the individual assigned by the Installer to conduct seaming operations of the geosynthetic products. The Master Seamer is responsible for seaming the geosynthetic products in accordance with the manufacturer guidelines and the project plans and specifications. The Master Seamer is responsible for maintaining a top quality seaming product free from defects and irregularities. The Master Seamer is responsible for reporting seaming problems and defects to the Field Installation Manager and Installation Supervisor.

### 2.11.2 Qualifications

The Master Seamer shall be a qualified individual who has previous experience in seaming the geosynthetic products. The master seamer shall demonstrate that he has seamed a minimum of 500,000 square feet of the geosynthetic product.

## 2.12 Quality Assurance Laboratory (QAL)

### 2.12.1 Responsibilities

The Quality Assurance Laboratory is a firm, independent from the Supervising Authority/Contract Owner, CQA Certifying Engineer and Contractor, responsible for conducting geotechnical testing, as appropriate, on samples required for the project.

The Quality Assurance Laboratory shall be responsible for conducting the appropriate laboratory tests in accordance with this CQA Plan or as directed by the CQA Manager/RPR. The test procedures shall be in accordance with the test methods specified. The Quality Assurance Laboratory shall be responsible for providing tests results as outlined in Section 3 through Section 5 of this CQA Plan.

### 2.12.2 Qualifications

The Quality Assurance Laboratory shall be an approved certified laboratory having experience in testing soils, and familiarity with American Society for Testing and Materials (ASTM) and other applicable test standards.

## 2.13 Permitting Agency

The Permitting Agency, NMED, has the responsibility to review the CQA Plan for compliance with the Department's regulations and to make a decision to approve or deny the Plan. The NMED will have the responsibility and authority to review and accept or reject any design revisions or requests for variance that are submitted by the facility applicant after the CQA Plan is approved. The Permitting Agency also has the responsibility and authority to enforce compliance with the permit requirements during the construction process and may review all CQA documentation during or after facility construction to confirm that the approved CQA

Plan was followed and that the facility was constructed as specified in the design. Finally, the NMED will review the certification report and make a decision as to whether the liner system and/or final cover were constructed in accordance with the CQA Plan and the approved Permit Documents.

## 2.14 Communications Between Parties

To guarantee a high degree of quality during construction and assure a final product that meets all of the project plans and specifications, open channels of communication are essential. This section discusses appropriate lines of communication and describes all necessary meetings.

### 2.14.1 Lines of Communication

All lines of communication shall go through the CQA Certifying Engineer who, in turn, will direct the necessary course of action.

### 2.14.2 Pre-Construction Meeting

A pre-construction meeting shall be held before any construction activity begins. The meeting shall be attended by the Owner, Contractor (if contracted), CQA Certifying Engineer, CQA personnel, and any appropriate subconsultants, subcontractors, suppliers, and utilities. The following is a list of CQA Plan related items suggested for discussion at the pre-construction meeting.

1. Familiarizing each organization with the CQA Plan and its role relative to the construction.
2. Providing each organization with all relevant CQA/CQC documents.
3. Defining the lines of authority and reviewing the responsibilities of each organization.
4. Discussing the established procedures or protocol for handling construction deficiencies, repairs, and retesting.
5. Reviewing methods for documenting and reporting field data.
6. Reviewing methods for distributing and storing documents.
7. Reviewing work area security and safety protocols.
8. Discussing procedures for the location and protection of construction materials and for the prevention of damage to the materials from inclement weather or other adverse events.
9. Conducting a site walk-around to review construction material and inspection equipment storage locations.
10. The meeting shall be documented and minutes will be transmitted to all parties by the CQA Certifying Engineer.



### 2.14.3 Progress Meetings

Progress meetings between the CQA Certifying Engineer, CQA Manager/RPR, Contractor's Representative, and any other concerned parties (e.g. other subconsultants, subcontractors, and suppliers) shall be held periodically during construction. These meetings shall discuss current progress, planned activities and schedule for the upcoming weeks, issues requiring resolution, and any new business or revisions to the work. The CQA Manager/RPR shall log any problems, decisions, or questions arising at this meeting in his progress report. If any matter remains unresolved at the end of this meeting, the CQA Manager/RPR and/or CQA Certifying Engineer shall be responsible for the resolution of the matter and the communication of the decision to the appropriate parties.



## Section 3

# Inspection Activities

### 3.1 Scope of Inspection Activities

Throughout implementation of the construction activities there will be numerous inspections and testing requirements for specific work tasks. The inspection and testing requirements will ensure compliance with the design as presented in the construction drawings and specifications, as well as ensure completion of the work tasks to the highest level of quality. Inspections and testing will provide a means of monitoring the quality and progress of work performed.

The components of the construction that will require some form of inspection or testing as described by the CQA Plan are as follows:

- Basegrading
- HDPE Liner and GCL Construction
- Geotextile
- Geonet
- Granular Fill Materials
- Leachate Pipe Materials
- Leachate Collection System
- Top of Waste Grading
- Soil Infiltration Layer
- Topsoil with Native Seeding
- Stormwater Control Structures

The inspections and testing is described in further detail in the Sections below.

### 3.2 Inspections

Throughout the period of construction, the quality of work completed and material used for each of the work tasks will be maintained at its highest possible level through regular inspections of the work. The CQA Manager and/or Resident Project Representative (RPR) and

representatives of the Owner (as required) will complete inspections throughout the construction period.

Overall, inspections to be conducted by the CQA Manager/RPR include the following:

1. Daily inspections of the work progress using the **Daily CQC Report** in **Appendix 17C**.
2. Inspections of material at the time of delivery to the site to check for characteristics rendering material unsuitable for use.
3. Comparison of the material delivered to the site to the design specifications to ensure that the material delivered meets applicable project specifications.
4. Inspection of materials following installation to verify that materials have been installed in accordance with the Project Plans and Specifications.

### 3.2.1 Pre-Construction Inspection

A pre-construction inspection will be performed prior to beginning work on any major work task. The pre-construction inspection will include the following:

1. Review of contract requirements to ensure that all materials and/or equipment have been determined to meet applicable standards and specifications.
2. Confirmation that provisions have been made to provide required quality control testing.
3. Examination of the work area to ascertain that all applicable preliminary work tasks have been completed.
4. Coordination of work activities with corresponding CQA required testing and inspections.

### 3.2.2 General Inspections

General inspections will be performed periodically as the amount of work completed warrants an inspection. A general inspection will include the following:

1. Examination of the quality of workmanship.
2. Testing of materials for compliance with contract requirements.
3. Identification of any omissions.
4. Record of general progress of construction activities.

### 3.2.3 Final Inspection

A final inspection will be performed upon completion of each work task to ensure compliance with the Project Plans and Specifications and to ensure that deficiencies identified in the general inspections have been corrected.

The CQA Manager/RPR will perform these inspections and the results of the inspections will be provided in the final construction report. The CQA Certifying Engineer will notify Supervising Authority/Contract Owner and NMED representatives **at least three days** in advance of any major final inspections. The results of all inspections will be recorded in the CQA Manager/RPR's site logbook.

### 3.3 Testing

In addition to the CQA inspections, quality control testing of materials will be carried out as required in the CQA Plan and the Project Plans and Specifications. All testing of geosynthetic and soil material shall be performed in accordance with applicable American Society of Testing Materials (ASTM) standards. Testing of select materials provides additional assurances that the component has been properly installed and coordinated with the other components of construction.

The testing requirements, applicable test methods, testing frequency, and acceptance criteria for relevant work task materials and components are detailed in the project specifications, and are summarized in Sections 5 and 6 of this plan.

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## Section 4

# Geomembrane Manufacturing and Delivery

### 4.1 Manufacturing

#### 4.1.1 Raw Material

The raw material shall be first quality resin containing no more than 2% clean recycled polymer by weight, and meeting the following specifications:

**For HDPE:**

Specific Gravity (ASTM D792 Method A or ASTM D1505):  $> 0.94$  g/cc, Melt Index (ASTM D1238 Condition 190/2.16):  $< 1.0$  gm/10 min.

Quality control testing shall be carried out by the Manufacturer to demonstrate that the product meets this specification.

Prior to liner delivery and installation, the Manufacturer shall provide the CQA Manager/RPR with the following information:

1. The origin (resin supplier's name, resin production plant), identification (brand name, number) and production date of the resin;
2. A copy of the quality control certificates issued by the resin supplier noting results of density and melt index;
3. Reports on the tests conducted by the Manufacturer to verify the quality of the resin used to manufacture the geomembrane rolls assigned to the considered facility (these tests should include specific gravity (ASTM D792 Method A or ASTM D1505) and melt index (ASTM D1238 Condition 190/2.16));
4. Reports on the tests conducted by the Manufacturer to certify the quality of the liner sheet.

#### 4.1.2 Geomembrane Manufacturing

Prior to liner delivery and installation, the Manufacturer shall provide the CQA Manager/RPR with the following:

1. A properties sheet including, at a minimum, all specified properties, measured using test methods indicated in the specification, or equivalent;
2. The CQA Manager/RPR shall verify that:
  - a. The property values certified by the geosynthetic Manufacturer meet all of the specifications; and

- b. The measurements of properties by the geosynthetic Manufacturer are properly documented, and that the test methods used are acceptable.

### 4.1.3 Rolls

After receipt of material, the Manufacturer shall provide the CQA Manager/RPR with one quality control certificate for every roll of geosynthetic provided. The quality control certificate shall be signed by the Manufacturer's responsible party. The quality control certificate shall include at a minimum:

1. Roll numbers and identification; and
2. Results of quality control tests. As a minimum, ASTM test methods shall be used to test for thickness, tensile strength, and tear resistance.

## 4.2 Delivery, Storage and Handling

### 4.2.1 Delivery and Handling

1. The geosynthetic products shall be packaged and shipped by appropriate means to prevent damage of the material. Off-loading and storage of the geosynthetic is the responsibility of the Contractor. The Contractor shall be responsible for replacing any damaged or unacceptable material. Geosynthetic products shall be carefully off loaded prior to unwrapping any product. For off loading, appropriate equipment equipped with a cloth sling shall be used.
3. The CQA Manager shall be responsible for completing the **Material Receiving Log 1 of 7** in **Appendix 17C** for each geosynthetic material.
2. No off-loading shall be performed unless CQA Manager/RPR and/or CQA Monitor is present. Damage during off-loading shall be documented by the CQA Manager/RPR and/or CQA Monitor. All damaged products must be separated from the undamaged products until the proper disposition of that material has been determined by the CQA Manager/RPR and/or CQA Monitor.
3. The geosynthetic products shall be stored so as to be protected from light, puncture, dirt, grease, water, moisture, mud, mechanical abrasions and excessive heat that may damage the geosynthetic material. The rolls shall be stored on a prepared level surface (not wooden pallets) without sharp edges and shall not be stacked more than two rolls high (rolls shall be limited to a maximum of 5 feet diameter).

### 4.2.2 Storage

The delivered material shall be stored in a location (or several locations) such that on-site transportation and handling are minimized. Storage space shall be protected from theft, vandalism, passage of vehicles, and be adjacent to the area to be lined.



## Section 5

# Liner System Construction Quality Assurance

Construction of the liner and leachate collections systems must be in accordance with the approved design plans and Project Specifications. This CQA Plan establishes the construction quality assurance monitoring and testing program designed to ensure construction compliance. The liner and leachate collection system quality assurance testing program consists of the testing requirements of the high-density polyethylene (HDPE) liner, geosynthetic clay liner (GCL), liner protection material, geotextiles, geonets and leachate pipe materials. All testing of geosynthetic and soil material shall be performed in accordance with applicable American Society of Testing Materials (ASTM) standards. Quality assurance testing and observations are required during construction of liner system components as described below.

## 5.1 Geosynthetic Clay Liner

The lower component of the liner system will consist of GCL.

### 5.1.1 Conformance Testing

Conformance testing shall be performed by an independent Quality Assurance Laboratory approved by the Owner. CQA Manager shall obtain samples from the delivered material, mark the machine direction and identification number. The Quality Assurance Technician, in the presence of the CQA Manager, will obtain samples from the delivered material, mark the machine direction and identification number. Samples shall be taken at the rate of one sample per lot, but not to exceed one conformance test per 100,000 square feet of material. A lot is defined as a group of consecutively numbered rolls from the same manufacturing line. This sampling frequency may be increased as deemed necessary by the CQA Manager. The samples shall be taken across the entire roll width and shall not include the first 3 feet. This sampling frequency may be increased as deemed necessary by the CQA Manager. The samples shall be taken across the entire roll width and shall not include the first 3 feet. The following tests shall be performed on the samples per **Appendix 17A** at the laboratory:

#### Bentonite

1. Swell Index
2. Fluid Loss
3. Moisture Content
4. Particle Size Distribution (Granular Bentonite)

#### Woven Geotextile

## 5. Mass Per Unit Area

Non-Woven Geotextile

## 6. Mass Per Unit Area

GCL

## 7. Hydraulic Conductivity

## 8. Tensile Strength

## 9. Peel Strength

## 10. Mass Per Unit Area

## 11. Index Flux

**5.1.2 Execution****5.1.2.1 Basegrade Preparation**

1. Preparation of the basegrade shall consist of the top six inches of the in-situ material being compacted to 90 percent of the standard proctor density (ASTM D698). The basegrade shall be tested per **Table 17D-1** in **Appendix 17D**.
2. The surface of the subgrade shall be smooth, uniform, free from sudden changes in grade (such as vehicular ruts), rocks, stones, debris and deleterious materials. During actual placing and seaming of the geomembrane, the subgrade shall be kept free of all standing water. If the subgrade below the geomembrane becomes wet and unstable, it shall be dried and recompact.
3. All fill shall consist of well graded material that is free of organic matter, trash, clayballs, and other deleterious material that could damage the geomembrane. The upper six (6) inches of the finished subgrade shall not contain stones or debris larger than one half (1/2) inch. The subgrade shall have no sudden sharp or abrupt changes in grade.
4. The subgrade shall be protected from desiccation, flooding and freezing. Protection, if required, may consist of a thin plastic protective cover (or other material, as approved by the Engineer) that is installed over the completed subgrade until placement of the geomembrane liner begins. Subgrades found to have desiccation cracks greater than one half (1/2) inch in width or depth, or which exhibit swelling, heaving, or other similar conditions, shall be replaced or reworked.
5. The CQA Manager/RPR shall inspect and approve the basegrade before installation of the geosynthetic clay liner can proceed (**Appendix 17C – Subgrade Surface Acceptance Form**). It shall be the Contractor's responsibility to properly prepare and

maintain the basegrade in a smooth, uniform and compacted condition during installation of the liner.

6. If the basegrade is damaged during liner installation, the Contractor shall restore, recompact and test the area and retest the basegrade prior to installing the liner.
7. The Contractor shall protect the geosynthetic clay liner delivered to the site from inclement weather conditions using plastic sheeting on other method approved by the Engineer. The stockpile shall be barricaded from any traffic that may occur near the stockpile.
8. The base grade shall be at a minimum 2 percent slope to promote positive drainage and facilitate leachate collection.

#### 5.1.2.2 Geosynthetic Clay Liner Placement

1. GCL rolls should be delivered to the working area of the site in their original packaging. Immediately prior to deployment, the packaging should be carefully removed. Unless otherwise specified, the GCL shall be installed such that the product name printed on one side of the GCL faces up.
2. Rolls shall be handled utilizing a solid steel bar inserted through the core bar and slings or chains attached to the ends of the bar. The core bar shall be suspended from a spreader bar so that the edges of the liner are not damaged by the suspending straps or chains.
3. Traffic across the GCL shall be minimized; Construction equipment shall not be used on top of the GCL. If the installation equipment causes rutting of the basegrade, the basegrade must be restored to its originally accepted condition prior to placement.
4. Care must be taken to minimize the extent to which the GCL is dragged across the basegrade in order to avoid damage to the bottom surface of the GCL. A slip sheet or rub sheet shall be used to reduce friction damage during significant movement of the GCL.
5. The GCL shall be placed so that seams are parallel to the direction of the line of maximum slope. Seams should be located at least 5 feet from the toe and crest of slopes steeper than 4H: 1V. The number of field seams in corners and irregular shaped areas shall be minimized.
6. Seam areas or runs shall be flat and clear of any large rocks, debris, or ruts. Contacting surfaces shall be clean and clear of dirt or native soil with all edges pulled tight to maximize contact and to smooth out any wrinkles or creases. Overlaps shall be minimum of 6 inches and verified by the Engineer. Overlap seams shall be placed so that the edge of the upper panel aligns with the appropriate match line on the lower panel. End-of-roll overlapped seams should be construction with a minimum overlap of

24-inches (consider end of roll overlaps, on steep slopes, of as much as 36-inches to ensure proper overlap in case of slippage during HDPE and Geocomposite installation). Seams at the ends of the panels shall be constructed such that they are shingled in the direction of the grade to prevent the potential for runoff flow to enter the overlap zone.

7. The GCL shall be secured at the top of the slope in an anchor trench with the HDPE liner, as shown on the Drawings. Vertical seams within the anchor trench shall be sealed with an approved adhesive. Seams along the bottom shall be sealed per No. 6 above.
8. Seams shall be augmented with granular bentonite to insure seam integrity if recommended by the GCL manufacturer. Granular bentonite shall be dispersed evenly from the panel edge to the lap line at the manufacturer's recommended rate continuously along all seams or overlap areas. Accessory bentonite shall be of the same type as the material within the composite liner itself. Adhesives may be used on seams to keep panels in contact during backfill operation, if necessary.
9. GCL shall be manufactured by the needle punched-reinforced method. GCL shall not be allowed to hydrate to an extent greater than that recommended by the manufacturer. The Engineer, using the manufacturer's criteria, will decide if any wetted materials shall remain or be removed from the premises.
10. Large rips or tears shall be repaired by completely exposing the affected area, removing all foreign objects or soil, and by then placing a patch over the damage, with a minimum overlap of 12 inches on all edges. Accessory bentonite shall be placed between the patch and the repaired material at the manufacturer's recommended rate, spread in a 6-inch width.
11. Cutting the GCL should be performed using a sharp utility knife. Frequent blade changes are recommended to avoid damage to the geotextile components of the GCL during the cutting process.
12. Although direct vehicular contact with the GCL is to be avoided, lightweight, low wheel-pressure vehicles such as 4-wheel ATVs may be used to facilitate the installation of any geosynthetic material placed over the GCL. Vehicle type must be approved by Engineer prior to use.
13. Only as much GCL should be deployed in a given day as can be covered during that day by the HDPE liner. In the event wind conditions prohibit deploying HDPE, the GCL may be covered the following morning.

### 5.1.2.3 Field Quality Control

1. Documentation files for field quality control shall be maintained by the Contractor and the Construction Quality Assurance Monitor. Documentation shall include: subgrade acceptance form (**Appendix 17C**), pictures of daily progress, before and after pictures of problematic installation, conformance testing, panel layout diagram and daily panel

placement (**Log 2 of 7 in Appendix 17C**) and all required soils test per *20.9.4.13 NMAC*. At the end of each work week the files shall be updated and checked to assure that all copies of pertinent project information are included in each file. The Contractor shall submit daily copies of the documentation to the CQA Certifying Engineer.

2. Prior to placement of the HDPE liner over the GCL, the geotextile installation and related work shall be inspected by the CQA Manager/RPR and/or CQA Monitor. All work in the system therein being inspected shall be complete, clean and ready for use. All work shall meet the requirements as to line, grade, cleanliness and workmanship, as determined by the CQA Certifying Engineer.
3. All discrepancies shall be noted and repaired at no additional expense. Final acceptance of the system shall be contingent upon the approval of the CQA Certifying Engineer.

## 5.2 High Density Polyethylene (HDPE) Geomembrane Liner

A 60 mil geomembrane liner will be used on the West and East Phases of the landfill. A textured geomembrane will be used for the West and East Phases. A smooth geomembrane may alternatively be used for the cell floors of the West Phase.

### 5.2.1 Conformance Testing

1. Conformance testing shall be performed by an independent Quality Assurance Laboratory approved by the Owner. CQA Manager shall obtain samples from the delivered material, mark the machine direction and identification number. The Quality Assurance Technician, in the presence of the CQA Manager, will obtain samples from the delivered material, mark the machine direction and identification number. Samples shall be taken at the rate of one sample per lot, but not to exceed one conformance test per 100,000 square feet of material. A lot is defined as a group of consecutively numbered rolls from the same manufacturing line. This sampling frequency may be increased as deemed necessary by the CQA Manager. The samples shall be taken across the entire roll width and shall not include the first 3 feet. This sampling frequency may be increased as deemed necessary by the CQA Manager. The samples shall be taken across the entire roll width and shall not include the first 3 feet. The following conformance tests shall be conducted at the laboratory.
  - a. Thickness (ASTM D5994) (for textured geomembrane)
  - b. Thickness (ASTM D5199) (for smooth geomembrane)
  - c. Tensile characteristics (yield strength, elongation at yield, break strength, elongation at break) (ASTM D6693) (for smooth and textured geomembrane)
  - d. Puncture resistance (ASTM D4833) (for smooth and textured geomembrane)
  - e. Tear resistance (ASTM D1004) (for smooth and textured geomembrane)

- f. Density (ASTM D1505) (for smooth and textured geomembrane)
  - g. Carbon black content (ASTM D1603) (for smooth and textured geomembrane)
  - h. Carbon black dispersion (ASTM D5596) (for smooth and textured geomembrane)
  - h. Asperity (GM12) (for textured geomembrane)
2. These conformance tests shall be performed in accordance with **Appendix 17B**.
  3. All conformance test results shall be reviewed by the CQA Manager/RPR and accepted or rejected, prior to the placement of the geomembrane. All test results shall meet, or exceed, the property values listed in **Appendix 17B**. In case of failing test results, the manufacturer may request that another sample be retested by the Quality Assurance Laboratory with Manufacturer's technical representative present during the testing procedures. The retesting shall be paid for by the manufacturer. The Manufacturer may also have the sample retested at two different laboratories approved by the Owner. If both laboratories report passing results, the material shall be accepted. If both laboratories do not report passing results, all geomembrane material from the lot representing the failing sample will be considered out of specification and rejected.

## 5.2.2 Execution

### 5.2.2.1 Basegrade Preparation

1. Basegrade preparation shall be accomplished as specified in Section 5.1.2.1 of this exhibit, and the GCL shall be installed per Section 5.1 of this exhibit.
2. The geosynthetic liner material shall be installed over the GCL only after the condition of GCL has been thoroughly inspected, all seams and overlaps are per specified requirements, and approval is given by the CQA Manager/RPR for the work to proceed.

### 5.2.2.2 Anchor Trench

1. CQA Manager/RPR shall record information on anchor trench construction in his/her daily report. The anchor trench shall be constructed in accordance with plans and specifications.
2. Slightly rounded corners shall be provided in the trench to avoid sharp bends in the geomembrane.
3. The anchor trench shall be adequately drained to prevent water ponding and softening of adjacent soils. The anchor trench shall be backfilled with local fill material and compacted to 90 percent of the standard proctor density (ASTM D698).
4. If the anchor trench is located in a clay susceptible to desiccation, the amount of trench open at any time shall be limited to one day of geomembrane installation capacity.

5. Care shall be taken when backfill and compacting the trenches to prevent any damage to the lining materials. Compacting shall not be performed by directing the tires of heavy equipment or vehicles along the anchor trench. The use of mechanical tampers is recommended. To achieve the required compaction, lifts up to 6 to 8 inches of soil shall be placed then compacted using a mechanical tamper.

### 5.2.2.3 Geomembrane Placement

No geomembrane placement shall proceed without the presence of the CQA Manager/RPR or his/her designated CQA Monitor. A **Daily Panel Placement Log** shall be completed each day that geomembrane is installed (**Appendix 17C**).

#### 1. Weather Conditions

- a. Geomembrane placement shall not proceed at an ambient temperature below 40 degrees F or above 104 degrees F unless otherwise authorized, in writing, by the CQA Manager/RPR. Geomembrane placement shall not be performed during precipitation, excessive moisture, in an area of ponded water, or excessive winds or when winds exceed approximately 50 miles per hour or higher three times within ten minutes so as not to adversely affect the geomembrane installation.

#### 2. Method of Placement

- a. Each panel of the geomembrane shall be rolled out and installed in accordance with the approved shop drawings prepared by the Contractor. The layout shall be designed to keep field joining of the geomembrane to a minimum and consistent with proper methods of HDPE geomembrane installation. The geomembrane shall be installed in direct and uniform contact with the GCL.
- b. Geomembrane rolls shall be placed using proper spreader and rolling bars with cloth slings. If a sheet must be replaced a distance greater than its width, a slip sheet shall be used.
- c. The CQA Manager/RPR and/or CQA Monitor shall inspect each panel, after placement and prior to seaming, for damage and/or defects. Defective or damaged panels shall be replaced or repaired, as approved by the CQA Manager/RPR and/or CQA Monitor.
- d. The installer shall not drag the geomembrane sheets on rough soil basegrades.
- e. All geomembrane shall be anchored as shown on the drawings and consistent with Manufacturer's recommendations.
- f. Personnel working on the geomembrane shall not smoke, wear damaging shoes or involve themselves in any activity that may damage the geomembrane.



- g. All edges of the geomembrane shall be properly weighted to avoid uplift due to wind. Sand bags, if used, shall be tied shut.
- h. Vehicular traffic across the geomembrane shall not be allowed.
- i. All damage shall be recorded and located on the as-built drawings.
- j. When tying into existing geomembrane, all excavation of previously installed liner shall be performed by hand to prevent damage.
- k. The geomembrane shall be kept free of debris, unnecessary tools and materials. In general, the geomembrane area shall remain neat in appearance.

### 3. Liner Boots

- a. HDPE boots or shrouds shall be furnished and installed where indicated on the drawings. The boots shall be of the same material as the geomembrane.
- b. 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 inches. The boot shall be welded to the geomembrane as previously specified herein.
- c. Boots and shrouds shall fit snugly around the pipe. Prefabricated material shall be designed to fit site specific condition, for the intended slope and size of pipe.
- d. Neoprene sponge rubber gasket shall be used between the boot or shroud and the pipe with a stainless steel clamp. An HDPE sacrificial sheet shall be used between the boot or shroud and the clamp for protection.
- e. For pipes larger than 4 inches in diameter, a second clamp shall be used. The fastener of the second clamp shall be located on the opposite side of the pipe from the first clamp, to compensate for uneven pressure and elongation.

#### 5.2.2.4 Seaming Weather Conditions

##### 1. Normal Weather Conditions

- a. The normal required weather conditions for seaming are:
  - 1) Ambient temperature higher than 40 degrees F and lower than 104 degrees F.
  - 2) No precipitation or other excessive moisture, such as fog or dew.
  - 3) No excessive winds or when winds exceed approximately 50 miles per hour or higher three times within ten minutes. The wind speed at which installation of geosynthetics will be halted will be determined by the CQA manager and contractor's representative prior to the installation of geosynthetics.



- b. These weather conditions shall be fulfilled during seaming process.

## 2. Cold Weather Conditions

- a. If the ambient temperature is below 40 degrees F, the following conditions shall be met to ensure quality seaming process:
  - 1) Preheating the surface of the geomembrane to achieve normal temperature range.
  - 2) Preheating may be waived by the CQA Manager/RPR and/or CQA Monitor if the installer demonstrates that satisfactory welds of equivalent quality may be obtained without preheating at the expected temperature of installation.
  - 3) Preheating devices shall be approved by the Manufacturer.
  - 4) Care shall be taken to assure that surface temperatures are not lowered below the minimum required surface temperature for welding due to winds.
  - 5) Additional destructive tests samples shall be taken at the discretion of the CQA Manager/RPR and/or CQA Monitor.
  - 6) Test seams shall be performed under the same ambient temperature conditions as the actual seams.

## 3. Warm Weather Conditions

- a. If the ambient temperature is above 104 degrees F, no seaming of geomembrane shall be permitted unless the installer can demonstrate, to the satisfaction of the CQA Manager/RPR and/or CQA Monitor that geomembrane seam quality is not adversely impacted.
- b. Test seams shall be performed under the same ambient temperature conditions as the actual seams.
- c. Additional destructive tests shall be taken at the discretion of the CQA Manager/RPR and/or CQA Monitor.

### 5.2.2.5 Field Seams

- 1. Individual panels of geomembrane shall be laid out and overlapped by a minimum of 4 inches prior to welding. The area to be welded shall be cleaned and prepared in accordance with the quality control welding procedures.
- 2. Single or double track hot wedge fusion welder shall be used for straight welds.
- 3. Extrusion welder shall be used for cross seam tees, patches and repairs and penetration boots.

4. The welding equipment used shall be 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.
5. No "fish mouths" shall be allowed within the seam area. Where "fish mouths" occur, the material shall be cut, overlapped and a patch extrusion weld 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-foot length shall not exceed five. If more than five patches per 100-foot length are necessary, then the entire 100-foot length of seam shall be removed. Further welding shall cease at this time and the Engineer Field Representative shall be notified.
6. All seams shall have a seam number that corresponds with the panel layout numbers. The numbering system shall be used in the development of the as-built drawings. Seam numbers shall be derived from the combination of the two panel numbers that are to be welded together.
7. 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.
8. All extrudate shall be free of dirt, dry and protected from damage.
9. If an extrusion welder is stopped for longer than one minute, it shall be purged to remove heat-degraded extrudate. All purged extrudate shall be placed on a sacrificial sheet and disposed of.
10. All seams constructed on sloped surfaces shall be perpendicular (vertical) to the top and toe of slope.
11. All vertical panels placed on sloped surfaces shall extend 5 feet inward from the toe of slope or edge of trench.
12. All end seams shall be staggered a minimum of 5 feet in length between contiguous panels.
13. To prevent moisture buildup during fusion welding, the CQA Manager/RPR and/or CQA Monitor shall determine when it is necessary to place a movable protective layer of plastic (rub sheet) directly below each overlap of geomembrane during the seaming operation.
14. If required or determined by the CQA Manager/RPR and/or CQA Monitor, a firm substrate shall be provided by using a flat board or similar hard surface directly under the seam overlap to achieve proper support during seaming operation.

15. All seams shall extend across the anchor trench.
16. All factory seams, field seams and repair welds shall meet seam strength requirements specified in **Appendix 17B, Table 17B-2**.
17. The number of field seams in corners and irregular shaped areas shall be minimized.
18. No field seams shall be within five feet of the toe of the slope.
19. All seams shall be recorded using the **Daily Seaming Log** in **Appendix 17C**.

#### 5.2.2.6 Field Quality Control

1. Startup Testing
  - a. A test weld 3 feet 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 shall be required to be on-site before and during geomembrane installation for the purpose of testing samples. Six specimens of weld 1-in wide shall be cut from the test weld and tested on site. Specimens shall be tested on-site for shear and peel strength in accordance with **Appendix 17B, Table 17B-2**. No welder may start work until the sample weld has been approved by the CQA Manager/RPR and/or CQA Monitor. Test welds shall be documented using the **Trial Weld Log** in **Appendix 17C**.
  - b. Test seams shall be performed under the same conditions as the actual seams and shall be at least 3 feet long, 1 foot wide after seaming. Test seam for welding shall be cut out of the geomembrane rolls.
2. Nondestructive Seam Testing
  - a. The installer shall perform nondestructive test on all field seams over their full length. The purpose of this test is to assure continuity and integrity of the seams. 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.
  - b. Vacuum Testing
    - 1) Equipment for testing single wedge fusion seams and extrusion seams shall be comprised of the following:
      - a) 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.

- b) A vacuum tank and pump assembly equipped with a pressure controller and pipe connections.
  - c) A rubber pressure/vacuum hose with fittings and connections.
  - d) A plastic bucket and wide paint brush.
  - e) A soapy solution.
- 2) The following procedures shall be followed by the installer:
  - a) Excess sheet overlap shall be trimmed away.
  - b) Clean the window, gasket surfaces and check for leaks.
  - c) Energize the vacuum pump and reduce the tank pressure to approximately 5 psi.
  - d) Wet a strip of geomembrane approximately 12 inches by 48 inches (length of box) with the soapy solution.
  - e) Place the box over the wetted area and compress.
  - f) Close the bleed valve and open the vacuum valve.
  - g) Ensure that a leak-tight seal is created.
  - h) For a minimum period of 30 seconds, examine the geomembrane through the viewing window for the presence of soap bubbles.
  - i) If no bubbles appear after 30 seconds, close the vacuum valve and open the bleed valve, move the box over the next adjoining area with a minimum of 3-inch overlap and repeat the process.
  - j) All areas where soap bubbles appear shall be marked and repaired in accordance with Paragraph 5.2.2.7 of this exhibit and then retested.
- 3) If the seam cannot be tested prior to final installation, the seaming operations shall be observed by the CQA Manager/RPR and/or CQA Monitor for uniformity and completeness.
- 4) Vacuum testing shall be record on the appropriate **Seam Inspection Log in Appendix 17C**.
- c. Air Pressure Testing (for double track fusion seams only)
  - 1). The following procedures are applicable to those processes to produce a double seam with an enclosed space.

- 2) Equipment for testing double fusion seams shall be comprised of the following:
  - a) 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.
  - b) A manometer equipped with a sharp hollow needle, or other approved pressure feed device.
- 3) The following procedures shall be followed by the Installer.
  - a) Seal both ends of the seam to be tested.
  - b) Insert needle or other approved pressure feed device into the tunnel created by the double wedge fusion weld.
  - c) Energize the air pump to a pressure between 25 and 30 psi, close valve and sustain pressure for at least five minutes.
  - d) If loss of pressure exceeds 4 psi, or pressure does not stabilize, locate faulty area, repair in accordance with Paragraph 5.2.2.7 of this exhibit and retest.
  - e) Remove needle or other approved pressure feed device and seal with an extrusion weld.
- 4) Air pressure testing of welds shall be recorded using the **Seam Inspection Log** in **Appendix 17C**.

### 3. Destructive Seam Testing

- a. The purpose of the destructive testing is to evaluate seam strength properties. A minimum of one test sample shall be obtained per 500 feet of performed seam length. The location of samples shall be determined by the CQA Manager/RPR and/or CQA Monitor. Selection of such locations may be prompted by suspicion of overheating, contamination, or other potential cause that may adversely impact the welds. Sampling shall be performed by the installer. Testing of field samples shall be performed in the presence of the CQA Manager/RPR and/or CQA Monitor as described herein. Destructive test samples shall be recorded using the **Destructive Sample Log** in **Appendix 17C**.
- b. Sampling Procedures
  - 1) Samples shall be cut by the installer at locations chosen by the CQA Manager/RPR and/or CQA Monitor as the seaming progresses.
  - 2) The seams shall not be covered by another material before they have been tested and accepted by CQA Manager/RPR and/or CQA Monitor.

- 3) Upon obtaining each sample, 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 5.2.2.7 of this exhibit.
- c. Size and Disposition of Samples
- 1) The sample for testing shall be 12 inches wide by 36 inches long with the seam centered lengthwise. The sample shall be cut into three parts, labeled, and distributed as follows:
    - a) One portion to the installer for field testing (see below for procedure), 12 inches by 12 inches.
    - b) One portion for Quality Assurance Laboratory testing, 12 inches by 12 inches.
    - c) One portion to the CQA Manager/RPR for archive storage, 12 inches by 12 inches.
- d. Field Testing
- 1) The following shall be performed by the Installer in the presence of the CQA Manager/RPR and/or CQA Monitor:
    - a) The Installer shall cut ten 1-inch wide replicate specimens from the field testing samples to be tested for shear and peel strength, in accordance with the criteria set in **Appendix 17B, Table 17B-2**.
    - b) The Installer 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 by fusion at the weld sheet interface is a non-FTB (Film Tearing Bond) break and shall be considered a failure even if it achieves the acceptable strengths.
- e. Quality Assurance Laboratory Test
- 1) The Installer shall package and ship destructive test samples to the independent Quality Assurance Laboratory approved by the Owner.

- 2) Laboratory test shall include shear and peel strength tests. The minimum acceptable values obtained in these tests shall be in accordance with **Appendix 17B, Table 17B-2**.
  - 3) At least five specimens shall be tested each for shear and peel strength. A passing test shall meet the minimum required values in a least four of the five specimens tested for each method.
  - 4) The Quality Assurance Laboratory shall provide verbal test results to the CQA Manager/RPR and/or CQA Monitor no more than 24 hours after they receive the samples. The CQA Manager/RPR and/or CQA Monitor shall review the laboratory results as soon as they become available.
- f. Procedures for Destructive Test Failure
- 1) The following procedures shall apply whenever a sample fails a destructive test, whether that test is conducted in the field or by the Quality Assurance Laboratory.  
  
The Installer has two options:
    - a) The Installer can repair the entire length of the seam between any two passing test locations in accordance with Paragraph 5.2.2.7 of this exhibit.
    - b) The Installer can retrace the welding path to an intermediate location on each side of the original failed test, on both sides, and take a sample for an additional field test. If this test passes, then the seam shall be repaired between that location and the original failed location. If the test fails, then the process is repeated to establish the zone in which the seam should be repaired.
  - 2) All acceptable repaired seams shall be bound by two locations from which samples passing laboratory destructive tests have been taken. In cases where repaired seam exceeds 150 feet, a sample taken from the zone in which the seam has been repaired must pass destructive testing. Repairs shall be made in accordance with Paragraph 5.2.2.7 of this exhibit.
  - 3) The Quality Assurance Laboratory shall document all actions taken in conjunction with destructive test failures.

#### 5.2.2.7 Repair Procedures

1. Any portion of the geomembrane exhibiting signs of any kind of defect, or failing a destructive or a nondestructive test, shall be repaired. Several procedures exist for the repair of these areas. The final decision as to the appropriate repair procedure shall be made by the CQA Manager/RPR and/or CQA Monitor.

2. The repair procedures available include:
  - a. Patching, used to repair large holes, tears, undispersed raw materials and contamination by foreign matter.
  - b. Spot welding or seaming, used to repair small tears, pinholes, or other minor, localized defects.
  - c. Capping, used to repair large lengths of failed seams.
  - d. Removing bad seam and replacing 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 no more than one hour prior to the repair.
  - b. All surfaces shall be clean and dry at the time of the repair.
  - c. All seaming equipment used in repairing procedures shall be qualified.
  - d. All patches and caps shall extend at least 4 inches beyond the edge of the defect.
  - e. All patches shall have rounded corners.
4. Repair Verification
  - a. Each repair shall be numbered and logged by the Installer. Each repair shall be nondestructively tested using the methods described in Paragraph 5.2.2.6 Part 2 of this exhibit, as appropriate. Repairs which pass the nondestructive test shall be taken as an indication of an adequate repair. Repairs more than 150 feet long may be of sufficient length to require destructive test sampling, at the discretion of the CQA Manager/RPR and/or CQA Monitor. A failed test of the repaired section indicates that the repair shall be redone and retested until passing test results are achieved. The CQA Manager/RPR and/or CQA Monitor shall observe all nondestructive testing of repairs. The Installer shall record the number of each repair, date and test outcome.

#### 5.2.2.8 Wrinkles

1. Large wrinkles that remain in the sheet as a result of temperature expansion or uneven surface preparation may need removal as determined by the CQA Manager/RPR and/or CQA Monitor in consideration of applied loads on the wrinkle. Should the wrinkle need removing, the lower down-slope edge of the wrinkle shall be cut, overlapped and repaired as described in 5.2.2.7 of this exhibit. Both ends of the wrinkle repair shall be patched. Caution must be taken in removing any wrinkles. Wrinkles are needed to allow for future contraction of the geomembrane, especially in cold weather.



### 5.2.2.9 Construction Equipment

1. Construction equipment or vehicles with steel tracks shall not be permitted on the geomembrane. Vehicles with rubber tires may be allowed in accordance with the Manufacturer recommendation. Other equipment such as portable generators and power centers shall be permitted if the support apparatus is protected from damaging the liner, and if care is taken to prevent leaking lubricants from damaging the geomembrane.

### 5.2.2.10 Disposal of Waste Material

1. Upon completion of installation, the Contractor shall remove and dispose of all trash, waste material and equipment used in connection with the performed work and shall leave the premises in a condition that is neat and acceptable to the CQA Manager/RPR.

## 5.3 Granular Fill Material

Approved liner protection material includes sand, crushed glass (glass cullet), crushed basalt or any combination thereof meeting the specifications provided herein. When either glass cullet or crushed basalt is used as a liner protection material a cushion geotextile shall be placed over the geomembrane. When a mixture of granular fill materials is used, the glass cullet and soil or crushed basalt shall be mixed together to create a homogeneous liner protection material. Mixing shall occur prior to placement of the liner protection material.

Coarse aggregate will be installed as a component of the leachate collection system.

### 5.3.1 Testing

At the discretion of the CQA Manager/RPR, conformance testing of the delivered lining materials may be required. If deemed necessary, conformance testing shall be conducted in accordance with the following.

#### 5.3.1.1 Conformance Testing

1. Liner Protection Material
  - a. Two daily samples, separated by at least three truck loads shall be provided for conformance testing by the Quality Assurance Laboratory from each source of liner protection material to assure compliance with the specifications (a minimum of one sample per day shall be tested from each source). The following tests shall be performed on the samples prior to placement:
    - 1) Sieve Analysis (ASTM D422)
    - 2) Hydraulic Conductivity (ASTM D5084)
    - 3) Organic Content (ASTM D2974)

## 2. Coarse Aggregate

- a. At least one sample per day for each size of coarse aggregate shall be provided for conformance testing. Sieve analysis (ASTM D422) shall be performed by the Quality Assurance Laboratory on samples from each source of the coarse aggregate to assure compliance with the specifications.

### 5.3.2 Execution

#### 5.3.2.1 Liner Protection Material

1. After installation completion and acceptance of the liner system and related work activities, place the liner protection material to thickness and areas as shown on the drawings.
2. Liner protection material shall be brought to the work area with earth-carrying equipment, deposited on the previously spread soil cover, and then pushed onto the uncovered portion of the liner with graders or bulldozers. This operation shall be repeated until the total area is covered. During the placement of the granular fill material, no construction equipment shall be allowed directly on the liner and any damage shall be repaired immediately in accordance with the specifications.
3. Care shall be taken to protect the liner. Sand ramps shall be provided at down slopes and in other heavily traveled areas. All heavily traveled areas or areas traveled by rubber tired equipment shall have a minimum of three feet of material above the liner. Only large radius turns by the loader and other equipment shall be permitted, as sharp turns may damage the liner.
4. Placement of liner protection material on the liner shall not proceed at an ambient temperature below 40 degrees F (five degrees C) or above 104 degrees F (40 degrees C) unless otherwise specified in the engineering plans. A minimum thickness of one foot of protective sand is specified between a light dozer (such as a wide pad caterpillar D-3 or lighter) and the liner. When less than 24 inches of sand is in place the light dozer shall be forward and backward, no turning will be allowed until a minimum of 24 inches of sand is placed above the liner. In any case the following table shall be complied with:

| <u>Equipment Ground Pressure (psi)</u> | <u>Minimum Lift Thickness (inches)</u> |
|----------------------------------------|----------------------------------------|
| <4                                     | 12                                     |
| 4-8                                    | 18                                     |
| 8-16                                   | 24                                     |
| >16                                    | 36                                     |

5. While nominal HDPE geomembrane wrinkles are unavoidable, the first lift (a minimum of 24-inches) of liner protection material over the HDPE geomembrane shall be placed in

such a manner as to maintain HDPE geomembrane wrinkles less than 3-inches in height to prevent HDPE geomembrane wrinkles from folding over. This will be accomplished by placing liner protection material up to the edge of the wrinkle, then placing liner protection material on the other side of the wrinkle, and then pushing liner protection material over the wrinkle such that the wrinkle will not fold over creating a crease in the HDPE geomembrane.

6. If a wrinkle forms greater than 3-inches in height, every effort should be made to walk the wrinkle out prior to placement of the liner protection material. If the wrinkle cannot be walked out to a height of 3-inches or less, the wrinkle should be cut and repaired as specified in this Plan.
7. When sand is used as a liner protection layer it shall be compacted by rolling with a smooth drum roller to a maximum 90% of the Standard Proctor maximum dry density (ASTM D698). The final grade shall be laid to elevations as shown on the drawings.
8. When crushed basalt or mixture of liner protection material is used as a liner protection material, the initial depth of material place should be in exceedance of 24 inches. A grader shall be used to smooth out the liner protection material to a minimum depth of 24 inches.
9. Liner protection material (sand or crushed basalt only) shall be placed on the side slopes starting at the toe of the slope and working toward the top of the berm. Glass cullet shall only be placed on the cell floor and not the sideslopes.
10. Liner protection material can only be spread when the liner is taut or stretched evenly over the base of the landfill. The liner protection material shall not be spread when the geomembrane is elongated due to higher daytime temperatures and exposure to sun. The Contractor must make provisions to cover the geomembrane under non-elongated conditions.
11. No material shall be placed, spread, or compacted while the ground or material is frozen or thawing or during unfavorable weather conditions. The liner protection material surface must be made smooth and free from ruts or indentations at the end of any working day when significant precipitation is forecast and/or at completion of compaction operations in that area in order to prevent saturation of the sand liner protection material.
12. Sand or crushed basalt shall be placed to the extents of the leachate collection trench. Glass cullet should not be placed next to the leachate collection trench or in the trench in order to prevent smaller diameter particles from clogging leachate collection pipes. Once placement of the liner protection material is complete, filter geotextile fabric and leachate piping shall be installed, and shall be backfilled with coarse aggregate to the depth and width shown on the Drawings. A three inch minimum layer of coarse aggregate material shall be placed in the bottom of the leachate collection trench. The

leachate piping shall be installed, and shall be backfill with coarse aggregate. Backfill shall only be performed once the placement of the pipe has been approved. Care should be taken during backfilling of the pipe to assure the pipe will not be crushed or otherwise damaged. Equipment shall not be driven over the trench. The geotextile fabric shall then be overlapped at least 24-in over the coarse aggregate.

13. Following construction of the leachate piping, the granular fill material shall be brought to final grade. Sand or crushed basalt shall then be placed over the geotextile wrap to final grade.

### 5.3.2.2 Field Quality Control

#### 1. Liner Protection Material

- a. Samples shall be taken for every 1,500 cubic yards of in-place liner protection material for grain size. The liner protection thickness shall be measured periodically throughout the day during construction with a minimum frequency of 5 tests per acre to confirm that the thickness of the installed material is in accordance with the drawings (minimum 2-foot thick layer). Samples shall be taken for every 2 acres of in-place liner protection material for hydraulic conductivity testing. Samples shall be taken for every 2,500 cubic yards of in-place liner protection material for organic content. When sand is used as a liner protection material, testing for density and field compaction shall be performed at a rate of 4 tests/acres/lift. The samples shall be taken by the CQA Manager/RPR and the following tests shall be performed on the samples by the Quality Assurance Laboratory (Refer to **Appendix 17D**):

- 1) Sieve Analysis (ASTM D422)
- 2) Liner Protection Material Thickness
- 3) Hydraulic Conductivity (ASTM 5084)
- 4) Organic Content (ASTM D2974)
- 5) Density and Field Compaction – for sand only (ASTM D2922)

- b. Any sample or area tested shall be rejected, removed and replaced if it does not meet the requirements of the technical specifications. Reconstructed areas shall have feathered, overlapping edges that tie into adjacent fill material.

#### 2. Coarse Aggregate

- a. Samples shall be taken every 50 cubic yards of in-place coarse aggregate for grain size/type. One sample from each borrow source shall be tested for carbonate content. The samples shall be taken by the CQA Manager/RPR and the following tests shall be performed on the samples by the Quality Assurance Laboratory (Refer to **Appendix 17D**):

- 1) Grain Size/Type (ASTM D422/ASTM D2488)
- 2) Carbonate Content (ASTM 4373)

## 5.4 Geotextile Fabrics

A 10 oz nonwoven geotextile (cushion) will be placed over the geomembrane when crushed glass or crushed basalt is used as liner protection material. An 8 oz nonwoven geotextile (filter) will be used to wrap the leachate collection trench aggregate.

### 5.4.1 Testing

At the discretion of the CQA Manager, conformance testing of the delivered geotextile fabric materials may be required. If deemed necessary, conformance testing shall be conducted in accordance with the following

#### 5.4.1.1 Conformance Testing

1. Conformance testing shall be performed by an independent Quality Assurance Laboratory approved by the Owner. CQA Manager shall obtain samples from the delivered material, mark the machine direction and identification number. The Quality Assurance Technician, in the presence of the CQA Manager, will obtain samples from the delivered material, mark the machine direction and identification number. Samples shall be taken at the rate of one sample per lot, but not to exceed one conformance test per 100,000 square feet of material. A lot is defined as a group of consecutively numbered rolls from the same manufacturing line. This sampling frequency may be increased as deemed necessary by the CQA Manager. The samples shall be taken across the entire roll width and shall not include the first 3 feet. This sampling frequency may be increased as deemed necessary by the CQA Manager. The samples shall be taken across the entire roll width and shall not include the first 3 feet. The following conformance tests shall be conducted at the laboratory.
  - a. Mass per unit area (ASTM D5261)
  - b. Puncture resistance (ASTM D4833/D6241)
  - c. Grab tensile strength (ASTM D4632)
  - d. Flow Rate (ASTM D4491)
  - e. Apparent opening size (max) (ASTM D4751)
  - f. Permittivity (ASTM D4491)
2. All conformance test results shall be reviewed by the CQA Manager and accepted or rejected, prior to the deployment of the geotextile. All test results shall meet, or exceed, the property values listed in the specifications.

3. The Manufacturer reserves the right to obtain additional samples from rolls immediately before and after the failing roll or as directed by the Engineer's Field Representative and have them tested. If these rolls pass, then only the failing roll will be rejected. If they fail, then the entire lot will be rejected.

## 5.4.2 Execution

### 5.4.2.1 Installation

1. 10 oz Geotextile Panel Placement
  - a. The geotextile shall be installed as shown on the drawings and in accordance with the Manufacturer's recommendations and approved shop drawings. Each panel, in accordance with the approved panel layout, shall have an identification number corresponding to adjacent roll numbers.
  - b. No mechanical equipment shall be driven directly on top of the geotextile.
  - c. The subgrade shall be maintained in a smooth, uniform and compacted condition during installation of the geotextile.
  - d. Soil cover shall be placed with mechanical equipment; however, no mechanical equipment shall be allowed directly on top of the geotextile material. Equipment shall be driven on pre-deposited material.
  - e. Soil cover shall be brought to the work area with earth-carrying equipment, deposited on the previously spread soil cover, and then pushed onto the uncovered portion of the fabric with graders or bulldozers. This operation shall be repeated until the total area is covered.
  - f. Soil cover for the side slopes of the geotextile shall be placed at the bottom and pushed up so as to reduce any tension on the geotextile.
  - g. Damage to the geotextile occurring during the placement of soil cover shall be repaired immediately.
  - h. All fabric installation shall be completely covered at the end of each work day unless otherwise approved by the CQA Manager.
2. 10 oz Geotextile Field Seaming
  - a. The seams shall be overlapped a minimum of 6 inches.
  - b. The geotextile panels shall be sewn together. The thread used to sew the panels shall be as approved by the Manufacturer.
3. 8 oz Geotextile Placement

- a. The geotextile shall be installed as shown on the drawings and in accordance with the Manufacturer's recommendations and approved shop drawings.
- b. The geotextile shall overlap a minimum of 24 inches.

#### 5.4.2.2 Field Quality Control

1. Documentation files for panel placement shall be maintained by the Contractor. The Contractor will be responsible for construction quality control. At the end of each work week the files shall be updated and checked to assure that all copies of pertinent project information are included in each file. The Contractor shall submit daily copies of the documentation to the CQA Manager. Documentation files will be reviewed for accuracy and approval by the CQA Manager.
2. Prior to placement of the soil cover, the geotextile installation and related work shall be inspected by the Engineer's Field Representative. All work in the system therein being inspected shall be complete, clean and ready for use. All work shall meet the requirements as to line, grade, cleanliness and workmanship, as determined by CQA Manager.
3. All discrepancies shall be noted and repaired. Final acceptance of the system shall be contingent upon the approval of the Engineer's Field Representative.
4. Upon completion of installation, the Contractor shall remove and dispose of all trash, waste material and equipment used in connection with the performed work and shall leave the premises in a neat condition acceptable to the CQA Manager.

#### 5.4.3 Specifications

The minimum specifications for the non-woven geotextile fabrics are shown on **Table 17-1**. Values are presented as minimum average roll values (MARV)

**Table 17-1 Minimum Nonwoven Geotextile Average Roll Values**

| Properties                   | Test Method     | NIT                     | Filter     | Cushion    |
|------------------------------|-----------------|-------------------------|------------|------------|
| Mass per unit area           | ASTM D5261      | oz./yd <sup>2</sup>     | <b>8</b>   | <b>10</b>  |
| Thickness                    | ASTM D5199      | Mils                    | <b>90</b>  | <b>108</b> |
| Grab Tensile                 | ASTM D4632      | Lbs                     | <b>220</b> | <b>260</b> |
| Grab Elongation              | ASTM D4632      | Percent                 | <b>50</b>  | <b>50</b>  |
| Trapezoidal tear strength    | ASTM D4533      | Lbs                     | <b>80</b>  | <b>100</b> |
| Puncture Resistance          | ASTM D4833D6241 | Lbs                     | <b>120</b> | <b>165</b> |
| Flow Rate                    | ASTM D4491      | gal/min-ft <sup>2</sup> | <b>95</b>  | <b>75</b>  |
| Apparent Opening Size (max.) | ASTM D4751      | Sieve #                 | <b>80</b>  | <b>100</b> |

|               |            |                     |            |            |
|---------------|------------|---------------------|------------|------------|
| Permittivity  | ASTM D4491 | Sec <sup>-2</sup>   | <b>1.2</b> | <b>1.0</b> |
| UV Resistance | ASTM D4355 | % Strength Retained | <b>70</b>  | <b>100</b> |

## 5.5 Geonet

### 5.5.1 Testing

At the discretion of the CQA Manager, conformance testing of the delivered geonet materials may be required. If deemed necessary, conformance testing shall be conducted in accordance with the following:

#### 5.5.1.1 Conformance Testing

1. Conformance testing shall be performed by an independent Quality Assurance Laboratory approved by the Owner. CQA Manager shall obtain samples from the delivered material, mark the machine direction and identification number. The Quality Assurance Technician, in the presence of the CQA Manager, will obtain samples from the delivered material, mark the machine direction and identification number. Samples shall be taken at the rate of one sample per lot, but not to exceed one conformance test per 100,000 square feet of material. A lot is defined as a group of consecutively numbered rolls from the same manufacturing line. This sampling frequency may be increased as deemed necessary by the CQA Manager. The samples shall be taken across the entire roll width and shall not include the first 3 feet. This sampling frequency may be increased as deemed necessary by the CQA Manager. The samples shall be taken across the entire roll width and shall not include the first 3 feet. The following conformance tests shall be conducted at the laboratory.
  - a. Thickness (ASTM D5199)
  - b. Mass per unit area (ASTM D5261)
  - c. Hydraulic transmissivity (ASTM 4716)
  - d. Carbon black content (ASTM D1603)
  - e. Tensile strength (ASTM D5035)
2. All conformance test results shall be reviewed by the CQA Manager and accepted or rejected, prior to the deployment of the geonet. All test results shall meet, or exceed, the property values listed in the specifications.
3. The Manufacturer reserves the right to obtain additional samples from rolls immediately before and after the failing roll or as directed by the Engineer's Field Representative and have them tested. If these rolls pass, then only the failing roll will be rejected. If they fail, then the entire lot will be rejected.



## 5.5.2 Execution

### 5.5.2.1 Installation

#### 1. Panel Placement

- a. The geonet shall be installed as shown on the drawings and in accordance with the Manufacturer's recommendations and approved shop drawings. Each panel, in accordance with the approved panel layout, shall have an identification number corresponding to adjacent roll numbers.
- b. No mechanical equipment shall be driven directly on top of the geonet.
- c. The subgrade shall be maintained in a smooth, uniform and compacted condition during installation of the geonet.
- d. Soil cover/liner protection material (sand, crushed basalt, or crushed glass) shall be placed with mechanical equipment; however, no mechanical equipment shall be allowed directly on top of the geonet material. Equipment shall be driven on pre-deposited material.
- e. Soil cover shall be brought to the work area with earth-carrying equipment, deposited on the previously spread soil cover, and then pushed onto the uncovered portion of the geonet with graders or bulldozers. This operation shall be repeated until the total area is covered.
- f. Soil cover for the side slopes of the geonet shall be placed at the bottom and pushed up so as to reduce any tension on the geonet.
- g. Damage to the geonet occurring during the placement of soil cover shall be repaired immediately.
- h. All geonet installation shall be completely covered at the end of each work day unless otherwise approved by the CQA Manager.

#### 2. Field Seaming

- a. The seams shall be overlapped a minimum of 6 inches.
- b. The geonet panels shall be tied with plastic ties or the most current manufacturer's recommendations.

### 5.5.2.2 Field Quality Control

1. Documentation files for panel placement shall be maintained by the Contractor. The Contractor will be responsible for quality control. At the end of each work week the files shall be updated and checked to assure that all copies of pertinent project information are included in each file. The Contractor shall submit daily copies of the documentation to

the CQA Manager. Documentation files shall be reviewed for accuracy and acceptance by the CQA Manager.

2. Prior to placement of the soil cover, the geonet installation and related work shall be inspected by the Engineer's Field Representative. All work in the system therein being inspected shall be complete, clean and ready for use. All work shall meet the requirements as to line, grade, cleanliness and workmanship, as determined by CQA Manager.
3. All discrepancies shall be noted and repaired. Final acceptance of the system shall be contingent upon the approval of the Engineer's Field Representative.
4. Upon completion of installation, the Contractor shall remove and dispose of all trash, waste material and equipment used in connection with the performed work and shall leave the premises in a neat condition acceptable to the CQA Manager.

### 5.5.3 Specifications

The minimum specifications for the geonet are shown on **Table 17-2**. Values are presented as minimum average roll values (MARV)

**Table 17-2 Minimum Geonet Average Roll Values**

| Properties           | Test Method   | Unit                   | Requirement                  |
|----------------------|---------------|------------------------|------------------------------|
| Mass Per Unit Area   | ASTM D5261    | lbs./ft <sup>2</sup>   | <b>0.17</b>                  |
| Thickness            | ASTM D5199    | inches                 | <b>200</b>                   |
| Density of Polymer   | ASTM D1505    | grams/cm <sup>3</sup>  | <b>0.94</b>                  |
| Carbon Black Content | ASTM D1603    | percent                | <b>2.00</b>                  |
| Resin Melt Index     | ASTM D1238    | grams/10 minutes       | <b>1.00</b>                  |
| Tensile Strength     | ASTM D5035    | lb/in                  | <b>45</b>                    |
| Transmissivity       | ASTM D4716-95 | m <sup>2</sup> /second | <b>2.0 x 10<sup>-3</sup></b> |

## 5.6 Leachate Collection Pipe

### 5.6.1 Specifications

1. High Density Polyethylene (HDPE) Pipe resins shall be high molecular weight, high density polyethylene with a cell classification number of 345464C in accordance with ASTM D3350 and a minimum density of 0.955 in accordance with ASTM D1505.
2. The pipes shall have the nominal dimensions shown on the Engineering Drawings, and shall meet the requirements of IPS Standard Dimension Ratio (SDR) 11, as specified in the drawings.

3. All polyethylene pipe shall meet the requirements of ASTM F714.
4. The pipe shall be joined with butt, heat fusion joints. All joints shall be made in strict compliance with the MANUFACTURER's recommendations.
5. Pipe shall be furnished in standard laying lengths not exceeding 50-ft.
6. All high density polyethylene pipe and fittings shall be made from the same resin. If rework compounds are required, only those generated in the manufacturer's own plant from resin compounds of the same class and type from the same raw material supplier shall be used.
7. The polyethylene compound shall be suitably protected against degradation by ultraviolet light as required by ASTM D1603.
8. The following shall be continuously indent printed on the pipe or spaced at intervals not exceeding 5-ft per ASTM F714:
  - a. Name and/or trademark of the pipe MANUFACTURER.
  - b. Nominal pipe size (outside diameter) in accordance with ASTM F714.
  - c. Dimension ratio (DR) and pressure rating per ASTM F714.
  - d. The letters PE followed by the polyethylene grade in accordance with ASTM D3350, (e.g., PE 345464C). Where applicable, the standard thermoplastic pipe materials designation code may be used as an alternative marking, eg. PE 3608.
  - e. Manufacturing standard reference, e.g., ASTM F714.
  - f. A production code from which the date and place of manufacture can be determined.
9. The leachate collection pipes inside the lined area, as shown on the Drawings, shall be perforated. The perforations shall be drilled into the pipe at the factory after manufacturing, as shown on the Drawings.
10. The perforation shall be covered with tape compatible to the pipe material upon delivery to prevent soil material from entering the pipe prior to installation.

## 5.6.2 Execution

### 5.6.2.1 Pre-Installation

Prior to the installation of any pipe material, each Manufacturer must submit to the CQA Manager/RPR all quality control documentation required below. This documentation shall be reviewed and approved by the CQA Manager/RPR before installation can begin.

1. List of materials to be furnished, the names of the suppliers and the date of delivery of materials to the site.

2. The origin of the resin to be used in the manufacturing of the pipe including the suppliers name and production plant, as well as brand name and number.
3. Documentation from the resin's manufacturer showing results of the following tests for resin identification:

Melt Flow Index      ASTM D1238

Density                ASTM D1505

4. Manufacturer quality control manual describing implementation of quality control procedures during pipe manufacturing process.
5. Pipe manufacturer's certification of compliance with the Engineer's Specifications.
6. Complete, detailed shop drawings of all polyethylene pipe, including the location of all fittings, joints and connections to structures.
7. Manufacturer's recommendations for handling, storing and installing pipe and fittings.
8. For each shipment of pipe a manufacturer's certification that the pipe was manufactured from the same resin identified herein.
9. Certification demonstrating that the joining technician was trained by the pipe manufacturer and is qualified to perform heat fusion welding.
10. Cleaning Contractor qualifications for all leachate piping.

#### 5.6.2.2 Quality Assurance

1. Resin Evaluation
  - a. All incoming resin shall be sampled for conformance testing against test results supplied by the resin manufacturer. Samples shall be taken from the top and bottom of each compartment from every hopper car received. The following conformance tests shall be performed on the sampler:
    1. Melt Flow Index      ASTM D1238
    2. Density                ASTM D1505
    3. The results of these tests shall become part of the Manufacturer's permanent quality control records.

## 2. Finished Product Evaluation

- a. Each length of pipe produced shall be checked by production staff for the items listed below. The results of all measurements shall be recorded on production sheets which become part of the Manufacturer's permanent records.
  1. Pipe in process shall be checked visually, inside and out for cosmetic defects (grooves, pits, hollows, etc).
  2. Pipe outside diameter shall be measured using a suitable periphery tape to ensure conformance with ASTM F714.
  3. Pipe wall thickness shall be measured at twelve equally spaced locations around the circumference at both ends of the pipe to ensure conformance with ASTM F714.
  4. Pipe length shall be measured.
  5. Pipe marking shall be examined and checked for accuracy.
  6. Pipe ends shall be checked to ensure they are cut square and clean.
  7. Subject inside surface to a "reverse bend test" to ensure the pipe is free of oxidation (brittleness).

## 3. Stress Regression Testing

- a. The polyethylene pipe Manufacturer shall provide certification that stress regression testing has been performed on the specific polyethylene resin being utilized in the manufacture of this product. This stress regression testing shall have been done in accordance with ASTM D2837 and the Manufacturer shall provide a product supplying a minimum Hydrostatic Design Basis (HDB) of 1600 psi as determined in accordance with ASTM D2837.

### 5.6.2.3 Installation

1. HDPE Pipe shall be installed in accordance with the instruction of the Manufacturer, as shown on the Engineering Drawings and as specified herein. All heat fusion joints shall be done by a factory qualified joining technician as designated by the pipe Manufacturer.
2. Pipe shall be laid to lines and grade shown on the Drawings with bedding and backfill as shown on the Drawings. The tape covering the perforations shall be removed during installation. The pipe shall be installed such that perforations face the bottom of trench.
3. When laying is not in progress, including lunchtime, the open ends of the pipe shall be closed by fabricated plugs, or by other approved means. All plugs shall be OD fitting type plugs. No plugs will be allowed that require insertion of the plug into pipe, unless approved by the CQA Manager/RPR.

4. Pipe shall be stored on clean level ground to prevent undue scratching or gouging. The handling of the pipe shall be in such a manner that the pipe is not damaged by dragging it over sharp and cutting objects. The maximum allowable depth of cuts, scratches or gouges on the exterior of the pipe is 10 percent of wall thickness. The interior pipe surface shall be free of cuts, gouges or scratches.
5. Sections of pipe with cuts, scratches or gouges deeper than allowed shall be removed completely and the ends of the pipeline rejoined.
6. The pipe shall be joined by the method of thermal butt fusion, as outlined in ASTM F2620 or as recommended by the Manufacturer. All joints shall be made in strict compliance with the Manufacturer's recommendations. In tight locations in which the butt fusion equipment cannot be set up, a thermal coupling such as Central Electrofusion Systems, or equal, may be used. The pipe shall be joined as outlined in ASTM F1055.
7. Mechanical connections of the polyethylene pipe to auxiliary equipment such as valves, pumps and tanks shall be through flanged connections which shall consist of the following:
  - a. A stainless steel back-up, polyethylene flange shall be thermally butt-fused to the stub end of the pipe.
  - b. A Type 316 stainless steel back up ring on both sides of the connection shall be used as approved by the CQA Manager/RPR.
8. Flange connections shall be provided with a full face neoprene gasket.
9. All HDPE pipe must be at the temperature of the surrounding soil at the time of backfilling and compaction.
10. Installation of pipe shall be observed and accepted by the CQA Manager/RPR prior to backfilling.
11. As pipe laying progresses, and at the conclusion of the work, thoroughly clean all of the new pipelines to remove all dirt, stones, pieces of wood or other material which may have entered during the construction period. Debris cleaned from the lines shall be removed from the job site. If, after this cleaning, any obstructions remain, they shall be removed.

## 5.7 CQA Surveying

CQA surveying shall be conducted such that all applicable standards are followed. CQA surveying is for the development of “Record Drawings” at the end of the project, or at intervals defined in the contract documents. Additional surveying for construction purposes may be performed by either the CQA Surveyor or by the Contractor, as deemed appropriate by the CQA Certifying Engineer. The CQA Surveyor shall furnish “Record Drawings” (also referred

to as “as-built” drawings) for review by the CQA Certifying Engineer. Required Record Drawings shall be as specified in the Project Plans and Specifications. All CQA surveying shall be performed under the direction of a surveyor licensed to perform such work in the State of New Mexico. All Record Drawings shall be signed and sealed by the licensed surveyor who directed the CQA survey work. Record Drawings shall be at a scale not smaller than 1 inch = 100 feet. The accuracy of the surveying shall be sufficient to determine if the measurements are within the tolerances specified in the Project Plans and Specifications.

The required surveying of the liner system elevations shall be carried out on a 50-foot square grid at the locations designated in the Project Plans. The grid points for each successive earthworks layer shall have the same horizontal locations for comparison of layer thickness. Additional survey locations shall be recorded to define the following features in the final liner system elevations: toe of slope, crest of slope, grade breaks, drainage systems, and perimeter drainage ditches. Additionally CQA surveying shall be conducted to provide elevations and locations of leachate collection system sumps, collection pipe openings, riser pipe openings, lengths of riser pipes from daylight to bottom of sump, and elevation in riser pipe equal to one foot of head on the liner.

## 5.8 Permanent and Temporary Markers

Permanent markers shall be put in place at all cell boundary corners and leachate collection system pipes and outlets and temporary markers at the edge of anchor trench/edge of liner. Geomembrane and leachate riser and cleanout pipe markers shall be placed so that all areas and pipes for which a construction certification report will be submitted are easily identified in the field. Markers are to provide facility operators immediate knowledge of the extent of constructed disposal areas and leachate collection system risers and cleanout locations. Geomembrane and leachate riser and cleanout pipe markers shall not be destroyed during operations and shall remain in place until a lateral expansion requires markers to be relocated. The location of the markers shall be tied into the landfill grid system and must be reported on each landfill liner certification report. Area markers shall not be placed inside constructed areas. Limits of the geomembrane liner area are to be marked with a red marker, leachate collection system pipes are to be marked with a yellow marker.

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## Section 6

# Final Cover, Stormwater Control System and Landfill Gas Collection System Expansion Construction Quality Assurance

Construction of the final cover or specified earthwork must be in accordance with the approved design plans and Project Specifications. This CQA Plan establishes the construction quality assurance monitoring and testing program designed to ensure construction compliance. The earthwork quality assurance testing program consists of testing soil used to construct the final cover. Quality assurance testing and observation are required during construction of the test pad and during construction of the final cover system components.

## 6.1 Test Pad Construction

### 6.1.1 Purpose and Scope

The purpose of the test pad is to establish the placement and compaction procedures to be used to construct the subgrade and soil component of the final cover system and to ensure conformance with the Project Specifications and state and federal requirements. The test pad program is intended to establish methods, equipment, and procedures for attaining the specified properties, not to pre-qualify materials for the soil component.

### 6.1.2 Test Pad Construction

The test pad shall be constructed in a rectangular shape to a minimum plan area of 25 feet by 40 feet. The test pad shall consist of an established base grade (intermediate cover), infiltration layer, and topsoil layer placed and compacted in accordance with the requirements of the Project Specifications. The test pad shall be constructed on a side slope in an area of the project site designated by the CQA Manager/RPR.

In addition, one of the alternative covers includes a GCL. GCL shall be installed in accordance with Section 5.1 of this exhibit.

The top of waste grading shall be established per the project plans and specifications. Once the material is approved for compaction by the CQA Manager/RPR, it shall be compacted a minimum of 75% standard proctor density. Material may be compacted to greater than 85% standard proctor density in order to achieve the necessary soil properties to minimize infiltration of water through the soil cover. The final thickness of the compacted material shall be confirmed based upon survey information to ensure it was constructed in accordance with project plans and specifications.

Construction of the soil infiltration layer shall not commence until the condition of the top of waste grading has been examined and documented by the CQA Manager/RPR. The soil infiltration layer in the test pad shall be constructed in lifts not exceeding 12 inches loose and 6 inches to 8 inches in compacted thickness. Each lift of soil shall be compacted within the specified moisture-density window. If appropriate, the moisture-density window may be modified by the CQA Manager/RPR to ensure the soil meets the specified hydraulic conductivity or to improve constructability based on the results of the test pad, if approved by the CQA Certifying Engineer. The CQA Manager/Certifying Engineer shall finalize the moisture-density compaction window in writing prior to construction of the full-scale soil layer in each module.

When the CQA Manager/RPR has determined that each lift meets the target dry density and moisture content requirements, the next lift shall be constructed. The completed soil layer shall be rolled with appropriate equipment (e.g., rubber-tired or smooth-drum roller) to obtain a sufficiently smooth top surface.

### 6.1.3 Monitoring and Testing

The CQA Manager/RPR shall monitor and document borrow material and construction of each lift of the test pad and shall ensure that construction is performed in accordance with the appropriate sections of the Project Specifications. Monitoring and documentation shall include:

- Weather conditions during construction
- Equipment used in construction
- Manner in which equipment was used
- Moisture content and dry density measurements for each lift
- Approximate thickness of each uncompacted and compacted soil lift

Field and laboratory testing shall be performed by the CQA Manager/RPR or other designated CQA personnel during construction of the top of waste grading and soil layers in the test pad and shall include those tests presented in **Appendix 17D, Table 17D-1**.

### 6.1.4 Test Pad Data Interpretation

The interpretation of the test results shall focus on the feasibility of constructing a full-scale soil cover in conformance with the project and regulatory requirements. A letter report summarizing the test results shall be issued by the CQA Manager/RPR to the CQA Certifying Engineer at the completion of the test pad testing program. This letter report shall also be included as a part of the final project CQA documentation.

## 6.2 Cover Construction

Full-scale cover construction will commence in a similar fashion to test pad construction including construction of top of waste grading, soil infiltration, and topsoil layers. However,

the full scale cover will also include a native seed mixture that will be applied to the topsoil layer according to the Specifications.

Cover construction will also include construction of stormwater control features such as berms, swales, and downdrains as required by the Project Plans and Specifications (Section 6.3).

All components of the construction shall be observed and tested as required by the CQA Plan and monitored to verify that the construction is in accordance with the Project Plans and Specifications. The cover construction will also comply with the final cover requirements contained in *20.9.6.9 NMAC* in addition to other closure requirements in effect at the time of closure. The CQA Certifying Engineer shall review the work performed by the CQA Manager/RPR and identify inadequate construction methodologies or materials that may adversely impact the performance of the facility being constructed and/or existing structures. Visual observations and verification of the independent survey required for specific layers through the construction process shall be made to evaluate whether the materials are placed to the lines and grades as shown on the Project Plans.

The CQA Manager/RPR will give the CQA Certifying Engineer sufficient notice of anticipated completion of the construction components so that related CQA documentation may be reviewed and accepted without delay to the Contractor. Specific CQA observations and/or testing are required for the following:

- Top of Waste/Intermediate Cover Grading
- Soil Infiltration Layer
- Topsoil with Native Seeding
- Stormwater Control Structures

A list of anticipated equipment used to install the final cover system is included in below. Depending on the selected final cover system some of the equipment may not be used and additional equipment may be required:

- Track and Wheel Loaders
- Hydraulic Excavator
- Wheel Tractor-Scraper
- Articulated Truck
- Motor Grader
- Vibratory Soil Compactor
- Skidsteer

- Backhoe Loader
- Water Truck/Wagon

### 6.2.1 Monitoring and Testing

The general earthworks components of the final cover system include establishing the top of waste grading, soil infiltration layer, and the erosion resistant layer. Borrow materials for the soil cover will be obtained from a location meeting the requirements of the Project Plans and Specifications. CQA observation and testing are required during construction to verify that the materials and construction are in accordance with these Project Plans and Specifications. The tests to be performed for each material type, including testing frequency, are presented in **Appendix 17D**. The testing frequencies specified in **Appendix 17D** may be increased when construction conditions warrant additional tests. Additional tests shall be recommended by the CQA Manager/RPR and approved by the CQA Certifying Engineer.

General construction observation and monitoring duties during construction include:

- Observing construction staking to verify that all materials are placed to the lines, grades, and elevations shown in the Project Plans
- Verifying that fill is placed in loose lifts that result in a nominal compacted thickness of 6 to 8 inches
- Performing field and laboratory testing in accordance with **Appendix 17D, Table 17D-1** to verify that the fill materials are placed to the moisture and density requirements indicated in the Project Plans and Specifications
- Verifying top of waste grading is suitable for supporting soil layer materials
- Promptly notifying the Contractor of test results that affect the work; notifying the CQA Certifying Engineer of construction progress and of the results of all testing; in the event of failing tests, verifying that the Contractor adequately reworks the areas that do not meet the Project Plans and Specifications
- Verifying that the CQA Survey has been completed and that the Record Drawings furnished by the surveyor indicates compliance with the lines, grades, elevations, and tolerances as indicated by the Project Plans and Specifications

## 6.3 CQA Surveying

CQA surveying shall be conducted such that all applicable standards are followed. CQA surveying is for the development of “Record Drawings” at the end of the project, or at intervals defined in the contract documents. Additional surveying for construction purposes may be performed by either the CQA Surveyor or by the Contractor, as deemed appropriate by the CQA Certifying Engineer. The CQA Surveyor shall furnish “Record Drawings” (also referred to as “as-built” drawings) for review by the CQA Certifying Engineer. Required Record

Drawings shall be as specified in the Project Plans and Specifications. All CQA surveying shall be performed under the direction of a surveyor licensed to perform such work in the State of New Mexico. All Record Drawings shall be signed and sealed by the licensed surveyor who directed the CQA survey work. Record Drawings shall be at a scale not smaller than 1 inch = 100 feet. The accuracy of the surveying shall be sufficient to determine if the measurements are within the tolerances specified in the Project Plans and Specifications.

The required surveying of final cover system elevations shall be carried out on a 50-foot square grid at the locations designated in the Project Plans. The grid points for each successive earthworks layer shall have the same horizontal locations for comparison of layer thickness. Additional survey locations shall be recorded to define the following features in the final cover: toe of slope, crest of slope, grade breaks, drainage systems, and perimeter drainage ditches.

## 6.4 Stormwater Control System Construction

The grading plan is designed to provide a uniform slope that diverts storm runoff into structures designed to reduce the erosion of the cover and possible exposure of buried waste. The stormwater control system is designed to direct flow to a channel system created by 4-foot high berms at the top of the landfill. Run-off from the top and side slopes of the landfill will be directed to an intermediate channel system and ultimately to a perimeter channel system located along the toe of the landfill. Flow from this channel system is then directed to site outfall. A summary of stormwater control structures including their location, dimensions and materials is provided in Table 17-3. The stormwater control structures will be installed per the Project Specifications and Drawings as well as shown in Table 17-3. The design and construction of the stormwater control structures will maintain the minimum required thickness of the final cover. A geotextile will underlay rip rap and gabion mattresses where installed in channels and berms.

**Table 17-3 Stormwater Control Structures**

| <b>Stormwater Control Structure</b> | <b>Location</b>                             | <b>Dimensions</b>                                                                                                                   | <b>Material</b>                 |
|-------------------------------------|---------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------|---------------------------------|
| Berms                               | Existing (West Phase) Landfill Area         | 4-foot high berm with 2:1 side slopes                                                                                               | Native earth & Rip-rap          |
|                                     | Future (East Phase) Landfill Area           | 4-foot high berm with 2:1 side slopes                                                                                               | Native earth & Rip-rap          |
| Perimeter Channels                  | West Conveyance Channel                     | Bottom width = 10 ft; 3 to 1 side slopes; Depth varies; Maximum depth required = 4 ft (w/ 12 inches freeboard)                      | Native Earth                    |
|                                     | Channel located between East and West Phase | Bottom width = 30 ft; 3 to 1 side slopes; Depth varies; Maximum depth required = 2 ft (w/ 12 inches freeboard)                      | Native Earth<br>Gabion mattress |
|                                     | East Conveyance Channel                     | Bottom width = 30 ft; 3 to 1 side slopes; Depth varies; Maximum depth required = 3 ft (w/ 12 inches freeboard); D50=6" riprap lined | Native Earth                    |
| Interior Channels                   | Existing (West Phase) Landfill Area         | V-shape swale with 2:1 side slopes; 10 feet top width and 2.5 feet deep                                                             | Riprap lined                    |
|                                     | Future (East Phase) Landfill Area           | V-shape swale with 2:1 side slopes; 10 feet top width and 2.5 feet deep                                                             | Riprap lined                    |
| Downdrains                          | Existing (West Phase) Landfill Area         | Trapezoid – 4 feet wide (bottom), 2 feet deep, 16 feet wide (top)                                                                   | Wire Enclosed Riprap            |
|                                     | Future (East Phase) Landfill Area           | Trapezoid – 4 feet wide (bottom), 2 feet deep, 16 feet wide (top)                                                                   | Wire Enclosed Riprap            |
| Culverts                            | Existing (West Phase) Landfill Area         | Perimeter Road Culverts: Two 21-inch RCP sections<br>Interior Road and Downdrain Crossings: Two 21-inch RCP sections                | Reinforced Concrete Pipe (RCP)  |
|                                     | Future (East Phase) Landfill Area           | Perimeter Road Culverts: Two 21-inch                                                                                                | RCP                             |

|  |  |                                                                                        |  |
|--|--|----------------------------------------------------------------------------------------|--|
|  |  | RCP sections<br><br>Interior Road and Downdrain<br>Crossings: Two 21-inch RCP sections |  |
|--|--|----------------------------------------------------------------------------------------|--|

General construction observation and monitoring duties during construction include:

- Observing construction staking to verify that all materials are placed to the lines, grades, and elevations shown in the Project Plans
- Promptly notifying the Contractor of test results that affect the work; notifying the CQA Certifying Engineer of construction progress and of the results of all testing; in the event of failing tests, verifying that the Contractor adequately reworks the areas that do not meet the Project Plans and Specifications
- Verifying that the CQA Survey has been completed and that the Record Drawings furnished by the surveyor indicates compliance with the lines, grades, elevations, and tolerances as indicated by the Project Plans and Specifications

## 6.5 Landfill Gas Collection System Expansion Construction

All components of the construction for expansion of the landfill gas collection system shall be observed and tested as required by the CQA Plan and monitored to verify that the construction is in accordance with the Project Plans and Specifications. The CQA Certifying Engineer shall review the work performed by the CQA Manager/RPR and identify inadequate construction methodologies or materials that may adversely impact the performance of the facility being constructed and/or existing structures. Visual observations and verification of the independent survey through the construction process shall be made to evaluate whether the materials are placed to the lines and grades as shown on the Project Plans.

The CQA Manager/RPR will give the CQA Certifying Engineer sufficient notice of anticipated completion of the construction components so that related CQA documentation may be reviewed and accepted without delay to the Contractor.

General construction observation and monitoring duties during construction include:

- Observing construction staking to verify that all materials are placed to the lines, grades, and elevations shown in the Project Plans
- Promptly notifying the Contractor of test results that affect the work; notifying the CQA Certifying Engineer of construction progress and of the results of all testing; in the event of failing tests, verifying that the Contractor adequately reworks the areas that do not meet the Project Plans and Specifications

- Verifying that the CQA Survey has been completed and that the Record Drawings furnished by the surveyor indicates compliance with the lines, grades, elevations, and tolerances as indicated by the Project Plans and Specifications



## Section 7

# Documentation and Certification

### 7.1 Documentation

The documentation of landfill cell construction is an important factor to ensure the performance of the installed system. The documentation shall be performed as described below and all related activities shall be recorded on the appropriate forms included in **Appendix 17C**.

### 7.2 Reporting

All reports shall be prepared by the CQA Manager/RPR. Standard reporting procedures should include preparation of a summary report containing any recorded deficiencies and corrective measures. At a minimum the reports should include:

1. Project name, location and date.
2. Weather conditions including:
  - a. Temperature (daily high and low)
  - b. Wind conditions
  - c. Precipitation events
  - d. Amount of precipitation
3. Description of construction activities underway and those completed.
4. Equipment and personnel onsite.
5. Types of materials and equipment delivered.
6. Summary of material quantities installed and tested.
7. Any work deficiencies and corrective actions taken.
8. Record of visitors.
9. Any relevant conversations.
10. Any field modifications.
11. Laboratory and/or field test data attached.

## 7.3 Record Drawings

After the installation and completion of all construction activities, record drawings shall be prepared by the Contractor, CQA Surveyor, and CQA Certifying Engineer and submitted to the Owner and NMED. The record drawings shall include final survey by a registered land surveyor as described in Section 3 through Section 5 of this exhibit and approved by a professional engineer to verify that all contours and elevations are in accordance with the Project Plans and Specifications.

Record drawings shall include inverts and daylight opening elevations and locations of leachate collection system sumps, collection pipe daylight elevations on edge of pipe and locations, and riser pipe daylight elevation on edge of pipe and locations, lengths of riser pipes from daylight to invert of sump, elevation in riser pipe equal to one foot of head on the liner.

## 7.4 Certification

A certification report shall be prepared by the CQA Manager/RPR and the CQA Certifying Engineer certifying the construction of the cover and drainage systems. The report, at a minimum, shall include:

1. Certification letter stating that construction activities were conducted in accordance with the Project Plans and Specifications.
2. Description and location of the site.
3. Description of the construction activities.
4. Description of the location, frequency, and results of all the testing conducted during construction.
5. Description of steps and methods followed to report and retest the failed areas and results of the retesting.
6. A copy of the record drawings.
7. A copy of all the forms completed during construction activities.
8. Sufficient photographic documents of the work progression, problems encountered and corrective action results.

Upon receipt and review by the CQA Certifying Engineer, the report shall be sealed by the CQA Certifying Engineer and submitted to the Owner and NMED.

## Appendix 17A

### GCL Material Properties

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## Appendix 17B

# HDPE Material Property and Factory and Field Seams Properties

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## Appendix 17A

### GCL Material Properties

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**Table 17A-1**  
**GCL and Bentonite Material Properties**

| MATERIAL                             | TEST                                               | METHOD <sup>1,2,3</sup> | MIN. ACCEPTABLE<br>VALUE <sup>9</sup> (REINFORCED)              | TEST FREQUENCY        | COMMENTS        |
|--------------------------------------|----------------------------------------------------|-------------------------|-----------------------------------------------------------------|-----------------------|-----------------|
| BENTONITE <sup>6</sup>               | Swell Index                                        | ASTM D5890              | 24 mL/2g                                                        | Every 100,000 lb      | by Manufacturer |
|                                      | Fluid Loss                                         | ASTM D5891              | 18 mL (max.)                                                    | Every 100,000 lb      | by Manufacturer |
|                                      | Moisture Content                                   | ASTM D5993              | 35% (max.)                                                      | Every 100,000 lb      | by Manufacturer |
|                                      | Particle Size Distribution<br>(Granular Bentonite) | ASTM D421               | Submit Test Results                                             | Every 100,000 lb      | by Manufacturer |
| WOVEN<br>GEOTEXTILE                  | Mass per unit area                                 | ASTM D5261              | 3.0 oz./sy                                                      | Every 200,000 sq. ft. | by Manufacturer |
| NON-WOVEN<br>GEOTEXTILE <sup>5</sup> | Mass per unit area                                 | ASTM D5261              | 5.8 oz./sy                                                      | Every 200,000 sq. ft. | by Manufacturer |
| GCL                                  | Hydraulic Conductivity <sup>8</sup>                | ASTM D5887              | $5 \times 10^{-9}$ cm/sec (max.)                                | Every week            | by Manufacturer |
|                                      | Tensile Strength <sup>4</sup>                      | ASTM D6768              | 23 lb./in.                                                      | Every 200,000 sq. ft. | by Manufacturer |
|                                      | Peel Strength                                      | ASTM D6496              | 2.1 lb./in.                                                     | Every 40,000 sq. ft.  | by Manufacturer |
|                                      | Mass per unit area <sup>7</sup>                    | ASTM D5993              | 0.81 lb/sf                                                      | Every 40,000 sq. ft.  | field sample    |
|                                      | Index Flux                                         | ASTM D5887              | $1 \times 10^{-6}$ cm <sup>3</sup> /cm <sup>2</sup> /sec (max.) | Every Lot             | field sample    |

Explanatory Notes for Table 17A-1:

1. Testing methods and values shall be in accordance with GRI-GCL3\* document
2. ASTM procedures modified as necessary to utilize three test specimens across the roll width. Results are reported as the average of these three values. Size of test specimens may also differ slightly from those indicated in ASTM methods.
3. All required values listed are minimum average roll values (MARVs) unless otherwise indicated.
4. All tensile testing on the geotextiles and on the GCL is performed with the test specimens oriented in the machine direction.
5. The values listed represent the non-woven geotextile before being needle punched into the GCL. The actual tensile strength of the non-woven may be higher but cannot be accurately measured due to difficulties in separating it from the woven geotextile.
6. These parameters are for the bentonite as delivered to the GCL MANUFACTURER, not for the bentonite in the finished product.
7. Mass of the GCL is measured after oven drying per the stated test method
8. Permeability testing is performed with a 5-psi confining pressure and a 2-psi head pressure.
9. Hydraulic Conductivity, Index Flux, and Fluid Loss are maximum values.



## Appendix 17B

# HDPE Material Property and Factory and Field Seams Properties

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**TABLE 17B-1**  
**MATERIAL PROPERTIES**  
**HIGH DENSITY POLYETHYLENE (HDPE) GEOMEMBRANE**  
**TEXTURED SHEET**

| Property                 | Unit                      | Value     | Test Method        | Specified Thickness (mil) |                       |                       |                       | 100                   | 120                   | Min. Testing Frequency |
|--------------------------|---------------------------|-----------|--------------------|---------------------------|-----------------------|-----------------------|-----------------------|-----------------------|-----------------------|------------------------|
|                          |                           |           |                    | 30                        | 40                    | 60                    | 80                    |                       |                       |                        |
| Thickness                | Mil                       | min. ave. | ASTM D5994         |                           |                       |                       |                       |                       |                       |                        |
| -Nominal                 | Mil                       |           |                    | 30                        | 40                    | 60                    | 80                    | 100                   | 120                   | per roll               |
| -Lowest Individual       | Mil                       |           |                    | 27                        | 36                    | 54                    | 72                    | 90                    | 100                   | per roll               |
| -Asperity Height         | Mil                       | min. ave. | GRI GM 12          | 10                        | 10                    | 10                    | 10                    | 10                    | 10                    | every 2nd roll         |
| Density                  | g/ml                      | min.      | ASTM D1505/D792    | 0.940                     | 0.940                 | 0.940                 | 0.940                 | 0.940                 | 0.940                 | 200,000 lb             |
| Tensile Properties       | lb/in                     | min. ave. | ASTM D6639 Type IV |                           |                       |                       |                       |                       |                       | 20,000 lb              |
| -Yield Stress            | lb/in                     |           |                    | 63                        | 84                    | 126                   | 168                   | 210                   | 252                   |                        |
| -Break Stress            | lb/in                     |           |                    | 45                        | 60                    | 90                    | 120                   | 150                   | 180                   |                        |
| -Yield Elongation        | %                         |           |                    | 12                        | 12                    | 12                    | 12                    | 12                    | 12                    |                        |
| -Break Elongation        | %                         |           |                    | 100                       | 100                   | 100                   | 100                   | 100                   | 100                   |                        |
| Tear Resistance          | Lb                        | min. ave. | ASTM D1004         | 21                        | 28                    | 42                    | 56                    | 70                    | 84                    | 45,000 lb              |
| Puncture Resistance      | Lb                        | min. ave. | ASTM D4833         | 45                        | 60                    | 90                    | 120                   | 150                   | 180                   | 45,000 lb              |
| Stress Crack Resistance  | Hr.                       | min.      | ASTM D5397 (APP.)  | 300                       | 300                   | 300                   | 300                   | 300                   | 300                   | per GRI, GM 10         |
| Carbon Black Content     | %                         | range     | ASTM D1603         | 2-3                       | 2-3                   | 2-3                   | 2-3                   | 2-3                   | 2-3                   | 20,000 lb              |
| Carbon Black Dispersion  |                           | category  | ASTM D5596         | 9 in 1 or 2<br>1 in 3     | 9 in 1 or 2<br>1 in 3 | 9 in 1 or 2<br>1 in 3 | 9 in 1 or 2<br>1 in 3 | 9 in 1 or 2<br>1 in 3 | 9 in 1 or 2<br>1 in 3 | 45,000 lb              |
| Oxidative Induction Time |                           | min. ave. |                    |                           |                       |                       |                       |                       |                       | 200,000 lb             |
| -Standard OIT, or        | Minutes                   |           | ASTM D3895         | 100                       | 100                   | 100                   | 100                   | 100                   | 100                   |                        |
| -High Pressure OIT       |                           |           | ASTM D5885         | 400                       | 400                   | 400                   | 400                   | 400                   | 400                   |                        |
| Oven Aging @ 85C         |                           |           | ASTM D5721         |                           |                       |                       |                       |                       |                       |                        |
| -Standard OIT, or        | % retained after 90 days  | min. ave. | ASTM D3895         | 55                        | 55                    | 55                    | 55                    | 55                    | 55                    | per formulation        |
| -High Pressure OIT       | % retained after 90 days  | min. ave. | ASTM D5885         | 80                        | 80                    | 80                    | 80                    | 80                    | 80                    |                        |
| UV Resistance            |                           |           | GM 11              |                           |                       |                       |                       |                       |                       |                        |
| -High Pressure OIT       | % retained after 1600 hrs | min. ave. | ASTM D5885         | 50                        | 50                    | 50                    | 50                    | 50                    | 50                    | per formulation        |

<sup>1</sup>Testing methods and procedures shall be in accordance with GRI, GM13 document.

**TABLE 17B-2**  
**MATERIAL PROPERTIES**  
**HIGH DENSITY POLYETHYLENE (HDPE) GEOMEMBRANE**  
**SMOOTH SHEET**

| Property                 | Unit                      | Value     | Test Method <sup>1</sup> | Specified (Thickness mil) |                       |                       |                       |                       |                       | Min. Testing Frequency |
|--------------------------|---------------------------|-----------|--------------------------|---------------------------|-----------------------|-----------------------|-----------------------|-----------------------|-----------------------|------------------------|
|                          |                           |           |                          | 30                        | 40                    | 60                    | 80                    | 100                   | 120                   |                        |
| Thickness                | mil                       | min. ave. | ASTM D5199               |                           |                       |                       |                       |                       |                       |                        |
| -Nominal                 | mil                       |           |                          | 30                        | 40                    | 60                    | 80                    | 100                   | 120                   |                        |
| - Lowest Individual      | mil                       |           |                          | 27                        | 36                    | 54                    | 72                    | 90                    | 108                   | per roll               |
| Density                  | g/ml                      | min.      | ASTM D1505/D792          | 0.940                     | 0.940                 | 0.940                 | 0.940                 | 0.940                 | 0.940                 | 200,000 lb             |
| Tensile Properties       | lb/in                     | min. ave. | ASTM D6693 Type IV       |                           |                       |                       |                       |                       |                       | 20,000 lb              |
| -Yield Stress            | lb/in                     |           |                          | 63                        | 84                    | 126                   | 168                   | 210                   | 252                   |                        |
| - Break Stress           | lb/in                     |           |                          | 114                       | 152                   | 228                   | 304                   | 380                   | 456                   |                        |
| - Yield Elongation       | %                         |           |                          | 12                        | 12                    | 12                    | 12                    | 12                    | 12                    |                        |
| - Break Elongation       | %                         |           |                          | 700                       | 700                   | 700                   | 700                   | 700                   | 700                   |                        |
| Tear Resistance          | lb                        | min. ave. | ASTM D1004               | 21                        | 28                    | 42                    | 56                    | 70                    | 84                    | 45,000 lb              |
| Puncture Resistance      | lb                        | min. ave. | ASTM D4833               | 54                        | 72                    | 108                   | 144                   | 180                   | 216                   | 45,000 lb              |
| Stress Crack Resistance  | hr.                       | min.      | ASTM D5397 (APP. A)      | 300                       | 300                   | 300                   | 300                   | 300                   | 300                   | per GRI-GM10           |
| Carbon Black Content     | %                         | range     | ASTM D4218<br>ASTM D1603 | 2-3                       | 2-3                   | 2-3                   | 2-3                   | 2-3                   | 2-3                   | 20,000 lb              |
| Carbon Black Dispersion  |                           | category  | ASTM D5596               | 9 in 1 or 2, ≤ 1 in 3     | 9 in 1 or 2, ≤ 1 in 3 | 9 in 1 or 2, ≤ 1 in 3 | 9 in 1 or 2, ≤ 1 in 3 | 9 in 1 or 2, ≤ 1 in 3 | 9 in 1 or 2, ≤ 1 in 3 | 45,000 lb              |
| Oxidative Induction Time |                           |           |                          |                           |                       |                       |                       |                       |                       |                        |
| - Standard OIT, or       | minutes                   | min. ave. | ASTM D3895               | 100                       | 100                   | 100                   | 100                   | 100                   | 100                   | 200,000 lb             |
| - High Pressure OIT      | minutes                   | min. ave. | ASTM D5885               | 400                       | 400                   | 400                   | 400                   | 400                   | 400                   | 200,000 lb             |
| Oven Aging @ 85 C        |                           |           | ASTM D5721               |                           |                       |                       |                       |                       |                       |                        |
| - Standard OIT, or       | % retained after 90 days  | min. ave. | ASTM D3895               | 55                        | 55                    | 55                    | 55                    | 55                    | 55                    | per formulation        |
| - High Pressure OIT      | % retained after 90 days  | min. ave. | ASTM D5885               | 80                        | 80                    | 80                    | 80                    | 80                    | 80                    | per formulation        |
| UV Resistance            |                           |           | GRI-GM 11                |                           |                       |                       |                       |                       |                       |                        |
| - High Pressure OIT      | % retained after 1600 hrs | min. ave. | ASTM D5885               | 50                        | 50                    | 50                    | 50                    | 50                    | 50                    | per formulation        |

<sup>1</sup>Testing methods and procedures shall be in accordance with GRI, GM13 document.

**TABLE 17B-3**  
**FACTORY AND FIELD SEAMS PROPERTIES**  
**HIGH DENSITY POLYETHYLENE (HDPE) GEOMEMBRANE**  
**SMOOTH AND TEXTURED SHEET**

| PROPERTY       | UNIT  | VALUE | TEST METHOD <sup>1</sup> | SPECIFIED THICKNESS (mil) |    |     |     |     |     |
|----------------|-------|-------|--------------------------|---------------------------|----|-----|-----|-----|-----|
|                |       |       |                          | 30                        | 40 | 60  | 80  | 100 | 120 |
| Shear Strength |       |       |                          |                           |    |     |     |     |     |
| Fusion         | lb/in | min.  | ASTM D6392               | 57                        | 80 | 120 | 160 | 200 | 240 |
| Extrusion      | lb/in | min.  | ASTM D6392               | 57                        | 80 | 120 | 160 | 200 | 240 |
|                |       |       |                          |                           |    |     |     |     |     |
| Peel Strength  |       |       |                          |                           |    |     |     |     |     |
| Fusion         | lb/in | min.  | ASTM D6392               | 45                        | 60 | 91  | 121 | 151 | 181 |
| Extrusion      | lb/in | min.  | ASTM D6392               | 39                        | 52 | 78  | 104 | 130 | 156 |

<sup>1</sup>Testing methods and procedures shall be in accordance with ASTM D6392 and GRI, GM19 document.





## Appendix 17C

# Liner Quality Control Documentation Forms

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## SUBGRADE SURFACE ACCEPTANCE

DATE: \_\_\_\_\_ PROJECT NUMBER: \_\_\_\_\_

PROJECT NAME: \_\_\_\_\_

EARTH CONTRACTOR: \_\_\_\_\_

ADDRESS: \_\_\_\_\_

CITY: \_\_\_\_\_ STATE: \_\_\_\_\_ ZIP: \_\_\_\_\_

SUPERINTENDENT OF PROJECT: \_\_\_\_\_ PHONE: \_\_\_\_\_

GEOMEMBRANE INSTALLER: \_\_\_\_\_

ADDRESS: \_\_\_\_\_

CITY: \_\_\_\_\_ STATE: \_\_\_\_\_ ZIP: \_\_\_\_\_

SUPERINTENDENT OF PROJECT: \_\_\_\_\_ PHONE: \_\_\_\_\_

## CERTIFICATE OF ACCEPTANCE OF SUBGRADE SOIL BY INSTALLER

I the undersigned, duly authorize representative of

\_\_\_\_\_

do hereby accept the soil surface as being acceptable for placement of a geomembrane liner.

| Name | Signature | Title | Date |
|------|-----------|-------|------|
|------|-----------|-------|------|

Certificate Accepted by Inspector-Company: \_\_\_\_\_

| Name | Signature | Title | Date |
|------|-----------|-------|------|
|------|-----------|-------|------|

EFR: \_\_\_\_\_

CONTRACTOR'S REPRESENTATIVE: \_\_\_\_\_

INSTALLING SUPERVISOR: \_\_\_\_\_

*Use back for comments.*

## DAILY CQC REPORT

PROJECT:

DATE:\_\_\_\_\_ WEATHER:\_\_\_\_\_ TEMP.: AM\_\_PM\_\_

CONTRACTOR:\_\_\_\_\_

Log:\_\_\_\_\_

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Deficiencies and Corrective

Actions:\_\_\_\_\_

---

---

Outstanding

Items:\_\_\_\_\_

---

Attachments:\_\_\_\_\_

---

---

QA/QC MANAGER:\_\_\_\_\_

DATE:\_\_\_\_\_

MATERIAL RECEIVING LOG 1 of 7

PROJECT NAME: \_\_\_\_\_

DATE: \_\_\_\_\_ PROJECT NO.: \_\_\_\_\_ MATERIAL TYPE: \_\_\_\_\_

| BATCH/<br>LOT NO. | FACTORY<br>ROLL NO. | LENGTH | WIDTH | COMMENTS |
|-------------------|---------------------|--------|-------|----------|
|                   |                     |        |       |          |
|                   |                     |        |       |          |
|                   |                     |        |       |          |
|                   |                     |        |       |          |
|                   |                     |        |       |          |
|                   |                     |        |       |          |
|                   |                     |        |       |          |
|                   |                     |        |       |          |
|                   |                     |        |       |          |
|                   |                     |        |       |          |

NOTE: BILLS OF LADING/SHIPPING STATEMENTS ATTACHED

**DAILY PANEL PLACEMENT LOG 2 of 7**

**PROJECT NAME:** \_\_\_\_\_

**DATE:** \_\_\_\_\_ **PROJECT NO.:** \_\_\_\_\_ **MATERIAL TYPE:** \_\_\_\_\_

| <b>PANEL NO.</b> | <b>FACTORY<br/>ROLL NO.</b> | <b>LENGTH</b> | <b>WIDTH</b> | <b>COMMENTS</b> |
|------------------|-----------------------------|---------------|--------------|-----------------|
|                  |                             |               |              |                 |
|                  |                             |               |              |                 |
|                  |                             |               |              |                 |
|                  |                             |               |              |                 |
|                  |                             |               |              |                 |
|                  |                             |               |              |                 |
|                  |                             |               |              |                 |

**TOTAL SO. FT. DEPLOYED TODAY:**

\_\_\_\_\_

# TRIAL WELD LOG 3 of 7

PROJECT NAME: \_\_\_\_\_

DATE: \_\_\_\_\_

PROJECT NO.: \_\_\_\_\_

MATERIAL TYPE: \_\_\_\_\_

| SEAMER I.D. | MACHINE<br>NUMBER | AMBIENT<br>TEMPERATURE | AM/<br>PM | EXTRUSION WELDS<br>MACHINE<br>TEMP/PREHEAT TEMP | FUSION WELDS<br>WEDGE<br>TEMP/SPEED SET | PEEL VALUES<br>LBS/INCH | SHEAR<br>VALUES<br>LBS/INCH |
|-------------|-------------------|------------------------|-----------|-------------------------------------------------|-----------------------------------------|-------------------------|-----------------------------|
|             |                   |                        |           |                                                 |                                         |                         |                             |
|             |                   |                        |           |                                                 |                                         |                         |                             |
|             |                   |                        |           |                                                 |                                         |                         |                             |
|             |                   |                        |           |                                                 |                                         |                         |                             |
|             |                   |                        |           |                                                 |                                         |                         |                             |
|             |                   |                        |           |                                                 |                                         |                         |                             |
|             |                   |                        |           |                                                 |                                         |                         |                             |
|             |                   |                        |           |                                                 |                                         |                         |                             |
|             |                   |                        |           |                                                 |                                         |                         |                             |
|             |                   |                        |           |                                                 |                                         |                         |                             |

DAILY SEAMING LOG 4 of 7

PROJECT NAME: \_\_\_\_\_

DATE: \_\_\_\_\_ PROJECT NO.: \_\_\_\_\_ MATERIAL TYPE: \_\_\_\_\_

| SEAMER I.D.                                  | SEAM LENGTH | AM/PM | COMMENTS |
|----------------------------------------------|-------------|-------|----------|
|                                              |             |       |          |
|                                              |             |       |          |
|                                              |             |       |          |
|                                              |             |       |          |
|                                              |             |       |          |
|                                              |             |       |          |
|                                              |             |       |          |
|                                              |             |       |          |
|                                              |             |       |          |
|                                              |             |       |          |
|                                              |             |       |          |
|                                              |             |       |          |
|                                              |             |       |          |
|                                              |             |       |          |
| TOTAL LINEAL FEET WELDED:                    |             |       |          |
| TODAY _____ FUSION WELD _____ EXTRUSION WELD |             |       |          |



SEAM INSPECTION LOG 5 of 7 - FUSION WELD

AIR PRESSURE TESTING

PROJECT NAME: \_\_\_\_\_

DATE: \_\_\_\_\_ PROJECT NO.: \_\_\_\_\_ MATERIAL TYPE: \_\_\_\_\_

| SEAMER<br>I.D. NO. | START<br>TIME | END<br>TIME | START<br>PRESSURE | END<br>PRESSURE | +/- | LENGTH<br>TESTED | COMMENTS |
|--------------------|---------------|-------------|-------------------|-----------------|-----|------------------|----------|
|                    |               |             |                   |                 |     |                  |          |
|                    |               |             |                   |                 |     |                  |          |
|                    |               |             |                   |                 |     |                  |          |
|                    |               |             |                   |                 |     |                  |          |
|                    |               |             |                   |                 |     |                  |          |
|                    |               |             |                   |                 |     |                  |          |
|                    |               |             |                   |                 |     |                  |          |
|                    |               |             |                   |                 |     |                  |          |
|                    |               |             |                   |                 |     |                  |          |
|                    |               |             |                   |                 |     |                  |          |

## SEAM INSPECTION LOG 6 of 7 - EXTRUSION WELD

## VACUUM TESTING

PROJECT NAME: \_\_\_\_\_

PRIMARY/SECONDARY: \_\_\_\_\_ PROJECT NO: \_\_\_\_\_ MATERIAL TYPE: \_\_\_\_\_

[illegible]

## DESTRUCTIVE SAMPLE LOG 7 of 7

**PROJECT NAME:** \_\_\_\_\_

**DATE:**\_\_\_\_\_ **PROJECT NO.:**\_\_\_\_\_ **MATERIAL NO.:**\_\_\_\_\_

[illegible]



## Appendix 17D

# Final Cover Material Properties and Testing

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**Table 17D-1**  
**Summary of Liner and Final Cover Construction Quality Control (CQC) Testing**

| Material / Type of Test                                                                                                                                 | Standard    | Frequency                                            | Acceptance Criteria <sup>1</sup>                                                                                                                                                                                    |
|---------------------------------------------------------------------------------------------------------------------------------------------------------|-------------|------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>TEST PAD (For Final Cover Installation)</b>                                                                                                          |             |                                                      |                                                                                                                                                                                                                     |
| - Thickness (in-place)                                                                                                                                  | -           | 3 tests/lift                                         | Minimum Established by Project Plans and Specifications (May Be Greater)                                                                                                                                            |
| - Density and Field Compaction (in-place)                                                                                                               | ASTM D698   | 3 tests/lift                                         | Minimum 75% of standard proctor. Minimum established by Project Plans and Specifications (May be greater)                                                                                                           |
| - Grain Size                                                                                                                                            | ASTM D422   | 1 test/lift                                          | For soil type confirmation per Specifications                                                                                                                                                                       |
| - Atterberg Limits                                                                                                                                      | ASTM D4318  | 1 test/lift                                          | For soil type confirmation per Specifications                                                                                                                                                                       |
| - Standard Proctor                                                                                                                                      | ASTM D698   | 1 test/lift                                          | For Use to Confirm Density/Field Compaction and Perform Hydraulic Conductivity                                                                                                                                      |
| - Hydraulic Conductivity (Undisturbed Sample)                                                                                                           | ASTM D5084  | 1 test/lift                                          | Equal to or less than $1.0 \times 10^{-5}$ cm/sec                                                                                                                                                                   |
| - Soil Classification                                                                                                                                   | D2487/D2488 | 1 test/lift                                          | For soil type confirmation per Specifications                                                                                                                                                                       |
| <b>CONSTRUCTION TESTING</b>                                                                                                                             |             |                                                      |                                                                                                                                                                                                                     |
| <b><i>Subgrade (Base Grading for Liner Installation)</i></b>                                                                                            |             |                                                      |                                                                                                                                                                                                                     |
| - Top of Subgrade Elevation                                                                                                                             | Survey      | Minimum 50-ft grid spacing                           | +/- 0.1 foot                                                                                                                                                                                                        |
| - Standard Proctor                                                                                                                                      | ASTM D698   | 1 sample/source and 1 test /5,000 CY                 | 90% of Standard Proctor                                                                                                                                                                                             |
| - Thickness (in-place)                                                                                                                                  | -           | 1 test/acre (survey on grid)                         | Minimum 6-inches                                                                                                                                                                                                    |
| - Density and Field Compaction (in-place)                                                                                                               | ASTM D2922  | 4 tests/acre /lift                                   | 90% of Standard Proctor                                                                                                                                                                                             |
| - Grain Size                                                                                                                                            | ASTM D422   | 1 sample/source and 1 test/5,000 CY                  | Particle size gradation: Sieve size 1/2 inch = 100 percent passing by weight; Sieve size 200 mesh = less than 35 percent passing by weight                                                                          |
| <b><i>Borrow Material for Liner Protection Material Which Includes Sand, Crushed Basalt, Crushed Glass, or Combination (For Liner Installation)</i></b> |             |                                                      |                                                                                                                                                                                                                     |
| - Grain Size                                                                                                                                            | ASTM D422   | 1 sample per 1,000 CY of each borrow source material | Portion of material passing the No. 200 sieve no greater than 5 percent by weight. Portion of material passing 1/2-inch sieve, 100 percent. Uniformity coefficient (Cu) less than 6 where Cu is defined as D60/D10. |
| - Hydraulic Conductivity (Remolded Sample) <sup>4</sup>                                                                                                 | ASTM D5084  | 1 sample per 5,000 CY of each borrow source material | Minimum $1.3 \times 10^{-4}$ cm/sec                                                                                                                                                                                 |
| - Organic Content                                                                                                                                       | ASTM D2974  | 1 sample per 2,500 CY of each borrow source material | Free of organic material (<5 percent)                                                                                                                                                                               |
| - Standard Proctor (for sand only)                                                                                                                      | ASTM D698   | 1 sample/source and 1 test /5,000 CY                 | 90% of Standard Proctor                                                                                                                                                                                             |

**Table 17D-1**  
**Summary of Liner and Final Cover Construction Quality Control (CQC) Testing**

| <b>Material / Type of Test</b>                                                                                                      | <b>Standard</b>          | <b>Frequency</b>                                                                         | <b>Acceptance Criteria<sup>1</sup></b>                                                                                                                                                                                                     |
|-------------------------------------------------------------------------------------------------------------------------------------|--------------------------|------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b><i>Liner Protection Material Which Includes Sand, Crushed Basalt, Crushed Glass, or Combination (For Liner Installation)</i></b> |                          |                                                                                          |                                                                                                                                                                                                                                            |
| - Grain Size                                                                                                                        | ASTM D422                | 1 sample/1,500 CY (in-place)                                                             | Portion of material passing the No. 200 sieve no greater than 5 percent by weight. Portion of material passing ½-inch sieve, 100 percent. Uniformity coefficient (Cu) less than 6 where Cu is defined as D60/D10.                          |
| - Thickness (in-place)                                                                                                              | -                        | 5 test/acres (survey on grid)                                                            | 2-feet. Minimum Established by Project Plans and Specifications (May Be Greater)                                                                                                                                                           |
| - Hydraulic Conductivity (Remolded Sample) <sup>4</sup>                                                                             | ASTM D5084               | 1 test per 2 acres (In-Place) molded to field condition                                  | Minimum $1.3 \times 10^{-4}$ cm/sec when compacted at 95% standard proctor                                                                                                                                                                 |
| - Organic Content                                                                                                                   | ASTM D2974               | 1 sample/2,500 CY (in-place)                                                             | Free of organic material (<5 percent)                                                                                                                                                                                                      |
| - Density and Field Compaction (in-place) (for sand only)                                                                           | ASTM D2922               | 4 tests/acre /lift                                                                       | 90% of Standard Proctor                                                                                                                                                                                                                    |
| <b><i>Coarse Aggregate (For Liner Installation)</i></b>                                                                             |                          |                                                                                          |                                                                                                                                                                                                                                            |
| - Grain Size/Type                                                                                                                   | ASTM D422 and ASTM D2488 | 1 sample/50 CY                                                                           | Particle size gradation: Sieve size 1-1/2 inch = 100 percent passing by weight; Sieve size 1 inch = 20-55 percent passing by weight; Sieve size ¾ inch = less than 2 percent passing by weight. Aggregate shall be rounded per ASTM D2488. |
| - Carbonate Content                                                                                                                 | ASTM D4373               | 1 sample per borrow source                                                               | Carbonate content less than 1%                                                                                                                                                                                                             |
| <b><i>Anchor Trench</i></b>                                                                                                         |                          |                                                                                          |                                                                                                                                                                                                                                            |
| - Density                                                                                                                           | ASTM D698                | 1 test per 150 feet                                                                      | At least 90% of the maximum dry density                                                                                                                                                                                                    |
| <b><i>Soil Infiltration Layer (For Final Cover Installation)</i></b>                                                                |                          |                                                                                          |                                                                                                                                                                                                                                            |
| - Grain Size                                                                                                                        | ASTM D422                | 1 sample/1,000 CY (Borrow)                                                               | For soil type confirmation per Specifications                                                                                                                                                                                              |
| - Atterberg Limits                                                                                                                  | ASTM D4318               | 1 sample/5,000 CY (borrow)                                                               | For soil type confirmation per Specifications                                                                                                                                                                                              |
| - Standard Proctor                                                                                                                  | ASTM D698                | 1 sample/source and 1 test /5,000 CY (Borrow)                                            | For Use to Confirm Density/Field Compaction and Perform Hydraulic Conductivity                                                                                                                                                             |
| - Hydraulic Conductivity (Remolded Sample)                                                                                          | ASTM D5084               | 1 test per 5,000 cy (Borrow) and 1 test per 2 acres (In-Place) molded to field condition | Equal to or less than $1.0 \times 10^{-5}$ cm/sec                                                                                                                                                                                          |
| - Thickness (in-place)                                                                                                              | -                        | 1 test/acre (survey on grid)                                                             | Minimum Established by Project Plans and Specifications (May Be Greater)                                                                                                                                                                   |
| - Density and Moisture Content (in-place)                                                                                           | ASTM D2922               | 4 tests/acre /lift                                                                       | Minimum 75% of standard proctor. Minimum established by Project Plans and Specifications (May be greater)                                                                                                                                  |



**Table 17D-1**  
**Summary of Liner and Final Cover Construction Quality Control (CQC) Testing**

| Material / Type of Test                       | Standard  | Frequency             | Acceptance Criteria <sup>1</sup>                                         |
|-----------------------------------------------|-----------|-----------------------|--------------------------------------------------------------------------|
| <b>Topsoil (For Final Cover Installation)</b> |           |                       |                                                                          |
| – Grain Size                                  | ASTM D422 | 1 sample/5,000 C.Y    | For soil type confirmation per Specifications                            |
| – Thickness (in-place)                        | -         | 1 test/acre (on grid) | Minimum Established by Project Plans and Specifications (May Be Greater) |

<sup>1</sup> Or as approved by CQA Certifying Engineer.

<sup>2</sup> Nuclear Gauge tests for moisture content and dry density shall be performed at evenly spaced locations in a grid pattern within the area of the test pad. Acceptance will be based on test results that fall within the compaction window developed by the Design Engineer, or as modified by the CQA Certifying Engineer based on pre-construction testing.

<sup>3</sup> Upon completion of the test pad, samples shall be collected using 3-inch outside diameter thin-walled sampling tubes (Shelby tubes) in accordance with ASTM D1587 or by the block sampling technique in accordance with ASTM D4220, at the discretion of the CQA Certifying Engineer. One sample in each list shall be collected to represent the soil layer.

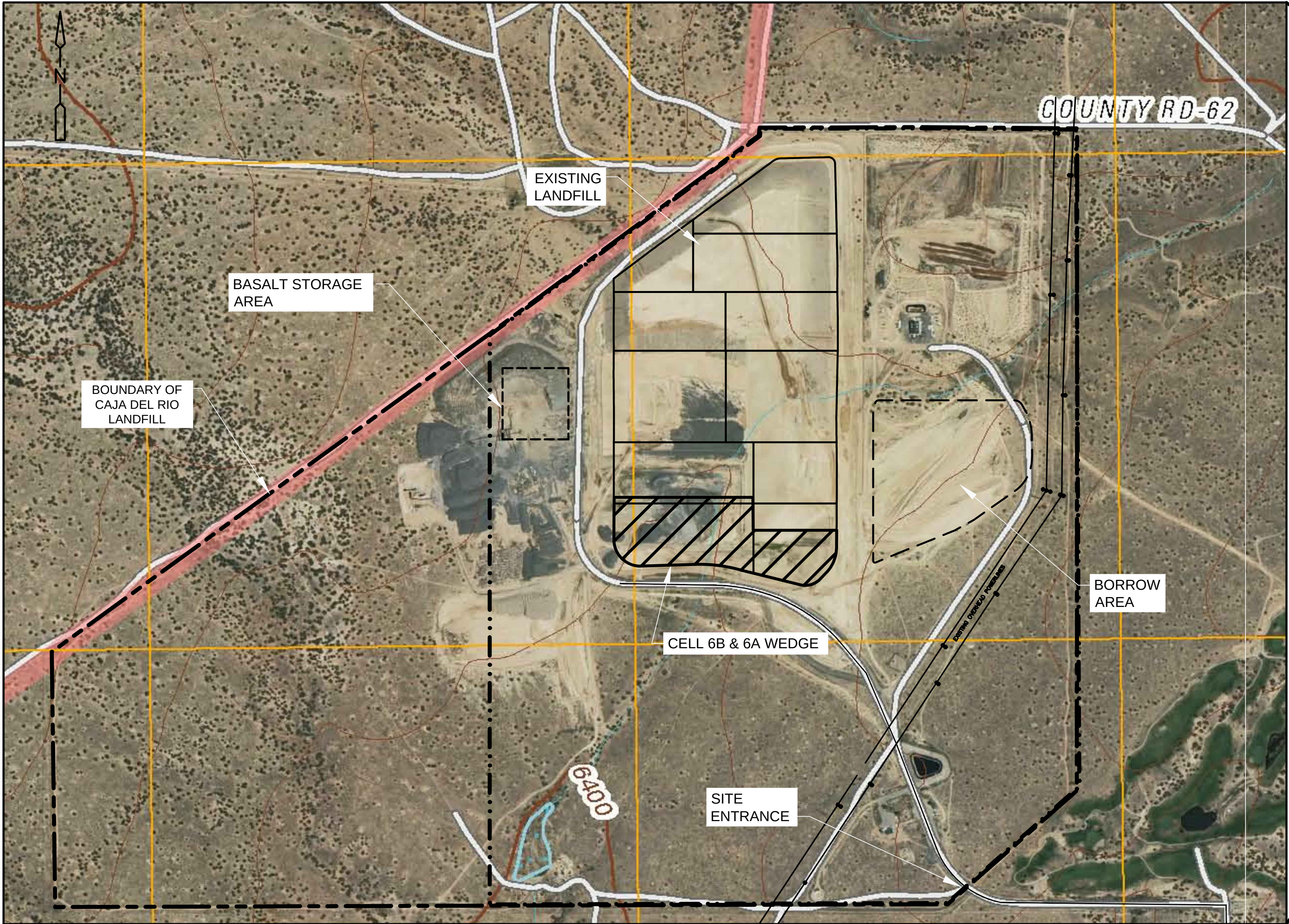
<sup>4</sup> Due to incompatibility of crushed glass with standard hydraulic conductivity testing, hydraulic conductivity testing is not required for crushed glass. Past laboratory results for crushed glass used at this landfill have shown permeability ranging from 0.5 cm/sec to 2 cm/sec.

## **Construction Plans**

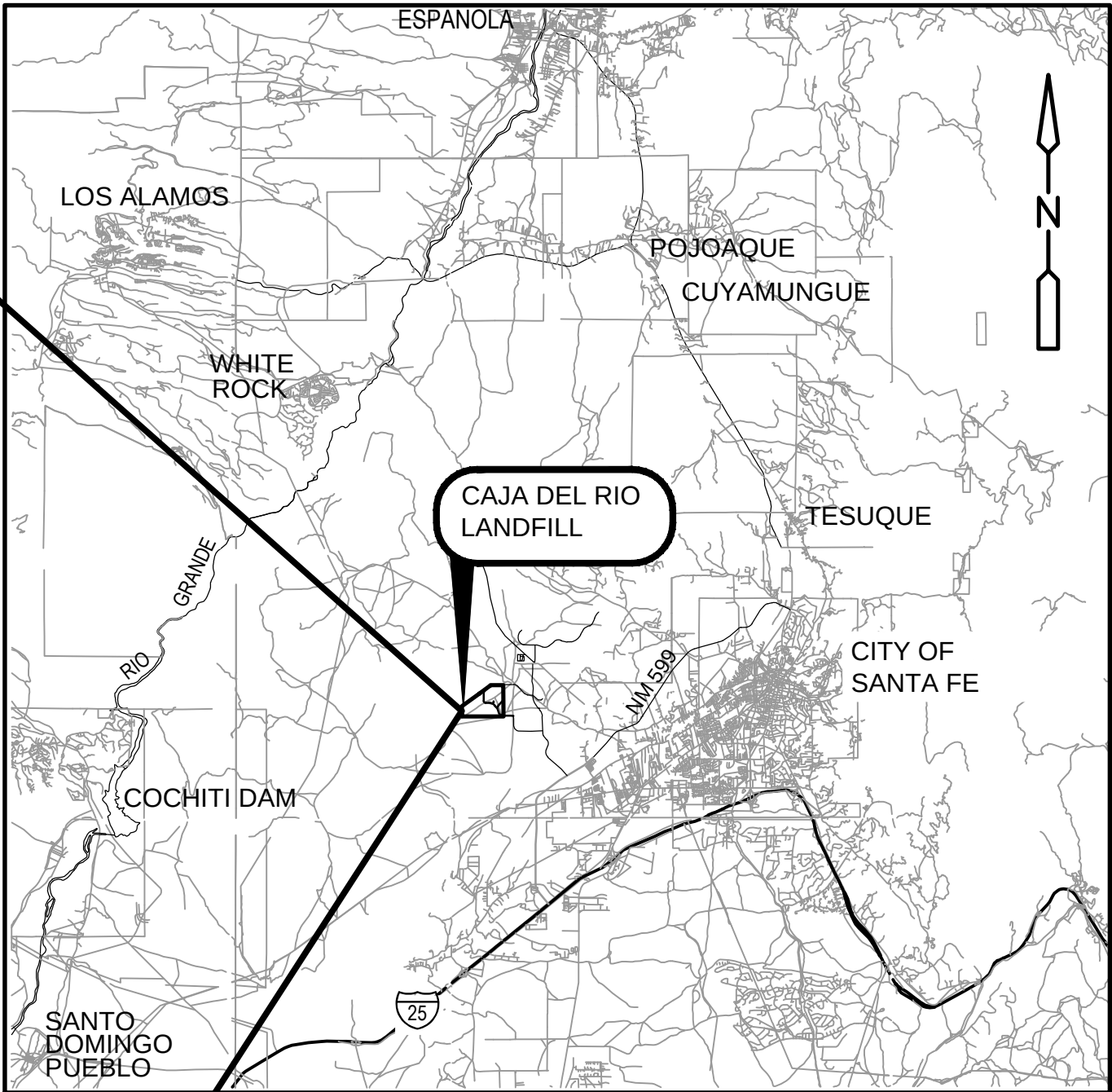
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SANTA FE SOLID WASTE MANAGEMENT AGENCY  
CAJA DEL RIO LANDFILL  
CELLS 6B & 6A WEDGE  
LINER SYSTEM CONSTRUCTION  
MAY 2019



SITE LOCATION MAP  
1" = 500'  
250 0 500



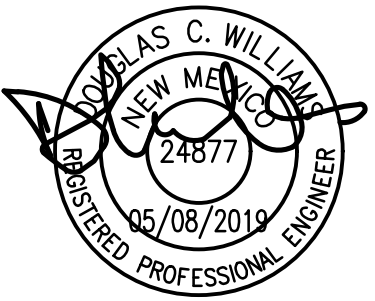
VICINITY MAP  
NO SCALE

SHEET INDEX

| <u>SHEET</u> | <u>TITLE</u>                                                  |
|--------------|---------------------------------------------------------------|
| -            | COVER SHEET, SITE LOCATION MAP, SHEET INDEX                   |
| G-1          | GENERAL AND CIVIL NOTES, ABBREVIATIONS                        |
| G-2          | OVERALL SITE PLAN                                             |
| G-3          | CELLS 6B & 6A WEDGE EXISTING CONDITIONS PLAN                  |
| C-1          | CELLS 6B & 6A WEDGE LINER AND LEACHATE COLLECTION SYSTEM PLAN |
| C-2          | CELL 6B LINER AND LEACHATE COLLECTION SYSTEM PLAN             |
| C-3          | CELL 6A WEDGE LINER AND LEACHATE COLLECTION SYSTEM PLAN       |
| CD-1         | LINER SYSTEM DETAILS                                          |
| CD-2         | LEACHATE COLLECTION SYSTEM DETAILS                            |

**CDM  
Smith**

6001 INDIAN SCHOOL RD. NE, SUITE 310  
ALBUQUERQUE, NM 87110  
Tel: (505) 243-3200





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pw:\\pw.cdm-smith.com:PW\_PL1\10679\234307\04 Design Services NM\_90%\\01 General\10 CAD\G001NFNT.dwg  
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GENERAL NOTES:

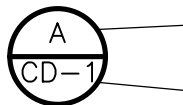
- GENERAL NOTES AND ABBREVIATIONS APPLY TO ALL SHEETS, EXCEPT WHERE MORE SPECIFIC REQUIREMENTS ARE PROVIDED. SEE INDIVIDUAL DRAWINGS FOR ADDITIONAL ABBREVIATIONS, SYMBOLS, LEGENDS, NOTES, DETAILS AND OTHER REQUIREMENTS. IN ALL CASES THE INFORMATION SHOWN ON INDIVIDUAL DRAWINGS SHALL GOVERN OVER ANY GENERAL INFORMATION. NOT ALL SPECIFIED ITEMS AND/OR STANDARD DETAILS SHOWN MAY BE APPLICABLE TO THIS PROJECT.
- UNLESS NOTED OTHERWISE, ALL WORK SHOWN IN THESE DOCUMENTS IS NEW AND TO BE PERFORMED UNDER THIS CONTRACT. ON SHEETS WHERE IT IS INDICATED THAT EXISTING IS TO BE MODIFIED AND/OR ADDED TO, WORK UNDER THIS CONTRACT IS NORMALLY SHOWN IN HEAVY LINES AND CALLOUTS ARE BOXED.
- WRITTEN DISTANCES AND ELEVATIONS SHALL GOVERN OVER SCALED DISTANCES AND ELEVATIONS. PIPE LENGTHS SHOWN IN PROFILE OR PLAN ARE APPROXIMATE AND MAY VARY UP TO 5 PERCENT OF INDICATED LENGTH.
- THE LOCATION OF ALL EXISTING UTILITIES, STRUCTURES, PROPERTY LINES, SUBSURFACE SOIL OR ROCK CONDITIONS ARE BASED ON THE BEST AVAILABLE INFORMATION AND ARE NOT WARRANTED TO BE EXACT, NOR IS IT WARRANTED THAT ALL ARE SHOWN. IN PARTICULAR ALL UNDERGROUND GAS LINES, UNDERGROUND AND/OR OVERHEAD ELECTRICAL AND TELEPHONE CABLES, AND POLES ARE NOT WARRANTED TO BE SHOWN.
- THE CONTRACTOR SHALL BE RESPONSIBLE FOR VERIFYING THE LOCATIONS OF ALL PROPERTY LINES, EASEMENTS, EXISTING UTILITIES AND OTHER EXISTING ITEMS. IT IS THE INTENT TO SHOW ALL PROPERTY LINES, EASEMENTS, UTILITIES, AND STRUCTURES. HOWEVER, IT SHALL BE THE CONTRACTOR'S RESPONSIBILITY TO SATISFY THEMSELVES THAT ALL EXISTING UTILITIES AND OTHER ITEMS, WHETHER SHOWN ON THESE DRAWINGS OR NOT, HAVE BEEN PROPERLY LOCATED.

5.1

PRIOR TO THE START OF ANY CONSTRUCTION, THE CONTRACTOR SHALL CONTACT ALL UTILITIES OR OTHER OWNERS AND IF NECESSARY, MAKE EXPLORATORY EXCAVATIONS AND INQUIRIES TO DETERMINE THE EXACT LOCATION AND STATUS OF OPERATIONS OF UTILITIES AND STRUCTURES, AND THE LIMITS AND CHARACTER OF SOIL AND/OR ROCK.

5.2

IF ANY ITEM REQUIRES RELOCATION AND/OR REQUIRES BEING TAKEN TEMPORARILY OUT OF SERVICE, THE CONTRACTOR SHALL NOTIFY THE OWNER OF THE ITEM WELL IN ADVANCE AND SHALL BE RESPONSIBLE FOR MAKING ALL ARRANGEMENTS WITH THE OWNER OF THE ITEM FOR TIMELY RELOCATION OF THE ITEM.
- THE CONTRACTOR SHALL CONTACT BURIED CABLE LOCATION SERVICE AT 1-800-321-2537 FOR FIELD LOCATION OF UTILITIES AT LEAST 48 HOURS PRIOR TO THE START OF WORK.
- THE CONTRACTOR SHALL ASSUME SOLE AND COMPLETE RESPONSIBILITY FOR THE JOB SITE CONDITIONS DURING THE COURSE OF CONSTRUCTION OF THIS PROJECT, INCLUDING SAFETY OF ALL PERSONS AND PROPERTY, THESE REQUIREMENTS SHALL APPLY CONTINUOUSLY AND SHALL NOT BE LIMITED TO NORMAL WORKING HOURS. THE CONTRACTOR SHALL DEFEND, INDEMNIFY AND HOLD THE OWNER AND THE CONSULTING ENGINEER HARMLESS FROM ANY AND ALL LIABILITY, REAL OR ALLEGED, IN CONNECTION WITH THE CONTRACTORS PERFORMANCE OF WORK ON THIS PROJECT.
- FINAL LOCATIONS OF ALL FACILITIES SHALL BE RECORDED BY THE CONTRACTOR AND SUBMITTED TO THE ENGINEER IN ACCORDANCE WITH THE CONTRACT SPECIFICATIONS.
- CONTRACTOR SHALL TAKE ALL PRECAUTIONARY MEASURES NECESSARY TO PROTECT EXISTING IMPROVEMENTS WHICH ARE TO REMAIN IN PLACE FROM DAMAGE. ALL IMPROVEMENTS WHICH ARE DAMAGED BY THE CONTRACTOR'S OPERATIONS SHALL BE EXPEDITIOUSLY REPAIRED OR RECONSTRUCTED TO THE ENGINEER'S SATISFACTION AT THE CONTRACTOR'S EXPENSE WITHOUT ADDITIONAL COMPENSATION.
- IT SHALL BE THE CONTRACTOR'S RESPONSIBILITY TO OBTAIN ALL PERMITS NECESSARY FOR THIS PROJECT PRIOR TO COMMENCING CONSTRUCTION.
- THE TERM "ACCEPTABLE TO ENGINEER" SHALL MEAN WRITTEN ACCEPTANCE BY ENGINEER AND IS TO BE RECEIVED BY THE CONTRACTOR BEFORE WORK IS STARTED.
- ANY DEVIATIONS FROM CONTRACT DOCUMENTS, INCLUDING DRAWINGS AND/OR SPECIFICATIONS, MUST BE ACCEPTED BY THE ENGINEER, IN WRITING, PRIOR TO THE WORK BEING DONE. ANY DEVIATIONS PERFORMED WITHOUT THE ENGINEER'S ACCEPTANCE WILL NOT BE PAID FOR, AND MAY BE REQUIRED TO BE REDONE AT THE CONTRACTOR'S EXPENSE.
- EXCEPT AS MODIFIED BY THE CONTRACT DOCUMENTS, ALL WORK SHALL BE IN ACCORDANCE WITH THE CONTRACT DOCUMENTS (DRAWINGS, SPECIFICATIONS, ADDENDA, CHANGE ORDERS, APPROVED SUBMITTALS, ETC.) THE CONTRACTOR SHALL HAVE THE LATEST UPDATED VERSION OF THE ABOVE NAMED DOCUMENTS AT THE WORK SITE AT ALL TIMES.
- THE CONTRACTOR SHALL BE RESPONSIBLE FOR COMPLIANCE BY CONTRACTOR PERSONNEL WITH APPLICABLE CURRENT STATE REGULATIONS AND FEDERAL OSHA STANDARDS AND AS REQUIRED IN SECTION 107.8 OF THE NEW MEXICO STATE HIGHWAY AND TRANSPORTATION DEPT. STANDARD SPECIFICATIONS, 2014 EDITION.
- THE ENGINEER IS NOT RESPONSIBLE FOR THE CONSTRUCTION METHODS OR TECHNIQUES, OR FOR THE EXECUTION OF THE WORK AS SHOWN ON THESE PLANS. THE OWNER AND ENGINEER SHALL NOT BE RESPONSIBLE FOR THE ACTS OR OMISSIONS OF THE CONTRACTOR, SUBCONTRACTORS, OR OTHER PERSONS PERFORMING ANY OF THE WORK, OR FOR THE FAILURE OF ANY OF THE CONTRACTORS OR SUBCONTRACTORS TO CARRY OUT THE WORK IN ACCORDANCE WITH THE CONTRACT DOCUMENTS.
- ALL CIVIL SHEETS USE THE FOLLOWING DETAIL AND SECTION CALLOUT CONVENTION:



DETAIL LETTER OR SECTION NUMBER

DETAIL OR SECTION IS REFERENCED OR SHOWN ON SHEET CD-1\*

\* IF SECTION OR DETAIL IS DRAWN ON THE SAME SHEET WHERE IT IS CALLED OUT, THE SHEET NUMBER IS REPLACED WITH A HYPHEN.

- ELEVATIONS, NORTHINGS, AND EASTINGS ARE BASED ON FIELD SURVEY DATA PERFORMED IN JANUARY 2019 BY PRECISION SURVEYS, INC.
- ALL WORK DETAILED ON THESE PLANS TO BE PERFORMED UNDER THIS CONTRACT, EXCEPT AS OTHERWISE STATED OR PROVIDED FOR HEREIN, SHALL BE CONSTRUCTED IN ACCORDANCE WITH THE NEW MEXICO STATE HIGHWAY & TRANSPORTATION DEPARTMENT STANDARD SPECIFICATIONS (2014 EDITION) AND THE SUPPLEMENTAL TECHNICAL SPECIFICATIONS IN THE CONTRACT DOCUMENTS.
- WORK UNDER THIS CONTRACT WILL BE PERFORMED AT AN OPERATING LANDFILL. CONTRACTOR SHALL COORDINATE ALL WORK WITH OWNER'S OPERATION STAFF.

CIVIL NOTES:

- CONTRACTOR SHALL TAKE NECESSARY MEASURES TO ENSURE THE PRESERVATION OF SURVEY MONUMENTS. THE CONTRACTOR SHALL NOT DISTURB ANY SURFACE MONUMENTS WITHOUT THE CONSENT OF THE ENGINEER, AND SHALL NOTIFY THE ENGINEER AND BEAR THE EXPENSE OF REPLACING ANY MONUMENTS THAT MAY BE DISTURBED WITHOUT PERMISSION. REPLACEMENT SHALL ONLY BE DONE BY THE ENGINEER AT THE CONTRACTOR'S EXPENSE.
- ALL REFERENCES MADE HEREIN TO COMPACTION DENSITY OF SOIL REFER TO THE STANDARD PROCTOR TEST OR THE MODIFIED PROCTOR TEST – ASTM D-698 OR D-1557 RESPECTIVELY, AS NOTED.
- THE CONTRACTOR IS RESPONSIBLE FOR TEMPORARY EROSION AND SEDIMENT CONTROL MEASURES IN ACCORDANCE WITH NMSH&TD SPECIFICATIONS AND THE NATIONAL POLLUTANT DISCHARGE ELIMINATION SYSTEM (NPDES).
- THE CONTRACTOR IS RESPONSIBLE FOR FILING A NOTICE OF INTENT (NOI) WITH THE EPA CONCERNING A TEMPORARY STORM WATER POLLUTION PREVENTION PLAN FOR CONSTRUCTION. UPON COMPLETION AND ACCEPTANCE OF ALL WORK, CONTRACTOR MUST FILE A NOTICE OF TERMINATION (NOT) WITH THE EPA.
- ALL EXISTING DRAINAGE FEATURES SHALL BE PROPERLY PROTECTED BY THE CONTRACTOR AT NO ADDITIONAL EXPENSE TO THE OWNER.
- THE CONTRACTOR IS NOTIFIED TO THE POTENTIAL PRESENCE OF EXPLOSIVE METHANE GAS. THIS GAS IS GENERATED IN DISPOSAL CELLS THROUGH THE NATURAL DECOMPOSITION OF WASTE MATERIALS.
- ALL EXCAVATION, TRENCHING, AND SHORING ACTIVITIES MUST BE CARRIED OUT IN ACCORDANCE WITH OSHA 29 CFR 1926.650 SUBPART P.
- WATER IS AVAILABLE TO THE CONTRACTOR VIA THE FILL STAND LOCATED NORTH OF THE SCALE HOUSE. CONTRACTOR SHALL COORDINATE USE WITH OWNER.

TABLE 1  
CAJA DEL RIO LANDFILL  
SURVEY CONTROL COORDINATES  
COUNTY OF SANTA FE, STATE OF NEW MEXICO  
CONTROL POINT DATA

| *NEW MEXICO STATE PLANE GRID<br>COORDINATES CENTRAL ZONE (NAD 83) |            |            | **NEW MEXICO STATE PLANE COORDINATES<br>MODIFIED GROUND |            |           | ***LOCAL LANDFILL COORDINATE SYSTEM<br>(GROUND) |           |           | DESCRIPTION          |
|-------------------------------------------------------------------|------------|------------|---------------------------------------------------------|------------|-----------|-------------------------------------------------|-----------|-----------|----------------------|
| NAME                                                              | NORTHING   | EASTING    | NORTHING                                                | EASTING    | ELEVATION | NORTHING                                        | EASTING   | ELEVATION |                      |
| HV-1                                                              | 1700981.22 | 1685773.98 | 1701667.00                                              | 1686453.63 | 6396.54   | 701672.14                                       | 686458.85 | 6396.54   | REBAR W/ALUMINUM CAP |
| HV-3                                                              | 1700989.11 | 1689575.17 | 1701674.90                                              | 1690256.35 | 6436.52   | 701679.99                                       | 690261.57 | 6436.52   | REBAR W/ALUMINUM CAP |
| HV-6                                                              | 1702802.38 | 1689574.10 | 1703488.89                                              | 1690255.28 | 6460.55   | 703493.99                                       | 690260.53 | 6460.55   | REBAR W/ALUMINUM CAP |
| PP-61                                                             | 1700983.17 | 1682800.40 | 1701668.96                                              | 1683478.86 | 6442.37   | 701674.13                                       | 683484.09 | 6442.37   | REBAR W/ALUMINUM CAP |
| CP62                                                              | 1701004.81 | 1686458.32 | 1701690.60                                              | 1687138.25 | 6395.37   | 701695.73                                       | 687143.47 | 6395.37   | REBAR W/ALUMINUM CAP |
| CP200                                                             | 1705303.83 | 1688490.19 | 1705991.36                                              | 1689170.94 | 6482.38   | 705996.45                                       | 689176.23 | 6482.38   | NO. 4 REBAR          |
| CP210                                                             | 1703838.04 | 1686309.81 | 1704524.98                                              | 1686989.68 | 6426.85   | 704530.10                                       | 686994.96 | 6426.85   | REBAR W/ALUMINUM CAP |
| CP221                                                             | 1704762.37 | 1686340.91 | 1705449.68                                              | 1687020.79 | 6431.28   | 705454.82                                       | 687026.07 | 6431.28   | REBAR W/ALUMINUM CAP |
| CP224                                                             | 1706245.07 | 1689678.37 | 1706932.98                                              | 1690359.60 | 6481.87   | 706938.07                                       | 690364.89 | 6481.87   | REBAR W/ALUMINUM CAP |
| CP225                                                             | 1703500.80 | 1689678.74 | 1704187.60                                              | 1690359.97 | 6457.70   | 704192.68                                       | 690365.22 | 6457.70   | REBAR W/ALUMINUM CAP |
| CP227                                                             | 1704834.63 | 1685696.37 | 1705521.97                                              | 1686376.00 | 6440.06   | 705527.09                                       | 686381.27 | 6440.06   | REBAR W/ALUMINUM CAP |
| CP229                                                             | 1700977.26 | 1685698.56 | 1701663.04                                              | 1686378.19 | 6398.86   | 701668.18                                       | 686383.42 | 6398.86   | REBAR W/ALUMINUM CAP |
| CP230                                                             | 1701098.42 | 1688937.29 | 1701784.25                                              | 1689618.22 | 6447.02   | 701789.35                                       | 689623.44 | 6447.02   | REBAR W/ALUMINUM CAP |
| CP231                                                             | 1702628.45 | 1688206.49 | 1703314.90                                              | 1688887.12 | 6441.69   | 703320.00                                       | 688892.36 | 6441.69   | X IN CONCRETE        |
| CP232                                                             | 1702682.67 | 1688150.72 | 1703369.14                                              | 1688831.34 | 6442.05   | 703374.26                                       | 688836.58 | 6442.05   | REBAR W/ALUMINUM CAP |
| CP235                                                             | 1706215.36 | 1687594.20 | 1706903.25                                              | 1688274.58 | 6433.21   | 706908.37                                       | 688279.88 | 6433.21   | REBAR W/ALUMINUM CAP |

\*NEW MEXICO STATE PLANE COORDINATES, COMBINED SCALE FACTOR (GRID TO GROUND) = 1.0040317 (@ 0,0).  
\*\*NM STATE PLANE MODIFIED GROUND TO LOCAL LANDFILL COORDINATES TRANSLATION N=-999,994.88, E=-999,994.75, ROTATION= 00° 00' 00"  
\*\*\*LOCAL LANDFILL COORDINATE SYSTEM (GROUND) TO BE USED FOR ALL LANDFILL SURVEYS AND DESIGN

ABBREVIATIONS

|       |                            |
|-------|----------------------------|
| CMP   | CORRUGATED METAL PIPE      |
| COR   | CORNER                     |
| DIA   | DIAMETER                   |
| EXIST | EXISTING                   |
| FML   | FLEXIBLE MEMBRANE LINER    |
| GCL   | GEOSYNTHETIC CLAY LINER    |
| HDPE  | HIGH-DENSITY POLYETHYLENE  |
| INV   | INVERT                     |
| LCS   | LEACHATE COLLECTION SYSTEM |
| LF    | LENGTH FEET                |
| MIN   | MINIMUM                    |
| MH    | MANHOLE                    |
| MW    | MONITORING WELL            |
| NIC   | NOT IN CONTRACT            |
| NTS   | NOT TO SCALE               |
| PI    | POINT OF INTERSECTION      |
| PVC   | POLYVINYL CHLORIDE         |
| SDR   | STANDARD DIAMETER RATIO    |
| STA   | STATION                    |
| TYP   | TYPICAL                    |

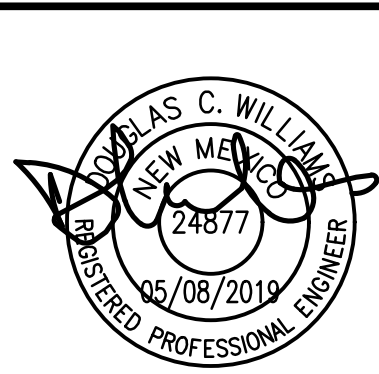
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| REV. NO. | DATE | DRWN | CHKD | REMARKS |  |

DESIGNED BY: D. WILLIAMS  
DRAWN BY: E. DOAK  
SHEET CHK'D BY: C. GABEL  
CROSS CHK'D BY: R. FOWLE  
APPROVED BY: D. WILLIAMS  
DATE: MAY 2019



SANTA FE SOLID WASTE MANAGEMENT AGENCY  
CAJA DEL RIO LANDFILL  
CELLS 6B AND 6A WEDGE  
LINER SYSTEM CONSTRUCTION

GENERAL AND CIVIL NOTES  
ABBREVIATIONS



PROJECT NO. 10679-234307  
FILE NAME: G001NFNT.DWG

SHEET NO.

G-1

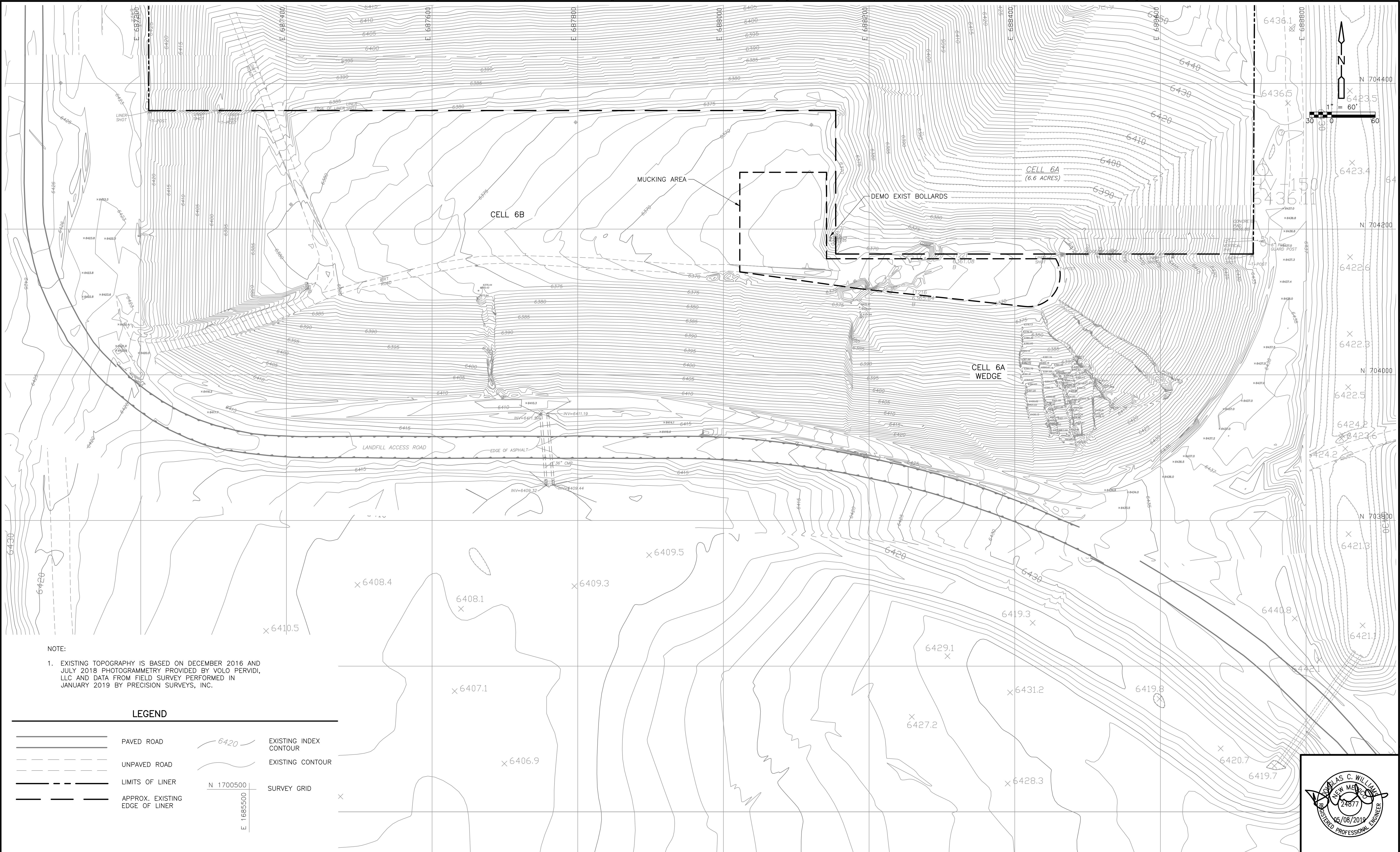


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- NOTE:
1. EXISTING TOPOGRAPHY IS BASED ON DECEMBER 2016 AND JULY 2018 PHOTOGRAMMETRY PROVIDED BY VOLO PERVIDI, LLC AND DATA FROM FIELD SURVEY PERFORMED IN JANUARY 2019 BY PRECISION SURVEYS, INC.

LEGEND

|  |                                |  |                        |
|--|--------------------------------|--|------------------------|
|  | PAVED ROAD                     |  | EXISTING INDEX CONTOUR |
|  | UNPAVED ROAD                   |  | EXISTING CONTOUR       |
|  | LIMITS OF LINER                |  | SURVEY GRID            |
|  | APPROX. EXISTING EDGE OF LINER |  |                        |

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DESIGNED BY: D. WILLIAMS  
DRAWN BY: E. DOAK  
SHEET CHK'D BY: C. GABEL  
CROSS CHK'D BY: R. FOWLE  
APPROVED BY: D. WILLIAMS  
DATE: MAY 2019

**CDM Smith**  
6001 Indian School Rd. NE, Suite 310  
Albuquerque, NM 87110  
Tel: (505) 243-3200

SANTA FE SOLID WASTE MANAGEMENT AGENCY  
CAJA DEL RIO LANDFILL  
CELLS 6B AND 6A WEDGE  
LINER SYSTEM CONSTRUCTION

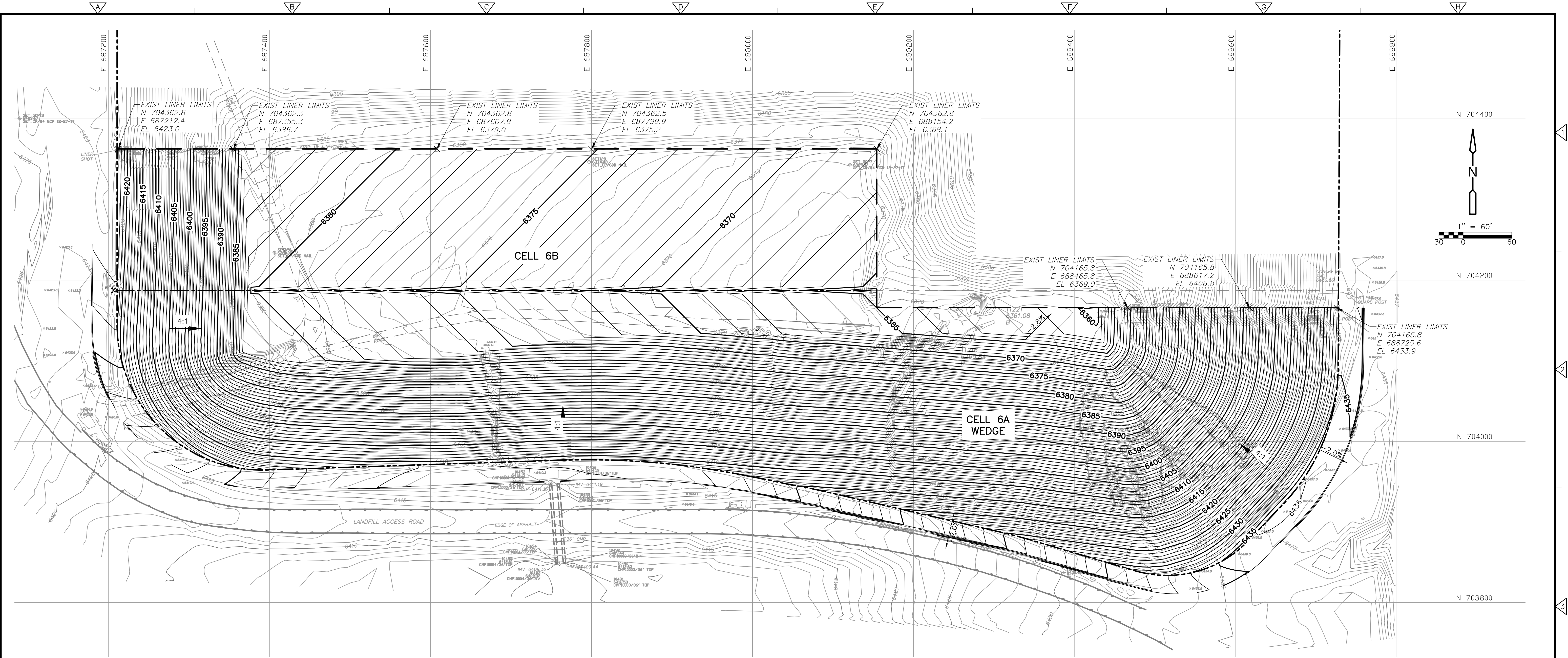
CELLS 6B & 6A WEDGE  
EXISTING CONDITIONS PLAN



PROJECT NO. 10679-234307  
FILE NAME: G003STPL.DWG  
SHEET NO.  
**G-3**



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LEGEND

- APPROXIMATE EXISTING EDGE OF LINER
- 5' DESIGN BASE GRADE
- 1' DESIGN BASE GRADE
- 5' EXISTING CONTOUR
- 1' EXISTING CONTOUR
- LIMITS OF LINER
- SURVEY GRID

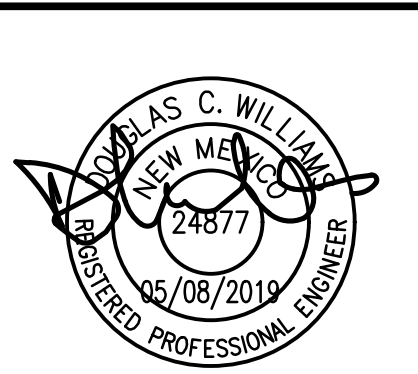
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SANTA FE SOLID WASTE MANAGEMENT AGENCY  
CAJA DEL RIO LANDFILL  
CELLS 6B AND 6A WEDGE  
LINER SYSTEM CONSTRUCTION

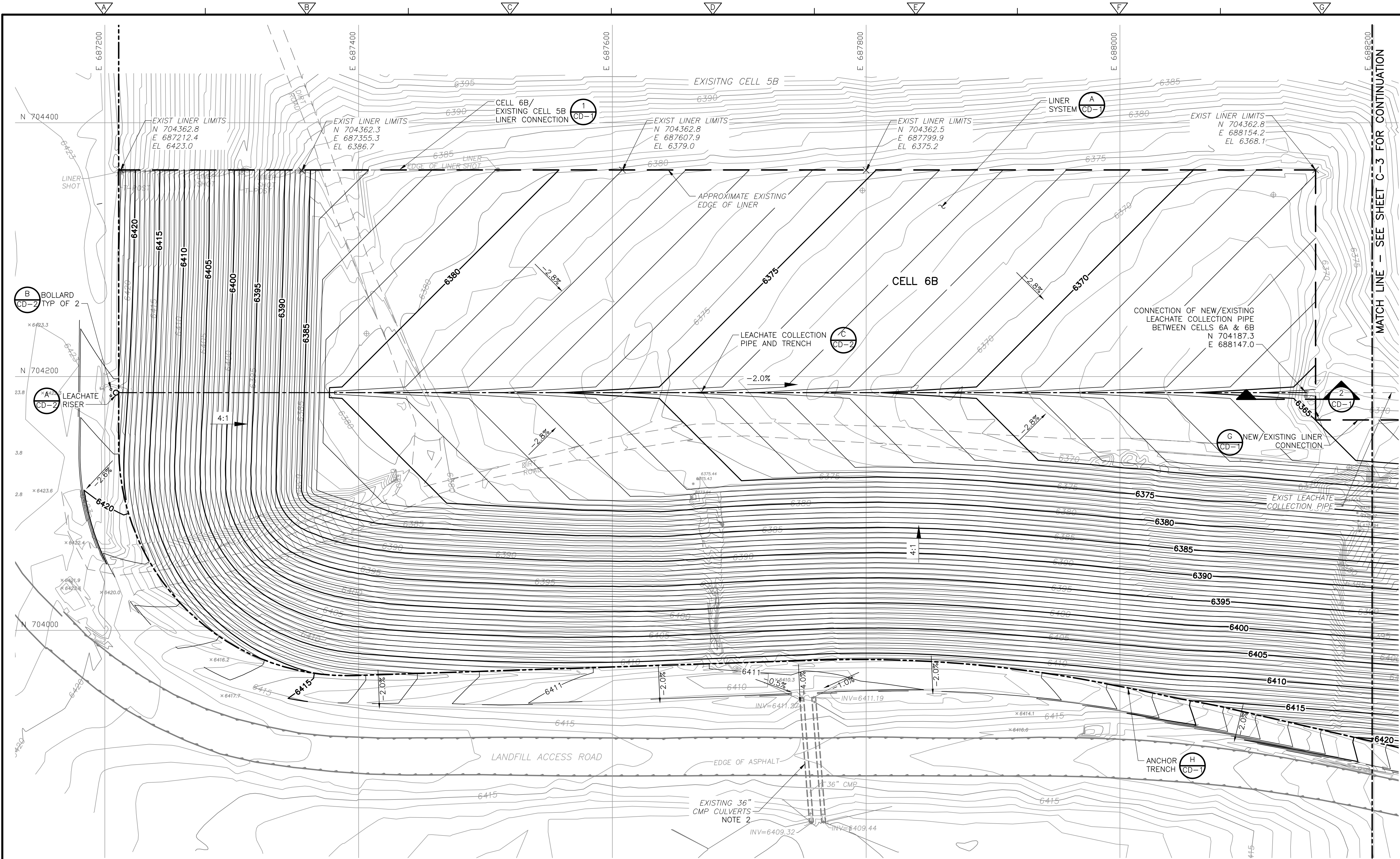
CELLS 6B AND 6A WEDGE  
LINER AND LEACHATE COLLECTION SYSTEM  
PLAN



PROJECT NO. 10679-234307  
FILE NAME: CO01GRPL.DWG  
SHEET NO. C-1



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#### LEGEND

- APPROXIMATE EXISTING EDGE OF LINER
- 5' DESIGN BASE GRADE
- 1' DESIGN BASE GRADE
- 5' EXISTING CONTOUR
- 1' EXISTING CONTOUR
- LIMITS OF LINER

N 1700500  
E 1685500  
SURVEY GRID

- NOTES:
- GRADES REPRESENT TOP OF LINER SYSTEM SUBGRADE.
  - GRADING SHALL FACILITATE DRAINAGE TO EXISTING CULVERTS.
  - CRUSHED BASALT AND GLASS CULLET FOR 2' THICK DRAINAGE LAYER SHALL BE PROVIDED BY OWNER AND INSTALLED BY CONTRACTOR. CONTRACTOR SHALL BE RESPONSIBLE FOR HAULING, PLACING, AND SAMPLING AND TESTING DRAINAGE MATERIAL. GLASS CULLET SHALL BE MIXED WITH CRUSHED BASALT AT A RATIO OF 1:1 USING LOADER AND PLACED ON CELL FLOOR. GLASS CULLET SHALL NOT BE PLACED ON SIDE SLOPES.

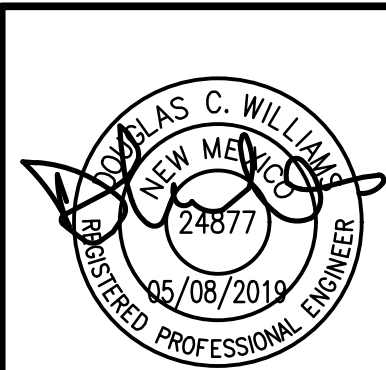
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APPROVED BY: D. WILLIAMS  
DATE: MAY 2019

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SANTA FE SOLID WASTE MANAGEMENT AGENCY  
CAJA DEL RIO LANDFILL  
CELLS 6B AND 6A WEDGE  
LINER SYSTEM CONSTRUCTION

CELL 6B  
LINER AND LEACHATE COLLECTION SYSTEM  
PLAN



PROJECT NO. 10679-234307  
FILE NAME: CO02GRPL.DWG

SHEET NO.  
C-2



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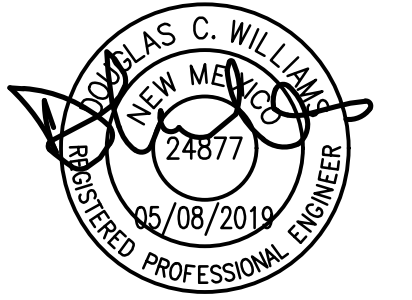
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DATE: MAY 2019

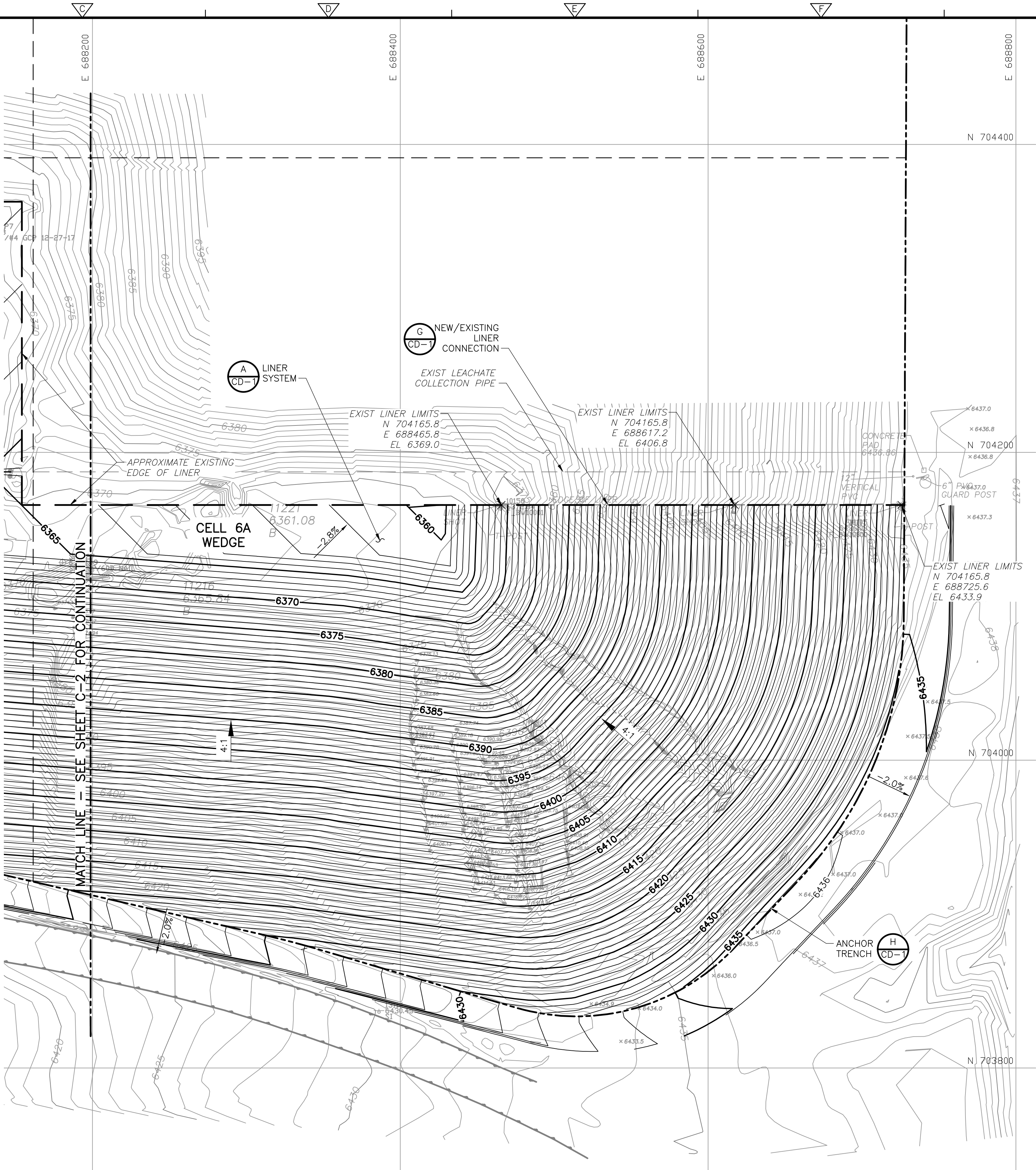
**CDM Smith**  
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Tel: (505) 243-3200

SANTA FE SOLID WASTE MANAGEMENT AGENCY  
CAJA DEL RIO LANDFILL  
CELLS 6B AND 6A WEDGE  
LINER SYSTEM CONSTRUCTION

CELL 6A WEDGE  
LINER AND LEACHATE COLLECTION SYSTEM  
PLAN



PROJECT NO. 10679-234307  
FILE NAME: CO03GRPL.DWG  
SHEET NO. C-3



**LEGEND**

- APPROXIMATE EXISTING EDGE OF LINER
- 5' DESIGN BASE GRADE
- 1' DESIGN BASE GRADE
- 5' EXISTING CONTOUR
- 1' EXISTING CONTOUR
- LIMITS OF LINER

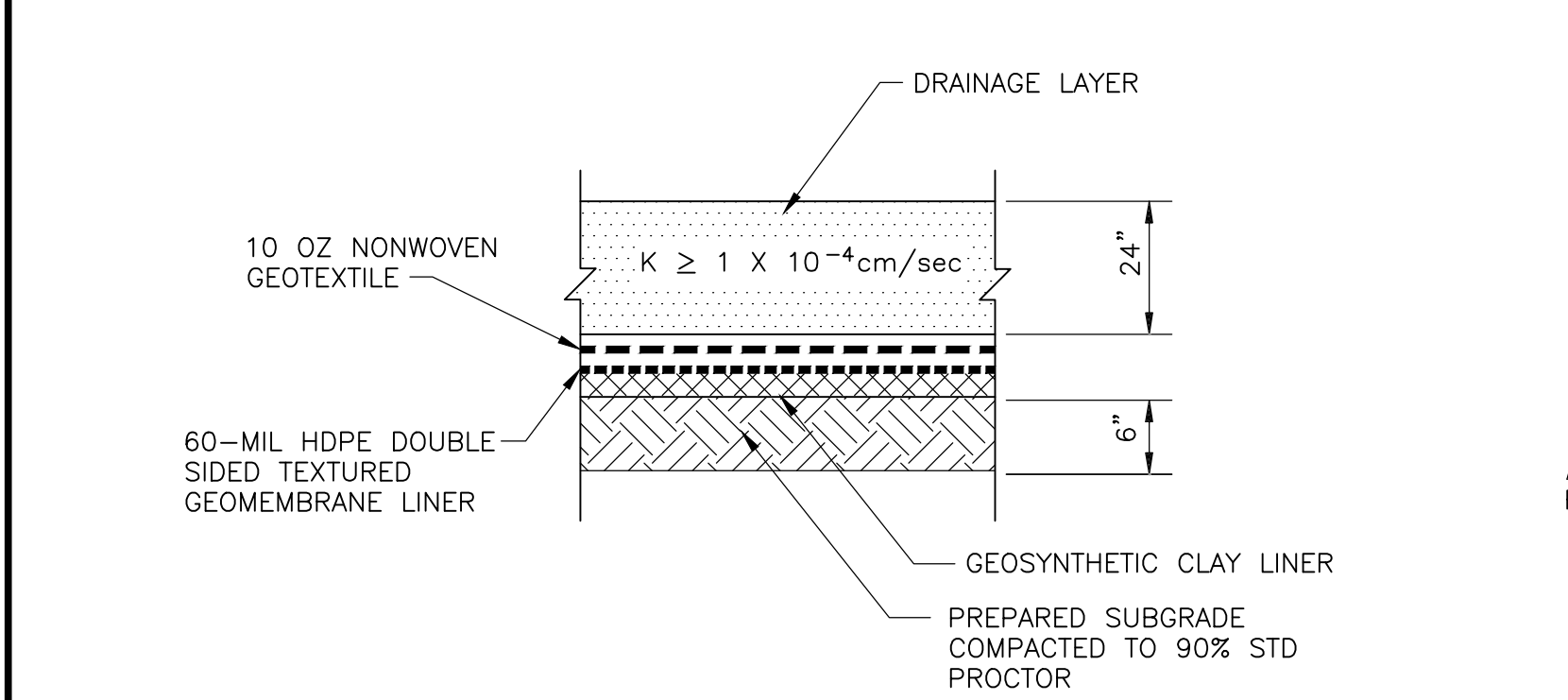
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E 1685500

SURVEY GRID

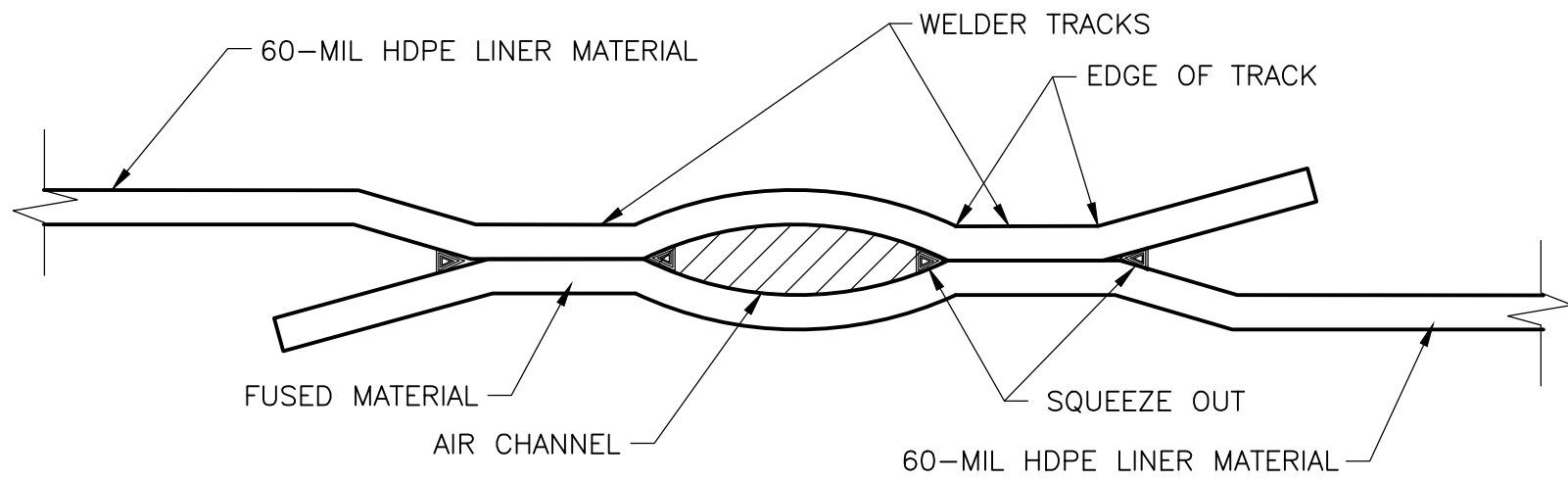
- NOTES:
- GRADES REPRESENT TOP OF LINER SYSTEM SUBGRADE.
  - CRUSHED BASALT AND GLASS CULLET FOR 2' THICK DRAINAGE LAYER SHALL BE PROVIDED BY OWNER AND INSTALLED BY CONTRACTOR. CONTRACTOR SHALL BE RESPONSIBLE FOR HAULING, PLACING, AND SAMPLING AND TESTING DRAINAGE MATERIAL. GLASS CULLET SHALL BE MIXED WITH CRUSHED BASALT AT A RATIO OF 1:1 USING LOADER AND PLACED ON CELL FLOOR. GLASS CULLET SHALL NOT BE PLACED ON SIDE SLOPES.



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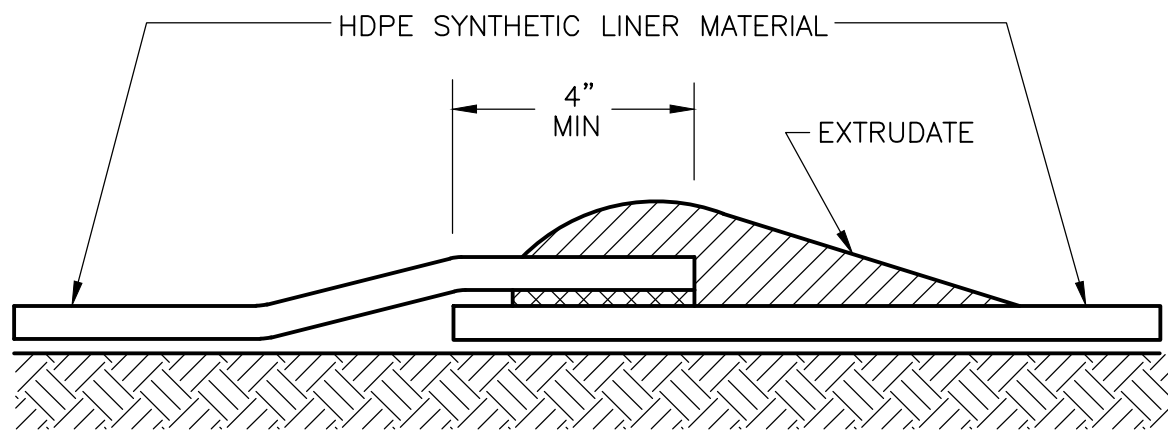


LINER SYSTEM  
DETAIL A  
NTS C-2

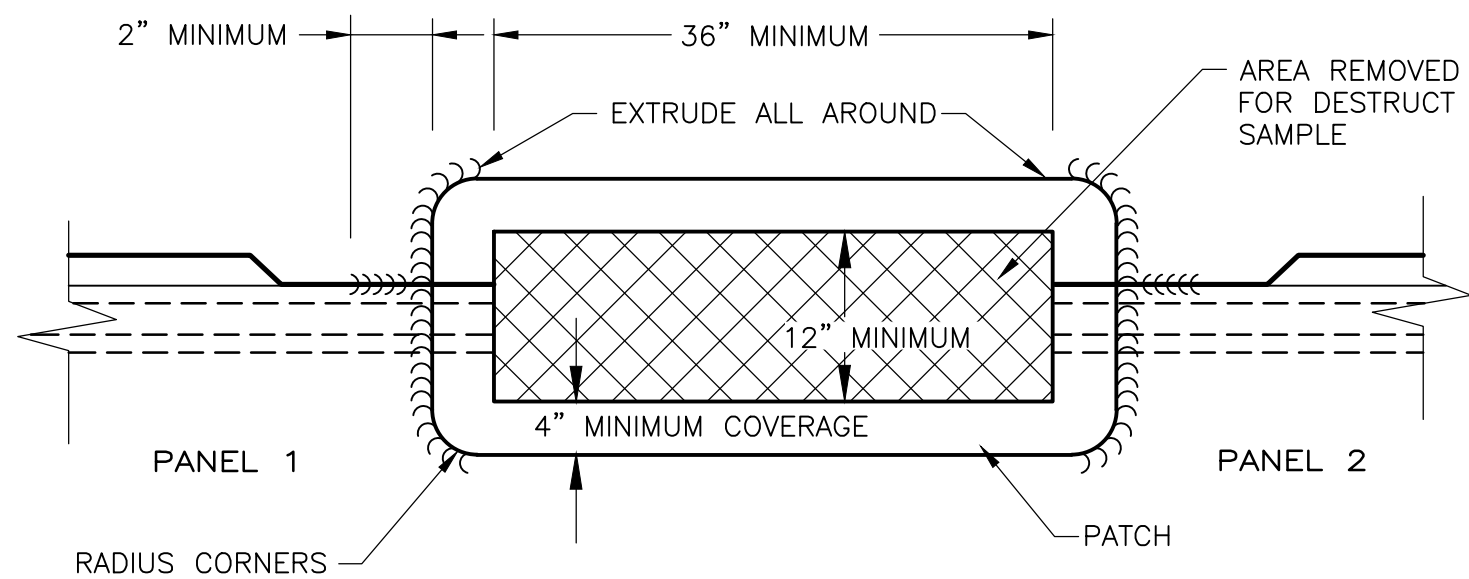


- NOTES:
1. BOTH AREAS OF FUSED MATERIAL SHOULD BE VOID OF ANY SEAM LINES.
  2. EDGE OF TRACKS NOT TO CUT THE LINER.
  3. AIR CHANNEL SHOULD BE CLEAR.
  4. BOTH WELDER TRACKS SHALL BE EQUAL WIDTHS.

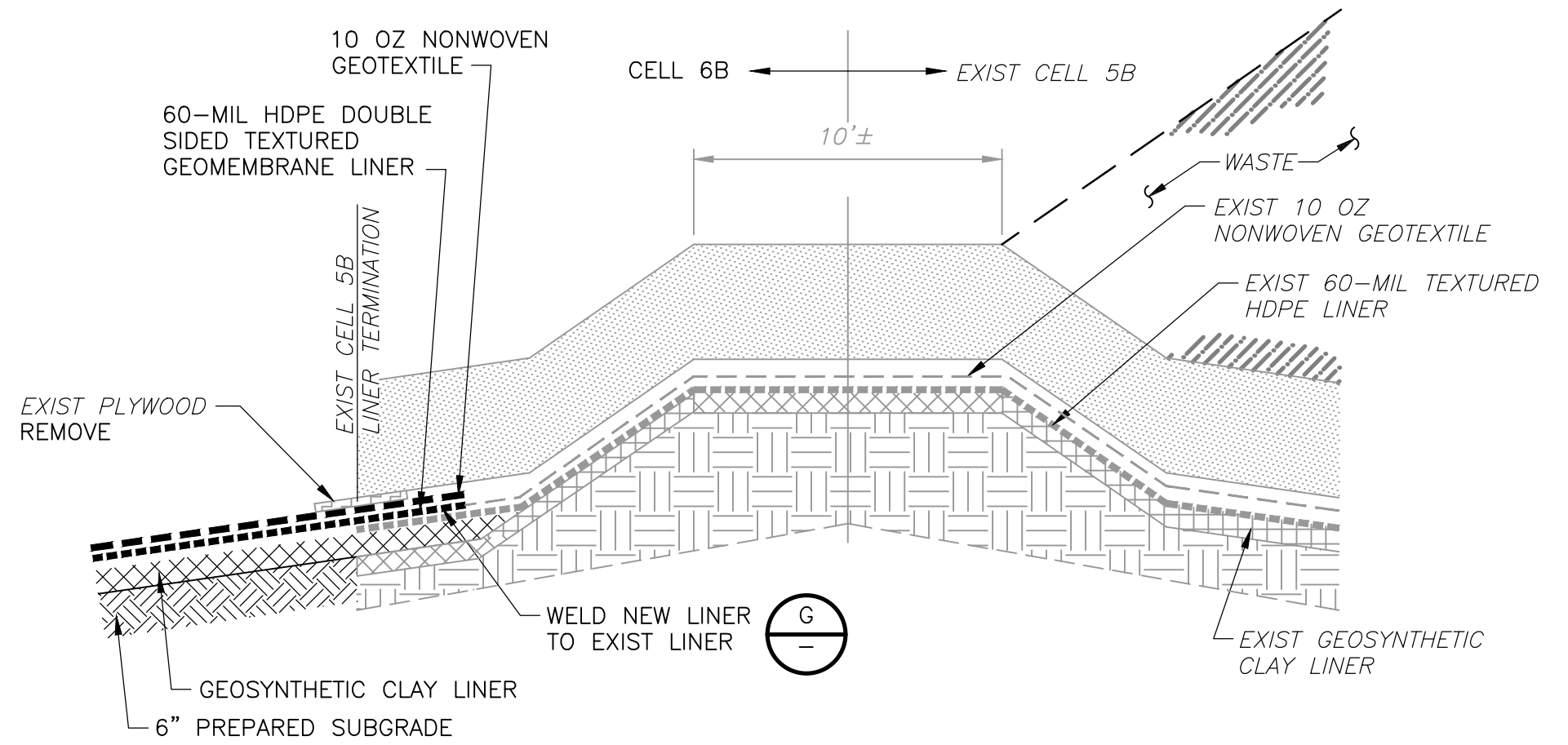
TYPICAL FUSION WELD  
DETAIL B  
NTS -



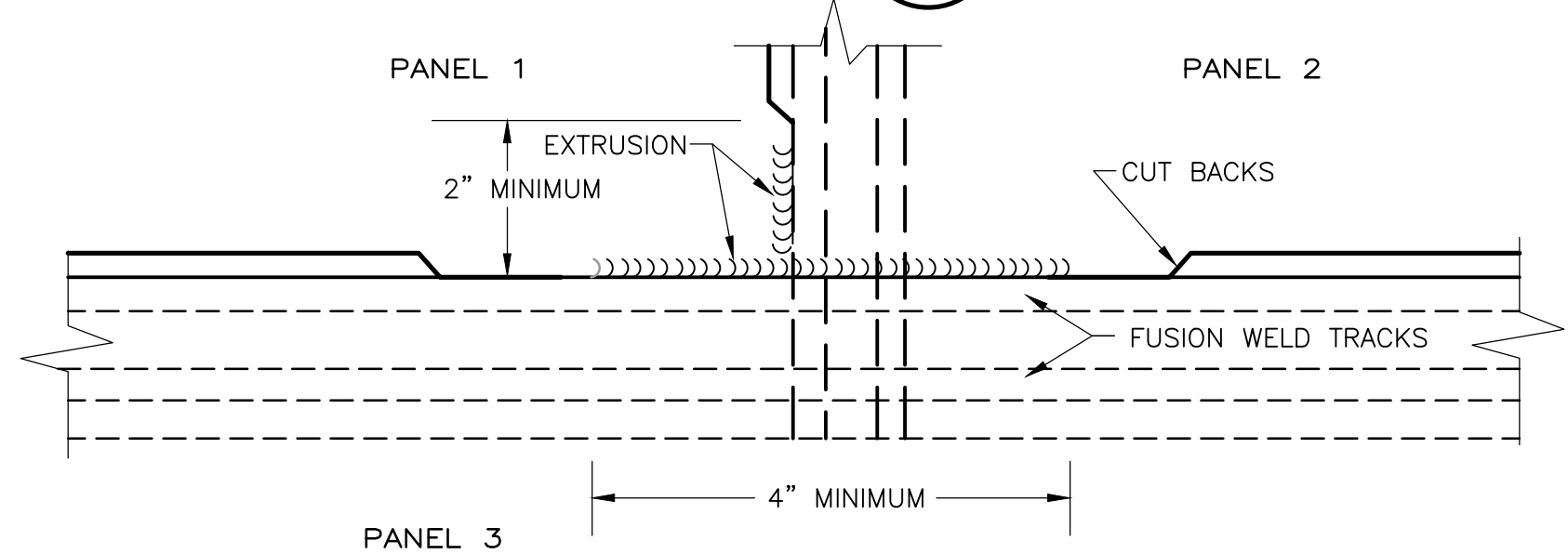
TYPICAL EXTRUSION WELD  
DETAIL C  
NTS -



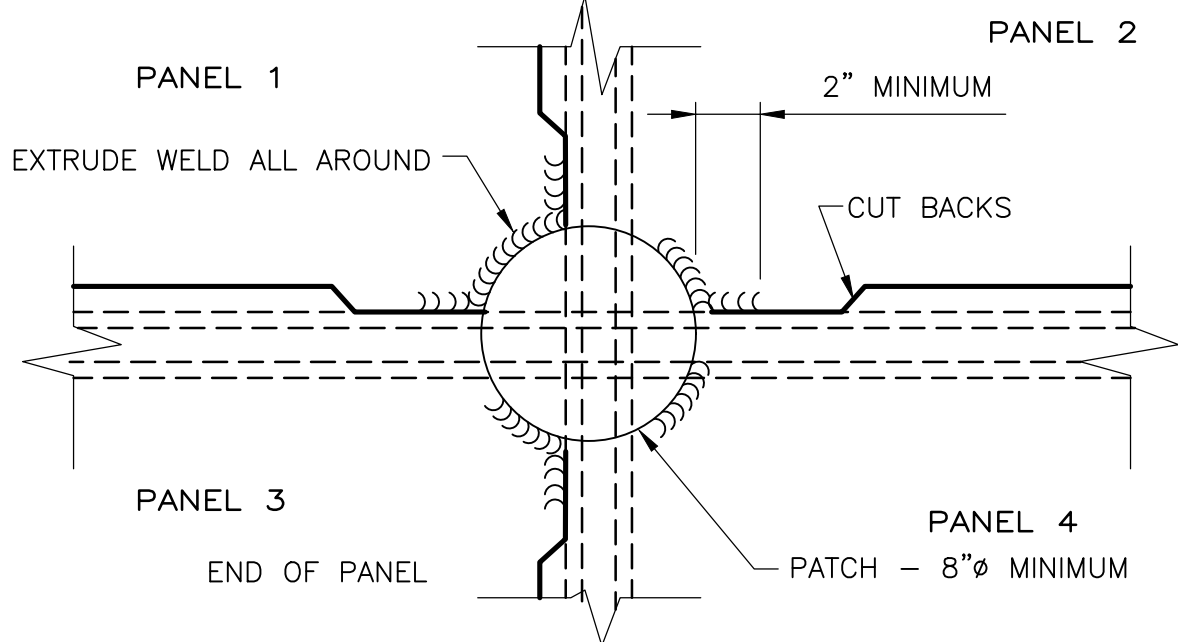
TYPICAL DESTRUCT SAMPLE PATCH  
DETAIL D  
NTS -



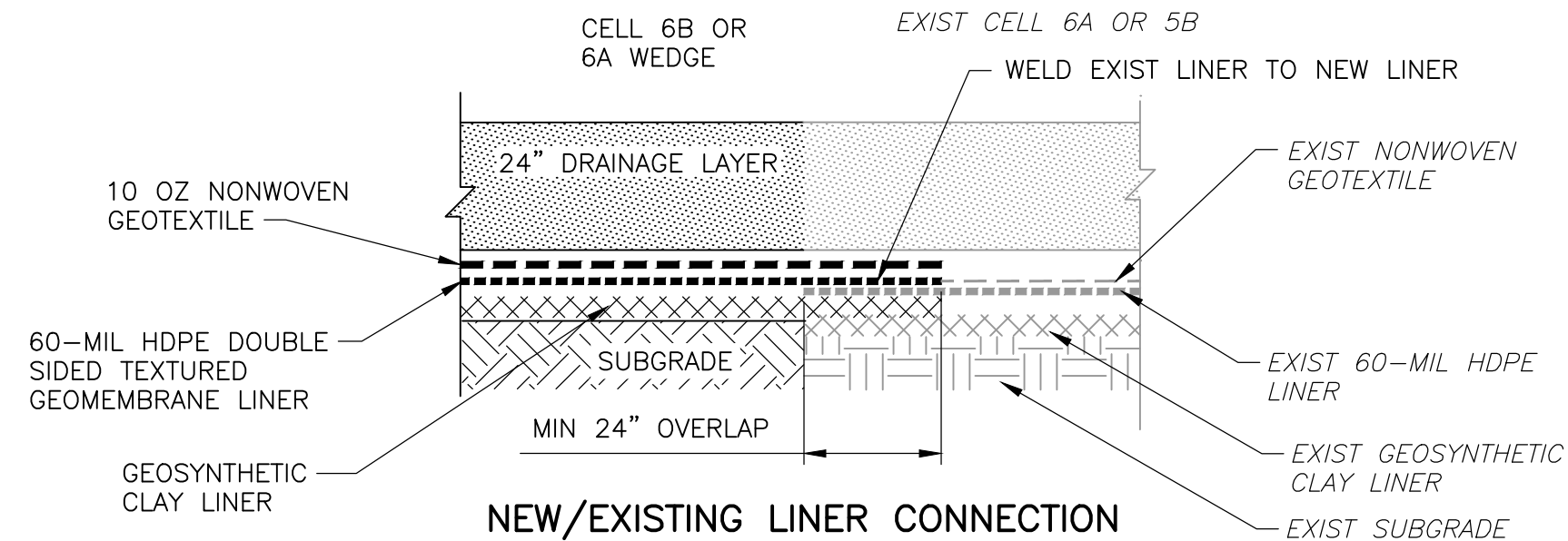
CELL 6B/EXISTING CELL 5B LINER CONNECTION  
SECTION 1  
NTS C-2



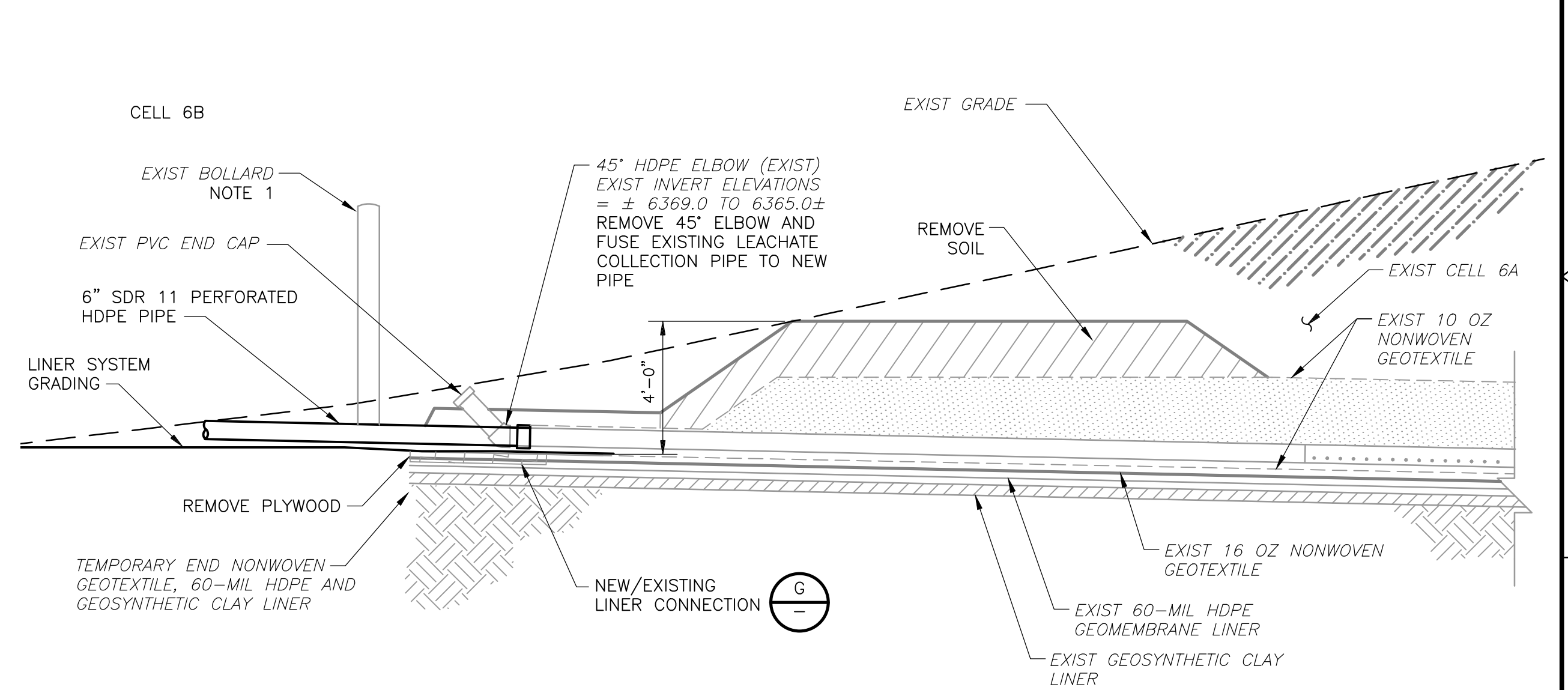
TYPICAL "T" AT BUTT SEAM  
DETAIL E  
NTS -



TYPICAL PATCH AT PANEL END  
DETAIL F  
NTS -

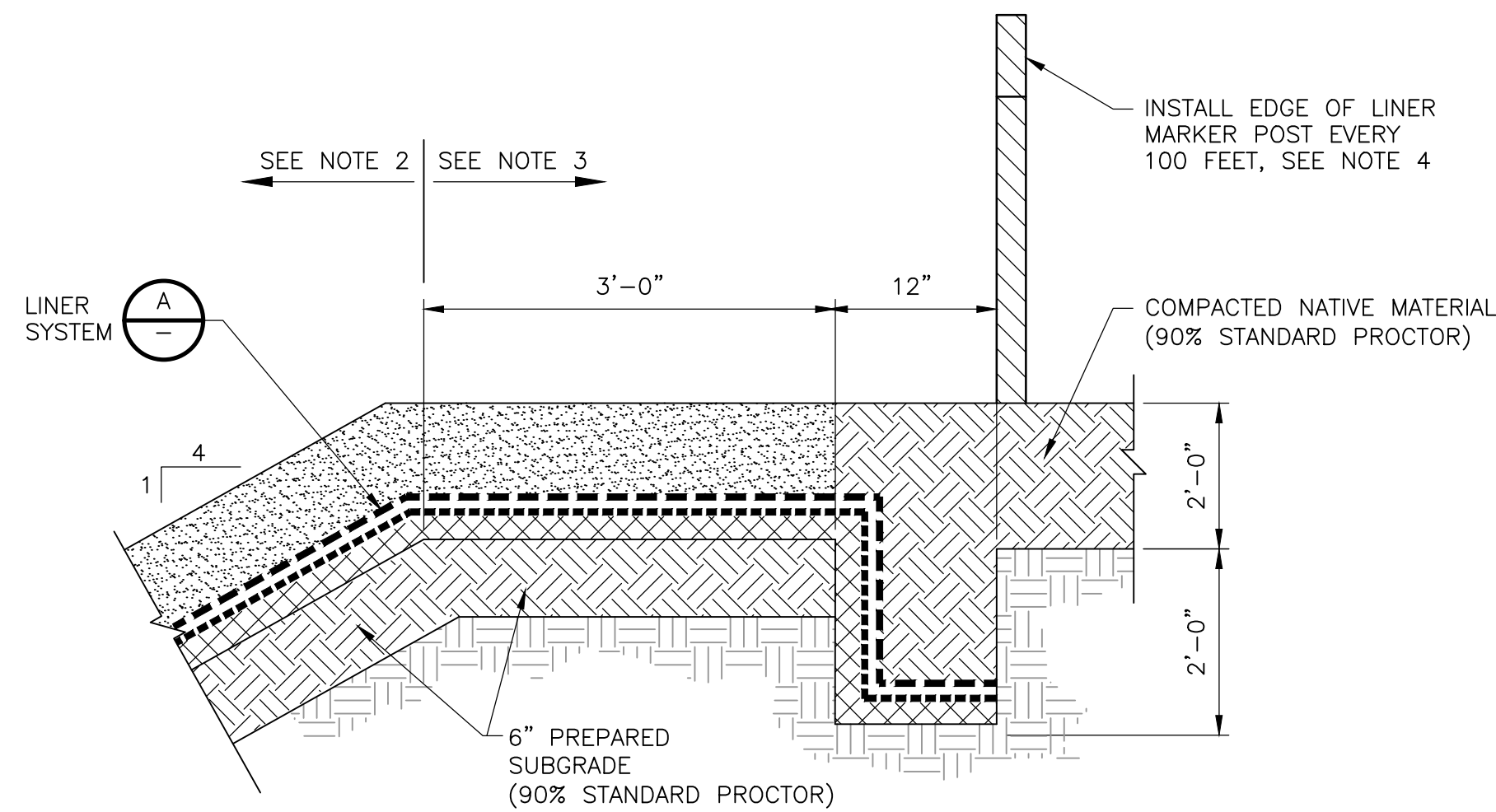


NEW/EXISTING LINER CONNECTION  
DETAIL G  
NTS C-2



- NOTE:
1. REMOVE EXISTING BOLLARDS (QTY 2).

CONNECTION OF NEW/EXISTING LINER AND LEACHATE PIPE  
SECTION 2  
NTS C-2



- NOTES:
1. THE 2' LAYER OF FILL SHALL EXTEND A MAXIMUM OF 5' OUTSIDE OF THE ANCHOR TRENCH.
  2. LOCATION CORRESPONDS TO LIMITS OF LINER SHOWN ON C-1, C-2 AND C-3.
  3. THIS PORTION OF THE LINER SYSTEM IS NOT INCLUDED IN THE MEASUREMENT QUANTITY FOR MEASUREMENT AND PAYMENT. INCLUDE AS AN INCIDENTAL.
  4. MARKER SHALL BE A CARSONITE 72" CFUM-400 CURV-FLEX. MARKER DECAL SHALL READ "EDGE OF LINER" AND SHALL BE CUSTOM DECAL 2 COLOR (YELLOW) NON-REFLECTIVE, 2 7/8" X 1/16".

LINER SYSTEM ANCHOR TRENCH  
DETAIL H  
NTS C-2, C-3

| REV. NO. | DATE | DRWN | CHKD | REMARKS |
|----------|------|------|------|---------|
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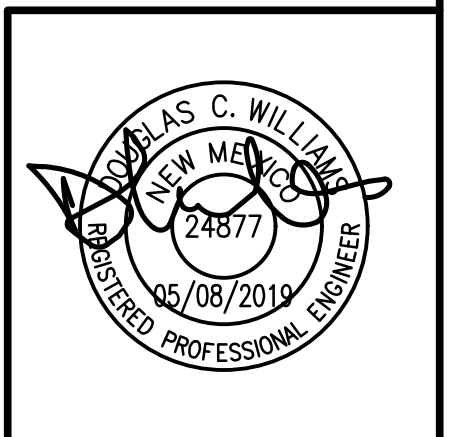
|                 |             |
|-----------------|-------------|
| DESIGNED BY:    | D. WILLIAMS |
| DRAWN BY:       | E. DOAK     |
| SHEET CHK'D BY: | C. GABEL    |
| CROSS CHK'D BY: | R. FOWLE    |
| APPROVED BY:    | D. WILLIAMS |
| DATE:           | MAY 2019    |

**CDM Smith**  
6001 Indian School Rd. NE, Suite 310  
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Tel: (505) 243-3200

SANTA FE SOLID WASTE MANAGEMENT AGENCY  
CAJA DEL RIO LANDFILL  
CELLS 6B AND 6A WEDGE  
LINER SYSTEM CONSTRUCTION

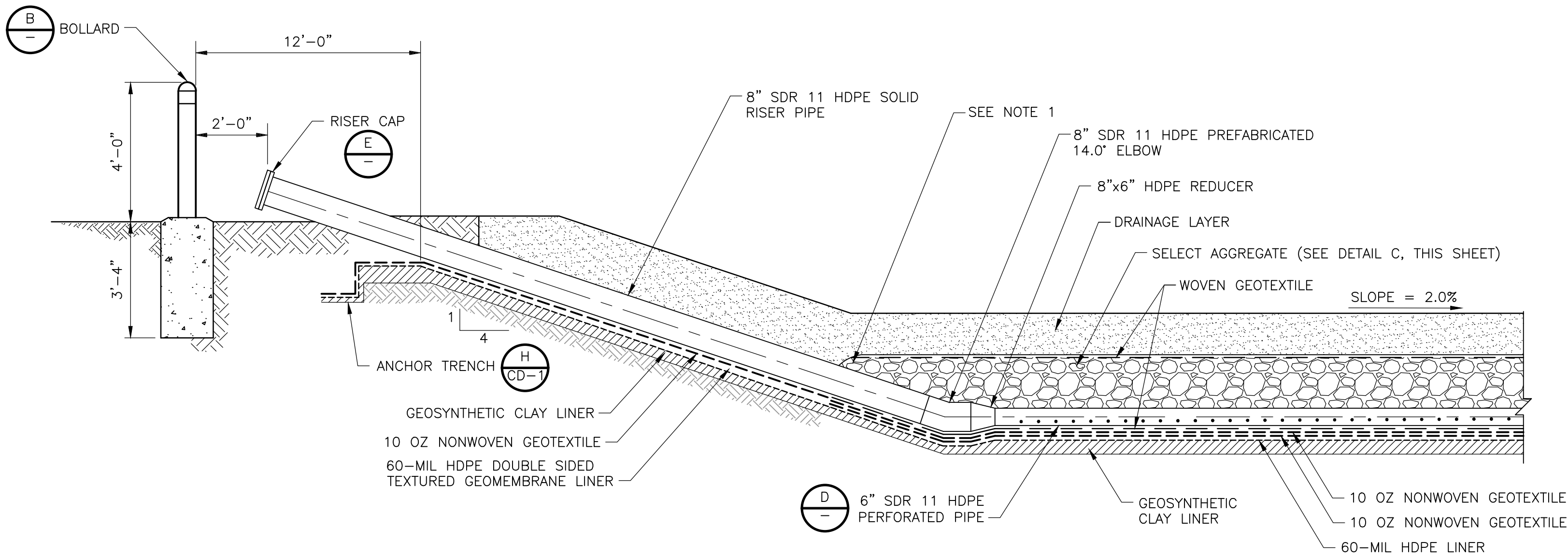
LINER SYSTEM DETAILS

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| PROJECT NO. | 10679-234307 |
| FILE NAME:  | CD01LSDT.DWG |
| SHEET NO.   | CD-1         |





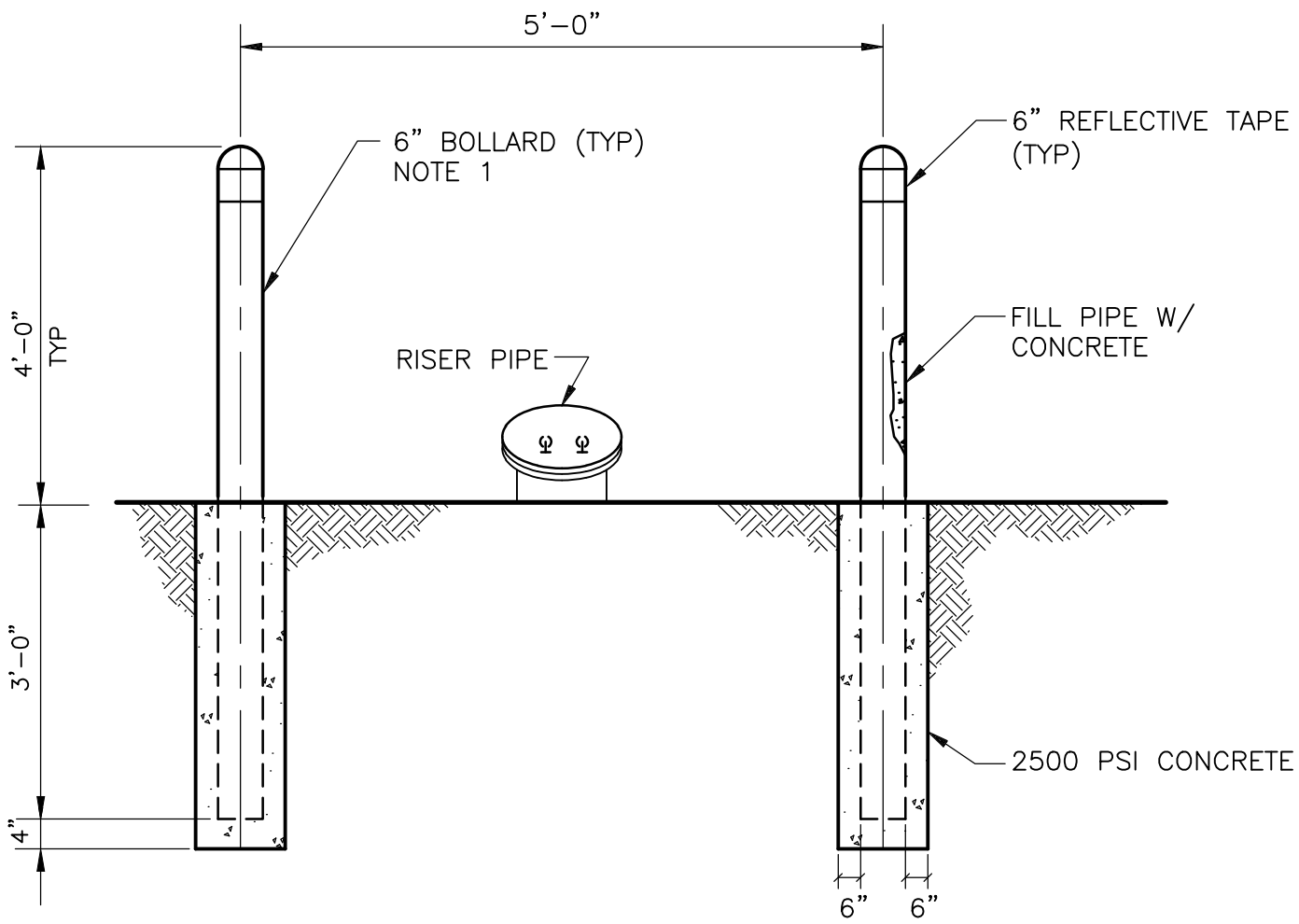
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NOTES:

1. WRAP AND SECURE FABRIC TO PIPE WITH STAINLESS STEEL CLAMP TO PREVENT FINES FROM ENTERING.
2. PRIOR TO BACKFILLING TRENCHES FOR THE LEACHATE COLLECTION PIPING, THE CONTRACTOR SHALL BE RESPONSIBLE FOR VERIFYING THAT ALL PIPE BENDS/FITTINGS/DEFLECTIONS WILL ALLOW FOR CAMERA AND PIPE CLEANING EQUIPMENT TO BE LOWERED AND REMOVED FROM PIPE.

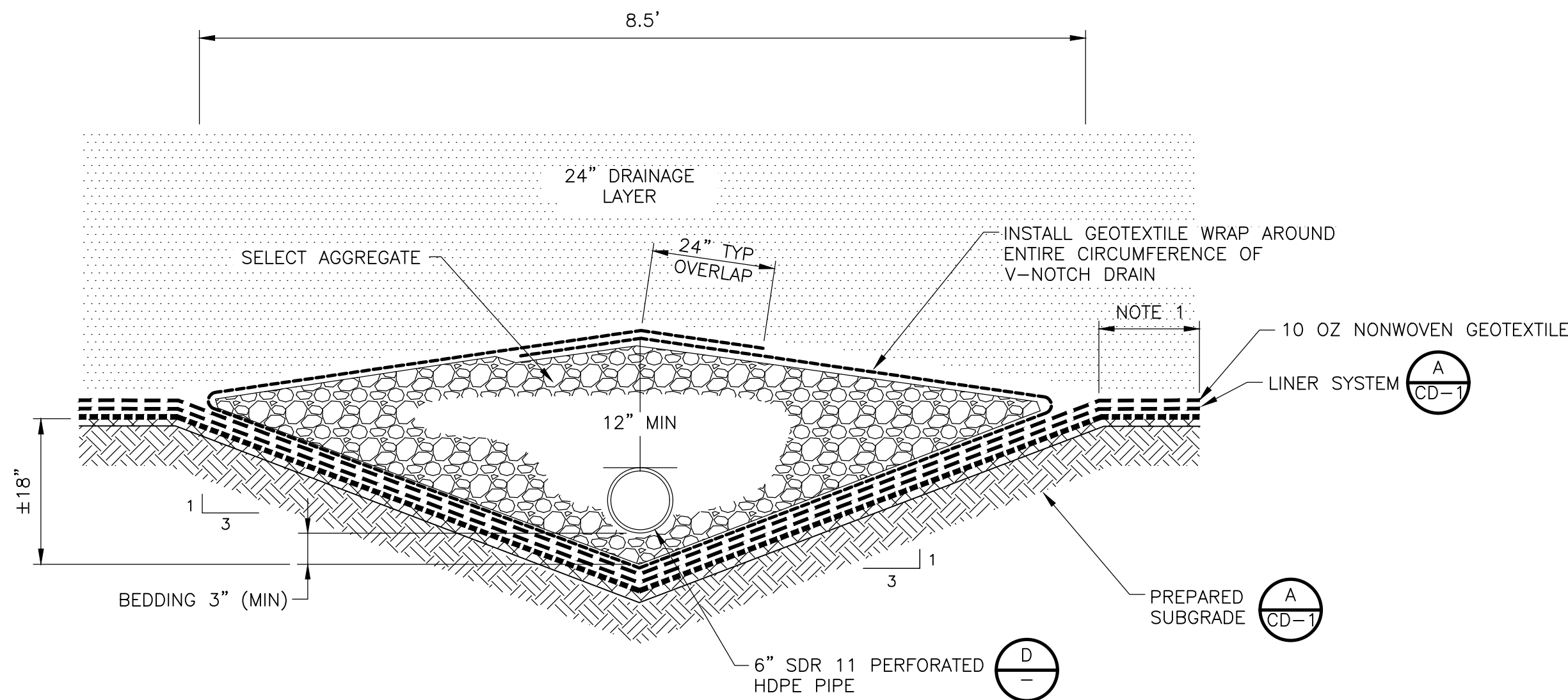
LEACHATE RISER  
DETAIL  
NOT TO SCALE  
A  
C-2



NOTE:

1. BOLLARDS SHALL BE PAINTED SAFETY YELLOW.

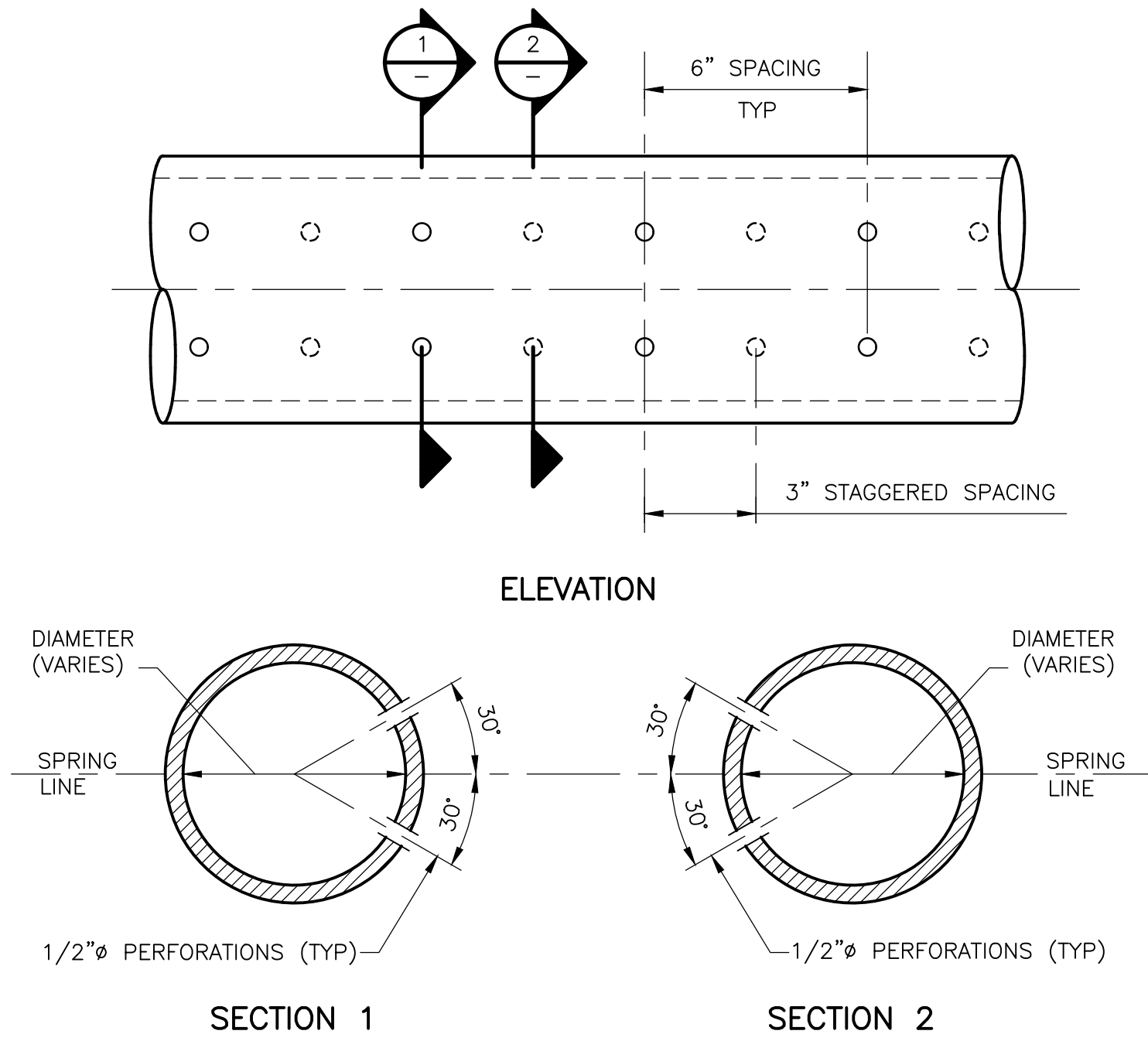
LEACHATE RISER BOLLARDS  
DETAIL  
NTS  
B



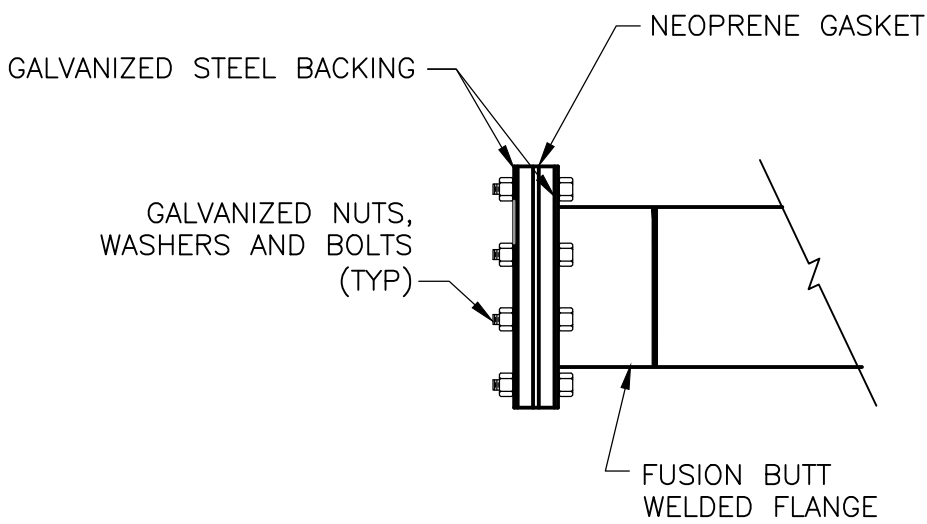
NOTE:

1. AN ADDITIONAL LAYER OF 10 OZ NONWOVEN GEOTEXTILE SHALL BE INSTALLED IN LEACHATE COLLECTION TRENCH AND EXTEND A MINIMUM OF 1 FOOT BEYOND TRENCH.

LEACHATE COLLECTION PIPE AND TRENCH - FLOOR  
DETAIL  
NTS  
C



PERFORATED HDPE PIPE  
DETAIL  
NTS  
D



NOTE:

1. BLIND FLANGE BOLTS SHALL BE TORQUED TO MEET MFR RECOMMENDATION. DO NOT OVERTIGHTEN.

LEACHATE RISER CAP  
DETAIL  
1" = 1'-0"  
E

| REV. NO. | DATE | DRWN | CHKD | REMARKS |
|----------|------|------|------|---------|
|          |      |      |      |         |
|          |      |      |      |         |
|          |      |      |      |         |
|          |      |      |      |         |

DESIGNED BY: D. WILLIAMS  
DRAWN BY: E. DOAK  
SHEET CHK'D BY: C. GABEL  
CROSS CHK'D BY: R. FOWLE  
APPROVED BY: D. WILLIAMS  
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CAJA DEL RIO LANDFILL  
CELLS 6B AND 6A WEDGE  
LINER SYSTEM CONSTRUCTION

LEACHATE COLLECTION SYSTEM DETAILS

PROJECT NO. 10679-234307  
FILE NAME: CD02LCDT.DWG  
SHEET NO.  
CD-2

