



REQUEST FOR PROPOSAL

Project: Montezuma County
Landfill Cell 5 Construction

MONTEZUMA COUNTY

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SECTION I – BID INFORMATION

1.0 BID INFORMATION

Section I provides general information to potential Bidders, such as bid submittal instructions and other similar administrative elements. This Invitation for Bid (IFB) is available on the Montezuma County website at www.montezumacounty.org/rfp-notices/ beginning on **March 1, 2024**.

It is the Prime Contractor's responsibility to review the site for addenda and changes before submitting their bid. All addenda or amendments shall be issued through the Montezuma County Website and may not be available through any other source.

1.1 SPECIAL TERMS

Please note the following definitions of terms as used herein:

The term "County" means Montezuma County, Colorado.

The term "Contractor" means the Bidder whose offer is accepted and is awarded the contract to provide the products or services specified in the IFB.

The term "Offer" or "Bid" means a bid submitted in response to this IFB.

The term "Offer or" or "Bidder" means the person, firm, or corporation that submits a formal bid or offer and that may or may not be successful in being awarded the contract.

The term "Project" refers to Landfill Cell 5 Construction.

The term "Invitation for Bid" or "IFB" means this solicitation of formal, competitive, sealed bids from prospective bidders in which the intent is to award a contract to the resultant lowest responsible and responsive bidder.

1.2 BID ISSUE DATE

The complete set of Specifications and Contract Documents can be downloaded from www.montezumacounty.org/rfp-notices/ beginning on **March 1, 2024**. It is the Prime Contractor's responsibility to review the site for addenda and changes before submitting their bid.

1.3 SUBMITTAL OF BIDS

- A. Sealed Bids will be received until Thursday, April 4, at 3:00pm. All bids will be publicly opened and read aloud. Bids will be received by Montezuma County Admin Building, 109 West Main Street, Cortez, CO 81321.
- B. Bid bond will be required. (Also see 1.24)
- C. The cost of Bid preparation is not a reimbursable cost. Bid preparation shall be at the Bidder's sole expense and is the Bidder's total and sole responsibility.

1.4 PRE-BID CONFERENCE

The pre-bid conference for this project will be held on **March 14th, 2024 at 9:00AM MST**. The conference will be held at the project location. This conference is mandatory.

1.5 LATE BIDS/LATE MODIFICATIONS OF BIDS

Bids, withdrawals or modifications of Bids received after the time set for opening, as designated in 1.3 above, are considered "late bids", and will not be accepted by the County, except as provided for in the Montezuma County Procurement Guidance, dated March 2021, and approved by the Montezuma County Board of County Commissioners. Bidders are solely responsible for ensuring their bids arrive on time and to the place specified in this Invitation for Bid.

1.6 MISTAKES IN BIDS - CONFIRMATION OF BID

If it appears from a review of a Bid that a mistake has been made, the Bidder may be requested to confirm its Bid in writing. Situations in which the confirmation may be requested include obvious, apparent errors on the face of a Bid or a Bid unreasonably lower than the other Bids submitted. All mistakes in Bids will be handled in accordance with the Montezuma County Procurement Guidance.

1.7 PROCUREMENT GUIDANCE

All formal IFBs advertised by Montezuma County are solicited in accordance with the County's Procurement Guidance. Any discrepancies or conflicting statements, decisions regarding bidding irregularities, or clarifications regarding clauses or specifications will be rectified utilizing the County's Procurement Guidance, when applicable. It is the Bidder's responsibility to advise the Bid Manager listed in this IFB of any perceived discrepancies, conflicting statements, or problems with clauses or specifications prior to the Bid opening date and time.

1.8 MINOR INFORMALITIES/IRREGULARITIES IN BIDS

- A. A minor informality or irregularity is one that is merely a matter of form and not of substance. It also pertains to some immaterial defect in a Bid or variation of a Bid from the exact requirements of the invitation that can be corrected or waived without being prejudicial to other Bidders. The defect or variation is considered immaterial when the effect on price, quantity, quality, or delivery is negligible when contrasted with the total cost or scope of the goods and/or services being acquired.
- B. If the County determines that a Bid submitted contains a minor informality or irregularity, then the Contract Manager shall either give the Bidder an opportunity to cure any deficiency resulting from the minor informality or irregularity or waive the deficiency, whichever is to the advantage of the County. In no event will the Bidder be allowed to change the Bid amount. Examples of minor informalities or irregularities include but are not limited to the following:
 - 1. Bidder fails to sign the Bid, but only if the unsigned Bid is accompanied by other material evidence, which indicates the Bidder's intention to be bound by the unsigned Bid (such as Bid security, or signed cover letter which references the Bid Number and amount of Bid).
 - 2. Bidder fails to acknowledge an Amendment, although this may be considered a minor informality only if the Amendment, which was not acknowledged, involves only a matter of form or has either no effect or merely a negligible effect on price, quantity, quality, or delivery of the item or services bid upon.

1.9 REJECTION OF BIDS

The Board of County Commissioners has the authority to reject any Bid based on, but not limited to, the following:

- A. Any Bid that fails to conform to the essential requirements of the Invitation for Bids shall be rejected.

- B. Any Bid that does not conform to the applicable specifications shall be rejected unless the IFB authorizes the submittal of alternate bids and the items or services offered as alternates meet the requirements specified in the IFB.
- C. A Bid that fails to conform to the specified delivery schedule.
- D. A Bid shall be rejected when the Bidder imposes conditions that would modify requirements of the IFB or limit the Bidder's liability to the County, since to allow the Bidder to impose such conditions would be prejudicial to other Bidders.

For example, Bids shall be rejected in which the Bidder:

1. Protects against future changes in conditions, such as increased costs, if total possible costs to the County cannot be determined. This includes failure to completely fill out the required bid schedule.
 2. Fails to state a price and indicates that price shall be "price in effect at time delivery".
 3. States a price but qualifies it as being subject to "price in effect at time of delivery".
 4. Takes exceptions to the IFB terms and conditions.
 5. Inserts the Bidder's terms and conditions.
 6. Limits the rights of the County under any Contract/Invitation for Bid clause.
- E. Any Bid in which the price is considered to be unreasonable or is over budget.
 - F. Any Bid if the prices are determined to be unbalanced.
 - G. Bids received from any person or contractor that is suspended, debarred, proposed for debarment, or under investigation for fraud, including failure to pay federal, state, or local taxes.
 - H. When a bid guarantee is required and the bidder fails to furnish the guarantee in accordance with the requirements of the IFB.
 - I. Low Bids received from bidders who are determined to be non-responsible in accordance with the County's Procurement Guidance.
 - J. Any Bid that was prepared and submitted by a vendor who has been determined by the Board of County Commissioners to have an unfair advantage over other Bidders. Examples of an unfair advantage include, but are not limited to, the following:
 1. A previous or prior employee who in the last six (6) months was directly involved in the design or specification preparation of the competed procurement.
 2. A vendor who was directly involved in design or specification preparation of the competed project either for pay or voluntarily.

1.10 ESTIMATED QUANTITIES

If the Bid Form (Attachment A) herein contains estimated quantities, this provision is applicable. The quantities listed for each of the items in the Bid Form are only estimated quantities. Contractors are required to bid a firm unit price for each item specified. The actual quantities ordered may fluctuate up or down. The unit prices proposed by each Bidder will remain firm and will not be re-negotiated if the estimated quantities are not met or are exceeded. This clause will take precedence over any/all other estimated quantity clauses that conflict with this clause.

For bidding purposes, if there is a conflict between the extended total of an item and the unit price, the unit price shall prevail and be considered as the amount of the Bid. All unit prices shall include all necessary overhead and profit. Items not listed in the Bid Form such as overhead, profit, bonding, etc. shall be distributed throughout the Bidder's Unit Prices for the items listed on the Bid Form.

1.11 NUMBER OF COPIES

Bidders shall submit one original of each required document outlined in Section 1.32 Bid Documents.

1.12 IDENTIFICATION OF BID

Bids must be submitted to the Board of County Commissioners as detailed in Section 1.3 Submittal of Bids. The solicitation number and Offer or name must be clearly marked within the Bid.

Bid No.: Landfill Cell 5
Due Date and Time: April 4, 2024 at 3:00 PM MST

1.13 TAXES

Contractor shall pay all taxes imposed by law in connection with the Work.

1.14 PREPARATION OF BID OFFER

- A. Bidders are expected to examine the drawings, specifications, bid documents, proposed contract forms, terms and conditions, and all other instructions and solicitation documents.
Bidders are expected to visit the project location to determine all requirements and conditions that will affect the work. Failure to do so will not relieve a Bidder from their responsibility to know what is contained in this Invitation for Bid, or site conditions affecting the work.
- B. The Bidder certifies that it has checked all of its figures and understands that the County will not be responsible for any errors or omissions on the part of the Bidders in preparing its Bid.
- C. All items, (unless the invitation specifically states otherwise) including any additive or deductive alternates on the Bid Form, must be completely filled out or the Bid will be determined non-responsive and ineligible for consideration for award.
- D. The Bidder declares that the person or persons signing this Bid is/are authorized to sign on behalf of the firm listed and to fully bind the Bidder to all the requirements of the IFB.
- E. The Bidder certifies that no person or firm other than the Bidder or as otherwise indicated has any interest whatsoever in the Bid or the contract that may be entered into as a result of the Bid and that in all respects the Bid is legal and firm, submitted in good faith without collusion or fraud.
- F. By submitting a Bid the Bidder certifies that it has complied and will comply with all requirements of local, state, and federal laws, and that no legal requirements have been or will be violated in making or accepting this Bid. Bidders are expected to review the County's Procurement Guidance, which will be used when determining whether a Bidder is responsive and responsible and awarding contracts in the best interest of the County.
- G. If there is a discrepancy between the unit price and the total price, the unit price shall be used to determine the applicable total price. Bidders are responsible for including profit and overhead associated with the project when determining their unit prices.

1.15 BASIS OF AWARD

- A. Montezuma County intends to award a contract to the Bidder whose bid is determined to fulfil the best interest of the County.
- B. The County reserves the right to reject any or all Bids and to waive informalities and/or irregularities in a Bid. Whether or not a contract is awarded as a result of this Invitation for Bid, as stated above, Bid preparation costs are not reimbursable.

1.16 PERIOD OF ACCEPTANCE

The Bidder agrees that its Bid shall remain open for acceptance by the County for a period of nineteen (19) calendar days from the date specified in the IFB for receipt of Bids.

1.17 CONTRACT AWARD

The signature of the Bidder indicates that within ten (10) calendar days from acceptance of its Bid, it will execute a contract with the County and, if indicated in this IFB, furnish a project specific Certificate of Insurance naming the County as Additional Insured, furnish Performance, Labor and Materials, Payment and Maintenance Bonds and any other documents required by the Specifications or Contract Documents.

1.18 NOTICE TO PROCEED

Upon bid opening, the apparent low bidder will be selected by the County, and the bid results will be prepared and submitted to the Montezuma County Board of County Commissioners for approvals. BOCC Board meetings typically occur once per week.

After the construction contract has been approved by the BOCC, the full Notice to Proceed will be issued by the County.

1.19 AMENDMENTS TO THE SOLICITATION

Amendments are also referred to as addendum or addenda; and these terms shall be considered synonymous. It is the Bidder's responsibility to contact the Contract Specialist listed in 1.21 below to confirm the number of Amendments which have been issued.

- A. If this solicitation is amended, then all specifications, terms and conditions, which are not specifically amended, remain unchanged.
- B. Bidders shall acknowledge receipt of any amendment to this solicitation by signing and returning the amendment and by identifying the amendment number and date in the space provided on the form for submitting a Bid.
- C. Acknowledged amendments must be received prior to Bid opening. Bidders are encouraged to include signed addenda or initialed acknowledgment with returned Bids.

1.20 EXPLANATIONS TO PROSPECTIVE OFFERORS

Any prospective Bidder desiring an explanation or interpretation of the IFB documents, drawings, specifications, etc., must request it in writing. Oral explanations or instructions given before the opening of Bids will not be binding. Any information provided to a prospective Bidder during the Bid preparation stage will be promptly furnished to all other prospective Bidders as an amendment to the solicitation, if that information is necessary in submitting Bids or if the lack of it would be prejudicial to other prospective Bidders.

1.21 QUESTIONS AND OTHER REQUESTS FOR INFORMATION

All questions and requests for clarifications shall be submitted via email to Weaver Consultants at jmidkiff@wcgrp.com. All questions must be received no later than **March 22, 2024 at 3:00PM MST**. Questions and clarifications will be provided by issuance of addenda published on the Montezuma County website. It is Prime Contractor's responsibility to monitor the website.

DO NOT CONTACT ANY OTHER INDIVIDUAL AT MONTEZUMA COUNTY
REGARDING THIS SOLICITATION.

1.22 CONTRACTOR PREQUALIFICATION

Not Applicable.

1.23 CIVIL RIGHTS

Not Applicable

1.24 SECURITY REQUIREMENTS

A. Bid Security

1. The Bidder is required to furnish with their Bid a bid security in the form of a bank certified check, bank cashier's check or a one-time bid bond underwritten by a company licensed to issue bonds in the State of Colorado and acceptable to the County in an amount equal to at least 5% of the total amount of the Bid payable without condition to the County.
2. The Bid security shall guarantee that the Bid will not be withdrawn or modified for a period of sixty (60) calendar days after the time set for the receipt of Bids, and, if the Bid is accepted within those sixty (60) calendar days, that the person, firm or corporation submitting same shall within ten (10) calendar days after being notified of the acceptance of its Bid, enter into a Contract and furnish the required bonds and all insurance certificates called for under this Invitation for Bid.
3. The Bid bonds of unsuccessful Bidders will not be returned to the respective Bidders unless a self-addressed, stamped envelope is provided along with a written request for bid bond return. However, if a certified check or a cashier's check is submitted as Bid security, it will be returned as soon as possible after the lowest responsive and responsible Bidder is determined and a contract is executed.
4. In the event the Bidder whose Bid is accepted fails to enter into the contract and/or furnish the required contract bonds, its certified check, cashier's check or bid bond will be forfeited in full to the County.

B. Performance and Labor and Materials Payment Bonds

1. The Contractor shall furnish to the County each of the following: a Performance Bond and a Labor and Materials Payment Bond. Each such bond shall be in the amount of one hundred percent (100%) of the contract price. Bonds shall be submitted within ten (10) calendar days after notification of award of a Contract. The cost of all bonds shall be included in Contractor's Bid.
2. Bonds shall:
 - a. Be for the full amount of the Contract price.
 - b. Guarantee the Contractor's faithful performance of the work under the Contract, and the prompt and full payment for all labor and materials involved therein.
 - c. Guarantee protection to the County against liens of any kind.
 - d. Be from a surety company operating lawfully in the state of Colorado and accompanied by an acceptable "Power-of-Attorney" form attached to each bond copy.
 - e. Be issued from a surety company that is acceptable to the County.
 - f. Be submitted using the forms as are approved by the County Attorney's Office.

1.25 INSURANCE

1. Contractor agrees to procure and maintain, at its own cost, a policy or policies of insurance sufficient to insure against all liability, claims, demands, and other obligations assumed by Contractor pursuant to this Contract. Such insurance shall be in addition to any other insurance requirements imposed by law.
2. Contractor shall procure and maintain, and shall cause any subcontractor of Contractor to procure and maintain, the minimum insurance coverages listed below. Such coverages shall be procured and maintained with forms and insurers acceptable to the Town. In the case of any claims-made policy, the necessary retroactive dates and extended reporting periods shall be procured to maintain such continuous coverage.
 - a. Worker's compensation insurance to cover obligations imposed by applicable law for any employee engaged in the performance of work under this Contract, and Employer's Liability insurance with minimum limits of one hundred thousand dollars (\$100,000) each accident, five hundred thousand dollars (\$500,000) disease – policy limit, and one hundred thousand dollars (\$100,000) disease – each employee. Evidence of qualified self-insured status may be substituted for the worker's compensation requirements of this paragraph.
 - b. Commercial general liability insurance with minimum combined single limits of at least one million (\$1,000,000) each occurrence and two million dollars (\$2,000,000) general aggregate. The policy shall be applicable to all premises and operations. The policy shall include coverage for bodily injury, broad form property damage (including completed operations), personal injury (including coverage for contractual and employee acts), blanket contractual, products, and completed operations. The policy shall contain a severability of interests provision, and, to the M-8 extent that liability results from the acts or omissions of Contractor, the policy shall be endorsed to include the County and the County's officers, employees, and consultants as well as CDOT as additional insureds. No additional insured endorsement shall contain any exclusion for bodily injury or property damage arising from completed operations.
 - c. Business Automobile liability insurance with minimum combined single limits of at least one million (\$1,000,000) each occurrence. The policy shall be endorsed to include the County and the County's officers, employees, and consultants as well as CDOT as additional insureds.
3. Any insurance carried by the County, its officers, its employees, or its consultants shall be excess and not contributory insurance to that provided by Contractor.
4. Contractor shall provide to the County a certificate of insurance as evidence that policies providing the required coverages, conditions, and minimum limits are in full force and effect. The certificate shall identify this Contract and shall provide that the coverages afforded under the policies shall not be cancelled, terminated or materially changed until at least thirty (30) days prior written notice has been given to the County. The County reserves the right to request and receive a certified copy of any policy and any endorsement thereto.

1.26 SPECIFICATIONS AND DRAWINGS

Specifications and Drawings are included in the IFB and are included in this solicitation.

1.27 TYPE OF CONTRACT

As a result of this Invitation for Bids, it is the County's intention to award a fixed unit price Contract based on the prices offered by the lowest responsive and responsible bidder. Contract prices shall remain firm and fixed throughout the Contract performance period.

1.28 F.O.B. DESTINATION

Unless otherwise specified in the Invitation for Bid, all goods, materials, supplies, equipment or services covered by this IFB shall be delivered F.O.B. Destination shall be the location indicated in the awarded Contract or Purchase Order.

1.29 BID RESULTS

The County does not mail Bid results or tabulations. However, Bid tabulations will be posted on the Montezuma County Website upon execution of project award.

1.30 APPROPRIATION OF FUNDS

- A. In the event funds are not appropriated in whole or in part sufficient for performance of the County's obligations under this IFB, then the County, without compensation to Bidders, may terminate or cancel this IFB or not award any contracts under this IFB.
- B. Performance of the County's obligations under any resultant Contract will be expressly subject to appropriations of funds by the Montezuma County Board of County Commissioners, and, in the event the budget or other means of appropriation for any year of the Contract fails to provide funds in sufficient amounts to discharge such obligations, such failure (i) shall act to terminate the Contract at such time as the then-existing and available appropriations are depleted, and (ii) neither such failure nor termination shall constitute a default or breach of the Contract, including any sub-agreement, attachment, schedule, or exhibit thereto, by the County.

1.31 PERIOD OF PERFORMANCE

Contract

Days:

All work under this IFB shall be completed within 120 Working Days. Contract days will start once the Notice to Proceed (NTP) has been issued to the contractor.

The Contractor shall start work promptly after receipt of the Notice to Proceed and Pre-Construction Meeting and continue to work diligently until all work is completed and accepted by the County.

Time of substantial Completion. The work to be performed pursuant to this agreement shall be substantially completed, as that term is defined in the General Conditions, within ONE HUNDRED CALENDAR (120) DAYS of the Contractor having received Notice to Proceed. Any extension of that time limit set forth above must be agreed upon in writing by the parties hereto.

Liquidated Damages. It is specifically recognized by and between the parties hereto that the county will suffer certain unspecified damages in the event the project is not completed within the time set forth above. In recognition of the difficulty of the ascertaining the actual damages to be sustained by the county, the parties agree that the assessment of liquidated damages shall be appropriate. In the event the project is not completed within the specified time, there shall be assessed against the contractor, and the contractor hereby authorizes the county to retain from the moneys due to the contractor, the sum specified \$1500.00 in the contract per day for each and every calendar day the project remains unfinished.

Progress Payment. The county will make progress payments for the work included in the contract based upon the percentage completion of the unit quantities actually installed for each work item of the contract. The contractor shall prepare an itemized statement indicating by unit quantities the amount of each item completed for that period. The project manager will review the progress payment request to verify the quantities indicated. The county shall retain FIVE percent (5%) of the amount of each payment until the final completion and acceptance of all work covered by the Contact Documents.

Final Payment. Final payment shall be paid by the county to the contractor FORTY-FIVE (45) days after substantial completion of the work unless otherwise stipulated in the notice of substantial completion the date fixed for the final settlement as legally published, provided the work has been completed, the contract fully performed, and a final certificate of payment has been issued by the Engineer

1.32 BID DOCUMENTS

The following are included in Section II and comprise this Invitation for Bid.

Attachment A - Bid Form

Attachment B – Special Provisions

Attachment C – Ad Plan Set

The following list of documents **MUST** be included with your Bid in order for your Bid submittal to be considered responsive.

Attachment A – Bid Form
Executed Bid Bond

SECTION II – ATTACHMENTS

Attachment A - Bid Form
Attachment B – Special Provisions
Attachment C – Ad Plan Set

Attachment A

Bid Form

BID FORM

Company: _____

Address: _____

Telephone Number: _____

Bidder acknowledges receipt of the following Addenda:

BID SUMMARY

The undersigned offers and agrees to furnish all items, upon which the prices are quoted, at the price set opposite each item, if this Bid is accepted within sixty (60) days of the due date.

Total Bid Price: \$ _____

(In Words)

BIDDER

By: _____
(Name)

(Title)

(Signature)

STATE OF COLORADO)
) ss.
COUNTY OF _____)

The foregoing instrument was subscribed, sworn to, and acknowledged before me this _____ day of _____, 2024, by _____, as _____ of _____.

My commission expires: _____

(SEAL)

Notary Public

BID WORKSHEET

The following worksheet is to be used to make your cost proposal. Where quantities are not given, Contractors must calculate their own.

The final pay quantity shall be plan quantity. Generally, the plan quantity was calculated using AutoCAD software, are 3 dimensional, and the dimensions are based on station to station dimensions and widths based on neat lines shown in the Bid Documents. If a bid item of the Contract is found to be in error and so verified by the Engineer, payment will be made in accordance with the corrected plan quantity and adjusted based on the unit price. Only items 2b, 2c, 2g, 2l, and 2m will be based on field measurement. Before and after field measurement will be at the sole cost of the contractor and shall be under the direction of a Professional Licensed Colorado Surveyor.

MONTEZUMA COUNTY LANDFILL CELL 5 CONSTRUCTION

Item #	Description	Quantity	Unit	Unit Price	Total Price
1	Mobilization				
a	Mobilization	1	EA		
				Subtotal 1	
2	Cell 5	---	---	---	---
a	Clearing and Grubbing	4.75	Acre		
b	Soil Excavation	7,500	CY		
c	Structural Fill	7,500	CY		
d	Liner Subgrade Preparation	210,000	Sq. Feet		
e	Anchor Trench Excavation and Fill	1,500	LF		
f	Cell 4 Liner Tie-in	700	LF		
g	Leachate Collection Layer Gravel	6,200	CY		
h	60-mil HDPE textured Geomembrane	240,000	Sq. Feet		
i	Geosynthetic Clay Liner (GCL)	210,000	Sq. Feet		
j	Geotextile 6-ounce	210,000	Sq. Feet		
k	Geotextile 8-ounce	180,000	Sq. Feet		
l	Protective Cover Soil Material	1,300	CY		
m	Termination Berm	1,000	LF		
				Subtotal 2	
Total					

SCOPE OF WORK

1.1 CONTRACTOR'S SCOPE OF WORK

The CONTRACTOR shall furnish all labor, materials, and equipment for the construction of the work as shown and indicated on the drawings and described in the Technical Specifications. The scope of work covered by this Contract includes, but is not necessarily limited to, the following:

1. **(See Item 1a of Bid Worksheet)** – Furnish all transportation, equipment, and labor required to supply all materials and equipment at the site. CONTRACTOR will be required to unload any geosynthetic materials for cell construction. CONTRACTOR is also responsible for not damaging any geosynthetic materials during the unloading process. The mobilization/demobilization shall not exceed 5% of the total cost. A maximum of 60% of the total mobilization/demobilization cost can be billed with the first application for payment. No more than 10% of the total mobilization/demobilization cost can be billed on subsequent applications for payment. The final 10% of the total mobilization/demobilization cost can not be billed until completion all work items, demobilization of equipment and any unused materials, and leaving allocated work areas, including borrow sources, haul roads and stockpiles, in a satisfactory condition.
2. **(See Item 2a of Bid Worksheet)** – Furnish materials, labor, and equipment necessary to clear and grub Cell 5. Cleared and grubbed materials may be transported to and disposed of in the working face of the landfill or placed into the compost slash pile if appropriate with approval from the owner.
3. **(See Item 2b of Bid Worksheet)** – Furnish materials, labor, and equipment necessary to excavate materials from the Cell 5 construction area to the lines and grades specified in the drawings and haul excavated materials to a stockpile. CONTRACTOR to secure an offsite water source. This item includes the transportation of all water to the site needed for dust control, liner construction, etc., this item assumes 1-foot of cut will be required across the cell footprint.
4. **(See Item 2c of Bid Worksheet)** – Furnish materials, labor, and equipment necessary to excavate, haul, place, and compact the structural fill for Cell 5 to the lines and grades shown on the drawings and as described and indicated in the Technical Specifications. CONTRACTOR to secure an offsite water source. The OWNER will supply the materials for the structural fill. This item includes the transportation of all water to the site needed for dust control, liner construction, etc.

5. **(See Item 2d of Bid Worksheet)** – Furnish materials, labor, and equipment necessary to coordinate and prepare the top of the subgrade for Cell 5, as described and indicated in the Technical Specifications. The CONTRACTOR shall remove rocks, organic materials, protruding waste, and other deleterious materials from the liner as described and indicated in the Technical Specifications. Removed rocks, organic materials, etc., shall be placed in the “active waste disposal area.” The CONTRACTOR shall protect the subgrade from desiccation, flooding, and freezing. Protection, if required, may consist of a thin plastic protective cover (or other material as approved by the OWNER) installed over the completed liner until such time as the placement of drainage media begins. Subgrades found to have desiccation cracks greater than ½ inch in width or depth, or which exhibit swelling, heaving or other similar conditions shall be replaced or reworked by the CONTRACTOR at no additional cost to the OWNER to remove these defects. CONTRACTOR is to secure an offsite water source. This item includes the transportation of all water to the site needed for dust control, liner construction, etc.
6. **(See Item 2e of Bid Worksheet)** – Furnish materials, labor, and equipment necessary to excavate the anchor trenches for Cell 5, place structural fill in the anchor trench, and prepare the anchor trench subgrade as shown on the drawings and as indicated in the Technical Specifications.
7. **(See Item 2f of Bid Worksheet)** – Furnish materials, labor, and equipment necessary to coordinate and construct the tie-in to the existing Cell 4 liner system. This item is inclusive of the tie in for the clay liner, Geosynthetic clay liner (GCL), 60-mil high density polyethylene (HDPE) textured geomembrane, 6 and 8 ounce geotextiles, and leachate collection layer gravel, as shown on the drawings and using the methodologies indicated in the Technical Specifications. CONTRACTOR to secure an offsite water source. This item includes the transportation of all water to the site needed for dust control, liner construction, etc.
8. **(See Item 2g of Bid Worksheet)** – Furnish materials, labor, and equipment necessary to haul, stockpile, and install the leachate collection layer gravel for Cell 5 to the lines and grades shown on the drawings and as described and indicated in the Technical Specifications. The CONTRACTOR shall supply all materials.
11. **(See Item 2h of Bid Worksheet)** – Furnish materials, labor, and equipment necessary for storage and installation of the 60-mil HDPE Geomembrane for Cell 5 as shown on the drawings and as described and indicated in the Technical Specifications. This line item will be paid based on plan quantity, not quantity placed. The CONTRACTOR shall be responsible for any defects in the material or defects encountered during placement. CONTRACTOR shall repair or replace any defects at no additional cost to the OWNER.

- 12.(See Items 2i of Bid Worksheet)** – Furnish materials, labor, and equipment necessary for purchase, transportation, storage, and installation of the Geosynthetic Clay Liner (GCL) for Cell 5 as shown on the drawings and as described and indicated in the Technical Specifications. This line item will be paid based on plan quantity, not quantity placed. The CONTRACTOR shall be responsible for any defects in the material or defects encountered during placement. CONTRACTOR shall repair or replace any defects at no additional cost to the OWNER.
- 14.(See Items 2j of Bid Worksheet)** – Furnish materials, labor, and equipment necessary for purchase, transportation, storage, and installation of the 6 oz/yd² geotextile for Cell 5 as shown on the drawings and as described and indicated in the Technical Specifications. The CONTRACTOR shall be responsible for any defects in the material or defects encountered during placement. CONTRACTOR shall repair or replace any defects at no additional cost to the OWNER. This line item will be paid based on plan quantity, not quantity placed.
- 15.(See Items 2k of Bid Worksheet)** – Furnish materials, labor, and equipment necessary for purchase, transportation, storage, and installation of the 8 oz/yd² geotextile for Cell 5 as shown on the drawings and as described and indicated in the Technical Specifications. The CONTRACTOR shall be responsible for any defects in the material or defects encountered during placement. CONTRACTOR shall repair or replace any defects at no additional cost to the OWNER. This line item will be paid based on plan quantity, not quantity placed.
- 19.(See Items 2l of Bid Worksheet)** – Furnish materials, labor, and equipment necessary to excavate, haul, and place the protective cover material to the lines and grades shown on the drawings and as described and indicated in the Technical Specifications. The OWNER will supply the protective cover material.
- 20. (See Items 2m of Bid Worksheet)** – Furnish materials, labor, and equipment necessary to excavate, haul, place, and compact the structural fill termination berm for Cell 5 to the lines and grades shown on the drawings and as described and indicated in the Technical Specifications. CONTRACTOR to secure an offsite water source. The OWNER will supply the materials for the compacted structural fill. This item includes the transportation of all water to the site needed for dust control, liner construction, etc.

MONTEZUMA COUNTY LANDFILL

CONSTRUCTION QUALITY ASSURANCE PLAN LINER, LEACHATE COLLECTION, & FINAL COVER SYSTEMS REVISION 2

PREPARED FOR
MONTEZUMA COUNTY LANDFILL

January 23, 2024

Original Plan – May 27, 2016
Revision 1 – April 29, 2020
Revision 2 – January 23, 2024



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1 INTRODUCTION

This Liner, Leachate Collection, & Final Cover Systems Construction Quality Assurance Plan (CQA Plan) for the Montezuma County Landfill (MCLF), in Cortez, Colorado, has been prepared to guide construction of the liner system, leachate collection system (LCS), and the final cover system. The MCLF Engineering Design and Operations Plan, Revision 2 (EDOP) provides the details of the design and operation of these systems. The MCLF is owned and operated by Montezuma County.

1.1 Purpose

This CQA Plan defines the quality assurance (QA) activities that will accompany construction to ensure the following:

- Liner system, leachate collection and recovery system (LCRS), and final cover system components are constructed in accordance with the EDOP;
- Required testing is conducted to verify components meet quality standards; and
- Records are produced and maintained to enable the production of the construction quality assurance (CQA) report to satisfy regulatory requirements.

Guidance, established by the Colorado Department of Public Health and Environment (CDPHE), pertaining to installation and verification of the liner system, LCRS, and final cover was incorporated into this CQA Plan.

This CQA Plan was developed to specify how materials used to construct the landfill components will be manufactured, installed, and tested to verify that they meet design criteria established in the EDOP. Details pertaining to where design components will be installed are included in the EDOP. The specifics of the incremental landfill cell development are provided in the construction documents.

2 PERSONNEL QUALIFICATIONS AND RESPONSIBILITIES

The qualifications and training required for CQA personnel, and the roles and responsibilities of the parties involved in constructing the landfill components are discussed in the following sections.

2.1 Project Meetings

Project meeting for CQA construction projects shall be held at the discretion of the owner. The intent of the meetings is to ensure communication between organizations involved in the construction of the MCLF.

2.2 Personnel Qualifications and Training

The qualifications and training required for CQA personnel are described in the following sections.

2.2.1 CQA Engineer

The CQA Engineer shall have landfill construction certification experience and be registered in the State of Colorado as a professional engineer. The CQA Engineer will certify the CQA report that is submitted to CDPHE following construction activities.

2.2.2 CQA Monitor

The CQA Monitor will have at least 1 year of experience conducting CQA monitoring for earthworks and liner installation, or a Bachelor of Science degree from a 4-year college or university in a degree program deemed relevant by the CQA Engineer. The CQA Monitor will collect samples, oversee construction, and prepare documentation.

2.2.3 CQA Surveyor

The CQA Surveyor must be, or work under the direct supervision of, a Professional Land Surveyor (PLS) registered in the State of Colorado. All record drawings need to be sealed by the PLS. The CQA Surveyor will collect as-built elevation data during construction.

2.2.4 Owner

The owner, Montezuma County, may conduct various aspects of the construction of the landfill components, which will generally include material procurement, earthworks, soil and LCRS material placement, final cover placement, geotextile fabric and synthetic liner installation, and protective layer placement.

2.2.5 Synthetic Liner Installer

The synthetic liner will be installed by an International Association of Geosynthetic Installers (IAGI) certified liner installer, who will prepare field sample seams, collect destructive liner samples, and conduct non-destructive seam testing.

3 PRE-CONSTRUCTION MATERIAL TESTING

3.1 General

Pre-construction material testing is intended to verify that the products needed for installation can meet the required material performance requirements. Additionally, pre-construction soil testing will be conducted to aid in soil liner selection and to determine a target range of moisture and dry density that increases the likelihood that permeability testing of completed clay liner system (CLS) results in passing values.

3.2 Structural Fill Testing

Pre-construction testing conducted on the soil to be used as structural fill during construction will confirm that the soil from the borrow source is suitable to be used for that purpose.

**Pre-Construction Material Testing
Structural Fill**

Phase	Material	Test and ASTM Number	Frequency	Required Value
Pre-Construction	Soil	Laboratory Standard Proctor Curve (D698)	1 per 10,000 cy	--
		Atterberg Limits (D4318)	1 per 10,000 cy	--
		Natural Moisture Content (D2216)	1 per 10,000 cy	--
		Particle Size Analysis (ASTM D7928/6913)	1 per 10,000 cy	Maximum of 2-inches
		USCS Classification (ASTM D2487)	1 per 10,000 cy	SM, SC, ML, CL, MH, CH

3.3 Clay Liner Classification Testing

Pre-construction testing conducted on the soil to be used in the low permeability CLS will confirm that the soil from the borrow source is suitable to be used for that purpose. The pre-construction testing will also establish target soil placed properties to archive the required hydraulic conductivity.

**Pre-Construction Material Testing
Soil Liner**

Test	Frequency	Required Result
Water Content (ASTM D2216)	1 per 5,000 cy	N/A
Atterberg Limits (ASTM D4318)	1 per 5,000 cy	CL/CH
Particle Size Analysis (ASTM D7928/6913)	1 per 5,000 cy	N/A
Laboratory Standard Proctor Curve (ASTM D698)	1 per 5,000 cy	N/A
Hydraulic Conductivity - remodeled (ASTM D5084)	1 per 10,000 cy	1×10^{-7} cm/sec

3.4 Synthetic Liner Manufacturer's Quality Control

The pre-construction testing of synthetic liner material focuses on the information provided by the manufacturer (i.e., manufacturer's quality control (MQC)). The synthetic liner MQC information is provided by the manufacturer and reviewed by the CQA Monitor to verify that the material provided to construct the liner meets or exceeds the specifications for the liner. Synthetic liner specifications are based on 60-mil thick, high-density polyethylene (HDPE).

MQC Testing Requirements – Synthetic Liner

Properties	Test Method	Manufacturer QC Test Freq.	Required Test Values*
Thickness (min)	ASTM D5994	1 per Roll	54 mil (lowest individual for 8 of 10) 51 mil (lowest of any 10)
Asperity Height (min. avg.)	ASTM D7466	1 per 2 rolls	20 mil
Sheet Density (min)	ASTM D792 or ASTM D1505	1 per 200,000 lbs	0.940 g/cc
Tensile Properties (min. avg.) <ul style="list-style-type: none"> • Yield strength • Break strength • Yield elongation • Break elongation 	ASTM D6693	1 per 20,000 lbs	126 lb/in 90 lb/in 12% 100%
Tear Resistance (min. avg.)	ASTM D1004 Die C	1 per 45,000 sf	42 lbs
Puncture Resistance (min. avg.)	ASTM D4833	1 per 45,000 sf	90 lbs
Stress Crack Resistance	ASTM D5397 (App.)	1 per 400,000 lbs	500 hours
Carbon Black Content (range)	ASTM D4218	1 per 20,000 lbs	2-3%
Carbon Black Dispersion	ASTM D5596	1 per 45,000 lbs	9 of 10 in categories 1 or 2
Oxidative Induction Time (OIT) (min. avg.) <ul style="list-style-type: none"> • Std. OIT, or • High Pressure OIT 	ASTM D3895 ASTM D5885	1 per 200,000 lbs	100 min 400 min
Oven Aging at 85 C <ul style="list-style-type: none"> • Std OIT (min. avg.), or • High Pressure OIT (min.avg.), 	ASTM D5721 ASTM D3895 ASTM D5885	1 per 200,000 lbs	55% retained after 90 days 80% retained after 90 days
UV Resistance <ul style="list-style-type: none"> • High Pressure OIT (min. avg.) % 	ASTM D7238	1 per 200,000 lbs	50% retained after 1600 hrs

Notes: * Required values can change if published by the Geosynthetic Research Institute via the test method GM 13, with the exception of asperity height.

QC = quality control min = minimum min.avg.= minimum average sf = square feet
mil = thousandth of an inch lbs = pounds lb/in = pounds per inch
g/cc = grams per cubic centimeter hrs = hours

MQC Testing Requirements – GCL

Properties	ASTM Test Method	Manufacturer QC Test Frequency	Required Test Values*
BENTONITE			
Swell Index	ASTM D5890	1 per 100,000 lbs	24 ml/2g min.
Moisture Content	ASTM D4643	1 per 100,000 lbs	12% max.
Fluid Loss	ASTM D5891	1 per 100,000 lbs	18 mil max.
FINISHED GCL			
Bentonite Mass Per Unit Area	ASTM D5261	1 per 50,000 sf	0.90 lbs/sf MARV
Grab Strength	ASTM D4362	1 per 50,000 sf	95 lbs MARV
Grab Elongation	ASTM D4632	1 per 50,000 sf	75% Typical
Peel Strength	ASTM D4632	1 per 50,000 sf	15 lbs. min.
Permeability*	ASTM D5084	1 per 100,000 sf	5x10 ⁻⁹ cm/sec max
Internal Interface Shear	ASTM 5321	1 per lot	C=440 psf

Notes: * Required values can change if published by the Geosynthetic Research Institute via the test method GM 13, with the exception of asperity height.

QC = quality control lbs = pounds ml/2g = milliliters per 2 grams min = minimum

max = maximum sf = square feet lb/sf = pounds per square feet

MARV = minimum average roll value cm/sec = centimeters per second

psf = pounds per square feet

3.5 Geomembrane and Geosynthetic Clay-Receiving Inspection and Conformance Testing

The CQA Monitor shall perform receiving inspection on geomembrane and geosynthetic clay liner (GCL) material, and confirm that transportation, handling, and storage of geomembrane are performed in accordance with the specifications and manufacturer's instructions, as well as determine the condition of geomembrane rolls upon delivery to the site.

The CQA Monitor shall remove samples to be tested to determine conformance to the design specifications and the manufacturer's specifications. Samples may also be taken at the manufacturing facility.

Conformance Testing – Geomembrane

Properties	Test Method	Conformation QC Test Freq.	Required Test Values*
Thickness (min)	ASTM D5994	1 per 100,000 sf or per lot	54 mil (lowest individual for 8 of 10) 51 mil (lowest of any 10)
Asperity Height (min. avg.)	ASTM D7466	1 per 100,000 sf or per lot	20 mil
Sheet Density (min)	ASTM D792 or ASTM D1505	1 per 100,000 sf or per lot	0.940 g/cc
Tensile Properties (min.avg.) • Yield strength • Break strength • Yield elongation • Break elongation	ASTM D6693	1 per 100,000 sf or per lot	126 lb/in 90 lb/in 12% 100%

Notes: * Required values can change if published by the Geosynthetic Research Institute via the test method GM 13, with the exception of asperity height.

QC = quality control min = minimum sf = square feet min avg = minimum average
mil = millimeter g/cc = grams per cubic centimeter lb/in = pounds per inch lbs = pounds
hrs = hours

Conformance Testing – GCL

Properties	ASTM Test Method	Manufacturer QC Test Frequency	Required Test Values*
FINISHED GCL			
Bentonite Mass Per Unit Area	ASTM D5261	1 per 250,000 sf	0.90 lbs/sf MARV
Grab Strength	ASTM D4362	1 per 250,000 sf	95 lbs MARV
Grab Elongation	ASTM D4632	1 per 250,000 sf	75% Typical
Peel Strength	ASTM D4632	1 per 250,000 sf	15 lbs. min.
Permeability*	ASTM D5084	1 per 250,000 sf	5x10 ⁻⁹ cm/sec max

Notes: * Required values can change if published by the Geosynthetic Research Institute via the test method GM 13, with the exception of asperity height.

QC = quality control lbs = pounds ml/2g = milliliters per 2 grams min = minimum
max = maximum sf = square feet lb/sf = pounds per square feet
MARV = minimum average roll value cm/sec = centimeters per second
psf = pounds per square feet

Samples of geomembrane and geosynthetic clay shall be taken across the entire width of the roll and shall not include the first 3 feet. Unless otherwise specified, samples shall be 3 feet long by the roll width.

All GCL rolls shall be stockpiled and kept dry in a flat location area away from high-traffic areas but sufficiently close to the active work area to minimize handling.

GCL should be stored no higher than three to four rolls high or limited to the height at which the handling apparatus may be safely handled by installation personnel. Stacks or

tiers of rolls should be situated in a manner that prevents sliding or rolling by choking the bottom layer of rolls. The GCL rolls should remain in the manufacturer’s packaging until the rolls are ready for deployment.

Rolls shall not be stacked on uneven or discontinuous surfaces in order to prevent bending, deformation, damage to the GCL, or cause difficulty inserting the core pipe.

Bagged bentonite material shall be stored and tarped next to GCL rolls unless other more protective measures are available. Bags shall be stored on pallets or other suitably dry surface that will prevent undue pre-hydration.

3.6 Drainage Layer Material Testing

The pre-construction testing of the drainage layer material is used to verify that the materials selected are suitable to be used for that purpose.

Preconstruction Material Testing Aggregate

Properties (Test Method)	Frequency	Required Result
Grain Size Distribution (ASTM C136)	1 per 2,500 cy	<10% passing the 200 sieve
Permeability (ASTM D2434)	1 per 2,500 cy	$\geq 1 \times 10^{-2}$ cm/sec
Carbonate Content (ASTM D4373)	1 per 2,500 cy	Less than 15%

Notes: cy = cubic yards cm/sec = centimeter per second

MQC Testing Requirements – Geotextile

Properties (Test Method)	Frequency	Required Result
Mass Per Unit Area	1 per 100,000 sf and minimum of 1 test per lot	8 oz/yd ²

Notes: sf = square feet oz/yd² = ounce per square yard

3.7 Final Cover Soil Classification Testing

Pre-construction testing of the water balance material is used to demonstrate that the soil has appropriate properties to be used as a water balance cover, which focuses on the soil’s ability to store and release moisture and support vegetation. The measured soil texture is referenced to CDPHE’s Water Balance Cover Acceptance Zone for Colorado Ecozone 1, provided below.

3.7.1 Final Cover Soil Classification Testing

The pre-construction testing conducted on the soil to be used in the final cover layer will confirm that the soil from the borrow source is suitable to be used for that purpose.

Pre-Construction Material Testing Final Cover Soil

Test	Frequency	Required Result
Water Content (ASTM D2216)	1 per 2,000 cy	N/A
Atterberg Limits (ASTM D4318)	1 per 5,000 cy	N/A
Particle Size Analysis (ASTM D7928/6913)	1 per 5,000 cy	N/A
Laboratory Standard Proctor Curve (ASTM D698)	1 per 5,000 cy	N/A

Notes: cy = cubic yards N/A = not applicable

Pre-Construction Material Testing Vegetative Layer

Properties (Test Method)	Frequency	Required Result
pH (EPA Method SW-846 SW 9045C)	1 per 6,500 cy	6.0 - 8.4
CaCO ₃ (USDA Handbook Number 60)	1 per 6,500 cy	Less than 15%

Notes: cy = cubic yards

4 SUBGRADE AND SITE PREPARATION

4.1 General

The MCLF soil liner subgrade is primarily constructed through excavation, with the exception of the berms along the eastern and western edges of the landfill footprint, which requires the placement of structural fill. Observations made by the CQA Monitor shall be recorded on daily field monitoring forms, drawings, and test data forms. Sample frequency assumes a 1-foot thick subgrade material in excavation areas.

4.2 Earthworks

4.2.1 Excavation

During excavation, CQA personnel shall generally observe the excavated material and subgrade conditions and shall perform the following activities:

- Periodically observe stripping and excavation to document that there are no moisture seeps and that soft, organic, and otherwise undesirable materials are removed.
- Coordinate with the Contractor to confirm that the depth and slope of the excavations, sumps, surface water drainage ditches, and other construction components meet design requirements.

4.2.2 Fill

Prior to placement of any structural backfill, or compacted soil liner, CQA personnel will verify that the subgrade has been prepared (scarified, moisture-conditioned, and compacted) in accordance with the requirements of the specifications. Prior to filling, CQA personnel shall test the subgrade with in-place density methods. Nuclear density methods may be used (e.g., American Society for Testing and Materials (ASTM) D2922), or as approved by the designer.

During structural fill or compacted soil liner placement, CQA personnel will conduct tests and observations to document that the quality of compacted fill meets project specifications. This will include visual observation, measurement of lift thickness, verifying grain size analysis, determining moisture-compaction characteristics, and measuring in-place density and moisture content and other tests. Loose lift thickness shall not exceed 9 inches. Field in-place density tests shall be conducted at a frequency listed in this section. Additional tests may be conducted at the discretion of the CQA Engineer.

Subgrade preparation shall be observed by CQA personnel for compliance with the specifications. On the floor of the cell, the subgrade shall be compacted to at least 95%

of standard Proctor dry density (ASTM D698), and at the frequency listed in the table below. Compaction and testing will be required if fill is required to bring the subgrade elevations up to design grades

Subgrade Material Testing Requirements

Properties (Test Method)	Frequency	Required Result
Standard Proctor Curve (ASTM D698)	1 per material type	N/A
Atterberg Limits (ASTM D4318)	1 per material type	N/A
Particle Size Analysis (ASTM D7928 with hydrometer)	1 per material type	N/A
In-Situ Compaction and Water Content Testing (ASTM D6938)	1 per 750 cy	95% or greater of Standard Proctor Maximum Dry Density (SPMDD)

Notes: N/A = not applicable cy = cubic yards

4.3 Stormwater Controls

Stormwater controls will be installed, as shown in the construction drawings. Stormwater from outside the landfill footprint should be kept out of the active construction area through run-on control features.

4.4 Survey Requirements

The subgrade will be prepared to the lines and grades shown in the construction drawings. The horizontal survey tolerance for this layer shall be 0.0 feet to 0.2 feet, in relation to the design elevations. The vertical survey tolerance for this layer shall be -0.2 feet to 0.0 feet, in relation to the design elevations.

5 LOW PERMEABILITY LINER CONSTRUCTION

5.1 General

The MCLF will use one of three proposed composite liner systems, depending on site conditions and location within the landfill footprint. One system will be comprised of 2 feet of compacted clay liner and a 60-mil HDPE geomembrane. The second will be comprised of 1 foot of compacted clay liner, a GCL, and a 60-mil HDPE geomembrane. The third will be comprised of 1 foot of compacted structural fill, a GCL, and a 60-mil HDPE geomembrane.

5.2 Compacted Clay Liner

The following section provides a description of the CQA activities required during placement of the clay liner portion of both composite liner system alternatives.

5.2.1 Soil Liner Material Testing

During placement of the compacted soil liner material, the moisture content and placed dry density will be measured. These measurements will be compared to the placement specifications in this CQA Plan. Areas not meeting the moisture or density requirements will be moisture conditioned and compacted or removed and replaced with suitable material. Moisture and density measurements will be conducted on each 6-inch compacted lift until the full design thickness is achieved.

The CQA monitor will also observe and document the following:

- Equipment is not disturbing the underlying layers as material is placed;
- Large clods will be removed or reduced in size prior to compaction;
- Significant water loss from the soil material is prevented through watering, covering, or other appropriate methods. Overbuilding the soil liner is considered a protective cover;
- At tie-in locations, any dry, cracked, or otherwise unsuitable areas of the existing soil are removed;
- Document the equipment type, configuration, and weight utilized for soil placement and compaction;
- Coverage by compaction equipment is uniform, especially at compacted fill edges, in equipment turnaround areas, and at the tops and bottoms of slopes;
- The specified soil density, water content, and permeability throughout each completed lift is achieved. This will be determined by laboratory and field testing;

- Repaired sections are tied-in with undisturbed sections of the liner, if necessary;
- Compacted lifts are tied together by scarifying the top of each lift, if necessary, with appropriate equipment prior to applying the following lift; and
- Newly placed material is thoroughly kneaded into existing material at tie-in locations.

Soil classification testing is intended to build the relationship between the moisture content and dry density field measurements to the resulting hydraulic conductivity measure in the laboratory. The line of optimums will be used to define the placement moisture content and density requirements.

Required Material Testing – Clay Liner

Properties (Test Method)	Frequency	Required Result
In-situ Density and Moisture Content (ASTM D6938)	1 per 500 cy	Min of 95% of max dry density of standard Proctor
Moisture Content (ASTM D2216)	1 per 2,000 cy	N/A (Refer to the degree of saturation requirements below)
Grain Size Analysis (ASTM D7928 with hydrometer)	1 per 1,000 cy	N/A
Standard Proctor Curve (ASTM D698)	1 per 5,000 cy or change in material type	N/A
Modified Proctor Curve (ASTM 1557)	1 per 5,000 cy or change in material type	N/A
Atterberg Limits (ASTM D4318)	1 per 5,000 cy or change in material type	CL/CH
Specific Gravity (ASTM D854)	1 per material type	N/A
Hydraulic Conductivity In Place (ASTM D5084)	1 per 5,000 cy or 1 per lift (whichever yields a larger number)	$\leq 1.0 \times 10^{-7}$ cm/sec

Notes: cy = cubic yards min = minimum max = maximum cm/sec = centimeters per second

Line of Optimum Method

The compacted soil layer shall be moisture conditioned so that at least 80% of the moisture tests indicate a moisture content wet of optimum moisture. All moisture tests will achieve minimum moisture corresponding to 75% saturation. The use of the standard and modified Proctor curves will be used to generate an acceptable zone for use with the in-situ measurements of moisture and density. In-situ measurements of density and moisture will be conducted with a moisture/density gauge to determine if the compacted soil material is within the acceptable zone for moisture and density.

Voids created during the use of the moisture/density gauge or in-situ hydraulic conductivity sampling shall be backfilled with granular bentonite.

5.3 Composite GCL Liners

5.3.1 Composite GCL Liner- Clay

Shelby tube samples of the in place soil liner shall be obtained at a minimum frequency, as listed for hydraulic conductivity in Section 5.2.1 of this CQA Plan, for material placed. At any time, additional samples may be obtained at the discretion of the CQA Engineer.

In some instances, a composite liner that includes a GCL layer may be preferred for the landfill liner system. The composite liner consists of a 1-foot compacted soil layer, a GCL layer, and a 60-mil HDPE geomembrane. The CQA requirements for the composite liner's compacted clay liner layer are identical to that shown in Section 5.2.

Sections 5.3.3 through 5.4.7, provide a description of the CQA activities required during placement of the geosynthetic clay component of the composite liner.

5.3.2 Composite GCL Liner -Structural Fill

Structural fill materials shall be from on-site soils derived from the cell excavation or other on-site borrow areas that consist of relatively homogeneous, well-graded, natural soils that are free of debris, foreign objects, large rock fragments, roots, and organic material. No materials greater than 2 inches shall be allowed.

Required Material Testing – Structural fill Liner

Properties (Test Method)	Frequency	Required Result
In-situ Density and Moisture Content (ASTM D6938)	1 per 500 cy	Min of 95% of max dry density of standard Proctor and +/- 2% of optimum moisture content.
Moisture Content (ASTM D2216)	1 per 2,000 cy	+/- 2% of optimum
Grain Size Analysis (ASTM D7928 with hydrometer)	1 per 5,000 cy	N/A
Standard Proctor Curve (ASTM D698)	1 per 5,000 cy or change in material type	N/A
Atterberg Limits (ASTM D4318)	1 per 5,000 cy or change in material type	N/A
USCS Classification (ASTM D2487)	1 per 5,000 cy or change in material type	SM, SC, ML, CL, MH, CH

Notes: cy = cubic yards min = minimum max = maximum cm/sec = centimeters per second

Sections 5.3.3 through 5.4.7, provide a description of the CQA activities required during placement of the geosynthetic clay component of the composite liner.

5.3.3 Geosynthetic Clay Liner Panel Placement

The CQA Monitor shall confirm that the surface upon which the GCL will be installed is suitably prepared and will not damage the GCL. GCL shall not be deployed in quantities

greater than what can be covered with geomembrane by the end of the working day, unless otherwise approved by the CQA Engineer. The surface that the GCL is deployed over shall be free of clods, rocks, sticks, sharp changes in grade, ruts greater than 1 inch in length, desiccation cracks, and standing water. Where the bedding surface is the low permeability liner, methods shall be taken to prevent the soil liner surface from drying and cracking prior to installing the GCL. These methods may include the use of a temporary cover.

The GCL installer shall inspect and provide written certification to the owner or CQA Engineer that the prepared surface under consideration is suitable for installation of the geomembrane.

Panels of GCL will be joined together as described in Section 5.3.2 after they are placed in the landfill to form a continuous moisture barrier. The CQA Monitor shall document that the placement and seaming activities are performed as specified in this CQA Plan.

On slopes or grades steeper than 10%, seams shall be oriented down and not across the slope. No horizontal seam shall be less than 5 feet from the top of the slope or other area of potential stress concentration. Seams shall not line up with leachate piping runs. The number of field seams shall be minimized in areas such as corners and odd-shaped geometric locations. In anchor trenches, the GCL shall be continuous through the trench, over the crest, and down the slope.

Placement shall not be attempted in rain, snow, or under conditions of excessive fog or dew. Placement will not be permitted in areas of ponded water or in the presence of excessive winds.

Equipment used for placement shall not damage the GCL or the subgrade by handling, trafficking, leakage of hydrocarbons, or in other ways. Personnel working on the GCL shall not engage in any activities or wear footwear that could damage the GCL. Direct contact of any heavy mechanical equipment with the GCL shall not be allowed.

Panels shall be carefully unrolled according to the manufacturer and fabricator's instructions, and in a manner that does not scratch or crimp the geomembrane. Panels shall be aligned to minimize wrinkles or fish mouths, especially along the field seams. Adequate precautions, such as placement of sand bags, shall be taken to minimize the likelihood of wind uplift.

5.3.4 Joining

The GCL shall be joined, as described below:

- Adjacent sections of GCL shall be overlapped, according to the manufacturer's directions.
- Overlaps shall be free of wrinkles, folds, or more importantly fish mouths.

- Overlap seams shall be a minimum of 12 inches on panel edges and 24 inches on panel ends or as otherwise provided by the manufacturer.
- Loose granular bentonite should be placed between panels at a rate of ¼ pound per lineal foot of seam if the GCL is the primary hydraulic seal, or as otherwise provided by the manufacturer.
- No horizontal seams shall be allowed on sideslopes provided rolls can be manufactured to sufficient length. If required because of manufacturing limitation end seams shall be staggered.
- If more than one layer of GCL is installed, joints shall be staggered.
- Rips or tears may be repaired by completely exposing the affected area, removing all foreign objects or soil, and by then placing a patch cut from unused GCL over the damage (damaged material may be left in place), with a minimum overlap of 12 inches on all edges.
- Accessory bentonite should be placed between the patch edges and the repaired material at a rate of a quarter pound per lineal foot of edge spread in a continuous 6-inch fillet.

5.3.5 Materials in Contact with GCL

The requirements of this section are intended only to minimize the risk of GCL damage during installation on existing surfaces or during placement of overlying materials. The installer shall not perform any cutting, testing, or work on top of the GCL.

The installer, with prior approval from the owner, may elect to use a remnant piece of geosynthetic material as a temporary “rub-sheet” beneath the GCL to act as a cushion during panel deployment.

Installation of the overlying geosynthetic component can be accomplished through the use of lightweight, rubber-tired equipment such as a 4-wheel all-terrain vehicle (ATV) or pickup truck/all-terrain forklift. This vehicle can be driven directly on the GCL, provided the ATV/truck/forklift makes no sudden stops, starts, or turns.

Equipment used for placing and compacting overlying soil materials shall not be driven directly on to any geosynthetic material. No sharp turning of the spreading equipment will be allowed on the initial 12 inches of cover. No heavy rubber-tired vehicles shall be allowed in areas underlain by GCL until a minimum of 3 feet of cover material has been placed. Equipment shall be observed by the CQA Monitor during placement to document that no leakage of hydrocarbons occurs, particularly on top of the GCL.

Placement of soil materials on top of the GCL shall not be allowed within 50 feet of any unseamed edge of GCL until field seaming of that edge is complete. This is required to allow sufficient room to work out any large wrinkles or fish mouths prior to seaming.

The placement of cover materials shall be done with caution and in a manner that is least likely to cause wrinkles in, or damage to, the GCL. The CQA Monitor shall observe the placement of cover materials over the GCL on a regular basis.

5.4 Geomembrane Panel Placement

The following text and sections provide a description of the CQA activities required during placement of the geomembrane component of both composite liner systems.

The CQA Monitor shall confirm that the surface upon which the geomembrane will be installed is suitably prepared and will not damage the geomembrane. The geomembrane bedding layer shall be free of clods, rocks, sticks, sharp changes in grade, ruts greater than 1 inch in length, desiccation cracks, and standing water. Where the bedding surface is the low permeability liner, methods shall be taken to prevent the soil liner surface from drying and cracking prior to installing the geomembrane. These methods may include the use of a temporary cover.

The geomembrane installer shall inspect and provide written certification to the owner or CQA Engineer that the prepared surface under consideration is suitable for installation of the geomembrane.

Sheets of geomembrane will be welded together after they are placed in the landfill to form a continuous moisture barrier. The CQA Monitor shall document that the placement and seaming activities are performed as specified in this CQA Plan. Seams or repaired areas that do not pass the tests shall be repaired and retested until a passing result is achieved.

Each field panel and field seam shall be given an identification code that is consistent with the proposed sequence of installation. A field panel is defined as the area of geomembrane that is to be cut and seamed in the field by the installer.

On slopes or grades steeper than 10%, seams shall be oriented down and not across the slope. No horizontal seam shall be less than 5 feet from the top of the slope or other area of potential stress concentration. Seams shall not line up with leachate piping runs. The number of field seams shall be minimized in areas such as corners and odd-shaped geometric locations. In anchor trenches, the geomembrane shall be continuous through the trench, over the crest, and down the slope.

Geomembrane shall not be placed when ambient temperatures are less than 32 °F or more than 104 °F, measured 12 inches above the geomembrane. Placement shall not be attempted in rain, snow, or under conditions of excessive fog or dew. Placement will not be permitted in areas of ponded water or in the presence of excessive winds.

Equipment used for placement shall not damage the geomembrane or the subgrade by handling, trafficking, leakage of hydrocarbons, or in other ways. Personnel working on the geomembrane shall not engage in any activities or wear footwear that could damage the geomembrane. Direct contact of any heavy mechanical equipment with the geomembrane shall not be allowed.

Panels shall be carefully unrolled according to the manufacturer and fabricator's instructions, and in a manner that does not scratch or crimp the geomembrane. Panels shall be aligned to minimize wrinkles or fish mouths, especially along the field seams. Adequate precautions, such as placement of sand bags, shall be taken to minimize the likelihood of wind uplift.

5.4.1 Geomembrane Field Seaming

General

Approved seaming methods are extrusion welding and single or dual track fusion welding. Fusion welding shall be utilized for tie-in seams between existing and new geomembrane.

Seaming shall be a continuous process with a minimum of interruptions along any given seam. The installer shall maintain at least two operable spare seaming units onsite.

Where conditions warrant, the installer may be allowed to use a temporary support surface between the geomembrane and the subgrade to achieve proper support conditions during seaming operations. The use of such support methods shall be subject to the approval of the CQA Engineer. The support shall not be left in-place and shall be removed on completion of seaming.

Wherever possible, wrinkles or fish mouths shall be pulled out of the overlap area prior to seaming. Where this cannot be done, they shall be cut along the ridge of the wrinkle in order to achieve a flat surface. Such cuts shall be seamed. Where the overlap is inadequate, an oval or round patch of the same geomembrane, extending a minimum of 6 inches beyond the cut in all directions, shall be seamed onto the geomembrane.

Required Testing During Installation – Geomembrane

Properties (Test Method)	Frequency	Required Result
Seam Overlap	Every Panel	3-inch for extrusion 5-inch for fusion
Trial Seam (ASTM 6392)	1 trail seam every 4 hours per welding machine	Follow section 5.4.1 requirements
Vacuum Test (ASTM D5641)	All extrusion welds or single wedge fusion welds	No Bubbles
Air Pressure Test (ASTM D5820)	All double wedge fusion welds	Less than 2 psi drop over 5 minutes

Extrusion Welding Process

The extrusion welding apparatus shall be equipped with gauges to measure the temperature at the nozzle or the preheat temperature of the apparatus. The CQA Monitor shall verify the extrudate and ambient temperature at appropriate intervals. The extruder shall be purged of heat-degraded extrudate at the beginning of each seaming sequence. The extrudate rod shall be dry and free of moisture before entering the apparatus. If there is moisture, the operator shall clean the extrudate rod before entering the apparatus.

Artificially induced cooling of extrudate welds (using water or any other means) shall not be allowed. Sufficient time between welding and non-destructive testing shall be taken so that non-destructive testing procedures do not cause artificial cooling of the extrudate.

Fusion Welding Process

Fusion welding apparatus shall be automated, self-propelled devices that produce either a single seam or a double seam with an enclosed central air space. The apparatus shall be equipped with gauges that indicate the equipment temperatures during welding. For the seaming of cross-seams, the top and bottom edges of the cross-seam shall be ground to a smooth incline prior to seaming.

The CQA monitor shall log ambient and seaming apparatus temperatures and seaming apparatus speed for each seam.

Seam Overlap and Preparation

Prior to seaming, geomembrane rolls or panels shall be overlapped by a minimum of 3 inches for extrusion welding and 5 inches for fusion welding or as recommended by the manufacturer. Procedures used to bond adjacent rolls together temporarily shall not result in damage to the geomembrane. If mechanical devices such as hot air leisters are used for temporary bonding, the air temperature at the nozzle of such equipment shall be controlled so as not to damage the geomembrane. Solvents or adhesives shall not be used.

Seams shall be aligned to create the smoothest surface as practicable with a minimum of wrinkles and fish mouths. The area in the immediate vicinity of the seam shall be free of moisture, dust, dirt, debris, or any other foreign material and, if necessary, sheltered from wind and dust immediately prior to and during the seaming operation. If grinding is required along the seam, this shall be done according to the manufacturer's recommendations, within 1 hour of the seaming operation and in a manner that does not damage the geomembrane. This process shall also include cleaning the seam area with a brush or forced air immediately prior to seaming. Particular care shall be paid to the condition of existing geomembrane prior to tie-in with new geomembrane.

The CQA Monitor shall document geomembrane seam overlaps and preparation procedures.

Weather Conditions

In general, seaming shall not be attempted when ambient temperatures are below 32 °F or above 104 °F, as measured 12 inches above the liner. Below 32 °F, seaming may be allowed, if suitable precautions are taken and the installer is able to certify in writing that seaming under these conditions will not cause any chemical or physical alteration to the geomembrane that may deleteriously affect its short- or long-term performance. Approval by the CQA Engineer will be required to seam with ambient temperatures that are below 32 °F or above 104 °F. Extrusion welding will require the geomembrane to be preheated by either the sun or the use of a hot air device, and the installer shall take precautions that excessive cooling resulting from wind does not affect the seaming

operation. The CQA Monitor shall determine when preheating is required and whether wind affects may be deleterious to seaming operations.

Seaming shall not be performed during wet weather where the geomembrane is exposed to the elements.

Trial Seams

Trial seams shall be made to verify that adequate conditions exist for field seaming to proceed. Each seamer shall produce a trial seam at the beginning of each shift. Additional trial seams shall be made every 4 hours or, if a breakdown of the seaming equipment occurs, prior to resumption of seaming operations. The CQA Monitor shall monitor and log the trial seam results.

Trial seams shall be made on pieces of geomembrane identical to the installed product measuring at least 2 feet long by 1 foot wide (after seaming) with the seam centered lengthwise and overlapped as required for the particular seaming process.

Six samples, each 1-inch wide, shall be cut from the test seam and tested, two in shear and four in peel, using a tensiometer calibrated within the past 6 months. The samples shall not fail in the seam. If a seam failure occurs, then a second seam shall be produced and tested. If a second failure results, the apparatus or seamer shall be rejected and shall not be used for field seaming until any deficiencies have been corrected. This shall be verified by the production and successful testing of two consecutive trial seams.

5.4.2 Geomembrane Non-Destructive Seam Testing

Seams shall be non-destructively tested by the installer over their full length to verify their continuity. It should be noted that this testing does not provide any information regarding seam strength. Non-destructive testing shall be performed concurrently with field seaming using the equipment and procedures described below. Any seam that fails the non-destructive test shall be repaired. Repairs shall be retested to determine the success of the repair.

Where the CQA Monitor has determined that seams cannot be non-destructively tested due to physical constraints, the seams shall be capped with the same geomembrane or double seamed. The CQA Monitor shall observe the seaming and capping of such seams to assess their adequacy and determine whether additional action is required. Where such a seam is accessible for testing prior to final geomembrane deployment, testing shall be performed prior to deployment.

All nondestructive testing shall be conducted by the installer and continuously observed by the CQA Monitor.

Vacuum Testing

For extrusion and single wedge fusion welded seams, seams shall be evaluated using vacuum box testing. The vacuum box shall consist of a rigid housing with a transparent viewing window on top and a soft, flexible gasket attached to the bottom of the housing. A porthole and valve assembly along with a calibrated vacuum gauge shall be provided at one end of the housing. The vacuum gauge shall be calibrated prior to initial use on the project and recalibrated on at least an annual basis, at the end of the project, or at the discretion of the CQA Engineer. The installer shall supply vacuum gauge calibrations to the CQA Engineer for review prior to the start of testing. A steel vacuum tank and pump assembly complete with the necessary pressure controls, pipe connections, pressure hoses, and fittings shall be provided. A soapy solution and a method of dispensing the solution are also required.

The tests shall be performed according to ASTM D5641. To perform the test, the pressure in the vacuum tank shall be reduced to approximately 5 inches of mercury. The soapy solution shall be applied to the test section and the vacuum box placed over the wetted area. The bleed valve shall then be closed and the vacuum valve opened. Once a tight seal has been established, the test section shall be visually examined for a period of not less than 10 seconds to determine whether bubbling of the soapy solution is occurring. The vacuum valve shall then be closed and the bleed valve opened. The vacuum box shall be removed and the process repeated on the next adjacent test section. A minimum 3-inch overlap shall be provided on test sections. Any locations where bubbling of the soapy solution is observed, shall be clearly marked for repairs. Repairs shall be retested.

Air Pressure Testing

This test method (ASTM D5820) shall apply only when the double hot wedge fusion seaming method is used to form the seam. The testing equipment shall consist of an air pump capable of generating and sustaining pressure of at least 40 pound-force per square inch (psi) complete with a pressure gauge and the necessary pressure hose, fittings, and connections. An approved pressure feed device, such as a sharp hollow needle, shall be provided to penetrate into the central air channel at one end of the seam. A second calibrated pressure gauge in 1 psi increments capable of reading pressures up to 40 psi shall be provided to detect any pressure loss at the opposite end of the seam from the pressure feed device.

To perform the test, a section of the seam shall be sealed off at both ends. The pressure feed device shall be inserted into the air channel at one end of the sealed section, and the second pressure gauge shall be inserted into the opposite end of the air channel. If the seam is ½-inch wide, it shall be pressurized to a minimum pressure of 30 psi. The pressure valve shall be closed and the pressure monitored for a period of not less than 5 minutes. If a pressure loss greater than 2 psi is observed at either end or if the required pressure cannot be reached, then the seam shall be rejected. If, in the judgment of the CQA personnel, significant changes in temperature occur during the test (e.g., due to

cloud cover), the test shall be repeated after the geomembrane has stabilized. Faulty areas along the seam shall be identified and repaired in accordance with Section 5.4.4. Holes created during non-destructive testing shall be repaired in accordance with Section 5.4.4.

5.4.3 Geomembrane Destructive Seam Testing

Destructive testing of field seams shall be performed at selected locations in order to verify the seams' strength. Seam destructive tests shall be performed at a minimum average of one test per 750 lineal foot per welder. Sampling and testing shall be done concurrently with field seaming operations so that corrective action, if required, may be implemented as the work progresses. Sample locations shall be determined by the CQA Monitor based on the required sampling frequency and seaming observations. The installer shall not be informed in advance of the locations where the seam samples will be taken. Additional test locations may be required during seaming operations, such as along tie-in seams with existing geomembranes. The necessity for such additional sampling and testing shall be determined by the CQA Monitor, and extra testing shall be performed when there is cause to suspect the presence of excess crystallinity, contamination, offset welds, or any other potential defect. The CQA Engineer may increase the minimum frequency of destructive testing as the work progresses based on the results of previous testing.

Samples shall be cut by the installer under the observation of the CQA Monitor. Each sample shall be numbered and identified. The sample number and location shall be recorded by the CQA personnel on the layout drawings to be included in the CQA Report.

The test sample shall measure approximately 12 inches wide by 42 inches long, with the seam centered lengthwise. Two 1-inch wide strips shall then be cut, one from either end of the sample. Both of these strips shall be tested by the installer in the field using a tensiometer to determine the mode of failure in both peel and shear. The remaining portion of the sample shall be cut into three equal parts having a minimum length of 12 inches. One sample shall be taken by the CQA Monitor for destructive testing under laboratory conditions. One sample shall be given to the installer to perform CQA testing. The third sample shall be kept in storage by the owner, if desired.

The area from which the test sample was cut shall be immediately repaired, as described in Section 5.4.4. Seams created for these repairs shall be non-destructively tested in accordance with Section 5.4.2.

Neither of the field tests shall fail in the seams. The results of the laboratory testing by the CQA Monitor shall determine the acceptability of the field seam.

A field seam shall only be considered acceptable when it is bounded by two destructive test locations that meet the seam strength requirements listed in the specifications, as

well as passing the non-destructive tests described in Section 5.4.2. Whenever a sample fails a destructive test, whether that test is conducted by field tensiometer, CQA laboratory, or the installer’s laboratory, the following procedures shall be employed to remedy the failed seam section:

- The installer may cap the failing seam between any two passed test locations;
- The installer may elect to trace the seam to two intermediate locations a minimum of 10 feet in either direction from the point of the failed test and take a small sample for an additional field test at each location. If these additional samples pass the test, then full samples shall be taken for CQA laboratory testing. If these laboratory samples pass the tests, then the seam shall be capped between these locations. If either sample fails, the sampling and testing process shall be repeated to establish the zone over which the seam shall be capped; or
- Cap all seams welded by the machine that had the failing test.

The continuity of capped seams shall be verified by non-destructive testing in accordance with Section 5.4.2. In addition, if the total capped seam length exceeds 150 feet, a destructive sample shall be taken for laboratory testing, as described above.

The CQA Monitor shall document actions taken in conjunction with destructive test failures.

Required Geomembrane Seam Destructive Testing During Installation

Property	Qualifier	Unit	Specified Value ¹	Test Method
PHYSICAL PROPERTIES – HOT WEDGE SEAMS				
Shear Strength ^{1,2} (at yield point)	Minimum	lb/in width	120	FTB ^{2,3} ASTM D6392
Peel Adhesion	Minimum	lb/in width	91	FTB ASTM D6392
PHYSICAL PROPERTIES – EXTRUSION SEAMS				
Shear Strength ^{1,2} (at yield point)	Minimum	lb/in width	120	FTB ^{2,3} ASTM D6392
Peel Adhesion ⁴	Minimum	lb/in width	78	FTB ASTM D6392

Notes: ¹ Destructive testing shall meet specified values for all testing. Values from GRIGM-19

² Also called Bonded Seam Strength.

³ FTB = Film Tear Bond (failure occurs through intact geomembrane, not through seam).

⁴ No more than 25% of the seam width can separate (peel) to be considered a passing specimen.

5.4.4 Defects and Repairs

Any field panel or part of a field panel that becomes seriously damaged shall be replaced at the direction of the CQA Monitor. Minor damage, such as small wrinkles or crimps, shall be repaired. Damaged field panels that have been rejected for use shall be removed from the site.

The entire geomembrane surface shall be examined by the CQA Monitor in order to confirm that the geomembrane is free of any defects, holes, blisters, undispersed raw materials, or contamination by foreign matter. Particular attention shall be paid to existing geomembrane in tie-in areas. Whenever possible, the examination of the geomembrane surface shall be done prior to any seaming in that area. If necessary, the geomembrane surface shall be cleaned by the installer so that it is free of dust, mud, or any other materials that may inhibit a thorough examination of the surface. Any suspect areas shall be clearly marked by the CQA Monitor and non-destructively tested by the installer in accordance with Section 5.4.2. Any location that fails to pass the non-destructive testing, or where a destructive test sample has been removed, shall be repaired using one of the procedures described below.

Small tears, wrinkles, scratches, or pinholes shall be repaired by the installer using spot welding, seaming, or patching, as appropriate. Large holes and tears, undispersed raw materials, and any areas that have been contaminated by foreign matter shall be repaired by the installer using patches or by capping the area. All damage that fully penetrates the layers shall be repaired with a patch. Patches shall be round or oval in shape, shall consist of the same geomembrane material, and shall extend a minimum of 6 inches beyond the edge of the defect in all directions. Temporary bonding methods used to hold patches in-place prior to seaming shall not damage the geomembrane. Geomembrane surfaces to be patched shall be abraded in accordance with the specifications. Surfaces shall be clean and dry at the time the repair work is performed. Repair seaming shall follow the seaming procedures described in Section 5.4.1.

Repairs shall be non-destructively tested using the appropriate methods described in Section 5.4.2. Unless additional destructive testing is required, as described in Section 5.4.3, repairs that pass the non-destructive test shall be considered acceptable. Any repairs that fail the non-destructive test shall not be accepted, and the installer shall perform the necessary remedial work and retest the repaired area until it passes the non-destructive testing criteria.

Upon completion of field seaming and testing, and prior to any placement of materials on top of the geomembrane, the CQA Monitor shall identify any large wrinkles or fish mouths that may have been built into the geomembrane. Any such features shall be cut out, repaired, and tested by the installer.

In any given area, no work shall proceed with any materials that may cover the geomembrane until repairs in that area have been successfully made. As the work progresses, the CQA Monitor shall document locations requiring repair work and shall confirm that repairs have been successfully made.

Required Geomembrane Testing Following Repairs

Properties (Test Method)	Frequency	Required Result
Seam Overlap	Every Repair Seam	6-inch for all every seam
Vacuum Test (ASTM D5641)	All extrusion welds or single wedge Fusion welds	No Bubbles

5.4.5 Materials in Contact with Geomembrane

The requirements of this section are intended only to minimize the risk of geomembrane damage during placement of overlying materials. The installer shall not perform any cutting, testing, or work on top of the geomembrane. All generators shall be kept off the geomembrane.

The installer, with prior approval from the owner, may elect to use a remnant piece of geosynthetic material as a temporary rub-sheet beneath the geomembrane to act as a cushion during panel deployment.

Placement of materials on top of the geomembrane shall not be allowed when the ambient temperature is below 32 °F or above 104 °F.

Equipment used for placing and compacting overlying soil materials shall not be driven directly on to any geosynthetic material. A minimum thickness of 6 inches of material shall be maintained between the geomembrane and the low contact pressure bulldozer or light motor grader used to place cover materials. No sharp turning of the spreading equipment will be allowed on the initial 12 inches of cover. No heavy rubber-tired vehicles shall be allowed in areas underlain by geomembrane until a minimum of 3 feet of cover material has been placed, with the exception that a light grader may be used on the 6-inch cover for fine grading and trimming operations. However, the weight of the equipment may not exceed 5 psi, as measured on the geomembrane surface. Equipment shall be observed by the CQA Monitor during placement to document that no leakage of hydrocarbons occurs, particularly on top of the geomembrane.

Placement of soil materials on top of the geomembrane shall not be allowed within 50 feet of any unseamed edge of geomembrane until field seaming of that edge is complete. This is required to allow sufficient room to work out any large wrinkles or fish mouths prior to seaming.

The placement of cover materials shall be done with caution and in a manner that is least likely to cause wrinkles in, or damage to, the geomembrane.

5.4.6 Anchor Trench

The CQA Monitor will observe the anchor trench construction to ensure that the trench surface is suitably smoothed and that it will not damage the liner. The structural fill placed back on top of the liner will be placed as discussed in Section 4.2.2.

5.4.7 Survey Requirements

The liner will be prepared to the lines and grades shown in the construction documentation. The horizontal survey tolerance for this layer shall be 0.0 feet to 0.2 feet in relation to the design elevations. The vertical survey tolerance for this layer shall be 0.0 feet to 0.2 feet in relation to the design elevations.

6 DRAINAGE LAYER CONSTRUCTION

6.1 General

The CQA Monitor shall observe placement of the drainage material and shall confirm that the placed depth is at a minimum of 6 inches. Placement of drainage materials over geomembranes will follow the procedures of Section 5.4.5.

6.2 Sump Pipe Installation

The high-density polyethylene HDPE pipe network shall be placed according to the design. CQA monitoring activities shall include:

- Review of construction subcontractor's submittals concerning joining methods and type of perforations;
- Review of manufacturer's certification to document that the HDPE pipe meets the specifications;
- Observe and measure to confirm that the pipes are placed at specified locations and in specified configurations, and that pipe grades are as specified;
- Verify that the internal cleanliness of HDPE pipe is maintained;
- Visually observe that pipes are joined together and perforated in accordance with the approved procedures;
- Observe that the placement of any filter or backfill materials around the pipe proceeds, as shown on the plans;
- Witness, review, and document testing of HDPE piping prior to being buried or covered with liner; and
- Observe that backfilling and compaction are completed as specified and that, in the process, the pipe network is not damaged.

6.3 Aggregate Leachate Header

The stone drainage collection channel network shall be placed according to the design. CQA monitoring activities shall include:

- Testing the material to confirm that it has the specified particle size and is free from excessive amounts of fines or organic materials;
- Measuring the thickness and observing coverage of each drainage layer as it is placed in the LCS;

- Observe placement of geotextile as required;
- Observe and measure to confirm that the header are placed at specified locations and in specified configurations, and that header grades are as specified;
- Verify that the internal cleanliness of header is maintained;
- Observe that the placement of any filter or backfill materials around the header proceeds as shown in the construction documents; and
- Observe that backfilling and compaction are completed as specified and that, in the process, the header network is not damaged.

6.4 Leachate Collection Layer

The drainage material may be composed of sand/gravel or geocomposite. Inspection of the drainage layer shall include the following:

- Measuring the thickness of the drainage layer material either by survey or by direct measurement from the top of the material to the top of the underlying material;
- Observe placement of geotextile as required; and
- Confirm the horizontal survey tolerance for the drainage layer is 0.0 feet to 0.2 feet.

Placement of the drainage layers shall not damage any component of the underlying composite liner or header.

6.5 Geocomposite Drainage Layers

Should a geocomposite be the chosen alternative for the drainage layer, a double-sided geocomposite with a 6 ounce per square yard (oz/yd²) non-woven geotextile on both sides shall be used, and the following section shall be applied.

6.5.1 Pre-Construction

Prior to shipment of the rolls of geocomposite, the CQA Subcontractor will obtain samples at a frequency of one per production lot or one per 100,000 square feet of each material type, whichever results in the greater number of tests; except that only one friction angle tests on each interface will be performed. The CQA Subcontractor will test the samples to determine conformance to both the Technical Specifications and the list of certified properties.

Tests on the geonets and geotextiles that are intended for use for the geocomposite shall be performed prior to geocomposite fabrication. Geotextiles shall be tested in accordance with requirements for geotextile.

The following tests will be performed on geonets, at a minimum:

- Polymer specific gravity (ASTM D1505)
- Thickness (ASTM D5199)
- Mass per unit area (ASTM D5261)

The following tests will be performed on geocomposites, at a minimum:

- Ply Adhesion (ASTM D7005)
- Transmissivity (ASTM D4716)

6.5.2 Construction

Materials and work that fail to meet the requirements of these specifications shall be removed, disposed of, and replaced at the Subcontractor's expense.

6.5.3 Installation Plan

The Subcontractor shall submit a plan describing the proposed methods for geocomposite unloading, storage, deployment, panel layout, seaming, testing, repair, and protection. The plan shall include a QA program (training, qualifications, procedures, records, oversight/peer review, etc.) for the Subcontractor's activities, related to geocomposite installation.

6.5.4 Handling and Placement

The geocomposites shall be handled and placed, as described below:

- The Subcontractor shall handle geocomposites in such a manner as to ensure that these materials are not damaged.
- Clean geomembrane surface prior to placing geocomposite to remove dust, dirt, and debris.
- On slopes, geocomposite may be deployed over slip-sheets with the roll at the top of the slope. An alternative method is to secure the geocomposite, then roll it down slope in a manner to continually keep it in tension, if necessary, position the geocomposite after deployment to minimize wrinkles, and remove the slip-sheet, if used.
- Do not drag the geocomposite across textured geomembrane.

- In the presence of wind, exposed geocomposites shall be weighted with ultraviolet (UV) resistant sandbags, or equivalent. Sandbags shall be installed during geocomposite placement and shall remain until replaced with cover material.
- Unless otherwise specified, geocomposites shall not be welded to geomembranes.
- Geocomposites shall only be cut using approved cutting tool.
- The Subcontractor shall take necessary precautions to prevent damage to underlying layers, during placement of the geocomposite.
- During placement of geocomposites, care shall be taken not to entrap dirt or excessive dust that could cause clogging of the drainage system, and/or stones that could damage the adjacent geomembrane. If dirt or excessive dust is entrapped in the geocomposite, it shall be cleaned prior to placement of the next material on top of it.
- Vehicles shall not be permitted on the geocomposite unless approved by the Contractor.
- Tools shall not be left on or under the geocomposite.
- In geocomposites, tearing the geotextile away from the geonet shall not be allowed, except at seam locations in corners, as approved by the CQA Subcontractor.
- After deployment, geocomposite shall be covered to prevent exposure to UV radiation (sunlight), within a maximum period of 14 calendar days.

6.5.5 Joining

The geocomposite drainage layers shall be joined, as described below:

- Adjacent sections of geocomposite shall be overlapped, according to the manufacturer's directions.
- Overlaps shall be secured by tying. Acceptable tying devices include plastic fasteners or polymer braid. Tying devices shall be white or yellow for easy observation. Metallic joining devices are not allowed.
- Overlaps shall be secured every 1.5 meters (5 feet), along slopes and on the floor of the landfill. Along end-to-end seams, spot-weld and tie two rows 75 millimeter (3 inches) apart. Spot-weld and tie each row at 150-mm (6-inch) intervals; stagger weld or ties between rows.
- No horizontal seams shall be allowed on sideslopes provided rolls can be manufactured to sufficient length. If required because of manufacturing limitation end seams shall be staggered.
- If more than one layer of geocomposite is installed, joints shall be staggered.

- Top geotextile component of the geocomposite shall be sewn.

6.5.6 Repair

The geocomposite shall be repaired, as described below:

- Remove the damaged or un-bonded area of geocomposite.
- Cut a piece of geocomposite to fit over the repair area. Geocomposite shall fit over repair area and be tied similar to end-to-end seams.
- Remove any dirt or other foreign material that may have entered the geocomposite.
- Geocomposite damage greater than 4 sf shall require removal of a full roll width of damaged area.

6.5.7 Materials in Contact with Geocomposites

The Subcontractor shall place soil materials located on top of a geocomposite layer in such a manner as to ensure that the following conditions are satisfied:

- No damage to the geocomposite;
- No slippage of the geocomposite on underlying layers; and
- No excess tensile stresses in the geocomposite.

Placement of soil materials shall begin at the bottom of the sideslopes and progress upslope, or laterally, at about the same elevation in such a manner that a full layer of material is covering the geosynthetics downslope, from the area being covered.

6.6 Anchor Trench

6.6.1 Pre-Construction

There are no pre-construction requirements for the proposed anchor-trench backfill materials.

6.6.2 Construction

During placement of backfill in the anchor trenches, CQA personnel shall observe the placement operations on a periodic basis and perform the following:

- Visually observe the material for contamination with debris or deleterious material;
- Visually observe the material for particle size;

- Visually observe that the material is moisture conditioned and compacted, as specified;
- Observe the placement of the material to document minimum thickness under equipment, to prevent damage to the underlying materials; and
- Visually observe to detect any damage to the underlying liner materials.

Tests shall be conducted in accordance with the methods and procedures specified in the table provided in Section 4.2.2.

6.7 LCS System Equipment and Components

6.7.1 Electrical System and Pump Controls

The electrical system that controls the leachate pumps shall be checked for proper installation and operation. CQA personnel shall perform the following activities:

- Receipt inspections of electrical components (verify Underwriters Laboratories (UL), listings, etc.);
- Review the Construction Subcontractor's submittals and proposed equipment to document compliance with the specifications;
- Verify and document final tagging, labeling, and marking of the electrical systems (i.e. breaker, outlets, disconnects, switches, etc.); and
- Perform or review component checks of resistance, grounding, and load prior to complete system check.

6.7.2 Pumps, Piping, Meters, and Valves

The pumps, piping, instruments (such as the flow meters), and valves that are included in the leachate collection (removal and transfer) system shall be examined and tested at the system level for conformance to the specifications and proper performance. CQA personnel shall perform the following activities, in conjunction with these items:

- Review Construction Subcontractor's submittals and equipment deliveries to the site to verify conformance with the specifications;
- Review the results of Subcontractor's acceptance testing of the piping system;
- Review system performance checks to confirm operation, in accordance with the specifications; and
- Review the complete leachate removal system performance using the installed pumps, as described in the specifications.

6.8 Geotextile

Should a geocomposite not be used a geotextile will be installed over the drainage material and secured to prevent wind damage. The CQA Monitor will observe the placement of the geotextile and record the panel locations on the record drawings.

6.9 Protective Layer

The protective layer over a geocomposite LCS will consist of 12 inches of soil and 60 inches of select trash. The protective layer over a sand/gravel LCS will consist of 60 inches of select waste. Once the protective layer is placed, wheeled vehicles can drive over the newly constructed area. The CQA Engineer will not oversee placement of select waste or protective soil above the LCS.

6.10 Survey Requirements

The survey requirements for the drainage layer are 0.0 feet to +0.2 feet and can be directly measured. The survey requirements for the protective layer are 0.0 feet to +0.2 feet and can be directly measured.

7 FINAL COVER CONSTRUCTION

7.1 General

The CQA Monitor shall observe that the final cover is placed at a maximum overall slope of 4 horizontal to 1 vertical (4H:1V) with the exception of the north face of the landfill that will be placed at a maximum overall slope of 3H:1V and a minimum slope of 20H:1V.

7.2 Water Balance Final Cover

The water balance cover consists of 12 inches of intermediate cover and 30 inches of water storage layer.

7.2.1 Intermediate Cover

Intermediate cover is placed during landfilling. The thickness is verified prior to placing the water storage layer.

Required Intermediate Cover Layer Verification

Properties (Test Method)	Frequency	Required Result
Thickness (survey)	50 foot grid	1.0 ft to +1.5 ft

Note: ft = feet

7.2.2 Water Storage Layer

The water storage layer will be loosely placed in a single 30-inch lift. Moisture and density measurements will be taken to measure the placed material compaction. The water storage layer is placed as a 30-inch veneer over the intermediate cover soil layer and does not have specific design elevations. The water balance cover will be constructed in accordance with the guidelines set forth in the Final Guidance Document for Water Balance Covers in Colorado from the CDPHE, dated March of 2013.

Required Water Storage Layer Verification Laboratory Testing

Properties (Test Method)	Frequency	Required Result
Texture (ASTM D7928)	1 per 1,500 CY	Inside acceptable zone +
Standard Proctor (ASTM D698)	1 per 3,000 CY*	NA

Notes: cy = cubic yards

+refers to a soil composition on the USDA Textural Triangle for Ecozone 1 in the Guidance Document for Water Balance Covers in Colorado

*Or less frequently based on change in soil type as determined by the CQA Engineer

Required Water Storage Layer Verification Field Testing

Properties (Test Method)	Frequency	Required Result
Thickness (Survey)	3 per acre per lift	2.5 ft
In-Situ Density and Moisture Content (ASTM D6938)	3 per acre per lift	80%-90%
Moisture Content (ASTMD 2216)	3 per acre per lift	Less than Optimum Moisture Content

Notes: ft = feet cy = cubic yards

8 DOCUMENTATION

8.1 Daily Reports

Each of the CQA Monitors shall complete daily reports when they are onsite. Entries may include, but not be limited to, the following information:

- Reports on any meetings held and the results of those meetings;
- Equipment and personnel being used in each location, including subcontractors;
- Descriptions of areas being observed, inspected, samples collected, and testing results;
- Description of materials delivered to the site, including any quality verification (manufacturer's certification) documentation;
- Decisions made regarding use of material and/or corrective actions to be taken in instances of substandard quality;
- Unique identifying sheet numbers of inspection data sheets, problem reporting, and corrective measures reports used to substantiate the decisions described in the preceding item; and
- Any deviations from the construction documents.

The CQA Engineer shall review each daily report.

8.2 Design Changes and Clarifications

Requests for modifications to the CQA Plan, or design changes, shall be made by memorandum to the owner; with copies to the CQA Engineer, and will require approval from CDPHE.

8.3 Final Documentation

At the completion of the project, a CQA report that incorporates the field-testing, manufacturer testing, and lab testing along with as-built drawings, shall be prepared by the CQA Engineer and submitted to the owner and CDPHE. The as-built drawings shall include scale drawings depicting depths, plan dimensions, elevations, and fill thicknesses; and will be sealed by a Colorado Professional Engineer and retained by the owner. The CQA Report shall include documentation of each construction component, monitored by the CQA Monitor, and shall certify that the facility was constructed in accordance with the CQA Plan and construction documents. The report shall be sealed by a Professional

Engineer registered in the State of Colorado. Use of any newly constructed portion of the landfill shall commence after CDPHE approves the CQA report.

8.4 Storage of Records

During the construction of MCLF, the CQA Engineer shall be responsible for CQA documents. This includes the CQA Engineer's copy of the design criteria, construction documents, the CQA Plan, and the originals of the data sheets and reports.

The CQA Monitor shall maintain MQC documentation from the manufacturer including the following:

- The origin (resin supplier's name, resin production plant), identification (brand name, number), and production date of the resin;
- A list of quantities and descriptions of materials, other than the base polymer, that comprise the geomembrane;
- A copy of the quality control certificates issued by the resin supplier;
- Reports on the tests conducted by the manufacturer and the CQA Engineer to confirm that the quality of the resin used to manufacture the geomembrane satisfies the specifications;
- A statement that no recycled polymer is added to the resin or that recycled polymer is clean, does not exceed 2% by weight, and does not include material that has seen previous service life;
- A properties sheet including properties listed in the specifications, measured using test methods indicated in the specifications, or equivalent;
- Reports on the tests, including sampling procedures, conducted by the manufacturer and/or the CQA Engineer to confirm that the geomembrane meets the project specifications; and
- A certification that property values, given in the properties sheet, are guaranteed by the geomembrane manufacturer.

9 REFERENCES

Colorado Department of Public Health and Environment. (2010). *Solid Waste Guidance Document, Concerning Solid waste Site, and facility engineering Design Quality Assurance/Quality Control Plans for Disposal Cell Subgrade, Liner, Leachate Collection System (including Sumps) and Protective Layer Components*. Colorado: Colorado Department of Public Health and Environment.

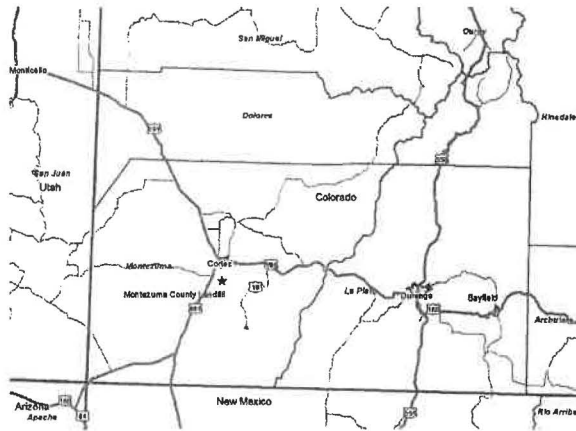
Colorado Department of Public Health and Environment. (2013). *Guidelines for Design, Construction, and Development of Water Balance Covers According to the Regulations Pertainig to Solid Waste Sites and Facilities 6CCR 1007-2, Part 1*. Colorado: Colorado Department of Public Health and Environment.

APPENDIX C
CELL 5 CONSTRUCTION DRAWINGS

APPENDIX C
CELL 5 CONSTRUCTION DRAWINGS

MONTEZUMA COUNTY LANDFILL CELL 5 CONSTRUCTION DRAWINGS

January, 2024



PREPARED FOR



PREPARED BY



7340 E CALEY AVENUE, SUITE 110
CENTENNIAL, CO 80111
(720) 529-0132
(720) 529-0137 (FAX)

INDEX OF DRAWINGS

SHEET NO.	SHEET TITLE	REVISION NO.	DATE
0	COVER SHEET		01/2024
1	SITE PLAN		01/2024
2	SITE LAYOUT		01/2024
3	EXCAVATION POINT LAYOUT		01/2024
4	EXCAVATION POINT TABLES		01/2024
5	STRUCTURAL FILL POINT LAYOUT		01/2024
6	STRUCTURAL FILL POINT TABLES		01/2024
7	LEACHATE COLLECTION LAYER		01/2024
8	LEACHATE COLLECTION LAYER		01/2024
9	PROTECTIVE COVER POINT LAYOUT		01/2024
10	PROTECTIVE COVER POINT TABLES		01/2024
11	DETAILS		01/2024



ISSUED FOR CONSTRUCTION

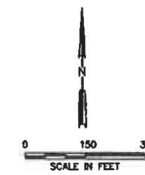


LEGEND:

- CELL BOUNDARY
- LIMITS OF WASTE

NOTES:

1. EXISTING AERIAL IMAGERY PERFORMED BY GOOGLE EARTH DATED OCTOBER, 2017.



- DRAFT
- FOR INFORMATIONAL PURPOSES ONLY
- ISSUED FOR CONSTRUCTION

DATE: 01/20/24
 FILE: 2023-803-10-17-02
 CAD:

DRAWN BY:
 DESIGNED BY: GJM
 REVIEWED BY: JSM

APPROVED FOR
MONTEZUMA COUNTY

REVISIONS		
NO.	DATE	DESCRIPTION

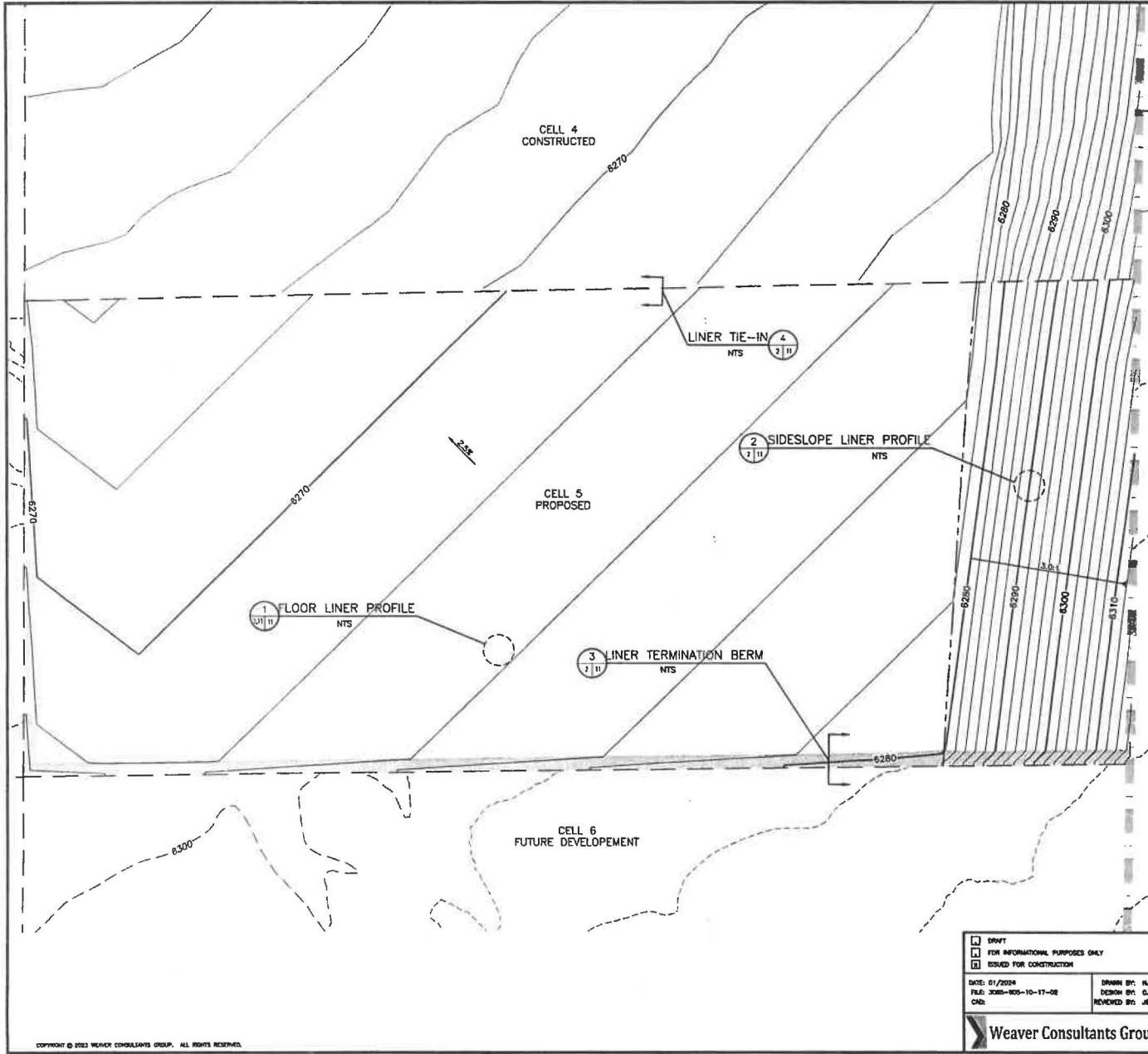
**CELL 5
 SITE PLAN**

MONTEZUMA COUNTY LANDFILL
 CORTEZ, COLORADO

WWW.WCCRP.COM

DRAWING 1

Weaver Consultants Group



LEGEND:

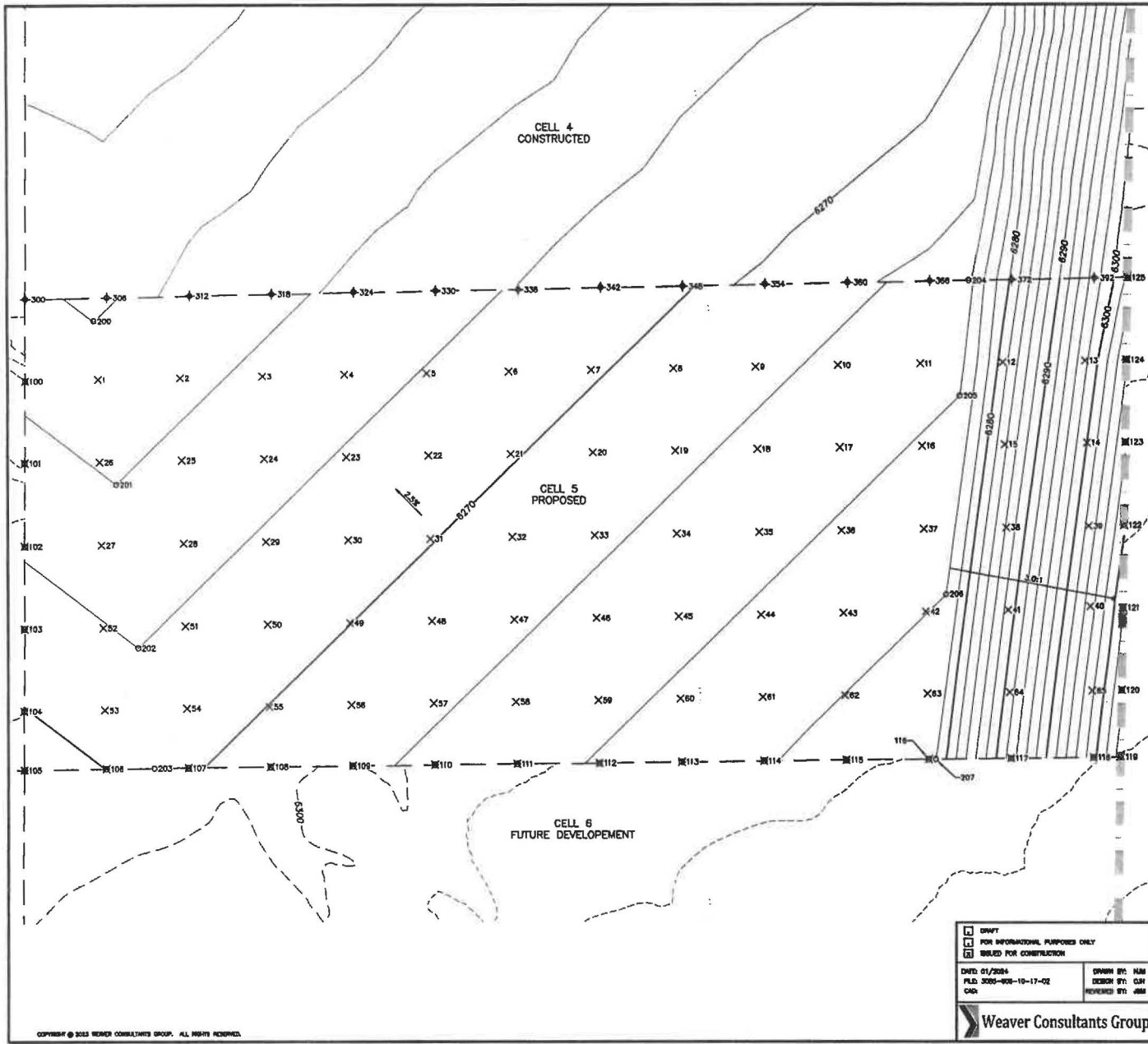
- 4920 --- 10' MAJOR EXISTING CONTOURS
- - - - 2' MINOR EXISTING CONTOURS
- 4920 --- 10' MAJOR AS-BUILT TOP OF CELL 4 CONTOURS
- - - - 2' MINOR AS-BUILT TOP OF CELL 4 CONTOURS
- 4920 --- 10' MAJOR TOP OF CELL 5 CONTOURS
- - - - 2' MINOR TOP OF CELL 5 CONTOURS
- --- CELL BOUNDARY
- - - - LIMITS OF WASTE
- - - - LIMIT OF LCL/PROTECTIVE COVER
- █ TERMINATION BERM

NOTES:

1. EXISTING AS-BUILT TOPOGRAPHY FOR CELL 4 FROM SURVEY PERFORMED BY FOUR CORNERS SURVEYING, INC. CERTIFIED BY PLS ON NOVEMBER 5, 2020 FOR EXCAVATION, CLAY LINER, AND LCL. PROTECTIVE COVER SURVEY IS CERTIFIED BY PLS ON APRIL 7, 2022. THE BALANCE OF EXISTING TOPOGRAPHY FROM AIR PHOTO SERVICES, INC. FLOWN ON MAY 11, 1993 AND DIGITIZED BY TERRAMATRIX IN JULY 1993.
2. TOP OF AS-BUILT CELL 4 CONTOURS REPRESENT A COMBINATION OF THE AS-BUILT TOP OF PROTECTIVE COVER AND AS-BUILT TOP OF LCL FOR CELL 4.
3. TOP OF CELL 5 CONTOURS REPRESENT A COMBINATION OF TOP OF PROTECTIVE COVER, TOP OF LCL, AND TOP OF TERMINATION BERM FOR CELL 5.



<input type="checkbox"/> DRAFT <input type="checkbox"/> FOR INFORMATIONAL PURPOSES ONLY <input type="checkbox"/> ISSUED FOR CONSTRUCTION	PREPARED FOR MONTEZUMA COUNTY		CELL 5 CONSTRUCTION DRAWINGS SITE LAYOUT														
	DATE: 01/2024 FILE: 2023-105-10-17-02 CAD:	DRAWN BY: ALM DESIGN BY: GJM REVIEWED BY: JHM	REVISIONS <table border="1"> <thead> <tr> <th>NO.</th> <th>DATE</th> <th>DESCRIPTION</th> </tr> </thead> <tbody> <tr> <td> </td> <td> </td> <td> </td> </tr> <tr> <td> </td> <td> </td> <td> </td> </tr> <tr> <td> </td> <td> </td> <td> </td> </tr> </tbody> </table>			NO.	DATE	DESCRIPTION									
	NO.	DATE	DESCRIPTION														
Weaver Consultants Group		MONTEZUMA COUNTY LANDFILL MONTEZUMA COUNTY, COLORADO		WWW.WCGRP.COM DRAWING 2													



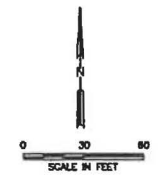
LEGEND:

- 10' MAJOR EXISTING CONTOURS
- 2' MINOR EXISTING CONTOURS
- 10' MAJOR AS-BUILT CELL 4 EXCAVATION CONTOURS
- 2' MINOR AS-BUILT CELL 4 EXCAVATION CONTOURS
- 10' MAJOR CELL 5 EXCAVATION CONTOURS
- 2' MINOR CELL 5 EXCAVATION CONTOURS
- CELL BOUNDARY
- PERMITTED LIMITS OF WASTE

- 2.5% PERCENT GRADE
- 3.0:1 SLOPE DESIGNATOR
- X1-99 50 FT GRID CERTIFICATION POINT (SEE NOTE J)
- 100-199 BORDER TIE-IN CERTIFICATION POINT
- 200-299 GRADE BREAK CERTIFICATION POINT
- 300-399 AS-BUILT CELL 4 CERTIFICATION POINT

NOTES:

1. EXISTING AS-BUILT TOPOGRAPHY FOR CELL 4 FROM SURVEY PERFORMED BY FOUR CORNERS SURVEYING, INC. CERTIFIED BY PLS ON NOVEMBER 5, 2020. THE BALANCE OF EXISTING TOPOGRAPHY FROM AIR PHOTO SERVICES, INC. FLOWN ON MAY 11, 1993 AND DIGITIZED BY TERRAMATRIX IN JULY 1993.



<input type="checkbox"/> DWG <input type="checkbox"/> FOR INFORMATIONAL PURPOSES ONLY <input type="checkbox"/> ISSUED FOR CONSTRUCTION	PREPARED FOR MONTEZUMA COUNTY		CELL 5 CONSTRUCTION DRAWINGS EXCAVATION POINT LAYOUT	
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Weaver Consultants Group		NO.	DATE	DESCRIPTION
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				DRAWING 3

EXCAVATION GRID CERTIFICATION POINT TABLE			
POINT #	NORTHING	EASTING	ELEVATION
1	10154.94	10683.87	6264.76
2	10155.88	10733.86	6265.53
3	10156.81	10783.85	6266.38
4	10157.75	10833.84	6267.24
5	10158.69	10883.83	6268.10
6	10159.63	10933.82	6268.95
7	10160.57	10983.82	6269.81
8	10161.51	11033.81	6270.67
9	10162.44	11083.80	6271.52
10	10163.38	11133.79	6272.38
11	10164.32	11183.78	6273.24
12	10165.26	11233.77	6280.84
13	10166.20	11283.76	6297.46
14	10116.20	11284.72	6300.04
15	10115.24	11234.73	6283.56
16	10114.28	11184.74	6274.20
17	10113.32	11134.75	6273.29
18	10112.36	11084.76	6272.44
19	10111.40	11034.77	6271.58
20	10110.44	10984.78	6270.73
21	10109.49	10934.79	6269.87
22	10108.53	10884.80	6269.01
23	10107.57	10834.80	6268.16
24	10106.61	10784.81	6267.30
25	10105.65	10734.82	6266.44
26	10104.69	10684.83	6265.57
27	10054.70	10685.78	6266.98
28	10055.66	10735.78	6267.35
29	10056.62	10785.77	6268.21
30	10057.58	10835.76	6269.07
31	10058.54	10885.75	6269.92
32	10059.50	10935.74	6270.78
33	10060.45	10985.74	6271.64
34	10081.41	11035.73	6272.49
35	10062.37	11085.72	6273.35
36	10063.33	11135.71	6274.20
37	10064.29	11185.70	6275.14
38	10065.25	11235.69	6286.18
39	10066.21	11285.68	6302.62
40	10017.52	11286.54	6305.11
41	10015.26	11236.65	6288.78
42	10014.30	11186.66	6275.97
43	10013.34	11136.67	6275.12
44	10012.38	11086.68	6274.26
45	10011.42	11036.69	6273.40
46	10010.46	10986.69	6272.55
47	10009.50	10936.70	6271.69
48	10008.55	10886.71	6270.84
49	10007.59	10836.72	6269.98
50	10006.63	10786.73	6269.12

EXCAVATION GRID CERTIFICATION POINT TABLE			
POINT #	NORTHING	EASTING	ELEVATION
51	10005.67	10736.74	6268.27
52	10004.71	10686.75	6268.09
53	9954.72	10687.71	6269.20
54	9955.68	10737.70	6269.18
55	9956.64	10787.69	6270.04
56	9957.60	10837.68	6270.89
57	9958.55	10887.67	6271.75
58	9959.51	10937.66	6272.60
59	9960.47	10987.65	6273.46
60	9961.43	11037.64	6274.32
61	9962.39	11087.63	6275.17
62	9963.35	11137.63	6276.03
63	9964.31	11187.62	6276.88
64	9965.27	11237.61	6291.16
65	9966.23	11287.60	6307.68

EXCAVATION BOUNDARY CERTIFICATION POINT TABLE			
POINT #	NORTHING	EASTING	ELEVATION
100	10154.15	10639.56	6265.53
101	10104.15	10639.33	6266.66
102	10054.15	10639.11	6267.80
103	10004.13	10638.88	6268.93
104	9954.11	10638.65	6270.06
105	9918.65	10638.49	6270.86
106	9918.21	10688.39	6269.99
107	9919.77	10738.39	6269.83
108	9920.33	10788.39	6270.70
109	9920.90	10838.39	6271.56
110	9921.46	10888.38	6272.43
111	9922.02	10938.38	6273.29
112	9922.58	10988.38	6274.15
113	9923.15	11038.38	6275.01
114	9923.71	11088.38	6275.85
115	9924.27	11138.38	6276.74
116	9924.83	11188.37	6277.63
117	9925.40	11238.37	6293.00
118	9925.96	11288.37	6309.50
119	9926.15	11304.94	6314.96
120	9966.57	11305.81	6313.57
121	10016.60	11306.43	6311.87
122	10066.62	11307.28	6309.71
123	10116.65	11308.09	6307.73
124	10166.67	11308.91	6305.74
125	10216.65	11309.75	6302.50

EXCAVATION GRADEBREAK CERTIFICATION POINT TABLE			
POINT #	NORTHING	EASTING	ELEVATION
200	10190.59	10681.58	6264.00
201	10091.33	10694.82	6266.00
202	9992.53	10708.00	6268.00
203	9919.54	10717.73	6269.48
204	10214.85	11213.34	6273.00
205	10144.92	11207.63	6274.00
206	10024.76	11199.05	6276.00
207	9924.88	11182.56	6278.00

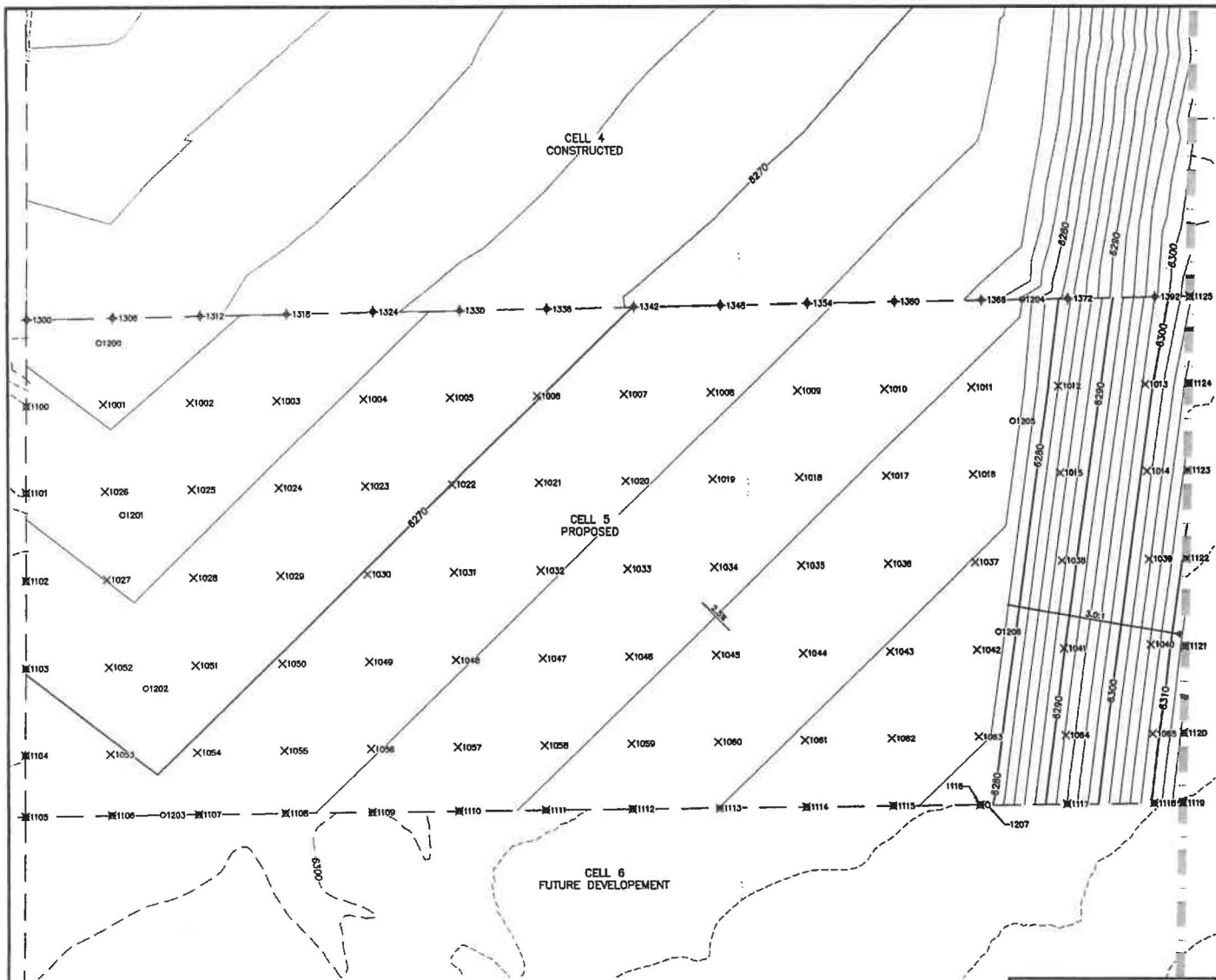
EXCAVATION AS-BUILT CELL 4 CERTIFICATION POINT TABLE			
POINT #	NORTHING	EASTING	ELEVATION
300	10204.08	10640.00	6263.16
306	10204.87	10689.58	6263.10
312	10205.86	10739.85	6264.55
318	10206.81	10789.68	6265.58
324	10207.97	10839.58	6266.84
330	10208.70	10889.43	6268.05
338	10209.42	10939.63	6268.21
342	10210.77	10989.71	6269.03
348	10211.47	11039.60	6269.20
354	10212.64	11089.61	6270.49
360	10213.68	11139.74	6271.73
366	10214.81	11189.67	6272.66
372	10215.32	11239.39	6290.52
392	10215.34	11289.51	6298.72

* AS-BUILT CELL 4 POINTS FROM SURVEY PERFORMED BY FOUR CORNERS SURVEYING INC. CERTIFIED BY PLS ON NOVEMBER 5, 2020.

NOTE:
ELEVATIONS REPRESENT THE DESIGN TOP OF SUBGRADE.



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Weaver Consultants Group		MONTEZUMA COUNTY LANDFILL MONTEZUMA COUNTY, COLORADO		WWW.WCOP.COM
		DRAWING 4		



LEGEND:

- 4920 10' MAJOR EXISTING CONTOURS
- 2' MINOR EXISTING CONTOURS
- 4920 10' MAJOR AS-BUILT CELL 4 TOP OF LINER CONTOURS
- 2' MINOR AS-BUILT CELL 4 TOP OF LINER CONTOURS
- 4820 10' MAJOR CELL 5 TOP OF LINER CONTOURS
- 2' MINOR CELL 5 TOP OF LINER CONTOURS
- CELL BOUNDARY
- PERMITTED LIMITS OF WASTE
- 2.5H PERCENT GRADE
- 3.0:1 SLOPE DESIGNATOR
- X1000-1099 50 FT GRID CERTIFICATION POINT (SEE NOTE 3)
- 1100-1199 BORDER TIE-IN CERTIFICATION POINT
- O1200-1299 GRADE BREAK CERTIFICATION POINT
- 1300-1399 AS-BUILT CELL 4 CERTIFICATION POINT

NOTES:

1. EXISTING AS-BUILT TOPOGRAPHY FOR CELL 4 FROM SURVEY PERFORMED BY FOUR CORNERS SURVEYING, INC. CERTIFIED BY PLS ON NOVEMBER 5, 2020. THE BALANCE OF EXISTING TOPOGRAPHY FROM AIR PHOTO SERVICES, INC. FLOWN ON MAY 11, 1993 AND DIGITIZED BY TERRAMATRIX IN JULY 1993.
2. CELL 4 AS-BUILT POINT 1392 WAS NOT SURVEYED DURING CELL 4 CONSTRUCTION. DESIGN ELEVATIONS FOR THE CELL 5 TOP OF STRUCTURAL FILL SURFACE WERE USED OR THE SURVEY POINT.



<input type="checkbox"/> DRAFT <input type="checkbox"/> FOR INFORMATIONAL PURPOSES ONLY <input checked="" type="checkbox"/> ISSUED FOR CONSTRUCTION	PREPARED FOR MONTEZUMA COUNTY		CELL 5 CONSTRUCTION DRAWINGS STRUCTURAL FILL POINT LAYOUT													
	DATE: 01/20/24 P.L.D. 2005-005-10-17-02 C.H.		DESIGN BY: CAJ REVIEWED BY: JSM													
DRAWN BY: DESIGNED BY: CAJ REVIEWED BY: JSM		<table border="1"> <thead> <tr> <th>NO.</th> <th>DATE</th> <th>DESCRIPTION</th> </tr> </thead> <tbody> <tr> <td> </td> <td> </td> <td> </td> </tr> <tr> <td> </td> <td> </td> <td> </td> </tr> <tr> <td> </td> <td> </td> <td> </td> </tr> </tbody> </table>			NO.	DATE	DESCRIPTION									
NO.	DATE	DESCRIPTION														
		MONTEZUMA COUNTY LANDFILL MONTEZUMA COUNTY, COLORADO		WWW.WCGRP.COM												
COPYRIGHT © 2023 WEAVER CONSULTANTS GROUP. ALL RIGHTS RESERVED.		DRAWING 5														

CLAY LINER GRID CERTIFICATION POINT TABLE			
POINT #	NORTHING	EASTING	ELEVATION
1001	10154.94	10883.87	6265.76
1002	10155.88	10733.86	6266.53
1003	10156.81	10783.85	6267.38
1004	10157.75	10833.84	6268.24
1005	10158.69	10883.83	6269.10
1006	10159.63	10933.82	6269.95
1007	10160.57	10983.82	6270.81
1008	10161.51	11033.81	6271.67
1009	10162.44	11083.80	6272.52
1010	10163.38	11133.79	6273.38
1011	10164.32	11183.78	6274.24
1012	10165.26	11233.77	6275.10
1013	10166.20	11283.76	6275.95
1014	10167.14	11333.75	6276.81
1015	10168.08	11383.74	6277.67
1016	10169.02	11433.73	6278.52
1017	10169.96	11483.72	6279.38
1018	10170.90	11533.71	6280.24
1019	10171.84	11583.70	6281.10
1020	10172.78	11633.69	6281.95
1021	10173.72	11683.68	6282.81
1022	10174.66	11733.67	6283.67
1023	10175.60	11783.66	6284.53
1024	10176.54	11833.65	6285.38
1025	10177.48	11883.64	6286.24
1026	10178.42	11933.63	6287.10
1027	10179.36	11983.62	6287.96
1028	10180.30	12033.61	6288.81
1029	10181.24	12083.60	6289.67
1030	10182.18	12133.59	6290.53
1031	10183.12	12183.58	6291.39
1032	10184.06	12233.57	6292.24
1033	10185.00	12283.56	6293.10
1034	10185.94	12333.55	6293.96
1035	10186.88	12383.54	6294.82
1036	10187.82	12433.53	6295.67
1037	10188.76	12483.52	6296.53
1038	10189.70	12533.51	6297.39
1039	10190.64	12583.50	6298.25
1040	10191.58	12633.49	6299.10
1041	10192.52	12683.48	6299.96
1042	10193.46	12733.47	6300.82
1043	10194.40	12783.46	6301.68
1044	10195.34	12833.45	6302.53
1045	10196.28	12883.44	6303.39
1046	10197.22	12933.43	6304.25
1047	10198.16	12983.42	6305.11
1048	10199.10	13033.41	6305.96
1049	10199.04	13083.40	6306.82
1050	10200.00	13133.39	6307.68

CLAY LINER GRID CERTIFICATION POINT TABLE			
POINT #	NORTHING	EASTING	ELEVATION
1051	10005.67	10736.74	6269.27
1052	10004.71	10686.75	6269.09
1053	9954.72	10687.71	6270.20
1054	9955.68	10737.70	6270.18
1055	9956.64	10787.69	6271.04
1056	9957.60	10837.68	6271.89
1057	9958.55	10887.67	6272.75
1058	9959.51	10937.66	6273.60
1059	9960.47	10987.65	6274.46
1060	9961.43	11037.64	6275.32
1061	9962.39	11087.63	6276.17
1062	9963.35	11137.63	6277.03
1063	9964.31	11187.62	6277.88
1064	9965.27	11237.61	6278.74
1065	9966.23	11287.60	6308.74
1100	10154.11	10639.67	6266.53

CLAY LINER BOUNDARY CERTIFICATION POINT TABLE			
POINT #	NORTHING	EASTING	ELEVATION
1100	10154.15	10638.56	6266.53
1101	10104.15	10639.33	6267.66
1102	10054.15	10639.11	6268.80
1103	10004.13	10638.88	6269.93
1104	9954.11	10638.65	6271.06
1105	9918.65	10638.49	6271.86
1106	9918.21	10688.39	6270.99
1107	9918.77	10738.39	6270.83
1108	9920.33	10788.39	6271.70
1109	9920.90	10838.39	6272.56
1110	9921.46	10888.38	6273.43
1111	9922.02	10938.38	6274.29
1112	9922.58	10988.38	6275.15
1113	9923.15	11038.38	6276.01
1114	9923.71	11088.38	6276.85
1115	9924.27	11138.38	6277.74
1116	9924.83	11188.37	6278.63
1117	9925.40	11238.37	6294.05
1118	9925.96	11288.37	6310.55
1119	9926.15	11304.94	6316.01
1120	9966.57	11305.61	6314.62
1121	10016.80	11306.43	6312.93
1122	10066.62	11307.26	6310.77
1123	10116.65	11308.09	6308.76
1124	10166.67	11308.91	6306.80
1125	10216.55	11309.75	6303.55
1200	10190.59	10681.58	6265.00

CLAY LINER GRADEBREAK CERTIFICATION POINT TABLE			
POINT #	NORTHING	EASTING	ELEVATION
1200	10190.59	10681.58	6265.00
1201	10091.33	10694.82	6267.00
1202	9992.53	10708.00	6269.00
1203	9919.54	10717.73	6270.48
1204	10214.83	11213.34	6274.00
1205	10144.92	11207.63	6275.05
1206	10024.76	11199.05	6277.05
1207	9924.88	11192.56	6279.05
1300	10204.06	10640.00	6264.51

CLAY LINER AS-BUILT CELL 4 CERTIFICATION POINT TABLE			
POINT #	NORTHING	EASTING	ELEVATION
1300	10204.06	10640.00	6264.51
1306	10204.87	10689.56	6264.49
1312	10205.86	10739.65	6265.71
1318	10206.81	10789.68	6266.83
1324	10207.87	10839.56	6267.72
1330	10208.70	10889.43	6268.61
1336	10209.42	10939.63	6269.35
1342	10210.77	10989.71	6270.22
1348	10211.47	11039.80	6270.34
1354	10212.64	11089.61	6271.89
1360	10213.66	11139.74	6272.74
1366	10214.81	11189.67	6274.29
1372	10215.32	11239.39	6282.23
1392	10216.34	11289.51	6297.50

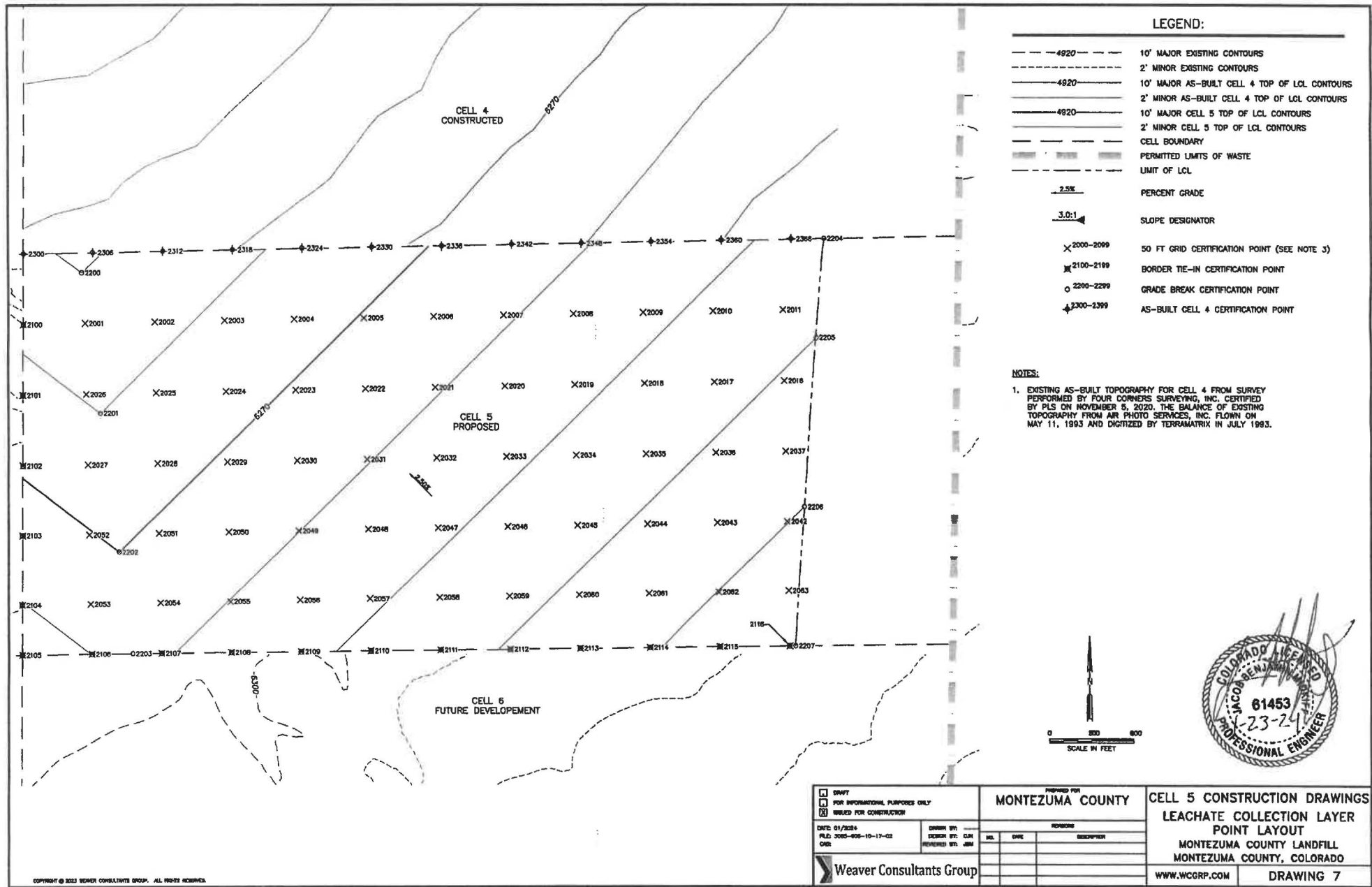
* AS-BUILT CELL 4 POINTS FROM SURVEY PERFORMED BY FOUR CORNERS SURVEYING INC. CERTIFIED BY PLS ON NOVEMBER 5, 2020.

** CELL 4 AS-BUILT POINT 1392 WAS NOT SURVEYED DURING CELL 4 CONSTRUCTION. DESIGN ELEVATIONS FOR THE CELL 5 TOP OF STRUCTURAL FILL SURFACE WERE USED OR THE SURVEY POINT.



NOTE:
ELEVATIONS REPRESENT THE DESIGN TOP OF STRUCTURAL FILL.

<input type="checkbox"/> DRAFT <input type="checkbox"/> FOR INFORMATIONAL PURPOSES ONLY <input checked="" type="checkbox"/> ISSUED FOR CONSTRUCTION	PROVIDED FOR MONTEZUMA COUNTY		CELL 5 CONSTRUCTION DRAWINGS STRUCTURAL FILL POINT TABLE	
	DATE: 01/2024 FILE: 2024-029-10-17-02 CVD:	DRAWN BY: DESIGNED BY: GJM REVIEWED BY: JSM	NO. DATE DESCRIPTION	MONTEZUMA COUNTY LANDFILL MONTEZUMA COUNTY, COLORADO WWW.WCGRP.COM
Weaver Consultants Group		DRAWING 6		



LEGEND:

- 4920 --- 10' MAJOR EXISTING CONTOURS
- - - - - 2' MINOR EXISTING CONTOURS
- 4920 — 10' MAJOR AS-BUILT CELL 4 TOP OF LCL CONTOURS
- - - - - 2' MINOR AS-BUILT CELL 4 TOP OF LCL CONTOURS
- 4920 — 10' MAJOR CELL 5 TOP OF LCL CONTOURS
- - - - - 2' MINOR CELL 5 TOP OF LCL CONTOURS
- CELL BOUNDARY
- PERMITTED LIMITS OF WASTE
- - - - - LIMIT OF LCL
- 2.5% PERCENT GRADE
- 3.0:1 SLOPE DESIGNATOR
- X2000-2099 50 FT GRID CERTIFICATION POINT (SEE NOTE 3)
- 2100-2199 BORDER TIE-IN CERTIFICATION POINT
- 2200-2299 GRADE BREAK CERTIFICATION POINT
- 2300-2399 AS-BUILT CELL 4 CERTIFICATION POINT

NOTES:

1. EXISTING AS-BUILT TOPOGRAPHY FOR CELL 4 FROM SURVEY PERFORMED BY FOUR CORNERS SURVEYING, INC. CERTIFIED BY PLS ON NOVEMBER 5, 2020. THE BALANCE OF EXISTING TOPOGRAPHY FROM AIR PHOTO SERVICES, INC. FLOWN ON MAY 11, 1993 AND DIGITIZED BY TERRAMATRIX IN JULY 1993.



<input type="checkbox"/> DWG <input type="checkbox"/> FOR INFORMATIONAL PURPOSES ONLY <input checked="" type="checkbox"/> ISSUED FOR CONSTRUCTION	PREPARED FOR MONTEZUMA COUNTY		CELL 5 CONSTRUCTION DRAWINGS LEACHATE COLLECTION LAYER POINT LAYOUT MONTEZUMA COUNTY LANDFILL MONTEZUMA COUNTY, COLORADO	
	DATE: 01/2024 P.L.D.: 2005-006-10-17-C2 O.D.:	DRAWN BY: CHECKED BY: CJM REVISIONS BY: JEM	NO. DATE REVISION	REVISION REVISION REVISION

Weaver Consultants Group

LEACHATE COLLECTION LAYER GRID CERTIFICATION POINT TABLE

POINT #	NORTHING	EASTING	ELEVATION
2001	10154.84	10683.87	6286.76
2002	10155.88	10733.86	6267.53
2003	10156.81	10783.85	6268.38
2004	10157.75	10833.84	6269.24
2005	10158.69	10883.83	6270.10
2006	10159.63	10933.82	6270.95
2007	10160.57	10983.82	6271.81
2008	10161.51	11033.81	6272.67
2009	10162.44	11083.80	6273.52
2010	10163.38	11133.79	6274.38
2011	10164.32	11183.78	6275.24
2016	10114.28	11184.74	6276.20
2017	10113.32	11134.75	6275.29
2018	10112.36	11084.76	6274.44
2019	10111.40	11034.77	6273.58
2020	10110.44	10984.78	6272.73
2021	10109.49	10934.79	6271.87
2022	10108.53	10884.80	6271.01
2023	10107.57	10834.80	6270.16
2024	10106.61	10784.81	6269.30
2025	10105.65	10734.82	6268.44
2026	10104.69	10684.83	6267.57
2027	10054.70	10685.79	6268.98
2028	10055.66	10735.78	6269.35
2029	10056.62	10785.77	6270.21
2030	10057.58	10835.76	6271.07
2031	10058.54	10885.75	6271.92
2032	10059.50	10935.74	6272.78
2033	10060.45	10985.74	6273.64
2034	10061.41	11035.73	6274.49
2035	10062.37	11085.72	6275.35
2036	10063.33	11135.71	6276.20
2037	10064.29	11185.70	6277.14
2042	10014.30	11186.66	6277.97
2043	10013.34	11136.67	6277.12
2044	10012.38	11086.68	6276.26
2045	10011.42	11036.69	6275.40
2046	10010.46	10986.69	6274.55
2047	10009.50	10936.70	6273.69
2048	10008.55	10886.71	6272.84
2049	10007.59	10836.72	6271.98
2050	10006.63	10786.73	6271.12
2051	10005.67	10736.74	6270.27
2052	10004.71	10686.75	6270.09
2053	9954.72	10687.71	6271.20
2054	9955.68	10737.70	6271.18
2055	9956.64	10787.69	6272.04
2056	9957.60	10837.68	6272.89
2057	9958.55	10887.67	6273.75
2058	9959.51	10937.66	6274.60

LEACHATE COLLECTION LAYER GRID CERTIFICATION POINT TABLE

POINT #	NORTHING	EASTING	ELEVATION
2059	9960.47	10987.85	6275.46
2060	9961.43	11037.84	6276.32
2061	9962.39	11087.83	6277.17
2062	9963.35	11137.83	6278.03
2063	9964.31	11187.82	6278.88

LEACHATE COLLECTION LAYER BOUNDARY CERTIFICATION POINT TABLE

POINT #	NORTHING	EASTING	ELEVATION
2100	10154.15	10638.56	6267.53
2101	10104.15	10638.33	6268.66
2102	10054.15	10638.11	6269.80
2103	10004.13	10638.88	6270.93
2104	9954.11	10638.65	6272.06
2105	9918.55	10638.49	6272.86
2106	9918.21	10688.39	6271.99
2107	9919.77	10738.39	6271.83
2108	9920.33	10788.39	6272.70
2109	9920.90	10838.39	6273.56
2110	9921.46	10888.38	6274.43
2111	9922.02	10938.38	6275.29
2112	9922.58	10988.38	6276.15
2113	9923.15	11038.38	6277.01
2114	9923.71	11088.38	6277.85
2115	9924.27	11138.38	6278.74
2116	9924.83	11188.37	6279.63

LEACHATE COLLECTION LAYER GRADEBREAK CERTIFICATION POINT TABLE

POINT #	NORTHING	EASTING	ELEVATION
2200	10180.59	10681.58	6268.00
2201	10081.33	10694.82	6268.00
2202	9992.53	10708.00	6270.00
2203	9919.54	10717.73	6271.48
2204	10214.85	11213.34	6275.00
2205	10144.92	11207.63	6276.05
2206	10024.76	11199.05	6278.05
2207	9924.88	11192.56	6280.05

LEACHATE COLLECTION LAYER CELL 4 AS-BUILT CERTIFICATION POINT TABLE

POINT #	NORTHING	EASTING	ELEVATION
2300	10204.08	10840.00	6288.30
2306	10204.87	10889.56	6286.63
2312	10205.86	10739.85	6287.01
2318	10206.81	10789.68	6287.63
2324	10207.97	10839.56	6288.80
2330	10208.70	10888.43	6289.65
2336	10209.42	10938.63	6270.13
2342	10210.77	10989.71	6271.02
2348	10211.47	11039.60	6271.84
2354	10212.84	11089.81	6272.93
2360	10213.88	11139.74	6273.93
2366	10214.61	11189.67	6275.22

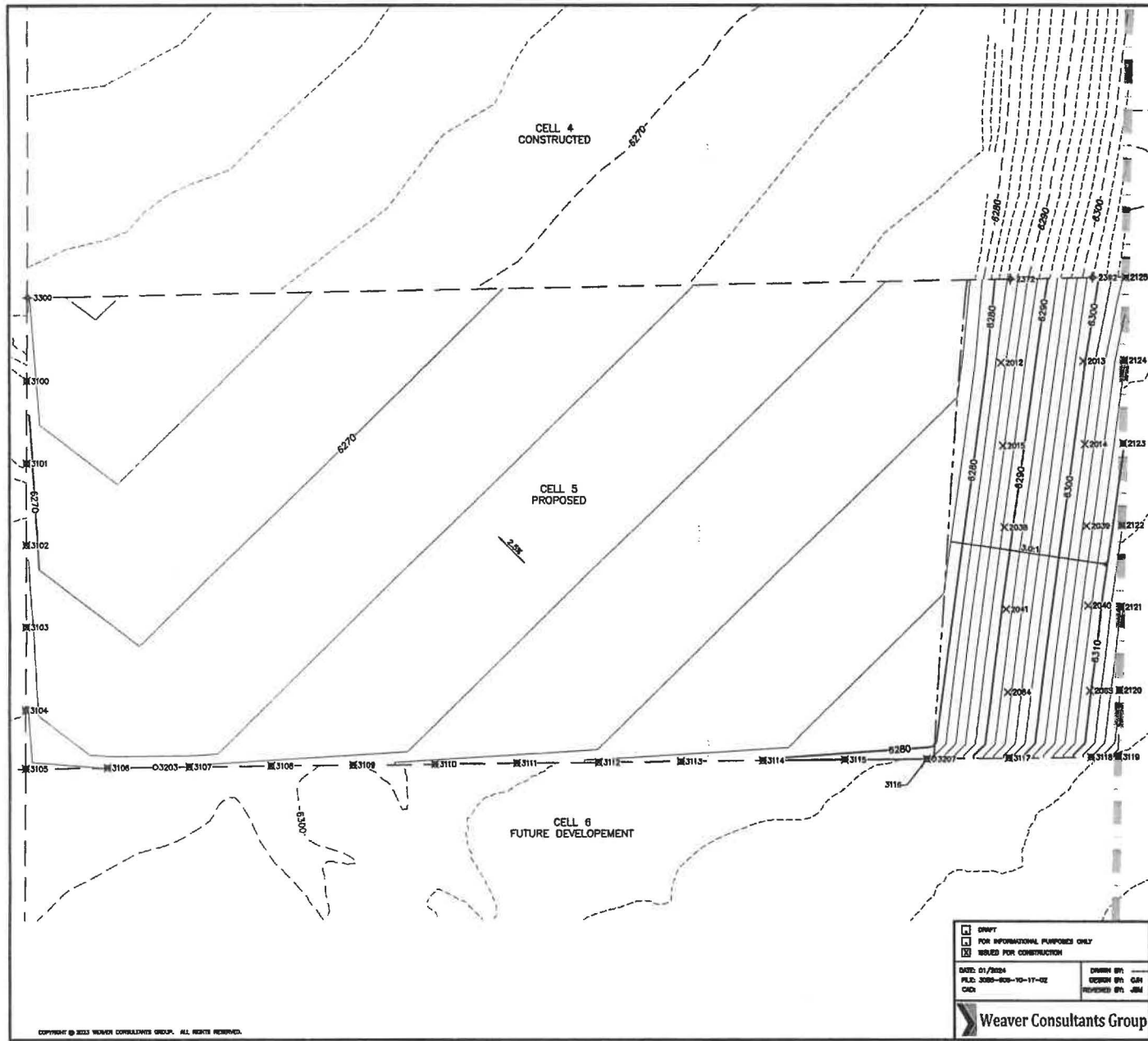
* AS-BUILT CELL 4 POINTS FROM SURVEY PERFORMED BY FOUR CORNERS SURVEYING INC. CERTIFIED BY PLS ON NOVEMBER 5, 2020.

NOTE:

ELEVATIONS REPRESENT THE DESIGN TOP OF LEACHATE COLLECTION LAYER



<input type="checkbox"/> DRAFT <input type="checkbox"/> FOR INFORMATIONAL PURPOSES ONLY <input checked="" type="checkbox"/> ISSUED FOR CONSTRUCTION	PREPARED FOR MONTEZUMA COUNTY		CELL 5 CONSTRUCTION DRAWINGS LEACHATE COLLECTION LAYER POINT TABLES MONTEZUMA COUNTY LANDFILL MONTEZUMA COUNTY, COLORADO	
	DATE: 01/2024 FILE: 2020-000-10-17-02 C/D:	DRAWN BY: DESIGN BY: CMH CHECKED BY: JSM	REVISIONS	NO.
Weaver Consultants Group		DESCRIPTION	www.wcgrp.com	DRAWING 8

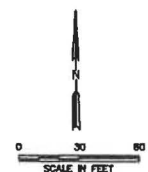


LEGEND:

- 10' MAJOR EXISTING AND AS-BUILT CELL 4 CONTOURS
- 2' MINOR EXISTING AND AS-BUILT CELL 4 CONTOURS
- 10' MAJOR CELL 5 TOP OF LCL CONTOURS
- 2' MINOR CELL 5 TOP OF LCL CONTOURS
- 10' MAJOR CELL 5 TOP OF PROTECTIVE COVER AND TERMINATION BERM CONTOURS
- 2' MINOR CELL 5 TOP OF PROTECTIVE COVER AND TERMINATION BERM CONTOURS
- CELL BOUNDARY
- PERMITTED LIMITS OF WASTE
- LIMIT OF PROTECTIVE COVER
- TERMINATION BERM
- 2.5% PERCENT GRADE
- 3.0:1 SLOPE DESIGNATOR
- X2000-2099 50 FT GRID CERTIFICATION POINT (SEE NOTE 3)
- M2100-2199 BORDER TIE-IN CERTIFICATION POINT
- O2200-2299 GRADE BREAK CERTIFICATION POINT
- T2300-2399 AS-BUILT CELL 4 CERTIFICATION POINT
- M3100-3302 TERMINATION BERM CERTIFICATION POINT
- O3300-3399 TERMINATION BERM CERTIFICATION POINT

NOTES:

1. EXISTING AS-BUILT TOPOGRAPHY FOR CELL 4 FROM SURVEY PERFORMED BY FOUR CORNERS SURVEYING, INC. CERTIFIED BY PLS ON APRIL 7, 2022 FOR PROTECTIVE COVER. THE BALANCE OF EXISTING TOPOGRAPHY FROM AIR PHOTO SERVICES, INC. FLOWN ON MAY 11, 1993 AND DIGITIZED BY TERRAMATRIX IN JULY 1993.
2. AS-BUILT CELL 4 PROTECTIVE COVER POINTS ARE OVERBUILT AND OVER EXISTING CELL 4 TERMINATION BERM TO BE REMOVED.



<input type="checkbox"/> SHEET <input type="checkbox"/> FOR INFORMATIONAL PURPOSES ONLY <input checked="" type="checkbox"/> ISSUED FOR CONSTRUCTION		PREPARED FOR MONTEZUMA COUNTY		CELL 5 CONSTRUCTION DRAWINGS PROTECTIVE COVER POINT LAYOUT	
DATE: 01/2024 P.L.S. 2023-029-10-17-02 C.D.		DRAWN BY: CHECKED BY: GJM REVISIONS BY: JSM		PROJECT NO. DATE DESCRIPTION	
Weaver Consultants Group				MONTEZUMA COUNTY LANDFILL MONTEZUMA COUNTY, COLORADO WWW.WCGRP.COM DRAWING 9	

PROTECTIVE COVER GRID CERTIFICATION POINT TABLE			
POINT #	NORTHING	EASTING	ELEVATION
2012	10165.26	11233.77	6283.05
2013	10166.20	11283.76	6290.57
2014	10116.20	11284.72	6302.15
2015	10115.24	11234.73	6285.67
2038	10085.25	11235.89	6288.29
2039	10066.21	11285.68	6304.72
2040	10017.52	11286.54	6307.22
2041	10015.26	11236.85	6290.89
2064	9965.27	11237.61	6293.27
2065	9966.23	11287.60	6309.79

PROTECTIVE COVER BOUNDARY CERTIFICATION POINT TABLE			
POINT #	NORTHING	EASTING	ELEVATION
2120	9966.57	11305.61	6315.68
2121	10016.60	11306.43	6313.98
2122	10066.62	11307.26	6311.82
2123	10116.65	11308.09	6309.84
2124	10166.67	11308.91	6307.85
2125	10216.55	11309.75	6304.61

PROTECTIVE COVER CELL 4 AS-BUILT CERTIFICATION POINT TABLE*			
POINT #	NORTHING	EASTING	ELEVATION
2372	10215.32	11239.39	6286.88
2392	10216.34	11289.51	6301.77

* AS-BUILT CELL 4 POINTS FROM SURVEY PERFORMED BY FOUR CORNERS SURVEYING INC. CERTIFIED BY PLS ON APRIL 7, 2022 FOR PROTECTIVE COVER POINTS. POINTS ARE OVERBUILT AND ARE OVER EXISTING CELL 4 TERMINATION BERM TO BE REMOVED.

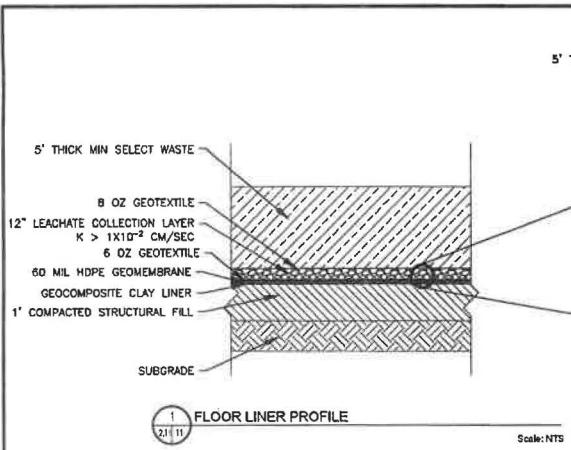
TERMINATION BERM CERTIFICATION POINT TABLE			
POINT #	NORTHING	EASTING	ELEVATION
3100	10154.15	10639.56	6269.53
3101	10104.15	10639.33	6270.66
3102	10054.15	10639.11	6271.80
3103	10004.13	10638.88	6272.93
3104	9954.11	10638.65	6274.06
3105	9918.65	10638.49	6274.88
3106	9919.21	10686.39	6273.59
3107	9919.77	10736.39	6273.83
3108	9920.33	10786.39	6274.70
3109	9920.90	10836.39	6273.56
3110	9921.46	10886.38	6276.43
3111	9922.02	10936.38	6277.29
3112	9922.58	10986.38	6278.15
3113	9923.15	11036.38	6279.01
3114	9923.71	11086.38	6279.85
3115	9924.27	11136.38	6280.74
3116	9924.83	11186.37	6281.83
3117	9925.40	11236.37	6297.26
3118	9925.96	11286.37	6313.76
3119	9926.15	11304.94	6319.22
3203	9919.54	10717.73	6273.48
3207	9924.88	11192.56	6282.26
3300	10204.06	10640.00	6267.51

NOTE:

ELEVATIONS REPRESENT THE DESIGN TOP OF PROTECTIVE COVER AND TERMINATION BERM.

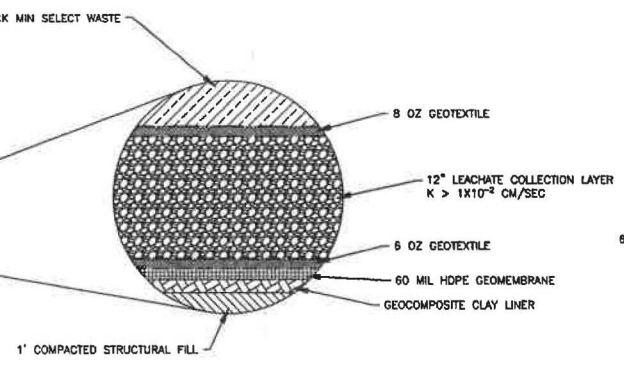


<input type="checkbox"/> DRAFT <input type="checkbox"/> FOR INFORMATIONAL PURPOSES ONLY <input checked="" type="checkbox"/> ISSUED FOR CONSTRUCTION	PREPARED FOR MONTEZUMA COUNTY		CELL 5 CONSTRUCTION DRAWINGS PROTECTIVE COVER POINT TABLES MONTEZUMA COUNTY LANDFILL MONTEZUMA COUNTY, COLORADO WWW.WCGRP.COM DRAWING 10											
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NO.	DATE	DESCRIPTION												
Weaver Consultants Group														



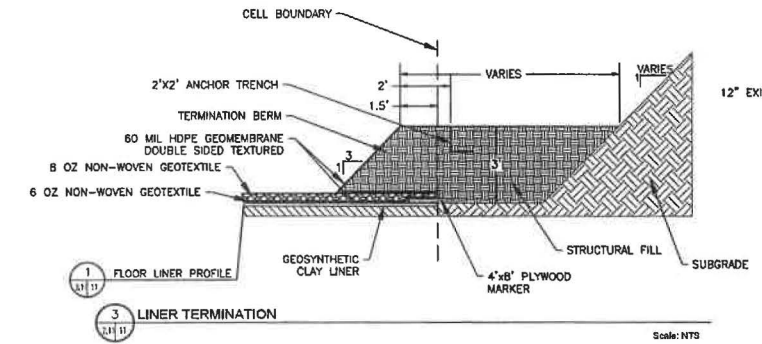
1 FLOOR LINER PROFILE
Scale: NTS

NOTE:
1. SELECT WASTE SHALL CONSIST OF SOFT TRASH FREE OF CONSTRUCTION WASTE OR OTHER WASTE WITH LARGE OR PROTRUDING HARD PIECES THAT COULD POTENTIALLY PUNCTURE OR RIP THROUGH THE LINER OR LEACHATE COLLECTION LAYER.

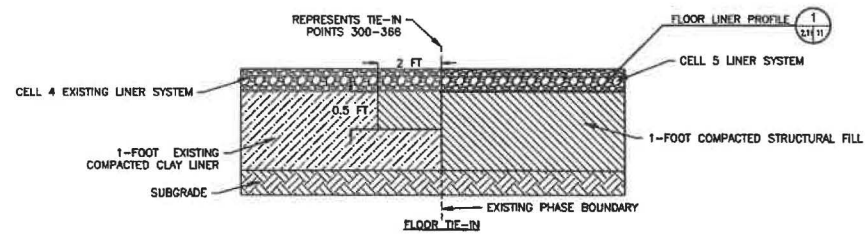


2 SLOPE LINER PROFILE
Scale: NTS

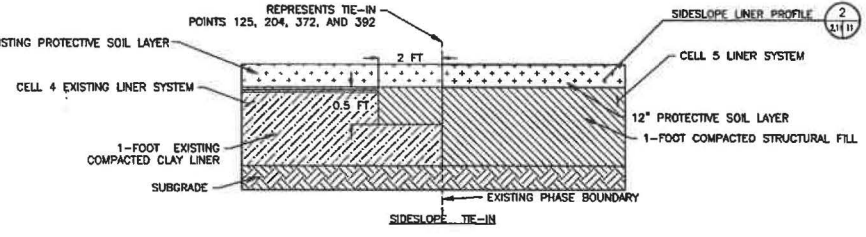
NOTE:
1. SELECT WASTE SHALL CONSIST OF SOFT TRASH FREE OF CONSTRUCTION WASTE OR OTHER WASTE WITH LARGE OR PROTRUDING HARD PIECES THAT COULD POTENTIALLY PUNCTURE OR RIP THROUGH THE LINER OR LEACHATE COLLECTION LAYER.



3 LINER TERMINATION
Scale: NTS



4 TYPICAL LINER TIE-IN DETAIL
Scale: NTS



NOTES:
1. ALTERNATIVE TIE-IN CONFIGURATIONS MAY BE INCORPORATED DEPENDING ON RECOMMENDATIONS FROM THE DESIGN ENGINEER.
2. EDGE OF THE EXISTING LEACHATE COLLECTION LAYER SHALL BE CLEANED TO PROVIDE HYDRAULIC CONNECTIVITY.



<input type="checkbox"/> DRAFT <input type="checkbox"/> FOR INFORMATIONAL PURPOSES ONLY <input checked="" type="checkbox"/> READY FOR CONSTRUCTION	PREPARED FOR MONTEZUMA COUNTY		CELL 5 CONSTRUCTION DRAWINGS DETAILS													
	DATE: 01/2024 FILE: 3085-005-10-17-02 GAC:	DRAWN BY: DESIGN BY: CAH REVIEWED BY: JBR	REVISIONS <table border="1"> <thead> <tr> <th>NO.</th> <th>DATE</th> <th>DESCRIPTION</th> </tr> </thead> <tbody> <tr> <td> </td> <td> </td> <td> </td> </tr> <tr> <td> </td> <td> </td> <td> </td> </tr> <tr> <td> </td> <td> </td> <td> </td> </tr> </tbody> </table>			NO.	DATE	DESCRIPTION								
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