

Attachment VI-4

Closure Design Engineering Report

For

Cell B/6 and 7

**RECEIVED**

DEC 16 2010

UTAH DIVISION OF  
SOLID & HAZARDOUS WASTE  
2010 03855

**CLEAN HARBORS  
GRASSY MOUNTAIN, LLC  
TOOELE COUNTY, UTAH**

**LANDFILL CELLS 6B AND 7  
CLOSURE DESIGN  
MODIFICATIONS FOR  
VERTICAL EXPANSION**

**DESIGN ENGINEERING  
REPORT**

(HAL PROJECT NO 064 82 100)

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**LANDFILL CELLS 6B AND 7  
CLOSURE DESIGN MODIFICATIONS  
FOR VERTICAL EXPANSION**

**DESIGN ENGINEERING REPORT**



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**December 2010**

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SEPTEMBER 28, 2009, Revised December 6, 2010	
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## CHAPTER I

### INTRODUCTION

Clean Harbors Grassy Mountain, LLC (Clean Harbors) is interested in increasing the height and the top slope of the closure caps of Landfill Cells 6B and 7, which will provide an increase in the permitted waste capacities within each of the cells. Clean Harbors requested that Hansen, Allen & Luce, Inc (HAL) provide engineering evaluations to determine the potential for closure design modification. Applied Geotechnical Engineering Consultants (AGEC) was retained to perform geotechnical stability analyses of the raised closure caps to ensure stability under static and seismic conditions. This report provides a summary of background information associated with the design of the landfills and closure caps, presents proposed design modifications, and provides a summary of results from the geotechnical evaluation and other engineering calculations for the proposed design modifications. The geotechnical evaluation and engineering calculations are to provide a basis for approval of a permit modification from the Utah Division of Solid and Hazardous Waste (DSHW) for the proposed design modifications.

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## CHAPTER II

### BACKGROUND

#### LANDFILL CELL 6B

##### Landfill Cell Design

The original design of Landfill Cell B/6 was completed and presented in a design engineering report dated January 1992 as RCRA Landfill Cell 6, with an original design capacity of 493,300 cy. Revisions to the design were completed and presented in a design engineering report dated September 1992 which incorporated design modifications and discussions resulting from regulatory changes that were made to the rules in 1992. The September 1992 design modifications included a design change to lower the floor by a vertical distance of 5 feet, which changed the design capacity to approximately 592,000 cy. A report dated January 1993 provided information regarding the effects of groundwater on lowering the floor 5 feet from the original design. The current permitted capacity of 592,000 cy reflects acceptance of the September 1992 design and the January 1993 report.

After construction of Landfill Cell 6 (constructed in 1993), the permit was revised to allow disposal of TSCA wastes in Cell 6 and the cell was given the designation of Landfill Cell B/6 or Landfill Cell 6B. Both references have been used for the landfill since it was permitted to receive TSCA waste.

##### Closure Cap Design

The original closure cap design used to determine the permitted waste capacity consisted of the following (from top to bottom):

- 4 inches of gravel armor erosion protection
- 2 feet of protective soil cover
- 8 oz Non-woven geotextile filter fabric
- geonet
- 60-mil HDPE geomembrane (textured on the 2H 1V perimeter slopes)
- 2 feet (minimum) of compacted clay liner

Original design slopes consisted of 2H 1V (horizontal to vertical) perimeter slopes around closure caps extending from the top of the cell embankments to the outside edge of the closure cap's top slope. The top slope consisted of 5 percent slopes from the top center to the outside edges of the caps and 0.63 percent cross slopes to provide a resultant slope of 0.7 percent in the perimeter drainage ditches.

Original drainage design from the closure cap includes six different drainage areas. Runoff from the six drainage areas collects in the perimeter ditches that convey runoff to six different down drains (or down spouts) that convey storm water from the top of the closure cap to the bottom toe of the cell embankments.



## LANDFILL CELL 7

### Landfill Cell Design

Design of RCRA Landfill Cell 7 was completed and presented in a design engineering report dated December 1995 with an original design capacity of 645,100 cy. Construction of the cell was completed and construction documentation was submitted in November 1996. Engineering evaluations and geotechnical stability and settlement analyses were completed in December 2000, and were provided to the facility for a permit application to increase the capacity to 733,000 cubic yards by raising the height of the closure cap 2.18 feet and by replacing the compacted clay liner with GCL. This permit modification was approved by DSHW.

### Closure Cap Design

The original closure cap design used to determine the permitted waste capacity consisted of the following (from top to bottom):

#### On the top slopes

- 4 inches of gravel armor erosion protection
- 2 feet of protective soil cover
- 8 oz Non-woven geotextile filter fabric
- geonet
- 60-mil HDPE geomembrane
- geosynthetic clay liner (GCL)
- six inches (minimum) of soil cushion

#### On the perimeter slopes

- 4 inches of gravel armor erosion protection
- 2 feet of protective soil cover
- 8 oz Non-woven geotextile filter fabric
- geonet
- 60-mil HDPE textured geomembrane
- 2 feet minimum of compacted clay liner (CCL)

Original design slopes consisted of 2H 1V (horizontal to vertical) perimeter slopes around closure caps extending from the top of the cell embankments to the outside edge of the top slope of the closure caps. The top slope consisted of 5 percent slopes from the top center to the outside edges of the caps and 0.63 percent cross slopes to provide a resultant slope of 0.7 percent in the perimeter drainage ditches.

Original drainage design from the closure cap includes four different drainage areas. Runoff from the four drainage areas collects in the perimeter ditches that convey runoff to four different down drains (or down spouts) that convey storm water from the top of the closure cap to the bottom toe of the cell embankments.

## CHAPTER III

### MODIFIED CLOSURE DESIGN

#### CLOSURE CAP CONFIGURATIONS

The proposed closure cap design for both Landfill Cell 6B and Landfill Cell 7 consists of the following from top to bottom (See Exhibit A for drawings)

##### On the top 10% slopes

4 inches of gravel armor erosion protection

2 feet of protective soil cover

Double sided geocomposite (consisting of 8 oz Non-woven geotextile filter fabric bonded to both sides of geonet)

60-mil HDPE textured geomembrane

geosynthetic clay liner (GCL)

six inches (minimum) of soil cushion

##### On the perimeter 3H 1V slopes

4 inches of gravel armor erosion protection

2 feet of protective soil cover (compacted clay soil)

60-mil HDPE textured geomembrane

2 feet minimum of compacted clay liner (CCL)

Design slopes include 3H 1V (horizontal to vertical) perimeter slopes around closure cap extending from the top of the cell embankments to the outside edge of the top slope of the closure cap. The top slope consists of 10 percent slopes from the top center to the outside edges of the cap and 0.80 percent cross slopes to provide a resultant slope of 1.14 percent in the perimeter drainage ditches.

Landfill Cell 6B is designed to have a maximum vertical height of 31.98 feet from the top of the cell embankment to the top of the perimeter berm. Total vertical height at the center of the Cell 6B closure cap is 48.82 feet above the cell embankment. Landfill Cell 7 is designed to have a maximum vertical height of 33.13 feet from the top of the cell embankment to the top of the perimeter berms. Total vertical height at the center of the Cell 7 closure cap is 63.92 feet above the cell embankment. Landfill Cell 7 has a much higher center height because it is approximately 286 feet wider than Landfill Cell 6B which provides a greater distance of rise for the 10 percent slope.

The perimeter drainage ditches are V-shaped with a perimeter berm providing the outside 3H 1V slope and the 10 percent closure cap slope providing the inside side slope for the ditches. The perimeter ditches are designed to receive storm water runoff from the 10 percent cap slope areas and convey the runoff to down drains, which convey storm water to the bottom exterior toes of the landfill cell embankments.

## LANDFILL CAPACITIES

Capacities of the landfill cells were determined using volume calculation routines within AutoCAD Civil 3D 2010 by Autodesk. Surfaces were built within AutoCAD, representing the surface of the protective soil cover above the bottom lining system within the cell and the top of the waste mound based on the modified closure cap design. These two surfaces were then defined to determine the capacity within the landfill cell using a grid spacing of 2 feet in both the north/south and the east/west directions. The modified capacity within Cell 6B is approximately 1,022,600 cubic yards and the modified capacity within Cell 7 is approximately 1,106,000 cubic yards.

## CLOSURE CAP DRAINAGE

### Hydrology

Runoff was estimated using the SCS curve number methodology and the unit hydrograph procedure developed by the USDA Soil Conservation Service. Hydrologic calculations are presented in Exhibit C. Rainfall depth for the 100-year, 24-hour precipitation event of 1.85 inches was obtained from Point Precipitation Frequency Estimates from NOAA Atlas 14 using the coordinates and elevations of the Grassy Mountain Facility.

A gravel road with hydrologic soil group B has a curve number of 85. The gravel armor erosion protective layer is not compacted, has less fines, and has greater storm water retention potential than a gravel road. Therefore, a curve number of 83 was estimated to conservatively represent the runoff conditions for the gravel armor surfaces.

Design of the perimeter drainage ditches and the down drains was based on using the largest drainage areas for Landfill Cells 6B and 7. Therefore, the drainage areas for Cells 6B and 7 were evaluated to determine the largest contributing area to the perimeter ditch and to the down drain. Runoff calculated on the largest areas was then used for design of all perimeter ditches and for all down drains for both landfill cell closure caps.

The closure cap for landfill Cell 6B consists of six different drainage areas that collect and convey storm water runoff to six down drains (or down spouts) located around the perimeter of the closure cap. Four drainage areas are located at each of the four corners of the closure cap, and two of the drainage areas are located at the center of the north and south sides of the closure cap. The drainage areas at the center of the north and south sides each have areas of 64,157 square feet (1.473 acres) which are larger than the four drainage areas located at the corners of the closure cap. A single drainage area contributes runoff to a segment of the perimeter ditch and two of the center drainage areas (128,314 square feet or 2.946 acres) combine to contribute drainage to a single down drain.

The closure cap for Landfill Cell 7 is symmetrical such that four drainage areas are located in the corners of the closure cap and the drainage areas are all equal in size. The largest area contributing runoff to the perimeter ditches is 53,339 square feet (1.225 acres) and the largest area contributing runoff to a down drain is 106,678 square feet (2.45 acres).

## Perimeter Ditch and Down Dram Design

Using 1 473 acres of area provides an estimated peak discharge of 0 96 cfs to the drainage ditches and using an area of 2 946 acres provides an estimated peak discharge of 1 92 cfs (i e 2 x 0 96 cfs) to the down drains The perimeter ditches will convey 0 96 cfs with a flow depth of about 0 4 foot and a safety factor of about 1 33 against erosion of the gravel armor material in the perimeter ditches An 18-inch diameter pipe will convey the 1 92 cfs with a headwater depth of 0 7 foot at the pipe inlet Since the inlet boxes are 1 5 feet deep below the perimeter ditch flow lines, the headwater depth of 0 7 foot will not obstruct or back storm water in the perimeter ditches

## Erosion Protection

Erosion protection calculations were completed on the gravel armor material for both the 10 percent top slope and the 3H 1V perimeter slopes of the closure caps These calculations were completed for the longest slopes (worst case conditions) represented for the closure caps of both cells Results were then applied to all slopes on both of the closure caps "Erosion and Sedimentation in Utah - A Guide for Control" published by the Utah Water Research Laboratory, February 1984, was used to determine the depth of the gravel armor needed for erosion protection The maximum length of the 10 percent slopes for both cells is 361 feet and the maximum length of the 3H 1V slopes is 99 36 feet Using these slope lengths, the minimum gravel armor thickness is 1 inch for the 10 percent slopes and 2 inches for the 3H 1V slopes

Stephens method from NUREG/CR-4651 was used to determine the minimum  $D_{50}$  size for the gravel armor material based on the estimated flow per foot of width across the gravel armor The flow per unit width was calculated using the storm water discharge rate estimated for an acre of area for the closure caps The slope length for the 10 percent slopes for the largest area under evaluation is 190 feet resulting in a width of 230 feet and the slope length for the 3H 1V slopes is 94 feet resulting in a width of 463 feet for corresponding one acre areas Dividing that storm water discharge of 0 65 cfs per acre by 190 and by 94 gives a flow per unit width of 0 003 cfs per foot for the 10 percent slopes and 0 002 cfs per foot for the 3H 1V slopes Concentration factors are not a component of NUREG/CR-4651 procedure, but are provided to show the types of flow concentration that may occur, beyond the safety factors already provided in the procedure, and still maintain erosion stability The concentration factors were calculated assuming a  $D_{50}$  size of approximately 1 inch, which is representative of the local gravel source historically used for the gravel armor A  $D_{50}$  size of 1 inch will allow for additional flow concentrations of 66 times on the 10 percent slopes and of 12 times on the 3H 1V slopes and still maintain stability against erosion An additional factor of 1 35, called Oliver's constant, was also applied to the flow rates as suggested in NUREG/CR-4651 Flow rates used for calculating the  $D_{50}$  size, after applying the factors discussed, are 0 273 cfs per foot for the 10 percent slopes and 0 032 cfs per foot for the 3H 1V slopes Calculated minimum  $D_{50}$  sizes are 0 90 inch for the 10 percent slopes and 0 96 inch for the 3H 1V slopes

The minimum gravel thickness should accommodate twice the  $D_{50}$  size rock which is about 2 inches Applying erosion control procedures for determining gravel thickness and using criteria for establishing the  $D_{50}$  rock size results in minimum gravel thicknesses of 2 inches for the 10 percent slopes and 3 inches for the 3H 1V slopes

The closure caps and cell embankments have historically received a gravel armor thickness of 4 inches (as is shown on the closure cap design drawings) due to the difficulty in consistently placing less thickness of gravel armor with a  $D_{50}$  size of about 1 inch. Observations show no noticeable erosion where gravel armor has previously been placed on closure caps and embankment slopes. Therefore, it is recommended that the erosion control measures consist of a targeted 4 inches of gravel armor thickness on all surfaces with a minimum of 3 inches on the 3H 1V slopes and a minimum of 2 inches on the 10 percent slopes.

## LEACHATE WITHDRAWAL PIPES

The leachate withdrawal pipes were evaluated to determine their structural integrity under the increased weight (or loading) resulting from the vertical expansion. High density polyethylene (HDPE) pipes with a standard dimension ratio (SDR) of 21 (Cell 6B) and 17 (Cell 7) were installed in the landfills and were evaluated for wall crushing, wall buckling, and ring deflection. Calculations show the vertical expansion should not jeopardize the structural integrity of the leachate withdrawal pipes.

## GEOTECHNICAL EVALUATIONS

Geotechnical stability and settlement evaluations were completed by Applied Geotechnical Engineering Consultants (AGEC) to determine the feasibility of increasing the closure cap height and are provided in a letter report dated September 28, 2009 (revised December 6, 2010). The letter report is included in Exhibit B.

Results from these evaluations show that the closure cap for Landfill Cell 6B can be raised to a height of 31.98 feet and the closure cap height for Landfill Cell 7 can be raised to a height of 33.13 feet from the top of the landfill cell embankments to the top of the highest point of the perimeter berms around the closure caps and still maintain stability and the integrity of other engineering aspects of the landfill cell and the closure cap.

### Stability

Stability analysis included an evaluation of global stability of the landfill and underlying soil structure with the proposed additional waste in place. Local stability of the 3:1 cap slope and liner interface stability were also considered. Stability analysis was conducted assuming both static and seismic conditions.

Stability evaluations were based on a seismic event having a 90 percent probability of not being exceeded in a 250 year period. A bedrock peak horizontal acceleration of 0.15g was used resulting in a horizontal ground acceleration of 0.20g for the site, which was used in the stability analysis. A seismic coefficient of one half of the PGA ( $k = 0.10g$ ) was used for the pseudo-static stability analysis. Soil parameters used were obtained from reports of previous geotechnical studies at the site. Safety factors were determined under static and seismic conditions for the overall landfill including subsurface soils and for the closure cap side slopes. Results of the analysis are presented in Table III-1.

Infinite slope stability analyses were used to determine interface stability safety factors for the design components of the 3H 1V and the 10 percent slopes of the closure caps. Results from

these analyses are also presented in Table III-1. The soil strength at the interface with the HDPE textured membrane on the 3H 1V slopes were evaluated to ensure that soil strength will not be exceeded.

**TABLE III-1**  
**Minimum Landfill and Closure Cap Safety Factors**  
**for Stability of Landfill Cell 6B and Landfill Cell 7**

Description	Safety Factor	
	Static	Seismic
Overall landfill slope stability, including subsurface soils	2.0	1.5
Closure cap slope stability	2.0	1.5
Interface slope stability on 3H 1V perimeter slopes using infinite slope analysis	4.5	3.5
Interface slope stability on top 10% slopes using infinite slope analysis	5.1	2.5

Note: Safety factors presented are minimum and are similar for Landfill Cells 6B and 7 combined.

### Settlement

Calculations were performed considering the additional waste height and increase in final closure top slope. Settlement calculations were completed to provide a settlement profile and to determine the final slope of the cell floor after settlement. Subsurface soil profiles and conditions were obtained from previous geotechnical evaluations performed at the site.

Landfill Cell 6B had a design slope of 2.7 percent at the time of construction and is estimated to have a final floor slope of 2.1 percent after settlement and Landfill Cell 7 had a design slope of 2.3 percent at the time of construction and is estimated to have a final floor slope of 1.8 percent after settlement with the modified closure designs. The final floor slopes meet the regulatory minimum slope requirements of 1 percent.

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## CHAPTER IV

### CONCLUSIONS

The Landfill Cell 6B and Landfill Cell 7 closure cap designs can be raised and modified as presented herein. The modified design is presented in the design drawings provided in Exhibit A and is summarized herein.

Layers (from the uppermost layer to the bottom layer) within the 10 percent top slopes and the 3H 1V perimeter slopes are provided below.

#### 10 Percent Top Slopes

4 inches of gravel armor erosion protection

2 feet of protective soil cover

Double sided geocomposite (consisting of 8 oz. Non-woven geotextile filter fabric bonded to both sides of geonet)

60-mil HDPE textured geomembrane

geosynthetic clay liner (GCL)

six inches (minimum) of soil cushion

#### 3H 1V Perimeter Slopes

4 inches of gravel armor erosion protection

2 feet of protective soil cover (compacted clay soil)

60-mil HDPE textured geomembrane

2 feet minimum of compacted clay liner (CCL)

Landfill Cell 6B is designed to have a maximum vertical height of 31.98 feet from the top of the cell embankment to the top of the perimeter berms. Total vertical height at the center of the Cell 6B closure cap is 48.82 feet above the cell embankment. Landfill Cell 7 is designed to have a maximum vertical height of 33.13 feet from the top of the cell embankment to the top of the perimeter berms. Total vertical height at the center of the Cell 7 closure cap is 63.92 feet above the cell embankment.

The perimeter drainage ditches are V-shaped with a perimeter berm providing the outside 3H 1V slope and the 10 percent closure cap slope providing the inside side slope for the ditches. The perimeter ditches are designed to receive storm water runoff from the 10 percent cap slope areas and convey the runoff to down drains which convey storm water to the bottom exterior toes of the landfill cell embankments.

The armor plating thickness (stone mulch) should be a minimum of 3 inches on the 3H 1V perimeter slopes and 2 inches on the 10% slopes. The target thickness of 4 inches provided on all surfaces in the design drawings allows for some grading tolerance during placement.

The modified capacity within Cell 6B is approximately 1,022,600 cubic yards and the modified capacity within Cell 7 is approximately 1,106,000 cubic yards. This vertical expansion will increase the capacity of Cells 6B and 7 by 430,600 cy and 373,000 cy, respectively.



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**EXHIBIT A**

**DESIGN DRAWINGS**

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GRASSY MOUNTAIN FACILITY  
**LANDFILL CELL 6B CLOSURE**  
**MODIFIED DESIGN**

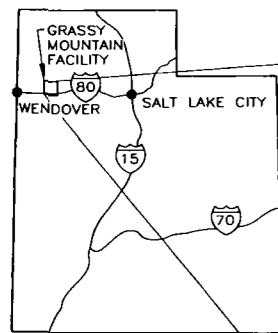
FACILITY LOCATION

KNOLLS, UTAH  
Phone (435) 884-8900

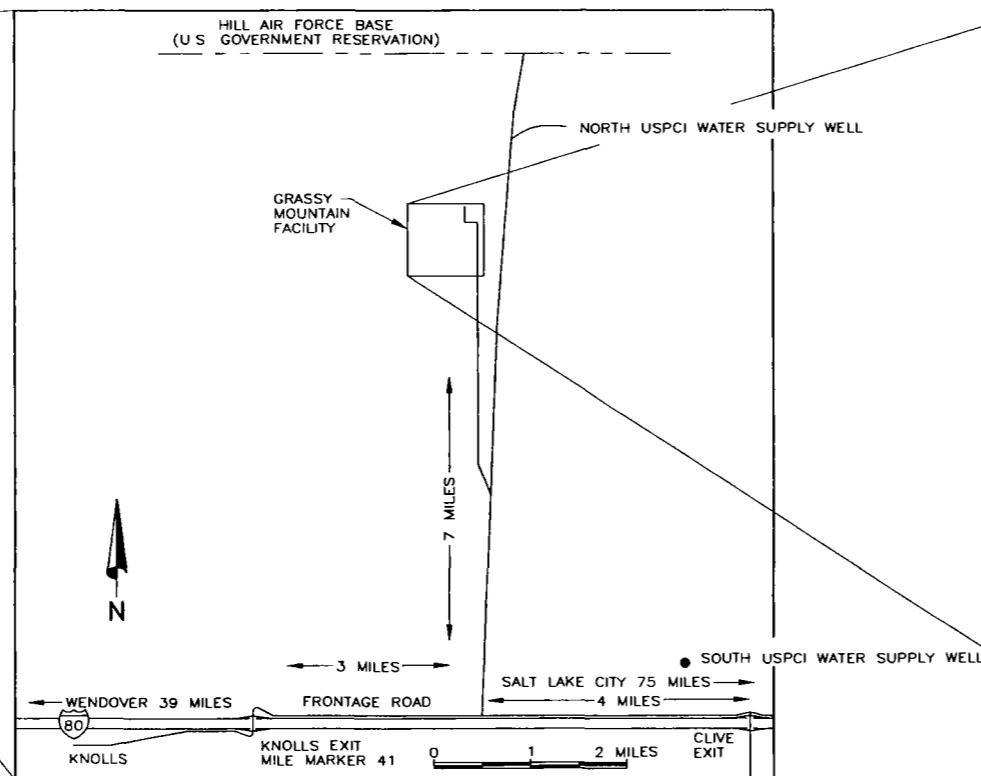
DECEMBER 2010

REGIONAL HEADQUARTERS

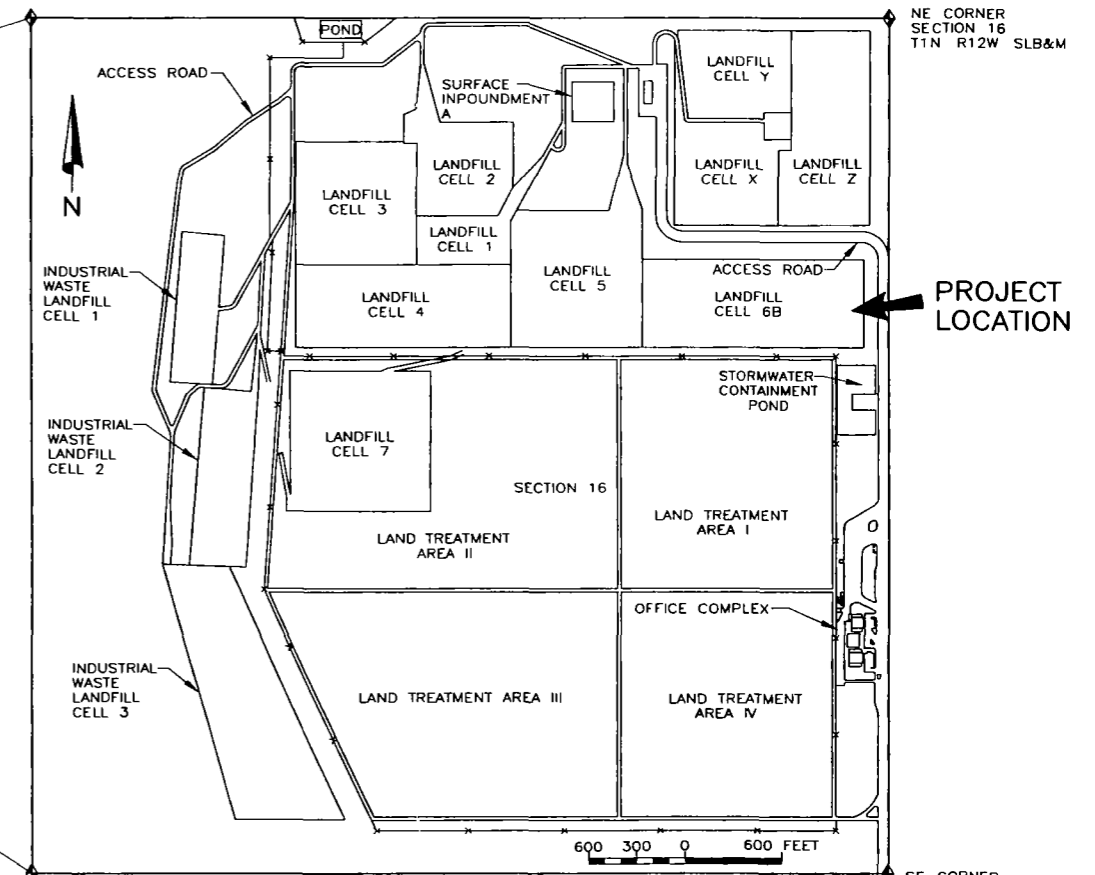
42 LONGWATER DRIVE  
NORWELL, MA 02061  
Phone (781) 792-5000



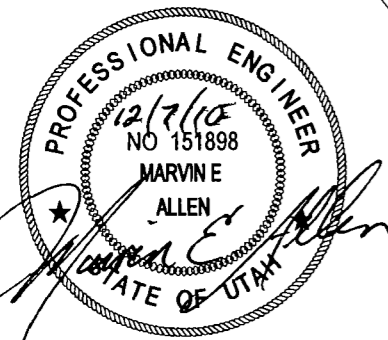
STATE OF UTAH



VICINITY MAP



PROJECT LOCATION



**GENERAL NOTES**

- COORDINATES AND ELEVATIONS PROVIDED ARE BASED ON SITE SPECIFIC COORDINATE SYSTEM AND DATUM CONTROL
- ALL ELEVATIONS PROVIDED ARE BASED ON ORIGINAL EMBANKMENT DESIGN AND CONSTRUCTION ELEVATIONS ADJUSTMENTS SHALL BE MADE PRIOR TO CLOSURE TO ACCOUNT FOR SETTLEMENT

**LINING SYSTEM SUBGRADES & SOIL FILL**

- ALL SURFACES PROVIDING SUBGRADES FOR LINING SYSTEMS SHALL BE PROOF ROLLED FOR SOFT AND/OR YIELDING SURFACES SOFT AND/OR YIELDING SURFACES SHALL BE COMPACTED TO PROVIDE A FIRM SUBGRADE FOR LINING SYSTEMS
- ALL CLAY LINER MATERIALS SHALL BE COMPACTED TO 95% OF ASTM D-698 AT A MOISTURE CONTENT BETWEEN MINUS 2% AND PLUS 4% OF OPTIMUM ALL CLAY LINER SHALL MEET THE REQUIRED PERMEABILITY OF 1 X 10<sup>-7</sup> CM/SEC A DEFLOCCULATING AGENT (SODIUM-TRIPOLY PHOSPHATE) MIXED WITH THE CLAY LINER AT A MINIMUM RATE OF 3.5 POUNDS PER 50 CUBIC FEET OF LOOSE MATERIAL IS TYPICALLY REQUIRED TO MEET THE REQUIRED PERMEABILITY CLAY LINER SURFACES SHALL BE MAINTAINED UNTIL PLACEMENT OF OVERLYING GEOSYNTHETIC MATERIALS
- ALL FILL MATERIALS REQUIRING COMPACTION ON THE PERIMETER SIDESLOPES PIPE BACKFILL AND OTHER DESIGNATED COMPACTION AREAS SHALL BE COMPACTED TO 95% OF ASTM D-698 AT A MOISTURE REQUIRED TO FACILITATE COMPACTION
- THE SUB-GRADE FOR THE GEOSYNTHETIC MATERIALS SHALL BE FREE OF PROTRUDING ROCKS AND DEBRIS THAT MAY POTENTIALLY CAUSE DAMAGE TO THE GEOSYNTHETIC MATERIALS THE SUBGRADE SHALL ALSO BE ROLLED WITH A SMOOTH DRUM ROLLER TO LEAVE THE SURFACE SMOOTH
- BORROW SOURCES FOR 6-INCH THICK SAND AND 2-FOOT THICK PROTECTIVE SOIL COVER LAYERS TO BE APPROVED BASED ON THE FOLLOWING TESTS USING LIQUID OBTAINED FROM SYNTHETIC LEACHATE PRODUCED USING BORROW SOURCE SOILS 1 SCREENING CLAY PORTION OF GEOSYNTHETIC CLAY LINER FOR CHEMICAL COMPATIBILITY TO LIQUIDS (ASTM D6141) 2 SWELL INDEX (ASTM D5890) 3 FLUID LOSS TESTING (ASTM D5891) AND 4 HYDRAULIC CONDUCTIVITY (ASTM D6766 OR ASTM D5084) AS REQUIRED BY THE ENGINEER BASED ON RESULTS OF OTHER TESTING MAXIMUM HYDRAULIC CONDUCTIVITY OF GCL SHALL MEET AN EQUIVALENCY OF A 2-FOOT THICK COMPACTED CLAY LINER WITH A HYDRAULIC CONDUCTIVITY OF 1X10<sup>-7</sup> CM/SEC
- COMPACTED CLAY SOIL ON THE PERIMETER SLOPES HAS NO PERMEABILITY REQUIREMENT AND SHALL BE COMPACTED TO 95% OF ASDM D-698

**GENERAL GEOSYNTHETICS**

- MANUFACTURER S CERTIFICATIONS SHALL BE PROVIDED FOR ALL RAW AND MANUFACTURED MATERIALS CERTIFICATIONS SHALL BE IN ACCORDANCE WITH THE MANUFACTURER S MATERIAL SPECIFICATIONS AND PROJECT COA PLAN CRITERIA AND SHALL INCLUDE ALL TEST DATA FOR MATERIALS DELIVERED AND AT A MINIMUM THE TEST FREQUENCIES DESIGNATED IN THE MANUFACTURER S QUALITY ASSURANCE MANUALS AND SPECIFICATIONS AND THE PROJECT COA PLAN
- ALL GEOSYNTHETIC MATERIALS SHALL BE LOADED TRANSPORTED OFF-LOADED STORED AND HANDLED IN ACCORDANCE WITH MANUFACTURER RECOMMENDATIONS
- AT A MINIMUM ALL GEOSYNTHETIC MATERIALS SHALL BE INSTALLED IN ACCORDANCE WITH MANUFACTURER S RECOMMENDATIONS AND INSTALLATION GUIDES AND IN ACCORDANCE WITH THE PROJECT SPECIFICATIONS AND COA PLAN
- THE GEOSYNTHETIC INSTALLER SHALL PROVIDE A SUBGRADE ACCEPTANCE CERTIFICATION FOR ALL AREAS OF GCL DEPLOYMENT

**GEOSYNTHETIC CLAY LINER (GCL)**

- ALL GCL MATERIALS SHALL BE NEEDLE PUNCH REINFORCED
- GCL SHALL BE DEPLOYED WITH NON-WOVEN GEOTEXTILE SIDE UP
- ALL DEPLOYED GCL MATERIALS SHALL BE COVERED BY THE END OF EACH WORK DAY TO MINIMIZE EVAPORATION OF MOISTURE WITHIN THE BENTONITE AND TO PROTECT THE GCL MATERIALS FROM EXPOSURE TO RAINY AND SNOWY WEATHER
- SEAMING SHALL BE IN ACCORDANCE WITH MANUFACTURER S RECOMMENDATIONS THE PROJECT SPECIFICATIONS AND THE PROJECT COA PLAN
- GCL MATERIALS THAT ARE MANUFACTURED TO PROVIDE SELF-SEALING SEAMS AND DO NOT REQUIRE A BENTONITE BEAD SHALL RECEIVE A BENTONITE BEAD WHEN THE SELF-SEALING DESIGN IS COMPROMISED ON THE ENDS OF PANELS AND WHERE THE SELF-SEALING GROOVE (IF PART OF THE SELF-SEALING DESIGN) HAS BEEN REMOVED FROM PARTIAL WIDTH ROLLS
- GCL MATERIALS THAT HAVE NOT BEEN MANUFACTURED TO PROVIDE SELF SEALING SEAMS SHALL RECEIVE A BENTONITE BEAD TO PROVIDE THE SEAM SEAL IN ACCORDANCE WITH MANUFACTURER S RECOMMENDATIONS

**GEOMEMBRANE LINER**

- ALL GEOMEMBRANE MATERIALS SHALL BE TEXTURED ON BOTH SIDES
- NO GEOMEMBRANE MATERIALS SHALL BE DEPLOYED IN SUB-FREEZING TEMPERATURES UNLESS APPROVED BY OWNER WITH AN APPROVED COLD WEATHER DEPLOYMENT PLAN
- NO SEAMING SHALL BE ALLOWED IN SUB-FREEZING TEMPERATURES WITHOUT OWNER APPROVAL OF AN APPROPRIATE COLD WEATHER SEAMING PLAN AND ONLY AFTER PROPER DEMONSTRATION OF PRE-QUALIFIED TEST SEAMS
- FIELD TESTING AND QUALITY CONTROL SHALL FOLLOW AT A MINIMUM THE REQUIREMENTS PROVIDED IN THE MOST RECENT VERSION OF THE INTERNATIONAL ASSOCIATION OF GEOSYNTHETIC INSTALLERS HDPE AND LLDPE GEOMEMBRANE INSTALLATION SPECIFICATION THE MANUFACTURERS INSTALLATION PROCEDURES AND/OR THE PROJECT SPECIFICATIONS AND COA PLAN WHICHEVER IS MOST STRINGENT

**DRAINAGE COMPOSITE**

- DOUBLE-SIDED DRAINAGE COMPOSITE SHALL CONSIST OF 802 NON-WOVEN GEOTEXTILE BONDED TO BOTH SIDES OF GEONET
- GEOMEMBRANE MATERIALS SHALL BE CLEANED OF DIRT AND DEBRIS PRIOR TO DEPLOYMENT OF DRAINAGE COMPOSITS
- DRAINAGE COMPOSITE SHALL BE FASTENED OR SECURED WITH HEAT BONDING SEWING OR OTHER APPROVED METHOD BETWEEN GEOTEXTILE FABRIC MATERIALS ALONG THE ENTIRE LENGTH OF THE SEAMS
- OVERLAPS OF SEAMS SHALL BE AT A MINIMUM THE DIMENSIONS RECOMMENDED BY THE MANUFACTURERS

**PROTECTIVE SOIL COVER**

- CARE SHALL BE EXERCISED DURING PLACEMENT OF PROTECTIVE SOIL COVER MATERIALS A MINIMUM COVER THICKNESS AS DESIGNATED IN THE PROJECT SPECIFICATIONS AND/OR THE PROJECT COA PLAN SHALL BE MAINTAINED AT ALL TIMES BETWEEN THE TIRES OR TRACKS OF EQUIPMENT AND THE UNDERLYING GEOSYNTHETIC MATERIALS
- NO SHARP ABRUPT OR PIVOTING TURNS SHALL BE ALLOWED BY EQUIPMENT USED ABOVE THE PROTECTIVE SOIL COVER THAT MAY CAUSE SOIL DISPLACEMENT AND DAMAGE TO UNDERLYING GEOSYNTHETIC MATERIALS
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- TYPE I RIPRAP AND TYPE II FILTER TO EXTEND AT A RADIUS OF 14 FEET MINIMUM FROM THE DOWNSPOUT PIPE OUTLET (WHERE BAFFLED OUTLETS ARE NOT PROVIDED) AND TO CONSIST OF THE FOLLOWING GRADATIONS

	7 SMALLER BY WEIGHT	INTERMEDIATE ROCK DIMENSION (INCHES)	MEAN ROCK DIAMETER D <sub>50</sub> (INCHES)
TYPE I RIPRAP	70-100 50-70 35-50 2-10	14 12 9 3	9
	U S STANDARD SIEVE SIZE	PERCENT PASSING BY WEIGHT	
TYPE II GRANULAR FILTER	3-INCH 3/4 INCH NO 4 NO 16 NO 200	90-100 35-90 8-30 0-10 0-3	

**INDEX OF DRAWINGS**

**GENERAL**

- G6B-1 COVER SHEET
- G6B-2 INDEX SHEET

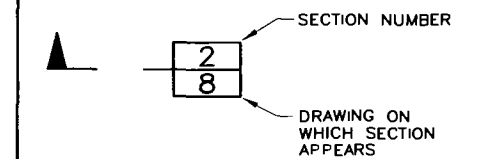
**CIVIL-CELL 6B CLOSURE**

- C6B-1 WASTE GRADE PLAN
- C6B-2 LINER SURFACE PLAN
- C6B-3 FINAL CLOSURE PLAN
- C6B-4 TYPICAL HIGH-LOW SECTIONS

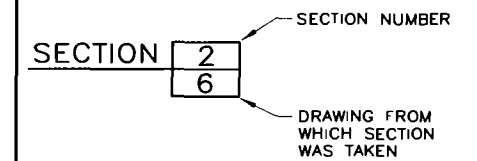
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**SECTION IDENTIFICATION**

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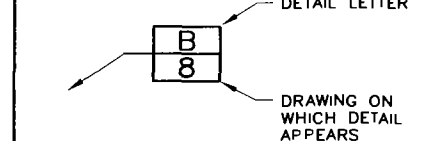


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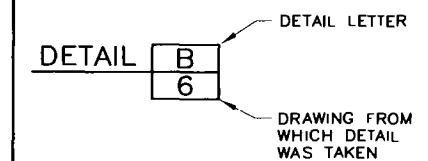


**DETAIL IDENTIFICATION**

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ON DRAWING NO 8 THIS DETAIL IS IDENTIFIED AS



**NOTES**

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FILE NAME PROJECTS\064 - CLEAN HARBORS\82.100 - CURRENT - CB6-C7 MOUNDING\CAD\CELL 6B\CURRENT DESIGN\G6B-2 CELL 6B INDEX SHEET.DWG  
FILE DATE 12.6.2010 10.48.41 (CAH)



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CHECKED MEA	1
PROJECT ENGINEER	
DATE DECEMBER 2010	NO
DATE	DATE

NO	DATE	REVISIONS	BY	APVD

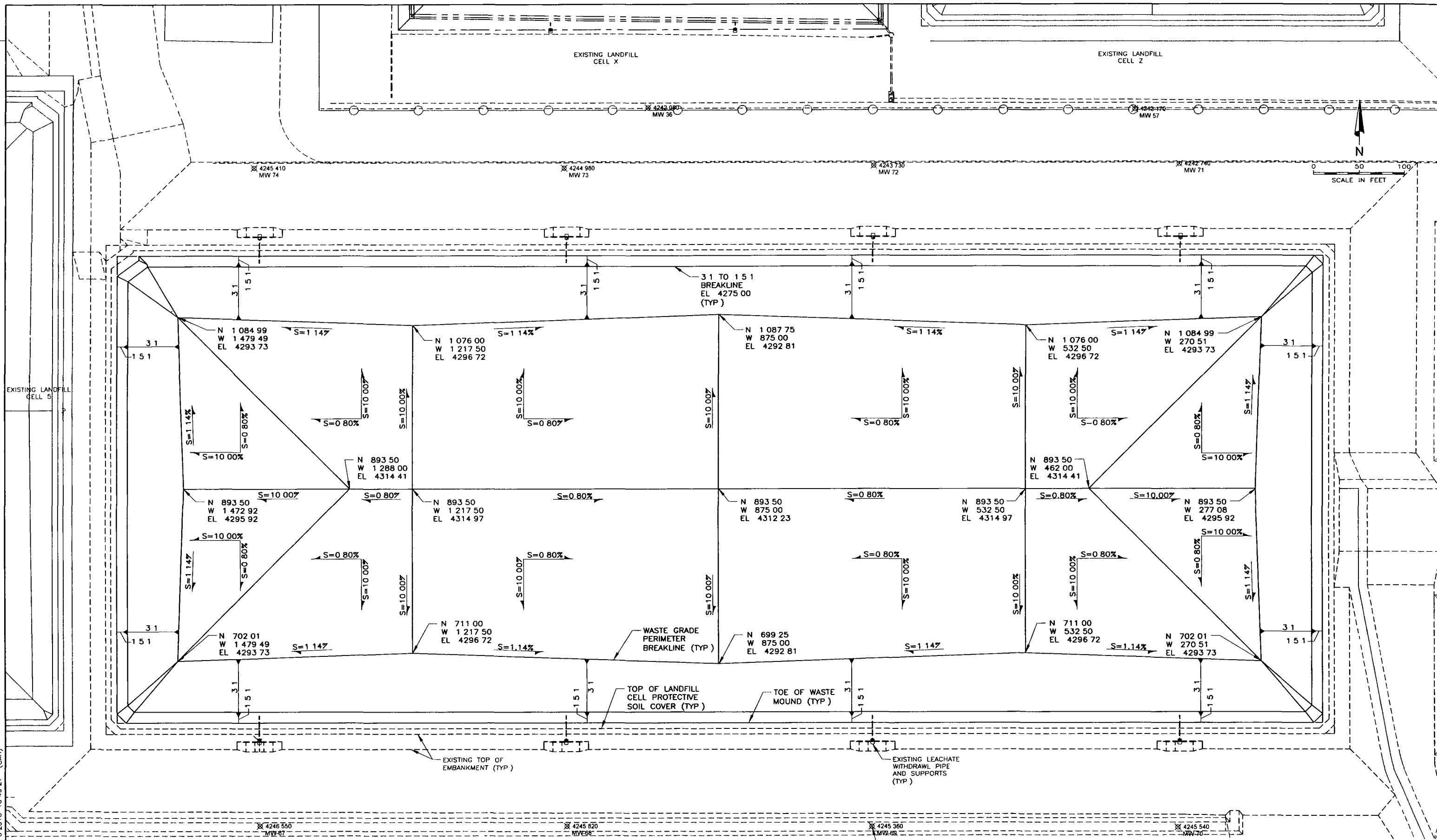
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GRASSY MOUNTAIN FACILITY  
LANDFILL CELL 6B - CLOSURE  
INDEX SHEET

SHEET  
G6B-2  
64.82.100

FILE NAME: PROJECTS\064 - CLEAN HARBORS\82100 - CURRENT - C6B-C7 MOUNDING\CAD\CELL 6B\CURRENT DESIGN\C6B-1 CELL 6B CLOSURE - WASTE GRADE PLAN.DWG  
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DATE		

NO.	DATE	REVISIONS

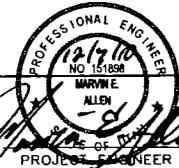
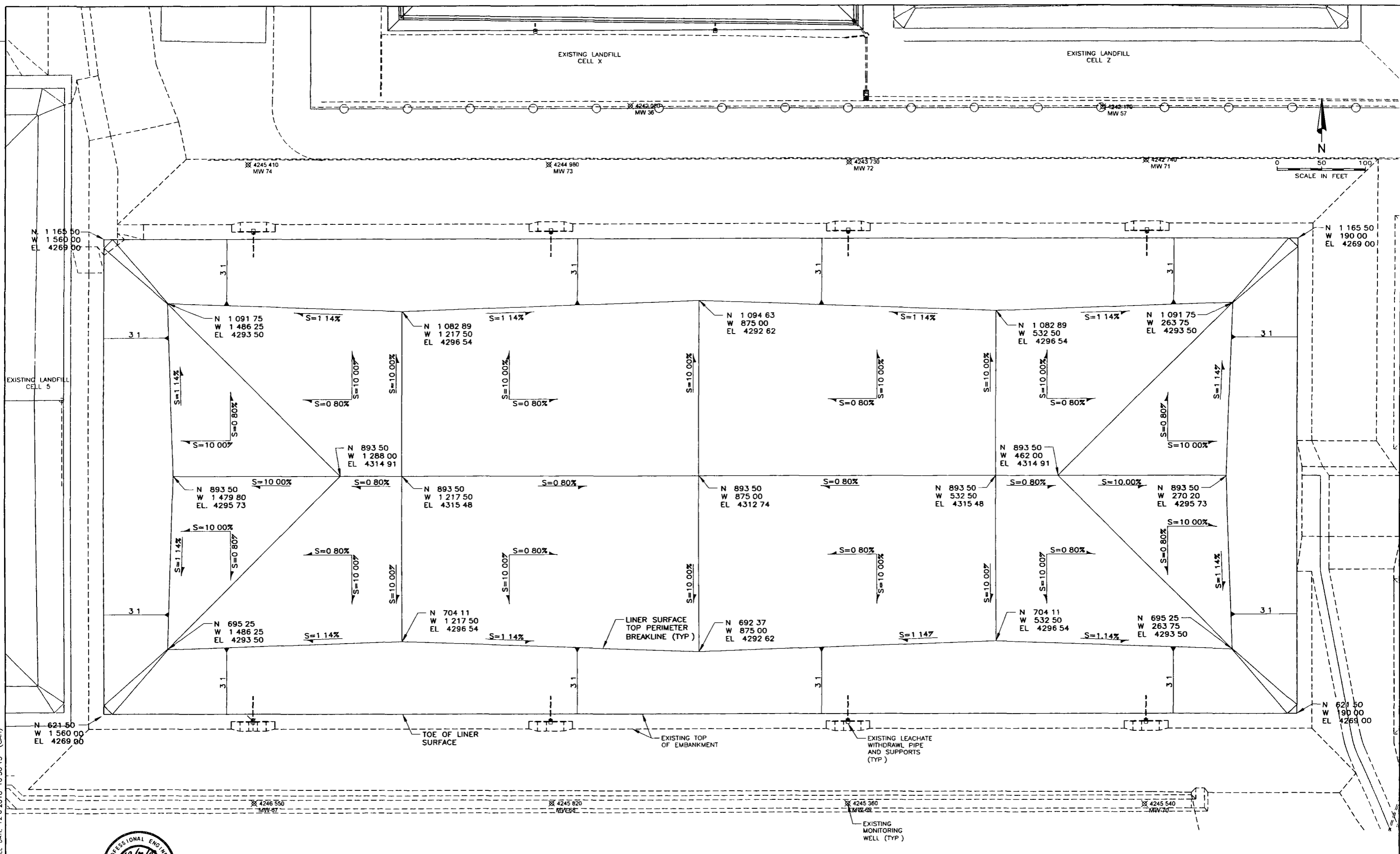
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GRASSY MOUNTAIN FACILITY  
 LANDFILL CELL 6B - CLOSURE  
 WASTE GRADE PLAN

SHEET  
 C6B-1  
 64 82 100

FILE NAME PROJECTS\064 - CLEAN HARBORS\82.100 - CURRENT - C6B-C7 MOUNDING\CAD\CELL 6B\CURRENT DESIGN\C6B-2 CELL 6B CLOSURE - LINER SURFACE PLAN DWG  
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REVISIONS	
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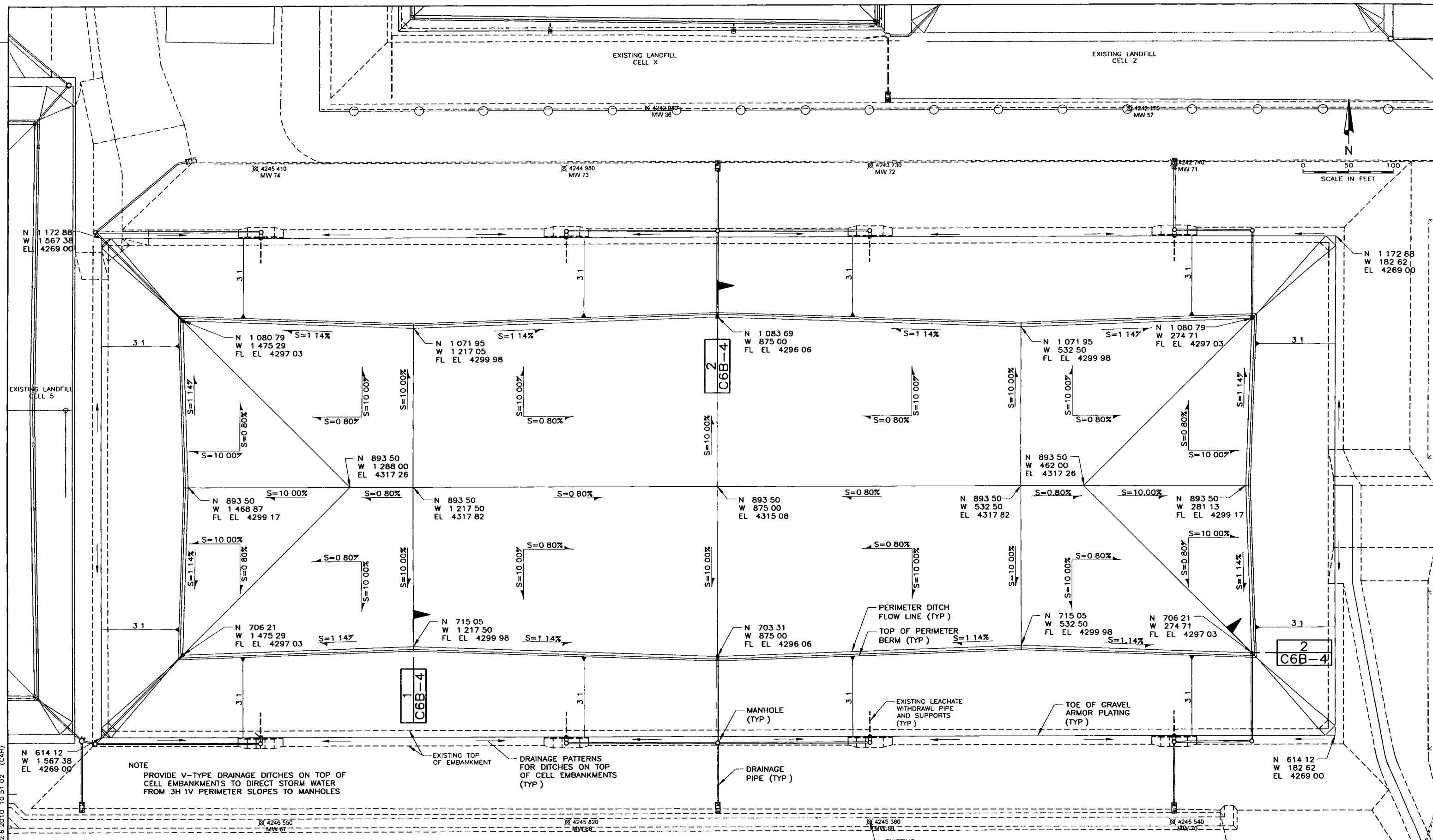
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GRASSY MOUNTAIN FACILITY  
 LANDFILL CELL 6B - CLOSURE  
 LINER SURFACE PLAN

SHEET  
**C6B-2**  
 64 82 100

FILE NAME: PROJECTS\064 - CLEAN HARBORS\82100 - CURRENT - C6B-C7 MOUNDING\CAD\CELL 6B\CURRENT DESIGN\C6B-3 CELL 6B CLOSURE - FINAL CLOSURE PLAN.DWG  
 FILE DATE: 12 6 2010 10:51:02 (CAH)



NOTE  
 PROVIDE V-TYPE DRAINAGE DITCHES ON TOP OF CELL EMBANKMENTS TO DIRECT STORM WATER FROM 3H 1V PERIMETER SLOPES TO MANHOLES

EXISTING TOP OF EMBANKMENT  
 DRAINAGE PATTERNS FOR DITCHES ON TOP OF CELL EMBANKMENTS (TYP)  
 DRAINAGE PIPE (TYP)

PERIMETER DITCH FLOW LINE (TYP)  
 TOP OF PERIMETER BERM (TYP)  
 EXISTING LEACHATE WITHDRAWAL PIPE AND SUPPORTS (TYP)  
 TOE OF GRAVEL ARMOR PLATING (TYP)

EXISTING MONITORING WELL (TYP)



DESIGNED	KCS	3
DRAFTED	CAH	2
CHECKED	MEA	1
DATE	DECEMBER 2010	NO

NO	DATE	REVISIONS	BY	APPROVED

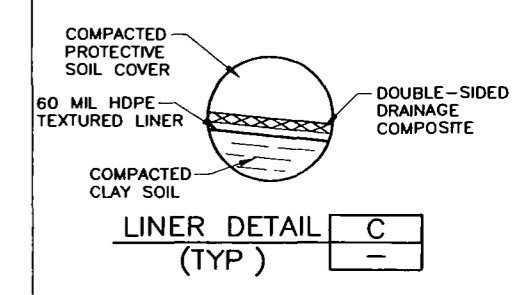
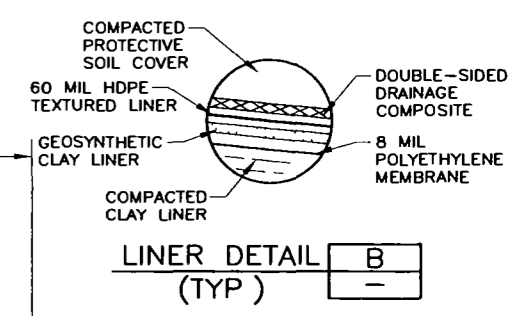
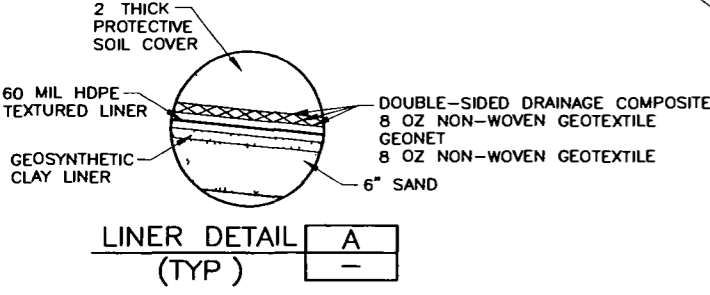
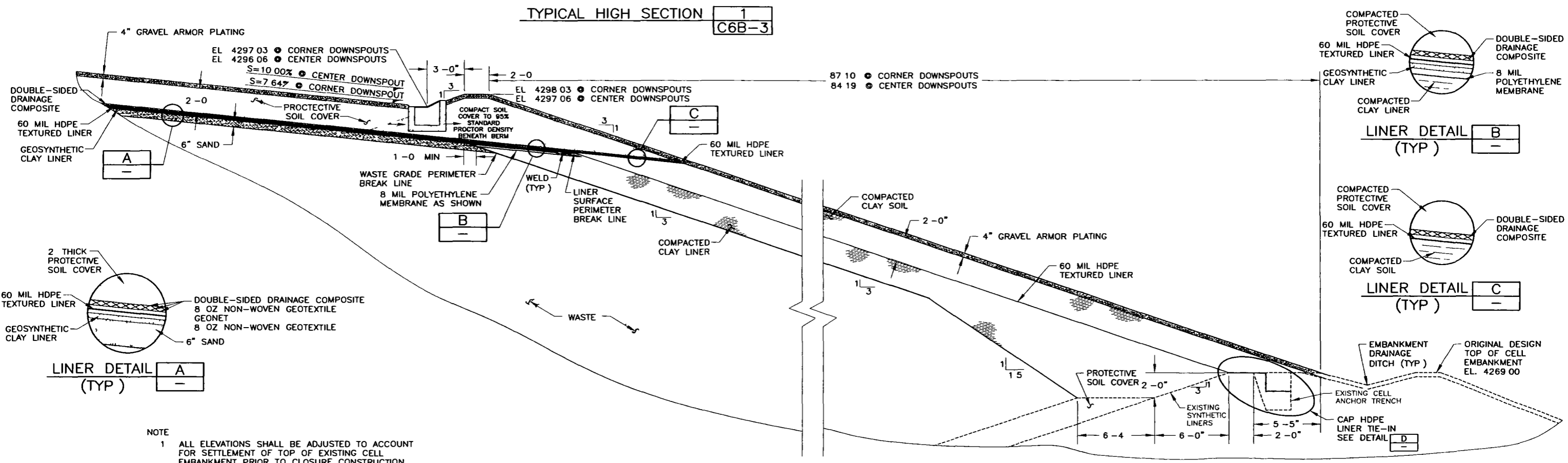
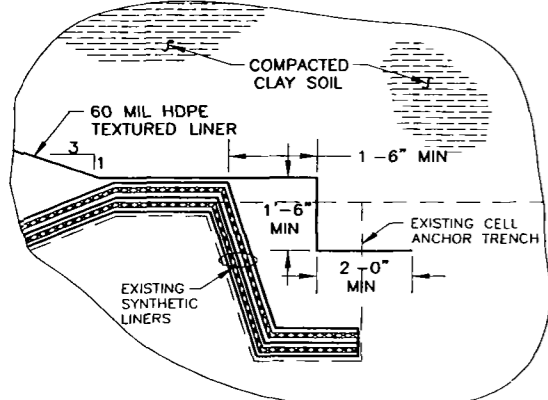
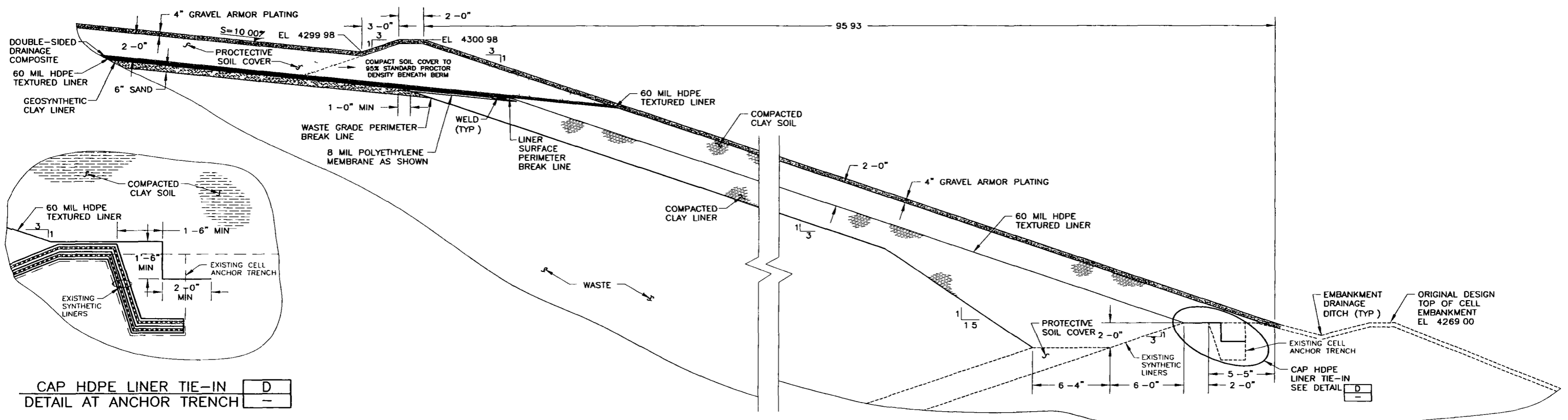
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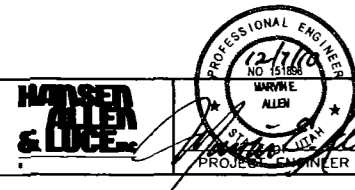
GRASSY MOUNTAIN FACILITY  
 LANDFILL CELL 6B - CLOSURE  
 FINAL CLOSURE PLAN

SHEET  
**C6B-3**  
 64 82 100

FILE NAME: PROJECTS\064 - CLEAN HARBORS\82100 - CURRENT - C6B-C7 MOUNDING\CAD\CELL 6B TYP HIGH LOW SECTIONS.DWG  
 FILE DATE: 12/8/2010 10:52:12 (CAH)  
 15/07



**NOTE**  
1 ALL ELEVATIONS SHALL BE ADJUSTED TO ACCOUNT FOR SETTLEMENT OF TOP OF EXISTING CELL EMBANKMENT PRIOR TO CLOSURE CONSTRUCTION



DESIGNED	KCS	3					
DRAFTED	CAH	2					
CHECKED	MEA	1					
DATE	DECEMBER 2010	NO	DATE				

SCALE  
NOT TO SCALE



GRASSY MOUNTAIN FACILITY  
LANDFILL CELL 6B - CLOSURE  
TYPICAL HIGH-LOW SECTIONS

SHEET  
C6B-4  
64 82 100



# CleanHarbors®

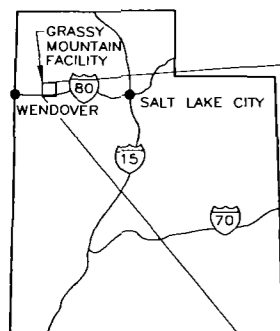
ENVIRONMENTAL SERVICES, INC.

## GRASSY MOUNTAIN FACILITY LANDFILL CELL 7 CLOSURE MODIFIED DESIGN

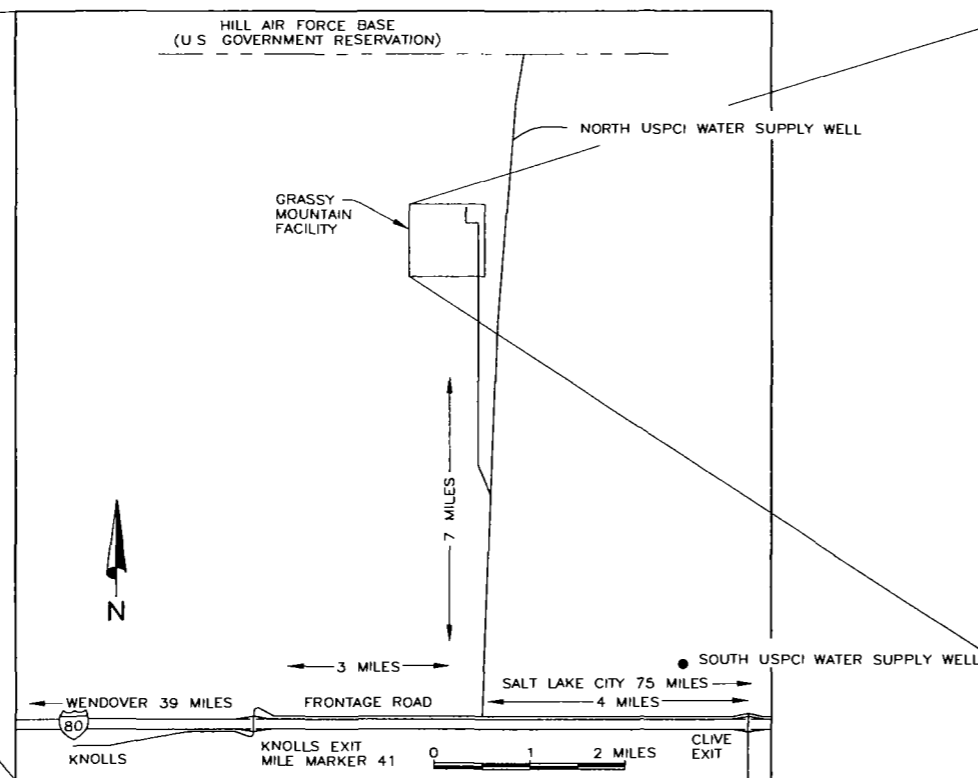
FACILITY LOCATION  
KNOLLS, UTAH  
Phone (435) 884-8900

DECEMBER 2010

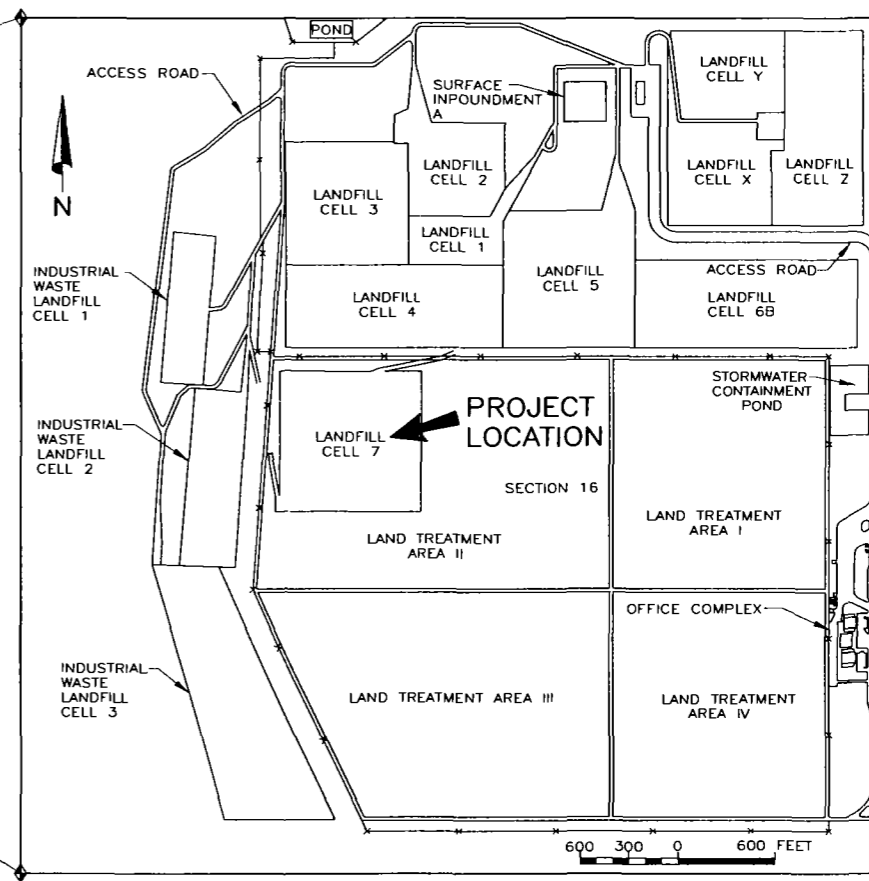
REGIONAL HEADQUARTERS  
42 LONGWATER DRIVE  
NORWELL, MA 02061  
Phone (781) 792-5000



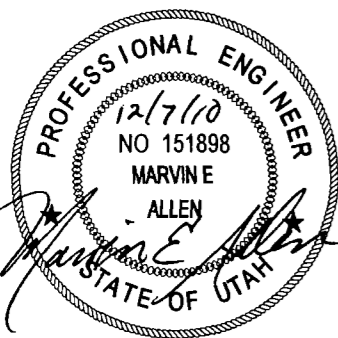
STATE OF UTAH



VICINITY MAP



PROJECT LOCATION



**GENERAL NOTES**

- COORDINATES AND ELEVATIONS PROVIDED ARE BASED ON SITE SPECIFIC COORDINATE SYSTEM AND DATUM CONTROL
- ALL ELEVATIONS PROVIDED ARE BASED ON ORIGINAL EMBANKMENT DESIGN AND CONSTRUCTION ELEVATIONS. ADJUSTMENTS SHALL BE MADE PRIOR TO CLOSURE TO ACCOUNT FOR SETTLEMENT

**LINING SYSTEM SUBGRADES & SOIL FILL**

- ALL SURFACES PROVIDING SUBGRADES FOR LINING SYSTEMS SHALL BE PROOF ROLLED FOR SOFT AND/OR YIELDING SURFACES. SOFT AND/OR YIELDING SURFACES SHALL BE COMPACTED TO PROVIDE A FIRM SUBGRADE FOR LINING SYSTEMS
- ALL CLAY LINER MATERIALS SHALL BE COMPACTED TO 95% OF ASTM 0-698 AT A MOISTURE CONTENT BETWEEN MINUS 2% AND PLUS 4% OF OPTIMUM. ALL CLAY LINER SHALL MEET THE REQUIRED PERMEABILITY OF 1 X 10<sup>-7</sup> CM/SEC. A DEFLOCCULATING AGENT (SODIUM-TRIPOLY PHOSPHATE) MIXED WITH THE CLAY LINER AT A MINIMUM RATE OF 3.5 POUNDS PER 50 CUBIC FEET OF LOOSE MATERIAL IS TYPICALLY REQUIRED TO MEET THE REQUIRED PERMEABILITY. CLAY LINER SURFACES SHALL BE MAINTAINED UNTIL PLACEMENT OF OVERLYING GEOSYNTHETIC MATERIALS
- ALL FILL MATERIALS REQUIRING COMPACTION ON THE PERIMETER SIDESLOPES, PIPE BACKFILL AND OTHER DESIGNATED COMPACTION AREAS SHALL BE COMPACTED TO 95% OF ASTM D-698 AT A MOISTURE REQUIRED TO FACILITATE COMPACTION
- THE SUB-GRADE FOR THE GEOSYNTHETIC MATERIALS SHALL BE FREE OF PROTRUDING ROCKS AND DEBRIS THAT MAY POTENTIALLY CAUSE DAMAGE TO THE GEOSYNTHETIC MATERIALS. THE SUBGRADE SHALL ALSO BE ROLLED WITH A SMOOTH DRUM ROLLER TO LEAVE THE SURFACE SMOOTH
- BORROW SOURCES FOR 6-INCH THICK SAND AND 2-FOOT THICK PROTECTIVE SOIL COVER LAYERS TO BE APPROVED BASED ON THE FOLLOWING TESTS USING LIQUID OBTAINED FROM SYNTHETIC LEACHATE PRODUCED USING BORROW SOURCE SOILS: 1 SCREENING CLAY PORTION OF GEOSYNTHETIC CLAY LINER FOR CHEMICAL COMPATIBILITY TO LIQUIDS (ASTM D6141) 2 SWELL INDEX (ASTM D5890) 3 FLUID LOSS TESTING (ASTM D5891) AND 4 HYDRAULIC CONDUCTIVITY (ASTM D6766 OR ASTM D5084) AS REQUIRED BY THE ENGINEER BASED ON RESULTS OF OTHER TESTING. MAXIMUM HYDRAULIC CONDUCTIVITY OF GCL SHALL MEET AN EQUIVALENCY OF A 2-FOOT THICK COMPACTED CLAY LINER WITH A HYDRAULIC CONDUCTIVITY OF 1X10<sup>-7</sup> CM/SEC
- COMPACTED CLAY SOIL ON THE PERIMETER SLOPES HAS NO PERMEABILITY REQUIREMENT AND SHALL BE COMPACTED TO 95% OF ASDM D-698

**GENERAL GEOSYNTHETICS**

- MANUFACTURER'S CERTIFICATIONS SHALL BE PROVIDED FOR ALL RAW AND MANUFACTURED MATERIALS. CERTIFICATIONS SHALL BE IN ACCORDANCE WITH THE MANUFACTURER'S MATERIAL SPECIFICATIONS AND PROJECT COA PLAN CRITERIA AND SHALL INCLUDE ALL TEST DATA FOR MATERIALS DELIVERED AND AT A MINIMUM THE TEST FREQUENCIES DESIGNATED IN THE MANUFACTURER'S QUALITY ASSURANCE MANUALS AND SPECIFICATIONS AND THE PROJECT COA PLAN
- ALL GEOSYNTHETIC MATERIALS SHALL BE LOADED, TRANSPORTED, OFF-LOADED, STORED AND HANDLED IN ACCORDANCE WITH MANUFACTURER RECOMMENDATIONS
- AT A MINIMUM ALL GEOSYNTHETIC MATERIALS SHALL BE INSTALLED IN ACCORDANCE WITH MANUFACTURER'S RECOMMENDATIONS AND INSTALLATION GUIDES AND IN ACCORDANCE WITH THE PROJECT SPECIFICATIONS AND COA PLAN
- THE GEOSYNTHETIC INSTALLER SHALL PROVIDE A SUBGRADE ACCEPTANCE CERTIFICATION FOR ALL AREAS OF GCL DEPLOYMENT

**GEOSYNTHETIC CLAY LINER (GCL)**

- ALL GCL MATERIALS SHALL BE NEEDLE PUNCH REINFORCED
- GCL SHALL BE DEPLOYED WITH NON-WOVEN GEOTEXTILE SIDE UP
- ALL DEPLOYED GCL MATERIALS SHALL BE COVERED BY THE END OF EACH WORK DAY TO MINIMIZE EVAPORATION OF MOISTURE WITHIN THE BENTONITE AND TO PROTECT THE GCL MATERIALS FROM EXPOSURE TO RAINY AND SNOWY WEATHER
- SEAMING SHALL BE IN ACCORDANCE WITH MANUFACTURER'S RECOMMENDATIONS THE PROJECT SPECIFICATIONS AND THE PROJECT COA PLAN
- GCL MATERIALS THAT ARE MANUFACTURED TO PROVIDE SELF-SEALING SEAMS AND DO NOT REQUIRE A BENTONITE BEAD SHALL RECEIVE A BENTONITE BEAD WHEN THE SELF-SEALING DESIGN IS COMPROMISED ON THE ENDS OF PANELS AND WHERE THE SELF-SEALING GROOVE (IF PART OF THE SELF-SEALING DESIGN) HAS BEEN REMOVED FROM PARTIAL WIDTH ROLLS
- GCL MATERIALS THAT HAVE NOT BEEN MANUFACTURED TO PROVIDE SELF SEALING SEAMS SHALL RECEIVE A BENTONITE BEAD TO PROVIDE THE SEAM SEAL IN ACCORDANCE WITH MANUFACTURER'S RECOMMENDATIONS

**GEOMEMBRANE LINER**

- ALL GEOMEMBRANE MATERIALS SHALL BE TEXTURED ON BOTH SIDES
- NO GEOMEMBRANE MATERIALS SHALL BE DEPLOYED IN SUB-FREEZING TEMPERATURES UNLESS APPROVED BY OWNER WITH AN APPROVED COLD WEATHER DEPLOYMENT PLAN
- NO SEAMING SHALL BE ALLOWED IN SUB-FREEZING TEMPERATURES WITHOUT OWNER APPROVAL OF AN APPROPRIATE COLD WEATHER SEAMING PLAN AND ONLY AFTER PROPER DEMONSTRATION OF PRE-QUALIFIED TEST SEAMS
- FIELD TESTING AND QUALITY CONTROL SHALL FOLLOW AT A MINIMUM THE REQUIREMENTS PROVIDED IN THE MOST RECENT VERSION OF THE INTERNATIONAL ASSOCIATION OF GEOSYNTHETIC INSTALLERS HDPE AND LLDPE GEOMEMBRANE INSTALLATION SPECIFICATION THE MANUFACTURER'S INSTALLATION PROCEDURES AND/OR THE PROJECT SPECIFICATIONS AND COA PLAN WHICHEVER IS MOST STRINGENT

**DRAINAGE COMPOSITE**

- DOUBLE-SIDED DRAINAGE COMPOSITE SHALL CONSIST OF 80Z NON-WOVEN GEOTEXTILE BONDED TO BOTH SIDES OF GEONET
- GEOMEMBRANE MATERIALS SHALL BE CLEANED OF DIRT AND DEBRIS PRIOR TO DEPLOYMENT OF DRAINAGE COMPOSITE
- DRAINAGE COMPOSITE SHALL BE FASTENED OR SECURED WITH HEAT BONDING SEWING OR OTHER APPROVED METHOD BETWEEN GEOTEXTILE FABRIC MATERIALS ALONG THE ENTIRE LENGTH OF THE SEAMS
- OVERLAPS OF SEAMS SHALL BE AT A MINIMUM THE DIMENSIONS RECOMMENDED BY THE MANUFACTURERS

**PROTECTIVE SOIL COVER**

- CARE SHALL BE EXERCISED DURING PLACEMENT OF PROTECTIVE SOIL COVER MATERIALS. A MINIMUM COVER THICKNESS AS DESIGNATED IN THE PROJECT SPECIFICATIONS AND/OR THE PROJECT COA PLAN SHALL BE MAINTAINED AT ALL TIMES BETWEEN THE TIRES OR TRACKS OF EQUIPMENT AND THE UNDERLYING GEOSYNTHETIC MATERIALS
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- TYPE I RIPRAP AND TYPE II FILTER TO EXTEND AT A RADIUS OF 14 FEET MINIMUM FROM THE DOWNSPOUT PIPE OUTLET (WHERE BAFFLED OUTLETS ARE NOT PROVIDED) AND TO CONSIST OF THE FOLLOWING GRADATIONS

	% SMALLER BY WEIGHT	INTERMEDIATE ROCK DIMENSION (INCHES)	MEAN ROCK DIAMETER D <sub>50</sub> (INCHES)
TYPE I RIPRAP	70-100	14	9
	50-70	12	
	35-50	9	
	2-10	3	
	U.S. STANDARD SIEVE SIZE	PERCENT PASSING BY WEIGHT	
TYPE II GRANULAR FILTER	3-INCH	90-100	
	3/4 INCH	35-90	
	NO. 4	8-30	
	NO. 16	0-10	
	NO. 200	0-3	

**INDEX OF DRAWINGS**

**GENERAL**

- G7-1 COVER SHEET
- G7-2 INDEX SHEET

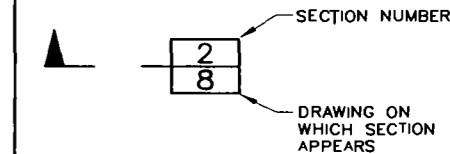
**CIVIL-CELL 7 CLOSURE**

- C7-1 WASTE GRADE PLAN
- C7-2 LINER SURFACE PLAN
- C7-3 FINAL CLOSURE PLAN
- C7-4 TYPICAL HIGH-LOW SECTIONS

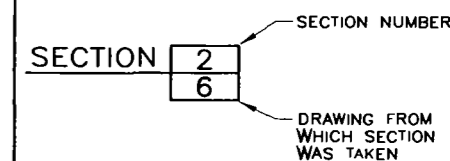
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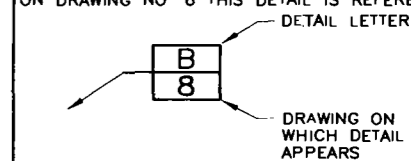


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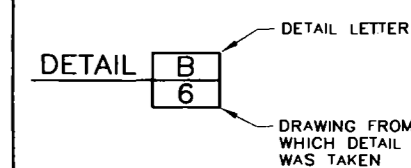


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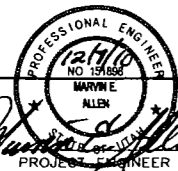
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CPP = CORRUGATED POLYETHYLENE PIPE	PSI = POUND PER SQUARE INCH
DIA. = DIAMETER	PT = POINT OF TANGENT
DWG = DRAWING	REINF = REINFORCEMENT
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HDPE = HIGH DENSITY POLYETHYLENE	T O C = TOP OF CONCRETE
ID = INSIDE DIAMETER	TYP = TYPICAL
MAX = MAXIMUM	UBC = UNTREATED BASE COURSE

FILE NAME: PROJECTS\084 - CLEAN HARBORS\82 100 - CURRENT - CB6-C7 MOUNDING\CA0\CELL 7\CURRENT DESIGN\G7-2 CELL 7 INDEX SHEET.DWG  
FILE DATE: 12/6/2010 10:58:12 (CAH)



DESIGNED	KCS	3
DRAFTED	CAH	2
CHECKED	MEA	1
DATE	DECEMBER 2010	NO

REVISIONS

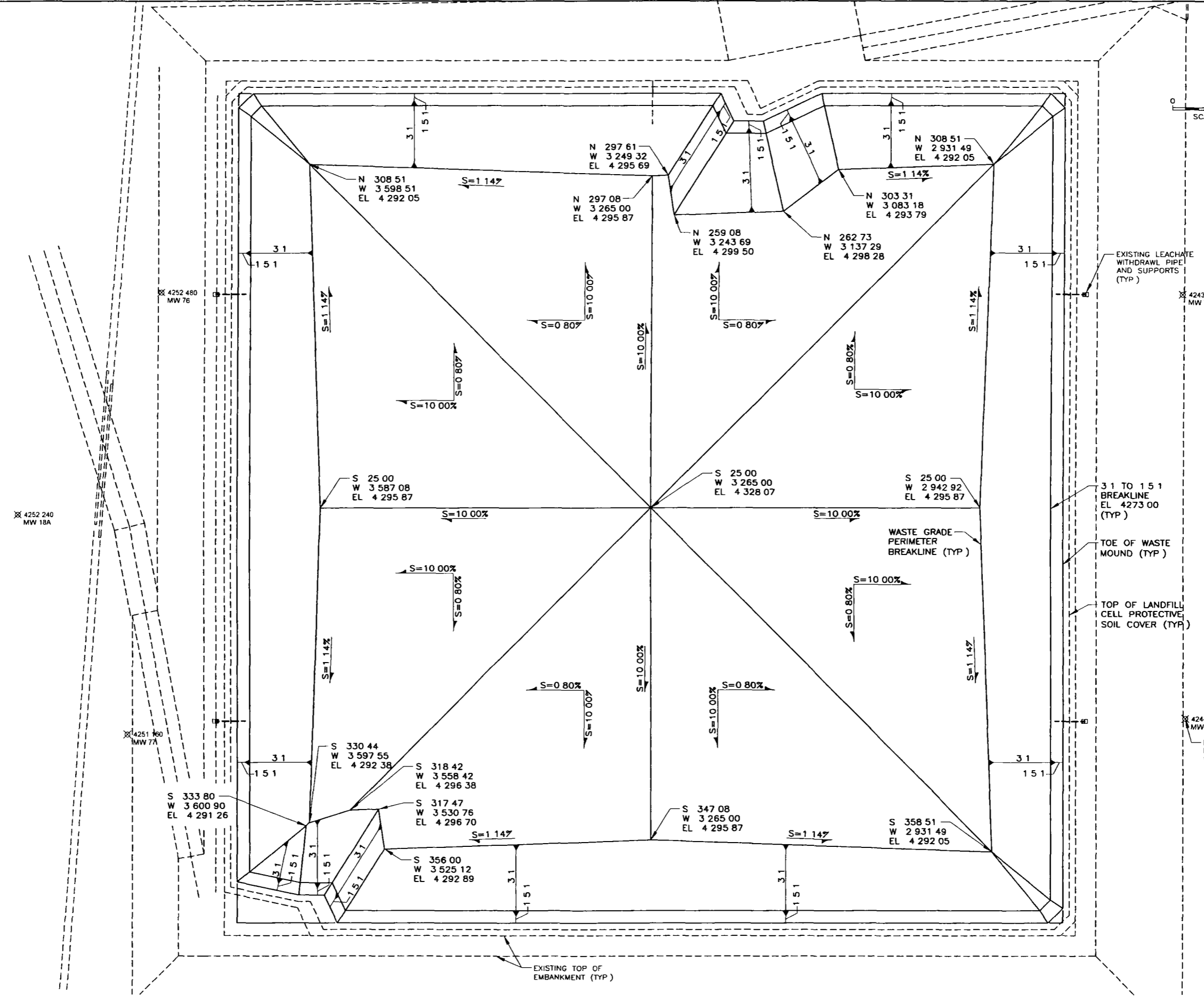
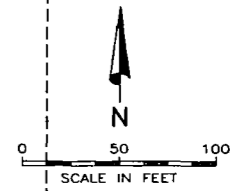
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GRASSY MOUNTAIN FACILITY  
LANDFILL CELL 7 - CLOSURE  
INDEX SHEET

SHEET  
G7-2  
64 82 100

FILE NAME: PROJECTS\064 - CLEAN HARBORS\B2 100 - CURRENT - CB6-C7 MOUNDING\CAD\CELL 7\CURRENT DESIGN\C7-1 CELL 7 CLOSURE - WASTE GRADE PLAN.DWG  
 FILE DATE: 12 8 2010 10 59 32 (CAH)



DESIGNED	KCS	3
DRAFTED	CAH	2
CHECKED	MEA	1
DATE	DECEMBER 2010	NO

NO	DATE	REVISIONS	BY	APVD

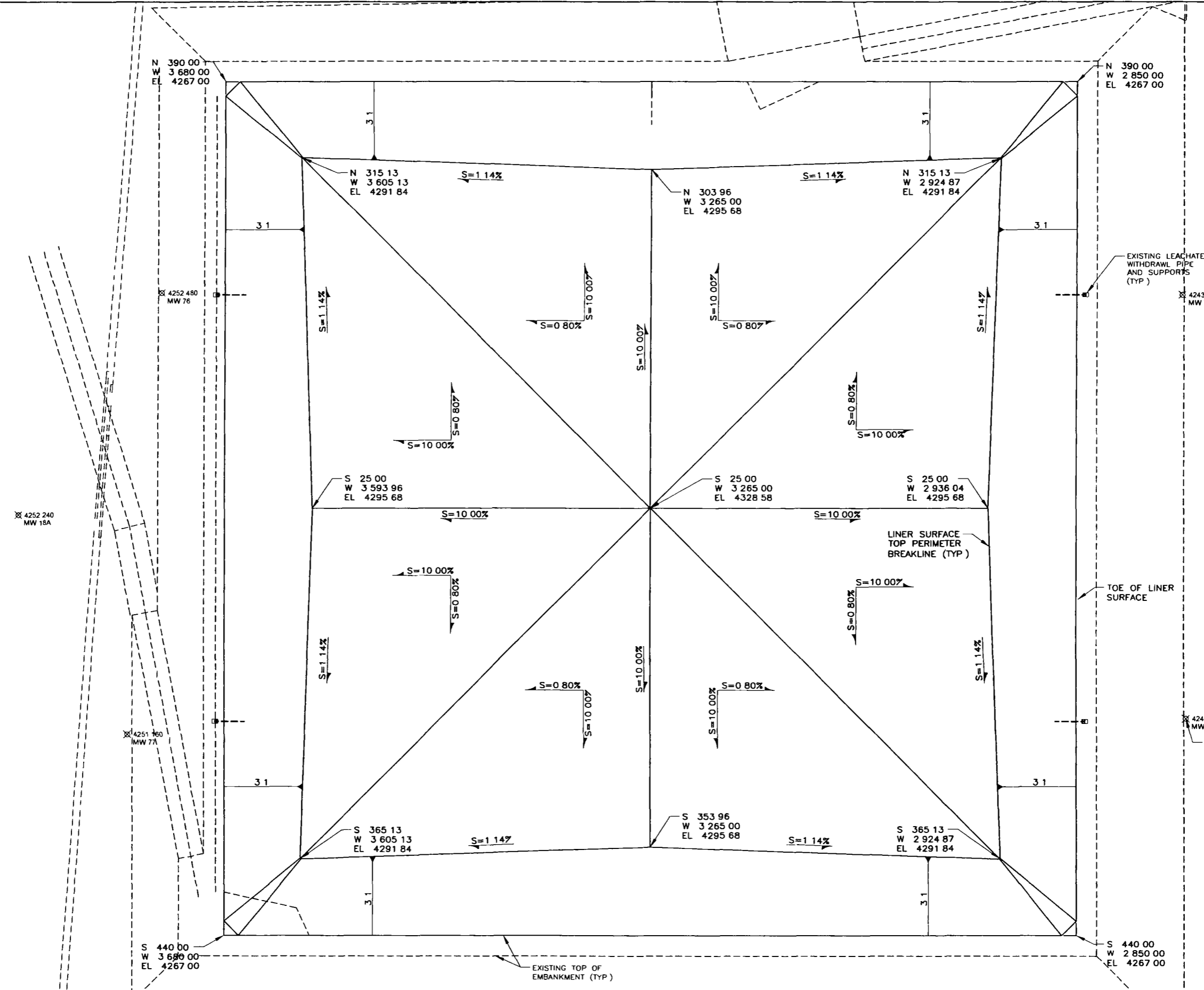
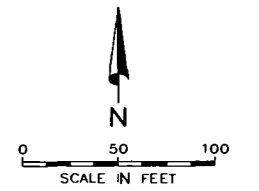
SCALE: AS SHOWN



GRASSY MOUNTAIN FACILITY  
 LANDFILL CELL 7 - CLOSURE  
 WASTE GRADE PLAN

SHEET: C7-1  
 64 82 100

FILE NAME PROJECTS\064 - CLEAN HARBORS\82 100 - CURRENT - CB6-C7 MOUNDING\CAD\CELL 7\CURRENT DESIGN\C7-2 CELL 7 CLOSURE - LINER SURFACE PLAN.DWG  
 FILE DATE 12 8 2010 11:01:03 (CAH)



DESIGNED	KCS	3
DRAFTED	CAH	2
CHECKED	MEA	1
DATE	DECEMBER 2010	NO

NO	DATE	REVISIONS

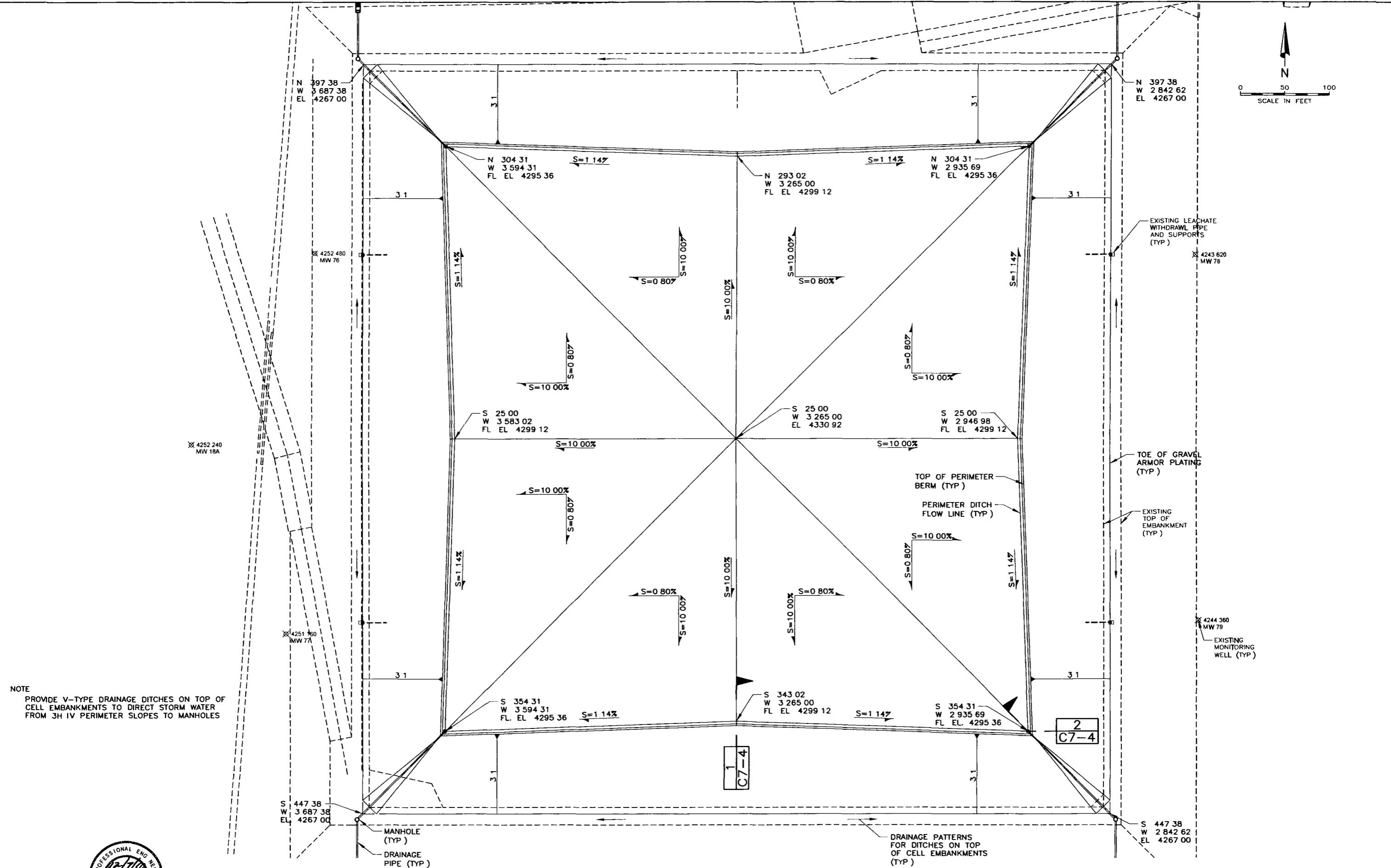
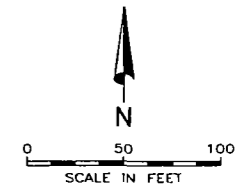
SCALE  
AS SHOWN



GRASSY MOUNTAIN FACILITY  
 LANDFILL CELL 7 - CLOSURE  
 LINER SURFACE PLAN

SHEET  
C7-2  
64 82 100

FILE NAME: PROJECTS\064 - CLEAN HARBORS\82 100 - CURRENT - CB6-C7 MOUNDING\CAD\CELL 7\CURRENT DESIGN\C7-3 CELL 7 CLOSURE - FINAL CLOSURE PLAN.DWG  
 FILE DATE: 12 6 2010 11 02 28 (CAH)



**NOTE**  
 PROVIDE V-TYPE DRAINAGE DITCHES ON TOP OF CELL EMBANKMENTS TO DIRECT STORM WATER FROM 3H IV PERIMETER SLOPES TO MANHOLES

**MARK ALLEN**  
 PROFESSIONAL ENGINEER  
 NO. 15169  
 STATE OF CALIFORNIA

DESIGNED	KCS	3
DRAFTED	CAH	2
CHECKED	MEA	1
DATE	DECEMBER 2010	NO
DATE		

NO	DATE	REVISIONS	BY	APVD

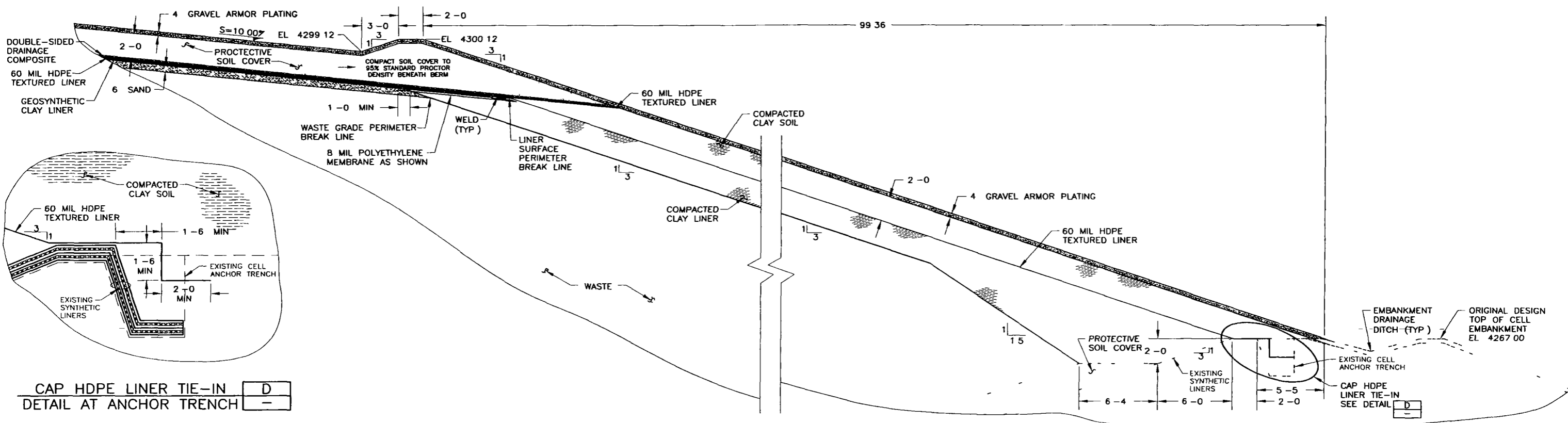
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GRASSY MOUNTAIN FACILITY  
 LANDFILL CELL 7 - CLOSURE  
 FINAL CLOSURE PLAN

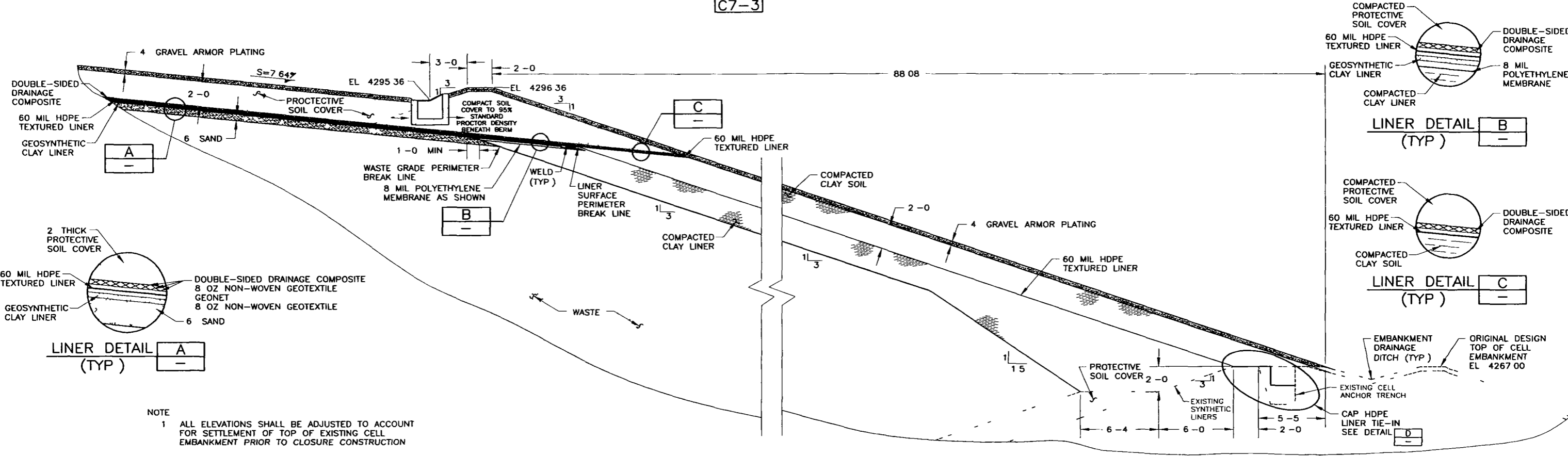
SHEET  
**C7-3**  
 64 82 100

FILE NAME PROJECTS\064 - CLEAN HARBORS\82 100 - CURRENT - CB6-C7 MOUNDING\CAD\CELL 7\CURRENT DESIGN\C7-4 CELL 7 TYP HIGH LOW SECTIONS.DWG  
 FILE DATE 12/2/2010 11:03:55 (CAH)



CAP HDPE LINER TIE-IN  
 DETAIL AT ANCHOR TRENCH D

TYPICAL HIGH SECTION 1  
C7-3



LINER DETAIL A  
 (TYP)

LINER DETAIL B  
 (TYP)

LINER DETAIL C  
 (TYP)

NOTE  
 1 ALL ELEVATIONS SHALL BE ADJUSTED TO ACCOUNT FOR SETTLEMENT OF TOP OF EXISTING CELL EMBANKMENT PRIOR TO CLOSURE CONSTRUCTION

TYPICAL LOW SECTION 2  
C7-3



DESIGNED	KCS	3
DRAFTED	CAH	2
CHECKED	MEA	1
DATE	DECEMBER 2010	NO

NO	DATE	REVISIONS	BY

SCALE  
 NOT TO SCALE



GRASSY MOUNTAIN FACILITY  
 LANDFILL CELL 7 - CLOSURE  
 TYPICAL HIGH-LOW SECTIONS

SHEET  
 C7-4  
 64 82 100