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Golder has prepared these responses on behalf of, and with input from, Omni staff. We hope these responses and the changes made to the application, as attached, are satisfactory to FDEP. If you have any questions on the contents of these responses, please don't hesitate to call Mike Kaiser at (904) 673-0446 or either of the undersigned.

Sincerely,

GOLDER ASSOCIATES INC.

Don E. Grigg, P.E.
Senior Project Engineer

Kevin S. Brown, P.E.
Senior Consultant and Associate
Florida Professional Engineer No. [illegible]819

9/24/2010
Date

cc: Mr. Mike Kaiser, Omni Waste of Osceola County, LLC

Attachments:	Attachment 1	Revised FDEP Form 62-701.900(1) Page 33 of 39
	Attachment 2	Revised Pages of Exhibit 2 – Engineering Design Narrative
	Attachment 3	Revised Horizontal Gas Collector Head Loss Calculation
	Attachment 4	Revised Horizontal Gas Collector Head Loss (SSC) Calculation
	Attachment 5	Revised Drawings

FN: G:\Projects\083\083-82\083-82734\083-82734.12\250_Final_Reports\RAI 1\RAI1-JED Horizontal Mod.docx

September 24, 2010 083-82734.12

Mr. F. Thomas Lubozynski, P.E.
Waste Program Administrator
Florida Department of Environmental Protection
3319 Maguire Boulevard, Suite 232
Orlando, FL 32803-3767

RE: RESPONSE TO FIRST REQUEST FOR ADDITIONAL INFORMATION
J.E.D. SOLID WASTE MANAGEMENT FACILITY
MODIFICATION OF GCCS SYSTEM – INTERMEDIATE MODIFICATION
ADDITION OF HORIZONTAL GAS COLLECTORS (CELL 7 THROUGH 10)
AND GCCS/LEACHATE SUMP CONNECTIONS
MODIFICATION OF PERMIT NUMBER S049-0199726-012
PERMIT APPLICATION NO. S049-199726-015

Dear Mr. Lubozynski:

Golder Associates Inc. (Golder), on behalf of Omni Waste of Osceola County, LLC (Omni), has prepared the following responses to the First Request for Additional Information (RAI) provided by the Florida Department of Environmental Protection (FDEP) in a letter dated August 24, 2010. A summary of associated correspondence follows:

- Solid Waste Permit Modification Application, Golder, July 21, 2010.

The format of this response includes the comment in italics followed by the responses in bold text. Responses may include references to attachments that follow. Note that revisions made to the engineering design narrative are shown via underline and strikethrough.

Comment 1 *DEP Form 62-701.900(1), Page 33 and 39, Item N.3, Provide Documentation describing how the gas remediation plan and odor remediation plan will be implemented (62-701.530(3), FAC:* *You have checked two boxes marked S and N/C for this item. If S is correct, please submit the corrected page with the information about where in the application the information is located. If N/C is correct, we can make that correction for you. Or, you can submit a corrected page.*

Response 1 **N/C is the correct box to be checked. The corrected page has been included in Attachment 1.**

Comment 2 *Exhibit 2, Engineering Design Narrative, Page 1, Section 1.0, Background, Third Paragraph:* *No design data and calculations were presented to show how the current capacity of the GCCS system (including the anticipated flow rates, condensate management, flare system capacities, mechanical and electrical systems) is sufficient to handle the additional gas flow anticipated from 16 new horizontal gas collectors, 4 sideslope gas collectors, some leachate sumps and adjoining cleanout risers. Please submit the additional information.*

Response 2 **The maximum capacity of the GCCS is based upon the gas recovery estimates from the design capacity (of waste) and waste acceptance rate of the facility, not the number of wells (or other gas collection devices). The proposed horizontal collectors, sideslope collectors, and connections to the leachate management system are intended to provide a means to extract the generated gas more promptly and also improve the efficiency of the system. No change in ultimate capacity of the GCCS is being proposed within this modification application.**

Comment 3 *<u>Exhibit 2, Engineering Design Narrative, Page 2, Section 2.0, Design Information:</u> The last sentence states that the existing sumps and leachate cleanout risers are providing a significant source of landfill gas generated from the adjacent waste mass. What assumptions were used to determine the amount of gas flow necessary to adequately remove landfill gas from the existing sumps and leachate cleanout risers?*

Response 3 **Leachate sumps and cleanout risers associated with the leachate collection and management system typically intercept landfill gas on an interim basis. Because the leachate collection system is often inundated with leachate, landfill gas flows are typically low and the volumetric flow rate cannot be predicted with a reasonable accuracy. Leachate levels within the landfill greatly affect the ability of landfill gas to be extracted from sumps and cleanout risers. These devices often will surge with periods of landfill gas pressure followed by periods of "inactivity". Therefore, the primary function of the GCCS connections associated with the leachate collection system is to relieve pressure and reduce possible odors. The goal of this connection is to remove landfill gas which may be present in the sumps, not to draw landfill gas closer to the perimeter of the landfill. Again, these connections will supplement the currently designed GCCS and no increase in ultimate capacity of the GCCS is being proposed within this modification.**

Comment 4 *<u>Exhibit 2, Engineering Design Narrative, Page 3, Last Paragraph:</u> The last sentence states that the horizontal gas collectors will be terminated approximately 120 feet from the interior cell limit (from the first layer of HGCs) in order to stagger the wells. Clarify the following:*

a. Is the end cap for each run of HGC a solid cap or perforated cap?

b. Provide the basis for the assumption that the horizontal radius of influence (ROI) will extend 120 feet horizontally past either end of each HGC pipe.

Response 4a **The end cap of each HGC is to be solid.**

Response 4b **The ROI used as a design assumption was taken from the interpretation of data (results) from the ROI calculations provided in Appendix A of Exhibit 2. For a more detailed discussion, refer to Response 10.**

Comment 5 *<u>Exhibit 2, Engineering Design Narrative, Page 5, Section 2.1.2, HGC Pipe Sizing</u>: The second bullet states that the well flow is assumed to be approximately 0.2 cfm per foot of well screen. Clarify if the well flow unit is standard cubic feet per minute (scfm) or actual cubic feet per minute (acfm). Provide the data in scfm units that includes correction factor for field conditions.*

Response 5 **The units provided in the design may be considered acfm because the calculations account for actual operating conditions. A conversion factor of 1 acfm = 0.835 scfm was calculated using the following assumptions.**

- Standard Temperature = 528°R
- Standard Pressure = 14.7 psia
- Actual Temperature = 560°R (100°F) - assumed
- Actual Pressure = 13.98 psia (-20" w.c.) - assumed
- Saturation Pressure = 0.9493 psia (assume 100% humidity)

Note that the pressure assumed in this conversion will not reflect actual field conditions as the well pressure is adjusted on a monthly basis to maintain compliance with the facility's Title V Permit and 40 CFR 60, Subpart WWW,

Standards of Performance for Municipal Solid Waste Landfills (NSPS). The calculations have been revised using the above stated assumptions. Refer to the revised page 5 of the Engineering Design Narrative included in Attachment 2.

Comment 6 *Exhibit 2, Engineering Design Narrative, Page 7, Section 2.2.1, SSC Pipe Sizing: The second bullet states that the well flow is assumed to be approximately 0.1 cfm per foot of well screen. Clarify if the well flow unit is standard cubic feet per minute (scfm) or actual cubic feet per minute (acfm). Provide the data in scfm units that includes correction factor for field conditions.*

Response 6 **This assumption is based on actual conditions. Page 7 has been revised to address this comment and is included in Attachment 2. See Response 5 for additional information.**

Comment 7 *Exhibit 2, Engineering Design Narrative, Page 7, Section 2.3, Leachate Collection System Tie-In: The third sentence states that the proposed design includes connections to select leachate cleanout risers located adjacent to the leachate sump pads. However, the first sentence of the third paragraph states that at each sump station, all sumps (Secondary, Primary No. 1, Primary No. 2) and associated leachate collection system cleanout riser will be connected to the GCCS via a single wellhead. Clarify the conflicting statements. Additionally, correct the monitoring point table provided on this page to reflect uniform labeling (i.e. LCS versus LSC). Show these locations on the drawings submitted in Exhibit 3.*

Response 7 **Page 8 has been revised to clarify this apparent contradictory statement. Additionally, the table has been corrected. The drawings have been updated as well. Revised pages of the Engineering Design Narrative are presented in Attachment 2 and the revised Drawings are included in Attachment 5.**

Comment 8 *Exhibit 2, Engineering Design Narrative, Page 7, Section 2.4, Design Life: Provide additional information related to the following:*

a. Maintenance procedures that will be used during the operating life of the horizontal gas collectors (HGC), including what actions will be taken to prevent "watering-in".

b. What field data will be collected from each HGC to determine whether it is operating correctly?

c. Procedures that will be used to revive an HGC if the field operating data indicates that the HGC is inoperable due to "watering-in".

d. If the HGC will not be revived in the event of watering-in, describe the process that will be used to abandon the HGC in place, associated well heads and piping.

Response 8a **There are no maintenance procedures associated with the HGC to prevent "watering-in" outside of normal landfilling procedures. Interim waste grades will be sloped to promote stormwater runoff. The design presented in the application for the HGCs has implemented features (as seen on Drawing No. 32A) to assist in the removal/drainage of liquid that may be encountered. These features include the condensate pocket drains and bottom drains located at the toe (of the first level HGCs). Watering-in is a known issue associated with HGC, but since these devices are being implemented as an interim/temporary gas collection device, there are no long term plans for routine maintenance. Unlike vertical gas extraction wells (which typically can be pumped with minimal modifications), horizontal gas wells are difficult to access once they are buried by waste. Page 9 of the Engineering Design Narrative has been revised and is included in Attachment 2.**

The installation of the HGCs will allow a more timely control of landfill gas and minimize the impact of the GCCS on the waste acceptance operations (since there will be minimal risers within the active waste placement area).

Response 8b **The field data collected from the HGC (and all landfill gas collection devices) is dictated by the facility's Title V Permit and NSPS. Mandatory parameters collected on a monthly basis are: oxygen (or nitrogen) content, pressure (vacuum), and temperature. Additional parameters which may be monitored by the facility include: methane content, carbon dioxide content, and flow rate. Results from the monthly monitoring will be reviewed to determine if a watered-in condition exists. Page 10 of the Engineering Design Narrative has been revised and is included in Attachment 2.**

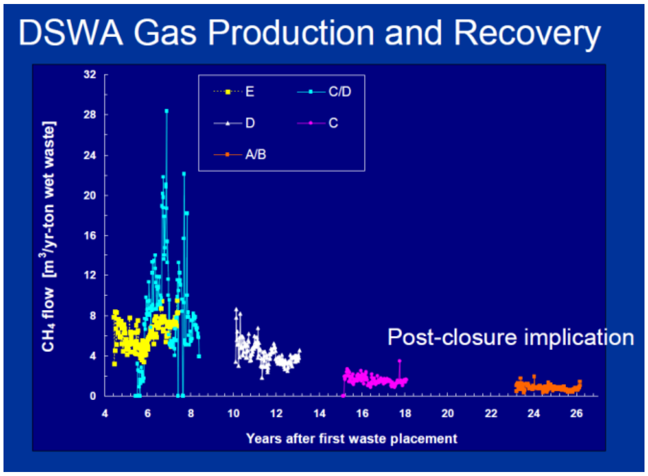
Response 8c **Since the HGCs are being installed as an interim device, there will be minimal actions utilized to revive a watered-in condition. Should a HGC become watered-in, efforts to drain the liquids (where possible) may be made if economically feasible and can be completed safely. This may include pumping of liquids (where possible) in an effort to revive the HGC. Golder's experience in this has shown little success of reviving a watered-in well. Page 9 of the Engineering Design Narrative has been revised and in included in Attachment 2.**

Response 8d **Prior to abandoning any HGC (or other gas collection device), FDEP Air Resource Management will be contacted. Typical abandonment procedures will include the removal of the wellhead and capping any lateral/header connection. For the 1st level HGCs, the HGC will be abandoned in place by excavating approximately 4-feet, cutting and capping the lateral (vacuum) supply pipe and then backfilling appropriately. The 2nd level HGCs will be abandoned by excavating approximately 10-feet along the HGC, cutting and capping the lateral (vacuum) supply pipe. A two-foot thick bentonite plug will be placed around the end of the HGC and then backfilled appropriately. Page 9 of the Engineering Design Narrative has been revised and is included in Attachment 2.**

Comment 9 *Exhibit 2, Engineering Design Narrative, Appendix A, Design Calculations: Provide the source/reference used for the following constants used in your design calculations: $P_{landfill}$, Intrinsic Waste Permeability (Ki), Gas Generation Rate (GGR), Waste Density, and Dynamic Viscosity.*

Response 9 **The landfill pressure is based on Golder's experience for landfill sites under steady state conditions and represents the generation of landfill gas under nominal cover conditions. We have measured this pressure in passive landfill vents. The intrinsic waste permeability was estimated using data from a paper entitled "Gas permeability and tortuosity for packed layers of processed municipal solid waste and incinerator residue", by Kallel et. al published in Waste Management and Research in 2004.**

The graph on the following page is from a presentation from Dr. Mort Barlaz regarding the gas production and recovery at a Delaware landfill. During the first 8 to 10 years after waste placement, the gas generation rate tends to range between 4 and 8 cubic meters per year per ton of wet waste and decreases thereafter. Using a value of 6 cubic meters per year per ton of wet waste yields 0.1 cubic feet of gas per year per pound of waste as used in the calculations.



The waste density is based on typical values measured using aerial surveys and waste acceptance values at modern solid waste landfills. The dynamic viscosity is based on a gas consisting of 50 percent methane and 50 percent carbon dioxide. Note that the calculation is not sensitive to this value and fluctuations would be expected under operating conditions.

Comment 10 *Exhibit 2, Engineering Design Narrative, Appendix A, Design Calculations, LFG Extraction Well Horizontal Design and Spacing Calculations:* *The longest perforated pipe length is Well HGC-8; it is approximately 1005 feet long. Provide the basis for using 400, 500, and 600 feet H values in the calculations for well pressure and well ROI. Provide the revised calculations using H value of 1005 feet or explain why this H value of 1005 was not used in the design calculations related to well pressure and well ROI.*

Response 10 **The calculation presented uses the H value (for vertical wells total well depth) to estimate the associated radius of influence. In converting that calculation to estimate the zone of influence for HGCs, some compromises were required. The H value still represents total depth, but we have conservatively estimated it to be high (greater than the total waste thickness at the facility). We looked at three separate scenarios to illustrate variations in the zone of influence associated with various waste depths and then extrapolated this data to estimate ROI's for different pipe lengths. Note that these devices are temporary in nature, due to this the spacing (ROI) is not deemed critical.**

Comment 11 *Exhibit 2, Engineering Design Narrative, Appendix A, Design Calculations, Horizontal Gas Well Design Calculations:* *Provide the source/reference for the Q value (120 cfm) used in the calculation of head loss using the Darcy-Weisbach Equation. If the well flow is 0.20 cfm/ft of perforated pipe and well HGC-8 has slotted length of 1005 feet, this equates to approximately 200 cfm. Additionally, clarify the conflicting statement provided in the "Given Information/Assumptions Section" that indicates SDR 17 pipe is used to calculate Pipe Area and the very last sentence in this section that states SDR 11 HDPE pipe will be used for the wells. Provide the revised calculations based upon the correct pipe type that will be used for Horizontal Gas Well Design.*

Response 11 **The 120 cfm was assumed as a maximum flow based upon Golder's experience. For conservatism, the calculation was revised based upon the assumption that only 885 feet of the total length of HGC is slotted (120 feet long solid portion). The revised calculation is provided in Attachment 3. Additionally, the SDR reference has been revised.**

Golder Associates

Comment 12 *<u>Exhibit 2, Engineering Design Narrative, Appendix A, Design Calculations, Horizontal Gas Well Design Calculations:</u> The second set of horizontal gas well design calculations presented in Appendix A using well flow of 0.1 cfm/ft or perforated pipe appears to have an error in Step 2 of the calculation (Solve the Bernoulli equation to determine the pressure at the end of the horizontal well.) Specifically, the hL (head loss) value used in the equation should be -1516.01 ft gas instead of -735.77 ft gas. Additionally, the z1 and z2 (elevation head) values used in this calculation appears to be very similar to the previous data set (i.e. using well flow of 0.20 cfm/ft or perforated pipe). Clarify this discrepancy, submit the corrected page.*

Response 12 The calculation has been revised and is provided in Attachment 4.

Comment 13 *<u>Exhibit 3, Drawings, Drawings No. 29A and 29B of 40:</u> Review of the Drawings 29A and 29B show only two side slope collectors. However, Section 2.2 titled Sideslope Gas Collection Wells, on page 6 of Exhibit 2, shows a table with well identifications SSC-1 through SSC-4. These wells are not marked or identified on Drawing 29A or 29B of 40. Submit the revised corrected drawings that show these sideslope gas collection wells. Additionally, show if these side slope gas collections wells are tied to existing headers or new headers will be installed and connected to the flare stations.*

Response 13 Drawings No. 29A and 20B of 40 have been revised accordingly and are included in Attachment 5.

Comment 14 *<u>Exhibit 3, Drawings, Drawing No. 29B of 40:</u> The Legend refers to Note 5 and Note 6 for information related to Wetland Boundary and 100-year Floodplain. However, there is no Note 5 or 6 in the Notes section. It appears that Notes 5 and 6 refers to References Nos 3 and 4. Please submit the corrected drawing or if you prefer the Department can make this correction for you. Additionally, clarify if more recently updated 100-year flood-plain map is available for this site. The 100-year flood-plain information presented on Drawing No. 29B is based upon map dated January 9, 2002.*

Response 14 References to the floodplain are not being affected by this permit modification and have been removed from the drawing.

Comment 15 *<u>Exhibit 3, Drawings, Drawing No. 32A of 40:</u> The typical section of 10" diameter HDPE Horizontal Gas Collector shown on Section 2/32A is confusing. It appears that the Geotextile wrap should be around the 10" diameter pipe as shown on Section 1-32A and not on top of the trench as shown on Section 2-32A. Please clarify or, if necessary, submit the corrected drawing.*

Response 15 The geotextile shown on detail 2-32A is correct. The geotextile was meant to only be installed above the HGCs to prevent soil from infiltrating into the HGC due to facility operations. Detail 1-32A has been revised to better illustrate this. Revised drawing No. 32A is presented in Attachment 5.

Comment 16 *<u>Exhibit 3, Drawings, Drawing No. 32B of 40:</u> Refer to Sections C/32B and D-32B. Show the locations of the proposed vertical gas extraction wells in Cells 7 through 10. Additionally, provide a drawing that shows the radius of influence (ROI) associated with the proposed horizontal gas collectors and also the vertical gas extraction wells for cells 7 through 10. The Department recognizes that the ROI for the horizontal gas well collectors are elliptical and difficult to depict on a drawing. An approximation of these details is acceptable.*

Response 16 **Drawing No 32B has been revised to illustrate the zone of influence for the HGCs and is presented in Attachment 5. The vertical wells have not been added to this drawing as the interaction (if any) between the vertical wells and horizontal wells will not affect the performance of the GCCS. Note that the HGCs are not replacing any of the vertical wells, they are strictly being included to manage landfill gas in a more timely manner while minimizing impacts of the GCCS on operations of the facility. The vertical gas wells will still be installed as final waste grades are reached. If the HGC(s) are still operable, overlapping of the radius (zone) of influences for the HGCs and vertical wells will be managed by controlling the imposed vacuum at each respective device.**

Comment 17 *Exhibit 3, Drawings, Drawing No. 32B of 40:* *Clarify why only two rows of horizontal gas collectors are recommended as part of this permit application located at approximate elevations of 95 feet NGVD and 180 feet NGVD of waste in Cells 7 through 10. The Department Solid Waste Permit Nos SC49-0199726-006 and SO49-0199726-007 issued on April 04, 2008, in the modified Specific Condition No. A states that the final maximum top elevation for Cells 1-21 has been modified from 178 feet NGVD to 330 ft NGVD.*

a. Will there be additional horizontal gas well collectors added as more waste lifts are added beyond the 180 feet NGVD elevation?

b. Additionally, the Sections C-32B and D-32B show final covers for Cells 7 and 8 and Cells 9 and 10 at elevations of approximately 220 feet NGVD elevations instead of 330 feet NGVD. Clarify this discrepancy and if necessary submit the revised drawing.

Response 17a **This design calls out for only two rows of HGCs as illustrated in the application package dated July 21, 2010. Only two levels of HGCs are being proposed as they are viewed as interim gas collection devices. The installation of these two rows of HGCs will allow a more timely (likely before the mandated installation timelines for vertical well installation in the facility's Title V Permit and NSPS) as well as allow waste acceptance operations to continue unimpeded by vertical wells associated with the GCCS. Once waste operations allow the installation of the currently designed vertical gas extraction wells, the HGCs may be continue to be operated (as long as they are not watered-in and meet the operational requirements of the facility's Title V Permit and NSPS. Should the HGCs become watered-in, landfill gas will be managed with the currently design system of vertical wells.**

Response 17b **Sections C-32B and D-32B (as shown on Drawings Nos 29B and 32B) are cut roughly parallel to the contours of the final cover system. Omni and Golder acknowledge that the permitted final cover elevation is 330 feet NGVD, it is not at the locations shown in the application package. No revisions to the drawings were made in support of this comment.**

Golder has prepared these responses on behalf of, and with input from, Omni staff. We hope these responses and the changes made to the application, as attached, are satisfactory to FDEP. If you have any questions on the contents of these responses, please don't hesitate to call Mike Kaiser at (904) 673-0446 or either of the undersigned.

Sincerely,

GOLDER ASSOCIATES INC.

Don E. Grigg, P.E.
Senior Project Engineer

Kevin S. Brown, P.E.
Senior Consultant and Associate
Florida Professional Engineer No. 57819

9/24/2010
Date

cc: Mr. Mike Kaiser, Omni Waste of Osceola County, LLC

Attachments:
Attachment 1 Revised FDEP Form 62-701.900(1) Page 33 of 39
Attachment 2 Revised Pages of Exhibit 2 – Engineering Design Narrative
Attachment 3 Revised Horizontal Gas Collector Head Loss Calculation
Attachment 4 Revised Horizontal Gas Collector Head Loss (SSC) Calculation
Attachment 5 Revised Drawings

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ATTACHMENT 1

PART M. SPECIAL WASTE HANDLING REQUIREMENTS (62-701.520, FAC)

S	LOCATION	N/A	N/C	
☐		☐	☑	1. Describe procedures for managing motor vehicles; (62-701.520(1),FAC)
☐		☐	☑	2. Describe procedures for landfilling shredded waste; (62-701.520(2),FAC)
☐		☐	☑	3. Describe procedures for asbestos waste disposal; (62-701.520(3),FAC)
☐		☐	☑	4. Describe procedures for disposal or management of contaminated soil; (62-701.520(4), FAC)
☐		☐	☑	5. Describe procedures for disposal of biological wastes; (62-701.520(5), FAC)

PART N. GAS MANAGEMENT SYSTEM REQUIREMENTS (62-701.530,FAC)

S	LOCATION	N/A	N/C	
☑	Exhibits 2 through 3	☐	☐	1. Provide the design for a gas management system that will (62-701.530(1), FAC):
☑	Exhibits 2 through 3	☐	☐	a. Be designed to prevent concentrations of combustible gases from exceeding 25% the LEL in structures and 100% the LEL at the property boundary;
☑	Exhibits 2 through 3	☐	☐	b. Be designed for site-specific conditions;
☑	Exhibits 2 through 3	☐	☐	c. Be designed to reduce gas pressure in the interior of the landfill;
☑	Exhibits 2 through 3	☐	☐	d. Be designed to not interfere with the liner, leachate control system or final cover.
☐		☐	☑	2. Provide documentation that will describe locations, construction details and procedures for monitoring gas at ambient monitoring points and with soil monitoring probes; (62-701.530(2), FAC):
☐		☐	☑	3. Provide documentation describing how the gas remediation plan and odor remediation plan will be implemented; (62-701.530(3), FAC):
☐		☐	☑	4. Landfill gas recovery facilities; (62-701.530(5), FAC):

ATTACHMENT 2

2.1.2 HGC Pipe Sizing

In order to estimate the pressure loss in the horizontal well, calculations were performed on the longest horizontal well. These calculations use the Darcy-Weisbach equation for pressure loss and the Bernoulli equation to equate total pressure loss from the connection to the header to the end of the well. In order to perform the calculations, several assumptions were made as follows:

- The pressure at the well head (connection to the header) is assumed to be 15 inches vacuum based on operational knowledge of GCCSs;
- The well flow is assumed to be approximately 0.2 acfm (0.17 scfm) per foot of well screen. This assumption is based on typical data from several active extraction systems;
- In order to estimate pressure loss through the perforated pipe, the area of the perforations per foot of pipe is calculated and an equivalent "tee" is estimated. These calculations determine that an equivalent 2 inch diameter branch tee is located for every foot of pipe. Based on typical pipe design methodology, an equivalent length is estimated for each tee in order to calculate pressure losses along the perforated section of pipe.

The attached calculations in Appendix A provide detailed computations for HGC-8. These calculations estimate that the vacuum at the end of the extraction well will be over 14 inches of water.

Note that these calculations do not account for the positive pressure within the landfill that will also facilitate flow of gas into the pipe. Additionally, these calculations were performed on an 8-inch perforated HDPE pipe, this gives the facility the option to use 8-inch or larger pipe for the perforated section of the HGC.

2.1.3 HGC Header Connection

Each HGC will be individually connected to the main GCCS header via a wellhead (to allow for adjustment and monitoring). From the wellhead, the HGC may be connected either directly to the header or via a lateral (which in-turn is connected to the header). No changes to main header layout or size are proposed with this modification. Depending on the actual layout of the main header and the slope direction of the HGC, a down-slope (remote wellhead) may be needed to allow for condensate drainage. This entails keeping the valve location at the highpoint to prevent a hydraulic plug/block of the HGC. Landtec wellheads (or equivalent) are proposed for use on the HGCs.

2.1.4 HGC Tire Chip Use

Several options have been listed in the design drawings for the HGCs. Backfill material should provide stability for the HGC while having a permeability/transmissivity to promote gas flow. Typically a coarse stone/aggregate is specified to meet these requirements. Tire chips can also be used as a suitable backfill material, provided that compressibility is considered. Tire chips have been successfully used throughout the waste industry, and specifically have been used successfully in MSW landfills located in Florida.

2.2.1 SSC Pipe Sizing

In order to estimate the pressure loss in the SSC, calculations were performed on the longest horizontal well (SSC-1 located within Cell 7). These calculations use the Darcy-Weisbach equation for pressure loss and the Bernoulli equation to equate total pressure loss from the connection to the header to the end of the well. In order to perform the calculations, several assumptions were made as follows:

- The pressure at the well head (connection to the header) is assumed to be 15 inches vacuum based on operational knowledge of GCCSs;
- The well flow is assumed to be approximately 0.1 acfm (0.08 scfm) per foot of well screen. This assumption is based on typical data from several active extraction systems and engineering judgment;
- In order to estimate pressure loss through the perforated pipe, the area of the perforations per foot of pipe is calculated and an equivalent "tee" is estimated. These calculations determine that an equivalent 2 inch diameter branch tee is located for every foot of pipe. Based on typical pipe design methodology, an equivalent length is estimated for each tee in order to calculate pressure losses along the perforated section of pipe.

The attached calculations in Appendix A provide detailed computations for SSC-1. These calculations estimate that the vacuum at the end of the extraction well will be over 13 inches of water.

Note that these calculations do not account for the positive pressure within the landfill that will also facilitate flow of gas into the pipe. Additionally, these calculations were performed on a 4-inch perforated HDPE pipe, this gives the facility the option to use 4-inch or larger pipe for the perforated section of the SSC.

2.2.2 SSC Header Connection

Refer to Section 2.1.3 for technical discussion of header connection. Actual connection may vary depending on conditions encountered in the field during construction.

2.2.3 SSC Tire Chip Use

Refer to Section 2.1.4 for technical discussion of tire chip usage. Note that the vertical loading of the SSCs is expected to be less than that of the HGCs, but a 50% increase in bedding and cover material will still be used for tire chips.

2.3 Leachate Collection System Tie-In

One final modification that is being proposed within this application is to connect the leachate collection system to the GCCS at various points within Cells 1 through 6, and future cells 7-10. Connections will be made directly into each sump manhole to allow active gas extraction. In addition, the proposed design includes connections to select leachate cleanout risers located adjacent to the leachate sump pads. It should be noted that not all leachate cleanout risers will be connected to the GCCS. The leachate cleanout risers for existing cells connect to a common leachate collection line which runs at the toe of the perimeter berm sideslope and interior leachate collection trenches. Connecting to adjacent leachate cleanout risers could likely cause interference between risers and potentially cause oxygen (i.e. ambient air) to enter the GCCS. Typically, one leachate collection system cleanout riser will be connected to the GCCS at each leachate sump pad location. To better determine which leachate cleanout riser should be connected, sampling with a GEM 2000 (or similar device) may be used to determine which riser has the higher methane concentration or higher pressure.

The sumps and selected leachate collection system cleanout risers will be connected to the GCCS via 4- and 6-inch HDPE laterals. A lateral will be run to a nearby header riser. Since all of these connections will be at a lower elevation than the header, a "downslope" well head connection will need to be utilized. This consists of installing the wellhead at the highpoint (i.e. at the header/lateral riser), vice at the gas collection device. Condensate will flow downslope and enter back into the respective sump manhole or leachate collection system cleanout riser. This will allow any condensate (that is generated within the 4-and 6-inch lateral) to be handled as leachate within the leachate collection system.

At each sump station, all sumps (Secondary, Primary No. 1, and Primary No. 2) and selected~~associated~~ leachate collection system cleanout riser will be connected to the GCCS via a single wellhead. This manifold approach will allow gas extraction at each individual sump location while mitigating the possibility of excess air infiltration. Since the individual sumps and leachate cleanout risers may interact with each other, this manifold approach will enable a more distributed vacuum applied in the sump area. The following table lists the proposed monitoring point identification and location of each:

Monitoring Point Identification	Location
LSC~~LCS~~-1	Cell 1
LSC~~LCS~~-2	Cell 2
LSC-3	Cell 3
LSC-4	Cell 4
LSC-5	Cell 5
LSC-6	Cell 6
LSC-7	Cell 7
LSC-8	Cell 8
LSC-9	Cell 9
LSC-10	Cell 10

The conceptual layout of the proposed connections to the leachate collection system sumps and leachate collection system cleanout risers is shown on Drawing 32C. For additional information, refer to the drawing package.

2.4 Design Life

HGCs are often plagued by liquid management issues especially in a sub-tropic climate (such as Florida). The very nature of installing a horizontal pipe within the waste mass leads to multiple operations issues. Liquids management is of upmost importance with HGCs. The design presented herein applies liquid management technology to maximize the design life of the proposed HGCs. Pocket drains have been included in the design to assist in the management of liquids (drainage away from the HGC).

Adding to the issue is the differential settlement of the waste adjacent to each HGC. It is expected that at some time in the future, an HGC may become inoperable due to "watering-in". Note that once a HGC waters-in, little can be done to recover that collector as the horizontal pipes are buried beneath the waste and no feasible method to remove liquids exists. Additionally, replacing a HGC is not possible (due to waste thickness and continued operations at a disposal facility. HGCs may be abandoned in place by cutting and capping all connections between the HGC and the GCCS header system. For the 1st level HGCs, the HGC will be abandoned in place by excavating approximately 4-feet, cutting and capping the lateral (vacuum) supply pipe and then backfilling appropriately. The 2nd level HGCs will be abandoned by excavating approximately 10-feet along the HGC, cutting and capping the lateral (vacuum) supply pipe. A two-foot thick bentonite plug will be placed around the end of the HGC and then backfilled appropriately. Once an HGC is abandoned, landfill gas extraction will revert to the originally planned and approved system of vertically installed wells. Note that no revision to the vertical system of gas extraction wells is planned with this application.

3.0 OPERATION INFORMATION

Omni is proposing to operate the gas extraction devices presented in this application in accordance with the approved Title V Operation Permit. Specifically, each will be operated to maintain compliance with 40 CFR 60, Subpart WWW, Standards of Performance for Municipal Solid Waste Landfills (NSPS) and will be monitored monthly for the following parameters:

- Methane Content (not a compliance point)
- Carbon Dioxide Content (not a compliance point)
- Oxygen (Compliance point)
- Temperature (Compliance point)
- Pressure (Compliance point)

The oxygen content at each gas collection device must be kept to less than 5% (by volume). Temperature for each must be kept less than 131°F (55°C). Lastly each gas collection device must be maintained under vacuum. Corrective actions for non-compliant readings will be performed in accordance with the facility's GCCS O&M plan, the facility's Title V Permit, and the NSPS. In addition to the above mentioned parameters, landfill gas flow may be monitored for and used to assist in assessing the operational performance of each gas extraction device.

ATTACHMENT 3

Golder Associates	Subject		HORIZONTAL GAS WELL DESIGN			
	Job No.	083-82734	Made by:	DEG	Date:	9/8/2010
	Ref.		Ckd. By:	VKF	Sheet:	
			Rev. by:	KSB		

OBJECTIVE:

Determine the approximate head loss for the proposed horizontal wells at the JEDSWMF.

GIVEN INFORMATION / ASSUMPTIONS:

Well Flow =	0.20	cfm / ft. perf. Pipe
Pipe Dia. =	0.58	ft. (inside diameter of 8-in. pipe based on SDR 11)
Pipe Area =	0.2642	sq. ft.
Perforations =	0.50	in.
	0.04	ft.
No. Perforations =	18.00	per ft.
Header Pressure at Well Head =	15.00	in. water

Perform calculations for longest segment of perforated pipe and determine pressure loss. Well HGC-8 has a length of 1,005 ft (885 ft slotted). SDR 11 HDPE pipe will be used for the wells.

APPROACH:

1. Determine the friction loss using the Darcy-Weisbach equation.
2. Solve the Bernoulli equation for the selected well to determine the pressure at the end of the well.

CALCULATIONS:

Step 1 - Determine head loss

Area of Perforations per foot of pipe:

A_{perfs} = 0.025 sq. ft.

Determine equivalent pipe size for perf. area:

r =	0.09	ft.
d =	0.18	ft.
	2.12	in.
Use	2.00	in.

Therefore, each 1-ft segment of pipe has an equivalent 2-in diameter tee. Use an equivalent length to determine head loss from branch tees.

From the Plexco Design Manual, the L_{eq} = Sum (K x d)

K =	60	for branch tees
d =	0.58	(inside pipe diameter of the tee based on SDR of 11)
No. Tees =	1005	(No. tees equals length of HGC)
L_{eq} =	34,974	ft.
L =	35,979	

Determine the head loss using the Darcy-Weisbach Equation

$$h_L = f(L/d)(v^2/2g)$$

L =	35,979	ft (Length of Pipe, including equivalent length)
d =	0.58	ft (inside diameter of pipe)
Q =	177	cfm (well flow)
v =	670	ft/min (well flow velocity)
g =	115,920	ft/min^2 (acceleration from gravity)

Friction factor, f = $0.316 / R_e^{.25}$ (for Reynolds numbers less than 100,000)

R_e = Reynolds Number = $(v \times d)/\nu$

ν = 0.0108 ft^2/min (kinematic viscosity of LFG)

R_e = 35,978

f = 0.023

Therefore, the head loss is calculated to be:

h_L = -2,755.29 ft. gas

γ_{gas}= 0.0737 pcf

h_L = -39.05 in. Water

Step 2 - Solve the Bernoulli equation to determine the pressure at the end of the horizontal well.

$$\frac{P_1}{\gamma_{gas}} + \frac{V_1^2}{2g} + z_1 = \frac{P_2}{\gamma_{gas}} + \frac{V_2^2}{2g} + z_2 + h_L$$

Assume that the vacuum at the connection to the header is 15 in. water or 1,058.3 ft. gas

From the design drawings, the elevation at the beginning of the well is 95 and the elevation at the end of the well is 115.1

$$\frac{-1{,}058.3}{0.0737} + \frac{448{,}802.01}{231{,}840} + 95 = \frac{P_2}{0.0737} + 0 + 115.1 \quad -2{,}755.29$$

$$-14360 + 1.94 + 95 = 13.57P_2 + -2{,}640.19$$

$$-11{,}622.44 = 13.57P_2$$

P_2 = -856.48 ft. gas

P_2 = -12.14 in. water

Therefore, the pressure at the end of the horizontal well is -12.14 in water, which is acceptable.

ATTACHMENT 4

Golder Associates	Subject		**HORIZONTAL GAS WELL DESIGN (SSC)**			
	Job No.	083-82734	Made by:	**DEG**	Date:	**9/8/2010**
	Ref.		Ckd. By:	**VKF**	Sheet:	
			Rev. by:	**KSB**		

OBJECTIVE:

Determine the approximate head loss for the proposed horizontal (SSC) wells at the JEDSWMF.

GIVEN INFORMATION / ASSUMPTIONS:

Well Flow =	0.10	cfm / ft. perf. Pipe
Pipe Dia. =	0.33	ft. (inside diameter of 4-in. pipe based on SDR 17)
Pipe Area =	0.0855	sq. ft.
Perforations =	0.25	in.
	0.02	ft.
No. Perforations =	18.00	per ft.
Header Pressure at Well Head =	15.00	in. water

Perform calculations for each segment of perforated pipe and determine pressure loss. Design spacing of wellheads is 480 feet.

APPROACH:

1. Determine the friction loss using the Darcy-Weisbach equation.
2. Solve the Bernoulli equation for the selected well to determine the pressure at the end of the well.

CALCULATIONS:

Step 1 - Determine head loss

Area of Perforations per foot of pipe:

A_{perfs} = 0.006 sq. ft.

Determine equivalent pipe size for perf. area:

r =	0.04	ft.
d =	0.09	ft.
	1.06	in.
Use	1.00	in.

Therefore, each 1-ft segment of pipe has an equivalent 2-in diameter tee. Use an equivalent length to determine head loss from branch tees.

From the Plexco Design Manual, the L_{eq} = Sum (K x d)

K =	60	for branch tees
d =	0.33	(inside pipe diameter of the tee based on SDR of 17)
No. Tees =	480	(No. tees equals length of HGC)
L_{eq} =	9504	ft.
L =	10,509	

Determine the head loss using the Darcy-Weisbach Equation

$h_L = f(L/d)(v^2/2g)$

L =	10,509	ft (Length of Pipe, including equivalent length)
d =	0.33	ft (inside diameter of pipe)
Q =	55	cfm (well flow)
v =	643	ft/min (well flow velocity)
g =	115,920	ft/min^2 (acceleration from gravity)

Friction factor, $f = 0.316 / R_e^{.25}$ (for Reynolds numbers less than 100,000)

Golder Associates	Subject	HORIZONTAL GAS WELL DESIGN (SSC)				
	Job No.	083-82734	Made by:	**DEG**	Date:	**9/8/2010**
	Ref.		Ckd. By:	**VKF**	Sheet:	
			Rev. by:	**KSB**		

R_e = Reynolds Number = $(v \times d)/\nu$

ν = 0.0108 ft^2/min (kinematic viscosity of LFG)

R_e = 19,649

f = 0.027

Therefore, the head loss is calculated to be:

h_L = -1516.01 ft. gas

γ_{gas}= 0.0737 pcf

h_L = -21.49 in. Water

Step 2 - Solve the Bernoulli equation to determine the pressure at the end of the horizontal well.

$$\frac{P_1}{\gamma_{gas}} + \frac{V_1^2}{2g} + z_1 = \frac{P_2}{\gamma_{gas}} + \frac{V_2^2}{2g} + z_2 + h_L$$

Assume that the vacuum at the connection to the header is 15 in. water or 1058.3 ft. gas

From the design drawings, the elevation of each sideslope collector is fairly consistent. An elevation difference of 5 feet has been assumed over the 240 feet distance to the midpoint (high point).

$$\frac{-1{,}058.3}{0.0737} + \frac{413{,}513.66}{231{,}840} + 92 = \frac{P_2}{0.0737} + 0 + 97 \quad -1{,}516.01$$

$$-14{,}360 + 1.78 + 92 = 13.57P_2 + -1{,}419.01$$

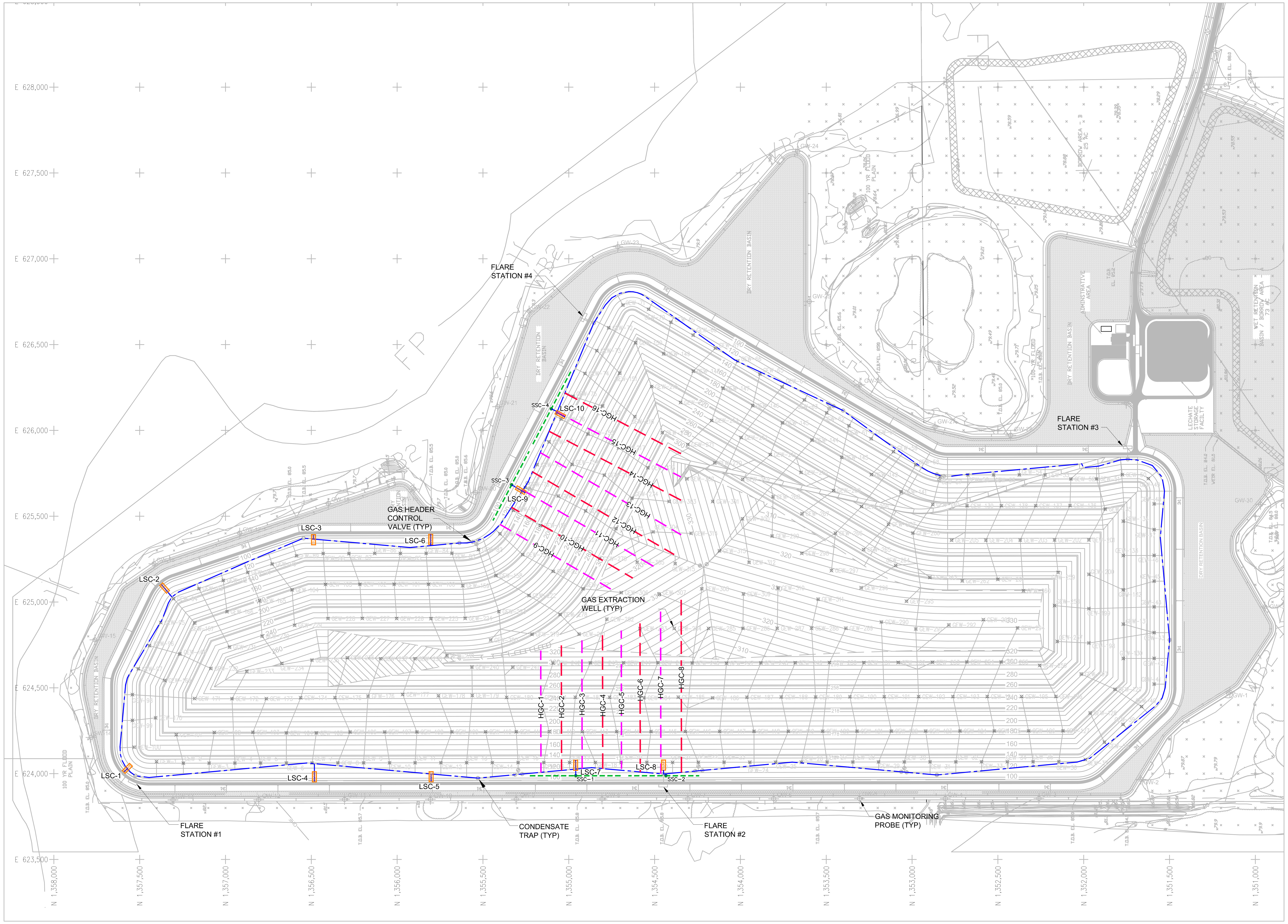
$$-12846.77 = 13.57P_2$$

P_2 = -946.70 ft. gas

P_2 = -13.42 in. water

Therefore, the pressure at the end of the horizontal well is -13.42 in water, which is acceptable.

ATTACHMENT 5



NORTH

0 300' 600'
SCALE IN FEET

LEGEND

120	TOP OF FINAL COVER (FEET, NGVD)
	MAIN HEADER LINE
GEW-186	PROPOSED VERTICAL GAS EXTRACTION WELL
CT	CONDENSATE TRAP AT LOW POINT
	CONTROL VALVE/MONITORING PORT
	FLARE STATION
GW-1	GAS MONITORING PROBE
	HORIZONTAL GAS COLLECTOR (1st LEVEL)
	HORIZONTAL GAS COLLECTOR (2nd LEVEL)
	SIDESLOPE GAS COLLECTOR
	MAIN GAS HEADER
	LEACHATE COLLECTION SUMP
SSC-1	SIDE SLOPE COLLECTOR
	GAS LATERAL PIPE

NOTES:

1. THE PURPOSE OF THIS SHEET IS TO ILLUSTRATE THE LAYOUT OF HORIZONTAL GAS COLLECTOR WELLS IN PHASE 2 AND 3, CELLS 7, 8, 9, & 10, IN RELATIONSHIP TO THE GAS COLLECTION AND CONTROL SYSTEM SHOWN ON PERMIT DRAWING 29.
2. AS WASTE FILLING OCCURS IN CELLS 7, 8, 9, & 10, THE HORIZONTAL GAS COLLECTORS WILL BE INSTALLED IN ACCORDANCE WITH THE DETAILS SHOWN ON DRAWINGS 29B, 32A, AND 32B.
3. THE EXISTING VERTICAL WELL NETWORK AND MAIN GAS HEADER ARE DESIGNED BY OTHERS AND WILL BE INSTALLED ACCORDINGLY.

300 0 300 600
SCALE FEET

Golder Associates
Jacksonville, Florida

REV	DATE	DES	REVISION DESCRIPTION	CADD	CHK	RVW
1	09/09/10	DEG	SHOW SSCs AND LCS CONNECTIONS, REVISED REFERENCE CALL OUTS	BCL		

Kevin Brown, P.E.

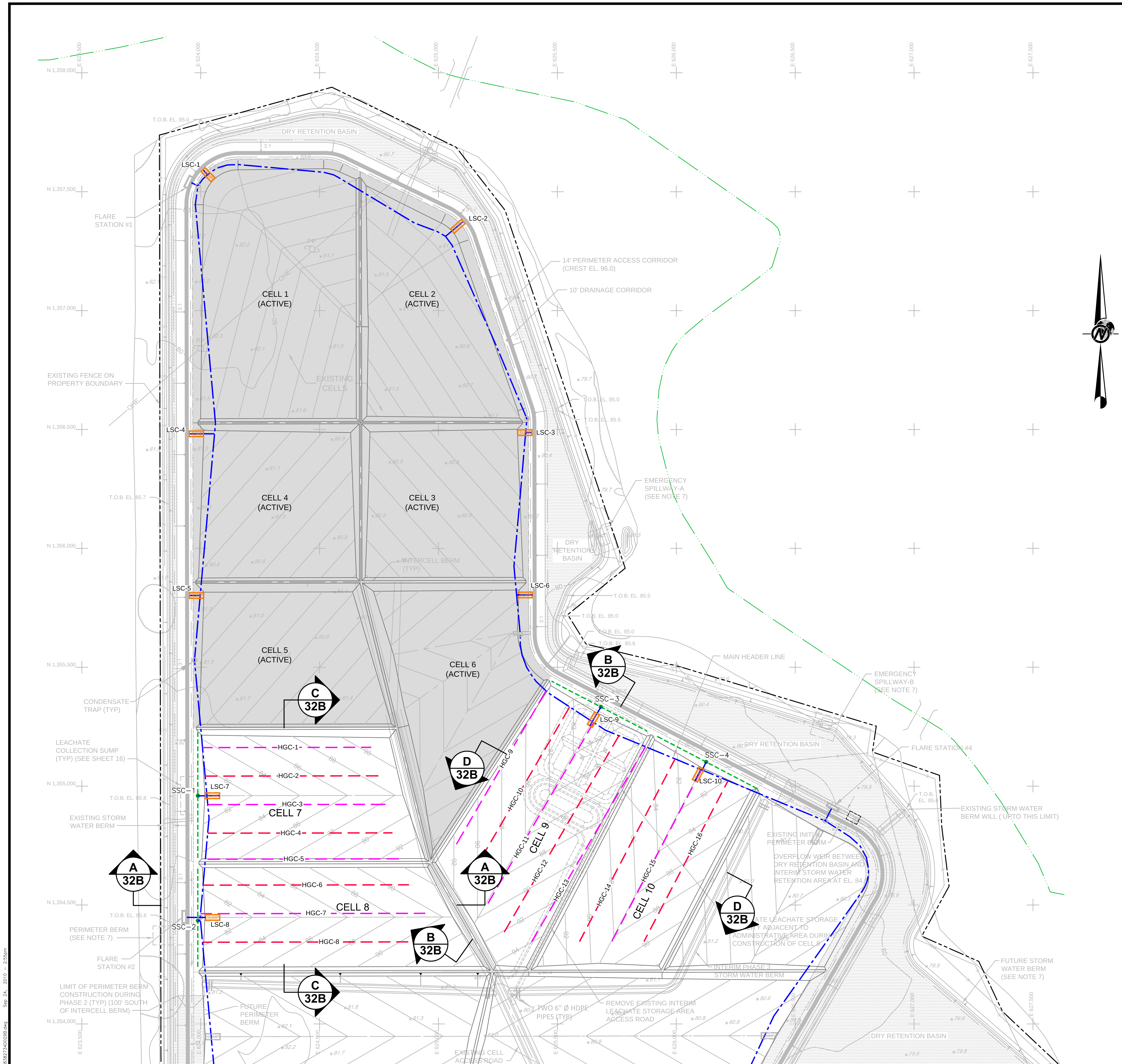
PROJECT
J.E.D. SOLID WASTE MANAGEMENT FACILITY
ST. CLOUD, OSCEOLA COUNTY, FLORIDA

TITLE
GAS MANAGEMENT PLAN
HORIZONTAL GAS COLLECTORS

PROJECT No.		083-82734
FILE No.		08382734D029A
REV. 0	SCALE	AS SHOWN
DESIGN	DEG	03/23/10
CADD	BCL	09/03/10
CHECK	DEG	
REVIEW		

29A OF 40

Drawing file: 08382734D029A.dwg Sep 24, 2010 - 2:53pm



LEGEND

- PROPERTY BOUNDARY
- APPROXIMATE LOCATION OF INTERMITTENT STREAM
- 80 — EXISTING GROUND ELEVATION (FEET) (SEE NOTE 2)
- 80 — SUBBASE ELEVATION (FEET)
- EXISTING FENCE
- STORMWATER MANAGEMENT BASINS
- BORROW AREA BOUNDARY
- MAIN HEADER LINE
- HORIZONTAL GAS COLLECTOR (1st LEVEL)
- HORIZONTAL GAS COLLECTOR (2nd LEVEL)
- SIDESLOPE GAS COLLECTOR
- LEACHATE COLLECTION SUMP
- SSC−1 SIDE SLOPE COLLECTOR
- GAS LATERAL PIPE

NOTES

1. NORTHING AND EASTING COORDINATES SHOWN REPRESENT FLORIDA STATE PLANE EAST ZONE NORTH AMERICAN DATUM OF 1983 (NAD83).

2. THE ELEVATIONS SHOWN REPRESENT NATIONAL GEODETIC VERTICAL DATUM OF 1929 (NGVD29) (FEET).

3. HORIZONTAL GAS COLLECTOR'S FIRST 120 FEET TO BE SOLID PIPE. SEE SHEET 32A FOR DETAILS

REFERENCES

1. THE PROPERTY BOUNDARY BASED ON A COMPOSITE BOUNDARY SURVEY PROVIDED BY JOHNSTON SURVEYING INC., KISSIMMEE FLORIDA, DATED AUGUST 12, 1999.

2. THE TOPOGRAPHIC INFORMATION SHOWN IN SECTION 11 AND THE NORTH HALF OF SECTION 14 WAS PROVIDED BY AERIAL CARTOGRAPHICS OF AMERICA, ORLANDO, FLORIDA BASED ON AN AERIAL PHOTOGRAPH FLOWN ON NOVEMBER 7, 2001. IN AREAS OUTSIDE THE LIMITS OF CONSTRUCTION, TOPOGRAPHIC INFORMATION WAS ADDED FROM USGS QUAD MAP FOR HOLOPAW SE, FLORIDA.

LANDFILL - RELATED NOTES

1. PHASE 1 AND 2 (CELLS 1 THROUGH 6) HAVE BEEN CONSTRUCTED AND WASTE DISPOSAL ACTIVITIES ARE ACTIVE IN THESE CELLS.

2. PHASE 2 CELL 7 IS CURRENTLY UNDER CONSTRUCTION.

3. FUTURE CELLS (CELLS 7 THROUGH 21) WILL BE CONSTRUCTED IN ACCORDANCE WITH THE VERTICAL EXPANSION PERMIT DRAWINGS DATED SEPTEMBER 2007.

200 0 200 400
SCALE FEET

Golder Associates
Jacksonville, Florida

REV	DATE	DES	REVISION DESCRIPTION	CADD	CHK	RVW
1	09/09/10	DEG	SHOW SSCs AND LCS CONNECTIONS; REVISED REFERENCE CALL OUTS	BCL		

Kevin Brown, P.E.

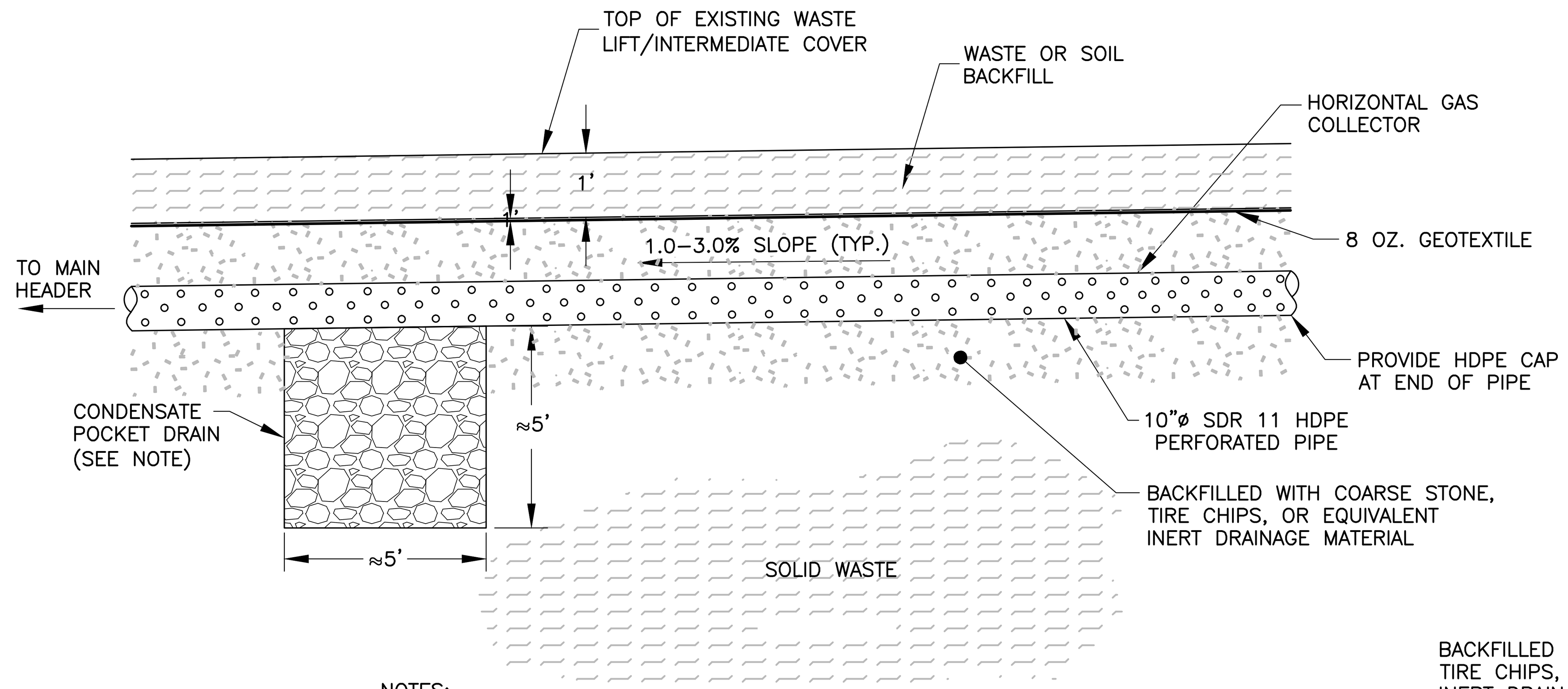
PROJECT
J.E.D. SOLID WASTE MANAGEMENT FACILITY
ST. CLOUD, OSCEOLA COUNTY, FLORIDA

TITLE
HORIZONTAL GAS COLLECTORS PLAN LAYOUT (CELL 7 TO CELL 10)

PROJECT No.		083−82734	
FILE No.		08382734D029B	
REV. 0		SCALE	AS SHOWN
DESIGN	DEG	03/23/10	
CADD	BCL	09/03/10	
CHECK	DEG		
REVIEW			

DRAWING
29B OF 40

Drawing file: 08382734D029B.dwg Sep 24, 2010 - 2:55pm



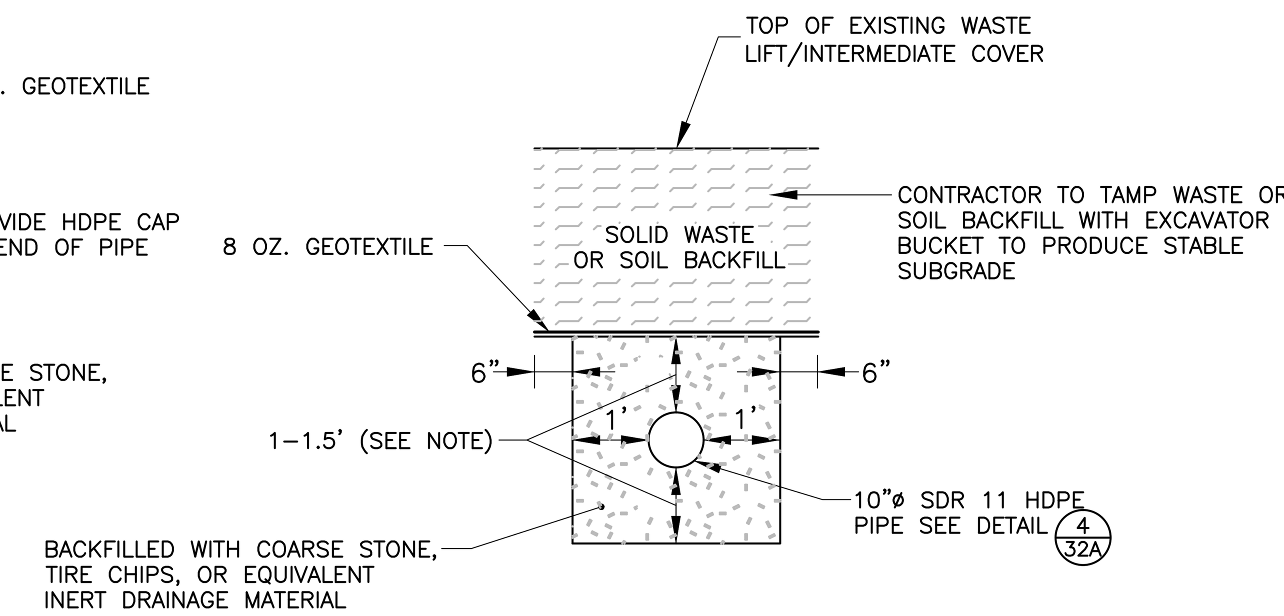
NOTES:

1. CONDENSATE POCKET DRAIN TO BE INSTALLED APPROXIMATELY EVERY 150 LINEAR FEET ALONG HORIZONTAL GAS COLLECTOR. DRAINS TO BE APPROXIMATELY 5'x5'x5' AND BACKFILLED WITH COARSE STONE, TIRE CHIPS, OR EQUIVALENT INERT DRAINAGE MATERIAL.
2. TO ALLOW FOR INCREASED SETTLEMENT AND COMPRESSIBILITY WHEN USING TIRE CHIPS AS BACKFILL MEDIA, INCREASE DEPTHS TO 1.5' ABOVE AND BELOW PIPE. DIMENSIONS OF TRENCH ARE MINIMUM. OWNER MAY INCREASE SIZE OF TRENCH BASED ON MATERIAL USED.

TYPICAL PROFILE OF HORIZONTAL GAS COLLECTOR

1 / 32A

NTS

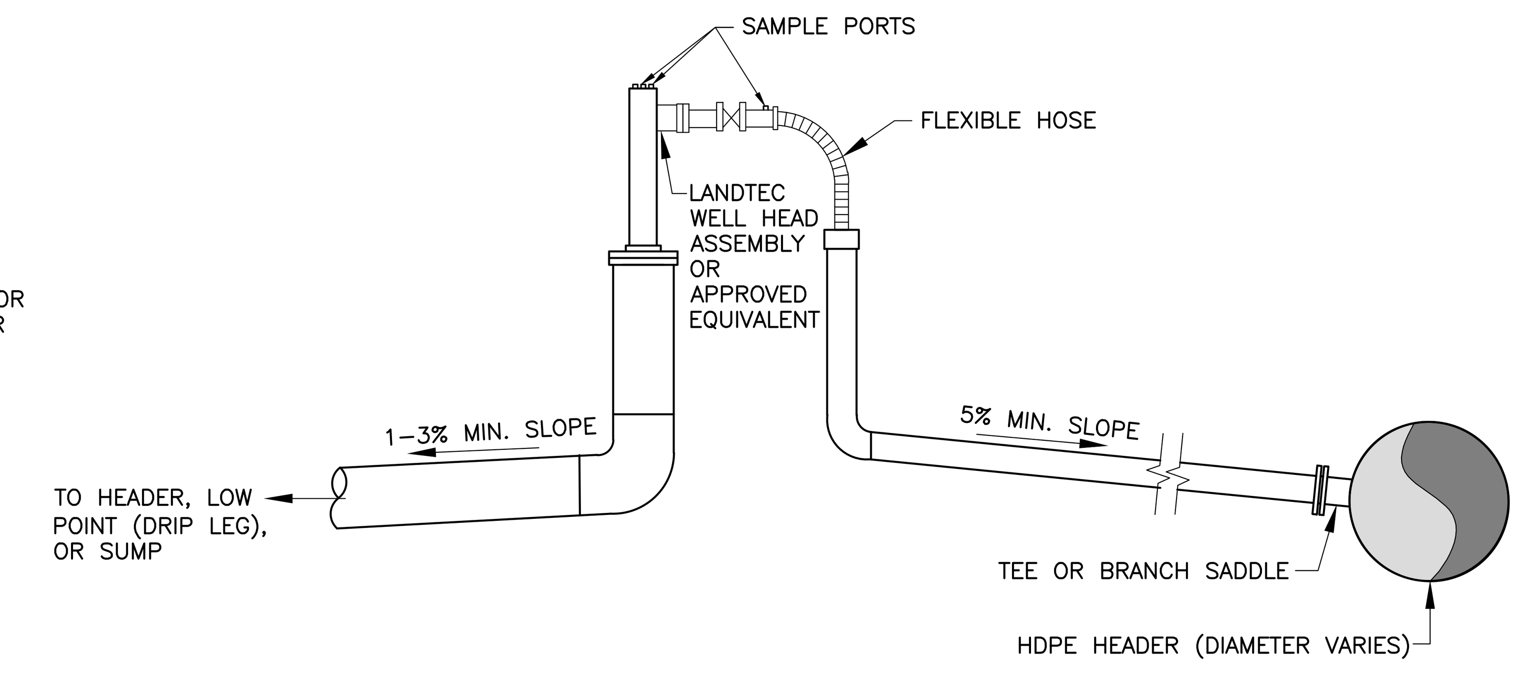


NOTE: TO ALLOW FOR INCREASED SETTLEMENT AND COMPRESSIBILITY WHEN USING TIRE CHIPS AS BACKFILL MEDIA, INCREASE DEPTHS TO 1.5' ABOVE AND BELOW PIPE. DIMENSIONS OF TRENCH ARE MINIMUM. OWNER MAY INCREASE SIZE OF TRENCH BASED ON MATERIAL USED.

TYPICAL SECTION OF 10"Ø HDPE HORIZONTAL GAS COLLECTOR

2 / 32A

NTS

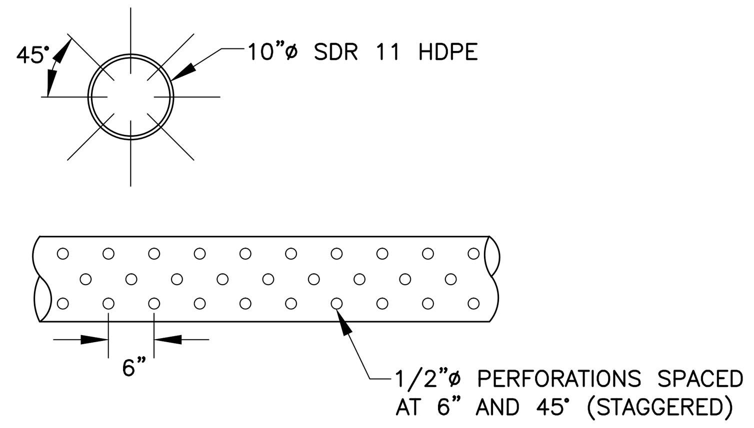


NOTE: ACTUAL CONNECTION MAY VARY BASED UPON FILL OPERATIONS AND LOCATION OF CONNECTION.

STUB-OUT & CONNECTION DETAIL FOR 10"Ø HDPE HORIZONTAL GAS COLLECTOR

3 / 32A

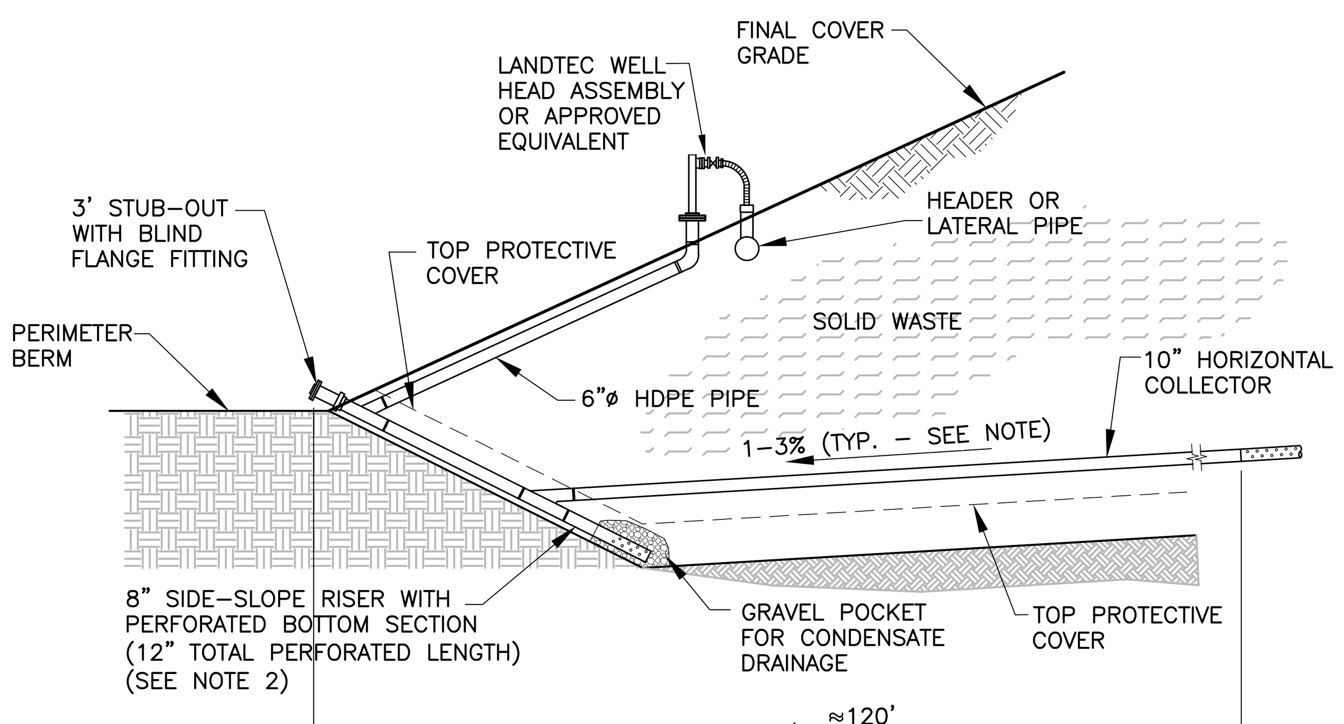
NTS



HDPE PERFORATED PIPE DETAIL

4 / 32A

NTS



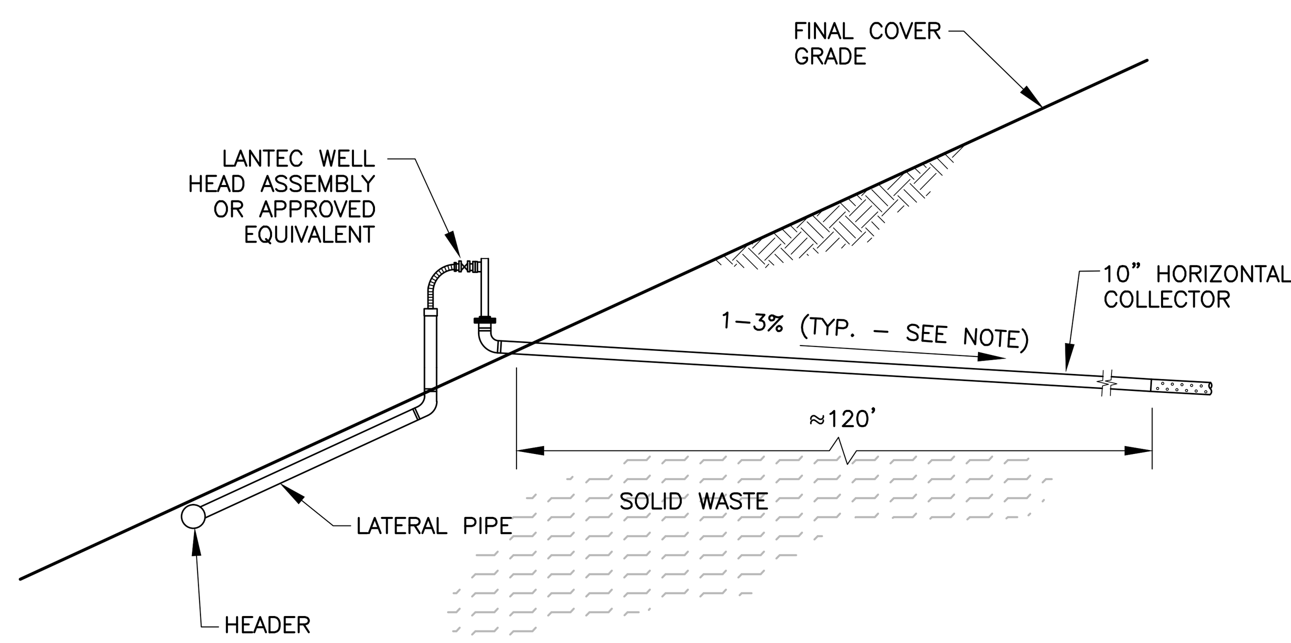
NOTES:

1. SLOPE DIRECTION AND GRADE OF HORIZONTAL GAS COLLECTOR WILL BE BASED ON SLOPE DIRECTION AND GRADE OF FILL OPERATIONS.
2. 8" SIDESLOPE RISER TO BE INSTALLED DIRECTLY ON UNDERLYING BASE OF GEOCOMPOSITE LINER DURING CELL CONSTRUCTION. PLACE ADDITIONAL STRIP OF GEOCOMPOSITE BENEATH PIPE FOR ADDITIONAL CUSHION.

CONNECTION DETAIL HORIZONTAL GAS COLLECTOR 1ST LEVEL

5 / 32A

NTS

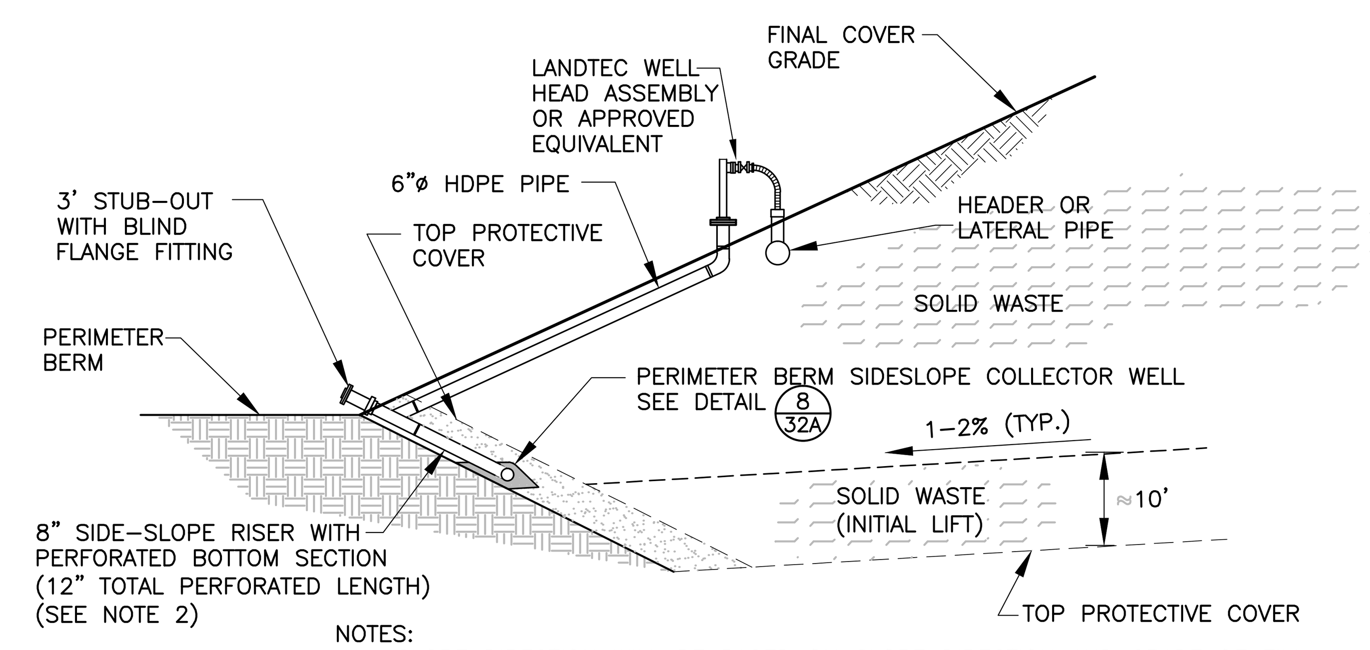


NOTE: SLOPE DIRECTION AND GRADE OF HORIZONTAL GAS COLLECTOR WILL BE BASED ON SLOPE DIRECTION AND GRADE OF FILL OPERATIONS.

CONNECTION DETAIL HORIZONTAL GAS COLLECTOR 2ND LEVEL

6 / 32A

NTS



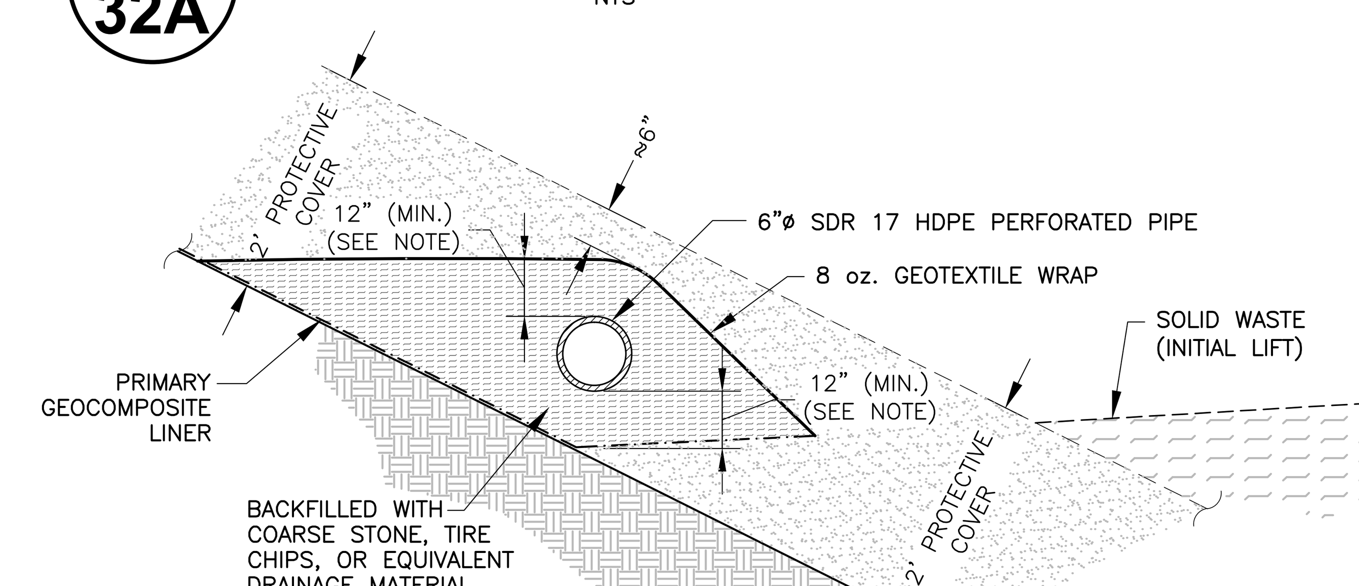
NOTES:

1. SLOPE DIRECTION WILL BE BASED ON SLOPE DIRECTION AND GRADE OF FILL OPERATIONS.
2. 8" SIDESLOPE RISER TO BE INSTALLED DIRECTLY ON UNDERLYING BASE OF GEOCOMPOSITE LINER DURING CELL CONSTRUCTION. PLACE ADDITIONAL STRIP OF GEOCOMPOSITE BENEATH PIPE FOR ADDITIONAL CUSHION.

CONNECTION DETAIL PERIMETER BERM SIDESLOPE GAS COLLECTOR

7 / 32A

NTS



NOTE: TO ALLOW FOR INCREASED SETTLEMENT AND COMPRESSIBILITY WHEN USING TIRE CHIPS AS BACKFILL MEDIA, INCREASE DEPTHS TO 1.5' ABOVE AND BELOW PIPE.

TYPICAL SECTION OF 6"Ø HDPE PERIMETER BERM SIDESLOPE GAS COLLECTOR

8 / 32A

NTS

Golder Associates
Jacksonville, Florida

REV	DATE	DES	REVISION DESCRIPTION	CADD	CHK	RVW
1	09/09/10	DEG	REVISED DETAIL 1-32A	BCL		

Kevin Brown, P.E.

PROJECT

J.E.D. SOLID WASTE MANAGEMENT FACILITY
ST. CLOUD, OSCEOLA COUNTY, FLORIDA

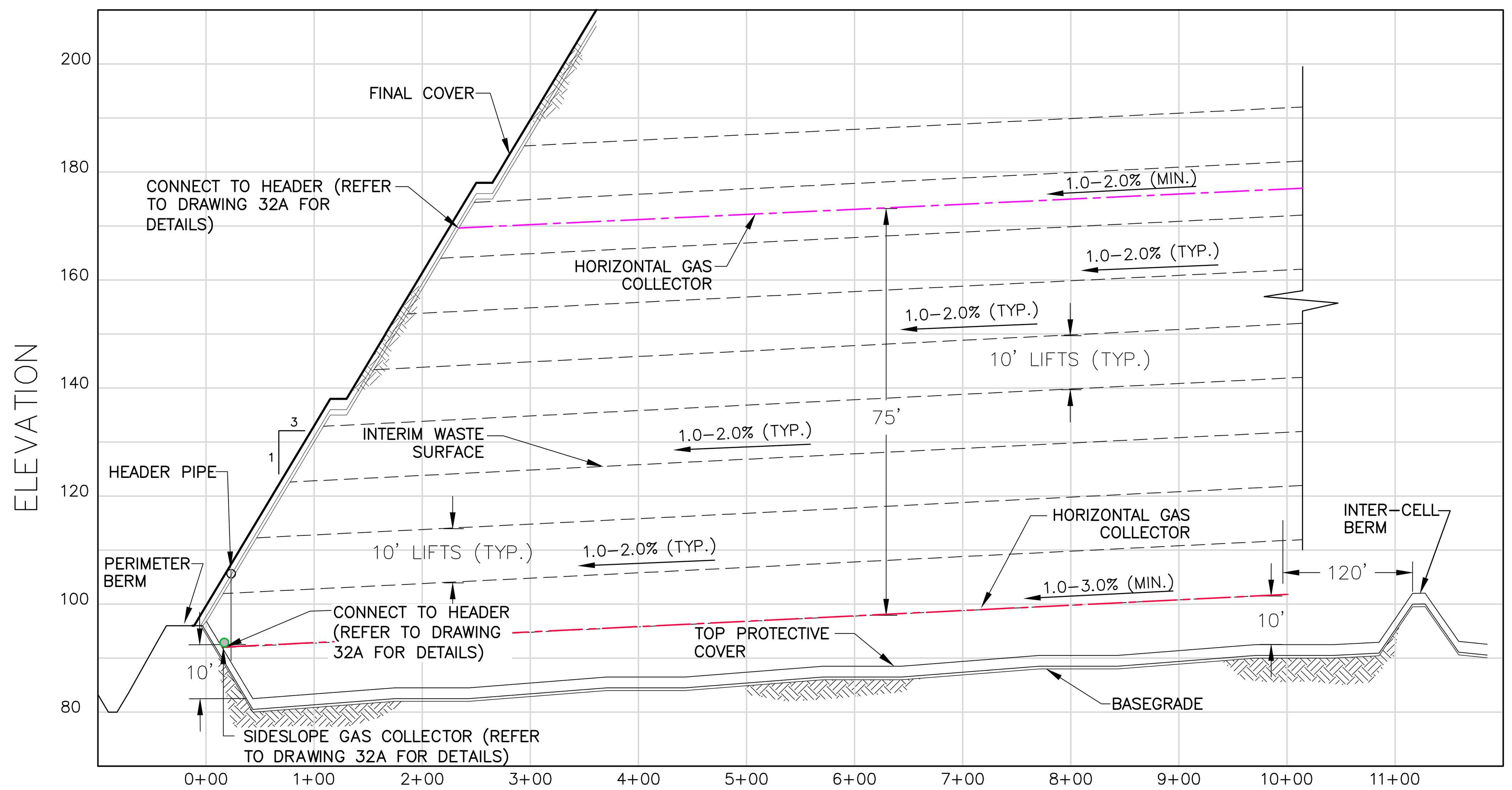
TITLE

HORIZONTAL GAS COLLECTORS DETAILS

PROJECT No.		083-82734
FILE No.		08382734D032A
REV. 0	SCALE	AS SHOWN
DESIGN	DEG	03/23/10
CADD	BCL	09/03/10
CHECK	DEG	
REVIEW		

DRAWING 32A OF 40

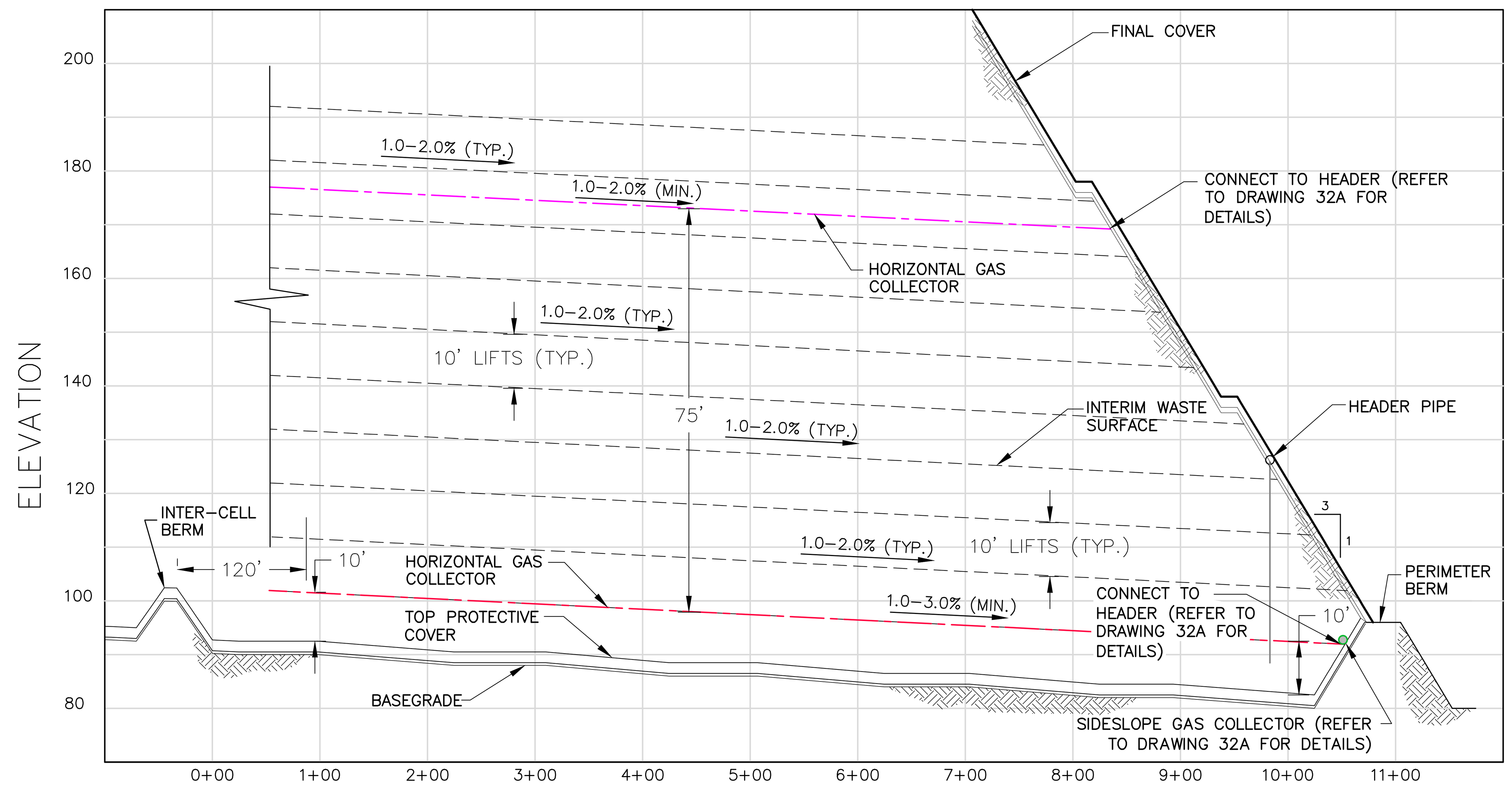
Drawing file: 08382734D032A.dwg Sep 24, 2010 – 2:56pm



NOTE: ACTUAL SLOPE DIRECTION MAY VARY BASED ON FILL OPERATIONS.

A / 32B CELLS 7 & 8 TYPICAL CROSS SECTION

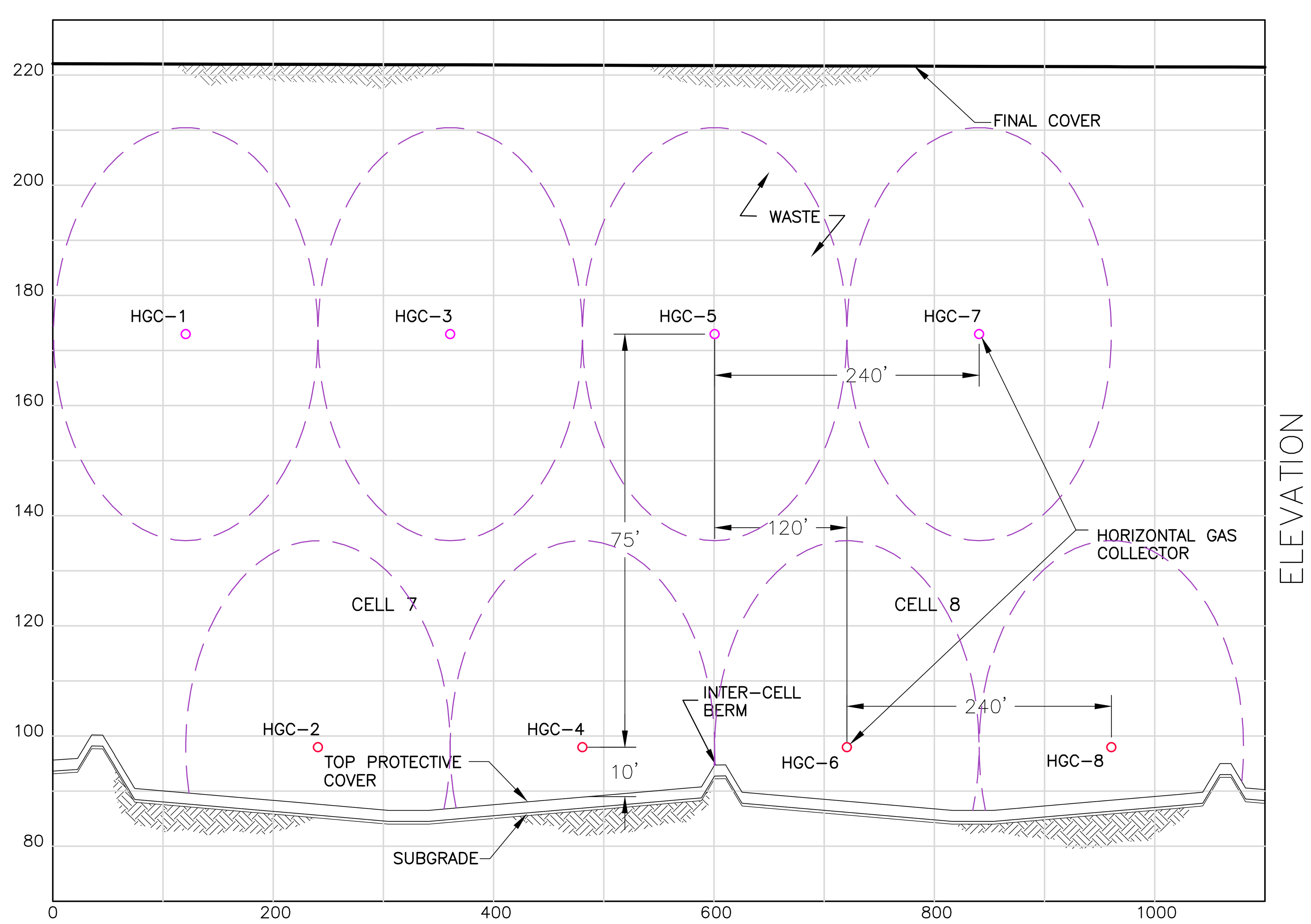
20 0 20 VERTICAL SCALE FEET
100 0 100 HORIZONTAL SCALE FEET



NOTE: ACTUAL SLOPE DIRECTION MAY VARY BASED ON FILL OPERATIONS.

B / 32B CELLS 9 & 10 TYPICAL CROSS SECTION

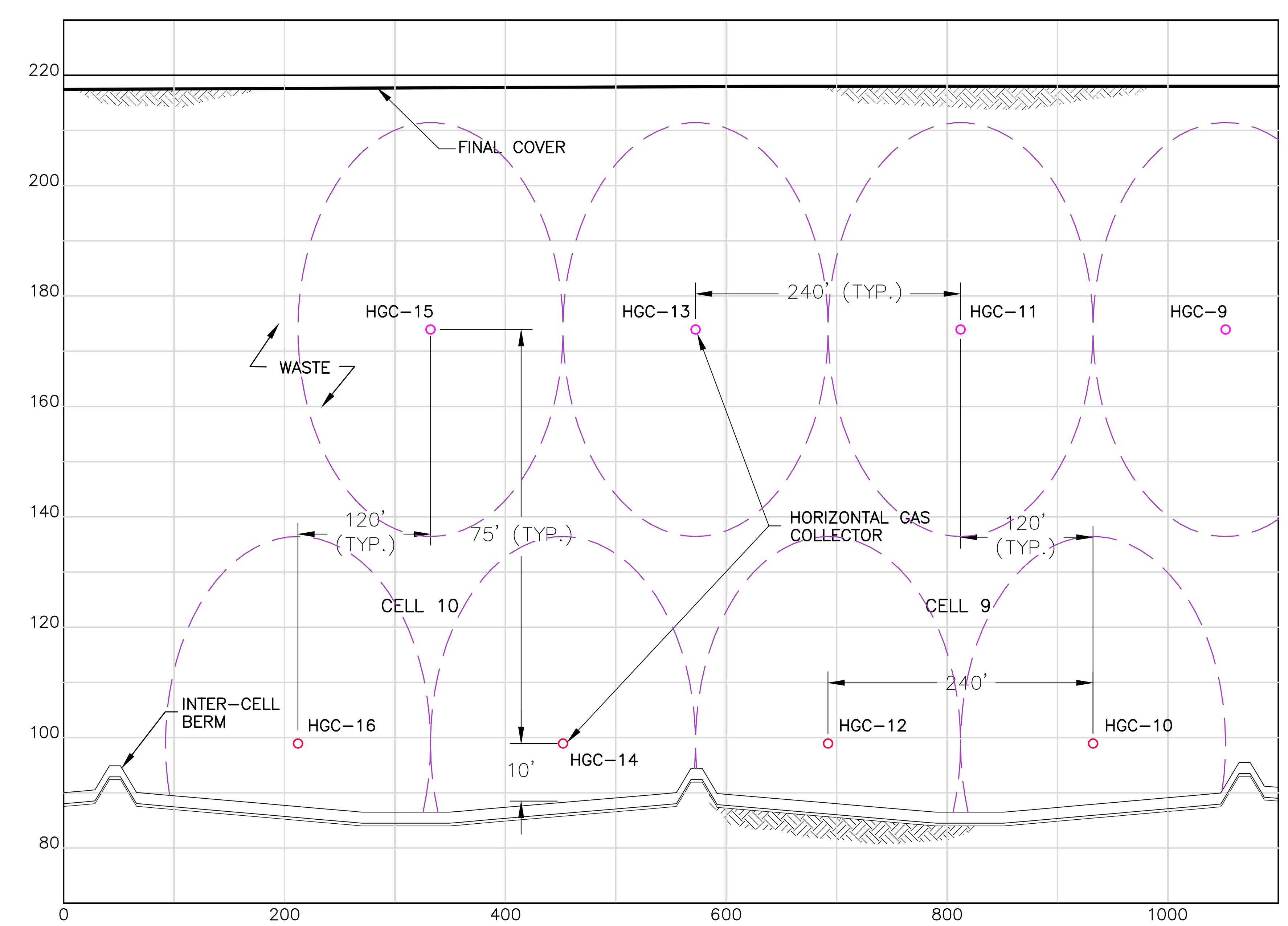
20 0 20 VERTICAL SCALE FEET
100 0 100 HORIZONTAL SCALE FEET



NOTES:
1. ACTUAL SLOPE DIRECTION MAY VARY BASED ON FILL OPERATIONS.
2. NUMBER SEQUENCE OF HORIZONTAL COLLECTORS MAY VARY DEPENDING ON ORDER OF INSTALLATION. NUMBERING WILL BE CONSECUTIVE AS INSTALLATION OCCURS.

C / 32B SECTION THRU CELLS 7 AND 8

20 0 20 VERTICAL SCALE FEET
100 0 100 HORIZONTAL SCALE FEET



NOTES:
1. ACTUAL SLOPE DIRECTION MAY VARY BASED ON FILL OPERATIONS.
2. NUMBER SEQUENCE OF HORIZONTAL COLLECTORS MAY VARY DEPENDING ON ORDER OF INSTALLATION. NUMBERING WILL BE CONSECUTIVE AS INSTALLATION OCCURS.

D / 32B SECTION THRU CELLS 9 AND 10

20 0 20 VERTICAL SCALE FEET
100 0 100 HORIZONTAL SCALE FEET

Golder Associates
Jacksonville, Florida

REV	DATE	DES	CADD	CHK	RVW	REVISION DESCRIPTION
1	09/09/10	DEG	BCL			ADDED ZOI (ROI) TO HGCs

Kevin Brown, P.E.

PROJECT
J.E.D. SOLID WASTE MANAGEMENT FACILITY
ST. CLOUD, OSCEOLA COUNTY, FLORIDA

TITLE
HORIZONTAL GAS COLLECTORS CROSS SECTIONS

PROJECT No.		083-82734	
FILE No.		08382734D032B	
REV. 0		SCALE	AS SHOWN
DESIGN	DEG	03/23/10	
CADD	BCL	09/03/10	
CHECK	DEG		
REVIEW			

DRAWING 32B OF 40