2008-01

CENTURY ENGINEERING

CONSULTING ENGINEERS

P. 3

Ex. 10

June 12, 2008

Solid Waste Program
Maryland Department of the Environment
1800 Washington Boulevard, Suite 605

ATTN: Mr. Kassa Kebede
Section Head for Landfill Operations

RE: Response to Review Comments on the April 14, 2005 Phase III Report submittal for Chesapeake Terrace Rubble Landfill Permit Application (1993-WRF-0225)

Dear Mr. Kebede:

Century Engineering Inc. has revised the referenced Phase III Report, based on the following comments from the Department:

- Comments from September 14, 2005 Joint Plan Review Committee meeting at Department offices
- Comments on Permit Drawings (revised per Joint Plan Review Committee meeting comments), from August 21, 2006 meeting at Department offices
- Comments from the Department's November 27, 2006 letter
- Comments from March 1, 2007 meeting at Department offices
- Comments on Permit Drawings (revised per August 2006 and March 2007 meetings) in September 25, 2007 meeting at Department offices

Response to comments herein are under **NOVEMBER 2006 WRITTEN COMMENTS** (which include response to September 2005, August 2006 and March 2007 Meeting Comments, as applicable) and **SEPTEMBER 2007 MEETING COMMENTS.**

Point-by-point response to Comments follows:

NOVEMBER 2006 WRITTEN COMMENTS

COMMENT A-1

1. *Comparison of the proposed waste types listed in the application against those defined as acceptable wastes in the Anne Arundel County Solid Waste Management Plan (the "County Plan") and the Code of Maryland Regulations (COMAR) 26.04.07.13 for rubble landfills indicates that the proposed wastes in the Phase III Report do not match those listed by the County or in COMAR. Please note that Section 9-210(b) of the Environment Article, Annotated Code of Maryland, requires that the types of waste allowed to be accepted by a rubble landfill in a County is limited to those identified in the law, and is further restricted as specified by the local government in the County Plan. Rubble landfills may not accept municipal or industrial waste, and are limited to the specific waste streams allowed in the referenced authorities. The operations plan must be revised to clearly conform to the regulation and the list of approved wastes allowed in the County Plan.*

The Phase III Report has been revised to list the types of waste that Chesapeake Terrace Rubble Landfill may accept, as described under Section 2.1, "Acceptable and Unacceptable Waste", and Section 12.3, "Service Information". The acceptable wastes, as described by

the 2003 Anne Arundel County Solid Waste Management Plan for rubble landfills, reference Code of Maryland Regulations (COMAR 26.04.07.1), which is the basis of acceptable rubble waste at Chesapeake Terrace Rubble Landfill. COMAR 26.04.07.1 describes in detail the types of waste described in Section 9-210(b) of the Environment Article, Annotated Code of Maryland.

COMMENT A-2

2. *A rubble landfill of this size and volume has the potential to generate significant amounts of landfill gas. The Department has come to recognize that there are two potential areas of concern that must be addressed. These are:*

   a) *The generation of hydrogen sulfide. The natural decomposition of gypsum-bearing waste such as plaster and wallboard in an anaerobic environment has the potential to create hydrogen sulfide gas. This can create significant odor problems, and if it occurs at sufficient concentrations, can have possible health implications for onsite workers.*

   b) *The generation of methane. The Department has determined that rubble landfills can generate significant amounts of methane gas. Methane is a potent "greenhouse" gas, and can be combustible at concentrations between 5 and 15% of the atmosphere. Although landfill gas monitoring and control measures are not currently specifically required by COMAR 26.04.07.13-.18 and .21 for rubble landfil1s, the Department recognizes that a rubble landfill of the magnitude proposed is very likely to have to address these potential problems during its life, as have other rubble landfills in Maryland. Therefore, a soil gas monitoring system and a system for controlling landfill gas (e.g., by flaring or use as a fuel) must be included in the design for the facility. This plan must address a schedule for landfill gas monitoring, landfill gas monitoring probe networks based on size and volume of waste to be disposed, sample collection, record keeping and reporting, and actions to be taken in case of elevated gas leve1s. The authority for these requirements is COMAR 26.04.07.03A(I), (3), (5), and (6), and B(9).*

The Phase III Report has been revised to include Section 11.0, "Landfill Gas Management Plan". This plan includes a perimeter soil gas monitoring system and an active collection system for controlling and burning landfill gas with a flare. The plan also includes: a schedule for routine landfill gas monitoring on the landfill; the landfill gas monitoring probe network; and description of monitoring methods (including sample collection, record keeping, reporting, and actions to be taken in case of elevated gas levels).

COMMENT A-3

3. *The proposed final grades include provisions for a benched slope, with slopes of 3:1. Note that this is near the limits of constructability for modern capping systems, due to gravitational stresses between the layers of the closure cap, and difficulty in draining the expected volume of infiltrating liquid from the large area of the proposed landfill. Careful attention must be paid to the design of the drainage layer for the cap to insure that it can handle the volume of water anticipated in order to prevent slope failures due to hydraulic pressure on the overlying soils at the base of slopes. Please address the method of benching to be employed, including cap geomembrane anchoring and drainage of the benches, the overall waste cross-section, percent of slope, and all pertinent features in the legend and operation and maintenance manual. If this matter cannot be satisfactorily addressed, a less steep slope must be utilized.*

Final Grading Plans on Permit Drawing Sheets 47 and 48 depict 3H:1V slopes, with slope benches at 30 feet maximum vertical separation and 2 to 3 percent longitudinal slopes. "Slope Bench Detail" on Permit Drawing Sheet 23 specifies slope bench construction requirements.

The Phase III Report has been revised to include cap drain sizing, slope bench drainage, downchutes, cross-sections, slopes, and other cover details. See Section 15.0 "Closure and Post-Closure Plan" Appendix A for Cap Drain Calculations.

COMMENT A-4

4. *The report discusses three possible access roads but only one is depicted on the plans, and that in a cursory and entirely incomplete manner. The means that will be employed to access this site for construction and operation must be designed and provided in the report. If more than one access is proposed or intended for use, or there is more than one option being considered, then all access roads must be depicted and thoroughly described.*

Three possible access roads (i.e., site entrances) are introduced on Permit Drawing Sheets 1 and 2. Queue lanes (per August 2006 Meeting Comments) and infrastructure for each possible site entrance are described under Section 3.6, "Site Entrances".

Description regarding utilization and maintenance of the site entrance roads is provided under Section 12.6.2.3, "Traffic Routing".

COMMENT A-5

5. *In several areas detailed below, design elements or construction practices were discussed in the text but not depicted in the plans, or vice versa. The final report should provide a coherent document that provides discussion and amplification of the plans, particularly in the area of how the features shown on the plans are to be constructed, and how operations are to proceed.*

Based on the Department's November 2006 Written Comments (and subsequent meetings at Department offices), significant revisions have been made to the Permit Drawings and Phase III Report narrative. Per previous reference herein, comments from the September 2007 meeting are addressed hereinafter.

The April 14, 2005 Phase III Report contained Sections 1.0 through 16.0. Sections 1.0 through 10.0 have been revised; Sections 11.0 and 12.0 have been combined under Section 17.0, "Stormwater Management/Sediment Control Report"; Section 13.0, "Operations Plan", has been replaced by Section 12.0; and Section 14.0, "Closure and Post-Closure Plan" has been replaced by Section 15.0.

Section 15.0, "Groundwater Monitoring Plan" has been moved to Section 16.0; Section 11.0, "Landfill Gas Management Plan", Section 13.0, "Construction Quality Assurance Plan"; and Section 14.0, "Construction Specifications" have been added; and Permit Drawings have been moved to Section 18.0.

COMMENT A-6

6. *The shop drawings included in Appendix C lacked page numbering and detailed descriptions of the intended use. Please include these in the next submittal.*

Referenced shop drawings apparently refer to Section 10.0, Appendix C, "Force Main Calculations", which contain hand drafted sketches of the landfill's 5 force main systems. Revised Force Main Calculations are under Section 10.0 Appendix B.

COMMENT A-7

7. *COMAR 26.04.07.08C(2) requires the engineering drawings to be 24 inches wide and 36 inches long. Please revise your drawings to meet this requirement or request a variance in accordance with COMAR 26.04.07.26, and provide justification for the variance.*

Variance for Permit Drawing size has been granted by the Department.

COMMENT A-8

8. *All pertinent features must be shown on the drawings and the intended use clearly identified in the legend. This includes all leachate collection pipes, laterals, leachate storage tanks, sumps, pumps, pipe clean-outs, manholes, landfill cells and other features that are pertinent to the facility.*

The 24-sheet set of Permit Drawings contained in the April 14, 2005 submittal has been increased to 68 sheets, to clarify and enhance the intent of the design for the rubble landfill construction and operation.

COMMENT B-1

1. *In order to comply with the requirements of COMAR 26.04.07.16C(4), the liner system must be placed upon a foundation or base capable of providing support to the liner and settlement resistance to pressure gradients above and below the liner to prevent failure of the liner due to settlement, compression and uplift, puncture, cutting, or activities at the landfill. The Phase III Report must address the following:*

COMMENT B-1(a)

a. *Page 6-2 and elsewhere - The manner in which the compacted subbase will be constructed in a series of compacted lifts of appropriate lift thickness; the soil characteristics; the type of compaction equipment to be used; the fitness of the foundation materials with respect to stability and permeability; and the anticipated compactive effort to be achieved by the various materials. The quality assurance and control, test sample repair, failed-area repair, and repair verification procedures to be used must be specified.*

The Phase III Report has been revised to include Section 13.0, "Construction Quality Assurance Plan" and Section 14.0, "Construction Specifications". Construction Specification Section 02224 contains detailed requirements for both Subbase and Clay Dam material placement, compaction and testing. The Construction Quality Assurance Plan describes testing and documentation to confirm that construction of the landfill and infrastructure meets construction specification requirements.

COMMENT B-1(b)

b. *The construction and preparation of the subbase and liner system design layout, as well as the leachate collection system installation sequences, must be described in greater detail in the text, and not just on the plans. Minimum specifications for the performance of the materials must be provided, with references to the required ASTM or other relevant test protocols.*

See response to Comment B-1(a).

COMMENT B-1(c)

c. *The manner in which the subbase and liner systems will be connected from one cell to another as the lined area is constructed sequentially over time must be described, with details provided in the plans.*

Permit Drawing Sheets 25 through 41 depict Intermediate Construction Stage Plans for individual cells. Details on Sheet 42 show the manner in which cells will be accessed for construction, and methodology for liner connection between newly constructed and future cells. Sections IC-1 through IC-5 on Sheets 43 through 46 demonstrate construction requirements associated with connecting landfill cells.

COMMENT B-1(d)

d. Page 7-2 and elsewhere - You have proposed a clay plug inside the base of the interior landfill side slope to prevent groundwater seepage from entering the landfill's cell floor. Your proposal did not adequately address the engineering justifications for the performance of the clay plug or its capability in preventing groundwater seepage from entering the cell floor for the life of the landfill. Although the drainage system is estimated to produce 3.5 gallons per minute after the perched system is drained, no description of the manner in which this will be accomplished, the amount of water expected during the initial period, or the effect that this will have on construction is included. We are concerned that saturation of the clay over time may lead to solifluction or differential settlement in this area. The report must address the effectiveness of the clay plug in preventing groundwater buildup underneath the landfill, and the related stability of the liner system under load. It must also address in detail the means or methods of engineering remedies to be taken if problems are encountered with groundwater seepage entering the landfill's cell floor.

Revisions to Permit Drawings, following the March 2007 meeting at Department offices, included significant revisions to "Clay Dam Detail" on Permit Drawing Sheet 16. During discussion regarding the revised Permit Drawings at the September 2007 meeting, the Department expressed concern regarding stability of the revised Clay Dam at the interface of sandy soil (saturated with perched water), and the impact of clay dam construction on perched water level in the adjacent sandy soil.

Clay Dam foundation was extended vertically from the top of in situ clay to the bottom of 2 feet prepared subbase for the landfill cell floor. Per this design revision, Hardin-Kight Associates, Inc. performed a Slope Stability Analysis for the Clay Dam. Using Clay Dam construction as the worst case design condition, Hardin Kight's Analysis substantiates the stability of all 2H:1V landfill perimeter berm slopes.

Golder Associates Inc. checked Hardin-Kight's Slope Stability Analysis and confirmed Hardin-Kight's conclusion that the Clay Dam slope will be structurally stable. Following this conclusion, Golder Associates Inc. and Century Engineering, Inc. revised the Clay Dam design and construction procedures, as necessary to retain and control perched water, during and following Clay Dam construction throughout the life of landfill construction and operation, in accordance with the following design considerations:

1. **Clay Dam construction requires that perched water in sandy soil at the interface of the Clay Dam be drained as necessary to facilitate the Clay Dam construction operation. To accomplish this dewatering, a Perched Water Drain will be installed on top of the in situ clay near Clay Dam 2H:1V slope subgrade (see "Perched Water Drain Detail" on Permit Drawing Sheet 16).**

2. Clay Dam construction will be separated into 4 areas (i.e., Phases). Limits of the entire Clay Dam construction area are shown on Sheet 8, "West Section Composite Top of Cell Subbase Grading Plan". Intermediate Construction Stage Permit Drawing Sheets 35, 37, 38 and 39 have been revised as necessary to depict each Phase of Clay Dam construction.

   Clay Dam Sequence of Construction is provided for each Phase of Clay Dam Construction. As indicated in each Construction Sequence, to retain and control perched water behind the finished Clay Dam, a perched water drain outlet equipped with a valve will be connected to the perched water drain behind the Clay Dam.

   Perched water drain outlets discharge to a surface runoff impoundment designed to impound surface runoff due to a 10-Year Storm Event (see Permit Drawing Sheet 56 for surface runoff impoundment design criteria). Following rainfall events, the surface runoff impoundment shall be pumped as required to ensure that water depth in the impoundment does not exceed 3 feet (per Sheet 56 Specification).

   To facilitate Clay Dam Construction, the Perched Water Drain Outlet valve shall be open during the Clay Dam construction operation. To ensure that water from the surface runoff impoundment area will not enter the Perched Water Drain during Clay Dam construction, the Perched Water Drain Outlet invert shall be 3 feet above the applicable surface runoff impoundment design high water elevation (see Permit Drawing Sheet 56 for temporary surface runoff impoundments' design high water elevations and pumping requirements).

   To control perched water elevation behind the Clay Dam, Perched Water Drain outlet valve shall be closed, following Clay Dam Construction.

3. Per the site's Phase II Report, Perched Water maximum height above the top of in situ clay along the entire Clay Dam horizontal alignment is 15 feet. Therefore, material which abuts dry, sandy soil above the Clay Dam will be subbase, equivalent to cell floor subbase permeability requirement.

4. Clay Dam Construction Sequence Schedules on Permit Drawing Sheets 35, 37, 38 and 39 are from calculations attached to Construction Specification Section 02224, "Subbase and Clay Dam".

Hardin-Kight Associates, Inc. reviewed revised Permit Drawings associated with Clay Dam construction and provided their "Landfill Perimeter Berm Slope Stability Analysis", which is included herein under Section 9.0 Appendix D. Golder Associates Inc.'s "Clay Dam Slope Stability Analysis" is under Section 9.0 Appendix E.

Clay Dam Phased, Sequenced Construction per the revised Clay Dam design, as described above and contained in the revised Phase III Report:

- Provides a structurally stable barrier which will prevent perched water seepage into landfill cells for the life of the landfill.
- Provides perched water control under which perched water at the Clay Dam/Sandy Soil interface will be dewatered to facilitate construction during the Clay Dam construction operation only.

COMMENT B-1(e)

e. *Note 3 on drawing No.3 of 30 states "depiction of the clay dam design as based on information provided by others" for the clay darn design. Also, the Clay Dam Detail on drawing No. 18 of 30 shows the clay dam to be constructed at the toe of the subbase slope while groundwater impinges on the top of the subgrade directly impacting the landfill's stability. The clay dam design lacks any groundwater modeling and groundwater volumes to rectify encountered problems. The proposed design is supposed to be based on site-specific conditions related to the construction of the cell floor rather than information gathered by others. The proposed design also lacks the required 3-foot groundwater buffer distance from the subgrade.*

History of events related to Clay Dam design is given under Note #1 for "Clay Dam Detail" on Permit Drawing Sheet 16.

Elevation of highest anticipated groundwater has been added on Sheet 16 "Clay Dam Detail". Determination of minimum buffer between highest anticipated groundwater and bottom of cell floor subbase (after landfill settlement) is under Section 4.0, "3 Feet Cell Subbase/Highest Anticipated Groundwater Buffer".

COMMENT B-1(f)

f. Additional slope stability analyses must be performed for both, the foundation area and the side slopes, assuming groundwater build-up behind the side slopes of the landfill, and continuous saturation of the clay plug.

Additional analyses have been performed (see response to Comment B-1(d).

COMMENT B-1(g)

g. The design for dikes and cut slopes should show the design layout with cross sections indicating the proposed grade and bearing elevations relative to the existing grade, along with details of the dikes and soil shear strength including all slope angles and dimensions.

As indicated under response to Comment B-1(d) above, slope stability analyses for Landfill Perimeter Berm (including Clay Dam) 2H:1V slopes are under Section 9.0, Appendix D and Appendix E.

"HDPE Liner Stability Analysis" has been added under Section 9.0, "Slope Stability and Textured 60-Mil HDPE Liner Analyses". Liner Stability analysis includes the following methods:

- **Infinite Slope Stability Method (Koerner, 1999)**
- **Finite Slope Stability Method (Cover Only - Koerner, 1999)**
- **Finite Slope Stability Method (Cover with 8-ft Waste - Koerner, 1999)**
- **Run-out and Anchor Trench Design Method (Koerner, 1999)**

COMMENT B-1(h)

h. The report did not address in detail activities to occur during construction of the landfill such as site preparation, aerial survey, clearing, and grubbing. In addition, borrow area management, and areas to be used for storage of materials, soil balance equations, and use of control benchmarks. The creation of soil stockpiles was mentioned in the text, but no identification of areas to be used for each cell was

described in the plans. These elements must be provided for consideration of landfill operations and sediment and erosion control features. The report must address a general schedule for construction events, a landfilling sequence, cell acreages, and describe the manner in which the landfill will be constructed in greater detail than is provided in the plans, as required by COMAR 26.04.07.16A.

See Sections 12.0 and 14.0 for site preparation, aerial survey, clearing and grubbing. Most of the site will be excavated to construct landfill cells (see Section 8.3, "Soil Volume"). Control benchmarks are located near the site.

Sequence of construction on Permit Drawing Sheet 24 is reiterated under Section 7.0, "Schedule, Sequence and Contract Documents for Construction". Intermediate Construction Stage Permit Drawing Sheets 25 through 41 have been added. Stockpiles will be placed in disturbed areas necessary to construct the landfill cells, as shown. Meetings with Anne Arundel Soil Conservation District (AASCD) were held and plans were submitted to AASCD on December 26, 2007. "Previous meetings addressed the broader erosion control plan issues which have been completely addressed" is an excerpt from a letter dated January 4, 2008, from AASCD to the Owner.

Cell acreage is tabulated on Permit Drawing Sheet 2.

COMMENT B-2

2. *The effect of settlement on the proposed HDPE geomembrane is estimated and potential effects addressed. However, no such discussion is provided for the performance of the clay liner, and we are concerned that a clay liner might not accommodate the calculated 0.1% elongation it is likely to experience, especially across the distances to be encountered in the proposed landfill, which could amount to several feet. Also, there was no discussion of clay liner installation, quality assurance, or protective techniques in the plan. It is recommended that this alternative be removed from the proposal.*

Option for utilization of a clay liner in lieu of 60-Mil textured HDPE liner has been eliminated.

COMMENT C-1

1. *On page 4-1, the area and population to be served by the facility as specified in COMAR 26.04.07.16A(3)(b) is inadequately described. Please amplify.*

Source of the waste is unknown. Revised description is under Section 2.2, "Area Served".

COMMENT C-2

2. *Section 7.1 and Plan 14 000 and 15 of 30 - The description of the leachate storage tanks provided in Section 7.1 did not address means of leachate movement to the tank by gravity or by pump. Note that COMAR 26.04.07.16C(7)(e) requires that the leachate collection system be "designed to operate solely by the force of gravity in all areas where the system will directly underlie solid waste." Therefore, the pump sumps should be relocated outside of the landfill proper, unless a variance is requested and approved in accordance with COMAR 26.04.07.26.*

Variance to pump leachate from cell sumps has been granted by the Department.

COMMENT C-3

3. *On page 9-2, Section 9.2, Alternate Clay Liner - You propose one foot of clay as an alternate liner. This contradicts the Cell Liner Detail on drawing No. 13 of 30, which shows only a geomembrane liner. Please be specific in your design descriptions. Alternative liner designs*

may be proposed, but each alternate design must be completely described in plans, construction techniques and specifications, and quality assurance/quality control protocols. Also, if contemplated. the manner in which different cells possessing different liner designs will be interfaced must be described.

Option for utilization of a clay liner in lieu of 60-Mil textured HDPE liner has been eliminated.

COMMENT C-4

4. *Page 9-2, Section 9.3.2 evaluates the stability of the 2:1 interior slopes, and finds them stable. However, the report also recommends that the granular drainage layer only be constructed in sections 20 feet high due to potential instability. This is unacceptable, as it would leave part of the liner uncovered and exposed for damage. Moreover, we have had experience with the failure of steep lined slopes during winter weather conditions when freeze-thaw in the drainage layer can seriously degrade the stability of the material. Please revise the design to significantly increase the stability of this system, and provide careful documentation of the actual constructability and stability of the liner and drainage layer at the revised design slopes.*

Design of the leachate collection system for the landfill perimeter berm 2H:1V slopes has been revised, as shown on Permit Drawing Sheet 16, " Leachate Collection Liner Details." Under the revised design, maximum vertical height of the granular drainage layer has been reduced to 10 feet, as shown on Sheet 16 Detail entitled "Landfill Perimeter Berm Section (10 Feet to Maximum Vertical Height)". Sacrificial 12-Mil Polypropylene Liner on top of permanent Geocomposite Drainage Net will be placed on 2H:1V slopes that exceed 10 feet vertical height.

Construction of landfill 2H:1V slopes, utilizing this design methodology, has been successfully achieved on similar landfill projects.

COMMENT C-5

5. *Page 10-2, Section 10.1.3 and 4 - The HELP hydraulic model was used for estimating leachate volumes. However, although valuable for estimating long-term production in a landfill of significant thickness, this model does not provide a good estimate for "worst case" liquid volumes that would be encountered in an actual landfill environment. A more plausible "worst case" would occur following a heavy rain while the landfill cell is only partially filled with waste, but some waste is in the cell so the resulting liquid must be managed as leachate. This "worst case" scenario must be addressed in the operations manual, and either the pumps must be resized or alternative means for addressing the increased liquid volumes must be proposed.*

Description of leachate long term and worst case scenario production, provided under Section 10.2, indicates that long term leachate production analysis was performed to size leachate pumps, force mains and storage tanks. Worst case scenario leachate production was performed to ensure adequacy of pumps, force mains and storage tanks, during a rainfall event (assuming no waste placement) on a newly constructed landfill cell.

Based on Hydrologic Evaluation of Landfill Performance version 3.07 (HELP 3) computer analysis, it was determined that newly constructed cells will be temporarily separated into approximate 3-acre increments. Methodology to accomplish this cell separation is described under Section 10.11.4. To depict the concept associated with temporary cell separation, a plan was prepared to demonstrate separation of Cell 5, the largest landfill cell (see Section 10.0, Appendix G).

Per description under Section 10.11.5, leachate force mains and storage tanks are adequate to accommodate worst case scenario leachate production. An additional submersible pump will be provided in cell sumps indicated on the "Cell Pump List" under Section 10.9.4 and on Permit Drawing Sheet 20).

COMMENT C-6

6. *The report must address in detail the minimum specifications for the impermeable liner be used, and its ability to withstand the stress caused by hydrostatic forces, temperature variations, exposure to ultraviolet light, resistance to chemicals; foundation settlement, construction and operational loading without compromising its integrity.*

Impermeable liner specifications, which address properties listed above, are included under Construction Specification Section 02597, "High Density Polyethylene (HDPE) Geomembrane".

COMMENT C-7

7. *Section 12 - Sediment and erosion control calculations are noted, but the directions and notes provided in the Plans, should be repeated here, particularly with respect to the phasing of tasks. The section lacks a discussion of stormwater management at the site. Instead, the plan references the wetland study presented in the Phase II Report. Please provide a detailed discussion of stormwater management features and capacities.*

Section 17.0 (combined former Sections 11.0 and 12.0) contains the "Stormwater Management/Sediment Control Report for Chesapeake Terrace Rubble Landfill". Sediment Control and Stormwater Management information contained in the April 14, 2005 Phase III Report submittal was revised as necessary to meet Anne Arundel County Soil Conservation District (AASCD) requirements, for a submittal made on December 26, 2007. Excluding updated seal and signature on Drawings, documents in Section 17.0 are per the December 2007 submittal to AASCD.

Contents of the revised Stormwater Management/Sediment Control Report (from the table of contents in Section 17.0 hereunder) are as follows:

- **Site Stormwater Management/Sediment Control Description**
- **Stormwater Management Computations**
- **Miscellaneous Stormwater Management/Sediment Control Design Data**
- **Soils Report**
- **Dam Breach Analysis**
- **Storm Drain/Perimeter Ditch Design**
- **Culvert Analysis for Assumed East Entrance Access Road**
- **Appendices containing Surface Runoff/Sediment Control Drainage Area Maps, Topographic Exhibit for Dam Breach Analysis, and Drainage Area Map for Assumed East Entrance Access Road Culverts**

In addition to the above, Permit Drawings 51 through 68 address Stormwater Management/Sediment Control issues exclusively.

An excerpt from a January 4, 2008 letter from AASCD to the Owner follows:

"Subject: Chesapeake Terrace Rubble Landfill; AASCD #333-12

The plans received December 26, 2007 have been reviewed and the District offers the following comments. Previous meetings addressed the broader erosion control plan issues which have been addressed completely.

1. **Sheets 58, 59 & 60; include a dewatering device for the three ponds, be sure to include a detail.**
2. **Sheet 64; Remove the three 378 small pond letters.**
3. **Seal and sign all sheets.**
4. **The three ponds must be reviewed by the Maryland Department of the Environment to approve of the required stormwater design. They will also review for dam safety. The District will require their approval prior to our signing off on the plans."**

Three Basins shown on Permit Drawing Sheets 58, 59 and 60 were designed to provide sediment control and stormwater management for 2-, 10-, 25- and 100-year storm events. Comment #4 above specifies MDE approval for the stormwater management design. Subsequent interaction with MDE and Anne Arundel County Planning and Code Enforcement (PACE) have resulted in the determination that it is the exclusive responsibility of PACE to approve stormwater management for the site.

COMMENT C-8

8. *Page 13-1, Section 13.1 - The report references a scale house: maintenance facilities, other features in a cursory manner with insufficient description, and these features are not reflected on the plans. The plans must describe and depict these features, as required by COMAR 26.04.07.16A(1) and (2).*

There are 3 site entrances, per depiction and description on Permit Drawing Sheet 2, "Site Plan". Each Site Entrance has infrastructure comprised of queue lanes, scale house and truck scales, maintenance building, and wheel wash with concrete clean-out (see Section 3.6, "Site Entrances"). Grading plan for each site entrance is shown on Permit Drawing Sheets 4, 5 and 6.

COMMENT C-9

9. *Page 13-1 and 2, Sections 13.3 and .5 - The plan describes the landfill staff as consisting of only a landfill manager/scale operator and two equipment operators. This is inadequate staffing for a landfill proposing to accept 2,100 tons per day on average. The plan does not address many of the daily tasks that must be performed in the operation of a landfill, such as maintenance of sediment controls, hauling of cover material, inspection of waste dumped at the working face, traffic management, vehicle and equipment maintenance, litter control, environmental monitoring, and other routine activities. For example, Section 13.16 indicates that a "litter patrol" will be implemented, but no provision is made for these workers in the plan. Also, the plan only provides for load inspection by the scale operator, and none at the working face, where disguised unacceptable waste may be encountered. This section must be revised to specify a realistic staffing requirement for a landfill of the proposed scale, including sufficient operators, waste inspectors, truck spotters at the working face, mechanics, laborers, and supervisors.*

Section 13.0, "Operation's Plans" in the April, 2005 Phase III Report has been replaced by revised Phase III Report Section 12.0. Items above are addressed as follows:

- **Equipment and Personnel - Section 12.4 and Section 12.0 Appendix A.**
- **Maintenance of Sediment Controls - Section 12.11.3**

- **Hauling of Cover Material - Section 12.9**
- **Inspection of Waste - Section 12.7**
- **Traffic Management - Section 12.6.2**
- **Vehicle and Equipment Maintenance - Section 12.8**
- **Litter Control - Section 12.7.2**
- **Environmental Monitoring - Section 12.12**

COMMENT C-10

10. Page 13-1 and 2, Section 13.4 - The plan only vaguely identified some of the equipment that will be needed to operate the site, and does not enumerate either adequately or completely the numbers and specifications of the equipment needed to operate a landfill that expects to receive over 2,000 tons of waste a day. It also does not describe OJ adequately mention other equipment that is likely to be required, such as pumps in various capacities, generators, lighting for emergency work or operations in winter, and monitoring and safety equipment. This section must address all equipment required to operate the landfill in a safe and effective manner.

Items referenced above are addressed as follows:

- **Equipment - Section 12.0 Appendix A**
- **Pumps - Submersible pumps for landfill cell sumps are shown in "Cell Pump List" on Permit Drawing Sheet 20 and Section 10.9.4. Spare pumps for emergency use shall be stored in the site's maintenance building, per Section 12.12.1.2.1. Pumps for surface runoff impoundments in Cell 10 and Cell 7 areas are specified on Permit Drawing Sheet 56.**
- **Emergency Lighting - Section 12.11.10.6**
- **Operations in Winter - Section 12.6.3**
- **Monitoring and Safety Equipment - Section 12.0 Appendix C**

COMMENT C-11

11. Page 13-2, Sections 13.5 and .6 - The proposed procedures for detection and management of unacceptable wastes is not adequate. In addition to procedures for performing inspections at the working face as well as at the scale house, plans for identifying and managing unacceptable waste of various kinds and amounts must be prepared. In addition to the potential for the receipt of hazardous materials, rubble fills may receive other unacceptable materials such as scrap tires, municipal household waste, and liquids such as paints, fuels and lubricants, and pressure cylinders such as Freon and propane tanks and welding gases. Please expand this section accordingly.

Acceptable and unacceptable waste is under Section 2.1. Plans for identifying and managing unacceptable waste are under Sections 12.7 and 12.11. Handling of special wastes is under Section 12.7.8.

COMMENT C-12

12. Page 13-5, Section 13.10 - The phrase "weather permitting" should be removed from the discussion of the placement of intermediate cover.

The phrase "weather permitting" has been deleted.

COMMENT C-13

13. *Page 13-7, Section 13.17 - The plan notes that the operator will "not mix heavy traffic with light trucks" but does not describe how this will be accomplished. If a separate unloading area for pickups and other light vehicles will be provided, it must be depicted in the plan, or at least the operating procedures must be described if it is merely a separate part of the working face. Alternatively, this sentence may be deleted.*

It is anticipated that most of the rubble waste will be transported to the site in semi-trailers. There is no provision for mixing heavy traffic with light trucks in the revised Operations Plan.

COMMENT C-14

14. *Page 13-7 and 8, Section 13.18 - The section on fire prevention and control is cursory and should be expanded. It should include provision for immediate notification of fire officials, and describe the responsibility and manner in which this will be accomplished.*

Fire prevention and control is addressed under Section 12.7.4 and Section 12.0 Appendix D.

COMMENT C-15

15. *Page 13-9, Section 13-19 - The section on odor control neglects to mention the generation of landfill gas and the potential for generation of hydrogen sulfide and other odorants due to the decomposition of gypsum wastes in the landfill. This section must be significantly expanded to address these issues. Also, given the size of the landfill and the traffic proposed, the section on dust control must be expanded. It is likely that dust control will be required on any day that it is not actively raining, and procedures for the control of sediment drag-out will be required on all operating days. These: issues must be addressed, and any necessary changes made to the manpower and equipment sections of the report.*

Section 11.0, "Landfill Gas Management Plan", has been added to the Phase III Report. The active system specified under the Plan will control landfill gas odor. Odor and dust control are addressed under Section 12.7.3.

COMMENT C-16

16. *Drawing 1 of 30, the Site: Plan, lacks a scale. Although it can be calculated from the Maryland Grid Coordinate System markings, this is inconvenient. Please add a scale.*

Scale has been added under Permit Drawing Sheet 1 Location Map.

COMMENT C-17

17. *The West Section Perimeter Ditch on drawing No.2 of 3 drainage area map shows that all stormwater is directed to Basin No. 1. The proposed basin may not be adequate enough to handle all stormwater generated by this portion of the landfill. Please address the adequacy of the basin to handle all stormwater collected for this portion of the landfill. This also applies to the eastern section of the landfill depicted on drawing No. 3 of 3 for Basins 2 and 3. Also, some of the sediment trap basins on the plan are not clear, partially shown, and obscured by heavy contours. To minimize confusion, please clearly depict complete sediment basins and profiles on a sheet for the designated cells to be served and address the adequacy of these basins during high storm events.*

All basins are designed to accommodate surface runoff discharge as required to provide peak control for 2-, 10-, 25- and 100 year storms to less than surface runoff discharge under Existing Conditions.

The Stormwater Management/Sediment Control Report under section 17.0 has been rearranged for clarification of contents. A revised table of contents and "Executive Summary" have been added.

Existing and Developed Conditions Drainage Area Maps are in Section 17.0 Appendix A. Drainage Areas are utilized for Existing and Developed RCN Computations in Appendix B. There are two sediment traps for the site. Sediment traps plan and design criteria are shown on Permit Drawing Sheet 57. Basin Plans and profiles through principal spillways are shown on Permit Drawing Sheets 58, 59 and 60. Basin dam centerline and emergency spillway profiles are on Permit Drawing Sheet 63.

COMMENT C-18

18. The title page on drawing No.1 of 1 is entitled "Existing Conditions Drainage Area Map" while depicting soil classifications for the site. Also, the drawing page numbering lacks proper continuity.

Soil classifications are typically depicted on drainage area maps utilized for stormwater management design, because soil classifications are necessary to compute RCN's for Basin design (See Section 17.0 Appendix B). All drainage area maps utilized to design basins and sediment traps are in Section 17.0 Appendix A.

COMMENT C-19

19. The title page on drawing Nos. 1 of 3 through 3 of 3 is entitled "Developed Conditions Drainage Area Map" while depicting different types of soil classifications. Please revise the title page to reflect the proper title and drawing page number continuity.

See response to Comment C-17.

COMMENT C-20

20. On drawing Nos. 1 of 1 and 1 of 3 through 3 of 3, there is depicted a star with a note in the legend that says "Study Point". What was studied and why was this point selected for the study?

Study points on drainage area maps (used to design stormwater management basins) indicate the downstream limit of watersheds where the basins will be constructed.

COMMENT C-21

21. Drawing No.1 of 30, Title Sheet refers to drawing Nos. 3 of 30 and 4 of 30 as "Initial Grading Plan". Neither of these drawings show bottom liner system detail except for inadequately depicted base grading contours. Please address in the operation and maintenance manual, as well as depict on the drawings, the liner system detail cross sections, landfill side slope design, and sump pump specifications.

Significant revisions to the Permit Drawings have been made since the April 14, 2005 Phase III Report submittal. Composite Cell Top of Subbase Grading Plans are shown on Permit Drawing Sheets 7 and 8. Liner System Details on Permit Drawing Sheet 16 (which reference other Permit Drawings) have been revised.

Liner system installation and quality assurance are described in Section 13.0, "Construction Quality Assurance Plan" and Section 14.0, "Construction Specification".

COMMENT C-22

22. Note 1 on drawing Nos. 3 of 30 and 4 of 30 "Cell Base Plan" for the proposed finished landfill states "Perimeter Finished Grade" and "Subgrade Geomembrane Liner"; this is confusing. Also, the drawings do not specify cell acreage, nor clearly depict the cell

separation. This may result in inaccurate leachate volume calculations and pump specifications for the intended cell. Please clarify.

Significant revisions to the Permit Drawings have been made since the April 14, 2005 Phase III Report submittal. Cell acreage tabulation is shown on Permit Drawing Sheet 2. Cell separation berm depiction has been added.

COMMENT C-23

23. The drawings do not depict intermediate stages of landfill construction, including internal access roads and temporary construction entrances. Drawings that depict the landfill in various stages of construction are helpful in determining how the landfill will be constructed and accessed, as well as helping to determine where runoff will be pumped, which helps determine the required pump capacities, etc. Also, construction access roads and entries may require additional protection for liners and leachate collection system elements. Please clearly depict the proposed finished grade, subgrade, access roads, acreage of each cell and inter-cell berm separation on a clear sheet to minimize confusion, in addition to the map projecting these features onto the base topographic map as required by the regulation. The cell floor must show the required minimum 2% slope, and be graded to maintain this slope after anticipated settlement under the projected load.

Intermediate Construction Stage Plans (per description under Item II(D) on Permit Drawing Sheet 24) are provided on Permit Drawing Sheets 25 through 41.

COMMENT C-24

24. Drawings No.7 of 30 and 8 of 30 depict a drainage ditch on the outside of the perimeter landfill access road. In the western comer opposite Cell 8, this exterior ditch appears to terminate without a sediment control structure. An appropriate means of runoff control must be applied in this area to the satisfaction of the local Soil Conservation District.

Per response to Comment C-7, in a January 4, 2008 letter to the Owner, AASCD stated erosion control plan issues have been completely addressed.

COMMENT C-25

25. Drawings Nos. 1 of 2 and 3 of 30 show a crest in the middle of Cell 1 and 2 grading from an elevation of 108 to 111, a 2% slope, and sloping in both directions without any explanation in the text. This may create leachate build-up on the liner. Please address the purpose of this design and the reason behind it.

Cell high point elevation between Cells 1 and 2 has been corrected (see Permit Drawing Sheet 8).

COMMENT C-26

26. Drawings for the cell floor plan are confusing with too many features drawn on the map. Please show only the proposed base grade contours for Cell Nos. 1 through 10 and the minimum 2% slope necessary to facilitate movement of leachate towards the leachate collection system on these drawings. Additional drawings may be added to depict other features.

Permit Drawing Sheets 8 and 9 were created to depict only composite grading required to construct landfill perimeter berm and cell top of subbase.

COMMENT C-27

27. The report failed to address leachate pipe selection and construction. The selected pipe materials should be indicated similarly on the plans and drawings as well as in the

specifications, and should agree with the assumptions in the design calculations. Calculations that the specified piping will withstand anticipated loadings with acceptable maximum ring deflection must be included. The specifications must include:

- *Type of material piping,*
- *Diameter and wall thickness,*
- *Size and distribution of slots or perforations,*
- *Seaming or other connections between pipes and different sizes and types of pipes;*
- *Type of coatings used in the pipe manufacturing, and*
- *Type of bedding material used to support the pipes.*

The following high density polyethylene (HDPE) pipes will be used to construct and operate the landfill cells:

- **24" perforated SDR-11 HDPE pump carrier pipes in landfill sumps, connected to solid wall pipes buried in perimeter berm 2H:1V slope (see Permit Drawing Sheets 9, 10, 16, 17 and 18)**
- **Double wall force main comprised of 6-inch SDR-11 HDPE inside 10" SDR-11 HDPE (see Permit Drawing Sheets 9, 10, 11, 12, 20, 21 and 22)**
- **12" perforated SDR-11 HDPE perched water drain behind clay dam (see Permit Drawing Sheets 16 and 35 through 39)**

Calculations for worst case loading conditions on each HDPE pipe are provided under Section 10.0 Appendix B.

COMMENT C-28

28. *The cell floor design shows individual cells to be served by a single pump. However, each cell pump must be designed with its own network having check valves and gate valves to control leachate and a gas vent with a screen.*

Each cell pump is designed with its own check valve and ball valve (i.e., shut-off valve) per depiction on Permit Drawing Sheet 20. Each Pump House is provided with an aluminum roll-up door for venting, and vents are provided in the building wall, as shown on Sheet 20 Section A-A.

COMMENT C-29

29. *The pump design lacked typical sump profile and section detail, liner pipe penetration and pipe connection detail. Please add these details.*

See Permit Drawing Sheets 17 and 18 for Cell Sump to Pump House plans and profiles.

There are no liner pipe penetrations.

COMMENT C-30

30. *The leachate collection system design must address the ability of the proposed leachate removal system to effectively remove leachate from the bottom of the landfill during worst case, high storm scenarios and over the life of the landfill. The report must address methods of testing the leachate head on the liner to insure that at all times it does not exceed the 1-foot regulatory limit.*

See response to Comment C-5 for worst case scenario leachated production.

All submersible leachate sumps will be provided with level sensors and alarm systems described under Section 10.4, and illustrated in Section 10.0 Appendix A.

COMMENT C-31

31. The leachate main force header lacked leachate pipe flow calculations to justify the design. The design must prevent excessive full pipe flow or pipe angle deflection to insure free leachate movement through the pipe without scouring, etc.

Calculations for the leachate force main are under Section 10.0 Appendix B. The design allows free movement of leachate through each of the five force main trunk lines shown on Permit Drawing Sheet 11. Design criteria considers all pumps running under conditions that do not exceed full pipe flow. Leachate pump and force main design criteria is tabulated under Section 10.9.4, "Leachate Pumps and Force Main Selection."

COMMENT C-32

32. A 6-inch leachate force main is proposed to be buried around the landfill at an elevation more than 30 feet higher than the sumps. Please address the effectiveness of this design for easy access for maintenance and for free movement of leachate to the storage tank over the life of the landfill.

Based on discussion at the September 2005 meeting at Department offices, a meeting was held with a Contractor having landfill cell construction experience. Per discussion regarding ease of construction equipment access for force main maintenance throughout the life of the landfill, the horizontal alignment of the force main buried under the landfill perimeter berm top width was relocated to the perimeter access road shoulder.

Based on force main realignment conditions, leachate pump and HDPE pipe calculations were revised (See Section 10.9.4).

COMMENT C-33

33. A discussion of the leachate flow to the storage tank should be included. The discussion must address the effectiveness of the system over the life of the landfill. Also, it must address the system's ability to withstand the static pressure of the wastes.

Description of leachate flow to the storage tank, including leachate pumps, HDPE pipes, and storage tanks requirements; Help 3 analysis methodology for long term and worst case scenario leachate production; leachate management; and adequacy of pumps, force mains and storage tanks for worst case scenario leachate production are under Section 10.0.

Leachate collection and conveyance systems will be effective over the life of the landfill (see manufacturer's literature in Section 10.0 Appendices A, B and C).

Calculations in Section 10.0 Appendix B show that HDPE pipes under worst case rubble waste loading conditions are structurally stable.

COMMENT C-34

34. Drawing No. 13 of 30, Cell Liner Detail fails to depict the required 2 feet of compacted clay subbase with a maximum permeability of 1 x 10^{-7} cm/sec, geomembrane liner specifications, or the 2-ft leachate drainage layer with a permeability of l x $l0.^{3}$ cm/sec or greater.

Revised leachate collection liner details are shown on Permit Drawing Sheet 16.

COMMENT C-35

35. The Sump to Pump House Section A-A and Landfill Side Slope Section C-C details on drawing No. 14000 must clearly address pipe specification, functions, and leachate flow to the storage tank. All features that are depicted as part of the cross section must be clearly labeled on the plan and also addressed in detail in the report.

Section 10.0 "Leachate Collection System Pumps, HDPE Pipes, and Storage Tanks" and Permit Drawings have been significantly revised to describe and depict leachate flow to the storage tanks.

COMMENT C-36

36. Leachate manholes section: The pump house and leachate manholes must be made of pre-cast concrete, concrete poured in place, or other acceptable materials, and must be waterproofed on the exterior. A drop pipe must be provided for leachate entering at an elevation of 24 inches or more above the manhole invert. All manholes must have a minimum diameter of 2 inches for access to the manhole during inspection and maintenance. Consideration must be given to the potential for the occurrence of explosive levels of methane gas in these structures.

There are no manholes or drop pipes in the leachate collection system. Check valve vaults, air release valve vaults and cleanouts will be provided for force mains (see Permit Drawing Sheets 9, 10, 11, 21 and 22). See Section 12.0 for system operation, maintenance, and safety procedures.

COMMENT C-37

37. The leachate collection system must be designed for each cell to convey leachate by gravity to leachate collection sumps, with level controls set in each collection sump to control and transfer leachate to the leachate storage tanks through underground piping. The system must be designed with sensors that turn the pump off at low levels and activate the pump at a predetermined level and sound an alarm in times of high water or power outages.

Leachate collection system is designed per COMAR requirements to convey leachate to each cell sump. Description of force mains, level sensors and alarm systems is under Section 10.0. Depiction of pump-off, pump-on and pump alarm levels is provided on Permit Drawing Sheet 17 "Sump to Pump House Section A-A".

COMMENT C-38

38. The submersible pumping systems in all cells should be designed in accordance with the National Electric Code Class I, Division 1, Groups C and D hazardous locations. These locations have the likelihood for flammable gases to exist. Pumps must be two stage grinders or other pumps capable of handling biological solids. These details should be reflected in the report and the pumping station details reflected on the plan.

Submersible pumps are designed for National Electric Code Class I, Division I, Groups C and D hazardous locations, and are capable of handling biological solids. See Section 10.0 Appendix A and Permit Drawing Sheet 20.

COMMENT C-39

39. All pumping stations must be designed to be easily accessible and convey leachate via PVC piping within the perimeter berm to the leachate storage tank. Each pumping station should be equipped with adequate horsepower, duplex self-priming pumps, and with grinder pump ability. Also, each pumping station in each cell must have an adjacent valve chamber that contains check valves.

Pump houses are designed to be easily accessible for Pump Installation and Removal Equipment (see Permit Drawing Sheet 21 "Force Main Lateral Plan" Note #4).

Pumps have adequate horsepower and grinder ability (see Section 10.0 Appendix A). Each Pump House contains stainless steel ball valve and stainless steel check valve on each pump discharge pipe.

COMMENT C-40

40. The schematic pump station detail must show and label all pertinent parts on the drawing. The pump maintenance instructions supplied by the pump manufacturer must be clearly addressed and included in the report.

Pump House plan and section on Permit drawing Sheet 20 has been revised to indicate all pertinent parts.

Pump Manufacturer provides a Pump Operations and Manual with each pump (based on site specific conditions) upon placement of an order to purchase the pump. Sample Pump Manufacturer's Operation and Maintenance Manual is included under Section 10.0 Appendix A.

COMMENT C-41

41. Drawing Nos. 3 of 30 through 17 of 30 showing bottom liner system details and the landfill subgrade, including the Clay Dam Detail on Drawing No. 18 of 30, should be depicted based on the anticipated maximum occurrence of the water table, to demonstrate the minimum 3-foot buffer separation between the highest observed/anticipated groundwater table and the subgrade.

Determination of buffer between the bottom of cell subbase and highest anticipated groundwater is provided under Section 4.0, "3 Feet Cell Subbase/Highest Predicted Groundwater Buffer". Three feet minimum buffer is shown on Permit Drawing Sheets 16 and 17 details.

COMMENT C-42

42. The liner detail cross section design must depict the components of the liner, protective layer including berm design, anchor trench detail specification, methods to prevent geocomposite pull-back during waste placement, methods of liner tie-in, pipe penetrations, and pipe clean-out details.

HDPE Liner Stability Analysis in Section 9.0 Appendix C includes calculations used to design the liner anchor trench shown on Permit Drawing Sheet 16. Section 12.0 addresses the waste placement operation. Methods of liner tie-in are shown on Permit Drawing Sheets 42 through 45. There are no pipe penetrations. Force main clean-out detail is on Permit Drawing Sheet 22.

COMMENT C-43

43. Please address means of maintenance and checks for pumps, access to the sumps and leachate pipes to insure the proper functioning of the system and for maintenance purposes, methods to minimize future pipe clogging, and leachate equipment housing and safety appurtenances in the operation and maintenance plan.

See Section 12.12 for leachate management and maintenance of leachate collection and conveyance systems. Force main clean-outs and access to pumps and force mains for purpose of maintenance is provided.

COMMENT C-44

44. On drawing Nos. 14 of 30 and 15 of 30, the Sump Pump House and Pump House Cross Sections must show the percent of slope of the leachate carrier pipes, the liner system detail, and the required 3-foot base grade vertical buffer to the highest observed groundwater table.

See Permit Drawing Sheets 17, 18 and 19 for revised Sump to Pump House plans and sections. See response to Comment C-41 for 3-foot buffer description.

COMMENT C-45

45. The proposed pumps to remove leachate from the sumps should be sized to ensure removal of leachate at the expected rate of generation (see previous comment on the "worst case" scenario in paragraph C.4), and must have a sufficient operating head to lift the leachate at the required height from the sump to the access port. Also, the types of pumps to be used and their specifications must be indicated on the plans and drawings, as well as in the operation and maintenance manual specifications.

Pumps are designed in accordance with "Leachate Pump and Force Main Design Criteria" tabulation under Section 10.9.4. A submersible pump will be provided in each cell sump. To accommodate requirements associated with worst case scenario leachate management, an additional pump will be provided in Cells 1, 2, 6, 9, 12, 13, 14 and 16. "Cell Pump List" is shown under Section 10.9.4 and on Permit Drawing Sheet 20.

Description of pumps and accessories is provided under Section 10.0 Appendix A. See Section 12.12 for pump maintenance.

COMMENT C-46

46. The specifications for the submersible pumps and motors must be included. The pumps must be designed specifically for leachate use, including totally submerged operation during each pumping cycle, and be readily removable or replaceable without dewatering of the wet well or disconnecting any pipes in the wet well. Each submersible pump must have the same capacity, and each must be capable of handling flows in excess of the expected maximum flow. Provisions must be made to automatically alternate the pumps in use to ensure the leachate head over the liner will not exceed 30 centimeters (1 foot) during the life of the landfill in accordance with COMAR 26.04.07.07C(12)(c)(iii).

See Section 10.4 for leachate pump specifications. Pump lead/lag systems to alternate pumps will be provided as required to operate dual pumps in cell sumps, per description under Section 10.4.1.

COMMENT C-47

47. The leachate collection system must be designed and constructed based on the calculated mean velocities for full flow, but not less than 2.0 feet per second. The layout for the leachate collection pipes should be designed to minimize leachate head loss due to a greater than 45 degree angle when entering the main pipe. The pipes must be laid at a depth sufficient to prevent freezing.

Leachate pumps and force mains are designed for full flow condition, based on design criteria tabulation under Section 10.9.4.

COMMENT C-48

48. A System Head/Pump Curve must be shown on the drawing. Use the pump curve supplied by the manufacturer and develop a system head curve for the pumping system that provides the greatest total dynamic head at the facility. The point of intersection between these two curves will be the design capacity for the pumping system.

System Head/Pump Curves with design capacity for each specified submersible pump are under Section 10.0 Appendix A.

COMMENT C-49

49. An alarm system shall be provided and activated in case of power failure, overflow, pump failure, use of the lag pump, or any cause of pump station malfunction. Pump station alarms may be telemetered to the main maintenance office if it is manned 24 hours a day. If

such a facility is not available, the alarm shall be telemetered to the main maintenance office during normal working hours and to the home of the person(s) responsible for the pump station during off-duty hours; or another acceptable alarm system may be proposed. An audiovisual alarm system with a self-contained power supply may be acceptable in some cases in lieu of the telemetering system, depending upon location, station holding capacity and inspection frequency. Consideration must be given to the potential for the occurrence of explosive levels of methane gas in these structures.

Pump alarm system description is provided under Sections 10.4.1 and 12.12.1.2.1.

Consideration of methane gas occurrence is under Section 12.0 Appendix C, "Safety Plan."

COMMENT C-50

50. The leachate storage tanks on drawings Nos. 3 of 30 and 4 of 30 are identified as "leachate storage area 1, future 250,000 gallon leachate storage tank" and "250,000 gallon leachate storage tank". This specifications and construction sequence must be fully addressed in the operation and maintenance manual. You have proposed two 250,000-gallon leachate storage tanks to store all leachate that will be generated at the landfill. Please demonstrate that the proposed storage tanks can meet peak flow during occurrence of major storm conditions. This demonstration must also include the names of wastewater treatment plants that will accept the leachate, frequency of emptying the tanks, and detailed information for the storage tanks.

Permit Drawings have been revised to indicate that each of two Leachate Storage Facilities will contain (2) 250,000 Gallon Leachate Storage Tanks, connected by an overflow pipe. Leachate Storage Tank Manufacturer and design criteria are referenced under Sections 10.6, 10.10 and 10.11.5. Maintenance, access and description of operation are under Sections 12.12.1.2.2.1 and Construction Specification Section 02652.

Leachate storage disposal is addressed under Section 10.12.

COMMENT C-51

51. The operation manual must clearly address the adequacy of the proposed leachate storage tanks, and the pumps must be designed with a float cable system or equivalent to indicate liquid levels in the tank. The leachate levels must be recorded on a daily basis to monitor leachate production and storage capacity. Provisions for adequate storage tank capacity must be included in the design as a contingency in case of high rainfall events.

Leachate storage tanks are adequate to accommodate worst case scenario leachate production, per description under Section 10.11.5. Leachate storage tanks will have floats and alarm systems which will shut down leachate pumps to prevent tank overflow (see Sections 10.4.1 and 12.12.1.2.2). See Section 12.12.2 for Leachate Record Keeping.

Adequate leachate storage tank capacity for worst case scenario leachate production is addressed under Section 10.11.5.

COMMENT C-52

52. The pumping station design lacked an emergency shut off plan to override the cutoff switch in the pump station to prevent tank overflow. The design specification for the pumps and storage tanks must have a contingency plan and be clearly addressed in the operation and maintenance manual for facility. You should explore leachate disposal site options, and identify proposed facilities for leachate disposal in the plan.

See response to Comments C-50 and C-51.

COMMENT C-53

53. The descriptions of the leachate storage tanks are inadequate, and must include the type of tank and description of safety mechanisms such as lighting fixtures or audible alarm systems for warning of leachate overflow, spill or leak management plans, cover systems, and methods to control odor.

Leachate storage facilities have been revised to include (2) 250,000 gallon storage tanks connected by an overflow pipe. Storage tanks are provided with an overflow alarm system under which pumps would be shut down to prevent overflow in a storage tank (see Sections 10.6 and Construction Specification Section 02652).

Odor control will be provided by the active landfill gas system and in accordance with Section 12.7.3.

COMMENT C-54

54. The plan shows the proposed leachate storage tanks (No. 1 and No. 2) are inside the fill area. Please address this discrepancy

Permit Drawings have been revised to clarify location of Leachate Storage Facilities.

COMMENT C-55

55. Drawing No. 14 of 30 and 15 of 30 - The use of double-walled pipes for the force main is discussed, but no specific design details are provided. On this plan, it appears to indicate a 4" pipe inside an 8" pipe, but the means of constructing this system is not discussed. There is no discussion of the leachate pipe (header) method of connection, i.e., double-walled pipe to collect leachate via gravity or pump to the storage tank, how the outer pipe will be checked for the presence of liquid (which could indicate a leak in the force main) or what the fate of liquid in the outer pipe will be. Also, the collection pipes must ensure that the leachate collection piping will operate effectively over the life of the landfill, and material characteristics of the piping must be specified.

Permit Drawings have been revised for clarification regarding the location of the site's 5 force main trunk lines, and force main details have been added (see Permit Drawing Sheets 9, 10, 11, 12, 21 and 22). Force Main Access and Maintenance is under Section 12.12.1.2.1.2.

COMMENT C-56

56. Plans 14 of 30 and 15 of 30 and the description of the leachate storage tanks provided in Section 7.1, did not address means of leachate movement to the tank by gravity or by pump. Note that COMAR 26.04.07.16C(7)(e) requires that the leachate collection system be "designed to operate solely by the force of gravity in all areas where the system will directly underlie solid waste." Therefore, the pump sumps should be relocated outside of the landfill proper, unless a variance is requested and approved in accordance with COMAR 26.04.07.26.

See response to Comment C-2.

COMMENT C-57

57. Drawing No. 15 of 30: the pump house plan must be designed to avoid turbulence near the intake of each pump. The pump control system must be located away from the turbulence of incoming flow to the pump station. The plan does not address the size of the proposed concrete base and its function. Please fully address these items in the design and in the operation and maintenance manual. Consideration must be given to the potential for the occurrence of explosive levels of methane gas in these structures.

There will be no turbulence at the intake of each leachate pump. Pump House design has been revised to indicate complete dimensions for upper and lower level. (see Permit Drawing Sheet 20).

Pump House requirements are under Construction Specification Section 15250. Leachate management, record keeping and safety procedures are under Section 12.12.1, Section 12.12.2 and Section 12.0 Appendix C, respectively.

COMMENT C-58

58. Suitable devices for measuring leachate flow must be installed along with shutoff and check valves on the discharge line of each pump in a separate valve pit. Accumulated liquid in the valve pit must be drained to the wet well by gravity, and must incorporate an energy dissipater and a backflow preventer where appropriate.

Check valves, air release valves and cleanouts for the force main are shown on Permit Drawing Sheets 9, 10 and 11. Flow meters will be provided per Section 12.12.2.

COMMENT C-59

59. The Leachate Sump Typical Section on drawing No. 15 of 30 must show the minimum required 2% slope for the sump floor.

Permit Drawings have been revised to clarify minimum 2 percent slope requirement.

COMMENT C-60

60. The report proposes to build a clay dam to prevent groundwater seepage from entering the landfill cell floor, while a Perched Water Interceptor is also shown on drawing No. 18 of 30. It is unclear whether you intend to propose both plans, and how the Perched Water Interceptor will drain the accumulated groundwater. Please address in the report and on the drawings which plan is proposed and how the proposed plan will be implemented and able to withdraw perched water.

The Perched Water Interceptor has been eliminated. Clay Dam design has been revised per description under Comment B-1(d).

COMMENT C-61

61. An Erosion and Sediment Control Plan approved by the local soil conservation district and an approved Stormwater Management Plan must be submitted to the Department prior to the approval of the Phase 1II plan as required by COMAR 26.04.07 .16A(11). The Erosion and Sediment Control Plan failed to address calculations for the amount of sediment to be excavated and onsite sediment storage capacities.

Per response to Comment C-7, AASCD stated in a January 4, 2008 letter to the Owner that erosion control plan issues have been addressed.

COMMENT C-62

62. The number and types of equipment to be used for day-la-day operation, including inclement weather operations, as specified in COMAR 26.04.07.16A(8)(b) is required.

See Section 12.0, Appendix A, "Equipment and Personnel Requirements".

COMMENT C-63

63. The number of employees and their duties as specified in COMAR 26.04.07. 1 6A(8)(c) is required. The operation and maintenance manual lacked a detailed description of the

landfill operating procedures for the following: security, general inspection, qualifications of skilled personnel and manpower, inspection procedures, remedial maintenance, preventive procedures, communications, equipment and power failure.

Items referenced above are addressed as follows:

- **Security - Section 12.6.2.2**
- **Inspection - Section 12.11**
- **Personnel - Section 12.4**
- **Remedial Maintenance - Section 12.8**
- **Communications - Section 12.6.1**
- **Equipment and Power Failure - Section 12.0 Appendix C**

COMMENT C-64

64. The report must include a description of a general maintenance program for the following: facility equipment, site maintenance, berm and cover systems, leachate management, gas management, utilities, roads and drainage, and sediment and erosion control.

Items referenced above are addressed as follows:

- **Equipment and Maintenance - Section 12.8**
- **Compaction and Cover - Section 12.9**
- **Leachate Management - Section 12.12.2**
- **Gas Management - Section 12.11.8**
- **Utilities, Roads and Sediment Control - Section 12.11**

COMMENT C-65

65. The report lacks detailed quality assurance and quality control (QA/QC) procedures for the foundation preparation to assure the adequacy of the sub grade, density testing of the compacted fill that can be performed to establish an adequate subgrade, and technical guidance regarding quality assurance procedures to be used during the pre-construction, construction and post-construction phases.

See Section 13.0, "Construction Quality Assurance Plan" and Section 14.0 "Construction Specifications".

COMMENT C-66

66. Similarly, the report lacks construction quality assurance and quality control procedures for the geosynthetic and alternative clay liner systems.

Alternate clay liner system has been eliminated. Section 13.0, "Construction Quality Assurance Plan", has been added.

COMMENT D-1

1. Section D-D on drawing No. 15 of 30 "East Section Cross Sections": Cells 12 and 14 seem to have very steep slopes. COMAR 26.04.07.21E(1) requires the cap to be installed with a minimum slope of 4 percent to facilitate drainage. The Department does not recommend that the maximum slopes be steeper than 3:1, unless it can be satisfactorily demonstrated that these slopes will be stable and constructible.

Final Grading Plans on Permit Drawing Sheets 47 and 48 indicate 4 percent minimum slope.

See response to Comment A-3 for substantiation of 3H:1V final grade slope.

COMMENT D-2

2. *The plan did not address in detail closure activities, security, and post-closure maintenance and monitoring frequency requirements.*

Closure and Post-Closure requirements are addressed under Section 15.0.

SEPTEMBER 2007 MEETING COMMENTS

The following point-by-point response list addresses comments on Permit Drawings, dated August 2007, at the September 25, 2007 meeting held at Department offices.

PERMIT DRAWING SHEET 1

Site Entrances have been added on "Location Map".

PERMIT DRAWING SHEET 4

Per comment on the adequacy of storm drain pipes under the East Entrance Access Road, culvert analysis was performed (See Section 17.0 Section G).

Per comment on the Concrete Clean-out, General Note was revised to describe the clean-out's function and detail was added on Permit Drawing Sheet 67, "Sediment Control Details".

PERMIT DRAWING SHEET 5

Comment was made regarding surface runoff across the North Entrance Access Road. Drainage area across the road is essentially limited only to the road surface itself. Drainage from Basin No. 3 drains away from the entrance access and across Patuxent Road (See Section 17.0 Section E, "Dam Breach Analysis". One percent cross slope across a paved surface is sufficient to ensure proper surface runoff drainage.

PERMIT DRAWING SHEET 7

Per comment on similarity of "Property Line" and "Limit of Waste" symbols on the Sheet Legend, "Limit of Waste" symbol has been revised on all applicable Permit Drawings.

PERMIT DRAWING SHEET 10

Per comment on Leachate Storage Facility No. 2:

- **Pipe to drain clean surface runoff from the Secondary Containment Area has been deleted (see Section 12.12.1.2.2, "Leachate Storage" and Construction Specification Section 02652, "Leachate Storage Facilities"**
- **Tank adequacy and overflow alarm system are addressed per response to NOVEMBER 2006 WRITTEN COMMENTS.**

PERMIT DRAWING SHEET 11

Permit Drawing Sheet 11 was created primarily to show the site's entire force main configuration on one sheet (per "Plan Depiction Notes"). Specific features for force main (i.e., pipe size, etc.) are shown on Permit Drawings Sheets 9 and 10. Profiles of all force mains buried in perimeter access road shoulders are also shown (see "Profile Depiction Notes").

Storm drain pipes on Sheet 11 are shown because the force main will cross storm drain pipes in several areas, per Sheet 12, "Force Main Trunk Line Profiles." Specific storm drain and stormwater management features are shown on other Permit Drawings.

PERMIT DRAWING SHEET 12

HDPE pipe bending radius allows pipes to deflect under storm drain pipes, as shown on applicable profiles (see Pipe Manufacturer's Literature under Section 10.0 Appendix B).

PERMIT DRAWING SHEET 13

Per comments on Leachate Storage Facilities on Sheet 13 and elsewhere:

- **Leachate Storage future 250,000 gallon tank will be active with an overflow pipe connection to the adjacent tank.**
- **Secondary containment areas have been deepened by 1 foot to ensure 500,000 gallon spill containment capacity with 1-foot freeboard to top of secondary containment berm.**
- **Response to comments regarding tank design and operation are provided under NOVEMBER 2006 WRITTEN COMMENTS.**

PERMIT DRAWING SHEET 15

Response to Comment regarding Leachate Storage Facility No. 2 is provided under response to Sheet 12 Comments.

PERMIT DRAWING SHEET 16

Per Comments on "Cell Floor Liner Section" and "Clay Dam Detail":

- **Highest anticipated groundwater buffer has been added.**
- **Four feet select waste is shown.**
- **Clay Dam revisions (per response to NOVEMBER 2006 WRITTEN COMMENTS) were made in addition to Sheet 16 Comments.**
- **Fifteen feet maximum perched water height has been added.**
- **Clay Dam under the revised design is structurally stable, per slope stability analyses in Section 10.0 Appendices D and E.**
- **Existing clay in the cell floor subbase area will be removed as specified.**
- **The distance from the bottom of cell floor subbase to the top of liner anchor trench elevation is provided.**

PERMIT DRAWING SHEET 17

Per comments on "Sump to Pump House Section A-A":

- **Perimeter Berm 2H:1V slope is stable, per "Landfill Perimeter Berm Slope Stability Analysis" under Section 9.0 Appendix D.**
- **Top of liner anchor trench is 4 feet below finished grade at Pump House locations. Typical liner anchor trench location is shown on Permit Drawing Sheet 16. Anchor trench location at riprap chute crossings is shown on Permit Drawing Sheet 23.**

- Stainless steel pulling cable sized for pump has been added. Access for pump maintenance is addressed under response to NOVEMBER 2006 WRITTEN COMMENTS.

PERMIT DRAWING SHEET 20

Per comments on "Pump House Plan" and "Section A-A":

- For venting, aluminum roll-up doors replace mandoors, and top course of masonry block wall is vented.
- Stainless steel pulling cable sized for pump has been added.
- Pump house section has been revised.
- Pump maintenance access is provided under response to NOVEMBER 2006 WRITTEN COMMENTS.

PERMIT DRAWING SHEET 21

Per Comments on force main lateral profile and check valve vaults:

- Force main calculations under Section 10.0 Appendix B have been performed to ensure structural stability of force mains buried at 3.5 feet minimum depth, under H2O (i.e., semi-trailer) traffic loading.
- Check valve vaults and air release vaults shown non Sheet 22 and all double wall force main HDPE pipe connections are tight sealed. There should be no leachate or methane gas seepage into the vault. Vents should not be necessary. See Operation Plan Section 12.12.1.2.1.2, "Force Main Access and Maintenance".
- Vault access is by manhole steps as noted on vault plan and section.
- Vault manhole cover and frame is designed for H20 traffic loading.

PERMIT DRAWING SHEET 22

Response to Comments on Sheet 22 are:

- The cleanout detail for the force main is from Anne Arundel County Standard Construction Details for sanitary sewer pipes. Force main cleaning and sanitary sewer cleaning is similar. Cleanouts are spaced at 400 feet minimum, to allow proper cleaning by Contractors who provide the required services.
- Cleanout caps are located in the center of the perimeter access road shoulder, as applicable (see Permit Drawing Sheets 9, 10 and 11 for cleanout locations).
- Force main vaults should not be subject to vibration. No vaults are located in traffic areas or areas required for landfill construction and operation.
- Vaults are accessed by manhole steps, per notes on vault plan and section.
- Vault vents should not be necessary (see response to Comments on Permit Drawing Sheet 21).

PERMIT DRAWING SHEET 29

Response to comment on cell separation berm symbols on the Plan Legend is: Cells 12-16 cell separation berm symbol is larger because the berm is 10 feet high. Future cell separation berms in the other East Section cells are 5 feet high.

PERMIT DRAWING SHEET 35

Response to Comments are:

- **Sheet 35 has been revised. Access roads and perimeter ditches will be constructed first (see "Sequence of Construction for Cell 3", Item #1). During initial Clay Dam construction, (per "Clay Dam Sequence of Construction, Item #1) surface runoff will drain away from Clay Dam construction area through existing drainage swales to Sediment Basin No. 1 (see existing drainage swale flow path on Permit Drawing Sheet 56). Following Perched Water Drain installation, surface runoff will be diverted to the surface runoff impoundment sump area (per "Clay Dam Sequence of Construction", Item #2).**

  Drainage flow path symbols (per the Plan Legend) indicate that upstream surface runoff is diverted to Cell 10 surface runoff impoundment. Clean surface runoff will be pumped from the impoundment to Perimeter Ditch No. 3C (see Sheet 56 temporary surface runoff impoundment pumping requirement).

- **All cell separation berms are shown. Screened berms (i.e., berms with lighter lines) are future berms, per the Plan Legend. Darker, shaded cell separation berm is the berm required for Cell 3 construction.**

PERMIT DRAWING SHEET 36

Response to Comment regarding the existing 36" HDPE pipe is: the storm drain pipe must cross the perimeter access road to drain surface runoff to Sediment Basin No. 1, in order to ensure that requirements regarding stormwater management design for Basin No. 1 are met (see Development Conditions Drainage Area Maps in Section 17.0).

PERMIT DRAWING SHEET 37

Response to Comment regarding perched water outlet is that perched water drains to Cell 7 surface runoff impoundment, as specified under the added "Clay Dam Sequence of Construction."

PERMIT DRAWING SHEET 44

Response to Comments are:

- **Width and height of the cell separation berm have been added.**
- **Minimum 2 feet liner overlap dimensions have been added.**
- **Typical liner anchor trench dimensions are 1 foot wide by 1 foot deep.**
- **The sheet has been revised to clarify the manner in which the HDPE liner in an existing cell will be connected to the HDPE liner in the adjacent future cell.**

Please find the revised Phase III Report hereunder. We appreciate your consideration regarding this submittal and look forward to your response.

Sincerely,

Century Engineering

Michael N. Armstrong

Michael N. Armstrong, P.E.