COMMONWEALTH OF MASSACHUSETTS
THE TRIAL COURT
SUFFOLK SUPERIOR COURT

Suffolk, ss

COMMONWEALTH OF MASSACHUSETTS, Plaintiff	§ § §	
V.	§ §	CA # SUCV2006-00790
NEW VENTURES ASSOCIATES, LLC, Defendant	§ §	

EXHIBIT "F"

Richard Nylen

From: Hawkes, Martin [mhawkes@geocomp.com]
Sent: Thursday, October 22, 2009 9:17 AM
To: Carrigan, John (DEP); Chalpin, Richard (DEP); Ireland, Matthew (AGO); benjamin.siebecker@shawgrp.com
Cc: Richard Nylen; Bill Thibeault; omlcllc@aol.com; Marr, Allen; McNulty, Peter
Subject: Crow Lane Landfill - Response to Notice of Deficiency
Attachments: Geocomp Response to NoD Crow Lane Landfill 10-21-09.pdf

Gentlemen,

Please find attached Geocomp's the letter report for the Crow Land landfill, Newburyport, MA. - Response to Notice of Deficiency

The attachments to the letter is 1MB and will be sent in the following email.

Martin Hawkes
Geocomp Engineering

Geocomp
CORPORATION
Technologies to manage risk for infrastructure

Boston
Atlanta
New York

21 October 2009

Mr., William Thibeault
New Ventures Associates, LLC
85-87 Boston Street
Everett, MA 02149

Subject: Notice of Deficiency
Revised Closure Plan
Crow Lane Landfill

Dear Mr. Thibeault:

This letter report addresses issues raised by MassDEP in their "Notice of Deficiency" letter dated 6 October 2009. Specifically, these issues include the following:

1. "Boulder Buttress" section of berm:
    a. Include a detailed discussion of this area with demonstration of how it meets the requirements for berm stability, as established by the Geocomp stability assessment.
    b. Address inconsistent design features of the boulder buttress section, as compared with design details of other berm sections.
2. Relative to the "organic material" zone within the existing berm, select a design approach and address any issues previously identified by MassDEP's consultant (Shaw Environmental).
3. Provide further justification of the assumptions relative to the strength of the clay underlying the berm and the settlement of the organic layer within the berm.
4. Address additional concerns raised by Shaw Environmental concerning the effects of water level in the berm, seismic stability of berm, current topography, and the impact of settlement on berm stability and liner tensions.
5. Provide adequate QA/QC procedures to insure that boulders used in the Boulder Buttress" section of the berm will meet the specification requirements.
6. The topography for the area of the boulder buttress section of the berm is based on a survey conducted in 2005. The plans should address consideration of whether adjustment of the berm is required to accommodate anticipated settlement.
7. Modify plans to indicate the location of Cross section D-D.

Also, at a 14 September 2009 meeting, Shaw Environmental requested that a compilation be provided of all geotechnical engineering and design documents produced to date. The attachments to this letter include that information.

Response to Notice of Deficiency Items

1. Boulder Buttress

a. Discussion of How the Boulder Buttress Sections Meet the Requirements for Berm Stability.

For the boulder buttress to meet berm stability requirements, it was assumed in the analysis that the boulders have a unit weight of 150 pcf (including the voids), and the in-place boulder mass has a strength represented by a friction angle of 50 degrees. To meet these requirements the boulder buttress wall must be constructed according to the guidelines presented in the FHWA-CFL/TD-06-006 Rockery Design and Construction Guidelines, November, 2006. Page 57 from the guidelines is attached, which indicates that 150 pcf is a reasonable design density if the construction guidelines are implemented. To ensure that the requirements are met, the following sections will be added to the construction specifications for the Crow Lane Landfill.

Boulder Buttress Foundation Excavation - Excavate a foundation trench at least 300 millimeters (12 inches) below the bottom of the buttress, running the full length of the proposed buttress. Excavate the foundation to a minimum width equal to the specified base rock width ('B') plus 300 millimeters (12 inches) to include the granular rock back drain behind the buttress. Conform to the following:

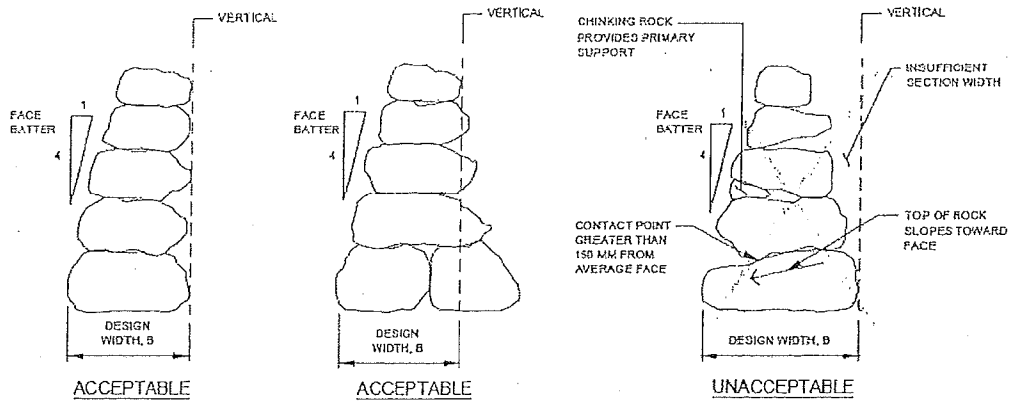
1) Excavate the foundation in sections such that the buttress can be constructed in one shift or one day's work, unless shoring is provided for the purpose to support the excavation.
2) Exercise care during excavation of the back cut. Stability of temporary cut slopes is the responsibility of the Contractor.

Rock Placement - Place the first course of rock (base rock) on firm, unyielding soil or bedrock with full contact between the rock and the subgrade. Excavate any loose, soft or otherwise unsuitable material present at foundation grade and replace with foundation fill as shown in the plans. Compact the foundation fill according to the compaction specifications. As the buttress is constructed, place the rocks so that there are no continuous joints in either the vertical or lateral direction.

Stockpile a sufficient number of rocks to provide a good selection for placement. To obtain a better fit, place rocks which do not match the spaces offered by the previous course in a different location.

Avoid placing rocks which have shapes that create voids with a linear dimension greater than 300 millimeters (12 inches).

Except in isolated cases, place each rock so that it bears on at least two rocks below it. Locate at least one bearing point a distance no greater than 150 millimeters (6 inches) from the average face of the buttress, as shown in the following figure.



The allowable tolerance for base rock widths is 150 millimeters (6 inches); however, do not place two or more consecutive base rocks with a width less than specified on the plans.

Slope the top surface of each rock towards the back of the buttress at an inclination of at least five (5) percent.

The minimum buttress thickness is based on minimum base rock width, as specified on the plans, and allowable face batter.

Securely place facing rocks so that the rocks are unable to be moved with a pry bar after the rockery is complete.

Voids - Where voids with a minimum dimension of 150 millimeters (6 inches) or greater exist in the face of the buttress, chink the voids with smaller rock.

1) If there is no rock contact within the buttress thickness, chink the void with a smaller piece of rock.
2) Chinking rocks do not provide primary structural support for the overlying rock.
3) Chinking rocks cannot be moved or removed by hand after the buttress is complete. Reset loose chinking rocks until securely placed or grouted in place. Do not allow grout to be readily visible from the face of the buttress.

Geotextile Fabric - Install the geotextile fabric between the buttress and the back cut face being supported. Separate all the boulders from the crushed rock from the back cut by Type 1-B non-woven geotextile. Overlap the non-woven geotextile at least 300 millimeters (12 inches) at all seams.

Rock for Buttress - Furnish hard, angular, and durable rock that consists of intact blocks without open fractures, foliation, or other planes of weakness. Rock must conform to the following:

1) Rock has sufficient hardness so that it cannot be scratched with a knife or scratched only with difficulty.
2) Apparent specific gravity, AASHTO T 85: 2.5 min.
3) Absorption, AASHTO T 85: 4.2% max.

4) Los Angeles abrasion, AASHTO T 96 (500 rev): 40% max.
5) Coarse durability index, AASHTO T 210: 50 min.
6) Sodium sulfate soundness (5 cycles), AASHTO T 104: 10% max.
7) Freeze-thaw loss (12 cycles), AASHTO T 103: 10% max.

Sizes and shapes - Furnish angular rocks that are generally cubical, tabular, or rectangular in shape. Conform to the following:

1) The minimum rock length is shown in the Rockery Design Schedule in the plans.
2) Rock width and height are greater than or equal to one-third of the rock length.
3) The minimum rock dimension is 450 millimeters (18 inches).

b. Address Inconsistent Design Features of the Boulder Buttress

The design drawings have been revised to include a one foot setback of the MSE wall from the top edge of the boulder buttress.

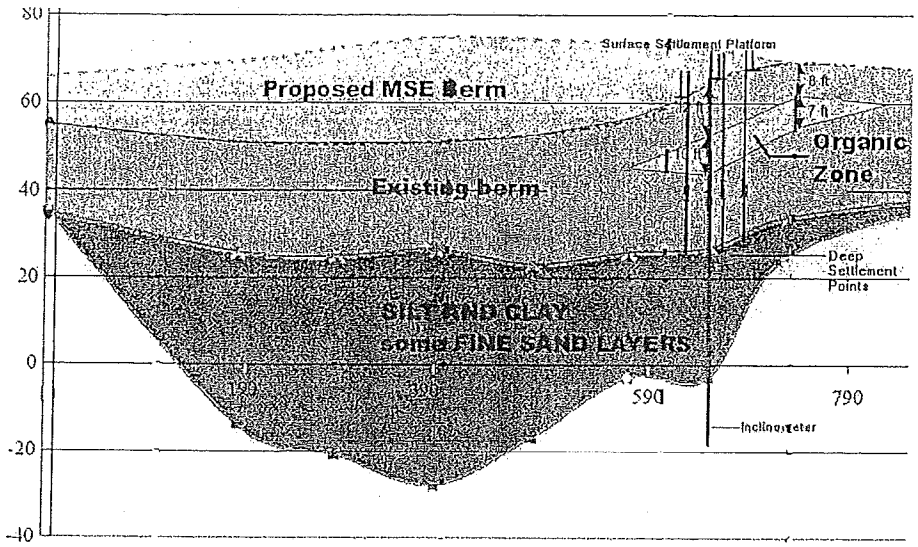
The design detail previously submitted by Geocomp to Sitec for development of the construction drawings has been updated to include a nonwoven geotextile filter fabric between the rip rap and the underlying structural berm soils. A copy of the detail developed by Geocomp is attached. The design drawings have also been updated to include a nonwoven geotextile between the boulders and the underlying finer gravelly soils.

2. Impact of "Organic Material" Zone Within Berm

Field investigations conducted earlier this year identified a zone of organic material buried within the existing berm. We have indicated that, in our opinion, the presence of this material was problematic with respect to increasing the existing berm height. We recommended either removing and replacing the organic material or allowing the organic material to remain in place, but modifying the berm slope design and implementing an observational approach. Due to concerns for potential landfill instability during removal and replacement of the organic material and the possibility of significant release of odors in this area of the landfill, New Ventures, LLC prefers the slope design modification with observational approach alternate.

The "Observational Method" involves instrumentation to monitor critical parameters, careful review of the data and comparison with expected performance, and adjusting the construction process, if necessary, to reduce risk to an acceptable level. The instrumentation provides data essential for evaluating both field consolidation behavior of the organic zone and foundation clay and berm stability.

In evaluating construction and long term stability of the berm, subsurface horizontal deformation and vertical movement of the organic zone within the berm and the foundation clay will be measured. As noted in the figure below, vertical movements will be measured using surface settlement plates and deep settlement points. This will allow determination of the portion of the total measured settlement that is attributable to the material within the organic zone and the



foundation clays. Subsurface horizontal deformations will be measured in special vertical inclinometer casings. If established threshold limits of lateral movements are approached during construction, construction will temporarily be terminated until the rate of movement has decreased and sufficient strength gain has occurred to resume construction.

We have successfully implemented the observational approach during and after construction of earth fill perimeter berms at a landfill site in NH. At that site, foundation conditions beneath the berm included a zone of organic material similar to that encountered within the existing berm at Crow Lane (see figure below).

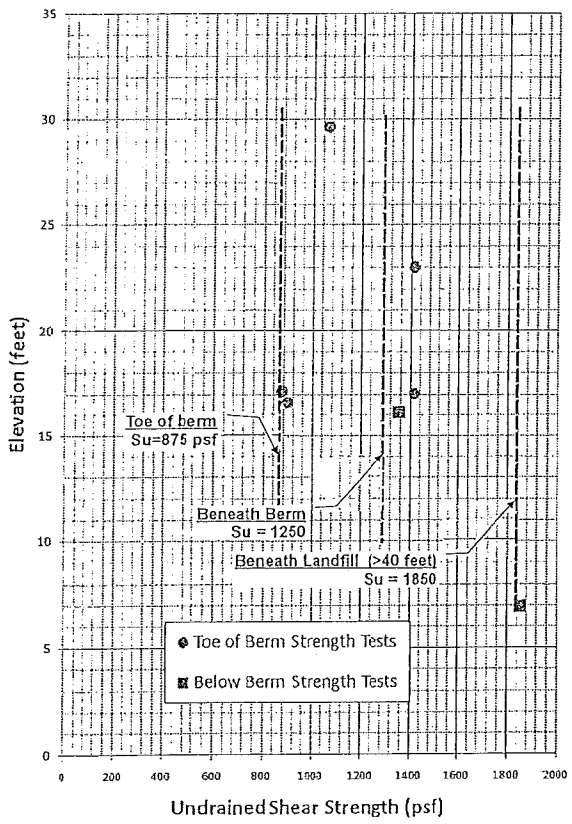
Our 20 August 2009 report contained the results of stability analyses that we performed to evaluate the potential impact of the organic zone on the short and long term stability of the increased berm height at Crow Lane. The results indicated that, for reasonable assumptions of the shear strength of the material in the organic zone, acceptable short and long term stability can be expected. The shear strength assumptions used in our analyses are based on the results of the laboratory testing conducted on the "NH organic material", field instrumentation observations at that site, and our experience with other organic soils throughout New England.

With respect to the impact of future decomposition of the wood fiber component of the organic zone, this would most probably result in some additional settlement within that zone, but not "weakening" of the berm. The instrumentation will provide data to confirm this.

Instrumentation monitoring will be continued during the post closure period. Threshold limits will be established for acceptable long-term lateral movement within the berm. Although we do not expect long term movements to be an issue, contingency plans will be developed to protect the berm in the unlikely event that unacceptable movements occur.

3. Assumed Clay Strength

The foundation clay strengths used in the stability analyses are presented in the following figure, together with the laboratory measured values.



In our opinion, the measured laboratory strength data is representative of the in-situ strength of the foundation clay, and that the strength values assumed in our stability analyses are reasonable. Further, gain in strength can be expected as the foundation clay consolidates under the new load from the increased berm height.

4. Additional Consideration of Water Effects, Seismic Stability, Current Topography and Tension in Geomembrane Cap

Water effects - The design drawings have been updated to include a geotextile fabric between the rip rap slopes and the berm soils. The purpose of the thick rip rap layer is to protect the berm slope face from surface water erosion.

Seismic stability - The pseudo-static seismic coefficient used in the analysis is 0.06g. The parameters used to determine this value were obtained from the Ground Motion Parameter Calculator on the USGS website. The method is documented in NCHRP 12-70 "Seismic Analysis and Design of Retaining Walls, Buried Structures, Slopes, and Embankments, November 2007. The report states the following:

> "A factor of safety is determined by applying the seismic coefficient in the limit equilibrium Stability program. An allowable factor of safety is selected such that behavior of the slope, in terms of permanent deformation, is within a range considered acceptable. A factor of safety (or C/D ratio) of more than 1.0 when using the peak seismic coefficient implies no slope movement, while a factor of safety less than 1.0 when using the peak seismic coefficient implies permanent movement. Typically, the seismic coefficient is assumed to be 50 percent of the peak, as noted above, reflecting the acceptance of 1 to 2 inches of permanent movement. In this case, as long as the factor of safety is greater than 1.1 to 1.3, the deformations are assumed to be minimal."

Current Topography - Current topography is discussed under Item 6 of this letter.

Tension in Geomembrane Cap - It is our understanding the geomembrane cap is not secured in a perimeter anchor trench at the top of the present berm, and that it is simply "tucked" into the berm soils. We have not computed future potential differential settlement between the cap and the berm, as we believe the cap will settle with the berm, and, with time, the cap will settle significantly more than the perimeter berm as the underlying waste decomposes.

5. QA/QC Procedures for Boulder Buttress

Item 1 of this letter describes QA/QC procedures that will be included in the specifications to insure that boulders used meet the specification requirements.

6. Effects of Current Topography on Berm Stability and Settlement.

Previous geotechnical analyses were conducted based on the best topographical survey information available at that time, and was supported by engineering judgments as to landfill side slope configurations that may have changed due to grading and shaping material placement. As requested, an updated survey was performed by Hancock Survey Associates, Inc. on October 1, 2009. This survey included determination of current landfill elevations at each of the cross section locations analyzed as part of this study.

The updated survey sections are shown overlaid on the analyzed sections in an attachment to this report. For section B-B, C-C, and D-D, the new survey data is sufficiently close to the analyzed conditions so that reanalysis is not warranted. While Section A-A does not match the existing conditions, it does serve the purpose for which it was developed, which was to represent a generic section through the highest portion of the wall. The entire layer in Section A-A (including the clay) are approximately 10 feet high (see section A-A in the attachments). If all the layers are lowered in the analysis by 10 feet the match with the survey is very good. Shifting all the layers by 10 feet will not change the stability analysis results. Therefore, we conclude that the analysis presented in the report correctly models the current topography.

7. Cross section D-D is not labeled on plans.

The plans have been updated to include labeling on section DD.

Sincerely yours,
GEOCOMP CORPORATION

Martin Hawkes
Senior Project Engineer

Attachments:

Crow Lane Landfill - Summary of Geotechnical Engineering Documents

Perimeter Berm Slope Protection Detail

Survey Plan prepared by Hancock Survey Associates, for New Ventures, dated 10/01/09

Updated Survey Sections overlaid on analyzed sections

Page 57 from FHWA-CFL/TD-06-006 Rockery Design and Construction Guidelines November, 2006