

November 15, 2016
Manitoba Sustainable Development
Environmental Approvals Branch
Attn: Tracey Braun. Director
Ste. 160, 123 Main Street R3C 1A5

Dear Ms. Braun,
Notice of Alteration - R.M. of Ritchot Waste Disposal Ground, Environment Act Licence No. 2482R

This Notice of Alteration is being submitted on behalf of MidCanada Environmental Services and the Rural Municipality of Ritchot, pursuant to Section 14(1) of the Environment Act, in regard to provisions of Licence No. 2482R issued to the R.M. of Ritchot for the construction and operation of a Class 1 waste disposal ground.

The requested alterations involve a revision to the design of the landfill cells from the design submitted with the original Environment Act Proposal. The changes relate to the re-design of the east-west berm along the centre of the facility and the finished height of the cells.

Background and further details on the proposed alteration are provided in the following sections.

## 1. Background to Proposed Alteration

The original Environment Act Proposal included detailed design documents and drawings, dated July and August 2000, which contained the specifications for the construction of the individual landfill cells. The original design included an earth berm built to six metres above grade along the east-west centre line of the site, with cells being developed on either side of the berm. The plan view of the original cell configuration is shown in Figure 1. As indicated in the figure, cells were to be separated on the east and west sides by berms constructed to prairie grade, while the north and south sides were enclosed by berms constructed to an elevation of six metres above grade. Although a record of the rationale for including the centre line berm in the original design could not be located, MidCanada personnel have indicated that it was intended to provide a solid road base for accessing the landfill cells.

As the initial cells at the Ritchot facility were completed, and additional cell construction was undertaken, it became apparent to the operator that additional waste capacity could be gained by reducing the centre line berm to prairie grade height. Furthermore, when the final waste height was reached within the cell and cover material applied, a proper road surface could still be achieved without the requiring the centre line berm to provide a firm base.

The original design specified the finished height of the landfill cells, including final clay cap, at eight metres above grade. The final elevation was stipulated in Section 31 of Licence 2482R. This design height was chosen by Ritchot council based primarily on aesthetic considerations. The eight metre maximum elevation was also consistent with the finished slopes of the site with the six metre centre berm in place.

In December 2015 a Notice of Alteration was submitted for an increase of the finished elevation of the five cells at the Ritchot facility that had already been closed. The requested increase to a maximum elevation of twelve metres was accepted. The major reason for the alteration was that treated soil from the adjacent soil remediation facility had been stockpiled over the top of the closed cells. Since the soil had been treated to provincial landfill acceptance criteria, the operator proposed to leave the soil as an additional waste layer over the five cells, resulting in the increased final elevation. The calculations done for the earlier Notice of Alteration confirmed that the additional height would not compromise the structural integrity of the perimeter berms.

## 2. Proposed Alteration

It is proposed that the design of the Ritchot landfill site be altered as follows:

- The elevation of the berm, shown on Figure 1 as being situated down the centre of the facility in an east-west direction, be reduced from six metres above grade to prairie grade elevation.
- The maximum completed elevation of the cells, including final cover be increased from eight metres to twelve metres above prairie grade.

It is requested that the proposed alteration apply to Cells 6 and 7 as well as all future cell construction.

### 2.1 Berm Design Detail

The revised design for the landfill cell is shown in the drawings identified as AMEC Figures 1 to 5. Cell 7, which is currently under construction, is used as the example in the detail drawings. In this instance, the north berm is constructed to six metres above grade as per original design. The south berm is proposed to be sloped from the cell base to approximate prairie grade level. The top of the east and west interior berms are at prairie grade as per the original design. Cell 6 , which is immediately to the south, has the six metre berm on the south side. The completed profile of the two cells is illustrated in AMEC Figure 2, with Cell 6 on the left side of the separator berm and Cell 7 on the right.

All surfaces within the cell incorporate a compacted clay liner as indicated on AMEC Figure 4. The specifications for the liner system are consistent with the original design and comply with the construction requirements in Licence 2482R.

Essentially, with the proposed alteration, the waste layer from the individual cells will intersect as the waste elevations rise above prairie grade, resulting in a continuous layer of waste within the six metre exterior berms surround the facility. The separation of the cells below grade level is maintained to facilitate effective leachate management. This design has been developed to provide maximum waste capacity within the original footprint of the landfill.

### 2.2 Leachate Collection

The leachate collection system will remain essentially the same as in the original proposal. Details of the leachate trench and collection system are shown in AMEC Figures 4 and 5. All leachate risers will be constructed up the east slope of the respective cells.

### 2.3 Finished Cell Height

The proposed completed profile of the landfill is shown in AMEC Figure 2. The covered waste will slope upward from the top of the perimeter berms on the north and south sides of the landfill to the centre road. The slope will be $10: 1$ or less. Prior to applying the final compacted clay cap, the area over the cells will be leveled and shaped to ensure that the twelve metre limit is not exceeded.

As part of the previous Notice of Alteration referred to in Section 1, AMEC had conducted a slope stability analysis for the five closed cells, which was based on the additional four metres of cell height being composed of treated soil. A copy of that slope stability analysis is included as Attachment 1 to this document. The analysis had calculated the Factor of Safety (FS) of 1.663 for the exterior berms when the additional height is factored in, which exceeds the required FS of 1.5 specified in the original design specifications for the landfill. AMEC recalculated the Factor of Safety using a mixture of $75 \%$ waste and $25 \%$ treated soil making up the additional four metre height. The FS was found to increase slightly with this change.
3. Environmental Impact of Proposed Alterations and Mitigation Measures

The alteration to the centre berm described in this document occurs within the containment features incorporated in the original design of the Ritchot landfill. This changes is not expected to alter the environmental impacts described in the material submitted in 2000 as part of the original Environment Act Proposal.

The increase in cell height could potentially result in increased flow rates of run-off water, particularly during extreme weather events or snow melt. This increased flow could cause erosion of the lower slopes of the exterior berms. To mitigate this potential effect, a bench will be created where the cap intersects with the top of the exterior berms, as shown in AMEC Figure 2. The purpose of the bench is to slow the runoff velocity, thereby reducing any potential for erosion of the lower 6:1 slope.

The net effect of the described alterations is positive in that it extends the life of the landfill on the existing parcel of land.

## 4. Regulatory Impact of Proposed Alterations

The major regulatory issue related to the proposed alterations is that Section 18 of Environment Act Licence Number 2482R stipulates that the Development be constructed in accordance with the plans and specifications submitted as part of the original Environment Act Proposal. Since the altered design described in this document was not part of the original submission, submission of this Notice of Alteration is required to remain in compliance.

As stated earlier in this document, Section 31 of Licence 2482R limits the finished height of the Ritchot landfill to eight metre above grade. Acceptance of the proposed alteration is required to permit the finished height to be increased to twelve metres.

We look forward to receiving your response on this matter. If any additional information is required, please contact me.

Sincerely,


David Ediger
D. Ediger Consulting Services
c. S. McCabe, MidCanada Environmental
attach.

## ATTACHMENT 1

## Slope Stability Analysis <br> AMEC Foster Wheeler <br> November, 2015

Amec Foster Wheeler Project No. WX04690
MidCanada Environmental Services Ltd.
1090 Kenaston Boulevard
Winnipeg, Manitoba
Attention: Mr. Stephen McCabe

Slope Stability Analysis<br>Proposed Cell Height Increase<br>MidCanada Environmental<br>Ile Des Chenes, Manitoba

### 1.0 INTRODUCTION

As requested, Amec Foster Wheeler Environment and Infrastructure, a division of Amec Foster Wheeler Americas Ltd. (Amec Foster Wheeler), is pleased to provide geotechnical analyses for the existing cell slopes at the MidCanada Waste Disposal Grounds located in Ile Des Chenes, Manitoba. The geotechnical analyses were required to evaluate the stability impacts of the proposed raise in overall cell height to 12 m from the previous maximum height of 8 m .

### 2.0 EXISTING INFORMATION

Topographic data utilized in the analysis of the existing berms was based on data obtained during an Unmanned Aerial Vehicle (UAV) survey of the overall landfill facility completed in December 2014. Two cross sections (cross sections A-A and B-B) taken through the highest sections of the Class I area were evaluated, the locations of which are shown on Figure 1. In general, berm slopes of $7 \mathrm{H}: 1 \mathrm{~V}$ and $4.5 \mathrm{H}: 1 \mathrm{~V}$ were observed on the west and east sides of cross section A-A, respectively. Existing side slopes of $5 \mathrm{H}: 1 \mathrm{~V}$ and $5.5 \mathrm{H}: 1 \mathrm{~V}$ were observed on the north and south sides of cross section B-B. It should be noted that extension of the landfill to the east is likely to be undertaken and as a result the existing slope at the east side of Cross Section A-A is not considered a final layout. Details of each existing cross section are shown on Figure 2. As can be seen in the Figure 2, the maximum berm height within this area is relatively undulating, however for the purposes of the analysis, the top of cell was assumed to be approximately level, with a slight slope to the exterior. Re-shaping of the top of the cells is understood to be undertaken on site, however given that the slope analyses were related specifically to the exterior slopes this re-shaping was not considered for the analysis. Furthermore, re-grading of the exterior slopes such that a final slope configuration is $4 \mathrm{H}: 1 \mathrm{~V}$ is achieved will be undertaken.

### 3.0 SLOPE ANALYSIS

The existing soil and groundwater conditions within the refuse cell and surrounding berms were analyzed using SlopeW, a limit equilibrium component of the GeoStudio software package, which is commercially available for geotechnical slope analysis.

Amec Foster Wheeler completed several analyses related to refuse cell and berm stability at the MidCanada facility as part of the original design in 2001. As well, a number of follow up assessments have been completed based on observed conditions. Accordingly, the soil parameters for the refuse and berm material, as shown in Table 1, have been previously established and confirmed to be realistic based on observations over 15 years of operation. It should be noted that native clay and clay fill materials (within the berms) have been assigned the same parameters. This is based on the assumption that clay fill has generally been excavated from the MidCanada site (i.e. little to no fill has been imported) and that clay fill has been compacted to a minimum 95\% Standard Proctor Moisture Dry Density (SPMDD). It has further been assumed that treated soil has been placed above the refuse and lightly compacted for cover and thus, given lower strength parameters.

Table 1: Soil Parameters

| Soil Layer | Unit Weight <br> $\left(\mathbf{k N} / \mathbf{m}^{\mathbf{3}}\right)$ | Cohesion (kPa) | Friction Angle <br> (Degrees) |
| :---: | :---: | :---: | :---: |
| High Plastic Clay <br> (Native or Fill) | 18.5 | 5 (Long Term) | 18 (Long Term) |
|  | 30 (Short Term) | N/A (Short Term) |  |
| Refuse | 10 | 2 | 20 |
| Treated Soil | 16 | 3 | 15 |

Groundwater conditions for all analyses were assumed to extend along prairie grade through the clay berm and into the refuse. Given the presence of the leachate collection system within the cells and the highly permeable nature of the refuse, this condition is considered to be highly conservative.

Based on current assessments of optimal landfill height, berms were assumed to be a maximum of 12 m above prairie grade, with the base of the cell extending to a total of 6 m below prairie grade, with a 1 m thick compacted clay liner at the cell bottom. Analyses of the existing slopes along Cross Sections A-A and B-B were undertaken assuming the groundwater conditions noted above. Further to the above, an analysis of a $4 \mathrm{H}: 1 \mathrm{~V}$ slope was undertaken to represent the final configuration of Cells 1 to 5 after re-grading is completed.

The analysis targeted a long term Factor of Safety of 1.5 for exterior berms. Based on observations made during Amec Foster Wheeler's site visits as well as information provided by MidCanada, it was assumed that once the original clay berms and refuse were placed in the

Slope Stability Analysis
MidCanada Environmental
Ile Des Chenes, Manitoba
November 2015
existing cells, treated soil was placed above the refuse extending from approximately 6 m to 11 m above prairie grade, with a 1 m clay cap placed above the treated soil.

### 4.0 RESULTS

Results of the analyses of the existing exterior slopes at each location along Cross Sections A-A and $B-B$, as well as the final $4 \mathrm{H}: 1 \mathrm{~V}$ slope configuration, are provided in Table 2, below.

Table 2: Factor of Safety

|  | Cross Section | FS |
| :---: | :---: | :---: |
| Existing Cell Configurations | A-A West Side <br> (long term conditions) | 2.069 |
|  | A-A East Side <br> (long term conditions) | 1.574 |
|  | B-B North Side <br> (long term conditions) | 1.610 |
|  | B-B South Side <br> (long term conditions) | 2.084 |
| Final Cell Configuration | 4H:1V Slope | 1.663 |

Plots showing the results of each of the above analyses can be found on Figure 3 and Figure 4. It should be noted that the small undulations in the surfaces of the existing slopes as shown on Figure 2 were ignored, and in this regard the analyses were undertaken assuming that removal of these small undulations such that a relatively smooth slope would be provided would be completed.

### 5.0 DISCUSSION

As shown, the existing slopes are considered stable for long term conditions at their current height, however this is contingent groundwater within the cell and adjacent berms remaining at or below prairie grade. Given the leachate removal system that is currently in place, groundwater conditions above prairie grade are unlikely to occur, and have not been observed to occur in the past. Furthermore, should groundwater in the cell and adjacent berms be higher than prairie grade, only minor instability would be expected.

Slope Stability Analysis
MidCanada Environmental
Ile Des Chenes, Manitoba
November 2015

### 6.0 CLOSURE

Amec Foster Wheeler trusts that the forgoing is sufficient for your present requirements. Should you require additional information, please contact the undersigned.

Sincerely,
Amec Foster Wheeler
Environment and Infrastructure


Caolan McEvoy, CET, EIT<br>Geotechnical Engineer-In-Training

Jorden Wiwcharyk, P.Eng.
Geotechnical Engineer
Reviewed by:
Harley Pankratz, P. Eng.
Vice President; East Prairies / Northern Alberta
Attachments:
Figure 1: Cell Location Plan
Figure 2: Existing Cross Section Topography
Figure 3: Existing Cross Section Slope Stability Results
Figure 4: Final 4H:1V Configuration Slope Stability Results





## FIGURE 1

Ritchot Landfill<br>Excerpt from Original Detailed Design AGRA Earth \& Environmental<br>July, 2000<br>Location of Centre Berm Noted in Blue



# AMEC FIGURES 1 to 5 

AMEC Foster Wheeler<br>November 7, 2016







