ERRATA

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To: Vicki Mitchell – Project Officer
Ministry of the Environment – Environmental Assessment and Approvals Branch

From: John Desbiens, P. Eng.
President - Cambium Inc.

Date: February 8, 2013

Copies: Bryan Martin – Township of Bonnechere Valley
Chief Administrative Officer

Enclosure: Associated Correspondence as Outlined in the Errata Summary Herein
(4 pieces of correspondence)

Re: Errata to Township of Bonnechere Valley Environmental Screening Report
Ruby Road Waste Disposal Site Expansion
Cambium Ref. No.: 07-1219-001

The following additions are made to the Township of Bonnechere Valley document entitled *"Environmental Screening Report: Ruby Road Waste Disposal Site Capacity Expansion",* to include copies of referenced correspondence that have been identified as absent from the aforementioned document. The items are listed in the Errata summary below.

A copy of these errata is being posted to the Township's project webpage, and a hard copy is being made available for review at each of the public viewing locations.

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Item	Description	Correction
Letter: dated October 17, 2012	Subject: Hydrogeological Modelling – Groundwater Elevations Comment: Provided to Kyle Stephenson to address his request for water elevations for the site monitoring wells.	Should be added to Appendix J of the ESR and is included at the end of this document. This correspondence should be inserted as per the order of correspondence outlined in Table 3 of the ESR.
Letter: dated May 31, 2012	Subject: Constant Chloride Concentration – Hydrogeological Modelling Comment: Provided to Kyle Stephenson in response to email correspondence from the MOE dated May 11, 2012.	Should be added to Appendix J of the ESR and is included at the end of this document. This correspondence should be inserted as per the order of correspondence outlined in Table 3 of the ESR.
Letter: dated January 19, 2012	Subject: Responses to MOE Comments in 2011 dated July 28, October 18 and November 15 Comment: Provided to Ms. Mitchell as discussed at a meeting held at the MOE Kingston District Office on December 22, 2011.	Should be added to Appendix J of the ESR and is included at the end of this document. This correspondence should be inserted as per the order of correspondence outlined in Table 3 of the ESR.
Email: dated May 19, 2011	Subject: Follow-up to Independent Review of Ruby Road Landfill Proposal (1219-001)	Should be added to the end of Appendix N of the ESR and is included at the end of this document. Questions and comments were noted, and have been addressed within the ESR document.

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Errata to Appendix J

Correspondence with the Ministry of the Environment

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October 18, 2012

Ontario Ministry of the Environment
Technical Support Section, Eastern Region
1259 Gardiners Road
Kingston, Ontario, K7P 3J6

Attn: Kyle Stephenson
Hydrogeologist

via email: Kyle.Stephenson@ontario.ca

Re: Hydrogeological Modelling – Groundwater Elevations
Environmental Screening of Capacity Expansion at Ruby Road Waste Disposal Site
Cambium Reference: 1219-001

Dear Mr. Stephenson,

Cambium Environmental Inc. (Cambium), on behalf of the Township of Bonnechere Valley (Township), has prepared the following response to your correspondence dated October 10, 2012, which recommended an additional round of groundwater level measurements to confirm the water levels measured at the newly installed monitoring wells and to confirm the overall conceptual model.

Water levels were obtained from the Site, from all existing monitoring wells (i.e. BH1 through MW11) on October 16, 2012. An updated table of water elevations and figures with groundwater elevations and groundwater flow have been attached for your records. The groundwater elevations obtained in October were similar to those observed in July and have confirmed the conceptual model for the Site. Based on the attached, Cambium and the Township will await formal comment from the Ministry of the Environment (MOE) prior to finalizing the Environmental Screening Report for submission.

All other comments and recommendations included in the above referenced correspondence, as well as the updated information from the *Numerical Hydrogeological Modelling Report for Expansion Feasibility of the Ruby Road Waste Disposal Site* (Cambium, September 7, 2012) will be incorporated into the Environmental Screening Report, Environmental Compliance Approval Application, and the Site Design and Operations Plan, where appropriate.

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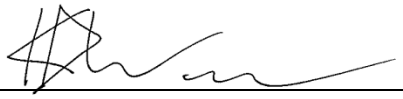
October 18, 2012

CLOSING

Cambium trusts that the information provided in this correspondence is complete and suitable to meet the needs of the MOE. Should you require any additional information or clarification, please do not hesitate to contact the undersigned at 705-742-7900 ext. 203.

Best regards,

Cambium Environmental Inc.



Kevin Warner, P.Geo. (Ltd.)
Senior Project Manager and Senior Hydrogeologist

KDW/snr

Copies: *Bryan Martin, Township of Bonnechere Valley*
Dale Gable, Landfill Approvals Engineer
Vicki Mitchell, Environmental Assessment Coordinator
Emily Tieu, Senior Environmental Officer
Peter Taylor, Technical Support Manager
Laurel Rudd, Technical Support Section, Surface Water Specialist
Gillian Dagg-Foster, SWP Surface Water Specialist
Tara MacDonald, District Supervisor, Ottawa District Office

Encl. *Table Groundwater Elevation Data*
Figure 4 Hydrograph
Figure 7 Groundwater Elevations

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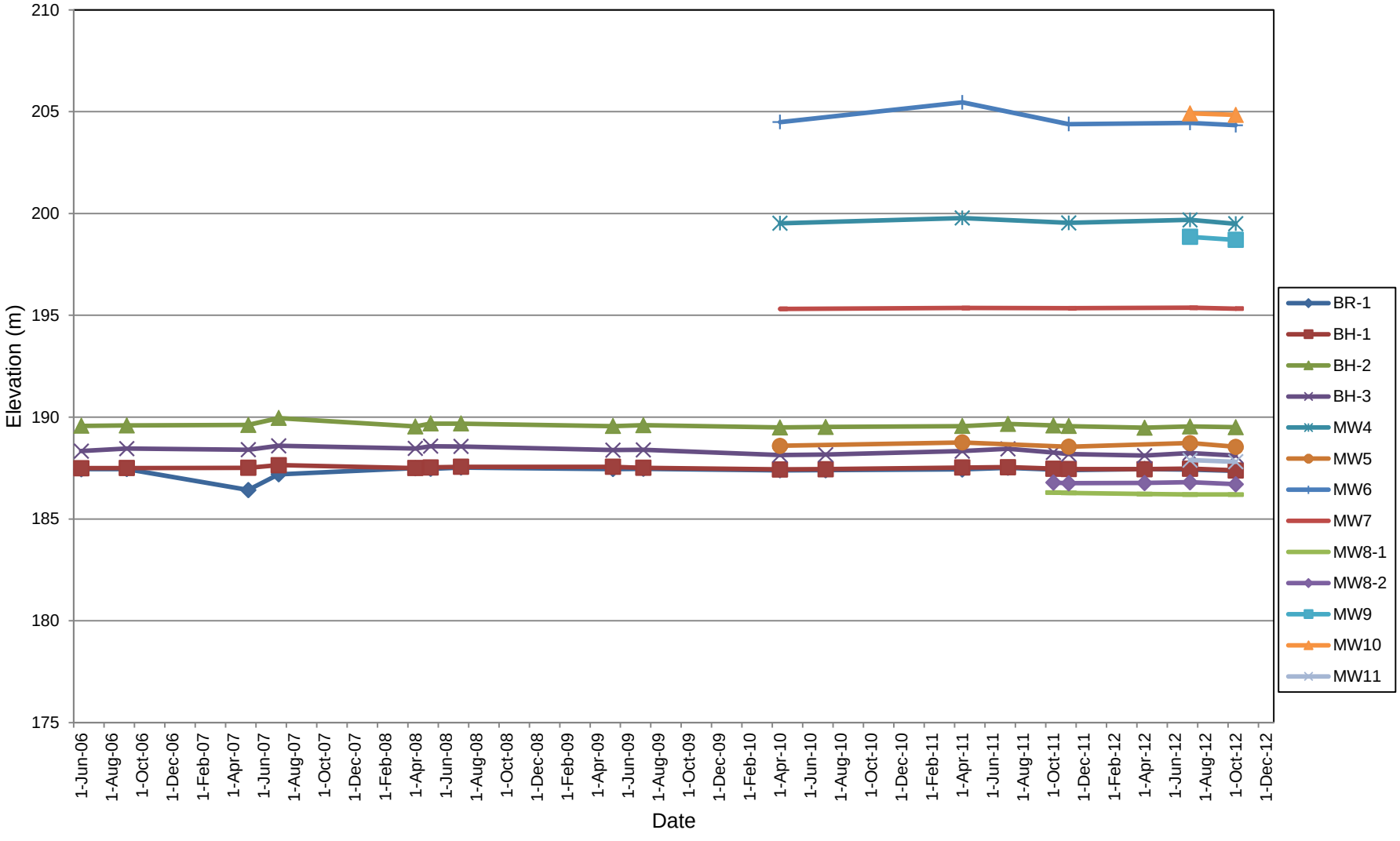
Groundwater Elevation Data

Monitor	BR-1	BH-1	BH-2	BH-3	MW4	MW5	MW6	MW7	MW8-1	MW8-2	MW9	MW10	MW11
UTM Zone 18	317594, 5045183	317594, 5045183	317584, 5045141	317525, 5045194	317339, 5044901	317637, 5044766	317429, 5044708	317473, 5045017	317648, 5045194	317648, 5045194	317319, 5045013	317264, 5044862	317650, 5045055
Ground Elevation (masl)	214.35	214.35	215.61	214.81	208.21	213.43	216.88	215.08	211.55	211.55	222.83	208.66	208.66
Top of Casing Elevation (m)	215.15	215.17	216.12	215.89	209.04	214.43	217.65	215.92	212.14	212.41	223.58	209.10	209.15
Depth to Bedrock (m)	27.80	-	-	-	11.50	26.00	8.60	20.00	25.60	27.40	30.03	8.76	20.73
Elevation of Bedrock (masl)	186.55	-	-	-	196.71	187.43	208.28	195.08	185.95	-	192.80	199.90	187.93
Casing Stick-up (m)	0.80	0.82	0.51	1.08	0.80	0.94	0.75	0.90	0.59	0.86	0.67	0.70	0.48
Measured Depth of Well (m)	33.69	28.02	27.80	27.91	22.29	27.29	16.68	20.81	54.86	27.67	30.44	10.72	24.7
Elevation of Bottom of Well (masl)	181.46	187.15	188.32	187.98	186.75	187.14	200.97	195.11	157.28	184.74	193.14	198.38	184.45
2-Jun-06	187.44	187.49	189.57	188.33	-	-	-	-	-	-	-	-	-
14-Sep-06	187.45	187.50	189.59	188.46	-	-	-	-	-	-	-	-	-
3-May-07	186.42	187.51	189.61	188.40	-	-	-	-	-	-	-	-	-
19-Jul-07	187.19	187.64	189.95	188.59	-	-	-	-	-	-	-	-	-
29-Apr-08	187.49	187.50	189.54	188.46	-	-	-	-	-	-	-	-	-
29-May-08	187.46	187.53	189.68	188.57	-	-	-	-	-	-	-	-	-
10-Jul-08	187.52	187.56	189.68	188.56	-	-	-	-	-	-	-	-	-
28-May-09	187.45	187.56	189.56	188.38	-	-	-	-	-	-	-	-	-
20-Jul-09	187.46	187.51	189.60	188.40	-	-	-	-	-	-	-	-	-
14-Apr-10	187.39	187.43	189.49	188.14	199.52	188.59	204.49	195.32	-	-	-	-	-
21-Jul-10	187.40	187.45	189.52	188.16	-	-	-	-	-	-	-	-	-
19-Apr-11	187.43	187.52	189.56	188.33	199.78	188.76	205.46	195.36	-	-	-	-	-
21-Jul-11	187.51	187.54	189.66	188.44	-	-	-	-	-	-	-	-	-
21-Oct-11	187.42	187.47	189.59	188.26	-	-	-	-	186.30	186.79	-	-	-
22-Nov-11	187.40	187.45	189.56	188.18	199.54	188.55	204.39	195.35	186.28	186.76	-	-	-
16-Apr-12	187.45	187.44	189.48	188.11	-	-	-	-	186.23	186.77	-	-	-
16-Jul-12	187.42	187.47	189.54	188.23	199.69	188.73	204.45	195.37	186.20	186.81	198.86	204.91	187.89
16-Oct-12	187.36	187.38	189.50	188.11	199.50	188.54	204.34	195.33	186.20	186.71	198.71	204.84	187.81

Notes:

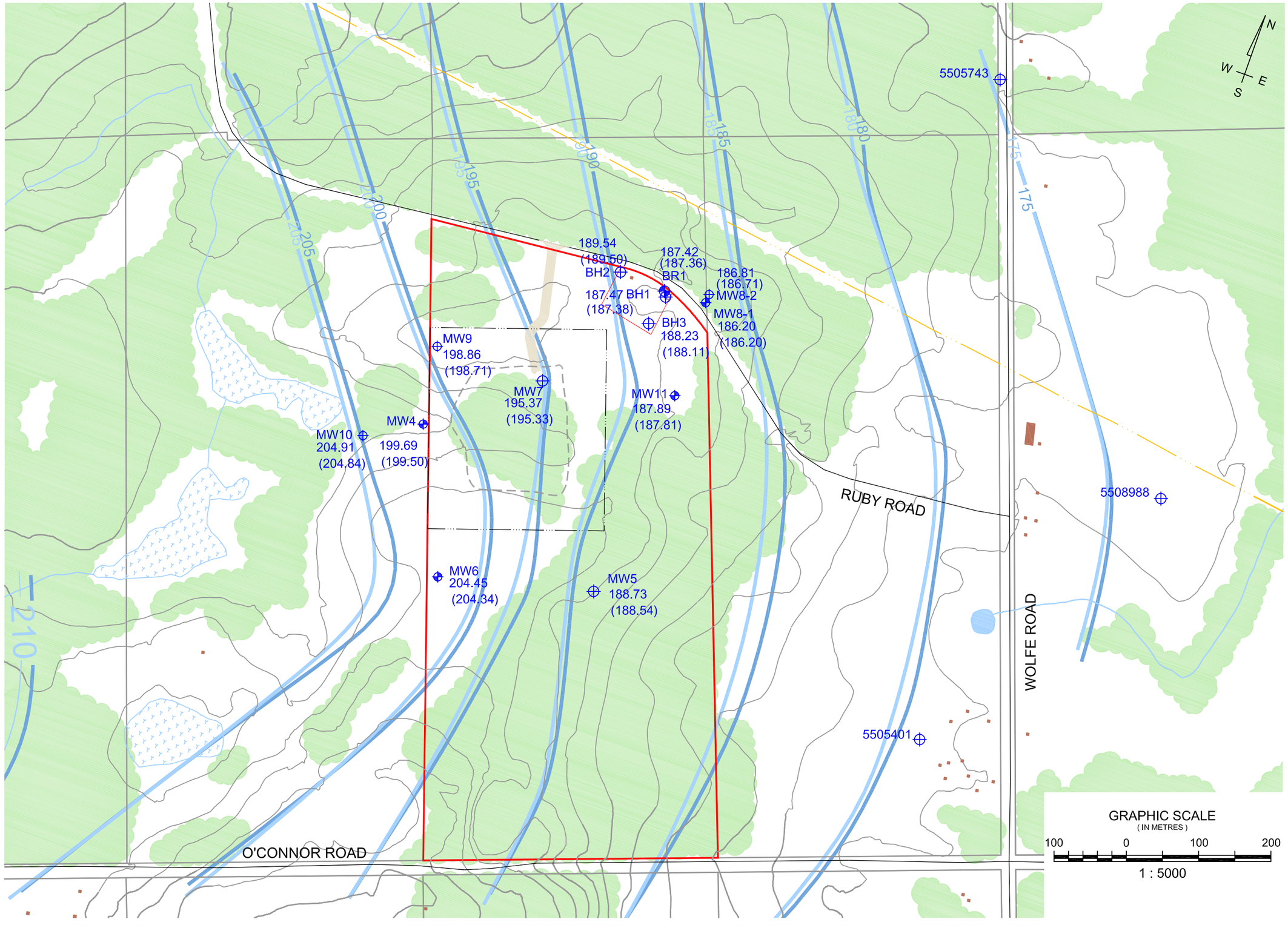
1. All values expressed in metres above sea level (mASL) based on the Site benchmark.
2. Top of casing and ground elevations updated June 2012.
3. - Denotes unable to obtain water level.
4. Shaded cells indicated monitoring wells installed in the bedrock. All other wells installed in the overburden.

Figure 4 - Groundwater Elevations



RUBY ROAD
WASTE DISPOSAL SITE

Township of Bonnechere Valley
County of Renfrew



GRAPHIC SCALE
(IN METRES)

100 0 100 200

1 : 5000

LEGEND

BR1	Groundwater Monitoring Well Location - Bedrock
BH1	Water Well/Groundwater Monitoring Well - Overburden/Interface
	Proposed Property Boundary (32.8 ha.)
	Existing Property Boundary (0.5 ha.)
	Proposed Operational Buffer (6.8 ha.)
	Proposed Limit of Waste (2.5 ha.)
	Proposed Entrance (185 m x 12 m)
186.20 (186.20)	Groundwater Elevation July 16, 2012 (October 16, 2012)
	Groundwater Contours July 16, 2012
	Groundwater Contours October 16, 2012

Notes:
1.
2. Distances on this plan are in metres and can be converted to feet by dividing by 3,048.
3. Monitoring well MW4 was not included in the groundwater configuration. This monitoring well is installed in a deep aquifer whereas all other monitors are installed in the shallow aquifer at the Site.

Benchmarks:
1. Nail and washer in southeast corner of pressure treated wood base of Quonset hut.
Elevation 215.477 m.

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GROUNDWATER ELEVATIONS

Drawn By: SNR	Checked By: KDW	Scale: HORZ: 1:5000 VERT: N/A
Date: October 2012		
Revision Date:		Figure: 7
Project No.: 1219-001		

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May 31, 2012

Ontario Ministry of the Environment
Technical Support Section, Eastern Region
1259 Gardiners Road
Kingston, Ontario, K7P 3J6

Attn: Kyle Stephenson
Hydrogeologist

Re: Constant Chloride Concentration – Hydrogeological Modelling
Environmental Screening of Capacity Expansion at Ruby Road Waste Disposal Site
Cambium Reference: 1219-001

Dear Mr. Stephenson,

Cambium Environmental Inc. (Cambium), on behalf of the Township of Bonnechere Valley (Township), has prepared the following response to your email correspondence dated May 11, 2012. This correspondence requested rational to support a reduced chloride concentration of 561 milligrams per litre (mg/L) to be used in the revised numerical hydrogeological modelling to support the expansion feasibility study of the Ruby Road Waste Disposal Site (Site). In addition, it was requested that previous information be included with respect to the rational for using 300 mg/L in the original model, as submitted in the report entitled *Numerical Hydrogeological Modelling Report for Expansion Feasibility of the Ruby Road Waste Disposal Site* (revised September 20, 2012).

The following information was originally provided in the above referenced report:

CONSTANT CONCENTRATION

The constant concentration is used by MODFLOW as a contaminant source providing solute mass to the model domain in the form of a known concentration and must be located in the water table. This particular transport boundary essentially represents a constant source of contamination located in the surface of the water table. Although this does not represent the real field conditions of a source located above the water table at surface and contamination entering the water table through infiltration, it does serve as a precautionary approach such that the entire waste disposal area will be homogenously represented by a chosen conservative concentration of a given contaminant. Furthermore, due to the significant depth of the groundwater table below the ground surface, and the restriction of MODFLOW not being a model intended to be used for unsaturated materials, using a constant concentration is a better representation within MODFLOW's capabilities of the Site conditions that are expected to be observed.

A conservative concentration is understood to be a concentration greater than would reasonably be expected for a landfill in the Township of Bonnechere Valley diverting

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problematic materials that contribute to leachate strength. Additionally, using a conservative value across the entire WDS further exhibits a precautionary approach as the waste will actually be emplaced at decreasing depths from the centre of the waste disposal area and therefore decreasing parameter concentrations in leachate will infiltrate nearer the toe of the waste mound (i.e. greatest concentrations infiltrated in areas of greatest depth). The model represents only the conservative concentration across the entire waste disposal area.

Contaminant concentrations used were determined from average of the greatest 25% of historical concentrations for other waste disposal sites of similar size and waste composition and are shown in comparison to the maximum historical concentration at the existing Ruby Road WDS and typical leachate concentrations as per Table 1 of the *Guidance Manual for Landfill Sites Receiving Municipal Waste* (MOEE, 1993) in Table 1. The maximum chloride concentrations observed at the Eganville and Sand Road WDS, eliminating those wells which are noted to be impacted by salt storage facilities, are also included in the table to show the typical concentrations of chloride observed in leachate produced from waste deposited by residents of the Township of Bonnechere Valley. It can be seen that the constant concentration values used are within or greater than the typical leachate concentrations as per Table 1 of the *Guidance Manual for Landfill Sites Receiving Municipal Waste* (MOEE, 1993) and are seven (7) times greater than concentrations observed at the Ruby Road WDS and almost two (2) times greater than any chloride concentrations observed with the Township of Bonnechere Valley. It should be noted that for the typical leachate values in Table 1 of the *Guidance Manual*, the size or age of the sites is not known, nor is the composition of the waste at the sites known where these values were obtained from. This approach is believed to be conservative and sufficiently precautionary.

Table 1 Contaminant Concentration Values Summary

Concentration Source	Chloride Concentration (mg/L)
Average of the Greatest 25% of Concentrations for Similar Sites[1]	300
Maximum Concentration Observed at Existing Ruby Road Site[2]	42
Typical Leachate Concentration[3]	20 – 2500
Maximum Concentration Observed at the Eganville Site	180
Maximum Concentration Observed at the Sand Road Site	150
Value Used for Proposed Expanded Footprint Simulations	300

Notes:

1. Values obtained from sites of similar size and waste composition. Average of the greatest 25% of historical values were used.

2. Maximum historical value from monitoring well BH-1 at the existing Ruby Road waste disposal site.

3. From Table 1 in Guidance Manual for Landfill Sites Receiving Municipal Waste (MOEE, 1993).

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May 31, 2012

In addition to the above, the following rational was provided to Ms. Vicki Mitchell on May 8, 2012 in response to comments received from you on April 26, 2012 (copied to you):

> ***Cambium should revise the source chloride concentration used in the numerical model as discussed above.***
>
> Cambium disagrees with this recommendation. As previously discussed and approved by the MOE (Mr. Kinney and Ms. Mitton in correspondence dated December 8, 2010: "The ministry is satisfied with this approach and with the hydrogeological investigation completed to date to demonstrate the feasibility of the expansion of the Ruby Road waste disposal site."), the chloride concentration of 300 mg/L for the Site is both acceptable for design purposes and conservative. The following information was used to derive and continues to support the use of 300 mg/L for the feasibility studies for the expanded Ruby Road waste site:

Peak Chloride Concentrations in Leachate observed at any one site of 31 sites in Eastern Ontario	517 mg/L
Average Peak Chloride Concentrations in Leachate – 31 sites in Eastern Ontario	165 mg/L
Maximum Average Chloride Concentration in Leachate observed at any one site of 31 sites in Eastern Ontario	**294 mg/L**
Average Chloride Concentration in Leachate – 31 sites in Eastern Ontario	**81 mg/L**
Peak Chloride Concentration in Leachate observed in any one of the Township of Bonnechere Valley WDS	180 mg/L
Peak Chloride Concentration in Leachate observed at the Ruby Road WDS	43 mg/L
Average Chloride Concentration in Leachate observed in the Township of Bonnechere Valley	71 mg/L
Average Chloride Concentration in Leachate observed at the Ruby Road WDS	33 mg/L
Typical Chloride Concentrations in Leachate - Landfill Guidance Document, 1993	20-2500 mg/L
Typical Chloride Concentrations in Leachate – Landfill Guidance Document, 2010 (and Reg. 232/98) based on waste loadings of 150,000 to 250,000 tonnes/hectare	1500 – 2500 mg/L
Design Chloride Concentration using ratio of 1:100** (concentration : waste loading; 1,500 mg/L : 150,000 tonnes/hectare)	207 mg/L

*****Proposed Waste Loading of Ruby Road WDS:***

Assumed Waste Density (truck compactor)	*505 kg/m³*
Proposed Average Depth of Waste	*4.1 m*
Proposed Footprint Area	*25,000 m²*
Proposed Volume of Waste	*102,500 m³*
Waste loading	*20,705 tonnes/hectare*

As indicated by Section 10 (3) 6. of O.Reg232/98,

> *"…if it is appropriate because of the nature of the waste…the Director may…require or permit the objective of the design to be based in whole or in part on contaminants other than those listed in Column 1 of Table 1 and, for the purpose of evaluating the design with respect to that objective…require or permit the use of an initial source concentration, mass as a proportion of total (wet) mass or half-life in leachate specified by the Director with respect to each of the other contaminants. O. Reg. 232/98, s. 10 (3)."*

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Cambium maintains that the above explanation and information provided indicates an initial concentration of 300 mg/L is adequate to conservatively assess the feasibility of the Site to accept typical waste from the municipality. It should be noted that the initial concentration of 300 mg/L was also used for the contaminant lifespan calculations.

Regardless of the above, Cambium has provided herein, calculations and rational to use a constant concentration less than that provided in Ontario Regulation (O. Reg.) 232/98, as agreed upon by Cambium, the Township, and yourself during discussions at the Site meeting held on May 9, 2012.

As presented in the document entitled *A Method for Predicting Chloride Concentrations in Leachate at Natural Attenuation Landfills in the Precambrian Shield Regions of Ontario, Canada* (Gehrels and Puumala, GWMR, Summer 2000), the recommended peak chloride concentrations included in O. Reg. 232/98 are based on five (5) large engineered facilities where waste is underlain by clay liners; these concentrations are therefore not representative of chloride concentrations observed small rural natural attenuation sites throughout the Precambrian Shield observed in northern Ontario. As such, a study was completed and showed that for sites underlain by sandy permeable soils with hydraulic conductivities ranging from 4×10^{-7} to 2×10^{-4} metres per second (m/s) a significant correlation existed between the volume of waste deposited and the peak chloride concentrations observed. The relationship developed is as follows:

$C_{Cl} = 0.00098V + 463$;

where C_{Cl} is reported in mg/L and V is less than 2×10^{6} cubic metres (m^3). The above referenced calculation incorporates a conservative chloride concentration of 370 mg/L which is ±1.96 times the standard error (i.e. 188 mg/L) at a confidence interval of 0.95; this ensures the design value for the site will adequately determine the required contaminant attenuation zone for the purposes of risk assessment. With respect to the volume of the Site, as the volume approaches 2,000,000 m^3, the chloride concentration approaches the concentration of 2500 mg/L as specified in O. Reg. 232/98.

For the Ruby Road site, the overburden materials meet the specified hydraulic conductivities of permeable sandy soils, the site is typical of the Precambrian Shield (i.e. sandy soils underlain by Precambrian bedrock), and the Site will have a final volume significantly less than 2,000,000 m^3. As such, the above calculation can be used to determine a conservative chloride concentration to be used for the feasibility modelling. Using the design volume of 130,000 m^3, the peak chloride concentration was determined 590 mg/L.

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May 31, 2012

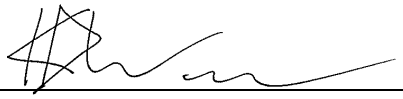
CLOSING

As discussed during the Site meeting on May 9, 2012, Cambium will revise the feasibility modelling to incorporate an increased initial chloride concentration of 590 mg/L. Cambium, on behalf of the Township, will also incorporate the results of the installation of three (3) additional monitoring wells to be installed in mid-June including the observed groundwater elevations of all on-site monitoring wells following installation of these monitoring wells and the determined in-situ hydraulic conductivities from all on-site monitoring wells. Prior to revising the feasibility model, Cambium and the Township would appreciate acknowledgment in writing that the source concentration of 590 mg/L is acceptable.

Cambium trusts that the information provided in this correspondence is complete and suitable to meet the needs of the MOE TSS. Should you require any additional information or clarification, please do not hesitate to contact the undersigned at 705-742-7900 ext. 203.

Best regards,

Cambium Environmental Inc.



Kevin Warner, P.Geo. (Ltd.)
Senior Project Manager/Hydrogeologist

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Copies: *Bryan Martin, Township of Bonnechere Valley*
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Vicki Mitchell, Environmental Assessment Coordinator
Emily Tieu, Senior Environmental Officer
Peter Taylor, Technical Support Manager

P:\1200 to 1299\07-1219-001 - TBV Environmental Screening\Correspondence\2012-05-28 LTR Response to MOE TSS - Cl conc.docx

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January 19, 2012

Ontario Ministry of the Environment
Technical Support Section, Eastern Region
PO Box 22032
1259 Gardiners Road, Kingston, Ontario, K7M 8S5

Attn: Vicki Mitchell
Environmental Planner

Re: Responses to MOE Comments in 2011 dated July 28, October 18, and November 15
Environmental Screening of Capacity Expansion at Ruby Road Waste Disposal Site
Cambium Reference: 1219-001

Dear Ms. Mitchell,

As per our meeting at your offices on December 22, 2011 with members of the Technical Support Section (TSS Meeting, 2011), Cambium Environmental Inc. (Cambium) has prepared the following formal response to the discussions during the aforementioned meeting and to the comments provided in the following correspondence:

Kinney, S. (2011, July 28). Ruby Road Waste Disposal Site A411501, Lot 27, Concession 9, Geographic Township of South Algona, Environmental Screening Report. *Memorandum*. Kingston, Ontario, Canada: Ontario Ministry of the Environment.

Mitchell, V. (2011, November 15). Ruby Road Waste Disposal Site. *Email Correspondence*. Kingston, Ontario, Canada: Ontario Minsitry of the Environment.

Grills, L. (2011, October 18). Environmetnal Screening Report: Ruby Road Waste Disposal Site Capacity Expansion, The Corporation of the Township of Bonnechere Valley. *Memorandum*. Kingston, Ontario, Canada: Ontario Ministry of the Environment.

In order to address the comments in a clear and concise manner, Cambium has summarized what are understood to be the issues for resolution. They are as follows:

1. **Requirement to Remedy Existing Noncompliance:** The existing Ruby Road waste disposal site (WDS) currently does not comply with Reasonable Use Guideline B-7 (RUG) and the Technical Support Section does not endorse landfill site operation when such conditions exist (Kinney, 2011). As such, a reopening of the site for waste disposal will not be endorsed while the Ruby Road WDS does not comply with the RUG (TSS Meeting, 2011).
2. **Extent of Predicted Leachate Groundwater Impacts:** The groundwater reviewer for the TSS is concerned that the potential extent of the groundwater leachate impact of an expanded landfill may be greater than what has been forecasted in the predictive models prepared by Cambium; the doubts in large part being attributed to the representative validity of hydraulic conductivity values in the subsurface and the water recharge values that were applied (Kinney, 2011).

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3. **Expansion Directly Requires CAZ in Lot 26, Concession 9 Prior to Approval:** Based on concerns about the potential extent of the groundwater leachate impacts of an expanded landfill, the groundwater reviewer for the TSS contends that an appropriately sized Contaminant Attenuation Zone (CAZ) for the proposed expansion would require legal care and control of subsurface areas in Lot 26, Concession 9, geographic township of South Algona (Kinney, 2011).
4. **Surface Water Impact from Leachate:** The surface water evaluator for the TSS requires clarification from the groundwater reviewer that the groundwater movement/direction from the proposed expansion has been determined to be towards the east. Once confirmed, it is also understood that these conditions negate the potential risk of leachate contaminated groundwater from the expansion area to discharge to the unnamed surface water feature on the adjacent westerly property, Lot 28 Concession 9, geographic township of South Algona (Grills, 2011).
5. **Lands Delineation:** The current lands owned by the Township, the proposed CAZ, the privately owned lands, and the proposed waste disposal site property boundary should be clarified in the Environmental Screening Report (Mitchell, 2011).
6. **Aboriginal Consultation:** The information on Aboriginal consultation should be updated (Mitchell, 2011).
7. **Review of Supporting Technical Studies by Non-MOE Entities:** The MOE TSS surface water reviewer will defer to the Ministry of Natural Resources to review and comment on the technical reports prepared to date relating to an unnamed water feature located on the property west of the proposed landfill expansion (TSS Meeting, 2011).

The responses to the comments provided below have been prepared by Cambium based on the study and interpretation of information, observations, and measurements collected from the area of study in conjunction with discussions with MOE TSS representatives. The responses are presented in the order of the comment summaries provided above.

REQUIREMENT TO REMEDY EXISTING NONCOMPLIANCE

The Township of Bonnechere Valley had decided to close the Ruby Road WDS in early 2003 due in part to the recognition of the inferred offsite groundwater impacts that were understood to exist based on groundwater monitoring. This noncompliance with the RUG is readily anticipated given there has never existed any downgradient groundwater CAZ.

Since the site closure and conversion to a waste transfer station, monitoring of the groundwater quality in the existing landfill site has shown a trending decrease in leachate associated parameters. In order to provide better determination of the presence and magnitude of any existing offsite groundwater impacts, two additional monitoring wells were installed in October

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2011 on the north roadside of Ruby Road at the border of Lot 27 and Lot 26; a bedrock well and an overburden well identified as MW8-I and MW8-II, respectively. The results of analysis conducted on samples collected from these wells reported RUG and Reasonable Use Criteria (RUC) exceedances for total dissolved solids (TDS) and hardness. The presence of these parameters is not recognized to pose a threat to human health or the natural environment as they currently exist in the subsurface offsite.

Assuming the reported concentrations of TDS and hardness are entirely due to landfill influence, then in order to bring the existing Ruby Road WDS back into regulatory compliance as per the RUG, legal care and control by the municipality of the subsurface areas in the northern portions of Lot 26 and Lot 27, Concession 9, geographic township of South Algona would be required. A linear extrapolation of the concentrations along the groundwater flow direction suggests a conceptual approximation of this CAZ to be as shown below in Figure 1.

Attenuation distance was determined by evaluating the in-situ ability of the sites' subsurface to naturally attenuate landfill impacts and determine the approximate attenuation distances required to meet the RUC.

The attenuation distance was estimated by using the groundwater quality data of two test wells located along the flow path of the existing leachate plume. The specific attenuation value for each critical parameter of interest (TDS, hardness) was estimated from the following expression:

$$A_S = \frac{C_n - C_d}{L} = \frac{\Delta C}{L}$$

Where,

A_S *= the concentration gradient, or specific attenuation (mg/L/m)*
C_n *= the concentration for the critical parameter in the test well nearest the landfill (mg/L)*
C_d *= the concentration for the same parameter in the distant test well (mg/L)*
L *= the flow distance between the two monitoring wells (m)*

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Figure 1 Approximation of Subsurface Area for Legal Care and Control

Source: County of Renfrew GIS Website

The Township therefore acknowledges that in order to remedy the existing RUG noncompliance for the non-health related parameters of TDS and hardness, the Township would require legal care and control of a yet to be confirmed subsurface area in the northern parts of Lot 27 and Lot 26, Concession 9 in the geographic township of South Algona. So long as the Ruby Road WDS has not received any further waste for onsite emplacement, the MOE has continued to be satisfied to allow the continued monitoring of the natural attenuation of the offsite impacts to groundwater. However, in the event that the Township should wish to reopen the Ruby Road WDS, the existing RUG noncompliance must be addressed.

EXTENT OF PREDICTED LEACHATE GROUNDWATER IMPACTS

The TSS groundwater reviewer has expressed doubt regarding the extent of the leachate plume migration predicted by the hydrogeological modeling as prepared by Cambium to determine the groundwater impact of the proposed capacity expansion at the Ruby Road WDS. These doubts are based on concerns over the representative and predictive accuracy of the hydrogeological model specifically due to: a discrepancy in the hydraulic conductivity value used at groundwater monitoring point MW4-08 in the model, the groundwater recharge values used in the model, and the representation of the overburden and bedrock characteristics downgradient of the proposed waste disposal area expansion in the model.

In recognition of the reviewer's concerns, Cambium updated the hydrogeological model to the measured hydraulic conductivity value of 4.84×10^{-6} m/s instead of the value of 4.84×10^{-7} m/s that had been inappropriately applied to MW4-08. The values used in the model are intended to reflect actual field measured values whenever they are available, as is the case with this correction. The concern of the reviewer that the correction of the hydraulic conductivity value at

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MW4-08 would have profound implications for the model were not validated by the fact that the resultant leachate plume extent prediction did not change significantly and the calibration of the model overall remained acceptable as shown below in Figure 2 and Figure 3.

Figure 2 Updated Depiction of Predicted Leachate Plume

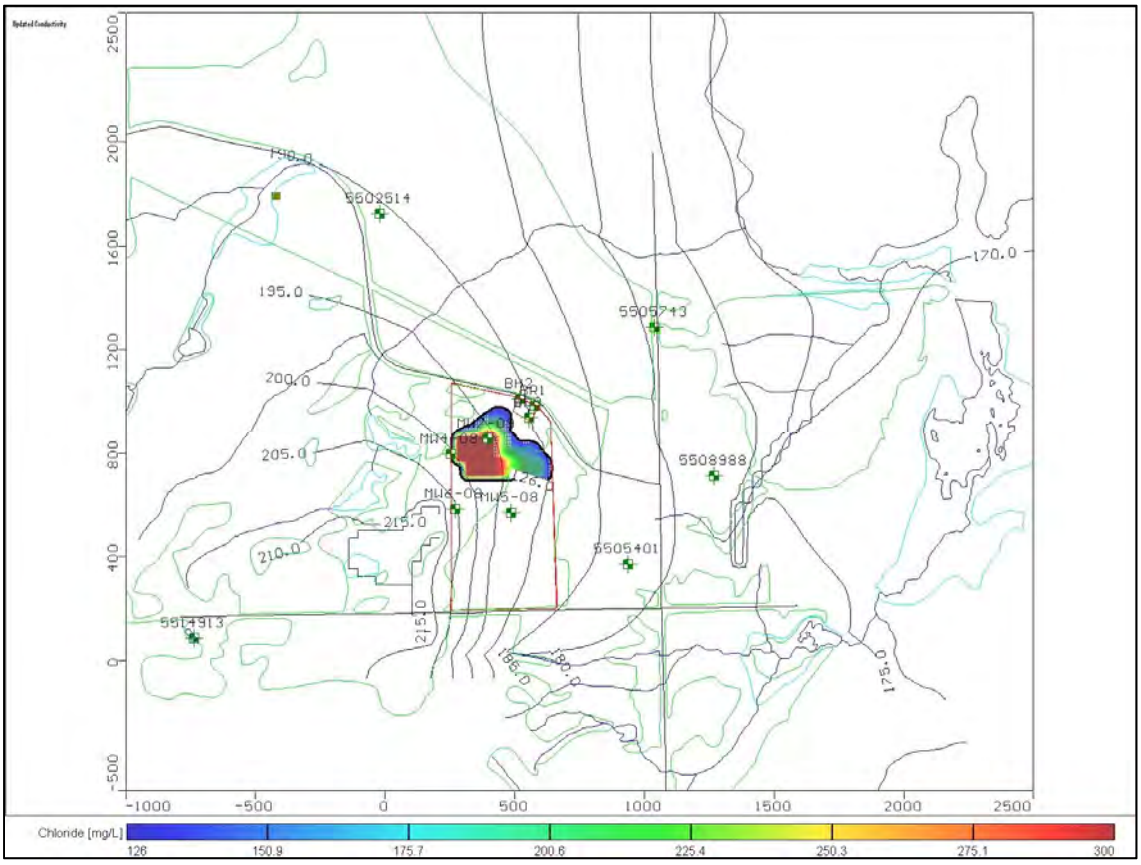

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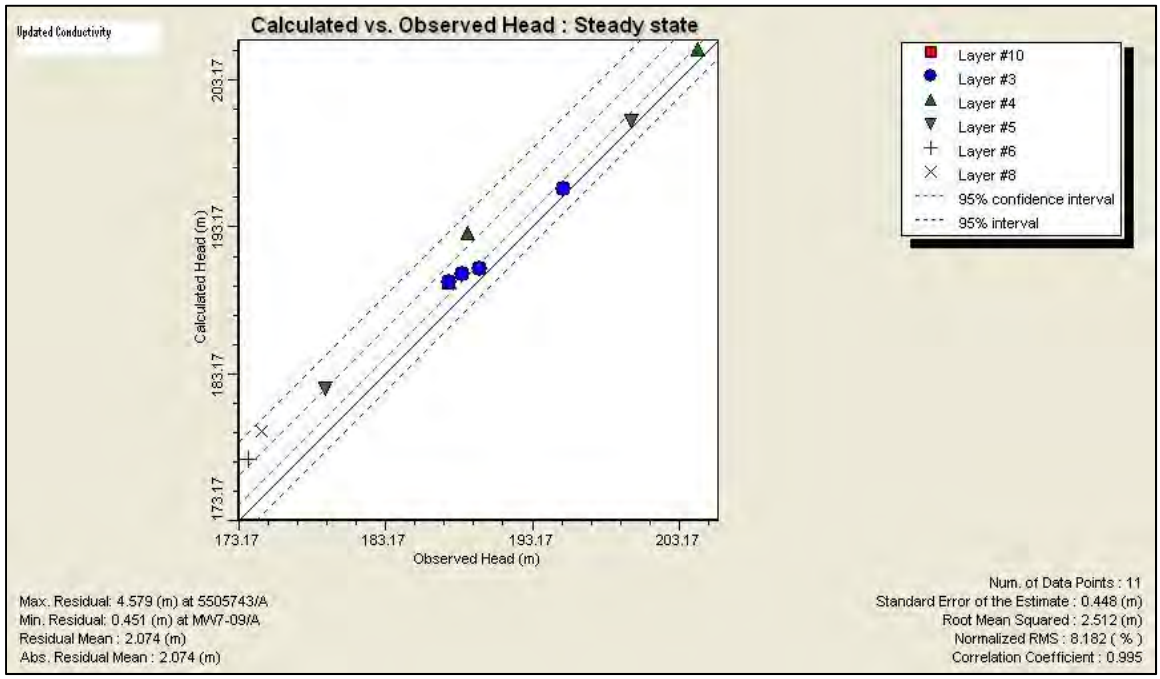
Figure 3 Updated Calibration Graph



Similarly, the value of the groundwater recharge was changed in the model from 87.5 mm/year to 175 mm/year. It is important to note that the reviewer appears to have misinterpreted the notion of the sensitivity of the model to recharge values used based on commentary from a Mr. Wilf Ruland on behalf of the Golden Lake Property Owners Association. The hydrogeological modelling report states in Section 8.2 that as the recharge rate is increased, the distance of the RUC value in the plume increases in distance away from the proposed eastern CAZ boundary. For example, Chart 2 in the report shows a 40% increase in the recharge rate results in a 100% increase in the distance of the RUC concentration front in the plume away from the eastern CAZ boundary. This is more clearly shown in Table 7 of the same report as presented in the excerpt from the same table shown below:

Table 1 Excerpt from Table 7 in the Hydrogeological Modelling Report (Cambium 2010)

Parameter	Initial Value in Original Model	Value Used for Sensitivity Analysis	Percent Change in Input Value	RUC Distance[1]	Percent Change in Output Value	Max. Conc. Calculated at Property Boundary[2]	Percent Change in Output Value	Normal-ized RMS (on-site wells only)
Original Model[2]	-	-	-	3	-	120	-	3.028
Recharge Increased	87.5	175	100	10	233	105	-13	6.507

Notes: 1. Distance from (i.e. west of) property boundary where the concentration in the plume equals the RUC value (m).
2: Following initial sensitive analysis of the flow model (Section 8.1)

The indication that an increased recharge value will only serve to withdraw the RUC concentration front in the leachate plume from the CAZ boundary could be reasonably affirmed by the concept that increasing the recharge not only increases the amount of leachate produced in

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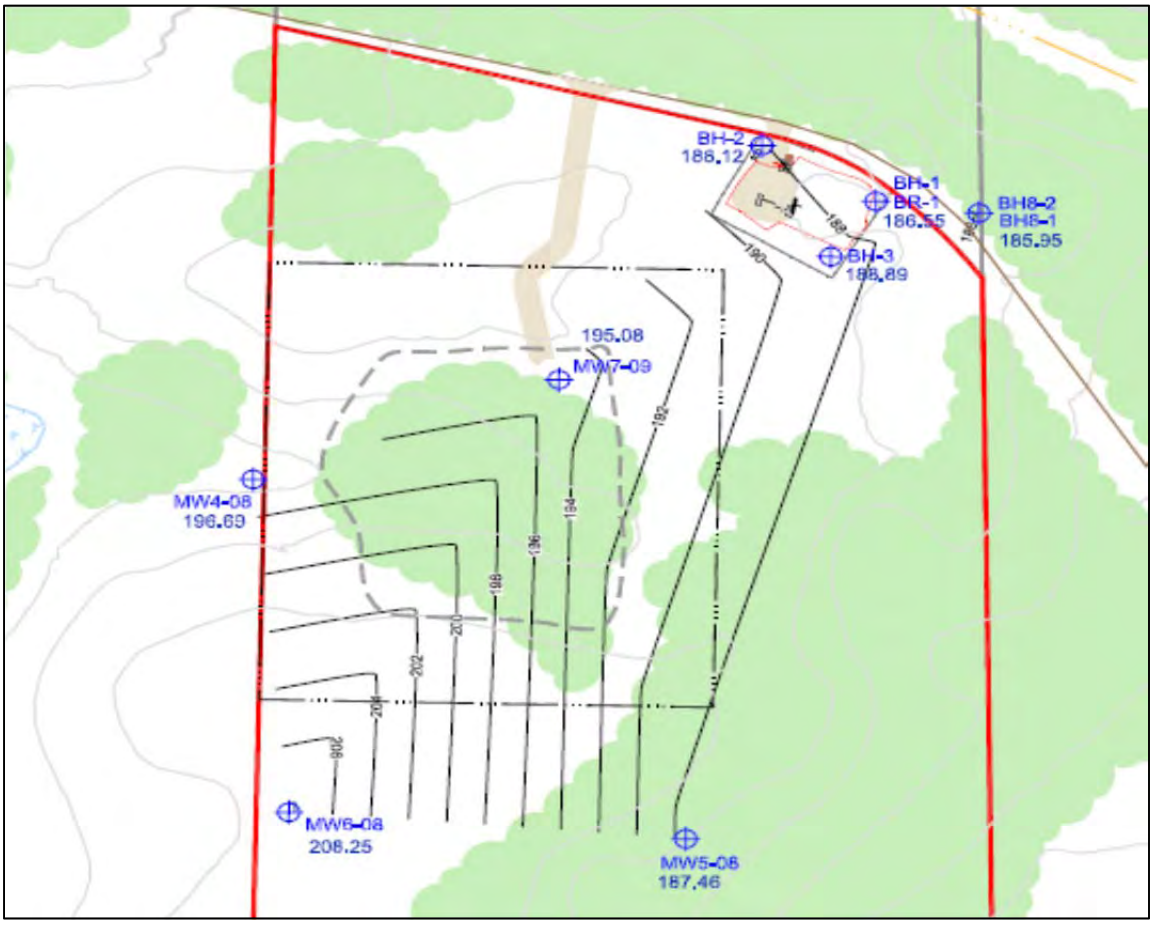
the model but also will significantly increase the quantity of groundwater at the site; effectively diluting the leachate plume. Therefore, use of a greater recharge value, as promoted by reviewers of the modelling report, will only serve to produce a less precautionary model.

The representation of the overburden and bedrock characteristics downgradient of the proposed waste disposal area expansion in the model is based on investigations conducted on site and literary research. The monitoring well logs and the residential well records for the area suggest a consistent pattern of silty sand overlying sand and gravel overlying fractured bedrock. Groundwater generally travels in the bedrock overburden interface. The bedrock surface itself is reasonably uniform and predictable as shown in Figure 4. As such, the thickness of the overburden is rationally represented by the known topography and inferred bedrock surfaces.

Figure 4 Inferred Bedrock Surface Contours from Monitor Well Records



The hydraulic conductivities selected for both overburden and bedrock downgradient of the proposed waste disposal area are consistent with those values measured throughout the site. As shown in Table 2, the measured hydraulic conductivities show little variation, and therefore it is reasonable to use similar values to represent subsurface in the downgradient CAZ.

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Table 2 Summary of Measured Hydraulic Conductivities

Monitor	Type	Hydraulic Conductivity (m/s)
BH2	Overburden	8.85×10^{-6}
BH3	Overburden	3.61×10^{-7}
MW8-II	Overburden	4.40×10^{-7}
BR1	Interface	5.85×10^{-5}
MW5	Interface	1.81×10^{-5}
MW4	Bedrock	4.84×10^{-6}
MW6	Bedrock	2.62×10^{-6}
MW7	Bedrock	2.61×10^{-7}
MW8-I	Bedrock	1.41×10^{-6}

The resultant model, with regard for observed groundwater elevations and measured hydraulic conductivities, has maintained good calibration throughout varied iterations and this robustness is believed to further support that the downgradient overburden thickness and hydraulic conductivities are appropriately represented.

It should also be noted that when reviewing Figure 2 and Figure 3 in the Hydrogeological Modelling Report, that these figures are two dimensional "slices" of a three dimensional model. For example, Figure 3 is a plan view of layer 4 in the model which will be significantly different in appearance than an illustration of layer 5 which contains a significant amount of the fractured bedrock through which much of the groundwater travels. Similar may be said for Figure 2. Therefore, these "slices" are themselves only a partial depiction of the downgradient conditions

As an overall follow-up to the concerns of the leachate plume concentrations, a mass balance calculation was performed for chloride as follows:

$$C_{Total} = \frac{(Q_1 C_1 + Q_2 C_2)}{Q_1 + Q_2}$$

Where,

Q_1 = non-leachate or background groundwater flow contribution
= non-waste disposal area in direction of groundwater flow consistent with waste disposal area x recharge rate
= 45,200 m^2 x 0.175 m/year

C_1 = background chloride concentration
= 2.1 mg/L

Q2 = annual leachate flow contribution
= area of proposed waste disposal area x recharge rate
= 25,000 m^2 x 0.175 m/year

C2 = Leachate chloride concentration
= 300 mg/L

The calculated concentration at the eastern CAZ limit (C_{Total}) was 108 mg/L and the previously calculated RUC value was 126 mg/L. This simplified method for assessing the suitability of the proposed CAZ supports the overall prediction that the leachate impacts to the groundwater will not exceed the RUC at the proposed eastern property boundary of Lot 27, Concession 9.

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EXPANSION DIRECTLY REQUIRES CAZ IN LOT 26, CONCESSION 9 PRIOR TO APPROVAL

The requirement to satisfy the CAZ requirement for natural attenuation associated with the proposed expansion is appreciated by the Township. For this reason, based on the hydrogeological investigations and modelling completed, the purchase of Lot 27, Concession 9 in the geographic township of South Algona has been proposed. The relocation of the waste disposal area and the extent of proposed CAZ on the subject property have been demonstrated to provide the necessary conditions to maintain RUG compliance throughout the operation and perpetual care of the landfill expansion. Although it has not been predicted that that the leachate plume concentrations may someday exceed the RUC values at the eastern CAZ boundary, there does remain the need to retain a contingency plan. That contingency plan includes the care and control of subsurface areas in Lot 26, Concession 9 should it ever become necessary; however, such a requirement it is not justified as an immediate course of action.

In the full consideration of the environment (natural, social, cultural, technical and built) and impacts thereto, the Township considers the premature fulfillment of such a contingency plan as producing a negative net impact to the societal fabric of the community due to sensitivities of land ownership and rights in the region. In the event that the sentinel monitors within the CAZ actually do indicate the need for additional area, the Township will discuss those needs with the affected land owner of that time. Little or no change to the property, aside for a possible change in ownership, would be expected on Lot 26 given the proximity to the existing landfill in the context of the restrictions imposed by the Official Plan. As such, it is proposed that the consideration of requiring CAZ in Lot 26 as a direct result of the proposed expanded waste disposal site appropriately remain a contingency.

SURFACE WATER IMPACT FROM LEACHATE

Groundwater has been clearly determined to move in an easterly direction. No shallow aquifers were encountered and all overburden within the proposed waste disposal area is well drained and expected to transmit directly to the deep aquifer whereupon it will travel to the east as it is attenuated.

LANDS DELINEATION

The lands currently owned by the Township are only the existing Ruby Road WDS within Lot 27, Concession 9 shown in the Figure 8, the Proposed Property Plan, in the Environmental Screening Report. The remainder of Lot 27, as well as Lots 26 and 28 are privately owned. The municipality maintains an agreement for the option to purchase Lot 27 south of Ruby Road as illustrated in Figure 8 of the Environmental Screening Report.

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The current lands owned by the Township, the proposed CAZ, the privately owned lands, and the proposed waste disposal site property boundary will be further clarified in the Environmental Screening Report to reflect the information above.

ABORIGINAL CONSULTATION

Aboriginal consultation, and other interested entity consultation as well, has been on a hiatus while the technical issues regarding the hydrogeological aspects of the proposed expansion have been discussed with the MOE TSS over the past two years. Cambium will renew the consultation process (including the Aboriginal components) and update the record of consultation once the hydrogeological aspects of the draft Environmental Screening Report are resolved with the MOE.

REVIEW OF SUPPORTING TECHNICAL STUDIES BY NON-MOE ENTITIES

As per a conversation with a previous MOE primary contact (Ms. Alida Mitton) for this environmental screening project, the TSS was sent the following reports on February 3, 2009:

- Initial Environmental Impact Study
- Supplemental Biological Studies
- Hydrogeological Study
- Noise Impact Assessment
- Stage I and II Archaeological Assessment

Subsequent to sending the studies for review, a follow up regarding the status of the reviews was sent by email to Ms. Mitton on March 23, 2009. The response from the MOE contact on March 25, 2009 indicated that the TSS would only review the Hydrogeological and Noise Impact studies. Unfortunately, no direction, recommendation or suggestion was provided that a review and approval of the remaining studies was required by other specified agencies; specifically a review by the Ministry of Natural Resources (MNR) of the Initial Environmental Impact Study and Supplemental Biological Study. During the MOE TSS Meeting in December 2011, it was suggested that the relevant studies should be forwarded to the MNR in order to confirm the findings of the professionals of Snider Ecological that the surface water feature is an intermittent, cool water stream that does not provide fish habitat. Although the MNR review may be irrelevant given that there is not deemed to be a risk of leachate impacted groundwater affecting this ephemeral drainage course, Cambium will forward the copies of the reports for review.

The Archeological Assessments were forwarded by the archeological consultants, The Archeology Group, to the Ministry of Culture for review. A response was received dated June 27, 2008 confirming a low potential for the discovery of archeological resources on the property.

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January 19, 2012

CLOSING

Cambium trusts that the information provided in this correspondence is complete and suitable to meet the needs of the MOE TSS. Should you require any additional information or clarification, please do not hesitate to contact the undersigned at 705-742-7900 ext. 202.

Best regards,

Cambium Environmental Inc.

Original Signed by

John Desbiens, P.Eng.
President

JPD/jpd

Copies: *Bryan Martin, Township of Bonnechere Valley*
Lance Larkin, Ministry of the Environment, Ottawa District Office

\\srvapp\projects\1200 to 1299\07-1219-001 - TBV Environmental Screening\Correspondence\2012-01-17 LTR Response to Draft ESR Comments from MOE TSS.docx

ERRATA

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Errata to Appendix N

Correspondence with Private Interest Groups

From: Wilf Ruland [mailto:deerspring1@gmail.com]
Sent: May-19-11 3:24 AM
To: Bryan Martin; Bob Peltzer; Cairine Cybulski; Charlotte Neitzel; Jack Roesner; Jennifer Murphy
Cc: Kevin O'Connor; John Gulland; Alida (ENE) Mitton; Wilf Ruland
Subject: Follow-up to Independent Review of Ruby Road Landfill Proposal

Dear Mr. Martin,

I am writing with regard to several matters:

1) There was a March 23, 2011 article in the Eganville Leader entitled "Report challenging Ruby Road study based more on opinion". The article provided coverage of a "waste management update" provided to Bonnechere Council by its consultant John Desbiens regarding the proposed Ruby Road landfill site.

In particular the article provided extensive coverage of the Township Council's and its consultant's negative opinions about the independent review of the Ruby Road proposal which I had prepared for the Golden Lake Property Owners Association (GLPOA), and which had been provided to the Township.

I would like to remind the Township that the concerns which I have raised are scientifically based, and related directly to the fact that the Township is proposing to put a landfill on the Ruby Road site (near the location of a former gravel pit) without making any provision to collect and contain the leachate which will be flowing into groundwater and/or surface water from that site. As I have indicated in my review, the hydrogeological setting of the site does not appear consistent with what is needed for a landfill of this type (ie. an attenuation landfill) at this location.

Rather than publicly disparaging my review, I would like to suggest that it would have been more constructive for Council and its consultant to actually discuss the concerns which I've raised - and how the Township intends to address them.

2) There has been no response at all from the Township (aside from what was reported in the aforementioned news article) to my independent review of the proposed Ruby Road Landfill. I am concerned that the Township may be mistakenly proceeding on the assumption that it does not need to address the concerns which I raised in my review.

Council should be aware that it is required under the Environmental Screening Process to conduct further investigations in response to substantive concerns which are brought to its attention (such as those the GLPOA has brought to its attention through my review). In my opinion it would be a mistake if, as reported in the article, Council intends to have its consultant issue the Environmental Screening Report on the Ruby Road location later this spring without first conducting the additional investigations which I have recommended are necessary.

If concerns are brought to the proponent's attention through the Environmental Screening Process, then under that process the proponent is required to conduct additional investigations. If Council is planning on not following the requirements of the process (as the article suggests), then this could result in a later rejection of the Environmental Screening Report by the Ministry of the Environment (MOE).

I have done my best to provide a science-based review of the potential problems associated with the current Ruby Road landfill proposal, and the GLPOA has provided a valuable service to Council in bringing these issues to its attention at this stage of the process. It is not too late at this point for Council to do the right thing, and have its consultant carry out the recommended investigations.

3) I have downloaded from the Township website the contents of what was posted under the heading "Environmental Screening Report Ruby Road Waste Site". What was posted there was however not an environmental screening report - instead it appears to be the posters which were out for display at the recent "Public Consultation Event No. 4" which was held in an open house type of format. My understanding is that what was posted on the website makes up the entirety of what was on the posters and handouts at the open house. If I am incorrect in this assumption, then I would respectfully request that you forward any missing documentation to me so that I have a complete record in my files.

4) I have a number of questions based on my review of these posters from the recent open house:

a) Why were none of the substantive concerns which have been raised by the GLPOA through my review mentioned or addressed in the posters?

b) What is the basis for the statement that the modelling was "approved" by the MOE?

c) Why did the list of typical leachate constituents not include volatile organic chemicals (VOCs)?

d) The proposed Contingency Plans appear to have either not been accounted for in the Estimated Costs of the proposed landfill on the Township Website, or to have been underestimated. Please provide the details of the cost estimates for the proposed Contingency Plans?

e) It appears from the Conceptual Plan that the Township is intending to have all surface water runoff from the waste disposal site infiltrate into the ground at selected locations. Could you please confirm that this is what is intended?

f) The poster which is entitled "Assessment of Environmental Advantages and Disadvantages of the Project" is problematic in that it implies that the proposed landfill already has a Provisional Certificate of Approval. What is the basis for the Township's statement that the proposed landfill already has a Certificate of Approval? I believe this is a major misstatement which needs to be publicly corrected as soon as possible.

5) I am concerned that the Township may be misrepresenting the position of the Ministry of the Environment (MOE), as raised in my Questions 4b) and 4f) above. I have thus taken the liberty of copying Ms. Alida Mitton of the MOE on this e-mail.

I would like to sincerely request a detailed response from the Township to this e-mail at the earliest opportunity.

Sincerely,

Wilf Ruland (P. Geo.)

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