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January 30, 2015

The United Townships of Head, Clara & Maria
15 Township Hall Road
Stonecliffe, Ontario
K0J 2K0

Via email: twpshcm@xplornet.com

Attn: Melinda Reith
Municipal Clerk and CAO

**Re: Waste Disposal Site Closure and Post-Closure Cost Projections
The United Townships of Head, Clara & Maria
Cambium Ref No. 2923-001**

Dear Melinda,

As requested, Cambium Inc. (Cambium) is pleased to provide a summary of closure and post-closure cost projections for the United Townships of Head, Clara & Maria's (Townships) three (3) waste disposal sites (WDS) including:

- Stonecliffe
- Bissett Creek
- Deux Rivieres

BACKGROUND

Cambium has prepared the attached closure and post-closure cost projections based on the Public Sector Accounting Board (PSAB) Section PS 3270 issued by the Ontario Ministry of Municipal Affairs and Housing. The closure and post-closure costs are based on Ontario Regulation 232/98 (O. Reg. 232/98), Part IV, made under the *Environmental Protection Act*. This regulation indicates that the costs associated with the closure and post-closure care and with contingency plans for privately owned landfills be estimated. Site closure involves completing the final cover, landscaping, and construction of the site monitoring and control works. Post-closure care activities include site inspection, monitoring and maintenance activities, and the construction or replacement of any monitoring or control works.

Although payment of financial assurance is not required to be made by municipal governments, completion of the financial assurance in the form of landfill liability cost estimation, based on the private sector methodology, will assist municipalities in meeting the PSAB requirements.

O. Reg. 232/98 requires that a financial statement, be provided for closure and post-closure care of landfilling sites, must be sufficient to cover the potential contaminating life span of the site, and that the financial assurance must be dependent on the complexity of the site (e.g. waste characteristics, waste volume, engineered works, and environmental setting).



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In addition to O. Reg. 232/98, the cost estimates provided herein are based on Ministry of the Environment and Climate Change (MOECC) Guideline F-15 "Financial Assurance" dated November 2005, and MOECC Procedure F-15-1 "Procedures for Financial Assurance" dated April 1994. These documents outline the methodology for determining closure costs and post-closure costs associated with the financial assurance for waste disposal sites.

SITE OPERATING PARAMETERS

To calculate the cost estimates on which the landfill liability requirements are based, the following site operating parameters shall be taken into consideration:

- Projected fill rate/estimated site life; and
- Environmental monitoring requirements.

These operating parameters are discussed in the following subsections.

PROJECTED FILL RATE/ESTIMATED SITE LIFE

Required for the cost estimates is an equivalent volume for the total site capacity and average annual fill rate for the three (3) Sites as summarized in Table 1 (attached). It is important to note that the projected remaining life is an estimate based on historical filling rates.

ENVIRONMENTAL MONITORING

The current environmental monitoring programs for all three (3) sites consist of environmental monitoring, as well as the completion of biennial reports to be submitted to the MOE.

CONTAMINATING LIFESPAN

The contaminating lifespan (CLS) of a landfill is the time required for the leachate concentrations to decrease in concentration to regulatory defined water quality objectives (i.e., Provincial Water Quality Objectives, Ontario Drinking Water Quality Guidelines) or site defined maximum allowable concentrations as specified in O. Reg. 232/98, Part III, Section 10(3)2. Post-closure care funding is required to be provided for the duration of the CLS of a site, following closure of a site, to ensure that adequate funds are available to mitigate any potential environmental impacts (MOE 2005).

The CLS for the Municipal sites have not been determined through site specific data modelling or calculation, as such, Cambium utilized a 25 year CLS based on literature review. Studies have evaluated the variation in leachate concentration with municipal refuse over time (Rowe 1991 and Lu et al., 1985). Lu et al. (1985) combined the data obtained from numerous studies to produce contaminant production curves. Lu et al. (1985) determined that the leachate generated from a site receiving municipal waste is expected to be reduced to concentrations below regulatory levels or site specific trigger levels in approximately 25 to 30 years from time of closure.



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DISCOUNT AND INFLATION RATES

To calculate required financial assurances for the closure and post closure of the Site, both the annual discount factor used to calculate present worth values and the inflation rate used to calculate future costs are required. A 10-year annual average of Long Term Government of Canada Benchmark Bond Yields and the Non-Residential Building Construction Price Index for Toronto and Ottawa-Gatineau has been used to determine the discount and inflation rates provided by the MOECC in March 2014. The 10-year running average is considered appropriate by the MOECC since it dampens the effects of year-to-year fluctuations in calculating the financial assurances.

As shown in Table 2, the 10-year running average inflation rate for the Non-Residential Building Construction Price Indices for Toronto and Ottawa-Gatineau is 4.07 percent.

The most recent 10-year annual average of Long Term Government of Canada Benchmark Bond Yields where “Long Term” is equal to 30 years is determined to be 3.84 percent, also shown in Table 2. As required by the MOECC, estimates from the 10-year rolling average bond rates should be used for calculations during the first 30 years of the Planning Period for a landfill site. The Planning Period is defined as the post-closure contaminating life span (i.e. 25 years for the Municipal sites); therefore, discount rates will be 3.84 percent for the entire Planning Period.

In summary, the inflation rate and the discount factor used for calculating present worth costs and future costs in the following subsections, is set at 4.07 percent and 3.84 percent, respectively.

CLOSURE AND POST-CLOSURE CARE COSTS

A summary of the capital and engineering cost estimate and post-closure operation and maintenance care costs for the sites are provided in Table 2. The costs typically required to close and maintain each site are based on the following activities:

- Clean-up of Site at closure (e.g. Litter, debris, etc.);
- Site preparation – compaction and grading of the landfill surface;
- Final cover, topsoil, and vegetation;
- Regrading of surface water controls;
- Installation or repair of groundwater monitoring wells;
- Post-closure management and maintenance of landfill surface (e.g. Repair of leachate seeps, Site inspections, etc.); and,
- Annual monitoring and reporting costs.

Cost estimates for annual sampling including laboratory sample analysis and reporting are provided in Table 2.



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Table 2 summarizes both the one-time payments associated with closure costs, and the total ongoing management costs associated with closure and post-closure costs, for each of the respective waste disposal sites and their closure dates. Table 2 summarizes all the costs associated with closure and post closure care, maintenance, monitoring and report, specifically identifying the one-time cost upon closure, and the total costs associated with the 25 year post closure period for each respective waste disposal site.

It should be noted that the Present Worth Value includes 25 years of post-closure operation and maintenance activities. The 25-year post-closure period is consistent with the site's estimated contaminating lifespan of 25 years as previously discussed.

The closure and post-closure costs are based on the assumed site closure dates. Table 1 indicates the final closure dates of the waste disposal sites, which are based on estimated fill rates and remaining disposal capacities, as of December 2014. This is subject to change over the course of the operational span of the waste disposal sites and should therefore be considered as an estimate. As discussed above, the future values presented in Table 2 are based on an annual inflation rate of 4.07 percent and the Present Value is based on a discount rate of 3.84 percent for 25 years from time of closure.

LANDFILL LIABILITY COST SUMMARY

Although it is recognized that the waste disposal sites are municipally owned and payment of Financial Assurance is not required, the Township is required to provide Landfill Liability costing for closure and post-closure care of the landfill.

As required by Section PS 3270 of the Public Sector Handbook, the costs associated with a landfill liability are based on the percentage of landfill used.

Landfill Liability is based on the following equation

$$= \text{estimated total expenditure} \times \text{cumulative capacity used} / \text{total estimated capacity}$$

As summarized in Table 3, using this equation, the Township's current liability for the three (3) waste disposal sites is estimated to be \$1,676,166.

The Landfill Liability should be recalculated each year as landfilled volumes increase and life expectancy decreases.



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If you have any questions or comments concerning the above or enclosed, please do not hesitate to contact the undersigned at (705) 742-7900 ext. 208.

Best regards,

Cambium Inc.



David Bucholtz, C.Tech, EP
Senior Project Manager

DFB/snr

Encl Table 1: Municipal Waste Disposal Capacity Status

Table 2: Waste Disposal Site Closure and Post Closure Cost Projection Summary - 2015

Table 3: Landfill Liability Estimation

Table 4: Stonecliffe Waste Disposal Site

Table 5: Bissett Creek Waste Disposal Site

Table 6: Deux Rivieres Waste Disposal Site

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Table 1
Township of Head, Clara and Maria
Municipal Waste Disposal Capacity Status

	Stonecliffe	Bissett Creek	Deux Rivieres	Municipality
Approved Landfill Capacity (m ³):	26,680	18,502	-	45,182
Approved Waste Disposal Area (ha):	0.90	0.60	0.44	1.94
Existing Limit of Waste (ha)	0.60	0.40	0.44	1.44
Property Area (ha)	2.43	22.22	16.29	40.94
Capacity Used (m ³)**:	17,710	10,747	12,175	40,632
Remaining volume of capacity (m ³):	8,970	7,755	0	16,725
Average annual waste placement (m ³):	290	405	0	695
Estimate of Remaining site life (years):	31	19	0	24

Notes:

* Landfill Liability = estimated total expenditure x cumulative capacity used/total estimated capacity

**Estimated for December 2014 based on previous survey and average annual waste placement



Table 2
Township of Head, Clara and Maria
Waste Disposal Site Closure and Post Closure Cost Projection Summary - 2015

Closure-Related Task	Waste Disposal Site			Total
	Stonecliffe	Bissett Creek	Deux Rivieres	
Clean-up: litter, debris on and around site	\$1,700	\$1,060	\$0	\$2,760
Security Fence and Gate Installation	\$0	\$0	\$0	\$0
Repair of leachate seeps	\$0	\$0	\$0	\$0
Site Preperation and Rough Grading	\$18,640	\$7,710	\$0	\$26,350
Final Cover Material & Compaction ¹	\$324,810	\$134,200	\$0	\$459,010
Topsoil ¹	\$182,920	\$75,520	\$0	\$258,440
Vegetation	\$57,540	\$23,690	\$0	\$81,230
Surface Water Controls	\$0	\$0	\$0	\$0
Monitoring Well Repair	\$23,240	\$17,600	\$0	\$40,840
Project Engineering	\$24,740	\$10,260	\$0	\$35,000
Contingency (15%)	\$95,000	\$40,500	\$0	\$135,500
<i>Total - Closure Tasks</i>	<i>\$728,590</i>	<i>\$310,540</i>	<i>\$0</i>	<i>\$1,039,130</i>
Present Value of Total Expenses	\$700,610	\$298,620	\$0	\$999,230
On-going Maintenance of Closed Site ²	\$69,560	\$43,140	\$12,780	\$125,480
On-going Monitoring of Closed Site ^{2,3}	\$496,480	\$307,350	\$31,700	\$835,530
On-going Reporting of Closed Site ²	\$494,420	\$306,330	\$51,600	\$852,350
<i>Total - Continued Monitoring Tasks</i>	<i>\$1,060,460</i>	<i>\$656,820</i>	<i>\$96,080</i>	<i>\$1,813,360</i>
Present Value of Total Expenses	\$1,019,710	\$631,600	\$92,390	\$1,743,700
Estimated Total	\$1,720,320	\$930,220	\$92,390	\$2,742,930

Notes:

1. Cover and compaction costs based on the required 0.6 m of barrier material, and 0.15 m of topsoil
2. Based on assumed 25-year contaminating life period, commencing after site closure.
3. Monitoring costs based on continuation of current programs for 10 years after closure and a 75% reduction in costs from 10 to 25 years, as per Note 2.
4. Inflation assumed constant at an annual rate of 4.07%
5. Interest assumed constant at an annual rate of 3.84%
6. One time cost for Spring Bay and Sandfield required.



Table 3
Township of Head, Clara and Maria
Landfill Liability Estimation

	Stonecliffe	Bissett Creek	Deux Rivieres	Summary
Approved Landfill Capacity (m3):	26,680	18,502	12,175	57,357
Existing Capacity Used (m ³):	17,130	9,532	12,175	38,837
Landfill Closure Costs (\$)	\$700,610	\$298,620	\$0	\$999,230
Post Closure Costs (\$)	\$1,019,710	\$631,600	\$92,390	\$1,743,700
Total Cost (\$)	\$1,720,320	\$930,220	\$92,390	\$2,742,930
Estimated Landfill Liability (\$)	\$1,104,538	\$479,238	\$92,390	\$1,676,166

Notes:

1. Landfill Liability = estimated total expenditure x cumulative capacity used/total estimated capacity



Table 4: Stonecliffe Waste Disposal Site

Table 4a: Closure and Post Closure Activities and Costs

Activity Number	Closure and Long Term Maintenance Activity	Payment Period	Estimated Cost
1	Clean-up: litter, debris on and around site	One-time payment	\$500
2	Security Fence and Gate Installation	One-time payment	\$0
3	Repair of leachate seeps	One-time payment	\$0
4	Site Preparation and Rough Grading	One-time payment	\$5,400
5	Final Cover Material & Compaction	One-time payment	\$94,300
6	Topsoil	One-time payment	\$53,100
7	Vegetation	One-time payment	\$16,700
8	Surface Water Controls	One-time payment	\$0
9	Monitoring Well Repair	One-time payment	\$6,750
10	Project Engineering	One-time payment	\$7,200
11	On-going Maintenance and Inspection of Closed Site ¹	Annual payment	\$500
12	On-going Monitoring of Closed Site ²	Annual payment	\$4,300
13	On-going Reporting of Closed Site ¹	Annual payment	\$3,500
	Landfill Area	hectares	0.9
	Area to be Closed	hectares	0.9
	Final Cover Material Depth	metres	0.6
	Topsoil Depth	metres	0.15
	Clearing and Grubbing	\$/ha	\$7,250
	Rough Grading	\$/ha	\$5,190
	Cover Material Unit Cost	\$/cubic metre	\$15.18
	Topsoil Unit Cost	\$/square metre	\$3.93
	Vegetation Unit Cost	\$/square metre	\$1.85
	Drainage Ditch (600 mm deep)	\$/linear metre	\$16.35
	Monitoring Well Repair	One-time payment	\$750
	Project Engineering	\$/ha	\$8,000
	Contingency Costs	One-time payment	15%
	Inflation Rate (Projected) ³	percentage	4.07%
	Interest (discount) Rate ⁴	percentage	3.84%



Table 4: Stonecliffe Waste Disposal Site
Table 4b: Planned Closure and Post Closure Costs

PLANNED CLOSURE AND POST-CLOSURE ITEMS (Estimated cost in 2015 dollars)															TOTAL ANNUAL PLANNED CLOSURE AND POST-CLOSURE COSTS		
ITEM:	1	2	3	4	5	6	7	8	9	10	Contingency	11	12	13	TOTAL EXPENSES (Row Sum)	PRESENT VALUE OF TOTAL EXPENSES	
One-time Payment	\$500	\$0	\$0	\$5,400	\$94,300	\$53,100	\$16,700	\$0	\$6,750	\$7,200	15%						
Annual Payments												\$500	\$4,300	\$3,500			
ANTICIPATED PAYMENT SCHEDULE (Amounts in current dollars)															CURRENT \$'s	2015 \$'s	
ITEM:	1	2	3	4	5	6	7	8	9	10	Contingency	11	12	13			
YEAR																	
2015	31	\$500	\$0	\$0	\$5,400	\$94,300	\$53,100	\$16,700	\$0	\$6,750	\$7,200	\$27,600	\$500	\$4,300	\$3,500	\$211,550	\$211,550
2016	30	\$520	\$0	\$0	\$5,620	\$98,140	\$55,260	\$17,380	\$0	\$7,020	\$7,490	\$28,700	\$520	\$4,480	\$3,640		
2017	29	\$540	\$0	\$0	\$5,850	\$102,130	\$57,510	\$18,090	\$0	\$7,310	\$7,790	\$29,900	\$540	\$4,660	\$3,790		
2018	28	\$560	\$0	\$0	\$6,090	\$106,290	\$59,850	\$18,830	\$0	\$7,610	\$8,110	\$31,100	\$560	\$4,850	\$3,940		
2019	27	\$580	\$0	\$0	\$6,340	\$110,620	\$62,290	\$19,600	\$0	\$7,920	\$8,440	\$32,400	\$580	\$5,050	\$4,100		
2020	26	\$600	\$0	\$0	\$6,600	\$115,120	\$64,830	\$20,400	\$0	\$8,240	\$8,780	\$33,700	\$600	\$5,260	\$4,270		
2021	25	\$620	\$0	\$0	\$6,870	\$119,810	\$67,470	\$21,230	\$0	\$8,580	\$9,140	\$35,100	\$620	\$5,470	\$4,440		
2022	24	\$650	\$0	\$0	\$7,150	\$124,690	\$70,220	\$22,090	\$0	\$8,930	\$9,510	\$36,500	\$650	\$5,690	\$4,620		
2023	23	\$680	\$0	\$0	\$7,440	\$129,760	\$73,080	\$22,990	\$0	\$9,290	\$9,900	\$38,000	\$680	\$5,920	\$4,810		
2024	22	\$710	\$0	\$0	\$7,740	\$135,040	\$76,050	\$23,930	\$0	\$9,670	\$10,300	\$39,500	\$710	\$6,160	\$5,010		
2025	21	\$740	\$0	\$0	\$8,060	\$140,540	\$79,150	\$24,900	\$0	\$10,060	\$10,720	\$41,100	\$740	\$6,410	\$5,210		
2026	20	\$770	\$0	\$0	\$8,390	\$146,260	\$82,370	\$25,910	\$0	\$10,470	\$11,160	\$42,800	\$770	\$6,670	\$5,420		
2027	19	\$800	\$0	\$0	\$8,730	\$152,210	\$85,720	\$26,960	\$0	\$10,900	\$11,610	\$44,500	\$800	\$6,940	\$5,640		
2028	18	\$830	\$0	\$0	\$9,090	\$158,400	\$89,210	\$28,060	\$0	\$11,340	\$12,080	\$46,400	\$830	\$7,220	\$5,870		
2029	17	\$860	\$0	\$0	\$9,460	\$164,850	\$92,840	\$29,200	\$0	\$11,800	\$12,570	\$48,200	\$860	\$7,510	\$6,110		
2030	16	\$900	\$0	\$0	\$9,850	\$171,560	\$96,620	\$30,390	\$0	\$12,280	\$13,080	\$50,200	\$900	\$7,820	\$6,360		
2031	15	\$940	\$0	\$0	\$10,250	\$178,540	\$100,550	\$31,630	\$0	\$12,780	\$13,610	\$52,200	\$940	\$8,140	\$6,620		
2032	14	\$980	\$0	\$0	\$10,670	\$185,810	\$104,640	\$32,920	\$0	\$13,300	\$14,160	\$54,400	\$980	\$8,470	\$6,890		
2033	13	\$1,020	\$0	\$0	\$11,100	\$193,370	\$108,900	\$34,260	\$0	\$13,840	\$14,740	\$56,600	\$1,020	\$8,810	\$7,170		
2034	12	\$1,060	\$0	\$0	\$11,550	\$201,240	\$113,330	\$35,650	\$0	\$14,400	\$15,340	\$58,900	\$1,060	\$9,170	\$7,460		
2035	11	\$1,100	\$0	\$0	\$12,020	\$209,430	\$117,940	\$37,100	\$0	\$14,990	\$15,960	\$61,300	\$1,100	\$9,540	\$7,760		
2036	10	\$1,140	\$0	\$0	\$12,510	\$217,950	\$122,740	\$38,610	\$0	\$15,600	\$16,610	\$63,800	\$1,140	\$9,930	\$8,080		
2037	9	\$1,190	\$0	\$0	\$13,020	\$226,820	\$127,740	\$40,180	\$0	\$16,230	\$17,290	\$66,400	\$1,190	\$10,330	\$8,410		
2038	8	\$1,240	\$0	\$0	\$13,550	\$236,050	\$132,940	\$41,820	\$0	\$16,890	\$17,990	\$69,100	\$1,240	\$10,750	\$8,750		
2039	7	\$1,290	\$0	\$0	\$14,100	\$245,660	\$138,350	\$43,520	\$0	\$17,580	\$18,720	\$71,900	\$1,290	\$11,190	\$9,110		
2040	6	\$1,340	\$0	\$0	\$14,670	\$255,660	\$143,980	\$45,290	\$0	\$18,300	\$19,480	\$74,800	\$1,340	\$11,650	\$9,480		
2041	5	\$1,390	\$0	\$0	\$15,270	\$266,070	\$149,840	\$47,130	\$0	\$19,040	\$20,270	\$77,900	\$1,390	\$12,120	\$9,870		
2042	4	\$1,450	\$0	\$0	\$15,890	\$276,900	\$155,940	\$49,050	\$0	\$19,810	\$21,090	\$81,000	\$1,450	\$12,610	\$10,270		
2043	3	\$1,510	\$0	\$0	\$16,540	\$288,170	\$162,290	\$51,050	\$0	\$20,620	\$21,950	\$84,300	\$1,510	\$13,120	\$10,690		
2044	2	\$1,570	\$0	\$0	\$17,210	\$299,900	\$168,900	\$53,130	\$0	\$21,460	\$22,840	\$87,800	\$1,570	\$13,650	\$11,130		
2045	1	\$1,630	\$0	\$0	\$17,910	\$312,110	\$175,770	\$55,290	\$0	\$22,330	\$23,770	\$91,300	\$1,630	\$14,210	\$11,580		
2046	0	\$1,700	\$0	\$0	\$18,640	\$324,810	\$182,920	\$57,540	\$0	\$23,240	\$24,740	\$95,000	\$1,700	\$14,790	\$12,050	\$728,590	\$700,610
2047	1												\$1,770	\$15,390	\$12,540	\$29,700	\$28,560
2048	2												\$1,840	\$16,020	\$13,050	\$30,910	\$29,720
2049	3												\$1,910	\$16,670	\$13,580	\$32,160	\$30,930
2050	4												\$1,990	\$17,350	\$14,130	\$33,470	\$32,180
2051	5												\$2,070	\$18,060	\$14,710	\$34,840	\$33,500
2052	6												\$2,150	\$18,800	\$15,310	\$36,260	\$34,870
2053	7												\$2,240	\$19,570	\$15,930	\$37,740	\$36,290
2054	8												\$2,330	\$20,370	\$16,580	\$39,280	\$37,770
2055	9												\$2,420	\$21,200	\$17,250	\$40,870	\$39,300
2056	10												\$2,520	\$16,550	\$17,950	\$37,020	\$35,600
2057	11												\$2,620	\$17,220	\$18,680	\$38,520	\$37,040
2058	12												\$2,730	\$17,920	\$19,440	\$40,090	\$38,550
2059	13												\$2,840	\$18,650	\$20,230	\$41,720	\$40,120
2060	14												\$2,960	\$19,410	\$21,050	\$43,420	\$41,750
2061	15												\$3,080	\$20,200	\$21,910	\$45,190	\$43,450
2062	16												\$3,210	\$21,020	\$22,800	\$47,030	\$45,220
2063	17												\$3,340	\$21,880	\$23,730	\$48,950	\$47,070
2064	18												\$3,480	\$22,770	\$24,700	\$50,950	\$48,990
2065	19												\$3,620	\$23,700	\$25,710	\$53,030	\$50,990
2066	20												\$3,770	\$24,660	\$26,760	\$55,190	\$53,070
2067	21												\$3,920	\$25,660	\$27,850	\$57,430	\$55,220
2068	22												\$4,080	\$26,700	\$28,980	\$59,760	\$57,470
2069	23												\$4,250	\$27,790	\$30,160	\$62,200	\$59,810
2070	24												\$4,420	\$28,920	\$31,390	\$64,730	\$62,240
TOTAL PLANNED CLOSURE AND POST-CLOSURE COSTS IN 2015 DOLLARS															\$1,720,320		

Notes:
1. Based on assumed 25-year contaminating life period, commencing after site closure.
2. Based on continuation of the current monitoring program for 10 years after site closure and a 25% reduction in costs from 10 to 25 years.
3. Inflation is assumed to be constant at an annual rate of 4.07%
4. Interest is assumed to be constant at an annual rate of 3.84%



Table 5 Bissett Creek Waste Disposal Site
Table 5a: Closure and Post Closure Activities and Costs

Activity Number	Closure and Long Term Maintenance Activity	Payment Period	Estimated Cost
1	Clean-up: litter, debris on and around site	One-time payment	\$500
2	Security Fence and Gate Installation	One-time payment	\$0
3	Repair of leachate seeps	One-time payment	\$0
4	Site Preparation and Rough Grading	One-time payment	\$3,600
5	Final Cover Material & Compaction	One-time payment	\$62,900
6	Topsoil	One-time payment	\$35,400
7	Vegetation	One-time payment	\$11,100
8	Surface Water Controls	One-time payment	\$0
9	Monitoring Well Repair	One-time payment	\$8,250
10	Project Engineering	One-time payment	\$4,800
11	On-going Maintenance and Inspection of Closed Site ¹	Annual payment	\$500
12	On-going Monitoring of Closed Site ²	Annual payment	\$4,300
13	On-going Reporting of Closed Site ²	Annual payment	\$3,500
	Landfill Area	hectares	0.6
	Area to be Closed	hectares	0.6
	Final Cover Material Depth	metres	0.6
	Topsoil Depth	metres	0.15
	Clearing and Grubbing	\$/ha	\$7,250
	Rough Grading	\$/ha	\$5,190
	Cover Material Unit Cost	\$/cubic metre	\$15.18
	Topsoil Unit Cost	\$/square metre	\$3.93
	Vegetation Unit Cost	\$/square metre	\$1.85
	Drainage Ditch (600 mm deep)	\$/linear metre	\$16.35
	Monitoring Well Repair	One-time payment	\$750
	Project Engineering	\$/ha	\$8,000
	Contingency Costs	One-time payment	15%
	Inflation Rate (Projected) ³	percentage	4.07%
	Interest (discount) Rate ⁴	percentage	3.84%



Table 5 Bissett Creek Waste Disposal Site
Table 5b: Planned Closure and Post Closure Costs

PLANNED CLOSURE AND POST-CLOSURE ITEMS (Estimated cost in 2015 dollars)															TOTAL ANNUAL PLANNED CLOSURE AND POST-CLOSURE COSTS		
ITEM:	1	2	3	4	5	6	7	8	9	10	Contingency	11	12	13	TOTAL EXPENSES (Row Sum)	PRESENT VALUE OF TOTAL EXPENSES	
YEAR	1	2	3	4	5	6	7	8	9	10	Contingency	11	12	13			CURRENT \$'s
One-time Payment	\$500	\$0	\$0	\$3,600	\$62,900	\$35,400	\$11,100	\$0	\$8,250	\$4,800	15%						
Annual Payments												\$500	\$4,300	\$3,500			
ANTICIPATED PAYMENT SCHEDULE (Amounts in current dollars)																	
2015	19	\$500	\$0	\$0	\$3,600	\$62,900	\$35,400	\$11,100	\$0	\$8,250	\$4,800	\$19,000	\$500	\$4,300	\$3,500	\$145,550	\$145,550
2016	18	\$520	\$0	\$0	\$3,750	\$65,460	\$36,840	\$11,550	\$0	\$8,590	\$5,000	\$19,800	\$520	\$4,480	\$3,640		
2017	17	\$540	\$0	\$0	\$3,900	\$68,120	\$38,340	\$12,020	\$0	\$8,940	\$5,200	\$20,600	\$540	\$4,660	\$3,790		
2018	16	\$560	\$0	\$0	\$4,060	\$70,890	\$39,900	\$12,510	\$0	\$9,300	\$5,410	\$21,400	\$560	\$4,850	\$3,940		
2019	15	\$580	\$0	\$0	\$4,230	\$73,780	\$41,520	\$13,020	\$0	\$9,680	\$5,630	\$22,300	\$580	\$5,050	\$4,100		
2020	14	\$600	\$0	\$0	\$4,400	\$76,780	\$43,210	\$13,550	\$0	\$10,070	\$5,860	\$23,200	\$600	\$5,260	\$4,270		
2021	13	\$620	\$0	\$0	\$4,580	\$79,900	\$44,970	\$14,100	\$0	\$10,480	\$6,100	\$24,100	\$620	\$5,470	\$4,440		
2022	12	\$650	\$0	\$0	\$4,770	\$83,150	\$46,800	\$14,670	\$0	\$10,910	\$6,350	\$25,100	\$650	\$5,690	\$4,620		
2023	11	\$680	\$0	\$0	\$4,960	\$86,530	\$48,700	\$15,270	\$0	\$11,350	\$6,610	\$26,100	\$680	\$5,920	\$4,810		
2024	10	\$710	\$0	\$0	\$5,160	\$90,050	\$50,680	\$15,890	\$0	\$11,810	\$6,880	\$27,200	\$710	\$6,160	\$5,010		
2025	9	\$740	\$0	\$0	\$5,370	\$93,720	\$52,740	\$16,540	\$0	\$12,290	\$7,160	\$28,300	\$740	\$6,410	\$5,210		
2026	8	\$770	\$0	\$0	\$5,590	\$97,530	\$54,890	\$17,210	\$0	\$12,790	\$7,450	\$29,400	\$770	\$6,670	\$5,420		
2027	7	\$800	\$0	\$0	\$5,820	\$101,500	\$57,120	\$17,910	\$0	\$13,310	\$7,750	\$30,600	\$800	\$6,940	\$5,640		
2028	6	\$830	\$0	\$0	\$6,060	\$105,630	\$59,440	\$18,640	\$0	\$13,850	\$8,070	\$31,900	\$830	\$7,220	\$5,870		
2029	5	\$860	\$0	\$0	\$6,310	\$109,930	\$61,860	\$19,400	\$0	\$14,410	\$8,400	\$33,200	\$860	\$7,510	\$6,110		
2030	4	\$900	\$0	\$0	\$6,570	\$114,400	\$64,380	\$20,190	\$0	\$15,000	\$8,740	\$34,500	\$900	\$7,820	\$6,360		
2031	3	\$940	\$0	\$0	\$6,840	\$119,060	\$67,000	\$21,010	\$0	\$15,610	\$9,100	\$35,900	\$940	\$8,140	\$6,620		
2032	2	\$980	\$0	\$0	\$7,120	\$123,910	\$69,730	\$21,870	\$0	\$16,250	\$9,470	\$37,400	\$980	\$8,470	\$6,890		
2033	1	\$1,020	\$0	\$0	\$7,410	\$128,950	\$72,570	\$22,760	\$0	\$16,910	\$9,860	\$38,900	\$1,020	\$8,810	\$7,170		
2034	0	\$1,060	\$0	\$0	\$7,710	\$134,200	\$75,520	\$23,690	\$0	\$17,600	\$10,260	\$40,500	\$1,060	\$9,170	\$7,460	\$310,540	\$298,620
2035	1												\$1,100	\$9,540	\$7,760	\$18,400	\$17,690
2036	2												\$1,140	\$9,930	\$8,080	\$19,150	\$18,410
2037	3												\$1,190	\$10,330	\$8,410	\$19,930	\$19,160
2038	4												\$1,240	\$10,750	\$8,750	\$20,740	\$19,940
2039	5												\$1,290	\$11,190	\$9,110	\$21,590	\$20,760
2040	6												\$1,340	\$11,650	\$9,480	\$22,470	\$21,610
2041	7												\$1,390	\$12,120	\$9,870	\$23,380	\$22,480
2042	8												\$1,450	\$12,610	\$10,270	\$24,330	\$23,400
2043	9												\$1,510	\$13,120	\$10,690	\$25,320	\$24,350
2044	10												\$1,570	\$10,240	\$11,130	\$22,940	\$22,060
2045	11												\$1,630	\$10,660	\$11,580	\$23,870	\$22,950
2046	12												\$1,700	\$11,090	\$12,050	\$24,840	\$23,890
2047	13												\$1,770	\$11,540	\$12,540	\$25,850	\$24,860
2048	14												\$1,840	\$12,010	\$13,050	\$26,900	\$25,870
2049	15												\$1,910	\$12,500	\$13,580	\$27,990	\$26,920
2050	16												\$1,990	\$13,010	\$14,130	\$29,130	\$28,010
2051	17												\$2,070	\$13,540	\$14,710	\$30,320	\$29,160
2052	18												\$2,150	\$14,090	\$15,310	\$31,550	\$30,340
2053	19												\$2,240	\$14,660	\$15,930	\$32,830	\$31,570
2054	20												\$2,330	\$15,260	\$16,580	\$34,170	\$32,860
2055	21												\$2,420	\$15,880	\$17,250	\$35,550	\$34,180
2056	22												\$2,520	\$16,530	\$17,950	\$37,000	\$35,580
2057	23												\$2,620	\$17,200	\$18,680	\$38,500	\$37,020
2058	24												\$2,730	\$17,900	\$19,440	\$40,070	\$38,530
TOTAL PLANNED CLOSURE AND POST-CLOSURE COSTS IN 2015 DOLLARS															\$930,220		

Notes:
1. Based on assumed 25-year contaminating life period, commencing after site closure.
2. Based on continuation of the current monitoring program for 10 years after site closure and a 25% reduction in costs from 10 to 25 years.
3. Inflation is assumed to be constant at an annual rate of 4.07%
4. Interest is assumed to be constant at an annual rate of 3.84%



Table 6 Deux Rivieres Waste Disposal Site
Table 6a: Closure and Post Closure Activities and Costs

Activity Number	Closure and Long Term Maintenance Activity	Payment Period	Estimated Cost
1	Clean-up: litter, debris on and around site	One-time payment	\$0
2	Security Fence and Gate Installation	One-time payment	\$0
3	Repair of leachate seeps	One-time payment	\$0
4	Site Preparation and Rough Grading	One-time payment	\$0
5	Final Cover Material & Compaction	One-time payment	\$0
6	Topsoil	One-time payment	\$0
7	Vegetation	One-time payment	\$0
8	Surface Water Controls	One-time payment	\$0
9	Monitoring Well Repair	One-time payment	\$0
10	Project Engineering	One-time payment	\$0
11	On-going Maintenance and Inspection of Closed Site ¹	Annual payment	\$500
12	On-going Monitoring of Closed Site ²	Annual payment	\$1,600
13	On-going Reporting of Closed Site ²	Annual payment	\$2,000
	Landfill Area	hectares	0.44
	Area to be Closed	hectares	0.44
	Final Cover Material Depth	metres	0.6
	Topsoil Depth	metres	0.15
	Clearing and Grubbing	\$/ha	\$7,250
	Rough Grading	\$/ha	\$5,190
	Cover Material Unit Cost	\$/cubic metre	\$15.18
	Topsoil Unit Cost	\$/square metre	\$3.93
	Vegetation Unit Cost	\$/square metre	\$1.85
	Drainage Ditch (600 mm deep)	\$/linear metre	\$16.35
	Monitoring Well Repair	One-time payment	\$750
	Project Engineering	\$/ha	\$8,000
	Contingency Costs	One-time payment	15%
	Inflation Rate (Projected) ³	percentage	4.07%
	Interest (discount) Rate ⁴	percentage	3.84%



Table 6 Deux Rivieres Waste Disposal Site
Table 6b: Planned Closure and Post Closure Costs

PLANNED CLOSURE AND POST-CLOSURE ITEMS (Estimated cost in 2015 dollars)														TOTAL ANNUAL PLANNED CLOSURE AND POST- CLOSURE COSTS		
ITEM:	1	2	3	4	5	6	7	8	9	10	Contingency	11	12	13	TOTAL EXPENSES (Row Sum)	PRESENT VALUE OF TOTAL EXPENSES
One-time Payment	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	15%					
Annual Payments												\$500	\$1,600	\$2,000		
ANTICIPATED PAYMENT SCHEDULE (Amounts in current dollars)																
ITEM: YEAR	1	2	3	4	5	6	7	8	9	10	Contingency	11	12	13		
2015 8												\$500	\$1,600	\$2,000	\$4,100	\$3,940
2016 9												\$520	\$1,670	\$2,080	\$4,270	\$4,110
2017 10												\$540	\$1,300	\$2,160	\$4,000	\$3,850
2018 11												\$560	\$1,350	\$2,250	\$4,160	\$4,000
2019 12												\$580	\$1,400	\$2,340	\$4,320	\$4,150
2020 13												\$600	\$1,460	\$2,440	\$4,500	\$4,330
2021 14												\$620	\$1,520	\$2,540	\$4,680	\$4,500
2022 15												\$650	\$1,580	\$2,640	\$4,870	\$4,680
2023 16												\$680	\$1,640	\$2,750	\$5,070	\$4,880
2024 17												\$710	\$1,710	\$2,860	\$5,280	\$5,080
2025 18												\$740	\$1,780	\$2,980	\$5,500	\$5,290
2026 19												\$770	\$1,850	\$3,100	\$5,720	\$5,500
2027 20												\$800	\$1,930	\$3,230	\$5,960	\$5,730
2028 21												\$830	\$2,010	\$3,360	\$6,200	\$5,960
2029 22												\$860	\$2,090	\$3,500	\$6,450	\$6,200
2030 23												\$900	\$2,180	\$3,640	\$6,720	\$6,460
2031 24												\$940	\$2,270	\$3,790	\$7,000	\$6,730
2032 25												\$980	\$2,360	\$3,940	\$7,280	\$7,000
TOTAL PLANNED CLOSURE AND POST-CLOSURE COSTS IN 2015 DOLLARS																\$92,390

- Notes:
1. Based on assumed 25-year contaminating life period, commencing after site closure.
 2. Based on continuation of the current monitoring program for 10 years after site closure and a 25% reduction in costs from 10 to 25 years.
 3. Inflation is assumed to be constant at an annual rate of 4.07%
 4. Interest is assumed to be constant at an annual rate of 3.84%