CVWMC Landfill Expansion Strategy

Comox Strathcona Waste Management

Presented to the CVRD Board by Tetra Tech EBA Inc.

February 13, 2014

RETHINK REDUCE REUSE RECYCLE

PURPOSE

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- Present Lateral, Subsurface and Budgetary Constraints
- Present Landfill Expansion Strategy
- Discuss Options for Landfill Height and Depth
- Discuss Impact of Organics Diversion on Landfill Life
- Present Preliminary Schedule for Obtaining the Amended OC

Lateral Constraints

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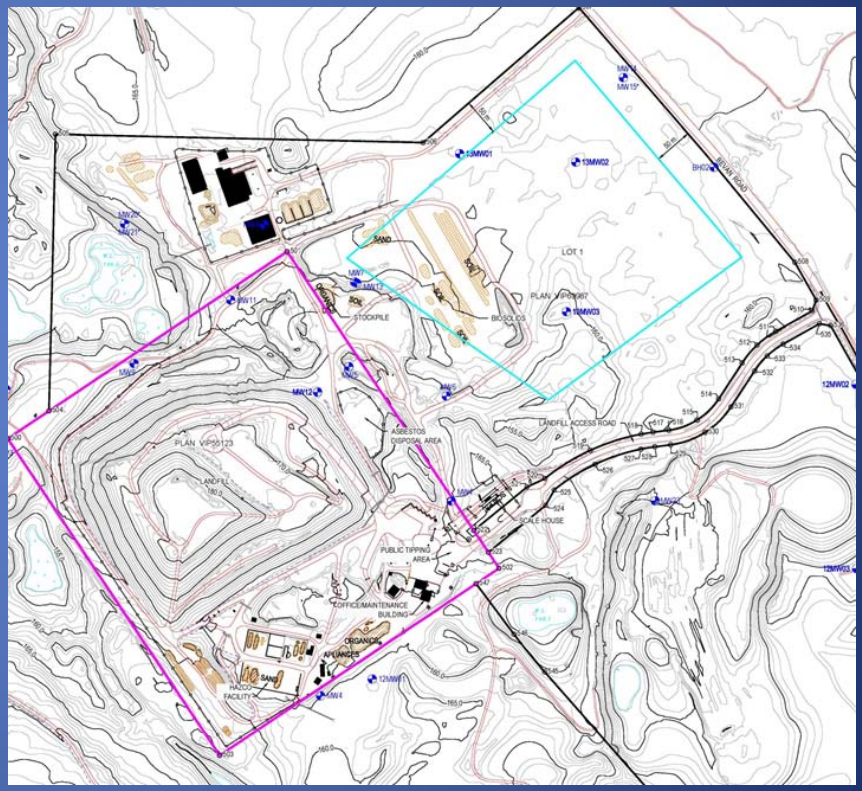
Lateral constraints include:

- The proposed surface water pond to the southeast.
- Required buffers of 50 m and 15 m.
- The static stability assessment showed that 3H:1V below-ground side slopes are stable
- The static stability assessment for the existing landfill showed that 3H:1V above-ground side slopes are stable once a suitably designed cover was placed.
- 110 m set back from the fault.
- Maintain height of the existing landfill (waste elevation = 185 masl).



Subsurface Constraints

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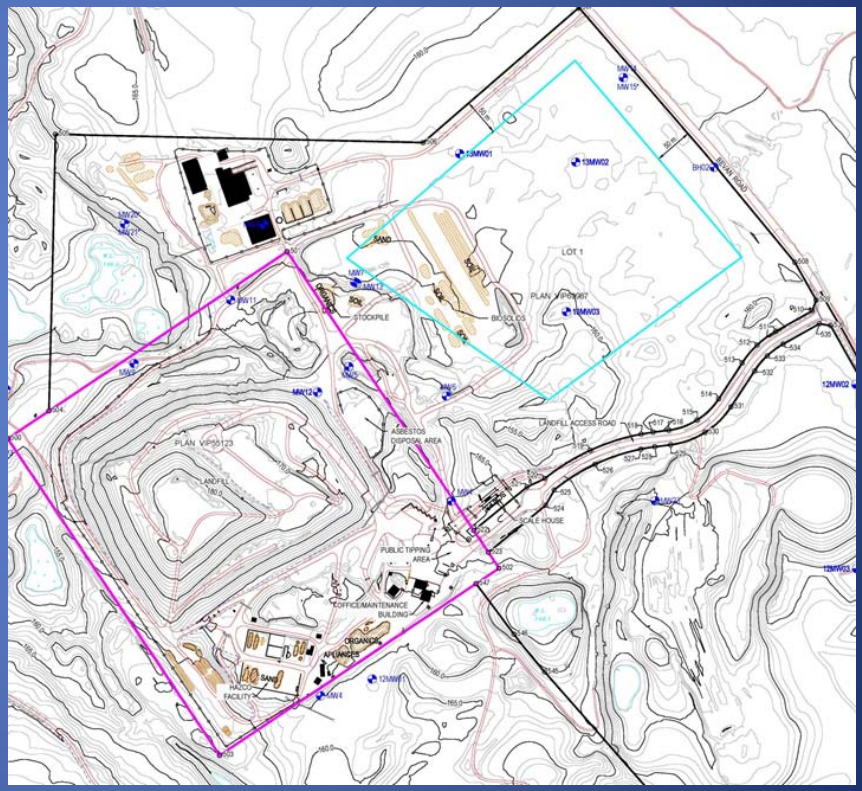
Subsurface constraints include:

- Groundwater elevation varies from 143 masl (south) to 137 masl (north).
- The stability assessment determined a landfill depth of 6 m acceptable.
- Minimum bottom slopes of the liner are to be 2% on controlled slopes and 0.5% on remaining slopes.
- Topography is generally higher in the north. Sloping the bottom of the landfill to the southeast will lead to less excavation.



Budgetary Constraints

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- CVRD budget of 13 million for construction in 2017 including leachate treatment and LFG infrastructure (Class D estimate).
- Tetra Tech prepared a preliminary cost estimate. The cost to construct the entire landfill was estimated at over 20 million (Class C estimate).
- Based on the budget and Tetra Tech's preliminary cost estimate it was recommended the landfill be developed in 3 cells.

Expansion Footprint and Cell Layout

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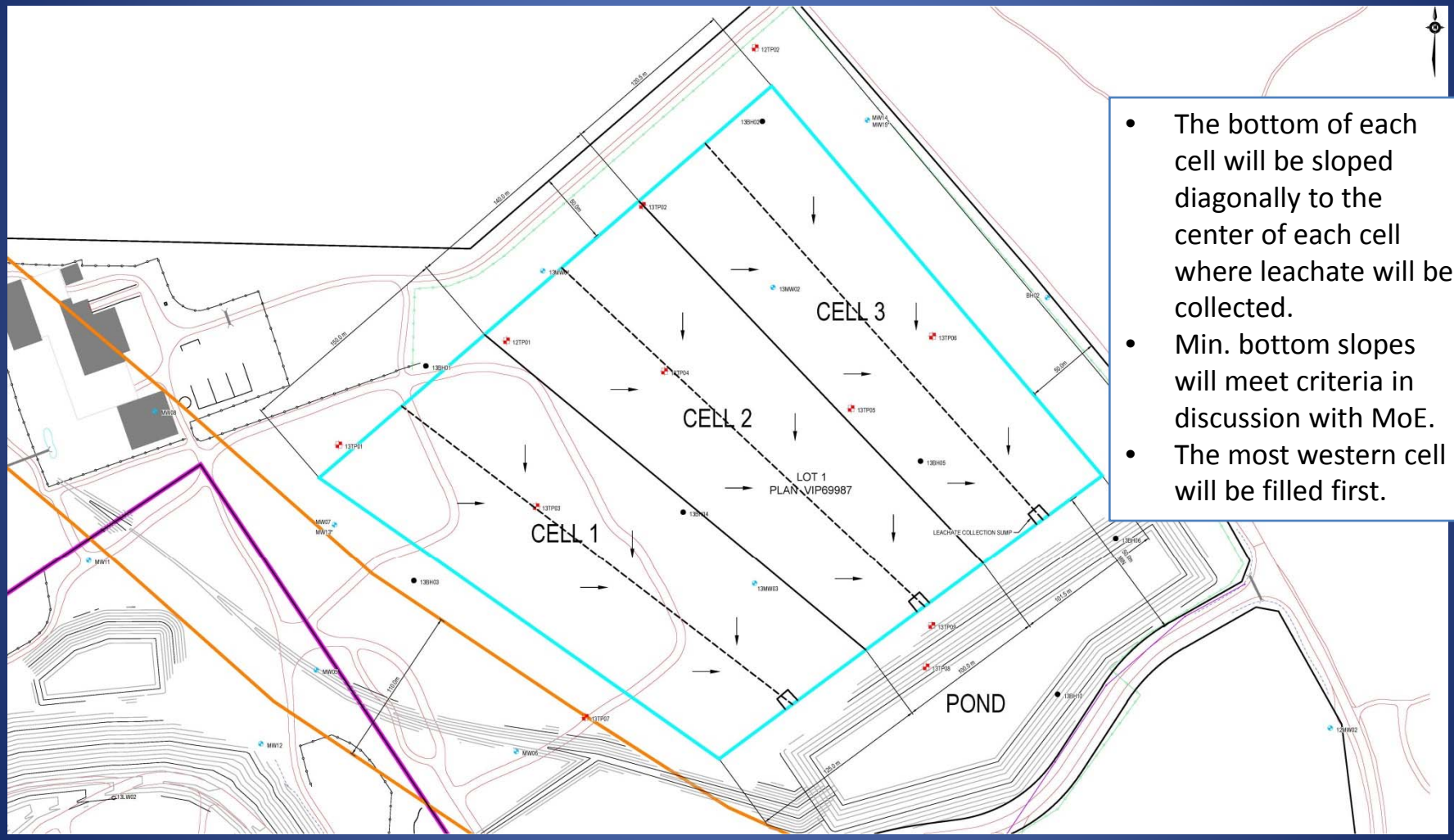

- The bottom of each cell will be sloped diagonally to the center of each cell where leachate will be collected.
- Min. bottom slopes will meet criteria in discussion with MoE.
- The most western cell will be filled first.

Final Topography Plan

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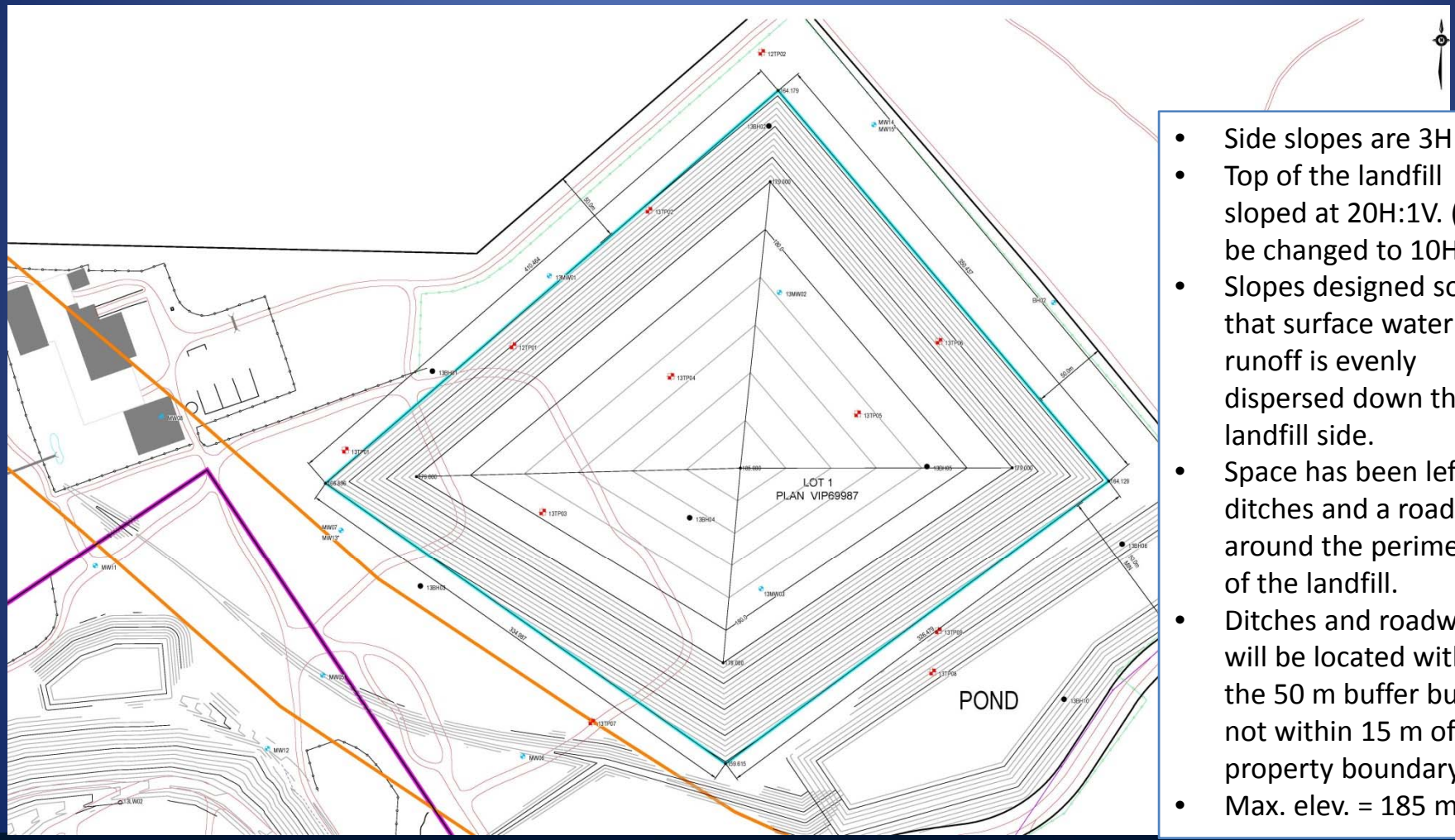

- Side slopes are 3H:1V
- Top of the landfill sloped at 20H:1V. (may be changed to 10H:1V)
- Slopes designed so that surface water runoff is evenly dispersed down the landfill side.
- Space has been left for ditches and a roadway around the perimeter of the landfill.
- Ditches and roadways will be located within the 50 m buffer but not within 15 m of the property boundary.
- Max. elev. = 185 masl.

Phase by Phase Filling Plan

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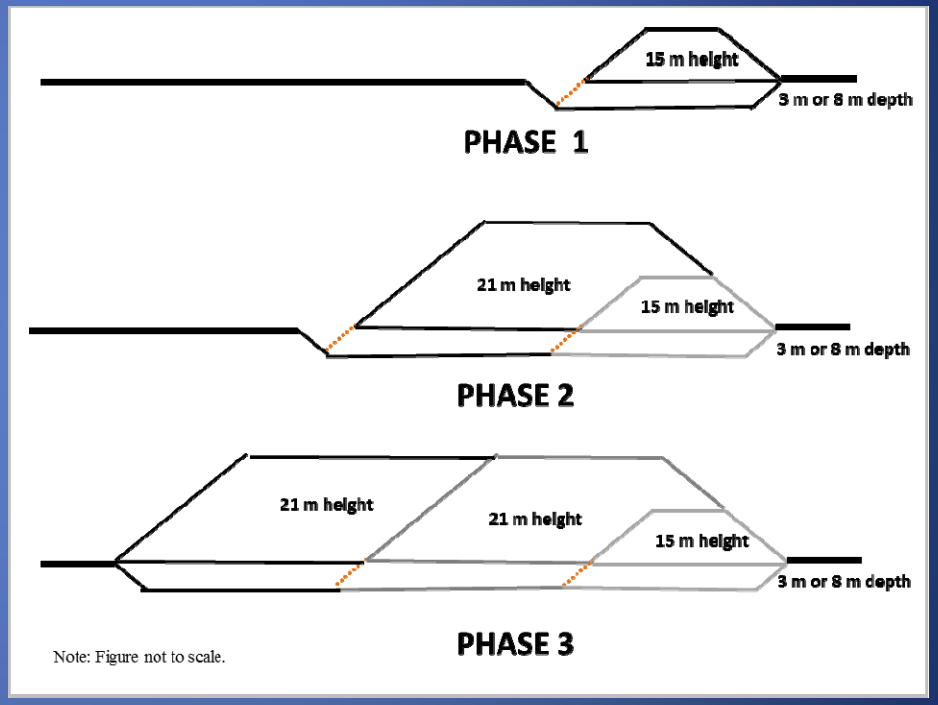
- **Phase 1:** Fill Cell 1 (west cell) to bring waste up to 179 masl (approx. 15 m above ground). Place intermediate cover.
- **Phase 2:** Fill Cell 2 (middle cell) to bring waste above Cell 1 and 2 to final elevation (185 masl). Place final cover on completed sections during Phase 3.
- **Phase 3:** Filling of Cell 3 (west cell) complete liner system to bring all waste to final elevations. Once filling is complete at Cell 3 the final cover can be placed on the remainder of the landfill.



Average Waste Depth of 3 m vs. 8 m

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THREE CELL SCENARIO

A1. WASTE DEPTH 3 M

							ESTIMATED COST			
Phases	**Ave. Wd. (m)**	**Excavation (m^3)**	**Height (m)**	**Air Space (m^3)**	**Life (yr)**	**Cum Air Space (m^3)**	**2013 Rate**	**Future Rate**	**Future Year**	**$ Per m^3**
Phase 1	130	169,600	15	545,100	5	545,100	$12,418,000	$13,977,000	2017	$25.64
Phase 2	120	139,800	21	870,500	7	1,415,600	$6,010,000	$6,967,000	2,022	$8.00
Phase 3	112.5	106,100	21	761,500	5	2,177,100	$5,350,000	$7,628,000	2,029	$10.02
TOTAL		**415,500**		**2,177,100**	**17**		**$23,778,000**	**$28,572,000**	**2034**	**$13.12**

A2. WASTE DEPTH 8 M

Phases	**Ave. Wd. (m)**	**Excavation (m^3)**	**Height (m)**	**Air Space (m^3)**	**Life (yr)**	**Cum Air Space (m^3)**	**2013 Rate**	**Future Rate**	**Future Year**	**$ Per m^3**
Phase 1	130	434,100	15	756,400	7	756,400	$15,625,000	$17,586,000	2017	$23.25
Phase 2	120	324,800	21	1,056,300	8	1,812,700	$7,918,000	$9,738,000	2024	$9.22
Phase 3	112.5	165,700	21	883,200	6	2,695,900	$5,928,000	$9,236,000	2032	$10.46
TOTAL		**924,600**		**2,695,900**	**21**		**$29,471,000**	**$36,560,000**	**2038**	**$13.56**

Assumptions: Final footprint size : Length (410 and 326 m), Width (335 and 350 m)

Side Slope	H3: V1		Waste Density	0.65	t/m3
Extra Excavation for liner	0.5	m	Waste to Soil Ratio	3.5	
Three layer HDPE protection			Diversion	0%	
Average height above GL	21	m	Waste Generation Rates (2017)	55,000	t/yr
			Annual growth rate	1.80%	
Contingency	30%		Construction/operation year of first cell	2017	
Engineering Cost	10%				
CQA	10%				
Annual Inflation Rate	3%				

Note ***The airspace and excavation volume may vary subjected to final design***

Soil Budget

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Based on the max elevation of 185 masl and 3 m waste depth :

- Cut volume from landfill excavation = 415,000 m^3
- Fill volume for perimeter berm construction = 29,000 m^3
- Fill volume for daily and intermediate cover requirements = 484,000 m^{3*}
- Resulting in a deficit of approx. **98,000 m^3** available for other construction requirements such as the perimeter road and final cover.

Based on the max elevation of 185 masl and 8 m waste depth :

- Cut volume from landfill excavation = 925,000 m^3
- Fill volume for perimeter berm construction = 29,000 m^3
- Fill volume for daily and intermediate cover requirements = 660,000 m^{3*}
- Resulting in a surplus of approx. **236,000 m^3** available for other construction requirements such as the perimeter road and final cover.

*Assumes a waste to soil ratio of 3.5:1

8 m Depth Recommended

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Tetra Tech recommends an average 8 m waste depth because:

- The landfill will hold an additional 4 years of waste and will better utilize the CVRD's land.
- Using a tipping fee of 90 $/t, the CVRD will collect approx. **23 million** dollars in additional tipping fees.
- Constructing the landfill to 8 m instead of 3 m will cost approximately **6 million** dollars more.
- Additional operating costs are expected at 8 m depth such as general costs for additional access ramp maintenance and extra leachate pumping.
- Additional cost associated with these operational issues is expected to be significantly lower than the revenue generated through additional tipping fees.

Waste Height

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- Currently designed to 185 masl (current landfill waste elev.).
- Height could also be determined by stability or other constraints.
- Stability relies mainly on the slope angle and not the height. Landfill height will likely be determined by other constraints. Slope stability will be confirmed during detailed design.
- Min. width of 50 m at landfill top, height = 46 m (210 masl).
- At this height additional operational issues would arise such as:
  - wind, noise, odour;
  - aesthetics - view from road; and
  - additional effort for waste placement, additional access road distance and maintenance.

Airspace vs. Height

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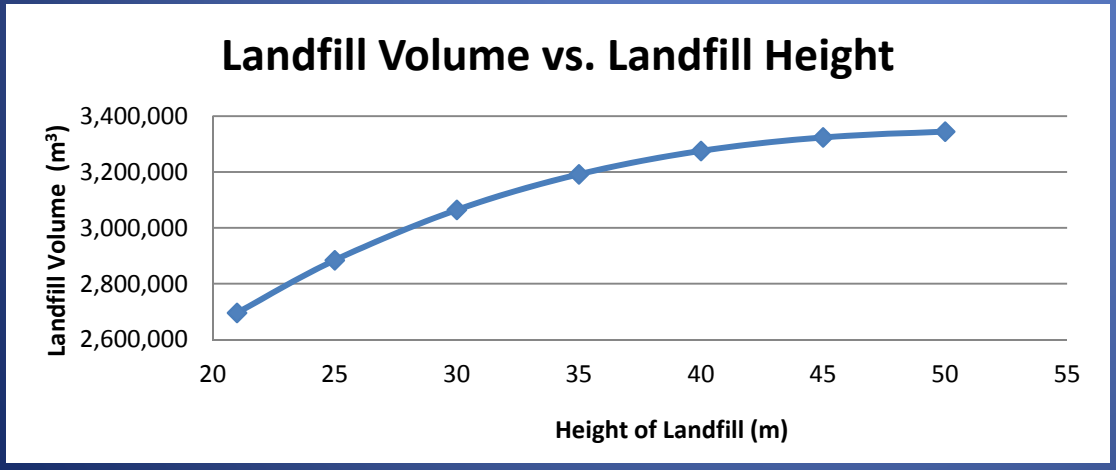
Landfill Volume vs. Landfill Height						
Height (m)	Max Elevation (masl)	Volume (m3)	Min Width (m)	Volume Gained (m^3)	Landfill Life (yrs)	Life Gained (yrs)
21	185	2,695,913	200	NA	20.7	NA
25	189	2,884,146	176	188,234	21.8	1.1
30	194	3,064,469	146	180,323	22.9	1.1
35	199	3,192,042	116	127,573	23.8	0.85
40	204	3,275,711	86	83,668	24.3	0.5
45	209	3,324,096	56	48,385	24.4	0.17
50	214	3,344,968	26	20,873	24.4	0

Calculations based on:

- 8 m deep landfill (assuming flat bottom elevation)
- 55000 t/yr first year with annual growth rate of 1.8 %.
- 3.5:1 waste to soil ratio.
- Waste density of 0.65 t/m^3
- 3:1 side slopes with simplified flat top



Landfill Life w/o Organics Diversion

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Landfill Depth	With Diversion (55,000 t/yr)	Without Diversion (62,000 t/yr)	Difference (yrs)
3 m	17.2 years	15.5 years	1.7
8 m	20.7 years	18.7 years	2.0

The table above shows the effect of the food scrap composting program mentioned in the Solid Waste Management Plan.

Calculations based on:

- Initial annual tonnage of 62,000 without diversion and 55,000 with diversion.
- Growth rate of 1.8 % annually.
- 3.5:1 waste to soil ratio.
- Waste density of 0.65 t/m^3.
- Landfill height of 21 m (185 masl), 3:1 side slopes
- Simplified bottom and top of landfill design (assumed flat).

Schedule to Obtain Amended OC

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Task	Completion Date
Letter of Intent	February 18, 2014
Completed Application for Amendment to the OC	February 18, 2014
Public Consultations with First Nations on Leachate	February 25, 2014
Complete Updated Design, Operations and Closure Plan	**March 13, 2013**
CVRD Review and Approval of Submission	March 21, 2013
Submit Application and Supporting Documents to MoE	**April 4, 2014**
MoE Feedback	June 6, 2014
Address MoE Concerns	June 20, 2014
MoE Notice for Public Input and Address Comments	July 11, 2014
MoE Issue a Draft of Amended OC to CVRD	**July 25, 2014**
Feedback from CVRD to MoE	August 1, 2014
MoE Issue the Amended OC	**August 15, 2014**

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Questions?