

APPENDIX H

Stormwater Ditch Calculation Sheet

Memo



To: James Walker
From: Fabiano Gondim – Golder Associates Ltd.
Date: March 6, 2020
Subject: Ridge Landfill Expansion Ditch Sizing Calculations
Our File: 19-1859

As requested, please find attached a summary of the ditch sizing calculations for the Ridge Landfill Expansion Area. The calculations were carried out based on the ditch profile information provided by Golder (Drawings Issued for Design and Operations Report and Approval, March 2020).

Design flow information for the ditch sizing calculations was obtained from the HEC-HMS hydrologic model that was developed for the Ridge Landfill Expansion. Additional information regarding the hydrologic analysis is provided in the Stormwater Management Design Brief for the Ridge Landfill Expansion prepared by Dillon (March, 2020).

Ridge Landfill Expansion
Ditch Sizing Calculations

Catchment Area Information			Ditch Characteristics			25 Year (Design Flow)							100 Year (Check Flow)							
Location	Outlet	Area (ha)	Manning's Roughness n	Slope (m/m)	Side Slopes (X:1)	Q (m ³ /s)	Qn/sqrt(S)	Depth (m)	Bottom Width (m)	Check (A ^{5/3} /P ^{2/3})	Area (m ²)	Velocity (m/s)	Q (m ³ /s)	Qn/sqrt(S)	Depth (m)	Bottom Width (m)	Check (A ^{5/3} /P ^{2/3})	Area (m ²)	Velocity (m/s)	
Expansion Area A																				
Ditch A1	Pond 7	26.0	0.035	0.0020	3	2.20	1.72	0.76	1.50	1.72	2.90	0.76	2.40	1.88	0.80	1.50	1.88	3.09	0.78	
Ditch A2	Pond 7	12.0	0.035	0.0022	3	1.20	0.90	0.56	1.50	0.90	1.79	0.67	1.30	0.97	0.59	1.50	0.97	1.90	0.68	
Ditch A3	Pond 4	34.5	0.035	0.0033	3	2.70	1.65	0.75	1.50	1.65	2.81	0.96	3.00	1.83	0.79	1.50	1.83	3.04	0.99	
Expansion Area B																				
Ditch B1	Pond 6	16.2	0.035	0.0046	3	1.60	0.83	0.80	0.00	0.83	1.90	0.84	1.80	0.93	0.83	0.00	0.93	2.06	0.88	
Ditch B2	Pond 6	8.8	0.035	0.0050	3	0.90	0.45	0.64	0.00	0.45	1.23	0.73	1.00	0.49	0.66	0.00	0.49	1.31	0.77	
Ditch B3	Pond 7	8.4	0.035	0.0300	3	1.00	0.20	0.48	0.00	0.20	0.69	1.45	1.10	0.22	0.50	0.00	0.22	0.75	1.47	
Ditch B4	Pond 7	18.5	0.035	0.0020	3	2.10	1.64	0.75	1.50	1.64	2.80	0.75	2.30	1.80	0.78	1.50	1.80	3.00	0.77	

Notes:

1. Landfill perimeter ditch calculations based on profiles provided by Golder (Issued for Design and Operations Report and Approval, March 2020).
2. Design flows estimated through hydrologic modelling using HEC-HMS (refer to Ridge Landfill Expansion Stormwater Management Design Brief, March 2020).
3. Hydraulic calculations performed using Manning's Equation for triangular ditch configuration, as noted below.

Manning Equation: $Q = AR^{2/3} S^{1/2} / n$ where $A =$ cross-sectional area (m²)
 $R =$ hydraulic radius (m) = $\frac{A}{P}$
 Re-organized to: $Qn/S^{1/2} = A^{5/3} / P^{2/3}$ $P =$ wetted perimeter (m)
 $S =$ slope (m/m)
 $n =$ Manning's roughness coefficient