REPORT

Stormwater Management System Design Report

Capital Region Resource Recovery Centre

Submitted to:

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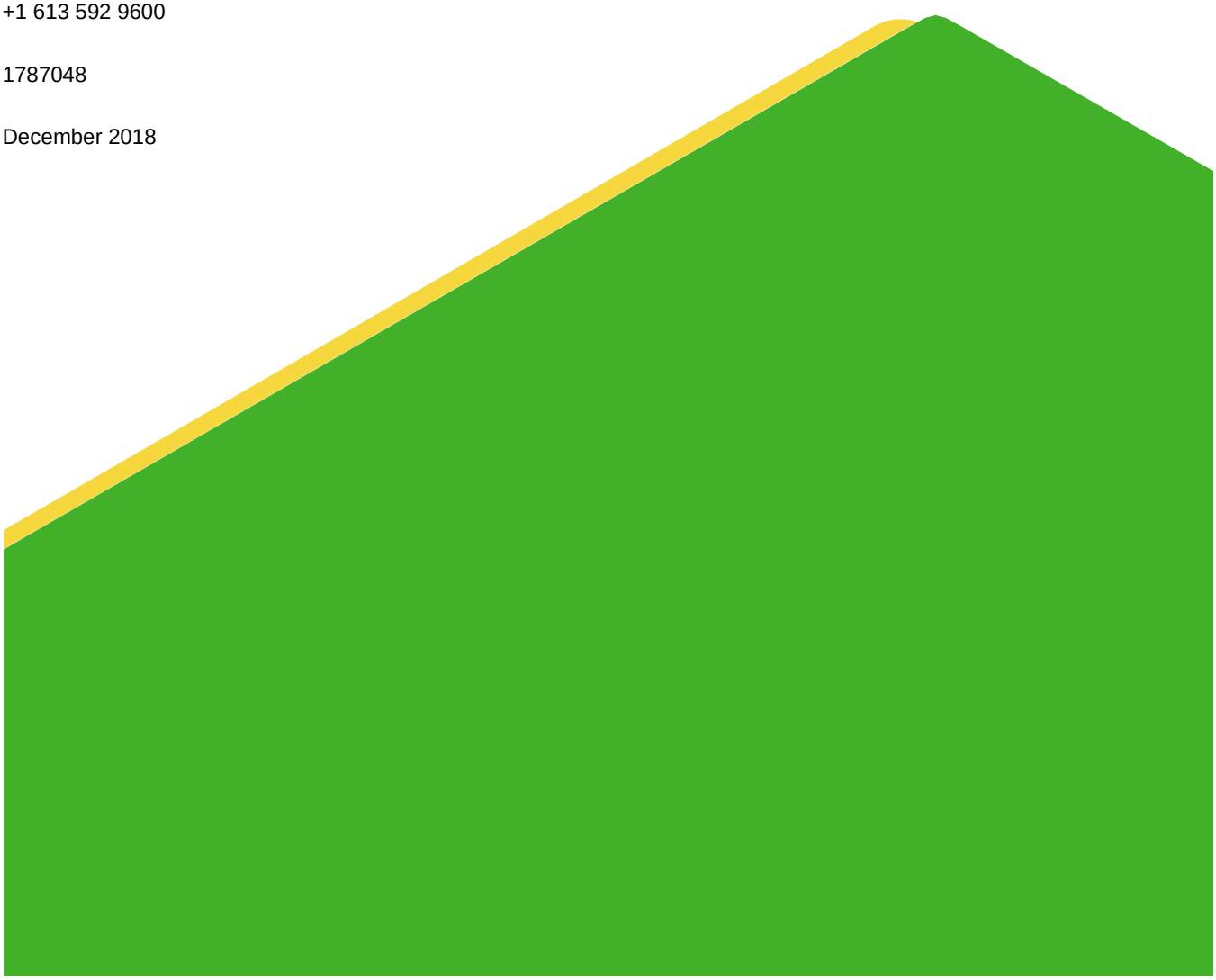

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1.0 INTRODUCTION

A new integrated waste management facility, the Capital Region Resource Recovery Centre (CRRRC), is proposed for the Capital Region of eastern Ontario. The CRRRC will provide facilities and capacity for the recovery of resources and diversion of materials from wastes that are generated by Industrial, Commercial and Institutional (IC&I) and Construction and Demolition (C&D) sectors in Ottawa and eastern Ontario. It will also provide landfill disposal capacity on the same Site for post-diversion residuals and materials that are not diverted. This report includes updated analysis taking into consideration changes to the landfill cover design to include an impervious membrane. The report also reflects changes to the Site Plan.

This report has been prepared to describe the proposed drainage and stormwater management for the development of the CRRRC in support of the Site Plan Application to the City of Ottawa. This report should be read in conjunction with the engineering drawings enclosed.

1.1 Background

The proposed CRRRC Site (the Site) is located in the east part of the City of Ottawa just southeast of the Highway 417/ Boundary Road interchange. The property is located on the east side of Boundary Road, north of Devine Road and west of Frontier Road, and east of an existing industrial park, on Lots 22 to 25, Concession XI, the former Township of Cumberland.

The Site, totalling approximately 192 hectares (ha), is located in the Bear Brook Subwatershed in the Lower Ottawa – South Nation Watershed. The area surrounding the Site primarily consists of rural and agricultural land, an industrial park, residential properties and open spaces. Figure 1 shows the Site and surrounding area. The Site is generally flat, and slopes from local high point elevations at the western side of the Site at Boundary Road, towards the lowest portion of the Site found along the eastern edge at Frontier Road. The Mer Bleue bog is about 3.7 km to the north/northwest of the Site.

The property is adjacent to an existing Industrial Park with few existing immediate neighbours. It is underlain by a surficial silty sand layer followed by a thick deposit of silty clay soil.

2.0 ASSESSMENT OF EXISTING SURFACE WATER CONDITIONS

Hydrologic Model

A hydrological model was used to calculate surface water runoff and peak flows in the area of the proposed CRRRC under existing conditions, using design storms with return periods from 2 through 100 year as set out in *Ontario Regulation* (O.Reg.) 232/98 (MOE, 1998). To assist with the assessment and designs, Golder prepared a SWM model for the Site using the U.S. Environmental Protection Agency Stormwater Management Model Version 5.0.02 (‘SWMM5’) software program (US-EPA, 2008). The SWMM5 software was used to estimate the hydrologic pre-development conditions for the Site’s sub catchment areas.

SWMM5 is widely used for single event and long-term (continuous) simulation of runoff quantity from urban and non-urban areas. In the runoff component, sub-catchment areas receive precipitation and generate runoff. The routing portion then transports this runoff through a system of pipes, channels and storage reservoirs that are user defined. SWMM5 tracks the quantity of runoff generated within each sub-catchment, and the flow rate and flow depth of water in each pipe and channel during a simulation period comprised of multiple time steps.

Drainage

A small portion of the northern section of the Site is currently used for agricultural purposes, but the majority of the Site is heavily vegetated and treed. The Site is known to have generally high groundwater levels, minimal relief and gradual slope of typically less than 1% draining west to east, with elevations ranging from approximately 78 metres to 76 metres above sea level (masl). Soils encountered in the Site area during the subsurface investigation program consisted of topsoil over a layer of silty sand with a thickness of up to approximately 1.5 metres, underlain by an extensive and thick silty clay deposit. Based on these investigations, Site visits performed by the Golder team, aerial photography and available topography, the model hydrologic parameters, including Soil Conservation Service (SCS) Curve Number, depression storage, Manning's coefficient and land use were defined for the pre-development drainage areas. Other user-defined hydrologic parameters applied in the SWMM5 hydrologic model are area, width, slope, and percentage impervious surfaces. All of the hydrologic input parameters for the modeling are summarized in Attachment A.1.

Drainage in the vicinity of the Site is mainly by means of a network of agricultural ditches and three municipal drains. Ditches that cross the Site, some of which are old farm field drainage, have not been maintained. There are roadside ditches along Boundary, Devine and Frontier Roads that eventually all drain eastward. At present, drainage on the Site is not well established and the land is poorly drained. Sub-catchment delineation is challenging due to the poorly drained land and many references, including municipal drainage plans, were used. Ultimately, delineations were based on those previously concluded by Stantec (Stantec, 2000). Delineated pre-development drainage catchments are presented in Figure 1.

The Site is in the headwaters of the Shaw's Creek sub-watershed of approximately 35 km^2, and the Bear Brook watershed of approximately 484 km^2. Bear Brook is a tributary to the South Nation River and the Site is therefore within the South Nation Conservation area. The Site contributes roughly 5% of the land area draining to the Shaw's Creek drainage area.

The Site is divided into three sub-catchment areas with discharge to the eastern boundaries of the Site. The discharge ditches of the three sub-catchments all eventually tie into municipal drains. Summaries for each of these Site drainage areas, including additional descriptions of off-Site downstream routing to Highway 417, are provided below. The SWMM5 schematic illustrating the existing drainage is provided in Attachment A.2.

Regimbald Municipal Drain

The northern Site sub-catchment area primarily drains to two on-Site agricultural ditches. One ditch segment drains northerly from the Site while another drains easterly towards Frontier Road. Both ditch segments eventually become part of the Regimbald Drain, the first about 200 metres north of the northern property limit, while the second at the east side of Frontier Road.

Drainage to the east is conveyed via a 600 millimetre diameter culvert under Frontier Road. Off-Site drainage from this sub-catchment area is then conveyed northeast via a ditch to a 1,000 millimetre diameter culvert under Highway 417, meeting up with the other branch of the Regimbald Drain approximately 800 metres northeast of Highway 417.

The Site drainage to the northern ditch segment appears to be relatively insignificant based on-Site observations. For the purposes of the assessment it has been considered that the east discharge location is the outlet for the northern portion of the Site. The portion of the Site draining to the Regimbald Drain is about 21 ha, or about 11% of the Site.

Simpson Municipal Drain

The Simpson Municipal Drain bisects the Site and drains from west to east. An upstream drainage area drains to the Simpson Drain segment through the Site, extending to the west of Boundary Road, along Mitch Owens Road to Black Creek Road.

The runoff from the central portions of the Site is directed to the Simpson Municipal Drain and is conveyed off-Site and then discharges through a 1,200 mm diameter culvert under Frontier Road. Downstream, the Simpson Drain continues to a culvert under Highway 417 approximately 1 km further east of the Site. Downstream of Highway 417, the Simpson Drain continues as Shaw's Creek, which eventually feeds Bear Brook Creek. The stream flow distance of the Simpson Municipal Drain from the east perimeter Site boundary to Bear Brook Creek is approximately 11 km.

The portion of the Site draining to the Simpson Drain is about 75.6 ha, or about 39% of the Site.

Wilson - Johnston Municipal Drain

The southern portion of the Site is primarily drained by a ditch flowing west to east across the entire width of the Site. This ditch extends west to Boundary Road but only receives runoff from the eastern half of the road allowance as the western portion connects to the Simpson Drain at Mitch Owens Road. This ditch continues to flow east and eventually becomes part of the Wilson-Johnston Municipal Drain downstream of the Site.

Off-Site flows from the Site are routed under Frontier Road, via a 1,000 mm diameter culvert. The ditch then turns south and parallels Frontier Road for about 150 metres before turning back to the east. The Wilson-Johnston Drain crosses under Highway 417 via a culvert about 2.4 km east of the Site.

A second small ditch in the southeast corner of the Site drains east to Frontier Road and crosses under the road via a 600 mm culvert and ties into the main ditch at the location where it turns east.

Some drainage along the southern limits of the Site may drain to the roadside ditch along Devine Road. It doesn't appear that very much runoff follows this route and it is difficult to estimate how much, due to the very flat topography. Since the Devine Road drainage also eventually connects into the Wilson-Johnston Drain, it has been assumed that no runoff from the Site discharges to Devine Road.

The portion of the Site draining to the Wilson-Johnston Drain is about 95.1 ha, or about 50% of the Site.

2.1 Water Quantity

Flow measurements were conducted at the Site during the Environmental Assessment (EA) approval process. The conditions at the time of sampling resulted in very low or no flow conditions in many cases or unreliable information in others. This prevented successful determination of consistent flow quantities. As a result, this data was not used in preparation of the SWM model nor for calibration.

A hydrological model using SWMM5 was used to calculate surface water runoff and peak flows in the area of the proposed CRRRC under existing conditions, using design storms with return periods of 2 through 100 year as set out in O.Reg. 232/98 (MOE, 1998).

Precipitation conditions on-Site are represented by the record from Environment Canada's Ottawa CDA RCS meteorological station. The station is located approximately 20 km northwest of the Site at 45°23'N 75°43'W and an elevation of 79 masl. Rainfall depths for 24-hour storms were extracted from the Ottawa short duration rainfall Intensity-Duration-Frequency (IDF) data. Rainfall depths for 6-hour Historical rainfall storms (August 8, 1996 and August 4, 1988) were also extracted from Environment Canada's Ottawa CDA RCS meteorological station and used as a comparison measure.

The collection, conveyance and detention of runoff through the Site were modelled. The modelling data denotes the extent of knowledge on the quantity of surface runoff water from the Site. The values from the hydrological modelling are presented in Table 1.

Table 1: Estimated Pre-Development Peak Flow Rates

	Peak Flow (L/s)					
	24 Hour Design Storm					
Sub-Catchment Area	1:2 Year	1:5 Year	1:10 Year	1:25 Year	1:50 Year	1:100 Year
Regimbald (Northern)	86	298	375	471	535	556
Simpson (Central)	35	284	406	585	732	899
Wilson-Johnston (Southern)	40	345	495	715	898	1106

The Regimbald sub-catchment experiences the highest peak flows for the 1:2 year event, while the Wilson-Johnston Drain experiences the highest peak flows in all the other design storm events.

3.0 STORMWATER MANAGEMENT DESIGN CRITERIA AND OBJECTIVES

The objectives of the SWM design are to:

1) Control post-development stormwater discharges from the Site to the three Municipal Drain watersheds at or below pre-development rates, for the 1 in 2 year to 1 in 100 year design storm events; and,

2) Minimize sediment loading in runoff leaving the Site during and post-construction, to adhere to the MOECC Guidelines for Enhanced Level of treatment (80% Total Suspended Solids (TSS) removal) or greater (MOE, 2003).

The SWM design criteria for the Site to meet the above objectives are set out in following:

- The City of Ottawa, Stormwater Control Quantity and Surface Water Quality Policies (City of Ottawa, 2009).
- O.Reg. 232/98 for Landfilling Sites (MOE, 1998).
- The Ontario MOECC SWM Pond sizing guidelines for impervious area percentages to achieve TSS removal objectives (MOE, 2003).

Table 2 below summarizes the SWM criteria presented in this design report.

Table 2: Site SWM Design Criteria

Criterion	Description	Target
Peak Runoff Control	1 in 2 year to 1 in 100 year runoff events	Post-development peak flows at/below pre-development
Conveyance Capacity	Internal drainage ditches and culverts	Design Capacity to accommodate 1 in 25 year design storm
	Storm Sewers	Design Capacity to accommodate 1 in 2 year design storm
	Continuous overland flow route	Convey the peak flow from the 1 in 100 year design storm
Stormwater Water Quality	Total Suspended Solids (TSS)	Enhanced level of treatment (80% TSS removal) (MOE, 2003)

4.1 Surface Water Quantity

Since the proposed project has the potential for effects on surface water management, predicted impacts were assessed with consideration of mitigation measures. Several mitigation measures are incorporated into the Site design to manage surface water quantity and minimize potential off-Site impacts. Mitigation options were explored by routing runoff to different outlets in the SWMM5 model and used to predict changes in water quantity.

As previously discussed, there are three main drainage areas on-Site that convey drainage off-Site.

3.1.1 Predicted Changes in Drainage Areas

The post-development conditions scenario considers the Site layout for the ultimate build-out of the CRRRC facilities, the landfill final cover, and the SWM controls shown on Figure 3.

The three Site sub-catchment drainage areas and corresponding land uses for the proposed ultimate build-out state of the Site, and the technical details of the proposed SWM controls for each sub-catchment are described below in more detail. Figure 4 shows individual sub-catchments for each SWM Pond.

The SWMM5 schematic illustrating the proposed routing of post-development Site drainage is provided in Attachment A.2, Figure A-2. The sub-catchment areas on Figure A-2 are shown on Figure 4.

Regimbald Municipal Drain

The proposed northern Regimbald Municipal Drain sub-catchment area will increase by 4.9 ha, to a total sub-catchment area of 25.9 ha. The proposed grading and servicing plans route the drainage from this part of the CRRRC facility area to the two cell SWM Pond. This post-development Site sub-catchment area includes buildings, parking areas, roadways, stockpile areas, preserved existing and/or landscaped green space, and the two SWM cells (Ponds 5A and 5B) located in the central area of this sub-catchment.

Simpson Municipal Drain

The proposed Simpson Municipal Drain post-development total sub-catchment area of approximately 82.1 ha increases from existing conditions by approximately 6.5 ha.

This post-development drainage area is proposed to control runoff via a pond northwest and northeast of the Simpson Drain (Ponds 3, 4A and 4B), and one pond southwest of the drain (Pond 1). The area north of the Drain will include pads for the composting operations and soil treatment facilities, buildings, roadways and leachate storage ponds. The area south of the Simpson Drain will include the northwest segment of the landfill.

Wilson - Johnston Municipal Drain

The post-development final build-out sub-catchment area to the Wilson-Johnston Drain will decrease by approximately 11.4 ha, from 95.1 ha to 83.7 ha. This area will include approximately two-thirds of the landfill area and will include one long pond located along the southern and eastern sides of the Site.

A summary of existing and proposed drainage areas is presented in Table 3.

Table 3: Existing and Proposed Drainage Areas

Site Municipal Drain Sub-catchment	Area (ha)	
	Existing	Proposed
Regimbald	21.0	25.9
Simpson	75.6	82.1
Wilson-Johnston	95.1	83.7
Total Site	***191.7***	***191.7***

The total drainage area is not expected to change. The Regimbald Municipal Drain still has the smallest drainage area, and the Simpson and Wilson-Johnston Municipal Drains will have identically sized drainage areas.

4.0 STORMWATER MANAGEMENT DESIGN

Design drawings for the Site grading and proposed stormwater control works are required for the various approvals. The stormwater infrastructure consists of:

- SWM Ponds
- Conveyance Channels (Ditches, Spillways, Outfall Channels)
- Culverts
- Storm Sewers

A set of Design Drawings is provided and includes drawings of the SWM Ponds, typical sections of the conveyance features, and typical details of berms, along with a grading information, and erosion and sediment control information. The following sections summarize the detailed design of the SWM and conveyance features for the Site.

Throughout the course of the Site development, the phased construction of the landfill area will be conducted such that any contact-runoff is contained within the limit of the proposed waste footprint, through a series of berms. Buffer zones of existing and constructed vegetation screening will be maintained. Erosion and Sediment Control (E&SC) measures, including perimeter silt fencing, will also be installed and maintained between the vegetation screening area and the perimeter road during the phased construction of the landfill.

4.1 SWM Pond Design

The SWM Pond design plans, sections and details are included in the Design Drawings. A summary of the SWM Pond dimensions and capacities for each feature are outlined in the sections below.

To improve the settling of TSS within the permanent pool, SWM Ponds 1, 2, 3, and 4b will be constructed with a forebay equal to approximately 1/5 of the width and length of the pond bottom. Due to the long, linear nature of most of the SWM Ponds, some of the runoff entering the ponds will bypass the forebays. To assist with removal of TSS, it is proposed that much of the runoff for these areas be promoted to enter the ponds as sheet flow across vegetated buffer areas adjacent to the ponds. To avoid re-suspension of accumulated sediments and flushing of the ponds during major storm events exceeding the 1 in 100 year event, a pond bypass/overflow would convey excess flow to the outlet.

The updated conclusions below have taken into consideration the impervious landfill cover.

4.1.1 Pond 1

4.1.1.1 Quality Control

SWM Pond 1 collects surface water runoff from the northwest portion of the landfill. There is a perimeter ditch around the base of the landfill which will collect and convey surface water to the Pond. The ditch collects water from overland flow as well as runoff through the soil off the impervious membrane within the final cover of the landfill. The outlet structure includes a 600 mm x 600 mm ditch inlet catchbasin with a 90 mm control orifice at elevation 76.0 m. A second control which includes a 600 mm outlet culvert with a 500 mm control orifice at elevation 77.45. The retention time for runoff produced by a 25 mm design storm is over 10 days. An overflow weir is also included at elevation 78.20 m. The 25 mm design storm hydrograph for Pond 1 is provided in Attachment A.3 The total drainage area is approximately 48.2 ha (Drainage Area 204 on Figure 4). SWM Pond 1 discharges to the Simpson Municipal Drain.

Table 3.2 of the MOE SWM Planning and Design Manual (2003) provides storage volume design requirements based on specific site imperviousness levels to achieve required TSS removal objectives. Table 3.2 indicates that the minimum storage volume should be based on 140 m^3/ha for Enhanced 80% long-term TSS removal and an impervious level of 35%. For an area of 48.2 ha, this results in a required storage volume of approximately 6,748 m^3, of which 40 m^3/ha is required for extended detention and the remainder representing the permanent pool. The proposed pond provides a permanent pool storage volume of approximately 4,451 m^3 and an extended detention storage volume of 46,867 m^3 exceeding the requirements of 4,820 m^3 and 1,928 m^3 for permanent pool and extended detention respectively.

The following table provides the design values for the wet pond and compares these values to the minimum or preferred criteria as per Table 4.6 of the MOECC Manual:

Table 4: Pond 1 – MOECC Design Criteria

Design Element	Design Value	Comparison to MOECC Criteria
Drainage Area	48.2 ha	Meets Preferred Criteria
Treatment Volume	Permanent Pool – 4,451 m^3 Active Storage (25mm event) – 15,237 m^3	Exceeds Preferred Criteria
Forebay	Depth – 1.85 m Maximum Area – 21.4% of total area	Exceeds Minimum Criteria
Length-to-Width Ratio	Overall – 27.9:1 Forebay – 6.0:1	Exceeds Preferred Criteria
Permanent Pool Depth	Maximum Depth – 1.85 m Mean Depth – 1.68 m	Meets Preferred Criteria
Active Storage Depth	Water Quality and Erosion Control – 0.68 m Total Depth – 2.50 m	Exceeds Preferred Criteria
Side Slopes	3:1, 4:1, 7:1	Minimum 5:1 Safety Criteria Not Met (landfill site with restricted access)

Design Element	Design Value	Comparison to MOECC Criteria
Inlet	Ditch at 0.35% from west and 1.5% from east	Meets Minimum Criteria
Outlet	90 mm control orifice at elevation 76.0 m and a 500 mm control orifice at elevation 77.45, 1.0% slope 6 m wide overflow weir at 78.20	Exceeds Preferred Criteria

The following calculations summarize the design requirements of the forebay as per Section 4.6.2 of the MOECC Manual:

Forebay Settling Length

$$Dist = \sqrt{\frac{rQ_p}{V_s}}$$

Where: Dist = forebay length (m)

r = length-to-width ratio

Q_p = peak flow rate from the pond during design quality event (25 mm storm event) (m^3/s)

V_s = settling velocity (m/s)

$$Dist = \sqrt{\frac{6.0(0.015)}{0.0003}}$$

Dist = 17.3 m

Dispersion Length

$$Dist = \frac{8Q}{dV_f}$$

Where: Dist = length of dispersion (m)

Q = inlet pipe capacity (10 year storm event) (m^3/s)

d = depth of permanent pool in the forebay (m)

V_f = desired velocity in the forebay (m/s)

$$Dist = \frac{8(3.35)}{1.7(0.5)}$$

Dist = 31.5 m

The proposed forebay length is 54 metres and is therefore greater than the required lengths for settling and dispersion.

Minimum Forebay Bottom Width

$$Width = \frac{Dist}{8}$$

$$Width = \frac{31.5}{8}$$

Width = 3.9 m

The proposed bottom width is 3.9 metres and is therefore greater than the required width.

4.1.1.2 Quantity Control

SWM Pond 1 discharges to the Simpson Municipal Drain. The peak flows comparing the post-development flows to the pre-development flows for each drain can be found in Section 4.1.8. Based on the Quality outlet controls from Table 4, a stage-storage curve for Pond 1 was determined. The storage volume of the permanent pool is 4,451 m^3 and the surface area of the permanent pool is 4,114 m^2 at normal water elevation of 76.00. The Stage-Storage Curve for the Active Storage of Pond 1 can be found in Table 5 below.

Table 5: Pond 1 Stage-Storage Curve

Elevation (masl)	Depth above Perm Pool (m)	Active Storage Volume (m^3)
76.00	0.00	0
76.05	0.05	221
76.10	0.10	476
76.15	0.15	764
76.20	0.20	1,080
76.25	0.25	1,459
76.30	0.30	1,922
76.35	0.35	2,478
76.40	0.40	3,131
76.45	0.45	3,883
76.50	0.50	4,707
76.55	0.55	5,543
76.60	0.60	6,390
76.65	0.65	7,248
76.70	0.70	8,116
76.75	0.75	8,995
76.80	0.80	9,885
76.85	0.85	10,786
76.90	0.90	11,698
76.95	0.95	12,621
77.00	1.00	13,555
77.05	1.05	14,500
77.10	1.10	15,456
77.15	1.15	16,423
77.20	1.20	17,401

Elevation (masl)	Depth above Perm Pool (m)	Active Storage Volume (m^3)
77.25	1.25	18,390
77.30	1.30	19,390
77.35	1.35	20,402
77.40	1.40	21,425
77.45	1.45	22,459
77.50	1.50	23,505
77.55	1.55	24,562
77.60	1.60	25,631
77.65	1.65	26,711
77.70	1.70	27,803
77.75	1.75	28,906
77.80	1.80	30,021
77.85	1.85	31,147
77.90	1.90	32,285
77.95	1.95	33,435
78.00	2.00	34,597
78.05	2.05	35,770
78.10	2.10	36,955
78.15	2.15	38,152
78.20	2.20	39,361
78.25	2.25	40,582
78.30	2.30	41,815
78.35	2.35	43,060
78.40	2.40	44,317
78.45	2.45	45,586
78.50	2.50	46,867

The post-development controlled peak flow, storage volume, depth above permanent pool, and outlet control flows for Pond 1 can be found in Table 6 below.

Table 6: Pond 1 Quantity Control Results

Return Period	Post-Development Controlled Peak Flow (L/s)	Storage Volume (m^3)	Depth Above Perm. Pool (m)	Flow Through Orifice 1 (90 mm) (L/s)	Flow Through Orifice 2 (500 mm) (L/s)	Weir Spillway Outflow (L/s)
25 mm 4-hr	15	10,888	0.86	15	0	0
1:2 year	21	22,697	1.46	20	1	0
1:5 year	110	27,595	1.69	21	89	0
1:10 year	212	31,140	1.85	22	190	0
1:25 year	324	35,125	2.02	23	301	0
1:50 year	384	38,410	2.16	24	360	0
1:100 year	597	41,110	2.27	24	401	172

According to the MOECC SWM Planning & Design Manual, the smallest diameter orifice accepted by most municipalities to ensure that clogging does not occur in a stormwater system is 75mm. Where a very small (e.g., 75-100 mm) is required for discharge control, the design should provide for overflow caused by freezing. The release rates for each orifice was found using the orifice equation.

The following calculation summarizes the design requirements of the Inlet Control Device's as per Section 4.6.2 of the MOECC Manual for the 2-year event to compare against the model output:

Flow Through Orifice

$$Q = C\left(\frac{D}{2}\right)^2 \pi\sqrt{2gh}$$

Where: Q = flow through the orifice (m^3/s)

C = discharge coefficient

D = diameter of orifice (m)

g = gravitational acceleration constant (9.81 m/s^2)

h = head above the center of orifice (m) (1.46 m – 0.090 m / 2)

$$Q = (0.61)\left(\frac{0.090}{2}\right)^2 \pi\sqrt{2(9.81)(1.415)}$$

$$Q = 0.020\ {}^{m^3}/_{s}$$

The proposed orifice diameter of 90 mm provides an outflow of 0.020 m3/s for the 2-year storm which matches the value in the model as presented in Table 6 above.

4.1.2 Pond 2

4.1.2.1 Quality Control

SWM Pond 2 collects surface water runoff from the southern and northeastern portion of the landfill. There is a perimeter ditch around the base of the landfill which will collect and convey surface water to the Pond. The ditch collects water from overland flow as well as runoff through the soil off the impervious membrane over the landfill. The outlet structure includes a 130 mm diameter orifice at elevation 75.35 within a 600 mm x 600 mm ditch inlet catchbasin and two 375 mm diameter HDPE pipes at an elevation of 76.65 m. A 10-day retention time is provided for runoff produced by a 25 mm design storm. An overflow weir at elevation 77.00 m is also included. The 25 mm design storm hydrograph for Pond 2 is provided in Attachment A.3. The total drainage area is approximately 83.62 ha (Drainage Area 301, 302 and 303 on Figure 4). SWM Pond 2 discharges to the Wilson-Johnston Municipal Drain watershed.

Table 3.2 of the MOE SWM Planning and Design Manual (2003) provides storage volume design requirements based on specific site imperviousness levels to achieve required TSS removal objectives. Table 3.2 indicates that the minimum storage volume should be based on 140 m^3/ha for Enhanced 80% long-term TSS removal and an impervious level of 35%. For an area of 88.62 ha, this results in a required storage volume of approximately 11,707 m^3, of which 40 m^3/ha is required for extended detention and the remainder representing the permanent pool. The proposed pond provides a permanent pool storage volume of approximately 9,609 m^3 and an extended detention storage volume of 88,869 m^3 exceeding the requirements of 8,362 m^3 and 3,345 m^3 for permanent pool and extended detention respectively.

The following table provides the design values for the wet pond and compares these values to the minimum or preferred criteria as per Table 4.6 of the MOECC Manual:

Table 7: Pond 2 - MOECC Design Criteria

Design Element	Design Value	Comparison to MOECC Criteria
Drainage Area	83.62 ha	Meets Preferred Criteria
Treatment Volume	Permanent Pool – 9,609 m^3 Active Storage – 29,276 m^3	Exceeds Preferred Criteria
Forebay	Depth – 1.3 m Maximum Area – 20.0% of total area	Exceeds Minimum Criteria
Length-to-Width Ratio	Overall – 91.3:1 Forebay (north) – 3.1:1 Forebay (south) – 15.4:1	Exceeds Preferred Criteria
Permanent Pool Depth	Maximum Depth – 1.5 m Mean Depth – 1.4 m	Meets Preferred Criteria
Active Storage Depth	Water Quality and Erosion Control – 0.81m Total Depth – 1.95 m	Exceeds Preferred Criteria
Side Slopes	3:1, 4:1, 7:1	Minimum 5:1 Safety Criteria Not Met (landfill site with restricted access)
Inlet	Ditch at 0.35% from north and 0.3% from west	Meets Minimum Criteria
Outlet	130 mm diameter orifice at elevation 75.35 m and two 375mm dia. pipes at an elevation of 76.65 m and 1% slope. 10 m wide overflow weir at elevation 77.00 m	Exceeds Preferred Criteria

Pond 2 has two forebays, one at the north and one at the southwest end. The north forebay collects runoff from the northeast portion of the landfill including Drainage Area 303. The southwest forebay collects runoff from the south part of the landfill included Drainage Area 301 and 302. The following calculations summarize the design requirements of the forebay as per Section 4.6.2 of the MOECC Manual:

Forebay Settling Length – North Forebay

$$Dist = \sqrt{\frac{r Q_p}{V_s}}$$

Where: Dist = forebay length (m)

r = length-to-width ratio

Q_p = peak flow rate from the pond during design quality event (25 mm storm event) (m^3/s)

V_s = settling velocity (m/s)

$$Dist = \sqrt{\frac{3.1(0.0031)}{0.0003}}$$

Dist = 17.9 m

Dispersion Length – North Forebay

$$Dist = \frac{8Q}{dV_f}$$

Where: Dist = length of dispersion (m)

Q = inlet pipe capacity (10 year storm event) (m^3/s)

d = depth of permanent pool in the forebay (m)

V_f = desired velocity in the forebay (m/s)

$$Dist = \frac{8(1.66)}{1.3(0.5)}$$

Dist = 20.4 m

The proposed forebay length is 36 metres and is therefore greater than the required lengths for settling and dispersion.

Minimum Forebay Bottom Width – North Forebay

$$Width = \frac{Dist}{8}$$

$$Width = \frac{20.4}{8}$$

Width = 2.6 m

The proposed bottom width is 4.32 metres and is therefore greater than the required width.

Forebay Settling Length – Southwest Forebay

$$Dist = \sqrt{\frac{rQ_p}{V_s}}$$

Where: Dist = forebay length (m)

r = length-to-width ratio

Q_p = peak flow rate from the pond during design quality event (25 mm storm event) (m^3/s)

V_s = settling velocity (m/s)

$$Dist = \sqrt{\frac{3.1(0.0031)}{0.0003}}$$

Dist = 17.9 m

Dispersion Length – Southwest Forebay

$$Dist = \frac{8Q}{dV_f}$$

Where: Dist = length of dispersion (m)

Q = inlet pipe capacity (10 year storm event) (m^3/s)

d = depth of permanent pool in the forebay (m)

V_f = desired velocity in the forebay (m/s)

$$Dist = \frac{8(3.04)}{1.3(0.5)}$$

Dist = 37.4 m

The proposed forebay length is 205 metres and is therefore greater than the required lengths for settling and dispersion.

Minimum Forebay Bottom Width – Southwest Forebay

$$Width = \frac{Dist}{8}$$

$$Width = \frac{37.4}{8}$$

Width = 4.7 m

The proposed bottom width is 9.9 metres and is therefore greater than the required width.

4.1.2.2 Quantity Control

SWM Pond 2 discharges to the Wilson-Johnston Municipal Drain. Based on the Quality outlet controls from Table 7, a stage-storage curve for Pond 2 was determined. The storage volume of the permanent pool is 9,609 m^3 and the surface area of the permanent pool is 13,411 m^2 at normal water elevation of 75.35. The Stage-Storage Curve for the Active Storage for Pond 2 can be found in Table 8 below.

Table 8: Pond 2 Stage-Storage Curve

Elevation (masl)	Depth Above Perm Pool (m)	Active Storage Volume (m^3)
75.35	0.00	0.00
75.40	0.05	683
75.45	0.10	1,391
75.50	0.15	2,125
75.55	0.20	2,893
75.60	0.25	3,737
75.65	0.30	4,675
75.70	0.35	5,708
75.75	0.40	6,837
75.80	0.45	8,064
75.85	0.50	9,390
75.90	0.55	10,777
75.95	0.60	12,188
76.00	0.65	13,624
76.05	0.70	15,086
76.10	0.75	16,578
76.15	0.80	18,103
76.20	0.85	19,667
76.25	0.90	21,270
76.30	0.95	22,922
76.35	1.00	24,831
76.40	1.05	27,120
76.45	1.10	29,788
76.50	1.15	32,832
76.55	1.20	36,080
76.60	1.25	39,362
76.65	1.30	42,678
76.70	1.35	46,028
76.75	1.40	49,412
76.80	1.45	52,829
76.85	1.50	56,280
76.90	1.55	59,765
76.95	1.60	63,284
77.00	1.65	66,837
77.05	1.70	70,424
77.10	1.75	74,045
77.15	1.80	77,700
77.20	1.85	81,389
77.25	1.90	85,112
77.30	1.95	88,869

The peak flows comparing the post-development flows to the pre-development flows for each drain can be found in Section 4.1.8. The post-development controlled peak flow, storage volume, and depth above permanent pool for Pond 2 can be found in Table 9 below.

Table 9: Pond 2 - Quantity Control Results

Return Period	Post-Development Controlled Peak Flow (L/s)	Storage Volume (m^3)	Depth Above Perm. Pool (m)	Flow Through Orifice (130 mm) (L/s)	Flow Through Each Culvert (2 x 375mm) (L/s)	Weir Spillway Outflow (L/s)
25 mm 4-hr	62	19,186	0.83	31	0	0
1:2 year	78	40,942	1.27	39	10	0
1:5 year	229	49,527	1.40	41	94	0
1:10 year	467	55,035	1.48	43	212	0
1:25 year	685	62,152	1.58	43	321	0
1:50 year	795	67,775	1.66	44	365	21
1:100 year	1144	72,930	1.73	44	373	354

According to the MOECC SWM Planning & Design Manual, the smallest diameter orifice accepted by most municipalities to ensure that clogging does not occur in a stormwater system is 75mm. Where a very small (e.g., 75-100 mm) is required for discharge control, the design should provide for overflow caused by freezing. The release rates for each orifice was found using the orifice equation.

The following calculation summarizes the design requirements of the Inlet Control Device's as per Section 4.6.2 of the MOECC Manual for the 2-year event to compare against the model output:

Flow Through Orifice

$$Q = C\left(\frac{D}{2}\right)^2 \pi\sqrt{2gh}$$

Where: Q = flow through the orifice (m^3/s)

C = discharge coefficient

D = diameter of orifice (m)

g = gravitational acceleration constant (9.81 m/s^2)

h = head above the center of orifice (m) (1.27 m – 0.130 m / 2)

$$Q = (0.61)\left(\frac{0.130}{2}\right)^2 \pi\sqrt{2(9.81)(1.205)}$$

$$Q = 0.039\ {}^{m^3}/_{s}$$

The proposed orifice diameter of 130 mm provides an outflow of 0.039 m3/s for the 2-year storm which matches the value from the model presented in Table 9 above.

4.1.3 Pond 3

4.1.3.1 Quality Control

SWM Pond 3 collects surface water runoff from the west portion of the industrial portion of the Site. There are a series of ditches and culverts which collect surface water runoff from the Site entrance, drop-off area, administration building and parking, and petroleum hydrocarbon soil treatment area. The outlet structure includes a 90 mm orifice at elevation 75.25 within a 600 mm x 600 mm ditch inlet catchbasin, and a 500 mm orifice at elevation 76.05. A 100-hour retention time is provided for runoff produced by a 25 mm design storm. An overflow weir at elevation 76.40 m is also included. The 25 mm design storm hydrograph for Pond 3 is provided in Attachment A.3. The total drainage area is approximately 11.30 ha (Drainage Area 201 on Figure 4). SWM Pond 3 discharges to the Simpson Municipal Drain.

Table 3.2 of the MOE SWM Planning and Design Manual (2003) provides storage volume design requirements based on specific site imperviousness levels to achieve required TSS removal objectives. Table 3.2 indicates that the minimum storage volume should be based on 190 m^3/ha for Enhanced 80% long-term TSS removal and an impervious level of 55%. For an area of 11.30 ha, this results in a required storage volume of approximately 2,147 m^3, of which 40 m^3/ha is required for extended detention and the remainder representing the permanent pool. The proposed pond provides a permanent pool storage volume of approximately 2,803 m^3 and an extended detention storage volume of 5,794 m^3 exceeding the requirements of 1,695 m^3 and 452 m^3 for permanent pool and extended detention respectively.

The following table provides the design values for the wet pond and compares these values to the minimum or preferred criteria as per Table 4.6 of the MOECC Manual:

Table 10: Pond 3 - MOECC Design Criteria

Design Element	Design Value	Comparison to MOECC Criteria
Drainage Area	11.30 ha	Meets Preferred Criteria
Treatment Volume	Permanent Pool – 2,803 m^3 Active Storage – 4,503 m^3	Exceeds Preferred Criteria
Forebay	Depth – 1.5 m Maximum Area – 23% of total area	Exceeds Minimum Criteria
Length-to-Width Ratio	Overall – 11.5:1 Forebay – 3.0:1	Exceeds Preferred Criteria
Permanent Pool Depth	Maximum Depth – 1.5 m Mean Depth – 1.5 m	Meets Preferred Criteria
Active Storage Depth	Water Quality and Erosion Control – 0.50 m Total Depth – 1.42 m	Exceeds Preferred Criteria
Side Slopes	4:1	Minimum 5:1 Safety Criteria Not Met (landfill site with restricted access)
Inlet	Ditch at 0.15%	Meets Minimum Criteria
Outlet	90 mm orifice at elevation 75.25 m and a 500 mm orifice at elevation 76.05 m 10 m wide overflow weir at elevation 76.40 m	Meets Minimum Criteria

The following calculations summarize the design requirements of the forebay as per Section 4.6.2 of the MOECC Manual:

Forebay Settling Length

$$Dist = \sqrt{\frac{rQ_p}{V_s}}$$

Where: Dist = forebay length (m)
r = length-to-width ratio
Q_p = peak flow rate from the pond during design quality event (25 mm design storm event) (m^3/s)
V_s = settling velocity (m/s)

$$Dist = \sqrt{\frac{3(0.012)}{0.0003}}$$

Dist = 11.0 m

Dispersion Length

$$Dist = \frac{8Q}{dV_f}$$

Where: Dist = length of dispersion (m)
Q = inlet pipe capacity (10 year storm event) (m^3/s)
d = depth of permanent pool in the forebay (m)
V_f = desired velocity in the forebay (m/s)

$$Dist = \frac{8(1.70)}{1.3(0.5)}$$

Dist = 20.9 m

The proposed forebay length is 40 metres and is therefore greater than the required lengths for settling and dispersion.

Minimum Forebay Bottom Width

$$Width = \frac{Dist}{8}$$

$$Width = \frac{20.9}{8}$$

Width = 2.6 m

The proposed bottom width is 5.0 metres and is therefore greater than the required width.

4.1.3.2 Quantity Control

SWM Pond 3 discharges to the Simpson Municipal Drain. Based on the Quality outlet controls from Table 10, a stage-storage curve for Pond 3 was determined. The storage volume of the permanent pool is 2,803 m^3 and the surface area of the permanent pool is 2,998 m^2 at normal water elevation of 75.25. The Stage-Storage Curve for the Active Storage of Pond 3 can be found in Table 11 below.

Table 11: Pond 3 Stage-Storage Curve

Elevation (masl)	Depth Above Perm Pool (m)	Active Storage Volume (m^3)
75.25	0.00	0.00
75.35	0.10	308
75.45	0.20	632
75.55	0.30	972
75.65	0.40	1,328
75.75	0.50	1,700
75.85	0.60	2,088
75.95	0.70	2,493
76.05	0.80	2,914
76.15	0.90	3,352
76.25	1.00	3,807
76.35	1.10	4,278
76.45	1.20	4,766
76.55	1.30	5,271
76.65	1.40	5,794

The peak flows comparing the post-development flows to the pre-development flows for each drain can be found in Section 4.1.8. The post-development controlled peak flow, storage volume, and depth above permanent pool for Pond 3 can be found in Table 12 below.

Table 12: Pond 3 - Quantity Control Results

Return Period	Post-Development Controlled Peak Flow (L/s)	Storage Volume (m^3)	Depth Above Perm. Pool (m)	Flow Through Orifice 1 (90 mm) (L/s)	Flow Through Orifice 2 (500 mm) (L/s)	Weir Spillway Outflow (L/s)
25 mm 4-hr	12	1,781	0.52	12	0	0
1:2 year	48	3,427	0.92	16	32	0
1:5 year	117	4,046	1.05	16	101	0
1:10 year	182	4,516	1.15	17	165	0
1:25 year	431	4,807	1.21	17	209	205
1:50 year	659	4,977	1.24	17	235	407
1:100 year	935	5,152	1.28	17	263	655

According to the MOECC SWM Planning & Design Manual, the smallest diameter orifice accepted by most municipalities to ensure that clogging does not occur in a stormwater system is 75mm. Where a very small (e.g., 75-100 mm) is required for discharge control, the design should provide for overflow caused by freezing. The release rates for each orifice was found using the orifice equation.

The following calculation summarizes the design requirements of the Inlet Control Device's as per Section 4.6.2 of the MOECC Manual for the 2-year event to compare against the model output:

Flow Through Orifice

$$Q = C\left(\frac{D}{2}\right)^2 \pi\sqrt{2gh}$$

Where: Q = flow through the orifice (m^3/s)

C = discharge coefficient

D = diameter of orifice (m)

g = gravitational acceleration constant (9.81 m/s^2)

h = head above the center of orifice (m) (0.92 m – 0.09 m / 2)

$$Q = (0.61)\left(\frac{0.090}{2}\right)^2 \pi\sqrt{2(9.81)(0.875)}$$

$$Q = 0.016\ {}^{m^3}/_{s}$$

The proposed orifice diameter of 90 mm provides an outflow of 0.016 m3/s for the 2-year storm which matches the model output as presented in Table 12 above.

4.1.4 Pond 4A

4.1.4.1 Quality Control

SWM Pond 4A collects surface water runoff from the compost processing and storage pad. Pond 4A will be a two celled storage pond dedicated to receive runoff from the proposed compost pad area. One cell will be dedicated to receive runoff from final curing areas of the pad while the other will be for runoff from the remainder. This pond is sized to contain runoff equivalent to the 1:100 year, 24 hour event for the pad area, without discharge to off-Site surface water. The total drainage area is 4.2 ha (Drainage Area 202 on Figure 4). The stored water within the pond cells will be managed to maintain adequate capacity by re-using the water from the appropriate cell for compost pile spraying and Site irrigation. To ensure Site irrigation is a viable option, water quality samples from both cells of Pond 4A will be collected for analysis during the demonstration phase of the organics processing facility. Should water quality be such that Site irrigation is not possible, surplus water from Pond 4A would be taken to the City of Ottawa wastewater treatment plant with the pre-treated leachate/wastewater from the Site.

4.1.4.2 Quantity Control

The Pond 4A Stage-Storage Curve was determined based on the total volume required based on the drainage area. The storage volume of the pond (no permanent pool) is 5,528 m^3. The elevation at the bottom of the Pond is 73.85 m and the pond is 2.45m deep. The Stage-Storage Curve for Pond 4A can be found in Table 13 below.

Table 13: Pond 4A Stage-Storage Curve

Elevation (masl)	Depth of Pond 4A (m)	Storage Volume (m^2)
73.85	0.00	0
73.90	0.05	55
73.95	0.10	112
74.00	0.15	171
74.05	0.20	232
74.10	0.25	295
74.15	0.30	359
74.20	0.35	425
74.25	0.40	493
74.30	0.45	563
74.35	0.50	636
74.40	0.55	712
74.45	0.60	790
74.50	0.65	870
74.55	0.70	952
74.60	0.75	1036
74.65	0.80	1123
74.70	0.85	1212
74.75	0.90	1303
74.80	0.95	1397
74.85	1.00	1494
74.90	1.05	1593
74.95	1.10	1694
75.00	1.15	1798
75.05	1.20	1905
75.10	1.25	2015
75.15	1.30	2127
75.20	1.35	2242
75.25	1.40	2360
75.30	1.45	2480
75.35	1.50	2604
75.40	1.55	2730
75.45	1.60	2859
75.50	1.65	2991
75.55	1.70	3126
75.60	1.75	3264
75.65	1.80	3405
75.70	1.85	3549
75.75	1.90	3696
75.80	1.95	3847

Elevation (masl)	Depth of Pond 4A (m)	Storage Volume (m^2)
75.85	2.00	4000
75.90	2.05	4157
75.95	2.10	4317
76.00	2.15	4480
76.05	2.20	4646
76.10	2.25	4816
76.15	2.30	4989
76.20	2.35	5165
76.25	2.40	5345
76.30	2.45	5528

SWMP Pond 4A does not drain off-site, therefore does not impact the overall peak flows back to the watershed. In Table 14 below, the peak flows are seen to be 0 L/s due to the process decribed in Section 4.1.4.1. The amount of storage volume and depth above the permanent pool can be found below as a reference for the amount of water to be re-used.

Table 14: Pond 4A - Quantity Control Results

Return Period	Post-Development Controlled Peak Flow (L/s)	Storage Volume (m^3)	Depth (m)
25 mm 4-hr	0	769	0.59
1:2 year	0	1,839	1.16
1:5 year	0	2,483	1.45
1:10 year	0	3,076	1.68
1:25 year	0	3,701	1.90
1:50 year	0	4,163	2.05
1:100 year	0	4,648	2.20

4.1.5 Pond 4B

4.1.5.1 Quality Control

SWM Pond 4B collects surface water runoff from the east portion of the industrial portion of the Site. There are a series of ditches and culverts which collect surface water runoff from the organics processing facility primary reactor cells, the secondary digester and flare, and the leachate treatment building. The outlet structure includes a 600 mm x 600 mm ditch inlet catchbasin with a 90 mm orifice at elevation 75.25 and a 450 mm orifice at elevation 76.25. A 100-hour retention time is provided for runoff produced by a 25 mm design storm. An overflow weir at elevation 76.45 m is also included. The 25 mm design storm hydrograph for Pond 4B is provided in Attachment A.3. The total drainage area is approximately 16.3 ha (Drainage Area 202 on Figure 4). SWM Pond 4B discharges to the Simpson Municipal Drain.

Table 3.2 of the MOE SWM Planning and Design Manual (2003) provides storage volume design requirements based on specific site imperviousness levels to achieve required TSS removal objectives. Table 3.2 indicates that the minimum storage volume should be based on 140 m^3/ha for Enhanced 80% long-term TSS removal and an impervious level of 65%. For an area of 16.30 ha, this results in a required storage volume of approximately 3,472 m^3, of which 40 m^3/ha required for extended detention and the remainder representing the permanent pool. The proposed pond provides a permanent pool storage volume of approximately 3,407 m^3 and an extended detention storage volume of 3,274 m^3 exceeding the requirements 2,820 m^3 and of 652 m^3 for permanent pool and extended detention respectively.

The following table provides the design values for the wet pond and compares these values to the minimum or preferred criteria as per Table 4.6 of the MOECC Manual:

Table 15: Pond 4B – MOECC Design Criteria

Design Element	Design Value	Comparison to MOECC Criteria
Drainage Area	16.30 ha	Meets Preferred Criteria
Treatment Volume	Permanent Pool – 3,407 m^3 Active Storage – 5,705 m^3	Exceeds Preferred Criteria
Forebay	Depth – 1.25 m Maximum Area – 21.4% of total area	Exceeds Minimum Criteria
Length-to-Width Ratio	Overall – 23.6:1 Forebay – 3.8:1	Exceeds Preferred Criteria
Permanent Pool Depth	Maximum Depth – 1.5 m Mean Depth – 1.38 m	Meets Preferred Criteria
Active Storage Depth	Water Quality and Erosion Control – 0.46 m Total Depth – 1.44 m	Exceeds Preferred Criteria
Side Slopes	4:1	Minimum 5:1 Safety Criteria Not Met (landfill site with restricted access)
Inlet	Ditch at 0.15%	Meets Minimum Criteria
Outlet	2,000 mm dia. pipe with a 90 mm orifice at elevation 75.25 and a 450 mm orifice at elevation 76.25, 1.0% slope 10 m wide overflow weir at elevation 76.45	Meets Minimum Criteria

The following calculations summarize the design requirements of the forebay as per Section 4.6.2 of the MOECC Manual:

Forebay Settling Length

$$Dist = \sqrt{\frac{rQ_p}{V_s}}$$

Where: Dist = forebay length (m)

r = length-to-width ratio

Q_p = peak flow rate from the pond during design quality event (25 mm storm event) (m^3/s)

V_s = settling velocity (m/s)

$$Dist = \sqrt{\frac{3.8(0.014)}{0.0003}}$$

Dist = 13.3 m

Dispersion Length

$$Dist = \frac{8Q}{dV_f}$$

Where: Dist = length of dispersion (m)

Q = inlet pipe capacity (10 year storm event) (m^3/s)

d = depth of permanent pool in the forebay (m)

V_f = desired velocity in the forebay (m/s)

$$Dist = \frac{8(2.573)}{1.25(0.5)}$$

Dist = 32.9 m

The proposed forebay length is 56.2 metres and is therefore greater than the required lengths for settling and dispersion.

Minimum Forebay Bottom Width

$$Width = \frac{Dist}{8}$$

$$Width = \frac{32.9}{8}$$

Width = 4.1 m

The proposed bottom width is 6.0 metres and is therefore greater than the required width.

4.1.5.2 Quantity Control

SWM Pond 4B discharges to the Simpson Municipal Drain. Based on the Quality outlet controls from Table 15, a stage-storage curve for Pond 4B was determined. The storage volume of the permanent pool is 3,407 m^3 and the surface area of the permanent pool is 3,274 m^2 at normal water elevation of 75.25. The Stage-Storage Curve for the Active Storage Pond 4B can be found in Table 16 below.

Table 16: Pond 4B Stage-Storage Curve

Elevation (masl)	Depth Above Perm Pool (m)	Active Storage Volume (m^3)
75.25	0.00	0.00
75.30	0.05	168
75.35	0.10	341
75.40	0.15	518
75.45	0.20	700
75.50	0.25	887
75.55	0.30	1,080
75.60	0.35	1,279

Elevation (masl)	Depth Above Perm Pool (m)	Active Storage Volume (m^3)
75.65	0.40	1,485
75.70	0.45	1,703
75.75	0.50	1,948
75.80	0.55	2,229
75.85	0.60	2,546
75.90	0.65	2,899
75.95	0.70	3,287
76.00	0.75	3,695
76.05	0.80	4,108
76.10	0.85	4,526
76.15	0.90	4,948
76.20	0.95	5,375
76.25	1.00	5,806
76.30	1.05	6,242
76.35	1.10	6,683
76.40	1.15	7,128
76.45	1.20	7,578
76.50	1.25	8,032
76.55	1.30	8,491
76.60	1.35	8,954
76.65	1.40	9,422
76.70	1.45	9,895
76.75	1.50	10,372

The peak flows comparing the post-development flows to the pre-development flows for each drain can be found in Section 4.1.8. The post-development controlled peak flow, storage volume, and depth above permanent pool for Pond 4b can be found in Table 17 below.

Table 17: Pond 4B - Quantity Control Results

Return Period	Post-Development Controlled Peak Flow (L/s)	Storage Volume (m^3)	Depth Above Perm. Pool (m)	Flow Through Orifice 1 (90 mm) (L/s)	Flow Through Orifice 2 450 mm) (L/s)	Weir Spillway Outflow (L/s)
25 mm 4-hr	14	2,678	0.62	14	0	0
1:2 year	28	6,323	1.06	18	10	0
1:5 year	78	7,469	1.19	19	59	0
1:10 year	259	7,838	1.23	19	79	161
1:25 year	608	8,127	1.26	19	96	493
1:50 year	950	8,352	1.28	19	109	822
1:100 year	1386	8,599	1.31	19	125	1242

According to the MOECC SWM Planning & Design Manual, the smallest diameter orifice accepted by most municipalities to ensure that clogging does not occur in a stormwater system is 75mm. Where a very small (e.g., 75-100 mm) is required for discharge control, the design should provide for overflow caused by freezing. The release rates for each orifice was found using the orifice equation.

The following calculation summarizes the design requirements of the Inlet Control Device's as per Section 4.6.2 of the MOECC Manual for the 2-year event to compare against the model output:

Flow Through Orifice

$$Q = C\left(\frac{D}{2}\right)^2 \pi\sqrt{2gh}$$

Where: Q = flow through the orifice (m^3/s)

C = discharge coefficient

D = diameter of orifice (m)

g = gravitational acceleration constant (9.81 m/s^2)

h = head above the center of orifice (m) (1.06 m – 0.09 m / 2)

$$Q = (0.61)\left(\frac{0.090}{2}\right)^2 \pi\sqrt{2(9.81)(1.015)}$$

$$Q = 0.017\ {}^{m^3}/_{s}$$

The proposed orifice diameter of 90 mm provides an outflow of 0.017 m3/s for the 2-year storm which consistent to the value from the model (noting differences due to rounding) as noted in Table 15 above.

4.1.6 Pond 5A

4.1.6.1 Quality Control

SWM Pond 5A collects surface water runoff from the northwest portion of the industrial portion of the Site. There are a series of ditches and culverts which collect surface water runoff from the drop-off area and C&D processing facility. SWM Pond 5A outlets to Pond 5B via three 600 mm diameter HDPE pipes. The total drainage area is approximately 14.74 ha (Drainage Area 101 on Figure 4). SWM Pond 5A discharges to the Regimbald Municipal Drain via SWM Pond 5B.

Table 3.2 of the MOE SWM Planning and Design Manual (2003) provides storage volume design requirements based on specific site imperviousness levels to achieve required TSS removal objectives. Table 3.2 indicates that the minimum storage volume should be based on 225 m^3/ha for Enhanced 80% long-term TSS removal and an impervious level of 70%. For an area of 14.74 ha, this results in a required storage volume of approximately 3,316 m^3, of which 40 m^3/ha required for extended detention and the remainder representing the permanent pool. The proposed pond provides a permanent pool storage volume of approximately 13,554 m^3 and an extended detention storage volume of 13,981 m^3 exceeding the requirements of 2,726.9 m^3 and 590 m^3 for permanent pool and extended detention respectively.

The permanent pool will also be used for the fire protection system using a wet well and pump which distributes water to the sprinkler / standpipe systems at the C&D, MRF, Leachate Treatment and Organics Pre-Processing buildings. The details of the fire protection system are provided in the Site Servicing Report.

The following table provides the design values for the wet pond and compares these values to the minimum or preferred criteria as per Table 4.6 of the MOECC Manual:

Table 18: Pond 5A - MOECC Design Criteria

Design Element	Design Value	Comparison to MOECC Criteria
Drainage Area	14.74 ha	Meets Preferred Criteria
Treatment Volume	Permanent Pool – 13,554 m^3 Active Storage – 11,744 m^3	Exceeds Preferred Criteria
Forebay	No forebay provided	Does not meet Criteria
Length-to-Width Ratio	Overall – 11.5:1	Exceeds Preferred Criteria
Permanent Pool Depth	Maximum Depth – 1.85 m Mean Depth – 1.85 m	Meets Preferred Criteria
Active Storage Depth	Water Quality and Erosion Control – 0.12 m Total Depth – 0.49 m	Exceeds Preferred Criteria
Side Slopes	4:1	Minimum 5:1 Safety Criteria Not Met (industrial and landfill site with restricted access)
Inlet	Ditch at 0.15% and 450 mm storm sewers at 0.30%	Does not meet Minimum Criteria (<1% slope on inlet pipes)
Outlet	3-600 mm dia. outlet pipes, 1.0% slope	Meets Minimum Criteria

4.1.6.2 Quantity Control

SWM Pond 5A discharges to the Regimbald Municipal Drain via SWM Pond 5B. Based on the Quality outlet controls from Table 18, a stage-storage curve for Pond 5A was determined. The storage volume of the permanent pool is 13,554 m^3 and the surface area of the permanent pool is 14,405 m^2 at normal water elevation of 75.70. The Stage-Storage Curve for the Active Storage for Pond 5A can be found in Table 19 below.

Table 19: Pond 5A Stage-Storage Curve

Elevation (masl)	Depth above Perm Pool (m)	Active Storage Volume (m^3)
75.70	0.00	0.00
75.75	0.05	764
75.80	0.10	1,576
75.85	0.15	2,396
75.90	0.20	3,224
75.95	0.25	4,060
76.00	0.30	4,904
76.05	0.35	5,756
76.10	0.40	6,616
76.15	0.45	7,484
76.20	0.50	8,360
76.25	0.55	9,243
76.30	0.60	10,134

Elevation (masl)	Depth above Perm Pool (m)	Active Storage Volume (m^3)
76.35	0.65	11,032
76.40	0.70	11,937
76.45	0.75	12,845

The peak flows comparing the post-development flows to the pre-development flows for each drain can be found in Section 4.1.8. Since Pond 5A discharges to Pond 5B, only the storage volume, and depth above permanent pool are included in Table 20 below. The flow between the two ponds are controlled with three 600 mm HDPE culverts at the normal water level.

Table 20: Pond 5A - Quantity Control Results

Return Period	Storage Volume (m^3)	Depth Above Perm. Pool (m)
25 mm 4-hr	1,332	0.09
1:2 year	3,861	0.24
1:5 year	4,876	0.30
1:10 year	5,843	0.35
1:25 year	6,897	0.42
1:50 year	7,658	0.46
1:100 year	8,437	0.50

4.1.7 Pond 5B

4.1.7.1 Quality Control

SWM Pond 5B collects surface water runoff from the northwest portion of the industrial portion of the Site and the flow through the connecting Pond 5A. There are a series of ditches and culverts which collect surface water runoff from the drop-off area and C&D processing facility. SWM Pond 5B outlets via a 900 mm diameter HDPE pipe with a 700 mm diameter orifice which provides a 160-hour retention time for runoff produced by a 25 mm design storm. The total drainage area is approximately 9.51 ha (Drainage Area 102 on Figure 4). SWM Pond 5B discharges to the Regimbald Municipal Drain.

Table 3.2 of the MOE SWM Planning and Design Manual (2003) provides storage volume design requirements based on specific site imperviousness levels to achieve required TSS removal objectives. Table 3.2 indicates that the minimum storage volume should be based on 225 m^3/ha for Enhanced 80% long-term TSS removal and an impervious level of 70%. For an area of 9.51 ha, this results in a required storage volume of approximately 2,140 m^3, of which 40 m^3/ha is required for extended detention and the remainder representing the permanent pool.

The proposed pond provides a permanent pool storage volume of approximately 9,542 m^3 and an extended detention storage volume of 10,830 m^3 exceeding the requirements of 1,759 m^3 and 380 m^3 for permanent pool and extended detention respectively.

The following table provides the design values for the wet pond and compares these values to the minimum or preferred criteria as per Table 4.6 of the MOECC Manual:

Table 21: Pond 5B - MOECC Design Criteria

Design Element	Design Value	Comparison to MOECC Criteria
Drainage Area	9.51 ha	Meets Preferred Criteria
Treatment Volume	Permanent Pool – 9,542 m^3 Active Storage – 10,830 m^3	Exceeds Preferred Criteria
Forebay	No forebay provided	Does not meet Criteria
Length-to-Width Ratio	Overall – 11.5:1	Exceeds Preferred Criteria
Permanent Pool Depth	Maximum Depth – 1.9 m Mean Depth – 1.9 m	Meets Preferred Criteria
Active Storage Depth	Water Quality and Erosion Control – 0.12 m Total Depth – 0.49 m	Exceeds Preferred Criteria
Side Slopes	4:1	Minimum 5:1 Safety Criteria Not Met (industrial and landfill site with restricted access)
Inlet	3 - 600 mm culvert at 0.3% and 450 mm storm sewers at 0.30%	Does not meet Minimum Criteria (<1% slope on inlet pipes)
Outlet	900 mm dia. outlet pipe with 700 mm diameter orifice, 1.0% slope	Meets Minimum Criteria

4.1.7.2 Quantity Control

SWM Pond 5B discharges to the Regimbald Municipal Drain. Based on the Quality outlet controls from Table 21, a stage-storage curve for Pond 5B was determined. The storage volume of the permanent pool is 9,542 m^3 and the surface area of the permanent pool is 13,450 m^2 at normal water elevation of 75.70. The Stage-Storage Curve for the Active Storage for Pond 5B can be found in Table 22 below.

Table 22: Pond 5B Stage-Storage Curve

Elevation (masl)	Depth Above Perm Pool (m)	Storage Volume (m^2)
75.70	0.00	0.00
75.75	0.05	712
75.80	0.10	1,454
75.85	0.15	2,202
75.90	0.20	2,956
75.95	0.25	3,717
76.00	0.30	4,484
76.05	0.35	5,257
76.10	0.40	6,036
76.15	0.45	6,821
76.20	0.50	7,612
76.25	0.55	8,409
76.30	0.60	9,211
76.35	0.65	10,018
76.40	0.70	10,830
76.45	0.75	10,830

The peak flows comparing the post-development flows to the pre-development flows for each drain can be found in Section 4.1.8. The post-development controlled peak flow, storage volume, and depth above permanent pool for Pond 5B can be found in Table 23 below.

Table 23: Pond 5B - Quantity Control Results

Return Period	Post-Development Controlled Peak Flow (L/s)	Storage Volume (m^3)	Depth Above Perm. Pool (m)	Flow Through Orifice (700 mm) (L/s)	Weir Spillway Outflow (L/s)
25 mm 4-hr	10	1224	0.08	10	0
1:2 year	39	3517	0.24	39	0
1:5 year	70	4422	0.30	70	0
1:10 year	196	5285	0.35	196	0
1:25 year	251	6220	0.41	251	0
1:50 year	293	6888	0.45	293	0
1:100 year	337	7566	0.50	337	0

The release rates for each orifice was found using the orifice equation. The fire pond (Pond 5B) was sized using the 100-year storm while remaining under the pre-development conditions for all storms. The following calculation summarizes the design requirements of the Inlet Control Device's as per Section 4.6.2 of the MOECC Manual for the 100-year event to compare against the model output:

Flow Through Orifice

$$Q = C\left(\frac{D}{2}\right)^2 \pi\sqrt{2gh}$$

Where: Q = flow through the orifice (m^3/s)

C = discharge coefficient

D = diameter of orifice (m)

g = gravitational acceleration constant (9.81 m/s^2)

h = head above the center of orifice (m) (0.5 m – 0.700m / 2)

$$Q = (0.61)\left(\frac{0.700}{2}\right)^2 \pi\sqrt{2(9.81)(0.110)}$$

$$Q = 0.34\ {}^{m^3}/_{s}$$

The proposed orifice diameter of 700 mm provides an outflow of 0.34 m3/s for the 100-year storm which is below the pre-development requirements for Pond 5B.

4.1.8 Predicted Effects on On-Site Flows

The ditches within the Site are designed to convey stormwater to the SWM Ponds, or eastern Site boundary culverts directly, as shown in engineered drawing package. Three types of channels (ditch, SWM Pond inlet, or outfall channels and spillways) have been designed considering the slope along with the peak flow and corresponding velocity computed for a 1 in 25 year design storm. Based on the functionality of the channels, with consideration of peak velocity results, these conveyance features have been designed with two types of surface treatment: rip-rap lined, or vegetated ditches. Conveyance channel design details are outlined in Section 4.2.

Post-closure conditions are used for the surface water quantity assessment as the entire Site will be contributing to Site runoff when the landfill component has been capped. In order to minimize potential for nuisance flooding during minor storm events, and property damage during major events, the ponds have been designed for the 1:100 year storm event.

Peak flow rates were extracted from the SWMM5 model for pre- and post-development conditions. Under the post-development scenario, the increase in respective impervious land use and average slopes for the sub-catchment areas are expected to generate increased runoff conditions. Peak flow rates were extracted from the SWMM5 model for the 6-hour Historical storm to be used as a comparison measure against the other drains. Due to the nature of the historical storm, the peak flows were under the 100-year flow rates.

The model identified that the calculated post-development un-mitigated peak flows at all Site outlet locations exceeded pre-development peak flow conditions. The model was then updated to include SWM Ponds (storage reservoirs). Table 24 below compares the pre-development and controlled, post-development peak flows for each Site sub-catchment area.

Table 24: Pre- and Post-Development Peak Flow Rates Comparison

Municipal Drain Sub-Catchment		Drainage Areas (ha)		Peak Discharge to Municipal Drains (L/s)											
				1:2yr		1:5yr		1:10yr		1:25yr		1:50yr		1:100yr	
		Pre	Post	Pre	Post	Pre	Post	Pre	Post	Pre	Post	Pre	Post	Pre	Post
1	Regimbald	21.0	25.9	86	31	298	70	375	112	471	159	535	195	556	234
2	Simpson	75.6	82.1	35	30	284	154	406	341	585	522	732	641	899	871
3	Wilson-Johnston	95.1	83.7	40	39	345	221	495	449	715	664	898	773	1106	1050

These SWMM5 peak flows, generated from local IDF curves over a 24 hour period using the SCS type II distribution, are conservative for the purposes of recommending the approximate SWM Pond sizes to meet storage volume requirements to manage peak flows without flooding (James, 2003).

4.2 Conveyance Channels

The ditches within the Site are designed to convey stormwater to the SWM Ponds, or eastern Site boundary culverts directly, as shown on Grading and Drainage Plans.

The three types of channels (ditch, SWM Pond inlet or outfall channels, and spillways) have been designed, considering the slope, along with the peak flow and corresponding velocity computed for a 1 in 25 year design storm. Based on the functionality of the channels, with consideration of peak velocity results, these conveyance features have been prescribed with two types of surface treatment: rip-rap lined, or vegetated ditches.

Summaries of both types of ditches, along with the rip-rap lining and associated geotextile fabric specifications for a few prescribed locations at the outlets of the conveyance features are outlined below. Typical details and slopes for channels are provided on Design Drawings.

Landfill Perimeter Vegetated Ditches

The perimeter ditches around the landfill boundaries are proposed to be grass lined. These perimeter ditches will be trapezoidal with a 0.5 metre bottom width, a 7H:1V sideslope on the landfill side and a 3H:1V sideslope on the outer side. Slopes will be approximately 0.30%, respecting the proposed topography, and will have a minimum depth of 0.5 m, up to 1.1 m to convey the 1:100 year flows to Ponds 1 and 2.

Interior Ditches – Facility Operations Area

Most of the interior ditches will be trapezoidal with a 1.0 metre bottom width, 4H:1V side slopes, and will have a minimum depth of 0.5 metres. There will also be some v-notch ditches where flows are low and there are space constraints. The longitudinal slopes of these ditches vary with a minimum of 0.15%, respecting the existing topography.

Inlet, Outlet and Spillway Channels with Rip-Rap Lining

Pond inlet conveyance channels, overflow spillways or outfall channels experience high erosive forces. To provide effective energy dissipation and minimize erosion potential from the 1 in 25 year design storm, and any larger major events (e.g. 1 in 100 year storm), it is proposed these channels be lined with rip-rap and annual maintenance and repair practices be followed.

The thickness of the rip-rap layer is to be a minimum of 1.5 times the rip-rap nominal diameter. The mean diameter for the rip-rap stone was selected to have nominal diameter of 200 millimetres.

Geotextile Fabric

A geotextile fabric will be required beneath rip-rap areas and is recommended to be extended three to five channel widths downstream to mitigate any scour potential. The fabric is required to be “keyed in” 200 mm from the crest of the ditch as indicated in the Ontario Provincial Standard Drawing 219.211 (MTO, 2006).

4.3 Culvert Design

All of the culverts on-Site have been designed to convey the 1 in 25 year, 24 hour storm event and will be located beneath existing roadways. Minimum culvert diameter will be 600 millimetres.

There are two road crossings of the Simpson drain to the landfill. Each will require a 1500 mm diameter culvert which has been sized to accommodate the 1 in 100 year, 24 hour storm event from the upstream area of 83.8 ha.

4.4 Storm Sewers

All of the storm sewers on-Site have been designed to convey the 1 in 2 year storm event and will be located beneath existing asphalt and roadways. For storms larger than the 1 in 2 year storm event surface water will be conveyed overland via the paved surfaces to the stormwater management ponds. The C&D and MRF building will have downspouts for stormwater from the roof to be collected and brought to SWM Pond 5A and 5B respectively. The roof downspouts are directed via sewers instead of discharging to the asphalt to avoid potential ice buildup in the winter months. The downspouts will incorporate an overflow just above the exterior ground elevation. Surcharging of the sewers and overflow during events greater than the 1 in 2 year event are likely to only occur during the warmer periods when ice build-up is not an issue. The compost pad will have catchbasins within the asphalt surface to collect surface water and a series of storm sewers to convey the water to SWM Pond 4A. The overland flow route from the compost pad is also towards Pond 4A in the event that the sewers are unable to convey all of the flow, without overflowing the pad and draining to other areas of the Site.

5.0 MONITORING, OPERATION AND MAINTENANCE

The inspection of E&SC measures during construction should occur on a weekly basis, at minimum. E&SC inspection during construction should also occur after significant rainfall events (e.g., greater than approximately 10 mm). An inspection report, highlighting any E&SC deficiencies, should be prepared for each inspection and kept on-Site for reference and reporting purposes, if needed (GGHA CAs, 2006).

Visual inspections of SWM or water conveyance features should be performed post-construction on a quarterly (seasonal) basis to ensure sediment build-up has not caused any conveyance capacity issues or potential for an increase in TSS loadings transported downstream. During rainfall-runoff events, visual observations will continue to support the post-development runoff assessment and the successful performance of the SWM Ponds in meeting Enhanced Level of treatment (MOE, 2003).

At minimum, the following should be observed during inspections:

- Signs of erosion of the SWM structures. This is important particularly before the re-vegetation cover has been established;
- Sediment build-up in the swales. For any retention controls (i.e., rock check dams, sediment traps), sediment build-up can be expected at the upstream end of these structures and therefore the stormwater conveyance channels should be inspected on a regular basis and cleaned out periodically to avoid sediment deposits being transported off-Site. Clean-out is recommended to occur once sediment accumulation is clearly visible (GGHA CAs, 2006). In practical terms, clean-out of the rock check dams is recommended if the build-up is greater than one-half the height, from the toe to the spillway. Sediment should be removed in a matter that avoids escape of the sediment downstream and that avoids damage to the control structure. Sediment should be removed to the level of the grade existing at the time the control structure was constructed;
- Ponding in the swales or sediment traps; and,
- Silt fencing. All silt fences used for E&SC should meet required minimum height of 0.6 m. They should be repaired or replaced if damaged.

Environmental monitoring related to surface water at the CRRRC will be carried out concurrently with the overall Site monitoring program. As such, reference should be made to the overall facility D&O report for monitoring, trigger mechanisms and contingency measures related to surface water, sediment and biology.

6.0 SEDIMENT AND EROSION CONTROL

The following sections summarizes the Erosion and Sediment Control (ESC) Plan measures for the proposed Capital Region Resource Recovery Centre (CRRRC) as per commitments 42, 44, 48, 53, 55 and 57 of the Environmental Assessment Study Report.

6.1 General Considerations

- The ESC measures will be according to the future permits and approval requirements issued by regulatory and authority bodies (Ministry of Environment and Climate Change/South Nation Conservation Authority). A copy of the permit conditions and the ESC Plan will be maintained on-site at all times during construction and operation.
- Contractor staff will be familiar with the ESC measures and be aware of the existing and proposed measures as outlined in this memorandum.
- The ESC measures will be installed upstream of the stormwater outlets where the runoff drains into existing municipal drains.
- Accumulated sediment will be removed on a regular basis, and as needed, to ensure the proper operation and maintenance of the ESC measures as intended. The accumulated sediment and debris should be removed prior to the removal of the ESC measures.
- The maintenance and refueling of the machinery on-site should be limited to the areas with a minimum of 30 metre distance away from the ditches, drains and outlets that facilitate stormwater conveyance.
- The unloading of the construction materials and soil stockpiling will be performed in areas with at least a 30 metre distance from the ESC measures and ditches, drains and outlets that facilitate stormwater conveyance.
- All work along the Simpson Municipal Drain and existing drain outlets will only be done during dry weather. Weather forecasts will be monitored by contractors and construction scheduled accordingly.

6.2 Cover Vegetation

A major focus for control of sediments is to minimize the erosion potential.

- The existing vegetation cover will be removed progressively in sequence with the site development to minimize the area of removed vegetation during construction.
- Best management practices for erosion control, as described below, will be used until the vegetation cover is re-established.
- Any soil stockpiles that are left in place for prolonged periods of time will be seeded to establish vegetation.
- Until vegetation is established, an erosion control blanket may be utilized and placed over the seeded areas, depending on the site location.

6.3 Grading and Soil Stockpiles

- The extent of disturbed areas and soil stockpiles (and the stockpile orientation with respect to prevailing wind directions) will be limited, as practical.
- To provide separation and assist in potential impacts from surface erosion, stockpiled materials will not be placed closer than 30 metres from ESC measures.
- Surface drainage will be inspected visually during construction to provide temporary grading such that runoff is directed towards suitable outlets.

6.4 Silt Fence and Straw Bale Barriers

- Prior to regrading the existing soil or placement of new soil materials on the north and/or south sides of the Simpson Drain, silt fence barriers will be installed adjacent to the Simpson Drain, on both the northern and southern sides of the buffer strip, to protect the watercourse from sediments entering the drain. The type of silt fence geotextile and number of tiers (layers) required for each sub-catchment area will be selected as part of the Final ESC design and included in the SNC work permit application.
- Silt fence tiers will also be installed around the perimeter of the site, where there are existing roadside ditches that facilitate drainage. The silt fence will be positioned adjacent to the side of the ditch within the site limits. The fence should extend to the final outlets to the north and south to control the amount of sediments that enter the outlets and ensure these ditches will not be blocked by the accumulated debris.
- To the extent possible, the silt fences should be installed perpendicular to the water runoff direction.
- Prior to filling the on-site ditches that outlet to the Regimbald and Wilson-Johnston Drains and any earthwork adjacent to these drains, straw bale barriers will be installed upstream of the existing culverts under Frontier Road.
- The silt fence and straw bale barriers installed along the perimeters of the site where a drainage ditch exists will remain in place until vegetation cover is re-established.

6.5 Rock Check Dams

- Rock check dams (150 mm D_{50} stone) are proposed upstream of the Regimbald and Wilson-Johnston culverts that convey drainage under Frontier Road to east of the site. These rock checks dams would be downstream of the above mentioned straw bale barriers.
- The height and width of the check dams will be determined as appropriate for the specific entrance channel/area and culvert. The width of the check dams will not be less than the opening of each respective culvert.

6.6 Settling Basin / Dewatering Trap

- For cut operations in areas with high groundwater level at the time of excavation, the excavation area will be pumped and water will be discharged directly to a temporary treatment train consisting of a siltation bag and/or sedimentation pond or dewatering trap.
- The location of the treatment train is expected to shift as construction proceeds in various areas of the site. The treated discharge from the dewatering trap will sheet flow toward the outlets.

6.7 Inspection and Maintenance

- The ESC measures will be inspected on a daily basis by Contractor personnel.
- Any maintenance, including the removal of accumulated sediment will be carried out as required.
- The water removed from dewatering of accumulated sediments will also be directed to a sedimentation pond or dewatering traps.
- Any catch basins and maintenance holes will be temporarily protected by berms and/or covers to control the amount of sediments entering the storm sewers.

6.8 Works Within the Simpson Drain

- Work within the Simpson Municipal Drain will only be done during dry weather. Weather forecasts will be monitored by the Contractor and construction scheduled accordingly.
- Due to the low gradient of the drain, even during dry weather there will likely be a small base flow or ponded water within the drain. Temporary cofferdams may need to be installed to isolate the work area so that the work can be done in the dry. Water accumulation / flow in the drain would be temporarily managed, as required, by pumping from upstream to downstream of the work area.
- Straw bale barriers and/or other silt control barriers will be installed directly downstream of the location of the two new culverts prior to installation. Rip-rap will be installed at the inlet and outlet of the culverts as per OPSS 511 and OPSD 810.010, underlain with geotextile including the drain side slopes.
- The installation of the two additional service crossings for the leachate and landfill gas conveyance pipes will be installed via open cut across the drain. Temporary cofferdams and silt control barriers will be used to isolate the work area. The excavation will need to be kept dry and will include a dewatering pump with discharge to a sedimentation pond or similar silt removal system, as mentioned above. If it is anticipated that the duration of the installation work will result in excessive build-up of water upstream of the cofferdam, a temporary bypass system may also need to be installed to pump base flow in the Simpson Drain around the work area.

7.0 EROSION AND SEDIMENT CONTROL PLAN – OPERATIONS

- Where cover vegetation is not established, erosion control blankets or other erosion control measures such as diversion berms will be used on new external landfill slopes.
- The Simpson Drain will be protected by a buffer zone adjacent to both the north and south sides of the drain. No construction or landfill operation will be carried out within 10 metres from the drain.
- The two proposed culverts in the Simpson Drain under the proposed access roads will be inspected and maintained on a regular basis, as required.
- The reinstated roadside ditches will be separated by the perimeter vegetated strip from active landfill operation on-site, and additional temporary or permanent ESC measures, i.e., silt fencing will be implemented adjacent to these ditches as and if required.
- A tire wash facility will be located on-site to reduce transport of material on truck tires from the landfill area. Similarly, the majority of access roads and traffic areas north of the Simpson Drain will be paved to minimize dust potential and subsequent transport of fines via runoff

Signature Page

We trust that this report meets your current needs. If you have any questions, or if we may be of further assistance, please contact the undersigned.

Golder Associates Ltd.

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TL/MHK/DVK/ca/lc
https://golderassociates.sharepoint.com/sites/18733g/technical work/phase 500 detailed design/task 5.1 civil engineering/reporting/6. final swm report dec 2018/1787048-001-r-revc-crrrc swm-17dec2018.docx

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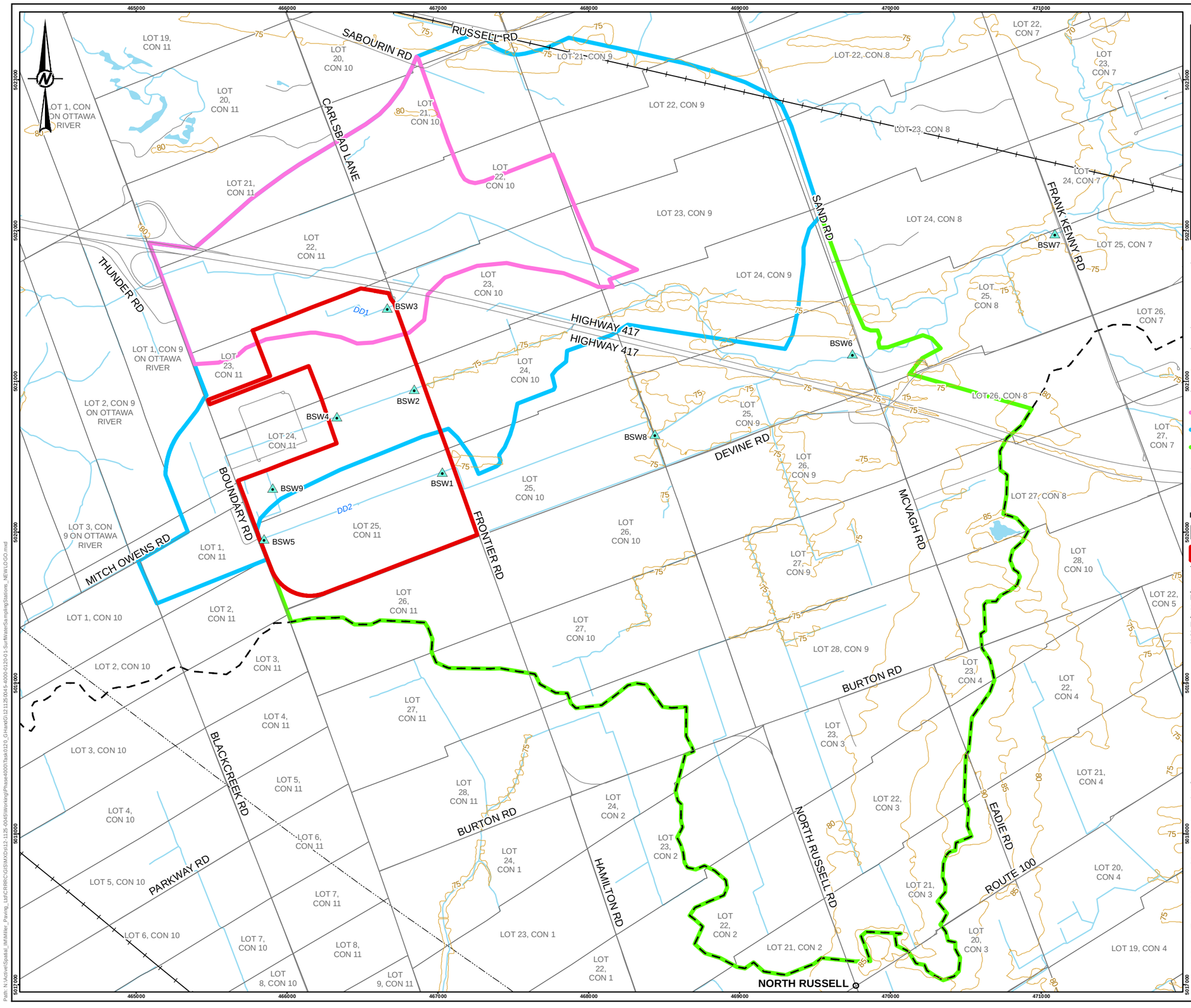
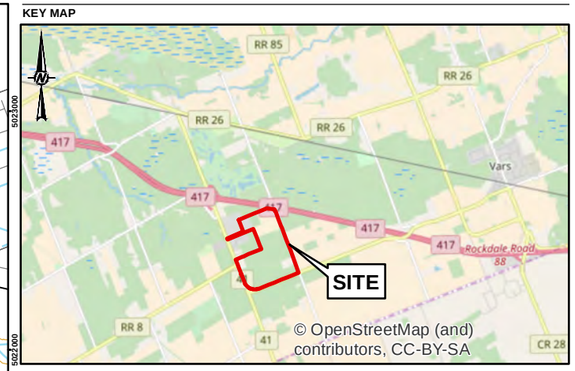


KEY MAP



SCALE 1:150,000

LEGEND

- POPULATED PLACENAME
- SURFACE WATER SAMPLING STATION
- ROAD
- RAIL ROAD
- CONTOUR LINE, (5m)
- UTILITY LINE
- REGIMBALD MUNICIPAL DRAIN BOUNDARY
- SIMPSON MUNICIPAL DRAIN BOUNDARY
- WILSON-JOHNSTON MUNICIPAL DRAIN BOUNDARY
- SURFACE WATER FEATURE
- WATER AREA
- SUBWATERSHED DIVIDE
- LOT/CONCESSION
- PROPERTY BOUNDARY

NOTE(S)

1. ALL LOCATIONS ARE APPROXIMATE

REFERENCE(S)

1. LAND INFORMATION ONTARIO (LIO) DATA PRODUCED BY GOLDER ASSOCIATES LTD. UNDER LICENCE FROM ONTARIO MINISTRY OF NATURAL RESOURCES, © QUEENS PRINTER 2012.
2. PROJECTION: TRANSVERSE MERCATOR DATUM: NAD 83 COORDINATE SYSTEM: UTM ZONE 18

0 250 500 1,000

1:25,000 METRES

CLIENT

TAGGART MILLER ENVIRONMENTAL SERVICES

PROJECT

CAPITAL REGION RESOURCE RECOVERY CENTRE

TITLE

KEY PLAN AND SURFACE WATER FEATURES

CONSULTANT

GOLDER

YYYY-MM-DD	2014-07-21
DESIGNED	JPAO
PREPARED	BR
REVIEWED	PLE
APPROVED	PAS

PROJECT NO.	CONTROL	REV.	FIGURE
12-1125-0045	4000	0	1

IF THIS MEASUREMENT DOES NOT MATCH WHAT IS SHOWN, THE SHEET SIZE HAS BEEN MODIFIED FROM: 25mm

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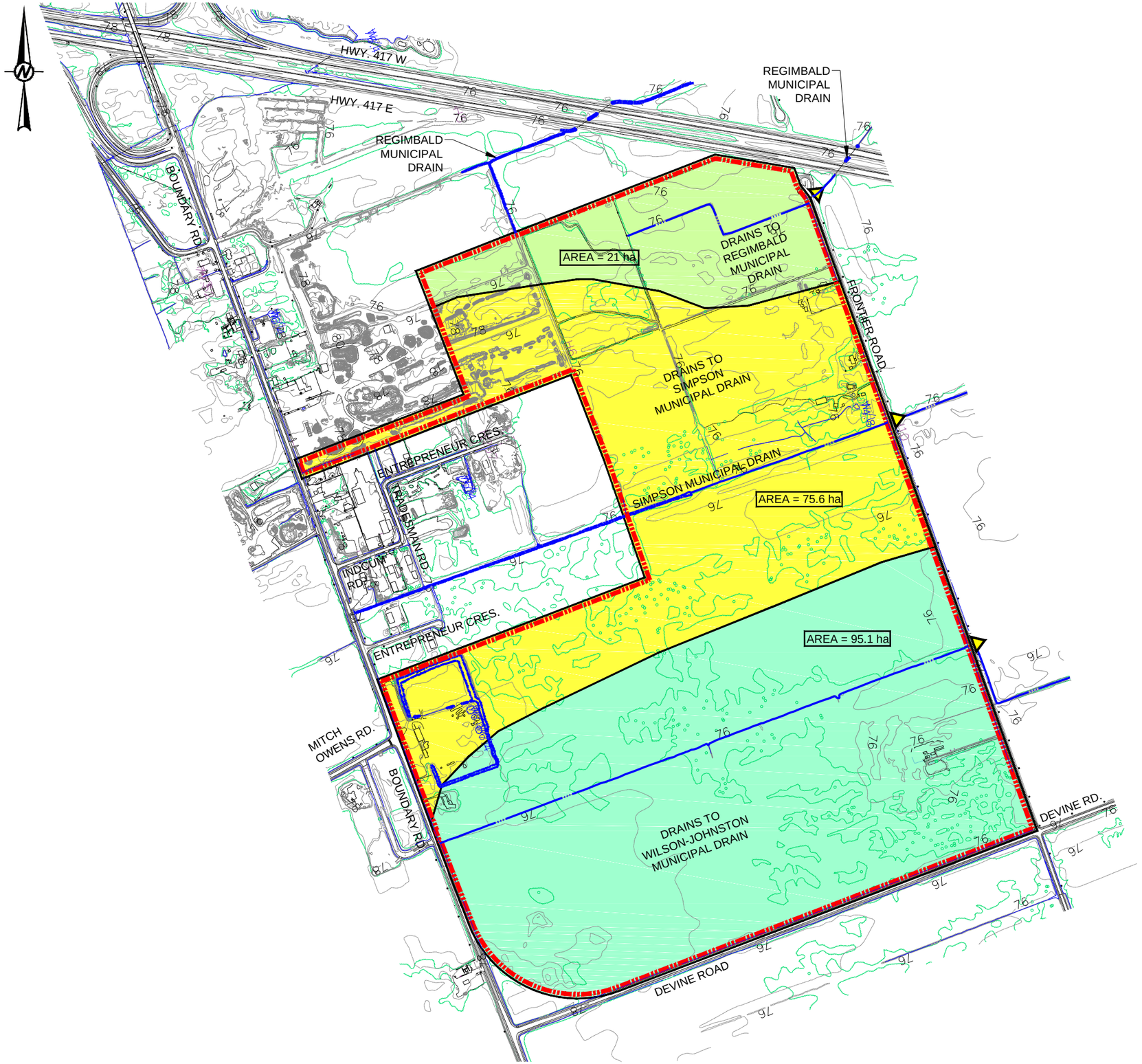


LEGEND

- PROPERTY BOUNDARY
- SURFACE WATER
- OUTLET
- DRAINAGE AREA BOUNDARY

REFERENCE(S)

1. BASE DRAWING PROVIDED IN A DIGITAL FORMAT BY BASE MAPPING CO. LTD., CONTRACT NO. 2517-12, PHOTO DATE: NOVEMBER 7, 2012, DATE RECEIVED: JANUARY 9, 2013.
2. PROJECTION: TRANSVERSE MERCATOR DATUM: NAD 83 COORDINATE SYSTEM: UTM ZONE 18.
3. MUNICIPAL DRAIN BOUNDARIES FROM TOWNSHIP OF CUMBERLAND MUNICIPAL DRAIN & MUTUAL AGREEMENT PREPARED BY STANTEC, REVISED MARCH 2000.

0 250 500
1:10,000 METRES

CLIENT
TAGGART MILLER ENVIRONMENTAL SERVICES

PROJECT
CAPITAL REGION RESOURCES RECOVERY CENTRE

TITLE
PRE-DEVELOPMENT DRAINAGE AREAS

CONSULTANT
GOLDER

YYYY-MM-DD	2016-06-06
DESIGNED	M.L.F.
PREPARED	D.H.
REVIEWED	D.V.K.
APPROVED	P.A.S.

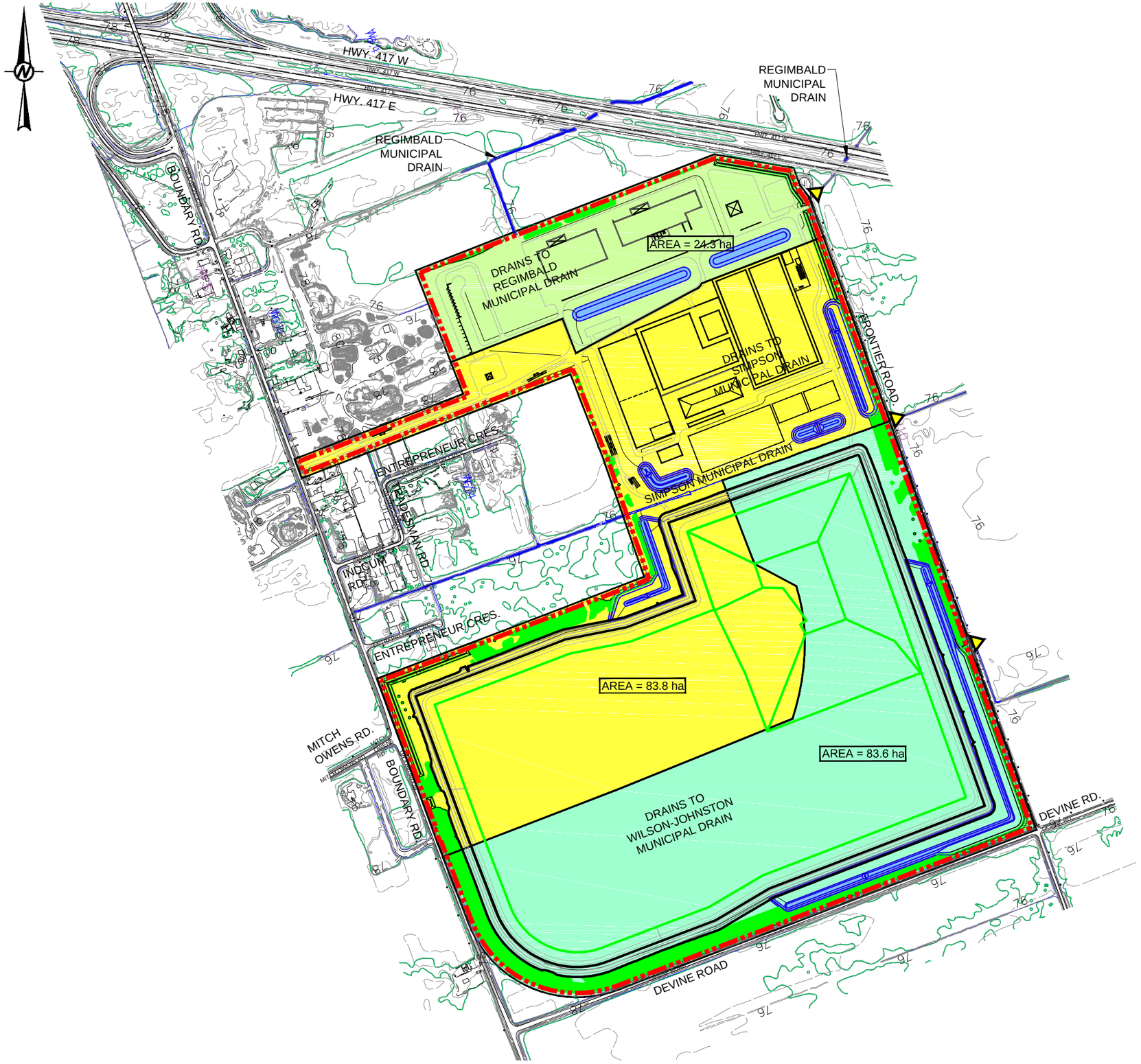
PROJECT NO.	PHASE	REV.	FIGURE
1787048	4000	0	2

IF THIS MEASUREMENT DOES NOT MATCH WHAT IS SHOWN, THE SHEET SIZE HAS BEEN MODIFIED FROM: ANSI B

25 mm

0

Path: \\golder.gds\ga\ottawa\Active\Spatial_MM\Miller_Paving_Ltd\CRRRC\ACAD\1787048#40_PROD\0010_Drainage\ | File Name: 1787048-0010-Storm-Fig 2.dwg | Last Edited By: jmcconnell Date: 2018-06-06 Time:2:40:43 PM | Printed By: jmcconnell Date: 2018-06-06 Time:2:41:16 PM



LEGEND

- PROPERTY BOUNDARY
- SURFACE WATER
- OUTLET
- DRAINAGE AREA BOUNDARY

REFERENCE(S)

1. BASE DRAWING PROVIDED IN A DIGITAL FORMAT BY BASE MAPPING CO. LTD., CONTRACT NO. 2517-12, PHOTO DATE: NOVEMBER 7, 2012, DATE RECEIVED: JANUARY 9, 2013.
2. PROJECTION: TRANSVERSE MERCATOR DATUM: NAD 83 COORDINATE SYSTEM: UTM ZONE 18

0 250 500
1:10,000 METRES

CLIENT
TAGGART MILLER ENVIRONMENTAL SERVICES

PROJECT
CAPITAL REGION RESOURCES RECOVERY CENTRE

TITLE
POST-DEVELOPMENT DRAINAGE AREAS

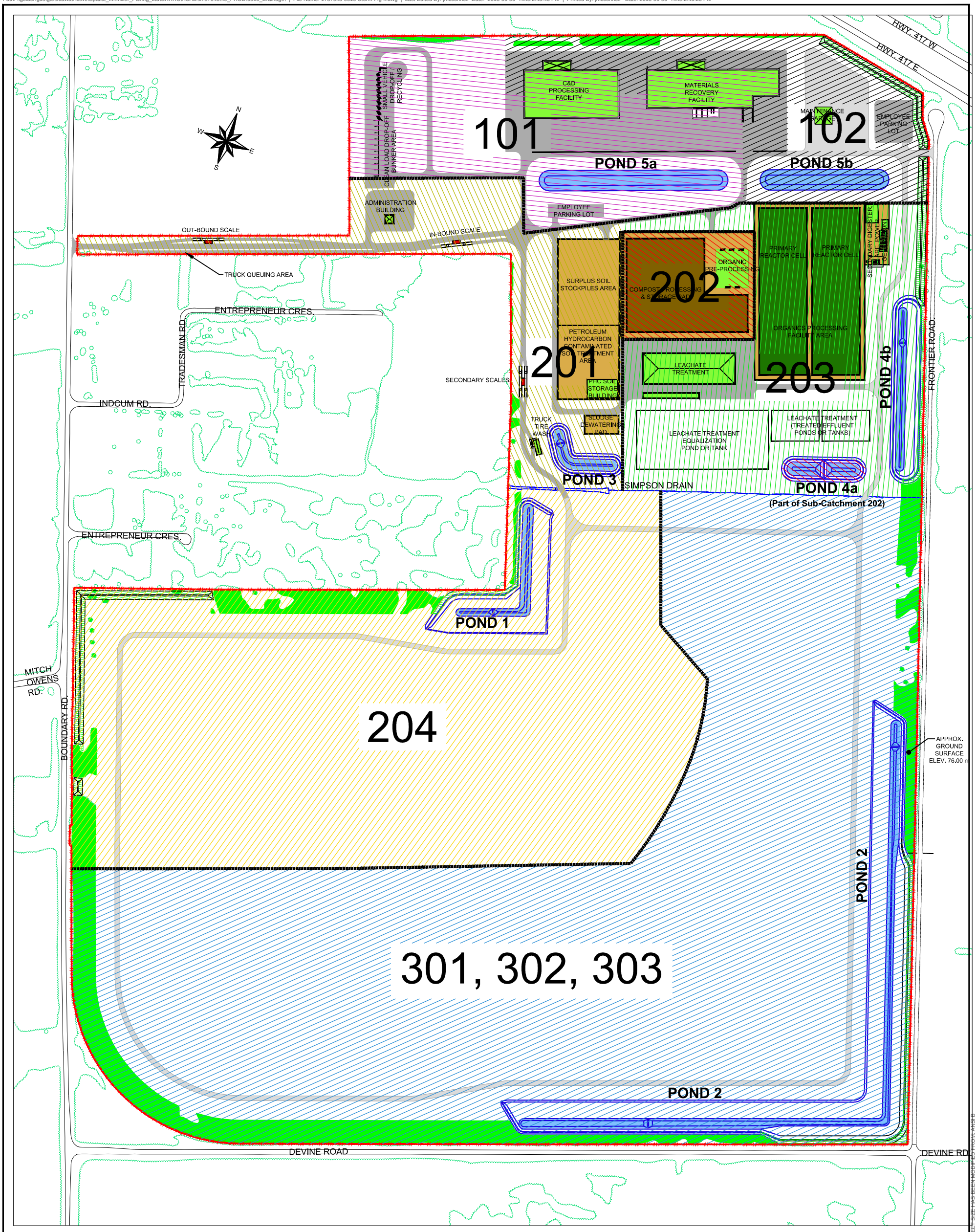
CONSULTANT
GOLDER

YYYY-MM-DD	2018-06-06
DESIGNED	M.L.F.
PREPARED	D.H.
REVIEWED	D.V.K.
APPROVED	P.A.S.

PROJECT NO.	PHASE	REV.	FIGURE
1787048	4000	0	3

IF THIS MEASUREMENT DOES NOT MATCH WHAT IS SHOWN, THE SHEET SIZE HAS BEEN MODIFIED FROM ANSI B
25 mm
0

Path: \\golder.gds\gal\ottawa\Active\Spatial_IM\Miller_Paving_Ltd\CRRRC\ACAD\1787048\40_PROD\0010_Drainage\ | File Name: 1787048-0010-Storm-Fig 3.dwg | Last Edited By: jmcconnell Date: 2018-06-06 Time:2:42:47 PM | Printed By: jmcconnell Date: 2018-06-06 Time:2:43:27 PM



LEGEND

- FACILITY BUILDINGS
- OUTDOOR DIVERSION AREA
- PAVED ROAD (ASPHALT)
- GRAVEL ROAD
- PROPERTY BOUNDARY
- EXISTING VEGETATION SCREENING
- CONSTRUCTED SCREENING FEATURE
- PERIMETER BERM CONTOURS (interval 1 m)
- STORMWATER MANAGEMENT PONDS

203 SUB-CATCHMENT AREA NUMBER

0 250 500
1:10,000 METRES

IF THIS MEASUREMENT DOES NOT MATCH WHAT IS SHOWN, THE SHEET SIZE HAS BEEN MODIFIED FROM ANSI B
25 mm
0

CLIENT
TAGGART MILLER ENVIRONMENTAL SERVICES

PROJECT
CAPITAL REGION RESOURCES RECOVERY CENTRE

CONSULTANT
GOLDER

YYYY-MM-DD	2018-06-06
DESIGNED	M.L.F.
PREPARED	M.L.F
REVIEWED	D.V.K
APPROVED	P.A.S.

TITLE
SUB-CATCHMENT PLAN

PROJECT NO.	PHASE	REV.	FIGURE
1787048	4000	0	4

ATTACHMENT A.1

SWM Model Development

A.1 Hydrologic Model Input Summary Tables

1.0 HYDROLOGICAL PARAMETER SELECTION

The existing Site condition were determined to have five significant land use types: Scrubland; Woods; Pavement; Gravel; and Grasslands. The Manning's n coefficient, depression storage depth and SCS Curve Number values assigned for each of these land use types are summarized in Table A.1.2. In addition to the five significant land use types identifies for the pre-development scenario, Vegetated Slope, and ravel land use types have also been incorporated into the post-development input parameters identified for each land use type.

Tables A.1.1 to A.1.5 summarize the pre-development and post-development hydrological input parameters for representing the Site conditions. Subsurface investigations performed by Golder were also utilized to identify the clay soil type parameters such as the curve number, depression storage, Manning's n coefficient and the land use. These parameters were defined based on published literature values and Site investigations. Based on the subsurface investigations, Hydrologic Soil Type D was found to be the most appropriate soil type used in analysis. For further information on the published literature values, see the references in the footnotes on Page 2.

2.0 HYDROLOGIC MODEL INPUT SUMMARY TABLES

Table A.1.1: 24-hour Rainfall at City of Ottawa, CDA RCS Weather Station

Return Period (yrs)	Rainfall Depth (mm)
2	33.0
5	72.1
10	87.6
25	103.9
50	115.8
100	128.1

Note: The total depths were distributed over a 24-hour time period using 15-minute intensity intervals and a SCS Type II rainfall distribution.

Table A.1.2: Pre-Development Land Use Hydrologic Input Parameters

	Scrubland	Woods	Paved Road	Gravel	Grassland
Manning's n[1]	0.15	0.4	0.012	0.024	0.035
Depression Storage[2] (mm)	5	8	2	2	4
SCS Curve Number[3]	77	70	98	89	71

Table A.1.3: Post-Development Land Use Hydrologic Input Parameters

	Scrubland	Woods	Paved Road	Gravel	Grassland	Landfill Slope
Manning's n[1]	0.15	0.4	0.012	0.024	0.035	0.013
Depression Storage (mm)[2]	5	8	2	2	4	5
SCS Curve Number[3]	77	70	98	89	71	82

Table A.1.4: Pre-Development Sub-Catchment Hydrologic Input Parameters

Sub-Catchment	Area (ha)	Width (m)	Slope (%)	Impervious (%)	N Pervious	Dep. Stor. Pervious (mm) [2]	Curve Number[3]
E101	21.0	200	0.1	10	0.133	4	86.8
E201	42.3	220	0.125	7.5	0.165	4	85.1
E202	33.3	150	0.343	0	0.213	6	76.7
E301	95.1	250	0.167	7.5	0.184	5	80.6

Table A.1.5: Post-Development Sub-Catchment Hydrologic Input Parameters

Sub-Catchment	Area (ha)	Width (m)	Slope (%)	Impervious (%)	N Pervious	Dep. Stor. Pervious (mm) [2]	Curve Number[3]
P101	14.9	125	0.05	70	0.012	4	88.9
P102	9.51	125	0.076	70	0.012	4	88.9
P201	12.9	250	0.4	75	0.012	4	91.9
P202	4.20	100	0.5	90	0.012	5	95.3
P203	16.26	250	0.4	75	0.012	4	91.9
P204	48.30	640	6.0	10	0.012	5	79.0
P301	41.81	670	6.0	10	0.012	4	74.0
P302	27.87	430	6.0	10	0.012	4	72.6
P303	13.94	300	6.0	10	0.012	4	79.0

Note: Leachate Treatment Ponds (1.9ha Equalization Pond and 0.66ha Effluent Pond) are not included in the P203 Drainage Area

[1] McCuen, R. et al. (1996), *Hydrology*, FHWA-SA-96-067, Federal Highway Administration, Washington, DC

[2] ASCE, (1992), *Design & Construction of Urban Stormwater Management Systems*, New York, NY

[3] *SCS Urban Hydrology for Small Watershed*, *2nd Ed.*, (TR-55)

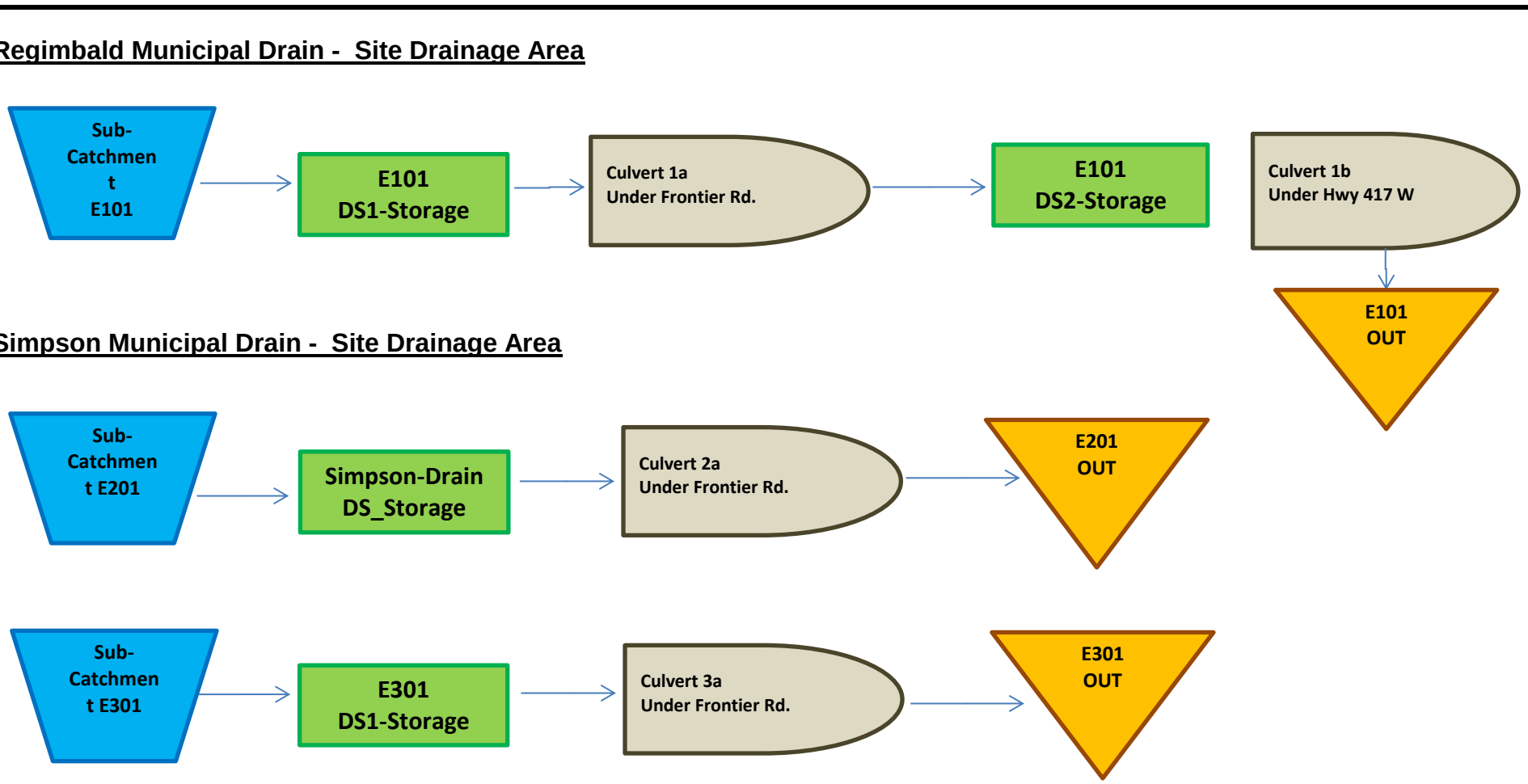
ATTACHMENT A.2

Existing and Proposed SWMM5 Schematics

Figure A-1 – Existing Scenario SWMM5 Schematic

Figure A-2 – Proposed Scenario SWMM5 Schematic

Figure A-1: Existing Scenario SWMM5 Schematic

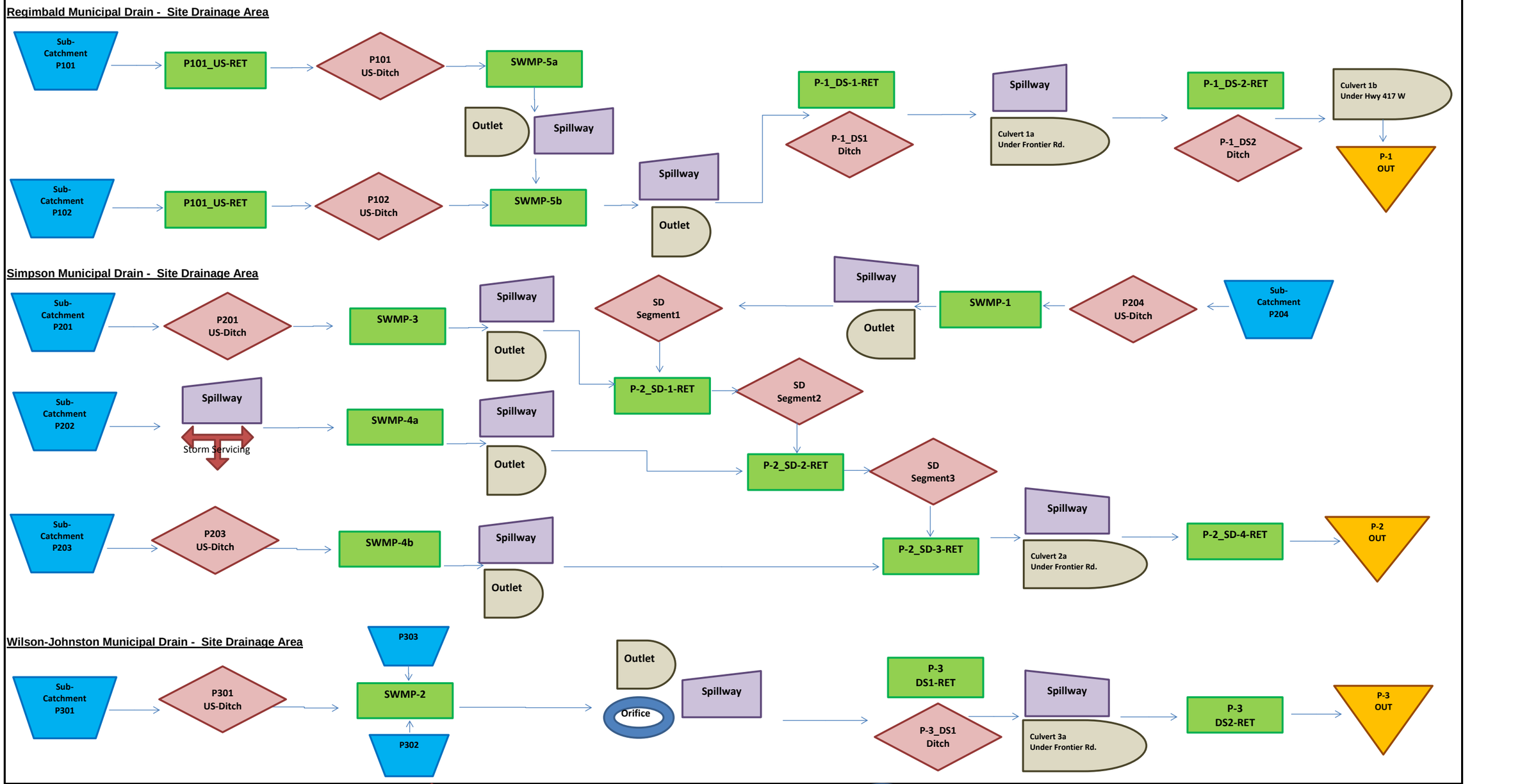


PROJECT: 1787048
DATE: June 2018

Golder Associates

DRAWN: JSA
CHECK: TL

Figure A-2: Proposed Scenario SWMM5 Schematic



PROJECT: 1787048
DATE: June 2018

Golder Associates

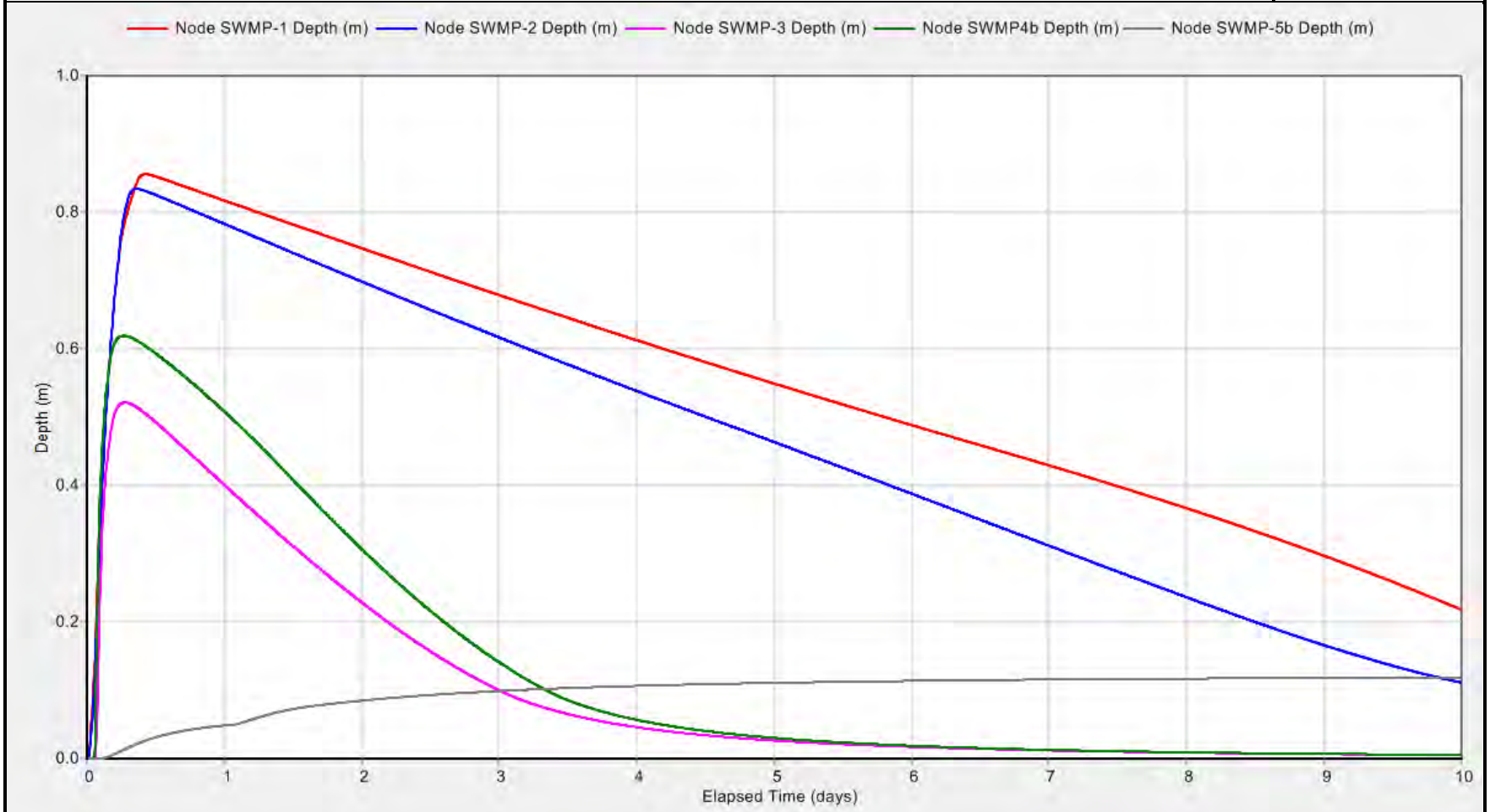
DRAWN: JSA
CHECK: TL

ATTACHMENT A.3

24 hr Detention Time Assessment / Verification Hydrographs

Figure A-3 – 25mm – 4 hr, City of Ottawa Design Storm Hydrographs for CRRRC SWMPs

CRRRC - SWMPs - Depths above NWL (m) - 25 mm, 4 hr Design Storm	Figure A-3



PROJECT: 1787048
DATE: December 2018

GOLDER

DRAWN: TL
CHECK:

ATTACHMENT A.4

SWMM5 Model Outputs

```
EPA STORM WATER MANAGEMENT MODEL - VERSION 5.1 (Build 5.1.011)
--------------------------------------------------------------

WARNING 04: minimum elevation drop used for Conduit SWMP5a-Outlet
WARNING 04: minimum elevation drop used for Conduit P-2_SD-4-Ditch
WARNING 04: minimum elevation drop used for Conduit SWMP5a-Outlet_2
WARNING 04: minimum elevation drop used for Conduit SWMP5a-Outlet_3
WARNING 02: maximum depth increased for Node P-2C_1
WARNING 02: maximum depth increased for Node P-2C_2
WARNING 02: maximum depth increased for Node P-3-SW_SWM-Ditch
WARNING 02: maximum depth increased for Node P-3_1
WARNING 02: maximum depth increased for Node SWMP3-OrificeOutlet
WARNING 02: maximum depth increased for Node SWMP1-OrificeOutlet
WARNING 02: maximum depth increased for Node SWMP4b-OrificeOutlet
WARNING 02: maximum depth increased for Node SWMP5b-OrificeOutlet

*****************************************************
NOTE: The summary statistics displayed in this report are
based on results found at every computational time step,
not just on results from each reporting time step.
*****************************************************

****************
Analysis Options
****************
Flow Units ............... CMS
Process Models:
  Rainfall/Runoff ........ YES
  RDII ................... NO
  Snowmelt ............... NO
  Groundwater ............ YES
  Flow Routing ........... YES
  Ponding Allowed ........ YES
  Water Quality .......... NO
Infiltration Method ...... CURVE_NUMBER
Flow Routing Method ...... DYNWAVE
Starting Date ............ 07/14/2013 00:00:00
Ending Date .............. 07/24/2013 00:00:00
Antecedent Dry Days ...... 0.0
Report Time Step ......... 00:05:00
Wet Time Step ............ 00:05:00
Dry Time Step ............ 01:00:00
Routing Time Step ........ 30.00 sec
Variable Time Step ....... YES
Maximum Trials ........... 8
Number of Threads ........ 1
Head Tolerance ........... 0.001500 m
```

Runoff Quantity Continuity	Volume hectare-m	Depth mm
Total Precipitation	10.447	55.075
Evaporation Loss	0.000	0.000
Infiltration Loss	4.668	24.610
Surface Runoff	5.515	29.074
Final Storage	0.277	1.460
Continuity Error (%)	-0.125	

Groundwater Continuity	Volume hectare-m	Depth mm
Initial Storage	13.786	104.500
Infiltration	4.350	32.972
Upper Zone ET	0.000	0.000
Lower Zone ET	0.000	0.000
Deep Percolation	0.000	0.000
Groundwater Flow	4.349	32.968
Final Storage	13.786	104.500
Continuity Error (%)	0.003	

Flow Routing Continuity	Volume hectare-m	Volume 10^6 ltr
Dry Weather Inflow	0.000	0.000
Wet Weather Inflow	5.511	55.113
Groundwater Inflow	4.350	43.495
RDII Inflow	0.000	0.000
External Inflow	0.000	0.000
External Outflow	5.582	55.817
Flooding Loss	0.000	0.000
Evaporation Loss	0.000	0.000
Exfiltration Loss	0.000	0.000
Initial Stored Volume	0.000	0.000
Final Stored Volume	4.310	43.105
Continuity Error (%)	-0.318	

****
Highest Continuity Errors
****
Node SWMP4a (16.17%)
Node P-1_DS-1-RET (-14.12%)

Node SWMP5b-OrificeOutlet (9.77%)
Node SWMP-5b (3.18%)
Node SWMP-3 (3.18%)

****
Time-Step Critical Elements
****
Link SWMP5a-Outlet (17.87%)
Link P301_SWM-Inlet (2.34%)

****
Highest Flow Instability Indexes
****
Link SWMP2-Outlet (83)
Link SWMP1-Outlet (74)
Link SWMP5b-Orifice (51)
Link SWMP5b-Outlet (51)
Link Culvert-1a (48)

****
Routing Time Step Summary
****
Minimum Time Step : 18.70 sec
Average Time Step : 29.59 sec
Maximum Time Step : 30.00 sec
Percent in Steady State : 0.00
Average Iterations per Step : 3.69
Percent Not Converging : 0.25

****
Subcatchment Runoff Summary
****

Subcatchment	Total Precip mm	Total Runon mm	Total Evap mm	Total Infil mm	Total Runoff mm	Total Runoff 10^6 ltr	Peak Runoff CMS	Runoff Coeff

P101			55.08	0.00	0.00	7.09	46.23
6.89	0.61	0.839					
P102			55.07	0.00	0.00	7.01	46.34
4.41	0.60	0.841					
P201			55.08	0.00	0.00	4.82	48.55
6.26	1.36	0.882					
P202			55.07	0.00	0.00	1.25	51.92
2.18	0.59	0.943					
P203			55.08	0.00	0.00	4.85	48.50
7.89	1.49	0.881					
P204			55.07	0.00	0.00	31.66	22.15
10.70	2.10	0.402					
P301			55.08	0.00	0.00	34.03	19.87
8.31	1.79	0.361					
P302			55.08	0.00	0.00	34.89	18.92
5.27	1.15	0.343					
P303			55.08	0.00	0.00	30.50	23.31
3.25	0.75	0.423					

****
Groundwater Summary
****

Subcatchment	Total Infil mm	Total Evap mm	Total Lower Seepage mm	Total Lateral Outflow mm	Maximum Lateral Outflow CMS	Average Upper Moist.	Final Water Table m	Average Water Table m	Final Upper Moist.
P204	31.66	0.00	0.00	31.66	0.52	0.19	100.00	0.19	100.00
P301	34.03	0.00	0.00	34.02	0.53	0.19	100.00	0.19	100.00
P302	34.89	0.00	0.00	34.89	0.33	0.19	100.00	0.19	100.00
P303	30.50	0.00	0.00	30.50	0.15	0.19	100.00	0.19	100.00

****
Node Depth Summary
****

Node	Type	Average Depth Meters	Maximum Depth Meters	Maximum HGL Meters	Time of Max Occurrence days hr:min	Reported Max Depth Meters
P-1_DS-1_Node	JUNCTION	0.01	0.02	75.22	1 14:28	0.02
P202_Compost-Pad-Node	JUNCTION	0.01	0.42	76.42	0 12:08	0.42
EXT-2	JUNCTION	0.07	0.08	75.34	1 23:23	0.08
P-2C_1	JUNCTION	0.07	1.54	81.24	0 12:12	1.54
P-2C_2	JUNCTION	0.91	1.21	77.46	1 23:03	1.21
P-3-SW_SWM-Ditch	JUNCTION	0.52	1.07	77.22	0 12:07	1.00
SWMP3-OUT	JUNCTION	0.02	0.09	75.24	0 18:05	0.09
SWMP4-OUT	JUNCTION	0.00	0.00	75.20	0 00:00	0.00
P201_US-Node	JUNCTION	0.02	0.63	77.03	0 12:17	0.63
P203_US-Node	JUNCTION	0.05	0.51	76.51	0 12:06	0.48
SWMP1-OUT	JUNCTION	0.04	0.05	76.00	1 23:17	0.05
SWMP4b-OUT	JUNCTION	0.06	0.12	75.32	1 00:26	0.12
P-3_1	JUNCTION	0.10	1.58	81.28	0 12:36	1.58
SWMP3-OrificeOutlet	JUNCTION	0.04	0.10	75.35	0 18:04	0.10
SWMP2-OrificeOutlet	JUNCTION	0.10	0.10	75.14	2 12:00	0.10
SWMP1-OrificeOutlet	JUNCTION	0.06	0.07	76.07	1 22:11	0.07
SWMP4b-OrificeOutlet	JUNCTION	0.05	0.10	75.35	1 00:12	

0.10						
SWMP5b-OrificeOutlet	JUNCTION	0.17	0.23	76.03	1	12:21
0.23						
P-1_OUT	OUTFALL	0.03	0.09	74.09	1	15:10
0.09						
P-2_OUT	OUTFALL	0.02	0.04	74.54	2	17:38
0.04						
P-3_OUT	OUTFALL	0.05	0.05	74.89	1	16:35
0.05						
SWMP-1	STORAGE	1.14	1.46	77.46	1	23:03
1.46						
SWMP-2	STORAGE	1.01	1.27	76.62	1	14:09
1.27						
SWMP-3	STORAGE	0.27	0.92	76.17	0	18:04
0.92						
SWMP4a	STORAGE	1.20	1.26	74.66	10	00:00
1.26						
SWMP4b	STORAGE	0.41	1.06	76.31	1	00:12
1.06						
SWMP-5a	STORAGE	0.17	0.24	76.04	1	14:22
0.24						
SWMP-5b	STORAGE	0.17	0.24	76.04	1	14:23
0.24						
P-101_US-RET	STORAGE	0.21	0.97	76.97	0	16:44
0.97						
P102_US-RET	STORAGE	0.11	0.66	76.66	0	15:10
0.66						
P-1_DS-1-RET	STORAGE	1.41	1.58	76.03	1	14:36
1.58						
P-1_DS-2-RET	STORAGE	0.07	0.16	74.22	1	15:10
0.16						
P-2_SD-1-RET	STORAGE	0.21	0.34	75.09	0	19:16
0.34						
P-2_SD-2-RET	STORAGE	0.05	0.08	74.74	0	21:14
0.08						
P-2_SD-3-RET	STORAGE	0.56	0.64	74.70	2	17:29
0.64						
P-2_SD-4-RET	STORAGE	1.03	1.19	74.69	2	17:38
1.19						
P-3_DS-1-RET	STORAGE	0.09	0.11	75.08	1	15:54
0.11						
P-3_DS-2-RET	STORAGE	0.21	0.23	75.06	1	16:35
0.23						

****
Node Inflow Summary
****

Node	Type	Maximum Lateral Inflow CMS	Maximum Total Inflow CMS	Time of Max Occurrence days hr:min	Total Inflow Volume 10^6 ltr	Flow Balance Error Percent
P-1_DS-1_Node	JUNCTION	0.000	0.032	1 14:21	0	5.5 0.252
P202_Compost-Pad-Node	JUNCTION	0.594	0.594	0 12:05	2.18	2.18 -0.760
EXT-2	JUNCTION	0.000	0.021	1 23:07	0	15.2 0.156
P-2C_1	JUNCTION	2.098	2.098	0 12:05	10.7	10.7 -0.759
P-2C_2	JUNCTION	0.000	1.441	0 16:02	0	12.1 2.395
P-3-SW_SWM-Ditch	JUNCTION	1.152	1.396	0 12:05	5.27	13.9 0.433
SWMP3-OUT	JUNCTION	0.000	0.047	0 18:05	0	6.22 -0.002
SWMP4-OUT	JUNCTION	0.000	0.000	0 00:00	0	0 0.000 ltr
P201_US-Node	JUNCTION	1.363	1.363	0 12:05	6.26	6.26 -3.105
P203_US-Node	JUNCTION	1.494	1.494	0 12:05	7.88	7.88 -0.303
SWMP1-OUT	JUNCTION	0.000	0.022	1 23:27	0	15.2 -0.098
SWMP4b-OUT	JUNCTION	0.000	0.028	1 00:13	0	7.83 -0.009
P-3_1	JUNCTION	1.794	1.794	0 12:05	8.3	8.3 -4.031
SWMP3-OrificeOutlet	JUNCTION	0.000	0.047	0 18:04	0	6.22 0.000
SWMP2-OrificeOutlet	JUNCTION	0.000	0.039	1 14:09	0	29.7 0.134
SWMP1-OrificeOutlet	JUNCTION	0.000	0.021	1 23:04	0	15.2 0.155
SWMP4b-OrificeOutlet	JUNCTION	0.000	0.028	1 00:12	0	

7.83	0.000						
SWMP5b-OrificeOutlet		JUNCTION	0.000	0.039	1	19:50	0
5.84	10.832						
P-1_OUT		OUTFALL	0.000	0.031	1	15:10	0
5.45	0.000						
P-2_OUT		OUTFALL	0.000	0.047	2	17:38	0
21.5	0.000						
P-3_OUT		OUTFALL	0.000	0.039	1	16:35	0
28.9	0.000						
SWMP-1		STORAGE	0.517	2.170	0	15:47	15.3
27.1	-0.234						
SWMP-2		STORAGE	1.402	2.510	0	12:07	31.4
45.3	0.099						
SWMP-3		STORAGE	0.000	0.928	0	12:23	0
6.46	3.282						
SWMP4a		STORAGE	0.000	0.506	0	12:08	0
2.19	19.284						
SWMP4b		STORAGE	0.000	1.470	0	12:07	0
7.91	0.344						
SWMP-5a		STORAGE	0.000	0.090	0	17:58	0
6.81	0.924						
SWMP-5b		STORAGE	0.000	0.091	0	21:33	0
8.52	3.286						
P-101_US-RET		STORAGE	0.608	0.608	0	12:10	6.89
6.89	-0.614						
P102_US-RET		STORAGE	0.600	0.600	0	12:05	4.41
4.41	-1.560						
P-1_DS-1-RET		STORAGE	0.000	0.045	0	21:03	0
5.26	-12.375						
P-1_DS-2-RET		STORAGE	0.000	0.032	1	14:28	0
5.48	0.193						
P-2_SD-1-RET		STORAGE	0.000	0.067	0	18:15	0
21.4	0.299						
P-2_SD-2-RET		STORAGE	0.000	0.090	0	21:01	0
29.1	0.037						
P-2_SD-3-RET		STORAGE	0.000	0.022	0	21:14	0
8.01	1.268						
P-2_SD-4-RET		STORAGE	0.000	0.089	0	22:08	0
28.6	0.082						
P-3_DS-1-RET		STORAGE	0.000	0.040	1	02:56	0
29.6	-0.132						
P-3_DS-2-RET		STORAGE	0.000	0.039	1	14:18	0
29.6	0.058						

****
Node Surcharge Summary
****

No nodes were surcharged.

****
Node Flooding Summary
****

No nodes were flooded.

****
Storage Volume Summary
****

Storage Unit	Average Volume 1000 m3	Avg Pcnt Full	Evap Pcnt Loss	Exfil Pcnt Loss	Maximum Volume 1000 m3	Max Pcnt Full	Time of Max Occurrence days hr:min	Maximum Outflow CMS
SWMP-1	16.390	35	0	0	22.697	48	1 23:03	1.261
SWMP-2	27.602	21	0	0	40.942	31	1 14:09	0.039
SWMP-3	0.927	15	0	0	3.427	54	0 18:04	0.047
SWMP4a	1.735	32	0	0	1.840	34	10 00:00	0.000
SWMP4b	2.037	21	0	0	6.323	64	1 00:12	0.028
SWMP-5a	2.750	7	0	0	3.861	10	1 14:22	0.029
SWMP-5b	2.511	7	0	0	3.517	10	1 14:23	0.039
P-101_US-RET	0.569	2	0	0	3.697	16	0 16:44	0.090
P102_US-RET	0.277	1	0	0	2.170	9	0 15:10	0.072
P-1_DS-1-RET	0.465	57	0	0	0.536	66	1 14:36	0.032
P-1_DS-2-RET	0.043	0	0	0	0.102	1	1	

15:10	0.031						
P-2_SD-1-RET	0.107	4	0	0	0.188	7	0
19:16	0.066						
P-2_SD-2-RET	0.044	0	0	0	0.076	1	0
21:14	0.090						
P-2_SD-3-RET	0.369	7	0	0	0.428	8	2
17:29	0.022						
P-2_SD-4-RET	6.506	18	0	0	7.751	22	2
17:38	0.047						
P-3_DS-1-RET	0.052	0	0	0	0.060	0	1
15:54	0.039						
P-3_DS-2-RET	0.774	2	0	0	0.855	2	1
16:35	0.039						

****
Outfall Loading Summary
****

Outfall Node	Flow Freq Pcnt	Avg Flow CMS	Max Flow CMS	Total Volume 10^6 ltr
P-1_OUT	89.45	0.007	0.031	5.448
P-2_OUT	83.94	0.029	0.047	21.514
P-3_OUT	98.03	0.034	0.039	28.855
System	90.47	0.071	0.105	55.817

****
Link Flow Summary
****

Link	Type	Maximum |Flow| CMS	Time of Max Occurrence days	hr:min	Maximum |Veloc| m/sec	Max/ Full Flow	Max/ Full Depth
SWMP1-Outlet	CONDUIT	0.022	1	23:27	0.74	0.00	0.02
SWMP2-Outlet	CONDUIT	0.040	1	02:56	0.66	0.00	0.05
SWMP3-Outlet	CONDUIT	0.047	0	18:05	0.86	0.01	0.05
SWMP4a-Outlet	CONDUIT	0.000	0	00:00	0.00	0.00	0.00
SWMP4b-Outlet	CONDUIT	0.028	1	00:13	0.43	0.00	0.05
SWMP5a-Outlet	CONDUIT	0.010	0	21:30	0.22	0.64	0.40
SWMP5b-Outlet	CONDUIT	0.045	0	21:03	0.65	0.01	0.62
Culvert-1a	CONDUIT	0.032	1	14:21	2.00	0.01	0.05

Culvert-1b	CONDUIT	0.031	1	15:10	0.51	0.03	0.10
Culvert-2a	CONDUIT	0.022	0	23:07	0.51	0.01	0.11
Culvert-3a	CONDUIT	0.039	1	14:18	0.75	0.00	0.09
P101_US-Ditch	CONDUIT	0.090	0	17:58	0.26	0.25	0.44
P102_US-Ditch	CONDUIT	0.072	0	15:59	0.19	0.12	0.35
P-1_DS2-Ditch	CONDUIT	0.032	1	14:28	0.08	0.00	0.03
SD-Segment1	CONDUIT	0.021	1	23:24	0.15	0.00	0.10
P204_US-Ditch	CONDUIT	0.842	0	12:13	0.91	0.03	0.26
P204_SWM-Inlet	CONDUIT	1.921	0	15:47	1.35	0.03	0.72
P301_US-Ditch	CONDUIT	0.500	0	12:36	0.60	0.03	0.25
P301_SWM-Inlet	CONDUIT	1.231	0	12:07	1.98	0.28	0.47
SWMP3-Outfall-Channel	CONDUIT	0.047	0	18:06	0.14	0.00	0.11
SWMP1-Outfall	CONDUIT	0.021	1	23:07	0.27	0.00	0.02
P3_DS2-Ditch	CONDUIT	0.039	1	16:35	0.19	0.00	0.04
SD-Segment2	CONDUIT	0.066	0	19:26	0.19	0.00	0.07
SWMP4a_Outfall-Channel	CONDUIT	0.000	0	00:00	0.00	0.00	0.04
SD-Segment3	CONDUIT	0.022	0	21:14	0.13	0.00	0.17
P-2_SD-4-Ditch	CONDUIT	0.047	2	17:38	0.17	0.05	0.05
P201_US-Ditch	CONDUIT	0.928	0	12:23	0.47	0.15	0.45
P203_US-Ditch	CONDUIT	1.470	0	12:07	0.86	0.12	0.57
SWMP4b_Outfall-Channel	CONDUIT	0.028	1	00:20	0.49	0.01	0.05
P202_Storm-Outlet	CONDUIT	0.506	0	12:08	1.07	0.17	0.43
SWMP5a-Outlet_2	CONDUIT	0.010	0	21:30	0.22	0.64	0.40
SWMP5a-Outlet_3	CONDUIT	0.010	0	21:30	0.22	0.64	0.40
Culvert-2b	CONDUIT	0.068	0	21:14	1.40	0.01	0.42
SWMP2-Outlet_2	CONDUIT	0.000	0	00:00	0.00	0.00	0.14
SWMP2-Outlet_3	CONDUIT	0.000	0	00:00	0.00	0.00	0.14
SWMP2-Orifice	ORIFICE	0.039	1	14:09			1.00
SWMP3-Orifice	ORIFICE	0.016	0	18:04			1.00
SWMP1-Orifice	ORIFICE	0.001	1	23:03			0.02
SWMP4b-Orifice	ORIFICE	0.018	1	00:12			1.00
SWMP5b-Orifice	ORIFICE	0.039	1	19:50			0.34
SWMP1-Orifice_2	ORIFICE	0.020	1	23:27			1.00
SWMP3-Orifice_2	ORIFICE	0.032	0	18:04			0.23
SWMP4b-Orifice_2	ORIFICE	0.010	1	00:12			0.13
SWMP1-Overflow	WEIR	0.000	0	00:00			0.00
SWMP2_Overflow-Spillway	WEIR	0.000	0	00:00			0.00
SWMP3_Overflow-Spillway	WEIR	0.000	0	00:00			0.00
SWMPond4b-Spillover	WEIR	0.000	0	00:00			0.00
SWMP_5a-5b-Overflow-Weir	WEIR	0.000	0	00:00			0.00
SWM_5b-Overflow-Weir	WEIR	0.000	0	00:00			0.00
P-1_Frontier-Rd_Spillway	WEIR	0.000	0	00:00			0.00
P-3_SWMP-2_NE-Fronteir-Rd-Spill	WEIR	0.000	0	00:00			0.00
P-2-DS_Frontier-Rd-Spillway	WEIR	0.000	0	00:00			0.00

****
Flow Classification Summary
****

Conduit	Adjusted /Actual Length	Fraction of Time in Flow Class: Dry	Up Dry	Down Dry	Sub Crit	Sup Crit	Up Crit	Down Crit	Norm Ltd	Inlet Ctrl
SWMP1-Outlet	1.00	0.00	0.00	0.00	0.01	0.99	0.00	0.00	0.00	0.00
SWMP2-Outlet	1.00	0.00	0.00	0.00	0.99	0.01	0.00	0.00	0.00	0.00
SWMP3-Outlet	1.00	0.02	0.00	0.00	0.48	0.51	0.00	0.00	0.00	0.00
SWMP4a-Outlet	1.00	1.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
SWMP4b-Outlet	1.00	0.01	0.00	0.00	0.99	0.00	0.00	0.00	0.99	0.00
SWMP5a-Outlet	1.00	0.03	0.00	0.00	0.97	0.00	0.00	0.00	0.00	0.00
SWMP5b-Outlet	1.00	0.03	0.00	0.00	0.95	0.02	0.00	0.00	0.05	0.00
Culvert-1a	1.00	0.10	0.00	0.00	0.00	0.90	0.00	0.00	0.00	0.00
Culvert-1b	1.00	0.10	0.00	0.00	0.90	0.00	0.00	0.00	0.00	0.00
Culvert-2a	1.00	0.08	0.00	0.00	0.83	0.00	0.00	0.09	0.00	0.00
Culvert-3a	1.00	0.00	0.00	0.00	0.98	0.02	0.00	0.00	0.26	0.00
P101_US-Ditch	1.00	0.01	0.00	0.00	0.99	0.00	0.00	0.00	0.69	0.00
P102_US-Ditch	1.00	0.01	0.00	0.00	0.99	0.00	0.00	0.00	0.85	0.00
P-1_DS2-Ditch	1.00	0.10	0.00	0.00	0.90	0.00	0.00	0.00	0.90	0.00
SD-Segment1	1.00	0.00	0.00	0.00	1.00	0.00	0.00	0.00	0.98	0.00

P204_US-Ditch	1.00	0.01	0.00	0.00	0.99	0.00	0.00	0.00	0.97
0.00									
P204_SWM-Inlet	1.00	0.00	0.02	0.00	0.98	0.00	0.00	0.00	0.04
0.00									
P301_US-Ditch	1.00	0.01	0.00	0.00	0.00	0.00	0.00	0.99	0.00
0.00									
P301_SWM-Inlet	1.00	0.00	0.35	0.00	0.64	0.00	0.00	0.00	0.99
0.00									
SWMP3-Outfall-Channel	1.00	0.01	0.01	0.00	0.98	0.00	0.00	0.00	0.98
0.00									
SWMP1-Outfall	1.00	0.00	0.00	0.00	1.00	0.00	0.00	0.00	0.99
0.00									
P3_DS2-Ditch	1.00	0.01	0.01	0.00	0.98	0.00	0.00	0.00	0.00
0.00									
SD-Segment2	1.00	0.01	0.00	0.00	0.99	0.00	0.00	0.00	0.00
0.00									
SWMP4a_Outfall-Channel	1.00	0.01	0.99	0.00	0.00	0.00	0.00	0.00	0.00
0.00									
SD-Segment3	1.00	0.01	0.00	0.00	0.99	0.00	0.00	0.00	0.96
0.00									
P-2_SD-4-Ditch	1.00	0.16	0.00	0.00	0.84	0.00	0.00	0.00	0.00
0.00									
P201_US-Ditch	1.00	0.01	0.00	0.00	0.99	0.00	0.00	0.00	0.96
0.00									
P203_US-Ditch	1.00	0.01	0.00	0.00	0.99	0.00	0.00	0.00	0.73
0.00									
SWMP4b_Outfall-Channel	1.00	0.01	0.00	0.00	0.99	0.00	0.00	0.00	0.31
0.00									
P202_Storm-Outlet	1.00	0.01	0.16	0.00	0.83	0.00	0.00	0.00	0.98
0.00									
SWMP5a-Outlet_2	1.00	0.03	0.00	0.00	0.97	0.00	0.00	0.00	0.00
0.00									
SWMP5a-Outlet_3	1.00	0.03	0.00	0.00	0.97	0.00	0.00	0.00	0.00
0.00									
Culvert-2b	1.00	0.01	0.00	0.00	0.94	0.05	0.00	0.00	0.96
0.00									
SWMP2-Outlet_2	1.00	0.00	1.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00									
SWMP2-Outlet_3	1.00	0.00	1.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00									

****
Conduit Surcharge Summary
****

	Hours	Hours

Conduit	Hours Full: Both Ends	Hours Full: Upstream	Hours Full: Dnstream	Above Full Normal Flow	Capacity Limited
SWMP5b-Outlet	0.01	0.01	220.91	0.01	0.01

Analysis begun on: Mon Dec 10 14:53:07 2018
Analysis ended on: Mon Dec 10 14:53:09 2018
Total elapsed time: 00:00:02

```
EPA STORM WATER MANAGEMENT MODEL - VERSION 5.1 (Build 5.1.011)
--------------------------------------------------------------

WARNING 04: minimum elevation drop used for Conduit SWMP5a-Outlet
WARNING 04: minimum elevation drop used for Conduit P-2_SD-4-Ditch
WARNING 04: minimum elevation drop used for Conduit SWMP5a-Outlet_2
WARNING 04: minimum elevation drop used for Conduit SWMP5a-Outlet_3
WARNING 02: maximum depth increased for Node P-2C_1
WARNING 02: maximum depth increased for Node P-2C_2
WARNING 02: maximum depth increased for Node P-3-SW_SWM-Ditch
WARNING 02: maximum depth increased for Node P-3_1
WARNING 02: maximum depth increased for Node SWMP3-OrificeOutlet
WARNING 02: maximum depth increased for Node SWMP1-OrificeOutlet
WARNING 02: maximum depth increased for Node SWMP4b-OrificeOutlet
WARNING 02: maximum depth increased for Node SWMP5b-OrificeOutlet

*****************************************************
NOTE: The summary statistics displayed in this report are
based on results found at every computational time step,
not just on results from each reporting time step.
*****************************************************

****************
Analysis Options
****************
Flow Units ............... CMS
Process Models:
  Rainfall/Runoff ........ YES
  RDII ................... NO
  Snowmelt ............... NO
  Groundwater ............ YES
  Flow Routing ........... YES
  Ponding Allowed ........ YES
  Water Quality .......... NO
Infiltration Method ...... CURVE_NUMBER
Flow Routing Method ...... DYNWAVE
Starting Date ............ 07/14/2013 00:00:00
Ending Date .............. 07/24/2013 00:00:00
Antecedent Dry Days ...... 0.0
Report Time Step ......... 00:05:00
Wet Time Step ............ 00:05:00
Dry Time Step ............ 01:00:00
Routing Time Step ........ 30.00 sec
Variable Time Step ....... YES
Maximum Trials ........... 8
Number of Threads ........ 1
Head Tolerance ........... 0.001500 m
```

Runoff Quantity Continuity	Volume hectare-m	Depth mm
Total Precipitation	13.681	72.125
Evaporation Loss	0.000	0.000
Infiltration Loss	5.324	28.069
Surface Runoff	8.102	42.711
Final Storage	0.277	1.462
Continuity Error (%)	-0.163	

Groundwater Continuity	Volume hectare-m	Depth mm
Initial Storage	13.786	104.500
Infiltration	4.984	37.782
Upper Zone ET	0.000	0.000
Lower Zone ET	0.000	0.000
Deep Percolation	0.000	0.000
Groundwater Flow	4.984	37.778
Final Storage	13.786	104.500
Continuity Error (%)	0.003	

Flow Routing Continuity	Volume hectare-m	Volume 10^6 ltr
Dry Weather Inflow	0.000	0.000
Wet Weather Inflow	8.089	80.893
Groundwater Inflow	4.983	49.832
RDII Inflow	0.000	0.000
External Inflow	0.000	0.000
External Outflow	8.307	83.073
Flooding Loss	0.000	0.000
Evaporation Loss	0.000	0.000
Exfiltration Loss	0.000	0.000
Initial Stored Volume	0.000	0.000
Final Stored Volume	4.821	48.206
Continuity Error (%)	-0.424	

****
Highest Continuity Errors
****
Node SWMP4a (14.72%)
Node P-1_DS-1-RET (-8.01%)

Node SWMP5b-OrificeOutlet (5.75%)
Node SWMP-3 (3.20%)
Node SWMP-5b (2.47%)

****
Time-Step Critical Elements
****
Link SWMP2-Outlet_2 (31.67%)
Link SWMP5a-Outlet (10.09%)
Link Culvert-1b (5.04%)
Link P301_SWM-Inlet (1.94%)

****
Highest Flow Instability Indexes
****
All links are stable.

****
Routing Time Step Summary
****
Minimum Time Step : 2.56 sec
Average Time Step : 20.44 sec
Maximum Time Step : 30.00 sec
Percent in Steady State : 0.00
Average Iterations per Step : 3.05
Percent Not Converging : 0.22

****
Subcatchment Runoff Summary
****

Subcatchment	Total Precip mm	Total Runon mm	Total Evap mm	Total Infil mm	Total Runoff mm	Total Runoff 10^6 ltr	Peak Runoff CMS	Runoff Coeff
P101	72.13	0.00	0.00	7.64	62.75			

9.35	1.04	0.870					
P102			72.12	0.00	0.00	7.57	62.89
5.98	1.04	0.872					
P201			72.12	0.00	0.00	5.10	65.43
8.44	2.27	0.907					
P202			72.12	0.00	0.00	1.25	69.07
2.90	0.97	0.958					
P203			72.12	0.00	0.00	5.12	65.37
10.63	2.50	0.906					
P204			72.12	0.00	0.00	35.78	35.12
16.96	3.94	0.487					
P301			72.13	0.00	0.00	39.33	31.65
13.23	3.32	0.439					
P302			72.13	0.00	0.00	40.52	30.37
8.46	2.11	0.421					
P303			72.13	0.00	0.00	34.60	36.29
5.06	1.43	0.503					

****
Groundwater Summary
****

Subcatchment	Total Infil mm	Total Evap mm	Total Lower Seepage mm	Total Lateral Outflow mm	Maximum Lateral Outflow CMS	Average Upper Moist.	Final Water Table m	Average Water Table m	Final Upper Moist.
P204	35.78	0.00	0.00	35.77	0.58	0.19	100.00	100.00	0.19
P301	39.33	0.00	0.00	39.33	0.61	0.19	100.00	100.00	0.19
P302	40.52	0.00	0.00	40.52	0.39	0.19	100.00	100.00	0.19
P303	34.60	0.00	0.00	34.60	0.17	0.19	100.00	100.00	0.19

****

Node Depth Summary
****

Node	Type	Average Depth Meters	Maximum Depth Meters	Maximum HGL Meters	Time of Max Occurrence days	hr:min	Reported Max Depth Meters
P-1_DS-1_Node	JUNCTION	0.01	0.03	75.23	1	06:57	0.03
P202_Compost-Pad-Node	JUNCTION	0.02	0.55	76.55	0	12:07	0.52
EXT-2	JUNCTION	0.12	0.20	75.46	1	00:32	0.20
P-2C_1	JUNCTION	0.18	2.16	81.86	0	12:14	2.16
P-2C_2	JUNCTION	1.11	1.45	77.70	1	00:08	1.45
P-3-SW_SWM-Ditch	JUNCTION	0.56	1.34	77.49	0	12:08	1.28
SWMP3-OUT	JUNCTION	0.04	0.14	75.29	0	15:03	0.14
SWMP4-OUT	JUNCTION	0.00	0.00	75.20	0	00:00	0.00
P201_US-Node	JUNCTION	0.04	0.75	77.15	0	12:14	0.75
P203_US-Node	JUNCTION	0.16	0.63	76.63	0	12:06	0.59
SWMP1-OUT	JUNCTION	0.07	0.12	76.07	1	00:23	0.12
SWMP4b-OUT	JUNCTION	0.09	0.18	75.38	0	17:06	0.18
P-3_1	JUNCTION	0.26	2.13	81.83	0	12:26	2.13
SWMP3-OrificeOutlet	JUNCTION	0.06	0.16	75.41	0	15:02	0.16
SWMP2-OrificeOutlet	JUNCTION	0.14	0.27	75.31	1	00:34	0.27
SWMP1-OrificeOutlet	JUNCTION	0.09	0.15	76.15	1	00:16	0.15
SWMP4b-OrificeOutlet	JUNCTION	0.08	0.16	75.41	0	17:21	0.16
SWMP5b-OrificeOutlet	JUNCTION	0.19	0.28	76.08	1	06:56	

0.28						
P-1_OUT	OUTFALL	0.05	0.14	74.14	1	07:26
0.14						
P-2_OUT	OUTFALL	0.04	0.08	74.58	1	05:33
0.08						
P-3_OUT	OUTFALL	0.07	0.15	74.99	1	00:49
0.15						
SWMP-1	STORAGE	1.35	1.69	77.69	1	00:19
1.69						
SWMP-2	STORAGE	1.18	1.40	76.75	0	23:03
1.40						
SWMP-3	STORAGE	0.47	1.05	76.30	0	15:02
1.05						
SWMP4a	STORAGE	1.48	1.55	74.95	10	00:00
1.55						
SWMP4b	STORAGE	0.65	1.19	76.44	0	17:29
1.19						
SWMP-5a	STORAGE	0.20	0.30	76.10	1	06:46
0.30						
SWMP-5b	STORAGE	0.20	0.30	76.10	1	06:51
0.30						
P-101_US-RET	STORAGE	0.39	1.15	77.15	0	15:31
1.15						
P102_US-RET	STORAGE	0.21	0.79	76.79	0	14:19
0.79						
P-1_DS-1-RET	STORAGE	1.47	1.63	76.08	1	06:55
1.63						
P-1_DS-2-RET	STORAGE	0.10	0.22	74.28	1	07:25
0.22						
P-2_SD-1-RET	STORAGE	0.30	0.50	75.25	0	20:32
0.50						
P-2_SD-2-RET	STORAGE	0.08	0.17	74.83	1	05:36
0.17						
P-2_SD-3-RET	STORAGE	0.62	0.76	74.82	1	05:30
0.76						
P-2_SD-4-RET	STORAGE	1.10	1.32	74.82	1	05:33
1.32						
P-3_DS-1-RET	STORAGE	0.17	0.34	75.31	1	00:34
0.34						
P-3_DS-2-RET	STORAGE	0.29	0.46	75.29	1	00:49
0.46						

****
Node Inflow Summary
****

Node	Type	Maximum Lateral Inflow CMS	Maximum Total Inflow CMS	Time of Max Occurrence days hr:min	Lateral Inflow Volume 10^6 ltr	Total Inflow Volume 10^6 ltr	Flow Balance Error Percent
P-1_DS-1_Node	JUNCTION	0.000	0.070	1 06:56	0	9.52	0.142
P202_Compost-Pad-Node	JUNCTION	0.973	0.973	0 12:05	2.9	2.89	-0.623
EXT-2	JUNCTION	0.000	0.110	1 00:23	0	22.3	0.117
P-2C_1	JUNCTION	3.936	3.936	0 12:05	17	16.9	-0.842
P-2C_2	JUNCTION	0.000	4.933	0 14:59	0	23	1.630
P-3-SW_SWM-Ditch	JUNCTION	2.110	2.647	0 12:05	8.46	22.5	0.901
SWMP3-OUT	JUNCTION	0.000	0.117	0 15:02	0	8.39	-0.010
SWMP4-OUT	JUNCTION	0.000	0.000	0 00:00	0	0	0.000 ltr
P201_US-Node	JUNCTION	2.274	2.274	0 12:05	8.43	8.42	-3.139
P203_US-Node	JUNCTION	2.497	2.497	0 12:05	10.6	10.6	-0.300
SWMP1-OUT	JUNCTION	0.000	0.113	1 00:07	0	22.3	-0.067
SWMP4b-OUT	JUNCTION	0.000	0.077	0 17:30	0	10.6	-0.019
P-3_1	JUNCTION	3.318	3.318	0 12:05	13.2	13.2	-5.789
SWMP3-OrificeOutlet	JUNCTION	0.000	0.117	0 15:02	0	8.39	0.001
SWMP2-OrificeOutlet	JUNCTION	0.000	0.041	0 23:04	0	31	0.139
SWMP1-OrificeOutlet	JUNCTION	0.000	0.110	1 00:19	0	22.3	0.106
SWMP4b-OrificeOutlet	JUNCTION	0.000	0.077	0 17:29	0	10.6	0.000
SWMP5b-OrificeOutlet	JUNCTION	0.000	0.146	0 18:37	0		

9.89	6.097						
P-1_OUT		OUTFALL	0.000	0.070	1	07:26	0
9.47	0.000						
P-2_OUT		OUTFALL	0.000	0.154	1	05:33	0
33.5	0.000						
P-3_OUT		OUTFALL	0.000	0.221	1	00:49	0
40.1	0.000						
SWMP-1		STORAGE	0.577	5.191	0	14:50	17.3
39.9	-0.040						
SWMP-2		STORAGE	2.145	4.195	0	12:08	37.6
59.9	0.087						
SWMP-3		STORAGE	0.000	1.521	0	12:19	0
8.7	3.302						
SWMP4a		STORAGE	0.000	0.827	0	12:07	0
2.91	17.261						
SWMP4b		STORAGE	0.000	2.441	0	12:06	0
10.6	0.332						
SWMP-5a		STORAGE	0.000	0.156	0	16:30	0
9.3	0.898						
SWMP-5b		STORAGE	0.000	0.157	0	18:37	0
12.6	2.536						
P-101_US-RET		STORAGE	1.044	1.044	0	12:05	9.35
9.34	-0.669						
P102_US-RET		STORAGE	1.042	1.042	0	12:05	5.98
5.97	-1.720						
P-1_DS-1-RET		STORAGE	0.000	0.172	0	18:35	0
9.3	-7.416						
P-1_DS-2-RET		STORAGE	0.000	0.070	1	06:57	0
9.51	0.113						
P-2_SD-1-RET		STORAGE	0.000	0.169	0	19:40	0
30.7	0.204						
P-2_SD-2-RET		STORAGE	0.000	0.345	1	05:26	0
43	0.014						
P-2_SD-3-RET		STORAGE	0.000	0.064	1	03:57	0
9.41	1.110						
P-2_SD-4-RET		STORAGE	0.000	0.306	1	05:28	0
42.2	0.070						
P-3_DS-1-RET		STORAGE	0.000	0.229	0	23:04	0
40.9	-0.104						
P-3_DS-2-RET		STORAGE	0.000	0.227	0	23:40	0
40.9	0.045						

****
Node Surcharge Summary
****

No nodes were surcharged.

****
Node Flooding Summary
****

No nodes were flooded.

****
Storage Volume Summary
****

Storage Unit	Average Volume 1000 m3	Avg Pcnt Full	Evap Pcnt Loss	Exfil Pcnt Loss	Maximum Volume 1000 m3	Max Pcnt Full	Time of Max Occurrence days hr:min	Maximum Outflow CMS
SWMP-1	20.649	44	0	0	27.595	59	1 00:19	4.582
SWMP-2	36.877	28	0	0	49.527	38	0 23:03	0.229
SWMP-3	1.708	27	0	0	4.046	64	0 15:02	0.117
SWMP4a	2.357	44	0	0	2.484	47	10 00:00	0.000
SWMP4b	3.664	37	0	0	7.469	75	0 17:29	0.077
SWMP-5a	3.284	9	0	0	4.876	13	1 06:46	0.048
SWMP-5b	2.982	9	0	0	4.422	13	1 06:51	0.070
P-101_US-RET	1.301	6	0	0	4.808	21	0 15:31	0.156
P102_US-RET	0.605	3	0	0	2.806	12	0 14:19	0.126
P-1_DS-1-RET	0.489	60	0	0	0.563	69	1 06:55	0.103
P-1_DS-2-RET	0.067	1	0	0	0.153	1	1 07:25	0.070
P-2_SD-1-RET	0.168	6	0	0	0.310	12	0	

```
20:32      0.168
 P-2_SD-2-RET             0.078       1     0     0         0.167       2       1
05:36      0.320
 P-2_SD-3-RET             0.422       8     0     0         0.553      11       1
05:30      0.067
 P-2_SD-4-RET             7.075      20     0     0         9.084      25       1
05:33      0.326
 P-3_DS-1-RET             0.118       1     0     0         0.300       2       1
00:34      0.227
 P-3_DS-2-RET             1.111       3     0     0         1.999       6       1
00:49      0.221
```

****
Outfall Loading Summary
****

Outfall Node	Flow Freq Pcnt	Avg Flow CMS	Max Flow CMS	Total Volume 10^6 ltr
P-1_OUT	89.43	0.023	0.070	9.473
P-2_OUT	85.76	0.059	0.154	33.527
P-3_OUT	98.75	0.081	0.221	40.073
System	91.31	0.163	0.404	83.073

****
Link Flow Summary
****

Link	Type	Maximum |Flow| CMS	Time of Max Occurrence days hr:min	Maximum |Veloc| m/sec	Max/ Full Flow	Max/ Full Depth
SWMP1-Outlet	CONDUIT	0.113	1 00:07	1.11	0.01	0.05
SWMP2-Outlet	CONDUIT	0.041	1 00:06	0.67	0.00	0.15
SWMP3-Outlet	CONDUIT	0.117	0 15:02	1.08	0.01	0.08
SWMP4a-Outlet	CONDUIT	0.000	0 00:00	0.00	0.00	0.00
SWMP4b-Outlet	CONDUIT	0.077	0 17:30	0.59	0.01	0.09
SWMP5a-Outlet	CONDUIT	0.016	1 04:33	0.24	1.05	0.50
SWMP5b-Outlet	CONDUIT	0.172	0 18:35	0.67	0.03	0.65
Culvert-1a	CONDUIT	0.070	1 06:56	2.33	0.02	0.08
Culvert-1b	CONDUIT	0.070	1 07:26	0.66	0.06	0.15
Culvert-2a	CONDUIT	0.052	0 20:08	0.65	0.02	0.19

Culvert-3a	CONDUIT	0.227	0	23:40	0.77	0.03	0.20
P101_US-Ditch	CONDUIT	0.156	0	16:30	0.32	0.44	0.52
P102_US-Ditch	CONDUIT	0.126	0	14:58	0.23	0.22	0.42
P-1_DS2-Ditch	CONDUIT	0.070	1	06:57	0.11	0.00	0.04
SD-Segment1	CONDUIT	0.110	1	00:32	0.16	0.01	0.17
P204_US-Ditch	CONDUIT	1.853	0	12:14	1.15	0.07	0.35
P204_SWM-Inlet	CONDUIT	4.728	0	14:50	1.86	0.08	0.82
P301_US-Ditch	CONDUIT	1.190	0	12:26	0.77	0.07	0.34
P301_SWM-Inlet	CONDUIT	2.376	0	12:08	2.64	0.54	0.54
SWMP3-Outfall-Channel	CONDUIT	0.117	0	15:03	0.25	0.00	0.15
SWMP1-Outfall	CONDUIT	0.110	1	00:23	0.45	0.00	0.05
P3_DS2-Ditch	CONDUIT	0.221	1	00:49	0.38	0.01	0.08
SD-Segment2	CONDUIT	0.168	0	20:21	0.28	0.01	0.10
SWMP4a_Outfall-Channel	CONDUIT	0.000	0	00:00	0.00	0.00	0.08
SD-Segment3	CONDUIT	0.067	1	05:59	0.14	0.00	0.23
P-2_SD-4-Ditch	CONDUIT	0.154	1	05:33	0.29	0.15	0.08
P201_US-Ditch	CONDUIT	1.521	0	12:19	0.54	0.25	0.56
P203_US-Ditch	CONDUIT	2.441	0	12:06	0.97	0.20	0.68
SWMP4b_Outfall-Channel	CONDUIT	0.077	0	17:33	0.69	0.01	0.08
P202_Storm-Outlet	CONDUIT	0.827	0	12:07	1.24	0.28	0.52
SWMP5a-Outlet_2	CONDUIT	0.016	1	04:33	0.24	1.05	0.50
SWMP5a-Outlet_3	CONDUIT	0.016	1	04:33	0.24	1.05	0.50
Culvert-2b	CONDUIT	0.306	1	05:28	1.47	0.03	0.49
SWMP2-Outlet_2	CONDUIT	0.094	0	23:04	1.58	0.16	0.59
SWMP2-Outlet_3	CONDUIT	0.094	0	23:04	1.58	0.16	0.59
SWMP2-Orifice	ORIFICE	0.041	0	23:04			1.00
SWMP3-Orifice	ORIFICE	0.016	0	15:02			1.00
SWMP1-Orifice	ORIFICE	0.089	1	00:18			0.48
SWMP4b-Orifice	ORIFICE	0.019	0	17:36			1.00
SWMP5b-Orifice	ORIFICE	0.070	1	06:44			0.42
SWMP1-Orifice_2	ORIFICE	0.021	1	00:19			1.00
SWMP3-Orifice_2	ORIFICE	0.101	0	15:02			0.50
SWMP4b-Orifice_2	ORIFICE	0.059	0	17:29			0.42
SWMP1-Overflow	WEIR	0.000	0	00:00			0.00
SWMP2_Overflow-Spillway	WEIR	0.000	0	00:00			0.00
SWMP3_Overflow-Spillway	WEIR	0.000	0	00:00			0.00
SWMPond4b-Spillover	WEIR	0.000	0	00:00			0.00
SWMP_5a-5b-Overflow-Weir	WEIR	0.000	0	00:00			0.00
SWM_5b-Overflow-Weir	WEIR	0.000	0	00:00			0.00
P-1_Frontier-Rd_Spillway	WEIR	0.000	0	00:00			0.00
P-3_SWMP-2_NE-Fronteir-Rd-Spill	WEIR	0.000	0	00:00			0.00
P-2-DS_Frontier-Rd-Spillway	WEIR	0.000	0	00:00			0.00

****
Flow Classification Summary
****

Conduit	Adjusted /Actual Length	Fraction of Time in Flow Class: Dry	Up Dry	Down Dry	Sub Crit	Sup Crit	Up Crit	Down Crit	Norm Ltd	Inlet Ctrl
SWMP1-Outlet	1.00	0.00	0.00	0.00	0.01	0.99	0.00	0.00	0.02	0.00
SWMP2-Outlet	1.00	0.00	0.00	0.00	1.00	0.00	0.00	0.00	0.00	0.00
SWMP3-Outlet	1.00	0.01	0.00	0.00	0.33	0.67	0.00	0.00	0.00	0.00
SWMP4a-Outlet	1.00	1.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
SWMP4b-Outlet	1.00	0.01	0.00	0.00	0.99	0.00	0.00	0.00	0.93	0.00
SWMP5a-Outlet	1.00	0.02	0.00	0.00	0.98	0.00	0.00	0.00	0.00	0.00
SWMP5b-Outlet	1.00	0.02	0.00	0.00	0.96	0.02	0.00	0.00	0.04	0.00
Culvert-1a	1.00	0.09	0.00	0.00	0.00	0.91	0.00	0.00	0.00	0.00
Culvert-1b	1.00	0.09	0.00	0.00	0.91	0.00	0.00	0.00	0.00	0.00
Culvert-2a	1.00	0.05	0.00	0.00	0.83	0.00	0.00	0.12	0.00	0.00
Culvert-3a	1.00	0.00	0.00	0.00	0.99	0.01	0.00	0.00	0.11	0.00
P101_US-Ditch	1.00	0.01	0.00	0.00	0.99	0.00	0.00	0.00	0.72	0.00
P102_US-Ditch	1.00	0.01	0.00	0.00	0.99	0.00	0.00	0.00	0.87	0.00
P-1_DS2-Ditch	1.00	0.09	0.00	0.00	0.91	0.00	0.00	0.00	0.92	0.00
SD-Segment1	1.00	0.00	0.00	0.00	1.00	0.00	0.00	0.00	0.98	0.00
P204_US-Ditch	1.00	0.01	0.00	0.00	0.99	0.00	0.00	0.00	0.97	0.00

P204_SWM-Inlet	1.00	0.00	0.01	0.00	0.99	0.00	0.00	0.00	0.04
0.00									
P301_US-Ditch	1.00	0.00	0.00	0.00	0.14	0.00	0.00	0.86	0.06
0.00									
P301_SWM-Inlet	1.00	0.00	0.42	0.00	0.58	0.00	0.00	0.00	0.86
0.00									
SWMP3-Outfall-Channel	1.00	0.00	0.00	0.00	0.99	0.00	0.00	0.00	0.97
0.00									
SWMP1-Outfall	1.00	0.00	0.00	0.00	1.00	0.00	0.00	0.00	0.99
0.00									
P3_DS2-Ditch	1.00	0.00	0.01	0.00	0.99	0.00	0.00	0.00	0.00
0.00									
SD-Segment2	1.00	0.00	0.00	0.00	1.00	0.00	0.00	0.00	0.00
0.00									
SWMP4a_Outfall-Channel	1.00	0.01	0.99	0.00	0.00	0.00	0.00	0.00	0.00
0.00									
SD-Segment3	1.00	0.01	0.00	0.00	0.99	0.00	0.00	0.00	0.83
0.00									
P-2_SD-4-Ditch	1.00	0.14	0.00	0.00	0.86	0.00	0.00	0.00	0.00
0.00									
P201_US-Ditch	1.00	0.01	0.00	0.00	0.99	0.00	0.00	0.00	0.96
0.00									
P203_US-Ditch	1.00	0.01	0.00	0.00	0.99	0.00	0.00	0.00	0.71
0.00									
SWMP4b_Outfall-Channel	1.00	0.01	0.00	0.00	0.99	0.00	0.00	0.00	0.39
0.00									
P202_Storm-Outlet	1.00	0.01	0.11	0.00	0.88	0.00	0.00	0.00	0.98
0.00									
SWMP5a-Outlet_2	1.00	0.02	0.00	0.00	0.98	0.00	0.00	0.00	0.00
0.00									
SWMP5a-Outlet_3	1.00	0.02	0.00	0.00	0.98	0.00	0.00	0.00	0.00
0.00									
Culvert-2b	1.00	0.01	0.00	0.00	0.95	0.04	0.00	0.00	0.93
0.00									
SWMP2-Outlet_2	1.00	0.00	0.57	0.00	0.27	0.16	0.00	0.00	0.93
0.00									
SWMP2-Outlet_3	1.00	0.00	0.57	0.00	0.27	0.16	0.00	0.00	0.93
0.00									

****
Conduit Surcharge Summary
****

Conduit	Hours Full: Both Ends	Hours Full: Upstream	Hours Full: Dnstream	Hours Above Full Normal Flow	Hours Capacity Limited

SWMP5a-Outlet	0.01	0.01	0.01	6.40	0.01
SWMP5b-Outlet	0.01	0.01	222.99	0.01	0.01
P204_SWM-Inlet	0.01	0.01	41.22	0.01	0.01
P202_Storm-Outlet	0.01	0.01	217.66	0.01	0.01
SWMP5a-Outlet_2	0.01	0.01	0.01	6.40	0.01
SWMP5a-Outlet_3	0.01	0.01	0.01	6.40	0.01

Analysis begun on: Mon Dec 10 14:55:23 2018
Analysis ended on: Mon Dec 10 14:55:26 2018
Total elapsed time: 00:00:03

```
EPA STORM WATER MANAGEMENT MODEL - VERSION 5.1 (Build 5.1.011)
--------------------------------------------------------------

WARNING 04: minimum elevation drop used for Conduit SWMP5a-Outlet
WARNING 04: minimum elevation drop used for Conduit P-2_SD-4-Ditch
WARNING 04: minimum elevation drop used for Conduit SWMP5a-Outlet_2
WARNING 04: minimum elevation drop used for Conduit SWMP5a-Outlet_3
WARNING 02: maximum depth increased for Node P-2C_1
WARNING 02: maximum depth increased for Node P-2C_2
WARNING 02: maximum depth increased for Node P-3-SW_SWM-Ditch
WARNING 02: maximum depth increased for Node P-3_1
WARNING 02: maximum depth increased for Node SWMP3-OrificeOutlet
WARNING 02: maximum depth increased for Node SWMP1-OrificeOutlet
WARNING 02: maximum depth increased for Node SWMP4b-OrificeOutlet
WARNING 02: maximum depth increased for Node SWMP5b-OrificeOutlet

*****************************************************
NOTE: The summary statistics displayed in this report are
based on results found at every computational time step,
not just on results from each reporting time step.
*****************************************************

****************
Analysis Options
****************
Flow Units ............... CMS
Process Models:
  Rainfall/Runoff ........ YES
  RDII ................... NO
  Snowmelt ............... NO
  Groundwater ............ YES
  Flow Routing ........... YES
  Ponding Allowed ........ YES
  Water Quality .......... NO
Infiltration Method ...... CURVE_NUMBER
Flow Routing Method ...... DYNWAVE
Starting Date ............ 07/14/2013 00:00:00
Ending Date .............. 07/24/2013 00:00:00
Antecedent Dry Days ...... 0.0
Report Time Step ......... 00:05:00
Wet Time Step ............ 00:05:00
Dry Time Step ............ 01:00:00
Routing Time Step ........ 30.00 sec
Variable Time Step ....... YES
Maximum Trials ........... 8
Number of Threads ........ 1
Head Tolerance ........... 0.001500 m
```

Runoff Quantity Continuity	Volume hectare-m	Depth mm
Total Precipitation	16.620	87.617
Evaporation Loss	0.000	0.000
Infiltration Loss	5.820	30.682
Surface Runoff	10.543	55.581
Final Storage	0.277	1.462
Continuity Error (%)	-0.123	

Groundwater Continuity	Volume hectare-m	Depth mm
Initial Storage	13.786	104.500
Infiltration	5.465	41.424
Upper Zone ET	0.000	0.000
Lower Zone ET	0.000	0.000
Deep Percolation	0.000	0.000
Groundwater Flow	5.464	41.418
Final Storage	13.786	104.500
Continuity Error (%)	0.004	

Flow Routing Continuity	Volume hectare-m	Volume 10^6 ltr
Dry Weather Inflow	0.000	0.000
Wet Weather Inflow	10.528	105.276
Groundwater Inflow	5.461	54.611
RDII Inflow	0.000	0.000
External Inflow	0.000	0.000
External Outflow	11.145	111.446
Flooding Loss	0.000	0.000
Evaporation Loss	0.000	0.000
Exfiltration Loss	0.000	0.000
Initial Stored Volume	0.000	0.000
Final Stored Volume	4.910	49.100
Continuity Error (%)	-0.412	

****
Highest Continuity Errors
****
Node SWMP4a (13.54%)
Node P-1_DS-1-RET (-4.82%)

Node SWMP5b-OrificeOutlet (3.46%)
Node SWMP-3 (2.64%)
Node SWMP-5b (2.14%)

****
Time-Step Critical Elements
****
Link SWMP2-Outlet_2 (33.49%)
Link Culvert-2b (10.70%)
Link SWMP5a-Outlet (6.88%)
Link Culvert-1b (5.39%)
Link SWMP5b-Outlet (2.89%)

****
Highest Flow Instability Indexes
****
All links are stable.

****
Routing Time Step Summary
****
Minimum Time Step : 0.50 sec
Average Time Step : 15.81 sec
Maximum Time Step : 30.00 sec
Percent in Steady State : 0.00
Average Iterations per Step : 2.80
Percent Not Converging : 0.14

****
Subcatchment Runoff Summary
****

Subcatchment	Total Precip mm	Total Runon mm	Total Evap mm	Total Infil mm	Total Runoff mm	Total Runoff 10^6 ltr	Peak Runoff CMS	Runoff Coeff

P101		87.62	0.00	0.00	8.04	77.84	
11.60	1.19	0.888					
P102		87.62	0.00	0.00	7.96	77.98	
7.42	1.14	0.890					
P201		87.62	0.00	0.00	5.29	80.71	
10.41	2.37	0.921					
P202		87.62	0.00	0.00	1.25	84.50	
3.55	0.99	0.964					
P203		87.62	0.00	0.00	5.32	80.65	
13.11	2.63	0.920					
P204		87.62	0.00	0.00	38.84	47.54	
22.96	4.63	0.543					
P301		87.62	0.00	0.00	43.38	43.09	
18.01	3.88	0.492					
P302		87.62	0.00	0.00	44.85	41.53	
11.57	2.46	0.474					
P303		87.62	0.00	0.00	37.65	48.74	
6.79	1.66	0.556					

****
Groundwater Summary
****

Subcatchment	Total Infil mm	Total Evap mm	Total Lower Seepage mm	Total Lateral Outflow mm	Maximum Lateral Outflow CMS	Average Upper Moist.	Final Upper Water m	Average Water Table m	Final Water Table m
P204	38.84	0.00	0.00	38.83	0.56	0.19	100.00	0.19	100.00
P301	43.38	0.00	0.00	43.37	0.60	0.19	100.00	0.19	100.00
P302	44.85	0.00	0.00	44.84	0.39	0.19	100.00	0.19	100.00
P303	37.65	0.00	0.00	37.65	0.16	0.19	100.00	0.19	100.00

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Node Depth Summary
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Node	Type	Average Depth Meters	Maximum Depth Meters	Maximum HGL Meters	Time of Max Occurrence days hr:min	Reported Max Depth Meters
P-1_DS-1_Node	JUNCTION	0.02	0.05	75.25	1 04:53	0.05
P202_Compost-Pad-Node	JUNCTION	0.03	0.56	76.56	0 12:07	0.53
EXT-2	JUNCTION	0.16	0.29	75.55	0 21:16	0.29
P-2C_1	JUNCTION	0.26	2.47	82.17	0 12:14	2.47
P-2C_2	JUNCTION	1.24	1.61	77.86	0 20:49	1.61
P-3-SW_SWM-Ditch	JUNCTION	0.60	1.49	77.64	0 12:09	1.47
SWMP3-OUT	JUNCTION	0.08	0.25	75.40	0 18:30	0.25
SWMP4-OUT	JUNCTION	0.00	0.00	75.20	0 00:00	0.00
P201_US-Node	JUNCTION	0.06	0.72	77.12	0 12:13	0.72
P203_US-Node	JUNCTION	0.22	0.63	76.63	0 12:06	0.61
SWMP1-OUT	JUNCTION	0.10	0.17	76.12	0 21:08	0.17
SWMP4b-OUT	JUNCTION	0.10	0.20	75.40	0 13:38	0.20
P-3_1	JUNCTION	0.39	2.41	82.11	0 12:24	2.41
SWMP3-OrificeOutlet	JUNCTION	0.08	0.20	75.45	0 14:26	0.20
SWMP2-OrificeOutlet	JUNCTION	0.21	0.43	75.47	0 20:46	0.43
SWMP1-OrificeOutlet	JUNCTION	0.12	0.20	76.20	0 21:03	0.20
SWMP4b-OrificeOutlet	JUNCTION	0.09	0.18	75.43	0 13:46	0.18

SWMP5b-OrificeOutlet	JUNCTION	0.21	0.37	76.17	1	04:23
0.36						
P-1_OUT	OUTFALL	0.08	0.17	74.17	1	05:13
0.17						
P-2_OUT	OUTFALL	0.06	0.13	74.63	1	01:09
0.13						
P-3_OUT	OUTFALL	0.11	0.22	75.06	0	21:02
0.22						
SWMP-1	STORAGE	1.48	1.85	77.85	0	21:05
1.85						
SWMP-2	STORAGE	1.26	1.48	76.83	0	18:55
1.48						
SWMP-3	STORAGE	0.59	1.15	76.40	0	14:26
1.15						
SWMP4a	STORAGE	1.70	1.78	75.18	9	23:59
1.78						
SWMP4b	STORAGE	0.77	1.23	76.48	0	14:00
1.23						
SWMP-5a	STORAGE	0.24	0.35	76.15	1	04:06
0.35						
SWMP-5b	STORAGE	0.23	0.35	76.15	1	04:06
0.35						
P-101_US-RET	STORAGE	0.52	1.29	77.29	0	15:27
1.29						
P102_US-RET	STORAGE	0.28	0.87	76.87	0	14:02
0.87						
P-1_DS-1-RET	STORAGE	1.49	1.68	76.13	1	04:14
1.68						
P-1_DS-2-RET	STORAGE	0.14	0.28	74.34	1	05:13
0.28						
P-2_SD-1-RET	STORAGE	0.37	0.64	75.39	0	18:37
0.64						
P-2_SD-2-RET	STORAGE	0.13	0.29	74.95	1	01:12
0.29						
P-2_SD-3-RET	STORAGE	0.69	0.88	74.94	1	01:14
0.88						
P-2_SD-4-RET	STORAGE	1.19	1.45	74.95	1	01:09
1.45						
P-3_DS-1-RET	STORAGE	0.25	0.50	75.47	0	20:46
0.50						
P-3_DS-2-RET	STORAGE	0.36	0.60	75.43	0	21:02
0.60						

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Node Inflow Summary
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Node	Type	Maximum Lateral Inflow CMS	Maximum Total Inflow CMS	Time of Max Occurrence days hr:min	Lateral Inflow Volume 10^6 ltr	Total Inflow Volume 10^6 ltr	Flow Balance Error Percent
P-1_DS-1_Node	JUNCTION	0.000	0.123	1 04:53	0	13.2	0.100
P202_Compost-Pad-Node	JUNCTION	0.991	0.991	0 12:05	3.55	3.54	-0.485
EXT-2	JUNCTION	0.000	0.212	0 21:08	0	29.7	0.096
P-2C_1	JUNCTION	4.629	4.629	0 12:05	22.9	22.9	-0.901
P-2C_2	JUNCTION	0.000	5.513	0 14:06	0	31.1	1.517
P-3-SW_SWM-Ditch	JUNCTION	2.461	3.284	0 12:05	11.6	30.5	0.737
SWMP3-OUT	JUNCTION	0.000	0.186	0 14:27	0	10.4	-0.014
SWMP4-OUT	JUNCTION	0.000	0.000	0 00:00	0	0	0.000 ltr
P201_US-Node	JUNCTION	2.369	2.369	0 12:05	10.4	10.4	-2.608
P203_US-Node	JUNCTION	2.626	2.626	0 12:05	13.1	13.1	-0.244
SWMP1-OUT	JUNCTION	0.000	0.212	0 21:03	0	29.6	-0.046
SWMP4b-OUT	JUNCTION	0.000	0.097	0 14:00	0	11.7	-0.033
P-3_1	JUNCTION	3.879	3.879	0 12:05	18	18	-5.080
SWMP3-OrificeOutlet	JUNCTION	0.000	0.182	0 14:26	0	10.4	0.002
SWMP2-OrificeOutlet	JUNCTION	0.000	0.043	0 17:47	0	31.2	0.135
SWMP1-OrificeOutlet	JUNCTION	0.000	0.212	0 21:03	0	29.7	0.075
SWMP4b-OrificeOutlet	JUNCTION	0.000	0.097	0 14:00	0	11.7	0.000

SWMP5b-OrificeOutlet	JUNCTION	0.000	0.524	1	03:50	0	16.7
3.586							
P-1_OUT	OUTFALL	0.000	0.112	1	05:13	0	13.2
0.000							
P-2_OUT	OUTFALL	0.000	0.341	1	01:09	0	45.3
0.000							
P-3_OUT	OUTFALL	0.000	0.449	0	21:02	0	53
0.000							
SWMP-1	STORAGE	0.562	6.703	0	14:05	18.8	49.4
-0.141							
SWMP-2	STORAGE	2.400	5.003	0	12:09	42.7	72.9
0.072							
SWMP-3	STORAGE	0.000	1.700	0	12:15	0	10.7
2.711							
SWMP4a	STORAGE	0.000	0.851	0	12:07	0	3.56
15.665							
SWMP4b	STORAGE	0.000	2.573	0	12:06	0	13.1
0.256							
SWMP-5a	STORAGE	0.000	0.209	0	18:22	0	11.6
0.868							
SWMP-5b	STORAGE	0.000	0.210	0	17:29	0	16.5
2.183							
P-101_US-RET	STORAGE	1.189	1.189	0	12:05	11.6	11.6
-0.707							
P102_US-RET	STORAGE	1.142	1.142	0	12:05	7.41	7.41
-1.788							
P-1_DS-1-RET	STORAGE	0.000	0.583	1	03:44	0	15.9
-4.598							
P-1_DS-2-RET	STORAGE	0.000	0.115	1	04:53	0	13.2
0.082							
P-2_SD-1-RET	STORAGE	0.000	0.322	0	17:48	0	40
0.145							
P-2_SD-2-RET	STORAGE	0.000	1.007	1	00:48	0	62.2
0.009							
P-2_SD-3-RET	STORAGE	0.000	0.182	0	22:46	0	13.5
0.814							
P-2_SD-4-RET	STORAGE	0.000	0.954	1	01:12	0	60.9
0.050							
P-3_DS-1-RET	STORAGE	0.000	0.465	0	18:29	0	53.8
-0.078							
P-3_DS-2-RET	STORAGE	0.000	0.457	0	19:28	0	53.8
0.034							

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Node Surcharge Summary
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No nodes were surcharged.

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Node Flooding Summary
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No nodes were flooded.

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Storage Volume Summary
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Storage Unit	Average Volume 1000 m3	Avg Pcnt Full	Evap Pcnt Loss	Exfil Pcnt Loss	Maximum Volume 1000 m3	Max Pcnt Full	Time of Max Occurrence days hr:min	Maximum Outflow CMS
SWMP-1	23.486	50	0	0	31.140	66	0 21:05	4.860
SWMP-2	41.175	32	0	0	55.035	42	0 18:55	0.465
SWMP-3	2.188	35	0	0	4.516	71	0 14:26	0.182
SWMP4a	2.904	54	0	0	3.078	58	9 23:59	0.000
SWMP4b	4.502	45	0	0	7.838	79	0 14:00	0.258
SWMP-5a	3.825	10	0	0	5.843	15	1 04:06	0.077
SWMP-5b	3.467	10	0	0	5.285	15	1 04:06	0.196
P-101_US-RET	1.863	8	0	0	5.718	24	0 15:27	0.209
P102_US-RET	0.844	4	0	0	3.230	13	0 14:02	0.173
P-1_DS-1-RET	0.500	61	0	0	0.595	73	1 04:14	0.478
P-1_DS-2-RET	0.092	1	0	0	0.197	2	1 05:13	0.112

P-2_SD-1-RET	0.228	9	0	0	0.444	17	0 18:37 0.322
P-2_SD-2-RET	0.133	1	0	0	0.323	3	1 01:12 1.032
P-2_SD-3-RET	0.488	9	0	0	0.687	13	1 01:14 0.202
P-2_SD-4-RET	7.935	22	0	0	10.509	29	1 01:09 0.966
P-3_DS-1-RET	0.222	1	0	0	0.536	3	0 20:46 0.457
P-3_DS-2-RET	1.534	4	0	0	2.858	8	0 21:02 0.449

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Outfall Loading Summary
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Outfall Node	Flow Freq Pcnt	Avg Flow CMS	Max Flow CMS	Total Volume 10^6 ltr
P-1_OUT	88.59	0.044	0.112	13.153
P-2_OUT	89.99	0.131	0.341	45.299
P-3_OUT	99.15	0.169	0.449	52.994
System	92.58	0.344	0.849	111.446

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Link Flow Summary
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Link	Type	Maximum |Flow| CMS	Time of Max Occurrence days	hr:min	Maximum |Veloc| m/sec	Max/ Full Flow	Max/ Full Depth
SWMP1-Outlet	CONDUIT	0.212	0	21:03	1.26	0.01	0.08
SWMP2-Outlet	CONDUIT	0.042	0	17:47	0.67	0.00	0.23
SWMP3-Outlet	CONDUIT	0.186	0	14:27	1.23	0.02	0.10
SWMP4a-Outlet	CONDUIT	0.000	0	00:00	0.00	0.00	0.00
SWMP4b-Outlet	CONDUIT	0.097	0	14:00	0.67	0.02	0.09
SWMP5a-Outlet	CONDUIT	0.026	1	02:14	0.22	1.69	0.59
SWMP5b-Outlet	CONDUIT	0.583	1	03:44	1.30	0.09	0.69
Culvert-1a	CONDUIT	0.123	1	04:53	2.52	0.03	0.11
Culvert-1b	CONDUIT	0.112	1	05:13	0.76	0.10	0.19

Culvert-2a	CONDUIT	0.147	1	00:37	0.75	0.05	0.27
Culvert-3a	CONDUIT	0.457	0	19:28	0.95	0.05	0.28
P101_US-Ditch	CONDUIT	0.209	0	18:22	0.34	0.59	0.59
P102_US-Ditch	CONDUIT	0.173	0	14:40	0.26	0.30	0.47
P-1_DS2-Ditch	CONDUIT	0.115	1	04:53	0.14	0.00	0.05
SD-Segment1	CONDUIT	0.212	0	21:16	0.21	0.01	0.23
P204_US-Ditch	CONDUIT	2.554	0	12:15	1.26	0.09	0.39
P204_SWM-Inlet	CONDUIT	6.185	0	14:05	1.94	0.11	0.87
P301_US-Ditch	CONDUIT	1.697	0	12:24	0.85	0.09	0.38
P301_SWM-Inlet	CONDUIT	3.039	0	12:09	2.71	0.70	0.63
SWMP3-Outfall-Channel	CONDUIT	0.182	0	14:21	0.32	0.01	0.22
SWMP1-Outfall	CONDUIT	0.212	0	21:08	0.55	0.00	0.08
P3_DS2-Ditch	CONDUIT	0.449	0	21:02	0.49	0.03	0.10
SD-Segment2	CONDUIT	0.322	0	21:45	0.35	0.02	0.14
SWMP4a_Outfall-Channel	CONDUIT	0.000	0	00:00	0.00	0.00	0.14
SD-Segment3	CONDUIT	0.202	1	01:39	0.14	0.01	0.29
P-2_SD-4-Ditch	CONDUIT	0.341	1	01:09	0.41	0.33	0.12
P201_US-Ditch	CONDUIT	1.700	0	12:15	0.53	0.28	0.62
P203_US-Ditch	CONDUIT	2.573	0	12:06	0.86	0.21	0.70
SWMP4b_Outfall-Channel	CONDUIT	0.099	0	13:55	0.77	0.02	0.11
P202_Storm-Outlet	CONDUIT	0.851	0	12:07	1.07	0.29	0.54
SWMP5a-Outlet_2	CONDUIT	0.026	1	02:14	0.22	1.69	0.59
SWMP5a-Outlet_3	CONDUIT	0.026	1	02:14	0.22	1.69	0.59
Culvert-2b	CONDUIT	0.954	1	01:12	2.01	0.08	0.58
SWMP2-Outlet_2	CONDUIT	0.212	0	18:31	2.41	0.36	0.74
SWMP2-Outlet_3	CONDUIT	0.212	0	18:31	2.41	0.36	0.74
SWMP2-Orifice	ORIFICE	0.043	0	17:47			1.00
SWMP3-Orifice	ORIFICE	0.017	0	14:21			1.00
SWMP1-Orifice	ORIFICE	0.190	0	21:03			0.80
SWMP4b-Orifice	ORIFICE	0.019	0	14:11			1.00
SWMP5b-Orifice	ORIFICE	0.196	1	04:05			0.52
SWMP1-Orifice_2	ORIFICE	0.022	0	21:03			1.00
SWMP3-Orifice_2	ORIFICE	0.165	0	14:26			0.70
SWMP4b-Orifice_2	ORIFICE	0.079	0	14:00			0.51
SWMP1-Overflow	WEIR	0.000	0	00:00			0.00
SWMP2_Overflow-Spillway	WEIR	0.000	0	00:00			0.00
SWMP3_Overflow-Spillway	WEIR	0.000	0	00:00			0.00
SWMPond4b-Spillover	WEIR	0.161	0	14:00			0.03
SWMP_5a-5b-Overflow-Weir	WEIR	0.000	0	00:00			0.00
SWM_5b-Overflow-Weir	WEIR	0.000	0	00:00			0.00
P-1_Frontier-Rd_Spillway	WEIR	0.000	0	00:00			0.00
P-3_SWMP-2_NE-Fronteir-Rd-Spill	WEIR	0.000	0	00:00			0.00
P-2-DS_Frontier-Rd-Spillway	WEIR	0.000	0	00:00			0.00

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Flow Classification Summary
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Conduit	Adjusted /Actual Length	Fraction of Time in Flow Class: Dry	Up Dry	Down Dry	Sub Crit	Sup Crit	Up Crit	Down Crit	Norm Ltd	Inlet Ctrl
SWMP1-Outlet	1.00	0.00	0.00	0.00	0.00	1.00	0.00	0.00	0.07	0.00
SWMP2-Outlet	1.00	0.00	0.00	0.00	1.00	0.00	0.00	0.00	0.00	0.00
SWMP3-Outlet	1.00	0.01	0.00	0.00	0.58	0.41	0.00	0.00	0.04	0.00
SWMP4a-Outlet	1.00	1.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
SWMP4b-Outlet	1.00	0.00	0.00	0.00	1.00	0.00	0.00	0.00	0.93	0.00
SWMP5a-Outlet	1.00	0.01	0.00	0.00	0.99	0.00	0.00	0.00	0.00	0.00
SWMP5b-Outlet	1.00	0.01	0.00	0.00	0.97	0.01	0.00	0.00	0.05	0.00
Culvert-1a	1.00	0.10	0.00	0.00	0.00	0.90	0.00	0.00	0.00	0.00
Culvert-1b	1.00	0.10	0.00	0.00	0.90	0.00	0.00	0.00	0.00	0.00
Culvert-2a	1.00	0.04	0.00	0.00	0.88	0.00	0.00	0.08	0.00	0.00
Culvert-3a	1.00	0.00	0.00	0.00	0.99	0.01	0.00	0.00	0.10	0.00
P101_US-Ditch	1.00	0.00	0.00	0.00	1.00	0.00	0.00	0.00	0.73	0.00
P102_US-Ditch	1.00	0.00	0.00	0.00	1.00	0.00	0.00	0.00	0.88	0.00
P-1_DS2-Ditch	1.00	0.10	0.00	0.00	0.90	0.00	0.00	0.00	0.92	0.00
SD-Segment1	1.00	0.00	0.00	0.00	1.00	0.00	0.00	0.00	0.98	0.00
P204_US-Ditch	1.00	0.00	0.00	0.00	1.00	0.00	0.00	0.00	0.98	

0.00									
P204_SWM-Inlet	1.00	0.00	0.01	0.00	0.99	0.00	0.00	0.00	0.04
0.00									
P301_US-Ditch	1.00	0.00	0.00	0.00	0.20	0.00	0.00	0.80	0.08
0.00									
P301_SWM-Inlet	1.00	0.00	0.34	0.00	0.66	0.00	0.00	0.00	0.85
0.00									
SWMP3-Outfall-Channel	1.00	0.00	0.00	0.00	0.99	0.00	0.00	0.00	0.93
0.00									
SWMP1-Outfall	1.00	0.00	0.00	0.00	1.00	0.00	0.00	0.00	0.99
0.00									
P3_DS2-Ditch	1.00	0.00	0.01	0.00	0.99	0.00	0.00	0.00	0.00
0.00									
SD-Segment2	1.00	0.00	0.00	0.00	1.00	0.00	0.00	0.00	0.00
0.00									
SWMP4a_Outfall-Channel	1.00	0.01	0.99	0.00	0.00	0.00	0.00	0.00	0.00
0.00									
SD-Segment3	1.00	0.01	0.00	0.00	0.99	0.00	0.00	0.00	0.79
0.00									
P-2_SD-4-Ditch	1.00	0.10	0.00	0.00	0.90	0.00	0.00	0.00	0.00
0.00									
P201_US-Ditch	1.00	0.00	0.00	0.00	1.00	0.00	0.00	0.00	0.97
0.00									
P203_US-Ditch	1.00	0.00	0.00	0.00	1.00	0.00	0.00	0.00	0.71
0.00									
SWMP4b_Outfall-Channel	1.00	0.00	0.00	0.00	1.00	0.00	0.00	0.00	0.44
0.00									
P202_Storm-Outlet	1.00	0.00	0.08	0.00	0.91	0.00	0.00	0.00	0.98
0.00									
SWMP5a-Outlet_2	1.00	0.01	0.00	0.00	0.99	0.00	0.00	0.00	0.00
0.00									
SWMP5a-Outlet_3	1.00	0.01	0.00	0.00	0.99	0.00	0.00	0.00	0.00
0.00									
Culvert-2b	1.00	0.01	0.00	0.00	0.96	0.03	0.00	0.00	0.91
0.00									
SWMP2-Outlet_2	1.00	0.00	0.44	0.00	0.23	0.33	0.00	0.00	0.89
0.00									
SWMP2-Outlet_3	1.00	0.00	0.44	0.00	0.23	0.33	0.00	0.00	0.89
0.00									

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Conduit Surcharge Summary
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	Hours Full		Hours Above Full	Hours Capacity

Conduit	Both Ends	Upstream	Dnstream	Normal Flow	Limited
SWMP5a-Outlet	0.01	0.01	0.01	22.02	0.01
SWMP5b-Outlet	0.01	0.01	223.93	0.01	0.01
P101_US-Ditch	0.01	4.82	0.01	0.01	0.01
P204_SWM-Inlet	0.01	0.01	45.65	0.01	0.01
P203_US-Ditch	0.01	0.01	6.79	0.01	0.01
P202_Storm-Outlet	0.01	0.01	224.87	0.01	0.01
SWMP5a-Outlet_2	0.01	0.01	0.01	22.02	0.01
SWMP5a-Outlet_3	0.01	0.01	0.01	22.02	0.01
SWMP2-Outlet_2	0.01	0.01	13.05	0.01	0.01
SWMP2-Outlet_3	0.01	0.01	13.05	0.01	0.01

Analysis begun on: Mon Dec 10 14:56:02 2018
Analysis ended on: Mon Dec 10 14:56:07 2018
Total elapsed time: 00:00:05

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EPA STORM WATER MANAGEMENT MODEL - VERSION 5.1 (Build 5.1.011)
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WARNING 04: minimum elevation drop used for Conduit SWMP5a-Outlet
WARNING 04: minimum elevation drop used for Conduit P-2_SD-4-Ditch
WARNING 04: minimum elevation drop used for Conduit SWMP5a-Outlet_2
WARNING 04: minimum elevation drop used for Conduit SWMP5a-Outlet_3
WARNING 02: maximum depth increased for Node P-2C_1
WARNING 02: maximum depth increased for Node P-2C_2
WARNING 02: maximum depth increased for Node P-3-SW_SWM-Ditch
WARNING 02: maximum depth increased for Node P-3_1
WARNING 02: maximum depth increased for Node SWMP3-OrificeOutlet
WARNING 02: maximum depth increased for Node SWMP1-OrificeOutlet
WARNING 02: maximum depth increased for Node SWMP4b-OrificeOutlet
WARNING 02: maximum depth increased for Node SWMP5b-OrificeOutlet

*****************************************************
NOTE: The summary statistics displayed in this report are
based on results found at every computational time step,
not just on results from each reporting time step.
*****************************************************

****************
Analysis Options
****************
Flow Units ............... CMS
Process Models:
  Rainfall/Runoff ........ YES
  RDII ................... NO
  Snowmelt ............... NO
  Groundwater ............ YES
  Flow Routing ........... YES
  Ponding Allowed ........ YES
  Water Quality .......... NO
Infiltration Method ...... CURVE_NUMBER
Flow Routing Method ...... DYNWAVE
Starting Date ............ 07/14/2013 00:00:00
Ending Date .............. 07/24/2013 00:00:00
Antecedent Dry Days ...... 0.0
Report Time Step ......... 00:05:00
Wet Time Step ............ 00:05:00
Dry Time Step ............ 01:00:00
Routing Time Step ........ 30.00 sec
Variable Time Step ....... YES
Maximum Trials ........... 8
Number of Threads ........ 1
Head Tolerance ........... 0.001500 m
```

Runoff Quantity Continuity	Volume hectare-m	Depth mm
Total Precipitation	4.745	25.017
Evaporation Loss	0.000	0.000
Infiltration Loss	3.035	16.002
Surface Runoff	1.444	7.613
Final Storage	0.270	1.424
Continuity Error (%)	-0.089	

Groundwater Continuity	Volume hectare-m	Depth mm
Initial Storage	13.786	104.500
Infiltration	2.774	21.029
Upper Zone ET	0.000	0.000
Lower Zone ET	0.000	0.000
Deep Percolation	0.000	0.000
Groundwater Flow	2.773	21.017
Final Storage	13.786	104.500
Continuity Error (%)	0.009	

Flow Routing Continuity	Volume hectare-m	Volume 10^6 ltr
Dry Weather Inflow	0.000	0.000
Wet Weather Inflow	1.444	14.439
Groundwater Inflow	2.773	27.729
RDII Inflow	0.000	0.000
External Inflow	0.000	0.000
External Outflow	2.644	26.440
Flooding Loss	0.000	0.000
Evaporation Loss	0.000	0.000
Exfiltration Loss	0.000	0.000
Initial Stored Volume	0.000	0.000
Final Stored Volume	1.595	15.947
Continuity Error (%)	-0.518	

****
Highest Continuity Errors
****
Node SWMP4a (18.07%)
Node P-2C_2 (9.82%)

Node SWMP5b-OrificeOutlet (-7.80%)
Node SWMP-3 (5.17%)
Node SWMP-5b (3.52%)

****
Time-Step Critical Elements
****
None

****
Highest Flow Instability Indexes
****
All links are stable.

****
Routing Time Step Summary
****
Minimum Time Step : 12.15 sec
Average Time Step : 29.99 sec
Maximum Time Step : 30.00 sec
Percent in Steady State : 0.00
Average Iterations per Step : 3.78
Percent Not Converging : 0.02

****
Subcatchment Runoff Summary
****

Subcatchment	Total Precip mm	Total Runon mm	Total Evap mm	Total Infil mm	Total Runoff mm	Total Runoff 10^6 ltr	Peak Runoff CMS	Runoff Coeff
P101	25.02	0.00	0.00	5.61	17.63	2.63	0.19	0.705
P102	25.02	0.00	0.00	5.41	17.84	1.70	0.18	0.713

P201		25.02	0.00	0.00	4.11	19.13	
2.47	0.57	0.765					
P202		25.02	0.00	0.00	1.25	21.91	
0.92	0.25	0.876					
P203		25.02	0.00	0.00	4.18	19.06	
3.10	0.61	0.762					
P204		25.02	0.00	0.00	21.05	2.70	
1.30	0.67	0.108					
P301		25.02	0.00	0.00	21.15	2.73	
1.14	0.58	0.109					
P302		25.02	0.00	0.00	21.23	2.50	
0.70	0.39	0.100					
P303		25.02	0.00	0.00	20.21	3.52	
0.49	0.19	0.141					

****
Groundwater Summary
****

Subcatchment	Total Infil mm	Total Evap mm	Total Lower Seepage mm	Total Lateral Outflow mm	Maximum Lateral Outflow CMS	Average Upper Moist.	Average Water Table m	Final Upper Moist.	Final Water Table m
P204	21.05	0.00	0.00	21.04	0.54	0.19	100.00	0.19	100.00
P301	21.15	0.00	0.00	21.13	0.52	0.19	100.00	0.19	100.00
P302	21.23	0.00	0.00	21.22	0.33	0.19	100.00	0.19	100.00
P303	20.21	0.00	0.00	20.20	0.16	0.19	100.00	0.19	100.00

****
Node Depth Summary
****

Node	Type	Average Depth Meters	Maximum Depth Meters	Maximum HGL Meters	Time of Max Occurrence days	Time of Max Occurrence hr:min	Reported Max Depth Meters
P-1_DS-1_Node	JUNCTION	0.00	0.00	75.20	0	00:00	0.00
P202_Compost-Pad-Node	JUNCTION	0.00	0.32	76.32	0	01:34	0.32
EXT-2	JUNCTION	0.06	0.07	75.33	0	10:46	0.07
P-2C_1	JUNCTION	0.02	1.17	80.87	0	01:33	1.16
P-2C_2	JUNCTION	0.51	0.76	77.01	0	01:40	0.76
P-3-SW_SWM-Ditch	JUNCTION	0.50	0.89	77.04	0	01:30	0.88
SWMP3-OUT	JUNCTION	0.01	0.04	75.19	0	02:07	0.04
SWMP4-OUT	JUNCTION	0.00	0.00	75.20	0	00:00	0.00
P201_US-Node	JUNCTION	0.01	0.59	76.99	0	01:51	0.59
P203_US-Node	JUNCTION	0.01	0.43	76.43	0	01:37	0.42
SWMP1-OUT	JUNCTION	0.03	0.04	75.99	0	10:24	0.04
SWMP4b-OUT	JUNCTION	0.03	0.09	75.29	0	03:30	0.09
P-3_1	JUNCTION	0.04	1.07	80.77	0	01:39	1.07
SWMP3-OrificeOutlet	JUNCTION	0.02	0.06	75.31	0	06:39	0.06
SWMP2-OrificeOutlet	JUNCTION	0.07	0.09	75.13	0	08:39	0.09
SWMP1-OrificeOutlet	JUNCTION	0.05	0.06	76.06	1	02:24	0.06
SWMP4b-OrificeOutlet	JUNCTION	0.03	0.07	75.32	0	06:29	0.07
SWMP5b-OrificeOutlet	JUNCTION	0.10	0.12	75.92	9	23:59	0.12
P-1_OUT	OUTFALL	0.00	0.00	74.00	0	00:00	0.00

P-2_OUT	OUTFALL	0.01	0.02	74.52	3	08:49
0.02						
P-3_OUT	OUTFALL	0.03	0.04	74.88	1	00:04
0.04						
SWMP-1	STORAGE	0.54	0.86	76.86	0	10:17
0.86						
SWMP-2	STORAGE	0.46	0.83	76.18	0	08:40
0.83						
SWMP-3	STORAGE	0.11	0.52	75.77	0	06:39
0.52						
SWMP4a	STORAGE	0.66	0.67	74.07	9	23:59
0.67						
SWMP4b	STORAGE	0.13	0.62	75.87	0	06:28
0.62						
SWMP-5a	STORAGE	0.10	0.12	75.92	10	00:00
0.12						
SWMP-5b	STORAGE	0.10	0.12	75.92	10	00:00
0.12						
P-101_US-RET	STORAGE	0.20	0.60	76.60	0	07:59
0.60						
P102_US-RET	STORAGE	0.10	0.42	76.42	0	05:57
0.42						
P-1_DS-1-RET	STORAGE	1.35	1.47	75.92	10	00:00
1.47						
P-1_DS-2-RET	STORAGE	0.00	0.00	74.06	0	00:00
0.00						
P-2_SD-1-RET	STORAGE	0.17	0.22	74.97	0	11:49
0.22						
P-2_SD-2-RET	STORAGE	0.04	0.05	74.71	0	11:24
0.05						
P-2_SD-3-RET	STORAGE	0.54	0.58	74.64	0	21:19
0.58						
P-2_SD-4-RET	STORAGE	0.98	1.13	74.63	3	08:49
1.13						
P-3_DS-1-RET	STORAGE	0.07	0.10	75.07	0	02:46
0.10						
P-3_DS-2-RET	STORAGE	0.18	0.21	75.04	1	00:04
0.21						

****
Node Inflow Summary
****

		Maximum	Maximum			Lateral

Node	Type	Lateral Inflow CMS	Total Inflow CMS	Time of Max Occurrence days hr:min	Inflow Volume 10^6 ltr	Total Inflow Volume 10^6 ltr	Flow Balance Error Percent
P-1_DS-1_Node	JUNCTION	0.000	0.000	0 00:00	0	0	0.000 ltr
P202_Compost-Pad-Node	JUNCTION	0.249	0.249	0 01:30	0.92	0.921	-1.953
EXT-2	JUNCTION	0.000	0.015	0 10:25	0	10.2	0.142
P-2C_1	JUNCTION	0.669	0.669	0 01:30	1.3	1.3	-5.771
P-2C_2	JUNCTION	0.000	0.438	0 01:35	0	1.39	10.891
P-3-SW_SWM-Ditch	JUNCTION	0.387	0.525	0 01:30	0.697	2.02	1.674
SWMP3-OUT	JUNCTION	0.000	0.012	0 06:40	0	2.45	-0.010
SWMP4-OUT	JUNCTION	0.000	0.000	0 00:00	0	0	0.000 ltr
P201_US-Node	JUNCTION	0.568	0.568	0 01:30	2.47	2.47	-5.073
P203_US-Node	JUNCTION	0.610	0.610	0 01:30	3.1	3.1	-0.555
SWMP1-OUT	JUNCTION	0.000	0.015	0 10:17	0	10.2	-0.349
SWMP4b-OUT	JUNCTION	0.000	0.014	0 06:29	0	3.08	-0.051
P-3_1	JUNCTION	0.581	0.581	0 01:30	1.14	1.14	-14.364
SWMP3-OrificeOutlet	JUNCTION	0.000	0.012	0 06:39	0	2.45	0.000
SWMP2-OrificeOutlet	JUNCTION	0.000	0.031	0 08:40	0	18.5	0.215
SWMP1-OrificeOutlet	JUNCTION	0.000	0.015	0 10:17	0	10.2	0.397
SWMP4b-OrificeOutlet	JUNCTION	0.000	0.014	0 06:29	0	3.08	-0.001
SWMP5b-OrificeOutlet	JUNCTION	0.000	0.010	1 01:51	0	0.448	-7.236
P-1_OUT	OUTFALL	0.000	0.000	0 00:00	0	0	0.000 ltr

P-2_OUT	OUTFALL	0.000	0.020	3	08:49	0	8.4	0.000
P-3_OUT	OUTFALL	0.000	0.030	1	00:04	0	18	0.000
SWMP-1	STORAGE	0.538	0.792	0	01:42	10.2	11.4	0.025
SWMP-2	STORAGE	1.023	1.329	0	01:30	18.1	20	0.028
SWMP-3	STORAGE	0.000	0.404	0	02:03	0	2.6	5.450
SWMP4a	STORAGE	0.000	0.232	0	01:36	0	0.939	22.059
SWMP4b	STORAGE	0.000	0.613	0	01:26	0	3.12	0.577
SWMP-5a	STORAGE	0.000	0.019	0	08:35	0	2.5	0.859
SWMP-5b	STORAGE	0.000	0.017	0	06:27	0	2.26	3.652
P-101_US-RET	STORAGE	0.190	0.190	0	02:10	2.63	2.63	-0.339
P102_US-RET	STORAGE	0.183	0.183	0	01:50	1.7	1.7	-0.876
P-1_DS-1-RET	STORAGE	0.000	0.020	1	02:01	0	0.462	-1.890
P-1_DS-2-RET	STORAGE	0.000	0.000	0	00:00	0	0	0.000 ltr
P-2_SD-1-RET	STORAGE	0.000	0.027	0	09:45	0	12.6	0.332
P-2_SD-2-RET	STORAGE	0.000	0.040	0	11:06	0	15.6	0.041
P-2_SD-3-RET	STORAGE	0.000	0.011	0	11:24	0	4.72	1.989
P-2_SD-4-RET	STORAGE	0.000	0.038	0	19:45	0	15.2	0.126
P-3_DS-1-RET	STORAGE	0.000	0.031	0	08:40	0	18.4	-0.216
P-3_DS-2-RET	STORAGE	0.000	0.031	0	08:58	0	18.5	0.049

****
Node Surcharge Summary
****

No nodes were surcharged.

****

Node Flooding Summary
****

No nodes were flooded.

****
Storage Volume Summary
****

Storage Unit	Average Volume 1000 m3	Avg Pcnt Full	Evap Pcnt Loss	Exfil Pcnt Loss	Maximum Volume 1000 m3	Max Pcnt Full	Time of Max Occurrence days hr:min	Maximum Outflow CMS
SWMP-1	5.606	12	0	0	10.888	23	0 10:17	0.018
SWMP-2	8.918	7	0	0	19.186	15	0 08:40	0.031
SWMP-3	0.344	5	0	0	1.781	28	0 06:39	0.012
SWMP4a	0.760	14	0	0	0.769	14	9 23:59	0.000
SWMP4b	0.513	5	0	0	2.678	27	0 06:28	0.014
SWMP-5a	1.565	4	0	0	1.885	5	10 00:00	0.006
SWMP-5b	1.421	4	0	0	1.729	5	10 00:00	0.010
P-101_US-RET	0.496	2	0	0	1.860	8	0 07:59	0.019
P102_US-RET	0.247	1	0	0	1.181	5	0 05:57	0.017
P-1_DS-1-RET	0.427	52	0	0	0.471	58	10 00:00	0.003
P-1_DS-2-RET	0.000	0	0	0	0.000	0	0 00:00	0.000
P-2_SD-1-RET	0.081	3	0	0	0.114	4	0 11:49	0.027
P-2_SD-2-RET	0.032	0	0	0	0.050	0	0 11:24	0.040

P-2_SD-3-RET	0.342	7	0	0	0.376	7	0 21:19 0.011
P-2_SD-4-RET	5.952	17	0	0	7.157	20	3 08:49 0.020
P-3_DS-1-RET	0.038	0	0	0	0.056	0	0 02:46 0.031
P-3_DS-2-RET	0.617	2	0	0	0.755	2	1 00:04 0.030

****
Outfall Loading Summary
****

Outfall Node	Flow Freq Pcnt	Avg Flow CMS	Max Flow CMS	Total Volume 10^6 ltr
P-1_OUT	0.00	0.000	0.000	0.000
P-2_OUT	77.31	0.013	0.020	8.396
P-3_OUT	98.78	0.021	0.030	18.043
System	58.70	0.034	0.047	26.440

****
Link Flow Summary
****

Link	Type	Maximum |Flow| CMS	Time of Max Occurrence days hr:min	Maximum |Veloc| m/sec	Max/ Full Flow	Max/ Full Depth
SWMP1-Outlet	CONDUIT	0.015	0 10:17	0.68	0.00	0.02
SWMP2-Outlet	CONDUIT	0.031	0 08:40	0.68	0.00	0.04
SWMP3-Outlet	CONDUIT	0.012	0 06:40	0.61	0.00	0.02
SWMP4a-Outlet	CONDUIT	0.000	0 00:00	0.00	0.00	0.00
SWMP4b-Outlet	CONDUIT	0.014	0 06:29	0.36	0.00	0.04
SWMP5a-Outlet	CONDUIT	0.002	1 02:31	0.15	0.14	0.20
SWMP5b-Outlet	CONDUIT	0.020	1 02:01	0.51	0.00	0.56
Culvert-1a	CONDUIT	0.000	0 00:00	0.00	0.00	0.00
Culvert-1b	CONDUIT	0.000	0 00:00	0.00	0.00	0.00
Culvert-2a	CONDUIT	0.011	0 21:19	0.43	0.00	0.07
Culvert-3a	CONDUIT	0.031	0 08:58	0.93	0.00	0.07
P101_US-Ditch	CONDUIT	0.019	0 08:51	0.16	0.05	0.26
P102_US-Ditch	CONDUIT	0.017	0 06:27	0.12	0.03	0.22

P-1_DS2-Ditch	CONDUIT	0.000	0	00:00	0.00	0.00	0.00
SD-Segment1	CONDUIT	0.015	0	10:46	0.17	0.00	0.07
P204_US-Ditch	CONDUIT	0.438	0	01:35	0.76	0.02	0.21
P204_SWM-Inlet	CONDUIT	0.403	0	01:41	2.35	0.01	0.32
P301_US-Ditch	CONDUIT	0.165	0	01:40	0.45	0.01	0.17
P301_SWM-Inlet	CONDUIT	0.515	0	01:30	2.38	0.12	0.29
SWMP3-Outfall-Channel	CONDUIT	0.012	0	06:41	0.24	0.00	0.07
SWMP1-Outfall	CONDUIT	0.015	0	10:25	0.27	0.00	0.02
P3_DS2-Ditch	CONDUIT	0.030	1	00:04	0.17	0.00	0.03
SD-Segment2	CONDUIT	0.027	0	11:46	0.14	0.00	0.05
SWMP4a_Outfall-Channel	CONDUIT	0.000	0	00:00	0.00	0.00	0.03
SD-Segment3	CONDUIT	0.011	0	11:24	0.16	0.00	0.16
P-2_SD-4-Ditch	CONDUIT	0.020	3	08:49	0.12	0.02	0.03
P201_US-Ditch	CONDUIT	0.404	0	02:03	0.41	0.07	0.30
P203_US-Ditch	CONDUIT	0.613	0	01:26	1.42	0.05	0.31
SWMP4b_Outfall-Channel	CONDUIT	0.014	0	06:32	0.67	0.00	0.04
P202_Storm-Outlet	CONDUIT	0.232	0	01:36	1.43	0.08	0.24
SWMP5a-Outlet_2	CONDUIT	0.002	1	02:31	0.15	0.14	0.20
SWMP5a-Outlet_3	CONDUIT	0.002	1	02:31	0.15	0.14	0.20
Culvert-2b	CONDUIT	0.029	0	11:24	1.76	0.00	0.39
SWMP2-Outlet_2	CONDUIT	0.000	0	00:00	0.00	0.00	0.13
SWMP2-Outlet_3	CONDUIT	0.000	0	00:00	0.00	0.00	0.13
SWMP2-Orifice	ORIFICE	0.031	0	08:40			1.00
SWMP3-Orifice	ORIFICE	0.012	0	06:39			1.00
SWMP1-Orifice	ORIFICE	0.000	0	00:00			0.00
SWMP4b-Orifice	ORIFICE	0.014	0	06:29			1.00
SWMP5b-Orifice	ORIFICE	0.010	1	01:51			0.17
SWMP1-Orifice_2	ORIFICE	0.015	0	10:17			1.00
SWMP3-Orifice_2	ORIFICE	0.000	0	00:00			0.00
SWMP4b-Orifice_2	ORIFICE	0.000	0	00:00			0.00
SWMP1-Overflow	WEIR	0.000	0	00:00			0.00
SWMP2_Overflow-Spillway	WEIR	0.000	0	00:00			0.00
SWMP3_Overflow-Spillway	WEIR	0.000	0	00:00			0.00
SWMPond4b-Spillover	WEIR	0.000	0	00:00			0.00
SWMP_5a-5b-Overflow-Weir	WEIR	0.000	0	00:00			0.00
SWM_5b-Overflow-Weir	WEIR	0.000	0	00:00			0.00
P-1_Frontier-Rd_Spillway	WEIR	0.000	0	00:00			0.00
P-3_SWMP-2_NE-Fronteir-Rd-Spill	WEIR	0.000	0	00:00			0.00
P-2-DS_Frontier-Rd-Spillway	WEIR	0.000	0	00:00			0.00

****
Flow Classification Summary
****

Inlet Conduit Ctrl	Adjusted /Actual Length	Fraction of Time in Flow Class: Dry	Up Dry	Down Dry	Sub Crit	Sup Crit	Up Crit	Down Crit	Norm Ltd
SWMP1-Outlet	1.00	0.00	0.00	0.00	0.00	0.99	0.00	0.00	0.00
0.00									
SWMP2-Outlet	1.00	0.00	0.00	0.00	0.99	0.00	0.00	0.00	0.00
0.00									
SWMP3-Outlet	1.00	0.01	0.00	0.00	0.71	0.29	0.00	0.00	0.00
0.00									
SWMP4a-Outlet	1.00	1.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00									
SWMP4b-Outlet	1.00	0.00	0.00	0.00	1.00	0.00	0.00	0.00	0.99
0.00									
SWMP5a-Outlet	1.00	0.01	0.00	0.00	0.99	0.00	0.00	0.00	0.00
0.00									
SWMP5b-Outlet	1.00	0.01	0.00	0.00	0.98	0.01	0.00	0.00	0.09
0.00									
Culvert-1a	1.00	1.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00									
Culvert-1b	1.00	1.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00									
Culvert-2a	1.00	0.06	0.00	0.00	0.76	0.00	0.00	0.18	0.05
0.00									
Culvert-3a	1.00	0.00	0.00	0.00	0.99	0.01	0.00	0.00	0.97
0.00									
P101_US-Ditch	1.00	0.00	0.00	0.00	1.00	0.00	0.00	0.00	0.39
0.00									
P102_US-Ditch	1.00	0.00	0.00	0.00	1.00	0.00	0.00	0.00	0.68
0.00									
P-1_DS2-Ditch	1.00	1.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00									
SD-Segment1	1.00	0.00	0.00	0.00	1.00	0.00	0.00	0.00	0.99
0.00									
P204_US-Ditch	1.00	0.00	0.00	0.00	1.00	0.00	0.00	0.00	0.99
0.00									
P204_SWM-Inlet	1.00	0.00	0.01	0.00	0.99	0.00	0.00	0.00	0.84
0.00									
P301_US-Ditch	1.00	0.00	0.00	0.00	0.00	0.00	0.00	0.99	0.00

P301_SWM-Inlet	1.00	0.00	0.44	0.00	0.55	0.00	0.00	0.00	0.99
SWMP3-Outfall-Channel	1.00	0.01	0.00	0.00	0.99	0.00	0.00	0.00	0.99
SWMP1-Outfall	1.00	0.00	0.00	0.00	1.00	0.00	0.00	0.00	0.99
P3_DS2-Ditch	1.00	0.00	0.01	0.00	0.99	0.00	0.00	0.00	0.00
SD-Segment2	1.00	0.01	0.00	0.00	0.99	0.00	0.00	0.00	0.00
SWMP4a_Outfall-Channel	1.00	0.01	0.99	0.00	0.00	0.00	0.00	0.00	0.00
SD-Segment3	1.00	0.01	0.00	0.00	0.99	0.00	0.00	0.00	0.98
P-2_SD-4-Ditch	1.00	0.22	0.00	0.00	0.78	0.00	0.00	0.00	0.00
P201_US-Ditch	1.00	0.00	0.00	0.00	1.00	0.00	0.00	0.00	0.99
P203_US-Ditch	1.00	0.00	0.00	0.00	1.00	0.00	0.00	0.00	0.99
SWMP4b_Outfall-Channel	1.00	0.00	0.00	0.00	0.99	0.00	0.00	0.00	0.65
P202_Storm-Outlet	1.00	0.00	0.20	0.00	0.79	0.00	0.00	0.00	0.99
SWMP5a-Outlet_2	1.00	0.01	0.00	0.00	0.99	0.00	0.00	0.00	0.00
SWMP5a-Outlet_3	1.00	0.01	0.00	0.00	0.99	0.00	0.00	0.00	0.00
Culvert-2b	1.00	0.01	0.00	0.00	0.97	0.03	0.00	0.00	0.98
SWMP2-Outlet_2	1.00	0.00	1.00	0.00	0.00	0.00	0.00	0.00	0.00
SWMP2-Outlet_3	1.00	0.00	1.00	0.00	0.00	0.00	0.00	0.00	0.00

****
Conduit Surcharge Summary
****

Conduit	Hours Full: Both Ends	Hours Full: Upstream	Hours Full: Dnstream	Hours Above Full Normal Flow	Hours Capacity Limited
SWMP5b-Outlet	0.01	0.01	220.30	0.01	0.01

Analysis begun on: Mon Dec 10 13:34:10 2018
Analysis ended on: Mon Dec 10 13:34:12 2018
Total elapsed time: 00:00:02

```
EPA STORM WATER MANAGEMENT MODEL - VERSION 5.1 (Build 5.1.011)
--------------------------------------------------------------

WARNING 04: minimum elevation drop used for Conduit SWMP5a-Outlet
WARNING 04: minimum elevation drop used for Conduit P-2_SD-4-Ditch
WARNING 04: minimum elevation drop used for Conduit SWMP5a-Outlet_2
WARNING 04: minimum elevation drop used for Conduit SWMP5a-Outlet_3
WARNING 02: maximum depth increased for Node P-2C_1
WARNING 02: maximum depth increased for Node P-2C_2
WARNING 02: maximum depth increased for Node P-3-SW_SWM-Ditch
WARNING 02: maximum depth increased for Node P-3_1
WARNING 02: maximum depth increased for Node SWMP3-OrificeOutlet
WARNING 02: maximum depth increased for Node SWMP1-OrificeOutlet
WARNING 02: maximum depth increased for Node SWMP4b-OrificeOutlet
WARNING 02: maximum depth increased for Node SWMP5b-OrificeOutlet

*****************************************************
NOTE: The summary statistics displayed in this report are
based on results found at every computational time step,
not just on results from each reporting time step.
*****************************************************

****************
Analysis Options
****************
Flow Units ............... CMS
Process Models:
  Rainfall/Runoff ........ YES
  RDII ................... NO
  Snowmelt ............... NO
  Groundwater ............ YES
  Flow Routing ........... YES
  Ponding Allowed ........ YES
  Water Quality .......... NO
Infiltration Method ...... CURVE_NUMBER
Flow Routing Method ...... DYNWAVE
Starting Date ............ 07/14/2013 00:00:00
Ending Date .............. 07/24/2013 00:00:00
Antecedent Dry Days ...... 0.0
Report Time Step ......... 00:05:00
Wet Time Step ............ 00:05:00
Dry Time Step ............ 01:00:00
Routing Time Step ........ 30.00 sec
Variable Time Step ....... YES
Maximum Trials ........... 8
Number of Threads ........ 1
Head Tolerance ........... 0.001500 m
```

Runoff Quantity Continuity	Volume hectare-m	Depth mm
Total Precipitation	19.706	103.883
Evaporation Loss	0.000	0.000
Infiltration Loss	6.244	32.916
Surface Runoff	13.209	69.636
Final Storage	0.278	1.463
Continuity Error (%)	-0.126	

Groundwater Continuity	Volume hectare-m	Depth mm
Initial Storage	13.786	104.500
Infiltration	5.877	44.547
Upper Zone ET	0.000	0.000
Lower Zone ET	0.000	0.000
Deep Percolation	0.000	0.000
Groundwater Flow	5.876	44.539
Final Storage	13.786	104.500
Continuity Error (%)	0.005	

Flow Routing Continuity	Volume hectare-m	Volume 10^6 ltr
Dry Weather Inflow	0.000	0.000
Wet Weather Inflow	13.176	131.766
Groundwater Inflow	5.873	58.728
RDII Inflow	0.000	0.000
External Inflow	0.000	0.000
External Outflow	14.122	141.221
Flooding Loss	0.000	0.000
Evaporation Loss	0.000	0.000
Exfiltration Loss	0.000	0.000
Initial Stored Volume	0.000	0.000
Final Stored Volume	4.997	49.975
Continuity Error (%)	-0.369	

****
Highest Continuity Errors
****
Node SWMP4a (12.59%)
Node P-1_DS-1-RET (-3.57%)

Node SWMP5b-OrificeOutlet (2.71%)
Node SWMP-3 (2.38%)
Node SWMP-5b (1.80%)

****
Time-Step Critical Elements
****
Link SWMP2-Outlet_2 (31.28%)
Link Culvert-2b (18.10%)
Link Culvert-1b (5.83%)
Link SWMP5a-Outlet (5.49%)
Link SWMP5b-Outlet (5.01%)

****
Highest Flow Instability Indexes
****
All links are stable.

****
Routing Time Step Summary
****
Minimum Time Step : 1.98 sec
Average Time Step : 13.35 sec
Maximum Time Step : 30.00 sec
Percent in Steady State : 0.00
Average Iterations per Step : 2.66
Percent Not Converging : 0.02

****
Subcatchment Runoff Summary
****

Subcatchment	Total Precip mm	Total Runon mm	Total Evap mm	Total Infil mm	Total Runoff mm	Total Runoff 10^6 ltr	Peak Runoff CMS	Runoff Coeff

P101		103.88	0.00	0.00	8.34	93.82		
13.98	1.51	0.903						
P102		103.88	0.00	0.00	8.27	93.97		
8.94	1.43	0.905						
P201		103.88	0.00	0.00	5.44	96.87		
12.50	2.90	0.933						
P202		103.88	0.00	0.00	1.25	100.80		
4.23	1.20	0.970						
P203		103.88	0.00	0.00	5.46	96.80		
15.74	3.23	0.932						
P204		103.88	0.00	0.00	41.43	61.24		
29.58	6.09	0.589						
P301		103.88	0.00	0.00	46.88	55.87		
23.36	5.10	0.538						
P302		103.88	0.00	0.00	48.62	54.04		
15.06	3.24	0.520						
P303		103.88	0.00	0.00	40.20	62.47		
8.71	2.16	0.601						

****
Groundwater Summary
****

Subcatchment	Total Infil mm	Total Evap mm	Total Lower Seepage mm	Total Lateral Outflow mm	Maximum Lateral Outflow CMS	Average Upper Moist.	Final Water Table m	Final Upper Moist.	Final Water Table m
P204	41.43	0.00	0.00	41.42	0.57	0.19	100.00	0.19	100.00
P301	46.88	0.00	0.00	46.87	0.63	0.19	100.00	0.19	100.00
P302	48.62	0.00	0.00	48.62	0.41	0.19	100.00	0.19	100.00
P303	40.20	0.00	0.00	40.20	0.17	0.19	100.00	0.19	100.00

****
Node Depth Summary
****

Node	Type	Average Depth Meters	Maximum Depth Meters	Maximum HGL Meters	Time of Max Occurrence days hr:min	Reported Max Depth Meters
P-1_DS-1_Node	JUNCTION	0.03	0.06	75.26	1 02:54	0.06
P202_Compost-Pad-Node	JUNCTION	0.04	0.62	76.62	0 12:07	0.58
EXT-2	JUNCTION	0.20	0.35	75.61	0 18:59	0.35
P-2C_1	JUNCTION	0.35	2.84	82.54	0 12:13	2.83
P-2C_2	JUNCTION	1.35	1.77	78.02	0 18:48	1.77
P-3-SW_SWM-Ditch	JUNCTION	0.65	1.87	78.02	0 12:20	1.87
SWMP3-OUT	JUNCTION	0.13	0.35	75.50	0 17:03	0.35
SWMP4-OUT	JUNCTION	0.00	0.00	75.20	0 00:00	0.00
P201_US-Node	JUNCTION	0.08	0.76	77.16	0 12:12	0.75
P203_US-Node	JUNCTION	0.25	0.69	76.69	0 12:05	0.67
SWMP1-OUT	JUNCTION	0.12	0.22	76.17	0 18:51	0.22
SWMP4b-OUT	JUNCTION	0.11	0.21	75.41	0 12:50	0.21
P-3_1	JUNCTION	0.50	2.75	82.45	0 12:16	2.74
SWMP3-OrificeOutlet	JUNCTION	0.10	0.25	75.50	0 17:03	0.25
SWMP2-OrificeOutlet	JUNCTION	0.27	0.53	75.57	0 19:16	0.53
SWMP1-OrificeOutlet	JUNCTION	0.15	0.25	76.25	0 18:48	0.25
SWMP4b-OrificeOutlet	JUNCTION	0.10	0.19	75.44	0 12:53	0.19

SWMP5b-OrificeOutlet	JUNCTION	0.22	0.42	76.22	1	02:51
0.42						
P-1_OUT	OUTFALL	0.10	0.21	74.21	1	03:21
0.21						
P-2_OUT	OUTFALL	0.08	0.17	74.67	0	21:43
0.17						
P-3_OUT	OUTFALL	0.14	0.27	75.11	0	19:33
0.27						
SWMP-1	STORAGE	1.59	2.02	78.02	0	18:48
2.02						
SWMP-2	STORAGE	1.31	1.58	76.93	0	17:49
1.58						
SWMP-3	STORAGE	0.66	1.21	76.46	0	13:17
1.21						
SWMP4a	STORAGE	1.90	2.00	75.40	9	23:59
2.00						
SWMP4b	STORAGE	0.83	1.26	76.51	0	13:02
1.26						
SWMP-5a	STORAGE	0.26	0.42	76.22	1	02:43
0.42						
SWMP-5b	STORAGE	0.26	0.41	76.21	1	02:47
0.41						
P-101_US-RET	STORAGE	0.62	1.47	77.47	0	15:33
1.47						
P102_US-RET	STORAGE	0.33	0.96	76.96	0	13:44
0.96						
P-1_DS-1-RET	STORAGE	1.49	1.72	76.17	1	02:49
1.72						
P-1_DS-2-RET	STORAGE	0.16	0.33	74.39	1	03:21
0.33						
P-2_SD-1-RET	STORAGE	0.43	0.74	75.49	0	17:03
0.74						
P-2_SD-2-RET	STORAGE	0.17	0.37	75.03	0	21:34
0.37						
P-2_SD-3-RET	STORAGE	0.74	0.96	75.02	0	21:36
0.96						
P-2_SD-4-RET	STORAGE	1.25	1.53	75.03	0	21:43
1.53						
P-3_DS-1-RET	STORAGE	0.31	0.60	75.57	0	19:16
0.60						
P-3_DS-2-RET	STORAGE	0.42	0.70	75.53	0	19:33
0.70						

****
Node Inflow Summary
****

Node	Type	Maximum Lateral Inflow CMS	Maximum Total Inflow CMS	Time of Max Occurrence days hr:min	Lateral Inflow Volume 10^6 ltr	Total Inflow Volume 10^6 ltr	Flow Balance Error Percent
P-1_DS-1_Node	JUNCTION	0.000	0.172	1 02:49	0	17.1	0.072
P202_Compost-Pad-Node	JUNCTION	1.199	1.199	0 12:05	4.23	4.22	-0.400
EXT-2	JUNCTION	0.000	0.324	0 18:51	0	37.4	0.086
P-2C_1	JUNCTION	6.086	6.086	0 12:05	29.5	29.5	-0.961
P-2C_2	JUNCTION	0.000	4.664	0 13:43	0	34.9	1.203
P-3-SW_SWM-Ditch	JUNCTION	3.245	4.627	0 12:07	15	39.4	0.847
SWMP3-OUT	JUNCTION	0.000	0.430	0 13:18	0	12.4	-0.018
SWMP4-OUT	JUNCTION	0.000	0.000	0 00:00	0	0	0.000 ltr
P201_US-Node	JUNCTION	2.903	2.903	0 12:05	12.5	12.5	-2.356
P203_US-Node	JUNCTION	3.230	3.230	0 12:05	15.7	15.7	-0.232
SWMP1-OUT	JUNCTION	0.000	0.324	0 18:48	0	37.4	-0.035
SWMP4b-OUT	JUNCTION	0.000	0.115	0 13:01	0	12.3	-0.040
P-3_1	JUNCTION	5.103	5.103	0 12:05	23.3	23.3	-4.483
SWMP3-OrificeOutlet	JUNCTION	0.000	0.226	0 13:18	0	11.5	-0.001
SWMP2-OrificeOutlet	JUNCTION	0.000	0.043	0 15:24	0	31.4	0.129
SWMP1-OrificeOutlet	JUNCTION	0.000	0.324	0 18:48	0	37.5	0.056
SWMP4b-OrificeOutlet	JUNCTION	0.000	0.115	0 13:02	0	12.3	0.000

SWMP5b-OrificeOutlet	JUNCTION	0.000	0.614	1	03:30	0	23.9	2.781
P-1_OUT	OUTFALL	0.000	0.159	1	03:21	0	17	0.000
P-2_OUT	OUTFALL	0.000	0.522	0	21:43	0	57.8	0.000
P-3_OUT	OUTFALL	0.000	0.664	0	19:33	0	66.4	0.000
SWMP-1	STORAGE	0.574	7.667	0	13:21	20	54.5	0.000
SWMP-2	STORAGE	2.933	6.347	0	12:08	47.4	86.5	0.063
SWMP-3	STORAGE	0.000	2.007	0	12:12	0	12.8	2.440
SWMP4a	STORAGE	0.000	1.035	0	12:07	0	4.24	14.407
SWMP4b	STORAGE	0.000	3.164	0	12:06	0	15.7	0.237
SWMP-5a	STORAGE	0.000	0.252	0	20:47	0	14.1	0.814
SWMP-5b	STORAGE	0.000	0.299	0	21:04	0	20.7	1.830
P-101_US-RET	STORAGE	1.510	1.510	0	12:05	14	14	-0.776
P102_US-RET	STORAGE	1.434	1.434	0	12:05	8.93	8.92	-1.834
P-1_DS-1-RET	STORAGE	0.000	0.778	1	02:31	0	22.9	-3.447
P-1_DS-2-RET	STORAGE	0.000	0.162	1	02:52	0	17.1	0.064
P-2_SD-1-RET	STORAGE	0.000	0.474	0	16:48	0	49.8	0.114
P-2_SD-2-RET	STORAGE	0.000	1.543	0	21:05	0	83.1	-0.002
P-2_SD-3-RET	STORAGE	0.000	0.309	0	20:02	0	18.7	0.634
P-2_SD-4-RET	STORAGE	0.000	1.557	0	21:34	0	81.3	0.035
P-3_DS-1-RET	STORAGE	0.000	0.684	0	17:30	0	67.2	-0.060
P-3_DS-2-RET	STORAGE	0.000	0.674	0	18:15	0	67.2	0.027

****
Node Surcharge Summary
****

No nodes were surcharged.

****
Node Flooding Summary
****

No nodes were flooded.

****
Storage Volume Summary
****

Storage Unit	Average Volume 1000 m3	Avg Pcnt Full	Evap Pcnt Loss	Exfil Pcnt Loss	Maximum Volume 1000 m3	Max Pcnt Full	Time of Max Occurrence days hr:min	Maximum Outflow CMS
SWMP-1	25.723	55	0	0	35.125	75	0 18:48	3.738
SWMP-2	44.726	34	0	0	62.152	48	0 17:49	0.684
SWMP-3	2.461	39	0	0	4.807	76	0 13:17	0.430
SWMP4a	3.462	65	0	0	3.703	69	9 23:59	0.000
SWMP4b	4.935	50	0	0	8.127	82	0 13:02	0.607
SWMP-5a	4.292	11	0	0	6.897	18	1 02:43	0.118
SWMP-5b	3.896	11	0	0	6.220	18	1 02:47	0.251
P-101_US-RET	2.409	10	0	0	7.003	30	0 15:33	0.252
P102_US-RET	1.025	4	0	0	3.718	15	0 13:44	0.235
P-1_DS-1-RET	0.506	62	0	0	0.620	76	1 02:49	0.567
P-1_DS-2-RET	0.115	1	0	0	0.241	2	1 03:21	0.159

P-2_SD-1-RET	0.278	11	0	0	0.548	21	0 17:03 0.504
P-2_SD-2-RET	0.183	2	0	0	0.439	4	0 21:34 1.722
P-2_SD-3-RET	0.543	10	0	0	0.782	15	0 21:36 0.316
P-2_SD-4-RET	8.615	24	0	0	11.523	32	0 21:43 1.506
P-3_DS-1-RET	0.313	2	0	0	0.738	5	0 19:16 0.674
P-3_DS-2-RET	1.863	5	0	0	3.497	10	0 19:33 0.664

****
Outfall Loading Summary
****

Outfall Node	Flow Freq Pcnt	Avg Flow CMS	Max Flow CMS	Total Volume 10^6 ltr
P-1_OUT	87.52	0.068	0.159	17.045
P-2_OUT	92.24	0.212	0.522	57.750
P-3_OUT	99.33	0.257	0.664	66.425
System	93.03	0.537	1.272	141.220

****
Link Flow Summary
****

Link	Type	Maximum |Flow| CMS	Time of Max Occurrence days hr:min	Maximum |Veloc| m/sec	Max/ Full Flow	Max/ Full Depth
SWMP1-Outlet	CONDUIT	0.324	0 18:48	1.41	0.02	0.09
SWMP2-Outlet	CONDUIT	0.043	0 15:24	0.67	0.00	0.28
SWMP3-Outlet	CONDUIT	0.226	0 13:18	1.22	0.03	0.15
SWMP4a-Outlet	CONDUIT	0.000	0 00:00	0.00	0.00	0.00
SWMP4b-Outlet	CONDUIT	0.115	0 13:01	0.73	0.02	0.10
SWMP5a-Outlet	CONDUIT	0.039	0 22:00	0.22	2.59	0.69
SWMP5b-Outlet	CONDUIT	0.778	1 02:31	1.68	0.12	0.72
Culvert-1a	CONDUIT	0.172	1 02:49	2.64	0.04	0.14
Culvert-1b	CONDUIT	0.159	1 03:21	0.85	0.14	0.22

Culvert-2a	CONDUIT	0.258	0	21:18	0.84	0.10	0.33
Culvert-3a	CONDUIT	0.674	0	18:15	1.10	0.08	0.33
P101_US-Ditch	CONDUIT	0.252	0	20:47	0.37	0.70	0.64
P102_US-Ditch	CONDUIT	0.235	0	14:18	0.29	0.40	0.52
P-1_DS2-Ditch	CONDUIT	0.162	1	02:52	0.17	0.00	0.06
SD-Segment1	CONDUIT	0.324	0	18:59	0.25	0.02	0.27
P204_US-Ditch	CONDUIT	3.637	0	12:13	1.40	0.13	0.44
P204_SWM-Inlet	CONDUIT	7.096	0	13:21	1.93	0.13	0.92
P301_US-Ditch	CONDUIT	2.686	0	12:18	0.95	0.15	0.46
P301_SWM-Inlet	CONDUIT	4.239	0	12:19	2.86	0.97	0.81
SWMP3-Outfall-Channel	CONDUIT	0.430	0	13:18	0.51	0.01	0.27
SWMP1-Outfall	CONDUIT	0.324	0	18:51	0.62	0.00	0.09
P3_DS2-Ditch	CONDUIT	0.664	0	19:33	0.56	0.04	0.12
SD-Segment2	CONDUIT	0.504	0	18:41	0.41	0.04	0.17
SWMP4a_Outfall-Channel	CONDUIT	0.000	0	00:00	0.00	0.00	0.18
SD-Segment3	CONDUIT	0.316	0	22:08	0.22	0.02	0.33
P-2_SD-4-Ditch	CONDUIT	0.522	0	21:43	0.48	0.50	0.14
P201_US-Ditch	CONDUIT	2.007	0	12:12	0.54	0.33	0.70
P203_US-Ditch	CONDUIT	3.164	0	12:06	0.86	0.26	0.72
SWMP4b_Outfall-Channel	CONDUIT	0.121	0	12:57	0.92	0.02	0.14
P202_Storm-Outlet	CONDUIT	1.035	0	12:07	1.09	0.36	0.57
SWMP5a-Outlet_2	CONDUIT	0.039	0	22:00	0.22	2.59	0.69
SWMP5a-Outlet_3	CONDUIT	0.039	0	22:00	0.22	2.59	0.69
Culvert-2b	CONDUIT	1.557	0	21:34	3.17	0.13	0.62
SWMP2-Outlet_2	CONDUIT	0.321	0	17:31	3.13	0.55	0.88
SWMP2-Outlet_3	CONDUIT	0.321	0	17:31	3.13	0.55	0.88
SWMP2-Orifice	ORIFICE	0.043	0	15:24			1.00
SWMP3-Orifice	ORIFICE	0.017	0	13:17			1.00
SWMP1-Orifice	ORIFICE	0.301	0	18:48			1.00
SWMP4b-Orifice	ORIFICE	0.019	0	13:03			1.00
SWMP5b-Orifice	ORIFICE	0.251	1	02:39			0.60
SWMP1-Orifice_2	ORIFICE	0.023	0	18:48			1.00
SWMP3-Orifice_2	ORIFICE	0.209	0	13:18			0.82
SWMP4b-Orifice_2	ORIFICE	0.096	0	13:02			0.58
SWMP1-Overflow	WEIR	0.000	0	00:00			0.00
SWMP2_Overflow-Spillway	WEIR	0.000	0	00:00			0.00
SWMP3_Overflow-Spillway	WEIR	0.205	0	13:18			0.06
SWMPond4b-Spillover	WEIR	0.493	0	13:02			0.06
SWMP_5a-5b-Overflow-Weir	WEIR	0.000	0	00:00			0.00
SWM_5b-Overflow-Weir	WEIR	0.000	0	00:00			0.00
P-1_Frontier-Rd_Spillway	WEIR	0.000	0	00:00			0.00
P-3_SWMP-2_NE-Fronteir-Rd-Spill	WEIR	0.000	0	00:00			0.00
P-2-DS_Frontier-Rd-Spillway	WEIR	0.000	0	00:00			0.00

****
Flow Classification Summary
****

Conduit	Adjusted /Actual Length	Fraction of Time in Flow Class: Dry	Up Dry	Down Dry	Sub Crit	Sup Crit	Up Crit	Down Crit	Norm Ltd	Inlet Ctrl
SWMP1-Outlet	1.00	0.00	0.00	0.00	0.00	1.00	0.00	0.00	0.09	0.00
SWMP2-Outlet	1.00	0.00	0.00	0.00	1.00	0.00	0.00	0.00	0.00	0.00
SWMP3-Outlet	1.00	0.00	0.00	0.00	0.68	0.32	0.00	0.00	0.03	0.00
SWMP4a-Outlet	1.00	1.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
SWMP4b-Outlet	1.00	0.00	0.00	0.00	1.00	0.00	0.00	0.00	0.92	0.00
SWMP5a-Outlet	1.00	0.01	0.00	0.00	0.99	0.00	0.00	0.00	0.00	0.00
SWMP5b-Outlet	1.00	0.01	0.00	0.00	0.98	0.01	0.00	0.00	0.05	0.00
Culvert-1a	1.00	0.11	0.00	0.00	0.00	0.89	0.00	0.00	0.00	0.00
Culvert-1b	1.00	0.12	0.00	0.00	0.88	0.00	0.00	0.00	0.00	0.00
Culvert-2a	1.00	0.04	0.00	0.00	0.90	0.00	0.00	0.06	0.00	0.00
Culvert-3a	1.00	0.00	0.00	0.00	0.99	0.01	0.00	0.00	0.09	0.00
P101_US-Ditch	1.00	0.00	0.00	0.00	1.00	0.00	0.00	0.00	0.75	0.00
P102_US-Ditch	1.00	0.00	0.00	0.00	1.00	0.00	0.00	0.00	0.89	0.00
P-1_DS2-Ditch	1.00	0.11	0.00	0.00	0.89	0.00	0.00	0.00	0.93	0.00
SD-Segment1	1.00	0.00	0.00	0.00	1.00	0.00	0.00	0.00	0.98	0.00
P204_US-Ditch	1.00	0.00	0.00	0.00	1.00	0.00	0.00	0.00	0.98	

0.00									
P204_SWM-Inlet	1.00	0.00	0.01	0.00	0.99	0.00	0.00	0.00	0.04
0.00									
P301_US-Ditch	1.00	0.00	0.00	0.00	0.28	0.00	0.00	0.72	0.10
0.00									
P301_SWM-Inlet	1.00	0.00	0.29	0.00	0.71	0.00	0.00	0.00	0.82
0.00									
SWMP3-Outfall-Channel	1.00	0.00	0.00	0.00	1.00	0.00	0.00	0.00	0.90
0.00									
SWMP1-Outfall	1.00	0.00	0.00	0.00	1.00	0.00	0.00	0.00	0.99
0.00									
P3_DS2-Ditch	1.00	0.00	0.00	0.00	0.99	0.00	0.00	0.00	0.00
0.00									
SD-Segment2	1.00	0.00	0.00	0.00	1.00	0.00	0.00	0.00	0.00
0.00									
SWMP4a_Outfall-Channel	1.00	0.00	1.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00									
SD-Segment3	1.00	0.00	0.00	0.00	1.00	0.00	0.00	0.00	0.77
0.00									
P-2_SD-4-Ditch	1.00	0.08	0.00	0.00	0.92	0.00	0.00	0.00	0.00
0.00									
P201_US-Ditch	1.00	0.00	0.00	0.00	1.00	0.00	0.00	0.00	0.97
0.00									
P203_US-Ditch	1.00	0.00	0.00	0.00	1.00	0.00	0.00	0.00	0.71
0.00									
SWMP4b_Outfall-Channel	1.00	0.00	0.00	0.00	1.00	0.00	0.00	0.00	0.47
0.00									
P202_Storm-Outlet	1.00	0.00	0.07	0.00	0.93	0.00	0.00	0.00	0.98
0.00									
SWMP5a-Outlet_2	1.00	0.01	0.00	0.00	0.99	0.00	0.00	0.00	0.00
0.00									
SWMP5a-Outlet_3	1.00	0.01	0.00	0.00	0.99	0.00	0.00	0.00	0.00
0.00									
Culvert-2b	1.00	0.00	0.00	0.00	0.96	0.03	0.00	0.00	0.90
0.00									
SWMP2-Outlet_2	1.00	0.00	0.37	0.00	0.20	0.43	0.00	0.00	0.87
0.00									
SWMP2-Outlet_3	1.00	0.00	0.37	0.00	0.20	0.43	0.00	0.00	0.87
0.00									

****
Conduit Surcharge Summary
****

	Hours Full		Hours Above Full	Hours Capacity

Conduit	Both Ends	Upstream	Dnstream	Normal Flow	Limited
SWMP5a-Outlet	0.01	0.01	0.01	24.52	0.01
SWMP5b-Outlet	0.01	0.01	224.67	0.01	0.01
P101_US-Ditch	0.01	8.14	0.01	0.01	0.01
P204_SWM-Inlet	0.01	0.01	48.41	0.01	0.01
P301_SWM-Inlet	0.01	0.01	10.78	0.01	0.01
P201_US-Ditch	0.01	0.01	0.65	0.01	0.01
P203_US-Ditch	0.01	0.01	9.41	0.01	0.01
P202_Storm-Outlet	0.01	0.01	226.91	0.01	0.01
SWMP5a-Outlet_2	0.01	0.01	0.01	24.52	0.01
SWMP5a-Outlet_3	0.01	0.01	0.01	24.52	0.01
Culvert-2b	0.01	0.01	7.19	0.01	0.01
SWMP2-Outlet_2	0.01	0.01	18.06	0.01	0.01
SWMP2-Outlet_3	0.01	0.01	18.06	0.01	0.01

Analysis begun on: Mon Dec 10 14:57:18 2018
Analysis ended on: Mon Dec 10 14:57:23 2018
Total elapsed time: 00:00:05

```
EPA STORM WATER MANAGEMENT MODEL - VERSION 5.1 (Build 5.1.011)
--------------------------------------------------------------

WARNING 04: minimum elevation drop used for Conduit SWMP5a-Outlet
WARNING 04: minimum elevation drop used for Conduit P-2_SD-4-Ditch
WARNING 04: minimum elevation drop used for Conduit SWMP5a-Outlet_2
WARNING 04: minimum elevation drop used for Conduit SWMP5a-Outlet_3
WARNING 02: maximum depth increased for Node P-2C_1
WARNING 02: maximum depth increased for Node P-2C_2
WARNING 02: maximum depth increased for Node P-3-SW_SWM-Ditch
WARNING 02: maximum depth increased for Node P-3_1
WARNING 02: maximum depth increased for Node SWMP3-OrificeOutlet
WARNING 02: maximum depth increased for Node SWMP1-OrificeOutlet
WARNING 02: maximum depth increased for Node SWMP4b-OrificeOutlet
WARNING 02: maximum depth increased for Node SWMP5b-OrificeOutlet

*****************************************************
NOTE: The summary statistics displayed in this report are
based on results found at every computational time step,
not just on results from each reporting time step.
*****************************************************

****************
Analysis Options
****************
Flow Units ............... CMS
Process Models:
  Rainfall/Runoff ........ YES
  RDII ................... NO
  Snowmelt ............... NO
  Groundwater ............ YES
  Flow Routing ........... YES
  Ponding Allowed ........ YES
  Water Quality .......... NO
Infiltration Method ...... CURVE_NUMBER
Flow Routing Method ...... DYNWAVE
Starting Date ............ 07/14/2013 00:00:00
Ending Date .............. 07/24/2013 00:00:00
Antecedent Dry Days ...... 0.0
Report Time Step ......... 00:05:00
Wet Time Step ............ 00:05:00
Dry Time Step ............ 01:00:00
Routing Time Step ........ 30.00 sec
Variable Time Step ....... YES
Maximum Trials ........... 8
Number of Threads ........ 1
Head Tolerance ........... 0.001500 m
```

Runoff Quantity Continuity	Volume hectare-m	Depth mm
Total Precipitation	21.958	115.758
Evaporation Loss	0.000	0.000
Infiltration Loss	6.507	34.304
Surface Runoff	15.202	80.141
Final Storage	0.278	1.464
Continuity Error (%)	-0.130	

Groundwater Continuity	Volume hectare-m	Depth mm
Initial Storage	13.786	104.500
Infiltration	6.133	46.492
Upper Zone ET	0.000	0.000
Lower Zone ET	0.000	0.000
Deep Percolation	0.000	0.000
Groundwater Flow	6.132	46.483
Final Storage	13.786	104.500
Continuity Error (%)	0.006	

Flow Routing Continuity	Volume hectare-m	Volume 10^6 ltr
Dry Weather Inflow	0.000	0.000
Wet Weather Inflow	15.158	151.580
Groundwater Inflow	6.129	61.292
RDII Inflow	0.000	0.000
External Inflow	0.000	0.000
External Outflow	16.284	162.845
Flooding Loss	0.000	0.000
Evaporation Loss	0.000	0.000
Exfiltration Loss	0.000	0.000
Initial Stored Volume	0.000	0.000
Final Stored Volume	5.066	50.660
Continuity Error (%)	-0.297	

****
Highest Continuity Errors
****
Node SWMP4a (12.00%)
Node P-1_DS-1-RET (-3.09%)

Node SWMP5b-OrificeOutlet (2.36%)
Node SWMP-3 (2.19%)
Node SWMP-5b (1.68%)

****
Time-Step Critical Elements
****
Link SWMP2-Outlet_2 (38.36%)
Link Culvert-2b (15.49%)
Link Culvert-1b (5.68%)
Link SWMP5b-Outlet (5.09%)
Link SWMP5a-Outlet (4.87%)

****
Highest Flow Instability Indexes
****
All links are stable.

****
Routing Time Step Summary
****
Minimum Time Step : 1.64 sec
Average Time Step : 12.11 sec
Maximum Time Step : 30.00 sec
Percent in Steady State : 0.00
Average Iterations per Step : 2.59
Percent Not Converging : 0.02

****
Subcatchment Runoff Summary
****

Subcatchment	Total Precip mm	Total Runon mm	Total Evap mm	Total Infil mm	Total Runoff mm	Total Runoff 10^6 ltr	Peak Runoff CMS	Runoff Coeff

P101			115.76	0.00	0.00	8.52	105.53	
15.72	1.76	0.912						
P102			115.76	0.00	0.00	8.44	105.69	
10.05	1.66	0.913						
P201			115.76	0.00	0.00	5.52	108.70	
14.02	3.31	0.939						
P202			115.76	0.00	0.00	1.25	112.72	
4.73	1.36	0.974						
P203			115.76	0.00	0.00	5.55	108.63	
17.66	3.69	0.938						
P204			115.76	0.00	0.00	43.01	71.55	
34.56	7.20	0.618						
P301			115.76	0.00	0.00	49.09	65.56	
27.41	6.06	0.566						
P302			115.76	0.00	0.00	50.99	63.55	
17.71	3.86	0.549						
P303			115.76	0.00	0.00	41.79	72.79	
10.15	2.55	0.629						

****
Groundwater Summary
****

Subcatchment	Total Infil mm	Total Evap mm	Total Lower Seepage mm	Total Lateral Outflow mm	Maximum Lateral Outflow CMS	Average Upper Moist.	Average Water Table m	Final Upper Moist.	Final Water Table m
P204	43.01	0.00	0.00	43.00	0.58	0.19	100.00	0.19	100.00
P301	49.09	0.00	0.00	49.07	0.65	0.19	100.00	0.19	100.00
P302	50.99	0.00	0.00	50.98	0.42	0.19	100.00	0.19	100.00
P303	41.79	0.00	0.00	41.78	0.17	0.19	100.00	0.19	100.00

****
Node Depth Summary
****

Node	Type	Average Depth Meters	Maximum Depth Meters	Maximum HGL Meters	Time of Max Occurrence days hr:min	Reported Max Depth Meters
P-1_DS-1_Node	JUNCTION	0.03	0.06	75.26	1 02:32	0.06
P202_Compost-Pad-Node	JUNCTION	0.05	0.66	76.66	0 12:07	0.62
EXT-2	JUNCTION	0.23	0.38	75.64	0 18:34	0.38
P-2C_1	JUNCTION	0.40	3.07	82.77	0 12:12	3.06
P-2C_2	JUNCTION	1.43	1.91	78.16	0 18:23	1.91
P-3-SW_SWM-Ditch	JUNCTION	0.70	3.20	79.35	0 12:23	3.19
SWMP3-OUT	JUNCTION	0.15	0.39	75.54	0 14:04	0.39
SWMP4-OUT	JUNCTION	0.00	0.00	75.20	0 00:00	0.00
P201_US-Node	JUNCTION	0.09	0.80	77.20	0 12:12	0.79
P203_US-Node	JUNCTION	0.27	0.73	76.73	0 12:05	0.71
SWMP1-OUT	JUNCTION	0.14	0.24	76.19	0 18:26	0.24
SWMP4b-OUT	JUNCTION	0.11	0.21	75.41	0 12:34	0.21
P-3_1	JUNCTION	0.54	2.86	82.56	0 12:12	2.84
SWMP3-OrificeOutlet	JUNCTION	0.11	0.29	75.54	0 14:05	0.29
SWMP2-OrificeOutlet	JUNCTION	0.31	0.58	75.62	0 18:43	0.58
SWMP1-OrificeOutlet	JUNCTION	0.16	0.27	76.27	0 18:23	0.27
SWMP4b-OrificeOutlet	JUNCTION	0.11	0.20	75.45	0 12:43	0.20

SWMP5b-OrificeOutlet	JUNCTION	0.23	0.46	76.26	1	02:31
0.45						
P-1_OUT	OUTFALL	0.11	0.23	74.23	1	02:46
0.23						
P-2_OUT	OUTFALL	0.10	0.20	74.70	0	20:03
0.20						
P-3_OUT	OUTFALL	0.15	0.29	75.13	0	19:01
0.29						
SWMP-1	STORAGE	1.67	2.16	78.16	0	18:23
2.16						
SWMP-2	STORAGE	1.36	1.66	77.01	0	17:41
1.66						
SWMP-3	STORAGE	0.70	1.24	76.49	0	12:58
1.24						
SWMP4a	STORAGE	2.05	2.15	75.55	9	23:59
2.15						
SWMP4b	STORAGE	0.87	1.28	76.53	0	12:44
1.28						
SWMP-5a	STORAGE	0.28	0.46	76.26	1	02:12
0.46						
SWMP-5b	STORAGE	0.28	0.45	76.25	1	02:19
0.45						
P-101_US-RET	STORAGE	0.69	1.59	77.59	0	15:35
1.59						
P102_US-RET	STORAGE	0.35	1.01	77.01	0	13:37
1.01						
P-1_DS-1-RET	STORAGE	1.51	1.75	76.20	1	02:29
1.74						
P-1_DS-2-RET	STORAGE	0.18	0.36	74.42	1	02:46
0.36						
P-2_SD-1-RET	STORAGE	0.47	0.79	75.54	0	14:30
0.79						
P-2_SD-2-RET	STORAGE	0.20	0.41	75.07	0	20:07
0.41						
P-2_SD-3-RET	STORAGE	0.77	1.00	75.06	0	20:09
1.00						
P-2_SD-4-RET	STORAGE	1.30	1.58	75.08	0	20:03
1.58						
P-3_DS-1-RET	STORAGE	0.35	0.65	75.62	0	18:43
0.65						
P-3_DS-2-RET	STORAGE	0.46	0.74	75.57	0	19:01
0.74						

****
Node Inflow Summary
****

Node	Type	Maximum Lateral Inflow CMS	Maximum Total Inflow CMS	Time of Max Occurrence days hr:min	Lateral Inflow Volume 10^6 ltr	Total Inflow Volume 10^6 ltr	Flow Balance Error Percent
P-1_DS-1_Node	JUNCTION	0.000	0.210	1 02:32	0	20	0.063
P202_Compost-Pad-Node	JUNCTION	1.358	1.358	0 12:05	4.72	4.72	-0.337
EXT-2	JUNCTION	0.000	0.384	0 18:26	0	43.1	0.076
P-2C_1	JUNCTION	7.202	7.202	0 12:05	34.5	34.5	-0.997
P-2C_2	JUNCTION	0.000	5.382	0 12:55	0	38.3	1.266
P-3-SW_SWM-Ditch	JUNCTION	3.856	6.419	0 12:20	17.7	45.6	-0.279
SWMP3-OUT	JUNCTION	0.000	0.659	0 12:58	0	13.9	-0.023
SWMP4-OUT	JUNCTION	0.000	0.000	0 00:00	0	0	0.000 ltr
P201_US-Node	JUNCTION	3.310	3.310	0 12:05	14	14	-2.140
P203_US-Node	JUNCTION	3.692	3.692	0 12:05	17.6	17.6	-0.213
SWMP1-OUT	JUNCTION	0.000	0.384	0 18:23	0	43.1	-0.049
SWMP4b-OUT	JUNCTION	0.000	0.128	0 12:44	0	12.5	-0.044
P-3_1	JUNCTION	6.055	6.055	0 12:05	27.4	27.3	-2.062
SWMP3-OrificeOutlet	JUNCTION	0.000	0.252	0 12:58	0	12.1	-0.002
SWMP2-OrificeOutlet	JUNCTION	0.000	0.044	0 14:26	0	31.5	0.129
SWMP1-OrificeOutlet	JUNCTION	0.000	0.384	0 18:23	0	43.1	0.071
SWMP4b-OrificeOutlet	JUNCTION	0.000	0.128	0 12:44	0	12.5	0.000

SWMP5b-OrificeOutlet	JUNCTION	0.000	0.679	1	02:43	0	28.2 2.420
P-1_OUT	OUTFALL	0.000	0.195	1	02:46	0	19.9 0.000
P-2_OUT	OUTFALL	0.000	0.641	0	20:03	0	66.8 0.000
P-3_OUT	OUTFALL	0.000	0.773	0	19:01	0	76.1 0.000
SWMP-1	STORAGE	0.581	8.156	0	13:01	20.8	58.6 -0.026
SWMP-2	STORAGE	3.342	7.884	0	12:20	50.7	96.3 0.055
SWMP-3	STORAGE	0.000	2.271	0	12:12	0	14.3 2.243
SWMP4a	STORAGE	0.000	1.170	0	12:07	0	4.73 13.630
SWMP4b	STORAGE	0.000	3.609	0	12:05	0	17.6 0.222
SWMP-5a	STORAGE	0.000	0.278	0	20:54	0	16 0.771
SWMP-5b	STORAGE	0.000	0.326	0	20:57	0	23.7 1.711
P-101_US-RET	STORAGE	1.757	1.757	0	12:05	15.7	15.7 -0.826
P102_US-RET	STORAGE	1.659	1.659	0	12:05	10	10 -1.857
P-1_DS-1-RET	STORAGE	0.000	0.848	1	01:57	0	27.2 -2.998
P-1_DS-2-RET	STORAGE	0.000	0.199	1	02:32	0	19.9 0.055
P-2_SD-1-RET	STORAGE	0.000	0.675	0	12:55	0	57 0.105
P-2_SD-2-RET	STORAGE	0.000	1.854	0	19:33	0	98.2 -0.011
P-2_SD-3-RET	STORAGE	0.000	0.401	0	18:32	0	23 0.547
P-2_SD-4-RET	STORAGE	0.000	1.929	0	20:07	0	96 0.028
P-3_DS-1-RET	STORAGE	0.000	0.789	0	17:32	0	76.9 -0.053
P-3_DS-2-RET	STORAGE	0.000	0.782	0	17:59	0	76.9 0.024

****
Node Surcharge Summary
****

No nodes were surcharged.

****
Node Flooding Summary
****

No nodes were flooded.

****
Storage Volume Summary
****

Storage Unit	Average Volume 1000 m3	Avg Pcnt Full	Evap Pcnt Loss	Exfil Pcnt Loss	Maximum Volume 1000 m3	Max Pcnt Full	Time of Max Occurrence days hr:min	Maximum Outflow CMS
SWMP-1	27.621	59	0	0	38.410	82	0 18:23	3.762
SWMP-2	47.755	37	0	0	67.775	52	0 17:41	0.789
SWMP-3	2.610	41	0	0	4.977	79	0 12:58	0.659
SWMP4a	3.879	73	0	0	4.164	78	9 23:59	0.000
SWMP4b	5.163	52	0	0	8.352	84	0 12:44	0.950
SWMP-5a	4.651	12	0	0	7.658	20	1 02:12	0.161
SWMP-5b	4.225	12	0	0	6.888	20	1 02:19	0.293
P-101_US-RET	2.832	12	0	0	7.985	34	0 15:35	0.278
P102_US-RET	1.133	5	0	0	4.068	17	0 13:37	0.286
P-1_DS-1-RET	0.516	63	0	0	0.638	78	1 02:29	0.634
P-1_DS-2-RET	0.131	1	0	0	0.273	3	1 02:46	0.195

P-2_SD-1-RET	0.312	12	0	0	0.595	23	0
14:30	0.597						
P-2_SD-2-RET	0.215	2	0	0	0.505	5	0
20:07	2.160						
P-2_SD-3-RET	0.580	11	0	0	0.836	16	0
20:09	0.385						
P-2_SD-4-RET	9.087	25	0	0	12.090	34	0
20:03	1.828						
P-3_DS-1-RET	0.381	2	0	0	0.835	5	0
18:43	0.782						
P-3_DS-2-RET	2.098	6	0	0	3.781	11	0
19:01	0.773						

****
Outfall Loading Summary
****

Outfall Node	Flow Freq Pcnt	Avg Flow CMS	Max Flow CMS	Total Volume 10^6 ltr
P-1_OUT	88.00	0.085	0.195	19.904
P-2_OUT	93.60	0.274	0.641	66.809
P-3_OUT	99.41	0.324	0.773	76.131
System	93.67	0.683	1.515	162.844

****
Link Flow Summary
****

Link	Type	Maximum |Flow| CMS	Time of Max Occurrence days	hr:min	Maximum |Veloc| m/sec	Max/ Full Flow	Max/ Full Depth
SWMP1-Outlet	CONDUIT	0.384	0	18:23	1.48	0.02	0.10
SWMP2-Outlet	CONDUIT	0.043	0	14:26	0.67	0.00	0.31
SWMP3-Outlet	CONDUIT	0.252	0	12:59	1.24	0.03	0.17
SWMP4a-Outlet	CONDUIT	0.000	0	00:00	0.00	0.00	0.00
SWMP4b-Outlet	CONDUIT	0.128	0	12:44	0.76	0.02	0.10
SWMP5a-Outlet	CONDUIT	0.054	0	22:34	0.26	3.54	0.76
SWMP5b-Outlet	CONDUIT	0.848	1	01:57	1.77	0.13	0.74
Culvert-1a	CONDUIT	0.210	1	02:32	2.71	0.05	0.16
Culvert-1b	CONDUIT	0.195	1	02:46	0.90	0.17	0.25

Culvert-2a	CONDUIT	0.334	0	19:33	0.93	0.12	0.36
Culvert-3a	CONDUIT	0.782	0	17:59	1.20	0.09	0.35
P101_US-Ditch	CONDUIT	0.278	0	20:54	0.39	0.78	0.68
P102_US-Ditch	CONDUIT	0.286	0	14:14	0.31	0.49	0.56
P-1_DS2-Ditch	CONDUIT	0.199	1	02:32	0.18	0.00	0.07
SD-Segment1	CONDUIT	0.384	0	18:34	0.27	0.02	0.29
P204_US-Ditch	CONDUIT	4.440	0	12:13	1.49	0.16	0.47
P204_SWM-Inlet	CONDUIT	7.578	0	13:01	1.96	0.14	0.97
P301_US-Ditch	CONDUIT	4.535	0	12:20	1.00	0.25	0.59
P301_SWM-Inlet	CONDUIT	5.705	0	12:23	3.47	1.31	0.92
SWMP3-Outfall-Channel	CONDUIT	0.659	0	12:59	0.66	0.02	0.30
SWMP1-Outfall	CONDUIT	0.384	0	18:26	0.64	0.00	0.10
P3_DS2-Ditch	CONDUIT	0.773	0	19:01	0.59	0.05	0.13
SD-Segment2	CONDUIT	0.597	0	17:34	0.43	0.04	0.19
SWMP4a_Outfall-Channel	CONDUIT	0.000	0	00:00	0.00	0.00	0.21
SD-Segment3	CONDUIT	0.385	0	20:31	0.27	0.02	0.35
P-2_SD-4-Ditch	CONDUIT	0.641	0	20:03	0.52	0.61	0.16
P201_US-Ditch	CONDUIT	2.271	0	12:12	0.53	0.37	0.75
P203_US-Ditch	CONDUIT	3.609	0	12:05	0.86	0.30	0.73
SWMP4b_Outfall-Channel	CONDUIT	0.133	0	12:37	0.92	0.02	0.15
P202_Storm-Outlet	CONDUIT	1.170	0	12:07	1.12	0.40	0.60
SWMP5a-Outlet_2	CONDUIT	0.054	0	22:34	0.26	3.54	0.76
SWMP5a-Outlet_3	CONDUIT	0.054	0	22:34	0.26	3.54	0.76
Culvert-2b	CONDUIT	1.929	0	20:07	3.83	0.16	0.64
SWMP2-Outlet_2	CONDUIT	0.365	0	16:50	3.33	0.62	0.98
SWMP2-Outlet_3	CONDUIT	0.365	0	16:50	3.33	0.62	0.98
SWMP2-Orifice	ORIFICE	0.044	0	14:26			1.00
SWMP3-Orifice	ORIFICE	0.017	0	12:47			1.00
SWMP1-Orifice	ORIFICE	0.360	0	18:23			1.00
SWMP4b-Orifice	ORIFICE	0.019	0	12:44			1.00
SWMP5b-Orifice	ORIFICE	0.293	1	02:16			0.65
SWMP1-Orifice_2	ORIFICE	0.024	0	18:23			1.00
SWMP3-Orifice_2	ORIFICE	0.235	0	12:58			0.88
SWMP4b-Orifice_2	ORIFICE	0.109	0	12:44			0.63
SWMP1-Overflow	WEIR	0.000	0	00:00			0.00
SWMP2_Overflow-Spillway	WEIR	0.021	0	17:41			0.04
SWMP3_Overflow-Spillway	WEIR	0.407	0	12:58			0.09
SWMPond4b-Spillover	WEIR	0.822	0	12:44			0.08
SWMP_5a-5b-Overflow-Weir	WEIR	0.000	0	00:00			0.00
SWM_5b-Overflow-Weir	WEIR	0.000	0	00:00			0.00
P-1_Frontier-Rd_Spillway	WEIR	0.000	0	00:00			0.00
P-3_SWMP-2_NE-Fronteir-Rd-Spill	WEIR	0.000	0	00:00			0.00
P-2-DS_Frontier-Rd-Spillway	WEIR	0.000	0	00:00			0.00

****
Flow Classification Summary
****

Conduit	Adjusted /Actual Length	Fraction of Time in Flow Class: Dry	Up Dry	Down Dry	Sub Crit	Sup Crit	Up Crit	Down Crit	Norm Ltd	Inlet Ctrl
SWMP1-Outlet	1.00	0.00	0.00	0.00	0.00	1.00	0.00	0.00	0.11	0.00
SWMP2-Outlet	1.00	0.00	0.00	0.00	1.00	0.00	0.00	0.00	0.00	0.00
SWMP3-Outlet	1.00	0.00	0.00	0.00	0.73	0.27	0.00	0.00	0.03	0.00
SWMP4a-Outlet	1.00	1.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
SWMP4b-Outlet	1.00	0.00	0.00	0.00	1.00	0.00	0.00	0.00	0.92	0.00
SWMP5a-Outlet	1.00	0.01	0.00	0.00	0.99	0.00	0.00	0.00	0.00	0.00
SWMP5b-Outlet	1.00	0.01	0.00	0.00	0.98	0.01	0.00	0.00	0.05	0.00
Culvert-1a	1.00	0.11	0.00	0.00	0.00	0.89	0.00	0.00	0.00	0.00
Culvert-1b	1.00	0.11	0.00	0.00	0.89	0.00	0.00	0.00	0.00	0.00
Culvert-2a	1.00	0.04	0.00	0.00	0.92	0.00	0.00	0.04	0.00	0.00
Culvert-3a	1.00	0.00	0.00	0.00	0.99	0.01	0.00	0.00	0.09	0.00
P101_US-Ditch	1.00	0.00	0.00	0.00	1.00	0.00	0.00	0.00	0.76	0.00
P102_US-Ditch	1.00	0.00	0.00	0.00	1.00	0.00	0.00	0.00	0.88	0.00
P-1_DS2-Ditch	1.00	0.11	0.00	0.00	0.89	0.00	0.00	0.00	0.93	0.00
SD-Segment1	1.00	0.00	0.00	0.00	1.00	0.00	0.00	0.00	0.98	0.00
P204_US-Ditch	1.00	0.00	0.00	0.00	1.00	0.00	0.00	0.00	0.98	

0.00									
P204_SWM-Inlet	1.00	0.00	0.00	0.00	1.00	0.00	0.00	0.00	0.04
0.00									
P301_US-Ditch	1.00	0.00	0.00	0.00	0.33	0.00	0.00	0.67	0.12
0.00									
P301_SWM-Inlet	1.00	0.00	0.27	0.00	0.73	0.00	0.00	0.00	0.81
0.00									
SWMP3-Outfall-Channel	1.00	0.00	0.00	0.00	1.00	0.00	0.00	0.00	0.89
0.00									
SWMP1-Outfall	1.00	0.00	0.00	0.00	1.00	0.00	0.00	0.00	0.99
0.00									
P3_DS2-Ditch	1.00	0.00	0.00	0.00	0.99	0.00	0.00	0.00	0.00
0.00									
SD-Segment2	1.00	0.00	0.00	0.00	1.00	0.00	0.00	0.00	0.00
0.00									
SWMP4a_Outfall-Channel	1.00	0.00	1.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00									
SD-Segment3	1.00	0.00	0.00	0.00	1.00	0.00	0.00	0.00	0.76
0.00									
P-2_SD-4-Ditch	1.00	0.06	0.00	0.00	0.94	0.00	0.00	0.00	0.00
0.00									
P201_US-Ditch	1.00	0.00	0.00	0.00	1.00	0.00	0.00	0.00	0.97
0.00									
P203_US-Ditch	1.00	0.00	0.00	0.00	1.00	0.00	0.00	0.00	0.71
0.00									
SWMP4b_Outfall-Channel	1.00	0.00	0.00	0.00	1.00	0.00	0.00	0.00	0.48
0.00									
P202_Storm-Outlet	1.00	0.00	0.06	0.00	0.93	0.00	0.00	0.00	0.99
0.00									
SWMP5a-Outlet_2	1.00	0.01	0.00	0.00	0.99	0.00	0.00	0.00	0.00
0.00									
SWMP5a-Outlet_3	1.00	0.01	0.00	0.00	0.99	0.00	0.00	0.00	0.00
0.00									
Culvert-2b	1.00	0.00	0.00	0.00	0.96	0.04	0.00	0.00	0.90
0.00									
SWMP2-Outlet_2	1.00	0.00	0.34	0.00	0.21	0.45	0.00	0.00	0.86
0.00									
SWMP2-Outlet_3	1.00	0.00	0.34	0.00	0.21	0.45	0.00	0.00	0.86
0.00									

****
Conduit Surcharge Summary
****

	Hours Full		Hours Above Full	Hours Capacity

Conduit	Both Ends	Upstream	Dnstream	Normal Flow	Limited
SWMP5a-Outlet	0.01	0.01	0.01	26.71	0.01
SWMP5b-Outlet	0.01	0.01	225.09	0.01	0.01
P101_US-Ditch	0.01	9.73	0.01	0.01	0.01
P102_US-Ditch	0.01	1.12	0.01	0.01	0.01
P204_SWM-Inlet	0.01	0.01	50.34	0.01	0.01
P301_SWM-Inlet	0.01	0.54	14.06	0.55	0.01
P201_US-Ditch	0.01	0.01	1.31	0.01	0.01
P203_US-Ditch	0.01	0.01	11.11	0.01	0.01
P202_Storm-Outlet	0.01	0.01	227.39	0.01	0.01
SWMP5a-Outlet_2	0.01	0.01	0.01	26.71	0.01
SWMP5a-Outlet_3	0.01	0.01	0.01	26.71	0.01
Culvert-2b	0.01	0.01	11.88	0.01	0.01
SWMP2-Outlet_2	0.01	0.01	20.90	0.01	0.01
SWMP2-Outlet_3	0.01	0.01	20.90	0.01	0.01

Analysis begun on: Mon Dec 10 14:58:08 2018
Analysis ended on: Mon Dec 10 14:58:14 2018
Total elapsed time: 00:00:06

```
EPA STORM WATER MANAGEMENT MODEL - VERSION 5.1 (Build 5.1.011)
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WARNING 04: minimum elevation drop used for Conduit SWMP5a-Outlet
WARNING 04: minimum elevation drop used for Conduit P-2_SD-4-Ditch
WARNING 04: minimum elevation drop used for Conduit SWMP5a-Outlet_2
WARNING 04: minimum elevation drop used for Conduit SWMP5a-Outlet_3
WARNING 02: maximum depth increased for Node P-2C_1
WARNING 02: maximum depth increased for Node P-2C_2
WARNING 02: maximum depth increased for Node P-3-SW_SWM-Ditch
WARNING 02: maximum depth increased for Node P-3_1
WARNING 02: maximum depth increased for Node SWMP3-OrificeOutlet
WARNING 02: maximum depth increased for Node SWMP1-OrificeOutlet
WARNING 02: maximum depth increased for Node SWMP4b-OrificeOutlet
WARNING 02: maximum depth increased for Node SWMP5b-OrificeOutlet

*****************************************************
NOTE: The summary statistics displayed in this report are
based on results found at every computational time step,
not just on results from each reporting time step.
*****************************************************

****************
Analysis Options
****************
Flow Units ............... CMS
Process Models:
  Rainfall/Runoff ........ YES
  RDII ................... NO
  Snowmelt ............... NO
  Groundwater ............ YES
  Flow Routing ........... YES
  Ponding Allowed ........ YES
  Water Quality .......... NO
Infiltration Method ...... CURVE_NUMBER
Flow Routing Method ...... DYNWAVE
Starting Date ............ 07/14/2013 00:00:00
Ending Date .............. 07/24/2013 00:00:00
Antecedent Dry Days ...... 0.0
Report Time Step ......... 00:05:00
Wet Time Step ............ 00:05:00
Dry Time Step ............ 01:00:00
Routing Time Step ........ 30.00 sec
Variable Time Step ....... YES
Maximum Trials ........... 8
Number of Threads ........ 1
Head Tolerance ........... 0.001500 m
```

Runoff Quantity Continuity	Volume hectare-m	Depth mm
Total Precipitation	24.306	128.133
Evaporation Loss	0.000	0.000
Infiltration Loss	6.744	35.555
Surface Runoff	17.316	91.287
Final Storage	0.278	1.464
Continuity Error (%)	-0.134	

Groundwater Continuity	Volume hectare-m	Depth mm
Initial Storage	13.786	104.500
Infiltration	6.365	48.249
Upper Zone ET	0.000	0.000
Lower Zone ET	0.000	0.000
Deep Percolation	0.000	0.000
Groundwater Flow	6.364	48.240
Final Storage	13.786	104.500
Continuity Error (%)	0.006	

Flow Routing Continuity	Volume hectare-m	Volume 10^6 ltr
Dry Weather Inflow	0.000	0.000
Wet Weather Inflow	17.266	172.659
Groundwater Inflow	6.361	63.610
RDII Inflow	0.000	0.000
External Inflow	0.000	0.000
External Outflow	18.570	185.701
Flooding Loss	0.000	0.000
Evaporation Loss	0.000	0.000
Exfiltration Loss	0.000	0.000
Initial Stored Volume	0.000	0.000
Final Stored Volume	5.134	51.344
Continuity Error (%)	-0.328	

Highest Continuity Errors

Node SWMP4a (11.44%)
Node P-1_DS-1-RET (-2.70%)

Node SWMP5b-OrificeOutlet (2.11%)
Node SWMP-3 (2.00%)
Node SWMP-5b (1.54%)

****
Time-Step Critical Elements
****
Link Culvert-2b (23.29%)
Link SWMP2-Outlet_2 (18.75%)
Link Culvert-1a (14.95%)
Link Culvert-1b (5.54%)
Link SWMP5b-Outlet (5.36%)

****
Highest Flow Instability Indexes
****
All links are stable.

****
Routing Time Step Summary
****
Minimum Time Step : 0.50 sec
Average Time Step : 11.04 sec
Maximum Time Step : 30.00 sec
Percent in Steady State : 0.00
Average Iterations per Step : 2.54
Percent Not Converging : 0.02

****
Subcatchment Runoff Summary
****

Subcatchment	Total Precip mm	Total Runon mm	Total Evap mm	Total Infil mm	Total Runoff mm	Total Runoff 10^6 ltr	Peak Runoff CMS	Runoff Coeff

P101			128.13	0.00	0.00	8.67	117.77	
17.55	2.02	0.919						
P102			128.13	0.00	0.00	8.60	117.94	
11.22	1.90	0.920						
P201			128.13	0.00	0.00	5.59	121.05	
15.61	3.74	0.945						
P202			128.13	0.00	0.00	1.25	125.13	
5.26	1.52	0.977						
P203			128.13	0.00	0.00	5.60	120.97	
19.67	4.18	0.944						
P204			128.13	0.00	0.00	44.42	82.53	
39.86	8.39	0.644						
P301			128.13	0.00	0.00	51.09	75.95	
31.76	7.08	0.593						
P302			128.13	0.00	0.00	53.16	73.77	
20.56	4.51	0.576						
P303			128.13	0.00	0.00	43.20	83.78	
11.68	2.96	0.654						

****
Groundwater Summary
****

Subcatchment	Total Infil mm	Total Evap mm	Total Lower Seepage mm	Total Lateral Outflow mm	Maximum Lateral Outflow CMS	Average Upper Moist.	Average Water Table m	Final Upper Moist.	Final Water Table m
P204	44.42	0.00	0.00	44.41	0.58	0.19	100.00	0.19	100.00
P301	51.09	0.00	0.00	51.07	0.66	0.19	100.00	0.19	100.00
P302	53.16	0.00	0.00	53.15	0.43	0.19	100.00	0.19	100.00
P303	43.20	0.00	0.00	43.19	0.17	0.19	100.00	0.19	100.00

****
Node Depth Summary
****

Node	Type	Average Depth Meters	Maximum Depth Meters	Maximum HGL Meters	Time of Max Occurrence days hr:min	Reported Max Depth Meters
P-1_DS-1_Node	JUNCTION	0.04	0.07	75.27	1 02:16	0.07
P202_Compost-Pad-Node	JUNCTION	0.05	0.71	76.71	0 12:07	0.66
EXT-2	JUNCTION	0.25	0.47	75.73	0 16:58	0.47
P-2C_1	JUNCTION	0.42	3.30	83.00	0 12:12	3.28
P-2C_2	JUNCTION	1.49	2.02	78.27	0 16:50	2.02
P-3-SW_SWM-Ditch	JUNCTION	0.75	3.79	79.94	0 12:22	3.78
SWMP3-OUT	JUNCTION	0.18	0.48	75.63	0 13:38	0.48
SWMP4-OUT	JUNCTION	0.00	0.00	75.20	0 00:00	0.00
P201_US-Node	JUNCTION	0.09	0.84	77.24	0 12:12	0.83
P203_US-Node	JUNCTION	0.28	0.77	76.77	0 12:05	0.75
SWMP1-OUT	JUNCTION	0.15	0.25	76.20	0 16:54	0.25
SWMP4b-OUT	JUNCTION	0.12	0.22	75.42	0 12:36	0.22
P-3_1	JUNCTION	0.55	3.01	82.71	0 12:10	3.01
SWMP3-OrificeOutlet	JUNCTION	0.13	0.38	75.63	0 13:38	0.38
SWMP2-OrificeOutlet	JUNCTION	0.35	0.69	75.73	0 17:47	0.69
SWMP1-OrificeOutlet	JUNCTION	0.18	0.28	76.28	0 16:51	0.28
SWMP4b-OrificeOutlet	JUNCTION	0.11	0.21	75.46	0 12:34	0.21

SWMP5b-OrificeOutlet	JUNCTION	0.24	0.50	76.30	1	02:07
0.50						
P-1_OUT	OUTFALL	0.13	0.25	74.25	1	02:36
0.25						
P-2_OUT	OUTFALL	0.11	0.24	74.74	0	18:45
0.24						
P-3_OUT	OUTFALL	0.17	0.34	75.18	0	18:05
0.34						
SWMP-1	STORAGE	1.74	2.27	78.27	0	16:51
2.27						
SWMP-2	STORAGE	1.40	1.73	77.08	0	17:07
1.73						
SWMP-3	STORAGE	0.72	1.28	76.53	0	12:46
1.28						
SWMP4a	STORAGE	2.20	2.30	75.70	10	00:00
2.30						
SWMP4b	STORAGE	0.89	1.31	76.56	0	12:33
1.31						
SWMP-5a	STORAGE	0.32	0.50	76.30	1	01:59
0.50						
SWMP-5b	STORAGE	0.31	0.50	76.30	1	02:09
0.50						
P-101_US-RET	STORAGE	0.74	1.72	77.72	0	15:38
1.72						
P102_US-RET	STORAGE	0.37	1.08	77.08	0	13:39
1.08						
P-1_DS-1-RET	STORAGE	1.53	1.77	76.22	1	02:12
1.77						
P-1_DS-2-RET	STORAGE	0.21	0.39	74.45	1	02:36
0.39						
P-2_SD-1-RET	STORAGE	0.50	0.88	75.63	0	13:42
0.88						
P-2_SD-2-RET	STORAGE	0.22	0.48	75.14	0	18:50
0.48						
P-2_SD-3-RET	STORAGE	0.80	1.07	75.13	0	18:52
1.06						
P-2_SD-4-RET	STORAGE	1.34	1.65	75.15	0	18:45
1.65						
P-3_DS-1-RET	STORAGE	0.39	0.76	75.73	0	17:47
0.76						
P-3_DS-2-RET	STORAGE	0.49	0.82	75.65	0	18:05
0.82						

****
Node Inflow Summary
****

Node	Type	Maximum Lateral Inflow CMS	Maximum Total Inflow CMS	Time of Max Occurrence days hr:min	Lateral Inflow Volume 10^6 ltr	Total Inflow Volume 10^6 ltr	Flow Balance Error Percent
P-1_DS-1_Node	JUNCTION	0.000	0.249	1 02:12	0	23	0.055
P202_Compost-Pad-Node	JUNCTION	1.522	1.522	0 12:05	5.25	5.23	-0.281
EXT-2	JUNCTION	0.000	0.597	0 16:51	0	49	0.066
P-2C_1	JUNCTION	8.386	8.386	0 12:05	39.8	39.7	-1.030
P-2C_2	JUNCTION	0.000	6.453	0 12:38	0	42.2	1.288
P-3-SW_SWM-Ditch	JUNCTION	4.512	8.729	0 12:13	20.5	52.6	-0.851
SWMP3-OUT	JUNCTION	0.000	0.935	0 12:46	0	15.5	-0.027
SWMP4-OUT	JUNCTION	0.000	0.000	0 00:00	0	0	0.000 ltr
P201_US-Node	JUNCTION	3.737	3.737	0 12:05	15.6	15.6	-1.901
P203_US-Node	JUNCTION	4.176	4.176	0 12:05	19.6	19.6	-0.192
SWMP1-OUT	JUNCTION	0.000	0.425	0 16:51	0	46.9	-0.042
SWMP4b-OUT	JUNCTION	0.000	0.144	0 12:33	0	12.7	-0.046
P-3_1	JUNCTION	7.077	7.077	0 12:05	31.7	31.7	-1.303
SWMP3-OrificeOutlet	JUNCTION	0.000	0.280	0 12:46	0	12.7	-0.002
SWMP2-OrificeOutlet	JUNCTION	0.000	0.044	0 13:45	0	31.6	0.124
SWMP1-OrificeOutlet	JUNCTION	0.000	0.425	0 16:51	0	47	0.066
SWMP4b-OrificeOutlet	JUNCTION	0.000	0.144	0 12:33	0	12.7	0.000

SWMP5b-OrificeOutlet	JUNCTION	0.000	0.738	1	02:10	0	32.3
2.154							
P-1_OUT	OUTFALL	0.000	0.234	1	02:36	0	22.9
0.000							
P-2_OUT	OUTFALL	0.000	0.861	0	18:45	0	76.3
0.000							
P-3_OUT	OUTFALL	0.000	1.050	0	18:05	0	86.5
0.000							
SWMP-1	STORAGE	0.585	8.633	0	12:47	21.4	63.1
-0.010							
SWMP-2	STORAGE	3.777	8.696	0	12:16	53.8	107
0.049							
SWMP-3	STORAGE	0.000	2.552	0	12:12	0	15.9
2.039							
SWMP4a	STORAGE	0.000	1.308	0	12:07	0	5.25
12.922							
SWMP4b	STORAGE	0.000	4.077	0	12:05	0	19.6
0.203							
SWMP-5a	STORAGE	0.000	0.307	0	21:02	0	18
0.730							
SWMP-5b	STORAGE	0.000	0.362	0	20:38	0	26.8
1.561							
P-101_US-RET	STORAGE	2.020	2.020	0	12:05	17.5	17.5
-0.874							
P102_US-RET	STORAGE	1.896	1.896	0	12:05	11.2	11.2
-1.888							
P-1_DS-1-RET	STORAGE	0.000	0.911	1	01:54	0	31.4
-2.627							
P-1_DS-2-RET	STORAGE	0.000	0.238	1	02:14	0	22.9
0.048							
P-2_SD-1-RET	STORAGE	0.000	0.935	0	12:47	0	64.5
0.098							
P-2_SD-2-RET	STORAGE	0.000	2.399	0	18:22	0	113
-0.016							
P-2_SD-3-RET	STORAGE	0.000	0.578	0	18:26	0	28
0.469							
P-2_SD-4-RET	STORAGE	0.000	2.562	0	18:50	0	111
0.023							
P-3_DS-1-RET	STORAGE	0.000	1.097	0	17:04	0	87.3
-0.045							
P-3_DS-2-RET	STORAGE	0.000	1.079	0	17:18	0	87.3
0.021							

****
Node Surcharge Summary
****

No nodes were surcharged.

****
Node Flooding Summary
****

No nodes were flooded.

****
Storage Volume Summary
****

Storage Unit	Average Volume 1000 m3	Avg Pcnt Full	Evap Pcnt Loss	Exfil Pcnt Loss	Maximum Volume 1000 m3	Max Pcnt Full	Time of Max Occurrence days hr:min	Maximum Outflow CMS
SWMP-1	29.135	62	0	0	41.110	88	0 16:51	3.504
SWMP-2	50.312	39	0	0	72.930	56	0 17:07	1.097
SWMP-3	2.709	43	0	0	5.152	81	0 12:46	0.935
SWMP4a	4.351	82	0	0	4.649	87	10 00:00	0.000
SWMP4b	5.339	54	0	0	8.599	87	0 12:33	1.386
SWMP-5a	5.203	14	0	0	8.437	22	1 01:59	0.202
SWMP-5b	4.718	14	0	0	7.566	22	1 02:09	0.337
P-101_US-RET	3.105	13	0	0	9.031	39	0 15:38	0.307
P102_US-RET	1.186	5	0	0	4.501	19	0 13:39	0.323
P-1_DS-1-RET	0.531	65	0	0	0.656	80	1 02:12	0.697
P-1_DS-2-RET	0.156	1	0	0	0.305	3	1 02:36	0.234

P-2_SD-1-RET	0.343	13	0	0	0.697	27	0
13:42	0.794						
P-2_SD-2-RET	0.245	2	0	0	0.614	6	0
18:50	2.920						
P-2_SD-3-RET	0.616	12	0	0	0.922	18	0
18:52	0.505						
P-2_SD-4-RET	9.556	27	0	0	13.012	36	0
18:45	2.381						
P-3_DS-1-RET	0.450	3	0	0	1.075	7	0
17:47	1.079						
P-3_DS-2-RET	2.334	7	0	0	4.435	12	0
18:05	1.050						

****
Outfall Loading Summary
****

Outfall Node	Flow Freq Pcnt	Avg Flow CMS	Max Flow CMS	Total Volume 10^6 ltr
P-1_OUT	88.97	0.111	0.234	22.904
P-2_OUT	94.84	0.341	0.861	76.283
P-3_OUT	99.49	0.397	1.050	86.512
System	94.43	0.849	1.979	185.700

****
Link Flow Summary
****

Link	Type	Maximum |Flow| CMS	Time of Max Occurrence days	hr:min	Maximum |Veloc| m/sec	Max/ Full Flow	Max/ Full Depth
SWMP1-Outlet	CONDUIT	0.425	0	16:51	1.52	0.03	0.11
SWMP2-Outlet	CONDUIT	0.043	0	14:10	0.68	0.00	0.36
SWMP3-Outlet	CONDUIT	0.280	0	12:47	1.24	0.03	0.22
SWMP4a-Outlet	CONDUIT	0.000	0	00:00	0.00	0.00	0.00
SWMP4b-Outlet	CONDUIT	0.144	0	12:33	0.79	0.02	0.11
SWMP5a-Outlet	CONDUIT	0.067	0	23:34	0.28	4.44	0.83
SWMP5b-Outlet	CONDUIT	0.911	1	01:54	1.83	0.14	0.76
Culvert-1a	CONDUIT	0.249	1	02:12	2.77	0.06	0.17
Culvert-1b	CONDUIT	0.234	1	02:36	0.95	0.20	0.27

Culvert-2a	CONDUIT	0.475	0	18:21	1.01	0.18	0.40
Culvert-3a	CONDUIT	1.079	0	17:18	1.30	0.13	0.39
P101_US-Ditch	CONDUIT	0.307	0	21:02	0.40	0.86	0.70
P102_US-Ditch	CONDUIT	0.323	0	15:21	0.32	0.55	0.59
P-1_DS2-Ditch	CONDUIT	0.238	1	02:14	0.20	0.00	0.08
SD-Segment1	CONDUIT	0.596	0	16:58	0.30	0.03	0.33
P204_US-Ditch	CONDUIT	5.302	0	12:12	1.57	0.19	0.50
P204_SWM-Inlet	CONDUIT	8.065	0	12:47	1.99	0.14	1.00
P301_US-Ditch	CONDUIT	6.069	0	12:13	1.05	0.33	0.66
P301_SWM-Inlet	CONDUIT	6.269	0	12:23	3.75	1.44	0.97
SWMP3-Outfall-Channel	CONDUIT	0.935	0	12:47	0.80	0.03	0.34
SWMP1-Outfall	CONDUIT	0.425	0	16:54	0.65	0.00	0.12
P3_DS2-Ditch	CONDUIT	1.050	0	18:05	0.65	0.06	0.15
SD-Segment2	CONDUIT	0.794	0	18:25	0.47	0.06	0.22
SWMP4a_Outfall-Channel	CONDUIT	0.000	0	00:00	0.00	0.00	0.24
SD-Segment3	CONDUIT	0.505	0	19:16	0.33	0.03	0.38
P-2_SD-4-Ditch	CONDUIT	0.861	0	18:45	0.58	0.82	0.18
P201_US-Ditch	CONDUIT	2.552	0	12:12	0.52	0.42	0.80
P203_US-Ditch	CONDUIT	4.077	0	12:05	0.85	0.34	0.77
SWMP4b_Outfall-Channel	CONDUIT	0.144	0	12:36	0.86	0.03	0.16
P202_Storm-Outlet	CONDUIT	1.308	0	12:07	1.13	0.45	0.64
SWMP5a-Outlet_2	CONDUIT	0.067	0	23:34	0.28	4.44	0.83
SWMP5a-Outlet_3	CONDUIT	0.067	0	23:34	0.28	4.44	0.83
Culvert-2b	CONDUIT	2.562	0	18:50	4.41	0.22	0.66
SWMP2-Outlet_2	CONDUIT	0.373	0	14:51	3.40	0.63	1.00
SWMP2-Outlet_3	CONDUIT	0.373	0	14:51	3.40	0.63	1.00
SWMP2-Orifice	ORIFICE	0.044	0	13:45			1.00
SWMP3-Orifice	ORIFICE	0.017	0	12:31			1.00
SWMP1-Orifice	ORIFICE	0.401	0	16:51			1.00
SWMP4b-Orifice	ORIFICE	0.019	0	12:32			1.00
SWMP5b-Orifice	ORIFICE	0.337	1	02:08			0.71
SWMP1-Orifice_2	ORIFICE	0.024	0	16:51			1.00
SWMP3-Orifice_2	ORIFICE	0.263	0	12:46			0.95
SWMP4b-Orifice_2	ORIFICE	0.125	0	12:33			0.69
SWMP1-Overflow	WEIR	0.172	0	16:51			0.07
SWMP2_Overflow-Spillway	WEIR	0.354	0	17:07			0.28
SWMP3_Overflow-Spillway	WEIR	0.655	0	12:46			0.13
SWMPond4b-Spillover	WEIR	1.242	0	12:33			0.11
SWMP_5a-5b-Overflow-Weir	WEIR	0.000	0	00:00			0.00
SWM_5b-Overflow-Weir	WEIR	0.000	0	00:00			0.00
P-1_Frontier-Rd_Spillway	WEIR	0.000	0	00:00			0.00
P-3_SWMP-2_NE-Fronteir-Rd-Spill	WEIR	0.000	0	00:00			0.00
P-2-DS_Frontier-Rd-Spillway	WEIR	0.000	0	00:00			0.00

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Flow Classification Summary
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Conduit	Adjusted /Actual Length	Fraction of Time in Flow Class: Dry	Up Dry	Down Dry	Sub Crit	Sup Crit	Up Crit	Down Crit	Norm Ltd	Inlet Ctrl
SWMP1-Outlet	1.00	0.00	0.00	0.00	0.00	1.00	0.00	0.00	0.12	0.00
SWMP2-Outlet	1.00	0.00	0.00	0.00	1.00	0.00	0.00	0.00	0.00	0.00
SWMP3-Outlet	1.00	0.00	0.00	0.00	0.75	0.25	0.00	0.00	0.03	0.00
SWMP4a-Outlet	1.00	1.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
SWMP4b-Outlet	1.00	0.00	0.00	0.00	1.00	0.00	0.00	0.00	0.92	0.00
SWMP5a-Outlet	1.00	0.01	0.00	0.00	0.99	0.00	0.00	0.00	0.00	0.00
SWMP5b-Outlet	1.00	0.01	0.00	0.00	0.99	0.01	0.00	0.00	0.05	0.00
Culvert-1a	1.00	0.10	0.00	0.00	0.00	0.90	0.00	0.00	0.00	0.00
Culvert-1b	1.00	0.11	0.00	0.00	0.89	0.00	0.00	0.00	0.00	0.00
Culvert-2a	1.00	0.03	0.00	0.00	0.94	0.00	0.00	0.03	0.00	0.00
Culvert-3a	1.00	0.00	0.00	0.00	0.99	0.00	0.00	0.00	0.08	0.00
P101_US-Ditch	1.00	0.00	0.00	0.00	1.00	0.00	0.00	0.00	0.77	0.00
P102_US-Ditch	1.00	0.00	0.00	0.00	1.00	0.00	0.00	0.00	0.85	0.00
P-1_DS2-Ditch	1.00	0.10	0.00	0.00	0.90	0.00	0.00	0.00	0.93	0.00
SD-Segment1	1.00	0.00	0.00	0.00	1.00	0.00	0.00	0.00	0.97	0.00
P204_US-Ditch	1.00	0.00	0.00	0.00	1.00	0.00	0.00	0.00	0.98	

0.00									
P204_SWM-Inlet	1.00	0.00	0.00	0.00	1.00	0.00	0.00	0.00	0.04
0.00									
P301_US-Ditch	1.00	0.00	0.00	0.00	0.39	0.00	0.00	0.61	0.13
0.00									
P301_SWM-Inlet	1.00	0.00	0.24	0.00	0.76	0.00	0.00	0.00	0.80
0.00									
SWMP3-Outfall-Channel	1.00	0.00	0.00	0.00	1.00	0.00	0.00	0.00	0.89
0.00									
SWMP1-Outfall	1.00	0.00	0.00	0.00	1.00	0.00	0.00	0.00	0.99
0.00									
P3_DS2-Ditch	1.00	0.00	0.00	0.00	1.00	0.00	0.00	0.00	0.00
0.00									
SD-Segment2	1.00	0.00	0.00	0.00	1.00	0.00	0.00	0.00	0.00
0.00									
SWMP4a_Outfall-Channel	1.00	0.00	1.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00									
SD-Segment3	1.00	0.00	0.00	0.00	1.00	0.00	0.00	0.00	0.75
0.00									
P-2_SD-4-Ditch	1.00	0.05	0.00	0.00	0.95	0.00	0.00	0.00	0.00
0.00									
P201_US-Ditch	1.00	0.00	0.00	0.00	1.00	0.00	0.00	0.00	0.98
0.00									
P203_US-Ditch	1.00	0.00	0.00	0.00	1.00	0.00	0.00	0.00	0.71
0.00									
SWMP4b_Outfall-Channel	1.00	0.00	0.00	0.00	1.00	0.00	0.00	0.00	0.48
0.00									
P202_Storm-Outlet	1.00	0.00	0.06	0.00	0.94	0.00	0.00	0.00	0.99
0.00									
SWMP5a-Outlet_2	1.00	0.01	0.00	0.00	0.99	0.00	0.00	0.00	0.00
0.00									
SWMP5a-Outlet_3	1.00	0.01	0.00	0.00	0.99	0.00	0.00	0.00	0.00
0.00									
Culvert-2b	1.00	0.00	0.00	0.00	0.96	0.03	0.00	0.00	0.90
0.00									
SWMP2-Outlet_2	1.00	0.00	0.30	0.00	0.35	0.35	0.00	0.00	0.86
0.00									
SWMP2-Outlet_3	1.00	0.00	0.30	0.00	0.35	0.35	0.00	0.00	0.86
0.00									

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Conduit Surcharge Summary
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	--- Hours Full ---			Hours Above Full	Hours Capacity

Conduit	Both Ends	Upstream	Dnstream	Normal Flow	Limited
SWMP5a-Outlet	0.01	0.01	0.01	29.41	0.01
SWMP5b-Outlet	0.01	0.01	225.35	0.01	0.01
P101_US-Ditch	0.01	11.05	0.01	0.01	0.01
P102_US-Ditch	0.01	2.72	0.01	0.01	0.01
P204_SWM-Inlet	2.84	2.84	51.84	0.01	0.01
P301_SWM-Inlet	0.01	0.75	16.15	0.75	0.01
P201_US-Ditch	0.01	0.01	1.64	0.01	0.01
P203_US-Ditch	0.01	0.01	12.11	0.01	0.01
P202_Storm-Outlet	0.01	0.01	227.62	0.01	0.01
SWMP5a-Outlet_2	0.01	0.01	0.01	29.41	0.01
SWMP5a-Outlet_3	0.01	0.01	0.01	29.41	0.01
Culvert-2b	0.01	0.01	14.49	0.01	0.01
SWMP2-Outlet_2	6.54	6.54	22.79	0.01	0.01
SWMP2-Outlet_3	6.54	6.54	22.79	0.01	0.01

Analysis begun on: Mon Dec 10 16:17:48 2018
Analysis ended on: Mon Dec 10 16:17:54 2018
Total elapsed time: 00:00:06

File No.: **1787048**
Project: **CRRRC - Compost Pad Storm Sewers**
Date: **11-Dec-2018**

Pipe	Location				Drainage Area				Runoff				Pipe Selection							
	From		To																	
	CB/MH No.	CB No.	CB/MH No.	CB	A ha	C	Cumul. A ha	Adjusted C	T_i min.	Cumul. Tc min.	I (Ottawa, 2yr) mm/hr	Q m^3/s	Dia. m	So m/m	Pipe Length m	Rough Coeff. n	Velocity (full) m/s	Actual Capacity (full) m^3/s	Time of Flow min.	Percent Full Flow
1		1		3	0.09	0.90	0.09	0.90	10.0	10.0	76.81	**0.0173**	**0.300**	0.0031	88.0	0.012	**0.82**	**0.0580**	1.79	30%
2		3		4	0.1625	0.90	0.25	0.90		11.79	70.56	**0.0445**	**0.375**	0.0032	37.1	0.012	**0.98**	**0.1080**	0.63	41%
3		4		5	0.1625	0.90	0.42	0.90		12.42	68.62	**0.0712**	**0.375**	0.0032	37.1	0.012	**0.98**	**0.1080**	0.63	66%
4		2		5	0.0875	0.90	0.09	0.90	10.0	10.00	76.81	**0.0168**	**0.300**	0.0066	92.0	0.012	**1.21**	**0.0853**	1.27	20%
5		5	MH1		0.1625	0.90	0.67	0.90		13.05	66.79	**0.1110**	**0.450**	0.0030	40.5	0.012	**1.06**	**0.1681**	0.64	66%

File No.: **1787048**
Project: **CRRRC - C&D Building Storm Sewers**
Date: **11-Dec-2018**

Pipe	Location				Drainage Area				Runoff				Pipe Selection							
	From		To																	
	CB/MH No.	CB No.	CB/MH No.	CB	A ha	C	Cumul. A ha	Adjusted C	T_i min.	Cumul. Tc min.	I (Ottawa, 2yr) mm/hr	Q m^3/s	Dia. m	So m/m	Pipe Length m	Rough Coeff. n	Velocity (full) m/s	Actual Capacity (full) m^3/s	Time of Flow min.	Percent Full Flow
1	2		1		0.3156	0.90	0.32	0.90	10.0	10.0	76.81	**0.0606**	**0.375**	0.00250	65.0	0.012	**0.86**	**0.0950**	1.26	64%
2	1		ditch		0	0.00	0.32	0.90		11.3	72.28	**0.0570**	**0.375**	0.00250	28.0	0.012	**0.86**	**0.0950**	0.54	60%
3	3A		3		0.3156	0.90	0.32	0.90	10.0	10.00	76.81	**0.0606**	**0.375**	0.00200	55.0	0.012	**0.77**	**0.0849**	1.19	71%
4	3		ditch		0	0.00	0.32	0.90		11.2	72.51	**0.0572**	**0.375**	0.00200	28.0	0.012	**0.77**	**0.0849**	0.61	67%
5	5		6		0.29835	0.90	0.30	0.90	10.0	10.00	76.81	**0.0573**	**0.300**	0.00400	76.0	0.012	**0.94**	**0.0663**	1.35	86%
6	7		6		0.29835	0.90	0.30	0.90	10.0	10.00	76.81	**0.0573**	**0.300**	0.00400	76.0	0.012	**0.94**	**0.0663**	1.35	86%
6	6		fire pond		0.29835	0.90	0.60	0.90		11.35	71.98	**0.1074**	**0.375**	0.00400	95.0	0.012	**1.09**	**0.1201**	1.46	89%

File No.: 1787048
Project: CRRRC - MRF Building Storm Sewers
Date: 11-Dec-2018

Pipe	Location				Drainage Area				Runoff				Pipe Selection							
	From		To																	
	CB/MH No.	CB No.	CB/MH No.	CB	A ha	C	Cumul. A ha	Adjusted C	T_i min.	Cumul. Tc min.	I (Ottawa, 2yr) mm/hr	Q m^3/s	Dia. m	So m/m	Pipe Length m	Rough Coeff. n	Velocity (full) m/s	Actual Capacity (full) m^3/s	Time of Flow min.	Percent Full Flow
1	7		8		0.17955	0.90	0.18	0.90	10.0	10.0	76.81	**0.0345**	**0.375**	0.00230	49.5	0.012	**0.82**	**0.0911**	1.00	38%
2	8		8a		0.23535	0.90	0.41	0.90		11.00	73.17	**0.0759**	**0.375**	0.00230	49.5	0.012	**0.82**	**0.0911**	1.00	83%
3	8a		ditch		0	0.90	0.41	0.90		12.00	69.89	**0.0725**	**0.375**	0.00230	30.0	0.012	**0.82**	**0.0911**	0.61	80%
4	9		10		0.31095	0.90	0.31	0.90	10.0	10.00	76.81	**0.0597**	**0.375**	0.00280	76.0	0.012	**0.91**	**0.1005**	1.39	59%
5	10		ditch		0	0.90	0.31	0.90		11.39	71.84	**0.0558**	**0.375**	0.00280	22.0	0.012	**0.91**	**0.1005**	0.40	56%
6	13		12		0.2772	0.90	0.28	0.90	10.0	10.00	76.81	**0.0532**	**0.375**	0.00250	85.5	0.012	**0.86**	**0.0950**	1.66	56%
7	12		11		0.2772	0.90	0.55	0.90		11.66	70.98	**0.0984**	**0.450**	0.00250	85.5	0.012	**0.97**	**0.1544**	1.47	64%
8	11		fire pond		0	0.90	0.55	0.90		13.12	66.58	**0.0923**	**0.450**	0.00250	69.0	0.012	**0.97**	**0.1544**	1.18	60%
8	14		ditch		0.04945	0.90	0.05	0.90		13.12	66.58	**0.0082**	**0.300**	0.00250	22.0	0.012	**0.74**	**0.0524**	0.49	16%

Project: CRRRC - Simpson Culvert
File No: 1787048

Conventional Culvert Design Sheet

Date: December 11, 2018

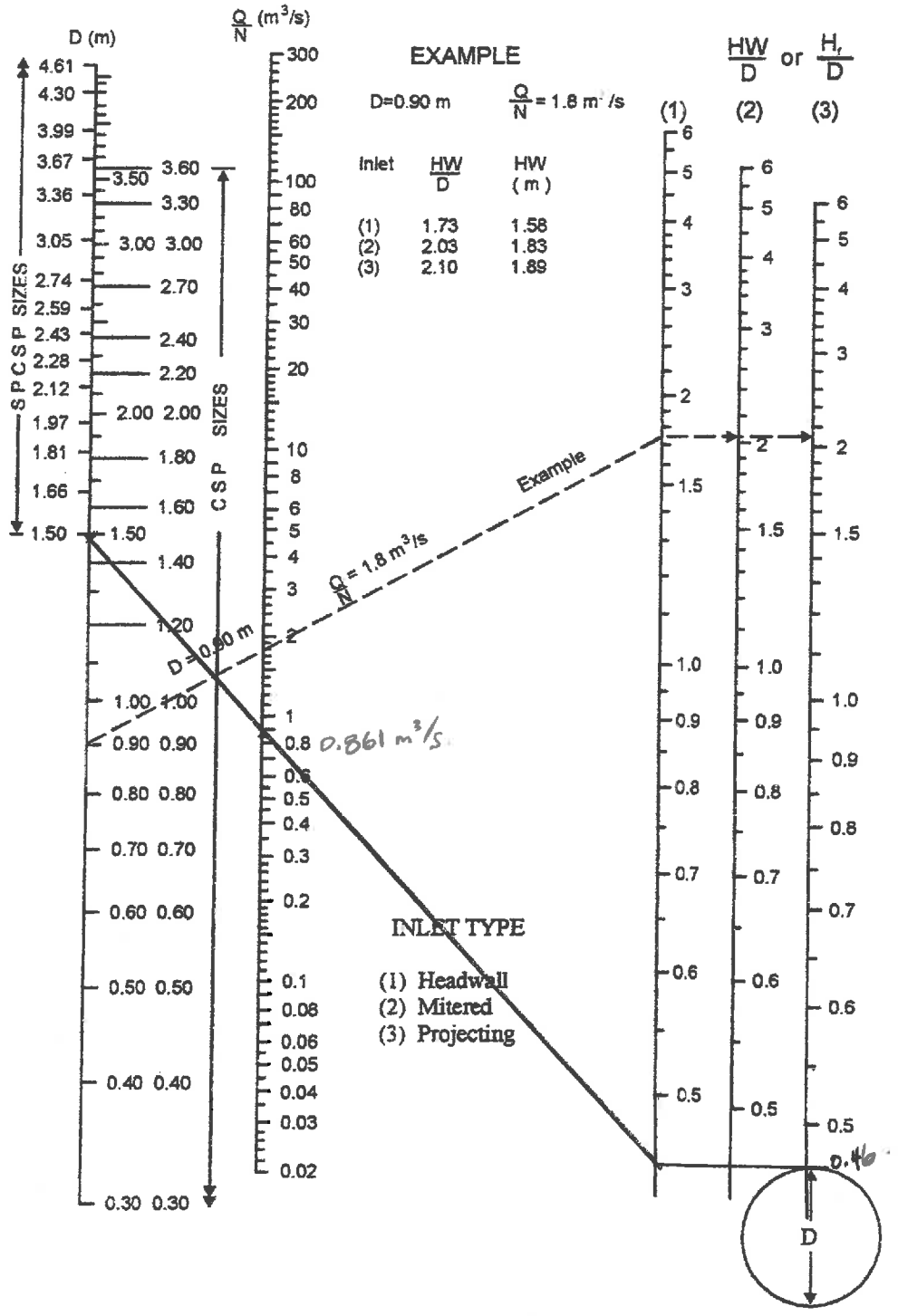
Culvert	Design Data							Culvert Data					Inlet Control			Outlet Control								Max.	Vel.
	Q	d	de	AHW	Skew	L	S	Type	D or BxD	N	Q/N	A (each)	Q/NB	HW/D	HW	ke	H	dc	(dc+D)/2	TW	ho	LS	HW	HW	Vo
	m^3/s	m	m	m	No.	m	m/m		m		m^3/s	m^2	m^2/s		m		m	m	m	m	m	m	m	m	m/s
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26
Simpson	0.861	0.56	0.1	0.66	0	30	0.001	Circular CSP	1.5	1	0.861	1.767		0.46	0.69	0.9	0	0.48	0.99	0.66	0.99	0.039	0.951	0.951	1.86

GOLDER

Prepared by: MHK
Checked by: DVK
C:\Users\sgaudette\Desktop\SWM\C MTO Culvert Design Sheet 2018.12.14.xls

Simpson Culvert

Design Chart 2.32: Inlet Control: Circular CSP and SPCSP Culverts

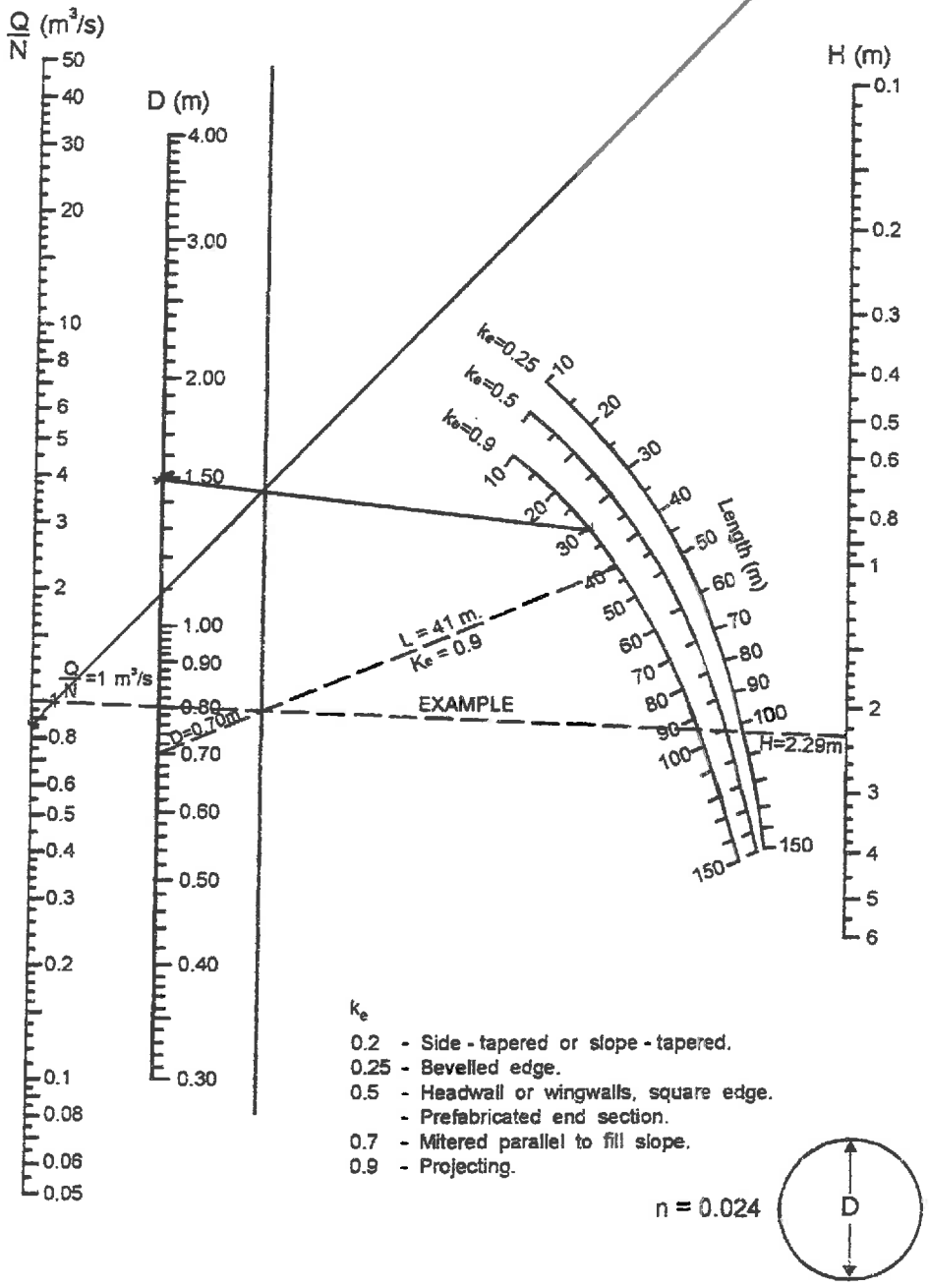


Source: Herr (1977)

Simpson Culvert

Design Chart 2.35: Outlet Control: CSP Culvert - Flowing Full

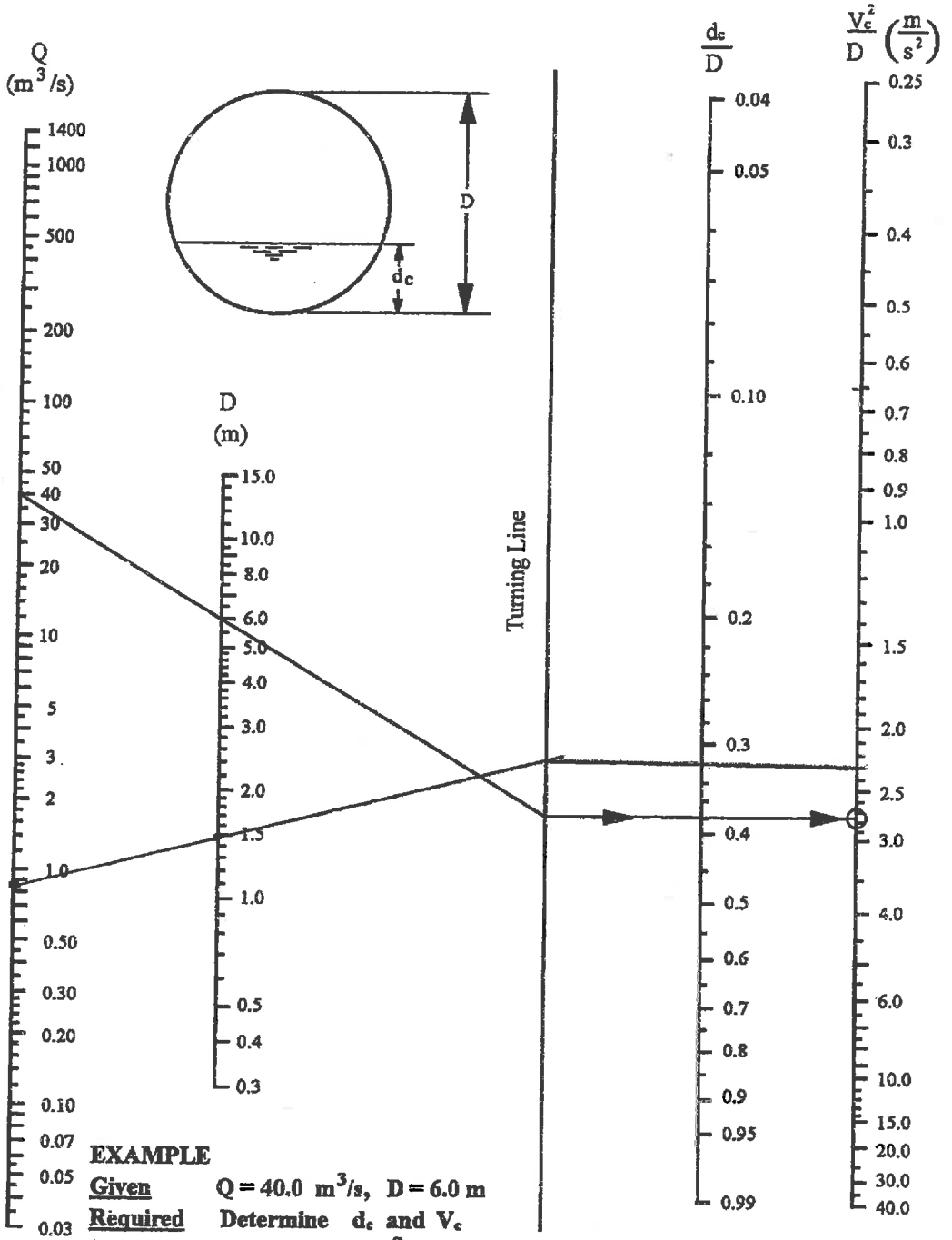
H=0.



Source: Herr (1977)

Simpson Culvert

Design Chart 2.38: Critical Depth - Velocity relationships: Circular Pipes



EXAMPLE

Given $Q = 40.0\ m^3/s$, $D = 6.0\ m$

Required Determine d_c and V_c

Solution Join $Q = 40.0\ m^3/s$ to $D = 6.0\ m$ and extend to turning line.
Draw a horizontal line perpendicular to the turning line to intersect $d_c/D = 0.38$ and $V_c^2/D = 2.76$
Calculate $d_c = 0.38 \times 6.0 = 2.28\ m$.
$V_c = (2.76 \times 6.0)^{0.5} = 4.07\ m/s$

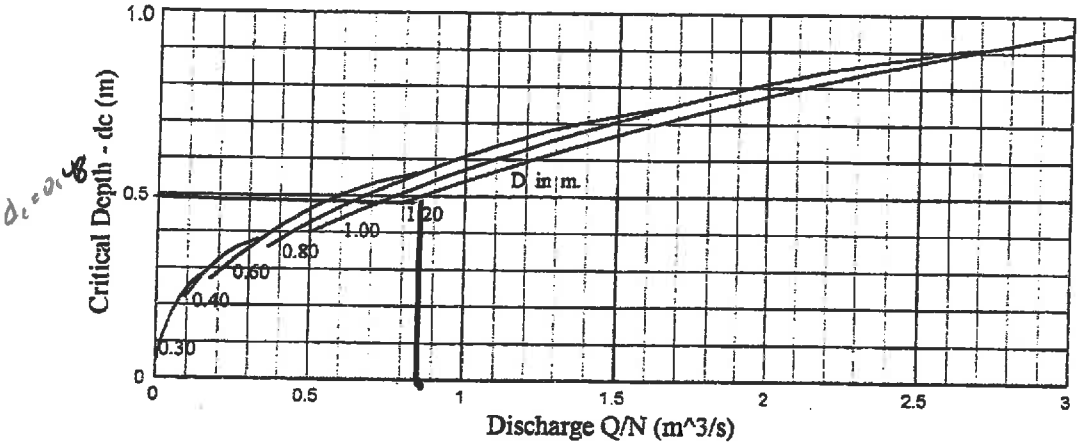
$d_c = 0.32 \times 1.5 = 0.48$

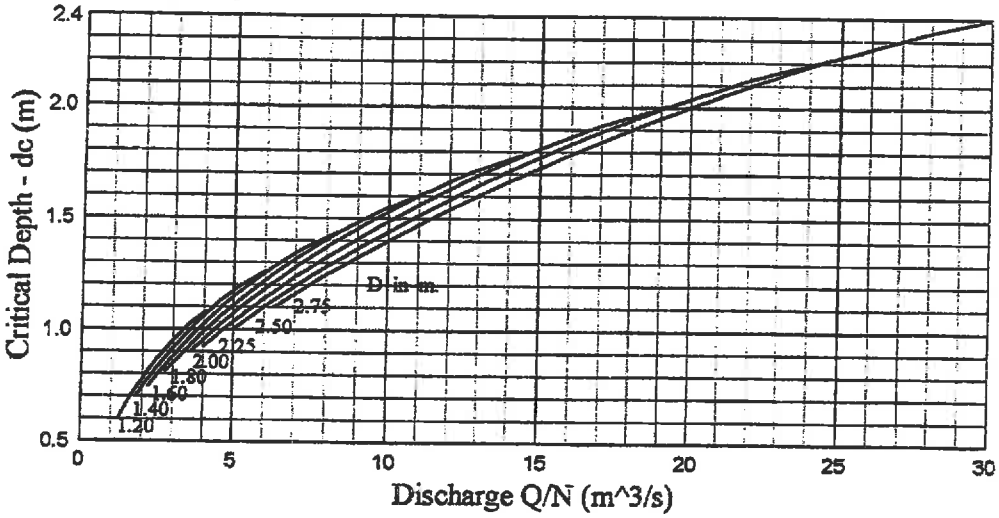
$V_c = (2.3 \times 1.5)^{0.5} = 1.86\ m/s$

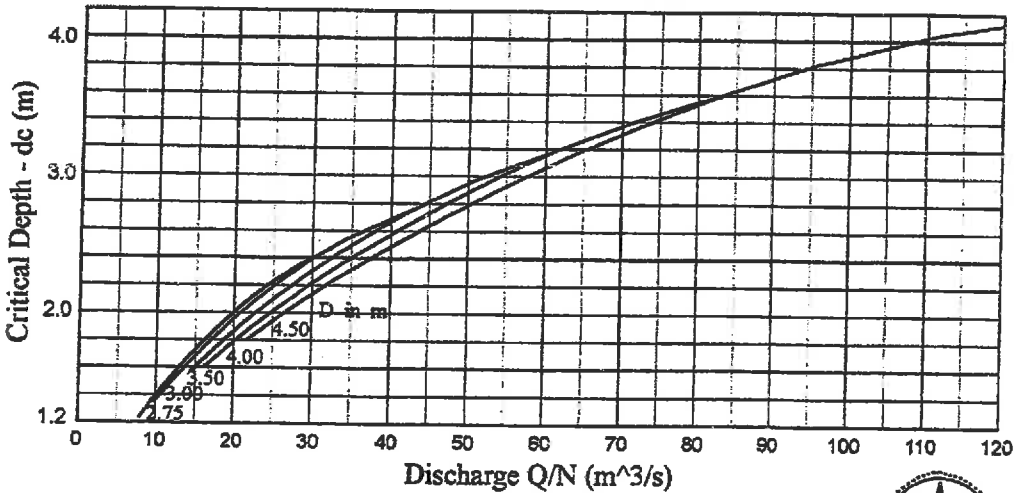
Source: American Iron and Steel Institute

Simpson Culvert

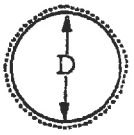
Design Chart 2.37: Critical Depth Chart for Circular Pipes







(dc > D)



Source: Herr (1977)

Ditch Design Sheet

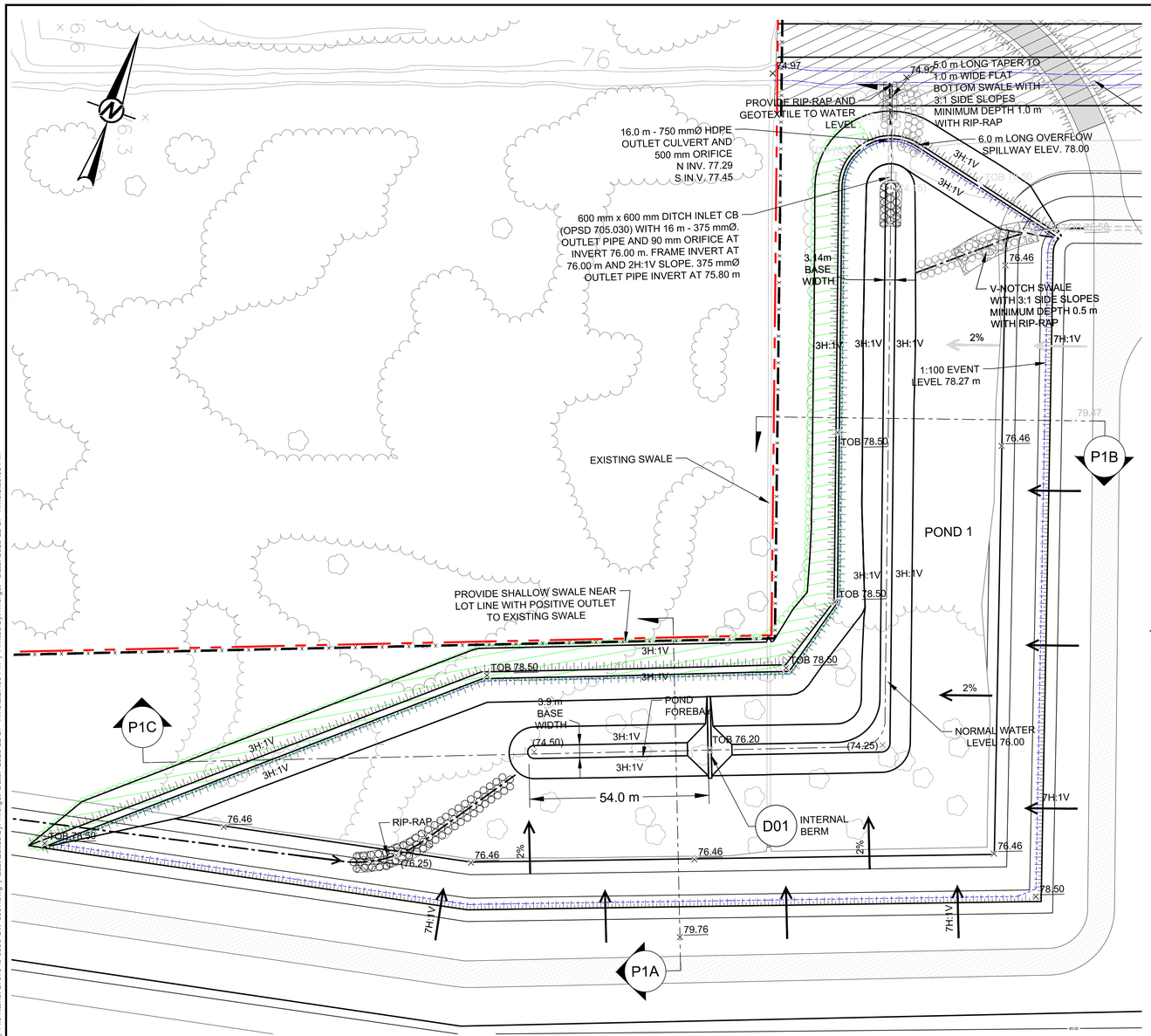
Project 1787048
Description CRRRC - Ditch Sizing
Date 12-Dec-18

Channel ID	Design Storm	Area (ha)	Design Runoff Rate (m^3/s)	Channel Slope (m/m)	Right Channel Side Slope (H: 1V)	Left Channel Side Slope (H: 1V)	Channel Bottom Width (m)	Flow Depth (m)	Flow Area (m^2)	Wetted Perimeter (m)	Hydraulic Radius (m)	Manning's Roughness	Calc. Runoff Rate (m^3/s)	Flow velocity (m/s)	U/S Channel Depth (m)	D/S Channel Depth (m)	Max. Channel Top Width (m)	Percent Full
		A	Q_p	S_o			b	y	A	P	R	n	Q_{calc}				TW	
N-204 to Pond 1 N-inlet	100	4.830	0.839	0.0150	3	7	0.50	0.50	1.50	5.62	0.27	0.035	2.177	1.45	0.00	0.00	0.50	39%
E-204 to Pond 1 W-inet	100	19.320	3.356	0.0035	3	7	0.50	0.90	4.50	9.71	0.46	0.035	4.555	1.01	0.00	0.00	0.50	74%
W-204 to Pond 1 W-inlet	100	9.660	1.678	0.0035	3	7	0.50	0.70	2.80	7.66	0.37	0.035	2.419	0.86	0.00	0.00	0.50	69%
N-303 to Pond 2 N-inlet	100	6.970	1.480	0.0030	3	7	0.50	0.70	2.80	7.66	0.37	0.035	2.239	0.80	0.00	0.00	0.50	66%
E-301 to Pond 2 W-inlet	100	41.810	7.080	0.0035	3	7	0.50	1.10	6.60	11.76	0.56	0.035	7.592	1.15	0.00	0.00	0.50	93%
W-301 to Pond 2 W-inlet	100	20.905	3.540	0.0035	3	7	0.50	0.90	4.50	9.71	0.46	0.035	4.555	1.01	0.00	0.00	0.50	78%
201 to Pond 3	25	12.900	2.900	0.0015	4	4	1.00	1.10	5.94	10.07	0.59	0.035	4.623	0.78	0.00	0.00	1.00	63%
201 to Pond 3	100	12.900	3.740	0.0015	4	4	1.00	1.10	5.94	10.07	0.59	0.035	4.623	0.78	0.00	0.00	1.00	81%
203 to Pond 4B	25	16.260	3.230	0.0015	4	4	1.00	1.10	5.94	10.07	0.59	0.035	4.623	0.78	0.00	0.00	1.00	70%
203 to Pond 4B	100	16.260	4.180	0.0015	4	4	1.00	1.10	5.94	10.07	0.59	0.035	4.623	0.78	0.00	0.00	1.00	90%
Simpson Drain	100		0.861	0.0015	3	3	2.00	0.56	2.06	5.54	0.37	0.048	0.860	0.42	0.00	0.00	2.00	100%

Manning's Equation
$Q=(AR^{2/3}\sqrt{S})/n$

ATTACHMENT B

Drawings



PLAN VIEW OF POND 1

SCALE 1:800 m

POND 1 LEVEL (masl)

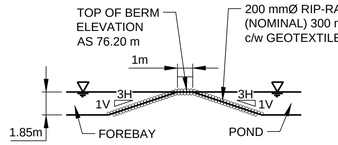
NORMAL WATER LEVEL = 76.00

1:2 EVENT LEVEL = 77.46

1:5 EVENT LEVEL = 77.69

1:25 EVENT LEVEL = 78.02

1:100 EVENT LEVEL = 78.27



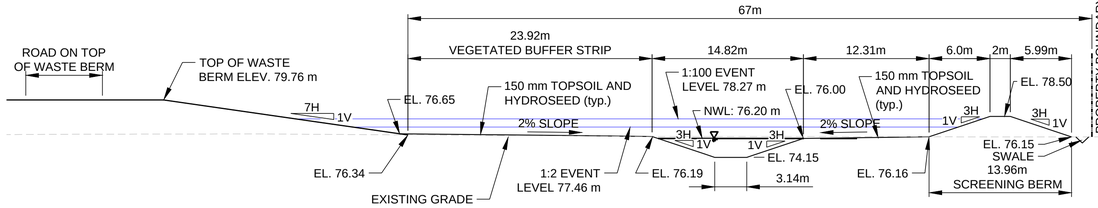
SCALE 1:200 m D01 C27 INTERNAL BERM DETAIL POND 1

LEGEND

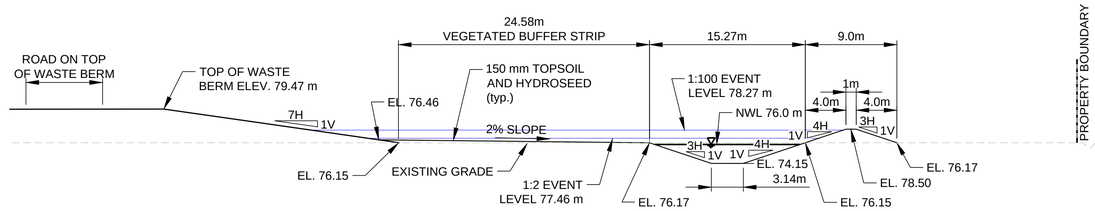
- PROPERTY BOUNDARY
- × (75.50) — PROPOSED SWALE GRADE
- × 77.25 — PROPOSED GRADE
- × TOB 77.25 — PROPOSED TOP OF BERM GRADE
- H.P. — HIGH POINT
- PROPOSED SURFACE DRAINAGE DIRECTION
- PROPOSED RIP-RAP (NOMINAL 200 mmØ, 300 mm THICK c/w GEOTEXTILE)
- × 75.00 — EXISTING GRADE
- PROPOSED DITCH
- PROPOSED 600 mmØ CULVERT OR AS NOTED
- EXISTING CULVERT AS NOTED

NOTE(S)

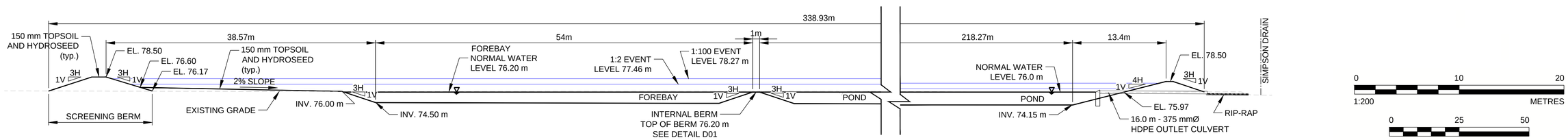
1. ALL GRADES ARE METRES ABOVE SEA LEVEL (masl)
2. TO BE READ IN CONJUNCTION WITH GRADING PLAN NO. GD1 TO GD14.



SCALE 1:300 m P1A C27 SECTION



SCALE 1:300 m P1B C27 SECTION



SCALE SCALE P1C C27 SECTION

1:200 — 0, 10, 20 METRES

1:750 — 0, 25, 50 METRES

REV.	YYYY-MM-DD	DESCRIPTION	DESIGNED	PREPARED	REVIEWED	APPROVED
2	2018-12-14	REVISED FOR SITE PLAN APPROVAL	MHK	MLF	DVK	DVK
1	2018-06-15	ISSUED FOR SITE PLAN APPROVAL	MHK	MLF	DVK	DVK

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2018/12/14
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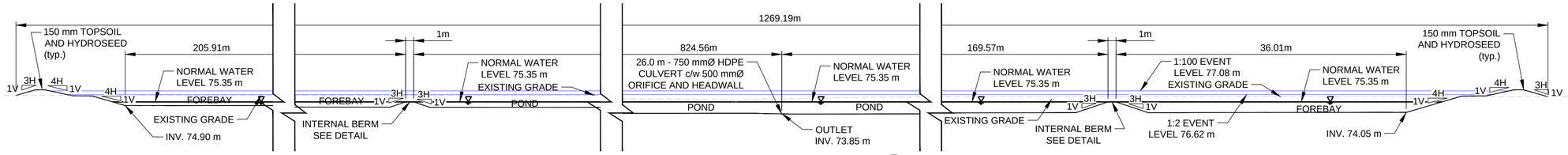
1787048	0006	2		C27

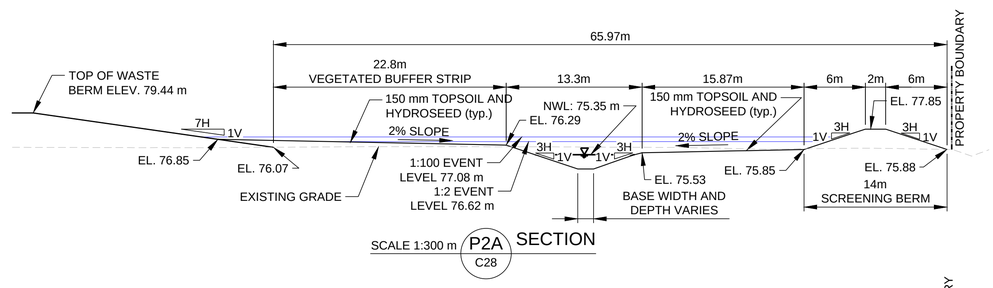
IF THIS MEASUREMENT DOES NOT MATCH WHAT IS SHOWN, THE SHEET SIZE HAS BEEN MODIFIED FROM: ANSI D

25 mm

0



SCALE 1:300 m P2D C28 SECTION



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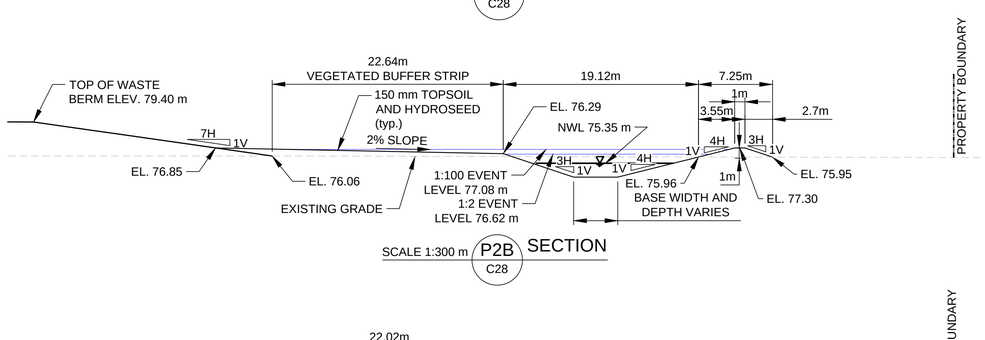

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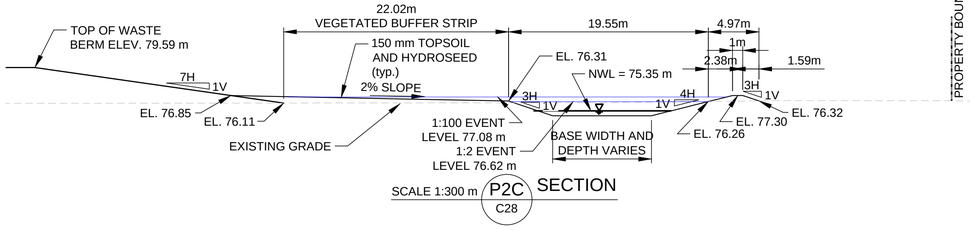
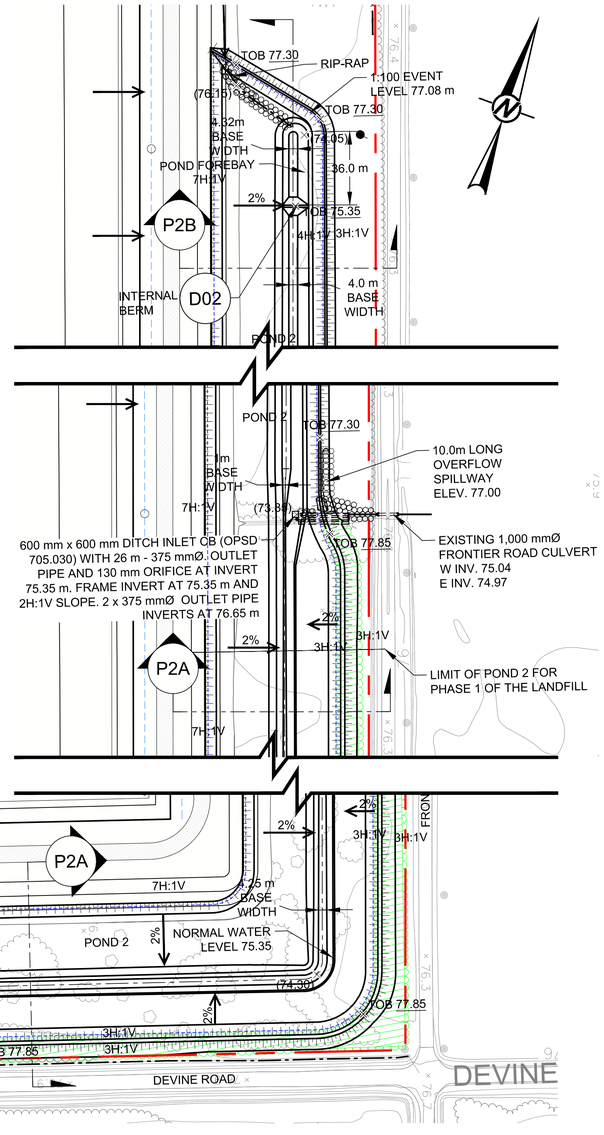
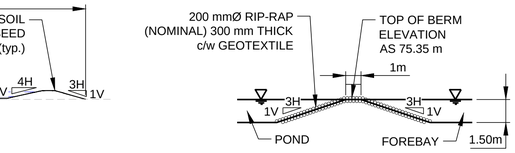


SCALE 1:300 m P2C C28 SECTION



PLAN VIEW OF POND 2

SCALE 1:1,500 m



INTERNAL BERM DETAIL POND 2 (NORTH)

SCALE 1:200 m D02 C28

LEGEND

- PROPERTY BOUNDARY
- × (75.50) — PROPOSED SWALE GRADE
- × 77.25 — PROPOSED GRADE
- × TOB 77.25 — PROPOSED TOP OF BERM GRADE
- H.P. — HIGH POINT
- PROPOSED SURFACE DRAINAGE DIRECTION
- PROPOSED RIP-RAP (NOMINAL 200 mmØ, 300 mm THICK c/w GEOTEXTILE)
- × 75.00 — EXISTING GRADE
- PROPOSED DITCH
- PROPOSED 600 mmØ CULVERT OR AS NOTED
- EXISTING CULVERT AS NOTED

NOTE(S)

1. ALL GRADES ARE METRES ABOVE SEA LEVEL (masl)
2. TO BE READ IN CONJUNCTION WITH GRADING PLAN NO. GD1 TO GD14.

POND 2 LEVEL (masl)

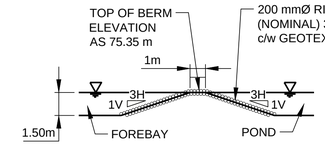
NORMAL WATER LEVEL = 75.35

1:2 EVENT LEVEL = 76.62

1:5 EVENT LEVEL = 76.75

1:25 EVENT LEVEL = 76.93

1:100 EVENT LEVEL = 77.08



SCALE 1:200 m D03 C28 INTERNAL BERM DETAIL POND 2 (SOUTH)

0 10 20
1:300 METRES

0 50 100
1:1,500 METRES

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2	2018-12-14	REVISED FOR SITE PLAN APPROVAL	MHK	MLF	DVK	DVK
1	2018-06-15	ISSUED FOR SITE PLAN APPROVAL	MHK	MLF	DVK	DVK

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25mm 0

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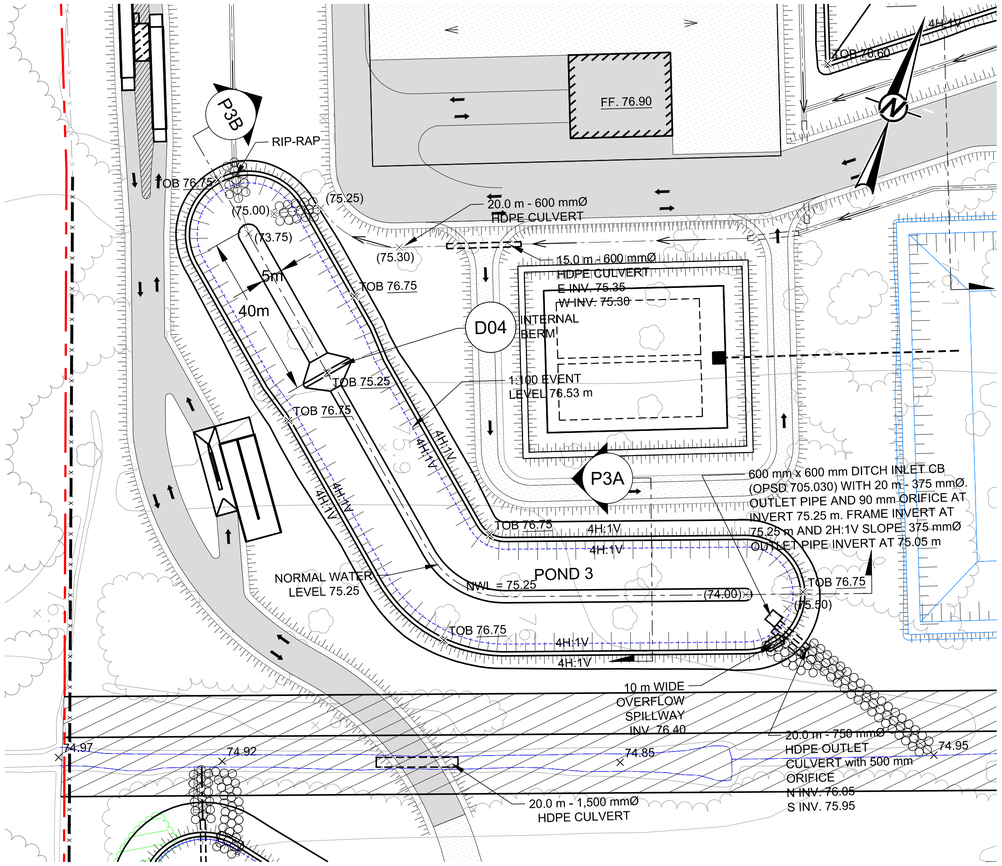


PLAN VIEW OF POND 3
SCALE 1:750 m

POND 3 LEVEL (masl)

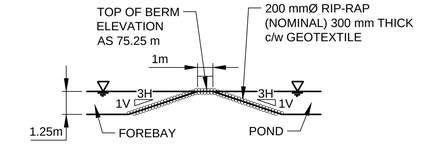
NORMAL WATER LEVEL = 75.25

1:2 EVENT LEVEL = 76.17

1:5 EVENT LEVEL = 76.30

1:25 EVENT LEVEL = 76.46

1:100 EVENT LEVEL = 76.53



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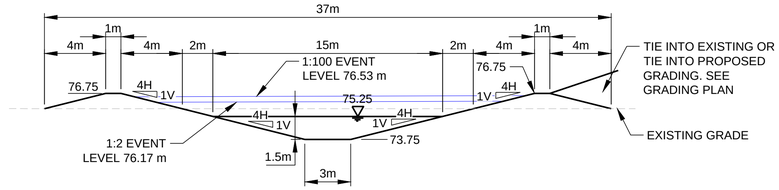
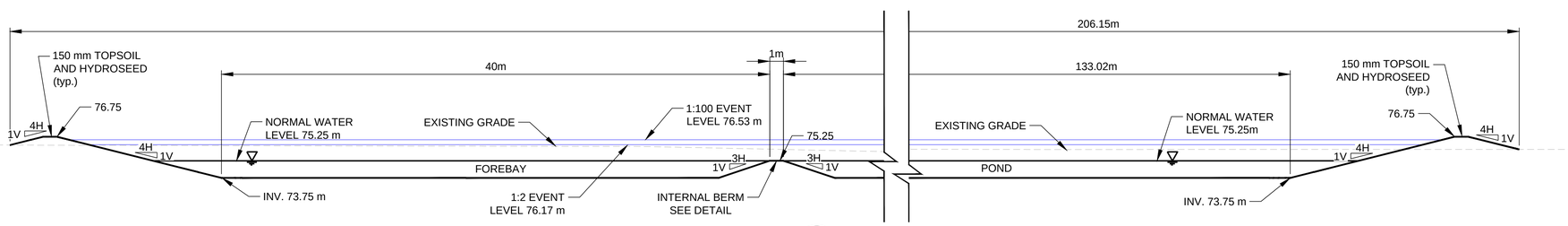


SCALE 1:200 m — P3A C29 — SECTION



SCALE 1:200 m — P3B C29 — SECTION

LEGEND

- PROPERTY BOUNDARY
- × (75.50) — PROPOSED SWALE GRADE
- × 77.25 — PROPOSED GRADE
- × TOB 77.25 — PROPOSED TOP OF BERM GRADE
- H.P. — HIGH POINT
- PROPOSED SURFACE DRAINAGE DIRECTION
- PROPOSED RIP-RAP (NOMINAL 200 mmØ, 300 mm THICK c/w GEOTEXTILE)
- × 57.00 — EXISTING GRADE
- PROPOSED DITCH
- PROPOSED 600 mmØ CULVERT OR AS NOTED
- EXISTING CULVERT AS NOTED

NOTE(S)

1. ALL GRADES ARE METRES ABOVE SEA LEVEL (masl)
2. TO BE READ IN CONJUNCTION WITH GRADING PLAN NO. GD1 TO GD14.

0 10 20
1:200 METRES

0 25 50
1:750 METRES

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2	2018-12-14	REVISED FOR SITE PLAN APPROVAL	MHK	MLF	DVK	DVK
1	2018-06-15	ISSUED FOR SITE PLAN APPROVAL	MHK	MLF	DVK	DVK

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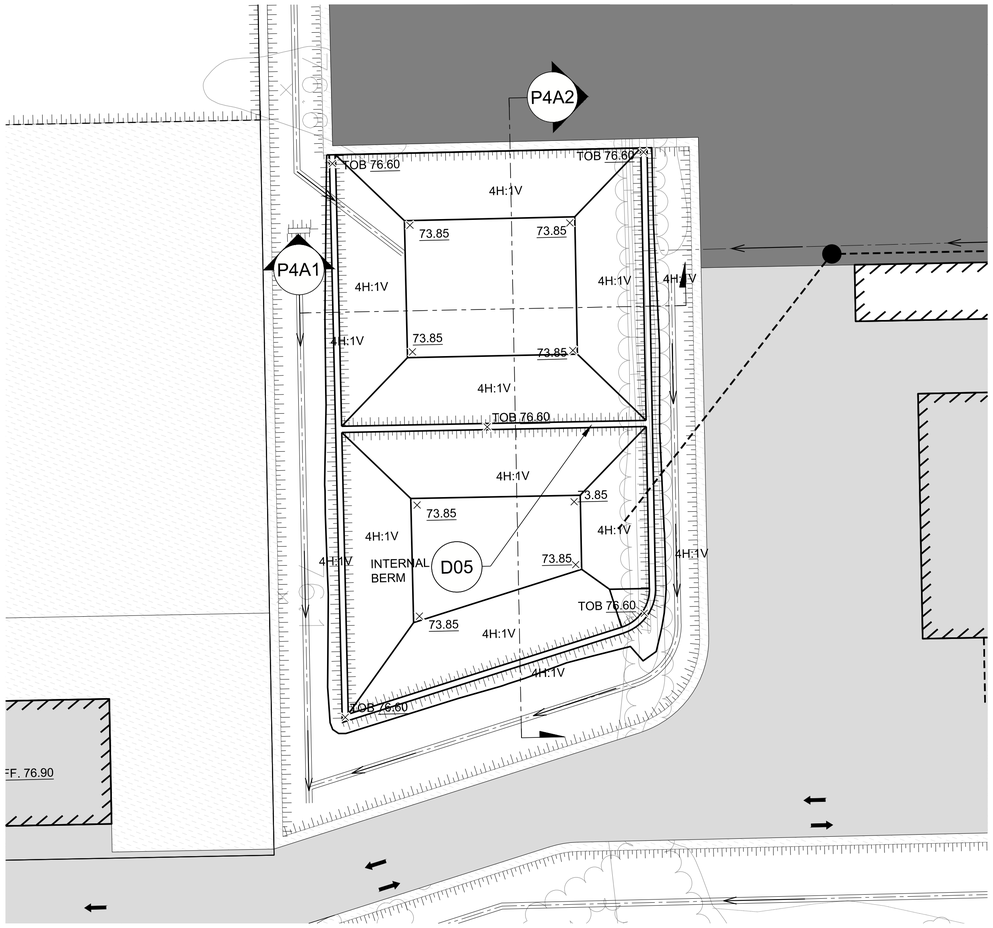
0 25mm



PLAN VIEW OF POND 4A
SCALE 1:500 m

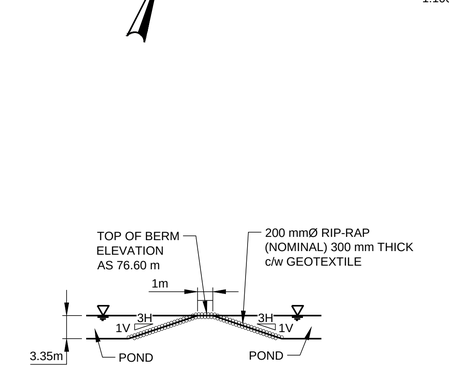
POND 4A LEVEL (masl)

1:2 EVENT LEVEL = 75.01

1:5 EVENT LEVEL = 75.30

1:25 EVENT LEVEL = 75.75

1:100 EVENT LEVEL = 76.05



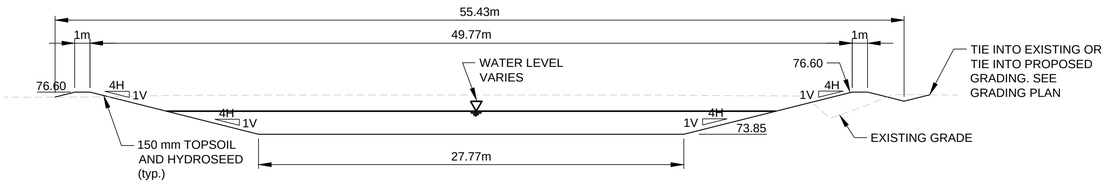
SCALE 1:200 m — D05 C30 — INTERNAL BERM DETAIL POND 4A

LEGEND

- PROPERTY BOUNDARY
- × (75.50) — PROPOSED SWALE GRADE
- × 77.25 — PROPOSED GRADE
- × TOB 77.25 — PROPOSED TOP OF BERM GRADE
- H.P. — HIGH POINT
- PROPOSED SURFACE DRAINAGE DIRECTION
- PROPOSED RIP-RAP (NOMINAL 200 mmØ, 300 mm THICK c/w GEOTEXTILE)
- × 57.00 — EXISTING GRADE
- PROPOSED DITCH
- PROPOSED 600 mmØ CULVERT OR AS NOTED
- EXISTING CULVERT AS NOTED

NOTE(S)

1. ALL GRADES ARE METRES ABOVE SEA LEVEL (masl)
2. TO BE READ IN CONJUNCTION WITH GRADING PLAN NO. GD1 TO GD14.



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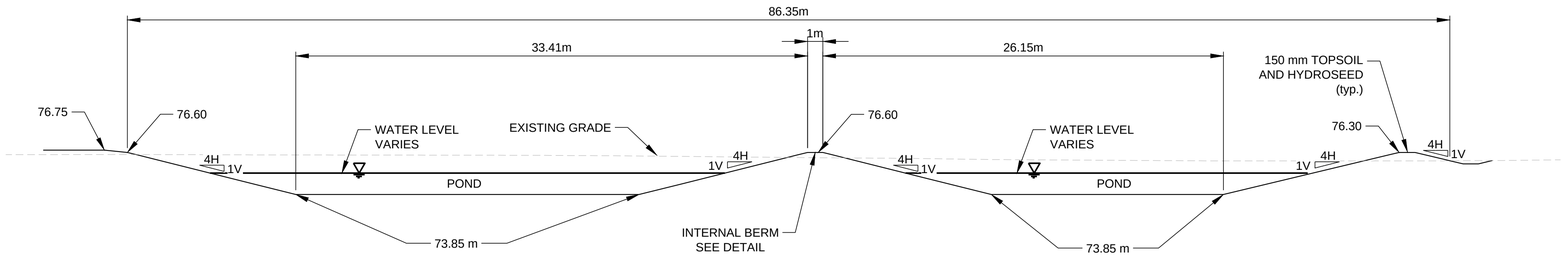

SCALE 1:200 m — P4A2 C30 — SECTION

0 10 20
1:200 METRES

0 20 40
1:500 METRES

REV.	YYYY-MM-DD	DESCRIPTION	DESIGNED	PREPARED	REVIEWED	APPROVED
2	2018-12-14	REVISED FOR SITE PLAN APPROVAL	MHK	MLF	DVK	DVK
1	2018-06-15	ISSUED FOR SITE PLAN APPROVAL	MHK	MLF	DVK	DVK

SEAL

LICENSED PROFESSIONAL ENGINEER
M. H. H. KNOWLES
100119790
2018/12/14
PROVINCE OF ONTARIO

CLIENT
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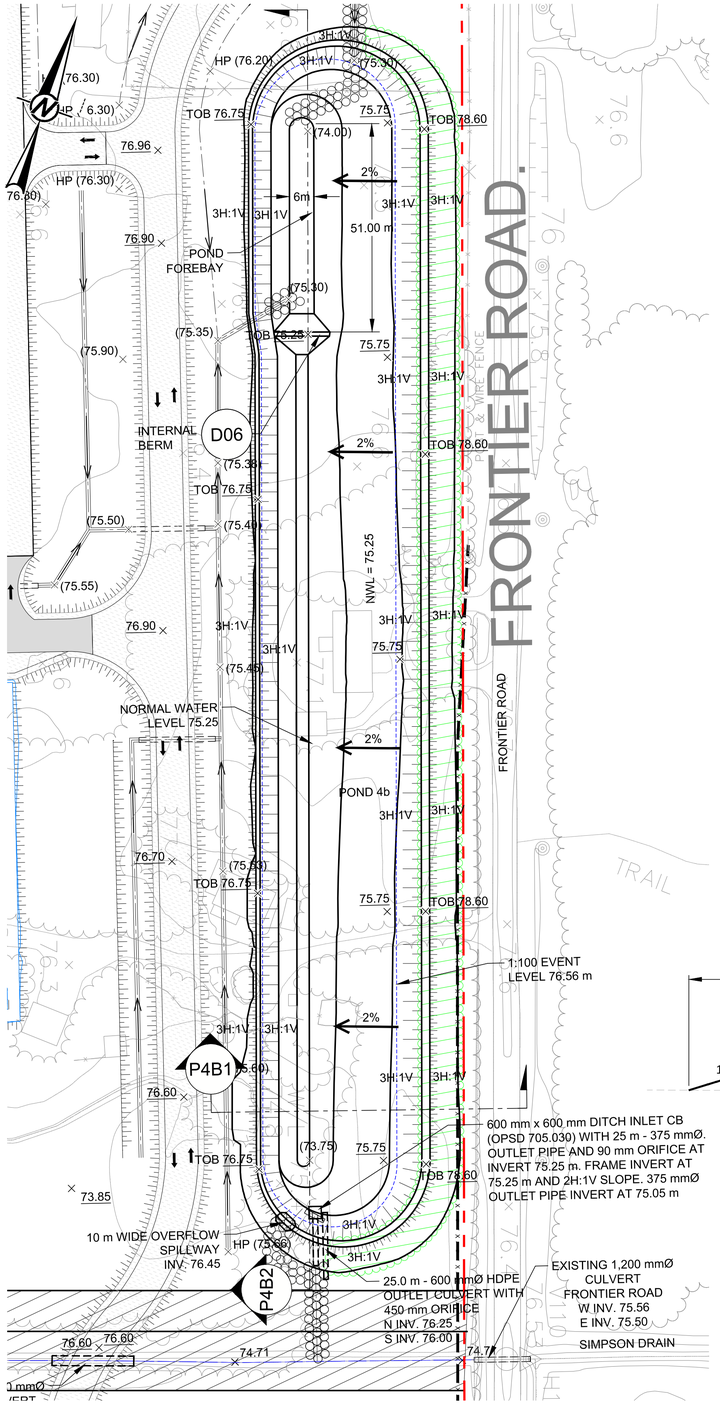
PROJECT
CAPITAL REGION RESOURCE RECOVERY CENTRE

TITLE
POND 4a PLAN VIEW AND DETAILS

PROJECT NO.	CONTROL	REV.	of	DRAWING
1787048	0006	2		C30

IF THIS MEASUREMENT DOES NOT MATCH WHAT IS SHOWN, THE SHEET SIZE HAS BEEN MODIFIED FROM: ANSI D

0 25 mm



PLAN VIEW OF POND 4B

SCALE 1:750 m

POND 4B LEVEL (masl)

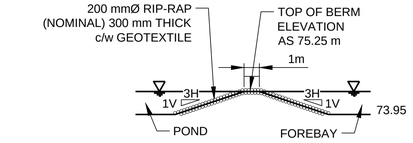
NORMAL WATER LEVEL = 75.25

1:2 EVENT LEVEL = 76.31

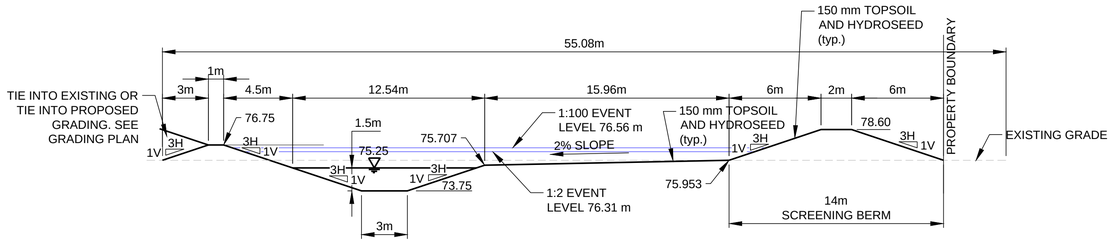
1:5 EVENT LEVEL = 76.44

1:25 EVENT LEVEL = 76.51

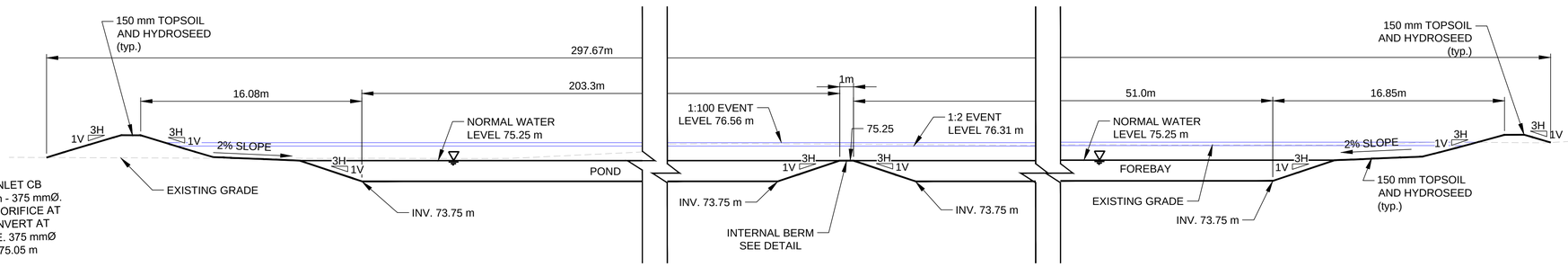
1:100 EVENT LEVEL = 76.56



SCALE 1:200 m D06 C31 INTERNAL BERM DETAIL POND 4B



SCALE 1:200 m P4B1 C31 SECTION



SCALE 1:200 m P4B2 C31 SECTION

0 10 20
1:200 METRES

0 25 50
1:750 METRES

LEGEND

- PROPERTY BOUNDARY
- × (75.50) — PROPOSED SWALE GRADE
- × 77.25 — PROPOSED GRADE
- × TOB 77.25 — PROPOSED TOP OF BERM GRADE
- H.P. — HIGH POINT
- PROPOSED SURFACE DRAINAGE DIRECTION
- PROPOSED RIP-RAP (NOMINAL 200 mmØ, 300 mm THICK c/w GEOTEXTILE)
- × 75.00 — EXISTING GRADE
- PROPOSED DITCH
- PROPOSED 600 mmØ CULVERT OR AS NOTED
- EXISTING CULVERT AS NOTED

NOTE(S)

1. ALL GRADES ARE METRES ABOVE SEA LEVEL (masl)
2. TO BE READ IN CONJUNCTION WITH GRADING PLAN NO. GD1 TO GD14.

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1	2018-06-15	ISSUED FOR SITE PLAN APPROVAL	MHK	MLF	DVK	DVK

SEAL

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PROJECT
CAPITAL REGION RESOURCE RECOVERY CENTRE

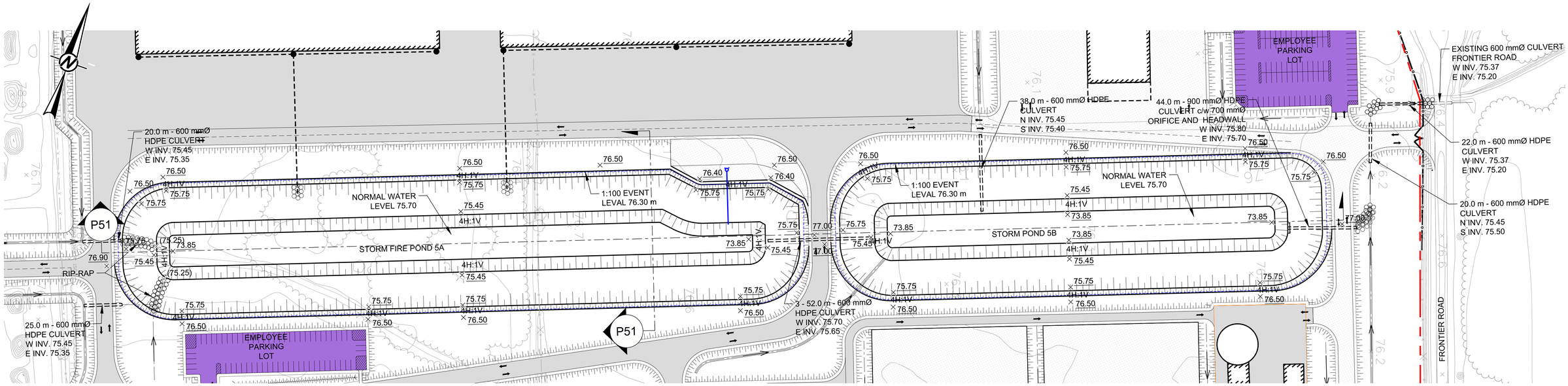
TITLE
POND 4b PLAN VIEW AND DETAILS

PROJECT NO.	CONTROL	REV.	of	DRAWING
1787048	0006	2		C31

IF THIS MEASUREMENT DOES NOT MATCH WHAT IS SHOWN, THE SHEET SIZE HAS BEEN MODIFIED FROM: ANSI D

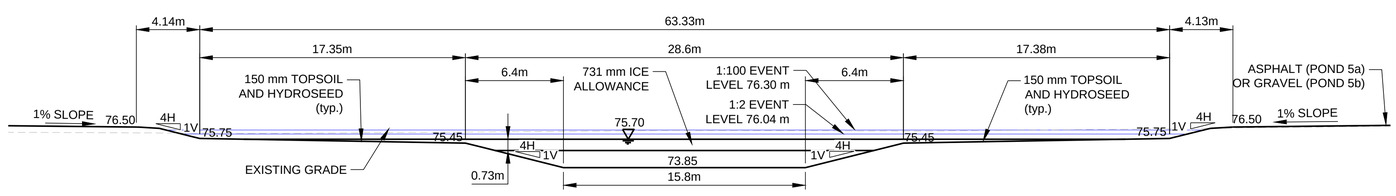
0 25 mm

Path: \\golder.gds\gal\ottawa\Active\Spatial_IM\Miller_Paving_Ltd\CRRRCA\CAD\1787048\40_PROD\0006_Storm_Grading_Plan_I File Name: 1787048-0006-CW-0007.dwg | Last Edited By: mforget Date: 2018-12-17 Time:1:27:09 PM | Printed By: mforget Date: 2018-12-17 Time:2:00:16 PM



PLAN VIEW OF POND 5A AND 5B

SCALE 1:1000



SCALE 1:200 m P51 C32 TYPICAL SECTION FOR POND 5A AND 5B

POND 5A LEVEL (masl)
NORMAL WATER LEVEL = 75.80

1:2 EVENT LEVEL = 76.04

1:5 EVENT LEVEL = 76.10

1:25 EVENT LEVEL = 76.22

1:100 EVENT LEVEL = 76.30

POND 5BLEVEL (masl)
NORMAL WATER LEVEL = 75.80

1:2 EVENT LEVEL = 76.04

1:5 EVENT LEVEL = 76.10

1:25 EVENT LEVEL = 76.21

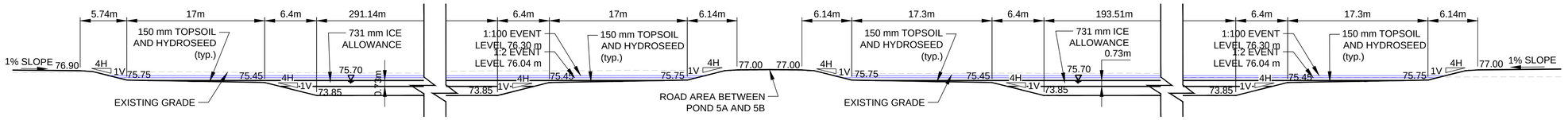
1:100 EVENT LEVEL = 76.30

LEGEND

- PROPERTY BOUNDARY
- × (75.50) — PROPOSED SWALE GRADE
- × 77.25 — PROPOSED GRADE
- × TOB 77.25 — PROPOSED TOP OF BERM GRADE
- H.P. — HIGH POINT
- PROPOSED SURFACE DRAINAGE DIRECTION
- PROPOSED RIP-RAP (NOMINAL 200 mmØ, 300 mm THICK c/w GEOTEXTILE)
- × 75.50 — EXISTING GRADE
- PROPOSED DITCH
- PROPOSED 600 mmØ CULVERT OR AS NOTED
- EXISTING CULVERT AS NOTED

NOTE(S)

1. ALL GRADES ARE METRES ABOVE SEA LEVEL (masl)
2. TO BE READ IN CONJUNCTION WITH GRADING PLAN NO. GD1 to GD14.



SCALE 1:300 m P52 C32 SECTION POND 5A AND 5B

0 10 20
1:200 METRES

0 10 20
1:300 METRES

0 50 100
1:1,000 METRES

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1	2018-06-15	ISSUED FOR SITE PLAN APPROVAL	MHK	MLF	DVK	DVK

SEAL

LICENSED PROFESSIONAL ENGINEER M. H. H. KNOWLES 100113790 2018/12/14 PROVINCE OF ONTARIO

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PROJECT
CAPITAL REGION RESOURCE RECOVERY CENTRE

TITLE
PLAN VIEW OF STORM - FIRE POND 5A AND 5B AND DETAILS

PROJECT NO.	CONTROL	REV.	of	DRAWING
1787048	0006	2		C32

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