GRAND RENEWABLE ENERGY PARK
STORMWATER MANAGEMENT REPORT
DRAFT

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1.0 Introduction

Stantec Consulting Ltd. (Stantec) has been retained to complete the design of the stormwater management (SWM) works associated with two components of the Grand Renewable Energy Park, namely the substation and operation and maintenance facilities within the solar project. The facilities are generally located east of Mount Olivet Road / Bains Road and north and south of Haldimand Road 20, respectively, as shown on Figure 1.

This report documents the SWM strategy and designs developed to mitigate against potential off-site water quality and quantity impacts associated with the development of the subject facilities, both during- and after-construction.

The SWM design approach involved the following study components:

- Complete hydrologic models for the existing and proposed conditions to determine potential negative impacts of project development, if left uncontrolled
- Finalize the SWM designs to control the site runoff in a manner consistent with current requirements (water quality and water quantity)
- Define an erosion and sediment control plan to minimize the potential for erosion and off-site transfer of sediment during construction
- Define a post-development monitoring program to confirm that implemented measures achieve the design level of treatment / control
- Outline an anticipated operation and maintenance program to be implemented by the Owners
- Summarize the study by identifying conclusions and recommendations

The primary guidance document referenced in the completion of the proposed SWM design is the Stormwater Management Planning and Design (SWMPD) Manual, Ministry of the Environment, 2003. The Natural Heritage Assessment Report (Stantec, January 2011) documented site-specific background information relating, in particular, to the characteristics of the receiving systems that was utilized in the establishment of appropriate SWM control criteria and considered in the siting of associated infrastructure.

2.0 Existing Conditions

The existing conditions of the substation and operations and maintenance (O&M) sites are similar, given the geographic proximity. As delineated on Figures 2.0 and 6.0, the drainage catchments for both facilities are relatively small and comprise primarily agricultural land use under existing conditions. The total catchment areas analyzed for the purposes of comparing with proposed development runoff conditions include 34.1 ha and 24.9 ha for the substation and O&M facilities, respectively.

The existing topography of the site is relatively flat, with slopes in the range of 0.5%, and the majority of at-surface soils comprised of a combination of Haldimand and Lincoln clays, as identified on mapping OMAFRA / MNR. Runoff curve numbers, as defined by the US Soil Conservation Service (SCS) and other hydrologic parameters were calculated for each existing catchment based on land use and soil type and are provided in Appendices B and C.

Drainage from both sites is conveyed to a tributary of Wardells Creek, though the O&M facility is more immediately adjacent to the receiver, whereas drainage from the substation facility area will be conveyed along roadside ditches and/or intermittent tributaries prior to its confluence with the more significant tributary system.

The locations of the substation and O&M facilities and/or their associated access roads receive drainage from upstream, external contributing lands that is proposed for diversion around the infrastructure area using grassed swales similar in characteristic to the existing drainage systems. Diversion of such flows minimizes the potential for unnecessary mixing of runoff from the subject sites and/or compromising the effectiveness of the proposed treatment systems. Additional discussion in this regard is provided within Section 4.

3.0 Stormwater Management Objectives / Criteria

The primary stormwater management philosophies, or fundamental principles, developed within the SWMP generally mimic those promoted by the SWMP Planning and Design Manual and reflect current standards of practice. The general approach incorporates a Best Management Practice (BMP), multi-component 'treatment train' approach and includes emphasis on at-source, conveyance, and end-of-pipe treatment controls. The following general objectives guided the development of the site SWM designs:

- Minimize the impact of post development conditions on downstream areas
- Maintain, protect, and enhance the existing watercourse function
- Maintain and preserve the quality of runoff discharge to the receiving waters

Lacking a formally established subwatershed management plan, the SWM criteria were based on an assessment of the characteristics of the receiving systems to define appropriate level of quality control, as well as typical standards of drainage and riparian rights law to define the approach to water quantity control. In this regard, the criteria proposed for implementation include:

- Provide peak flow control of runoff for the return-period events to ensure that pre-development release rates area achieved or reduced to minimize the potential for peak flow related impacts on downstream landowners
- Provide an Enhanced (formerly Level 1) degree of water quality control that aims to reduce effluent total suspended solids (TSS) concentrations by 80% through use of engineered treatment systems. While the reduction of TSS loads is also considered to achieve corresponding reductions in other contaminants, given their adsorption to the suspended particulates, consideration of spills potential at the subject facilities should also be incorporated to minimize the potential off-site of oils, greases, etc.

4.0 Proposed Conditions

The relative size and impervious coverage characteristics of the proposed collector substation and operations and maintenance (O&M) facilities, as well as their associated access roads, are such that negative impacts on stormwater quality and quantity could occur if not mitigated through the use of SWM detention/treatment systems.

4.1 SUBSTATION

The collector substation will be built to accumulate the power circuits from the wind and solar generation equipment. The substation will be located near Haldimand Road 20 and Mt. Olivet Road within the solar lands of the Project Location.

The collector substation will consist of a gravel pad area containing associated infrastructure that is 85 m by 85 m in size with an approximately 1 km long access road entering from Haldimand Rd 20. The gravel surface, traveled portion of the access road is approximately 8 m wide and is of rural cross-section, with grassed swale drainage ditches on either side. For the purposes of proposed conditions hydrologic modeling, the gravel surfaces of substation pad and access road are considered to be 100% impervious.

The delineation of the proposed drainage catchments is provided on Figure 3.0 and is summarized as follows:

- Catchment 201 – 10.62 ha of solar module fields draining to a proposed diversion swale immediately east of the access road discharging to the existing drainage ditch along Haldimand Road 20
- Catchment 202 – 18.25 ha of predominantly agricultural land (1 solar module) draining to a proposed drainage swale on the west side of the access road discharging to the existing drainage ditch along Haldimand Road 20
- Catchment 203 – 2.53 ha of the proposed substation block, proposed access road right-of-way (including grassed swale drainage ditches), and the 0.5 ha SWM block. All major and minor flows are to be conveyed to the proposed SWM facility
- Catchment 204 – 3.20 ha of external lands which are to be diverted along the east side of the proposed SWM facility to the existing drainage ditch located along Haldimand Road 20
- SCS curve numbers (CNs) and hydrologic parameters were calculated for each catchment based on land use and soil type and are provided in Appendix B.

4.2 OPERATIONS & MAINTENANCE FACILITY PROPOSED CONDITIONS

The operations and maintenance facility is proposed on the south side of Haldimand Road 20 opposite the solar farm land area, just east of Mount Olivet Road / Bains Road. The building will be a prefabricated engineered structure measuring 46 m wide by 85 m long by 7 m high. It will be founded on concrete foundations that are extended below grade to below the frost line. The access road and equipment/material storage area surrounding the buildings are to be gravel-surfaced and assumed, for the purposes of hydrologic modeling herein, to be 100% impervious coverage.

A 10 m wide gravel-surfaced access road servicing the O&M facility will intersect with Haldimand Road 20 northeast of the facility, just east of a woodlot, and proceed due south and west to the building parking area. Grassed swale drainage ditches on either side will convey road runoff to the SWM facility.

The delineation of the proposed conditions drainage catchments is provided on Figure 7.0 and is summarized as follows:

- Catchment 201a – 10.9 ha of solar module field / agricultural area east of the site draining to a grassed diversion swale immediately east of the access road, discharging to the existing receiver south of the O&M facility
- Catchment 201b – 0.2 ha catchment containing the northerly 1/3 of access road (~100 m) and associated grassed swale drainage ditches
- Catchment 202a – 6.3 ha of solar module field / agricultural area east of the site draining to a grassed diversion swale immediately east of the access road, discharging to the existing receiver south of the O&M facility
- Catchment 202b - 5.8 ha containing the proposed O&M facility, the southerly 2/3 of proposed access road (including grassed swale drainage ditches), and the SWM block. All major and minor flows are to be conveyed to the proposed SWM facility
- Catchment 202c – 1.7 ha of solar module field east of the site draining to a grassed diversion swale immediately east of the O&M facility and associated SWM, discharging to the existing receiver south of the O&M facility

SCS curve numbers (CNs) and hydrologic parameters were calculated for each catchment based on land use and soil type and are provided in Appendix C.

5.0 Proposed Stormwater Management System

The proposed SWM systems include a 'treatment train' approach to mitigate potential impacts from the proposed land use changes in accordance with the MOE recommended hierarchy of SWM approaches, ranging in preference from lot level controls, to conveyance controls, to end-of-pipe controls. The SWM designs for both the substation and operations and maintenance facilities utilize a rural cross-section for the access roads, complete with shallow-slope grassed swale drainage ditches, and end-of-pipe detention basins. Details of all aspects of the proposed SWM systems are outlined in the following sections, with additional design information and modeling included within the Appendices. Summary tables outlining the most important design and operating characteristics for each of the SWM Facilities are provided within the following sections.

5.1 HYDROLOGIC MODELING

Hydrologic models were prepared to simulate proposed drainage conditions for the subject developments using the Stormwater Management Hydrologic Model (SWMHYMO) software. The models predicted flows for the existing and proposed development conditions and assessed the design of SWM systems within the collector substation and O&M Management Facility to ensure that the previously discussed stormwater criteria are achieved.

To assess the proposed SWM designs ability to mimic existing conditions hydrology, the

2-100 year, 24-hour SCS storms derived using the Simcoe Station IDF parameters were analyzed. The parameters used to define the design storm events are summarized on Table 5.1, below:

Table 5.1: Rainfall Events – 24-hour SCS Storm Event Depths (Simcoe Station)

Storm	Depth (mm)
1:2-year	50.7
1:5-year	66.8
1:10-year	77.4
1:25-year	90.8
1:50-year	100.7
1:100-year	110.6

Schematics of the SWMHYMO models, as well as input and output files, are appended.

5.2 SUBSTATION FACILITY

Drainage generated within this site is conveyed along approximately 1000 m of shallow-slope (~0.5%) grassed swale drainage ditches and temporarily detained within a dry end-of-pipe SWM facility before discharging to a road drainage ditch along Haldimand Road 20. Contributory drainage generated with the catchments upstream of and surrounding of the proposed substation and SWM facility will bypass the developing portions of the site as well as the SWM conveyance / treatment systems via vegetated diversion swales. All discharge (diverted or treated) is to the north ditch of Haldimand Road 20, in a manner consistent with that which occurs under existing conditions. Drainage from this system ultimately contributes to a tributary of Wardells Creek.

An impervious coverage value of 100% has been assumed for the substation pad and the 8 m wide access roads; the grassed swale drainage ditches represent an additional 2.5 m wide pervious zone paralleling either side of the access road along its entirety. Given the typically 'dry' character of the SWM facility, this area (0.5 ha) is also considered to be pervious for the purposes of the hydrologic assessment.

Additional details regarding the drainage area characteristics and SWM designs for the substation facility are provided in Appendix B.

5.2.1 Water Quality Control

The drainage outlet for the substation facility and access road is a roadside ditch along Haldimand Road 20, which eventually discharges to a tributary of Wardells Creek. In recognition of the wetland associated with the tributary downstream (near the O&M facility discharge location), the proposed grassed swale drainage ditch / dry end-of-pipe detention facility treatment train has been designed to achieve an Enhanced (formerly Level 1) degree of water quality protection, as identified within Section 3.

Scientific literature documenting the pollutant removal capabilities of grassed swales indicates widely variable results, dependent to a large extent on the design characteristics of the systems. Critical design aspects to be considered in the improvement of performance include the maximization of bottom width and swale length, and minimization of longitudinal slope, all of which improve runoff / vegetation contact and minimize flow velocities. These aspects have been incorporated into the subject design through incorporation of very long flow length (~1000 m), broad trapezoidal cross-section relative to the predicted flow rates, and shallow longitudinal slope (~0.5%) mimicking the existing topography. It can reasonably be expected that the swales will provide at least 60-70% TSS reduction.

As per the MOE design guidelines, the TSS reduction capabilities of dry, end-of-pipe SWM facilities are generally limited to approximately 60%, primarily achieved through the temporary detention of flows giving sediments an opportunity to settle out and be captured. Performance

in this regard has been maximized within the subject facility design through the use of the smallest permitted quality control orifice (50 mm diameter), maximizing the detention time.

Extended detention drawdown control has been incorporated within the design to achieve the 24-hour drawdown of the 213 m3/ha volume specified by the MOE SWMPD Manual. In order to meet these criteria with such a limited contributing drainage area, the low-flow quality control orifice has been sized at 50 mm diameter (minimum permitted), providing an approximate 29-hour drawdown of the 433 m3 water quality volume.

The vegetated characteristic of dry facilities also provides sediment removal and nutrient uptake benefits. A planting strategy utilizing careful selection of plant species tolerant of a range of moisture conditions, and their strategic location in and around the basin will stabilize banks, mitigate temperature increases, deter waterfowl from nesting within the area, improve performance, and provide aesthetic and safety benefits.

Table 5.2: Substation Facility SWM System Water Quality Design Characteristics

General Parameters	Basin Value
Total Contributing Area to SWM Facility (ha)	2.53
Total Area to SWM Facility requiring quality control (ha)[1]	2.03
Imperviousness of Contributing Area (%)	60
Total Area of SWM Block (ha)	0.50
SWM Basin Water Quality Parameters	
Water Quality Unit Volume Requirements as per SWMPD Manual (m^3/ha)	213
Total Required Water Quality / Extended Detention Volume (m^3)	433
Extended Detention Volume Provided (m^3)	509
Peak Release Rate for MOE Extended Detention (m^3/s)	0.044
Extended Detention Drawdown Time Required (hrs)	24
Extended Detention Drawdown Time Provided (hrs)	30

Notes:
1 Drainage Area for Quality control represents total drainage area to SWMF less the area of the SWM Block itself.

5.2.2 Water Quantity Control

As outlined in Section 3.0, water quantity controls within the proposed development are required to minimize the potential for peak flow related impacts on receiving systems and downstream landowners. A dual-stage outlet structure is proposed for implementation at the dry SWM facility, as detailed on Figure 5.0. In addition to the water quality control described above, this system includes a second orifice, also contained within the perforated CSP riser structure. A detailed stage-storage-discharge analysis for the facility is provided within Appendix B. Target peak flow values and proposed post-development controlled values for the 2-100 year return-period rainfall events are provided in Table 5.3.

In the event of an extreme rainfall event (>1:100-year return-period) or blockage of the SWM facility outlet, flows would spill southerly to the Haldimand Road 20 ditch via a proposed rip-rap lined emergency overflow weir.

Table 5.3: Substation Facility SWM Quantity Control Design Characteristics

	Return-Period Event (yrs)				
	2	**5**	**10**	**25**	**100**
Existing Conditions Peak Discharge (m^3/s) [1]	0.61	0.94	1.17	1.47	1.93
Proposed Conditions Peak Discharge (m^3/s) [1]	0.57	0.88	1.10	1.38	1.80
Proposed SWM Facility Discharge (m^3/s)	0.04	0.07	0.09	0.11	0.12
Maximum Ponding Elevation (m)	199.85	199.85	199.94	199.98	200.04
Maximum Storage Volume Used (m^3)	500	650	760	900	1,130

Notes:

1 The comparison point of existing and proposed conditions peak discharge values is at the Haldimand Road 20 ditch and includes all areas for which runoff is being detained, treated, or diverted, as illustrated on Figures 2 and 3.

5.2.3 Stormwater Management Facility Design

The design of the end-of-pipe SWM facility adheres to standard principles and characteristics recommended or required by the SWMP Design Manual (MOE, 2003). The following list of design characteristics, read in conjunction with Figures 4.0 and 5.0, outlines all significant design aspects and rationales:

- The SWM basin has been designed as a dry, extended detention facility with sufficient active storage volumes to achieve a Basic (formerly Level 3) degree of protection
- Water quantity controls will be implemented to limit peak discharge rates for the return-period rainfall events (2-100 year) to existing conditions rates, as determined within the current work
- Given the proximity of access for maintenance around the entire facility, the shallow depth to pond invert, and the 'dry' nature of the pond bottom, generally making maintenance tasks a simpler procedure than with a 'wet' facility, an access road has not been incorporated into the design
- Internal side slopes of 3:1 are proposed as the safety concerns normally associated with a 'dry' facility are not a concern given the shallow, 'dry' nature of the proposed design
- The design of the required outlet structures incorporates a dual-stage configuration for control across the range of rainfall-runoff events, as outlined on Tables 5.3 and 5.4

- Operation, maintenance, and monitoring (OMM) of the stormwater management facility will be the responsibility of the Owners. Additional detailed discussion pertaining to the anticipated OMM program is provided within Section 8 of this report

Table 5.4: Substation Facility SWM Pond Outlet Structure Characteristics

Outlet Structure Parameter	
Water Quality Orifice Plate Diameter (within CSP Riser)(mm)	50
Extended Detention Orifice Plate Invert (m)	199.45
Quantity Control Orifice Diameter (within CSP Riser)(mm)	350
Quantity Control Orifice Invert (m)	199.65
Trapezoidal Overflow Spillway Elevation (m)	200.10
Trapezoidal Overflow Spillway Bottom Width (m)	3
Trapezoidal Overflow Spillway Side Slopes	3

5.3 O&M STORMWATER MANAGEMENT FACILITY

Drainage generated within this site is conveyed via shallow-sloped (~0.5%) grassed swale drainage ditches and temporarily detained within a constructed wetland end-of-pipe SWM facility. Contributory drainage generated with the catchments upstream of and surrounding of the proposed O&M facility and SWM facility will bypass the developing portions of the site as well as the SWM conveyance / treatment systems via vegetated diversion swales. All discharge (diverted or treated) is to an existing drainage draw that conveys flows to a tributary of Wardells Creek, in a manner consistent with that which occurs under existing conditions.

An impervious coverage value of 100% has been assumed for the O&M building/parking area and the 10 m wide access road; the grassed swale drainage ditches represent an additional 5 m wide pervious zone paralleling either side of the access road along its entirety. Given the permanent pool proposed within the wetland SWM facility, this block is assumed to be 50% 'impervious' for the purpose of assessing hydrologic characteristics.

Additional details regarding the drainage area characteristics and SWM designs for the O&M facility are provided in Appendix C.

5.3.1 Water Quality Control

The O&M SWM facility has been designed as a constructed wetland with an average permanent pool depth of 0.3 m within the wetland component of the facility. Constructed wetlands offer the dual benefits of dilution and settling of sediment within the forebay and the wetland components of the facility, with the added benefit of biological removal of pollutants (i.e., nutrient uptake) via the wetland plantings. Careful selection of plant species and their location in and around each basin helps stabilize banks, mitigate temperature increases, deter waterfowl from nesting within the area, improve performance, and provide aesthetic and safety benefits.

A sediment forebay has been provided at the inlet to the O&M facility and is designed with a maximum depth of 1.5 m. The design depth is that anticipated immediately following construction and after sediment clean-out operations. The minimum design operating depth of 1.0 m is that which follows a period of sediment collection to 0.5 m depth, and coincides with the point immediately prior to the required clean-out operations. Maintenance of at least 1.0 m of permanent pool in the forebay at all points in the sediment accumulation / clean-out cycle minimizes the potential for scour and re-suspension of previously settled sediments.

It is noted that the proposed forebay area exceeds the MOE recommended design criterion of

≤ 20% of the total permanent pool surface area. The primary rationale for that design criterion, however, reflects the fact that the volumetric sizing criteria for constructed wetland-type facilities relies on the wetland vegetation component of the facility to provide the majority of the water quality treatment functions. In other words, it is contrary to the design sizing guidance to utilize deep water areas, such as those in forebays, to achieve the volumetric storage requirements established as appropriate for constructed wetland facilities. Within the current design, the permanent pool volumetric sizing requirements, as defined by the SWM Planning and Design Manual (MOE, 2003), are achieved within the wetland component of the facility without accounting for the storage volume provided within the forebay. It is concluded, therefore, that the proposed facilities achieve the target of the MOE in this regard.

Specifics of the SWM facility design characteristics pertaining to the provision of water quality treatment are summarized on Table 5.5.

Table 5.5: O&M SWM Facility Water Quality Design Characteristics	
General Parameters	
Total Contributing Area to SWM Facility (ha)	6.0
Imperviousness of Contributing Area (%)	50%
Surface area of Permanent Pool (ha)	2,813
SWM Basin Water Quality Parameters	
Forebay Invert Elevation (m)	195.80
Water Quality Volume Requirements as per SWMPD Manual (m^3/ha)	99
Total Required Water Quality Volume (m^3)	594
Required Extended Detention Volume (m^3)	240
Extended Detention Volume Provided (m^3)[2]	289
Required Permanent Pool Volume (m^3)	353
Permanent Pool Volume Provided (Total – above sediment storage) (m^3)[2]	1,078
Permanent Pool Volume Provided within wetland component alone (m^3)[2]	546
Peak Release Rate for Extended Detention (Quality Control) (m^3/s)	0.003
Extended Detention Drawdown Time (Quality Control) (hrs)	27
Forebay Parameters	
Required Forebay Length (m)	6
Actual Forebay Length (m)	30
Sediment Storage Volume Provided (m^3)	90
Clean-Out Frequency (yrs)	12

5.3.2 Water Quantity Control

As outlined in Section 3.0, water quantity controls within the proposed development are required to minimize the potential for peak flow related impacts on receiving systems and downstream landowners. A dual-stage outlet structure is proposed for implementation at the SWM facility, as detailed on Figure 9.0. In addition to the water quality control described above, this system includes a second orifice, also contained within the perforated CSP riser structure. A detailed stage-storage-discharge analysis for the facility is provided within Appendix C. Target peak flow values and proposed post-development controlled values for the 2-100 year return-period rainfall events are provided in Table 5.6.

In the event of an extreme rainfall event (>1:100-year return-period) or blockage of the SWM facility outlet, flows would spill to the receiving drainage system via a proposed rip-rap lined emergency overflow weir.

Table 5.6: O&M SWM Facility Quantity Control Design Characteristics

	Return-Period Event (yrs)				
	2	**5**	**10**	**25**	**100**
Existing Conditions Peak Discharge (m^3/s) [1]	0.54	0.84	1.04	1.32	1.74
Proposed Conditions Peak Discharge (m^3/s) [1]	0.44	0.70	0.88	1.11	1.46
Proposed SWM Facility Discharge (m^3/s)	0.05	0.09	0.11	0.12	0.15
Maximum Ponding Elevation (m)	197.71	197.83	197.91	198.02	198.18
Maximum Storage Volume Used (m^3)	1,290	1,720	2,030	2,450	3,100

5.3.3 5.3.3 Stormwater Management Facility Design

The design of the end-of-pipe SWM facility adheres to standard principles and characteristics recommended or required by the SWMP Design Manual (MOE, 2003). The following list of design characteristics, read in conjunction with Figures 8.0 and 9.0, outlines all significant design aspects and rationales:

- The facility has been designed as a constructed wetland with sufficient permanent and active storage volumes to achieve an Enhanced (formerly Level 1) degree of protection, in recognition of the Provincially Significant Wetland (assumed) present within the valley of the receiving watercourse
- Water quantity controls have been incorporated to provide extended detention for erosion control and to limit peak discharge rates for the return-period rainfall events (2- to 100-year) to existing conditions flow values
- Anticipated clean-out frequencies for the facility's forebay, as summarized in Table 5.5, is 12 years
- The design of the outlet structure incorporates a dual-stage configuration for flow control across the range of rainfall-runoff events, as outlined on Table 5.7
- Design permanent water depths within the forebays are set at 1.5 m and are anticipated to be present immediately after construction and following future sediment clean-out procedures. The provision of 1.5 m depth within the forebay allows for 0.5 m sediment accumulation prior to recommended clean-out while maintaining 1.0 m of permanent pool storage, thereby minimizing the risk of scour and re-suspension of previously settled sediments throughout the deposition / clean-out cycle
- Operation, maintenance, and monitoring (OMM) of the stormwater management facilities will be the responsibility of the Owners. Additional detailed discussion pertaining to the anticipated OMM program is provided within Section 8.0 of this report.

Table 5.7: O&M SWM Facility Outlet Structure Characteristics

Outlet Structure Parameter	
Water Quality Orifice Plate # 1 Diameter (within CSP Riser)(mm)	75
Water Quality Orifice Plate # 1 Invert (m)	197.30
Quantity Control Orifice Plate # 2 Diameter (within CSP Riser)(mm)	300
Quantity Control Orifice Plate # 2 Invert (m)	197.50
Trapezoidal Overflow Spillway Elevation (m)	198.20
Trapezoidal Overflow Spillway Bottom Width (m)	5
Trapezoidal Overflow Spillway Side Slopes	5

6.0 Erosion and Sediment Control

In order to control erosion and transportation of sediment off-site, an Erosion and Sediment Control Plan (ESC) has been developed and will be implemented during the construction process. The plan focuses on the protection of downstream receivers, namely the adjacent wetland units and receiving watercourses.

The Greater Golden Horseshoe Conservation Authorities Erosion and Sediment Control Guideline for Urban Construction (2006) document was used to determine the erosion potential of the site. Those factors affecting the erosion potential of a given site considered in the assessment include slope gradient, slope length, and soil texture. The relative magnitude of erosion potential guides the development of an appropriate erosion control strategy.

Existing conditions gradients on the subject lands can be summarized as generally gentle

(< 2%) with predominantly long slope lengths (greater than 30 m). Site soils are comprised primarily of Haldimand and Lincoln clays, which are considered to represent a low erodibility potential. Finally, the potential for negative impact on the receiving systems should sediment be transported off-site during construction, should be considered. In the case of the subject lands, the potential for impact on the receiving natural systems is high. In consideration of all of the evaluation parameters described above, the overall erosion potential for the site is considered to be “moderate”.

Most of the various construction activities will result in the disturbance of at-surface soils to various extents, ranging from construction traffic to topsoil stripping and/or grading activities involving cutting or filling, all of which expose the underlying earth to potential erosion and sediment transport to off-site locations. In all instances where the potential for erosion is identified a series of control measures will be implemented including, but not limited to:

- Erect silt fence before grading begins on the downstream side of the area to be graded to protect the downstream lands from potential sediment transport that may be entrained in overland flows.
- Provide a construction entrance feature (“mud mat”) at all site entrances to minimize the transport of sediment on construction vehicle tires
- Direct runoff via swales and erosion control berms (where necessary) to sediment control measures to ensure that no untreated runoff is discharged from the site.
- Utilize the proposed end-of-pipe SWM facilities as temporary sediment control measures.

- Install temporary rock check dams in swales where appropriate to help attenuate flows, reduce erosive velocities, and encourage sediment deposition
- Immediately stabilize all disturbed areas not subject to construction activities within 30 days, according to OPSS 572.

In order to ensure the effectiveness of the various erosion and sediment control measures, an appropriate inspection and maintenance program is necessary. The inspection activities will include:

- Inspection of the erosion and sediment controls after each significant rainfall event or weekly, whichever is more frequent
- Inspections should include all silt fence installations, rock-check dams, the sediment control facility, outlets and vegetation
- Submission of regular monitoring results to the LPRCA during active construction periods

7.0 Monitoring Program

The proposed monitoring program includes detailed monitoring requirements for the during-construction and post-construction stages of development. Within each stage of the program, monitoring requirements with respect to water quality and quantity have been detailed.

7.1 DURING-CONSTRUCTION MONITORING

Grading and servicing activities constitute the during-construction monitoring stage within which the minimization of potential stormwater impacts is primarily concerned with the control of erosion and off-site transport of sediment.

In addition to the erosion and sediment control inspections discussed in Section 6, the following elements will be monitored and documented during the construction period:

i. The general condition of the discharge point from the SWM facilities

ii. The stability of the SWM facilities embankment slopes and the condition of plantings

iii. The performance and sedimentation levels within the SWM facilities

An annual report will be submitted to the LPRCA summarizing the monitoring results and will make appropriate recommendations for future monitoring if necessary.

7.2 POST-CONSTRUCTION MONITORING

Implementation of a post-construction monitoring program provides the data necessary to assess that the SWM system is functioning as designed and achieves the target control values for treatment. Within the current study, the post-construction period is defined as the two-year period after construction and stabilization of the associated infrastructure (substation, O&M facility, and associated access roads).

The monitoring of SWM facility performance will represent a key component of the post-construction period program, with an objective of confirming the operational characteristics predicted as part of the design process, identifying any discrepancies, and implementing remediative approaches in the event that such are required. Operational inspections will focus on the surface water quantity and quality characteristics of the facilities. Monitoring of inflow and outflow conditions during and immediately after rainfall events, combined with observations of water level fluctuations, will confirm hydrologic characteristics of the contributing catchment area and SWM facility response to the associated runoff. Laboratory testing of grab samples obtained at the inlet and outlet of the SWM facilities on a quarterly basis will confirm pollutant removal characteristics. Water quality parameters to be tested include TSS, TP, DO and E.coli.

Concurrent with the grab sampling / laboratory analysis testing program, in situ air and water temperatures will also be recorded.

Further to the operational characteristics, inspections and monitoring of the general condition of stormwater management infrastructure is discussed in detail in the following section, dealing with operations and maintenance.

Annual reports will be submitted to the LPRCA summarizing the monitoring results and will make appropriate recommendations for future monitoring if necessary.

8.0 Operations and Maintenance Program

The ability of any SWM practice to continue functioning as designed relies on the development and implementation of an operations and maintenance program. While the following sections outline the details of the program components anticipated at the time of design, the adoption of a broader adaptive management philosophy acknowledges the potential for refinement of the program to reflect actual field observations recorded as part of the monitoring program, described in the previous section.

The various components of the stormwater systems proposed for implementation within the Grand Renewable Energy Park are typical of standard practice and represent straightforward activities. Typical SWM measures incorporated within the proposed strategy include the use of grassed swale (ditch) conveyance systems as well as dry and constructed wetland end-of-pipe quality / quantity control facilities.

8.1 GRASSED SWALE (DITCH) CONVEYANCE SYSTEMS

Grassed swale (ditch) conveyance systems represent a familiar, passive, and simple type of stormwater management practice, with operational and maintenance requirements to match. Generally speaking, the treatment benefits of a grassed swale are the result of the contact between the flows being conveyed and the vegetation within the swale. Given this, inspection, operational, and maintenance activities can be generally limited to:

- Routine observations as to the presence of trash/debris within the swale that could be conveyed downstream and/or affect the conveyance capacity of the system and removal of same as needed.

- For the first two years following construction, a semi-annual walking inspection should be completed to identify areas of bare soil and/or the formation of erosive gullies (annually thereafter). Remediative efforts would typically involve re-grading the area and/or re-vegetating with sod or appropriate seed mix, with fertilizer and water applied as necessary to ensure germination and stabilization.

- Concurrent with the walking inspections, a visual assessment of any areas of isolated ponding or sediment build-up should be identified. Minor areas of ponding can be resolved with re-grading / re-stabilization, if the magnitude of associated nuisance warrants such action. From a stormwater management perspective, there are no functional concerns associated with ponding and, therefore, remediation is not strictly required. Excessive sedimentation is an issue requiring attention if it remains in a non-vegetated condition and is, therefore, prone to re-suspension and transport downstream, if it creates an isolated ponding area as described above, or if it occurs to an extent that it impacts on the conveyance capacity of the swale. If any such condition occurs, the sediment should be removed and the area re-stabilized.

- Vegetation management is not a strict requirement in that excess growth will serve to improve water quality treatment benefits. If the density of vegetation reaches a level where conveyance capacity is impacted, a cutting operation should be undertaken. A minimum vegetation height of 0.15 m (6") should be maintained.

8.2 END-OF-PIPE STORMWATER MANAGEMENT FACILITIES

Long-term operation and maintenance responsibilities at end-of-pipe SWM facilities include regular facility inspections and the implementation of associated remediative actions. For the first two years following construction, inspections should be undertaken following each significant rainfall event (averaging approximately 4 inspections / year) to gain confidence that the facilities are functioning as designed. Following this period, the frequency of inspections can be reduced to an annual or as-needed basis.

The types of information that operations staff should be recording and rectifying, if required, include questions such as:

- Are the regular pond levels above the permanent pool elevation after the predicted extended detention drawdown times outlined herein? This situation could be indicative of outlet blockage by trash or sediment; visual inspection should be completed to confirm.

- Within a 'wet' SWM facility, such as the constructed wetland SWM facility proposed as part of the O&M infrastructure design, pond levels should be assessed to determine if they are lower than the normal permanent pool elevation. Such a condition could be indicative of a blockage of the inlet or leakage through the pond's invert; visual inspection of inlet should be completed to confirm clear passage. Given the predominantly clay characteristic of on-site soils at location of the subject facility, significant leakage is not anticipated. Weather conditions in the days and weeks leading up to the inspection should also be considered as evaporative losses during a hot, dry spell could be significant.

- Is there damage to facility structures including headwalls, pipes, berms, maintenance accesses, etc.? Maintenance requirements in this regard should be performed on an as required basis.

- What are the visual characteristics of water in the facilities (i.e., oily sheen, frothy, colour, etc.)? Issues in this regard could be indicative of an upstream spill and the need for cleanup.

- Is the vegetation around the facilities unhealthy or dying? Are there areas around the ponds with easy access to open water? Deficiencies in this regard could be indicative of either poor species selection at design, or any number of chronic causes. Lack of vegetation, particularly around the water's edge, increase attractiveness and use by

waterfowl, often leading to degradation in effluent water quality (i.e., increased bacteria loadings). Replanting should be undertaken to ensure sufficient vegetation densities.

- Sediment depth and oil accumulation within the forebay or main cell. Within a 'wet' facility, sediment depth can be measured with a graduated pole at a standardized location (can be identified with a marker that is left in the facilities). Sediment should be removed when the permanent pool depth is reduced to 1.0 m within the forebay areas. Owing to the increased sediment loadings anticipated during construction, the clean-out frequencies estimated during the design process might be reduced during the interval prior to complete stabilization of the upstream contributing drainage areas. In any event, the removal and disposal of sediment from all facilities should be completed by a qualified party and/or licensed contractor.

- Erosion around outlet structures or downstream areas requiring stabilization work. All noticeable erosion and damage within and immediately outside the basin should be repaired and stabilized as quickly as possible.

- Draining of the O&M SWM facility will be accomplished through pumping when maintenance is required.

9.0 Conclusions

Based on the preceding report, it is concluded that the proposed SWM strategies for the substation and operations and maintenance facility sites are appropriate for the provision of required water quality and quantity control. Stormwater management approaches including diversion swales designed to route flows from external drainage areas around the proposed facilities, grassed swale drainage ditch conveyance systems, and end-of-pipe stormwater management basins (dry and constructed wetland type for the substation and O&M facilities, respectively) provide:

- Enhanced (formerly Level 1) degree of water quality protection
- Water quantity controls to ensure that discharge to the proposed conditions peak flow discharge rates to the receiving systems are at or below those predicted for the same rainfall events under existing conditions

Site topography, native soils, slope lengths, and the relative sensitivity of adjacent areas and downstream receivers are such that the site is considered to represent a 'moderate' erosion potential. In recognition of such conditions, an ESC strategy that utilizes a multi-component approach aimed at minimizing erosion potential across the graded site and providing a series of sediment control measures to maximize on-site capture of any eroded material has been developed.

During-Construction and Post-Construction Monitoring Programs will be implemented to record data to ensure that they are functioning as designed and achieving the required levels of control. Following an adaptive management approach, the monitoring work programs will continue to evolve, as necessary, in consultation with the respective agencies (LPRCA, MOE), as information is compiled.

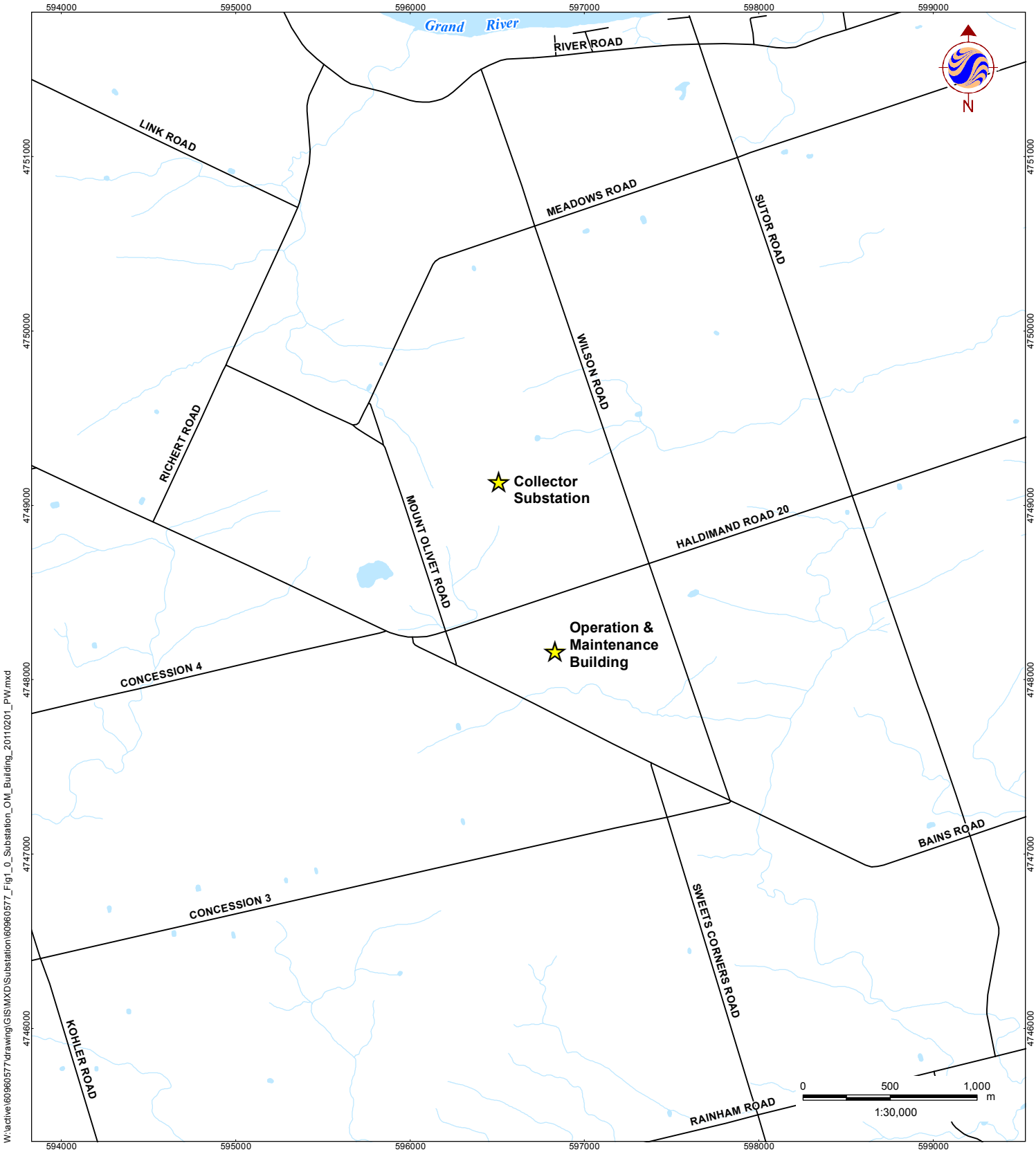
STANTEC CONSULTING LTD.

DRAFT

Scott Robertson, P.Eng.
Associate, Water Resources Project Manager

Appendix A

Figures



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February 2011
160960577

Legend

- Electrical Transmission Component
- Road
- Watercourse
- Waterbody

Notes

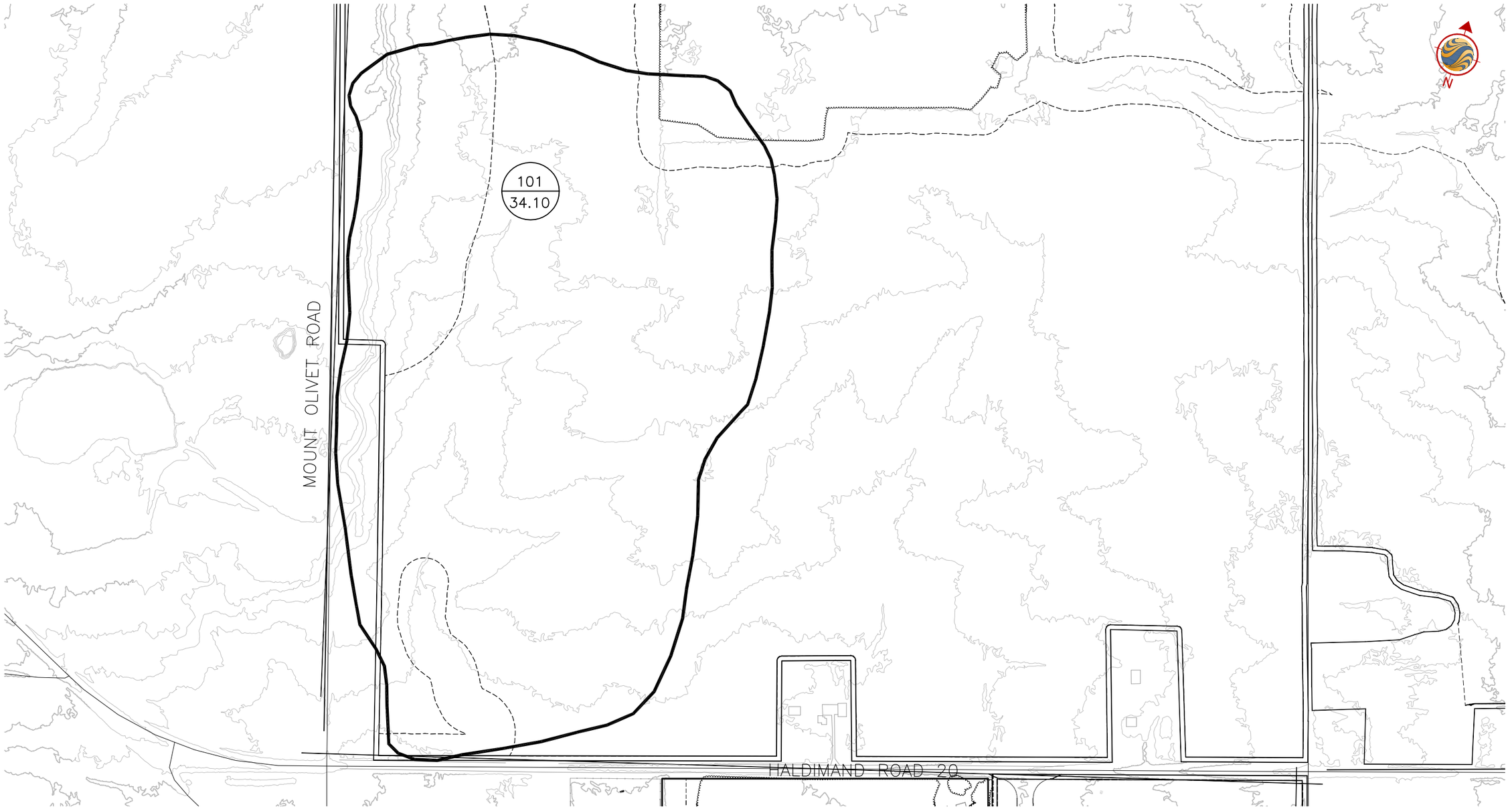
1. Coordinate System: UTM NAD 83 - Zone 17 (N).
2. Base features produced under license with the Ontario Ministry of Natural Resources © Queens Printer Ontario, 2011; © Samsung, 2011.
3. Image Source: © Terrapoint, 2011 - Imagery Date: July 2009; Grand River Conservation Authority © First Base Solutions, 2011 - Imagery Date: Spring 2006.

Client/Project
SAMSUNG, PATTERN & KEPCO (SPK)
GRAND RENEWABLE ENERGY PARK

Figure No.
1.0

Title
LOCATION MAP

Stantec



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ORIGINAL SHEET – ANSI B

JANUARY 2011
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Fax. 519.579.8664
www.stantec.com

Legend

101
34.10 — DRAINAGE CATCHMENT NUMBER
CONTRIBUTING AREA (ha)

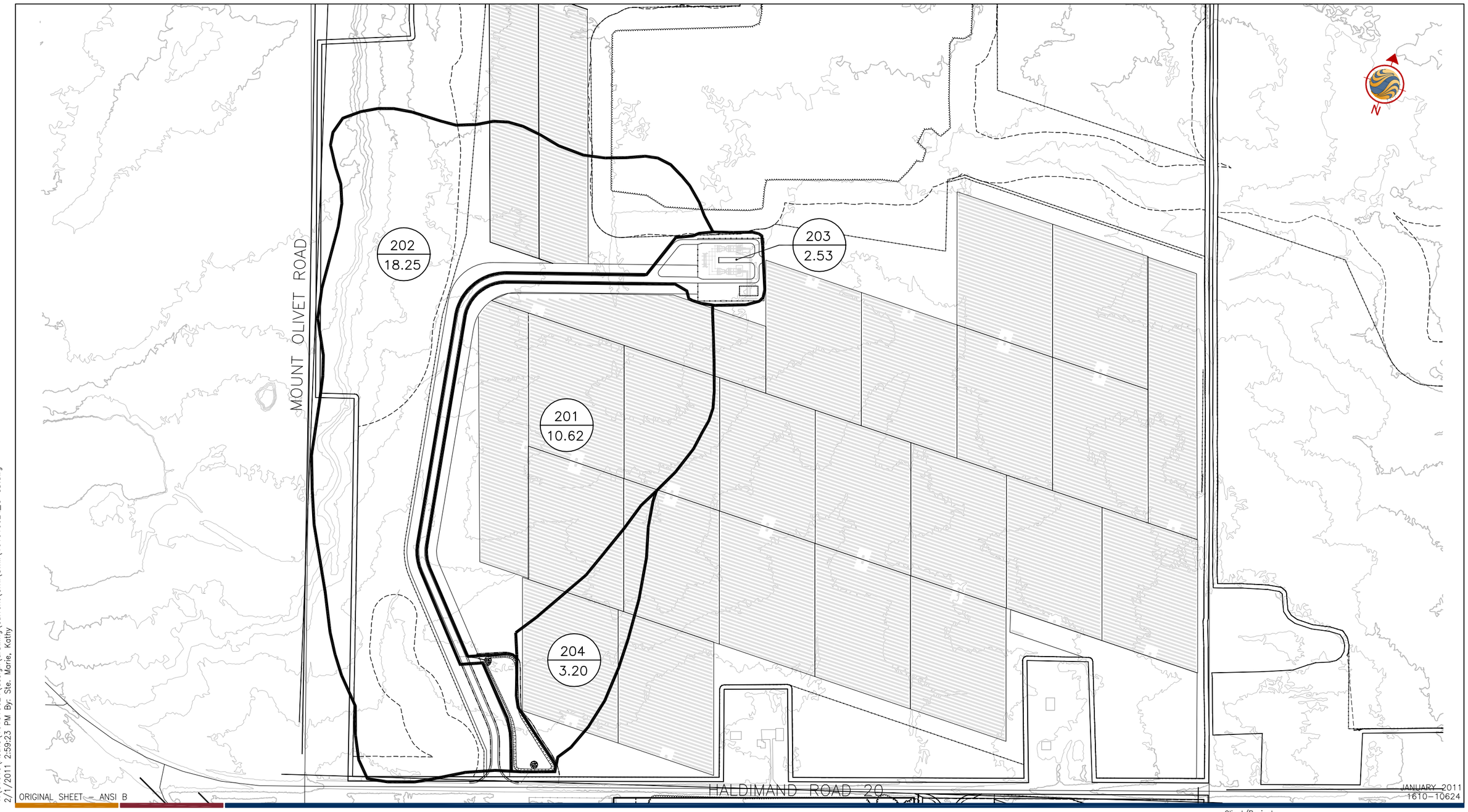
DRAINAGE CATCHMENT BOUNDARY

1:5000 0 50 150 250m

Client/Project
SAMSUNG RENEWABLE ENERGY INC.
GRAND RENEWABLE ENERGY PARK
HALDIMAND, ON

Figure No.
2.0

Title
EXISTING CONDITIONS DRAINAGE PLAN - SUBSTATION FACILITY



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201
10.62

DRAINAGE CATCHMENT NUMBER

CONTRIBUTING AREA (ha)

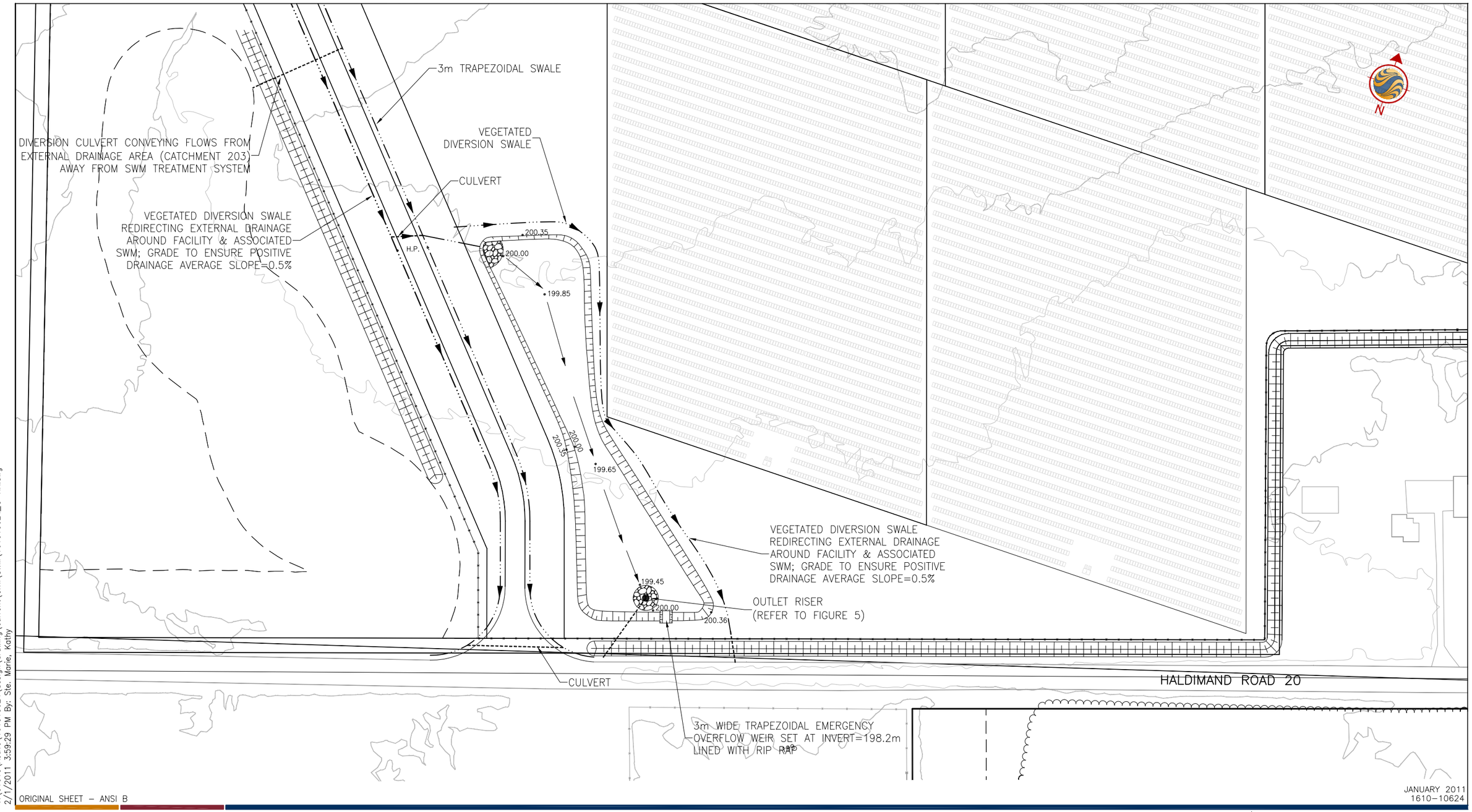
DRAINAGE CATCHMENT BOUNDARY

1:5000 0 50 150 250m

Client/Project
SAMSUNG RENEWABLE ENERGY INC.
GRAND RENEWABLE ENERGY PARK
HALDIMAND, ON

Figure No.
3.0

Title
PROPOSED CONDITIONS DRAINAGE PLAN - SUBSTATION FACILITY



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Legend

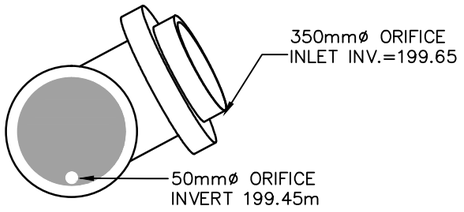
- SLOPE (3:1 UNLESS NOTED OTHERWISE)
- 200.00 ELEVATION
- 200.0 CONTOUR
- SWALE

1:1500 0 15 45 75m

Client/Project
SAMSUNG RENEWABLE ENERGY INC.
GRAND RENEWABLE ENERGY PARK
HALDIMAND, ON

Figure No.
4.0

Title
SUBSTATION SWM FACILITY - PLAN VIEW



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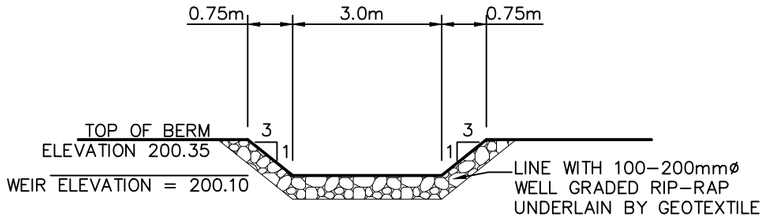
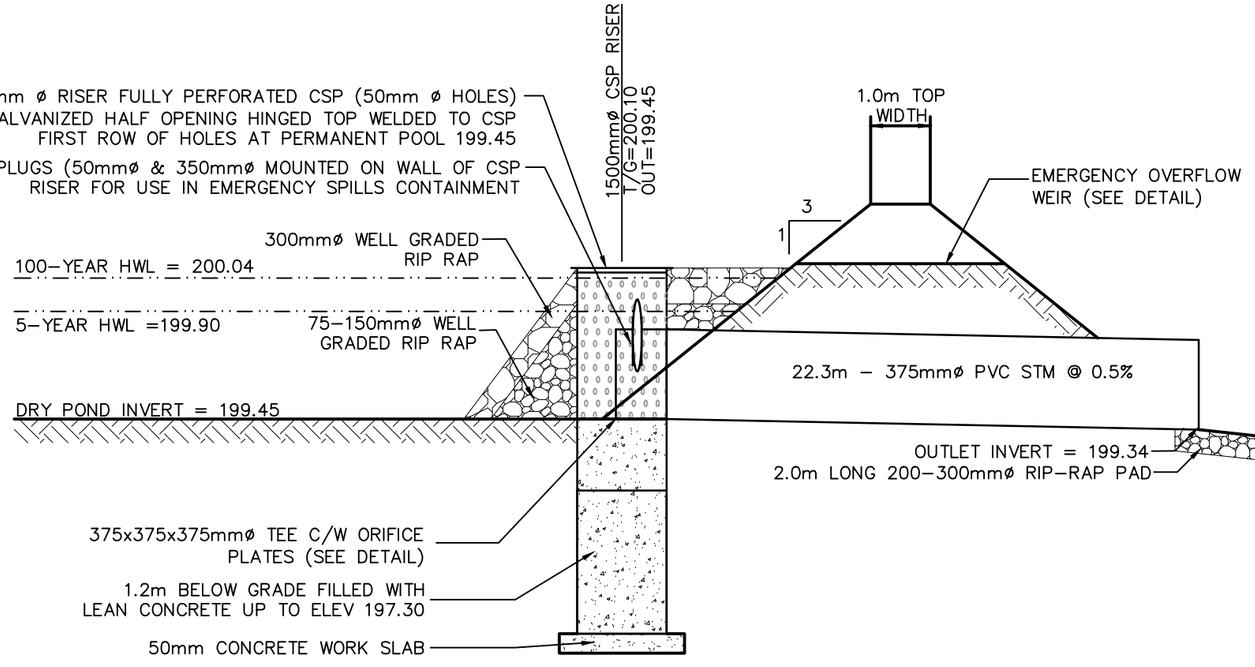
END VIEW SHOWING ORIENTATION



EMERGENCY WEIR CROSS–SECTION



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161010624

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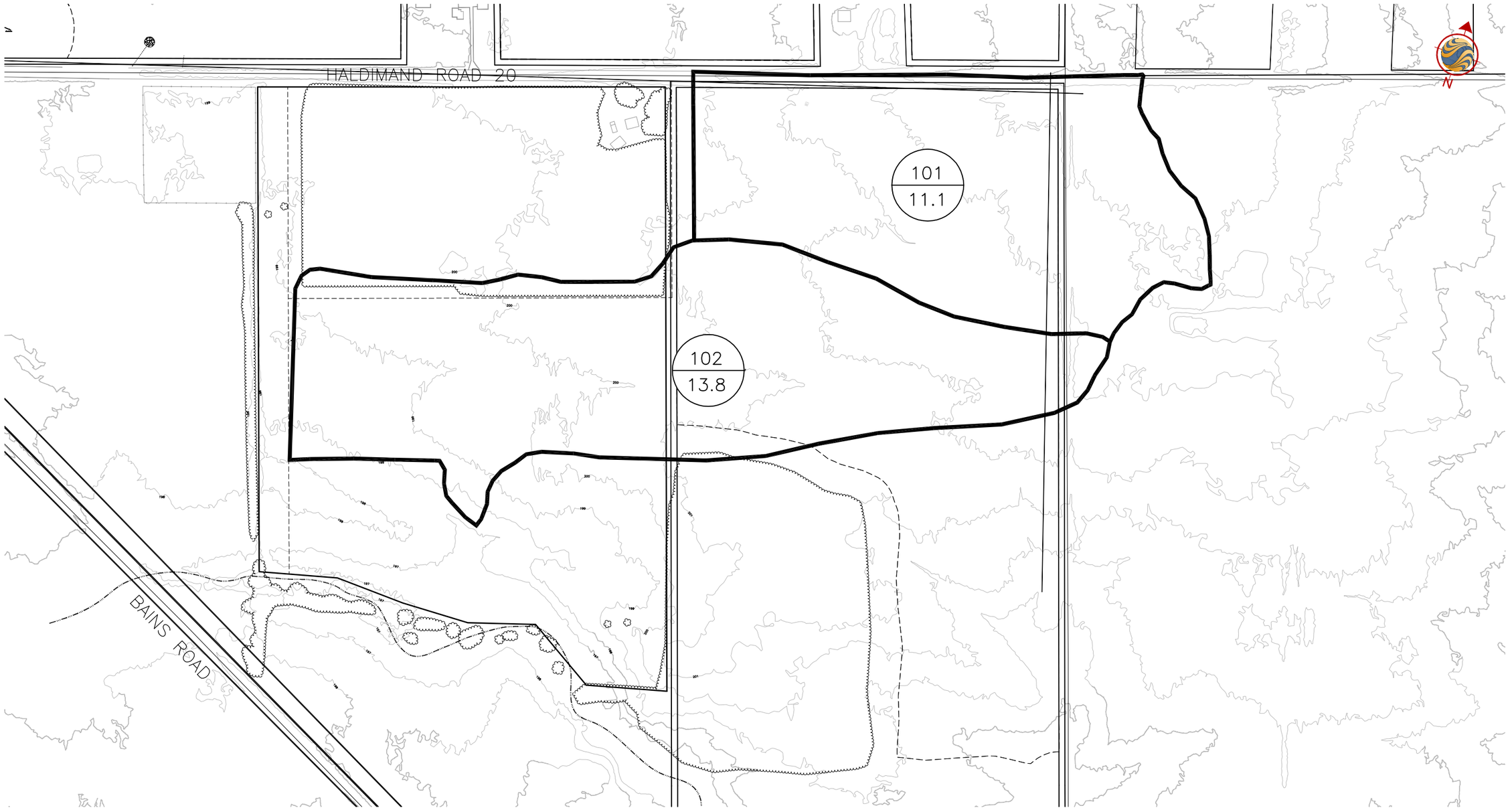
Client/Project
SAMSUNG RENEWABLE ENERGY INC.
GRAND RENEWABLE ENERGY PARK
HALDIMAND, ON

Figure No.
5.0

Title
SUBSTATION SWM FACILITY -
OUTLET PROFILE AND DETAIL



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Legend

102
13.8 DRAINAGE CATCHMENT NUMBER
CONTRIBUTING AREA (ha)

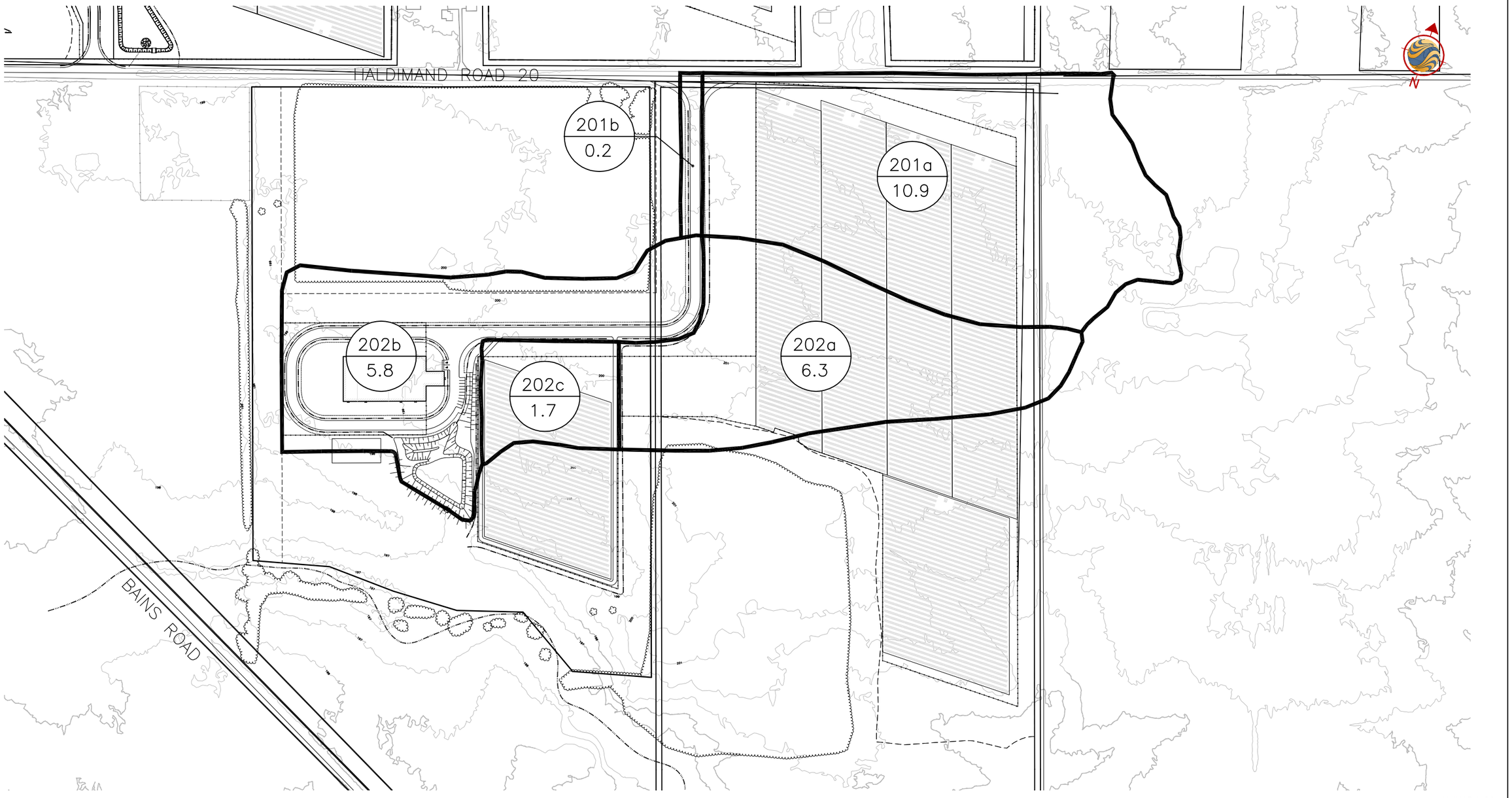
DRAINAGE CATCHMENT BOUNDARY

1:4000 0 40 120 200m

Client/Project
SAMSUNG RENEWABLE ENERGY INC.
GRAND RENEWABLE ENERGY PARK
HALDIMAND, ON

Figure No.
6.0

Title
EXISTING CONDITIONS DRAINAGE PLAN - O & M FACILITY



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201a / 10.9 — DRAINAGE CATCHMENT NUMBER / CONTRIBUTING AREA (ha)

DRAINAGE CATCHMENT BOUNDARY

1:4000 0 40 120 200m

Client/Project
SAMSUNG RENEWABLE ENERGY INC.
GRAND RENEWABLE ENERGY PARK
HALDIMAND, ON

Figure No.
7.0

Title
PROPOSED CONDITIONS DRAINAGE PLAN - O & M FACILITY

Appendix B

Substation Analyses

Grand Renewable Energy Park - Substation Facility
Samsung Renewable Energy Inc.
SCS Curve Number Determination
Existing Conditions

Site Soils: (as per Soil Survey Complex, OMAFRA / MNR, 2009)

Soil Type	**Hydrologic Soil Group**
Hal: Haldimand (clay)	C
Lic: Lincoln (clay)	D

TABLE OF CURVE NUMBERS (CN's)							
Land Use	Hydrologic Soil Type						
	A	AB	B	BC	C	CD	D
Meadow	50	54	58	64.5	71	74.5	78
Woodlot	50	55.3	60.5	67	73.5	76.8	80
Long Grass	55	60	65	72	79	81.5	84
Lawns	60	65.5	71	77	83	86	89
Pasture/Range	58	61.5	65	70.5	76	78.5	81
Crop	66	70	74	78	82	84	86
Fallow (Bare)	77	82	86	89	91	93	94
Wetland	50	50	50	50	50	50	50

HYDROLOGIC SOIL TYPE (%) - Existing Conditions								
Catchment	Hydrologic Soil Type							
	A	AB	B	BC	C	CD	D	TOTAL
101					56		44	100

LAND USE (%) - Existing Conditions									
Catchment	Meadow	Woodlot	Long Grass	Lawns	Pasture Range	Crop	Fallow (Bare)	Wetland	Total
101						100			100

CURVE NUMBER (CN) - Existing Conditions									
Catchment	Meadow	Woodlot	Long Grass	Lawns	Pasture Range	Crop	Fallow (Bare)	Wetland	Weighted CN
101	0	0	0	0	0	84	0	0	83

** post development catchments concerned with pervious CN values only
** AMC II assumed
** Hydrological Soil Group taken from MTO Drainage Manual for each soil type

Grand Renewable Energy Park - Substation Facility
Samsung Renewable Energy Inc.
SCS Curve Number Determination (Applies to Pervious Component of Developed Catchments Only)
Proposed Conditions

Site Soils: (as per Soil Survey Complex, OMAFRA / MNR, 2009)

Soil Type	**Hydrologic Soil Group**
Hal: Haldimand (clay)	C
Lic: Lincoln (clay)	D

TABLE OF CURVE NUMBERS (CN's)							
	Hydrologic Soil Type						
Land Use	A	AB	B	BC	C	CD	D
Meadow	50	54	58	65	71	75	78
Woodlot	50	55	61	67	74	77	80
Long Grass	55	60	65	72	79	82	84
Lawns	60	66	71	77	83	86	89
Pasture/Range	58	62	65	71	76	79	81
Crop	66	70	74	78	82	84	86
Fallow (Bare)	77	82	86	89	91	93	94
Wetland	50	50	50	50	50	50	50

HYDROLOGIC SOIL TYPE (%) - Proposed Conditions								
Catchment	Hydrologic Soil Type							
	A	AB	B	BC	C	CD	D	TOTAL
201					68		32	100
202					57		43	100
203					20		80	100
204					85		15	100

LAND USE (%) - Proposed Conditions									
Catchment	Meadow	Woodlot	Long Grass	Lawns	Pasture Range	Crop	Fallow (Bare)	Wetland	Total
201			100						100
202			11			89			100
203			100						100
204			100						100

CURVE NUMBER (CN) - Proposed Conditions									
Catchment	Meadow	Woodlot	Long Grass	Lawns	Pasture Range	Crop	Fallow (Bare)	Wetland	Weighted CN
201	0	0	81	0	0	0	0	0	81
202	0	0	9	0	0	75	0	0	83
203	0	0	83	0	0	0	0	0	83
204	0	0	80	0	0	0	0	0	80

** post development catchments concerned with pervious CN values only
** AMC II assumed
** Hydrological Soil Group taken from MTO Drainage Manual for each soil type

Grand Renewable Energy Park - Substation Facility
Samsung Renewable Energy Inc.
SWMHYMO Parameters

Existing Conditions

Catchment Number	Area Description	SWMHYMO Command	Area (ha)	CN	TIMP	XIMP	Slope (%)	Length (m)	Tc (hrs)	Tp (hrs)
101	Agricultural area just east of Mount Olivet Road containing area of proposed access road	DESIGN NASHYD	34.10	83	5.00	5.00	0.63	1000	1.80	1.08

Proposed Conditions

Catchment Number	Area Description	SWMHYMO Command	Area (ha)	CN	TIMP	XIMP	Slope (%)	Length (m)	Tc (hrs)	Tp (hrs)
201	Solar module field draining to diversion swale on east side of access road	DESIGN NASHYD	10.62	81	0.05	0.05	0.58	950	1.81	1.08
202	Agricultural area + 1 solar module draining to diversion swale on west side of access road	DESIGN NASHYD	18.25	83	0.05	0.05	0.44	1020	2.05	1.23
203	Substation, access road, and grassed swale drainage ditches, and SWM facility	DESIGN STANDHYD	2.53	83	0.60	0.60	0.43	1050	2.10	1.26
204	Solar module area draining to diversion swale on east side of SWM facility	DESIGN NASHYD	3.20	80	0.00	0.00	0.46	650	1.61	0.97

Total area draining to SWMF including SWM Block =	2.53	ha	
Total area draining to SWMF requiring quality control =	2.03	ha	75%

Notes:

CN calculated for pervious areas only for DESIGN STANDHYD. CN is a weighed average for DESIGN NASHYD

TIMP ..... *Total percent impervious*

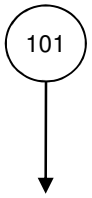
XIMP ..... *Percent impervious directly connected*

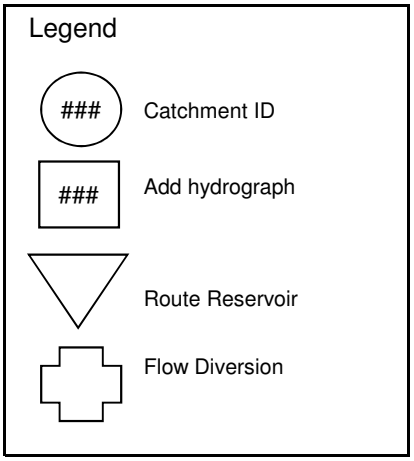
Time of Concentration calculated using the Airport Method ..... $Tc = [\ 3.26\ (1.1-C)\ L^{0.5}\ ] / S^{0.33}$

Where: *C = Runoff Coefficient = 0.2 for undeveloped areas*
L = Length of Overland Flow (m)
= (Area/1.5)^0.5
S = Slope (%)

Time to Peak ..... $Tp = 0.6Tc$

Grand Renewable Energy Park - Substation Facility
Samsung Renewable Energy Inc.
Existing Conditions SYMHYMO Schematic





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00004> *#  Project Number: 1610-10624
00005> *#  Date          : 1-24-2011
00006> *#  Company       : Stantec Consulting Ltd. (Kitchener)
00007> *#  Modeller      : George Golding, EIT
00008> *#  Reviewed / Revised : SRobertson (Jan 31, 2011)
00009> *#  License #     :  4730904
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00011> *#  EXISTING CONDITIONS
00012> *#*************************************************************************
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00008>                                                        9   9  9   9 # 4730904
00009>       StormWater Management HYdrologic Model          999    999  =========
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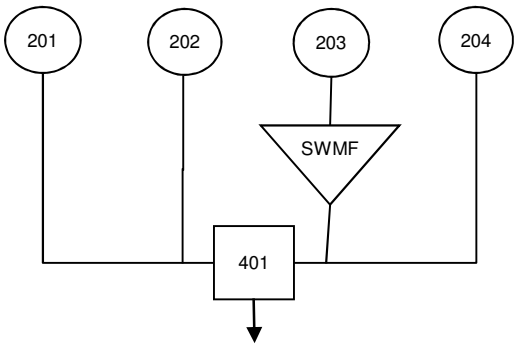
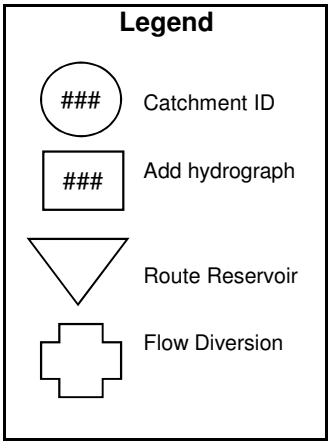
00011>  ********************************************************************************
00012>  ************************** SWMHYMO-99 Ver/4.02 ********************************
00013>  *******  A single event and continuous hydrologic simulation model  *******
00014>  *******     based on the principles of HYMO and its successors       *******
00015>  *******                  OTTHYMO-83 and OTTHYMO-89.                  *******
00016>  ********************************************************************************
00017>  ******* Distributed by:  J.F. Sabourin and Associates Inc.           *******
00018>  *******                  Ottawa,  Ontario: (613) 727-5199           *******
00019>  *******                  Gatineau, Quebec: (819) 243-6858           *******
00020>  *******                  E-Mail: swmhymo@jfsa.com                   *******
00021>  ********************************************************************************
00022>
00023>  ++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
00024>  +++++++ Licensed user: Stantec Consulting Ltd. (Kitchener)          +++++++
00025>  +++++++                Kitchener            SERIAL#:4730904        +++++++
00026>  ++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
00027>
00028>  ********************************************************************************
00029>  *******           ++++++ PROGRAM ARRAY DIMENSIONS ++++++             *******
00030>  *******           Maximum value for ID numbers  :     10             *******
00031>  *******           Max. number of rainfall points:  15000             *******
00032>  *******           Max. number of flow points    :  15000             *******
00033>  ********************************************************************************
00034>
00035>
00036>  ********************   D E T A I L E D   O U T P U T   ********************
00037>  ********************************************************************************
00038>  *       DATE: 2011-01-31     TIME: 21:34:35     RUN COUNTER: 001066       *
00039>  ********************************************************************************
00040>  * Input   filename: C:\PROGRA~1\SWMHYMO\Sub_Ex.dat                        *
00041>  * Output  filename: C:\PROGRA~1\SWMHYMO\Sub_Ex.out                        *
00042>  * Summary filename: C:\PROGRA~1\SWMHYMO\Sub_Ex.sum                        *
00043>  * User comments:                                                          *
00044>  * 1:_____________________________________________________________________*
00045>  * 2:_____________________________________________________________________*
00046>  * 3:_____________________________________________________________________*
00047>  ********************************************************************************
00048>
00049> --------------------------------------------------------------------------------
00050> 001:0001--------------------------------------------------------------------------
00051> *#*****************************************************************************
00052> *#  Project Name  : Grand Renewable Energy Park - Substation Facility
00053> *#  Project Number: 1610-10624
00054> *#  Date          : 1-24-2011
00055> *#  Company       : Stantec Consulting Ltd. (Kitchener)
00056> *#  Modeller      : George Golding, EIT
00057> *#  Reviewed / Revised : SRobertson (Jan 31, 2011)
00058> *#  License #     :  4730904
00059> *#*****************************************************************************
00060> *#  EXISTING CONDITIONS
00061> *#*****************************************************************************
00062> --------------------
00063> | START            |  Project  dir.: C:\PROGRA~1\SWMHYMO\
00064> --------------------  Rainfall dir.: C:\PROGRA~1\SWMHYMO\
00065>     TZERO =   .00 hrs on       0
00066>     METOUT=   2 (output = METRIC)
00067>     NRUN  = 001
00068>     NSTORM=   1
00069>              #  1=si_2.STM
00070> --------------------------------------------------------------------------------
00071> 001:0002--------------------------------------------------------------------------
00072> --------------------
00073> | READ STORM       |    Filename: C:\PROGRA~1\SWMHYMO\si_2.STM
00074> | Ptotal=  50.70 mm|    Comments: SCS-II 24H 2-YEAR SIMCOE
00075> --------------------
00076>               TIME    RAIN |   TIME    RAIN |   TIME    RAIN |   TIME    RAIN
00077>                hrs   mm/hr |    hrs   mm/hr |    hrs   mm/hr |    hrs   mm/hr
00078>                .25    .558 |   6.25   1.014 |  12.25   7.301 |  18.25    .913
00079>                .50    .558 |   6.50   1.014 |  12.50   7.301 |  18.50    .913
00080>                .75    .558 |   6.75   1.014 |  12.75   3.752 |  18.75    .913
00081>               1.00    .558 |   7.00   1.014 |  13.00   3.752 |  19.00    .913
00082>               1.25    .558 |   7.25   1.014 |  13.25   2.636 |  19.25    .913
00083>               1.50    .558 |   7.50   1.014 |  13.50   2.839 |  19.50    .913
00084>               1.75    .558 |   7.75   1.014 |  13.75   2.129 |  19.75    .913
00085>               2.00    .558 |   8.00   1.014 |  14.00   2.129 |  20.00    .913
00086>               2.25    .659 |   8.25   1.369 |  14.25   1.521 |  20.25    .608
00087>               2.50    .659 |   8.50   1.369 |  14.50   1.521 |  20.50    .608
00088>               2.75    .659 |   8.75   1.369 |  14.75   1.521 |  20.75    .608
00089>               3.00    .659 |   9.00   1.369 |  15.00   1.521 |  21.00    .608
00090>               3.25    .659 |   9.25   1.622 |  15.25   1.521 |  21.25    .608
00091>               3.50    .659 |   9.50   1.622 |  15.50   1.521 |  21.50    .608
00092>               3.75    .659 |   9.75   1.825 |  15.75   1.521 |  21.75    .608
00093>               4.00    .659 |  10.00   1.825 |  16.00   1.521 |  22.00    .608
00094>               4.25    .811 |  10.25   2.332 |  16.25    .913 |  22.25    .608
00095>               4.50    .811 |  10.50   2.332 |  16.50    .913 |  22.50    .608
00096>               4.75    .811 |  10.75   3.143 |  16.75    .913 |  22.75    .608
00097>               5.00    .811 |  11.00   3.143 |  17.00    .913 |  23.00    .608
00098>               5.25    .811 |  11.25   4.867 |  17.25    .913 |  23.25    .608
00099>               5.50    .811 |  11.50   4.867 |  17.50    .913 |  23.50    .608
00100>               5.75    .811 |  11.75  21.091 |  17.75    .913 |  23.75    .608
00101>               6.00    .811 |  12.00  55.973 |  18.00    .913 |  24.00    .608
00102>
00103> --------------------------------------------------------------------------------
00104> 001:0003--------------------------------------------------------------------------
00105> *#-----------------|------------------------------------------------------------|
00106> *# Catchment North of Haldimand Road
00107> *#-----------------|------------------------------------------------------------|
00108> ---------------------
00109> | DESIGN NASHYD      |   Area    (ha)=   34.10   Curve Number   (CN)=83.00
00110> | 01:101    DT= 5.00 |   Ia      (mm)=   1.500   # of Linear Res.(N)= 3.00
00111> ---------------------  U.H. Tp(hrs)=   1.080
00112>
00113>     Unit Hyd Qpeak  (cms)=    1.206
00114>
00115>     PEAK FLOW       (cms)=     .613 (i)
00116>     TIME TO PEAK    (hrs)=   13.000
00117>     RUNOFF VOLUME    (mm)=   23.913
00118>     TOTAL RAINFALL   (mm)=   50.699
00119>     RUNOFF COEFFICIENT   =    .472
00120>
00121>     (i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.
00122>
00123> --------------------------------------------------------------------------------
00124> 001:0004--------------------------------------------------------------------------
00125> *#-----------------|------------------------------------------------------------|
00126>   ** END OF RUN :   1
00127>
00128> ********************************************************************************
00129>
00130>
00131>
00132>
00133>
00134> --------------------
00135> | START            |  Project  dir.: C:\PROGRA~1\SWMHYMO\
00136> --------------------  Rainfall dir.: C:\PROGRA~1\SWMHYMO\
00137>     TZERO =   .00 hrs on       0
00138>     METOUT=   2 (output = METRIC)
00139>     NRUN  = 002
00140>     NSTORM=   1
00141>              #  1=si_5.STM
00142> --------------------------------------------------------------------------------
00143> 002:0002--------------------------------------------------------------------------
00144> *#*****************************************************************************
00145> *#  Project Name  : Grand Renewable Energy Park - Substation Facility
00146> *#  Project Number: 1610-10624
00147> *#  Date          : 1-24-2011
00148> *#  Company       : Stantec Consulting Ltd. (Kitchener)
00149> *#  Modeller      : George Golding, EIT
00150> *#  Reviewed / Revised : SRobertson (Jan 31, 2011)
00151> *#  License #     :  4730904
00152> *#*****************************************************************************
00153> *#  EXISTING CONDITIONS
00154> *#*****************************************************************************
00155> --------------------------------------------------------------------------------
00156> 002:0002--------------------------------------------------------------------------
00157> --------------------
00158> | READ STORM       |    Filename: C:\PROGRA~1\SWMHYMO\si_5.STM
00159> | Ptotal=  66.80 mm|    Comments: SCS-II 24H 5-YEAR SIMCOE
00160> --------------------
00161>               TIME    RAIN |   TIME    RAIN |   TIME    RAIN |   TIME    RAIN
00162>                hrs   mm/hr |    hrs   mm/hr |    hrs   mm/hr |    hrs   mm/hr
00163>                .25    .735 |   6.25   1.336 |  12.25   9.619 |  18.25   1.202
00164>                .50    .735 |   6.50   1.336 |  12.50   9.619 |  18.50   1.202
00165>                .75    .735 |   6.75   1.336 |  12.75   4.943 |  18.75   1.202
00166>               1.00    .735 |   7.00   1.336 |  13.00   4.943 |  19.00   1.202
00167>               1.25    .735 |   7.25   1.336 |  13.25   3.474 |  19.25   1.202
00168>               1.50    .735 |   7.50   1.336 |  13.50   3.741 |  19.50   1.202
00169>               1.75    .735 |   7.75   1.336 |  13.75   2.806 |  19.75   1.202
00170>               2.00    .735 |   8.00   1.336 |  14.00   2.806 |  20.00   1.202
00171>               2.25    .868 |   8.25   1.804 |  14.25   2.004 |  20.25    .802
00172>               2.50    .868 |   8.50   1.804 |  14.50   2.004 |  20.50    .802
00173>               2.75    .868 |   8.75   1.804 |  14.75   2.004 |  20.75    .802
00174>               3.00    .868 |   9.00   1.804 |  15.00   2.004 |  21.00    .802
00175>               3.25    .868 |   9.25   2.138 |  15.25   2.004 |  21.25    .802
00176>               3.50    .868 |   9.50   2.138 |  15.50   2.004 |  21.50    .802
00177>               3.75    .868 |   9.75   2.405 |  15.75   2.004 |  21.75    .802
00178>               4.00    .868 |  10.00   2.405 |  16.00   2.004 |  22.00    .802
00179>               4.25   1.069 |  10.25   3.073 |  16.25   1.202 |  22.25    .802
00180>               4.50   1.069 |  10.50   3.073 |  16.50   1.202 |  22.50    .802
00181>               4.75   1.069 |  10.75   4.142 |  16.75   1.202 |  22.75    .802
00182>               5.00   1.069 |  11.00   4.142 |  17.00   1.202 |  23.00    .802
00183>               5.25   1.069 |  11.25   6.413 |  17.25   1.202 |  23.25    .802
00184>               5.50   1.069 |  11.50   6.413 |  17.50   1.202 |  23.50    .802
00185>               5.75   1.069 |  11.75  27.789 |  17.75   1.202 |  23.75    .802
00186>               6.00   1.069 |  12.00  73.747 |  18.00   1.202 |  24.00    .802
00187>
00188> --------------------------------------------------------------------------------
00189> 002:0003--------------------------------------------------------------------------
00190> *#-----------------|------------------------------------------------------------|
00191> *# Catchment North of Haldimand Road
00192> *#-----------------|------------------------------------------------------------|
00193> ---------------------
00194> | DESIGN NASHYD      |   Area    (ha)=   34.10   Curve Number   (CN)=83.00
00195> | 01:101    DT= 5.00 |   Ia      (mm)=   1.500   # of Linear Res.(N)= 3.00
00196> ---------------------  U.H. Tp(hrs)=   1.080
00197>
00198>     Unit Hyd Qpeak  (cms)=    1.206
00199>
00200>     PEAK FLOW       (cms)=     .941 (i)
00201>     TIME TO PEAK    (hrs)=   13.000
00202>     RUNOFF VOLUME    (mm)=   36.346
00203>     TOTAL RAINFALL   (mm)=   66.801
00204>     RUNOFF COEFFICIENT   =    .544
00205>
00206>     (i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.
00207>
00208> --------------------------------------------------------------------------------
00209> 002:0004--------------------------------------------------------------------------
00210> *#-----------------|------------------------------------------------------------|
00211> --------------------------------------------------------------------------------
00212> 002:0002--------------------------------------------------------------------------
00213>   ** END OF RUN :   2
00214>
00215> ********************************************************************************
00216>
00217>
00218>
00219>
00220>
00221> --------------------
00222> | START            |  Project  dir.: C:\PROGRA~1\SWMHYMO\
00223> --------------------  Rainfall dir.: C:\PROGRA~1\SWMHYMO\
00224>     TZERO =   .00 hrs on       0
00225>     METOUT=   2 (output = METRIC)
00226>     NRUN  = 003
00227>     NSTORM=   1
00228>              #  1=si_10.STM
00229> --------------------------------------------------------------------------------
00230> 003:0002--------------------------------------------------------------------------
00231> *#*****************************************************************************
00232> *#  Project Name  : Grand Renewable Energy Park - Substation Facility
00233> *#  Project Number: 1610-10624
00234> *#  Date          : 1-24-2011
00235> *#  Company       : Stantec Consulting Ltd. (Kitchener)
00236> *#  Modeller      : George Golding, EIT
00237> *#  Reviewed / Revised : SRobertson (Jan 31, 2011)
00238> *#  License #     :  4730904
00239> *#*****************************************************************************
00240> *#  EXISTING CONDITIONS
00241> *#*****************************************************************************
00242> --------------------------------------------------------------------------------
00243> 003:0002--------------------------------------------------------------------------
00244> --------------------
00245> | READ STORM       |    Filename: C:\PROGRA~1\SWMHYMO\si_10.STM
00246> | Ptotal=  77.40 mm|    Comments: SCS-II 24H 10-YEAR SIMCOE
00247> --------------------
00248>               TIME    RAIN |   TIME    RAIN |   TIME    RAIN |   TIME    RAIN
00249>                hrs   mm/hr |    hrs   mm/hr |    hrs   mm/hr |    hrs   mm/hr
00250>                .25    .851 |   6.25   1.548 |  12.25  11.146 |  18.25   1.393
00251>                .50    .851 |   6.50   1.548 |  12.50  11.146 |  18.50   1.393
00252>                .75    .851 |   6.75   1.548 |  12.75   5.728 |  18.75   1.393
00253>               1.00    .851 |   7.00   1.548 |  13.00   5.728 |  19.00   1.393
00254>               1.25    .851 |   7.25   1.548 |  13.25   4.025 |  19.25   1.393
00255>               1.50    .851 |   7.50   1.548 |  13.50   4.334 |  19.50   1.393
00256>               1.75    .851 |   7.75   1.548 |  13.75   3.251 |  19.75   1.393
00257>               2.00    .851 |   8.00   1.548 |  14.00   3.251 |  20.00   1.393
00258>               2.25   1.006 |   8.25   2.090 |  14.25   2.322 |  20.25    .929
00259>               2.50   1.006 |   8.50   2.090 |  14.50   2.322 |  20.50    .929
00260>               2.75   1.006 |   8.75   2.090 |  14.75   2.322 |  20.75    .929
00261>               3.00   1.006 |   9.00   2.090 |  15.00   2.322 |  21.00    .929
00262>               3.25   1.006 |   9.25   2.477 |  15.25   2.322 |  21.25    .929
00263>               3.50   1.006 |   9.50   2.477 |  15.50   2.322 |  21.50    .929
00264>               3.75   1.006 |   9.75   2.786 |  15.75   2.322 |  21.75    .929
00265>               4.00   1.006 |  10.00   2.786 |  16.00   2.322 |  22.00    .929
00266>               4.25   1.238 |  10.25   3.560 |  16.25   1.393 |  22.25    .929
00267>               4.50   1.238 |  10.50   3.560 |  16.50   1.393 |  22.50    .929
00268>               4.75   1.238 |  10.75   4.799 |  16.75   1.393 |  22.75    .929
00269>               5.00   1.238 |  11.00   4.799 |  17.00   1.393 |  23.00    .929
00270>               5.25   1.238 |  11.25   7.430 |  17.25   1.393 |  23.25    .929
```

```
00271>              5.50   1.238 |  11.50   7.430 |  17.50   1.393 |  23.50    .929
00272>              5.75   1.238 |  11.75  32.198 |  17.75   1.393 |  23.75    .929
00273>              6.00   1.238 |  12.00  85.450 |  18.00   1.393 |  24.00    .929
00274>
00275> ---------------------------------------------------------------------------
00276> 003:0003-----------------------------------------------------------------
00277> *#-----------------|-------------------------------------------------------|
00278> *# Catchment North of Haldimand Road
00279> *#-----------------|-------------------------------------------------------|
00280>  --------------------
00281> | DESIGN NASHYD      |   Area    (ha)=   34.10   Curve Number   (CN)=83.00
00282> | 01:101    DT= 5.00 |   Ia      (mm)=   1.500   # of Linear Res.(N)= 3.00
00283>  ----------------------  U.H. Tp(hrs)=   1.080
00284>
00285>      Unit Hyd Qpeak  (cms)=    1.206
00286>
00287>      PEAK FLOW       (cms)=    1.171 (i)
00288>      TIME TO PEAK    (hrs)=   13.000
00289>      RUNOFF VOLUME    (mm)=   45.032
00290>      TOTAL RAINFALL   (mm)=   77.398
00291>      RUNOFF COEFFICIENT   =     .582
00292>
00293>      (i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.
00294>
00295> ---------------------------------------------------------------------------
00296> 003:0004-----------------------------------------------------------------
00297> *#-----------------|-------------------------------------------------------|
00298> ---------------------------------------------------------------------------
00299> 003:0002-----------------------------------------------------------------
00300> ---------------------------------------------------------------------------
00301> 003:0002-----------------------------------------------------------------
00302>   ** END OF RUN :   3
00303>
00304> ***************************************************************************
00305>
00306>
00307>
00308>
00309>
00310>  --------------------
00311> | START              |  Project  dir.: C:\PROGRA~1\SWMHYMO\
00312>  --------------------  Rainfall dir.: C:\PROGRA~1\SWMHYMO\
00313>     TZERO =   .00 hrs on       0
00314>     METOUT=   2 (output = METRIC)
00315>     NRUN  = 004
00316>     NSTORM=   1
00317>               #  1=si_25.STM
00318> ---------------------------------------------------------------------------
00319> 004:0002-----------------------------------------------------------------
00320> *#***************************************************************************
00321> *#  Project Name  : Grand Renewable Energy Park - Substation Facility
00322> *#  Project Number: 1610-10624
00323> *#  Date          : 1-24-2011
00324> *#  Company       : Stantec Consulting Ltd. (Kitchener)
00325> *#  Modeller      : George Golding, EIT
00326> *#  Reviewed / Revised : SRobertson (Jan 31, 2011)
00327> *#  License #     :  4730904
00328> *#***************************************************************************
00329> *#  EXISTING CONDITIONS
00330> *#***************************************************************************
00331> ---------------------------------------------------------------------------
00332> 004:0002-----------------------------------------------------------------
00333>  --------------------
00334> | READ STORM       |    Filename: C:\PROGRA~1\SWMHYMO\si_25.STM
00335> | Ptotal=  90.80 mm|    Comments: SCS-II 24H 25-YEAR SIMCOE
00336>  --------------------
00337>               TIME    RAIN |   TIME    RAIN |   TIME    RAIN |   TIME    RAIN
00338>                hrs   mm/hr |    hrs   mm/hr |    hrs   mm/hr |    hrs   mm/hr
00339>                .25    .999 |   6.25   1.816 |  12.25  13.075 |  18.25   1.634
00340>                .50    .999 |   6.50   1.816 |  12.50  13.075 |  18.50   1.634
00341>                .75    .999 |   6.75   1.816 |  12.75   6.719 |  18.75   1.634
00342>               1.00    .999 |   7.00   1.816 |  13.00   6.719 |  19.00   1.634
00343>               1.25    .999 |   7.25   1.816 |  13.25   4.722 |  19.25   1.634
00344>               1.50    .999 |   7.50   1.816 |  13.50   5.085 |  19.50   1.634
00345>               1.75    .999 |   7.75   1.816 |  13.75   3.814 |  19.75   1.634
00346>               2.00    .999 |   8.00   1.816 |  14.00   3.814 |  20.00   1.634
00347>               2.25   1.180 |   8.25   2.452 |  14.25   2.724 |  20.25   1.090
00348>               2.50   1.180 |   8.50   2.452 |  14.50   2.724 |  20.50   1.090
00349>               2.75   1.180 |   8.75   2.452 |  14.75   2.724 |  20.75   1.090
00350>               3.00   1.180 |   9.00   2.452 |  15.00   2.724 |  21.00   1.090
00351>               3.25   1.180 |   9.25   2.906 |  15.25   2.724 |  21.25   1.090
00352>               3.50   1.180 |   9.50   2.906 |  15.50   2.724 |  21.50   1.090
00353>               3.75   1.180 |   9.75   3.269 |  15.75   2.724 |  21.75   1.090
00354>               4.00   1.180 |  10.00   3.269 |  16.00   2.724 |  22.00   1.090
00355>               4.25   1.453 |  10.25   4.177 |  16.25   1.634 |  22.25   1.090
00356>               4.50   1.453 |  10.50   4.177 |  16.50   1.634 |  22.50   1.090
00357>               4.75   1.453 |  10.75   5.630 |  16.75   1.634 |  22.75   1.090
00358>               5.00   1.453 |  11.00   5.630 |  17.00   1.634 |  23.00   1.090
00359>               5.25   1.453 |  11.25   8.717 |  17.25   1.634 |  23.25   1.090
00360>               5.50   1.453 |  11.50   8.717 |  17.50   1.634 |  23.50   1.090
00361>               5.75   1.453 |  11.75  37.773 |  17.75   1.634 |  23.75   1.090
00362>               6.00   1.453 |  12.00 100.243 |  18.00   1.634 |  24.00   1.090
00363>
00364> ---------------------------------------------------------------------------
00365> 004:0003-----------------------------------------------------------------
00366> *#-----------------|-------------------------------------------------------|
00367> *# Catchment North of Haldimand Road
00368> *#-----------------|-------------------------------------------------------|
00369>  --------------------
00370> | DESIGN NASHYD      |   Area    (ha)=   34.10   Curve Number   (CN)=83.00
00371> | 01:101    DT= 5.00 |   Ia      (mm)=   1.500   # of Linear Res.(N)= 3.00
00372>  ----------------------  U.H. Tp(hrs)=   1.080
00373>
00374>      Unit Hyd Qpeak  (cms)=    1.206
00375>
00376>      PEAK FLOW       (cms)=    1.473 (i)
00377>      TIME TO PEAK    (hrs)=   13.000
00378>      RUNOFF VOLUME    (mm)=   56.428
00379>      TOTAL RAINFALL   (mm)=   90.801
00380>      RUNOFF COEFFICIENT   =     .621
00381>
00382>      (i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.
00383>
00384> ---------------------------------------------------------------------------
00385> 004:0004-----------------------------------------------------------------
00386> *#-----------------|-------------------------------------------------------|
00387> ---------------------------------------------------------------------------
00388> 004:0002-----------------------------------------------------------------
00389> ---------------------------------------------------------------------------
00390> 004:0002-----------------------------------------------------------------
00391> ---------------------------------------------------------------------------
00392> 004:0002-----------------------------------------------------------------
00393>   ** END OF RUN :   4
00394>
00395> ***************************************************************************
00396>
00397>
00398>
00399>
00400>
00401>  --------------------
00402> | START              |  Project  dir.: C:\PROGRA~1\SWMHYMO\
00403>  --------------------  Rainfall dir.: C:\PROGRA~1\SWMHYMO\
00404>     TZERO =   .00 hrs on       0
00405>     METOUT=   2 (output = METRIC)
00406>     NRUN  = 005
00407>     NSTORM=   1
00408>               #  1=si_50.STM
00409> ---------------------------------------------------------------------------
00410> 005:0002-----------------------------------------------------------------
00411> *#***************************************************************************
00412> *#  Project Name  : Grand Renewable Energy Park - Substation Facility
00413> *#  Project Number: 1610-10624
00414> *#  Date          : 1-24-2011
00415> *#  Company       : Stantec Consulting Ltd. (Kitchener)
00416> *#  Modeller      : George Golding, EIT
00417> *#  Reviewed / Revised : SRobertson (Jan 31, 2011)
00418> *#  License #     :  4730904
00419> *#***************************************************************************
00420> *#  EXISTING CONDITIONS
00421> *#***************************************************************************
00422> ---------------------------------------------------------------------------
00423> 005:0002-----------------------------------------------------------------
00424>  --------------------
00425> | READ STORM       |    Filename: C:\PROGRA~1\SWMHYMO\si_50.STM
00426> | Ptotal= 100.70 mm|    Comments: SCS-II 24H 50-YEAR SIMCOE
00427>  --------------------
00428>               TIME    RAIN |   TIME    RAIN |   TIME    RAIN |   TIME    RAIN
00429>                hrs   mm/hr |    hrs   mm/hr |    hrs   mm/hr |    hrs   mm/hr
00430>                .25   1.108 |   6.25   2.014 |  12.25  14.501 |  18.25   1.813
00431>                .50   1.108 |   6.50   2.014 |  12.50  14.501 |  18.50   1.813
00432>                .75   1.108 |   6.75   2.014 |  12.75   7.452 |  18.75   1.813
00433>               1.00   1.108 |   7.00   2.014 |  13.00   7.452 |  19.00   1.813
00434>               1.25   1.108 |   7.25   2.014 |  13.25   5.236 |  19.25   1.813
00435>               1.50   1.108 |   7.50   2.014 |  13.50   5.639 |  19.50   1.813
00436>               1.75   1.108 |   7.75   2.014 |  13.75   4.229 |  19.75   1.813
00437>               2.00   1.108 |   8.00   2.014 |  14.00   4.229 |  20.00   1.813
00438>               2.25   1.309 |   8.25   2.719 |  14.25   3.021 |  20.25   1.208
00439>               2.50   1.309 |   8.50   2.719 |  14.50   3.021 |  20.50   1.208
00440>               2.75   1.309 |   8.75   2.719 |  14.75   3.021 |  20.75   1.208
00441>               3.00   1.309 |   9.00   2.719 |  15.00   3.021 |  21.00   1.208
00442>               3.25   1.309 |   9.25   3.222 |  15.25   3.021 |  21.25   1.208
00443>               3.50   1.309 |   9.50   3.222 |  15.50   3.021 |  21.50   1.208
00444>               3.75   1.309 |   9.75   3.625 |  15.75   3.021 |  21.75   1.208
00445>               4.00   1.309 |  10.00   3.625 |  16.00   3.021 |  22.00   1.208
00446>               4.25   1.611 |  10.25   4.632 |  16.25   1.813 |  22.25   1.208
00447>               4.50   1.611 |  10.50   4.632 |  16.50   1.813 |  22.50   1.208
00448>               4.75   1.611 |  10.75   6.243 |  16.75   1.813 |  22.75   1.208
00449>               5.00   1.611 |  11.00   6.243 |  17.00   1.813 |  23.00   1.208
00450>               5.25   1.611 |  11.25   9.667 |  17.25   1.813 |  23.25   1.208
00451>               5.50   1.611 |  11.50   9.667 |  17.50   1.813 |  23.50   1.208
00452>               5.75   1.611 |  11.75  41.891 |  17.75   1.813 |  23.75   1.208
00453>               6.00   1.611 |  12.00 111.173 |  18.00   1.813 |  24.00   1.208
00454>
00455> ---------------------------------------------------------------------------
00456> 005:0003-----------------------------------------------------------------
00457> *#-----------------|-------------------------------------------------------|
00458> *# Catchment North of Haldimand Road
00459> *#-----------------|-------------------------------------------------------|
00460>  --------------------
00461> | DESIGN NASHYD      |   Area    (ha)=   34.10   Curve Number   (CN)=83.00
00462> | 01:101    DT= 5.00 |   Ia      (mm)=   1.500   # of Linear Res.(N)= 3.00
00463>  ----------------------  U.H. Tp(hrs)=   1.080
00464>
00465>      Unit Hyd Qpeak  (cms)=    1.206
00466>
00467>      PEAK FLOW       (cms)=    1.702 (i)
00468>      TIME TO PEAK    (hrs)=   13.000
00469>      RUNOFF VOLUME    (mm)=   65.073
00470>      TOTAL RAINFALL   (mm)=  100.699
00471>      RUNOFF COEFFICIENT   =     .646
00472>
00473>      (i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.
00474>
00475> ---------------------------------------------------------------------------
00476> 005:0004-----------------------------------------------------------------
00477> *#-----------------|-------------------------------------------------------|
00478> ---------------------------------------------------------------------------
00479> 005:0002-----------------------------------------------------------------
00480> ---------------------------------------------------------------------------
00481> 005:0002-----------------------------------------------------------------
00482> ---------------------------------------------------------------------------
00483> 005:0002-----------------------------------------------------------------
00484> ---------------------------------------------------------------------------
00485> 005:0002-----------------------------------------------------------------
00486>   ** END OF RUN :   5
00487>
00488> ***************************************************************************
00489>
00490>
00491>
00492>
00493>
00494>  --------------------
00495> | START              |  Project  dir.: C:\PROGRA~1\SWMHYMO\
00496>  --------------------  Rainfall dir.: C:\PROGRA~1\SWMHYMO\
00497>     TZERO =   .00 hrs on       0
00498>     METOUT=   2 (output = METRIC)
00499>     NRUN  = 006
00500>     NSTORM=   1
00501>               #  1=si_100.STM
00502> ---------------------------------------------------------------------------
00503> 006:0002-----------------------------------------------------------------
00504> *#***************************************************************************
00505> *#  Project Name  : Grand Renewable Energy Park - Substation Facility
00506> *#  Project Number: 1610-10624
00507> *#  Date          : 1-24-2011
00508> *#  Company       : Stantec Consulting Ltd. (Kitchener)
00509> *#  Modeller      : George Golding, EIT
00510> *#  Reviewed / Revised : SRobertson (Jan 31, 2011)
00511> *#  License #     :  4730904
00512> *#***************************************************************************
00513> *#  EXISTING CONDITIONS
00514> *#***************************************************************************
00515> ---------------------------------------------------------------------------
00516> 006:0002-----------------------------------------------------------------
00517>  --------------------
00518> | READ STORM       |    Filename: C:\PROGRA~1\SWMHYMO\si_100.STM
00519> | Ptotal= 110.60 mm|    Comments: SCS-II 24H 100-YEAR SIMCOE
00520>  --------------------
00521>               TIME    RAIN |   TIME    RAIN |   TIME    RAIN |   TIME    RAIN
00522>                hrs   mm/hr |    hrs   mm/hr |    hrs   mm/hr |    hrs   mm/hr
00523>                .25   1.217 |   6.25   2.212 |  12.25  15.926 |  18.25   1.991
00524>                .50   1.217 |   6.50   2.212 |  12.50  15.926 |  18.50   1.991
00525>                .75   1.217 |   6.75   2.212 |  12.75   8.184 |  18.75   1.991
00526>               1.00   1.217 |   7.00   2.212 |  13.00   8.184 |  19.00   1.991
00527>               1.25   1.217 |   7.25   2.212 |  13.25   5.751 |  19.25   1.991
00528>               1.50   1.217 |   7.50   2.212 |  13.50   6.194 |  19.50   1.991
00529>               1.75   1.217 |   7.75   2.212 |  13.75   4.645 |  19.75   1.991
00530>               2.00   1.217 |   8.00   2.212 |  14.00   4.645 |  20.00   1.991
00531>               2.25   1.438 |   8.25   2.986 |  14.25   3.318 |  20.25   1.327
00532>               2.50   1.438 |   8.50   2.986 |  14.50   3.318 |  20.50   1.327
00533>               2.75   1.438 |   8.75   2.986 |  14.75   3.318 |  20.75   1.327
00534>               3.00   1.438 |   9.00   2.986 |  15.00   3.318 |  21.00   1.327
00535>               3.25   1.438 |   9.25   3.539 |  15.25   3.318 |  21.25   1.327
00536>               3.50   1.438 |   9.50   3.539 |  15.50   3.318 |  21.50   1.327
00537>               3.75   1.438 |   9.75   3.982 |  15.75   3.318 |  21.75   1.327
00538>               4.00   1.438 |  10.00   3.982 |  16.00   3.318 |  22.00   1.327
00539>               4.25   1.770 |  10.25   5.088 |  16.25   1.991 |  22.25   1.327
00540>               4.50   1.770 |  10.50   5.088 |  16.50   1.991 |  22.50   1.327
```

```
00541>               4.75   1.770 |  10.75   6.857 |  16.75   1.991 |  22.75   1.327
00542>               5.00   1.770 |  11.00   6.857 |  17.00   1.991 |  23.00   1.327
00543>               5.25   1.770 |  11.25  10.618 |  17.25   1.991 |  23.25   1.327
00544>               5.50   1.770 |  11.50  10.618 |  17.50   1.991 |  23.50   1.327
00545>               5.75   1.770 |  11.75  46.010 |  17.75   1.991 |  23.75   1.327
00546>               6.00   1.770 |  12.00 122.102 |  18.00   1.991 |  24.00   1.327
00547>
00548> ------------------------------------------------------------------------------
00549> 006:0003----------------------------------------------------------------------
00550> *#-----------------|----------------------------------------------------------|
00551> *# Catchment North of Haldimand Road
00552> *#-----------------|----------------------------------------------------------|
00553> ---------------------
00554> | DESIGN NASHYD      |   Area    (ha)=   34.10   Curve Number   (CN)=83.00
00555> | 01:101    DT= 5.00 |   Ia      (mm)=   1.500   # of Linear Res.(N)= 3.00
00556> ---------------------   U.H. Tp(hrs)=   1.080
00557>
00558>      Unit Hyd Qpeak  (cms)=    1.206
00559>
00560>      PEAK FLOW       (cms)=    1.934 (i)
00561>      TIME TO PEAK    (hrs)=   13.000
00562>      RUNOFF VOLUME    (mm)=   73.875
00563>      TOTAL RAINFALL   (mm)=  110.602
00564>      RUNOFF COEFFICIENT   =     .668
00565>
00566>      (i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.
00567>
00568> ------------------------------------------------------------------------------
00569> 006:0004----------------------------------------------------------------------
00570> *#-----------------|----------------------------------------------------------|
00571> ------------------------------------------------------------------------------
00572> 006:0002----------------------------------------------------------------------
00573> ------------------------------------------------------------------------------
00574> 006:0002----------------------------------------------------------------------
00575> ------------------------------------------------------------------------------
00576> 006:0002----------------------------------------------------------------------
00577> ------------------------------------------------------------------------------
00578> 006:0002----------------------------------------------------------------------
00579> ------------------------------------------------------------------------------
00580> 006:0002----------------------------------------------------------------------
00581>       FINISH
00582> ------------------------------------------------------------------------------
00583> ******************************************************************************
00584>      WARNINGS / ERRORS / NOTES
00585>      -------------------------
00586>    Simulation ended on 2011-01-31     at 21:34:36
00587> ==============================================================================
00588>
```

Grand Renewable Energy Park - Substation Facility
Samsung Renewable Energy Inc.
Proposed Conditions SYMHYMO Schematic





```
00001> 2     Metric units
00002> *#*************************************************************************
00003> *#  Project Name  : Grand Renewable Energy Park-Substation
00004> *#  Project Number: 1610-10624
00005> *#  Date          : 1-24-2011
00006> *#  Company       : Stantec Consulting Ltd. (Kitchener)
00007> *#  Modeller      : George Golding, EIT
00008> *#  Reviewed / Revised : S Robertson (Jan 31, 2011)
00009> *#  License #     :  4730904
00010> *#*************************************************************************
00011> *#  PROPOSED CONDITIONS
00012> *#*************************************************************************
00013> START               TZERO=[0.0],  METOUT=[2],  NSTORM=[1],  NRUN=[1]
00014> *%                  ["si_2.STM"] <--storm filename, one per line for NSTORM time
00015> *%-----------------|-------------------------------------------------------|
00016> READ STORM          STORM_FILENAME=["STORM.001"]
00017> *#-----------------|-------------------------------------------------------|
00018> *# Catchment North of Haldimand Road
00019> *#-----------------|-------------------------------------------------------|
00020> DESIGN NASHYD       ID=[1], NHYD=["201"], DT=[5]min, AREA=[10.62](ha),
00021>                     DWF=[0](cms), CN/C=[81], TP=[1.08]hrs,
00022>                     RAINFALL=[ ,  ,  ,  , ](mm/hr), END=-1
00023> *#-----------------|-------------------------------------------------------|
00024> *# Catchment North of Haldimand Road
00025> *#-----------------|-------------------------------------------------------|
00026> DESIGN NASHYD       ID=[2], NHYD=["202"], DT=[5]min, AREA=[18.25](ha),
00027>                     DWF=[0](cms), CN/C=[83], TP=[1.23]hrs,
00028>                     RAINFALL=[ ,  ,  ,  , ](mm/hr), END=-1
00029> *#-----------------|-------------------------------------------------------|
00030> *# Catchment North of Haldimand Road
00031> *#-----------------|-------------------------------------------------------|
00032> DESIGN STANDHYD     ID=[3], NHYD=["203"], DT=[1]min, AREA=[2.53](ha),
00033>                     XIMP=[0.60], TIMP=[0.60], DWF=[0](cms), LOSS=[2], CN=[83],
00034>                     SLOPE=[0.43](%), RAINFALL=[ , , , , ](mm/hr), END=-1
00035> *#-----------------|-------------------------------------------------------|
00036> *# Catchment North of Haldimand Road
00037> *#-----------------|-------------------------------------------------------|
00038> DESIGN NASHYD       ID=[4], NHYD=["204"], DT=[5]min, AREA=[3.20](ha),
00039>                     DWF=[0](cms), CN/C=[80], TP=[0.97]hrs,
00040>                     RAINFALL=[ ,  ,  ,  , ](mm/hr), END=-1
00041> *#-----------------|-------------------------------------------------------|
00042> *# Dry End-of-Pipe SWM Facility
00043> *#-----------------|-------------------------------------------------------|
00044> ROUTE RESERVOIR     IDout=[5],   NHYD=["501"],  IDin=[3],
00045>                     RDT=[1](min),
00046>                           TABLE of ( OUTFLOW-STORAGE ) values
00047>                                      (cms) - (ha-m)
00048>                                    [   0.0 ,  0.0    ]
00049>                                    [ 0.001 ,  0.0018 ]
00050>                                    [ 0.002 ,  0.0104 ]
00051>                                    [ 0.006 ,  0.0181 ]
00052>                                    [ 0.014 ,  0.0277 ]
00053>                                    [ 0.027 ,  0.0387 ]
00054>                                    [ 0.044 ,  0.0509 ]
00055>                                    [ 0.073 ,  0.0642 ]
00056>                                    [ 0.094 ,  0.0788 ]
00057>                                    [ 0.111 ,  0.0971 ]
00058>                                    [ 0.125 ,  0.1188 ]
00059>                                    [ 0.138 ,  0.1411 ]
00060>                                    [ 0.209 ,  0.1640 ]
00061>                                    [ 0.336 ,  0.1876 ]
00062>                                    [ 0.505 ,  0.2117 ]
00063>                                    [ 0.713 ,  0.2365 ]
00064>                                    [ 0.961 ,  0.2620 ]
00065>                                    [   -1  ,  -1  ]  (max twenty pts)
00066>                           IDovf=[   ], NHYDovf=[   ]
00067> *%-----------------|-------------------------------------------------------|
00068> ADD HYD             IDsum=[6], NHYD=["401"], IDs to add=[1+2+4+5]
00069> *#-----------------|-------------------------------------------------------|
00070> START               TZERO=[0.0]hrs or date,  METOUT=[2],  NSTORM=[1],  NRUN=[2]
00071> *                   ["si_5.STM"] <--storm filename, one per line for NSTORM time
00072> *%-----------------|-------------------------------------------------------|
00073> START               TZERO=[0.0]hrs or date,  METOUT=[2],  NSTORM=[1],  NRUN=[3]
00074> *                   ["si_10.STM"] <--storm filename, one per line for NSTORM tim
00075> *%-----------------|-------------------------------------------------------|
00076> START               TZERO=[0.0]hrs or date,  METOUT=[2],  NSTORM=[1],  NRUN=[4]
00077> *                   ["si_25.STM"] <--storm filename, one per line for NSTORM tim
00078> *%-----------------|-------------------------------------------------------|
00079> START               TZERO=[0.0]hrs or date,  METOUT=[2],  NSTORM=[1],  NRUN=[5]
00080> *                   ["si_50.STM"] <--storm filename, one per line for NSTORM tim
00081> *%-----------------|-------------------------------------------------------|
00082> START               TZERO=[0.0]hrs or date,  METOUT=[2],  NSTORM=[1],  NRUN=[6]
00083> *                   ["si_100.STM"] <--storm filename, one per line for NSTORM ti
00084> *%-----------------|-------------------------------------------------------|
00085> FINISH
00086>
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00150>
```

```
00001> ================================================================================
00002>
00003>  SSSSS  W   W  M   M  H   H  Y   Y  M   M   OOO        999    999  =========
00004>  S      W W W  MM MM  H   H   Y Y   MM MM  O   O      9   9  9   9
00005>  SSSSS  W W W  M M M  HHHHH    Y    M M M  O   O  ##  9   9  9   9  Ver. 4.02
00006>      S  W W W  M   M  H   H    Y    M   M  O   O       9999   9999  July 1999
00007>  SSSSS   W W   M   M  H   H    Y    M   M   OOO           9      9  =========
00008>                                                        9   9  9   9  # 4730904
00009>       StormWater Management HYdrologic Model            999    999  =========
00010>
00011>  ********************************************************************************
00012>  ************************** SWMHYMO-99 Ver/4.02 ********************************
00013>  *******  A single event and continuous hydrologic simulation model  *******
00014>  *******     based on the principles of HYMO and its successors      *******
00015>  *******                  OTTHYMO-83 and OTTHYMO-89.                  *******
00016>  ********************************************************************************
00017>  ******* Distributed by:  J.F. Sabourin and Associates Inc.           *******
00018>  *******                  Ottawa,  Ontario: (613) 727-5199            *******
00019>  *******                  Gatineau, Quebec: (819) 243-6858            *******
00020>  *******                  E-Mail: swmhymo@jfsa.Com                    *******
00021>  ********************************************************************************
00022>
00023>  ++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
00024>  +++++++ Licensed user: Stantec Consulting Ltd. (Kitchener)          +++++++
00025>  +++++++                Kitchener            SERIAL#:4730904        +++++++
00026>  ++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
00027>
00028>  ********************************************************************************
00029>  *******          ++++++ PROGRAM ARRAY DIMENSIONS ++++++             *******
00030>  *******          Maximum value for ID numbers  :     10            *******
00031>  *******          Max. number of rainfall points:  15000            *******
00032>  *******          Max. number of flow points    :  15000            *******
00033>  ********************************************************************************
00034>
00035>
00036>  ********************   D E T A I L E D   O U T P U T   *********************
00037>  ********************************************************************************
00038>  *       DATE: 2011-01-31     TIME: 21:52:12     RUN COUNTER: 001067       *
00039>  ********************************************************************************
00040>  * Input   filename: C:\PROGRA~1\SWMHYMO\Sub_Pro.dat                       *
00041>  * Output  filename: C:\PROGRA~1\SWMHYMO\Sub_Pro.out                       *
00042>  * Summary filename: C:\PROGRA~1\SWMHYMO\Sub_Pro.sum                       *
00043>  * User comments:                                                         *
00044>  * 1:_____________________________________________________________________*
00045>  * 2:_____________________________________________________________________*
00046>  * 3:_____________________________________________________________________*
00047>  ********************************************************************************
00048>
00049> --------------------------------------------------------------------------------
00050> 001:0001--------------------------------------------------------------------------
00051> *#*****************************************************************************
00052> *#  Project Name  : Grand Renewable Energy Park-Substation
00053> *#  Project Number: 1610-10624
00054> *#  Date          : 1-24-2011
00055> *#  Company       : Stantec Consulting Ltd. (Kitchener)
00056> *#  Modeller      : George Golding, EIT
00057> *#  Reviewed / Revised : S Robertson (Jan 31, 2011)
00058> *#  License #     :  4730904
00059> *#*****************************************************************************
00060> *#  PROPOSED CONDITIONS
00061> *#*****************************************************************************
00062> ---------------------
00063> | START             |  Project  dir.: C:\PROGRA~1\SWMHYMO\
00064> --------------------  Rainfall dir.: C:\PROGRA~1\SWMHYMO\
00065>     TZERO =   .00 hrs on        0
00066>     METOUT=   2 (output = METRIC)
00067>     NRUN  = 001
00068>     NSTORM=   1
00069>               #  1=si_2.STM
00070> --------------------------------------------------------------------------------
00071> 001:0002--------------------------------------------------------------------------
00072> ---------------------
00073> | READ STORM        |    Filename: C:\PROGRA~1\SWMHYMO\si_2.STM
00074> | Ptotal=  50.70 mm|    Comments: SCS-II 24H 2-YEAR SIMCOE
00075> ---------------------
00076>                TIME    RAIN |   TIME    RAIN |   TIME    RAIN |   TIME    RAIN
00077>                 hrs   mm/hr |    hrs   mm/hr |    hrs   mm/hr |    hrs   mm/hr
00078>                 .25    .558 |   6.25   1.014 |  12.25   7.301 |  18.25    .913
00079>                 .50    .558 |   6.50   1.014 |  12.50   7.301 |  18.50    .913
00080>                 .75    .558 |   6.75   1.014 |  12.75   3.752 |  18.75    .913
00081>                1.00    .558 |   7.00   1.014 |  13.00   3.752 |  19.00    .913
00082>                1.25    .558 |   7.25   1.014 |  13.25   2.636 |  19.25    .913
00083>                1.50    .558 |   7.50   1.014 |  13.50   2.839 |  19.50    .913
00084>                1.75    .558 |   7.75   1.014 |  13.75   2.129 |  19.75    .913
00085>                2.00    .558 |   8.00   1.014 |  14.00   2.129 |  20.00    .913
00086>                2.25    .659 |   8.25   1.369 |  14.25   1.521 |  20.25    .608
00087>                2.50    .659 |   8.50   1.369 |  14.50   1.521 |  20.50    .608
00088>                2.75    .659 |   8.75   1.369 |  14.75   1.521 |  20.75    .608
00089>                3.00    .659 |   9.00   1.369 |  15.00   1.521 |  21.00    .608
00090>                3.25    .659 |   9.25   1.622 |  15.25   1.521 |  21.25    .608
00091>                3.50    .659 |   9.50   1.622 |  15.50   1.521 |  21.50    .608
00092>                3.75    .659 |   9.75   1.825 |  15.75   1.521 |  21.75    .608
00093>                4.00    .659 |  10.00   1.825 |  16.00   1.521 |  22.00    .608
00094>                4.25    .811 |  10.25   2.332 |  16.25    .913 |  22.25    .608
00095>                4.50    .811 |  10.50   2.332 |  16.50    .913 |  22.50    .608
00096>                4.75    .811 |  10.75   3.143 |  16.75    .913 |  22.75    .608
00097>                5.00    .811 |  11.00   3.143 |  17.00    .913 |  23.00    .608
00098>                5.25    .811 |  11.25   4.867 |  17.25    .913 |  23.25    .608
00099>                5.50    .811 |  11.50   4.867 |  17.50    .913 |  23.50    .608
00100>                5.75    .811 |  11.75  21.091 |  17.75    .913 |  23.75    .608
00101>                6.00    .811 |  12.00  55.973 |  18.00    .913 |  24.00    .608
00102>
00103> --------------------------------------------------------------------------------
00104> 001:0003--------------------------------------------------------------------------
00105> *#-----------------|------------------------------------------------------------|
00106> *# Catchment North of Haldimand Road
00107> *#-----------------|------------------------------------------------------------|
00108> ---------------------
00109> | DESIGN NASHYD     |   Area    (ha)=   10.62   Curve Number   (CN)=81.00
00110> | 01:201    DT= 5.00 |   Ia      (mm)=   1.500   # of Linear Res.(N)= 3.00
00111> ---------------------  U.H. Tp(hrs)=   1.080
00112>
00113>     Unit Hyd Qpeak  (cms)=     .376
00114>
00115>     PEAK FLOW       (cms)=     .176 (i)
00116>     TIME TO PEAK    (hrs)=   13.083
00117>     RUNOFF VOLUME    (mm)=   22.252
00118>     TOTAL RAINFALL   (mm)=   50.699
00119>     RUNOFF COEFFICIENT   =     .439
00120>
00121>     (i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.
00122>
00123> --------------------------------------------------------------------------------
00124> 001:0004--------------------------------------------------------------------------
00125> *#-----------------|------------------------------------------------------------|
00126> *# Catchment North of Haldimand Road
00127> *#-----------------|------------------------------------------------------------|
00128> ---------------------
00129> | DESIGN NASHYD     |   Area    (ha)=   18.25   Curve Number   (CN)=83.00
00130> | 02:202    DT= 5.00 |   Ia      (mm)=   1.500   # of Linear Res.(N)= 3.00
00131> ---------------------  U.H. Tp(hrs)=   1.230
00132>
00133>     Unit Hyd Qpeak  (cms)=     .567
00134>
00135>     PEAK FLOW       (cms)=     .297 (i)
00136>     TIME TO PEAK    (hrs)=   13.250
00137>     RUNOFF VOLUME    (mm)=   23.913
00138>     TOTAL RAINFALL   (mm)=   50.699
00139>     RUNOFF COEFFICIENT   =     .472
00140>
00141>     (i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.
00142>
00143> --------------------------------------------------------------------------------
00144> 001:0005--------------------------------------------------------------------------
00145> *#-----------------|------------------------------------------------------------|
00146> *# Catchment North of Haldimand Road
00147> *#-----------------|------------------------------------------------------------|
00148> ---------------------
00149> | DESIGN STANDHYD   |   Area    (ha)=    2.53
00150> | 03:203    DT= 1.00 |   Total Imp(%)=   60.00   Dir. Conn.(%)=   60.00
00151> ---------------------
00152>                              IMPERVIOUS    PERVIOUS (i)
00153>     Surface Area     (ha)=       1.52         1.01
00154>     Dep. Storage     (mm)=        .80         1.50
00155>     Average Slope     (%)=        .43          .43
00156>     Length            (m)=     129.87        40.00
00157>     Mannings n           =       .013         .250
00158>
00159>     Max.eff.Inten.(mm/hr)=      55.97        21.21
00160>               over (min)        5.00        26.00
00161>     Storage Coeff.  (min)=      4.86 (ii)   25.67 (ii)
00162>     Unit Hyd. Tpeak (min)=      5.00        26.00
00163>     Unit Hyd. peak  (cms)=       .23          .04
00164>                                                          *TOTALS*
00165>     PEAK FLOW       (cms)=       .22          .04          .244 (iii)
00166>     TIME TO PEAK    (hrs)=     12.00        12.32        12.000
00167>     RUNOFF VOLUME    (mm)=     49.90        23.90        39.505
00168>     TOTAL RAINFALL   (mm)=     50.70        50.70        50.699
00169>     RUNOFF COEFFICIENT   =       .98          .47          .779
00170>
00171>       (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
00172>           CN* =  83.0    Ia = Dep. Storage  (Above)
00173>        (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
00174>             THAN THE STORAGE COEFFICIENT.
00175>     (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.
00176>
00177> --------------------------------------------------------------------------------
00178> 001:0006--------------------------------------------------------------------------
00179> *#-----------------|------------------------------------------------------------|
00180> *# Catchment North of Haldimand Road
00181> *#-----------------|------------------------------------------------------------|
00182> ---------------------
00183> | DESIGN NASHYD     |   Area    (ha)=    3.20   Curve Number   (CN)=80.00
00184> | 04:204    DT= 5.00 |   Ia      (mm)=   1.500   # of Linear Res.(N)= 3.00
00185> ---------------------  U.H. Tp(hrs)=    .970
00186>
00187>     Unit Hyd Qpeak  (cms)=     .126
00188>
00189>     PEAK FLOW       (cms)=     .055 (i)
00190>     TIME TO PEAK    (hrs)=   12.917
00191>     RUNOFF VOLUME    (mm)=   21.478
00192>     TOTAL RAINFALL   (mm)=   50.699
00193>     RUNOFF COEFFICIENT   =     .424
00194>
00195>     (i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.
00196>
00197> --------------------------------------------------------------------------------
00198> 001:0007--------------------------------------------------------------------------
00199> *#-----------------|------------------------------------------------------------|
00200> *# Dry End-of-Pipe SWM Facility
00201> *#-----------------|------------------------------------------------------------|
00202> ---------------------
00203> | ROUTE RESERVOIR   |    Requested routing time step =  1.0 min.
00204> |  IN>03:(203   )   |
00205> | OUT<05:(501   )   |    =========  OUTLFOW STORAGE TABLE  =========
00206> ---------------------    OUTFLOW    STORAGE   |  OUTFLOW    STORAGE
00207>                            (cms)     (ha.m.)   |    (cms)    (ha.m.)
00208>                             .000  .0000E+00    |     .111  .9710E-01
00209>                             .001  .1800E-02    |     .125  .1188E+00
00210>                             .002  .1040E-01    |     .138  .1411E+00
00211>                             .006  .1810E-01    |     .209  .1640E+00
00212>                             .014  .2770E-01    |     .336  .1876E+00
00213>                             .027  .3870E-01    |     .505  .2117E+00
00214>                             .044  .5090E-01    |     .713  .2365E+00
00215>                             .073  .6420E-01    |     .961  .2620E+00
00216>                             .094  .7880E-01    |     .000  .0000E+00
00217>
00218>     ROUTING RESULTS             AREA     QPEAK     TPEAK       R.V.
00219>     --------------------         (ha)     (cms)     (hrs)       (mm)
00220>     INFLOW >03: (203   )        2.53      .244    12.000     39.505
00221>     OUTFLOW<05: (501   )        2.53      .043    12.683     39.504
00222>
00223>                    PEAK   FLOW   REDUCTION [Qout/Qin](%)=   17.489
00224>                    TIME SHIFT OF PEAK FLOW          (min)=   41.00
00225>                    MAXIMUM  STORAGE   USED       (ha.m.)=.4998E-01
00226>
00227> --------------------------------------------------------------------------------
00228> 001:0008--------------------------------------------------------------------------
00229> ---------------------
00230> | ADD HYD (401   ) | ID: NHYD     AREA     QPEAK   TPEAK   R.V.    DWF
00231> ---------------------                (ha)     (cms)   (hrs)   (mm)   (cms)
00232>                  ID1 01:201       10.62      .176   13.08  22.25    .000
00233>                +ID2 02:202       18.25      .297   13.25  23.91    .000
00234>                +ID3 04:204        3.20      .055   12.92  21.48    .000
00235>                +ID4 05:501        2.53      .043   12.68  39.50    .000
00236>                 ==========================================================
00237>                 SUM 06:401       34.60      .568   13.08  24.32    .000
00238>
00239>   NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.
00240>
00241> --------------------------------------------------------------------------------
00242> 001:0009--------------------------------------------------------------------------
00243> *#-----------------|------------------------------------------------------------|
00244>  ** END OF RUN :   1
00245>
00246>  ********************************************************************************
00247>
00248>
00249>
00250>
00251>
00252> ---------------------
00253> | START             |  Project  dir.: C:\PROGRA~1\SWMHYMO\
00254> --------------------  Rainfall dir.: C:\PROGRA~1\SWMHYMO\
00255>     TZERO =   .00 hrs on        0
00256>     METOUT=   2 (output = METRIC)
00257>     NRUN  = 002
00258>     NSTORM=   1
00259>               #  1=si_5.STM
00260> --------------------------------------------------------------------------------
00261> 002:0002--------------------------------------------------------------------------
00262> *#*****************************************************************************
00263> *#  Project Name  : Grand Renewable Energy Park-Substation
00264> *#  Project Number: 1610-10624
00265> *#  Date          : 1-24-2011
00266> *#  Company       : Stantec Consulting Ltd. (Kitchener)
00267> *#  Modeller      : George Golding, EIT
00268> *#  Reviewed / Revised : S Robertson (Jan 31, 2011)
00269> *#  License #     :  4730904
00270> *#*****************************************************************************
```

```
00271> *#  PROPOSED CONDITIONS
00272> *#************************************************************************
00273> ----------------------------------------------------------------------------
00274> 002:0002------------------------------------------------------------------
00275> --------------------
00276> | READ STORM       |    Filename: C:\PROGRA~1\SWMHYMO\si_5.STM
00277> | Ptotal=  66.80 mm|    Comments: SCS-II 24H 5-YEAR SIMCOE
00278> --------------------
00279>               TIME    RAIN |   TIME    RAIN |   TIME    RAIN |   TIME    RAIN
00280>               hrs   mm/hr |    hrs   mm/hr |    hrs   mm/hr |    hrs   mm/hr
00281>                .25    .735 |   6.25   1.336 |  12.25   9.619 |  18.25   1.202
00282>                .50    .735 |   6.50   1.336 |  12.50   9.619 |  18.50   1.202
00283>                .75    .735 |   6.75   1.336 |  12.75   4.943 |  18.75   1.202
00284>               1.00    .735 |   7.00   1.336 |  13.00   4.943 |  19.00   1.202
00285>               1.25    .735 |   7.25   1.336 |  13.25   3.474 |  19.25   1.202
00286>               1.50    .735 |   7.50   1.336 |  13.50   3.741 |  19.50   1.202
00287>               1.75    .735 |   7.75   1.336 |  13.75   2.806 |  19.75   1.202
00288>               2.00    .735 |   8.00   1.336 |  14.00   2.806 |  20.00   1.202
00289>               2.25    .868 |   8.25   1.804 |  14.25   2.004 |  20.25    .802
00290>               2.50    .868 |   8.50   1.804 |  14.50   2.004 |  20.50    .802
00291>               2.75    .868 |   8.75   1.804 |  14.75   2.004 |  20.75    .802
00292>               3.00    .868 |   9.00   1.804 |  15.00   2.004 |  21.00    .802
00293>               3.25    .868 |   9.25   2.138 |  15.25   2.004 |  21.25    .802
00294>               3.50    .868 |   9.50   2.138 |  15.50   2.004 |  21.50    .802
00295>               3.75    .868 |   9.75   2.405 |  15.75   2.004 |  21.75    .802
00296>               4.00    .868 |  10.00   2.405 |  16.00   2.004 |  22.00    .802
00297>               4.25   1.069 |  10.25   3.073 |  16.25   1.202 |  22.25    .802
00298>               4.50   1.069 |  10.50   3.073 |  16.50   1.202 |  22.50    .802
00299>               4.75   1.069 |  10.75   4.142 |  16.75   1.202 |  22.75    .802
00300>               5.00   1.069 |  11.00   4.142 |  17.00   1.202 |  23.00    .802
00301>               5.25   1.069 |  11.25   6.413 |  17.25   1.202 |  23.25    .802
00302>               5.50   1.069 |  11.50   6.413 |  17.50   1.202 |  23.50    .802
00303>               5.75   1.069 |  11.75  27.789 |  17.75   1.202 |  23.75    .802
00304>               6.00   1.069 |  12.00  73.747 |  18.00   1.202 |  24.00    .802
00305>
00306> ----------------------------------------------------------------------------
00307> 002:0003------------------------------------------------------------------
00308> *#-----------------|--------------------------------------------------------|
00309> *# Catchment North of Haldimand Road
00310> *#-----------------|--------------------------------------------------------|
00311> --------------------
00312> | DESIGN NASHYD     |   Area    (ha)=   10.62   Curve Number   (CN)=81.00
00313> | 01:201    DT= 5.00 |   Ia      (mm)=   1.500   # of Linear Res.(N)= 3.00
00314> --------------------   U.H. Tp(hrs)=   1.080
00315>
00316>      Unit Hyd Qpeak  (cms)=     .376
00317>
00318>      PEAK FLOW       (cms)=     .274 (i)
00319>      TIME TO PEAK    (hrs)=   13.000
00320>      RUNOFF VOLUME    (mm)=   34.146
00321>      TOTAL RAINFALL   (mm)=   66.801
00322>      RUNOFF COEFFICIENT   =     .511
00323>
00324>      (i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.
00325>
00326> ----------------------------------------------------------------------------
00327> 002:0004------------------------------------------------------------------
00328> *#-----------------|--------------------------------------------------------|
00329> *# Catchment North of Haldimand Road
00330> *#-----------------|--------------------------------------------------------|
00331> --------------------
00332> | DESIGN NASHYD     |   Area    (ha)=   18.25   Curve Number   (CN)=83.00
00333> | 02:202    DT= 5.00 |   Ia      (mm)=   1.500   # of Linear Res.(N)= 3.00
00334> --------------------   U.H. Tp(hrs)=   1.230
00335>
00336>      Unit Hyd Qpeak  (cms)=     .567
00337>
00338>      PEAK FLOW       (cms)=     .456 (i)
00339>      TIME TO PEAK    (hrs)=   13.167
00340>      RUNOFF VOLUME    (mm)=   36.346
00341>      TOTAL RAINFALL   (mm)=   66.801
00342>      RUNOFF COEFFICIENT   =     .544
00343>
00344>      (i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.
00345>
00346> ----------------------------------------------------------------------------
00347> 002:0005------------------------------------------------------------------
00348> *#-----------------|--------------------------------------------------------|
00349> *# Catchment North of Haldimand Road
00350> *#-----------------|--------------------------------------------------------|
00351> --------------------
00352> | DESIGN STANDHYD   |   Area    (ha)=    2.53
00353> | 03:203    DT= 1.00 |   Total Imp(%)=   60.00   Dir. Conn.(%)=   60.00
00354> --------------------
00355>                             IMPERVIOUS    PERVIOUS (i)
00356>      Surface Area     (ha)=       1.52         1.01
00357>      Dep. Storage     (mm)=        .80         1.50
00358>      Average Slope     (%)=        .43          .43
00359>      Length            (m)=     129.87        40.00
00360>      Mannings n             =       .013         .250
00361>
00362>      Max.eff.Inten.(mm/hr)=      73.75        37.11
00363>            over (min)     =       4.00        21.00
00364>      Storage Coeff.  (min)=       4.35 (ii)   20.99 (ii)
00365>      Unit Hyd. Tpeak (min)=       4.00        21.00
00366>      Unit Hyd. peak  (cms)=        .27          .05
00367>                                                          *TOTALS*
00368>      PEAK FLOW       (cms)=        .30          .06          .342 (iii)
00369>      TIME TO PEAK    (hrs)=      12.00        12.23        12.000
00370>      RUNOFF VOLUME    (mm)=      65.99        36.33        54.138
00371>      TOTAL RAINFALL   (mm)=      66.80        66.80        66.801
00372>      RUNOFF COEFFICIENT   =        .99          .54          .810
00373>
00374>        (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
00375>            CN* =  83.0    Ia = Dep. Storage  (Above)
00376>       (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
00377>            THAN THE STORAGE COEFFICIENT.
00378>      (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.
00379>
00380> ----------------------------------------------------------------------------
00381> 002:0006------------------------------------------------------------------
00382> *#-----------------|--------------------------------------------------------|
00383> *# Catchment North of Haldimand Road
00384> *#-----------------|--------------------------------------------------------|
00385> --------------------
00386> | DESIGN NASHYD     |   Area    (ha)=    3.20   Curve Number   (CN)=80.00
00387> | 04:204    DT= 5.00 |   Ia      (mm)=   1.500   # of Linear Res.(N)= 3.00
00388> --------------------   U.H. Tp(hrs)=    .970
00389>
00390>      Unit Hyd Qpeak  (cms)=     .126
00391>
00392>      PEAK FLOW       (cms)=     .086 (i)
00393>      TIME TO PEAK    (hrs)=   12.917
00394>      RUNOFF VOLUME    (mm)=   33.107
00395>      TOTAL RAINFALL   (mm)=   66.801
00396>      RUNOFF COEFFICIENT   =     .496
00397>
00398>      (i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.
00399>
00400> ----------------------------------------------------------------------------
00401> 002:0007------------------------------------------------------------------
00402> *#-----------------|--------------------------------------------------------|
00403> *# Dry End-of-Pipe SWM Facility
00404> *#-----------------|--------------------------------------------------------|
00405> --------------------
00406> | ROUTE RESERVOIR   |    Requested routing time step =  1.0 min.
00407> |  IN>03:(203   )   |
00408> | OUT<05:(501   )   |    =========  OUTLFOW STORAGE TABLE  =========
00409> --------------------    OUTFLOW    STORAGE   |  OUTFLOW    STORAGE
00410>                           (cms)     (ha.m.)   |    (cms)    (ha.m.)
00411>                            .000  .0000E+00    |     .111  .9710E-01
00412>                            .001  .1800E-02    |     .125  .1188E+00
00413>                            .002  .1040E-01    |     .138  .1411E+00
00414>                            .006  .1810E-01    |     .209  .1640E+00
00415>                            .014  .2770E-01    |     .336  .1876E+00
00416>                            .027  .3870E-01    |     .505  .2117E+00
00417>                            .044  .5090E-01    |     .713  .2365E+00
00418>                            .073  .6420E-01    |     .961  .2620E+00
00419>                            .094  .7880E-01    |     .000  .0000E+00
00420>
00421>      ROUTING RESULTS             AREA     QPEAK     TPEAK       R.V.
00422>      --------------------         (ha)     (cms)     (hrs)        (mm)
00423>      INFLOW >03: (203   )        2.53      .342    12.000      54.138
00424>      OUTFLOW<05: (501   )        2.53      .074    12.567      54.138
00425>
00426>                    PEAK   FLOW   REDUCTION [Qout/Qin](%)=   21.720
00427>                    TIME SHIFT OF PEAK FLOW          (min)=    34.00
00428>                    MAXIMUM  STORAGE   USED        (ha.m.)=.6510E-01
00429>
00430> ----------------------------------------------------------------------------
00431> 002:0008------------------------------------------------------------------
00432> --------------------
00433> | ADD HYD (401   ) | ID: NHYD     AREA     QPEAK   TPEAK   R.V.    DWF
00434> --------------------                (ha)     (cms)   (hrs)   (mm)   (cms)
00435>                     ID1 01:201      10.62     .274   13.00  34.15    .000
00436>                   +ID2 02:202       18.25     .456   13.17  36.35    .000
00437>                   +ID3 04:204        3.20     .086   12.92  33.11    .000
00438>                   +ID4 05:501        2.53     .074   12.57  54.14    .000
00439>                    ==========================================================
00440>                    SUM 06:401       34.60     .878   13.08  36.67    .000
00441>
00442>    NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.
00443>
00444> ----------------------------------------------------------------------------
00445> 002:0009------------------------------------------------------------------
00446> *#-----------------|--------------------------------------------------------|
00447> ----------------------------------------------------------------------------
00448> 002:0002------------------------------------------------------------------
00449>   ** END OF RUN :   2
00450>
00451> ****************************************************************************
00452>
00453>
00454>
00455>
00456>
00457> --------------------
00458> | START             |  Project  dir.: C:\PROGRA~1\SWMHYMO\
00459> --------------------  Rainfall dir.: C:\PROGRA~1\SWMHYMO\
00460>     TZERO =   .00 hrs on        0
00461>     METOUT=   2 (output = METRIC)
00462>     NRUN  = 003
00463>     NSTORM=   1
00464>               #  1=si_10.STM
00465> ----------------------------------------------------------------------------
00466> 003:0002------------------------------------------------------------------
00467> *#************************************************************************
00468> *#  Project Name  : Grand Renewable Energy Park-Substation
00469> *#  Project Number: 1610-10624
00470> *#  Date          : 1-24-2011
00471> *#  Company       : Stantec Consulting Ltd. (Kitchener)
00472> *#  Modeller      : George Golding, EIT
00473> *#  Reviewed / Revised : S Robertson (Jan 31, 2011)
00474> *#  License #     :  4730904
00475> *#************************************************************************
00476> *#  PROPOSED CONDITIONS
00477> *#************************************************************************
00478> ----------------------------------------------------------------------------
00479> 003:0002------------------------------------------------------------------
00480> --------------------
00481> | READ STORM       |    Filename: C:\PROGRA~1\SWMHYMO\si_10.STM
00482> | Ptotal=  77.40 mm|    Comments: SCS-II 24H 10-YEAR SIMCOE
00483> --------------------
00484>               TIME    RAIN |   TIME    RAIN |   TIME    RAIN |   TIME    RAIN
00485>               hrs   mm/hr |    hrs   mm/hr |    hrs   mm/hr |    hrs   mm/hr
00486>                .25    .851 |   6.25   1.548 |  12.25  11.146 |  18.25   1.393
00487>                .50    .851 |   6.50   1.548 |  12.50  11.146 |  18.50   1.393
00488>                .75    .851 |   6.75   1.548 |  12.75   5.728 |  18.75   1.393
00489>               1.00    .851 |   7.00   1.548 |  13.00   5.728 |  19.00   1.393
00490>               1.25    .851 |   7.25   1.548 |  13.25   4.025 |  19.25   1.393
00491>               1.50    .851 |   7.50   1.548 |  13.50   4.334 |  19.50   1.393
00492>               1.75    .851 |   7.75   1.548 |  13.75   3.251 |  19.75   1.393
00493>               2.00    .851 |   8.00   1.548 |  14.00   3.251 |  20.00   1.393
00494>               2.25   1.006 |   8.25   2.090 |  14.25   2.322 |  20.25    .929
00495>               2.50   1.006 |   8.50   2.090 |  14.50   2.322 |  20.50    .929
00496>               2.75   1.006 |   8.75   2.090 |  14.75   2.322 |  20.75    .929
00497>               3.00   1.006 |   9.00   2.090 |  15.00   2.322 |  21.00    .929
00498>               3.25   1.006 |   9.25   2.477 |  15.25   2.322 |  21.25    .929
00499>               3.50   1.006 |   9.50   2.477 |  15.50   2.322 |  21.50    .929
00500>               3.75   1.006 |   9.75   2.786 |  15.75   2.322 |  21.75    .929
00501>               4.00   1.006 |  10.00   2.786 |  16.00   2.322 |  22.00    .929
00502>               4.25   1.238 |  10.25   3.560 |  16.25   1.393 |  22.25    .929
00503>               4.50   1.238 |  10.50   3.560 |  16.50   1.393 |  22.50    .929
00504>               4.75   1.238 |  10.75   4.799 |  16.75   1.393 |  22.75    .929
00505>               5.00   1.238 |  11.00   4.799 |  17.00   1.393 |  23.00    .929
00506>               5.25   1.238 |  11.25   7.430 |  17.25   1.393 |  23.25    .929
00507>               5.50   1.238 |  11.50   7.430 |  17.50   1.393 |  23.50    .929
00508>               5.75   1.238 |  11.75  32.198 |  17.75   1.393 |  23.75    .929
00509>               6.00   1.238 |  12.00  85.450 |  18.00   1.393 |  24.00    .929
00510>
00511> ----------------------------------------------------------------------------
00512> 003:0003------------------------------------------------------------------
00513> *#-----------------|--------------------------------------------------------|
00514> *# Catchment North of Haldimand Road
00515> *#-----------------|--------------------------------------------------------|
00516> --------------------
00517> | DESIGN NASHYD     |   Area    (ha)=   10.62   Curve Number   (CN)=81.00
00518> | 01:201    DT= 5.00 |   Ia      (mm)=   1.500   # of Linear Res.(N)= 3.00
00519> --------------------   U.H. Tp(hrs)=   1.080
00520>
00521>      Unit Hyd Qpeak  (cms)=     .376
00522>
00523>      PEAK FLOW       (cms)=     .343 (i)
00524>      TIME TO PEAK    (hrs)=   13.000
00525>      RUNOFF VOLUME    (mm)=   42.520
00526>      TOTAL RAINFALL   (mm)=   77.398
00527>      RUNOFF COEFFICIENT   =     .549
00528>
00529>      (i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.
00530>
00531> ----------------------------------------------------------------------------
00532> 003:0004------------------------------------------------------------------
00533> *#-----------------|--------------------------------------------------------|
00534> *# Catchment North of Haldimand Road
00535> *#-----------------|--------------------------------------------------------|
00536> --------------------
00537> | DESIGN NASHYD     |   Area    (ha)=   18.25   Curve Number   (CN)=83.00
00538> | 02:202    DT= 5.00 |   Ia      (mm)=   1.500   # of Linear Res.(N)= 3.00
00539> --------------------   U.H. Tp(hrs)=   1.230
00540>
```

```
      Unit Hyd Qpeak  (cms)=     .567

      PEAK FLOW       (cms)=     .568 (i)
      TIME TO PEAK    (hrs)=   13.167
      RUNOFF VOLUME    (mm)=   45.032
      TOTAL RAINFALL   (mm)=   77.398
      RUNOFF COEFFICIENT   =     .582

      (i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

 ------------------------------------------------------------------------------
 003:0005------------------------------------------------------------------------
 *#------------------|-----------------------------------------------------------|
 *# Catchment North of Haldimand Road
 *#------------------|-----------------------------------------------------------|
 ---------------------
 | DESIGN STANDHYD    |   Area    (ha)=    2.53
 | 03:203    DT= 1.00 |   Total Imp(%)=   60.00   Dir. Conn.(%)=   60.00
 ---------------------
                             IMPERVIOUS    PERVIOUS (i)
      Surface Area     (ha)=       1.52         1.01
      Dep. Storage     (mm)=        .80         1.50
      Average Slope     (%)=        .43          .43
      Length            (m)=     129.87        40.00
      Mannings n             =      .013         .250

      Max.eff.Inten.(mm/hr)=      85.45        49.05
                    over (min)        4.00        19.00
      Storage Coeff.  (min)=       4.10 (ii)   18.98 (ii)
      Unit Hyd. Tpeak (min)=       4.00        19.00
      Unit Hyd. peak  (cms)=        .28          .06
                                                          *TOTALS*
      PEAK FLOW       (cms)=        .35          .09          .409 (iii)
      TIME TO PEAK    (hrs)=      12.00        12.20        12.000
      RUNOFF VOLUME    (mm)=      76.59        45.02        63.972
      TOTAL RAINFALL   (mm)=      77.40        77.40        77.399
      RUNOFF COEFFICIENT   =        .99          .58          .827

        (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
            CN* =  83.0    Ia = Dep. Storage  (Above)
       (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
            THAN THE STORAGE COEFFICIENT.
      (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

 ------------------------------------------------------------------------------
 003:0006------------------------------------------------------------------------
 *#------------------|-----------------------------------------------------------|
 *# Catchment North of Haldimand Road
 *#------------------|-----------------------------------------------------------|
 ---------------------
 | DESIGN NASHYD      |   Area    (ha)=    3.20   Curve Number   (CN)=80.00
 | 04:204    DT= 5.00 |   Ia      (mm)=   1.500   # of Linear Res.(N)= 3.00
 ---------------------  U.H. Tp(hrs)=    .970

      Unit Hyd Qpeak  (cms)=     .126

      PEAK FLOW       (cms)=     .108 (i)
      TIME TO PEAK    (hrs)=   12.917
      RUNOFF VOLUME    (mm)=   41.324
      TOTAL RAINFALL   (mm)=   77.398
      RUNOFF COEFFICIENT   =     .534

      (i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

 ------------------------------------------------------------------------------
 003:0007------------------------------------------------------------------------
 *#------------------|-----------------------------------------------------------|
 *# Dry End-of-Pipe SWM Facility
 *#------------------|-----------------------------------------------------------|
 ---------------------
 | ROUTE RESERVOIR    |    Requested routing time step =  1.0 min.
 |  IN>03:(203   )    |
 | OUT<05:(501   )    |    =========  OUTLFOW STORAGE TABLE  =========
 ---------------------    OUTFLOW    STORAGE   |  OUTFLOW    STORAGE
                            (cms)    (ha.m.)   |    (cms)    (ha.m.)
                            .000  .0000E+00    |     .111  .9710E-01
                            .001  .1800E-02    |     .125  .1188E+00
                            .002  .1040E-01    |     .138  .1411E+00
                            .006  .1810E-01    |     .209  .1640E+00
                            .014  .2770E-01    |     .336  .1876E+00
                            .027  .3870E-01    |     .505  .2117E+00
                            .044  .5090E-01    |     .713  .2365E+00
                            .073  .6420E-01    |     .961  .2620E+00
                            .094  .7880E-01    |     .000  .0000E+00

      ROUTING RESULTS            AREA     QPEAK     TPEAK       R.V.
      ---------------            (ha)     (cms)     (hrs)       (mm)
      INFLOW >03: (203   )       2.53      .409    12.000     63.972
      OUTFLOW<05: (501   )       2.53      .090    12.550     63.972

                     PEAK   FLOW   REDUCTION [Qout/Qin](%)=   21.931
                     TIME SHIFT OF PEAK FLOW         (min)=   33.00
                     MAXIMUM  STORAGE   USED       (ha.m.)=.7580E-01

 ------------------------------------------------------------------------------
 003:0008------------------------------------------------------------------------
 ---------------------
 | ADD HYD (401   ) | ID: NHYD     AREA     QPEAK   TPEAK   R.V.    DWF
 ---------------------              (ha)     (cms)   (hrs)   (mm)   (cms)
                   ID1 01:201       10.62     .343   13.00  42.52    .000
                  +ID2 02:202       18.25     .568   13.17  45.03    .000
                  +ID3 04:204        3.20     .108   12.92  41.32    .000
                  +ID4 05:501        2.53     .090   12.55  63.97    .000
                   ==========================================================
                   SUM 06:401       34.60    1.095   13.08  45.30    .000

    NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

 ------------------------------------------------------------------------------
 003:0009------------------------------------------------------------------------
 *#------------------|-----------------------------------------------------------|
 ------------------------------------------------------------------------------
 003:0002------------------------------------------------------------------------
 ------------------------------------------------------------------------------
 003:0002------------------------------------------------------------------------
   ** END OF RUN :   3
 ------------------------------------------------------------------------------
 ******************************************************************************
```

```
 ---------------------
 | START              |  Project  dir.: C:\PROGRA-1\SWMHYMO\
 ---------------------  Rainfall dir.: C:\PROGRA-1\SWMHYMO\
     TZERO =   .00 hrs on      0
     METOUT=   2 (output = METRIC)
     NRUN  = 004
     NSTORM=   1
            #  1=si_25.STM
 ------------------------------------------------------------------------------
 004:0002------------------------------------------------------------------------
 *#**************************************************************************
 *#  Project Name  : Grand Renewable Energy Park-Substation
 *#  Project Number: 1610-10624
 *#  Date          : 1-24-2011
 *#  Company       : Stantec Consulting Ltd. (Kitchener)
 *#  Modeller      : George Golding, EIT
 *#  Reviewed / Revised : S Robertson (Jan 31, 2011)
 *#  License #     :  4730904
 *#**************************************************************************
 *#  PROPOSED CONDITIONS
 *#**************************************************************************
 ------------------------------------------------------------------------------
 004:0002------------------------------------------------------------------------
 ---------------------
 | READ STORM       |    Filename: C:\PROGRA-1\SWMHYMO\si_25.STM
 | Ptotal=  90.80 mm|    Comments: SCS-II 24H 25-YEAR SIMCOE
 ---------------------
              TIME    RAIN |   TIME    RAIN |   TIME    RAIN |   TIME    RAIN
              hrs   mm/hr |    hrs   mm/hr |    hrs   mm/hr |    hrs   mm/hr
              .25    .999 |   6.25  1.816 |  12.25 13.075 |  18.25  1.634
              .50    .999 |   6.50  1.816 |  12.50 13.075 |  18.50  1.634
              .75    .999 |   6.75  1.816 |  12.75  6.719 |  18.75  1.634
             1.00    .999 |   7.00  1.816 |  13.00  6.719 |  19.00  1.634
             1.25    .999 |   7.25  1.816 |  13.25  4.722 |  19.25  1.634
             1.50    .999 |   7.50  1.816 |  13.50  5.085 |  19.50  1.634
             1.75    .999 |   7.75  1.816 |  13.75  3.814 |  19.75  1.634
             2.00    .999 |   8.00  1.816 |  14.00  3.814 |  20.00  1.634
             2.25  1.180 |   8.25  2.452 |  14.25  2.724 |  20.25  1.090
             2.50  1.180 |   8.50  2.452 |  14.50  2.724 |  20.50  1.090
             2.75  1.180 |   8.75  2.452 |  14.75  2.724 |  20.75  1.090
             3.00  1.180 |   9.00  2.452 |  15.00  2.724 |  21.00  1.090
             3.25  1.180 |   9.25  2.906 |  15.25  2.724 |  21.25  1.090
             3.50  1.180 |   9.50  2.906 |  15.50  2.724 |  21.50  1.090
             3.75  1.180 |   9.75  3.269 |  15.75  2.724 |  21.75  1.090
             4.00  1.180 |  10.00  3.269 |  16.00  2.724 |  22.00  1.090
             4.25  1.453 |  10.25  4.177 |  16.25  1.634 |  22.25  1.090
             4.50  1.453 |  10.50  4.177 |  16.50  1.634 |  22.50  1.090
             4.75  1.453 |  10.75  5.630 |  16.75  1.634 |  22.75  1.090
             5.00  1.453 |  11.00  5.630 |  17.00  1.634 |  23.00  1.090
             5.25  1.453 |  11.25  8.717 |  17.25  1.634 |  23.25  1.090
             5.50  1.453 |  11.50  8.717 |  17.50  1.634 |  23.50  1.090
             5.75  1.453 |  11.75  37.773 |  17.75  1.634 |  23.75  1.090
             6.00  1.453 |  12.00 100.243 |  18.00  1.634 |  24.00  1.090

 ------------------------------------------------------------------------------
 004:0003------------------------------------------------------------------------
 *#------------------|-----------------------------------------------------------|
 *# Catchment North of Haldimand Road
 *#------------------|-----------------------------------------------------------|
 ---------------------
 | DESIGN NASHYD      |   Area    (ha)=   10.62   Curve Number   (CN)=81.00
 | 01:201    DT= 5.00 |   Ia      (mm)=   1.500   # of Linear Res.(N)= 3.00
 ---------------------  U.H. Tp(hrs)=   1.080

      Unit Hyd Qpeak  (cms)=     .376

      PEAK FLOW       (cms)=     .434 (i)
      TIME TO PEAK    (hrs)=   13.000
      RUNOFF VOLUME    (mm)=   53.564
      TOTAL RAINFALL   (mm)=   90.801
      RUNOFF COEFFICIENT   =     .590

      (i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

 ------------------------------------------------------------------------------
 004:0004------------------------------------------------------------------------
 *#------------------|-----------------------------------------------------------|
 *# Catchment North of Haldimand Road
 *#------------------|-----------------------------------------------------------|
 ---------------------
 | DESIGN NASHYD      |   Area    (ha)=   18.25   Curve Number   (CN)=83.00
 | 02:202    DT= 5.00 |   Ia      (mm)=   1.500   # of Linear Res.(N)= 3.00
 ---------------------  U.H. Tp(hrs)=   1.230

      Unit Hyd Qpeak  (cms)=     .567

      PEAK FLOW       (cms)=     .715 (i)
      TIME TO PEAK    (hrs)=   13.167
      RUNOFF VOLUME    (mm)=   56.428
      TOTAL RAINFALL   (mm)=   90.801
      RUNOFF COEFFICIENT   =     .621

      (i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

 ------------------------------------------------------------------------------
 004:0005------------------------------------------------------------------------
 *#------------------|-----------------------------------------------------------|
 *# Catchment North of Haldimand Road
 *#------------------|-----------------------------------------------------------|
 ---------------------
 | DESIGN STANDHYD    |   Area    (ha)=    2.53
 | 03:203    DT= 1.00 |   Total Imp(%)=   60.00   Dir. Conn.(%)=   60.00
 ---------------------
                             IMPERVIOUS    PERVIOUS (i)
      Surface Area     (ha)=       1.52         1.01
      Dep. Storage     (mm)=        .80         1.50
      Average Slope     (%)=        .43          .43
      Length            (m)=     129.87        40.00
      Mannings n             =      .013         .250

      Max.eff.Inten.(mm/hr)=     100.24        65.99
                    over (min)        4.00        17.00
      Storage Coeff.  (min)=       3.85 (ii)   17.06 (ii)
      Unit Hyd. Tpeak (min)=       4.00        17.00
      Unit Hyd. peak  (cms)=        .29          .07
                                                          *TOTALS*
      PEAK FLOW       (cms)=        .41          .12          .498 (iii)
      TIME TO PEAK    (hrs)=      12.00        12.17        12.000
      RUNOFF VOLUME    (mm)=      89.99        56.41        76.572
      TOTAL RAINFALL   (mm)=      90.80        90.80        90.802
      RUNOFF COEFFICIENT   =        .99          .62          .843

        (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
            CN* =  83.0    Ia = Dep. Storage  (Above)
       (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
            THAN THE STORAGE COEFFICIENT.
      (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

 ------------------------------------------------------------------------------
 004:0006------------------------------------------------------------------------
 *#------------------|-----------------------------------------------------------|
 *# Catchment North of Haldimand Road
 *#------------------|-----------------------------------------------------------|
 ---------------------
 | DESIGN NASHYD      |   Area    (ha)=    3.20   Curve Number   (CN)=80.00
 | 04:204    DT= 5.00 |   Ia      (mm)=   1.500   # of Linear Res.(N)= 3.00
 ---------------------  U.H. Tp(hrs)=    .970

      Unit Hyd Qpeak  (cms)=     .126

      PEAK FLOW       (cms)=     .138 (i)
      TIME TO PEAK    (hrs)=   12.917
      RUNOFF VOLUME    (mm)=   52.190
      TOTAL RAINFALL   (mm)=   90.801
      RUNOFF COEFFICIENT   =     .575

      (i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.
```

```
00811>
00812> ---------------------------------------------------------------------------
00813> 004:0007-----------------------------------------------------------------
00814> *#-----------------|-------------------------------------------------------|
00815> *# Dry End-of-Pipe SWM Facility
00816> *#-----------------|-------------------------------------------------------|
00817> ---------------------
00818> | ROUTE RESERVOIR   |    Requested routing time step =  1.0 min.
00819> |  IN>03:(203   )   |
00820> | OUT<05:(501   )   |    =========  OUTLFOW STORAGE TABLE  =========
00821> ---------------------    OUTFLOW    STORAGE   |  OUTFLOW    STORAGE
00822>                            (cms)    (ha.m.)   |    (cms)    (ha.m.)
00823>                            .000  .0000E+00   |     .111  .9710E-01
00824>                            .001  .1800E-02   |     .125  .1188E+00
00825>                            .002  .1040E-01   |     .138  .1411E+00
00826>                            .006  .1810E-01   |     .209  .1640E+00
00827>                            .014  .2770E-01   |     .336  .1876E+00
00828>                            .027  .3870E-01   |     .505  .2117E+00
00829>                            .044  .5090E-01   |     .713  .2365E+00
00830>                            .073  .6420E-01   |     .961  .2620E+00
00831>                            .094  .7880E-01   |     .000  .0000E+00
00832>
00833>      ROUTING RESULTS            AREA     QPEAK     TPEAK       R.V.
00834>      ---------------            (ha)     (cms)     (hrs)       (mm)
00835>      INFLOW >03: (203   )       2.53      .498    12.000     76.572
00836>      OUTFLOW<05: (501   )       2.53      .105    12.550     76.572
00837>
00838>                     PEAK   FLOW   REDUCTION [Qout/Qin](%)=   21.025
00839>                     TIME SHIFT OF PEAK FLOW          (min)=    33.00
00840>                     MAXIMUM  STORAGE   USED       (ha.m.)=.9028E-01
00841>
00842> ---------------------------------------------------------------------------
00843> 004:0008-----------------------------------------------------------------
00844> ---------------------
00845> | ADD HYD (401   ) | ID: NHYD     AREA     QPEAK   TPEAK   R.V.    DWF
00846> ---------------------              (ha)     (cms)   (hrs)   (mm)    (cms)
00847>                     ID1 01:201      10.62     .434   13.00  53.56    .000
00848>                   +ID2 02:202       18.25     .715   13.17  56.43    .000
00849>                   +ID3 04:204        3.20     .138   12.92  52.19    .000
00850>                   +ID4 05:501        2.53     .105   12.55  76.57    .000
00851>                    ================================================
00852>                    SUM 06:401       34.60    1.377   13.08  56.63    .000
00853>
00854>    NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.
00855>
00856> ---------------------------------------------------------------------------
00857> 004:0009-----------------------------------------------------------------
00858> *#-----------------|-------------------------------------------------------|
00859> ---------------------------------------------------------------------------
00860> 004:0002-----------------------------------------------------------------
00861> ---------------------------------------------------------------------------
00862> 004:0002-----------------------------------------------------------------
00863> ---------------------------------------------------------------------------
00864> 004:0002-----------------------------------------------------------------
00865>   ** END OF RUN :   4
00866>
00867> ***************************************************************************
00868>
00869>
00870>
00871>
00872>
00873> ---------------------
00874> | START             |  Project  dir.: C:\PROGRA~1\SWMHYMO\
00875> ---------------------  Rainfall dir.: C:\PROGRA~1\SWMHYMO\
00876>     TZERO =   .00 hrs on       0
00877>     METOUT=   2 (output = METRIC)
00878>     NRUN  = 005
00879>     NSTORM=   1
00880>               # 1=si_50.STM
00881> ---------------------------------------------------------------------------
00882> 005:0002-----------------------------------------------------------------
00883> *#***************************************************************************
00884> *#  Project Name  : Grand Renewable Energy Park-Substation
00885> *#  Project Number: 1610-10624
00886> *#  Date          : 1-24-2011
00887> *#  Company       : Stantec Consulting Ltd. (Kitchener)
00888> *#  Modeller      : George Golding, EIT
00889> *#  Reviewed / Revised : S Robertson (Jan 31, 2011)
00890> *#  License #     : 4730904
00891> *#***************************************************************************
00892> *#  PROPOSED CONDITIONS
00893> *#***************************************************************************
00894> ---------------------------------------------------------------------------
00895> 005:0002-----------------------------------------------------------------
00896> ---------------------
00897> | READ STORM        |    Filename: C:\PROGRA~1\SWMHYMO\si_50.STM
00898> | Ptotal= 100.70 mm|    Comments: SCS-II 24H 50-YEAR SIMCOE
00899> ---------------------
00900>               TIME    RAIN |   TIME    RAIN |   TIME    RAIN |   TIME    RAIN
00901>               hrs   mm/hr |    hrs   mm/hr |    hrs   mm/hr |    hrs   mm/hr
00902>               .25   1.108 |   6.25   2.014 |  12.25  14.501 |  18.25   1.813
00903>               .50   1.108 |   6.50   2.014 |  12.50  14.501 |  18.50   1.813
00904>               .75   1.108 |   6.75   2.014 |  12.75   7.452 |  18.75   1.813
00905>              1.00   1.108 |   7.00   2.014 |  13.00   7.452 |  19.00   1.813
00906>              1.25   1.108 |   7.25   2.014 |  13.25   5.236 |  19.25   1.813
00907>              1.50   1.108 |   7.50   2.014 |  13.50   5.639 |  19.50   1.813
00908>              1.75   1.108 |   7.75   2.014 |  13.75   4.229 |  19.75   1.813
00909>              2.00   1.108 |   8.00   2.014 |  14.00   4.229 |  20.00   1.813
00910>              2.25   1.309 |   8.25   2.719 |  14.25   3.021 |  20.25   1.208
00911>              2.50   1.309 |   8.50   2.719 |  14.50   3.021 |  20.50   1.208
00912>              2.75   1.309 |   8.75   2.719 |  14.75   3.021 |  20.75   1.208
00913>              3.00   1.309 |   9.00   2.719 |  15.00   3.021 |  21.00   1.208
00914>              3.25   1.309 |   9.25   3.222 |  15.25   3.021 |  21.25   1.208
00915>              3.50   1.309 |   9.50   3.222 |  15.50   3.021 |  21.50   1.208
00916>              3.75   1.309 |   9.75   3.625 |  15.75   3.021 |  21.75   1.208
00917>              4.00   1.309 |  10.00   3.625 |  16.00   3.021 |  22.00   1.208
00918>              4.25   1.611 |  10.25   4.632 |  16.25   1.813 |  22.25   1.208
00919>              4.50   1.611 |  10.50   4.632 |  16.50   1.813 |  22.50   1.208
00920>              4.75   1.611 |  10.75   6.243 |  16.75   1.813 |  22.75   1.208
00921>              5.00   1.611 |  11.00   6.243 |  17.00   1.813 |  23.00   1.208
00922>              5.25   1.611 |  11.25   9.667 |  17.25   1.813 |  23.25   1.208
00923>              5.50   1.611 |  11.50   9.667 |  17.50   1.813 |  23.50   1.208
00924>              5.75   1.611 |  11.75  41.891 |  17.75   1.813 |  23.75   1.208
00925>              6.00   1.611 |  12.00 111.173 |  18.00   1.813 |  24.00   1.208
00926>
00927> ---------------------------------------------------------------------------
00928> 005:0003-----------------------------------------------------------------
00929> *#-----------------|-------------------------------------------------------|
00930> *# Catchment North of Haldimand Road
00931> *#-----------------|-------------------------------------------------------|
00932> ---------------------
00933> | DESIGN NASHYD     |   Area    (ha)=   10.62   Curve Number   (CN)=81.00
00934> | 01:201    DT= 5.00 |   Ia      (mm)=   1.500   # of Linear Res.(N)= 3.00
00935> ---------------------   U.H. Tp(hrs)=   1.080
00936>
00937>      Unit Hyd Qpeak  (cms)=     .376
00938>
00939>      PEAK FLOW       (cms)=     .503 (i)
00940>      TIME TO PEAK    (hrs)=   13.000
00941>      RUNOFF VOLUME    (mm)=   61.976
00942>      TOTAL RAINFALL   (mm)=  100.699
00943>      RUNOFF COEFFICIENT   =     .615
00944>
00945>      (i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.
00946>
00947> ---------------------------------------------------------------------------
00948> 005:0004-----------------------------------------------------------------
00949> *#-----------------|-------------------------------------------------------|
00950> *# Catchment North of Haldimand Road
00951> *#-----------------|-------------------------------------------------------|
00952> ---------------------
00953> | DESIGN NASHYD     |   Area    (ha)=   18.25   Curve Number   (CN)=83.00
00954> | 02:202    DT= 5.00 |   Ia      (mm)=   1.500   # of Linear Res.(N)= 3.00
00955> ---------------------   U.H. Tp(hrs)=   1.230
00956>
00957>      Unit Hyd Qpeak  (cms)=     .567
00958>
00959>      PEAK FLOW       (cms)=     .826 (i)
00960>      TIME TO PEAK    (hrs)=   13.167
00961>      RUNOFF VOLUME    (mm)=   65.073
00962>      TOTAL RAINFALL   (mm)=  100.699
00963>      RUNOFF COEFFICIENT   =     .646
00964>
00965>      (i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.
00966>
00967> ---------------------------------------------------------------------------
00968> 005:0005-----------------------------------------------------------------
00969> *#-----------------|-------------------------------------------------------|
00970> *# Catchment North of Haldimand Road
00971> *#-----------------|-------------------------------------------------------|
00972> ---------------------
00973> | DESIGN STANDHYD   |   Area    (ha)=    2.53
00974> | 03:203    DT= 1.00 |   Total Imp(%)=   60.00   Dir. Conn.(%)=   60.00
00975> ---------------------
00976>                                IMPERVIOUS    PERVIOUS (i)
00977>      Surface Area      (ha)=       1.52         1.01
00978>      Dep. Storage      (mm)=        .80         1.50
00979>      Average Slope      (%)=        .43          .43
00980>      Length             (m)=     129.87        40.00
00981>      Mannings n              =       .013         .250
00982>
00983>      Max.eff.Inten.(mm/hr)=     111.17        79.08
00984>                  over (min)        4.00        16.00
00985>      Storage Coeff. (min)=       3.69 (ii)   15.98 (ii)
00986>      Unit Hyd. Tpeak (min)=      4.00        16.00
00987>      Unit Hyd. peak  (cms)=       .30          .07
00988>                                                          *TOTALS*
00989>      PEAK FLOW       (cms)=       .46          .14          .565 (iii)
00990>      TIME TO PEAK    (hrs)=     12.00        12.15        12.000
00991>      RUNOFF VOLUME    (mm)=     99.89        65.05        85.969
00992>      TOTAL RAINFALL   (mm)=    100.70       100.70       100.700
00993>      RUNOFF COEFFICIENT   =       .99          .65          .854
00994>
00995>        (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
00996>            CN* =  83.0    Ia = Dep. Storage  (Above)
00997>       (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
00998>            THAN THE STORAGE COEFFICIENT.
00999>      (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.
01000>
01001> ---------------------------------------------------------------------------
01002> 005:0006-----------------------------------------------------------------
01003> *#-----------------|-------------------------------------------------------|
01004> *# Catchment North of Haldimand Road
01005> *#-----------------|-------------------------------------------------------|
01006> ---------------------
01007> | DESIGN NASHYD     |   Area    (ha)=    3.20   Curve Number   (CN)=80.00
01008> | 04:204    DT= 5.00 |   Ia      (mm)=   1.500   # of Linear Res.(N)= 3.00
01009> ---------------------   U.H. Tp(hrs)=    .970
01010>
01011>      Unit Hyd Qpeak  (cms)=     .126
01012>
01013>      PEAK FLOW       (cms)=     .160 (i)
01014>      TIME TO PEAK    (hrs)=   12.917
01015>      RUNOFF VOLUME    (mm)=   60.482
01016>      TOTAL RAINFALL   (mm)=  100.699
01017>      RUNOFF COEFFICIENT   =     .601
01018>
01019>      (i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.
01020>
01021> ---------------------------------------------------------------------------
01022> 005:0007-----------------------------------------------------------------
01023> *#-----------------|-------------------------------------------------------|
01024> *# Dry End-of-Pipe SWM Facility
01025> *#-----------------|-------------------------------------------------------|
01026> ---------------------
01027> | ROUTE RESERVOIR   |    Requested routing time step =  1.0 min.
01028> |  IN>03:(203   )   |
01029> | OUT<05:(501   )   |    =========  OUTLFOW STORAGE TABLE  =========
01030> ---------------------    OUTFLOW    STORAGE   |  OUTFLOW    STORAGE
01031>                            (cms)    (ha.m.)   |    (cms)    (ha.m.)
01032>                            .000  .0000E+00   |     .111  .9710E-01
01033>                            .001  .1800E-02   |     .125  .1188E+00
01034>                            .002  .1040E-01   |     .138  .1411E+00
01035>                            .006  .1810E-01   |     .209  .1640E+00
01036>                            .014  .2770E-01   |     .336  .1876E+00
01037>                            .027  .3870E-01   |     .505  .2117E+00
01038>                            .044  .5090E-01   |     .713  .2365E+00
01039>                            .073  .6420E-01   |     .961  .2620E+00
01040>                            .094  .7880E-01   |     .000  .0000E+00
01041>
01042>      ROUTING RESULTS            AREA     QPEAK     TPEAK       R.V.
01043>      ---------------            (ha)     (cms)     (hrs)       (mm)
01044>      INFLOW >03: (203   )       2.53      .565    12.000     85.969
01045>      OUTFLOW<05: (501   )       2.53      .114    12.550     85.968
01046>
01047>                     PEAK   FLOW   REDUCTION [Qout/Qin](%)=   20.128
01048>                     TIME SHIFT OF PEAK FLOW          (min)=    33.00
01049>                     MAXIMUM  STORAGE   USED       (ha.m.)=.1014E+00
01050>
01051> ---------------------------------------------------------------------------
01052> 005:0008-----------------------------------------------------------------
01053> ---------------------
01054> | ADD HYD (401   ) | ID: NHYD     AREA     QPEAK   TPEAK   R.V.    DWF
01055> ---------------------              (ha)     (cms)   (hrs)   (mm)    (cms)
01056>                     ID1 01:201      10.62     .503   13.00  61.98    .000
01057>                   +ID2 02:202       18.25     .826   13.17  65.07    .000
01058>                   +ID3 04:204        3.20     .160   12.92  60.48    .000
01059>                   +ID4 05:501        2.53     .114   12.55  85.97    .000
01060>                    ================================================
01061>                    SUM 06:401       34.60    1.589   13.08  65.23    .000
01062>
01063>    NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.
01064>
01065> ---------------------------------------------------------------------------
01066> 005:0009-----------------------------------------------------------------
01067> *#-----------------|-------------------------------------------------------|
01068> ---------------------------------------------------------------------------
01069> 005:0002-----------------------------------------------------------------
01070> ---------------------------------------------------------------------------
01071> 005:0002-----------------------------------------------------------------
01072> ---------------------------------------------------------------------------
01073> 005:0002-----------------------------------------------------------------
01074> ---------------------------------------------------------------------------
01075> 005:0002-----------------------------------------------------------------
01076>   ** END OF RUN :   5
01077>
01078> ***************************************************************************
01079>
01080>
```

```
01081>
01082>
01083>
01084> --------------------
01085> | START            |  Project  dir.: C:\PROGRA~1\SWMHYMO\
01086> --------------------  Rainfall dir.: C:\PROGRA~1\SWMHYMO\
01087>     TZERO =   .00 hrs on      0
01088>     METOUT=   2 (output = METRIC)
01089>     NRUN  = 006
01090>     NSTORM=   1
01091>           #  1=si_100.STM
01092> ----------------------------------------------------------------------------
01093> 006:0002-------------------------------------------------------------------
01094> *#***************************************************************************
01095> *#  Project Name  : Grand Renewable Energy Park-Substation
01096> *#  Project Number: 1610-10624
01097> *#  Date          : 1-24-2011
01098> *#  Company       : Stantec Consulting Ltd. (Kitchener)
01099> *#  Modeller      : George Golding, EIT
01100> *#  Reviewed / Revised : S Robertson (Jan 31, 2011)
01101> *#  License #     :  4730904
01102> *#***************************************************************************
01103> *#  PROPOSED CONDITIONS
01104> *#***************************************************************************
01105> ----------------------------------------------------------------------------
01106> 006:0002-------------------------------------------------------------------
01107> --------------------
01108> | READ STORM       |    Filename: C:\PROGRA~1\SWMHYMO\si_100.STM
01109> | Ptotal= 110.60 mm|    Comments: SCS-II 24H 100-YEAR SIMCOE
01110> --------------------
01111>               TIME    RAIN |   TIME    RAIN |   TIME    RAIN |   TIME    RAIN
01112>                hrs   mm/hr |    hrs   mm/hr |    hrs   mm/hr |    hrs   mm/hr
01113>                .25   1.217 |   6.25   2.212 |  12.25  15.926 |  18.25   1.991
01114>                .50   1.217 |   6.50   2.212 |  12.50  15.926 |  18.50   1.991
01115>                .75   1.217 |   6.75   2.212 |  12.75   8.184 |  18.75   1.991
01116>               1.00   1.217 |   7.00   2.212 |  13.00   8.184 |  19.00   1.991
01117>               1.25   1.217 |   7.25   2.212 |  13.25   5.751 |  19.25   1.991
01118>               1.50   1.217 |   7.50   2.212 |  13.50   6.194 |  19.50   1.991
01119>               1.75   1.217 |   7.75   2.212 |  13.75   4.645 |  19.75   1.991
01120>               2.00   1.217 |   8.00   2.212 |  14.00   4.645 |  20.00   1.991
01121>               2.25   1.438 |   8.25   2.986 |  14.25   3.318 |  20.25   1.327
01122>               2.50   1.438 |   8.50   2.986 |  14.50   3.318 |  20.50   1.327
01123>               2.75   1.438 |   8.75   2.986 |  14.75   3.318 |  20.75   1.327
01124>               3.00   1.438 |   9.00   2.986 |  15.00   3.318 |  21.00   1.327
01125>               3.25   1.438 |   9.25   3.539 |  15.25   3.318 |  21.25   1.327
01126>               3.50   1.438 |   9.50   3.539 |  15.50   3.318 |  21.50   1.327
01127>               3.75   1.438 |   9.75   3.982 |  15.75   3.318 |  21.75   1.327
01128>               4.00   1.438 |  10.00   3.982 |  16.00   3.318 |  22.00   1.327
01129>               4.25   1.770 |  10.25   5.088 |  16.25   1.991 |  22.25   1.327
01130>               4.50   1.770 |  10.50   5.088 |  16.50   1.991 |  22.50   1.327
01131>               4.75   1.770 |  10.75   6.857 |  16.75   1.991 |  22.75   1.327
01132>               5.00   1.770 |  11.00   6.857 |  17.00   1.991 |  23.00   1.327
01133>               5.25   1.770 |  11.25  10.618 |  17.25   1.991 |  23.25   1.327
01134>               5.50   1.770 |  11.50  10.618 |  17.50   1.991 |  23.50   1.327
01135>               5.75   1.770 |  11.75  46.010 |  17.75   1.991 |  23.75   1.327
01136>               6.00   1.770 |  12.00 122.102 |  18.00   1.991 |  24.00   1.327
01137>
01138> ----------------------------------------------------------------------------
01139> 006:0003-------------------------------------------------------------------
01140> *#------------------|--------------------------------------------------------|
01141> *# Catchment North of Haldimand Road
01142> *#------------------|--------------------------------------------------------|
01143> ---------------------
01144> | DESIGN NASHYD      |   Area    (ha)=   10.62   Curve Number   (CN)=81.00
01145> | 01:201    DT= 5.00 |   Ia      (mm)=   1.500   # of Linear Res.(N)= 3.00
01146> ---------------------  U.H. Tp(hrs)=   1.080
01147>
01148>     Unit Hyd Qpeak  (cms)=     .376
01149>
01150>     PEAK FLOW       (cms)=     .574 (i)
01151>     TIME TO PEAK    (hrs)=   13.000
01152>     RUNOFF VOLUME    (mm)=   70.566
01153>     TOTAL RAINFALL   (mm)=  110.602
01154>     RUNOFF COEFFICIENT   =     .638
01155>
01156>     (i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.
01157>
01158> ----------------------------------------------------------------------------
01159> 006:0004-------------------------------------------------------------------
01160> *#------------------|--------------------------------------------------------|
01161> *# Catchment North of Haldimand Road
01162> *#------------------|--------------------------------------------------------|
01163> ---------------------
01164> | DESIGN NASHYD      |   Area    (ha)=   18.25   Curve Number   (CN)=83.00
01165> | 02:202    DT= 5.00 |   Ia      (mm)=   1.500   # of Linear Res.(N)= 3.00
01166> ---------------------  U.H. Tp(hrs)=   1.230
01167>
01168>     Unit Hyd Qpeak  (cms)=     .567
01169>
01170>     PEAK FLOW       (cms)=     .939 (i)
01171>     TIME TO PEAK    (hrs)=   13.167
01172>     RUNOFF VOLUME    (mm)=   73.875
01173>     TOTAL RAINFALL   (mm)=  110.602
01174>     RUNOFF COEFFICIENT   =     .668
01175>
01176>     (i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.
01177>
01178> ----------------------------------------------------------------------------
01179> 006:0005-------------------------------------------------------------------
01180> *#------------------|--------------------------------------------------------|
01181> *# Catchment North of Haldimand Road
01182> *#------------------|--------------------------------------------------------|
01183> ---------------------
01184> | DESIGN STANDHYD    |   Area    (ha)=    2.53
01185> | 03:203    DT= 1.00 |   Total Imp(%)=   60.00   Dir. Conn.(%)=   60.00
01186> ---------------------
01187>                              IMPERVIOUS    PERVIOUS (i)
01188>     Surface Area     (ha)=       1.52         1.01
01189>     Dep. Storage     (mm)=        .80         1.50
01190>     Average Slope     (%)=        .43          .43
01191>     Length            (m)=     129.87        40.00
01192>     Mannings n           =       .013         .250
01193>
01194>     Max.eff.Inten.(mm/hr)=     122.10        93.51
01195>                 over (min)       4.00        15.00
01196>     Storage Coeff.  (min)=       3.55 (ii)   15.05 (ii)
01197>     Unit Hyd. Tpeak (min)=       4.00        15.00
01198>     Unit Hyd. peak  (cms)=        .30          .08
01199>                                                      *TOTALS*
01200>     PEAK FLOW       (cms)=        .51          .16          .636 (iii)
01201>     TIME TO PEAK    (hrs)=      12.00        12.13        12.000
01202>     RUNOFF VOLUME    (mm)=     109.79        73.86        95.432
01203>     TOTAL RAINFALL   (mm)=     110.60       110.60       110.603
01204>     RUNOFF COEFFICIENT   =        .99          .67          .863
01205>
01206>       (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
01207>           CN* =  83.0   Ia = Dep. Storage  (Above)
01208>      (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
01209>           THAN THE STORAGE COEFFICIENT.
01210>     (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.
01211>
01212> ----------------------------------------------------------------------------
01213> 006:0006-------------------------------------------------------------------
01214> *#------------------|--------------------------------------------------------|
01215> *# Catchment North of Haldimand Road
01216> *#------------------|--------------------------------------------------------|
01217> ---------------------
01218> | DESIGN NASHYD      |   Area    (ha)=    3.20   Curve Number   (CN)=80.00
01219> | 04:204    DT= 5.00 |   Ia      (mm)=   1.500   # of Linear Res.(N)= 3.00
01220> ---------------------  U.H. Tp(hrs)=    .970
01221>
01222>     Unit Hyd Qpeak  (cms)=     .126
01223>
01224>     PEAK FLOW       (cms)=     .183 (i)
01225>     TIME TO PEAK    (hrs)=   12.917
01226>     RUNOFF VOLUME    (mm)=   68.963
01227>     TOTAL RAINFALL   (mm)=  110.602
01228>     RUNOFF COEFFICIENT   =     .624
01229>
01230>     (i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.
01231>
01232> ----------------------------------------------------------------------------
01233> 006:0007-------------------------------------------------------------------
01234> *#------------------|--------------------------------------------------------|
01235> *# Dry End-of-Pipe SWM Facility
01236> *#------------------|--------------------------------------------------------|
01237> ---------------------
01238> | ROUTE RESERVOIR    |    Requested routing time step =  1.0 min.
01239> |  IN>03:(203   )    |
01240> | OUT<05:(501   )    |    =========  OUTLFOW STORAGE TABLE  =========
01241> ---------------------    OUTFLOW    STORAGE   |  OUTFLOW    STORAGE
01242>                            (cms)     (ha.m.)   |    (cms)    (ha.m.)
01243>                             .000  .0000E+00    |     .111  .9710E-01
01244>                             .001  .1800E-02    |     .125  .1188E+00
01245>                             .002  .1040E-01    |     .138  .1411E+00
01246>                             .006  .1810E-01    |     .209  .1640E+00
01247>                             .014  .2770E-01    |     .336  .1876E+00
01248>                             .027  .3870E-01    |     .505  .2117E+00
01249>                             .044  .5090E-01    |     .713  .2365E+00
01250>                             .073  .6420E-01    |     .961  .2620E+00
01251>                             .094  .7880E-01    |     .000  .0000E+00
01252>
01253>     ROUTING RESULTS             AREA     QPEAK     TPEAK       R.V.
01254>     ---------------             (ha)     (cms)     (hrs)       (mm)
01255>     INFLOW >03: (203   )       2.53      .636    12.000     95.432
01256>     OUTFLOW<05: (501   )       2.53      .121    12.567     95.431
01257>
01258>                   PEAK   FLOW   REDUCTION [Qout/Qin](%)=   19.072
01259>                   TIME SHIFT OF PEAK FLOW          (min)=    34.00
01260>                   MAXIMUM  STORAGE   USED       (ha.m.)=.1130E+00
01261>
01262> ----------------------------------------------------------------------------
01263> 006:0008-------------------------------------------------------------------
01264> ---------------------
01265> | ADD HYD (401   ) | ID: NHYD     AREA     QPEAK   TPEAK   R.V.    DWF
01266> ---------------------              (ha)     (cms)   (hrs)   (mm)   (cms)
01267>                    ID1 01:201      10.62     .574   13.00  70.57    .000
01268>                  +ID2 02:202       18.25     .939   13.17  73.87    .000
01269>                  +ID3 04:204        3.20     .183   12.92  68.96    .000
01270>                  +ID4 05:501        2.53     .121   12.57  95.43    .000
01271>                   ================================================
01272>                   SUM 06:401       34.60    1.802   13.08  73.98    .000
01273>
01274>    NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.
01275>
01276> ----------------------------------------------------------------------------
01277> 006:0009-------------------------------------------------------------------
01278> *#------------------|--------------------------------------------------------|
01279> ----------------------------------------------------------------------------
01280> 006:0002-------------------------------------------------------------------
01281> ----------------------------------------------------------------------------
01282> 006:0002-------------------------------------------------------------------
01283> ----------------------------------------------------------------------------
01284> 006:0002-------------------------------------------------------------------
01285> ----------------------------------------------------------------------------
01286> 006:0002-------------------------------------------------------------------
01287> ----------------------------------------------------------------------------
01288> 006:0002-------------------------------------------------------------------
01289>       FINISH
01290> ----------------------------------------------------------------------------
01291> ****************************************************************************
01292>      WARNINGS / ERRORS / NOTES
01293>      -------------------------
01294>    Simulation ended on 2011-01-31     at 21:52:14
01295> ============================================================================
01296>
```

Grand Renewable Energy Park
Samsung Renewable Energy Inc.
Substation Facility SWM Drainage Area Characteristics and Storage Requirements

	Drainage Areas (See below)
Total Area Tributary to Basin (ha)	2.53
Tributary Area requiring quality control (ha)	2.03
MOE Quality Control Requirement	Basic
Basin Design	Dry Pond
[1]Quality Control Volume Requirement (m^3/ha)	213
Extended Detention - Quality Control (m^3)	433

[1] Based on MOE guidelines and overall percent impervious

Catchment Number	Area (ha)	% Imperv (XIMP)
203	2.53	60%
Quality Control Area	**2.03**	**75%**
Quantity Control Area	**2.53**	**60%**

Grand Renewable Energy Park
Samsung Renewable Energy Inc.
Substation Facility SWM Basin Stage-Storage-Discharge Calculations

Rating Curve

Elevation (m)	Discharge (m^3/s)	Active Storage (m^3)	Drawdown (hrs) Increment	Drawdown (hrs) Total
199.45				
199.50	0.001	4	2.9	2.9
199.55	0.001	18	3.2	6.2
199.60	0.002	48	5.1	11.3
199.65	0.002	104	7.7	19.0
199.70	0.006	181	5.6	24.6
199.75	0.014	277	2.7	27.4
199.80	0.027	387	1.5	28.9
199.85	0.044	509	1.0	29.8
199.90	0.073	642	0.6	30.5
199.95	0.094	788	0.5	30.9
200.00	0.111	971	0.5	31.4
200.05	0.125	1,188	0.5	31.9
200.10	0.138	1,411	0.5	32.4
200.15	0.209	1,640	0.4	32.8
200.20	0.336	1,876	0.2	33.0
200.25	0.505	2,117	0.2	33.2
200.30	0.713	2,365	0.1	33.3
200.35	0.961	2,620	0.1	33.4

Volume Estimation

Elevation (m)	Area (m^2)	Int. Vol (m^3)	Cum. Vol (m^3)
199.45			
199.50	175	4	4
199.55	350	13	18
199.60	860	30	48
199.65	1370	56	104
199.70	1735	78	181
199.75	2100	96	277
199.80	2315	110	387
199.85	2530	121	509
199.90	2795	133	642
199.95	3060	146	788
200.00	4270	183	971
200.05	4396	217	1188
200.10	4521	223	1411
200.15	4647	229	1640
200.20	4773	236	1876
200.25	4899	242	2117
200.30	5024	248	2365
200.35	5150	254	2620

Outlet Structure Controls

Elevation (m)	Orifice 1 (m^3/s)	Orifice 2 (m^3/s)	Weir (m^3/s)	Total Flow (m^3/s)
199.45				
199.50	0.001			0.001
199.55	0.001			0.001
199.60	0.002			0.002
199.65	0.002			0.002
199.70	0.002	0.003		0.006
199.75	0.003	0.011		0.014
199.80	0.003	0.024		0.027
199.85	0.003	0.040		0.044
199.90	0.003	0.070		0.073
199.95	0.004	0.090		0.094
200.00	0.004	0.107		0.111
200.05	0.004	0.121		0.125
200.10	0.004	0.134		0.138
200.15	0.004	0.146	0.059	0.209
200.20	0.004	0.157	0.175	0.336
200.25	0.005	0.167	0.333	0.505
200.30	0.005	0.176	0.532	0.713
200.35	0.005	0.185	0.770	0.961

Parameters	
Orifice 1	
Orifice Invert Elev. (m)	Orifice Coeff.
199.45	0.60
Orifice Mid-point Elev. (m)	Perimeter (m)
199.48	0.16
Orifice Diam.(mm)	Area (m^2)
50	0.002
Weir Coeff. (semi-circular)	Orientation
1.62	Vertical
Orifice 2	
Orifice Invert Elev. (m)	Orifice Coeff.
199.65	0.60
Orifice Mid-point Elev. (m)	Perimeter (m)
199.83	1.10
Orifice Diam.(mm)	Area (m^2)
350	0.096
Weir Coeff. (semi-circular)	Orientation
1.62	Vertical
Emergency Overflow Weir	
Weir Invert (m)	Weir Length m)
200.10	3.0
Weir Coeff. (rect.)	Side Slopes
1.70	(H:V) (?:1)
Weir Coeff. (tri.)	3.0
0.60	

Orifice Equation Used: Orifice flow equation

$Q = C \cdot A \cdot (2 \cdot g \cdot h)^{0.5}$

where

C = orifice coefficient
A = area of orifice
g = acceleration due to gravity

h = head above centre line of orifice

Note: Sharp crested weir equation with equivalent linear length used for calculating orifice flow rates when head is below centre line

Sharp crested semi-circular weir equation

$Q = C^* D^{2.5} * (H/D)^{1.88}$

where

C = sharp crested semi-circular weir coefficient
D = diameter of orifice

H = head above orifice invert

Note: used when water elevation is below mid-point of orifice

Broad Crested Weir Equation: $Q = (C_{rectangle} \cdot L \cdot H^{3/2}) + ((C_{triangle} \cdot (8/15 \cdot (2*g)^{1/2} \cdot \tan \Theta/2) \cdot H^{5/2})$

where

L = bottom width of weir
H = head above weir invert
S = side slopes (ratio of H:V)
$C_{triangle}$ = triangular weir coefficient

$C_{rectangle}$ = broad-crested rectangular weir coefficient

g = 9.81 m/s^2
$\Theta/2$ = angle formed by trapezoidal weir side slopes

Appendix C

Operations and Maintenance Facility Analyses

Grand Renewable Energy Park - O & M Facility
Samsung Renewable Energy Inc.
SCS Curve Number Determination
Existing Conditions

Site Soils: (as per Soil Survey Complex, OMAFRA / MNR, 2009)

Soil Type	**Hydrologic Soil Group**
Hal: Haldimand (clay)	C
Lic: Lincoln (clay)	D

TABLE OF CURVE NUMBERS (CN's)							
Land Use	Hydrologic Soil Type						
	A	AB	B	BC	C	CD	D
Meadow	50	54	58	64.5	71	74.5	78
Woodlot	50	55.3	60.5	67	73.5	76.8	80
Long Grass	55	60	65	72	79	81.5	84
Lawns	60	65.5	71	77	83	86	89
Pasture/Range	58	61.5	65	70.5	76	78.5	81
Crop	66	70	74	78	82	84	86
Fallow (Bare)	77	82	86	89	91	93	94
Wetland	50	50	50	50	50	50	50

HYDROLOGIC SOIL TYPE (%) - Existing Conditions								
Catchment	Hydrologic Soil Type							
	A	AB	B	BC	C	CD	D	TOTAL
101					100			100
102					93		7	100

LAND USE (%) - Existing Conditions									
Catchment	Meadow	Woodlot	Long Grass	Lawns	Pasture Range	Crop	Fallow (Bare)	Wetland	Total
101						100			100
102		4				96			100

CURVE NUMBER (CN) - Existing Conditions									
Catchment	Meadow	Woodlot	Long Grass	Lawns	Pasture Range	Crop	Fallow (Bare)	Wetland	Weighted CN
101	0	0	0	0	0	82	0	0	82
102	0	3	0	0	0	79	0	0	81

** post development catchments concerned with pervious CN values only
** AMC II assumed
** Hydrological Soil Group taken from OMAFRA website

Grand Renewable Energy Park - O & M Facility
Samsung Renewable Energy Inc.
SCS Curve Number Determination (Applies to Pervious Component of Developed Catchments Only)
Proposed Conditions

Site Soils: (as per Soil Survey Complex, OMAFRA / MNR, 2009)

Soil Type	**Hydrologic Soil Group**
Hal: Haldimand (clay)	C
Lic: Lincoln (clay)	D

TABLE OF CURVE NUMBERS (CN's)							
Land Use	Hydrologic Soil Type						
	A	AB	B	BC	C	CD	D
Meadow	50	54	58	64.5	71	74.5	78
Woodlot	50	55.3	60.5	67	73.5	76.8	80
Long Grass	55	60	65	72	79	81.5	84
Lawns	60	65.5	71	77	83	86	89
Pasture/Range	58	61.5	65	70.5	76	78.5	81
Crop	66	70	74	78	82	84	86
Fallow (Bare)	77	82	86	89	91	93	94
Wetland	50	50	50	50	50	50	50
Streets, paved	98	98	98	98	98	98	98

HYDROLOGIC SOIL TYPE (%) - Proposed Conditions								
Catchment	Hydrologic Soil Type							TOTAL
	A	AB	B	BC	C	CD	D	
201a					100			100
201b					100			100
202a					100			100
202b					87		13	100
202c					97		3	100

LAND USE (%) - Proposed Conditions									
Catchment	Meadow	Woodlot	Long Grass	Lawns	Pasture Range	Crop	Fallow (Bare)	Wetland	Total
201a			75			25			100
201b			100						100
202a		4	96						100
202b		7	93						100
202c			100						100

CURVE NUMBER (CN) - Proposed Conditions									
Catchment	Meadow	Woodlot	Long Grass	Lawns	Pasture Range	Crop	Fallow (Bare)	Wetland	Weighted CN
201a	0	0	59	0	0	21	0	0	80
201b	0	0	79	0	0	0	0	0	79
202a	0	3	76	0	0	0	0	0	79
202b	0	5	74	0	0	0	0	0	79
202c	0	0	79	0	0	0	0	0	79

** post development catchments concerned with pervious CN values only
** AMC II assumed
** Hydrological Soil Group taken from MTO Drainage Manual for each soil type

Grand Renewable Energy Park - O & M Facility
Samsung Renewable Energy Inc.
SWMHYMO Parameters

Existing Conditions

Catchment Number	Area Description	SWMHYMO Command	Area (ha)	CN	TIMP	XIMP	Slope (%)	Length (m)	Tc (hrs)	Tp (hrs)
101	Agricultural area draining to location of proposed access road	DESIGN NASHYD	11.1	82			0.60	500	1.29	0.78
102	Agricultural area draining to location of access road / solar module / O&M works	DESIGN NASHYD	13.8	81			0.90	650	1.29	0.77
		Total Area	24.9							

Proposed Conditions

Catchment Number	Area Description	SWMHYMO Command	Area (ha)	CN	TIMP	XIMP	Slope (%)	Length (m)	Tc (hrs)	Tp (hrs)
201a	Agricultural area to draining to diversion swale at east side of proposed access road	DESIGN NASHYD	10.9	80			0.60	470	1.25	0.75
201b	Access road right-of-way (most northerly 160 m stretch)	DESIGN STANDHYD	0.2	79	0.50	0.50	0.40	160	0.84	0.50
202a	Agricultural area draining to diversion swale at east side of access road / solar module	DESIGN NASHYD	6.3	79			0.60	470	1.25	0.75
202b	Southern 2/3 of access road, O&M facility, SWMF, and surrounding lands	DESIGN STANDHYD	5.8	79	0.50	0.50	0.90	450	1.07	0.64
202c	Solar module area draining to diversion swale at west side of module	DESIGN NASHYD	1.7	79			0.63	150	0.70	0.42
		Total Area	24.9							

Notes:

CN calculated for pervious areas only for DESIGN STANDHYD. CN is a weighed average for DESIGN NASHYD

TIMP ..... *Total percent impervious*

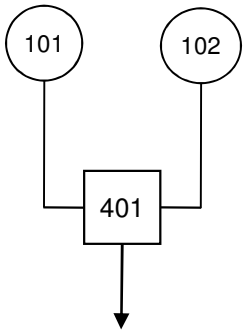
XIMP ..... *Directly connected percent impervious*

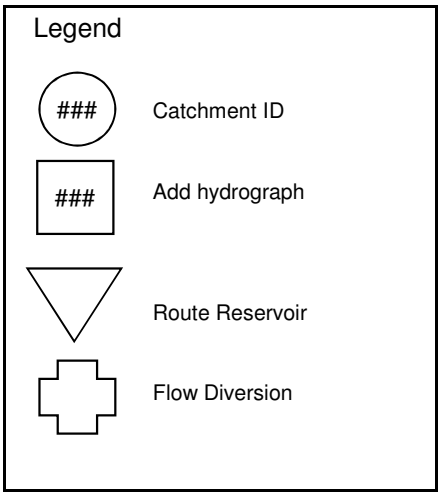
Time of Concentration calculated using the Airport Method ..... *Tc = [3.26 (1.1-C) $L^{0.5}$] / $S^{0.33}$*

Where: *C = Runoff Coefficient = 0.2 for undeveloped areas*
L = Length of Overland Flow (m)
= (Area/1.5)^0.5
S = Slope (%)

Time to Peak ..... *Tp = 0.6Tc*

Grand Renewable Energy Park - O & M Facility
Samsung Renewable Energy Inc.
Existing Conditions SYMHYMO Schematic





```
00001> 2     Metric units
00002> *#*************************************************************************
00003> *#  Project Name  : Grand Renewable Energy Park - O & M Facility
00004> *#  Project Number: 1610-10624
00005> *#  Date          : 1-27-2011
00006> *#  Company       : Stantec Consulting Ltd. (Kitchener)
00007> *#  Modeller      : S Robertson
00008> *#  License #     : 4730904
00009> *#*************************************************************************
00010> *#  EXISTING CONDITIONS
00011> *#*************************************************************************
00012> START                TZERO=[0.0],  METOUT=[2],  NSTORM=[1],  NRUN=[1]
00013> *%                   ["si_2.STM"] <--storm filename, one per line for NSTORM time
00014> *%-----------------|-------------------------------------------------------|
00015> READ STORM           STORM_FILENAME=["STORM.001"]
00016> *#-----------------|-------------------------------------------------------|
00017> *# Agricultural area draining to location of proposed access road
00018> *#-----------------|-------------------------------------------------------|
00019> DESIGN NASHYD        ID=[1], NHYD=["101"], DT=[5]min, AREA=[11.10](ha),
00020>                      DWF=[0](cms), CN/C=[82], TP=[0.78]hrs,
00021>                      RAINFALL=[ ,  ,  ,  , ](mm/hr), END=-1
00022> *#-----------------|-------------------------------------------------------|
00023> *# Agricultural area draining to location of access road/solar module/O&M works
00024> *#-----------------|-------------------------------------------------------|
00025> DESIGN NASHYD        ID=[2], NHYD=["102"], DT=[5]min, AREA=[13.8](ha),
00026>                      DWF=[0](cms), CN/C=[81], TP=[0.77]hrs,
00027>                      RAINFALL=[ ,  ,  ,  , ](mm/hr), END=-1
00028> *#-----------------|-------------------------------------------------------|
00029> ADD HYD              IDsum=[3], NHYD=["401"], IDs to add=[1+2]
00030> *#-----------------|-------------------------------------------------------|
00031> START                TZERO=[0.0]hrs or date,  METOUT=[2],  NSTORM=[1],  NRUN=[2]
00032> *                    ["si_5.STM"] <--storm filename, one per line for NSTORM time
00033> *%-----------------|-------------------------------------------------------|
00034> START                TZERO=[0.0]hrs or date,  METOUT=[2],  NSTORM=[1],  NRUN=[3]
00035> *                    ["si_10.STM"] <--storm filename, one per line for NSTORM tim
00036> *%-----------------|-------------------------------------------------------|
00037> START                TZERO=[0.0]hrs or date,  METOUT=[2],  NSTORM=[1],  NRUN=[4]
00038> *                    ["si_25.STM"] <--storm filename, one per line for NSTORM tim
00039> *%-----------------|-------------------------------------------------------|
00040> START                TZERO=[0.0]hrs or date,  METOUT=[2],  NSTORM=[1],  NRUN=[5]
00041> *                    ["si_50.STM"] <--storm filename, one per line for NSTORM tim
00042> *%-----------------|-------------------------------------------------------|
00043> START                TZERO=[0.0]hrs or date,  METOUT=[2],  NSTORM=[1],  NRUN=[6]
00044> *                    ["si_100.STM"] <--storm filename, one per line for NSTORM ti
00045> *%-----------------|-------------------------------------------------------|
00046> FINISH
00047>
00048>
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00100>
```

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00001> ================================================================================
00002>
00003>  SSSSS  W   W  M   M  H   H  Y   Y  M   M   OOO        999    999  =========
00004>  S      W W W  MM MM  H   H   Y Y   MM MM  O   O      9   9  9   9
00005>  SSSSS  W W W  M M M  HHHHH    Y    M M M  O   O  ##  9   9  9   9 Ver. 4.02
00006>      S   W W   M   M  H   H    Y    M   M  O   O       9999   9999 July 1999
00007>  SSSSS   W W   M   M  H   H    Y    M   M   OOO           9      9 =========
00008>                                                       9   9  9   9 # 4730904
00009>       StormWater Management HYdrologic Model          999    999  =========
00010>
00011>  ********************************************************************************
00012>  ************************** SWMHYMO-99 Ver/4.02 ********************************
00013>  *******  A single event and continuous hydrologic simulation model  *******
00014>  *******     based on the principles of HYMO and its successors       *******
00015>  *******                  OTTHYMO-83 and OTTHYMO-89.                  *******
00016>  ********************************************************************************
00017>  ******* Distributed by:  J.F. Sabourin and Associates Inc.           *******
00018>  *******                  Ottawa,  Ontario: (613) 727-5199           *******
00019>  *******                  Gatineau, Quebec: (819) 243-6858           *******
00020>  *******                  E-Mail: swmhymo@jfsa.com                   *******
00021>  ********************************************************************************
00022>
00023>  ++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
00024>  +++++++ Licensed user: Stantec Consulting Ltd. (Kitchener)          +++++++
00025>  +++++++                Kitchener            SERIAL#:4730904        +++++++
00026>  ++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
00027>
00028>  ********************************************************************************
00029>  *******           ++++++ PROGRAM ARRAY DIMENSIONS ++++++                *******
00030>  *******           Maximum value for ID numbers  :     10               *******
00031>  *******           Max. number of rainfall points:  15000               *******
00032>  *******           Max. number of flow points    :  15000               *******
00033>  ********************************************************************************
00034>
00035>
00036>  ********************   D E T A I L E D   O U T P U T   **********************
00037>  ********************************************************************************
00038>  *       DATE: 2011-01-27     TIME: 22:38:46     RUN COUNTER: 001059       *
00039>  ********************************************************************************
00040>  * Input   filename: C:\PROGRA~1\SWMHYMO\OM_Ex.dat                         *
00041>  * Output  filename: C:\PROGRA~1\SWMHYMO\OM_Ex.out                         *
00042>  * Summary filename: C:\PROGRA~1\SWMHYMO\OM_Ex.sum                         *
00043>  * User comments:                                                          *
00044>  * 1:_____________________________________________________________________*
00045>  * 2:_____________________________________________________________________*
00046>  * 3:_____________________________________________________________________*
00047>  ********************************************************************************
00048>
00049> --------------------------------------------------------------------------------
00050> 001:0001-----------------------------------------------------------------------
00051> *#*****************************************************************************
00052> *#  Project Name  : Grand Renewable Energy Park - O & M Facility
00053> *#  Project Number: 1610-10624
00054> *#  Date          : 1-27-2011
00055> *#  Company       : Stantec Consulting Ltd. (Kitchener)
00056> *#  Modeller      : S Robertson
00057> *#  License #     : 4730904
00058> *#*****************************************************************************
00059> *#  EXISTING CONDITIONS
00060> *#*****************************************************************************
00061> --------------------
00062> | START            |  Project  dir.: C:\PROGRA~1\SWMHYMO\
00063> --------------------  Rainfall dir.: C:\PROGRA~1\SWMHYMO\
00064>     TZERO =   .00 hrs on       0
00065>     METOUT=   2 (output = METRIC)
00066>     NRUN  = 001
00067>     NSTORM=   1
00068>               #  1=si_2.STM
00069> --------------------------------------------------------------------------------
00070> 002:0002-----------------------------------------------------------------------
00071> --------------------
00072> | READ STORM       |    Filename: C:\PROGRA~1\SWMHYMO\si_2.STM
00073> | Ptotal=  50.70 mm|    Comments: SCS-II 24H 2-YEAR SIMCOE
00074> --------------------
00075>               TIME    RAIN |   TIME    RAIN |   TIME    RAIN |   TIME    RAIN
00076>                hrs   mm/hr |    hrs   mm/hr |    hrs   mm/hr |    hrs   mm/hr
00077>                .25    .558 |   6.25   1.014 |  12.25   7.301 |  18.25    .913
00078>                .50    .558 |   6.50   1.014 |  12.50   7.301 |  18.50    .913
00079>                .75    .558 |   6.75   1.014 |  12.75   3.752 |  18.75    .913
00080>               1.00    .558 |   7.00   1.014 |  13.00   3.752 |  19.00    .913
00081>               1.25    .558 |   7.25   1.014 |  13.25   2.636 |  19.25    .913
00082>               1.50    .558 |   7.50   1.014 |  13.50   2.839 |  19.50    .913
00083>               1.75    .558 |   7.75   1.014 |  13.75   2.129 |  19.75    .913
00084>               2.00    .558 |   8.00   1.014 |  14.00   2.129 |  20.00    .913
00085>               2.25    .659 |   8.25   1.369 |  14.25   1.521 |  20.25    .608
00086>               2.50    .659 |   8.50   1.369 |  14.50   1.521 |  20.50    .608
00087>               2.75    .659 |   8.75   1.369 |  14.75   1.521 |  20.75    .608
00088>               3.00    .659 |   9.00   1.369 |  15.00   1.521 |  21.00    .608
00089>               3.25    .659 |   9.25   1.622 |  15.25   1.521 |  21.25    .608
00090>               3.50    .659 |   9.50   1.622 |  15.50   1.521 |  21.50    .608
00091>               3.75    .659 |   9.75   1.825 |  15.75   1.521 |  21.75    .608
00092>               4.00    .659 |  10.00   1.825 |  16.00   1.521 |  22.00    .608
00093>               4.25    .811 |  10.25   2.332 |  16.25    .913 |  22.25    .608
00094>               4.50    .811 |  10.50   2.332 |  16.50    .913 |  22.50    .608
00095>               4.75    .811 |  10.75   3.143 |  16.75    .913 |  22.75    .608
00096>               5.00    .811 |  11.00   3.143 |  17.00    .913 |  23.00    .608
00097>               5.25    .811 |  11.25   4.867 |  17.25    .913 |  23.25    .608
00098>               5.50    .811 |  11.50   4.867 |  17.50    .913 |  23.50    .608
00099>               5.75    .811 |  11.75  21.091 |  17.75    .913 |  23.75    .608
00100>               6.00    .811 |  12.00  55.973 |  18.00    .913 |  24.00    .608
00101>
00102> --------------------------------------------------------------------------------
00103> 001:0003-----------------------------------------------------------------------
00104> *#------------------|-------------------------------------------------------|
00105> *# Agricultural area draining to location of proposed access road
00106> *#------------------|-------------------------------------------------------|
00107> ---------------------
00108> | DESIGN NASHYD      |   Area    (ha)=   11.10   Curve Number   (CN)=82.00
00109> | 01:101    DT= 5.00 |   Ia      (mm)=   1.500   # of Linear Res.(N)= 3.00
00110> ---------------------  U.H. Tp(hrs)=    .780
00111>
00112>      Unit Hyd Qpeak  (cms)=     .544
00113>
00114>      PEAK FLOW       (cms)=     .244 (i)
00115>      TIME TO PEAK    (hrs)=   12.667
00116>      RUNOFF VOLUME    (mm)=   23.063
00117>      TOTAL RAINFALL   (mm)=   50.699
00118>      RUNOFF COEFFICIENT   =     .455
00119>
00120>      (i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.
00121>
00122> --------------------------------------------------------------------------------
00123> 001:0004-----------------------------------------------------------------------
00124> *#------------------|-------------------------------------------------------|
00125> *# Agricultural area draining to location of access road/solar module/O&M works
00126> *#------------------|-------------------------------------------------------|
00127> ---------------------
00128> | DESIGN NASHYD      |   Area    (ha)=   13.80   Curve Number   (CN)=81.00
00129> | 02:102    DT= 5.00 |   Ia      (mm)=   1.500   # of Linear Res.(N)= 3.00
00130> ---------------------  U.H. Tp(hrs)=    .770
00131>
00132>      Unit Hyd Qpeak  (cms)=     .685
00133>
00134>      PEAK FLOW       (cms)=     .295 (i)
00135>      TIME TO PEAK    (hrs)=   12.667
00136>      RUNOFF VOLUME    (mm)=   22.252
00137>      TOTAL RAINFALL   (mm)=   50.699
00138>      RUNOFF COEFFICIENT   =     .439
00139>
00140>      (i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.
00141>
00142> --------------------------------------------------------------------------------
00143> 001:0005-----------------------------------------------------------------------
00144> *#------------------|-------------------------------------------------------|
00145> ---------------------
00146> | ADD HYD (401    ) | ID: NHYD     AREA     QPEAK   TPEAK   R.V.    DWF
00147> ---------------------      (ha)     (cms)   (hrs)   (mm)   (cms)
00148>                      ID1 01:101      11.10     .244   12.67  23.06    .000
00149>                    +ID2 02:102       13.80     .295   12.67  22.25    .000
00150>                     ================================================
00151>                     SUM 03:401       24.90     .539   12.67  22.61    .000
00152>
00153>    NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.
00154>
00155> --------------------------------------------------------------------------------
00156> 001:0006-----------------------------------------------------------------------
00157> *#------------------|-------------------------------------------------------|
00158>   ** END OF RUN :   1
00159>
00160> ********************************************************************************
00161>
00162>
00163>
00164>
00165>
00166> --------------------
00167> | START            |  Project  dir.: C:\PROGRA~1\SWMHYMO\
00168> --------------------  Rainfall dir.: C:\PROGRA~1\SWMHYMO\
00169>     TZERO =   .00 hrs on       0
00170>     METOUT=   2 (output = METRIC)
00171>     NRUN  = 002
00172>     NSTORM=   1
00173>               #  1=si_5.STM
00174> --------------------------------------------------------------------------------
00175> 002:0002-----------------------------------------------------------------------
00176> *#*****************************************************************************
00177> *#  Project Name  : Grand Renewable Energy Park - O & M Facility
00178> *#  Project Number: 1610-10624
00179> *#  Date          : 1-27-2011
00180> *#  Company       : Stantec Consulting Ltd. (Kitchener)
00181> *#  Modeller      : S Robertson
00182> *#  License #     : 4730904
00183> *#*****************************************************************************
00184> *#  EXISTING CONDITIONS
00185> *#*****************************************************************************
00186> --------------------------------------------------------------------------------
00187> 002:0002-----------------------------------------------------------------------
00188> --------------------
00189> | READ STORM       |    Filename: C:\PROGRA~1\SWMHYMO\si_5.STM
00190> | Ptotal=  66.80 mm|    Comments: SCS-II 24H 5-YEAR SIMCOE
00191> --------------------
00192>               TIME    RAIN |   TIME    RAIN |   TIME    RAIN |   TIME    RAIN
00193>                hrs   mm/hr |    hrs   mm/hr |    hrs   mm/hr |    hrs   mm/hr
00194>                .25    .735 |   6.25   1.336 |  12.25   9.619 |  18.25   1.202
00195>                .50    .735 |   6.50   1.336 |  12.50   9.619 |  18.50   1.202
00196>                .75    .735 |   6.75   1.336 |  12.75   4.943 |  18.75   1.202
00197>               1.00    .735 |   7.00   1.336 |  13.00   4.943 |  19.00   1.202
00198>               1.25    .735 |   7.25   1.336 |  13.25   3.474 |  19.25   1.202
00199>               1.50    .735 |   7.50   1.336 |  13.50   3.741 |  19.50   1.202
00200>               1.75    .735 |   7.75   1.336 |  13.75   2.806 |  19.75   1.202
00201>               2.00    .735 |   8.00   1.336 |  14.00   2.806 |  20.00   1.202
00202>               2.25    .868 |   8.25   1.804 |  14.25   2.004 |  20.25    .802
00203>               2.50    .868 |   8.50   1.804 |  14.50   2.004 |  20.50    .802
00204>               2.75    .868 |   8.75   1.804 |  14.75   2.004 |  20.75    .802
00205>               3.00    .868 |   9.00   1.804 |  15.00   2.004 |  21.00    .802
00206>               3.25    .868 |   9.25   2.138 |  15.25   2.004 |  21.25    .802
00207>               3.50    .868 |   9.50   2.138 |  15.50   2.004 |  21.50    .802
00208>               3.75    .868 |   9.75   2.405 |  15.75   2.004 |  21.75    .802
00209>               4.00    .868 |  10.00   2.405 |  16.00   2.004 |  22.00    .802
00210>               4.25   1.069 |  10.25   3.073 |  16.25   1.202 |  22.25    .802
00211>               4.50   1.069 |  10.50   3.073 |  16.50   1.202 |  22.50    .802
00212>               4.75   1.069 |  10.75   4.142 |  16.75   1.202 |  22.75    .802
00213>               5.00   1.069 |  11.00   4.142 |  17.00   1.202 |  23.00    .802
00214>               5.25   1.069 |  11.25   6.413 |  17.25   1.202 |  23.25    .802
00215>               5.50   1.069 |  11.50   6.413 |  17.50   1.202 |  23.50    .802
00216>               5.75   1.069 |  11.75  27.789 |  17.75   1.202 |  23.75    .802
00217>               6.00   1.069 |  12.00  73.747 |  18.00   1.202 |  24.00    .802
00218>
00219> --------------------------------------------------------------------------------
00220> 002:0003-----------------------------------------------------------------------
00221> *#------------------|-------------------------------------------------------|
00222> *# Agricultural area draining to location of proposed access road
00223> *#------------------|-------------------------------------------------------|
00224> ---------------------
00225> | DESIGN NASHYD      |   Area    (ha)=   11.10   Curve Number   (CN)=82.00
00226> | 01:101    DT= 5.00 |   Ia      (mm)=   1.500   # of Linear Res.(N)= 3.00
00227> ---------------------  U.H. Tp(hrs)=    .780
00228>
00229>      Unit Hyd Qpeak  (cms)=     .544
00230>
00231>      PEAK FLOW       (cms)=     .377 (i)
00232>      TIME TO PEAK    (hrs)=   12.667
00233>      RUNOFF VOLUME    (mm)=   35.225
00234>      TOTAL RAINFALL   (mm)=   66.801
00235>      RUNOFF COEFFICIENT   =     .527
00236>
00237>      (i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.
00238>
00239> --------------------------------------------------------------------------------
00240> 002:0004-----------------------------------------------------------------------
00241> *#------------------|-------------------------------------------------------|
00242> *# Agricultural area draining to location of access road/solar module/O&M works
00243> *#------------------|-------------------------------------------------------|
00244> ---------------------
00245> | DESIGN NASHYD      |   Area    (ha)=   13.80   Curve Number   (CN)=81.00
00246> | 02:102    DT= 5.00 |   Ia      (mm)=   1.500   # of Linear Res.(N)= 3.00
00247> ---------------------  U.H. Tp(hrs)=    .770
00248>
00249>      Unit Hyd Qpeak  (cms)=     .685
00250>
00251>      PEAK FLOW       (cms)=     .458 (i)
00252>      TIME TO PEAK    (hrs)=   12.667
00253>      RUNOFF VOLUME    (mm)=   34.146
00254>      TOTAL RAINFALL   (mm)=   66.801
00255>      RUNOFF COEFFICIENT   =     .511
00256>
00257>      (i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.
00258>
00259> --------------------------------------------------------------------------------
00260> 002:0005-----------------------------------------------------------------------
00261> *#------------------|-------------------------------------------------------|
00262> ---------------------
00263> | ADD HYD (401    ) | ID: NHYD     AREA     QPEAK   TPEAK   R.V.    DWF
00264> ---------------------      (ha)     (cms)   (hrs)   (mm)   (cms)
00265>                      ID1 01:101      11.10     .377   12.67  35.23    .000
00266>                    +ID2 02:102       13.80     .458   12.67  34.15    .000
00267>                     ================================================
00268>                     SUM 03:401       24.90     .835   12.67  34.63    .000
00269>
00270>    NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.
```

```
00271>
00272> ------------------------------------------------------------------------------
00273> 002:0006------------------------------------------------------------------------
00274> *#------------------|-----------------------------------------------------------|
00275> ------------------------------------------------------------------------------
00276> 002:0002------------------------------------------------------------------------
00277>   ** END OF RUN :   2
00278>
00279> ******************************************************************************
00280>
00281>
00282>
00283>
00284>
00285> --------------------
00286> | START            |  Project  dir.: C:\PROGRA~1\SWMHYMO\
00287> --------------------  Rainfall dir.: C:\PROGRA~1\SWMHYMO\
00288>     TZERO =   .00 hrs on       0
00289>     METOUT=   2 (output = METRIC)
00290>     NRUN  = 003
00291>     NSTORM=   1
00292>              #  1=si_10.STM
00293> ------------------------------------------------------------------------------
00294> 003:0002------------------------------------------------------------------------
00295> *#**************************************************************************
00296> *#  Project Name  : Grand Renewable Energy Park - O & M Facility
00297> *#  Project Number: 1610-10624
00298> *#  Date          : 1-27-2011
00299> *#  Company       : Stantec Consulting Ltd. (Kitchener)
00300> *#  Modeller      : S Robertson
00301> *#  License #     : 4730904
00302> *#**************************************************************************
00303> *#  EXISTING CONDITIONS
00304> *#**************************************************************************
00305> ------------------------------------------------------------------------------
00306> 003:0002------------------------------------------------------------------------
00307> --------------------
00308> | READ STORM       |    Filename: C:\PROGRA~1\SWMHYMO\si_10.STM
00309> | Ptotal=  77.40 mm|    Comments: SCS-II 24H 10-YEAR SIMCOE
00310> --------------------
00311>               TIME    RAIN |   TIME    RAIN |   TIME    RAIN |   TIME    RAIN
00312>                hrs   mm/hr |    hrs   mm/hr |    hrs   mm/hr |    hrs   mm/hr
00313>                .25    .851 |   6.25   1.548 |  12.25  11.146 |  18.25   1.393
00314>                .50    .851 |   6.50   1.548 |  12.50  11.146 |  18.50   1.393
00315>                .75    .851 |   6.75   1.548 |  12.75   5.728 |  18.75   1.393
00316>               1.00    .851 |   7.00   1.548 |  13.00   5.728 |  19.00   1.393
00317>               1.25    .851 |   7.25   1.548 |  13.25   4.025 |  19.25   1.393
00318>               1.50    .851 |   7.50   1.548 |  13.50   4.334 |  19.50   1.393
00319>               1.75    .851 |   7.75   1.548 |  13.75   3.251 |  19.75   1.393
00320>               2.00    .851 |   8.00   1.548 |  14.00   3.251 |  20.00   1.393
00321>               2.25   1.006 |   8.25   2.090 |  14.25   2.322 |  20.25    .929
00322>               2.50   1.006 |   8.50   2.090 |  14.50   2.322 |  20.50    .929
00323>               2.75   1.006 |   8.75   2.090 |  14.75   2.322 |  20.75    .929
00324>               3.00   1.006 |   9.00   2.090 |  15.00   2.322 |  21.00    .929
00325>               3.25   1.006 |   9.25   2.477 |  15.25   2.322 |  21.25    .929
00326>               3.50   1.006 |   9.50   2.477 |  15.50   2.322 |  21.50    .929
00327>               3.75   1.006 |   9.75   2.786 |  15.75   2.322 |  21.75    .929
00328>               4.00   1.006 |  10.00   2.786 |  16.00   2.322 |  22.00    .929
00329>               4.25   1.238 |  10.25   3.560 |  16.25   1.393 |  22.25    .929
00330>               4.50   1.238 |  10.50   3.560 |  16.50   1.393 |  22.50    .929
00331>               4.75   1.238 |  10.75   4.799 |  16.75   1.393 |  22.75    .929
00332>               5.00   1.238 |  11.00   4.799 |  17.00   1.393 |  23.00    .929
00333>               5.25   1.238 |  11.25   7.430 |  17.25   1.393 |  23.25    .929
00334>               5.50   1.238 |  11.50   7.430 |  17.50   1.393 |  23.50    .929
00335>               5.75   1.238 |  11.75  32.198 |  17.75   1.393 |  23.75    .929
00336>               6.00   1.238 |  12.00  85.450 |  18.00   1.393 |  24.00    .929
00337>
00338> ------------------------------------------------------------------------------
00339> 003:0003------------------------------------------------------------------------
00340> *#------------------|-----------------------------------------------------------|
00341> *# Agricultural area draining to location of proposed access road
00342> *#------------------|-----------------------------------------------------------|
00343> ----------------------
00344> | DESIGN NASHYD      |   Area    (ha)=   11.10   Curve Number   (CN)=82.00
00345> | 01:101    DT= 5.00 |   Ia      (mm)=   1.500   # of Linear Res.(N)= 3.00
00346> ----------------------  U.H. Tp(hrs)=    .780
00347>
00348>     Unit Hyd Qpeak  (cms)=     .544
00349>
00350>     PEAK FLOW       (cms)=     .471 (i)
00351>     TIME TO PEAK    (hrs)=   12.667
00352>     RUNOFF VOLUME    (mm)=   43.755
00353>     TOTAL RAINFALL   (mm)=   77.398
00354>     RUNOFF COEFFICIENT   =     .565
00355>
00356>     (i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.
00357>
00358> ------------------------------------------------------------------------------
00359> 003:0004------------------------------------------------------------------------
00360> *#------------------|-----------------------------------------------------------|
00361> *# Agricultural area draining to location of access road/solar module/O&M works
00362> *#------------------|-----------------------------------------------------------|
00363> ----------------------
00364> | DESIGN NASHYD      |   Area    (ha)=   13.80   Curve Number   (CN)=81.00
00365> | 02:102    DT= 5.00 |   Ia      (mm)=   1.500   # of Linear Res.(N)= 3.00
00366> ----------------------  U.H. Tp(hrs)=    .770
00367>
00368>     Unit Hyd Qpeak  (cms)=     .685
00369>
00370>     PEAK FLOW       (cms)=     .573 (i)
00371>     TIME TO PEAK    (hrs)=   12.667
00372>     RUNOFF VOLUME    (mm)=   42.520
00373>     TOTAL RAINFALL   (mm)=   77.398
00374>     RUNOFF COEFFICIENT   =     .549
00375>
00376>     (i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.
00377>
00378> ------------------------------------------------------------------------------
00379> 003:0005------------------------------------------------------------------------
00380> *#------------------|-----------------------------------------------------------|
00381> --------------------
00382> | ADD HYD (401   ) | ID: NHYD     AREA     QPEAK   TPEAK   R.V.    DWF
00383> --------------------              (ha)     (cms)   (hrs)   (mm)   (cms)
00384>                  ID1 01:101       11.10     .471   12.67  43.76    .000
00385>                 +ID2 02:102       13.80     .573   12.67  42.52    .000
00386>                  ==========================================================
00387>                  SUM 03:401       24.90    1.043   12.67  43.07    .000
00388>
00389>    NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.
00390>
00391> ------------------------------------------------------------------------------
00392> 003:0006------------------------------------------------------------------------
00393> *#------------------|-----------------------------------------------------------|
00394> ------------------------------------------------------------------------------
00395> 003:0002------------------------------------------------------------------------
00396> ------------------------------------------------------------------------------
00397> 003:0002------------------------------------------------------------------------
00398>   ** END OF RUN :   3
00399>
00400> ******************************************************************************
00401>
00402>
00403>
00404>
00405>
00406> --------------------
00407> | START            |  Project  dir.: C:\PROGRA~1\SWMHYMO\
00408> --------------------  Rainfall dir.: C:\PROGRA~1\SWMHYMO\
00409>     TZERO =   .00 hrs on       0
00410>     METOUT=   2 (output = METRIC)
00411>     NRUN  = 004
00412>     NSTORM=   1
00413>              #  1=si_25.STM
00414> ------------------------------------------------------------------------------
00415> 004:0002------------------------------------------------------------------------
00416> *#**************************************************************************
00417> *#  Project Name  : Grand Renewable Energy Park - O & M Facility
00418> *#  Project Number: 1610-10624
00419> *#  Date          : 1-27-2011
00420> *#  Company       : Stantec Consulting Ltd. (Kitchener)
00421> *#  Modeller      : S Robertson
00422> *#  License #     : 4730904
00423> *#**************************************************************************
00424> *#  EXISTING CONDITIONS
00425> *#**************************************************************************
00426> ------------------------------------------------------------------------------
00427> 004:0002------------------------------------------------------------------------
00428> --------------------
00429> | READ STORM       |    Filename: C:\PROGRA~1\SWMHYMO\si_25.STM
00430> | Ptotal=  90.80 mm|    Comments: SCS-II 24H 25-YEAR SIMCOE
00431> --------------------
00432>               TIME    RAIN |   TIME    RAIN |   TIME    RAIN |   TIME    RAIN
00433>                hrs   mm/hr |    hrs   mm/hr |    hrs   mm/hr |    hrs   mm/hr
00434>                .25    .999 |   6.25   1.816 |  12.25  13.075 |  18.25   1.634
00435>                .50    .999 |   6.50   1.816 |  12.50  13.075 |  18.50   1.634
00436>                .75    .999 |   6.75   1.816 |  12.75   6.719 |  18.75   1.634
00437>               1.00    .999 |   7.00   1.816 |  13.00   6.719 |  19.00   1.634
00438>               1.25    .999 |   7.25   1.816 |  13.25   4.722 |  19.25   1.634
00439>               1.50    .999 |   7.50   1.816 |  13.50   5.085 |  19.50   1.634
00440>               1.75    .999 |   7.75   1.816 |  13.75   3.814 |  19.75   1.634
00441>               2.00    .999 |   8.00   1.816 |  14.00   3.814 |  20.00   1.634
00442>               2.25   1.180 |   8.25   2.452 |  14.25   2.724 |  20.25   1.090
00443>               2.50   1.180 |   8.50   2.452 |  14.50   2.724 |  20.50   1.090
00444>               2.75   1.180 |   8.75   2.452 |  14.75   2.724 |  20.75   1.090
00445>               3.00   1.180 |   9.00   2.452 |  15.00   2.724 |  21.00   1.090
00446>               3.25   1.180 |   9.25   2.906 |  15.25   2.724 |  21.25   1.090
00447>               3.50   1.180 |   9.50   2.906 |  15.50   2.724 |  21.50   1.090
00448>               3.75   1.180 |   9.75   3.269 |  15.75   2.724 |  21.75   1.090
00449>               4.00   1.180 |  10.00   3.269 |  16.00   2.724 |  22.00   1.090
00450>               4.25   1.453 |  10.25   4.177 |  16.25   1.634 |  22.25   1.090
00451>               4.50   1.453 |  10.50   4.177 |  16.50   1.634 |  22.50   1.090
00452>               4.75   1.453 |  10.75   5.630 |  16.75   1.634 |  22.75   1.090
00453>               5.00   1.453 |  11.00   5.630 |  17.00   1.634 |  23.00   1.090
00454>               5.25   1.453 |  11.25   8.717 |  17.25   1.634 |  23.25   1.090
00455>               5.50   1.453 |  11.50   8.717 |  17.50   1.634 |  23.50   1.090
00456>               5.75   1.453 |  11.75  37.773 |  17.75   1.634 |  23.75   1.090
00457>               6.00   1.453 |  12.00 100.243 |  18.00   1.634 |  24.00   1.090
00458>
00459> ------------------------------------------------------------------------------
00460> 004:0003------------------------------------------------------------------------
00461> *#------------------|-----------------------------------------------------------|
00462> *# Agricultural area draining to location of proposed access road
00463> *#------------------|-----------------------------------------------------------|
00464> ----------------------
00465> | DESIGN NASHYD      |   Area    (ha)=   11.10   Curve Number   (CN)=82.00
00466> | 01:101    DT= 5.00 |   Ia      (mm)=   1.500   # of Linear Res.(N)= 3.00
00467> ----------------------  U.H. Tp(hrs)=    .780
00468>
00469>     Unit Hyd Qpeak  (cms)=     .544
00470>
00471>     PEAK FLOW       (cms)=     .594 (i)
00472>     TIME TO PEAK    (hrs)=   12.667
00473>     RUNOFF VOLUME    (mm)=   54.976
00474>     TOTAL RAINFALL   (mm)=   90.801
00475>     RUNOFF COEFFICIENT   =     .605
00476>
00477>     (i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.
00478>
00479> ------------------------------------------------------------------------------
00480> 004:0004------------------------------------------------------------------------
00481> *#------------------|-----------------------------------------------------------|
00482> *# Agricultural area draining to location of access road/solar module/O&M works
00483> *#------------------|-----------------------------------------------------------|
00484> ----------------------
00485> | DESIGN NASHYD      |   Area    (ha)=   13.80   Curve Number   (CN)=81.00
00486> | 02:102    DT= 5.00 |   Ia      (mm)=   1.500   # of Linear Res.(N)= 3.00
00487> ----------------------  U.H. Tp(hrs)=    .770
00488>
00489>     Unit Hyd Qpeak  (cms)=     .685
00490>
00491>     PEAK FLOW       (cms)=     .725 (i)
00492>     TIME TO PEAK    (hrs)=   12.667
00493>     RUNOFF VOLUME    (mm)=   53.564
00494>     TOTAL RAINFALL   (mm)=   90.801
00495>     RUNOFF COEFFICIENT   =     .590
00496>
00497>     (i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.
00498>
00499> ------------------------------------------------------------------------------
00500> 004:0005------------------------------------------------------------------------
00501> *#------------------|-----------------------------------------------------------|
00502> --------------------
00503> | ADD HYD (401   ) | ID: NHYD     AREA     QPEAK   TPEAK   R.V.    DWF
00504> --------------------              (ha)     (cms)   (hrs)   (mm)   (cms)
00505>                  ID1 01:101       11.10     .594   12.67  54.98    .000
00506>                 +ID2 02:102       13.80     .725   12.67  53.56    .000
00507>                  ==========================================================
00508>                  SUM 03:401       24.90    1.319   12.67  54.19    .000
00509>
00510>    NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.
00511>
00512> ------------------------------------------------------------------------------
00513> 004:0006------------------------------------------------------------------------
00514> *#------------------|-----------------------------------------------------------|
00515> ------------------------------------------------------------------------------
00516> 004:0002------------------------------------------------------------------------
00517> ------------------------------------------------------------------------------
00518> 004:0002------------------------------------------------------------------------
00519> ------------------------------------------------------------------------------
00520> 004:0002------------------------------------------------------------------------
00521>   ** END OF RUN :   4
00522>
00523> ******************************************************************************
00524>
00525>
00526>
00527>
00528>
00529> --------------------
00530> | START            |  Project  dir.: C:\PROGRA~1\SWMHYMO\
00531> --------------------  Rainfall dir.: C:\PROGRA~1\SWMHYMO\
00532>     TZERO =   .00 hrs on       0
00533>     METOUT=   2 (output = METRIC)
00534>     NRUN  = 005
00535>     NSTORM=   1
00536>              #  1=si_50.STM
00537> ------------------------------------------------------------------------------
00538> 005:0002------------------------------------------------------------------------
00539> *#**************************************************************************
00540> *#  Project Name  : Grand Renewable Energy Park - O & M Facility
```

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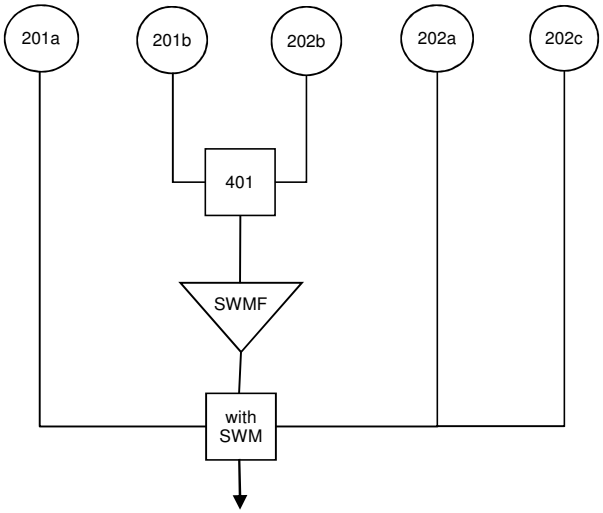
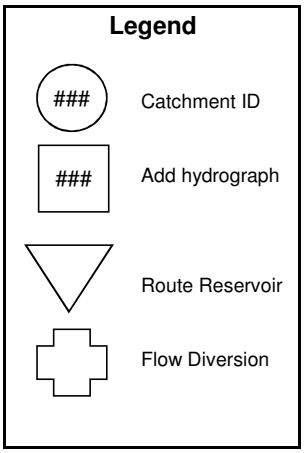
00541> *#  Project Number: 1610-10624
00542> *#  Date          : 1-27-2011
00543> *#  Company       : Stantec Consulting Ltd. (Kitchener)
00544> *#  Modeller      : S Robertson
00545> *#  License #     : 4730904
00546> *#*****************************************************************************
00547> *#  EXISTING CONDITIONS
00548> *#*****************************************************************************
00549> ------------------------------------------------------------------------------
00550> 005:0002----------
00551> --------------------
00552> | READ STORM       |    Filename: C:\PROGRA~1\SWMHYMO\si_50.STM
00553> | Ptotal= 100.70 mm|    Comments: SCS-II 24H 50-YEAR SIMCOE
00554> --------------------
00555>               TIME    RAIN |   TIME    RAIN |   TIME    RAIN |   TIME    RAIN
00556>                hrs   mm/hr |    hrs   mm/hr |    hrs   mm/hr |    hrs   mm/hr
00557>                .25   1.108 |   6.25   2.014 |  12.25  14.501 |  18.25   1.813
00558>                .50   1.108 |   6.50   2.014 |  12.50  14.501 |  18.50   1.813
00559>                .75   1.108 |   6.75   2.014 |  12.75   7.452 |  18.75   1.813
00560>               1.00   1.108 |   7.00   2.014 |  13.00   7.452 |  19.00   1.813
00561>               1.25   1.108 |   7.25   2.014 |  13.25   5.236 |  19.25   1.813
00562>               1.50   1.108 |   7.50   2.014 |  13.50   5.639 |  19.50   1.813
00563>               1.75   1.108 |   7.75   2.014 |  13.75   4.229 |  19.75   1.813
00564>               2.00   1.108 |   8.00   2.014 |  14.00   4.229 |  20.00   1.813
00565>               2.25   1.309 |   8.25   2.719 |  14.25   3.021 |  20.25   1.208
00566>               2.50   1.309 |   8.50   2.719 |  14.50   3.021 |  20.50   1.208
00567>               2.75   1.309 |   8.75   2.719 |  14.75   3.021 |  20.75   1.208
00568>               3.00   1.309 |   9.00   2.719 |  15.00   3.021 |  21.00   1.208
00569>               3.25   1.309 |   9.25   3.222 |  15.25   3.021 |  21.25   1.208
00570>               3.50   1.309 |   9.50   3.222 |  15.50   3.021 |  21.50   1.208
00571>               3.75   1.309 |   9.75   3.625 |  15.75   3.021 |  21.75   1.208
00572>               4.00   1.309 |  10.00   3.625 |  16.00   3.021 |  22.00   1.208
00573>               4.25   1.611 |  10.25   4.632 |  16.25   1.813 |  22.25   1.208
00574>               4.50   1.611 |  10.50   4.632 |  16.50   1.813 |  22.50   1.208
00575>               4.75   1.611 |  10.75   6.243 |  16.75   1.813 |  22.75   1.208
00576>               5.00   1.611 |  11.00   6.243 |  17.00   1.813 |  23.00   1.208
00577>               5.25   1.611 |  11.25   9.667 |  17.25   1.813 |  23.25   1.208
00578>               5.50   1.611 |  11.50   9.667 |  17.50   1.813 |  23.50   1.208
00579>               5.75   1.611 |  11.75  41.891 |  17.75   1.813 |  23.75   1.208
00580>               6.00   1.611 |  12.00 111.173 |  18.00   1.813 |  24.00   1.208
00581>
00582> ------------------------------------------------------------------------------
00583> 005:0003----------
00584> *#-----------------|------------------------------------------------------------|
00585> *# Agricultural area draining to location of proposed access road
00586> *#-----------------|------------------------------------------------------------|
00587> ----------------------
00588> | DESIGN NASHYD      |   Area    (ha)=   11.10   Curve Number   (CN)=82.00
00589> | 01:101    DT= 5.00 |   Ia      (mm)=   1.500   # of Linear Res.(N)= 3.00
00590> ----------------------  U.H. Tp(hrs)=    .780
00591>
00592>      Unit Hyd Qpeak  (cms)=     .544
00593>
00594>      PEAK FLOW       (cms)=     .687 (i)
00595>      TIME TO PEAK    (hrs)=   12.667
00596>      RUNOFF VOLUME    (mm)=   63.505
00597>      TOTAL RAINFALL   (mm)=  100.699
00598>      RUNOFF COEFFICIENT   =     .631
00599>
00600>      (i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.
00601>
00602> ------------------------------------------------------------------------------
00603> 005:0004----------
00604> *#-----------------|------------------------------------------------------------|
00605> *# Agricultural area draining to location of access road/solar module/O&M works
00606> *#-----------------|------------------------------------------------------------|
00607> ----------------------
00608> | DESIGN NASHYD      |   Area    (ha)=   13.80   Curve Number   (CN)=81.00
00609> | 02:102    DT= 5.00 |   Ia      (mm)=   1.500   # of Linear Res.(N)= 3.00
00610> ----------------------  U.H. Tp(hrs)=    .770
00611>
00612>      Unit Hyd Qpeak  (cms)=     .685
00613>
00614>      PEAK FLOW       (cms)=     .841 (i)
00615>      TIME TO PEAK    (hrs)=   12.667
00616>      RUNOFF VOLUME    (mm)=   61.976
00617>      TOTAL RAINFALL   (mm)=  100.699
00618>      RUNOFF COEFFICIENT   =     .615
00619>
00620>      (i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.
00621>
00622> ------------------------------------------------------------------------------
00623> 005:0005----------
00624> *#-----------------|------------------------------------------------------------|
00625> --------------------
00626> | ADD HYD (401   ) | ID: NHYD     AREA     QPEAK   TPEAK   R.V.    DWF
00627> --------------------                (ha)     (cms)   (hrs)   (mm)   (cms)
00628>                    ID1 01:101       11.10     .687   12.67  63.51    .000
00629>                   +ID2 02:102       13.80     .841   12.67  61.98    .000
00630>                    ================================================
00631>                    SUM 03:401       24.90    1.528   12.67  62.66    .000
00632>
00633>    NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.
00634>
00635> ------------------------------------------------------------------------------
00636> 005:0006----------
00637> *#-----------------|------------------------------------------------------------|
00638> ------------------------------------------------------------------------------
00639> 005:0002----------
00640> ------------------------------------------------------------------------------
00641> 005:0002----------
00642> ------------------------------------------------------------------------------
00643> 005:0002----------
00644> ------------------------------------------------------------------------------
00645> 005:0002----------
00646>   ** END OF RUN :   5
00647>
00648> ********************************************************************************
00649>
00650>
00651>
00652>
00653>
00654> --------------------
00655> | START            |  Project  dir.: C:\PROGRA~1\SWMHYMO\
00656> --------------------  Rainfall dir.: C:\PROGRA~1\SWMHYMO\
00657>      TZERO =   .00 hrs on      0
00658>      METOUT=   2 (output = METRIC)
00659>      NRUN  = 006
00660>      NSTORM=   1
00661>               #  1=si_100.STM
00662> ------------------------------------------------------------------------------
00663> 006:0002----------
00664> *#*****************************************************************************
00665> *#  Project Name  : Grand Renewable Energy Park - O & M Facility
00666> *#  Project Number: 1610-10624
00667> *#  Date          : 1-27-2011
00668> *#  Company       : Stantec Consulting Ltd. (Kitchener)
00669> *#  Modeller      : S Robertson
00670> *#  License #     : 4730904
00671> *#*****************************************************************************
00672> *#  EXISTING CONDITIONS
00673> *#*****************************************************************************
00674> ------------------------------------------------------------------------------
00675> 006:0002----------
00676> --------------------
00677> | READ STORM       |    Filename: C:\PROGRA~1\SWMHYMO\si_100.STM
00678> | Ptotal= 110.60 mm|    Comments: SCS-II 24H 100-YEAR SIMCOE
00679> --------------------
00680>               TIME    RAIN |   TIME    RAIN |   TIME    RAIN |   TIME    RAIN
00681>                hrs   mm/hr |    hrs   mm/hr |    hrs   mm/hr |    hrs   mm/hr
00682>                .25   1.217 |   6.25   2.212 |  12.25  15.926 |  18.25   1.991
00683>                .50   1.217 |   6.50   2.212 |  12.50  15.926 |  18.50   1.991
00684>                .75   1.217 |   6.75   2.212 |  12.75   8.184 |  18.75   1.991
00685>               1.00   1.217 |   7.00   2.212 |  13.00   8.184 |  19.00   1.991
00686>               1.25   1.217 |   7.25   2.212 |  13.25   5.751 |  19.25   1.991
00687>               1.50   1.217 |   7.50   2.212 |  13.50   6.194 |  19.50   1.991
00688>               1.75   1.217 |   7.75   2.212 |  13.75   4.645 |  19.75   1.991
00689>               2.00   1.217 |   8.00   2.212 |  14.00   4.645 |  20.00   1.991
00690>               2.25   1.438 |   8.25   2.986 |  14.25   3.318 |  20.25   1.327
00691>               2.50   1.438 |   8.50   2.986 |  14.50   3.318 |  20.50   1.327
00692>               2.75   1.438 |   8.75   2.986 |  14.75   3.318 |  20.75   1.327
00693>               3.00   1.438 |   9.00   2.986 |  15.00   3.318 |  21.00   1.327
00694>               3.25   1.438 |   9.25   3.539 |  15.25   3.318 |  21.25   1.327
00695>               3.50   1.438 |   9.50   3.539 |  15.50   3.318 |  21.50   1.327
00696>               3.75   1.438 |   9.75   3.982 |  15.75   3.318 |  21.75   1.327
00697>               4.00   1.438 |  10.00   3.982 |  16.00   3.318 |  22.00   1.327
00698>               4.25   1.770 |  10.25   5.088 |  16.25   1.991 |  22.25   1.327
00699>               4.50   1.770 |  10.50   5.088 |  16.50   1.991 |  22.50   1.327
00700>               4.75   1.770 |  10.75   6.857 |  16.75   1.991 |  22.75   1.327
00701>               5.00   1.770 |  11.00   6.857 |  17.00   1.991 |  23.00   1.327
00702>               5.25   1.770 |  11.25  10.618 |  17.25   1.991 |  23.25   1.327
00703>               5.50   1.770 |  11.50  10.618 |  17.50   1.991 |  23.50   1.327
00704>               5.75   1.770 |  11.75  46.010 |  17.75   1.991 |  23.75   1.327
00705>               6.00   1.770 |  12.00 122.102 |  18.00   1.991 |  24.00   1.327
00706>
00707> ------------------------------------------------------------------------------
00708> 006:0003----------
00709> *#-----------------|------------------------------------------------------------|
00710> *# Agricultural area draining to location of proposed access road
00711> *#-----------------|------------------------------------------------------------|
00712> ----------------------
00713> | DESIGN NASHYD      |   Area    (ha)=   11.10   Curve Number   (CN)=82.00
00714> | 01:101    DT= 5.00 |   Ia      (mm)=   1.500   # of Linear Res.(N)= 3.00
00715> ----------------------  U.H. Tp(hrs)=    .780
00716>
00717>      Unit Hyd Qpeak  (cms)=     .544
00718>
00719>      PEAK FLOW       (cms)=     .783 (i)
00720>      TIME TO PEAK    (hrs)=   12.667
00721>      RUNOFF VOLUME    (mm)=   72.203
00722>      TOTAL RAINFALL   (mm)=  110.602
00723>      RUNOFF COEFFICIENT   =     .653
00724>
00725>      (i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.
00726>
00727> ------------------------------------------------------------------------------
00728> 006:0004----------
00729> *#-----------------|------------------------------------------------------------|
00730> *# Agricultural area draining to location of access road/solar module/O&M works
00731> *#-----------------|------------------------------------------------------------|
00732> ----------------------
00733> | DESIGN NASHYD      |   Area    (ha)=   13.80   Curve Number   (CN)=81.00
00734> | 02:102    DT= 5.00 |   Ia      (mm)=   1.500   # of Linear Res.(N)= 3.00
00735> ----------------------  U.H. Tp(hrs)=    .770
00736>
00737>      Unit Hyd Qpeak  (cms)=     .685
00738>
00739>      PEAK FLOW       (cms)=     .959 (i)
00740>      TIME TO PEAK    (hrs)=   12.667
00741>      RUNOFF VOLUME    (mm)=   70.566
00742>      TOTAL RAINFALL   (mm)=  110.602
00743>      RUNOFF COEFFICIENT   =     .638
00744>
00745>      (i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.
00746>
00747> ------------------------------------------------------------------------------
00748> 006:0005----------
00749> *#-----------------|------------------------------------------------------------|
00750> --------------------
00751> | ADD HYD (401   ) | ID: NHYD     AREA     QPEAK   TPEAK   R.V.    DWF
00752> --------------------                (ha)     (cms)   (hrs)   (mm)   (cms)
00753>                    ID1 01:101       11.10     .783   12.67  72.20    .000
00754>                   +ID2 02:102       13.80     .959   12.67  70.57    .000
00755>                    ================================================
00756>                    SUM 03:401       24.90    1.742   12.67  71.30    .000
00757>
00758>    NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.
00759>
00760> ------------------------------------------------------------------------------
00761> 006:0006----------
00762> *#-----------------|------------------------------------------------------------|
00763> ------------------------------------------------------------------------------
00764> 006:0002----------
00765> ------------------------------------------------------------------------------
00766> 006:0002----------
00767> ------------------------------------------------------------------------------
00768> 006:0002----------
00769> ------------------------------------------------------------------------------
00770> 006:0002----------
00771> ------------------------------------------------------------------------------
00772> 006:0002----------
00773>       FINISH
00774> ------------------------------------------------------------------------------
00775> ********************************************************************************
00776>      WARNINGS / ERRORS / NOTES
00777>      -------------------------
00778>    Simulation ended on 2011-01-27     at 22:38:46
00779> ================================================================================
00780>
```

Grand Renewable Energy Park - O & M Facility
Samsung Renewable Energy Inc.
Proposed Conditions SYMHYMO Schematic





```
00001> 2     Metric units
00002> *#*************************************************************************
00003> *#  Project Name  : Grand Renewable Energy Park - O & M Facility
00004> *#  Project Number: 1610-10624
00005> *#  Date          : 1-27-2011
00006> *#  Company       : Stantec Consulting Ltd. (Kitchener)
00007> *#  Modeller      : S Robertson
00008> *#  License #     : 4730904
00009> *#*************************************************************************
00010> *#  PROPOSED CONDITIONS
00011> *#*************************************************************************
00012> START                TZERO=[0.0],  METOUT=[2],  NSTORM=[1],  NRUN=[1]
00013> *%                   ["si_2.STM"] <--storm filename, one per line for NSTORM time
00014> *%------------------|-----------------------------------------------------------|
00015> READ STORM           STORM_FILENAME=["STORM.001"]
00016> *#------------------|-----------------------------------------------------------|
00017> *# Agricultural area to draining to diversion swale at east side of access road
00018> *#------------------|-----------------------------------------------------------|
00019> DESIGN NASHYD        ID=[1], NHYD=["201a"], DT=[5]min, AREA=[10.9](ha),
00020>                      DWF=[0](cms), CN/C=[80], TP=[0.75]hrs,
00021>                      RAINFALL=[ ,  ,  ,  , ](mm/hr), END=-1
00022> *#------------------|-----------------------------------------------------------|
00023> *# Access road right-of-way (most northerly 160 m stretch)
00024> *#------------------|-----------------------------------------------------------|
00025> DESIGN STANDHYD      ID=[2], NHYD=["201b"], DT=[1]min, AREA=[0.2](ha),
00026>                      XIMP=[0.5], TIMP=[0.5], DWF=[0](cms), LOSS=[2], CN=[79],
00027>                      SLOPE=[0.6](%), RAINFALL=[ , , , , ](mm/hr), END=-1
00028> *#------------------|-----------------------------------------------------------|
00029> *# Agricultural area draining to diversion swale at access road/solar module
00030> *#------------------|-----------------------------------------------------------|
00031> DESIGN NASHYD        ID=[3], NHYD=["202a"], DT=[5]min, AREA=[6.3](ha),
00032>                      DWF=[0](cms), CN/C=[79], TP=[0.75]hrs,
00033>                      RAINFALL=[ ,  ,  ,  , ](mm/hr), END=-1
00034> *#------------------|-----------------------------------------------------------|
00035> *# Southern 2/3 of access road, O&M facility, SWMF, and surrounding lands
00036> *#------------------|-----------------------------------------------------------|
00037> DESIGN STANDHYD      ID=[4], NHYD=["202b"], DT=[1]min, AREA=[5.8](ha),
00038>                      XIMP=[0.5], TIMP=[0.5], DWF=[0](cms), LOSS=[2], CN=[79],
00039>                      SLOPE=[0.9](%), RAINFALL=[ , , , , ](mm/hr), END=-1
00040> *#------------------|-----------------------------------------------------------|
00041> *# Sum of flows to constructed wetland SWMF
00042> *#------------------|-----------------------------------------------------------|
00043> ADD HYD              IDsum=[5], NHYD=["401"], IDs to add=[2+4]
00044> *#------------------|-----------------------------------------------------------|
00045> *# Constructed wetland SWMF
00046> *#------------------|-----------------------------------------------------------|
00047> ROUTE RESERVOIR      IDout=[6],   NHYD=["DP1"],  IDin=[5],
00048>                      RDT=[1](min),
00049>                           TABLE of ( OUTFLOW-STORAGE ) values
00050>                                      (cms) - (ha-m)
00051>                                   [   0.0 ,  0.0 ]
00052>                                   [ 0.003 ,  0.0289 ]
00053>                                   [ 0.005 ,  0.0595 ]
00054>                                   [ 0.016 ,  0.0916 ]
00055>                                   [ 0.049 ,  0.1253 ]
00056>                                   [ 0.081 ,  0.1607 ]
00057>                                   [ 0.103 ,  0.1976 ]
00058>                                   [ 0.121 ,  0.2361 ]
00059>                                   [ 0.136 ,  0.2763 ]
00060>                                   [ 0.150 ,  0.3180 ]
00061>                                   [ 0.459 ,  0.3613 ]
00062>                                   [ 1.087 ,  0.4063 ]
00063>                                   [ 2.002 ,  0.4528 ]
00064>                                   [   -1  ,  -1  ]  (max twenty pts)
00065>                           IDovf=[   ], NHYDovf=[   ]
00066> *%------------------|-----------------------------------------------------------|
00067> *# Solar module area draining to diversion swale at west side of module
00068> *#------------------|-----------------------------------------------------------|
00069> DESIGN NASHYD        ID=[7], NHYD=["202c"], DT=[5]min, AREA=[1.70](ha),
00070>                      DWF=[0](cms), CN/C=[79], TP=[0.42]hrs,
00071>                      RAINFALL=[ ,  ,  ,  , ](mm/hr), END=-1
00072> *#------------------|-----------------------------------------------------------|
00073> ADD HYD              IDsum=[8], NHYD=["woutSWM"], IDs to add=[1+2+3+4+7]
00074> *#------------------|-----------------------------------------------------------|
00075> ADD HYD              IDsum=[10], NHYD=["withSWM"], IDs to add=[1+3+6+7]
00076> *#------------------|-----------------------------------------------------------|
00077> START                TZERO=[0.0]hrs or date,  METOUT=[2],  NSTORM=[1],  NRUN=[2]
00078> *                    ["si_5.STM"] <--storm filename, one per line for NSTORM time
00079> *%------------------|-----------------------------------------------------------|
00080> START                TZERO=[0.0]hrs or date,  METOUT=[2],  NSTORM=[1],  NRUN=[3]
00081> *                    ["si_10.STM"] <--storm filename, one per line for NSTORM tim
00082> *%------------------|-----------------------------------------------------------|
00083> START                TZERO=[0.0]hrs or date,  METOUT=[2],  NSTORM=[1],  NRUN=[4]
00084> *                    ["si_25.STM"] <--storm filename, one per line for NSTORM tim
00085> *%------------------|-----------------------------------------------------------|
00086> START                TZERO=[0.0]hrs or date,  METOUT=[2],  NSTORM=[1],  NRUN=[5]
00087> *                    ["si_50.STM"] <--storm filename, one per line for NSTORM tim
00088> *%------------------|-----------------------------------------------------------|
00089> START                TZERO=[0.0]hrs or date,  METOUT=[2],  NSTORM=[1],  NRUN=[6]
00090> *                    ["si_100.STM"] <--storm filename, one per line for NSTORM ti
00091> *%------------------|-----------------------------------------------------------|
00092> FINISH
00093>
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```

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00001> ================================================================================
00002>
00003>  SSSSS  W   W  M   M  H   H  Y   Y  M   M   OOO        999    999  =========
00004>  S      W W W  MM MM  H   H   Y Y   MM MM  O   O      9   9  9   9
00005>  SSSSS  W W W  M M M  HHHHH    Y    M M M  O   O  ##  9   9  9   9  Ver. 4.02
00006>      S   W W   M   M  H   H    Y    M   M  O   O       9999   9999  July 1999
00007>  SSSSS   W W   M   M  H   H    Y    M   M   OOO            9      9  =========
00008>                                                        9   9  9   9  # 4730904
00009>       StormWater Management HYdrologic Model            999    999  =========
00010>
00011>  ********************************************************************************
00012>  ************************** SWMHYMO-99 Ver/4.02 ********************************
00013>  *******  A single event and continuous hydrologic simulation model  *******
00014>  *******     based on the principles of HYMO and its successors       *******
00015>  *******                  OTTHYMO-83 and OTTHYMO-89.                  *******
00016>  ********************************************************************************
00017>  ******* Distributed by:  J.F. Sabourin and Associates Inc.           *******
00018>  *******                  Ottawa,  Ontario: (613) 727-5199           *******
00019>  *******                  Gatineau, Quebec: (819) 243-6858           *******
00020>  *******                  E-Mail: swmhymo@jfsa.com                   *******
00021>  ********************************************************************************
00022>
00023>  ++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
00024>  +++++++ Licensed user: Stantec Consulting Ltd. (Kitchener)          +++++++
00025>  +++++++                Kitchener              SERIAL#:4730904      +++++++
00026>  ++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
00027>
00028>  ********************************************************************************
00029>  *******           ++++++ PROGRAM ARRAY DIMENSIONS ++++++             *******
00030>  *******           Maximum value for ID numbers  :     10             *******
00031>  *******           Max. number of rainfall points:  15000             *******
00032>  *******           Max. number of flow points    :  15000             *******
00033>  ********************************************************************************
00034>
00035>
00036>  ********************   D E T A I L E D   O U T P U T   ********************
00037>  ********************************************************************************
00038>  *       DATE: 2011-01-28     TIME: 15:21:06     RUN COUNTER: 001065       *
00039>  ********************************************************************************
00040>  * Input   filename: C:\PROGRA~1\SWMHYMO\OM_Prop.dat                       *
00041>  * Output  filename: C:\PROGRA~1\SWMHYMO\OM_Prop.out                       *
00042>  * Summary filename: C:\PROGRA~1\SWMHYMO\OM_Prop.sum                       *
00043>  * User comments:                                                         *
00044>  * 1:_____________________________________________________________________*
00045>  * 2:_____________________________________________________________________*
00046>  * 3:_____________________________________________________________________*
00047>  ********************************************************************************
00048>
00049> --------------------------------------------------------------------------------
00050> 001:0001--------------------------------------------------------------------------
00051> *#*****************************************************************************
00052> *#  Project Name  : Grand Renewable Energy Park - O & M Facility
00053> *#  Project Number: 1610-10624
00054> *#  Date          : 1-27-2011
00055> *#  Company       : Stantec Consulting Ltd. (Kitchener)
00056> *#  Modeller      : S Robertson
00057> *#  License #     : 4730904
00058> *#*****************************************************************************
00059> *#  PROPOSED CONDITIONS
00060> *#*****************************************************************************
00061> --------------------
00062> | START            |  Project  dir.: C:\PROGRA~1\SWMHYMO\
00063> --------------------  Rainfall dir.: C:\PROGRA~1\SWMHYMO\
00064>     TZERO =   .00 hrs on       0
00065>     METOUT=   2 (output = METRIC)
00066>     NRUN  = 001
00067>     NSTORM=   1
00068>               #  1=si_2.STM
00069> --------------------------------------------------------------------------------
00070> 001:0002--------------------------------------------------------------------------
00071> --------------------
00072> | READ STORM       |    Filename: C:\PROGRA~1\SWMHYMO\si_2.STM
00073> | Ptotal=  50.70 mm|    Comments: SCS-II 24H 2-YEAR SIMCOE
00074> --------------------
00075>                TIME    RAIN |   TIME    RAIN |   TIME    RAIN |   TIME    RAIN
00076>                 hrs   mm/hr |    hrs   mm/hr |    hrs   mm/hr |    hrs   mm/hr
00077>                 .25    .558 |   6.25   1.014 |  12.25   7.301 |  18.25    .913
00078>                 .50    .558 |   6.50   1.014 |  12.50   7.301 |  18.50    .913
00079>                 .75    .558 |   6.75   1.014 |  12.75   3.752 |  18.75    .913
00080>                1.00    .558 |   7.00   1.014 |  13.00   3.752 |  19.00    .913
00081>                1.25    .558 |   7.25   1.014 |  13.25   2.636 |  19.25    .913
00082>                1.50    .558 |   7.50   1.014 |  13.50   2.839 |  19.50    .913
00083>                1.75    .558 |   7.75   1.014 |  13.75   2.129 |  19.75    .913
00084>                2.00    .558 |   8.00   1.014 |  14.00   2.129 |  20.00    .913
00085>                2.25    .659 |   8.25   1.369 |  14.25   1.521 |  20.25    .608
00086>                2.50    .659 |   8.50   1.369 |  14.50   1.521 |  20.50    .608
00087>                2.75    .659 |   8.75   1.369 |  14.75   1.521 |  20.75    .608
00088>                3.00    .659 |   9.00   1.369 |  15.00   1.521 |  21.00    .608
00089>                3.25    .659 |   9.25   1.622 |  15.25   1.521 |  21.25    .608
00090>                3.50    .659 |   9.50   1.622 |  15.50   1.521 |  21.50    .608
00091>                3.75    .659 |   9.75   1.825 |  15.75   1.521 |  21.75    .608
00092>                4.00    .659 |  10.00   1.825 |  16.00   1.521 |  22.00    .608
00093>                4.25    .811 |  10.25   2.332 |  16.25    .913 |  22.25    .608
00094>                4.50    .811 |  10.50   2.332 |  16.50    .913 |  22.50    .608
00095>                4.75    .811 |  10.75   3.143 |  16.75    .913 |  22.75    .608
00096>                5.00    .811 |  11.00   3.143 |  17.00    .913 |  23.00    .608
00097>                5.25    .811 |  11.25   4.867 |  17.25    .913 |  23.25    .608
00098>                5.50    .811 |  11.50   4.867 |  17.50    .913 |  23.50    .608
00099>                5.75    .811 |  11.75  21.091 |  17.75    .913 |  23.75    .608
00100>                6.00    .811 |  12.00  55.973 |  18.00    .913 |  24.00    .608
00101>
00102> --------------------------------------------------------------------------------
00103> 001:0003--------------------------------------------------------------------------
00104> *#----------------|-------------------------------------------------------------|
00105> *# Agricultural area to draining to diversion swale at east side of access road
00106> *#----------------|-------------------------------------------------------------|
00107> ---------------------
00108> | DESIGN NASHYD      |   Area    (ha)=   10.90   Curve Number   (CN)=80.00
00109> | 01:201a   DT= 5.00 |   Ia      (mm)=   1.500   # of Linear Res.(N)= 3.00
00110> ---------------------  U.H. Tp(hrs)=    .750
00111>
00112>     Unit Hyd Qpeak  (cms)=     .555
00113>
00114>     PEAK FLOW       (cms)=     .229 (i)
00115>     TIME TO PEAK    (hrs)=   12.667
00116>     RUNOFF VOLUME    (mm)=   21.478
00117>     TOTAL RAINFALL   (mm)=   50.699
00118>     RUNOFF COEFFICIENT   =     .424
00119>
00120>     (i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.
00121>
00122> --------------------------------------------------------------------------------
00123> 001:0004--------------------------------------------------------------------------
00124> *#----------------|-------------------------------------------------------------|
00125> *# Access road right-of-way (most northerly 160 m stretch)
00126> *#----------------|-------------------------------------------------------------|
00127> ---------------------
00128> | DESIGN STANDHYD    |   Area    (ha)=     .20
00129> | 02:201b   DT= 1.00 |   Total Imp(%)=   50.00   Dir. Conn.(%)=   50.00
00130> ---------------------
00131>                            IMPERVIOUS    PERVIOUS (i)
00132>     Surface Area     (ha)=        .10          .10
00133>     Dep. Storage     (mm)=        .80         1.50
00134>     Average Slope     (%)=        .60          .60
00135>     Length            (m)=      36.51        40.00
00136>     Mannings n              =       .013         .250
00137>
00138>     Max.eff.Inten.(mm/hr)=      55.97        20.81
00139>                 over (min)=       2.00        21.00
00140>     Storage Coeff.  (min)=       2.05 (ii)   21.03 (ii)
00141>     Unit Hyd. Tpeak (min)=       2.00        21.00
00142>     Unit Hyd. peak  (cms)=        .55          .05
00143>                                                          *TOTALS*
00144>     PEAK FLOW       (cms)=        .02          .00          .018 (iii)
00145>     TIME TO PEAK    (hrs)=      12.00        12.23        12.000
00146>     RUNOFF VOLUME    (mm)=      49.90        20.73        35.319
00147>     TOTAL RAINFALL   (mm)=      50.70        50.70        50.699
00148>     RUNOFF COEFFICIENT   =        .98          .41          .697
00149>
00150>       (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
00151>           CN* =  79.0    Ia = Dep. Storage  (Above)
00152>        (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
00153>             THAN THE STORAGE COEFFICIENT.
00154>     (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.
00155>
00156> --------------------------------------------------------------------------------
00157> 001:0005--------------------------------------------------------------------------
00158> *#----------------|-------------------------------------------------------------|
00159> *# Agricultural area draining to diversion swale at access road/solar module
00160> *#----------------|-------------------------------------------------------------|
00161> ---------------------
00162> | DESIGN NASHYD      |   Area    (ha)=    6.30   Curve Number   (CN)=79.00
00163> | 03:202a   DT= 5.00 |   Ia      (mm)=   1.500   # of Linear Res.(N)= 3.00
00164> ---------------------  U.H. Tp(hrs)=    .750
00165>
00166>     Unit Hyd Qpeak  (cms)=     .321
00167>
00168>     PEAK FLOW       (cms)=     .127 (i)
00169>     TIME TO PEAK    (hrs)=   12.667
00170>     RUNOFF VOLUME    (mm)=   20.738
00171>     TOTAL RAINFALL   (mm)=   50.699
00172>     RUNOFF COEFFICIENT   =     .409
00173>
00174>     (i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.
00175>
00176> --------------------------------------------------------------------------------
00177> 001:0006--------------------------------------------------------------------------
00178> *#----------------|-------------------------------------------------------------|
00179> *# Southern 2/3 of access road, O&M facility, SWMF, and surrounding lands
00180> *#----------------|-------------------------------------------------------------|
00181> ---------------------
00182> | DESIGN STANDHYD    |   Area    (ha)=    5.80
00183> | 04:202b   DT= 1.00 |   Total Imp(%)=   50.00   Dir. Conn.(%)=   50.00
00184> ---------------------
00185>                            IMPERVIOUS    PERVIOUS (i)
00186>     Surface Area     (ha)=       2.90         2.90
00187>     Dep. Storage     (mm)=        .80         1.50
00188>     Average Slope     (%)=        .90          .90
00189>     Length            (m)=     196.64        40.00
00190>     Mannings n              =       .013         .250
00191>
00192>     Max.eff.Inten.(mm/hr)=      55.97        20.19
00193>                 over (min)=       5.00        22.00
00194>     Storage Coeff.  (min)=       4.99 (ii)   22.00 (ii)
00195>     Unit Hyd. Tpeak (min)=       5.00        22.00
00196>     Unit Hyd. peak  (cms)=        .23          .05
00197>                                                          *TOTALS*
00198>     PEAK FLOW       (cms)=        .43          .10          .487 (iii)
00199>     TIME TO PEAK    (hrs)=      12.00        12.25        12.000
00200>     RUNOFF VOLUME    (mm)=      49.90        20.73        35.319
00201>     TOTAL RAINFALL   (mm)=      50.70        50.70        50.699
00202>     RUNOFF COEFFICIENT   =        .98          .41          .697
00203>
00204>       (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
00205>           CN* =  79.0    Ia = Dep. Storage  (Above)
00206>        (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
00207>             THAN THE STORAGE COEFFICIENT.
00208>     (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.
00209>
00210> --------------------------------------------------------------------------------
00211> 001:0007--------------------------------------------------------------------------
00212> *#----------------|-------------------------------------------------------------|
00213> *# Sum of flows to constructed wetland SWMF
00214> *#----------------|-------------------------------------------------------------|
00215> --------------------
00216> | ADD HYD (401    ) | ID: NHYD     AREA     QPEAK   TPEAK   R.V.    DWF
00217> --------------------          (ha)     (cms)   (hrs)   (mm)    (cms)
00218>                      ID1 02:201b       .20      .018   12.00  35.32    .000
00219>                    +ID2 04:202b       5.80      .487   12.00  35.32    .000
00220>                     ================================================
00221>                     SUM 05:401        6.00      .504   12.00  35.32    .000
00222>
00223>    NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.
00224>
00225> --------------------------------------------------------------------------------
00226> 001:0008--------------------------------------------------------------------------
00227> *#----------------|-------------------------------------------------------------|
00228> *# Constructed wetland SWMF
00229> *#----------------|-------------------------------------------------------------|
00230> ---------------------
00231> | ROUTE RESERVOIR    |    Requested routing time step =  1.0 min.
00232> |  IN>05:(401    )   |
00233> | OUT<06:(DP1    )   |    =========  OUTFLOW STORAGE TABLE  =========
00234> ---------------------    OUTFLOW    STORAGE   |  OUTFLOW    STORAGE
00235>                            (cms)     (ha.m.)   |    (cms)    (ha.m.)
00236>                             .000  .0000E+00    |     .121  .2361E+00
00237>                             .003  .2890E-01    |     .136  .2763E+00
00238>                             .005  .5950E-01    |     .150  .3180E+00
00239>                             .016  .9160E-01    |     .459  .3613E+00
00240>                             .049  .1253E+00    |    1.087  .4063E+00
00241>                             .081  .1607E+00    |    2.002  .4528E+00
00242>                             .103  .1976E+00    |     .000  .0000E+00
00243>
00244>     ROUTING RESULTS             AREA     QPEAK     TPEAK       R.V.
00245>     ---------------------        (ha)     (cms)     (hrs)       (mm)
00246>     INFLOW >05: (401    )       6.00      .504    12.000     35.319
00247>     OUTFLOW<06: (DP1    )       6.00      .052    13.183     35.316
00248>
00249>                     PEAK   FLOW   REDUCTION [Qout/Qin](%)=   10.300
00250>                     TIME SHIFT OF PEAK FLOW          (min)=    71.00
00251>                     MAXIMUM  STORAGE   USED        (ha.m.)=.1286E+00
00252>
00253> --------------------------------------------------------------------------------
00254> 001:0009--------------------------------------------------------------------------
00255> *# Solar module area draining to diversion swale at west side of module
00256> *#----------------|-------------------------------------------------------------|
00257> ---------------------
00258> | DESIGN NASHYD      |   Area    (ha)=    1.70   Curve Number   (CN)=79.00
00259> | 07:202c   DT= 5.00 |   Ia      (mm)=   1.500   # of Linear Res.(N)= 3.00
00260> ---------------------  U.H. Tp(hrs)=    .420
00261>
00262>     Unit Hyd Qpeak  (cms)=     .155
00263>
00264>     PEAK FLOW       (cms)=     .052 (i)
00265>     TIME TO PEAK    (hrs)=   12.250
00266>     RUNOFF VOLUME    (mm)=   20.738
00267>     TOTAL RAINFALL   (mm)=   50.699
00268>     RUNOFF COEFFICIENT   =     .409
00269>
00270>     (i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.
```

```
00271>
00272> ------------------------------------------------------------------------------
00273> 001:0010----------------------------------------------------------------------
00274> *#------------------|-------------------------------------------------------|
00275> --------------------
00276> | ADD HYD (woutSW) | ID: NHYD     AREA     QPEAK   TPEAK   R.V.    DWF
00277> --------------------              (ha)     (cms)   (hrs)   (mm)    (cms)
00278>                    ID1 01:201a     10.90     .229   12.67  21.48    .000
00279>                   +ID2 02:201b       .20     .018   12.00  35.32    .000
00280>                   +ID3 03:202a      6.30     .127   12.67  20.74    .000
00281>                   +ID4 04:202b      5.80     .487   12.00  35.32    .000
00282>                   +ID5 07:202c      1.70     .052   12.25  20.74    .000
00283>                    ================================================
00284>                    SUM 08:woutSW    24.90     .680   12.02  24.58    .000
00285>
00286>    NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.
00287>
00288> ------------------------------------------------------------------------------
00289> 001:0011----------------------------------------------------------------------
00290> *#------------------|-------------------------------------------------------|
00291> --------------------
00292> | ADD HYD (withSW) | ID: NHYD     AREA     QPEAK   TPEAK   R.V.    DWF
00293> --------------------              (ha)     (cms)   (hrs)   (mm)    (cms)
00294>                    ID1 01:201a     10.90     .229   12.67  21.48    .000
00295>                   +ID2 03:202a      6.30     .127   12.67  20.74    .000
00296>                   +ID3 06:DP1       6.00     .052   13.18  35.32    .000
00297>                   +ID4 07:202c      1.70     .052   12.25  20.74    .000
00298>                    ================================================
00299>                    SUM 10:withSW    24.90     .442   12.67  24.57    .000
00300>
00301>    NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.
00302>
00303> ------------------------------------------------------------------------------
00304> 001:0012----------------------------------------------------------------------
00305> *#------------------|-------------------------------------------------------|
00306>   ** END OF RUN :   1
00307>
00308> ******************************************************************************
00309>
00310>
00311>
00312>
00313>
00314> --------------------
00315> | START            |  Project  dir.: C:\PROGRA~1\SWMHYMO\
00316> --------------------  Rainfall dir.: C:\PROGRA~1\SWMHYMO\
00317>     TZERO =   .00 hrs on      0
00318>     METOUT=   2 (output = METRIC)
00319>     NRUN  = 002
00320>     NSTORM=   1
00321>              #  1=si_5.STM
00322> ------------------------------------------------------------------------------
00323> 002:0002----------------------------------------------------------------------
00324> *#**************************************************************************
00325> *#  Project Name  : Grand Renewable Energy Park - O & M Facility
00326> *#  Project Number: 1610-10624
00327> *#  Date          : 1-27-2011
00328> *#  Company       : Stantec Consulting Ltd. (Kitchener)
00329> *#  Modeller      : S Robertson
00330> *#  License #     : 4730904
00331> *#**************************************************************************
00332> *#  PROPOSED CONDITIONS
00333> *#**************************************************************************
00334> ------------------------------------------------------------------------------
00335> 002:0002----------------------------------------------------------------------
00336> --------------------
00337> | READ STORM       |    Filename: C:\PROGRA~1\SWMHYMO\si_5.STM
00338> | Ptotal=  66.80 mm|    Comments: SCS-II 24H 5-YEAR SIMCOE
00339> --------------------
00340>              TIME    RAIN |   TIME    RAIN |   TIME    RAIN |   TIME    RAIN
00341>               hrs   mm/hr |    hrs   mm/hr |    hrs   mm/hr |    hrs   mm/hr
00342>               .25    .735 |   6.25  1.336 |  12.25  9.619 |  18.25  1.202
00343>               .50    .735 |   6.50  1.336 |  12.50  9.619 |  18.50  1.202
00344>               .75    .735 |   6.75  1.336 |  12.75  4.943 |  18.75  1.202
00345>              1.00    .735 |   7.00  1.336 |  13.00  4.943 |  19.00  1.202
00346>              1.25    .735 |   7.25  1.336 |  13.25  3.474 |  19.25  1.202
00347>              1.50    .735 |   7.50  1.336 |  13.50  3.741 |  19.50  1.202
00348>              1.75    .735 |   7.75  1.336 |  13.75  2.806 |  19.75  1.202
00349>              2.00    .735 |   8.00  1.336 |  14.00  2.806 |  20.00  1.202
00350>              2.25    .868 |   8.25  1.804 |  14.25  2.004 |  20.25   .802
00351>              2.50    .868 |   8.50  1.804 |  14.50  2.004 |  20.50   .802
00352>              2.75    .868 |   8.75  1.804 |  14.75  2.004 |  20.75   .802
00353>              3.00    .868 |   9.00  1.804 |  15.00  2.004 |  21.00   .802
00354>              3.25    .868 |   9.25  2.138 |  15.25  2.004 |  21.25   .802
00355>              3.50    .868 |   9.50  2.138 |  15.50  2.004 |  21.50   .802
00356>              3.75    .868 |   9.75  2.405 |  15.75  2.004 |  21.75   .802
00357>              4.00    .868 |  10.00  2.405 |  16.00  2.004 |  22.00   .802
00358>              4.25   1.069 |  10.25  3.073 |  16.25  1.202 |  22.25   .802
00359>              4.50   1.069 |  10.50  3.073 |  16.50  1.202 |  22.50   .802
00360>              4.75   1.069 |  10.75  4.142 |  16.75  1.202 |  22.75   .802
00361>              5.00   1.069 |  11.00  4.142 |  17.00  1.202 |  23.00   .802
00362>              5.25   1.069 |  11.25  6.413 |  17.25  1.202 |  23.25   .802
00363>              5.50   1.069 |  11.50  6.413 |  17.50  1.202 |  23.50   .802
00364>              5.75   1.069 |  11.75 27.789 |  17.75  1.202 |  23.75   .802
00365>              6.00   1.069 |  12.00 73.747 |  18.00  1.202 |  24.00   .802
00366>
00367> ------------------------------------------------------------------------------
00368> 002:0003----------------------------------------------------------------------
00369> *#------------------|-------------------------------------------------------|
00370> *# Agricultural area to draining to diversion swale at east side of access road
00371> *#------------------|-------------------------------------------------------|
00372> --------------------
00373> | DESIGN NASHYD    |   Area    (ha)=   10.90   Curve Number   (CN)=80.00
00374> | 01:201a   DT= 5.00 |   Ia      (mm)=  1.500   # of Linear Res.(N)= 3.00
00375> --------------------   U.H. Tp(hrs)=    .750
00376>
00377>     Unit Hyd Qpeak  (cms)=     .555
00378>
00379>     PEAK FLOW       (cms)=     .356 (i)
00380>     TIME TO PEAK    (hrs)=   12.667
00381>     RUNOFF VOLUME    (mm)=   33.107
00382>     TOTAL RAINFALL   (mm)=   66.801
00383>     RUNOFF COEFFICIENT   =     .496
00384>
00385>     (i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.
00386>
00387> ------------------------------------------------------------------------------
00388> 002:0004----------------------------------------------------------------------
00389> *#------------------|-------------------------------------------------------|
00390> *# Access road right-of-way (most northerly 160 m stretch)
00391> *#------------------|-------------------------------------------------------|
00392> --------------------
00393> | DESIGN STANDHYD   |   Area    (ha)=     .20
00394> | 02:201b   DT= 1.00 |   Total Imp(%)=   50.00   Dir. Conn.(%)=   50.00
00395> --------------------
00396>                          IMPERVIOUS    PERVIOUS (i)
00397>     Surface Area     (ha)=       .10         .10
00398>     Dep. Storage     (mm)=       .80        1.50
00399>     Average Slope     (%)=       .60         .60
00400>     Length            (m)=     36.51       40.00
00401>     Mannings n            =      .013        .250
00402>
00403>     Max.eff.Inten.(mm/hr)=     73.75       37.28
00404>                  over (min)      2.00       17.00
00405>     Storage Coeff.  (min)=      1.84 (ii)  16.87 (ii)
00406>     Unit Hyd. Tpeak (min)=      2.00       17.00
00407>     Unit Hyd. peak  (cms)=       .59         .07
00408>                                                      *TOTALS*
00409>     PEAK FLOW       (cms)=       .02         .01         .025 (iii)
00410>     TIME TO PEAK    (hrs)=     12.00       12.17       12.000
00411>     RUNOFF VOLUME    (mm)=     66.00       32.10       49.053
00412>     TOTAL RAINFALL   (mm)=     66.80       66.80       66.801
00413>     RUNOFF COEFFICIENT   =       .99         .48         .734
00414>
00415>       (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
00416>           CN* =  79.0    Ia = Dep. Storage  (Above)
00417>        (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
00418>           THAN THE STORAGE COEFFICIENT.
00419>     (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.
00420>
00421> ------------------------------------------------------------------------------
00422> 002:0005----------------------------------------------------------------------
00423> *#------------------|-------------------------------------------------------|
00424> *# Agricultural area draining to diversion swale at access road/solar module
00425> *#------------------|-------------------------------------------------------|
00426> --------------------
00427> | DESIGN NASHYD    |   Area    (ha)=    6.30   Curve Number   (CN)=79.00
00428> | 03:202a   DT= 5.00 |   Ia      (mm)=  1.500   # of Linear Res.(N)= 3.00
00429> --------------------   U.H. Tp(hrs)=    .750
00430>
00431>     Unit Hyd Qpeak  (cms)=     .321
00432>
00433>     PEAK FLOW       (cms)=     .199 (i)
00434>     TIME TO PEAK    (hrs)=   12.667
00435>     RUNOFF VOLUME    (mm)=   32.105
00436>     TOTAL RAINFALL   (mm)=   66.801
00437>     RUNOFF COEFFICIENT   =     .481
00438>
00439>     (i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.
00440>
00441> ------------------------------------------------------------------------------
00442> 002:0006----------------------------------------------------------------------
00443> *#------------------|-------------------------------------------------------|
00444> *# Southern 2/3 of access road, O&M facility, SWMF, and surrounding lands
00445> *#------------------|-------------------------------------------------------|
00446> --------------------
00447> | DESIGN STANDHYD    |   Area    (ha)=    5.80
00448> | 04:202b   DT= 1.00 |   Total Imp(%)=   50.00   Dir. Conn.(%)=   50.00
00449> --------------------
00450>                          IMPERVIOUS    PERVIOUS (i)
00451>     Surface Area     (ha)=       2.90        2.90
00452>     Dep. Storage     (mm)=       .80        1.50
00453>     Average Slope     (%)=       .90         .90
00454>     Length            (m)=    196.64       40.00
00455>     Mannings n            =      .013        .250
00456>
00457>     Max.eff.Inten.(mm/hr)=     73.75       35.90
00458>                  over (min)      4.00       18.00
00459>     Storage Coeff.  (min)=      4.47 (ii)  17.98 (ii)
00460>     Unit Hyd. Tpeak (min)=      4.00       18.00
00461>     Unit Hyd. peak  (cms)=       .26         .06
00462>                                                      *TOTALS*
00463>     PEAK FLOW       (cms)=       .57         .18         .696 (iii)
00464>     TIME TO PEAK    (hrs)=     12.00       12.18       12.000
00465>     RUNOFF VOLUME    (mm)=     66.00       32.09       49.053
00466>     TOTAL RAINFALL   (mm)=     66.80       66.80       66.801
00467>     RUNOFF COEFFICIENT   =       .99         .48         .734
00468>
00469>       (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
00470>           CN* =  79.0    Ia = Dep. Storage  (Above)
00471>        (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
00472>           THAN THE STORAGE COEFFICIENT.
00473>     (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.
00474>
00475> ------------------------------------------------------------------------------
00476> 002:0007----------------------------------------------------------------------
00477> *#------------------|-------------------------------------------------------|
00478> *# Sum of flows to constructed wetland SWMF
00479> *#------------------|-------------------------------------------------------|
00480> --------------------
00481> | ADD HYD (401   ) | ID: NHYD     AREA     QPEAK   TPEAK   R.V.    DWF
00482> --------------------              (ha)     (cms)   (hrs)   (mm)    (cms)
00483>                    ID1 02:201b       .20     .025   12.00  49.05    .000
00484>                   +ID2 04:202b      5.80     .696   12.00  49.05    .000
00485>                    ================================================
00486>                    SUM 05:401       6.00     .721   12.00  49.05    .000
00487>
00488>    NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.
00489>
00490> ------------------------------------------------------------------------------
00491> 002:0008----------------------------------------------------------------------
00492> *#------------------|-------------------------------------------------------|
00493> *# Constructed wetland SWMF
00494> *#------------------|-------------------------------------------------------|
00495> --------------------
00496> | ROUTE RESERVOIR   |    Requested routing time step =  1.0 min.
00497> |  IN>05:(401   )   |
00498> | OUT<06:(DP1   )   |     =========  OUTLFOW STORAGE TABLE  =========
00499> --------------------    OUTFLOW     STORAGE   |  OUTFLOW     STORAGE
00500>                           (cms)     (ha.m.)   |    (cms)     (ha.m.)
00501>                           .000  .0000E+00   |     .121  .2361E+00
00502>                           .003  .2890E-01   |     .136  .2763E+00
00503>                           .005  .5950E-01   |     .150  .3180E+00
00504>                           .016  .9160E-01   |     .459  .3613E+00
00505>                           .049  .1253E+00   |    1.087  .4063E+00
00506>                           .081  .1607E+00   |    2.002  .4528E+00
00507>                           .103  .1976E+00   |     .000  .0000E+00
00508>
00509>     ROUTING RESULTS            AREA     QPEAK     TPEAK       R.V.
00510>     ---------------------       (ha)     (cms)     (hrs)       (mm)
00511>     INFLOW >05: (401   )       6.00      .721    12.000     49.053
00512>     OUTFLOW<06: (DP1   )       6.00      .087    13.000     49.050
00513>
00514>                   PEAK   FLOW   REDUCTION [Qout/Qin](%)=   12.126
00515>                   TIME SHIFT OF PEAK FLOW          (min)=    60.00
00516>                   MAXIMUM  STORAGE   USED       (ha.m.)=.1716E+00
00517>
00518> ------------------------------------------------------------------------------
00519> 002:0009----------------------------------------------------------------------
00520> *# Solar module area draining to diversion swale at west side of module
00521> *#------------------|-------------------------------------------------------|
00522> --------------------
00523> | DESIGN NASHYD     |   Area    (ha)=    1.70   Curve Number   (CN)=79.00
00524> | 07:202c   DT= 5.00 |   Ia      (mm)=  1.500   # of Linear Res.(N)= 3.00
00525> --------------------   U.H. Tp(hrs)=    .420
00526>
00527>     Unit Hyd Qpeak  (cms)=     .155
00528>
00529>     PEAK FLOW       (cms)=     .081 (i)
00530>     TIME TO PEAK    (hrs)=   12.250
00531>     RUNOFF VOLUME    (mm)=   32.105
00532>     TOTAL RAINFALL   (mm)=   66.801
00533>     RUNOFF COEFFICIENT   =     .481
00534>
00535>     (i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.
00536>
00537> ------------------------------------------------------------------------------
00538> 002:0010----------------------------------------------------------------------
00539> *#------------------|-------------------------------------------------------|
00540> --------------------
```

```
| ADD HYD (woutSW) | ID: NHYD     AREA     QPEAK   TPEAK   R.V.    DWF
------------------                (ha)     (cms)   (hrs)   (mm)   (cms)
                   ID1 01:201a      10.90     .356   12.67  33.11    .000
                  +ID2 02:201b       .20     .025   12.00  49.05    .000
                  +ID3 03:202a      6.30     .199   12.67  32.11    .000
                  +ID4 04:202b      5.80     .696   12.00  49.05    .000
                  +ID5 07:202c      1.70     .081   12.25  32.11    .000
                   ================================================
                   SUM 08:woutSW    24.90     .999   12.02  36.63    .000

   NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

------------------------------------------------------------------------------
002:0011------------------------------------------------------------------------
*#------------------|---------------------------------------------------------|
------------------
| ADD HYD (withSW) | ID: NHYD     AREA     QPEAK   TPEAK   R.V.    DWF
------------------                (ha)     (cms)   (hrs)   (mm)   (cms)
                   ID1 01:201a      10.90     .356   12.67  33.11    .000
                  +ID2 03:202a      6.30     .199   12.67  32.11    .000
                  +ID3 06:DP1       6.00     .087   13.00  49.05    .000
                  +ID4 07:202c      1.70     .081   12.25  32.11    .000
                   ================================================
                   SUM 10:withSW    24.90     .702   12.58  36.63    .000

   NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

------------------------------------------------------------------------------
002:0012------------------------------------------------------------------------
*#------------------|---------------------------------------------------------|
------------------------------------------------------------------------------
002:0002------------------------------------------------------------------------
  ** END OF RUN :   2

********************************************************************************



----------------------
| START              |  Project  dir.: C:\PROGRA~1\SWMHYMO\
----------------------  Rainfall dir.: C:\PROGRA~1\SWMHYMO\
    TZERO =   .00 hrs on       0
    METOUT=  2 (output = METRIC)
    NRUN  = 003
    NSTORM=   1
             #  1=si_10.STM
------------------------------------------------------------------------------
003:0002------------------------------------------------------------------------
*#**************************************************************************
*#  Project Name  : Grand Renewable Energy Park - O & M Facility
*#  Project Number: 1610-10624
*#  Date          : 1-27-2011
*#  Company       : Stantec Consulting Ltd. (Kitchener)
*#  Modeller      : S Robertson
*#  License #     : 4730904
*#**************************************************************************
*#  PROPOSED CONDITIONS
*#**************************************************************************
------------------------------------------------------------------------------
002:0002------------------------------------------------------------------------
----------------------
| READ STORM       |    Filename: C:\PROGRA~1\SWMHYMO\si_10.STM
| Ptotal=  77.40 mm|    Comments: SCS-II 24H 10-YEAR SIMCOE
----------------------
               TIME    RAIN |   TIME    RAIN |   TIME    RAIN |   TIME    RAIN
               hrs   mm/hr |    hrs   mm/hr |    hrs   mm/hr |    hrs   mm/hr
               .25    .851 |   6.25  1.548 |  12.25  11.146 |  18.25  1.393
               .50    .851 |   6.50  1.548 |  12.50  11.146 |  18.50  1.393
               .75    .851 |   6.75  1.548 |  12.75   5.728 |  18.75  1.393
              1.00    .851 |   7.00  1.548 |  13.00   5.728 |  19.00  1.393
              1.25    .851 |   7.25  1.548 |  13.25   4.025 |  19.25  1.393
              1.50    .851 |   7.50  1.548 |  13.50   4.334 |  19.50  1.393
              1.75    .851 |   7.75  1.548 |  13.75   3.251 |  19.75  1.393
              2.00    .851 |   8.00  1.548 |  14.00   3.251 |  20.00  1.393
              2.25   1.006 |   8.25  2.090 |  14.25   2.322 |  20.25   .929
              2.50   1.006 |   8.50  2.090 |  14.50   2.322 |  20.50   .929
              2.75   1.006 |   8.75  2.090 |  14.75   2.322 |  20.75   .929
              3.00   1.006 |   9.00  2.090 |  15.00   2.322 |  21.00   .929
              3.25   1.006 |   9.25  2.477 |  15.25   2.322 |  21.25   .929
              3.50   1.006 |   9.50  2.477 |  15.50   2.322 |  21.50   .929
              3.75   1.006 |   9.75  2.786 |  15.75   2.322 |  21.75   .929
              4.00   1.006 |  10.00  2.786 |  16.00   2.322 |  22.00   .929
              4.25   1.238 |  10.25  3.560 |  16.25   1.393 |  22.25   .929
              4.50   1.238 |  10.50  3.560 |  16.50   1.393 |  22.50   .929
              4.75   1.238 |  10.75  4.799 |  16.75   1.393 |  22.75   .929
              5.00   1.238 |  11.00  4.799 |  17.00   1.393 |  23.00   .929
              5.25   1.238 |  11.25  7.430 |  17.25   1.393 |  23.25   .929
              5.50   1.238 |  11.50  7.430 |  17.50   1.393 |  23.50   .929
              5.75   1.238 |  11.75 32.198 |  17.75   1.393 |  23.75   .929
              6.00   1.238 |  12.00 85.450 |  18.00   1.393 |  24.00   .929
------------------------------------------------------------------------------
003:0003------------------------------------------------------------------------
*#------------------|---------------------------------------------------------|
*# Agricultural area to draining to diversion swale at east side of access road
*#------------------|---------------------------------------------------------|
----------------------
| DESIGN NASHYD      |   Area    (ha)=   10.90   Curve Number   (CN)=80.00
| 01:201a   DT= 5.00 |   Ia      (mm)=   1.500   # of Linear Res.(N)= 3.00
----------------------  U.H. Tp(hrs)=    .750

     Unit Hyd Qpeak  (cms)=     .555

     PEAK FLOW       (cms)=     .447 (i)
     TIME TO PEAK    (hrs)=   12.667
     RUNOFF VOLUME    (mm)=   41.324
     TOTAL RAINFALL   (mm)=   77.398
     RUNOFF COEFFICIENT   =     .534

     (i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

------------------------------------------------------------------------------
003:0004------------------------------------------------------------------------
*#------------------|---------------------------------------------------------|
*# Access road right-of-way (most northerly 160 m stretch)
*#------------------|---------------------------------------------------------|
----------------------
| DESIGN STANDHYD    |   Area    (ha)=     .20
| 02:201b   DT= 1.00 |   Total Imp(%)=   50.00   Dir. Conn.(%)=   50.00
----------------------
                                IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=         .10           .10
     Dep. Storage     (mm)=         .80          1.50
     Average Slope     (%)=         .60           .60
     Length            (m)=       36.51         40.00
     Mannings n           =         .013          .250

     Max.eff.Inten.(mm/hr)=       85.45         50.86
                   over (min)        2.00         15.00
     Storage Coeff.  (min)=        1.73 (ii)    15.01 (ii)
     Unit Hyd. Tpeak (min)=        2.00         15.00
     Unit Hyd. peak  (cms)=         .61           .08
                                                          *TOTALS*
     PEAK FLOW       (cms)=         .02           .01          .030 (iii)
     TIME TO PEAK    (hrs)=       12.00         12.13         12.000
     RUNOFF VOLUME    (mm)=       76.59         40.16         58.383
     TOTAL RAINFALL   (mm)=       77.40         77.40         77.399
     RUNOFF COEFFICIENT   =         .99           .52           .754

       (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
           CN* =  79.0    Ia = Dep. Storage  (Above)
        (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
             THAN THE STORAGE COEFFICIENT.
       (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

------------------------------------------------------------------------------
003:0005------------------------------------------------------------------------
*#------------------|---------------------------------------------------------|
*# Agricultural area draining to diversion swale at access road/solar module
*#------------------|---------------------------------------------------------|
----------------------
| DESIGN NASHYD      |   Area    (ha)=    6.30   Curve Number   (CN)=79.00
| 03:202a   DT= 5.00 |   Ia      (mm)=   1.500   # of Linear Res.(N)= 3.00
----------------------  U.H. Tp(hrs)=    .750

     Unit Hyd Qpeak  (cms)=     .321

     PEAK FLOW       (cms)=     .251 (i)
     TIME TO PEAK    (hrs)=   12.667
     RUNOFF VOLUME    (mm)=   40.166
     TOTAL RAINFALL   (mm)=   77.398
     RUNOFF COEFFICIENT   =     .519

     (i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

------------------------------------------------------------------------------
003:0006------------------------------------------------------------------------
*#------------------|---------------------------------------------------------|
*# Southern 2/3 of access road, O&M facility, SWMF, and surrounding lands
*#------------------|---------------------------------------------------------|
----------------------
| DESIGN STANDHYD    |   Area    (ha)=    5.80
| 04:202b   DT= 1.00 |   Total Imp(%)=   50.00   Dir. Conn.(%)=   50.00
----------------------
                                IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=        2.90          2.90
     Dep. Storage     (mm)=         .80          1.50
     Average Slope     (%)=         .90           .90
     Length            (m)=      196.64         40.00
     Mannings n           =         .013          .250

     Max.eff.Inten.(mm/hr)=       85.45         48.69
                   over (min)        4.00         16.00
     Storage Coeff.  (min)=        4.21 (ii)    16.17 (ii)
     Unit Hyd. Tpeak (min)=        4.00         16.00
     Unit Hyd. peak  (cms)=         .27           .07
                                                          *TOTALS*
     PEAK FLOW       (cms)=         .67           .24          .847 (iii)
     TIME TO PEAK    (hrs)=       12.00         12.15         12.000
     RUNOFF VOLUME    (mm)=       76.60         40.16         58.383
     TOTAL RAINFALL   (mm)=       77.40         77.40         77.399
     RUNOFF COEFFICIENT   =         .99           .52           .754

       (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
           CN* =  79.0    Ia = Dep. Storage  (Above)
        (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
             THAN THE STORAGE COEFFICIENT.
       (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

------------------------------------------------------------------------------
003:0007------------------------------------------------------------------------
*#------------------|---------------------------------------------------------|
*# Sum of flows to constructed wetland SWMF
*#------------------|---------------------------------------------------------|
--------------------
| ADD HYD (401   ) | ID: NHYD     AREA     QPEAK   TPEAK   R.V.    DWF
--------------------                (ha)     (cms)   (hrs)   (mm)   (cms)
                   ID1 02:201b       .20     .030   12.00  58.38    .000
                  +ID2 04:202b      5.80     .847   12.00  58.38    .000
                   ================================================
                   SUM 05:401       6.00     .878   12.00  58.38    .000

   NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

------------------------------------------------------------------------------
003:0008------------------------------------------------------------------------
*#------------------|---------------------------------------------------------|
*# Constructed wetland SWMF
*#------------------|---------------------------------------------------------|
----------------------
| ROUTE RESERVOIR    |    Requested routing time step =  1.0 min.
|  IN>05:(401   )    |
| OUT<06:(DP1   )    |    =========  OUTFLOW STORAGE TABLE  =========
----------------------    OUTFLOW    STORAGE   |  OUTFLOW    STORAGE
                            (cms)     (ha.m.)  |    (cms)    (ha.m.)
                             .000  .0000E+00   |     .121  .2361E+00
                             .003  .2890E-01   |     .136  .2763E+00
                             .005  .5950E-01   |     .150  .3180E+00
                             .016  .9160E-01   |     .459  .3613E+00
                             .049  .1253E+00   |    1.087  .4063E+00
                             .081  .1607E+00   |    2.002  .4528E+00
                             .103  .1976E+00   |     .000  .0000E+00

     ROUTING RESULTS             AREA     QPEAK     TPEAK       R.V.
     ---------------------        (ha)     (cms)     (hrs)       (mm)
     INFLOW >05: (401   )        6.00      .878    12.000     58.383
     OUTFLOW<06: (DP1   )        6.00      .106    12.917     58.379

                   PEAK   FLOW   REDUCTION [Qout/Qin](%)=   12.030
                   TIME SHIFT OF PEAK FLOW       (min)=    55.00
                   MAXIMUM  STORAGE   USED       (ha.m.)=.2032E+00

------------------------------------------------------------------------------
003:0009------------------------------------------------------------------------
*#------------------|---------------------------------------------------------|
*# Solar module area draining to diversion swale at west side of module
*#------------------|---------------------------------------------------------|
----------------------
| DESIGN NASHYD      |   Area    (ha)=    1.70   Curve Number   (CN)=79.00
| 07:202c   DT= 5.00 |   Ia      (mm)=   1.500   # of Linear Res.(N)= 3.00
----------------------  U.H. Tp(hrs)=    .420

     Unit Hyd Qpeak  (cms)=     .155

     PEAK FLOW       (cms)=     .102 (i)
     TIME TO PEAK    (hrs)=   12.250
     RUNOFF VOLUME    (mm)=   40.166
     TOTAL RAINFALL   (mm)=   77.398
     RUNOFF COEFFICIENT   =     .519

     (i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

------------------------------------------------------------------------------
003:0010------------------------------------------------------------------------
*#------------------|---------------------------------------------------------|
--------------------
| ADD HYD (woutSW) | ID: NHYD     AREA     QPEAK   TPEAK   R.V.    DWF
--------------------                (ha)     (cms)   (hrs)   (mm)   (cms)
                   ID1 01:201a      10.90     .447   12.67  41.32    .000
```

```
                +ID2 02:201b        .20     .030   12.00  58.38    .000
                +ID3 03:202a       6.30     .251   12.67  40.17    .000
                +ID4 04:202b       5.80     .847   12.00  58.38    .000
                +ID5 07:202c       1.70     .102   12.25  40.17    .000
                 ================================================
                 SUM 08:woutSW    24.90    1.234   12.02  45.06    .000

   NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

--------------------------------------------------------------------------------
003:0011-----------------------------------------------------------------------
*#-----------------|--------------------------------------------------------|
--------------------
| ADD HYD (withSW) | ID: NHYD     AREA     QPEAK   TPEAK   R.V.    DWF
--------------------                (ha)     (cms)   (hrs)   (mm)   (cms)
                 ID1 01:201a      10.90     .447   12.67  41.32    .000
                +ID2 03:202a       6.30     .251   12.67  40.17    .000
                +ID3 06:DP1        6.00     .106   12.92  58.38    .000
                +ID4 07:202c       1.70     .102   12.25  40.17    .000
                 ================================================
                 SUM 10:withSW    24.90     .879   12.58  45.06    .000

   NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

--------------------------------------------------------------------------------
003:0012-----------------------------------------------------------------------
*#-----------------|--------------------------------------------------------|
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003:0002-----------------------------------------------------------------------
--------------------------------------------------------------------------------
003:0002-----------------------------------------------------------------------
  ** END OF RUN :   3
********************************************************************************
--------------------
| START            |  Project  dir.: C:\PROGRA~1\SWMHYMO\
--------------------  Rainfall dir.: C:\PROGRA~1\SWMHYMO\
    TZERO =   .00 hrs on       0
    METOUT=   2 (output = METRIC)
    NRUN  = 004
    NSTORM=   1
             #  1=si_25.STM
--------------------------------------------------------------------------------
004:0002-----------------------------------------------------------------------
*#*****************************************************************************
*#  Project Name  : Grand Renewable Energy Park - O & M Facility
*#  Project Number: 1610-10624
*#  Date          : 1-27-2011
*#  Company       : Stantec Consulting Ltd. (Kitchener)
*#  Modeller      : S Robertson
*#  License #     : 4730904
*#*****************************************************************************
*#  PROPOSED CONDITIONS
*#*****************************************************************************
--------------------------------------------------------------------------------
004:0002-----------------------------------------------------------------------
--------------------
| READ STORM       |    Filename: C:\PROGRA~1\SWMHYMO\si_25.STM
| Ptotal=  90.80 mm|    Comments: SCS-II 24H 25-YEAR SIMCOE
--------------------
               TIME    RAIN |   TIME    RAIN |   TIME    RAIN |   TIME    RAIN
                hrs   mm/hr |    hrs   mm/hr |    hrs   mm/hr |    hrs   mm/hr
                .25    .999 |   6.25   1.816 |  12.25  13.075 |  18.25   1.634
                .50    .999 |   6.50   1.816 |  12.50  13.075 |  18.50   1.634
                .75    .999 |   6.75   1.816 |  12.75   6.719 |  18.75   1.634
               1.00    .999 |   7.00   1.816 |  13.00   6.719 |  19.00   1.634
               1.25    .999 |   7.25   1.816 |  13.25   4.722 |  19.25   1.634
               1.50    .999 |   7.50   1.816 |  13.50   5.085 |  19.50   1.634
               1.75    .999 |   7.75   1.816 |  13.75   3.814 |  19.75   1.634
               2.00    .999 |   8.00   1.816 |  14.00   3.814 |  20.00   1.634
               2.25   1.180 |   8.25   2.452 |  14.25   2.724 |  20.25   1.090
               2.50   1.180 |   8.50   2.452 |  14.50   2.724 |  20.50   1.090
               2.75   1.180 |   8.75   2.452 |  14.75   2.724 |  20.75   1.090
               3.00   1.180 |   9.00   2.452 |  15.00   2.724 |  21.00   1.090
               3.25   1.180 |   9.25   2.906 |  15.25   2.724 |  21.25   1.090
               3.50   1.180 |   9.50   2.906 |  15.50   2.724 |  21.50   1.090
               3.75   1.180 |   9.75   3.269 |  15.75   2.724 |  21.75   1.090
               4.00   1.180 |  10.00   3.269 |  16.00   2.724 |  22.00   1.090
               4.25   1.453 |  10.25   4.177 |  16.25   1.634 |  22.25   1.090
               4.50   1.453 |  10.50   4.177 |  16.50   1.634 |  22.50   1.090
               4.75   1.453 |  10.75   5.630 |  16.75   1.634 |  22.75   1.090
               5.00   1.453 |  11.00   5.630 |  17.00   1.634 |  23.00   1.090
               5.25   1.453 |  11.25   8.717 |  17.25   1.634 |  23.25   1.090
               5.50   1.453 |  11.50   8.717 |  17.50   1.634 |  23.50   1.090
               5.75   1.453 |  11.75  37.773 |  17.75   1.634 |  23.75   1.090
               6.00   1.453 |  12.00 100.243 |  18.00   1.634 |  24.00   1.090
--------------------------------------------------------------------------------
004:0003-----------------------------------------------------------------------
*#-----------------|--------------------------------------------------------|
*# Agricultural area to draining to diversion swale at east side of access road
*#-----------------|--------------------------------------------------------|
--------------------
| DESIGN NASHYD    |   Area    (ha)=   10.90   Curve Number   (CN)=80.00
| 01:201a   DT= 5.00 |   Ia      (mm)=   1.500   # of Linear Res.(N)= 3.00
--------------------  U.H. Tp(hrs)=    .750

     Unit Hyd Qpeak  (cms)=     .555

     PEAK FLOW       (cms)=     .567 (i)
     TIME TO PEAK    (hrs)=   12.667
     RUNOFF VOLUME    (mm)=   52.190
     TOTAL RAINFALL   (mm)=   90.801
     RUNOFF COEFFICIENT   =     .575

     (i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

--------------------------------------------------------------------------------
004:0004-----------------------------------------------------------------------
*#-----------------|--------------------------------------------------------|
*# Access road right-of-way (most northerly 160 m stretch)
*#-----------------|--------------------------------------------------------|
--------------------
| DESIGN STANDHYD    |   Area    (ha)=     .20
| 02:201b   DT= 1.00 |   Total Imp(%)=   50.00   Dir. Conn.(%)=   50.00
--------------------

                         IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=       .10         .10
     Dep. Storage     (mm)=       .80        1.50
     Average Slope     (%)=       .60         .60
     Length            (m)=     36.51       40.00
     Mannings n             =     .013        .250

     Max.eff.Inten.(mm/hr)=     100.24       65.03
                over (min)        2.00       14.00
     Storage Coeff.  (min)=      1.63 (ii)  13.66 (ii)
     Unit Hyd. Tpeak (min)=      2.00       14.00
     Unit Hyd. peak  (cms)=       .63         .08
                                                      *TOTALS*
     PEAK FLOW       (cms)=       .03         .01          .037 (iii)
     TIME TO PEAK    (hrs)=     12.00       12.12        12.000
     RUNOFF VOLUME    (mm)=     90.00       50.85        70.427
     TOTAL RAINFALL   (mm)=     90.80       90.80        90.802
     RUNOFF COEFFICIENT   =       .99         .56          .776

       (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
           CN* =  79.0    Ia = Dep. Storage  (Above)
      (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
           THAN THE STORAGE COEFFICIENT.
     (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

--------------------------------------------------------------------------------
004:0005-----------------------------------------------------------------------
*#-----------------|--------------------------------------------------------|
*# Agricultural area draining to diversion swale at access road/solar module
*#-----------------|--------------------------------------------------------|
--------------------
| DESIGN NASHYD      |   Area    (ha)=    6.30   Curve Number   (CN)=79.00
| 03:202a   DT= 5.00 |   Ia      (mm)=   1.500   # of Linear Res.(N)= 3.00
--------------------  U.H. Tp(hrs)=    .750

     Unit Hyd Qpeak  (cms)=     .321

     PEAK FLOW       (cms)=     .319 (i)
     TIME TO PEAK    (hrs)=   12.667
     RUNOFF VOLUME    (mm)=   50.852
     TOTAL RAINFALL   (mm)=   90.801
     RUNOFF COEFFICIENT   =     .560

     (i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

--------------------------------------------------------------------------------
004:0006-----------------------------------------------------------------------
*#-----------------|--------------------------------------------------------|
*# Southern 2/3 of access road, O&M facility, SWMF, and surrounding lands
*#-----------------|--------------------------------------------------------|
--------------------
| DESIGN STANDHYD    |   Area    (ha)=    5.80
| 04:202b   DT= 1.00 |   Total Imp(%)=   50.00   Dir. Conn.(%)=   50.00
--------------------

                         IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=      2.90        2.90
     Dep. Storage     (mm)=       .80        1.50
     Average Slope     (%)=       .90         .90
     Length            (m)=    196.64       40.00
     Mannings n             =     .013        .250

     Max.eff.Inten.(mm/hr)=     100.24       64.45
                over (min)        4.00       15.00
     Storage Coeff.  (min)=      3.95 (ii)  14.64 (ii)
     Unit Hyd. Tpeak (min)=      4.00       15.00
     Unit Hyd. peak  (cms)=       .28         .08
                                                      *TOTALS*
     PEAK FLOW       (cms)=       .79         .32          1.041 (iii)
     TIME TO PEAK    (hrs)=     12.00       12.13        12.000
     RUNOFF VOLUME    (mm)=     89.99       50.84        70.427
     TOTAL RAINFALL   (mm)=     90.80       90.80        90.802
     RUNOFF COEFFICIENT   =       .99         .56          .776

       (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
           CN* =  79.0    Ia = Dep. Storage  (Above)
      (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
           THAN THE STORAGE COEFFICIENT.
     (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

--------------------------------------------------------------------------------
004:0007-----------------------------------------------------------------------
*#-----------------|--------------------------------------------------------|
*# Sum of flows to constructed wetland SWMF
*#-----------------|--------------------------------------------------------|
--------------------
| ADD HYD (401   ) | ID: NHYD     AREA     QPEAK   TPEAK   R.V.    DWF
--------------------                (ha)     (cms)   (hrs)   (mm)   (cms)
                 ID1 02:201b        .20     .037   12.00  70.43    .000
                +ID2 04:202b       5.80    1.041   12.00  70.43    .000
                 ================================================
                 SUM 05:401        6.00    1.078   12.00  70.43    .000

   NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

--------------------------------------------------------------------------------
004:0008-----------------------------------------------------------------------
*#-----------------|--------------------------------------------------------|
*# Constructed wetland SWMF
*#-----------------|--------------------------------------------------------|
--------------------
| ROUTE RESERVOIR    |    Requested routing time step =  1.0 min.
|  IN>05:(401   )    |
| OUT<06:(DP1   )    |    =========  OUTLFOW STORAGE TABLE  =========
--------------------    OUTFLOW    STORAGE   |  OUTFLOW    STORAGE
                          (cms)     (ha.m.)   |    (cms)    (ha.m.)
                          .000  .0000E+00     |     .121  .2361E+00
                          .003  .2890E-01     |     .136  .2763E+00
                          .005  .5950E-01     |     .150  .3180E+00
                          .016  .9160E-01     |     .459  .3613E+00
                          .049  .1253E+00     |    1.087  .4063E+00
                          .081  .1607E+00     |    2.002  .4528E+00
                          .103  .1976E+00     |     .000  .0000E+00

     ROUTING RESULTS             AREA     QPEAK     TPEAK       R.V.
     --------------------         (ha)     (cms)     (hrs)       (mm)
     INFLOW >05: (401   )        6.00     1.078    12.000     70.427
     OUTFLOW<06: (DP1   )        6.00      .124    12.900     70.423

                    PEAK   FLOW   REDUCTION [Qout/Qin](%)=   11.537
                    TIME SHIFT OF PEAK FLOW          (min)=    54.00
                    MAXIMUM  STORAGE   USED        (ha.m.)=.2451E+00

--------------------------------------------------------------------------------
004:0009-----------------------------------------------------------------------
*# Solar module area draining to diversion swale at west side of module
*#-----------------|--------------------------------------------------------|
--------------------
| DESIGN NASHYD      |   Area    (ha)=    1.70   Curve Number   (CN)=79.00
| 07:202c   DT= 5.00 |   Ia      (mm)=   1.500   # of Linear Res.(N)= 3.00
--------------------  U.H. Tp(hrs)=    .420

     Unit Hyd Qpeak  (cms)=     .155

     PEAK FLOW       (cms)=     .130 (i)
     TIME TO PEAK    (hrs)=   12.250
     RUNOFF VOLUME    (mm)=   50.852
     TOTAL RAINFALL   (mm)=   90.801
     RUNOFF COEFFICIENT   =     .560

     (i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

--------------------------------------------------------------------------------
004:0010-----------------------------------------------------------------------
*#-----------------|--------------------------------------------------------|
--------------------
| ADD HYD (woutSW) | ID: NHYD     AREA     QPEAK   TPEAK   R.V.    DWF
--------------------                (ha)     (cms)   (hrs)   (mm)   (cms)
                 ID1 01:201a      10.90     .567   12.67  52.19    .000
                +ID2 02:201b        .20     .037   12.00  70.43    .000
```

```
                +ID3 03:202a       6.30     .319   12.67  50.85    .000
                +ID4 04:202b       5.80    1.041   12.00  70.43    .000
                +ID5 07:202c       1.70     .130   12.25  50.85    .000
                 ================================================
                 SUM 08:woutSW    24.90    1.539   12.02  56.16    .000

   NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

------------------------------------------------------------------------------
004:0011----------------------------------------------------------------------
*#----------------|-------------------------------------------------------------|
------------------------------------------------------------------------------
| ADD HYD (withSW) | ID: NHYD     AREA     QPEAK   TPEAK   R.V.    DWF
------------------                (ha)     (cms)   (hrs)   (mm)    (cms)
                  ID1 01:201a      10.90     .567   12.67  52.19    .000
                +ID2 03:202a       6.30     .319   12.67  50.85    .000
                +ID3 06:DP1        6.00     .124   12.90  70.42    .000
                +ID4 07:202c       1.70     .130   12.25  50.85    .000
                 ================================================
                 SUM 10:withSW    24.90    1.108   12.58  56.15    .000

   NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

------------------------------------------------------------------------------
004:0012----------------------------------------------------------------------
*#----------------|-------------------------------------------------------------|
------------------------------------------------------------------------------
004:0002----------------------------------------------------------------------
------------------------------------------------------------------------------
004:0002----------------------------------------------------------------------
------------------------------------------------------------------------------
004:0002----------------------------------------------------------------------
  ** END OF RUN :   4

*******************************************************************************
```

```
--------------------
| START            |  Project  dir.: C:\PROGRA~1\SWMHYMO\
--------------------  Rainfall dir.: C:\PROGRA~1\SWMHYMO\
    TZERO =   .00 hrs on       0
    METOUT=   2 (output = METRIC)
    NRUN  = 005
    NSTORM=   1
           #  1=si_50.STM
------------------------------------------------------------------------------
005:0002----------------------------------------------------------------------
*#*****************************************************************************
*#  Project Name  : Grand Renewable Energy Park - O & M Facility
*#  Project Number: 1610-10624
*#  Date          : 1-27-2011
*#  Company       : Stantec Consulting Ltd. (Kitchener)
*#  Modeller      : S Robertson
*#  License #     : 4730904
*#*****************************************************************************
*#  PROPOSED CONDITIONS
*#*****************************************************************************
------------------------------------------------------------------------------
005:0002----------------------------------------------------------------------
--------------------
| READ STORM       |    Filename: C:\PROGRA~1\SWMHYMO\si_50.STM
| Ptotal= 100.70 mm|    Comments: SCS-II 24H 50-YEAR SIMCOE
--------------------
```

TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr
.25	1.108	6.25	2.014	12.25	14.501	18.25	1.813
.50	1.108	6.50	2.014	12.50	14.501	18.50	1.813
.75	1.108	6.75	2.014	12.75	7.452	18.75	1.813
1.00	1.108	7.00	2.014	13.00	7.452	19.00	1.813
1.25	1.108	7.25	2.014	13.25	5.236	19.25	1.813
1.50	1.108	7.50	2.014	13.50	5.639	19.50	1.813
1.75	1.108	7.75	2.014	13.75	4.229	19.75	1.813
2.00	1.108	8.00	2.014	14.00	4.229	20.00	1.813
2.25	1.309	8.25	2.719	14.25	3.021	20.25	1.208
2.50	1.309	8.50	2.719	14.50	3.021	20.50	1.208
2.75	1.309	8.75	2.719	14.75	3.021	20.75	1.208
3.00	1.309	9.00	2.719	15.00	3.021	21.00	1.208
3.25	1.309	9.25	3.222	15.25	3.021	21.25	1.208
3.50	1.309	9.50	3.222	15.50	3.021	21.50	1.208
3.75	1.309	9.75	3.625	15.75	3.021	21.75	1.208
4.00	1.309	10.00	3.625	16.00	3.021	22.00	1.208
4.25	1.611	10.25	4.632	16.25	1.813	22.25	1.208
4.50	1.611	10.50	4.632	16.50	1.813	22.50	1.208
4.75	1.611	10.75	6.243	16.75	1.813	22.75	1.208
5.00	1.611	11.00	6.243	17.00	1.813	23.00	1.208
5.25	1.611	11.25	9.667	17.25	1.813	23.25	1.208
5.50	1.611	11.50	9.667	17.50	1.813	23.50	1.208
5.75	1.611	11.75	41.891	17.75	1.813	23.75	1.208
6.00	1.611	12.00	111.173	18.00	1.813	24.00	1.208

```
------------------------------------------------------------------------------
005:0003----------------------------------------------------------------------
*#----------------|-------------------------------------------------------------|
*# Agricultural area to draining to diversion swale at east side of access road
*#----------------|-------------------------------------------------------------|
--------------------
| DESIGN NASHYD      |   Area    (ha)=   10.90   Curve Number   (CN)=80.00
| 01:201a   DT= 5.00 |   Ia      (mm)=   1.500   # of Linear Res.(N)= 3.00
----------------------  U.H. Tp(hrs)=    .750

     Unit Hyd Qpeak  (cms)=     .555

     PEAK FLOW       (cms)=     .659 (i)
     TIME TO PEAK    (hrs)=   12.667
     RUNOFF VOLUME    (mm)=   60.483
     TOTAL RAINFALL   (mm)=  100.699
     RUNOFF COEFFICIENT   =     .601

     (i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

------------------------------------------------------------------------------
005:0004----------------------------------------------------------------------
*#----------------|-------------------------------------------------------------|
*# Access road right-of-way (most northerly 160 m stretch)
*#----------------|-------------------------------------------------------------|
--------------------
| DESIGN STANDHYD    |   Area    (ha)=     .20
| 02:201b   DT= 1.00 |   Total Imp(%)=   50.00   Dir. Conn.(%)=   50.00
----------------------
                                IMPERVIOUS    PERVIOUS (i)
     Surface Area      (ha)=         .10           .10
     Dep. Storage      (mm)=         .80          1.50
     Average Slope      (%)=         .60           .60
     Length             (m)=       36.51         40.00
     Mannings n            =         .013          .250

     Max.eff.Inten.(mm/hr)=      111.17         76.06
                   over (min)         2.00         13.00
     Storage Coeff.  (min)=        1.56 (ii)    12.86 (ii)
     Unit Hyd. Tpeak (min)=        2.00         13.00
     Unit Hyd. peak  (cms)=         .65           .09
                                                          *TOTALS*
     PEAK FLOW       (cms)=         .03           .01          .043 (iii)
     TIME TO PEAK    (hrs)=       12.00         12.10         12.000
     RUNOFF VOLUME    (mm)=       99.90         59.01         79.463
     TOTAL RAINFALL   (mm)=      100.70        100.70        100.700
     RUNOFF COEFFICIENT   =         .99           .59           .789

       (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
           CN* =  79.0    Ia = Dep. Storage  (Above)
        (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
             THAN THE STORAGE COEFFICIENT.
       (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

------------------------------------------------------------------------------
005:0005----------------------------------------------------------------------
*#----------------|-------------------------------------------------------------|
*# Agricultural area draining to diversion swale at access road/solar module
*#----------------|-------------------------------------------------------------|
--------------------
| DESIGN NASHYD      |   Area    (ha)=    6.30   Curve Number   (CN)=79.00
| 03:202a   DT= 5.00 |   Ia      (mm)=   1.500   # of Linear Res.(N)= 3.00
----------------------  U.H. Tp(hrs)=    .750

     Unit Hyd Qpeak  (cms)=     .321

     PEAK FLOW       (cms)=     .371 (i)
     TIME TO PEAK    (hrs)=   12.667
     RUNOFF VOLUME    (mm)=   59.025
     TOTAL RAINFALL   (mm)=  100.699
     RUNOFF COEFFICIENT   =     .586

     (i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

------------------------------------------------------------------------------
005:0006----------------------------------------------------------------------
*#----------------|-------------------------------------------------------------|
*# Southern 2/3 of access road, O&M facility, SWMF, and surrounding lands
*#----------------|-------------------------------------------------------------|
--------------------
| DESIGN STANDHYD    |   Area    (ha)=    5.80
| 04:202b   DT= 1.00 |   Total Imp(%)=   50.00   Dir. Conn.(%)=   50.00
----------------------
                                IMPERVIOUS    PERVIOUS (i)
     Surface Area      (ha)=        2.90          2.90
     Dep. Storage      (mm)=         .80          1.50
     Average Slope      (%)=         .90           .90
     Length             (m)=      196.64         40.00
     Mannings n            =         .013          .250

     Max.eff.Inten.(mm/hr)=      111.17         75.45
                   over (min)        4.00         14.00
     Storage Coeff.  (min)=        3.79 (ii)    13.83 (ii)
     Unit Hyd. Tpeak (min)=        4.00         14.00
     Unit Hyd. peak  (cms)=         .29           .08
                                                          *TOTALS*
     PEAK FLOW       (cms)=         .88           .39         1.194 (iii)
     TIME TO PEAK    (hrs)=       12.00         12.12         12.000
     RUNOFF VOLUME    (mm)=       99.89         59.01         79.463
     TOTAL RAINFALL   (mm)=      100.70        100.70        100.700
     RUNOFF COEFFICIENT   =         .99           .59           .789

       (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
           CN* =  79.0    Ia = Dep. Storage  (Above)
        (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
             THAN THE STORAGE COEFFICIENT.
       (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

------------------------------------------------------------------------------
005:0007----------------------------------------------------------------------
*#----------------|-------------------------------------------------------------|
*# Sum of flows to constructed wetland SWMF
*#----------------|-------------------------------------------------------------|
--------------------
| ADD HYD (401   ) | ID: NHYD     AREA     QPEAK   TPEAK   R.V.    DWF
------------------                (ha)     (cms)   (hrs)   (mm)    (cms)
                  ID1 02:201b       .20     .043   12.00  79.46    .000
                +ID2 04:202b       5.80    1.194   12.00  79.46    .000
                 ================================================
                 SUM 05:401        6.00    1.236   12.00  79.46    .000

   NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

------------------------------------------------------------------------------
005:0008----------------------------------------------------------------------
*#----------------|-------------------------------------------------------------|
*# Constructed wetland SWMF
*#----------------|-------------------------------------------------------------|
--------------------
| ROUTE RESERVOIR    |    Requested routing time step =  1.0 min.
|  IN>05:(401   )    |
| OUT<06:(DP1   )    |    =========  OUTFLOW STORAGE TABLE  =========
--------------------    OUTFLOW    STORAGE    |  OUTFLOW    STORAGE
                          (cms)     (ha.m.)    |    (cms)    (ha.m.)
                          .000  .0000E+00      |     .121  .2361E+00
                          .003  .2890E-01      |     .136  .2763E+00
                          .005  .5950E-01      |     .150  .3180E+00
                          .016  .9160E-01      |     .459  .3613E+00
                          .049  .1253E+00      |    1.087  .4063E+00
                          .081  .1607E+00      |    2.002  .4528E+00
                          .103  .1976E+00      |     .000  .0000E+00

     ROUTING RESULTS             AREA     QPEAK     TPEAK       R.V.
     ---------------             (ha)     (cms)     (hrs)       (mm)
     INFLOW >05: (401   )       6.00     1.236    12.000     79.463
     OUTFLOW<06: (DP1   )       6.00      .136    12.900     79.459

                   PEAK   FLOW   REDUCTION [Qout/Qin](%)=   11.024
                   TIME SHIFT OF PEAK FLOW       (min)=    54.00
                   MAXIMUM  STORAGE   USED       (ha.m.)=.2771E+00

------------------------------------------------------------------------------
005:0009----------------------------------------------------------------------
*# Solar module area draining to diversion swale at west side of module
*#----------------|-------------------------------------------------------------|
--------------------
| DESIGN NASHYD      |   Area    (ha)=    1.70   Curve Number   (CN)=79.00
| 07:202c   DT= 5.00 |   Ia      (mm)=   1.500   # of Linear Res.(N)= 3.00
----------------------  U.H. Tp(hrs)=    .420

     Unit Hyd Qpeak  (cms)=     .155

     PEAK FLOW       (cms)=     .151 (i)
     TIME TO PEAK    (hrs)=   12.250
     RUNOFF VOLUME    (mm)=   59.024
     TOTAL RAINFALL   (mm)=  100.699
     RUNOFF COEFFICIENT   =     .586

     (i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

------------------------------------------------------------------------------
005:0010----------------------------------------------------------------------
*#----------------|-------------------------------------------------------------|
--------------------
| ADD HYD (woutSW) | ID: NHYD     AREA     QPEAK   TPEAK   R.V.    DWF
------------------                (ha)     (cms)   (hrs)   (mm)    (cms)
                  ID1 01:201a      10.90     .659   12.67  60.48    .000
```

```
                +ID2 02:201b        .20     .043   12.00  79.46    .000
                +ID3 03:202a       6.30     .371   12.67  59.02    .000
                +ID4 04:202b       5.80    1.194   12.00  79.46    .000
                +ID5 07:202c       1.70     .151   12.25  59.02    .000
                 ================================================
                 SUM 08:woutSW    24.90    1.777   12.02  64.59    .000

   NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

005:0011-----------------------------------------------------------------------
*#-----------------|-----------------------------------------------------------|
---------------------
| ADD HYD (withSW) | ID: NHYD     AREA     QPEAK   TPEAK   R.V.    DWF
---------------------               (ha)     (cms)   (hrs)   (mm)   (cms)
                 ID1 01:201a      10.90     .659   12.67  60.48    .000
                +ID2 03:202a       6.30     .371   12.67  59.02    .000
                +ID3 06:DP1        6.00     .136   12.90  79.46    .000
                +ID4 07:202c       1.70     .151   12.25  59.02    .000
                 ================================================
                 SUM 10:withSW    24.90    1.280   12.58  64.58    .000

   NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

005:0012-----------------------------------------------------------------------
*#-----------------|-----------------------------------------------------------|
005:0002-----------------------------------------------------------------------
005:0002-----------------------------------------------------------------------
005:0002-----------------------------------------------------------------------
005:0002-----------------------------------------------------------------------
005:0002-----------------------------------------------------------------------
   ** END OF RUN :   5
*****************************************************************************
---------------------
| START             |  Project  dir.: C:\PROGRA~1\SWMHYMO\
---------------------  Rainfall dir.: C:\PROGRA~1\SWMHYMO\
    TZERO =   .00 hrs on      0
    METOUT=   2 (output = METRIC)
    NRUN  = 006
    NSTORM=   1
           #  1=si_100.STM
-----------------------------------------------------------------------------
006:0002-----------------------------------------------------------------------
*#***************************************************************************
*#  Project Name  : Grand Renewable Energy Park - O & M Facility
*#  Project Number: 1610-10624
*#  Date          : 1-27-2011
*#  Company       : Stantec Consulting Ltd. (Kitchener)
*#  Modeller      : S Robertson
*#  License #     : 4730904
*#***************************************************************************
*#  PROPOSED CONDITIONS
*#***************************************************************************
-----------------------------------------------------------------------------
006:0002-----------------------------------------------------------------------
---------------------
| READ STORM        |    Filename: C:\PROGRA~1\SWMHYMO\si_100.STM
| Ptotal= 110.60 mm|    Comments: SCS-II 24H 100-YEAR SIMCOE
---------------------
               TIME    RAIN |   TIME    RAIN |   TIME    RAIN |   TIME    RAIN
               hrs   mm/hr |    hrs   mm/hr |    hrs   mm/hr |    hrs   mm/hr
               .25   1.217 |   6.25   2.212 |  12.25  15.926 |  18.25   1.991
               .50   1.217 |   6.50   2.212 |  12.50  15.926 |  18.50   1.991
               .75   1.217 |   6.75   2.212 |  12.75   8.184 |  18.75   1.991
              1.00   1.217 |   7.00   2.212 |  13.00   8.184 |  19.00   1.991
              1.25   1.217 |   7.25   2.212 |  13.25   5.751 |  19.25   1.991
              1.50   1.217 |   7.50   2.212 |  13.50   6.194 |  19.50   1.991
              1.75   1.217 |   7.75   2.212 |  13.75   4.645 |  19.75   1.991
              2.00   1.217 |   8.00   2.212 |  14.00   4.645 |  20.00   1.991
              2.25   1.438 |   8.25   2.986 |  14.25   3.318 |  20.25   1.327
              2.50   1.438 |   8.50   2.986 |  14.50   3.318 |  20.50   1.327
              2.75   1.438 |   8.75   2.986 |  14.75   3.318 |  20.75   1.327
              3.00   1.438 |   9.00   2.986 |  15.00   3.318 |  21.00   1.327
              3.25   1.438 |   9.25   3.539 |  15.25   3.318 |  21.25   1.327
              3.50   1.438 |   9.50   3.539 |  15.50   3.318 |  21.50   1.327
              3.75   1.438 |   9.75   3.982 |  15.75   3.318 |  21.75   1.327
              4.00   1.438 |  10.00   3.982 |  16.00   3.318 |  22.00   1.327
              4.25   1.770 |  10.25   5.088 |  16.25   1.991 |  22.25   1.327
              4.50   1.770 |  10.50   5.088 |  16.50   1.991 |  22.50   1.327
              4.75   1.770 |  10.75   6.857 |  16.75   1.991 |  22.75   1.327
              5.00   1.770 |  11.00   6.857 |  17.00   1.991 |  23.00   1.327
              5.25   1.770 |  11.25  10.618 |  17.25   1.991 |  23.25   1.327
              5.50   1.770 |  11.50  10.618 |  17.50   1.991 |  23.50   1.327
              5.75   1.770 |  11.75  46.010 |  17.75   1.991 |  23.75   1.327
              6.00   1.770 |  12.00 122.102 |  18.00   1.991 |  24.00   1.327
-----------------------------------------------------------------------------
006:0003-----------------------------------------------------------------------
*#-----------------|-----------------------------------------------------------|
*# Agricultural area to draining to diversion swale at east side of access road
*#-----------------|-----------------------------------------------------------|
---------------------
| DESIGN NASHYD     |   Area    (ha)=   10.90   Curve Number   (CN)=80.00
| 01:201a   DT= 5.00 |   Ia      (mm)=   1.500   # of Linear Res.(N)= 3.00
---------------------   U.H. Tp(hrs)=    .750

     Unit Hyd Qpeak  (cms)=     .555

     PEAK FLOW       (cms)=     .753 (i)
     TIME TO PEAK    (hrs)=   12.667
     RUNOFF VOLUME    (mm)=   68.963
     TOTAL RAINFALL   (mm)=  110.602
     RUNOFF COEFFICIENT   =     .624

     (i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

-----------------------------------------------------------------------------
006:0004-----------------------------------------------------------------------
*#-----------------|-----------------------------------------------------------|
*# Access road right-of-way (most northerly 160 m stretch)
*#-----------------|-----------------------------------------------------------|
---------------------
| DESIGN STANDHYD    |   Area    (ha)=    .20
| 02:201b   DT= 1.00 |   Total Imp(%)=   50.00   Dir. Conn.(%)=   50.00
---------------------

                         IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=       .10         .10
     Dep. Storage     (mm)=       .80        1.50
     Average Slope     (%)=       .60         .60
     Length            (m)=     36.51       40.00
     Mannings n            =      .013        .250

     Max.eff.Inten.(mm/hr)=    122.10       87.34
                  over (min)       2.00       12.00
     Storage Coeff.  (min)=       1.50 (ii)  12.19 (ii)
     Unit Hyd. Tpeak (min)=       2.00       12.00
     Unit Hyd. peak  (cms)=        .66         .09
                                                      *TOTALS*
     PEAK FLOW       (cms)=        .03         .02        .048 (iii)
     TIME TO PEAK    (hrs)=      12.00       12.08      12.000
     RUNOFF VOLUME    (mm)=     109.80       67.38       88.599
     TOTAL RAINFALL   (mm)=     110.60       110.60     110.603
     RUNOFF COEFFICIENT   =        .99         .61        .801

       (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
           CN* =  79.0    Ia = Dep. Storage  (Above)
        (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
           THAN THE STORAGE COEFFICIENT.
       (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

-----------------------------------------------------------------------------
006:0005-----------------------------------------------------------------------
*#-----------------|-----------------------------------------------------------|
*# Agricultural area draining to diversion swale at access road/solar module
*#-----------------|-----------------------------------------------------------|
---------------------
| DESIGN NASHYD     |   Area    (ha)=    6.30   Curve Number   (CN)=79.00
| 03:202a   DT= 5.00 |   Ia      (mm)=   1.500   # of Linear Res.(N)= 3.00
---------------------   U.H. Tp(hrs)=    .750

     Unit Hyd Qpeak  (cms)=     .321

     PEAK FLOW       (cms)=     .424 (i)
     TIME TO PEAK    (hrs)=   12.667
     RUNOFF VOLUME    (mm)=   67.394
     TOTAL RAINFALL   (mm)=  110.602
     RUNOFF COEFFICIENT   =     .609

     (i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

-----------------------------------------------------------------------------
006:0006-----------------------------------------------------------------------
*#-----------------|-----------------------------------------------------------|
*# Southern 2/3 of access road, O&M facility, SWMF, and surrounding lands
*#-----------------|-----------------------------------------------------------|
---------------------
| DESIGN STANDHYD    |   Area    (ha)=    5.80
| 04:202b   DT= 1.00 |   Total Imp(%)=   50.00   Dir. Conn.(%)=   50.00
---------------------

                         IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=       2.90        2.90
     Dep. Storage     (mm)=        .80        1.50
     Average Slope     (%)=        .90         .90
     Length            (m)=     196.64       40.00
     Mannings n            =      .013        .250

     Max.eff.Inten.(mm/hr)=    122.10       86.72
                  over (min)       4.00       13.00
     Storage Coeff.  (min)=       3.65 (ii)  13.15 (ii)
     Unit Hyd. Tpeak (min)=       4.00       13.00
     Unit Hyd. peak  (cms)=        .30         .09
                                                      *TOTALS*
     PEAK FLOW       (cms)=        .97         .46       1.353 (iii)
     TIME TO PEAK    (hrs)=      12.00       12.10      12.000
     RUNOFF VOLUME    (mm)=     109.80       67.38       88.599
     TOTAL RAINFALL   (mm)=     110.60       110.60     110.603
     RUNOFF COEFFICIENT   =        .99         .61        .801

       (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
           CN* =  79.0    Ia = Dep. Storage  (Above)
        (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
           THAN THE STORAGE COEFFICIENT.
       (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

-----------------------------------------------------------------------------
006:0007-----------------------------------------------------------------------
*#-----------------|-----------------------------------------------------------|
*# Sum of flows to constructed wetland SWMF
*#-----------------|-----------------------------------------------------------|
---------------------
| ADD HYD (401   ) | ID: NHYD     AREA     QPEAK   TPEAK   R.V.    DWF
---------------------               (ha)     (cms)   (hrs)   (mm)   (cms)
                 ID1 02:201b        .20     .048   12.00  88.60    .000
                +ID2 04:202b       5.80    1.353   12.00  88.60    .000
                 ================================================
                 SUM 05:401        6.00    1.401   12.00  88.60    .000

   NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

-----------------------------------------------------------------------------
006:0008-----------------------------------------------------------------------
*#-----------------|-----------------------------------------------------------|
*# Constructed wetland SWMF
*#-----------------|-----------------------------------------------------------|
---------------------
| ROUTE RESERVOIR   |    Requested routing time step =  1.0 min.
|  IN>05:(401   )   |
| OUT<06:(DP1   )   |     =========  OUTLFOW STORAGE TABLE  =========
---------------------    OUTFLOW     STORAGE   |  OUTFLOW     STORAGE
                           (cms)     (ha.m.)   |    (cms)     (ha.m.)
                           .000  .0000E+00   |     .121  .2361E+00
                           .003  .2890E-01   |     .136  .2763E+00
                           .005  .5950E-01   |     .150  .3180E+00
                           .016  .9160E-01   |     .459  .3613E+00
                           .049  .1253E+00   |    1.087  .4063E+00
                           .081  .1607E+00   |    2.002  .4528E+00
                           .103  .1976E+00   |     .000  .0000E+00

     ROUTING RESULTS            AREA     QPEAK     TPEAK       R.V.
     -----------------------     (ha)     (cms)     (hrs)       (mm)
     INFLOW >05: (401   )       6.00     1.401    12.000     88.598
     OUTFLOW<06: (DP1   )       6.00      .147    12.917     88.595

                   PEAK   FLOW   REDUCTION [Qout/Qin](%)=   10.504
                   TIME SHIFT OF PEAK FLOW          (min)=    55.00
                   MAXIMUM  STORAGE   USED       (ha.m.)=.3096E+00

-----------------------------------------------------------------------------
006:0009-----------------------------------------------------------------------
*# Solar module area draining to diversion swale at west side of module
*#-----------------|-----------------------------------------------------------|
---------------------
| DESIGN NASHYD     |   Area    (ha)=    1.70   Curve Number   (CN)=79.00
| 07:202c   DT= 5.00 |   Ia      (mm)=   1.500   # of Linear Res.(N)= 3.00
---------------------   U.H. Tp(hrs)=    .420

     Unit Hyd Qpeak  (cms)=     .155

     PEAK FLOW       (cms)=     .173 (i)
     TIME TO PEAK    (hrs)=   12.250
     RUNOFF VOLUME    (mm)=   67.394
     TOTAL RAINFALL   (mm)=  110.602
     RUNOFF COEFFICIENT   =     .609

     (i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

-----------------------------------------------------------------------------
006:0010-----------------------------------------------------------------------
*#-----------------|-----------------------------------------------------------|
---------------------
```

```
| ADD HYD (woutSW) | ID: NHYD     AREA     QPEAK   TPEAK   R.V.    DWF
-------------------               (ha)     (cms)   (hrs)   (mm)   (cms)
                    ID1 01:201a      10.90     .753   12.67  68.96    .000
                   +ID2 02:201b        .20     .048   12.00  88.60    .000
                   +ID3 03:202a       6.30     .424   12.67  67.39    .000
                   +ID4 04:202b       5.80    1.353   12.00  88.60    .000
                   +ID5 07:202c       1.70     .173   12.25  67.39    .000
                    ================================================
                    SUM 08:woutSW    24.90    2.025   12.02  73.19    .000

   NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

--------------------------------------------------------------------------------
006:0011----------------------------------------------------------------------
*#-----------------|-------------------------------------------------------------|
--------------------
| ADD HYD (withSW) | ID: NHYD     AREA     QPEAK   TPEAK   R.V.    DWF
-------------------               (ha)     (cms)   (hrs)   (mm)   (cms)
                    ID1 01:201a      10.90     .753   12.67  68.96    .000
                   +ID2 03:202a       6.30     .424   12.67  67.39    .000
                   +ID3 06:DP1        6.00     .147   12.92  88.59    .000
                   +ID4 07:202c       1.70     .173   12.25  67.39    .000
                    ================================================
                    SUM 10:withSW    24.90    1.456   12.58  73.19    .000

   NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

--------------------------------------------------------------------------------
006:0012----------------------------------------------------------------------
*#-----------------|-------------------------------------------------------------|
--------------------------------------------------------------------------------
006:0002----------------------------------------------------------------------
--------------------------------------------------------------------------------
006:0002----------------------------------------------------------------------
--------------------------------------------------------------------------------
006:0002----------------------------------------------------------------------
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006:0002----------------------------------------------------------------------
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006:0002----------------------------------------------------------------------
      FINISH
--------------------------------------------------------------------------------
********************************************************************************
     WARNINGS / ERRORS / NOTES
     -------------------------
   Simulation ended on 2011-01-28     at 15:21:08
================================================================================
```

Grand Renewable Energy Park - O & M Facility
Samsung Renewable Energy Inc.
O&M SWM Facility - Drainage Area Characteristics and Storage Requirements

	Drainage Areas (See below)
Total Area Tributary to Basin (ha)	6.00
Tributary Area requiring quality control (ha)	6.00
MOE Quality Control Requirement	Enhanced
Basin Design	Wetland
[1]Quality Control Volume Requirement (m^3/ha)	99
[2]Permanent Pool (m^3)	353
[3]Extended Detention - Quality Control (m^3)	240

[1] Based on MOE guidelines and overall percent impervious

[2]Permanent Pool sized for quality control - All but 40 m^3/ha of required quality control volume

[3]Extended Detention sized for quality control - 40 m^3/ha

Catchment Number	Area (ha)	% Imperv (XIMP)
201b	0.20	50%
201c	5.80	50%
Quality Control Area	**6.00**	**50.0%**
Quantity Control Area	**6.00**	**50.0%**

Grand Renewable Energy Park
Samsung Renewable Energy Inc.
Operations and Maintenance Facility SWM Basin Stage-Storage-Discharge Calculations

Rating Curve					
Elevation (m)	Discharge (m³/s)	Total SWMF Storage (m³)	Active Storage (m³)	Drawdown (hrs) Increment	Drawdown (hrs) Total
195.80					
195.90		9			
196.00		22			
196.10		40			
196.20		63			
196.30		90			
196.40		122			
196.50		159			
196.60		200			
196.70		247			
196.80		297			
196.90		353			
197.00		413			
197.10		645			
197.20		896			
197.30		1,168			
197.40	0.003	1,457	289	27.4	27.4
197.50	0.005	1,763	595	22.1	49.5
197.60	0.016	2,084	916	8.6	58.0
197.70	0.049	2,421	1,253	2.9	60.9
197.80	0.081	2,775	1,607	1.5	62.4
197.90	0.103	3,144	1,976	1.1	63.6
198.00	0.121	3,529	2,361	1.0	64.5
198.10	0.136	3,931	2,763	0.9	65.4
198.20	0.150	4,348	3,180	0.8	66.2
198.30	0.454	4,781	3,613	0.4	66.6
198.40	1.062	5,231	4,063	0.2	66.8
198.50	1.932	5,696	4,528	0.1	66.8

Volume Estimation							
	Forebay		Main Pond		Total Pond		Total SWMF
Elevation (m)	Area (m²)	Volume (m³)	Area (m²)	Volume (m³)	Area (m²)	Volume (m³)	Volume (m³)
195.80	63						
195.90	110	9					9
196.00	157	22					22
196.10	204	40					40
196.20	250	63					63
196.30	297	90					90
196.40	344	122					122
196.50	391	159					159
196.60	438	200					200
196.70	485	247					247
196.80	532	297					297
196.90	579	353					353
197.00	625	413	1,594				413
197.10	672	478	1,745	167			645
197.20	719	547	1,896	349			896
197.30	766	622	2,047	546	2,813		1,168
197.40					2,973	289	1,457
197.50					3,133	595	1,763
197.60					3,293	916	2,084
197.70					3,453	1,253	2,421
197.80					3,613	1,607	2,775
197.90					3,774	1,976	3,144
198.00					3,934	2,361	3,529
198.10					4,094	2,763	3,931
198.20					4,254	3,180	4,348
198.30					4,414	3,613	4,781
198.40					4,574	4,063	5,231
198.50					4,734	4,528	5,696

Outlet Structure Controls					
Elevation (m)	Orifice 1 (m³/s)	Orifice 2 (m³/s)	Weir (m³/s)	Total Flow (m³/s)	Outlet Structure Characteristics
195.80					Orifice 1
195.90					Orifice Invert Elev. (m) 197.30 | Orifice Coeff. 0.60
196.00					Orifice Mid-point Elev. (m) 197.34 | Perimeter (m) 0.24
196.10					Orifice Diam.(mm) 75 | Area (m^2) 0.004
196.20					Weir Coeff. (semi-circular) 1.62 | Orientation Vertical
196.30					Orifice 2
196.40					Orifice Invert Elev. (m) 197.50 | Orifice Coeff. 0.60
196.50					Orifice Mid-point Elev. (m) 197.65 | Perimeter (m) 0.94
196.60					Orifice Diam.(mm) 300 | Area (m^2) 0.071
196.70					Weir Coeff. (semi-circular) 1.62 | Orientation Vertical
196.80					Emergency Overflow Weir
196.90					Weir Invert 198.20 | Weir Length 5
197.00					Weir Coeff. (rect.) 1.700 | Weir Side Slopes (H:V) (?:1)
197.10					Weir Coeff. (tri.) 0.600 | 5
197.20					
197.30					
197.40	0.003			0.003	
197.50	0.005			0.005	
197.60	0.006	0.010		0.016	
197.70	0.007	0.042		0.049	
197.80	0.008	0.073		0.081	
197.90	0.009	0.094		0.103	
198.00	0.010	0.111		0.121	
198.10	0.010	0.126		0.136	
198.20	0.011	0.139		0.150	
198.30	0.012	0.151	0.291	0.454	
198.40	0.012	0.163	0.887	1.062	
198.50	0.013	0.173	1.746	1.932	

Orifice Equation Used: Orifice flow equation

$Q = C \cdot A \cdot (2 \cdot g \cdot h)^{0.5}$

where

C = orifice coefficient

A = area of orifice

g = acceleration due to gravity

h = head above centre line of orifice

Note: Sharp crested weir equation with equivalent linear length used for calculating orifice flow rates when head is below centre line

Sharp crested semi-circular weir equation

$Q = C^* D^{2.5} * (H/D)^{1.88}$

where

C = sharp crested semi-circular weir coefficient

D = diameter of orifice

H = head above orifice invert

Note: used when water elevation is below mid-point of orifice

Weir Equation Used: $Q = (C_{rectangle} \cdot L \cdot H^{3/2}) + ((C_{triangle} \cdot (8/15 \cdot (2*g)^{1/2} \cdot \tan \Theta/2) \cdot H^{5/2})$

where

L = bottom width of weir

H = head above weir invert

S = side slopes (ratio of H:V)

$C_{triangle}$ = triangular weir coefficient

$C_{rectangle}$ = broad-crested rectangular weir coefficient

$g = 9.81\ m/s^2$

$\Theta/2$ = angle formed by trapezoidal weir side slopes

Grand Renewable Energy Park

Operations and Maintenance Facility SWM Basin

Sediment Forebay Sizing Calculations

Using MOE - SWMPD Manual Criteria (2003)

STORMWATER MANAGEMENT FACILITY

Settling

Dist = sqrt(r*Q_p/v_s)

= **5.5** **m**

r : 1 = l to w ratio — r = 3.00

Q_p = peak SWM outflow for water quality portion of E.D. zone — Q_p = 0.0030

v_s = settling velocity for 0.15 mm particles (m/s) — v_s = 0.0003

Dispersion Length (not applicable given the swale/ditch character of inlet conveyance - i.e. no jet dispersion)

Dist = 8Q/dv

= n/a **m**

Q = 10 yr max inlet flow (m^3/s) — Q = n/a

d = depth of perm pool in forebay (m) — d = 1

v_f = desired vel in forebay (m/s) — v_f = 0.5

Velocity

v = Q/A

= **0.04** **m/s**

y = total depth of forebay from perm. pool (m) — y = 1 — Note 1.

b = bottom width (avg) of forebay (m) — b = 2

Q = 10 yr inlet flow (m^3/s) — Q = 0.878

A = cross-sectional area (m^2) — A = 24 — Note 1.

Target velocity = 0.15 — V_{targ} = 0.15

Therefore, **Velocity Target Satisfied**

Cleanout Frequency

Table 6.3 MOE SWMPD Guidelines

cleanout = Vol/(load*A_{sew}*effic)

= **11.9** **years**

Therefore, **Cleanout Time OK**

A_{sew} = Contributing Sewer Area (ha) — A_{sew} = 6.00

Imp = Percent Impervious (%) — Imp = 50%

load = Sediment Loading (m^3/ha) — load = 1.6 — Note 2.

effic = Removal Efficiency (%) — effic = 80%

Targ = Cleanout Frequency Target (years) — Targ = 7

Vol = Sediment volume (m^3) (0.5m depth) — Vol = 90 — Note 3.

Surface Area Check

SA_f/SA_{pp} = **27.2%**

SA_f = Forebay Surface Area (m^2) — SA_f = 766

SA_{pp} = Total Permanent Pool Surface Area (m^2) — SA_{pp} = 2,813

Targ = Forebay size (as % of Permanent Pool Area) — Targ = 20%

The recommended design parameter limiting the forebay area to 20% of the total permanent pool surface area is a reflection of the fact that the volumetric sizing criteria for constructed wetland-type SWM facilities relies on the wetland vegetation component of the facility to perform the majority of the sediment removal functions, as opposed to a wet pond facility that relies on the dilution properties of the permanent pool. In this instance, it should be noted that the permanent pool volumetric sizing requirements, as defined by the MOE 2003 SWMPD Manual, are achieved within the wetland component *without accounting for storage volume provided within the forebay*. Therefore, it is suggested that that the facility, as designed, achieves the targets of the MOE Design Manual.

Notes

1. Total depth and cross-sectional area are 'worst-case' values, representative of conditions just prior to sediment clean-out
2. Interpolated based on percent impervious
3. Volume of bottom 0.5 m depth, the maximum sediment accumulation depth