
DAVENPORT SUBDIVISION

Township of Georgian Bluffs (Sarawak)
Project No. 06-D-3969

FUNCTIONAL PLANNING REPORT

STORMWATER MANAGEMENT COMPONENT

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1.0 INTRODUCTION

The proposed Davenport Subdivision is located on part of Lot 27, Concession III in the geographic township of Sarawak, now in the Township of Georgian Bluffs. The owner is proposing to develop 4.41 hectares of land adjacent to Church Side Road East, and leave the remaining property undeveloped. The proposed development will result in the creation of 20 rural residential lots.

The site is located approximately ten kilometres north of the City of Owen Sound, in the area of East Linton on the west side of Owen Sound. The project site is south of Church Side Road East, east of Grey County Road No.1, and west of Balmy Beach Road. The site is bordered by residential lands on the west, east and south sides. The area north of the project site is still rural agricultural land. The entire project site is well vegetated as either inactive pasture/meadow or wooded areas.

The development of the project site requires a stormwater management plan which addresses the potential impacts of increased surfacewater runoff with consideration given to the quality of that runoff and erosion control. Given the relatively low imperviousness which will be associated with a rural residential development it is preferred to utilize source and conveyance controls to provide the stormwater controls required. Due to the relatively low slopes (0 - 5.0%), source and conveyance controls will be feasible in providing adequate stormwater controls for the project site.

The goal of the stormwater management controls will be to meet the quantity control requirements of the Township of Georgian Bluffs and the Grey Sauble Conservation Authority (GSCA) plus the quality control requirements of GSCA and the Ontario Ministry of the Environment (MOE) 2003 guidelines. Due to the close proximity to Georgian Bay, "Enhanced" water quality treatment will be provided. It is also the intention of the project development to maintain post-development peak flow rates equal to or below pre-development levels.

2.0 EXISTING CONDITIONS

The existing project site has variable topography with good vegetation cover over the majority of the site. The topography of the site and external associated lands varies from quite flat on the project site to very steep in the east with slopes approaching 30% on the west side of Balmy Beach Road. The existing land use of the project site consists mainly of idle field and meadow with a single detached family dwelling with surrounding manicured lawn and some scrub brush in the center of the site. Runoff from the subdivision and adjacent lands crosses easterly under Balmy Beach Road

through one of two existing culverts. A 800mm diameter corrugated steel pipe (C.S.P.) culvert underneath Balmy Beach Road or a 760mm diameter corrugated steel pipe culvert near the intersection of Balmy Beach Road and Church Side Road East. Both culverts drain into Georgian Bay (Owen Sound), with the 800mm culvert across privately owned lands and the 760mm within the municipal roadway.

Based on the Grey County soil mapping from the Ministry of Agriculture and Food there are two main type of surficial soils present within the study area; Morely Bouldery Clay and Donnybrook Sandy Loam. Morely Bouldery Clay accounts for 100% of the surficial soil within the project site and is considered a poorly drained calcareous stony loam till. This loam soil is classified as type 'C' within the Soil Conservation Service (SCS) hydrologic soil grouping. Donnybrook Sandy Loam is present as surficial soil to the west of the project site, within the watershed area that drains through the site. It is considered a well drained moderately gravelly sand loam and is classified as type 'AB' within the Soil Conservation Service (SCS) hydrologic soil grouping.

Under existing conditions, the project site is considered three watershed areas based on the natural topography of the land determined by contour data (1.0m interval) from Ontario Base Maps, a stormwater management report prepared by Crozier & Associates (April, 2008) for the adjacent property to the south and a topographical survey carried out by M.J. Davenport & Associates plus a visual field inspection. The existing subwatershed areas are illustrated on Pre-Development Subwatershed Areas Drawing No. 3969-SW1.

The existing subwatershed area includes:

Subwatershed Area No. 1 (8.195 hectares) consists of a small area of the north western portion of the project site and additional area west of the site that drains towards the subject property. This subwatershed area is comprised primarily of open meadow with patches of mature trees and several single family detached dwellings and manicured landscaped areas. Under pre-development conditions this area drains mostly as sheet flow towards the roadside ditches running north-south across the subject property.

Subwatershed Area No. 2 (2.294 hectares) consists of an area within the subject property on both the east and west side of the existing driveway. This subwatershed area is comprised primarily of open pasture/meadows with a portion of a small treed area and a single family detached dwelling and manicured landscaped areas. Under pre-development conditions this area drains as sheet flow towards the existing ditches on both the east and west sides of the existing driveway.

Subwatershed Area No. 3 (1.524 hectares) consists of the easterly area within the subject property. This subwatershed area is comprised primarily of open pasture/meadows with a portion of a small treed area and a single family detached dwelling and manicured landscaped areas. Under pre-development conditions this area drains as sheet flow easterly onto adjacent lands.

The parameters used in the Visual Otthymo computer program are shown in Table 1.

Table 1 Existing Subwatershed Area Information								
Sub-watershed	Area (ha)	Land use	Slope (%)	Length (m)	C	Time to Peak (hr)	CN*	Ia (mm)
1	8.195	Woods / Meadow	3.0	650	0.376	0.407	67	5.0
2	2.294	Meadow / Lawns	3.0	320	0.446	0.246	75	5.0
3	1.524	Meadow / Lawns	3.0	70	0.393	0.129	75	5.0

The weighted runoff coefficient, 'C' is based upon "Design Chart 1.07: Runoff Coefficients" of the MTO Drainage Management Manual (MTO, 1997). The 'C' value considers the land use and topography plus the hydrologic soil classification or soil texture then is used to calculate "Time to Peak." Figure 3 in Appendix I "Supporting Information" includes the calculation of "time to peak".

Curve Number (CN) is based upon "Design Chart 1.09: Soil/Land Use Curve Numbers" of the MTO Drainage Management Manual (MTO, 1997). The CN value considers the soil type and the Hydrologic condition. The Curve Number (CN*) is the weighted value for the antecede moisture condition of the soil (AMC II). The weighted Curve Number (CN*) is calculated based on the weighted average of the imperviousness of the subwatershed area. For modelling purposes different CN* values are used due to the existence of different quantities of impervious areas within the subwatershed area. An initial abstraction value (Ia) of 5.0mm or less was used. Figure 2 in Appendix I includes the conversion of CN value to CN*.

The Visual OTTHYMO computer program was used to model the surface water runoff from the subject area under existing conditions. Peak flows for varying return periods were computed, and the results are shown in Table 4 on page 7. The detailed Visual OTTHYMO output for the existing conditions is attached in Appendix II.

3.0 POST DEVELOPMENT CONDITIONS

The development will create 20 rural residential lots with a street constructed as a rural road cross section consistent with standards specified by the Township of Georgian Bluffs. The existing ditching along the proposed Street 'A' will remain mostly as is, with the current gravel roadway paved with hot mix asphalt, and an under drained infiltration trench installed under the existing ditching to promote infiltration and provide quality control. This configuration will affect both pre-development watersheds and will require some minor lot grading.

The proposed subwatershed areas include:

Subwatershed Area No. 1 (7.730 hectares) consists of the area west of the site that drains towards the subject property. This subwatershed area will remain largely unchanged, with only the extension of the existing drainage swale along the west boundary of the subject property to the Church Side Road East roadside ditch occurring. This will divert westerly flowing water directly into the roadside ditch, as opposed to flowing across the subject property. All area west of the subject property is assumed to remain unchanged. Under post-development conditions this subwatershed will continue to drain in the existing direction into the roadside ditches of Street "A". The low impervious area of this subwatershed allows the use of the NasHYD command in the Visual OTTHYMO model.

Subwatershed Area No. 2 (3.269 hectares) consists of the majority of the area within the subject property on both the east and west side of the proposed Street "A". This subwatershed includes all of the area draining to the roadside ditches for Street "A" within the project site. This subwatershed area will be developed into 20 rural residential lots complete with single family detached homes, driveways and manicured lawn areas. Under post-development conditions the frontages of lots 1-20 will now drain into the roadside ditches of Street "A". The higher impervious area of this subwatershed (30.53%) due to the proposed development allows the use of the StandHYD command in the Visual OTTHYMO model.

Subwatershed Area No. 3 (1.014 hectares) consists of the easterly area within the subject property. The drainage for this subwatershed area will remain largely unchanged and will be developed into manicured lawn areas. Under post-development conditions this area drains in the existing direction, easterly as sheet flow onto adjacent lands. The low impervious area of this subwatershed allows the use of the NasHYD command in the Visual OTTHYMO model.

All parameters used to model the post-development subwatershed areas in the Visual Otthymo program are shown in Table 2 and 3.

Table 2 Proposed StandHYD Subwatershed Areas Information									
Sub-watershed Area	Area (ha)	Imperviousness (%)		Slope (%)		Length (m)		CN*	la (mm)
		Total	Connected	Imp.	Perv.	Imp.	Perv.		
2	3.269	31	20	2.0	3.0	147.6	320	86	3.0

Table 3 Proposed NasHYD Subwatershed Area Information								
Sub-watershed	Area (ha)	Land use	Slope (%)	Length (m)	C	Time to Peak (hr)	CN*	la (mm)
1	7.730	Woods / Meadow	3.0	630	0.375	0.402	67	5.0
3	1.014	Lawns	3.0	45	0.351	0.112	82	4.0

Curve Number (CN) is based upon "Design Chart 1.09: Soil/Land Use Curve Numbers" of the MTO Drainage Management Manual (MTO, 1997). The 'CN' value considers the hydrologic soil type of 'AB' and 'C'. The weighted CN values were used to calculate the modified CN values, CN*, for use in the Visual Otthymo modelling. The calculation of the CN* values can be found in Figure 4 of Appendix I.

Peak flows listed in this report were calculated using the Visual Otthymo (version 2.0) computer modeling program. Peak flows were calculated for each of the 2, 5, 10, 25, 50 and 100 year design storms. Calculations include consideration for the 6 hour SCS Type II and Chicago storm distribution and the 1 Hour AES storm distribution. Rainfall data for the site was taken from the Owen Sound gauging station and is included in Appendix I.

4.0 STORMWATER QUALITY AND QUANTITY CONTROL

The project site area requires Enhanced Protection as described in the Ministry of the Environment and Energy's "Stormwater Management Practices Planning and Design Manual, 2003".

Providing quality and quantity control for Street 'B' and the proposed houses and associated driveways (Subwatershed Area No. 2) is critical. Stormwater quality and quantity control will be achieved on this site through a treatment train approach using

a combination of low impact development techniques.

The opportunity for rainwater infiltration into the native soils is limited due to the fact that the percolation rate of the native loam till soils range from 3.6 to 36 millimetres per hour according to the hydrogeological report prepared by GHD (July, 2017) for the subject site. In order to promote infiltration and achieve a pre/post development water balance, we are proposing several different low impact development techniques. It is important to note that although the infiltration rate on the subject site is low, low impact development techniques can work in any soil type.

Surface water runoff from the proposed right-of-way lands will be controlled, treated and conveyed using the roadside ditches constructed as enhanced grassed swales with infiltration under-drains. The proposed enhanced grassed swales will be located on either side of the municipal road and are proposed to have a 0.33% longitudinal slope over the entire length of the road. We are proposing the construction of rock check dams located near where the proposed enhanced grass swales meet the existing municipal ditch on Church Side Road East. These check dams will create a controlled level of ponding in the proposed enhanced grass swales until reaching the spillway height on the check dams. This ponding affect will cause attenuation of peak flows under storm events and allow stormwater to enter the proposed under-drain and infiltrate. The under-drain will consist of three six (6) inch diameter perforated "Big O" pipes surrounded by 3/4" washed stone. The volume of water able to contained within the under-drain structure is 68.82 cubic metres, which is greater than the resulting volume of rainfall from the right-of-way 25mm rainfall storm event, the quality control storm. The water captured within the under-drain will slowly percolate into the underlying native soils, helping to promote groundwater recharge within the development. The detailed calculations for the required right-of-way 25mm storm volume and stage storage relationship of the ponding area and spillway outflow can be found in Appendix I.

In order to reduce the stormwater runoff from rooftop rainwater from the proposed houses, we are proposing that half of the rooftop water be directed onto pervious landscaped areas that have a minimum pervious flow path of 5 metres. Known as a downspout disconnection, the pervious area should be graded between one to five percent and an energy dissipater should be placed at the location of the downspout in order to ensure a level spread of flow. Rooftop rainwater is considered clean, and therefore does not require quality control. Furthermore, we are proposing that the remaining half of the rooftop area be directly connected to a soakaway pit infiltration practice located on each lot of the subdivision. In order to completely capture the 25mm storm event, the soakaway pit should have a bed footprint of 4.22 metres by 1.83 metres with a depth of 0.91 metres. Detailed calculations for the soakaway pit sizing can be found in Appendix I of this report. The downspout disconnect detail and

soakaway pit design drawings can be found on Drawing No. 3969-SW2 prepared by M.J. Davenport & Associates.

We are also proposing to maximize pervious surfaces by planning the subdivision with single detached lots and large grassed lawns. The larger grassed areas on each individual lot will further promote attenuation and re-use of stormwater as well as work in conjunction with the rooftop rainwater leader disconnect feature to attenuate rooftop rainwater before reaching the roadside ditch.

Stormwater management quality and quantity control as it relates to the individual lots will be provided for during construction of the individual houses. Low Impact Development in the form of soak away pits and downspout disconnects shall be utilized to control, treat and convey surface water runoff from the developed lots.

The proposed site development will increase impervious areas and if left uncontrolled will result in an increase in surface water runoff leaving the site. Stormwater management facilities must maintain post development at pre-development levels to ensure the proposed development does not increase downstream flooding.

Peak flows listed in this report were calculated using the Visual Otthymo (version 2.0) computer modeling program. Peak flows were calculated for each of the 2, 5, 10, 25, 50 and 100 year design storms. Calculations include consideration for the 1 hour AES, 6 hour Chicago and the 6 hour SCS Type II storm distribution.

The wide range of design storms were utilized in the Visual Otthymo Model to ensure that both peak flows and maximum runoff volumes are incorporated into the stormwater management facility design. Rainfall data for the site was taken from the Owen Sound gauging station and is included in Appendix I.

Table 4 summarizes the 100 year peak flows for the existing condition compared to the proposed uncontrolled condition for all design storms discharging off site.

Table 4 – Existing and Proposed Uncontrolled 100 Year Peak Flows Draining Off-site

Design Storm (yr)	Peak Flows (m ³ /s)								
	6 Hour Chicago			6 Hour SCS			1 Hour AES		
	Pre	Post	Diff	Pre	Post	Diff	Pre	Post	Diff
2	0.154	0.203	0.049	0.193	0.251	0.058	0.106	0.166	0.060
5	0.282	0.313	0.031	0.338	0.404	0.066	0.209	0.260	0.051
10	0.400	0.426	0.026	0.450	0.525	0.075	0.291	0.336	0.045
25	0.526	0.559	0.033	0.604	0.695	0.091	0.409	0.440	0.031
50	0.669	0.734	0.065	0.729	0.823	0.094	0.504	0.529	0.025
100	0.770	0.849	0.079	0.859	0.952	0.093	0.608	0.625	0.017

Table 4 indicates that off site flows will increase to a maximum peak flow of 0.952 cubic metres per second during the 100 year, 6 hour SCS Type II storm event under post development conditions. Quantity control measures are required to reduce the post development peak flows to pre-development levels. To achieve this, a series of low impact development methods will be employed.

The stage-storage discharge values for the storage created behind the proposed rock check dams in the under-drained roadside ditch was calculated using peak flows generated by post development Subwatershed No. 2 under the 6 Hour SCS Type II storm event. The stage-storage discharge values for the roadside ditch are summarized in Table 5.

Table 5 – Stage-Storage Discharge Values For Roadside Ditches

Elev. (m)	Ponding Depth (m)	Spillway Flow (m ³ /s)	Volume (m ³)	Notes
214.50	0.0	0.0000	69	Top of Under-drain
215.00	0.0	0.0000	69	Toe of Check Dam
215.40	0.40	0.0000	155	Start of Spillway
215.42	0.42	0.0273	168	25mm Storm
215.50	0.50	0.1870	223	5 Year SCS Storm
215.56	0.56	0.4132	287	100 Year SCS Storm
215.60	0.60	0.5617	328	Top of Spillway/Ditch

The supporting calculations for the stage-storage discharge values are included in Appendix I. The peak flows discharging off-site for the pre-development and post-development controlled condition are summarized in Table 6.

Table 6 – Existing and Proposed 100 Year Peak Flows Draining Off-site

Design Storm (yr)	Peak Flows (m ³ /s)								
	6 Hour Chicago			6 Hour SCS			1 Hour AES		
	Pre	Post	Diff	Pre	Post	Diff	Pre	Post	Diff
2	0.154	0.147	-0.007	0.193	0.177	-0.016	0.106	0.069	-0.037
5	0.282	0.285	0.003	0.338	0.354	0.016	0.209	0.183	-0.026
10	0.400	0.418	0.018	0.450	0.475	0.025	0.291	0.284	-0.007
25	0.526	0.548	0.022	0.604	0.641	0.037	0.409	0.414	0.005
50	0.669	0.716	0.047	0.729	0.764	0.035	0.504	0.527	0.023
100	0.770	0.826	0.056	0.859	0.888	0.029	0.608	0.640	0.032

Table 6 indicates that off-site stormwater peak flows will see a net increase in all storm events above the 2 year design storm under post development conditions. It is important to note that the simulated conditions include consideration for the storage capacity of the proposed roadside ditch under-drain, but do not take into account the storage and decrease in expected peak flows from the proposed individual lot soakaway pits. During construction of individual lots, it will be shown that low impact development lot level controls will reduce post development peak flows to be equal to or less than pre development peak flows.

The supporting calculations for the stormwater management simulation are included in Appendix I. The summary and detailed Visual Otthymo output files for all three (3) scenarios are included in Appendix I.

The combination of lot level controls and enhanced grassed swales with underdrain will adequately control, treat and convey surface water runoff from the proposed development and outlet into the existing roadside ditches along Church Side Road East with no negative impact on downstream land owners.

5.0 EROSION AND SEDIMENTATION CONTROL

Erosion and sedimentation control measures will be installed within the development during every step of construction, to minimize the effects on lands external to the development as well as to protect the infiltration techniques within the development.

Infiltration underdrains are susceptible to clogging during the construction stage of development. As a result, we are recommending that the municipal infrastructure be constructed within the Right-of-Way before the underdrain is installed. Two rows of silt fence will be installed before the ditches outlet onto Church Side Road East to capture any sedimentation that enters the road side ditches. After paving is complete

on the proposed road way, the underdrain shall be installed under the road side ditches and the silt fencing can be removed.

During construction of homes on the individual lots, the municipal road side ditches shall be protected from silt entering the ditch by installing silt fence between the proposed residence and the road side ditches.

The erosion and sedimentation control measures shall be inspected after every major rainfall event, and sediment buildup shall be cleaned and removed from the ditches as required.

6.0 CONCLUSIONS AND RECOMMENDATIONS

In our professional opinion, the use of low impact development techniques as well as lot level controls will prevent the development from having adverse negative impacts on adjacent and downstream land owners.

Prepared by:

M.J. DAVENPORT & ASSOCIATES LTD.



Jacob Clark, EIT

September 4, 2018



Michael M. Davenport, P. Eng.

APPENDIX I

**STORMWATER MANAGEMENT
SUPPORTING INFORMATION**

FIGURE 1
DAVENPORT SUBDIVISION
WEIGHTED VALUES FOR CN & C - PRE-DEVELOPMENT
UNCALIBRATED PARAMETERS

Soil Type from Mapping	Hydrologic Soil Group for Modelling	Land Use	CN Value	Runoff Coeff. C'	Subwatershed No. 1			Subwatershed No. 2			Subwatershed No. 3		
					Area (ha.)	Weighted CN Portion	Weighted C Portion	Area (ha.)	Weighted CN Portion	Weighted C Portion	Area (ha.)	Weighted CN Portion	Weighted C Portion
Morely Bouldery Clay	C	Woodland	77	0.35	1.682	129.514	0.589	0.057	4.389	0.020	0.072	5.544	0.025
Morely Bouldery Clay	C	Meadow	71	0.40	3.995	283.645	1.598	1.834	130.214	0.734	1.087	77.177	0.435
Morely Bouldery Clay	C	Lawns	82	0.35	0.089	7.298	0.031	0.168	13.776	0.059	0.345	28.290	0.121
Morely Bouldery Clay	C	Impervious	98	0.90	0.225	22.050	0.203	0.235	23.030	0.212	0.020	1.960	0.018
Donnybrook Sandy Loam	AB	Woodland	54	0.25	2.032	109.728	0.508	0.000	0.000	0.000	0.000	0.000	0.000
Donnybrook Sandy Loam	AB	Impervious	98	0.90	0.172	16.856	0.155	0.000	0.000	0.000	0.000	0.000	0.000
Total Area :					8.195				2.294				1.524
Weighted CN :					69.444			74.721			74.128		
Weighted 'C' :					0.376			0.446			0.393		

FIGURE 2
DAVENPORT SUBDIVISION
CONVERSION OF CN TO CN* - PRE-DEVELOPMENT
UNCALIBRATED PARAMETERS

Subwatershed	Command	CN (AMC II)	CN (AMC III)	S (mm)	Standard		Q	P	Calculated	S*	CN* (AMC III)	CN* (AMC II)	Condition		Condition	
					la	la							I	II		
Post-Development Conditions																
1	101	69.4	84	48.38	7.26	126.8	85.10	5	52.52	83	67	0	0	0	0	0
2	102	74.7	88	34.64	5.20	151.3	118.11	5	34.92	88	75	5	13	22	10	5
3	103	74.1	88	34.64	5.20	151.3	118.11	5	34.92	88	75	6	15	30	15	15
												9	20	37	20	20
												12	25	43	25	25
												15	30	50	30	30
												16	31	51	31	31
												18	32	52	32	32
												17	33	53	33	33
												18	34	54	34	34
												19	35	55	35	35
												20	36	56	36	36
												21	37	57	37	37
												22	38	58	38	38
												23	39	59	39	39
												24	40	60	40	40
												25	41	61	41	41
												26	42	62	42	42
												27	43	63	43	43
												28	44	64	44	44
												29	45	65	45	45
												30	46	66	46	46
												31	47	67	47	47
												32	48	68	48	48
												33	49	69	49	49
												34	50	70	50	50
												35	51	71	51	51
												36	52	72	52	52
												37	53	73	53	53
												38	54	74	54	54
												39	55	75	55	55
												40	56	76	56	56
												41	57	77	57	57
												42	58	78	58	58
												43	59	79	59	59
												44	60	80	60	60
												45	61	81	61	61
												46	62	82	62	62
												47	63	83	63	63
												48	64	84	64	64
												49	65	85	65	65
												50	66	86	66	66
												51	67	87	67	67
												52	68	88	68	68
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												57	73	93	73	73
												58	74	94	74	74
												59	75	95	75	75
												60	76	96	76	76
												61	77	97	77	77
												62	78	98	78	78
												63	79	99	79	79
												64	80	100	80	80
												65	81	101	81	81
												66	82	102	82	82
												67	83	103	83	83
												68	84	104	84	84
												69	85	105	85	85
												70	86	106	86	86
												71	87	107	87	87
												72	88	108	88	88
												73	89	109	89	89
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												75	91	111	91	91
												76	92	112	92	92
												77	93	113	93	93
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												84	100	120	100	100
												85	101	121	101	101
												86	102	122	102	102
												87	103	123	103	103
												88	104	124	104	104
												89	105	125	105	105
												90	106	126	106	106
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												92	108	128	108	108
												93	109	129	109	109
												94	110	130	110	110
												95	111	131	111	111
												96	112	132	112	112
												97	113	133	113	113
												98	114	134	114	114
												99	115	135	115	115
												100	116	136	116	116

The CN values used for each subcatchment are the weighted values calculated based upon the different soils and land use.

The CN values used for each subcatchment are the weighted values calculated based upon the different soils and land use.

FIGURE 3

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TIME TO PEAK (Tp) FOR DIFFERENT RETURN PERIODS

Subwatershed	Area (ha)	Average Slope (%)	Travel Length (m)	2/5/10 Year	Runoff Coefficient - 'C' 25 Year	50 Year	100 Year	2/5/10 Year	25 Year	50 Year	100 Year
Pre-Development											
1	8.195	3.00	650	0.376	0.414	0.451	0.470	0.467	0.443	0.419	0.407
2	2.294	3.00	320	0.446	0.491	0.536	0.558	0.296	0.276	0.256	0.246
3	1.524	3.00	70	0.393	0.432	0.471	0.491	0.150	0.142	0.133	0.129

**Bransby-Williams Method
Post-Development Urban Watersheds**

Subwatershed	Average Slope (%)	Travel Length (m)	Velocity (m/s)	Time to Peak (hr)

FIGURE 4
DAVENPORT SUBDIVISION
WEIGHTED VALUES FOR CN & C - POST-DEVELOPMENT
UNCALIBRATED PARAMETERS

Soil Type from Mapping	Hydrologic Soil Group for Modelling	Land Use	CN Value	Runoff Coeff. C'	Subwatershed No. 1			Subwatershed No. 2			Subwatershed No. 3		
					Area (ha.)	Weighted CN Portion	Weighted C Portion	Area (ha.)	Weighted CN Portion	Weighted C Portion	Area (ha.)	Weighted CN Portion	Weighted C Portion
Morely Bouldery Clay	C	Woodland	77	0.35	1.682	129.514	0.589	0.000	0.000	0.000	0.000	0.000	0.000
Morely Bouldery Clay	C	Meadow	71	0.40	3.530	250.630	1.412	0.000	0.000	0.000	0.000	0.000	0.000
Morely Bouldery Clay	C	Lawns	82	0.35	0.089	7.298	0.031	2.271	186.222	0.795	1.013	83.066	0.355
Morely Bouldery Clay	C	Impervious	98	0.90	0.225	22.050	0.203	0.998	97.804	0.898	0.001	0.098	0.001
Donnybrook Sandy Loam	AB	Woodland	54	0.25	2.032	109.728	0.508	0.000	0.000	0.000	0.000	0.000	0.000
Donnybrook Sandy Loam	AB	Impervious	98	0.90	0.172	16.856	0.155	0.000	0.000	0.000	0.000	0.000	0.000
Total Area :					7.730	69.350			3.269	86.885			1.014
Weighted CN :										0.518			82.016
Weighted 'C' :										0.375			0.351

FIGURE 5
DAVENPORT SUBDIVISION
CONVERSION OF CN TO CN* - POST-DEVELOPMENT
UNCALIBRATED PARAMETERS

Subwatershed	Command	CN (AMC II)	CN (AMC III)	S (mm)	Calculated Ia	P	Q	Standard Ia	S*	CN* (AMC II)	CN* (AMC III)	CN* (AMC II)	CN for Condition I	CN for Condition II	CN for Condition III	CN for Condition	II
Post-Development Conditions																	
1	101	69.4	84	48.38	7.26	126.8	85.10	5	52.52	83	67	67	0	0	0	0	0
2	102	86.9	94	16.21	3.24	192.7	174.52	3	16.50	94	86	86	2	5	13	10	5
3	103	82.0	92	22.09	4.42	192.7	168.51	4	22.60	92	82	82	6	15	30	15	15
													9	20	37	20	20
													12	25	43	25	25
													15	30	50	30	30
													16	31	51	31	31
													16	32	52	32	32
													17	33	53	33	33
													18	34	54	34	34
													18	35	55	35	35
													19	36	56	36	36
													20	37	57	37	37
													21	38	58	38	38
													21	39	59	39	39
													22	40	60	40	40
													22	41	61	41	41
													24	42	62	42	42
													25	43	63	43	43
													25	44	64	44	44
													26	45	65	45	45
													27	46	66	46	46
													27	47	67	47	47
													28	48	68	48	48
													29	49	69	49	49
													30	50	70	50	50
													31	51	71	51	51
													31	52	72	52	52
													32	53	73	53	53
													33	54	74	54	54
													34	55	75	55	55
													35	56	76	56	56
													36	57	77	57	57
													38	58	78	58	58
													39	59	79	59	59
													40	60	80	60	60
													41	61	81	61	61
													41	62	82	62	62
													43	63	83	63	63
													44	64	84	64	64
													45	65	85	65	65
													46	66	86	66	66
													47	67	87	67	67
													48	68	88	68	68
													49	69	89	69	69
													50	70	90	70	70
													51	71	91	71	71
													52	72	92	72	72
													53	73	93	73	73
													54	74	94	74	74
													55	75	95	75	75
													56	76	96	76	76
													57	77	97	77	77
													58	78	98	78	78
													59	79	99	79	79
													60	80	100	80	80
													62	82	102	82	82
													63	83	103	83	83
													64	84	104	84	84
													66	86	106	86	86
													67	87	107	87	87
													68	88	108	88	88
													69	89	109	89	89
													70	90	110	90	90
													71	91	111	91	91
													72	92	112	92	92
													73	93	113	93	93
													75	95	115	95	95
													76	96	116	96	96
													77	97	117	97	97
													78	98	118	98	98
													79	99	119	99	99
													80	100	120	100	100
													81	101	121	101	101
													82	102	122	102	102
													83	103	123	103	103
													85	105	125	105	105
													86	106	126	106	106
													87	107	127	107	107
													88	108	128	108	108
													89	109	129	109	109
													90	110	130	110	110
													91	111	131	111	111
													92	112	132	112	112
													93	113	133	113	113
													94	114	134	114	114
													95	115	135	115	115
													96	116	136	116	116
													97	117	137	117	117
													98	118	138	118	118
													99	119	139	119	119
													100	120	140	120	120

The CN values used for each subcatchment are the weighted values calculated based upon the different soils and land use.

FIGURE 6

DAVENPORT SUBDIVISION

TIME TO PEAK (Tp) FOR DIFFERENT RETURN PERIODS

Subwatershed	Area (ha)	Average Slope (%)	Travel Length (m)	Runoff Coefficient - 'C'			Time to Peak (hr)				
				2/5/10 Year	25 Year	50 Year	100 Year	2/5/10 Year	25 Year	50 Year	100 Year
Post-Development											
1	7.73	3.00	630	0.375	0.412	0.450	0.468	0.461	0.437	0.413	0.402
3	1.014	3.00	45	0.351	0.386	0.421	0.438	0.127	0.121	0.115	0.112

**Bransby-Williams Method
Post-Development Urban Watersheds**

Subwatershed	Average Slope (%)	Travel Length (m)	Velocity (m/s)	Time to Peak (hr)
2	1.2	320.0		0.389

FIGURE 7

DEERFIELD ACRES

STORMWATER MANAGEMENT ROCK CHECK DAM VOLUMES

Width of Spillway on Rock Check Dam		2.00 m	Last updated:		August 29, 2018
Total Length of Underdrained Ditch		246.00 m			
Elevation of Rock Check Spillway		215.40 m			
ELEVATION (m)	FLOW OUT ONE SPILLWAY SECTION (m ³ /s)	SURFACE AREA OF ONE DITCH (m ²)	LENGTH OF PONDING AREA (m)	TOTAL FLOW CAPACITY OF BOTH SPILLWAYS (m ³ /s)	ACTIVE STORAGE OF BOTH DITCHES (m ³)
Top of Underdrain	0.0000	0.000	0	0.0000	69.0
Toe of Check Dam	0.0000	0.000	0	0.0000	69.0
	0.0000	0.040	15	0.0000	69.6
	0.0000	0.090	30	0.0000	71.7
	0.0000	0.160	45	0.0000	76.2
	0.0000	0.240	60	0.0000	83.4
	0.0000	0.340	75	0.0000	94.5
	0.0000	0.450	90	0.0000	109.5
	0.0000	0.580	105	0.0000	129.9
	0.0000	0.720	120	0.0000	153.4
	0.0351	0.880	135	0.0702	187.8
	0.0993	1.050	150	0.1986	226.5
	0.1824	1.240	165	0.3648	273.6
	0.2809	1.440	180	0.5617	328.2
Bottom of Spillway					25mm Storm Elev. = 215.42
					5 Year Storm Elev. = 215.50
					100 Year Storm Elev. = 215.56
Top of Ditch/Spillway					

Based on the 6 Hour SCS Storm

DITCH UNDERDRAIN DESIGN

25mm Storm Depth:

In order to contain the 25mm quality storm event, the storage volume in the proposed underdrain must meet the volume expected to accumulate during this storm event. In order to determine the volume necessary, the equation below was used.

$$V = A \times D \times C$$

Where:

- V = Volume required to contain the 25mm storm (m^3)
- A = Area draining to the road side ditches (m^2)
= 4991.27 m^2
- D = Depth of rainfall event (m)
= 0.025 m
- C = Runoff coefficient (unitless)
= 0.53

$$V = 4991.27 \times 0.025 \times 0.53$$

$$V = 66.13 \text{ } m^3 \text{ required to contain the 25mm storm event}$$

The proposed underdrain with a width of 0.75 metres and a depth of 0.36 metres and extending 246 metres in length creates approximately 68.82 cubic metres of storage. This is accounting for a 40% void ratio in the gravel surrounding the triple 150mm underdrain pipes. This exceeds the required 66.13 cubic metres to completely contain the 25mm storm event for the proposed paved road.

SOAKAWAY PIT INFILTRATION PRACTICE DESIGN

25mm Storm Depth:

In order to contain the 25mm quality storm event, the storage volume in the proposed soakaway pit must meet or exceed the volume expected to accumulate during this storm event. In the case of each lot, one soak away pit will be constructed to capture half of the rooftop rainwater. Therefore, the area used will be half of the rooftop area of one residence shown on Drawing No. 3969-SW2 prepared by M.J. Davenport & Associates. To determine the volume necessary, the equation below was used.

$$V = A \times D \times C$$

Where:

- V = Volume required to contain the 25mm storm (m³)
- A = Area draining to the soakaway pit (m²)
= 125.00 m²
- D = Depth of rainfall event (m)
= 0.025 m
- C = Runoff coefficient (unitless)
= 0.90

$$V = 125.00 \times 0.025 \times 0.90$$

$$V = 2.81 \text{ m}^3 \text{ required to contain the 25mm storm event}$$

To ensure that the proposed soakaway pit will maintain rooftop rainwater post development peak flows equal to or less than pre-development flows, the rational method can be used to determine the required storage capacity of each soakaway pit. The rational method was used to calculate the selected return period peak discharges. Intensity-Duration-Frequency (IDF) curves developed from the 1965 to 2006 Owen Sound Gauging Station data were used in the stormwater calculations. In accordance with the MTO Drainage Management Manual, we have increased the 100 year runoff coefficient (C) by 25.0%.

Rational Method Formula

$$Q = 0.0028CIA$$

Where:

- Q = Calculated peak flow discharge (cms)
- C = Calculated runoff coefficient
- A = Area under consideration (ha)
- I = 15 minute rainfall intensity (mm/hr)

Table 1 below calculates the predevelopment peak flows generated by the meadow area that is proposed to be replaced with a residence.

Table 1 - Pre-Development Site Condition Uncontrolled 5 and 100 year Peak Discharges					
Surface Type	Description	Area (sm)	Runoff Coefficient (C)	5 Year Peak Flow (cms)	100 Year Peak Flow (cms)
Landscape	Meadow	125.00	0.4	0.0011	0.0022

Table 2 below calculates the predevelopment peak flows generated by the impervious rooftop area.

Table 2 - Post-Development Site Condition Uncontrolled 5 and 100 year Peak Discharges					
Surface Type	Description	Area (sm)	Runoff Coefficient (C)	5 Year Peak Flow (cms)	100 Year Peak Flow (cms)
Hard	Rooftop	125.00	0.9	0.0025	0.0050

The proposed development, when compared to the existing site, results in an uncontrolled increase in the 5 year and 100 year peak flow rates of 0.0014 and 0.0028 cubic metres per second respectively. On-site storage is required to restrict post development peak flows to pre-development conditions. Tables 3 and 4 below provide the summary of the stormwater quantity control required for the 5 and 100 year storm event, respectively.

Table 3 – Post Development Storage Volume Requirement 5 year Storm Event					
Tc (min)	I (mm/hr)	Q (cms)	Qallow (cms)	Qstored (cms)	Qstorage (cu.m)
5	130.8	0.0041	0.0011	0.0030	0.90
10	95.2	0.0030	0.0011	0.0019	1.13
15	79.4	0.0025	0.0011	0.0014	1.25
20	70.8	0.0022	0.0011	0.0011	1.35
25	62.4	0.0020	0.0011	0.0009	1.29
30	54.1	0.0017	0.0011	0.0006	1.07

Table 4 – Post Development Storage Volume Requirement 100 year Storm Event					
Tc (min)	I (mm/hr)	Q (cms)	Qallow (cms)	Qstored (cms)	Qstorage (cu.m)
5	220.3	0.0087	0.0022	0.0065	1.94
10	151.3	0.0060	0.0022	0.0037	2.24
15	126.8	0.0050	0.0022	0.0028	2.50
20	114.9	0.0045	0.0022	0.0023	2.76
25	102.9	0.0041	0.0022	0.0018	2.75
30	91.0	0.0036	0.0022	0.0014	2.46

Therefore, from the calculations above, the total volume required to maintain pre to post development peak flow rates is calculated to be 1.35 cubic metres for the 5 year storm event and 2.76 cubic metres for the 100 year storm event. Each soakaway pit shall be designed to completely capture the 25mm storm event, so the required volume is 2.81 cubic metres.

Maximum Depth of Soakaway Pit

The maximum depth of the soakaway pit is dependent on the native soil infiltration rate, porosity of the chosen gravel storage and the desired drawdown time of the practice in-between storm events. From the LID-SWM guide 2010, page 4-57, the maximum depth can be calculated using:

$$d_{r\ max} = i \times t_s / V_r$$

Where:

- $d_{r\ max}$ = Maximum stone reservoir depth (mm)
- i = Infiltration rate for native soils (mm/hr)
= 10 mm/hr (Taken from range in GHD Geotechnical Report)
- V_r = Void space ratio for aggregate used
= 0.40 (For 19mm clearstone to 50mm clearstone)
- t_s = Time to drain
= 48 hours (recommended by guide)

$$d_{r\ max} = (10 \times 48) / 0.40$$

$$d_{r\ max} = 1200mm$$

Footprint of the Soakaway Pit

The required footprint of the soakaway pit is determined using the required storage volume determined from the 25mm water quality storm event, the depth of the practice and the void space ratio, which will be the same as previously.

$$A_f = WQV / (d_r \times V_r)$$

Where:

A_f = Footprint surface area (m^2)

WQV = Water quality volume (m^3)
= 2.81 m^3

d_r = Stone reservoir depth (m)
= 0.91 m

V_r = Void space ratio for aggregate used
= 0.40 (For 19mm clearstone to 50mm clearstone)

$$A_f = 2.81 / (0.91 \times 0.4)$$

$$A_f = 7.72 \text{ m}^2$$

The proposed bed size is 4.22 metres by 1.83 metres with a depth of 0.91 metre. This would meet the requirement of maximum depth less than 1.2 metres, while also providing a minimum bed footprint of 7.72 square metres with a volume of 2.81 cubic metres, after accounting for the void space of the stone reservoir. Therefore the proposed soakaway pit is sufficient by these criteria. Each property would contain one soak away pit, capturing half of the rooftop rain water.

Short Duration Rainfall Intensity-Duration-Frequency Data
Données sur l'intensité, la durée et la fréquence des chutes
de pluie de courte durée

Gumbel - Method of moments/Méthode des moments

2014/12/21

OWEN SOUND MOE

ON 6116132

Latitude: 44 35'N Longitude: 80 56'W Elevation/Altitude: 178 m

Years/Années : 1965 - 2006 # Years/Années : 37

Table 1 : Annual Maximum (mm)/Maximum annuel (mm)

Year Année	5 min	10 min	15 min	30 min	1 h	2 h	6 h	12 h	24 h
1965	12.7	16.0	23.9	28.7	32.3	35.1	35.1	35.1	35.1
1966	6.9	8.9	13.2	18.8	21.8	22.1	30.5	32.0	32.3
1967	11.4	15.7	21.3	38.1	43.9	43.9	43.9	46.5	52.6
1968	14.7	19.6	24.4	31.2	43.9	56.4	63.8	68.1	75.9
1969	6.6	13.0	17.0	22.9	30.2	39.4	49.3	71.9	71.9
1970	10.2	18.8	25.4	32.5	41.4	42.7	42.7	55.6	55.6
1971	7.6	12.2	17.3	26.9	36.1	39.1	55.6	55.6	55.9
1972	7.4	13.2	18.3	19.3	20.1	23.6	36.8	42.7	42.7
1973	5.8	10.2	12.4	16.3	16.5	16.5	18.3	29.7	33.5
1974	6.6	10.4	11.7	16.3	18.8	23.9	43.9	43.9	45.0
1975	6.9	9.4	9.4	11.2	17.0	17.0	24.6	25.4	25.4
1976	7.1	13.2	17.3	22.4	22.6	22.6	29.2	31.7	34.8
1977	13.0	14.7	18.0	22.9	22.9	25.1	26.9	37.3	37.3
1979	18.4	26.0	26.4	30.4	32.1	32.2	41.1	47.1	48.3
1980	9.4	16.1	19.8	30.8	32.0	41.3	45.7	45.7	72.4
1981	-99.9	-99.9	-99.9	-99.9	14.5	19.7	29.4	40.6	41.4
1982	11.8	11.8	12.0	12.0	12.6	23.0	52.6	56.6	56.8
1983	5.6	7.8	8.2	15.7	27.3	38.2	46.8	50.0	53.4
1984	6.9	11.4	15.6	22.3	36.4	45.1	47.0	47.0	47.0
1985	10.1	16.0	18.0	22.4	25.9	32.1	44.8	62.4	73.0
1986	4.6	8.4	11.2	12.4	16.2	16.3	39.2	43.3	60.9
1987	9.0	13.5	15.1	15.1	15.5	15.8	17.0	28.0	28.0
1988	11.4	14.2	18.0	21.0	24.8	27.7	35.9	45.0	54.0
1989	6.9	12.1	12.7	13.5	13.9	14.0	-99.9	-99.9	47.2
1990	10.6	15.0	18.7	27.4	34.1	35.9	40.0	45.4	45.4
1991	5.6	7.0	8.1	8.3	10.5	18.0	27.3	28.6	38.9
1992	4.8	7.4	8.4	8.9	14.1	18.2	27.9	43.3	47.5
1993	7.7	15.4	23.1	25.9	27.9	28.6	33.1	39.0	49.9
1994	5.2	10.4	15.4	27.4	32.4	32.6	35.7	35.7	48.0
1995	7.6	12.0	12.5	12.5	16.4	21.6	30.5	33.2	38.7
1996	10.8	15.3	18.1	27.8	32.5	41.7	47.0	55.9	55.9
1999	7.2	11.1	15.2	20.6	21.7	21.7	36.5	40.8	42.4
2000	7.2	14.1	18.0	33.0	53.0	70.3	79.3	79.5	80.5
2001	5.2	9.0	11.6	14.6	21.4	24.4	30.8	35.6	42.0
2002	8.2	11.0	12.8	15.8	16.4	25.8	53.0	54.8	65.2

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2003	11.2	16.3	20.6	24.5	30.5	32.2	32.4	32.4	48.1
2004	6.5	9.7	11.3	16.9	27.8	35.4	54.6	70.8	76.2
2006	12.2	17.4	20.0	30.6	53.1	74.8	74.8	76.6	85.8
# Yrs.	37	37	37	37	38	38	37	37	38
Années									
Mean	8.7	13.1	16.2	21.5	26.6	31.4	40.6	46.3	51.2
Moyenne									
Std. Dev.	3.1	3.9	4.9	7.6	10.9	14.0	13.8	14.1	15.1
Écart-type									
skew.	1.08	0.96	0.23	0.13	0.73	1.39	0.89	0.76	0.58
Dissymétrie									
Kurtosis	4.39	5.17	2.55	2.32	3.23	5.37	4.30	3.09	2.87

*-99.9 Indicates Missing Data/Données manquantes

Warning: annual maximum amount greater than 100-yr return period amount
Avertissement : la quantité maximale annuelle excède la quantité pour une période de retour de 100 ans

Year/Année	Duration/Durée	Data/Données	100-yr/ans
1979	5 min	18.4	18.4
1979	10 min	26.0	25.2

Table 2a : Return Period Rainfall Amounts (mm)
Quantité de pluie (mm) par période de retour

Duration/Durée	2	5	10	25	50	100	#Years Années
	yr/ans	yr/ans	yr/ans	yr/ans	yr/ans	yr/ans	
5 min	8.2	10.9	12.7	15.0	16.7	18.4	37
10 min	12.4	15.9	18.1	21.0	23.1	25.2	37
15 min	15.4	19.8	22.7	26.3	29.0	31.7	37
30 min	20.3	27.0	31.5	37.1	41.3	45.5	37
1 h	24.8	34.5	40.8	48.9	54.9	60.9	38
2 h	29.1	41.5	49.7	60.1	67.8	75.5	38
6 h	38.4	50.5	58.6	68.7	76.3	83.8	37
12 h	44.0	56.5	64.7	75.2	83.0	90.7	37
24 h	48.7	62.0	70.9	82.0	90.3	98.5	38

Table 2b :

Return Period Rainfall Rates (mm/h) - 95% Confidence limits
Intensité de la pluie (mm/h) par période de retour - Limites de confiance de 95%

Duration/Durée	2	5	10	25	50	100	#Years Années
	yr/ans	yr/ans	yr/ans	yr/ans	yr/ans	yr/ans	
5 min	98.0	130.8	152.4	179.8	200.2	220.3	37
	+/- 11.0	+/- 18.5	+/- 24.9	+/- 33.6	+/- 40.2	+/- 46.9	37
10 min	74.6	95.2	108.7	125.9	138.7	151.3	37
	+/- 6.9	+/- 11.6	+/- 15.6	+/- 21.1	+/- 25.2	+/- 29.4	37
15 min	61.7	79.1	90.6	105.2	116.0	126.8	37
	+/- 5.8	+/- 9.8	+/- 13.3	+/- 17.9	+/- 21.4	+/- 24.9	37
30 min	40.6	54.1	63.0	74.3	82.7	91.0	37
	+/- 4.5	+/- 7.6	+/- 10.3	+/- 13.8	+/- 16.6	+/- 19.3	37
1 h	24.8	34.5	40.8	48.9	54.9	60.9	38
	+/- 3.2	+/- 5.4	+/- 7.3	+/- 9.8	+/- 11.7	+/- 13.6	38

	idf_v2-3_2014_12_21_611_ON_6116132_OWEN_SOUND_MOE							
2 h	14.6	20.8	24.9	30.1	33.9	37.7		38
	+/- 2.0	+/- 3.5	+/- 4.7	+/- 6.3	+/- 7.5	+/- 8.8		38
6 h	6.4	8.4	9.8	11.5	12.7	14.0		37
	+/- 0.7	+/- 1.1	+/- 1.5	+/- 2.1	+/- 2.5	+/- 2.9		37
12 h	3.7	4.7	5.4	6.3	6.9	7.6		37
	+/- 0.3	+/- 0.6	+/- 0.8	+/- 1.1	+/- 1.3	+/- 1.5		37
24 h	2.0	2.6	3.0	3.4	3.8	4.1		38
	+/- 0.2	+/- 0.3	+/- 0.4	+/- 0.6	+/- 0.7	+/- 0.8		38

Table 3 : Interpolation Equation / Équation d'interpolation: $R = A \cdot T^B$

R = Interpolated Rainfall rate (mm/h)/Intensité interpolée de la pluie (mm/h)

RR = Rainfall rate (mm/h) / Intensité de la pluie (mm/h)

T = Rainfall duration (h) / Durée de la pluie (h)

Statistics/Statistiques	2	5	10	25	50	100
	yr/ans	yr/ans	yr/ans	yr/ans	yr/ans	yr/ans
Mean of RR/Moyenne de RR	36.3	47.8	55.4	65.0	72.2	79.3
Std. Dev. /Écart-type (RR)	34.8	45.4	52.5	61.4	68.1	74.7
Std. Error/Erreur-type	10.4	13.9	16.3	19.4	21.7	24.0
Coefficient (A)	21.8	28.8	33.5	39.3	43.7	48.0
Exponent/Exposant (B)	-0.701	-0.703	-0.704	-0.705	-0.706	-0.706
Mean % Error/% erreur moyenne	10.2	12.2	13.1	13.8	14.3	14.8

Design Chart 1.07: Runoff Coefficients**- Urban for 5 to 10-Year Storms**

Land Use	Runoff Coefficient	
	Min.	Max.
Pavement - asphalt or concrete	0.80	0.95
- brick	0.70	0.85
Gravel roads and shoulders	0.40	0.60
Roofs	0.70	0.95
Business - downtown	0.70	0.95
- neighbourhood	0.50	0.70
- light	0.50	0.80
- heavy	0.60	0.90
Residential - single family urban	0.30	0.50
- multiple, detached	0.40	0.60
- multiple, attached	0.60	0.75
- suburban	0.25	0.40
Industrial - light	0.50	0.80
- heavy	0.60	0.90
Apartments	0.50	0.70
Parks, cemeteries	0.10	0.25
Playgrounds (unpaved)	0.20	0.35
Railroad yards	0.20	0.35
Unimproved areas	0.10	0.30
Lawns - Sandy soil		
- flat, to 2%	0.05	0.10
- average, 2 to 7%	0.10	0.15
- steep, over 7%	0.15	0.20
- Clayey soil		
- flat, to 2%	0.13	0.17
- average, 2 to 7%	0.18	0.22
- steep, over 7%	0.25	0.35

For flat or permeable surfaces, use the lower values. For steeper or more impervious surfaces, use the higher values. For return period of more than 10 years, increase above values as 25-year - add 10%, 50-year - add 20%, 100-year - add 25%.

The coefficients listed above are for unfrozen ground.

Design Chart 1.07: Runoff Coefficients (Continued)**- Rural**

Land Use & Topography ³	Soil Texture		
	Open Sand Loam	Loam or Silt Loam	Clay Loam or Clay
CULTIVATED			
Flat 0 - 5% Slopes	0.22	0.35	0.55
Rolling 5 - 10% Slopes	0.30	0.45	0.60
Hilly 10- 30% Slopes	0.40	0.65	0.70
PASTURE			
Flat 0 - 5% Slopes	0.10	0.28	0.40
Rolling 5 - 10% Slopes	0.15	0.35	0.45
Hilly 10- 30% Slopes	0.22	0.40	0.55
WOODLAND OR CUTOVER			
Flat 0 - 5% Slopes	0.08	0.25	0.35
Rolling 5 - 10% Slopes	0.12	0.30	0.42
Hilly 10- 30% Slopes	0.18	0.35	0.52
BARE ROCK	COVERAGE³		
	30%	50%	70%
Flat 0 - 5% Slopes	0.40	0.55	0.75
Rolling 5 - 10% Slopes	0.50	0.65	0.80
Hilly 10- 30% Slopes	0.55	0.70	0.85
LAKES AND WETLANDS	0.05		

² Terrain Slopes

³ Interpolate for other values of % imperviousness

Sources: American Society of Civil Engineers - ASCE (1960)
U.S. Department of Agriculture (1972)

Design Chart 1.08: Hydrologic Soil Groups

- Based on Surficial Geology Maps

Map Ref.No.	Soil Type or Texture	Hydrologic Soil Group (Tentative)
	<u>Ground Moraine</u>	
1a	Usually sandy till, stony, varying depth. (Most widespread type in Shield).	Usually B (shallow); may be A or AB
1b	Clayey till, varying depth.	BC-C
	<u>End or Interlobate Moraine</u>	
2a	Sand & stones, deep. (May be rough topography).	A
2b	Sand & stones capped by till, deep.	A-C depending on type of till.
2c	Sand & stones, deep. (Smoother topography).	A
	<u>Kames & Eskers</u>	
3a	Sand & stones, deep. (May be rough topography).	A
3b	Sand & stones capped by till, deep.	A-C depending on type of till.
3c	Sand & stones, deep. (Smoother topography).	A
	<u>Lacustrine</u>	
4a	Clay & silt, in lowlands.	BC-C
4b	Fine sand, in lowlands.	AB-B
4c	Sand, in lowlands.	AB
4d	Sand (deltas & valley trains).	A-AB
	<u>Outwash</u>	
5	Sand, some gravel, deep.	A
	<u>Aeolian</u>	
6	Very fine sand & silt, shallow. (Loess)	B
	<u>Bedrock</u>	
7	Bare bedrock (normally negligible areas).	Varies according to rock type.

Source: Ministry of Natural Resources - MNR

Design Chart 1.08: Hydrologic Soil Groups (Continued)**- Based on Soil Texture**

<u>Sands, Sandy Loams and Gravels</u>	
- overlying sand, gravel or limestone bedrock, very well drained	A
- ditto, imperfectly drained	AB
- shallow, overlying Precambrian bedrock or clay subsoil	B
<u>Medium to Coarse Loams</u>	
- overlying sand, gravel or limestone, well drained	AB
- shallow, overlying Precambrian bedrock or clay subsoil	B
<u>Medium Textured Loams</u>	
- shallow, overlying limestone bedrock	B
- overlying medium textured subsoil	BC
<u>Silt Loams, Some Loams</u>	
- with good internal drainage	BC
- with slow internal drainage and good external drainage	C
<u>Clays, Clay Loams, Silty Clay Loams</u>	
- with good internal drainage	C
- with imperfect or poor external drainage	C
- with slow internal drainage and good external drainage	D

Source: U.S. Department of Agriculture (1972)

Design Chart 1.09: Soil/Land Use Curve Numbers

Land Use	Treatment or Practice	Hydrologic Condition ⁴	Hydrologic Soil Group			
			A	B	C	D
Fallow	Straight row	---	77	86	91	94
Row crops	"	Poor	72	81	88	91
	"	Good	67	78	85	89
	Contoured	Poor	70	79	84	88
	"	Good	65	75	82	86
	" and terraced	Poor	66	74	8	82
	" " "	Good	62	71	78	81
Small grain	Straight row	Poor	65	76	84	88
		Good	63	75	83	87
	Contoured	Poor	63	74	82	85
		Good	61	73	81	84
	" and terraced	Poor	61	72	79	82
		Good	59	70	78	81
Close-seeded legumes ² or rotation meadow	Straight row	Poor	66	77	85	89
		Good	58	72	81	85
	Contoured	Poor	64	75	83	85
		Good	55	69	78	83
	" and terraced	Poor	63	73	80	83
		Good	51	67	76	80
Pasture or range	Contoured	Poor	68	79	86	89
		Fair	49	69	79	84
		Good	39	61	74	80
		Poor	47	67	81	88
		Fair	25	59	75	83
		Good	6	35	70	79
Meadow		Good	30	58	71	78
Woods		Poor	45	66	77	83
		Fair	36	60	73	79
		Good	25	55	70	77
Farmsteads		---	59	74	82	86
		---	72	82	87	89
		---	74	84	90	92

For average antecedent soil moisture condition (AMC II)

² Close-drilled or broadcast.

⁴ The hydrologic condition of cropland is good if a good crop rotation practice is used; it is poor if one crop is grown continuously.

Source: U.S. Department of Agriculture (1972)

Design Chart 1.09: Soil Conservation Service Curve Numbers (Continued)

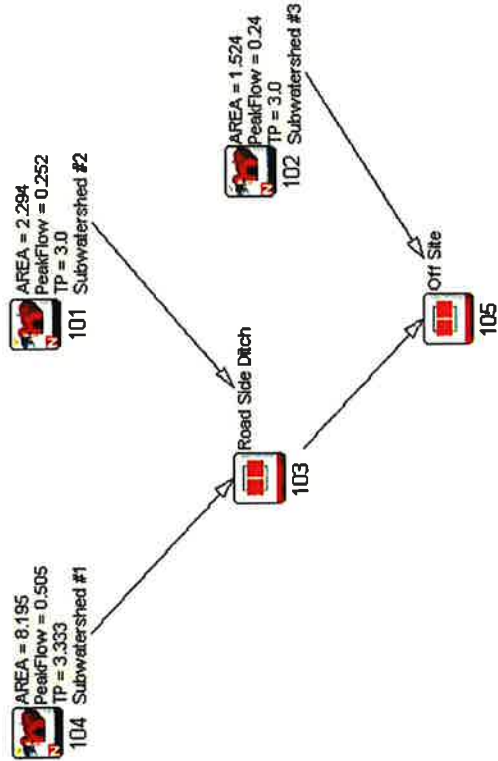
Land Use or Surface	Hydrologic Soil Group						
	A	AB	B	BC	C	CD	D
Fallow (special cases only)	77	82	86	89	91	93	94
Crop and other improved land	66** (62)	70** (68)	74	78	82	84	86 AMC I
Pasture & other unimproved land	58* (38)	62* (51)	65	71	76	79	81
Woodlots and forest	50* (30)	54* (44)	58	65	71	74	77
Impervious areas (paved)							98
Bare bedrock draining directly to stream by surface flow							98
Bare bedrock draining indirectly to stream as groundwater (usual case)							70
Lakes and wetlands							50

Notes

- (i) All values are based on AMC II except those marked by * (AMC III) or ** (mean of AMC II and AMC III).
- (ii) Values in brackets are AMC II and are to be used only for special cases.
- (iii) Table is not applicable to frozen soils or to periods in which snowmelt contributes to runoff.

APPENDIX II

VISUAL OTTHYMO OUTPUT
PRE DEVELOPMENT



Existing-25mm

```

V V I SSSSS U U A L
V V I SS U U A A L
V V I SS U U A A L
W I SSSSS UUUUU A A LLLLL
000 TTTT TTTT H H Y Y M M 000 TM, Version 2.0
O O T T H H Y Y M M O O Licensed To: MJ Davenport
O O T T H H Y Y M M 000 vo2-0057

```

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***** DETAILED OUTPUT *****

Input filename: C:\Program Files\Visual OTTHYMO v2.0\voind.dat

Output filename: C:\visual otthymo files\3969\3969-A11

Scenarios\Pre-Development.out

Summary filename: C:\visual otthymo files\3969\3969-A11

scenarios\Pre-Development.sum

DATE: 9/4/2018

TIME: 10:48:11 AM

USER:

COMMENTS:

** SIMULATION NUMBER: 9 **

CHICAGO STORM
Ptotal= 25.00 mm

IDF curve parameters: A= 486.300
B= 7.500
C= .790

used in: INTENSITY = A / (C + B)^{AC}

Duration of storm = 4.00 hrs
Storm time step = 10.00 min
Time to peak ratio = .38

TIME	RAIN	TIME	RAIN	TIME	RAIN
hrs	mm/hr	hrs	mm/hr	hrs	mm/hr
.17	1.66	1.17	6.41	2.17	4.73
.33	1.87	1.33	14.61	2.33	3.84
.50	2.16	1.50	50.69	2.50	3.25
.67	2.55	1.67	17.59	2.67	2.82
.83	3.16	1.83	9.15	2.83	2.50
1.00	4.20	2.00	6.21	3.00	2.25

Page 1

Existing-25mm

CALIB
NASHYD (0102)
ID= 1 DT=10.0 min

Area (ha)= 1.52
Ia (mm)= 5.00
U.H. Tp(hrs)= .13

Curve Number (CN)= 75.0
of Linear Res.(N)= 3.00

Unit Hyd Qpeak (cms)= .451

PEAK FLOW (cms)= .016 (i)
TIME TO PEAK (hrs)= 1.500
RUNOFF VOLUME (mm)= 3.385
TOTAL RAINFALL (mm)= 24.995
RUNOFF COEFFICIENT = .135

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

CALIB
NASHYD (0101)
ID= 1 DT=10.0 min

Area (ha)= 2.29
Ia (mm)= 5.00
U.H. Tp(hrs)= .25

Curve Number (CN)= 75.0
of Linear Res.(N)= 3.00

Unit Hyd Qpeak (cms)= .356

PEAK FLOW (cms)= .020 (i)
TIME TO PEAK (hrs)= 1.567
RUNOFF VOLUME (mm)= 3.775
TOTAL RAINFALL (mm)= 24.995
RUNOFF COEFFICIENT = .151

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

CALIB
NASHYD (0104)
ID= 1 DT=10.0 min

Area (ha)= 8.19
Ia (mm)= 5.00
U.H. Tp(hrs)= .41

Curve Number (CN)= 67.0
of Linear Res.(N)= 3.00

Unit Hyd Qpeak (cms)= .769

PEAK FLOW (cms)= .040 (i)
TIME TO PEAK (hrs)= 2.000
RUNOFF VOLUME (mm)= 2.750
TOTAL RAINFALL (mm)= 24.995
RUNOFF COEFFICIENT = .110

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

ADD HYD (0103)
1 + 2 = 3

AREA (ha)
QPEAK (cms)
TPEAK (hrs)
R.V. (mm)

ID1= 1 (0101): 2.29 .020 1.67 3.77
* ID2= 2 (0104): 8.19 .040 2.00 2.75
ID = 3 (0103): 10.49 .057 1.83 2.97

Page 2

Existing-25mm

NOTE: PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

ADD HYD (0105)
1 + 2 = 3

	AREA (ha)	QPEAK (cms)	TPEAK (hrs)	R.V. (mm)
ID1= 1 (0102):	1.52	.016	1.50	3.38
+ ID2= 2 (0103):	10.49	.057	1.83	2.97
ID = 3 (0105):	12.01	.068	1.83	3.03

NOTE: PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

FINISH

Existing-6hr-Chicago

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V V I SSSS U U A L
V V I SS U U A A L
V V I SS U U A A A L
V V I SS U U A A L
W I SSSS UUUU A A LLLL
000 TTTT TTTT H H Y Y M M 000 TM, Version 2.0
O O T T H H Y Y M M O O Licensed To: MJ Davenport
000 T T H H Y Y M M 000 vo2-0057

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***** DETAILED OUTPUT *****

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Output filename: C:\visual otthymo files\3969\3969-A11
Scenarios\Pre-Development.out
Summary filename: C:\visual otthymo files\3969\3969-A11
Scenarios\Pre-Development.sum

DATE: 9/4/2018 TIME: 10:47:10 AM
USER:

COMMENTS:

** SIMULATION NUMBER: 1 **

CHICAGO STORM IDF curve parameters: A= 662.000
Ptotal= 37.36 mm B= 7.500
C= .790
used in: INTENSITY = A / (t + B)^C
Duration of storm = 6.00 hrs
Storm time step = 10.00 min
Time to peak ratio = .38

TIME	RAIN	TIME	RAIN	TIME	RAIN	TIME	RAIN
hrs	mm/hr	hrs	mm/hr	hrs	mm/hr	hrs	mm/hr
.17	1.48	1.67	4.30	3.17	5.23	4.67	2.08
.33	1.59	1.83	5.71	3.33	4.42	4.83	1.96
.50	1.71	2.00	8.73	3.50	3.84	5.00	1.86
.67	1.86	2.17	19.90	3.67	3.41	5.17	1.76
.83	2.04	2.33	69.00	3.83	3.07	5.33	1.68
1.00	2.26	2.50	23.94	4.00	2.79	5.50	1.61

Page 1

Existing-6hr-Chicago
+ ID2= 2 (0104): 8.19 .092 2.83 6.64
ID = 3 (0103): 10.49 .134 2.67 7.12
NOTE: PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

ADD HYD (0105)
1 + 2 = 3
ID1= 1 (0102): AREA (ha)= 1.52 QPEAK (cms)= .040 TPEAK (hrs)= 2.33 R.V. (mm)= 7.93
+ ID2= 2 (0103): 10.49 .134 2.67 7.12
ID = 3 (0105): 12.01 .154 2.67 7.22

NOTE: PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

** SIMULATION NUMBER: 2 **

CHICAGO STORM IDF curve parameters: A=1098.000
Ptotal= 48.64 mm B= 10.100
C= .830
used in: INTENSITY = A / (t + B)^C
Duration of storm = 6.00 hrs
Storm time step = 10.00 min
Time to peak ratio = .38

TIME	RAIN	TIME	RAIN	TIME	RAIN	TIME	RAIN
hrs	mm/hr	hrs	mm/hr	hrs	mm/hr	hrs	mm/hr
.17	1.65	1.67	5.38	3.17	6.69	4.67	2.40
.33	1.78	1.83	7.38	3.33	5.55	4.83	2.25
.50	1.93	2.00	11.78	3.50	4.74	5.00	2.12
.67	2.12	2.17	28.11	3.67	4.15	5.17	2.00
.83	2.35	2.33	90.98	3.83	3.69	5.33	1.90
1.00	2.63	2.50	33.98	4.00	3.33	5.50	1.80
1.17	3.01	2.67	17.30	4.17	3.03	5.67	1.72
1.33	3.51	2.83	11.37	4.33	2.79	5.83	1.64
1.50	4.24	3.00	8.43	4.50	2.58	6.00	1.58

CALIB NASHYO (0102) Area (ha)= 1.52 Curve Number (CN)= 75.0
ID= 1 DT=10.0 min Ia (mm)= 5.00 # of Linear Res.(N)= 3.00
U.H. Tp(hrs)= .13

Unit Hyd Qpeak (cms)= .451
PEAK FLOW (cms)= .072 (i)
TIME TO PEAK (hrs)= 2.333
RUNOFF VOLUME (mm)= 13.154
TOTAL RAINFALL (mm)= 48.645
RUNOFF COEFFICIENT = .270

(i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.
Page 3

Existing-6hr-Chicago
1.17 2.55 2.67 12.46 4.17 2.57 5.67 1.54
1.33 2.94 2.83 8.46 4.33 2.38 5.83 1.48
1.50 3.48 3.00 6.44 4.50 2.22 6.00 1.42

CALIB NASHYO (0102) Area (ha)= 1.52 Curve Number (CN)= 75.0
ID= 1 DT=10.0 min Ia (mm)= 5.00 # of Linear Res.(N)= 3.00
U.H. Tp(hrs)= .13

Unit Hyd Qpeak (cms)= .451
PEAK FLOW (cms)= .040 (i)
TIME TO PEAK (hrs)= 2.333
RUNOFF VOLUME (mm)= 7.930
TOTAL RAINFALL (mm)= 37.363
RUNOFF COEFFICIENT = .212

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

CALIB NASHYO (0101) Area (ha)= 2.29 Curve Number (CN)= 75.0
ID= 1 DT=10.0 min Ia (mm)= 5.00 # of Linear Res.(N)= 3.00
U.H. Tp(hrs)= .25

Unit Hyd Qpeak (cms)= .356
PEAK FLOW (cms)= .048 (i)
TIME TO PEAK (hrs)= 2.500
RUNOFF VOLUME (mm)= 8.840
TOTAL RAINFALL (mm)= 37.363
RUNOFF COEFFICIENT = .237

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

CALIB NASHYO (0104) Area (ha)= 8.19 Curve Number (CN)= 67.0
ID= 1 DT=10.0 min Ia (mm)= 5.00 # of Linear Res.(N)= 3.00
U.H. Tp(hrs)= .41

Unit Hyd Qpeak (cms)= .769
PEAK FLOW (cms)= .092 (i)
TIME TO PEAK (hrs)= 2.833
RUNOFF VOLUME (mm)= 6.639
TOTAL RAINFALL (mm)= 37.363
RUNOFF COEFFICIENT = .178

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

ADD HYD (0103)
1 + 2 = 3
ID1= 1 (0101): AREA (ha)= 2.29 QPEAK (cms)= .048 TPEAK (hrs)= 2.50 R.V. (mm)= 8.84
ID1= 1 (0101): 2.29 .048 2.50 8.84
Page 2

Existing-6hr-Chicago

CALIB NASHYO (0101) Area (ha)= 2.29 Curve Number (CN)= 75.0
ID= 1 DT=10.0 min Ia (mm)= 5.00 # of Linear Res.(N)= 3.00
U.H. Tp(hrs)= .25

Unit Hyd Qpeak (cms)= .356
PEAK FLOW (cms)= .086 (i)
TIME TO PEAK (hrs)= 2.500
RUNOFF VOLUME (mm)= 14.665
TOTAL RAINFALL (mm)= 48.645
RUNOFF COEFFICIENT = .301

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

CALIB NASHYO (0104) Area (ha)= 8.19 Curve Number (CN)= 67.0
ID= 1 DT=10.0 min Ia (mm)= 5.00 # of Linear Res.(N)= 3.00
U.H. Tp(hrs)= .41

Unit Hyd Qpeak (cms)= .769
PEAK FLOW (cms)= .168 (i)
TIME TO PEAK (hrs)= 2.833
RUNOFF VOLUME (mm)= 11.268
TOTAL RAINFALL (mm)= 48.645
RUNOFF COEFFICIENT = .232

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

ADD HYD (0103)
1 + 2 = 3
ID1= 1 (0101): AREA (ha)= 2.29 QPEAK (cms)= .086 TPEAK (hrs)= 2.50 R.V. (mm)= 14.66
+ ID2= 2 (0104): 8.19 .168 2.83 11.27
ID = 3 (0103): 10.49 .245 2.67 12.01

NOTE: PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

ADD HYD (0105)
1 + 2 = 3
ID1= 1 (0102): AREA (ha)= 1.52 QPEAK (cms)= .072 TPEAK (hrs)= 2.33 R.V. (mm)= 13.15
+ ID2= 2 (0103): 10.49 .245 2.67 12.01
ID = 3 (0105): 12.01 .282 2.67 12.16

NOTE: PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

Page 4

** SIMULATION NUMBER: 3 **
Existing-6hr-Chicago

CHICAGO STORM
Ptotal= 57.49 mm

IDF curve parameters: A=1560.000
B= 13.000
C= .860
used in: INTENSITY = A / (t + B)AC

Duration of storm = 6.00 hrs
Storm time step = 10.00 min
Time to peak ratio = .38

TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr
.17	1.73	1.67	6.29	3.17	7.97	4.67	2.60
.33	1.88	1.83	8.87	3.33	6.51	4.83	2.42
.50	2.06	2.00	14.61	3.50	5.48	5.00	2.27
.67	2.27	2.17	35.36	3.67	4.74	5.17	2.13
.83	2.54	2.33	105.21	3.83	4.17	5.33	2.01
1.00	2.88	2.50	42.69	4.00	3.72	5.50	1.90
1.17	3.33	2.67	21.79	4.17	3.36	5.67	1.81
1.33	3.95	2.83	14.08	4.33	3.06	5.83	1.72
1.50	4.85	3.00	10.23	4.50	2.81	6.00	1.64

CALIB
NASHVD (0102)
ID= 1 DT=10.0 min

Area (ha)= 1.52 Curve Number (CN)= 75.0
Ia (mm)= 5.00 # of Linear Res.(N)= 3.00
U.H. Tp(hrs)= .13

Unit Hyd Qpeak (cms)= .451
PEAK FLOW (cms)= .099 (i)
TIME TO PEAK (hrs)= 2.333
RUNOFF VOLUME (mm)= 17.800
TOTAL RAINFALL (mm)= 57.490
RUNOFF COEFFICIENT = .310

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

CALIB
NASHVD (0101)
ID= 1 DT=10.0 min

Area (ha)= 2.29 Curve Number (CN)= 75.0
Ia (mm)= 5.00 # of Linear Res.(N)= 3.00
U.H. Tp(hrs)= .25

Unit Hyd Qpeak (cms)= .356
PEAK FLOW (cms)= .120 (i)
TIME TO PEAK (hrs)= 2.500
RUNOFF VOLUME (mm)= 19.843
TOTAL RAINFALL (mm)= 57.490
RUNOFF COEFFICIENT = .345

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

CALIB

Page 5

NASHVD (0104) Area (ha)= 8.19 Curve Number (CN)= 67.0
ID= 1 DT=10.0 min Ia (mm)= 5.00 # of Linear Res.(N)= 3.00
U.H. Tp(hrs)= .41

Unit Hyd Qpeak (cms)= .769
PEAK FLOW (cms)= .240 (i)
TIME TO PEAK (hrs)= 2.833
RUNOFF VOLUME (mm)= 15.487
TOTAL RAINFALL (mm)= 57.490
RUNOFF COEFFICIENT = .269

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

ADD HYD (0103)
1 + 2 = 3

	AREA (ha)	QPEAK (cms)	TPEAK (hrs)	R.V. (mm)
ID1= 1 (0101):	2.29	.120	2.50	19.84
+ ID2= 2 (0104):	8.19	.240	2.83	15.49
ID = 3 (0103):	10.49	.347	2.67	16.44

NOTE: PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

ADD HYD (0105)
1 + 2 = 3

	AREA (ha)	QPEAK (cms)	TPEAK (hrs)	R.V. (mm)
ID1= 1 (0102):	1.52	.099	2.33	17.80
+ ID2= 2 (0103):	10.49	.347	2.67	16.44
ID = 3 (0105):	12.01	.400	2.67	16.61

NOTE: PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

** SIMULATION NUMBER: 4 **

CHICAGO STORM
Ptotal= 65.65 mm

IDF curve parameters: A=2010.000
B= 14.000
C= .880
used in: INTENSITY = A / (t + B)AC

Duration of storm = 6.00 hrs
Storm time step = 10.00 min
Time to peak ratio = .38

TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr
.17	1.78	1.67	6.98	3.17	8.95	4.67	2.75
.33	1.95	1.83	10.01	3.33	7.23	4.83	2.55
.50	2.14	2.00	16.85	3.50	6.04	5.00	2.37
.67	2.38	2.17	41.62	3.67	5.17	5.17	2.22
.83	2.67	2.33	122.63	3.83	4.52	5.33	2.09
1.00	3.05	2.50	50.34	4.00	4.00	5.50	1.97

Page 6

TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr
1.17	3.56	2.67	25.45	4.17	5.67	1.87	
1.33	4.27	2.83	16.21	4.33	5.83	1.77	
1.50	5.31	3.00	11.63	4.50	2.98	6.00	1.69

Existing-6hr-Chicago

	Existing-6hr-Chicago
+ ID2= 2 (0104):	8.19 .317 2.83 19.77
ID = 3 (0103):	10.49 .459 2.67 20.91

NOTE: PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

CALIB
NASHVD (0102)
ID= 1 DT=10.0 min

Area (ha)= 1.52 Curve Number (CN)= 75.0
Ia (mm)= 5.00 # of Linear Res.(N)= 3.00
U.H. Tp(hrs)= .13

Unit Hyd Qpeak (cms)= .451
PEAK FLOW (cms)= .131 (i)
TIME TO PEAK (hrs)= 2.333
RUNOFF VOLUME (mm)= 22.427
TOTAL RAINFALL (mm)= 65.646
RUNOFF COEFFICIENT = .342

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

CALIB
NASHVD (0101)
ID= 1 DT=10.0 min

Area (ha)= 2.29 Curve Number (CN)= 75.0
Ia (mm)= 5.00 # of Linear Res.(N)= 3.00
U.H. Tp(hrs)= .25

Unit Hyd Qpeak (cms)= .356
PEAK FLOW (cms)= .158 (i)
TIME TO PEAK (hrs)= 2.500
RUNOFF VOLUME (mm)= 25.002
TOTAL RAINFALL (mm)= 65.646
RUNOFF COEFFICIENT = .381

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

CALIB
NASHVD (0104)
ID= 1 DT=10.0 min

Area (ha)= 8.19 Curve Number (CN)= 67.0
Ia (mm)= 5.00 # of Linear Res.(N)= 3.00
U.H. Tp(hrs)= .41

Unit Hyd Qpeak (cms)= .769
PEAK FLOW (cms)= .317 (i)
TIME TO PEAK (hrs)= 2.833
RUNOFF VOLUME (mm)= 19.765
TOTAL RAINFALL (mm)= 65.646
RUNOFF COEFFICIENT = .301

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

ADD HYD (0103)
1 + 2 = 3

	AREA (ha)	QPEAK (cms)	TPEAK (hrs)	R.V. (mm)
ID1= 1 (0101):	2.29	.158	2.50	25.00

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ADD HYD (0105)
1 + 2 = 3

	AREA (ha)	QPEAK (cms)	TPEAK (hrs)	R.V. (mm)
ID1= 1 (0102):	1.52	.131	2.33	22.43
+ ID2= 2 (0103):	10.49	.459	2.67	20.91
ID = 3 (0105):	12.01	.526	2.67	21.10

NOTE: PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

** SIMULATION NUMBER: 5 **

CHICAGO STORM
Ptotal= 76.13 mm

IDF curve parameters: A=2200.000
B= 14.600
C= .870
used in: INTENSITY = A / (t + B)AC

Duration of storm = 6.00 hrs
Storm time step = 10.00 min
Time to peak ratio = .38

TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr
.17	2.22	1.67	8.42	3.17	10.74	4.67	3.38
.33	2.41	1.83	11.98	3.33	8.72	4.83	3.14
.50	2.65	2.00	19.90	3.50	7.31	5.00	2.93
.67	2.93	2.17	47.86	3.67	6.28	5.17	2.75
.83	3.29	2.33	135.62	3.83	5.50	5.33	2.59
1.00	3.75	2.50	57.60	4.00	4.89	5.50	2.44
1.17	4.36	2.67	29.60	4.17	4.40	5.67	2.32
1.33	5.21	2.83	19.18	4.33	4.00	5.83	2.20
1.50	6.45	3.00	13.86	4.50	3.67	6.00	2.10

CALIB
NASHVD (0102)
ID= 1 DT=10.0 min

Area (ha)= 1.52 Curve Number (CN)= 75.0
Ia (mm)= 5.00 # of Linear Res.(N)= 3.00
U.H. Tp(hrs)= .13

Unit Hyd Qpeak (cms)= .451
PEAK FLOW (cms)= .164 (i)
TIME TO PEAK (hrs)= 2.333
RUNOFF VOLUME (mm)= 28.775
TOTAL RAINFALL (mm)= 76.131
RUNOFF COEFFICIENT = .378

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

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Existing-6hr-Chicago

CALIB
NASHYD (0101)
ID= 1 DT=10.0 min

Area (ha)= 2.29 Curve Number (CN)= 75.0
Ia (mm)= 5.00 # of Linear Res.(N)= 3.00
U.H. Tp(hrs)= .25

Unit Hyd Qpeak (cms)= .356

PEAK FLOW (cms)= .199 (i)
TIME TO PEAK (hrs)= 2.500
RUNOFF VOLUME (mm)= 32.079
TOTAL RAINFALL (mm)= 76.131
RUNOFF COEFFICIENT = .421

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

CALIB
NASHYD (0104)
ID= 1 DT=10.0 min

Area (ha)= 8.19 Curve Number (CN)= 67.0
Ia (mm)= 5.00 # of Linear Res.(N)= 3.00
U.H. Tp(hrs)= .41

Unit Hyd Qpeak (cms)= .769

PEAK FLOW (cms)= .406 (i)
TIME TO PEAK (hrs)= 2.833
RUNOFF VOLUME (mm)= 25.737
TOTAL RAINFALL (mm)= 76.131
RUNOFF COEFFICIENT = .338

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

ADD HYD (0103)
1 + 2 = 3

	AREA (ha)	QPEAK (cms)	TPEAK (hrs)	R.V. (mm)
ID1= 1 (0101):	2.29	.199	2.50	32.08
+ ID2= 2 (0104):	8.19	.406	2.83	25.74
ID = 3 (0103):	10.49	.584	2.67	27.12

NOTE: PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

ADD HYD (0105)
1 + 2 = 3

	AREA (ha)	QPEAK (cms)	TPEAK (hrs)	R.V. (mm)
ID1= 1 (0102):	1.52	.164	2.33	28.78
+ ID2= 2 (0103):	10.49	.584	2.67	27.12
ID = 3 (0105):	12.01	.669	2.67	27.33

NOTE: PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

Existing-6hr-Chicago

** SIMULATION NUMBER: 6 **

CHICAGO STORM
Ptotal= 81.72 mm

IDF curve parameters: A=2507.000
B= 14.800
C= .880
used in: INTENSITY = A / (t + B)^C

Duration of storm = 6.00 hrs
Storm time step = 10.00 min
Time to peak ratio = .38

TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr
.17	2.25	1.67	8.85	3.17	11.36	4.67	3.47
.33	2.45	1.83	12.70	3.33	9.17	4.83	3.22
.50	2.70	2.00	21.34	3.50	7.66	5.00	3.00
.67	3.00	2.17	52.05	3.67	6.56	5.17	2.81
.83	3.38	2.33	148.61	3.83	5.72	5.33	2.64
1.00	3.86	2.50	62.77	4.00	5.07	5.50	2.49
1.17	4.51	2.67	32.11	4.17	4.55	5.67	2.36
1.33	5.41	2.83	20.54	4.33	4.12	5.83	2.24
1.50	6.73	3.00	14.75	4.50	3.77	6.00	2.13

CALIB
NASHYD (0102)
ID= 1 DT=10.0 min

Area (ha)= 1.52 Curve Number (CN)= 75.0
Ia (mm)= 5.00 # of Linear Res.(N)= 3.00
U.H. Tp(hrs)= .13

Unit Hyd Qpeak (cms)= .451

PEAK FLOW (cms)= .190 (i)
TIME TO PEAK (hrs)= 2.333
RUNOFF VOLUME (mm)= 32.319
TOTAL RAINFALL (mm)= 81.724
RUNOFF COEFFICIENT = .395

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

CALIB
NASHYD (0101)
ID= 1 DT=10.0 min

Area (ha)= 2.29 Curve Number (CN)= 75.0
Ia (mm)= 5.00 # of Linear Res.(N)= 3.00
U.H. Tp(hrs)= .25

Unit Hyd Qpeak (cms)= .356

PEAK FLOW (cms)= .229 (i)
TIME TO PEAK (hrs)= 2.500
RUNOFF VOLUME (mm)= 36.030
TOTAL RAINFALL (mm)= 81.724
RUNOFF COEFFICIENT = .441

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

CALIB

Existing-6hr-Chicago

NASHYD (0104)
ID= 1 DT=10.0 min

Area (ha)= 8.19 Curve Number (CN)= 67.0
Ia (mm)= 5.00 # of Linear Res.(N)= 3.00
U.H. Tp(hrs)= .41

Unit Hyd Qpeak (cms)= .769

PEAK FLOW (cms)= .469 (i)
TIME TO PEAK (hrs)= 2.667
RUNOFF VOLUME (mm)= 29.114
TOTAL RAINFALL (mm)= 81.724
RUNOFF COEFFICIENT = .356

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

ADD HYD (0103)
1 + 2 = 3

	AREA (ha)	QPEAK (cms)	TPEAK (hrs)	R.V. (mm)
ID1= 1 (0101):	2.29	.229	2.50	36.03
+ ID2= 2 (0104):	8.19	.469	2.67	29.11
ID = 3 (0103):	10.49	.674	2.67	30.63

NOTE: PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

ADD HYD (0105)
1 + 2 = 3

	AREA (ha)	QPEAK (cms)	TPEAK (hrs)	R.V. (mm)
ID1= 1 (0102):	1.52	.190	2.33	32.32
+ ID2= 2 (0103):	10.49	.674	2.67	30.63
ID = 3 (0105):	12.01	.770	2.67	30.84

NOTE: PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

FINISH

Existing-AES

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V V I SSSS U U A L
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***** DETAILED OUTPUT *****

Input filename: C:\Program Files\Visual OTTHYMO v2.0\voind.dat
Output filename: C:\visual otthymo files\3969\3969-A11
Scenarios\Pre-Development.out
Summary filename: C:\visual otthymo files\3969\3969-A11
Scenarios\Pre-Development.sum

DATE: 9/4/2018 TIME: 10:45:51 AM
USER:

COMMENTS:

** SIMULATION NUMBER: 1 **

MASS STORM Ptotal= 22.50 mm
Filename: C:\visual otthymo files\4456\AES 1-hr.mst
Comments: AES 1 HOUR STORM DISTRIBUTION a=21min k=
Duration of storm = 1.00 hrs
Mass curve time step = 5.00 min

TIME	RAIN	TIME	RAIN	TIME	RAIN	TIME	RAIN
hrs	mm/hr	hrs	mm/hr	hrs	mm/hr	hrs	mm/hr
.08	10.02	.33	69.93	.58	11.10	.83	.81
.17	30.00	.42	64.29	.67	4.62	.92	.30
.25	49.98	.50	27.03	.75	1.92	1.00	.03

CALIB NASHYD (0102)
ID= 1 DT=10.0 min
Area (ha)= 1.52
Ia (mm)= 5.00
Curve Number (CN)= 75.0
of Linear Res.(N)= 3.00
Page 1

Existing-AES

ID = 3 (0103): 10.49 .090 .67 2.32

NOTE: PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

ADD HYD (0105)
1 + 2 = 3
ID1= 1 (0102): 1.52 .033 .50 2.66
+ ID2= 2 (0103): 10.49 .090 .67 2.32
ID = 3 (0103): 12.01 .106 .67 2.36

NOTE: PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

** SIMULATION NUMBER: 2 **

MASS STORM Ptotal= 30.50 mm
Filename: C:\visual otthymo files\4456\AES 1-hr.mst
Comments: AES 1 HOUR STORM DISTRIBUTION a=21min k=
Duration of storm = 1.00 hrs
Mass curve time step = 5.00 min

TIME	RAIN	TIME	RAIN	TIME	RAIN	TIME	RAIN
hrs	mm/hr	hrs	mm/hr	hrs	mm/hr	hrs	mm/hr
.08	13.58	.33	94.79	.58	15.04	.83	1.10
.17	40.66	.42	87.14	.67	6.26	.92	.40
.25	67.75	.50	36.64	.75	2.60	1.00	.04

CALIB NASHYD (0102)
ID= 1 DT=10.0 min
Area (ha)= 1.52
Ia (mm)= 5.00
Curve Number (CN)= 75.0
of Linear Res.(N)= 3.00
U.H. Tp(hrs)= .13

NOTE: RAINFALL WAS TRANSFORMED TO 10.0 MIN. TIME STEP.

TIME	RAIN	TIME	RAIN	TIME	RAIN	TIME	RAIN
hrs	mm/hr	hrs	mm/hr	hrs	mm/hr	hrs	mm/hr
.167	27.12	.500	61.89	.833	1.85		
.333	81.27	.667	10.65	1.000	.22		

Unit Hyd Qpeak (cms)= .451

PEAK FLOW (cms)= .064 (i)
TIME TO PEAK (hrs)= .500
RUNOFF VOLUME (mm)= 5.230
TOTAL RAINFALL (mm)= 30.500
RUNOFF COEFFICIENT = .171

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

Existing-AES
U.H. Tp(hrs)= .13

NOTE: RAINFALL WAS TRANSFORMED TO 10.0 MIN. TIME STEP.

TIME	RAIN	TIME	RAIN	TIME	RAIN	TIME	RAIN
hrs	mm/hr	hrs	mm/hr	hrs	mm/hr	hrs	mm/hr
.167	20.01	.500	45.66	.833	1.36		
.333	59.95	.667	7.86	1.000	.16		

Unit Hyd Qpeak (cms)= .451

PEAK FLOW (cms)= .033 (i)
TIME TO PEAK (hrs)= .500
RUNOFF VOLUME (mm)= 2.656
TOTAL RAINFALL (mm)= 22.500
RUNOFF COEFFICIENT = .118

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

CALIB NASHYD (0101)
ID= 1 DT=10.0 min
Area (ha)= 2.29
Ia (mm)= 5.00
Curve Number (CN)= 75.0
of Linear Res.(N)= 3.00
U.H. Tp(hrs)= .25

Unit Hyd Qpeak (cms)= .356

PEAK FLOW (cms)= .033 (i)
TIME TO PEAK (hrs)= .667
RUNOFF VOLUME (mm)= 2.961
TOTAL RAINFALL (mm)= 22.500
RUNOFF COEFFICIENT = .132

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

CALIB NASHYD (0104)
ID= 1 DT=10.0 min
Area (ha)= 8.19
Ia (mm)= 5.00
Curve Number (CN)= 67.0
of Linear Res.(N)= 3.00
U.H. Tp(hrs)= .41

Unit Hyd Qpeak (cms)= .769

PEAK FLOW (cms)= .058 (i)
TIME TO PEAK (hrs)= .833
RUNOFF VOLUME (mm)= 2.144
TOTAL RAINFALL (mm)= 22.500
RUNOFF COEFFICIENT = .095

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

ADD HYD (0103)
1 + 2 = 3
ID1= 1 (0101): 2.29 .033 .67 2.96
+ ID2= 2 (0104): 8.19 .058 .83 2.14
Page 2

Existing-AES

CALIB NASHYD (0101)
ID= 1 DT=10.0 min
Area (ha)= 2.29
Ia (mm)= 5.00
Curve Number (CN)= 75.0
of Linear Res.(N)= 3.00
U.H. Tp(hrs)= .25

Unit Hyd Qpeak (cms)= .356

PEAK FLOW (cms)= .063 (i)
TIME TO PEAK (hrs)= .667
RUNOFF VOLUME (mm)= 5.830
TOTAL RAINFALL (mm)= 30.500
RUNOFF COEFFICIENT = .191

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

CALIB NASHYD (0104)
ID= 1 DT=10.0 min
Area (ha)= 8.19
Ia (mm)= 5.00
Curve Number (CN)= 67.0
of Linear Res.(N)= 3.00
U.H. Tp(hrs)= .41

Unit Hyd Qpeak (cms)= .769

PEAK FLOW (cms)= .116 (i)
TIME TO PEAK (hrs)= .667
RUNOFF VOLUME (mm)= 4.310
TOTAL RAINFALL (mm)= 30.500
RUNOFF COEFFICIENT = .141

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

ADD HYD (0103)
1 + 2 = 3
ID1= 1 (0101): 2.29 .063 .67 5.83
+ ID2= 2 (0104): 8.19 .116 .67 4.31
ID = 3 (0103): 10.49 .179 .67 4.64

NOTE: PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

ADD HYD (0105)
1 + 2 = 3
ID1= 1 (0102): 1.52 .064 .50 5.23
+ ID2= 2 (0103): 10.49 .179 .67 4.64
ID = 3 (0105): 12.01 .209 .67 4.72

NOTE: PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

** SIMULATION NUMBER: 3 **

Existing-AES

MASS STORM
Ptotal= 35.80 mm

Filename: C:\visual otthymo files\4456\AES 1-hr.mst
Comments: AES 1 HOUR STORM DISTRIBUTION a=21min k=

Duration of storm = 1.00 hrs
Mass curve time step = 5.00 min

TIME	RAIN	TIME	RAIN	TIME	RAIN	TIME	RAIN
hrs	mm/hr	hrs	mm/hr	hrs	mm/hr	hrs	mm/hr
.08	15.94	.33	111.27	.58	17.66	.83	1.29
.17	47.73	.42	102.29	.67	7.35	.92	.47
.25	79.52	.50	43.00	.75	3.05	1.00	.04

CALIB
NASHVD (0102)
ID= 1 DT=10.0 min

Area (ha)= 1.52 Curve Number (CN)= 75.0
Ia (mm)= 5.00 # of Linear Res.(N)= 3.00
U.H. Tp(hrs)= .13

NOTE: RAINFALL WAS TRANSFORMED TO 10.0 MIN. TIME STEP.

TIME	RAIN	TIME	RAIN	TIME	RAIN	TIME	RAIN
hrs	mm/hr	hrs	mm/hr	hrs	mm/hr	hrs	mm/hr
.167	31.83	.500	72.65	.833	2.17		
.333	95.39	.667	12.50	1.000	.26		

Unit Hyd Qpeak (cms)= .451
PEAK FLOW (cms)= .087 (i)
TIME TO PEAK (hrs)= .500
RUNOFF VOLUME (mm)= 7.279
TOTAL RAINFALL (mm)= 35.800
RUNOFF COEFFICIENT = .203

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

CALIB
NASHVD (0101)
ID= 1 DT=10.0 min

Area (ha)= 2.29 Curve Number (CN)= 75.0
Ia (mm)= 5.00 # of Linear Res.(N)= 3.00
U.H. Tp(hrs)= .25

Unit Hyd Qpeak (cms)= .356
PEAK FLOW (cms)= .088 (i)
TIME TO PEAK (hrs)= .500
RUNOFF VOLUME (mm)= 8.115
TOTAL RAINFALL (mm)= 35.800
RUNOFF COEFFICIENT = .227

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

CALIB
NASHVD (0104)
ID= 1 DT=10.0 min

Area (ha)= 8.19 Curve Number (CN)= 67.0
Ia (mm)= 5.00 # of Linear Res.(N)= 3.00
U.H. Tp(hrs)= .41

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Existing-AES

Unit Hyd Qpeak (cms)= .769

PEAK FLOW (cms)= .164 (i)
TIME TO PEAK (hrs)= .667
RUNOFF VOLUME (mm)= 6.074
TOTAL RAINFALL (mm)= 35.800
RUNOFF COEFFICIENT = .170

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

ADD HYD (0103)
1 + 2 = 3

AREA	QPEAK	TPEAK	R.V.
(ha)	(cms)	(hrs)	(mm)
ID1= 1 (0101): 2.29	.088	.50	8.12
+ ID2= 2 (0104): 8.19	.164	.67	6.07
ID = 3 (0103): 10.49	.251	.67	6.52

NOTE: PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

ADD HYD (0105)
1 + 2 = 3

AREA	QPEAK	TPEAK	R.V.
(ha)	(cms)	(hrs)	(mm)
ID1= 1 (0102): 1.52	.087	.50	7.28
+ ID2= 2 (0103): 10.49	.251	.67	6.52
ID = 3 (0105): 12.01	.291	.67	6.62

NOTE: PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

** SIMULATION NUMBER: 4 **

MASS STORM
Ptotal= 42.50 mm

Filename: C:\visual otthymo files\4456\AES 1-hr.mst
Comments: AES 1 HOUR STORM DISTRIBUTION a=21min k=

Duration of storm = 1.00 hrs
Mass curve time step = 5.00 min

TIME	RAIN	TIME	RAIN	TIME	RAIN	TIME	RAIN
hrs	mm/hr	hrs	mm/hr	hrs	mm/hr	hrs	mm/hr
.08	18.92	.33	132.09	.58	20.96	.83	1.53
.17	56.66	.42	121.43	.67	8.72	.92	.56
.25	94.40	.50	51.05	.75	3.62	1.00	.05

CALIB
NASHVD (0102)
ID= 1 DT=10.0 min

Area (ha)= 1.52 Curve Number (CN)= 75.0
Ia (mm)= 5.00 # of Linear Res.(N)= 3.00
U.H. Tp(hrs)= .13

NOTE: RAINFALL WAS TRANSFORMED TO 10.0 MIN. TIME STEP.
Page 6

Existing-AES

TIME	RAIN	TIME	RAIN	TIME	RAIN	TIME	RAIN
hrs	mm/hr	hrs	mm/hr	hrs	mm/hr	hrs	mm/hr
.167	37.79	.500	86.24	.833	2.58		
.333	113.25	.667	14.84	1.000	.31		

Unit Hyd Qpeak (cms)= .451
PEAK FLOW (cms)= .121 (i)
TIME TO PEAK (hrs)= .500
RUNOFF VOLUME (mm)= 10.199
TOTAL RAINFALL (mm)= 42.500
RUNOFF COEFFICIENT = .240

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

CALIB
NASHVD (0101)
ID= 1 DT=10.0 min

Area (ha)= 2.29 Curve Number (CN)= 75.0
Ia (mm)= 5.00 # of Linear Res.(N)= 3.00
U.H. Tp(hrs)= .25

Unit Hyd Qpeak (cms)= .356
PEAK FLOW (cms)= .124 (i)
TIME TO PEAK (hrs)= .500
RUNOFF VOLUME (mm)= 11.370
TOTAL RAINFALL (mm)= 42.500
RUNOFF COEFFICIENT = .268

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

CALIB
NASHVD (0104)
ID= 1 DT=10.0 min

Area (ha)= 8.19 Curve Number (CN)= 67.0
Ia (mm)= 5.00 # of Linear Res.(N)= 3.00
U.H. Tp(hrs)= .41

Unit Hyd Qpeak (cms)= .769
PEAK FLOW (cms)= .233 (i)
TIME TO PEAK (hrs)= .667
RUNOFF VOLUME (mm)= 8.633
TOTAL RAINFALL (mm)= 42.500
RUNOFF COEFFICIENT = .203

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

ADD HYD (0103)
1 + 2 = 3

AREA	QPEAK	TPEAK	R.V.
(ha)	(cms)	(hrs)	(mm)
ID1= 1 (0101): 2.29	.124	.50	11.37
+ ID2= 2 (0104): 8.19	.233	.67	8.63
ID = 3 (0103): 10.49	.355	.67	9.23

Page 7

Existing-AES

NOTE: PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

ADD HYD (0105)
1 + 2 = 3

AREA	QPEAK	TPEAK	R.V.
(ha)	(cms)	(hrs)	(mm)
ID1= 1 (0102): 1.52	.121	.50	10.20
+ ID2= 2 (0103): 10.49	.355	.67	9.23
ID = 3 (0105): 12.01	.409	.67	9.35

NOTE: PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

** SIMULATION NUMBER: 5 **

MASS STORM
Ptotal= 47.40 mm

Filename: C:\visual otthymo files\4456\AES 1-hr.mst
Comments: AES 1 HOUR STORM DISTRIBUTION a=21min k=

Duration of storm = 1.00 hrs
Mass curve time step = 5.00 min

TIME	RAIN	TIME	RAIN	TIME	RAIN	TIME	RAIN
hrs	mm/hr	hrs	mm/hr	hrs	mm/hr	hrs	mm/hr
.08	21.10	.33	147.32	.58	23.38	.83	1.71
.17	63.19	.42	135.43	.67	9.73	.92	.63
.25	105.28	.50	56.94	.75	4.04	1.00	.06

CALIB
NASHVD (0102)
ID= 1 DT=10.0 min

Area (ha)= 1.52 Curve Number (CN)= 75.0
Ia (mm)= 5.00 # of Linear Res.(N)= 3.00
U.H. Tp(hrs)= .13

NOTE: RAINFALL WAS TRANSFORMED TO 10.0 MIN. TIME STEP.

TIME	RAIN	TIME	RAIN	TIME	RAIN	TIME	RAIN
hrs	mm/hr	hrs	mm/hr	hrs	mm/hr	hrs	mm/hr
.167	42.15	.500	96.18	.833	2.87		
.333	126.30	.667	16.55	1.000	.34		

Unit Hyd Qpeak (cms)= .451
PEAK FLOW (cms)= .147 (i)
TIME TO PEAK (hrs)= .500
RUNOFF VOLUME (mm)= 12.536
TOTAL RAINFALL (mm)= 47.400
RUNOFF COEFFICIENT = .264

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

CALIB
NASHVD (0101)

Area (ha)= 2.29 Curve Number (CN)= 75.0
Page 8

Existing-AES
 ID= 1 DT=10.0 min | Ia (mm)= 5.00 # of Linear Res.(N)= 3.00
 U.H. Tp(hrs)= .25
 Unit Hyd Qpeak (cms)= .356
 PEAK FLOW (cms)= .153 (i)
 TIME TO PEAK (hrs)= .500
 RUNOFF VOLUME (mm)= 13.976
 TOTAL RAINFALL (mm)= 47.400
 RUNOFF COEFFICIENT = .295
 (i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

CALIB
 NASHYD (0104) | Area (ha)= 8.19 Curve Number (CN)= 67.0
 ID= 1 DT=10.0 min | Ia (mm)= 5.00 # of Linear Res.(N)= 3.00
 U.H. Tp(hrs)= .41
 Unit Hyd Qpeak (cms)= .769
 PEAK FLOW (cms)= .290 (i)
 TIME TO PEAK (hrs)= .667
 RUNOFF VOLUME (mm)= 10.713
 TOTAL RAINFALL (mm)= 47.400
 RUNOFF COEFFICIENT = .226
 (i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

ADD HYD (0103)
 1 + 2 = 3
 ID1= 1 (0101): AREA (ha) QPEAK (cms) TPEAK (hrs) R.V. (mm)
 + ID2= 2 (0104): 2.29 .153 .50 13.98
 8.19 .290 .67 10.71
 ID = 3 (0103): 10.49 .438 .67 11.43
 NOTE: PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

ADD HYD (0105)
 1 + 2 = 3
 ID1= 1 (0102): AREA (ha) QPEAK (cms) TPEAK (hrs) R.V. (mm)
 + ID2= 2 (0103): 1.52 .147 .50 12.54
 10.49 .438 .67 11.43
 ID = 3 (0105): 12.01 .504 .67 11.57
 NOTE: PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

** SIMULATION NUMBER: 6 **

MASS STORM | Filename: C:\visual otthymo files\4456\AES 1-hr.mst
 Page 9

Existing-AES
 Total= 52.40 mm | Comments: AES 1 HOUR STORM DISTRIBUTION a=21min k=
 Duration of storm = 1.00 hrs
 Mass curve time step = 5.00 min

TIME	RAIN	TIME	RAIN	TIME	RAIN	TIME	RAIN
hrs	mm/hr	hrs	mm/hr	hrs	mm/hr	hrs	mm/hr
.08	23.33	.33	162.86	.58	25.84	.83	1.89
.17	69.86	.42	149.72	.67	10.75	.92	.69
.25	116.39	.50	62.94	.75	4.46	1.00	.06

CALIB
 NASHYD (0102) | Area (ha)= 1.52 Curve Number (CN)= 75.0
 ID= 1 DT=10.0 min | Ia (mm)= 5.00 # of Linear Res.(N)= 3.00
 U.H. Tp(hrs)= .13
 NOTE: RAINFALL WAS TRANSFORMED TO 10.0 MIN. TIME STEP.

--- TRANSFORMED HYETOGRAPH ---

TIME	RAIN	TIME	RAIN	TIME	RAIN	TIME	RAIN
hrs	mm/hr	hrs	mm/hr	hrs	mm/hr	hrs	mm/hr
.167	46.59	.500	106.33	.833	3.18		
.333	139.63	.667	18.30	1.000	.38		

 Unit Hyd Qpeak (cms)= .451
 PEAK FLOW (cms)= .176 (i)
 TIME TO PEAK (hrs)= .500
 RUNOFF VOLUME (mm)= 15.074
 TOTAL RAINFALL (mm)= 52.400
 RUNOFF COEFFICIENT = .288
 (i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

CALIB
 NASHYD (0101) | Area (ha)= 2.29 Curve Number (CN)= 75.0
 ID= 1 DT=10.0 min | Ia (mm)= 5.00 # of Linear Res.(N)= 3.00
 U.H. Tp(hrs)= .25
 Unit Hyd Qpeak (cms)= .356
 PEAK FLOW (cms)= .185 (i)
 TIME TO PEAK (hrs)= .500
 RUNOFF VOLUME (mm)= 16.805
 TOTAL RAINFALL (mm)= 52.400
 RUNOFF COEFFICIENT = .321
 (i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

CALIB
 NASHYD (0104) | Area (ha)= 8.19 Curve Number (CN)= 67.0
 ID= 1 DT=10.0 min | Ia (mm)= 5.00 # of Linear Res.(N)= 3.00
 U.H. Tp(hrs)= .41
 Unit Hyd Qpeak (cms)= .769
 Page 10

Existing-AES
 PEAK FLOW (cms)= .353 (i)
 TIME TO PEAK (hrs)= .667
 RUNOFF VOLUME (mm)= 13.001
 TOTAL RAINFALL (mm)= 52.400
 RUNOFF COEFFICIENT = .248
 (i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

ADD HYD (0103)
 1 + 2 = 3
 ID1= 1 (0101): AREA (ha) QPEAK (cms) TPEAK (hrs) R.V. (mm)
 + ID2= 2 (0104): 2.29 .185 .50 16.80
 8.19 .353 .67 13.00
 ID = 3 (0103): 10.49 .530 .67 13.83
 NOTE: PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

ADD HYD (0105)
 1 + 2 = 3
 ID1= 1 (0102): AREA (ha) QPEAK (cms) TPEAK (hrs) R.V. (mm)
 + ID2= 2 (0103): 1.52 .176 .50 15.07
 10.49 .530 .67 13.83
 ID = 3 (0105): 12.01 .608 .67 13.99
 NOTE: PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

FINISH

Existing-SCS

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V V I SSSS U U A L
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***** DETAILED OUTPUT *****

Input filename: C:\Program Files\Visual OTHYMO v2.0\voind.dat

Output filename: C:\visual othymo files\3969\3969-A11

Scenarios\Pre-Development.out

Summary filename: C:\visual othymo files\3969\3969-A11

Scenarios\Pre-Development.sum

DATE: 9/4/2018

TIME: 10:43:49 AM

USER:

COMMENTS:

** SIMULATION NUMBER: 1 **

MASS STORM
Ptotal= 38.40 mm

Filename: C:\visual othymo files\4456\SCS II 6-hr.mst
Comments: SCS 6 HOUR TYPE II STORM DISTRIBUTION

Duration of storm = 6.00 hrs
Mass curve time step = 10.00 min

TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr
.17	1.61	1.67	3.92	3.17	8.52	4.67	2.30
.33	1.38	1.83	3.69	3.33	8.29	4.83	2.30
.50	1.61	2.00	3.92	3.50	8.52	5.00	2.30
.67	2.30	2.17	4.61	3.67	3.92	5.17	1.61
.83	2.30	2.33	4.61	3.83	3.69	5.33	1.38
1.00	2.30	2.50	4.61	4.00	3.92	5.50	1.61
1.17	2.30	2.67	23.04	4.17	3.00	5.67	1.61
1.33	2.30	2.83	41.47	4.33	3.23	5.83	1.38
1.50	2.30	3.00	59.90	4.50	3.00	6.00	1.61

Page 1

Existing-SCS

CALIB
NASHVD (0102)
ID= 1 DT=10.0 min

Area (ha)= 1.52
Ia (mm)= 5.00
U.H. Tp(hrs)= .13

Curve Number (CN)= 75.0
of Linear Res.(N)= 3.00

Unit Hyd Qpeak (cms)= .451

PEAK FLOW (cms)= .060 (i)
TIME TO PEAK (hrs)= 3.000
RUNOFF VOLUME (mm)= 8.372
TOTAL RAINFALL (mm)= 38.400
RUNOFF COEFFICIENT = .218

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

CALIB
NASHVD (0101)
ID= 1 DT=10.0 min

Area (ha)= 2.29
Ia (mm)= 5.00
U.H. Tp(hrs)= .25

Curve Number (CN)= 75.0
of Linear Res.(N)= 3.00

Unit Hyd Qpeak (cms)= .356

PEAK FLOW (cms)= .059 (i)
TIME TO PEAK (hrs)= 3.000
RUNOFF VOLUME (mm)= 9.333
TOTAL RAINFALL (mm)= 38.400
RUNOFF COEFFICIENT = .243

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

CALIB
NASHVD (0104)
ID= 1 DT=10.0 min

Area (ha)= 8.19
Ia (mm)= 5.00
U.H. Tp(hrs)= .41

Curve Number (CN)= 67.0
of Linear Res.(N)= 3.00

Unit Hyd Qpeak (cms)= .769

PEAK FLOW (cms)= .113 (i)
TIME TO PEAK (hrs)= 3.333
RUNOFF VOLUME (mm)= 7.025
TOTAL RAINFALL (mm)= 38.400
RUNOFF COEFFICIENT = .183

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

ADD HYD (0103)
1 + 2 = 3

AREA (ha)	QPEAK (cms)	TPEAK (hrs)	R.V. (mm)
ID1= 1 (0101):	2.29	.059	3.00
+ ID2= 2 (0104):	8.19	.113	3.33
ID = 3 (0103):	10.49	.167	3.17

Page 2

Existing-SCS

NOTE: PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

ADD HYD (0105)
1 + 2 = 3

AREA (ha)	QPEAK (cms)	TPEAK (hrs)	R.V. (mm)
ID1= 1 (0102):	1.52	.060	3.00
+ ID2= 2 (0103):	10.49	.167	3.17
ID = 3 (0105):	12.01	.193	3.17

NOTE: PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

** SIMULATION NUMBER: 2 **

MASS STORM
Ptotal= 50.50 mm

Filename: C:\visual othymo files\4456\SCS II 6-hr.mst
Comments: SCS 6 HOUR TYPE II STORM DISTRIBUTION

Duration of storm = 6.00 hrs
Mass curve time step = 10.00 min

TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr
.17	2.12	1.67	5.15	3.17	11.21	4.67	3.03
.33	1.82	1.83	4.85	3.33	10.91	4.83	3.03
.50	2.12	2.00	5.15	3.50	11.21	5.00	3.03
.67	3.03	2.17	6.06	3.67	5.15	5.17	2.12
.83	3.03	2.33	6.06	3.83	4.85	5.33	1.82
1.00	3.03	2.50	6.06	4.00	5.15	5.50	2.12
1.17	3.03	2.67	30.30	4.17	3.94	5.67	2.12
1.33	3.03	2.83	54.54	4.33	4.24	5.83	1.82
1.50	3.03	3.00	78.78	4.50	3.94	6.00	2.12

CALIB
NASHVD (0102)
ID= 1 DT=10.0 min

Area (ha)= 1.52
Ia (mm)= 5.00
U.H. Tp(hrs)= .13

Curve Number (CN)= 75.0
of Linear Res.(N)= 3.00

Unit Hyd Qpeak (cms)= .451

PEAK FLOW (cms)= .101 (i)
TIME TO PEAK (hrs)= 3.000
RUNOFF VOLUME (mm)= 14.093
TOTAL RAINFALL (mm)= 50.500
RUNOFF COEFFICIENT = .279

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

CALIB
NASHVD (0101)
ID= 1 DT=10.0 min

Area (ha)= 2.29
Ia (mm)= 5.00
U.H. Tp(hrs)= .25

Curve Number (CN)= 75.0
of Linear Res.(N)= 3.00

Page 3

Existing-SCS

Unit Hyd Qpeak (cms)= .356

PEAK FLOW (cms)= .102 (i)
TIME TO PEAK (hrs)= 3.000
RUNOFF VOLUME (mm)= 15.711
TOTAL RAINFALL (mm)= 50.500
RUNOFF COEFFICIENT = .311

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

CALIB
NASHVD (0104)
ID= 1 DT=10.0 min

Area (ha)= 8.19
Ia (mm)= 5.00
U.H. Tp(hrs)= .41

Curve Number (CN)= 67.0
of Linear Res.(N)= 3.00

Unit Hyd Qpeak (cms)= .769

PEAK FLOW (cms)= .197 (i)
TIME TO PEAK (hrs)= 3.333
RUNOFF VOLUME (mm)= 12.113
TOTAL RAINFALL (mm)= 50.500
RUNOFF COEFFICIENT = .240

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

ADD HYD (0103)
1 + 2 = 3

AREA (ha)	QPEAK (cms)	TPEAK (hrs)	R.V. (mm)
ID1= 1 (0101):	2.29	.102	3.00
+ ID2= 2 (0104):	8.19	.197	3.33
ID = 3 (0103):	10.49	.292	3.17

NOTE: PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

ADD HYD (0105)
1 + 2 = 3

AREA (ha)	QPEAK (cms)	TPEAK (hrs)	R.V. (mm)
ID1= 1 (0102):	1.52	.101	3.00
+ ID2= 2 (0103):	10.49	.292	3.17
ID = 3 (0105):	12.01	.338	3.00

NOTE: PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

** SIMULATION NUMBER: 3 **

MASS STORM
Ptotal= 58.60 mm

Filename: C:\visual othymo files\4456\SCS II 6-hr.mst
Comments: SCS 6 HOUR TYPE II STORM DISTRIBUTION

Duration of storm = 6.00 hrs
Page 4

Existing-SCS
Mass curve time step = 10.00 min

TIME	RAIN	TIME	RAIN	TIME	RAIN	TIME	RAIN
hrs	mm/hr	hrs	mm/hr	hrs	mm/hr	hrs	mm/hr
.17	2.46	1.67	5.98	3.17	13.01	4.67	3.52
.33	2.11	1.83	5.63	3.33	12.66	4.83	3.52
.50	2.46	2.00	5.98	3.50	13.01	5.00	3.52
.67	3.52	2.17	7.03	3.67	5.98	5.17	2.46
.83	3.52	2.33	7.03	3.83	5.63	5.33	2.11
1.00	3.52	2.50	7.03	4.00	5.98	5.50	2.46
1.17	3.52	2.67	35.16	4.17	4.57	5.67	2.46
1.33	3.52	2.83	63.29	4.33	4.92	5.83	2.11
1.50	3.52	3.00	91.42	4.50	4.57	6.00	2.46

CALIB					
NASHYD (0102)	Area	(ha)=	1.52	Curve Number (CN)=	75.0
ID= 1 DT=10.0 min	Ia	(mm)=	5.00	# of Linear Res.(N)=	3.00
	U.H. Tp(hrs)=		.13		

Unit Hyd Qpeak (cms)= .451
PEAK FLOW (cms)= .132 (i)
TIME TO PEAK (hrs)= 3.000
RUNOFF VOLUME (mm)= 18.411
TOTAL RAINFALL (mm)= 58.600
RUNOFF COEFFICIENT = .314

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

CALIB					
NASHYD (0101)	Area	(ha)=	2.29	Curve Number (CN)=	75.0
ID= 1 DT=10.0 min	Ia	(mm)=	5.00	# of Linear Res.(N)=	3.00
	U.H. Tp(hrs)=		.25		

Unit Hyd Qpeak (cms)= .356
PEAK FLOW (cms)= .135 (i)
TIME TO PEAK (hrs)= 3.000
RUNOFF VOLUME (mm)= 20.525
TOTAL RAINFALL (mm)= 58.600
RUNOFF COEFFICIENT = .350

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

CALIB					
NASHYD (0104)	Area	(ha)=	8.19	Curve Number (CN)=	67.0
ID= 1 DT=10.0 min	Ia	(mm)=	5.00	# of Linear Res.(N)=	3.00
	U.H. Tp(hrs)=		.41		

Unit Hyd Qpeak (cms)= .769
PEAK FLOW (cms)= .263 (i)
TIME TO PEAK (hrs)= 3.333
RUNOFF VOLUME (mm)= 16.048
TOTAL RAINFALL (mm)= 58.600
RUNOFF COEFFICIENT = .274

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Existing-SCS
RUNOFF VOLUME (mm)= 24.233
TOTAL RAINFALL (mm)= 68.700
RUNOFF COEFFICIENT = .353

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

CALIB					
NASHYD (0101)	Area	(ha)=	2.29	Curve Number (CN)=	75.0
ID= 1 DT=10.0 min	Ia	(mm)=	5.00	# of Linear Res.(N)=	3.00
	U.H. Tp(hrs)=		.25		

Unit Hyd Qpeak (cms)= .356
PEAK FLOW (cms)= .179 (i)
TIME TO PEAK (hrs)= 3.000
RUNOFF VOLUME (mm)= 27.016
TOTAL RAINFALL (mm)= 68.700
RUNOFF COEFFICIENT = .393

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

CALIB					
NASHYD (0104)	Area	(ha)=	8.19	Curve Number (CN)=	67.0
ID= 1 DT=10.0 min	Ia	(mm)=	5.00	# of Linear Res.(N)=	3.00
	U.H. Tp(hrs)=		.41		

Unit Hyd Qpeak (cms)= .769
PEAK FLOW (cms)= .354 (i)
TIME TO PEAK (hrs)= 3.333
RUNOFF VOLUME (mm)= 21.453
TOTAL RAINFALL (mm)= 68.700
RUNOFF COEFFICIENT = .312

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

ADD HYD (0103)					
1 + 2 = 3	AREA	QPEAK	TPEAK	R.V.	
	(ha)	(cms)	(hrs)	(mm)	
ID1= 1 (0101):	2.29	.179	3.00	27.02	
+ ID2= 2 (0104):	8.19	.354	3.33	21.45	
ID = 3 (0103):	10.49	.522	3.17	22.67	

NOTE: PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

ADD HYD (0105)					
1 + 2 = 3	AREA	QPEAK	TPEAK	R.V.	
	(ha)	(cms)	(hrs)	(mm)	
ID1= 1 (0102):	1.52	.173	3.00	24.23	
+ ID2= 2 (0103):	10.49	.522	3.17	22.67	
ID = 3 (0105):	12.01	.604	3.00	22.87	

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

ADD HYD (0103)					
1 + 2 = 3	AREA	QPEAK	TPEAK	R.V.	
	(ha)	(cms)	(hrs)	(mm)	
ID1= 1 (0101):	2.29	.135	3.00	20.53	
+ ID2= 2 (0104):	8.19	.263	3.33	16.05	
ID = 3 (0103):	10.49	.389	3.17	17.03	

NOTE: PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

ADD HYD (0105)					
1 + 2 = 3	AREA	QPEAK	TPEAK	R.V.	
	(ha)	(cms)	(hrs)	(mm)	
ID1= 1 (0102):	1.52	.132	3.00	18.41	
+ ID2= 2 (0103):	10.49	.389	3.17	17.03	
ID = 3 (0105):	12.01	.450	3.00	17.20	

NOTE: PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

** SIMULATION NUMBER: 4 **

MASS STORM	Filename: C:\visual otthymo files\4456\SCS II 6-hr.mst
Ptotal= 68.70 mm	Comments: SCS 6 HOUR TYPE II STORM DISTRIBUTION

Duration of storm = 6.00 hrs
Mass curve time step = 10.00 min

TIME	RAIN	TIME	RAIN	TIME	RAIN	TIME	RAIN
hrs	mm/hr	hrs	mm/hr	hrs	mm/hr	hrs	mm/hr
.17	2.89	1.67	7.01	3.17	15.25	4.67	4.12
.33	2.47	1.83	6.60	3.33	14.84	4.83	4.12
.50	2.89	2.00	7.01	3.50	15.25	5.00	4.12
.67	4.12	2.17	8.24	3.67	7.01	5.17	2.89
.83	4.12	2.33	8.24	3.83	6.60	5.33	2.47
1.00	4.12	2.50	8.24	4.00	7.01	5.50	2.89
1.17	4.12	2.67	41.22	4.17	5.36	5.67	2.89
1.33	4.12	2.83	75.20	4.33	5.77	5.83	2.47
1.50	4.12	3.00	107.17	4.50	5.36	6.00	2.89

CALIB					
NASHYD (0102)	Area	(ha)=	1.52	Curve Number (CN)=	75.0
ID= 1 DT=10.0 min	Ia	(mm)=	5.00	# of Linear Res.(N)=	3.00
	U.H. Tp(hrs)=		.13		

Unit Hyd Qpeak (cms)= .451
PEAK FLOW (cms)= .173 (i)
TIME TO PEAK (hrs)= 3.000

Page 6

Existing-SCS
NOTE: PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

** SIMULATION NUMBER: 5 **

MASS STORM	Filename: C:\visual otthymo files\4456\SCS II 6-hr.mst
Ptotal= 76.30 mm	Comments: SCS 6 HOUR TYPE II STORM DISTRIBUTION

Duration of storm = 6.00 hrs
Mass curve time step = 10.00 min

TIME	RAIN	TIME	RAIN	TIME	RAIN	TIME	RAIN
hrs	mm/hr	hrs	mm/hr	hrs	mm/hr	hrs	mm/hr
.17	3.20	1.67	7.78	3.17	16.94	4.67	4.58
.33	2.75	1.83	7.32	3.33	16.48	4.83	4.58
.50	3.20	2.00	7.78	3.50	16.94	5.00	4.58
.67	4.58	2.17	9.16	3.67	7.78	5.17	3.20
.83	4.58	2.33	9.16	3.83	7.32	5.33	2.75
1.00	4.58	2.50	9.16	4.00	7.78	5.50	3.20
1.17	4.58	2.67	45.78	4.17	5.95	5.67	3.20
1.33	4.58	2.83	82.40	4.33	6.41	5.83	2.75
1.50	4.58	3.00	119.03	4.50	5.95	6.00	3.20

CALIB					
NASHYD (0102)	Area	(ha)=	1.52	Curve Number (CN)=	75.0
ID= 1 DT=10.0 min	Ia	(mm)=	5.00	# of Linear Res.(N)=	3.00
	U.H. Tp(hrs)=		.13		

Unit Hyd Qpeak (cms)= .451
PEAK FLOW (cms)= .206 (i)
TIME TO PEAK (hrs)= 3.000
RUNOFF VOLUME (mm)= 28.881
TOTAL RAINFALL (mm)= 76.300
RUNOFF COEFFICIENT = .379

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

CALIB					
NASHYD (0101)	Area	(ha)=	2.29	Curve Number (CN)=	75.0
ID= 1 DT=10.0 min	Ia	(mm)=	5.00	# of Linear Res.(N)=	3.00
	U.H. Tp(hrs)=		.25		

Unit Hyd Qpeak (cms)= .356
PEAK FLOW (cms)= .215 (i)
TIME TO PEAK (hrs)= 3.000
RUNOFF VOLUME (mm)= 32.198
TOTAL RAINFALL (mm)= 76.300
RUNOFF COEFFICIENT = .422

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

Page 8

Existing-SCS

CALIB NASHVD (0104) ID= 1 DT=10.0 min	Area (ha)= 8.19 Ia (mm)= 5.00 U.H. Tp(hrs)= .41	Curve Number (CN)= 67.0 # of Linear Res.(N)= 3.00
---	---	--

Unit Hyd Qpeak (cms)= .769

PEAK FLOW (cms)= .428 (i)
TIME TO PEAK (hrs)= 3.133
RUNOFF VOLUME (mm)= 25.838
TOTAL RAINFALL (mm)= 76.300
RUNOFF COEFFICIENT = .339

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

ADD HYD (0103) 1 + 2 = 3	AREA (ha) QPEAK (cms) TPEAK (hrs) R.V. (mm)
ID1= 1 (0101):	2.29 .215 3.00 32.20
+ ID2= 2 (0104):	8.19 .428 3.33 25.84
ID = 3 (0103):	10.49 .630 3.17 27.23

NOTE: PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

ADD HYD (0105) 1 + 2 = 3	AREA (ha) QPEAK (cms) TPEAK (hrs) R.V. (mm)
ID1= 1 (0102):	1.52 .206 3.00 28.88
+ ID2= 2 (0103):	10.49 .630 3.17 27.23
ID = 3 (0105):	12.01 .729 3.00 27.44

NOTE: PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

** SIMULATION NUMBER: 6 **

MASS STORM Ptotal= 83.80 mm	Filename: C:\visual otthymo files\4456\SCS II 6-hr.mst Comments: SCS 6 HOUR TYPE II STORM DISTRIBUTION
--------------------------------	---

Duration of storm = 6.00 hrs
Mass curve time step = 10.00 min

TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr
.17	3.52	1.67	8.55	3.17	18.60	4.67	5.03
.33	3.02	1.83	8.04	3.33	18.10	4.83	5.03
.50	3.52	2.00	8.55	3.50	18.60	5.00	5.03
.67	5.03	2.17	10.06	3.67	8.55	5.17	3.52
.83	5.03	2.33	10.06	3.83	8.04	5.33	3.02
1.00	5.03	2.50	10.06	4.00	8.55	5.50	3.52
1.17	5.03	2.67	50.28	4.17	6.54	5.67	3.52
1.33	5.03	2.83	90.50	4.33	7.04	5.83	3.02

Page 9

Existing-SCS

1.50	5.03	3.00	130.73	4.50	6.54	6.00	3.52
------	------	------	--------	------	------	------	------

CALIB NASHVD (0102) ID= 1 DT=10.0 min	Area (ha)= 1.52 Ia (mm)= 5.00 U.H. Tp(hrs)= .13	Curve Number (CN)= 75.0 # of Linear Res.(N)= 3.00
---	---	--

Unit Hyd Qpeak (cms)= .451

PEAK FLOW (cms)= .240 (i)
TIME TO PEAK (hrs)= 3.000
RUNOFF VOLUME (mm)= 33.658
TOTAL RAINFALL (mm)= 83.800
RUNOFF COEFFICIENT = .402

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

CALIB NASHVD (0101) ID= 1 DT=10.0 min	Area (ha)= 2.29 Ia (mm)= 5.00 U.H. Tp(hrs)= .25	Curve Number (CN)= 75.0 # of Linear Res.(N)= 3.00
---	---	--

Unit Hyd Qpeak (cms)= .356

PEAK FLOW (cms)= .252 (i)
TIME TO PEAK (hrs)= 3.000
RUNOFF VOLUME (mm)= 37.523
TOTAL RAINFALL (mm)= 83.800
RUNOFF COEFFICIENT = .448

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

CALIB NASHVD (0104) ID= 1 DT=10.0 min	Area (ha)= 8.19 Ia (mm)= 5.00 U.H. Tp(hrs)= .41	Curve Number (CN)= 67.0 # of Linear Res.(N)= 3.00
---	---	--

Unit Hyd qpeak (cms)= .769

PEAK FLOW (cms)= .505 (i)
TIME TO PEAK (hrs)= 3.333
RUNOFF VOLUME (mm)= 30.398
TOTAL RAINFALL (mm)= 83.800
RUNOFF COEFFICIENT = .363

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

ADD HYD (0103) 1 + 2 = 3	AREA (ha) QPEAK (cms) TPEAK (hrs) R.V. (mm)
ID1= 1 (0101):	2.29 .252 3.00 37.52
+ ID2= 2 (0104):	8.19 .505 3.33 30.40
ID = 3 (0103):	10.49 .742 3.17 31.96

Page 10

Existing-SCS

NOTE: PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

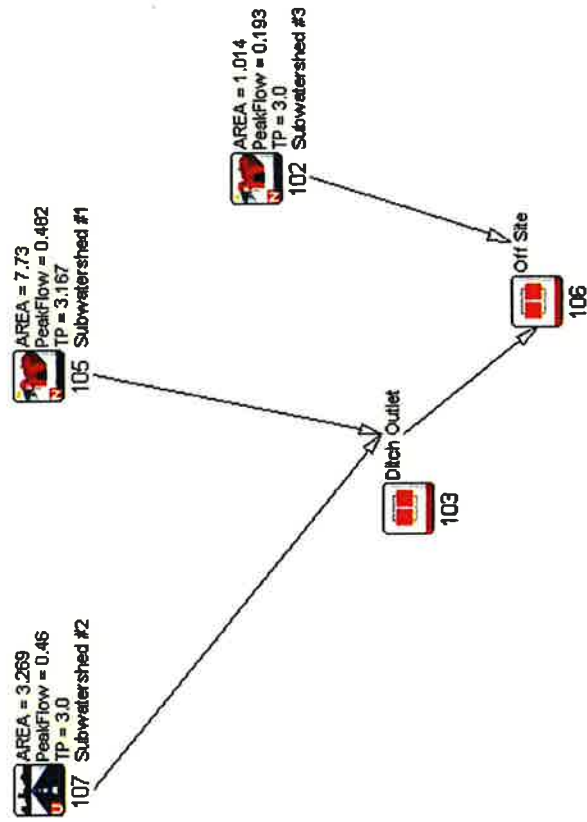
ADD HYD (0105) 1 + 2 = 3	AREA (ha) QPEAK (cms) TPEAK (hrs) R.V. (mm)
ID1= 1 (0102):	1.52 .240 3.00 33.66
+ ID2= 2 (0103):	10.49 .742 3.17 31.96
ID = 3 (0105):	12.01 .859 3.00 32.17

NOTE: PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

FINISH

APPENDIX III

VISUAL OTTHYMO OUTPUT
PRE DEVELOPMENT UN-CONTROLLED



Post-Dev-Uncon-25mm

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V V I SSSS U U A L
V V I SS U U AAAA L
V V I SS U U A L
V V I SSSS UUUU A A LLLL
000 TTTT TTTT H H Y Y M M 000 TM, Version 2.0
0 0 T T H H Y Y M M 0 0 Licensed To: MJ Davenport
000 T T H H Y M M 000 vo2-0057

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***** DETAILED OUTPUT *****

Input filename: C:\Program Files\Visual OTTHYMO v2.0\vo1n.dat

Output filename: C:\visual otthymo files\3969\3969-A11

Scenarios\Post-Dev-Uncontrolled.out

Summary filename: C:\visual otthymo files\3969\3969-A11

Scenarios\Post-Dev-Uncontrolled.sum

DATE: 9/4/2018 TIME: 10:52:42 AM

USER:

COMMENTS:

** SIMULATION NUMBER: 9 **

CHICAGO STORM
Ptotal= 25.00 mm

IDF curve parameters: A= 486.300
B= 7.500
C= -.790

used in: INTENSITY = $A / (C + B)^C$

Duration of storm = 4.00 hrs
Storm time step = 10.00 min
Time to peak ratio = .38

TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr
.17	1.66	1.17	6.41	2.17	4.73	3.17	2.05
.33	1.87	1.33	14.61	2.33	3.84	3.33	1.89
.50	2.16	1.50	50.69	2.50	3.25	3.50	1.75
.67	2.55	1.67	17.59	2.67	2.82	3.67	1.63
.83	3.16	1.83	9.15	2.83	2.50	3.83	1.53
1.00	4.20	2.00	6.21	3.00	2.25	4.00	1.44

Page 1

Post-Dev-Uncon-25mm

CALIB
STANDHYD (0107)
ID= 1 DT= 5.0 min

Area (ha)= 3.27
Total Imp(%)= 30.50 Dir. Conn.(%)= 20.00

IMPERVIOUS PERVIOUS (i)
Surface Area (ha)= 1.00 2.27
Dep. Storage (mm)= 1.00 3.00
Average Slope (%)= 2.00 3.00
Length (m)= 147.60 320.00
Mannings n = .013 .250

NOTE: RAINFALL WAS TRANSFORMED TO 5.0 MIN. TIME STEP.

TIME		RAIN		--- TRANSFORMED ---		HYETOGRAPH ---		TIME		RAIN	
hrs	mm/hr	hrs	mm/hr	hrs	mm/hr	hrs	mm/hr	hrs	mm/hr	hrs	mm/hr
.083	1.66	1.083	6.41	2.083	4.73	3.08	2.05				
.167	1.66	1.167	6.41	2.167	4.73	3.17	2.05				
.250	1.87	1.250	14.61	2.250	3.84	3.25	1.89				
.333	1.87	1.333	14.61	2.333	3.84	3.33	1.89				
.417	2.16	1.417	50.69	2.417	3.25	3.42	1.75				
.500	2.16	1.500	50.69	2.500	3.25	3.50	1.75				
.583	2.55	1.583	17.59	2.583	2.82	3.58	1.63				
.667	2.55	1.667	17.59	2.667	2.82	3.67	1.63				
.750	3.16	1.750	9.15	2.750	2.50	3.75	1.53				
.833	3.16	1.833	9.15	2.833	2.50	3.83	1.53				
.917	4.20	1.917	6.21	2.917	2.25	3.92	1.44				
1.000	4.20	2.000	6.21	3.000	2.25	4.00	1.44				

Max. Eff. Inten. (mm/hr)= 50.69 7.12
over (min)= 5.00 70.00
Storage Coeff. (min)= 3.44 (ii) 66.05 (iii)
Unit Hyd. Tpeak (min)= 5.00 70.00
Unit Hyd. peak (cms)= .26 .02

PEAK FLOW (cms)= .09 .02 *TOTALS*
TIME TO PEAK (hrs)= 1.50 2.75 .090 (iii)
RUNOFF VOLUME (mm)= 24.00 8.60 11.66
TOTAL RAINFALL (mm)= 25.00 25.00 25.00
RUNOFF COEFFICIENT = .96 .34 .47

**** WARNING: STORAGE COEFF. IS SMALLER THAN TIME STEP!
**** WARNING: FOR AREAS WITH IMPERVIOUS RATIOS BELOW 20%
YOU SHOULD CONSIDER SPLITTING THE AREA.

- (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
CN* = 86.0 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.

CALIB
NASHYD (0105)
ID= 1 DT=10.0 min

Area (ha)= 7.73 Curve Number (CN)= 67.0
Ia (mm)= 5.00 # of Linear Res.(N)= 3.00
U.H. Tp(hrs)= .40

Page 2

Post-Dev-Uncon-25mm

NOTE: RAINFALL WAS TRANSFORMED TO 10.0 MIN. TIME STEP.

TIME		RAIN		--- TRANSFORMED ---		HYETOGRAPH ---		TIME		RAIN	
hrs	mm/hr	hrs	mm/hr	hrs	mm/hr	hrs	mm/hr	hrs	mm/hr	hrs	mm/hr
.167	1.66	1.167	6.41	2.167	4.73	3.17	2.05				
.333	1.87	1.333	14.61	2.333	3.84	3.33	1.89				
.500	2.16	1.500	50.69	2.500	3.25	3.50	1.75				
.667	2.55	1.667	17.59	2.667	2.82	3.67	1.63				
.833	3.16	1.833	9.15	2.833	2.50	3.83	1.53				
1.000	4.20	2.000	6.21	3.000	2.25	4.00	1.44				

Unit Hyd Tpeak (cms)= .734

PEAK FLOW (cms)= .038 (i)
TIME TO PEAK (hrs)= 2.000
RUNOFF VOLUME (mm)= 2.689
TOTAL RAINFALL (mm)= 24.755
RUNOFF COEFFICIENT = .109

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

ADD HYD (0103)
1 + 2 = 3

	AREA (ha)	QPEAK (cms)	TPEAK (hrs)	R.V. (mm)
ID1= 1 (0107):	3.27	.090	1.50	11.66
+ ID2= 2 (0105):	7.73	.038	2.00	2.69
ID = 3 (0103):	11.00	.101	1.50	5.36

NOTE: PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

CALIB
NASHYD (0102)
ID= 1 DT=10.0 min

Area (ha)= 1.01 Curve Number (CN)= 82.0
Ia (mm)= 4.00 # of Linear Res.(N)= 3.00
U.H. Tp(hrs)= .11

Unit Hyd Tpeak (cms)= .346

PEAK FLOW (cms)= .018 (i)
TIME TO PEAK (hrs)= 1.500
RUNOFF VOLUME (mm)= 4.652
TOTAL RAINFALL (mm)= 24.755
RUNOFF COEFFICIENT = .188

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

ADD HYD (0106)
1 + 2 = 3

	AREA (ha)	QPEAK (cms)	TPEAK (hrs)	R.V. (mm)
ID1= 1 (0103):	11.00	.101	1.50	5.36
+ ID2= 2 (0102):	1.01	.018	1.50	4.65
ID = 3 (0106):	12.01	.119	1.50	5.30

Page 3

Post-Dev-Uncon-25mm

NOTE: PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

FINISH

Page 4

Post-Dev-Uncon-6hr-Chicago

V V I SSSSS U U A L
V V I SS U U A A L
V V I SS U U A A L
V V I SS U U A A L
V V I SSSSS UUUUU A A LLLLL

000 TTTT TTTT H H Y Y M M 000 TM, Version 2.0
O O T T H H Y Y M M O O Licensed To: M3 Davenport
000 T T H H Y Y M M 000 vo2-0057

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***** DETAILED OUTPUT *****

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Output filename: C:\visual otthymo files\3969\3969-A11
Scenarios\Post-Dev-uncontrolled.out
Summary filename: C:\visual otthymo files\3969\3969-A11
Scenarios\Post-Dev-uncontrolled.sum

DATE: 9/4/2018 TIME: 10:51:42 AM

USER:

COMMENTS:

** SIMULATION NUMBER: 1 **

CHICAGO STORM IDF curve parameters: A= 662.000
Ptotal= 37.36 mm B= 7.500
C= .790
used in: INTENSITY = A / (t + B)^{AC}
Duration of storm = 6.00 hrs
Storm time step = 10.00 min
Time to peak ratio = .38

TIME	RAIN	TIME	RAIN	TIME	RAIN	TIME	RAIN
hrs	mm/hr	hrs	mm/hr	hrs	mm/hr	hrs	mm/hr
.17	1.48	1.67	4.30	3.17	5.23	4.67	2.08
.33	1.59	1.83	5.71	3.33	4.42	4.83	1.96
.50	1.71	2.00	8.73	3.50	3.84	5.00	1.86
.67	1.86	2.17	19.90	3.67	3.41	5.17	1.76
.83	2.04	2.33	69.00	3.83	3.07	5.33	1.68
1.00	2.26	2.50	23.94	4.00	2.79	5.50	1.61

Page 1

Post-Dev-Uncon-6hr-Chicago	1.17	2.55	2.67	12.46	4.17	2.57	5.67	1.54
	1.33	2.94	2.83	8.46	4.33	2.38	5.83	1.48
	1.50	3.48	3.00	6.44	4.50	2.22	6.00	1.42

CALIB STANDHYD (0107)
ID= 1 DT= 5.0 min
Area (ha)= 3.27
Total Imp(%)= 30.50 Dir. Conn.(%)= 20.00

Surface Area (ha)= 1.00
Dep. Storage (mm)= 1.00
Average Slope (%)= 2.00
Length (m)= 147.60
Mannings n = .013
IMPERVIOUS PERVIOUS (i)
2.27 3.00
3.00 3.00
320.00 320.00
.250 .250

NOTE: RAINFALL WAS TRANSFORMED TO 5.0 MIN. TIME STEP.

TIME	RAIN	TIME	RAIN	TIME	RAIN	TIME	RAIN
hrs	mm/hr	hrs	mm/hr	hrs	mm/hr	hrs	mm/hr
.083	1.48	1.583	4.30	3.083	5.23	4.58	2.08
.167	1.48	1.667	4.30	3.167	5.23	4.67	2.08
.250	1.59	1.750	5.71	3.250	4.42	4.75	1.96
.333	1.59	1.833	5.71	3.333	4.42	4.83	1.96
.417	1.71	1.917	8.73	3.417	3.84	4.92	1.86
.500	1.71	2.000	8.73	3.500	3.84	5.00	1.86
.583	1.86	2.083	19.90	3.583	3.41	5.08	1.76
.667	1.86	2.167	19.90	3.667	3.41	5.17	1.76
.750	2.04	2.250	69.00	3.750	3.07	5.25	1.68
.833	2.04	2.333	69.00	3.833	3.07	5.33	1.68
.917	2.26	2.417	23.94	3.917	2.79	5.42	1.61
1.000	2.26	2.500	23.94	4.000	2.79	5.50	1.61
1.083	2.55	2.583	12.46	4.083	2.57	5.58	1.54
1.167	2.55	2.667	12.46	4.167	2.57	5.67	1.54
1.250	2.94	2.750	8.46	4.250	2.38	5.75	1.48
1.333	2.94	2.833	8.46	4.333	2.38	5.83	1.48
1.417	3.48	2.917	6.44	4.417	2.22	5.92	1.42
1.500	3.48	3.000	6.44	4.500	2.22	6.00	1.42

Max. Eff. Inten. (mm/hr)= 69.00 14.69
over (min)= 5.00 50.00
Storage Coeff. (min)= 3.04 (ii) 49.91 (iii)
Unit Hyd. Tpeak (min)= 5.00 50.00
Unit Hyd. peak (cms)= .27 .02

PEAK FLOW (cms)= .12 .05
TIME TO PEAK (hrs)= 2.33 3.17
RUNOFF VOLUME (mm)= 36.36 17.09
TOTAL RAINFALL (mm)= 37.36 37.36
RUNOFF COEFFICIENT = .97 .46

***** WARNING: STORAGE COEFF. IS SMALLER THAN TIME STEP!
***** WARNING: FOR AREAS WITH IMPERVIOUS RATIOS BELOW 20%
YOU SHOULD CONSIDER SPLITTING THE AREA.

(i) CN PROCEDURE SELECTED FOR PVIOUS LOSSES:
CN* = 86.0 Ia = Dep. Storage (Above)
(ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
THAN THE STORAGE COEFFICIENT.

Page 2

Post-Dev-Uncon-6hr-Chicago
(iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

CALIB NASHYD (0105)
ID= 1 DT=10.0 min
Area (ha)= 7.73
Ia (mm)= 5.00
U.H. Tp(hrs)= .40
Curve Number (CN)= 67.0
of Linear Res.(N)= 3.00

NOTE: RAINFALL WAS TRANSFORMED TO 10.0 MIN. TIME STEP.

TIME	RAIN	TIME	RAIN	TIME	RAIN	TIME	RAIN
hrs	mm/hr	hrs	mm/hr	hrs	mm/hr	hrs	mm/hr
.167	1.48	1.667	4.30	3.167	5.23	4.67	2.08
.333	1.59	1.833	5.71	3.333	4.42	4.83	1.96
.500	1.71	2.000	8.73	3.500	3.84	5.00	1.86
.667	1.86	2.167	19.90	3.667	3.41	5.17	1.76
.833	2.04	2.333	69.00	3.833	3.07	5.33	1.68
1.000	2.26	2.500	23.94	4.000	2.79	5.50	1.61
1.167	2.55	2.667	12.46	4.167	2.57	5.67	1.54
1.333	2.94	2.833	8.46	4.333	2.38	5.83	1.48
1.500	3.48	3.000	6.44	4.500	2.22	6.00	1.42

Unit Hyd Qpeak (cms)= .734

PEAK FLOW (cms)= .087 (i)
TIME TO PEAK (hrs)= 2.833
RUNOFF VOLUME (mm)= 6.639
TOTAL RAINFALL (mm)= 37.363
RUNOFF COEFFICIENT = .178

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

ADD HYD (0103)
1 + 2 = 3
ID1= 1 (0107): 3.27 .129 2.33 20.94
+ ID2= 2 (0105): 7.73 .087 2.83 6.64
ID = 3 (0103): 11.00 .161 2.33 10.89

NOTE: PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

CALIB NASHYD (0102)
ID= 1 DT=10.0 min
Area (ha)= 1.01
Ia (mm)= 4.00
U.H. Tp(hrs)= .11
Curve Number (CN)= 82.0
of Linear Res.(N)= 3.00

Unit Hyd Qpeak (cms)= .346

PEAK FLOW (cms)= .041 (i)
TIME TO PEAK (hrs)= 2.333
RUNOFF VOLUME (mm)= 10.321
TOTAL RAINFALL (mm)= 37.363
RUNOFF COEFFICIENT = .276

Page 3

Post-Dev-Uncon-6hr-Chicago
(i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

ADD HYD (0106)
1 + 2 = 3
ID1= 1 (0103): 11.00 .161 2.33 10.89
+ ID2= 2 (0102): 1.01 .041 2.33 10.32
ID = 3 (0106): 12.01 .203 2.33 10.84

NOTE: PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

** SIMULATION NUMBER: 2 **

CHICAGO STORM IDF curve parameters: A=1098.000
Ptotal= 48.64 mm B= 10.100
C= .830
used in: INTENSITY = A / (t + B)^{AC}
Duration of storm = 6.00 hrs
Storm time step = 10.00 min
Time to peak ratio = .38

TIME	RAIN	TIME	RAIN	TIME	RAIN	TIME	RAIN
hrs	mm/hr	hrs	mm/hr	hrs	mm/hr	hrs	mm/hr
.17	1.65	1.67	5.38	3.17	6.69	4.67	2.40
.33	1.78	1.83	7.38	3.33	5.55	4.83	2.25
.50	1.93	2.00	11.78	3.50	4.74	5.00	2.12
.67	2.12	2.17	28.11	3.67	4.15	5.17	2.00
.83	2.35	2.33	90.98	3.83	3.69	5.33	1.90
1.00	2.63	2.50	33.98	4.00	3.33	5.50	1.80
1.17	3.01	2.67	17.30	4.17	3.03	5.67	1.72
1.33	3.51	2.83	11.37	4.33	2.79	5.83	1.64
1.50	4.24	3.00	8.43	4.50	2.58	6.00	1.58

CALIB STANDHYD (0107)
ID= 1 DT= 5.0 min
Area (ha)= 3.27
Total Imp(%)= 30.50 Dir. Conn.(%)= 20.00

Surface Area (ha)= 1.00
Dep. Storage (mm)= 1.00
Average Slope (%)= 2.00
Length (m)= 147.60
Mannings n = .013
IMPERVIOUS PERVIOUS (i)
2.27 3.00
3.00 3.00
320.00 320.00
.250 .250

NOTE: RAINFALL WAS TRANSFORMED TO 5.0 MIN. TIME STEP.

TIME	RAIN	TIME	RAIN	TIME	RAIN	TIME	RAIN
hrs	mm/hr	hrs	mm/hr	hrs	mm/hr	hrs	mm/hr
.083	1.65	1.583	5.38	3.083	6.69	4.58	2.40

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Post-Dev-Uncon-6hr-Chicago									
.167	1.65	1.667	5.38	3.167	6.69	4.67	2.40		
.250	1.78	1.750	7.38	3.250	5.55	4.75	2.25		
.333	1.78	1.833	7.38	3.333	5.55	4.83	2.25		
.417	1.93	1.917	11.78	3.417	4.74	4.92	2.12		
.500	1.93	2.000	11.78	3.500	4.74	5.00	2.12		
.583	2.12	2.083	28.11	3.583	4.15	5.08	2.00		
.667	2.12	2.167	28.11	3.667	4.15	5.17	2.00		
.750	2.35	2.250	90.98	3.750	3.69	5.25	1.90		
.833	2.35	2.333	90.98	3.833	3.69	5.33	1.90		
.917	2.63	2.417	33.98	3.917	3.33	5.42	1.80		
1.000	2.63	2.500	33.98	4.000	3.33	5.50	1.80		
1.083	3.01	2.583	17.30	4.083	3.03	5.58	1.72		
1.167	3.01	2.667	17.30	4.167	3.03	5.67	1.72		
1.250	3.51	2.750	11.37	4.250	2.79	5.75	1.64		
1.333	3.51	2.833	11.37	4.333	2.79	5.83	1.64		
1.417	4.24	2.917	8.43	4.417	2.58	5.92	1.58		
1.500	4.24	3.000	8.43	4.500	2.58	6.00	1.58		

Max.Eff.Inten.(mm/hr)= 90.98 27.09
 over (min)= 5.00 40.00
 Storage Coeff. (min)= 2.72 (ii) 39.41 (ii)
 Unit Hyd. Tpeak (min)= 5.00 40.00
 Unit Hyd. peak (cms)= .29 .03

PEAK FLOW (cms)= .16 .10 *TOTALS*
 TIME TO PEAK (hrs)= 2.33 2.92 1.82 (iii)
 RUNOFF VOLUME (mm)= 47.64 25.86 30.21
 TOTAL RAINFALL (mm)= 48.64 48.64 48.64
 RUNOFF COEFFICIENT = .98 .53 .62

***** WARNING: STORAGE COEFF. IS SMALLER THAN TIME STEP!
 ***** WARNING: FOR AREAS WITH IMPERVIOUS RATIOS BELOW 20%
 YOU SHOULD CONSIDER SPLITTING THE AREA.

(i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
 CN* = 86.0 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.

CALIB					
NASHYD (0105)	Area (ha)=	7.73	Curve Number (CN)=	67.0	
ID= 1 DT=10.0 min	Ia (mm)=	5.00	# of Linear Res.(N)=	3.00	
	U.H. Tp(hrs)=	.40			

NOTE: RAINFALL WAS TRANSFORMED TO 10.0 MIN. TIME STEP.

TRANSFORMED HYETOGRAPH									
TIME	RAIN	TIME	RAIN	TIME	RAIN	TIME	RAIN	TIME	RAIN
hrs	mm/hr	hrs	mm/hr	hrs	mm/hr	hrs	mm/hr	hrs	mm/hr
.167	1.65	1.667	5.38	3.167	6.69	4.67	2.40		
.333	1.78	1.833	7.38	3.333	5.55	4.83	2.25		
.500	1.93	2.000	11.78	3.500	4.74	5.00	2.12		
.667	2.12	2.167	28.11	3.667	4.15	5.17	2.00		
.833	2.35	2.333	90.98	3.833	3.69	5.33	1.90		
1.000	2.63	2.500	33.98	4.000	3.33	5.50	1.80		
1.167	3.01	2.667	17.30	4.167	3.03	5.67	1.72		
1.333	3.51	2.833	11.37	4.333	2.79	5.83	1.64		
1.500	4.24	3.000	8.43	4.500	2.58	6.00	1.58		

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Post-Dev-Uncon-6hr-Chicago

Duration of storm = 6.00 hrs
 Storm time step = 10.00 min
 Time to peak ratio = .38

TIME	RAIN	TIME	RAIN	TIME	RAIN	TIME	RAIN	TIME	RAIN
hrs	mm/hr	hrs	mm/hr	hrs	mm/hr	hrs	mm/hr	hrs	mm/hr
.17	1.73	1.67	6.29	3.17	7.97	4.67	2.60		
.33	1.88	1.83	8.87	3.33	6.51	4.83	2.42		
.50	2.06	2.00	14.61	3.50	5.48	5.00	2.27		
.67	2.27	2.17	35.36	3.67	4.74	5.17	2.13		
.83	2.54	2.33	105.21	3.83	4.17	5.33	2.01		
1.00	2.88	2.50	42.69	4.00	3.72	5.50	1.90		
1.17	3.33	2.67	21.79	4.17	3.36	5.67	1.81		
1.33	3.95	2.83	14.08	4.33	3.06	5.83	1.72		
1.50	4.85	3.00	10.23	4.50	2.81	6.00	1.64		

CALIB					
STANDHYD (0107)	Area (ha)=	3.27			
ID= 1 DT= 5.0 min	Total Imp(%)=	30.50	Dir. Conn.(%)=	20.00	

IMPERVIOUS PERVIOUS (i)
 Surface Area (ha)= 1.00 2.27
 Dep. Storage (mm)= 2.00 3.00
 Average Slope (%)= 2.00 3.00
 Length (m)= 147.60 320.00
 Mannings n = .013 .250

NOTE: RAINFALL WAS TRANSFORMED TO 5.0 MIN. TIME STEP.

TRANSFORMED HYETOGRAPH									
TIME	RAIN	TIME	RAIN	TIME	RAIN	TIME	RAIN	TIME	RAIN
hrs	mm/hr	hrs	mm/hr	hrs	mm/hr	hrs	mm/hr	hrs	mm/hr
.083	1.73	1.583	6.29	3.083	7.97	4.58	2.60		
.167	1.73	1.667	6.29	3.167	7.97	4.67	2.60		
.250	1.88	1.750	8.87	3.250	6.51	4.75	2.42		
.333	1.88	1.833	8.87	3.333	6.51	4.83	2.42		
.417	2.06	1.917	14.61	3.417	5.48	4.92	2.27		
.500	2.06	2.000	14.61	3.500	5.48	5.00	2.27		
.583	2.27	2.083	35.36	3.583	4.74	5.08	2.13		
.667	2.27	2.167	35.36	3.667	4.74	5.17	2.13		
.750	2.54	2.250	105.21	3.750	4.17	5.25	2.01		
.833	2.54	2.333	105.21	3.833	4.17	5.33	2.01		
.917	2.88	2.417	42.69	3.917	3.72	5.42	1.90		
1.000	2.88	2.500	42.69	4.000	3.72	5.50	1.90		
1.083	3.33	2.583	21.79	4.083	3.36	5.58	1.81		
1.167	3.33	2.667	21.79	4.167	3.36	5.67	1.81		
1.250	3.95	2.750	14.08	4.250	3.06	5.75	1.72		
1.333	3.95	2.833	14.08	4.333	3.06	5.83	1.72		
1.417	4.85	2.917	10.23	4.417	2.81	5.92	1.64		
1.500	4.85	3.000	10.23	4.500	2.81	6.00	1.64		

Max.Eff.Inten.(mm/hr)= 105.21 38.82
 over (min)= 5.00 35.00
 Storage Coeff. (min)= 2.57 (ii) 34.34 (ii)
 Unit Hyd. Tpeak (min)= 5.00 35.00
 Unit Hyd. peak (cms)= .29 .03

PEAK FLOW (cms)= .19 .15 *TOTALS*
 TIME TO PEAK (hrs)= 2.22 2.33 2.22 (iii)

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Unit Hyd Qpeak (cms)= Post-Dev-Uncon-6hr-Chicago

PEAK FLOW (cms)= .159 (i)
 TIME TO PEAK (hrs)= 2.833
 RUNOFF VOLUME (mm)= 11.267
 TOTAL RAINFALL (mm)= 48.645
 RUNOFF COEFFICIENT = .232

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

ADD HYD (0103)					
1 + 2 = 3	AREA (ha)	QPEAK (cms)	TPEAK (hrs)	R.V. (mm)	
ID1= 1 (0107):	3.27	.182	2.33	30.21	
+ ID2= 2 (0105):	7.73	.159	2.83	11.27	
ID = 3 (0103):	11.00	.276	2.83	16.90	

NOTE: PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

CALIB					
NASHYD (0102)	Area (ha)=	1.01	Curve Number (CN)=	82.0	
ID= 1 DT=10.0 min	Ia (mm)=	4.00	# of Linear Res.(N)=	3.00	
	U.H. Tp(hrs)=	.11			

Unit Hyd Qpeak (cms)= .346
 PEAK FLOW (cms)= .070 (i)
 TIME TO PEAK (hrs)= 2.333
 RUNOFF VOLUME (mm)= 16.405
 TOTAL RAINFALL (mm)= 48.645
 RUNOFF COEFFICIENT = .337

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

ADD HYD (0106)					
1 + 2 = 3	AREA (ha)	QPEAK (cms)	TPEAK (hrs)	R.V. (mm)	
ID1= 1 (0103):	11.00	.276	2.83	16.90	
+ ID2= 2 (0102):	1.01	.070	2.33	16.41	
ID = 3 (0106):	12.01	.333	2.33	16.86	

NOTE: PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

 ** SIMULATION NUMBER: 3 **

CHICAGO STORM					
Ptotal= 57.49 mm	IDF curve parameters:	A=1560.000	B= 13.000	C= .860	
	used in: INTENSITY =	A / (t + B)AC			

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Post-Dev-Uncon-6hr-Chicago
 TIME TO PEAK (hrs)= 2.33 2.83 2.33
 RUNOFF VOLUME (mm)= 56.49 33.17 37.83
 TOTAL RAINFALL (mm)= 57.49 57.49 57.49
 RUNOFF COEFFICIENT = .98 .58 .66

***** WARNING: STORAGE COEFF. IS SMALLER THAN TIME STEP!
 ***** WARNING: FOR AREAS WITH IMPERVIOUS RATIOS BELOW 20%
 YOU SHOULD CONSIDER SPLITTING THE AREA.

(i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
 CN* = 86.0 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.

CALIB					
STANDHYD (0105)	Area (ha)=	7.73	Curve Number (CN)=	67.0	
ID= 1 DT=10.0 min	Ia (mm)=	5.00	# of Linear Res.(N)=	3.00	
	U.H. Tp(hrs)=	.40			

NOTE: RAINFALL WAS TRANSFORMED TO 10.0 MIN. TIME STEP.

TRANSFORMED HYETOGRAPH									
TIME	RAIN	TIME	RAIN	TIME	RAIN	TIME	RAIN	TIME	RAIN
hrs	mm/hr	hrs	mm/hr	hrs	mm/hr	hrs	mm/hr	hrs	mm/hr
.167	1.73	1.667	6.29	3.167	7.97	4.67	2.60		
.333	1.88	1.833	8.87	3.333	6.51	4.83	2.42		
.500	2.06	2.000	14.61	3.500	5.48	5.00	2.27		
.667	2.27	2.167	35.36	3.667	4.74	5.17	2.13		
.833	2.54	2.333	105.21	3.833	4.17	5.33	2.01		
1.000	2.88	2.500	42.69	4.000	3.72	5.50	1.90		
1.167	3.33	2.667	21.79	4.167	3.36	5.67	1.81		
1.333	3.95	2.833	14.08	4.333	3.06	5.83	1.72		
1.500	4.85	3.000	10.23	4.500	2.81	6.00	1.64		

Unit Hyd Qpeak (cms)= .734

PEAK FLOW (cms)= .227 (i)
 TIME TO PEAK (hrs)= 2.833
 RUNOFF VOLUME (mm)= 15.485
 TOTAL RAINFALL (mm)= 57.490
 RUNOFF COEFFICIENT = .269

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

ADD HYD (0103)					
1 + 2 = 3	AREA (ha)	QPEAK (cms)	TPEAK (hrs)	R.V. (mm)	
ID1= 1 (0107):	3.27	.222	2.33	37.83	
+ ID2= 2 (0105):	7.73	.227	2.83	15.49	
ID = 3 (0103):	11.00	.402	2.83	22.13	

NOTE: PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

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Post-Dev-Uncon-6hr-Chicago

CALIB	NASHYD (0102)	Area (ha)= 1.01	Curve Number (CN)= 82.0
ID= 1 DT=10.0 min	Ia (mm)= 4.00	# of Linear Res.(N)= 3.00	
	U.H. Tp(hrs)= .11		

Unit Hyd Qpeak (cms)= .346

PEAK FLOW (cms)= .093 (i)
 TIME TO PEAK (hrs)= 2.333
 RUNOFF VOLUME (mm)= 21.643
 TOTAL RAINFALL (mm)= 57.490
 RUNOFF COEFFICIENT = .376

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

ADD HYD (0106)	AREA (ha)	QPEAK (cms)	TPEAK (hrs)	R.V. (mm)
1 + 2 = 3				
ID1= 1 (0103):	11.00	.402	2.83	22.13
+ ID2= 2 (0102):	1.01	.093	2.33	21.64
ID = 3 (0106):	12.01	.426	2.83	22.08

NOTE: PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

 ** SIMULATION NUMBER: 4 **

CHICAGO STORM
 Ptotal= 65.65 mm

IDF curve parameters: A=2010.000
 B= 14.000
 C= .880
 used in: INTENSITY = $A / (t + B)^C$
 Duration of storm = 6.00 hrs
 Storm time step = 10.00 min
 Time to peak ratio = .38

TIME	RAIN	TIME	RAIN	TIME	RAIN	TIME	RAIN
hrs	mm/hr	hrs	mm/hr	hrs	mm/hr	hrs	mm/hr
.17	1.78	1.67	6.98	3.17	8.95	4.67	2.75
.33	1.95	1.83	10.01	3.33	7.23	4.83	2.55
.50	2.14	2.00	16.85	3.50	6.04	5.00	2.37
.67	2.38	2.17	41.62	3.67	5.17	5.17	2.22
.83	2.67	2.33	122.63	3.83	4.52	5.33	2.09
1.00	3.05	2.50	50.34	4.00	4.00	5.50	1.97
1.17	3.56	2.67	25.45	4.17	3.60	5.67	1.87
1.33	4.27	2.83	16.21	4.33	3.26	5.83	1.77
1.50	5.31	3.00	11.63	4.50	2.98	6.00	1.69

CALIB	STANDHYD (0107)	Area (ha)= 3.27	Dir. Conn.(%)= 20.00
ID= 1 DT= 5.0 min	Total Imp(%)= 30.50		

IMPERVIOUS Pervious (i)
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Post-Dev-Uncon-6hr-Chicago

TIME	RAIN	TIME	RAIN	TIME	RAIN	TIME	RAIN
hrs	mm/hr	hrs	mm/hr	hrs	mm/hr	hrs	mm/hr
.17	1.78	1.67	6.98	3.17	8.95	4.67	2.75
.33	1.95	1.83	10.01	3.33	7.23	4.83	2.55
.50	2.14	2.00	16.85	3.50	6.04	5.00	2.37
.67	2.38	2.17	41.62	3.67	5.17	5.17	2.22
.83	2.67	2.33	122.63	3.83	4.52	5.33	2.09
1.00	3.05	2.50	50.34	4.00	4.00	5.50	1.97
1.17	3.56	2.67	25.45	4.17	3.60	5.67	1.87
1.33	4.27	2.83	16.21	4.33	3.26	5.83	1.77
1.50	5.31	3.00	11.63	4.50	2.98	6.00	1.69

Unit Hyd Qpeak (cms)= .734

PEAK FLOW (cms)= .301 (i)
 TIME TO PEAK (hrs)= 2.667
 RUNOFF VOLUME (mm)= 19.764
 TOTAL RAINFALL (mm)= 65.646
 RUNOFF COEFFICIENT = .301

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

ADD HYD (0103)	AREA (ha)	QPEAK (cms)	TPEAK (hrs)	R.V. (mm)
1 + 2 = 3				
ID1= 1 (0107):	3.27	.267	2.33	45.05
+ ID2= 2 (0105):	7.73	.301	2.67	19.76
ID = 3 (0103):	11.00	.528	2.83	27.28

NOTE: PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

CALIB	NASHYD (0102)	Area (ha)= 1.01	Curve Number (CN)= 82.0
ID= 1 DT=10.0 min	Ia (mm)= 4.00	# of Linear Res.(N)= 3.00	
	U.H. Tp(hrs)= .11		

Unit Hyd Qpeak (cms)= .346

PEAK FLOW (cms)= .119 (i)
 TIME TO PEAK (hrs)= 2.333
 RUNOFF VOLUME (mm)= 26.730
 TOTAL RAINFALL (mm)= 65.646
 RUNOFF COEFFICIENT = .407

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

ADD HYD (0106)	AREA (ha)	QPEAK (cms)	TPEAK (hrs)	R.V. (mm)
1 + 2 = 3				
ID1= 1 (0103):	11.00	.528	2.83	27.28
+ ID2= 2 (0102):	1.01	.119	2.33	26.73
ID = 3 (0106):	12.01	.559	2.83	27.23

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Post-Dev-Uncon-6hr-Chicago

Surface Area (ha)= 1.00	Curve Number (CN)= 82.0
Dep. Storage (mm)= 1.00	# of Linear Res.(N)= 3.00
Average Slope (%)= 2.00	
Length (m)= 147.60	320.00
Mannings n = .013	.250

NOTE: RAINFALL WAS TRANSFORMED TO 5.0 MIN. TIME STEP.

TIME	RAIN	TIME	RAIN	TIME	RAIN	TIME	RAIN
hrs	mm/hr	hrs	mm/hr	hrs	mm/hr	hrs	mm/hr
.083	1.78	1.583	6.98	3.083	8.95	4.58	2.75
.167	1.78	1.667	6.98	3.167	8.95	4.67	2.75
.250	1.95	1.750	10.01	3.250	7.23	4.75	2.55
.333	1.95	1.833	10.01	3.333	7.23	4.83	2.55
.417	2.14	1.917	16.85	3.417	6.04	4.92	2.37
.500	2.14	2.000	16.85	3.500	6.04	5.00	2.37
.583	2.38	2.083	41.62	3.583	5.17	5.08	2.22
.667	2.38	2.167	41.62	3.667	5.17	5.17	2.22
.750	2.67	2.250	122.63	3.750	4.52	5.25	2.09
.833	2.67	2.333	122.63	3.833	4.52	5.33	2.09
.917	3.05	2.417	50.34	3.917	4.00	5.42	1.97
1.000	3.05	2.500	50.34	4.000	4.00	5.50	1.97
1.083	3.56	2.583	25.45	4.083	3.60	5.58	1.87
1.167	3.56	2.667	25.45	4.167	3.60	5.67	1.87
1.250	4.27	2.750	16.21	4.250	3.26	5.75	1.77
1.333	4.27	2.833	16.21	4.333	3.26	5.83	1.77
1.417	5.31	2.917	11.63	4.417	2.98	5.92	1.69
1.500	5.31	3.000	11.63	4.500	2.98	6.00	1.69

Max.Eff.Inten.(mm/hr)= 122.63
 over (min)= 5.00
 Storage Coeff. (min)= 2.42 (ii)
 Unit Hyd. Tpeak (min)= 5.00
 Unit Hyd. peak (cms)= .30
 PEAK FLOW (cms)= .22
 TIME TO PEAK (hrs)= 2.33
 RUNOFF VOLUME (mm)= 64.65
 TOTAL RAINFALL (mm)= 65.65
 RUNOFF COEFFICIENT = .98

TOTALS (iii)

***** WARNING: STORAGE COEFF. IS SMALLER THAN TIME STEP!
 ***** WARNING: FOR AREAS WITH IMPERVIOUS RATIOS BELOW 20%
 YOU SHOULD CONSIDER SPLITTING THE AREA.

(i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
 CN* = 86.0 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.

CALIB	NASHYD (0105)	Area (ha)= 7.73	Curve Number (CN)= 67.0
ID= 1 DT=10.0 min	Ia (mm)= 5.00	# of Linear Res.(N)= 3.00	
	U.H. Tp(hrs)= .40		

NOTE: RAINFALL WAS TRANSFORMED TO 10.0 MIN. TIME STEP.

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Post-Dev-Uncon-6hr-Chicago

NOTE: PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

 ** SIMULATION NUMBER: 5 **

CHICAGO STORM
 Ptotal= 76.13 mm

IDF curve parameters: A=2200.000
 B= 14.600
 C= .870
 used in: INTENSITY = $A / (t + B)^C$
 Duration of storm = 6.00 hrs
 Storm time step = 10.00 min
 Time to peak ratio = .38

TIME	RAIN	TIME	RAIN	TIME	RAIN	TIME	RAIN
hrs	mm/hr	hrs	mm/hr	hrs	mm/hr	hrs	mm/hr
.17	1.78	1.67	8.42	3.17	10.74	4.67	3.38
.33	2.41	1.83	11.98	3.33	8.72	4.83	3.14
.50	2.65	2.00	19.90	3.50	7.31	5.00	2.93
.67	2.93	2.17	47.86	3.67	6.28	5.17	2.75
.83	3.29	2.33	135.62	3.83	5.50	5.33	2.59
1.00	3.75	2.50	57.60	4.00	4.89	5.50	2.44
1.17	4.36	2.67	29.73	4.17	4.40	5.67	2.32
1.33	5.21	2.83	19.18	4.33	4.00	5.83	2.20
1.50	6.45	3.00	13.86	4.50	3.67	6.00	2.10

CALIB	STANDHYD (0107)	Area (ha)= 3.27	Dir. Conn.(%)= 20.00
ID= 1 DT= 5.0 min	Total Imp(%)= 30.50		

IMPERVIOUS Pervious (i)
 Surface Area (ha)= 1.00
 Dep. Storage (mm)= 1.00
 Average Slope (%)= 2.00
 Length (m)= 147.60
 Mannings n = .013

NOTE: RAINFALL WAS TRANSFORMED TO 5.0 MIN. TIME STEP.

TIME	RAIN	TIME	RAIN	TIME	RAIN	TIME	RAIN
hrs	mm/hr	hrs	mm/hr	hrs	mm/hr	hrs	mm/hr
.083	2.22	1.583	8.42	3.083	10.74	4.58	3.38
.167	2.22	1.667	8.42	3.167	10.74	4.67	3.38
.250	2.41	1.750	11.98	3.250	8.72	4.75	3.14
.333	2.41	1.833	11.98	3.333	8.72	4.83	3.14
.417	2.65	1.917	19.90	3.417	7.31	4.92	2.93
.500	2.65	2.000	19.90	3.500	7.31	5.00	2.93
.583	2.93	2.083	47.86	3.583	6.28	5.08	2.75
.667	2.93	2.167	47.86	3.667	6.28	5.17	2.75
.750	3.29	2.250	135.62	3.750	5.50	5.25	2.59
.833	3.29	2.333	135.62	3.833	5.50	5.33	2.59
.917	3.75	2.417	57.60	3.917	4.89	5.42	2.44
1.000	3.75	2.500	57.60	4.000	4.89	5.50	2.44
1.083	4.36	2.583	29.73	4.083	4.40	5.58	2.32

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Post-Dev-Uncon-6hr-Chicago									
1.167	4.36	2.667	29.73	4.167	4.40	5.67	2.32		
1.250	5.21	2.750	19.18	4.250	4.00	5.75	2.20		
1.333	5.21	2.833	19.18	4.333	4.00	5.83	2.20		
1.417	6.45	2.917	13.86	4.417	3.67	5.92	2.10		
1.500	6.45	3.000	13.86	4.500	3.67	6.00	2.10		

Max. Eff. Inten. (mm/hr) = 135.62
 over (min) = 5.00
 Storage Coeff. (min) = 2.32 (ii)
 Unit Hyd. Tpeak (min) = 5.00
 Unit Hyd. peak (cms) = .30
 PEAK FLOW (cms) = .24
 TIME TO PEAK (hrs) = 2.33
 RUNOFF VOLUME (mm) = 75.13
 TOTAL RAINFALL (mm) = 76.13
 RUNOFF COEFFICIENT = .99

TOTALS
 319 (iii)
 2.33
 54.53
 76.13
 .72

***** WARNING: STORAGE COEFF. IS SMALLER THAN TIME STEP!
 ***** WARNING: FOR AREAS WITH IMPERVIOUS RATIOS BELOW 20% YOU SHOULD CONSIDER SPLITTING THE AREA.

- (i) CN PROCEDURE SELECTED FOR PVIOUS LOSSES: CN* = 86.0 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.

CALIB NASHVD (0105)									
ID= 1 DT=10.0 min	Area (ha)= 7.73	Curve Number (CN)= 67.0							
	Ia (mm)= 5.00	# of Linear Res. (N)= 3.00							
	U.H. Tp(hrs)= .40								

NOTE: RAINFALL WAS TRANSFORMED TO 10.0 MIN. TIME STEP.

--- TRANSFORMED HYETOGRAPH ---									
TIME	RAIN	TIME	RAIN	TIME	RAIN	TIME	RAIN	TIME	RAIN
hrs	mm/hr	hrs	mm/hr	hrs	mm/hr	hrs	mm/hr	hrs	mm/hr
.167	2.22	1.667	8.42	3.167	10.74	4.67	3.38		
.333	2.41	1.833	11.98	3.333	8.72	4.83	3.14		
.500	2.65	2.000	19.90	3.500	7.31	5.00	2.93		
.667	2.93	2.167	47.86	3.667	6.48	5.17	2.75		
.833	3.29	2.333	135.62	3.833	5.50	5.33	2.59		
1.000	3.75	2.500	57.60	4.000	4.89	5.50	2.44		
1.167	4.36	2.667	29.73	4.167	4.40	5.67	2.32		
1.333	5.21	2.833	19.18	4.333	4.00	5.83	2.20		
1.500	6.45	3.000	13.86	4.500	3.67	6.00	2.10		

Unit Hyd Qpeak (cms) = .734
 PEAK FLOW (cms) = .386 (i)
 TIME TO PEAK (hrs) = 2.667
 RUNOFF VOLUME (mm) = 25.735
 TOTAL RAINFALL (mm) = 76.131
 RUNOFF COEFFICIENT = .338

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

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Post-Dev-Uncon-6hr-Chicago									
1.00	3.86	2.50	62.77	4.00	5.07	5.50	2.49		
1.17	4.51	2.67	32.11	4.17	4.55	5.67	2.36		
1.33	5.41	2.83	20.54	4.33	4.12	5.83	2.24		
1.50	6.73	3.00	14.75	4.50	3.77	6.00	2.13		

CALIB STANDHYD (0107)									
ID= 1 DT= 5.0 min	Area (ha)= 3.27								
	Total Imp(%)= 30.50	Dir. Conn.(%)= 20.00							

IMPERVIOUS PVIOUS (i)
 Surface Area (ha)= 1.00
 Dep. Storage (mm)= 1.00
 Average Slope (%)= 2.00
 Length (m)= 147.60
 Mannings n = .013

NOTE: RAINFALL WAS TRANSFORMED TO 5.0 MIN. TIME STEP.

--- TRANSFORMED HYETOGRAPH ---									
TIME	RAIN	TIME	RAIN	TIME	RAIN	TIME	RAIN	TIME	RAIN
hrs	mm/hr	hrs	mm/hr	hrs	mm/hr	hrs	mm/hr	hrs	mm/hr
.167	2.25	1.583	8.85	3.083	11.36	4.58	3.47		
.333	2.45	1.750	12.70	3.250	9.17	4.75	3.22		
.500	2.70	1.917	21.34	3.417	7.66	4.92	3.00		
.667	3.00	2.083	52.05	3.583	7.66	5.00	3.00		
.833	3.38	2.250	148.61	3.750	6.56	5.08	2.81		
1.000	3.86	2.500	62.77	4.000	5.07	5.50	2.49		
1.167	4.51	2.667	32.11	4.167	4.55	5.67	2.36		
1.333	5.41	2.833	20.54	4.333	4.12	5.83	2.24		
1.500	6.73	3.000	14.75	4.500	3.77	6.00	2.13		

Max. Eff. Inten. (mm/hr) = 148.61
 over (min) = 5.00
 Storage Coeff. (min) = 2.24 (ii)
 Unit Hyd. Tpeak (min) = 5.00
 Unit Hyd. peak (cms) = .30
 PEAK FLOW (cms) = .27
 TIME TO PEAK (hrs) = 2.33
 RUNOFF VOLUME (mm) = 80.72
 TOTAL RAINFALL (mm) = 81.72
 RUNOFF COEFFICIENT = .99

TOTALS
 .357 (iii)
 2.33
 59.67
 81.72
 .73

***** WARNING: STORAGE COEFF. IS SMALLER THAN TIME STEP!
 ***** WARNING: FOR AREAS WITH IMPERVIOUS RATIOS BELOW 20% YOU SHOULD CONSIDER SPLITTING THE AREA.

- (i) CN PROCEDURE SELECTED FOR PVIOUS LOSSES: CN* = 86.0 Ia = Dep. Storage (Above)
- (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL

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Post-Dev-Uncon-6hr-Chicago

ADD HYD (0103)									
1 + 2 = 3	AREA (ha)	QPEAK (cms)	TPEAK (hrs)	R.V. (mm)					
ID1= 1 (0107):	3.27	.319	2.33	54.53					
+ ID2= 2 (0105):	7.73	.386	2.67	25.73					
ID = 3 (0103):	11.00	.674	2.75	34.29					

NOTE: PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

CALIB NASHVD (0102)									
ID= 1 DT=10.0 min	Area (ha)= 1.01	Curve Number (CN)= 82.0							
	Ia (mm)= 4.00	# of Linear Res. (N)= 3.00							
	U.H. Tp(hrs)= .11								

Unit Hyd Qpeak (cms) = .346
 PEAK FLOW (cms) = .146 (i)
 TIME TO PEAK (hrs) = 2.333
 RUNOFF VOLUME (mm) = 33.620
 TOTAL RAINFALL (mm) = 76.131
 RUNOFF COEFFICIENT = .442

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

ADD HYD (0106)									
1 + 2 = 3	AREA (ha)	QPEAK (cms)	TPEAK (hrs)	R.V. (mm)					
ID1= 1 (0103):	11.00	.674	2.75	34.29					
+ ID2= 2 (0102):	1.01	.146	2.33	33.62					
ID = 3 (0106):	12.01	.746	2.67	34.24					

NOTE: PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

 ** SIMULATION NUMBER: 6 **

CHICAGO STORM									
ID= 1 DT= 81.72 min	IDF curve parameters: A=2507.000								
	B= 14.800								
	C= .880								

used in: INTENSITY = A / (t + B) AC

Duration of storm = 6.00 hrs
 Storm time step = 10.00 min
 Time to peak ratio = .38

TIME	RAIN	TIME	RAIN	TIME	RAIN	TIME	RAIN
hrs	mm/hr	hrs	mm/hr	hrs	mm/hr	hrs	mm/hr
.17	2.25	1.67	8.85	3.17	11.36	4.67	3.47
.33	2.45	1.83	12.70	3.33	9.17	4.83	3.22
.50	2.70	2.00	21.34	3.50	7.66	5.00	3.00
.67	3.00	2.17	52.05	3.67	6.56	5.17	2.81
.83	3.38	2.33	148.61	3.83	5.72	5.33	2.64

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Post-Dev-Uncon-6hr-Chicago
 THAN THE STORAGE COEFFICIENT.
 (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

CALIB NASHVD (0105)									
ID= 1 DT=10.0 min	Area (ha)= 7.73	Curve Number (CN)= 67.0							
	Ia (mm)= 5.00	# of Linear Res. (N)= 3.00							
	U.H. Tp(hrs)= .40								

NOTE: RAINFALL WAS TRANSFORMED TO 10.0 MIN. TIME STEP.

--- TRANSFORMED HYETOGRAPH ---									
TIME	RAIN	TIME	RAIN	TIME	RAIN	TIME	RAIN	TIME	RAIN
hrs	mm/hr	hrs	mm/hr	hrs	mm/hr	hrs	mm/hr	hrs	mm/hr
.167	2.25	1.667	8.85	3.167	11.36	4.67	3.47		
.333	2.45	1.833	12.70	3.333	9.17	4.83	3.22		
.500	2.70	2.000	21.34	3.500	7.66	5.00	3.00		
.667	3.00	2.167	52.05	3.667	6.56	5.17	2.81		
.833	3.38	2.333	148.61	3.833	5.72	5.33	2.64		
1.000	3.86	2.500	62.78	4.000	5.07	5.50	2.49		
1.167	4.51	2.667	32.11	4.167	4.55	5.67	2.36		
1.333	5.41	2.833	20.54	4.333	4.12	5.83	2.24		
1.500	6.73	3.000	14.75	4.500	3.77	6.00	2.13		

Unit Hyd Qpeak (cms) = .734

PEAK FLOW (cms) = .447 (i)
 TIME TO PEAK (hrs) = 2.667
 RUNOFF VOLUME (mm) = 29.112
 TOTAL RAINFALL (mm) = 81.724
 RUNOFF COEFFICIENT = .356

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

ADD HYD (0103)									
1 + 2 = 3	AREA (ha)	QPEAK (cms)	TPEAK (hrs)	R.V. (mm)					
ID1= 1 (0107):	3.27	.357	2.33	59.67					
+ ID2= 2 (0105):	7.73	.447	2.67	29.11					
ID = 3 (0103):	11.00	.782	2.67	36.19					

NOTE: PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

CALIB NASHVD (0102)									
ID= 1 DT=10.0 min	Area (ha)= 1.01	Curve Number (CN)= 82.0							
	Ia (mm)= 4.00	# of Linear Res. (N)= 3.00							
	U.H. Tp(hrs)= .11								

Unit Hyd Qpeak (cms) = .346
 PEAK FLOW (cms) = .167 (i)
 TIME TO PEAK (hrs) = 2.333
 RUNOFF VOLUME (mm) = 37.401
 TOTAL RAINFALL (mm) = 81.724
 RUNOFF COEFFICIENT = .458

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Post-Dev-Uncon-6hr-Chicago

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

ADD HYD (0106)		AREA	QPEAK	TPEAK	R.V.
1 + 2 = 3		(ha)	(cms)	(hrs)	(mm)
ID1= 1	(0103):	11.00	.782	2.67	38.19
+ ID2= 2	(0102):	1.01	.167	2.33	37.40
ID = 3	(0106):	12.01	.849	2.67	38.13

NOTE: PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

FINISH

Post-Dev-Uncon-AES

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V V I SSSSS U U A L
V V I SS U U A A L
V V I SS U U A A L
V V I SS U U A A L
V V I SSSSS UUUU A A LLLL
000 TTTT TTTT H H Y Y M M 000 TM, Version 2.0
O O T T H H Y Y M M 0 O Licensed To: MJ Davenport
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***** DETAILED OUTPUT *****

Input filename: C:\Program Files\Visual OTTHYMO v2.0\vo1n.dat

Output filename: C:\visual otthymo files\3969\3969-A11

Scenarios\Post-Dev-Uncontrolled.out

Summary filename: C:\visual otthymo files\3969\3969-A11

scenarios\Post-Dev-Uncontrolled.sum

DATE: 9/4/2018

TIME: 10:50:28 AM

USER:

COMMENTS:

** SIMULATION NUMBER: 1 **

MASS STORM Ptotal= 22.50 mm
Filename: C:\visual otthymo files\4456\AES 1-hr.mst
Comments: AES 1 HOUR STORM DISTRIBUTION a=21min k=

Duration of storm = 1.00 hrs
Mass curve time step = 5.00 min

TIME	RAIN	TIME	RAIN	TIME	RAIN	TIME	RAIN
hrs	mm/hr	hrs	mm/hr	hrs	mm/hr	hrs	mm/hr
.08	10.02	.33	69.93	.58	11.10	.83	.81
.17	30.00	.42	64.29	.67	4.62	.92	.30
.25	49.98	.50	27.03	.75	1.92	1.00	.03

CALIB NASHYD (0107)
ID= 1 DT= 5.0 min
Area (ha)= 3.27
Total Imp(%)= 30.50 Dir. Conn.(%)= 20.00
Page 1

Post-Dev-Uncon-AES
+ ID2= 2 (0105): 7.73 .055 .83 2.14
ID = 3 (0103): 11.00 .142 .42 4.47

NOTE: PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

CALIB NASHYD (0102)
ID= 1 DT=10.0 min
Area (ha)= 1.01 Curve Number (CN)= 82.0
Ia (mm)= 4.00 # of Linear Res.(N)= 3.00
U.H. Tp(hrs)= .11

Unit Hyd Qpeak (cms)= .346
PEAK FLOW (cms)= .033 (i)
TIME TO PEAK (hrs)= .500
RUNOFF VOLUME (mm)= 3.808
TOTAL RAINFALL (mm)= 22.500
RUNOFF COEFFICIENT = .169

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

ADD HYD (0106)
1 + 2 = 3
ID1= 1 (0103): 11.00 .142 .42 4.47
+ ID2= 2 (0102): 1.01 .033 .50 3.81
ID = 3 (0106): 12.01 .166 .42 4.41

NOTE: PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

** SIMULATION NUMBER: 2 **

MASS STORM Ptotal= 30.50 mm
Filename: C:\visual otthymo files\4456\AES 1-hr.mst
Comments: AES 1 HOUR STORM DISTRIBUTION a=21min k=

Duration of storm = 1.00 hrs
Mass curve time step = 5.00 min

TIME	RAIN	TIME	RAIN	TIME	RAIN	TIME	RAIN
hrs	mm/hr	hrs	mm/hr	hrs	mm/hr	hrs	mm/hr
.08	13.58	.33	94.79	.58	15.04	.83	1.10
.17	40.66	.42	87.14	.67	6.26	.92	.40
.25	67.75	.50	36.64	.75	2.60	1.00	.04

CALIB NASHYD (0107)
ID= 1 DT= 5.0 min
Area (ha)= 3.27
Total Imp(%)= 30.50 Dir. conn.(%)= 20.00

Surface Area (ha)= 1.00 IMPERVIOUS PERVIOUS (i)
Dep. Storage (mm)= 1.00 2.27 3.00
Page 3

Post-Dev-Uncon-AES

	IMPERVIOUS	PERVIOUS (i)
Surface Area (ha)=	1.00	2.27
Dep. Storage (mm)=	1.00	3.00
Average Slope (%)=	2.00	3.00
Length (m)=	147.60	320.00
Mannings n =	.013	.250
Max.Eff.Inten.(mm/hr)=	69.93	8.16
over (min)	5.00	65.00
Storage Coeff. (min)=	3.02 (ii)	62.31 (ii)
Unit Hyd. Tpeak (min)=	5.00	65.00
Unit Hyd. peak (cms)=	.27	.02
PEAK FLOW (cms)=	.12	.03
TIME TO PEAK (hrs)=	.33	1.42
RUNOFF VOLUME (mm)=	21.50	7.09
TOTAL RAINFALL (mm)=	22.50	22.50
RUNOFF COEFFICIENT =	.96	.32

TOTALS
.120 (iii)
.42
9.96
22.50
.44

***** WARNING: STORAGE COEFF. IS SMALLER THAN TIME STEP!
***** WARNING: FOR AREAS WITH IMPERVIOUS RATIOS BELOW 20%
YOU SHOULD CONSIDER SPLITTING THE AREA.

(i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
CN* = 86.0 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.

CALIB NASHYD (0105)
ID= 1 DT=10.0 min
Area (ha)= 7.73 Curve Number (CN)= 67.0
Ia (mm)= 5.00 # of Linear Res.(N)= 3.00
U.H. Tp(hrs)= .40

NOTE: RAINFALL WAS TRANSFORMED TO 10.0 MIN. TIME STEP.

TIME	RAIN	TIME	RAIN	TIME	RAIN	TIME	RAIN
hrs	mm/hr	hrs	mm/hr	hrs	mm/hr	hrs	mm/hr
.167	20.01	.500	45.66	.833	1.36		
.333	59.95	.667	7.86	1.000	.16		

Unit Hyd Qpeak (cms)= .734

PEAK FLOW (cms)= .055 (i)
TIME TO PEAK (hrs)= .833
RUNOFF VOLUME (mm)= 2.143
TOTAL RAINFALL (mm)= 22.500
RUNOFF COEFFICIENT = .095

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

ADD HYD (0103)
1 + 2 = 3
ID1= 1 (0107): 3.27 .120 .42 9.96
Page 2

	IMPERVIOUS	PERVIOUS (i)
Average Slope (%)=	2.00	3.00
Length (m)=	147.60	320.00
Mannings n =	.013	.250
Max.Eff.Inten.(mm/hr)=	94.79	18.67
over (min)	5.00	50.00
Storage Coeff. (min)=	2.68 (ii)	45.26 (ii)
Unit Hyd. Tpeak (min)=	5.00	50.00
Unit Hyd. peak (cms)=	.29	.02
PEAK FLOW (cms)=	.16	.07
TIME TO PEAK (hrs)=	.33	1.17
RUNOFF VOLUME (mm)=	29.50	12.19
TOTAL RAINFALL (mm)=	30.50	30.50
RUNOFF COEFFICIENT =	.97	.40

TOTALS
.168 (iii)
.42
15.65
30.50
.51

***** WARNING: STORAGE COEFF. IS SMALLER THAN TIME STEP!
***** WARNING: FOR AREAS WITH IMPERVIOUS RATIOS BELOW 20%
YOU SHOULD CONSIDER SPLITTING THE AREA.

(i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
CN* = 86.0 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.

CALIB NASHYD (0105)
ID= 1 DT=10.0 min
Area (ha)= 7.73 Curve Number (CN)= 67.0
Ia (mm)= 5.00 # of Linear Res.(N)= 3.00
U.H. Tp(hrs)= .40

NOTE: RAINFALL WAS TRANSFORMED TO 10.0 MIN. TIME STEP.

TIME	RAIN	TIME	RAIN	TIME	RAIN	TIME	RAIN
hrs	mm/hr	hrs	mm/hr	hrs	mm/hr	hrs	mm/hr
.167	27.12	.500	61.89	.833	1.85		
.333	81.27	.667	10.65	1.000	.22		

Unit Hyd Qpeak (cms)= .734

PEAK FLOW (cms)= .111 (i)
TIME TO PEAK (hrs)= .667
RUNOFF VOLUME (mm)= 4.309
TOTAL RAINFALL (mm)= 30.500
RUNOFF COEFFICIENT = .141

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

ADD HYD (0103)
1 + 2 = 3
ID1= 1 (0107): 3.27 .168 .42 15.65
+ ID2= 2 (0105): 7.73 .111 .67 4.31
ID = 3 (0103): 11.00 .215 .42 7.68

Page 4

Post-Dev-Uncon-AES
NOTE: PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

CALIB
NASHYD (0102)
ID= 1 DT=10.0 min

Area (ha)	1.01	Curve Number (CN)	82.0
Ia (mm)	4.00	# of Linear Res.(N)	3.00
U.H. Tp(hrs)	.11		

Unit Hyd Qpeak (cms)= .346

PEAK FLOW (cms)= .059 (i)
TIME TO PEAK (hrs)= .500
RUNOFF VOLUME (mm)= 7.055
TOTAL RAINFALL (mm)= 30.500
RUNOFF COEFFICIENT = .231

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

ADD HYD (0106)
1 + 2 = 3

AREA (ha)	QPEAK (cms)	TPEAK (hrs)	R.V. (mm)
ID1= 1 (0103):	11.00	.215	.42
+ ID2= 2 (0102):	1.01	.059	.50
ID = 3 (0106):	12.01	.260	.42
			7.72

NOTE: PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

** SIMULATION NUMBER: 3 **

MASS STORM
Ptotal= 35.80 mm

Filename: C:\visual otthymo files\4456\AES 1-hr.mst
Comments: AES 1 HOUR STORM DISTRIBUTION a=21min k=

Duration of storm = 1.00 hrs
Mass curve time step = 5.00 min

TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr
.08	15.94	.33	111.27	.58	17.66	.83	1.29
.17	47.73	.42	102.29	.67	7.35	.92	.47
.25	79.52	.50	43.00	.75	3.05	1.00	.04

CALIB
STANDHYD (0107)
ID= 1 DT= 5.0 min

Area (ha)	3.27	Dir. Conn.(%)	20.00
Total Imp(%)	30.50		

IMPERVIOUS PERVIOUS (i)

Surface Area (ha)	1.00	2.27
Dep. Storage (mm)	1.00	3.00
Average Slope (%)	2.00	3.00
Length (m)	147.60	320.00
Mannings n	.013	.250

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Post-Dev-Uncon-AES

Max.Eff.Inten.(mm/hr)=	111.27	30.88
over (min)	5.00	40.00
Storage Coeff. (min)=	2.51 (ii)	37.33 (ii)
Unit Hyd. Tpeak (min)=	5.00	40.00
Unit Hyd. peak (cms)=	.29	.03

PEAK FLOW (cms)= .19 .11 *TOTALS* (iii)
TIME TO PEAK (hrs)= .33 1.00 .42
RUNOFF VOLUME (mm)= 34.80 15.94 19.71
TOTAL RAINFALL (mm)= 35.80 35.80 35.80
RUNOFF COEFFICIENT = .97 .45 .55

***** WARNING: STORAGE COEFF. IS SMALLER THAN TIME STEP!
***** WARNING:FOR AREAS WITH IMPERVIOUS RATIOS BELOW 20% YOU SHOULD CONSIDER SPLITTING THE AREA.

(i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
CN* = 86.0 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.

CALIB
NASHYD (0105)
ID= 1 DT=10.0 min

Area (ha)	7.73	Curve Number (CN)	67.0
Ia (mm)	5.00	# of Linear Res.(N)	3.00
U.H. Tp(hrs)	.40		

NOTE: RAINFALL WAS TRANSFORMED TO 10.0 MIN. TIME STEP.

TRANSFORMED HYETOGRAPH

TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr
.167	31.83	.500	72.65	.833	2.17		
.333	95.39	.667	12.50	1.000	.26		

Unit Hyd Qpeak (cms)= .734

PEAK FLOW (cms)= .157 (i)
TIME TO PEAK (hrs)= .667
RUNOFF VOLUME (mm)= 6.073
TOTAL RAINFALL (mm)= 35.800
RUNOFF COEFFICIENT = .170

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

ADD HYD (0103)
1 + 2 = 3

AREA (ha)	QPEAK (cms)	TPEAK (hrs)	R.V. (mm)
ID1= 1 (0107):	3.27	.206	.42
+ ID2= 2 (0105):	7.73	.157	.67
ID = 3 (0103):	11.00	.274	.42
			10.13

NOTE: PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

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Post-Dev-Uncon-AES

Area (ha)	1.01	Curve Number (CN)	82.0
Ia (mm)	4.00	# of Linear Res.(N)	3.00
U.H. Tp(hrs)	.11		

Unit Hyd Qpeak (cms)= .346

PEAK FLOW (cms)= .078 (i)
TIME TO PEAK (hrs)= .500
RUNOFF VOLUME (mm)= 9.545
TOTAL RAINFALL (mm)= 35.800
RUNOFF COEFFICIENT = .267

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

ADD HYD (0106)
1 + 2 = 3

AREA (ha)	QPEAK (cms)	TPEAK (hrs)	R.V. (mm)
ID1= 1 (0103):	11.00	.274	.42
+ ID2= 2 (0107):	1.01	.078	.50
ID = 3 (0106):	12.01	.336	.42
			10.21

NOTE: PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

** SIMULATION NUMBER: 4 **

MASS STORM
Ptotal= 42.50 mm

Filename: C:\visual otthymo files\4456\AES 1-hr.mst
Comments: AES 1 HOUR STORM DISTRIBUTION a=21min k=

Duration of storm = 1.00 hrs
Mass curve time step = 5.00 min

TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr
.08	18.92	.33	132.09	.58	20.96	.83	1.53
.17	56.66	.42	121.43	.67	8.72	.92	.56
.25	94.40	.50	51.05	.75	3.62	1.00	.05

CALIB
STANDHYD (0107)
ID= 1 DT= 5.0 min

Area (ha)	3.27	Dir. Conn.(%)	20.00
Total Imp(%)	30.50		

IMPERVIOUS PERVIOUS (i)

Surface Area (ha)	1.00	2.27
Dep. Storage (mm)	1.00	3.00
Average Slope (%)	2.00	3.00
Length (m)	147.60	320.00
Mannings n	.013	.250

Max.Eff.Inten.(mm/hr)= 132.09 46.68
over (min) 5.00 35.00
Storage Coeff. (min)= 2.34 (ii) 31.86 (ii)
Unit Hyd. Tpeak (min)= 5.00 35.00

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Post-Dev-Uncon-AES

Unit Hyd. peak (cms)=	.30	.03
PEAK FLOW (cms)=	.23	.16
TIME TO PEAK (hrs)=	.33	.92
RUNOFF VOLUME (mm)=	41.50	20.99
TOTAL RAINFALL (mm)=	42.50	42.50
RUNOFF COEFFICIENT =	.98	.49

***** WARNING: STORAGE COEFF. IS SMALLER THAN TIME STEP!
***** WARNING:FOR AREAS WITH IMPERVIOUS RATIOS BELOW 20% YOU SHOULD CONSIDER SPLITTING THE AREA.

(i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
CN* = 86.0 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.

CALIB
NASHYD (0105)
ID= 1 DT=10.0 min

Area (ha)	7.73	Curve Number (CN)	67.0
Ia (mm)	5.00	# of Linear Res.(N)	3.00
U.H. Tp(hrs)	.40		

NOTE: RAINFALL WAS TRANSFORMED TO 10.0 MIN. TIME STEP.

TRANSFORMED HYETOGRAPH

TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr
.167	37.79	.500	86.24	.833	2.58		
.333	113.25	.667	14.84	1.000	.31		

Unit Hyd Qpeak (cms)= .734

PEAK FLOW (cms)= .223 (i)
TIME TO PEAK (hrs)= .667
RUNOFF VOLUME (mm)= 8.632
TOTAL RAINFALL (mm)= 42.500
RUNOFF COEFFICIENT = .203

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

ADD HYD (0103)
1 + 2 = 3

AREA (ha)	QPEAK (cms)	TPEAK (hrs)	R.V. (mm)
ID1= 1 (0107):	3.27	.256	.42
+ ID2= 2 (0105):	7.73	.223	.67
ID = 3 (0103):	11.00	.376	.83
			13.52

NOTE: PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

CALIB
NASHYD (0102)
ID= 1 DT=10.0 min

Area (ha)	1.01	Curve Number (CN)	82.0
Ia (mm)	4.00	# of Linear Res.(N)	3.00
U.H. Tp(hrs)	.11		

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Post-Dev-Uncon-AES

Unit Hyd Qpeak (cms) = .346

PEAK FLOW (cms) = .104 (i)
 TIME TO PEAK (hrs) = .500
 RUNOFF VOLUME (mm) = 12.996
 TOTAL RAINFALL (mm) = 42.500
 RUNOFF COEFFICIENT = .306

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

ADD HYD (0106)				
1 + 2 = 3	AREA (ha)	QPEAK (cms)	TPEAK (hrs)	R.V. (mm)
ID1= 1 (0103):	11.00	.376	.83	13.52
+ ID2= 2 (0102):	1.01	.104	.50	13.00

ID = 3 (0106):	12.01	.440	.42	13.67

NOTE: PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

*** SIMULATION NUMBER: 5 ***

Filename: c:\visual otthymo files\4456\AES 1-hr.mst
 Comments: AES 1 HOUR STORM DISTRIBUTION a=21min k=
 Duration of storm = 1.00 hrs
 Mass curve time step = 5.00 min

TIME	RAIN	TIME	RAIN	TIME	RAIN	TIME	RAIN
hrs	mm/hr	hrs	mm/hr	hrs	mm/hr	hrs	mm/hr
.08	21.10	.33	147.32	.58	23.38	.83	1.71
.17	63.19	.42	135.43	.67	9.73	.92	.63
.25	105.28	.50	56.94	.75	4.04	1.00	.06

CALIB STANDHYD (0107)				
ID= 1 DT= 5.0 min	Area (ha)	QPEAK (cms)	TPEAK (hrs)	R.V. (mm)
Total	Imp(%) = 30.50	Dir. Conn.(%) = 20.00		

IMPERVIOUS Pervious (i)
 Surface Area (ha) = 1.00 2.27
 Dep. Storage (mm) = 1.00 3.00
 Average Slope (%) = 2.00 3.00
 Length (m) = 147.60 320.00
 Mannings n = .013 .250
 Max. Eff. Inten. (mm/hr) = 147.32 55.13
 over (min) = 5.00 30.00
 Storage Coeff. (min) = 2.24 (ii) 29.86 (ii)
 Unit Hyd. Tpeak (min) = 5.00 30.00
 Unit Hyd. peak (cms) = .30 .04

PEAK FLOW (cms) = .26 .20 *TOTALS*
 TIME TO PEAK (hrs) = .33 .83 .301 (iii)
 .42

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Post-Dev-Uncon-AES
 TIME TO PEAK (hrs) = .500
 RUNOFF VOLUME (mm) = 15.698
 TOTAL RAINFALL (mm) = 47.400
 RUNOFF COEFFICIENT = .331

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

ADD HYD (0106)				
1 + 2 = 3	AREA (ha)	QPEAK (cms)	TPEAK (hrs)	R.V. (mm)
ID1= 1 (0103):	11.00	.478	.75	16.20
+ ID2= 2 (0102):	1.01	.125	.50	15.70

ID = 3 (0106):	12.01	.529	.42	16.39

NOTE: PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

*** SIMULATION NUMBER: 6 ***

Filename: c:\visual otthymo files\4456\AES 1-hr.mst
 Comments: AES 1 HOUR STORM DISTRIBUTION a=21min k=
 Duration of storm = 1.00 hrs
 Mass curve time step = 5.00 min

TIME	RAIN	TIME	RAIN	TIME	RAIN	TIME	RAIN
hrs	mm/hr	hrs	mm/hr	hrs	mm/hr	hrs	mm/hr
.08	23.33	.33	162.86	.58	25.84	.83	1.89
.17	69.86	.42	149.72	.67	10.75	.92	.69
.25	116.39	.50	62.94	.75	4.46	1.00	.06

CALIB STANDHYD (0107)				
ID= 1 DT= 5.0 min	Area (ha)	QPEAK (cms)	TPEAK (hrs)	R.V. (mm)
Total	Imp(%) = 30.50	Dir. Conn.(%) = 20.00		

IMPERVIOUS Pervious (i)
 Surface Area (ha) = 1.00 2.27
 Dep. Storage (mm) = 1.00 3.00
 Average Slope (%) = 2.00 3.00
 Length (m) = 147.60 320.00
 Mannings n = .013 .250
 Max. Eff. Inten. (mm/hr) = 162.86 74.74
 over (min) = 5.00 30.00
 Storage Coeff. (min) = 2.16 (ii) 26.61 (ii)
 Unit Hyd. Tpeak (min) = 5.00 30.00
 Unit Hyd. peak (cms) = .31 .04

PEAK FLOW (cms) = .29 .25 *TOTALS*
 TIME TO PEAK (hrs) = .33 .83 .342 (iii)
 .42
 RUNOFF VOLUME (mm) = 51.40 28.93 33.42
 TOTAL RAINFALL (mm) = 52.40 52.40 52.40
 RUNOFF COEFFICIENT = .98 .55 .64

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Post-Dev-Uncon-AES

RUNOFF VOLUME (mm) = 46.40 24.86 29.16
 TOTAL RAINFALL (mm) = 47.40 47.40 47.40
 RUNOFF COEFFICIENT = .98 .52 .62

***** WARNING: STORAGE COEFF. IS SMALLER THAN TIME STEP!
 ***** WARNING: FOR AREAS WITH IMPERVIOUS RATIOS BELOW 20%
 YOU SHOULD CONSIDER SPLITTING THE AREA.

(i) CN PROCEDURE SELECTED FOR Pervious LOSSES:
 CN* = 86.0 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.

CALIB NASHYD (0105)				
ID= 1 DT=10.0 min	Area (ha)	QPEAK (cms)	TPEAK (hrs)	R.V. (mm)
	Ia (mm) = 5.00	Curve Number (CN) = 67.0		
	U.H. Tp(hrs) = .40	# of Linear Res.(N) = 3.00		

NOTE: RAINFALL WAS TRANSFORMED TO 10.0 MIN. TIME STEP.

--- TRANSFORMED HYETOGRAPH ---					
TIME	RAIN	TIME	RAIN	TIME	RAIN
hrs	mm/hr	hrs	mm/hr	hrs	mm/hr
.167	42.15	.500	96.18	.833	2.87
.333	126.30	.667	16.55	1.000	.34

Unit Hyd Qpeak (cms) = .734

PEAK FLOW (cms) = .277 (i)
 TIME TO PEAK (hrs) = .667
 RUNOFF VOLUME (mm) = 10.713
 TOTAL RAINFALL (mm) = 47.400
 RUNOFF COEFFICIENT = .226

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

ADD HYD (0103)				
1 + 2 = 3	AREA (ha)	QPEAK (cms)	TPEAK (hrs)	R.V. (mm)
ID1= 1 (0107):	3.27	.301	.42	29.16
+ ID2= 2 (0105):	7.73	.277	.67	10.71

ID = 3 (0103):	11.00	.478	.75	16.20

NOTE: PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

CALIB NASHYD (0102)				
ID= 1 DT=10.0 min	Area (ha)	QPEAK (cms)	TPEAK (hrs)	R.V. (mm)
	Ia (mm) = 4.00	Curve Number (CN) = 82.0		
	U.H. Tp(hrs) = .11	# of Linear Res.(N) = 3.00		

Unit Hyd Qpeak (cms) = .346

PEAK FLOW (cms) = .125 (i)

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Post-Dev-Uncon-AES
 TIME TO PEAK (hrs) = .500
 RUNOFF VOLUME (mm) = 15.698
 TOTAL RAINFALL (mm) = 47.400
 RUNOFF COEFFICIENT = .331

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

ADD HYD (0106)				
1 + 2 = 3	AREA (ha)	QPEAK (cms)	TPEAK (hrs)	R.V. (mm)
ID1= 1 (0103):	11.00	.478	.75	16.20
+ ID2= 2 (0102):	1.01	.125	.50	15.70

ID = 3 (0106):	12.01	.529	.42	16.39

NOTE: PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

*** SIMULATION NUMBER: 6 ***

Filename: c:\visual otthymo files\4456\AES 1-hr.mst
 Comments: AES 1 HOUR STORM DISTRIBUTION a=21min k=
 Duration of storm = 1.00 hrs
 Mass curve time step = 5.00 min

TIME	RAIN	TIME	RAIN	TIME	RAIN	TIME	RAIN
hrs	mm/hr	hrs	mm/hr	hrs	mm/hr	hrs	mm/hr
.08	23.33	.33	162.86	.58	25.84	.83	1.89
.17	69.86	.42	149.72	.67	10.75	.92	.69
.25	116.39	.50	62.94	.75	4.46	1.00	.06

CALIB STANDHYD (0107)				
ID= 1 DT= 5.0 min	Area (ha)	QPEAK (cms)	TPEAK (hrs)	R.V. (mm)
Total	Imp(%) = 30.50	Dir. Conn.(%) = 20.00		

IMPERVIOUS Pervious (i)
 Surface Area (ha) = 1.00 2.27
 Dep. Storage (mm) = 1.00 3.00
 Average Slope (%) = 2.00 3.00
 Length (m) = 147.60 320.00
 Mannings n = .013 .250
 Max. Eff. Inten. (mm/hr) = 162.86 74.74
 over (min) = 5.00 30.00
 Storage Coeff. (min) = 2.16 (ii) 26.61 (ii)
 Unit Hyd. Tpeak (min) = 5.00 30.00
 Unit Hyd. peak (cms) = .31 .04

PEAK FLOW (cms) = .29 .25 *TOTALS*
 TIME TO PEAK (hrs) = .33 .83 .342 (iii)
 .42
 RUNOFF VOLUME (mm) = 51.40 28.93 33.42
 TOTAL RAINFALL (mm) = 52.40 52.40 52.40
 RUNOFF COEFFICIENT = .98 .55 .64

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Post-Dev-Uncon-AES

***** WARNING: STORAGE COEFF. IS SMALLER THAN TIME STEP!
 ***** WARNING: FOR AREAS WITH IMPERVIOUS RATIOS BELOW 20%
 YOU SHOULD CONSIDER SPLITTING THE AREA.

(i) CN PROCEDURE SELECTED FOR Pervious LOSSES:
 CN* = 86.0 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.

CALIB NASHYD (0105)				
ID= 1 DT=10.0 min	Area (ha)	QPEAK (cms)	TPEAK (hrs)	R.V. (mm)
	Ia (mm) = 5.00	Curve Number (CN) = 67.0		
	U.H. Tp(hrs) = .40	# of Linear Res.(N) = 3.00		

NOTE: RAINFALL WAS TRANSFORMED TO 10.0 MIN. TIME STEP.

--- TRANSFORMED HYETOGRAPH ---					
TIME	RAIN	TIME	RAIN	TIME	RAIN
hrs	mm/hr	hrs	mm/hr	hrs	mm/hr
.167	46.59	.500	106.33	.833	3.18
.333	139.63	.667	18.30	1.000	.38

Unit Hyd Qpeak (cms) = .734

PEAK FLOW (cms) = .337 (i)
 TIME TO PEAK (hrs) = .667
 RUNOFF VOLUME (mm) = 13.000
 TOTAL RAINFALL (mm) = 52.400
 RUNOFF COEFFICIENT = .248

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

ADD HYD (0103)				
1 + 2 = 3	AREA (ha)	QPEAK (cms)	TPEAK (hrs)	R.V. (mm)
ID1= 1 (0107):	3.27	.342	.42	33.42
+ ID2= 2 (0105):	7.73	.337	.67	13.00

ID = 3 (0103):	11.00	.586	.75	19.07

NOTE: PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

CALIB NASHYD (0102)				
ID= 1 DT=10.0 min	Area (ha)	QPEAK (cms)	TPEAK (hrs)	R.V. (mm)
	Ia (mm) = 4.00	Curve Number (CN) = 82.0		
	U.H. Tp(hrs) = .11	# of Linear Res.(N) = 3.00		

Unit Hyd Qpeak (cms) = .346

PEAK FLOW (cms) = .146 (i)
 TIME TO PEAK (hrs) = .500
 RUNOFF VOLUME (mm) = 18.586
 TOTAL RAINFALL (mm) = 52.400
 RUNOFF COEFFICIENT = .355

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Post-Dev-Uncon-AES

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

ADD HYD (0106)	AREA	QPEAK	TPEAK	R.V.
1 + 2 = 3	(ha)	(cms)	(hrs)	(mm)
ID1= 1 (0103):	11.00	.586	.75	19.07
+ ID2= 2 (0102):	1.01	.146	.50	18.59
ID = 3 (0106):	12.01	.625	.50	19.31

NOTE: PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

FINISH

Post-Dev-Uncon-SCS

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V V I SSSS U U A L
V V I SS U U A A L
V V I SS U U A A L
V V I SSSS UUUU A A LLLL
000 TTTT TTTT H H Y Y M M 000 TM, Version 2.0
O O T T H H Y Y M M O O Licensed To: M3 Davenport
000 T T H H Y Y M M 000 vo2-0057

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***** DETAILED OUTPUT *****

Input filename: C:\Program Files\Visual OTTHYMO V2.0\voin.dat

Output filename: C:\visual otthymo files\3969\3969-A11

Scenarios\Post-Dev-Uncontrolled.out

Summary filename: C:\visual otthymo files\3969\3969-A11

Scenarios\Post-Dev-Uncontrolled.sum

DATE: 9/4/2018 TIME: 10:49:08 AM

USER:

COMMENTS:

** SIMULATION NUMBER: 1 **

MASS STORM
Ptotal= 38.40 mm

Filename: C:\visual otthymo files\4456\SCS II 6-hr.mst
Comments: SCS 6 HOUR TYPE II STORM DISTRIBUTION

Duration of storm = 6.00 hrs
Mass curve time step = 10.00 min

TIME	RAIN	TIME	RAIN	TIME	RAIN	TIME	RAIN
hrs	mm/hr	hrs	mm/hr	hrs	mm/hr	hrs	mm/hr
.17	1.61	1.67	3.92	3.17	8.52	4.67	2.30
.33	1.38	1.83	3.69	3.33	8.29	4.83	2.30
.50	1.61	2.00	3.92	3.50	8.52	5.00	2.30
.67	2.30	2.17	4.61	3.67	3.92	5.17	1.61
.83	2.30	2.33	4.61	3.83	3.69	5.33	1.38
1.00	2.30	2.50	4.61	4.00	3.92	5.50	1.61
1.17	2.30	2.67	23.04	4.17	3.00	5.67	1.61
1.33	2.30	2.83	41.47	4.33	3.23	5.83	1.38
1.50	2.30	3.00	59.90	4.50	3.00	6.00	1.61

Page 1

Post-Dev-Uncon-SCS

CALIB
STANDHYD (0107)
ID= 1 DT= 5.0 min

Area (ha)= 3.27
Total Imp(%)= 30.50 Dir. Conn.(%)= 20.00

IMPERVIOUS Pervious (i)
Surface Area (ha)= 1.00 2.27
Dep. Storage (mm)= 1.00 3.00
Average Slope (%)= 2.00 3.00
Length (m)= 147.60 320.00
Mannings n = .013 .250

NOTE: RAINFALL WAS TRANSFORMED TO 5.0 MIN. TIME STEP.

TIME	RAIN	TIME	RAIN	TIME	RAIN	TIME	RAIN
hrs	mm/hr	hrs	mm/hr	hrs	mm/hr	hrs	mm/hr
.083	1.61	1.583	3.92	3.083	8.53	4.58	2.30
.167	1.61	1.667	3.92	3.167	8.52	4.67	2.30
.250	1.38	1.750	3.69	3.250	8.29	4.75	2.30
.333	1.38	1.833	3.69	3.333	8.29	4.83	2.30
.417	1.61	1.917	3.92	3.417	8.52	4.92	2.30
.500	1.61	2.000	3.92	3.500	8.52	5.00	2.30
.583	2.30	2.083	4.61	3.583	3.92	5.08	1.61
.667	2.30	2.167	4.61	3.667	3.92	5.17	1.61
.750	2.30	2.250	4.61	3.750	3.69	5.25	1.38
.833	2.30	2.333	4.61	3.833	3.69	5.33	1.38
.917	2.30	2.417	4.61	3.917	3.92	5.42	1.61
1.000	2.30	2.500	4.61	4.000	3.92	5.50	1.61
1.083	2.30	2.583	23.04	4.083	3.00	5.58	1.61
1.167	2.30	2.667	23.04	4.167	3.00	5.67	1.61
1.250	2.30	2.750	41.47	4.250	3.23	5.75	1.38
1.333	2.30	2.833	41.47	4.333	3.23	5.83	1.38
1.417	2.30	2.917	59.90	4.417	3.00	5.92	1.61
1.500	2.30	3.000	59.90	4.500	3.00	6.00	1.61

Max.Eff.Inten.(mm/hr)= 59.90 17.51
over (min)= 5.00 50.00
Storage Coeff. (min)= 3.22 (ii) 46.91 (ii)
Unit Hyd. Tpeak (min)= 5.00 50.00
Unit Hyd. peak (cms)= .27 .02

PEAK FLOW (cms)= .11 .07 *TOTALS*
TIME TO PEAK (hrs)= 3.00 3.75 125 (iii)
RUNOFF VOLUME (mm)= 37.40 17.86 1.00
TOTAL RAINFALL (mm)= 38.40 38.40 21.76
RUNOFF COEFFICIENT = .97 .47 .57

***** WARNING: STORAGE COEFF. IS SMALLER THAN TIME STEP!
***** WARNING: FOR AREAS WITH IMPERVIOUS RATIOS BELOW 20%
YOU SHOULD CONSIDER SPLITTING THE AREA.

(i) CN PROCEDURE SELECTED FOR Pervious LOSSES:
CN* = 85.0 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.

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Post-Dev-Uncon-SCS

CALIB
NASHYD (0105)
ID= 1 DT=10.0 min

Area (ha)= 7.73 Curve Number (CN)= 67.0
Ia (mm)= 5.00 # of Linear Res.(N)= 3.00
U.H. Tp(hrs)= .40

NOTE: RAINFALL WAS TRANSFORMED TO 10.0 MIN. TIME STEP.

TIME	RAIN	TIME	RAIN	TIME	RAIN	TIME	RAIN
hrs	mm/hr	hrs	mm/hr	hrs	mm/hr	hrs	mm/hr
.167	1.61	1.667	3.92	3.167	8.52	4.67	2.30
.333	1.38	1.833	3.69	3.333	8.29	4.83	2.30
.500	1.61	2.000	3.92	3.500	8.52	5.00	2.30
.667	2.30	2.167	4.61	3.667	3.92	5.17	1.61
.833	2.30	2.333	4.61	3.833	3.69	5.33	1.38
1.000	2.30	2.500	4.61	4.000	3.92	5.50	1.61
1.167	2.30	2.667	23.04	4.167	3.00	5.67	1.61
1.333	2.30	2.833	41.47	4.333	3.23	5.83	1.38
1.500	2.30	3.000	59.90	4.500	3.00	6.00	1.61

Unit Hyd Tpeak (cms)= .734

PEAK FLOW (cms)= .107 (i)
TIME TO PEAK (hrs)= 3.333
RUNOFF VOLUME (mm)= 7.025
TOTAL RAINFALL (mm)= 38.400
RUNOFF COEFFICIENT = .183

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

ADD HYD (0103)
1 + 2 = 3

ID= 1 (0107): 3.27 .125 3.00 21.76
+ ID= 2 (0105): 7.73 .107 3.33 7.02
ID = 3 (0103): 11.00 .196 3.00 11.41

NOTE: PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

CALIB
NASHYD (0102)
ID= 1 DT=10.0 min

Area (ha)= 1.01 Curve Number (CN)= 82.0
Ia (mm)= 4.00 # of Linear Res.(N)= 3.00
U.H. Tp(hrs)= .11

Unit Hyd Tpeak (cms)= .346

PEAK FLOW (cms)= .055 (i)
TIME TO PEAK (hrs)= 3.000
RUNOFF VOLUME (mm)= 10.847
TOTAL RAINFALL (mm)= 38.400
RUNOFF COEFFICIENT = .282

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

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Post-Dev-Uncon-SCS

ADD HYD (0106)
1 + 2 = 3

AREA QPEAK TPEAK R.V.
(ha) (cms) (hrs) (mm)
ID= 1 (0103): 11.00 .196 3.00 11.41
+ ID= 2 (0102): 1.01 .055 3.00 10.85
ID = 3 (0106): 12.01 .251 3.00 11.36

NOTE: PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

** SIMULATION NUMBER: 2 **

MASS STORM
Ptotal= 50.50 mm

Filename: C:\visual otthymo files\4456\SCS II 6-hr.mst
Comments: SCS 6 HOUR TYPE II STORM DISTRIBUTION

Duration of storm = 6.00 hrs
Mass curve time step = 10.00 min

TIME	RAIN	TIME	RAIN	TIME	RAIN	TIME	RAIN
hrs	mm/hr	hrs	mm/hr	hrs	mm/hr	hrs	mm/hr
.17	2.12	1.67	5.15	3.17	11.21	4.67	3.03
.33	1.82	1.83	4.85	3.33	10.91	4.83	3.03
.50	2.12	2.00	5.15	3.50	11.21	5.00	3.03
.67	3.03	2.17	6.06	3.67	5.15	5.17	2.12
.83	3.03	2.33	6.06	3.83	4.85	5.33	1.82
1.00	3.03	2.50	6.06	4.00	5.15	5.50	2.12
1.17	3.03	2.67	30.30	4.17	3.94	5.67	2.12
1.33	3.03	2.83	54.54	4.33	4.24	5.83	1.82
1.50	3.03	3.00	78.78	4.50	3.94	6.00	2.12

CALIB
STANDHYD (0107)
ID= 1 DT= 5.0 min

Area (ha)= 3.27
Total Imp(%)= 30.50 Dir. Conn.(%)= 20.00

IMPERVIOUS Pervious (i)
Surface Area (ha)= 1.00 2.27
Dep. Storage (mm)= 1.00 3.00
Average slope (%)= 2.00 3.00
Length (m)= 147.60 320.00
Mannings n = .013 .250

NOTE: RAINFALL WAS TRANSFORMED TO 5.0 MIN. TIME STEP.

TIME	RAIN	TIME	RAIN	TIME	RAIN	TIME	RAIN
hrs	mm/hr	hrs	mm/hr	hrs	mm/hr	hrs	mm/hr
.083	2.12	1.583	5.15	3.083	11.21	4.58	3.03
.167	2.12	1.667	5.15	3.167	11.21	4.67	3.03
.250	1.82	1.750	4.85	3.250	10.91	4.75	3.03
.333	1.82	1.833	4.85	3.333	10.91	4.83	3.03
.417	2.12	1.917	5.15	3.417	11.21	4.92	3.03
.500	2.12	2.000	5.15	3.500	11.21	5.00	3.03
.583	3.03	2.083	6.06	3.583	5.15	5.08	2.12
.667	3.03	2.167	6.06	3.667	5.15	5.17	2.12
.750	3.03	2.250	6.06	3.750	4.85	5.25	1.82

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Post-Dev-Uncon-SCS						
.833	3.03	2.333	6.06	3.833	4.85	5.33
.917	3.03	2.417	6.06	3.917	5.15	5.42
1.000	3.03	2.500	6.06	4.000	5.15	5.50
1.083	3.03	2.583	30.30	4.083	3.94	5.58
1.167	3.03	2.667	30.30	4.167	3.94	5.67
1.250	3.03	2.750	54.54	4.250	4.24	5.75
1.333	3.03	2.833	54.54	4.333	4.24	5.83
1.417	3.03	2.917	78.78	4.417	3.94	5.92
1.500	3.03	3.000	78.78	4.500	3.94	6.00

Max.Eff.Inten.(mm/hr)= 78.78 32.12
over (min)= 5.00 40.00
Storage Coeff. (min)= 2.88 (ii) 37.16 (ii)
Unit Hyd. Tpeak (min)= 5.00 40.00
Unit Hyd. peak (cms)= .28 .03
PEAK FLOW (cms)= .14 .12
TIME TO PEAK (hrs)= 3.00 3.50
RUNOFF VOLUME (mm)= 49.50 27.37
TOTAL RAINFALL (mm)= 50.50 50.50
RUNOFF COEFFICIENT = .98 .54

TOTALS
.185 (iii)
3.00
31.79
50.50
.63

***** WARNING: STORAGE COEFF. IS SMALLER THAN TIME STEP!
***** WARNING: FOR AREAS WITH IMPERVIOUS RATIOS BELOW 20%
YOU SHOULD CONSIDER SPLITTING THE AREA.

(i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
CN* = 86.0 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.

CALIB NASHYD (0105)
ID= 1 DT=10.0 min
Area (ha)= 7.73 Curve Number (CN)= 67.0
Ia (mm)= 5.00 # of Linear Res.(N)= 3.00
U.H. Tp(hrs)= .40

NOTE: RAINFALL WAS TRANSFORMED TO 10.0 MIN. TIME STEP.

TRANSFORMED HYETOGRAPH			
TIME	RAIN	TIME	RAIN
hrs	mm/hr	hrs	mm/hr
.167	2.12	1.667	5.15
.333	1.82	1.833	4.85
.500	2.12	2.000	5.15
.667	3.03	2.167	6.06
.833	3.03	2.333	6.06
1.000	3.03	2.500	6.06
1.167	3.03	2.667	30.30
1.333	3.03	2.833	54.54
1.500	3.03	3.000	78.78
		4.500	3.94
		6.00	2.12

Unit Hyd Qpeak (cms)= .734
PEAK FLOW (cms)= .187 (i)
TIME TO PEAK (hrs)= 3.333
RUNOFF VOLUME (mm)= 12.112
TOTAL RAINFALL (mm)= 50.500
RUNOFF COEFFICIENT = .240

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Post-Dev-Uncon-SCS						
.83	3.52	2.33	7.03	3.83	5.63	5.33
1.00	3.52	2.50	7.03	4.00	5.98	5.50
1.17	3.52	2.67	35.16	4.17	4.57	5.67
1.33	3.52	2.83	63.29	4.33	4.92	5.83
1.50	3.52	3.00	91.42	4.50	4.57	6.00

CALIB STANDHYD (0107)
ID= 1 DT= 5.0 min
Area (ha)= 3.27
Total Imp(%)= 30.50 Dir. Conn.(%)= 20.00

IMPERVIOUS PERVIOUS (i)
Surface Area (ha)= 1.00 2.27
Dep. Storage (mm)= 1.00 3.00
Average Slope (%)= 2.00 3.00
Length (m)= 147.60 320.00
Manning's n = .013 .250

NOTE: RAINFALL WAS TRANSFORMED TO 5.0 MIN. TIME STEP.

TRANSFORMED HYETOGRAPH			
TIME	RAIN	TIME	RAIN
hrs	mm/hr	hrs	mm/hr
.083	2.46	1.583	5.98
.167	2.46	1.667	5.98
.250	2.11	1.750	5.63
.333	2.11	1.833	5.63
.417	2.46	1.917	5.98
.500	2.46	2.000	5.98
.583	3.52	2.083	7.03
.667	3.52	2.167	7.03
.750	3.52	2.250	7.03
.833	3.52	2.333	7.03
.917	3.52	2.417	7.03
1.000	3.52	2.500	7.03
1.083	3.52	2.583	35.16
1.167	3.52	2.667	35.16
1.250	3.52	2.750	63.29
1.333	3.52	2.833	63.29
1.417	3.52	2.917	91.42
1.500	3.52	3.000	91.42

Max.Eff.Inten.(mm/hr)= 91.42 45.06
over (min)= 5.00 35.00
Storage Coeff. (min)= 2.72 (ii) 32.65 (ii)
Unit Hyd. Tpeak (min)= 5.00 35.00
Unit Hyd. peak (cms)= .29 .03

PEAK FLOW (cms)= .16 .16
TIME TO PEAK (hrs)= 3.00 3.42
RUNOFF VOLUME (mm)= 57.60 34.11
TOTAL RAINFALL (mm)= 58.60 58.60
RUNOFF COEFFICIENT = .98 .66

***** WARNING: STORAGE COEFF. IS SMALLER THAN TIME STEP!
***** WARNING: FOR AREAS WITH IMPERVIOUS RATIOS BELOW 20%
YOU SHOULD CONSIDER SPLITTING THE AREA.

(i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
CN* = 86.0 Ia = Dep. Storage (Above)
(ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
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Post-Dev-Uncon-SCS
(i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

ADD HYD (0103)
1 + 2 = 3
ID= 1 (0107): 3.27 .185 3.00 31.79
+ ID= 2 (0105): 7.73 .187 3.33 12.11
ID = 3 (0103): 11.00 .316 3.00 17.96

NOTE: PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

CALIB NASHYD (0102)
ID= 1 DT=10.0 min
Area (ha)= 1.01 Curve Number (CN)= 82.0
Ia (mm)= 4.00 # of Linear Res.(N)= 3.00
U.H. Tp(hrs)= .11

Unit Hyd Qpeak (cms)= .346
PEAK FLOW (cms)= .088 (i)
TIME TO PEAK (hrs)= 3.000
RUNOFF VOLUME (mm)= 17.474
TOTAL RAINFALL (mm)= 50.500
RUNOFF COEFFICIENT = .346

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

ADD HYD (0106)
1 + 2 = 3
ID= 1 (0103): 11.00 .316 3.00 17.96
+ ID= 2 (0102): 1.01 .088 3.00 17.47
ID = 3 (0106): 12.01 .404 3.00 17.92

NOTE: PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

** SIMULATION NUMBER: 3 **

MASS STORM Ptotal= 58.60 mm
Filename: C:\visual otthymo files\4456\SCS II 6-hr.mst
Comments: SCS 6 HOUR TYPE II STORM DISTRIBUTION
Duration of storm = 6.00 hrs
Mass curve time step = 10.00 min

TIME	RAIN	TIME	RAIN	TIME	RAIN	TIME	RAIN
hrs	mm/hr	hrs	mm/hr	hrs	mm/hr	hrs	mm/hr
.17	2.46	1.67	5.98	3.17	13.01	4.67	3.52
.33	2.11	1.83	5.63	3.33	12.66	4.83	3.52
.50	2.46	2.00	5.98	3.50	13.01	5.00	3.52
.67	3.52	2.17	7.03	3.67	5.98	5.17	2.46

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Post-Dev-Uncon-SCS
THAN THE STORAGE COEFFICIENT.
(iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

CALIB NASHYD (0105)
ID= 1 DT=10.0 min
Area (ha)= 7.73 Curve Number (CN)= 67.0
Ia (mm)= 5.00 # of Linear Res.(N)= 3.00
U.H. Tp(hrs)= .40

NOTE: RAINFALL WAS TRANSFORMED TO 10.0 MIN. TIME STEP.

TRANSFORMED HYETOGRAPH			
TIME	RAIN	TIME	RAIN
hrs	mm/hr	hrs	mm/hr
.167	2.46	1.667	5.98
.333	2.11	1.833	5.63
.500	2.46	2.000	5.98
.667	3.52	2.167	7.03
.833	3.52	2.333	7.03
1.000	3.52	2.500	7.03
1.167	3.52	2.667	35.16
1.333	3.52	2.833	63.29
1.500	3.52	3.000	91.42

Unit Hyd Qpeak (cms)= .734
PEAK FLOW (cms)= .250 (i)
TIME TO PEAK (hrs)= 3.333
RUNOFF VOLUME (mm)= 16.047
TOTAL RAINFALL (mm)= 58.600
RUNOFF COEFFICIENT = .274

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

ADD HYD (0103)
1 + 2 = 3
ID= 1 (0107): 3.27 .236 3.00 38.80
+ ID= 2 (0105): 7.73 .250 3.33 16.05
ID = 3 (0103): 11.00 .427 3.33 22.81

NOTE: PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

CALIB NASHYD (0102)
ID= 1 DT=10.0 min
Area (ha)= 1.01 Curve Number (CN)= 82.0
Ia (mm)= 4.00 # of Linear Res.(N)= 3.00
U.H. Tp(hrs)= .11

Unit Hyd Qpeak (cms)= .346
PEAK FLOW (cms)= .112 (i)
TIME TO PEAK (hrs)= 3.000
RUNOFF VOLUME (mm)= 22.324
TOTAL RAINFALL (mm)= 58.600
RUNOFF COEFFICIENT = .381

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Post-Dev-Uncon-SCS

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

ADD HYD (0106)					
1 + 2 = 3					
ID#	AREA (ha)	QPEAK (cms)	TPEAK (hrs)	R.V. (mm)	
ID1= 1 (0103):	11.00	.427	3.33	22.81	
+ ID2= 2 (0102):	1.01	.112	3.00	22.32	
ID = 3 (0106):	12.01	.525	3.00	22.77	

NOTE: PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

** SIMULATION NUMBER: 4 **

Filename: C:\visual otthymo files\4456\SCS II 6-hr.mst
Comments: SCS 6 HOUR TYPE II STORM DISTRIBUTION

Duration of storm = 6.00 hrs
Mass curve time step = 10.00 min

TIME	RAIN	TIME	RAIN	TIME	RAIN	TIME	RAIN
hrs	mm/hr	hrs	mm/hr	hrs	mm/hr	hrs	mm/hr
.17	2.89	1.67	7.01	3.17	15.25	4.67	4.12
.33	2.47	1.83	6.60	3.33	14.84	4.83	4.12
.50	2.89	2.00	7.01	3.50	15.25	5.00	4.12
.67	4.12	2.17	8.24	3.67	7.01	5.17	2.89
.83	4.12	2.33	8.24	3.83	6.60	5.33	2.47
1.00	4.12	2.50	8.24	4.00	7.01	5.50	2.89
1.17	4.12	2.67	41.22	4.17	5.36	5.67	2.89
1.33	4.12	2.83	74.20	4.33	5.77	5.83	2.47
1.50	4.12	3.00	107.17	4.50	5.36	6.00	2.89

CALIB STANDHYD (0107)			
ID= 1 DT= 5.0 min			
Area (ha)=	3.27	Dir. Conn.(%)=	20.00
Total Imp(%)=	30.50		

IMPERVIOUS		PERVIOUS (i)	
Surface Area (ha)=	1.00	2.27	
Dep. Storage (mm)=	1.00	3.00	
Average Slope (%)=	2.00	3.00	
Length (m)=	147.60	320.00	
Mannings n	.013	.250	

NOTE: RAINFALL WAS TRANSFORMED TO 5.0 MIN. TIME STEP.

TIME	RAIN	TIME	RAIN	TIME	RAIN	TIME	RAIN
hrs	mm/hr	hrs	mm/hr	hrs	mm/hr	hrs	mm/hr
.083	2.89	1.583	7.01	3.083	15.25	4.58	4.12
.167	2.89	1.667	7.01	3.167	15.25	4.67	4.12
.250	2.47	1.750	6.60	3.250	14.84	4.75	4.12
.333	2.47	1.833	6.60	3.333	14.84	4.83	4.12

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Post-Dev-Uncon-SCS
TIME TO PEAK (hrs)= 3.33
RUNOFF VOLUME (mm)= 21.451
TOTAL RAINFALL (mm)= 68.700
RUNOFF COEFFICIENT = .312

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

ADD HYD (0103)					
1 + 2 = 3					
ID#	AREA (ha)	QPEAK (cms)	TPEAK (hrs)	R.V. (mm)	
ID1= 1 (0107):	3.27	.309	3.00	47.79	
+ ID2= 2 (0105):	7.73	.336	3.33	21.45	
ID = 3 (0103):	11.00	.583	3.33	29.28	

NOTE: PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

CALIB NASHYD (0102)			
ID= 1 DT=10.0 min			
Area (ha)=	1.01	Curve Number (CN)=	82.0
Imp (mm)=	4.00	# of Linear Res.(N)=	3.00
U.H. Tp(hrs)=	.11		

Unit Hyd Qpeak (cms)= .346

PEAK FLOW (cms)= .144 (i)

TIME TO PEAK (hrs)= 3.000

RUNOFF VOLUME (mm)= 28.718

TOTAL RAINFALL (mm)= 68.700

RUNOFF COEFFICIENT = .418

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

ADD HYD (0106)					
1 + 2 = 3					
ID#	AREA (ha)	QPEAK (cms)	TPEAK (hrs)	R.V. (mm)	
ID1= 1 (0103):	11.00	.583	3.33	29.28	
+ ID2= 2 (0102):	1.01	.144	3.00	28.72	
ID = 3 (0106):	12.01	.695	3.00	29.23	

NOTE: PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

** SIMULATION NUMBER: 5 **

Filename: C:\visual otthymo files\4456\SCS II 6-hr.mst
Comments: SCS 6 HOUR TYPE II STORM DISTRIBUTION

Duration of storm = 6.00 hrs
Mass curve time step = 10.00 min

TIME	RAIN	TIME	RAIN	TIME	RAIN

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Post-Dev-Uncon-SCS

.417	2.89	1.917	7.01	3.417	15.25	4.92	4.12
.500	2.89	2.000	7.01	3.500	15.25	5.00	4.12
.583	4.12	2.083	8.24	3.583	7.01	5.08	2.89
.667	4.12	2.167	8.24	3.667	7.01	5.17	2.89
.750	4.12	2.250	8.24	3.750	6.60	5.25	2.47
.833	4.12	2.333	8.24	3.833	6.60	5.33	2.47
.917	4.12	2.417	8.24	3.917	7.01	5.42	2.89
1.000	4.12	2.500	8.24	4.000	7.01	5.50	2.89
1.083	4.12	2.583	41.22	4.083	5.36	5.58	2.89
1.167	4.12	2.667	41.22	4.167	5.36	5.67	2.89
1.250	4.12	2.750	74.20	4.250	5.77	5.75	2.47
1.333	4.12	2.833	74.20	4.333	5.77	5.83	2.47
1.417	4.12	2.917	107.17	4.417	5.36	5.92	2.89
1.500	4.12	3.000	107.17	4.500	5.36	6.00	2.89

Max.Eff.Inten.(mm/hr)= 107.17
over (min)= 5.00
Storage Coeff. (min)= 2.55 (ii)
Unit Hyd. Tpeak (min)= 5.00
Unit Hyd. peak (cms)= .29

PEAK FLOW (cms)= .19
TIME TO PEAK (hrs)= 3.00
RUNOFF VOLUME (mm)= 67.70
TOTAL RAINFALL (mm)= 68.70
RUNOFF COEFFICIENT = .99

TOTALS (iii)

**** WARNING: STORAGE COEFF. IS SMALLER THAN TIME STEP!
**** WARNING: FOR AREAS WITH IMPERVIOUS RATIOS BELOW 20% YOU SHOULD CONSIDER SPLITTING THE AREA.

(i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:

CN* = 86.0 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.

CALIB NASHYD (0105)			
ID= 1 DT=10.0 min			
Area (ha)=	7.73	Curve Number (CN)=	67.0
Imp (mm)=	5.00	# of Linear Res.(N)=	3.00
U.H. Tp(hrs)=	.40		

NOTE: RAINFALL WAS TRANSFORMED TO 10.0 MIN. TIME STEP.

TIME	RAIN	TIME	RAIN	TIME	RAIN	TIME	RAIN
hrs	mm/hr	hrs	mm/hr	hrs	mm/hr	hrs	mm/hr
.167	2.89	1.667	7.01	3.167	15.25	4.67	4.12
.333	2.47	1.833	6.60	3.333	14.84	4.83	4.12
.500	2.89	2.000	7.01	3.500	15.25	5.00	4.12
.667	4.12	2.167	8.24	3.667	7.01	5.17	2.89
.833	4.12	2.333	8.24	3.833	6.60	5.33	2.47
1.000	4.12	2.500	8.24	4.000	7.01	5.50	2.89
1.167	4.12	2.667	41.22	4.167	5.36	5.67	2.89
1.333	4.12	2.833	74.20	4.333	5.77	5.83	2.47
1.500	4.12	3.000	107.17	4.500	5.36	6.00	2.89

Unit Hyd Qpeak (cms)= .734

PEAK FLOW (cms)= .336 (i)

Page 10

hrs	mm/hr	hrs	mm/hr	hrs	mm/hr	hrs	mm/hr
.17	3.20	1.67	7.78	3.17	16.94	4.67	4.58
.33	2.75	1.83	7.32	3.33	16.48	4.83	4.58
.50	4.58	2.00	7.78	3.50	16.94	5.00	4.58
.67	4.58	2.17	9.16	3.67	7.78	5.17	3.20
.83	4.58	2.33	9.16	3.83	7.32	5.33	2.75
1.00	4.58	2.50	9.16	4.00	7.78	5.50	3.20
1.17	4.58	2.67	45.78	4.17	5.95	5.67	3.20
1.33	4.58	2.83	82.40	4.33	6.41	5.83	2.75
1.50	4.58	3.00	119.03	4.50	5.95	6.00	3.20

CALIB STANDHYD (0107)			
ID= 1 DT= 5.0 min			
Area (ha)=	3.27	Dir. Conn.(%)=	20.00
Total Imp(%)=	30.50		

IMPERVIOUS		PERVIOUS (i)	
Surface Area (ha)=	1.00	2.27	
Dep. Storage (mm)=	1.00	3.00	
Average Slope (%)=	2.00	3.00	
Length (m)=	147.60	320.00	
Mannings n	.013	.250	

NOTE: RAINFALL WAS TRANSFORMED TO 5.0 MIN. TIME STEP.

TIME	RAIN	TIME	RAIN	TIME	RAIN	TIME	RAIN
hrs	mm/hr	hrs	mm/hr	hrs	mm/hr	hrs	mm/hr
.083	3.20	1.583	7.78	3.083	16.94	4.58	4.58
.167	3.20	1.667	7.78	3.167	16.94	4.67	4.58
.250	2.75	1.750	7.32	3.250	16.48	4.75	4.58
.333	2.75	1.833	7.32	3.333	16.48	4.83	4.58
.417	3.20	1.917	7.78	3.417	16.94	4.92	4.58
.500	3.20	2.000	7.78	3.500	16.94	5.00	4.58
.583	4.58	2.083	9.16	3.583	7.78	5.08	3.20
.667	4.58	2.167	9.16	3.667	7.78	5.17	3.20
.750	4.58	2.250	9.16	3.750	7.32	5.25	2.75
.833	4.58	2.333	9.16	3.833	7.32	5.33	2.75
.917	4.58	2.417	9.16	3.917	7.78	5.42	3.20
1.000	4.58	2.500	9.16	4.000	7.78	5.50	3.20
1.083	4.58	2.583	45.78	4.083	5.95	5.58	3.20
1.167	4.58	2.667	45.78	4.167	5.95	5.67	3.20
1.250	4.58	2.750	82.40	4.250	6.41	5.75	2.75
1.333	4.58	2.833	82.40	4.333	6.41	5.83	2.75
1.417	4.58	2.917	119.03	4.417	5.95	5.92	3.20
1.500	4.58	3.000	119.03	4.500	5.95	6.00	3.20

Max.Eff.Inten.(mm/hr)= 119.03
over (min)= 5.00
Storage Coeff. (min)= 2.44 (ii)
Unit Hyd. Tpeak (min)= 5.00
Unit Hyd. peak (cms)= .30

PEAK FLOW (cms)= .22
TIME TO PEAK (hrs)= 3.00
RUNOFF VOLUME (mm)= 75.30
TOTAL RAINFALL (mm)= 76.30
RUNOFF COEFFICIENT = .99

TOTALS (iii)

**** WARNING: STORAGE COEFF. IS SMALLER THAN TIME STEP!
**** WARNING: FOR AREAS WITH IMPERVIOUS RATIOS BELOW 20% YOU SHOULD CONSIDER SPLITTING THE AREA.

Page 12

Post-Dev-Uncon-SCS
YOU SHOULD CONSIDER SPLITTING THE AREA.

- (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
CN* = 86.0 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.

CALIB
NASHYD (0105) Area (ha)= 7.73 Curve Number (CN)= 67.0
ID= 1 DT=10.0 min Ia (mm)= 5.00 # of Linear Res.(N)= 3.00
U.H. Tp(hrs)= .40

NOTE: RAINFALL WAS TRANSFORMED TO 10.0 MIN. TIME STEP.

--- TRANSFORMED HYETOGRAPH ---			
TIME	RAIN	TIME	RAIN
hrs	mm/hr	hrs	mm/hr
.167	3.20	1.667	7.78
.333	2.75	1.833	7.32
.500	3.20	2.000	7.78
.667	4.58	2.167	9.16
.833	4.58	2.333	9.16
1.000	4.58	2.500	9.16
1.167	4.58	2.667	45.78
1.333	4.58	2.833	82.40
1.500	4.58	3.000	119.03
		4.500	5.95
		5.000	3.20

Unit Hyd Qpeak (cms)= .734

PEAK FLOW (cms)= .407 (i)
TIME TO PEAK (hrs)= 3.167
RUNOFF VOLUME (mm)= 25.835
TOTAL RAINFALL (mm)= 76.300
RUNOFF COEFFICIENT = .339

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

ADD HYD (0103)
1 + 2 = 3
ID1= 1 (0107): 3.27 .359 3.00 54.69
+ ID2= 2 (0105): 7.73 .407 3.17 25.84
ID = 3 (0103): 11.00 .704 3.33 34.41

NOTE: PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

CALIB
NASHYD (0102) Area (ha)= 1.01 Curve Number (CN)= 82.0
ID= 1 DT=10.0 min Ia (mm)= 4.00 # of Linear Res.(N)= 3.00
U.H. Tp(hrs)= .11

Unit Hyd Qpeak (cms)= .346

Page 13

Post-Dev-Uncon-SCS
PEAK FLOW (cms)= .168 (i)
TIME TO PEAK (hrs)= 3.000
RUNOFF VOLUME (mm)= 33.734
TOTAL RAINFALL (mm)= 76.300
RUNOFF COEFFICIENT = .442

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

ADD HYD (0106)
1 + 2 = 3
ID1= 1 (0103): 11.00 .704 3.33 34.41
+ ID2= 2 (0102): 1.01 .168 3.00 33.73
ID = 3 (0106): 12.01 .873 3.00 34.35

NOTE: PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

** SIMULATION NUMBER: 6 **

MASS STORM
Ptotal= 83.80 mm
Filename: c:\visual otthymo files\4456\SCS II 6-hr.mst
Comments: SCS 6 HOUR TYPE II STORM DISTRIBUTION

Duration of storm = 6.00 hrs
Mass curve time step = 10.00 min

TIME	RAIN	TIME	RAIN	TIME	RAIN	TIME	RAIN
hrs	mm/hr	hrs	mm/hr	hrs	mm/hr	hrs	mm/hr
.17	3.52	1.67	8.55	3.17	18.60	4.67	5.03
.33	3.02	1.83	8.04	3.33	18.10	4.83	5.03
.50	3.52	2.00	8.55	3.50	18.60	5.00	5.03
.67	5.03	2.17	10.06	3.67	8.55	5.17	3.52
.83	5.03	2.33	10.06	3.83	8.04	5.33	3.02
1.00	5.03	2.50	10.06	4.00	8.55	5.50	3.52
1.17	5.03	2.67	50.28	4.17	6.54	5.67	3.52
1.33	5.03	2.83	90.50	4.33	7.04	5.83	3.02
1.50	5.03	3.00	130.73	4.50	6.54	6.00	3.52

CALIB
STANDHYD (0107) Area (ha)= 3.27
ID= 1 DT= 5.0 min Total Imp(%)= 30.50 Dir. Conn.(%)= 20.00

Surface Area (ha)= 1.00 IMPERVIOUS (i)
Dep. Storage (mm)= 1.00 PERVIOUS (i)
Average Slope (%)= 2.00
Length (m)= 147.60
Mannings n = .013 .250

NOTE: RAINFALL WAS TRANSFORMED TO 5.0 MIN. TIME STEP.

--- TRANSFORMED HYETOGRAPH ---
TIME RAIN | TIME RAIN | TIME RAIN | TIME RAIN
Page 14

Post-Dev-Uncon-SCS

hrs	mm/hr	hrs	mm/hr	hrs	mm/hr	hrs	mm/hr
.083	3.52	1.583	8.55	3.083	18.60	4.58	5.03
.167	3.52	1.667	8.55	3.167	18.60	4.67	5.03
.250	3.02	1.750	8.04	3.250	18.10	4.75	5.03
.333	3.02	1.833	8.04	3.333	18.10	4.83	5.03
.417	3.52	1.917	8.55	3.417	18.60	4.92	5.03
.500	3.52	2.000	8.55	3.500	18.60	5.00	5.03
.583	5.03	2.083	10.06	3.583	8.55	5.08	3.52
.667	5.03	2.167	10.06	3.667	8.55	5.17	3.52
.750	5.03	2.250	10.06	3.750	8.04	5.25	3.02
.833	5.03	2.333	10.06	3.833	8.04	5.33	3.02
.917	5.03	2.417	10.06	3.917	8.55	5.42	3.52
1.000	5.03	2.500	10.06	4.000	8.55	5.50	3.52
1.083	5.03	2.583	50.28	4.083	6.54	5.58	3.52
1.167	5.03	2.667	50.28	4.167	6.54	5.67	3.52
1.250	5.03	2.750	90.50	4.250	7.04	5.75	3.02
1.333	5.03	2.833	90.50	4.333	7.04	5.83	3.02
1.417	5.03	2.917	130.73	4.417	6.54	5.92	3.52
1.500	5.03	3.000	130.73	4.500	6.54	6.00	3.52

Max. Eff. Inten. (mm/hr)= 130.73
over (min)= 5.00
Storage Coeff. (min)= 2.35 (i)
Unit Hyd. Tpeak (min)= 5.00
Unit Hyd. peak (cms)= .30
PEAK FLOW (cms)= .24
TIME TO PEAK (hrs)= 3.00
RUNOFF VOLUME (mm)= 82.80
TOTAL RAINFALL (mm)= 83.80
RUNOFF COEFFICIENT = .99

TOTALS
(iii)
31
407
3.00
56.29
83.80
83.80
-73

***** WARNING: STORAGE COEFF. IS SMALLER THAN TIME STEP!
***** WARNING: FOR AREAS WITH IMPERVIOUS RATIOS BELOW 20%
YOU SHOULD CONSIDER SPLITTING THE AREA.

- (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
CN* = 86.0 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.

CALIB
NASHYD (0105) Area (ha)= 7.73 Curve Number (CN)= 67.0
ID= 1 DT=10.0 min Ia (mm)= 5.00 # of Linear Res.(N)= 3.00
U.H. Tp(hrs)= .40

NOTE: RAINFALL WAS TRANSFORMED TO 10.0 MIN. TIME STEP.

--- TRANSFORMED HYETOGRAPH ---			
TIME	RAIN	TIME	RAIN
hrs	mm/hr	hrs	mm/hr
.167	3.52	1.667	8.55
.333	3.02	1.833	8.04
.500	3.52	2.000	8.55
.667	5.03	2.167	10.06
.833	5.03	2.333	10.06
1.000	5.03	2.500	10.06
1.167	5.03	2.667	50.28
1.333	5.03	2.833	90.50
		4.333	7.04
		5.833	3.02

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ADD HYD (0103)
1 + 2 = 3
ID1= 1 (0107): 3.27 .407 3.00 61.59
+ ID2= 2 (0105): 7.73 .462 3.17 30.40
ID = 3 (0103): 11.00 .874 3.33 39.67

NOTE: PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

CALIB
NASHYD (0102) Area (ha)= 1.01 Curve Number (CN)= 82.0
ID= 1 DT=10.0 min Ia (mm)= 4.00 # of Linear Res.(N)= 3.00
U.H. Tp(hrs)= .11

Unit Hyd Qpeak (cms)= .346

PEAK FLOW (cms)= .193 (i)
TIME TO PEAK (hrs)= 3.000
RUNOFF VOLUME (mm)= 38.822
TOTAL RAINFALL (mm)= 83.800
RUNOFF COEFFICIENT = .463

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

ADD HYD (0106)
1 + 2 = 3
ID1= 1 (0103): 11.00 .824 3.33 39.67
+ ID2= 2 (0102): 1.01 .193 3.00 38.82
ID = 3 (0106): 12.01 .952 3.00 39.59

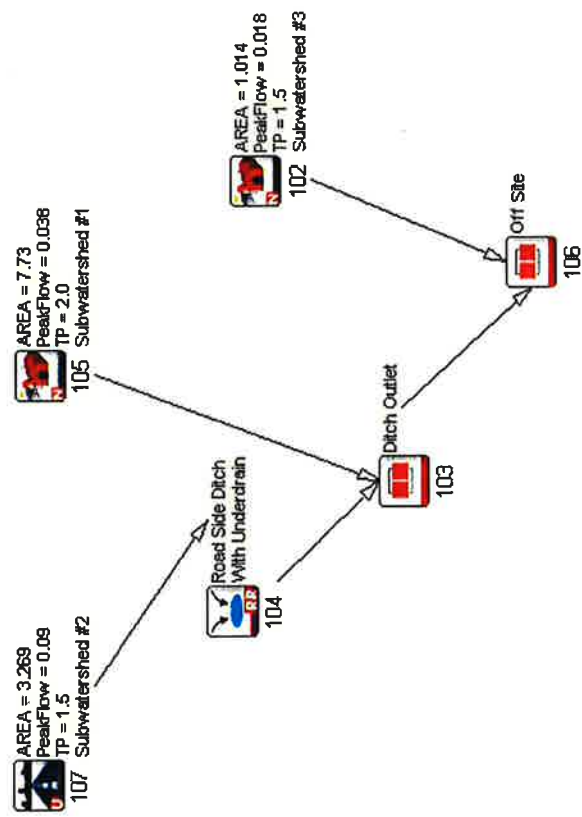
NOTE: PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

FINISH

Page 16

APPENDIX IV

VISUAL OTTHYMO OUTPUT
POST DEVELOPMENT CONTROLLED



Post-Dev-Con-25mm

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V V I SSSSS U U A L
V V I SS U U A A L
V V I SS U U A A L
V V I SS U U A A L
W I SSSSS UUUUU A A LLLLL
000 TTTT TTTT H H Y Y M M 000 TM, Version 2.0
0 0 T T H H Y Y M M 0 0 Licensed To: MJ Davenport
000 T T H H Y Y M M 000 vo2-0057

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***** DETAILED OUTPUT *****

Input filename: C:\Program Files\Visual OTTHYMO v2.0\voind.dat

Output filename: C:\visual otthymo files\3969\3969-A11
Scenarios\Post-Dev-Controlled.out
Summary filename: C:\visual otthymo files\3969\3969-A11
Scenarios\Post-Dev-Controlled.sum

DATE: 9/4/2018

TIME: 11:02:10 AM

USER:

COMMENTS:

** SIMULATION NUMBER: 9 **

CHICAGO STORM IDF curve parameters: A= 486.300
Ptotal= 25.00 mm B= 7.500
C= .790
used in: INTENSITY = A / (C + B)AC

Duration of storm = 4.00 hrs
Storm time step = 10.00 min
Time to peak ratio = .38

TIME	RAIN	TIME	RAIN	TIME	RAIN	TIME	RAIN
hrs	mm/hr	hrs	mm/hr	hrs	mm/hr	hrs	mm/hr
.17	1.66	1.17	6.41	2.17	4.73	3.17	2.05
.33	1.87	1.33	14.61	2.33	3.84	3.33	1.89
.50	2.16	1.50	50.69	2.50	3.25	3.50	1.75
.67	2.55	1.67	17.59	2.67	2.82	3.67	1.63
.83	3.16	1.83	9.15	2.83	2.50	3.83	1.53
1.00	4.20	2.00	6.21	3.00	2.25	4.00	1.44

Page 1

Post-Dev-Con-25mm

CALIB
NASHYD (0102)
ID= 1 DT=10.0 min
Area (ha)= 1.01
Ia (mm)= 4.00
U.H. Tp(hrs)= .11
Curve Number (CN)= 82.0
of Linear Res.(N)= 3.00

Unit Hyd Qpeak (cms)= .346

PEAK FLOW (cms)= .018 (i)
TIME TO PEAK (hrs)= 1.500
RUNOFF VOLUME (mm)= 4.746
TOTAL RAINFALL (mm)= 24.995
RUNOFF COEFFICIENT = .190

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

CALIB
NASHYD (0105)
ID= 1 DT=10.0 min
Area (ha)= 7.73
Ia (mm)= 5.00
U.H. Tp(hrs)= .40
Curve Number (CN)= 67.0
of Linear Res.(N)= 3.00

Unit Hyd Qpeak (cms)= .734

PEAK FLOW (cms)= .038 (i)
TIME TO PEAK (hrs)= 2.000
RUNOFF VOLUME (mm)= 2.750
TOTAL RAINFALL (mm)= 24.995
RUNOFF COEFFICIENT = .110

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

CALIB
STANDHYD (0107)
ID= 1 DT= 5.0 min
Area (ha)= 3.27
Total Imp(%)= 30.50
Dir. Conn.(%)= 20.00

Surface Area (ha)= 1.00
Dep. Storage (mm)= 1.00
Average Slope (%)= 2.00
Length (m)= 147.60
Mannings n = .013
IMPERVIOUS 2.27
PERVIOUS (i) 3.00
3.00
320.00
.250

NOTE: RAINFALL WAS TRANSFORMED TO 5.0 MIN. TIME STEP.

--- TRANSFORMED ---				HYETOGRAPH ---			
TIME	RAIN	TIME	RAIN	TIME	RAIN	TIME	RAIN
hrs	mm/hr	hrs	mm/hr	hrs	mm/hr	hrs	mm/hr
.083	1.66	1.083	6.41	2.083	4.73	3.08	2.05
.167	1.66	1.167	6.41	2.167	4.73	3.17	2.05
.250	1.87	1.250	14.61	2.250	3.84	3.25	1.89
.333	1.87	1.333	14.61	2.333	3.84	3.33	1.89
.417	2.16	1.417	50.69	2.417	3.25	3.42	1.75
.500	2.16	1.500	50.69	2.500	3.25	3.50	1.75
.583	2.55	1.583	17.59	2.583	2.82	3.58	1.63
.667	2.55	1.667	17.59	2.667	2.82	3.67	1.63

Page 2

Post-Dev-Con-25mm

TIME	RAIN	TIME	RAIN	TIME	RAIN	TIME	RAIN
hrs	mm/hr	hrs	mm/hr	hrs	mm/hr	hrs	mm/hr
.750	3.16	1.750	9.15	2.750	3.75	3.75	1.53
.833	3.16	1.833	9.15	2.833	2.50	3.83	1.53
.917	4.20	1.917	6.21	2.917	2.25	3.92	1.44
1.000	4.20	2.000	6.21	3.000	2.25	4.00	1.44

Max. Eff. Inten. (mm/hr)= 50.69
over (min)= 5.00
Storage Coeff. (min)= 3.44 (ii)
Unit Hyd. Tpeak (min)= 5.00
Unit Hyd. peak (cms)= .26

TOTALS

PEAK FLOW (cms)= .09
TIME TO PEAK (hrs)= 1.50
RUNOFF VOLUME (mm)= 24.00
TOTAL RAINFALL (mm)= 25.00
RUNOFF COEFFICIENT = .96

.02
70.00
66.05 (iii)
70.00
8.60
25.00
.34
.090 (iii)
1.50
11.66
25.00
.47

***** WARNING: STORAGE COEFF. IS SMALLER THAN TIME STEP!
***** WARNING: FOR AREAS WITH IMPERVIOUS RATIOS BELOW 20%
YOU SHOULD CONSIDER SPLITTING THE AREA.

(i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
CN* = 86.0 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.

RESERVOIR (0104)
IN= 2---> OUT= 1
DT= 5.0 min

OUTFLOW	STORAGE	OUTFLOW	STORAGE
(cms)	(ha.m.)	(cms)	(ha.m.)
.0000	.0000	.0007	.0110
.0001	.0069	.0008	.0130
.0002	.0070	.0009	.0155
.0003	.0072	.0020	.0188
.0004	.0076	.0186	.0227
.0005	.0083	.0368	.0274
.0006	.0095	.0617	.0328

INFLOW	AREA	QPEAK	TPEAK	R.V.
ID= 2 (0107)	(ha)	(cms)	(hrs)	(mm)
3.27	.09	1.50	11.66	
OUTFLOW: ID= 1 (0104)	3.27	.03	2.83	9.49

PEAK FLOW REDUCTION [qout/qin] (%) = 30.89
TIME SHIFT OF PEAK FLOW (min) = 80.00
MAXIMUM STORAGE USED (ha.m.) = .0168

ADD HYD (0103)
1 + 2 = 3

ID= 1 (0105):	AREA	QPEAK	TPEAK	R.V.
+ ID= 2 (0104):	(ha)	(cms)	(hrs)	(mm)
7.73	.038	2.00	2.75	
3.27	.028	2.83	9.49	
ID = 3 (0103):	11.00	.049	2.67	4.75

NOTE: PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

Post-Dev-Con-25mm

ADD HYD (0106)
1 + 2 = 3
ID= 1 (0102):
+ ID= 2 (0103):
ID = 3 (0106):
AREA (ha)= 1.01
QPEAK (cms)= .018
TPEAK (hrs)= 1.50
R.V. (mm)= 4.75
11.00
.049
2.67
12.01
.052
2.58
4.75

NOTE: PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

FINISH

Post-Dev-Con-6hr-Chicago

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V V I SSSS U U A A L
V V I SS U U A A A L
V V I SS U U A A L
V V I SSSS UUUU A A LLLL
000 TTTT TTTT H H Y Y M M 000 TM, Version 2.0
O O T T H H Y Y M M O O Licensed To: M J Davenport
O O T T H H Y Y M M 000 vo2-0057

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***** DETAILED OUTPUT *****

Input filename: C:\Program Files\Visual OTTHYMO v2.0\voind.dat

Output filename: C:\visual otthymo files\3969\3969-A11
Scenarios\Post-dev-Controlled.out
Summary filename: C:\visual otthymo files\3969\3969-A11
Scenarios\Post-dev-Controlled.sum

DATE: 9/4/2018 TIME: 11:01:11 AM

USER:

COMMENTS:

** SIMULATION NUMBER: 1 **

CHICAGO STORM
Ptotal= 37.36 mm
IDF curve parameters: A= 662,000
B= 7,500
C= .790
used in: INTENSITY = A / (C + B)^C

Duration of storm = 6.00 hrs
Storm time step = 10.00 min
Time to peak ratio = .38

TIME	RAIN	TIME	RAIN	TIME	RAIN	TIME	RAIN
hrs	mm/hr	hrs	mm/hr	hrs	mm/hr	hrs	mm/hr
.17	1.48	1.67	4.30	3.17	5.23	4.67	2.08
.33	1.59	1.83	5.71	3.33	4.42	4.83	1.96
.50	1.71	2.00	8.73	3.50	3.84	5.00	1.86
.67	1.86	2.17	19.90	3.67	3.41	5.17	1.76
.83	2.04	2.33	69.00	3.83	3.07	5.33	1.68
.917	2.26	2.417	23.94	3.917	.79	5.42	1.61
1.000	2.26	2.500	23.94	4.000	2.79	5.50	1.61
1.083	2.55	2.583	12.46	4.083	2.57	5.58	1.54
1.167	2.55	2.667	12.46	4.167	2.57	5.67	1.54
1.250	2.94	2.750	8.46	4.250	2.38	5.75	1.48
1.333	2.94	2.833	8.46	4.333	2.38	5.83	1.48
1.417	3.48	2.917	6.44	4.417	2.22	5.92	1.42
1.500	3.48	3.000	6.44	4.500	2.22	6.00	1.42

Page 1

Max. Eff. Inten. (mm/hr) = 69.00
over (min) = 5.00
Storage Coeff. (min) = 3.04 (ii)
Unit Hyd. Tpeak (min) = 5.00
Unit Hyd. peak (cms) = .27
PEAK FLOW (cms) = .12
TIME TO PEAK (hrs) = 2.33
RUNOFF VOLUME (mm) = 36.36
TOTAL RAINFALL (mm) = 37.36
RUNOFF COEFFICIENT = .97

TOTALS

.129 (iii)

***** WARNING: STORAGE COEFF. IS SMALLER THAN TIME STEP!
***** WARNING: FOR AREAS WITH IMPERVIOUS RATIOS BELOW 20%
YOU SHOULD CONSIDER SPLITTING THE AREA.

(i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
CN = 86.0 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.

RESERVOIR (0104)	IN= 2--> OUT= 1	DT= 5.0 min	OUTFLOW (cms)	STORAGE (ha.m.)	OUTFLOW (cms)	STORAGE (ha.m.)	AREA (ha)	QPEAK (cms)	TPEAK (hrs)	R.V. (mm)
.0000	.0000	.0007	.0110							
.0001	.0069	.0008	.0130							
.0002	.0070	.0009	.0135							
.0003	.0072	.0020	.0188							
.0004	.0076	.0027	.0227							
.0005	.0083	.0048	.0274							
.0006	.0095	.0067	.0328							
INFLOW: ID= 2 (0107)	3.27	.13	2.33							
OUTFLOW: ID= 1 (0104)	3.27	.06	3.25							
PEAK FLOW REDUCTION [qout/qin] (%) = 48.33										
TIME SHIFT OF PEAK FLOW (min) = 55.00										
MAXIMUM STORAGE USED (ha.m.) = .0184										

ADD HYD (0103)

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1.17	2.55	2.67	12.46	4.17	2.57	5.67	1.54
1.33	2.94	2.83	8.46	4.33	2.38	5.83	1.48
1.50	3.48	3.00	6.44	4.50	2.22	6.00	1.42

CALIB
NASHYD (0102)
ID= 1 DT=10.0 min
Area (ha)= 1.01
Ia (mm)= 4.00
U.H. Tp(hrs)= .11
Curve Number (CN)= 82.0
of Linear Res.(N)= 3.00

Unit Hyd Qpeak (cms)= .346
PEAK FLOW (cms)= .041 (i)
TIME TO PEAK (hrs)= 2.333
RUNOFF VOLUME (mm)= 10.321
TOTAL RAINFALL (mm)= 37.363
RUNOFF COEFFICIENT = .276

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

CALIB
NASHYD (0105)
ID= 1 DT=10.0 min
Area (ha)= 7.73
Ia (mm)= 5.00
U.H. Tp(hrs)= .40
Curve Number (CN)= 67.0
of Linear Res.(N)= 3.00

Unit Hyd Qpeak (cms)= .734
PEAK FLOW (cms)= .087 (i)
TIME TO PEAK (hrs)= 2.833
RUNOFF VOLUME (mm)= 6.639
TOTAL RAINFALL (mm)= 37.363
RUNOFF COEFFICIENT = .178

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

CALIB
STANDHYD (0107)
ID= 1 DT= 5.0 min
Area (ha)= 3.27
Total Imp(%)= 30.50
Dir. Conn.(%)= 20.00

IMPERVIOUS	PERVIOUS (i)
Surface Area (ha)= 1.00	2.27
Dep. Storage (mm)= 1.00	3.00
Average Slope (%)= 2.00	3.00
Length (m)= 147.60	320.00
Mannings n = .013	.250

NOTE: RAINFALL WAS TRANSFORMED TO 5.0 MIN. TIME STEP.

TIME	RAIN	TIME	RAIN	TIME	RAIN	TIME	RAIN
hrs	mm/hr	hrs	mm/hr	hrs	mm/hr	hrs	mm/hr
.083	1.48	1.583	4.30	3.083	5.23	4.58	2.08
.167	1.48	1.667	4.30	3.167	5.23	4.67	2.08
.250	1.59	1.750	5.71	3.250	4.42	4.75	1.96
.333	1.59	1.833	5.71	3.333	4.42	4.83	1.96
.417	1.71	1.917	8.73	3.417	3.84	4.92	1.86

Page 2

1	2	3	AREA (ha)	QPEAK (cms)	TPEAK (hrs)	R.V. (mm)
ID1= 1 (0105):	7.73	.087	2.83	6.64		
+ ID2= 2 (0104):	3.27	.062	3.25	18.77		
ID = 3 (0103):	11.00	.136	2.83	10.25		

NOTE: PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

ADD HYD (0106)	1	2	3	AREA (ha)	QPEAK (cms)	TPEAK (hrs)	R.V. (mm)
ID1= 1 (0102):	1.01	.041	2.33	10.32			
+ ID2= 2 (0103):	11.00	.136	2.83	10.25			
ID = 3 (0106):	12.01	.147	2.83	10.25			

NOTE: PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

** SIMULATION NUMBER: 2 **

CHICAGO STORM
Ptotal= 48.64 mm
IDF curve parameters: A=1098,000
B= 10,100
C= .830
used in: INTENSITY = A / (C + B)^C
Duration of storm = 6.00 hrs
Storm time step = 10.00 min
Time to peak ratio = .38

TIME	RAIN	TIME	RAIN	TIME	RAIN	TIME	RAIN
hrs	mm/hr	hrs	mm/hr	hrs	mm/hr	hrs	mm/hr
.17	1.65	1.67	5.38	3.17	6.69	4.67	2.40
.33	1.78	1.83	7.38	3.33	5.55	4.83	2.25
.50	1.93	2.00	11.78	3.50	4.74	5.00	2.12
.67	2.12	2.17	28.11	3.67	4.15	5.17	2.00
.83	2.35	2.33	90.98	3.83	3.69	5.33	1.90
1.00	2.63	2.50	33.98	4.00	3.33	5.50	1.80
1.17	3.01	2.67	17.30	4.17	3.03	5.67	1.72
1.33	3.51	2.83	11.37	4.33	2.79	5.83	1.64
1.50	4.24	3.00	8.43	4.50	2.58	6.00	1.58

CALIB
NASHYD (0102)
ID= 1 DT=10.0 min
Area (ha)= 1.01
Ia (mm)= 4.00
U.H. Tp(hrs)= .11
Curve Number (CN)= 82.0
of Linear Res.(N)= 3.00

Unit Hyd Qpeak (cms)= .346
PEAK FLOW (cms)= .070 (i)
TIME TO PEAK (hrs)= 2.333
RUNOFF VOLUME (mm)= 16.405
TOTAL RAINFALL (mm)= 48.645

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RUNOFF COEFFICIENT = Post-Dev-Con-6hr-Chicago
.337

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

CALIB NASHVD ID= 1 DT=10.0 min	Area (ha)= 7.73 Ia (mm)= 5.00 U.H. Tp(hrs)= .40	Curve Number (CN)= 67.0 # of Linear Res.(N)= 3.00
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Unit Hyd Qpeak (cms)= .734

PEAK FLOW (cms)= .159 (i)
TIME TO PEAK (hrs)= 2.833
RUNOFF VOLUME (mm)= 11.267
TOTAL RAINFALL (mm)= 48.645
RUNOFF COEFFICIENT = .232

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

CALIB STANDHYD (0107) ID= 1 DT= 5.0 min	Area (ha)= 3.27 Total Imp(%)= 30.50 Dir. Conn.(%)= 20.00
---	--

Surface Area (ha)= 1.00
Dep. Storage (mm)= 1.00
Average Slope (%)= 2.00
Length (m)= 147.60
Mannings n = .013

NOTE: RAINFALL WAS TRANSFORMED TO 5.0 MIN. TIME STEP.

TIME RAIN		TRANSFORMED		HYETOGRAPH		TIME RAIN	
hrs	mm/hr	hrs	mm/hr	hrs	mm/hr	hrs	mm/hr
.083	1.65	1.583	5.38	3.083	6.69	4.58	2.40
.167	1.65	1.667	5.38	3.167	6.69	4.67	2.40
.250	1.78	1.750	7.38	3.250	5.55	4.75	2.25
.333	1.78	1.833	7.38	3.333	5.55	4.83	2.25
.417	1.93	1.917	11.78	3.417	4.74	4.92	2.12
.500	1.93	2.000	11.78	3.500	4.74	5.00	2.12
.583	2.12	2.083	28.11	3.583	4.15	5.08	2.00
.667	2.12	2.167	28.11	3.667	4.15	5.17	2.00
.750	2.35	2.250	90.98	3.750	3.69	5.25	1.90
.833	2.35	2.333	90.98	3.833	3.69	5.33	1.90
.917	2.63	2.417	33.98	3.917	3.33	5.42	1.80
1.000	2.63	2.500	33.98	4.000	3.33	5.50	1.80
1.083	3.01	2.583	17.30	4.083	3.03	5.58	1.72
1.167	3.01	2.667	17.30	4.167	3.03	5.67	1.72
1.250	3.51	2.750	11.37	4.250	2.79	5.75	1.64
1.333	3.51	2.833	11.37	4.333	2.79	5.83	1.64
1.417	4.24	2.917	8.43	4.417	2.58	5.92	1.58
1.500	4.24	3.000	8.43	4.500	2.58	6.00	1.58

Max. Eff. Inten. (mm/hr)= 90.98
over (min)= 5.00
Storage Coeff. (min)= 2.72 (ii)
Unit Hyd. Tpeak (min)= 5.00

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Unit Hyd. peak (cms)=	Post-Dev-Con-6hr-Chicago .29	.03	*TOTALS*
PEAK FLOW (cms)=	.16	.10	.182 (iii)
TIME TO PEAK (hrs)=	2.33	2.92	2.33
RUNOFF VOLUME (mm)=	47.64	25.86	30.21
TOTAL RAINFALL (mm)=	48.64	48.64	48.64
RUNOFF COEFFICIENT =	.98	.53	.62

***** WARNING: STORAGE COEFF. IS SMALLER THAN TIME STEP!
***** WARNING: FOR AREAS WITH IMPERVIOUS RATIOS BELOW 20%
YOU SHOULD CONSIDER SPLITTING THE AREA.

(i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
CN* = 86.0 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.

RESERVOIR (0104) IN= 2--> OUT= 1 DT= 5.0 min	OUTFLOW (cms) .0000 .0001 .0002 .0003 .0004 .0005 .0006	STORAGE (ha.m.) .0000 .0069 .0070 .0072 .0076 .0083 .0095	OUTFLOW (cms) .0007 .0008 .0009 .0002 .0006 .0068 .0067	STORAGE (ha.m.) .0110 .0130 .0155 .0188 .0227 .0274 .0328
INFLOW : ID= 2 (0107)	AREA (ha)	QPEAK (cms)	TPEAK (hrs)	R.V. (mm)
OUTFLOW: ID= 1 (0104)	3.27	.18	2.33	30.21
	3.27	.12	3.00	28.04

PEAK FLOW REDUCTION [out/qin](%) = 64.49
TIME SHIFT OF PEAK FLOW (min) = 40.00
MAXIMUM STORAGE USED (ha.m.) = .0204

ADD HYD 1 + 2 = 3	AREA (ha)	QPEAK (cms)	TPEAK (hrs)	R.V. (mm)
ID1= 1 (0105):	7.73	.159	2.83	11.27
+ ID2= 2 (0104):	3.27	.117	3.00	28.04
ID = 3 (0103):	11.00	.267	2.83	16.25

NOTE: PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

ADD HYD 1 + 2 = 3	AREA (ha)	QPEAK (cms)	TPEAK (hrs)	R.V. (mm)
ID1= 1 (0102):	1.01	.070	2.33	16.41
+ ID2= 2 (0103):	11.00	.267	2.83	16.25

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ID = 3 (0106): Post-Dev-Con-6hr-Chicago
12.01 .285 2.83 16.27

NOTE: PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

** SIMULATION NUMBER: 3 **

CHICAGO STORM
Ptotal= 57.49 mm

IDF curve parameters: A=1560.000
B= 13.000
C= .860
used in: INTENSITY = A / (t + B)^C
Duration of storm = 6.00 hrs
Storm time step = 10.00 min
Time to peak ratio = .38

TIME RAIN		TIME RAIN		TIME RAIN		TIME RAIN	
hrs	mm/hr	hrs	mm/hr	hrs	mm/hr	hrs	mm/hr
.17	1.73	1.67	6.29	3.17	7.97	4.67	2.60
.33	1.88	1.83	8.07	3.33	6.51	4.83	2.42
.50	2.06	2.00	14.61	3.50	5.48	5.00	2.27
.67	2.27	2.17	35.36	3.67	4.74	5.17	2.13
.83	2.54	2.33	105.21	3.83	4.17	5.33	2.01
1.00	2.88	2.50	42.69	4.00	3.72	5.50	1.90
1.17	3.33	2.67	21.79	4.17	3.36	5.67	1.81
1.33	3.95	2.83	14.08	4.33	3.06	5.83	1.72
1.50	4.85	3.00	10.23	4.50	2.81	6.00	1.64

CALIB NASHVD ID= 1 DT=10.0 min	Area (ha)= 1.01 Ia (mm)= 4.00 U.H. Tp(hrs)= .11	Curve Number (CN)= 82.0 # of Linear Res.(N)= 3.00
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Unit Hyd Qpeak (cms)= .346

PEAK FLOW (cms)= .093 (i)
TIME TO PEAK (hrs)= 2.333
RUNOFF VOLUME (mm)= 21.643
TOTAL RAINFALL (mm)= 57.490
RUNOFF COEFFICIENT = .376

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

CALIB NASHVD ID= 1 DT=10.0 min	Area (ha)= 7.73 Ia (mm)= 5.00 U.H. Tp(hrs)= .40	Curve Number (CN)= 67.0 # of Linear Res.(N)= 3.00
--------------------------------------	---	--

Unit Hyd Qpeak (cms)= .734

PEAK FLOW (cms)= .227 (i)
TIME TO PEAK (hrs)= 2.833
RUNOFF VOLUME (mm)= 15.485
TOTAL RAINFALL (mm)= 57.490
RUNOFF COEFFICIENT = .269

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Post-Dev-Con-6hr-Chicago

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

CALIB STANDHYD (0107) ID= 1 DT= 5.0 min	Area (ha)= 3.27 Total Imp(%)= 30.50 Dir. Conn.(%)= 20.00
---	--

Surface Area (ha)= 1.00
Dep. Storage (mm)= 1.00
Average Slope (%)= 2.00
Length (m)= 147.60
Mannings n = .013

NOTE: RAINFALL WAS TRANSFORMED TO 5.0 MIN. TIME STEP.

TIME RAIN		TRANSFORMED		HYETOGRAPH		TIME RAIN	
hrs	mm/hr	hrs	mm/hr	hrs	mm/hr	hrs	mm/hr
.083	1.73	1.583	6.29	3.083	7.97	4.58	2.60
.167	1.73	1.667	6.29	3.167	7.97	4.67	2.60
.250	1.88	1.750	8.07	3.250	6.51	4.75	2.42
.333	1.88	1.833	8.07	3.333	6.51	4.83	2.42
.417	2.06	1.917	14.61	3.417	5.48	4.92	2.27
.500	2.06	2.000	14.61	3.500	5.48	5.00	2.27
.583	2.27	2.083	35.36	3.583	4.74	5.08	2.13
.667	2.27	2.167	35.36	3.667	4.74	5.17	2.13
.750	2.54	2.250	105.21	3.750	4.17	5.25	2.01
.833	2.54	2.333	105.21	3.833	4.17	5.33	2.01
.917	2.88	2.417	42.69	3.917	3.72	5.42	1.90
1.000	2.88	2.500	42.69	4.000	3.72	5.50	1.90
1.083	3.33	2.583	21.79	4.083	3.36	5.58	1.81
1.167	3.33	2.667	21.79	4.167	3.36	5.67	1.81
1.250	3.95	2.750	14.08	4.250	3.06	5.75	1.72
1.333	3.95	2.833	14.08	4.333	3.06	5.83	1.72
1.417	4.85	2.917	10.23	4.417	2.81	5.92	1.64
1.500	4.85	3.000	10.23	4.500	2.81	6.00	1.64

Max. Eff. Inten. (mm/hr)= 105.21
over (min)= 5.00
Storage Coeff. (min)= 2.57 (ii)
Unit Hyd. Tpeak (min)= 5.00
Unit Hyd. peak (cms)= .29

PEAK FLOW (cms)= .19
TIME TO PEAK (hrs)= 2.33
RUNOFF VOLUME (mm)= 56.49
TOTAL RAINFALL (mm)= 57.49
RUNOFF COEFFICIENT = .98

***** WARNING: STORAGE COEFF. IS SMALLER THAN TIME STEP!
***** WARNING: FOR AREAS WITH IMPERVIOUS RATIOS BELOW 20%
YOU SHOULD CONSIDER SPLITTING THE AREA.

(i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
CN* = 86.0 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.

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Post-Dev-Con-6hr-Chicago

Post-Dev-Con-6hr-Chicago

RESERVOIR (0104)
IN= 2--> OUT= 1
DT= 5.0 min

OUTFLOW (cms)	STORAGE (ha.m.)	OUTFLOW (cms)	STORAGE (ha.m.)
.0000	.0000	.0007	.0110
.0001	.0069	.0008	.0130
.0002	.0070	.0009	.0155
.0003	.0072	.0070	.0188
.0004	.0076	.1986	.0227
.0005	.0083	.3648	.0274
.0006	.0095	.5617	.0328

INFLOW : ID= 2 (0107)
OUTFLOW: ID= 1 (0104)

PEAK FLOW REDUCTION [Qout/Qin](%)= 76.02
TIME SHIFT OF PEAK FLOW (min)= 35.00
MAXIMUM STORAGE USED (ha.m.)= .0220

ADD HYD (0103)
1 + 2 = 3

ID1= 1 (0105): 7.73 2.27 2.83 15.49
+ ID2= 2 (0104): 3.27 .169 2.92 35.66
ID = 3 (0103): 11.00 .393 2.83 21.48

NOTE: PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

ADD HYD (0106)
1 + 2 = 3

ID1= 1 (0102): 1.01 .093 2.33 21.64
+ ID2= 2 (0103): 11.00 .393 2.83 21.48
ID = 3 (0106): 12.01 .418 2.83 21.50

NOTE: PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

** SIMULATION NUMBER: 4 **

CHICAGO STORM
Ptotal= 65.65 mm

IDF curve parameters: A=2010.000
B= 14.000
C= .880
used in: INTENSITY = $A / (t + B)^C$
Duration of storm = 6.00 hrs
Storm time step = 10.00 min
Time to peak ratio = .38
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TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr
.17	1.78	1.67	6.98	3.17	8.95	4.67	2.75
.33	1.95	1.83	10.01	3.33	7.23	4.83	2.55
.50	2.14	2.00	16.85	3.50	6.04	5.00	2.37
.67	2.38	2.17	41.62	3.67	5.17	5.17	2.22
.83	2.67	2.33	122.63	3.83	4.52	5.33	2.09
1.00	3.05	2.50	50.34	4.00	4.00	5.50	1.97
1.17	3.56	2.67	25.45	4.17	3.60	5.67	1.87
1.33	4.27	2.83	16.21	4.33	3.26	5.83	1.77
1.50	5.31	3.00	11.63	4.50	2.98	6.00	1.69

CALIB
NASHYD (0102)
ID= 1 DT=10.0 min

Area (ha)= 1.01
Ia (mm)= 4.00
U.H. Tp(hrs)= .11
Curve Number (CN)= 82.0
of Linear Res.(N)= 3.00

Unit Hyd Qpeak (cms)= .346

PEAK FLOW (cms)= .119 (i)
TIME TO PEAK (hrs)= 2.333
RUNOFF VOLUME (mm)= 26.750
TOTAL RAINFALL (mm)= 65.646
RUNOFF COEFFICIENT = .407

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

CALIB
NASHYD (0105)
ID= 1 DT=10.0 min

Area (ha)= 7.73
Ia (mm)= 5.00
U.H. Tp(hrs)= .40
Curve Number (CN)= 67.0
of Linear Res.(N)= 3.00

Unit Hyd Qpeak (cms)= .734

PEAK FLOW (cms)= .301 (i)
TIME TO PEAK (hrs)= 2.567
RUNOFF VOLUME (mm)= 19.764
TOTAL RAINFALL (mm)= 65.646
RUNOFF COEFFICIENT = .301

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

CALIB
STANOHYD (0107)
ID= 1 DT= 5.0 min

Area (ha)= 3.27
Total Imp(%)= 30.50
Dir. Conn.(%)= 20.00

Surface Area (ha)= 1.00
Dep. Storage (mm)= 1.00
Average Slope (%)= 2.00
Length (m)= 147.60
Mannings n = .013
IMPERVIOUS PERVIOUS (i)
2.27 2.27
3.01 2.67 19.76
1.00 3.00
147.60 320.00
.013 .250

NOTE: RAINFALL WAS TRANSFORMED TO 5.0 MIN. TIME STEP.

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Post-Dev-Con-6hr-Chicago

Post-Dev-Con-6hr-Chicago

TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr
.083	1.78	1.583	6.98	3.083	8.95	4.58	2.75
.167	1.78	1.667	6.98	3.167	8.95	4.67	2.75
.250	1.95	1.750	10.01	3.250	7.23	4.75	2.55
.333	1.95	1.833	10.01	3.333	7.23	4.83	2.55
.417	2.14	1.917	16.85	3.417	6.04	4.92	2.37
.500	2.14	2.000	16.85	3.500	6.04	5.00	2.37
.583	2.38	2.083	41.62	3.583	5.17	5.08	2.22
.667	2.38	2.167	41.62	3.667	5.17	5.17	2.22
.750	2.67	2.250	122.63	3.750	4.52	5.25	2.09
.833	2.67	2.333	122.63	3.833	4.52	5.33	2.09
.917	3.05	2.417	50.34	3.917	4.00	5.42	1.97
1.000	3.05	2.500	50.34	4.000	4.00	5.50	1.97
1.083	3.56	2.583	25.45	4.083	3.60	5.58	1.87
1.167	3.56	2.667	25.45	4.167	3.60	5.67	1.87
1.250	4.27	2.750	16.21	4.250	3.26	5.75	1.77
1.333	4.27	2.833	16.21	4.333	3.26	5.83	1.77
1.417	5.31	2.917	11.63	4.417	2.98	5.92	1.69
1.500	5.31	3.000	11.63	4.500	2.98	6.00	1.69

Max.Eff.Inten.(mm/hr)= 122.63
over (min)= 5.00
Storage Coeff. (min)= 2.42 (i)
Unit Hyd. Tpeak (min)= 5.00
Unit Hyd. peak (cms)= .30

TOTALS

PEAK FLOW (cms)= .22
TIME TO PEAK (hrs)= 2.33
RUNOFF VOLUME (mm)= 64.65
TOTAL RAINFALL (mm)= 65.65
RUNOFF COEFFICIENT = .98

***** WARNING: STORAGE COEFF. IS SMALLER THAN TIME STEP!
***** WARNING:FOR AREAS WITH IMPERVIOUS RATIOS BELOW 20%
YOU SHOULD CONSIDER SPLITTING THE AREA.

- (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
CN* = 86.0 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.

RESERVOIR (0104)
IN= 2--> OUT= 1
DT= 5.0 min

OUTFLOW (cms)	STORAGE (ha.m.)	OUTFLOW (cms)	STORAGE (ha.m.)
.0000	.0000	.0007	.0110
.0001	.0069	.0008	.0130
.0002	.0070	.0009	.0155
.0003	.0072	.0070	.0188
.0004	.0076	.1986	.0227
.0005	.0083	.3648	.0274
.0006	.0095	.5617	.0328

INFLOW : ID= 2 (0107)
OUTFLOW: ID= 1 (0104)

Page 11

PEAK FLOW REDUCTION [Qout/Qin](%)= 82.72
TIME SHIFT OF PEAK FLOW (min)= 35.00
MAXIMUM STORAGE USED (ha.m.)= .0238

ADD HYD (0103)
1 + 2 = 3

ID1= 1 (0105): 7.73 2.27 2.83 15.49
+ ID2= 2 (0104): 3.27 .169 2.92 35.66
ID = 3 (0103): 11.00 .393 2.83 21.48

NOTE: PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

ADD HYD (0106)
1 + 2 = 3

ID1= 1 (0102): 1.01 .093 2.33 21.64
+ ID2= 2 (0103): 11.00 .393 2.83 21.48
ID = 3 (0106): 12.01 .418 2.83 21.50

NOTE: PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

** SIMULATION NUMBER: 5 **

CHICAGO STORM
Ptotal= 76.13 mm

IDF curve parameters: A=2200.000
B= 14.600
C= .870
used in: INTENSITY = $A / (t + B)^C$
Duration of storm = 6.00 hrs
Storm time step = 10.00 min
Time to peak ratio = .38

TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr
.17	2.22	1.67	8.42	3.17	10.74	4.67	3.38
.33	2.41	1.83	11.98	3.33	8.72	4.83	3.14
.50	2.65	2.00	19.90	3.50	7.31	5.00	2.93
.67	2.93	2.17	47.86	3.67	6.28	5.17	2.75
.83	3.29	2.33	135.62	3.83	5.50	5.33	2.59
1.00	3.75	2.50	57.60	4.00	4.89	5.50	2.44
1.17	4.36	2.67	29.73	4.17	4.40	5.67	2.32
1.33	5.21	2.83	19.18	4.33	4.00	5.83	2.20
1.50	6.45	3.00	13.86	4.50	3.67	6.00	2.10

CALIB
NASHYD (0102)

Area (ha)= 1.01
Curve Number (CN)= 82.0
Page 12

ID= 1 DT=10.0 min | I_a (mm)= 4.00 # of Linear Res.(N)= 3.00
U.H. Tp(hrs)= .11

Unit Hyd Qpeak (cms)= .346
PEAK FLOW (cms)= .146 (i)
TIME TO PEAK (hrs)= 2.333
RUNOFF VOLUME (mm)= 33.620
TOTAL RAINFALL (mm)= 76.131
RUNOFF COEFFICIENT = .442

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

CALIB NASHYD (0105) | Area (ha)= 7.73 Curve Number (CN)= 67.0
ID= 1 DT=10.0 min | I_a (mm)= 5.00 # of Linear Res.(N)= 3.00
U.H. Tp(hrs)= .40

Unit Hyd Qpeak (cms)= .734
PEAK FLOW (cms)= .386 (i)
TIME TO PEAK (hrs)= 2.667
RUNOFF VOLUME (mm)= 25.735
TOTAL RAINFALL (mm)= 76.131
RUNOFF COEFFICIENT = .338

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

CALIB STANDHYD (0107) | Area (ha)= 3.27
ID= 1 DT= 5.0 min | Total Imp(%)= 30.50 Dir. Conn.(%)= 20.00

IMPERVIOUS PERVIOUS (i)
Surface Area (ha)= 1.00 2.27
Dep. Storage (mm)= 1.00 3.00
Average Slope (%)= 2.00 3.00
Length (m)= 147.60 320.00
Mannings n = .013 .250

NOTE: RAINFALL WAS TRANSFORMED TO 5.0 MIN. TIME STEP.

--- TRANSFORMED HYETOGRAPH ---							
TIME	RAIN	TIME	RAIN	TIME	RAIN	TIME	RAIN
hrs	mm/hr	hrs	mm/hr	hrs	mm/hr	hrs	mm/hr
.083	2.22	1.583	8.42	3.083	10.74	4.58	3.38
.167	2.22	1.667	8.42	3.167	10.74	4.67	3.38
.250	2.41	1.750	11.98	3.250	8.72	4.75	3.14
.333	2.41	1.833	11.98	3.333	8.72	4.83	3.14
.417	2.65	1.917	19.90	3.417	7.31	4.92	2.93
.500	2.65	2.000	19.90	3.500	7.31	5.00	2.93
.583	2.93	2.083	47.86	3.583	6.28	5.08	2.75
.667	2.93	2.167	47.86	3.667	6.28	5.17	2.75
.750	3.29	2.250	135.62	3.750	5.50	5.25	2.59
.833	3.29	2.333	135.62	3.833	5.50	5.33	2.59
.917	3.75	2.417	57.60	3.917	4.89	5.42	2.44
1.000	3.75	2.500	57.60	4.000	4.89	5.50	2.44
1.083	4.36	2.583	29.73	4.083	4.40	5.58	2.32
1.167	4.36	2.667	29.73	4.167	4.40	5.67	2.32

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Post-Dev-Con-6hr-Chicago

ADD HYD (0106)
1 + 2 = 3

AREA (ha)= 11.01 QPEAK (cms)= 2.33 R.V. (mm)= 33.62
+ ID2= 2 (0103): 11.00 .669 2.83 33.65
ID = 3 (0106): 12.01 .716 2.75 33.65

NOTE: PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

** SIMULATION NUMBER: 6 **

CHICAGO STORM
Ptotal= 81.72 mm

IDF curve parameters: A=2507.000
B= 14.800
C= .880
used in: INTENSITY = A / (C + B)AC
Duration of storm = 6.00 hrs
Storm time step = 10.00 min
Time to peak ratio = .38

TIME	RAIN	TIME	RAIN	TIME	RAIN	TIME	RAIN
hrs	mm/hr	hrs	mm/hr	hrs	mm/hr	hrs	mm/hr
.17	2.25	1.67	8.85	3.17	11.36	4.67	3.47
.33	2.45	1.83	12.70	3.33	9.17	4.83	3.22
.50	2.70	2.00	21.34	3.50	7.66	5.00	3.00
.67	3.00	2.17	52.05	3.67	6.56	5.17	2.81
.83	3.38	2.33	148.61	3.83	5.72	5.33	2.64
1.00	3.86	2.50	62.77	4.00	5.07	5.50	2.49
1.17	4.51	2.67	32.11	4.17	4.55	5.67	2.36
1.33	5.41	2.83	20.54	4.33	4.12	5.83	2.24
1.50	6.73	3.00	14.75	4.50	3.77	6.00	2.13

CALIB NASHYD (0102)
ID= 1 DT=10.0 min

Area (ha)= 1.01 Curve Number (CN)= 82.0
I_a (mm)= 4.00 # of Linear Res.(N)= 3.00
U.H. Tp(hrs)= .11

Unit Hyd Qpeak (cms)= .346
PEAK FLOW (cms)= .167 (i)
TIME TO PEAK (hrs)= 2.333
RUNOFF VOLUME (mm)= 37.401
TOTAL RAINFALL (mm)= 81.724
RUNOFF COEFFICIENT = .458

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

CALIB NASHYD (0105) | Area (ha)= 7.73 Curve Number (CN)= 67.0
ID= 1 DT=10.0 min | I_a (mm)= 5.00 # of Linear Res.(N)= 3.00
Page 15

Post-Dev-Con-6hr-Chicago
1.250 5.21 2.750 19.18 4.250 4.00 5.75 2.20
1.333 5.21 2.833 19.18 4.333 4.00 5.83 2.20
1.417 6.45 2.917 13.86 4.417 3.67 5.92 2.10
1.500 6.45 3.000 13.86 4.500 3.67 6.00 2.10

Max.Eff.Inten.(mm/hr)= 135.62 62.82
over (min)= 5.00 30.00
Storage Coeff. (min)= 2.32 (ii) 28.53 (ii)
Unit Hyd. Tpeak (min)= 5.00 30.00
Unit Hyd. peak (cms)= .30 .04

PEAK FLOW (cms)= .24 .25 *TOTALS*
TIME TO PEAK (hrs)= 2.33 2.75 .319 (iii)
RUNOFF VOLUME (mm)= 75.13 49.39 2.33
TOTAL RAINFALL (mm)= 76.13 76.13 54.53
RUNOFF COEFFICIENT = .99 .65 76.13

***** WARNING: STORAGE COEFF. IS SMALLER THAN TIME STEP!
***** WARNING: FOR AREAS WITH IMPERVIOUS RATIOS BELOW 20% YOU SHOULD CONSIDER SPLITTING THE AREA.

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

RESERVOIR (0104)
IN= 2 OUT= 1
DT= 5.0 min

OUTFLOW (cms)	STORAGE (ha.m.)	OUTFLOW (cms)	STORAGE (ha.m.)
.0000	.0000	.0007	.0110
.0001	.0069	.0008	.0130
.0002	.0070	.0009	.0155
.0003	.0072	.0010	.0188
.0004	.0076	.0011	.0227
.0005	.0083	.0012	.0274
.0006	.0095	.0013	.0328

AREA (ha) QPEAK (cms) TPEAK (hrs) R.V. (mm)
INFLOW : ID= 2 (0107) 3.27 .32 2.33 54.53
OUTFLOW : ID= 1 (0104) 3.27 .29 2.83 52.36

PEAK FLOW REDUCTION [out/qin] (%) = 89.31
TIME SHIFT OF PEAK FLOW (min) = 30.00
MAXIMUM STORAGE USED (ha.m.) = .0258

ADD HYD (0103)
1 + 2 = 3

AREA (ha) QPEAK (cms) TPEAK (hrs) R.V. (mm)
ID1= 1 (0105): 7.73 .386 2.67 25.73
+ ID2= 2 (0104): 3.27 .285 2.83 52.36
ID = 3 (0103): 11.00 .669 2.83 33.65

NOTE: PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

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Post-Dev-Con-6hr-Chicago

Post-Dev-Con-6hr-Chicago
U.H. Tp(hrs)= .40

Unit Hyd Qpeak (cms)= .734
PEAK FLOW (cms)= .447 (i)
TIME TO PEAK (hrs)= 2.667
RUNOFF VOLUME (mm)= 29.112
TOTAL RAINFALL (mm)= 81.724
RUNOFF COEFFICIENT = .356

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

CALIB STANDHYD (0107)
ID= 1 DT= 5.0 min

Area (ha)= 3.27
Total Imp(%)= 30.50 Dir. Conn.(%)= 20.00

IMPERVIOUS PERVIOUS (i)
Surface Area (ha)= 1.00 2.27
Dep. Storage (mm)= 1.00 3.00
Average Slope (%)= 2.00 3.00
Length (m)= 147.60 320.00
Mannings n = .013 .250

NOTE: RAINFALL WAS TRANSFORMED TO 5.0 MIN. TIME STEP.

--- TRANSFORMED HYETOGRAPH ---							
TIME	RAIN	TIME	RAIN	TIME	RAIN	TIME	RAIN
hrs	mm/hr	hrs	mm/hr	hrs	mm/hr	hrs	mm/hr
.083	2.25	1.583	8.85	3.083	11.36	4.58	3.47
.167	2.25	1.667	8.85	3.167	11.36	4.67	3.47
.250	2.45	1.750	12.70	3.250	9.17	4.75	3.22
.333	2.45	1.833	12.70	3.333	9.17	4.83	3.22
.417	2.70	1.917	21.34	3.417	7.66	4.92	3.00
.500	2.70	2.000	21.34	3.500	7.66	5.00	3.00
.583	3.00	2.083	52.05	3.583	6.56	5.08	2.81
.667	3.00	2.167	52.05	3.667	6.56	5.17	2.81
.750	3.38	2.250	148.61	3.750	5.72	5.25	2.64
.833	3.38	2.333	148.61	3.833	5.72	5.33	2.64
.917	3.86	2.417	62.77	3.917	5.07	5.42	2.49
1.000	3.86	2.500	62.77	4.000	5.07	5.50	2.49
1.083	4.51	2.583	32.11	4.083	4.55	5.58	2.36
1.167	4.51	2.667	32.11	4.167	4.55	5.67	2.36
1.250	5.41	2.750	20.54	4.250	4.12	5.75	2.24
1.333	5.41	2.833	20.54	4.333	4.12	5.83	2.24
1.417	6.73	2.917	14.75	4.417	3.77	5.92	2.13
1.500	6.73	3.000	14.75	4.500	3.77	6.00	2.13

Max.Eff.Inten.(mm/hr)= 148.61 78.31
over (min)= 5.00 30.00
Storage Coeff. (min)= 2.24 (ii) 26.23 (ii)
Unit Hyd. Tpeak (min)= 5.00 30.00
Unit Hyd. peak (cms)= .30 .04

PEAK FLOW (cms)= .27 .30 *TOTALS*
TIME TO PEAK (hrs)= 2.33 2.75 .357 (iii)
RUNOFF VOLUME (mm)= 80.72 54.41 2.33
TOTAL RAINFALL (mm)= 81.72 81.72 59.67
RUNOFF COEFFICIENT = .99 .67 81.72

***** WARNING: STORAGE COEFF. IS SMALLER THAN TIME STEP!
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Post-Dry-Con-6hr-Chicago
 ***** WARNING: FOR AREAS WITH IMPERVIOUS RATIOS BELOW 20%
 YOU SHOULD CONSIDER SPLITTING THE AREA.

- (i) CN PROCEDURE SELECTED FOR PVIOUS LOSSES:
 CN* = 86.0 Ia = Dep. Storage (Above)
 (††) TIME STEP (OT) SHOULD BE SMALLER OR EQUAL
 THAN THE STORAGE COEFFICIENT.
 (†††) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

RESERVOIR (0104)				
IN= 2--> OUT= 1				
DT= 5.0 min				
OUTFLOW (cms)	STORAGE (ha.m.)	OUTFLOW (cms)	STORAGE (ha.m.)	
.0000	.0000	.0007	.0110	
.0001	.0069	.0008	.0130	
.0002	.0070	.0009	.0153	
.0003	.0072	.0020	.0188	
.0004	.0076	.0026	.0227	
.0005	.0083	.0048	.0274	
.0006	.0095	.0617	.0328	
AREA (ha)	QPEAK (cms)	TPEAK (hrs)	R.V. (mm)	
INFLOW : ID= 2 (0107)	3.27	.36	2.33	59.67
OUTFLOW: ID= 1 (0104)	3.27	.33	2.83	57.50
PEAK FLOW REDUCTION [qout/qin](%)= 92.41				
TIME SHIFT OF PEAK FLOW (min)= 30.00				
MAXIMUM STORAGE USED (ha.m.)= .0272				

ADD HYD (0103)				
1 + 2 = 3				
ID1= 1 (0105):	AREA (ha)	QPEAK (cms)	TPEAK (hrs)	R.V. (mm)
+ ID2= 2 (0104):	7.73	.447	2.67	29.11
	3.27	.330	2.83	57.50
ID = 3 (0103):	11.00	.773	2.83	37.55

NOTE: PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

ADD HYD (0106)				
1 + 2 = 3				
ID1= 1 (0102):	AREA (ha)	QPEAK (cms)	TPEAK (hrs)	R.V. (mm)
+ ID2= 2 (0103):	1.01	.167	2.33	37.40
	11.00	.773	2.83	37.55
ID = 3 (0106):	12.01	.826	2.75	37.54

NOTE: PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

FINISH

Post-Dev-Con-AES

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V V I SSSS U U A L
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V V I SS U U A A L
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***** DETAILED OUTPUT *****

Input filename: C:\Program Files\Visual OTTHYMO v2.0\voindat

Output filename: C:\visual otthymo files\3969\3969-A11
scenarios\Post-Dev-Controlled.out
Summary filename: C:\visual otthymo files\3969\3969-A11
scenarios\Post-Dev-Controlled.sum

DATE: 9/4/2018

TIME: 10:57:14 AM

USER:

COMMENTS:

** SIMULATION NUMBER: 1 **

MASS STORM
Ptotal= 22.50 mm

Filename: C:\visual otthymo files\4456\AES 1-hr.mst
Comments: AES 1 HOUR STORM DISTRIBUTION a=21min k=

Duration of storm = 1.00 hrs
Mass curve time step = 5.00 min

TIME	RAIN	TIME	RAIN	TIME	RAIN	TIME	RAIN
hrs	mm/hr	hrs	mm/hr	hrs	mm/hr	hrs	mm/hr
.08	10.02	.33	69.93	.58	11.10	.83	.81
.17	30.00	.42	64.29	.67	4.62	.92	.30
.25	49.98	.50	27.03	.75	1.92	1.00	.03

CALIB
NASHYD (0102)
ID= 1 DT=10.0 min

Area (ha)= 1.01 Curve Number (CN)= 82.0
Ia (mm)= 4.00 # of Linear Res.(N)= 3.00
Page 1

Storage Coeff. (min)= 3.02 (ii) 52.31 (ii)
Unit Hyd. Tpeak (min)= 5.00 65.00
Unit Hyd. peak (cms)= .27 .02
PEAK FLOW (cms)= .12 .03
TIME TO PEAK (hrs)= .33 1.42
RUNOFF VOLUME (mm)= 21.50 7.09
TOTAL RAINFALL (mm)= 22.50 22.50
RUNOFF COEFFICIENT = .96 .44

TOTALS

***** WARNING: STORAGE COEFF. IS SMALLER THAN TIME STEP!
***** WARNING: FOR AREAS WITH IMPERVIOUS RATIOS BELOW 20%
YOU SHOULD CONSIDER SPLITTING THE AREA.

- (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
CN* = 86.0 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.

RESERVOIR (0104)
IN= 2--> OUT= 1
DT= 5.0 min

OUTFLOW	STORAGE	OUTFLOW	STORAGE
(cms)	(ha.m.)	(cms)	(ha.m.)
.0000	.0000	.0007	.0110
.0001	.0069	.0008	.0130
.0002	.0070	.0009	.0155
.0003	.0072	.0010	.0188
.0004	.0076	.0011	.0227
.0005	.0083	.0012	.0274
.0006	.0095	.0013	.0328

INFLOW	AREA	QPEAK	TPEAK	R.V.
: ID= 2 (0107)	(ha)	(cms)	(hrs)	(mm)
OUTFLOW: ID= 1 (0104)	3.27	.12	.42	9.96
	3.27	.03	1.50	7.79

PEAK FLOW REDUCTION [qout/qin](%)= 23.89
TIME SHIFT OF PEAK FLOW (min)= 65.00
MAXIMUM STORAGE USED (ha.m.)= .0168

ADD HYD (0103)
1 + 2 = 3

ID1= 1 (0105):	AREA	QPEAK	TPEAK	R.V.
	(ha)	(cms)	(hrs)	(mm)
+ ID2= 2 (0104):	7.73	.055	.83	2.14
	3.27	.029	1.50	7.79
ID = 3 (0103):	11.00	.056	.83	3.82

NOTE: PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

ADD HYD (0106)
1 + 2 = 3

ID1= 1 (0102):	AREA	QPEAK	TPEAK	R.V.
	(ha)	(cms)	(hrs)	(mm)
	1.01	.033	.50	3.81

Page 3

Post-Dev-Con-AES
U.H. Tp(hrs)= .11

NOTE: RAINFALL WAS TRANSFORMED TO 10.0 MIN. TIME STEP.

TIME	RAIN	TIME	RAIN	TIME	RAIN	TIME	RAIN
hrs	mm/hr	hrs	mm/hr	hrs	mm/hr	hrs	mm/hr
.167	20.01	.500	45.66	.833	1.36		
.333	59.95	.667	7.86	1.000	.16		

Unit Hyd Qpeak (cms)= .346

PEAK FLOW (cms)= .033 (i)
TIME TO PEAK (hrs)= .500
RUNOFF VOLUME (mm)= 3.808
TOTAL RAINFALL (mm)= 22.500
RUNOFF COEFFICIENT = .169

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

CALIB
NASHYD (0105)
ID= 1 DT=10.0 min

Area (ha)= 7.73 Curve Number (CN)= 67.0
Ia (mm)= 5.00 # of Linear Res.(N)= 3.00
U.H. Tp(hrs)= .40

Unit Hyd Qpeak (cms)= .734

PEAK FLOW (cms)= .055 (i)
TIME TO PEAK (hrs)= .833
RUNOFF VOLUME (mm)= 2.143
TOTAL RAINFALL (mm)= 22.500
RUNOFF COEFFICIENT = .095

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

CALIB
STANDHYD (0107)
ID= 1 DT= 5.0 min

Area (ha)= 3.27
Total Imp(ha)= 30.50 Dir. Conn.(%)= 20.00

Surface Area	(ha)	IMPERVIOUS	PERVIOUS (i)
Dep. Storage	(mm)		
Average Slope	(%)	2.00	3.00
Length	(m)	147.60	320.00
Mannings n		.013	.250

NOTE: RAINFALL WAS TRANSFORMED TO 5.0 MIN. TIME STEP.

TIME	RAIN	TIME	RAIN	TIME	RAIN	TIME	RAIN
hrs	mm/hr	hrs	mm/hr	hrs	mm/hr	hrs	mm/hr
.083	10.02	.333	69.93	.583	11.10	.83	.81
.167	30.00	.417	64.29	.667	4.62	.92	.30
.250	49.98	.500	27.03	.750	1.92	1.00	.03

Max.Eff.Inten.(mm/hr)= 69.93 8.16
over (min) 5.00 65.00

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Post-Dev-Con-AES
+ ID2= 2 (0103): 11.00 .056 .83 3.82
ID = 3 (0106): 12.01 .069 .50 3.82

NOTE: PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

** SIMULATION NUMBER: 2 **

MASS STORM
Ptotal= 30.50 mm

Filename: C:\visual otthymo files\4456\AES 1-hr.mst
Comments: AES 1 HOUR STORM DISTRIBUTION a=21min k=

Duration of storm = 1.00 hrs
Mass curve time step = 5.00 min

TIME	RAIN	TIME	RAIN	TIME	RAIN	TIME	RAIN
hrs	mm/hr	hrs	mm/hr	hrs	mm/hr	hrs	mm/hr
.08	13.58	.33	94.79	.58	15.04	.83	1.10
.17	40.66	.42	87.14	.67	6.26	.92	.40
.25	67.75	.50	36.64	.75	2.60	1.00	.04

CALIB
NASHYD (0102)
ID= 1 DT=10.0 min

Area (ha)= 1.01 Curve Number (CN)= 82.0
Ia (mm)= 4.00 # of Linear Res.(N)= 3.00
U.H. Tp(hrs)= .11

NOTE: RAINFALL WAS TRANSFORMED TO 10.0 MIN. TIME STEP.

TIME	RAIN	TIME	RAIN	TIME	RAIN	TIME	RAIN
hrs	mm/hr	hrs	mm/hr	hrs	mm/hr	hrs	mm/hr
.167	27.12	.500	61.89	.833	1.85		
.333	81.27	.667	10.65	1.000	.22		

Unit Hyd Qpeak (cms)= .346

PEAK FLOW (cms)= .059 (i)
TIME TO PEAK (hrs)= .500
RUNOFF VOLUME (mm)= 7.055
TOTAL RAINFALL (mm)= 30.500
RUNOFF COEFFICIENT = .231

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

CALIB
NASHYD (0105)
ID= 1 DT=10.0 min

Area (ha)= 7.73 Curve Number (CN)= 67.0
Ia (mm)= 5.00 # of Linear Res.(N)= 3.00
U.H. Tp(hrs)= .40

Unit Hyd Qpeak (cms)= .734

PEAK FLOW (cms)= .111 (i)
TIME TO PEAK (hrs)= .667
RUNOFF VOLUME (mm)= 4.309
TOTAL RAINFALL (mm)= 30.500

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Post-Dev-Con-AES
RUNOFF COEFFICIENT = .141

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

CALIB
STANDHYD (0107)
ID= 1 DT= 5.0 min

Area	(ha)=	3.27
Total Imp(%)	=	30.50
Dir. Conn.(%)	=	20.00

Surface Area	(ha)=	1.00	PERVIOUS (i)
Dep. Storage	(mm)=	1.00	3.00
Average Slope	(%)=	2.00	3.00
Length	(m)=	147.60	320.00
Mannings n	=	.013	.250

NOTE: RAINFALL WAS TRANSFORMED TO 5.0 MIN. TIME STEP.

TIME	RAIN	TIME	RAIN	TIME	RAIN
hrs	mm/hr	hrs	mm/hr	hrs	mm/hr
.083	13.58	.333	94.79	.583	15.04
.167	40.66	.417	87.14	.667	6.26
.250	67.75	.500	36.64	.750	2.60

Max. Eff. Inten. (mm/hr)=	94.79	18.67
over (min)	5.00	50.00
Storage Coeff. (min)=	2.68 (ii)	45.26 (ii)
Unit Hyd. Tpeak (min)=	5.00	50.00
Unit Hyd. peak (cms)=	.29	.02
PEAK FLOW (cms)=	.16	.07
TIME TO PEAK (hrs)=	.33	1.17
RUNOFF VOLUME (mm)=	29.50	12.19
TOTAL RAINFALL (mm)=	30.50	30.50
RUNOFF COEFFICIENT =	.97	.40

TOTALS

PEAK FLOW (cms)=	.168 (iii)
TIME TO PEAK (hrs)=	.42
RUNOFF VOLUME (mm)=	15.65
TOTAL RAINFALL (mm)=	30.50
RUNOFF COEFFICIENT =	.51

***** WARNING: STORAGE COEFF. IS SMALLER THAN TIME STEP!
***** WARNING: FOR AREAS WITH IMPERVIOUS RATIOS BELOW 20%
YOU SHOULD CONSIDER SPLITTING THE AREA.

(i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
CN* = 86.0 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.

RESERVOIR (0104)
IN= 2--> OUT= 1
DT= 5.0 min

OUTFLOW	STORAGE	OUTFLOW	STORAGE
(cms)	(ha.m.)	(cms)	(ha.m.)
.0000	.0000	.0007	.0110
.0001	.0069	.0008	.0130
.0002	.0070	.0009	.0155
.0003	.0072	.0070	.0188
.0004	.0075	.1986	.0227
.0005	.0083	.3648	.0274
.0006	.0095	.5617	.0328

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Post-Dev-Con-AES
AREA OPEAK TPEAK R.V.
(ha) (cms) (hrs) (mm)
INFLOW : ID= 2 (0107) 3.27 .17 .42 15.65
OUTFLOW : ID= 1 (0104) 3.27 .06 1.25 13.47

PEAK FLOW REDUCTION [qout/qin] (%) = 38.33
TIME SHIFT OF PEAK FLOW (min) = 50.00
MAXIMUM STORAGE USED (ha.m.) = .0188

ADD HYD (0103)
1 + 2 = 3

AREA	OPEAK	TPEAK	R.V.
(ha)	(cms)	(hrs)	(mm)
ID1= 1 (0105):	7.73	.111	.67
+ ID2= 2 (0104):	3.27	.064	1.25
ID = 3 (0103):	11.00	.161	.67

NOTE: PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

ADD HYD (0106)
1 + 2 = 3

AREA	OPEAK	TPEAK	R.V.
(ha)	(cms)	(hrs)	(mm)
ID1= 1 (0102):	1.01	.059	.50
+ ID2= 2 (0103):	11.00	.161	.67
ID = 3 (0106):	12.01	.183	.67

NOTE: PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

** SIMULATION NUMBER: 3 **

MASS STORM
Ptotal= 35.80 mm

Filename: C:\visual otthymo files\4456\AES 1-hr.mst
Comments: AES 1 HOUR STORM DISTRIBUTION a=21min k=

Duration of storm = 1.00 hrs
Mass curve time step = 5.00 min

TIME	RAIN	TIME	RAIN	TIME	RAIN
hrs	mm/hr	hrs	mm/hr	hrs	mm/hr
.08	15.94	.33	111.27	.58	17.66
.17	47.73	.42	102.29	.67	7.35
.25	79.52	.50	43.00	.75	3.05

CALIB
NASHHYD (0102)
ID= 1 DT=10.0 min

Area	(ha)=	1.01	Curve Number (CN)=	82.0
Ia	(mm)=	4.00	# of Linear Res. (N)=	3.00
U.H. Tp(hrs)=		.11		

NOTE: RAINFALL WAS TRANSFORMED TO 10.0 MIN. TIME STEP.

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Post-Dev-Con-AES
TRANSFORMED HYETOGRAPH

TIME	RAIN	TIME	RAIN	TIME	RAIN
hrs	mm/hr	hrs	mm/hr	hrs	mm/hr
.167	31.83	.500	72.65	.833	2.17
.333	95.39	.667	12.50	1.000	.26

Unit Hyd peak (cms)=	.346
PEAK FLOW (cms)=	.078 (i)
TIME TO PEAK (hrs)=	.500
RUNOFF VOLUME (mm)=	9.545
TOTAL RAINFALL (mm)=	35.800
RUNOFF COEFFICIENT =	.267

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

CALIB
NASHHYD (0105)
ID= 1 DT=10.0 min

Area	(ha)=	7.73	Curve Number (CN)=	67.0
Ia	(mm)=	5.00	# of Linear Res. (N)=	3.00
U.H. Tp(hrs)=		.40		

Unit Hyd peak (cms)=	.734
PEAK FLOW (cms)=	.157 (i)
TIME TO PEAK (hrs)=	.667
RUNOFF VOLUME (mm)=	6.073
TOTAL RAINFALL (mm)=	35.800
RUNOFF COEFFICIENT =	.170

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

CALIB
STANDHYD (0107)
ID= 1 DT= 5.0 min

Area	(ha)=	3.27
Total Imp(%)	=	30.50
Dir. Conn.(%)	=	20.00

Surface Area	(ha)=	1.00	PERVIOUS (i)
Dep. Storage	(mm)=	1.00	3.00
Average Slope	(%)=	2.00	3.00
Length	(m)=	147.60	320.00
Mannings n	=	.013	.250

NOTE: RAINFALL WAS TRANSFORMED TO 5.0 MIN. TIME STEP.

TIME	RAIN	TIME	RAIN	TIME	RAIN
hrs	mm/hr	hrs	mm/hr	hrs	mm/hr
.083	15.94	.333	111.27	.583	17.66
.167	47.73	.417	102.29	.667	7.35
.250	79.52	.500	43.00	.750	3.05

Max. Eff. Inten. (mm/hr)=	111.27	30.88
over (min)	5.00	40.00
Storage Coeff. (min)=	2.51 (ii)	37.33 (ii)
Unit Hyd. Tpeak (min)=	5.00	40.00
Unit Hyd. peak (cms)=	.29	.03
PEAK FLOW (cms)=	.19	.11

TOTALS

PEAK FLOW (cms)=	.206 (iii)
TIME TO PEAK (hrs)=	.42
RUNOFF VOLUME (mm)=	15.65
TOTAL RAINFALL (mm)=	30.50
RUNOFF COEFFICIENT =	.51

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Post-Dev-Con-AES
TIME TO PEAK (hrs)= .33
RUNOFF VOLUME (mm)= 34.80
TOTAL RAINFALL (mm)= 35.80
RUNOFF COEFFICIENT = .97

***** WARNING: STORAGE COEFF. IS SMALLER THAN TIME STEP!
***** WARNING: FOR AREAS WITH IMPERVIOUS RATIOS BELOW 20%
YOU SHOULD CONSIDER SPLITTING THE AREA.

(i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
CN* = 86.0 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.

RESERVOIR (0104)
IN= 2--> OUT= 1
DT= 5.0 min

OUTFLOW	STORAGE	OUTFLOW	STORAGE
(cms)	(ha.m.)	(cms)	(ha.m.)
.0000	.0000	.0007	.0110
.0001	.0069	.0008	.0130
.0002	.0070	.0009	.0155
.0003	.0072	.0070	.0188
.0004	.0075	.1986	.0227
.0005	.0083	.3648	.0274
.0006	.0095	.5617	.0328

INFLOW : ID= 2 (0107)	AREA	OPEAK	TPEAK	R.V.
OUTFLOW : ID= 1 (0104)	(ha)	(cms)	(hrs)	(mm)
	3.27	.21	.42	19.71
	3.27	.10	1.08	17.54

PEAK FLOW REDUCTION [qout/qin] (%) = 50.05
TIME SHIFT OF PEAK FLOW (min) = 40.00
MAXIMUM STORAGE USED (ha.m.) = .0205

ADD HYD (0103)
1 + 2 = 3

AREA	OPEAK	TPEAK	R.V.
(ha)	(cms)	(hrs)	(mm)
ID1= 1 (0105):	7.73	.157	.67
+ ID2= 2 (0104):	3.27	.103	1.08
ID = 3 (0103):	11.00	.245	.67

NOTE: PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

ADD HYD (0106)
1 + 2 = 3

AREA	OPEAK	TPEAK	R.V.
(ha)	(cms)	(hrs)	(mm)
ID1= 1 (0102):	1.01	.078	.50
+ ID2= 2 (0103):	11.00	.245	.67
ID = 3 (0106):	12.01	.284	.58

NOTE: PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

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Post-Dev-Con-AES

 ** SIMULATION NUMBER: 4 **

MASS STORM
 Ptotal= 42.50 mm

Filename: C:\visual otthymo files\4456\AES 1-hr.mst
 Comments: AES 1 HOUR STORM DISTRIBUTION a=21min k=
 Duration of storm = 1.00 hrs
 Mass curve time step = 5.00 min

TIME	RAIN	TIME	RAIN	TIME	RAIN	TIME	RAIN
hrs	mm/hr	hrs	mm/hr	hrs	mm/hr	hrs	mm/hr
.08	18.92	.33	132.09	.58	20.96	.83	1.53
.17	56.66	.42	121.43	.67	8.72	.92	.56
.25	94.40	.50	51.05	.75	3.62	1.00	.05

CALIB
 NASHYD (0102)
 ID= 1 DT=10.0 min

Area (ha)= 1.01 Curve Number (CN)= 82.0
 Ia (mm)= 4.00 # of Linear Res.(N)= 3.00
 U.H. Tp(hrs)= .11

NOTE: RAINFALL WAS TRANSFORMED TO 10.0 MIN. TIME STEP.

TIME	RAIN	TIME	RAIN	TIME	RAIN	TIME	RAIN
hrs	mm/hr	hrs	mm/hr	hrs	mm/hr	hrs	mm/hr
.167	37.79	.500	86.24	.833	2.58		
.333	113.25	.667	14.84	1.000	.31		

Unit Hyd Qpeak (cms)= .346

PEAK FLOW (cms)= .104 (i)
 TIME TO PEAK (hrs)= .500
 RUNOFF VOLUME (mm)= 12.996
 TOTAL RAINFALL (mm)= 42.500
 RUNOFF COEFFICIENT = .306

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

CALIB
 NASHYD (0105)
 ID= 1 DT=10.0 min

Area (ha)= 7.73 Curve Number (CN)= 67.0
 Ia (mm)= 5.00 # of Linear Res.(N)= 3.00
 U.H. Tp(hrs)= .40

Unit Hyd Qpeak (cms)= .734

PEAK FLOW (cms)= .223 (i)
 TIME TO PEAK (hrs)= .667
 RUNOFF VOLUME (mm)= 8.632
 TOTAL RAINFALL (mm)= 42.500
 RUNOFF COEFFICIENT = .203

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

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Post-Dev-Con-AES

CALIB
 STANDHYD (0107)
 ID= 1 DT= 5.0 min

Area (ha)= 3.27
 Total Imp(%)= 30.50 Dir. Conn.(%)= 20.00

Surface Area (ha)= 1.00 IMPERVIOUS 2.27
 Dep. Storage (mm)= 1.00 PERVIOUS (i) 3.00
 Average Slope (%)= 2.00 3.00
 Length (m)= 147.60 320.00
 Mannings n = .013 .250

NOTE: RAINFALL WAS TRANSFORMED TO 5.0 MIN. TIME STEP.

TIME	RAIN	TIME	RAIN	TIME	RAIN	TIME	RAIN
hrs	mm/hr	hrs	mm/hr	hrs	mm/hr	hrs	mm/hr
.083	18.92	.333	132.09	.583	20.96	.83	1.53
.167	56.66	.417	121.43	.667	8.72	.92	.56
.250	94.40	.500	51.05	.750	3.62	1.00	.05

Max.Eff.Inten.(mm/hr)= 132.09 46.68
 over (min)= 5.00 35.00
 Storage Coeff. (min)= 2.34 (ii) 31.86 (iii)
 Unit Hyd. Tpeak (min)= 5.00 35.00
 Unit Hyd. peak (cms)= .30 .03
 PEAK FLOW (cms)= .23 .16
 TIME TO PEAK (hrs)= .33 .92
 RUNOFF VOLUME (mm)= 41.50 20.99
 TOTAL RAINFALL (mm)= 42.50 42.50
 RUNOFF COEFFICIENT = .98 .49

***** WARNING: STORAGE COEFF. IS SMALLER THAN TIME STEP!
 ***** WARNING: FOR AREAS WITH IMPERVIOUS RATIOS BELOW 20%
 YOU SHOULD CONSIDER SPLITTING THE AREA.

(i) CN PROCEDURE SELECTED FOR PVIOUS LOSSES:
 CN* = 86.0 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.

RESERVOIR (0104)
 IN= 2--> OUT= 1
 DT= 5.0 min

OUTFLOW	STORAGE	OUTFLOW	STORAGE
(cms)	(ha.m.)	(cms)	(ha.m.)
.0000	.0000	.0007	.0110
.0001	.0069	.0008	.0130
.0002	.0070	.0009	.0153
.0003	.0072	.0072	.0188
.0004	.0076	.1986	.0227
.0005	.0083	.3648	.0274
.0006	.0095	.5617	.0328

AREA QPEAK TPEAK R.V.
 (ha) (cms) (hrs) (mm)
 INFLOW: ID= 2 (0107) 3.27 .26 .42 25.09
 OUTFLOW: ID= 1 (0104) 3.27 .16 .50 22.92

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Post-Dev-Con-AES
 PEAK FLOW REDUCTION [qout/qin](%)= 61.18
 TIME SHIFT OF PEAK FLOW (min)= 5.00
 MAXIMUM STORAGE USED (ha.m.)= .0223

ADD HYD (0103)
 1 + 2 = 3

	AREA	OPEAK	TPEAK	R.V.
	(ha)	(cms)	(hrs)	(mm)
ID1= 1 (0105):	7.73	.223	.67	8.63
+ ID2= 2 (0104):	3.27	.157	.50	22.92
ID = 3 (0103):	11.00	.364	.83	12.88

NOTE: PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

ADD HYD (0106)
 1 + 2 = 3

	AREA	OPEAK	TPEAK	R.V.
	(ha)	(cms)	(hrs)	(mm)
ID1= 1 (0102):	1.01	.104	.50	13.00
+ ID2= 2 (0103):	11.00	.364	.83	12.88
ID = 3 (0106):	12.01	.414	.50	13.08

NOTE: PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

 ** SIMULATION NUMBER: 5 **

MASS STORM
 Ptotal= 47.40 mm

Filename: C:\visual otthymo files\4456\AES 1-hr.mst
 Comments: AES 1 HOUR STORM DISTRIBUTION a=21min k=
 Duration of storm = 1.00 hrs
 Mass curve time step = 5.00 min

TIME	RAIN	TIME	RAIN	TIME	RAIN	TIME	RAIN
hrs	mm/hr	hrs	mm/hr	hrs	mm/hr	hrs	mm/hr
.08	21.10	.33	147.32	.58	23.38	.83	1.71
.17	63.19	.42	135.43	.67	9.73	.92	.63
.25	105.28	.50	56.94	.75	4.04	1.00	.06

CALIB
 NASHYD (0102)
 ID= 1 DT=10.0 min

Area (ha)= 1.01 Curve Number (CN)= 82.0
 Ia (mm)= 4.00 # of Linear Res.(N)= 3.00
 U.H. Tp(hrs)= .11

NOTE: RAINFALL WAS TRANSFORMED TO 10.0 MIN. TIME STEP.

TIME	RAIN	TIME	RAIN	TIME	RAIN	TIME	RAIN
hrs	mm/hr	hrs	mm/hr	hrs	mm/hr	hrs	mm/hr
.167	42.15	.500	96.18	.833	2.67		
.333	126.30	.667	16.55	1.000	.34		

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Post-Dev-Con-AES

Unit Hyd Qpeak (cms)= .346

PEAK FLOW (cms)= .125 (i)
 TIME TO PEAK (hrs)= .500
 RUNOFF VOLUME (mm)= 15.698
 TOTAL RAINFALL (mm)= 47.400
 RUNOFF COEFFICIENT = .331

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

CALIB
 NASHYD (0105)
 ID= 1 DT=10.0 min

Area (ha)= 7.73 Curve Number (CN)= 67.0
 Ia (mm)= 5.00 # of Linear Res.(N)= 3.00
 U.H. Tp(hrs)= .40

Unit Hyd Qpeak (cms)= .734

PEAK FLOW (cms)= .277 (i)
 TIME TO PEAK (hrs)= .667
 RUNOFF VOLUME (mm)= 10.713
 TOTAL RAINFALL (mm)= 47.400
 RUNOFF COEFFICIENT = .226

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

CALIB
 STANDHYD (0107)
 ID= 1 DT= 5.0 min

Area (ha)= 3.27
 Total Imp(%)= 30.50 Dir. Conn.(%)= 20.00

Surface Area (ha)= 1.00 IMPERVIOUS 2.27
 Dep. Storage (mm)= 1.00 PERVIOUS (i) 3.00
 Average Slope (%)= 2.00 3.00
 Length (m)= 147.60 320.00
 Mannings n = .013 .250

NOTE: RAINFALL WAS TRANSFORMED TO 5.0 MIN. TIME STEP.

TIME	RAIN	TIME	RAIN	TIME	RAIN	TIME	RAIN
hrs	mm/hr	hrs	mm/hr	hrs	mm/hr	hrs	mm/hr
.083	21.10	.333	147.32	.583	23.38	.83	1.71
.167	63.19	.417	135.43	.667	9.73	.92	.63
.250	105.28	.500	56.94	.750	4.04	1.00	.06

Max.Eff.Inten.(mm/hr)= 147.32 55.13
 over (min)= 5.00 30.00
 Storage Coeff. (min)= 2.24 (ii) 29.86 (iii)
 Unit Hyd. Tpeak (min)= 5.00 30.00
 Unit Hyd. peak (cms)= .30 .04
 PEAK FLOW (cms)= .26 .20
 TIME TO PEAK (hrs)= .33 .83
 RUNOFF VOLUME (mm)= 46.40 24.86
 TOTAL RAINFALL (mm)= 47.40 47.40
 RUNOFF COEFFICIENT = .98 .52

TOTALS
 (iii)
 .301 (iii)
 .42
 29.16
 47.40
 .62

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Post-Dev-Con-AES
 ***** WARNING: STORAGE COEFF. IS SMALLER THAN TIME STEP!
 ***** WARNING: FOR AREAS WITH IMPERVIOUS RATIOS BELOW 20%
 YOU SHOULD CONSIDER SPLITTING THE AREA.

- (i) CN PROCEDURE SELECTED FOR PVIOUS LOSSES:
 CN* = 86.0 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.

RESERVOIR (0104)				
IN= 2--> OUT= 1				
DT= 5.0 min				
OUTFLOW (cms)	STORAGE (ha.m.)	OUTFLOW (cms)	STORAGE (ha.m.)	
.0000	.0000	.0007	.0110	
.0001	.0069	.0008	.0130	
.0002	.0070	.0009	.0155	
.0003	.0072	.0702	.0188	
.0004	.0076	.1986	.0227	
.0005	.0083	.3648	.0274	
.0006	.0095	.5617	.0328	
AREA (ha)	QPEAK (cms)	TPEAK (hrs)	R.V. (mm)	
INFLOW : ID= 2 (0107)	3.27	.30	29.16	
OUTFLOW: ID= 1 (0104)	3.27	.50	26.99	

PEAK FLOW REDUCTION [Qout/Qin](%)= 69.82
 TIME SHIFT OF PEAK FLOW (min)= 5.00
 MAXIMUM STORAGE USED (ha.m.)= .0235

ADD HYD (0103)				
1 + 2 = 3				
ID= 1 (0105):	7.73	.277	10.71	
+ ID2= 2 (0104):	3.27	.50	26.99	
ID = 3 (0103):	11.00	.471	15.55	

NOTE: PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

ADD HYD (0106)				
1 + 2 = 3				
ID= 1 (0102):	1.01	.125	15.70	
+ ID2= 2 (0103):	11.00	.471	15.55	
ID = 3 (0106):	12.01	.527	15.80	

NOTE: PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

 ** SIMULATION NUMBER: 6 **

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Post-Dev-Con-AES

MASS STORM		Filename: C:\visual otthymo files\4456\AES 1-hr.mst	
Ptotal= 52.40 mm		Comments: AES 1 HOUR STORM DISTRIBUTION a=21min k=	
		Duration of storm = 1.00 hrs	
		Mass curve time step = 5.00 min	
TIME	RAIN	TIME	RAIN
hrs	mm/hr	hrs	mm/hr
.08	23.33	.33	162.86
.17	69.86	.42	149.72
.25	116.39	.50	62.94
		.75	4.46
		1.00	.06

CALIB		Area (ha)=	
NASHYD (0102)		1.01	
ID= 1 DT=10.0 min		# of Linear Res.(N)= 3.00	
		U.H. Tp(hrs)= .11	

NOTE: RAINFALL WAS TRANSFORMED TO 10.0 MIN. TIME STEP.

TIME		TIME	
hrs	mm/hr	hrs	mm/hr
.167	46.59	.500	106.33
.333	139.63	.667	18.30
		1.000	.38

Unit Hyd Qpeak (cms)= .346

PEAK FLOW (cms)= .146 (i)
 TIME TO PEAK (hrs)= .500
 RUNOFF VOLUME (mm)= 18.586
 TOTAL RAINFALL (mm)= 52.400
 RUNOFF COEFFICIENT = .355

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

CALIB		Area (ha)=	
NASHYD (0105)		7.73	
ID= 1 DT=10.0 min		5.00	
		# of Linear Res.(N)= 3.00	
		U.H. Tp(hrs)= .40	

Unit Hyd Qpeak (cms)= .734

PEAK FLOW (cms)= .337 (i)
 TIME TO PEAK (hrs)= .667
 RUNOFF VOLUME (mm)= 13.000
 TOTAL RAINFALL (mm)= 52.400
 RUNOFF COEFFICIENT = .248

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

CALIB		Area (ha)=	
STANDHYD (0107)		3.27	
ID= 1 DT= 5.0 min		30.50	
		Dir. Conn.(%)= 20.00	

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Surface Area		IMPERVIOUS	
(ha)=		PERVIOUS (i)	
Dep. Storage		1.00	
Average slope		2.27	
Length		3.00	
Mannings n		147.60	
		.013	

NOTE: RAINFALL WAS TRANSFORMED TO 5.0 MIN. TIME STEP.

TIME		TIME	
hrs	mm/hr	hrs	mm/hr
.083	23.33	.333	162.86
.167	69.86	.417	149.72
.250	116.39	.500	62.94
		.750	4.46
		1.00	.06
Max.Eff.Inten.(mm/hr)=		162.86	
over (min)=		5.00	
Storage Coeff. (min)=		2.16 (ii)	
Unit Hyd. Tpeak (min)=		5.00	
Unit Hyd. peak (cms)=		.31	
PEAK FLOW (cms)=		.29	
TIME TO PEAK (hrs)=		.33	
RUNOFF VOLUME (mm)=		51.40	
TOTAL RAINFALL (mm)=		52.40	
RUNOFF COEFFICIENT =		.98	

***** WARNING: STORAGE COEFF. IS SMALLER THAN TIME STEP!
 ***** WARNING: FOR AREAS WITH IMPERVIOUS RATIOS BELOW 20%
 YOU SHOULD CONSIDER SPLITTING THE AREA.

- (i) CN PROCEDURE SELECTED FOR PVIOUS LOSSES:
 CN* = 86.0 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.

RESERVOIR (0104)				
IN= 2--> OUT= 1				
DT= 5.0 min				
OUTFLOW (cms)	STORAGE (ha.m.)	OUTFLOW (cms)	STORAGE (ha.m.)	
.0000	.0000	.0007	.0110	
.0001	.0069	.0008	.0130	
.0002	.0070	.0009	.0155	
.0003	.0072	.0702	.0188	
.0004	.0076	.1986	.0227	
.0005	.0083	.3648	.0274	
.0006	.0095	.5617	.0328	
AREA (ha)	QPEAK (cms)	TPEAK (hrs)	R.V. (mm)	
INFLOW : ID= 2 (0107)	3.27	.34	33.42	
OUTFLOW: ID= 1 (0104)	3.27	.26	31.24	

PEAK FLOW REDUCTION [Qout/Qin](%)= 75.64
 TIME SHIFT OF PEAK FLOW (min)= 5.00
 MAXIMUM STORAGE USED (ha.m.)= .0253

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Post-Dev-Con-AES

ADD HYD (0103)				
1 + 2 = 3				
ID= 1 (0105):	7.73	.337	13.00	
+ ID2= 2 (0104):	3.27	.259	31.24	
ID = 3 (0103):	11.00	.577	18.42	

NOTE: PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

ADD HYD (0106)				
1 + 2 = 3				
ID= 1 (0102):	1.01	.146	18.59	
+ ID2= 2 (0103):	11.00	.577	18.42	
ID = 3 (0106):	12.01	.640	18.72	

NOTE: PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

FINISH

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Post-Dev-Con-SCS

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V V I SSSS U U A L
V V I SS U U A A L
V V I SS U U A A L
V V I SS U U A A L
V V I SSSS UUUU A A LLLL
000 TTTT TTTT H H Y Y M M 000 TM, Version 2.0
0 0 T T H H Y Y M M 0 0 Licensed To: M J Davenport
000 T T H H Y Y M M 000 vo2-0057

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***** DETAILED OUTPUT *****

Input filename: C:\Program Files\Visual OTTHYMO v2.0\voind.dat

Output filename: C:\visual otthymo files\3969\3969-A11
Scenarios\Post-Dev-Controlled.out
Summary filename: C:\visual otthymo files\3969\3969-A11
Scenarios\Post-Dev-Controlled.sum

DATE: 9/4/2018

TIME: 10:53:50 AM

USER:

COMMENTS:

** SIMULATION NUMBER: 1 **

MASS STORM
Ptotal= 38.40 mm

Filename: C:\visual otthymo files\4456\SCS II 6-hr.mst
Comments: SCS 6 HOUR TYPE II STORM DISTRIBUTION

Duration of storm = 6.00 hrs
Mass curve time step = 10.00 min

TIME	RAIN	TIME	RAIN	TIME	RAIN	TIME	RAIN
hrs	mm/hr	hrs	mm/hr	hrs	mm/hr	hrs	mm/hr
.17	1.61	1.67	3.92	3.17	8.52	4.67	2.30
.33	1.38	1.83	3.69	3.33	8.29	4.83	2.30
.50	1.61	2.00	3.92	3.50	8.52	5.00	2.30
.67	2.30	2.17	4.61	3.67	3.92	5.17	1.61
.83	2.30	2.33	4.61	3.83	3.69	5.33	1.38
1.00	2.30	2.50	4.61	4.00	3.92	5.50	1.61
1.17	2.30	2.67	23.04	4.17	3.00	5.67	1.61
1.33	2.30	2.83	41.47	4.33	3.23	5.83	1.38
1.50	2.30	3.00	59.90	4.50	3.00	6.00	1.61

Page 1

Post-Dev-Con-SCS

CALIB
NASHYD (0102)
ID= 1 DT=10.0 min

Area (ha)= 1.01
Ia (mm)= 4.00
U.H. Tp(hrs)= .11
Curve Number (CN)= 82.0
of Linear Res.(N)= 3.00

Unit Hyd Qpeak (cms)= .346

PEAK FLOW (cms)= .055 (i)

TIME TO PEAK (hrs)= 3.000

RUNOFF VOLUME (mm)= 10.847

TOTAL RAINFALL (mm)= 38.400

RUNOFF COEFFICIENT = .282

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

CALIB
NASHYD (0105)
ID= 1 DT=10.0 min

Area (ha)= 7.73
Ia (mm)= 5.00
U.H. Tp(hrs)= .40
Curve Number (CN)= 67.0
of Linear Res.(N)= 3.00

Unit Hyd Qpeak (cms)= .734

PEAK FLOW (cms)= .107 (i)

TIME TO PEAK (hrs)= 3.333

RUNOFF VOLUME (mm)= 7.025

TOTAL RAINFALL (mm)= 38.400

RUNOFF COEFFICIENT = .183

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

CALIB
STANDHYD (0107)
ID= 1 DT= 5.0 min

Area (ha)= 3.27
Total Imp(%)= 30.50
Dir. Conn.(%)= 20.00

Surface Area (ha)= 1.00
Dep. Storage (mm)= 1.00
Average Slope (%)= 2.00
Length (m)= 147.60
Mannings n = .013

IMPERVIOUS PERVIOUS (i)

1.00 2.27

3.00 3.00

3.00 3.00

320.00 3.92

.250 5.17

NOTE: RAINFALL WAS TRANSFORMED TO 5.0 MIN. TIME STEP.

TIME	RAIN	TIME	RAIN	TIME	RAIN	TIME	RAIN
hrs	mm/hr	hrs	mm/hr	hrs	mm/hr	hrs	mm/hr
.083	1.61	1.583	3.92	3.083	8.53	4.58	2.30
.167	1.61	1.667	3.92	3.167	8.52	4.67	2.30
.250	1.38	1.750	3.69	3.250	8.29	4.75	2.30
.333	1.38	1.833	3.69	3.333	8.29	4.83	2.30
.417	1.61	1.917	3.92	3.417	8.52	4.92	2.30
.500	1.61	2.000	3.92	3.500	8.52	5.00	2.30
.583	2.30	2.083	4.61	3.583	3.92	5.08	1.61
.667	2.30	2.167	4.61	3.667	3.92	5.17	1.61
.750	2.30	2.250	4.61	3.750	3.69	5.25	1.38

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Post-Dev-Con-SCS

TIME	RAIN	TIME	RAIN	TIME	RAIN	TIME	RAIN
hrs	mm/hr	hrs	mm/hr	hrs	mm/hr	hrs	mm/hr
.833	2.30	2.333	4.61	3.833	3.69	5.33	1.38
.917	2.30	2.417	4.61	3.917	3.92	5.42	1.61
1.000	2.30	2.500	4.61	4.000	3.92	5.50	1.61
1.083	2.30	2.583	23.04	4.083	3.00	5.58	1.61
1.167	2.30	2.667	23.04	4.167	3.00	5.67	1.61
1.250	2.30	2.750	41.47	4.250	3.23	5.75	1.38
1.333	2.30	2.833	41.47	4.333	3.23	5.83	1.38
1.417	2.30	2.917	59.90	4.417	3.00	5.92	1.61
1.500	2.30	3.000	59.90	4.500	3.00	6.00	1.61

Max. Eff. Inten. (mm/hr)= 59.90
over (min)= 5.00
Storage Coeff. (min)= 3.22 (ii)
Unit Hyd. Tpeak (min)= 5.00
Unit Hyd. peak (cms)= .27

TOTALS

PEAK FLOW (cms)= .11
TIME TO PEAK (hrs)= .07
RUNOFF VOLUME (mm)= 37.40
TOTAL RAINFALL (mm)= 38.40
RUNOFF COEFFICIENT = .97

***** WARNING: STORAGE COEFF. IS SMALLER THAN TIME STEP!
***** WARNING: FOR AREAS WITH IMPERVIOUS RATIOS BELOW 20%
YOU SHOULD CONSIDER SPLITTING THE AREA.

(i) CN PROCEDURE SELECTED FOR PREVIOUS LOSSES:
CN* = 86.0 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.

RESERVOIR (0104)
IN= 2--> OUT= 1
DT= 5.0 min

OUTFLOW	STORAGE	OUTFLOW	STORAGE
(cms)	(ha.m.)	(cms)	(ha.m.)
.0000	.0000	.0007	.0110
.0001	.0009	.0009	.0130
.0002	.0070	.0009	.0155
.0003	.0072	.0702	.0188
.0004	.0076	.1986	.0227
.0005	.0083	.3648	.0274
.0006	.0093	.5617	.0328

INFLOW: ID= 2 (0107)
OUTFLOW: ID= 1 (0104)

PEAK FLOW REDUCTION [Qout/Qin] (%) = 57.17
TIME SHIFT OF PEAK FLOW (min) = 45.00
MAXIMUM STORAGE USED (ha.m.) = .0189

ADD HYD (0103)
1 + 2 = 3

ID1= 1 (0105):
+ ID2= 2 (0104):

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Post-Dev-Con-SCS

ID= 3 (0103): 11.00 .161 3.33 10.76

NOTE: PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

ADD HYD (0106)
1 + 2 = 3

AREA (ha)= 1.01
OPEAK (cms)= .055
TPEAK (hrs)= 3.00
R.V. (mm)= 10.85
ID1= 1 (0102):
+ ID2= 2 (0103):
ID= 3 (0106):

NOTE: PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

** SIMULATION NUMBER: 2 **

MASS STORM
Ptotal= 50.50 mm

Filename: C:\visual otthymo files\4456\SCS II 6-hr.mst
Comments: SCS 6 HOUR TYPE II STORM DISTRIBUTION

Duration of storm = 6.00 hrs
Mass curve time step = 10.00 min

TIME	RAIN	TIME	RAIN	TIME	RAIN	TIME	RAIN
hrs	mm/hr	hrs	mm/hr	hrs	mm/hr	hrs	mm/hr
.17	2.12	1.67	5.15	3.17	11.21	4.67	3.03
.33	1.82	1.83	4.85	3.33	10.91	4.83	3.03
.50	2.12	2.00	5.15	3.50	11.21	5.00	3.03
.67	3.03	2.17	6.06	3.67	5.15	5.17	2.12
.83	3.03	2.33	6.06	3.83	4.85	5.33	1.82
1.00	3.03	2.50	6.06	4.00	5.15	5.50	2.12
1.17	3.03	2.67	30.30	4.17	3.94	5.67	2.12
1.33	3.03	2.83	34.54	4.33	4.24	5.83	1.82
1.50	3.03	3.00	78.78	4.50	3.94	6.00	2.12

CALIB
NASHYD (0102)
ID= 1 DT=10.0 min

Area (ha)= 1.01
Ia (mm)= 4.00
U.H. Tp(hrs)= .11
Curve Number (CN)= 82.0
of Linear Res.(N)= 3.00

Unit Hyd Qpeak (cms)= .346

PEAK FLOW (cms)= .088 (i)

TIME TO PEAK (hrs)= 3.000

RUNOFF VOLUME (mm)= 17.474

TOTAL RAINFALL (mm)= 50.500

RUNOFF COEFFICIENT = .346

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

CALIB
NASHYD (0105)

Area (ha)= 7.73
Curve Number (CN)= 67.0
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Post-Dev-Con-SCS
[ID= 1 DT=10.0 min] Ia (mm)= 5.00 # of Linear Res.(N)= 3.00
U.H. Tp(hrs)= .40
Unit Hyd Qpeak (cms)= .734
PEAK FLOW (cms)= .187 (i)
TIME TO PEAK (hrs)= 3.333
RUNOFF VOLUME (mm)= 12.112
TOTAL RAINFALL (mm)= 50.510
RUNOFF COEFFICIENT = .240

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

CALIB
STANDHYD (0107)
ID= 1 DT= 5.0 min
Area (ha)= 3.27
Total Imp(%)= 30.50 Dir. Conn.(%)= 20.00
IMPERVIOUS PERVIOUS (i)
Surface Area (ha)= 1.00 2.27
Dep. Storage (mm)= 1.00 3.00
Average Slope (%)= 2.00 3.00
Length (m)= 147.60 320.00
Mannings n = .013 .250

NOTE: RAINFALL WAS TRANSFORMED TO 5.0 MIN. TIME STEP.

--- TRANSFORMED HYETOGRAPH ---
TIME RAIN TIME RAIN TIME RAIN TIME RAIN
hrs mm/hr hrs mm/hr hrs mm/hr hrs mm/hr
.083 2.12 1.583 5.15 3.083 11.21 4.58 3.03
.167 2.12 1.667 5.15 3.167 11.21 4.67 3.03
.250 1.82 1.750 4.85 3.250 10.91 4.75 3.03
.333 1.82 1.833 4.85 3.333 10.91 4.83 3.03
.417 2.12 1.917 5.15 3.417 11.21 4.92 3.03
.500 2.12 2.000 5.15 3.500 11.21 5.00 3.03
.583 3.03 2.083 6.06 3.583 5.15 5.08 2.12
.667 3.03 2.167 6.06 3.667 5.15 5.17 2.12
.750 3.03 2.250 6.06 3.750 4.85 5.25 1.82
.833 3.03 2.333 6.06 3.833 4.85 5.33 1.82
.917 3.03 2.417 6.06 3.917 5.15 5.42 2.12
1.000 3.03 2.500 6.06 4.000 5.15 5.50 2.12
1.083 3.03 2.583 30.30 4.083 3.94 5.58 2.12
1.167 3.03 2.667 30.30 4.167 3.94 5.67 2.12
1.250 3.03 2.750 54.54 4.250 4.24 5.75 1.82
1.333 3.03 2.833 54.54 4.333 4.24 5.83 1.82
1.417 3.03 2.917 78.78 4.417 3.94 5.92 2.12
1.500 3.03 3.000 78.78 4.500 3.94 6.00 2.12
Max.Eff.Inten.(mm/hr)= 78.78 32.12
over (min)= 5.00 40.00
Storage Coeff. (min)= 2.88 (ii) 37.16 (iii)
Unit Hyd. Tpeak (min)= 5.00 40.00
Unit Hyd. peak (cms)= .28 .03
PEAK FLOW (cms)= .14 .12
TIME TO PEAK (hrs)= 3.00 3.50
RUNOFF VOLUME (mm)= 49.50 27.37
TOTAL RAINFALL (mm)= 50.50 50.50
RUNOFF COEFFICIENT = .98 .54
TOTALS (iii)
3.00 3.00
31.79 31.79
50.50 50.50
3.63 3.63

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Post-Dev-Con-SCS
***** WARNING: STORAGE COEFF. IS SMALLER THAN TIME STEP!
***** WARNING: FOR AREAS WITH IMPERVIOUS RATIOS BELOW 20%
YOU SHOULD CONSIDER SPLITTING THE AREA.
(i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
CN* = 86.0 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.

RESERVOIR (0104)
IN= 2---> OUT= 1
DT= 5.0 min
OUTFLOW (cms) STORAGE (ha.m.)
.0000 .0000 .0007 .0110
.0001 .0069 .0008 .0130
.0002 .0070 .0009 .0155
.0003 .0072 .0070 .0188
.0004 .0076 .1986 .0227
.0005 .0083 .3648 .0274
.0006 .0095 .5617 .0328
AREA (ha) QPEAK (cms) TPEAK (hrs) R.V. (mm)
INFLOW: ID= 2 (0107) 3.27 .19 3.00 31.79
OUTFLOW: ID= 1 (0104) 3.27 .14 3.08 29.61
PEAK FLOW REDUCTION [qout/qin] (%) = 73.98
TIME SHIFT OF PEAK FLOW (min) = 5.00
MAXIMUM STORAGE USED (ha.m.) = .0223

ADD HYD (0103)
1 + 2 = 3
ID= 1 (0105): 7.73 .187 3.33 12.11
+ ID= 2 (0104): 3.27 .137 3.08 29.61
ID = 3 (0103): 11.00 .300 3.33 17.32

NOTE: PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

ADD HYD (0106)
1 + 2 = 3
ID= 1 (0102): 1.01 .088 3.00 17.47
+ ID= 2 (0105): 11.00 .300 3.33 17.32
ID = 3 (0106): 12.01 .354 3.08 17.33

NOTE: PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

** SIMULATION NUMBER: 3 **

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Post-Dev-Con-SCS

MASS STORM
Ptotal= 58.60 mm
Filename: C:\visual otthymo files\4456\SCS II 6-hr.mst
Comments: SCS 6 HOUR TYPE II STORM DISTRIBUTION

Duration of storm = 6.00 hrs
Mass curve time step = 10.00 min

TIME RAIN TIME RAIN TIME RAIN TIME RAIN
hrs mm/hr hrs mm/hr hrs mm/hr hrs mm/hr
.17 2.46 1.67 5.98 3.17 13.01 4.67 3.52
.33 2.11 1.83 5.63 3.33 12.66 4.83 3.52
.50 2.46 2.00 5.98 3.50 13.01 5.00 3.52
.67 3.52 2.17 7.03 3.67 5.98 5.17 2.46
.83 3.52 2.33 7.03 3.83 5.63 5.33 2.11
1.00 3.52 2.50 7.03 4.00 5.98 5.50 2.46
1.17 3.52 2.67 35.16 4.17 4.57 5.67 2.46
1.33 3.52 2.83 63.29 4.33 4.92 5.83 2.11
1.50 3.52 3.00 91.42 4.50 4.57 6.00 2.46

CALIB
NASHYD (0102)
ID= 1 DT=10.0 min
Area (ha)= 1.01 Curve Number (CN)= 82.0
Ia (mm)= 4.00 # of Linear Res.(N)= 3.00
U.H. Tp(hrs)= .11

Unit Hyd Qpeak (cms)= .346

PEAK FLOW (cms)= .112 (i)
TIME TO PEAK (hrs)= 3.000
RUNOFF VOLUME (mm)= 22.324
TOTAL RAINFALL (mm)= 58.600
RUNOFF COEFFICIENT = .381

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

CALIB
NASHYD (0105)
ID= 1 DT=10.0 min
Area (ha)= 7.73 Curve Number (CN)= 67.0
Ia (mm)= 5.00 # of Linear Res.(N)= 3.00
U.H. Tp(hrs)= .40

Unit Hyd Qpeak (cms)= .734

PEAK FLOW (cms)= .250 (i)
TIME TO PEAK (hrs)= 3.333
RUNOFF VOLUME (mm)= 16.047
TOTAL RAINFALL (mm)= 58.600
RUNOFF COEFFICIENT = .274

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

CALIB
STANDHYD (0107)
ID= 1 DT= 5.0 min
Area (ha)= 3.27
Total Imp(%)= 30.50 Dir. Conn.(%)= 20.00
IMPERVIOUS PERVIOUS (i)
Surface Area (ha)= 1.00 2.27
Dep. Storage (mm)= 1.00 3.00

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Average Slope (%)= 2.00
Length (m)= 147.60 320.00
Mannings n = .013 .250

NOTE: RAINFALL WAS TRANSFORMED TO 5.0 MIN. TIME STEP.

--- TRANSFORMED HYETOGRAPH ---
TIME RAIN TIME RAIN TIME RAIN TIME RAIN
hrs mm/hr hrs mm/hr hrs mm/hr hrs mm/hr
.083 2.46 1.583 5.98 3.083 13.01 4.58 3.52
.167 2.46 1.667 5.98 3.167 13.01 4.67 3.52
.250 2.11 1.750 5.63 3.250 12.66 4.75 3.52
.333 2.11 1.833 5.63 3.333 12.66 4.83 3.52
.417 2.46 1.917 5.98 3.417 13.01 4.92 3.52
.500 2.46 2.000 5.98 3.500 13.01 5.00 3.52
.583 3.52 2.083 7.03 3.583 5.98 5.08 2.46
.667 3.52 2.167 7.03 3.667 5.98 5.17 2.46
.750 3.52 2.250 7.03 3.750 5.63 5.25 2.11
.833 3.52 2.333 7.03 3.833 5.63 5.33 2.11
.917 3.52 2.417 7.03 3.917 5.98 5.42 2.46
1.000 3.52 2.500 7.03 4.000 5.98 5.50 2.46
1.083 3.52 2.583 35.16 4.083 4.57 5.58 2.46
1.167 3.52 2.667 35.16 4.167 4.57 5.67 2.46
1.250 3.52 2.750 63.29 4.250 4.92 5.75 2.11
1.333 3.52 2.833 63.29 4.333 4.92 5.83 2.11
1.417 3.52 2.917 91.42 4.417 4.57 5.92 2.46
1.500 3.52 3.000 91.42 4.500 4.57 6.00 2.46

Max.Eff.Inten.(mm/hr)= 91.42 45.06
over (min)= 5.00 35.00
Storage Coeff. (min)= 2.72 (ii) 32.65 (iii)
Unit Hyd. Tpeak (min)= 5.00 35.00
Unit Hyd. peak (cms)= .29 .03

PEAK FLOW (cms)= .16 .16
TIME TO PEAK (hrs)= 3.00 3.42
RUNOFF VOLUME (mm)= 57.60 34.11
TOTAL RAINFALL (mm)= 58.60 58.60
RUNOFF COEFFICIENT = .98 .58
TOTALS (iii)
3.00 3.00
38.80 38.80
58.60 58.60
3.66 3.66

***** WARNING: STORAGE COEFF. IS SMALLER THAN TIME STEP!
***** WARNING: FOR AREAS WITH IMPERVIOUS RATIOS BELOW 20%
YOU SHOULD CONSIDER SPLITTING THE AREA.

(i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
CN* = 86.0 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.

RESERVOIR (0104)
IN= 2---> OUT= 1
DT= 5.0 min
OUTFLOW (cms) STORAGE (ha.m.)
.0000 .0000 .0007 .0110
.0001 .0069 .0008 .0130
.0002 .0070 .0009 .0155
.0003 .0072 .0070 .0188
.0004 .0076 .1986 .0227
.0005 .0083 .3648 .0274
Page 8

Post-Dev-Con-SCS
 .0006 .0095 .5617 .0328
 AREA QPEAK TPEAK R.V.
 (ha) (cms) (hrs) (mm)
 INFLOW : ID= 2 (0107) 3.27 .24 3.00 38.80
 OUTFLOW: ID= 1 (0104) 3.27 .19 3.08 36.63

PEAK FLOW REDUCTION [qout/qin](%) = 79.55
 TIME SHIFT OF PEAK FLOW (min) = 5.00
 MAXIMUM STORAGE USED (ha.m.) = .0240

ADD HYD (0103)
 1 + 2 = 3
 ID1= 1 (0105): 7.73 .250 3.33 16.05
 + ID2= 2 (0104): 3.27 .188 3.08 36.63
 ID = 3 (0103): 11.00 .414 3.33 22.17

NOTE: PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

ADD HYD (0106)
 1 + 2 = 3
 ID1= 1 (0102): 1.01 .112 3.00 22.32
 + ID2= 2 (0103): 11.00 .414 3.33 22.17
 ID = 3 (0106): 12.01 .475 3.08 22.18

NOTE: PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

** SIMULATION NUMBER: 4 **

MASS STORM Ptotal= 68.70 mm
 Filename: C:\visual otthymo files\4456\SCS II 6-hr.mst
 Comments: SCS 6 HOUR TYPE II STORM DISTRIBUTION

Duration of storm = 6.00 hrs
 Mass curve time step = 10.00 min

TIME	RAIN	TIME	RAIN	TIME	RAIN	TIME	RAIN
hrs	mm/hr	hrs	mm/hr	hrs	mm/hr	hrs	mm/hr
.17	2.89	1.67	7.01	3.17	15.25	4.67	4.12
.33	2.47	1.83	6.60	3.33	14.84	4.83	4.12
.50	2.89	2.00	7.01	3.50	15.25	5.00	4.12
.67	4.12	2.17	8.24	3.67	7.01	5.17	2.89
.83	4.12	2.33	8.24	3.83	6.60	5.33	2.47
1.00	4.12	2.50	8.24	4.00	7.01	5.50	2.89
1.17	4.12	2.67	41.22	4.17	5.36	5.67	2.89
1.33	4.12	2.83	74.20	4.33	5.77	5.83	2.47
1.50	4.12	3.00	107.17	4.50	5.36	6.00	2.89

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Post-Dev-Con-SCS
 CALIB NASHYD (0102) Area (ha)= 1.01 Curve Number (CN)= 82.0
 ID= 1 DT=10.0 min Ia (mm)= 4.00 # of Linear Res.(N)= 3.00
 U.H. Tp(hrs)= .11

Unit Hyd Qpeak (cms)= .346
 PEAK FLOW (cms)= .144 (i)
 TIME TO PEAK (hrs)= 3.000
 RUNOFF VOLUME (mm)= 28.718
 TOTAL RAINFALL (mm)= 68.700
 RUNOFF COEFFICIENT = .418

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

CALIB NASHYD (0105) Area (ha)= 7.73 Curve Number (CN)= 67.0
 ID= 1 DT=10.0 min Ia (mm)= 5.00 # of Linear Res.(N)= 3.00
 U.H. Tp(hrs)= .40

Unit Hyd Qpeak (cms)= .734
 PEAK FLOW (cms)= .336 (i)
 TIME TO PEAK (hrs)= 3.333
 RUNOFF VOLUME (mm)= 21.451
 TOTAL RAINFALL (mm)= 68.700
 RUNOFF COEFFICIENT = .312

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

CALIB STANDHYD (0107) Area (ha)= 3.27 Dir. Conn.(%)= 20.00
 ID= 1 DT= 5.0 min Total Imp(%)= 30.50

Surface Area (ha)= 1.00 IMPERVIOUS PERVIOUS (i)
 Dep. Storage (mm)= 1.00 3.00
 Average Slope (%)= 2.00 3.00
 Length (m)= 147.60 320.00
 Mannings n = .013 .250

NOTE: RAINFALL WAS TRANSFORMED TO 5.0 MIN. TIME STEP.

--- TRANSFORMED HYETOGRAPH ---			
TIME	RAIN	TIME	RAIN
hrs	mm/hr	hrs	mm/hr
.17	2.89	1.67	7.01
.33	2.47	1.83	6.60
.50	2.89	2.00	7.01
.67	4.12	2.17	8.24
.83	4.12	2.33	8.24
1.00	4.12	2.50	8.24
1.17	4.12	2.67	41.22
1.33	4.12	2.83	74.20
1.50	4.12	3.00	107.17

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Post-Dev-Con-SCS
 1.083 4.12 2.583 41.22 4.083 5.36 5.58 2.89
 1.167 4.12 2.667 41.22 4.167 5.36 5.67 2.89
 1.250 4.12 2.750 74.20 4.250 5.77 5.75 2.47
 1.333 4.12 2.833 74.20 4.333 5.77 5.83 2.47
 1.417 4.12 2.917 107.17 4.417 5.36 5.92 2.89
 1.500 4.12 3.000 107.17 4.500 5.36 6.00 2.89

Max. Eff. Inten. (mm/hr)= 107.17 56.93
 over (min)= 5.00 30.00
 Storage Coeff. (min)= 2.55 (ii) 29.81 (ii)
 Unit Hyd. Tpeak (min)= 5.00 30.00
 Unit Hyd. peak (cms)= .29 .04
 PEAK FLOW (cms)= .19 .22
 TIME TO PEAK (hrs)= 3.00 3.33
 RUNOFF VOLUME (mm)= 67.70 42.82
 TOTAL RAINFALL (mm)= 68.70 68.70
 RUNOFF COEFFICIENT = .99 .62
 TOTALS
 .309 (iii)
 3.00
 47.79
 68.70
 .70

***** WARNING: STORAGE COEFF. IS SMALLER THAN TIME STEP!
 ***** WARNING: FOR AREAS WITH IMPERVIOUS RATIOS BELOW 20%
 YOU SHOULD CONSIDER SPLITTING THE AREA.

(i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
 CN* = 86.0 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.

RESERVOIR (0104)
 IN= 2--> OUT= 1
 DT= 5.0 min
 OUTFLOW STORAGE OUTFLOW STORAGE
 (cms) (ha.m.) (cms) (ha.m.)
 .0000 .0000 .0007 .0110
 .0001 .0069 .0008 .0130
 .0002 .0070 .0009 .0155
 .0003 .0072 .0010 .0188
 .0004 .0076 .0011 .0227
 .0005 .0083 .0012 .0274
 .0006 .0095 .0013 .0328
 AREA QPEAK TPEAK R.V.
 (ha) (cms) (hrs) (mm)
 INFLOW : ID= 2 (0107) 3.27 .31 3.00 47.79
 OUTFLOW: ID= 1 (0104) 3.27 .26 3.08 45.62

PEAK FLOW REDUCTION [qout/qin](%) = 82.60
 TIME SHIFT OF PEAK FLOW (min) = 5.00
 MAXIMUM STORAGE USED (ha.m.) = .0258

ADD HYD (0103)
 1 + 2 = 3
 ID1= 1 (0105): 7.73 .336 3.33 21.45
 + ID2= 2 (0104): 3.27 .255 3.08 45.62
 ID = 3 (0103): 11.00 .571 3.33 28.64

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Post-Dev-Con-SCS
 NOTE: PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

ADD HYD (0106)
 1 + 2 = 3
 ID1= 1 (0102): 1.01 .144 3.00 28.72
 + ID2= 2 (0103): 11.00 .571 3.33 28.64
 ID = 3 (0106): 12.01 .641 3.00 28.64

NOTE: PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

** SIMULATION NUMBER: 5 **

MASS STORM Ptotal= 76.30 mm
 Filename: C:\visual otthymo files\4456\SCS II 6-hr.mst
 Comments: SCS 6 HOUR TYPE II STORM DISTRIBUTION

Duration of storm = 6.00 hrs
 Mass curve time step = 10.00 min

TIME	RAIN	TIME	RAIN	TIME	RAIN	TIME	RAIN
hrs	mm/hr	hrs	mm/hr	hrs	mm/hr	hrs	mm/hr
.17	3.20	1.67	7.78	3.17	16.94	4.67	4.58
.33	2.75	1.83	7.32	3.33	16.48	4.83	4.58
.50	3.20	2.00	7.78	3.50	16.94	5.00	4.58
.67	4.58	2.17	9.16	3.67	7.78	5.17	3.20
.83	4.58	2.33	9.16	3.83	7.32	5.33	2.75
1.00	4.58	2.50	9.16	4.00	7.78	5.50	3.20
1.17	4.58	2.67	45.78	4.17	5.95	5.67	3.20
1.33	4.58	2.83	82.40	4.33	6.41	5.83	2.75
1.50	4.58	3.00	119.03	4.50	5.95	6.00	3.20

CALIB NASHYD (0102) Area (ha)= 1.01 Curve Number (CN)= 82.0
 ID= 1 DT=10.0 min Ia (mm)= 4.00 # of Linear Res.(N)= 3.00
 U.H. Tp(hrs)= .11

Unit Hyd Qpeak (cms)= .346
 PEAK FLOW (cms)= .168 (i)
 TIME TO PEAK (hrs)= 3.000
 RUNOFF VOLUME (mm)= 33.734
 TOTAL RAINFALL (mm)= 76.300
 RUNOFF COEFFICIENT = .442

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

CALIB NASHYD (0105) Area (ha)= 7.73 Curve Number (CN)= 67.0
 ID= 1 DT=10.0 min Ia (mm)= 5.00 # of Linear Res.(N)= 3.00
 U.H. Tp(hrs)= .40

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Unit Hyd Qpeak (cms)= .734 Post-Dev-Con-SCS

PEAK FLOW (cms)= .407 (i)
TIME TO PEAK (hrs)= 3.167
RUNOFF VOLUME (mm)= 25.835
TOTAL RAINFALL (mm)= 76.300
RUNOFF COEFFICIENT = .339

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

CALIB
STANDHYD (0107)
ID= 1 DT= 5.0 min

Area (ha)= 3.27
Total Imp(%)= 30.50 Dir. Conn.(%)= 20.00

IMPERVIOUS PERVIOUS (i)
Surface Area (ha)= 1.00 2.27
Dep. Storage (mm)= 1.00 3.00
Average Slope (%)= 2.00 3.00
Length (m)= 147.60 320.00
Mannings n = .013 .250

NOTE: RAINFALL WAS TRANSFORMED TO 5.0 MIN. TIME STEP.

TIME		RAIN		TIME		RAIN		TIME		RAIN	
hrs	mm/hr	hrs	mm/hr	hrs	mm/hr	hrs	mm/hr	hrs	mm/hr	hrs	mm/hr
.083	3.20	1.583	7.78	3.083	16.94	4.58	4.58				
.167	3.20	1.667	7.78	3.167	16.94	4.67	4.58				
.250	2.75	1.750	7.32	3.250	16.48	4.75	4.58				
.333	2.75	1.833	7.32	3.333	16.48	4.83	4.58				
.417	3.20	1.917	7.78	3.417	16.94	4.92	4.58				
.500	3.20	2.000	7.78	3.500	16.94	5.00	4.58				
.583	4.58	2.083	9.16	3.583	7.78	5.08	3.20				
.667	4.58	2.167	9.16	3.667	7.78	5.17	3.20				
.750	4.58	2.250	9.16	3.750	7.32	5.25	2.75				
.833	4.58	2.333	9.16	3.833	7.32	5.33	2.75				
.917	4.58	2.417	9.16	3.917	7.78	5.42	3.20				
1.000	4.58	2.500	9.16	4.000	7.78	5.50	3.20				
1.083	4.58	2.583	45.78	4.083	5.95	5.58	3.20				
1.167	4.58	2.667	45.78	4.167	5.95	5.67	3.20				
1.250	4.58	2.750	82.40	4.250	6.41	5.75	2.75				
1.333	4.58	2.833	82.40	4.333	6.41	5.83	2.75				
1.417	4.58	2.917	119.03	4.417	5.95	5.92	3.20				
1.500	4.58	3.000	119.03	4.500	5.95	6.00	3.20				

Max. Eff. Inten. (mm/hr)= 119.03 74.28
over (min)= 5.00 30.00
Storage Coeff. (min)= 2.44 (ii) 26.95 (ii)
Unit Hyd. Tpeak (min)= 5.00 30.00
Unit Hyd. peak (cms)= .30 .04

PEAK FLOW (cms)= .22 .27 .359 (iii)
TIME TO PEAK (hrs)= 3.00 3.33 3.00
RUNOFF VOLUME (mm)= 75.30 49.54 54.69
TOTAL RAINFALL (mm)= 76.30 76.30 76.30
RUNOFF COEFFICIENT = .99 .65 .72

***** WARNING: STORAGE COEFF. IS SMALLER THAN TIME STEP!
***** WARNING: FOR AREAS WITH IMPERVIOUS RATIOS BELOW 20%
YOU SHOULD CONSIDER SPLITTING THE AREA.
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Post-Dev-Con-SCS

- (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
CN* = 86.0 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.

RESERVOIR (0104)
IN= 2---> OUT= 1
DT= 5.0 min

OUTFLOW (cms)	STORAGE (ha.m.)	OUTFLOW (cms)	STORAGE (ha.m.)
.0000	.0000	.0007	.0110
.0001	.0069	.0008	.0130
.0002	.0070	.0009	.0155
.0003	.0072	.0009	.0188
.0004	.0076	.0007	.0186
.0005	.0083	.0006	.0274
.0006	.0095	.0005	.0328

AREA (ha) QPEAK (cms) TPEAK (hrs) R.V. (mm)
INFLOW : ID= 2 (0107) 3.27 .36 3.00 54.69
OUTFLOW : ID= 1 (0104) 3.27 .30 3.08 52.52

PEAK FLOW REDUCTION [qout/qin] (%) = 83.55
TIME SHIFT OF PEAK FLOW (min) = 5.00
MAXIMUM STORAGE USED (ha.m.) = .0273

ADD HYD (0103)
1 + 2 = 3

AREA (ha) QPEAK (cms) TPEAK (hrs) R.V. (mm)
ID1= 1 (0105): 7.73 .407 3.17 25.84
+ ID2= 2 (0104): 3.27 .300 3.08 52.52
ID = 3 (0103): 11.00 .691 3.33 33.77

NOTE: PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

ADD HYD (0106)
1 + 2 = 3

AREA (ha) QPEAK (cms) TPEAK (hrs) R.V. (mm)
ID1= 1 (0102): 1.01 .168 3.00 33.73
+ ID2= 2 (0103): 11.00 .691 3.33 33.77
ID = 3 (0106): 12.01 .764 3.08 33.76

NOTE: PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

** SIMULATION NUMBER: 6 **

MASS STORM | Filename: C:\visual otthymo files\4456\SCS II 6-hr.mst
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| Ptotal= 83.80 mm | Post-Dev-Con-SCS
Comments: SCS 6 HOUR TYPE II STORM DISTRIBUTION

Duration of storm = 6.00 hrs
Mass curve time step = 10.00 min

TIME		RAIN		TIME		RAIN		TIME		RAIN	
hrs	mm/hr	hrs	mm/hr	hrs	mm/hr	hrs	mm/hr	hrs	mm/hr	hrs	mm/hr
.17	3.52	1.67	8.55	3.17	18.60	4.67	5.03				
.33	3.02	1.83	8.04	3.33	18.10	4.83	5.03				
.50	3.52	2.00	8.55	3.50	18.60	5.00	5.03				
.67	5.03	2.17	10.06	3.67	8.55	5.17	3.52				
.83	5.03	2.33	10.06	3.83	8.04	5.33	3.02				
1.00	5.03	2.50	10.06	4.00	8.55	5.50	3.52				
1.17	5.03	2.67	50.28	4.17	6.54	5.67	3.52				
1.33	5.03	2.83	90.50	4.33	7.04	5.83	3.02				
1.50	5.03	3.00	130.73	4.50	6.54	6.00	3.52				

CALIB
NASHYD (0102)
ID= 1 DT=10.0 min

Area (ha)= 1.01 Curve Number (CN)= 82.0
Ia (mm)= 4.00 # of Linear Res.(N)= 3.00
U.H. Tp(hrs)= .11

Unit Hyd Qpeak (cms)= .346
PEAK FLOW (cms)= .193 (i)
TIME TO PEAK (hrs)= 3.000
RUNOFF VOLUME (mm)= 38.822
TOTAL RAINFALL (mm)= 83.800
RUNOFF COEFFICIENT = .463

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

CALIB
NASHYD (0105)
ID= 1 DT=10.0 min

Area (ha)= 7.73 Curve Number (CN)= 67.0
Ia (mm)= 5.00 # of Linear Res.(N)= 3.00
U.H. Tp(hrs)= .40

Unit Hyd Qpeak (cms)= .734
PEAK FLOW (cms)= .482 (i)
TIME TO PEAK (hrs)= 3.167
RUNOFF VOLUME (mm)= 30.396
TOTAL RAINFALL (mm)= 83.800
RUNOFF COEFFICIENT = .363

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

CALIB
STANDHYD (0107)
ID= 1 DT= 5.0 min

Area (ha)= 3.27
Total Imp(%)= 30.50 Dir. Conn.(%)= 20.00

IMPERVIOUS PERVIOUS (i)
Surface Area (ha)= 1.00 2.27
Dep. Storage (mm)= 1.00 3.00
Average Slope (%)= 2.00 3.00
Length (m)= 147.60 320.00
Mannings n = .013 .250

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Post-Dev-Con-SCS

NOTE: RAINFALL WAS TRANSFORMED TO 5.0 MIN. TIME STEP.

TIME		RAIN		TIME		RAIN		TIME		RAIN	
hrs	mm/hr	hrs	mm/hr	hrs	mm/hr	hrs	mm/hr	hrs	mm/hr	hrs	mm/hr
.083	3.52	1.583	8.55	3.083	18.60	4.58	5.03				
.167	3.52	1.667	8.55	3.167	18.60	4.67	5.03				
.250	3.02	1.750	8.04	3.250	18.10	4.75	5.03				
.333	3.02	1.833	8.04	3.333	18.10	4.83	5.03				
.417	3.52	1.917	8.55	3.417	18.60	4.92	5.03				
.500	3.52	2.000	8.55	3.500	18.60	5.00	5.03				
.583	5.03	2.083	10.06	3.583	8.55	5.08	3.52				
.667	5.03	2.167	10.06	3.667	8.55	5.17	3.52				
.750	5.03	2.250	10.06	3.750	8.04	5.25	3.02				
.833	5.03	2.333	10.06	3.833	8.04	5.33	3.02				
.917	5.03	2.417	10.06	3.917	8.55	5.42	3.52				
1.000	5.03	2.500	10.06	4.000	8.55	5.50	3.52				
1.083	5.03	2.583	50.28	4.083	6.54	5.58	3.52				
1.167	5.03	2.667	50.28	4.167	6.54	5.67	3.52				
1.250	5.03	2.750	90.50	4.250	7.04	5.75	3.02				
1.333	5.03	2.833	130.73	4.333	7.04	5.83	3.02				
1.417	5.03	2.917	130.73	4.417	6.54	5.92	3.52				
1.500	5.03	3.000	130.73	4.500	6.54	6.00	3.52				

Max. Eff. Inten. (mm/hr)= 130.73 84.44
over (min)= 5.00 30.00
Storage Coeff. (min)= 2.35 (ii) 25.64 (ii)
Unit Hyd. Tpeak (min)= 5.00 30.00
Unit Hyd. peak (cms)= .30 .04

PEAK FLOW (cms)= .24 .31 .407 (iii)
TIME TO PEAK (hrs)= 3.00 3.33 3.00
RUNOFF VOLUME (mm)= 82.80 56.29 61.59
TOTAL RAINFALL (mm)= 83.80 83.80 83.80
RUNOFF COEFFICIENT = .99 .67 .73

***** WARNING: STORAGE COEFF. IS SMALLER THAN TIME STEP!
***** WARNING: FOR AREAS WITH IMPERVIOUS RATIOS BELOW 20%
YOU SHOULD CONSIDER SPLITTING THE AREA.

- (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
CN* = 86.0 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.

RESERVOIR (0104)
IN= 2---> OUT= 1
DT= 5.0 min

OUTFLOW (cms)	STORAGE (ha.m.)	OUTFLOW (cms)	STORAGE (ha.m.)
.0000	.0000	.0007	.0110
.0001	.0069	.0008	.0130
.0002	.0070	.0009	.0155
.0003	.0072	.0009	.0188
.0004	.0076	.0007	.0186
.0005	.0083	.0006	.0274
.0006	.0095	.0005	.0328

AREA (ha) QPEAK (cms) TPEAK (hrs) R.V. (mm)
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Post-Dev-Con-SCS
 INFLOW : ID= 2 (0107) (ha) (cms) (hrs) (mm)
 3.27 .41 3.00 61.59
 OUTFLOW: ID= 1 (0104) 3.27 .34 3.08 59.42

PEAK FLOW REDUCTION [qout/qin](%)= 84.01
 TIME SHIFT OF PEAK FLOW (min)= 5.00
 MAXIMUM STORAGE USED (ha.m.)= .0287

```

-----
| ADD HYD (0103) |
| 1 + 2 = 3 |
-----
ID1= 1 (0105): AREA QPEAK TPEAK R.V.
              (ha) (cms) (hrs) (mm)
+ ID2= 2 (0104): 7.73 .482 3.17 30.40
                  3.27 .342 3.08 59.42
-----
ID = 3 (0103): 11.00 .809 3.33 39.02
  
```

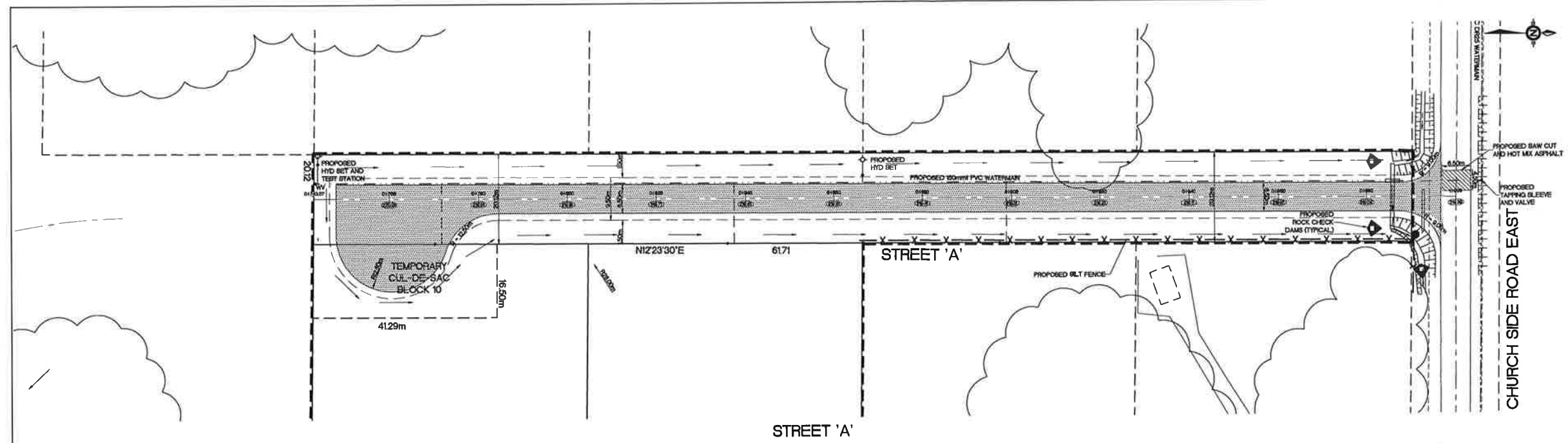
NOTE: PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

```

-----
| ADD HYD (0106) |
| 1 + 2 = 3 |
-----
ID1= 1 (0102): AREA QPEAK TPEAK R.V.
              (ha) (cms) (hrs) (mm)
+ ID2= 2 (0103): 1.01 .193 3.00 38.82
                  11.00 .809 3.33 39.02
-----
ID = 3 (0106): 12.01 .888 3.08 39.00
  
```

NOTE: PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

FINISH



KEY PLAN

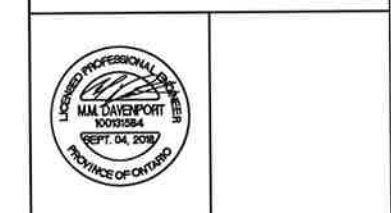
NO.	REVISIONS	DATE	BY	APP'D
1	REVISED LOT LAYOUT	31/08/18	JC	MJD

BENCHMARKS

BM	ELEV.
BM 1	216.32
NAIL IN EAST FACE OF HYDRO POLE LOCATED AT INTERSECTION OF SUBJECT PROPERTY ROADWAY AND CHURCHSIDE ROAD EAST.	
BM 2	225.320
SPIKE IN FACE OF HYDRO POLE LOCATED AT INTERSECTION OF GREY COUNTY ROAD #1 AND CHURCHSIDE ROAD EAST.	
BM 3	219.04
NAIL IN FACE OF HYDRO POLE 20.0m EAST TO NORTHWEST CORNER OF THE SUBJECT PROPERTY, SOUTH SIDE OF CHURCHSIDE ROAD EAST.	

LEGEND

---	PROPERTY LIMIT
---	PHASE LIMIT
---	NEW SANITARY SEWER
---	NEW STORM SEWER
---	NEW WATERMAIN
---	PROPOSED DRAINAGE
100.00	PROPOSED LOT CORNER ELEVATION
100.00	PROPOSED ELEVATION AT HOUSE
100.00	PROPOSED DRAVE ELEVATION
---	EXISTING DRAINAGE
---	EXISTING SANITARY SEWER
---	EXISTING STORM SEWER
---	EXISTING WATERMAIN
100.00	EXISTING LOT CORNER ELEVATION
100.00	EXISTING ELEVATION TO REMAIN THE SAME
-X-	PROPOSED SILT FENCE

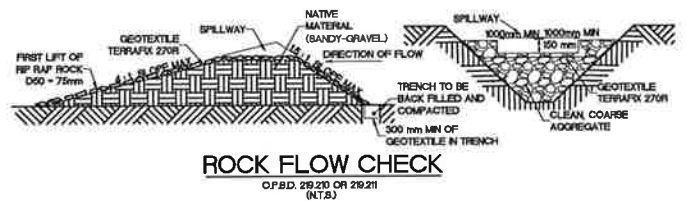
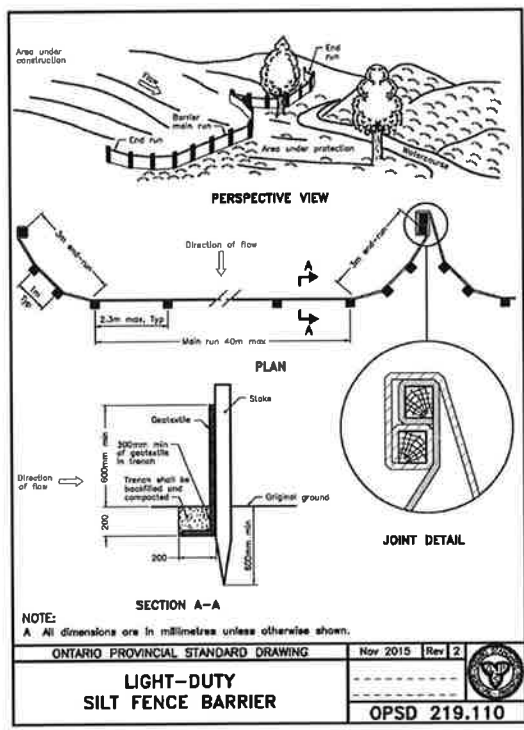
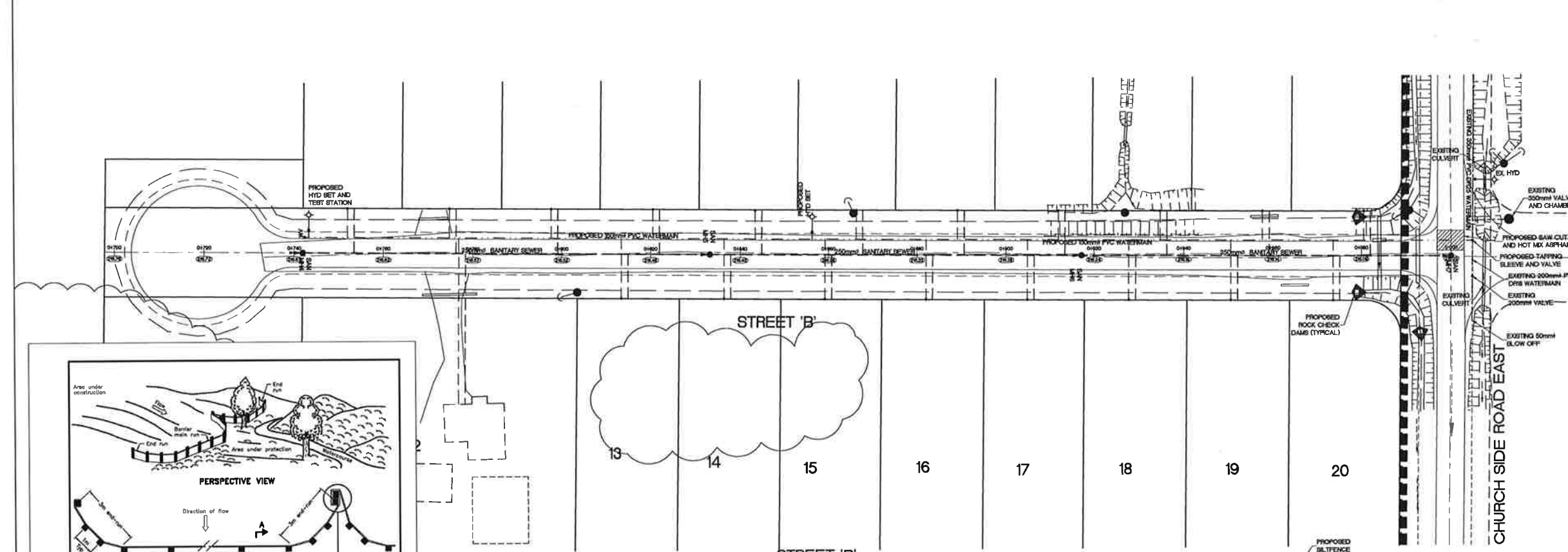


M.J. DAVENPORT & ASSOCIATES LIMITED
 P.O. BOX 2452 STN MAIN
 LOCATION: 2010 KESWICK ROAD
 OTTAWA, ONTARIO
 K9J 7Y8
 TEL: (705) 745-8878
 FAX: (705) 745-7328

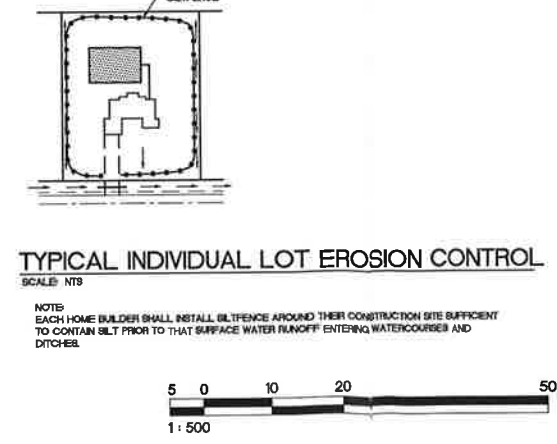
DAVENPORT SUBDIVISION
 PART OF LOT 27
 CONCESSION III
 TOWNSHIP OF SARAWAK
 TOWNSHIP OF GEORGIAN BLUFFS

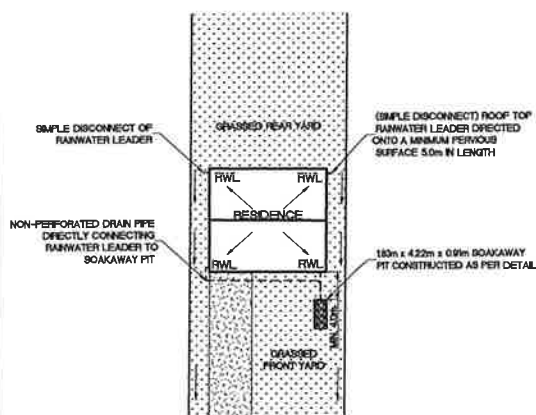
EROSION AND SEDIMENT CONTROL PLAN

DESIGNED BY:	M.J. DAVENPORT	SCALE:	1:500
DRAWN BY:	J. CLARK	DATE:	NOVEMBER, 2017
PROJECT NO.:	06-D-3969	DRWG. NO.:	3969-EC1

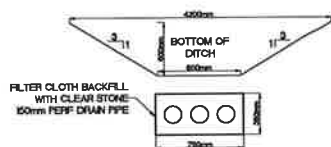


- NOTES:**
- SILT FENCE SHALL BE ENVIRONMENTAL MANUFACTURED BY MIRAIR INC. AMOCO 1280/225 SILT STOP OR APPROVED EQUAL.
 - TEMPORARY EROSION CONTROL MEASURES SHALL BE INSTALLED AND INSPECTED BEFORE ANY SITE WORK COMMENCE.
 - MONITORING OF THE EROSION AND SEDIMENT CONTROL MEASURES DURING CONSTRUCTION SHALL BE INSPECTED FOLLOWING RAINFALL EVENTS AND MAINTENANCE CARRIED OUT WITHIN 48 HOURS ON ANY PART OF THE FACILITIES REQUIRING REPAIRS.
 - TOPSOIL PILES REMAINING IN PLACE LONGER THAN 30 DAYS SHALL BE REEDED OR OTHERWISE STABILIZED TO PREVENT EROSION.
 - PROGRESSIVE STRIPPING AND GRADING TO ENSURE MINIMUM DURATION OF EXPOSED SOIL AREAS IS REQUIRED TO THE EXTENT PRACTICAL.
 - TEMPORARY EROSION CONTROL MEASURES SHALL BE MAINTAINED UNTIL CONSTRUCTION HAS BEEN COMPLETED AND BALANCE OF SITE VEGETATED AND STABILIZED.
 - THE PROPOSED DITCH UNDERDRAIN IN THE MUNICIPAL ROW SHALL BE INSTALLED AFTER MUNICIPAL SERVICES HAVE BEEN CONSTRUCTED. THE DOUBLE LAYER OF SILT FENCE SHALL REMAIN IN THE DITCH UNTIL THE UNDERDRAIN HAS BEEN CONSTRUCTED AND THE PROPOSED MUNICIPAL ROAD HAS BEEN PAVED.

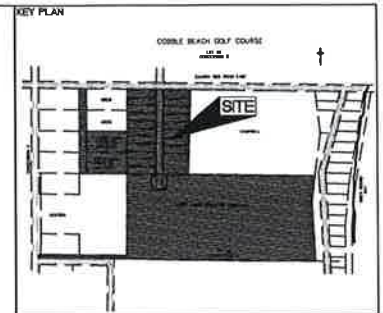
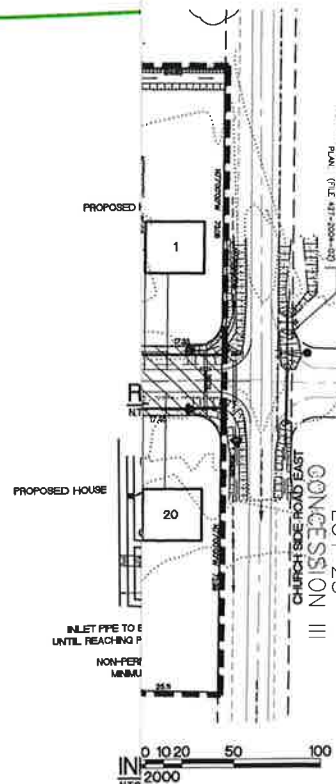




TYPICAL LOT LEVEL SWM CONTROLS
SCALE = 1:500



TYPICAL DITCH SECTION WITH FRENCH DRAIN



NO.	REVISIONS	DATE	BY	APP'D
1	REVISED TO 20 LOT LAYOUT	23/06/18	JC	MJD

BENCHMARKS

BM 1 ELEV. 216.32

NAIL IN EAST FACE OF HYDRO POLE LOCATED AT INTERSECTION OF SUBJECT PROPERTY ROADWAY AND CHURCHSIDE ROAD EAST.

BM 2 ELEV. 225.320

SPIKE IN FACE OF HYDRO POLE LOCATED AT INTERSECTION OF GREY COUNTY ROAD #1 AND CHURCHSIDE ROAD EAST.

BM 3 ELEV. 219.04

NAIL IN FACE OF HYDRO POLE 20.8m EAST TO NORTHWEST CORNER OF THE SUBJECT PROPERTY, SOUTH SIDE OF CHURCHSIDE ROAD EAST.

LEGEND

- PROPERTY LIMIT
- PHASE LIMIT
- NEW SANITARY SEWER
- NEW STORM SEWER
- NEW WATERMAIN
- PROPOSED DRAINAGE
- 100.00 PROPOSED LOT CORNER ELEVATION
- 100.00 PROPOSED ELEVATION AT HOUSE
- 100.00 PROPOSED SHALE ELEVATION
- EXISTING DRAINAGE
- EXISTING SANITARY SEWER
- EXISTING STORM SEWER
- EXISTING WATERMAIN
- 100.00 EXISTING LOT CORNER ELEVATION
- *100.00 EXISTING ELEVATION TO REMAIN THE SAME



M.J. DAVENPORT
& ASSOCIATES LIMITED

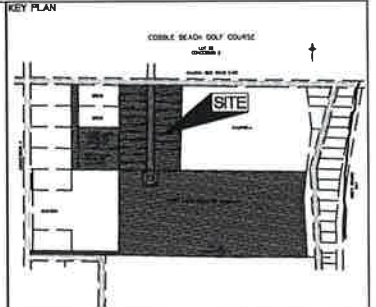
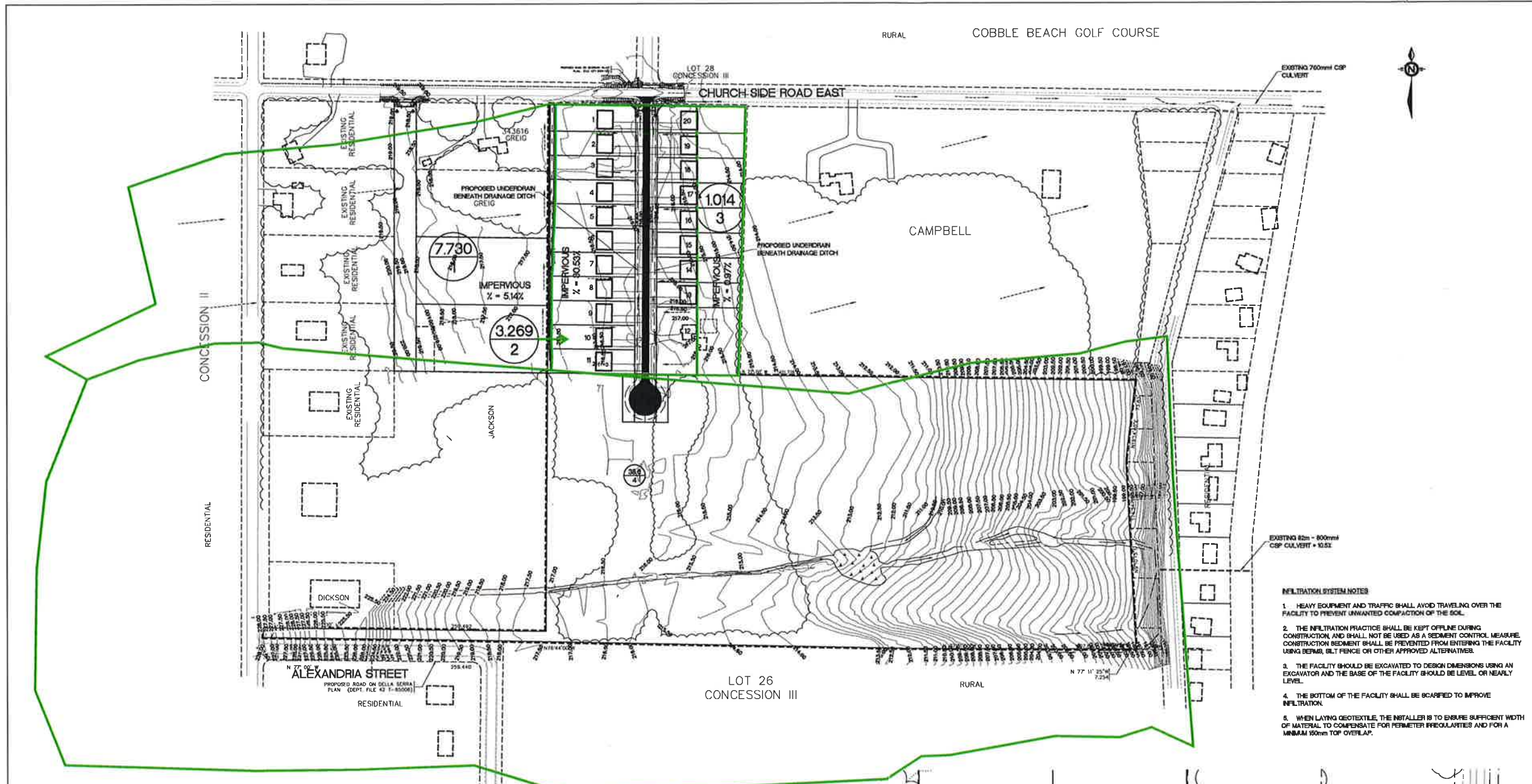
P.O. BOX 2452 STN MAIN TEL : (705) 745-8678
LOCATION: 2010 KEENE ROAD FAX : (705) 745-7328
OTONABEE, ONTARIO
K9J 7Y8

DAVENPORT SUBDIVISION
PART OF LOT 27
CONCESSION III
TOWNSHIP OF SARAWAK
TOWNSHIP OF GEORGIAN BLUFFS

**POST-DEVELOPMENT
SUB-WATERSHED AREA**

DESIGNED BY: M.J. DAVENPORT
DRAWN BY: J. CLARK
DATE: APRIL, 2017
PROJECT NO.: 06-D-3969

SCALE: 1:2000
DWG. NO.: 3969-SW2A



NO.	REVISIONS	DATE	BY	APPD
1	REVISED TO 20 LOT LAYOUT	23/08/18	JC	MJD

BENCHMARKS

BM 1	ELEV. 216.32
NAIL IN EAST FACE OF HYDRO POLE LOCATED AT INTERSECTION OF SUBJECT PROPERTY ROADWAY AND CHURCHSIDE ROAD EAST.	
BM 2	ELEV. 225.320
SPIKE IN FACE OF HYDRO POLE LOCATED AT INTERSECTION OF GREY COUNTY ROAD #1 AND CHURCHSIDE ROAD EAST.	
BM 3	ELEV. 219.04
NAIL IN FACE OF HYDRO POLE 20.0m EAST TO NORTHWEST CORNER OF THE SUBJECT PROPERTY, SOUTH SIDE OF CHURCHSIDE ROAD EAST.	

LEGEND

---	PROPERTY LIMIT
---	PHASE LIMIT
---	NEW SANITARY SEWER
---	NEW STORM SEWER
---	NEW WATERMAIN
---	PROPOSED DRAINAGE
100.00	PROPOSED LOT CORNER ELEVATION
100.00	PROPOSED ELEVATION AT HOUSE
100.00	PROPOSED SWALE ELEVATION
---	EXISTING DRAINAGE
---	EXISTING SANITARY SEWER
---	EXISTING STORM SEWER
---	EXISTING WATERMAIN
100.00	EXISTING LOT CORNER ELEVATION
+100.00	EXISTING ELEVATION TO REMAIN THE SAME



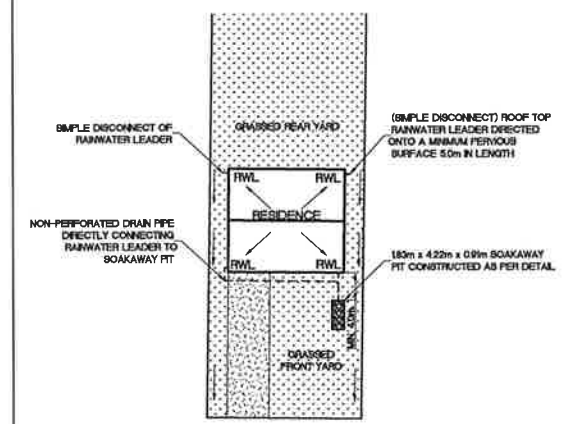
M.J. DAVENPORT & ASSOCIATES LIMITED

P.O. BOX 2452 5TH MAIN TEL: (705) 745-6678
LOCATION: 2010 KENNEDY ROAD FAX: (705) 745-7322
OTTAWA, ONTARIO
K2J 7Y8

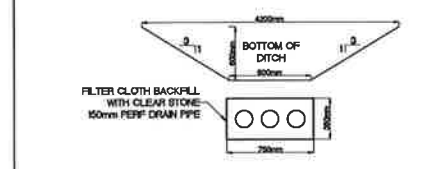
DAVENPORT SUBDIVISION
PART OF LOT 27
CONCESSION III
TOWNSHIP OF SARAWAK
TOWNSHIP OF GEORGIAN BLUFFS

**POST-DEVELOPMENT
SUB-WATERSHED AREA**

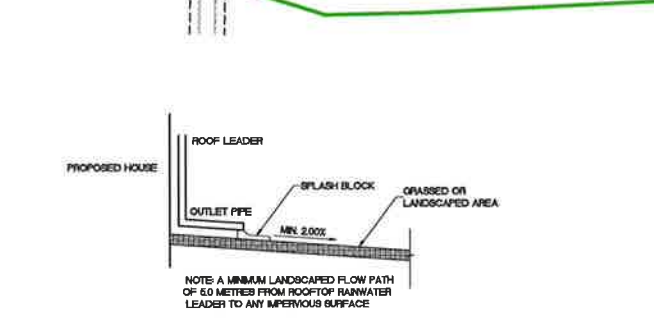
DESIGNED BY:	M.J. DAVENPORT	SCALE:	1:2000
DRAWN BY:	J. CLARK		
DATE:	APRIL, 2017		
PROJECT NO.:	09-D-3969		3969-SW2A



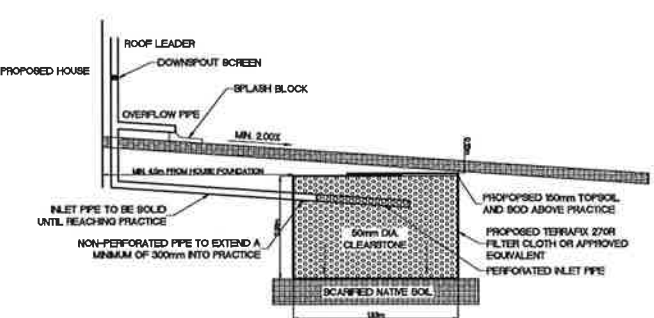
TYPICAL LOT LEVEL SWM CONTROLS
SCALE = 1:500



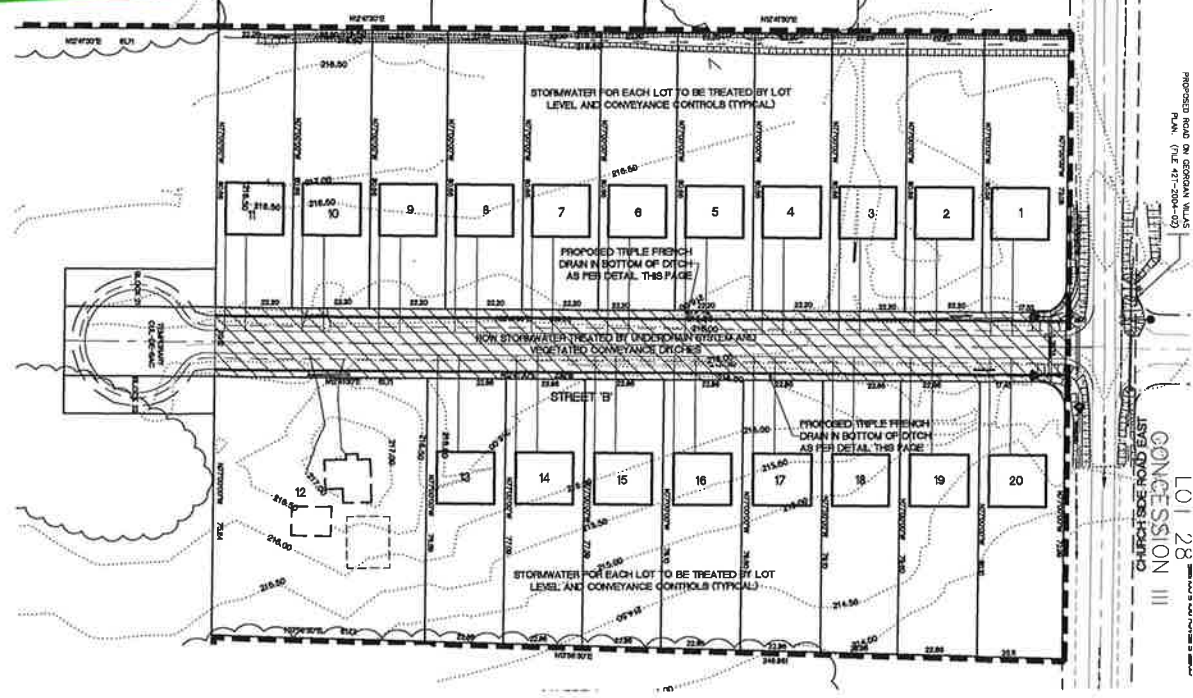
**TYPICAL DITCH SECTION
WITH FRENCH DRAIN**



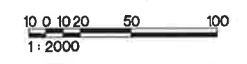
RAINWATER LEADER DISCONNECT DETAIL
NTS

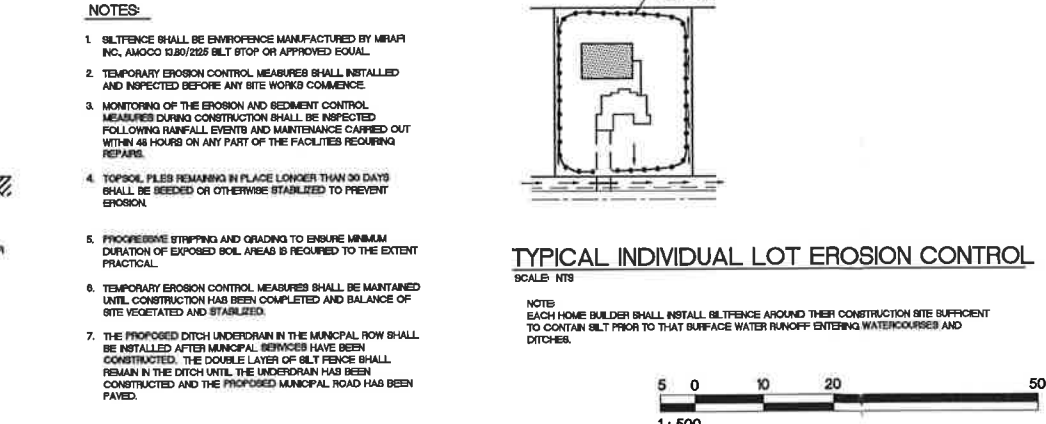
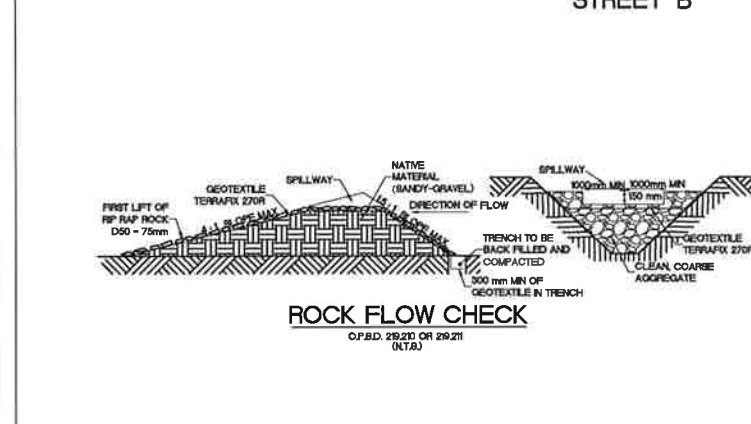
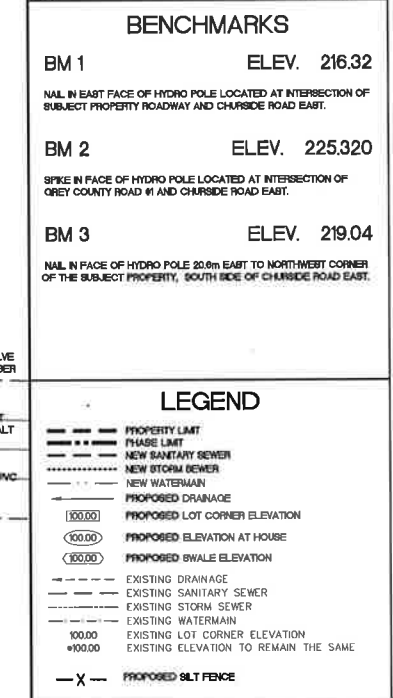
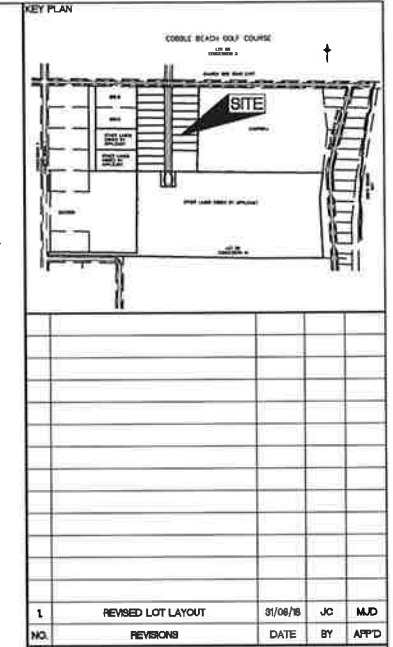



INFILTRATION SYSTEM SECTION
NTS

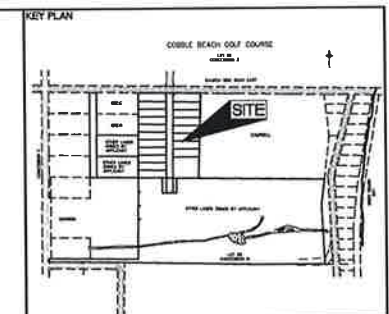


UNDERDRAIN DETAIL
SCALE = 1:1000





	
	<p>M.J. DAVENPORT & ASSOCIATES LIMITED</p> <p>TEL : (705) 745-8878 FAX : (705) 745-7326</p>
<p>P.O. BOX 2452 5TH MAIN LOCATION: 2010 KEENE ROAD OTHAUSEE, ONTARIO K9V 7Y8</p>	
<p>DAVENPORT SUBDIVISION</p> <p>PART OF LOT 27</p> <p>CONCESSION III</p> <p>TOWNSHIP OF SARAWAK</p> <p>TOWNSHIP OF GEORGIAN BLUFFS</p>	
<p>EROSION AND SEDIMENT CONTROL PLAN</p>	
<p>DESIGNED BY M.J. DAVENPORT</p> <p>DRAWN BY J. CLARK</p>	<p>SCALE 1 : 500</p>
<p>DATES NOVEMBER, 2017</p>	<p>OTHER NO.'S 2060, 501</p>



NO.	REVISIONS	DATE	BY	APP'D
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BENCHMARKS

BM 1	ELEV. 216.32
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NAIL IN EAST FACE OF HYDRO POLE LOCATED AT INTERSECTION OF
SUBJECT PROPERTY ROADWAY AND CHURCHSIDE ROAD EAST.

BM 2	ELEV. 225.320
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BIKE IN FACE OF HYDRO POLE LOCATED AT INTERSECTION OF
GREY COUNTY ROAD #1 AND CHURSIDE ROAD EAST.

BM 3	ELEV. 219.04
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NAIL IN FACE OF HYDRO POLE 20.6m EAST TO NORTHWEST CORNER OF THE SUBJECT PROPERTY, SOUTH SIDE OF CHURSIDE ROAD EAST.

LEGEND

- | | |
|--------|---------------------------------------|
| 100.00 | PROPERTY LIMIT |
| 100.00 | PHASE LIMIT |
| ----- | NEW SANITARY SEWER |
| ----- | NEW STORM SEWER |
| ----- | NEW WATERMAIN |
| ----- | PROPOSED DRAINAGE |
| 100.00 | PROPOSED LOT CORNER ELEVATION |
| 100.00 | PROPOSED ELEVATION AT HOUSE |
| 100.00 | PROPOSED 8"WALE ELEVATION |
| ----- | EXISTING DRAINAGE |
| ----- | EXISTING SANITARY SEWER |
| ----- | EXISTING STORM SEWER |
| ----- | EXISTING WATERMAIN |
| 100.00 | EXISTING LOT CORNER ELEVATION |
| 100.00 | EXISTING ELEVATION TO REMAIN THE SAME |



M.J. DAVENPORT
 & ASSOCIATES LIMITED

P.O. BOX 2452 STN MAIN TEL : (705) 743-6678
LOCATION: 2010 KEENE ROAD FAX : (705) 745-7328
OTONABEE, ONTARIO
K0J 7Y8

DAVENPORT SUBDIVISION
PART OF LOT 27
CONCESSION III
TOWNSHIP OF SARAWAK
TOWNSHIP OF GEORGIAN BLUFFS

PRE-DEVELOPMENT
SUB-WATERSHED AREA

DESIGNED BY: M.J. DAVENPORT	SCALE: 1" = 2000'
DRAWN BY: J. CLARK	
DATE: APRIL, 2017	
PROJECT NO.: 06-D-3969	

3969-SW1

