STORMWATER MANAGEMENT REPORT

74 Edwards Dr Development

Keene, ON

February 3, 2025

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Revision Summary

February 3, 2025

Preliminary SWM Report issued for Draft Plan of Subdivision application.

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1 Introduction and Background

Jewell Engineering Inc. (Jewell) was retained to provide stormwater design services for a proposed residential development at 74 Edwards Dr in Keene, ON. The ~14ha parcel of land is situated in a wooded area north of County Road 2 and west of Pinecrest Ave, 14km SE of Peterborough.

A wetland area is situated to the east of the site. The wetland drains to a creek which runs south through an underground culvert across the North Shore Public School property, emerges at the south end of the property, and ultimately drains to the Indian River 650m to the east.

The proposed development will be comprised of single-detached dwellings on rural lots. The total impervious cover will be less than 20%.

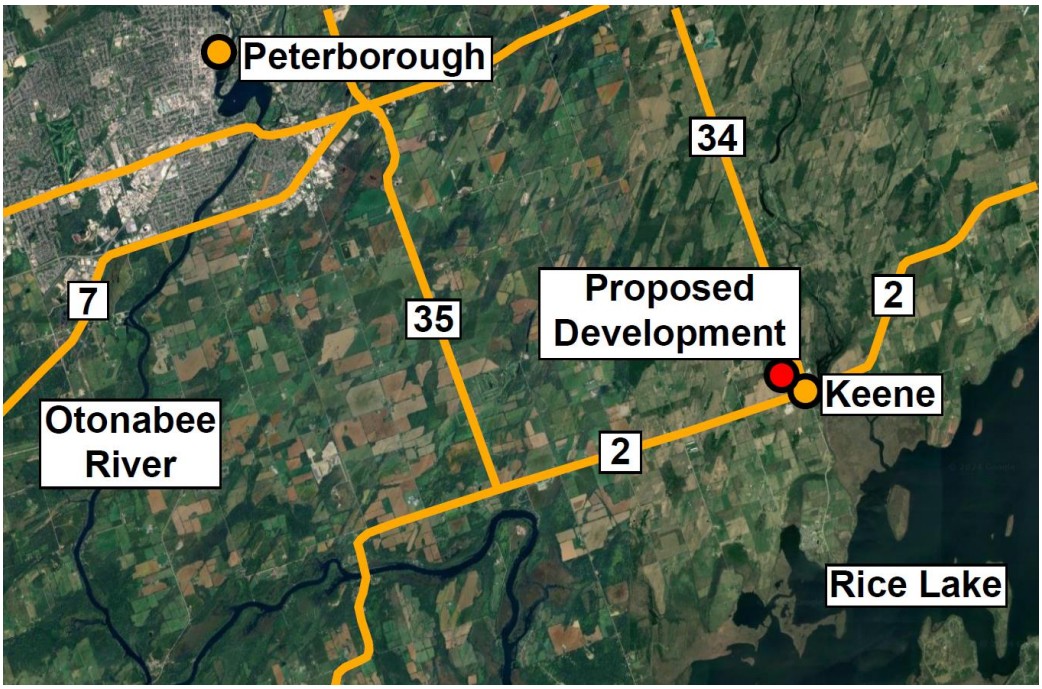

Figure 1-1: Development Site Location (Google, Maxar Tech 2018)

2 Existing Conditions

The existing site is in an undeveloped condition, with wild vegetation and some tree cover (Figure 2-1).

Figure 2-1: Existing Conditions (Google, Maxar Tech 2018)

2.1 Drainage Scheme

The development is situated on the south side of a drumlin, oriented NE-SW (as is common in the region). Runoff accordingly drains in three directions: to the southwest field (via sheet flow), the south (field immediately west of the school property), and the east (wetland).

Pre-development drainage patterns will be maintained where possible. Runoff from hardened areas (the road right-of-way and portions of driveway runoff) will drain along roadside ditches to the site's natural low contour in the east. The natural low area provides a good location for stormwater treatment (see Section 4) before draining to the wetland.

There will be a 40-70% decrease in contributing area to the west and south nodes with low surface hardening, resulting in post-development peak flows being lower than pre-development targets – quantity control for the two nodes is therefore not required.

In contrast, the area contributing to the wetland will be increased and a more appreciable portion of the existing pervious cover will be hardened. This will result in an increase of peak flows from pre- to post-development conditions, and stormwater management will be required.

2.2 Soils – Cambium Geotechnical Report, 2023

The developer retained Cambium Inc. to complete a geotechnical investigation of the site. A report outlining the findings of the investigation was completed in December 2023.

Borehole and test pit information identified a multi-layered soil profile on the site. The soils have a topsoil thickness of 0.1 to 0.4m, averaging a depth of 0.2 metres. Below the topsoil layer, technicians encountered a layer of silt and silty-sand material, underlain by a layer of glacial till with some clay deposits.

The findings of the investigation are consistent with the information published in the Peterborough County Soils Investigation Report (Ontario Institute of Pedology, 1981) and Ag Maps, which classify the site's soils as Otonabee Loam with portions of Emily Loam along the raised portion of the site, both of which fall under Hydrologic Soils Group (HSG) B – moderate infiltration potential.

Figure 2-2 (MTO, 2008) outlines the classifications of Hydrologic Soils Groups.

Hydrologic Soil Group

The hydrologic soil group is used to classify soils into groups of various runoff potential.

The Soil Conservation Service (SCS) classifies bare thoroughly wet soils into four hydrologic soil groups (A, B, C and D). SCS descriptions of the four groups, modified slightly to suit Ontario conditions, are as follows: (Design Chart 1.09)

A: High infiltration and transmission rates when thoroughly wet, eg. deep, well drained to excessively-drained sands and gravels. These soils have a low runoff potential.

B: Moderate infiltration and transmission rates when thoroughly wet, such as moderately deep to deep open textured loam.

C: Slow infiltration and transmission rates when thoroughly wet, eg. fine to moderately fine-textured soils such as silty clay loam.

D: Very slow infiltration and transmission rates when thoroughly wet, eg. clay loams with a high swelling potential. These soils have the highest runoff potential.

In Ontario, soils have been found to lie between the main groups given above, and have therefore been interpolated as AB, BC, CD as appropriate, such as Guelph loam, which is classified as BC.

Figure 2-2: Soils MTO Drainage Management Manual – Description of Hydrologic Soils Groups

2.3 Targets

The stormwater management plan focuses on three environmental objectives when considering the treatment and conveyance of stormwater runoff. The objectives are to mitigate flooding, quality, and erosion impacts to the receiving system. These objectives, such as preventing increase in flood risk and protecting water quality, comply with the environmental guidelines set out by Otonabee Region Conservation Authority (2015) and the Ministry of Environment Stormwater Planning and Design Manual (2003).

The MTO Drainage Manual (1997) outlines potential negative impacts as a result of development, including increase in surface runoff, soil erosion, and higher downstream flow velocities.

Based on the guidance above, Jewell proposed a SWM methodology to achieve the following targets:

Quantity Control

- Ensure the development does not increase peak flows to the downstream receivers.

Quality Control

- Follow the Ministry of Environment guidelines to provide adequate quality treatment to runoff to ensure effluent meets **Enhanced** quality control objectives.

Erosion and Sediment Control

- Minimize the potential for erosion of soils,
- Mitigate the release of sediment offsite.

Quality controls will be provided using a treatment train approach and a combination of best management practices, discussed further in Section 4.

3 Proposed Conditions

3.1 Drainage Scheme

Runoff from the residential lots will generally drain via split drainage, with front-yard and driveway areas draining to the roadway via sheet flow. Roadside ditches/swales will collect from yards and the road surface, and convey it to an underground SWM Facility in the road ROW. The facility will be constructed from EZ Storm Units (or equivalent): underground storage blocks with a high porosity (96% volume of voids to total volume) that are designed to be placed under the road structure with sufficient cover. Runoff will be controlled via an outlet structure at the downstream end of the facility, discharging to the wetland to the east.

Underground storage is preferred for this development for several reasons, including:

- Maximization of lot yield – no dedicated blocks are required for SWM Technologies
- Flexibility in placement – underground storage can be placed in uneven topography; conventional SWM Technologies are more difficult to place on a grade, and significant regrading is sometimes required for proper storage/implementation
- Irregular shape – unlike conventional SWMFs, storage blocks can be installed in irregular shapes, no decreased efficiency when used in long, narrow configurations.

3.2 Site Hydrology

Jewell used the Rational Method equation to compare existing peak flows to uncontrolled post-development peak flows. The Rational Method relies on an estimation of runoff coefficient, flow intensity, and drainage area.

Equation 1: Rational Method

$$Q = \frac{CiA}{360}$$

Where:

Q = Peak Flow in m^3/s
C = Runoff Coefficient
i = Rainfall Intensity in mm/hr
A = Area in hectares

Rainfall intensities are derived from the Environment Canada Peterborough Airport IDF curves (Appendix A).

Runoff peak flows are expected to increase in uncontrolled post-development conditions, which occurs due to surface hardening (increased runoff coefficient), and the resulting decrease in times of concentration.

The pre-development peak flow to the wetland in the 100Yr 24hr event is as follows:

Table 3-1: Pre-Development and Post-Development, Uncontrolled Peak Flow

Catchment	Area (ha)	RC	CN	L (m)	Slope (%)	Tp (hr)	Q (m^3/s)
100	2.80	0.30	58	224	10.4	0.20	0.15

The pre-development times of concentration are calculated using the Airport Method. The Airport Method uses site topography and soil conditions to estimate the time of concentration, as follows:

Equation 2: Time of Concentration

$$T_c = \frac{3.26 * (1.1 - C) * \sqrt{L}}{S_w^{0.33}}$$

Where

T_c = Time of concentration
C = Runoff Coefficient
L = watershed length, m
S_w = Slope of watershed, %

The peak runoff contributing to the wetland is increased in post-development conditions as shown.

Table 3-2: Post-Development, Uncontrolled Peak Flows – 100Yr 24hr Event

Catchment	Area (ha)	Post-Development, Uncontrolled				Q (m^3/s)
		CN	L (m)	XIMP	TIMP	
A2	5.07	66	184	10	20	0.26
A5	0.30	66	45	10	20	0.02
Total	**5.37**	-	-	-	-	**0.26**

Note: The peak from catchment A5 occurs 10 minutes later than the peak from A2 in the 24hr event (12.17 vs 12.00hr), therefore peaks are not additive.

As the post-development peak flows are greater than the pre-development flows, quantity control is required. The proposed stormwater mitigation measures are discussed in Section 4.

4 Stormwater Management Controls

Runoff from the subject site will increase in post-development conditions as a result of the conversion of rural lands to a residential development with impervious surfaces. Therefore, SWM controls for quality and quantity control will be required.

4.1 Quality Treatment

As indicated previously, the proposed residential development will be constructed using large rural lots. The low-density nature of the development will provide opportunity to use rural quality treatment technologies, such as Enhanced Grassed Swales and vegetated contact. In addition to these methods, an Oil and Grit Separator (OGS) Manufactured Treatment Device (MTD) will remove additional entrained sediment, in addition to isolating and detaining floatable hydrocarbons and other contaminants such as trash and inorganic debris.

The *Treatment Train* (i.e., combination of technologies) approach proposed will have an overall TSS removal calculated as follows in Equation 3 (North Carolina Division of Water Quality, 2007).

Equation 3: TSS Removal, General Form

$$Treatment = 1 - [TSS_0 * (1 - A) * (1 - B)]$$

Where:

TSS_0 = Initial TSS Concentration
A = TSS removal of Technology A (bioretention facilities)
B = TSS removal of Technology B (vegetated contact, enhanced grass swale)

Features that improve sediment removal rates are outlined in the Low Impact Development Guide (Toronto and Region Conservation Authority, 2010):

- Swale length is increased to encourage infiltration and provide greater quality treatment;
- Bottom width is maximized;
- Longitudinal slope is minimized;
- Check dams may be incorporated to encourage infiltration and increase retention times;
- Runoff receives pre-treatment from vegetated filter strips and bioretention facilities.

In a study performed by Terry Lucke et al. (2013), researchers studied the effectiveness of TSS removal in grassed swales and concluded grass swales were very effective in a treatment train approach at providing pre-treatment to prevent clogging of downstream treatment systems.

> *Swales investigated were triangular in shape and had slopes of 1% or less. Results showed that between 50% and 80% of the TSS was generally removed within the first 10m of the swales. A further 10% to 20% reduction in TSS concentrations can be expected in swales up to 30m long.*

The development's roadside ditches will be flattened to a ~0.5 to 1% slope upstream of the OGS Unit. The decreased slope for >30m will provide ample opportunity for sediment removal. Jewell conservatively applied a 70% TSS removal for the swale upstream of the OGS Unit. As the small A5 catchment will not have the desired length for treatment, Jewell applied a 20% TSS removal efficiency to account for preliminary TSS removal via vegetated contact.

Jewell specified an FD-5HC OGS Unit to be installed for secondary treatment of Catchment A2's runoff, to be installed immediately upstream of the EZStorm units. The OGS Unit will achieve a TSS removal of 47% based on the development's characteristics (see Appendix D for sizing). The EZStorm units may provide additional sediment removal, however this has not been relied upon in the treatment train calculations.

As such, the weighted TSS removal is provided below.

Table 4-1: Treatment Train – Weighted TSS Removal

		Technology 1	Technology 2	
Catchment	**Area, ha**	**Swale/Vegetated Contact TSS Removal**	**OGS TSS Removal**	**Combined**
A2	5.07	70%	47%	84%
A5	0.30	20%	-	20%
			Weighted	**80%**

An 80% *Enhanced* TSS removal is demonstrated by the proposed technologies, therefore the quality treatment target is achieved.

4.2 Quantity Treatment

Quantity control will be provided in the EZStorm storage units. EZStorm units are modular blocks that are installed underground to provide stormwater storage.

The design included herein is based on 701m^2 of storage area, and a depth of storage of 1.32m (corresponding to two blocks high) – this configuration produces a linear stage-storage relationship with a total provided storage of 888m^3 (see Appendix C).

Discharge from the underground SWMF will be controlled via a control-structure manhole downstream of the storage. The Manhole will have the following controls, which will provide

matching of pre-development targets in post-development conditions (the wetland downstream will provide additional flow attenuation naturally, however this is not relied upon in the SWM design).

- 175mm orifice invert at 216.60 (bottom of storage)
- 160mm orifice invert at 216.93
- 160mm orifice invert at 217.26
- 1.0m spillway weir invert at 217.92 (top of full storage)

The proposed controls will be installed in a dividing wall in the manhole structure. Openings should be staggered with a minimum dimension of 0.3m between orifice controls and the structure wall / adjacent controls to ensure proper discharge rates, provide structural stability, and reduce the potential for blockage of multiple outlets. The 1m spillway weir can be constructed by stopping the structure's dividing wall at 217.92m (i.e., the invert of the weir will be the top of the dividing wall).

4.2.1 Hydraulics

The outlets were sized using the orifice equation:

Equation 4: Orifice Equation

$$Q = C_d A_0 \sqrt{2gh}$$

Where

Q is peak flow in m^3/s
C_d is coefficient of discharge, = 0.60
A_0 is the area of the orifice, m^2
h is the pressure head on the orifice, m

The equation for discharge through the outlet below the obvert is calculated by the following equation:

$$Q = 0.6 * \left(\left(arccos\left(\frac{r-h}{r}\right)\right)r^2 - (r-h)\left(r * sin\left(arccos\left(\frac{r-h}{r}\right)\right)\right)\right) * \sqrt{2g * \left(\frac{4r * sin^3\left(arccos\left(\frac{r-h}{r}\right)\right)}{3\left(2\left(arccos\left(\frac{r-h}{r}\right)\right) - sin\left(2\left(arccos\left(\frac{r-h}{r}\right)\right)\right)\right)} - (r-h)\right)}$$

Equation 5: Modified Orifice Equation (Rosenthal, 2024)

Where

r is the radius of the orifice (m)
h is the head on the invert of the orifice (m)

The site's conveyance features were sized using the Manning's equation:

$$Q = \frac{1}{n} A R^{2/3} \sqrt{S_0}$$

Where

Q is flow in m^3/s
n is the Manning's coefficient of friction
A is the cross-sectional area of flow, m^2
R is hydraulic radius ($\frac{Area}{Wetted\ Perimeter}$), m
S_0 is frictional slope, m/m

As demonstrated below, the proposed SWM storage configuration controls post-development discharge to pre-development targets for various return periods, durations, and distributions.

Table 4-2: Comparison of Peak Flows (Pre-Development, Post- Uncontrolled, Post- Controlled)

Return Period, Condition		1hr Chicago	4hr Chicago	12hr SCS II	24hr SCS II
2Yr	Pre-Development	0.02	0.03	0.04	0.03
	Post, Uncontrolled	0.11	0.11	0.06	0.05
	Post, Controlled	0.01	0.02	0.03	0.03
5Yr	Pre-Development	0.04	0.05	0.08	0.06
	Post, Uncontrolled	0.14	0.14	0.10	0.09
	Post, Controlled	0.02	0.04	0.06	0.06
100Yr	Pre-Development	0.12	0.16	0.20	0.15
	Post, Uncontrolled	0.25	0.27	0.32	0.26
	Post, Controlled	0.09	0.14	**0.16**	0.15
Pre ≥ Post?		✓	✓	✓	✓
Storage Used, m^3		510	750	**880**	820

The 24hr SCS Type II event was the critical event for the proposed development, as matching the pre-development peak for the 24hr event resulted in the 1, 4, and 12hr events matching pre-development targets. The 12hr event results in the greatest storage requirement in the underground SWM Facility as the outflows are overcontrolled to align with the $0.15m^3/s$ target for the 24hr event.

The proposed underground storage solution will achieve the peak flow objectives for all studied events. The EZStorm storage chambers provide $888m^3$ of storage at Full Storage elevation of 217.92m; the full storage volume will be used in the 100Yr 12hr event.

4.2.2 Climate Resiliency

Climate change projections typically increase rainfall intensity values by 10% compared to base-year events. In the unlikely event of outlet blockage and/or events exceeding the 100Yr design event peak flows/volumes, the outlet structure is designed with a 1m broad-crested weir (constructed as a dividing wall in the structure). The broad-crested weir will have a capacity of approx. 0.42m^3/s at an overtopping depth of 0.4m, exceeding the inflow of the 100Yr event by 30%.

Additional storage capacity may be provided by installing additional EZStorm Units.

Additionally, inflows to the storage facility will safely pool upstream of the inlet in the unlikely event of full outlet obstruction, and spill over the road to the wetland to the east.

Therefore, climate resiliency and safe conveyance are provided.

5 Low-Impact Development

Low Impact Development is a requirement of the new 2024 Provincial Planning Statement. This requires that all developments consider LID strategies to reduce the impact of development on the hydrologic regime.

The Low Impact Development Guidelines (Toronto and Region Conservation Authority, 2010) states that "increases in the quantity, rate, and frequency of runoff can be linked to two root causes:

- the conversion of undeveloped or agricultural land cover to urban uses, and
- the application of storm sewer systems."

The goal of LID site design strategies is to minimize these two sources of hydrologic impacts (Toronto and Region Conservation Authority, 2010, p. 3.3). Large urban areas are negatively impacted by flash flooding associated with extensive hardening. The LID design techniques seek to mitigate flooding and erosion associated with urbanization. While water quality improvements are associated with the recommended techniques, quantity control remains the focus of LID.

The guidelines provide some site design strategies for reducing the hydrologic impact postulating 4 major groupings or "themes":

1) Preserving important hydrologic features and functions;
2) siting and layout of development;
3) reducing impervious area; and
4) using natural drainage systems.

The site design incorporates all four of the themes. Some strategies are applied with greater care since municipal requirements limit such techniques as setbacks, road design, parking, and drainage design. The LID guidelines provide a hierarchy of applying the LID techniques by first invoking the use of natural hydrologic areas and then development of green infrastructure. As such, the design adds limited green technologies that will encourage infiltration.

Discussion of the LID design used in the stormwater management design is provided below.

5.1 Theme 1 – Preserving Important Hydrologic Features

This theme focuses on preservation. Site design is adjusted to preserve natural features that benefit hydrology.

- Preserve stream buffers, including along intermittent and ephemeral channels
- Preserve areas of undisturbed soil and vegetation cover
- Avoid development on permeable soils
- Preserve existing trees and, where possible, tree clusters

Important hydrologic features include:

- Highly permeable soils
- Pocket wetlands
- Significant small (headwater) drainage features
- Riparian buffers
- Floodplains
- Undisturbed natural vegetation
- Tree clusters

The majority of the site's pre-development pervious cover (> 80%) will be maintained, including the mature vegetation (forested area) to the north. The development is situated outside the wetland.

5.2 Theme 2 – Application of Siting and Layout Techniques

Siting and layout techniques aim to reduce the environmental impacts of the development by fitting the development within the framework of the natural heritage features.

- Fit the design to the terrain
- Use open space or clustered development
- Use innovative street network designs
- Reduce roadway setbacks and lot frontages

The development's drainage scheme will reflect pre-development drainage conditions, and open space will be used to encourage runoff pre-treatment and infiltration.

5.3 Theme 3 – Reducing the Impervious Area

Imperviousness can be reduced by minimizing unnecessary surface hardening. Some strategies include:

- Reducing street width
- Reducing building footprints
- Reducing parking footprints

- Considering alternatives to cul-de-sacs
- Eliminating unnecessary sidewalks and driveways

The proposed development has an imperviousness of < 20%, which naturally reduces the development's environmental impact.

5.4 Theme 4 – Using Natural Drainage Systems

These strategies focus on the use of existing natural drainage systems where available "to take advantage of undisturbed vegetated areas and natural drainage patterns."

- "Disconnect" impervious areas
- Preserve or create micro-topography
- Extend drainage flow paths

The development is designed to encourage flows to drain across pervious grassed surfaces prior to collection in the grassed swales. Vegetated contact will encourage filtration and slow discharge rates.

5.5 LID Summary

The development site design follows the LID strategies provided in the Low Impact Development guide and makes extensive use of techniques to preserve natural drainage features, adjust the layout to the site, reduce impervious areas, and take advantage of natural drainage features.

6 Maintenance

Runoff from the development will receive quality and quantity treatment through use of a treatment train (Vegetated Contact / Enhanced Swales, OGS Unit, and EZStorm Units). The facilities will require routine maintenance to function as intended. For further detail and guidance, Section 6 of the 2003 Stormwater Planning and Design Manual outlines maintenance activities for various SWM technologies.

6.1 Enhanced Swales, Vegetated Contact

Enhanced Swales and ditches rely on healthy grass cover to maintain design geometry and prevent erosion; therefore, the grass should be watered as necessary and mowed to keep the grass height between 75mm and 150mm (3" and 6"). Other maintenance activities, such as weed control, removal of accumulated sediment, and trash removal, will need to be carried out to ensure the ditches can convey runoff without overtopping. The frequency of these maintenance activities will vary based on experience.

Maintenance for Vegetated Contact areas include the following (Credit Valley Conservation and Toronto and Region Conservation Authority, 2010):

- Inspect for vegetation density (80% minimum coverage), damage by foot or vehicle traffic, accumulation of trash or sediment
- Water and mow vegetation regularly, maintaining 50 to 150mm (2" to 6") vegetation height
- Repair eroded or sparsely vegetated areas.

The main areas of vegetated contact in the development will occur as runoff drains over lawns. Property owners will mow lawns, remove trash and debris, and repair erosion as part of regular property upkeep.

6.2 OGS Unit – FD-5HC

An FD-5HC OGS Unit will be placed in the road ROW immediately upstream of the EZStorm underground storage units. The specified unit has a peak flowthrough capacity of 566 L/s, sediment storage of 0.84m^3, and oil storage of 1136L. The OGS Unit is well-sized for the development, as the sediment storage capacity exceeds the anticipated annual sediment loading of 0.24m^3 (5.07ha * 0.34 m^3/ha * 30% incoming TSS concentration * 47% TSS removal), and the flowthrough capacity exceeds the uncontrolled peak flow of 320 L/s.

The OGS Unit manufacturer recommends an annual cleanout frequency, to be completed by a trained sewer maintenance contractor.

6.3 EZStorm Units

EZStorm unit cleanouts are triggered when 6” or more of sediment has accumulated.

Significant sediment deposition is not anticipated as runoff contributing to the storage units should be mostly treated by vegetated contact, enhanced swales, and the OGS unit upstream. In practice, the units should be inspected after every major rainfall event for the first year of service, and twice annually after (NextStorm *Inspection and Maintenance Manual – Manuel d’inspection et entretien*, 2023).

During inspections, maintenance staff should observe the general condition of the EZStorm blocks, access points, and inlet/outlet structures. Sediment accumulation depth should be measured or estimated, and any indication of backflow should be noted (this is less likely to pose an issue for the Keene development as the storage units discharge to a slope with minimal chance for backwater).

Further installation, operations & maintenance, and inspection information can be found on the distributor’s website (nextstorm.ca).

7 Erosion and Sediment Control

Erosion and sediment control is one of the three targets identified in Section 2.3. The following measures are proposed to prevent the negative erosion and sediment impacts of development.

Typical site development requires removal of some vegetated cover. While it is the intention to reduce vegetation removal, exposed soils from the work will be at risk of eroding into the receiving drainage system. Measures will need to be put in place to reduce erosion during construction, and for a period of up to one year after construction is completed. Typical erosion and sediment control measures include:

- Siltation fencing.
- Strawbale check dams.
- Rip-rap check dams.
- Filter sock inserts in catch basins.

Controls are to be placed downstream of all active work areas and upstream of protected receivers. Controls should also be placed around stockpiles of topsoil and fill materials.

Typical OPSDs provide good instruction on the correct placement and construction of the controls. The controls provide some protection if they are properly maintained, but they should be considered last-resort measures. The most effective means of control are those which prevent or reduce erosion at the source. This would include diligent stabilization of exposed areas immediately after grading is completed. Stabilization measures include sod, erosion blankets, or rip-rap and filter cloth on steep slopes, as well as topsoil and hydroseed on gently sloped areas (with slope 10% or less).

The site developer and contractor should actively maintain the new drainage works to remove accumulations of sediment.

A silt fence should be located along the upland perimeter of all sensitive features during the construction process, which should be maintained until the lands have stabilized or as directed by the municipality. There would be benefit in maintaining this silt fence for up to 2 growing seasons.

8 Conclusions

The owner of 74 Edwards Dr in Keene has retained Jewell Engineering to prepare a Stormwater Management design for a proposed residential development on the site. The owner is proposing to construct 16 residential (single-detached) dwellings on estate lots. The site has an area of approx. 14ha, and the post-development impervious cover will be under 20%.

The site's runoff will drain to an underground SWM Facility under the road structure towards the east end of the site, immediately upstream of a wetland. The facility is sized to control post-development peak flows to pre-development targets in events of varying durations up to the 100Yr 24hr event.

Table 8-1: Design Discharge Rates (pre- vs post-development) – 24hr SCS Type II

Return Period	Peak Flow, m^3/s			Post ≤ Pre?
	Pre-Development	Post-Development, Uncontrolled	Post-Development, Controlled	
2 Yr	0.03	0.05	0.03	✓
5 Yr	0.06	0.09	0.06	✓
100 Yr	0.15	0.26	0.15	✓

The proposed design provides $888m^3$ of storage capacity, of which $880m^3$ is used in the 100Yr (12hr) event; additional storage capacity may be added by installing additional EZStorm Units.

Quality treatment will be provided via a treatment train approach, through use of vegetated contact / enhanced swales, and an OGS Unit in series. Additional sediment removal may occur through the EZStorm storage units, however this was not relied upon to achieve the design TSS removal.

Table 8-2: Treatment Train – Weighted TSS Removal

Catchment	Area, ha	Swale/Vegetated Contact TSS Removal	OGS TSS Removal	Combined
A2	5.07	70%	47%	84%
A5	0.30	20%	-	20%
			Weighted	**80%**

Low impact development guidance (including minimizing impervious cover, disconnecting impervious areas, extending drainage distances, and preserving natural drainage patterns) will be followed to ensure environmental impacts of the development are successfully mitigated.

Prepared by

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Reviewed by

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9 References

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APPENDIX A

Environment Canada IDF Curves

Environment and Climate Change Canada
Environnement et Changement climatique Canada

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

2022/10/31

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PETERBOROUGH A ON 6166418

Latitude: 44 14'N Longitude: 78 22'W Elevation/Altitude: 191 m

Years/Années : 1971 - 2006 # Years/Années : 33

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

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Year / Année	5 min	10 min	15 min	30 min	1 h	2 h	6 h	12 h	24 h
1971	4.3	5.8	7.4	11.7	17.5	24.6	30.7	34.8	34.8
1972	5.8	6.1	8.1	10.2	13.2	16.5	22.9	41.4	44.2
1973	6.9	13.2	18.0	19.3	20.8	26.7	48.0	48.3	58.2
1974	7.6	13.5	14.0	16.0	20.1	25.7	43.9	49.8	49.8
1975	6.3	9.9	13.7	21.8	39.6	55.1	55.1	67.8	67.8
1976	5.3	8.4	11.9	15.0	16.3	16.5	22.6	24.6	37.6
1977	8.4	12.7	13.7	19.6	24.9	24.9	52.3	62.2	62.5
1978	7.2	12.4	17.3	19.2	21.7	27.7	43.9	45.6	45.8
1979	10.1	13.8	15.3	17.5	26.2	31.6	33.3	33.7	33.7
1980	8.8	16.0	21.6	29.0	32.0	48.3	61.8	62.2	83.2
1981	9.7	18.6	27.9	42.3	52.2	53.2	53.4	53.4	54.1
1982	5.3	7.6	7.8	9.9	11.7	15.4	30.3	34.1	34.1
1983	11.3	18.3	23.3	25.1	26.1	36.3	56.8	57.1	77.5
1984	8.9	14.2	17.3	18.9	25.3	29.4	35.5	37.8	39.2
1985	7.6	10.4	12.0	19.7	22.7	26.8	36.4	53.6	53.6
1986	12.5	15.8	19.3	19.7	19.7	23.2	35.8	42.0	44.8
1987	17.9	21.3	22.7	23.2	23.2	23.2	23.2	26.0	29.0
1988	7.8	11.5	14.5	20.7	23.2	24.4	27.0	28.8	30.4

1989	9.9	14.2	15.7	18.7	20.2	26.3	46.1	47.8	52.8
1990	8.9	13.4	17.8	23.2	23.7	23.7	42.2	43.4	44.8
1991	4.1	6.8	7.6	8.8	9.2	12.2	17.1	21.2	29.6
1992	8.6	9.3	12.8	20.4	25.8	31.7	38.9	45.0	51.2
1993	9.1	10.9	14.1	20.4	21.9	23.3	29.9	34.2	42.0
1994	8.8	14.4	17.4	19.8	22.2	24.1	24.1	33.6	41.5
1995	9.3	12.1	18.1	32.2	49.0	82.5	89.8	90.1	90.1
1996	6.8	8.6	10.5	13.9	16.5	22.0	38.3	40.8	41.0
1997	3.6	7.2	7.6	9.2	17.8	30.6	35.0	35.2	35.2
1998	11.4	15.7	16.5	18.7	28.1	32.4	60.0	65.1	76.2
1999	8.4	11.4	13.5	18.6	23.2	32.5	39.9	46.8	55.6
2000	6.4	10.0	12.7	16.6	18.8	23.5	47.8	61.2	61.2
2002	7.3	9.6	10.4	13.8	23.4	35.1	50.9	73.6	73.6
2004	6.2	10.9	15.2	22.0	26.5	41.6	65.9	80.1	97.8
2006	7.4	11.1	12.5	14.2	15.0	17.8	22.0	34.0	42.5
# Yrs. Années	33	33	33	33	33	33	33	33	33
Mean Moyenne	8.1	12.0	14.8	19.1	23.6	30.0	41.2	47.1	52.0
Std. Dev. Écart-type	2.7	3.7	4.8	6.7	9.1	13.7	15.5	16.4	18.1
Skew. Dissymétrie	1.33	0.45	0.55	1.30	1.66	2.13	0.92	0.75	0.92
Kurtosis	7.16	3.29	3.67	6.74	6.80	9.09	4.68	3.45	3.35

*-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
1981	30 min	42.3	40.1
1981	1 h	52.2	52.0
1987	5 min	17.9	16.7
1995	2 h	82.5	72.9

****

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

****

Duration/Durée	2 yr/ans	5 yr/ans	10 yr/ans	25 yr/ans	50 yr/ans	100 yr/ans	#Years Années
5 min	7.7	10.1	11.7	13.7	15.2	16.7	33

10 min	11.4	14.6	16.8	19.5	21.5	23.5	33
15 min	14.0	18.3	21.1	24.7	27.4	30.0	33
30 min	18.0	23.9	27.8	32.8	36.4	40.1	33
1 h	22.1	30.1	35.4	42.1	47.1	52.0	33
2 h	27.7	39.8	47.8	57.9	65.4	72.9	33
6 h	38.7	52.4	61.5	72.9	81.4	89.9	33
12 h	44.4	58.9	68.5	80.6	89.5	98.4	33
24 h	49.0	65.0	75.6	88.9	98.9	108.7	33

****

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 yr/ans	5 yr/ans	10 yr/ans	25 yr/ans	50 yr/ans	100 yr/ans	#Years Années
5 min	92.0	121.0	140.2	164.4	182.3	200.2	33
	+/- 10.3	+/- 17.3	+/- 23.3	+/- 31.5	+/- 37.7	+/- 43.9	33
10 min	68.2	87.7	100.7	117.0	129.1	141.1	33
	+/- 6.9	+/- 11.7	+/- 15.7	+/- 21.2	+/- 25.4	+/- 29.6	33
15 min	56.0	73.1	84.5	98.8	109.4	120.0	33
	+/- 6.1	+/- 10.2	+/- 13.8	+/- 18.6	+/- 22.3	+/- 26.0	33
30 min	35.9	47.8	55.6	65.5	72.9	80.2	33
	+/- 4.2	+/- 7.1	+/- 9.6	+/- 12.9	+/- 15.4	+/- 18.0	33
1 h	22.1	30.1	35.4	42.1	47.1	52.0	33
	+/- 2.8	+/- 4.8	+/- 6.5	+/- 8.7	+/- 10.4	+/- 12.1	33
2 h	13.9	19.9	23.9	29.0	32.7	36.4	33
	+/- 2.1	+/- 3.6	+/- 4.9	+/- 6.6	+/- 7.9	+/- 9.2	33
6 h	6.4	8.7	10.2	12.2	13.6	15.0	33
	+/- 0.8	+/- 1.4	+/- 1.8	+/- 2.5	+/- 3.0	+/- 3.5	33
12 h	3.7	4.9	5.7	6.7	7.5	8.2	33
	+/- 0.4	+/- 0.7	+/- 1.0	+/- 1.3	+/- 1.6	+/- 1.8	33
24 h	2.0	2.7	3.1	3.7	4.1	4.5	33
	+/- 0.2	+/- 0.4	+/- 0.5	+/- 0.7	+/- 0.9	+/- 1.0	33

****

Table 3 : Interpolation Equation / Équation d'interpolation: R = A*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)

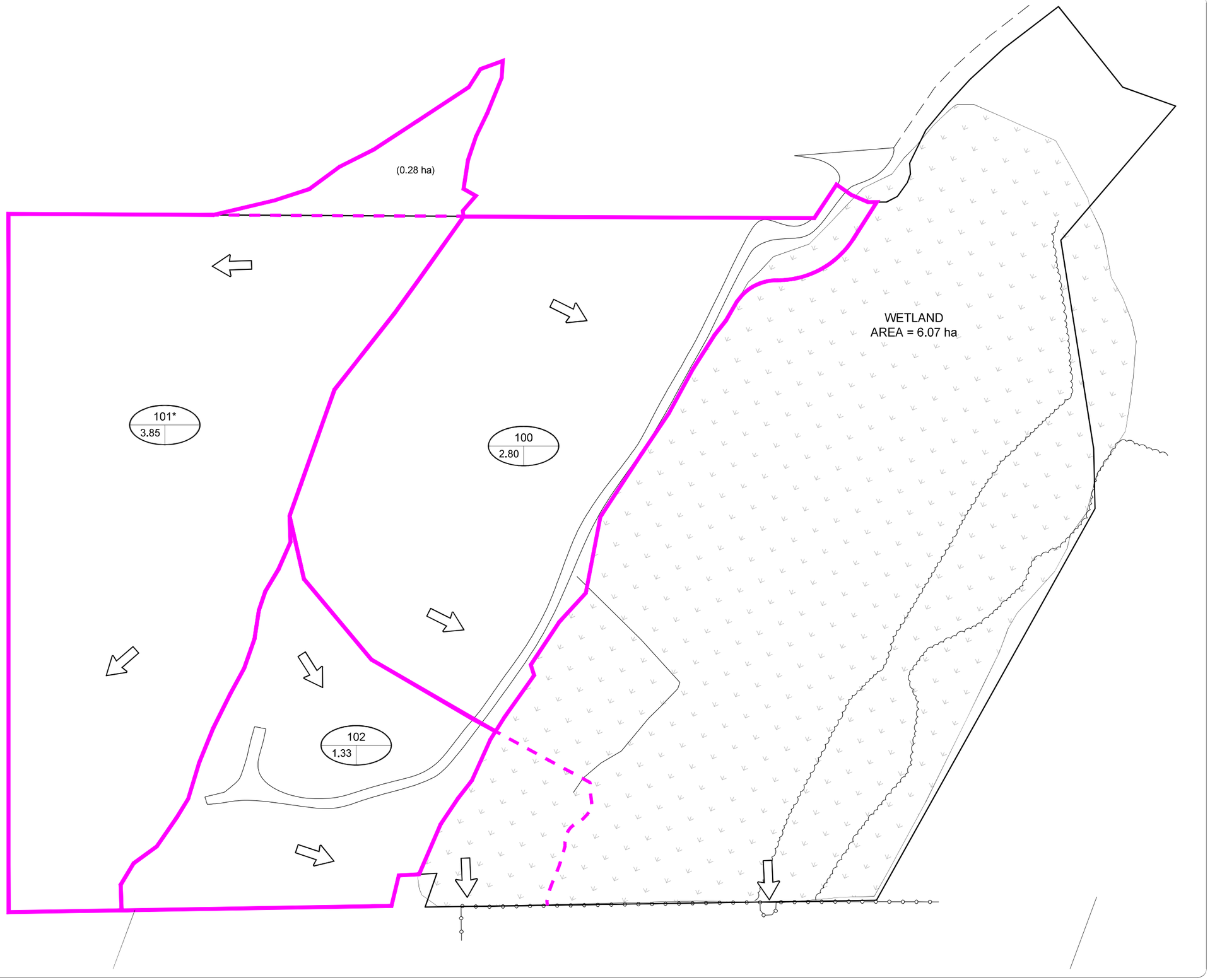
****

Statistics/Statistiques	2 yr/ans	5 yr/ans	10 yr/ans	25 yr/ans	50 yr/ans	100 yr/ans
Mean of RR/Moyenne de RR	33.4	44.0	51.0	59.9	66.5	73.1
Std. Dev. /Écart-type (RR)	32.1	41.8	48.1	56.2	62.2	68.1
Std. Error/Erreur-type	7.4	10.0	11.7	14.0	15.6	17.2
Coefficient (A)	20.5	27.4	31.9	37.7	41.9	46.1
Exponent/Exposant (B)	-0.680	-0.675	-0.672	-0.670	-0.669	-0.668
Mean % Error/% erreur moyenne	8.4	10.1	10.8	11.4	11.7	12.0

APPENDIX B

Catchment Area Drawings

08/20/2024



GENERAL NOTES:
- ALL INFORMATION TO BE VERIFIED ON SITE PRIOR TO COMMENCING ANY WORK. ANY DISCREPANCIES ARE TO BE REPORTED TO THE CONSULTANT IMMEDIATELY.
- ALL UTILITY LOCATIONS SHOWN ON THE DRAWINGS ARE APPROXIMATE. THE CONTRACTOR SHALL CONFIRM THE LOCATION ON SITE AND ASSUME ALL LIABILITY FOR DAMAGE TO ALL UTILITIES.
- EXCLUDING THE BENCHMARK AND DESCRIPTION PROVIDED FOR THIS PROJECT, NO OTHER ELEVATIONS ARE TO BE USED AS A REFERENCE ELEVATION FOR ANY PURPOSE.

METRIC NOTE:
- ALL DIMENSIONS SHOWN ARE IN METRES OR MILLIMETRES, UNLESS OTHERWISE NOTED.

GEOMETRIC NOTE:
- ALL SURVEY DATA SHOWN ON THIS DRAWING WAS RECORDED USING REAL-TIME KINETIC (RTK) GPS OBSERVATIONS IN REFERENCE TO UTM 18 NORTH COORDINATE SYSTEM.
- ALL ELEVATIONS ARE IN REFERENCE TO LOCAL DATUM NAD83 - GEODETIC MODEL HT2_0, UNLESS DESCRIBED OTHERWISE.

* * DRAWINGS ARE NOT TO BE SCALED * *

REVISIONS

NO.	DATE	DESCRIPTION	BY

LEGEND

CATCHMENT AREA (ha) — 100 (CATCHMENT ID) — 14.6 | 0.35 (RUNOFF COEFFICIENT)

- CATCHMENT BOUNDARY
- OVERLAND FLOW DIRECTION
- WETLAND
- TOP OF BANK
- TOE OF SLOPE
- BOTTOM OF SWALE

*CATCHMENT 101 INCLUDES EXTERNAL LANDS

JEWELL ENGINEERING

KEENE SUBDIVISION

KEENE, ONTARIO

PRE-DEVELOPMENT
STORMWATER CATCHMENT AREAS

DRAWN BY: JO	PROJECT NO: 220-5237	
DESIGNED BY:	DATE: 17 September 2024	
CHECKED BY: AMR	SCALE: HORIZONTAL - 1:750 VERTICAL - N/A	
APPROVED BY:	CONTRACT NO:	DRAWING NO: CA1

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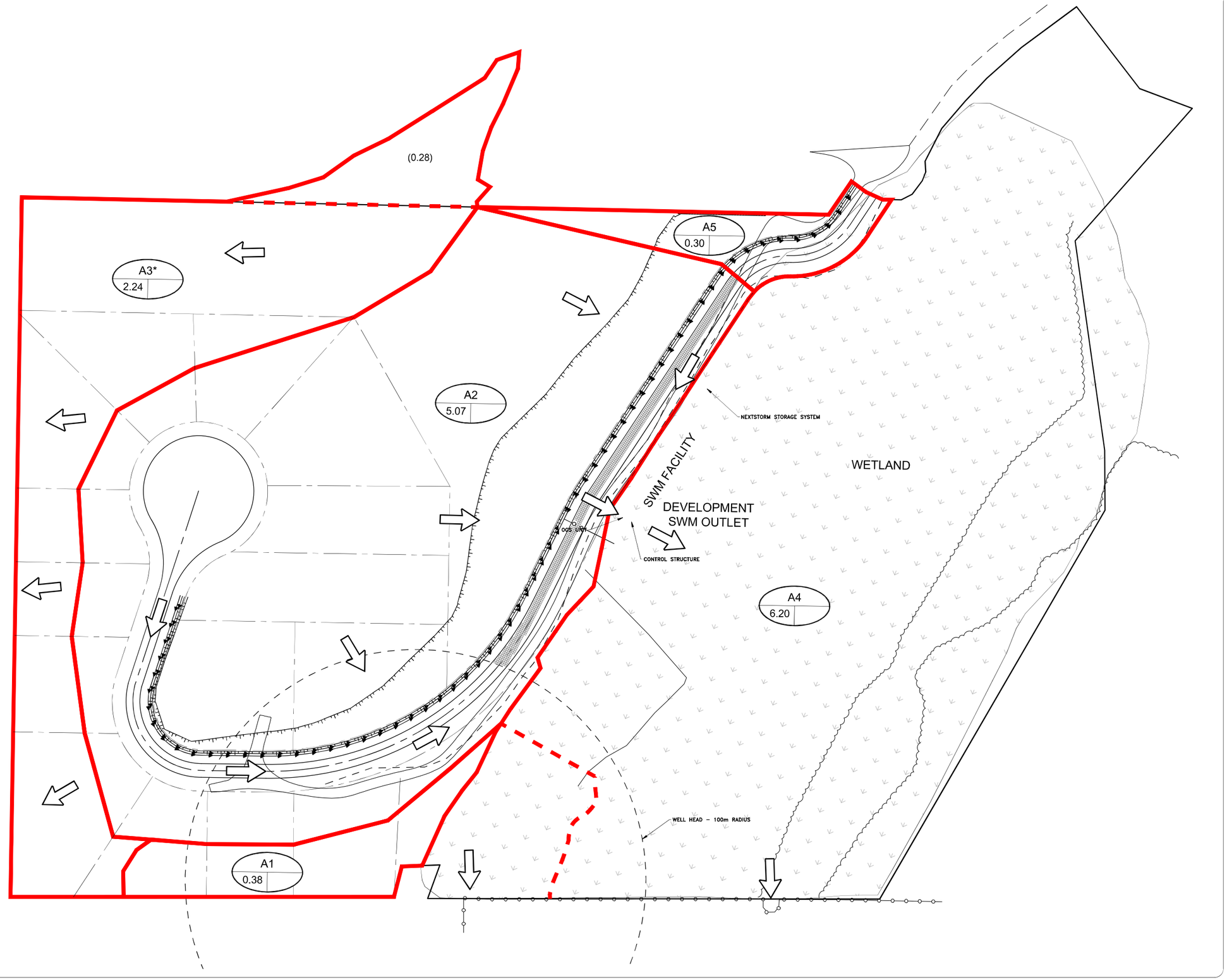
08/20/2024



GENERAL NOTES:
- ALL INFORMATION TO BE VERIFIED ON SITE PRIOR TO COMMENCING ANY WORK. ANY DISCREPANCIES ARE TO BE REPORTED TO THE CONSULTANT IMMEDIATELY.
- ALL UTILITY LOCATIONS SHOWN ON THE DRAWINGS ARE APPROXIMATE. THE CONTRACTOR SHALL CONFIRM THE LOCATION ON SITE AND ASSUME ALL LIABILITY FOR DAMAGE TO ALL UTILITIES.
- EXCLUDING THE BENCHMARK AND DESCRIPTION PROVIDED FOR THIS PROJECT, NO OTHER ELEVATIONS ARE TO BE USED AS A REFERENCE ELEVATION FOR ANY PURPOSE.

METRIC NOTE:
- ALL DIMENSIONS SHOWN ARE IN METRES OR MILLIMETRES, UNLESS OTHERWISE NOTED.

GEOMETRIC NOTE:
- ALL SURVEY DATA SHOWN ON THIS DRAWING WAS RECORDED USING REAL-TIME KINETIC (RTK) GPS OBSERVATIONS IN REFERENCE TO UTM 18 NORTH COORDINATE SYSTEM.
- ALL ELEVATIONS ARE IN REFERENCE TO LOCAL DATUM NAD83 - GEODETIC MODEL HT2_0, UNLESS DESCRIBED OTHERWISE.

* * DRAWINGS ARE NOT TO BE SCALED * *

REVISIONS

NO.	DATE	DESCRIPTION	BY

LEGEND

CATCHMENT AREA (ha) — 100 / 14.6 | 0.35 — CATCHMENT ID / RUNOFF COEFFICIENT

CATCHMENT BOUNDARY

OVERLAND FLOW DIRECTION

WETLAND

TOP OF BANK

TOE OF SLOPE

BOTTOM OF SWALE

*CATCHMENT A3 INCLUDES EXTERNAL LANDS

JEWELL ENGINEERING

KEENE SUBDIVISION

KEENE, ONTARIO

POST-DEVELOPMENT
STORMWATER CATCHMENT AREAS

DRAWN BY: JO	PROJECT NO: 220-5237		
DESIGNED BY:	DATE: September 2024		
CHECKED BY: AMR	SCALE: HORIZONTAL - 1:750 VERTICAL - N/A		
APPROVED BY:	CONTRACT NO:	DRAWING NO: CA2	

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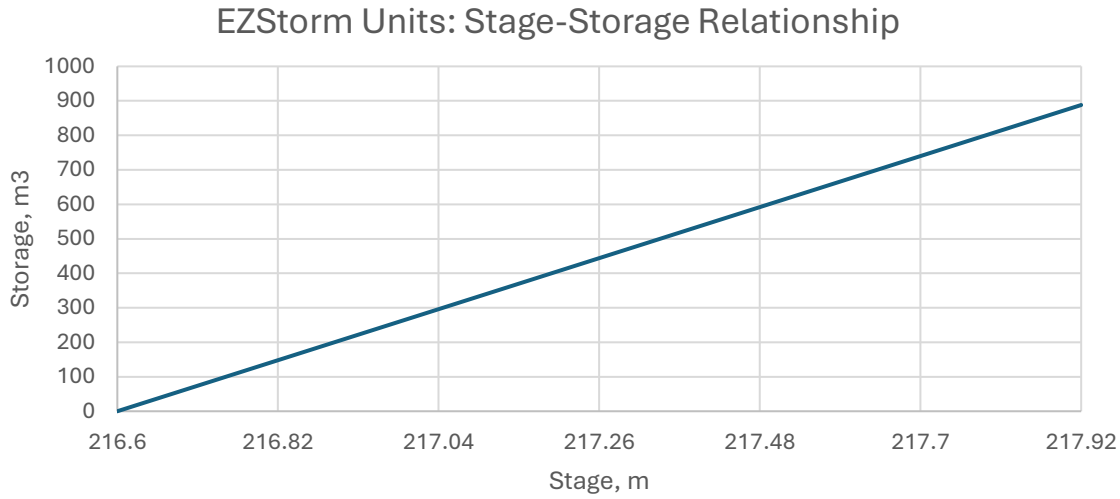
APPENDIX C

SWM Facility Sizing – EZStorm Units

Storage Unit Dimensions	0.80 x 0.80 x 0.66 (h) -> porosity = 96%
Volume per Unit	0.405m^3
Use 2,190 Units in two layers	888m^3 total storage volume



Model spillway as broad-crested weir, assume 1.0m length (conservative)

Q = 1.67LH^1.5 = 1.67(1)(0.4)^1.5 = 0.422 m^3/s

Keene SWMF Sizing

Andrew Rosenthal, EIT / September 20, 2024

Pond Elevations	
Perm.Pool	216.6
Max. Elev	217.92
Increment	0.11

Outlet 1	
Use Outlet 1?	Yes
Type	Orifice
Invert	216.6
diam (m)	0.175
No. of Outlets	1

Outlet 2	
Use Outlet 2?	Yes
Type	Orifice
Invert	216.93
diam (m)	0.16
No. of Outlets	1

Outlet 3	
Use Outlet 3?	Yes
Type	Orifice
Invert	217.26
diam (m)	0.16
No. of Outlets	1

Orifice Equation - Allows orifice flowing partially full

$$=\langle h \le 2r\rangle 0.6 * \left[\left(arccos\left(\frac{r-h}{r}\right)\right)r^2 - r(r-h) * sin\left(arccos\left(\frac{r-h}{r}\right)\right)\right] * \sqrt{2g * \left(\frac{4r * sin^3\left(arccos\left(\frac{r-h}{r}\right)\right)}{3\left(2\left(arccos\left(\frac{r-h}{r}\right)\right) - sin\left(2\left(arccos\left(\frac{r-h}{r}\right)\right)\right)\right)} - (r-h)\right)}$$

$$+\langle h > 2r\rangle 0.6\pi r^2 * \sqrt{2g(h-r)}$$

Elevation m	Incr.Vol m3	Cum.Vol m3	Head on inv., m	Q, m3/s	Head on inv., m	Q, m3/s	Head on inv., m	Q, m3/s	Q.total m3/s
216.60	0	0	0	0.000	-	0.000	-	0.000	0.000
216.71	74	74	0.11	0.009	-	0.000	-	0.000	0.009
216.82	74	148	0.22	0.023	-	0.000	-	0.000	0.023
216.93	74	222	0.33	0.031	0	0.000	-	0.000	0.031
217.04	74	296	0.44	0.038	0.11	0.008	-	0.000	0.046
217.15	74	370	0.55	0.043	0.22	0.019	-	0.000	0.062
217.26	74	444	0.66	0.048	0.33	0.025	0	0.000	0.074
217.37	74	518	0.77	0.053	0.44	0.030	0.11	0.009	0.092
217.48	74	592	0.88	0.057	0.55	0.034	0.22	0.020	0.111
217.59	74	666	0.99	0.061	0.66	0.038	0.33	0.027	0.126
217.70	74	740	1.1	0.064	0.77	0.042	0.44	0.032	0.138
217.81	74	814	1.21	0.068	0.88	0.045	0.55	0.037	0.149
217.92	74	888	1.32	0.071	0.99	0.048	0.66	0.041	0.160

APPENDIX D

OGS Sizing

Hydro First Defense® - HC

Rev. 12.5

Project Name:	**Keene Subdivision**	*Report Date:*	**2024/09/13**
Street:	**74 Edwards St**	*City:*	**Keene**
Province:	**ON**	*Country:*	**CAN**
Designer:	**A.Rosenthal, EIT**	*email:*	

Paste

Treatment Parameters:

Structure ID:	OGS A	
TSS Goal:	47	% Removal
TSS Particle Size:	ETV	
Area:	5.07	ha
Percent Impervious:	20%	
Rational C value:	0.30	Calc. Cn
Rainfall Station:	Peterborough	MAP
Peak Storm Flow:	260	L/s

RESULTS SUMMARY

Model	TSS	Volume
FD-3HC	36.0%	>90%
FD-4HC	43.0%	>90%
FD-5HC	**47.0%**	**>90%**
FD-6HC	50.0%	>90%
FD-8HC	54.0%	>90%
FD-10HC	57.0%	>90%

Model Specification:

Model:	**FD-5HC**	
Diameter:	1500	mm
Peak Flow Capacity:	566.00	L/s
Sediment Storage:	0.84	m^3
Oil Storage:	1136.00	L

Installation Configuration:

Placement:	Online		
Outlet Pipe Size:		mm	*OK*
Inlet Pipe 1 Size:		mm	*OK*
Inlet Pipe 2 Size:		mm	*OK*
Inlet Pipe 3 Size:		mm	*OK*
Rim Level:	100.000	m	Calc Invs.
Outlet Pipe Invert:		m	
Invert Pipe 1:		m	*OK!*
Invert Pipe 2:		m	
Invert Pipe 3:		m	

Net Annual Removal Model: FD-5HC

Intensity[1]	Fraction of Rainfall[1]	FD-5HC Removal Efficiency[2]	Weighted Net Annual Efficiency
(mm/hr)	(%)	(%)	(%)
0.50	9.5%	60.6%	5.8%
1.00	10.4%	55.6%	5.8%
1.50	8.9%	52.7%	4.7%
2.00	8.1%	50.7%	4.1%
2.50	7.3%	49.1%	3.6%
3.00	5.6%	47.7%	2.7%
3.50	5.1%	46.6%	2.4%
4.00	4.1%	45.7%	1.9%
4.50	3.2%	44.8%	1.4%
5.00	3.3%	44.1%	1.5%
6.00	6.4%	42.7%	2.7%
7.00	4.7%	41.6%	2.0%
8.00	4.1%	40.7%	1.7%
9.00	2.8%	39.8%	1.1%
10.00	2.0%	39.1%	0.8%
15.00	7.3%	36.1%	2.6%
20.00	3.7%	34.1%	1.3%
25.00	2.5%	32.5%	0.8%
30.00	0.2%	31.2%	0.1%
35.00	0.5%	30.0%	0.2%
40.00	0.3%	29.1%	0.1%
Total Net Annual Removal Efficiency:			**47.0%**
Total Annual Runoff Volume Treated:			**>90%**

1. Based on 32 years of hourly rainfall data from Canada Station 6166418, Peterborough ON
2. Canada ETV PSD & Test Protocols - ISO14034 Certifed
3. Rainfall adjusted to 5 min peak intensity based on hourly average.

Designer Notes:

APPENDIX E

OTTHYMO – 2Yr, 5Yr, 100Yr, Timmins Event

```
================================================================================

        OOO   TTTTT  TTTTT  H   H  Y   Y  M   M   OOO    I N T E R H Y M O
       O   O    T      T    H   H   Y Y   MM MM  O   O   * * * 1989a * * *
       O   O    T      T    HHHHH    Y    M M M  O   O
       O   O    T      T    H   H    Y    M   M  O   O
        OOO     T      T    H   H    Y    M   M   OOO             00004

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  Input   filename: 74ed.dat
  Output  filename: 74ed.out
  Summary filename: 74ed.sum



DATE: 03-07-2024                      TIME: 11:09:38


COMMENTS: _____________________________________________________________


--------------------------------------------------------------------------------
*
  ****************************
  ** SIMULATION NUMBER:   1 **
  ****************************

*
*                   74 Edwards St
*
*                   Environment Canada Peterborough Airport Station
*
*                   100-Yr Return Period
*                   August 28, 2024
*                   Andrew Rosenthal, EIT
*
*                   LGI, LGP from L=SQRT(A/1.5)
*
********************************************************************************
*                   2 Year Storms
********************************************************************************
--------------------
| CHICAGO STORM    |    IDF curve parameters: A= 585.138
| Ptotal= 22.79 mm |                          B=   6.050
--------------------                          C=    .774
                        used in:   INTENSITY =  A / (t + B)^C

                        Duration of storm  =  1.00 hrs
                        Storm time step    =  5.00 min
                        Time to peak ratio =   .33

                    The CORRELATION coefficient is =  .9997

                     TIME       INPUT INT.           TAB. INT.
                    (min)        (mm/hr)              (mm/hr)
                       5.          92.00                91.14
                      10.          68.20                68.27
                      15.          56.00                55.34
                      30.          35.90                36.49
                      60.          22.10                22.84
                     120.          13.90                13.85
```

360.	6.40	6.07
720.	3.70	3.57
1440.	2.00	2.10

TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr
.08	9.43	.33	91.14	.58	16.33	.83	8.65
.17	14.43	.42	40.97	.67	12.56	.92	7.52
.25	32.18	.50	23.43	.75	10.23	1.00	6.66

---

* Pre-Development Catchment 100

CALIB NASHYD (0001) ID= 1 DT= 5.0 min					
	Area	(ha)=	2.80	Curve Number (CN)=	58.0
	Ia	(mm)=	5.00	# of Linear Res.(N)=	3.00
	U.H. Tp(hrs)=		.20		

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

Unit Hyd Qpeak (cms)= .53

PEAK FLOW (cms)= .02 (i)
TIME TO PEAK (hrs)= .67
RUNOFF VOLUME (mm)= 1.46
TOTAL RAINFALL (mm)= 22.79
RUNOFF COEFFICIENT = .06

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

---

* Post-Development Catchment A2 to SWMF

CALIB STANDHYD (0001) ID= 1 DT= 5.0 min					
	Area	(ha)=	5.07		
	Total Imp(%)=		20.00	Dir. Conn.(%)=	10.00

		IMPERVIOUS	PERVIOUS (i)	
Surface Area	(ha)=	1.01	4.06	
Dep. Storage	(mm)=	2.00	5.00	
Average Slope	(%)=	2.00	2.00	
Length	(m)=	184.00	184.00	
Mannings n	=	.013	.250	
Max.eff.Inten.(mm/hr)=		66.05	1.77	
over (min)		10.00	90.00	
Storage Coeff. (min)=		3.53 (ii)	92.06 (ii)	
Unit Hyd. Tpeak (min)=		5.00	95.00	
Unit Hyd. peak (cms)=		.26	.01	
				TOTALS
PEAK FLOW	(cms)=	.11	.01	.11 (iii)
TIME TO PEAK	(hrs)=	.50	2.17	.50
RUNOFF VOLUME	(mm)=	20.24	2.36	4.05
TOTAL RAINFALL	(mm)=	22.79	22.79	22.79
RUNOFF COEFFICIENT	=	.89	.10	.18

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

(i) CN PROCEDURE SELECTED FOR RAINFALL LOSSES:
CN* = 66.0 Ia = Dep. Storage (Above)

```
      (ii) COMPUTATIONAL TIME STEP SHOULD BE SMALL OR EQUAL
           THAN THE STORAGE COEFFICIENT.
     (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

--------------------------------------------------------------------------------
--------------------
| SAVE HYD  (0001) |   AREA       (ha)=   5.07
| ID= 1   PCYC= 74 |   QPEAK     (cms)=    .11 (i)
| DT= 5.0 min      |   TPEAK     (hrs)=    .50
--------------------   VOLUME     (mm)=   4.05
  Filename: ED02C01.QIN
  Comments: -

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

--------------------------------------------------------------------------------
*                   Route through EZStorm
--------------------
| RESERVOIR (0001) |
| IN= 1---> OUT= 2 |
| DT=  5.0 min     |     OUTFLOW    STORAGE   |  OUTFLOW    STORAGE
--------------------      (cms)     (ha.m.)   |   (cms)     (ha.m.)
                            .000       .000    |     .130       .068
                            .030       .022    |     .160       .088
                            .060       .036    |     .000       .000

                                  AREA     QPEAK     TPEAK       R.V.
                                  (ha)     (cms)     (hrs)       (mm)
     INFLOW : ID= 1 (0001)      5.07       .11       .50       4.05
     OUTFLOW: ID= 2 (0001)      5.07       .01      1.08       4.01

                   PEAK   FLOW   REDUCTION [Qout/Qin](%)= 10.72
                   TIME SHIFT OF PEAK FLOW         (min)= 35.00
                   MAXIMUM  STORAGE   USED       (ha.m.)=   .01

--------------------------------------------------------------------------------
*                   Post-Development Catchment A5, Uncontrolled
--------------------
| CALIB            |
| STANDHYD  (0001) |   Area    (ha)=    .30
|ID= 1 DT= 5.0 min |   Total Imp(%)=  20.00   Dir. Conn.(%)=  10.00
--------------------
                                IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=        .06          .24
     Dep. Storage     (mm)=       2.00         5.00
     Average Slope     (%)=       2.00         2.00
     Length            (m)=      45.00        45.00
     Mannings n           =       .013         .250

     Max.eff.Inten.(mm/hr)=      66.05         4.58
               over (min)        10.00        30.00
     Storage Coeff.  (min)=       1.52 (ii)   27.51 (ii)
     Unit Hyd. Tpeak (min)=       5.00        30.00
     Unit Hyd. peak  (cms)=        .33          .04
                                                          *TOTALS*
     PEAK FLOW       (cms)=        .01          .00           .01 (iii)
     TIME TO PEAK    (hrs)=        .33          .92           .33
     RUNOFF VOLUME    (mm)=      20.24         2.36          3.66
     TOTAL RAINFALL   (mm)=      22.79        22.79         22.79
     RUNOFF COEFFICIENT   =        .89          .10           .16

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

```
       (i) CN PROCEDURE SELECTED FOR RAINFALL LOSSES:
            CN*  =  66.0    Ia = Dep. Storage  (Above)
      (ii) COMPUTATIONAL TIME STEP SHOULD BE SMALL OR EQUAL
           THAN THE STORAGE COEFFICIENT.
     (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

--------------------------------------------------------------------------------

--------------------
| ADD HYD   (0001) |
|   1 +  2 =  3    |          AREA    QPEAK    TPEAK     R.V.
--------------------          (ha)    (cms)    (hrs)     (mm)
          ID1= 1 (0001):       .30      .01      .33     3.66
        + ID2= 2 (0001):     5.07      .01     1.08     4.01
          ================================================
          ID = 3 (0001):     5.37      .01      .92     3.99

     NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

--------------------------------------------------------------------------------
--------------------
| CHICAGO STORM    |    IDF curve parameters: A= 585.138
| Ptotal= 33.01 mm |                          B=   6.050
--------------------                          C=    .774
                         used in:   INTENSITY =  A / (t + B)^C

                         Duration of storm  =  4.00 hrs
                         Storm time step    =  5.00 min
                         Time to peak ratio =   .33

                      The CORRELATION coefficient is =  .9997

                       TIME       INPUT INT.           TAB. INT.
                      (min)        (mm/hr)              (mm/hr)
                         5.          92.00                91.14
                        10.          68.20                68.27
                        15.          56.00                55.34
                        30.          35.90                36.49
                        60.          22.10                22.84
                       120.          13.90                13.85
                       360.           6.40                 6.07
                       720.           3.70                 3.57
                      1440.           2.00                 2.10


                    TIME    RAIN |  TIME    RAIN |  TIME    RAIN |  TIME    RAIN
                     hrs   mm/hr |   hrs   mm/hr |   hrs   mm/hr |   hrs   mm/hr
                     .08    2.15 |  1.08    9.43 |  2.08    5.99 |  3.08    2.86
                     .17    2.28 |  1.17   14.43 |  2.17    5.46 |  3.17    2.75
                     .25    2.43 |  1.25   32.18 |  2.25    5.01 |  3.25    2.65
                     .33    2.60 |  1.33   91.14 |  2.33    4.64 |  3.33    2.56
                     .42    2.81 |  1.42   40.97 |  2.42    4.33 |  3.42    2.47
                     .50    3.05 |  1.50   23.43 |  2.50    4.06 |  3.50    2.39
                     .58    3.34 |  1.58   16.33 |  2.58    3.82 |  3.58    2.32
                     .67    3.71 |  1.67   12.56 |  2.67    3.61 |  3.67    2.25
                     .75    4.19 |  1.75   10.23 |  2.75    3.43 |  3.75    2.19
                     .83    4.82 |  1.83    8.65 |  2.83    3.27 |  3.83    2.13
                     .92    5.72 |  1.92    7.52 |  2.92    3.12 |  3.92    2.07
                    1.00    7.08 |  2.00    6.66 |  3.00    2.99 |  4.00    2.01


--------------------------------------------------------------------------------
*                    Pre-Development Catchment 100
```

```
--------------------
| CALIB            |
| NASHYD    (0001) |   Area    (ha)=   2.80   Curve Number   (CN)= 58.0
|ID= 1 DT= 5.0 min |   Ia      (mm)=   5.00   # of Linear Res.(N)= 3.00
--------------------   U.H. Tp(hrs)=    .20

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

     Unit Hyd Qpeak  (cms)=    .53

     PEAK FLOW       (cms)=    .03 (i)
     TIME TO PEAK    (hrs)=   1.58
     RUNOFF VOLUME    (mm)=   3.64
     TOTAL RAINFALL   (mm)=  33.01
     RUNOFF COEFFICIENT   =    .11

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

------------------------------------------------------------------------------
*                   Post-Development Catchment A2 to SWMF
--------------------
| CALIB            |
| STANDHYD  (0001) |   Area    (ha)=   5.07
|ID= 1 DT= 5.0 min |   Total Imp(%)=  20.00   Dir. Conn.(%)=  10.00
--------------------
                            IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=       1.01         4.06
     Dep. Storage     (mm)=       2.00         5.00
     Average Slope     (%)=       2.00         2.00
     Length            (m)=     184.00       184.00
     Mannings n             =       .013         .250

     Max.eff.Inten.(mm/hr)=      66.05         4.06
               over (min)        10.00        65.00
     Storage Coeff.  (min)=       3.53 (ii)   67.03 (ii)
     Unit Hyd. Tpeak (min)=       5.00        70.00
     Unit Hyd. peak  (cms)=        .26          .02
                                                        *TOTALS*
     PEAK FLOW       (cms)=        .11          .02           .11 (iii)
     TIME TO PEAK    (hrs)=       1.50         2.83          1.50
     RUNOFF VOLUME    (mm)=      30.84         5.57          8.02
     TOTAL RAINFALL   (mm)=      33.01        33.01         33.01
     RUNOFF COEFFICIENT   =        .93          .17           .24

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

       (i) CN PROCEDURE SELECTED FOR RAINFALL LOSSES:
            CN*  =  66.0    Ia = Dep. Storage  (Above)
      (ii) COMPUTATIONAL TIME STEP SHOULD BE SMALL OR EQUAL
           THAN THE STORAGE COEFFICIENT.
     (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

------------------------------------------------------------------------------
--------------------
| SAVE HYD  (0001) |   AREA       (ha)=   5.07
| ID= 1   PCYC= 93 |   QPEAK     (cms)=    .11 (i)
| DT= 5.0 min      |   TPEAK     (hrs)=   1.50
--------------------   VOLUME     (mm)=   8.02
  Filename: ED02C04.QIN
  Comments: -

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

```
--------------------------------------------------------------------------------
*                   Route through EZStorm
--------------------
| RESERVOIR (0001) |
| IN= 1---> OUT= 2 |
| DT=  5.0 min     |     OUTFLOW    STORAGE   |  OUTFLOW    STORAGE
--------------------      (cms)     (ha.m.)   |   (cms)     (ha.m.)
                            .000       .000    |     .130       .068
                            .030       .022    |     .160       .088
                            .060       .036    |     .000       .000

                                  AREA     QPEAK     TPEAK       R.V.
                                  (ha)     (cms)     (hrs)       (mm)
     INFLOW : ID= 1 (0001)      5.07       .11      1.50       8.02
     OUTFLOW: ID= 2 (0001)      5.07       .02      4.08       7.99

                   PEAK   FLOW   REDUCTION [Qout/Qin](%)= 19.71
                   TIME SHIFT OF PEAK FLOW         (min)=155.00
                   MAXIMUM  STORAGE   USED       (ha.m.)=   .02

--------------------------------------------------------------------------------
*                   Post-Development Catchment A5, Uncontrolled
--------------------
| CALIB            |
| STANDHYD  (0001) |   Area    (ha)=    .30
|ID= 1 DT= 5.0 min |   Total Imp(%)=  20.00   Dir. Conn.(%)=  10.00
--------------------
                                IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=        .06          .24
     Dep. Storage     (mm)=       2.00         5.00
     Average Slope     (%)=       2.00         2.00
     Length            (m)=      45.00        45.00
     Mannings n           =       .013         .250

     Max.eff.Inten.(mm/hr)=      66.05         7.06
               over (min)        10.00        25.00
     Storage Coeff.  (min)=       1.52 (ii)   23.39 (ii)
     Unit Hyd. Tpeak (min)=       5.00        25.00
     Unit Hyd. peak  (cms)=        .33          .05
                                                          *TOTALS*
     PEAK FLOW       (cms)=        .01          .00           .01 (iii)
     TIME TO PEAK    (hrs)=       1.33         1.83          1.33
     RUNOFF VOLUME    (mm)=      30.84         5.57          7.24
     TOTAL RAINFALL   (mm)=      33.01        33.01         33.01
     RUNOFF COEFFICIENT   =        .93          .17           .22

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

       (i) CN PROCEDURE SELECTED FOR RAINFALL LOSSES:
            CN*  =  66.0    Ia = Dep. Storage  (Above)
      (ii) COMPUTATIONAL TIME STEP SHOULD BE SMALL OR EQUAL
           THAN THE STORAGE COEFFICIENT.
     (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

--------------------------------------------------------------------------------

--------------------
| ADD HYD   (0001) |
|   1 +  2 =  3    |         AREA    QPEAK    TPEAK     R.V.
--------------------         (ha)    (cms)    (hrs)     (mm)
          ID1= 1 (0001):      .30      .01     1.33     7.24
```

```
        + ID2= 2 (0001):     5.07      .02     4.08     7.99
          ================================================
          ID = 3 (0001):     5.37      .02     3.50     7.94

     NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

--------------------------------------------------------------------------------

--------------------
|    READ STORM    |    Filename: YPQ2y12.stm
| Ptotal= 44.41 mm |    Comments: 12hr SCS Type 2 - 2Yr
--------------------
                TIME    RAIN |  TIME    RAIN |  TIME    RAIN |  TIME    RAIN
                 hrs   mm/hr |   hrs   mm/hr |   hrs   mm/hr |   hrs   mm/hr
                 .50     .98 |  3.50    1.78 |  6.50    9.68 |  9.50    1.60
                1.00     .98 |  4.00    1.78 |  7.00    4.26 | 10.00    1.60
                1.50    1.15 |  4.50    2.40 |  7.50    2.66 | 10.50    1.07
                2.00    1.15 |  5.00    3.02 |  8.00    2.66 | 11.00    1.07
                2.50    1.42 |  5.50    4.80 |  8.50    1.60 | 11.50    1.07
                3.00    1.42 |  6.00   38.01 |  9.00    1.60 | 12.00    1.07

--------------------------------------------------------------------------------

*                   Pre-Development Catchment 100
--------------------
| CALIB            |
| NASHYD    (0001) |   Area    (ha)=   2.80   Curve Number   (CN)= 58.0
|ID= 1 DT= 5.0 min |   Ia      (mm)=   5.00   # of Linear Res.(N)= 3.00
--------------------   U.H. Tp(hrs)=    .20

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

     Unit Hyd Qpeak  (cms)=    .53

     PEAK FLOW       (cms)=    .04 (i)
     TIME TO PEAK    (hrs)=   6.08
     RUNOFF VOLUME    (mm)=   6.90
     TOTAL RAINFALL   (mm)=  44.41
     RUNOFF COEFFICIENT   =    .16

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

--------------------------------------------------------------------------------
*                   Post-Development Catchment A2 to SWMF
--------------------
| CALIB            |
| STANDHYD  (0001) |   Area    (ha)=   5.07
|ID= 1 DT= 5.0 min |   Total Imp(%)=  20.00   Dir. Conn.(%)=  10.00
--------------------
                              IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=       1.01         4.06
     Dep. Storage     (mm)=       2.00         5.00
     Average Slope     (%)=       2.00         2.00
     Length            (m)=     184.00       184.00
     Mannings n            =       .013         .250

     Max.eff.Inten.(mm/hr)=      38.01         6.76
                over (min)       10.00        55.00
     Storage Coeff.  (min)=       4.41 (ii)   56.22 (ii)
     Unit Hyd. Tpeak (min)=       5.00        60.00
     Unit Hyd. peak  (cms)=        .23          .02
                                                      *TOTALS*
     PEAK FLOW       (cms)=        .05          .04          .06 (iii)
     TIME TO PEAK    (hrs)=       6.25         7.17         6.25
```

```
     RUNOFF VOLUME    (mm)=      42.33        10.18          13.33
     TOTAL RAINFALL   (mm)=      44.41        44.41          44.41
     RUNOFF COEFFICIENT   =        .95          .23            .30

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

       (i) CN PROCEDURE SELECTED FOR RAINFALL LOSSES:
            CN*  =  66.0    Ia = Dep. Storage  (Above)
      (ii) COMPUTATIONAL TIME STEP SHOULD BE SMALL OR EQUAL
           THAN THE STORAGE COEFFICIENT.
     (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

--------------------------------------------------------------------------------
--------------------
| SAVE HYD  (0001) |   AREA       (ha)=   5.07
| ID= 1   PCYC=174 |   QPEAK     (cms)=    .06 (i)
| DT= 5.0 min      |   TPEAK     (hrs)=   6.25
--------------------   VOLUME     (mm)=  13.33
  Filename: ED02S12.QIN
  Comments: -

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

--------------------------------------------------------------------------------
*                    Route through EZStorm
--------------------
| RESERVOIR (0001) |
| IN= 1---> OUT= 2 |
| DT=  5.0 min     |     OUTFLOW    STORAGE   |  OUTFLOW    STORAGE
--------------------      (cms)     (ha.m.)   |   (cms)     (ha.m.)
                            .000       .000    |     .130       .068
                            .030       .022    |     .160       .088
                            .060       .036    |     .000       .000

                                  AREA     QPEAK     TPEAK       R.V.
                                  (ha)     (cms)     (hrs)       (mm)
     INFLOW : ID= 1 (0001)      5.07       .06      6.25      13.33
     OUTFLOW: ID= 2 (0001)      5.07       .03      8.25      13.30

                PEAK   FLOW   REDUCTION [Qout/Qin](%)= 48.13
                TIME SHIFT OF PEAK FLOW         (min)=120.00
                MAXIMUM  STORAGE   USED       (ha.m.)=   .02

--------------------------------------------------------------------------------
*                    Post-Development Catchment A5, Uncontrolled
--------------------
| CALIB            |
| STANDHYD  (0001) |   Area    (ha)=    .30
|ID= 1 DT= 5.0 min |   Total Imp(%)=  20.00   Dir. Conn.(%)=  10.00
--------------------
                               IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=        .06          .24
     Dep. Storage     (mm)=       2.00         5.00
     Average Slope     (%)=       2.00         2.00
     Length            (m)=      45.00        45.00
     Mannings n           =       .013         .250

     Max.eff.Inten.(mm/hr)=      38.01        10.94
               over (min)        10.00        20.00
     Storage Coeff.  (min)=       1.89 (ii)   20.25 (ii)
     Unit Hyd. Tpeak (min)=       5.00        25.00
     Unit Hyd. peak  (cms)=        .32          .05
```

```
                                                          *TOTALS*
     PEAK FLOW       (cms)=        .00          .00           .01 (iii)
     TIME TO PEAK    (hrs)=       6.00         6.33          6.08
     RUNOFF VOLUME    (mm)=      42.33        10.18         10.36
     TOTAL RAINFALL   (mm)=      44.41        44.41         44.41
     RUNOFF COEFFICIENT   =        .95          .23           .23

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

       (i) CN PROCEDURE SELECTED FOR RAINFALL LOSSES:
            CN*  =  66.0    Ia = Dep. Storage  (Above)
      (ii) COMPUTATIONAL TIME STEP SHOULD BE SMALL OR EQUAL
           THAN THE STORAGE COEFFICIENT.
     (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

--------------------------------------------------------------------------------

--------------------
| ADD HYD   (0001) |
|   1 +  2 =  3    |          AREA    QPEAK    TPEAK     R.V.
--------------------          (ha)    (cms)    (hrs)     (mm)
          ID1= 1 (0001):      .30      .01     6.08    10.36
        + ID2= 2 (0001):     5.07      .03     8.25    13.30
          ================================================
          ID = 3 (0001):     5.37      .03     8.08    13.14

     NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

--------------------------------------------------------------------------------

--------------------
|    READ STORM    |    Filename: YPQ2y24.stm
| Ptotal= 49.00 mm |    Comments: 24hr SCS Type 2 - 2Yr
--------------------
                TIME    RAIN |  TIME    RAIN |  TIME    RAIN |  TIME    RAIN
                 hrs   mm/hr |   hrs   mm/hr |   hrs   mm/hr |   hrs   mm/hr
                1.00     .54 |  7.00     .98 | 13.00    5.34 | 19.00     .88
                2.00     .54 |  8.00     .98 | 14.00    2.35 | 20.00     .88
                3.00     .64 |  9.00    1.32 | 15.00    1.47 | 21.00     .59
                4.00     .64 | 10.00    1.67 | 16.00    1.47 | 22.00     .59
                5.00     .78 | 11.00    2.65 | 17.00     .88 | 23.00     .59
                6.00     .78 | 12.00   20.97 | 18.00     .88 | 24.00     .59

--------------------------------------------------------------------------------

*                   Pre-Development Catchment 100
--------------------
| CALIB            |
| NASHYD    (0001) |   Area    (ha)=   2.80   Curve Number   (CN)= 58.0
|ID= 1 DT= 5.0 min |   Ia      (mm)=   5.00   # of Linear Res.(N)= 3.00
--------------------   U.H. Tp(hrs)=    .20

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

     Unit Hyd Qpeak  (cms)=    .53

     PEAK FLOW       (cms)=    .03 (i)
     TIME TO PEAK    (hrs)=  12.00
     RUNOFF VOLUME    (mm)=   8.44
     TOTAL RAINFALL   (mm)=  49.00
     RUNOFF COEFFICIENT   =    .17
```

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

--------------------------------------------------------------------------------
*                   Post-Development Catchment A2 to SWMF
--------------------
| CALIB            |
| STANDHYD  (0001) |   Area    (ha)=   5.07
|ID= 1 DT= 5.0 min |   Total Imp(%)=  20.00   Dir. Conn.(%)=  10.00
--------------------
                              IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=       1.01         4.06
     Dep. Storage     (mm)=       2.00         5.00
     Average Slope     (%)=       2.00         2.00
     Length            (m)=     184.00       184.00
     Mannings n           =       .013         .250

     Max.eff.Inten.(mm/hr)=      20.97         5.92
               over (min)        10.00        55.00
     Storage Coeff.  (min)=       5.59 (ii)   60.20 (ii)
     Unit Hyd. Tpeak (min)=       5.00        65.00
     Unit Hyd. peak  (cms)=        .20          .02
                                                          *TOTALS*
     PEAK FLOW       (cms)=        .03          .04           .05 (iii)
     TIME TO PEAK    (hrs)=      12.25        13.08         12.25
     RUNOFF VOLUME    (mm)=      46.95        12.32         15.71
     TOTAL RAINFALL   (mm)=      49.00        49.00         49.00
     RUNOFF COEFFICIENT   =        .96          .25           .32

***** WARNING: FOR AREAS WITH IMPERVIOUS LESS THAN 20%
               YOU SHOULD CONSIDER SPLITTING THE AREA.

       (i) CN PROCEDURE SELECTED FOR RAINFALL LOSSES:
            CN*  =  66.0    Ia = Dep. Storage  (Above)
      (ii) COMPUTATIONAL TIME STEP SHOULD BE SMALL OR EQUAL
           THAN THE STORAGE COEFFICIENT.
     (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

--------------------------------------------------------------------------------
--------------------
| SAVE HYD  (0001) |   AREA       (ha)=   5.07
| ID= 1   PCYC=313 |   QPEAK     (cms)=    .05 (i)
| DT= 5.0 min      |   TPEAK     (hrs)=  12.25
--------------------   VOLUME     (mm)=  15.71
  Filename: ED02S24.QIN
  Comments: -

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

--------------------------------------------------------------------------------
*                   Route through EZStorm
--------------------
| RESERVOIR (0001) |
| IN= 1---> OUT= 2 |
| DT=  5.0 min     |     OUTFLOW    STORAGE   |  OUTFLOW    STORAGE
--------------------      (cms)     (ha.m.)   |   (cms)     (ha.m.)
                           .000       .000    |     .130       .068
                           .030       .022    |     .160       .088
                           .060       .036    |     .000       .000

                                  AREA     QPEAK     TPEAK       R.V.
                                  (ha)     (cms)     (hrs)       (mm)
     INFLOW : ID= 1 (0001)      5.07       .05     12.25      15.71
     OUTFLOW: ID= 2 (0001)      5.07       .03     14.25      15.67
```

```
                  PEAK   FLOW   REDUCTION [Qout/Qin](%)= 60.86
                  TIME SHIFT OF PEAK FLOW         (min)=120.00
                  MAXIMUM  STORAGE   USED       (ha.m.)=   .02

--------------------------------------------------------------------------------
*                   Post-Development Catchment A5, Uncontrolled
--------------------
| CALIB            |
| STANDHYD  (0001) |   Area    (ha)=    .30
|ID= 1 DT= 5.0 min |   Total Imp(%)=  20.00   Dir. Conn.(%)=  10.00
--------------------
                              IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=        .06          .24
     Dep. Storage     (mm)=       2.00         5.00
     Average Slope     (%)=       2.00         2.00
     Length            (m)=      45.00        45.00
     Mannings n           =       .013         .250

     Max.eff.Inten.(mm/hr)=      20.97         7.29
               over (min)        10.00        25.00
     Storage Coeff.  (min)=       2.40 (ii)   23.99 (ii)
     Unit Hyd. Tpeak (min)=       5.00        25.00
     Unit Hyd. peak  (cms)=        .30          .05
                                                          *TOTALS*
     PEAK FLOW       (cms)=        .00          .00           .01 (iii)
     TIME TO PEAK    (hrs)=      11.58        12.25         12.08
     RUNOFF VOLUME    (mm)=      46.95        12.32         10.84
     TOTAL RAINFALL   (mm)=      49.00        49.00         49.00
     RUNOFF COEFFICIENT   =        .96          .25           .22

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

       (i) CN PROCEDURE SELECTED FOR RAINFALL LOSSES:
            CN*  =  66.0    Ia = Dep. Storage  (Above)
      (ii) COMPUTATIONAL TIME STEP SHOULD BE SMALL OR EQUAL
           THAN THE STORAGE COEFFICIENT.
     (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

--------------------------------------------------------------------------------

--------------------
| ADD HYD   (0001) |
|   1 +  2 =  3    |         AREA    QPEAK    TPEAK     R.V.
--------------------         (ha)    (cms)    (hrs)     (mm)
          ID1= 1 (0001):      .30      .01    12.08    10.84
        + ID2= 2 (0001):     5.07      .03    14.25    15.67
          ================================================
          ID = 3 (0001):     5.37      .03    14.08    15.41

     NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

--------------------------------------------------------------------------------
********************************************************************************
*                   5 Year Storms
********************************************************************************
--------------------
| CHICAGO STORM    |    IDF curve parameters: A= 847.380
| Ptotal= 31.09 mm |                          B=   7.559
--------------------                          C=    .784
                         used in:   INTENSITY =  A / (t + B)^C

                         Duration of storm  =  1.00 hrs
```

Storm time step = 5.00 min
Time to peak ratio = .33

The CORRELATION coefficient is = .9996

TIME (min)	INPUT INT. (mm/hr)	TAB. INT. (mm/hr)
5.	121.00	116.55
10.	87.70	89.62
15.	73.10	73.63
30.	47.80	49.37
60.	30.10	31.16
120.	19.90	18.93
360.	8.70	8.26
720.	4.90	4.83
1440.	2.70	2.82

TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr
.08	13.30	.33	116.55	.58	23.26	.83	12.18
.17	20.52	.42	56.87	.67	17.83	.92	10.53
.25	45.05	.50	33.28	.75	14.46	1.00	9.30

---

* Pre-Development Catchment 100

CALIB NASHYD (0001) ID= 1 DT= 5.0 min	Area (ha)= 2.80	Curve Number (CN)= 58.0
	Ia (mm)= 5.00	# of Linear Res.(N)= 3.00
	U.H. Tp(hrs)= .20	

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

Unit Hyd Qpeak (cms)= .53

PEAK FLOW (cms)= .04 (i)
TIME TO PEAK (hrs)= .67
RUNOFF VOLUME (mm)= 3.04
TOTAL RAINFALL (mm)= 31.09
RUNOFF COEFFICIENT = .10

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

---

* Post-Development Catchment A2 to SWMF

CALIB STANDHYD (0001) ID= 1 DT= 5.0 min	Area (ha)= 5.07	Total Imp(%)= 20.00	Dir. Conn.(%)= 10.00

		IMPERVIOUS	PERVIOUS (i)
Surface Area	(ha)=	1.01	4.06
Dep. Storage	(mm)=	2.00	5.00
Average Slope	(%)=	2.00	2.00
Length	(m)=	184.00	184.00
Mannings n	=	.013	.250
Max.eff.Inten.(mm/hr)=		86.71	5.30
over (min)		10.00	60.00
Storage Coeff. (min)=		3.17 (ii)	60.27 (ii)
Unit Hyd. Tpeak (min)=		5.00	65.00
Unit Hyd. peak (cms)=		.27	.02

```
                                                                  *TOTALS*
     PEAK FLOW       (cms)=        .14          .03            .14 (iii)
     TIME TO PEAK    (hrs)=        .50         1.67            .50
     RUNOFF VOLUME    (mm)=      28.32         4.71           7.00
     TOTAL RAINFALL   (mm)=      31.09        31.09          31.09
     RUNOFF COEFFICIENT   =        .91          .15            .23

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

       (i) CN PROCEDURE SELECTED FOR RAINFALL LOSSES:
            CN*  =  66.0    Ia = Dep. Storage  (Above)
      (ii) COMPUTATIONAL TIME STEP SHOULD BE SMALL OR EQUAL
           THAN THE STORAGE COEFFICIENT.
     (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

--------------------------------------------------------------------------------
--------------------
| SAVE HYD  (0001) |   AREA       (ha)=   5.07
| ID= 1   PCYC= 65 |   QPEAK     (cms)=    .14 (i)
| DT= 5.0 min      |   TPEAK     (hrs)=    .50
--------------------   VOLUME     (mm)=   7.00
  Filename: ED05C01.QIN
  Comments: -

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

--------------------------------------------------------------------------------
*                    Route through EZStorm
--------------------
| RESERVOIR (0001) |
| IN= 1---> OUT= 2 |
| DT=  5.0 min     |     OUTFLOW    STORAGE   |  OUTFLOW    STORAGE
--------------------      (cms)     (ha.m.)   |   (cms)     (ha.m.)
                            .000       .000    |     .130       .068
                            .030       .022    |     .160       .088
                            .060       .036    |     .000       .000

                                 AREA     QPEAK     TPEAK       R.V.
                                 (ha)     (cms)     (hrs)       (mm)
     INFLOW : ID= 1 (0001)      5.07       .14       .50       7.00
     OUTFLOW: ID= 2 (0001)      5.07       .02      2.25       6.97

                   PEAK   FLOW   REDUCTION [Qout/Qin](%)= 15.64
                   TIME SHIFT OF PEAK FLOW         (min)=105.00
                   MAXIMUM  STORAGE   USED       (ha.m.)=   .02

--------------------------------------------------------------------------------
*                    Post-Development Catchment A5, Uncontrolled
--------------------
| CALIB            |
| STANDHYD  (0001) |   Area    (ha)=    .30
|ID= 1 DT= 5.0 min |   Total Imp(%)=  20.00   Dir. Conn.(%)=  10.00
--------------------
                                 IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=        .06          .24
     Dep. Storage     (mm)=       2.00         5.00
     Average Slope     (%)=       2.00         2.00
     Length            (m)=      45.00        45.00
     Mannings n           =       .013         .250

     Max.eff.Inten.(mm/hr)=      86.71        10.99
                over (min)       10.00        20.00
```

```
     Storage Coeff.  (min)=       1.36 (ii)   19.68 (ii)
     Unit Hyd. Tpeak (min)=       5.00        20.00
     Unit Hyd. peak  (cms)=        .33          .06
                                                          *TOTALS*
     PEAK FLOW       (cms)=        .01          .00           .01 (iii)
     TIME TO PEAK    (hrs)=        .33          .75           .33
     RUNOFF VOLUME    (mm)=      28.32         4.71          6.66
     TOTAL RAINFALL   (mm)=      31.09        31.09         31.09
     RUNOFF COEFFICIENT   =        .91          .15           .21

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

       (i) CN PROCEDURE SELECTED FOR RAINFALL LOSSES:
            CN*  =  66.0    Ia = Dep. Storage  (Above)
      (ii) COMPUTATIONAL TIME STEP SHOULD BE SMALL OR EQUAL
           THAN THE STORAGE COEFFICIENT.
     (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

--------------------------------------------------------------------------------

--------------------
| ADD HYD   (0001) |
|   1 +  2 =  3    |          AREA    QPEAK    TPEAK     R.V.
--------------------          (ha)    (cms)    (hrs)     (mm)
          ID1= 1 (0001):       .30      .01      .33     6.66
        + ID2= 2 (0001):     5.07      .02     2.25     6.97
          ================================================
          ID = 3 (0001):     5.37      .02     2.25     6.95

     NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

--------------------------------------------------------------------------------
--------------------
| CHICAGO STORM    |    IDF curve parameters: A= 847.380
| Ptotal= 45.03 mm |                          B=   7.559
--------------------                          C=    .784
                         used in:   INTENSITY =  A / (t + B)^C

                         Duration of storm  =  4.00 hrs
                         Storm time step    =  5.00 min
                         Time to peak ratio =   .33

                    The CORRELATION coefficient is =  .9996

                     TIME       INPUT INT.           TAB. INT.
                    (min)        (mm/hr)              (mm/hr)
                       5.         121.00               116.55
                      10.          87.70                89.62
                      15.          73.10                73.63
                      30.          47.80                49.37
                      60.          30.10                31.16
                     120.          19.90                18.93
                     360.           8.70                 8.26
                     720.           4.90                 4.83
                    1440.           2.70                 2.82


                  TIME    RAIN |  TIME    RAIN |  TIME    RAIN |  TIME    RAIN
                   hrs   mm/hr |   hrs   mm/hr |   hrs   mm/hr |   hrs   mm/hr
                   .08    2.88 |  1.08   13.30 |  2.08    8.33 |  3.08    3.87
                   .17    3.06 |  1.17   20.52 |  2.17    7.55 |  3.17    3.72
                   .25    3.27 |  1.25   45.05 |  2.25    6.92 |  3.25    3.58
```

```
                  .33    3.51 |  1.33  116.55 |  2.33    6.39 |  3.33    3.45
                  .42    3.79 |  1.42   56.87 |  2.42    5.94 |  3.42    3.33
                  .50    4.13 |  1.50   33.28 |  2.50    5.55 |  3.50    3.21
                  .58    4.55 |  1.58   23.26 |  2.58    5.22 |  3.58    3.11
                  .67    5.07 |  1.67   17.83 |  2.67    4.93 |  3.67    3.02
                  .75    5.74 |  1.75   14.46 |  2.75    4.67 |  3.75    2.93
                  .83    6.65 |  1.83   12.18 |  2.83    4.44 |  3.83    2.84
                  .92    7.93 |  1.92   10.53 |  2.92    4.23 |  3.92    2.76
                 1.00    9.90 |  2.00    9.30 |  3.00    4.04 |  4.00    2.69


--------------------------------------------------------------------------------
*                   Pre-Development Catchment 100
--------------------
| CALIB             |
| NASHYD    (0001)  |   Area    (ha)=   2.80   Curve Number   (CN)= 58.0
|ID= 1 DT= 5.0 min  |   Ia      (mm)=   5.00   # of Linear Res.(N)= 3.00
--------------------   U.H. Tp(hrs)=    .20

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

     Unit Hyd Qpeak  (cms)=    .53

     PEAK FLOW       (cms)=    .05 (i)
     TIME TO PEAK    (hrs)=   1.58
     RUNOFF VOLUME    (mm)=   7.05
     TOTAL RAINFALL   (mm)=  45.03
     RUNOFF COEFFICIENT   =    .16

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

--------------------------------------------------------------------------------
*                   Post-Development Catchment A2 to SWMF
--------------------
| CALIB             |
| STANDHYD  (0001)  |   Area    (ha)=   5.07
|ID= 1 DT= 5.0 min  |   Total Imp(%)=  20.00   Dir. Conn.(%)=  10.00
--------------------
                              IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=       1.01         4.06
     Dep. Storage     (mm)=       2.00         5.00
     Average Slope     (%)=       2.00         2.00
     Length            (m)=     184.00       184.00
     Mannings n           =       .013         .250

     Max.eff.Inten.(mm/hr)=      86.71         9.03
               over (min)        10.00        50.00
     Storage Coeff.  (min)=       3.17 (ii)   49.31 (ii)
     Unit Hyd. Tpeak (min)=       5.00        50.00
     Unit Hyd. peak  (cms)=        .27          .02
                                                        *TOTALS*
     PEAK FLOW       (cms)=        .14          .06          .14 (iii)
     TIME TO PEAK    (hrs)=       1.50         2.42         1.50
     RUNOFF VOLUME    (mm)=      42.80        10.40        13.58
     TOTAL RAINFALL   (mm)=      45.03        45.03        45.03
     RUNOFF COEFFICIENT   =        .95          .23          .30

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

       (i) CN PROCEDURE SELECTED FOR RAINFALL LOSSES:
            CN*  =  66.0    Ia = Dep. Storage  (Above)
      (ii) COMPUTATIONAL TIME STEP SHOULD BE SMALL OR EQUAL
```

```
           THAN THE STORAGE COEFFICIENT.
     (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

--------------------------------------------------------------------------------
--------------------
| SAVE HYD  (0001) |   AREA       (ha)=   5.07
| ID= 1   PCYC= 86 |   QPEAK     (cms)=    .14 (i)
| DT= 5.0 min      |   TPEAK     (hrs)=   1.50
--------------------   VOLUME     (mm)=  13.58
  Filename: ED05C04.QIN
  Comments: -

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

--------------------------------------------------------------------------------
*                   Route through EZStorm
--------------------
| RESERVOIR (0001) |
| IN= 1---> OUT= 2 |
| DT=  5.0 min     |     OUTFLOW    STORAGE   |  OUTFLOW    STORAGE
--------------------      (cms)     (ha.m.)   |   (cms)     (ha.m.)
                            .000       .000    |     .130       .068
                            .030       .022    |     .160       .088
                            .060       .036    |     .000       .000

                                  AREA     QPEAK     TPEAK       R.V.
                                  (ha)     (cms)     (hrs)       (mm)
     INFLOW : ID= 1 (0001)       5.07       .14      1.50      13.58
     OUTFLOW: ID= 2 (0001)       5.07       .04      3.50      13.54

                   PEAK   FLOW   REDUCTION [Qout/Qin](%)= 29.58
                   TIME SHIFT OF PEAK FLOW         (min)=120.00
                   MAXIMUM  STORAGE   USED       (ha.m.)=   .03

--------------------------------------------------------------------------------
*                   Post-Development Catchment A5, Uncontrolled
--------------------
| CALIB            |
| STANDHYD  (0001) |   Area    (ha)=    .30
|ID= 1 DT= 5.0 min |   Total Imp(%)=  20.00   Dir. Conn.(%)=  10.00
--------------------
                              IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=        .06          .24
     Dep. Storage     (mm)=       2.00         5.00
     Average Slope     (%)=       2.00         2.00
     Length            (m)=      45.00        45.00
     Mannings n           =       .013         .250

     Max.eff.Inten.(mm/hr)=      86.71        15.00
               over (min)        10.00        20.00
     Storage Coeff.  (min)=       1.36 (ii)   17.54 (ii)
     Unit Hyd. Tpeak (min)=       5.00        20.00
     Unit Hyd. peak  (cms)=        .33          .06
                                                        *TOTALS*
     PEAK FLOW       (cms)=        .01          .01          .01 (iii)
     TIME TO PEAK    (hrs)=       1.33         1.67         1.33
     RUNOFF VOLUME    (mm)=      42.80        10.40        13.25
     TOTAL RAINFALL   (mm)=      45.03        45.03        45.03
     RUNOFF COEFFICIENT   =        .95          .23          .29

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

```
       (i) CN PROCEDURE SELECTED FOR RAINFALL LOSSES:
            CN*  =  66.0    Ia = Dep. Storage  (Above)
      (ii) COMPUTATIONAL TIME STEP SHOULD BE SMALL OR EQUAL
           THAN THE STORAGE COEFFICIENT.
     (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

--------------------------------------------------------------------------------

--------------------
| ADD HYD   (0001) |
|   1 +  2 =  3    |          AREA    QPEAK    TPEAK     R.V.
--------------------          (ha)    (cms)    (hrs)     (mm)
          ID1= 1 (0001):      .30      .01     1.33    13.25
        + ID2= 2 (0001):     5.07      .04     3.50    13.54
          ================================================
          ID = 3 (0001):     5.37      .04     3.50    13.53

     NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

--------------------------------------------------------------------------------

--------------------
|    READ STORM    |    Filename: YPQ5y12.stm
| Ptotal= 58.89 mm |    Comments: 12hr SCS Type 2 - 5Yr
--------------------
                TIME    RAIN |  TIME    RAIN |  TIME    RAIN |  TIME    RAIN
                 hrs   mm/hr |   hrs   mm/hr |   hrs   mm/hr |   hrs   mm/hr
                 .50    1.30 |  3.50    2.36 |  6.50   12.84 |  9.50    2.12
                1.00    1.30 |  4.00    2.36 |  7.00    5.65 | 10.00    2.12
                1.50    1.53 |  4.50    3.18 |  7.50    3.53 | 10.50    1.41
                2.00    1.53 |  5.00    4.01 |  8.00    3.53 | 11.00    1.41
                2.50    1.88 |  5.50    6.36 |  8.50    2.12 | 11.50    1.41
                3.00    1.88 |  6.00   50.42 |  9.00    2.12 | 12.00    1.41

--------------------------------------------------------------------------------

*                   Pre-Development Catchment 100
--------------------
| CALIB            |
| NASHYD    (0001) |   Area    (ha)=   2.80   Curve Number   (CN)= 58.0
|ID= 1 DT= 5.0 min |   Ia      (mm)=   5.00   # of Linear Res.(N)= 3.00
--------------------   U.H. Tp(hrs)=    .20

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

     Unit Hyd Qpeak  (cms)=    .53

     PEAK FLOW       (cms)=    .08 (i)
     TIME TO PEAK    (hrs)=   6.08
     RUNOFF VOLUME    (mm)=  12.12
     TOTAL RAINFALL   (mm)=  58.89
     RUNOFF COEFFICIENT   =    .21

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

--------------------------------------------------------------------------------
*                   Post-Development Catchment A2 to SWMF
--------------------
| CALIB            |
| STANDHYD  (0001) |   Area    (ha)=   5.07
|ID= 1 DT= 5.0 min |   Total Imp(%)=  20.00   Dir. Conn.(%)=  10.00
--------------------
                           IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=       1.01         4.06
```

```
     Dep. Storage     (mm)=       2.00         5.00
     Average Slope     (%)=       2.00         2.00
     Length            (m)=     184.00       184.00
     Mannings n           =       .013         .250

     Max.eff.Inten.(mm/hr)=      50.42        13.70
               over (min)        10.00        40.00
     Storage Coeff.  (min)=       3.93 (ii)   42.98 (ii)
     Unit Hyd. Tpeak (min)=       5.00        45.00
     Unit Hyd. peak  (cms)=        .24          .03
                                                          *TOTALS*
     PEAK FLOW       (cms)=        .07          .09          .10 (iii)
     TIME TO PEAK    (hrs)=       6.17         6.75         6.67
     RUNOFF VOLUME    (mm)=      56.77        17.30        21.19
     TOTAL RAINFALL   (mm)=      58.89        58.89        58.89
     RUNOFF COEFFICIENT   =        .96          .29          .36

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

       (i) CN PROCEDURE SELECTED FOR RAINFALL LOSSES:
            CN*  =  66.0    Ia = Dep. Storage  (Above)
      (ii) COMPUTATIONAL TIME STEP SHOULD BE SMALL OR EQUAL
           THAN THE STORAGE COEFFICIENT.
     (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

--------------------------------------------------------------------------------
--------------------
| SAVE HYD  (0001) |   AREA       (ha)=   5.07
| ID= 1   PCYC=170 |   QPEAK     (cms)=    .10 (i)
| DT= 5.0 min      |   TPEAK     (hrs)=   6.67
--------------------   VOLUME     (mm)=  21.19
  Filename: ED05S12.QIN
  Comments: -

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

--------------------------------------------------------------------------------
*                   Route through EZStorm
--------------------
| RESERVOIR (0001) |
| IN= 1---> OUT= 2 |
| DT=  5.0 min     |     OUTFLOW    STORAGE   |  OUTFLOW    STORAGE
--------------------      (cms)     (ha.m.)   |   (cms)     (ha.m.)
                            .000       .000    |     .130       .068
                            .030       .022    |     .160       .088
                            .060       .036    |     .000       .000

                                 AREA     QPEAK     TPEAK       R.V.
                                 (ha)     (cms)     (hrs)       (mm)
     INFLOW : ID= 1 (0001)      5.07       .10      6.67      21.19
     OUTFLOW: ID= 2 (0001)      5.07       .06      7.58      21.16

                   PEAK   FLOW   REDUCTION [Qout/Qin](%)= 57.89
                   TIME SHIFT OF PEAK FLOW         (min)= 55.00
                   MAXIMUM  STORAGE   USED       (ha.m.)=   .04

--------------------------------------------------------------------------------
*                   Post-Development Catchment A5, Uncontrolled
--------------------
| CALIB            |
| STANDHYD  (0001) |   Area    (ha)=    .30
|ID= 1 DT= 5.0 min |   Total Imp(%)=  20.00   Dir. Conn.(%)=  10.00
```

```
--------------------
                              IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=        .06          .24
     Dep. Storage     (mm)=       2.00         5.00
     Average Slope     (%)=       2.00         2.00
     Length            (m)=      45.00        45.00
     Mannings n           =       .013         .250

     Max.eff.Inten.(mm/hr)=      50.42        19.96
                over (min)       10.00        15.00
     Storage Coeff.  (min)=       1.69 (ii)   16.12 (ii)
     Unit Hyd. Tpeak (min)=       5.00        20.00
     Unit Hyd. peak  (cms)=        .32          .06
                                                        *TOTALS*
     PEAK FLOW       (cms)=        .00          .01           .01 (iii)
     TIME TO PEAK    (hrs)=       5.83         6.17          6.00
     RUNOFF VOLUME    (mm)=      56.77        17.30         18.13
     TOTAL RAINFALL   (mm)=      58.89        58.89         58.89
     RUNOFF COEFFICIENT   =        .96          .29           .31

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

       (i) CN PROCEDURE SELECTED FOR RAINFALL LOSSES:
            CN*  =  66.0    Ia = Dep. Storage  (Above)
      (ii) COMPUTATIONAL TIME STEP SHOULD BE SMALL OR EQUAL
           THAN THE STORAGE COEFFICIENT.
     (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

--------------------------------------------------------------------------------

--------------------
| ADD HYD   (0001) |
|   1 +  2 =  3    |          AREA    QPEAK    TPEAK     R.V.
--------------------          (ha)    (cms)    (hrs)     (mm)
          ID1= 1 (0001):      .30      .01     6.00    18.13
        + ID2= 2 (0001):     5.07      .06     7.58    21.16
          ================================================
          ID = 3 (0001):     5.37      .06     7.58    20.99

     NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

--------------------------------------------------------------------------------

--------------------
|    READ STORM    |    Filename: YPQ5y24.stm
| Ptotal= 65.03 mm |    Comments: 24hr SCS Type 2 - 5Yr
--------------------
                TIME    RAIN |  TIME    RAIN |  TIME    RAIN |  TIME    RAIN
                 hrs   mm/hr |   hrs   mm/hr |   hrs   mm/hr |   hrs   mm/hr
                1.00     .72 |  7.00    1.30 | 13.00    7.09 | 19.00    1.17
                2.00     .72 |  8.00    1.30 | 14.00    3.12 | 20.00    1.17
                3.00     .85 |  9.00    1.76 | 15.00    1.95 | 21.00     .78
                4.00     .85 | 10.00    2.21 | 16.00    1.95 | 22.00     .78
                5.00    1.04 | 11.00    3.51 | 17.00    1.17 | 23.00     .78
                6.00    1.04 | 12.00   27.82 | 18.00    1.17 | 24.00     .78

--------------------------------------------------------------------------------

*                  Pre-Development Catchment 100
--------------------
| CALIB            |
| NASHYD    (0001) |   Area    (ha)=   2.80   Curve Number   (CN)= 58.0
```

```
|ID= 1 DT= 5.0 min |   Ia      (mm)=   5.00   # of Linear Res.(N)= 3.00
--------------------   U.H. Tp(hrs)=    .20

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

     Unit Hyd Qpeak  (cms)=    .53

     PEAK FLOW       (cms)=    .06 (i)
     TIME TO PEAK    (hrs)=  12.00
     RUNOFF VOLUME    (mm)=  14.70
     TOTAL RAINFALL   (mm)=  65.03
     RUNOFF COEFFICIENT   =    .23

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

--------------------------------------------------------------------------------
*                   Post-Development Catchment A2 to SWMF
--------------------
| CALIB             |
| STANDHYD  (0001)  |   Area    (ha)=   5.07
|ID= 1 DT= 5.0 min  |   Total Imp(%)=  20.00   Dir. Conn.(%)=  10.00
--------------------
                              IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=       1.01         4.06
     Dep. Storage     (mm)=       2.00         5.00
     Average Slope     (%)=       2.00         2.00
     Length            (m)=     184.00       184.00
     Mannings n           =       .013         .250

     Max.eff.Inten.(mm/hr)=      27.82        10.93
               over (min)        10.00        45.00
     Storage Coeff.  (min)=       4.99 (ii)   47.74 (ii)
     Unit Hyd. Tpeak (min)=       5.00        50.00
     Unit Hyd. peak  (cms)=        .22          .02
                                                          *TOTALS*
     PEAK FLOW       (cms)=        .04          .08           .09 (iii)
     TIME TO PEAK    (hrs)=      12.25        12.83         12.25
     RUNOFF VOLUME    (mm)=      62.97        20.71         24.88
     TOTAL RAINFALL   (mm)=      65.03        65.03         65.03
     RUNOFF COEFFICIENT   =        .97          .32           .38

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

       (i) CN PROCEDURE SELECTED FOR RAINFALL LOSSES:
            CN*  =  66.0    Ia = Dep. Storage  (Above)
      (ii) COMPUTATIONAL TIME STEP SHOULD BE SMALL OR EQUAL
           THAN THE STORAGE COEFFICIENT.
     (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

--------------------------------------------------------------------------------
--------------------
| SAVE HYD  (0001)  |   AREA       (ha)=   5.07
| ID= 1   PCYC=312  |   QPEAK     (cms)=    .09 (i)
| DT= 5.0 min       |   TPEAK     (hrs)=  12.25
--------------------   VOLUME     (mm)=  24.88
  Filename: ED05S24.QIN
  Comments: -

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

--------------------------------------------------------------------------------
*                   Route through EZStorm
```

```
--------------------
| RESERVOIR (0001) |
| IN= 1---> OUT= 2 |
| DT=  5.0 min     |     OUTFLOW    STORAGE    |  OUTFLOW    STORAGE
--------------------      (cms)     (ha.m.)    |   (cms)     (ha.m.)
                           .000       .000     |     .130       .068
                           .030       .022     |     .160       .088
                           .060       .036     |     .000       .000

                                  AREA     QPEAK     TPEAK       R.V.
                                  (ha)     (cms)     (hrs)       (mm)
     INFLOW : ID= 1 (0001)       5.07       .09     12.25      24.88
     OUTFLOW: ID= 2 (0001)       5.07       .06     13.67      24.84

                    PEAK   FLOW   REDUCTION [Qout/Qin](%)= 63.00
                    TIME SHIFT OF PEAK FLOW         (min)= 85.00
                    MAXIMUM  STORAGE   USED       (ha.m.)=   .03

--------------------------------------------------------------------------------
*                    Post-Development Catchment A5, Uncontrolled
--------------------
| CALIB            |
| STANDHYD  (0001) |   Area    (ha)=    .30
|ID= 1 DT= 5.0 min |   Total Imp(%)=  20.00   Dir. Conn.(%)=  10.00
--------------------
                                 IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=         .06           .24
     Dep. Storage     (mm)=        2.00          5.00
     Average Slope     (%)=        2.00          2.00
     Length            (m)=       45.00         45.00
     Mannings n           =        .013          .250

     Max.eff.Inten.(mm/hr)=       27.82         12.55
               over (min)         10.00         20.00
     Storage Coeff.  (min)=        2.14 (ii)    19.52 (ii)
     Unit Hyd. Tpeak (min)=        5.00         20.00
     Unit Hyd. peak  (cms)=         .31           .06
                                                          *TOTALS*
     PEAK FLOW       (cms)=         .00           .01          .01 (iii)
     TIME TO PEAK    (hrs)=       11.50         12.17        12.08
     RUNOFF VOLUME    (mm)=       62.96         20.71        18.46
     TOTAL RAINFALL   (mm)=       65.03         65.03        65.03
     RUNOFF COEFFICIENT   =         .97           .32          .28

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

       (i) CN PROCEDURE SELECTED FOR RAINFALL LOSSES:
            CN*  =  66.0    Ia = Dep. Storage  (Above)
      (ii) COMPUTATIONAL TIME STEP SHOULD BE SMALL OR EQUAL
           THAN THE STORAGE COEFFICIENT.
     (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

--------------------------------------------------------------------------------

--------------------
| ADD HYD   (0001) |
|   1 +  2 =  3    |          AREA    QPEAK    TPEAK     R.V.
--------------------          (ha)    (cms)    (hrs)     (mm)
          ID1= 1 (0001):       .30      .01    12.08    18.46
        + ID2= 2 (0001):      5.07      .06    13.67    24.84
          ================================================
          ID = 3 (0001):      5.37      .06    13.58    24.49
```

NOTE: PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

****

* 100 Year Storms

****

CHICAGO STORM	IDF curve parameters: A=1697.022 B= 10.512 C= .808 used in: INTENSITY = A / (t + B)^C Duration of storm = 1.00 hrs Storm time step = 5.00 min Time to peak ratio = .33
Ptotal= 54.36 mm	

The CORRELATION coefficient is = .9990

TIME (min)	INPUT INT. (mm/hr)	TAB. INT. (mm/hr)
5.	200.20	185.19
10.	141.10	147.77
15.	120.00	123.89
30.	80.20	85.26
60.	52.00	54.49
120.	36.40	33.13
360.	15.00	14.26
720.	8.20	8.24
1440.	4.50	4.73

TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr
.08	24.40	.33	185.19	.58	43.26	.83	22.24
.17	38.12	.42	100.98	.67	33.06	.92	19.08
.25	81.18	.50	61.48	.75	26.62	1.00	16.70

---

* Pre-Development Catchment 100

CALIB NASHYD (0001)	Area (ha)= 2.80	Curve Number (CN)= 58.0
ID= 1 DT= 5.0 min	Ia (mm)= 5.00	# of Linear Res.(N)= 3.00
	U.H. Tp(hrs)= .20	

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

Unit Hyd Qpeak (cms)= .53

PEAK FLOW (cms)= .12 (i)
TIME TO PEAK (hrs)= .58
RUNOFF VOLUME (mm)= 9.88
TOTAL RAINFALL (mm)= 54.36
RUNOFF COEFFICIENT = .18

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

---

* Post-Development Catchment A2 to SWMF

CALIB STANDHYD (0001)	Area (ha)= 5.07

```
|ID= 1 DT= 5.0 min |   Total Imp(%)=  20.00   Dir. Conn.(%)=  10.00
--------------------
                              IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=       1.01         4.06
     Dep. Storage     (mm)=       2.00         5.00
     Average Slope     (%)=       2.00         2.00
     Length            (m)=     184.00       184.00
     Mannings n           =       .013         .250

     Max.eff.Inten.(mm/hr)=     143.09        27.30
                over (min)       10.00        30.00
     Storage Coeff.  (min)=       2.59 (ii)   32.23 (ii)
     Unit Hyd. Tpeak (min)=       5.00        35.00
     Unit Hyd. peak  (cms)=        .29          .03
                                                          *TOTALS*
     PEAK FLOW       (cms)=        .24          .16           .25 (iii)
     TIME TO PEAK    (hrs)=        .42         1.08           .42
     RUNOFF VOLUME    (mm)=      50.97        14.28         17.92
     TOTAL RAINFALL   (mm)=      54.36        54.36         54.36
     RUNOFF COEFFICIENT   =        .94          .26           .33

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

       (i) CN PROCEDURE SELECTED FOR RAINFALL LOSSES:
            CN*  =  66.0    Ia = Dep. Storage  (Above)
      (ii) COMPUTATIONAL TIME STEP SHOULD BE SMALL OR EQUAL
           THAN THE STORAGE COEFFICIENT.
     (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

--------------------------------------------------------------------------------
--------------------
| SAVE HYD  (0001) |   AREA       (ha)=   5.07
| ID= 1   PCYC= 49 |   QPEAK     (cms)=    .25 (i)
| DT= 5.0 min      |   TPEAK     (hrs)=    .42
--------------------   VOLUME     (mm)=  17.92
  Filename: ED00C01.QIN
  Comments: -

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

--------------------------------------------------------------------------------
*                   Route through EZStorm
--------------------
| RESERVOIR (0001) |
| IN= 1---> OUT= 2 |
| DT=  5.0 min     |     OUTFLOW    STORAGE    |  OUTFLOW    STORAGE
--------------------      (cms)     (ha.m.)    |   (cms)     (ha.m.)
                            .000       .000     |     .130       .068
                            .030       .022     |     .160       .088
                            .060       .036     |     .000       .000

                                  AREA     QPEAK     TPEAK       R.V.
                                  (ha)     (cms)     (hrs)       (mm)
     INFLOW : ID= 1 (0001)      5.07       .25       .42      17.92
     OUTFLOW: ID= 2 (0001)      5.07       .09      1.67      17.88

                   PEAK   FLOW   REDUCTION [Qout/Qin](%)= 35.67
                   TIME SHIFT OF PEAK FLOW         (min)= 75.00
                   MAXIMUM  STORAGE   USED       (ha.m.)=   .05

--------------------------------------------------------------------------------
*                   Post-Development Catchment A5, Uncontrolled
```

```
--------------------
| CALIB            |
| STANDHYD  (0001) |   Area    (ha)=    .30
|ID= 1 DT= 5.0 min |   Total Imp(%)=  20.00   Dir. Conn.(%)=  10.00
--------------------
                              IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=        .06          .24
     Dep. Storage     (mm)=       2.00         5.00
     Average Slope     (%)=       2.00         2.00
     Length            (m)=      45.00        45.00
     Mannings n             =     .013         .250

     Max.eff.Inten.(mm/hr)=     143.09        37.18
               over (min)       10.00        15.00
     Storage Coeff.  (min)=      1.11 (ii)   12.37 (ii)
     Unit Hyd. Tpeak (min)=      5.00        15.00
     Unit Hyd. peak  (cms)=       .34          .08
                                                        *TOTALS*
     PEAK FLOW       (cms)=       .02          .02           .02 (iii)
     TIME TO PEAK    (hrs)=       .33          .58           .58
     RUNOFF VOLUME    (mm)=     50.97        14.28         17.67
     TOTAL RAINFALL   (mm)=     54.36        54.36         54.36
     RUNOFF COEFFICIENT   =       .94          .26           .32

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

       (i) CN PROCEDURE SELECTED FOR RAINFALL LOSSES:
            CN*  =  66.0    Ia = Dep. Storage  (Above)
      (ii) COMPUTATIONAL TIME STEP SHOULD BE SMALL OR EQUAL
           THAN THE STORAGE COEFFICIENT.
     (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

--------------------------------------------------------------------------------

--------------------
| ADD HYD   (0001) |
|   1 +  2 =  3    |          AREA    QPEAK    TPEAK     R.V.
--------------------          (ha)    (cms)    (hrs)     (mm)
          ID1= 1 (0001):      .30      .02      .58    17.67
        + ID2= 2 (0001):     5.07      .09     1.67    17.88
          ================================================
          ID = 3 (0001):     5.37      .09     1.67    17.87

     NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

--------------------------------------------------------------------------------
--------------------
| CHICAGO STORM    |    IDF curve parameters: A=1697.022
| Ptotal= 78.24 mm |                          B=  10.512
--------------------                          C=    .808
                       used in:   INTENSITY =  A / (t + B)^C

                       Duration of storm  =  4.00 hrs
                       Storm time step    =  5.00 min
                       Time to peak ratio =   .33

                    The CORRELATION coefficient is =  .9990

                     TIME       INPUT INT.           TAB. INT.
                    (min)        (mm/hr)              (mm/hr)
                       5.         200.20               185.19
                      10.         141.10               147.77
```

15.	120.00	123.89
30.	80.20	85.26
60.	52.00	54.49
120.	36.40	33.13
360.	15.00	14.26
720.	8.20	8.24
1440.	4.50	4.73

TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr
.08	4.74	1.08	24.40	2.08	14.85	3.08	6.51
.17	5.05	1.17	38.12	2.17	13.38	3.17	6.23
.25	5.42	1.25	81.18	2.25	12.17	3.25	5.97
.33	5.85	1.33	185.19	2.33	11.17	3.33	5.74
.42	6.36	1.42	100.98	2.42	10.33	3.42	5.53
.50	6.98	1.50	61.48	2.50	9.61	3.50	5.33
.58	7.74	1.58	43.26	2.58	8.98	3.58	5.14
.67	8.70	1.67	33.06	2.67	8.44	3.67	4.97
.75	9.95	1.75	26.62	2.75	7.96	3.75	4.82
.83	11.65	1.83	22.24	2.83	7.54	3.83	4.67
.92	14.09	1.92	19.08	2.92	7.16	3.92	4.53
1.00	17.87	2.00	16.70	3.00	6.82	4.00	4.40

---

* Pre-Development Catchment 100

CALIB		
NASHYD (0001)	Area (ha)= 2.80	Curve Number (CN)= 58.0
ID= 1 DT= 5.0 min	Ia (mm)= 5.00	# of Linear Res.(N)= 3.00
	U.H. Tp(hrs)= .20	

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

Unit Hyd Qpeak (cms)= .53

PEAK FLOW (cms)= .16 (i)
TIME TO PEAK (hrs)= 1.58
RUNOFF VOLUME (mm)= 20.62
TOTAL RAINFALL (mm)= 78.24
RUNOFF COEFFICIENT = .26

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

---

* Post-Development Catchment A2 to SWMF

CALIB		
STANDHYD (0001)	Area (ha)= 5.07	
ID= 1 DT= 5.0 min	Total Imp(%)= 20.00	Dir. Conn.(%)= 10.00

		IMPERVIOUS	PERVIOUS (i)
Surface Area	(ha)=	1.01	4.06
Dep. Storage	(mm)=	2.00	5.00
Average Slope	(%)=	2.00	2.00
Length	(m)=	184.00	184.00
Mannings n	=	.013	.250
Max.eff.Inten.(mm/hr)=		143.09	34.03
over (min)		10.00	30.00
Storage Coeff. (min)=		2.59 (ii)	29.73 (ii)
Unit Hyd. Tpeak (min)=		5.00	30.00
Unit Hyd. peak (cms)=		.29	.04

```
                                                              *TOTALS*
     PEAK FLOW       (cms)=        .24          .23            .27 (iii)
     TIME TO PEAK    (hrs)=       1.42         2.00           1.42
     RUNOFF VOLUME    (mm)=      75.88        28.42          33.13
     TOTAL RAINFALL   (mm)=      78.24        78.24          78.24
     RUNOFF COEFFICIENT   =        .97          .36            .42

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

       (i) CN PROCEDURE SELECTED FOR RAINFALL LOSSES:
            CN*  =  66.0    Ia = Dep. Storage  (Above)
      (ii) COMPUTATIONAL TIME STEP SHOULD BE SMALL OR EQUAL
           THAN THE STORAGE COEFFICIENT.
     (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

--------------------------------------------------------------------------------
--------------------
| SAVE HYD  (0001) |   AREA       (ha)=   5.07
| ID= 1   PCYC= 74 |   QPEAK     (cms)=    .27 (i)
| DT= 5.0 min      |   TPEAK     (hrs)=   1.42
--------------------   VOLUME     (mm)=  33.13
  Filename: ED00C04.QIN
  Comments: -

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

--------------------------------------------------------------------------------
*                    Route through EZStorm
--------------------
| RESERVOIR (0001) |
| IN= 1---> OUT= 2 |
| DT=  5.0 min     |     OUTFLOW    STORAGE   |  OUTFLOW    STORAGE
--------------------      (cms)     (ha.m.)   |   (cms)     (ha.m.)
                            .000       .000    |     .130       .068
                            .030       .022    |     .160       .088
                            .060       .036    |     .000       .000

                                  AREA     QPEAK     TPEAK       R.V.
                                  (ha)     (cms)     (hrs)       (mm)
     INFLOW : ID= 1 (0001)      5.07       .27      1.42      33.13
     OUTFLOW: ID= 2 (0001)      5.07       .13      2.83      33.09

                   PEAK   FLOW   REDUCTION [Qout/Qin](%)= 50.17
                   TIME SHIFT OF PEAK FLOW         (min)= 85.00
                   MAXIMUM  STORAGE   USED       (ha.m.)=   .07

--------------------------------------------------------------------------------
*                    Post-Development Catchment A5, Uncontrolled
--------------------
| CALIB            |
| STANDHYD  (0001) |   Area    (ha)=    .30
|ID= 1 DT= 5.0 min |   Total Imp(%)=  20.00   Dir. Conn.(%)=  10.00
--------------------
                                IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=        .06          .24
     Dep. Storage     (mm)=       2.00         5.00
     Average Slope     (%)=       2.00         2.00
     Length            (m)=      45.00        45.00
     Mannings n           =       .013         .250

     Max.eff.Inten.(mm/hr)=     143.09        47.98
                over (min)       10.00        15.00
```

```
     Storage Coeff.  (min)=       1.11 (ii)   11.27 (ii)
     Unit Hyd. Tpeak (min)=       5.00        15.00
     Unit Hyd. peak  (cms)=        .34          .09
                                                          *TOTALS*
     PEAK FLOW       (cms)=        .02          .02          .03 (iii)
     TIME TO PEAK    (hrs)=       1.33         1.58         1.50
     RUNOFF VOLUME    (mm)=      75.88        28.42        32.98
     TOTAL RAINFALL   (mm)=      78.24        78.24        78.24
     RUNOFF COEFFICIENT   =        .97          .36          .42

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

       (i) CN PROCEDURE SELECTED FOR RAINFALL LOSSES:
            CN*  =  66.0    Ia = Dep. Storage  (Above)
      (ii) COMPUTATIONAL TIME STEP SHOULD BE SMALL OR EQUAL
           THAN THE STORAGE COEFFICIENT.
     (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

--------------------------------------------------------------------------------

--------------------
| ADD HYD   (0001) |
|   1 +  2 =  3    |          AREA    QPEAK    TPEAK     R.V.
--------------------          (ha)    (cms)    (hrs)     (mm)
          ID1= 1 (0001):       .30      .03     1.50    32.98
        + ID2= 2 (0001):     5.07      .13     2.83    33.09
          ================================================
          ID = 3 (0001):     5.37      .14     2.75    33.09

     NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

--------------------------------------------------------------------------------

--------------------
|    READ STORM    |    Filename: YPQ00y12.stm
| Ptotal= 98.39 mm |    Comments: 12hr SCS Type 2 - 100Yr
--------------------
                TIME    RAIN |  TIME    RAIN |  TIME    RAIN |  TIME    RAIN
                 hrs   mm/hr |   hrs   mm/hr |   hrs   mm/hr |   hrs   mm/hr
                 .50    2.16 |  3.50    3.94 |  6.50   21.45 |  9.50    3.54
                1.00    2.16 |  4.00    3.94 |  7.00    9.45 | 10.00    3.54
                1.50    2.56 |  4.50    5.31 |  7.50    5.90 | 10.50    2.36
                2.00    2.56 |  5.00    6.69 |  8.00    5.90 | 11.00    2.36
                2.50    3.15 |  5.50   10.63 |  8.50    3.54 | 11.50    2.36
                3.00    3.15 |  6.00   84.23 |  9.00    3.54 | 12.00    2.36

--------------------------------------------------------------------------------

*                   Pre-Development Catchment 100
--------------------
| CALIB            |
| NASHYD    (0001) |   Area    (ha)=   2.80   Curve Number   (CN)= 58.0
|ID= 1 DT= 5.0 min |   Ia      (mm)=   5.00   # of Linear Res.(N)= 3.00
--------------------   U.H. Tp(hrs)=    .20

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

     Unit Hyd Qpeak  (cms)=    .53

     PEAK FLOW       (cms)=    .20 (i)
     TIME TO PEAK    (hrs)=   6.08
     RUNOFF VOLUME    (mm)=  31.26
```

```
     TOTAL RAINFALL   (mm)=  98.39
     RUNOFF COEFFICIENT   =    .32

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

--------------------------------------------------------------------------------
*                    Post-Development Catchment A2 to SWMF
--------------------
| CALIB            |
| STANDHYD  (0001) |   Area    (ha)=   5.07
|ID= 1 DT= 5.0 min |   Total Imp(%)=  20.00   Dir. Conn.(%)=  10.00
--------------------
                              IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=       1.01         4.06
     Dep. Storage     (mm)=       2.00         5.00
     Average Slope     (%)=       2.00         2.00
     Length            (m)=     184.00       184.00
     Mannings n           =       .013         .250

     Max.eff.Inten.(mm/hr)=      84.23        43.79
               over (min)        10.00        25.00
     Storage Coeff.  (min)=       3.20 (ii)   27.74 (ii)
     Unit Hyd. Tpeak (min)=       5.00        30.00
     Unit Hyd. peak  (cms)=        .27          .04
                                                        *TOTALS*
     PEAK FLOW       (cms)=        .12          .29          .32 (iii)
     TIME TO PEAK    (hrs)=       6.17         6.50         6.50
     RUNOFF VOLUME    (mm)=      96.19        41.84        47.24
     TOTAL RAINFALL   (mm)=      98.39        98.39        98.39
     RUNOFF COEFFICIENT   =        .98          .43          .48

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

       (i) CN PROCEDURE SELECTED FOR RAINFALL LOSSES:
            CN*  =  66.0    Ia = Dep. Storage  (Above)
      (ii) COMPUTATIONAL TIME STEP SHOULD BE SMALL OR EQUAL
           THAN THE STORAGE COEFFICIENT.
     (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

--------------------------------------------------------------------------------
--------------------
| SAVE HYD  (0001) |   AREA       (ha)=   5.07
| ID= 1   PCYC=165 |   QPEAK     (cms)=    .32 (i)
| DT= 5.0 min      |   TPEAK     (hrs)=   6.50
--------------------   VOLUME     (mm)=  47.24
  Filename: ED00S12.QIN
  Comments: -

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

--------------------------------------------------------------------------------
*                    Route through EZStorm
--------------------
| RESERVOIR (0001) |
| IN= 1---> OUT= 2 |
| DT=  5.0 min     |     OUTFLOW    STORAGE    |  OUTFLOW    STORAGE
--------------------      (cms)     (ha.m.)    |   (cms)     (ha.m.)
                            .000       .000     |     .130       .068
                            .030       .022     |     .160       .088
                            .060       .036     |     .000       .000

                                AREA     QPEAK     TPEAK       R.V.
```

```
                                (ha)     (cms)     (hrs)       (mm)
     INFLOW : ID= 1 (0001)      5.07       .32      6.50      47.24
     OUTFLOW: ID= 2 (0001)      5.07       .16      7.25      47.20

                   PEAK   FLOW   REDUCTION [Qout/Qin](%)= 49.60
                   TIME SHIFT OF PEAK FLOW        (min)= 45.00
                   MAXIMUM  STORAGE   USED       (ha.m.)=   .09

--------------------------------------------------------------------------------
*                   Post-Development Catchment A5, Uncontrolled
--------------------
| CALIB            |
| STANDHYD  (0001) |   Area    (ha)=    .30
|ID= 1 DT= 5.0 min |   Total Imp(%)=  20.00   Dir. Conn.(%)=  10.00
--------------------
                              IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=        .06          .24
     Dep. Storage     (mm)=       2.00         5.00
     Average Slope     (%)=       2.00         2.00
     Length            (m)=      45.00        45.00
     Mannings n           =       .013         .250

     Max.eff.Inten.(mm/hr)=      84.23        48.38
               over (min)        10.00        15.00
     Storage Coeff.  (min)=       1.38 (ii)   11.50 (ii)
     Unit Hyd. Tpeak (min)=       5.00        15.00
     Unit Hyd. peak  (cms)=        .33          .09
                                                        *TOTALS*
     PEAK FLOW       (cms)=        .01          .03          .03 (iii)
     TIME TO PEAK    (hrs)=       5.83         6.08         6.00
     RUNOFF VOLUME    (mm)=      96.19        41.84        47.02
     TOTAL RAINFALL   (mm)=      98.39        98.39        98.39
     RUNOFF COEFFICIENT   =        .98          .43          .48

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

       (i) CN PROCEDURE SELECTED FOR RAINFALL LOSSES:
            CN*  =  66.0    Ia = Dep. Storage  (Above)
      (ii) COMPUTATIONAL TIME STEP SHOULD BE SMALL OR EQUAL
           THAN THE STORAGE COEFFICIENT.
     (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

--------------------------------------------------------------------------------

--------------------
| ADD HYD   (0001) |
|   1 +  2 =  3    |          AREA    QPEAK    TPEAK     R.V.
--------------------          (ha)    (cms)    (hrs)     (mm)
          ID1= 1 (0001):       .30      .03     6.00    47.02
        + ID2= 2 (0001):     5.07      .16     7.25    47.20
          ================================================
          ID = 3 (0001):     5.37      .16     7.17    47.19

     NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

--------------------------------------------------------------------------------

--------------------
|    READ STORM    |    Filename: YPQ00y24.stm
| Ptotal=108.69 mm |    Comments: 24hr SCS Type 2 - 100Yr
--------------------
                TIME    RAIN |  TIME    RAIN |  TIME    RAIN |  TIME    RAIN
```

hrs	mm/hr	hrs	mm/hr	hrs	mm/hr	hrs	mm/hr
1.00	1.20	7.00	2.17	13.00	11.85	19.00	1.96
2.00	1.20	8.00	2.17	14.00	5.22	20.00	1.96
3.00	1.41	9.00	2.93	15.00	3.26	21.00	1.30
4.00	1.41	10.00	3.70	16.00	3.26	22.00	1.30
5.00	1.74	11.00	5.87	17.00	1.96	23.00	1.30
6.00	1.74	12.00	46.52	18.00	1.96	24.00	1.30

---

* Pre-Development Catchment 100

CALIB			
NASHYD (0001)	Area (ha)= 2.80	Curve Number (CN)= 58.0	
ID= 1 DT= 5.0 min	Ia (mm)= 5.00	# of Linear Res.(N)= 3.00	
	U.H. Tp(hrs)= .20		

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

Unit Hyd Qpeak (cms)= .53

PEAK FLOW (cms)= .15 (i)
TIME TO PEAK (hrs)= 12.00
RUNOFF VOLUME (mm)= 37.22
TOTAL RAINFALL (mm)= 108.69
RUNOFF COEFFICIENT = .34

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

---

* Post-Development Catchment A2 to SWMF

CALIB			
STANDHYD (0001)	Area (ha)= 5.07		
ID= 1 DT= 5.0 min	Total Imp(%)= 20.00	Dir. Conn.(%)= 10.00	

		IMPERVIOUS	PERVIOUS (i)	
Surface Area	(ha)=	1.01	4.06	
Dep. Storage	(mm)=	2.00	5.00	
Average Slope	(%)=	2.00	2.00	
Length	(m)=	184.00	184.00	
Mannings n	=	.013	.250	
Max.eff.Inten.	(mm/hr)=	46.52	28.38	
over	(min)	10.00	30.00	
Storage Coeff.	(min)=	4.06 (ii)	33.25 (ii)	
Unit Hyd. Tpeak	(min)=	5.00	35.00	
Unit Hyd. peak	(cms)=	.24	.03	
				TOTALS
PEAK FLOW	(cms)=	.07	.22	.26 (iii)
TIME TO PEAK	(hrs)=	12.08	12.42	12.17
RUNOFF VOLUME	(mm)=	106.58	49.19	54.90
TOTAL RAINFALL	(mm)=	108.69	108.69	108.69
RUNOFF COEFFICIENT	=	.98	.45	.51

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

(i) CN PROCEDURE SELECTED FOR RAINFALL LOSSES:
CN* = 66.0 Ia = Dep. Storage (Above)
(ii) COMPUTATIONAL TIME STEP SHOULD BE SMALL OR EQUAL
THAN THE STORAGE COEFFICIENT.
(iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

```
--------------------------------------------------------------------------------
--------------------
| SAVE HYD  (0001) |   AREA       (ha)=   5.07
| ID= 1   PCYC=310 |   QPEAK     (cms)=    .26 (i)
| DT= 5.0 min      |   TPEAK     (hrs)=  12.17
--------------------   VOLUME     (mm)=  54.90
  Filename: ED00S24.QIN
  Comments: -

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

--------------------------------------------------------------------------------
*                    Route through EZStorm
--------------------
| RESERVOIR (0001) |
| IN= 1---> OUT= 2 |
| DT=  5.0 min     |     OUTFLOW    STORAGE    |  OUTFLOW    STORAGE
--------------------      (cms)     (ha.m.)    |   (cms)     (ha.m.)
                            .000       .000    |     .130       .068
                            .030       .022    |     .160       .088
                            .060       .036    |     .000       .000

                                 AREA     QPEAK     TPEAK       R.V.
                                 (ha)     (cms)     (hrs)       (mm)
     INFLOW : ID= 1 (0001)      5.07       .26     12.17      54.90
     OUTFLOW: ID= 2 (0001)      5.07       .15     13.25      54.86

                   PEAK   FLOW   REDUCTION [Qout/Qin](%)= 55.97
                   TIME SHIFT OF PEAK FLOW         (min)= 65.00
                   MAXIMUM  STORAGE   USED       (ha.m.)=   .08

--------------------------------------------------------------------------------
*                    Post-Development Catchment A5, Uncontrolled
--------------------
| CALIB            |
| STANDHYD  (0001) |   Area    (ha)=    .30
|ID= 1 DT= 5.0 min |   Total Imp(%)=  20.00   Dir. Conn.(%)=  10.00
--------------------
                                IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=        .06          .24
     Dep. Storage     (mm)=       2.00         5.00
     Average Slope     (%)=       2.00         2.00
     Length            (m)=      45.00        45.00
     Mannings n           =       .013         .250

     Max.eff.Inten.(mm/hr)=      46.52        29.99
               over (min)        10.00        15.00
     Storage Coeff.  (min)=       1.75 (ii)   14.01 (ii)
     Unit Hyd. Tpeak (min)=       5.00        15.00
     Unit Hyd. peak  (cms)=        .32          .08
                                                          *TOTALS*
     PEAK FLOW       (cms)=        .00          .02           .02 (iii)
     TIME TO PEAK    (hrs)=      11.42        12.00          12.00
     RUNOFF VOLUME    (mm)=     106.58        49.19          51.00
     TOTAL RAINFALL   (mm)=     108.69       108.69         108.69
     RUNOFF COEFFICIENT   =        .98          .45            .47

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

       (i) CN PROCEDURE SELECTED FOR RAINFALL LOSSES:
            CN*  =  66.0    Ia = Dep. Storage  (Above)
```

(ii) COMPUTATIONAL TIME STEP SHOULD BE SMALL OR EQUAL
THAN THE STORAGE COEFFICIENT.
(iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

ADD HYD (0001)		AREA	QPEAK	TPEAK	R.V.
1 + 2 = 3		(ha)	(cms)	(hrs)	(mm)
	ID1= 1 (0001):	.30	.02	12.00	51.00
	+ ID2= 2 (0001):	5.07	.15	13.25	54.86
	ID = 3 (0001):	5.37	.15	13.17	54.64

NOTE: PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

****

* Timmins Event

****

* Q Spillway (0.42 cms) > Q Timmins

READ STORM	Filename: TIMMINS.STM
Ptotal=193.00 mm	Comments: *12 HOUR - Timmins STORM

TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr
1.00	15.00	4.00	3.00	7.00	43.00	10.00	13.00
2.00	20.00	5.00	5.00	8.00	20.00	11.00	13.00
3.00	10.00	6.00	20.00	9.00	23.00	12.00	8.00

---

* Post-Development Catchment A2 to SWMF

CALIB STANDHYD (0001)	Area (ha)= 5.07
ID= 1 DT= 5.0 min	Total Imp(%)= 20.00 Dir. Conn.(%)= 10.00

		IMPERVIOUS	PERVIOUS (i)
Surface Area	(ha)=	1.01	4.06
Dep. Storage	(mm)=	2.00	5.00
Average Slope	(%)=	2.00	2.00
Length	(m)=	184.00	184.00
Mannings n	=	.013	.250

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

		IMPERVIOUS	PERVIOUS (i)	
Max.eff.Inten.(mm/hr)=		43.00	34.46	
over (min)		10.00	30.00	
Storage Coeff. (min)=		4.19 (ii)	31.20 (ii)	
Unit Hyd. Tpeak (min)=		5.00	35.00	
Unit Hyd. peak (cms)=		.24	.03	
				TOTALS
PEAK FLOW	(cms)=	.06	.32	.36 (iii)
TIME TO PEAK	(hrs)=	7.08	7.42	7.17
RUNOFF VOLUME	(mm)=	190.33	116.05	123.44
TOTAL RAINFALL	(mm)=	193.00	193.00	193.00
RUNOFF COEFFICIENT	=	.99	.60	.64

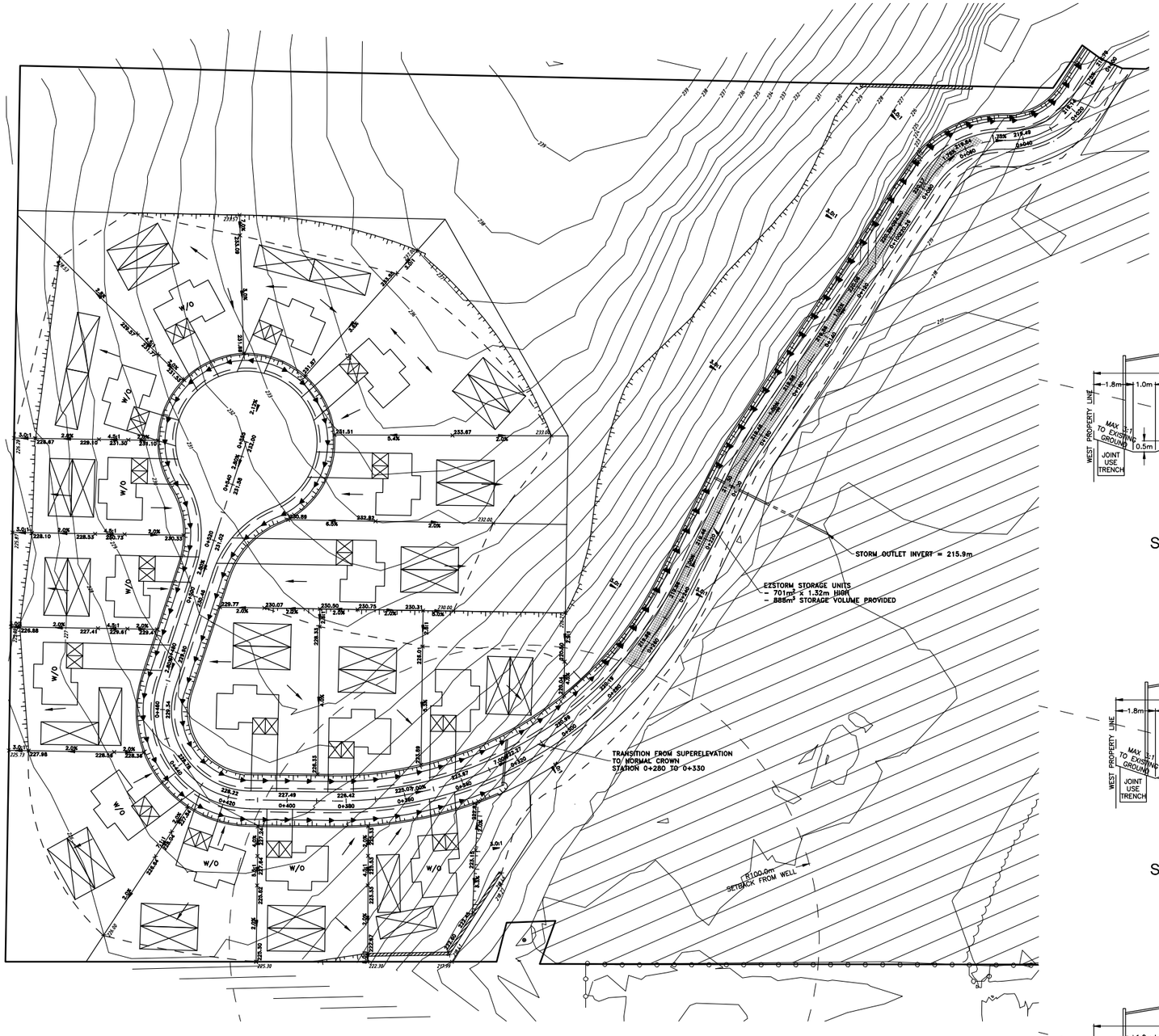
***** WARNING: STORAGE COEFF. IS SMALLER THAN TIME STEP!

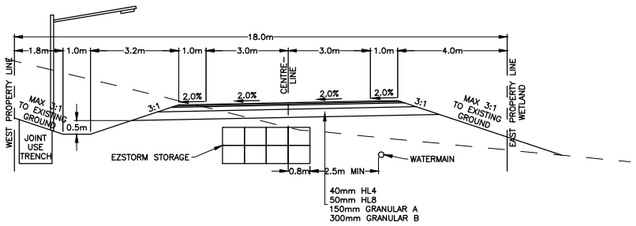
```
***** WARNING: FOR AREAS WITH IMPERVIOUS LESS THAN 20%
               YOU SHOULD CONSIDER SPLITTING THE AREA.

       (i) CN PROCEDURE SELECTED FOR RAINFALL LOSSES:
            CN*  =  66.0    Ia = Dep. Storage  (Above)
      (ii) COMPUTATIONAL TIME STEP SHOULD BE SMALL OR EQUAL
           THAN THE STORAGE COEFFICIENT.
     (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

--------------------------------------------------------------------------------
--------------------
| SAVE HYD  (0001) |   AREA       (ha)=   5.07
| ID= 1   PCYC=178 |   QPEAK     (cms)=    .36 (i)
| DT= 5.0 min      |   TPEAK     (hrs)=   7.17
--------------------   VOLUME     (mm)= 123.44
  Filename: EDTMC01.QIN
  Comments: -

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

--------------------------------------------------------------------------------

 FINISH
================================================================================
```

APPENDIX F

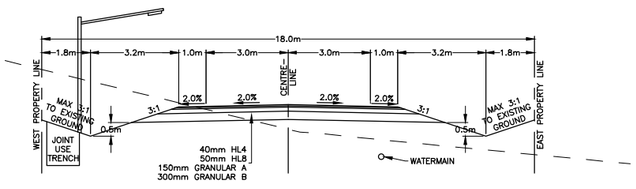
Preliminary Grading & Plan/Profile Drawings

09/19/2024

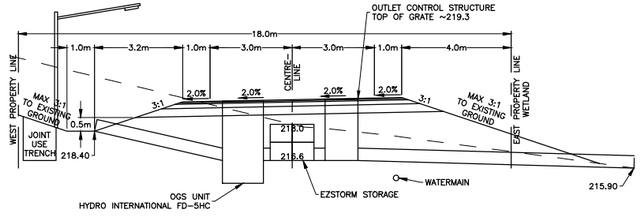




STREET A - TYPICAL CROSS-SECTION
STA. 0+000 TO 0+330



STREET A - TYPICAL CROSS-SECTION
STA. 0+330 TO 0+520



UNDERGROUND STORMWATER STORAGE SYSTEM -
CROSS SECTION @ STA. 0+200

GENERAL NOTES:

- ALL INFORMATION TO BE VERIFIED ON SITE PRIOR TO COMMENCING ANY WORK. ANY DISCREPANCIES ARE TO BE REPORTED TO THE CONSULTANT IMMEDIATELY.
- ALL UTILITY LOCATIONS SHOWN ON THE DRAWINGS ARE APPROXIMATE. THE CONTRACTOR SHALL CONFIRM THE LOCATION ON SITE AND ASSUME ALL LIABILITY FOR DAMAGE TO ALL UTILITIES.
- EXCLUDING THE BENCHMARK AND DESCRIPTION PROVIDED FOR THIS PROJECT, NO OTHER ELEVATIONS ARE TO BE USED AS A REFERENCE ELEVATION FOR ANY PURPOSE.

METRIC NOTE:

- ALL DIMENSIONS SHOWN ARE IN METRES OR MILLIMETRES, UNLESS OTHERWISE NOTED.

GEOMETRIC NOTE:

- ALL SURVEY DATA SHOWN ON THIS DRAWING WAS RECORDED USING REAL-TIME KINETIC (RTK) GPS OBSERVATIONS IN REFERENCE TO UTM 18 NORTH COORDINATE SYSTEM.
- ALL ELEVATIONS ARE IN REFERENCE TO LOCAL DATUM NAD83 - GEODETIC MODEL HT2_0, UNLESS DESCRIBED OTHERWISE.

** DRAWINGS ARE NOT TO BE SCALED **

REVISIONS

NO.	DATE	DESCRIPTION	BY
1	11/01/2024	REVISED LOT LAYOUT	JH

LEGEND

- SWALE/DITCH
- TOP OF SLOPE
- TOE OF SLOPE
- RETAINING WALL
- WELLHEAD PROTECTION ZONE (100m)
- 235.00 EXISTING GROUND ELEVATION
- **235.00** PROPOSED GROUND ELEVATION

N W E S

LICENSED PROFESSIONAL ENGINEERS
A.M. REDDEN
100177606
Nov. 1, 2024
PROVINCE OF ONTARIO

JEWELL ENGINEERING

KEENE SUBDIVISION

KEENE, ONTARIO
TOWNSHIP OF OTONABEE-SOUTH MONAGHAN

PRELIMINARY GRADING PLAN

DRAWN BY: JH	PROJECT NO: 220-5237	
DESIGNED BY:	DATE: November 2024	
CHECKED BY: AMR	SCALE: HORIZONTAL - 1:750 VERTICAL - N/A	
APPROVED BY:	CONTRACT NO:	DRAWING NO: GR-1

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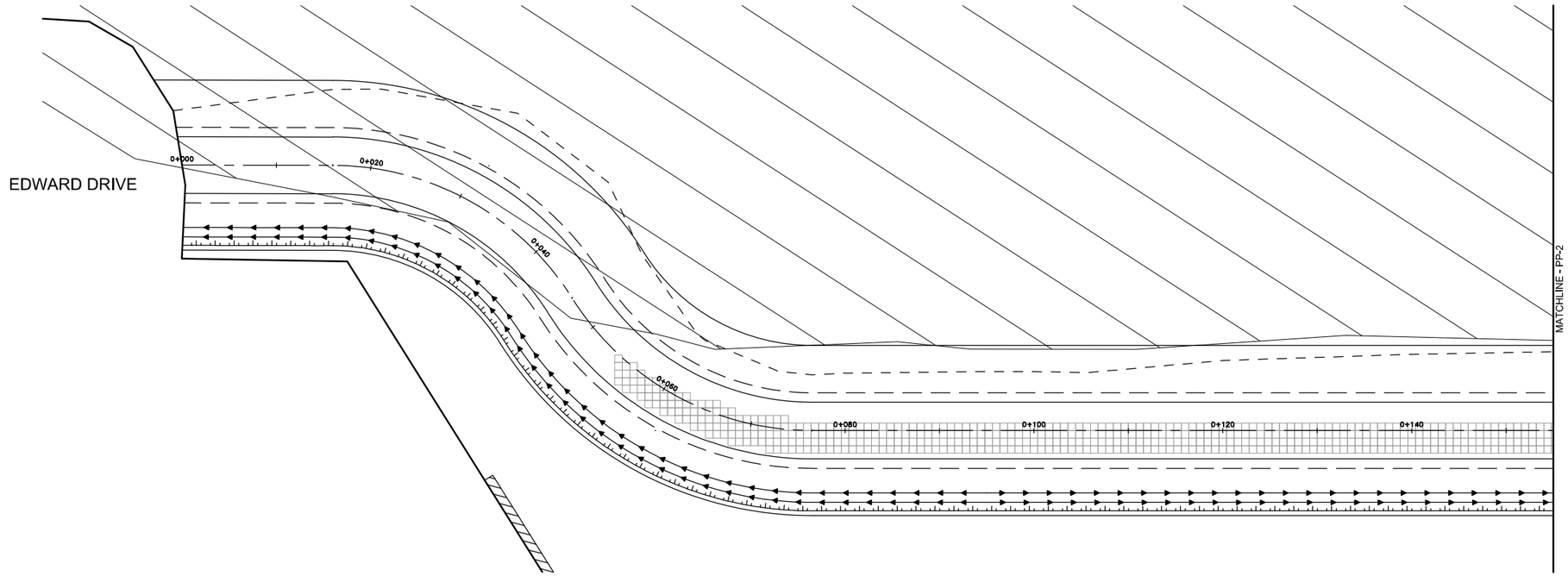
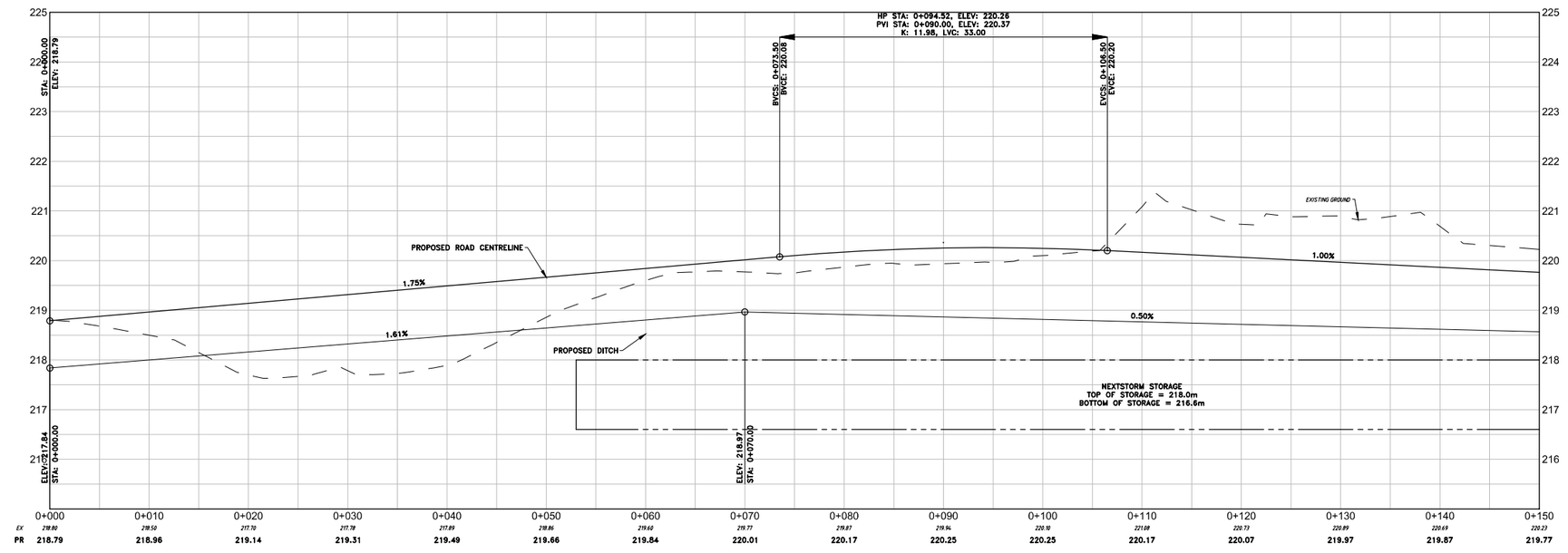
09/20/2024

STREET A





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METRIC NOTE:

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GEOMETRIC NOTE:

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- ALL ELEVATIONS ARE IN REFERENCE TO LOCAL DATUM NAD83 - GEODETIC MODEL HT2_0, UNLESS DESCRIBED OTHERWISE.

** DRAWINGS ARE NOT TO BE SCALED **

REVISIONS

NO.	DATE	DESCRIPTION	BY
1	11/01/2024	REVISED LOT LAYOUT	JH

LICENSED PROFESSIONAL ENGINEERS
A. M. REDDY
100177806
Nov. 1, 2024
PROVINCE OF ONTARIO

JEWELL ENGINEERING

KEENE SUBDIVISION

KEENE, ONTARIO

TOWNSHIP OF OTONABEE-SOUTH MONAGHAN

PLAN & PROFILE

STREET A

STA. 0+000 to 0+150

DRAWN BY: JH	PROJECT NO: 220-5237
DESIGNED BY:	DATE: September 2024
CHECKED BY: AMR	SCALE: HORIZONTAL - 1:250, VERTICAL - 1:50
APPROVED BY:	CONTRACT NO:
	DRAWING NO: PP-1

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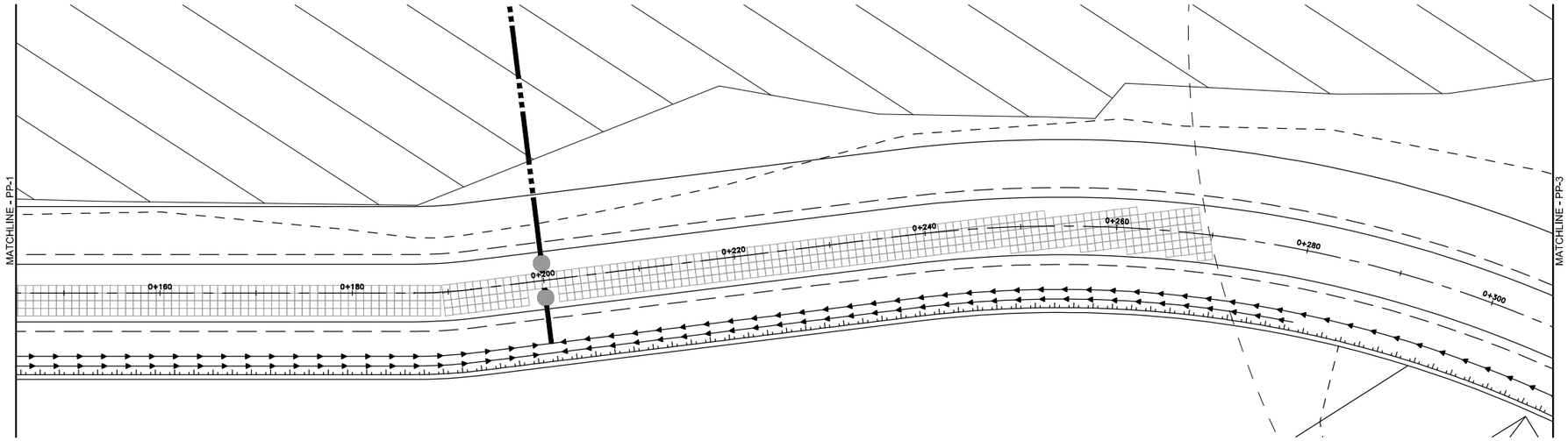
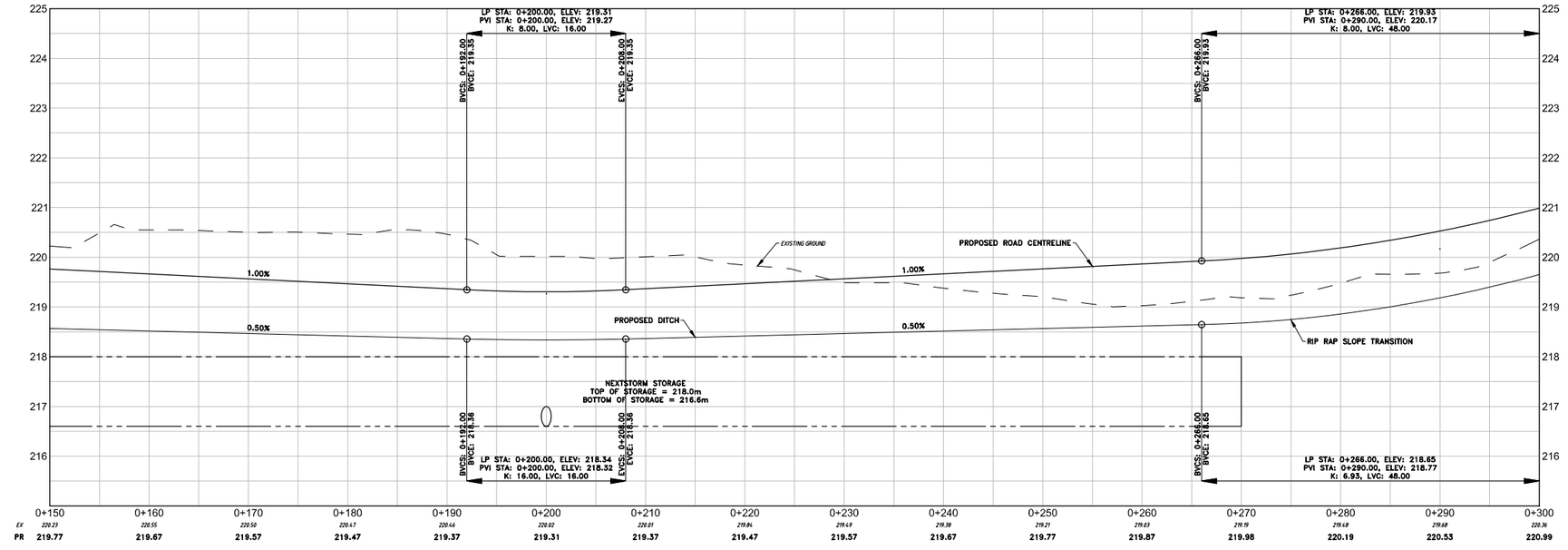
09/20/2024

STREET A





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METRIC NOTE:

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GEOMETRIC NOTE:

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- ALL ELEVATIONS ARE IN REFERENCE TO LOCAL DATUM NAD83 - GEODETIC MODEL HT2_0, UNLESS DESCRIBED OTHERWISE.

** DRAWINGS ARE NOT TO BE SCALED **

REVISIONS

NO.	DATE	DESCRIPTION	BY
1	11/01/2024	REVISED LOT LAYOUT	JH

LICENSED PROFESSIONAL ENGINEERS
A. M. REDDEI
100177806
Nov.1, 2024
PROVINCE OF ONTARIO

JEWELL ENGINEERING

KEENE SUBDIVISION

KEENE, ONTARIO
TOWNSHIP OF OTONABEE-SOUTH MONAGHAN

PLAN & PROFILE
STREET A
STA. 0+150 to 0+300

DRAWN BY: JH	PROJECT NO: 220-5237		
DESIGNED BY:	DATE: September 2024		
CHECKED BY: AMR	SCALE: HORIZONTAL - 1:250 VERTICAL - 1:50		
APPROVED BY:	CONTRACT NO:	DRAWING NO: PP-2	

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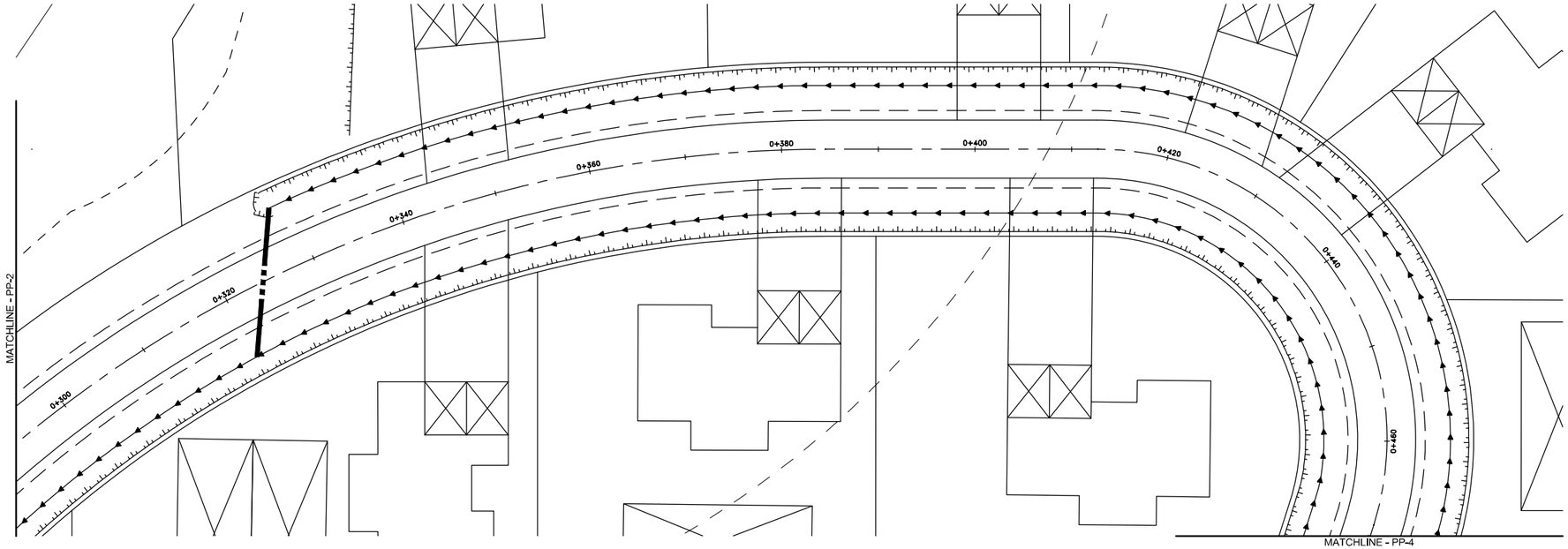
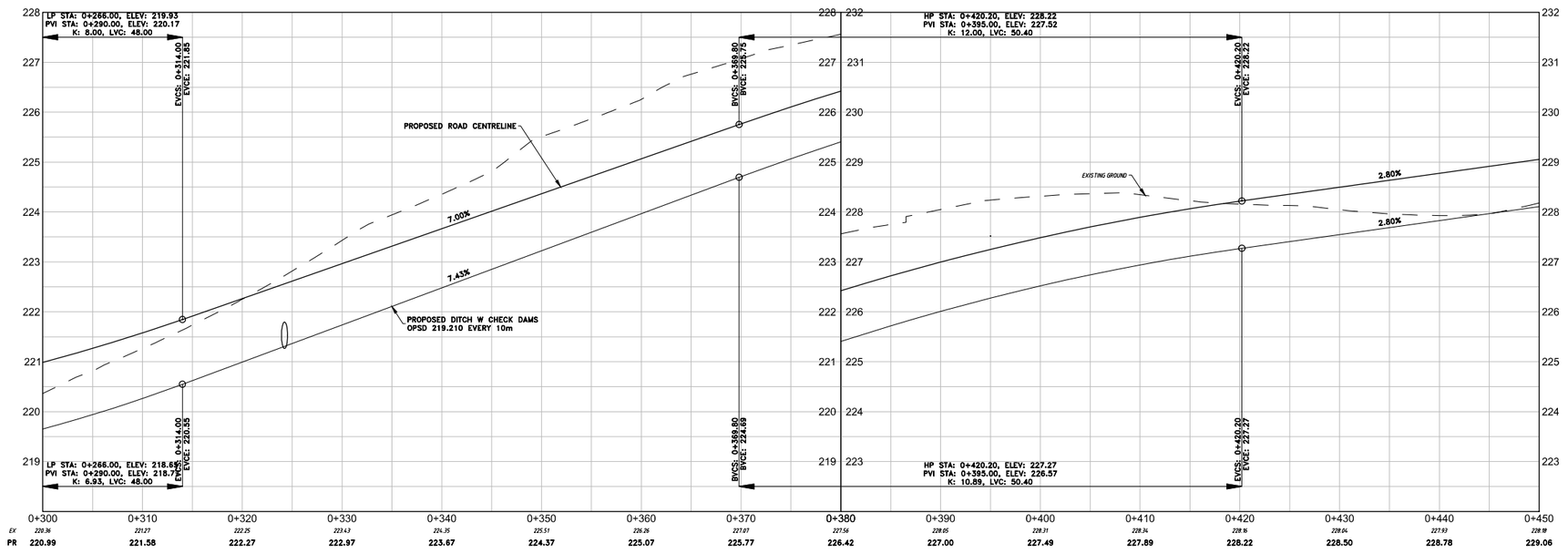
09/20/2024

STREET A





GENERAL NOTES:

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- ALL UTILITY LOCATIONS SHOWN ON THE DRAWINGS ARE APPROXIMATE. THE CONTRACTOR SHALL CONFIRM THE LOCATION ON SITE AND ASSUME ALL LIABILITY FOR DAMAGE TO ALL UTILITIES.
- EXCLUDING THE BENCHMARK AND DESCRIPTION PROVIDED FOR THIS PROJECT, NO OTHER ELEVATIONS ARE TO BE USED AS A REFERENCE ELEVATION FOR ANY PURPOSE.

METRIC NOTE:

- ALL DIMENSIONS SHOWN ARE IN METRES OR MILLIMETRES, UNLESS OTHERWISE NOTED.

GEOMETRIC NOTE:

- ALL SURVEY DATA SHOWN ON THIS DRAWING WAS RECORDED USING REAL-TIME KINETIC (RTK) GPS OBSERVATIONS IN REFERENCE TO UTM 18 NORTH COORDINATE SYSTEM.
- ALL ELEVATIONS ARE IN REFERENCE TO LOCAL DATUM NAD83 - GEODETIC MODEL HT2_0, UNLESS DESCRIBED OTHERWISE.

** DRAWINGS ARE NOT TO BE SCALED **

REVISIONS

NO.	DATE	DESCRIPTION	BY
1	11/01/2024	REVISED LOT LAYOUT	JH

LICENSED PROFESSIONAL ENGINEERS
A. M. REDDER
100177806
Nov. 1, 2024
PROVINCE OF ONTARIO

JEWELL ENGINEERING

KEENE SUBDIVISION

KEENE, ONTARIO
TOWNSHIP OF OTONABEE-SOUTH MONAGHAN

PLAN & PROFILE
STREET A
STA. 0+300 to 0+450

DRAWN BY: JH	PROJECT NO: 220-5237		
DESIGNED BY:	DATE: September 2024		
CHECKED BY: AMR	SCALE: HORIZONTAL - 1:250 VERTICAL - 1:50		
APPROVED BY:	CONTRACT NO:	DRAWING NO: PP-3	

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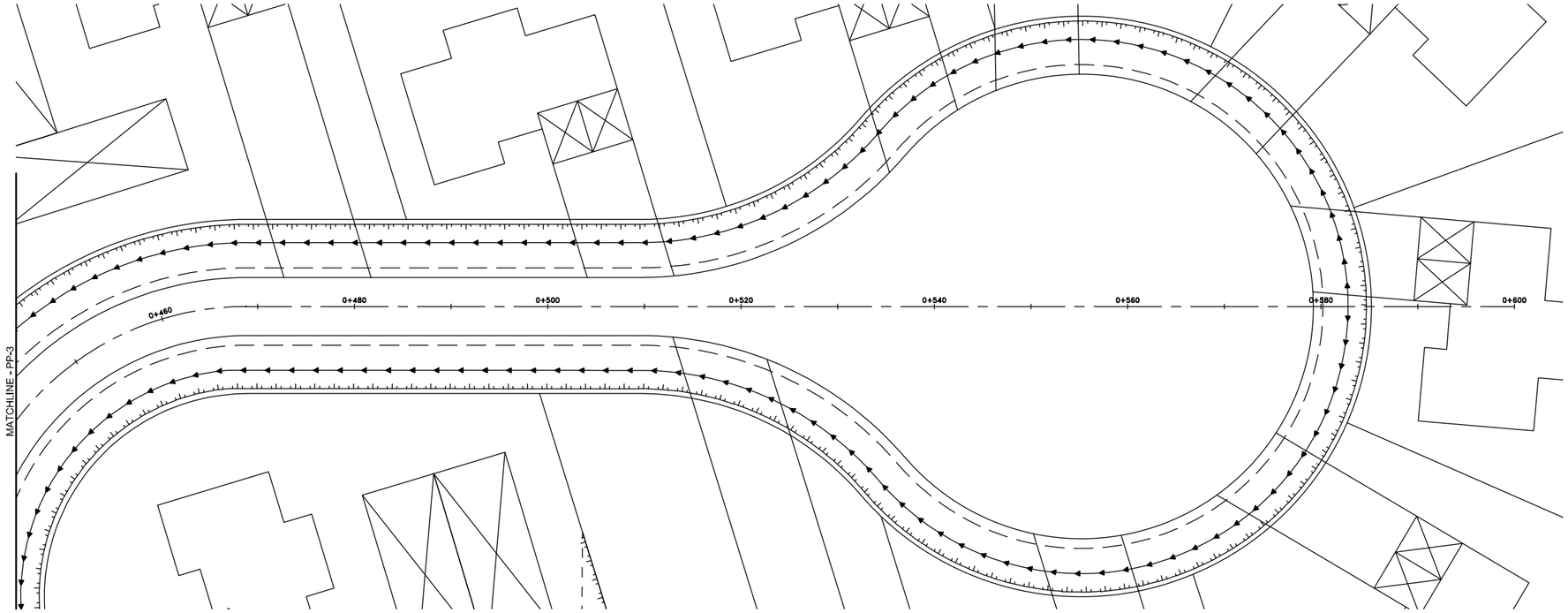
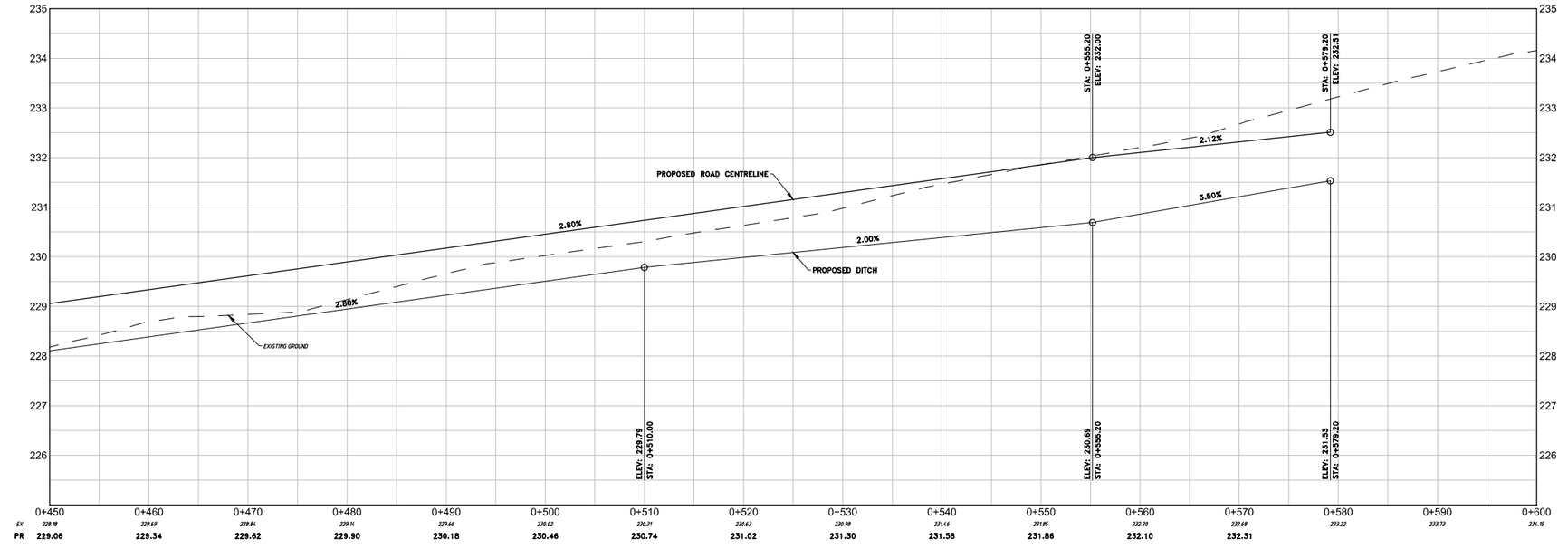
09/20/2024

STREET A





GENERAL NOTES:

- ALL INFORMATION TO BE VERIFIED ON SITE PRIOR TO COMMENCING ANY WORK. ANY DISCREPANCIES ARE TO BE REPORTED TO THE CONSULTANT IMMEDIATELY.
- ALL UTILITY LOCATIONS SHOWN ON THE DRAWINGS ARE APPROXIMATE. THE CONTRACTOR SHALL CONFIRM THE LOCATION ON SITE AND ASSUME ALL LIABILITY FOR DAMAGE TO ALL UTILITIES.
- EXCLUDING THE BENCHMARK AND DESCRIPTION PROVIDED FOR THIS PROJECT, NO OTHER ELEVATIONS ARE TO BE USED AS A REFERENCE ELEVATION FOR ANY PURPOSE.

METRIC NOTE:

- ALL DIMENSIONS SHOWN ARE IN METRES OR MILLIMETRES, UNLESS OTHERWISE NOTED.

GEOMETRIC NOTE:

- ALL SURVEY DATA SHOWN ON THIS DRAWING WAS RECORDED USING REAL-TIME KINETIC (RTK) GPS OBSERVATIONS IN REFERENCE TO UTM 18 NORTH COORDINATE SYSTEM.
- ALL ELEVATIONS ARE IN REFERENCE TO LOCAL DATUM NAD83 - GEODETIC MODEL HT2_0, UNLESS DESCRIBED OTHERWISE.

** DRAWINGS ARE NOT TO BE SCALED **

REVISIONS

NO.	DATE	DESCRIPTION	BY
1	11/01/2024	REVISED LOT LAYOUT	JH

LICENSED PROFESSIONAL ENGINEERS
A. M. REDDEN
100177806
Nov. 1, 2024
PROVINCE OF ONTARIO

JEWELL ENGINEERING

KEENE SUBDIVISION

KEENE, ONTARIO
TOWNSHIP OF OTONABEE-SOUTH MONAGHAN

PLAN & PROFILE
STREET A
STA. 0+450 to 0+600

DRAWN BY: JH	PROJECT NO: 220-5237
DESIGNED BY:	DATE: September 2024
CHECKED BY: AMR	SCALE: HORIZONTAL - 1:250, VERTICAL - 1:50
APPROVED BY:	CONTRACT NO:
	DRAWING NO: PP-4

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