ACCESS PROPERTY DEVELOPMENT INC

415 LEGGET DRIVE

STORMWATER MANAGEMENT REPORT

MARCH 25, 2022

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STORMWATER MANAGEMENT REPORT

ACCESS PROPERTY DEVELOPMENT INC.

2ND SUBMISSION

PROJECT NO.: 219-00058-04
CLIENT REF:
DATE: MARCH 25, 2022

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REVISION HISTORY

FIRST ISSUE

October 22nd, 2021	Draft SWM Report			
Prepared by	Reviewed by	Approved By		
MO	AJ	AJ		
SECOND ISSUE				
March 25th, 2022	SWM Report			
Prepared by	Reviewed by	Approved By		
MO	AJ	AJ		

SIGNATURES

PREPARED BY

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March 25th, 2022

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Designer, Water Resources

APPROVED[1] BY

Ayham Jadallah, M.Eng., P.Eng.
Project Engineer, Water Resources

March 25th, 2022

[1] Approval of this document is an administrative function indicating readiness for release and does not impart legal liability on to the Approver for any technical content contained herein. Technical accuracy and fit-for-purpose of this content is obtained through the review process. The Approver shall ensure the applicable review process has occurred prior to signing the document.

CONTRIBUTORS

CLIENT

Access Property Development Inc.

WSP

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Water Resources, Project Engineer	Ayham Jadallah

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1 INTRODUCTION

1.1 SCOPE

WSP Canada Inc. was retained by Access Property Development Inc. to prepare a Stormwater Management (SWM) report for the proposed development at 415 Legget Drive in Ottawa, Ontario. This SWM report examines the potential water quality and quantity impacts of the proposed commercial development and summarizes how each will be addressed in accordance with applicable guidelines.

1.2 SITE LOCATION

The site of the proposed commercial development is located at 415 Legget Drive, Ottawa, Ontario. The subject site is bounded by Solandt Road to the north, Legget Drive to the west, other commercial properties to the south, and a golf course to the east. The site is accessed via Legget Drive and Solandt Road. The site location is shown in Figure 1.

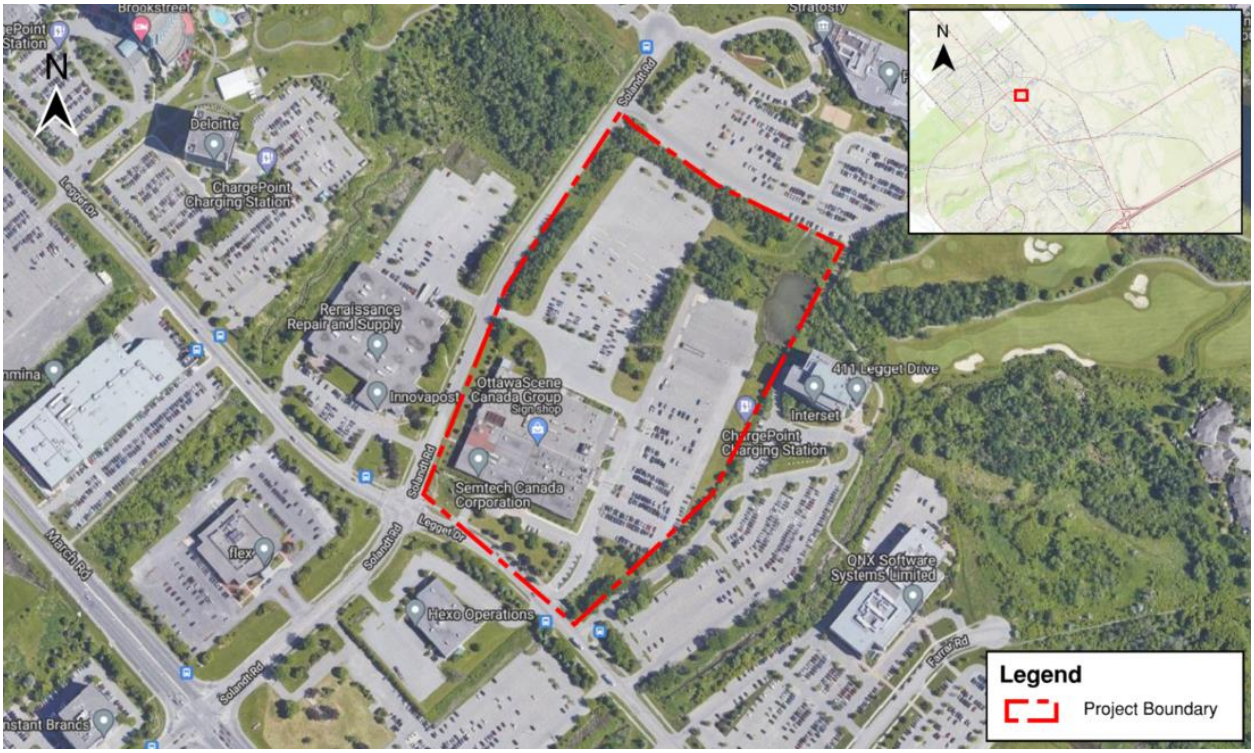


Figure 1: Site Location

1.3 STORMWATER MANAGEMENT PLAN OBJECTIVES

The objectives of the stormwater management plan are as follows:

- → Collect and review background information
- → Determine the site-specific stormwater management requirements to ensure that the proposals are in conformance with the applicable Provincial, Municipal and Conservation Authority stormwater management and development guidelines.
- → Evaluate various stormwater management practices that meet the applicable SWM and development requirements and recommend a preferred strategy.
- → Prepare a stormwater management report documenting the strategy along with the technical information necessary for the justification and sizing of the proposed stormwater management facilities.

1.4 DESIGN CRITERIA

Design criteria were obtained through a pre-consultation meeting with the City of Ottawa held on September 27th, 2021 (meeting minutes included in **Appendix A**). Criteria for 415 Legget Drive are as follows:

- → **Stormwater Quantity-** control post-development flows to pre-development levels for the 2- to 100-year storm events. The existing drainage patterns for the site should be maintained. Allowable runoff coefficient (C) shall be the lesser of pre-development conditions to a maximum of 0.5.
- → **Storm Quality-** enhanced level of protection per the Mississippi Valley Conservation Authority (MVCA) is required (80% TSS Removal).

2 PRE-DEVELOPMENT CONDITIONS

2.1 GENERAL

The subject site is a 7.28 ha parcel of land comprised of two paved parking areas and an existing commercial building. Vehicular access to the site is via two entrances on Legget Drive and Soldant Road. Under pre-development conditions the subject site consists of primarily impervious building and parking area with the exception of the north-east corner of the property which is undeveloped pervious area. Within the north-east corner of the site there is an existing stormwater management wet pond. Existing drainage patterns for the site were determined based on topographic survey information. With the exception of the existing building and a small portion along the north and west border of the site which drains to Solandt Rd, existing site drainage is towards the excising wet pond which discharges into the Kizell Drain. The existing building roof drainage discharges via roof drains into the Solandt Road sewer. It should be noted that the existing building will remain unchanged in the proposed development and therefore no new quantity or quality control measures were are proposed for this area (S-BEX). Additionally, as shown on the exhibits found in **Appendix B**, there is approximately 0.28 ha of external drainage area from the adjacent property to the south draining towards the site and into the existing wet pond. This area was considered in both the pre and post development calculations. The pre-development catchment characteristics are summarized in Table 1 and illustrated in Exhibit 1 and 2 in **Appendix B**.

Table 1: Pre-development Catchment Characteristics

CATCHMENT ID	AREA (ha)	% COVERAGE OF PROJECT AREA	RUNOFF COEFFICIENT
External Drainage Areas to Wet Pond / Kizell Drain			
S-EXT1	0.28		0.35
Un-Controlled Drainage Areas to Solandt Rd			
S-U1	0.76	10.4%	0.23
S-BEX	0.97	13.3%	0.90
Un-Controlled Drainage Areas to Wet Pond / Kizell Drain			
S-U2**	5.55	76.2%	0.63*
TOTAL PROJECT AREA	**7.28**	**100%**	**0.62**
TOTAL (INCL. EXTERNAL DRAINAGE)	**7.56**		**0.61**

**Runoff coefficient of 0.50 used for pre-development PCSWMM model per OSDG 8.3.7.3*
***Includes "Pond" catchment*

2.2 RAINFALL INFORMATION

The rainfall intensity is calculated in accordance with Section 5.4.2 of the Ottawa Sewer Design Guidelines (October, 2012):

Where;

$$i = \left[\frac{A}{(Td + C)^B}\right]$$

- A, B, C = regression constants for each return period (defined in section 5.4.2)
- i = rainfall intensity (mm/hour)
- Td = storm duration (minutes)

The IDF parameters/regression constants are per the Ottawa Sewer Design Guidelines (October, 2012).

2.3 ALLOWABLE FLOW RATES

As noted in section 1.4, relevant policies from the OSDG for a re-development and the pre-consultation meeting require the post-development discharge rate from the site match pre-development levels for the 2- to 100-year storm events where pre-development conditions are analyzed using the lesser of the actual runoff coefficient and a runoff coefficient of 0.5.

PCSWMM was used to analyze the existing conditions for the site and determine the allowable peak flow rates from the site into the existing wet pond and Soldant Rd, results are summarized in Table 2. It should be noted that "OF_1 – Wet Pond" is the existing peak inflow from the site into the pond, as limited information is known about the existing wet pond, the primary quantity control target was to control proposed flows from the site and into the wet pond to existing conditions. "OF2_2 – Kiezell Drain" is an estimate of the peak flows discharging from the pond into the Kizell Drain based on the available information about the wet pond. Detailed PCSWMM results are provided in **Appendix C**.

Table 2: Pre-Development Peak Flow Rates

OUTFALL	PEAK FLOW RATE (m^3/sec)					
	2-yr	5-yr	10-yr	25-yr	50-yr	100-yr
OF1 – Solandt Rd	0.22	0.33	0.40	0.50	0.58	0.66
OF2_1 – Wet Pond	0.29	0.54	0.73	1.00	1.21	1.43
OF2_2 – Kizell Drain	0.20	0.41	0.59	0.81	0.99	1.21

3 POST-DEVELOPMENT CONDITIONS

3.1 GENERAL

The proposed Legget Drive project is a commercial development in Ottawa, Ontario. Post development condition catchment characteristics are summarized in Table 3 and illustrated on Exhibits 3 and 4 found in **Appendix B**. The proposed development includes the construction of two additional commercial buildings over a portion of the two existing parking areas. Vehicular access to the site will continue to be via the existing entrances off Legget Drive and Soldant Road. In general, existing drainage patterns are maintained with the majority of the site draining to the existing wet pond.

Table 3: Post Development Catchment Characteristics

CATCHMENT ID	AREA (ha)	% COVERAGE OF PROJECT AREA	RUNOFF COEFFICIENT
External Drainage Areas to Wet Pond / Kizell Drain			
S-U2 (external portion)	0.08		0.67
S-U4 (external portion)	0.19		0.2
Un-Controlled Drainage Areas to Solandt Rd			
S-U1	0.59	8.1%	0.28
S-BEX	0.97	13.3%	0.90
Un-Controlled Drainage Areas to Wet Pond / Kizell Drain			
S-U2 (internal portion)	2.09	28.7%	0.73
S-U3	0.40	5.5%	0.82
S-U4 (internal portion)	0.25	3.4%	0.2
S-U5	0.23	3.2%	0.2
S-U6	0.07	1.0%	0.2
S-U7	0.37	5.1%	0.2
S-U8*	0.47	6.5%	0.2
Controlled Drainage Areas to Wet Pond / Kizell Drain			
S-BA	1.12	15.4%	0.90
S-BB	0.72	9.9%	0.90
TOTAL PROJECT AREA	**7.28**	**100%**	**0.66**
TOTAL (INCL. EXTERNAL DRAINAGE)	**7.56**		**0.65**

**Includes "Pond" catchment*

To meet stormwater management objectives, as defined by the design criteria outlined in Section 1.4, the following components have been proposed:

- → Roof storage on the two proposed buildings, controlled by WATTS Adjustable Flow Control Roof Drains (or equivalent)
- → Existing Wet Pond
- → Enhanced grassed swales

The application and sizing of these proposed stormwater management facilities is outlined in the following sections.

3.2 WATER QUANTITY

As noted previously, it is required that the post-development discharge rate from the site match pre-development levels for the 2- to 100-year storm events.

Proposed features to achieve these targets include;

- → Roof storage with flow control roof drains

PCSWMM software has been used to model the behaviour of the proposed SWM system and determine its response under various storm events. The model was developed and tested in an iterative manner to determine the necessary storage volumes and flow control rates from the two proposed buildings. Roof storage areas were defined using storage nodes in the model, with appropriate stage-storage relationships based on the volumes available in each area. Outflow controls from each storage node were defined using outlets with appropriate head-discharge curves as defined using manufacture information provided in **Appendix E**.

A summary of the modeling results is provided in Table 4 and Table 5, detailed PCSWMM modeling results are provided in **Appendix C**.

The model was developed assuming 90% of the roof area is available for storage, as shown on the roof plan, discharge from Building A and Building B will be controlled by 18 and 15 WATTS Adjustable Flow Control Roof Drains (or equivalent) respectively.

Table 4: Pre vs Post Development Flow Rates

OUTFALL	PEAK FLOW RATE (m^3/sec)					
	2-yr	5-yr	10-yr	25-yr	50-yr	100-yr
Existing Conditions						
OF1 – Solandt Rd	0.22	0.33	0.40	0.50	0.58	0.66
OF2_1 – Wet Pond	0.29	0.54	0.73	1.00	1.21	1.43
OF2_2 – Kizell Drain	0.20	0.41	0.59	0.81	0.99	1.21
Proposed Conditions						
OF1 – Solandt Rd	0.23	0.33	0.40	0.49	0.56	0.64
OF2_1 – Wet Pond	0.26	0.43	0.55	0.71	0.83	0.96
OF2_2 – Kizell Drain	0.17	0.30	0.41	0.57	0.70	0.84

Table 5: PCSWMM Modeling Results

RETURN PERIOD (Years)	BUILDING A			BUILDING B		
	ROOF STORAGE UTILIZED (m^3)	ROOF PONDING DEPTH (mm)	ROOF STORAGE AVAILABLE (m^3)	ROOF STORAGE UTILIZED (m^3)	ROOF PONDING DEPTH (mm)	ROOF STORAGE AVAILABLE (m^3)
2	186.1	172	1148	110.0	152	581
5	275.1	198		162.4	176	
10	336.5	214		199.5	190	
25	415.6	230		247.3	206	
50	476.6	242		284.2	217	
100	540.9	253		323.3	227	

As shown in Table 5, there is a maximum roof ponding depth of 253 mm and 227 for buildings A and B respectively during the full range of storm events and there is sufficient storage volume available on both roofs to store up to and including the 100-yr event. The available storage volume was calculated as the volume available below the overflow scuppers (340 mm and 290 mm above the roof drains for Building A and B respectively).

3.2.1 EXISTING WET POND

As previously discussed, there is an existing wet pond in the north-east corner of the site. A Phase 1 Environmental Site Assessment completed by SRL in April, 2021 determined that the existing wet pond is approximately 1 m deep and noted some additional ponding in the area around the pond as shown on Figure 2. It should be noted that the existing ponding area adjacent to the pond will be regraded in proposed conditions to promote positive drainage towards the wet pond and reduce risk of flooding the adjacent property. Detailed survey information found the pond to have an approximately 1,868 m^2 area at the top of the permanent pool and a top of water elevation of approximately 76.1 m at the time of the survey. The survey shows the pond to have a spill point elevation of approximately 76.16 m into a v-ditch discharging into the Kizell Drain as shown on the MVCA Floodplain Map in **Appendix D**. This spill point is the only observed outlet of the pond and therefore considered to be the permanent pool elevation in the pond. Although at the time of survey the water elevation was measured as 76.1 m, likely due to some loss through infiltration and evaporation, it was assumed that the water elevation would be at the spill point of 76.16 m at the beginning of a storm as a conservative approach of estimating the maximum ponding elevation in the site.

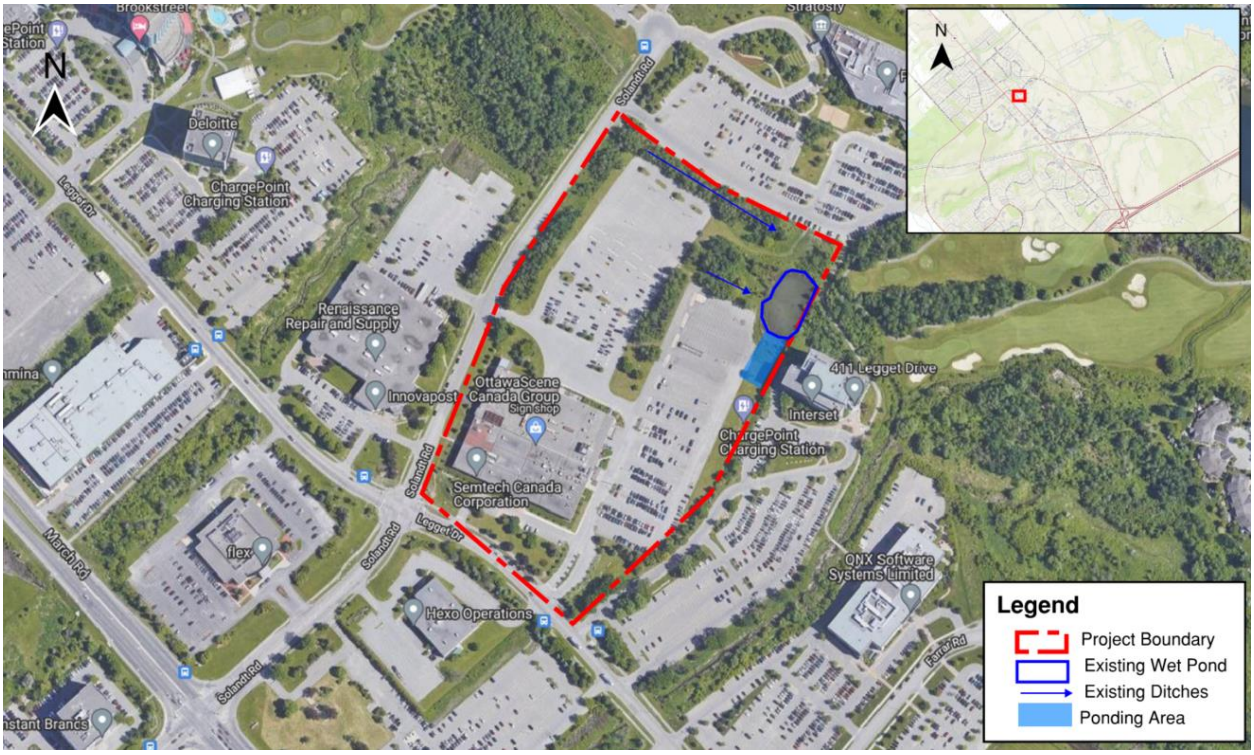


Figure 2: Existing Drainage

The existing wet pond was modeled using PCSWMM with the appropriate stage-storage information based on the available data. Existing contour lines were used to develop the storage curve above the water elevation. As no available survey or as-built information was available for the pond below the water elevation, the pond was assumed to be 1 m deep (per the ESA) with 3:1 side slopes below the permanent pool. The wet pond storage curve is included in **Appendix C**.

A summary of the modeling results showing expected high-water elevations and maximum storage volumes in the pond in both existing and proposed conditions is shown in Table 6, as shown, the expected storage and water elevations in the pond are reduced in proposed conditions. Detailed modeling results can be found in **Appendix C**.

Table 6: PCSWMM Results - Wet Pond

RETURN PERIOD	2-YR	5-YR	10-YR	25-YR	50-YR	100-YR
Existing Conditions						
Estimated Permanent Pool Volume (m^3)	1625					
Active Storage Volume (m^3)	384	479	535	594	639	685
Total Storage Volume (m3)	2009	2104	2160	2219	2264	2310
Maximum Water Elevation (m)	76.29	76.34	76.36	76.39	76.40	76.42
Proposed Conditions						
Estimated Permanent Pool Volume (m^3)	1625					
Active Storage Volume (m^3)	366	433	479	530	568	601
Total Storage Volume (m3)	1991	2058	2104	2155	2193	2226
Maximum Water Elevation (m)	76.29	76.32	76.34	76.36	76.38	76.39

3.3 WATER QUALITY

As noted previously, the majority of site runoff will continue to drain to the existing wet pond on site and ultimately discharge into the Kizell Drain.

It is assumed that runoff from the proposed rooftop areas and walkways areas will be free of typical sediment-generating activities and therefore runoff will leave them effectively unchanged and can be considered clean for the purposes of water quality assessment. It should be noted that the typical sediment-generating activities are in areas with vehicular access, such as loading areas and parking areas. In the case of this development, the overall parking area is reduced and replaced with the roof areas of the proposed buildings. Therefore, the overall water quality leaving the site is considered to be improved upon existing conditions.

Under existing conditions, a treatment train approach of grassed ditches and a wet pond exist on site which will be maintained under proposed conditions. Vegetation in the grassed ditches allow for sedimentation and filtration. Additionally, wet ponds allow for extended detention times allowing sediment to settle out prior to discharge. Finally, site runoff is generally directed over pervious grassed area, helping to filter out additional sediment and slow the runoff, prior to entering the pond. The combination of the existing quality control measures on site, as well as the overall reduction in parking area, is considered sufficient to meet the quality control requirements of this site.

To further improve the water quality leaving the site, proposed swales have been designed as enhanced swales. As shown on Exhibit 3 found in **Appendix B**, all impervious area discharge to enhanced grass swales prior to discharge into the existing pond.

Enhanced grass swales are vegetated open channels that convey, treat and attenuate stormwater runoff. Flat bottoms and vegetation in the swale decrease the velocity of the water, allowing for sedimentation, and filtration through the root zone and soil, and evapotranspiration, and infiltration into the underlying soil (TRCA, 2010).

The enhanced grassed swales have been designed according to the below design guidance (TRCA,2010):

- Shape: Grass swales should be designed with a trapezoidal or parabolic cross section. Trapezoidal swales will generally evolve into parabolic swales over time, so the initial trapezoidal cross section design should be checked for capacity and conveyance assuming it is a parabolic cross section. Swale length between culverts should be 5 meters or greater;
- Bottom Width: Grass swales should be designed with a bottom width between 0.75 and 3.0 meters. The design width should allow for shallow flows and adequate water quality treatment, while preventing flows from concentrating and creating gullies;
- Longitudinal Slope: Slopes should be between 0.5% and 4%. Check dams should be incorporated on slopes greater than 3%;
- Length: When used to convey and treat road runoff, the length simply parallels the road, and therefore should be equal to, or greater than the contributing roadway length;
- Flow Depth: The maximum flow depth should correspond to two-thirds the height of the vegetation. Vegetation in some grass swales may reach heights of 150 mm; therefore, a maximum flow depth of 100 mm is recommended during a 4-hour, 25 mm Chicago storm event;
- Side Slopes: The side slopes should be as flat as possible to aid in providing pre-treatment for lateral incoming flows and to maximize the swale filtering surface. Steeper side slopes are likely to have erosion gullying from incoming lateral flows. A maximum slope of 2.5:1 (H:V) is recommended and a 4:1 slope is preferred where space permits.
- Drainage Area and Runoff Volume: The conveyance capacity should match the drainage area. Sheet flow to the grass swale is preferable. If drainage areas are greater than 2 hectares, high discharge through the swale may not allow for filtering and infiltration, and may create erosive conditions. Typical ratios of impervious drainage area to swale area range from 5:1 to 10:1.

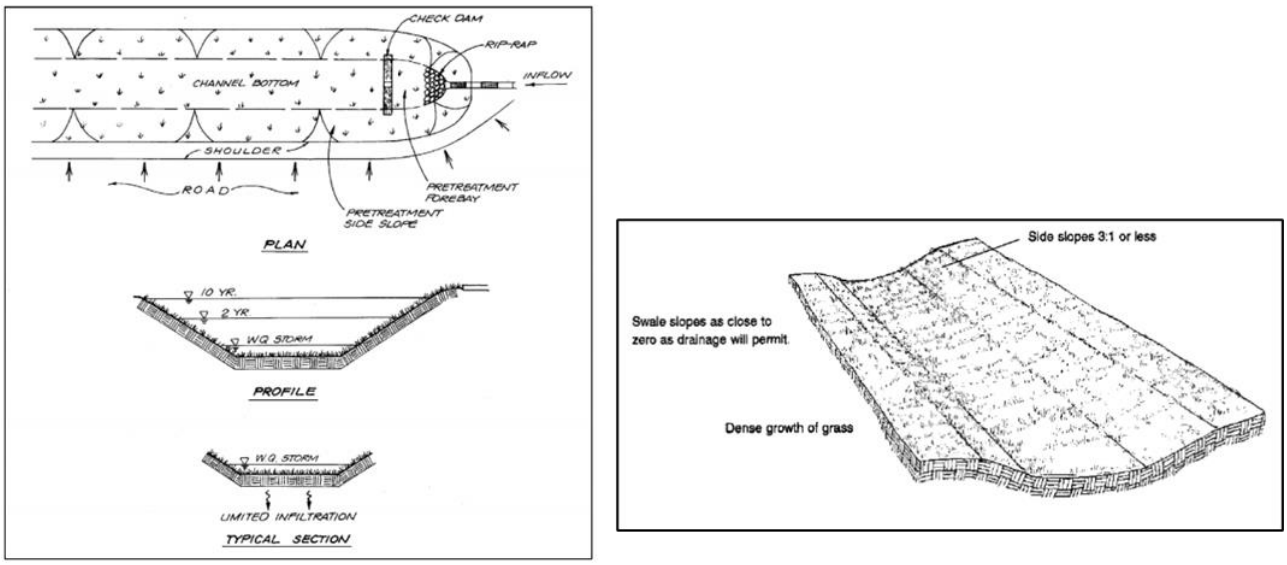


Figure 3: Plan, Profile, and Section Views of Grass Swale (ref: TRCA, 2010)

A detailed enhanced grass swale design sheets is included in **Appendix C**.

3.4 FLOODPLAIN CONSIDERATIONS

A flood plain map was provided by the MVCA and is included in **Appendix D**. As shown on the map, the proposed development is outside of both the Kizell Drain and Shirley's Brook 1:100-year floodplain and therefore loss of floodplain storage is not a concern in the case of this development.

3.5 TEMPERATURE CONSIDERATIONS

Proposed enhanced grass swales as well as the vegetation surrounding the existing pond help to cool runoff as it passes along / through naturally vegetated media and infiltrate flows from asphalt surfaces. Furthermore, existing trees around the wet pond further cool water within the pond.

In conjunction, the above measures are considered sufficient to address MVCA requirements related to temperature of storm runoff from the site.

4 CONCLUSIONS

A stormwater management report has been prepared to support the feasibility study for the proposed development at 415 Legget Drive in the City of Ottawa. The key points are summarized below.

WATER QUALITY

Enhanced grassed swales, and stormwater management wet pond is considered sufficient to meet the quality control requirements for the site.

WATER QUANTITY

Quantity control will be provided via roof storage on the two proposed buildings, controlled with flow control roof drains.

APPENDIX

A PRE-CONSULTATION MEETING MINUTES AND TECHNICAL COMMENTS

Pre-Application Consultation Meeting Notes

11:00am to 12:00pm, September 27, 2021, via Microsoft Teams
Property Address: 415 Legget Drive and 2700 Solandt Road
File No.: PC2021-0327

Attendees:

Molly Smith – Planner, City of Ottawa
Matthew Ippersiel – Planner (Urban Design), City of Ottawa
Matthew Hayley – Planner (Environmental), City of Ottawa
Jeffrey Ren – Co-op Student, City of Ottawa
Jill MacDonald – WSP
Justyna Garbos – WSP
Survir Pursnani – WSP
Jie Chen – Architecture49
Frank Abrantes – Access Storage
Hind Barnieh – Access Storage

Regrets:

Mark Richardson – Forester, City of Ottawa
Neeti Paudel – Project Manager (Transportation), City of Ottawa
Jessica Valic – Project Manager (Infrastructure), City of Ottawa
Jeff Goettling – Planner (Parks), City of Ottawa

Applicant's Proposal:

- The proposed development will be split into two phases – the first phase is interior retrofit of the existing building and the second phase is the construction of the two new warehouse buildings in the current parking lot
- The new buildings will be between 24 and 36 feet in height
- A total of 176 surface level parking spaces will be provided
- Access to the proposed development will be via the three existing accesses from Legget Drive and Solandt Road
- No minor variance being sought; the applicants expect that the proposed development conforms to the Zoning By-law.
- The applicant is targeting a submission on or before October 27

Preliminary comments and questions from staff and agencies, including follow-up actions:

Infrastructure
Water

Available Watermain

- 305mm (DI) – Legget Dr (existing 250mm service is located off this main)
- 305mm (PVC) – Solandt Rd

- Per WDG 4.3.1, where basic demand is greater than 50 m^3/day, there shall be a minimum of two water services, separated by an isolation valve, to avoid creation of vulnerable service area.
- Per WDG 4.4.7.2, District Meter Area (DMA) Chamber is required for services greater than 150mm in diameter.
- Only one water service is permitted per parcel. Servicing for additional buildings must be accomplished through internal branching of existing water service. If larger water service is required to accommodate additional development, please utilize the location of the existing service to limit cuts in watermain. If a new service is required, and existing location cannot be used, the existing service must be blanked at the main
- Demonstrate that the water service is adequately sized for increased water use.
- Demonstrate that adequate fire flow from fire hydrants and required pressures per City of Ottawa Water Design Guidelines are available. Provide fire hydrant coverage plan.

Boundary Conditions

Request prior to first submission. Contact assigned City Infrastructure Project Manager with the following information

- Location of service(s)
- Type of development
- Fire flow (per FUS method – include FUS calculation sheet with boundary condition request – boundary conditions will not be requested without fire flow calculations)
- Average Daily Demand (l/s)
- Maximum Hourly Demand (l/s)
- Maximum Daily Demand (l/s)

Sanitary

Available Sanitary Sewer

- 750mm (CONR) – Legget Dr – Marchwood Collector
- No available sanitary main on Solandt Rd
- Connections to collector sewers are discouraged. It is assumed that the existing building sanitary service is connected to this collector sewer. Reuse existing connection location to limit cuts in sanitary sewer.
- Demonstrate that the existing sanitary service is adequately sized for increased flow.
- Demonstrate that there is sufficient/adequate residual capacity in the receiving system to accommodate increase in flow
- Provided the existing service is adequately sized, please CCTV existing lateral to determine the condition of the lateral and submit CCTV video and report with application. If service is in poor condition, repair/replacement will be required.

Storm

Available Storm Sewer

- 525mm (CONC) – Solandt Rd
- 375mm (PVC) – Legget Dr

Stormwater Management

- Quantity Control
    - Required for the site up to and including the 100-yr storm event.
    - Refer to Shirley's Brook and Watts Creek Subwatershed Study Report for relevant environmental protection targets.
    - Consult Stormwater Management Plan, Kanata Research Park, City of Kanata for relevant stormwater management criteria.
    - Existing ditch system and wet pond exist on site.
    - If underground/inline stormwater storage is proposed, an average release rate equal to 50% of the determined peak allowable rate must be used. Otherwise, disregard the underground/inline storage as available storage or provide modeling to support the proposed design. The reasoning for this restriction is that the discharge rate at full storage is not representative of the discharge rate for more frequent storm events. Halving the discharge rate compensates for the inaccuracies of the modified rational method when underground storage is used.
    - Provide both pre and post development stormwater management plans, showing individual drainage areas and their respective coefficient.
    - If roof storage is proposed, please provide a roof drainage plan showing the 5 and 100-year storm ponding levels. Include the roof drain type, opening settings, and flow rate.
    - Per Technical Bulletin PIEDTB-2016-01 section 8.3.11.1 there shall be no surface ponding on private parking areas during the 2-year storm rainfall event.
    - Please note that the minimum orifice dia. for a plug style ICD is 83mm and the minimum flow rate from a vortex ICD is 6 L/s in order to reduce the likelihood of plugging.
- Quality Control: Please consult Conservation Authority (CA) regarding water quality control restrictions for the subject site. Include correspondence in servicing report.
- Ministry of Environment, Conservation, and Parks (MECP): Designer to determine if approval for sewage works under Section 53 of OWRA is required and to determine the type of application required. Reviews will be done through Transfer of Review or Direct Submission.
- Stormwater drainage systems that are designed to accommodate drainage from two separate parcels require an ECA.

Geotechnical Investigation

- Geotechnical Report is required for this development proposal.
- The Geotechnical Report shall speak to any proposed underground stormwater storage and provide confirmation that the site subsurface characteristics (groundwater table elevation, soil type) are appropriate. Of note, the high groundwater table must be 1.0m above the bottom of any proposed storage system per MECP requirements.

Exterior Lighting

- If exterior light fixtures are proposed, provide a plan showing the location of all exterior fixtures and include a table providing fixture details (make, model, mounting heights). All external light fixtures must meet the criteria for full cut-off classification as recognized by the Illuminating Engineering Society of North America (IESNA or IES), resulting in minimal light spillage onto

adjacent properties (as a guideline, 0.5 fc is normally the maximum allowable spillage). Provide certification letter from a relevant Professional Engineer.

Required Studies

- Servicing/Stormwater Management Report (Submit completed Servicing Study Checklist with Servicing Report)
- Geotechnical Investigation

Required Plans

- Site Servicing Plan
- Grade Control and Drainage Plan (Show major overland flow route)
- Erosion and Sediment Control Plan (Can be combined with grading plan)
- Existing Conditions and Removals Plan
- SWM Plans

General Information

1. The Servicing Study Guidelines for Development Applications are available at the following address: https://ottawa.ca/en/city-hall/planning-and-development/information-developers/development-application-review-process/development-application-submission/guide-preparing-studies-and-plans#servicing-study-guidelines-development-applications
2. Servicing and site works shall be in accordance with the following documents:
   - Ottawa Sewer Design Guidelines (October 2012) (including subsequent Technical Bulletins)
   - Ottawa Design Guidelines – Water Distribution (2010) (including subsequent Technical Bulletins)
   - Geotechnical Investigation and Reporting Guidelines for Development Applications in the City of Ottawa (2007)
   - Ottawa Standard Tender Documents (latest version)
3. Record drawings and utility plans are also available for purchase from the City (Contact the City's Information Centre by email at InformationCentre@ottawa.ca or by phone at (613) 580-2424 x.44455).
4. Any proposed work in utility easements requires written consent of easement owner.
5. **All submitted report and plan pdf documents to be flattened and unsecured to allow for editing and ease of use.**
6. All documents prepared by Engineers shall be signed and dated on the seal.

Please contact Infrastructure Project Manager Jessica Valic (jessica.valic@ottawa.ca) for follow-up questions.

Planning

- The application will be considered Site Plan Control (Manager Approval, Public Consultation), please fine the application form and information on fees here.
- Please review the following Official Plan policies and Zoning By-law provisions:

    - The subject site is designated as Urban Employment Area in the Official Plan
    - The subject site is zone Business Park Industrial Zone, Subzone 6 – Kanata North Business Park (IP6).
- The New Official Plan will be going to Planning Committee on October 14, 2021 and then to City Council for adoption on October 27, 2021 – please be aware of the following New Official Plan policies:
    - The subject site is designated as 'Kanata North Economic District' with an 'Evolving Neighbourhood' overlay; policies for the 'Kanata North Economic District' can be found under Section 6.6.3.2 of the revised draft New Official Plan.
        - Please provide a review and summary of the designation and applicable policies as they apply to the site.
    - The 'Kanata North Economic District' is expected to be the site of a Community Planning Permit System pilot project – the pilot project would require the passage of a Community Planning Permit System by-law after the New Official Plan comes into effect.
    - A complete application is received by no later than the day before the new Official Plan is adopted (October 27, 2021), it will be processed on the basis of existing Official Plan policy provided it is consistent with the 2020 Provincial Policy Statement.
    - Applications received after the day before the new Official Plan is adopted will be reviewed and evaluated on the basis of the policies of the new Official Plan.
    - Based on the submitted concept plan and the draft New Official Plan available at the time of the pre-consultation meeting, the proposed development does not appear to be affected by any proposed policy changes.

- Please consider providing only the minimum number of required parking spaces.
- Please consider relocating the parking spaces between the right-of-way and the existing building.
- Please incorporate additional landscaping throughout the parking lot through the introduction of additional parking lot islands and along the perimeter of the property where sidewalks would be found.
- Please ensure that all landscaping provisions for parking lots are being followed; please refer to Section 110 of the Zoning By-law.
- Please provide shaded landscaped pedestrian connections from the public sidewalk to building entrances.
- For bicycle parking, consider providing covered shelters for bicycle parking or integrate within buildings.
- Please refrain from designing blank walls along the street frontages; buildings should be street-oriented with entrances facing the street with highly transparent ground-floor facades.
- Please consider integrating pedestrian-oriented features such as shade trees, bicycle/scooter parking, outdoor seating areas and street furniture.
- Please ensure that the proposed development complies with all applicable provisions of the Zoning By-law and provide a comprehensive zoning table on the submitted site plan and report.
- Please note that Councillor Jenna Sudds has resigned as Councillor for Kanata North (Ward 4) – please reach out to her successor when applicable.
    - City Council will be declaring the office vacant and staff will recommend that City Council approve interim delegations of authority with respect to Ward 4 matters on

October 13, 2021, Council will then appoint person to fill the vacancy or hold a by-election.

- The application will be subject to public consultation (conducted through the posting of on-site signage, the notification of community groups, and through the City of Ottawa's DevApps website); please note that the Councillor may also ask for a Community Information and Comment Session.
- Please determine if Section 37 applies.

Urban Design

- Specific Design Comments
    - Avoid blank walls facing the public realm. Integrate as much glazing, transparency, entrances and active frontages as possible facing Legget and Solandt, particularly at the ground floor.
    - Integrate a generous landscaping treatment along Solandt that is in keeping with the character of Kanata Business Park. This often includes coniferous species of trees.
    - Consider opportunities for pedestrian-oriented features such as shade trees, bicycle/scooter parking, outdoor seating areas and street furniture
    - To minimize the impact on the public realm, service areas such as parking, loading, vehicle access and service entrances should be at the rear of the buildings. Use landscaping to screen them from the public realm.
    - Where exposed to the public realm, use landscaping to screen parking lots as much as possible.
    - Integrate as much greening into the parking lot as possible and ensure strong and logical pedestrian connectivity to building entrances.

- New Official Plan (New OP) – Note that the draft new OP aims to designate the greater area that this property falls within as a "Special Economic District" and as a Design Priority Area. The new policy will aim to enhance mobility options, encourage mixed-use development and promote enhanced urban design. Please refer to Section 6.6.3.2 of the draft plan. Though not currently in effect, the proponent is strongly encouraged to implement the new vision for the area as much as possible.

- Kanata North Tech Park Community Planning Permit Pilot Study (CPP) – Note that a study is currently underway for the greater area that this property falls within, which will have implications for urban design. It is being re-envisioned as a "highly-connected, vibrant mixed-use area where people live, work, connect and play". Refer to the project Website for more details.

- Design Brief – As part of your submission, please include a Design Brief. Please refer to the attached Design Brief Terms of Reference to inform the content of the brief.

- Urban Design Review Panel – In the current policy context, this application is not subject to review by the Urban Design Review Panel (UDRP). While the draft new Official Plan aims to recognize the area as a Design Priority Area, early indications from staff working on the Kanata

North CPP are that the area will likely be exempt from review by the UDRP (though it is possible that this may be subject to change).

Please contact Urban Design Planner Matthew Ippersiel (Matthew.Ippersiel@ottawa.ca) for follow-up questions.

Environmental Planning

Bird-safe Design

- Given the height of the proposal (mid to high rise) the proposal will need to review and incorporate bird safe design elements. Some of the risk factors include glass and related design traps such as corner glass and fly-through conditions, ventilation grates and open pipes, landscaping, light pollution. More guidance and solutions are available in the guidelines which can be found here: https://ottawa.ca/en/planning-development-and-construction/developing-property/development-application-review-process/development-application-submission/guide-preparing-studies-and-plans .

Environmental Impact Statement (EIS) to address species at risk and provide recommendations on wildlife mitigations.

- Blanding's turtles sighted in the area, indicating regulated habitat may be present on the property, particularly in the parts around the pond. MECP consultation will likely be required to address the limits of Blanding's turtle habitat and to obtain the necessary approvals.

Please contact Environmental Planner Matthew Hayley (Matthew.Hayley@ottawa.ca) for follow-up questions.

Forestry

- A Tree Conservation Report (TCR) must be supplied for review along with the suite of other plans/reports required by the City
    a. an approved TCR is a requirement of Site Plan approval.
    b. The TCR may be combined with the Landscape Plan provided all information is supplied.
- As of January 1 2021, any removal of privately-owned trees 10cm or larger in diameter, or publicly (City) owned trees of any diameter requires a tree permit issued under the Tree Protection Bylaw (Bylaw 2020 – 340); the permit will be based on an approved TCR and made available at or near plan approval.
- The Planning Forester from Planning and Growth Management as well as foresters from Forestry Services will review the submitted TCR.
    a. If tree removal is required, both municipal and privately-owned trees will be addressed in a single permit issued through the Planning Forester.
    b. Compensation may be required for city owned trees – if so, it will need to be paid prior to the release of the tree permit.
- The TCR must list all trees on site, as well as off-site trees if the CRZ extends into the developed area, by species, diameter and health condition.
- Please identify trees by ownership – private onsite, private on adjoining site, city owned, co-owned (trees on a property line).
- The TCR must list all trees on adjacent sites if they have a critical root zone that extends onto the development site.

- If trees are to be removed, the TCR must clearly show where they are, and document the reason they cannot be retained.
- All retained trees must be shown and all retained trees within the area impacted by the development process must be protected as per City guidelines available at Tree Protection Specification or by searching Ottawa.ca.
    a. The location of tree protection fencing must be shown on a plan
    b. Show the critical root zone of the retained trees
    c. If excavation will occur within the critical root zone, please show the limits of excavation
- The City encourages the retention of healthy trees; if possible, please seek opportunities for retention of trees that will contribute to the design/function of the site.
- For more information on the process or help with tree retention options, contact Mark Richardson mark.richardson@ottawa.ca or on City of Ottawa.

Landscape Plan tree planting requirements:

For additional information on the following please contact tracy.smith@Ottawa.ca

Minimum Setbacks

- Maintain 1.5m from sidewalk or MUP/cycle track.
- Maintain 2.5m from curb
- Coniferous species require a minimum 4.5m setback from curb, sidewalk or MUP/cycle track/pathway.
- Maintain 7.5m between large growing trees, and 4m between small growing trees. Park or open space planting should consider 10m spacing.
- Adhere to Ottawa Hydro's planting guidelines (species and setbacks) when planting around overhead primary conductors.

Tree specifications

- Minimum stock size: 50mm tree caliper for deciduous, 200cm height for coniferous.
- Maximize the use of large deciduous species wherever possible to maximize future canopy coverage
- Tree planting on city property shall be in accordance with the City of Ottawa's Tree Planting Specification; and include watering and warranty as described in the specification (can be provided by Forestry Services).
- Plant native trees whenever possible
- No root barriers, dead-man anchor systems, or planters are permitted.
- No tree stakes unless necessary (and only 1 on the prevailing winds side of the tree)

Hard surface planting

- Curb style planter is highly recommended
- No grates are to be used and if guards are required, City of Ottawa standard (which can be provided) shall be used.
- Trees are to be planted at grade

Soil Volume

- Please ensure adequate soil volumes are met:

Tree Type/Size	Single Tree Soil Volume (m3)	Multiple Tree Soil Volume (m3/tree)
Ornamental	15	9
Columnar	15	9
Small	20	12
Medium	25	15
Large	30	18
Conifer	25	15

Please note that these soil volumes are not applicable in cases with Sensitive Marine Clay.

Sensitive Marine Clay

- Please follow the City's 2017 Tree Planting in Sensitive Marine Clay guidelines

Please contact Planning Forester Mark Richardson (Mark.Richardson@ottawa.ca) for follow-up questions.

Transportation

- Follow Traffic Impact Assessment Guidelines
  - Proceed with scoping.
  - Start this process asap.
  - Applicant advised that their application will not be deemed complete until the submission of the draft step 1-4, including the functional draft RMA package (if applicable) and/or monitoring report (if applicable). Collaboration and communication between development proponents and City staff are required at the end of every step in the TIA process
  - Request base mapping asap if RMA is required. Contact Engineering Services (https://ottawa.ca/en/city-hall/planning-and-development/engineering-services)
- Noise Impact Studies required for the following:
  - Stationary (if, within 100m of noise sensitive land use).
- Ensure clear throat length requirements as per TAC are met at the accesses.
- The easterly access on Legget Drive does not meet the private approach guidelines. This may have to be reconfigured and will be further reviewed in the TIA.
- On site plan:
  - Show all details of the roads abutting the site up to and including the opposite curb; include such items as pavement markings, accesses and/or sidewalks.
  - Turning templates will be required for all accesses showing the largest vehicle to access the site; required for internal movements and at all access (entering and exiting and going in both directions).
  - Show all curb radii measurements; ensure that all curb radii are reduced as much as possible
  - Grey out any area that will not be impacted by this application.

- As the proposed site is industrial and for general public use, AODA legislation applies. Consider using the City's Accessibility Design Standards.
- Number of accessible parking spaces should meet the requirements from Table 3 of the City's accessible Design Standards.
- Site triangles at the following locations on the final plan will be required:
    - Collector Road to Collector Road: 5 metre x 5 metres
- The scoping and forecasting can be submitted together and should be done as soon as possible.

Please contact Transportation Project Manager Neeti Paudel (Neeti.Paudel@ottawa.ca) for follow-up questions.

Parks

- How will the proposal meet the Parkland Dedication (By-law No. 2009-95)?
- For commercial and industrial purposes, the parkland requirement is calculated as 2% of the gross land area of the site being developed.
- The conveyance of land for purposes or the payment of money in-lieu of accepting the conveyance is not required for development, redevelopment, subdivisions or consents, where it is known, or can be demonstrated that the required parkland conveyance or money in-lieu thereof has been previously satisfied.

Please contact Parks Planner Jeff Goettling (Jeff.Goettling@ottawa.ca) for follow-up questions.

Other

Please refer to the links to the guide to preparing studies and plans and development application fees for general information. Additional information is available related to building permits, development charges, and the Accessibility Design Standards. Be aware that other fees and permits may be required, outside of the development review process. You may obtain background drawings by contacting informationcentre@ottawa.ca.

These pre-consultation comments are valid for one year. If you submit a development application(s) after this time, you may be required to meet for another pre-consultation meeting and/or the submission requirements may change. You are as well encouraged to contact us for a follow-up meeting if the plan/concept will be further refined.

APPENDIX

B EXHIBITS

CLIENT

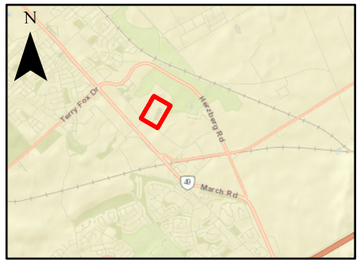
ACCESS PROPERTY DEVELOPMENT

PROJECT

415 LEGGET DRIVE

TITLE

EXHIBIT 1
EXISTING CONDITIONS
DRAINAGE MOSAIC



LEGEND

- Existing Ditches
- Existing Wet Pond

Existing Drainage Areas

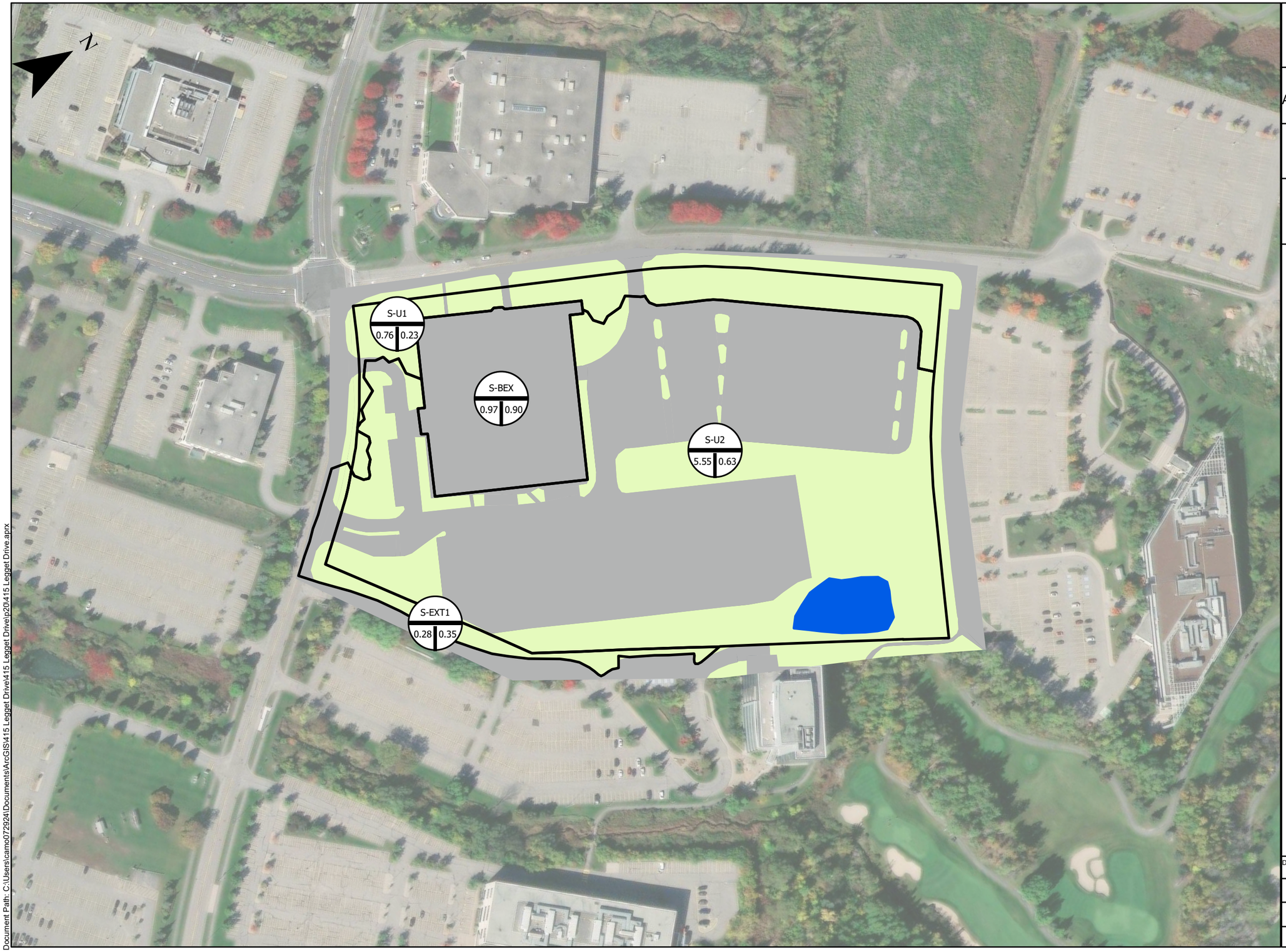
- S-BEX
- S-EXT1
- S-U1
- S-U2

Subcatchment ID
Area (ha) | Runoff C

0 0.01 0.03 km

DRAWN BY	CHECKED BY
MO	AJ
March 2022	
NAD 1983 MTM 9	
1:1,275	

Document Path: C:\Users\camo072924\Documents\ArcGIS\415 Legget Drive\415 Legget Drive\p20\415 Legget Drive.aprx



CLIENT

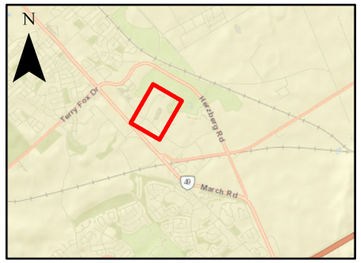
ACCESS PROPERTY DEVELOPMENT

PROJECT

415 LEGGET DRIVE

TITLE

EXHIBIT 2
EXISTING CONDITIONS
LAND USE



LEGEND

- Existing Drainage Areas
- Existing Wet Pond

Land Use

- Impervious
- Pervious

Subcatchment ID | Area (ha) | Runoff C

0 0.02 0.04 km

DRAWN BY	CHECKED BY
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March 2022	
NAD 1983 MTM 9	
1:2,204	

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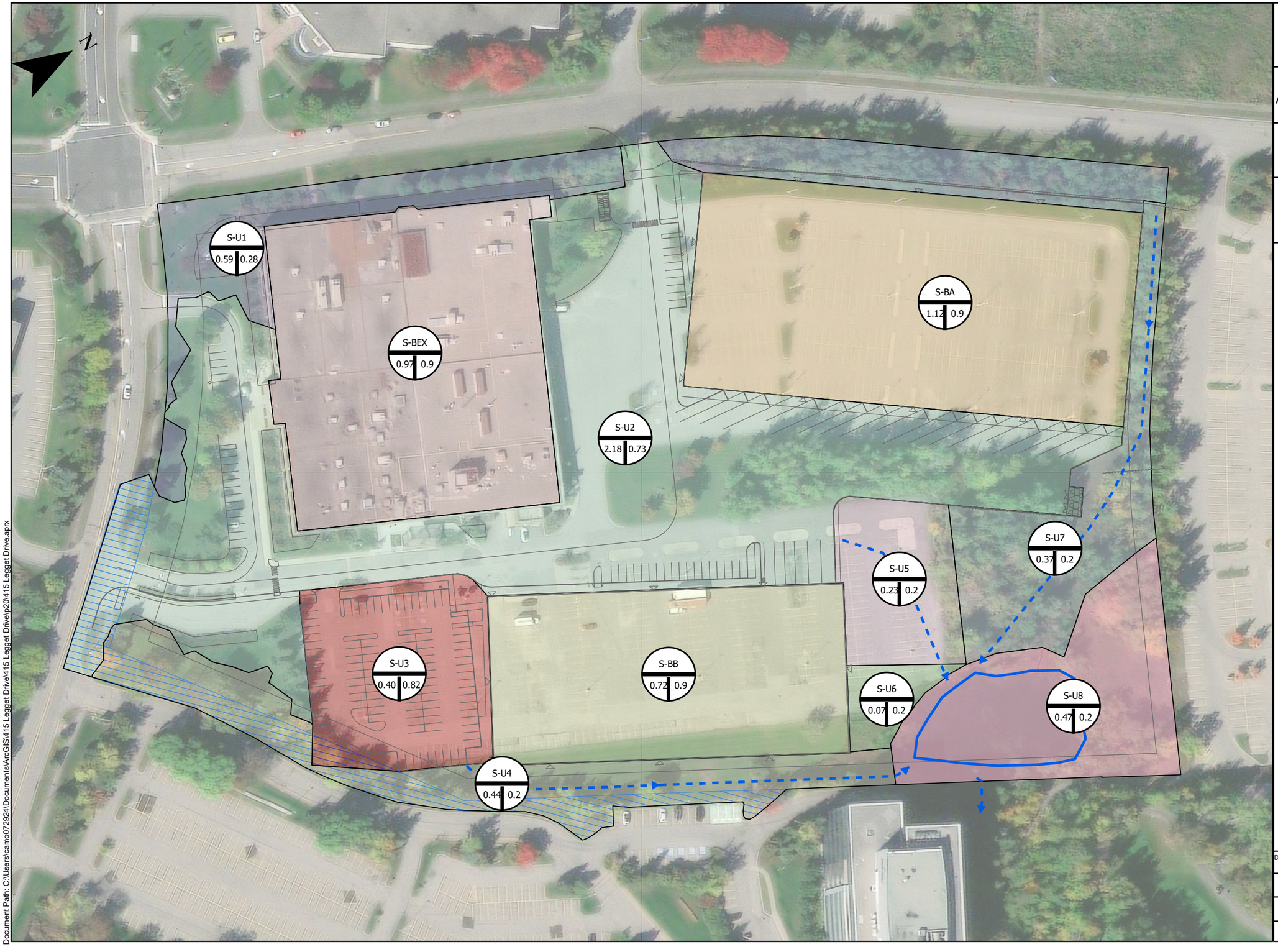

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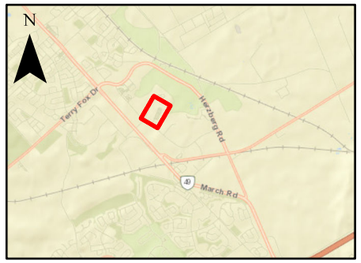
CLIENT
ACCESS PROPERTY DEVELOPMENT

PROJECT
415 LEGGET DRIVE

TITLE
EXHIBIT 3
PROPOSED CONDITIONS
DRAINAGE MOSAIC



LEGEND

- Proposed Swales
- Existing Wet Pond
- External Drainge Area

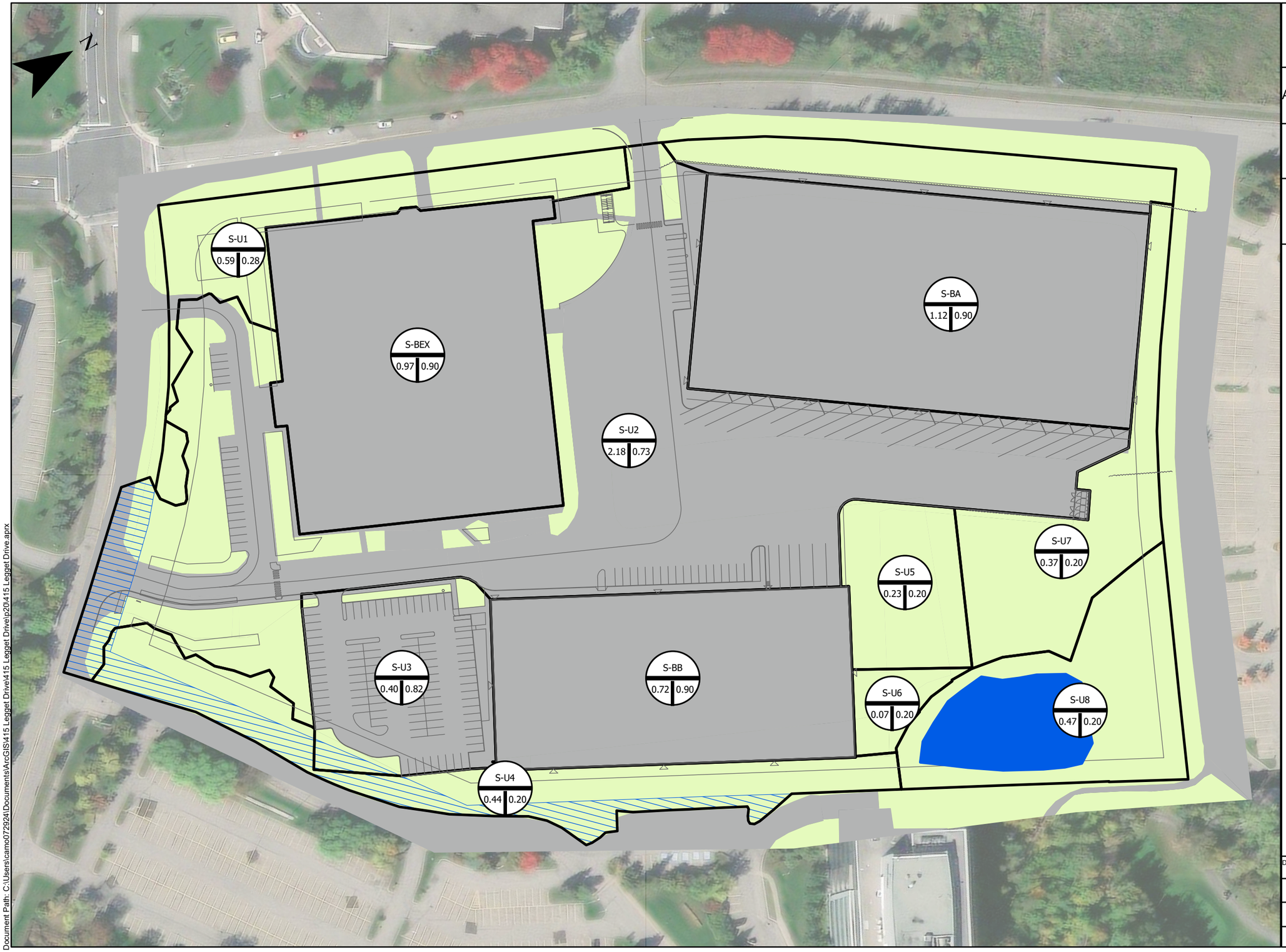
Proposed Drainage Areas

- S-BA
- S-BB
- S-BEX
- S-U1
- S-U2
- S-U3
- S-U4
- S-U5
- S-U6
- S-U7
- S-U8

Subcatchment ID
Area (ha) | Runoff C

0 0.01 0.03 km

DRAWN BY	CHECKED BY
MO	AJ
March 2022	
NAD 1983 MTM 9	
1:1,275	

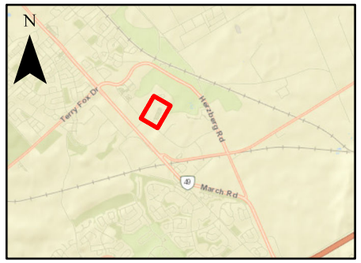


Document Path: C:\Users\camo072924\Documents\ArcGIS\415 Legget Drive\415 Legget Drive\p20\415 Legget Drive.aprx

CLIENT
ACCESS PROPERTY DEVELOPMENT

PROJECT
415 LEGGET DRIVE

TITLE
EXHIBIT 4
PROPOSED CONDITIONS
LAND USE



LEGEND

- External Drainge Area
- Existing Wet Pond

Land Use

- Impervious
- Pervious

Subcatchment ID
Area (ha) | Runoff C

0 0.01 0.03 km

DRAWN BY	CHECKED BY
MO	AJ
March 2022	
NAD 1983 MTM 9	
1:1,275	

APPENDIX

C CALCULATIONS & PCSWMM OUTPUT

SWALE CALCULATION SHEET

415 Legget - 25 mm, 4 hour storm

Check for satisfaction of criteria for enhanced grass swales (TRCA, 2010)

Designed by: Meaghan O'Neill **Date:** 3/17/2022
Checked by: Ayham Jadallah **Date:** 3/17/2022
Approved by: Ayham Jadallah **Date:** 3/17/2022
Drawing Ref:

Standard Design Calculation Sheet (Rational Method)

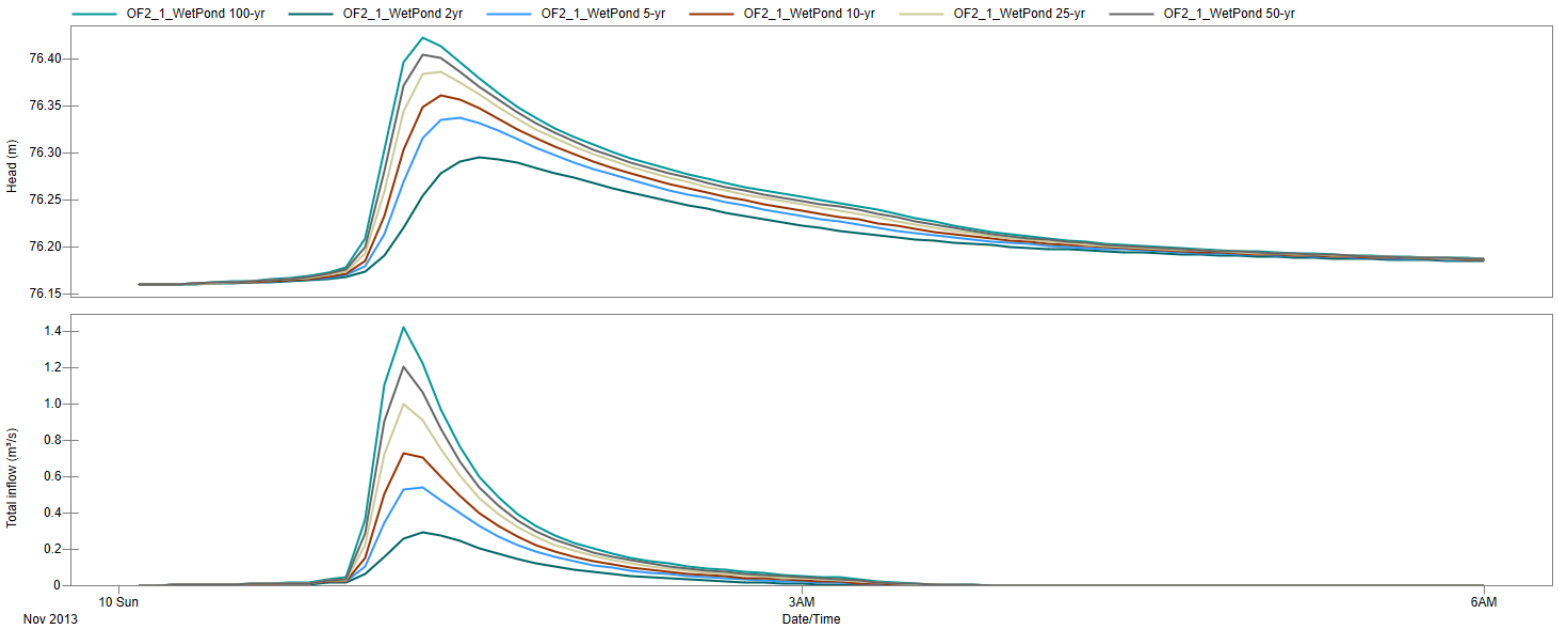
Location			Drainage Areas			Rational Method Runoff					Swale Data							Comment
Street Name or Description	From	To	Runoff Coefficients 0.20 ha	0.70 ha	0.90 ha	Individual AC	Accum. AC	Runoff Coefficient C	Rainfall Intensity i mm/h	Q L/s	Side Slope x:1	Bottom Width m	Depth m	Slope %	Length m	Q L/s	Vel. m/s	
S1	LCB01	Pond	0.37		1.12	1.08	1.08	0.73	37.1	112	3	0.75	0.17	0.60	174	112	0.5	
S2	LCB02	Pond	0.73		1.68	1.66	1.66	0.69	35.5	164	3	0.75	0.20	0.60	64	164	0.6	
S3	LCB03	Pond	0.48		1.08	1.07	1.07	0.68	35.3	104	3	0.75	0.16	0.60	153	104	0.5	

Notes:

The slope of open channels will depend on various factors including roadway longitudinal grade and natural topography;
The minimum allowable ditch/swale slope is 0.5% (1% is desirable);
For Runoff Coefficient (C), grassed area = 0.2, ballast = 0.7, paved area = 0.9
Also for C, add 10% for 25-year storm event, 20% for 50-year storm event and 25% for 100-year storm event (update this in appropriate drainage cell)
A minimum time of concentration of 10min shall be used
Rainfall intensity determined by MOE Stormwater Management Planning and Design Manual (2003) i = 43C + 5.9
Maximum velocity = 0.5m/s, Flow depth below 0.1m preferred
Channel protection in the form of sodding, gabion, armour stone, riprap, asphalt, and concrete lining may be required depending on design flow and velocities; and
Roughness Coefficient (n) = 0.04
Permissible velocities for channels lined with grass are included in Appendix 6-C of the Ottawa Sewer Design Guidelines.
Depths will be greater where checkdams are used

PRE-DEVELOPMENT CONDITIONS

WET POND - EXISTING CONDITIONS



2-year Pre-Development

```
EPA STORM WATER MANAGEMENT MODEL - VERSION 5.1 (Build 5.1.013)
--------------------------------------------------------------


*************
Element Count
*************
Number of rain gages ...... 16
Number of subcatchments ... 5
Number of nodes ........... 3
Number of links ........... 1
Number of pollutants ...... 0
Number of land uses ....... 0


****************
Raingage Summary
****************
                                                  Data       Recording
Name                 Data Source                  Type       Interval
----------------------------------------------------------------------
100yr_3hr_Chicago    100yr_3hr_Chicago            INTENSITY   10 min.
100yr_3hr_Chicago_Climate_Change 100yr_3hr_Chicago_Increase_20percent INTENSITY   10 min.
100yr_6hr_Chicago    100yr_6hr_Chicago            INTENSITY   10 min.
100yr_6hr_Chicago_Climate_Change 100yr_6hr_Chicago_Increase_20percent INTENSITY   10 min.
10yr_3hr_Chicago     10yr_3hr_Chicago             INTENSITY   10 min.
10yr_6hr_Chicago     10yr_6hr_Chicago             INTENSITY   10 min.
25mm_3hr_Chicago     25mm_3hr_Chicago             INTENSITY   10 min.
25mm_4hr_Chicago     25mm_4hr_Chicago             INTENSITY   10 min.
25yr_3hr_Chicago     25yr_3hr_Chicago             INTENSITY   10 min.
25yr_6hr_Chicago     25yr_6hr_Chicago             INTENSITY   10 min.
2yr_3hr_Chicago      2yr_3hr_Chicago              INTENSITY   10 min.
2yr_6hr_Chicago      2yr_6hr_Chicago              INTENSITY   10 min.
50yr_3hr_Chicago     50yr_3hr_Chicago             INTENSITY   10 min.
50yr_6hr_Chicago     50yr_6hr_Chicago             INTENSITY   10 min.
5yr_3hr_Chicago      5yr_3hr_Chicago              INTENSITY   10 min.
5yr_6hr_Chicago      5yr_6hr_Chicago              INTENSITY   10 min.


********************
Subcatchment Summary
********************
Name                         Area     Width   %Imperv    %Slope Rain Gage            Outlet
-----------------------------------------------------------------------------------------------
Pond                         0.28  27550.00    100.00    3.3690 2yr_3hr_Chicago      OF2_1_WetPond
S-BEX                        0.97    167.35     99.91    2.0000 2yr_3hr_Chicago      OF1
S-EXT1                       0.28      7.91     24.19    7.3320 2yr_3hr_Chicago      OF2_1_WetPond
S-U1                         0.76    162.55      8.85    4.9330 2yr_3hr_Chicago      OF1
S-U2                         5.27    198.99     66.00    3.4650 2yr_3hr_Chicago      OF2_1_WetPond


************
Node Summary
************
                                    Invert      Max.    Ponded    External
Name                 Type            Elev.     Depth      Area    Inflow
----------------------------------------------------------------------
OF1                  OUTFALL          77.70      0.00       0.0
OF2_2_KizellDrain    OUTFALL          75.90      1.49       0.0
OF2_1_WetPond        STORAGE          75.10      3.00       0.0


************
Link Summary
************
Name             From Node        To Node          Type            Length    %Slope Roughness
---------------------------------------------------------------------------------------------
C1               OF2_1_WetPond    OF2_2_KizellDrain CONDUIT          13.1    1.9788    0.0100


*********************
Cross Section Summary
*********************
                                   Full     Full     Hyd.     Max.   No. of     Full
Conduit          Shape            Depth     Area     Rad.    Width  Barrels     Flow
---------------------------------------------------------------------------------------
C1               Transect1         1.49    10.54     0.51    22.03        1    95.25



****************
Transect Summary
****************

Transect Transect1
Area:
            0.0004     0.0016     0.0037     0.0066     0.0103
            0.0148     0.0201     0.0261     0.0326     0.0398
            0.0475     0.0558     0.0646     0.0741     0.0841
            0.0947     0.1059     0.1177     0.1302     0.1434
            0.1572     0.1717     0.1868     0.2026     0.2189
            0.2359     0.2535     0.2716     0.2904     0.3099
            0.3302     0.3512     0.3730     0.3957     0.4193
            0.4438     0.4693     0.4958     0.5235     0.5525
            0.5838     0.6182     0.6557     0.6960     0.7395
            0.7867     0.8369     0.8897     0.9440     1.0000
Hrad:
            0.0283     0.0566     0.0849     0.1132     0.1415
            0.1698     0.2008     0.2341     0.2683     0.3015
            0.3339     0.3656     0.3968     0.4277     0.4581
            0.4872     0.5142     0.5413     0.5682     0.5951
            0.6221     0.6493     0.6764     0.7057     0.7351
            0.7644     0.7936     0.8227     0.8487     0.8719
            0.8954     0.9185     0.9383     0.9587     0.9797
            0.9957     1.0114     1.0281     1.0389     1.0427
            1.0049     0.9690     0.9539     0.9451     0.9240
            0.9138     0.9228     0.9436     0.9738     1.0000
Width:
            0.0131     0.0263     0.0394     0.0525     0.0657
            0.0788     0.0905     0.1006     0.1098     0.1189
            0.1281     0.1372     0.1463     0.1555     0.1646
            0.1742     0.1846     0.1949     0.2054     0.2159
            0.2264     0.2369     0.2475     0.2571     0.2667
            0.2763     0.2859     0.2955     0.3063     0.3183
            0.3302     0.3425     0.3563     0.3701     0.3840
            0.4001     0.4168     0.4335     0.4533     0.4772
            0.5243     0.5769     0.6225     0.6678     0.7269
            0.7828     0.8252     0.8580     0.8811     1.0000


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


****************
Analysis Options
****************
Flow Units ............... CMS
Process Models:
  Rainfall/Runoff ........ YES
  RDII ................... NO
  Snowmelt ............... NO
  Groundwater ............ NO
  Flow Routing ........... YES
  Ponding Allowed ........ YES
  Water Quality .......... NO
Infiltration Method ...... HORTON
Flow Routing Method ...... DYNWAVE
Surcharge Method ......... EXTRAN
Starting Date ............ 11/10/2013 00:00:00
Ending Date .............. 11/10/2013 06:00:00
Antecedent Dry Days ...... 0.0
Report Time Step ......... 00:05:00
Wet Time Step ............ 00:05:00
Dry Time Step ............ 00:05:00
Routing Time Step ........ 1.00 sec
Variable Time Step ....... YES
Maximum Trials ........... 20
Number of Threads ........ 1
Head Tolerance ........... 0.001500 m


*************************        Volume          Depth
Runoff Quantity Continuity     hectare-m             mm
*************************     ----------      ----------
Total Precipitation ......         0.241          31.860
Evaporation Loss .........         0.000           0.000
Infiltration Loss ........         0.126          16.677
Surface Runoff ...........         0.109          14.434
Final Storage ............         0.007           0.982
Continuity Error (%) .....        -0.730


*************************        Volume        Volume
Flow Routing Continuity        hectare-m      10^6 ltr
*************************     ----------     ----------
Dry Weather Inflow .......         0.000          0.000
Wet Weather Inflow .......         0.109          1.092
Groundwater Inflow .......         0.000          0.000
RDII Inflow ..............         0.000          0.000
External Inflow ..........         0.000          0.000
External Outflow .........         0.104          1.045
Flooding Loss ............         0.000          0.000
Evaporation Loss .........         0.000          0.000
Exfiltration Loss ........         0.000          0.000
```

Initial Stored Volume	0.174	1.738
Final Stored Volume	0.179	1.786
Continuity Error (%)	0.001	

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

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

****
Routing Time Step Summary
****

Minimum Time Step	:	0.50 sec
Average Time Step	:	1.00 sec
Maximum Time Step	:	1.00 sec
Percent in Steady State	:	0.00
Average Iterations per Step	:	2.00
Percent Not Converging	:	0.00

****
Subcatchment Runoff Summary
****

Subcatchment	Total Precip mm	Total Runon mm	Total Evap mm	Total Infil mm	Imperv Runoff mm	Perv Runoff mm	Total Runoff mm	Total Runoff 10^6 ltr	Peak Runoff CMS	Runoff Coeff
Pond	31.86	0.00	0.00	0.00	31.86	0.00	31.86	0.09	0.06	1.000
S-BEX	31.86	0.00	0.00	0.03	30.53	0.00	30.53	0.30	0.21	0.958
S-EXT1	31.86	0.00	0.00	30.67	7.39	0.89	0.89	0.00	0.00	0.028
S-U1	31.86	0.00	0.00	29.02	2.69	0.04	2.73	0.02	0.02	0.086
S-U2	31.86	0.00	0.00	18.10	20.13	12.96	12.96	0.68	0.27	0.407

****
Node Depth Summary
****

Node	Type	Average Depth Meters	Maximum Depth Meters	Maximum HGL Meters	Time of Max Occurrence days hr:min	Reported Max Depth Meters
OF1	OUTFALL	0.00	0.00	77.70	0 00:00	0.00
OF2_2_KizellDrain	OUTFALL	0.05	0.13	76.03	0 01:35	0.13
OF2_1_WetPond	STORAGE	1.11	1.19	76.29	0 01:35	1.19

****
Node Inflow Summary
****

Node	Type	Maximum Lateral Inflow CMS	Maximum Total Inflow CMS	Time of Max Occurrence days hr:min	Lateral Inflow Volume 10^6 ltr	Total Inflow Volume 10^6 ltr	Flow Balance Error Percent
OF1	OUTFALL	0.221	0.221	0 01:10	0.318	0.318	0.000
OF2_2_KizellDrain	OUTFALL	0.000	0.203	0 01:35	0	0.726	0.000
OF2_1_WetPond	STORAGE	0.292	0.292	0 01:20	0.774	2.51	0.003

****
Node Surcharge Summary
****

No nodes were surcharged.

****
Node Flooding Summary
****

No nodes were flooded.

****
Storage Volume Summary
****

Storage Unit	Average Volume 1000 m3	Avg Pcnt Full	Evap Pcnt Loss	Exfil Pcnt Loss	Maximum Volume 1000 m3	Max Pcnt Full	Time of Max Occurrence days hr:min	Maximum Outflow CMS
OF2_1_WetPond	1.834	5	0	0	2.009	5	0 01:35	0.203

****
Outfall Loading Summary
****

Outfall Node	Flow Freq Pcnt	Avg Flow CMS	Max Flow CMS	Total Volume 10^6 ltr
OF1	86.65	0.017	0.221	0.318
OF2_2_KizellDrain	84.80	0.040	0.203	0.726
System	85.73	0.057	0.203	1.044

****
Link Flow Summary
****

Link	Type	Maximum |Flow| CMS	Time of Max Occurrence days hr:min	Maximum |Veloc| m/sec	Max/ Full Flow	Max/ Full Depth
C1	CHANNEL	0.203	0 01:35	2.29	0.00	0.09

****
Flow Classification Summary
****

Conduit	Adjusted /Actual Length	Fraction of Time in Flow Class: Up Dry	Down Dry	Sub Crit	Sup Crit	Up Crit	Down Crit	Norm Ltd	Inlet Ctrl
C1	1.00	0.03	0.00	0.00	0.09	0.88	0.00	0.00	0.31	0.00

****
Conduit Surcharge Summary
****

No conduits were surcharged.

Analysis begun on: Fri Mar 18 15:10:58 2022
Analysis ended on: Fri Mar 18 15:10:58 2022
Total elapsed time: < 1 sec

EPA STORM WATER MANAGEMENT MODEL - VERSION 5.1 (Build 5.1.013)

****
Element Count
****
Number of rain gages 16
Number of subcatchments ... 5
Number of nodes 3
Number of links 1
Number of pollutants 0
Number of land uses 0

****
Raingage Summary
****

Name	Data Source	Data Type	Recording Interval
100yr_3hr_Chicago	100yr_3hr_Chicago	INTENSITY	10 min.
100yr_3hr_Chicago_Climate_Change	100yr_3hr_Chicago_Increase_20percent	INTENSITY	10 min.
100yr_6hr_Chicago	100yr_6hr_Chicago	INTENSITY	10 min.
100yr_6hr_Chicago_Climate_Change	100yr_6hr_Chicago_Increase_20percent	INTENSITY	10 min.
10yr_3hr_Chicago	10yr_3hr_Chicago	INTENSITY	10 min.
10yr_6hr_Chicago	10yr_6hr_Chicago	INTENSITY	10 min.
25mm_3hr_Chicago	25mm_3hr_Chicago	INTENSITY	10 min.
25mm_4hr_Chicago	25mm_4hr_Chicago	INTENSITY	10 min.
25yr_3hr_Chicago	25yr_3hr_Chicago	INTENSITY	10 min.
25yr_6hr_Chicago	25yr_6hr_Chicago	INTENSITY	10 min.
2yr_3hr_Chicago	2yr_3hr_Chicago	INTENSITY	10 min.
2yr_6hr_Chicago	2yr_6hr_Chicago	INTENSITY	10 min.
50yr_3hr_Chicago	50yr_3hr_Chicago	INTENSITY	10 min.
50yr_6hr_Chicago	50yr_6hr_Chicago	INTENSITY	10 min.
5yr_3hr_Chicago	5yr_3hr_Chicago	INTENSITY	10 min.
5yr_6hr_Chicago	5yr_6hr_Chicago	INTENSITY	10 min.

****
Subcatchment Summary
****

Name	Area	Width	%Imperv	%Slope	Rain Gage	Outlet
Pond	0.28	27550.00	100.00	3.3690	100yr_3hr_Chicago	OF2_1_WetPond
S-BEX	0.97	167.35	99.91	2.0000	100yr_3hr_Chicago	OF1
S-EXT1	0.28	7.91	24.19	7.3320	100yr_3hr_Chicago	OF2_1_WetPond
S-U1	0.76	162.55	8.85	4.9330	100yr_3hr_Chicago	OF1
S-U2	5.27	198.99	66.00	3.4650	100yr_3hr_Chicago	OF2_1_WetPond

****
Node Summary
****

Name	Type	Invert Elev.	Max. Depth	Ponded Area	External Inflow
OF1	OUTFALL	77.70	0.00	0.0	
OF2_2_KizellDrain	OUTFALL	75.90	1.49	0.0	
OF2_1_WetPond	STORAGE	75.10	3.00	0.0	

****
Link Summary
****

Name	From Node	To Node	Type	Length	%Slope	Roughness
C1	OF2_1_WetPond	OF2_2_KizellDrain	CONDUIT	13.1	1.9788	0.0100

****
Cross Section Summary
****

Conduit	Shape	Full Depth	Full Area	Hyd. Rad.	Max. Width	No. of Barrels	Full Flow
C1	Transect1	1.49	10.54	0.51	22.03	1	95.25

****
Transect Summary
****

Transect Transect1
Area:
0.0004 0.0016 0.0037 0.0066 0.0103
0.0148 0.0201 0.0261 0.0326 0.0398
0.0475 0.0558 0.0646 0.0741 0.0841
0.0947 0.1059 0.1177 0.1302 0.1434
0.1572 0.1717 0.1868 0.2026 0.2189
0.2359 0.2535 0.2716 0.2904 0.3099
0.3302 0.3512 0.3730 0.3957 0.4193
0.4438 0.4693 0.4958 0.5235 0.5525
0.5838 0.6182 0.6557 0.6960 0.7395
0.7867 0.8369 0.8897 0.9440 1.0000
Hrad:
0.0283 0.0566 0.0849 0.1132 0.1415
0.1698 0.2008 0.2341 0.2683 0.3015
0.3339 0.3656 0.3968 0.4277 0.4581
0.4872 0.5142 0.5413 0.5682 0.5951
0.6221 0.6493 0.6764 0.7057 0.7351
0.7644 0.7936 0.8227 0.8487 0.8719
0.8954 0.9185 0.9383 0.9587 0.9797
0.9957 1.0114 1.0281 1.0389 1.0427
1.0049 0.9690 0.9539 0.9451 0.9240
0.9138 0.9228 0.9436 0.9738 1.0000
Width:
0.0131 0.0263 0.0394 0.0525 0.0657
0.0788 0.0905 0.1006 0.1098 0.1189
0.1281 0.1372 0.1463 0.1555 0.1646
0.1742 0.1846 0.1949 0.2054 0.2159
0.2264 0.2369 0.2475 0.2571 0.2667
0.2763 0.2859 0.2955 0.3063 0.3183
0.3302 0.3425 0.3563 0.3701 0.3840
0.4001 0.4168 0.4335 0.4533 0.4772
0.5243 0.5769 0.6225 0.6678 0.7269
0.7828 0.8252 0.8580 0.8811 1.0000

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

****
Analysis Options
****
Flow Units ..... CMS
Process Models:
  Rainfall/Runoff ..... YES
  RDII ..... NO
  Snowmelt ..... NO
  Groundwater ..... NO
  Flow Routing ..... YES
  Ponding Allowed ..... YES
  Water Quality ..... NO
Infiltration Method ..... HORTON
Flow Routing Method ..... DYNWAVE
Surcharge Method ..... EXTRAN
Starting Date 11/10/2013 00:00:00
Ending Date 11/10/2013 06:00:00
Antecedent Dry Days 0.0
Report Time Step 00:05:00
Wet Time Step 00:05:00
Dry Time Step 00:05:00
Routing Time Step ..... 1.00 sec
Variable Time Step ..... YES
Maximum Trials 20
Number of Threads 1
Head Tolerance ..... 0.001500 m

Runoff Quantity Continuity	Volume hectare-m	Depth mm
Total Precipitation	0.542	71.677
Evaporation Loss	0.000	0.000
Infiltration Loss	0.154	20.371
Surface Runoff	0.386	51.038
Final Storage	0.007	0.983
Continuity Error (%)	-0.998	

Flow Routing Continuity	Volume hectare-m	Volume 10^6 ltr
Dry Weather Inflow	0.000	0.000
Wet Weather Inflow	0.386	3.860
Groundwater Inflow	0.000	0.000
RDII Inflow	0.000	0.000
External Inflow	0.000	0.000
External Outflow	0.381	3.808
Flooding Loss	0.000	0.000
Evaporation Loss	0.000	0.000
Exfiltration Loss	0.000	0.000

Initial Stored Volume	0.174	1.738
Final Stored Volume	0.179	1.791
Continuity Error (%)	0.003	

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

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

****
Routing Time Step Summary
****

Minimum Time Step	:	0.50 sec
Average Time Step	:	1.00 sec
Maximum Time Step	:	1.00 sec
Percent in Steady State	:	0.00
Average Iterations per Step	:	2.00
Percent Not Converging	:	0.00

****
Subcatchment Runoff Summary
****

Subcatchment	Total Precip mm	Total Runon mm	Total Evap mm	Total Infil mm	Imperv Runoff mm	Perv Runoff mm	Total Runoff mm	Total Runoff 10^6 ltr	Peak Runoff CMS	Runoff Coeff
Pond	71.68	0.00	0.00	0.00	71.67	0.00	71.67	0.20	0.14	1.000
S-BEX	71.68	0.00	0.00	0.04	70.56	0.03	70.59	0.69	0.48	0.985
S-EXT1	71.68	0.00	0.00	42.78	17.06	28.83	28.83	0.08	0.03	0.402
S-U1	71.68	0.00	0.00	42.11	6.21	23.89	30.10	0.23	0.18	0.420
S-U2	71.68	0.00	0.00	20.86	46.65	50.55	50.55	2.67	1.36	0.705

****
Node Depth Summary
****

Node	Type	Average Depth Meters	Maximum Depth Meters	Maximum HGL Meters	Time of Max Occurrence days hr:min	Reported Max Depth Meters
OF1	OUTFALL	0.00	0.00	77.70	0 00:00	0.00
OF2_2_KizellDrain	OUTFALL	0.07	0.26	76.16	0 01:20	0.26
OF2_1_WetPond	STORAGE	1.14	1.32	76.42	0 01:20	1.32

****
Node Inflow Summary
****

Node	Type	Maximum Lateral Inflow CMS	Maximum Total Inflow CMS	Time of Max Occurrence days hr:min	Lateral Inflow Volume 10^6 ltr	Total Inflow Volume 10^6 ltr	Flow Balance Error Percent
OF1	OUTFALL	0.662	0.662	0 01:10	0.918	0.918	0.000
OF2_2_KizellDrain	OUTFALL	0.000	1.210	0 01:20	0	2.89	0.000
OF2_1_WetPond	STORAGE	1.429	1.429	0 01:15	2.94	4.68	0.004

****
Node Surcharge Summary
****

No nodes were surcharged.

****
Node Flooding Summary
****

No nodes were flooded.

****
Storage Volume Summary
****

Storage Unit	Average Volume 1000 m3	Avg Pcnt Full	Evap Pcnt Loss	Exfil Pcnt Loss	Maximum Volume 1000 m3	Max Pcnt Full	Time of Max Occurrence days hr:min	Maximum Outflow CMS
OF2_1_WetPond	1.891	5	0	0	2.310	6	0 01:20	1.210

****
Outfall Loading Summary
****

Outfall Node	Flow Freq Pcnt	Avg Flow CMS	Max Flow CMS	Total Volume 10^6 ltr
OF1	92.20	0.046	0.662	0.918
OF2_2_KizellDrain	88.59	0.151	1.210	2.890
System	90.40	0.197	1.210	3.808

****
Link Flow Summary
****

Link	Type	Maximum |Flow| CMS	Time of Max Occurrence days hr:min	Maximum |Veloc| m/sec	Max/ Full Flow	Max/ Full Depth
C1	CHANNEL	1.210	0 01:20	3.69	0.01	0.18

****
Flow Classification Summary
****

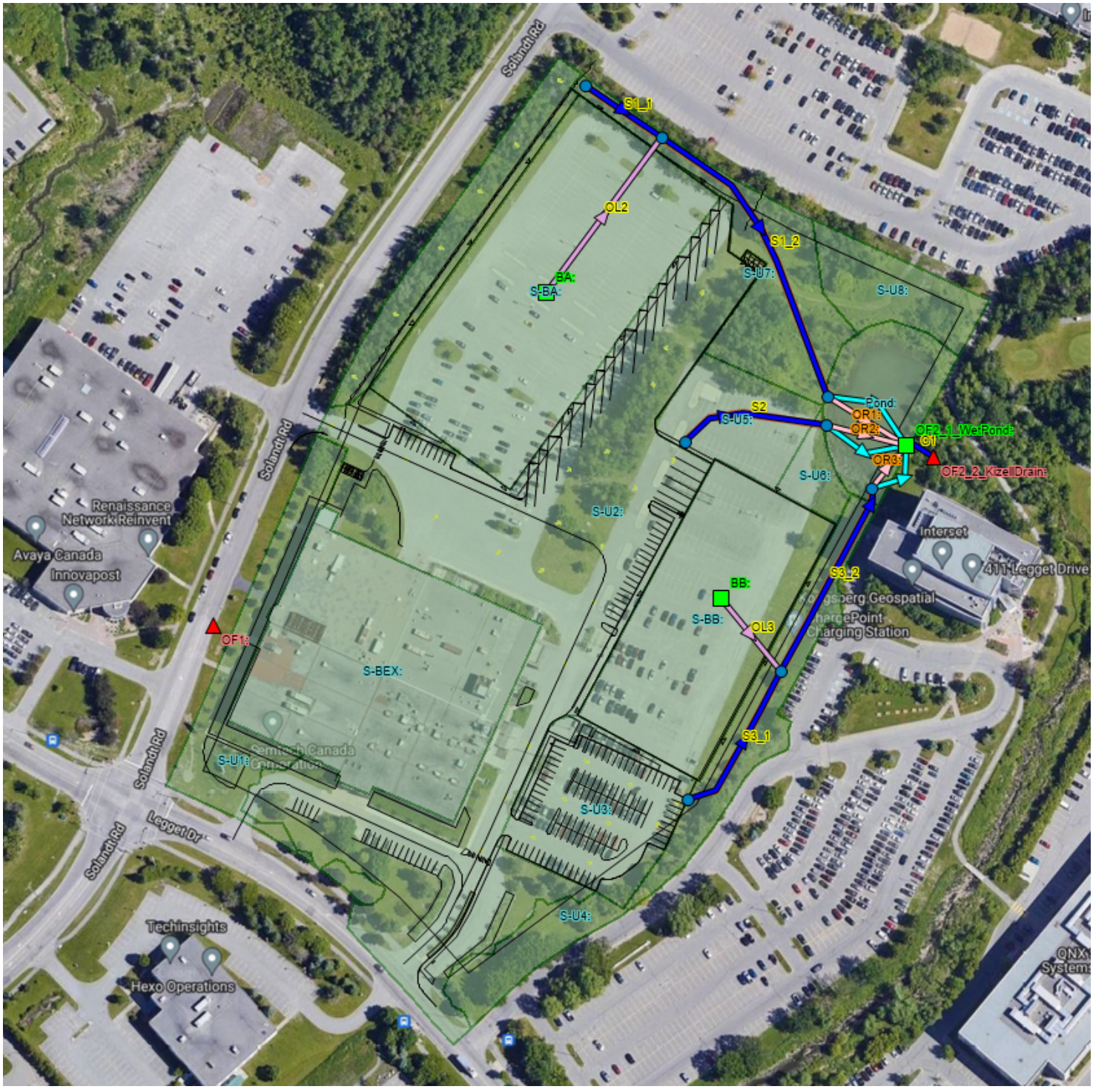
Conduit	Adjusted /Actual Length	Fraction of Time in Flow Class: Dry	Up Dry	Down Dry	Sub Crit	Sup Crit	Up Crit	Down Crit	Norm Ltd	Inlet Ctrl
C1	1.00	0.03	0.00	0.00	0.05	0.92	0.00	0.00	0.46	0.00

****
Conduit Surcharge Summary
****

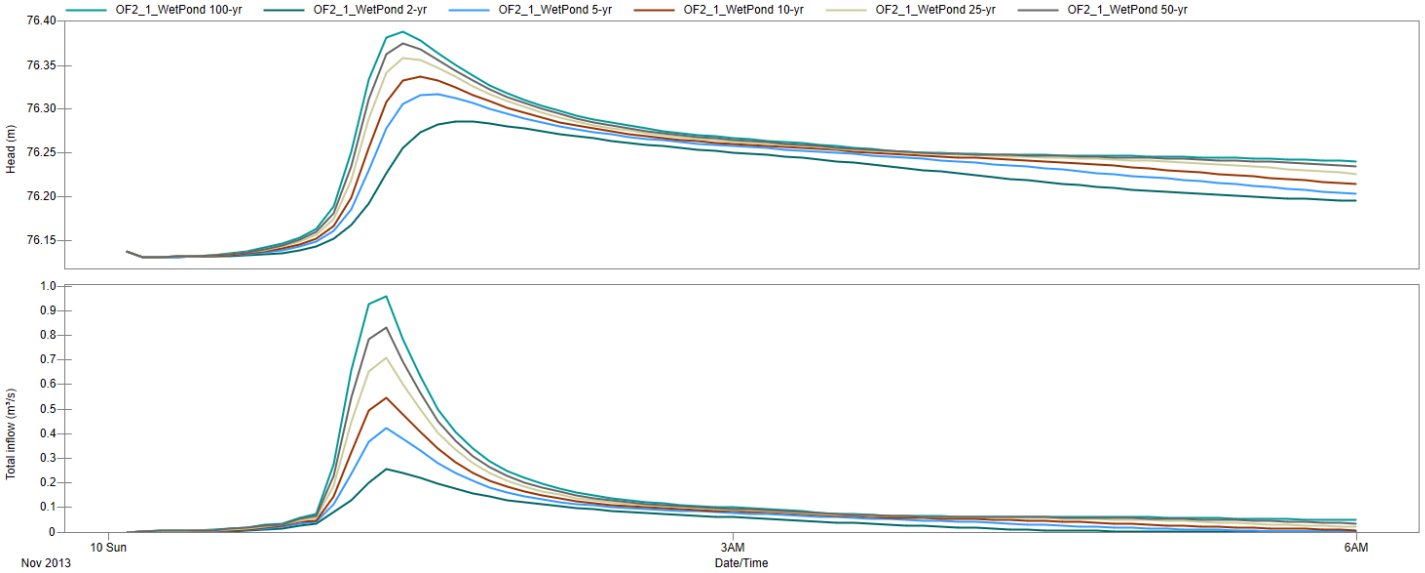
No conduits were surcharged.

Analysis begun on: Fri Mar 18 15:16:32 2022
Analysis ended on: Fri Mar 18 15:16:32 2022
Total elapsed time: < 1 sec

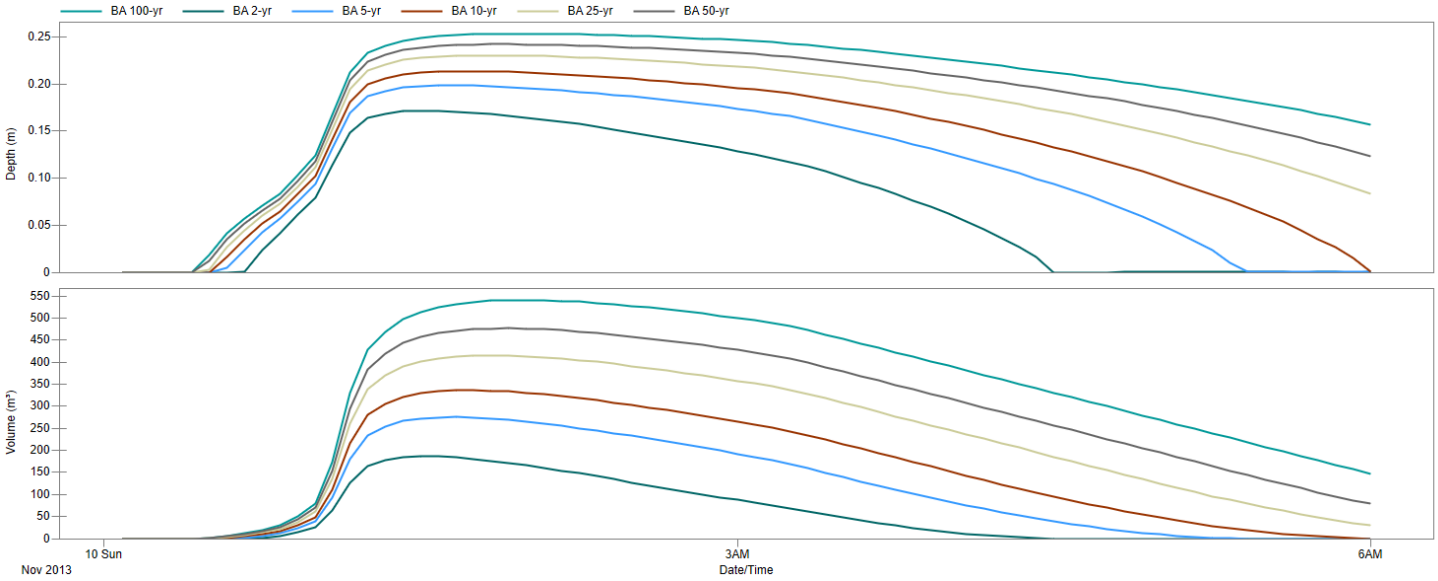
POST DEVELOPMENT CONDITIONS



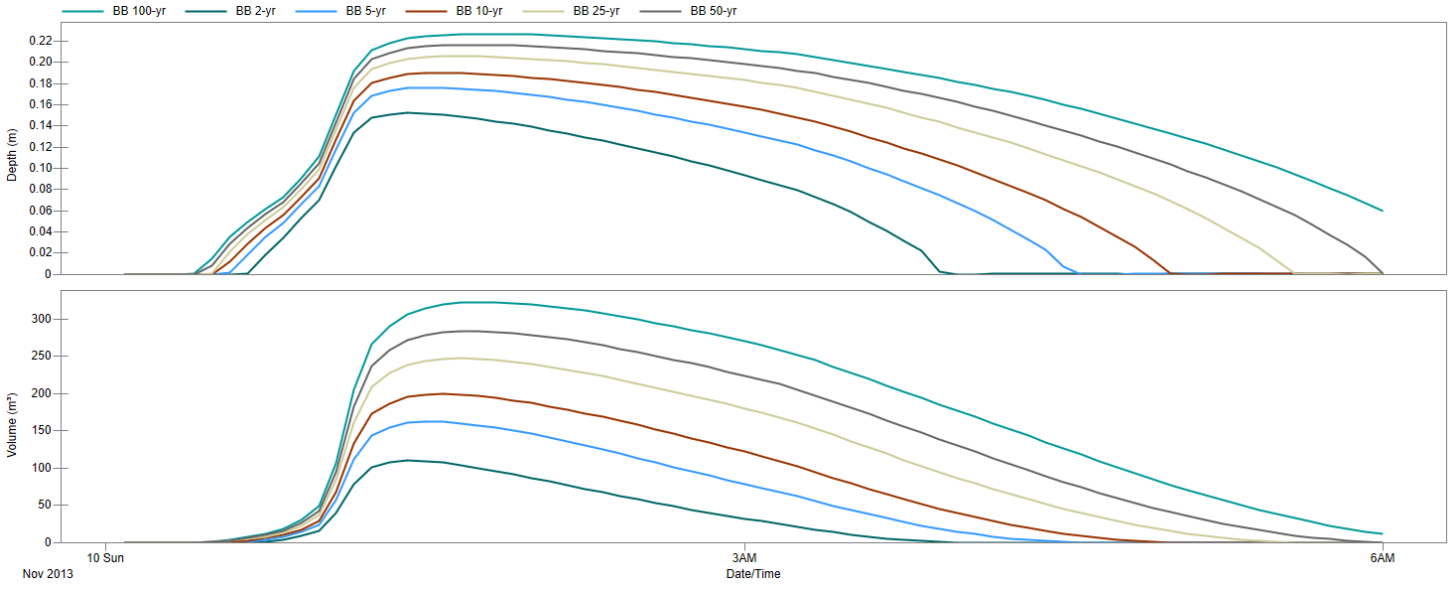
WET POND - PROPOSED CONDITIONS



BUILDING A



BUILDING B



2-year Post Development

```
EPA STORM WATER MANAGEMENT MODEL - VERSION 5.1 (Build 5.1.013)
--------------------------------------------------------------

*************
Element Count
*************
Number of rain gages ...... 16
Number of subcatchments ... 12
Number of nodes ........... 13
Number of links ........... 14
Number of pollutants ...... 0
Number of land uses ....... 0


****************
Raingage Summary
****************
                                                  Data       Recording
Name                 Data Source                  Type       Interval
----------------------------------------------------------------------
100yr_3hr_Chicago    100yr_3hr_Chicago            INTENSITY   10 min.
100yr_3hr_Chicago_Climate_Change 100yr_3hr_Chicago_Increase_20percent INTENSITY   10 min.
100yr_6hr_Chicago    100yr_6hr_Chicago            INTENSITY   10 min.
100yr_6hr_Chicago_Climate_Change 100yr_6hr_Chicago_Increase_20percent INTENSITY   10 min.
10yr_3hr_Chicago     10yr_3hr_Chicago             INTENSITY   10 min.
10yr_6hr_Chicago     10yr_6hr_Chicago             INTENSITY   10 min.
25mm_3hr_Chicago     25mm_3hr_Chicago             INTENSITY   10 min.
25mm_4hr_Chicago     25mm_4hr_Chicago             INTENSITY   10 min.
25yr_3hr_Chicago     25yr_3hr_Chicago             INTENSITY   10 min.
25yr_6hr_Chicago     25yr_6hr_Chicago             INTENSITY   10 min.
2yr_3hr_Chicago      2yr_3hr_Chicago              INTENSITY   10 min.
2yr_6hr_Chicago      2yr_6hr_Chicago              INTENSITY   10 min.
50yr_3hr_Chicago     50yr_3hr_Chicago             INTENSITY   10 min.
50yr_6hr_Chicago     50yr_6hr_Chicago             INTENSITY   10 min.
5yr_3hr_Chicago      5yr_3hr_Chicago              INTENSITY   10 min.
5yr_6hr_Chicago      5yr_6hr_Chicago              INTENSITY   10 min.


********************
Subcatchment Summary
********************
Name                         Area     Width   %Imperv    %Slope Rain Gage            Outlet
-----------------------------------------------------------------------------------------------
Pond                         0.28  27550.00    100.00    3.3690 2yr_3hr_Chicago      OF2_1_WetPond
S-BA                         1.12    660.53    100.00    2.0000 2yr_3hr_Chicago      BA
S-BB                         0.72    422.53     99.94    2.0000 2yr_3hr_Chicago      BB
S-BEX                        0.97    221.34     99.97    2.0000 2yr_3hr_Chicago      OF1
S-U1                         0.59    125.57     15.46    4.9330 2yr_3hr_Chicago      OF1
S-U2                         2.17     85.87     76.91    2.0000 2yr_3hr_Chicago      J2
S-U3                         0.40     51.44     89.02    0.6000 2yr_3hr_Chicago      J6
S-U4                         0.44     33.92      5.38    7.3320 2yr_3hr_Chicago      J6
S-U5                         0.23     91.12      5.05    2.0000 2yr_3hr_Chicago      J2
S-U6                         0.07     27.88      5.04    2.0000 2yr_3hr_Chicago      OF2_1_WetPond
S-U7                         0.37     98.63      5.36    2.0000 2yr_3hr_Chicago      J1
S-U8                         0.20     41.38      5.00    2.0000 2yr_3hr_Chicago      OF2_1_WetPond


************
Node Summary
************
                                    Invert      Max.    Ponded    External
Name                 Type            Elev.     Depth      Area    Inflow
-----------------------------------------------------------------------
J1                   JUNCTION        77.50      1.00       0.0
J2                   JUNCTION        76.20      1.00       0.0
J3                   JUNCTION        75.85      1.31       0.0
J4                   JUNCTION        75.85      1.31       0.0
J5                   JUNCTION        75.85      1.31       0.0
J6                   JUNCTION        76.72      1.00       0.0
J7                   JUNCTION        76.33      1.00       0.0
J8                   JUNCTION        77.13      1.00       0.0
OF1                  OUTFALL         77.70      0.00       0.0
OF2_2_KizellDrain    OUTFALL         75.90      1.49       0.0
BA                   STORAGE         95.50      2.00       0.0
BB                   STORAGE         95.50      2.00       0.0
OF2_1_WetPond        STORAGE         75.10      3.00       0.0


************
Link Summary
************
Name             From Node        To Node          Type            Length    %Slope Roughness
---------------------------------------------------------------------------------------------
C1               OF2_1_WetPond    OF2_2_KizellDrain CONDUIT          13.2    1.9662    0.0100
S1_1             J1               J8               CONDUIT          39.1    0.9572    0.0350
S1_2             J8               J3               CONDUIT         133.4    0.9566    0.0350
S2               J2               J4               CONDUIT          64.2    0.5453    0.0350
S3_1             J6               J7               CONDUIT          69.7    0.5555    0.0350
S3_2             J7               J5               CONDUIT          86.9    0.5561    0.0350
OR1              J3               OF2_1_WetPond    ORIFICE
OR2              J4               OF2_1_WetPond    ORIFICE
OR3              J5               OF2_1_WetPond    ORIFICE
W1               J3               OF2_1_WetPond    WEIR
W2               J4               OF2_1_WetPond    WEIR
W3               J5               OF2_1_WetPond    WEIR
OL2              BA               J8               OUTLET
OL3              BB               J7               OUTLET


********************
Cross Section Summary
********************
                                          Full      Full      Hyd.      Max.   No. of      Full
Conduit          Shape                   Depth      Area      Rad.     Width  Barrels      Flow
-----------------------------------------------------------------------------------------------
C1               Transect1                1.49     10.54      0.51     22.03       1     94.94
S1_1             TRAPEZOIDAL              1.00      3.75      0.53      6.75       1      6.87
S1_2             TRAPEZOIDAL              1.00      3.75      0.53      6.75       1      6.86
S2               TRAPEZOIDAL              1.00      3.75      0.53      6.75       1      5.18
S3_1             TRAPEZOIDAL              1.00      3.75      0.53      6.75       1      5.23
S3_2             TRAPEZOIDAL              1.00      3.75      0.53      6.75       1      5.23


****************
Transect Summary
****************

Transect Transect1
Area:
          0.0004    0.0016    0.0037    0.0066    0.0103
          0.0148    0.0201    0.0261    0.0326    0.0398
          0.0475    0.0558    0.0646    0.0741    0.0841
          0.0947    0.1059    0.1177    0.1302    0.1434
          0.1572    0.1717    0.1868    0.2026    0.2189
          0.2359    0.2535    0.2716    0.2904    0.3099
          0.3302    0.3512    0.3730    0.3957    0.4193
          0.4438    0.4693    0.4958    0.5235    0.5525
          0.5838    0.6182    0.6557    0.6960    0.7395
          0.7867    0.8369    0.8897    0.9440    1.0000
Hrad:
          0.0283    0.0566    0.0849    0.1132    0.1415
          0.1698    0.2008    0.2341    0.2683    0.3015
          0.3339    0.3656    0.3968    0.4277    0.4581
          0.4872    0.5142    0.5413    0.5682    0.5951
          0.6221    0.6493    0.6764    0.7057    0.7351
          0.7644    0.7936    0.8227    0.8487    0.8719
          0.8954    0.9185    0.9383    0.9587    0.9797
          0.9957    1.0114    1.0281    1.0389    1.0427
          1.0049    0.9690    0.9539    0.9451    0.9240
          0.9138    0.9228    0.9436    0.9738    1.0000
Width:
          0.0131    0.0263    0.0394    0.0525    0.0657
          0.0788    0.0905    0.1006    0.1098    0.1189
          0.1281    0.1372    0.1463    0.1555    0.1646
          0.1742    0.1846    0.1949    0.2054    0.2159
          0.2264    0.2369    0.2475    0.2571    0.2667
          0.2763    0.2859    0.2955    0.3063    0.3183
          0.3302    0.3425    0.3563    0.3701    0.3840
          0.4001    0.4168    0.4335    0.4533    0.4772
          0.5243    0.5769    0.6225    0.6678    0.7269
          0.7828    0.8252    0.8580    0.8811    1.0000

Transect Transect2
Area:
          0.0004    0.0016    0.0037    0.0066    0.0103
          0.0148    0.0201    0.0261    0.0326    0.0398
          0.0475    0.0558    0.0646    0.0741    0.0841
          0.0947    0.1059    0.1177    0.1302    0.1434
          0.1572    0.1717    0.1868    0.2026    0.2189
          0.2359    0.2535    0.2716    0.2904    0.3099
          0.3302    0.3512    0.3730    0.3957    0.4193
          0.4438    0.4693    0.4958    0.5235    0.5525
          0.5838    0.6182    0.6557    0.6960    0.7395
          0.7867    0.8369    0.8897    0.9440    1.0000
Hrad:
          0.0311    0.0622    0.0933    0.1244    0.1555
          0.1867    0.2208    0.2574    0.2950    0.3315
          0.3671    0.4020    0.4363    0.4702    0.5037
          0.5357    0.5653    0.5951    0.6247    0.6543
          0.6840    0.7138    0.7437    0.7759    0.8082
          0.8404    0.8725    0.9045    0.9331    0.9586
          0.9845    1.0099    1.0316    1.0540    1.0771
          1.0948    1.1120    1.1304    1.1422    1.1464
          1.1049    1.0653    1.0488    1.0391    1.0159
          1.0047    1.0146    1.0374    1.0706    1.0000
Width:
```

0.0131	0.0263	0.0394	0.0525	0.0657
0.0788	0.0905	0.1006	0.1098	0.1189
0.1281	0.1372	0.1463	0.1555	0.1646
0.1742	0.1846	0.1949	0.2054	0.2159
0.2264	0.2369	0.2475	0.2571	0.2667
0.2763	0.2859	0.2955	0.3063	0.3183
0.3302	0.3425	0.3563	0.3701	0.3840
0.4001	0.4168	0.4335	0.4533	0.4772
0.5243	0.5769	0.6225	0.6678	0.7269
0.7828	0.8252	0.8580	0.8811	1.0000

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

****
Analysis Options
****
Flow Units ..... CMS
Process Models:
  Rainfall/Runoff ..... YES
  RDII ..... NO
  Snowmelt ..... NO
  Groundwater ..... NO
  Flow Routing ..... YES
  Ponding Allowed ..... YES
  Water Quality ..... NO
Infiltration Method ..... HORTON
Flow Routing Method ..... DYNWAVE
Surcharge Method ..... EXTRAN
Starting Date 11/10/2013 00:00:00
Ending Date 11/10/2013 06:00:00
Antecedent Dry Days 0.0
Report Time Step 00:05:00
Wet Time Step 00:05:00
Dry Time Step 00:05:00
Routing Time Step ..... 1.00 sec
Variable Time Step ..... YES
Maximum Trials 20
Number of Threads 2
Head Tolerance ..... 0.001500 m

Runoff Quantity Continuity	Volume hectare-m	Depth mm
Total Precipitation	0.241	31.860
Evaporation Loss	0.000	0.000
Infiltration Loss	0.089	11.774
Surface Runoff	0.145	19.225
Final Storage	0.008	1.064
Continuity Error (%)	-0.636	

Flow Routing Continuity	Volume hectare-m	Volume 10^6 ltr
Dry Weather Inflow	0.000	0.000
Wet Weather Inflow	0.145	1.454
Groundwater Inflow	0.000	0.000
RDII Inflow	0.000	0.000
External Inflow	0.000	0.000
External Outflow	0.132	1.316
Flooding Loss	0.000	0.000
Evaporation Loss	0.000	0.000
Exfiltration Loss	0.000	0.000
Initial Stored Volume	0.174	1.738
Final Stored Volume	0.189	1.895
Continuity Error (%)	-0.570	

****
Highest Continuity Errors
****
Node J3 (9.63%)
Node J5 (7.04%)
Node J4 (4.47%)

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

****
Highest Flow Instability Indexes
****
Link OL3 (16)
Link OL2 (9)
Link OR1 (8)
Link OR2 (8)
Link OR3 (8)

****
Routing Time Step Summary
****
Minimum Time Step : 0.50 sec
Average Time Step : 1.00 sec
Maximum Time Step : 1.00 sec
Percent in Steady State : 0.00
Average Iterations per Step : 2.00
Percent Not Converging : 0.00

****
Subcatchment Runoff Summary
****

Subcatchment	Total Precip mm	Total Runon mm	Total Evap mm	Total Infil mm	Imperv Runoff mm	Perv Runoff mm	Total Runoff mm	Total Runoff 10^6 ltr	Peak Runoff CMS	Runoff Coeff
Pond	31.86	0.00	0.00	0.00	31.86	0.00	31.86	0.09	0.06	1.000
S-BA	31.86	0.00	0.00	0.00	30.46	0.00	30.46	0.34	0.24	0.956
S-BB	31.86	0.00	0.00	0.02	30.44	0.00	30.44	0.22	0.15	0.955
S-BEX	31.86	0.00	0.00	0.01	30.54	0.00	30.54	0.30	0.21	0.959
S-U1	31.86	0.00	0.00	26.92	4.70	0.04	4.74	0.03	0.02	0.149
S-U2	31.86	0.00	0.00	13.32	23.40	17.57	17.57	0.38	0.16	0.551
S-U3	31.86	0.00	0.00	6.62	27.15	24.31	24.31	0.10	0.07	0.763
S-U4	31.86	0.00	0.00	31.71	1.64	0.09	0.09	0.00	0.00	0.003
S-U5	31.86	0.00	0.00	31.63	1.54	0.20	0.20	0.00	0.00	0.006
S-U6	31.86	0.00	0.00	31.63	1.53	0.20	0.20	0.00	0.00	0.006
S-U7	31.86	0.00	0.00	31.66	1.63	0.15	0.15	0.00	0.00	0.005
S-U8	31.86	0.00	0.00	31.70	1.52	0.11	0.11	0.00	0.00	0.004

****
Node Depth Summary
****

Node	Type	Average Depth Meters	Maximum Depth Meters	Maximum HGL Meters	Time of Max Occurrence days hr:min	Reported Max Depth Meters
J1	JUNCTION	0.00	0.01	77.51	0 01:13	0.01
J2	JUNCTION	0.04	0.20	76.40	0 01:20	0.20
J3	JUNCTION	0.37	0.44	76.29	0 01:42	0.44
J4	JUNCTION	0.37	0.49	76.34	0 01:26	0.48
J5	JUNCTION	0.37	0.44	76.29	0 01:39	0.44
J6	JUNCTION	0.02	0.13	76.85	0 01:15	0.13
J7	JUNCTION	0.04	0.15	76.49	0 01:17	0.15
J8	JUNCTION	0.04	0.08	77.21	0 01:22	0.08
OF1	OUTFALL	0.00	0.00	77.70	0 00:00	0.00
OF2_2_KizellDrain	OUTFALL	0.06	0.13	76.03	0 01:42	0.13
BA	STORAGE	0.07	0.17	95.67	0 01:32	0.17
BB	STORAGE	0.05	0.15	95.65	0 01:24	0.15
OF2_1_WetPond	STORAGE	1.12	1.19	76.29	0 01:41	1.19

****
Node Inflow Summary
****

Node	Type	Maximum Lateral Inflow CMS	Maximum Total Inflow CMS	Time of Max Occurrence days hr:min	Lateral Inflow Volume 10^6 ltr	Total Inflow Volume 10^6 ltr	Flow Balance Error Percent
J1	JUNCTION	0.001	0.001	0 01:10	0.000568	0.000568	-0.308
J2	JUNCTION	0.158	0.158	0 01:20	0.382	0.382	-0.202
J3	JUNCTION	0.000	0.061	0 00:00	0	0.371	10.651
J4	JUNCTION	0.000	0.157	0 01:20	0	0.397	4.677
J5	JUNCTION	0.000	0.088	0 01:17	0	0.337	7.573
J6	JUNCTION	0.069	0.069	0 01:15	0.0979	0.0979	-0.185
J7	JUNCTION	0.000	0.094	0 01:15	0	0.321	0.223
J8	JUNCTION	0.000	0.035	0 01:13	0	0.346	0.217
OF1	OUTFALL	0.227	0.227	0 01:10	0.325	0.325	0.000
OF2_2_KizellDrain	OUTFALL	0.000	0.169	0 01:42	0	0.991	0.000
BA	STORAGE	0.240	0.240	0 01:10	0.342	0.342	-1.023
BB	STORAGE	0.153	0.153	0 01:10	0.219	0.219	-1.812
OF2_1_WetPond	STORAGE	0.059	0.257	0 01:20	0.0881	2.86	0.001

100-year Post Development

```
**********************
Node Surcharge Summary
**********************

No nodes were surcharged.


*********************
Node Flooding Summary
*********************

No nodes were flooded.


**********************
Storage Volume Summary
**********************

-------------------------------------------------------------------------------------------
                         Average     Avg  Evap Exfil        Maximum     Max    Time of Max    Maximum
                          Volume    Pcnt  Pcnt  Pcnt         Volume    Pcnt     Occurrence    Outflow
Storage Unit            1000 m3    Full  Loss  Loss       1000 m3    Full     days hr:min        CMS
-------------------------------------------------------------------------------------------
BA                        0.057       0     0     0          0.186       0       0  01:32      0.034
BB                        0.027       0     0     0          0.110       0       0  01:24      0.028
OF2_1_WetPond             1.849       5     0     0          1.991       5       0  01:41      0.182


************************
Outfall Loading Summary
************************

-----------------------------------------------------
                         Flow      Avg      Max      Total
                         Freq     Flow     Flow     Volume
Outfall Node             Pcnt      CMS      CMS   10^6 ltr
-----------------------------------------------------
OF1                     79.90    0.019    0.227      0.325
OF2_2_KizellDrain       80.69    0.057    0.169      0.991
-----------------------------------------------------
System                  80.30    0.076    0.169       1.31


*********************
Link Flow Summary
*********************
-------------------------------------------------------------------------
                            Maximum  Time of Max   Maximum    Max/    Max/
                            |Flow|   Occurrence   |Veloc|    Full    Full
Link                Type       CMS  days hr:min     m/sec    Flow   Depth
-------------------------------------------------------------------------
C1                  CHANNEL  0.169     0  01:42      2.18    0.00    0.08
S1_1                CONDUIT  0.001     0  01:13      0.02    0.00    0.04
S1_2                CONDUIT  0.034     0  01:22      0.11    0.01    0.26
S2                  CONDUIT  0.157     0  01:20      0.26    0.03    0.34
S3_1                CONDUIT  0.067     0  01:15      0.41    0.01    0.14
S3_2                CONDUIT  0.088     0  01:17      0.20    0.02    0.28
OR1                 ORIFICE  0.061     0  00:00                      1.00
OR2                 ORIFICE  0.061     0  00:00                      1.00
OR3                 ORIFICE  0.061     0  00:00                      1.00
W1                  WEIR     0.026     0  01:53                      0.13
W2                  WEIR     0.108     0  01:23                      0.18
W3                  WEIR     0.049     0  01:20                      0.13
OL2                 DUMMY    0.034     0  01:10
OL3                 DUMMY    0.028     0  01:24


***************************
Flow Classification Summary
***************************

-------------------------------------------------------------------------------
                  Adjusted    ---------- Fraction of Time in Flow Class ----------
                   /Actual          Up    Down  Sub   Sup   Up    Down  Norm  Inlet
Conduit             Length    Dry  Dry   Dry   Crit  Crit  Crit  Crit  Ltd   Ctrl
-------------------------------------------------------------------------------
C1                    1.00   0.19 0.00  0.00  0.00  0.81  0.00  0.00  0.44  0.00
S1_1                  1.00   0.10 0.31  0.00  0.60  0.00  0.00  0.00  0.82  0.00
S1_2                  1.00   0.00 0.10  0.00  0.90  0.00  0.00  0.00  0.90  0.00
S2                    1.00   0.00 0.17  0.00  0.83  0.00  0.00  0.00  0.37  0.00
S3_1                  1.00   0.10 0.06  0.00  0.84  0.00  0.00  0.00  0.84  0.00
S3_2                  1.00   0.00 0.10  0.00  0.90  0.00  0.00  0.00  0.90  0.00

*************************
Conduit Surcharge Summary
*************************

No conduits were surcharged
Analysis begun on:  Thu Mar 24 11:05:40 2022
Analysis ended on:  Thu Mar 24 11:05:41 2022
Total elapsed time: 00:00:01
```

```
EPA STORM WATER MANAGEMENT MODEL - VERSION 5.1 (Build 5.1.013)
--------------------------------------------------------------

*************
Element Count
*************
Number of rain gages ...... 16
Number of subcatchments ... 12
Number of nodes ........... 13
Number of links ........... 14
Number of pollutants ...... 0
Number of land uses ....... 0

****************
Raingage Summary
****************
                                                          Data       Recording
Name                Data Source                           Type       Interval
-----------------------------------------------------------------------------
100yr_3hr_Chicago   100yr_3hr_Chicago                     INTENSITY   10 min.
100yr_3hr_Chicago_Climate_Change 100yr_3hr_Chicago_Increase_20percent INTENSITY   10 min.
100yr_6hr_Chicago   100yr_6hr_Chicago                     INTENSITY   10 min.
100yr_6hr_Chicago_Climate_Change 100yr_6hr_Chicago_Increase_20percent INTENSITY   10 min.
10yr_3hr_Chicago    10yr_3hr_Chicago                      INTENSITY   10 min.
10yr_6hr_Chicago    10yr_6hr_Chicago                      INTENSITY   10 min.
25mm_3hr_Chicago    25mm_3hr_Chicago                      INTENSITY   10 min.
25mm_4hr_Chicago    25mm_4hr_Chicago                      INTENSITY   10 min.
25yr_3hr_Chicago    25yr_3hr_Chicago                      INTENSITY   10 min.
25yr_6hr_Chicago    25yr_6hr_Chicago                      INTENSITY   10 min.
2yr_3hr_Chicago     2yr_3hr_Chicago                       INTENSITY   10 min.
2yr_6hr_Chicago     2yr_6hr_Chicago                       INTENSITY   10 min.
50yr_3hr_Chicago    50yr_3hr_Chicago                      INTENSITY   10 min.
50yr_6hr_Chicago    50yr_6hr_Chicago                      INTENSITY   10 min.
5yr_3hr_Chicago     5yr_3hr_Chicago                       INTENSITY   10 min.
5yr_6hr_Chicago     5yr_6hr_Chicago                       INTENSITY   10 min.

*********************
Subcatchment Summary
*********************
Name                        Area     Width   %Imperv    %Slope Rain Gage            Outlet
-----------------------------------------------------------------------------------------------
Pond                        0.28  27550.00    100.00    3.3690 100yr_3hr_Chicago    OF2_1_WetPond
S-BA                        1.12    660.53    100.00    2.0000 100yr_3hr_Chicago    BA
S-BB                        0.72    422.53     99.94    2.0000 100yr_3hr_Chicago    BB
S-BEX                       0.97    221.34     99.97    2.0000 100yr_3hr_Chicago    OF1
S-U1                        0.59    125.57     15.46    4.9330 100yr_3hr_Chicago    OF1
S-U2                        2.17     85.87     76.91    2.0000 100yr_3hr_Chicago    J2
S-U3                        0.40     51.44     89.02    0.6000 100yr_3hr_Chicago    J6
S-U4                        0.44     33.92      5.38    7.3320 100yr_3hr_Chicago    J6
S-U5                        0.23     91.12      5.05    2.0000 100yr_3hr_Chicago    J2
S-U6                        0.07     27.88      5.04    2.0000 100yr_3hr_Chicago    OF2_1_WetPond
S-U7                        0.37     98.63      5.36    2.0000 100yr_3hr_Chicago    J1
S-U8                        0.20     41.38      5.00    2.0000 100yr_3hr_Chicago    OF2_1_WetPond

************
Node Summary
************
                                          Invert      Max.    Ponded    External
Name                Type                   Elev.     Depth      Area    Inflow
-----------------------------------------------------------------------------
J1                  JUNCTION               77.50      1.00       0.0
J2                  JUNCTION               76.20      1.00       0.0
J3                  JUNCTION               75.85      1.31       0.0
J4                  JUNCTION               75.85      1.31       0.0
J5                  JUNCTION               75.85      1.31       0.0
J6                  JUNCTION               76.72      1.00       0.0
J7                  JUNCTION               76.33      1.00       0.0
J8                  JUNCTION               77.13      1.00       0.0
OF1                 OUTFALL                77.70      0.00       0.0
OF2_2_KizellDrain   OUTFALL                75.90      1.49       0.0
BA                  STORAGE                95.50      2.00       0.0
BB                  STORAGE                95.50      2.00       0.0
OF2_1_WetPond       STORAGE                75.10      3.00       0.0

************
Link Summary
************
Name            From Node       To Node         Type            Length    %Slope Roughness
-----------------------------------------------------------------------------------------
C1              OF2_1_WetPond   OF2_2_KizellDrain CONDUIT          13.2    1.9662    0.0100
S1_1            J1              J8              CONDUIT          39.1    0.9572    0.0350
S1_2            J8              J3              CONDUIT         133.4    0.9566    0.0350
S2              J2              J4              CONDUIT          64.2    0.5453    0.0350
S3_1            J6              J7              CONDUIT          69.7    0.5555    0.0350
S3_2            J7              J5              CONDUIT          86.9    0.5561    0.0350
OR1             J3              OF2_1_WetPond   ORIFICE
OR2             J4              OF2_1_WetPond   ORIFICE
OR3             J5              OF2_1_WetPond   ORIFICE
```

W1	J3	OF2_1_WetPond	WEIR
W2	J4	OF2_1_WetPond	WEIR
W3	J5	OF2_1_WetPond	WEIR
OL2	BA	J8	OUTLET
OL3	BB	J7	OUTLET

****
Cross Section Summary
****

Conduit	Shape	Full Depth	Full Area	Hyd. Rad.	Max. Width	No. of Barrels	Full Flow
C1	Transect1	1.49	10.54	0.51	22.03	1	94.94
S1_1	TRAPEZOIDAL	1.00	3.75	0.53	6.75	1	6.87
S1_2	TRAPEZOIDAL	1.00	3.75	0.53	6.75	1	6.86
S2	TRAPEZOIDAL	1.00	3.75	0.53	6.75	1	5.18
S3_1	TRAPEZOIDAL	1.00	3.75	0.53	6.75	1	5.23
S3_2	TRAPEZOIDAL	1.00	3.75	0.53	6.75	1	5.23

****
Transect Summary
****

Transect Transect1
Area:

0.0004	0.0016	0.0037	0.0066	0.0103
0.0148	0.0201	0.0261	0.0326	0.0398
0.0475	0.0558	0.0646	0.0741	0.0841
0.0947	0.1059	0.1177	0.1302	0.1434
0.1572	0.1717	0.1868	0.2026	0.2189
0.2359	0.2535	0.2716	0.2904	0.3099
0.3302	0.3512	0.3730	0.3957	0.4193
0.4438	0.4693	0.4958	0.5235	0.5525
0.5838	0.6182	0.6557	0.6960	0.7395
0.7867	0.8369	0.8897	0.9440	1.0000

Hrad:

0.0283	0.0566	0.0849	0.1132	0.1415
0.1698	0.2008	0.2341	0.2683	0.3015
0.3339	0.3656	0.3968	0.4277	0.4581
0.4872	0.5142	0.5413	0.5682	0.5951
0.6221	0.6493	0.6764	0.7057	0.7351
0.7644	0.7936	0.8227	0.8487	0.8719
0.8954	0.9185	0.9383	0.9587	0.9797
0.9957	1.0114	1.0281	1.0389	1.0427
1.0049	0.9690	0.9539	0.9451	0.9240
0.9138	0.9228	0.9436	0.9738	1.0000

Width:

0.0131	0.0263	0.0394	0.0525	0.0657
0.0788	0.0905	0.1006	0.1098	0.1189
0.1281	0.1372	0.1463	0.1555	0.1646
0.1742	0.1846	0.1949	0.2054	0.2159
0.2264	0.2369	0.2475	0.2571	0.2667
0.2763	0.2859	0.2955	0.3063	0.3183
0.3302	0.3425	0.3563	0.3701	0.3840
0.4001	0.4168	0.4335	0.4533	0.4772
0.5243	0.5769	0.6225	0.6678	0.7269
0.7828	0.8252	0.8580	0.8811	1.0000

Transect Transect2
Area:

0.0004	0.0016	0.0037	0.0066	0.0103
0.0148	0.0201	0.0261	0.0326	0.0398
0.0475	0.0558	0.0646	0.0741	0.0841
0.0947	0.1059	0.1177	0.1302	0.1434
0.1572	0.1717	0.1868	0.2026	0.2189
0.2359	0.2535	0.2716	0.2904	0.3099
0.3302	0.3512	0.3730	0.3957	0.4193
0.4438	0.4693	0.4958	0.5235	0.5525
0.5838	0.6182	0.6557	0.6960	0.7395
0.7867	0.8369	0.8897	0.9440	1.0000

Hrad:

0.0311	0.0622	0.0933	0.1244	0.1555
0.1867	0.2208	0.2574	0.2950	0.3315
0.3671	0.4020	0.4363	0.4702	0.5037
0.5357	0.5653	0.5951	0.6247	0.6543
0.6840	0.7138	0.7437	0.7759	0.8082
0.8404	0.8725	0.9045	0.9331	0.9586
0.9845	1.0099	1.0316	1.0540	1.0771
1.0948	1.1120	1.1304	1.1422	1.1464
1.1049	1.0653	1.0488	1.0391	1.0159
1.0047	1.0146	1.0374	1.0706	1.0000

Width:

0.0131	0.0263	0.0394	0.0525	0.0657
0.0788	0.0905	0.1006	0.1098	0.1189
0.1281	0.1372	0.1463	0.1555	0.1646
0.1742	0.1846	0.1949	0.2054	0.2159
0.2264	0.2369	0.2475	0.2571	0.2667
0.2763	0.2859	0.2955	0.3063	0.3183
0.3302	0.3425	0.3563	0.3701	0.3840
0.4001	0.4168	0.4335	0.4533	0.4772
0.5243	0.5769	0.6225	0.6678	0.7269
0.7828	0.8252	0.8580	0.8811	1.0000

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

****
Analysis Options
****
Flow Units ..... CMS
Process Models:
  Rainfall/Runoff ..... YES
  RDII ..... NO
  Snowmelt ..... NO
  Groundwater ..... NO
  Flow Routing ..... YES
  Ponding Allowed ..... YES
  Water Quality ..... NO
Infiltration Method ..... HORTON
Flow Routing Method ..... DYNWAVE
Surcharge Method ..... EXTRAN
Starting Date 11/10/2013 00:00:00
Ending Date 11/10/2013 06:00:00
Antecedent Dry Days 0.0
Report Time Step 00:05:00
Wet Time Step 00:05:00
Dry Time Step 00:05:00
Routing Time Step ..... 1.00 sec
Variable Time Step ..... YES
Maximum Trials 20
Number of Threads 2
Head Tolerance ..... 0.001500 m

Runoff Quantity Continuity	Volume hectare-m	Depth mm
Total Precipitation	0.542	71.677
Evaporation Loss	0.000	0.000
Infiltration Loss	0.118	15.635
Surface Runoff	0.420	55.539
Final Storage	0.008	1.066
Continuity Error (%)	-0.785	

Flow Routing Continuity	Volume hectare-m	Volume 10^6 ltr
Dry Weather Inflow	0.000	0.000
Wet Weather Inflow	0.420	4.201
Groundwater Inflow	0.000	0.000
RDII Inflow	0.000	0.000
External Inflow	0.000	0.000
External Outflow	0.378	3.780
Flooding Loss	0.000	0.000
Evaporation Loss	0.000	0.000
Exfiltration Loss	0.000	0.000
Initial Stored Volume	0.174	1.738
Final Stored Volume	0.217	2.173
Continuity Error (%)	-0.214	

****
Highest Continuity Errors
****
Node J3 (5.93%)
Node J5 (3.36%)
Node J4 (1.78%)
Node J8 (1.08%)

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

****
Highest Flow Instability Indexes
****
Link W2 (17)
Link OR2 (6)
Link OR3 (3)
Link OL3 (2)
Link OL2 (2)

****
Routing Time Step Summary
****
Minimum Time Step : 0.50 sec
Average Time Step : 1.00 sec
Maximum Time Step : 1.00 sec
Percent in Steady State : 0.00
Average Iterations per Step : 2.00
Percent Not Converging : 0.00

****
Subcatchment Runoff Summary
****

Subcatchment	Total Precip mm	Total Runon mm	Total Evap mm	Total Infil mm	Imperv Runoff mm	Perv Runoff mm	Total Runoff mm	Total Runoff 10^6 ltr	Peak Runoff CMS	Runoff Coeff
Pond	71.68	0.00	0.00	0.00	71.67	0.00	71.67	0.20	0.14	1.000
S-BA	71.68	0.00	0.00	0.00	70.28	0.00	70.28	0.79	0.56	0.980
S-BB	71.68	0.00	0.00	0.03	70.24	0.02	70.26	0.50	0.36	0.980
S-BEX	71.68	0.00	0.00	0.01	70.52	0.01	70.53	0.69	0.48	0.984
S-U1	71.68	0.00	0.00	38.92	10.85	22.33	33.18	0.20	0.16	0.463
S-U2	71.68	0.00	0.00	15.00	54.31	56.29	56.29	1.22	0.67	0.785
S-U3	71.68	0.00	0.00	7.20	62.93	64.06	64.06	0.26	0.18	0.894
S-U4	71.68	0.00	0.00	46.83	3.78	25.13	25.13	0.11	0.05	0.351
S-U5	71.68	0.00	0.00	44.23	3.55	28.21	28.21	0.06	0.05	0.394
S-U6	71.68	0.00	0.00	44.23	3.54	28.20	28.20	0.02	0.02	0.393
S-U7	71.68	0.00	0.00	45.03	3.77	27.16	27.16	0.10	0.07	0.379
S-U8	71.68	0.00	0.00	45.81	3.51	26.27	26.27	0.05	0.03	0.367

****
Node Depth Summary
****

Node	Type	Average Depth Meters	Maximum Depth Meters	Maximum HGL Meters	Time of Max Occurrence days hr:min	Reported Max Depth Meters
J1	JUNCTION	0.01	0.11	77.61	0 01:10	0.11
J2	JUNCTION	0.09	0.50	76.70	0 01:17	0.48
J3	JUNCTION	0.40	0.55	76.40	0 01:23	0.55
J4	JUNCTION	0.42	0.81	76.66	0 01:17	0.80
J5	JUNCTION	0.41	0.60	76.45	0 01:19	0.60
J6	JUNCTION	0.04	0.25	76.97	0 01:11	0.25
J7	JUNCTION	0.09	0.26	76.59	0 01:15	0.26
J8	JUNCTION	0.07	0.14	77.26	0 01:14	0.14
OF1	OUTFALL	0.00	0.00	77.70	0 00:00	0.00
OF2_2_KizellDrain	OUTFALL	0.09	0.23	76.13	0 01:23	0.23
BA	STORAGE	0.19	0.25	95.75	0 02:00	0.25
BB	STORAGE	0.15	0.23	95.73	0 01:44	0.23
OF2_1_WetPond	STORAGE	1.15	1.29	76.39	0 01:23	1.29

****
Node Inflow Summary
****

Node	Type	Maximum Lateral Inflow CMS	Maximum Total Inflow CMS	Time of Max Occurrence days hr:min	Lateral Inflow Volume 10^6 ltr	Total Inflow Volume 10^6 ltr	Flow Balance Error Percent
J1	JUNCTION	0.068	0.068	0 01:10	0.102	0.102	-0.056
J2	JUNCTION	0.711	0.711	0 01:15	1.29	1.29	0.000
J3	JUNCTION	0.000	0.094	0 01:14	0	0.763	6.299
J4	JUNCTION	0.000	0.674	0 01:15	0	1.3	1.809
J5	JUNCTION	0.000	0.250	0 01:15	0	0.876	3.481
J6	JUNCTION	0.229	0.229	0 01:15	0.368	0.368	-0.133
J7	JUNCTION	0.000	0.255	0 01:15	0	0.862	0.415
J8	JUNCTION	0.000	0.100	0 01:10	0	0.745	1.094
OF1	OUTFALL	0.637	0.637	0 01:10	0.881	0.881	0.000
OF2_2_KizellDrain	OUTFALL	0.000	0.845	0 01:23	0	2.9	0.000
BA	STORAGE	0.557	0.557	0 01:10	0.789	0.789	-0.049
BB	STORAGE	0.356	0.356	0 01:10	0.505	0.505	-0.064
OF2_1_WetPond	STORAGE	0.183	0.994	0 01:17	0.269	4.85	-0.012

****
Node Surcharge Summary
****

No nodes were surcharged.

****
Node Flooding Summary
****

No nodes were flooded.

****
Storage Volume Summary
****

Storage Unit	Average Volume 1000 m3	Avg Pcnt Full	Evap Pcnt Loss	Exfil Pcnt Loss	Maximum Volume 1000 m3	Max Pcnt Full	Time of Max Occurrence days hr:min	Maximum Outflow CMS
BA	0.329	0	0	0	0.541	1	0 02:00	0.034
BB	0.162	0	0	0	0.323	0	0 01:44	0.028
OF2_1_WetPond	1.918	5	0	0	2.229	6	0 01:23	0.845

****
Outfall Loading Summary
****

Outfall Node	Flow Freq Pcnt	Avg Flow CMS	Max Flow CMS	Total Volume 10^6 ltr
OF1	85.24	0.048	0.637	0.881
OF2_2_KizellDrain	83.13	0.161	0.845	2.898
System	84.18	0.209	0.845	3.780

****
Link Flow Summary
****

Link	Type	Maximum |Flow| CMS	Time of Max Occurrence days hr:min	Maximum |Veloc| m/sec	Max/ Full Flow	Max/ Full Depth
C1	CHANNEL	0.845	0 01:23	3.32	0.01	0.15
S1_1	CONDUIT	0.066	0 01:10	0.50	0.01	0.12
S1_2	CONDUIT	0.094	0 01:14	0.20	0.01	0.34
S2	CONDUIT	0.674	0 01:15	0.43	0.13	0.65
S3_1	CONDUIT	0.227	0 01:15	0.63	0.04	0.25
S3_2	CONDUIT	0.250	0 01:15	0.31	0.05	0.42
OR1	ORIFICE	0.061	0 00:00			1.00
OR2	ORIFICE	0.077	0 01:16			1.00
OR3	ORIFICE	0.061	0 00:00			1.00
W1	WEIR	0.068	0 01:25			0.24
W2	WEIR	0.561	0 01:17			0.50
W3	WEIR	0.185	0 01:17			0.29
OL2	DUMMY	0.034	0 01:03			
OL3	DUMMY	0.028	0 01:05			

****
Flow Classification Summary
****

Conduit	Adjusted /Actual Length	Fraction of Time in Flow Class: Dry	Up Dry	Down Dry	Sub Crit	Sup Crit	Up Crit	Down Crit	Norm Ltd	Inlet Ctrl
C1	1.00	0.16	0.00	0.00	0.00	0.83	0.00	0.00	0.69	0.00
S1_1	1.00	0.06	0.13	0.00	0.81	0.00	0.00	0.00	0.83	0.00
S1_2	1.00	0.00	0.06	0.00	0.94	0.00	0.00	0.00	0.94	0.00
S2	1.00	0.00	0.15	0.00	0.85	0.00	0.00	0.00	0.25	0.00
S3_1	1.00	0.06	0.07	0.00	0.87	0.00	0.00	0.00	0.85	0.00
S3_2	1.00	0.00	0.06	0.00	0.94	0.00	0.00	0.00	0.94	0.00

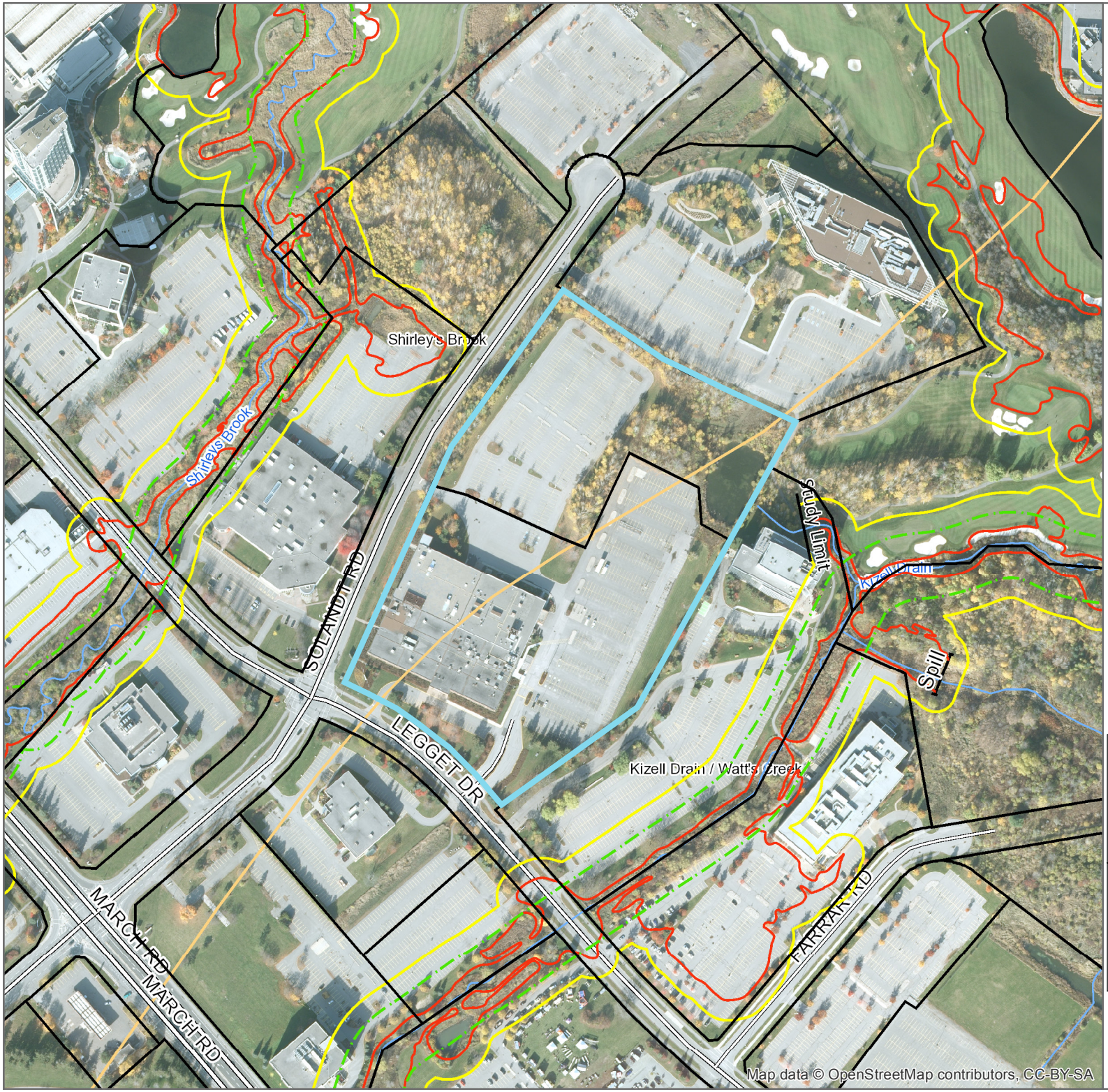
****
Conduit Surcharge Summary
****

No conduits were surcharged.

Analysis begun on: Thu Mar 24 10:13:22 2022
Analysis ended on: Thu Mar 24 10:13:23 2022
Total elapsed time: 00:00:01

APPENDIX

D MVCA FLOODPLAIN MAP



Mississippi Valley Conservation Authority

Ontario Regulation 153/06

415 Legget Drive

Legend

- Parcels - Assessment
- Meander Belt
- 1:100 yr Flood Plain
- Floodplain Spill Lines
- Floodplain Study Limit
- MVCA Regulation Limit
- MVCA Streams
- Ottawa_Subcatchments

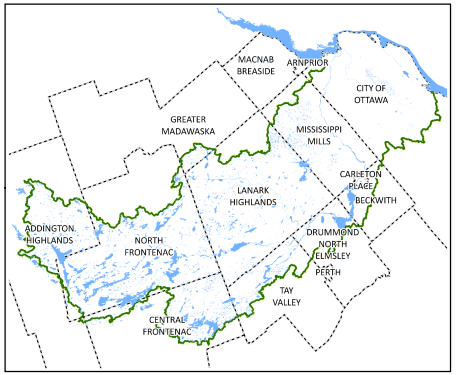
0 80 160

Meters

1:4,000

N W E S

Projection: UTM Zone 18- NAD 83 Datum



Date: 10/18/2021

APPENDIX

E SUPPORTING DOCUMENTS

WATTS®	Adjustable Accutrol Weir Tag: _____	Adjustable Flow Control for Roof Drains

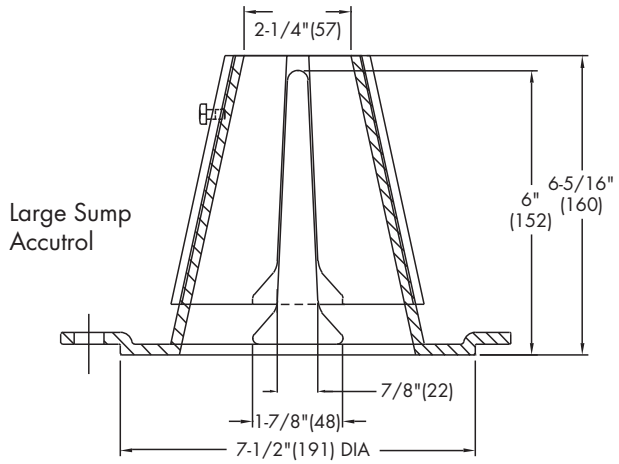
ADJUSTABLE ACCUTROL (for Large Sump Roof Drains only)

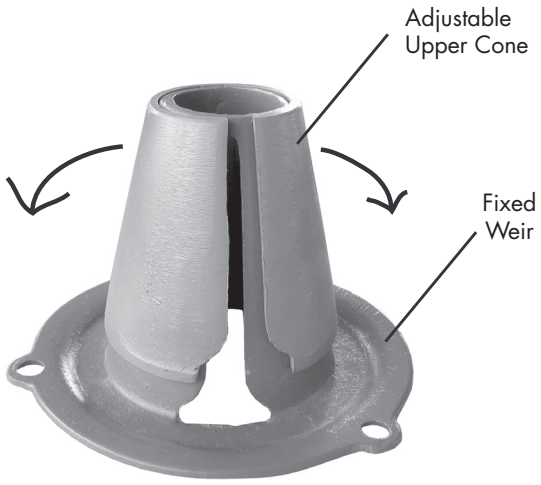
For more flexibility in controlling flow with heads deeper than 2", Watts Drainage offers the Adjustable Accutrol. The Adjustable Accutrol Weir is designed with a single parabolic opening that can be covered to restrict flow above 2" of head to less than 5 gpm per inch, up to 6" of head. To adjust the flow rate for depths over 2" of head, set the slot in the adjustable upper cone according to the flow rate required. Refer to Table 1 below.
Note: Flow rates are directly proportional to the amount of weir opening that is exposed.

EXAMPLE:

For example, if the adjustable upper cone is set to cover 1/2 of the weir opening, flow rates above 2"of head will be restricted to 2-1/2 gpm per inch of head.

Therefore, at 3"of head, the flow rate through the Accutrol Weir that has 1/2 the slot exposed will be:
[5 gpm (per inch of head) x 2 inches of head] + 2-1/2 gpm (for the third inch of head) = 12-1/2 gpm.





1/2 Weir Opening Exposed Shown Above

TABLE 1. Adjustable Accutrol Flow Rate Settings

Weir Opening Exposed	1"	2"	3"	4"	5"	6"
	Flow Rate (gallons per minute)					
Fully Exposed	5	10	15	20	25	30
3/4	5	10	13.75	17.5	21.25	25
1/2	5	10	12.5	15	17.5	20
1/4	5	10	11.25	12.5	13.75	15
Closed	5	5	5	5	5	5

Job Name _____ Contractor _____

Job Location _____ Contractor's P.O. No. _____

Engineer _____ Representative _____

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