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FUNCTIONAL SERVICING REPORT

FOR

TAMARACK (CARDINAL CREEK) CORPORATION
CARDINAL CREEK VILLAGE SOUTH

CITY OF OTTAWA

PROJECT NO.: 19-1153

NOVEMBER 2024 – SECOND SUBMISSION

FUNCTIONAL SERVICING REPORT
FOR
TAMARACK (CARDINAL CREEK) CORPORATION
CARDINAL CREEK VILLAGE SOUTH

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FUNCTIONAL SERVICING REPORT
FOR
TAMARACK (CARDINAL CREEK) CORPORATION
CARDINAL CREEK VILLAGE SOUTH

NOVEMBER 2024 – 2ND SUBMISSION

CITY OF OTTAWA
PROJECT NO.: 19-1153

1.0 INTRODUCTION

Tamarack (Cardinal Creek) Corporation has retained David Schaeffer Engineering Ltd. (DSEL) to prepare a Functional Servicing Report (FSR) in support of the Draft Plan of Subdivision application for the Cardinal Creek Village South development. The study area is comprised of portions of 1296 & 1400 Old Montreal Road and is located west of Cox Country Road, south of Old Montreal Road, and north of the Cardinal Creek South Tributary within the City of Ottawa, in the Cumberland Ward. The study area measures approximately 46.3 ha and is currently zoned Rural Countryside (RU) Zone, Rural Institutional (RI) Zone, and Arterial Mainstreet (AM) Zone. The study area is depicted in ***Figure 1*****.**

The development of the study area has been previously contemplated in background studies.

- The study area falls within the *Cardinal Creek Village Concept Plan (*Walker, Nott, Dragicevic Associates Limited, July 2013) area. The overarching *Concept Plan* and associated Official Plan Amendment were adopted in August 2013.
- To support the *Concept Plan* and associated Official Plan Amendment, a *Master Servicing Study* (DSEL, July 2013) was prepared to identify the preferred water, wastewater, and stormwater management systems needed to support the development. The *Master Servicing Study* (DSEL, July 2013) was prepared in accordance with the integration provisions of the Municipal Engineers Association's *Municipal Class Environmental Assessment* (June 2000, as amended in 2007 & 2011), which combined requirements under the *Planning Act* and the *Environmental Assessment Act*. The *Master Servicing Study* was approved on August 21, 2013, clearing the servicing infrastructure projects identified in the report for future planning, design, and construction activities.

As a next step in the Planning Act approvals process, Tamarack (Cardinal Creek) Corporation is seeking approval of the Draft Plan of Subdivision. The proposed Draft Plan

of Subdivision would allow for the development of two school blocks, a park block, a stormwater management pond, various residential units, and a road network.

This *FSR* is to be reviewed alongside the stormwater management analysis prepared by J.F. Sabourin and Associates Inc. and the watermain analysis prepared by GeoAdvice Inc, both to be provided under separate cover. Paterson Group has completed a geotechnical investigation for the study area and Kilgour & Associates have completed an environmental impact study. Transportation input has also been coordinated with CGH Transportation Inc. This *FSR* was prepared per the City Servicing Study Guidelines for Development Applications (***Appendix A***) to:

- Provide sufficient detail to demonstrate that development of the study area will be adequately supported by municipal services, as set out in the Master Servicing Study (MSS) (DSEL, July 2013) and the Cardinal Creek Village Concept Plan (CDP) (Walker, Nott, Dragicevic Associates Limited, July 2013);
- Link the requirements outlined in the MSS with the current Plan of Subdivision;
- Define the course of subsequent detailed design, review, and acceptance of the development services;
- Demonstrate conformance with the current Ministry of Environment, Conservation, and Parks (MECP), City of Ottawa, and other applicable servicing design criteria;
- Demonstrate that there is sufficient capacity in the water, wastewater, and stormwater systems to accommodate the proposed development; and
- Demonstrate good engineering practices for the protection of public safety, the environment, and sustainable operation.

1.1 Existing Conditions and Development Constraints

The study area is within the Cardinal Creek subwatershed (part of the Ottawa River East watershed), which is located within the eastern portion of the Rideau Valley Source Protection Area and is within the jurisdiction of the Rideau Valley Conservation Authority (RVCA).

The existing elevations within the study area generally range from 86 m to 95 m. Bedrock is present at depths between 0 to 10 m below existing ground and groundwater levels are 3 to 4 m below the existing surface per the *Geotechnical Investigation – Cardinal Creek Village South (Paterson Report)* (Paterson Group November 13, 2023). The overburden generally consists of topsoil or fill overlying stiff to very stiff silty clay deposits.

Select excavated materials from the construction of the existing phases of the Cardinal Creek Village development are currently being stored in piles within the study area. The piles will need to be either relocated or approved to be used for fill by a geotechnical engineer prior to construction. Further information can be found in the *Paterson Report*. Per the *Paterson Report*, the site has a permissible grade raise restriction of 2 m for lots and 2.5 m for roads in areas where the silty clay deposit is located below the design

footing level. As shown in the Permissible Grade Raise Plan included in the *Paterson Report*, the grade raise restriction applies to the western and southern portions of the study area.

The Cardinal Creek South Tributary is located to the south of the study area. It is understood that the tributary has been monitored as detailed in the *MSS* and reviewed as part of the ongoing application for Draft Plan of Subdivision approval. The aquatic habitat in the tributary has been classified and thermal mitigation measures are to be considered as part of the detailed design of Stormwater Management Pond 2.

There are existing headwater drainage features located within the study area directing flows towards the Cardinal Creek South Tributary. The closure of the features was assessed in the *Cardinal Creek Village – South Side Headwater Drainage Feature Assessment* (Bowfin Environmental Consulting Inc., March 2021). The existing watercourses identified on site can be seen in ***Figure A*** below.

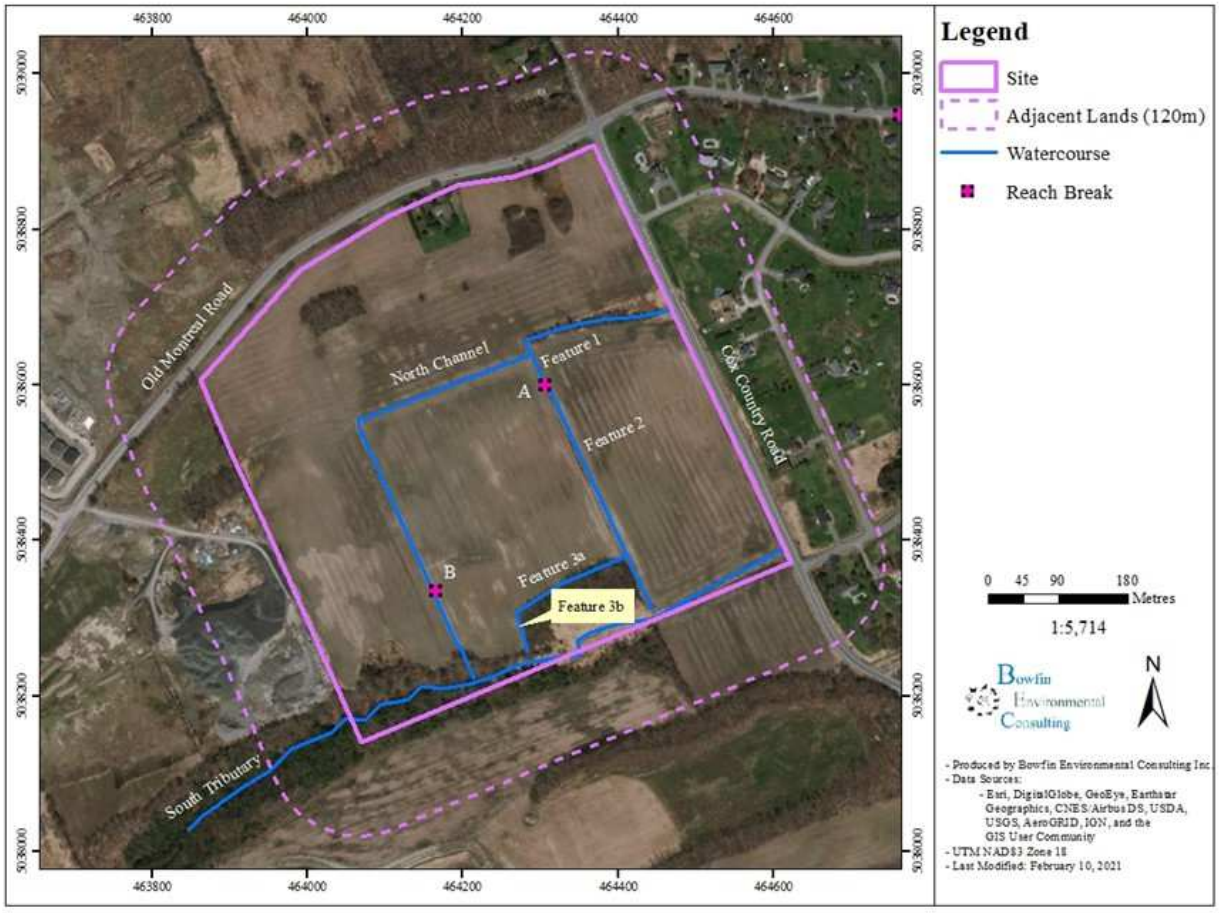

Figure A: Headwater Channels Assessed (Bowfin Environmental Consulting Inc., March 2021)

All features were classified as “No Management Required” except for the downstream end of the North Channel, which was classified as “Mitigation”. Consistent with the *MSS* and *CDP*, these features are to be closed as part of the CCV South Development, excluding the downstream end of the North Channel, which will be retained as part of the development setbacks from the South Tributary. As detailed in the *Cardinal Creek Village – South Side Headwater Drainage Feature Assessment* (Bowfin Environmental Consulting Inc., March 2021), no further mitigation measures are required for the North Channel as a result of the retention of the downstream segment connecting to the South Tributary.

The Site-Specific Water Budget Report – Cardinal Creek Village Development (PECG, June 2013), identified a significant groundwater recharge area in the northeast corner of the study area. Per the *MSS*, the introduction of impervious surfaces in this area is expected to reduce infiltration from pre-development levels, however, it is not essential to maintain pre-development infiltration levels within the study area as the natural flow regime of the South Tributary is to be maintained via the stormwater management plans for the proposed developments and groundwater contribution from the recharge areas south of the South Tributary Therefore, this is not considered a development constraint for the purpose of this *FSR*.

1.2 Development Concept

The proposed draft plan of subdivision contemplates 333 single detached units, 261 townhomes, and 152 back-to-back (B2B) townhomes. The study area also contemplates two school blocks, a commercial block, a park block, and a stormwater management pond block. The roads are proposed to consist of 26 m, 22 m, 18 m, and 14.8 m wide Right-of-Ways (ROW). The proposed concept plan and the Draft Plan of Subdivision can be found in ***Appendix A***. Corresponding development statistics are summarized in ***Table 1*** below.

Table 1: Development Statistics (Tamarack Homes, Oct 2024)

Land Use	Total Area (Ha)	Projected Residential Units	Residential Population per Unit	Population
Residential & Roads	33.0	333 Singles	3.4	2249
		261 Townhomes	2.7	
		152 B2B Townhomes	2.7	
Schools	4.9	-	-	-
Stormwater Management Pond	2.0	-	-	-
Park	1.6	-	-	-
Commercial	2.4			
Total	**43.9**	**746**	**-**	**2249**

It is understood that there are plans for Old Montreal Road to be widened in the vicinity of the study area. Based on input from CGH Transportation Inc., who has provided design information for the interim and ultimate conditions of the widened Old Montreal Road, future road widening blocks have been provided on the north side of the study area to allow for the required grading, roadwork, and ROW widening for Old Montreal in the future.

There are two properties adjacent to the study area and Old Montreal Road that have been identified for potential development as part of the *CDP* and *MSS*. The eastern property (PIN 14526-0019) is an existing residential property and was considered to be a part of the surrounding residential development in the *CDP* and *MSS*. The western property (PIN 14526-2259) is currently vacant and was considered to be a mixed-use block in the *CDP* and *MSS*. For the purpose of the grading plans in this *FSR*, these parcels are considered to remain undeveloped, however, servicing allowances for future development conditions have been accommodated in accordance with the *CDP* and *MSS.*

To the south of the Cardinal Creek South Tributary, there is a planned Urban Expansion Area. The MSS considered a 23.3 Ha future development to the south, however, per the City of Ottawa's latest Official Plan (November 2021), the boundary for the Urban Expansion Area has expanded since the time of the *MSS*. This Urban Expansion Area will undergo an independent study to confirm the preferred servicing strategy for these lands. In order to avoid removing a potential servicing alternative for these lands, this FSR has considered potential future water demands and wastewater flows from the future development. For the purposes of this *FSR*, development stats for the potential future development have been based on the unit densities from the proposed CCV South development.

Servicing blocks have been shown in the accompanying servicing figures to accommodate the proposed watermain, sanitary, and storm sewer networks. Prior to approval, the Draft Plan of Subdivision will be updated to reflect all servicing blocks identified on the servicing figures.

The limit of development in relation to the Cardinal Creek South Tributary has been reviewed and set by Paterson Group and Kilgour & Associates. Additional details pertaining to the limit of development can be found in their respective components of the Draft Plan of Subdivision application. Please note that the geotechnical setback limits provided by Paterson Group have been incorporated into the preliminary figures prepared by DSEL, for ease of City review of the preliminary grading and drainage plans.

1.3 Required Permits / Approvals

The approvals and permits listed in *Error! Not a valid bookmark self-reference.* could be expected to be required prior to construction of the municipal infrastructure detailed herein. Please note that other permits and approvals may be required, as detailed in the other studies submitted as part of the *Planning Act* development applications (e.g., *Tree*

Conservation Report, Environmental Impact Statement, Phase 1 Environmental Site Assessment, etc.).

The Environmental Compliance Approvals for the existing sanitary trunk sewer infrastructure within Cardinal Creek Phase 4 (ECA #7792-ASJR4M) and the existing Stormwater Management Pond 1 servicing the Cardinal Creek Village development (ECA #9999-BRWK2C) can be found in ***Appendix B***.

Table 2: Required Permits/Approvals

Agency	Permit / Approval Required	Trigger	Remarks
MECP/City of Ottawa	Environmental Compliance Approval **(ECA)**	Construction of proposed new stormwater management pond, sanitary & storm sewers.	The MECP/City of Ottawa is expected to review the stormwater collection system, wastewater collection system, and stormwater management pond in accordance with the City of Ottawa's ECA agreements with MECP at the time of detailed design (e.g., per linear ECA).
MECP	Permit to Take Water **(PTTW)**	Construction of proposed land uses (e.g., basements for residential homes) and services.	Pumping of groundwater may be required during construction, given groundwater conditions and proposed land uses and on-site/off-site municipal infrastructure.
City of Ottawa	MECP Form 1 – Record of Watermains Authorized as a Future Alteration.	Construction of proposed new watermains.	The City of Ottawa is expected to review the watermains on behalf of the MECP through Form 1 – Record of Watermains Authorized as a Future Alteration.
RVCA	Permit under Ontario Regulation 174/06, RVCA's Development, Interference with Wetlands and Alterations to Shorelines and Watercourses Regulation	Ditches requiring closure due to development and new stormwater management pond & outlet to the Cardinal Creek South Tributary	Proposed land uses & municipal infrastructure require grading within the subject lands and results in the closure of existing ditches. New outlet required to Cardinal Creek South Tributary from proposed SWM Pond 2.
City of Ottawa	Commence Work Notification **(CWN)**	Construction of proposed new watermains, sanitary sewers, and storm sewers throughout the subdivision. Construction of proposed SWM Pond 2.	The City of Ottawa will issue a commence work notification for construction of the sanitary and storm sewers once an ECA is issued by the MECP.

1.4 Pre-Application Consultation

Pre-application consultation was conducted with City of Ottawa staff on January 20, 2021. The municipal servicing approach and development concept were discussed. Pre-application consultation correspondence with the City of Ottawa is provided in ***Appendix A.***

Additionally, a pre-application consultation meeting was held with RVCA staff on February 24, 2021, to discuss setbacks from the watercourses among other topics. RVCA staff confirmed that the setbacks established under the approved *MSS,* and *CDP* are expected to govern in this area.

Per the City of Ottawa's current Transfer of Review Agreement No. TOR-OTT-E-2019-01, it is assumed that MECP pre-application consultation is not required, as the proposed works fall under Schedule A of the agreement. However, as detailed designs progress for the study area, consultation requirements and ECA requirements per the latest Municipal Consolidated Linear Infrastructure Environmental Compliance Approval process, related to the proposed municipal infrastructure ought to be confirmed.

Comments on the first submission of this *FSR* (dated June 2023) have been provided by City staff. Responses related to the FSR and JFSA's stormwater management modeling can be found in ***Appendix A***. It is understood Tamarack will be providing a compiled response matrix to address all comments received from City staff.

2.0 GUIDELINES, PREVIOUS STUDIES, AND REPORTS

2.1 Existing Studies, Guidelines, and Reports

The following key studies were utilized in the preparation of this report:

- **Ottawa Sewer Design Guidelines,**
  City of Ottawa, SDG002, October 2012
  (City Sewer Standards)

  - **Technical Bulletin ISDTB-2014-01, Revisions to Ottawa Design Guidelines – Sewer,**
    City of Ottawa, February 5, 2014.
    (ISDTB-2014-01)

  - **Technical Bulletin PIEDTB-2016-01, Revisions to Ottawa Design Guidelines – Sewer,**
    City of Ottawa, September 6, 2016.
    (PIEDTB-2016-01)

  - **Technical Bulletin ISTB-2018-01, Revisions to Ottawa Design Guidelines – Sewer,**
    City of Ottawa, March 21, 2018.
    (ISTB-2018-01)

  - **Technical Bulletin ISTB-2019-02, Revisions to Ottawa Design Guidelines – Sewer,**
    City of Ottawa, July 8, 2019.
    (ISTB-2019-02)

- **Ottawa Design Guidelines – Water Distribution,**
  City of Ottawa, July 2010.
  (City Water Supply Guidelines)

  - **Technical Bulletin ISD-2010-2**
    City of Ottawa, December 15, 2010.
    (ISDTB-2010-2)

  - **Technical Bulletin ISDTB-2014-02**
    City of Ottawa, May 27, 2014.
    (ISDTB-2014-02)

  - **Technical Bulletin ISTB-2018-02**
    City of Ottawa, March 21, 2018
    (ISDTB-2018-02)

  - **Technical Bulletin ISTB-2021-03**
    City of Ottawa, August 18, 2021
    (ISDTB-2021-03)

- **City of Ottawa Official Plan**
  Adopted by Council 2021, amended from time to time.
  (Official Plan)
- **Fire Underwriters Survey, 1999.**
  (FUS)

- **Design Guidelines for Sewage Works,**
  Ministry of the Environment, 2008.
  (MECP Design Guidelines)

- **Stormwater Planning and Design Manual,**
  Ministry of the Environment, March 2003,
  (SWMP Design Manual)

- **Cardinal Creek Village Master Servicing Study,**
  Tamarack (Queen Street) Corporation, July 2013,
  (MSS)

- **Cardinal Creek Village Concept Plan**
  Walker, Nott, Dragicevic Associates Limited, July 2013,
  (CDP)

- **Greater Cardinal Creek Subwatershed Management Plan,**
  AECOM, May 2014,
  (Subwatershed Study)

- **Ontario Building Code Compendium,**
  Ministry of Municipal Affairs and Housing Building Development Branch,
  January 1, 2012, as updated from time to time.
  (OBC)

- **Mississippi-Rideau Source Water Protection Plan,**
  MVCA & RVCA, August 2014

- **Evaluation of Karst at Cardinal Creek Village,**
  Worthington Groundwater, June 2013

- **Cardinal Creek Village Concept Plan,**
  Walker, Nott, Dragicevic Associates Limited, July 2013

- **Site Specific Water Budget Report – Cardinal Creek Village Development,**
  Palmer Environmental Consulting Group Inc., June 2013

- **Cardinal Creek Village Water Balance Analysis,**
  J.F. Sabourin and Associates Inc., June 2013

- **Cardinal Creek Village – South Side Headwater Drainage Feature Assessment,**
  Bowfin Environmental Consulting Inc., March 2021

- **Hydraulic Capacity and Modeling Analysis - Cardinal Creek Village South Development**
  GeoAdvice, June 16, 2022

- **Geotechnical Investigation – Cardinal Creek Village South, Revision 6**
  Paterson Group, November 13, 2023
  (Paterson Report)

- **Cardinal Creek Village South – Preliminary Stormwater Management Plan and Stormwater Management Facility Design**
  JFSA, November 8, 2024
  (JFSA Report)

- **Fluvial Geomorphological and Erosion Threshold Assessment, Tributary of Cardinal Creek Investigation – Cardinal Creek Village South, Revision 6**
  GEOMorphix, November 11, 2024
  (GEOMorphix Report)

3.0 WATER SUPPLY SERVICING

3.1 Existing Water Supply Services

The study area lies within the existing City of Ottawa 2E pressure zone. The existing watermain infrastructure in the surrounding area is shown in ***Figure 4.***

2E watermains service the existing Cardinal Creek Village Phase 4, located north of the study area. A 400 mm diameter watermain stub is provided on Old Montreal Road at Cardinal Creek Drive, as well as on Old Montreal Road near Cartographe Street.

3.2 Water Supply Servicing Design

Water supply servicing for the study area was contemplated as part of the *MSS*. The *MSS* considered a watermain network consisting of 400 mm diameter 2E trunk watermains extending along Old Montreal Road and Cardinal Creek Drive, forming a looped system following the road network in the western portion of the study area. A 400 mm diameter stub was shown in the *MSS* for a future connection under the south tributary. The eastern portion of the development was proposed to be serviced by 300 mm diameter 2E watermains, following the local road network. See ***Appendix B*** for details.

Potable water will be supplied to the study area through pressurized watermains on each street, connecting the existing City of Ottawa 2E pressure zone watermains on Cardinal Creek Drive and Old Montreal Road as shown in ***Figure 4***. Existing 400 mm diameter watermain stubs are available for connection at the intersection of Cardinal Creek Drive and Old Montreal Road, and Old Montreal Road near Cartographe Street.

As part of the *MSS*, a maximum service elevation of 95 m for pressure zone 2E and low pressures were reported in the northeast corner of the study area under the peak hour design condition. Per the *MSS*, the following recommendations were provided for this area:

- Detailed design of the site grading should minimize the ground floor elevations as much as possible;
- 25 mm service connections be utilized for any future service connections;
- Detailed design include internal plumbing considerations to minimize hydraulic pressure losses. Note that the minimum allowable pressure at any given fixture is generally 69 kPa (10 psi) according to the Ontario Building Code; and,
- Pressure monitoring after the first phases of construction be undertaken, to validate and/or calibrate the model and further refine requirements.

These recommendations are proposed to be carried forward to the detailed design of the study area.

Table 3: Water Supply Design Criteria

Design Parameter	Value
Residential – Single-Family	3.4 p/unit
Residential – Townhome/ Semi	2.7 p/unit
Residential Average Daily Demand	280 L/d/p
Residential – Maximum Daily Demand	2 x Average Daily Demand
Residential – Maximum Hourly Demand	3 x Maximum Daily Demand
Residential – Minimum Hourly Demand	0.5 x Average Daily Demand
Commercial/Institutional Average Daily Demand	28,000 L/gross ha/day
Park Average Daily Demand	28,000 L/gross ha/day
Commercial/Institutional/Park Maximum Daily Demand	1.5 x Average Daily Demand
Commercial/Institutional/Park Maximum Hour Demand	1.8 x Maximum Daily Demand
Commercial/Institutional/Park Minimum Hourly Demand	0.5 x Average Daily Demand
Minimum Watermain Size	150 mm diameter
Minimum Depth of Cover	2.4 m from top of watermain to finished grade
During normal operating conditions desired operating pressure is within	350 kPa and 480 kPa
During normal operating conditions pressure must not drop below	275 kPa
During normal operating conditions pressure must not exceed	552 kPa
During fire flow operating pressure must not drop below	140 kPa

Notes:

- *Extracted from Section 4: Ottawa Design Guidelines, Water Distribution (July 2010),*
- *Table 3-1 – Peaking Factors from MECP Water Supply Guidelines was used as the total combined population in the boundary condition request exceeds 3,000 people (consistent with Section 4 of the Ottawa Design Guidelines.*
- *Park water demands are assumed based on classification and potential for community facilities, etc.*
- *Residential Average Daily Demand assumed to be 280 L/d/P in accordance with 2018 changes to Sanitary Design Guidelines, see Section 4.0.*

A boundary conditions request was submitted to the City of Ottawa on October 2, 2024, and the results were provided on October 28, 2024. See ***Appendix C*** for details. The request was based on the demand rates detailed in ***Table 3*** and projected water demands for the study area are summarized in ***Table 4***. Note that demands from surrounding future development areas were included in the boundary conditions request to ensure the proposed network provides adequate service upon full buildout of the surrounding area. See ***Appendix C*** for further details and demands for the external developments.

Table 4: Summary of Water Demands

Dwelling Type	Number of Units	Persons per unit	**Population**	**Allocated Demand** (L/unit/d)	**Avg Day** (L/s)	**Max Day** (L/s)	**Peak Hour** (L/s)
Single Detached	333	3.4	1,133	280	3.67	7.36	11.03
Townhome	261	2.7	705	280	2.29	4.59	6.87
Back-to-Back Townhome	152	2.7	411	280	1.33	2.66	4.00
Land Use Type	Area (ha)			**Allocated Demand** (L/ha/d)	**Avg Day** (L/s)	**Max Day** (L/s)	**Peak Hour** (L/s)
Park	1.58	-	-	28,000	0.51	0.77	1.38
Schools	4.91	-	-	28,000	1.59	2.39	4.30
Commercial	2.4	-	-	28,000	0.78	1.17	2.10
				TOTAL	**10.19**	**18.93**	**29.68**

As part of the first *FSR* submission, GeoAdvice prepared the *Hydraulic Capacity and Modeling Analysis - Cardinal Creek Village South Development* (GeoAdvice, June 16, 2022). A comparison of the projected demands from the first and second *FSR* submission are summarized below in ***Table 5***. Given the projected water demand has increased by less than 1 L/s, and the boundary condition results are also similar to the ones used in the first *FSR* submission, it is expected that there will be adequate water supply to service the proposed development. GeoAdvice is preparing an updated hydraulic capacity analysis under separate cover, to confirm the conclusion from the first *FSR* submission is still accurate.

Table 5: Comparison of FSR Sub 1 vs. Sub 2 Projected Water Demands

	Average Day Demand (L/s)	**Max Day Demand (L/s)**	**Peak Hour Demand (L/s)**
Total Submission 1 Demand	**9.9**	**18.49**	**28.93**
Sub 1 Residential Demand	7.27	14.55	21.83
Sub 1 Non-Residential Demand	2.63	3.94	7.1
Total Submission 2 Demand	**10.19**	**18.93**	**29.68**
Sub 2 Residential Demand	7.31	14.6	21.9
Sub 2 Non-Residential Demand	2.88	4.33	7.78
TOTAL DIFFERENCE	***0.29***	***0.44***	***0.75***

Single-detached dwellings and traditional townhomes are expected to meet the requirements to apply the City of Ottawa's cap of 10,000 L/min (167 L/s), as outlined in *ISDTB-2014-02*. Firewalls will be required in the back-to-back townhomes to limit the required fire flow. Fire flow demands will be confirmed at detailed design, in accordance with the Fire Underwriters Survey's Water Supply for Public Fire Protection Guideline (1999) as amended by *ISTB-2014-02* & *ISTB-2018-02*.

A range of fire flows (167 L/s to 250 L/s) was included in the boundary conditions request. Hydraulic gradelines (HGL) for intermediate flows between 167 L/s and 250 L/s will be interpolated using the boundary conditions once provided by the City.

Demands from the two properties adjacent to the study area that were previously identified for development will be considered in the hydraulic analysis, should future connections be required. The eastern property will be treated as future residential, with the same water demands and unit density as the surrounding residential area. The western property will be treated as a Mixed-Use block, consistent with the *CDP* and *MSS,* with 26% of the block considered residential (135 pop/ha) and the remaining area considered as commercial. Demand rates from ***Table 3*** will be applied to these assumed land uses.

The demands for the Urban Expansion Area south of the Cardinal Creek South Tributary will also be considered in the hydraulic analysis, as discussed in Section 1.2 of this ***FSR***. The water demand rates used at the time of the *MSS* have been applied to this area.

The watermain network is expected to range in size between 200mm to 400mm. Sizing will be confirmed as part of the GeoAdvice analysis reporting, to be provided under separate cover.

3.3 Water Supply Servicing Conclusion

The City's 2E pressurized water supply network will be expanded at connections on Old Montreal Road and Cardinal Creek Drive to provide potable water to the study area through the proposed pressurized watermain network. A boundary condition request was submitted to the City on October 2, 2024 and results were provided on October 28, 2024.

The detailed design of the proposed watermain network will conform to all relevant City and MECP *Water Supply Guidelines*. Given the minimal change in the water demand as projected in the first *FSR* submission, the updated hydraulic analysis, completed by GeoAdvice under separate cover, is expected to confirm that all required domestic and fire flows can be met throughout the study area, as previously concluded.

Fire flow requirements are expected to be fully met throughout the development, in accordance with City Guidelines and ISTB-2018-02. To ensure compliance, firewalls will be incorporated into the back-to-back townhouse designs, limiting the required fire flow to 200 L/s.

4.0 WASTEWATER SERVICING

4.1 Existing Wastewater Services

Existing sanitary sewers service Cardinal Creek Village Phase 4, to the north of the study area. An existing 375 mm diameter sanitary trunk sewer, installed as part of phase 4 of Cardinal Creek Village, runs along Cardinal Creek Drive and crosses Old Montreal Road, offering a connection point to service the study area.

Existing wastewater servicing infrastructure in the vicinity of the study area is shown in ***Figure 3***.

4.2 Wastewater Design

The wastewater servicing strategy for the study area outlined in the *MSS* directs sanitary flows from the study area towards the existing Cardinal Creek Village Phase 4 north of Old Montreal Road. The flows are ultimately directed through the Cardinal Creek Village development towards the Trim Road collector sewer.

Consistent with the *MSS*, the wastewater flows from the study area and its external drainage areas are to be directed towards the existing 375 mm diameter sanitary trunk sewer at Cardinal Creek Drive and Old Montreal Road. The study area will be serviced by a network of internal gravity sewers, ranging from 200 mm to 375 mm in diameter, generally following the local road network. See ***Figure 3*** for the proposed sanitary sewer network.

The proposed sanitary sewer network was designed in accordance with the wastewater design parameters from *ISTB-2018-01* and the *Sewer Design Guidelines*, summarized in ***Table 6*** below. Sanitary sewer design sheets can be found in ***Appendix D***.

Wastewater flow from the properties adjacent to the study area that were previously identified for development in the *MSS,* as discussed in ***Section 1.2,*** were considered in the design of the sanitary network, should future connections be required. The eastern property was treated as future residential, with the same sanitary demands and population density as the surrounding residential area. The western property was treated as mixed-use, consistent with the *CDP* and *MSS*, assuming a high-density residential area would account for 26% of the total area, and the remaining area considered commercial. Demand rates from the *Sewer Design Guidelines* were applied to these assumed land uses.

Table 6: Wastewater Design Criteria

Design Parameter	Value
Residential - Single Family	3.4 p/unit
Residential – Townhome/ Back-to-Back	2.7 p/unit
Average Daily Demand	280 L/d/per
Peaking Factor	Harmon's Peaking Factor, where K=0.8
Commercial / Institutional Flows	28,000 L/ha/day
Commercial / Institutional Peak Factor	1.5 if contribution area >20%, otherwise 1.0
Infiltration and Inflow Allowance	0.33 L/s/ha for all areas
Park Flows	28,000 L/ha/d
Park Peaking Factor	1.0
Sanitary sewers are to be sized employing the Manning's Equation	$Q = \frac{1}{n} AR^{2/3} S^{1/2}$
Minimum Sewer Size	200mm diameter
Minimum Manning's 'n'	0.013
Minimum Depth of Cover	2.5m from the crown of the sewer to grade
Minimum Full Flowing Velocity	0.6m/s
Maximum Full Flowing Velocity	3.0m/s
Extracted from Sections 4 and 6 of the City of Ottawa Sewer Design Guidelines, October 2012, technical bulletins, and recent residential subdivisions in the City of Ottawa.	

More recently than the *MSS*, the Cardinal Creek Village Phase 4 detailed design included consideration for the study area's wastewater flows. See ***Appendix D*** for details. A summary of the assumed land uses and peak flows from the study area and its external drainage areas, including infiltration from Old Montreal Road, can be found in ***Table*** . Note, the Cardinal Creek Village Phase 4 detailed design used sanitary design parameters which have since been updated by the City of Ottawa.

As discussed in ***Section 1.2***, wastewater flows from the Urban Expansion Area have been considered in the downstream sanitary sewer capacity check to prevent removing a potential servicing alternative for these lands. The anticipated future connection point is now located in the southeast corner of the study area on Street 9, to allow for the future sanitary connection to cross the South Tributary further upstream, avoiding unnecessarily deep sewers. As mentioned in ***Section 1.2***, the servicing strategy for the Urban Expansion Area will be confirmed as part of a separate study for these lands.

As shown in ***Table 7***, the projected peak wastewater flow directed to the existing sanitary stub, including infiltration from Old Montreal Road, is 89.32 L/s, which represents a 13% increase compared to the peak flow considered in the Cardinal Creek Village Phase 4 design. Given the proposed 10.26 L/s increase in peak flow directed towards the existing sanitary sewer network, an analysis of the downstream network was completed. See ***Appendix D*** for details. It was determined that despite the flow increase, there is sufficient capacity in the downstream sewer to accommodate the additional flows. As shown in ***Appendix D***, all of the downstream sanitary sewers were found to be below 72% capacity when considering the proposed flows from the study area and its external drainage areas.

Table 7: Wastewater Design Comparison

Outlet	Design	Residential Area (Pop)	Park Area	Commercial / Institutional Area	Peak Flow
Existing MH2000A	MSS (July 2013)	53.38 ha (3802 pop.)	2.80 ha	4.36 ha	84.56 L/s*
	CCV Ph 4 (Nov 2017)	55.48 ha (4018 pop.)	2.42 ha	7.19 ha	79.06 L/s
	CCV South FSR Sub2 (Nov 2024)	79.02 ha (6008 pop.)	4.08 ha	10.82 ha	89.32 L/s

MSS* used different sanitary sewer design parameters from the ones summarized in ***Table 8*. See *MSS* for details.

In specific areas, high- and low-level sanitary sewers are proposed to allow for the trunk sewer to potentially provide service to the future development lands to the south of the Cardinal Creek South Tributary and to allow for residential services within the study area to connect to the high-level sewer. Further details can be found in ***Figures 3 & 6-8***. The need for high and low-level sanitary sewers will be confirmed as part of detailed design along with the exact location and details for any drop pipes in sanitary manholes.

4.3 Wastewater Servicing Conclusions

A network of gravity sewers is proposed within the study area to convey wastewater flow to the existing trunk sanitary sewer in Cardinal Creek Drive, installed as part of Cardinal Creek Village Phase 4. The sewers are to be designed in conformance with all relevant City of Ottawa and MECP Guidelines and Policies.

The flows are ultimately directed through the existing Cardinal Creek Village development towards the Trim Road collector sewer. Capacity in the downstream trunk sewer has been confirmed to accommodate flows from the study area and its external drainage areas.

5.0 STORMWATER MANAGEMENT

5.1 Existing Stormwater Drainage

The study area is located within the Cardinal Creek subwatershed. Existing drainage catchments within the study area were delineated in the *MSS*, as shown in ***Appendix B***. The study area's pre-development drainage is split between two receivers, with the majority of the site draining to the Cardinal Creek South Tributary, and the remaining area draining to the Cardinal Creek North Tributary. As part of the existing phases of CCV north of Old Montreal Road, portions of the Cardinal Creek North Tributary have been closed and the pre-development drainage from CCV South has been accommodated in the existing storm sewer network.

Existing Stormwater Management Pond 1 services the existing phases of Cardinal Creek Village and is located north of the study area and just south of Regional Road 174. The design of Stormwater Management Pond 1 considered pre-development drainage from a portion of CCV South and an allowance for post-development conditions.

An existing 1350 mm diameter storm sewer, installed as part of Cardinal Creek Village Phase 4, runs along Cardinal Creek Drive and ultimately directs flows to Stormwater Management Pond 1. Existing storm sewer infrastructure in the surrounding area is shown in ***Figure 2***.

As mentioned in ***Section 1.1***, there are existing headwater drainage features located within the study area that will be closed as part of the CCV South development. There are also existing roadside ditches for Old Montreal Road and Cox Country Road adjacent to the study area. These drainage patterns are not intended to be altered by the CCV South development, and any culverts required to maintain the existing drainage patterns will be sized as part of the detailed design process.

5.2 Stormwater Management Strategy

Stormwater management requirements for the study area have been adopted from the *MSS* and the *Subwatershed Study*. Stormwater runoff from the study area was planned in the *MSS* to be split and directed towards two stormwater management ponds:

- The northwestern portion of the study area (~6 ha) along Old Montreal Road was planned to be treated by Stormwater Management Pond 1 for Enhanced quality control before discharge to the Ottawa River.
- The remaining portion of the study area was planned to be treated by Stormwater Management Pond 2, located in the southwest corner of the study area, for Enhanced quality control, erosion control, and quantity control before discharge to the Cardinal Creek South Tributary.
- Stormwater Management Pond 1 has been constructed under ECA No. 9999-BFWK2C, (see ***Appendix B*** for reference) and has been sized to receive partial drainage from the study area per the detailed design of the pond, and in

accordance with the *MSS*. Stormwater Management Pond 1 has also been designed to accept pre-development drainage in the interim condition.

For stormwater runoff destined to the Cardinal Creek South Tributary via Stormwater Management Pond 2:

- Quantity control is required to control post-development peak flows to pre-development levels for all storms up to and including the 100-year storm;
- Erosion control is required to respect the determined erosion threshold of the South Tributary (0.184 m^3/s per the latest GEOMorphix erosion analysis, see ***Appendix E*** and the *GEOMorphix* Report for details).
- Quality control is to be provided to treat development runoff to the MECP Enhanced level of protection (long-term average removal of 80% of total suspended solids) to protect aquatic habitat.

The following key City standards will be required for stormwater management within the subject lands and conveyance to the proposed stormwater management ponds, among other requirements:

- Storm sewers on local roads are to be designed to provide a minimum 2-year level of service per the City's Technical Bulletin PIEDTB-2016-01.
- Storm sewers on collector roads are to be designed to provide a minimum 5-year level of service per the City's Technical Bulletin PIEDTB-2016-01.
- Storm sewers on arterial roads are to be designed to provide a minimum 10-year level of service.
- For less frequent storms (i.e., larger than the minimum level of service), the minor system sewer capture will be restricted with the use of inlet control devices to prevent excessive hydraulic surcharges.
- Under full flow conditions, the allowable velocity in storm sewers is to be no less than 0.80 m/s and no greater than 6.0 m/s.
- For the 100-year storm and local and collector roads, the maximum depth of water (static and/or dynamic) on streets, rear yards, public spaces, and parking areas shall not exceed 0.35 m at the gutter.
- The major system shall be designed with sufficient capacity to allow the excess runoff of a 100-year storm to be conveyed within the public ROW or adjacent to the right-of-way provided that the water level must not touch any part of the building envelope, must remain below all building openings during the stress test event (100-year + 20%), and must maintain 15 cm vertical clearance between spill elevation on the street and the ground elevation at the nearest building envelope.
- When catch basins are installed in rear yards, safe overland flow routes are to be provided to allow the release of excess flows from such areas. A minimum of 30 cm of vertical clearance is required between the rear yard spill elevation and the ground elevation at the adjacent building envelope.

- The product of the maximum flow depths on streets and maximum flow velocity must be less than 0.60 m2/s on all roads.

5.3 Stormwater Management Design

Consistent with the *MSS*, the study area's minor and major systems are to be split between the existing Stormwater Management Pond 1 and Stormwater Management Pond 2. The drainage split of the study area has been updated as part of this *FSR*, primarily to respect the reduced erosion threshold in the South Tributary since the time of the *MSS* (was 0.43 m^3/s, now 0.184 m^3/s). See ***Section 5.3.1*** and ***5.3.2*** for further details.

The study area will be serviced by an internal gravity storm sewer network that generally follows the local road network, as shown in ***Figure 2***. The proposed preliminary network ranges in diameter from 450 mm to 1800 mm. The rational method design sheet can be found in ***Appendix D***. ***Table 8*** summarizes the standards that will be employed in the detailed design of the storm sewer network, meeting the requirements in ***Section 5.2***.

A runoff coefficient of 0.68 was determined for singles, townhouses, and back-to-back units based on existing phases of Cardinal Creek development to the north of Old Montreal Road. Runoff coefficients of 0.7 and 0.4 were applied to the schools and park respectively, consistent with the MSS. All runoff coefficients will be further reviewed and confirmed as part of the detailed design of the study area.

Inlet control devices (ICD) will be employed to ensure that storm flows entering the minor system are limited to the flows described above. 100-year capture is proposed for the storm sewers connecting the existing Stormwater Management Pond 1 storm sewers to prevent any major system flows from crossing the arterial Old Montreal Road.

Table 8: Stormwater Management Design Criteria

Design Parameter	Value
Minor System Design Return Period	2-Year (Local Streets), 5-Year (Collector Streets), 10-Year (Arterial Streets) – PIEDTB-2016-01
Major System Design Return Period	100-Year
Intensity Duration Frequency Curve (IDF) 2-year storm event: A = 723.951, B = 6.199, C = 0.810 5-year storm event: A = 998.071, B = 6.053, C = 0.814	$i = \frac{A}{(t_c + B)^C}$
Minimum Time of Concentration	10 minutes
Rational Method	$Q = CiA$
Runoff coefficient for paved and roof areas	0.90
Runoff coefficient for landscaped areas	0.20
Storm sewers are to be sized employing the Manning's Equation	$Q = \frac{1}{n} A R^{2/3} S^{1/2}$
Minimum Sewer Size	250 mm diameter
Minimum Manning's 'n'	0.013
Service Lateral Size	100 mm dia PVC SDR 28 with a minimum slope of 1.0%.
Minimum Depth of Cover	2 m from the crown of the sewer to grade (or 1.5m where USF freeboard to HGL is not a constraint, such as in slab-on-grade products)
Minimum Full Flowing Velocity	0.8 m/s
Maximum Full Flowing Velocity	6.0 m/s
Clearance from 100-Year Hydraulic Grade Line to Building Opening	0.30 m
Max. Allowable Flow Depth on Municipal Roads	35 cm above gutter (PIEDTB-2016-01)
Extent of Major System	To be contained within the municipal right-of-way or adjacent to the right-of-way provided that the water level must not touch any part of the building envelope and must remain below the lowest building opening during the stress test event (100-year + 20%) and 15cm vertical clearance is maintained between spill elevation on the street and the ground elevation at the nearest building envelope (PIEDTB-2016-01)
Stormwater Management Model	SWMHYMO (v5.5) and HEC-RAS (v5.0).
Model Parameters	Fo = 76.2 mm/hr, Fc = 13.2 mm/hr, DCAY = 4.14/hr, D.Stor.Imp. = 1.57 mm, D.Stor.Per. = 4.67 mm
Imperviousness	Based on runoff coefficient (C) where Percent Imperviousness = (C - 0.2) / 0.7 x 100%.
Design Storms	Chicago 3-hour Design Storms and 24-hour SCS Type II Design Storms. Maximum intensity averaged over 10 minutes.
Historical Events	July 1st, 1979, August 4th, 1988, and August 8th, 1996
Climate Change Street Test	20% increase in the 100-year, 3-hour Chicago storm

Extracted from City of Ottawa Sewer Design Guidelines, October 2012, as amended by PIEDTB-2016-01, *and based on recently approved residential subdivision designs in the City of Ottawa.*

5.3.1 Proposed Outlet - Stormwater Management Pond 1

The minor and major system flows from a 12.03 ha portion of the study area are planned to be directed to the existing Stormwater Management Pond 1. As mentioned in ***Section 5.2***, the runoff from a portion of the study area was considered to drain to Stormwater Management Pond 1 in the *MSS*. More recently, drainage from the study area was considered as part of the detailed design of *Cardinal Creek Village Phase 5 and in the Stormwater Management Report for Phases 5 and 6 of Cardinal Creek Village* (JFSA, January 2020). See ***Appendix E*** for excerpts from the report. ECA approval for the latest Pond 1 drainage area can be found in ***Appendix B***.

Table 9: Stormwater Management Pond 1 Drainage Comparison

Outlet	Design	Area (Ha)	Avg. Runoff Coefficient	A*C
Existing MH200	Pre-development	11.50	0.25	2.88
	CCV Ph 5 & 6 (Jan 2020)	11.84	0.43	5.07
	CCV South FSR (Nov 2024)	12.03	0.65	7.82

As shown in ***Table 9***, the product of the tributary area and average runoff from the proposed drainage diversion results in an increased contribution to Stormwater Management Pond 1 and its storm sewer network. As such, the hydraulic grade line (HGL) of the downstream existing storm sewer network and Pond 1 storage volumes have been modeled and analyzed by JFSA to confirm there is capacity in the existing sewers and stormwater management pond. See the *JFSA Report*, provided under separate cover, for further details.

There is a 0.68 ha portion of external land to the west of the study area that is currently draining to Pond 1 via overland flow and the drainage swales and culverts within the Old Montreal Road right-of-way. The land was identified for potential redevelopment as part of the *MSS*, and upon redevelopment, the *MSS* considered the area to be redirected to Pond 2. Given the land's natural drainage, and the study area's drainage pattern, the area is proposed to continue draining to Pond 1 upon any potential redevelopment of the lands. ***Table 9*** above includes the 0.68 ha portion of external land in the total area draining to Pond 1. See ***Figure 10*** for details.

5.3.2 Proposed Outlet - Stormwater Management Pond 2

The minor and major system flows from a 32.54 ha portion of the study area are planned to be directed to the proposed Stormwater Management Pond 2, which is to be located in the southwest corner of the study area and outlet to the Cardinal Creek South Tributary. Pond 2 is to be constructed as part of the first phase of construction.

Per the *MSS*, Pond 2 is to provide quality, quantity, and erosion controls before release to the Cardinal Creek South Tributary. Specifically, permanent pool volumes are to be sized to provide an enhanced protection level (80% average long-term suspended solids

removal) per the SWMP Design Manual. Quantity control for Pond 2 is to be provided based on the requirement to maintain flow release rates post-to pre-development for the 2-to 100-year storm events. The erosion threshold within the South Tributary has been revisited by GEOMorphix since the first *FSR* submission. GEOMorphix has evaluated a revised erosion threshold of 0.184 m^3/s (***Appendix E***). Additional details can be found in the *GEOMorphix Report*, provided under separate cover.

The layout for the proposed stormwater management pond can be seen in ***Figure 8.*** Further pond design and sizing details, along with a preliminary HGL analysis of the proposed sewer network that outlets to Pond 2, can be found in the *JFSA Report* provided under separate cover.

The *MSS* reports that extended detention of the 25 mm storm in Pond 2, with a drawdown time of approximately 96 hours, is required for erosion control. The 96-hour drawdown time from the *MSS* has been carried forward in the preliminary Pond 2 design.

As suggested in the *MSS*, the proposed Pond 2 design will consider the implementation of thermal mitigation measures to help control temperature impacts of the stormwater flows entering the South Tributary from Pond 2. The planned measures to be considered include, but are not limited to, ensuring there is a tree planting strategy to provide maximum shade, providing a deeper permanent pool depth than required under the MECP SWM Guidelines (2003), and providing an outfall to diffuse flow before it enters the South Tributary.

A bottom draw outlet is also being proposed to aid with thermal mitigation of outlet flows. Specifically, a 300 mm diameter reverse outlet pipe has also been included in the design of Pond 2. Preliminary details can be seen in ***Figure 10***. The perforated intake pipe is to be located at the south end of the pond in a 0.5 m deep pool, which results in a permanent pool depth of 3 m at the outlet pipe. Further details are to be provided as part of the detailed design.

Rear yards backing onto the Cardinal Creek South Tributary are to drain directly into the watercourse. These rear yard flows have been considered as part of the revised erosion threshold analysis of the South Tributary prepared by GEOMorphix, along with the latest pond outflows provided by JFSA. As shown in ***Appendix E***, the cumulative work index for the South Tributary is reduced by 4.58%, indicating a slight decrease in erosion potential of the South Tributary in post-development conditions. See the *GEOMorphix Report* for further details.

A site-specific water budget was completed as part of the *MSS* (July 2013), and per the approved report, no Low Impact Development (LID) measures beyond the use of backyard perforated pipes are required to be implemented within the study area.

Per the *MSS*, an additional stormwater management facility that outlets to the Cardinal Creek South Tributary will be required to service the runoff from future development south

of the Cardinal Creek South Tributary. As discussed in ***Section 1.1***, these lands will undergo a separate study to determine their preferred servicing strategy.

5.4 Grading and Drainage

A preliminary grading plan has been developed to respect grade raise restrictions, minimize earthworks on-site and provide major system conveyance. See ***Figure 5*** for the concept level grading plan demonstrating proposed grades in the development.

The proposed grading plan has been based on a maximum grade raise restriction of 2 m for residential lots, and 2.5 m for roads as described in ***Section 1.1*** and the *Paterson Report*, provided under separate cover. The road grades and slopes shown in ***Figure 5*** represent the centerline of road low points. At detailed design, high points, road sags, and sawtoothing will be included in the detailed grading plans.

The following grading criteria will be applied to detailed design where possible, per *City of Ottawa Sewer Design Guidelines:*

- Driveway slopes will have a maximum slope of 6%;
- Slope in grassed areas will be between 2% and 5%;
- Grades in excess of 7% will require terracing to a maximum of a 3:1 slope;
- Swales are to be 0.15m deep with 3:1 side slopes unless otherwise indicated on the drawings; and,
- Perforated pipe will be required for drainage swales if they are less than 1.5% in slope.

Old Montreal Road grading was considered in the proposed grading plan based on input from the transportation consultant, for interim and ultimate design conditions.

Similar to Cardinal Creek Drive in the existing Cardinal Creek Village Phases 4 and 5, Street 1 is proposed to have a road slope exceeding 5% in order to tie into the Old Montreal Road elevation, respect grade raise restrictions and minimize earthworks on site. This is required in order to work with the existing topography, which has a steep rise south of Old Montreal Road. As such, retaining walls are expected to be required. As part of detailed design, detailed recommendations will be provided by a geotechnical engineer to support any proposed retaining wall.

There are two existing 900 mm diameter culverts under Cox Country Road directing runoff from the land to the east under the roadway. The northern culvert was found to convey runoff from a 1.30 Ha area towards an existing headwater feature within the study area before ultimately draining to the Cardinal Creek South Tributary. The southern culvert was found to convey runoff from a 73 Ha area directly into the Cardinal Creek South Tributary. See ***Figure 11*** for details.

Given the proposed closure of the headwater feature, the existing norther culvert is to be decommissioned and the eastern Cox Country Road roadside ditch is proposed to be regraded to direct flows from the entire 74.3 ha external drainage area towards the south culvert. Ditch capacity calculations can be found in ***Appendix E*** and the culvert freeboard confirmation can be found in the *JFSA Report*, provided under separate cover.

5.5 Stormwater Management Conclusions

The proposed minor and major systems direct a portion of the study area's runoff towards the existing Stormwater Management Pond 1 and the remaining runoff towards the proposed Stormwater Management Pond 2. The proposed stormwater system will conform to all relevant City Standards and MECP Guidelines and Policies.

The study area is proposed to be serviced by a gravity storm sewer network following local roads and servicing easements. Capacity in the downstream sewer network and Stormwater Management Pond 1 have been confirmed to accommodate runoff from a portion of the study area. Stormwater Management Pond 2 will be designed to meet all criteria set in the *MSS* as well as all relevant City of Ottawa and MECP Guidelines and Policies.

6.0 UTILITIES

Utility services extending to the site may require connections to multiple existing infrastructure points: consultation with Enbridge gas, Hydro Ottawa, Rogers, and Bell is required as part of the detailed design process to confirm the servicing plan for the subject lands. Through preliminary consultation with utility providers, it has been determined that infrastructure system capacity exists to service Cardinal Creek Village South (preliminary correspondence can be found in **Appendix A**).

Hydro One has an existing feeder in front of the development area and has been aware of the study area when designing the existing Cardinal Creek Village subdivision phases. Any need for system enhancement will be assessed by Hydro One as the loading details for the study area and surrounding area become clearer.

There is existing Bell service in the area and an extension of service will be required to service the study area. Rogers has existing aerial fiber cable as well as coax cable along the south side of Old Montreal Road, which is planned to be extended to service the study area with Fiber to Home technology.

There is existing gas infrastructure operating at intermediate pressure on the north side of Old Montreal Road near Laporte Avenue and at the intersection of Old Montreal Road and Cox Country Road. No capacity issues are expected for servicing the study area and a district station is not required.

The overhead lines south of the Old Montreal Road ROW interfere with the development area and will need to be relocated. This has been relayed to all utility agencies. Further coordination with the transportation engineers (for OMR ROW information) as well as the utility agencies will be required as detailed designs progress.

7.0 EROSION AND SEDIMENT CONTROL

Soil erosion occurs naturally and is a function of soil type, climate, and topography. The extent of erosion losses is exaggerated during construction where vegetation has been removed and the top layer of soil becomes agitated.

Before topsoil stripping, earthworks, or underground construction, erosion and sediment controls will be implemented and will be maintained throughout construction.

A silt fence will be installed around the perimeter of the active part of the site and will be cleaned and maintained throughout construction. The silt fence will remain in place until the working areas have been stabilized and re-vegetated.

Catch basins will have catch basin inserts installed during construction to protect from silt entering the storm sewer system.

An erosion and sediment control plan will be prepared as part of the detailed design package, and the following specific recommendations to the contractor will be included:

- Limit the extent of exposed soils at any given time.
- Re-vegetate exposed areas as soon as possible.
- Minimize the area to be cleared and grubbed.
- Protect exposed slopes with plastic or synthetic mulches.
- Install silt fence to prevent sediment from leaving the site and entering existing ditches.
- Install mud mat to prevent mud tracking onto adjacent roads.
- No refueling or cleaning of equipment near existing watercourses.
- Provide sediment traps and basins during dewatering.
- Install catch basin inserts.
- Plan construction at the proper time to avoid flooding.

The contractor will, at every rainfall, complete inspections and guarantee proper performance. The inspection is to include:

- Verification that water is not flowing under silt barriers.
- Clean and change inserts at catch basins.

8.0 CONCLUSIONS AND RECOMMENDATIONS

The overall municipal servicing strategy for the study area was contemplated as part of the *Cardinal Creek Village Master Servicing Study* (*MSS*) (DSEL, July 2013).

This Functional Servicing Report (*FSR*) (DSEL, November 2024) provides details on the planned municipal services for the study area, highlights proposed deviations from the *MSS,* and demonstrates that adequate municipal infrastructure capacity is expected to be available for the planned development of the study area.

The key features of the servicing plan for Cardinal Creek Village South are:

- Water supply is to be provided through extensions of the City's existing 2E Pressure Zone through connections to existing watermain infrastructure on Old Montreal Road and Cardinal Creek Drive. The watermain network is to be designed per the Ottawa Water Distribution Guidelines.
- Sanitary service is to be provided through gravity sewers that outlet to the existing Cardinal Creek Village Phase 4 sanitary sewer system. The sewers are to be designed in conformance with all relevant City of Ottawa and MECP Guidelines and Policies.
- Stormwater service is provided through gravity sewers that discharge to the Cardinal Creek Village Phase 4 storm sewer systems, ultimately discharging to the existing Stormwater Management Pond 1, and the proposed Stormwater Management Pond 2. The storm sewer network is to be designed per MECP & Ottawa Sewer Design Guidelines.
- Flows that are not captured by the gravity sewer system are conveyed overland to the existing and proposed stormwater management ponds. The overland flow routes are to be designed per MECP & City of Ottawa Sewer Design Guidelines.
- Stormwater Management Pond 2 will be designed to meet all quality, quantity, and erosion control criteria set in the *MSS*, as well as all relevant City of Ottawa and MECP Guidelines and Policies.
- Allowances for potential future developments adjacent to the study area have been considered in the preliminary design of the study area.

Before the detailed design of the infrastructure presented in this report, this *FSR* will require approval under the Planning Act as supporting information for the Draft Plan of Subdivision application. Project-specific approvals are also expected to be required for the infrastructure presented in this report from the City of Ottawa, Ministry of Environment, Conservation and Parks, and Rideau Valley Conservation Authority.

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Appendix A

DEVELOPMENT SERVICING STUDY CHECKLIST

4.1 General Content		
☐	Executive Summary (for larger reports only).	N/A
☐	Date and revision number of the report.	Title Page
☐	Location map and plan showing municipal address, boundary, and layout of proposed development.	Appendix A
☐	Plan showing the site and location of all existing services.	Figure 2, 3, 4
☐	Development statistics, land use, density, adherence to zoning and official plan, and reference to applicable subwatershed and watershed plans that provide context to applicable subwatershed and watershed plans that provide context to which individual developments must adhere.	Section 1.0
☐	Summary of Pre-consultation Meetings with City and other approval agencies.	Section 1.4 & Appendix A
☐	Reference and confirm conformance to higher level studies and reports (Master Servicing Studies, Environmental Assessments, Community Design Plans), or in the case where it is not in conformance, the proponent must provide justification and develop a defendable design criteria.	All sections
☐	Statement of objectives and servicing criteria.	Section 1.0 & Section 3.2, Section 4.2, and Section 5.3
☐	Identification of existing and proposed infrastructure available in the immediate area.	Sections 3.1, Section 4.1, and Section 5.1
☐	Identification of Environmentally Significant Areas, watercourses and Municipal Drains potentially impacted by the proposed development (Reference can be made to the Natural Heritage Studies, if available).	Sections 1.1
☐	Concept level master grading plan to confirm existing and proposed grades in the development. This is required to confirm the feasibility of proposed stormwater management and drainage, soil removal and fill constraints, and potential impacts to neighbouring properties. This is also required to confirm that the proposed grading will not impede existing major system flow paths.	Figure 5
☐	Identification of potential impacts of proposed piped services on private services (such as wells and septic fields on adjacent lands) and mitigation required to address potential impacts.	*Paterson Report*
☐	Proposed phasing of the development, if applicable.	N/A at FSR stage
☐	Reference to geotechnical studies and recommendations concerning servicing.	Section 1.1
☐	All preliminary and formal site plan submissions should have the following information: -Metric scale -North arrow (including construction North) -Key plan -Name and contact information of applicant and property owner -Property limits including bearings and dimensions -Existing and proposed structures and parking areas -Easements, road widening and rights-of-way -Adjacent street names	Figures

4.2 Development Servicing Report: Water		
☐	Confirm consistency with Master Servicing Study, if available	Section 3.2
☐	Availability of public infrastructure to service proposed development	MSS & Section 3.2
☐	Identification of system constraints	MSS & Section 3.2
☐	Identify boundary conditions	Appendix C
☐	Confirmation of adequate domestic supply and pressure	MSS & GeoAdvice Report

*Extracted from the City of Ottawa-Servicing Study Guidelines for Development Applications

☐	Confirmation of adequate fire flow protection and confirmation that fire flow is calculated as per the Fire Underwriter's Survey. Output should show available fire flow at locations throughout the development.	MSS & GeoAdvice Report
☐	Provide a check of high pressures. If pressure is found to be high, an assessment is required to confirm the application of pressure reducing valves.	MSS & GeoAdvice Report
☐	Definition of phasing constraints. Hydraulic modeling is required to confirm servicing for all defined phases of the project including the ultimate design	MSS & GeoAdvice Report
☐	Address reliability requirements such as appropriate location of shut-off valves	MSS & GeoAdvice Report
☐	Check on the necessity of a pressure zone boundary modification	MSS
☐	Reference to water supply analysis to show that major infrastructure is capable of delivering sufficient water for the proposed land use. This includes data that shows that the expected demands under average day, peak hour and fire flow conditions provide water within the required pressure range	MSS & GeoAdvice Report
☐	Description of the proposed water distribution network, including locations of proposed connections to the existing system, provisions for necessary looping, and appurtenances (valves, pressure reducing valves, valve chambers, and fire hydrants) including special metering provisions.	MSS, Section 3.2 & Figure 4
☐	Description of off-site required feedermains, booster pumping stations, and other water infrastructure that will be ultimately required to service proposed development, including financing, interim facilities, and timing of implementation.	MSS
☐	Confirmation that water demands are calculated based on the City of Ottawa Design Guidelines.	Section 3.2
☐	Provision of a model schematic showing the boundary conditions locations, streets, parcels, and building locations for reference.	Appendix C

4.3 Development Servicing Report: Wastewater

☐	Summary of proposed design criteria (Note: Wet-weather flow criteria should not deviate from the City of Ottawa Sewer Design Guidelines. Monitored flow data from relatively new infrastructure cannot be used to justify capacity requirements for proposed infrastructure).	Section 4.2
☐	Confirm consistency with Master Servicing Study and/or justifications for deviations.	Section 4.2
☐	Consideration of local conditions that may contribute to extraneous flows that are higher than the recommended flows in the guidelines. This includes groundwater and soil conditions, and age and condition of sewers.	MSS
☐	Description of existing sanitary sewer available for discharge of wastewater from proposed development.	Section 4.2
☐	Verify available capacity in downstream sanitary sewer and/or identification of upgrades necessary to service the proposed development. (Reference can be made to previously completed Master Servicing Study if applicable)	MSS, Section 4.2, Appendix D
☐	Calculations related to dry-weather and wet-weather flow rates from the development in standard MOE sanitary sewer design table (Appendix 'C') format.	Appendix D
☐	Description of proposed sewer network including sewers, pumping stations, and forcemains.	MSS, Section 4.2 & Appendix D
☐	Discussion of previously identified environmental constraints and impact on servicing (environmental constraints are related to limitations imposed on the development in order to preserve the physical condition of watercourses, vegetation, soil cover, as well as protecting against water quantity and quality).	MSS

*Extracted from the City of Ottawa-Servicing Study Guidelines for Development Applications

☐	Pumping stations: impacts of proposed development on existing pumping stations or requirements for new pumping station to service development.	MSS
☐	Forcemain capacity in terms of operational redundancy, surge pressure and maximum flow velocity.	N/A
☐	Identification and implementation of the emergency overflow from sanitary pumping stations in relation to the hydraulic grade line to protect against basement flooding.	MSS
☐	Special considerations such as contamination, corrosive environment etc.	MSS

4.4 Development Servicing Report: Stormwater Checklist

☐	Description of drainage outlets and downstream constraints including legality of outlets (i.e. municipal drain, right-of-way, watercourse, or private property)	Section 1.1 & Section 5.1
☐	Analysis of available capacity in existing public infrastructure.	Section 5.3
☐	A drawing showing the subject lands, its surroundings, the receiving watercourse, existing drainage patterns, and proposed drainage pattern.	Figures 10 & 11
☐	Water quantity control objective (e.g. controlling post-development peak flows to pre-development level for storm events ranging from the 2 or 5 year event (dependent on the receiving sewer design) to 100 year return period); if other objectives are being applied, a rationale must be included with reference to hydrologic analyses of the potentially affected subwatersheds, taking into account long-term cumulative effects.	MSS, Section 5.2 & *JFSA Report*
☐	Water Quality control objective (basic, normal or enhanced level of protection based on the sensitivities of the receiving watercourse) and storage requirements.	MSS & Section 5.2
☐	Description of the stormwater management concept with facility locations and descriptions with references and supporting information	Section 5.3 & Figures 2 & 8
☐	Set-back from private sewage disposal systems.	N/A
☐	Watercourse and hazard lands setbacks.	MSS, Section 1.2 & *Paterson Report*
☐	Record of pre-consultation with the Ontario Ministry of Environment and the Conservation Authority that has jurisdiction on the affected watershed.	Section 1.4
☐	Confirm consistency with sub-watershed and Master Servicing Study, if applicable study exists.	MSS, Section 5.2, Section 5.3 & Section 5.4
☐	Storage requirements (complete with calculations) and conveyance capacity for minor events (1:5 year return period) and major events (1:100 year return period).	N/A at FSR stage
☐	Identification of watercourses within the proposed development and how watercourses will be protected, or, if necessary, altered by the proposed development with applicable approvals.	Section 1.2
☐	Calculate pre and post development peak flow rates including a description of existing site conditions and proposed impervious areas and drainage catchments in comparison to existing conditions.	MSS
☐	Any proposed diversion of drainage catchment areas from one outlet to another.	MSS, Section 5.3
☐	Proposed minor and major systems including locations and sizes of stormwater trunk sewers, and stormwater management facilities.	Section 5.3, Appendix E & Figure 2
☐	If quantity control is not proposed, demonstration that downstream system has adequate capacity for the post-development flows up to and including the 100-year return period storm event.	MSS
☐	Identification of potential impacts to receiving watercourses	JFSA & GEOMorphix Reports
☐	Identification of municipal drains and related approval requirements.	N/A

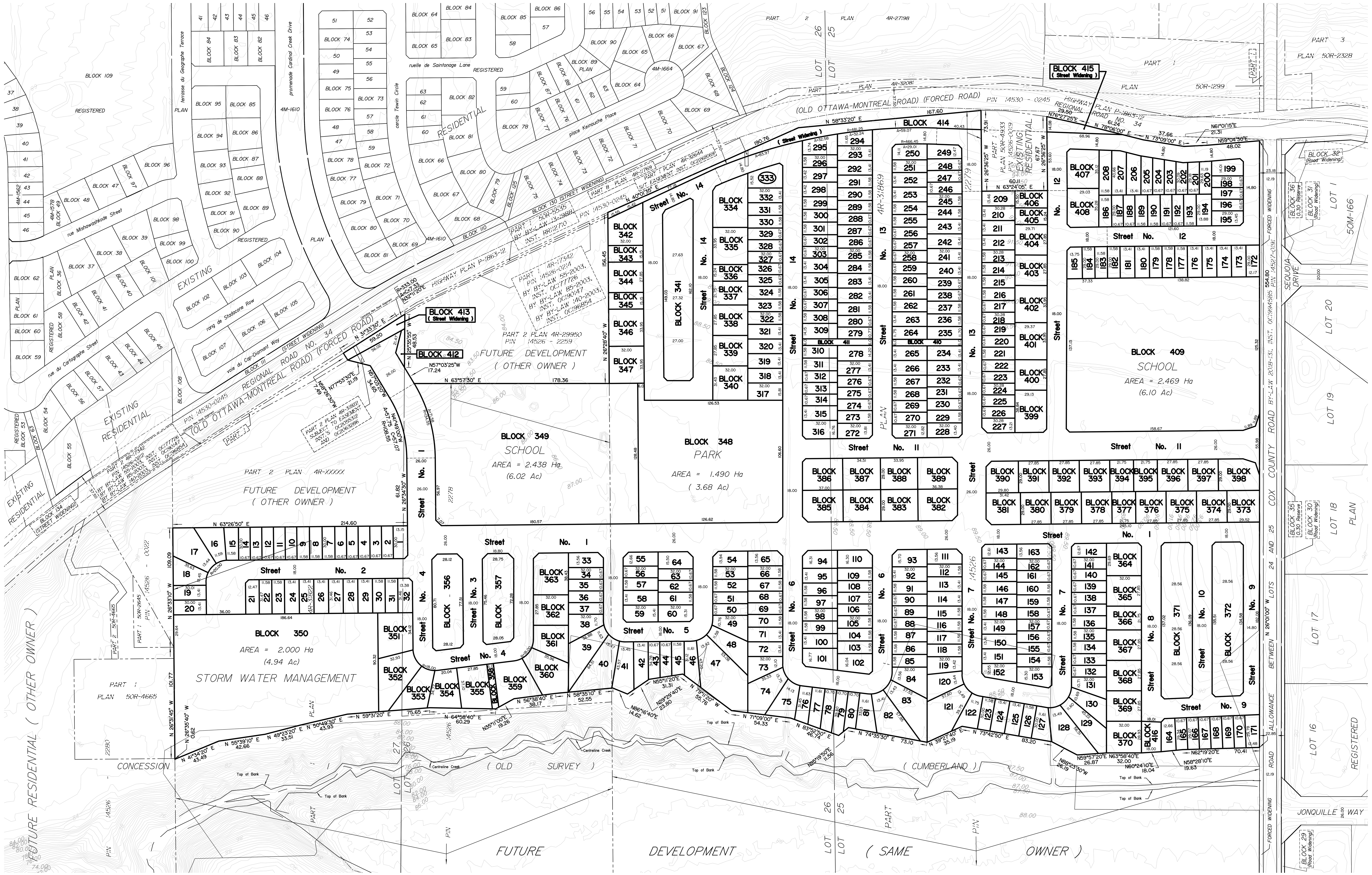
*Extracted from the City of Ottawa-Servicing Study Guidelines for Development Applications

☐	Descriptions of how the conveyance and storage capacity will be achieved for the development.	N/A at FSR stage
☐	100 year flood levels and major flow routing to protect proposed development from flooding for establishing minimum building elevations (MBE) and overall grading.	MSS
☐	Inclusion of hydraulic analysis including hydraulic grade line elevations.	*JFSA Report*
☐	Description of approach to erosion and sediment control during construction for the protection of receiving watercourse or drainage corridors.	Section 7.0
☐	Identification of floodplains – proponent to obtain relevant floodplain information from the appropriate Conservation Authority. The proponent may be required to delineate floodplain elevations to the satisfaction of the Conservation Authority if such information is not available or if information does not match current conditions.	MSS
☐	Identification of fill constraints related to floodplain and geotechnical investigation.	MSS

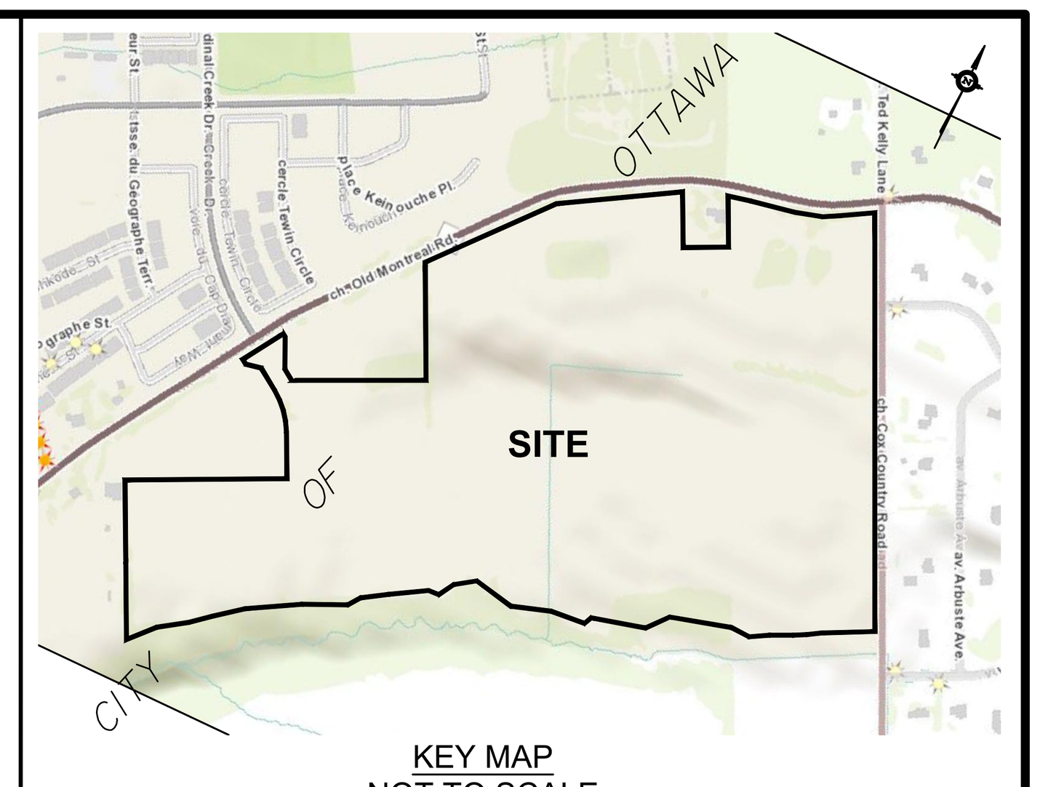
4.5 Approval and Permit Requirements: Checklist		
☐	Conservation Authority as the designated approval agency for modification of floodplain, potential impact on fish habitat, proposed works in or adjacent to a watercourse, cut/fill permits and Approval under Lakes and Rivers Improvement Act. The Conservation Authority is not the approval authority for the Lakes and Rivers Improvement ct. Where there are Conservation Authority regulations in place, approval under the Lakes and Rivers Improvement Act is not required, except in cases of dams as defined in the Act.	Section 1.3
☐	Application for Certificate of Approval (CofA) under the Ontario Water Resources Act.	N/A
☐	Changes to Municipal Drains.	N/A
☐	Other permits (National Capital Commission, Parks Canada, Public Works and Government Services Canada, Ministry of Transportation etc.)	Section 1.3

4.6 Conclusion Checklist		
☐	Clearly stated conclusions and recommendations	Section 8.0
☐	Comments received from review agencies including the City of Ottawa and information on how the comments were addressed. Final sign-off from the responsible reviewing agency.	N/A
☐	All draft and final reports shall be signed and stamped by a professional Engineer registered in Ontario	Section 8.0

*Extracted from the City of Ottawa-Servicing Study Guidelines for Development Applications



REVISION SCHEDULE			
NO.	REVISION	DATE	BY
13	REVISED CONCEPT	OCT. 17, 2024	N
12	revised with new road alignment	AUG. 15, 2024	N
11	REVISIONS	NOV. 24, 2021	N
10	REVISIONS	SEPT. 21, 2021	N
9	REVISIONS	SEPT. 15, 2021	N
8	REVISIONS	AUG. 18, 2021	N
7	REVISIONS	OCT. 14, 2020	N
5	added walkway blk 59	OCT. 5, 2020	N
4	DISCUSSION	OCT. 1, 2020	N
3	CONCEPTS		
2	CONCEPTS		
1	CONCEPTS	2020	??



KEY MAP
NOT TO SCALE

DRAFT PLAN OF SUBDIVISION OF

PART OF LOTS 25, 26 and 27
CONCESSION 1 (OLD SURVEY)
Geographic Township of Cumberland
CITY OF OTTAWA

Prepared by Annis , O'Sullivan , Vollebekk Ltd.

Scale 1 : 1500

60 45 30 15 0 30 60 Metres

Metric

DISTANCES SHOWN ON THIS PLAN ARE IN METRES AND CAN BE CONVERTED TO FEET BY DIVIDING BY 0.3048

SURVEYOR'S CERTIFICATE

I CERTIFY THAT :
The boundaries of the lands to be subdivided and their relationship to adjoining lands have been accurately and correctly shown.

_____________ Date

_____________ Jamie Leslie
Ontario Land Surveyor

OWNER'S CERTIFICATE

This is to certify that we are the owners of the lands to be subdivided and that this plan was prepared in accordance with our instructions.

_____________ Date

_____________ Chris Taggart
Tamarack Homes
I have authority to bind the corporation.

ADDITIONAL INFORMATION REQUIRED UNDER SECTION 51-17 OF THE PLANNING ACT

(a) see plan
(b) see plan
(c) see plan
(d) single and multi-family residential housing, park land, institutional and storm water management lands
(e) see plan
(f) see plan
(g) see plan
(h) City of Ottawa
(i) see soils report
(j) see plan
(k) sanitary, storm sewers, municipal water, bell, hydro, cable and gas to be available
(l) see plan

TABLE TO ILLUSTRATE PROPOSED LAND USE			
PROPOSE USE	LOTS / BLOCKS	NO. OF UNITS	AREA sqm (Ac)
SINGLE FAMILY	1 - 333	333	137 072 (33.87)
TOWNHOMES	334, 335, 337, 338, 339, 340, 342, 344, 346, 347, 351, 352, 354, 355, 359, 361-370, 373-404, 407, 408	247	55 229 (13.65)
SEMI-DETACHED	336, 343, 345, 353, 360, 405, 406	14	4 474 (1.11)
BACK 2 BACKS	341, 356, 357, 371, 372	152	17 169 (4.24)
PARK	348		14 906 (3.68)
WALKWAY	358, 410, 411		1 014 (0.25)
INSTITUTIONAL	349, 409		49 065 (12.12)
STORM WATER MANAGEMENT	350		19 997 (4.94)
STREETS	1 - 14		108 326 (26.77)
WIDENINGS	413, 414, 415		3 917 (0.97)
OTHER	412		170 (0.04)
	416		504 (0.12)
TOTAL		746	411 843 (101.76)

Ontario Land Surveyors
ANNIS, O'SULLIVAN, VOLLEBEKK LTD.
14 Concourse Gate, Suite 500
Nepean, Ont. K2E 7S6
Phone: (613) 727-0850 / Fax: (613) 727-1079
Email: Nepean@aovltd.com

Job No. 22004-20 Tamarack Pt Lts 26-27 CI OS CU DPS DI3 | N

REGIONAL ROAD NO. 34
PIN 14530 - 0245
PIN 14526-0214
PIN 14526-0019
(OLD OTTAWA-MONTREAL ROAD) (FORCED ROAD)
PROPOSED NEW ROAD ALIGNMENT FROM IBI
FORCED WIDENING
FRANK KENNY ROAD
BETWEEN LOTS 24 AND 25
ROAD ALLOWANCE
(OLD SURVEY) (CUMBERLAND)
LOT 27
LOT 26
LOT 25
BLOCK 59
SCHOOL
AREA = 2.44 Ha
(6.03 Ac)
BLOCK 58
PARK
AREA = 1.58Ha
(3.4 Ac)
BLOCK 34
SCHOOL
AREA = 2.464 Ha (6.09 Ac)
160 GALLERY TOWNS
286 TOWNS HOMES
377 SINGLES
822 TOTAL UNITS
Nov 11.14.23
COMMERCIAL BLOCK
(2.4 Ha)
BLOCK 8
AREA = 2.000 Ha
(4.94 Ac)
STORM WATER MANAGEMENT
BLOCK 60
BLOCK 645
STREET WIDENING
BLOCK 646
STREET WIDENING
BLOCK 55
BLOCK 29
BLOCK 27
BLOCK 23
BLOCK 22
BLOCK 21
BLOCK 19
BLOCK 18
BLOCK 17
BLOCK 15
BLOCK 14
BLOCK 13
BLOCK 12
BLOCK 9
BLOCK 8
BLOCK 6
BLOCK 5
BLOCK 4
BLOCK 53
BLOCK 51
BLOCK 50
BLOCK 45
BLOCK 44
BLOCK 43
BLOCK 41
BLOCK 37
BLOCK 35
Street No. 17
Street No. 15
Street No. 14
Street No. 13
Street No. 12
Street No. 10
Street No. 9
Street No. 8
Street No. 7
Street No. 6
Street No. 5
Street No. 4
Street No. 1
walkway
O/H UTILITY WIRES
ANCHOR

Braden Kaminski

From: Braden Kaminski
Sent: Wednesday, December 15, 2021 7:02 PM
To: Braden Kaminski
Subject: FW: 1153 - Summary of Pre-application Consultation Meeting - 1296 & 1400 Old Montreal Road (PC2021-0002)
Attachments: Site Plan - D07-19-17-0005.pdf; Submission Requirements ZBA,1296 & 1400 Old Montreal Road, 08 Feb 21.pdf; Pre-con Servicing Memo.docx; Submission Requirements SUBD, 1296 & 1400 Old Montreal Road, 08 Feb 21.pdf

From: Boughton, Michael [mailto:Michael.Boughton@ottawa.ca]
Sent: Tuesday, February 9, 2021 7:36 AM
To: Peter Hume <peter.hume@hpurban.ca>
Cc: Giampa, Mike <Mike.Giampa@ottawa.ca>; Young, Mark <Mark.Young@ottawa.ca>; Rehman, Sami <Sami.Rehman@ottawa.ca>; Richardson, Mark <Mark.Richardson@ottawa.ca>; Wood, Mary Ellen <MaryEllen.Wood@ottawa.ca>; Baird, Natasha <Natasha.Baird@ottawa.ca>; Michelle Taggart <mtaggart@taggart.ca>; Tim Lee <tim.lee@tamarackhomes.com>; Laura Maxwell <LMaxwell@dsel.ca>; Christopher Gordon <christopher.gordon@cghtransportation.com>
Subject: Summary of Pre-application Consultation Meeting - 1296 & 1400 Old Montreal Road (PC2021-0002)

Good morning Peter,

In follow up to our pre-application consultation meeting on 20 January 2021, I have summarized for you City staff's understanding of your proposed subdivision development along with City staff's comments and lists of the submission requirements for your future zoning amendment and draft plan of subdivision applications when you and your client decide to proceed.

PROPOSAL SUMMARY:

To briefly summarize the proposed development, Tamarack (Cardinal Creek) Corp. plans to subdivide the lands south of Old Montreal Road, excluding the "McGarry Lands", in conformity with the Cardinal Creek Village Concept Plan (2013) and to rezone the lands from "Rural Countryside" (RU), "Rural Institutional" (RI5), "Arterial Mainstreet" (AM[2139]) and "Parks and Open Space" (O1) to a range of Residential uses, Minor Institutional, Parks and Open Space, Environmental Protection and potentially commercial all in accordance with the proposed draft plan of subdivision. The proposed draft plan of subdivision would be expected to implement the policy direction of the Concept Plan, including the residential densities, projected unit targets and mix of residential uses, school allocations, parkland dedication and environmental protections. No commercial (Mainstreet) component is to be expected south of Old Montreal Road. All commercial development is to be concentrated along Highway 174 within the designated mixed-use blocks in the Concept Plan. A draft plan of subdivision in general conformity within the draft CDP preferred land use plan was not available for discussion purposes during the meeting.

STAFF COMMENTS:

1. Planning Comments.

- *Subdivision Design* – In the absence of a preliminary draft of the plan of subdivision, specific comments on the proposed draft plan of subdivision cannot be provided other than to state that Development Review staff generally would support a proposed draft plan of subdivision that is consistent with the direction of the

approved Concept Plan, Land Use and Greenspace Plans, and the Transportation Master Plan, Environmental Master Plan, Subwatershed Management Plan and Master Servicing Plan.

- A Planning Rationale is required in support of the draft plan of subdivision application. Among the usual requirements and specifications for a Planning Rationale, it is to address the conceptual Future Transit Corridor identified on Schedule D of the Official Plan and comment on how the transit corridor and subdivision will relate. The transportation consultant is advised to consult with Frank McKinney to discuss this matter, the results of which are to be contained in the Transportation Impact Assessment.
- *Concept Plan* – In addition to the above comment, it is noted the development proponents and City staff should remain aware of the directions contained in Section 6 of the Concept Plan – Implementation and Interpretation – particularly should the proposed draft plan of subdivision include what may be deemed to be a "major change" to the Concept Plan. A discussion on this matter may be necessary once City staff are provided with and have reviewed the proposed draft plan of subdivision.
- Cross-sections from Old Montreal Road through the subdivision lands at various locations along Old Montreal Road (at 1:1 scale) will be required to provide a clear demonstration of the subdivision and public road edge condition.
- It is requested that a separate plan clearly showing the pedestrian network be submitted. The plan should highlight the sidewalks within the road allowance, pathway blocks and multi-use pathways.
- The applicant is advised that the owner of 1422 Old Montreal Road has entered into an agreement with a telecommunications provider to install a 65m high monopole telecommunications antenna on his property, which may influence the planned layout of the subdivision. The site plan filed with the City showing the location of the antenna is attached for information purposes.
- *Draft New Official Plan* – For your information and as you are aware, between now and June 2021 when the new draft Official Plan is scheduled to be considered by the Joint Planning and Agriculture and Rural Affairs Committees, any development applications filed with the City will be evaluated against the existing Official Plan. Applications filed *after* the Joint Committee meeting but *before* Council's approval of the final draft Official Plan (slated for Fall 2021), will be evaluated against the policies of both the existing and final draft Official Plans. Once the new final Official Plan is in full force and effect, all development applications will be evaluated solely against the policies of the new OP.
- During the review and evaluation of the proposed Zoning Amendment Application, consideration will be given to whether the City should also initiate a rezoning of the "McGarry Lands" to run separately, but concurrent with, Tamarack (Cardinal Creek) Corp.'s zoning amendment application.

2. Parkland Comments.

- The comments provided by the City's Parks and Recreation staff are attached for your consideration and action. Should you have any questions or require clarification, please contact Mary Ellen Wood directly.

3. Natural Systems/Environmental Comments. The following comments are provided by Sami Rehman, Environmental Planner.

- The Subwatershed Study (Greater Cardinal Creek Subwatershed Management Plan, Aecom, Aug 2014) identifies:
    - the forested ravine as part of the Natural Heritage System – significant woodlands; and
    - the watercourse in the ravine is prescribed "protection" category (Fig. 2.3) – which requires a minimum setback based on the greater of (p.14):
        - Regulatory flood line
        - Geotechnical limit of hazard lands
        - 30 m from normal high water mark
        - 25 m from top of bank
        - Setback as determined through an Environmental Impact Statement
        - Setback as determined through a Drain Engineer's Report
- Schedule K of the City's Official Plan (OP) identifies the subject area as having unstable slopes.
- Schedule L1 of the OP identifies the subject area as part of the Natural Heritage System (NHS) and more specifically, it is identified as:
    - Significant Woodlands;

    - Significant Valley lands; and
    - Significant Wildlife habitat.
- The subject lands may also provide significant habitat for threatened or endangered species. Approved methodologies will be required to determine the presence/absence of potential significant habitat and specimens.
- The subject lands have a watercourse within the ravine and a watercourse traversing the property, as per the subwatershed study. The watercourse traversing the property will require a headwater features assessment, and the appropriate setbacks will be required in accordance with the subwatershed study.
- It is advised that the Rideau Valley Conservation Authority should be consulted early in the design process to determine whether any permits or approvals are required under the Regulations.
- In the absence of a proposed draft plan subdivision, the applicant is advised that a Harmful Alteration, Disruption or Destruction of Fish Habitat (HADD) authorization from the Department of Fisheries and Oceans (DFO) may be required.
- The following studies will be required in support of applications for Draft Plan of Subdivision approval and a Zoning By-law Amendment:
    - an Integrated Environmental Review (IER);
    - an Environmental Impact Statement (EIS) to cover all the items identified in the pre-application consultation meeting; and
    - a Tree Conservation Report (TCR) – for the Draft Plan of Subdivision, which can be combined with the EIS to avoid duplications.
- During the meeting the question arose whether a multi-use paths (MUPS) or other trail systems would be permitted within the ravine. While the appropriate studies will need to be completed and more detailed information presented, City staff will consider passive recreational opportunities within the ravine. However, it is strongly recommend that paved MUPs be kept out of the ravine and out of the setbacks.
- Should you have any questions or require clarification of the above matters, please contact Sami Rehman directly.

4. Forestry. The following comments are provided by Mark Richardson, Planning Forester.

1. A Tree Conservation Report (TCR) must be supplied for review along with the suite of other plans/reports required by the City.
    - An approved TCR is a requirement of draft plan of subdivision approval.
    - The TCR may be combined with the EIS.
2. As of 1 January 2021, any removal of privately- or publicly- (City-) owned trees 10cm or larger in 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.
3. The Planning Forester from Planning and Growth Management as well as foresters from Forestry Services will review the submitted TCR.
    - If tree removal is required, both municipal and privately-owned trees will be addressed in a single permit issued through the Planning Forester.
    - Compensation may be required for City-owned trees – if so, it will need to be paid *prior* to the release of the tree permit.
4. The TCR must list all trees on site by species, diameter and health condition; stands or groupings of trees may be considered together using percentages and general descriptions of tree health.
5. If trees are to be removed, the TCR must clearly show where they are and document the reason they cannot be retained.
6. 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 listed on Ottawa.ca.
    - The location of tree protection fencing must be shown on a plan.
    - If excavation is to occur within the critical root zone, please show the limits of excavation.
7. 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.

8. For more information on the process or help with tree retention options, contact Mark Richardson mark.richardson@ottawa.ca or on City of Ottawa.

5. Conservation Authority.

- Prior to submission of a formal application for draft plan of subdivision approval, a pre-application consultation with the Rideau valley Conservation Authority will be required. Please consult with Jamie Batchelor of the RVCA to determine whether any permits or approvals are required under the Regulations, as advised above, and please provide a copy of those comments to City staff.

6. Transportation/Noise. The following comments are provided by Mike Giampa, Senior Engineer, Infrastructure Applications.

- Front ending the road works for Old Montreal Road and Cardinal Creek Drive is a lengthy process that requires the submission of a functional plan and cost estimate. If there is an intent to do this work, please submit a Front Ending application to the file lead.
- The submission of a Screening Form is required. If a TIA is warranted, proceed to scoping.
    - The application for draft plan of subdivision approval 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).
    - Although a full review of the TIA Strategy report (Step 4) is not required prior to an application, it is strongly recommended. Synchro files are required with Step 4.
- The R.O.W. protection along Old Montreal Road is 37.5m, with the following exceptions specific to the south side of Old Montreal Road through the Cardinal Creek Village community, as approved by LPAT following the settlement of the outstanding appeal to Condition 50 of the approved Draft Plan of Subdivision north of Old Montreal Road.

Road	From	To	ROW to be Protected	Classification	Sector
Old Montreal Road	Trim Road	65m west of Famille-Laporte Avenue	37.5m	arterial	urban
Old Montreal Road	65m west of Famille-Laporte Avenue	65m east of Famille-Laporte Avenue	42.5m Note: Subject to unequal widening: North side 18.75m, South side 23.75m. Also, a taper on the south side extending 75m on both sides of the unequal widening is required.	arterial	urban
Old Montreal Road	65m east of	65m west of Cardinal Creek Drive	37.5m	arterial	urban

	Famille-Laporte Avenue				
Old Montreal Road	65m west of Cardinal Creek Drive	65m east of Cardinal Creek Drive	42.5m Note: Subject to unequal widening: North side 18.75m, South side 23.75m. Also, a taper on the south side extending 75m on both sides of the unequal widening is required.	arterial	urban
Old Montreal Road	65m east of Cardinal Creek Drive	East Urban Community east limit	37.5m	arterial	urban

- Geometric Road Design (GRD) drawings will be required with the first submission of underground infrastructure and grading drawings. These drawings should include such items as, but not limited to:
    - Road Signage and Pavement Marking for the subdivision;
    - Intersection control measure at new internal intersections; and
    - Location of depressed curbs and TWSIs.
- Traffic calming measures on roads are to be included within the limits of the subdivision to limit vehicular speed to 30 kph and improve pedestrian safety. These measures may include either vertical or horizontal features.
- Site triangles at the following locations on the final plan will be required:
    - Local Road to Local Road: 3 metres x 3 metres
    - Local Road to Collector Road: 5 metres x 5 metres
    - Collector Road to Collector Road: 5 metres x 5 metres
    - Collector Road to Arterial Road: 5 metres x 5 metres
- A Noise Impact Study is required.

7. Urban Design Comments. The following comments are provided by Mark Young, Senior Planner, Urban Design

- Additional comments will be provided upon receipt of a conceptual draft plan.
- A Design Brief is required for both the draft Plan of Subdivision and Zoning By-law Amendment applications. It can be combined with the Planning Rationale. The Terms of Reference document is attached.
- The Design Brief should reference the general principals of the Cardinal Creek Village Concept Plan.
- Please consider the edge conditions of the subdivision lands early on in the design process and setting of associated grades.
- Please consider sensitivities between Urban and Rural – the eastern border of the subdivision abuts existing estate lot residential development. This would not be a logical location for the highest residential densities.
- Please ensure connectivity is paramount in the community design, with linkages and visibility to the UNF to the south.
- Subject to the environmental restrictions and comments above, consider the connectivity between the subdivision and the UNF.

- If grades are a challenge along Old Montreal Road, alternatives to window streets may be considered, provided they are heavily landscaped.
- Please ensure that soil conditions, building setbacks and right-of-way cross-sections are considered early in the process to allow for tree planting.

8. Servicing Comments.

- The comments provided by Natasha Baird, Senior Engineer, are attached for your consideration and action. Should you have any questions or require clarification, please contact Natasha directly.
- The engineering related submission requirements are identified on the attached list of submission requirements.

REQUIRED PLANS AND REPORTS – SUBDIVISION:

Attached is a list of the submission requirements for the application for draft plan of subdivision approval for your action. It lists the reports and plans that are required in order to deem the draft plan of subdivision application complete. These reports focus on the above and other matters necessary for staff and circulated agencies to provide informed review and comment on the proposed application.

Please note and inform your consultants that all hard copy prints of plans are to be submitted folded on standard A1 sized (594mm x 841mm) drawing sheets, utilizing an appropriate metric scale (1:200, 1:250, 1:300, 1:400, or 1:500). All plans and reports are to be signed and stamped with professional seals (including the survey plan), as necessary.

The following link directs you to a guide for the preparation of the various required reports and plans identified above and in the attachments. All reports and plans are expected to follow these guidelines.

Guide for Preparation of Reports and Plans: https://ottawa.ca/en/planning-development-and-construction/developing-property/development-application-review-process/development-application-submission/guide-preparing-studies-and-plans

ZONING AMENDMENT SUBMISSION REQUIREMENTS:

I have also provided another list of additional submission requirements pertaining to the application to amend the Zoning By-law. In this case, it is assumed that you would file both the zoning amendment application and draft plan of subdivision applications concurrently.

APPLICATION FEES (2021 Rates):

Draft Plan of Subdivision Approval > 250 Dwelling Units:
Fee - $95,317.45, including HST
Initial Engineering Design Review & Inspection Fee - $10,000 (est. value of proposed hard and soft servicing > $300,000)
Conservation Authority Fee - $3,840.00
Total - **$109,157.45**

Zoning By-law Amendment:
Major Zoning Amendment - $21,722.94, including HST
Conservation Authority Fee - $390
Total - **$22,112.94**

Note: A 10% reduction in the planning fee component of each application type will be applied if both applications are filed concurrently.

Link to Draft Plan of Subdivision Application: https://app06.ottawa.ca/online_services/forms/ds/subdivision_en.pdf
Link to Zoning Amendment Application: https://app06.ottawa.ca/online_services/forms/ds/zoning_amendment_en.pdf

OTHER MATTERS:

It is recommended that you contact the Ward Councillor, Catherine Kitts, in advance of submitting your applications to briefly describe your proposal. Her telephone no. is 613-580-2489.

If you have any questions concerning the above information don't hesitate to contact me.

Sincerely,

Michael J. Boughton, MCIP, RPP
Senior Planner | *Urbaniste principal*
Development Review | *Examen des projects d'aménagement*
Planning, Infrastructure and Economic Development | *Service de la planification, de l'infrastructure et du développement économique*
City of Ottawa | Ville d'Ottawa
110 Laurier Avenue West, Ottawa, ON | 110, avenue Laurier Ouest (Ontario) K1P 1J1
613-580-2424, ext/poste 27588; Fax/téléc: 613-560-6006
Michael.Boughton@ottawa.ca

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MEMO

Date: February 8th, 2021

To / Destinataire	Michael Boughton, Planner
From / Expéditeur	Natasha Baird, Project Manager, Infrastructure Approvals
Subject / Objet	**Pre-Application Consultation** **Cardinal Creek Village (South) Draft Plan of Subdivision** File No. PC2021-0002

Please note the following information regarding the engineering design submission for the above noted site:

1. The Servicing Study Guidelines for Development Applications are available at the following address: https://ottawa.ca/en/planning-development-and-construction/developing-property/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)
   - ⇨ Ottawa Design Guidelines – Water Distribution (2010)
   - ⇨ Geotechnical Investigation and Reporting Guidelines for Development Applications in the City of Ottawa (2007)
   - ⇨ City of Ottawa Slope Stability Guidelines for Development Applications (revised 2012)
   - ⇨ City of Ottawa Environmental Noise Control Guidelines (January, 2016)
   - ⇨ City of Ottawa Park and Pathway Development Manual (2012)
   - ⇨ City of Ottawa Accessibility Design Standards (2012)
   - ⇨ Ottawa Standard Tender Documents (latest version)

- ⇨ Ontario Provincial Standards for Roads & Public Works (2013)

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. The Functional Servicing Design Report, for the subject site, is to be based on the 2013 Master Servicing Study for Cardinal Creek by DSEL.

5. The Macro Site Servicing Plan and the Macro Grade Control and Drainage Plan can be included in the Functional Servicing Design Report.

6. The Stormwater Management Criteria, for the subject site, is to be based on the 2013 Master Servicing Study for Cardinal Creek by DSEL.

7. Water Boundary condition requests must include the location of the service and the expected loads required by the proposed development. Please provide the following information via email (natasha.baird@ottawa.ca):

    i. Location of service

    ii. Type of development and the amount of fire flow required (as per FUS, 1999).

    iii. Average daily demand: ___ l/s.

    iv. Maximum daily demand: ___l/s.

    v. Maximum hourly daily demand: ___ l/s.

8. Phase 1 ESAs and Phase 2 ESAs must conform to clause 4.8.4 of the Official Plan that requires that development applications conform to Ontario Regulation 153/04.

9. Provide Geotechnical Study Report with settlement surcharge program as mentioned in the Master Servicing Report for Cardinal Creek Village.

10. Provide the Slope Stability Study. All development and pathways must be outside of the limit of hazard lands and respect the regulation set-backs from the Conservation Authority.

11. Provide Draft Plan of Subdivision.

12. Provide the Survey Plan.

13. This application will require Conservation Authority Pre-consultation. Please provide comments.

Should you have any questions or require additional information, please contact me directly at (613) 580-2424, ext. 27995 or by email at natasha.baird@ottawa.ca.

Parks & Facilities Planning
City of Ottawa

To / Destinataire	Michael Boughton Developer Review East	File/N° de fichier: Pre-consultation2021-0002
From / Expéditeur	Mary Ellen Wood, Planner Parks and Facilities Planning	
Subject / Objet	Draft Plan of Subdivision Cardinal Creek South - Tamarak Park Review Comments	Date: February 5 , 2021

Please find below Parks & Facilities Planning comments on the above-noted development application.

Park and Facility Planning Comments:

- PFP requests conveyances of land for parkland dedication.
- The CCV CDP contemplates two neighbhourhood parks south of Old Montreal Road. If the idea is to consolidate these parks into one larger park, please provide rationale and review parkland dedication distribution. The overall parkland dedication is to reflect the CDP parkland allocation of 10 hectares (assuming residential unit counts are similar to what is proposed in the CDP). If unit counts have increased, we will need to reassess parkland dedication.
- Requested parkland conveyance to be centrally located with two public frontages.
- Parkland dedication will not be accepted with floodplain, hazardous slopes, encumbrance etc.
- Parkland dedication will be calculated at a rate of one hectare per 300 units. For any blocks that are being developed for apartments, parkland conveyance will not exceed a maximum of 10% of the land area of the site being developed.
- Parks will reserve comments on parkland dedication until I've had a chance to review a submitted draft plan.

- As discussed at pre-consult, Creek corridor needs to be reviewed/investigated, at this time, unable to comment if creek corridor could handle a recreational trail. Lands developed with a recreational trail would be above and beyond required parkland dedication.

If you have any questions, please let me know.
Regards,
Mary Ellen Wood
Maryellen.wood@ottawa.ca

Hannah Bulmer

From: Hannah Bulmer
Sent: October 29, 2021 2:30 PM
To: 'Sarah.Szymczak@HydroOne.com'
Cc: Wade.Chapman@HydroOne.com
Subject: RE: 1153 Utility Start-Up

Hi Sarah,

Thank you for getting back to me, and forwarding my request to the distribution planner for comment.

DSEL will assume there are no external upgrades required, that capacity has been confirmed, and no further action is required on behalf of the developer until time for detailed design and construction.

Regards,

Hannah Bulmer, B.A.Sc.(Civil Eng)
Project Coordinator

DSEL
david schaeffer engineering ltd.

120 Iber Road, Unit 103
Stittsville, ON K2S 1E9

cell: (613) 898-4266
email: hbulmer@DSEL.ca

From: Sarah.Szymczak@HydroOne.com <Sarah.Szymczak@HydroOne.com>
Sent: October 28, 2021 1:03 PM
To: Hannah Bulmer <HBulmer@dsel.ca>
Cc: Wade.Chapman@HydroOne.com
Subject: RE: 1153 Utility Start-Up

Hello, Hannah;

I have sent your site plan off to Hydro One's distribution planner for comment and will forward it on as soon as received. However, I can note that Hydro One has an existing 27.6kV feeder in front of the site and has been aware of the potential for future development when assessing the previous subdivision phases. Any need for system enhancement will need to be assessed at the time of the subdivision applications as the loading details for each phase become more clear.

Thank-you;

Sarah

Sarah Szymczak (she/her)
Supervising Planning Technician
Distribution Design Services|Subdivisions|BAF
Hydro One Networks Inc.
M: 705 795 1160
420 Welham Road Barrie, ON L4N 8Z2
sarah.szymczak@hydroone.com
www.HydroOne.com

From: Hannah Bulmer [mailto:HBulmer@dsel.ca]
Sent: Thursday, October 28, 2021 10:21 AM
To: jdubeau@rci.rogers.com; CHAPMAN Wade
Cc: Laura Maxwell; Braden Kaminski; Anthony Temelini; Tim Lee; Peter Hume
Subject: RE: 1153 Utility Start-Up

Hello,

Checking in to see if you've had a chance to review the request below.

As a reminder we are hoping to get feedback by the end of day tomorrow, so that your input can be included in the draft plan of subdivision application.

Please let me know if you have any questions.

Thanks,

Hannah Bulmer, B.A.Sc.(Civil Eng)
Project Coordinator

DSEL
david schaeffer engineering ltd.

120 Iber Road, Unit 103
Stittsville, ON K2S 1E9

cell: (613) 898-4266
email: hbulmer@DSEL.ca

From: Hannah Bulmer
Sent: October 19, 2021 2:33 PM
To: d.levert@bell.ca; jdubeau@rci.rogers.com; Wade Chapman (Wade.Chapman@HydroOne.com)

<Wade.Chapman@HydroOne.com>; David Lal (David.Lal@enbridge.com) <David.Lal@enbridge.com>
Cc: Laura Maxwell <LMaxwell@dsel.ca>; Braden Kaminski <BKaminski@dsel.ca>; Anthony Temelini <ATemelini@dsel.ca>
Subject: 1153 Utility Start-Up

Hello,

We are beginning the preliminary planning of the Cardinal Creek Village South (CCV South) development, south of the existing Cardinal Creek Village development, in support of a future draft plan of subdivision application. We are reaching out on behalf of Tamarack, to gain an understanding of the general utility servicing approach at this time. As shown in the attached markup, CCV South is located south of Old Montreal Road, west of Cox County Road (formerly Frank Kenny Road), and north of the Cardinal Creek South Tributary.

CCV South is comprised of approximately 874 residential units (singles, townhouses and back-to-backs), two school blocks, a stormwater management pond, and a park block. The development will be developed in phases, which are yet to be confirmed. Both the development concept and units are likely to change throughout the development application process, however the information/numbers provided here offer a good starting point.

Servicing of this development has previously been discussed (with Hydro One, Enbridge, Rogers and Bell), as part of the 2013 Cardinal Creek Village Master Servicing Study.

There are existing overhead lines on the south side of Old Montreal Road that appear to be outside of the ROW within the subject property, that we expect will require further coordination.

It was identified in the Draft Plan of Conditions for the Cardinal Creek Village Subdivision (April 2017) that Enbridge will need to provide a 3m x 3m pressure reducing regulator station, however, the final location and size of the regulator station is to be confirmed by Enbridge.

In the future, development is planned to continue south of the proposed CCV South development and should be considered when determining a servicing strategy. Based on projected densities from the draft official plan and tamarack development statistics, we were able to predict future residential populations. Again, these values are likely to change as development advances but can be used as a starting point. Please see the attached figure for the location of surrounding future development areas, and corresponding unit projections.

In advance of our detailed utility design we are asking for you to please identify your general plan of servicing for this site, confirm that your infrastructure has capacity to service these lands, and identify any existing infrastructure on or near the site.

Please confirm if you are the appropriate contact for this project. If you are not, could you please kindly forward this email to the correct contact.

It would be greatly appreciated if you could respond to this email by next **Friday October 29**, so that your input can be included in the draft plan of subdivision application.

Feel free to contact me should you have any questions.

Thank you,

Hannah Bulmer, B.A.Sc.(Civil Eng)
Project Coordinator

DSEL
david schaeffer engineering ltd.

120 Iber Road, Unit 103
Stittsville, ON K2S 1E9

cell: (613) 898-4266
email: hbulmer@DSEL.ca

Hannah Bulmer

From: Levert, Daniel <d.levert@bell.ca>
Sent: October 21, 2021 4:08 PM
To: Hannah Bulmer
Subject: RE: 1153 Utility Start-Up
Attachments: Facilites.pdf

Hello Hannah

In regards to servicing that are we are going to need to add more facilities for sure but that is going to be added as we build each area. This is decided when we get the CUP.

I have attached where our facilities are. These are all in service. The 2 are for feeding customers homes. The one Cox County Road is a remote. (This is a major facilities for the cooper service.)

Please let is me if you have any question or concerns.

Thanks

Dan Levert
613-742-5179
Access Network Coordinator
Network Provisioning
Bell

From: Hannah Bulmer <HBulmer@dsel.ca>
Sent: Tuesday, October 19, 2021 2:11 PM
To: Levert, Daniel <d.levert@bell.ca>; jdubeau@rci.rogers.com; Wade Chapman (Wade.Chapman@HydroOne.com) <Wade.Chapman@HydroOne.com>; David Lal (David.Lal@enbridge.com) <David.Lal@enbridge.com>
Cc: Laura Maxwell <LMaxwell@dsel.ca>; Braden Kaminski <BKaminski@dsel.ca>; Anthony Temelini <ATemelini@dsel.ca>
Subject: [EXT]1153 Utility Start-Up

Hello,

We are beginning the preliminary planning of the Cardinal Creek Village South (CCV South) development, south of the existing Cardinal Creek Village development, in support of a future draft plan of subdivision application. We are reaching out on behalf of Tamarack, to gain an understanding of the general utility servicing approach at this time. As shown in the attached markup, CCV South is located south of Old Montreal Road, west of Cox County Road (formerly Frank Kenny Road), and north of the Cardinal Creek South Tributary.

CCV South is comprised of approximately 874 residential units (singles, townhouses and back-to-backs), two school blocks, a stormwater management pond, and a park block. The development will be developed in phases, which are yet to be confirmed. Both the development concept and units are likely to change throughout the development application process, however the information/numbers provided here offer a good starting point.

Servicing of this development has previously been discussed (with Hydro One, Enbridge, Rogers and Bell), as part of the 2013 Cardinal Creek Village Master Servicing Study.

There are existing overhead lines on the south side of Old Montreal Road that appear to be outside of the ROW within the subject property, that we expect will require further coordination.

It was identified in the Draft Plan of Conditions for the Cardinal Creek Village Subdivision (April 2017) that Enbridge will need to provide a 3m x 3m pressure reducing regulator station, however, the final location and size of the regulator station is to be confirmed by Enbridge.

In the future, development is planned to continue south of the proposed CCV South development and should be considered when determining a servicing strategy. Based on projected densities from the draft official plan and tamarack development statistics, we were able to predict future residential populations. Again, these values are likely to change as development advances but can be used as a starting point. Please see the attached figure for the location of surrounding future development areas, and corresponding unit projections.

In advance of our detailed utility design we are asking for you to please identify your general plan of servicing for this site, confirm that your infrastructure has capacity to service these lands, and identify any existing infrastructure on or near the site.

Please confirm if you are the appropriate contact for this project. If you are not, could you please kindly forward this email to the correct contact.

It would be greatly appreciated if you could respond to this email by next **Friday October 29**, so that your input can be included in the draft plan of subdivision application.

Feel free to contact me should you have any questions.

Thank you,

Hannah Bulmer, B.A.Sc.(Civil Eng)
Project Coordinator

DSEL
david schaeffer engineering ltd.

120 Iber Road, Unit 103
Stittsville, ON K2S 1E9

cell: (613) 898-4266
email: hbulmer@DSEL.ca

Hannah Bulmer

From: Hannah Bulmer
Sent: October 29, 2021 2:26 PM
To: 'Jeanne Dubeau'
Cc: Laura Maxwell; Braden Kaminski; Anthony Temelini; Tim Lee; Peter Hume
Subject: RE: 1153 Utility Start-Up

Hi Jeanne,

Thank you for getting back to me.

DSEL will assume there are no external upgrades required, that capacity has been confirmed, and no further action is required on behalf of the developer until time for detailed design and construction.

Regards,

Hannah Bulmer, B.A.Sc.(Civil Eng)
Project Coordinator

DSEL
david schaeffer engineering ltd.

120 Iber Road, Unit 103
Stittsville, ON K2S 1E9

cell: (613) 898-4266
email: hbulmer@DSEL.ca

From: Jeanne Dubeau <jdubeau@rci.rogers.com>
Sent: October 28, 2021 10:43 AM
To: Hannah Bulmer <HBulmer@dsel.ca>
Cc: Laura Maxwell <LMaxwell@dsel.ca>; Braden Kaminski <BKaminski@dsel.ca>; Anthony Temelini <ATemelini@dsel.ca>; Tim Lee <tim.lee@tamarackhomes.com>; Peter Hume <peter.hume@hpurban.ca>
Subject: RE: 1153 Utility Start-Up

Hi Hannah,

Please note that I will be your contact for this project.

Rogers has aerial fiber cable as well as coax cable along the south side of Old Montreal Road and I plan on servicing this new project with our Fiber to the Home technology, the exact location of our fiber feed will only be known once a cup plan is provided.

Thank you!

Regards,

Jeanne

Jeanne Dubeau
System Planner
Outside Planning & Engineering - Ottawa

Rogers Communications Canada Inc.
475 Richmond Road
Ottawa, Ontario K2A 3Y8

jeanne.dubeau@rci.rogers.com
o 613-759-8523 **m** 613-220-0853

ROGERS

From: Hannah Bulmer <HBulmer@dsel.ca>
Sent: October 28, 2021 10:21 AM
To: Jeanne Dubeau <jdubeau@rci.rogers.com>; Wade Chapman (Wade.Chapman@HydroOne.com) <Wade.Chapman@HydroOne.com>
Cc: Laura Maxwell <LMaxwell@dsel.ca>; Braden Kaminski <BKaminski@dsel.ca>; Anthony Temelini <ATemelini@dsel.ca>; Tim Lee <tim.lee@tamarackhomes.com>; Peter Hume <peter.hume@hpurban.ca>
Subject: RE: 1153 Utility Start-Up

Hello,

Checking in to see if you've had a chance to review the request below.

As a reminder we are hoping to get feedback by the end of day tomorrow, so that your input can be included in the draft plan of subdivision application.

Please let me know if you have any questions.

Thanks,

Hannah Bulmer, B.A.Sc.(Civil Eng)
Project Coordinator

DSEL
david schaeffer engineering ltd.

120 Iber Road, Unit 103
Stittsville, ON K2S 1E9

cell: (613) 898-4266
email: hbulmer@DSEL.ca

From: Hannah Bulmer
Sent: October 19, 2021 2:33 PM
To: d.levert@bell.ca; jdubeau@rci.rogers.com; Wade Chapman (Wade.Chapman@HydroOne.com) <Wade.Chapman@HydroOne.com>; David Lal (David.Lal@enbridge.com) <David.Lal@enbridge.com>
Cc: Laura Maxwell <LMaxwell@dsel.ca>; Braden Kaminski <BKaminski@dsel.ca>; Anthony Temelini <ATemelini@dsel.ca>
Subject: 1153 Utility Start-Up

Hello,

We are beginning the preliminary planning of the Cardinal Creek Village South (CCV South) development, south of the existing Cardinal Creek Village development, in support of a future draft plan of subdivision application. We are reaching out on behalf of Tamarack, to gain an understanding of the general utility servicing approach at this time. As shown in the attached markup, CCV South is located south of Old Montreal Road, west of Cox County Road (formerly Frank Kenny Road), and north of the Cardinal Creek South Tributary.

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Servicing of this development has previously been discussed (with Hydro One, Enbridge, Rogers and Bell), as part of the 2013 Cardinal Creek Village Master Servicing Study.

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It would be greatly appreciated if you could respond to this email by next **Friday October 29**, so that your input can be included in the draft plan of subdivision application.

Feel free to contact me should you have any questions.

Thank you,

Hannah Bulmer, B.A.Sc.(Civil Eng)

Project Coordinator

DSEL
david schaeffer engineering ltd.

120 Iber Road, Unit 103
Stittsville, ON K2S 1E9

cell: (613) 898-4266
email: hbulmer@DSEL.ca

Hannah Bulmer

From: David Lal <David.Lal@enbridge.com>
Sent: October 20, 2021 9:37 AM
To: Hannah Bulmer
Subject: RE: 1153 Utility Start-Up
Attachments: Atlas Plot_Old Montreal Rd.PDF

Morning Hannah,
There is an existing 6" plastic gas main on the North side of Old Montreal Rd at Laporte Ave and 4" plastic gas main at the intersection of Old Montreal Rd and Cox Country Rd. I see no capacity issues with servicing the developments as they progress. Both gas mains mentioned operate at intermediate pressure. A district station (pressure reducer) is not required.

David

David Lal
Connections Representative
Customer Connections
ENBRIDGE GAS
TEL: 613-748-6764
david.lal@enbridge.com
400 Coventry Rd, Ottawa, On, K1K 2C7
enbridge.com
Safety. Integrity. Respect. Inclusion.

From: Hannah Bulmer <HBulmer@dsel.ca>
Sent: Tuesday, October 19, 2021 2:11 PM
To: d.levert@bell.ca; jdubeau@rci.rogers.com; Wade Chapman (Wade.Chapman@HydroOne.com) <Wade.Chapman@HydroOne.com>; David Lal <David.Lal@enbridge.com>
Cc: Laura Maxwell <LMaxwell@dsel.ca>; Braden Kaminski <BKaminski@dsel.ca>; Anthony Temelini <ATemelini@dsel.ca>
Subject: [External] 1153 Utility Start-Up

Hello,

We are beginning the preliminary planning of the Cardinal Creek Village South (CCV South) development, south of the existing Cardinal Creek Village development, in support of a future draft plan of subdivision application. We are reaching out on behalf of Tamarack, to gain an understanding of the general utility servicing approach at this time. As shown in the attached markup, CCV South is located south of Old Montreal Road, west of Cox County Road (formerly Frank Kenny Road), and north of the Cardinal Creek South Tributary.

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There are existing overhead lines on the south side of Old Montreal Road that appear to be outside of the ROW within the subject property, that we expect will require further coordination.

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In the future, development is planned to continue south of the proposed CCV South development and should be considered when determining a servicing strategy. Based on projected densities from the draft official plan and tamarack development statistics, we were able to predict future residential populations. Again, these values are likely to change as development advances but can be used as a starting point. Please see the attached figure for the location of surrounding future development areas, and corresponding unit projections.

In advance of our detailed utility design we are asking for you to please identify your general plan of servicing for this site, confirm that your infrastructure has capacity to service these lands, and identify any existing infrastructure on or near the site.

Please confirm if you are the appropriate contact for this project. If you are not, could you please kindly forward this email to the correct contact.

It would be greatly appreciated if you could respond to this email by next **Friday October 29**, so that your input can be included in the draft plan of subdivision application.

Feel free to contact me should you have any questions.

Thank you,

Hannah Bulmer, B.A.Sc.(Civil Eng)
Project Coordinator

DSEL
david schaeffer engineering ltd.

120 Iber Road, Unit 103
Stittsville, ON K2S 1E9

cell: (613) 898-4266
email: hbulmer@DSEL.ca

CITY AND RVCA COMMENTS				
Issued By		**Comment**	**Party**	**Response**
1. ENGINEERING				
Functional Servicing Report Cardinal Creek Village South prepared by DSEL, Project No 19-1153, dated June 2022. Cardinal Creek Village South – **Preliminary Stormwater Management Plan and Stormwater Management Facility Design** prepared by JFSA dated December 21, 2021 **Associated Model and Drawings**				
12	**City**	The report refers to a permissible grade raise of 2.5m for roads in areas where there is silty clay. However, this is not indicated in the Geotechnical Report submitted. Please clarify.	Paterson / DSEL	Section 5.3 of the updated Geotechnical Report details the permissible grade raise of 2.5m.
13	**City**	Update table 3 and the geoAdvice report with the maximum daily and peak hour demand provided in the City of Ottawa Water Distribution Guidelines. Please also update table 4 accordingly	DSEL	Tables 3 and 4 have been updated for consistency with the latest boundary condition request prepared by GeoAdvice and provided to the City.
14	**City**	The development concept section refers to 168 proposed back-to-back townhomes while 160 townhomes are considered in the water demand calculations	Tamarack / DSEL	There are now 152 proposed back-to-back townhomes. This update is reflected in both the FSR and the water demand calculations.
15	**City**	Please ensure the water demands in the report match those in the GeoAdvice report provided in the Appendices	DSEL	Updated water demands have been coordinated with GeoAdvice for consistency.
16	**City**	Update the reference in the last paragraph before table 5	DSEL	Noted, the reference has been updated in the revised report.
17	**City**	The existing Cardinal Creek Master Servicing Study doesn't include the expansion areas south of the south tributary. There haven't been any studies specific to those areas to establish development restrictions and setbacks or development concept validated through the current Master Servicing Study. There must be a Master Servicing Study for the expansion areas to determine the preferred servicing strategy and impacts to infrastructure approved for CCV	DSEL	The existing Cardinal Creek Master Servicing Study does consider a 23.3 Ha expansion area south of the South Tributary, however, the comment is noted as the urban expansion area has expanded since the time of the MSS. The urban expansion area located south of the South Tributary will undergo an independent study to confirm the preferred servicing strategy for these lands. In order to avoid removing a potential servicing alternative for these lands, the preliminary design for CCV South has considered potential future water demands and wastewater flows.
18	**City**	Please review the City of Ottawa technical bulletin ISDTB-2021-03. Two feeds are now required in areas where there are more than 50 units. Please update section 5.1 of the GeoAdvice Report accordingly	DSEL	Noted.
19	**City**	The property servicing blocks will eventually be City property and not easements. To avoid confusion, please remove the label easements and only specify the width of the blocks	DSEL	Noted, the servicing figures have been updated accordingly.
20	**City**	Based on the proposed sanitary design sheet, the total flow to existing MH2000A is 92.16 l/s instead of 89.32l/s indicated in the report	DSEL	The revised total flow to existing MH2000A excluding external contributions is 89.32 L/s. Both the sanitary design sheet and FSR have been updated accordingly.
21	**City**	Please confirm the size of servicing block 1. It seems that services are only crossing the block. Please clarify the need for servicing block 1.	DSEL	The sizing of all servicing blocks has been added to the appropriate figures.
22	**City**	Please move MH89 A to the end of street 2 to the frontage of the 1 st lot to ensure direct connection to the sanitary sewer	DSEL	Comment no longer applies as the proposed street layout has been updated. Please note that the servicing figures included as part of the FSR are intended to demonstrate the preliminary servicing design strategy. As part of the detailed design for the development, the lengths of all pipes will be refined to ensure that connections are provided for all homes.

23	**City**	Please clarify the need for the sanitary sewer between MH49A and MH51A on street 17	DSEL	This portion of sanitary sewer along Street 17 has been removed.
24	**City**	Please extend MH30A to the upper lot frontage (entire lot frontage) on street 15	DSEL	The sanitary sewer on Street 15 has been extended along the entire lot frontage.
25	**City**	Servicing block 5 should extend to street 12	DSEL	Update made as requested.
26	**City**	Please clarify the need for two separate connections from street 19 to street 15	DSEL	Comment no longer applies as the proposed street layout has been updated.
27	**City**	Provide two separate servicing blocks to street 15 where the label servicing block 4 is shown	DSEL	Comment no longer applies as the proposed street layout has been updated.
28	**City**	Please clarify the need for the additional public watermain along servicing block 3 to the school block	DSEL	Comment no longer applies as the proposed street layout has been updated.
29	**City**	Please label the servicing blocks provided for the watermain from street 17 to street 13	DSEL	Update made as requested.
30	**City**	Please ensure the stormwater management criteria also adhere to the criteria set in the 2014 Greater Cardinal Creek Subwatershed Management Plan. Include details under the stormwater criteria section	DSEL	The stormwater management criteria outlined in the FSR adhere to the criteria set in the 2014 Greater Cardinal Creek Subwatershed Management Plan. Details have been included under the FSR stormwater criteria section.
31	**City**	According to the storm servicing plan and model, the storm sewers that drain to Pond 2 appear to be designed to handle up to a 2-year storm in most areas and up to a 5-year storm on Street 1 and Street 12. Conversely, the storm sewers that drain to Pond 1 seem to be designed to handle up to a 100-year storm. As the drainage boundary for Pond 1 and Pond 2 split at the intersection of Street 1 and Street 12, it is unclear whether the proposed network starting from MH-102 can capture the 100-year flow and discharge it to Pond 1. If it cannot, please explain how the grading can retain the major flows above the 5-year design flows (at the Street 12 and Street 1 intersection) without spilling to Pond 2 sub catchment. Consider moving the high point on Street 1 further away from the Street 12 intersection to ensure that slows from Street 12 are directed south and don't cut the corner to drain north	DSEL	The proposed CCV South storm sewers in the Pond 1 catchment have been sized for the 100-year flow as shown on the latest design sheets included in the FSR. The high point on Street 1 has been shifted further from Street 12 as requested and there is a 0.3m buffer between the elevation at the Street 1/12 intersection and the Street 1 high point. Detailed major system modeling will be prepared as part of the detailed design to confirm the Pond 2 major system does not spill to the Pond 1 catchment.
32	**City**	Were the storm sewers on Cardinal Creek Drive size to take the 100-year storm in the minor system from the Pond 1 catchment area of the development?	DSEL	Per the Phase 4 Stormwater Management Report (Dated December 2013 and updated October 2017), the sewers in Cardinal Creek Drive were sized to take the 100-year flow in the minor system from the Pond 1 catchment area in CCV South to prevent flow across an arterial road. As part of JFSA's latest modeling and reporting, capacity within the downstream Pond 1 sewer network has been reviewed and confirmed.
33	**City**	If there are spills between the drainage boundaries for Pond 1 and Pond 2, please explain the impact on the receiving SWM Pond 1. A simple comparison of existing A x C in Master Study and current design may not be sufficient to illustrate the impact to the proposed Pond 1. Is the existing 1350mm storm sewer sufficient to convey the 100-year runoff from the 6.29ha sub catchment plus any overflows from the boundary areas?	JFSA	A preliminary analysis of the existing Cardinal Creek Village (CCV) development storm sewer network and Pond 1 was undertaken during the FSR updates as described in the updated memo. The ultimate Pond 1 DDSWMM & XPSWMM models were updated based on the latest Cardinal Creek Village South (CCVS) drainage areas. Based on this preliminary analysis, it was found that under ultimate conditions, the existing storm sewer network to Pond 1 has sufficient capacity to accomodate the proposed 12.03 ha of drainage area south of Old Montreal Road with an overall imperviousness of 64% with minimal impacts on the 100-year HGL across the existing development. Additionally, based on the availabe design pond information, the proposed Pond 1 permanent pool, quality control and extended detention storage volumes are sufficient to provide quality treatment for the existing and proposed developments under ultimate conditions, including part of the CCVS development. Note that the analysis of Pond 1 under 100% blockage of the outlet controls, as well as the two sensitivity tests shown in the December 2018 "*Design Brief for the Interim Stormwater Management Pond 1 for Phases 1 to 5 in Cardinal Creek Village*" are being re-evaluated based on the changes in drainage area to SWM Pond 1 as detailed in the memo. These evaluations are expected to be supplemented with as-built information of Pond 1 when it becomes available. A detailed analysis of the HGL within the existing Cardinal Creek Village development, Pond 1 operation and peak flows to the existing culvert under Highway 174 will be prepared at the detailed design stage of CCVS to confirm if the existing storm sewer network, Pond 1 and culvert are sufficiently sized.
34	**City**	In the pond drainage plan in the FSR, there is an external catchment west of Street 2 with an area of 0.68 hectares that drains into Pond 1. The DSEL report stated that the area would continue to drain to Pond 1 even after redevelopment. Please confirm that this area is included in the Table 11 calculation (i.e. the 6.97 hectares). The text should be updated to clearly indicate that this area has been included. In addition, how will drainage from this land under future development get to Pond 1. Will it be conveyed via Street 2?. We note that the Pond Drainage Area Plan in the Preliminary SWM report by JFSA does not include this 0.68 hectare external area. Please ensure plans are coordinated.	JFSA	The 0.68 ha was part of subcatchment B324OS1 in the January 2020 SWM Report for Phases 5 and 6 of Cardinal Creek Village and respective DDSWMM & XPSWMM models. However, the drainage areas south of Old Montreal Road have been updated in the preliminary analysis mentioned in the response of Comment #33 above. Therefore, the 0.68 ha subcatchment is now accounted for according to the latest drainage areas provided by DSEL in the updated ultimate conditions modelling and will be carried on during the detailed design stage of CCVS and the existing development storm sewer network & Pond 1 analysis.
35	**City**	Section 5.3.2 of the FSR indicates that the drainage area from SWM Pond 2 has decreased from the original MSS study design. Could you please explain the reason for the change in the design drainage area and where the 1-ha difference is draining to?	DSEL	There are several contributing factors to the Pond 2 drainage area changing since the time of the MSS. The main factors are the revised erosion thresholds within the South Tributary restricting the allowable pond outflow and changes to the CCV South development concept, partially due to refined setbacks from the South Tributary.

<table>
<tr>
<td></td>
<td></td>
<td>The JFSA report has stated that the PCSWMM imported flow to each manhole node is estimated to be 14% higher than the calculated flows using the rational method, considering different LOS requirements. This increase is intended to account for the additional water head above the ICD in the 100-year event. Could you please provide a sensitivity analysis to demonstrate that the 14% increase is an appropriate number for the evaluation of the HGL's? Recent JFSA designs all show differences between design pipe flows and 100 year flows much higher than 14%.</td>
<td></td>
<td>The rationale for the 14% increase is based on the ICD/Lead pipe capacity for an assumed head of 1.20m (1.20m depth between the top of CB and the centre of the ICD/Lead pipe) for the required level of service and the ICD/Lead pipe capacity for a head of 1.55m (1.20m depth between the top of CB and the centre of the ICD/Lead pipe + 0.35m maximum allowed ponding depth on top of the CB) during the 100-year event. The higher differences between the design pipe flows and the 100-yr flows mentioned in the comment could be attributted to rear yard areas that in some cases drain directly to the storm sewers without being controlled by the ICDs or in some cases they could be attributted to the greater difference in the water head in the CBs, as the ICDs applied to the detailed design models are City of Ottawa standard sizes and not custom sizes, which often result in a greater head water differencial between the design event and the 100-year event, as the water level is often below the top of the CBs, not reaching the assumed 1.20m head for the design event, but typically closer to the maximum allowable water depth on the road/street during the 100-year event.

To conservatively estimate the appropriate flow increase for this development, a simplified calculation of the 2-/5-year flows was undertaken using the Rational Method to estimate the design flows excluding the rear yard drainage areas and assuming that the rear yard areas would have 100-year capture into the storm sewers. The total 2-/5-year flow excluding the rear yards, increased by 14% to account for the increased flows during the 100-year event on the front yards and roads/streets was added to the 100-yr rear yard flows. The result was then divided by the 2-/5-year design flow for the entire development, resulting in an increase of approximately 35% in flows. Please refer to the screenshot showing these calculations.
Note that the HGL elevations in the storm sewers presented in this study are only preliminary and both the pipe sizes and HGL elevations will be confirmed in the detailed design stage.</td>
</tr>
<tr>
<td>36</td>
<td>City</td>
<td></td>
<td>JFSA</td>
<td>Total Drainage Area to Pond 2 (Excludes Pond Block)
<table>
<tr><th colspan="2">2-yr</th><th colspan="2">5-yr</th><th>TC</th><th>2-yr Intensity</th><th>5-yr Intensity</th><th>Flow</th></tr>
<tr><th>Area (ha)</th><th>RC</th><th>Area (ha)</th><th>RC</th><th>(min)</th><th>(mm/hr)</th><th>(mm/hr)</th><th>(L/s)</th></tr>
<tr><td>26.66</td><td>0.68</td><td>4.02</td><td>0.69</td><td>26.45</td><td>43.53</td><td>58.67</td><td>2648</td></tr>
</table>
Drainage Areas Excluding Rear Yards
<table>
<tr><th colspan="2">2-yr</th><th colspan="2">5-yr</th><th>TC</th><th>2-yr Intensity</th><th>5-yr Intensity</th><th>Flow</th><th>Flow + 14%</th></tr>
<tr><th>Area (ha)</th><th>RC</th><th>Area (ha)</th><th>RC</th><th>(min)</th><th>(mm/hr)</th><th>(mm/hr)</th><th>(L/s)</th><th>(L/s)</th></tr>
<tr><td>17.33</td><td>0.68</td><td>4.02</td><td>0.69</td><td>26.45</td><td>43.53</td><td>58.67</td><td>1880</td><td>2143</td></tr>
</table>
Rear Yard Drainage Areas
<table>
<tr><th colspan="2">100-yr</th><th>TC</th><th>100-yr Intensity</th><th>Flow</th></tr>
<tr><th>RY Area (ha)</th><th>RC</th><th>(min)</th><th>(mm/hr)</th><th>(L/s)</th></tr>
<tr><td>9.33</td><td>0.55</td><td>26.45</td><td>100.02</td><td>1427</td></tr>
</table>
(2-/5-yr Flow +14%) + 100-yr RY Flow

2143 L/s + 1427 L/s = 3570 L/s

(2-/5-yr Flow +14% + 100-yr RY Flow) / (2-/5-yr Flow)

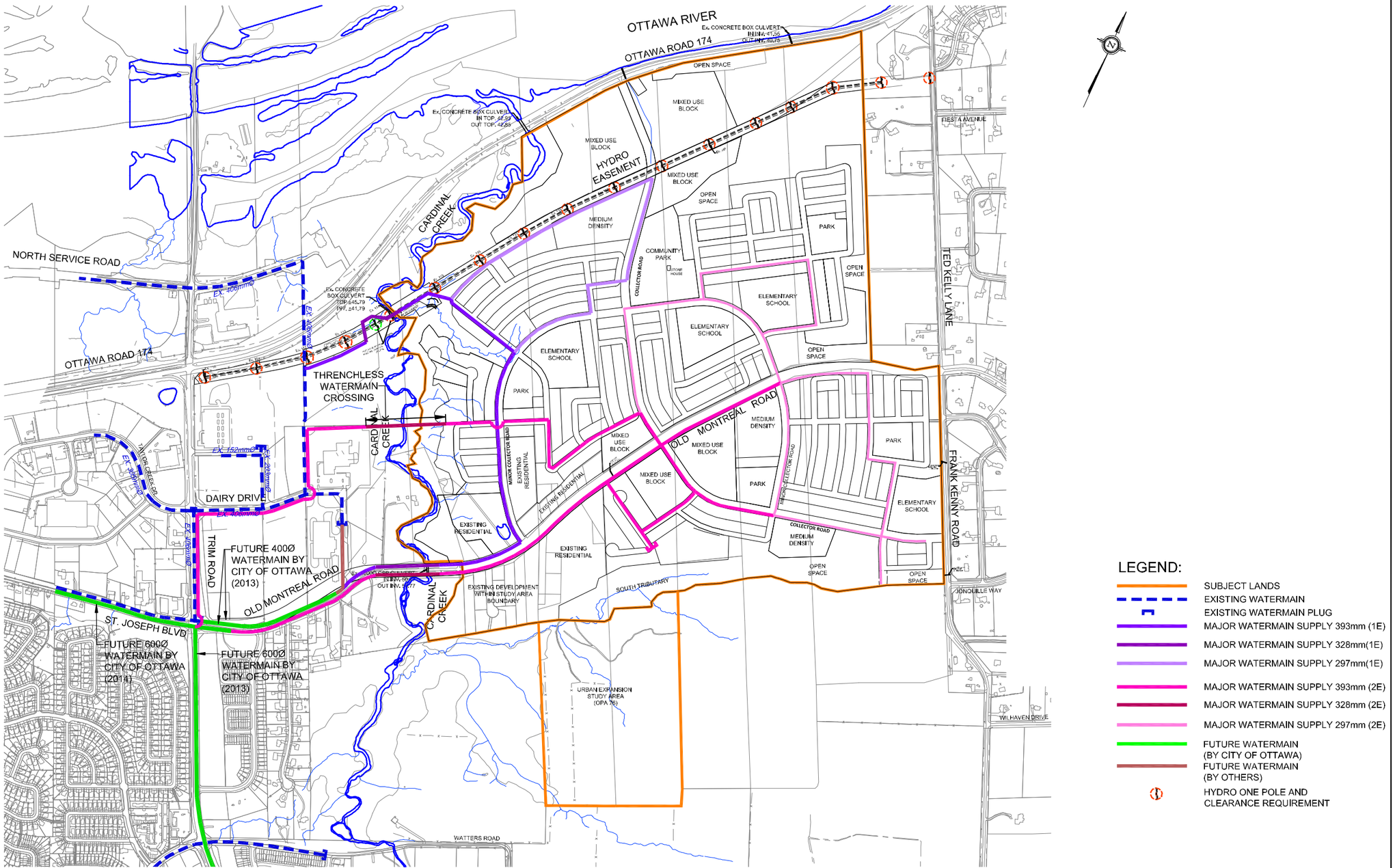
3570 L/s / 2648 L/s = 135%

Note: Analysis assume that rear yard areas make up for 35% of the total drainage area to Pond 2.</td>
</tr>
<tr>
<td>37</td>
<td>City</td>
<td>The grading plans shows the 100-year HGL for Cardinal Creek is 52.83m at XS 881.4, however, the 100-year HGL for the XS before and after XS 881.4 is 74.04m and 73.30m, respectively. Please confirm if the 52.83m 100-year HGL is correct.</td>
<td>DSEL</td>
<td>Update made as requested. The correct 100-year water level at cross-section 881.4 is 73.64m.</td>
</tr>
</table>

38	**City**	In reference to the JFSA report Attachment A Table A-2, which presents a comparison of pre- and post-development flow at the existing Pond 2 Outlet, the existing condition flows are area-weighted, as indicated by the reported existing flow from the AECOM Greater Cardinal Creek Sub watershed Study. Kindly provide a relevant excerpt from the background study to authenticate the reported existing flow values. As per the MSS please verify that minimum exceedance of 5% critical flow 430 l/s. Please provide a comparison of the pre to post hydrographs up to and including the 2 year storm. Criteria states they must match which implicitly means no increase in runoff volume	JFSA	The existing outflows/allowable release rates shown in Table A-2 of the memo are as per the approved DSEL's July 2013 "*Master Servicing Study for Cardinal Creek Village* " (MSS report). The memo text has been updated to provide more details. Regarding the critical flow mentioned in the comment, it is important to note that the erosion thresholds identified in the June 2013 memo have been updated during the preparation of the updated FSR design/SWM memo based on field work conducted by Geo Morphix Ltd. The continuous SWMHYMO erosion model was re-run based on the drainage area changes to Pond 2 and the updated erosion thresholds provided by Geo Morphix. Also, due to coordination that occurred during updates to the FSR design, the total proposed drainage area to Pond 2 used in the continuous erosion model updates (33.20 ha) was larger than the total proposed drainage area that will actually drain to Pond 2 (32.54 ha) as per DSEL's latest design, which is conservative considering that the pond size has not changed based on the drainage area reduction and the pond release rates to the South Tributary are now slightly less than the ones assumed in the updated continuous erosion model. The hydrographs generated by the updated continuous erosion model were provided to Geo Morphix and they subsequently prepared a preliminary erosion analysis. Based on Geo Morphix's preliminary erosion analysis results, it is anticipated that the proposed post-development scenario is acceptable from an erosion perspective. A detailed erosion analysis will be prepared in the detailed design stage of CCVS. The memo text has also been updated to include this information.
40	**City**	Please provide a subcatchment delineation plan to support the calculation, as the JFSA report Cox Culvert analysis indicated that an area of 74.30 hectares is draining to the 900 mm concrete culvert located under Cox Country Road.	DSEL	Please see Figure 11 of the revised FSR.
42	**City**	Additional monitoring of south tributary was referenced in the report. This was a requirement before detail design of pond 2. Where do we find this additional monitoring information? The MSS also indicated that InfraRed camera inspection was supposed to be taken during spring time to see if there is groundwater contribution to base flow	DSEL	Paterson Group, who originally mentioned the InfraRed inspection as part of MSS, has reviewed the MSS, existing conditions report and water budget for the development and advised that the information included in theses reports is sufficient and no additional monitoring is necessary.
44	**City**	A water budget is required. There appears to be opportunities in some areas for more than just rear yard pipes.	DSEL / Tamarack	A site-specific water budget was completed as part of the MSS, the *Site-Specific Water Budget Report - Cardinal Creek Village Development* (PECG, July 2013). Per the approved report, Low Impact Development (LID) measures are not required within CCV South to increase groundwater contribution to the South Tributary.
46	**City**	Provide a profile of the pond outlet pipe. Outlet pipe from pond should be extended to the creek channel and be oriented so it does not cause erosion on the opposite bank.	DSEL	A preliminary cross-section of the entire pond, including the outlet pipe, can be found in Figure 9 of the revised FSR.
47	**City**	Table 10 SWM report. Should the HGL clearance be from usf or building opening? The SYMHMO model plus PCSWMM were used.	JFSA	As mentioned in the SWM memo, USF elevations are not available at this stage and it has been assumed that they would be 1.90m below the top of MH/road elevation. Therefore, Table C1 of the SWM report shows the freeboard between the HGL and the top of MH. This will be updated in the detailed design stage once USF elevations are available for the development and the freeboard between the HGL and USF elevations can be verified in detail.
48	**City**	There are some steep pipes. Please note that if d/D is less than 0.4 then the actual velocity not full pipe velocity must be calculated.	DSEL	The actual velocity for all sanitary sewer segments can be found in the sanitary design sheets.
49	**City**	It appears that the lumped SWMHYMO modeling assumes no storage on the streets. Is there proposed surface storage on the roads? What about on the blocks? Storage requirements and release rates for Blocks should be indicated on the plan. A little more explanation on the lumped modeling would help answer some questions.	DSEL	At this design stage, no surface storage on the streets is available and is not accounted for in the modelling. The lumped SWMHYMO model is considered conservative and used to preliminarily determine the required Pond 2 volumes and verify its operation. A detailed PCSWMM model will be built in the detailed design stage to evaluate the minor and major systems within the development, as well as the operation of Pond 2.

51	**City**	Can't find the modeling that corresponds to the extended detention numbers in table A-2. It is not expected that the extended detention will provide much reduction in flows for the quantity events 2 years and greater. Therefore pond storage for 2 to 100 year should all have 8282 cu.m. added to the volume. The 2 year requirement would then be 17,414 cu.m. etc.	DSEL	As mentioned in the SWM memo, the extended detention volume is based on the 25mm storm runoff volume obtained by the SWMHYMO model, with a drawdown time of 96 hours as per the approved DSEL's July 2013 "*Master Servicing Study for Cardinal Creek Village* " (MSS report).
2. RVCA				
Page 4	**RVCA**	the conditions in the South Tributary have changed due to continuing erosion and slope failures observed. Given the evidence of changing conditions, it is the Conservation Authority's opinion that the assumptions and conclusions made in the MSS cannot be relied on without further investigation.	DSEL	Noted, GEOMorphix is has prepared an updated erosion analysis for the South Tributary provided under separate cover. The results of this analysis have been incorporated into the revised DSEL preliminary design.
Page 4	**RVCA**	Specifically, the geomorphological condition of the South Tributary needs to be fully understood, including the impacts downstream once a stormwater management outlet is constructed.	Paterson DSEL Geomorphix	Noted. See above response.
Discussion topic 3 - Functional Servicing Report for Tamarack (Cardinal Creek) Corporation				
1.a	**RVCA**	The minor and major system flows from a 6.29 ha portion of the study area are planned to be directed to the existing Stormwater Management Pond 1.	DSEL	Note, the area directed to Pond 1 has been updated to 12.03 Ha total as part of the latest preliminary design.
1.b	**RVCA**	The minor and major system flows from a 38.08 ha portion of the study area are planned to be directed to the proposed Stormwater Management Pond 2, which is to be located in the southwest corner of the study area and outlets to the Cardinal Creek South Tributary.	DSEL	Note, the area directed to Pond 2 has been updated to 32.54 Ha total as part of the latest preliminary design.
1.c	**RVCA**	Rear yards backing onto the Cardinal Creek South Tributary are to drain directly into the watercourse. The erosion threshold of the South Tributary is to be respected during the detailed design of the study area.	DSEL	Noted. The rear-yard areas proposed to drain directly to the South Tributary have been considered in the latest GEOMorphix erosion analysis.
1.d	**RVCA**	Additional culverts will be required on Cox Country Road and Old Montreal Road to accommodate road connections and maintain drainage patterns. Sizing of these culverts will be confirmed as part of detailed design.	DSEL	The need for additional culverts on Cox Country Road and Old Montreal Road has been included in the existing stormwater drainage section 5.1 of the FSR and sizing will be confirmed as part of detailed design.
2	**General comments regarding stormwater management from natural hazard perspective:**			
a.	**RVCA**	a. Assuming all of the supporting documentation are valid, the Stormwater Management design concept is acceptable to the RVCA. As mentioned, however, in Discussion Topic (1)(h) above, it is important to avoid directing water and discharging it in an uncontrolled manner towards the slopes that back into Cardinal Creek South Tributary.	DSEL	Noted.
b.	**RVCA**	b. The RVCA relies on the City to review the minor system design.	City	Noted.
Cardinal Creek Village South Side – Headwater Drainage Features Assessment" dated March 2021., prepared by Bowfin Environmental Consulting Ltd., and offer the following comments from an O. Reg 174/06 regulatory perspective:				
	RVCA	The mitigation measures as outlined in the mitigation section on pages 22 and 23 shall be implemented and incorporated into the stormwater management design.		Per page 22 of the Headwater Drainage Features Assessment, only the very downstream end of the North Channel comes out as Mitigation, and since the treed valley of the South Tributary is to be protected as part of the development setbacks, no additional measures are needed. This information has been added to section 5.3.2 of the FSR.
7. PLANNING				
7.5	**City**	The future neighbourhood overlay applies to the lands south of the creek. Per section 5.6.2 entitled Future Neighbourhood Overlay and Section 12 entitled Local Plans, a community design plan and several studies are required before proposed development can proceed in expansion areas. Therefore, the servicing stubs that are currently proposed, see section 1 of comment letter, are premature and should be removed until further planning processes occur.	DSEL	See City Comment 17.
10.1. BELL CANADA				
	Bell	Upon receipt of this comment letter, the Owner is to provide Bell Canada with servicing plans/CUP at their earliest convenience to planninganddevelopment@bell.ca to confirm the provision of communication/telecommunication infrastructure needed to service the development.	Tamarack / DSEL	Noted, the servicing plans and CUP will be provided to Bell as part of the detailed design stage.

Appendix B



LEGEND:

- SUBJECT LANDS
- EXISTING WATERMAIN
- EXISTING WATERMAIN PLUG
- MAJOR WATERMAIN SUPPLY 393mm (1E)
- MAJOR WATERMAIN SUPPLY 328mm(1E)
- MAJOR WATERMAIN SUPPLY 297mm(1E)
- MAJOR WATERMAIN SUPPLY 393mm (2E)
- MAJOR WATERMAIN SUPPLY 328mm (2E)
- MAJOR WATERMAIN SUPPLY 297mm (2E)
- FUTURE WATERMAIN (BY CITY OF OTTAWA)
- FUTURE WATERMAIN (BY OTHERS)
- HYDRO ONE POLE AND CLEARANCE REQUIREMENT

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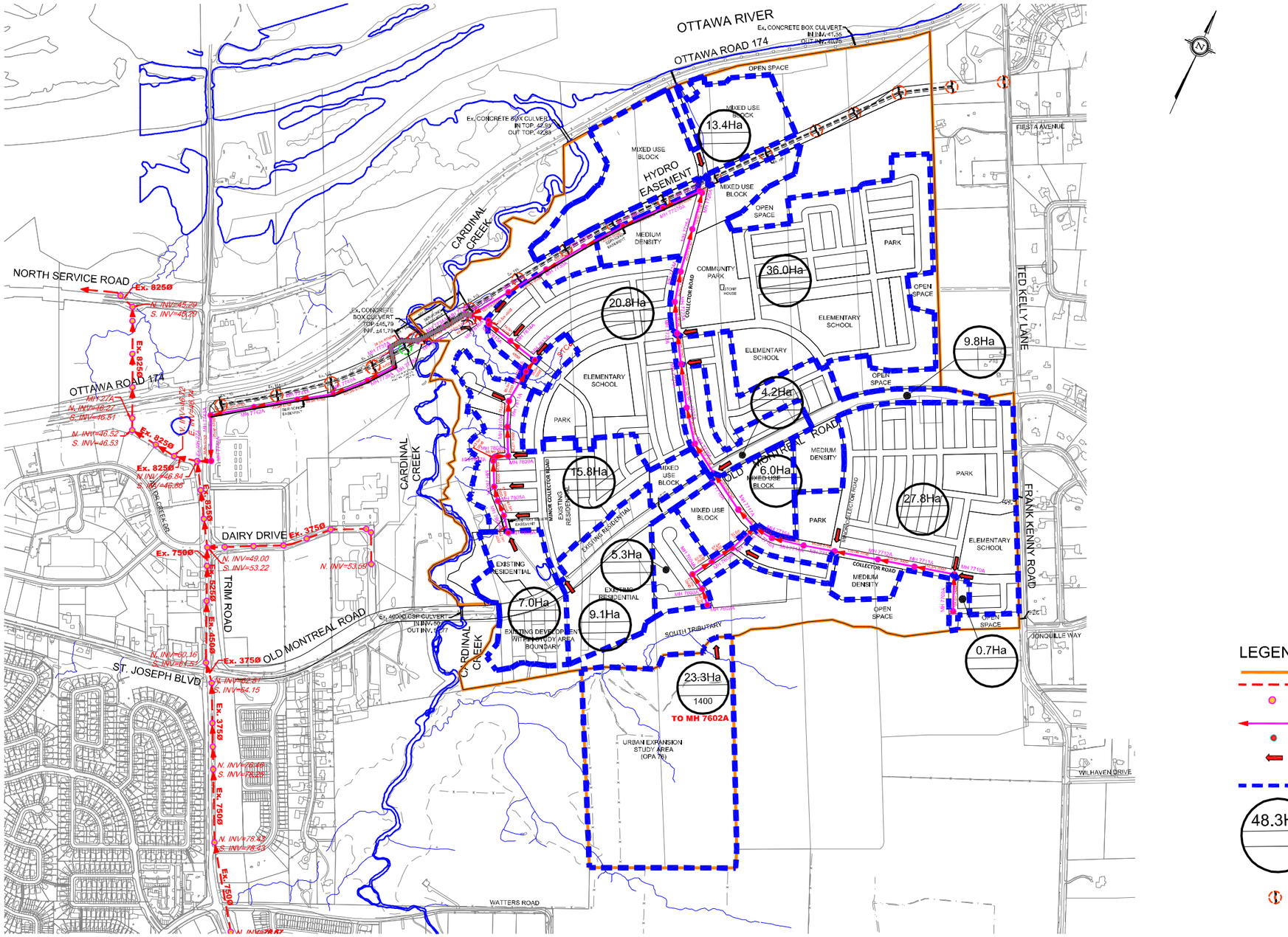
CARDINAL VILLAGE
PREFERRED WATER SUPPLY NETWORK
CITY OF OTTAWA

PROJECT No.:	11-513
SCALE:	1:12000
DATE:	JUNE 2013
FIGURE:	7



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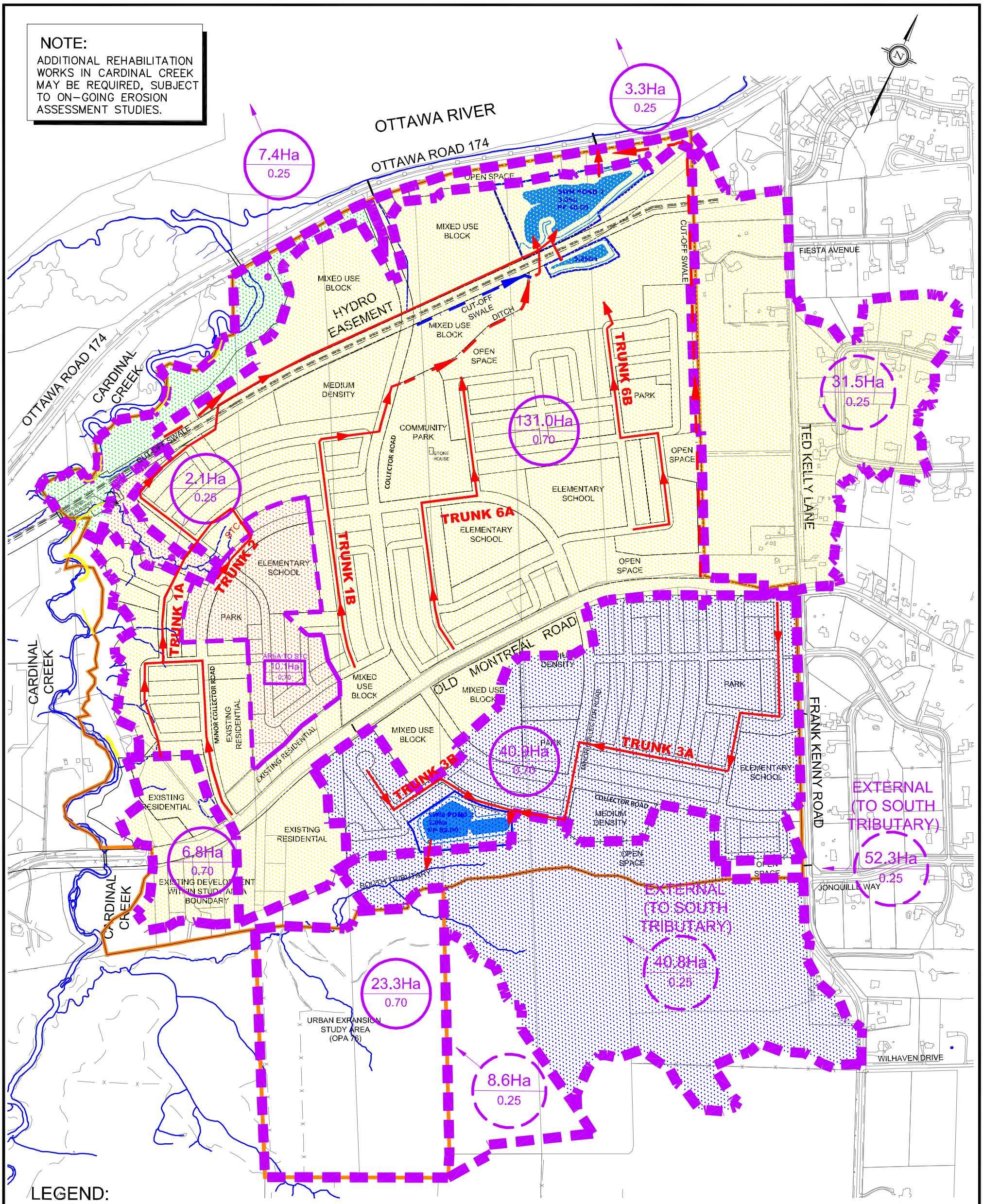
CARDINAL VILLAGE
PREFERRED SANITARY COLLECTION SYSTEM
CITY OF OTTAWA

PROJECT No.:	11-513
SCALE:	1:12000
DATE:	JUNE 2013
FIGURE:	10

NOTE:
ADDITIONAL REHABILITATION WORKS IN CARDINAL CREEK MAY BE REQUIRED, SUBJECT TO ON-GOING EROSION ASSESSMENT STUDIES.



LEGEND:

- SUBJECT LANDS
- STORM SEWER TRUNK
- DRAINAGE AREA BOUNDARY
- 39.9Ha / 0.70 — DRAINAGE AREA / RUN-OFF COEFFICENT
- 23.2Ha / 0.70 — EXTERNAL DRAINAGE AREA / RUN-OFF COEFFICENT
- AREA TO STC 10.1Ha / 0.70 — SPECIFIED DRAINAGE AREA / RUN-OFF COEFFICENT
- EROSION MITIGATION MEASURES
- STC — OIL & GRIT SEPERATOR UNIT
- OTTAWA RIVER
- CARDINAL CREEK
- NORTH TRIBUTARY OF CARDINAL CREEK
- SOUTH TRIBUTARY OF CARDINAL CREEK

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CARDINAL VILLAGE
CONCEPTUAL STORM DRAINAGE (MINOR SYSTEM)
CITY OF OTTAWA

DATE: JUNE 2013
SCALE: 1:8000
PROJECT No.: 11-513
FIGURE: 17

NOTE:
ADDITIONAL REHABILITATION WORKS IN CARDINAL CREEK MAY BE REQUIRED, SUBJECT TO ON-GOING EROSION ASSESSMENT STUDIES.

OTTAWA RIVER
OTTAWA ROAD 174
Ex. CONCRETE BOX CULVERT
IN INV. 41.55
OUT INV. 40.75
3.3Ha
OVERLAND AREA TO OTTAWA RIVER
7.4Ha
OVERLAND AREA TO EXISTING CHANNEL
Ex. CONCRETE BOX CULVERT
IN TOP. 42.95
OUT TOP. 42.85
OPEN SPACE
MIXED USE BLOCK
FIESTA AVENUE
HYDRO EASEMENT
CUT-OFF SWALE
DITCH
MIXED USE BLOCK
OPEN SPACE
TRUNK 6B
PARK
CUT-OFF SWALE
31.5Ha
OTTAWA ROAD 174
CARDINAL CREEK
MEDIUM DENSITY
101.4Ha
OVERLAND AREA TO POND
COMMUNITY PARK
STONE HOUSE
COLLECTOR ROAD
OPEN SPACE
TED KELLY LANE
2.1Ha
OVERLAND AREA TO EXISTING CHANNEL
ELEMENTARY SCHOOL
TRUNK 6A
ELEMENTARY SCHOOL
TRUNK 1B
TRUNK 1A
TRUNK 2
ELEMENTARY SCHOOL
OPEN SPACE
PARK
OLD MONTREAL ROAD
CARDINAL CREEK
29.6Ha
OVERLAND AREA TO EXISTING CHANNEL
MINOR COLLECTOR ROAD
EXISTING RESIDENTIAL
MIXED USE BLOCK
MIXED USE BLOCK
MEDIUM DENSITY
40.9Ha
PARK
MINOR COLLECTOR ROAD
TRUNK 3A
FRANK KENNY ROAD
TRUNK 3B
ELEMENTARY SCHOOL
COLLECTOR ROAD
EXISTING RESIDENTIAL
EXISTING RESIDENTIAL
6.8Ha
OVERLAND AREA TO EXISTING CHANNEL
MEDIUM DENSITY
OPEN SPACE
OPEN SPACE
52.3Ha
JONQUILLE WAY
Ex. 4000Ø CSP CULVERT
IN INV. 50.77
OUT INV. 50.77
CARDINAL CREEK
EXISTING DEVELOPMENT WITHIN STUDY AREA BOUNDARY
SOUTH TRIBUTARY
40.8Ha
23.3Ha
URBAN EXPANSION STUDY AREA (OPA 76)
8.6Ha
WILHAVEN DRIVE

LEGEND:

- SUBJECT LANDS
- DRAINAGE AREA BOUNDARY
- 39.9Ha — DRAINAGE AREA
- OVERLAND FLOW ROUTE
- 23.2Ha — EXTERNAL DRAINAGE AREA / RUN-OFF COEFFICENT
- EROSION MITIGATION MEASURES
- SOUTH TRIBUTARY OF CARDINAL CREEK
- OTTAWA RIVER
- CARDINAL CREEK
- NORTH TRIBUTARY OF CARDINAL CREEK
- STC — OIL & GRIT SEPERATOR UNIT

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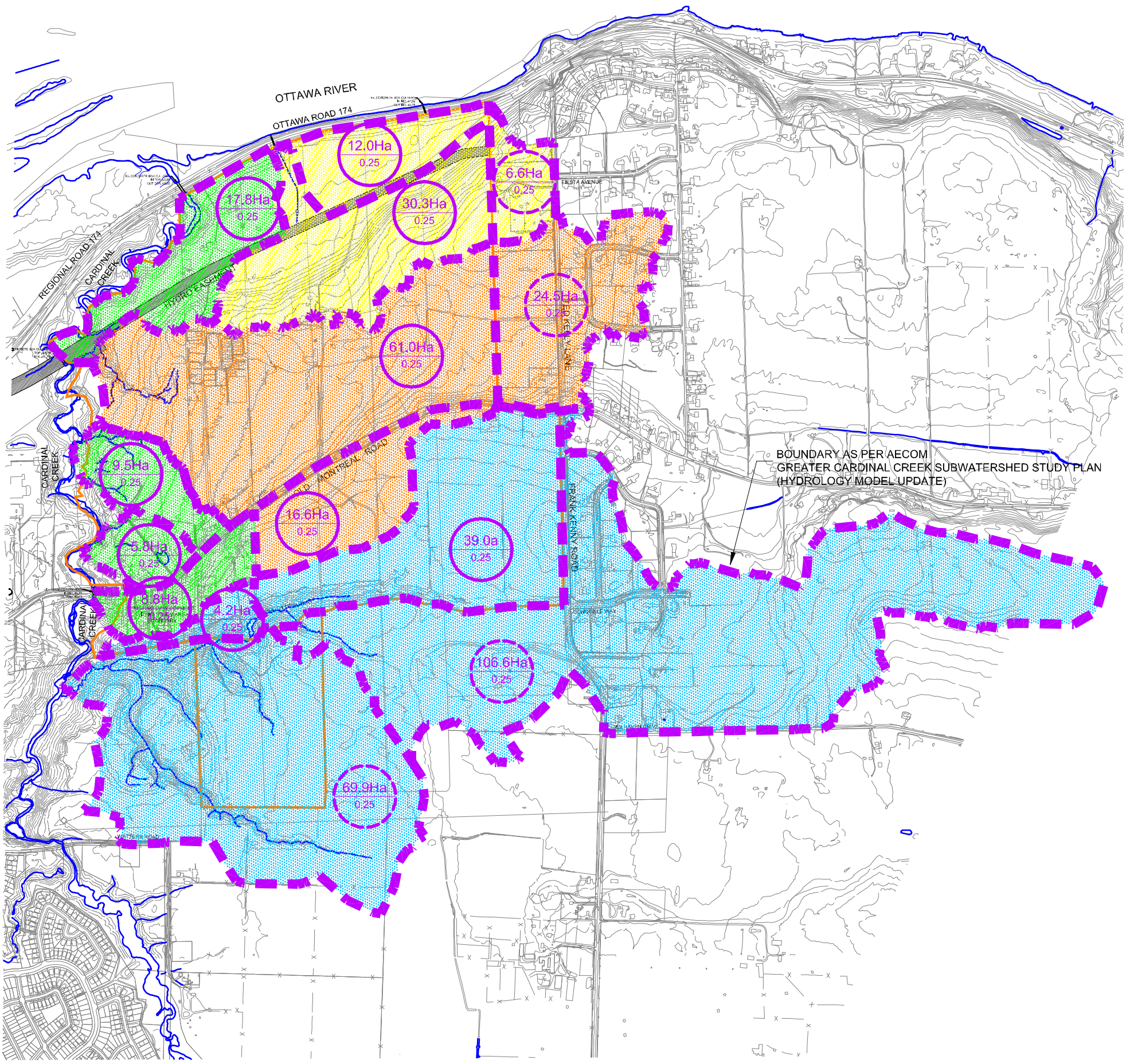
CARDINAL VILLAGE
CONCEPTUAL STORM DRAINAGE (MAJOR SYSTEM)
CITY OF OTTAWA

DATE: JUNE 2013
SCALE: 1:8000
PROJECT No.: 11-513
FIGURE: 18



LEGEND:

- SUBJECT LANDS
- PRELIMINARY DRAINAGE AREA BOUNDARY
- 35.6Ha / 0.25 — PRE-DEVELOPMENT DRAINAGE AREA / RUN-OFF COEFFICENT
- OTTAWA RIVER
- CARDINAL CREEK
- NORTH TRIBUTARY OF CARDINAL CREEK
- SOUTH TRIBUTARY OF CARDINAL CREEK

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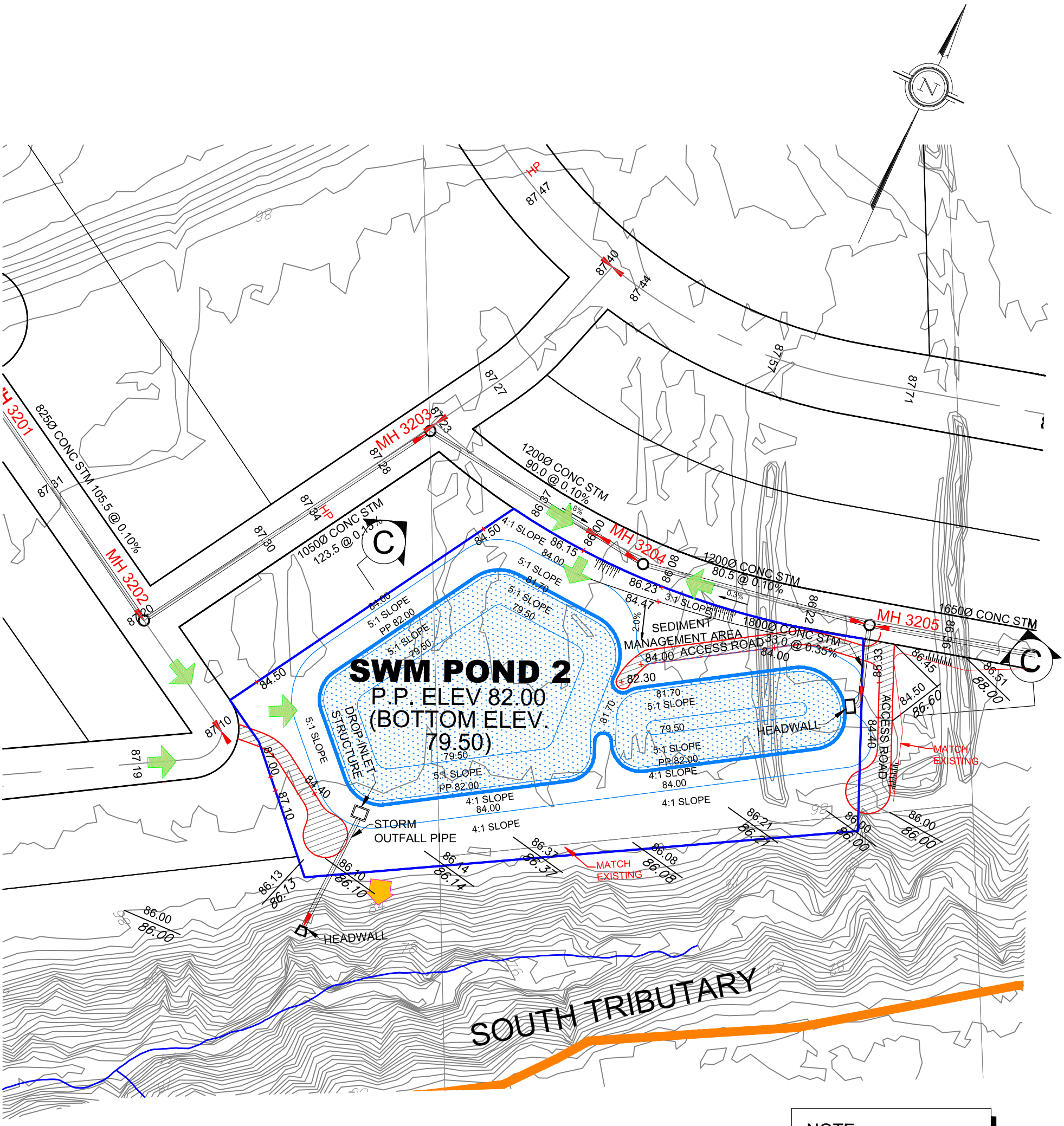
CARDINAL VILLAGE
PRE-DEVELOPMENT DRAINAGE AREAS
CITY OF OTTAWA

DATE: JUNE 2013
SCALE: 1:14000
PROJECT No.: 11-513
FIGURE: 13



NOTE:
FOR CROSS SECTIONS C–C, REFER TO DRAWING No. 22.

LEGEND:

SUBJECT LANDS

EMERGENCY OVERFLOW DIRECTION

POND CHARACTERISTICS			
	LOWER ELEVATION (m)	UPPER ELEVATION (m)	VOLUME PROVIDED (m^3)
PERMANENT POOL	79.50	82.00	14,138
QUALITY CONTROL	82.00	82.20	1,753
ACTIVE STORAGE	82.00	82.75	6,998
2 YR W.L.	82.00	82.93	8,822
5 YR W.L.	82.00	83.20	11,732
50 YR W.L.	82.00	83.79	18,670
100 YR W.L.	82.00	83.97	20,913

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www.DSEL.ca

CARDINAL VILLAGE
CONCEPT POND FACILITY LAYOUT
POND 2
CITY OF OTTAWA

DATE: JUNE 2013
SCALE: 1:1500
PROJECT No.: 11-513
FIGURE: 21

Ontario

Ministry of the Environment, Conservation and Parks
Ministère de l'Environnement, de la Protection de la nature et des Parcs

AMENDED ENVIRONMENTAL COMPLIANCE APPROVAL

NUMBER 9999-BFWK2C
Issue Date: September 20, 2019

Tamarack (Cardinal Creek) Corporation
3187 Albion Road South
Ottawa, Ontario
K1V 8Y3

Site Location: Cardinal Creek Village- Phase 5 and 6
Part of Lots 25 and 26, Concession 1
City of Ottawa, Ontario

You have applied under section 20.2 of Part II.1 of the Environmental Protection Act, R.S.O. 1990, c. E. 19 (Environmental Protection Act) for approval of:

the establishment of wastewater infrastructure Works located in the City of Ottawa, consisting of the following:

- **sanitary sewers** on Cardinal Creek Drive (from Abenaki Avenue to approximately 40 metres south of Abenaki Avenue), discharging to existing sewers, located west of Cardinal Creek Village Phase 5 and 6;
- **sanitary sewers** on Famille Laporte Avenue (from Antonio Farley Street to the limit of Phase 5 and 6), discharging to existing sewers, located west of Cardinal Creek Village Phase 5 and 6;
- **sanitary sewers** on Saintonge Lane (from Famille Laporte Avenue to Pennacook Place), discharging to existing sewers, located west of Cardinal Creek Village Phase 5 and 6;
- **sanitary sewers** on Pennacook Place (from the Pennacook Place cul-de-sac to Famille Laporte Avenue), discharging to existing sewers, located west of Cardinal Creek Village Phase 5 and 6;
- **sanitary sewers** on Antonio Farley Street (from Lévrier Walk to Famille Laporte Avenue), discharging to existing sewers, located west of Cardinal Creek Village Phase 5 and 6;
- **sanitary sewers** on L**é**vrier Walk (from Block 109 to approximately 45 metres east of Antonio Farley Street to Antonio Farley Street), discharging to existing sewers, located west of Cardinal Creek Village Phase 5 and 6;

- **sanitary sewers** on Canot d'Écorce Street (from Block 109 to L**é**vrier Walk), discharging to existing sewers, located west of Cardinal Creek Village Phase 5 and 6;

- **sanitary sewers** on L'Arquebuse Way (from Antonio Farley Street to Antonio Farley Street), discharging to existing sewers, located west of Cardinal Creek Village Phase 5 and 6;

- **sanitary sewers** on Tadoussac Terrace (from the limit of Phase 5 and 6 to Antonio Farley Street), discharging to existing sewers, located west of Cardinal Creek Village Phase 5 and 6;

- **sanitary sewers** on Onimiki Terrace (from Antonio Farley Street to Abenaki Avenue), discharging to existing sewers, located west of Cardinal Creek Village Phase 5 and 6;

- **sanitary sewers** on Abenaki Avenue (from Antonio Farley Street to Cardinal Creek Drive), discharging to existing sewers, located west of Cardinal Creek Village Phase 5 and 6;

- **sanitary sewers** on Servicing Block 109 (from L**é**vrier Walk to Canot d'Écorce Street), discharging to existing sewers, located west of Cardinal Creek Village Phase 5 and 6;

- **sanitary sewers** on Servicing Block 108 (from Canot d'Écorce Street to Antonio Farley Street), discharging to existing sewers, located west of Cardinal Creek Village Phase 5 and 6;

- **sanitary sewers** at sanitary connection to Phase 4 across Cardinal Creek Drive (from Cardinal Creek Drive to approximately 10 metres west of Cardinal Creek Drive), discharging to existing sewers, located west of Cardinal Creek Village Phase 5 and 6;

- **storm sewers** on Cardinal Creek Drive (from approximately 25 metres north of Famille Laporte Avenue to approximately 55 metres north of Abenaki Avenue), discharging to existing sewers, located west of Cardinal Creek Village Phase 5 and 6, the existing storm outfall channel located north of Cardinal Creek Village Phase 5 and 6 and ultimately to the Stormwater Management Facility Pond 1;

- **storm sewers** on Famille Laporte Avenue (from Antonio Farley Street to the limit of Phase 5 and 6), discharging to existing sewers, located west of Cardinal Creek Village Phase 5 and 6, the existing storm outfall channel located north of Cardinal Creek Village Phase 5 and 6 and ultimately to the Stormwater Management Facility Pond 1;

- **storm sewers** on Saintonge Lane (from Famille Laporte Avenue to Pennacook Place), discharging to existing sewers, located west of Cardinal Creek Village Phase 5 and 6, the existing storm outfall channel located north of Cardinal Creek Village Phase 5 and 6 and ultimately to the Stormwater Management Facility Pond 1;

- **storm sewers** on Pennacook Place (from the Pennacook Place cul-de-sac to Famille Laporte Avenue), discharging to existing sewers, located west of Cardinal Creek Village Phase 5 and 6, the existing storm outfall channel located north of Cardinal Creek Village Phase 5 and 6 and ultimately to the Stormwater Management Facility Pond 1;

- **storm sewers** on Antonio Farley Street (from L**é**vrier Walk to Famille Laporte Avenue), discharging to

existing sewers, located west of Cardinal Creek Village Phase 5 and 6, the existing storm outfall channel located north of Cardinal Creek Village Phase 5 and 6 and ultimately to the Stormwater Management Facility Pond 1;

- **storm sewers** on L**é**vrier Walk (from Block 109 to approximately 45 metres east of Antonio Farley Street), discharging to existing sewers, located west of Cardinal Creek Village Phase 5 and 6, the existing storm outfall channel located north of Cardinal Creek Village Phase 5 and 6 and ultimately to the Stormwater Management Facility Pond 1;

- **storm sewers** on Canot d'Écorce Street (from Block 109 to L**é**vrier Walk), discharging to existing sewers, located west of Cardinal Creek Village Phase 5 and 6, the existing storm outfall channel located north of Cardinal Creek Village Phase 5 and 6 and ultimately to the Stormwater Management Facility Pond 1;

- **storm sewers** on L'Arquebuse Way (from Antonio Farley Street to Antonio Farley Street), discharging to existing sewers, located west of Cardinal Creek Village Phase 5 and 6, the existing storm outfall channel located north of Cardinal Creek Village Phase 5 and 6 and ultimately to the Stormwater Management Facility Pond 1;

- **storm sewers** on Onimiki Terrace (from Antonio Farley Street to Abenaki Avenue), discharging to existing sewers, located west of Cardinal Creek Village Phase 5 and 6, the existing storm outfall channel located north of Cardinal Creek Village Phase 5 and 6 and ultimately to the Stormwater Management Facility Pond 1;

- **storm sewers** on Abenaki Avenue (from Antonio Farley Street to Cardinal Creek Drive), discharging to existing sewers, located west of Cardinal Creek Village Phase 5 and 6, the existing storm outfall channel located north of Cardinal Creek Village Phase 5 and 6 and ultimately to the Stormwater Management Facility Pond 1;

- **storm sewers** on Servicing Block 109 (from L**é**vrier Walk to Canot d'Écorce Street), discharging to existing sewers, located west of Cardinal Creek Village Phase 5 and 6, the existing storm outfall channel located north of Cardinal Creek Village Phase 5 and 6 and ultimately to the Stormwater Management Facility Pond 1;

- **storm sewers** on Servicing Block 108 (from Canot d'Écorce Street to Antonio Farley Street), discharging to existing sewers, located west of Cardinal Creek Village Phase 5 and 6, the existing storm outfall channel located north of Cardinal Creek Village Phase 5 and 6 and ultimately to the Stormwater Management Facility Pond 1;

- **storm sewers** on Servicing Block 119 (from approximately 50 metres south of Onimiki Terrace to Onimiki Terrace), discharging to existing sewers, located west of Cardinal Creek Village Phase 5 and 6, the existing storm outfall channel located north of Cardinal Creek Village Phase 5 and 6 and ultimately to the Stormwater Management Facility Pond 1;

- **storm sewers** across Cardinal Creek Drive (from Baie-des-Castors Street to Cardinal Creek Drive), discharging to existing sewers, located west of Cardinal Creek Village Phase 5 and 6, the existing storm outfall channel located north of Cardinal Creek Village Phase 5 and 6 and ultimately to the Stormwater Management Facility Pond 1;

- **storm outfall channel** approximately 42 metres of a temporary cut-off swale located to the north of Cardinal Creek Drive, receiving inflow from the Cardinal Creek Drive storm sewer and discharging to the existing temporary storm outfall;

- **1 corrugated steel pipe culvert** crossing on Old Montreal Road approximately 70 metres east of Cardinal Creek Drive;

- **grassed swales** on the south side of Old Montreal Road (from approximately 300 metres east of Cardinal Creek Drive to approximately 70 metres east of Cardinal Creek Drive), discharging to the the Old Montreal Road culvert;

- **grassed swales** on the north side of Old Montreal Road (from approximately 400 metres east of Cardinal Creek Drive to approximately 150 metres east of Cardinal Creek Drive), discharging to existing swale, located on the north side of Old Montreal Road;

- **grassed swales** on the east of Cardinal Creek Phase 5 and 6 (from approximately 30 metres east of Canot d' Écorce Street to the northern Phase 5 and 6 limit, discharging to undeveloped land, located north of Cardinal Creek Village Phase 5 and 6, and ultimately to the Stormwater Management Facility;

the modifications to existing stormwater management Works to serve Cardinal Creek Village Phase 5 and 6, located in the City of Ottawa, for the collection, transmission, treatment and disposal of stormwater runoff from a total modified catchment area of 143.64 hectares, to provide Enhanced Level water quality protection and erosion control, discharging to the Ottawa River, consisting of the following:

- **stormwater management facility (catchment area 143.64 hectares):** one (1) wet pond with sediment forebay, located on Block 626, north of an existing hydro corridor, west of Ted Kelly Lane, having a permanent storage volume of 20,770 cubic metres, an extended detention volume of 5,851 cubic metres and a total storage volume of approximately 57,471 cubic metres including the permanent pool, at a total depth of 4.55 metres, receiving inflow from the temporary storm outfall channel and 2,550 millimetre diameter and 3,000 millimetre diameter storm sewer to the sediment forebay, and 1,350 millimetre diameter bypass storm sewer to the main cell, and discharging via a concrete outlet structure, a 2,250 millimetre diameter outlet pipe, a secondary outfall structure and main spillway to an existing 2,550 millimetre concrete culvert under Ottawa Road 174 to the Ottawa River;

including erosion/sedimentation control measures during construction and all other controls and appurtenances essential for the proper operation of the aforementioned Works;

all in accordance with the submitted application and supporting documents listed in Schedule "A" forming part of this approval.

Previous Works

Sanitary Sewers servicing Phase 4 of Cardinal Creek Village, discharging to existing sewers in previous Cardinal Creek Village phases as follows:

- **Famillie-Laporte Avenue** from PH 4 Boundary (STA. 1+050.11) to PH4 Boundary (STA. 0+630.56)

- **Baie-des-Castors Street** from 15m east of Future Street (STA. 0+014.82) to 30m east of Honfleur Street (STA. 0+283.14));

- **Cardinal Creek Drive** from 28.5m east of PH4 Boundary (STA. 1+129.52) to Famille-Laporte Avenue (STA. 0+786.84);

- **Tewin Circle** from 156m south of Saintonge Lane (STA. 0+235.40) to Famille-Laporte Avenue (STA. 0+000.00);

- **Cap-Diamant Way (north)** from 78.5m east of Géographe Terrace (STA. 0+082.96) to Géographe Terrace (STA. 0+000.00);

- **Cap-Diamant Way (south)** from 51.5m south of Stadaconé Row (STA. 0+305.98) to Cartographe Street (STA. 0+517.81);

- **Cartographe Street** from Cap-Diamant Way (STA. 0+293.748) to Cap-Diamant Way (STA. 0+0+410.81);

- **Mishawashkode Street** from PH 4 Boundary (STA. 0+277.79) to Géographe Terrace (STA. 0+328.66);

- **Stadaconé Row** from 13m south of Cap-Diamant Way (STA. 0+121.52) to Cap-Diamant Way (STA. 0+000.00);

- **Géographe Terrace** from Cartographe Street (STA. 0+261.37) to Honfleur Street (STA. 0+000.00);

- **Honfleur Street** from 16m north of Future Street (STA. 0+148.14) to Baie-des-Castors Street (STA. 0+017.09); and,

- **Towards Future Phase** from 8m east of Baie-des-castors Street (STA. 0+008.00) to Baie-des-Castors Street (STA. 0+000.00).

Storm Sewers servicing Phase 4 of Cardinal Creek Village, discharging partly to existing sewers in previous Cardinal Creek Village phases, partly to Oil and Grit Separator, and partly to Temporary Storm Outfall Channel, as follows:

- **Famille-Laporte Avenue** from PH 4 Boundary (STA. 0+626.68 to STA. 0+798.76) to PH 4

Boundary (STA. 0+810.36 to STA. 1+050.11);

- **Baie-des-Castors Street (north)** from 89.5m east of Future Street (STA. 0+089.49 to STA. 0+226.58) to 30m east of Honfleur Street (STA. 0+235.03 to STA. 0+283.19);
- **Baie-des-Castors Street (south)** from Street 76.5m east of Honfleur Street (STA. 0+076.57) to Honfleur Street (STA. 0+000.00);
- **Cardinal Creek Drive** from 28.5m east of PH4 Boundary (STA. 1+130.25) to 22.5m north of Famille-Laporte Avenue (STA. 0+764.11);
- **Tewin Circle** from 157.5m south of Saintonge Lane (STA. 0+236.42) to Famille-Laporte Avenue (STA. 0+002.50);
- **Cap-Diamant Way (north)** from 81.5m east of Géographe Terrace (STA. 0+081.45) to Géographe Terrace (STA. -0+002.39);
- **Cap-Diamant Way (south)** from 52m south of Stadaconé Row (STA. 0+307.11) to Cartographe Street (STA. 0+515.79);
- **Cartographe Street** from Cap-Diamant Way (STA. 0+293.75) to Géographe Terrace (STA. 0+409.74);
- **Mishawashkode Street** from PH 4 Boundary (STA. 0+277.79) to Géographe Terrace (STA. 0+325.63);
- **Stadaconé Row** from 13m south of Cap-Diamant Way (STA. 0+123.10) to Block 108 (STA. -0+009.87);
- **Géographe Terrace** from Cartographe Street (STA. 0+263.66) to Honfleur Street (STA. 0+002.50);
- **Honfleur Street** from Famille-Laporte Avenue (STA. 0+251.62) to Baie-des-Castors Street (STA. 0+017.08); and,
- **Temporary Storm Outfall** from Baie-des-Castors Street (STA. 0+001.35) to Temporary Storm Outfall Channel (STA. 0+019.03).

Storm Outfall Channel approximately 461 m of a temporary storm outfall channel located to the north of Cardinal Creek Drive, receiving flow from the 1950mm concrete storm sewer at the north end of Cardinal Creek Drive, discharging via existing temporary storm outfall channel to Pond 1.

Grassed Swales servicing Phase 4 of Cardinal Creek Village, as follows:

- **Future Phase - South of Old Montreal Road –** Approximately 158 m of a temporary cut-off swale discharging to the storm sewer network mentioned above via MH 2000 south of Old Montreal Road;

- **Future Phase –** East of Phase 4 – Approximately 246 m of a temporary cut-off swale discharging to the Temporary Storm Outfall Channel mentioned above via and existing ditch north of Famille-Laporte Avenue; and,

- **Pond 1 Bypass –** east of Pond 1 – Approximately 145 m of a temporary cut-off swale discharging to the existing roadside ditch south of Ottawa Road 174 to maintain existing drainage patterns.

Oil and Grit Separator (the 10 mm storm flows for a catchment area of 4.01 ha): One (1) Hydroguard HG 10 oil/grit separator (OGS), or Equivalent Equipment, designed for Enhanced Level of protection, having a sediment storage capacity of 4.59 m^3, a maximum treatment rate of 252 L/s, receiving inflow from the storm sewer located north of the intersection of Honfleur Street and Famille-Laporte Avenue, discharging to the North Tributary of Cardinal Creek via a 450mm diameter outlet pipe and modifications to the existing North Tributary of Cardinal Creek.

trunk storm sewer: - a 2400 mm diameter storm sewer on the Service Easement (Block 147) from Block 146 (Drawing Number 152) (MH127), across the existing hydro corridor, to Service Easement (Drawing Number 153A), discharging to a temporary storm outfall channel, identified below;

temporary storm outfall channel: - approximately 776 m of a temporary storm outfall channel located in a Service Easement along the north side of an existing hydro corridor, receiving flow from the 2400 mm diameter trunk storm sewer, identified above, discharging via a 2550 mm diameter and 3000 mm diameter storm sewer, and 1350 mm diameter bypass storm sewer, to the stormwater management facility, identified below;

stormwater management facility (Pond 1 - catchment area 89.97 hectares): - one (1) wet pond with a sediment forebay, located on Block 626, north of an existing hydro corridor, west of Ted Kelly Lane, having a permanent pool volume of 20,341 m^3, an extended detention volume of 5,730 m^3, and a total storage volume of approximately 56,286 m^3, including the permanent pool volume, at a total depth of approximately 4.55 m, receiving flow from the temporary storm outfall channel and 2550 mm diameter and 3000 mm diameter storm sewer to the sediment forebay, and 1350 mm diameter bypass storm sewer to the main cell, identified above, and discharging via a concrete outlet structure, a 2250 mm diameter outlet pipe and spillway, and an existing 1.5 m by 1.15 m box culvert and 2100 diameter culvert under Ottawa Road 174 to the Ottawa River;

storm sewers servicing Phase 1 of Cardinal Creek Village, as follows:

- **Avenue de la Famille-Laporte Avenu**e from Old Montreal Road (Sta. 0+001.62) to avenue de la Famille-Laporte Avenue (Temp. dead end) (Sta. 0+630.56);

- **Côte de la Minoterie Ridge** from avenue de la Famille-Laporte Avenue (Sta. 0+015.76) to avenue de la Famille-Laporte Avenue (Sta. 0+381.44);

- **Service Easement Part 1, 2 & 3** from côte de la Minoterie Ridge (Sta. 0+009.63) to rue de la Baie-des-Castors Street (Sta. 0+129.93);

- **Rue Mishawashkode Street** from avenue de la Famille-Laporte Avenue (Sta. 0+001.40) to rue Mishawashkode Street (MH120) (Sta. 0+098.71);

- **Rue Mishawashkode Street** from rue de Cartographe Street (Sta. 0+141.34) to rue Mishawashkode Street (Temp. dead end) (Sta. 0+175.42);

- **Voie de Brouage Way** from côte de la Minoterie Ridge (Sta. -0+002.44) to voie de Brouage Way (Sta. 0+113.945);

- **Rue de Cartographe Street** from avenue de la Famille-Laporte Avenue (Sta. 0+001.47) to rue Mishawashkode Street (Sta. 0+194.29);

- **Rue de Cartographe Street** from rue Mishawashkode Street (Sta. -0+002.07) to rue de Cartographe Street (Temp. dead end) (Sta. 0+221.43);

- **Rue de la Baie-des-Castors Street** from avenue de la Famille-Laporte Avenue (Sta. -0+001.31) to rue de la Baie-des-Castors Street (Temp. dead end) (Sta. 0+463.916);

- **Avenue Mashkig Avenue** from rue de la Baie-des-Castors Street (Sta. -0+002.76) to avenue Mashkig Avenue (MH 1410) (Sta. 0+152.39);

- **Block 146** from rue de la Baie-des-Castors Street (Sta. 0+013.12) to Service Easement (Sta. 0+045.63);

sanitary sewers servicing Phase 1 of Cardinal Creek Village, as follows:

- **Avenue de la Famille-Laporte Avenue** from Old Montreal Road (Sta. -0+005.820) to avenue de la Famille-Laporte Avenue (Temp. dead end) (Sta. 0+630.560);

- **Côte de la Minoterie Ridge** from avenue de la Famille-Laporte Avenue (Sta. 0+013.390) to avenue de la Famille-Laporte Avenue (Sta. 0+392.220);

- **Service Easement Part 1, 2 & 3** from côte de la Minoterie Ridge (Sta. 0+000.000) to rue de la Baie-des-Castors Street (Sta. 0+132.450);

- **Rue Mishawashkode Street** from avenue de la Famille-Laporte Avenue (Sta. 0+001.230) to rue Mishawashkode Street (MH120A) (Sta. 0+100.660);

- **Rue Mishawashkode Street** from rue de Cartographe Street (Sta. 0+143.360) to rue Mishawashkode Street (Temp. dead end) (Sta. 0+173.930);

- **Voie de Brouage Way** from côte de la Minoterie Ridge (Sta. -0+000.370) to avenue de la Famille-Laporte Avenue (Sta. 0+129.610);

- **Rue de Cartographe Street** from avenue de la Famille-Laporte Avenue (Sta. -0+000.250) to rue Mishawashkode Street (Sta. 0+196.240);

- **Rue de Cartographe Street** from rue Mishawashkode Street (Sta. 0+000) to rue de Cartographe Street (Temp. dead end) (Sta. 0+221.430);

- **Rue de la Baie-des-Castors Street** from avenue de la Famille-Laporte Avenue (Sta. 0+000.250) to rue de la Baie-des-Castors Street (Temp. dead end) (Sta. 0+461.980);

- **Rue de la Baie-des-Castors Street** (High Level Sewer) from rue de la Baie-des-Castors Street (Sta. 0+113.370) to rue de la Baie-des-Castors Street (Sta. 0+236.260);

- **Avenue Mashkig Avenue** from rue de la Baie-des-Castors Street (Sta. 0+000) to avenue Mashkig Avenue (MH 1420A) (Sta. 0+152.480);

- **Block 146** from rue de la Baie-des-Castors Street (Sta. 0+003.820) to Service Easement (Sta. 0+054.542);

- **Service Easement** from Block 146 (Drawing 157) (Sta. 0+002.650) to Service Easement (Sta. 0+041.710);

- **Service Easement** from Service Easement (MH1015A) (Sta. 0+259.350) to Service Easement (Drawing 152) MH10160A – (Sta. 0+093.680);

- **Service Easement** from Trim Road (50 m south of Regional Road 174) (MH1103A) (Sta. 0+188.20) to Service Easement (MH10160A) (Sta. 1+053.100);

- **Service Easement (parallel to west side of Trim Road)** from Sanitary Outlet approximately 160 m south of Regional Road 174 (SAMH1100A) (Sta. 0+010.00) to Service Easement (east side of Trim Road) 50 m south of Regional Road 174 (MH1103A) (Sta. 0+188.20);

For the purpose of this environmental compliance approval, the following definitions apply:

Definitions:

1. "Approval" means this entire document and any schedules attached to it, and the application;

2. "Director" means a person appointed by the Minister pursuant to section 5 of the EPA for the purposes of Part II.1 of the EPA;

3. "District Manager" means the District Manager of the appropriate local District Office of the Ministry, where the Works are geographically located;

4. "EPA" means the *Environmental Protection Act,* R.S.O. 1990, c.E.19, as amended;

5. "Equivalent Equipment" means a substituted equipment or like-for-like equipment that

meets the required quality and performance standards of the approved named equipment.

6. "Ministry" means the ministry of the government of Ontario responsible for the EPA and OWRA and includes all officials, employees or other persons acting on its behalf;

7. "Owner" means Tamarack (Cardinal Creek) Corporation, and includes its successors and assignees;

8. "OWRA" means the *Ontario Water Resources Act, R.S.O. 1990, c. O.40* , as amended;

9. "Previous Works" means those portions of the sewage Works previously approved under an Approval;

10. "Works" means the sewage Works described in the Owner's application, and this Approval.

You are hereby notified that this environmental compliance approval is issued to you subject to the terms and conditions outlined below:

TERMS AND CONDITIONS

1. GENERAL CONDITIONS

1. The Owner shall ensure that any person authorized to carry out work on or operate any aspect of the Works is notified of this Approval and the conditions herein and shall take all reasonable measures to ensure any such person complies with the same.

2. Except as otherwise provided by these Conditions, the Owner shall design, build, install, operate and maintain the Works in accordance with the description given in this Approval, and the application for approval of the Works.

3. Where there is a conflict between a provision of any document in the schedule referred to in this Approval and the conditions of this Approval, the conditions in this Approval shall take precedence, and where there is a conflict between the documents in the schedule, the document bearing the most recent date shall prevail.

4. Where there is a conflict between the documents listed in Schedule "A" and the application, the application shall take precedence unless it is clear that the purpose of the document was to amend the application.

5. The conditions of this Approval are severable. If any condition of this Approval, or the application of any requirement of this Approval to any circumstance, is held invalid or unenforceable, the application of such condition to other circumstances and the remainder of this Approval shall not be affected thereby.

2. EXPIRY OF APPROVAL

1. This Approval will cease to apply to those parts of the Works which have not been constructed within five (5) years of the date of this Approval.

2. In the event that completion and commissioning of any portion of the Works is anticipated to be delayed beyond the specified expiry period, the Owner shall submit an application of extension to the expiry period, at least twelve (12) months prior to the end of the period. The application for extension shall include the reason(s) for the delay, whether there is any design change(s) and a review of whether the standards applicable at the time of Approval of the Works are still applicable at the time of request for extension, to ensure the ongoing protection of the environment.

3. CHANGE OF OWNER

1. The Owner shall notify the District Manager and the Director, in writing, of any of the following changes within thirty (30) days of the change occurring:

    a. change of Owner;

    b. change of address of the Owner;

    c. change of partners where the Owner is or at any time becomes a partnership, and a copy of the most recent declaration filed under the *Business Names Act,* R.S.O. 1990, c.B17 shall be included in the notification to the District Manager; or

    d. change of name of the corporation where the Owner is or at any time becomes a corporation, and a copy of the most current information filed under the *Corporations Information Act,* R.S.O. 1990, c. C39 shall be included in the notification to the District Manager.

2. In the event of any change in ownership of the Works, other than a change to a successor municipality, the Owner shall notify in writing the succeeding owner of the existence of this Approval, and a copy of such notice shall be forwarded to the District Manager and the Director.

3. The Owner shall ensure that all communications made pursuant to this condition refer to the number at the top of this Approval.

4. OPERATION AND MAINTENANCE

1. If applicable, any proposed storm sewers or other stormwater conveyance in this Approval can be constructed but not operated until the proposed stormwater management facilities in this Approval or any other Approval that are designed to service the storm sewers or other stormwater conveyance are in operation.

2. The Owner shall make all necessary investigations, take all necessary steps and obtain all necessary approvals so as to ensure that the physical structure, siting and operations of the Works do not constitute a safety or health hazard to the general public.

3. The Owner shall inspect and ensure that the design minimum liquid retention volume is maintained in the Works at all times, except when maintenance is required.

4. The Owner shall undertake an inspection of the condition of the Works, at least once a year, and undertake any necessary cleaning and maintenance to ensure that sediment, debris and excessive decaying vegetation are removed from the Works to prevent the excessive build-up of sediment, oil/grit, debris and/or decaying vegetation, to avoid reduction of the capacity and/or permeability of the Works, as applicable. The Owner shall also regularly inspect and clean out the inlet to and outlet from the Works to ensure that these are not obstructed.

5. The Owner shall construct, operate and maintain the Works with the objective that the effluent from the Works is essentially free of floating and settleable solids and does not contain oil or any other substance in amounts sufficient to create a visible film, sheen, foam or discoloration on the receiving waters.

6. The Owner shall maintain a logbook to record the results of these inspections and any cleaning and maintenance operations undertaken, and shall keep the logbook at the Owner's administrative office for inspection by the Ministry. The logbook shall include the following:

    a. the name of the Works; and

    b. the date and results of each inspection, maintenance and cleaning, including an estimate of the quantity of any materials removed and method of clean-out of the Works.

7. The Owner shall prepare an operations manual prior to the commencement of operation of the Works that includes, but is not necessarily limited to, the following information:

    a. operating and maintenance procedures for routine operation of the Works;

    b. inspection programs, including frequency of inspection, for the Works and the methods or tests employed to detect when maintenance is necessary;

    c. repair and maintenance programs, including the frequency of repair and maintenance for the Works;

d. contingency plans and procedures for dealing with potential spills and any other abnormal situations and for notifying the District Manager; and

e. procedures for receiving, responding and recording public complaints, including recording any follow-up actions taken.

8. The Owner shall maintain the operations manual current and retain a copy at the Owner's administrative office for the operational life of the Works. Upon request, the Owner shall make the manual available to Ministry staff.

5. TEMPORARY EROSION AND SEDIMENT CONTROL

1. The Owner shall install and maintain temporary sediment and erosion control measures during construction and conduct inspections once every two (2) weeks and after each significant storm event (a significant storm event is defined as a minimum of 25 mm of rain in any 24 hours period). The inspections and maintenance of the temporary sediment and erosion control measures shall continue until they are no longer required and at which time they shall be removed and all disturbed areas reinstated properly.

2. The Owner shall maintain records of inspections and maintenance which shall be made available for inspection by the Ministry, upon request. The record shall include the name of the inspector, date of inspection, and the remedial measures, if any, undertaken to maintain the temporary sediment and erosion control measures.

6. REPORTING

1. One (1) week prior to the start-up of the operation of the Works, the Owner shall notify the District Manager (in writing) of the pending start-up date.

2. The Owner shall, upon request, make all reports, manuals, plans, records, data, procedures and supporting documentation available to Ministry staff.

3. The Owner shall prepare a performance report within ninety (90) days following the end of the period being reported upon, and submit the report(s) to the District Manager when requested. The first such report shall cover the first annual period following the commencement of operation of the Works and subsequent reports shall be prepared to cover successive annual periods following thereafter. The reports shall contain, but shall not be limited to, the following information:

   a. a description of any operating problems encountered and corrective actions taken;

b. a summary of all maintenance carried out on any major structure, equipment, apparatus, mechanism or thing forming part of the Works, including an estimate of the quantity of any materials removed from the Works;

c. a summary of any complaints received during the reporting period and any steps taken to address the complaints;

d. a summary of all spill or abnormal discharge events; and

e. any other information the District Manager requires from time to time.

7. RECORD KEEPING

1. The Owner shall retain for a minimum of five (5) years from the date of their creation, all records and information related to or resulting from the operation, maintenance and monitoring activities required by this Approval.

Schedule "A"

1. Application for Environmental Compliance Approval, dated July 31, 2019, received on September 3, 2019, submitted by Tamarack (Cardinal Creek) Corporation;

2. Transfer of Review Letter of Recommendation, dated August 22, 2019, revised on September 9, 2019 and signed by Michael J Thivierge, P.Eng., Senior Engineer, Development Review, City of Ottawa, including the following supporting documents:

   a. Final Plans and Specifications prepared by David Schaeffer Engineering Ltd.

   b. Pipe Data Form - Watermain, Storm Sewer, Sanitary Sewer, and Forcemain Design Supplement to Application for Approval for Water and Sewage Works.

   c. Hydraulic Design Sheets prepared by David Schaeffer Engineering Ltd.

   d. Stormwater Management Report prepared by David Schaeffer Engineering Ltd.

3. Email received on September 9, 2019 from Michael J Thivierge, P.Eng., Senior Engineer, Development Review, City of Ottawa.

4. Emails received September 12, 2019 and September 17, 2019 from Braden Kaminski, E.I.T., Junior Project Manager, David Schaeffer Engineering Ltd.

5. Application for Environmental Compliance Approval for Municipal and Private Sewage Works, dated September 15, 2017 and received on October 12, 2017, submitted by Tamarack (Cardinal Creek) Corporation.

6. Transfer of Review Letter of Recommendation, dated October 5, 2017, and signed by Charles Warnock, P. Eng., City of Ottawa.

7. Application for Environmental Compliance Approval for Sanitary and Storm Sewers, dated April 22, 2014 and received on June 6, 2014, including final plans, specifications and documents prepared by David Schaeffer Engineering Ltd.;

8. Application for Environmental Compliance Approval for Trunk Storm Sewer, Temporary Outfall Ditchand Stormwater Management Pond, dated April 22, 2014 and June 6, 2014, submitted by David Schaeffer Engineering Ltd. through the City of Ottawa;

9. Design Brief for Interim Stormwater Management Pond 1 for Phase 1, 2 and 3 in Cardinal CreekVillage , dated May 2014, prepared by David Schaeffer Engineering Ltd. and J.F. Sabourin and Associates Inc.;

10. Copy of memorandum from David Gilbert of Paterson Group Inc. to David Schaeffer Engineering Ltd., dated February 25, 2014;

11. E-mail from Kevin Murphy of David Schaeffer Engineering Ltd. to the Ministry, dated March 24,2014;

12. Revision to Application for Environmental Compliance Submission by letter from Matt Wingate of David Schaeffer Engineering Ltd. through the City of Ottawa to the Ministry, dated September 19,2014;

13. Copy of letter from Florence Robinson of Hydro One Networks Inc. to Matt Wingate of David Schaeffer Engineering Ltd., dated May 29, 2014;

14. Pipe Date Form and Storm Sewer Design Sheet, dated May 27, 2014, prepared by David Schaeffer Engineering Ltd.;

15. Design Brief for Cardinal Creek Village Phases 1A & 1B , dated May 29, 2014, prepared by David Schaeffer Engineering Ltd.;

16. Stormwater Management Report for Phase 1 of Cardinal Creek Village , dated May 2014,prepared by J.F. Sabourin and Associates Inc.;

17. Plan of Subdivision of Part of Lots 25, 26, 27, 28 and 29, Concession 1 (Old Survey), undated,prepared by Stantec Geomatics Ltd.;

18. Plan of Subdivision of Part of Lots 27 and 28, Concession 1 (Old Survey), undated, prepared by Stantec Geomatics Ltd.;

19. Set of Engineering Drawings (30 drawings) for Cardinal Creek Village Phase 1, Pond ECA Application, dated May 27, 2014, prepared by David Schaeffer Engineering Ltd.; including 4 drawings dated May 15, 2014 and 3 drawings dated March 26, 2014, prepared by G.D. Jewell Engineering Inc.;

20. Set of Engineering Drawings (21 drawings) for Cardinal Creek Village Phase 1, ECA Direct Submission Application, Rev 1 Additional Attachments for Storm Sewers & Ditches), dated May 27,2014, prepared by David Schaeffer Engineering Ltd.;

21. E-mail from Matt Wingate of David Schaeffer Engineering Ltd. to the Ministry, dated September 25, 2014;

22. E-mail from Matt Wingate of David Schaeffer Engineering Ltd. to the Ministry, dated September 26,2014.

23. Pipe Data Form;

24. Sanitary Sewer & Storm Sewer Description Sheets, prepared by DSEL, dated September

2017;

25. Sanitary Sewer & Storm Design Sheets, prepared by DSEL, dated September 2017;

26. Engineering Drawings, prepared by DSEL, Revision 1, dated September 12, 2017;

27. Design Brief for Cardinal Creek Village Phase 4 prepared by DSEL, Submission 2, dated September 2017;

28. Stormwater Management Report for Phase 4 of Cardinal Creek Village, prepared by JFSA, dated September 2017;

29. Design Brief for Interim Stormwater Management Pond 1 for Phases 1,2,3, and 4 in Cardinal Creek Village, prepared by JFSA, dated July 2017;

30. Geotechnical Reports

    a. Geotechnical Review – Grading and Services – Cardinal Creek Village - Phase 4 – Old Montreal Road – Ottawa, prepared by Paterson Group, dated July 20, 2017;

    b. Grading Plan Review – Cardinal Creek Village Phase 4 – Old Montreal – Ottawa, prepared by Paterson Group, dated August 29, 2017;

    c. Geotechnical Review – Response to Engineering Comments – Cardinal Creek Village – Phase 4 – Old Montreal Road – Ottawa, prepared by Paterson Group, dated August 31, 2017;

31. Record of MOECC Pre-Consultation:

    a. Pre-submission Consultation Request Form, dated August 3, 2017;

    b. City of Ottawa Confirmation of Transfer of Review, dated September 14, 2017;

32. Conservation Authority Letter of Approval;

33. Articles of Incorporation, dated April 18, 2011;

34. Draft Plan of Subdivision for Cardinal Creek Village (All Phases), prepared by Stantec, dated December 13, 2013;

35. Conditions of Draft Approval – Cardinal Creek Village (All Phases) prepared by City of Ottawa, dated April 7, 2014;

36. Draft of M-Plan for Cardinal Creek Village Phase 4, prepared by Stantec, dated June 14, 2017;

37. Source Protection Maps, prepared by DSEL, dated July 2017:

    a. Environmental Constraints;

    b. Highly Vulnerable Aquifers;

    c. Natural Heritage Areas;

    d. Significant Groundwater Recharge Areas;

    e. Water Intake Protection Areas;

    f. Wellhead Protection Areas;

38. Official Plan Map, prepared by DSEL, dated July 2017;

39. Zoning Map, prepared by DSEL, dated July 2017;

40. Site Location Map, prepared by DSEL, dated August 2017;

41. Past MOECC Approvals:

    a. Environmental Compliance Approval for Cardinal Creek Village – Phase 1 Storm Sewers, Sanitary Sewers, and Stormwater Management Facility [ECA #0029-9P9RLU, dated September 26, 2014];

    b. Environmental Compliance Approval for Cardinal Creek Village – Phase 2 Storm Sewers and Sanitary Sewers [ECA #3548-9UCJYM, dated March 10, 2015];

    c. Environmental Compliance Approval for Cardinal Creek Village – Phase 3 Storm Sewers and Sanitary Sewers [ECA #3610-AAFH8K, dated June 01, 2016];

42. Notice of Completion of Class Environmental Assessment;

43. Agent Letter of Authorization from Owner, Email from Michelle Taggart, dated April 30, 2014;

44. Laporte Agreement with Tamarack (Cardinal Creek) Corporation, dated September 2013; and

45. Questionnaire Regarding Environmental Bill of Rights (EBR) Requirements – Equivalent Public Participation.

The reasons for the imposition of these terms and conditions are as follows:

Reasons:

1. Condition 1 is imposed to ensure that the Works are constructed and operated in the manner in which they were described and upon which approval was granted. This condition is also included to emphasize the precedence of conditions in the Approval and the practice that the Approval is based on the most current document, if several conflicting documents are submitted for review.

2. Condition 2 is included to ensure that, when the Works are constructed, the Works will meet the standards that apply at the time of construction to ensure the ongoing protection of the environment.

3. Condition 3 is included to ensure that the Ministry records are kept accurate and current with respect to the approved Works and to ensure that subsequent owners of the Works are made aware of the Approval and continue to operate the Works in compliance with it.

4. Condition 4 is included as regular inspection and necessary removal of sediment and excessive decaying vegetation from the Works are required to mitigate the impact of sediment, debris and/or decaying vegetation on the treatment capacity of the Works. The Condition also ensures that adequate storage is maintained in the Works at all times as required by the design. Furthermore, this Condition is included to ensure that the Works are operated and maintained to function as designed.

5. Condition 5 is included as installation, regular inspection and maintenance of the temporary sediment and erosion control measures is required to mitigate the impact on the downstream receiving watercourse during construction until they are no longer required.

6. Condition 6 is included to provide a performance record for future references, to ensure that the Ministry is made aware of problems as they arise, and to provide a compliance record for all the terms and conditions outlined in this Approval, so that the Ministry can work with the Owner in resolving any problems in a timely manner.

7. Condition 7 is included to require that all records are retained for a sufficient time period to adequately evaluate the long-term operation and maintenance of the Works.

Upon issuance of the environmental compliance approval, I hereby revoke Approval No(s). 7792-ASJR4M issued on October 31, 2017.

In accordance with Section 139 of the Environmental Protection Act, you may by written Notice served upon me and the Environmental Review Tribunal within 15 days after receipt of this Notice, require a hearing by the

Tribunal. Section 142 of the Environmental Protection Act provides that the Notice requiring the hearing shall state:

a. The portions of the environmental compliance approval or each term or condition in the environmental compliance approval in respect of which the hearing is required, and;
b. The grounds on which you intend to rely at the hearing in relation to each portion appealed.

Pursuant to subsection 139(3) of the Environmental Protection Act, a hearing may not be required with respect to any terms and conditions in this environmental compliance approval, if the terms and conditions are substantially the same as those contained in an approval that is amended or revoked by this environmental compliance approval.

The Notice should also include:

1. The name of the appellant;
2. The address of the appellant;
3. The environmental compliance approval number;
4. The date of the environmental compliance approval;
5. The name of the Director, and;
6. The municipality or municipalities within which the project is to be engaged in.

And the Notice should be signed and dated by the appellant.

This Notice must be served upon:

The Secretary*
Environmental Review Tribunal
655 Bay Street, Suite 1500
Toronto, Ontario
M5G 1E5

AND

The Director appointed for the purposes of Part II.1 of the Environmental Protection Act
Ministry of the Environment, Conservation and Parks
135 St. Clair Avenue West, 1st Floor
Toronto, Ontario
M4V 1P5

*** Further information on the Environmental Review Tribunal's requirements for an appeal can be obtained directly from the Tribunal at: Tel: (416) 212-6349, Fax: (416) 326-5370 or www.ert.gov.on.ca**

The above noted activity is approved under s.20.3 of Part II.1 of the Environmental Protection Act.

DATED AT TORONTO this 20th day of September, 2019

Aziz Ahmed, P.Eng.
Director
appointed for the purposes of Part II.1 of the
Environmental Protection Act

RV/
c: District Manager, MECP Ottawa
Clerk, City of Ottawa (File No. D07-16-13-0024)
Michael J Thivierge, P.Eng., Senior Engineer, Development Review, City of Ottawa
Matt Wingate, David Schaeffer Engineering Ltd.

Appendix C

September 27, 2024

Sent by email: BKaminski@dsel.ca

David Schaeffer Engineering Ltd.
120 Iber Road, Unit 103
Stittsville, ON K2S 1E9

Attention: **Braden Kaminski, P.Eng**
Project Manager

Re: Water Distribution Network Boundary Condition Request – Revision 3
Cardinal Creek Village South
GeoAdvice Project ID: 2021-077-DSE

Dear Mr.Kaminski,

In order to carry out the watermain analysis and hydraulic modeling for the Cardinal Creek Village (CCV) South development in the City of Ottawa, we request the hydraulic boundary conditions (HGL) for the proposed connection points as shown on the attached schematic. Flow conditions are outlined below:

Boundary conditions at **Connections 1 and 2** are required for the demand conditions:

- Average day demand = 22.39 L/s
- Maximum day demand = 39.13 L/s
- Maximum day demand + fire flow (167 L/s) = 206.13 L/s
- Maximum day demand + fire flow (250 L/s) = 289.13 L/s
- Peak hour demand = 68.26 L/s

The above demands should be allocated and split equally to Connections 1 and 2.

For the maximum day demand plus fire flow scenarios, the HGLs for the lowest (167 L/s) and highest (250 L/s) fire flow requirement scenarios should be provided. The HGLs for any intermediate fire flow scenarios will be interpolated. Please confirm if any pumps turn on between the lowest (167 L/s) and highest (250 L/s) fire flow requirement scenarios. If there are any pumps feeding the development area and any additional pumps turning on between the lowest and highest fire flow scenarios, the HGLs **cannot** be interpolate or extrapolated. In this case, boundary conditions should be provided for all fire flow scenarios listed above.

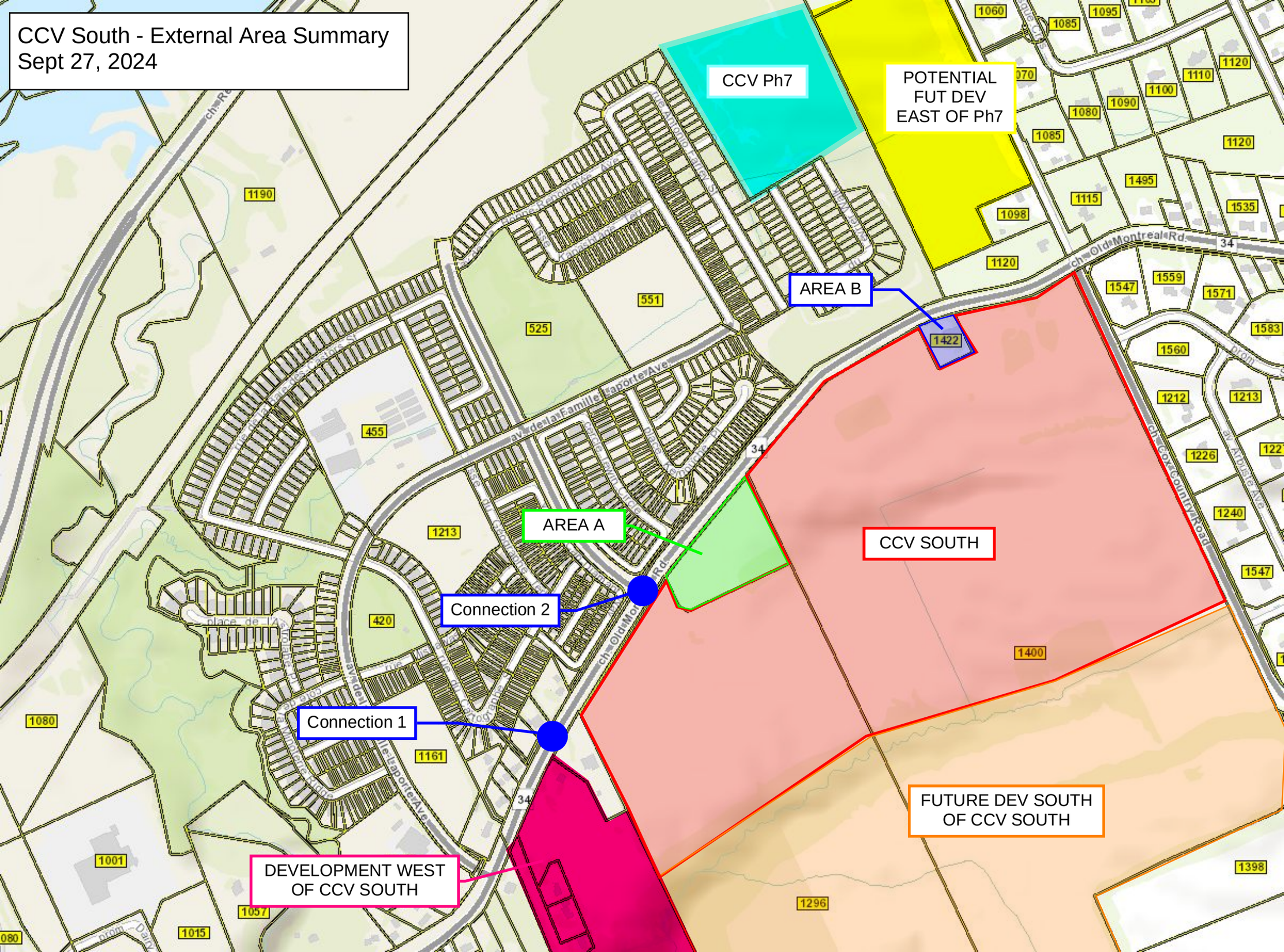
If you have any questions, please do not hesitate to contact me.

Yours truly,

GeoAdvice Engineering Inc.

Werner de Schaetzen, Ph.D., P.Eng.
President and Chief Executive Officer
werner@geoadvice.com
GeoAdvice Engineering Inc.

Attachments: Mark up for connection locations and demand calculations


CCV South - External Area Summary
Sept 27, 2024
CCV Ph7
POTENTIAL FUT DEV EAST OF Ph7
AREA B
AREA A
CCV SOUTH
Connection 2
Connection 1
FUTURE DEV SOUTH OF CCV SOUTH
DEVELOPMENT WEST OF CCV SOUTH
ch. Old Montreal Rd
ch. Cox County Road
av. de La Famille-Laporte Ave
1422
1400
1296
1190
551
525
455
1213
420
1080
1161
1001
1057
1015
1060
1085
1095
1070
1110
1120
1100
1090
1080
1085
1120
1495
1115
1098
1120
1535
1547
1559
1571
1583
1560
1212
1213
1226
1240
1547
1398

Consumer Water Demands

Residential Demands - CCV South Phase 1*

Dwelling Type	Number of Units	Population		Average Day Demand			Max Day	Peak Hour
		Persons per Unit	Population Per Dwelling Type	(L/c/d)	(L/d)	(L/s)	2 x Avg. Day (L/s)	3 x Avg. Day (L/s)
Single Detached	32	3.4	109	280	30,520	0.35	0.71	1.06
Back-to-Back Townhome	40	2.7	108		30,240	0.35	0.70	1.05
Traditional Townhome	35	2.7	95		26,600	0.31	0.62	0.92
Subtotal	**107**		**312**		**87,360**	**1.01**	**2.02**	**3.03**

Non Residential Demands - CCV South Phase 1

Property Type	Area (ha)		Average Day Demand			Max Day	Peak Hour
			(L/ha/d)	(L/d)	(L/s)	1.5 x Avg. Day (L/s)	1.8 x Max Day (L/s)
Commercial	2.40		28,000	67,200	0.78	1.17	2.10
Subtotal	**2.40**			**67,200**	**0.78**	**1.17**	**2.10**

Residential Demands - CCV South Phase 2*

Dwelling Type	Number of Units	Population		Average Day Demand			Max Day	Peak Hour
		Persons per Unit	Population Per Dwelling Type	(L/c/d)	(L/d)	(L/s)	2 x Avg. Day (L/s)	3 x Avg. Day (L/s)
Single Detached	78	3.4	266	280	74,480	0.86	1.72	2.59
Back-to-Back Townhome	0	2.7	-		-	-	-	-
Traditional Townhome	54	2.7	146		40,880	0.47	0.95	1.42
Subtotal	**132**		**412**		**115,360**	**1.34**	**2.67**	**4.01**

Non Residential Demands - CCV South Phase 2

Property Type	Area (ha)		Average Day Demand			Max Day	Peak Hour
			(L/ha/d)	(L/d)	(L/s)	1.5 x Avg. Day (L/s)	1.8 x Max Day (L/s)
Park (Block 59)	2.44		28,000	68,320	0.79	1.19	2.14
Subtotal	**2.44**			**68,320**	**0.79**	**1.19**	**2.14**

Residential Demands - CCV South Phase 3*

Dwelling Type	Number of Units	Population		Average Day Demand			Max Day	Peak Hour
		Persons per Unit	Population Per Dwelling Type	(L/c/d)	(L/d)	(L/s)	2 x Avg. Day (L/s)	3 x Avg. Day (L/s)
Single Detached	61	3.4	208	280	58,240	0.67	1.35	2.02
Back-to-Back Townhome	72	2.7	195		54,600	0.63	1.26	1.90
Traditional Townhome	62	2.7	168		47,040	0.54	1.09	1.63
Subtotal	**195**		**571**		**159,880**	**1.85**	**3.70**	**5.55**

Residential Demands - CCV South Phase 4*

Dwelling Type	Number of Units	Population		Average Day Demand			Max Day	Peak Hour
		Persons per Unit	Population Per Dwelling Type	(L/c/d)	(L/d)	(L/s)	2 x Avg. Day (L/s)	3 x Avg. Day (L/s)
Single Detached	39	3.4	133	280	37,240	0.43	0.86	1.29
Back-to-Back Townhome	40	2.7	108		30,240	0.35	0.70	1.05
Traditional Townhome	69	2.7	187		52,360	0.61	1.21	1.82
Subtotal	**148**		**428**		**119,840**	**1.39**	**2.77**	**4.16**

Non Residential Demands - CCV South Phase 4

Property Type	Area (ha)‡		Average Day Demand			Max Day	Peak Hour
			(L/ha/d)	(L/d)	(L/s)	1.5 x Avg. Day (L/s)	1.8 x Max Day (L/s)
Park (Block 58)	1.58		28,000	44,240	0.51	0.77	1.38
Subtotal	**1.58**			**44,240**	**0.51**	**0.77**	**1.38**

Residential Demands - CCV South Phase 5*

Dwelling Type	Number of Units	Population		Average Day Demand			Max Day	Peak Hour
		Persons per Unit	Population Per Dwelling Type	(L/c/d)	(L/d)	(L/s)	2 x Avg. Day (L/s)	3 x Avg. Day (L/s)
Single Detached	123	3.4	419	280	117,320	1.36	2.72	4.07
Back-to-Back Townhome	-	2.7	-		-	-	-	-
Traditional Townhome	41	2.7	111		31,080	0.36	0.72	1.08
Subtotal	**164**		**530**		**148,400**	**1.72**	**3.44**	**5.15**

Non Residential Demands - CCV South Phase 5

Property Type	Area (ha)		Average Day Demand			Max Day	Peak Hour
			(L/ha/d)	(L/d)	(L/s)	1.5 x Avg. Day (L/s)	1.8 x Max Day (L/s)
School (Block 34)	2.464		28,000	68,992	0.80	1.20	2.16
Subtotal	**2.464**			**68,992**	**0.80**	**1.20**	**2.16**

Residential Demands - Area A *

Dwelling Type	Number of Units	Population		Average Day Demand			Max Day	Peak Hour
		Persons per Unit	Population Per Dwelling Type	(L/c/d)	(L/d)	(L/s)	2 x Avg. Day (L/s)	3 x Avg. Day (L/s)
Multi-Family Residential (area 0.53 ha) ǂ	27	2.7	73	280	20,412	0.24	0.47	0.71
Subtotal	**27**		**73**		**20,412**	**0.24**	**0.47**	**0.71**

Non Residential Demands - Area A

Property Type	Area (ha)		Average Day Demand			Max Day	Peak Hour
			(L/ha/d)	(L/d)	(L/s)	1.5 x Avg. Day (L/s)	1.8 x Max Day (L/s)
Commercial ǂ	1.49		28,000	41,720	0.48	0.72	1.30
Subtotal	**1.49**			**41,720**	**0.48**	**0.72**	**1.30**

Residential Demands - Area B*

Dwelling Type	Number of Units	Population		Average Day Demand			Max Day	Peak Hour
		Persons per Unit	Population Per Dwelling Typeǂ	(L/c/d)	(L/d)	(L/s)	2 x Avg. Day (L/s)	3 x Avg. Day (L/s)
Single Family Residential (area 0.43 ha) ǂ	-	-	28	280	7,840	0.09	0.18	0.27
Subtotal	**-**		**28**		**7,840**	**0.09**	**0.18**	**0.27**

Residential Demands - Development west of CCV South*

Dwelling Type	Number of Units	Population		Average Day Demand			Max Day	Peak Hour
		Persons per Unit	Population Per Dwelling Typeǂ	(L/c/d)	(L/d)	(L/s)	2 x Avg. Day (L/s)	3 x Avg. Day (L/s)
Multi-Family Residentialǂ	-	-	991	280	277,480	3.21	6.42	9.63
Subtotal	**-**		**991**		**277,480**	**3.21**	**6.42**	**9.63**

Residential Demands - Future Development south of CCV Southǂ

Dwelling Type	Number of Units	Population		Average Day Demandǂǂ			Max Day	Peak Hour
		Persons per Unit	Population Per Dwelling Type	(L/unit/d)	(L/d)	(L/s)	(L/s)ǂǂ	(L/s)ǂǂ
Single Detached	368	3.4	1,252	570	209,760	2.43	6.90	18.13
Back-to-Back Townhome	245	2.7	662	560	137,200	1.59	1.59	2.54
Traditional Townhome	655	2.7	1,769	560	366,800	4.25	4.25	6.79
Subtotal	**1,268**		**3,683**		**713,760**	**8.26**	**12.73**	**27.47**

Non Residential Demands - Future Development south of CCV Southǂ

Property Type	Area (ha)		Average Day Demandǂǂ			Max Day	Peak Hour
			(L/ha/d)	(L/d)	(L/s)	(L/s)ǂǂ	(L/s)ǂǂ
School	2.00		8,500	17,000	0.20	0.20	0.26
Park	2.50		8,500	21,250	0.25	0.25	0.32
Subtotal	**4.50**			**38,250**	**0.44**	**0.44**	**0.58**

Residential Demands - CCV North Future Phase 7*

Dwelling Type	Number of Units	Population		Average Day Demand			Max Day 2 x Avg. Day (L/s)	Peak Hour 3 x Avg. Day (L/s)
		Persons per Unit	Population Per Dwelling Type	(L/c/d)	(L/d)	(L/s)		
Multi-Family Residential	-	-	484	280	135,520	1.57	3.14	4.71
Subtotal	**-**		**484**		**135,520**	**1.57**	**3.14**	**4.71**

Residential Demands - Future Development east of CCV North Phase 7*

Dwelling Type	Number of Units	Population		Average Day Demand			Max Day 2 x Avg. Day (L/s)	Peak Hour 3 x Avg. Day (L/s)
		Persons per Unit	Population Per Dwelling Type	(L/c/d)	(L/d)	(L/s)		
Multi-Family Residential	-	-	479	280	134,120	1.55	3.10	4.66
Subtotal	**-**		**479**		**134,120**	**1.55**	**3.10**	**4.66**

		Avg. Day	Max Day	Peak Hour
Total (Connection Points 1 & 2)		**22.39**	**39.13**	**68.26**

*Peaking factors based on development population of 3,001-10,000 capita from the MOE Design Guidelines

‡Provided by DSEL

‡‡Peaking factors from the previous Cardinal Creek Village Study (Veritec, 2013)

Braden Kaminski

From: Braden Kaminski
Sent: Wednesday, October 2, 2024 2:02 PM
To: 'Baird, Natasha'
Cc: Hannah Bulmer; 'Sarah Al Hajjar'
Subject: RE: Boundary Conditions Request | CCV South
Attachments: 2021-077-DSE_BoundaryConditionsRequest_r4_2024-09-27_USE.pdf

Hi Natasha,

I hope all is well. We're looking for updated water boundary conditions for Cardinal Creek Village South in response to the first submission City comments (provided on June 5, 2023, for quick reference). If you're no longer the contact for this file, could you please direct me to the appropriate contact?

The revised water demands and request from GeoAdvice can be found attached. If the City's modeling team has any questions please feel free to have them reach out to discuss. Please note:

- Fire flow scenarios between the two requested values (167 L/s & 250 L/s) are planned to be interpolated based on the results provided. As such, please flag if there are any additional pumps turned on that would not allow for intermediate results to be interpolated.
- Demands for potential future developments surrounding CCV South have been assumed as part of the attached request. These demands have been included as we have assumed that all these properties are not included in the City's current model. Please let us know if any of the future developments highlighted in the attached request have been included.
- The combined population considered in the attached request exceeds 3,000, and as such, consistent with Section 4.2.8 of the City's Water Distribution Design Guidelines, the residential peaking factors have been taken from Table 3-3 of the MOE Design Guidelines for Drinking-Water Systems.

Thank you,

Braden Kaminski, P.Eng
Project Manager

DSEL
david schaeffer engineering ltd.

120 Iber Road, Unit 103
Stittsville, ON K2S 1E9

phone: (613) 845-2107
cell: (343) 574-2872
email: BKaminski@DSEL.ca

From: Baird, Natasha <Natasha.Baird@ottawa.ca>
Sent: Thursday, February 24, 2022 8:40 AM
To: Braden Kaminski <BKaminski@dsel.ca>
Cc: Laura Maxwell <LMaxwell@dsel.ca>
Subject: RE: Boundary Conditions Request | CCV South

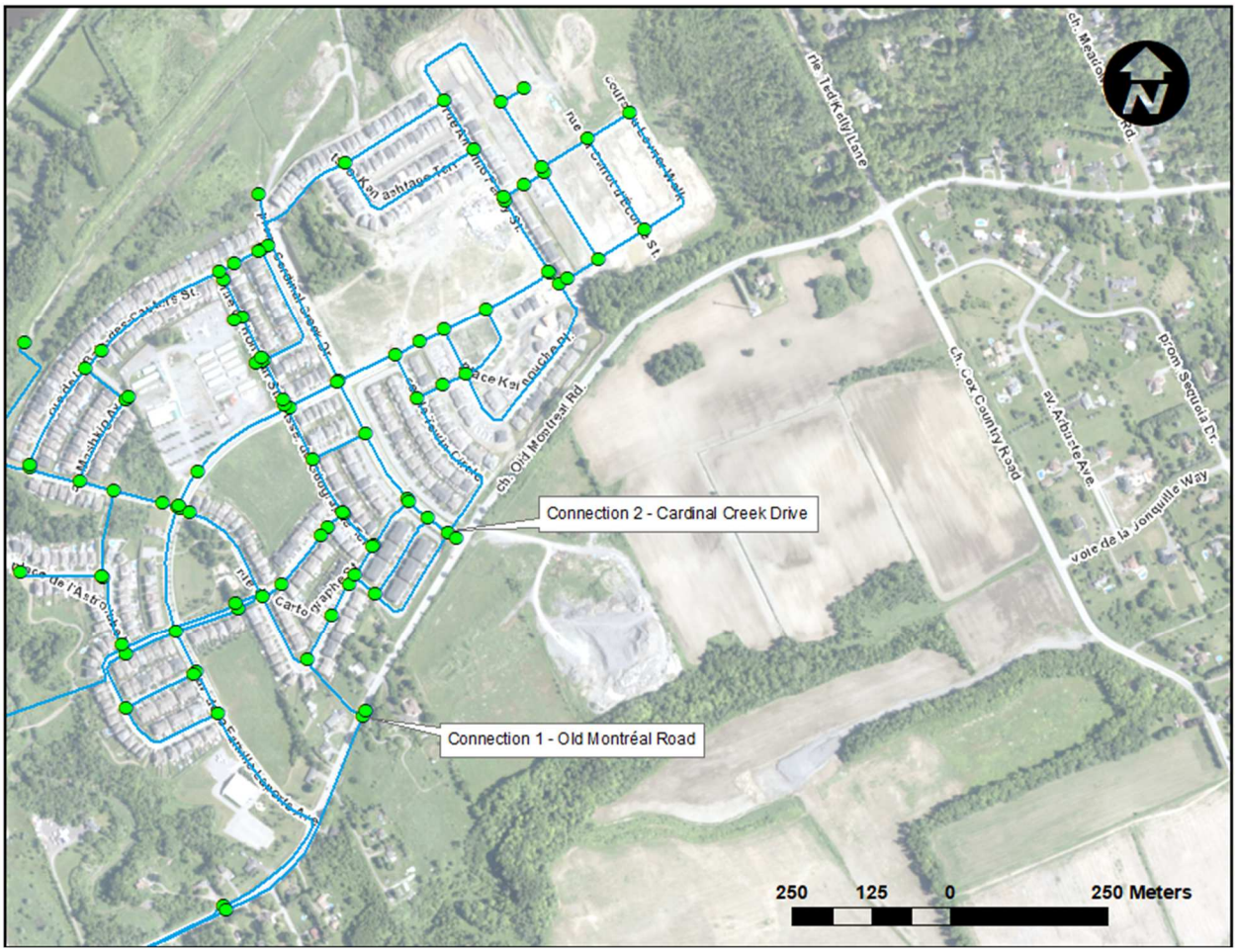
Good Morning Braden,

Boundary Conditions
Cardinal Creek Village South – E4 & E5 UEA

Provided Information

Scenario	Demand	
	L/min	L/s
Average Daily Demand	1,343	22.39
Maximum Daily Demand	2,348	39.13
Peak Hour	4,096	68.26
Fire Flow Demand #1	10,000	166.67
Fire Flow Demand #2	15,000	250.00

Location



Results

Connection 1 – Old Montréal Road

Demand Scenario	Head (m)	Pressure[1] (psi)
Maximum HGL	130.2	80.6
Peak Hour	124.9	73.1
Max Day plus Fire Flow #1	123.6	71.2
Max Day plus Fire Flow #2	119.8	65.8

Ground Elevation = 73.5 m

Connection 2 – Cardinal Creek Drive

Demand Scenario	Head (m)	Pressure[1] (psi)
Maximum HGL	130.1	76.5
Peak Hour	124.7	68.8
Max Day plus Fire Flow #1	121.3	63.9
Max Day plus Fire Flow #2	115.2	55.2

Ground Elevation = 76.3 m

Notes

1. As per the Ontario Building Code in areas that may be occupied, the static pressure at any fixture shall not exceed 552 kPa (80 psi.) Pressure control measures to be considered are as follows, in order of preference:
    a. If possible, systems to be designed to residual pressures of 345 to 552 kPa (50 to 80 psi) in all occupied areas outside of the public right-of-way without special pressure control equipment.
    b. Pressure reducing valves to be installed immediately downstream of the isolation valve in the home/ building, located downstream of the meter so it is owner maintained.
2. No additional pumps turned on during different scenarios.

Disclaimer

The boundary condition information is based on current operation of the city water distribution system. The computer model simulation is based on the best information available at the time. The operation of the water distribution system can change on a regular basis, resulting in a variation in boundary conditions. The physical properties of watermains deteriorate over time, as such must be assumed in the absence of actual field test data. The variation in physical watermain properties can therefore alter the results of the computer model simulation. Fire Flow analysis is a reflection of available flow in the watermain; there may be additional restrictions that occur between the watermain and the hydrant that the model cannot take into account.

Appendix D

SANITARY SEWER CALCULATION SHEET

Manning's n=0.013

LOCATION			RESIDENTIAL AREA AND POPULATION							COMM		INSTIT		PARK		C+I+I	INFILTRATION				PIPE						
STREET	FROM M.H.	TO M.H.	AREA (ha)	UNITS	POP.	CUMULATIVE AREA (ha)	CUMULATIVE POP.	PEAK FACT.	PEAK FLOW (l/s)	AREA (ha)	ACCU. AREA (ha)	AREA (ha)	ACCU. AREA (ha)	AREA (ha)	ACCU. AREA (ha)	PEAK FLOW (l/s)	TOTAL AREA (ha)	ACCU. AREA (ha)	INFILT. FLOW (l/s)	TOTAL FLOW (l/s)	DIST (m)	DIA (mm)	SLOPE (%)	CAP. (FULL) (l/s)	RATIO Q act/Q cap	VEL. (FULL) (m/s)	VEL. (ACT.) (m/s)
SERVICING BLOCK 2																											
Contribution From STREET 17, Pipe 95A - 96A						1.39	95				0.00		0.00		0.00		1.39	1.39									
	96A	97A	0.54		37	1.93	132	3.6	1.53		0.00		0.00		0.00	0.00	0.54	1.93	0.64	2.16	12.0	200	0.55	24.32	0.09	0.77	0.48
Contribution From STREET 17, Pipe 90A - 91A						0.50	34				0.00		0.00		0.00		0.50	0.50									
	91A	97A				0.50	34	3.7	0.41		0.00		0.00		0.00	0.00	0.00	0.50	0.17	0.57	6.0	200	0.35	19.40	0.03	0.62	0.27
	97A	98A				2.43	166	3.5	1.91		0.00		0.00	1.58	1.58	0.17	1.58	4.01	1.32	3.40	105.0	200	2.05	46.96	0.07	1.49	0.86
	98A	99A				2.43	166	3.5	1.91		0.00		1.58		1.58	0.17	0.00	4.01	1.32	3.40	91.5	200	1.05	33.61	0.10	1.07	0.68
	99A	100A				2.43	166	3.5	1.91		0.00	2.44	2.44		1.58	0.96	2.44	6.45	2.13	4.99	33.0	200	0.45	22.00	0.23	0.70	0.56
To STREET 1, Pipe 100A - 2000A						2.43	166				0.00		2.44		1.58			6.45									
STREET 5																											
	74A	75A	0.41		28	0.41	28	3.7	0.33		0.00		0.00		0.00	0.00	0.41	0.41	0.14	0.47	91.5	200	0.35	19.40	0.02	0.62	0.26
To STREET 12, Pipe 75A - 83A						0.41	28				0.00		0.00		0.00			0.41									
STREET 6																											
	64A	65A	0.33		23	0.33	23	3.7	0.28		0.00		0.00		0.00	0.00	0.33	0.33	0.11	0.38	44.5	200	0.80	29.34	0.01	0.93	0.32
To STREET 12, Pipe 65A - 71A						0.33	23				0.00		0.00		0.00			0.33									
	66A	67A	0.25		17	0.25	17	3.7	0.20		0.00		0.00		0.00	0.00	0.25	0.25	0.08	0.29	13.5	200	0.95	31.97	0.01	1.02	0.31
	67A	68A	0.31		22	0.56	39	3.7	0.46		0.00		0.00		0.00	0.00	0.31	0.56	0.18	0.65	11.5	200	0.35	19.40	0.03	0.62	0.29
	68A	69A	0.40		28	0.96	67	3.6	0.79		0.00		0.00		0.00	0.00	0.40	0.96	0.32	1.10	65.5	200	0.35	19.40	0.06	0.62	0.33
	69A	70A	0.25		17	1.21	84	3.6	0.98		0.00		0.00		0.00	0.00	0.25	1.21	0.40	1.38	11.5	200	0.75	28.40	0.05	0.90	0.47
	70A	71A	0.57		39	1.78	123	3.6	1.42		0.00		0.00		0.00	0.00	0.57	1.78	0.59	2.01	77.5	200	0.35	19.40	0.10	0.62	0.40
To STREET 12, Pipe 71A - 73A						1.78	123				0.00		0.00		0.00			1.78									
STREET 13																											
	16A	17A	0.68		46	0.68	46	3.7	0.55		0.00		0.00		0.00	0.00	0.68	0.68	0.22	0.77	87.5	200	2.95	56.33	0.01	1.79	0.62
	17A	18A	0.67		46	1.35	92	3.6	1.07		0.00		0.00		0.00	0.00	0.67	1.35	0.45	1.52	87.5	200	3.45	60.92	0.02	1.94	0.80
	18A	20A	0.66		45	2.01	137	3.6	1.58		0.00		0.00		0.00	0.00	0.66	2.01	0.66	2.25	87.5	200	0.45	22.00	0.10	0.70	0.45
To STREET 15, Pipe 20A - 26A						2.01	137				0.00		0.00		0.00			2.01									
	21A	22A	0.13		9	0.13	9	3.7	0.11		0.00		0.00		0.00	0.00	0.13	0.13	0.04	0.15	67.5	200	1.35	38.11	0.00	1.21	0.29
	22A	23A	0.06		5	0.19	14	3.7	0.17		0.00		0.00		0.00	0.00	0.06	0.19	0.06	0.23	11.0	200	1.10	34.40	0.01	1.09	0.30
	23A	24A	0.78		53	0.97	67	3.6	0.79		0.00		0.00		0.00	0.00	0.78	0.97	0.32	1.11	92.5	200	2.20	48.65	0.02	1.55	0.62
	24A	25A	0.73		50	1.70	117	3.6	1.36		0.00		0.00		0.00	0.00	0.73	1.70	0.56	1.92	92.5	200	2.55	52.37	0.04	1.67	0.79
	25A	26A	0.70		48	2.40	165	3.5	1.89		0.00		0.00		0.00	0.00	0.70	2.40	0.79	2.69	92.5	200	0.60	25.41	0.11	0.81	0.52
To STREET 15, Pipe 26A - 32A						2.40	165				0.00		0.00		0.00			2.40									
STREET 19																											
	8A	9A	0.05		4	0.05	4	3.8	0.05		0.00		0.00		0.00	0.00	0.05	0.05	0.02	0.07	21.0	200	0.65	26.44	0.00	0.84	0.17
	9A	10A	0.03		3	0.08	7	3.7	0.08		0.00		0.00		0.00	0.00	0.03	0.08	0.03	0.11	11.5	200	2.00	46.38	0.00	1.48	0.30
	10A	11A	0.44		30	0.52	37	3.7	0.44		0.00		0.00		0.00	0.00	0.44	0.52	0.17	0.61	80.5	200	2.05	46.96	0.01	1.49	0.52
	1A	2A	0.40		28	0.40	28	3.7	0.33		0.00		0.00		0.00	0.00	0.40	0.40	0.13	0.47	59.5	200	0.35	19.40	0.02	0.62	0.26
	2A	3A	0.14		10	0.54	38	3.7	0.45		0.00		0.00		0.00	0.00	0.14	0.54	0.18	0.63	53.0	200	0.35	19.40	0.03	0.62	0.28
	3A	4A				0.54	38	3.7	0.45		0.00		0.00		0.00	0.00	0.00	0.54	0.18	0.63	12.0	200	0.35	19.40	0.03	0.62	0.28
	4A	5A	0.29		20	0.83	58	3.6	0.68		0.00		0.00		0.00	0.00	0.29	0.83	0.27	0.96	62.0	200	2.20	48.65	0.02	1.55	0.60
	5A	6A	0.06		5	0.89	63	3.6	0.74		0.00		0.00		0.00	0.00	0.06	0.89	0.29	1.04	11.0	200	1.50	40.17	0.03	1.28	0.54

DESIGN PARAMETERS

Park Flow =	9300	L/ha/da	0.10764	l/s/Ha
Average Daily Flow =	280	l/p/day		
Comm/Inst Flow =	28000	L/ha/da	0.3241	l/s/Ha
Industrial Flow =	35000	L/ha/da	0.40509	l/s/Ha
Max Res. Peak Factor =	4.00			
Commercial/Inst./Park Peak Factor =	1.00			
Institutional =	0.32	l/s/Ha		

Industrial Peak Factor = as per MOE Graph
Extraneous Flow = 0.330 L/s/Ha
Minimum Velocity = 0.600 m/s
Manning's n = (Conc) 0.013 (CMP)
Townhouse coeff= 2.7
Single house coeff= 3.2

Designed: M.S.

Checked: S.L.M

Dwg. Reference: Sanitary Servicing Plan, Dwgs. No. 3

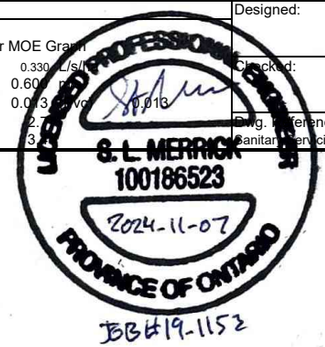
PROJECT: **Cardinal Creek Village South FSR**

LOCATION: **City of Ottawa**

File Ref:

Date: **07 Nov 2024**

Sheet No. 1 of 4



SANITARY SEWER CALCULATION SHEET

Manning's n=0.013

LOCATION			RESIDENTIAL AREA AND POPULATION							COMM		INSTIT		PARK		C+I+I	INFILTRATION				PIPE					VEL.	
STREET	FROM M.H.	TO M.H.	AREA (ha)	UNITS	POP.	CUMULATIVE AREA (ha)	CUMULATIVE POP.	PEAK FACT.	PEAK FLOW (l/s)	AREA (ha)	ACCU. AREA (ha)	AREA (ha)	ACCU. AREA (ha)	AREA (ha)	ACCU. AREA (ha)	PEAK FLOW (l/s)	TOTAL AREA (ha)	ACCU. AREA (ha)	INFILT. FLOW (l/s)	TOTAL FLOW (l/s)	DIST (m)	DIA (mm)	SLOPE (%)	CAP. (FULL) (l/s)	RATIO Q act/Q cap	(FULL) (m/s)	(ACT.) (m/s)
	6A	7A	0.58		39	1.47	102	3.6	1.19		0.00		0.00		0.00	0.00	0.58	1.47	0.49	1.67	85.0	200	0.35	19.40	0.09	0.62	0.37
	7A	11A	0.49		34	1.96	136	3.6	1.57		0.00		0.00		0.00	0.00	0.49	1.96	0.65	2.22	85.0	200	0.35	19.40	0.11	0.62	0.41
	11A	12A	0.48		33	2.96	206	3.5	2.35		0.00		0.00		0.00	0.00	0.48	2.96	0.98	3.32	95.5	200	1.60	41.49	0.08	1.32	0.79
	12A	15A	0.41		28	3.37	234	3.5	2.65		0.00		0.00		0.00	0.00	0.41	3.37	1.11	3.76	95.5	200	0.40	20.74	0.18	0.66	0.50
To STREET 15, Pipe 15A - 20A						3.37	234				0.00		0.00		0.00			3.37									
STREET 15																											
	13A	14A	0.51		35	0.51	35	3.7	0.42		0.00	2.47	2.47		0.00	0.80	2.98	2.98	0.98	2.20	84.5	200	0.35	19.40	0.11	0.62	0.41
	14A	15A	0.53		37	1.04	72	3.6	0.85		0.00		2.47		0.00	0.80	0.53	3.51	1.16	2.80	98.0	200	0.35	19.40	0.14	0.62	0.44
Contribution From STREET 19, Pipe 12A - 15A						3.37	234				0.00		0.00		0.00		3.37	6.88									
	15A	20A	0.34		24	4.75	330	3.4	3.69		0.00		2.47		0.00	0.80	0.34	7.22	2.38	6.87	77.5	200	0.60	25.41	0.27	0.81	0.69
Contribution From STREET 13, Pipe 18A - 20A						2.01	137				0.00		0.00		0.00		2.01	9.23									
Contribution From STREET 13, Pipe 19A - 20A						0.09	6				0.00		0.00		0.00		0.09	9.32									
	20A	26A	0.34		24	7.19	497	3.4	5.44		0.00		2.47		0.00	0.80	0.34	9.66	3.19	9.43	82.0	200	0.40	20.74	0.45	0.66	0.64
Contribution From STREET 13, Pipe 25A - 26A						2.40	165				0.00		0.00		0.00		2.40	12.06									
	26A	32A	0.34		24	9.93	686	3.3	7.38		0.00		2.47		0.00	0.80	0.34	12.40	4.09	12.27	82.0	200	0.35	19.40	0.63	0.62	0.65
To STREET 17, Pipe 32A - 63A						9.93	686				0.00		2.47		0.00			12.40									
STREET 17																											
	88A	89A	0.03		2	0.03	2	3.8	0.02		0.00		0.00		0.00	0.00	0.03	0.03	0.01	0.03	8.0	200	0.55	24.32	0.00	0.77	0.13
	89A	90A	0.47		32	0.50	34	3.7	0.41		0.00		0.00		0.00	0.00	0.47	0.50	0.17	0.57	76.0	200	0.35	19.40	0.03	0.62	0.27
	90A	91A				0.50	34	3.7	0.41		0.00		0.00		0.00	0.00	0.00	0.50	0.17	0.57	79.0	200	0.55	24.32	0.02	0.77	0.32
To SERVICING BLOCK 2, Pipe 91A - 97A						0.50	34				0.00		0.00		0.00			0.50									
	92A	93A	0.68		46	0.68	46	3.7	0.55		0.00		0.00		0.00	0.00	0.68	0.68	0.22	0.77	75.5	200	0.50	23.19	0.03	0.74	0.33
	93A	94A	0.66		45	1.34	91	3.6	1.06		0.00		0.00		0.00	0.00	0.66	1.34	0.44	1.50	91.0	200	0.35	19.40	0.08	0.62	0.36
	94A	95A				1.34	91	3.6	1.06		0.00		0.00		0.00	0.00	0.00	1.34	0.44	1.50	11.5	200	0.35	19.40	0.08	0.62	0.36
	95A	96A	0.05		4	1.39	95	3.6	1.11		0.00		0.00		0.00	0.00	0.05	1.39	0.46	1.57	30.5	200	1.85	44.61	0.04	1.42	0.66
To SERVICING BLOCK 2, Pipe 96A - 97A						1.39	95				0.00		0.00		0.00			1.39									
	28A	29A	0.13		9	0.13	9	3.7	0.11		0.00		0.00		0.00	0.00	0.13	0.13	0.04	0.15	9.0	200	0.85	30.24	0.01	0.96	0.25
	29A	30A	0.78		53	0.91	62	3.6	0.73		0.00		0.00		0.00	0.00	0.78	0.91	0.30	1.03	88.5	200	0.45	22.00	0.05	0.70	0.35
	30A	31A	0.69		47	1.60	109	3.6	1.27		0.00		0.00		0.00	0.00	0.69	1.60	0.53	1.79	88.0	200	1.35	38.11	0.05	1.21	0.61
	31A	32A	0.52		36	2.12	145	3.6	1.67		0.00		0.00		0.00	0.00	0.52	2.12	0.70	2.37	88.0	200	1.35	38.11	0.06	1.21	0.66
Contribution From STREET 15, Pipe 26A - 32A						9.93	686				0.00		2.47		0.00		12.40	14.52									
	32A	63A	0.13		9	12.18	840	3.3	8.92		0.00		2.47		0.00	0.80	0.13	14.65	4.83	14.56	80.0	200	0.70	27.44	0.53	0.87	0.88
To STREET 12, Pipe 63A - 65A						12.18	840				0.00		2.47		0.00			14.65									
STREET 7																											
	56A	57A	0.53		37	0.53	37	3.7	0.44		0.00		0.00		0.00	0.00	0.53	0.53	0.17	0.62	69.0	200	0.85	30.24	0.02	0.96	0.37
To STREET 12, Pipe 57A - 63A						0.53	37				0.00		0.00		0.00			0.53									
	58A	59A	0.46		32	0.46	32	3.7	0.38		0.00		0.00		0.00	0.00	0.46	0.46	0.15	0.53	39.5	200	0.75	28.40	0.02	0.90	0.35
	59A	60A	0.24		17	0.70	49	3.7	0.58		0.00		0.00		0.00	0.00	0.24	0.70	0.23	0.81	12.0	200	0.35	19.40	0.04	0.62	0.30
	60A	61A	0.37		26	1.07	75	3.6	0.88		0.00		0.00		0.00	0.00	0.37	1.07	0.35	1.23	66.0	200	1.50	40.17	0.03	1.28	0.58
	61A	62A	0.19		13	1.26	88	3.6	1.03		0.00		0.00		0.00	0.00	0.19	1.26	0.42	1.44	11.0	200	0.35	19.40	0.07	0.62	0.36
	62A	63A	0.91		62	2.17	150	3.6	1.73		0.00		0.00		0.00	0.00	0.91	2.17	0.72	2.44	119.0	200	0.35	19.40	0.13	0.62	0.42
To STREET 12, Pipe 63A - 65A						2.17	150				0.00		0.00		0.00			2.17									

DESIGN PARAMETERS

Park Flow =	9300	L/ha/da	0.10764	l/s/Ha
Average Daily Flow =	280	l/p/day		
Comm/Inst Flow =	28000	L/ha/da	0.3241	l/s/Ha
Industrial Flow =	35000	L/ha/da	0.40509	l/s/Ha
Max Res. Peak Factor =	4.00			
Commercial/Inst./Park Peak Factor =	1.00			
Institutional =	0.32	l/s/Ha		

Industrial Peak Factor = as per MOE Graph
Extraneous Flow = 0.33 L/s/ha
Minimum Velocity = 0.600 m/s
Manning's n = (Conc) 0.013 (PVC) 0.013
Townhouse coeff= 2.7
Single house coeff= 3.4

Designed: M.S.

Checked: S.L.M

Dwg. Reference: Servicing Plan, Dwgs. No. 3

PROJECT: **Cardinal Creek Village South FSR**

LOCATION: **City of Ottawa**

File Ref:

Date: **07 Nov 2024**

Sheet No. 2 of 4

SANITARY SEWER CALCULATION SHEET

Manning's n=0.013

LOCATION			RESIDENTIAL AREA AND POPULATION							COMM		INSTIT		PARK		C+I+I	INFILTRATION				PIPE						
STREET	FROM M.H.	TO M.H.	AREA (ha)	UNITS	POP.	CUMULATIVE AREA (ha)	CUMULATIVE POP.	PEAK FACT.	PEAK FLOW (l/s)	AREA (ha)	ACCU. AREA (ha)	AREA (ha)	ACCU. AREA (ha)	AREA (ha)	ACCU. AREA (ha)	PEAK FLOW (l/s)	TOTAL AREA (ha)	ACCU. AREA (ha)	INFILT. FLOW (l/s)	TOTAL FLOW (l/s)	DIST (m)	DIA (mm)	SLOPE (%)	CAP. (FULL) (l/s)	RATIO Q act/Q cap	VEL. (FULL) (m/s)	VEL. (ACT.) (m/s)
STREET 13																											
	19A	20A	0.09		6	0.09	6	3.7	0.07		0.00		0.00		0.00	0.00	0.09	0.09	0.03	0.10	30.0	200	1.35	38.11	0.00	1.21	0.25
To STREET 15, Pipe 20A - 26A						0.09	6				0.00		0.00		0.00			0.09									
	54A	55A	0.09		6	0.09	6	3.7	0.07		0.00		0.00		0.00	0.00	0.09	0.09	0.03	0.10	30.0	200	5.10	74.07	0.00	2.36	0.38
To STREET 12, Pipe 55A - 57A						0.09	6				0.00		0.00		0.00			0.09									
STREET 8																											
	46A	47A	0.40		28	0.40	28	3.7	0.33		0.00		0.00		0.00	0.00	0.40	0.40	0.13	0.47	10.0	200	0.35	19.40	0.02	0.62	0.26
	47A	48A	0.58		39	0.98	67	3.6	0.79		0.00		0.00		0.00	0.00	0.58	0.98	0.32	1.11	70.5	200	0.35	19.40	0.06	0.62	0.33
	48A	49A	0.52		36	1.50	103	3.6	1.20		0.00		0.00		0.00	0.00	0.52	1.50	0.50	1.69	70.5	200	0.35	19.40	0.09	0.62	0.37
To STREET 12, Pipe 49A - 55A						1.50	103				0.00		0.00		0.00			1.50									
	50A	51A	0.30		21	0.30	21	3.7	0.25		0.00		0.00		0.00	0.00	0.30	0.30	0.10	0.35	45.0	200	0.35	19.40	0.02	0.62	0.23
	51A	52A	0.15		11	0.45	32	3.7	0.38		0.00		0.00		0.00	0.00	0.15	0.45	0.15	0.53	11.0	200	0.35	19.40	0.03	0.62	0.26
	52A	53A	0.58		39	1.03	71	3.6	0.83		0.00		0.00		0.00	0.00	0.58	1.03	0.34	1.17	65.0	200	0.35	19.40	0.06	0.62	0.34
	53A	55A	0.46		32	1.49	103	3.6	1.20		0.00		0.00		0.00	0.00	0.46	1.49	0.49	1.69	65.0	200	0.35	19.40	0.09	0.62	0.37
To STREET 12, Pipe 55A - 57A						1.49	103				0.00		0.00		0.00			1.49									
STREET 9																											
	36A	37A	0.26		18	0.26	18	3.7	0.22		0.00		0.00		0.00	0.00	0.26	0.26	0.09	0.30	48.0	375	0.35	103.73	0.00	0.94	0.19
Contribution From STREET 12, Pipe 35A - 37A						0.70	49				0.00		0.00		0.00		0.70	0.96									
	37A	38A	0.51		35	1.47	102	3.6	1.19		0.00		0.00		0.00	0.00	0.51	1.47	0.49	1.67	80.5	375	0.35	103.73	0.02	0.94	0.34
	38A	45A	0.50		34	1.97	136	3.6	1.57		0.00		0.00		0.00	0.00	0.50	1.97	0.65	2.22	80.5	375	0.35	103.73	0.02	0.94	0.38
To STREET 12, Pipe 45A - 49A						1.97	136				0.00		0.00		0.00			1.97									
STREET 10																											
	39A	40A	0.32		22	0.32	22	3.7	0.26		0.00		0.00		0.00	0.00	0.32	0.32	0.11	0.37	65.0	200	0.35	19.40	0.02	0.62	0.24
	40A	44A	0.34		24	0.66	46	3.7	0.55		0.00		0.00		0.00	0.00	0.34	0.66	0.22	0.76	80.0	200	0.35	19.40	0.04	0.62	0.30
To STREET 12, Pipe 44A - 45A						0.66	46				0.00		0.00		0.00			0.66									
STREET 12																											
	33A	34A	0.22		15	0.22	15	3.7	0.18		0.00		0.00		0.00	0.00	0.22	0.22	0.07	0.25	70.5	200	0.35	19.40	0.01	0.62	0.21
	34A	35A	0.08		6	0.30	21	3.7	0.25		0.00		0.00		0.00	0.00	0.08	0.30	0.10	0.35	11.0	200	0.35	19.40	0.02	0.62	0.23
	35A	37A	0.40		28	0.70	49	3.7	0.58		0.00		0.00		0.00	0.00	0.40	0.70	0.23	0.81	84.0	200	0.35	19.40	0.04	0.62	0.30
To STREET 9, Pipe 37A - 38A						0.70	49				0.00		0.00		0.00			0.70									
	41A	42A	0.19		13	0.19	13	3.7	0.16		0.00		0.00		0.00	0.00	0.19	0.19	0.06	0.22	52.0	200	0.35	19.40	0.01	0.62	0.20
	42A	43A	0.12		8	0.31	21	3.7	0.25		0.00		0.00		0.00	0.00	0.12	0.31	0.10	0.35	11.5	200	0.35	19.40	0.02	0.62	0.23
	43A	44A	0.14		10	0.45	31	3.7	0.37		0.00		0.00		0.00	0.00	0.14	0.45	0.15	0.52	37.0	200	0.35	19.40	0.03	0.62	0.26
Contribution From STREET 10, Pipe 40A - 44A						0.66	46				0.00		0.00		0.00		0.66	1.11									
	44A	45A	0.16		11	1.27	88	3.6	1.03		0.00		0.00		0.00	0.00	0.16	1.27	0.42	1.45	46.5	200	0.35	19.40	0.07	0.62	0.36
Contribution From STREET 9, Pipe 38A - 45A						1.97	136				0.00		0.00		0.00		1.97	3.24									
	45A	49A	0.44		30	3.68	254	3.5	2.87		0.00		0.00		0.00	0.00	0.44	3.68	1.21	4.08	82.0	375	0.35	103.73	0.04	0.94	0.45
Contribution From STREET 8, Pipe 48A - 49A						1.50	103				0.00		0.00		0.00		1.50	5.18									
	49A	55A	0.31		22	5.49	379	3.4	4.21		0.00		0.00		0.00	0.00	0.31	5.49	1.81	6.02	82.0	375	0.40	110.89	0.05	1.00	0.53

DESIGN PARAMETERS

Park Flow =	9300	L/ha/da	0.10764	l/s/Ha		
Average Daily Flow =	280	l/p/day			Industrial Peak Factor = as per MOE Graph	
Comm/Inst Flow =	28000	L/ha/da	0.3241	l/s/Ha	Extraneous Flow =	0.33 L/s/ha
Industrial Flow =	35000	L/ha/da	0.40509	l/s/Ha	Minimum Velocity =	0.600 m/s
Max Res. Peak Factor =	4.00				Manning's n = (Conc)	0.013 (Pvd) 0.013
Commercial/Inst./Park Peak Factor =	1.00				Townhouse coeff=	1.7
Institutional =	0.32	l/s/Ha			Single house coeff=	3.4

Designed: M.S.

Checked: S.L.M

Dwg. Reference: Sanitary Servicing Plan, Dwgs. No. 3

PROJECT: **Cardinal Creek Village South FSR**

LOCATION: **City of Ottawa**

File Ref: **19-1153** | Date: **07 Nov 2024** | Sheet No. 3 of 4

SANITARY SEWER CALCULATION SHEET

Manning's n=0.013

LOCATION			RESIDENTIAL AREA AND POPULATION							COMM		INSTIT		PARK		C+I+I	INFILTRATION				PIPE						
STREET	FROM M.H.	TO M.H.	AREA (ha)	UNITS	POP.	CUMULATIVE AREA (ha)	CUMULATIVE POP.	PEAK FACT.	PEAK FLOW (l/s)	AREA (ha)	ACCU. AREA (ha)	AREA (ha)	ACCU. AREA (ha)	AREA (ha)	ACCU. AREA (ha)	PEAK FLOW (l/s)	TOTAL AREA (ha)	ACCU. AREA (ha)	INFILT. FLOW (l/s)	TOTAL FLOW (l/s)	DIST (m)	DIA (mm)	SLOPE (%)	CAP. (FULL) (l/s)	RATIO Q act/Q cap	VEL. (FULL) (m/s)	VEL. (ACT.) (m/s)
Contribution From STREET 8, Pipe 53A - 55A						1.49	103				0.00		0.00		0.00		1.49	6.98									
Contribution From STREET 13, Pipe 54A - 55A						0.09	6				0.00		0.00		0.00		0.09	7.07									
	55A	57A	0.39		27	7.46	515	3.4	5.63		0.00		0.00		0.00	0.00	0.39	7.46	2.46	8.09	82.0	375	0.40	110.89	0.07	1.00	0.58
Contribution From STREET 7, Pipe 56A - 57A						0.53	37				0.00		0.00		0.00		0.53	7.99									
	57A	63A	0.39		27	8.38	579	3.4	6.29		0.00		0.00		0.00	0.00	0.39	8.38	2.77	9.06	82.0	375	0.40	110.89	0.08	1.00	0.60
Contribution From STREET 17, Pipe 32A - 63A						12.18	840				0.00		2.47		0.00		14.65	23.03									
Contribution From STREET 7, Pipe 62A - 63A						2.17	150				0.00		0.00		0.00		2.17	25.20									
	63A	65A	0.19		13	22.92	1582	3.1	16.05		0.00		2.47		0.00	0.80	0.19	25.39	8.38	25.23	82.0	375	0.55	130.03	0.19	1.18	0.91
Contribution From STREET 6, Pipe 64A - 65A						0.33	23				0.00		0.00		0.00		0.33	25.72									
	65A	71A	0.20		14	23.45	1619	3.1	16.39		0.00		2.47		0.00	0.80	0.20	25.92	8.55	25.75	82.0	375	0.55	130.03	0.20	1.18	0.91
Contribution From STREET 6, Pipe 70A - 71A						1.78	123				0.00		0.00		0.00		1.78	27.70									
	71A	73A	0.20		14	25.43	1756	3.1	17.66		0.00		2.47		0.00	0.80	0.20	27.90	9.21	27.67	82.0	375	0.55	130.03	0.21	1.18	0.93
Contribution From STREET 1, Pipe 72A - 73A						0.71	48				0.00		0.00		0.00		0.71	28.61									
	73A	75A	0.11		8	26.25	1812	3.1	18.17		0.00		2.47		0.00	0.80	0.11	28.72	9.48	28.45	47.0	375	0.55	130.03	0.22	1.18	0.94
Contribution From STREET 5, Pipe 74A - 75A						0.41	28				0.00		0.00		0.00		0.41	29.13									
	75A	83A	0.10		7	26.76	1847	3.1	18.50		0.00		2.47		0.00	0.80	0.10	29.23	9.65	28.94	46.0	375	0.55	130.03	0.22	1.18	0.95
To STREET 1, Pipe 83A - 84A						26.76	1847				0.00		2.47		0.00			29.23									
POND INLET																											
	76A	77A	0.43		30	0.43	30	3.7	0.36		0.00		0.00		0.00	0.00	0.43	0.43	0.14	0.50	34.0	200	0.35	19.40	0.03	0.62	0.26
To STREET 2, Pipe 77A - 78A						0.43	30				0.00		0.00		0.00			0.43									
STREET 2																											
Contribution From POND INLET, Pipe 76A - 77A						0.43	30				0.00		0.00		0.00		0.43	0.43									
	77A	78A	0.71		48	1.14	78	3.6	0.91		0.00		0.00		0.00	0.00	0.71	1.14	0.38	1.29	89.5	200	0.35	19.40	0.07	0.62	0.34
	78A	82A	0.69		47	1.83	125	3.6	1.45		0.00		0.00		0.00	0.00	0.69	1.83	0.60	2.05	89.5	200	0.35	19.40	0.11	0.62	0.40
To STREET 1, Pipe 82A - 83A						1.83	125				0.00		0.00		0.00			1.83									
STREET 1																											
	72A	73A	0.71		48	0.71	48	3.7	0.57		0.00		0.00		0.00	0.00	0.71	0.71	0.23	0.80	90.5	200	0.35	19.40	0.04	0.62	0.30
To STREET 12, Pipe 73A - 75A						0.71	48				0.00		0.00		0.00			0.71									
	79A	80A	0.49		34	0.49	34	3.7	0.41		0.00		0.00		0.00	0.00	0.49	0.49	0.16	0.57	69.0	200	0.35	19.40	0.03	0.62	0.27
	80A	81A	0.25		17	0.74	51	3.7	0.60		0.00		0.00		0.00	0.00	0.25	0.74	0.24	0.85	12.0	200	0.35	19.40	0.04	0.62	0.31
	81A	82A	0.38		26	1.12	77	3.6	0.90		0.00		0.00		0.00	0.00	0.38	1.12	0.37	1.27	79.0	200	3.55	61.80	0.02	1.97	0.76
Contribution From STREET 2, Pipe 78A - 82A						1.83	125				0.00		0.00		0.00		1.83	2.95									
	82A	83A				2.95	202	3.5	2.30		0.00		0.00		0.00	0.00	0.00	2.95	0.97	3.28	23.5	250	0.25	29.73	0.11	0.61	0.39
Contribution From STREET 12, Pipe 75A - 83A						26.76	1847				0.00		2.47		0.00		29.23	32.18									
	83A	84A	0.21		15	29.92	2064	3.1	20.47		0.00		2.47		0.00	0.80	0.21	32.39	10.69	31.96	83.0	375	0.60	135.81	0.24	1.23	1.00
	84A	85A	0.08		6	30.00	2070	3.1	20.52		0.00		2.47		0.00	0.80	0.08	32.47	10.72	32.04	32.5	375	0.60	135.81	0.24	1.23	1.00
	85A	100A	0.07		4	30.07	2074	3.1	20.56		0.00		2.47		0.00	0.80	0.07	32.54	10.74	32.10	30.0	375	0.60	135.81	0.24	1.23	1.00
Contribution From SERVICING BLOCK 2, Pipe 99A - 100A						2.43	166				0.00		2.44		1.58		6.45	38.99									
			0.19		13	32.69	2253			1.51	1.51		4.91		1.58		1.70	40.69									
	100A	2000A	0.53		72	33.22	2325	3.0	22.81	2.40	3.91		4.91		1.58	3.03	2.93	43.62	14.39	40.23	50.5	375	0.70	146.69	0.27	1.33	1.13

DESIGN PARAMETERS

Park Flow =	9300	L/ha/da	0.10764	l/s/Ha			
Average Daily Flow =	280	l/p/day			Industrial Peak Factor = as per MOE Graph		
Comm/Inst Flow =	28000	L/ha/da	0.3241	l/s/Ha	Extraneous Flow =	0.33	L/s/ha
Industrial Flow =	35000	L/ha/da	0.40509	l/s/Ha	Minimum Velocity =	0.600	m/s
Max Res. Peak Factor =	4.00				Manning's n = (Conc)	0.013	(Pvc) 0.013
Commercial/Inst./Park Peak Factor =	1.00				Townhouse coeff=	0.7	
Institutional =	0.32	l/s/Ha			Single house coeff=	3.2	

Designed: M.S.

Checked: S.L.M

Dwg. Reference: Sanitary Servicing Plan, Dwgs. No. 3

PROJECT: **Cardinal Creek Village South FSR**

LOCATION: **City of Ottawa**

File Ref:

Date: **07 Nov 2024**

Sheet No. 4 of 4

SANITARY SEWER CALCULATION SHEET

Manning's n=0.013

LOCATION			RESIDENTIAL AREA AND POPULATION							COMM		INDUST		INSTIT		C+I+I	INFILTRATION				PIPE					
STREET	FROM M.H.	TO M.H.	AREA (ha)	UNITS	POP.	CUMULATIVE AREA (ha)	CUMULATIVE POP.	PEAK FACT.	PEAK FLOW (l/s)	AREA (ha)	ACCU. AREA (ha)	AREA (ha)	ACCU. AREA (ha)	AREA (ha)	ACCU. AREA (ha)	PEAK FLOW (l/s)	TOTAL AREA (ha)	ACCU. AREA (ha)	INFILT. FLOW (l/s)	TOTAL FLOW (l/s)	DIST (m)	DIA (mm)	SLOPE (%)	CAP. (FULL) (l/s)	RATIO Q act/Q cap	VEL. (FULL) (m/s)
PHASE 4																										
cercle Tewin Circle																										
		0.11	1	3.4	0.11	3.4											0.11	0.11								
	3043A	3042A	0.44	9	24.3	0.55	27.7	4.00	0.45								0.44	0.55	0.15	0.60	45.5	200	2.15	48.09	0.01	1.53
			0.31	9	24.3	0.86	52.0										0.31	0.86								
	3042A	3041A	0.05	1	3.4	0.91	55.4	4.00	0.90								0.05	0.91	0.25	1.15	45.0	200	2.15	48.09	0.02	1.53
			0.07	2	5.4	0.98	60.8										0.07	0.98								
	3041A	3040A	0.41	7	23.8	1.39	84.6	4.00	1.37								0.41	1.39	0.39	1.76	66.0	200	1.40	38.81	0.05	1.24
			0.07			1.46	84.6										0.07	1.46								
			0.24	4	13.6	1.70	98.2										0.24	1.70								
	3040A	305A	0.25	6	16.2	1.95	114.4	4.00	1.85								0.25	1.95	0.55	2.40	79.0	200	1.25	36.67	0.07	1.17
To avenue de la Famille-Laporte Avenue, Pipe 305A - 1004A						1.95	114.4											1.95								
promenade Cardinal Creek Drive																										
Contribution From Future Phase (MIXED USE BLOCK)			0.57		78.0	0.57	78.0	4.00	1.26	1.88	1.88					1.63	2.45	2.45	0.69	3.58	15.0	375	1.00	175.33	0.02	1.59
Contribution From External (FUTURE RESIDENTIAL)			31.68		2540.0									5.31	5.31	4.61	36.99	36.99	10.36	14.97						
Contribution From External (FUTURE RESIDENTIAL)			23.23		1400.0												23.23	23.23	6.50	6.50						
Contribution From Future Phase (PARK)														2.42	2.42	0.39	2.42	2.42	0.68	1.07						
		0.12			55.60	4018.0				1.88				7.73		0.12	65.21									
		0.11			55.71	4018.0				1.88				7.73		0.11	65.32									
	2000A	1000A	3.14			58.85	4018.0	3.33	54.20		1.88				7.73	6.63	3.14	68.46	19.17	80.00	32.5	375	0.60	135.81	0.59	1.23
	1000A	1001A	0.62	6	16.2	59.47	4034.2	3.33	54.42		1.88				7.73	6.63	0.62	69.08	19.34	80.39	77.0	375	2.75	290.75	0.28	2.63
	1001A	1002A	0.73	13	35.1	60.20	4069.3	3.33	54.89		1.88				7.73	6.63	0.73	69.81	19.55	81.07	71.0	375	1.45	211.13	0.38	1.91
			0.18	2	6.8	60.38	4076.1				1.88				7.73		0.18	69.99								
	1002A	1003A	0.66	14	37.8	61.04	4113.9	3.32	55.33		1.88				7.73	6.63	0.66	70.65	19.78	81.74	75.5	375	0.55	130.03	0.63	1.18
			0.11	2	5.4	61.15	4119.3				1.88				7.73		0.11	70.76								
	1003A	1004A	0.38	3	10.2	61.53	4129.5	3.32	55.54		1.88				7.73	6.63	0.38	71.14	19.92	82.09	85.0	375	0.55	130.03	0.63	1.18
To avenue de la Famille-Laporte Avenue, Pipe 1004A - 218A						61.53	4129.5			1.88				7.73				71.14								
rang de Stadaconé Row																										
	323A	324A	0.50	28	75.6	0.50	75.6	4.00	1.23								0.50	0.50	0.14	1.37	106.0	200	0.70	27.44	0.05	0.87
	324A	322A	0.04	1	2.7	0.54	78.3	4.00	1.27								0.04	0.54	0.15	1.42	15.5	200	1.10	34.40	0.04	1.09
To voie du Cap-Diamant Way, Pipe 322A - 149A						0.54	78.3											0.54								
rue Mishawashkode Street																										
	222A	2200A	0.14	4	10.8	0.14	10.8	4.00	0.18								0.14	0.14	0.04	0.22	31.0	200	1.00	32.80	0.01	1.04
	2200A	220A	0.09	2	5.4	0.23	16.2	4.00	0.26								0.09	0.23	0.06	0.32	21.0	200	1.00	32.80	0.01	1.04
To terrasse du Géographe Terrace, Pipe 220A - 221A						0.23	16.2											0.23								

Drainage from OMR that is not considered in comparison

LICENSED PROFESSIONAL ENGINEER
W. LIU
100167932
Nov 1, 2017
PROVINCE OF ONTARIO

DESIGN PARAMETERS

Average Daily Flow =	350	l/p/day	Industrial Peak Factor = as per MOE Graph		
Commercial/Institution Flow =	50000	L/ha/da	Extraneous Flow =	0.280	L/s/ha
Industrial Flow =	35000	L/ha/da	Minimum Velocity =	0.60	m/s
Max Res. Peak Factor =	4.00		Manning's n =	0.013	
Commercial/Institution peak Factor =	1.50		Townhouse/Semi coeff=	2.7	
Park Average Flow =	9300	L/ha/da	Single house coeff=	3.4	

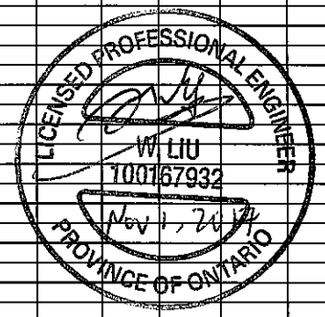
Designed: K.M.	PROJECT: CARDINAL CREEK VILLAGE - PHASE 4		
Checked: W.L.	LOCATION: City of Ottawa		
Dwg. Reference: Sanitary Drainage Plan, Dwg. No.38 & 39	File Ref: 16-864	Date: November, 2017	Sheet No. 1 of 3

SANITARY SEWER CALCULATION SHEET

Ottawa

Manning's n=0.013

LOCATION			RESIDENTIAL AREA AND POPULATION							COMM		INDUST		INSTIT		C+I+I	INFILTRATION				PIPE					
STREET	FROM M.H.	TO M.H.	AREA (ha)	UNITS	POP.	CUMULATIVE AREA (ha)	CUMULATIVE POP.	PEAK FACT.	PEAK FLOW (l/s)	AREA (ha)	ACCU. AREA (ha)	AREA (ha)	ACCU. AREA (ha)	AREA (ha)	ACCU. AREA (ha)	PEAK FLOW (l/s)	TOTAL AREA (ha)	ACCU. AREA (ha)	INFILT. FLOW (l/s)	TOTAL FLOW (l/s)	DIST (m)	DIA (mm)	SLOPE (%)	CAP. (FULL) (l/s)	RATIO Q act/Q cap	VEL. (FULL) (m/s)
voie du Cap-Diamant Way																										
	2170A	217A	0.40	10	27.0	0.40	27.0	4.00	0.44								0.40	0.40	0.11	0.55	83.0	200	0.65	26.44	0.02	0.84
To terrasse du Géographe Terrace, Pipe 217A - 218A						0.40	27.0											0.40								
	319A	320A	0.34	15	40.5	0.34	40.5	4.00	0.66								0.34	0.34	0.10	0.76	117.5	200	0.90	31.12	0.02	0.99
	320A	321A	0.02			0.36	40.5	4.00	0.66								0.02	0.36	0.10	0.76	13.0	200	0.90	31.12	0.02	0.99
	321A	322A	0.05			0.41	40.5	4.00	0.66								0.05	0.41	0.11	0.77	38.5	200	0.90	31.12	0.02	0.99
Contribution From rang de Stadaconé Row, Pipe 324A -322A						0.54	78.3										0.54									
	322A	149A	0.05			1.00	118.8	4.00	1.93								0.05	1.00	0.28	2.21	44.0	200	0.50	23.19	0.10	0.74
To rue du Cartographe Street, Pipe 149A - 326A						1.00	118.8											1.00								
rue du Cartographe Street																										
Contribution From voie du Cap-Diamant Way, Pipe 322A -149A						1.00	118.8										1.00									
	149A	326A	0.22	8	21.6	1.22	140.4	4.00	2.28								0.22	1.22	0.34	2.62	58.5	200	1.25	36.67	0.07	1.17
To terrasse du Géographe Terrace, Pipe 326A - 219A						1.22	140.4											1.22								
	325A	326A	0.21	8	21.6	0.21	21.6	4.00	0.35								0.21	0.21	0.06	0.41	57.0	200	1.00	32.80	0.01	1.04
To terrasse du Géographe Terrace, Pipe 326A - 219A						0.21	21.6											0.21								
terrasse du Géographe Terrace																										
Contribution From rue du Cartographe Street, Pipe 149A -326A						1.22	140.4										1.22									
Contribution From rue du Cartographe Street, Pipe 325A -326A						0.21	21.6										0.21									
	326A	219A	0.10	2	5.4	1.53	167.4	4.00	2.71								0.10	1.53	0.43	3.14	19.5	200	1.00	32.80	0.10	1.04
	219A	220A	0.42	13	35.1	1.95	202.5	4.00	3.28								0.42	1.95	0.55	3.83	56.0	200	1.00	32.80	0.12	1.04
Contribution From rue Mishawashkode Street, Pipe 2200A -220A						0.23	16.2										0.23									
	220A	221A	0.19	5	13.5	2.37	232.2	4.00	3.76								0.19	2.37	0.66	4.42	40.5	200	0.80	29.34	0.15	0.93
	221A	217A	0.26	7	18.9	2.63	251.1	4.00	4.07								0.26	2.63	0.74	4.81	60.5	200	0.35	19.40	0.25	0.62
Contribution From voie du Cap-Diamant Way, Pipe 2170A -217A						0.40	27.0										0.40									
	217A	218A	0.12			3.15	278.1	4.00	4.51								0.12	3.15	0.88	5.39	74.0	200	0.35	19.40	0.28	0.62
	218A	2100A				3.15	278.1	4.00	4.51								0.00	3.15	0.88	5.39	15.5	200	0.35	19.40	0.28	0.62
To avenue de la Famille-Laporte Avenue, Pipe 2100A - 210A						3.15	278.1											3.15								
avenue de la Famille-Laporte Avenue																										
Contribution From Future Phase						5.89	284.7										5.89									
	PLUG	305A	0.09			5.98	284.7	4.00	4.61								0.09	5.98	1.67	6.28	41.0	250	0.50	42.05	0.15	0.86
Contribution From cercle Tewin Circle, Pipe 3040A - 305A						1.95	114.4										1.95									
	305A	1004A	0.32			8.25	399.1	4.00	6.47								0.32	8.25	2.31	8.78	97.5	250	0.50	42.05	0.21	0.86
Contribution From promenade Cardinal Creek Drive, Pipe 1003A - 1004A						61.53	4129.5			1.88				7.73			71.14									
			0.13			69.91	4528.6				1.88				7.73	6.63	0.13	79.52								
	1004A	2100A	0.76	12	40.8	70.67	4569.4	3.28	60.71		1.88				7.73	6.63	0.76	80.28	22.48	89.82	109.5	375	1.60	221.78	0.40	2.01
Contribution From terrasse du Géographe Terrace, Pipe 218A - 2100A						3.15	278.1										3.15									
	2100A	210A	0.34	4	13.6	74.16	4861.1	3.26	64.20		1.88				7.73	6.63	0.34	83.77	23.46	94.29	55.0	375	1.00	175.33	0.54	1.59
	210A	211A	0.39	5	17.0	74.55	4878.1	3.26	64.42		1.88				7.73	6.63	0.39	84.16	23.56	94.61	68.5	375	3.25	316.08	0.30	2.86
	211A	*Ex. 212A*	0.26	3	10.2	74.81	4888.3	3.25	64.36		1.88				7.73	6.63	0.26	84.42	23.64	94.63	47.5	375	3.40	323.29	0.29	2.93



DESIGN PARAMETERS

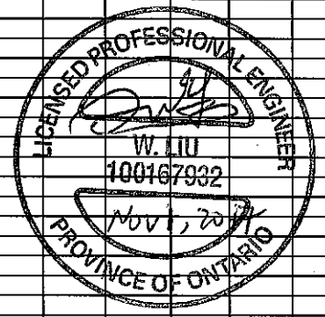
Average Daily Flow =	350	l/p/day	Industrial Peak Factor = as per MOE Graph		
Commercial/Institution Flow =	50000	L/ha/da	Extraneous Flow =	0.280	L/s/ha
Industrial Flow =	35000	L/ha/da	Minimum Velocity =	0.60	m/s
Max Res. Peak Factor =	4.00		Manning's n =	0.013	
Commercial/Institution peak Factor =	1.50		Townhouse/Semi coeff=	2.7	
Park Average Flow =	9300	L/ha/da	Single house coeff=	3.4	

Designed: K.M.	PROJECT: CARDINAL CREEK VILLAGE - PHASE 4		
Checked: W.L.	LOCATION: City of Ottawa		
Dwg. Reference: Sanitary Drainage Plan, Dwg. No.38 & 39	File Ref: 16-864	Date: November, 2017	Sheet No. 2 of 3

SANITARY SEWER CALCULATION SHEET

Manning's n=0.013

LOCATION			RESIDENTIAL AREA AND POPULATION							COMM		INDUST		INSTIT		C+I+I	INFILTRATION				PIPE					
STREET	FROM M.H.	TO M.H.	AREA (ha)	UNITS	POP.	CUMULATIVE AREA (ha)	CUMULATIVE POP.	PEAK FACT.	PEAK FLOW (l/s)	AREA (ha)	ACCU. AREA (ha)	AREA (ha)	ACCU. AREA (ha)	AREA (ha)	ACCU. AREA (ha)	PEAK FLOW (l/s)	TOTAL AREA (ha)	ACCU. AREA (ha)	INFILT. FLOW (l/s)	TOTAL FLOW (l/s)	DIST (m)	DIA (mm)	SLOPE (%)	CAP. (FULL) (l/s)	RATIO Q act/Q cap	VEL. (FULL) (m/s)
Contribution from BLOCK 109 (School)														2.09	2.09	1.81	2.09	2.09	0.59	2.40	14.0	200	1.00	32.80	0.07	1.04
			0.08	1	3.4	74.89	4891.7										0.08	86.59								
	Ex. 212A	*Ex. 144A*	0.27	3	10.2	75.16	4901.9	3.25	64.54		1.88				9.82	8.45	0.27	86.86	24.32	97.31	57.0	375	1.70	228.60	0.43	2.07
To rue de la Baie-des-Castors Street, Pipe *Ex. 144A - Ex. 145A*						75.16	4901.9				1.88				9.82			86.86								
rue de Honfleur Street																										
	7000A	710A	0.37	5	17.0	0.37	17.0	4.00	0.28								0.37	0.37	0.10	0.38	66.0	200	1.80	44.00	0.01	1.40
	710A	*Ex. Plug*	0.37	5	17.0	0.74	34.0	4.00	0.55								0.37	0.74	0.21	0.76	65.0	200	2.99	56.71	0.01	1.81
	Ex. Plug	*Ex. 706A*				0.74	34.0	4.00	0.55								0.00	0.74	0.21	0.76	17.0	200	2.99	56.71	0.01	1.81
To rue de la Baie-des-Castors Street, Pipe *Ex. 706A - Ex. 707A*						0.74	34.0											0.74								
rue de la Baie-des-Castors Street																										
	700A	701A	0.31	5	17.0	0.31	17.0	4.00	0.28								0.31	0.31	0.09	0.37	57.5	200	0.65	26.44	0.01	0.84
	701A	702A	0.07	1	3.4	0.38	20.4	4.00	0.33								0.07	0.38	0.11	0.44	11.0	200	0.40	20.74	0.02	0.66
	702A	703A	0.33	5	17.0	0.71	37.4	4.00	0.61								0.33	0.71	0.20	0.81	73.5	200	0.40	20.74	0.04	0.66
	703A	704A	0.33	5	17.0	1.04	54.4	4.00	0.88								0.33	1.04	0.29	1.17	73.5	200	3.10	57.75	0.02	1.84
Contribution from Future Park														4.10	4.10	0.66	4.10	4.10	1.15	1.81	8.0	200	1.00	32.80	0.06	1.04
	704A	705A	0.08	1	3.4	1.12	57.8	4.00	0.94						4.10	0.66	0.08	5.22	1.46	3.06	12.0	200	0.40	20.74	0.15	0.66
	705A	*Ex. Plug*	0.38	6	20.4	1.50	78.2	4.00	1.27						4.10	0.66	0.38	5.60	1.57	3.50	42.0	200	0.39	20.48	0.17	0.65
	Ex. Plug	Ex. 706A				1.50	78.2	4.00	1.27						4.10	0.66	0.00	5.60	1.57	3.50	30.0	200	0.39	20.48	0.17	0.65
Contribution From rue de Honfleur Street, Pipe Ex. Plug -Ex. 706A						0.74	34.0										0.74									
			0.06	1	3.4	2.30	115.6								4.10		0.06	6.40								
	Ex. 706A	*Ex. 707A*	0.59	11	37.4	2.89	153.0	4.00	2.48						4.10	0.66	0.59	6.99	1.96	5.10	78.0	200	0.40	20.74	0.25	0.66
To rue de la Baie-des-Castors Street, Pipe *Ex. 707A - Ex. 708A*						2.89	153.0								4.10			6.99								



DESIGN PARAMETERS

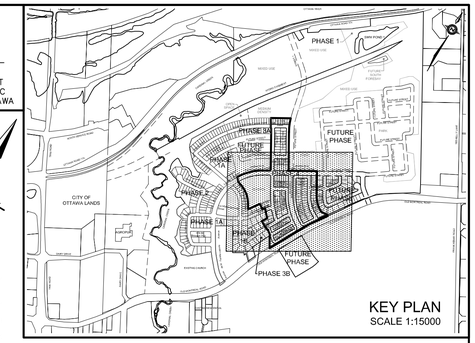
Average Daily Flow =	350	l/p/day	Industrial Peak Factor =	as per MOE Graph	
Commercial/Institution Flow =	50000	L/ha/da	Extraneous Flow =	0.280	L/s/ha
Industrial Flow =	35000	L/ha/da	Minimum Velocity =	0.60	m/s
Max Res. Peak Factor =	4.00		Manning's n =	0.013	
Commercial/Institution peak Factor =	1.50		Townhouse/Semi coeff=	2.7	
Park Average Flow =	9300	L/ha/da	Single house coeff=	3.4	

Designed: K.M.	PROJECT: **CARDINAL CREEK VILLAGE - PHASE 4**		
Checked: W.L.	LOCATION: **City of Ottawa**		
Dwg. Reference: Sanitary Drainage Plan, Dwg. No.38 & 39	File Ref: 16-864	Date: November, 2017	Sheet No. 3 of 3

APPROVED ☐ REFUSED ☐

THIS ____ DAY OF_____, 20____

JEFF MCEWEN, P.ENG
MANAGER DEVELOPMENT REVIEW – EAST
PLANNING, INFRASTRUCTURE & ECONOMIC
DEVELOPMENT DEPARTMENT, CITY OF OTTAWA



KEY PLAN
SCALE 1:15000

LEGEND

- SANITARY DRAINAGE BOUNDARY
- SANITARY SUB-DRAINAGE BOUNDARY
- UPSTREAM MH TO DOWNSTREAM MH — 43A - 44A
- AREA IN HECTARES — 0.78
- POPULATION — 61
- EXTERNAL AREA IN HECTARES — A=53.63
- EXTERNAL POPULATION — 207
- DENSITY (PERSONS/HECTARE) — POP=5736
- EXTERNAL LAND USE — RESIDENTIAL
- UPSTREAM MH TO DOWNSTREAM MH — 43A - 44A
- AREA IN OTHER PHASES IN HECTARES — 0.78
- POPULATION — 61
- MAINTENANCE HOLE — 200mm SAN — MH202A
- CAP
- OTHER PHASES
- LIMIT OF HAZARD LANDS
- 6m EROSION ACCESS ALLOWANCE
- 100YR W.L. CARDINAL CREEK

TOPOGRAPHIC INFORMATION

TOPOGRAPHIC INFORMATION PROVIDED BY STANTEC GEOMATICS LTD, PROJECT No. 161611900-111 RECEIVED ON JULY 6, 2012 AND PROJECT No. 16162924-111 RECEIVED ON OCTOBER 24, 2013 AND NOVEMBER 29, 2013 AND PROJECT No. 161613473-111 RECEIVED ON MAY 10, 2016

LEGAL INFORMATION

CALCULATED M-PLAN PROVIDED BY STANTEC GEOMATICS LTD, PROJECT No. 161613653-132 RECEIVED ON JUNE 14, 2017. R-PLAN PROVIDED BY STANTEC GEOMATICS LTD., PROJECT No. 161613473-114 DATED JUNE 15, 2016

3rd SUBMISSION 17-11-01

ELEVATION NOTE

ELEVATIONS HEREON ARE GEODETIC AND ARE DERIVED FROM THE CAN-NET VRS NETWORK.

No.	DATE	BY	DESCRIPTION	BY
3.	17-11-01	W.L.	3rd SUBMISSION	
2.	17-09-12	W.L.	2nd SUBMISSION	
1.	17-07-24	W.L.	1st SUBMISSION	

Ottawa CITY OF OTTAWA

PROJECT No. 16-864 B1

LICENSED PROFESSIONAL ENGINEER
W. LIU
100167932
PROVINCE OF ONTARIO

SANITARY DRAINAGE PLAN

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TAMARACK (CARDINAL CREEK) CORPORATION

CARDINAL CREEK VILLAGE PHASE 4

DSEL david schaeffer engineering ltd
120 Iber Road, Unit 103
Stittsville, ON K2S 1E9
Tel. (613) 836-0856
Fax. (613) 836-7183
www.DSEL.ca

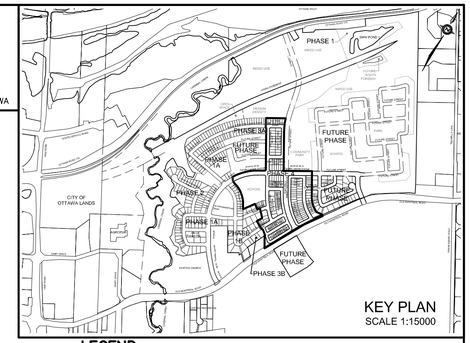
DRAWN BY: A.F/A.B	CHECKED BY: C.M/W.L	DRAWING NO.	SHEET NO.
DESIGNED BY: C.M/W.L	CHECKED BY: K.M.		39
SCALE: 1:1000	DATE: JULY 2017		

CITY FILE No. D07-16-13-0024PH4 CITY PLAN No.

APPROVED ☐ REFUSED ☐

THIS ____ DAY OF _____, 20____

JEFF MCEWEN, P.ENG
MANAGER DEVELOPMENT REVIEW – EAST
PLANNING, INFRASTRUCTURE & ECONOMIC
DEVELOPMENT DEPARTMENT, CITY OF OTTAWA



KEY PLAN
SCALE 1:15000

LEGEND

STORM DRAINAGE BOUNDARY
SUB-DRAINAGE BOUNDARY
UPSTREAM MH TO DOWNSTREAM MH — 42 - 43
AREA IN HECTARES — 0.37 | 0.74
RUNOFF COEFFICIENT
EXTERNAL 2.78AC = — 2.78AC=3.09
EXTERNAL TIME OF CONCENTRATION — TC=12.50 MIN
EXTERNAL BLENDED RUNOFF COEFFICIENT — C= 0.65 | 2YR
EXTERNAL RETURN FREQUENCY CAPTURE
UPSTREAM MH TO DOWNSTREAM MH — 21 - 23
AREA IN OTHER PHASES IN HECTARES — 0.28 | 0.78
RUNOFF COEFFICIENT
STREET CATCHBASIN & LEAD
STREET CATCHBASIN WITH CLOSED LID & LEAD MAINTENANCE HOLE — STORM ST — MH202
CURB INLET CATCHBASIN & LEAD CATCHBASIN/ MAINTENANCE HOLE — CBMH201
INTERCONNECTED CATCH BASIN & LEADS CAP
OVERLAND FLOW DIRECTION
EXTERNAL OVERLAND FLOW DIRECTION
OTHER PHASES
LIMIT OF HAZARD LANDS
6m EROSION ACCESS ALLOWANCE
100YR W.L. CARDINAL CREEK

TOPOGRAPHIC INFORMATION

TOPOGRAPHIC INFORMATION PROVIDED BY STANTEC GEOMATICS LTD, PROJECT No. 161611900-111 RECEIVED ON JULY 6, 2012 AND PROJECT No. 16162924-111 RECEIVED ON OCTOBER 24, 2013 AND NOVEMBER 29, 2013 AND PROJECT No. 161613473-111 RECEIVED ON MAY 10, 2016

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CALCULATED M-PLAN PROVIDED BY STANTEC GEOMATICS LTD, PROJECT No. 161613653-132 RECEIVED ON JUNE 14, 2017. R-PLAN PROVIDED BY STANTEC GEOMATICS LTD., PROJECT No. 161613473-114 DATED JUNE 15, 2016

3rd SUBMISSION 17-11-01

ELEVATION NOTE

ELEVATIONS HEREON ARE GEODETIC AND ARE DERIVED FROM THE CAN-NET VRS NETWORK.

No.	DATE	BY	DESCRIPTION	BY
3.	17-11-01	W.L.	3rd SUBMISSION	
2.	17-09-12	W.L.	2nd SUBMISSION	
1.	17-07-24	W.L.	1st SUBMISSION	

CITY OF OTTAWA

PROJECT No. 16-864 B1

LICENSED PROFESSIONAL ENGINEER
W. LIU
100167932
PROVINCE OF ONTARIO

EXTERNAL SANITARY DRAINAGE PLAN

© DSEL

TAMARACK (CARDINAL CREEK) CORPORATION

CARDINAL CREEK VILLAGE PHASE 4

DSEL
david schaeffer engineering ltd
120 Iber Road, Unit 103
Stittsville, ON K2S 1E9
Tel. (613) 836-0856
Fax. (613) 836-7183
www.DSEL.ca

DRAWN BY: A.F./A.B	CHECKED BY: C.M./W.L	DRAWING NO.	SHEET NO.
DESIGNED BY: C.M./W.L	CHECKED BY: K.M.		40
SCALE: 1:2500	DATE: JULY 2017		

CITY FILE No. D07-16-13-0024PH4 CITY PLAN No.

RES. AREA = 15.53 Ha
POPULATION = 3775
COMMERCIAL AREA = 4.00 Ha

TO MH 128A

RES. AREA = 18.34 Ha
POPULATION = 1070
EXTERNAL FUT. AREA = 3.50 Ha
EXTERNAL FUT. POPULATION = 315

TO MH 125A

FUTURE RESIDENTIAL

FUTURE RESIDENTIAL

RES. AREA = 4.63Ha
POPULATION = 276

TO MH 147A

RES. AREA = 15.57 Ha
POPULATION = 946
INSTITUTIONAL AREA = 2.84 Ha
PARK AREA = 4.12 Ha
EXTERNAL FUT. AREA = 6.50 Ha
EXTERNAL FUT. POPULATION = 585

TO MH 1004A

PARK AREA = 2.09Ha
TO MH 212A

RES. AREA = 26.98 Ha
POPULATION = 1820
PARK AREA = 1.29 Ha

TO MH 146A

RES. AREA = 3.15Ha
POPULATION = 279

TO MH 2100A

RES. AREA = 4.45Ha
POPULATION = 306

TO MH 144A

FUT. MIXED USE RES. AREA = 0.53 Ha
FUT. MIXED USE POPULATION = 72
FUT. MIXED USE COMMERCIAL AREA = 1.51 Ha

CCV SOUTH RES. AREA = 32.69 Ha
CCV SOUTH POPULATION = 2253
CCV SOUTH INSTITUTIONAL AREA = 4.91 Ha
CCV SOUTH PARK AREA = 1.58 Ha
CCV SOUTH COMMERCIAL AREA = 2.40 Ha

POTENTIAL FUT. EXTERNAL RES. AREA = 45.80 Ha
POTENTIAL FUT. EXTERNAL POPULATION = 3683
POTENTIAL FUT. EXTERNAL INSTITUTIONAL AREA = 2.00 Ha
POTENTIAL FUT. EXTERNAL PARK AREA = 2.50 Ha

TO MH 2000A

LEGEND

BULK SANITARY DRAINAGE AREA DIRECTED TO SANITARY TRUNK

SANITARY TRUNK DRAINAGE BOUNDARY

200Ø SAN 72.00 @ 0.35%

SANITARY TRUNK SEWER

DSEL
120 Iber Road, Unit 103
Stittsville, Ontario, K2S 1E9
Tel. (613) 836-0856
Fax. (613) 836-7183
www.DSEL.ca

CARDINAL CREEK VILLAGE SOUTH
CITY OF OTTAWA

TRUNK SANITARY SEWER ANALYSIS

SCALE:	1:2500	PROJECT No.:	19-1153
DATE:	NOVEMBER 2024	FIGURE:	App. D

SANITARY SEWER CALCULATION SHEET

Manning's n=0.013

LOCATION			RESIDENTIAL AREA AND POPULATION								COMM		INSTIT		PARK				C+I+P	INFILTRATION					PIPE				
STREET	FROM M.H.	TO M.H.	AREA (ha)	UNITS	UNITS Towns	UNITS* (KWR)	POP.	CUMULATIVE AREA (ha)	CUMULATIVE POP.	PEAK FACT.	PEAK FLOW (l/s)	AREA (ha)	ACCU. AREA (ha)	AREA (ha)	ACCU. AREA (ha)	AREA (ha)	ACCU. AREA (ha)	ICI Ratio	ICI Peaking Factor	PEAK FLOW (l/s)	TOTAL AREA (ha)	ACCU. AREA (ha)	INFILT. FLOW (l/s)	TOTAL FLOW (l/s)	DIST (m)	DIA (mm)	SLOPE (%)	CAP. (FULL) (l/s)	RATIO Q act/Q cap
promenade Cardinal Creek Drive																													
Contribution From Future Expansion development							0	0.00	0																				
Contribution From Future Phase (MIXED USE BLOCK)			0.53				72	0.53	72	2.00	0.47	1.51	1.51					0.74	1.50	0.73	2.04	2.04	0.67	1.87					
CCV South Per DSEL December 2021 FSR			32.69				2253					2.40	2.40	4.91	4.91	1.58	1.58	0.18	1.00	2.54	41.58	41.58	13.72	16.26					
Contribution from Fut Lands (South of Trib)			45.80				3683							2.00	2.00	2.50	2.50	0.04	1.00	0.92	50.30	50.30	16.60	17.52					
			0.12					79.14	6008				3.91		6.91		4.08				0.12	94.04	31.03						
			0.11					79.25	6008				3.91		6.91		4.08				0.11	94.15	31.07						
	2000A	1000A	3.14					82.39	6008	2.74	53.27		3.91		6.91		4.08	0.11	1.00	3.95	3.14	97.29	32.11	89.32	32.5	375	0.60	135.81	0.66
	1000A	1001A	0.62	6			17	83.01	6025	2.74	53.41		3.91		6.91		4.08	0.11	1.00	3.95	0.62	97.91	32.31	89.66	77.0	375	2.75	290.75	0.31
	1001A	1002A	0.73	13			36	83.74	6061	2.73	53.69		3.91		6.91		4.08	0.11	1.00	3.95	0.73	98.64	32.55	90.18	71.0	375	1.45	211.13	0.43
			0.18	2			7	83.92	6068				3.91		6.91		4.08				0.18	98.82	32.61						
	1002A	1003A	0.66	14			38	84.58	6106	2.73	54.03		3.91		6.91		4.08	0.11	1.00	3.95	0.66	99.48	32.83	90.81	75.5	375	0.55	130.03	0.70
			0.11	2			6	84.69	6112				3.91		6.91		4.08				0.11	99.59	32.86						
	1003A	1004A	0.38	3			11	85.07	6123	2.73	54.17		3.91		6.91		4.08	0.11	1.00	3.95	0.38	99.97	32.99	91.10	85.0	375	0.55	130.03	0.70
To avenue de la Famille-Laporte Avenue, Pipe 1004A - 218A								85.07	6123				3.91		6.91		4.08				99.97	99.97	32.99						
avenue de la Famille-Laporte Avenue																													
Contribution from avenue de la Famille-Laporte Avenue, Pipe 305A-1004A								85.07	6123			3.91	3.91	6.91	6.91	4.08	4.08				99.97	99.97	32.99						
Contribution from avenue de la Famille-Laporte Avenue, Pipe 305A-1004A								22.02	1220					2.84	2.84	4.12	4.12				28.98	28.98	9.56						
			0.13					107.22	7343				3.91		9.75		8.20				0.13	0.13	0.04						
	1004A	2100A	0.76	12			41	107.98	7384	2.67	63.83		3.91		9.75		8.20	0.11	1.00	5.31	0.76	129.84	42.85	111.98	109.5	375	1.60	221.78	0.50
Contribution From terrasse du Géographe Terrace, Pipe 218A - 2100A								3.15	278				0.00		0.00		0.00				3.15	3.15							
	2100A	210A	0.34	4			14	111.47	7676	2.65	66.02		3.91		9.75		8.20	0.10	1.00	5.31	0.34	133.33	44.00	115.33	55.0	375	1.00	175.33	0.66
	210A	211A	0.39	5			17	111.86	7693	2.65	66.15		3.91		9.75		8.20	0.10	1.00	5.31	0.39	133.72	44.13	115.59	68.5	375	3.25	316.08	0.37
	211A	212A	0.26	3			11	112.12	7704	2.65	66.23		3.91		9.75		8.20	0.10	1.00	5.31	0.26	133.98	44.21	115.76	47.5	375	3.40	323.29	0.36
Contribution from BLOCK 109 (School)														2.09	2.09			1.00	1.50	1.02	2.09	2.09	0.69	1.71	14.0	200	1.00	32.80	0.05
			0.08	1			4	112.20	7708	2.00	49.96										0.08	136.15	44.93						
	212A	144A	0.27	3			11	112.47	7719	2.65	66.35		3.91		11.84		8.20	0.12	1.00	5.99	0.27	136.42	45.02	117.35	57.0	375	1.70	228.60	0.51
To rue de la Baie-des-Castors Street, Pipe 144A - 145A								112.47	7719				3.91		11.84		8.20				136.42	136.42	45.02	45.02					
rue de la Baie-des-Castors Street																													
Contribution From rue de Cartographe Street (PH 1B&2), Pipe 209A -144A								4.46	301	3.46	3.37	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	4.46							
	144A	145A	0.03					116.96	8019	2.64	68.59		3.91		11.84		8.20	0.11	1.00	5.99	0.03	140.91	46.50	121.08	21.5	375	1.00	175.33	0.69
			0.75					117.71	8019	2.64	68.59		0.00		0.00		0.00		1.50	0.00	0.75	141.66	46.75						
	145A	146A	0.16					117.87	8019	2.64	68.59		3.91		11.84		8.20	0.11	1.00	5.99	0.16	141.82	46.80	121.38	88.5	375	2.00	247.95	0.49
Contribution From Block 34 (Servicing/Walkway) (PH 1B&2, Pipe 204A -146A								27.06	2038	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.29	0.00	0.00	0.00	0.00	28.35		5.00					
	146A	147A	0.28	4			14	145.21	10071	2.56	83.59		3.91		11.84		9.49	0.09	1.00	6.13	0.28	170.45	56.25	150.97	59.5	450	0.90	270.48	0.56
Contribution From avenue Mashkig Avenue (PH1), Pipe 143A -147A								4.63	275												4.63	4.63							
	147A	148A	0.31	4			14	150.15	10360	2.55	85.66		3.91		11.84		9.49	0.09	1.00	6.13	0.31	175.39	57.88	154.67	66.5	450	0.90	270.48	0.57
	148A	125A	0.04					150.19	10360	2.55	85.66		3.91		11.84		9.49	0.09	1.00	6.13	0.04	175.43	57.89	154.68	15.5	450	0.90	270.48	0.57
To BLOCK 256 (SERVICING), Pipe 125A - 126A								150.19	10360				3.91		11.84		9.49				175.43	175.43		5.00					
Contribution from PH1, Pipe 124A-125A								22.91	1350													22.91							

DESIGN PARAMETERS

Park Flow =	9300	L/ha/da	0.10764	l/s/Ha	Industrial Peak Factor = as per MOE Graph			
Average Daily Flow =	280	l/p/day						
Comm/Inst Flow =	28000	L/ha/da	0.3241	l/s/Ha	Extraneous Flow =	0.330	L/s/ha	
Industrial Flow =	35000	L/ha/da	0.40509	l/s/Ha	Minimum Velocity =	0.600	m/s	
Max Res. Peak Factor =	4.00				Manning's n = (Conc)	0.013	(Pvc)	0.013
Commercial/Inst./Park Peak Factor =	1.00				Townhouse coeff=	2.7		
Institutional =	0.32	l/s/Ha			Single house coeff=	3.4		

Designed: M.S.

Checked: S.L.M.

Dwg. Reference: External San figure base, Dwgs. No. 12

PROJECT: **Cardinal Creek Village South & UEA**

LOCATION: **City of Ottawa**

File Ref: 21-1263

Date: **07 Nov 2024**

Sheet No. 1 of 2

SANITARY SEWER CALCULATION SHEET

Manning's n=0.013

LOCATION				RESIDENTIAL AREA AND POPULATION									COMM		INSTIT		PARK				C+I+P	INFILTRATION				PIPE				
STREET		FROM M.H.	TO M.H.	AREA (ha)	UNITS	UNITS Towns	UNITS* (KWR)	POP.	CUMULATIVE AREA (ha)	CUMULATIVE POP.	PEAK FACT.	PEAK FLOW (l/s)	AREA (ha)	ACCU. AREA (ha)	AREA (ha)	ACCU. AREA (ha)	AREA (ha)	ACCU. AREA (ha)	ICI Ratio	ICI Peaking Factor	PEAK FLOW (l/s)	TOTAL AREA (ha)	ACCU. AREA (ha)	INFILT. FLOW (l/s)	TOTAL FLOW (l/s)	DIST (m)	DIA (mm)	SLOPE (%)	CAP. (FULL) (l/s)	RATIO Q act/Q cap
		125A	126A						173.10	11710	2.51	95.22		3.91		11.84		9.49	0.08	1.00	6.13	0.00	198.34	65.45	171.79	10.0	450	0.90	270.48	0.64
		126A	127A	0.06					173.16	11710	2.51	95.22		3.91		11.84		9.49	0.08	1.00	6.13	0.06	198.40	65.47	171.81	32.5	450	0.90	270.48	0.64
		127A	128A	0.05					173.21	11710	2.51	95.22		3.91		11.84		9.49	0.08	1.00	6.13	0.05	198.45	65.49	171.83	39.0	450	2.70	468.48	0.37
To SAN TRUNK 1 - 12.0m EASEMENT, Pipe 128A - 129A									173.21	11710				3.91		11.84		9.49				198.45							
SAN TRUNK 1 - 12.0m EASEMENT																														
Contribution From SAN TRUNK (Future Phase), Pipe MH 10160A - 128A									15.53	3775			4.00	4.00								19.53	19.53						
		128A	129A	0.02					188.76	15485	2.41	121.01		7.91		11.84		9.49	0.09	1.00	7.42	0.02	218.00	71.94	205.38	23.5	675	0.12	291.19	0.71
		129A	130A	0.14					188.90	15485	2.41	121.01		7.91		11.84		9.49	0.09	1.00	7.42	0.14	218.14	71.99	205.42	115.0	675	0.12	291.19	0.71
		130A	131A	0.04					188.94	15485	2.41	121.01		7.91		11.84		9.49	0.09	1.00	7.42	0.04	218.18	72.00	205.44	36.5	675	0.12	291.19	0.71
		131A	132A	0.04					188.98	15485	2.41	121.01		7.91		11.84		9.49	0.09	1.00	7.42	0.04	218.22	72.01	205.45	35.5	675	0.12	291.19	0.71
		132A	133A	0.05					189.03	15485	2.41	121.01		7.91		11.84		9.49	0.09	1.00	7.42	0.05	218.27	72.03	205.47	41.5	675	0.12	291.19	0.71
		133A	134A	0.06					189.09	15485	2.41	121.01		7.91		11.84		9.49	0.09	1.00	7.42	0.06	218.33	72.05	205.49	52.5	675	0.12	291.19	0.71
		134A	135A	0.10					189.19	15485	2.41	121.01		7.91		11.84		9.49	0.09	1.00	7.42	0.10	218.43	72.08	205.52	82.0	675	0.12	291.19	0.71
		135A	136A	0.11					189.30	15485	2.41	121.01		7.91		11.84		9.49	0.09	1.00	7.42	0.11	218.54	72.12	205.55	96.0	675	0.12	291.19	0.71
		136A	137A	0.10					189.40	15485	2.41	121.01		7.91		11.84		9.49	0.09	1.00	7.42	0.10	218.64	72.15	205.59	105.0	675	0.12	291.19	0.71
		137A	1104A (B.O.)	0.10					189.50	15485	2.41	121.01		7.91		11.84		9.49	0.09	1.00	7.42	0.10	218.74	72.18	205.62	109.5	675	0.12	291.19	0.71
		1104A (B.O.)	1103A (B.O.)	0.10					189.60	15485	2.41	121.01		7.91		11.84		9.49	0.09	1.00	7.42	0.10	218.84	72.22	205.65	110.0	675	0.12	291.19	0.71
		1103A (B.O.)	1102A (B.O.)	0.06					189.66	15485	2.41	121.01		7.91		11.84		9.49	0.09	1.00	7.42	0.06	218.90	72.24	205.67	63.1	675	0.12	291.19	0.71
		1102A (B.O.)	1101A (B.O.)	0.07					189.73	15485	2.41	121.01		7.91		11.84		9.49	0.09	1.00	7.42	0.07	218.97	72.26	205.70	89.0	675	0.12	291.19	0.71
		1101A (B.O.)	1100A (B.O.)						189.73	15485	2.41	121.01		7.91		11.84		9.49	0.09	1.00	7.42	0.00	218.97	72.26	205.70	12.5	675	0.12	291.19	0.71
To EXISTING SANITARY, Pipe 1100A (B.O.) - 30A									189.73	15485				7.91		11.84		9.49				218.97							

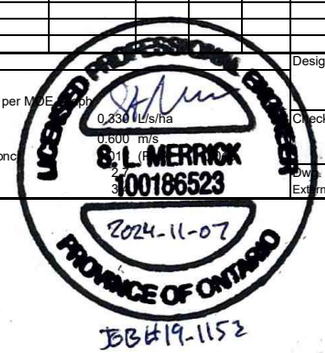
DESIGN PARAMETERS

Park Flow =	9300	L/ha/da	0.10764	l/s/Ha	
Average Daily Flow =	280	l/p/day			
Comm/Inst Flow =	28000	L/ha/da	0.3241	l/s/Ha	
Industrial Flow =	35000	L/ha/da	0.40509	l/s/Ha	
Max Res. Peak Factor =	4.00				
Commercial/Inst./Park Peak Factor =	1.00				
Institutional =	0.32	l/s/Ha			

Industrial Peak Factor = as per MOE graph
Extraneous Flow = 0.330 l/s/ha
Minimum Velocity = 0.600 m/s
Manning's n = (Concrete) 0.013 (PVC)
Townhouse coeff= 2.7
Single house coeff= 3.4

Designed: M.S.
Checked: S.L.M.
Dwgs Reference: External San figure base, Dwgs. No. 12

PROJECT: **Cardinal Creek Village South & UEA**
LOCATION: **City of Ottawa**
File Ref: 21-1263
Date: **07 Nov 2024**
Sheet No. 2 of 2



Appendix E

STORM SEWER CALCULATION SHEET (RATIONAL METHOD)

Local Roads Return Frequency = 2 years
Collector Roads Return Frequency = 5 years
Manning 0.013 Arterial Roads Return Frequency = 10 years

Ottawa

	LOCATION		AREA (Ha)																FLOW						SEWER DATA							
			2 YEAR				5 YEAR				10 YEAR				100 YEAR				Time of	Intensity	Intensity	Intensity	Intensity	Peak Flow	DIA. (mm)	DIA. (mm)	TYPE	SLOPE	LENGTH	CAPACITY	VELOCITY	TIME OF	RATIO
			AREA	R	Indiv.	Accum.	AREA	R	Indiv.	Accum.	AREA	R	Indiv.	Accum.	AREA	R	Indiv.	Accum.	Conc.	2 Year	5 Year	10 Year	100 Year										
Location	From Node	To Node	(Ha)		2.78 AC	2.78 AC	(Ha)		2.78 AC	2.78 AC	(Ha)		2.78 AC	2.78 AC	(Ha)		2.78 AC	2.78 AC	(min)	(mm/h)	(mm/h)	(mm/h)	(mm/h)	Q (l/s)	(actual)	(nominal)		(%)	(m)	(l/s)	(m/s)	LOW (min	Q/Q full
SERVICING BLOCK 2																																
Contribution From STREET 17, Pipe 105 - 106						-2.44				0.00				0.00				4.59	13.99													
	106	113			0.00	-2.44			0.00	0.00			0.00	0.00			0.00	4.59	13.99	64.26	86.97	101.87	148.79	527	900	900	CONC	1.10	12.0	1898.6704	2.9845	0.0670	0.277
Contribution From STREET 17, Pipe 110 - 111						2.31				0.00				0.00				0.00	13.23													
	111	113	0.07	0.68	0.13	2.44			0.00	0.00			0.00	0.00			0.00	0.00	13.23	66.29	89.75	105.13	153.58	162	525	525	CONC	2.20	16.5	637.8854	2.9467	0.0933	0.253
					0.00	0.00	1.49	0.40	1.66	1.66			0.00	0.00			0.00	4.59	12.00													
	113	114			0.00	0.00			0.00	1.66			0.00	0.00			0.00	4.59	14.06	64.09	86.74	101.59	148.39	825	900	900	CONC	1.10	105.0	1898.6704	2.9845	0.5864	0.435
					0.00	0.00	2.44	0.70	4.75	6.41			0.00	0.00			0.00	4.59	12.00													
	114	115			0.00	0.00			0.00	6.41			0.00	0.00			0.00	4.59	14.64	62.63	84.73	99.23	144.92	1208	900	900	CONC	1.10	96.5	1898.6704	2.9845	0.5389	0.636
	115	119			0.00	0.00			0.00	6.41			0.00	0.00			0.00	4.59	15.18	61.34	82.98	97.17	141.89	1183	975	975	CONC	0.45	24.0	1503.3442	2.0135	0.1987	0.787
To STREET 1, Pipe 119 - 121						0.00				6.41				0.00				4.59	15.38													
STREET 5																																
	75	76	0.41	0.68	0.78	0.78			0.00	0.00			0.00	0.00			0.00	0.00	10.00	76.81	104.19	122.14	178.56	60	450	450	CONC	0.20	99.5	127.5033	0.8017	2.0685	0.467
To STREET 12, Pipe 76 - 78						0.78				0.00				0.00				0.00	12.07													
STREET 6																																
	65	66	0.33	0.68	0.62	0.62			0.00	0.00			0.00	0.00			0.00	0.00	10.00	76.81	104.19	122.14	178.56	48	450	450	CONC	0.80	46.0	255.0067	1.6034	0.4782	0.188
To STREET 12, Pipe 66 - 72						0.62				0.00				0.00				0.00	10.48													
	67	68	0.25	0.68	0.47	0.47			0.00	0.00			0.00	0.00			0.00	0.00	10.00	76.81	104.19	122.14	178.56	36	450	450	CONC	0.75	13.0	246.9092	1.5525	0.1396	0.147
	68	69	0.13	0.68	0.25	0.72			0.00	0.00			0.00	0.00			0.00	0.00	10.14	76.27	103.46	121.28	177.29	55	450	450	CONC	0.50	10.5	201.6005	1.2676	0.1381	0.272
	69	70	0.26	0.68	0.49	1.21			0.00	0.00			0.00	0.00			0.00	0.00	10.28	75.76	102.75	120.44	176.06	92	450	450	CONC	0.20	64.5	127.5033	0.8017	1.3409	0.719
	70	71	0.11	0.68	0.21	1.42			0.00	0.00			0.00	0.00			0.00	0.00	11.62	71.10	96.36	112.91	165.00	101	450	450	CONC	0.20	10.5	127.5033	0.8017	0.2183	0.791
	71	72	0.58	0.68	1.10	2.51			0.00	0.00			0.00	0.00			0.00	0.00	11.84	70.41	95.40	111.78	163.35	177	600	600	CONC	0.15	78.5	237.8056	0.8411	1.5556	0.744
To STREET 12, Pipe 72 - 74						2.51				0.00				0.00				0.00	13.39													
STREET 13																																
			0.43	0.68	0.81	0.81			0.00	0.00			0.00	0.00			0.00	0.00														
	16	17	0.64	0.68	1.21	2.02			0.00	0.00			0.00	0.00			0.00	0.00	10.00	76.81	104.19	122.14	178.56	155	450	450	CONC	2.70	87.0	468.4772	2.9456	0.4923	0.332
	17	18	0.71	0.68	1.34	3.36			0.00	0.00			0.00	0.00			0.00	0.00	10.49	74.97	101.66	119.16	174.18	252	450	450	CONC	2.80	87.0	477.0738	2.9997	0.4834	0.529
	18	20	0.66	0.68	1.25	4.61			0.00	0.00			0.00	0.00			0.00	0.00	10.98	73.25	99.31	116.39	170.11	338	675	675	CONC	0.30	87.0	460.4091	1.2866	1.1270	0.734
To STREET 15, Pipe 20 - 26						4.61				0.00				0.00				0.00	12.10													
	21	22	0.13	0.68	0.25	0.25			0.00	0.00			0.00	0.00			0.00	0.00	10.00	76.81	104.19	122.14	178.56	19	450	450	CONC	1.30	66.0	325.0710	2.0439	0.5382	0.058
	22	23	0.07	0.68	0.13	0.38			0.00	0.00			0.00	0.00			0.00	0.00	10.54	74.80	101.43	118.89	173.78	28	450	450	CONC	1.60	9.5	360.6339	2.2675	0.0698	0.078
	23	24	0.77	0.68	1.46	1.83			0.00	0.00			0.00	0.00			0.00	0.00	10.61	74.55	101.09	118.48	173.19	137	450	450	CONC	2.20	92.0	422.8807	2.6589	0.5767	0.323
	24	25	0.73	0.68	1.38	3.21			0.00	0.00			0.00	0.00			0.00	0.00	11.18	72.54	98.33	115.23	168.41	233	450	450	CONC	2.30	91.5	432.3849	2.7187	0.5609	0.539
	25	26	0.70	0.68	1.32	4.54			0.00	0.00			0.00	0.00			0.00	0.00	11.75	70.69	95.80	112.25	164.03	321	600	600	CONC	0.45	91.5	411.8915	1.4568	1.0468	0.779
To STREET 15, Pipe 26 - 32						4.54				0.00				0.00				0.00	12.79													
STREET 19																																
	8	9	0.05	0.68	0.09	0.09			0.00	0.00			0.00	0.00			0.00	0.00	10.00	76.81	104.19	122.14	178.56	7	450	450	CONC	0.60	22.0	220.8423	1.3886	0.2641	0.033
	9	10	0.03	0.68	0.06	0.15			0.00	0.00			0.00	0.00			0.00	0.00	10.26	75.81	102.82	120.52	176.18	11	450	450	CONC	1.35	13.0	331.2634	2.0829	0.1040	0.035
	10	11	0.44	0.68	0.83	0.98			0.00	0.00			0.00	0.00			0.00	0.00	10.37	75.42	102.29	119.90	175.26	74	450	450	CONC	2.10	82.5	413.1580	2.5978	0.5293	0.179
	1	2	0.40	0.68	0.76	0.76			0.00	0.00			0.00	0.00			0.00	0.00	10.00	76.81	104.19	122.14	178.56	58	450	450	CONC	0.20	59.5	127.5033	0.8017	1.2370	0.455
	2	3	0.18	0.68	0.34	1.10			0.00	0.00			0.00	0.00			0.00	0.00	11.24	72.36	98.08	114.95	167.99	79	450	450	CONC	0.30	53.5	156.1591	0.9819	0.9081	0.508
	3	4	0.03	0.68	0.06	1.15			0.00	0.00			0.00	0.00			0.00	0.00	12.15	69.45	94.08	110.23	161.07	80	450	450	CONC	0.60	13.0	220.8423	1.3886	0.1560	0.363
	4	5	0.22	0.68	0.42	1.57			0.00	0.00			0.00	0.00			0.00	0.00	12.30	68.97	93.43	109.47	159.94	108	450	450	CONC	2.25	63.0	427.6592	2.6890	0.3905	0.253
	5	6	0.06	0.68	0.11	1.68			0.00	0.00			0.00	0.00			0.00	0.00	12.69	67.81	91.84	107.60	157.20	114	450	450	CONC	0.25	12.5	142.5531	0.8963	0.2324	0.800
	6	7	0.58	0.68	1.10	2.78			0.00	0.00			0.00	0.00			0.00	0.00	12.92	67.14	90.92	106.52	155.62	187	600	600	CONC	0.15	86.0	237.8056	0.8411	1.7042	0.785
	7	11	0.49	0.68	0.93	3.71			0.00	0.00			0.00	0.00			0.00	0.00	14.63	62.66	84.78	99.29	145.00	232	675	675	CONC	0.15	86.0	325.5584	0.9098	1.5755	0.713
	11	12	0.48	0.68	0.91	5.60			0.00	0.00			0.00	0.00			0.00	0.00	16.20	59.07	79.86	93.50	136.51	331	675	675	CONC	1.60	94.0	1063.2692	2.9713	0.5273	0.311
	12	15	0.40	0.68	0.76	6.35			0.00	0.00			0.00	0.00			0.00	0.00	16.73	57.96	78.35	91.73	133.91	368	750	750	CONC	0.20	94.0	497.8726	1.1270	1.3902	0.739
To STREET 15, Pipe 15 - 20						6.35				0.00				0.00				0.00	18.12													

Definitions:
Q = 2.78 AIR, where
Q = Peak Flow in Litres per second (L/s)
A = Areas in hectares (ha)
I = Rainfall Intensity (mm/h)
R = Runoff Coefficient

Notes:
1) Ottawa Rainfall-Intensity Curve
2) Min. Velocity = 0.80 m/s

Designed: M.S.	PROJECT:	Cardinal Creek Village South FSR
Checked: S.L.M	LOCATION:	City of Ottawa
Dwg. Reference: 2 STORM SERVCING PLAN	File Ref:	Date: 07 Nov 2024 — Sheet No. SHEET 1 OF 4

STORM SEWER CALCULATION SHEET (RATIONAL METHOD)

Local Roads Return Frequency = 2 years
Collector Roads Return Frequency = 5 years
Manning 0.013 Arterial Roads Return Frequency = 10 years

	LOCATION		AREA (Ha)																FLOW						SEWER DATA								
			2 YEAR				5 YEAR				10 YEAR				100 YEAR				Time of	Intensity	Intensity	Intensity	Intensity	Peak Flow	DIA. (mm)	DIA. (mm)	TYPE	SLOPE	LENGTH	CAPACITY	VELOCITY	TIME OF	RATIO
			AREA	R	Indiv.	Accum.	AREA	R	Indiv.	Accum.	AREA	R	Indiv.	Accum.	AREA	R	Indiv.	Accum.	Conc.	2 Year	5 Year	10 Year	100 Year											
Location	From Node	To Node	(Ha)		2.78 AC	2.78 AC	(Ha)		2.78 AC	2.78 AC	(Ha)		2.78 AC	2.78 AC	(Ha)		2.78 AC	2.78 AC	(min)	(mm/h)	(mm/h)	(mm/h)	(mm/h)	Q (l/s)	(actual)	(nominal)		(%)	(m)	(l/s)	(m/s)	LOW (min	Q/Q full
STREET 15																																	
	13	14	0.51	0.68	0.96	0.96			0.00	0.00			0.00	0.00			0.00	0.00	10.00	76.81	104.19	122.14	178.56	74	450	450	CONC	0.20	83.0	127.5033	0.8017	1.7255	0.581
					0.00	0.96	2.46	0.70	4.79	4.79			0.00	0.00			0.00	0.00	12.00														
	14	15	0.54	0.68	1.02	1.98			0.00	4.79			0.00	0.00			0.00	0.00	12.00	69.89	94.70	110.96	162.13	592	900	900	CONC	0.20	98.5	809.5958	1.2726	1.2900	0.731
Contribution From STREET 19, Pipe 12 - 15						6.35				0.00				0.00				0.00	18.12														
	15	20	0.34	0.68	0.64	8.98			0.00	4.79			0.00	0.00			0.00	0.00	18.12	55.26	74.66	87.40	127.56	854	900	900	CONC	0.80	77.5	1619.1915	2.5452	0.5075	0.527
Contribution From STREET 13, Pipe 18 - 20						4.61				0.00				0.00				0.00	12.10														
Contribution From STREET 13, Pipe 19 - 20						0.17				0.00				0.00				0.00	10.25														
	20	26	0.34	0.68	0.64	14.40			0.00	4.79			0.00	0.00			0.00	0.00	18.63	54.35	73.41	85.92	125.40	1134	1200	1200	CONC	0.15	79.0	1509.9717	1.3351	0.9862	0.751
Contribution From STREET 13, Pipe 25 - 26						4.54				0.00				0.00				0.00	12.79														
	26	32	0.35	0.68	0.66	19.60			0.00	4.79			0.00	0.00			0.00	0.00	19.61	52.66	71.11	83.22	121.43	1373	1200	1200	CONC	0.20	85.0	1743.5652	1.5417	0.9189	0.787
To STREET 17, Pipe 32 - 64						19.60				4.79				0.00				0.00	20.53														
STREET 17																																	
	107	108	0.55	0.68	1.04	1.04			0.00	0.00			0.00	0.00			0.00	0.00	10.00	76.81	104.19	122.14	178.56	80	450	450	CONC	0.50	74.0	201.6005	1.2676	0.9730	0.396
	108	109	0.53	0.68	1.00	2.04			0.00	0.00			0.00	0.00			0.00	0.00	10.97	73.26	99.32	116.40	170.13	150	525	525	CONC	0.20	89.5	192.3297	0.8885	1.6789	0.778
	109	110	0.14	0.68	0.26	2.31			0.00	0.00			0.00	0.00			0.00	0.00	12.65	67.93	92.00	107.79	157.47	157	525	525	CONC	0.25	10.5	215.0311	0.9933	0.1762	0.729
	110	111			0.00	2.31			0.00	0.00			0.00	0.00			0.00	0.00	12.83	67.42	91.30	106.96	156.27	155	525	525	CONC	0.25	24.0	215.0311	0.9933	0.4027	0.723
To SERVICING BLOCK 2, Pipe 111 - 113						2.31				0.00				0.00				0.00	13.23														
	100	101	0.04	0.68	0.08	0.08			0.00	0.00			0.00	0.00			0.00	0.00	10.00	76.81	104.19	122.14	178.56	6	450	450	CONC	2.80	18.5	477.0738	2.9997	0.1028	0.012
	101	102	0.03	0.68	0.06	0.13			0.00	0.00			0.00	0.00			0.00	0.00	10.10	76.41	103.65	121.51	177.62	10	450	450	CONC	2.05	18.0	408.2099	2.5667	0.1169	0.025
	102	103	0.06	0.68	0.11	0.25			0.00	0.00			0.00	0.00			0.00	0.00	10.22	75.97	103.05	120.79	176.58	19	450	450	CONC	0.20	43.0	127.5033	0.8017	0.8939	0.146
	103	104	0.03	0.68	0.06	0.30			0.00	0.00			0.00	0.00			0.00	0.00	11.11	72.78	98.66	115.62	168.98	22	450	450	CONC	0.20	7.0	127.5033	0.8017	0.1455	0.173
	104	105	0.46	0.68	0.87	1.17			0.00	0.00			0.00	0.00			0.00	0.00	11.26	72.29	97.98	114.83	167.81	85	450	450	CONC	0.20	76.0	127.5033	0.8017	1.5800	0.664
			-2.43	0.68	-4.59	-3.42			0.00	0.00			0.00	0.00			0.00	0.00															
			0.52	0.68	0.98	-2.44			0.00	0.00			0.00	0.00			0.00	0.00															
	105	106			0.00	-2.44			0.00	0.00			0.00	0.00	2.43	0.68	4.59	4.59	12.84	67.39	91.26	106.91	156.19	553	900	900	CONC	0.15	76.0	701.1305	1.1021	1.1493	0.789
To SERVICING BLOCK 2, Pipe 106 - 113						-2.44				0.00				0.00				4.59	13.99														
	27	28	0.05	0.68	0.09	0.09			0.00	0.00			0.00	0.00			0.00	0.00	10.00	76.81	104.19	122.14	178.56	7	450	450	CONC	0.20	25.0	127.5033	0.8017	0.5197	0.057
	28	29	0.08	0.68	0.15	0.25			0.00	0.00			0.00	0.00			0.00	0.00	10.52	74.87	101.53	119.00	173.94	18	450	450	CONC	0.20	7.5	127.5033	0.8017	0.1559	0.144
	29	30	0.71	0.68	1.34	1.59			0.00	0.00			0.00	0.00			0.00	0.00	10.68	74.30	100.75	118.09	172.61	118	450	450	CONC	0.50	87.5	201.6005	1.2676	1.1505	0.585
	30	31	0.72	0.68	1.36	2.95			0.00	0.00			0.00	0.00			0.00	0.00	11.83	70.44	95.44	111.84	163.43	208	450	450	CONC	0.90	87.5	270.4754	1.7006	0.8575	0.768
	31	32	0.56	0.68	1.06	4.01			0.00	0.00			0.00	0.00			0.00	0.00	12.68	67.84	91.87	107.64	157.26	272	675	675	CONC	0.20	87.5	375.9224	1.0505	1.3882	0.723
Contribution From STREET 15, Pipe 26 - 32						19.60				4.79				0.00				0.00	20.53														
	32	64	0.13	0.68	0.25	23.86			0.00	4.79			0.00	0.00			0.00	0.00	20.53	51.19	69.10	80.86	117.97	1552	1200	1200	CONC	0.75	80.0	3376.3995	2.9854	0.4466	0.460
To STREET 12, Pipe 64 - 66						23.86				4.79				0.00				0.00	20.98														
STREET 7																																	
	56	57	0.53	0.68	1.00	1.00			0.00	0.00			0.00	0.00			0.00	0.00	10.00	76.81	104.19	122.14	178.56	77	450	450	CONC	0.85	70.5	262.8549	1.6527	0.7109	0.293
To STREET 12, Pipe 57 - 64						1.00				0.00				0.00				0.00	10.71														
	58	59	0.44	0.68	0.83	0.83			0.00	0.00			0.00	0.00			0.00	0.00	10.00	76.81	104.19	122.14	178.56	64	450	450	CONC	0.75	40.0	246.9092	1.5525	0.4294	0.259
	59	60	0.09	0.68	0.17	1.00			0.00	0.00			0.00	0.00			0.00	0.00	10.43	75.19	101.98	119.53	174.73	75	450	450	CONC	0.20	13.5	127.5033	0.8017	0.2807	0.591
	60	61	0.21	0.68	0.40	1.40			0.00	0.00			0.00	0.00			0.00	0.00	10.71	74.18	100.59	117.89	172.32	104	450	450	CONC	1.45	67.5	343.3133	2.1586	0.5212	0.302
	61	62	0.09	0.68	0.17	1.57			0.00	0.00			0.00	0.00			0.00	0.00	11.23	72.38	98.11	114.98	168.04	114	450	450	CONC	0.25	12.0	142.5531	0.8963	0.2231	0.797
	62	63	0.53	0.68	1.00	2.57			0.00	0.00			0.00	0.00			0.00	0.00	11.45	71.64	97.09	113.78	166.27	184	600	600	CONC	0.15	60.5	237.8056	0.8411	1.1989	0.774
	63	64	0.39	0.68	0.74	3.31			0.00	0.00			0.00	0.00			0.00	0.00	12.65	67.93	91.99	107.78	157.47	225	675	675	CONC	0.15	60.5	325.5584	0.9098	1.1083	0.690
To STREET 12, Pipe 64 - 66						3.31				0.00				0.00				0.00	13.76														
STREET 13																																	
	19	20	0.09	0.68	0.17	0.17			0.00	0.00			0.00	0.00			0.00	0.00	10.00	76.81	104.19	122.14	178.56	13	450	450	CONC	1.35	31.5	331.2634	2.0829	0.2521	0.039
To STREET 15, Pipe 20 - 26						0.17				0.00				0.00				0.00	10.25														
	54	55	0.09	0.68	0.17	0.17			0.00	0.00			0.00	0.00			0.00	0.00	10.00	76.81	104.19	122.14	178.56	13	450	450	CONC	2.30	28.5	432.3849	2.7187	0.1747	0.030
To STREET 12, Pipe 55 - 57						0.17				0.00				0.00				0.00	10.17														

Definitions:
Q = 2.78 AIR, where
Q = Peak Flow in Litres per second (L/s)
A = Areas in hectares (ha)
I = Rainfall Intensity (mm/h)
R = Runoff Coefficient

Notes:
1) Ottawa Rainfall-Intensity Curve
2) Min. Velocity = 0.80 m/s

Designed: M.S.	PROJECT: **Cardinal Creek Village South FSR**	
Checked: S.L.M	LOCATION: **City of Ottawa**	
Dwg. Reference: 2 STORM SERVCING PLAN	File Ref:	Date: 07 Nov 2024
		Sheet No. SHEET 2 OF 4

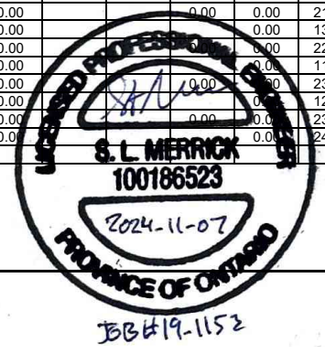
STORM SEWER CALCULATION SHEET (RATIONAL METHOD)

Local Roads Return Frequency = 2 years
Collector Roads Return Frequency = 5 years
Manning 0.013 Arterial Roads Return Frequency = 10 years

	LOCATION		AREA (Ha)																FLOW						SEWER DATA								
			2 YEAR				5 YEAR				10 YEAR				100 YEAR				Time of	Intensity	Intensity	Intensity	Intensity	Peak Flow	DIA. (mm)	DIA. (mm)	TYPE	SLOPE	LENGTH	CAPACITY	VELOCITY	TIME OF	RATIO
			AREA	R	Indiv.	Accum.	AREA	R	Indiv.	Accum.	AREA	R	Indiv.	Accum.	AREA	R	Indiv.	Accum.	Conc.	2 Year	5 Year	10 Year	100 Year										
Location	From Node	To Node	(Ha)		2.78 AC	2.78 AC	(Ha)		2.78 AC	2.78 AC	(Ha)		2.78 AC	2.78 AC	(Ha)		2.78 AC	2.78 AC	(min)	(mm/h)	(mm/h)	(mm/h)	(mm/h)	Q (l/s)	(actual)	(nominal)		(%)	(m)	(l/s)	(m/s)	LOW (min	Q/Q full
STREET 8																																	
	46	47	0.18	0.68	0.34	0.34			0.00	0.00			0.00	0.00			0.00	0.00	10.00	76.81	104.19	122.14	178.56	26	450	450	CONC	0.20	11.0	127.5033	0.8017	0.2287	0.205
	47	48	0.58	0.68	1.10	1.44			0.00	0.00			0.00	0.00			0.00	0.00	10.23	75.94	103.00	120.74	176.49	109	450	450	CONC	0.25	71.5	142.5531	0.8963	1.3295	0.765
	48	49	0.52	0.68	0.98	2.42			0.00	0.00			0.00	0.00			0.00	0.00	11.56	71.30	96.62	113.23	165.47	173	600	600	CONC	0.15	71.5	237.8056	0.8411	1.4169	0.725
To STREET 12, Pipe 49 - 55						2.42				0.00				0.00				0.00	12.98														
	50	51	0.19	0.68	0.36	0.36			0.00	0.00			0.00	0.00			0.00	0.00	10.00	76.81	104.19	122.14	178.56	28	450	450	CONC	0.20	45.5	127.5033	0.8017	0.9459	0.216
	51	52	0.06	0.68	0.11	0.47			0.00	0.00			0.00	0.00			0.00	0.00	10.95	73.35	99.45	116.55	170.35	35	450	450	CONC	0.20	12.0	127.5033	0.8017	0.2495	0.272
	52	53	0.58	0.68	1.10	1.57			0.00	0.00			0.00	0.00			0.00	0.00	11.20	72.50	98.28	115.17	168.32	114	450	450	CONC	0.25	66.0	142.5531	0.8963	1.2272	0.798
	53	55	0.46	0.68	0.87	2.44			0.00	0.00			0.00	0.00			0.00	0.00	12.42	68.61	92.93	108.88	159.08	167	525	525	CONC	0.25	66.0	215.0311	0.9933	1.1074	0.778
To STREET 12, Pipe 55 - 57						2.44				0.00				0.00				0.00	13.53														
STREET 9																																	
	36	37	0.08	0.68	0.15	0.15			0.00	0.00			0.00	0.00			0.00	0.00	10.00	76.81	104.19	122.14	178.56	12	450	450	CONC	0.20	45.0	127.5033	0.8017	0.9355	0.091
Contribution From STREET 12, Pipe 35 - 37						1.15				0.00				0.00				0.00	13.53														
	37	38	0.51	0.68	0.96	2.27			0.00	0.00			0.00	0.00			0.00	0.00	13.53	65.46	88.61	103.80	151.62	148	525	525	CONC	0.20	82.0	192.3297	0.8885	1.5382	0.772
	38	45	0.50	0.68	0.95	3.21			0.00	0.00			0.00	0.00			0.00	0.00	15.07	61.60	83.32	97.58	142.49	198	600	600	CONC	0.20	82.0	274.5943	0.9712	1.4072	0.721
To STREET 12, Pipe 45 - 49						3.21				0.00				0.00				0.00	16.48														
STREET 10																																	
	39	40	0.32	0.68	0.60	0.60			0.00	0.00			0.00	0.00			0.00	0.00	10.00	76.81	104.19	122.14	178.56	46	450	450	CONC	0.20	66.5	127.5033	0.8017	1.3825	0.364
	40	44	0.34	0.68	0.64	1.25			0.00	0.00			0.00	0.00			0.00	0.00	11.38	71.88	97.42	114.16	166.84	90	450	450	CONC	0.20	81.5	127.5033	0.8017	1.6943	0.703
To STREET 12, Pipe 44 - 45						1.25				0.00				0.00				0.00	13.08														
STREET 12																																	
	33	34	0.22	0.68	0.42	0.42			0.00	0.00			0.00	0.00			0.00	0.00	10.00	76.81	104.19	122.14	178.56	32	450	450	CONC	0.20	71.5	127.5033	0.8017	1.4864	0.251
	34	35	0.06	0.68	0.11	0.53			0.00	0.00			0.00	0.00			0.00	0.00	11.49	71.53	96.95	113.61	166.02	38	450	450	CONC	0.20	12.0	127.5033	0.8017	0.2495	0.297
	35	37	0.33	0.68	0.62	1.15			0.00	0.00			0.00	0.00			0.00	0.00	11.74	70.73	95.84	112.30	164.11	82	450	450	CONC	0.20	86.5	127.5033	0.8017	1.7983	0.640
To STREET 9, Pipe 37 - 38						1.15				0.00				0.00				0.00	13.53														
	41	42	0.19	0.68	0.36	0.36			0.00	0.00			0.00	0.00			0.00	0.00	10.00	76.81	104.19	122.14	178.56	28	450	450	CONC	0.20	53.0	127.5033	0.8017	1.1018	0.216
	42	43	0.07	0.68	0.13	0.49			0.00	0.00			0.00	0.00			0.00	0.00	11.10	72.82	98.71	115.69	169.08	36	450	450	CONC	0.20	12.5	127.5033	0.8017	0.2599	0.281
	43	44	0.19	0.68	0.36	0.85			0.00	0.00			0.00	0.00			0.00	0.00	11.36	71.94	97.51	114.27	167.00	61	450	450	CONC	0.60	39.0	220.8423	1.3886	0.4681	0.277
Contribution From STREET 10, Pipe 40 - 44						1.25				0.00				0.00				0.00	13.08														
	44	45	0.24	0.68	0.45	2.55			0.00	0.00			0.00	0.00			0.00	0.00	13.08	66.71	90.33	105.82	154.59	170	525	525	CONC	0.25	46.5	215.0311	0.9933	0.7802	0.792
Contribution From STREET 9, Pipe 38 - 45						3.21				0.00				0.00				0.00	16.48														
	45	49	0.36	0.68	0.68	6.45			0.00	0.00			0.00	0.00			0.00	0.00	16.48	58.48	79.06	92.57	135.14	377	750	750	CONC	0.20	79.0	497.8726	1.1270	1.1683	0.757
Contribution From STREET 8, Pipe 48 - 49						2.42				0.00				0.00				0.00	12.98														
	49	55	0.31	0.68	0.59	9.45			0.00	0.00			0.00	0.00			0.00	0.00	17.65	56.15	75.88	88.82	129.64	531	900	900	CONC	0.15	85.0	701.1305	1.1021	1.2854	0.757
Contribution From STREET 8, Pipe 53 - 55						2.44				0.00				0.00				0.00	13.53														
Contribution From STREET 13, Pipe 54 - 55						0.17				0.00				0.00				0.00	10.17														
	55	57			0.00	12.06	0.39	0.68	0.74	0.74			0.00	0.00			0.00	0.00	18.93	53.81	72.68	85.07	124.14	703	900	900	CONC	0.25	79.0	905.1556	1.4228	0.9254	0.776
Contribution From STREET 7, Pipe 56 - 57						1.00				0.00				0.00				0.00	10.71														
	57	64			0.00	13.06	0.40	0.68	0.76	1.49			0.00	0.00			0.00	0.00	19.86	52.26	70.56	82.58	120.49	788	900	900	CONC	0.55	85.0	1342.5627	2.1104	0.6713	0.587
Contribution From STREET 17, Pipe 32 - 64						23.86				4.79				0.00				0.00	20.98														
Contribution From STREET 7, Pipe 63 - 64						3.31				0.00				0.00				0.00	13.76														
	64	66			0.00	40.23	0.19	0.68	0.36	6.64			0.00	0.00			0.00	0.00	20.98	50.51	68.17	79.77	116.37	2484	1500	1500	CONC	0.20	82.0	3161.2940	1.7889	0.7640	0.786
Contribution From STREET 6, Pipe 65 - 66						0.62				0.00				0.00				0.00	10.48														
	66	72			0.00	40.85	0.19	0.68	0.36	7.00			0.00	0.00			0.00	0.00	21.74	49.38	66.64	77.97	113.73	2484	1500	1500	CONC	0.20	79.0	3161.2940	1.7889	0.7360	0.786
Contribution From STREET 6, Pipe 71 - 72						2.51				0.00				0.00				0.00	13.39														
	72	74			0.00	43.37	0.20	0.68	0.38	7.38			0.00	0.00			0.00	0.00	22.48	48.36	65.24	76.32	111.32	2578	1650	1650	CONC	0.25	85.0	4557.2242	2.1313	0.6647	0.566
Contribution From STREET 1, Pipe 73 - 74						1.19				0.00				0.00				0.00	11.56														
	74	76			0.00	44.56	0.10	0.68	0.19	7.57			0.00	0.00			0.00	0.00	23.15	47.47	64.03	74.90	109.23	2599	1650	1650	CONC	0.15	44.0	3530.0106	1.6509	0.4442	0.736
Contribution From STREET 5, Pipe 75 - 76						0.78				0.00				0.00				0.00	12.07														
	76	78			0.00	45.33	0.09	0.68	0.17	7.74			0.00	0.00			0.00	0.00	23.59	46.89	63.24	73.98	107.89	2615	1650	1650	CONC	0.15	46.0	3530.0106	1.6509	0.4644	0.741
To STREET 1, Pipe 78 - 83						45.33				7.74				0.00				0.00	24.05														

Definitions:
Q = 2.78 AIR, where
Q = Peak Flow in Litres per second (L/s)
A = Areas in hectares (ha)
I = Rainfall Intensity (mm/h)
R = Runoff Coefficient

Notes:
1) Ottawa Rainfall-Intensity Curve
2) Min. Velocity = 0.80 m/s



Designed: M.S.	PROJECT:	Cardinal Creek Village South FSR
Checked: S.L.M	LOCATION:	City of Ottawa
Dwg. Reference: 2 STORM SERVCING PLAN	File Ref:	Date: 07 Nov 2024 — Sheet No. SHEET 3 OF 4

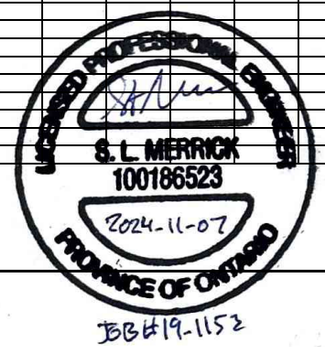
STORM SEWER CALCULATION SHEET (RATIONAL METHOD)

Local Roads Return Frequency = 2 years
Collector Roads Return Frequency = 5 years
Manning 0.013 Arterial Roads Return Frequency = 10 years

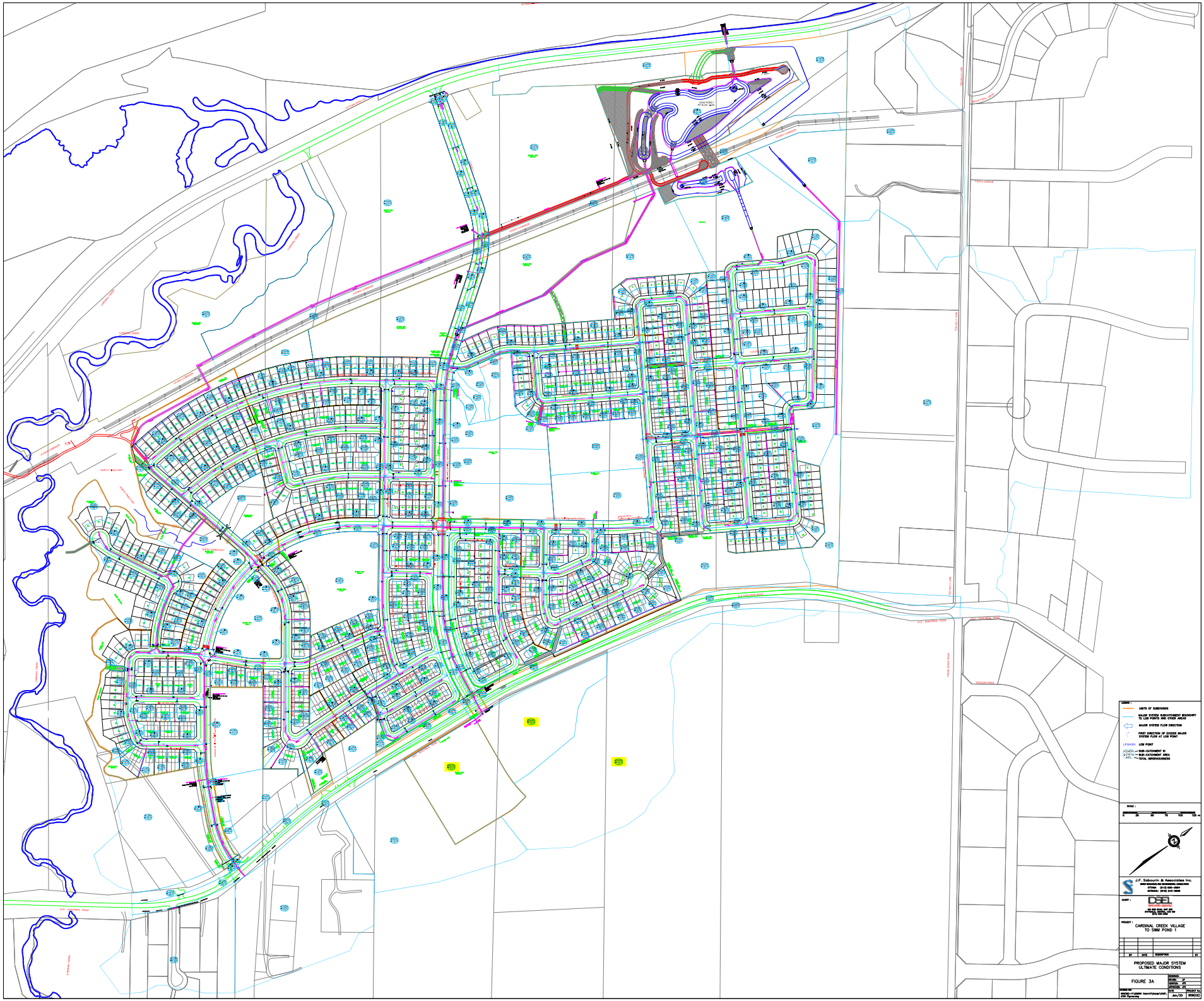
	LOCATION		AREA (Ha)																FLOW						SEWER DATA							
			2 YEAR				5 YEAR				10 YEAR				100 YEAR				Time of	Intensity	Intensity	Intensity	Intensity	Peak Flow	DIA. (mm)	DIA. (mm)	TYPE	SLOPE	LENGTH	CAPACITY	VELOCITY	TIME OF	RATIO
			AREA	R	Indiv.	Accum.	AREA	R	Indiv.	Accum.	AREA	R	Indiv.	Accum.	AREA	R	Indiv.	Accum.	Conc.	2 Year	5 Year	10 Year	100 Year										
Location	From Node	To Node	(Ha)		2.78 AC	2.78 AC	(Ha)		2.78 AC	2.78 AC	(Ha)		2.78 AC	2.78 AC	(Ha)		2.78 AC	2.78 AC	(min)	(mm/h)	(mm/h)	(mm/h)	(mm/h)	Q (l/s)	(actual)	(nominal)		(%)	(m)	(l/s)	(m/s)	LOW (min	Q/Q full
STREET 1																																
	73	74	0.63	0.68	1.19	1.19			0.00	0.00			0.00	0.00			0.00	0.00	10.00	76.81	104.19	122.14	178.56	91	450	450	CONC	0.30	92.0	156.1591	0.9819	1.5617	0.586
To STREET 12, Pipe 74 - 76						1.19				0.00				0.00				0.00	11.56														
	79	80	0.14	0.68	0.26	0.26			0.00	0.00			0.00	0.00			0.00	0.00	10.00	76.81	104.19	122.14	178.56	20	450	450	CONC	0.40	30.0	180.3170	1.1338	0.4410	0.113
	80	81	0.15	0.68	0.28	0.55			0.00	0.00			0.00	0.00			0.00	0.00	10.44	75.15	101.92	119.46	174.63	41	450	450	CONC	0.20	38.5	127.5033	0.8017	0.8004	0.323
	81	82	0.18	0.68	0.34	0.89			0.00	0.00			0.00	0.00			0.00	0.00	11.24	72.35	98.06	114.92	167.96	64	450	450	CONC	0.20	10.5	127.5033	0.8017	0.2183	0.504
	82	83	0.38	0.68	0.72	1.61			0.00	0.00			0.00	0.00			0.00	0.00	11.46	71.62	97.07	113.75	166.23	115	525	525	CONC	0.20	77.0	192.3297	0.8885	1.4444	0.598
To STREET 2, Pipe 83 - 84						1.61				0.00				0.00				0.00	12.90														
	116	117			0.00	0.00			0.00	0.00			0.00	0.00	0.15	0.80	0.33	0.33	10.00	76.81	104.19	122.14	178.56	60	450	450	CONC	2.80	47.0	477.0738	2.9997	0.2611	0.125
	117	118			0.00	0.00			0.00	0.00			0.00	0.00	0.08	0.80	0.18	0.51	10.26	75.82	102.83	120.54	176.21	90	450	450	CONC	2.80	32.0	477.0738	2.9997	0.1778	0.189
					0.00	0.00			0.00	0.00			0.00	0.00	2.44	0.60	4.07	4.58	12.00														
	118	119			0.00	0.00			0.00	0.00			0.00	0.00	0.07	0.80	0.16	4.74	12.00	69.89	94.70	110.96	162.13	768	675	675	CONC	1.60	26.0	1063.2692	2.9713	0.1458	0.722
Contribution From SERVICING BLOCK 2, Pipe 115 - 119						0.00				6.41				0.00				4.59	15.38														
					0.00	0.00			0.00	6.41			0.00	0.00	2.05	0.70	3.99	13.32	12.00														
	119	2000			0.00	0.00			0.00	6.41			0.00	0.00	0.20	0.80	0.44	13.76	15.38	60.89	82.35	96.43	140.81	2466	1200	1200	CONC	0.75	53.5	3376.3995	2.9854	0.2987	0.730
	77	78			0.00	0.00			0.00	0.00			0.00	0.00	0.06	0.80	0.13	0.13	10.00	76.81	104.19	122.14	178.56	24	450	450	CONC	1.80	14.5	382.5100	2.4051	0.1005	0.062
Contribution From STREET 12, Pipe 76 - 78						45.33				7.74				0.00				0.00	24.05														
	78	83	0.05	0.68	0.09	45.43			0.00	7.74			0.00	0.00			0.00	0.13	24.05	46.31	62.45	73.05	106.52	2601	1800	1800	CONC	0.10	26.5	3634.9621	1.4284	0.3092	0.716
To STREET 2, Pipe 83 - 84						45.43				7.74				0.00				0.13	24.36														
STREET 2																																
Contribution From STREET 1, Pipe 78 - 83						45.43				7.74				0.00				0.13	24.36														
Contribution From STREET 1, Pipe 82 - 83						1.61				0.00				0.00				0.00	12.90														
	83	84	0.64	0.68	1.21	48.24			0.00	7.74			0.00	0.00			0.00	0.13	24.36	45.93	61.93	72.44	105.63	2709	1800	1800	CONC	0.10	89.5	3634.9621	1.4284	1.0443	0.745
	84	85	0.71	0.68	1.34	49.59			0.00	7.74			0.00	0.00			0.00	0.13	25.41	44.70	60.25	70.47	102.74	2696	1800	1800	CONC	0.10	89.5	3634.9621	1.4284	1.0443	0.742
To POND INLET, Pipe 85 - HW1						49.59				7.74				0.00				0.13	26.45														
POND INLET																																
Contribution From STREET 2, Pipe 84 - 85						49.59				7.74				0.00				0.13	26.45														
	85	HW1	0.43	0.68	0.81	50.40			0.00	7.74			0.00	0.00			0.00	0.13	26.45	43.53	58.67	68.61	100.02	2661	1800	1800	CONC	0.10	61.0	3634.9621	1.4284	0.7117	0.732

Definitions:
Q = 2.78 AIR, where
Q = Peak Flow in Litres per second (L/s)
A = Areas in hectares (ha)
I = Rainfall Intensity (mm/h)
R = Runoff Coefficient

Notes:
1) Ottawa Rainfall-Intensity Curve
2) Min. Velocity = 0.80 m/s



Designed: M.S.	PROJECT:	Cardinal Creek Village South FSR
Checked: S.L.M	LOCATION:	City of Ottawa
Dwg. Reference: 2 STORM SERVCING PLAN	File Ref:	Date: 07 Nov 2024 — Sheet No. SHEET 4 OF 4


LEGEND :
LIMITS OF SUBDIVISION
MAJOR SYSTEM SUBCATCHMENT BOUNDARY TO LOW POINTS AND OTHER AREAS
MAJOR SYSTEM FLOW DIRECTION
FIRST DIRECTION OF EXCESS MAJOR SYSTEM FLOW AT LOW POINT
LP204SW
LOW POINT
A204SW
SUB-CATCHMENT ID
0.570 ha
SUB-CATCHMENT AREA
65%
TOTAL IMPERVIOUSNESS
SCALE :
0
30
60
75
100
125 m
J.F. Sabourin & Associates Inc.
CLIENT :
PROJECT :
CARDINAL CREEK VILLAGE
TO SWM POND 1
NO.
DATE
DESCRIPTION
BY
PROPOSED MAJOR SYSTEM
ULTIMATE CONDITIONS
FIGURE 3A
DESIGNED
DRAWN
CHECKED
APPROVED
DATE
PROJECT No.
Jun/20
2

Estimated Peak Stormwater Flow Rate
City of Ottawa Sewer Design Guidelines, 2012

Existing Drainage Charateristics

Ex Area to Ditch	1.31	ha	
Additional Area to Ditch	1.30	ha	
Total Area to Ditch	2.61	ha	
C	0.45	Rational Method runoff coefficient	
L	95	m	<-- Length equals longest path of travel to ditch
Up Elev	96.5	m	
Dn Elev	95.50	m	
Slope	1.1	%	
Tc	20.3	min	<-- Does not include travel time in ditch

1) Time of Concentration per Federal Aviation Administration

$$t_c = \frac{1.8(1.1-C)L^{0.5}}{S^{0.333}}$$

tc, in minutes
C, rational method coefficient, (-)
L, length in ft
S, average watershed slope in %

Estimated Peak Flow

	2-year	5-year	100-year	
i	76.8	104.2	178.6	mm/hr
Q	250.6	339.9	728.2	L/s

Note:
C value for the 100-year storm is increased by 25%, to a maximum of 1.0 per Ottawa Sewer Design Guidelines (5.4.5.2.1)

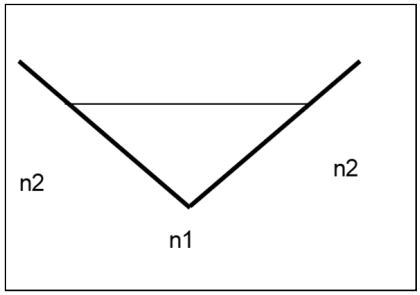
Date: December 2021
File: 19-1153

CCV South - Cox Country Roadside Ditch
Conveyance Calculation

Note: Existing roadside ditch dimensions & slope based on most restrictive section per Topographic Survey prepared by AOV (Job No. 22004-20) received July 23, 2021

Input:

Bottom Width	1.60	m	
Bottom "n1"	0.035		
Side Slope	3	:1	
Side "n2"	0.035		
Flow Depth	0.53	m	
Ditch Min. Dep	1.30	m	**OK**
Slope	0.0010	m/m	



Output:

Flow	**0.746**	**m^3/s**	Capacity
>	**0.728**	**m^3/s**	100Yr Flow refer to rational method calc
	OK		
Velocity	**0.44**	**m/s**	

Cardinal Creek (23076) Preliminary Erosion Exceedance Analysis
2024-10-18

Table 1. Reach characteristics and erosion thresholds for the South Tributary and Main Stem of Cardinal Creek

Channel parameter	R2 South Tributary (Parish Geomorphic, 2013)	R3 South Tributary (GEO Morphix Ltd, 2024)	C10 Main Stem (GEO Morphix Ltd, 2024)	C11-B Main Stem (Parish Geomorphic, 2013)
Measured				
Average bankfull channel width (m)	3.57	3.62	13.4	7.2
Average bankfull channel depth (m)	0.37	0.37	0.68	0.75
Channel gradient (%)	1.00	0.76	1.01	0.36
D_{50} (mm)	<2.0	<2.0	45	29.5
D_{84} (mm)	<2.0	<2.0	120	73
Manning's n roughness coefficient	0.035	0.040	0.040	0.034
Pre-development drainage area (ha)	146.67	211.28*	3,240.58***	3,337**
Computed				
Bankfull discharge (m^3/s)	2.21	1.75	16.85	8.55
Critical velocity (m/s)	0.82	0.61	0.76	0.8
Critical shear stress (N/m^2)	20.3	11.06	17.86	12.25
Material	Clay	Alluvial mud	Alluvial loamy clay	Clay till
Critical discharge (m^3/s)	**0.430[1]**	**0.184[2]**	**1.77[2]**	**1.50[3]**
Unitary erosion threshold ($m^3/s/ha$)	**0.0029**	**0.00087**	**0.00055**	**0.00045**

* Provided by JFSA (2024)
** Estimated using OWIT
*** Estimated using OWIT summed with drainage area provided by JFSA
[1] Based on the Dunn (1957) equation for critical discharge
[2] Based on the Julien (1994) permissible velocities for cohesive channels
[3] Based on the Chow (1959) critical shear stress values for cohesive clays

Note: The South Tributary drainage area at its confluence with the main stem of Cardinal Creek is approximately 256.18 ha, this represents 8.58% of the 2984.40 ha main stem drainage area at the confluence between the two watercourses. The South Tributary drainage area was estimated using the drainage area for Node CH2/R3 provided by JFSA (2024) summed with the drainage area for the South Tributary downstream of R3, which was estimated using the Ontario Watershed Information Tool (OWIT); the Cardinal Creek main stem drainage area was estimated using OWIT. Previous erosion exceedance conducted by JFSA (2013) incorporated the development lands north of the South Tributary. These included SWM Pond 1, with a drainage area of 138.04 ha and discharging directly to the Ottawa River, and SWM Pond 2, servicing the 39.08 ha portion of the development discharging to the South Tributary.

Table 2. Results of the exceedance analysis for pre- to post-development scenarios in Reach R3 within the South Tributary, using the critical discharge determined by GEO Morphix (2024).

Scenario		CED (m^3)	ω_{eff} (N/m^2)	t_{ex} (hrs)	# of exceedances
R3 (Q_{crit} = 0.184 m^3/s)	**(Pre)**	568,078	5,349	624	237
	(Post)	521,517	5,104	653	250
	Change (%)	**-8.20**	**-4.58**	**4.65**	**5.49**

*Results are based on hydrology from the continuous hydrologic simulation for Node CH2, which is located at the downstream end of R3. The drainage area at reach R3 is 211.28, consisting of approximately 82% of the 256.18 ha drainage area for the South Tributary.

Table 3. Results of the exceedance analysis for pre- to post-development scenarios in Reach C10 within the main stem, using the critical discharge determined by GEO Morphix (2024).

Scenario		CED (m^3)	ω_{eff} (N/m^2)	t_{ex} (hrs)	# of exceedances
C10 (Q_{crit} = 1.77 m^3/s)	**(Pre)**	9,596,301	88,298	1,474	216
	(Post)	9,636,289	89,396	1,506	218
	Change (%)	**0.42**	**1.24**	**2.16**	**0.93**

*Results are based on hydrology from the continuous hydrologic simulation for Node H, which is located at the downstream end of C10.

DRAWINGS & FIGURES

OTTAWA RIVER

OTTAWA ROAD 174

CARDINAL CREEK DRIVE

CARDINAL CREEK
VILLAGE
PHASE 5 & 6

CARDINAL CREEK
VILLAGE
PHASE 4

OLD MONTREAL ROAD

COX COUNTRY ROAD

SOUTH TRIBUTARY
TO CARDINAL CREEK

FUTURE
EXTERNAL LANDS

LEGEND

SITE BOUNDARY

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SITE LOCATION
CARDINAL CREEK VILLAGE SOUTH

PROJECT No.:	19-1153
SCALE:	1:7500
DATE:	NOVEMBER 2024
FIGURE:	1

LEGEND

- SUBJECT LANDS
- STORM TRUNK
- EXISTING STORM SEWER
- EXISTING STORM MANHOLE
- STORM DRAINAGE AREA
- 100-YEAR STORM DRAINAGE AREA
- EXTERNAL STORM DRAINAGE AREA
- STORM MANHOLE
- DRAINAGE AREA / RUNOFF COEFFICIENT / UPSTREAM/DOWNSTREAM MANHOLE (0.45Ha, 0.66, 523 524, 2-Year)
- EXTERNAL DRAINAGE
- EXTERNAL DRAINAGE AREA IN HECTARES / EXTERNAL RUNOFF COEFFICIENT / UPSTREAM MH / DOWNSTREAM MH / STORM FREQUENCY (0.24Ha, 0.7, 445 446, 2-Year)
- INFILL WORK AREA

SOUTH TRIBUTARY HAZARD LIMITS PER PATERSON GROUP (PROJ# PG5201-1) DATED NOVEMBER 29, 2021:

- EROSION ACCESS ALLOWANCE
- TOE EROSION ALLOWANCE/ LIMIT OF HAZARD LANDS
- STABLE SLOPE ALLOWANCE
- HIGH WATER LINE
- TOP OF SLOPE
- 30m SETBACK FROM NHWM

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CARDINAL CREEK VILLAGE SOUTH

CITY OF OTTAWA

STORM SERVCING PLAN

SCALE:	1:1500	PROJECT No.:	19-1153
DATE:	NOVEMBER 2024	DRAWING:	2

CARDINAL CREEK VILLAGE PHASE 4
CITY FILE NO. D07-16-13-002 PH4
PREPARED BY DSEL, SEPT. 2017
CONSTRUCTION COMPLETED.

CARDINAL CREEK VILLAGE PHASE 5&6
CITY FILE NO. D07-16-13-002 PH5PH6
PREPARED BY DSEL, MAY 2021.
CONSTRUCTION COMPLETED.

OUTLET STRUCTURE, PIPES AND ARMOUR STONE SPILLWAY SHOWN CONCEPTUALLY, DESIGN OF AMOUR STONE SPILLWAY TO BE PROVIDED BY GEOMORPHIX AT DETAILED DESIGN

S.W.M POND POND 3
PP ELEV 82.50
MAX ELEV 84.50

SOUTH TRIBUTARY HAZARD LIMITS PER PATERSON GROUP (PROJ# PG5201-1) DATED NOVEMBER 29, 2021

FUTURE DEVELOPMENT LANDS

NETWORK TO BE EXTENDED FOR FUTURE DEVELOPMENTS

6m SERVICING BLOCK 1

7.5m SERVICING BLOCK 2

6m SERVICING BLOCK 3

6m SERVICING BLOCK 4

OLD MONTREAL ROAD

COX COUNTRY ROAD

rue Mishawashkode Street

terrasse du Géographe Terrace

rue du Cartographe Street

rang de Stadaconé Row

voie du Cap-Diamant Way

promenade Cardinal Creek Drive

cercle Tewin Circle

Tewin Circle

ruelle de Saintonge Lane

place Keinouche Place

STREET 1
STREET 2
STREET 4
STREET 5
STREET 6
STREET 7
STREET 8
STREET 9
STREET 10
STREET 11
STREET 12
STREET 13
STREET 14
STREET 15
STREET 17
STREET 19

LEGEND

- SUBJECT LANDS
- PROPOSED SANITARY SEWER
- PROPOSED UPPER AND LOWER SANITARY SEWERS
- EXISTING SANITARY SEWER
- SANITARY DRAINAGE BOUNDARY
- EXTERNAL SANITARY DRAINAGE BOUNDARY
- SANITARY MANHOLE
- EXISTING SANITARY MH
- POPULATION PER UNIT / SANITARY DRAINAGE AREA / NUMBER OF UNITS / TOTAL POPULATION / UPSTREAM/DOWNSTREAM MANHOLE
- EXTERNAL POPULATION PER UNIT / EXTERNAL DRAINAGE AREA IN HECTARES / POPULATION PER HA / POPULATION
- POTENTIAL FUT. EXTERNAL SANITARY DRAINAGE AREA / POPULATION / POPULATION PER HA / TRIB TYPE / DOWNSTREAM MANHOLE

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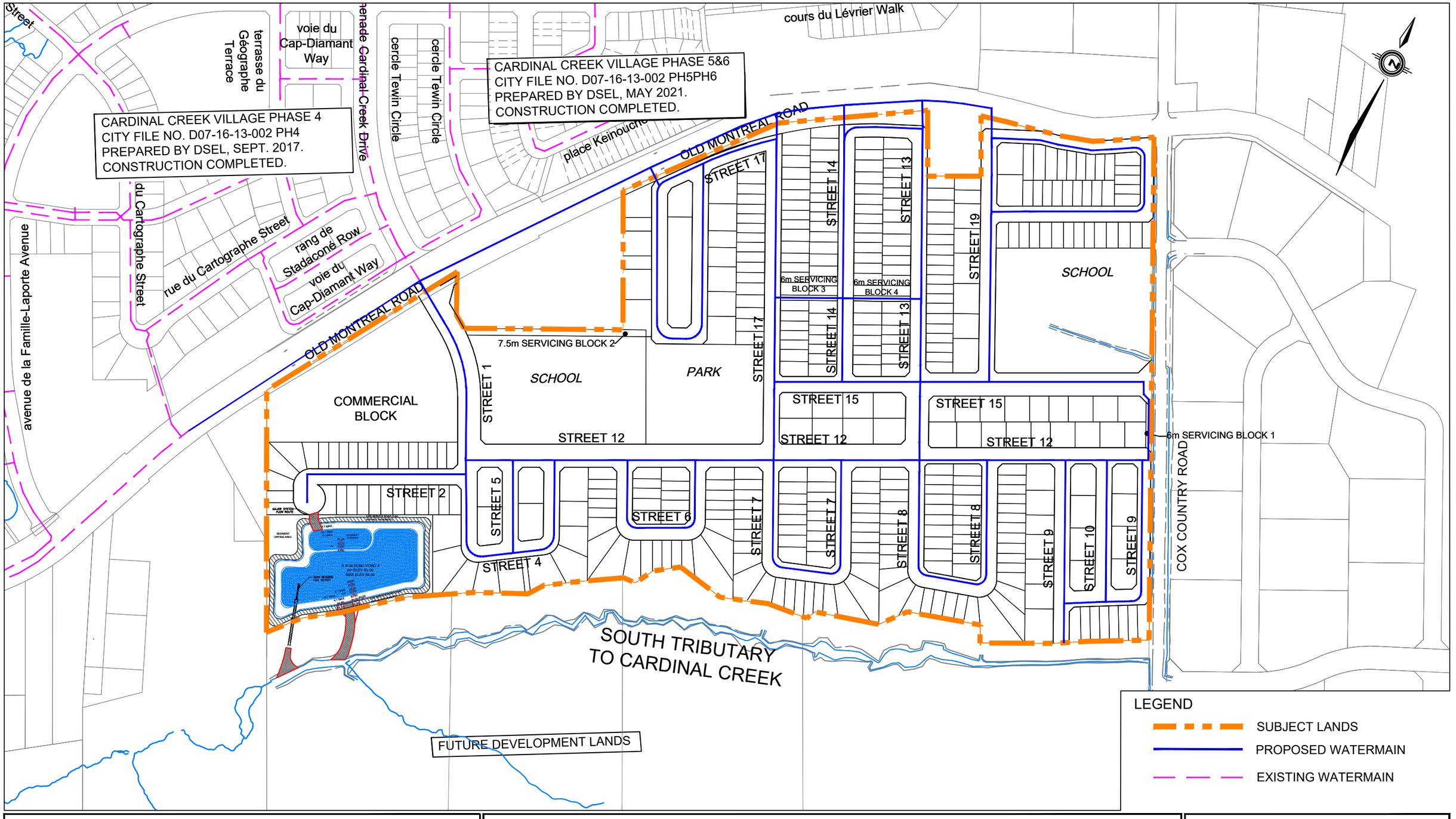
CARDINAL CREEK VILLAGE SOUTH

CITY OF OTTAWA

SANITARY SERVICING PLAN

SCALE:	1:1500	PROJECT No.:	19-1153
DATE:	NOVEMBER 2024	DRAWING:	3



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WATERMAIN SERVICING PLAN
CARDINAL CREEK VILLAGE SOUTH

PROJECT No.:	19-1153
SCALE:	1:4000
DATE:	NOVEMBER 2024
FIGURE:	4

GRADING NOTES

- PRELIMINARY GRADING REPRESENTS CENTERLINE OF ROAD LOW POINTS, CENTERLINE GRADES UP TO 0.35m HIGHER AT DETAILED DESIGN TO ACCOUNT FOR ROAD HIGH POINTS, LOT GRADING HIGHER TO BE PROVIDED AT DETAILED DESIGN
- PRELIMINARY GRADING BASED ON MAXIMUM GRADE RAISE OF 2.0m FOR RESIDENTIAL LOTS
- GRADE RAISE RESTRICTIONS AND PLACEMENT OF LIGHTWEIGHT FILL TO BE REVIEWED BY PATERSON GROUP DURING DETAILED DESIGN
- PRELIMINARY GRADING DOES NOT REPRESENT ROAD SAGS, MINIMUM LONGITUDINAL SLOPES OF 0.5% TO BE MAINTAINED DURING DETAILED DESIGN THROUGH SAWTOOTHING
- RETAINING WALLS TO BE DESIGNED BY STRUCTURAL ENGINEER AT DETAILED DESIGN

PREPARED BY DSEL, SEPT. 2017
CONSTRUCTION COMPLETED.

CARDINAL CREEK VILLAGE PHASE 4

CARDINAL CREEK VILLAGE PHASE 5&6
CITY FILE NO. D07-16-13-002 PH5PH6
PREPARED BY DSEL, MAY 2021.
CONSTRUCTION COMPLETED.

OUTLET STRUCTURE, PIPES AND ARMOUR STONE SPILLWAY SHOWN CONCEPTUALLY, DESIGN OF AMOUR STONE SPILLWAY TO BE PROVIDED BY GEOMORPHIX AT DETAILED DESIGN

FUTURE RESIDENTIAL/COMMERCIAL

FUTURE DEVELOPMENT LANDS

7.5m SERVICING BLOCK 2

6m SERVICING BLOCK 1

6m SERVICING BLOCK 3

6m SERVICING BLOCK 4

EX. 600ø CSP CULVERT
IN INV.=91.92
OUT INV.=91.87

EX. 500ø CSP CULVERT
INV.=91.55

MATCH EXISTING SWALE
EX. 900ø CSP CULVERT
IN INV.=88.48
OUT INV.=88.53

REGRADE EXISTING SWALE. REMOVE LOW POINT AND DIRECT FLOW FROM DITCH TO SOUTH CULVERT.
EX. 600ø CSP CULVERT
IN INV.=89.09
OUT INV.=89.03
(TO BE REMOVED)

EX. 900ø CULVERT
IN INV=87.31
OUT INV=87.31

EX. CULVERT

XS 881.4 PER CARDINAL CREEK 100 YEAR EVENT RISK MAP MARCH 18, 2013 100-YR =73.64

XS 829.4 PER CARDINAL CREEK 100 YEAR EVENT RISK MAP MARCH 18, 2013 100-YR =73.30

XS 1107.3 PER CARDINAL CREEK 100 YEAR EVENT RISK MAP MARCH 18, 2013 100-YR =77.67

XS 951.3 PER CARDINAL CREEK 100 YEAR EVENT RISK MAP MARCH 18, 2013 100-YR =74.04

XS 1281.8 PER CARDINAL CREEK 100 YEAR EVENT RISK MAP MARCH 18, 2013 100-YR =80.47

XS 1424.5 PER CARDINAL CREEK 100 YEAR EVENT RISK MAP MARCH 18, 2013 100-YR = 82.59

XS 1590.4 PER CARDINAL CREEK 100 YEAR EVENT RISK MAP MARCH 18, 2013 100-YR = 86.80

XS 1727.5 PER CARDINAL CREEK 100 YEAR EVENT RISK MAP MARCH 18, 2013 100-YR = 87.64

XS 1852.6 PER CARDINAL CREEK 100 YEAR EVENT RISK MAP MARCH 18, 2013

SOUTH TRIBUTARY HAZARD LIMITS PER PATERSON GROUP (PROJ# PG5201-1) DATED NOVEMBER 29, 2021

LEGEND

- SUBJECT LANDS
- STORM OVERLAND FLOW ARROW
- 192.851 PROPOSED CENTERLINE ELEVATION
- 193.50 / 193.50 PROPOSED ELEVATION EXISTING ELEVATION
- [192.851] EXISTING CENTERLINE ELEVATION
- INFILL WORK AREA

SOUTH TRIBUTARY HAZARD LIMITS PER PATERSON GROUP (PROJ# PG5201-1 DATED NOVEMBER 29, 2021

- EROSION ACCESS ALLOWANCE
- TOE EROSION ALLOWANCE/ LIMIT OF HAZARD LANDS
- STABLE SLOPE ALLOWANCE
- RETAINING WALL
- HIGH WATER LINE
- TOP OF SLOPE
- 30m SETBACK FROM NHWM

CUT-FILL DEPTH ALONG CENTER LINE:

CUT DEPTH (m)		FILL DEPTH (m)	
0 - 0.5	1.5 - 2.0	0 - 0.5	1.5 - 2.0
0.5 - 1.0	2.0- 2.5	0.5 - 1.0	2.0- 2.5
1.0 - 1.5	> 2.5	1.0 - 1.5	> 2.5

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CARDINAL CREEK VILLAGE SOUTH

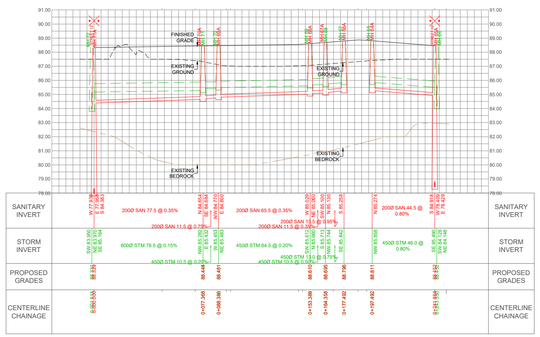
CITY OF OTTAWA

GRADING PLAN

SCALE:	1:1500	PROJECT No.:	19-1153
DATE:	NOVEMBER 2024	DRAWING:	5

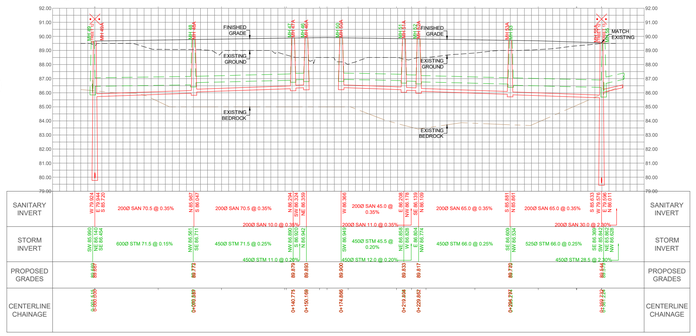
STREET 6

1



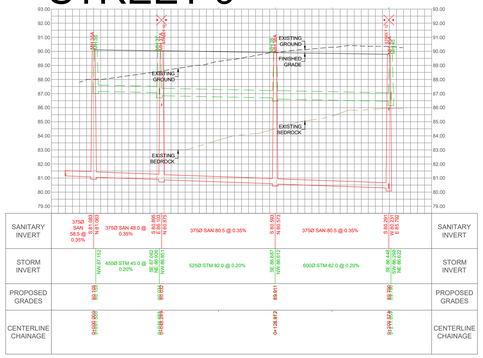
STREET 8

11



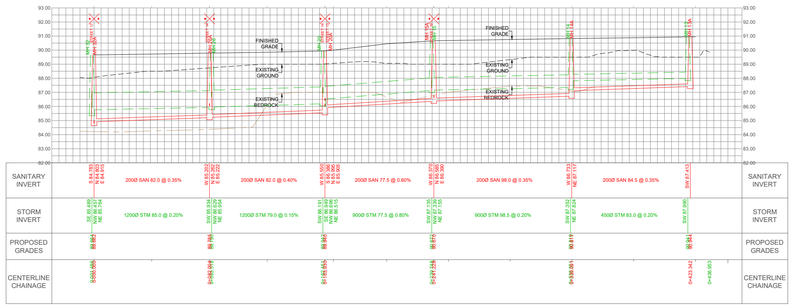
STREET 9

4



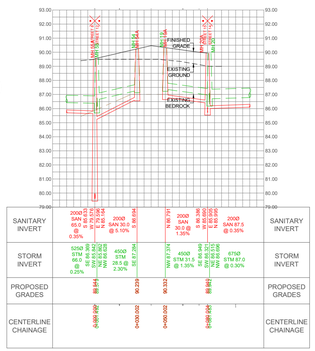
STREET 15

2



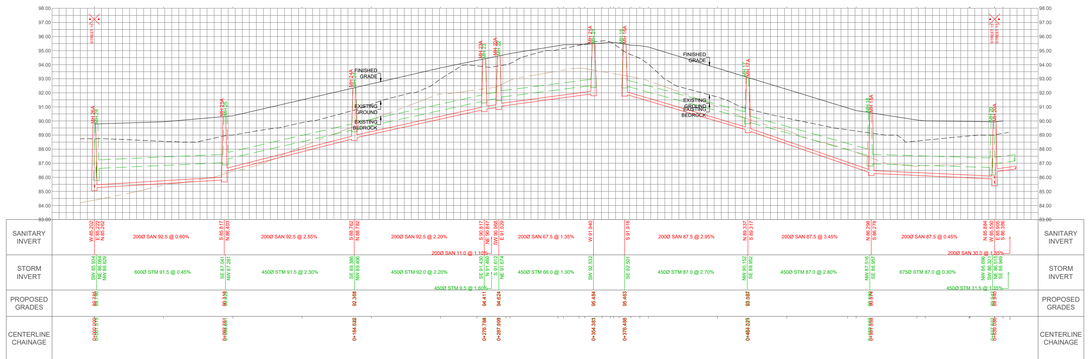
STREET 13

12



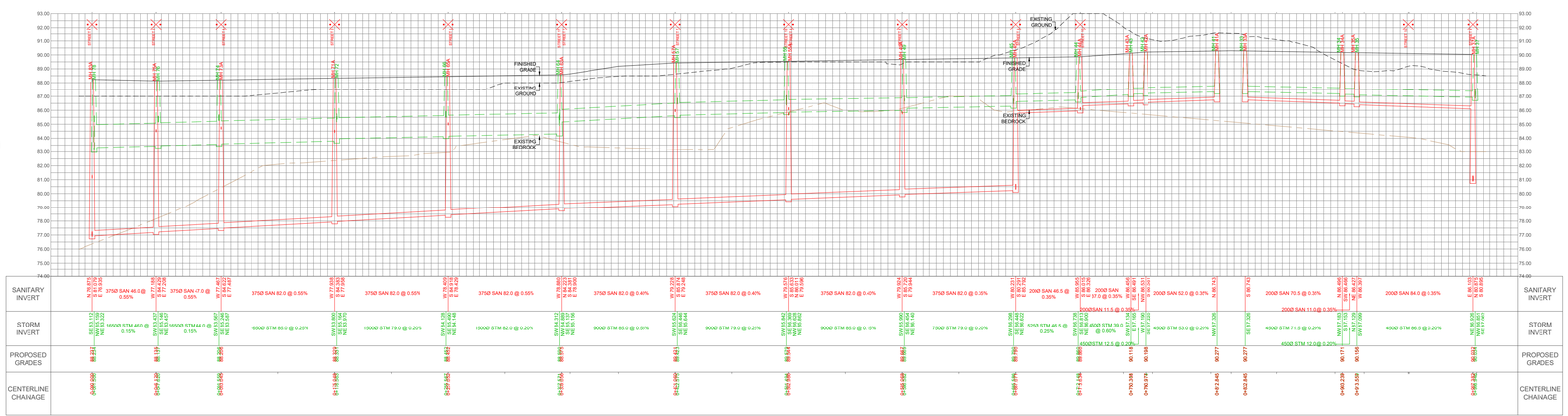
STREET 14

13



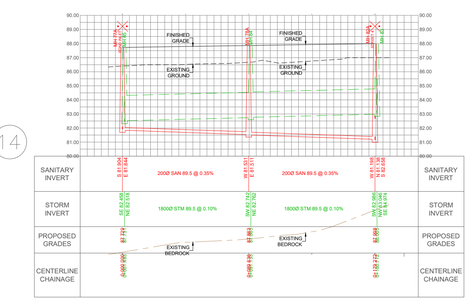
STREET 12

3



STREET 2

14



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CARDINAL CREEK
VILLAGE SOUTH

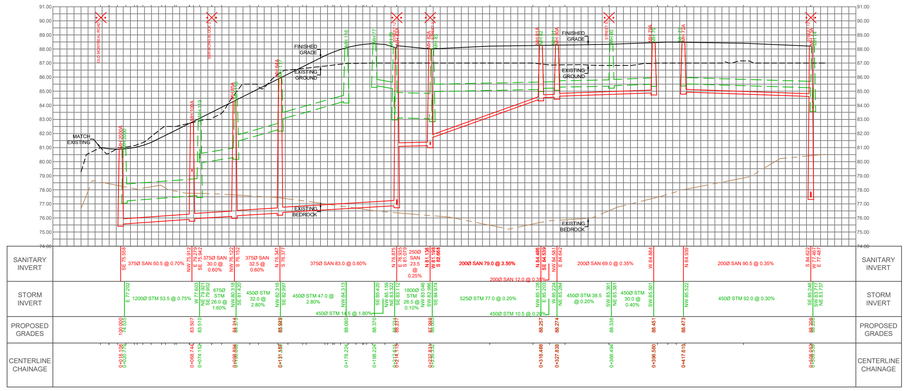
CITY OF OTTAWA

PROFILES

SCALE:	1:2000	PROJECT No.:	19-1153
DATE:	NOVEMBER 2024	DRAWING:	6

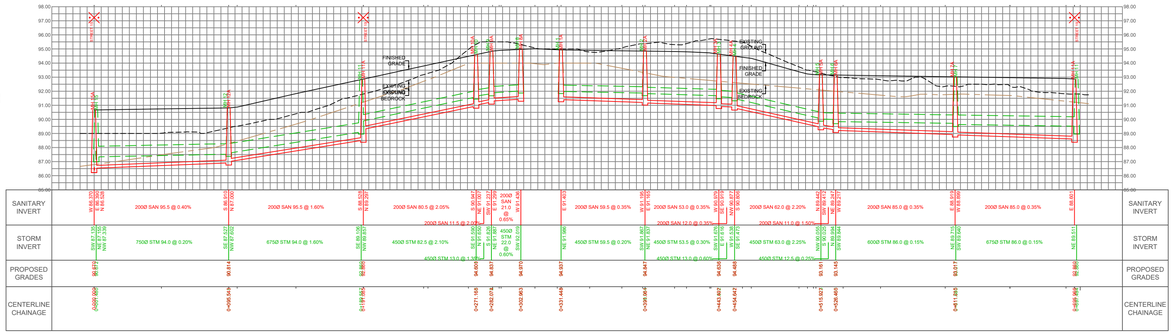
STREET 4

8



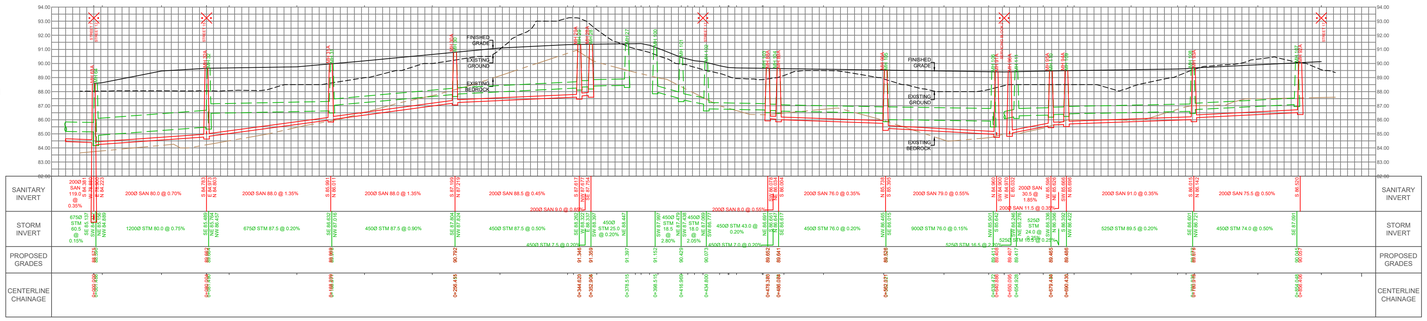
STREET 19

7



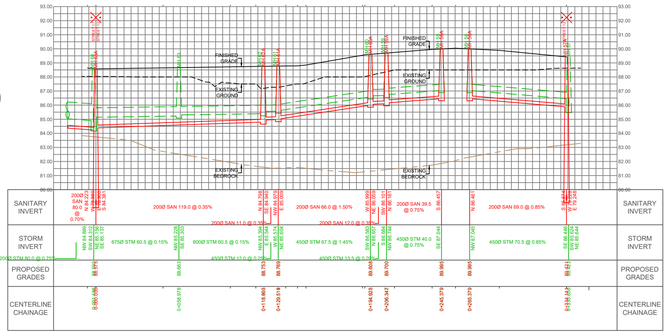
STREET 17

9



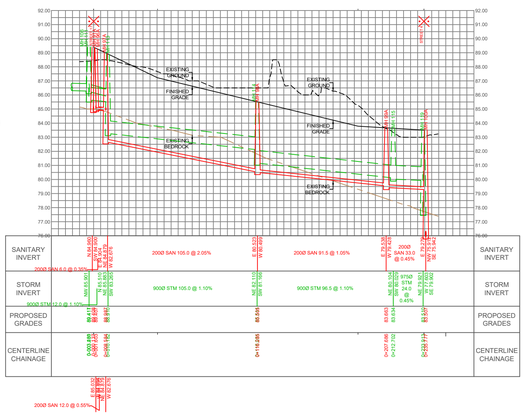
STREET 7

10



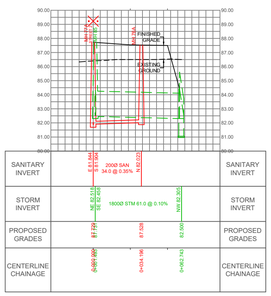
SERVICING BLOCK 2

16



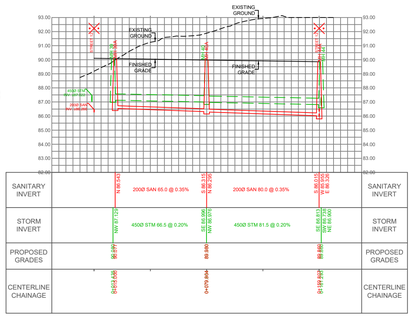
POND INLET

15



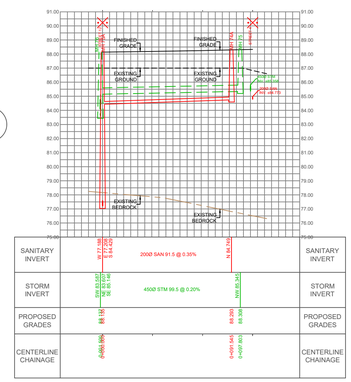
STREET 10

5



STREET 5

6



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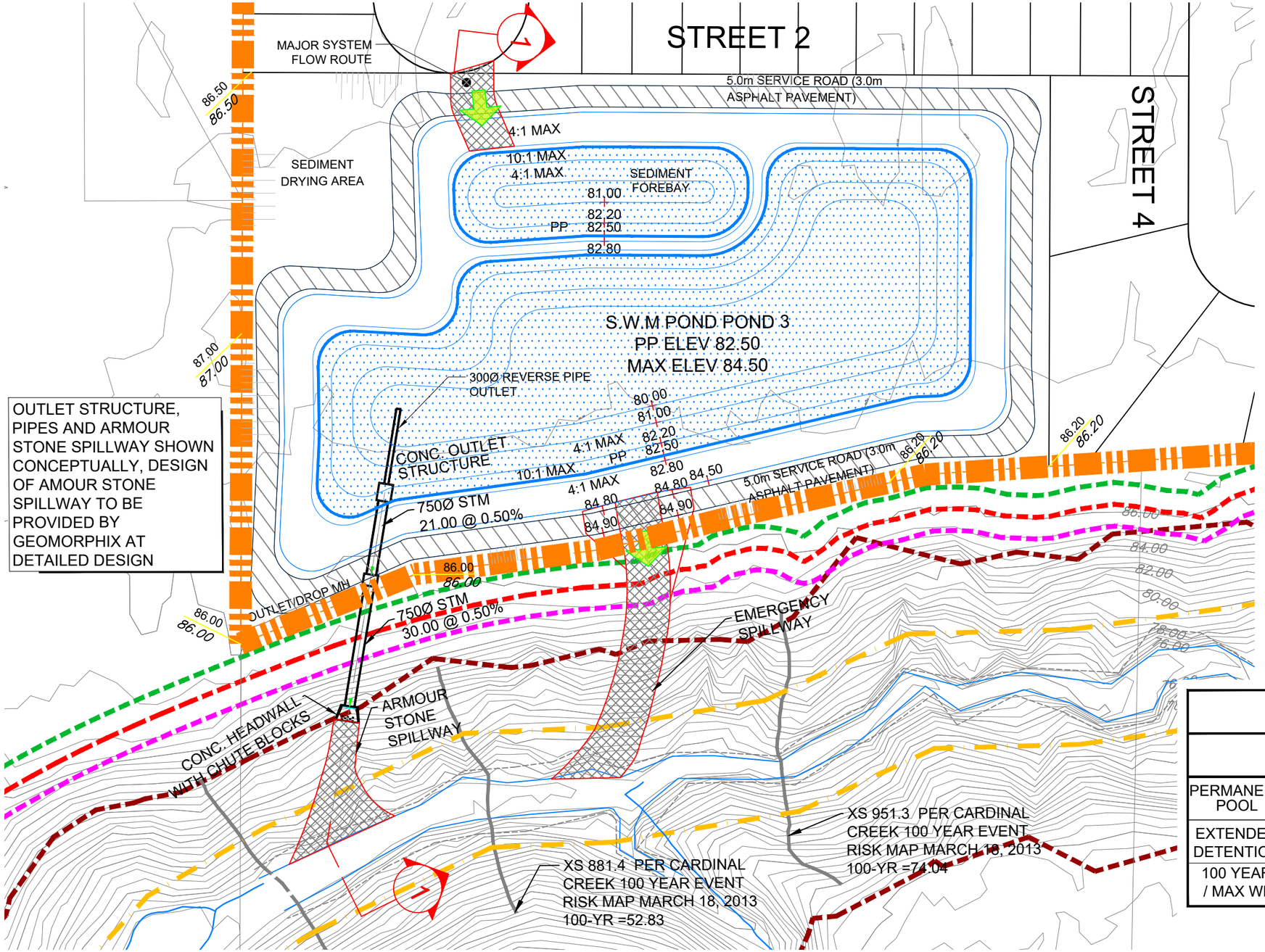
CARDINAL CREEK VILLAGE SOUTH

CITY OF OTTAWA

PROFILES

SCALE:	1:2000	PROJECT No.:	19-1153
DATE:	NOVEMBER 2024	DRAWING:	7



REFER TO DWG 9 FOR SECTION 1-1

NOTE: SOUTH TRIBUTARY HAZARD LIMITS PER PATERSON GROUP (PROJ# PG5201-1 DATED NOVEMBER 13, 2023

LEGEND

- 30m SETBACK FROM NHWM
- EROSION ACCESS ALLOWANCE
- TOE EROSION ALLOWANCE/ LIMIT OF HAZARD LANDS
- STABLE SLOPE ALLOWANCE
- MEANDER LIMIT
- MAJOR SYSTEM FLOW
- OVERLAND FLOW ROUTE

POND CHARACTERISTICS

	LOWER ELEVATION (m)	UPPER ELEVATION (m)	VOLUME REQUIRED (m^3)	VOLUME PROVIDED (m^3)
PERMANENT POOL	80.00	82.50	5,716	12,956
EXTENDED DETENTION	82.50	83.40	1,302	8,561
100 YEAR / MAX WL	82.50	84.50	21,198	21,198

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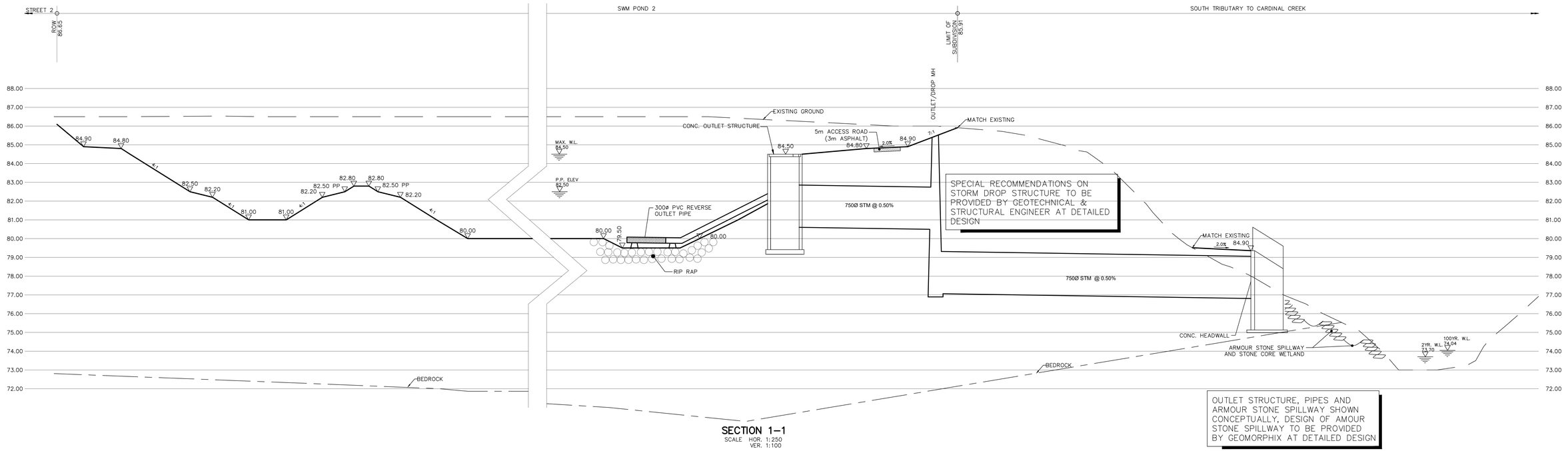
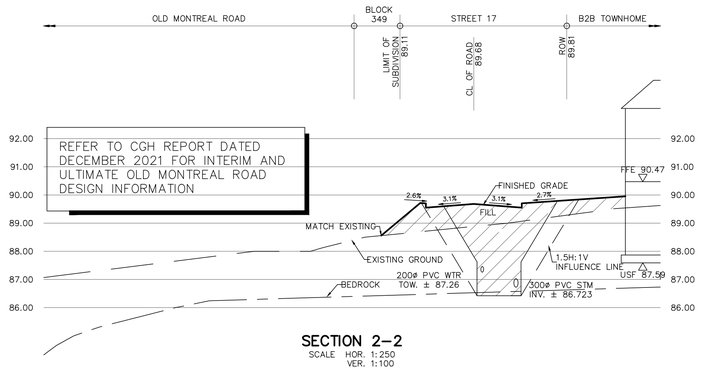
SWM POND
CARDINAL CREEK VILLAGE SOUTH

PROJECT No.:	19-1153
SCALE:	1:1000
DATE:	NOVEMBER 2024
FIGURE:	8

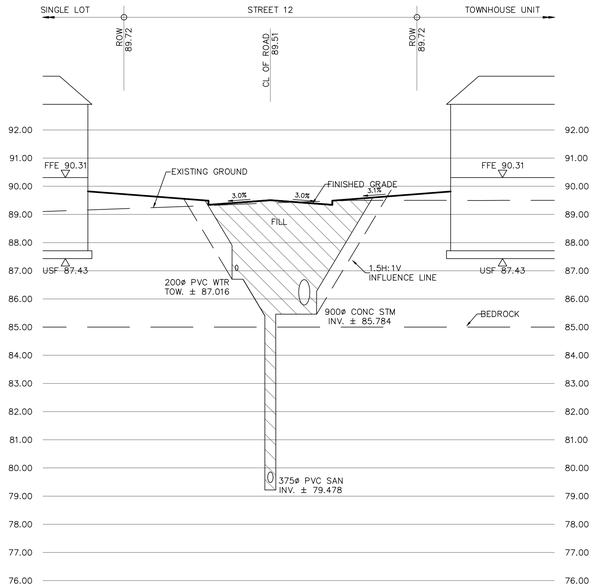


SECTION 1–1
SCALE HOR. 1:250
VER. 1:100



SECTION 2–2
SCALE HOR. 1:250
VER. 1:100

REFER TO PATERSON GROUP REPORT PG5201–1 REV. 5 DATED NOV. 29, 2021 FOR RECOMMENDATIONS ON SUBSURFACE WORK



SECTION 3–3
SCALE HOR. 1:250
VER. 1:100

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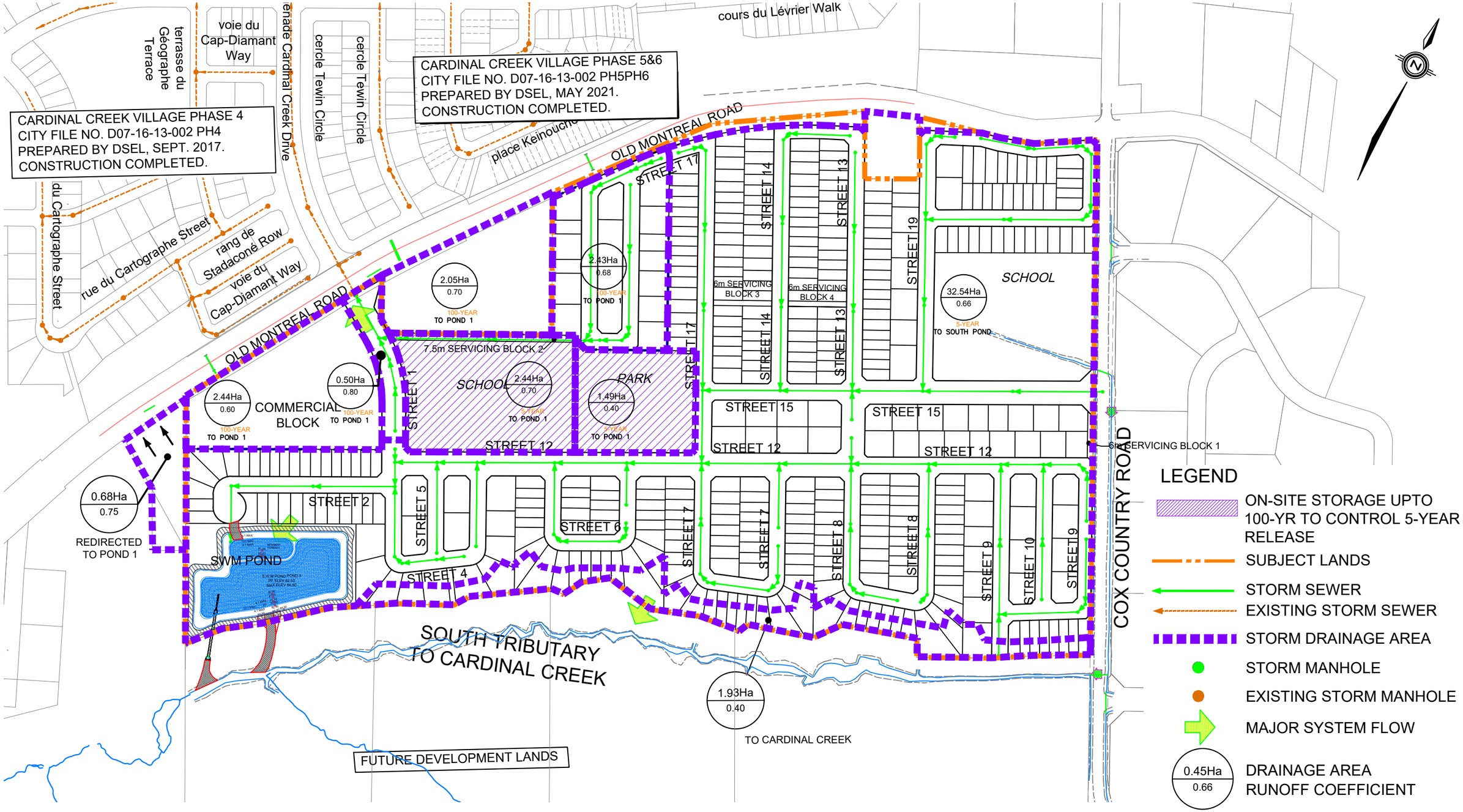
CARDINAL CREEK VILLAGE SOUTH

CITY OF OTTAWA

SECTIONS

SCALE:	AS SHOWN	PROJECT No.:	19-1153
DATE:	NOVEMBER 2024	DRAWING:	9



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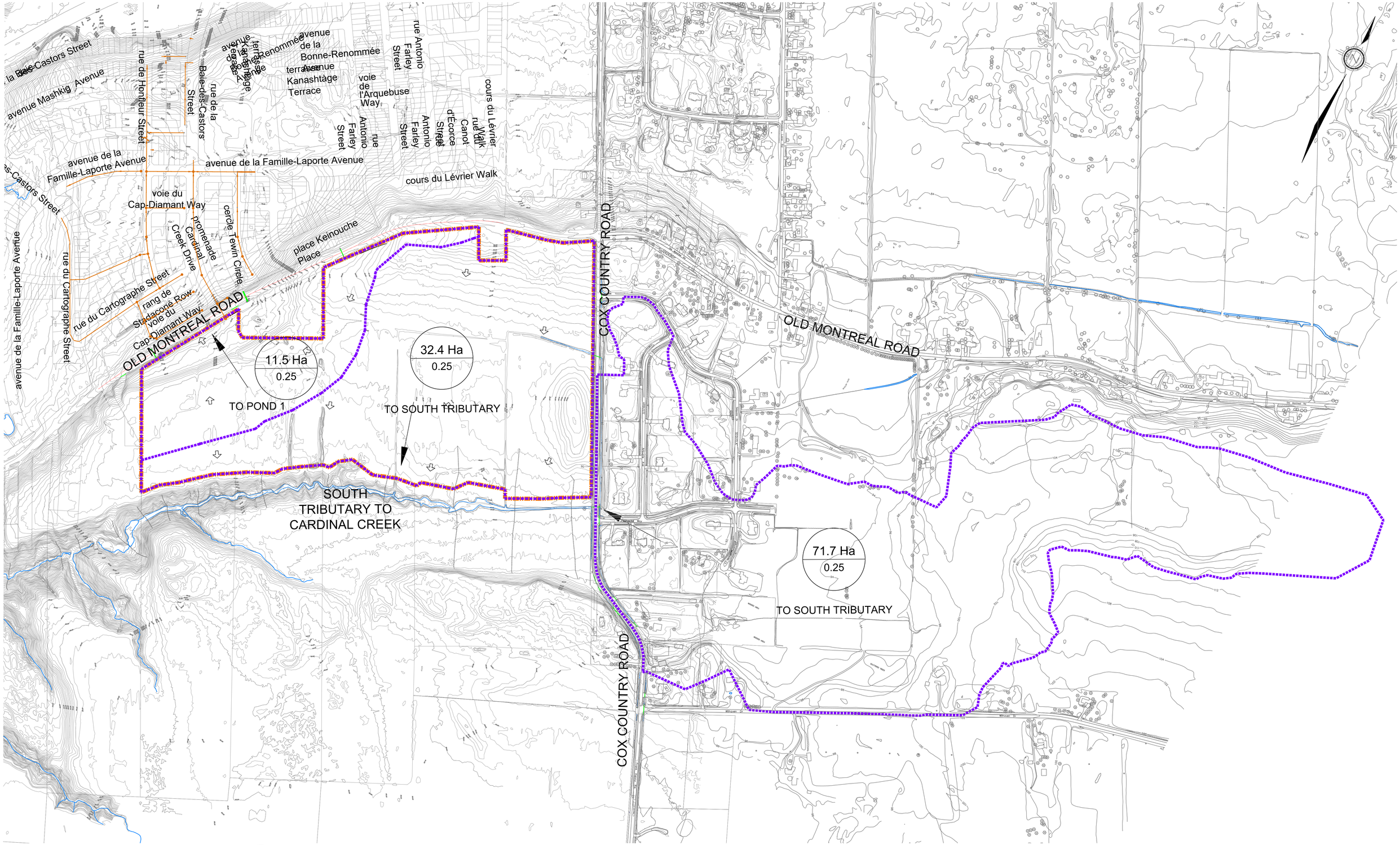
POND DRAINAGE PLAN
CARDINAL CREEK VILLAGE SOUTH

PROJECT No.:	19-1153
SCALE:	1:4000
DATE:	NOVEMBER 2024
FIGURE:	10



LEGEND

- SUBJECT LANDS
- EXISTING STORM DRAINAGE BOUNDARY
- EXISTING STORM SEWER
- EXISTING STORM MANHOLE

0.24Ha / 0.7 — DRAINAGE AREA IN HECTARES / DRAINAGE AREA

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CARDINAL CREEK VILLAGE SOUTH

CITY OF OTTAWA

PRE-DEV DRAINAGE PLAN

SCALE:	1:3500	PROJECT No.:	19-1153
DATE:	NOVEMBER 2024	DRAWING:	11