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Stormwater Management Strategy Report

Arcadia Residential Stages 3, 4, 5, and Commercial Stage 2

J.L.Richards
ENGINEERS · ARCHITECTS · PLANNERS

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1.0 Introduction

This Report is prepared in support of a proposed variation to the stormwater servicing and stormwater management (SWM) strategies that was developed as part of the 2006 Kanata West Master Servicing Study (KWMSS). The variation pertains to Minto's Arcadia lands (located east of the Huntmar Drive and Campeau Drive intersection), which also includes portions of the Campeau Drive right-of-way (ROW) and future Transitway corridor located to the south of Campeau Drive. This Report presents the advantages of a new servicing strategy, consisting of two (2) wet ponds discharging to the Carp River, over the single pond strategy recommended for the Arcadia development area in the 2006 KWMSS. The two-pond servicing strategy has been discussed in great details with various departments at the City of Ottawa and with the Mississippi Valley Conservation Authority (MVCA) from which a Stormwater Management Strategy Report was first issued in April 2017 and subsequently revised January, 2018. In principle, the two-pond servicing strategy was well-received as it offers advantages over the single pond strategy, which is closer to the concept in the 2006 KWMSS.

1.1 Proposed Development

Minto's development known as Arcadia consists of five (5) residential stages and two (2) commercial stages. Approximately 23 ha of the Arcadia Lands known as Arcadia Stages 1 and 2 have been developed as a residential subdivision, while another 4 ha area known as Commercial Stage 1 and a 4 ha external area located south of Campeau Drive, are pending construction. Three (3) residential stages (Stages 3, 4 and 5) and one (1) commercial stage (Stage 2) are proposed and scheduled for urbanization in Arcadia. These future stages, herein collectively referred to as the Arcadia Development, are sited on a 48 ha parcel of land that is bounded by the existing residential and planned commercial developments to the west, and by the Carp River to the east, as depicted on the Location Plan in Figure 1-1, the Staging Plan in Figure 1-2, and the Project Drawings provided in Appendix A. The Arcadia Development is bisected near the south end by the future Campeau Drive extension and the future transitway. Currently, the land is undeveloped and generally drains easterly towards the Carp River. There is an existing drainage corridor within the Arcadia Development that serves as the dedicated outlet to the Carp River for the existing 'interim' pond servicing existing Arcadia Stages 1 and 2 and Commercial Stage 1, as well as for the western portion of the Campeau Drive ROW.

1.2 Background

In 2006, the KWMSS was prepared on behalf of the Kanata West Owners Group (KWOG) to investigate servicing requirements for a large mixed-use community referred to as Kanata West. At build-out, the Kanata West area is envisaged to include a population of approximately 17,000 persons in 6,300 households and 24,000 jobs across approximately 1 million square metres of commercial space. In terms of stormwater servicing and SWM, the KWMSS recommended that the 725 ha area be serviced by seven (7) water quality/quantity facilities spread over the entire Kanata West Study Area. The largest facility in Kanata West, Pond 1, was identified to serve as the dedicated stormwater outlet for approximately 77 ha, which included all of Minto's Arcadia lands, the future transitway corridor (north of Feedmill Creek), and the Campeau Drive ROW (between Huntmar Drive and the Carp River). Refer to the 2006 KWMSS Storm Sewer Minor System Drawing ST-MN and Storm Drainage Area Plan North – Pond 1 Drawing ST-PN provided in Appendix B.

Since construction of Pond 1 could not proceed until the Carp River Restoration works were completed, an 'interim' wet pond facility was constructed to allow for the development of Arcadia

Stage 1 residential and commercial, Stage 2, and a portion of the Campeau Drive ROW to proceed. The 'interim' pond is located to the east of Stage 2 and is equipped with two (2) separate inlets and sedimentation forebays, as shown on the Interim Storm Drainage Plan prepared by IBI and provided in Appendix B. It was intended that this existing 'interim' pond would be decommissioned once the Carp River restoration works were completed and the permanent Pond 1 was constructed.

As part of the 2006 KWMSS, the ultimate Pond 1 was conceptually sized within a 1.50 ha block, based on design standards that were applicable at that time. Since then, the Ottawa Sewer Design Guidelines were updated and re-issued in October 2012 and a number of Technical Bulletins were also subsequently issued. The 2012 Design Guidelines provide more details in terms of the modelling approach for infiltration in urban areas (Horton Method), calculation of runoff coefficients based on maximum permissible zoning, calculation of time of concentration, and assessing the performance of the infrastructure under a specific climate change event.

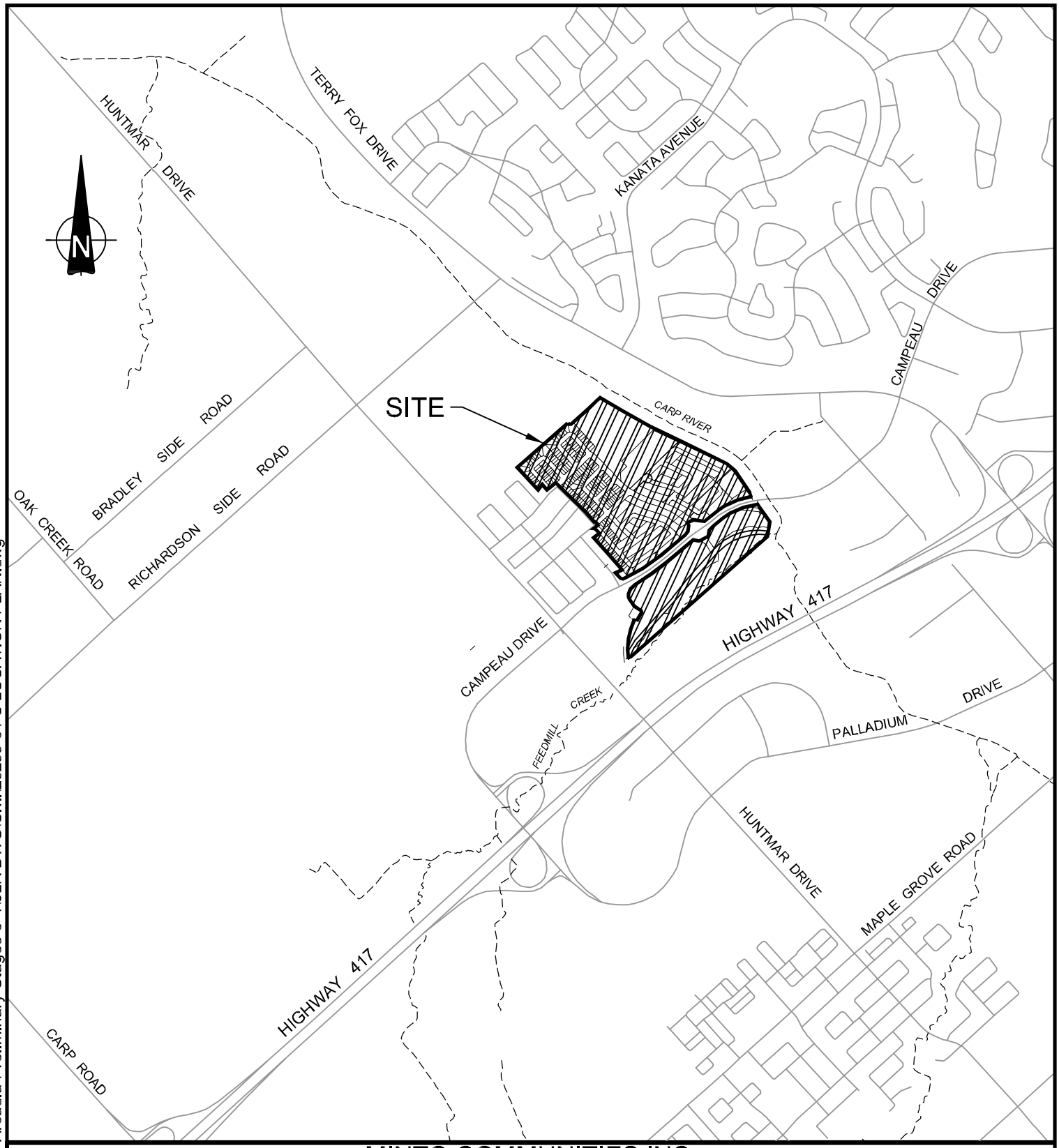
More recently, preliminary sizing of the ultimate Pond 1 was carried out by IBI in accordance with the 2012 Design Guidelines as part of the Report entitled "Conceptual Site Servicing Study – Arcadia Stages 1, 2, 5 & 8", dated September 2013. This sizing exercise showed that the Pond 1 block needed to be increased in size from 1.50 ha to approximately 2.45 ha in order to fulfill the requirements of the 2012 Design Guidelines and meet the design objectives of the 2006 KWMSS. The IBI Conceptual Site Servicing Study provided the following configuration details for Pond 1 (refer to cross section provided in Appendix B).

Table 1-1: IBI Pond 1 Concept Design (2013)

Parameter	Value
Pond Normal Water Level (NWL)	92.65 m
Pond 1:100 year Hydraulic Grade Line (HGL)	93.54 m
Pond Size	2.45 ha
Pond Bottom	92.00 m

It should be noted that the 2.45 ha SWM Block was not confirmed with an hydraulic grade line (HGL) analysis as noted in Section 5.6.2.1 of IBI's 2013 Conceptual Site Servicing Study. Hence, a greater surface area might have been required to limit the HGL elevations and provide the prescribed freeboard to the unit's underside of footings. Additionally, the pond block was sized prior to the development of the calibrated Carp River PCSWMM model by the City. Since 2013, the City has developed a PCSWMM model of the areas tributary to the Carp River, which was calibrated and validated to actual recorded data. A PCSWMM model was subsequently developed to reflect the post-development conditions and a series of hydrographs were generated at key locations that are to be matched under post-development conditions.

Due to the changes to the Design Guidelines, as well as the completion of the Carp River PCSWMM model, the SWM strategy outlined for the Arcadia Development in the 2006 KWMSS and the 2013 IBI Conceptual Site Servicing Study needed to be re-evaluated.



PROJECT:

MINTO COMMUNITIES INC.

ARCADIA STAGE 3, 4, 5; AND COMMERCIAL STAGE 2

450 HUNTMAR DRIVE, OTTAWA, ONTARIO

DRAWING:

LOCATION PLAN

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DESIGN: HM	JLR NO: 26299-01
DRAWN: KTK	DRAWING NO.: FIGURE 1-1
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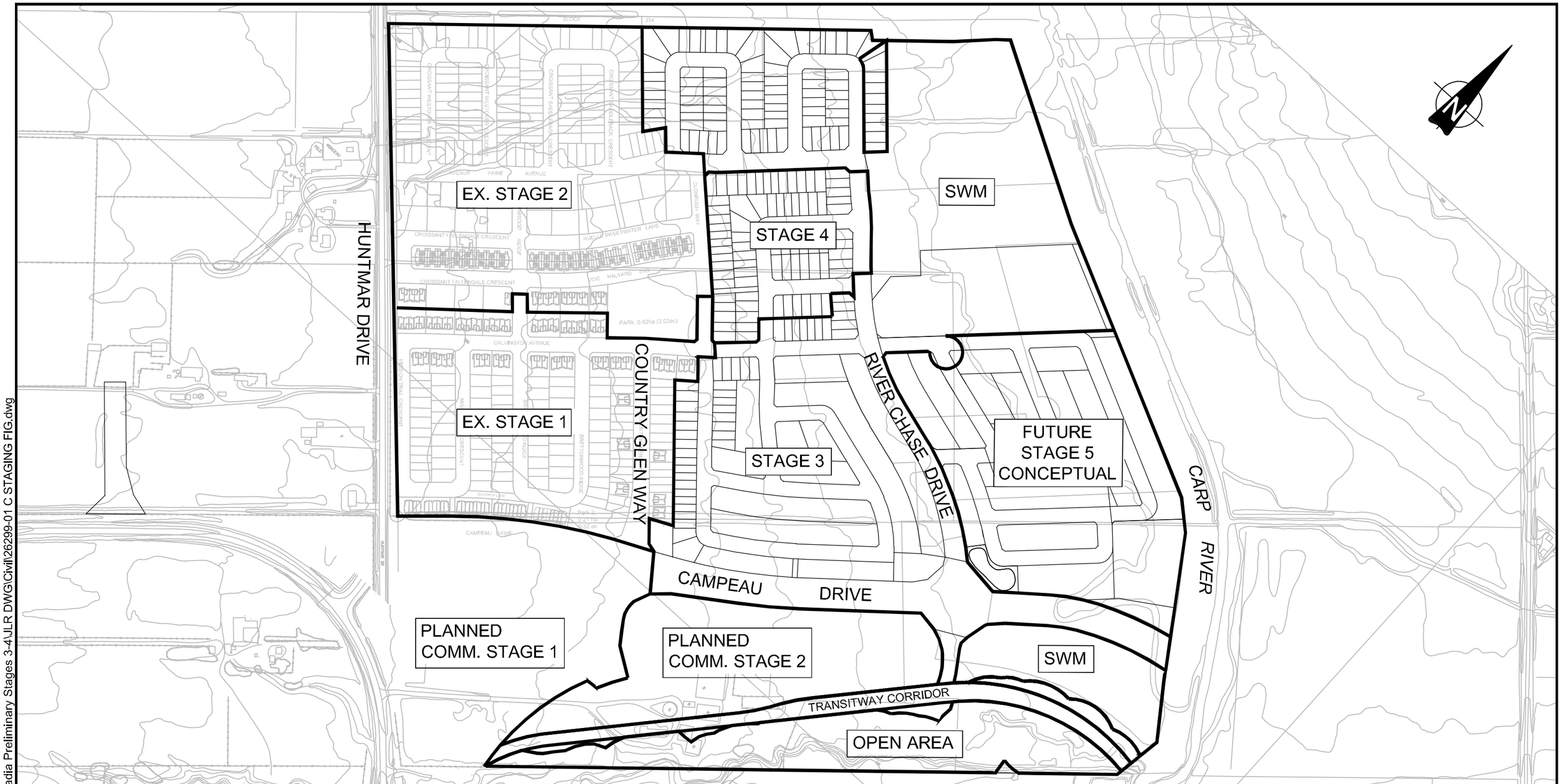

PROJECT:

MINTO COMMUNITIES INC. ARCADIA
STAGES 3, 4, 5; AND COMMERCIAL STAGE 2

DRAWING:

STAGING PLAN

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FIGURE 1-2

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2.0 Evaluation of Storm Servicing and SWM Alternatives

2.1 Conceptual Design Set up for Evaluation

JLR developed a conceptual storm sewer design for the Arcadia Development and carried out preliminary stormwater modelling using PCSWMM to re-assess the KWMSS Pond 1 SWM strategy based on current Design Guidelines while meeting the target hydrographs of the City's February 2017 calibrated Carp River PSCWMM model. As per the 2006 KWMSS, this storm servicing strategy would consist of runoff from all existing and future Arcadia Stages being conveyed to a wet pond located east of Riverchase Road (i.e., Street No. 2 per the Draft Plan in Appendix A) and 450 m north of Campeau Drive.

2.1.1 Hydrological Parameters

Catchment areas for the Arcadia Development were divided based on development stage and land use. Catchment areas were further subdivided for Stages 3, 4 and 5 based on the conceptual storm sewer network developed for each Stage. Table 2-1 shows the parameters that were incorporated into the PCSWMM model for the Arcadia Development:

Table 2-1: Land Use Percent Impervious and Runoff Coefficient Values

Land Use	Imperviousness (%)	Runoff Coefficient
Residential (plus roads)	64.3	0.65
Park Lands	14.3	0.30
Pond Blocks	70.0	0.70
Arterial Roads and Transitway	92.9	0.85
Commercial Lots	92.9	0.85

Runoff from existing Stages 1 and 2 and planned Commercial Stage 1, which drains to the existing 'interim' pond was modelled by IBI, as detailed in the Arcadia Stage 2 SWM Report and Stage 2 Inlet Design Brief, dated October 2014. As such, the existing flows to the 'interim' pond were extracted as hydrographs from IBI's XPSWMM model and incorporated in PCSWMM for the Arcadia Development at build-out.

As per the Carp River modelling, the Curve Number (CN) methodology was used to simulate infiltration. The CN for each catchment was area weighted from the value used for the area in the City's Carp River model.

The model was used to simulate the response to storm events ranging from the 1:2 year to 1:100 year under the 12 hour SCS distribution, which was identified as the critical storm for the Carp River system. In addition, the 1:2 year and 1:100 year 3 hour Chicago storms were also simulated to assess the performance of the conceptual storm servicing.

2.1.2 Catchment Storage Simulation Parameters

The Arcadia Development is proposed to be designed with street sag storage in residential areas and on-site storage within commercial blocks. Street sag storage has been included in the model in the form of storage nodes based on a unit volume of 50 m^3/ha, in accordance with the storage requirements outlined the 2006 KWMSS. Storage nodes in the Commercial Block has been modelled with sufficient storage to contain the 1:100 year event while releasing flows set to the 1:2 year - 3 hour Chicago storm event for residential areas. In regard to the minor storm releases for the Campeau Drive and future transitway ROWs, an allowable release rate was set to the 1:10 year, in accordance with the Design Guidelines for arterials and transitways. At the low point along Campeau Drive, the 1:100 year storm event was used to set the allowable release rate to reduce ponding on the arterial system as there was no overland flow outlet.

2.2 Alternative Servicing Strategies

2.2.1 One Pond Alternative

The One Pond Alternative servicing the Arcadia development is similar to the pond configuration proposed in the 2006 KWMSS, being a single pond off Riverchase Road at Paine Avenue discharging to the Carp River. Some changes are now proposed to the pond to accommodate the existing development and the latest City SWM guidelines.

With the construction of the single pond, namely the Paine Pond, the existing 'interim' pond servicing existing residential Stages 1 and 2 and planned commercial Stage 1 would be decommissioned and runoff from these stages, as well as that from future Stages 4 and 5 would be conveyed to the Paine Pond via a trunk storm sewer along Paine Avenue. It is anticipated that this trunk sewer would be 2750 mm in diameter at its downstream end at the intersection of Riverchase Road.

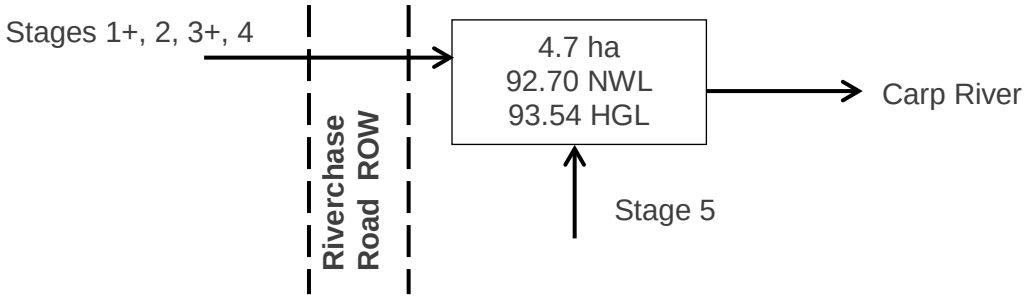
A trunk storm sewer along Riverchase Road would also be required to convey runoff from the future transitway corridor, Campeau Drive ROW, commercial Stage 2 and residential Stage 3, herein collectively referred to as 'Stage 3+'. The Riverchase Road trunk storm sewer would range in size from 1350 mm in diameter at the Campeau Drive intersection to 1650 mm in diameter at its downstream end. The Paine Avenue trunk and the Riverchase Road trunk storm sewers would ultimately converge to a single 2750 mm diameter inlet to the pond. A separate 1050 mm diameter inlet sewer to the pond would be provided and would service solely Stage 5.

Table 2-2 and Figure 2-1 provide the characteristics of the one pond servicing strategy evaluated in PCSWMM. Note that 'Stage 1+' herein refers to both existing residential Stage 1 and planned commercial Stage 1.

Table 2-2: One Pond Alternative Pond Characteristics

Pond (NWL)	92.70 m			
Pond 1:100 year HGL	93.54 m			
Pond Size	4.7 ha*			
Pond Inlets	**Stage(s)**	**Diameter**	**Invert Elevation**	**Depth of Submergence**
	1+,2,3+,4	2750 mm	90.35 m	2.35 m (85% submerged)
	5	1050 mm	92.70 m	0 m
Note *Pond size is conceptual only and does not include area required for access roads and/or clearances to adjacent properties/ROWs				

Figure 2-1: One Pond Alternative Schematic



A normal water level in the Paine pond of 92.70 m was selected based on the 1:2 year water level elevation of 92.69 m in the Carp River at the pond outlet location. A 1:100 year HGL elevation in the pond of 93.54 m was selected to be consistent with the IBI 2013 Concept Design for comparison purposes and to ensure that the HGL in existing Stage 1 and 2 sewers would be less than the current HGL elevations. With the development of a conceptual sewer design and the PCSWMM model, it was determined that a pond footprint of approximately 4.7 ha would be required to match the post-development target hydrographs of the Carp River. As indicated in the table above, this footprint area does not include any areas required for access roads or clearances to adjacent properties and/or ROWs.

2.2.2 Constraints of the One Pond Alternative

In addition to the calculated Pond 1 footprint being approximately 3 ha larger than that identified in the 2006 KWMSS, and approximately 2 ha larger than that in the 2013 IBI concept design, some significant constraints were identified in completing the conceptual storm sewer design and PCSWMM model for the Arcadia Development. The following five constraints were noted:

1. **Crossing conflict between Paine Avenue storm sewer and Riverchase Road sanitary sewer**

A crossing conflict would occur between the future Paine Avenue trunk storm sewer conveying runoff from Stages 1+, 2, and 4 to the pond, and the future

Riverchase Road sanitary sewer conveying wastewater from Stages 3 and 4 to the existing Campeau Drive trunk sanitary sewer.

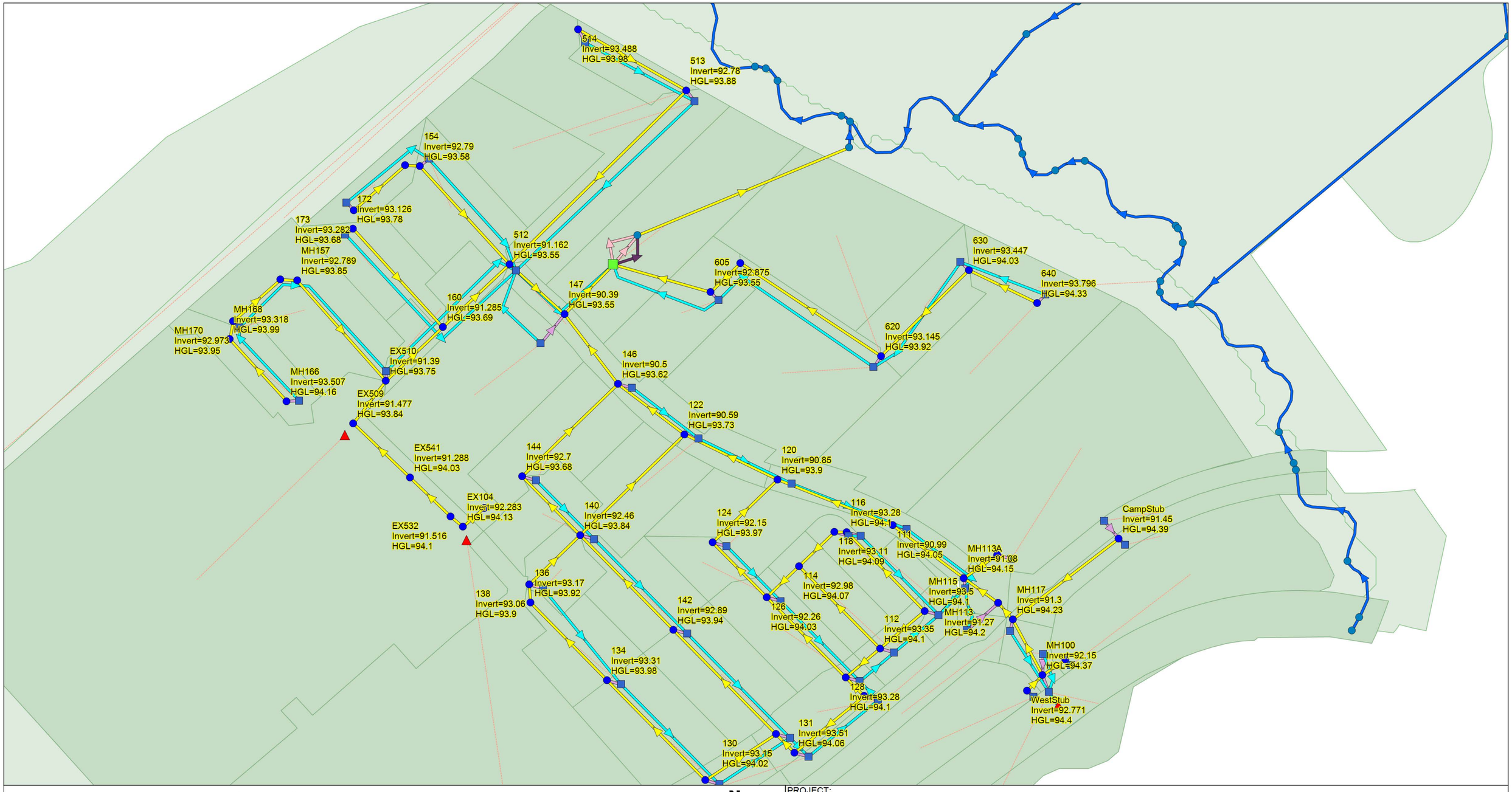
As a best case scenario, if the Paine Avenue trunk were to be extended from the existing elliptical sewer at MH 510, at minimum slope (0.15%), with invert to invert connections, it would have a minimum invert elevation of 91.16 m at the intersection of Riverchase Road. Similarly, if the Riverchase Road sanitary sewer were extended at minimum slope (0.20%) from the existing stub at Campeau Drive, it would have a minimum obvert elevation of 91.69 m at the intersection of Paine Avenue. The Riverchase Road sanitary sewer would, therefore, have to be approximately 1 meter lower to be able to cross under the Paine Avenue trunk storm sewer, which is not feasible due to the elevation of the Campeau Drive trunk sanitary sewer. Alternatively, it would have to be 2.8 m higher (with an invert elevation of 94.50 m) to cross over the storm sewer trunk, which would not provide a viable outlet for Stage 5 where existing ground ranges between 93.00 m to 93.50 m.

It should also be noted that providing sanitary servicing for Stages 3 and 4 via the existing sanitary sewers on Clonrush Way and Country Glen Way is not considered a viable alternative either, since the existing sanitary sewer obvert at the intersection of Clonrush Way and Paine Avenue is 94.02 m. This obvert elevation is approximately half a meter higher than existing ground in Stage 3, meaning that extensive fill works up to 5 m (exceeding the permissible grade raise) would be required to provide a gravity sanitary sewer outlet for Stage 3 via Clonrush Way.

2. HGL exceeds centreline road elevation on Campeau Drive

Stantec is currently in the process of completing the detailed design for Campeau Drive to the south of the Arcadia residential development from Country Glen Way to east of the Carp River. Construction of Campeau Drive is anticipated for commence in 2018.

Based on the results of the PCSWMM model provided on Figure 2-2, the 1:100 year HGL along Campeau Drive 120 m to the east of Riverchase Road would be approximately 94.39 m, which is 0.09 m higher than the future road centreline elevation of 94.30 m at that location (refer to Stantec plan & profile drawing for Campeau Drive provided in Appendix B). It is noted that only the 120 m section of the Campeau Drive storm sewer east of Riverchase Road was incorporated in the PCSWMM model as this section was deemed the most critical, as it has the lowest proposed centreline elevation. Additionally, this section of storm sewer was modelled as a 750 mm diameter sewer rather than a 600 mm diameter storm sewer, as per Stantec's drawing, in order to minimize headlosses along the system and reduce the HGL elevation. If a 600 mm diameter were to be used to service the eastern portion of Campeau Drive, then 1:100 year HGL would be higher.



Legend

- Junctions
- Outfalls

Storages
- Sag Storage
- Manhole
- Pond

Conduits
- Storm Sewers
- Carp River
- Orifices

Weirs
- Other
- Surface Flow
- Pond Outlet

N

200 m

PROJECT:

MINTO COMMUNITIES INC. ARCADIA
STAGES 3, 4, 5 AND COMMERCIAL STAGES 2 & 3

DRAWING:

One Pond Alternative Results

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DESIGN:	BP	JLR NO.:	26299
DRAWN:	BP	DRAWING NO.:	Figure 2-2
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3. Submergence of Riverchase Road Trunk and Campeau Drive Storm Sewers

To provide a gravity storm sewer outlet for the eastern portion of the Campeau Drive ROW, the Riverchase Road trunk storm sewer at the intersection of Campeau Drive would have to have a maximum invert elevation of 91.30 m, as per the Campeau storm sewer design prepared by Stantec (refer to the plan and profile drawing provided in Appendix B). The Riverchase Road trunk storm sewer at this location would be 1350 mm in diameter and would have an obvert elevation of 92.67 m. Based on a normal water level of 92.70 m in the pond, the entire Riverchase Road trunk sewer from the Paine pond to Campeau Drive (approximately 600 m) would be fully (100%) submerged, as would a 150 m section of Campeau Drive storm sewer east of Riverchase Road. Standing water would further extend an additional 20 m along the Campeau Drive storm sewer east of Riverchase Road, as well as 110 m along the Campeau Drive storm sewer west of Riverchase Road, until free flowing condition is reached.

4. Standing Water along Trunk Storm Sewers

Although the storm sewers in the northern portion of the Arcadia Development will not be completely submerged, there will be extensive standing water along existing and future storm sewers. Based on a normal water level of 92.70 m, standing water will extend along the storm sewer system as follows:

- 420 m along Paine Avenue from the pond inlet to the west leg of Saddleback Crescent;
- 150 m along Clonrush Way from Paine Avenue to south of Halyard Way;
- 620 m along Riverchase Road (includes 70 m south of Campeau);
- 170 m along Street No 5 (Stage 4);
- 170 m along the Campeau Drive storm sewer east of Riverchase Road, and 110 m along the Campeau Drive storm sewer west of Riverchase Road.
- 70 m along Block 227 (Stage 3).

2.2.3 Two Pond Alternative

The Two Pond Alternative keeps the Paine Pond as described in the One Pond Alternative but reduces the catchment area for the Pond and incorporates a second pond south of Campeau Drive, Campeau Pond, to service the remainder catchment area. The reduction in catchment area for Paine Pond and a second pond closer to the low point of the area at Campeau Drive will alleviate some of the constraints identified under the One Pond Alternative.

The Campeau Pond will serve as the dedicated stormwater outlet for the southern portion of Stage 3, Commercial Stage 2, a 2.4 ha section of the Campeau Drive ROW to the south of Stage 3, and the future transitway corridor. The Campeau Pond will be located south of Campeau Drive and west of the Carp

River Corridor, and will outlet to the Carp River immediately upstream of the Campeau Bridge crossing.

The Paine Pond will be located to the east of Riverchase Road at the northeast corner of the Arcadia lands and will serve as the dedicated stormwater outlet for existing Stages 1, residential and commercial, and 2 and proposed Stages 3 (northern portion) 4 and 5. Runoff from existing Stages 1 and 2 will be conveyed to the Paine Pond via separate trunk sewers along the future Stage 4 street (immediately south of the existing interim pond) and Paine Avenue, respectively, and will merge to a combined inlet to the pond, along with runoff from Stage 4, at Riverchase Road. Future Stage 5 will have a separate inlet and forebay to the Paine Pond.

The characteristics of the two-pond strategy are summarized in the following table and schematic:

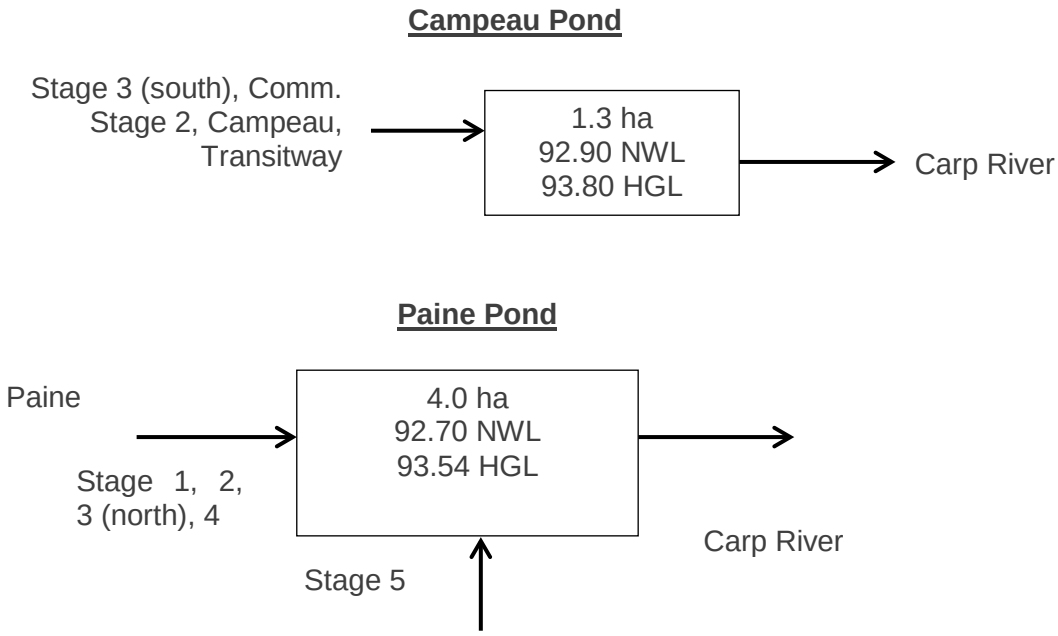
Table 2-3: Two Pond Alternative Pond Characteristics

CAMPEAU POND				
Pond NWL	92.90 m			
Pond 1:100 year HGL	93.80 m			
Pond Size	1.3 ha*			
Pond Inlets	**Stages**	**Diameter**	**Invert Elevation**	**Depth of Submergence**
	3 (south), Comm. 2, Campeau, Transitway	1800 mm	91.56	1.3 m (75%)
Length of Sewer with Standing Water	490 m			
PAINE POND				
Pond NWL	92.70 m			
Pond 1:100 year HGL	93.54 m			
Pond Size	4.0 ha*			
Pond Inlets	**Stage**	**Diameter**	**Invert Elevation**	**Depth of Submergence**
	1,2, 3 (north) 4	2400 mm	91.11	1.6 m (66%)
	5	900 mm	91.50	1.2 m
Length of Sewer with Standing Water	1120 m			
* Note Pond sizes are conceptual only and do not include area required for access roads and/or clearances to adjacent properties/ROWs				

The normal water levels in the ponds were established based on the 1:2 year water levels in the Carp River at the pond outlet locations. The Paine Pond HGL elevation of 93.54 m was selected to be consistent with IBI's 2013 Pond 1 concept design. An HGL elevation of 93.80 m was set at the Campeau Pond to maximize the use of the available Commercial Stage 3 lands east of Riverchase

Road, anticipating that the southern limit of the pond will be located outside the Feedmill Creek 100 m wide corridor and the City's current preferred transitway corridor. The southern limit of the Campeau Pond will be refined once the Feedmill Creek Restoration Plan is complete and setback requirements are confirmed.

Figure 2-3: Two Pond Schematic



The results of the PCSWMM model for the recommended storm servicing strategy (presented in Appendix D) indicate that the 1:100 year HGL on Campeau Drive (120 m of east of the Riverchase Road intersection) will be 93.81 m, which is 0.49 m below Stantec's proposed centreline elevation. Furthermore, the HGL at the southeastern limit of Stage 3 will be 93.95 m, which will allow for reduced grade difference between Stage 3 and Campeau Drive compared to 2006 KWMSS Option evaluated where the HGL is approximately 1.2 m higher.

2.3 Pond Comparison

Comparison of key pond design features of the two alternatives are compared in Table 2-4 below along with the values from Pond 1 of the 2006 KWMSS.

Table 2-4: Pond Comparison

Parameter	2006 KWMSS	One Pond	Two Ponds
Drainage Area (ha)	76.8	82.8	82.8
Pond Area (ha)	2.4	4.7	4.6
Pond Permanent Pool Volume Required (m^3)	14,200	6,390	6,170

Parameter	2006 KWMSS	One Pond	Two Ponds
Pond Active Storage Volume Required (m^3)	20,400	137,538	90,707
Total Storage Volume Provided (up to Max) (m^3)	36,300	143,928	103,920
Pond Invert (m)	91.0	90.35	91.1 ‡
Pond NWL (m)	92.7	92.7	92.7 ‡
Pond HGL (m)	93.96	93.54	93.54 ‡
Depth of Submerged Inlet (m)	1.7	1.35	0.6
Length of Submerged Sewer (m)	1,245	1,710	1,610
Length of 100% Submerged Sewer (m)	0	1,265	360

3.0 Recommended Storm Servicing Alternative

3.1 Advantages of Two-Pond Strategy

Based on the evaluation of the storm servicing and stormwater management (SWM) alternatives presented above, the two-pond strategy which includes the Campeau Pond and the Paine Pond is recommended for servicing of the existing and future Arcadia Development. Key advantages that support the implementation of the proposed two-pond strategy over the other three (3) options evaluated are as follows:

- The Campeau Pond provides the lowest HGL on Campeau Drive, which is also below the proposed minimum centreline elevation of 94.30 m, as per the Stantec design. Under the single pond option evaluated, the simulated HGL was found to exceed the minimum centreline elevation of 94.30 m on Campeau Drive.
- The total length of standing water and submergence in storm sewers is reduced resulting in lower maintenance costs. Total standing water along the storm sewer system is reduced from approximately 1,710 m in the One Pond Alternative to 1,610 m in the recommended Two Pond Alternative. Similarly, the length of completely (100%) submerged sewers is reduced from 1,265 m to 360 m with the two-pond strategy.

3.2 Addressing Constraints of the Recommended Two-Pond Strategy

Although the proposed SWM strategy allows for a significant reduction in completely (i.e.,100%) submerged storm sewers compared to the One Pond Alternative (from 1,265 m to 360 m), there will be standing water along the following sections of existing and proposed trunk storm sewers:

- 420 m along Paine Avenue from the pond inlet to the west leg of Saddleback Crescent;
- 150 m along Clonrush Way from Paine Avenue to south of Halyard Way;
- 190 m along Street No. 6 (i.e., Stage 1 outlet);
- 190 m along Riverchase Road (north of Campeau Drive, outletting to Paine Pond);
- 170 m along Street No 5 (Stage 4);
- 160 m along the Campeau Drive storm sewer east of Riverchase Road, and 110 m along the Campeau Drive storm sewer west of Riverchase Road;
- 150 m along Riverchase Road (at Campeau Drive, outletting to Campeau Pond);
- 70 m along Block 227 (Stage 3).

The extent of standing water along the trunk storm sewers totals 1,610 m which is 100 m less than the extent of standing water in the One Pond Alternative, refer to the schematic in Appendix ‘A’.

It is noted that the length of standing water along the Campeau Drive storm sewer could be reduced by discharging directly to the Carp River and providing quality treatment by means of a hydro dynamic separator (HDS). Although this option would reduce maintenance costs associated with standing water along the sewer, there would be added maintenance costs

associated with the water quality unit. The Campeau Pond would also have to be over-controlled to ensure the target hydrographs of the Carp are respected.

3.3 Water Quality and Quantity Control for the Two-Pond Strategy

The proposed Campeau and Paine Ponds have been conceptually sized to provide water quality control to achieve an MOECC Normal Level of Protection (i.e., 70% total suspended solids removal) before discharging to the Carp River, in accordance with the Carp River Watershed Study and the 2006 KWMSS. The Campeau Pond requires a permanent pool of 1,520 m^3 to provide quality control for its tributary lands while the Paine Pond requires a permanent pool of 4,650 m^3, refer to the preliminary water quality calculations are provided in Appendix E.

The 2006 KWMSS indicated that the outlet structure for Pond 1 would consist of three (3) outlets; a low flow french drain outlet to provide flow augmentation to the Carp River, an extended water quantity volume outlet and a weir outlet for peak flow reduction control. Both the Paine Avenue Pond and Campeau Drive Pond will be designed to incorporate this type of outlet configuration.

3.4 Major System with Two-Pond Strategy

Major overland flows generated from Stage 3 will be conveyed southeasterly as shown on the Conceptual Grading Plan Drawing CG8. Since major overland flow crossing the Campeau Drive is not permitted in accordance with Design Guidelines (i.e., major system flows may not cross arterial roadways), a spillover area northwest of the Campeau Drive / Riverchase Road intersection is anticipated to be required assuming that the roadway sags provide insufficient major system storage. Major system flows captured in the spill-over dry pond would then be gradually released to the minor system. This spill-over dry pond area would not be considered as part of the dedicated park land.

Major system flows in Stages 4 and 5 will be conveyed directly to the Paine Pond. It is anticipated that Commercial Stage 2 will be designed with on-site storage to contain the 1:100 year event.

3.5 Simulation of the Two-Pond SWM Strategy

3.5.1 Pond Simulation Parameters

The Paine and Campeau Ponds were simulated in PCSWMM as single storage nodes based on the configurations summarized in Table 3-1. The flow augmentation outlets were used to set the invert levels of the storage nodes, which represent the top of the permanent pool; however, the outlets were not included in the model as the release rate would be negligible.

Table 3-1: Pond Storage Parameter Summary

Parameter	Paine Avenue Pond	Campeau Drive Pond
Storage Volume (m^3)	81,240	21,070

Parameter	Paine Avenue Pond	Campeau Drive Pond
Maximum Active Storage Depth (m)	0.8	0.9
Surface Area at Maximum Depth (m^2)	40,500	12,860
Permanent Pool Elevation (m)	92.70	92.90
Active Storage Outlet Elevation (m)	92.85	93.05
Active Storage Outlet Diameter (mm)	2x 1.05	250
Weir Elevation (m)	93.52	93.70
Weir Dimensions (L x H) (m)	30 x 0.5	13 x 0.5
High Water Level Elevation (m)	93.54	93.80

3.5.2 Simulation Results

The outflow hydrographs from the end-of-pipe facilities need to conform to those set along the Carp River between the 1:2 year and the 1:100 year storm events. The impact of the two-pond strategy on the Carp River during the 1:100 year storm event is summarized in Table 3-2. Refer to Appendix D for Tables summarizing more frequent storm events as well as the complete PCSWMM model output files for the recommended two pond strategy. It should be noted that the February 2017 version of the Carp River Model has been used in the analysis.

Table 3-2: Peak Flow and Water Level Comparison – 1:100 Year Storm Event

PCSWMM Node ID	Peak Flow (m^3/s)		Max. Water Level (m)		Max. Velocity (m/s)	
	Carp	Carp With Arcadia	Carp	Carp With Arcadia	Carp	Carp With Arcadia
CJ038	40.09	39.78	93.14	93.14	0.10	0.10
CJ042	41.16	40.77	93.15	93.15	0.12	0.12
CJ045	42.55	42.15	93.18	93.17	0.22	0.22
CJ050	43.35	42.99	93.46	93.45	1.89	1.88
CJ056	42.49	42.19	93.47	93.46	0.10	0.10
CJ068	42.98	42.59	93.51	93.50	0.13	0.13
CJ104	43.97	44.10	93.65	93.65	0.23	0.23
CJ106	44.17	44.13	93.68	93.68	0.18	0.18
CJ120	32.49	32.53	93.97	93.97	1.10	1.10
CJ155	34.41	34.71	94.15	94.15	0.86	0.86

PCSWMM Node ID	Peak Flow (m^3/s)		Max. Water Level (m)		Max. Velocity (m/s)	
	Carp	Carp With Arcadia	Carp	Carp With Arcadia	Carp	Carp With Arcadia
CJ176	13.54	13.61	94.21	94.21	0.55	0.56
CJ179	19.73	19.76	94.22	94.22	0.35	0.35
CJ199	13.99	14.00	94.30	94.30	1.41	1.41
CJ203	9.01	9.01	94.35	94.35	0.42	0.42

The results presented in Table 3-2 above show that the peak flows from the two ponds (i.e, Campeau and Paine Ponds) have a negligible impact on peak flow and water levels in the Carp River. This is due to the low release rates from the Ponds and their timing, which occurs several hours prior to the overall peak flow along the Carp River in that vicinity.

Summary tables indicating anticipated freeboard from the 1:100 year HGL to conceptual underside of footing (USF) elevations are also provided in Appendix D for the two pond option. The tables generally show that units within the eastern portion of the subdivision will not achieve 0.30 m freeboard between the conceptual 1:100 year HGL and USF elevations and this is assuming that light weight fill will be used at houses fronting Riverchase Road and within the southeastern portion of Stage 3. Sump pumps are, therefore, anticipated to be required for units in these areas, however, this will be reviewed and verified at detailed design. Refer to the JLR Servicing Brief dated May 2018 for further details regarding grade raise constraints and rationale for implementing sump pumps.

4.0 Feedmill Creek

In 2006, KWOG mandated various consultants to undertake three (3) concurrent and integrated Class Environmental Assessment (Class EA) studies to provide; i) Master Plan for the road network, ii) Master Servicing for water, sanitary storm and stormwater management, and iii) River and Creek Restoration Projects.

A Class EA (Schedule B) Screening Report was completed for the Restoration of the Carp River, Poole Creek and Feedmill Creek (Totten Sims Hubicki and Parish Geomorphic). The purpose of this Class EA Screening Report was to develop, evaluate and recommend preferred rehabilitation alternatives for these watercourses within the Kanata West development area. Functional Design Drawings for the Carp River Restoration were prepared as part of this Class EA Screening Report based on a document entitled "Corridor Width Limits Rational, revised August 2009". This document presents the rationale of the rehabilitated corridor widths for the Carp River, Poole Creek and Feedmill Creek. Subsequently, AECOM were mandated by KWOG to prepare detailed design drawings for the Restoration of the Carp River. The Carp River Restoration Works are in the process of being completed and validated by the MVCA. The works include a short section of both Feedmill Creek and Poole Creek at their confluence with the Carp River.

In 2016, the City of Ottawa began a municipal Class EA for the stream rehabilitation measures proposed in the Feedmill Creek Stormwater Management Criteria Study. This study was required to confirm quantity control criteria for the remaining future development in the Feedmill Creek subwatershed. The study is being implemented under Schedule B of the Municipal Class EA, which will identify a preferred alternative and functional design for the Feedmill Creek corridor. Two (2) alternatives were reviewed and a preferred solution was identified, which included a series of in-stream rehabilitation measures for each of the reaches of Feedmill Creek. The two most downstream reaches (Reaches 1 and 2) span over Minto's holdings, from Huntmar Road to the confluence with the Carp River.

Although detailed design and construction of the restoration works were to be completed in 2018, these works were deferred until a separate Class Environmental Assessment for the Kanata Light Rail Transit (LRT) Planning and Environmental Assessment Study (LRT) is completed and the corridor alignment for the LRT is finalized. The location of the corridor might impact Reach 1 of the Feedmill Creek Restoration Plan. The LRT Class EA has recommended a corridor; however, the notice of completion has yet to be prepared and is not scheduled for completion until the end of 2018. In parallel to the above undertakings, a Class EA was also undertaken for Campeau Drive within the Arcadia Lands, which also includes a new river crossing at the Carp River.

In 2017, JLR was mandated by Minto to undertake high-level screening and to evaluate the two-pond servicing strategy as presented in the previous sections. Given that one of the SWMF, the Campeau Pond, is sited between Campeau Drive and Feedmill Creek and that the preferred LRT corridor appears to be in very close proximity to Feedmill Creek, JLR reviewed two potential Feedmill Creek alignments:

- An alignment that would follow an abandoned section of Feedmill Creek near the confluence with the Carp River. This abandoned reach of Feedmill Creek is referred to as the ancestral channel, which has been identified as the preferred alignment by the City's initiative for Feedmill Creek (Class EA for the Feedmill Creek Stream Rehabilitation

Measures). This alignment has been referred as Option 1 (refer to Drawing 1, Appendix F);

- An alignment that would follow the current alignment of the existing Feedmill Creek channel. This alignment has been referred as Option 2 (refer to Drawing 2, Appendix F);

Both alignments were derived from the constraints described in the Corridor Width Limits Rationale (Revised August, 2009) for Reach 1 (from the Carp River confluence to approximately 400 m upstream) and Reach 2 (from 400 m upstream of the Carp River confluence to Huntmar Drive).

5.0 Sanitary Sewer Overflows

The sanitary sewer system servicing the Arcadia converges to the Campeau Drive trunk sanitary sewer which ultimately outlet to the Signature Ridge Pump Station (SRPS). The SRPS does not have capability for an emergency overflow within the surrounds of the pump station and, therefore, alternative emergency overflows are provided within the SRPS service area. The purpose of an emergency overflow is to minimize the risk of basement flooding within the sanitary sewer system in the event of a catastrophic failure, and is a last line of protection during a situation where power back-up and redundant pump features within the pumping station are inoperable.

The Report entitled “Update to: Signature Ridge Pump Station Hydraulic Grade Line Analysis Arcadia Stage 2” (IBI, September 2014)” presented proposed overflow configurations which utilized stormwater management facilities as overflow points. There is an emergency sanitary overflow located at the existing ‘interim’ pond for Stages 1 and 2 set above the facility’s 1:100 year water surface elevation (WSEL).

The elevation of the emergency overflow outlet impacts the HGL along the sanitary sewer system, as the design assumes that the SRPS is inoperable during wet weather flow. Given that the topography within the undeveloped portion of the Arcadia Development is relatively flat, it is essential to maintain the HGL along the sanitary sewer system as low as possible. Consequently, emergency overflows are sought at both the Campeau Pond and the Paine Pond. The emergency overflows will only operate as a result of catastrophic failure of the SRPS. The sanitary HGLs and emergency overflows are discussed in greater detail in the Site Servicing Report (JLR, May 2018).

6.0 Conclusion

Based on the information presented above, the two-pond strategy, which includes the Campeau Pond and the Paine Pond, is proposed to service the Arcadia Development. This servicing and stormwater management strategy can be developed at detailed design to meet regulatory requirements, and will address a number of constraints. Key advantages that support the implementation of the proposed two-pond strategy over the other three (3) options evaluated are as follows:

- The Campeau Pond provides the lowest HGL on Campeau Drive, based on a 750 mm diameter storm sewer on Campeau Drive. Furthermore, the HGL is below the proposed minimum centreline elevation of 94.30 m whereas the One Pond Alternatives evaluated resulted in the HGL being above the proposed centreline elevation.
- The lengths of submergence and standing water in storm sewers are reduced, resulting in reduced maintenance costs.

For the aforementioned reasons, the two-pond SWM strategy is recommended to service the Arcadia Development, the Campeau Drive ROW and the future Transitway corridor.

This report has been prepared for the exclusive use of Minto Communities Inc, for the stated purpose, for the Arcadia Residential Stages 3, 4 and 5 and Commercial Stages 2 and 3 development. Its discussions and conclusions are summary in nature and cannot be properly used, interpreted or extended to other purposes without a detailed understanding and discussions with the client as to its mandated purpose, scope and limitations. This report was prepared for the sole benefit and use of Minto Communities Inc and may not be used or relied on by any other party without the express written consent of J.L. Richards & Associates Limited.

J.L. RICHARDS & ASSOCIATES LIMITED

Prepared by:

Bobby Pettigrew P.Eng.
Water Resources Engineer

Reviewed by:

Guy Forget P.Eng.
Senior Water Resources Engineer

Appendix A

Project Drawings

LEGEND

- PROPOSED STORM SEWER & MANHOLE
- PROPOSED SANITARY SEWER & MANHOLE
- PROPOSED WATERMAIN
- EXISTING STORM SEWER & MANHOLE
- EXISTING SANITARY SEWER & MANHOLE
- EXISTING WATERMAIN
- STAGE LIMIT

No.	ISSUE / REVISION	DD/MM/YY
1	ISSUED WITH SERVICING BRIEF	18/05/18

VERIFY SHEET SIZE AND SCALES. BAR TO THE RIGHT IS 25mm IF THIS IS A FULL SIZE DRAWING. 0 25mm

SCALE: 1:2000

CLIENT:
MINTO COMMUNITIES INC.
200-180 KENT STREET
OTTAWA, ON
K1P 0B6

CONSULTANT:
J.L.Richards
ENGINEERS · ARCHITECTS · PLANNERS
www.jlrichards.ca

CONSULTANT:

PROFESSIONAL STAMP

PROJECT NORTH

PROJECT:
MINTO COMMUNITIES INC.
ARCADIA RESIDENTIAL STAGES 3, 4, 5; AND COMMERCIAL STAGE 2
450 HUNTMAR DRIVE

DRAWING:
CONCEPTUAL SITE SERVICING

OPTION 8

DESIGN: LD	
DRAWN: TB	DRAWING #: CS8
CHECKED: LD	
JLR #: 26299-01	

PLOT DATE: May 23, 2018 3:26:14 PM

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REGULATION LIMIT
(FROM MVCA)

CARP RIVER
100 YEAR FLOOD PLAIN
(FROM MVCA)

EXISTING STAGE 2

STAGE 3

STAGE 4

CARP RIVER

BLOCK 222
PARK

Block 58
8m Service Block/Pathway

FUTURE
STAGE 5
CONCEPTUAL

Block 59
Grading Easement

EXISTING STAGE 1

STAGE 3

BLOCK 19
RESERVE

rue Journeyman Street

Commercial
Stage 1

Commercial
Stage 2

REGULATION LIMIT
(FROM MVCA)

FEEDMILL CREEK
100 YEAR FLOOD PLAIN
(FROM MVCA)

CITY'S PREFERRED
LRT CORRIDOR
(FROM CITY'S ON-GOING EA)
AND CONSTRUCTION EASEMENT

CAMPEAU STATION

BLOCK 224
SWP

BLOCK 234
OPEN SPACE

PRELIMINARY

LEGEND

GRADE RAISE RESTRICTIONS PER PATERSON DWG NO. PG0539-16

95.45	MAXIMUM ROAD CENTRELINE GRADE WITH LWF REQUIRED FOR HOUSING
95.15	MAXIMUM ROAD CENTRELINE GRADE WITH CONVENTIONAL HOUSE BACKFILL
95.90	MAXIMUM ROAD CENTRELINE GRADE WITH HOUSING ON IN SITU OR ENGINEERED FILL
94.70	ESTIMATED IN SITU SOIL OR ENGINEERED FILL LEVEL

95.85 — PROPOSED CENTERLINE GRADE

MAJOR OVERLAND FLOW DIRECTION

No.	ISSUE / REVISION	DD/MM/YY
1	ISSUED WITH SERVICING BRIEF	18/05/18

VERIFY SHEET SIZE AND SCALES. BAR TO THE RIGHT IS 25mm IF THIS IS A FULL SIZE DRAWING. 0 25mm

SCALE: 1:2000

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CONSULTANT:

PROFESSIONAL STAMP

PROJECT NORTH

PROJECT:
MINTO COMMUNITIES INC.
ARCADIA RESIDENTIAL STAGES
3, 4, 5; AND
COMMERCIAL STAGE 2
450 HUNTMAR DRIVE

DRAWING:
CONCEPTUAL
GRADING PLAN

DESIGN: HM	
DRAWN: TB	DRAWING #:
CHECKED: HM/LD	CG8
JLR #: 26299-01	

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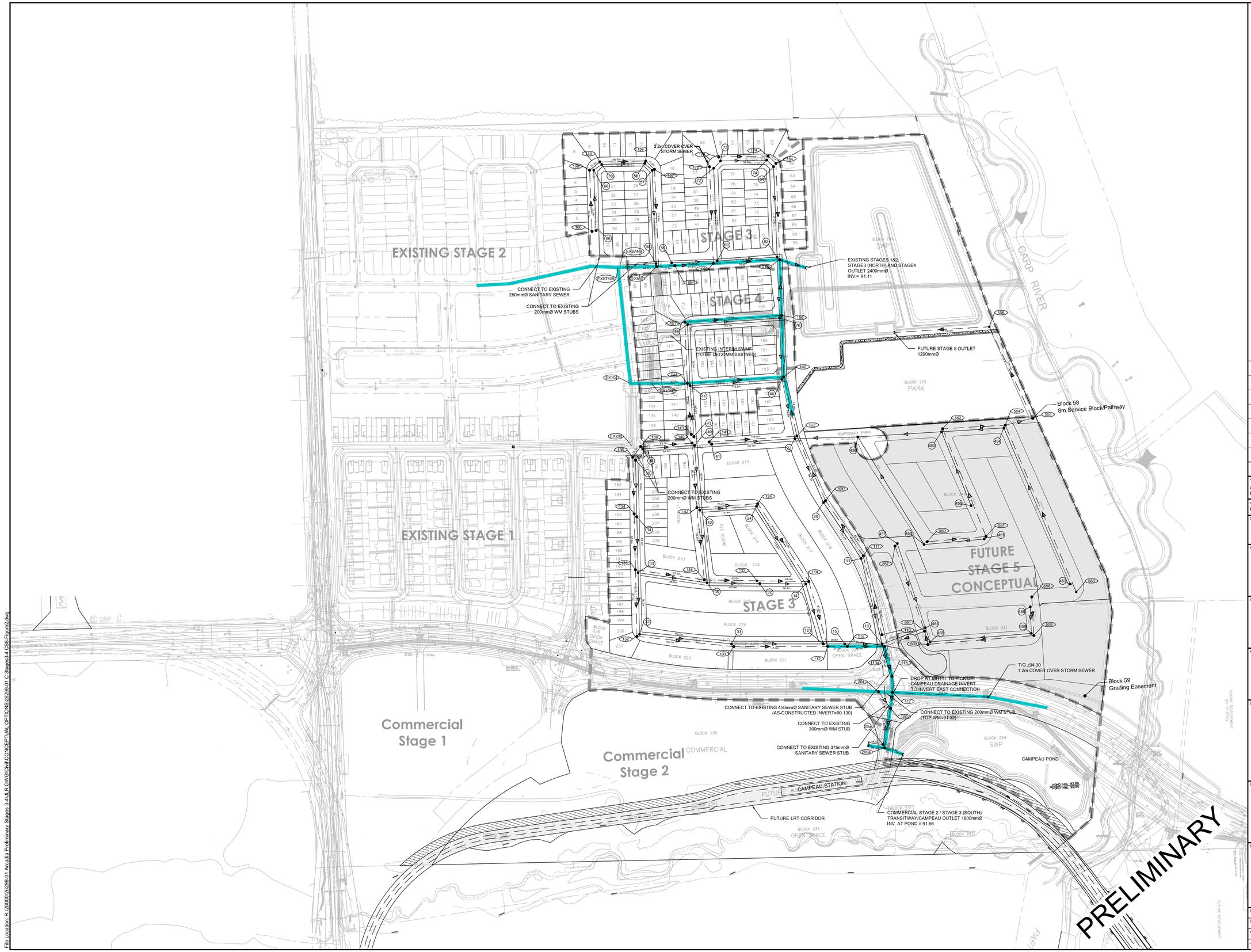

LEGEND

- PROPOSED STORM SEWER & MANHOLE
- PROPOSED SANITARY SEWER & MANHOLE
- PROPOSED WATERMAIN
- EXISTING STORM SEWER & MANHOLE
- EXISTING SANITARY SEWER & MANHOLE
- EXISTING WATERMAIN
- STAGE LIMIT
- STANDING WATER IN SEWER (i.e. INVERT <92.70 - PAINE POND OUTLET, OR INVERT < 92.90 - CAMPEAU POND OUTLET)

No.	ISSUE / REVISION	DD/MM/YY
1	ISSUED WITH SERVICING BRIEF	18/05/18

VERIFY SHEET SIZE AND SCALES. BAR TO THE RIGHT IS 25mm IF THIS IS A FULL SIZE DRAWING. 0 25mm

SCALE: 1:2000

CLIENT:
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PROFESSIONAL STAMP

PROJECT NORTH

PROJECT:
MINTO COMMUNITIES INC.
ARCADIA RESIDENTIAL STAGES 3, 4, 5; AND COMMERCIAL STAGE 2
450 HUNTMAR DRIVE

DRAWING:
CONCEPTUAL EXTENT OF STANDING WATER IN STORM SEWERS

DESIGN:	LD
DRAWN:	TB
CHECKED:	LD
JLR #:	26299-01

DRAWING #: Figure 2

PLOT DATE: May 24, 2018 8:55:45 AM

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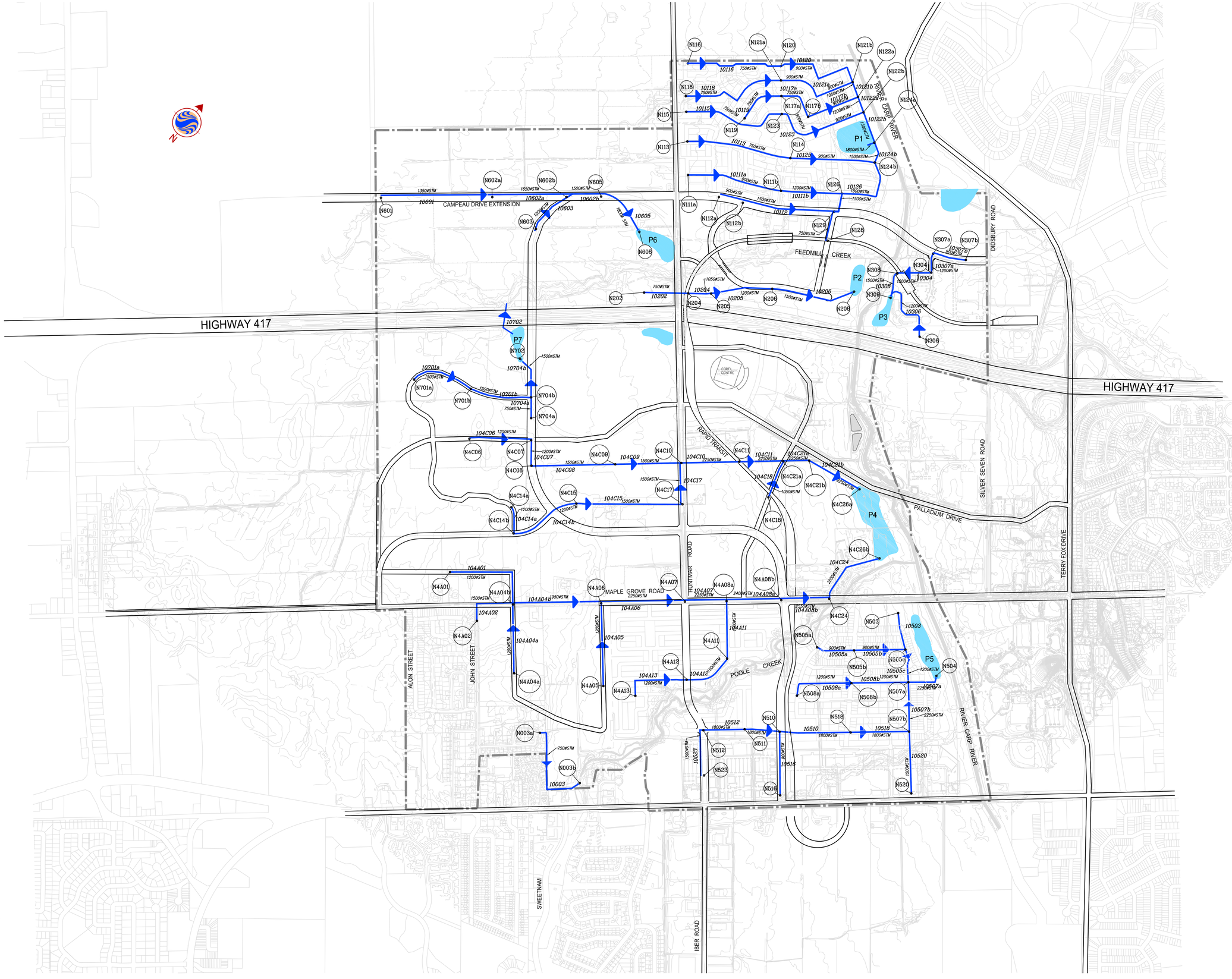
Appendix B

Background Storm Servicing and SWM Documents



Stantec Consulting Ltd.
1505 Laperriere Avenue
Ottawa ON Canada
K1Z 7T1
Tel. 613.722.4420
Fax. 613.722.2799
www.stantec.com

Legend

- KANATA–WEST CONCEPT PLAN BOUNDARY
- 1500#STM — PROPOSED STORM SEWER & SIZE
- N100 — STORM NODE
- 10304 — STORM SEWER IDENTIFICATION

CCL/IBI
Cumming Cockburn Limited
1770 WOODWARD DR., OTTAWA (613)225–1311

2	REVISED FOR DEC.21/05 SUBMISSION	GBU	SJP	DEC.21/05
1	REVISED AS PER CITY COMMENTS (Sept.16/05)	GBU	MAF	OCT.28/05
Revision		By	Appd.	Date

File Name: 160400406		LM	MAF	MAF	AUG./05
		Dwn.	Chkd.	Dsgn.	Date

Seals

Client/Project

Kanata West Concept Plan
Master Servicing Study

Ottawa, Ontario

Title

MODEL SCHEMATIC
STORM SEWER MINOR SYSTEM

Project No.	Scale	Sheet	Revision
60400406	1:7500 (0, 75, 225, 375m)	6 of 7	2

Drawing No. ST-MN

Stantec Consulting Ltd.
1505 Laperriere Avenue
Ottawa ON Canada
K1Z 7T1
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Fax. 613.722.2799
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Stantec

KANATA–WEST CONCEPT PLAN BOUNDARY

POND DRAINAGE BOUNDARY

STORM SEWER DRAINAGE LIMIT

A-1	DRAINAGE AREA IDENTIFICATION
A= 72.31 ha.	AREA IN HECTARES
C= 0.60	RUNOFF COEFFICIENT
I= 246 L/s	100yr. INLET CAPACITY (L/s)
MNR= N4A01	MINOR SYSTEM NODE NUMBER
MJR= 4A01	MAJOR SYSTEM SEGMENT NUMBER
INF=73 mm/yr	INFILTRATION

Notes

* REFER TO FIGURE 3.2 IN KANATA WEST MASTER SERVICING STUDY FOR FURTHER INFILTRATION DETAILS

1. THOSE AREAS WHICH ARE COMPLETELY SURROUNDED BY ARTERIAL ROADWAYS (SPECIFICALLY AREAS A-9, C-9, C-12, C-15, C-17, C-18) MUST PROVIDE SURFACE STORAGE IN THE AMOUNT OF 360m³/ha, OR IN SUFFICIENT QUANTITY TO DEMONSTRATE COMPLETE CONTAINMENT OF THE 100yr EVENT. (i.e. NO MAJOR SYSTEM FLOW IN THE 1:100yr EVENT)

CCL/IBI

Revision	By	Appd.	Date
2 REVISED FOR DEC.21/05 SUBMISSION	GBU	SJP	DEC.21/05
1 REVISED AS PER CITY COMMENTS (Sept.16/05)	GBU	MAF	OCT.28/05

Client/Project

Kanata West Concept Plan
Master Servicing Study

Ottawa, Ontario

Title

STORM DRAINAGE AREA PLAN
NORTH PONDS

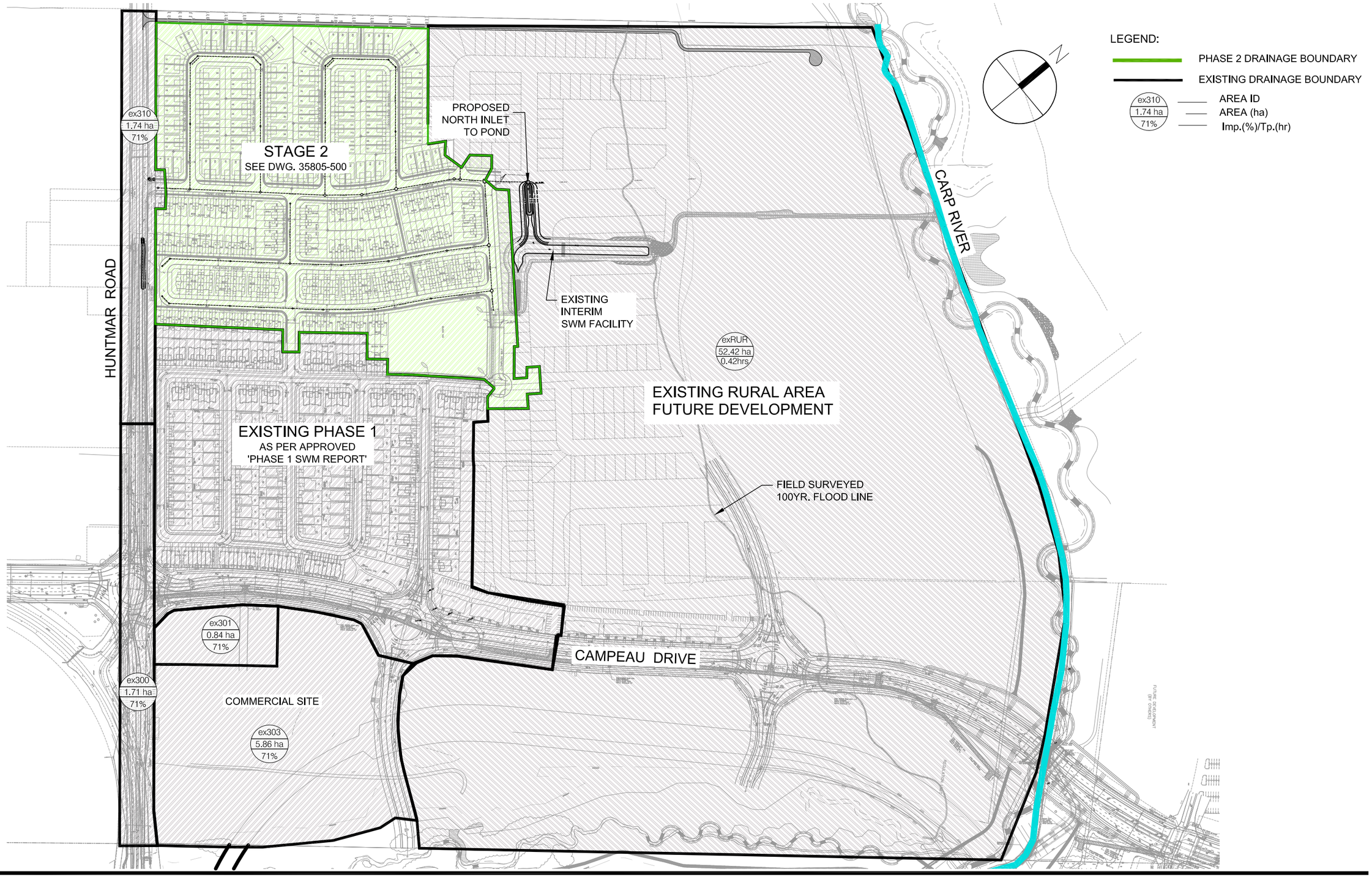
Project No. 60400406

Scale 1:3000 (0, 30, 90, 150m)

Drawing No. ST-PN

Sheet 4 of 7

Revision 2



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IBI GROUP

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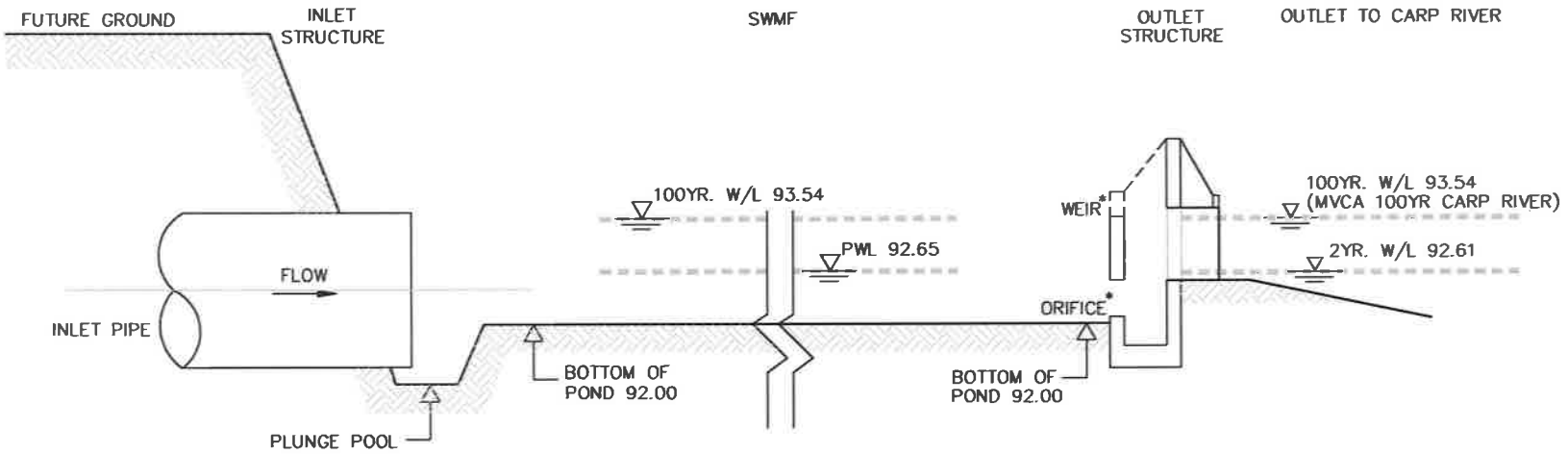
Drawing Title: INTERIM DEVELOPMENT SCENARIO DRAINAGE AREA PLAN

Sheet No.: FIGURE 2-RUR



NOTE:

* WEIR ELEVATION AND ORIFICE SIZE TO BE ADJUSTED TO PROVIDE EXTENDED DETENTION RELEASE FOR QUALITY TREATMENT.

J:\3775_KanataWest\5.9 Drawings\59swm\current\Phase2\3775 SWM-Figures_ph2-2013-08-21.dwg Layout Name: FIGURE 6

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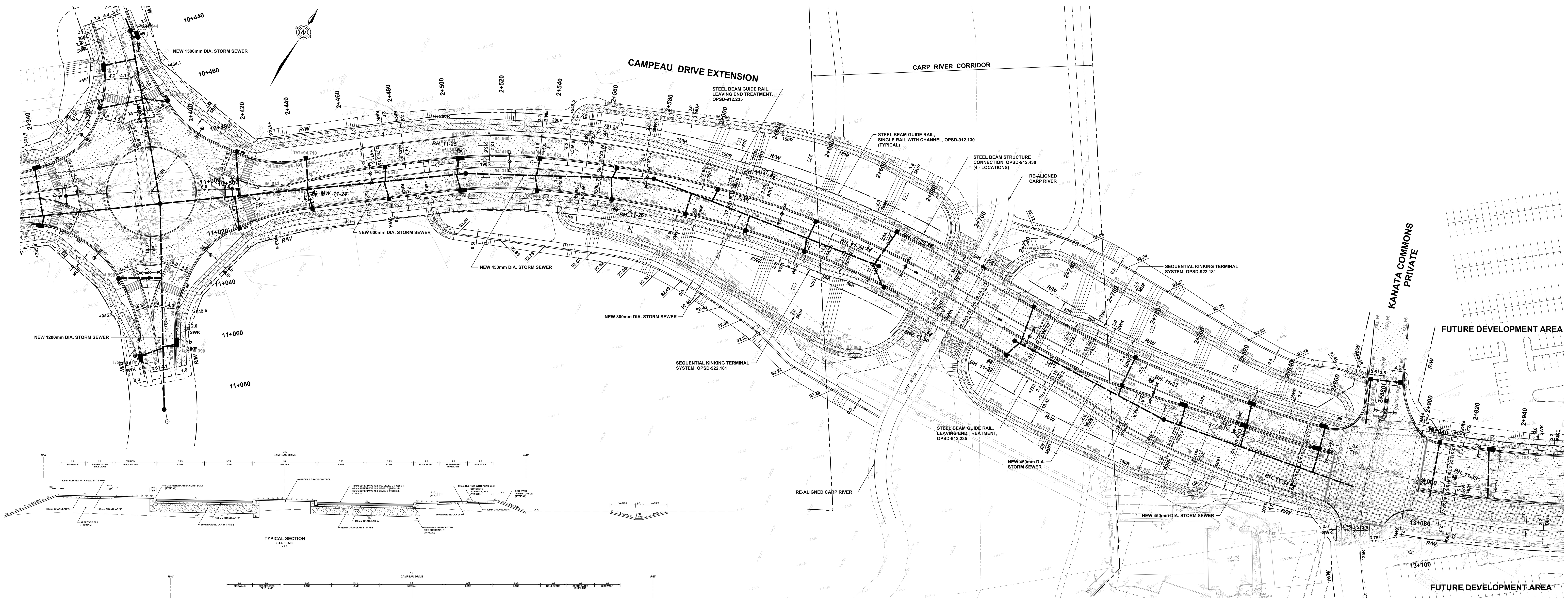
IBI GROUP

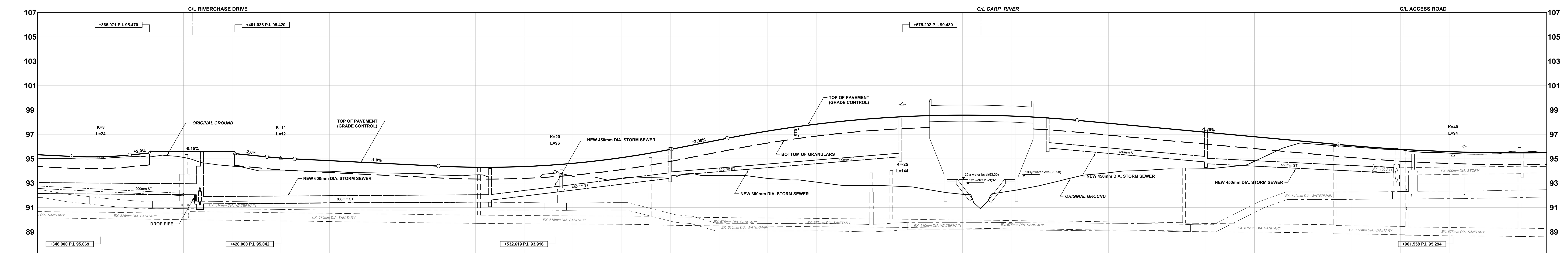
ULTIMATE POND CONCEPTUAL SECTION

FIGURE 6

Sheet No.

PROJECT No. 3775
DATE: 18-09-2013
SCALE: N.T.S.





STATION	℄ PROFILE
2+320	
2+340	95.152
2+360	95.349
2+380	95.602
2+400	95.572
2+420	95.056
2+440	94.842
2+460	94.642
2+480	94.442
2+500	94.301
2+520	94.360
2+540	94.623
2+560	95.091
2+580	95.764
2+600	96.544
2+620	97.269
2+640	97.836
2+660	98.243
2+680	98.491
2+700	98.578
2+720	98.505
2+740	98.273
2+760	97.913
2+780	97.543
2+800	97.173
2+820	96.803
2+840	96.433
2+860	96.067
2+880	95.774
2+900	95.581
2+920	95.488
2+940	95.495

DITCH GRADES

STORM INVERT: 92.040 / 91.295 — 119.3m - 600mm DIA. STORM SEWER AT 0.13% GRADE — 91.450 / 91.600 — 73.3m - 450mm DIA. STORM SEWER AT 2.45% GRADE — 93.396 / 93.610 — 93.8m - 300mm DIA. STORM SEWER AT 1.65% GRADE — 95.158; 95.879 — 65.5m - 450mm DIA. STORM SEWER AT 1.75% GRADE — 94.732 / 94.590 — 79.4m - 450mm DIA. STORM SEWER AT 1.0% GRADE — 93.810

COMBINED/ SANITARY INVERT

CAMPEAU DRIVE EXTENSION
PALLADIUM DRIVE TO DIDSBURY ROAD

Ottawa

PLAN AND PROFILE
CAMPEAU DRIVE

Contract No. ISD | Dwg. No. 001 | Sheet 1 of 1

Asset No.
Asset Group

W. R. NEWELL, P. ENG.
General Manager
Infrastructure Services Department

M. TREMBLAY, C.E.T.
Project Manager
Infrastructure Projects

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Ottawa ON Canada
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Tel. 613.722.4420
www.stantec.com

Des. J.B. | Chk'd. L.G.C.
Dwn. G.R.L. | Chk'd. L.G.C.
Utility Circ. No. | Index No.
Const. Inspector

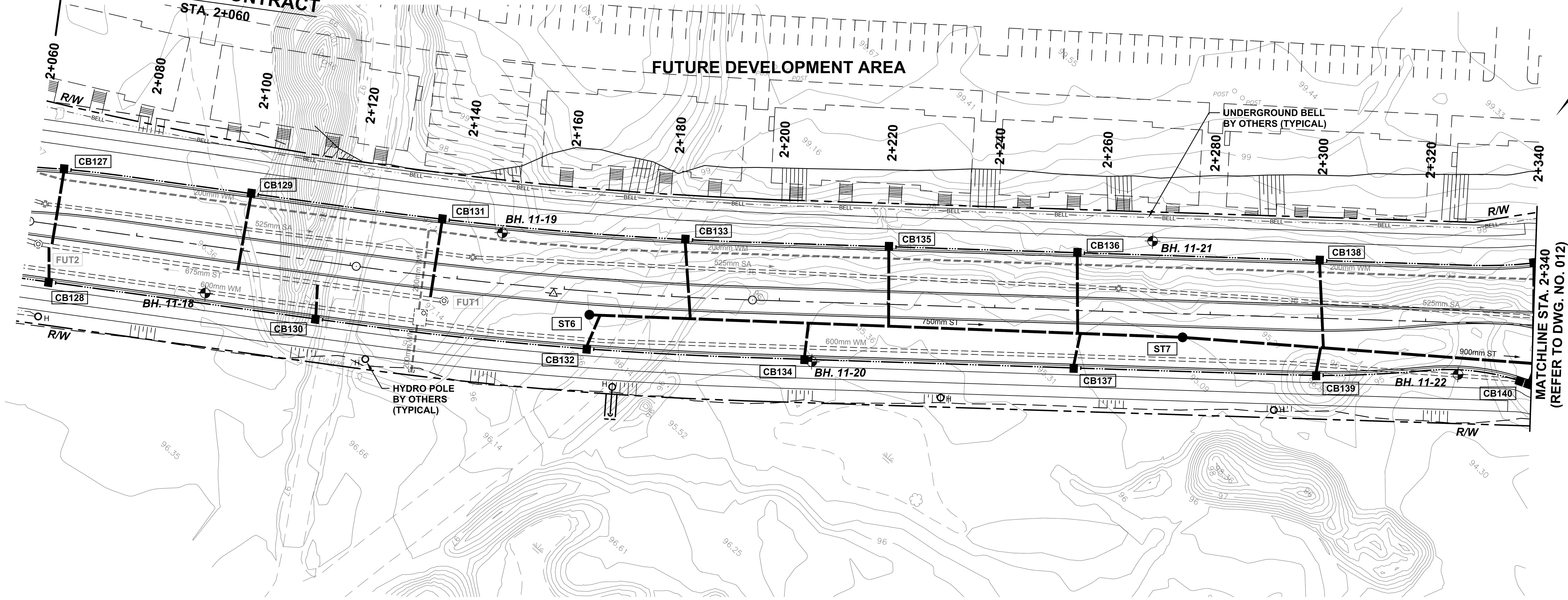
Scale: HORIZONTAL 1:500; VERTICAL 1:100

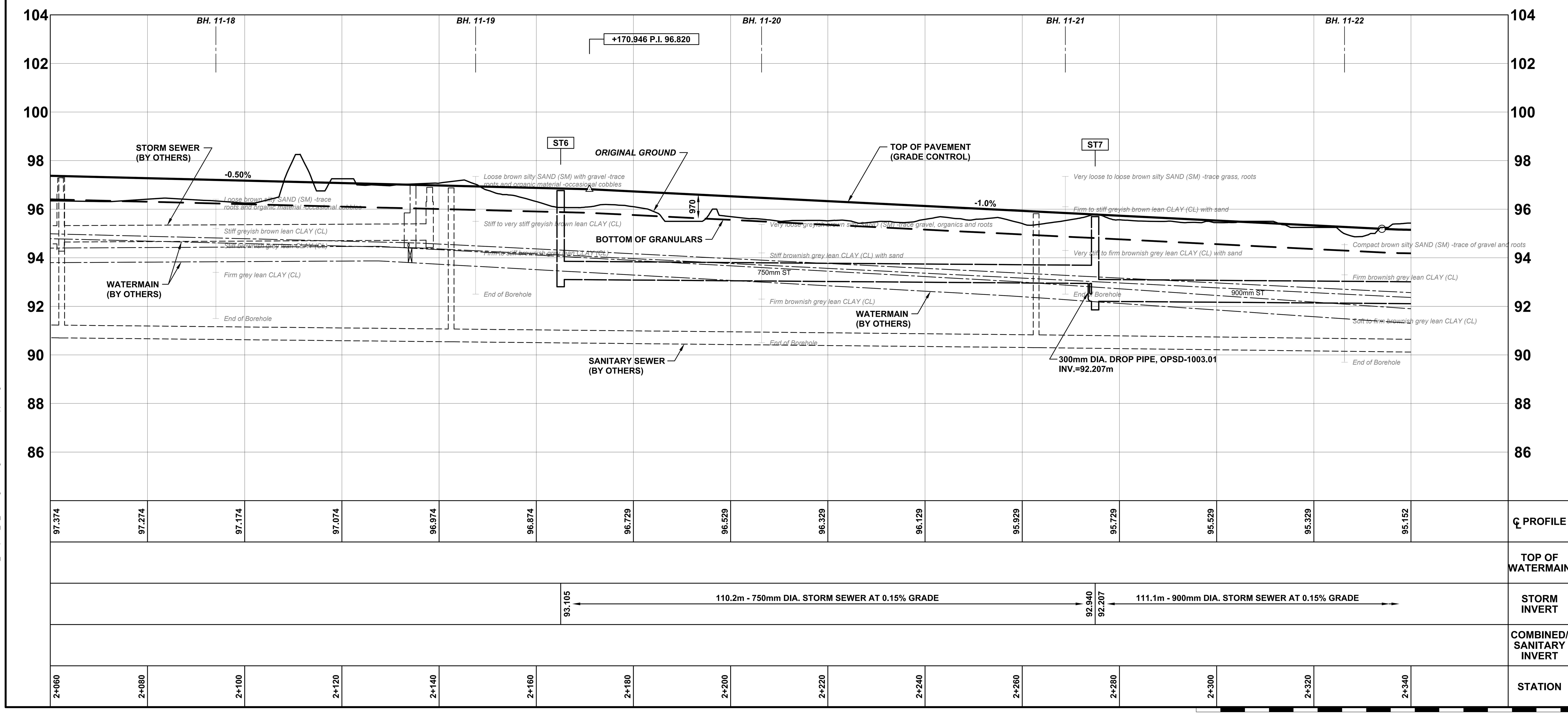
NOTE: The location of utilities is approximate only, the exact location should be determined by consulting the municipal authorities and utility companies concerned. The contractor shall prove the location of utilities and shall be responsible for adequate protection from damage.

REVISIONS No.	Description	By	Date (dd/mm/yyyy)

2017-01-19 3:46 PM c:\01-636\active\163600818_campeau_dr_ex\design\drawing\phase3\163600818-024-pp.dwg

CAMPEAU DRIVE EXTENSION





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CAMPEAU DRIVE EXTENSION
PALLADIUM DRIVE TO DIDSBURY ROAD

Ottawa

PLAN AND PROFILE
CAMPEAU DRIVE EXTENSION
STA. 2+060 TO STA. 2+340

Contract No. ISD12-5240 | Dwg. No. 011

Sheet 11 of 40

Asset No.

Asset Group

W. R. NEWELL, P. ENG. *General Manager* *Infrastructure Services Department*	**M. TREMBLAY, C.E.T.** *Project Manager* *Infrastructure Projects*

Stantec

Stantec Consulting Ltd.
400 - 1331 Clyde Avenue
Ottawa ON Canada
K2C 3G4
Tel. 613.722.4420
www.stantec.com

Des. J.B.	Chk'd. L.G.C.
Dwn. G.R.L.	Chk'd. J.B.
Utility Circ. No.	Index No.
Const. Inspector	

Scale:
HORIZONTAL 1:500
0m 5 10 20
0m 2 4
VERTICAL 1:100

NOTE: The location of utilities is approximate only, the exact location should be determined by consulting the municipal authorities and utility companies concerned. The contractor shall prove the location of utilities and shall be responsible for adequate protection from damage.

REVISIONS

No.	Description	By	Date (dd/mm/yyyy)
–	–	–	–

CATCHBASIN & MAINTENANCE HOLE DATA

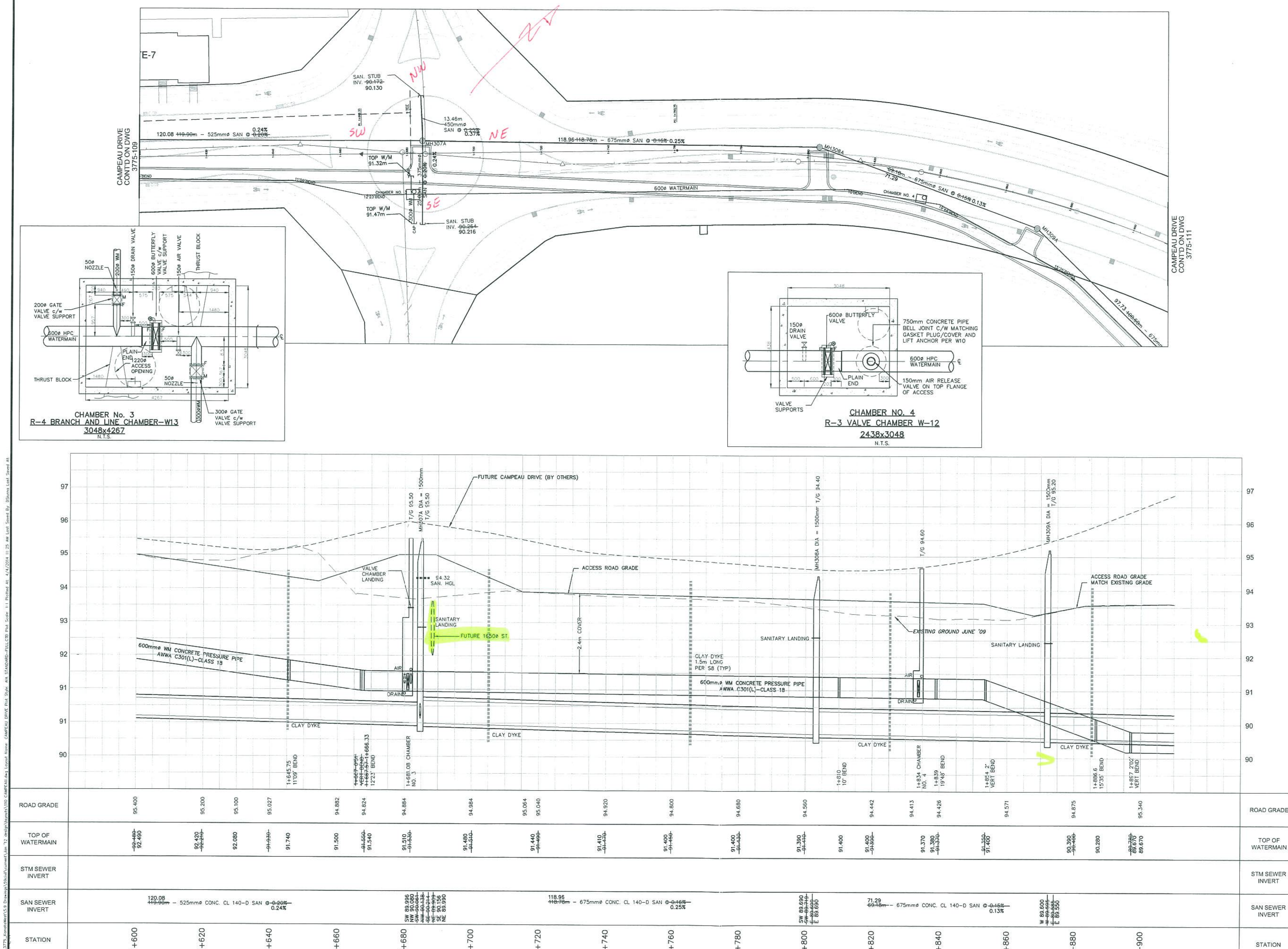
NO.	STATION	OFFSET (m)	TYPE		ICD(L/s)	ELEVATION	
			Structure	Cover	Odour Trap	Grate	Low Inv.
ST6	2+165.0	4.38 RT	701.011	SL	20/S5	96.762	93.105
ST7	2+275.0	4.38 RT	701.011	SL	20/S5	95.692	92.207
* CB127	2+065.0	9.72 LT	705.010	S22/S23	15cwOT	97.155	95.655
* CB128	2+065.0	10.00 RT	705.010	S22/S23	888	97.149	95.349
* CB129	2+100.0	10.00 LT	705.010	S22/S23	888	96.974	95.474
* CB130	2+115.0	10.00 RT	705.010	S22/S23	888	96.899	95.099
* CB131	2+136.0	10.00 LT	705.010	S22/S23	888	96.794	95.294
* CB132	2+165.0	10.00 RT	705.010	S22/S23	888	96.649	95.149
* CB133	2+182.0	10.00 LT	705.010	S22/S23	888	96.509	94.709
* CB134	2+205.0	10.00 RT	705.010	S22/S23	888	96.279	94.479
* CB135	2+220.0	10.00 LT	705.010	S22/S23	888	96.129	94.329
* CB136	2+255.0	10.00 LT	705.010	S22/S23	888	95.779	93.979
* CB137	2+255.0	10.00 RT	705.010	S22/S23	888	95.779	93.979
* CB138	2+300.0	10.00 LT	705.010	S22/S23	888	95.329	93.529
* CB139	2+300.0	9.94 RT	705.010	S22/S23	888	95.330	93.530
* CB140	2+338.9	10.01 RT	705.020	S22/S23	888	94.949	94.049

* DENOTES STRUCTURE TO BE INSULATED AS PER CITY OF OTTAWA STANDARD W23
SL DENOTES SELF-LEVELLING FRAME AND COVER

STORM SEWER DATA

NO. to NO. (high to low)		SIZE (mm)	LENGTH (m)	CLASS	INVERTS	
					Inlet	Outlet
ST6	ST7	750	110.2	CONC 100D	93.105	92.940 **
ST7	ST5	900	111.1	CONC 100D	92.207	92.040 **
CB127	PIPE	200	14.0	SDR 35	95.655	95.375 *
CB128	PIPE	200	6.5	SDR 35	95.349	95.219 *
CB129	PIPE	200	14.5	SDR 35	95.474	95.184 *
CB130	PIPE	200	6.0	SDR 35	95.099	94.979 *
CB131	PIPE	200	14.5	SDR 35	95.294	95.004
CB132	PIPE	200	6.5	SDR 35	95.149	95.019 *
CB133	PIPE	200	14.5	SDR 35	94.709	94.564 *
CB134	PIPE	200	6.5	SDR 35	94.479	94.349 *
CB135	PIPE	200	14.5	SDR 35	94.329	94.039 *
CB136	PIPE	200	14.5	SDR 35	93.979	93.689 *
CB137	PIPE	200	6.0	SDR 35	93.979	93.859 *
CB138	PIPE	200	16.0	SDR 35	93.529	93.369 *
CB139	PIPE	200	5.0	SDR 35	93.530	93.430 *
CB140	PIPE	250	3.5	SDR 35	94.049	93.979 *

* DENOTES INVERT GIVEN AT TOP OF RISER
** DENOTES DROP PIPE AT MAINTENANCE HOLE



NOTES :

1. ALL CONSTRUCTION IN ACCORDANCE WITH CURRENT CITY OF OTTAWA DRAWINGS & SPECIFICATIONS.
2. ALL CONNECTIONS TO EXISTING WATERMAIN BY CITY FORCES. CONTRACTOR TO EXCAVATE, BACKFILL, COMPACT AND REINSTATE.
3. ALL RYCB LEAD PIPES TO BE 200ø PVC DR 35 @ 1.00% UNLESS NOTED OTHERWISE.
4. THE HYDRAULIC GRADE LINE (HGL) IS SHOWN ONLY WHEN IT IS HIGHER THAN THE OBVERT OF THE SEWER.
5. FOR GEOMETRIC LAYOUT OF STREETS AND LOTS, REFER TO PLAN OF SUBDIVISION BY STANTEC GEOMATICS LTD.
6. STORM AND SANITARY SEWER LENGTHS AND INVERTS ARE CALCULATED AT THE CENTER OF EACH MAINTENANCE HOLE NOT AT THE OPENINGS. CONTRACTOR TO ENSURE THAT THE PROPER FALL IS PROVIDED THROUGH THE MAINTENANCE HOLE PER THE DESIGN PIPE GRADES.

LEGEND:

- SINGLE SERVICE LOCATION
- DOUBLE SERVICE LOCATION
- DRIVEWAY LOCATION
- CB STANDARD STREET CATCHBASIN *
- RYCB REARYARD CB C/W TOP OF GRATE *
- ECB ELBOW OR TEE REARYARD CB C/W TOP OF GRATE
- SC SINGLE CONNECTION BETWEEN PAIRS OF STREET CATCHBASINS
- BARRIER CURB
- MOUNTABLE CURB
- DC DEPRESSED CURB

* REFER TO CATCHBASIN DATA TABLE ON DRAWING 3775–100B FOR TOP OF GRATE ELEVATION, LEAD INVERT, PIPE SIZE AND INLET CONTROL DEVICE INFORMATION

No.	REVISIONS	By	Date
14			
13			
12	AS–BUILT	LME	14:02:13
11	REVISE WATERMAIN PIPE CLASS TO 18	LME	13:01:31
10	WATER CHAMBER REVISIONS	LME	12:12:19
9	GENERAL REVISIONS	LME	12:11:28
8	GENERAL WATERMAIN REVISIONS	LME	12:11:14
7	ADDED ACCESS ROAD	LME	12:10:30
6	ISSUED FOR TENDER	LME	12:08:21
5	REVISED PER CITY COMMENTS	LME	12:06:27
4	REVISED PER CITY COMMENTS	LME	12:06:08
3	REVISED PER LEGAL & CITY COMMENTS	LME	12:05:16
2	REVISED PER NEW LEGAL	LME	12:02:17
1	ISSUED FOR SUBMISSION	LME	10:11:26

minto

IBI GROUP
333 Preston Street
Tower 1, Suite 400
Ottawa, Ontario
Canada K1S 5N4
Tel (613)225–1311
FAX (613)225–9868

Project Title
ARCADIA KANATA WEST
PHASE I

LICENSED PROFESSIONAL ENGINEER
L. M. ERON
PROVINCE OF ONTARIO

N

Drawing Title
CAMPEAU DRIVE
STA. 1+600 TO STA. 1+910

Scale
HORIZ. SCALE 1:500
VERT. SCALE 1:50

Design	Date
L.M.E.	MARCH '09
Drawn	**Checked**
M.M.	R.W.W.
Project No.	**Drawing No.**
3775	110

Appendix C

City of Ottawa Correspondence

Hilary MacKay

From: Moodie, Derrick <Derrick.Moodie@ottawa.ca>
Sent: January 15, 2018 12:29 PM
To: 'Susan Murphy'; Lucie Dalrymple
Cc: Gonthier, Alain; Snedden, Lee Ann; Johns, Susan; Duclos, Carina; Newton, Tim; Fraser, Mark; Tremblay, Marc (ISD); Dickinson, Mary; Jolliet, Laurent
Subject: Campeau sewer elevation

Hi Susan M.
I have had a chance to connect with Alain to close the loop on our discussions about the storm sewer elevations in the Campeau Road Allowance, specifically the minimum cover.

The City will allow the sewers to have reduced depth, provided there is a minimum 1.2m of cover as proposed by JLR.

I think it is important for JLR and Stantec to continue their dialogue.

If you can confirm that you will proceed on the basis of this 1.2m minimum cover, Stantec will take this into consideration in their design and amend it to ensure adequate frost protection is provided. Stantec will be responsible for the road design within the Campeau Road allowance, including any frost protection measures required.

Alain,
If I have misunderstood anything, please flag it.

Derrick

'

'

Hilary MacKay

From: Guy Forget
Sent: April 25, 2017 3:46 PM
To: Hilary MacKay
Subject: FW: Campeau Rd/Arcadia Stormwater

Guy Forget, P.Eng., LEED AP
Associate
Senior Water Resources Engineer

J.L. Richards & Associates Limited
864 Lady Ellen Place, Ottawa, ON K1Z 5M2
Tel: 613-728-3571 Fax: 613-728-6012

From: Jolliet, Laurent [mailto:Laurent.Jolliet@ottawa.ca]
Sent: March 8, 2017 3:27 PM
To: Guy Forget
Cc: Lucie Dalrymple; Bobby Pettigrew; Newton, Tim; Dickinson, Mary; Moodie, Derrick; 'SMurphy@minto.com'
Subject: Campeau Rd/Arcadia Stormwater

Bonjour Guy,

Below are the comments regarding the existing interim pond.
Let me know if you have any questions.

Salutations,

Laurent Jolliet, M.A.Sc., P.Eng.
Project Manager, Infrastructure Policy
Asset Management Branch, Infrastructure Services
Planning, Infrastructure and Economic Development Department

Gestionnaire de projet, politique des infrastructures
Gestion des biens, service des infrastructures
Service de planification, d'infrastructure et de développement économique

City of Ottawa | Ville d'Ottawa
Tel. 613.580.2424 ext./poste 17149
110 Laurier Avenue West - 3rd Floor East, Ottawa, ON K1P 1J1

Comments received from Chris Melanson (Surface Water Services) on August 26, 2016:

Should the option to convert the status of this facility be entertained further, we will require a full design report and review.

From what is on site today and what this report would be required to address:

Water Quality
- Sediment forebays do not meet criteria for settlement (plunge pool, depth, length vs width ratio).
- It appears that the two sediment forebays may be treated as one, in that the check dam is located midway into the wet cell? This may be an issue if development types and rates in the two contributing areas differ greatly. We would like to minimize the overall maintenance frequency.
- Permanent pool volume and extended detention volumes of the wet cell appear inadequate.

Structural
- Presently there are no headwalls on the inlets, but the inlet design must include the means to isolate and dewater the sewer and forebay elements.
- It appears that the box pipe inlets will be submerged, the western entirely. This is to be minimized to the greatest extent possible and dewatering/sediment removal methodologies and logistics must be factored into the design.
- While there is presently no outlet structure to speak of, the outlet design must include control features that allow the greatest dewatering capacity via gravity possible and provide other operational features such as access, dewatering sumps and worker and public safety.
- Spillway is to be redesigned.

Maintenance
- In addition to the widening and deepening of the sediment forebays, the forebays require granular bottoms and the means to remove accumulated sediments - either from within or from along the sides.
- Access to the outlet structure is to be provided.
- The provision of a sediment management area is required. The required area is approximately that of the combined total surface area of the sediment forebays.

Outlet channel
- Since this facility would require a lengthy and flat channel to the Carp River, we would require this channel be located within the SWM Block and that an access road be placed adjacent to the channel to allow for the inevitable removal of vegetation.

Grading
- It appears that significant grade alterations would be required to "fit" the existing structures and water features within the lay of the land adjacent to the development. This may results in excessively steel slopes very close to the residential area. This is to be avoided.

That’s all we have for now, I hope it's of assistance. Photos are available upon request.

Appendix D

PCSWMM Results for Two Pond Alternative

Table 1: Peak Flow and Water Level Comparison - 1:2 year Storm Event

PCSWMM Node ID	Peak Flow (m^3/s)		Max.W.L. (m)		Max. Velocity (m/s)	
	City Future	Arcadia Future	City Future	Arcadia Future	City Future	Arcadia Future
CJ038	12.64	12.53	92.17	92.17	0.58	0.58
CJ042	12.92	12.83	92.25	92.25	0.51	0.51
CJ045	12.96	12.86	92.37	92.37	0.40	0.40
CJ050	13.03	12.93	92.58	92.57	0.93	0.93
CJ056	12.72	12.62	92.60	92.60	0.16	0.16
CJ068	13.61	13.53	92.68	92.67	0.10	0.10
CJ104	14.45	14.45	92.84	92.84	0.18	0.18
CJ106	14.56	14.54	92.88	92.88	0.30	0.31
CJ120	11.42	11.39	93.10	93.10	0.72	0.72
CJ155	15.67	15.22	93.40	93.40	0.87	0.87
CJ176	4.86	4.85	93.49	93.49	0.47	0.48
CJ179	4.85	4.85	93.50	93.50	0.40	0.40
CJ199	5.64	5.64	93.61	93.61	0.81	0.81
CJ203	3.84	3.84	93.82	93.82	0.27	0.27

Table 2: Peak Flow and Water Level Comparison - 1:5 year Storm Event

PCSWMM Node ID	Peak Flow (m^3/s)		Max.W.L. (m)		Max. Velocity (m/s)	
	City Future	Arcadia Future	City Future	Arcadia Future	City Future	Arcadia Future
CJ038	19.69	19.67	92.35	92.35	0.65	0.65
CJ042	19.62	19.60	92.42	92.42	0.46	0.45
CJ045	19.65	19.65	92.56	92.56	0.43	0.43
CJ050	20.24	20.23	92.85	92.85	1.22	1.22
CJ056	20.18	20.17	92.87	92.87	0.14	0.14
CJ068	21.45	21.47	92.93	92.93	0.11	0.11
CJ104	22.33	22.38	93.11	93.11	0.18	0.18
CJ106	22.41	22.39	93.15	93.15	0.31	0.31
CJ120	17.14	17.12	93.39	93.39	0.84	0.84
CJ155	20.09	21.34	93.61	93.61	0.91	0.91
CJ176	7.47	7.55	93.70	93.70	0.47	0.48
CJ179	7.59	7.69	93.71	93.71	0.42	0.42
CJ199	8.51	8.50	93.82	93.82	1.06	1.06
CJ203	5.57	5.57	93.99	93.99	0.29	0.29

Table 3: Peak Flow and Water Level Comparison - 1:10 year Storm Event

PCSWMM Node ID	Peak Flow (m^3/s)		Max.W.L. (m)		Max. Velocity (m/s)	
	City Future	Arcadia Future	City Future	Arcadia Future	City Future	Arcadia Future
CJ038	24.67	24.63	92.46	92.45	0.70	0.70
CJ042	24.84	24.80	92.52	92.52	0.38	0.37
CJ045	24.97	24.94	92.66	92.66	0.43	0.43
CJ050	24.99	24.96	93.03	93.03	1.33	1.32
CJ056	24.45	24.42	93.05	93.05	0.15	0.14
CJ068	26.49	26.58	93.10	93.10	0.12	0.12
CJ104	27.81	27.86	93.25	93.25	0.19	0.19
CJ106	27.92	27.91	93.29	93.29	0.31	0.31
CJ120	21.23	21.26	93.55	93.55	0.93	0.93
CJ155	23.94	23.99	93.75	93.75	0.96	0.96
CJ176	9.10	9.12	93.84	93.84	0.50	0.51
CJ179	9.24	9.27	93.85	93.85	0.44	0.44
CJ199	10.21	10.21	93.95	93.95	1.18	1.18
CJ203	6.57	6.57	94.08	94.08	0.30	0.30

Table 4: Peak Flow and Water Level Comparison - 1:25 year Storm Event

PCSWMM Node ID	Peak Flow (m^3/s)		Max.W.L. (m)		Max. Velocity (m/s)	
	City Future	Arcadia Future	City Future	Arcadia Future	City Future	Arcadia Future
CJ038	31.82	31.71	92.61	92.61	0.73	0.73
CJ042	32.37	32.26	92.66	92.65	0.33	0.33
CJ045	32.72	32.61	92.78	92.78	0.42	0.42
CJ050	32.80	32.69	93.18	93.18	1.62	1.62
CJ056	32.16	32.06	93.19	93.19	0.15	0.15
CJ068	33.03	32.91	93.25	93.24	0.14	0.14
CJ104	34.49	34.55	93.42	93.42	0.21	0.21
CJ106	34.65	34.65	93.46	93.45	0.31	0.31
CJ120	26.08	26.04	93.73	93.73	1.01	1.01
CJ155	27.43	27.64	93.92	93.92	0.96	0.96
CJ176	11.08	11.11	94.00	94.00	0.53	0.53
CJ179	11.26	13.16	94.00	94.01	0.45	0.45
CJ199	12.08	12.08	94.10	94.10	1.30	1.30
CJ203	7.56	7.56	94.19	94.19	0.31	0.31

Table 5: Peak Flow and Water Level Comparison - 1:50 year Storm Event

PCSWMM Node ID	Peak Flow (m^3/s)		Max.W.L. (m)		Max. Velocity (m/s)	
	City Future	Arcadia Future	City Future	Arcadia Future	City Future	Arcadia Future
CJ038	35.66	35.52	92.72	92.72	0.73	0.73
CJ042	36.47	36.32	92.76	92.75	0.34	0.34
CJ045	37.01	36.85	92.85	92.85	0.41	0.41
CJ050	37.12	36.96	93.28	93.28	1.76	1.76
CJ056	36.43	36.27	93.29	93.29	0.16	0.15
CJ068	37.74	37.52	93.34	93.34	0.15	0.15
CJ104	38.78	38.84	93.51	93.51	0.22	0.26
CJ106	38.92	38.90	93.54	93.55	0.31	0.31
CJ120	29.12	29.10	93.84	93.84	1.06	1.06
CJ155	31.11	30.94	94.02	94.02	0.96	0.97
CJ176	12.28	12.21	94.09	94.09	0.54	0.54
CJ179	14.77	14.69	94.10	94.10	0.45	0.45
CJ199	13.27	13.27	94.19	94.19	1.38	1.38
CJ203	8.18	8.18	94.26	94.26	0.35	0.35

Table 6: Peak Flow and Water Level Comparison - 1:100 year Storm Event

PCSWMM Node ID	Peak Flow (m^3/s)		Max.W.L. (m)		Max. Velocity (m/s)	
	City Future	Arcadia Future	City Future	Arcadia Future	City Future	Arcadia Future
CJ038	40.09	39.78	93.14	93.14	0.10	0.10
CJ042	41.16	40.77	93.15	93.15	0.12	0.12
CJ045	42.55	42.15	93.18	93.17	0.22	0.22
CJ050	43.35	42.99	93.46	93.45	1.89	1.88
CJ056	42.49	42.19	93.47	93.46	0.10	0.10
CJ068	42.98	42.59	93.51	93.50	0.13	0.13
CJ104	43.97	44.10	93.65	93.65	0.23	0.23
CJ106	44.17	44.13	93.68	93.68	0.18	0.18
CJ120	32.49	32.53	93.97	93.97	1.10	1.10
CJ155	34.41	34.71	94.15	94.15	0.86	0.86
CJ176	13.54	13.61	94.21	94.21	0.55	0.56
CJ179	19.73	19.76	94.22	94.22	0.35	0.35
CJ199	13.99	14.00	94.30	94.30	1.41	1.41
CJ203	9.01	9.01	94.35	94.35	0.42	0.42

Table 7: Minor System HGLs SCS Storms

Node ID	Underside of Footing (m)	1:2 year 12hr SCS		1:100 year 12hr SCS		1:100 CC year 12hr SCS	
		Max HGL (m)	Freeboard (m)	Max HGL (m)	Freeboard (m)	Max HGL (m)	Freeboard (m)
MH117	94.600	93.400	1.200	93.890	0.710	93.890	0.710
MH113	93.900	93.400	0.500	93.890	0.010	93.890	0.010
MH112	94.250	93.500	0.750	94.070	0.180	94.070	0.180
MH113A	94.100	93.400	0.700	93.900	0.200	93.900	0.200
MH110	94.650	93.640	1.010	94.020	0.630	94.020	0.630
MH111	94.400	93.490	0.910	93.990	0.410	93.990	0.410
MH114	94.350	93.620	0.730	94.200	0.150	94.200	0.150
MH120	94.300	93.390	0.910	93.950	0.350	93.950	0.350
MH150	93.800	93.140	0.660	93.770	0.030	93.770	0.030
MH146	94.050	93.140	0.910	93.770	0.280	93.770	0.280
MH122	94.150	93.200	0.950	93.870	0.280	93.870	0.280
MH124	94.600	93.960	0.640	94.340	0.260	94.340	0.260
MH142	95.100	94.340	0.760	94.410	0.690	94.410	0.690
MH135	95.000	93.750	1.250	94.330	0.670	94.330	0.670
MH131	94.900	93.610	1.290	94.210	0.690	94.210	0.690
MH132	95.350	93.800	1.550	94.340	1.010	94.340	1.010
MH133	95.420	93.960	1.460	94.440	0.980	94.440	0.980
MH134	95.120	93.990	1.130	94.460	0.660	94.460	0.660
MH141	95.200	94.270	0.930	94.290	0.910	94.290	0.910
MH140	95.200	94.680	0.520	94.720	0.480	94.720	0.480
MH143	95.200	93.220	1.980	93.970	1.230	93.970	1.230
MH138	95.570	94.920	0.650	94.950	0.620	94.950	0.620
MH136	95.570	94.160	1.410	94.510	1.060	94.510	1.060
MH144	94.800	93.170	1.630	94.100	0.700	94.100	0.700
MH151	94.000	93.140	0.860	93.930	0.070	93.930	0.070
MH166	95.450	93.750	1.700	94.280	1.170	94.280	1.170
EX510	94.750	93.140	1.610	93.890	0.860	93.890	0.860
MH159	94.600	93.140	1.460	93.850	0.750	93.850	0.750
MH160	94.450	93.140	1.310	93.790	0.660	93.790	0.660
MH512	93.900	93.140	0.760	93.760	0.140	93.760	0.140
MH154	94.200	93.540	0.660	93.770	0.430	93.770	0.430
MH174	94.200	93.570	0.630	93.770	0.430	93.770	0.430
MH173	94.600	93.640	0.960	93.770	0.830	93.770	0.830
MH172	94.600	93.140	1.460	93.850	0.750	93.850	0.750
MH157	94.900	93.190	1.710	93.980	0.920	93.980	0.920
MH156	94.900	93.270	1.630	94.010	0.890	94.010	0.890
MH170	95.050	93.380	1.670	94.080	0.970	94.080	0.970
MH168	95.050	93.540	1.510	94.110	0.940	94.110	0.940
MH142E	95.100	94.290	0.810	94.400	0.700	94.400	0.700
MH133E	95.420	93.870	1.550	94.390	1.030	94.390	1.030
MH144E	94.800	93.140	1.660	93.930	0.870	93.930	0.870
EX104	95.370	93.140	2.230	93.980	1.390	93.980	1.390
EX104B	95.300	93.140	2.160	93.970	1.330	93.970	1.330

Table 7: Continued

Node ID	Underside of Footing (m)	1:2 year 12hr SCS		1:100 year 12hr SCS		1:100 CC year 12hr SCS	
		Max HGL (m)	Freeboard (m)	Max HGL (m)	Freeboard (m)	Max HGL (m)	Freeboard (m)
EX509	95.350	93.140	2.210	93.930	1.420	93.930	1.420
EX532	95.470	93.140	2.330	93.970	1.500	93.970	1.500
EX541	95.420	93.140	2.280	93.960	1.460	93.960	1.460
MH556	93.500	93.140	0.360	93.760	-0.260	93.760	-0.260
MH555	93.700	93.140	0.560	93.760	-0.060	93.760	-0.060
MH554	93.750	93.140	0.610	93.760	-0.010	93.760	-0.010
MH552	93.850	93.140	0.710	93.850	0.000	93.850	0.000
MH551	94.100	93.230	0.870	93.980	0.120	93.980	0.120
MH550	94.200	93.240	0.960	94.000	0.200	94.000	0.200
MH557	94.150	93.410	0.740	94.030	0.120	94.030	0.120
MH561	94.010	93.400	0.610	93.950	0.060	93.950	0.060
MH560	93.990	93.400	0.590	93.970	0.020	93.970	0.020
MH559	94.200	93.440	0.760	94.090	0.110	94.090	0.110
MH558	94.300	93.440	0.860	94.090	0.210	94.090	0.210
MH553	94.100	93.170	0.930	93.920	0.180	93.920	0.180

Table 8: Minor System HGLs Chicago Storms

Node ID	Underside of Footing (m)	1:2 year 3hr CHI		1:100 year 3hr CHI		1:100 CC year 3hr CHI	
		Max HGL (m)	Freeboard (m)	Max HGL (m)	Freeboard (m)	Max HGL (m)	Freeboard (m)
MH117	94.600	93.260	1.340	93.740	0.860	93.930	0.670
MH113	93.900	93.260	0.640	93.750	0.150	93.940	-0.040
MH112	94.250	93.550	0.700	93.820	0.430	94.160	0.090
MH113A	94.100	93.260	0.840	93.750	0.350	94.000	0.100
MH110	94.650	93.680	0.970	93.690	0.960	93.930	0.720
MH111	94.400	93.540	0.860	93.580	0.820	93.890	0.510
MH114	94.350	93.700	0.650	93.960	0.390	94.300	0.050
MH120	94.300	93.440	0.860	93.520	0.780	93.840	0.460
MH150	93.800	93.040	0.760	93.440	0.360	93.620	0.180
MH146	94.050	93.040	1.010	93.440	0.610	93.670	0.380
MH122	94.150	93.250	0.900	93.450	0.700	93.750	0.400
MH124	94.600	93.990	0.610	94.070	0.530	94.440	0.160
MH142	95.100	94.380	0.720	94.390	0.710	94.480	0.620
MH135	95.000	93.830	1.170	94.090	0.910	94.430	0.570
MH131	94.900	93.680	1.220	93.950	0.950	94.300	0.600
MH132	95.350	93.860	1.490	94.070	1.280	94.440	0.910
MH133	95.420	94.020	1.400	94.150	1.270	94.530	0.890
MH134	95.120	94.050	1.070	94.170	0.950	94.550	0.570
MH141	95.200	94.290	0.910	94.290	0.910	94.280	0.920
MH140	95.200	94.710	0.490	94.720	0.480	94.720	0.480
MH143	95.200	93.240	1.960	93.590	1.610	93.850	1.350
MH138	95.570	94.950	0.620	94.950	0.620	94.950	0.620
MH136	95.570	94.190	1.380	94.220	1.350	94.600	0.970
MH144	94.800	93.210	1.590	93.720	1.080	94.020	0.780
MH151	94.000	93.060	0.940	93.540	0.460	93.850	0.150
MH166	95.450	93.790	1.660	93.940	1.510	94.190	1.260
EX510	94.750	93.040	1.710	93.530	1.220	93.780	0.970
MH159	94.600	93.040	1.560	93.490	1.110	93.750	0.850
MH160	94.450	93.040	1.410	93.440	1.010	93.690	0.760
MH512	93.900	93.040	0.860	93.440	0.460	93.560	0.340
MH154	94.200	93.590	0.610	93.620	0.580	93.650	0.550
MH174	94.200	93.620	0.580	93.640	0.560	93.670	0.530
MH173	94.600	93.700	0.900	93.720	0.880	93.740	0.860
MH172	94.600	93.040	1.560	93.480	1.120	93.760	0.840
MH157	94.900	93.270	1.630	93.630	1.270	93.870	1.030
MH156	94.900	93.340	1.560	93.660	1.240	93.900	1.000
MH170	95.050	93.450	1.600	93.730	1.320	93.970	1.080
MH168	95.050	93.570	1.480	93.770	1.280	94.010	1.040
MH142E	95.100	94.310	0.790	94.320	0.780	94.510	0.590
MH133E	95.420	93.900	1.520	94.140	1.280	94.480	0.940
MH144E	94.800	93.040	1.760	93.540	1.260	93.800	1.000
EX104	95.370	93.070	2.300	93.680	1.690	93.860	1.510
EX104B	95.300	93.070	2.230	93.670	1.630	93.860	1.440

Table 8: Continued

Node ID	Underside of Footing (m)	1:2 year 3hr CHI		1:100 year 3hr CHI		1:100 CC year 3hr CHI	
		Max HGL (m)	Freeboard (m)	Max HGL (m)	Freeboard (m)	Max HGL (m)	Freeboard (m)
EX509	95.350	93.040	2.310	93.580	1.770	93.810	1.540
EX532	95.470	93.040	2.430	93.660	1.810	93.860	1.610
EX541	95.420	93.040	2.380	93.640	1.780	93.850	1.570
MH556	93.500	93.040	0.460	93.440	0.060	93.600	-0.100
MH555	93.700	93.050	0.650	93.500	0.200	93.760	-0.060
MH554	93.750	93.050	0.700	93.550	0.200	93.800	-0.050
MH552	93.850	93.100	0.750	93.650	0.200	93.910	-0.060
MH551	94.100	93.260	0.840	93.790	0.310	94.050	0.050
MH550	94.200	93.280	0.920	93.810	0.390	94.060	0.140
MH557	94.150	93.350	0.800	93.790	0.360	94.120	0.030
MH561	94.010	93.290	0.720	93.750	0.260	94.040	-0.030
MH560	93.990	93.300	0.690	93.750	0.240	94.060	-0.070
MH559	94.200	93.400	0.800	93.850	0.350	94.170	0.030
MH558	94.300	93.410	0.890	93.850	0.450	94.170	0.130
MH553	94.100	93.200	0.900	93.720	0.380	93.980	0.120

Table 9: Major System Maximum Ponding Depths

Node ID	12hr SCS			3hr Chicago		
	1:2 Year Max Ponding Depth (m)	1:10 Year Max Ponding Depth (m)	1:100 Year Max Ponding Depth (m)	1:2 Year Max Ponding Depth (m)	1:10 Year Max Ponding Depth (m)	1:100 Year Max Ponding Depth (m)
CampStub-S	0.04	0.05	0.22	0.04	0.08	0.24
MH99-S	0.00	0.01	0.22	0.01	0.01	0.25
MH110-S	0.01	0.17	0.19	0.01	0.18	0.20
MH111-S	0.01	0.18	0.22	0.02	0.19	0.23
MH112-S	0.01	0.09	0.29	0.01	0.12	0.34
MH113A-S	0.01	0.01	0.20	0.01	0.01	0.26
MH114-S	0.01	0.11	0.29	0.01	0.14	0.34
MH117-S	0.02	0.03	0.22	0.03	0.04	0.23
MH120-S	0.01	0.19	0.23	0.02	0.20	0.25
MH122-S	0.01	0.20	0.27	0.02	0.22	0.30
MH124-S	0.01	0.17	0.20	0.01	0.18	0.22
MH131-S	0.01	0.20	0.31	0.01	0.21	0.33
MH132-S	0.01	0.19	0.30	0.01	0.20	0.32
MH133-S	0.01	0.18	0.30	0.02	0.19	0.32
MH133E-S	0.01	0.17	0.19	0.02	0.17	0.19
MH135-S	0.01	0.17	0.30	0.01	0.19	0.33
MH136-S	0.01	0.17	0.27	0.01	0.18	0.28
MH138-S	0.01	0.17	0.29	0.01	0.17	0.30
MH140-S	0.01	0.17	0.31	0.01	0.18	0.33
MH141-S	0.01	0.17	0.19	0.02	0.18	0.20
MH142-S	0.01	0.18	0.31	0.02	0.19	0.34
MH142E-S	0.01	0.16	0.17	0.01	0.17	0.18
MH143-S	0.01	0.16	0.17	0.01	0.17	0.18
MH144-S	0.01	0.18	0.20	0.02	0.18	0.21
MH144E-S	0.01	0.18	0.20	0.02	0.19	0.22
MH146-S	0.01	0.22	0.29	0.01	0.24	0.32
MH151-S	0.01	0.19	0.23	0.01	0.20	0.25
MH159-S	0.01	0.19	0.32	0.02	0.21	0.29
MH160-S	0.01	0.20	0.33	0.01	0.22	0.32
MH166-S	0.01	0.16	0.18	0.01	0.17	0.19
MH170-S	0.01	0.18	0.23	0.01	0.20	0.25
MH172-S	0.01	0.17	0.21	0.01	0.18	0.21
MH173-S	0.01	0.18	0.21	0.01	0.19	0.23
MH100-S	0.01	0.02	0.21	0.01	0.02	0.22
201-N	0.03	0.04	0.22	0.03	0.05	0.23
CAP-N	0.03	0.04	0.05	0.05	0.05	0.10
MH550-S	0.01	0.17	0.19	0.01	0.18	0.20
MH551-S	0.01	0.19	0.22	0.01	0.20	0.24
MH552-S	0.01	0.21	0.27	0.01	0.22	0.30
MH557-S	0.01	0.27	0.31	0.01	0.28	0.33
MH559-S	0.01	0.27	0.31	0.01	0.28	0.33
MH553-S	0.01	0.19	0.23	0.01	0.20	0.25

514
Invert=93.488
HGL=93.98

513
Invert=92.78
HGL=93.88

154
Invert=92.79
HGL=93.57

172
Invert=93.126
HGL=93.77

156
Invert=93.356
HGL=93.87

170
Invert=93.48
HGL=93.94

157
Invert=93.094
HGL=93.85

512
Invert=91.162
HGL=93.55

160
Invert=91.285
HGL=93.67

158
Invert=91.39
HGL=93.74

147
Invert=90.39
HGL=93.54

605
Invert=92.875
HGL=93.55

630
Invert=93.447
HGL=94.03

640
Invert=93.796
HGL=94.33

620
Invert=93.145
HGL=93.92

146
Invert=90.5
HGL=93.62

122
Invert=90.59
HGL=93.74

144
Invert=93.12
HGL=93.68

120
Invert=90.85
HGL=93.9

140
Invert=92.46
HGL=93.84

124
Invert=92.15
HGL=93.97

116
Invert=93.28
HGL=94.1

118
Invert=93.11
HGL=94.09

111
Invert=90.99
HGL=94.05

MH113A
Invert=91.08
HGL=94.15

CampStub
Invert=91.45
HGL=94.39

136
Invert=93.17
HGL=93.92

138
Invert=93.06
HGL=93.9

142
Invert=92.89
HGL=93.94

114
Invert=92.98
HGL=94.07

126
Invert=92.26
HGL=94.03

MH115
Invert=93.5
HGL=94.1

MH113
Invert=91.27
HGL=94.21

MH117
Invert=91.3
HGL=94.23

112
Invert=93.35
HGL=94.11

MH100
Invert=92.15
HGL=94.38

134
Invert=93.31
HGL=93.99

128
Invert=93.28
HGL=94.1

WestStub
Invert=92.771
HGL=94.4

131
Invert=93.51
HGL=94.07

130
Invert=93.15
HGL=94.02

Legend

- Junctions
- Outfalls

Storages
- Sag Storage
- Manhole
- Pond

Conduits
- Storm Sewers
- Carp River

Orifices

N

200 m

PROJECT:

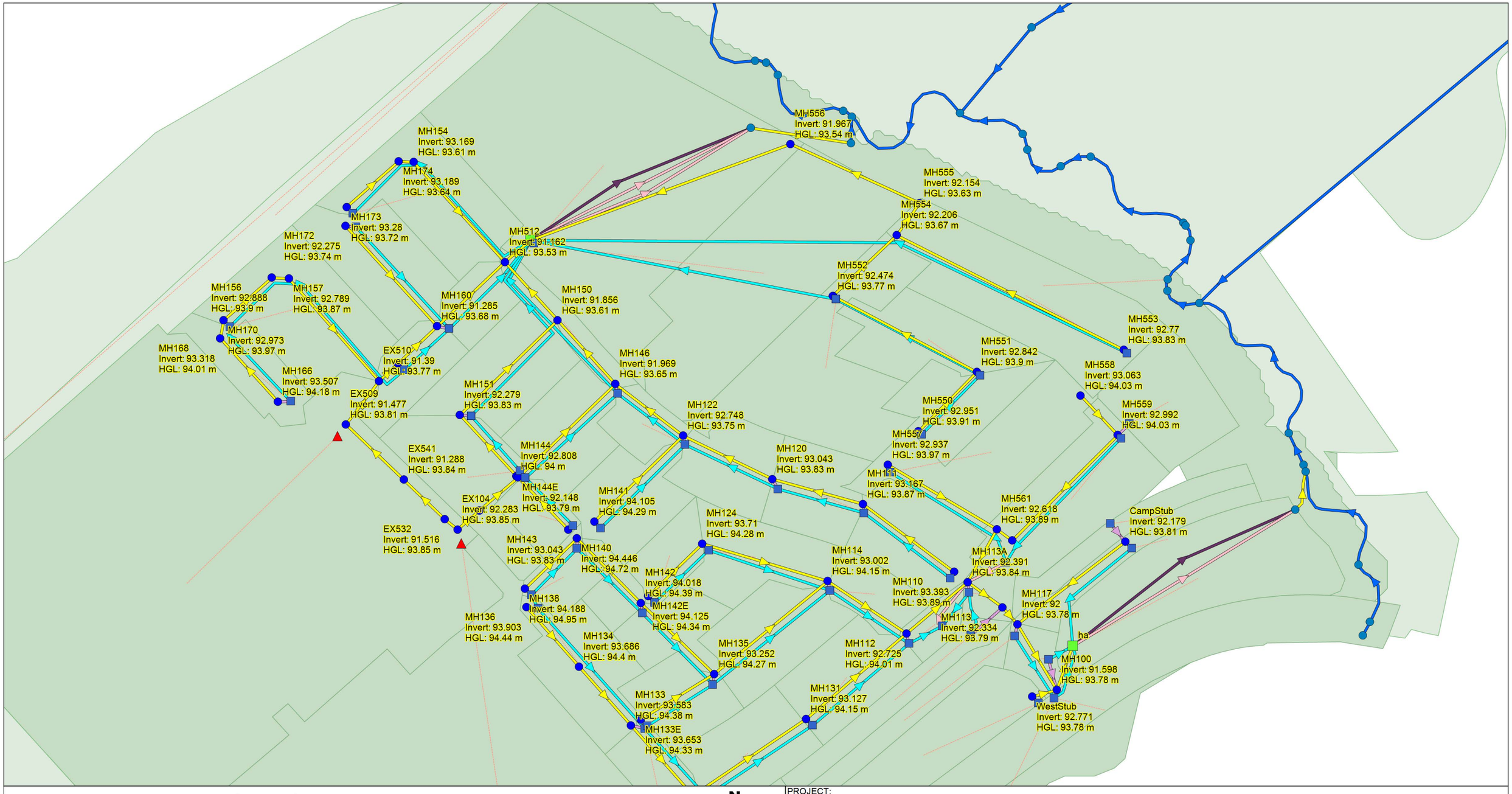
ARCADIA RESIDENTIAL STAGES 3, 4, 5 & 6 AND COMMERCIAL STAGES 2 & 3
OTTAWA, CITY OF OTTAWA

DRAWING:

One Pond Alternative Results

J.L.Richards
ENGINEERS · ARCHITECTS · PLANNERS

DESIGN:	BP	JLR NO.:	26299
DRAWN:	BP	DRAWING NO.:	Figure 1
CHECKED:			



Legend

- Junctions
- Outfalls

Storages
- Sag Storage
- Manhole
- Pond

Conduits
- Storm Sewers
- Carp River
- Open Channel

Orifices

N

200 m

PROJECT:

ARCADIA RESIDENTIAL STAGES 3, 4, 5 & 6 AND COMMERCIAL STAGES 2 & 3
OTTAWA, CITY OF OTTAWA

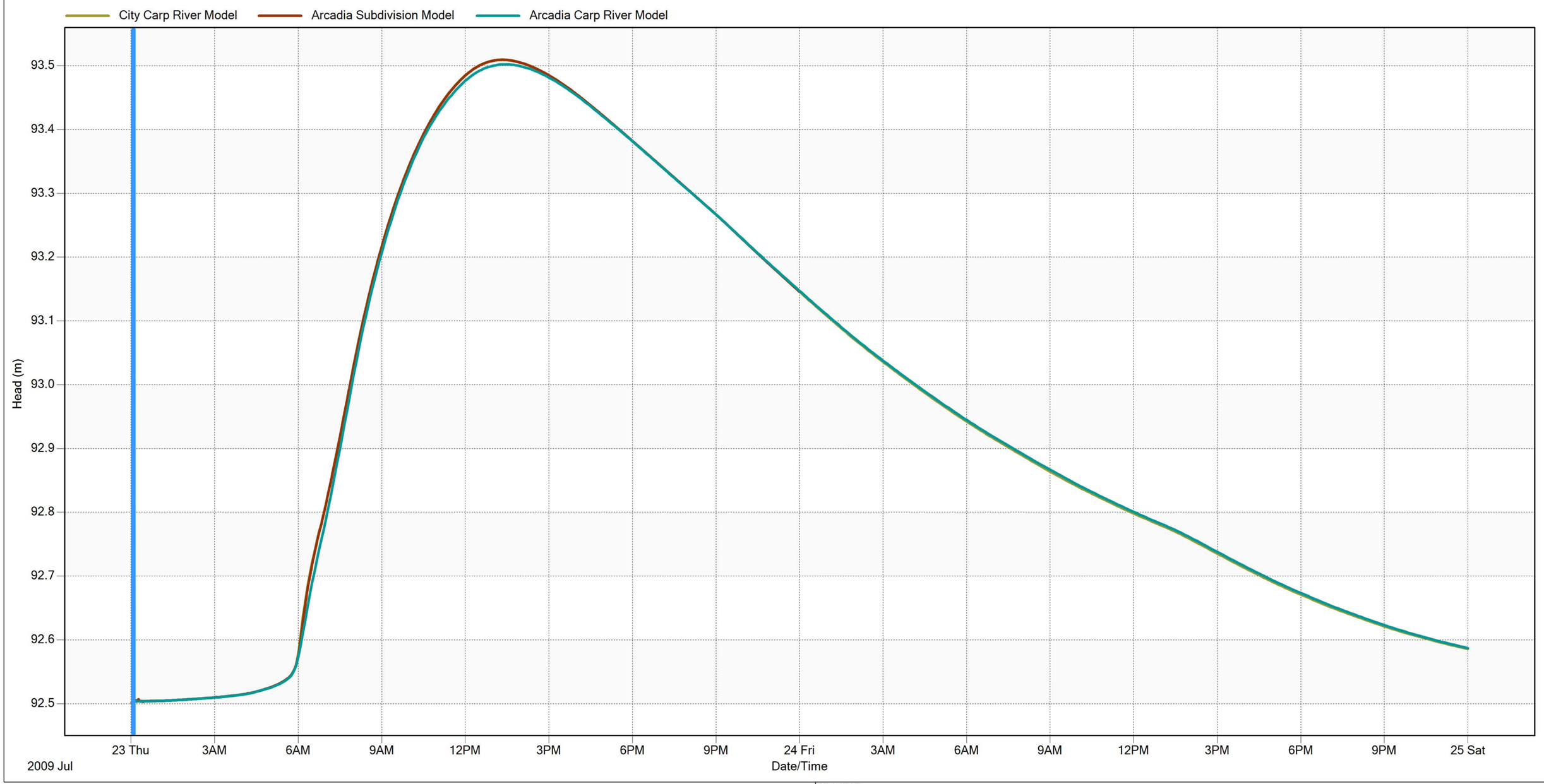
DRAWING:

Two Pond Alternative Results

J.L.Richards
ENGINEERS · ARCHITECTS · PLANNERS

DESIGN:	BP	JLR NO.:	26299
DRAWN:	BP	DRAWING NO.:	Figure 2
CHECKED:			

Node CJ068



Model	Max HGL (m)
Arcadia Carp River Model	93.502
Arcadia Subdivision Model	93.509
City Carp River Model	93.509

PROJECT:

MINTO COMMUNITIES INC. ARCADIA
STAGES 3, 4 & 5 AND COMMERCIAL STAGES 2 & 3

DRAWING:

Comparison of HGL at Node CJ068 in the Carp River

J.L.Richards
ENGINEERS · ARCHITECTS · PLANNERS

DESIGN:	BP	JLR NO.:	26299-01
DRAWN:	BP	DRAWING NO.:	FIGURE 3
CHECKED:	BP		

Appendix E

Water Quality Calculations

Calculation Sheet for Permanent Pool Sizing - One Pond Alternative

Removal Efficiency:	Normal 70% long-term S.S. removal	
SWMP Type:	Wet Pond	
Total Drainage Area:	75.4816	ha
Average Imperviousness:	66%	
Storage Volume (m^3/ha)	125	*(See Table 3.2 from MOECC SWMPDG, copied below)*
Extended Detention Volume (m^3/ha)	40	
Permanent Pool Volume Required:	**6,390**	**m^3**
Extended Detention Volume Required:	**3,020**	**m^3**

Protection Level	**SWMP Type**	**Storage Volume (m^3/ha) for Impervious Level**			
		35%	55%	70%	85%
Enhanced 80% long-term S.S. removal	Infiltration	25	30	35	40
	Wetlands	80	105	120	140
	Hybrid Wet Pond/Wetland	110	150	175	195
	Wet Pond	140	190	225	250
Normal 70% long-term S.S. removal	Infiltration	20	20	25	30
	Wetlands	60	70	80	90
	Hybrid Wet Pond/Wetland	75	90	105	120
	Wet Pond	90	110	130	150
Basic 60% long-term S.S. removal	Infiltration	20	20	20	20
	Wetlands	60	60	60	60
	Hybrid Wet Pond/Wetland	60	70	75	80
	Wet Pond	60	75	85	95
	Dry Pond (Continuous Flow)	90	150	200	240

Calculation Sheet for Permanent Pool Sizing - Two Pond Alternative - PAINE POND

Removal Efficiency:	Normal 70% long-term S.S. removal	
SWMP Type:	Wet Pond	
Total Drainage Area:	58.3579	ha
Average Imperviousness:	62%	
Storage Volume (m^3/ha)	120	*(See Table 3.2 from MOECC SWMPDG, copied below)*
Extended Detention Volume (m^3/ha)	40	
Permanent Pool Volume Required:	**4,650**	**m^3**
Extended Detention Volume Required:	**2,340**	**m^3**

Protection Level	**SWMP Type**	**Storage Volume (m^3/ha) for Impervious Level**			
		35%	55%	70%	85%
Enhanced 80% long-term S.S. removal	Infiltration	25	30	35	40
	Wetlands	80	105	120	140
	Hybrid Wet Pond/Wetland	110	150	175	195
	Wet Pond	140	190	225	250
Normal 70% long-term S.S. removal	Infiltration	20	20	25	30
	Wetlands	60	70	80	90
	Hybrid Wet Pond/Wetland	75	90	105	120
	Wet Pond	90	110	130	150
Basic 60% long-term S.S. removal	Infiltration	20	20	20	20
	Wetlands	60	60	60	60
	Hybrid Wet Pond/Wetland	60	70	75	80
	Wet Pond	60	75	85	95
	Dry Pond (Continuous Flow)	90	150	200	240

Calculation Sheet for Permanent Pool Sizing - Two Pond Option - CAMPEAU POND

Removal Efficiency:	Normal 70% long-term S.S. removal	
SWMP Type:	Wet Pond	
Total Drainage Area:	18.9053	ha
Average Imperviousness:	63%	
Storage Volume (m^3/ha)	120	*(See Table 3.2 from MOECC SWMPDG, copied below)*
Extended Detention Volume (m^3/ha)	40	
Permanent Pool Volume Required:	**1,520**	**m^3**
Extended Detention Volume Required:	**760**	**m^3**

Protection Level	**SWMP Type**	**Storage Volume (m^3/ha) for Impervious Level**			
		35%	55%	70%	85%
Enhanced 80% long-term S.S. removal	Infiltration	25	30	35	40
	Wetlands	80	105	120	140
	Hybrid Wet Pond/Wetland	110	150	175	195
	Wet Pond	140	190	225	250
Normal 70% long-term S.S. removal	Infiltration	20	20	25	30
	Wetlands	60	70	80	90
	Hybrid Wet Pond/Wetland	75	90	105	120
	Wet Pond	90	110	130	150
Basic 60% long-term S.S. removal	Infiltration	20	20	20	20
	Wetlands	60	60	60	60
	Hybrid Wet Pond/Wetland	60	70	75	80
	Wet Pond	60	75	85	95
	Dry Pond (Continuous Flow)	90	150	200	240

Calc Sheet for SWMF Forebay Sizing - Two Pond Alternative - PAINE POND - Main Forebay

Settling Criteria

$$L_{min}=\left(\frac{rQp}{V_S}\right)^{0.5}$$

Where:
- r = length to width ratio at the invert of the inlet pipe
- Q_p = peak outflow during design quality storm
- V_s = settling velocity

Input:
- l = length = 62 m
- w = width = 28 m
- r = 2.21
- Q_p = 0.048 m³/s
- V_s = 0.0003 m/s

L_{min} = 19 m

The peak flow rate from the pond during the quality storm is the 25 mm Event.

Dispersion Criteria

$$L_{min}=\frac{8Q}{dV_f}$$

Where:
- Q = Inlet flowrate (1:10 year Event)
- d = depth of permanent pool (forebay)
- V_f = desired final velocity

Input:
- Q = 7.704 m³/s
- d = 2.0 m
- V_f = 0.5 m/s

L_{min} = 61.70 m

The minimum forebay length is determined by the larger of the settling or dispersion criteria.
Minimum length of forebay required = 61.70 m
Length of Forebay Provided = 62.00 m

Average Forebay Velocity

$$V_{avg}=\frac{Q}{d\,W_{avg}}$$

Where:
- Q = Inlet flowrate (1:10 year Event)
- d = depth of pond during peak 1:100 year inflow
- W_{avg} = average width of forebay

Input:
- Q = 7.704 m³/s
- d = 2.0 m
- W_{avg} = 28 m

V_{avg} = 0.14 m/s <0.15 m/s

Calc Sheet for SWMF Forebay Sizing - Two Pond Alternative - PAINE POND - 2nd Forebay

Settling Criteria

$$L_{min}=\left(\frac{rQp}{V_S}\right)^{0.5}$$

Where:
- r = length to width ratio at the invert of the inlet pipe
- Q_p = peak outflow during design quality storm
- V_s = settling velocity

Input:
- l = length = 20 m
- w = width = 10 m
- r = 2.00
- Q_p = 0.048 m³/s
- V_s = 0.0003 m/s

L_{min} = 18 m

The peak flow rate from the pond during the quality storm is the 25 mm Event.

Dispersion Criteria

$$L_{min}=\frac{8Q}{dV_f}$$

Where:
- Q = Inlet flowrate (1:10 year Event)
- d = depth of permanent pool (forebay)
- V_f = desired final velocity

Input:
- Q = 0.617 m³/s
- d = 2.0 m
- V_f = 0.5 m/s

L_{min} = 5.00 m

The minimum forebay length is determined by the larger of the settling or dispersion criteria.
Minimum length of forebay required = 17.90 m
Length of Forebay Provided = 20.00 m

Average Forebay Velocity

$$V_{avg}=\frac{Q}{d\,W_{avg}}$$

Where:
- Q = Inlet flowrate (1:10 year Event)
- d = depth of pond during peak 1:100 year inflow
- W_{avg} = average width of forebay

Input:
- Q = 0.617 m³/s
- d = 2.0 m
- W_{avg} = 10 m

V_{avg} = 0.04 m/s <0.15 m/s

Calculation Sheet for SWM Facility Forebay Sizing - Two Pond Alternative - CAMPEAU POND

Settling Criteria

$$L_{min}=\left(\frac{rQp}{V_S}\right)^{0.5}$$

Where:
- r = length to width ratio at the invert of the inlet pipe
- Q_p = peak outflow during design quality storm
- V_s = settling velocity

Input:
- l = length = 22 m
- w = width = 10 m
- r = 2.20
- Q_p = 0.017 m³/s
- V_s = 0.0003 m/s

L_{min} = 11 m

The peak flow rate from the pond during the quality storm is the 25 mm Event.

Dispersion Criteria

$$L_{min}=\frac{8Q}{dV_f}$$

Where:
- Q = Inlet flowrate (1:10 year Event)
- d = depth of permanent pool (forebay)
- V_f = desired final velocity

Input:
- Q = 2.571 m³/s
- d = 2.0 m
- V_f = 0.5 m/s

L_{min} = 20.60 m

The minimum forebay length is determined by the larger of the settling or dispersion criteria.
Minimum length of forebay required = 20.60 m
Length of Forebay Provided = 22.00 m

Average Forebay Velocity

$$V_{avg}=\frac{Q}{d\,W_{avg}}$$

Where:
- Q = Inlet flowrate (1:10 year Event)
- d = depth of pond during peak 1:100 year inflow
- W_{avg} = average width of forebay

Input:
- Q = 2.571 m³/s
- d = 2.0 m
- W_{avg} = 10 m

V_{avg} = 0.13 m/s <0.15 m/s

Calculation Sheet for Sediment Storage

	One Pond	Two Pond - PAINE	Two Pond - CAMPEAU
Imperviousness	66%	62%	63%
Drainage Area	75	58	19
Annual Loading / ha	2.59	2.59	2.59
Annual Loading	196	151	49
10 year sediment	**1958**	**1514**	**490**
Slope _:1	4	4	4
Height	1.5	1.0	1.0
Base Length	50	30	30
Base Width	35	22	14
Base Area	1770	660	420
Top Area	904	313	156
Volume	**1970**	**476**	**277**

Appendix F

Feedmill Creek Documents

LEGEND

- FJ005 94.68 — 1:10 YEAR WATER ELEVATION
- EXISTING FLOOD PLAIN (FROM CITY GEOOTTAWA)
- CITY'S PREFERRED LRT CORRIDOR (FROM CITY'S ON-GOING EA)
- FEEDMILL CREEK 100 YEAR FLOOD PLAIN (FROM MVCA)
- REGULATION LIMIT (FROM MVCA)
- ORIGINAL FEEDMILL CREEK RESTORATION
- 80m & 100m WIDE FEEDMILL CREEK CORRIDOR - ANCESTRAL CHANNEL (KANATA WEST IMPLEMENTATION PLAN - CORRIDOR WIDTH LIMITS RATIONALE - 2009)
- 70m WIDE MEANDER BELT (CARP RIVER WATERSHED / SUBWATERSHED STUDY 2004, PRENT AND PARISH ANALYSIS 2000)
- PROPOSED FEEDMILL CREEK CORRIDOR LIMITS
- TOP OF SLOPE (PER PATERSON - DRAWING No. PG2472-5 DATED AUGUST, 2011)
- 13m OFFSET FROM TOP OF SLOPE
- LIMIT OF HAZARD LANDS (PER PATERSON) NOTE: NO HAZARD LIMIT DEFINED SOUTH OF CREEK
- EXISTING EDGE OF CREEK
- 30m OFFSET FROM EDGE OF CREEK
- CENTRELINE OF ANCESTRAL CHANNEL
- 5m BUFFER FROM PRIVATE DEVELOPMENT
- 3m PATHWAY
- EXISTING PATHWAY
- 5m SLOPE BUFFER

No.	ISSUE / REVISION	DD/MM/YY
1	ISSUED FOR CLIENT REVIEW	15/12/17

VERIFY SHEET SIZE AND SCALES. BAR TO THE RIGHT IS 25mm IF THIS IS A FULL SIZE DRAWING. 0 25mm

SCALE: 1:1,000

CLIENT:
MINTO COMMUNITIES INC.
200-180 KENT STREET
OTTAWA, ON
K1P 0B6

CONSULTANT:
J.L.Richards
ENGINEERS · ARCHITECTS · PLANNERS
www.jlrichards.ca

CONSULTANT:

PROFESSIONAL STAMP

PROJECT NORTH

PROJECT:
MINTO COMMUNITIES INC.
ARCADIA RESIDENTIAL STAGES 3, 4, 5; AND COMMERCIAL STAGES 2 & 3
450 HUNTMAR DRIVE

DRAWING:
FEEDMILL CREEK CONSTRAINTS
OPTION 1- ANCESTRAL CHANNEL

DESIGN: LD
DRAWN: TB
CHECKED: GF/LD
JLR #: 26299-01
DRAWING #: 1

PLOT DATE: May 2, 2018 8:38:54 AM

LEGEND

- FJ005 94.68 — 1:10 YEAR WATER ELEVATION
- EXISTING FLOOD PLAIN (FROM CITY GEOOTTAWA)
- CITY'S PREFERRED LRT CORRIDOR (FROM CITY'S ON-GOING EA)
- FEEDMILL CREEK 100 YEAR FLOOD PLAIN (FROM MVCA)
- REGULATION LIMIT (FROM MVCA)
- ORIGINAL FEEDMILL CREEK RESTORATION
- 80 & 100m WIDE FEEDMILL CREEK CORRIDOR - ORIGINAL RESTORATION CORRIDOR (KANATA WEST IMPLEMENTATION PLAN - CORRIDOR WIDTH LIMITS RATIONALE - 2009)
- 70m WIDE MEANDER BELT (CARP RIVER WATERSHED / SUBWATERSHED STUDY 2004, PRENT AND PARISH ANALYSIS 2000)
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- 13m OFFSET FROM TOP OF SLOPE
- LIMIT OF HAZARD LANDS
  NOTE: NO HAZARD LIMIT DEFINED SOUTH OF CREEK
- EXISTING EDGE OF CREEK
- 30m OFFSET FROM EDGE OF CREEK
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No.	ISSUE / REVISION	DD/MM/YY
1	ISSUED FOR CLIENT REVIEW	15/12/17

VERIFY SHEET SIZE AND SCALES. BAR TO THE RIGHT IS 25mm IF THIS IS A FULL SIZE DRAWING. 0 25mm

SCALE: 1:1,000

CLIENT:
MINTO COMMUNITIES INC.
200-180 KENT STREET
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PROFESSIONAL STAMP

PROJECT NORTH

PROJECT:
MINTO COMMUNITIES INC.
ARCADIA RESIDENTIAL STAGES 3, 4, 5; AND COMMERCIAL STAGES 2 & 3
450 HUNTMAR DRIVE

DRAWING:
FEEDMILL CREEK CONSTRAINTS OPTION 2 - ORIGINAL RESTORATION CORRIDOR

DESIGN: LD
DRAWN: TB
CHECKED: GF/LD
JLR #: #####-01
DRAWING #: 2

PLOT DATE: May 2, 2018 8:50:34 AM

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