RICHCRAFT GROUP OF COMPANIES

RICHCRAFT TERRACE FLATS, CRT LANDS (BLOCK 344)

FUNCTIONAL SERVICING REPORT

OCTOBER 15, 2021 COPY

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SERVICING REPORT
COPY

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1 INTRODUCTION

WSP Canada Inc. (WSP) was retained by Richcraft Group of Companies (Richcraft) to complete a Servicing Report for the development of 620 Bobolink Ridge (Block 344) which fronts Embankment Street located in Ottawa, Ontario (See Figure 1). The purpose of this report is to summarize the servicing requirements for the Site Plan Control Agreement Application, including but not limited to the following:

- Transportation System
- Sanitary Servicing
- Potable Water Supply
- Stormwater Management
- Utility Servicing
- Approvals

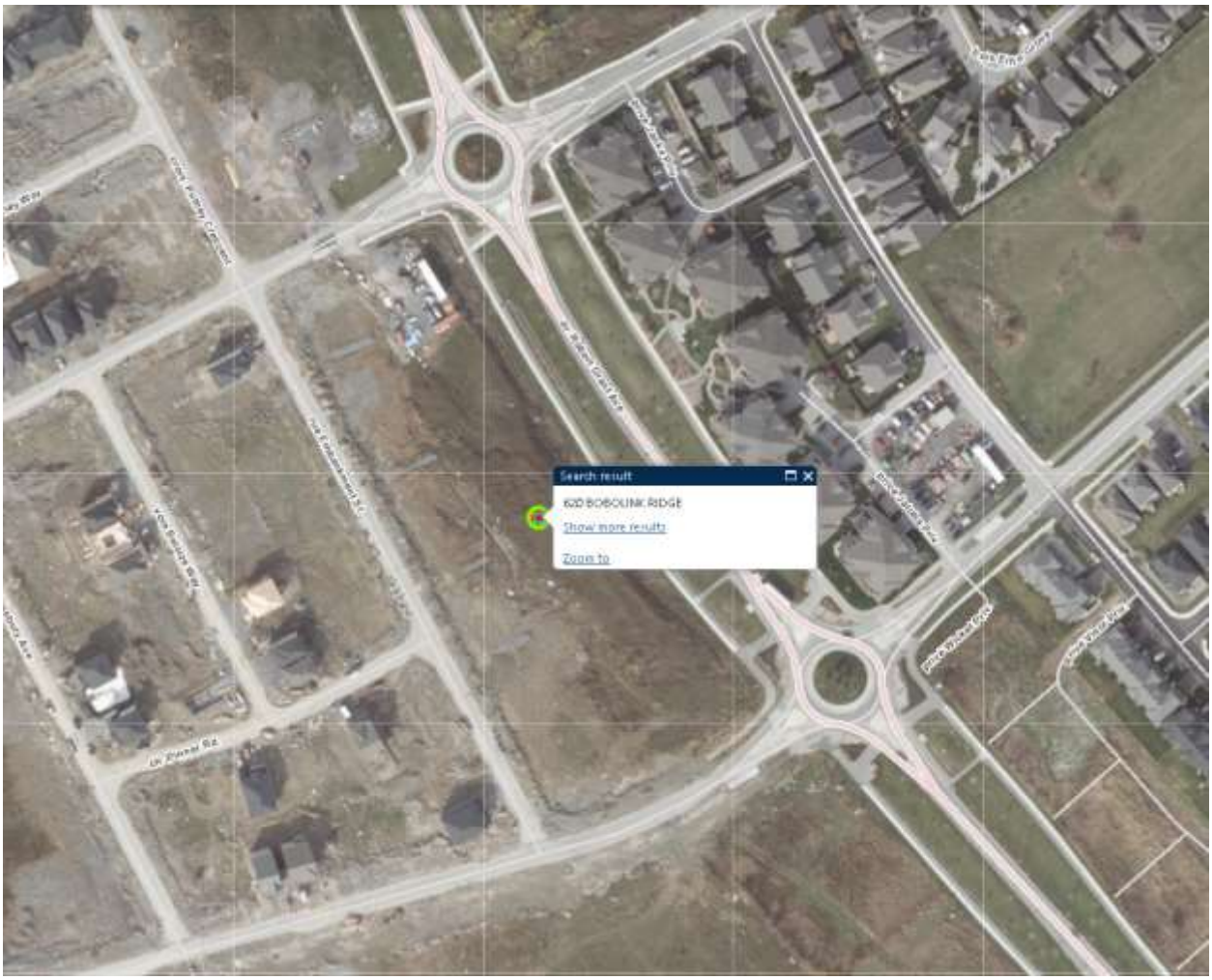

Figure 1: Site Location (Source: GeoOttawa).

2 OBJECTIVE

The objective of the site servicing report is to meet the requirements for the proposed modification of the site while adhering to the stipulations of all relevant master servicing documents and City of Ottawa servicing design guidelines.

3 EXISTING CONDITIONS

3.1 OVERVIEW / EXISTING LAND USE

The site is a greenfield site approximately 1.60 hectares in size and is located between Robert Grant Avenue, Bobolink Ridge, Embankment Street, and Cope Drive. The entire site is described as Block 344 Registered Plan No. 4M-1619 in the City of Ottawa and fronts Embankment Street where there are two (2) access corridors.

The property is currently zoned as "R4Z – Residential Fourth Density Zone" which permits a wide range of residential building forms. Subzone "Z" specifically promotes efficient land use and compact form while showcasing newer design approaches. Refer to Appendix A for the Civil Drawings.

3.2 EXISTING ACCESS AND PARKING

There is currently no existing parking on the site, given its greenfield state. There are however two (2) access corridors which connect Block 344 to Embankment Street. The southern access corridor is located at the intersection of Pinner Road and Embankment Street, while the northern access is approximately 110 m north of the aforementioned intersection.

3.3 EXISTING SANITARY AND WATER SERVICING

Based on as-constructed drawings provided by Richcraft to WSP, sanitary and potable water services have been carried into the site and stubbed for future development connections.

One (1) 200 mm diameter sanitary service stub was previously installed which is located at the site's southern access corridor (at the intersection of Pinner Street and Embankment Street). The service extends eastward from EXMH189A to the rear limits of adjacent residential lots, a length of approximately 40m. The sanitary service stub is reported (based on as-builts mark-ups provided by Richcraft) to have a pipe invert elevation of 103.59 m. Wastewater from the sanitary service will be routed south down Embankment Street, then west along Cope Drive, then north along Goldhank Drive, ultimately discharging to the 600 mm Fernbank trunk sewer located along Abbott Street.

Two (2) 200 mm diameter potable water service stubs were previously installed, one at each of the site's access corridors. Similar to the sanitary service, both water services extent eastward from Embankment Street to the rear limits of adjacent residential lots, each with a length of approximately 42 m. The northern and southern water service stubs are reported (based on as-builts mark-ups provided by Richcraft) to have top of pipe elevations of 105.86 m and 105.80 m, respectively. The existing water service stubs are feed by the existing 200 mm diameter watermain currently located along Embankment Street, which is connected to a larger looped system feed by the 400 mm diameter watermain located along Abbott Street.

Refer to Appendix A (Civil Drawings) for information related to existing services.

3.4 EXISTING TOPOGRAPHY & DRAINAGE

The topographic survey (carried out in March 2021 by Annis O'Sullivan Vollebekk Ltd.) shows the existing site draining from north to south towards the south-east corner of the property, with ground elevations ranging

from105.85 m to 110.55 m. A ridge of fill material (approximately 150m long and several metres in height) was identified along eastward side of the site.

According to the topographic survey, it appears that stormwater sheet flows to the south-east corner of the site. From here, surface inlets capture the stormwater and route it eastward along Cope Drive via storm sewers (600-2400 mm diameter) to Pond 6 of the Fernbank Crossing development.

4 PROPOSED DEVELOPMENT

The proposed development includes seven (7) new 12-unit townhouses, each with a building area of 412 m^2. In addition, an accessory building with a building area of 154 m^2 will be included for centralized storage and garbage collection services. The site will include both private and communal amenity areas totalling 546 m^2 and 980 m^2, respectively. The construction of this development will not be carried out in phases.

The following studies have been completed to support development on this site:

- Geotechnical Investigation - Proposed Residential Development - Kanata - Block 344 620 Bobolink Ridge Ottawa, Ontario (Paterson Group Inc. | Report, Dated March 9, 2021)
- Phase I Environmental Site Assessment (Paterson Group Inc. | Report dated March 2, 2021)
- Roadway Traffic Noise Assessment (Gradient Wind | Report dated June 18, 2021)

The subject site and its associated development constitute part of the CRT Lands Phase 1 – Fernbank Community. As such, numerous studies have been completed facilitate this development. Refer to IBI Group report titled "Design Brief – CRT Lands Phase 1 – Fernbank Community" dated July 2017 for details related to previous studies.

Pre-consultation with the City of Ottawa was held on February 22nd, 2021. Refer to Appendix B for provided relevant documentation, including the completed Servicing Report Checklist.

4.1 ADHERENCE TO ZONING AND RELATED REQUIREMENTS

The proposed property use will be in conformance with zoning and related requirements prior to approval and construction and is understood to be in conformance with current zoning.

4.2 GEOTECHNICAL STUDY

A geotechnical investigation report has been prepared by Paterson Group (Report PG5701-1, March 9, 2021). Its recommendations have been taken into account in the development of the engineering drawings and specifications.

4.3 ACCESS AND PARKING

Access to the site will be provided via two (2) - 6.7 m wide laneways connected to Embankment Street. Once in the site, 6.0 m wide laneways (possessing 12.0 m centerline radii where required for fire access routing) will provide connectivity between units and parking areas.

Parking for both bicycles and vehicles will be provided, 129 exterior vehicle spaces and 50 interior bicycle spaces are currently proposed. Of the 130 parking spaces, two (2) are barrier-free and three (3) are electric vehicle charging stations.

Refer to Appendix A for the Civil Drawings.

4.4 SANITARY SERVICING

4.4.1 PROPOSED SYSTEM DESCRIPTION

The proposed sanitary servicing system a limited to a series of gravity drainage sewers, laterals and manholes which collect wastewater from each blocks and route it to the site outlet (municipal sanitary sewer at intersection of Pinner Road and Embankment Street).

There are no pump stations, forcemains, or syphons in the proposed design.

4.4.2 DESIGN CRITERA

Private sanitary sewers and service laterals for the subject site were designed in accordance with the following publications:

- Sewer Design Guidelines (October 2012) & Technical Bulletins | City of Ottawa
- Design Brief – CRT Lands Phase 1 – Fernbank Community (July 2017) | IBI Group
- Design Guidelines for Sewage Works (2008) | Ministry of the Environment, Conservation, and Parks

Design sanitary flows and associated peaking factors were calculated using a population/unit-based approach using values summarized in Table 1.

Table 1: Sanitary System - Design Values.

Description	Value Used	Source
Population Density	2.7 persons/ townhouse unit	City of Ottawa / IBI Group
Average Daily Flow / Capita	280 l/cap/day	City of Ottawa
Peaking Factor (Harmon)	Min. 2 – Max. 4*	City of Ottawa
Peaking Factor – Correction Factor	0.8	City of Ottawa
Total Extraneous Flow	0.33 l/s/ha	City of Ottawa

*** Refer to the sanitary sewer design sheet (Appendix C) for calculated Harmon peaking factors.**

Based on a review of the geotechnical report (prepared by Paterson Group) there are no local conditions which would warrant the allocation of additional extraneous flows to size the system.

4.4.3 PROPOSED SEWER SIZING

Total sanitary flow for the site was calculated to be 3.07 l/s, corresponding to a population of 227 persons. Sanitary sewer diameters and slopes were selected such that peak flows corresponded to less than 80% of the pipe's conveyance capacity, as well as velocities within the permissible range of 0.6-3.0 m/s. Steps were introduced into the sewers at all bends to accommodate for hydraulics losses in accordance MECP Design Guidelines of Sewage Works (2008).

Refer to Appendix C for detailed sanitary sewer sizing calculations and associated catchment figure (SAN-SK1-1).

4.4.4 ADEQUACY OF MUNICIPAL INFRASTRUCTURE

The sanitary system outlet for the development is an existing 200mm diameter sanitary sewer running from north to south along Embankment street, which constitutes part of the CRT Lands - Phase 1 subdivision development

(designed by IBI). The design of the municipal collection system had assumed a post-development sanitary flow contribution of 2.22 l/s from the subject development. This corresponds to population of 139.5 persons.

Given the proposed peak sanitary flow from the development exceeds the allotted allowance (by 0.85 l/s), a desktop review of IBI sanitary sewer sizing sheets was completed to verify available capacity in the immediate downstream receiving sewers. All downstream sewers (within the CRT Phase 1 lands) are reported to have available capacity in excess of the additional 1.37 l/s required. As a result, no adverse impacts are anticipated for downstream receivers.

Refer to Appendix C for a mark-up of IBI's sizing calculations and associated sanitary catchment map.

4.4.5 PROVISIONS FOR SANITARY FLOW MONITORING

Sanitary manhole SANMH215 - which is located immediately up stream of the site's sanitary system outlet - has been selected to be the City's sanitary flow monitoring station. It was selected based on its location and conductivity for sanitary flow monitoring.

4.5 POTABLE WATER SUPPLY

4.5.1 PROPOSED SYSTEM DESCRIPTION

The proposed potable water supply system is a combination of watermain (ranging from 200mm-300mm), fittings, reducers, hydrants, laterals, blow-offs, and a district metering chambers.

The private system will include two (2) connections to the existing 200mm diameter stubs previous carried into the site. After the connections there will be a metering chambers (see Section 4.5.8), one for each municipal service connection. After the meters, the watermain will run parallel with the site laneway, where branching will occur to supply blocks from parking areas. No looping with the municipal system is proposed based on the presence of check valves within the metering chamber assembly.

Isolation valves, dead-end blow-offs, and fire hydrants will provide in accordance with City of Ottawa water design guides.

Pressure relief valves will be required on townhouse services for Blocks 5, 6, and 7.

4.5.2 DESIGN CRITERIA

Private watermains and water services for the subject site were designed in accordance with the following publications:

- Ottawa Design Guidelines – Water Distribution (July 2010) & Technical Bulletins | City of Ottawa
- Design Brief – CRT Lands Phase 1 – Fernbank Community (July 2017) | IBI Group
- Design Guidelines for Drinking-Water Systems (2008) | Ministry of the Environment, Conservation, and Parks

Domestic water demands and associated peaking factors were calculated using a population/unit-based approach using values summarized in Table 2. Refer to Table 3 for the calculated domestic water demands from each townhouse block and for the entire site.

Table 2: Domestic Demand Design Values.

DESCRIPTION	VALUE USED	SOURCE
Population Density	2.7 persons/ townhouse unit	City of Ottawa / IBI Group
Average Daily Flow / Capita	350 l/cap/day	City of Ottawa / IBI Group
Peaking Factor	Maximum Daily Demand (MDD): 4.02 Maximum Hourly Demand (MHD): 6.04	MECP (Table 3-3) for populations between 0-500. Peaking factors interpolated from table for proposed number of units.

Table 3: Calculated Domestic Water Demands.

	# OF UNITS	AVERAGE DAILY FLOW (L/S)	MAXIMUM DAILY FLOW, MDD (L/S)	MAXIMUM HOURLY DEMAND, MHD (L/S)
Block 1	12	0.13	0.53	0.79
Block 2	12	0.13	0.53	0.79
Block 3	12	0.13	0.53	0.79
Block 4	12	0.13	0.53	0.79
Block 5	12	0.13	0.53	0.79
Block 6	12	0.13	0.53	0.79
Block 7	12	0.13	0.53	0.79
Total	**84**	**0.92 L/s**	**3.69 L/s**	**5.55 L/s**

Refer to Appendix D for detailed water demand calculations.

4.5.3 FIRE FLOW DEMANDS

Required fire flow for the proposed development was determined in accordance with the following two (2) publications. From the two (2) methods used, the highest calculated fire flow was selected for design of the private potable water distribution system.

- Water Supply for Public Fire Protection (1999) | Fire Underwriters Survey (FUS)
- Ontario Building Code (OBC) (2012)

The FUS fire flow was first calculated, as it is typically the governing flow of the two methods. Based on the Architect's building design drawings, WSP has used the following inputs to complete the FUS calculation:

- Wood-Frame Construction
- Limited Combustible Occupancy
- No Sprinklered System
- Worst-Case Building Exposures (found to be Block 3)

Given these inputs, the required fire flow was calculated to be 11,000 l/min (or 183 l/s). As this exceeds the maximum fire flow which can be calculated per OBC (9,000 l/min), FUS was considered to be the governing case and used in the design of the potable water distribution system. Refer to Appendix D for detailed fire flow demand calculations.

4.5.4 WATERMAIN MODELLING & RESULTS

In order to appropriately size the proposed watermains on the site a WaterGEMS (version10.03.01.08) steady-state hydraulic model was constructed.

Five (5) scenarios were simulated to confirm adequacy of the propose watermain design, three (3) of which are related to fire flow analysis for specific areas. All five (5) scenarios have corresponding requirements for residual pressures (under specific demands) in the system which are dictated by the City water distribution design guidelines. Refer to

Table 4 for a summary of model scenarios and associated pressure objectives.

Table 4: Watermain Pressure and Demand Objectives.

ID	SCENARIOS*	System Residual Pressure Thresholds
1	Average Daily Demand (ADD)	345 (50 PSI) - 552 kPa (80 PSI)
2	Maximum Hourly Demand (MHD)	Min. 276 kPa (40 PSI)
3*	Maximum Daily + Fire Flow Demand (MDD+FF) – Block 1 & 2	Min. 140 kPa (20 PSI)
4*	Maximum Daily + Fire Flow Demand (MDD+FF) – Block 3 & 4	Min. 140 kPa (20 PSI)
5*	Maximum Daily + Fire Flow Demand (MDD+FF) – Block 5, 6 & 7	Min. 140 kPa (20 PSI)

*** Refer to Section 4.5.7.**

Boundary conditions for WSP's water model were set through specifying of hydraulic grade lines (HGL) elevations, represented through water levels in reservoirs at the connections to the municipal water distribution system. Refer to Table 5 for HGL elevations provided by the City of Ottawa (refer to Appendix D). It should be noted that watermain boundary condition results provided by the City on May June 22nd, 2021 were based on a single municipal service connection (at the intersection of Pinner Road and Embankment Street) relative to the site's full demand. WSP has conservatively assumed and used the provided boundary condition for both municipal connections, until such a time that revised boundary conditions – based on split demand – are received from the City.

Table 5: Water Model Boundary Conditions.

SCENARIOS	HGL @ EMBANKMENT ST. & PINNER RD. (CONNECTION #1 & 2)*
ADD	161.2
MHD	156.4
MDD+FF	145.0

*** Connections #1 and 2 are possible connection points (on either side of an existing valve) of the private main to the municipal main. Both options resulted in the same boundary condition results.**

The hydraulic analysis concluded that under each demand scenario pressure requirements were satisfied, with the exception of a few areas experiencing pressures slightly higher than 552 kPa (80 PSI) under scenarios #1 (ADD). To accommodate for this, the interior building plumbing system shall include pressure reducing valves on all water services for Blocks 5, 6, and 7. Combined available fire flow from hydrant clusters was found to exceed the required fire flow demand (183 l/s), while residual pressures within the system remained above 140 kPa (20 PSI). Refer to Appendix D for model report outputs and associated map figures.

It should be noted that after initial simulations using one municipal connection (at intersection of Pinner Road and Embankment Street), supply for fire flow demands was found to be insufficient. Therefore, a secondary municipal service connection was found to be required to meet fire flow demand and residual pressure requirements.

4.5.5 WATER AGE CHECK

To ensure the size of the proposed watermain did not jeopardize water quality, a high-level "total time of travel" estimate was carried out to solve for the time required to consume/replenish one (1) full pipe system volume at average day demand. With a pipe system volume of approximately 15.9 m^3 and an average day demand of 0.92 l/s (75.9 m^3/day), the resulting "total time of travel" was calculated to be 0.20 days. It should be noted that this is well below the preferred maximum "total travel time" of 5 days outlined in the City's water distribution system design guidelines.

4.5.6 ADEQUACY OF MUNICIPAL INFRASTRUCTURE

As previously stated, the site's water supply will come from the CRT Lands - Phase 1 subdivision water distribution system (designed by IBI). Design of subdivision's water distribution system included two (2) – 200mm diameter watermains (fed from Embankment Street's watermain) to service the subject site, where the allocation of water demand from the site was split between the two services. The associated design brief had assumed the following total post-development water demands for the site (under the respective scenarios) to size the municipal system:

- ADD: 0.56 l/s
- MDD: 1.38 l/s
- MHD: 3.04 l/s

* theoretical equivalent population of 136 persons.

It should be noted that the currently proposed water demands for the proposed development exceed the allotted allowance.

4.5.7 FIRE HYDRANTS

Fire hydrants were proposed in three (3) clusters based on proximity to principal entrances to jointly combat fires in specific townhome blocks. Within these clusters, fire flow demand has been splits based on maximum fire hydrant discharge capacity. The cluster include:

- Block 1and 2
- Block 3 and 4
- Block 5, 6, and 7

In addition, private fire hydrants were also positioned accordance with Section 3.2.5 of the Ontario Building Code (OBC) to ensure that contributing hydrants were within the maximum spacing of 45.0m between the following:

- on-site hydrants to ideal pumping truck parking locations, and
- ideal pumping truck parking locations to further principal entrances.

Proposed fire hydrants shall be rated to supply minimum flow capacity of 5700 l/min (or 91.5 l/s) corresponding to Type AA (Per City of Ottawa design guidelines).

4.5.8 WATER METERING

Two (2) district water meters have been proposed in the design to allow for measurement of water usage within the property. Based on the size of the connecting service (200mm diameter), water meter in accordance with City of Ottawa standard detail W32 have been proposed. Meter assembly dimensions to be specified by the City.

Two (2) meters are required to accommodate the need for two (2) municipal service connections. As previously stated, a secondary municipal service connection was found to be required to supply the site with adequate fire flow to the site's hydrants.

4.5.9 RELIABILITY REQUIREMENTS

Two (2) shut off valves are provided for the private watermain at the site boundaries, which were previously installed during the greater subdivision development. One (1) valve is present at the end of each access corridor to Embankment Street (at property line).

Two (2) isolation valves have been proposed at each “tee” connection and curb stop valves are proposed each of the unit services. As a result of the proposed valve arrangement, all major branches can be isolated for operation and maintenance purposes.

4.5.10 NEED FOR PRESSURE ZONE BOUNDARY MODIFICATION

There is no need for a pressure zone boundary modification.

4.6 STORMWATER MANAGEMENT

Refer to the Stormwater Management Report (located in Appendix E) for details related to the drainage, storm sewers, stormwater management, erosion and sediment control, hydraulic grade line analysis, foundation drainage, etc.

4.7 HYDRO, COMMUNICATIONS, GAS, AND LIGHTING

Hydro, communications, gas, and lighting will be provided as part of the proposed development and will be designed by others in accordance with the applicable codes/standards. Details related to the servicing from these utilities will be completed later in the detailed design phase of the project.

5 MISCELLANOUS CITY VERIFICATIONS

5.1 ENVIRONMENTAL CONSTRAINTS, ENVIRONMENTALLY SIGNIFICANT AREAS, WATERCOURSES, AND MUNICIPAL DRAINS

There are no watercourses, municipal drains, or environmentally significant areas on the site. The building program proposed for the site is not subject to any restrictions associated with the surrounding lands.

There are no previously identified environmental constraints that impact the sanitary servicing design in order to preserve the physical condition of watercourses, vegetation, or soil cover, or to manage water quantity or quality.

There is no known need for special considerations for sanitary sewer design related to existing site conditions.

5.2 IMPACTS TO PRIVATE SERVICES

There are no existing domestic private services (i.e. septic system and well) located on the site, nor are there neighbouring properties using these private services.

6 APPROVAL AND PERMIT REQUIREMENTS

The proposed development is subject to site plan approval and building permit approval. No approvals related to municipal drains are required. No permits or approvals are anticipated to be required from the Ontario Ministry of Transportation, National Capital Commission, Parks Canada, Public Works and Government Services Canada, or any other provincial or federal regulatory agency.

7 CONCLUSIONS CHECKLIST

7.1 CONCLUSIONS AND RECOMMENDATIONS

It is concluded that the proposed development can meet all provided servicing constraints and associated requirements. It is recommended that this report be submitted to the City of Ottawa in support of the application for site plan approval.

7.2 COMMENTS RECEIVED FROM REVIEW AGENCIES

Comments received from the City of Ottawa are provided in Appendix F.

APPENDIX

A CIVIL DRAWINGS

GENERAL

1. DRAWINGS TO BE READ IN CONJUNCTION WITH ARCHITECTURAL AND LANDSCAPE DRAWINGS.
2. ALL SERVICES, MATERIALS, CONSTRUCTION METHODS AND INSTALLATIONS SHALL BE IN ACCORDANCE WITH THE LATEST STANDARDS AND REGULATIONS OF THE: CITY OF OTTAWA STANDARD SPECIFICATIONS AND DRAWINGS, ONTARIO PROVINCIAL SPECIFICATION STANDARD SPECIFICATION (OPSS) AND ONTARIO PROVINCIAL STANDARD DRAWINGS (OPSD), UNLESS OTHERWISE SPECIFIED, TO THE SATISFACTION OF THE CITY AND THE CONSULTANT.
3. THE POSITION OF EXISTING POLE LINES, CONDUITS, WATERMAINS, SEWERS AND OTHER UNDERGROUND AND ABOVEGROUND UTILITIES, STRUCTURES AND APPURTENANCES IS NOT NECESSARILY SHOWN ON THE CONTRACT DRAWING, AND WHERE SHOWN, THE ACCURACY OF THE POSITION OF SUCH UTILITIES AND STRUCTURES IS NOT GUARANTEED. PRIOR TO CONSTRUCTION, THE CONTRACTOR SHALL SATISFY THEMSELVES OF THE EXACT LOCATION OF ALL SUCH UTILITIES AND STRUCTURES AND SHALL ASSUME ALL LIABILITY FOR DAMAGE TO THEM DURING THE COURSE OF CONSTRUCTION. ANY RELOCATION OF EXISTING UTILITIES REQUIRED BY THE DEVELOPMENT OF SUBJECT LANDS IS TO BE UNDERTAKEN AT CONTRACTOR'S EXPENSE.
4. THE CONTRACTOR MUST NOTIFY ALL EXISTING UTILITY COMPANY OFFICIALS FIVE (5) BUSINESS DAYS PRIOR TO START OF CONSTRUCTION AND HAVE ALL EXISTING UTILITIES AND SERVICES LOCATED IN THE FIELD OR EXPOSED PRIOR TO THE START OF CONSTRUCTION, INCLUDING BUT NOT LIMITED TO POWER, COMMUNICATION AND GAS LINES.
5. ALL TRENCHING AND EXCAVATIONS TO BE IN ACCORDANCE WITH THE LATEST REVISIONS OF THE OCCUPATIONAL HEALTH AND SAFETY ACT AND REGULATIONS FOR CONSTRUCTION PROJECTS AND AS PER THE RECOMMENDATIONS INCLUDED IN THE FOLLOWING GEOTECHNICAL REPORT:
   i. REPORT PG5701-1 PREPARED PATERSON GROUP, DATED MARCH 10, 2021 AND TITLED "GEOTECHNICAL INVESTIGATION - PROPOSED RESIDENTIAL DEVELOPMENT - KANATA - BLOCK 344 - 620 BOBOLINK RIDGE, OTTAWA, ONTARIO".
6. REFER TO ARCHITECTS PLANS FOR BUILDING DIMENSIONS, LAYOUT AND REMOVALS. REFER TO LANDSCAPE PLAN FOR LANDSCAPED DETAILS AND OTHER RELEVANT INFORMATION. ALL INFORMATION SHALL BE CONFIRMED PRIOR TO COMMENCEMENT OF CONSTRUCTION.
7. TOPOGRAPHIC SURVEY COMPLETED AND PROVIDED BY ANNIS, O'SULLIVAN, VOLLEBEKK LTD. DATED ON APRIL 16, 2021. CONTRACTOR TO VERIFY IN THE FIELD PRIOR TO CONSTRUCTION OF ANY WORK AND NOTIFY THE ENGINEER OF ANY DISCREPANCIES.
8. ALL ELEVATIONS ARE GEODETIC AND UTILIZE METRIC UNITS. VERIFY THAT JOB BENCHMARKS HAVE NOT BEEN ALTERED OR DISTURBED.
9. ALL GROUND SURFACES SHALL BE EVENLY GRADED WITHOUT PONDING AREAS AND WITHOUT LOW POINTS EXCEPT WHERE APPROVED SWALE OR CATCH BASIN OUTLETS ARE PROVIDED.
10. ALL EDGES OF DISTURBED PAVEMENT SHALL BE SAW CUT TO FORM A NEAT AND STRAIGHT LINE PRIOR TO PLACING NEW PAVEMENT. PAVEMENT REINSTATEMENT SHALL BE WITH STEP JOINTS OF 500MM WIDTH MINIMUM PER DETAIL 2/C1.7.
11. ALL DISTURBED AREAS OUTSIDE PROPOSED GRADING LIMITS ARE TO BE RESTORED TO ORIGINAL ELEVATIONS AND CONDITIONS UNLESS OTHERWISE SPECIFIED. ALL RESTORATION SHALL BE COMPLETED WITH THE GEOTECHNICAL REQUIREMENTS FOR BACKFILL AND COMPACTION.
12. ABUTTING PROPERTY GRADES TO BE MATCHED UNLESS OTHERWISE SHOWN.
13. CONTRACTOR SHALL OBTAIN AND PAY FOR ALL NECESSARY PERMITS AND APPROVALS FROM THE MUNICIPAL AUTHORITIES PRIOR TO COMMENCING CONSTRUCTION, INCLUDING WATER PERMIT AND ROAD CUT PERMIT.
14. MINIMIZE DISTURBANCE TO EXISTING VEGETATION DURING THE EXECUTION OF ALL WORKS.
15. REMOVE FROM SITE ALL EXCESS EXCAVATED MATERIAL UNLESS OTHERWISE DIRECTED FROM THE ENGINEER. EXCAVATE AND REMOVE ALL ORGANIC MATERIAL AND DEBRIS LOCATED WITHIN THE PROPOSED BUILDING, PARKING AND ROADWAY LOCATIONS.
16. AT PROPOSED UTILITY CONNECTION POINTS AND CROSSINGS (I.E. STORM SEWER, SANITARY SEWER, WATER, ETC.) THE CONTRACTOR SHALL DETERMINE THE PRECISE LOCATION AND DEPTH OF EXISTING UTILITIES AND REPORT ANY DISCREPANCIES OR CONFLICTS TO THE ENGINEER BEFORE COMMENCING WORK.
17. CONTRACTOR TO OBTAIN POST-CONSTRUCTION TOPOGRAPHIC SURVEY, COMPLETED BY OLS OR P.ENG CONFIRMING COMPLIANCE WITH DESIGN GRADING AND SERVICING. SURVEY IS TO INCLUDE LOCATION AND INVERTS FOR BURIED UTILITIES.
18. ABIDE BY RECOMMENDATIONS OF GEOTECHNICAL REPORT. REPORT ANY VARIATIONS IN OBSERVED CONDITIONS FROM THOSE INCLUDED IN REPORT.
19. ADDITIONAL REPORT REFERENCES
   i. DESIGN BRIEF, PREPARED BY IBI GROUP, PROJ. NO. 27970-5.2.2, JULY 2017
20. PROVIDE CCTV INSPECTION REPORT FOR ALL SEWERS AND CATCHBASIN LEADS 200MM DIAMETER AND LARGER. REPEAT CCTV INSPECTION FOLLOWING RECTIFICATION OF ANY DEFICIENCIES.
21. SEWER SERVICE CONNECTIONS TO FLEXIBLE MAIN SEWER PIPES AND RIGID MAIN SEWERS PIPES SHALL BE PER RESPECTIVE CITY OF OTTAWA STANDARD S11, S11.1, AND S11.2.
22. COMMON TRENCHES FOR TOWNHOME SERVICING SHALL BE PER CITY OF OTTAWA STANDARD S11.3.
23. CONTRACTOR TO FIELD VERIFY AND REPORT TO ENGINEER OF RECORD THE ELEVATION, MATERIAL, AND DIAMETER OF EXISTING UTILITIES AT ALL PROPOSED CONNECTIONS PRIOR TO CONSTRUCTION.

24. WATERMAIN

24.1. ALL WATERMAIN AND WATERMAIN APPURTANANCES, MATERIALS, CONSTRUCTION AND TESTING METHODS SHALL CONFORM TO THE CURRENT CITY OF OTTAWA AND MINISTRY OF ENVIRONMENT, CONSERVATION, AND PARKS WATERWORKS GUIDELINES.

24.2. ALL WATERMAIN 300MM DIAMETER AND SMALLER TO BE POLY VINYL CHLORIDE (PVC) CLASS 150 DR 18 MEETING AWWA SPECIFICATION C900.

24.3. ALL WATERMAIN TO BE INSTALLED AT MINIMUM COVER OF 2.4M BELOW FINISHED GRADE. WHERE WATERMAINS CROSS OVER OTHER UTILITIES, A MINIMUM 0.30M CLEARANCE SHALL BE MAINTAINED; WHERE WATERMAINS CROSS UNDER OTHER UTILITIES, A MINIMUM 0.50M CLEARANCE SHALL BE MAINTAINED. WHERE THE MINIMUM SEPARATION CANNOT BE ACHIEVED, THE WATERMAIN SHALL BE INSTALLED AS PER CITY OF OTTAWA STANDARDS W25 AND W25.2. WHERE 2.4M MINIMUM DEPTH CANNOT BE ACHIEVED, THERMAL INSULATION SHALL BE PROVIDED AS PER CITY OF OTTAWA STANDARD W22. WHERE A WATERMAIN IS IN CLOSE PROXIMITY TO AN OPEN STRUCTURE, THERMAL INSULATION SHALL BE PROVIDED AS PER CITY OF OTTAWA STANDARD W23.

24.4. CONCRETE THRUST BLOCKS AND MECHANICAL RESTRAINTS ARE TO BE INSTALLED AT ALL TEES, BENDS, HYDRANTS, REDUCERS, ENDS OF MAINS AND CONNECTIONS 100MM AND LARGER, IN ACCORDANCE WITH CITY OF OTTAWA STANDARDS W25.3 & W25.4.

24.5. CATHODIC PROTECTION REQUIRED FOR ALL IRON FITTINGS AS PER CITY OF OTTAWA STANDARD W40 & W42.

24.6. DOMESTIC WATER SERVICES SHALL BE IN ACCORDANCE WITH CITY STANDARD DETAIL W26.

24.7. ALL VALVES AND VALVE BOXES AND CHAMBERS, HYDRANTS, AND HYDRANT VALVES AND ASSEMBLES SHALL BE INSTALLED AS PER CITY OF OTTAWA STANDARD.

24.8. FIRE HYDRANT LOCATION AND INSTALLATION AS PER CITY OF OTTAWA STANDARD W18 & W19. CONTRACTOR TO PROVIDE FLOW TEST AND PAINTING OF NEW HYDRANT IN ACCORDANCE WITH CITY STANDARDS.

24.9. IF WATERMAIN MUST BE DEFLECTED TO MEET ALIGNMENT, ENSURE THAT THE AMOUNT OF DEFLECTION USED IS LESS THAN HALF THAT RECOMMENDED BY THE MANUFACTURER.

24.10. REFER TO LANDSCAPE DRAWINGS FOR IRRIGATION SYSTEM REQUIREMENTS (IF APPLICABLE).

24.11. WATERMAIN DEAD ENDS SHALL BE IN ACCORDANCE WITH CITY STANDARD DETAIL W37.2

25. SANITARY SEWER AND MANHOLES

25.1. ALL SANITARY SEWER, SANITARY SEWER APPURTENANCES AND CONSTRUCTION METHODS SHALL CONFORM TO THE CURRENT CITY OF OTTAWA STANDARDS AND SPECIFICATIONS. PROVIDE CCTV INSPECTION REPORTS FOR ALL NEW SANITARY PIPING. PROVIDE DYE TESTING FOR NEW SERVICES.

25.2. SANITARY SEWER PIPE SIZE 150MM DIAMETER AND GREATER TO BE PVC SDR-35 (UNLESS SPECIFIED OTHERWISE) WITH RUBBER GASKET TYPE JOINTS IN CONFORMANCE WITH CSA B-182.2,3,4.

25.3. SEWER BEDDING AS PER CITY OF OTTAWA DETAIL S6.

25.4. ALL SANITARY MANHOLES 1200MM IN DIAMETER TO BE AS PER OPSD 701.01. FRAME AND COVER TO BE AS PER CITY OF OTTAWA STANDARD S25 AND S24.

25.5. MAINTENANCE HOLE BENCHING AND PIPE OPENING ALTERNATIVES AS PER THE OPSD 701.021

25.6. ANY NEW OR EXISTING SANITARY SEWER (INCLUDING SERVICE LATERALS) WITH LESS THAN 2.0M COVER REQUIRES THERMAL INSULATION AS PER DETAIL 3/C1.7 OR APPROVED BY THE ENGINEER.

25.7. SANITARY MANHOLE WHICH RESIDE WITHIN 100-YEAR STORMWATER PONDING AREAS SHALL BE EQUIPPED WITH WATER-TIGHT LIDS IN ACCORDANCE WITH CITY STANDARD.

26. STORM SEWERS AND STRUCTURES

26.1. ALL STORM SEWER MATERIALS AND CONSTRUCTION METHODS SHALL CONFORM TO THE CURRENT CITY OF OTTAWA STANDARDS AND SPECIFICATIONS. PROVIDE CCTV INSPECTION REPORTS FOR ALL NEW STORM SEWERS, SERVICES AND CB LEADS.

26.2. STORM SEWERS 450MM DIAMETER AND SMALLER SHALL BE PVC SDR-35, WITH RUBBER GASKET PER CSA A-257.3.

26.3. STORM SEWER LARGER THAN 450MM SHALL BE REINFORCED CONCRETE CLASS 100.

26.4. SEWER BEDDING AS PER CITY OF OTTAWA DETAIL S6.

26.5. ALL STORM MANHOLES TO BE AS PER STORM STRUCTURE TABLE ON DRAWING C1.4 AND C1.5. ALL SANITARY MANHOLES SHALL BE PER ONTARIO PROVINCIAL STANDARDS. FRAME AND COVER TO BE AS PER CITY OF OTTAWA STANDARD S24 AND S25, UNLESS OTHERWISE SPECIFIED.

26.6. ANY NEW OR EXISTING STORM SEWER (INCLUDE SERVICE LATERALS) WITH LESS THAN 2.0M COVER REQUIRES THERMAL INSULATION AS PER DETAIL 3/C1.7 OR APPROVED BY THE ENGINEER.

26.7. CB IN LANDSCAPE AREAS SHALL BE AS PER CITY OF OTTAWA STANDARD S29, S30 AND S31, UNLESS OTHERWISE SPECIFIED.

26.8. ALL CATCHBASIN LEADS TO BE MINIMUM 200MM DIAMETER AT MINIMUM 1.0% SLOPE UNLESS OTHERWISE SPECIFIED.

26.9. STORM CATCHBASINS AS PER OPSD 705.010 AND FRAME/COVER AS PER CITY STANDARD DRAWINGS S19.

26.10. INSTALLATION OF FLOW CONTROL ICD'S TO BE VERIFIED BY QUALITY VERIFICATION ENGINEER RETAINED BY CONTRACTOR.

27. PARKING LOT AND WORK IN PUBLIC RIGHTS OF WAY

27.1. CONTRACTOR TO REINSTATE ROAD CUTS AS PER CITY OF OTTAWA DETAIL R10.

27.2. CONTRACTOR TO PREPARE SUBGRADE, INCLUDING PROOFROLLING, TO THE SATISFACTION OF THE GEOTECHNICAL CONSULTANT PRIOR TO THE COMMENCEMENT OF PLACEMENT OF SUB-BASE MATERIAL.

27.3. FILL TO BE PLACED AND COMPACTED PER THE GEOTECHNICAL REPORT REQUIREMENTS.

27.4. CONTRACTOR TO SUPPLY, PLACE AND COMPACT SUB-BASE MATERIAL IN ACCORDANCE WITH THE RECOMMENDATIONS OF THE GEOTECHNICAL CONSULTANT. CONTRACTOR TO PROVIDE CONSULTANT WITH SAMPLES OF SUB-BASE MATERIAL FOR TESTING AND CERTIFICATION FROM THE GEOTECHNICAL CONSULTANT THAT THE MATERIAL MEETS THE GRADATION REQUIREMENTS SPECIFIED IN THE GEOTECHNICAL REPORT.

27.5. BASE MATERIAL TO BE PLACED ONLY UPON APPROVAL BY THE GEOTECHNICAL CONSULTANT OF SUB-BASE PLACEMENT.

27.6. CONTRACTOR TO SUPPLY, PLACE AND COMPACT BASE MATERIAL IN ACCORDANCE WITH THE RECOMMENDATIONS OF THE GEOTECHNICAL CONSULTANT. CONTRACTOR TO PROVIDE CONSULTANT WITH SAMPLES OF BASE MATERIAL FOR TESTING AND CERTIFICATION FROM THE GEOTECHNICAL CONSULTANT THAT THE MATERIAL MEETS THE GRADATION REQUIREMENTS SPECIFIED IN THE GEOTECHNICAL REPORT.

27.7. ASPHALT MATERIAL TO BE PLACED ONLY UPON APPROVAL BY THE GEOTECHNICAL CONSULTANT OF BASE PLACEMENT.

27.8. CONTRACTOR TO SUPPLY, PLACE AND COMPACT ASPHALT MATERIAL IN ACCORDANCE WITH THE RECOMMENDATIONS OF THE GEOTECHNICAL CONSULTANT. CONTRACTOR TO PROVIDE CONSULTANT WITH SAMPLES OF ASPHALT MATERIAL FOR TESTING AND CERTIFICATION FROM THE GEOTECHNICAL CONSULTANT THAT THE MATERIAL MEETS THE REQUIREMENTS SPECIFIED IN THE GEOTECHNICAL REPORT.

27.9. CONTRACTOR IS RESPONSIBLE FOR ESTABLISHING LINE AND GRADE IN ACCORDANCE WITH THE PLANS, AND FOR PROVIDING THE CONSULTANT WITH VERIFICATION PRIOR TO PLACEMENT.

27.10. ALL EXCESS MATERIAL TO BE HAULED OFF-SITE AND DISPOSED OF AT AN APPROVED DUMP SITE. SHOULD THE CONTRACTOR DISCOVER ANY HAZARDOUS MATERIAL, CONTRACTOR IS TO NOTIFY CONSULTANT. CONSULTANT TO DETERMINE APPROPRIATE DISPOSAL METHOD/LOCATION.

27.11. PAVEMENT STRUCTURE (MATERIAL TYPES AND THICKNESS) FOR HEAVY DUTY AND LIGHT DUTY AREAS TO BE AS SPECIFIED IN THE GEOTECHNICAL REPORT AND SHOWN ON THE PLANS.

28. EROSION AND SEDIMENT CONTROL

** CONTRACTOR IS RESPONSIBLE FOR ALL INSTALLATION, MONITORING, REPAIR AND REMOVAL OF ALL EROSION AND SEDIMENT CONTROL FEATURES. **

1. PRIOR TO START OF CONSTRUCTION:
   1.1. INSTALL SILT FENCE IN LOCATION SHOWN ON DWG C1.8.
   1.2. INSTALL FILTER FABRIC OR SILT SACK FILTERS IN ALL THE CATCHBASINS AND MANHOLES TO REMAIN DURING CONSTRUCTION WITHIN THE SITE (SEE DETAIL 8/C1.7).
   1.3. INSPECT MEASURES IMMEDIATELY AFTER INSTALLATION.
2. DURING CONSTRUCTION:
   2.1. MINIMIZE THE EXTENT OF DISTURBED AREAS AND THE DURATION OF EXPOSURE AND IMPACTS TO EXISTING GRADING.
   2.2. PERIMETER VEGETATION TO REMAIN IN PLACE UNTIL PERMANENT STORM WATER MANAGEMENT IS IN PLACE. OTHERWISE, IMMEDIATELY INSTALL SILT FENCE WHEN THE EXISTING SITE IS DISTURBED AT THE PERIMETER.
   2.3. PROTECT DISTURBED AREAS FROM OVERLAND FLOW BY PROVIDING TEMPORARY SWALES TO THE SATISFACTION OF THE FIELD ENGINEER. TIE-IN TEMPORARY SWALE TO EXISTING CATCH BASINS AS REQUIRED.
   2.4. PROVIDE TEMPORARY COVER SUCH AS SEEDING OR MULCHING IF DISTURBED AREA WILL NOT BE REHABILITATED WITHIN 30 DAYS.
   2.5. INSPECT SILT FENCES, FILTER FABRIC FILTERS AND CATCH BASIN SUMPS WEEKLY AND WITHIN 24 HOURS AFTER A STORM EVENT. CLEAN AND REPAIR WHEN NECESSARY.
   2.6. SEDIMENT AND EROSION CONTROL PLAN DRAWING TO BE REVIEWED AND REVISED AS REQUIRED DURING CONSTRUCTION.
   2.7. EROSION CONTROL FENCING TO BE INSTALLED AROUND THE BASE OF ALL STOCKPILES.
   2.8. DO NOT LOCATE TOPSOIL PILES AND EXCAVATION MATERIAL CLOSER THAN 2.5M FROM ANY PAVED SURFACE, OR ONE WHICH IS TO BE PAVED BEFORE THE PILE IS REMOVED. ALL TOPSOIL PILES ARE TO BE SEEDED IF THEY ARE TO REMAIN ON-SITE LONG ENOUGH FOR SEEDS TO GROW (LONGER THAN 30 DAYS).
   2.9. CONTROL WIND-BLOWN DUST OFF-SITE BY SEEDING TOPSOIL PILES AND OTHER AREAS TEMPORARILY (PROVIDE WATERING AS REQUIRED AND TO THE SATISFACTION OF THE ENGINEER).
   2.10. NO ALTERNATE METHODS OF EROSION PROTECTION SHALL BE PERMITTED UNLESS APPROVED BY THE FIELD ENGINEER.
   2.11. CITY ROADWAY AND SIDEWALK TO BE CLEANED OF ALL SEDIMENT FROM VEHICULAR TRACKING AS REQUIRED.
   2.12. DURING WET CONDITIONS, TIRES OF ALL VEHICLES/EQUIPMENT LEAVING THE SITE ARE TO BE SCRAPED.
   2.13. ANY MUD/MATERIAL TRACKED ONTO THE ROAD SHALL BE REMOVED IMMEDIATELY BY HAND OR RUBBER TIRE LOADER.
   2.14. TAKE ALL NECESSARY STEPS TO PREVENT BUILDING MATERIAL, CONSTRUCTION DEBRIS OR WASTE BEING SPILLED OR TRACKED ONTO ABUTTING PROPERTIES OR PUBLIC STREETS DURING CONSTRUCTION AND PROCEED IMMEDIATELY TO CLEAN UP ANY AREAS SO AFFECTED.
   2.15. ALL EROSION CONTROL STRUCTURE TO REMAIN IN PLACE UNTIL ALL DISTURBED GROUND SURFACES HAVE BEEN STABILIZED EITHER BY PAVING OR RESTORATION OF VEGETATIVE GROUND COVER.
   2.16. THE CONTRACTOR SHALL IMPLEMENT BEST MANAGEMENT PRACTICES, TO PROVIDE FOR PROTECTION OF THE AREA DRAINAGE SYSTEM AND THE RECEIVING WATERCOURSE, DURING CONSTRUCTION ACTIVITIES. THE CONTRACTOR ACKNOWLEDGES THAT FAILURE TO IMPLEMENT APPROPRIATE EROSION AND SEDIMENT CONTROL MEASURES MAY BE SUBJECT TO PENALTIES IMPOSED BY ANY APPLICABLE REGULATORY AGENCY.

INLET CONTROL DEVICE (ICD) SCHEDULE

HOST STRUCTURE	ICD POSITION (DIRECTION & INLET/ OUTLET)	INVERT ELEV. (m)	ORIFICE DIA. (mm)	PEAK DISCHARGE (L/S) 2-YEAR	PEAK DISCHARGE (L/S) 100-YEAR	ACTING HEAD (m) 2-YEAR	ACTING HEAD (m) 100-YEAR
CB03	NORTH (OUTLET)	105.85	75	15	19	1.38	2.37
CB04	WEST (OUTLET)	105.80	60	8	12	1.05	2.35
CB06	EAST (OUTLET)	105.95	43	3	6	0.58	2.28
CB07	EAST (OUTLET)	105.95	43	3	6	0.58	2.28
CB08	WEST (OUTLET)	105.50	75	18	20	1.88	2.49
CB10	WEST (OUTLET)	105.65	60	7	12	0.80	2.38
CB11	WEST (OUTLET)	105.80	80	17	22	1.49	2.36
CB12	WEST (OUTLET)	105.81	60	7	12	0.80	2.29
CBMH13	WEST (OUTLET)	105.80	75	18	21	1.98	3.14
CB14	SOUTH (OUTLET)	105.75	53	6.5	9.5	1.04	2.34
CB15	NORTH (OUTLET)	105.75	53	6.5	9.5	0.95	2.34
CB16	WEST (OUTLET)	105.51	50	5	9	0.92	2.35
MH409	WEST (OUTLET)	104.81	190	49	64	0.76	1.24
RYCB02	SOUTH (OUTLET)	106.05	75	4	13	0.13	1.06
RYCB09	WEST (OUTLET)	105.69	60	8	12	0.89	2.37
RYCB18	SOUTHWEST (OUTLET)	105.39	120	14	34	0.23	1.17

NOTES:

1. TABLE SHALL BE READ IN CONJUNCTION WITH SITE STORMWATER MANAGEMENT REPORT (DATED OCTOBER 15, 2021, PREPARED BY WSP CANADA INC.).
2. WHERE ICD DIAMETERS ARE LESS THAN 75mm (REQUIRED MINIMUM PER MECP), MANUFACTURED LOW-FLOW ICDS WILL BE REQUIRED WITH SIMILAR DISCHARGE PERFORMANCE NOTED ACTIVE HEAD. PROPOSED DEVICES SHALL BE SUBJECT TO ENGINEER'S REVIEW AND APPROVAL.
3. UNLESS OTHERWISE SPECIFIED, ALL INLET CONTROL DEVICES (ICD'S) SHALL BE ORIFICE PLATES COMPOSED OF STAINLESS STEEL, BOLTED TO THE INSIDE OF THE REFERENCED STRUCTURES. ANY GAP BETWEEN PLATE PERIMETER AND STRUCTURE WALL SHALL BE SEALED USING A MASTIC SEALANT.

ALIGNMENT DATA

START STATION	END STATION	DESCRIPTION
1+000	1+278.75	MADDER STREET
2+000	2+052.73	NORTH ENTRANCE
3+000	3+052.60	SOUTH ENTRANCE
4+000	4+040.18	NORTH PARKING LOT
5+000	5+040.18	SOUTH PARKING LOT

TEMPORARY BENCH MARKS

TBM #	NORTHING (m)	EASTING (m)	ELEVATION (m)	DESCRIPTION
1	5014544.60	352417.98	109.680	FIRE HYDRANT TOP OF SPINDLE
2	5014377.94	352507.78	109.170	FIRE HYDRANT TOP OF SPINDLE

EXISTING LEGEND:

- EDGE OF PAVEMENT
- CURB
- BOTTOM OF SLOPE
- TOP OF SLOPE
- 99.00 MAJOR CONTOURS
- MINOR CONTOURS
- OW OVERHEAD WIRE
- GUY ANCHOR
- W WATERMAIN
- ST STORM SEWER
- SA SANITARY SEWER
- GAS GAS
- UG UNDERGROUND
- C CABLE
- S SWALE
- X X FENCE
- PROPERTY BOUNDARY
- TBM# SITE TEMPORARY BENCH MARK
- TP # TEST PIT LOCATION
- UP UTILITY POLE
- STREET LIGHT
- ROAD SIGN
- TRANSFORMER
- CULVERT
- ASPHALT
- SIDEWALK
- BUILDING

REMOVAL LEGEND:

- W WATER SERVICE REMOVAL
- CURB REMOVAL
- TYPICAL REMOVAL
- TYPICAL RELOCATION
- PARTIAL DEPTH ASPHALT REMOVAL

ESC LEGEND:

- LIGHT DUTY SILT FENCE (OPSD 219.110)
- FILTER CLOTH PROTECTION
- MUD MAT

PROPOSED LEGEND:

- ALIGNMENT
- EDGE OF PAVEMENT
- CONCRETE BARRIER CURB
- W WATERMAIN
- S S WATER SERVICE
- ST STORM SEWER
- STORM SUBDRAIN
- SA SANITARY SEWER
- S S SANITARY SERVICE
- JUT JOINT UTILITY TRENCH
- GRADING TOP OF SLOPE
- GRADING BOTTOM OF SLOPE
- S SWALE
- SS SWALE c/w SUBDRAIN
- 100mm LINE PAINTING
- 1.8m HIGH PVC FENCE
- TERRACING
- STORM MANHOLE
- REAR YARD CATCH BASIN/ CLEAN OUT
- CATCH BASIN MANHOLE
- CATCH BASIN
- SANITARY MANHOLE
- FIRE HYDRANT
- WATERMAIN VALVE
- TWSI
- BUILDING ENTRANCE
- SIGN
- 105.00 GRADE ELEVATION
- 105.00 IBI DESIGN GRADE
- 105.00 (T/B) TOP OF BERM GRADE ELEVATION
- FULL DEPTH ASPHALT
- PARTIAL DEPTH ASPHALT
- CONCRETE SIDEWALK
- ASPHALT SIDEWALK
- BUILDING
- RIVER STONE

FFE = FINISHED FLOOR ELEVATION
T/FD = TOP OF FOUNDATION
USF = UNDER SIDE OF FOOTING
MUSF = MIN. UNDER SIDE OF FOOTING

WSP
1224 GARDINERS ROAD, SUITE 201
KINGSTON, ONTARIO
CANADA K7P 0G2
PHONE: 613-634-7373
WWW.WSP.COM

CONSULTANT:
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2021.10.15
PROVINCE OF ONTARIO

LICENSED PROFESSIONAL ENGINEER
S. P. DAVIDSON
100133944
2021.10.15
PROVINCE OF ONTARIO

CLIENT:
RICHCRAFT Group Of Companies

CLIENT REF. #:

PROJECT:
TERRACE FLATS

KEY PLAN:

ISSUED FOR - REVISION:

IS	RE	DATE	DESCRIPTION
2		2021-10-15	RE-ISSUED FOR SPA
1		2021-07-07	ISSUED FOR SPA

PROJECT NO: 211-01221-00
DATE: MARCH 2021
ORIGINAL SCALE: N/A
IF THIS BAR IS NOT 25mm LONG, ADJUST YOUR PLOTTING SCALE.
DESIGNED BY: DS
DRAWN BY: MH
CHECKED BY: SD
25mm

DISCIPLINE: CIVIL

TITLE: GENERAL NOTES & LEGEND

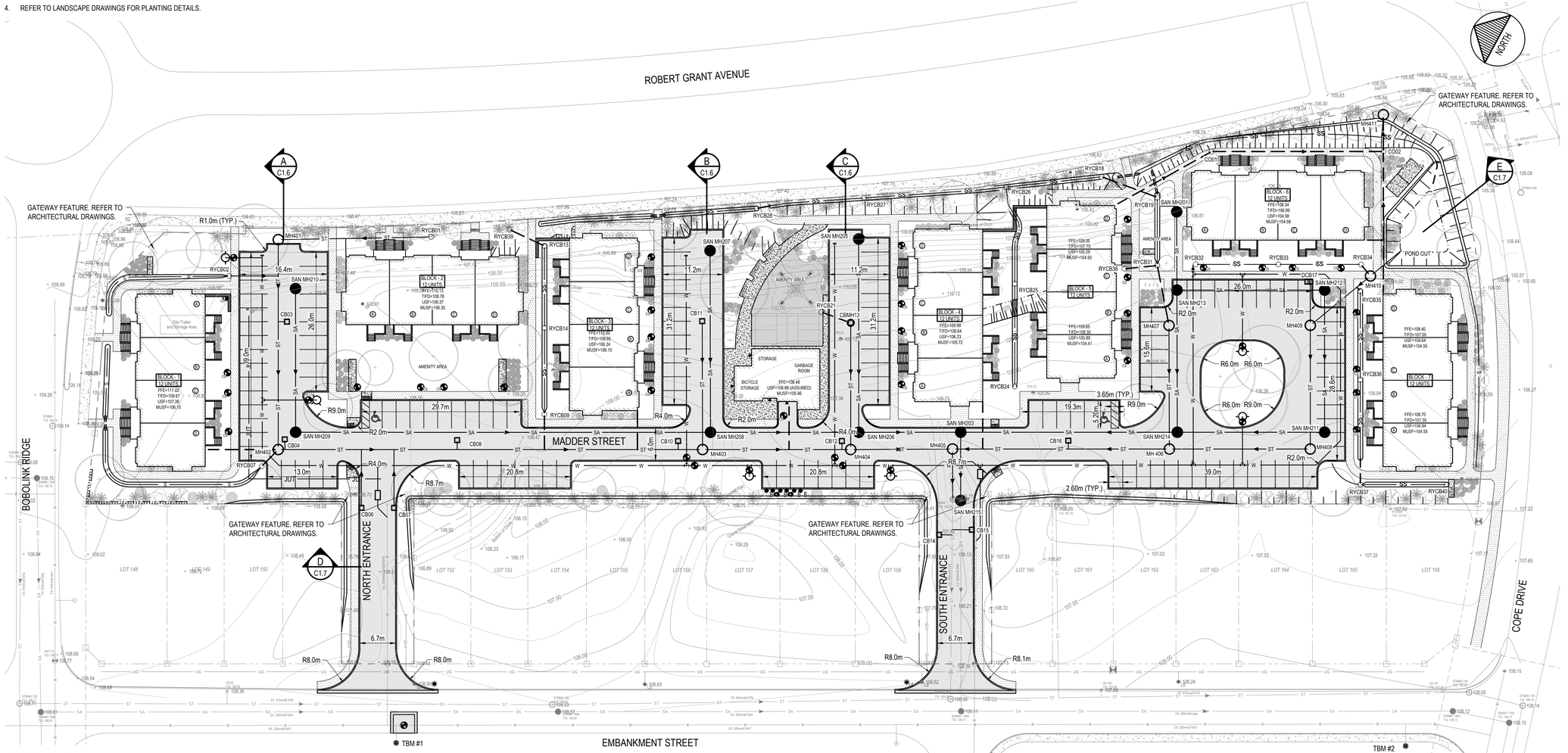
SHEET NUMBER: C0.1
SHEET #: 1 OF 10

ISSUE: RE-ISSUED FOR SPA
REV #: 1
DATE OF: OCTOBER 15, 2021

M:\2021\211-01221-00 - Richcraft Terrace Flats Site Plan\Drawings\01 Civil\01 Production\211-01221-00 GN.dwg Oct 15, 2021 - 12:26pm BY (burbhm)
CITY FILE NO. D07-12-21-0107
CITY PLAN NO. 1848

NOTES:

1. REFER TO DRAWING C0.1 FOR NOTES AND FULL LEGEND.
2. ALL CURB RADII SHALL BE 1.0m UNLESS OTHERWISE NOTED.
3. WATER AND SANITARY SERVICES ARE NOT SHOWN FOR CLARITY.
4. REFER TO LANDSCAPE DRAWINGS FOR PLANTING DETAILS.



PROPOSED LEGEND:

ALIGNMENT	CATCH BASIN MANHOLE
EDGE OF PAVEMENT	CATCH BASIN
CONCRETE BARRIER CURB	SANITARY MANHOLE
W — WATERMAIN	FIRE HYDRANT
WATER SERVICE	WATERMAIN VALVE
ST — STORM SEWER	TWSI
STORM SUBDRAIN	BUILDING ENTRANCE
SA — SANITARY SEWER	SIGN
SANITARY SERVICE	105.00 GRADE ELEVATION
JUT — JOINT UTILITY TRENCH	105.00 IBI DESIGN GRADE
GRADING TOP OF SLOPE	105.00 (T/B) TOP OF BERM GRADE ELEVATION
GRADING BOTTOM OF SLOPE	FULL DEPTH ASPHALT
S — SWALE	PARTIAL DEPTH ASPHALT
SS — SWALE c/w SUBDRAIN	CONCRETE SIDEWALK
100mm LINE PAINTING	ASPHALT SIDEWALK
1.8m HIGH PVC FENCE	BUILDING
TERRACING	RIVER STONE
STORM MANHOLE	
REAR YARD CATCH BASIN/	

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SEAL:

LICENSED PROFESSIONAL ENGINEER — D. D. SEARLE — 100503356 — 2021.10.15 — PROVINCE OF ONTARIO

LICENSED PROFESSIONAL ENGINEER — S.P. DAVIDSON — 100133944 — 2021.10.15 — PROVINCE OF ONTARIO

CLIENT:
RICHCRAFT Group Of Companies

CLIENT REF. #:

PROJECT:
TERRACE FLATS

KEY PLAN:

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IS	RE	DATE	DESCRIPTION
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1		2021-07-07	ISSUED FOR SPA

PROJECT NO: 211-01221-00
DATE: MARCH 2021
ORIGINAL SCALE: 1:400
IF THIS BAR IS NOT 25mm LONG, ADJUST YOUR PLOTTING SCALE.
25mm
DESIGNED BY: DS
DRAWN BY: MH
CHECKED BY: SD

DISCIPLINE: CIVIL

TITLE:
TERRACE FLATS
GENERAL ARRANGEMENT PLAN

SHEET NUMBER: C1.1
SHEET #: 2 OF 10

ISSUE: RE-ISSUED FOR SPA
DATE OF: OCTOBER 15, 2021
REV #: 1

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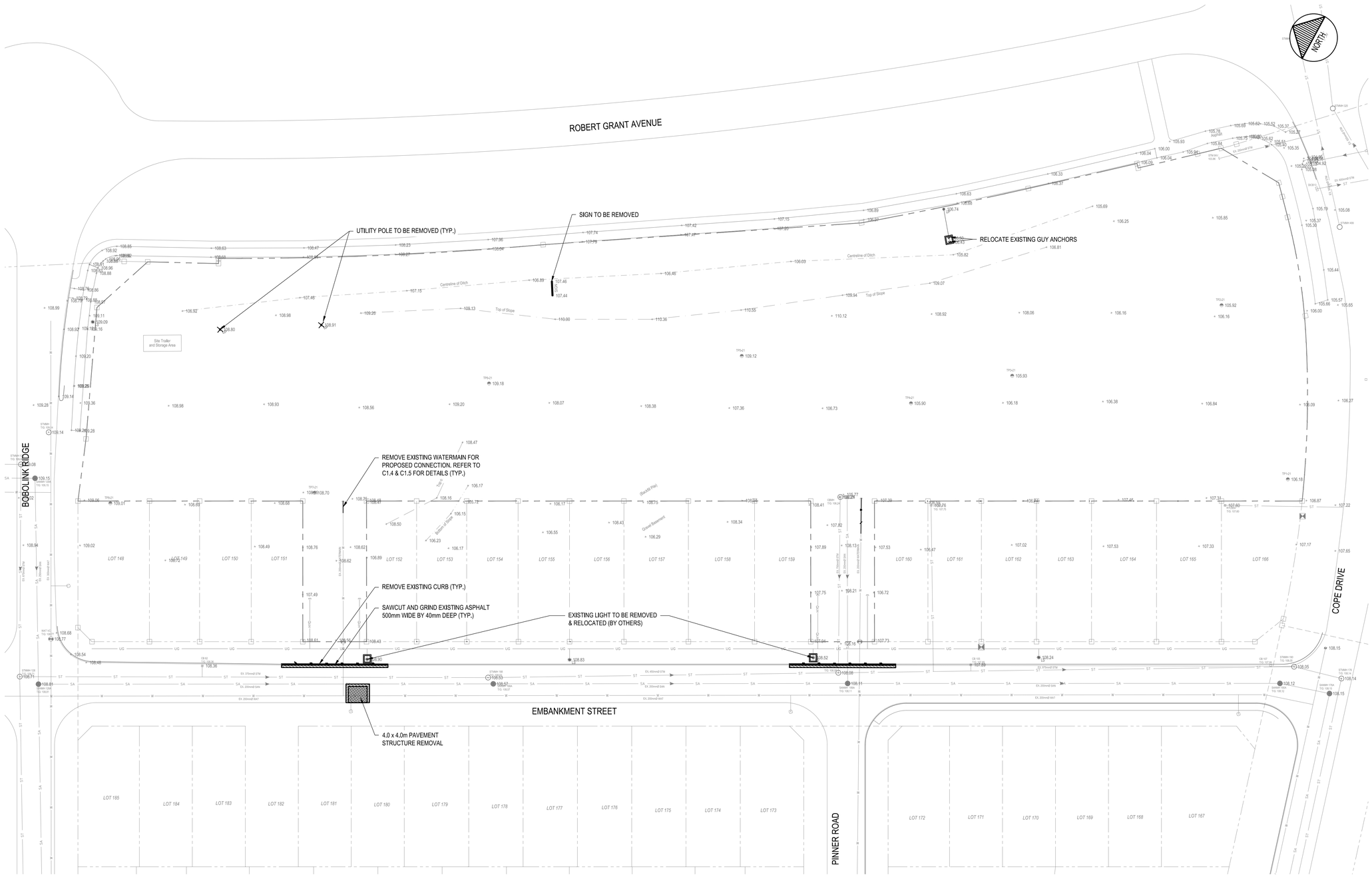
CITY FILE NO. D07-12-21-0107
CITY PLAN NO. 1848

NOTES:

1. REFER TO DRAWING C0.1 FOR NOTES AND FULL LEGEND.



REMOVAL LEGEND:

- WATER SERVICE REMOVAL
- CURB REMOVAL
- TYPICAL REMOVAL
- TYPICAL RELOCATION
- PARTIAL DEPTH ASPHALT REMOVAL

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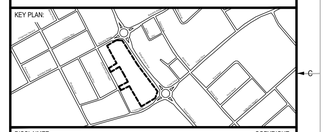

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IS	RE	DATE	DESCRIPTION
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1		2021-07-07	ISSUED FOR SPA

PROJECT NO: 211-01221-00

DATE: MARCH 2021

ORIGINAL SCALE: 1:400

IF THIS BAR IS NOT 25mm LONG, ADJUST YOUR PLOTTING SCALE.

25mm

DESIGNED BY: DS

DRAWN BY: MH/JT

CHECKED BY: SD

DISCIPLINE: CIVIL

TITLE:

TERRACE FLATS
REMOVAL PLAN

SHEET NUMBER: R1.0

SHEET #: 3 OF 10

ISSUE: RE-ISSUED FOR SPA

DATE OF: OCTOBER 15, 2021

REV #: 1

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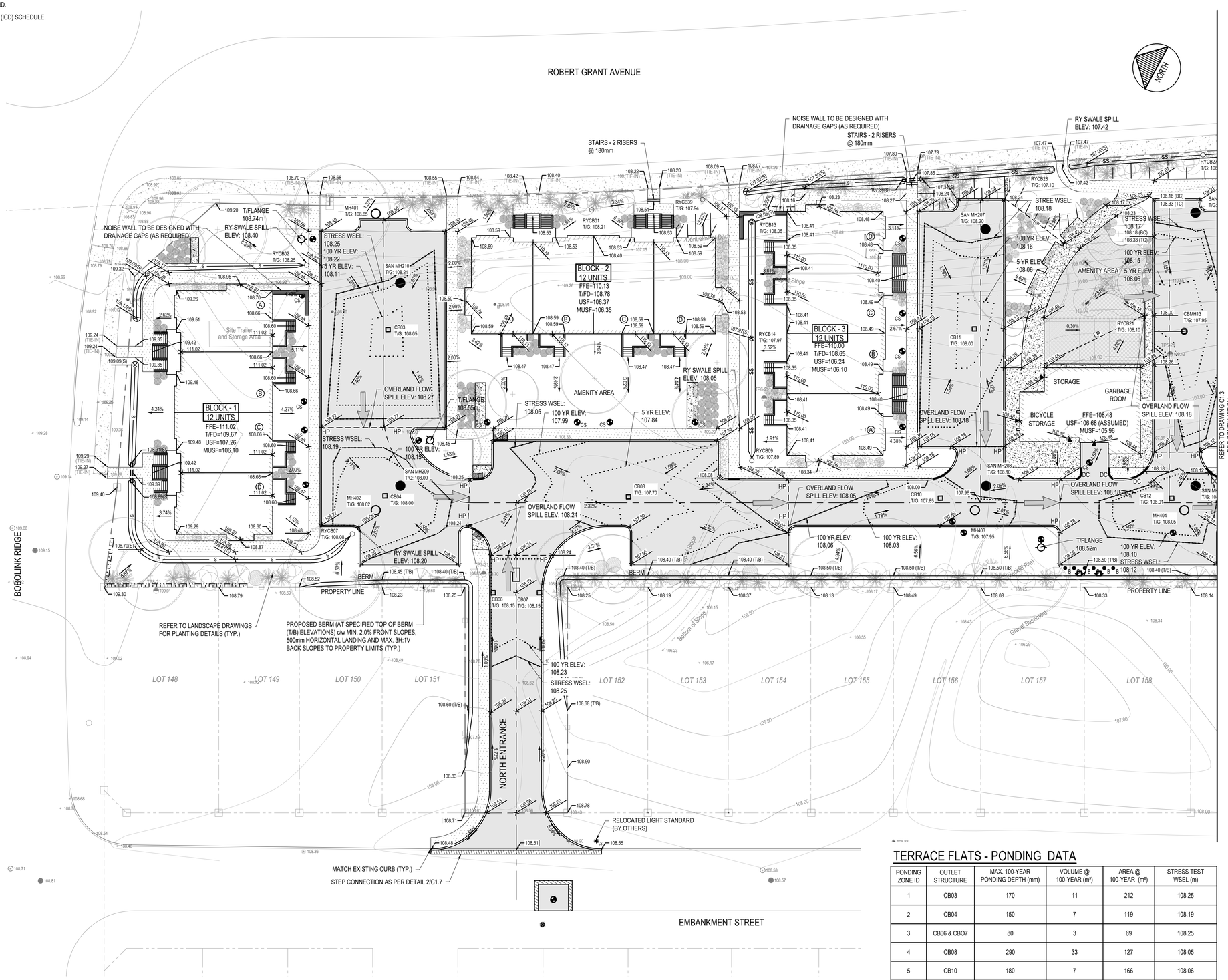
CITY FILE NO. D07-12-21-0107 CITY PLAN NO. I9498

NOTES:

1. REFER TO DRAWING C0.1 FOR NOTES AND FULL LEGEND.
2. REFER TO DRAWING C0.1 FOR INLET CONTROL DEVICE (ICD) SCHEDULE.

PROPOSED LEGEND:

- ALIGNMENT
- EDGE OF PAVEMENT
- CONCRETE BARRIER CURB
- W — WATERMAIN
- WATER SERVICE
- ST — STORM SEWER
- STORM SUBDRAIN
- SA — SANITARY SEWER
- SANITARY SERVICE
- JUT — JOINT UTILITY TRENCH
- GRADING TOP OF SLOPE
- GRADING BOTTOM OF SLOPE
- S — SWALE
- SS — SWALE c/w SUBDRAIN
- 100mm LINE PAINTING
- 1.8m HIGH PVC FENCE
- TERRACING
- STORM MANHOLE
- REAR YARD CATCH BASIN/ CLEAN OUT
- CATCH BASIN MANHOLE
- CATCH BASIN
- SANITARY MANHOLE
- FIRE HYDRANT
- WATERMAIN VALVE
- TWSI
- BUILDING ENTRANCE
- SIGN
- 105.00 — GRADE ELEVATION
- 105.00 — IBI DESIGN GRADE
- 105.00 (T/B) — TOP OF BERM GRADE ELEVATION
- FULL DEPTH ASPHALT
- PARTIAL DEPTH ASPHALT
- CONCRETE SIDEWALK
- ASPHALT SIDEWALK
- BUILDING
- RIVER STONE
- MAJOR FLOW ROUTING



TERRACE FLATS - PONDING DATA

PONDING ZONE ID	OUTLET STRUCTURE	MAX. 100-YEAR PONDING DEPTH (mm)	VOLUME @ 100-YEAR (m³)	AREA @ 100-YEAR (m²)	STRESS TEST WSEL (m)
1	CB03	170	11	212	108.25
2	CB04	150	7	119	108.19
3	CB06 & CBO7	80	3	69	108.25
4	CB08	290	33	127	108.05
5	CB10	180	7	166	108.06
6	CB11	160	10	298	108.18

wsp
1224 GARDINERS ROAD, SUITE 201
KINGSTON, ONTARIO
CANADA K7P 0G2
PHONE: 613-634-7373
WWW.WSP.COM

CONSULTANT:
M. David Blakely Architect Inc.
2200 Prince of Wales Dr., Suite 101
Ottawa, Ontario, K2E 6Z9
Phone (613) 226-8811 Fax (613) 226-7942

SEAL:

LICENSED PROFESSIONAL ENGINEER D. D. SEARLE 100503356 2021.10.15 PROVINCE OF ONTARIO

LICENSED PROFESSIONAL ENGINEER S. P. DAVIDSON 100133944 2021.10.15 PROVINCE OF ONTARIO

CLIENT:
RICHCRAFT Group Of Companies

CLIENT REF. #:

PROJECT:
TERRACE FLATS

KEY PLAN:

ISSUED FOR - REVISION:

IS	RE	DATE	DESCRIPTION
2		2021-10-15	RE-ISSUED FOR SPA
1		2021-07-07	ISSUED FOR SPA

PROJECT NO.: 211-01221-00
DATE: MARCH 2021
ORIGINAL SCALE: 1:250
DESIGNED BY: DS
DRAWN BY: MH
CHECKED BY: SD
IF THIS BAR IS NOT 25mm LONG, ADJUST YOUR PLOTTING SCALE. 25mm

DISCIPLINE: CIVIL

TITLE:
TERRACE FLATS
NORTH GRADING PLAN

SHEET NUMBER: C1.2
SHEET #: 4 OF 10

ISSUE: RE-ISSUED FOR SPA
DATE OF: OCTOBER 15, 2021
REV # 1

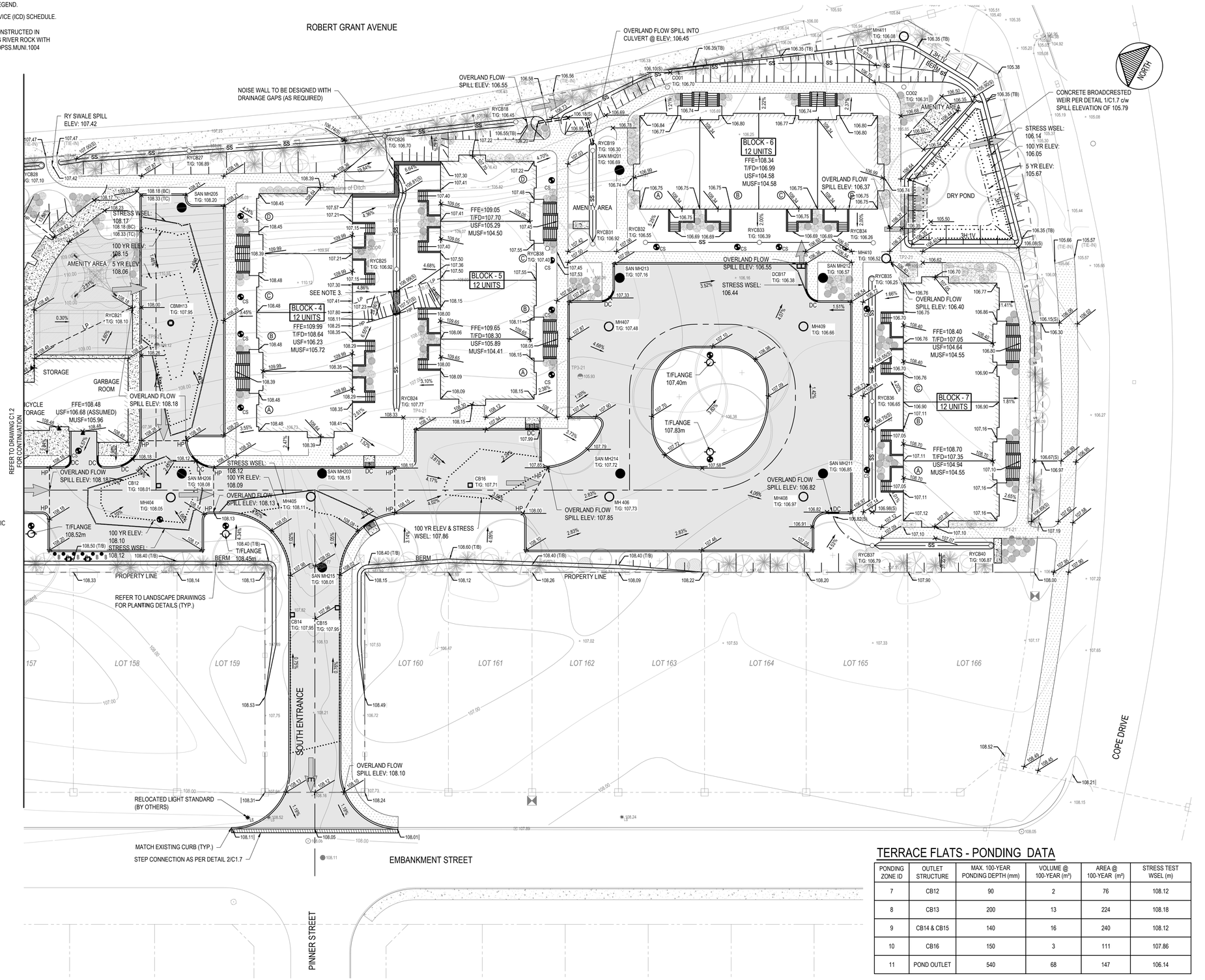
M:\2021\211-01221-00 - Richcraft Terrace Flats Site Plan\Drawings\01 Civil\01 Production\211-01221-00 GRADING.dwg Oct 15, 2021 - 12:06pm BY (hurtterm)
CITY FILE NO. D07-12-21-0107 CITY PLAN NO. 18468

NOTES:

1. REFER TO DRAWING C0.1 FOR NOTES AND FULL LEGEND.
2. REFER TO DRAWING C0.1 FOR INLET CONTROL DEVICE (ICD) SCHEDULE.
3. RIP-RAP PAD SHALL BE 1.0m x 3.0m x 0.3x DEEP. CONSTRUCTED IN ACCORDANCE WITH OPSD 810.010 (TYPE 'B') USING RIVER ROCK WITH GRADATION MATCHING 53mm CLEAR STONE PER OPSS.MUNI.1004

PROPOSED LEGEND:

- ALIGNMENT
- EDGE OF PAVEMENT
- CONCRETE BARRIER CURB
- W — WATERMAIN
- WATER SERVICE
- ST — STORM SEWER
- STORM SUBDRAIN
- SA — SANITARY SEWER
- SANITARY SERVICE
- JUT — JOINT UTILITY TRENCH
- GRADING TOP OF SLOPE
- GRADING BOTTOM OF SLOPE
- S — SWALE
- SS — SWALE c/w SUBDRAIN
- 100mm LINE PAINTING
- 1.8m HIGH PVC FENCE
- TERRACING
- STORM MANHOLE
- REAR YARD CATCH BASIN/ CLEAN OUT
- CATCH BASIN MANHOLE
- CATCH BASIN
- SANITARY MANHOLE
- FIRE HYDRANT
- WATERMAIN VALVE
- TWSI
- BUILDING ENTRANCE
- SIGN
- 105.00 — GRADE ELEVATION
- 105.00 — IBI DESIGN GRADE
- 105.00 (T/B) — TOP OF BERM GRADE ELEVATIC
- FULL DEPTH ASPHALT
- PARTIAL DEPTH ASPHALT
- CONCRETE SIDEWALK
- ASPHALT SIDEWALK
- BUILDING
- RIVER STONE
- MAJOR FLOW ROUTING
- E — EMERGENCY OUTLET



TERRACE FLATS - PONDING DATA

PONDING ZONE ID	OUTLET STRUCTURE	MAX. 100-YEAR PONDING DEPTH (mm)	VOLUME @ 100-YEAR (m³)	AREA @ 100-YEAR (m²)	STRESS TEST WSEL (m)
7	CB12	90	2	76	108.12
8	CB13	200	13	224	108.18
9	CB14 & CB15	140	16	240	108.12
10	CB16	150	3	111	107.86
11	POND OUTLET	540	68	147	106.14

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LICENSED PROFESSIONAL ENGINEER S. P. DAVIDSON 100133944 2021.10.15 PROVINCE OF ONTARIO

CLIENT:
RICHCRAFT Group Of Companies

CLIENT REF. #:

PROJECT:
TERRACE FLATS

KEY PLAN:

ISSUED FOR - REVISION:

IS	RE	DATE	DESCRIPTION
2		2021-10-15	RE-ISSUED FOR SPA
1		2021-07-07	ISSUED FOR SPA

PROJECT NO: 211-01221-00
DATE: MARCH 2021
ORIGINAL SCALE: 1:250
IF THIS BAR IS NOT 25mm LONG, ADJUST YOUR PLOTTING SCALE. 25mm
DESIGNED BY: DS
DRAWN BY: MH
CHECKED BY: SD
DISCIPLINE: CIVIL

TITLE:
TERRACE FLATS
SOUTH GRADING PLAN

SHEET NUMBER: C1.3
SHEET #: 5 OF 10

ISSUE: RE-ISSUED FOR SPA
DATE OF: OCTOBER 15, 2021
REV #: 1

M:\2021\211-01221-00 - Richcraft Terrace Flats Site Plan\Drawings\01 Civil\01 Production\211-01221-00 GRADING.dwg Oct 15, 2021 - 12:09pm BY (hutterm)
CITY FILE NO. D07-12-21-0107 CITY PLAN NO. 18458

NOTES:

1. REFER TO DRAWING C0.1 FOR NOTES AND FULL LEGEND.
2. ALL WATER SERVICES SHALL BE 50mmØ COPPER.
3. NEW WATER METER PER CITY OF OTTAWA STANDARD DETAIL W32 HOUSED IN A VALVE CHAMBER PER CITY STANDARD DETAIL W3. METER ASSEMBLY DIMENSIONS TO BE SPECIFIED BY THE CITY.

PROPOSED LEGEND:

- ALIGNMENT
- EDGE OF PAVEMENT
- CONCRETE BARRIER CURB
- W — WATERMAIN
- WATER SERVICE
- ST — STORM SEWER
- STORM SUBDRAIN
- SA — SANITARY SEWER
- SANITARY SERVICE
- JUT — JOINT UTILITY TRENCH
- GRADING TOP OF SLOPE
- GRADING BOTTOM OF SLOPE
- S — SWALE
- SS — SWALE c/w SUBDRAIN
- 100mm LINE PAINTING
- 1.8m HIGH PVC FENCE
- TERRACING
- STORM MANHOLE
- REAR YARD CATCH BASIN/ CLEAN OUT
- CATCH BASIN MANHOLE
- CATCH BASIN
- SANITARY MANHOLE
- FIRE HYDRANT
- WATERMAIN VALVE
- TWSI
- BUILDING ENTRANCE
- SIGN
- 105.00 — GRADE ELEVATION
- 105.00 — IBI DESIGN GRADE
- 105.00 (T/B) — TOP OF BERM GRADE ELEVATION
- FULL DEPTH ASPHALT
- PARTIAL DEPTH ASPHALT
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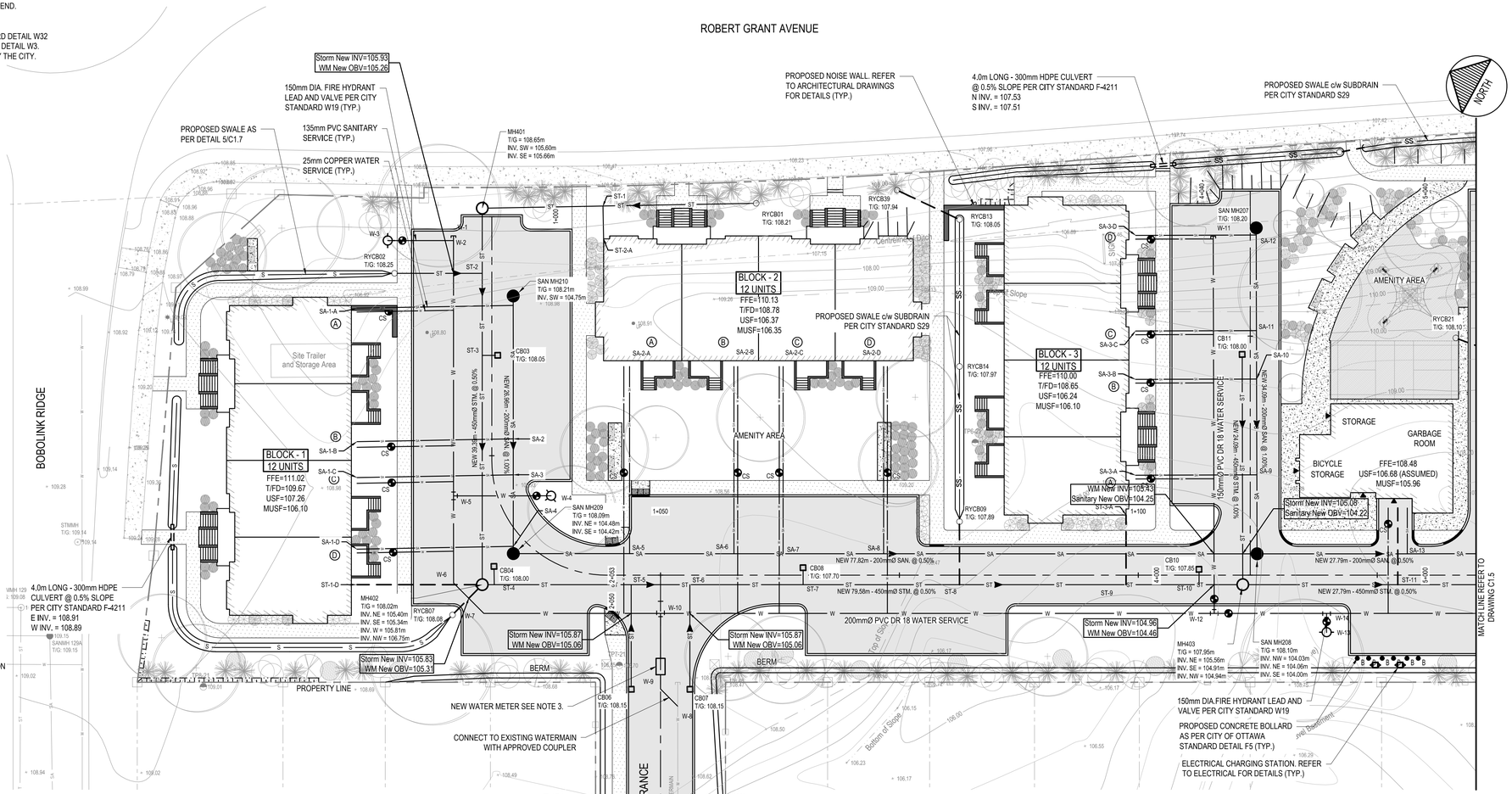
- ASPHALT SIDEWALK
- BUILDING



STRUCTURE DATA SANITARY SYSTEM

NUMBER	STATION	℄ OFFSET (m)	TOP OF GRATE	LOW INVERT	STRUCTURE (OPSD)	GRATE (OPSD)	SUMP (m)
SAN MH207	4+036.3	+0.62	108.198	104.401	701.010	S24	0.00
SAN MH208	1+112.4	-2.23	108.096	103.999	701.010	S24	0.00
SAN MH209	1+034.9	+1.79	108.086	104.419	701.010	S24	0.00
SAN MH210	1+008.3	-2.24	108.212	104.750	701.010	S24	0.00

PIPE DATA SANITARY SYSTEM

FROM	TO	INLET ELEV. (m)	OUTLET ELEV. (m)	SIZE	LENGTH	SLOPE	CITY STANDARD	MIN. COVER (m)
SA-1-A	SA-1	104.860	104.780	135 mm	16.3 m	0.49%	S6	3.26
SAN MH210	SAN MH209	104.750	104.480	200 mm	27.0 m	1.00%	S6	3.18
SA-1-B	SA-2	104.700	104.620	135 mm	16.3 m	0.49%	S6	3.40
SA-1-C	SA-3	104.685	104.610	135 mm	16.3 m	0.46%	S6	3.47
SA-1-D	SA-4	104.600	104.520	135 mm	16.4 m	0.49%	S6	3.38
SA-3-D	SA-12	104.566	104.440	135 mm	12.6 m	1.00%	S6	3.51
SA-2-A	SA-5	104.521	104.350	135 mm	19.6 m	0.87%	S6	3.70
SA-3-C	SA-11	104.496	104.370	135 mm	12.6 m	1.00%	S6	3.50
SA-2-B	SA-6	104.481	104.310	135 mm	19.6 m	0.87%	S6	3.40
SA-2-C	SA-7	104.451	104.280	135 mm	19.6 m	0.87%	S6	3.35
SA-3-B	SA-10	104.447	104.320	135 mm	12.7 m	1.00%	S6	3.54
SAN MH209	SAN MH208	104.419	104.030	200 mm	77.8 m	0.50%	S6	3.27
SA-2-D	SA-8	104.401	104.230	135 mm	19.6 m	0.87%	S6	3.40
SAN MH207	SAN MH208	104.401	104.060	200 mm	34.1 m	1.00%	S6	3.54
SA-3-A	SA-9	104.337	104.210	135 mm	12.7 m	1.00%	S6	3.72
SAN MH208	SAN MH206	103.999	103.860	200 mm	27.8 m	0.50%	S6	3.89

WATERMAIN SCHEDULE

NUMBER	DESCRIPTION	STATION	℄ OFFSET (m)	FINISHED GRADE	TOP OF WM
W-1	CAP	1+002.0	+4.01	108.46	106.06
W-2	200x150x200mm TEE	1+002.5	+4.01	108.45	106.05
W-3	FH & VB	1+002.5	+10.90	108.52	106.12
W-4	FIRE HYDRANT	1+032.3	-5.13	108.41	106.01
W-5	200x150x200mm TEE	1+028.2	+4.43	108.22	105.82
W-6	45° BEND	1+033.6	+8.51	108.07	105.67
W-7	45° BEND	1+036.2	+8.51	108.08	105.68
W-8	CONNECT TO EX.	2+039.0	+1.80	108.17	105.77
W-9	45° BEND	2+040.8	0.00	108.15	105.75
W-10	200x200x200mm TEE	1+050.0	+4.00	108.22	105.82
W-11	CAP	4+035.5	-3.88	108.19	105.79
W-12	200x150x200mm TEE	1+107.9	+4.00	108.09	105.69
W-13	FH & VB	1+119.7	+6.00	108.30	105.90
W-14	200x150x200mm TEE	1+119.7	+3.98	108.29	105.89

PIPE DATA STORM SYSTEM

FROM	TO	INLET ELEV. (m)	OUTLET ELEV. (m)	SIZE	LENGTH	SLOPE	CITY STANDARD	MIN. COVER (m)
ST-1-D	MH402	107.010	106.748	250 mm	13.1 m	2.00%	S29	1.00
RYCB13	RYCB06	106.970	106.893	250 mm	23.0m	2.04%	S29	1.01
RYCB14	RYCB09	106.891	106.810	250 mm	16.2 m	0.50%	S29	1.06
ST-2-A	ST-1	106.104	106.070	250 mm	3.4 m	0.99%	S29	2.20
RYCB02	ST-2	106.050	105.810	300 mm	9.2 m	2.61%	S6	1.89
CB07	ST-6	105.950	105.841	300 mm	10.9 m	1.00%	S6	1.89
CB06	ST-5	105.950	105.841	300 mm	10.9 m	1.00%	S6	1.89
RYCB07	MH402	105.850	105.806	250 mm	4.4 m	1.00%	S29	1.95
CB03	ST-3	105.850	105.800	300 mm	1.6 m	3.09%	S6	1.89
RYCB01	MH401	105.803	105.660	450 mm	28.7 m	0.50%	S6	1.95
CB04	ST-4	105.800	105.781	300 mm	1.9 m	1.00%	S6	1.89
CB11	MH403	105.800	105.559	450 mm	24.1 m	1.00%	S6	1.74
RYCB09	ST-8	105.690	105.250	300 mm	6.6 m	6.67%	S29	2.31
CB10	ST-10	105.650	105.634	300 mm	1.6 m	1.00%	S6	1.89
MH401	MH402	105.597	105.400	450 mm	39.4 m	0.50%	S6	2.11
CB08	ST-7	105.500	105.482	300 mm	1.8 m	1.00%	S6	1.89
MH402	MH403	105.340	104.940	450 mm	79.6 m	0.50%	S6	2.11
ST-3-A	ST-9	105.254	105.180	300 mm	7.3 m	1.01%	S29	2.44
ST	ST-11	105.100	105.020	300 mm	8.0 m	1.00%	S6	2.78
MH403	MH404	104.910	104.770	450 mm	27.8 m	0.50%	S6	2.58

STRUCTURE DATA STORM SYSTEM

NUMBER	STATION	℄ OFFSET (m)	TOP OF GRATE	LOW INVERT	STRUCTURE (OPSD)	GRATE (OPSD)	SUMP (m)
CB03	1+014.5	-0.62	108.050	105.850	705.010	S19.1	0.60
CB04	1+034.6	+4.17	108.000	105.800	705.010	S19.1	0.60
CB06	2+040.8	-3.06	108.152	105.950	705.010	S19.1	0.60
CB07	2+040.8	+3.08	108.152	105.950	705.010	S19.1	0.60
CB08	1+064.9	-0.78	107.700	105.500	705.010	S19.1	0.60
CB10	1+106.3	-0.61	107.850	105.650	705.010	S19.1	0.60
CB11	4+023.1	-0.85	108.000	105.800	705.010	S19.1	0.60
MH401	1+263.9	+171.59	108.650	105.597	701.010	S24.1	0.30
MH402	1+034.9	+6.38	108.020	105.340	701.010	S24.1	0.30
MH403	1+110.9	+1.00	107.954	104.910	701.010	S24.1	0.30
RYCB01	1+060.0	-38.90	108.210	105.803	S31	S31	0.00
RYCB02	1+005.9	+10.19	108.250	106.050	S30	S30	0.00
RYCB07	1+034.9	+10.82	108.085	105.850	S30	S30	0.00
RYCB09	1+081.3	-5.60	107.890	105.690	S30	S30	0.00
RYCB13	1+081.3	-37.21	108.050	106.970	S30	S30	0.00
RYCB14	1+081.3	-21.83	107.970	106.891	S30	S30	0.00
RYCB39	1+074.7	-40.28	107.940	107.006	S30	S30	0.00

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LICENSED PROFESSIONAL ENGINEER
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100503356
2021.10.15
PROVINCE OF ONTARIO

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S. P. DAVIDSON
100133944
2021.10.15
PROVINCE OF ONTARIO

CLIENT:
RICHCRAFT Group Of Companies

CLIENT REF. #:

PROJECT:
TERRACE FLATS

KEY PLAN:

ISSUED FOR - REVISION:

IS	RE	DATE	DESCRIPTION
2		2021-10-15	RE-ISSUED FOR SPA
1		2021-07-07	ISSUED FOR SPA

PROJECT NO: 211-01221-00
DATE: MARCH 2021
ORIGINAL SCALE: 1:250
IF THIS BAR IS NOT 25mm LONG, ADJUST YOUR PLOTTING SCALE. 25mm
DESIGNED BY: DS
DRAWN BY: MH
CHECKED BY: SD
DISCIPLINE: CIVIL

TITLE:
TERRACE FLATS
NORTH SERVICING PLAN

SHEET NUMBER: C1.4
SHEET #: 6 OF 10

ISSUE: RE-ISSUED FOR SPA
DATE OF: OCTOBER 15, 2021
REV #: 1

CITY PLAN NO. 1948
CITY FILE NO. D07-12-21-0107

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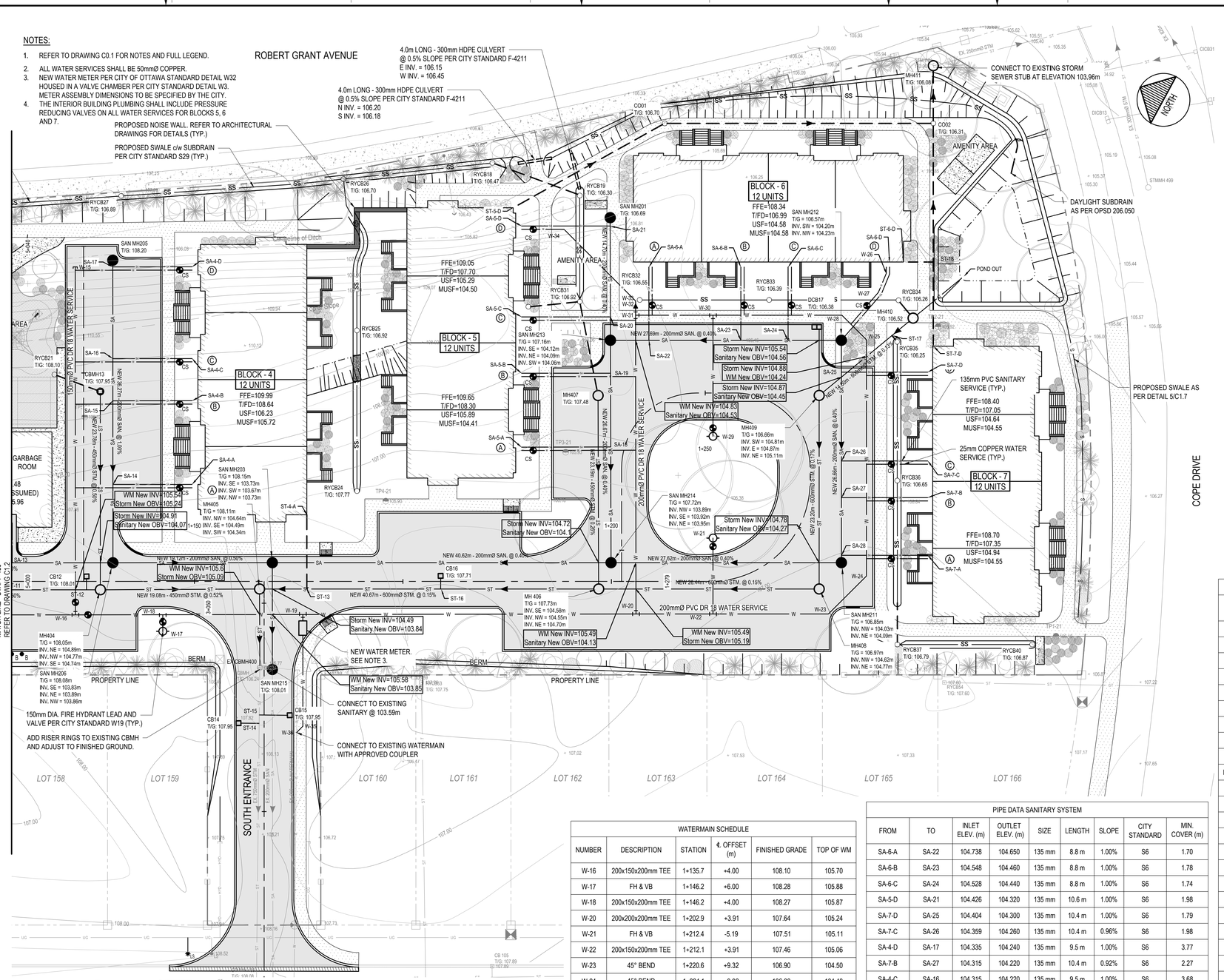
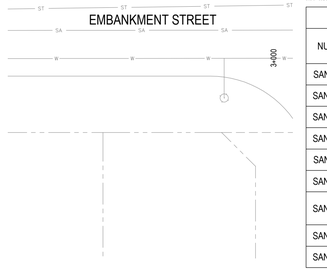
NOTES:

1. REFER TO DRAWING C0.1 FOR NOTES AND FULL LEGEND.
2. ALL WATER SERVICES SHALL BE 50mmØ COPPER.
3. NEW WATER METER PER CITY OF OTTAWA STANDARD DETAIL W32 HOUSED IN A VALVE CHAMBER PER CITY STANDARD DETAIL W3. METER ASSEMBLY DIMENSIONS TO BE SPECIFIED BY THE CITY.
4. THE INTERIOR BUILDING PLUMBING SHALL INCLUDE PRESSURE REDUCING VALVES ON ALL WATER SERVICES FOR BLOCKS 5, 6 AND 7.





STRUCTURE DATA STORM SYSTEM							
NUMBER	STATION	℄ OFFSET (m)	TOP OF GRATE	LOW INVERT	STRUCTURE (OPSD)	GRATE (OPSD)	SUMP (m)
CB12	1+137.1	-0.60	108.010	105.810	705.010	S19.1	0.60
CB14	3+035.6	-3.06	107.950	105.750	705.010	S19.1	0.60
CB15	3+036.6	+3.08	107.950	105.750	705.010	S19.1	0.60
CB16	1+179.5	-0.67	107.710	105.510	705.010	S19.1	0.60
CBMH13	5+022.8	+1.99	107.950	105.010	701.010	S19.1	0.60
CO01	1+251.8	+32.51	106.700	104.472	S30	S30	0.00
CO02	1+241.7	+38.67	106.311	104.090	S30	S30	0.00
DCB17	1+241.6	+10.69	106.380	105.170	705.020	S19.1	0.60
MH 406	1+198.5	+0.90	107.729	104.550	701.011	S24.1	0.30
MH404	1+138.7	+1.00	108.051	104.740	701.010	S24.1	0.30
MH405	1+157.8	+0.90	108.108	104.340	701.012	S24.1	0.30
MH407	1+259.4	+5.68	107.476	104.760	701.010	S24.1	0.30
MH408	1+221.3	+6.37	106.966	104.620	701.011	S24.1	0.30
MH409	1+238.7	+4.31	106.657	104.810	701.011	S24.1	0.30
MH410	1+238.6	+18.91	106.518	104.889	701.010	S24.1	0.30
MH411	1+242.3	+44.78	106.081	103.960	701.010	S24.1	0.30
RYCB18	1+256.3	+35.04	106.470	105.392	S30	S30	0.00
RYCB19	1+254.7	+26.56	106.300	105.215	S30	S30	0.00
RYCB21	5+024.8	-3.51	108.100	105.980	S31	S31	0.00
RYCB24	1+169.5	-10.84	107.770	106.093	S31	S31	0.00
RYCB25	1+169.5	-30.10	106.920	105.872	S30	S30	0.00
RYCB26	1+259.0	+45.73	106.696	105.630	S30	S30	0.00
RYCB27	1+141.2	-46.22	106.889	105.927	S30	S30	0.00
RYCB31	1+256.5	+15.38	106.920	104.960	S30	S30	0.00
RYCB32	1+254.0	+12.28	106.550	105.345	S31	S31	0.00
RYCB33	1+244.6	+11.56	106.395	105.155	S30	S30	0.00
RYCB34	1+239.5	+19.07	106.257	104.978	S30	S30	0.00
RYCB35	1+238.2	+15.63	106.250	105.110	S30	S30	0.00
RYCB36	1+230.8	+10.45	106.650	105.306	S30	S30	0.00
RYCB37	1+222.1	+17.78	106.790	104.725	S30	S30	0.00
RYCB40	1+225.1	+31.30	106.871	103.632	S31	S31	0.00

PIPE DATA STORM SYSTEM								
FROM	TO	INLET ELEV. (m)	OUTLET ELEV. (m)	SIZE	LENGTH	SLOPE	CITY STANDARD	MIN. COVER (m)
RYCB24	RYCB25	106.093	105.900	250 mm	19.3 m	1.00%	S29	0.76
RYCB21	CBMH13	105.980	105.921	250 mm	5.9 m	1.00%	S29	1.77
RYCB27	RYCB26	105.927	105.660	250 mm	26.7 m	1.00%	S29	0.70
RYCB25	RYCB26	105.872	105.690	250 mm	18.2 m	1.00%	S29	0.75
CB12	ST-12	105.810	105.794	300 mm	1.6 m	1.00%	S6	1.89
CB15	ST-15	105.750	105.713	300 mm	3.7 m	1.00%	S6	1.89
CB14	ST-14	105.750	105.725	300 mm	2.5 m	1.00%	S6	1.89
RYCB26	RYCB18	105.630	105.450	250 mm	18.0 m	1.00%	S29	0.76
CB16	ST-16	105.510	105.494	300 mm	1.6 m	1.00%	S6	1.89
POND OUT	MH410	105.500	105.189	300 mm	8.0 m	3.90%	S6	-0.31
RYCB18	RYCB19	105.392	105.280	250 mm	11.2 m	1.00%	S29	0.76
RYCB32	RYCB33	105.345	105.190	250 mm	15.5 m	1.00%	S29	0.95
RYCB36	RYCB35	105.306	105.140	250 mm	16.6 m	1.00%	S29	0.85
RYCB19	RYCB31	105.215	105.020	250 mm	12.7 m	1.53%	S29	0.83
DCB17	MH409	105.170	105.110	300 mm	8.2 m	0.73%	S6	0.92
RYCB33	RYCB34	105.155	105.000	250 mm	15.5 m	1.00%	S29	0.98
RYCB35	ST-17	105.110	105.100	250 mm	1.0 m	1.00%	S29	0.88
CBMH13	MH404	105.010	104.890	450 mm	23.8 m	0.50%	S6	2.48
RYCB34	MH410	104.978	104.950	250 mm	2.8 m	1.00%	S29	1.02
RYCB31	MH407	104.960	104.910	250 mm	11.5 m	0.44%	S29	1.70
MH410	MH409	104.889	104.870	600 mm	14.6 m	0.13%	S6	0.79
MH409	MH408	104.810	104.770	600 mm	23.2 m	0.17%	S6	1.14
ST-4-A	ST-13	104.790	104.700	300 mm	8.9 m	1.01%	S29	3.10
MH407	MH 406	104.760	104.700	450 mm	23.2 m	0.26%	S6	2.25
MH404	MH405	104.740	104.640	450 mm	19.1 m	0.52%	S6	2.85
RYCB37	RYCB36	104.725	105.340	250 mm	19.7 m	-3.13%	S29	1.05
ST-5-D	CO01	104.708	104.500	250 mm	20.8 m	1.00%	S29	1.72
MH408	MH 406	104.620	104.580	600 mm	26.4 m	0.15%	S6	1.64
MH 406	MH405	104.550	104.490	600 mm	40.7 m	0.15%	S6	2.47
CO01	CO02	104.472	104.150	250 mm	32.2 m	1.00%	S29	1.78
ST-7-D	CO02	104.340	104.120	250 mm	26.7 m	0.82%	S29	1.80
MH405	EX CBMH400	104.340	104.330	750 mm	9.4 m	0.11%	S6	2.80
ST-6-D	ST-18	104.300	104.260	250 mm	3.6 m	1.12%	S29	1.83
CO02	MH411	104.090	104.020	250 mm	6.9 m	1.01%	S29	1.82
RYCB40	RYCB37	103.632	103.416	250 mm	16.2 m	1.34%	S29	2.98

WATERMAIN SCHEDULE					
NUMBER	DESCRIPTION	STATION	℄ OFFSET (m)	FINISHED GRADE	TOP OF WM
W-16	200x150x200mm TEE	1+135.7	+4.00	108.10	105.70
W-17	FH & VB	1+146.2	+6.00	108.28	105.88
W-18	200x150x200mm TEE	1+146.2	+4.00	108.27	105.87
W-20	200x200x200mm TEE	1+202.9	+3.91	107.64	105.24
W-21	FH & VB	1+212.4	-5.19	107.51	105.11
W-22	200x150x200mm TEE	1+212.1	+3.91	107.46	105.06
W-23	45° BEND	1+220.6	+9.32	106.90	104.50
W-24	45° BEND	1+224.1	+9.92	106.88	104.48
W-25	45° BEND	1+239.2	+13.01	106.58	104.18
W-26	22.5° BEND	1+240.5	+20.56	106.72	103.57
W-27	22.5° BEND	1+240.3	+18.18	106.51	104.11
W-28	45° BEND	1+240.9	+13.35	106.51	104.11
W-29	FIRE HYDRANT	1+249.1	-5.20	107.18	104.78
W-30	200x150x200mm TEE	1+249.1	+9.32	106.81	104.14
W-31	200x25x200mm TEE	1+254.4	+10.73	107.06	104.66
W-32	REDUCER	1+254.2	+11.99	106.73	104.33
W-33	45° BEND	1+254.2	+12.34	106.65	104.25
W-34	45° BEND	1+255.6	+23.74	106.86	104.46
W-35	45° BEND	1+163.0	+17.36	108.13	105.73
W-36	CONNECT TO EX.	1+162.3	+18.11	108.12	105.72

PIPE DATA SANITARY SYSTEM								
FROM	TO	INLET ELEV. (m)	OUTLET ELEV. (m)	SIZE	LENGTH	SLOPE	CITY STANDARD	MIN. COVER (m)
SA-6-A	SA-22	104.738	104.650	135 mm	8.8 m	1.00%	S6	1.70
SA-6-B	SA-23	104.548	104.460	135 mm	8.8 m	1.00%	S6	1.78
SA-6-C	SA-24	104.528	104.440	135 mm	8.8 m	1.00%	S6	1.74
SA-5-D	SA-21	104.426	104.320	135 mm	10.6 m	1.00%	S6	1.98
SA-7-D	SA-25	104.404	104.300	135 mm	10.4 m	1.00%	S6	1.79
SA-7-C	SA-26	104.359	104.260	135 mm	10.4 m	0.96%	S6	1.98
SA-4-D	SA-17	104.335	104.240	135 mm	9.5 m	1.00%	S6	3.77
SA-7-B	SA-27	104.315	104.220	135 mm	10.4 m	0.92%	S6	2.27
SA-4-C	SA-16	104.315	104.220	135 mm	9.5 m	1.00%	S6	3.68
SA-5-C	SA-20	104.306	104.200	135 mm	10.6 m	1.00%	S6	2.81
SA-7-A	SA-28	104.298	104.200	135 mm	10.4 m	0.94%	S6	2.40
SA-4-B	SA-15	104.265	104.170	135 mm	9.5 m	1.00%	S6	3.70
SAN MH205	SAN MH206	104.253	103.890	200 mm	36.3 m	1.00%	S6	3.70
SA-5-B	SA-19	104.217	104.110	135 mm	10.7 m	1.00%	S6	3.07
SA-5-A	SA-18	104.177	104.070	135 mm	10.7 m	1.00%	S6	3.34
SA-4-A	SA-14	104.165	104.070	135 mm	9.5 m	1.00%	S6	3.91
SAN MH201	SAN MH213	104.149	104.090	200 mm	14.7 m	0.40%	S6	2.34
SAN MH213	SAN MH214	104.057	103.950	200 mm	26.7 m	0.40%	S6	2.89
SAN MH214	SAN MH203	103.892	103.730	200 mm	40.6 m	0.40%	S6	3.62
SAN MH206	SAN MH203	103.826	103.730	200 mm	19.1 m	0.50%	S6	4.05
SAN MH203	SAN MH215	103.671	103.620	200 mm	12.8 m	0.40%	S6	4.18

STRUCTURE DATA SANITARY SYSTEM							
NUMBER	STATION	℄ OFFSET (m)	TOP OF GRATE	LOW INVERT	STRUCTURE (OPSD)	GRATE (OPSD)	SUMP (m)
SAN MH201	1+254.0	+22.76	106.693	104.149	701.010	S24	0.00
SAN MH203	1+159.3	-2.25	108.145	103.671	701.010	S24	0.00
SAN MH205	5+038.5	+3.49	108.202	104.253	701.010	S24	0.00
SAN MH206	1+140.2	-2.24	108.081	103.826	701.010	S24	0.00
SAN MH211	1+224.0	+6.52	106.855	104.030	701.010	S24	0.00
SAN MH212	1+240.2	+10.93	106.566	104.197	701.010	S24	0.00
SAN MH213	1+256.4	+9.48	107.156	104.057	701.010	S24	0.00
SAN MH214	1+276.5	+1.27	107.715	103.892	701.010	S24	0.00
SAN MH215	3+042.0	+0.98	108.006	103.590	701.010	S24	0.00

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LICENSED PROFESSIONAL ENGINEER S. P. DAVIDSON 100133944 2021.10.15 PROVINCE OF ONTARIO

CLIENT:
RICHCRAFT Group Of Companies

CLIENT REF. #:

PROJECT:
TERRACE FLATS

KEY PLAN:

ISSUED FOR - REVISION:

IS	RE	DATE	DESCRIPTION
2		2021-10-15	RE-ISSUED FOR SPA
1		2021-07-07	ISSUED FOR SPA

PROJECT NO: 211-01221-00
DATE: MARCH 2021
ORIGINAL SCALE: 1:250
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DESIGNED BY: DS
DRAWN BY: MH
CHECKED BY: SD
25mm

DISCIPLINE: CIVIL

TITLE:
TERRACE FLATS
SOUTH SERVICING PLAN

SHEET NUMBER: C1.5
SHEET #: 7 OF 10

ISSUE: RE-ISSUED FOR SPA
DATE OF: OCTOBER 15, 2021
REV #: 1

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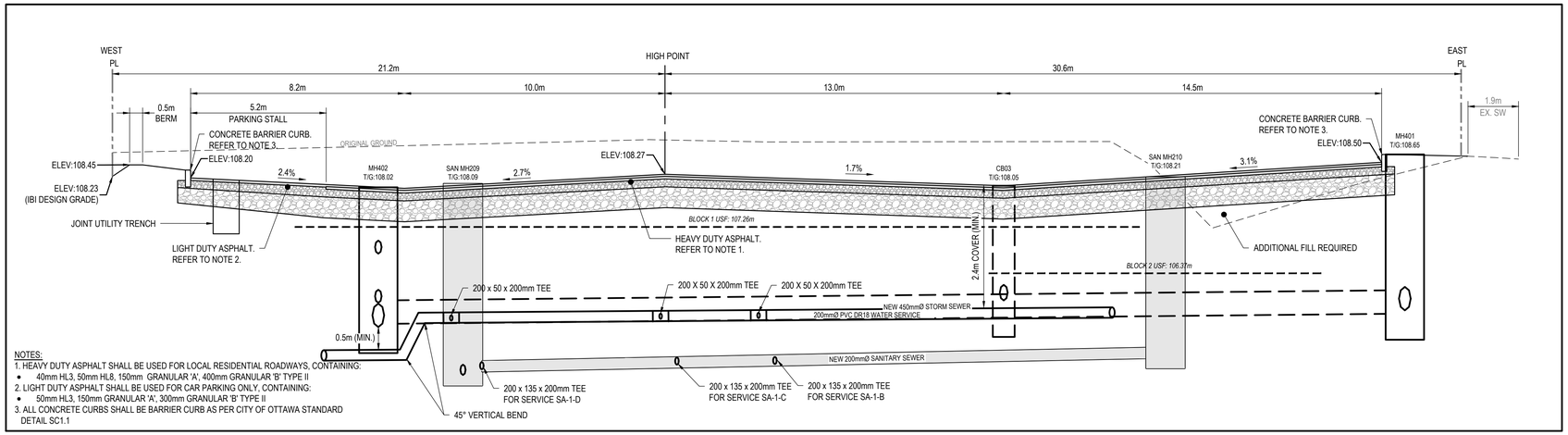
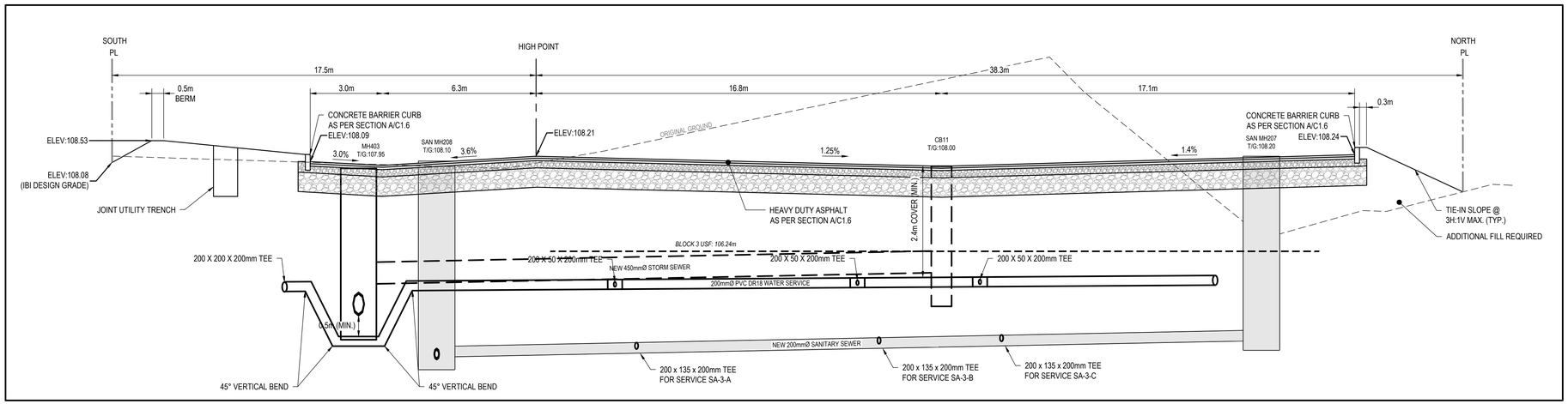
CITY FILE NO. D07-12-21-0107
CITY PLAN NO. 19458

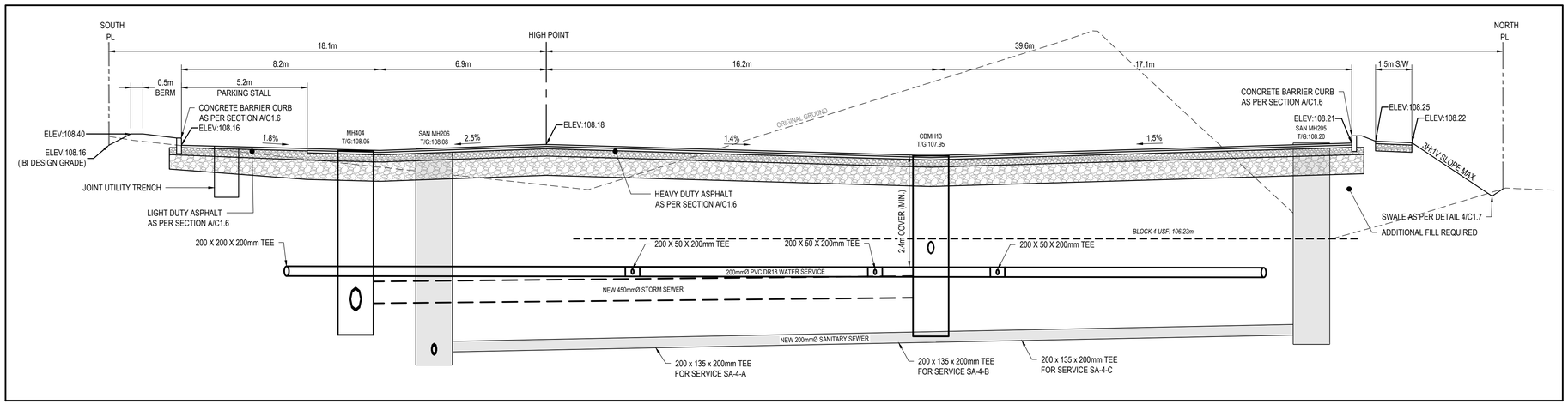


NOTES:
1. HEAVY DUTY ASPHALT SHALL BE USED FOR LOCAL RESIDENTIAL ROADWAYS, CONTAINING:
   - 40mm HL3, 50mm HL8, 150mm GRANULAR 'A', 400mm GRANULAR 'B' TYPE II
2. LIGHT DUTY ASPHALT SHALL BE USED FOR CAR PARKING ONLY, CONTAINING:
   - 50mm HL3, 150mm GRANULAR 'A', 300mm GRANULAR 'B' TYPE II
3. ALL CONCRETE CURBS SHALL BE BARRIER CURB AS PER CITY OF OTTAWA STANDARD DETAIL SC1.1

A C1.6 **SECTION A**
SCALE: H 1:100 V 1:50



B C1.6 **SECTION B**
SCALE: H 1:100 V 1:50



C C1.6 **SECTION C**
SCALE: H 1:100 V 1:50

wsp
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LICENSED PROFESSIONAL ENGINEER — S. P. DAVIDSON — 100133944 — 2021.10.15 — PROVINCE OF ONTARIO

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RICHCRAFT Group Of Companies

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DESIGNED BY:	DS
DRAWN BY:	MH
CHECKED BY:	SD

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TITLE:
TERRACE FLATS
DETAILS & SECTIONS I

SHEET NUMBER: C1.6
SHEET #: 8 OF 10

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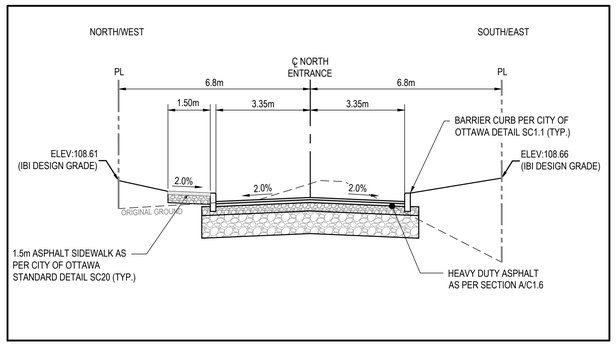
CITY PLAN NO. 1849B



D C1.7 **SECTION D**
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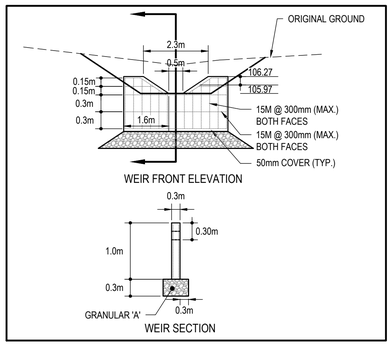

1 C1.7 **CONCRETE WEIR DETAIL**
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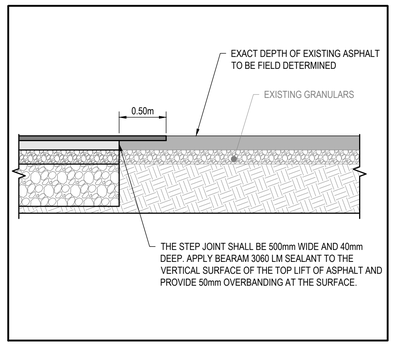

2 C1.7 **TYPICAL STEP CONNECTION**
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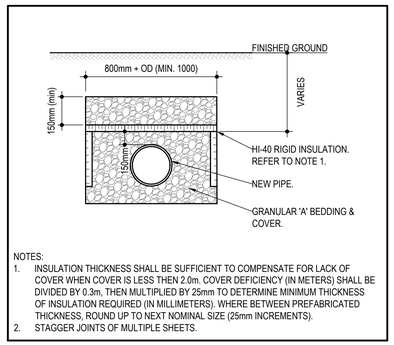
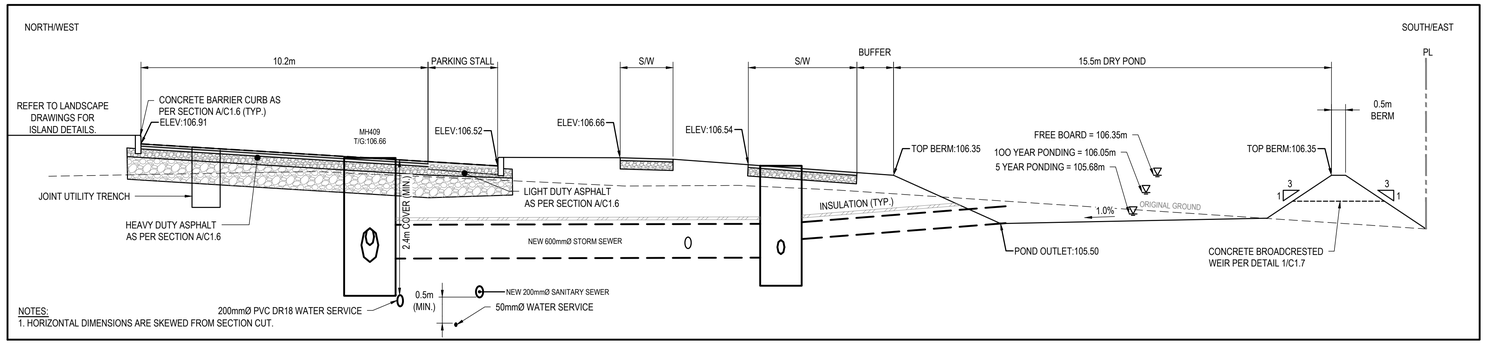
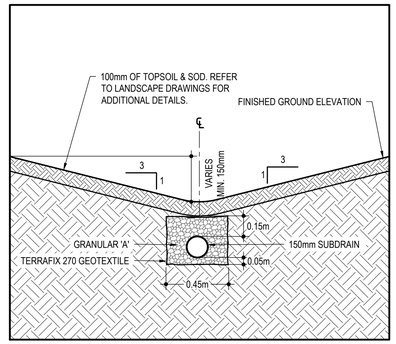


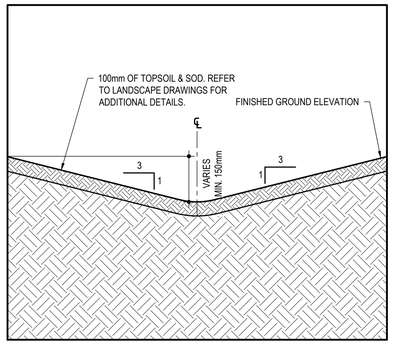
3 C1.7 **FROST PROTECTION DETAIL (SEWERS)**
SCALE: 1:20



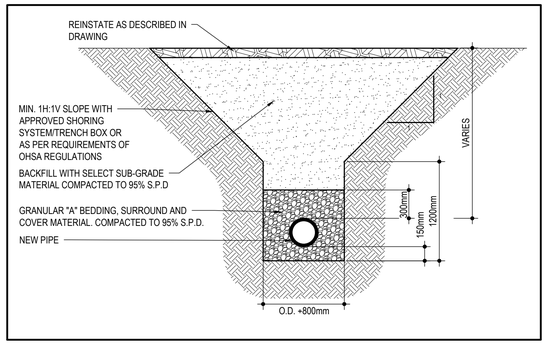
E C1.7 **SECTION E**
SCALE: H 1:100 V 1:50



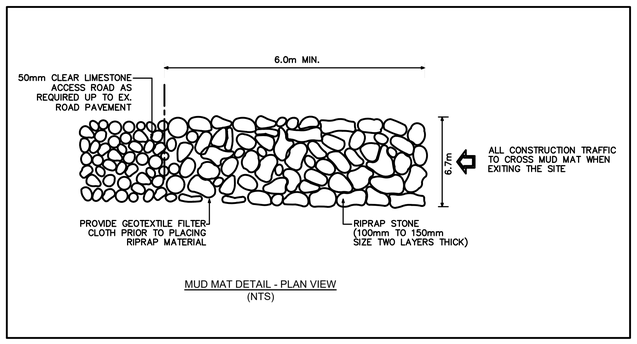
4 C1.7 **TYPICAL SWALE WITH SUBDRAIN**
SCALE: 1:20



5 C1.7 **TYPICAL SWALE WITHOUT SUBDRAIN**
SCALE: 1:20



6 C1.7 **TYPICAL TRENCH DETAIL**
SCALE: NTS



MUD MAT DETAIL - PLAN VIEW
(NTS)

7 C1.7 **MUD MAT DETAIL**
SCALE: NTS

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LICENSED PROFESSIONAL ENGINEER
S. P. DAVIDSON
100133944
2021.10.15
PROVINCE OF ONTARIO

CLIENT:

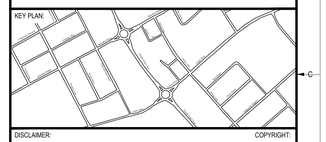
RICHCRAFT Group Of Companies

CLIENT REF. #:

PROJECT:

TERRACE FLATS

KEY PLAN:



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PROJECT NO: 211-01221-00
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CHECKED BY: SD
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TITLE:
TERRACE FLATS
DETAILS & SECTIONS II

SHEET NUMBER: C1.7
SHEET #: 9 OF 10

ISSUE: RE-ISSUED FOR SPA
REV #: 1
DATE OF: OCTOBER 15, 2021

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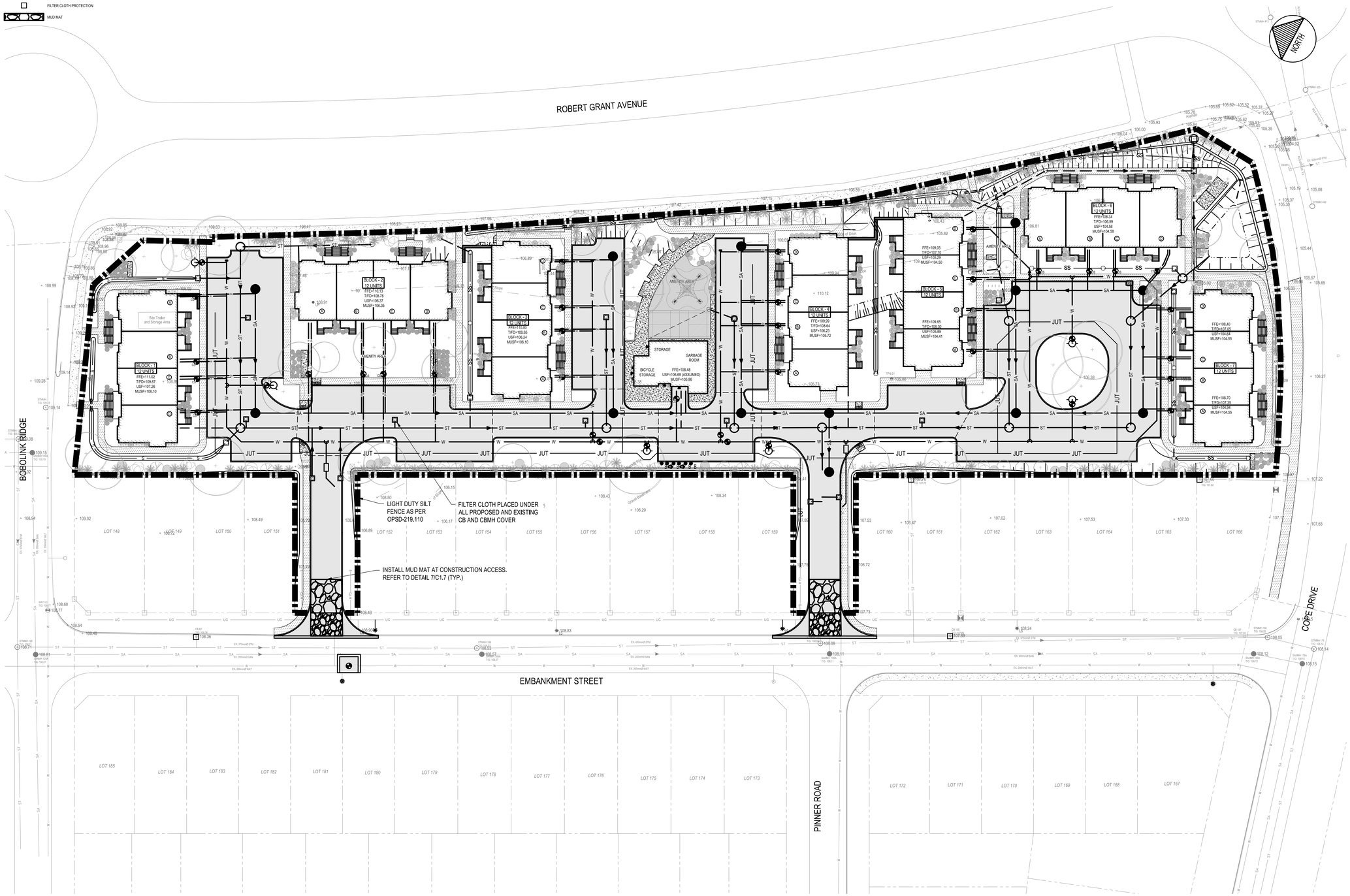
CITY FILE NO. D07-12-21-0107 CITY PLAN NO. 19498

NOTES:

1. REFER TO DRAWING C0.1 FOR NOTES AND FULL LEGEND.

ESC LEGEND:

- LIGHT DUTY SILT FENCE (OPSD 219.110)
- FILTER CLOTH PROTECTION
- MUD MAT



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2021.10.15
PROVINCE OF ONTARIO

CLIENT:
RICHCRAFT Group Of Companies

CLIENT REF. #:

PROJECT:
TERRACE FLATS

KEY PLAN:

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PROJECT NO: 211-01221-00
DATE: MARCH 2021
ORIGINAL SCALE: 1:400
DESIGNED BY: DS
DRAWN BY: MH/JT
CHECKED BY: SD
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25mm

DISCIPLINE: CIVIL

TITLE:
TERRACE FLATS
SEDIMENT AND EROSION CONTROL PLAN

SHEET NUMBER: C1.8
SHEET #: 10 OF 10

ISSUE: RE-ISSUED FOR SPA
DATE OF: OCTOBER 15, 2021
REV #: 1

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CITY FILE NO. D07-12-21-0107
CITY PLAN NO. 1848

APPENDIX

B

CITY PRE-CONSULTATION DOCUMENTS & CITY SERIVING CHECKLIST

Description:

A Design Brief is the core submission document that illustrates how the development is designed to work with its existing and planned context, to improve its surroundings and also demonstrate how the proposal supports the overall goals of the Official Plan, relevant secondary plans, Council approved plans and design guidelines. The purpose of the Terms of Reference is to assist the applicant to organize and substantiate the design justification in support of the proposed development and to assist staff and the public in the review of the proposal.

Authority to Request a Design Brief:

The *Planning Act* gives municipalities the authority to require that a Design Brief be prepared. Under Sections 22(4), (5) and Section 41(4) of the *Planning Act*, a Council has the authority to request such other information or material that the authority needs in order to evaluate and make a decision on an application. Section 5.2.6 of the Official Plan sets out the general requirement for a Design Brief.

Preparation:

The Design Brief should be signed by an urban designer, licenced architect, landscape architect, or a full member of the Canadian Institute of Planners.

When Required:

A Design Brief is required for a Site Plan Control planning application.

A Scoped Design Brief* is required when the following planning applications are applied for and not accompanied by a Site Plan Control application:

- Official Plan Amendment
- Zoning By-law Amendment (exception: a change in use which does not result in an increase in height or massing)

The requirement and scope of a Design Brief will be determined at the formal pre-application consultation meeting. Should an application be required to go to the Urban Design Review Panel (UDRP), the Design Brief may be submitted as part of the submission materials to the panel.

Contents for Design Brief Submissions:

A Design Brief will contain and/or address the points identified during the pre-consultation meeting. Failure to address the critical elements identified in the pre-consultation meeting may result in the application being considered incomplete.

** A Scoped Design Brief is composed of:*

- *Section 1 should be combined into the Planning Rationale submission, and*
- *Section 2 items will be confirmed in the pre-application consultation meeting.*

SECTION 1 Note: This section will be combined with the Planning Rationale report.

Application Submission:

Not Required	Required	
☐	☒	State the: type of application, legal description, municipal address, purpose of the application and provide an overall vision statement and goals for the proposal.

Response to City Documents:

Not Required	Required	
☐	☒	State the Official Plan land use designation for the subject property and demonstrate how the proposal conforms to the Official Plan as it relates to the design of the subject site. Reference specific policy numbers from the Official Plan to show consistency. Justify areas of non-compliance and explain why there is non-compliance.
☐	☒	State the applicable plans which apply to the subject proposal: community design plan, secondary plan, concept plan and design guideline. Reference the relevant design related polices within the applicable plans/guidelines and provide a comprehensive analysis as to how the proposed development incorporates the objectives or why it does not incorporate the objectives.

Context Plan:

Not Required	Required	
☐	☒	Provide a contextual analysis that discusses/illustrates abutting properties, key destinations and linkages within a 100 meter radius (a larger radius may be requested for larger/more complex projects), such as transit stations, transportation networks for cars, cyclists, and pedestrians, focal points/nodes, gateways; parks/open spaces, topography, views towards the site, the urban pattern (streets, blocks), future and current proposals (if applicable), public art and heritage resources.
☐	☒	Photographs to illustrate existing site conditions and surrounding contexts. Include a map pinpointing (with numbers) where each photo is taken and correspond these numbers with the site photos. Arrows illustrating the direction the photo is taken is also useful.

SECTION 2

Design Proposal:
The purpose of the Design Proposal is to show the building elevations, exterior details, transitions in form, treatment of the public realm and compatibility with adjacent buildings, using 3-D models, illustrations, diagrams, plans, and cross sections. Referencing Official Plan, Section 5.2.1, as determined at time of pre-application consultation meeting, submissions will need to address the following in the form of labelled graphics and written explanation:

Massing and Scale

Not Required	Required	
		Images which show: Building massing – from:
☐	☐	• at least two sides set within it current context (showing the entire height and width of the building) **OR**
☐	☒	• all four sides set within it current context (showing the entire height and width of the building).
		Views – of the entire block, from:
☐	☒	• at least two perspectives to show how the proposed building is set within its current context **OR**
☐	☐	• all four perspectives to show how the proposed building is set within its current context.
☒	☐	Building transition – to adjacent uses, with labelled explanation of the transition measures used.
☐	☒	Grading – if grades are an issue.
☐	☒	Alternative building massing – additional imagery and site layouts considered and provide justification for the ultimate proposal sought.

Public Realm

Not Required	Required	
		Labelled graphics and a written explanation which show:
☐	☒	Streetscape – cross sections which illustrate the street design and right of way (referencing the City's design manuals).
☐	☒	Relationship to the public realm – illustrating how the first few storeys of the proposed development responds to and relates to the existing context (e.g. through a podium plan and first floor plan). This is to include detailed explanation on: • Architectural responses • Landscaping details • Public art features (in accordance with Official Plan, Section 4.11) • For developments in Design Priority Areas, detail the building and site features, (in accordance with Official Plan, Section 4.11) which will enhance the public realm. Provide explanation for features which are not provided.

Building Design

Not Required	Required	
☐	X	Labelled graphics (e.g. building elevations and floor plans) and a written explanation which document the proposed exterior architectural details and design (in accordance with Official Plan, Section 5.2.1).
X	☐	For high-rise development applications, detail the building design and massing and scale elements and how they relate to the proposed high-rise development (in accordance with Official Plan, Section 5.2.1).

Sustainability

Not Required	Required	
☐	X	Any sustainable design features to be incorporated, such as green roofs or walls, sun traps, reflective or permeable surfaces.

Heritage

Not Required	Required	
☐	X	How the building relates to the historic details, materials, site and setting of any existing historic resources on or adjacent to the subject property (if applicable).

Additional Contents:

Some proponents may be requested to provide submission material which complements the Design Brief. These additional requirements could be incorporated into the Design Brief submission for ease of review. These will be identified at the time of application consultation meeting:

- X Site Plan
- X Landscape Plan
- X Plan showing existing and proposed servicing
- Shadow Analysis
- Wind Analysis

Submission Requirements

- Six hard copies and one digital copy

APPLICANT'S STUDY AND PLAN IDENTIFICATION LIST

Legend: **S** indicates that the study or plan is required with application submission.
A indicates that the study or plan may be required to satisfy a condition of approval/draft approval.

For information and guidance on preparing required studies and plans refer to:

http://ottawa.ca/en/development-application-review-process-0/guide-preparing-studies-and-plans

S/A	ENGINEERING		S/A
S	**1. Site Servicing Plan**	2. Assessment of Adequacy of Public Services / Site Servicing Report	
S	**3. Grade Control and Drainage Plan**	**4. Geotechnical Study / Slope Stability Study**	S
	5. Composite Utility Plan	6. Groundwater Impact Study	
	7. Servicing Options Report	8. Wellhead Protection Study	
	9. Transportation Impact Assessment Screening Form	**10.Erosion and Sediment Control Plan**	S
S	**11.Storm water Management Report**	12.Hydro geological and Terrain Analysis	
S	13.Hydraulic Watermain Analysis	**14.Noise Impact Assessment**	S
	15.Roadway Modification Design Plan	16.Confederation Line Proximity Study	
S/A	**PLANNING / DESIGN / SURVEY**		**S/A**
	17.Draft Plan of Subdivision	18.Plan Showing Layout of Parking Garage	S
	19.Draft Plan of Condominium	**20.Design Brief/ Planning Rationale**	S
S	**21.Site Plan**	22.Minimum Distance Separation (MDS)	
	23.Concept Plan Showing Proposed Land Uses and Landscaping	24.Agrology and Soil Capability Study	
S	25.Concept Site Plan	26.Cultural Heritage Impact Statement	
S	**27.Landscape Plan**	28.Archaeological Resource Assessment	
S	**29.Survey Plan**	30.Shadow Analysis	
S	**31.Architectural Building Elevation Drawings (dimensioned)**	32.Design Brief	
	33.Wind Analysis		
	ENVIRONMENTAL		
S	34. Phase 1 Environmental Site Assessment	35.Impact Assessment of Adjacent Waste Disposal/Former Landfill Site	
	36.Phase 2 Environmental Site Assessment (depends on the outcome of Phase 1)	37.Assessment of Landform Features	
	38.Record of Site Condition	39.Mineral Resource Impact Assessment	
S	40.Tree Conservation Report	41.Assessment of Endangered Species	
	42.Mine Hazard Study / Abandoned Pit or Quarry Study	43.Integrated Environmental Review (Draft, as part of Planning Rationale)	

Site Address 620 Bobolink Ridge

Application Type: Site Plan Control application
Planner : Kathy Rygus
Infrastructure Approvals Project Manager: Eric Surprenant
Date: February 22, 2021

*Preliminary Assessment: 1☐ 2☐ 3☐ 4☒ 5☐

*One (1) indicates that considerable major revisions are required before a planning application is submitted, while five (5) suggests that proposal appears to meet the City's key land use policies and guidelines. **This assessment is purely advisory and does not consider technical aspects of the proposal or in any way guarantee application approval.**

Please note that PDF versions of all the of the listed requirements must be submitted with the application.

It is important to note that the need for additional studies and plans may result during application review. If following the submission of your application, it is determined that material that is not identified in this checklist is required to achieve complete application status, in accordance with the Planning Act and Official Plan requirements, the Planning, Infrastructure and Economic Development Department *will notify you of outstanding material required within the required 30 day period. Mandatory pre-application consultation will not shorten the City's standard processing timelines, or guarantee that an application will be approved. It is intended to help educate and inform the applicant about submission requirements as well as municipal processes, policies, and key issues in advance of submitting a formal development application. This list is valid for one year following the meeting date. If the application is not submitted within this timeframe the applicant must again pre-consult with the* Planning, Infrastructure and Economic Development Department.

PC2021-0051

Pre-Application Consultation Meeting (Via Teams)

Site Plan Control Application: 620 Bobolink Ridge

February 22, 2021, 9-10:am

Attendees

Kathy Rygus - Development Review Planner, City of Ottawa
Eric Surprenant - Project Manager (Infrastructure), City of Ottawa
Randolph Wang - Urban Design Planner, City of Ottawa
Nadia DeSanti –Senior Project Manager, WSP
Samantha Gatchene - Planner, WSP
Daniela Correia – Landscape Architect, WSP
Steve Davidson - Engineer, WSP
Alexander Orakwue – Land Development Manager, Richcraft

Applicant's overview of proposal

- The site is a 1.6-hectare parcel located at 620 Bobolink Ridge in CRT Developments Inc. Phase 1 Westwood subdivision. The property has two access points on Embankment Crescent between Bobolink Ridge and Cope Drive and is currently vacant.
- Zoning is R4Z, permitting low rise apartments and stacked units.
- The proposed site plan is for 7 blocks of back-to-back stacked units, with 84 units total. A central building would provide bicycle storage together with garbage. And recycling facilities. 118 surface parking spaces would be provided as well as a central amenity area..

Process

1. The application type for the proposed development is Site Plan Control, Complex, Manager Approval. The application is subject to public notification through the Devapps website and an onsite sign. The fee is $59,338.80 with additional engineering fees and a $1,040 Conservation Authority fee. Information on process, timeline and fees for the different applications can be found here.
2. Fees are not required to be paid at the time of application submission. An email with instructions for payment of fees will be sent by the assigned planner once a file number has been assigned.
3. Information on process, timeline and fees for the different applications can be found here.
4. The application should be submitted digitally with PDFs of all documents (attached in the e-mail or link to dropbox provided). Please send application to planningcirculations@ottawa.ca. Please cc the Senior Planner in Development Review West, Wendy Tse: Wendy.tse@ottawa.ca
5. A list of required plans and studies is provided.

PC2021-0051

Planning & Urban Design

Please accept these comments on behalf of PRUD for the proposed Site Plan Control.

1. A Design Brief is required for a site plan control application. The Terms of Reference for the Design Brief is attached for convenience.
2. The site just touches the Design Priority Area designation, but the proposed development is exempted from the review by the Urban Design Review Panel.
3. With respect to the concept plan presented at the meeting, please consider the following (also see attached PDF diagrams for reference):
    a. Organize the 7 building blocks into two clusters;
    b. Create stronger rhythmic building edges along public streets;
    c. Locate the amenity space at the centre of the between the two clusters, clearly visible and easily accessible by all residents;
    d. Create a larger amenity space if possible;
    e. Locate the small accessory building to the edge of the street so that it won't become a visual barrier for residents, making sure the building is designed to be appropriate for street presence.

Please contact Randolph Wang for questions: Randolph.wang@ottawa.ca

Infrastructure

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

1. The easterly lot line is abutting Robert Grant Avenue. Tie-in of grading is important and noise walls or retaining walls are to be avoided.

2. The site is zoned to accommodate the type of development proposed, so we do not anticipate servicing constraints.

3. The site drains to Fernbank Pond 5, which is operational; there are no anticipated issues however there will be a need to demonstrate that imperviousness ratios are in accordance with Master Servicing study requirements etc and stormwater management on site as required…

4. A request for boundary conditions will need to be submitted.

5. As a residential site plan block, there will be requirements to demonstrate Fire Flow, via FUS methedology. At minimum there will be a need for water-loss leak detection chamber at property line and potential for fire-flow bypass metre at lot line is anticipated with sub-metering at units

6. The Servicing Study Guidelines for Development Applications are available at the following address: http://ottawa.ca/en/development-application-review-process-0/servicing-study-guidelines-development-applications

7. 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 Accessibility Design Standards (2012)
- Ottawa Standard Tender Documents (latest version)
- Ontario Provincial Standards for Roads & Public Works (2013)

8. 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.

Should you have any questions or require additional information, please contact Eric Surprenant by e-mail: Eric.surprenant@ottawa.ca

Transportation/Noise

1. No TIA is required (less than 90 units)
2. A noise impact assessment is required
3. On site plan, show:
    a. Turning movement diagrams required for all accesses showing the largest vehicle to access/egress the site.
    b. Turning movement diagrams required for internal movements (loading areas, garbage).
    c. All curb radii measurements; ensure that curb radii are reduced
    d. Show lane/aisle widths, access width and throat length

Feel free to contact Mike Giampa for follow-up questions: Mike.giampa@ottawa.ca

.**Tree Conservation**

1. A Tree Conservation Report (TCR) is required.
2. Any removal of privately-owned trees 10 cm or larger in diameter requires a tree permit issued under the Urban Tree Conservation Bylaw.

3. The TCR must list all trees on-site by species, diameter and health condition. Note that TCR must address all trees with a critical root zone that extends into the developable area.
4. If trees are to be removed, the TCR must clearly show where they are and document the reason they cannot be retained.
5. All retained trees must also be shown and all retained trees within the area impacted by the development process must be protected as per the City guidelines listed on Ottawa.ca.
6. The City encourages the retention of healthy trees wherever possible.
7. The removal of City-owned trees will require the permission of Forestry Services who will also review the submitted TCR.

Please contact Mark Richardson Mark.richardson@ottawa.ca for questions.

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

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

Feel free to contact me at Kathy.rygus@ottawa.ca if you have any questions.

Kathy Rygus

Planner, Development Review West

4.1 General Content

☒ Executive Summary (for larger reports only).

Comments: N/A

☒ Date and revision number of the report.

Comments: *Refer to front page of the Report*

☒ Location map and plan showing municipal address, boundary, and layout of proposed development.

Comments: *Refer to Figure 1 Site Location*

☒ Plan showing the site and location of all existing services.

Comments: *Refer to drawing C1.1-C1.5*

☒ Development statistics, land use, density, adherence to zoning and official plan, and reference to applicable subwatershed and watershed plans that provide context to which individual developments must adhere.

Comments: *Refer to Architectural Site Plan*

☒ Summary of Pre-consultation Meetings with City and other approval agencies.

Comments: Refer to Appendix B for Pre-Consultation Meeting Notes

☒ 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.

Comments: *N/A*

☒ Statement of objectives and servicing criteria.

Comments: Refer to Servicing Report Section 2

☒ Identification of existing and proposed infrastructure available in the immediate area.

Comments: *Refer to Servicing Report Section 3.3 and 3.4. Refer to drawing C1.1-C1.5*

☒ 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).

Comments: Refer to Servicing Report Section 5.1

☒ 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.

Comments: *Refer to drawing C1.2-C1.3*

☒ 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.

Comments: *Refer to Servicing Report Section 5.2*

☒ Proposed phasing of the development, if applicable.

Comments: *N/A*

☒ Reference to geotechnical studies and recommendations concerning servicing.

Comments: Refer to Servicing Report Section 4.2

☒ 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

Comments: *Refer to drawing C1.1-C1.5*

4.2 Development Servicing Report: Water

☒ Confirm consistency with Master Servicing Study, if available

Comments: Refer to Servicing Report Section 4.5.2

☒ Availability of public infrastructure to service proposed development

Comments: Refer to Servicing Report Section 3

☒ Identification of system constraints

Comments: N/A

☒ Identify boundary conditions

Comments: Refer to Servicing Report Section 4.5.4

☒ Confirmation of adequate domestic supply and pressure

Comments: *Refer to Servicing Report Section 4.5.4*

☒ 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.

Comments: *Refer to Servicing Report Section 4.5.3 and 4.5.3*

☒ 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.

Comments: Refer to Servicing Report Section 4.5.4

☒ Definition of phasing constraints. Hydraulic modeling is required to confirm servicing for all defined phases of the project including the ultimate design

Comments: N/A

☒ Address reliability requirements such as appropriate location of shut-off valves

Comments: Refer to Servicing Report Section 4.5.9

☒ Check on the necessity of a pressure zone boundary modification.

Comments: Refer to Servicing Report Section 4.5.10

☒ 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

Comments: *Refer to Servicing Report Section 4.5*

☒ 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.

Comments: *Refer to Servicing Report Section 4.5.1*

☒ 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.

Comments: N/A

☒ Confirmation that water demands are calculated based on the City of Ottawa Design Guidelines.

Comments: *Refer to Servicing Report Section 4.5.2*

☒ Provision of a model schematic showing the boundary conditions locations, streets, parcels, and building locations for reference.

Comments: Refer to Servicing Report - Appendix D

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).

Comments: *Refer to Servicing Report Section 4.4.2*

☒ Confirm consistency with Master Servicing Study and/or justifications for deviations.

Comments: Refer to Servicing Report Section 4.4.2

☒ 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.

Comments: *Refer to Servicing Report Section 4.4.2*

☒ Description of existing sanitary sewer available for discharge of wastewater from proposed development.

Comments: *Refer to Servicing Report Section 3.3*

☒ 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)

Comments: *Refer to Servicing Report Section 4.4.4*

☒ Identification and implementation of the emergency overflow from sanitary pumping stations in relation to the hydraulic grade line to protect against basement flooding.

Comments: N/A

☒ Special considerations such as contamination, corrosive environment etc.

Comments: N/A

4.4 Development Servicing Report: Stormwater

☒ Description of drainage outlets and downstream constraints including legality of outlets (i.e. municipal drain, right-of-way, watercourse, or private property)

Comments: *Refer to SWM Report Section 2.2*

☒ Analysis of available capacity in existing public infrastructure.

Comments: *Refer to SWM Report Section 2.2*

☒ A drawing showing the subject lands, its surroundings, the receiving watercourse, existing drainage patterns, and proposed drainage pattern.

Comments: *Refer to drawing C1.1-C1.5*

☒ 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.

Comments: *Refer to SWM Report Section 1.4*

☒ Water Quality control objective (basic, normal or enhanced level of protection based on the sensitivities of the receiving watercourse) and storage requirements.

Comments: Refer to SWM Report Section 1.4

☒ Description of the stormwater management concept with facility locations and descriptions with references and supporting information.

Comments: *Refer to SWM Report Section 3.2*

☒ Set-back from private sewage disposal systems.

Comments: *Refer to SWM Report Section 3.6*

☒ Watercourse and hazard lands setbacks.

Comments: Refer to SWM Report Section 3.6

☒ Record of pre-consultation with the Ontario Ministry of Environment and the Conservation Authority that has jurisdiction on the affected watershed.

Comments: N/A

☒ Confirm consistency with sub-watershed and Master Servicing Study, if applicable study exists.

Comments: *Refer to SWM Report Section 1.3 and 1.4*

☒ Storage requirements (complete with calculations) and conveyance capacity for minor events (1:5 year return period) and major events (1:100 year return period).

Comments: *Refer to SWM Report Section 3.2 and SWM Report - Appendix C*

☒ Identification of watercourses within the proposed development and how watercourses will be protected, or, if necessary, altered by the proposed development with applicable approvals.

Comments: Refer to SWM Report Section 3.5

☒ 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.

Comments: *Refer to SWM Report Section 2 and 3. Also SWM Report - Appendix A-C.*

☒ Any proposed diversion of drainage catchment areas from one outlet to another.

Comments: Refer to SWM Report Section 3.4

☒ Proposed minor and major systems including locations and sizes of stormwater trunk sewers, and stormwater management facilities.

Comments: Refer to SWM Report Section 3, Appendix A - C, and drawing C1.1-C1.5

☒ 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.

Comments: N/A

☒ Identification of potential impacts to receiving watercourses

Comments: Refer to SWM Report Section 3.5

☒ Identification of municipal drains and related approval requirements.

Comments: Refer to SWM Report Section 3.5

☒ Descriptions of how the conveyance and storage capacity will be achieved for the development.

Comments: *Refer to SWM Report Section 3*

☒ 100 year flood levels and major flow routing to protect proposed development from flooding for establishing minimum building elevations (MBE) and overall grading.

Comments: Refer to SWM Report Section 3 and drawings C1.1-C1.5

☒ Inclusion of hydraulic analysis including hydraulic grade line elevations.

Comments: Refer to SWM Report Section 3

☒ Description of approach to erosion and sediment control during construction for the protection of receiving watercourse or drainage corridors.

Comments: *Refer to SWM Report Section 4*

☒ 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.

Comments: *Refer to SWM Report Section 3.5*

☒ Identification of fill constraints related to floodplain and geotechnical investigation.

Comments: *Refer to SWM Report Section 3.7*

4.5 Approval and Permit Requirements: Checklist

The Servicing Study shall provide a list of applicable permits and regulatory approvals necessary for the proposed development as well as the relevant issues affecting each approval. The approval and permitting shall include but not be limited to the following:

☐ 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 Act. 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.

Comments: Not applicable.

☐ Application for Certificate of Approval (CofA) under the Ontario Water Resources Act.

Comments: Not applicable.

☐ Changes to Municipal Drains.

Comments: *Not applicable.*

☐ Other permits (National Capital Commission, Parks Canada, Public Works and Government Services Canada, Ministry of Transportation etc.)

Comments: *Not applicable.*

4.6 Conclusion Checklist

☒ Clearly stated conclusions and recommendations

Comments:

☐ 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.

Comments: *Further comments to be added following site plan application review.*

☒ All draft and final reports shall be signed and stamped by a professional Engineer registered in Ontario

Comments:

APPENDIX

C SANITARY SYSTEM CALCULATION

Table A1 - Proposed Development

DESIGNED BY: Daniel Searle, P.Eng.
CHECKED BY: Steve Davidson, P.Eng, OLS(ret.),MBA

Proposed Building Space Allocation

Building Type	Townhomes	Units/TWH	Cap/ Unit	Pop
Townnhouses	7	12	2.7	227
Total	**7**	**12**	**2.7**	**227**

Table A2 - Sanitary Sewer Calculation

DRAINAGE DESCRIPTION												OUTLET PIPE DATA				
AREA DESCRIPTION	From M.H.	To M.H.	Area (ha)	Population	Cumulative Area (ha)	Cumulative Population	Sewege Flow (L/s)	Peaking Factor (Corrected)	Peak Flow (L/s)	Extraneous Flow (L/s)	Total Flow, Q (L/s)	SIZE (mm)	Slope (%)	CAP (L/s)	Q/Qfull (%)	Full Flow Velocity (m/s)
Block 344	SAN MH210	SAN MH209	0.21	32.4	0.21	32	0.11	3.68	0.40	0.07	0.47	**200**	**1.00%**	32.36	**2%**	**1.04**
	SAN MH209	SAN MH208	0.32	32.4	0.53	65	0.21	3.64	0.76	0.17	0.93	**200**	**0.50%**	22.88	**5%**	**0.74**
	SAN MH207	SAN MH208	0.12	32.4	0.12	32	0.11	3.68	0.40	0.04	0.44	**200**	**1.00%**	32.36	**2%**	**1.04**
									0.00	0.00	0.00					
	SAN MH208	SAN MH206	0.04	0.0	0.69	97	0.32	3.60	1.15	0.23	1.38	**200**	**0.50%**	22.88	**7%**	**0.74**
	SAN MH205	SAN MH206	0.21	32.4	0.21	32	0.11	3.68	0.40	0.07	0.47	**200**	**1.00%**	32.36	**2%**	**1.04**
	SAN MH206	SAN MH203	0.02	0.0	0.92	130	0.42	3.57	1.50	0.30	1.80	**200**	**0.50%**	22.88	**8%**	**0.74**
	SAN MH212	SAN MH213	0.18	32.4	0.18	32	0.11	3.68	0.40	0.06	0.46	**200**	**0.40%**	20.46	**3%**	**0.66**
	SAN MH201	SAN MH213	0.07	16.2	0.07	16	0.05	3.72	0.19	0.02	0.21	**200**	**0.40%**	20.46	**2%**	**0.66**
	SAN MH213	SAN MH214	0.07	16.2	0.14	65	0.21	3.64	0.76	0.05	0.81	**200**	**0.40%**	20.46	**4%**	**0.66**
	SAN MH212	SAN MH211	0.15	32.4	0.15	32	0.11	3.68	0.40	0.05	0.45	**200**	**0.40%**	20.46	**3%**	**0.66**
	SAN MH211	SAN MH214	0.05	0.0	0.20	32	0.11	3.68	0.40	0.07	0.47	**200**	**0.40%**	20.46	**3%**	**0.66**
	SAN MH214	SAN MH203	0.12	0.0	0.46	97	0.32	3.60	1.15	0.15	1.30	**200**	**0.40%**	20.46	**7%**	**0.66**
	SAN MH203	EX. STUB	0.05	0.0	1.43	227	0.74	3.51	2.60	0.47	3.07	**200**	**0.40%**	20.46	**16%**	**0.66**

DESIGN PARAMETER

Average Daily Flow=	280 L/cap/day	Industrial Peak Factor=	N/A
Comm/Inst Flow=	N/A L/ha/day	Extraneous Flow (I&I) =	0.33 L/s/ha
Industrial Flow=	N/A L/ha/day	Minimum Velocity=	0.6 m/s
Res. Peak Factor=	2-0 - 4.0	Maximum Velocity =	3 m/s
Comm/Inst Peak Factor=	N/A	Manning n=	0.013
		Harmon - Correction Factor=	0.8

Designed By: Daniel Searle, P.Eng.
Checked By: Steve Davidson, P.Eng, OLS(ret.),MBA
Project Number: 211-01221-00

PROJECT: Richcraft Terrace Flats
LOCATION: 620 Bobolink Ridge (Block 344), Fernbank Phase 1 Ottawa, Ontario
Date: 2021.06.15 **Ref DWG.: SAN-SK1-1**

Notes:
1) Refer to Table A1 for population calculations.

SANITARY CATCHMENT AREA BUBBLE

1.0 ha
12 UN. | 33 POP.

- CATCHMENT AREA (HECTARES)
- POPULATION COUNT
- UNIT COUNT

ROBERT GRANT AVENUE

ROBERT GRANT AVENUE

BOBOLINK RIDGE

COPE DRIVE

EMBANKMENT STREET

EMBANKMENT STREET

PINNER STREET

PINNER ROAD

SAN MH210 T/G: 108.24

SAN MH209 T/G: 108.08

SAN MH207 T/G: 108.20

SAN MH205 T/G: 108.21

SAN MH208 T/G: 108.10

SAN MH206 T/G: 108.08

SAN MH203 T/G: 108.15

SAN MH201 T/G: 106.62

SAN MH213 T/G: 107.41

SAN MH212 T/G: 106.46

SAN MH214 T/G: 107.85

SAN MH211 T/G: 107.19

NEW 200mmØ SANITARY SEWER

NEW 200mmØ SANITARY SEWER

NEW 200mmØ SANITARY SEWER

NEW 200mmØ SANITARY SEWER

NEW 200mmØ SANITARY SEWER

NEW 200mmØ SANITARY SEWER

NEW 200mmØ SANITARY SEWER

NEW 200mmØ SANITARY SEWER

NEW 200mmØ SANITARY SEWER

NEW 200mmØ SANITARY SEWER

NEW 200mmØ SANITARY SEWER

NEW 200mmØ SANITARY SEWER

0.21 ha — 12 UN. | 33 POP.

0.32 ha — 12 UN. | 33 POP. — BLOCK - 2, 12 UNITS

0.12 ha — 12 UN. | 33 POP. — BLOCK - 3, 12 UNITS

0.21 ha — 12 UN. | 33 POP.

0.04 ha — 0 UN. | 0 POP.

0.02 ha — 0 UN. | 0 POP.

0.05 ha — 0 UN. | 0 POP.

0.07 ha — 6 UN. | 17 POP.

0.07 ha — 6 UN. | 17 POP. — BLOCK - 4, 12 UNITS

0.12 ha — 0 UN. | 0 POP.

0.05 ha — 0 UN. | 0 POP.

0.18 ha — 12 UN. | 33 POP. — BLOCK - 6, 12 UNITS

0.15 ha — 12 UN. | 33 POP. — BLOCK - 7, 12 UNITS

BLOCK - 1, 12 UNITS

NORTH ENTRANCE

SOUTH ENTRANCE

STORAGE

GARBAGE ROOM

BICYCLE STORAGE

Site Trailer and Storage Area

wsp
1224 GARDINERS ROAD, SUITE 201
KINGSTON, ONTARIO
CANADA K7P 0G2
PHONE: 613-634-7373
WWW.WSP.COM

CONSULTANT:
M. David Blakely Architect Inc.
2200 Prince of Wales Dr. - Suite 101
Ottawa, Ontario K2E 6Z9
Phone (613) 226-8811 Fax (613) 226-7942

SEAL:

NORTH

CLIENT:
RICHCRAFT Group Of Companies

CLIENT REF. #:

PROJECT:
TERRACE FLATS

KEY PLAN:

ISSUED FOR - REVISION:

IS	RE	DATE	DESCRIPTION
1		2021/06/18	ISSUED FOR CLIENT REVIEW

PROJECT NO: 211-01221-00
DATE: MARCH 2021
ORIGINAL SCALE: 1:400
IF THIS BAR IS NOT 25mm LONG, ADJUST YOUR PLOTTING SCALE.
25mm
DESIGNED BY: DS
DRAWN BY: MH
CHECKED BY: SD
DISCIPLINE: CIVIL

TITLE: SANITARY SEWER CATCHMENT MAP

SHEET NUMBER: SAN-SK1-1
SHEET #: 1 OF 1

ISSUE: ISSUED FOR DISTRIBUTION
DATE OF: 2020/06/11
REV #: 0

N:\2021\211-01221-00 - Richcraft Terrace Flats Site Plan\Drawings\01 Civil\03. FGS-SK\SO2. Sketches\211-01221-00- SAN-SK1-1.dwg Jun 25, 2021-3:27pm BY (daniel.leanle)

IBI GROUP
IBI Group
400-333 Preston Street
Ottawa, Ontario
K1S 5N4

SANITARY SEWER DESIGN SHEET

PROJECT: CRT DEVELOPMENT
LOCATION: CITY OF OTTAWA
CLIENT: CRT DEVELOPMENT INC.

LOCATION				RESIDENTIAL									ICI AREAS							INFILTRATION ALLOWANCE			TOTAL FLOW	PROPOSED SEWER DESIGN						
				UNIT TYPES				AREA	POPULATION		PEAK FACTOR	PEAK FLOW	AREA (Ha)						PEAK FLOW	AREA (Ha)		FLOW		CAPACITY	LENGTH	DIA	SLOPE	VELOCITY	AVAILABLE CAPACITY	
													INSTITUTIONAL		COMMERCIAL		INDUSTRIAL												
STREET	AREA ID	FROM MH	TO MH	SF	SD	TH	APT	(Ha)	IND	CUM		(L/s)	IND	CUM	IND	CUM	IND	CUM	(L/s)	IND	CUM	(L/s)	(L/s)	(L/s)	(m)	(mm)	(%)	(full) (m/s)	L/s	(%)
PUTNEY CRESCENT	141A	141A	142A			1		0.06	2.5	2.5	4.00	0.04		0.00		0.00		0.00	0.00	0.06	0.06	0.02	0.06	24.19	9.07	200	0.50	0.746	24.14	99.76
PUTNEY CRESCENT	142A	142A	143A			11		0.35	27.5	30.0	4.00	0.49		0.00		0.00		0.00	0.00	0.35	0.41	0.11	0.60	47.16	55.56	200	1.90	1.454	46.56	98.73
PUTNEY CRESCENT	143A	143A	144A			17		0.49	42.5	72.5	4.00	1.17		0.00		0.00		0.00	0.00	0.49	0.90	0.25	1.43	41.91	64.86	200	1.50	1.292	40.48	96.60
FINSBURY AVENUE	136AA	136A	144A			21		0.65	52.5	52.5	4.00	0.85		0.00		0.00		0.00	0.00	0.65	0.65	0.18	1.03	53.56	110.44	200	2.45	1.652	52.52	98.07
PUTNEY CRESCENT	144A	144A	145A			10		0.36	25.0	150.0	4.00	2.43		0.00		0.00		0.00	0.00	0.36	1.91	0.53	2.97	32.46	80.25	200	0.90	1.001	29.50	90.86
CLAPHAM TERRACE	136AB	136A	137A			10		0.37	25.0	25.0	4.00	0.41		0.00		0.00		0.00	0.00	0.37	0.37	0.10	0.51	24.19	78.00	200	0.50	0.746	23.69	97.90
BRIXTON WAY	137AA	137A	160A			12		0.35	30.0	55.0	4.00	0.89		0.00		0.00		0.00	0.00	0.35	0.72	0.20	1.09	41.91	50.77	200	1.50	1.292	40.81	97.39
BRIXTON WAY	160A	160A	145A			18		0.54	45.0	100.0	4.00	1.62		0.00		0.00		0.00	0.00	0.54	1.26	0.35	1.97	52.45	78.53	200	2.35	1.617	50.48	96.24
PUTNEY CRESCENT	145A	145A	146A			11		0.34	27.5	277.5	4.00	4.50		0.00		0.00		0.00	0.00	0.34	3.51	0.98	5.48	39.76	70.87	200	1.35	1.226	34.28	86.22
CLAPHAM WAY	137AB	137A	138A			9		0.38	22.5	22.5	4.00	0.36		0.00		0.00		0.00	0.00	0.38	0.38	0.11	0.47	37.48	78.00	200	1.20	1.156	37.01	98.74
PUTNEY CRESCENT	138A	138A	148A			10		0.35	25.0	47.5	4.00	0.77		0.00		0.00		0.00	0.00	0.35	0.73	0.20	0.97	40.49	77.95	200	1.40	1.248	39.51	97.59
PUTNEY CRESCENT	148A	148A	147A			7		0.26	17.5	65.0	4.00	1.05		0.00		0.00		0.00	0.00	0.26	0.99	0.28	1.33	55.70	59.50	200	2.65	1.718	54.37	97.61
PUTNEY CRESCENT	147A	147A	146A			0		0.03	0.0	65.0	4.00	1.05		0.00		0.00		0.00	0.00	0.03	1.02	0.29	1.34	55.70	12.47	200	2.65	1.718	54.36	97.60
BLOCK 323	146A	146A	161A			0		0.03	0.0	342.5	4.00	5.55		0.00		0.00		0.00	0.00	0.03	4.56	1.28	6.83	28.63	38.97	200	0.70	0.883	21.80	76.15
BLOCK 316	HYD. 2	161A	*Ex.209*			0		5.12	0.0	342.5	4.00	5.55		0.00		0.00		0.00	0.00	5.12	9.68	2.71	8.26	28.63	53.67	200	0.70	0.883	20.37	71.15
BLOCK 324	RES.1	BULKHEAD	*Ex.209*					1.89	170.1	170.1	4.00	2.76		0.00		0.00		0.00	0.00	1.89	1.89	0.53	3.29	43.87	8.00	250	0.50	0.866	40.58	92.51
				Refer to ECA No. 9079-9LNNZC dated July 9, 2014 for description of existing sewers.																											

Design Parameters:

Residential			ICI Areas			
						Peak Factor
SF	3.3	p/p/u				
TH/SD	2.5	p/p/u	INST	50,000	L/Ha/day	1.5
APT	1.8	p/p/u	COM	50,000	L/Ha/day	1.5
Low	60	p/p/Ha	IND	35,000	L/Ha/day	MOE Chart
Med	75	p/p/Ha				
High	90	p/p/Ha				

Notes:

1. Mannings coefficient (n) = 0.013
2. Demand (per capita): 350 L/day
3. Infiltration allowance: 0.28 L/s/Ha
4. Residential Peaking Factor:
   Harmon Formula = 1+(14/(4+P^0.5))
   where P = population in thousands

Designed: J.I.M.

Checked: P.K.

Dwg. Reference: 27970 - 501, 501A, 501B

No.	Revision	Date
1.	Submission No. 1 to City of Ottawa	2013-08-29
2.	Submission No. 2 to City of Ottawa	2014-01-22
3.	Submission No. 3 to City of Ottawa	2014-08-22
4.	Submission No. 4 to City of Ottawa	2015-06-15
5.	Submission No. 5 to City of Ottawa	2016-11-10
6.	Submission for MOE Approval	2017-02-10
7.	Resubmission for MOE Approval	2017-07-14

File Reference:	Date:	Sheet No:
27970.5.7.1	2017-07-14	1 of 4

IBI GROUP
IBI Group
400-333 Preston Street
Ottawa, Ontario
K1S 5N4

SANITARY SEWER DESIGN SHEET

PROJECT: CRT DEVELOPMENT
LOCATION: CITY OF OTTAWA
CLIENT: CRT DEVELOPMENT INC.

LOCATION				RESIDENTIAL									ICI AREAS							INFILTRATION ALLOWANCE			TOTAL FLOW	PROPOSED SEWER DESIGN						
				UNIT TYPES				AREA	POPULATION		PEAK FACTOR	PEAK FLOW	AREA (Ha)						PEAK FLOW	AREA (Ha)		FLOW		CAPACITY	LENGTH	DIA	SLOPE	VELOCITY	AVAILABLE CAPACITY	
													INSTITUTIONAL		COMMERCIAL		INDUSTRIAL												
STREET	AREA ID	FROM MH	TO MH	SF	SD	TH	APT	(Ha)	IND	CUM		(L/s)	IND	CUM	IND	CUM	IND	CUM	(L/s)	IND	CUM	(L/s)	(L/s)	(L/s)	(m)	(mm)	(%)	(full) (m/s)	L/s	(%)
CLAPHAM TERRACE	136AC	136A	135A			11		0.41	27.5	27.5	4.00	0.45		0.00		0.00		0.00	0.00	0.41	0.41	0.11	0.56	27.59	65.31	200	0.65	0.851	27.03	97.97
CLAPHAM TERRACE	135A	135A	134A			9		0.31	22.5	50.0	4.00	0.81		0.00		0.00		0.00	0.00	0.31	0.72	0.20	1.01	27.59	57.36	200	0.65	0.851	26.57	96.33
PUTNEY CRESCENT	141A	141A	134A			9		0.34	22.5	22.5	4.00	0.36		0.00		0.00		0.00	0.00	0.34	0.34	0.10	0.46	32.46	75.02	200	0.90	1.001	32.00	98.58
PUTNEY CRESCENT	134A	134A	140A	6				0.34	19.8	92.3	4.00	1.50		0.00		0.00		0.00	0.00	0.34	1.40	0.39	1.89	32.46	78.00	200	0.90	1.001	30.57	94.18
OSTERLEY WAY	153A	153A	152A	8				0.51	26.4	26.4	4.00	0.43		0.00		0.00		0.00	0.00	0.51	0.51	0.14	0.57	29.63	49.25	200	0.75	0.914	29.06	98.07
OSTERLEY WAY	152A	152A	151A	17				0.78	56.1	82.5	4.00	1.34		0.00		0.00		0.00	0.00	0.78	1.29	0.36	1.70	29.63	95.75	200	0.75	0.914	27.93	94.27
OSTERLEY WAY	151A	151A	150A	10				0.47	33.0	115.5	4.00	1.87		0.00		0.00		0.00	0.00	0.47	1.76	0.49	2.36	29.63	59.68	200	0.75	0.914	27.27	92.02
OSTERLEY WAY	150A	150A	140A	9				0.42	29.7	145.2	4.00	2.35		0.00		0.00		0.00	0.00	0.42	2.18	0.61	2.96	29.63	62.98	200	0.75	0.914	26.67	90.00
PUTNEY CRESCENT	140A	140A	124A	3				0.24	9.9	247.4	4.00	4.01		0.00		0.00		0.00	0.00	0.24	3.82	1.07	5.08	32.46	78.00	200	0.90	1.001	27.38	84.36
BLOCK 343	RES.2	BLKHD	129A					1.21	108.9	108.9	4.00	1.76		0.00		0.00		0.00	0.00	1.21	1.21	0.34	2.10	20.24	19.00	200	0.35	0.624	18.14	89.61
BOBOLINK RIDGE	129A	129A	128A	0				0.09	0.0	108.9	4.00	1.76		0.00		0.00		0.00	0.00	0.09	1.30	0.36	2.13	31.02	45.00	250	0.25	0.612	28.89	93.14
BOBOLINK RIDGE	128AA	128A	127A	6				0.41	19.8	128.7	4.00	2.09		0.00		0.00		0.00	0.00	0.41	1.71	0.48	2.56	31.02	78.00	250	0.25	0.612	28.46	91.73
BOBOLINK RIDGE	127AA	127A	126A	10				0.53	33.0	161.7	4.00	2.62		0.00		0.00		0.00	0.00	0.53	2.24	0.63	3.25	31.02	78.00	250	0.25	0.612	27.77	89.53
BOBOLINK RIDGE	126A	126A	125A	5				0.33	16.5	178.2	4.00	2.89		0.00		0.00		0.00	0.00	0.33	2.57	0.72	3.61	31.02	47.81	250	0.25	0.612	27.41	88.37
BOBOLINK RIDGE	125A	125A	124A	12				0.56	39.6	217.8	4.00	3.53		0.00		0.00		0.00	0.00	0.56	3.13	0.88	4.41	31.02	74.85	250	0.25	0.612	26.61	85.80
BOBOLINK RIDGE	124A	124A	123A	11				0.61	36.3	501.5	3.97	8.07		0.00		0.00		0.00	0.00	0.61	7.56	2.12	10.19	31.02	88.85	250	0.25	0.612	20.83	67.15
DAGENHAM STREET	PARK1, 131A	131A	130A	7				1.70	23.1	23.1	4.00	0.37		0.00		0.00		0.00	0.00	1.70	1.70	0.48	0.85	34.22	43.00	200	1.00	1.055	33.37	97.51
DAGENHAM STREET	130A	130A	123A	8				0.46	26.4	49.5	4.00	0.80		0.00		0.00		0.00	0.00	0.46	2.16	0.60	1.41	34.22	87.11	200	1.00	1.055	32.81	95.89
BOBOLINK RIDGE	123A	123A	122A	2				0.14	6.6	557.6	3.95	8.92		0.00		0.00		0.00	0.00	0.14	9.86	2.76	11.68	31.02	25.98	250	0.25	0.612	19.34	62.34
BOBOLINK RIDGE	122A	122A	121A	5				0.26	16.5	574.1	3.94	9.17		0.00		0.00		0.00	0.00	0.26	10.12	2.83	12.00	31.02	36.36	250	0.25	0.612	19.02	61.31
BOBOLINK RIDGE	121A	121A	120A	6				0.30	19.8	593.9	3.93	9.47		0.00		0.00		0.00	0.00	0.30	10.42	2.92	12.38	31.02	40.43	250	0.25	0.612	18.64	60.08
ANGEL HEIGHTS	111A	111A	112A	1				0.08	3.3	3.3	4.00	0.05		0.00		0.00		0.00	0.00	0.08	0.08	0.02	0.08	28.63	12.92	200	0.70	0.883	28.55	99.73
ANGEL HEIGHTS	112A	112A	113A	13				0.77	42.9	46.2	4.00	0.75		0.00		0.00		0.00	0.00	0.77	0.85	0.24	0.99	28.63	95.21	200	0.70	0.883	27.64	96.55
ANGEL HEIGHTS	113A	113A	114A	6				0.29	19.8	66.0	4.00	1.07		0.00		0.00		0.00	0.00	0.29	1.14	0.32	1.39	28.63	38.92	200	0.70	0.883	27.24	95.15
ANGEL HEIGHTS	114A	114A	120A	6				0.35	19.8	85.8	4.00	1.39		0.00		0.00		0.00	0.00	0.35	1.49	0.42	1.81	28.63	70.46	200	0.70	0.883	26.82	93.69
BOBOLINK RIDGE	120A	120A	105A	11				0.62	36.3	716.0	3.89	11.28		0.00		0.00		0.00	0.00	0.62	12.53	3.51	14.79	36.70	90.60	250	0.35	0.724	21.91	59.71

Design Parameters:

Residential			ICI Areas			
						Peak Factor
SF	3.3	p/p/u				
TH/SD	2.5	p/p/u	INST	50,000	L/Ha/day	1.5
APT	1.8	p/p/u	COM	50,000	L/Ha/day	1.5
Low	60	p/p/Ha	IND	35,000	L/Ha/day	MOE Chart
Med	75	p/p/Ha				
High	90	p/p/Ha				

Notes:

1. Mannings coefficient (n) = 0.013
2. Demand (per capita): 350 L/day
3. Infiltration allowance: 0.28 L/s/Ha
4. Residential Peaking Factor:
   Harmon Formula = 1+(14/(4+P^0.5))
   where P = population in thousands

Designed: J.I.M.

Checked: P.K.

Dwg. Reference: 27970 - 501, 501A, 501B

No.	Revision	Date
1.	Submission No. 1 to City of Ottawa	2013-08-29
2.	Submission No. 2 to City of Ottawa	2014-01-22
3.	Submission No. 3 to City of Ottawa	2014-08-22
4.	Submission No. 4 to City of Ottawa	2015-06-15
5.	Submission No. 5 to City of Ottawa	2016-11-10
6.	Submission for MOE Approval	2017-02-10
7.	Resubmission for MOE Approval	2017-07-14

File Reference: 27970.5.7.1
Date: 2017-07-14
Sheet No: 2 of 4

IBI GROUP
IBI Group
400-333 Preston Street
Ottawa, Ontario
K1S 5N4

SANITARY SEWER DESIGN SHEET

PROJECT: CRT DEVELOPMENT
LOCATION: CITY OF OTTAWA
CLIENT: CRT DEVELOPMENT INC.

IBI ASSUMED ALLOWANCE

LOCATION				RESIDENTIAL									ICI AREAS							INFILTRATION ALLOWANCE			TOTAL FLOW	PROPOSED SEWER DESIGN						
				UNIT TYPES				AREA	POPULATION		PEAK FACTOR	PEAK FLOW	AREA (Ha)						PEAK FLOW	AREA (Ha)		FLOW		CAPACITY	LENGTH	DIA	SLOPE	VELOCITY	AVAILABLE CAPACITY	
STREET	AREA ID	FROM MH	TO MH	SF	SD	TH	APT	(Ha)	IND	CUM		(L/s)	INSTITUTIONAL		COMMERCIAL		INDUSTRIAL		(L/s)	IND	CUM	(L/s)	(L/s)	(L/s)	(m)	(mm)	(%)	(full) (m/s)	L/s	(%)
													IND	CUM	IND	CUM	IND	CUM												
EMBANKMENT STREET	128AB	128A	188A	16				0.74	52.8	52.8	4.00	0.86		0.00		0.00		0.00	0.00	0.74	0.74	0.21	1.06	27.59	98.00	200	0.65	0.851	26.52	96.15
EMBANKMENT STREET	188A	188A	189A	11				0.52	36.3	89.1	4.00	1.44		0.00		0.00		0.00	0.00	0.52	1.26	0.35	1.80	27.59	74.80	200	0.65	0.851	25.79	93.49
BLOCK 344	RES.3	192A	189A					1.52	136.8	136.8	4.00	2.22		0.00		0.00		0.00	0.00	1.52	1.52	0.43	2.64	20.24	40.00	200	0.35	0.624	17.60	86.95
EMBANKMENT STREET	189A	189A	190A	14				0.69	46.2	272.1	4.00	4.41		0.00		0.00		0.00	0.00	0.69	3.47	0.97	5.38	20.24	92.53	200	0.35	0.624	14.86	73.42
EMBANKMENT STREET		190A	176A	0				0.00	0.0	272.1	4.00	4.41		0.00		0.00		0.00	0.00	0.00	3.47	0.97	5.38	20.24	10.78	200	0.35	0.624	14.86	73.42
BLOCK 345	INST.2	BULKHEAD	176A	0				0.00	0.0	0.0	4.00	0.00	6.53	6.53		0.00		0.00	5.67	6.53	6.53	1.83	7.50	20.24	21.00	200	0.35	0.624	12.75	62.97
COPE DRIVE	176A	176A	175A	3				0.63	9.9	282.0	4.00	4.57		6.53		0.00		0.00	5.67	0.63	10.63	2.98	13.21	20.24	76.03	200	0.35	0.624	7.03	34.72
COPE DRIVE	175A	175A	174A	5				0.46	16.5	298.5	4.00	4.84		6.53		0.00		0.00	5.67	0.46	11.09	3.11	13.61	20.24	84.94	200	0.35	0.624	6.63	32.76
BELSIZE WAY	127AB	127A	185A	11				0.53	36.3	36.3	4.00	0.59		0.00		0.00		0.00	0.00	0.53	0.53	0.15	0.74	27.59	88.50	200	0.65	0.851	26.85	97.33
BELSIZE WAY	185A	185A	186A	13				0.59	42.9	79.2	4.00	1.28		0.00		0.00		0.00	0.00	0.59	1.12	0.31	1.60	27.59	83.61	200	0.65	0.851	25.99	94.21
PINNER ROAD	191A	191A	186A	3				0.24	9.9	9.9	4.00	0.16		0.00		0.00		0.00	0.00	0.24	0.24	0.07	0.23	27.59	43.00	200	0.65	0.851	27.36	99.17
PINNER ROAD	186A	186A	187A	5				0.35	16.5	105.6	4.00	1.71		0.00		0.00		0.00	0.00	0.35	1.71	0.48	2.19	20.24	70.39	200	0.35	0.624	18.05	89.18
PINNER ROAD		187A	183A	0				0.00	0.0	105.6	4.00	1.71		0.00		0.00		0.00	0.00	0.00	1.71	0.48	2.19	20.24	9.00	200	0.35	0.624	18.05	89.18
FINSBURY AVENUE	182A	182A	183A	16				0.97	52.8	52.8	4.00	0.86		0.00		0.00		0.00	0.00	0.97	0.97	0.27	1.13	32.46	117.13	200	0.90	1.001	31.33	96.53
FINSBURY AVENUE	183A	183A	184A	4				0.33	13.2	171.6	4.00	2.78		0.00		0.00		0.00	0.00	0.33	3.01	0.84	3.62	20.24	65.71	200	0.35	0.624	16.62	82.10
FINSBURY AVENUE		184A	174A	0				0.00	0.0	171.6	4.00	2.78		0.00		0.00		0.00	0.00	0.00	3.01	0.84	3.62	20.24	17.89	200	0.35	0.624	16.62	82.10
COPE DRIVE	174A	174A	173A	7				0.47	23.1	493.2	3.98	7.95		6.53		0.00		0.00	5.67	0.47	14.57	4.08	17.69	31.02	82.90	250	0.25	0.612	13.33	42.96
COPE DRIVE	173A	173A	172A	6				0.41	19.8	513.0	3.97	8.25		6.53		0.00		0.00	5.67	0.41	14.98	4.19	18.11	31.02	76.02	250	0.25	0.612	12.91	41.62
BLOCK 313	INST.1	BULKHEAD	172A	0				0.00	0.0	0.0	4.00	0.00	2.88	2.88		0.00		0.00	2.50	2.88	2.88	0.81	3.31	20.24	16.00	200	0.35	0.624	16.94	83.67
COPE DRIVE	172A	172A	171B	3				0.23	9.9	522.9	3.96	8.40		9.41		0.00		0.00	8.17	0.23	18.09	5.07	21.63	31.02	36.96	250	0.25	0.612	9.39	30.27
COPE DRIVE	171B	171B	171A	2				0.22	6.6	529.5	3.96	8.50		9.41		0.00		0.00	8.17	0.22	18.31	5.13	21.79	31.02	41.21	250	0.25	0.612	9.23	29.75
DAGENHAM STREET	180A	180A	181A	7				0.50	23.1	23.1	4.00	0.37		0.00		0.00		0.00	0.00	0.50	0.50	0.14	0.51	20.24	90.00	200	0.35	0.624	19.73	97.46
DAGENHAM STREET	181A	181A	171A	0				0.11	0.0	23.1	4.00	0.37		0.00		0.00		0.00	0.00	0.11	0.61	0.17	0.55	20.24	67.50	200	0.35	0.624	19.70	97.31
COPE DRIVE	171A	171A	170B	1				0.17	3.3	555.9	3.95	8.90		9.41		0.00		0.00	8.17	0.17	19.09	5.35	22.41	45.12	37.91	300	0.20	0.618	22.71	50.33
COPE DRIVE	170B	170B	170A	3				0.25	9.9	565.8	3.95	9.04		9.41		0.00		0.00	8.17	0.25	19.34	5.42	22.63	45.12	43.98	300	0.20	0.618	22.49	49.84
BLOCK 312	RES.3A	BULKHEAD	sewer	0				3.26	195.6	195.6	4.00	3.17		0.00		0.00		0.00	0.00	3.26	3.26	0.91	4.08	20.24	16.22	200	0.35	0.624	16.16	79.83
COPE DRIVE	170A	170A	110A	6				0.62	19.8	781.2	3.87	12.24		9.41		0.00		0.00	8.17	0.62	23.22	6.50	26.91	45.12	120.00	300	0.20	0.618	18.21	40.36
GOLDHAWK DRIVE	306A	SOUTH	303A	31				1.83	102.3	102.3	4.00	1.66		0.00		0.00		0.00	0.00	1.83	1.83	0.51	2.17							
STREET NO. 26	304A	WEST	303A	14				0.69	46.2	46.2	4.00	0.75		0.00		0.00		0.00	0.00	0.69	0.69	0.19	0.94							
GOLDHAWK DRIVE	303A	303A	302A	10				0.62	33.0	181.5	4.00	2.94		0.00		0.00		0.00	0.00	0.62	3.14	0.88	3.82	20.24	94.58	200	0.35	0.624	16.42	81.13
Future Street	RES.5, 5A, Park3	EAST	302A					23.97	1421.4	1421.4	3.70	21.28		0.00		0.00		0.00	0.00	23.97	23.97	6.71	28.00							
GOLDHAWK DRIVE	302A	302A	301A	10				0.56	33.0	1635.9	3.65	24.20		0.00		0.00		0.00	0.00	0.56	27.67	7.75	31.95	50.44	70.68	300	0.25	0.691	18.49	36.66
GOLDHAWK DRIVE	301A	301A	207A	6				0.37	19.8	1655.7	3.65	24.47		0.00		0.00		0.00	0.00	0.37	28.04	7.85	32.32	50.44	70.00	300	0.25	0.691	18.12	35.93
STREET NO. 2	RES.4	EAST	207A					13.88	832.8	832.8	3.85	12.99		0.00		0.00		0.00	0.00	13.88	13.88	3.89	16.87							
GOLDHAWK DRIVE	207A	207A	206A	17				0.86	56.1	2544.6	3.50	36.10		0.00		0.00		0.00	0.00	0.86	42.78	11.98	48.08	70.84	107.19	375	0.15	0.621	22.76	32.13
GOLDHAWK DRIVE	206A	206A	205A	12				0.69	39.6	2584.2	3.50	36.60		0.00		0.00		0.00	0.00	0.69	43.47	12.17	48.78	70.84	106.61	375	0.15	0.621	22.07	31.15
GOLDHAWK DRIVE	205A	205A	110A	5				0.44	16.5	2600.7	3.49	36.81		0.00		0.00		0.00	0.00	0.44	43.91	12.29	49.11	70.84	100.61	375	0.15	0.621	21.73	30.68

Design Parameters:

Residential			ICI Areas			
						Peak Factor
SF	3.3	p/p/u	INST	50,000	L/Ha/day	1.5
TH/SD	2.5	p/p/u	COM	50,000	L/Ha/day	1.5
APT	1.8	p/p/u	IND	35,000	L/Ha/day	MOE Chart
Low	60	p/p/Ha				
Med	75	p/p/Ha				
High	90	p/p/Ha				

Notes:
1. Mannings coefficient (n) = 0.013
2. Demand (per capita): 350 L/day
3. Infiltration allowance: 0.28 L/s/Ha
4. Residential Peaking Factor:
   Harmon Formula = 1+(14/(4+P^0.5))
   where P = population in thousands

Designed: J.I.M.

Checked: P.K.

Dwg. Reference: 27970 - 501, 501A, 501B

No.	Revision	Date
1.	Submission No. 1 to City of Ottawa	2013-08-29
2.	Submission No. 2 to City of Ottawa	2014-01-22
3.	Submission No. 3 to City of Ottawa	2014-08-22
4.	Submission No. 4 to City of Ottawa	2015-06-15
5.	Submission No. 5 to City of Ottawa	2016-11-10
6.	Submission for MOE Approval	2017-02-10
7.	Resubmission for MOE Approval	2017-07-14

File Reference: 27970.5.7.1 | **Date:** 2017-07-14 | **Sheet No:** 3 of 4

IBI GROUP
IBI Group
400-333 Preston Street
Ottawa, Ontario
K1S 5N4

SANITARY SEWER DESIGN SHEET

PROJECT: CRT DEVELOPMENT
LOCATION: CITY OF OTTAWA
CLIENT: CRT DEVELOPMENT INC.

LOCATION				RESIDENTIAL									ICI AREAS							INFILTRATION ALLOWANCE			TOTAL	PROPOSED SEWER DESIGN						
				UNIT TYPES				AREA	POPULATION		PEAK	PEAK	AREA (Ha)						PEAK	AREA (Ha)		FLOW	FLOW	CAPACITY	LENGTH	DIA	SLOPE	VELOCITY	AVAILABLE CAPACITY	
STREET	AREA ID	FROM MH	TO MH	SF	SD	TH	APT	(Ha)	IND	CUM	FACTOR	FLOW (L/s)	INSTITUTIONAL IND	INSTITUTIONAL CUM	COMMERCIAL IND	COMMERCIAL CUM	INDUSTRIAL IND	INDUSTRIAL CUM	FLOW (L/s)	IND	CUM	(L/s)	(L/s)	(L/s)	(m)	(mm)	(%)	(full) (m/s)	L/s	(%)
																							0.00							
	LSPS	Allowance						0.00	0.0	0.0													108.00							
	STITTSVILLE 6 PS		110A					0.00	0.0	0.0				0.00		0.00		0.00	0.00				84.00							
Future Street	INST.3	BLKHD	110A					0.00	0.0	0.0			2.47	2.47		0.00		0.00	2.14											
	PARK4	BLKHD	110A					0.83	0.0	0.0				0.00		0.00		0.00	0.00											
	PARK5	BLKHD	110A					1.04	0.0	0.0				0.00		0.00		0.00	0.00											
	RES.9	BLKHD	110A					34.81	2610.8	2610.8				0.00		0.00		0.00	0.00											
	RES.7	BLKHD	110A					4.24	318.0	318.0				0.00		0.00		0.00	0.00											
	RES.13	BLKHD	110A					2.22	133.2	133.2				0.00		0.00		0.00	0.00											
	RES.12	BLKHD	110A					43.89	2633.4	2633.4				0.00		0.00		0.00	0.00											
	INST.4	BLKHD	110A					0.00	0.0	0.0			2.44	2.44		0.00		0.00	2.12											
	COMM.	BLKHD	110A					0.00	0.0	0.0				0.00	0.63	0.63		0.00	0.55											
	HYD.4	BLKHD	110A					3.06	0.0	0.0				0.00		0.00		0.00	0.00											
	RES.8	BLKHD	110A					2.30	172.5	172.5				0.00		0.00		0.00	0.00											
	HYD.5	BLKHD	110A					5.20	0.0	0.0				0.00		0.00		0.00	0.00											
Future Street	RES.11	BLKHD	110A					6.91	414.6	414.6				0.00		0.00		0.00	0.00											
	PARK6	BLKHD	110A					1.19	0.0	0.0				0.00		0.00		0.00	0.00											
	RES.10	BLKHD	110A					1.92	115.2	115.2				0.00		0.00		0.00	0.00											
	HYD.3	BLKHD	110A					6.31	0.0	0.0				0.00		0.00		0.00	0.00											
TOTAL		**BLKHD**	**110A**					**113.92**		**6397.7**	**3.14**	**81.49**		**4.91**		**0.63**		**0.00**	**4.81**	**119.46**	**119.46**	**33.45**	**311.74**	**320.28**	**24.02**	**600**	**0.25**	**1.097**	**8.54**	**2.67**
GOLDHAWK DRIVE		**110A**	**109A**					**0.00**	**0.0**	**9779.6**	**2.96**	**117.43**		**14.32**		**0.63**		**0.00**	**12.98**	**0.00**	**186.59**	**52.25**	**374.66**	**378.96**	**61.28**	**600**	**0.35**	**1.298**	**4.30**	**1.14**
GOLDHAWK DRIVE	**110A**	**1101A**	**1092A**	**1**				**0.18**	**3.3**	**3.3**	**4.00**	**0.05**								**0.18**	**0.18**	**0.05**	**0.10**	**28.63**	**61.28**	**200**	**0.70**	**0.883**	**28.52**	**99.64**
GOLDHAWK DRIVE		**109A**	**108A**					**0.00**	**0.0**	**9782.9**	**2.96**	**117.47**		**14.32**		**0.63**		**0.00**	**12.98**	**0.00**	**186.77**	**52.30**	**374.74**	**378.96**	**57.50**	**600**	**0.35**	**1.298**	**4.22**	**1.11**
GOLDHAWK DRIVE	**109A**	**1091A**	**1082A**	5				**0.32**	**16.5**	**16.5**	**4.00**	**0.27**								**0.32**	**0.32**	**0.09**	**0.36**	**28.63**	**57.50**	**200**	**0.70**	**0.883**	**28.27**	**98.75**
GOLDHAWK DRIVE		**108A**	**107A**					**0.00**	**0.0**	**9799.4**	**2.96**	**117.64**		**14.32**		**0.63**		**0.00**	**12.98**	**0.00**	**187.09**	**52.39**	**375.00**	**378.96**	**53.32**	**600**	**0.35**	**1.298**	**3.96**	**1.05**
GOLDHAWK DRIVE	**108A**	**1081A**	**1072A**	**4**				**0.30**	**13.2**	**13.2**	**4.00**	**0.21**							**0.00**	**0.30**	**0.30**	**0.08**	**0.30**	**28.63**	**53.32**	**200**	**0.70**	**0.883**	**28.33**	**98.96**
GOLDHAWK DRIVE		**107A**	**106A**					**0.00**	**0.0**	**9812.6**	**2.96**	**117.77**		**14.32**		**0.63**		**0.00**	**12.98**	**0.00**	**187.39**	**52.47**	**375.22**	**378.96**	**62.94**	**600**	**0.35**	**1.298**	**3.74**	**0.99**
GOLDHAWK DRIVE	**107A**	**1071A**	**1062A**	**7**				**0.31**	**23.1**	**23.1**	**4.00**	**0.37**		**0.00**		**0.00**		**0.00**	**0.00**	**0.31**	**0.31**	**0.09**	**0.46**	**28.63**	**62.94**	**200**	**0.70**	**0.883**	**28.17**	**98.39**
GOLDHAWK DRIVE		**106A**	**105A**					**0.00**	**0.0**	**9835.7**	**2.96**	**118.01**		**14.32**		**0.63**		**0.00**	**12.98**	**0.00**	**187.70**	**52.56**	**375.54**	**378.96**	**60.09**	**600**	**0.35**	**1.298**	**3.42**	**0.90**
GOLDHAWK DRIVE	**106A**	**1061A**	**1052A**	**2**				**0.24**	**6.6**	**6.6**	**4.00**	**0.11**		**0.00**		**0.00**		**0.00**	**0.00**	**0.24**	**0.24**	**0.07**	**0.17**	**28.63**	**60.09**	**200**	**0.70**	**0.883**	**28.45**	**99.39**
		105A	**104A**					**0.00**	**0.0**	**10558.3**	**2.93**	**125.37**		**14.32**		**0.63**		**0.00**	**12.98**	**0.00**	**200.47**	**56.13**	**386.48**	**389.64**	**72.85**	**600**	**0.37**	**1.335**	**3.16**	**0.81**
GOLDHAWK DRIVE	**105A**	**1051A**	**1042A**	**7**				**0.45**	**23.1**	**23.1**	**4.00**	**0.37**								**0.45**	**0.45**	**0.13**	**0.50**	**27.59**	**72.85**	**200**	**0.65**	**0.851**	**27.09**	**98.19**
GOLDHAWK DRIVE		**104A**	**103A**					**0.00**	**0.0**	**10581.4**	**2.93**	**125.60**		**14.32**		**0.63**		**0.00**	**12.98**	**0.00**	**200.92**	**56.26**	**386.84**	**389.64**	**48.77**	**600**	**0.37**	**1.335**	**2.80**	**0.72**
GOLDHAWK DRIVE	**104A**	**1041A**	**1032A**	**9**				**0.47**	**29.7**	**29.7**	**4.00**	**0.48**							**0.00**	**0.47**	**0.47**	**0.13**	**0.61**	**27.59**	**48.77**	**200**	**0.65**	**0.851**	**26.97**	**97.78**
GOLDHAWK DRIVE		**103A**	**102A**					**0.00**	**0.0**	**10611.1**	**2.93**	**125.90**		**14.32**		**0.63**		**0.00**	**12.98**	**0.00**	**201.39**	**56.39**	**387.27**	**389.64**	**45.00**	**600**	**0.37**	**1.335**	**2.37**	**0.61**
GOLDHAWK DRIVE	**103A, HYD1**	**1031A**	**1021A**	**6**				**2.01**	**19.8**	**19.8**	**4.00**	**0.32**							**0.00**	**2.01**	**2.01**	**0.56**	**0.88**	**27.59**	**45.00**	**200**	**0.65**	**0.851**	**26.70**	**96.80**
GOLDHAWK DRIVE	**102A**	**102A**	***FT-24 (EX)***					**0.12**	**0.0**	**10630.9**	**2.93**	**126.10**		**14.32**		**0.63**		**0.00**	**12.98**	**0.12**	**203.52**	**56.99**	**388.07**	**389.64**	**102.59**	**600**	**0.37**	**1.335**	**1.57**	**0.40**
HYDRO EASEMENT		***FT-24 (EX)***	***FT-23 (EX)***					**0.00**	**0.0**	**10650.7**	**2.93**	**126.30**		**14.32**		**0.63**		**0.00**	**12.98**	**0.00**	**205.53**	**57.55**	**388.83**	**400.03**	**107.50**	**600**	**0.39**	**1.371**	**11.20**	**2.80**

Design Parameters:

Residential			ICI Areas			
						Peak Factor
SF	3.3	p/p/u				
TH/SD	2.5	p/p/u	INST	50,000	L/Ha/day	1.5
APT	1.8	p/p/u	COM	50,000	L/Ha/day	1.5
Low	60	p/p/Ha	IND	35,000	L/Ha/day	MOE Chart
Med	75	p/p/Ha				
High	90	p/p/Ha				

Notes:

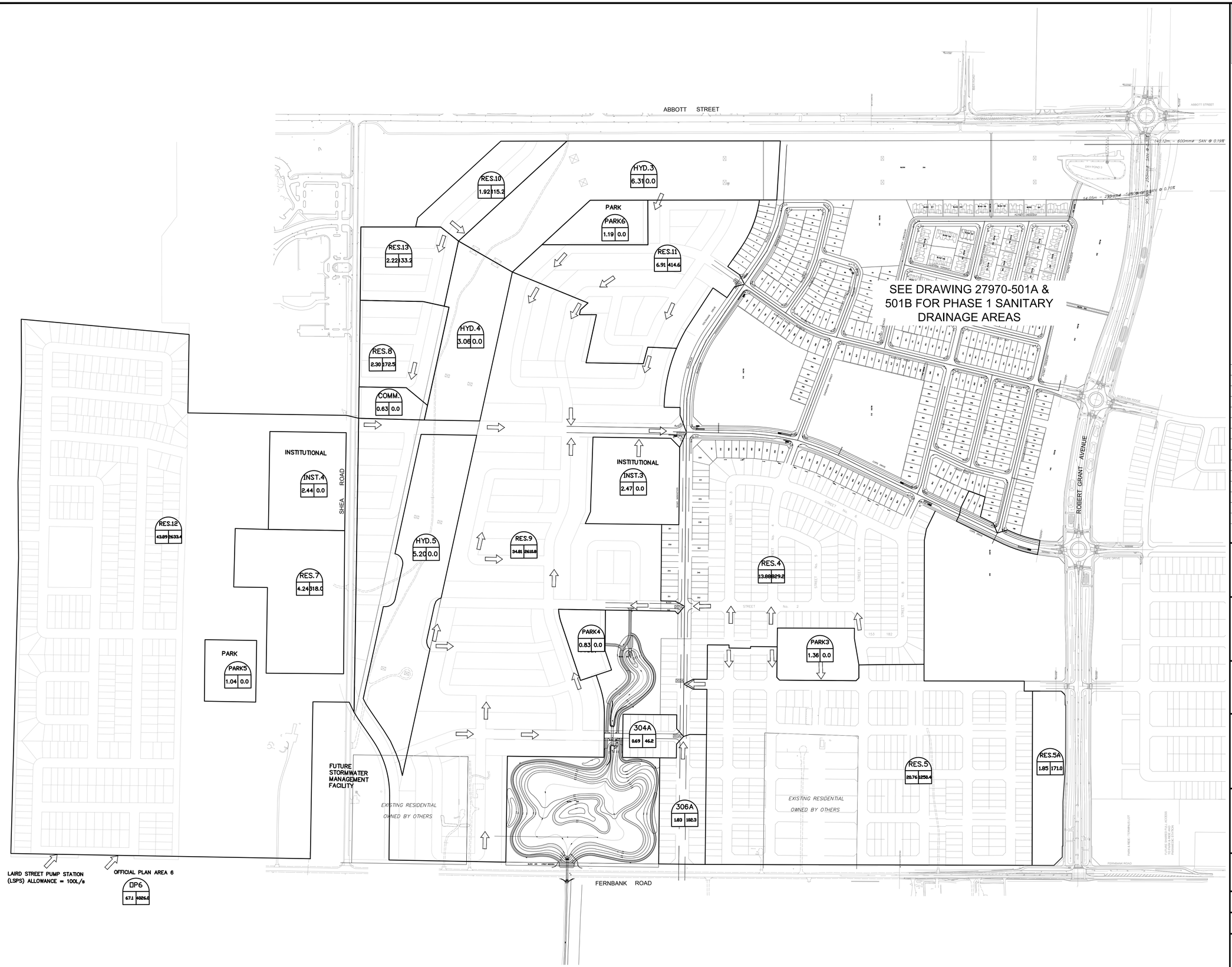
1. Mannings coefficient (n) = 0.013
2. Demand (per capita): 350 L/day
3. Infiltration allowance: 0.28 L/s/Ha
4. Residential Peaking Factor:
   Harmon Formula = 1+(14/(4+P^0.5))
   where P = population in thousands

Designed: J.I.M.
Checked: P.K.
Dwg. Reference: 27970 - 501, 501A, 501B

No.	Revision	Date
1.	Submission No. 1 to City of Ottawa	2013-08-29
2.	Submission No. 2 to City of Ottawa	2014-01-22
3.	Submission No. 3 to City of Ottawa	2014-08-22
4.	Submission No. 4 to City of Ottawa	2015-06-15
5.	Submission No. 5 to City of Ottawa	2016-11-10
6.	Submission for MOE Approval	2017-02-10
7.	Resubmission for MOE Approval	2017-07-14

File Reference:	Date:	Sheet No:
27970.5.7.1	2017-07-14	4 of 4

ALL SEWERS REPORTING AVAILABLE CAPACITY IN ESCESS OF 0.85 L/S.



REVIEWED BY
DEVELOPMENT REVIEW SERVICES BRANCH

Signed _____

Date _____ 2017

Plan Number _____

LEGEND :

145A / 0.38 / 27.5 — AREA IDENTIFICATION, POPULATION, AREA IN HECTARES

FUTURE MINOR FLOW DIRECTION

POPULATION :

SINGLE FAMILY	= 3.4 PPU
TOWNHOUSE / SEMIS	= 2.7 PPU

No.	REVISIONS	By	Date
14			
13			
12			
11			
10			
9			
8			
7	RESUBMISSION FOR MOE APPROVAL	JIM	17:07:14
6	SUBMISSION FOR MOE APPROVAL	JIM	17:02:10
5	SUBMISSION #5 FOR CITY REVIEW	JIM	16:11:10
4	SUBMISSION #4 FOR CITY REVIEW	JIM	15:06:15
3	SUBMISSION #3 FOR CITY REVIEW	JIM	14:08:22
2	SUBMISSION #2 FOR CITY REVIEW	JIM	14:01:22
1	SUBMISSION #1 FOR CITY REVIEW	JIM	13:08:29

CRT DEVELOPMENT INC.

IBI GROUP
400 – 333 Preston Street
Ottawa ON K1S 5N4 Canada
tel 613 225 1311 fax 613 225 9868
ibigroup.com

Project Title

CRT LANDS
FERNBANK COMMUNITY
PHASE 1

PROFESSIONAL ENGINEER — J. I. MOFFATT — 2017/07/14 — PROVINCE OF ONTARIO

Drawing Title

EXTERNAL SANITARY DRAINAGE

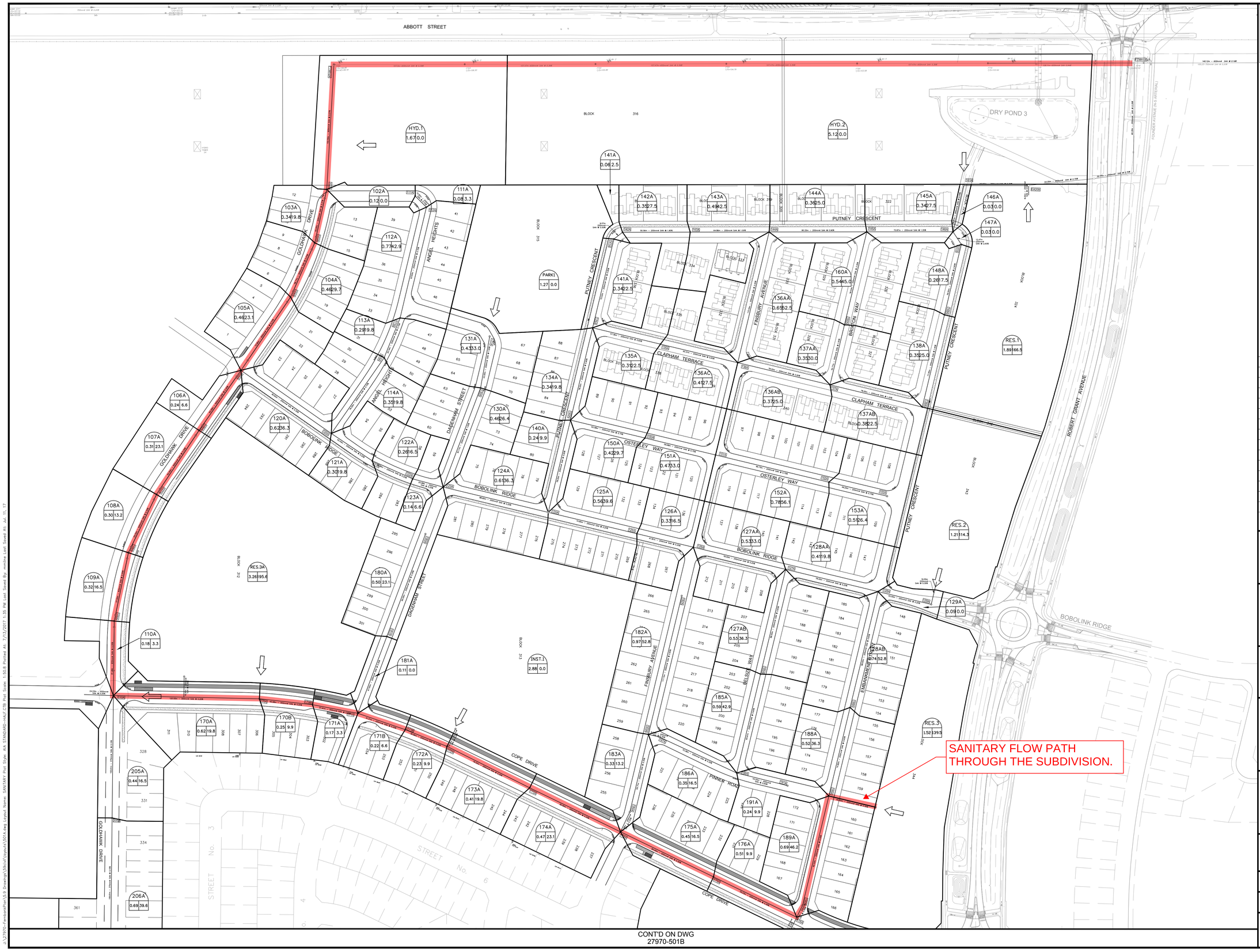
AREA PLAN

Scale: 1:3000

Design	Date
J.I.M.	OCTOBER '12
Drawn	Checked
M.M.	P.K.
Project No.	Drawing No.
27970	501

D07-16-11-0003

#17366



REVIEWED BY
DEVELOPMENT REVIEW SERVICES BRANCH

Signed _____

Date _____ 2017

Plan Number _____

LEGEND :

- 145A / 0.34 / 27.5 — AREA ID # / POPULATION / AREA IN HECTARES
- FUTURE MINOR FLOW DIRECTION

NOTES:

1. THIS ALLOWANCE IS FOR OPA66 EXPANSION AREAS 6a, 6b AND 6c.

2. AN ALLOWANCE OF 100l/s HAS BEEN MADE FOR FLOWS TRIBUTARY TO THE LAIRD STREET PUMP STATION.

No.	REVISIONS	By	Date
14			
13			
12			
11			
10			
9			
8			
7	RESUBMISSION FOR MOE APPROVAL	JIM	17:07:14
6	SUBMISSION FOR MOE APPROVAL	JIM	17:02:10
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1	SUBMISSION #1 FOR CITY REVIEW	JIM	13:08:29

CRT DEVELOPMENT INC.

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ibigroup.com

Project Title

CRT LANDS
FERNBANK COMMUNITY
PHASE 1

PROFESSIONAL ENGINEER
J. I. MOFFATT
2017/07/14
PROVINCE OF ONTARIO

Drawing Title

SANITARY DRAINAGE
AREA PLAN

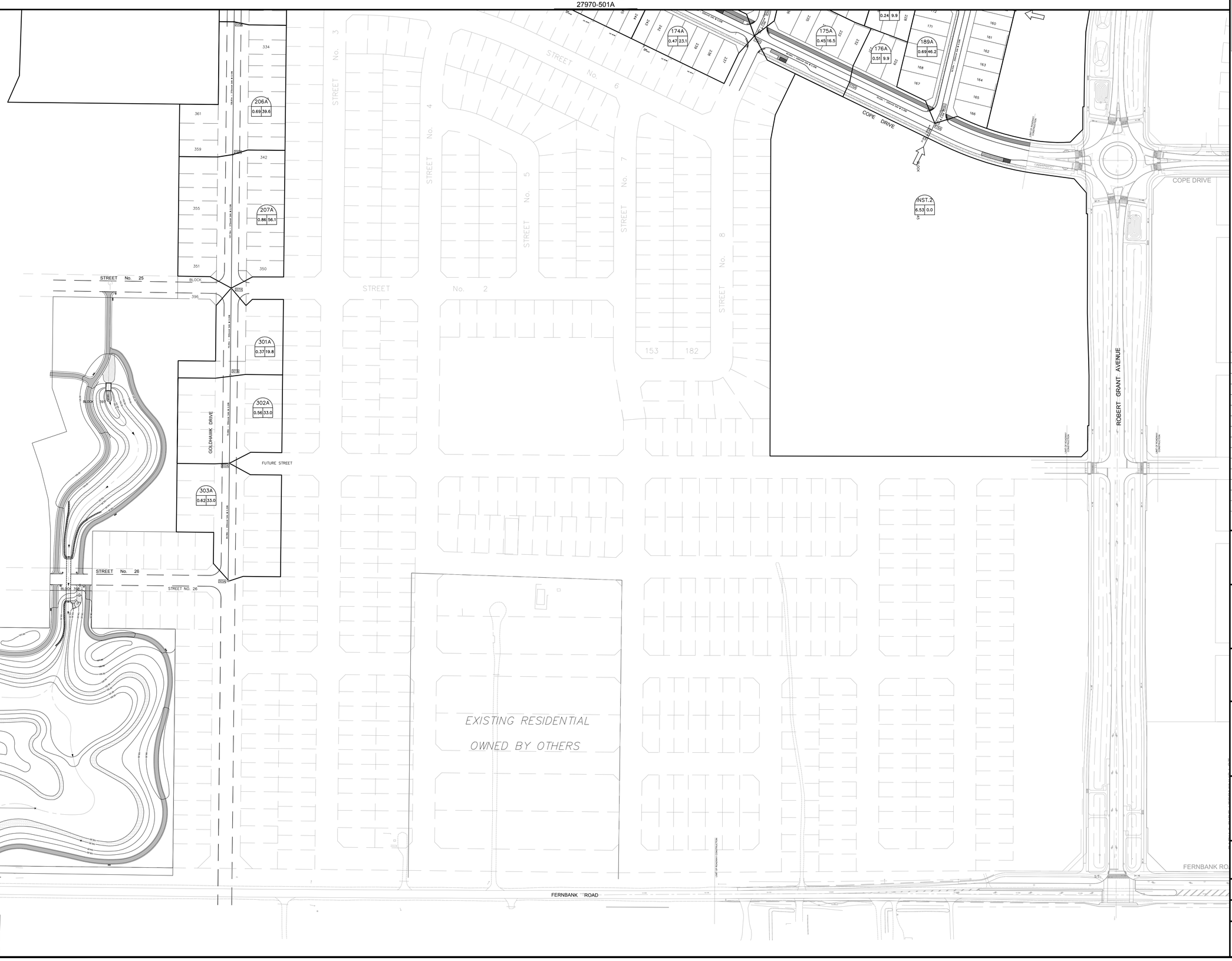
Scale: 1:1250

Design	Date
J.I.M.	OCTOBER '12
Drawn	Checked
M.M.	P.K.
Project No.	Drawing No.
27970	501A

D07-16-11-0003

#17366

CONT'D ON DWG
27970-501A



REVIEWED BY
DEVELOPMENT REVIEW SERVICES BRANCH

Signed _____

Date _____ 2017

Plan Number _____

LEGEND :

145A
0.34 27.5

- AREA ID #
- POPULATION
- AREA IN HECTARES
- FUTURE MINOR FLOW DIRECTION

NOTES:

1. THIS ALLOWANCE IS FOR OPA66 EXPANSION AREAS 6a, 6b AND 6c.

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No.	REVISIONS	By	Date
14			
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1	SUBMISSION #1 FOR CITY REVIEW	JIM	13:08:29

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Project Title

CRT LANDS
FERNBANK COMMUNITY
PHASE 1

LICENSED PROFESSIONAL ENGINEER
J. I. MOFFATT
2017/07/14
PROVINCE OF ONTARIO

Drawing Title

SANITARY DRAINAGE
AREA PLAN

Scale
1:1250

Design	Date
J.I.M.	OCTOBER '12
Drawn: M.M.	Checked: P.K.
Project No. 27970	Drawing No. 501B

D07-16-11-0003

#17366

APPENDIX

D WATER SYSTEM CALCULATIONS & MODELLING RESULT

Table A3 - Watermain Demands
Richcraft Terrace Flats

WATERMAIN DEMAND CALCULATIONS				COMMENTS
Average Day Flow:				
ADF =	79,380 L/d	=	0.92 L/s	Unit Count = 7 Townhouses @ 12 units = 84 units Population Density per Unit (2.7 cap/unit) per Ottawa Design Guidelines - Water Distribution - 2010 (Table 4.1) ADF demand (350 l/c/day) as dedicated by IBI Subdivision Servicing Report (Design Brief - CRT Lands Phase 1 - Fernbank Community) dated July 2017.
ADF_{TOTAL} =	79,380 L/d	=	0.92 L/s	Sum of ADF
Maximum Day Flow:				
Maximum Day Factor =	4.02			MECP Design Guidelines for Drinking-Water Systems, Table 3-3: Peaking Factors (Interpolated)
MDF_{BLDG} =	319,108 L/d	=	3.69 L/s	ADF multiplied by Maximum Day Factor
MDF_{TOTAL} =	319,108 L/d	=	3.69 L/s	Sum of MDF
Peak Hour Flow:				
Peak Hour Factor =	6.04			MECP Design Guidelines for Drinking-Water Systems, Table 3-3: Peaking Factors (Interpolated)
PHF_{BLDG} =	479,455 L/d	=	5.55 L/s	ADF multiplied by Peak Hour Factor
PHF_{TOTAL} =	479,455 L/d	=	5.55 L/s	Sum of PHF

Commentary:
Refer to Section 4.5 of te Servicing Report for details related to water system sizing/modelling.

Designed By: Daniel Searle, P.Eng.	**Project:** Richcraft Terrace Flats
Checked By: Steve Davidson, P.Eng., OLS (Ret.), MBA	**Location:** Block 344, Fernbank Phase 1, Ottawa, Ontario
Project Number: 211-01221-00	**Dwg. Reference:** N/A

Table A4 - Fire Flow Calculation

Richcraft Terrace Flats
FIRE UNDERWRITERS SURVEY FIRE FLOW CALCULATION

A = 813 sq.m 8751 sq.ft (See FUS for high buildings)

Formula F = 220 x c x Sq. Root "A"

F = the required fire flow in litres per minute c = the coefficient related to type of construction
A = Floor Area (See FUS)

STEP 1: TYPE OF CONSTRUCTION TO DETERMINE "c" COEFFICIENT

c: 1.5 for Wood Frame Construction c: 1.0 for Ordinary Construction
c: 0.8 for Non-Combustible Construction c: 0.6 for Fire-Resistive Construction

F= 220 x c 1.5 **x Sq. Root "A"** 28.5 = 9409.3

STEP 2: INCREASE OR DECREASE FOR OCCUPANCY

Non-Combustible (+ 75%) Charge: Limited Combustible (+ 85%) Charge: Combustible (+ 100%)
Free Burning (+115%) Charge: Rapid Burning (+125%) Charge
"APPLY ONE OF THESE CHARGES TO THE VALUE OBTAINED IN STEP 1 ROUNDED OFF TO THE NEAREST 1000"

Value from Step 1 9000.0 **x** **Charge** 0.85 = 7650

STEP 3: DETERMINE THE DECREASE FOR SPRINKLER SYSTEM (See FUS for Details)

For Complete Automatic Sprinkler Protection (full supervision) -50%
For Automatic Sprinkler System Conforming to NFPA 13 -30%

Value from Step 2 7650 **x** **Above Value** 0 = 0

Value from Step 2 7650 **-** **Answer from Above** 0 = 7650

STEP 4: INCREASE FOR EXPOSURE FROM OTHER BUILDINGS

0 to 3 m (+ 25%); 3.1 to 10 m (+20%), 10.1 to 20 m (+ 15%); 20.1 to 30 m (+ 10%); 30.1 to 45 m (+ 5%)
THE TOTAL % SHALL BE THE SUM OF THE % FOR ALL SIDES, BUT SHALL NOT EXCEED 75%

Value from Step 2	7650	x	North Side Step Charge	0.20	=	1530
Value from Step 2	7650	x	East Side Step Charge	0.00	=	0
Value from Step 2	7650	x	South Side Step Charge	0.15	=	1147.5
Value from Step 2	7650	x	West Side Step Charge	0.10	=	765
**Townhome (Block 3) - Greatest Exposure*			Total	0.45	=	3442.5

Value from Step 3 7650 + Total 3442.5 = 11092.5

STEP 5: TO DETERMINE THE FIRE FLOW

Round to nearest 1000

Take Value from Step 4 11000 Divide by 60 = 183.3 L/S

Designed By: Daniel Searle, P.Eng.	**Date:** 2021.06.18
Checked By: Steve Davidson, P.Eng., OLS (Ret.), MBA	**Project Number:** 211-01221-00

Boundary Conditions (2021.06.22)
620 Bobolink Ridge

Provided Information

Scenario	Demand	
	L/min	L/s
Average Daily Demand	55	0.92
Maximum Daily Demand	221	3.69
Peak Hour	333	5.55
Fire Flow Demand #1	11,000	183.33

Location

Results

Connection 1 – Embankment St.

Demand Scenario	Head (m)	Pressure[1] (psi)
Maximum HGL	161.2	77.4
Peak Hour	156.4	70.6
Max Day plus Fire 1	145.1	54.4

Ground Elevation = 106.8 m

Connection 2 – Embankment St.

Demand Scenario	Head (m)	Pressure[1] (psi)
Maximum HGL	161.2	77.3
Peak Hour	156.4	70.5
Max Day plus Fire 1	145.0	54.3

Ground Elevation = 106.8 m

Notes

1. Two service connections with a separation valve in between.

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.

Richcraft Terrrace Flats - Water Model

Hydraulic Model Properties

Title	Richcraft Terrace Flats - Block 344
Engineer	Daniel Searle, P.Eng.
Company	WSP Canada Inc.
Date	5/4/2021
Notes	

Scenario Summary

ID	1
Label	Average Day Demand
Notes	
Active Topology	Base Active Topology
User Data Extensions	Base User Data Extensions
Physical	ADD
Demand	Average Day
Initial Settings	Base Initial Settings
Operational	Base Operational
Age	Base Age
Constituent	Base Constituent
Trace	Base Trace
Fire Flow	Base Fire Flow
Energy Cost	Base Energy Cost
Pressure Dependent Demand	Base Pressure Dependent Demand
Transient	Base Transient
Failure History	Base Failure History
SCADA	Base SCADA
Steady State / EPS Solver Calculation Options	Average Day
Transient Solver Calculation Options	Base Calculation Options

Hydraulic Summary

Time Analysis Type	Steady State	Simulation Start Date	1/1/2000
Friction Method	Hazen-Williams	Hydraulic Time Step	1.000
Accuracy	0.001	Duration	24.000
Trials	40	Calculation Type	Hydraulics Only

Junction Table - Time: 0.00 hours

ID	Label	Elevation (m)	Demand (L/s)	Unit Demand Collection <Count>	Demand Adjusted Population (Capita)	Hydraulic Grade (m)
31	J-1	105.43	0.000	0	0	161.20
32	J-2	105.48	0.000	0	0	161.20
33	J-3	105.30	0.000	0	0	161.20
34	J-4	104.53	0.131	1	32	161.20
35	J-5	103.81	0.263	1	65	161.20
36	J-6	104.47	0.000	0	0	161.20
37	J-7	105.42	0.000	0	0	161.20

Richcraft Terrrace Flats - Water Model

Junction Table - Time: 0.00 hours

ID	Label	Elevation (m)	Demand (L/s)	Unit Demand Collection <Count>	Demand Adjusted Population (Capita)	Hydraulic Grade (m)	Pressure (kPa)
38	J-8	105.43	0.131	1	32	161.20	546
54	J-9	105.54	0.131	1	32	161.20	545
55	J-10	105.56	0.131	1	32	161.20	547
68	J-11	105.57	0.131	1	32	161.20	555
117	J-12	105.43	0.000	0	0	161.20	562
							555
							546
							546
							545
							545
							544
							546

Pipe Table - Time: 0.00 hours

ID	Label	Length (Scaled) (m)	Start Node	Stop Node	Diameter (mm)	Material	Hazen-Williams C	Flow (L/s)	Velocity (m/s)
43	P-2	32	J-2	J-7	204.0	PVC	110.0	-0.051	0.00
44	P-3	23	J-1	J-2	204.0	PVC	110.0	0.080	0.00
45	P-4	41	J-1	J-3	204.0	PVC	110.0	0.394	0.01
46	P-5	22	J-3	J-6	204.0	PVC	110.0	0.178	0.01
47	P-6	29	J-6	J-5	204.0	PVC	110.0	0.178	0.01
48	P-7	22	J-4	J-5	204.0	PVC			
49	P-8	29	J-3	J-4	204.0	PVC			
50	P-9	51	R-1	J-1	204.0	PVC			
51	P-10	10	J-7	H-2	154.0	PVC			
52	P-11	12	J-8	H-1	154.0	PVC			
53	P-12	17	J-5	H-3	154.0	PVC			
66	P-13	28	J-8	J-10	204.0	PVC			
67	P-14	35	J-7	J-9	154.0	PVC			
69	P-15	38	J-2	J-11	154.0	PVC			

Richcraft Terrrace Flats - Water Model

Pipe Table - Time: 0.00 hours

Hazen-Williams C	Flow (L/s)	Velocity (m/s)
110.0	0.085	0.00
110.0	0.216	0.01
110.0	0.474	0.01
100.0	0.000	0.00
100.0	0.000	0.00
100.0	0.000	0.00
110.0	0.131	0.00
100.0	0.131	0.01
100.0	0.131	0.01

Reservoir Table - Time: 0.00 hours

ID	Label	Elevation (m)	Flow (Out net) (L/s)	Hydraulic Grade (m)
30	R-1	161.20	0.474	161.20

Richcraft Terrrace Flats - Water Model

Scenario Summary

ID	57
Label	Maximum Hourly Demand
Notes	
Active Topology	Base Active Topology
User Data Extensions	Base User Data Extensions
Physical	MHD
Demand	Average Day
Initial Settings	Base Initial Settings
Operational	Base Operational
Age	Base Age
Constituent	Base Constituent
Trace	Base Trace
Fire Flow	Base Fire Flow
Energy Cost	Base Energy Cost
Pressure Dependent Demand	Base Pressure Dependent Demand
Transient	Base Transient
Failure History	Base Failure History
SCADA	Base SCADA
Steady State / EPS Solver Calculation Options	MHD
Transient Solver Calculation Options	Base Calculation Options

Hydraulic Summary

Time Analysis Type	Steady State	Simulation Start Date	1/1/2000
Friction Method	Hazen-Williams	Hydraulic Time Step	1.000
Accuracy	0.001	Duration	24.000
Trials	40	Calculation Type	Hydraulics Only

Junction Table - Time: 0.00 hours

ID	Label	Elevation (m)	Demand (L/s)	Unit Demand Collection <Count>	Demand Adjusted Population (Capita)	Hydraulic Grade (m)	Pressure (kPa)
31	J-1	105.43	0.000	0	0	156.39	
32	J-2	105.48	0.000	0	0	156.39	
33	J-3	105.30	0.000	0	0	156.39	
34	J-4	104.53	0.793	1	32	156.39	
35	J-5	103.81	1.586	1	65	156.39	
36	J-6	104.47	0.000	0	0	156.39	
37	J-7	105.42	0.000	0	0	156.39	
38	J-8	105.43	0.793	1	32	156.39	
54	J-9	105.54	0.793	1	32	156.39	
55	J-10	105.56	0.793	1	32	156.39	
68	J-11	105.57	0.793	1	32	156.39	
117	J-12	105.43	0.000	0	0	156.39	

Richcraft Terrrace Flats - Water Model

Junction Table - Time: 0.00 hours

Pressure (kPa)
499
498
500
508
515
508
499
499
498
497
497
499

Pipe Table - Time: 0.00 hours

ID	Label	Length (Scaled) (m)	Start Node	Stop Node	Diameter (mm)	Material	Hazen-Williams C	Flow (L/s)	Velocity (m/s)
43	P-2	32	J-2	J-7	204.0	PVC	110.0	-0.315	0.01
44	P-3	23	J-1	J-2	204.0	PVC	110.0	0.477	0.01
45	P-4	41	J-1	J-3	204.0	PVC	110.0	2.378	0.07
46	P-5	22	J-3	J-6	204.0	PVC	110.0	1.081	0.03
47	P-6	29	J-6	J-5	204.0	PVC	110.0	1.081	0.03
48	P-7	22	J-4	J-5	204.0	PVC	110.0	0.505	0.02
49	P-8	29	J-3	J-4	204.0	PVC	110.0	1.298	0.04
50	P-9	51	R-1	J-1	204.0	PVC	110.0	2.856	0.09
51	P-10	10	J-7	H-2	154.0	PVC	100.0	0.000	0.00
52	P-11	12	J-8	H-1	154.0	PVC	100.0	0.000	0.00
53	P-12	17	J-5	H-3	154.0	PVC	100.0	0.000	0.00
66	P-13	28	J-8	J-10	204.0	PVC	110.0	0.793	0.02
67	P-14	35	J-7	J-9	154.0	PVC	100.0	0.793	0.04
69	P-15	38	J-2	J-11	154.0	PVC	100.0	0.793	0.04

Richcraft Terrrace Flats - Water Model

Reservoir Table - Time: 0.00 hours

ID	Label	Elevation (m)	Flow (Out net) (L/s)	Hydraulic Grade (m)
30	R-1	156.40	2.856	156.40

Richcraft Terrrace Flats - Water Model

Scenario Summary

ID	132
Label	Max Day + Split Fire Flow (Block 1 & 2)
Notes	
Active Topology	Base Active Topology
User Data Extensions	Base User Data Extensions
Physical	MDD+FF
Demand	MDD+FF (Split FF - Blk 1 &2)
Initial Settings	Base Initial Settings
Operational	Base Operational
Age	Base Age
Constituent	Base Constituent
Trace	Base Trace
Fire Flow	Base Fire Flow
Energy Cost	Base Energy Cost
Pressure Dependent Demand	Base Pressure Dependent Demand
Transient	Base Transient
Failure History	Base Failure History
SCADA	Base SCADA
Steady State / EPS Solver Calculation Options	MDD+FF (Split HYD Demand)
Transient Solver Calculation Options	Base Calculation Options

Hydraulic Summary

Time Analysis Type	Steady State	Simulation Start Date	1/1/2000
Friction Method	Hazen-Williams	Hydraulic Time Step	1.000
Accuracy	0.001	Duration	24.000
Trials	40	Calculation Type	Hydraulics Only

Junction Table - Time: 0.00 hours

ID	Label	Elevation (m)	Demand (L/s)	Unit Demand Collection <Count>	Demand Adjusted Population (Capita)	Hydraulic Grade (m)	Pressure (kPa)
31	J-1	105.43	0.000	0	0	140.53	
32	J-2	105.48	0.000	0	0	139.63	
33	J-3	105.30	0.000	0	0	140.53	
34	J-4	104.53	0.528	1	32	140.53	
35	J-5	103.81	1.055	1	65	140.53	
36	J-6	104.47	0.000	0	0	140.53	
37	J-7	105.42	0.000	0	0	138.35	
38	J-8	105.43	0.528	1	32	132.29	
54	J-9	105.54	0.528	1	32	138.35	
55	J-10	105.56	0.528	1	32	130.82	
68	J-11	105.57	0.528	1	32	139.63	
117	J-12	105.43	0.000	0	0	136.25	

Richcraft Terrrace Flats - Water Model

Junction Table - Time: 0.00 hours

Pressure (kPa)
343
334
345
352
359
353
322
263
321
247
333
302

Pipe Table - Time: 0.00 hours

ID	Label	Length (Scaled) (m)	Start Node	Stop Node	Diameter (mm)	Material	Hazen-Williams C	Flow (L/s)	Velocity (m/s)
43	P-2	32	J-2	J-7	204.0	PVC	110.0	75.284	2.30
44	P-3	23	J-1	J-2	204.0	PVC	110.0	75.812	2.32
45	P-4	41	J-1	J-3	204.0	PVC	110.0	1.583	0.05
46	P-5	22	J-3	J-6	204.0	PVC	110.0	0.718	0.02
47	P-6	29	J-6	J-5	204.0	PVC	110.0	0.718	0.02
48	P-7	22	J-4	J-5	204.0	PVC	110.0	0.337	0.01
49	P-8	29	J-3	J-4	204.0	PVC	110.0	0.865	0.03
50	P-9	51	R-1	J-1	204.0	PVC	110.0	77.395	2.37
51	P-10	10	J-7	H-2	154.0	PVC	100.0	0.000	0.00
52	P-11	12	J-8	H-1	154.0	PVC	100.0	91.500	4.91
53	P-12	17	J-5	H-3	154.0	PVC	100.0	0.000	0.00
66	P-13	28	J-8	J-10	204.0	PVC	110.0	92.028	2.82
67	P-14	35	J-7	J-9	154.0	PVC	100.0	0.528	0.03
69	P-15	38	J-2	J-11	154.0	PVC	100.0	0.528	0.03

Richcraft Terrrace Flats - Water Model

Reservoir Table - Time: 0.00 hours

ID	Label	Elevation (m)	Flow (Out net) (L/s)	Hydraulic Grade (m)
30	R-1	145.00	77.395	145.00

Hydrant Table - Time: 0.00 hours

ID	Label	Elevation (m)	Demand (L/s)	Hydraulic Grade (m)	Pressure (kPa)
39	H-1	108.86	91.500	127.08	178
40	H-2	108.72	0.000	138.35	290
41	H-3	107.70	0.000	140.53	321
122	H-7	0.00	91.500	125.63	1,230
124	H-8	0.00	0.000	139.63	1,367
126	H-9	0.00	0.000	140.53	1,375

Richcraft Terrrace Flats - Water Model

Scenario Summary

ID	134
Label	Max Day + Split Fire Flow (Block 3 & 4)
Notes	
Active Topology	Base Active Topology
User Data Extensions	Base User Data Extensions
Physical	MDD+FF
Demand	MDD+FF (Split FF - Blk 3 &4)
Initial Settings	Base Initial Settings
Operational	Base Operational
Age	Base Age
Constituent	Base Constituent
Trace	Base Trace
Fire Flow	Base Fire Flow
Energy Cost	Base Energy Cost
Pressure Dependent Demand	Base Pressure Dependent Demand
Transient	Base Transient
Failure History	Base Failure History
SCADA	Base SCADA
Steady State / EPS Solver Calculation Options	MDD+FF (Split HYD Demand)
Transient Solver Calculation Options	Base Calculation Options

Hydraulic Summary

Time Analysis Type	Steady State	Simulation Start Date	1/1/2000
Friction Method	Hazen-Williams	Hydraulic Time Step	1.000
Accuracy	0.001	Duration	24.000
Trials	40	Calculation Type	Hydraulics Only

Junction Table - Time: 0.00 hours

ID	Label	Elevation (m)	Demand (L/s)	Unit Demand Collection <Count>	Demand Adjusted Population (Capita)	Hydraulic Grade (m)	Pressure (kPa)
31	J-1	105.43	0.000	0	0	137.86	
32	J-2	105.48	0.000	0	0	136.45	
33	J-3	105.30	0.000	0	0	137.86	
34	J-4	104.53	0.528	1	32	137.86	
35	J-5	103.81	1.055	1	65	137.86	
36	J-6	104.47	0.000	0	0	137.86	
37	J-7	105.42	0.000	0	0	136.44	
38	J-8	105.43	0.528	1	32	139.23	
54	J-9	105.54	0.528	1	32	136.44	
55	J-10	105.56	0.528	1	32	139.23	
68	J-11	105.57	0.528	1	32	136.45	
117	J-12	105.43	0.000	0	0	139.23	

Richcraft Terrrace Flats - Water Model

Junction Table - Time: 0.00 hours

Pressure (kPa)
317
303
319
326
333
327
304
331
302
329
302
331

Pipe Table - Time: 0.00 hours

ID	Label	Length (Scaled) (m)	Start Node	Stop Node	Diameter (mm)	Material	Hazen-Williams C	Flow (L/s)	Velocity (m/s)
43	P-2	32	J-2	J-7	204.0	PVC	110.0	4.849	0.15
44	P-3	23	J-1	J-2	204.0	PVC	110.0	96.877	2.96
45	P-4	41	J-1	J-3	204.0	PVC	110.0	1.583	0.05
46	P-5	22	J-3	J-6	204.0	PVC	110.0	0.718	0.02
47	P-6	29	J-6	J-5	204.0	PVC	110.0	0.718	0.02
48	P-7	22	J-4	J-5	204.0	PVC	110.0	0.337	0.01
49	P-8	29	J-3	J-4	204.0	PVC	110.0	0.865	0.03
50	P-9	51	R-1	J-1	204.0	PVC	110.0	98.460	3.01
51	P-10	10	J-7	H-2	154.0	PVC	100.0	91.500	4.91
52	P-11	12	J-8	H-1	154.0	PVC	100.0	0.000	0.00
53	P-12	17	J-5	H-3	154.0	PVC	100.0	0.000	0.00
66	P-13	28	J-8	J-10	204.0	PVC	110.0	0.528	0.02
67	P-14	35	J-7	J-9	154.0	PVC	100.0	0.528	0.03
69	P-15	38	J-2	J-11	154.0	PVC	100.0	0.528	0.03

Richcraft Terrrace Flats - Water Model

Reservoir Table - Time: 0.00 hours

ID	Label	Elevation (m)	Flow (Out net) (L/s)	Hydraulic Grade (m)
30	R-1	145.00	98.460	145.00

Hydrant Table - Time: 0.00 hours

ID	Label	Elevation (m)	Demand (L/s)	Hydraulic Grade (m)	Pressure (kPa)
39	H-1	108.86	0.000	139.23	297
40	H-2	108.72	91.500	131.54	223
41	H-3	107.70	0.000	137.86	295
122	H-7	0.00	0.000	139.23	1,363
124	H-8	0.00	91.500	132.18	1,294
126	H-9	0.00	0.000	137.86	1,349

Richcraft Terrrace Flats - Water Model

Scenario Summary

ID	135
Label	Max Day + Split Fire Flow (Block 5 , 6, & 7)
Notes	
Active Topology	Base Active Topology
User Data Extensions	Base User Data Extensions
Physical	MDD+FF
Demand	MDD+FF (Split FF - Blk 5,6, &7)
Initial Settings	Base Initial Settings
Operational	Base Operational
Age	Base Age
Constituent	Base Constituent
Trace	Base Trace
Fire Flow	Base Fire Flow
Energy Cost	Base Energy Cost
Pressure Dependent Demand	Base Pressure Dependent Demand
Transient	Base Transient
Failure History	Base Failure History
SCADA	Base SCADA
Steady State / EPS Solver Calculation Options	MDD+FF (Split HYD Demand)
Transient Solver Calculation Options	Base Calculation Options

Hydraulic Summary

Time Analysis Type	Steady State	Simulation Start Date	1/1/2000
Friction Method	Hazen-Williams	Hydraulic Time Step	1.000
Accuracy	0.001	Duration	24.000
Trials	40	Calculation Type	Hydraulics Only

Junction Table - Time: 0.00 hours

ID	Label	Elevation (m)	Demand (L/s)	Unit Demand Collection <Count>	Demand Adjusted Population (Capita)	Hydraulic Grade (m)	Pressure (kPa)
31	J-1	105.43	0.000	0	0	136.22	
32	J-2	105.48	0.000	0	0	137.10	
33	J-3	105.30	0.000	0	0	128.96	
34	J-4	104.53	0.528	1	32	127.88	
35	J-5	103.81	1.055	1	65	126.87	
36	J-6	104.47	0.000	0	0	127.02	
37	J-7	105.42	0.000	0	0	138.39	
38	J-8	105.43	0.528	1	32	140.55	
54	J-9	105.54	0.528	1	32	138.39	
55	J-10	105.56	0.528	1	32	140.55	
68	J-11	105.57	0.528	1	32	137.10	
117	J-12	105.43	0.000	0	0	140.55	

Richcraft Terrrace Flats - Water Model

Junction Table - Time: 0.00 hours

Pressure (kPa)
301
309
232
229
226
221
323
344
321
342
309
344

Pipe Table - Time: 0.00 hours

ID	Label	Length (Scaled) (m)	Start Node	Stop Node	Diameter (mm)	Material	Hazen-Williams C	Flow (L/s)	Velocity (m/s)
43	P-2	32	J-2	J-7	204.0	PVC	110.0	-75.561	2.31
44	P-3	23	J-1	J-2	204.0	PVC	110.0	-75.034	2.30
45	P-4	41	J-1	J-3	204.0	PVC	110.0	184.583	5.65
46	P-5	22	J-3	J-6	204.0	PVC	110.0	116.788	3.57
47	P-6	29	J-6	J-5	204.0	PVC	110.0	25.288	0.77
48	P-7	22	J-4	J-5	204.0	PVC	110.0	67.268	2.06
49	P-8	29	J-3	J-4	204.0	PVC	110.0	67.795	2.07
50	P-9	51	R-1	J-1	204.0	PVC	110.0	109.549	3.35
51	P-10	10	J-7	H-2	154.0	PVC	100.0	0.000	0.00
52	P-11	12	J-8	H-1	154.0	PVC	100.0	0.000	0.00
53	P-12	17	J-5	H-3	154.0	PVC	100.0	91.500	4.91
66	P-13	28	J-8	J-10	204.0	PVC	110.0	0.528	0.02
67	P-14	35	J-7	J-9	154.0	PVC	100.0	0.528	0.03
69	P-15	38	J-2	J-11	154.0	PVC	100.0	0.528	0.03

Richcraft Terrrace Flats - Water Model

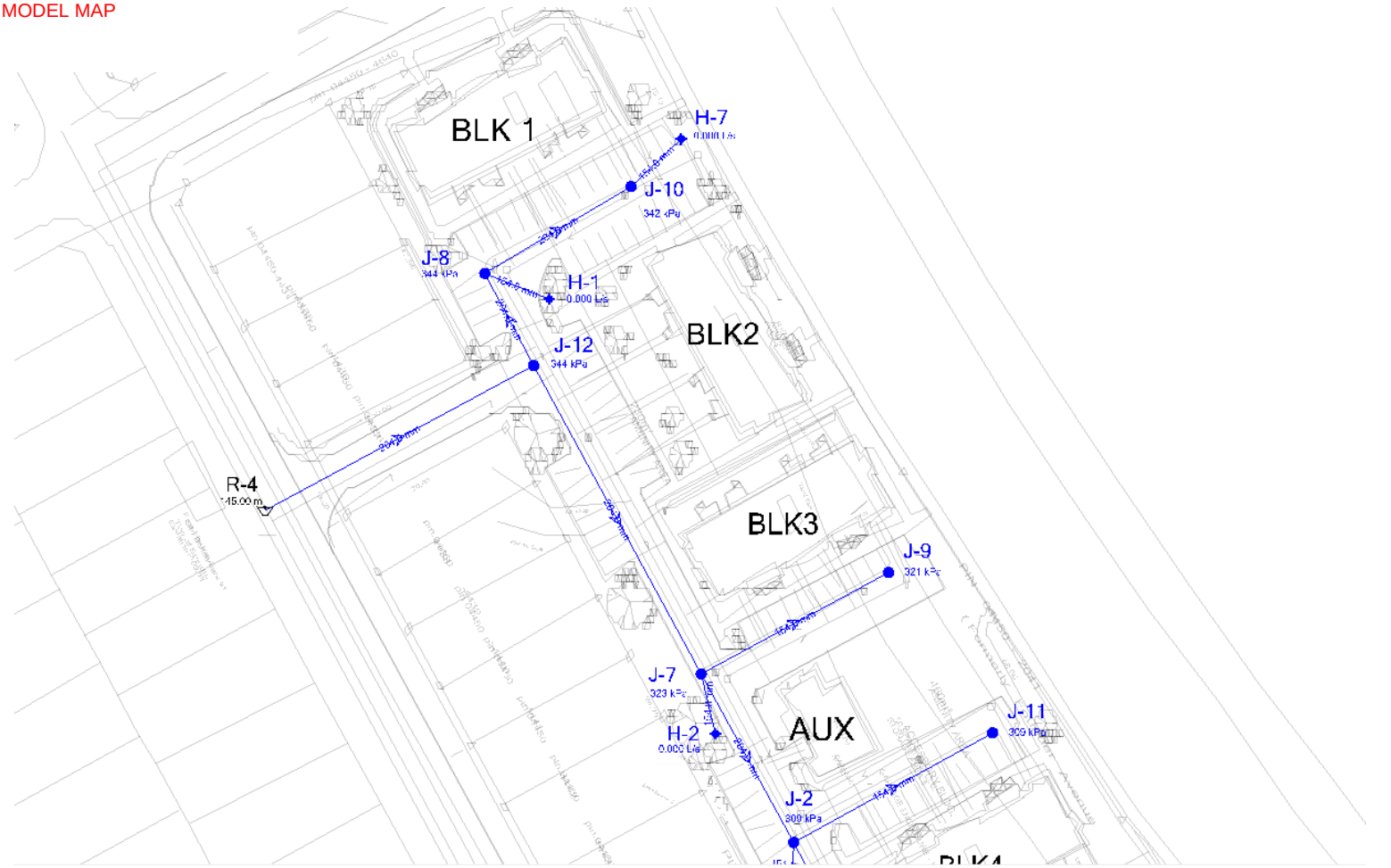
Reservoir Table - Time: 0.00 hours

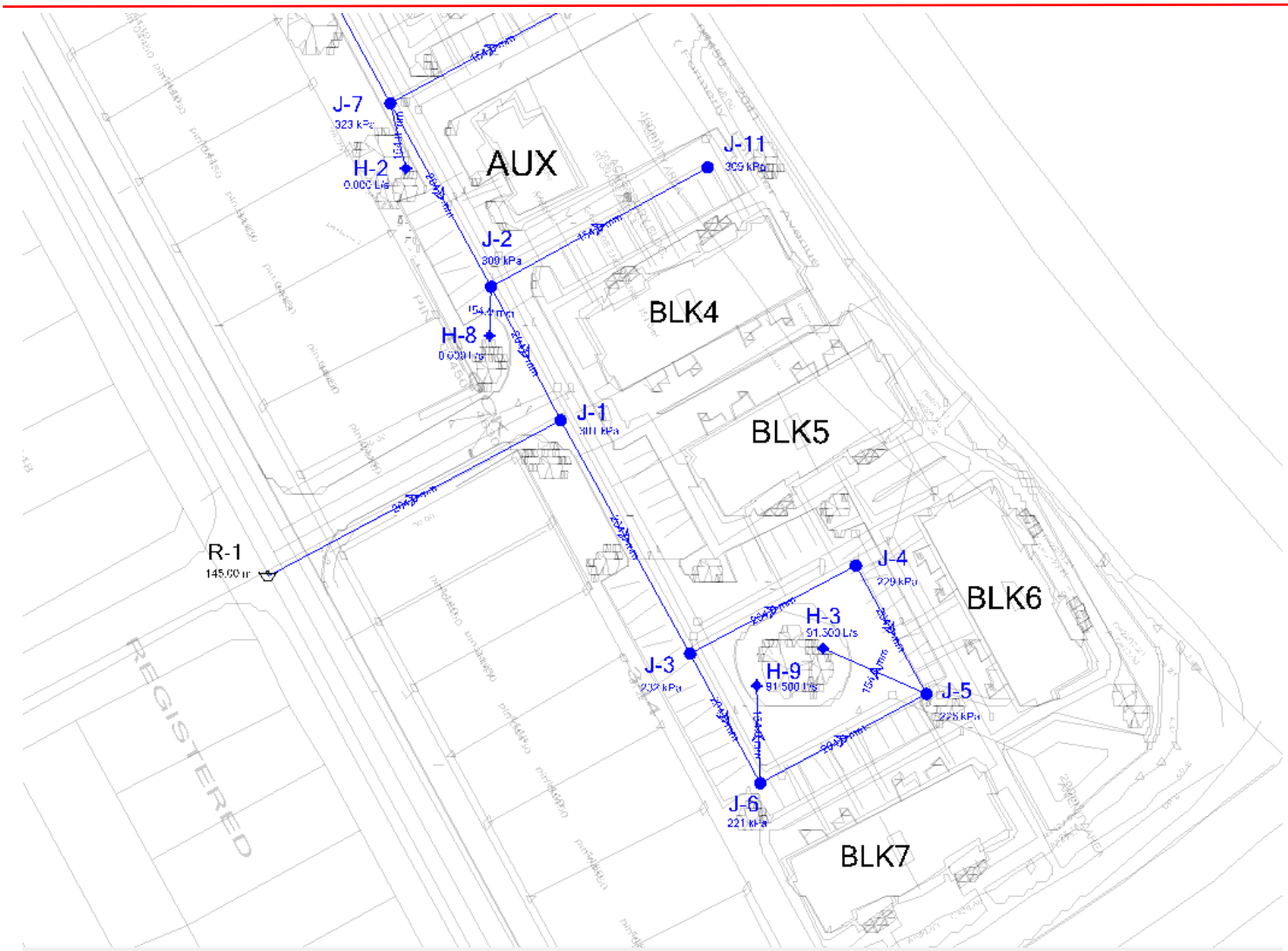
ID	Label	Elevation (m)	Flow (Out net) (L/s)	Hydraulic Grade (m)
30	R-1	145.00	109.549	145.00

Hydrant Table - Time: 0.00 hours

ID	Label	Elevation (m)	Demand (L/s)	Hydraulic Grade (m)	Pressure (kPa)
39	H-1	108.86	0.000	140.55	310
40	H-2	108.72	0.000	138.39	290
41	H-3	107.70	91.500	120.38	124
122	H-7	0.00	0.000	140.55	1,376
124	H-8	0.00	0.000	137.10	1,342
126	H-9	0.00	91.500	121.05	1,185

MODEL MAP


BLK 1
H-7
J-10
342 kPa
J-8
344 kPa
H-1
0.000 L/s
BLK2
J-12
344 kPa
R-4
145.00 m
BLK3
J-9
321 kPa
J-7
323 kPa
H-2
0.000 L/s
AUX
J-11
309 kPa
J-2
309 kPa


J-7
323 kPa
H-2
0.000 L/s
AUX
J-11
309 kPa
J-2
309 kPa
BLK4
H-8
0.000 L/s
J-1
311 kPa
BLK5
R-1
145.00 m
J-4
229 kPa
BLK6
H-3
91.500 L/s
H-9
91.500 L/s
J-3
232 kPa
J-5
228 kPa
J-6
221 kPa
BLK7
REGISTERED

APPENDIX

E

STORMWATER MANAGEMENT REPORT

APPENDIX

F

CITY COMMENTS

File Number: D07-12-21-0107

September 9, 2021

Sent via email to Nadia De Santi [Nadia.De-Santi@wsp.com]

Dear Ms. De Santi,

Re: Technical Comments – Site Plan Control Application
620 Bobolink Ridge

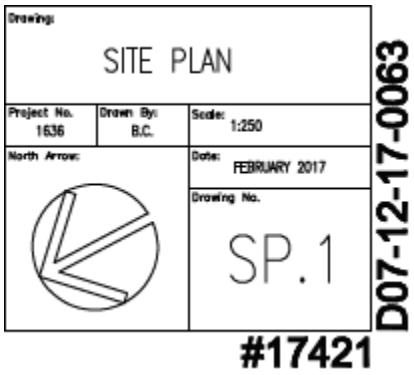
The following review comments are provided in response to the 1st submission of the site plan control application for the planned unit development at 620 Bobolink Ridge.

CITY OF OTTAWA:

Planning

General

1. Please add the file number **D07-12-21-0107** and Plan **#18498** to the bottom right corner of all drawings as per the sample shown below.



2. A private road naming agreement will be required for the proposed development. Please work with Addressing and Signs to choose an appropriate street name. They can be contacted by email at Addressingandsigns@ottawa.ca or by phone at 613-580-2424 x 41162.
    a. Information: https://ottawa.ca/en/planning-development-and-construction/building-and-renovating/municipal-addressing

b. Application: https://app06.ottawa.ca/online_services/forms/building_reno/private_road_naming_en.pdf

c. Fees ($1981.00): https://ottawa.ca/en/planning-development-and-construction/building-and-renovating/forms-applications-and-fees#comprehensive-building-code-fee-schedule

Site Plan, Sheet # SP-1, prepared by M. David Blakely Architect Inc., dated July 2020, revision 5, dated June 26 2021.

1. Please include a statement of where the property boundary information was derived from on the plan.

2. Please add more outdoor bicycle parking through out the site for visitor use. There does not appear to be any proposed outdoor bicycle parking on the northern portion of the site (towards Bobolink) to serve the residents of Blocks 1 and 2.

3. Please confirm whether there will be fencing provided along the shared property lines with the lots on Embankment Street. If so, show on the plan.

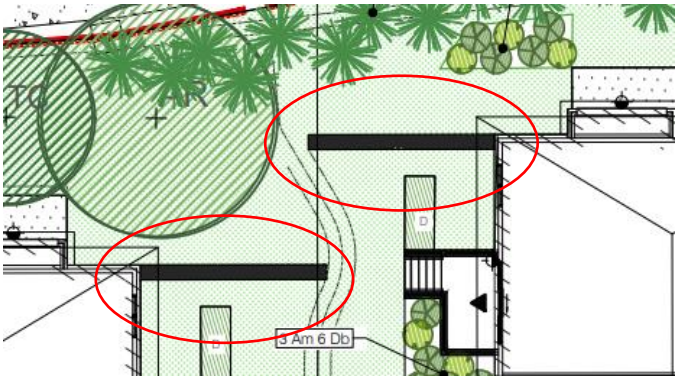
4. Show a measurement of the distance between the proposed accesses and the abutting lots on Embankment. Please note that a 3 metre landscape buffer is required on either side of the driveway, as per Table 110 in the Zoning By-law.

5. Please clarify how snow storage will be handled. It unclear as there is a note in the zoning information table that states “snow storage will be off site”, while snow storage areas are also identified on the plan.

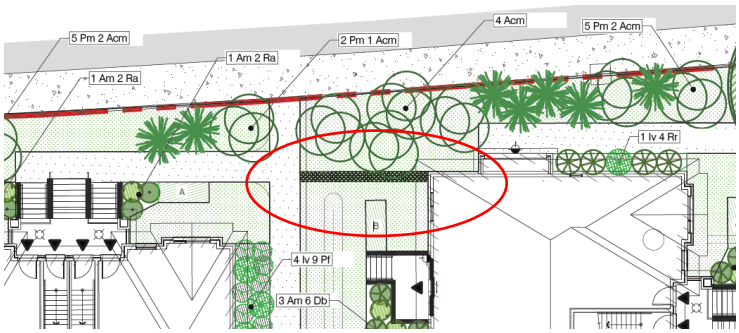
Landscape Plan, L1-1, prepared by Lashley + Associates Landscape Architecture & Site Engineering Inc., dated July 2021

6. Please identify all graphic symbols used on the Landscape Plan are either properly labelled or included in the legend. Please identify the following features/structures below:

    a. Thick black lines – are these intended to denote proposed noise walls?



b. Dotted black line – is this also a noise wall? (located between blocks 2 and 3, toward Robert Grant)



Elevations, A-5, prepared by M. David Blakely Architect Inc., dated May 2013, revision 12 dated August 15, 2018

7. Please update the side elevations for Blocks 3,4, and 5 better address the streetscape along Robert Grant Avenue (e.g. larger windows, porch, etc.).

620 Bobolink Ridge Planning Rationale and Design Brief, prepared by WSP, dated July 2021

8. Please ensure that the Proposed Development Section accurately describes the built form and height being proposed for this site. It is understood that the proposed stacked dwellings are to be three stories, not four.

620 Bobolink Ridge Planning Rationale and Design Brief, prepared by WSP, dated July 2021

9. Please ensure that the Proposed Development Section accurately describes the built form and height being proposed for this site. It is understood that the proposed stacked dwellings are to be three stories, not four.

10. Please provide a brief justification for the two accesses on Embankment Street. The justification should address how the two accesses will be able to accommodate traffic entering and exiting the site an why no accesses have been provided on other abutting streets.

Urban Design

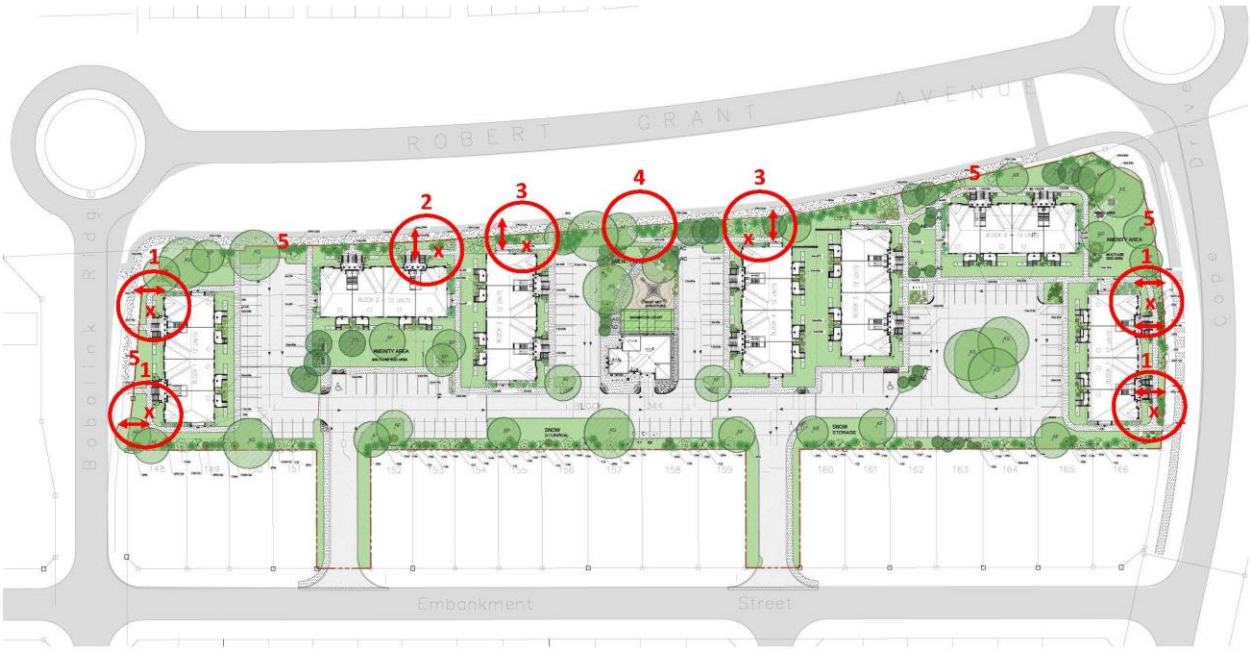
11. Some parallel walkways appear to be redundant. Please consider remove these, extend the perpendicular walkways to the public sidewalk, and introduce landscaping elements that can prevent “shortcut” on the grass. Refer to areas labelled as “1” on the below diagram.

12. Connect the entrance directly to the public sidewalk and remove the parallel walkway. Introduce landscaping elements to prevent “shortcut” on the grass. Refer to areas labelled as “2” on the below diagram.

13. Connect the utility rooms directly to the public sidewalk and remove the parallel walkways. Refer to areas labelled as “3” on the below diagram.

14. Is parallel walkway designed to address grading difference? Please clarify. Refer to areas labelled as “4” on the below diagram.

15. Considerations may be given to the installation of decorative fencing along the perimeters of the site as part of the landscaping strategy to provide delineation between public realm and private property. Refer to areas labelled as “5” on the below diagram.



Engineering

General

16. The City file number for this application is **D07-12-21-0107**. Please place this number on all drawings (bottom right side –vertically outside the border (“C**ity File No. D07-12-21-0107”)**).

17. The City plan number for this application is **18498**. Please place this number on all drawings, horizontally at the bottom right side (“**City Plan No. 18498**).

18. If you are proposing any exterior light fixtures, all must be included and approved as part of the site plan approval. Therefore, the lights must be clearly identified by make, model and part number. All external light fixtures must meet the criteria for full cut-off classification as recognized by the Illuminating Engineering Society of North America (IESNA or IES) and must result in minimal light spillage onto adjacent properties (as a guideline, 0.5 fc is normally the maximum allowable spillage). In order to satisfy these criteria, the applicant must provide certification from an acceptable professional engineer. The location of all exterior fixtures, a table showing the fixture types (including make, model, part number), and the mounting heights must be included on a plan.

Richcraft Terrace Flats, CRT Lands (Block 344) Functional Servicing Report, prepared by WSP, dated July 7, 2021

19. Section 4.4.4 indicates that the design of the municipal collection system had assumed a post-development sanitary flow contribution of 2.22 l/s from the subject development. This corresponds to population of 139.5 persons. Given the proposed peak sanitary flow from the allotted allowance by0.85 l/s., a review of IBI sizing calculated was completed to verify the impacts of the immediate downstream sewer system. All downstream sewers are reported to have available capacity in excess of 0.85 l/s. How far down stream of this site you did the sanitary sewer capacity analysis? Please name all the downstream streets that you did the capacity analysis and which sewer has the least excess capacity (provide the name of the street and the amount of excess capacity of this sewer section) in this section of this report. Also, please provide a certified letter by a professional engineer, stating that there is no adverse impact to the downstream sewers due to the increase in population (more than allotted-population increase- 140 persons). Please also state that the excess capacity is not allotted for future development within this sanitary sewer catchment area.

Richcraft Terrace Flats, CRT Lands (Block 344) Stormwater Management Report, prepared by WSP, dated July 07, 2021

20. Section 1.4; bullet #3 states that ponding shall occur in parking lot under the 2-year design storm event. Based on my conversation with the consultant, please correctly revise this bullet.

Terrace Flats North Grading Plan, C1.2, prepared by WSP, dated 2021-07-07

21. Number of sanitary maintenance holes (MH) are located within the 100-year ponding area. Please relocate these MH outside the ponding area. Please see section 4.4.1.4 of the latest Ottawa Sewer Design Guideline.

22. Please include the ponding area (m2) in the ponding data Table.

23. Show all the 5 and 100-year ponding elevation. For example, I do not see ponding elevations for CB12 and CBMH13.

24. Please show flow arrows and associated slope between the proposed development (Block 3, parking area and amenity area) and the west right-of-way of Robert Grant Ave.

25. If pressure reducing valves are required for any proposed unit, please identify all the units that require pressure reducing valves (PRV).

26. There is a symbol (arrow) shown under the proposed legend that describes it as “Major Flow Routing”. Does it represent a major overland flow route or emergency overland flow route? Please review and revise.

Terrace Flats South Grading Plan, C1.3, prepared by WSP, dated 2021-07-07

27. A grading of 30.26% is shown west of Block 7 (in the grassed area). Grading steeper than 7% is not acceptable. Please provide terracing at this location. Terracing is required for all grassed areas when grading is steeper that 7%.

28. A proposed grade of 28.66% is shown in front of Block 4 and a proposed grade of 18.88% is shown in front of Block 5. These grades are too steep and not acceptable. Please review and revise.

Terrace Flats North Servicing Plan & Terrace Flats South Servicing Plan, C1.4 & C1.5, prepared by WSP, dated 2021-07-07

29. As per the City detailed drawings W25 and W25.2, clearly show the vertical separation (D) between the watermain and the sewers. You have the option of showing the vertical clearance as you have shown for the crossing of storm and sanitary sewers at the south entrance.

30. Please provide adequate depth of cover for the proposed watermain number shown in the watermain schedule (W-2, W-3, W-8, W-9, W-10, W-17, W-18, W-21, W-22).

Phase 1 Environmental Site Assessment 5725 Fernbank Road – Block 344 Ottawa, Ontario, prepared by Paterson group, dated March 2, 2021

31. Incorrect address is shown (5725 Fernbank Road) on this report? Please review and revise.

Feel free to contact Santhosh Kuruvilla, Infrastructure Project Manager, for follow-up questions.

<u>Infrastructure Planning Unit</u>

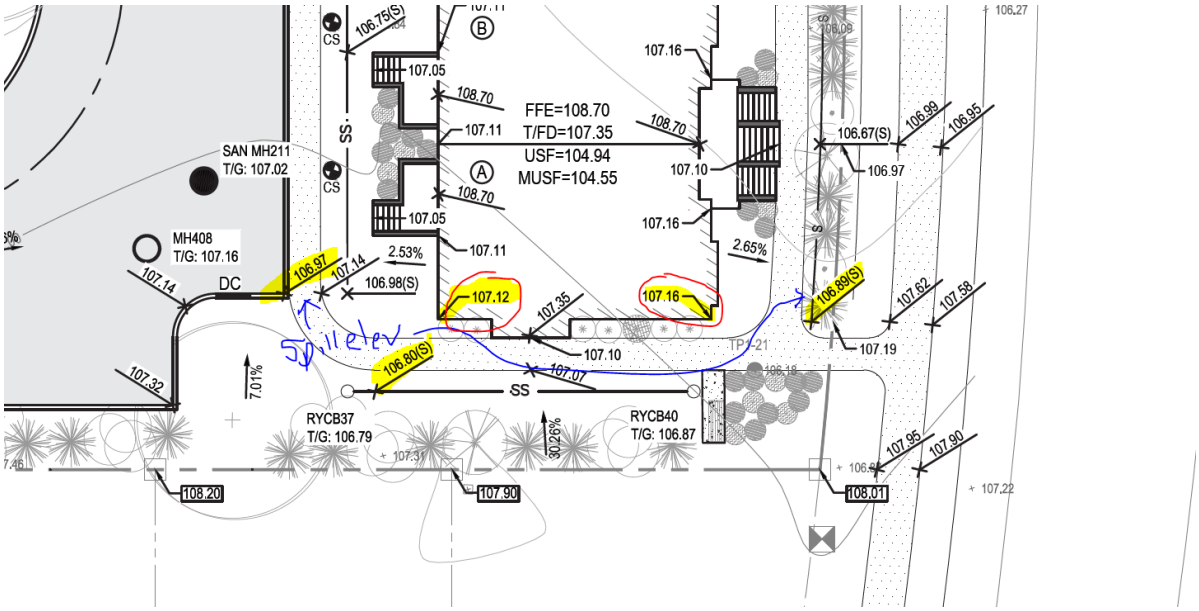
32. Confirm an isolation valve is present between the two water service stubs to ensure an uninterrupted water supply in the event of failure to the Embankment Street main.

General

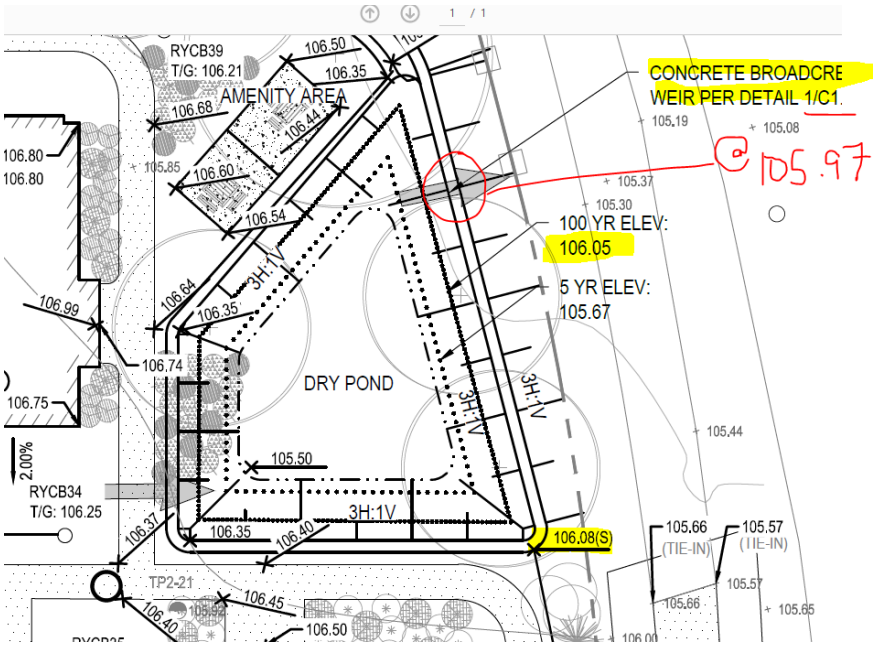
33. For next submission, and for each subsequent revised design package submitted, please provide a response letter from the design consultant that clearly summarizes all revisions/changes made to the revised, proposed design package. This includes revisions/changes made to: (1) address City comments and, (2) to clearly communicate any other additional changes made.

34. Please update the grading plan to include the stress test ponding extent (where surface ponding in modelled). Please include the 100 year depth and stress test WSEL at each of these ponding areas.

35. Please update the grading plan for all ponding areas, including RY swales (not modelled with storage), to identify all high points/spill elevations and major overland flow/emergency overland flow arrows. Please ensure that the "RY" swale grading meets PIEDTB 2016-01. In particular, per PIEDTB 2016-01: "*The maximum depth of flow depth in rear yards is 300 mm. Furthermore, there must be at least 30 cm of vertical clearance between the rear yard spill elevation and the ground elevation at the adjacent building envelope*." For example, please see the marked up grading plan below where it does not appear that vertical clearances have been met. Please revise.



36. Re the dry pond grading, per OSDG section 8.3.11.5 "*Dry ponds should have a freeboard of 0.3 m between the 100-year water elevation and the overflow elevation*". Per the marked up image below, it appears that the grading around the pond does not meet the 0.3 m freeboard. Please revise the grading design to ensure 0.3 m freeboard.



37. Please update Sheet No. C0.1 to specify active head and peak discharge for each orifice with a diameter less than 75 mm (per the Note highlighted yellow below).

INLET CONTROL DEVICE (ICD) SCHEDULE

HOST STRUCTURE	ICD POSITION (DIRECTION & INLET/ OUTLET)	INVERT ELEV. (m)	ORIFICE DIA. (mm)
CB03	NORTH (OUTLET)	105.91	75
CB04	WEST (OUTLET)	105.80	60
CB06	EAST (OUTLET)	105.95	25
CB07	EAST (OUTLET)	105.95	25
CB08	WEST (OUTLET)	105.69	75
CB10	WEST (OUTLET)	105.80	60
CB11	WEST (OUTLET)	105.83	80
CB12	WEST (OUTLET)	105.81	60
CBMH13	WEST (OUTLET)	105.80	75
CB14	SOUTH (OUTLET)	105.75	32
CB15	NORTH (OUTLET)	105.75	32
CB16	WEST (OUTLET)	105.66	50
MH409	WEST (OUTLET)	104.81	170
RYCB02	SOUTH (OUTLET)	106.18	75
RYCB04	SOUTH (OUTLET)	105.85	60
RYCB09	WEST (OUTLET)	105.69	60
RYCB18	SOUTHWEST (OUTLET)	105.39	120

NOTES:

1. ABLE SHALL BE READ IN CONJUNCTION WITH SITE STORMWATER MANAGEMENT REPORT (DATED JULY 7, 2021, PREPARED BY WSP CANADA INC.).
2. WHERE ICD DIAMETERS ARE LESS THAN 75mm (REQUIRED MINIMUM PER MECP), MANUFACTURED LOW-FLOW ICDS WILL BE REQUIRED WITH SIMILAR DISCHARGE PERFORMANCE NOTED ACTIVE HEAD. PROPOSED DEVICES SHALL BE SUBJECT TO ENGINEER'S REVIEW AND APPROVAL.\
3. UNLESS OTHERWISE SPECIFIED, ALL INLET CONTROL DEVICES (ICD'S) SHALL BE ORIFICE PLATES COMPOSED OF STAINLESS STEEL, BOLTED TO THE INSIDE OF THE REFERENCED STRUCTURES. ANY GAP BETWEEN PLATE PERIMETER AND STRUCTURE WALL SHALL BE SEALED USING A MASTIC SEALANT.

38. Please ensure that sanitary and storm maintenance holes are not located within ponding areas. Please revise the design to address this comment.

Richcraft Terrace Flats, CRT Lands (Block 344) Stormwater Management Report, prepared by WSP, dated July 07, 2021

39. Section 1.4 states: "*Ponding shall occur in parking lots under the 2-year design storm event*". Please revise as there shall be no ponding in the 2 year event.

40. Table 5.5 of the IBI 2017 Design Brief includes the stress test HGL at MH189. Please update the report to reference this HGL (furthermore, please update the stress test model scenario to include this fixed boundary condition).

41. The drainage areas delineated in the drainage plan (sheet No SWM-SK1-2 in appendix A) are not consistent with the subcatchments modelled in PCSWMM. Please revise the drainage plan to be consistent with the modelled subcatchments.

42. The MUSF declared in Table 8 is not consistent with the grading drawing. Please revise.

43. Per section 3.2.7 of the report: "*As previously stated in Section 3.2.5, foundation drains from Blocks 5, 6, and 7 are not connection to the site's minor system and therefore were omitted from this analysis*". The stress test HGL in the receiving MH shall be below the proposed USF and MUSF for Blocks 5, 6 and 7. Please confirm the stress test HGL in the receiving MH or provide justification to support that the stress test HGL in the receiving MH is lower than the proposed USF and MUSF.

44. Section 3.2.7 of the report declares: "*A review was carried out to confirm compliance with the two aforementioned criteria and no violations were identified. Refer to Servicing Report – Appendix A for detailed grading plan which communicates lowest building elevations and peak 100-year + 20% ponding elevations*". However, the extent and stress test water surface elevations (WSEL), have not been identified on the grading plans. Please update the grading plan to include the stress test extent and WSEL (see general comment above).

Stormwater Model

45. There is one outlet (with diameter of 60 mm) assigned to CB06 and CB07 in the model however the Inlet control schedule specifies 25 mm diameter orifices for each CB. Similarly, model CB14 and CB15 are specified to each have a 32 mm diameter orifice (modelled as one outlet with diameter of 75 mm). Please revise the model to simulate the orifices specified.

46. RYCB19 has been modelled as a square orifice of 164 mmx164 mm. Please update the ICD schedule to include this orifice.

47. Please revise minor system conduits modelled to include exist losses/hydraulic losses at bends per OSDG Appendix 6-B.

48. Subcatchment B2_1 was not discretized in the drainage plan (per comment above). This drainage area does not appear to include any sloped roof area. Please revise to ensure discretized subcatchments include relevant sloped roof areas (please do not consider roof leaders when discretizing drainage areas).

49. Its not clear how subcatchment B2_2 (not discretized in the drainage plan) has an imperviousness of 68% when the majority of the catchment is impervious. This is one example (another example is subcatchment B3_2). Please ensure that the runoff coefficient (converted to imperviousness when modelled), is updated in the revised drainage plan which is based on the proposed land cover for each subcatchment/drainage area.

50. Why is subcatchment B1 modelled with Horton Infiltration parameters that differ from the OSDG?

**Please note the model documentation has been reviewed for completeness and to confirm that parameters and methodologies applied are consistent with the current edition of the City of Ottawa Design Guideline (and any subsequent Technical Bulletins). The review has included spot checks of the model. Comments are provided on this basis, however the responsibility for overall model correctness and results rests with the engineer of record.*

Please feel free to contact me via email Ghislaine.Miliu@ottawa.ca if you have any questions.

Transportation

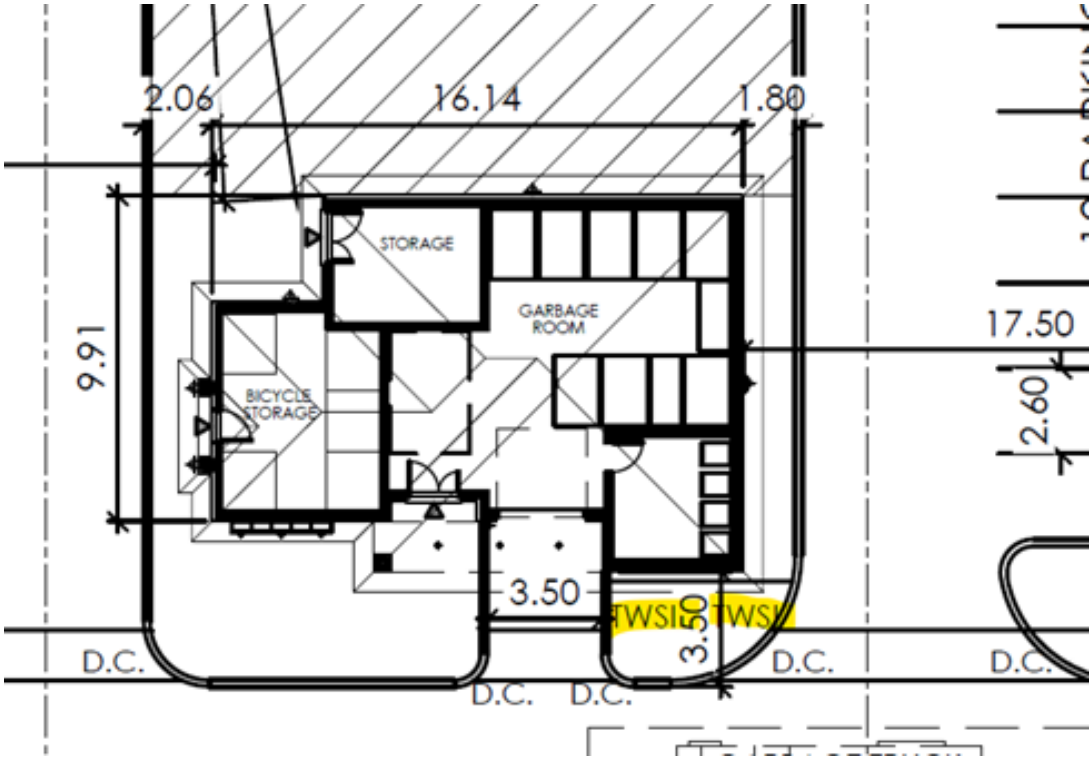
Site Plan, Sheet # SP-1, prepared by M. David Blakely Architect Inc., dated July 2020, revision 5, dated June 26 2021.

51. Show curb radii dimensions at the site accesses; ensure that all curb radii are reduced as much as possible.

52. Provide access aisle (with curb ramp and TWSI, as applicable) next to accessible visitor parking stalls, as per AODA. Refer to the City's Accessibility Design Standards as a reference to AODA requirements.

53. Consider providing all crosswalks located internally on the site provide a TWSI at the depressed curb, per Integrated Accessibility Standards Regulation under the AODA.

54. Clarify that the entire area surrounding the accessory building is hard surface, particularly around the north side of the building. Clarify where the TWSIs are located.



55. Include a depressed curb where the asphalt sidewalk meets the drive aisle, near the northwest corner of Block 3.

Roadway Traffic Noise Assessment, prepared by Gradient Wind, Consultant's Report # 21-083-Traffic Noise, dated May 12, 2021.

56. Robert Grant is ultimately to be widened to a 4-lane divided cross-section, and include BRT (at-grade crossings). A high-level design can be found on the West Transit Way Connections (Terry Fox Dr to Fernbank Rd) EA study. Please update Table 2 and study conclusions accordingly. (Note that you may reach out to the TPM for the file to confirm the future status of the roadway for future files.)

57. Include noise contour outputs with the noise barriers in place for the analysis presented in Section 5.2.

58. The City guidelines identifies Stamson software as the acceptable noise prediction method. Please provide additional information on the Predictor-Lima software. Is this

software acceptable by the MTO? Are there input/output data sheets available to review?

Feel free to contact Josiane Gervais, Transportation Project Manager, for follow-up questions.

Forestry

Landscape Plan, L1-1, prepared by Lashley + Associates Landscape Architecture & Site Engineering Inc., dated July 2021

59. Please add additional trees where planting space allows

60. Between Block 5 and Block 6 there is a grouping of five serviceberries that should be replaced with larger species; it is preferred to have fewer larger species than larger quantities of small species

61. Lot 163 has a grouping of three serviceberries; please replace with larger tree species if planting space allows

62. Please ensure the following setbacks are met:

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

Waste Collection Services

63. This location will be entitled to city of Ottawa front end bin collection. Please advise the exact square footage and dimensions of the garbage room.

64. The required containers for the site are the following:

    a. Garbage: 5 x 4 yard bins
    b. Fiber: 2 x 3 yard bins
    c. Glass metal plastic: 1 x 2 yard bin
    d. Organics: 2 x 240L carts

TECHNICAL AGENCIES:

Hydro Ottawa

65. The Owner is advised that there are medium voltage overhead lines along Robert Grant Ave at the East side of the property.

    a. The Owner is advised that permanent structures located within the "restricted zone" surrounding overhead lines are prohibited. This zone is defined by Hydro Ottawa's standard OLS0002 "Overhead High Voltage Clearances to Adjacent Building", which can be found at https://hydroottawa.com/accounts-services/accounts/contractors-developers/clearances. This standard complies with the requirements of the Ministry of Labour's Occupational Health & Safety Act, the Ontario Building Code, and the Ontario Electrical Safety Code. Permanent structures include buildings, signs (even lit signs when open for maintenance), antennas, pools, and fences.

    b. The Owner shall ensure that any landscaping or surface finishing does not encroach into existing or proposed Hydro Ottawa overhead or underground assets or easement. When proposing to plant trees in proximity of existing power lines, the Owner shall refer to Hydro Ottawa's free publication "Tree Planting Advice" which can be found at https://hydroottawa.com/outages-safety/safety-home/outside-home/planting-trees. The shrub or tree location and expected growth must be considered. If any Hydro Ottawa related activity requires the trimming, cutting or removal of vegetation, or removal of other landscaping or surface finishing, the activity and the re-instatement shall be at the owner's expense.

    c. Should any activity, such as tree trimming or working on the sides of a building, be anticipated within three meters (3m) of Hydro Ottawa's overhead lines, contact Hydro Ottawa to discuss arrangements before any activity is undertaken. In line with the Ministry of Labour's Occupational Health & Safety Act, only a Hydro Ottawa employee or Hydro Ottawa approved contractor can work in proximity of these lines.

66. The Owner is advised that there is medium voltage underground infrastructure along Robert Grant Ave and Embankment St at both East and West side of the property.

    a. The Owner shall ensure that no planting or permanent structures are placed within the clearance areas around padmounted equipment which is defined by Hydro Ottawa's standard UTS0038 "Above Ground Clearances for Padmounted Equipment" which can be found at https://hydroottawa.com/accounts-services/accounts/contractors-developers/clearances.

b. The Owner shall ensure crossing of Hydro Ottawa underground assets is carried out per Hydro Ottawa's engineering specification UDS0013, "Temporary and Permanent Support of Hydro Ottawa Duct Banks when Undercut by An Excavation" which can be found at https://hydroottawa.com/accounts-services/accounts/contractors-developers/commercial-design-specifications. The adoption of this specification does not relieve the Owner in any way for damage made to Hydro Ottawa plant.

c. Prior to the commencement of any excavation, the Owner shall arrange for an underground cable locate by contacting Ontario One Call at 1-800-400-2255, not less than seven (7) working days prior to excavating. There shall be no mechanical excavation within one and a half meters (1.5m) of any Hydro Ottawa underground plant unless the exact position of plant is determined by hand digging methods.

   The Owner shall contact Hydro Ottawa and expose existing duct banks and/or cable chambers. Hydro Ottawa will have the existing duct bank and manholes inspected to record existing condition. Once piling and shoring is completed, Hydro Ottawa will re-inspect the underground plant for any damages.

   The Owner shall inform Hydro Ottawa of any acute shock construction process or rubblization to be used during construction, and apply Hydro Ottawa's work procedure UDS0022 "Protecting Electrical Distribution Plant & Support Structures from Vibrations Caused by Construction Activity" which can be found at https://hydroottawa.com/accounts-services/accounts/contractors-developers/miscellaneous.

d. The Owner shall not use steel curb and sidewalk form support pins in the vicinity of Hydro Ottawa underground plant for electrical safety.

e. If the change in grade is more than three tenths of a meter (0.3m) in the vicinity of proposed or existing electric utility equipment. Hydro Ottawa requests to be consulted to prevent damages to its equipment.

67. The Owner shall enter an Installation and Service agreement with Hydro Ottawa.

68. The Owner shall be responsible for servicing the buildings within the property. Only one service entrance per property shall be permitted.

69. The Applicant may be responsible for a Capital Contribution payment(s) towards a distribution system expansion if the proposed development requires electrical servicing greater than can be provided by the existing distribution system in the

vicinity, either in capacity or in extension limit. This amount shall be in accordance with Hydro Ottawa's Contributed Capital Policy and Conditions of Service.

70. The Owner is to contact Hydro Ottawa if the electrical servicing of the site is to change in location or in size. A load summary will be needed for the technical evaluation.

71. The Owner is advised that Hydro Ottawa does not provide servicing through rear lanes.

72. The Owner shall be responsible for all costs for feasible relocations, protection or encasement of any existing Hydro Ottawa plant.

73. The Owner shall convey, at their cost, all required easements as determined by Hydro Ottawa.

74. The Applicant shall comply with Hydro Ottawa's Conditions of Service and thus should be consulted for the servicing terms. The document, including referenced standards, guidelines and drawings, may be found at https://hydroottawa.com/about-us/policies/conditions-service. The Owner should consult Hydro Ottawa prior to commencing engineering designs to ensure compliance with these documents.

75. Hydro Ottawa reserves the right to raise conditions throughout the development of this proposal should the revisions contain non-conformances with, for example, Hydro Ottawa's Conditions of Service or Standards. To ensure the best outcome, Hydro Ottawa welcomes an early discussion on the proposal.

For more information on electrical servicing, the following link outlines Hydro Ottawa's services for Commercial, Overhead and Underground, and Residential projects, together with contact information for Hydro Ottawa representatives:

https://hydroottawa.com/accounts-services/accounts/contractors-developers/distribution-system-design.

Maria Ongare, PEng
Distribution Engineer /
Ingénieur, Distribution de l'électricité
Tel./tél.: 613-668-0833
mariaongare@hydroottawa.com

Bell Canada

76. The following paragraphs are to be included as a condition of approval:

"The Owner acknowledges and agrees to convey any easement(s) as deemed necessary by Bell Canada to service this new development. The Owner further agrees and acknowledges to convey such easements at no cost to Bell Canada.

The Owner agrees that should any conflict arise with existing Bell Canada facilities where a current and valid easement exists within the subject area, the Owner shall be responsible for the relocation of any such facilities or easements at their own cost."

77. The Owner is advised to contact Bell Canada at planninganddevelopment@bell.ca during the detailed utility design stage to confirm the provision of communication/telecommunication infrastructure needed to service the development.

78. It shall be noted that it is the responsibility of the Owner to provide entrance/service duct(s) from Bell Canada's existing network infrastructure to service this development. In the event that no such network infrastructure exists, in accordance with the Bell Canada Act, the Owner may be required to pay for the extension of such network infrastructure.

79. If the Owner elects not to pay for the above noted connection, Bell Canada may decide not to provide service to this development.

80. To ensure that we are able to continue to actively participate in the planning process and provide detailed provisioning comments, we note that we would be pleased to receive circulations on all applications received by the Municipality and/or recirculations.

Ryan Courville
Manager - Planning and Development
Network Provisioning
Email: planninganddevelopment@bell.ca

Enbridge Gas Inc.

81. Enbridge Gas Inc. does not object to the proposed application(s) however, we reserve the right to amend or remove development conditions.

82. This response does not constitute a pipe locate, clearance for construction or availability of gas.

83. The applicant shall contact Enbridge Gas Inc.'s Customer Connections department by emailing SalesArea60@Enbridge.com to determine gas availability, service and meter installation details and to ensure all gas piping is installed prior to the

commencement of site landscaping (including, but not limited to: tree planting, silva cells, and/or soil trenches) and/or asphalt paving.

84. If the gas main needs to be relocated as a result of changes in the alignment or grade of the future road allowances or for temporary gas pipe installations pertaining to phased construction, all costs are the responsibility of the applicant.

85. In the event that easement(s) are required to service this development, and any future adjacent developments, the applicant will provide the easement(s) to Enbridge Gas Inc. at no cost. The inhibiting order will not be lifted until the application has met all of Enbridge Gas Inc.'s requirements.

Casey O'Neil
Sr Analyst Municipal Planning
Engineering
ENBRIDGE
TEL: 416-495-5180
500 Consumers Rd, North York, ON M2J1P8

Rogers Communications

86. Rogers has no comment or concerns regarding this circulation. Please contact Martin Proulx at 613-688-2191 or e-mail at martin.proulx@rci.rogers.com for Rogers Site Servicing if approved, or if you require additional information.

PUBLIC COMMENTS:

- Concerns with the width of the accesses along Embankment Street.
- Concerns with the width of the landscaped buffers between the proposed accesses and abutting homes on Embankment Street.
- More information requested about the fencing be provided along shared property lines with homes on Embankment Street.
- Besides the bicycle storage spaces, there should be some bicycle racks for use by visiting cyclists to the development.
- Concerns about increased noise and traffic along Embankment Street due to the two accesses serving the site. Several individuals requested that additional accesses are provided along Bobolink Ridge, Cope Drive, and/or Robert Grant Avenue.
- The inclusion of electric vehicle parking spaces is positive.
- Concerns about snow removal.

FOR THE NEXT SUBMISSION:

- The next submission should address all and each of the comments or issues, to ensure the effectiveness and consistency of the next review.
- A cover letter must be included that states how each comment was addressed in the resubmission. Please co-ordinate the numbering of each resubmission comment, or issue, with the above noted comment number.
- All addenda or revisions to any studies or plans must be provided as a PDF.

The development review team will be happy to meet you to discuss comments and resolve issues. We highly recommend holding the comments review meeting within one week from the date of this letter. Please contact me at your earliest convenience to confirm the meeting date, time, format and location.

Should there be any other questions, please do not hesitate to contact me.

Yours Truly,

Colette Gorni
Planner I | Urbaniste I
Development Review West | Services d'examen demandes d'aménagements Ouest
Planning, Infrastucture and Economic Development Department
City of Ottawa | Ville d'Ottawa
613-580-2424, ext./poste 21239
Colette.Gorni@ottawa.ca

APPENDIX

G

CRT PHASE 1 SERVICING REPORT

REPORT
PROJECT: 27970-5.2.2

DESIGN BRIEF
CRT LANDS PHASE 1
FERNBANK COMMUNITY

Prepared for CRT DEVELOPMENT INC.
by IBI GROUP

JULY 2017

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FIGURES:

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1 INTRODUCTION

1.1 Background

In 2009, the City of Ottawa completed the Fernbank Community Design Plan (FCDP).The FCDP covers approximately 675 gross hectares of land between the established communities of Stittsville, Kanata West and Kanata South. The community extends from Hazeldean Road to the north, the Carp River and Terry Fox Drive to the east, Fernbank Road to the south and the existing Urban Area of Stittsville to the west.

In conjunction with preparation of the Community Design Plan, several Class Environmental Assessment Studies/Master Plans were also prepared. Two of those were the Master Servicing Study (MSS) for water and sanitary and an Environmental Management Plan (EMP) for the natural environment and stormwater management. Those reports identify planning level solutions for on-site storm drainage, wastewater collection and water supply and distribution to the community. Those reports recommended a Preliminary Demonstration Plan on which the recommended major infrastructure servicing will be based. A copy of the Preliminary Demonstration Plan is included in **Figure 1.1**.

1.2 Objective

The purpose of this Design Brief is to provide stakeholder regulators with the project background together with the design philosophy and criteria incorporated in the subdivision design. This report will provide a logical framework to assist reviewers with evaluation of the design of the development.

Land is now being assembled in the Fernbank Community and development applications are being brought forward for approvals. This report is being prepared in support of development approval for the CRT Lands. This report will provide a recommended servicing plan for the major municipal infrastructure needed to support development of the subject property. The review will be a macro level detail study with further details to be confirmed and provided during the design process in the form of detail designs and design briefs. This report will demonstrate how proposed municipal servicing is in conformance with the MSS recommendations. Any deviation from the MSS documents will also be identified with rationalization for the change.

This report was prepared in accordance with the November 2009 Servicing Study Guidelines for Development Applications in the City of Ottawa. **Appendix A** contains a customized copy of those guidelines which can be used as a quick reference for the location of each of the guideline items within the study report.

1.3 Subject Property

The current draft plan for the subject property, which is located in the Fernbank Community, is identified on **Figure 1.2**, which is located in **Appendix A**. The property covers a total area of about 53 ha and is bounded by Fernbank Road to the south, Abbott Street and the Trans Canada Trail to the north, future CRT lands to the west and Robert Grant Avenue to the east. The upper reaches of the Flewellyn Drain also extend north of Fernbank Road into the property.

The proposed land use for the subject property, which is in general conformance with the FCDP, will include a residential mix of single family units, townhouses and stacked townhouses. The draft plan also provides land for both an elementary and secondary school and both a neighbourhood and community park. Also as per the FCDP, an east-west collector road (Cope Drive) is proposed to bisect the property.

1.4 Phasing

The total land holdings purchased by the CRT group cover about 165 ha. The proposed draft plan shown in **Figure 1.2** includes about 53 ha. However, the owners are proposing to develop the lands covered by the draft plan in at least two phases. **Figure 1.3** identifies the current phasing plan as envisioned by the Owners.

Phase 1, which includes construction of the first phase of the stormwater management facility covers about 53 ha. It includes the northern portion of the property including two school sites, one park and Cope Drive, the east-west collector street. Phase 1A, within Phase 1, is also identified in **Figure 1.3**. That area, covering about 7 ha, is the only portion of the draft plan with stormwater runoff tributary to Pond 6 which is located on the Fernbank Crossing lands east of Robert Grant Avenue.

It is the Owner's intent to develop Phase 1, including 1A, immediately upon receipt of approvals. The timing of development of Phase 2 will be market determined.

1.5 Previous Studies

The Fernbank Community development process included a number of background studies that are pertinent to the subject site. Three integrated Class Environmental Assessment Studies/Master Plans were prepared in support of the FCDP which include:

- Transportation Master Plan;
- Environmental Management Plan (EMP);
- Master Servicing Study (MSS).

In 2011, IBI Group completed a Conceptual Site Servicing Plan for the CRT Lands. That report was designed to assist the City in preparation of draft conditions for development of the subject property.

In January 2012, Novatech Engineering Consultants Ltd. completed the Fernbank Community Sanitary Trunk Sewer Design Report of the Fernbank Trunk Sewer. That sewer was identified in the 2009 MSS report. The 2012 report built upon previous design elements and included some changes to the proposed sewer design originally identified in the 2009 document. It is the latter report that will provide the design framework for the sanitary sewer design for the subject site.

Subsequent development applications under the Planning Act will be supported by these studies/plans. These studies were prepared and followed integration with the Planning Act provision of the Municipal Engineers Association Class Environmental Assessment Process

The subject property will follow closely the recommendations of those three reports. With respect to the provision of water supply, wastewater disposal and treatment of stormwater runoff, the recommendations of the EMP, MSS and the 2012 Fernbank Sewer Report will provide the development criteria on which the subject property will develop. Any deviations from the previous report criteria will be identified in later sections of this report.

1.6 Environmental Issues

The total property purchased by the CRT group includes some natural environment features as shown on Figure 3.2 in the EMP report which is included in **Appendix B** for reference. These include remnant higher quality trees, deciduous hedgerows, meadow habitat and wooded areas. The upper reaches of the Flewellyn Drain also extend about 950 meters into the property from Fernbank Road. In August 2011, under By-Law No. 2011-311, the City of Ottawa formally closed that portion of the Drain and it is no longer recognized as a Municipal Drain as per the provincial Drainage Act. A copy of the By-Law is attached in **Appendix B**.

A permit from the Rideau Valley Conservation Authority is required to fill the former Municipal Drains located north of Fernbank Road within the subject property. Two previously acquired permits have both expired. The owners have recently applied for an amendment to the expired permits.

It is also proposed to lower about 650 m of the existing Flewellyn Drain south of Fernbank Road. That work is required to achieve the herein recommended operating levels of the SWM Facility Pond 5. Additionally, the City of Ottawa has requested that the balance of Flewellyn Drain to Flewellyn Road also be upgraded. Therefore, an additional 800 m of existing drain will also be improved as part of the development of the CRT lands.

1.7 Pre-Consultation

There have been several consultations with City officials including project planners, engineers and municipal drain staff. Although no formal notes of these meetings were recorded, some of the issues reviewed include:

- Phasing;
- Wood lots;
- EIS and Tree Preservation Plan;
- Geotechnical Report;
- Traffic Impact Study;
- Park & Ride;
- Municipal Drain Closure.

During the recent City review of this report, the City advised that the City's 2013 Wastewater IMP and subsequent 2016 Update were completed. In accordance with the recommendations from these reports, the City requested that future flows through the CRT property be updated to include the following external flows:

• Liard Street Pump Station	108 l/s
• OPA 76 Area 6 Pump Station	84 l/s
• Future Developments	100 l/s
	292 l/s

IBI advised that the proposed sub-trunk sanitary sewer through the CRT lands could not accept the 100 l/s for future developments without significantly impacting the development of the CRT property. The City subsequently dropped the requirement for capacity provision for the 100 l/s for future developments. Therefore, the proposed sub-trunk sewer through the CRT property will be sized to provide capacity for external flow from both the existing Liard Street Pump Station and the Area 6 Pump Station. A copy of a relevant e-mail dated January 31, 2017 is included in **Appendix B**.

There also has been some previous correspondence with the provincial Ministry of Environment (MOE) and the Rideau Valley Conservation Authority (RVCA) regarding the development of Phase 1. Copies of e-mail correspondence from 2013 from those agents is also included in **Appendix B**.

1.8 Geotechnical Considerations

A Geotechnical Investigative Report entitled "Geotechnical Investigation Proposed Residential Development CRT Lands – Phase 1, Fernbank Road Ottawa, Ontario", number PG2236-2R, and dated July 23, 2014, was prepared by Paterson Group Inc. The objectives of the investigation include:

- Determination of the subsoil and groundwater conditions;
- Provision of preliminary geotechnical recommendations pertaining to the design and development of the subject site including construction considerations.

Among other items, the report will comment on the following:

- Site grading;
- Foundation design;
- Pavement structure;
- Infrastructure construction;
- Groundwater control;
- Grading;
- Tree planting.

Among other considerations, the report confirmed that there are limited locations where a maximum grade raise limit of 2.5 m is recommended. These limitations exist only in areas where silty clays are located below proposed footing elevations. **Figure 1.4** indicates these areas. The proposed maximum grade raises in the limitation areas are in the 2.2 m range. There are no grade raise limitations for the balance of the subject site.

The Owners have also obtained a Permit To Take Water for Phase 1. The PTTW No. 3238-9TLP82, which covers water taking for the subdivision, Pond 5 and the Flewellyn Drain improvements is included in **Appendix B**.

2 WATER SUPPLY

2.1 Existing Condition

The Fernbank Community is located within the City's 3W Pressure Zone which includes most of Kanata and Stittsville and is one of the most rapidly growing areas in the City. Potable water to this area is pressurized at the Glen Cairn Pump Station where a major water storage reservoir (Glen Cairn Reservoir) is located. Two of the major watermains in this pressure zone from the pump station are located along Hazeldean Road and Terry Fox Drive. As part of the development to the east of the site a 300 mm watermain has been extended from the Trans Canada Trail watermain along Livery Street and Bobolink Ridge crossing Robert Crescent Avenue to the limit of Phase 1. Another main adjacent to the subject site is located in Abbott Street and the Trans Canada Trail. **Figure 2.1** indicates the limits of existing watermains in the vicinity of the subject property.

2.2 Master Servicing Study

The Master Servicing Study recommended a conceptual water plan for the FCDP. A copy of the recommended plan, Watermain Layout Drawing No. 101108-WM, Revision 3, is included in **Appendix C**. For the subject property to be properly serviced with a reliable water supply, two connections to an existing 400 mm diameter main are recommended: one at Abbott Street west of Iber Road and the second along the Trans Canada Trail east of Iber Road. To complete a loop, an additional main is proposed along Bobolink Ridge. The 2009 MSS report recommended that all these mains be 300 mm diameter.

The connection to the existing 400 mm diameter main in the Trans Canada Trail has been completed by the adjacent Fernbank Crossing development which is located immediately east of Robert Grant Avenue and extended westward to Bobolink Ridge.

2.3 Design Criteria

2.3.1 Water Demands

Water demands have been calculated for the Phase 1. Per unit population density and consumption rates are taken from Tables 4.1 and 4.2 at the Ottawa Design Guidelines – Water Distribution and are summarized as follows:

- Single Family 3.4 person per unit
- Townhouse and Semi-Detached 2.7 person per unit
- Average Apartment 1.8 person per unit
- Residential Average Day Demand 350 l/cap/day
- Residential Peak Daily Demand 875 l/cap/day
- Residential Peak Hour Demand 1,925 l/cap/day
- ICI Average Day Demand 50,000 l/gross ha/day
- ICI Peak Daily Demand 75,000 l/gross ha/day
- ICI Peak Hour Demand 135,000 l/gross ha/day

Residential units in Phase 1 consist of single family and street townhouses. There are two school sites, Blocks 325 and 357, which are included in the hydraulic analysis and three future high density residential sites, Blocks 336, 355 and 356. A population of 90 persons per hectare is used

to calculate the water demands for the future high density sites. A watermain demand calculation sheet is included in **Appendix C** and the total water demands are summarized as follows:

- Average Day 13.39 l/s
- Maximum Day 28.04 l/s
- Peak Hour 58.41 l/s

2.3.2 System Pressure

The Ottawa Design Guidelines – Water Distribution (WDG001), July 2010, City of Ottawa, Clause 4.2.2 states that the preferred practice for design of a new distribution system is to have normal operating pressures range between 345 kPa (50 psi) and 552 kPa (80 psi) under maximum daily flow conditions. Other pressure criteria identified in Clause 4.2.2 of the guidelines are as follows:

Minimum Pressure	Minimum system pressure under peak hour demand conditions shall not be less than 276 kPa (40 psi)
Fire Flow	During the period of maximum day demand, the system pressure shall not be less than 140 kPa (20 psi) during a fire flow event.
Maximum Pressure	Maximum pressure at any point in the distribution system shall not exceed 689 kPa (100 psi). In accordance with the Ontario Building/Plumbing Code, the maximum pressure should not exceed 552 kPa (80 psi). Pressure reduction controls will be required for buildings where it is not possible/feasible to maintain the system pressure below 552 kPa.

2.3.3 Fire Flow Rates

In the recent Technical Bulletin 'ISDTB-2014-02, Revisions to Ottawa Design Guidelines – Water', the fire flow requirements for single detached dwellings and traditional town and row houses can be capped at 10,000 l/min providing that there is a minimum separation of 10 meters between the backs of adjacent units and that the town and row house blocks are limited to 600 square meters of building areas and seven dwelling units. As the residential units in the Phase 1 meet the requirements of ISDTB-2014-02, the fire flow rate of 10,000 l/min (166.7 l/s) is used in the fire flow analysis.

As there are no details for the institutional land, a fire flow rate of 13,500 l/min (225 l/s) will be used in the fire flow analysis. This value should be considered conservative for a school with a sprinkler system.

2.3.4 Boundary Conditions

CRT LANDS PHASE 1 - WATER BOUNDARY CONDITIONS

The City of Ottawa has provided hydraulic boundary conditions at two locations along the Trans Canada Trail 400 mm watermain. Two separate boundary conditions are given for the max day + fire scenario, one for a fire flow rate of 204 l/s which is used to calculate the residential units and one for a fire flow of 262 l/s which is used in the institutional lands analysis. A copy of the boundary condition is included in **Appendix C** and summarized as follows:

	CONNECTION 1	CONNECTION 2
Max HGL (Basic Day)	161.1 m	161.4 m
Peak Hour	154.7 m	154.8 m
Max Day + Fire (204 l/s Fire Flow)	152.8 m	153.0 m
Max Day + Fire (262 l/s Fire Flow)	150.6 m	150.9 m

2.3.5 Hydraulic Model

A computer model Phase 1 has been developed using the H20 MAP Version 6.0 program produced by MWH Soft Inc. The model includes the existing watermains and boundary conditions identified in Section 2.3.4.

2.4 Proposed Water Plan

2.4.1 Modeling Results

The hydraulic model was run under basic day, maximum day with fire flows and under peak hour conditions for Phase 1. Water pipes are sized to provide sufficient pressure and to deliver the required fire flows.

Results of the hydraulic model are include in **Appendix C** and summarized as follows:

Scenario	
Basic Day (Max HGL) Pressure Range	508.7 to 544.5 kPa
Peak Hour Pressure Range	441.4 to 477.1 kPa
Max Day + 204 l/s Fire Flow Minimum Flow	184.7 l/s
Max Day + 262 l/s Fire Flow Minimum Flow	243.4 l/s

A comparison of the results and design criteria is summarized as follows:

Maximum Pressure	All notes have basic day pressures under 552 kPa, therefore pressure reducing control is not required for this development.
Minimum Pressure	All nodes in the model exceed the minimum value of 276 kPa (40 psi).
Fire Flow	The lowest fire flow for the residential lands is 184.4 l/s which exceeds the requirement of 166.7 l/s while the lowest fire flow for the institutional blocks is 243.4 l/s which exceeds the requirement of 225 l/s.

2.4.2 Watermain Layout

The proposed watermain layout for Phase 1 is shown on Figure 2.2. In accordance with the Master Servicing Study, a 300 mm watermain is extended on Bobolink Ridge connecting to the existing 300 mm main. A 300 mm watermain is also installed on Goldhawk Drive and Angel Heights extending across the Hydro One corridor and Trans Canada Trail to connect to the existing 400 mm watermain providing two connections to the Phase 1 development. All other mains are 150 mm and 200 mm.

3 WASTEWATER DISPOSAL

3.1 Existing Conditions

The Hazeldean Pump Station (HPS) is the recommended wastewater outlet for all lands in the FCDP, including the subject site. Among other areas in Kanata, including Bridlewood, Kanata South Business Park and the Glen Cairn Community, the HPS also serves most developed lands in Stittsville west of Terry Fox Drive and south of Hazeldean Road. Flows are directed towards the station via the existing 750 mm diameter Stittsville Trunk Sewer which is located in Abbott Street and the Trans Canada Trail.

The 900Ø South Glen Cairn Trunk and 750Ø Glamorgan Trunk Sewer also contribute wastewater flows to the HPS. A 525Ø sub-trunk sewer in Cope Drive near the south west section of the FCDP, west of Terry Fox Drive, also directs flows to the South Glen Cairn Trunk sewer.

The design of the station did not consider the Fernbank Community. Recognizing the need to complete upgrades to the HPS in order to accommodate new growth from the Fernbank Community, the City, in 2014, completed upgrades to the HPS and increased its capacity to 1225 l/s. The Fernbank Trunk Sewer was subsequently completed and is terminated at MH FT24 which is located in the Hydro One easement within the subject site.

Figure 2.1 shows the location of the existing sanitary sewer system in the vicinity of the subject site.

3.2 Master Servicing Studies

The June 24, 2009 Master Servicing Study was completed in support of the FCDP. The MSS Report recommended a wastewater collection and disposal system for the FCDP, including the subject site. Subsequent to completion of the 2009 MSS report, Novatech Consulting Engineers Ltd completed the Fernbank Community Sanitary Trunk Sewer Design Report in 2012. The latter report recommended construction of the Fernbank Trunk Sewer in the Hydro One easement adjacent to the Trans Canada Trail. The upper reach of the Trunk Sewer is designed as a 600 mm dia pipe at 0.39% slope and is proposed to be constructed immediately north of the subject site and will provide an outlet capacity at MH-FT24. Copies of the Drainage Area Plan and design sheet from the 2012 Fernbank Trunk Sewer report are included in **Appendix D**.

The following is a comparison of the proposed tributary areas and population projections from the 2012 report and the CRT Phase 2 design.

Table 3.1 Elements Tributary to MH-FT24

DESIGN	AREA (HA)	POPULATION
2012	200.11	10436
CRT Phase 1*	203.44	10400

** The areas and populations for the MH-FT24 outlet have been adjusted to account for OPA Expansion Area 6.*

Table 3.2 Elements Tributary to MH-FT18

DESIGN	AREA (HA)	POPULATION
2012	13.19	538
CRT Phase 1*	12.21	524

** The areas and populations for the MH-FT24 outlet have been adjusted to account for OP Expansion Area 6.*

As is evident from these tables, the areas and population estimates for each outlet are relatively consistent. There are to be some minor differences expected between final design, when final lotting is known, and the more macro focused master study estimates. Therefore, the sanitary design is in general conformance with the 2012 Trunk Sewer Report.

There are some changes now recommended to the sanitary drainage area boundaries, especially along the west side of Robert Grant Avenue and the drainage divide along the Phase 1A limits. The changes are identified in **Figure 3.1**. The significant change is that the school site, Block 361, adjacent to Robert Grant Avenue is now proposed to be serviced from Cope Drive and be tributary to the proposed 600 mm Ø sub-trunk sewer in Goldhawk Drive. The MSS report recommended that the school site be tributary eastward to the Fernbank Crossing development. The change is recommended because of ownership boundaries.

Upstream of MH-FT24 on the Fernbank Trunk Sewer, the 2009 MSS document recommended construction of a 525 mm diameter sub-trunk sewer along Goldhawk Drive and a 450 mm diameter sewer oversized for external lands west of Shea Road. A copy of the 2009 MSS Sanitary Drainage Area Plan (Drawing 101108-SAN) is included in **Appendix D**. Since the 2009 MSS report was completed, the City of Ottawa has requested that the CRT sanitary sewer be oversized to account for wastewater flows to the existing Laird Street Pump Station and also expected flow from the 2012 OPA Area 6 expansion lands. The latter areas were brought into the urban envelope in 2012 as part of the last Official Plan review by the City.

In accordance with recent instructions from the City of Ottawa, an allowance for external flows of 192 l/s has been provided in the proposed 600 mm Ø sub-trunk sewer in the subject property, 108 l/s for the Liard Street Pump Station and 84 l/s for the OPA 76 Area 6 lands. Refer to an e-mail string last dated January 31, 2017 from the City located in **Appendix B**.

Therefore, the recommended sanitary sewer extension through the CRT Phase 1 site to accommodate the revised design criteria is now a 600 mm diameter pipe as opposed to the 450/525 pipe recommended in the MSS report.

As recently agreed with the City, the proposed 600 mm diameter sanitary sub-trunk sewer through the CRT property has been sized to accommodate the following external flows:

• Liard Street Pump Station	108 l/s
• OPA 76 Area 6 Pump Station	84 l/s
	192 l/s

Those flows are in addition to other upstream flows from future developments within the Fernbank CDP area.

3.3 Design Criteria

The sanitary sewers for the subject site will be based on the recommendations of the 2009 MSS and the standards of both the City of Ottawa and the provincial Ministry of the Environment. Some of the key criteria will include the following:

Average Day Residential Flow	350 l/cap/day
Residential Peaking Factor	Harmon Formula: (min. -2.0, max, -4.0)
Industrial Flow Rate	50,000 l/day/ha
Commercial & Institutional Flow Rate	35,000 l/day/ha
ICI Peaking Factor	1.5
Infiltration Rate	0.28 l/s/ha
Single Unit Population Density	3.3 ppu
Townhouse Unit Population Density	2.5 ppu
Mixed Use Residential Area Density	1.8 ppu
Velocities	Min 0.6 m/s
	Max 3.0 m/s

Table 3.3 Minimum Allowable Slopes

DIAMETER (MM)	SLOPE (%)
200	0.320
250	0.240
300	0.816
375	0.140
450	0.111
525 and larger	0.100

Where practical and where there are less than 10 residential connections, the first lengths of sanitary sewers are designed as 200 mm diameter pipes with a minimum slope of 0.65%. The population densities used for the wastewater design for the subject lands are those recommended in the 2009 MSS document which are:

Low Density	3.3 pers/unit
Medium Density	2.5 pers/unit
High Density	1.8 pers/unit

For the purpose of this Design Brief document, single family units are considered low density and townhouse units are considered medium density.

3.4 Recommended Wastewater Plan

The recommended wastewater plan for the CRT Lands is shown in **Figure 3.2**. Sanitary sewer sizes are included only for the sewers 250 mm Ø and larger. To accommodate the expanded external wastewater drainage limits, construction of a 600Ø sub-trunk sewer is now proposed in Goldhawk Drive south to Cope Drive. That sub-trunk sewer will be oversized for future developments west of Goldhawk Drive, including the Laird Street Pump Station sewer shed and OPA Expansion Area 6. With the exception of Area 1A identified on **Figure 1.3**, all wastewater flows for the draft plan area will be directed to the proposed Goldhawk Drive 600Ø sub-trunk sewer. Drainage from Area 1A will outlet directly to the Fernbank Trunk Sewer at MHFT18 near Robert Grant Avenue.

The balance of Goldhawk Drive within the draft plan will include 375Ø and 300Ø sewers. Most of the remaining sanitary sewers within the subject site will be 250Ø and 200Ø.

3.5 Wastewater Outlet

The recommended wastewater plan for the FCDP includes construction of a new Fernbank Trunk Sewer to be located in the Trans Canada Trail and hydro easement adjacent to the existing developments in Stittsville. The new trunk sewer, which is now installed up to MHFT24, outlets directly to the HPS. With the exception of about 25 ha in the extreme south-east of the FCDP, the new Fernbank Trunk Sewer will provide an outlet for the FCDP lands located south of the Trans Canada Trail.

The 2009 MSS Report also completed a sanitary hydraulic gradient analysis (HGL). The recommended Hazeldean Pump Station overflow system included a diversion to the Monahan Constructed Wetlands Stormwater Management Facility. The predicted HGL at the station was 95.0 meters. The overflow will protect all development lands in the FCDP and most of the existing sewershed. A copy of Figure 6.1 Hydraulic Grade Line Analysis and the Sanitary Sewer Hydraulic Grade line Analysis (2031) from the 2009 MSS report is attached in **Appendix D**.

The City recently advised that the current sanitary hydraulic grade line (HGL) at the Hazeldean Pump Station is now 95.30 m as opposed to the 95.0 m HGL predicted in the 2009 MSS review. Because the proposed sanitary sewer system through the subject property, as well as the new completed Fernbank Trunk Sewer, are to carry the 192 l/s external flow (Liard Street Pump Station and Area 6 Expansion Lands) recently requested by the City, we have completed another review of the sanitary HGL along the Fernbank Trunk Sewer as well as into the CRT development. The detailed analysis is included in **Appendix D**.

The static analysis is based on the Darcy–Weisbach formula. Table 3.4 shows a comparison of the current analysis based on the sewer as-built design, and the MSS analysis.

Table 3.4 Sanitary HGL Analysis along the Fernbank Trunk Sewer

FERNBANK TRUNK SEWER			
AS-BUILT SEWER		MSS DESIGN	
LOCATION	HGL	LOCATION	HGL
MH FT-01	95.39	974	95.09
MH FT-08	95.60	972	95.91
MH FT-18*	97.50	934	97.96
MH FT-24**	99.93	924	100.75

* CRT East connection point
**CRT West connection point

The sewer locations in the above table represent common locations. This analysis indicates that the sanitary HGL along the trunk sewer is lower than previously predicted in the MSS document even though more wastewater is included in the current analysis. This seems to be related to the different hydraulic loss coefficients used in the analysis. The current review used the hydraulic loss coefficients as per Appendix 6-B.1 from the City of Ottawa Sewer Design Guidelines and Section 1.7 from the MOE Guidelines which are both located in **Appendix D**. The difference however appears to be a moot matter. The current analysis indicates that the proposed basements are several meters above either sanitary HGL.

From MH FT-18 (MSS node 934) the hydraulic analysis was carried to MH 146A in Putney Crescent which is the nearest MH in Phase 1A. The estimated sanitary HGL at MH 146A is 100.96 meters and the lowest basement footings at this location are designed to be near 103.66 meters.

There is a similar situation immediately upstream from the Fernbank Trunk Sewer MH FT-24 where the analysis was extended to MH 103A in Goldhawk Drive. The HGL at MH 103A is predicted to be 100.60 meters and the nearest basement footings are designed to be near the 105.75 elevation. Based on this analysis, the logical conclusion is that the Fernbank Trunk Sewer hydraulic gradient will not impact building construction in the CRT development.

3.6 Local Extraneous Flows

All sanitary sewers will be constructed to City of Ottawa standards, including testing prior to being put into service. There are no unusual local conditions within the subject site that are expected to contribute extraneous flows higher than those noted in the City's guidelines.

3.7 Sewer Calculations

Detailed sanitary sewer design sheets, using recommendations from the MSS, and criteria of the City of Ottawa and the provincial Ministry of Environment, and Sanitary Drainage Area Plans (Drawings 27970-501, 501A and 501B) are provided in **Appendix D**.

3.8 Environmental Constraints

There are no significant environmental constraints associated with development of the subject site. The upper reaches of the former Flewellyn Municipal Drain on the Owners property will be filled as part of the Phase 1 development. The wood lot identified in the EMP report is in a future phase and not covered by the current draft plan. The City has the option to purchase the wood lot.

3.9 Emergency Overflow

The wastewater outlet for the CRT Lands will be the Hazeldean Pump Station. Most sanitary pump stations in urban locations include overflows as an additional redundant operational system. The HPS includes an overflow to the Monahan Drain.

4 MINOR STORM SEWER SYSTEM

4.1 Existing Conditions

The subject property is located within the Fernbank Community Development area north of Fernbank Road and south of Abbott Street/Trans Canada Trail and immediately west of Robert Grant Avenue. The approved MSS and EMP recommend construction of nine stormwater management facilities and associated storm sewer services to provide stormwater management for the Fernbank Community. As outlined in the MSS, the majority of the subject property is tributary to Pond 5 and a small portion is tributary to Pond 6. The draft plan covers an area of about 53 ha within the overall development.

The site's topography is generally between the 109 and 105 contours with most of the site draining towards the south into Flewellyn Drain. Although a portion of the plan is farmed, most of it consists of uncultivated grass lands. The north-east corner of the site, about 7 ha, drains to the east and runoff from this area will be tributary to Pond 6 which is located in the neighbouring development east of Robert Grant Avenue. **Figure 4.1** indicates the existing drainage patterns for the subject site.

The geotechnical report indicates that most of the site consists of about 0.2 to 0.3 meters of topsoil over glacial till. Bedrock is generally shallow being about 0.5 to 1.0 m below surface towards the north of the site and between 1.60 m and 3.15 m deep for the remainder of the site. These are also pockets of silty clay at varying depths.

BEDROCK

A portion of the Flewellyn Drain is located within the Owner's property. As outlined within **Section 1.6**, about 950 m of the upper reaches of the drain north of Fernbank Road were formally closed as municipal drains in a 2011 City By-Law (No. 2011-311) and a permit to fill those ditches was previously issued by the RVCA. However, because the permit expired in February 2016, the Owners will seek an extension to the permit. This work is to be coordinated with the City of Ottawa and the Rideau Valley Conservation Authority.

4.2 Master Servicing Studies

The 2009 EMP and MSS reports made preliminary recommendations for design of the stormwater management system for the FCDP. These recommendations included preliminary sizing of the stormwater management facilities complete with operating levels.

The MSS report recommended construction of Pond 5 on the subject site with an outlet to the existing Flewellyn Drain. In an effort to limit storm sewer hydraulic gradients and significant grade raising, the MSS report recommend that the 1:100 operating level of Pond 5 be about 104.4 m. To accomplish that elevation, about 375 meters of the Flewellyn Drain south of Fernbank Road was recommended to be lowered.

The 2011 Conceptual Site Servicing Study report completed a further analysis with respect to grade raising and recommended that the 1:100 year operating level of Pond 5 be lowered to about 103.9 m. It was also recommended that the Flewellyn Drain be lowered south of Fernbank Road for a distance of about 600 meters in order to accommodate the proposed operating levels.

It is also proposed to modify the drainage limits between Ponds 5 and 6. **Figure 4.2** shows these adjustments. There is a modest change to the drainage limits towards the north-east of the property as well as along the western limit of Robert Grant Avenue, which are now confirmed based on final lotting and the final design of the arterial road. Also, the secondary school site is recommended to be serviced by Pond 5, the construction of which is in control of the CRT Owners. These changes are fairly minor and will not impact the overall designs of either Pond 5 or 6. Additionally, the drainage split between Pond 5 and 6 at the north east corner of Phase 1 has now been finalized. These drainage limits were originally identified in the "West Park Pond 6

Stormwater Management Report and Design Brief Report" which was completed in support of the Pond 6 design. A copy of Figure 2 from that report is included in **Appendix E** for reference.

The minor storm sewers recommended in the 2009 MSS are now proposed to be larger. This is mostly due to the change in design criteria issued by the City in 2012. A copy of the Storm Drainage Area Plan Minor System Drainage (dwg 101108STM1) from the 2009 MSS report is included in **Appendix E**. A copy of the CRT Phase 1 storm design sheet and drainage area plans **27970-500**, **500A** and **500B** are also included in **Appendix E**. The following **Table 4.1** indicates some of the significant sewers size changes now recommended for Phase 1.

Table 4.1 Minor Storm Sewer Size Changes

LOCATION		SEWER SIZES (MM Ø)	
DESIGN	MSS NODE	2009 MSS	CURRENT DESIGN
Bobolink Ridge	(535-529)	975	1500
Goldhawk Drive	(529-523)	1650	2100
Cope Drive	(525-523)	1500	1950
Goldhawk Drive	(523-519)	1950	2700

4.3 Minor Storm Sewer Design Criteria

In keeping with guidelines published by the City of Ottawa for storm sewers in Greenfield developments, the storm drainage system proposed for the CRT Phase 1 lands will follow the principles of dual drainage.

The minor storm flow estimates were reviewed by the rational method. Some of the significant criteria used in the minor storm sewer design are:

- Intensity — 1.5 year curve (local and collector roads)
- Initial Time of Concentration — 10 min
- Runoff Coefficients:
  Singles/Townhouses — Front yards = 0.75
  Rear yards = 0.5
- Velocities — 0.80 m/s to 6.0 m/s
- Manning roughness coefficient — 0.013 (smooth wall pipes)
- Minimal allowable slopes — Refer to below table

Table 4.2 Minimal Allowable Slopes

DIAMETER (MM)	SLOPE (%)
250	0.432
300	0.340
375	0.250
450	0.195
525	0.160
600	0.132
750 and larger	0.100

- Minimum depth of cover of 2.0 m
- Inlet-control rate to capture 5 year peak flows

- 100 year Hydraulic Grade Line (HGL) separation to be greater than 0.30 m from the underside of footing
- HGL analysis calculated with XPSWMM

4.4 Proposed Minor Storm Sewer Plan

The minor storm sewer design sheet and the storm drainage area plans are included in **Appendix E**. The proposed minor storm sewer plan for the CRT Phase 1 lands is indicated on **Figure 4.3**. Only sewer sizes 750 mm diameter and larger are indicated.

All drainage form the subject site will be directed into the proposed SWMF Pond 5 via large storm sewers in Goldhawk Drive. Most of the storm sewers were designed based on the rational method; however, the sewer sections MH 303 to MH 207 on Goldhawk Street and Street No. 26 and MH 207 to MH 300 on Street No. 25 were sized based on stormwater management criteria which are discussed in detail in the "Fernbank Pond 5 Stormwater Management Facility Report and Design Brief, March 2016". Essentially, the proposed 1500 mm diameter sewer in Street No. 25 is a first flush pipe and the 2100 mm diameter sewer south of MH 207 is a dual purpose pipe serving as a minor storm pipe during most events but as an overflow conveyance during rare events. The overflow pipe provides flow separation, allowing the first flush to be diverted to the sediment forebay via the 1500 diameter first flush pipe, and minor flow in excess of the first flush to be conveyed directly to the wet well. During less frequent events, overflows will bypass the sediment forebay, thus preventing re-suspension of sediment. During these events, the 1500 mm diameter first flush pipe will continue to function concurrently.

4.5 Robert Grant Avenue Drainage

Phase 1 of the CRT lands abuts the arterial road Robert Grant Avenue which is located to the east of the subject site. The natural topography of the CRT property in the vicinity of the arterial road slopes from west to east towards the road. **Figure 4.1** provides an indication of the existing drainage pattern for the subject site.

Since there are two projects that were each designed by different engineers and abut and impact each other, IBI has discussed, reviewed and agreed with the roadway designers, Novatech Engineering, on the limits of runoff that can be accommodated by the arterial roadway drainage design. **Figure 4.4** indicates these limits in terms of location, areas and flows. The significant limitation to development of the CRT lands adjacent to the Robert Grant Avenue is that no minor storm runoff in the 1:5 yr. event can cross the roadway sidewalk. The only minor runoff from the subject site that can be accommodated by the arterial road drainage system is from short sections of three side streets: Bobolink Ridge; Cope Drive and a future street opposite Haliburton.

There will be some major storm runoff from the edges of most developments along Robert Grant Avenue as well as the three side streets.

5 SITE STORMWATER MANAGEMENT

5.1 Synopsis of Previous Reports

The post-development drainage strategy for the Fernbank Community Development, including the subject site, was presented in the 2009 EMP and MSS. The conceptual post-development servicing of the lands tributary to Pond was presented in the 2011 Conceptual Site Servicing Study. In May 2016, IBI completed the "Fernbank Pond 5 Stormwater Management Facility Report and Design Brief", outlining the design of the Pond 5 SWM Facility to which the majority of the development is tributary. The end-of-pipe SWM facility is designed to provide water quantity and quality control and outlet to the Flewellyn Drain.

This report builds upon the recommendations and findings of the 2009 EMP, 2009 MSS, 2011 Conceptual Site Servicing, and the 2016 Pond 5 Design Brief. It is intended to aid in the review and approval of the servicing for the proposed Phase 1 development.

5.2 Objective

The purpose of this report section is to present the dual drainage design, including the minor and major system, for the CRT Development Inc. Phase 1 development in the Fernbank Community. The design includes the sizing of inlet control devices, maximum depth and velocity of flow on the surface, and hydraulic grade line analysis. The stormwater system concept is discussed in subsequent sections and has been developed based on the October 2012 City of Ottawa Sewer Design Guidelines and February 2014 City of Ottawa Technical Bulletin ISDTB-2014-01.

5.3 Dual Drainage Design

The site was designed with dual drainage features, accommodating minor and major system flow. During frequent storm events, the effective runoff of a catchment area is directly released via catchbasin inlets to the network of storm sewers, called the minor system. During less frequent storm events, the balance of the flow (in excess of the minor flow) is accommodated by a system of rear yard swales and street segments, called the major system.

The streets within Phase 1 feature a mix of sawtooth and continuous grade profiles. The sawtooth profile facilitates surface storage on subdivision streets. In accordance with City of Ottawa guidelines, rear yard storage has not been accounted for. Inlet control devices (ICDs) are proposed across the site to maximize the use of available on-site storage and control surcharge of the minor system during infrequent storm events. The dual drainage system has been evaluated using the DDSWMM hydrological model, which offers single storm event flow generation and routing. The minor system hydraulic grade line analysis has been evaluated using the XPSWMM dynamic model.

There are two minor system outlets from Phase 1. The majority of the site is tributary to proposed Pond 5 to the south. The northern corner of the site, referred to as Phase 1A, is tributary to the existing Pond 6 to the east. Subsequently in this section, 'Phase 1' refers to those lands tributary to Pond 5.

ICDs were initially sized based on the 5 year 3 hour Chicago design storm event. In some instances, the proposed ICD release rates and minor system sewer sizing were optimized to protect lots from surface flooding. This was accomplished by increasing ICD release rates above the 5 year storm event. For Phase 1A, the minor system restriction was set to respect the allowable release rate of the existing outlet. DDSWMM input parameters, including ICD restrictions, are summarized in **Table 5.1**.

The major system flow pattern includes the following outlet locations: future Phase 2 to the south via Dagenham Street and via Goldhawk Drive; the existing Dry Pond 3 located southwest of the corner of Abbott Street and Robert Grant Avenue.

The DDSWMM drainage area plan is presented on **Drawings 27970-750A** and **750B** (enclosed in **Appendix F**).

Model files are enclosed on CD in **Appendix F**. It should be noted that due to the limitation of the modeling software, separate DDSWMM models were created for Phase 1 and Phase 1A. They read into one overall XPSWMM model.

5.4 Stormwater Evaluation

5.4.1 Hydrological Evaluation

Land use, selected modeling routines, and input parameters for the subject site are discussed in the following sections.

Land Use

Phase 1 and 1A will be developed with a mixture of townhouses, single family units, one park and two school sites. Higher density residential is proposed for the eastern portion of the site.

Storms and Drainage Area Parameters

The main hydrology parameters are summarized below and in **Table 5.1**.

- **Design storms:** The site was evaluated using the following storms:
    - 5 and 100 year 3 hour Chicago storm event with a 10 minute time step
    - 100 year 3 hour Chicago storm event + 20% increase in intensity with a 10 minute time step
    - July 1 1979, August 4 1988 and August 8 1996 historical storms with a 5 minute time step

  For consistency with the Pond 5 design, Phase 1 was also simulated with the following storms:
    - 100 year 24 hour SCS Type II storm event with a 12 minute time step, the design storm for the pond
    - 100 year 24 hour SCS design storm event with a 20% increase in intensity, 12 minute time step, stress test
- **Infiltration:** The selected infiltration losses are consistent with the City of Ottawa Sewer Design Guidelines. The Horton values are as follows: f_o = 76.2 mm/h, f_c = 13.2 mm/h, k = 0.00115 s^{-1}.
- **Area:** The catchment areas are based on the rational method spreadsheet, with some minor modifications for modeling purposes.
- **Imperviousness:** The imperviousness values are based on the runoff coefficients, which were determined by obtaining the footprint of the model units intended for the site and placing the maximum footprint on the lots.
- **Catchment Width:** The catchment width was based on the conveyance route length of the drainage area and multiplied by two. The multiplier of two was only used if the drainage area had runoff contribution from both sides of the drainage area.

- **Slope:** The ground slope was based upon the average slope for both impervious and pervious area. Generally, the slope is approximately 2% (0.02 m/m). This assumes a slope of approximately 1% for impervious or road surfaces and 3% for pervious surfaces (lot grading).

- **Initial Abstraction (Depression Storage):** The depression storage used for impervious areas was 1.57 mm and for pervious areas 4.67 mm, which is consistent with the City of Ottawa Sewer Design Guidelines values.

- **Manning's Roughness:** Manning's roughness coefficients of 0.013 and 0.25 were used for impervious and pervious areas, respectively.

- **Baseflow:** No baseflow components were assumed for any of the areas contributing runoff to the minor system.

- **Major system storage and routing:** The subject site is comprised of both continuous grade and sawtooth road profiles. For drainage areas with sawtoothing, available surface storage has been calculated based on the grading plan. Flow is attenuated within low points with potential overflow cascading to the next segment downstream. The total volume at each low point, up to the overflow depth, is the maximum static storage. Rear yard segments have a sawtooth pattern with some storage available, but the storage is not accounted for as part of the analysis.

  For street segments with ponding, minor system capture is set to fully utilize storage during the 100 year design storm, while minimizing ponding during the 5 year event. Cascading overflow from a low point to a downstream segment utilizes the static storage available plus an additional amount of storage equivalent to the depth required for the flow to cascade over the downstream high point. The attenuation in street sags was evaluated to account for static storage and, if overflow occurs, dynamic storage. Within this report it is referred to as double routing.

  DDSWMM does not have a direct way of coding double routing since it does not allow the user to code dynamic storage over the high point. For this analysis, the method employed is that recommended in the February 2014 City of Ottawa Technical Bulletin ISDTB-2014-01. It accounts for overflow from a street segment (regular static storage at a sag) being conveyed to a downstream dummy segment. In other words, a regular low point segment is provided with a downstream dummy segment for further flow attenuation to account for the dynamic ponding during overflow.

  There are no drainage area attributes associated with the dummy segment since it is a segment solely for routing. In addition, there is no inflow to the minor system from these dummy segments. The overflow hydrograph from the upstream catchment is routed in the dummy segment to the next "real" downstream segment. The dummy segments have the following specific characteristics:

  - Segment Length: Equivalent to the length of the maximum static storage from the street segment contributing to it.

  - Road Type: Equivalent to the right-of-way characteristics from the segment contributing to it, but with a longitudinal slope of 0.01% (0.0001 m/m).

  The dummy segments for major system routing have been applied to the analysis of the subject site. The segments are referenced as D1, D2, D3, etc. within the DDSWMM modeling file. The drainage area plan presented in **Drawing 27970-750A** and **750B** does

not show the dummy segments, but the DDSWMM output file shows the dummy segments immediately following the corresponding major segment which cascades into that dummy segment.

For street segments with continuous grade, simulations were based on the approach-capture characteristics of the catchbasin with the constraint that during the 100 year design storm the maximum cascading flow does not exceed 0.3 m.

For street segments with sawtoothing, simulations were based on the constraint that during the 100 year design storm the maximum depth of ponding (including cascading flow where applicable) does not exceed 0.3 m. Where surface storage is available, the storage-outflow characteristics for each low point were taken into consideration. The evaluation was undertaken assuming static conditions. The ponding plan for the subject site is presented on **Drawings 27970-751A and 751B** (enclosed in **Appendix F**).

Rear yards were considered independently of street segments and rear yard catch basins were incorporated in the DDSWMM model. Simulations were based on the total interception of runoff by the storm inlets. This was done by specifying a one-to-one relationship between approach flow and capture flow. Storage volume in rear yards was not accounted for as available on-site storage. Overflow from the rear yards cascades to a major system road segment via swales.

The two schools and higher density residential at the eastern edge of the site have been simulated with sufficient storage to contain the 100 year 3 hour Chicago storm event, with a provision for emergency overflow as indicated on **Drawings 27970-750A** and **750B**. For the higher density residential blocks, the required storage could consist of roof top storage, parking lot storage and/or underground storage. As discussed in **Section 4.5**, some major flow from the eastern edge of the residential blocks will cascade to the Robert Grant Way right-of-way. The information is illustrated on **Figure 4.4** and has been coordinated with the designers of the arterial road. The development of these blocks will be in accordance with the relevant constraints.

MAJOR

- **Minor system capture:** The minor system capture is based on the 5 year 3 hour Chicago storm event for maximum ponding conditions. ICDs are incorporated into the design to protect the minor system from surcharge during infrequent storm events and to utilize the available on-site storage. The size of the inlet control devices (ICDs) was optimized using DDSWMM.

  The minor system inflow rate was optimized to account for continuous grade. Specifically, the model incorporates the actual flow entering the minor system on continuous grade based on approach-capture curves derived from the 1984 MTO Drainage Manual (specifically, Charts E4-7D and Chart E4-7H). Minor system capture was set to correspond to either the 5 year simulated flow, or the maximum capture during unrestricted 100 year flow conditions, whichever was less. This is due to the fact that based on the approach-capture curve, the actual capture may be less than the 5 year simulated flow. This results in there being cascading flow on the surface during both the 5 and 100 year events. Therefore, at receiving low points, ICDs have been sized to fully capture the cascading flow from upstream street segments on continuous grade during the 5 year event, while minimizing ponding at the low point.

  The exception to this is the downstream low point within Phase 1A (S145B). The minor system restriction at this location was restricted to below the 5 year flow to meet the allowable release rate of 1200 l/s to the existing receiving trunk. The engineering

consultant for the trunk storm sewer, Novatech Engineering, provided the maximum allowable release rate to the sewer as well as the boundary condition (refer to correspondence in **Appendix F**).

Areas where the capture rates have been revised for site optimization are noted in **Table 5.1**.

The main hydrological parameters used in the DDSWMM model are summarized in the below table. ICD restrictions are also summarized in tabular form on **Drawing DETAILS-1**.

Table 5.1 DDSWMM Parameters

AREA ID	AREA (HA)	MH	D/S SEGMENT	IMP RATIO	LENGTH (M)	WIDTH (M)	AVAIL. STORAGE (CU-M)	5 YEAR SIMULATED FLOW (L/S) *07-PH1-5CH.OUT & 07-PH1A-5CH.OUT*	ICD RESTRICTION (L/S)
Phase 1 Minor system tributary to Pond 5									
S153	0.12	MH153	S149A	0.79	32	64	N/A	25	17.07(1)
S149A	0.08	MH149	S149B	0.79	38	76	N/A	17	17(1)
RES2A	0.66	MH129	S149C	0.86	74.25	148.5	64.6(2)	133	133
S149C	0.09	MH149	S149B	0.79	99	99	1.09(6)	19	21.64(4)
S149B	0.05	MH149	S128A	0.79	46	46	N/A	10	10(1)
RES2B	0.56	MH129	RES1	0.86	63	126	70(2)	113.14	113.14
S128A	0.18	MH128A	S127B	0.79	58	116	9.63	35	107(3)
S127B	0.26	MH127B	S191B	0.79	72	144	37.78	53	59.65(3)
S191B	0.37	MH191	S186	0.79	101	202	0.38 (6)	76	84.73(4)
S128B	0.33	MH128B	S188	0.79	73	146	35.6	67	74.28(3)
R128B	0.08	MH128B	RES3	0.50	48	48	N/A	10.83	10.83
S188	0.33	MH188	S191A	0.79	80	160	N/A	67	37.29(1)
R188A	0.08	MH188	RES3	0.50	43	43	N/A	10.75	10.75
R188B	0.08	MH188	RES3	0.50	51	51	N/A	10.87	10.87
R127B	0.19	MH127B	R127C	0.50	46	92	N/A	25.35	25.35
R127C	0.22	MH127B	R191A	0.50	54	108	N/A	29.37	29.37
R191A	0.19	MH191	S191A	0.50	45	90	N/A	25.31	25.31
R189	0.07	MH189	RES3	0.50	46	46	N/A	9.53	9.53
R177	0.07	MH177	RES3	0.50	45	45	N/A	9.52	9.52
RES3	1.58	MH189	RG	0.86	178	356	185(2)	318.71	318.71
S189	0.3	MH189	S191A	0.79	126	199	4.73	62	69.75(4)
S191A	0.23	MH191	S186	0.79	91	162	14.04	45	186.15(3)
R182A	0.3	MH182	R186	0.50	75	150	N/A	40.11	40.11
R186	0.23	MH186	S186	0.50	62	124	N/A	30.9	30.9
S186	0.23	MH186	S183	0.79	71	142	9.26	48	141.24(3)
R175	0.36	MH175	R183	0.50	73	146	N/A	47.4	47.4
R183	0.22	MH183	S183	0.50	57	114	N/A	29.48	29.48
S152A	0.3	MH152	S151B	0.79	80	160	42.07	61	68.54(4)
S152B	0.1	MH152	S151B	0.79	77	77	0.69(6)	21	23.49(4)
R128A	0.14	MH128A	R127A	0.50	35	70	N/A	18.72	18.72
R127A	0.19	MH127A	R151B	0.50	45	90	N/A	25.31	25.31
R151B	0.20	MH151B	S151B	0.50	49	98	N/A	26.70	26.70
S151B	0.25	MH151B	S182A	0.79	140	217	1.02	52.98	52.98
S127A	0.17	MH127A	S182A	0.79	46	92	N/A	35	23.51(1)
S182A	0.29	MH182	S182B	0.79	76	152	44.83	58	141.61(3)
S182B	0.29	MH182	S183	0.79	75	150	6.67	59	66.27(3)
S183	0.24	MH183	S174	0.79	76	152	66.51	50	132.73(3)
R182B	0.16	MH182	R182C	0.50	55	55	N/A	20.78	20.78
R182C	0.12	MH182	R174	0.50	58	58	N/A	16	16
R174	0.12	MH174	S174	0.50	58	58	N/A	16	16
S190	0.06	MH190	S176	0.79	71	71	0.55(6)	13	14.48(4)

AREA ID	AREA (HA)	MH	D/S SEGMENT	IMP RATIO	LENGTH (M)	WIDTH (M)	AVAIL. STORAGE (CU-M)	5 YEAR SIMULATED FLOW (L/S) *07-PH1-5CH.OUT & 07-PH1A-5CH.OUT*	ICD RESTRICTION (L/S)
S177	0.14	MH177	RG	0.79	49	98	N/A	29	9.4(1)
S176	0.14	MH176	S175	0.79	96	96	N/A	29	7.62(1)
INST2	6.57	MH176	S175	0.50	739	1478	618(2)	822	801.37
S175	0.42	MH175	S174	0.79	109	218	9.23	82	118.66(4)
S174	0.25	MH174	S173	0.79	68	136	14.44	51	57.18(4)
S173	0.75	MH173	S172	0.79	80	160	14.78	140	156.12(4)
INST1	2.88	MH172	S172	0.86	324	648	326(2)	582	579.45
S172	0.23	MH172	PH2	0.79	65	130	18.32	47	52.88(4)
S135A	0.14	MH135	S135B	0.79	75	75	N/A	29	16.77(1)
S135B	0.12	MH135	S134A	0.79	81	81	0.95(6)	23	46.36(4)
S134C	0.06	MH134	S134A	0.79	60	60	N/A	13	9.26(1)
S136A	0.11	MH136A	S134B	0.79	82	82	N/A	23	14.42(1)
S134B	0.14	MH134	S134A	0.79	77	77	N/A	27	22.21(1)
R151A	0.18	MH151A	R134	0.50	48	96	N/A	24.17	24.17
R134	0.21	MH134	S134A	0.50	56	112	N/A	28.2	28.2
S134A	0.19	MH134	S140	0.79	58	116	5.87	35	75.86(4)
S151A	0.1	MH151A	S150A	0.79	80	80	N/A	21	13.53(1)
S150A	0.28	MH150	S140	0.79	74	148	N/A	54	35.75(1)
S150B	0.04	MH150	S140	0.79	22	22	0.40(6)	8	9.17(4)
R125B	0.19	MH125	R140	0.50	47	94	N/A	25.39	25.39
R140	0.21	MH140	S140	0.50	50	100	N/A	27.98	27.98
S140	0.25	MH140	S124	0.79	78	156	17.74	50	104.9(4)
S125	0.39	MH125	S124	0.79	103	206	19.83	80	88.89(4)
R131	0.2	MH131	R130A	0.50	51	102	N/A	26.78	26.78
R130A	0.16	MH130	R130B	0.50	39	78	N/A	21.36	21.36
R130B	0.17	MH130	S130	0.50	38	76	N/A	22.55	22.55
S124	0.26	MH124	S180A	0.79	69	138	15.52	53	59.47(4)
S130	0.35	MH130	S180A	0.79	100	200	15.27	72	80.28(4)
R125A	0.16	MH125	R124B	0.50	78	78	N/A	21.33	21.33
R124B	0.16	MH124	S180A	0.50	86	86	N/A	21.47	21.47
R180A	0.09	MH180	R181	0.50	43	43	N/A	12	12
S180A	0.19	MH180	S180B	0.79	65	65	9.97	37	103.71(3)
R181	0.09	MH181	S181	0.50	43	43	N/A	12	12
S180B	0.18	MH180	S181	0.79	65	65	10.67	36	101.83(3)
S181	0.14	MH181	PH2	0.79	69	138	30.43	30	93.49(3)
S170A	0.27	MH170	S171	0.79	75	150	17.58	55	61.9(3)
RES3A	3.26	MH170	S171	0.66	367	734	81.50(7)	522	583
S171	0.26	MH171	PH2	0.79	74	148	29.26	54	259.83(3)
PARK1	1.27	MH132	S132	0.00	143	286	N/A	29.66	29.66
R112A	0.12	MH112	R112B	0.50	62	62	N/A	16.07	16.07
R112B	0.06	MH112	S132	0.50	28	28	N/A	7.99	7.99
S132	0.24	MH132	S113	0.79	32.5	65	44.45	54	116.8(3)
S112	0.27	MH112	S113	0.79	70	140	10.79	55	61.57(4)
S113	0.27	MH113	S114	0.79	70	140	4.29	55	61.57(4)
S114	0.24	MH114	S120	0.79	70	140	19.69	50	55.33(4)
R114A	0.32	MH114	R114B	0.50	65	130	N/A	42.14	42.14
R114B	0.18	MH114	S114	0.50	30	60	N/A	23.33	23.33
S122	0.31	MH122	S120	0.79	82	164	34.71	63	70.84(4)
R102	0.21	MH102	R103B	0.50	56	112	N/A	28.2	28.2
R103B	0.16	MH103	R104B	0.50	36	72	N/A	21.24	21.24
R104B	0.19	MH104	R104C	0.50	38	76	N/A	24.99	24.99
R104C	0.17	MH104	S104	0.50	39	78	N/A	21.36	21.36
S120	0.28	MH120	S105A	0.79	85	170	41.25	58	111.71(3)
S110	0.09	MH110C	S103	0.79	80	80	2.96	19	19(1)
S102	0.09	MH102	S103	0.79	80	80	3.02	19	21.31(4)

AREA ID	AREA (HA)	MH	D/S SEGMENT	IMP RATIO	LENGTH (M)	WIDTH (M)	AVAIL. STORAGE (CU-M)	5 YEAR SIMULATED FLOW (L/S) *07-PH1-5CH.OUT & 07-PH1A-5CH.OUT*	ICD RESTRICTION (L/S)
R103A	0.34	MH103	R104A	0.50	77	154	N/A	45.14	45.14
S103	0.34	MH103	S104	0.79	81	162	55.49	69	77.01(4)
R104A	0.23	MH104	S105A	0.50	57	114	N/A	30.73	30.73
S104	0.30	MH104	S105A	0.79	80	160	11.06	61	68.60(4)
R122	0.07	MH122	R121	0.50	35	35	N/A	9.36	9.36
R121	0.13	MH121	R105	0.50	60	60	N/A	17.27	17.27
R105	0.13	MH105	S105A	0.50	65	65	N/A	17.37	17.37
S105A	0.4	MH105	S105B	0.79	65	65	16	72	110.18(4)
S105B	0.51	MH105	S107	0.79	70	70	15.71	89	129.60(4)
S107	0.61	MH107	S109	0.79	80	80	29.42	106	141.24(3)
S109	0.52	MH109	EXT110	0.79	79	79	4.18	92	103.19(4)
S170B	0.06	MH170	EXT110	0.79	40	40	0.3(6)	13	13.99(4)
EXT110	0.47	MH110	PH1OVF	0.79	53	106	9.6	88	98.49(4)
Phase 1A Minor system tributary to Pond 6									
R142B	0.19	MH142	R143	0.50	75	150	N/A	26.13	26.13
R136A	0.27	MH136	S136E	0.50	128	256	N/A	37.39	37.39
S143	0.32	MH143	S136E	0.79	93	186	N/A	66	41.87(1)
S136E	0.17	MH136C	S144	0.79	55	55	N/A	30.48	30.48(1)
S136B	0.27	MH136C	S144	0.79	80	160	N/A	56	36.99(1)
S144	0.25	MH144	S145A	0.79	80	80	N/A	49	45.32(1)
R137A	0.11	MH137A	R144C	0.50	28	56	N/A	14.73	14.73
R144C	0.26	MH144	S160B	0.50	65	130	N/A	34.74	34.74
S160B	0.13	MH160	S145A	0.79	50	50	N/A	26	14.77(1)
S136D	0.07	MH136B	S160A	0.79	48	48	N/A	15	9.58(1)
S160A	0.3	MH160	S145A	0.79	86	172	N/A	62	36.92(1)
S145A	0.27	MH145	S145B	0.79	80	80	N/A	51	51(1)
S136C	0.11	MH136B	S137A	0.79	77	77	N/A	23	13.42(1)
R136B	0.23	MH136B	R137B	0.50	52	104	N/A	30.53	30.53
R137B	0.3	MH137A	S137A	0.50	72	144	N/A	39.97	39.97
S137A	0.14	MH137A	S137B	0.79	67	67	N/A	28	22.8(1)
S137B	0.13	MH137A	S138	0.79	90	90	1.1	27	61.15(4)
S138	0.15	MH138	S148	0.79	120	120	N/A	32	18.01(1)
S148	0.22	MH148	S145B	0.79	72	144	N/A	45	35.33(1)
R138	0.14	MH138	R145	0.50	35	70	N/A	18.72	18.72
R145	0.3	MH145	S145B	0.50	75	150	N/A	40.09	40.09
S145B	0.28	MH145	BLK335	0.79	60	120	35.13	55	90(5)
R142A	0.14	MH142	R143A	0.50	70	70	N/A	18.7	18.7
R143A	0.16	MH143	R144A	0.50	75	75	N/A	21.27	21.27
R144A	0.15	MH144	R146	0.50	63	63	N/A	19.79	19.79
R146	0.14	MH146	BLK335	0.50	63	63	N/A	18.57	18.57
RES1	1.89	MH162	DP	0.86	212.5	425	233(2)	381.83	381.83
HYD2	5.12	N/A	DP	0.00	576	1152	N/A	N/A	N/A

(1) Continuous grade, ICD set to correspond to lower of the 5 year simulated flow and the maximum capture during unrestricted 100 year flow conditions
(2) Assumed ponding volume. Assumes that on-site storage will be provided up to the 100 year 3 hour Chicago event
(3) Minor flow restrictions have been increased based on optimization of the system
(4) The minor flow restriction has been increased in sags to allow full capture of overflow from upstream segments on continuous grade during the 5 year storm event without ponding and/or to maintain ponding depths within the maximum depth during the 100 year storm event.
(5) Over-controlled to meet allowable release rate to existing receiving storm trunk
(6) Due to the limitation of the DDSWMM modeling software (specifically the allowable number of storage-release curves) the ponding was either discounted or merged to that of an adjacent drainage area.
(7) Assumed ponding volume.

5.4.2 Results of Hydrological Modeling

Minor system hydrographs generated by DDSWMM were exported to XPSWMM for the hydraulic grade line analysis (refer to **Section 5.4.3**). The results of the DDSWMM major system evaluation are summarized in the following sections.

5.4.2.1 Cascading Flow

The cascading flow across the site was evaluated to confirm that depth and velocity were in accordance with City guidelines. To determine velocity of cascading overflow at critical locations, SWMHYMO was used. The applicable right-of-way (ROW) sections were entered into the model with the corresponding longitudinal slopes to obtain the maximum velocity of flow using the Route Channel routine. The resulting depths were also applied for street segments with continuous grade. To determine depth of the cascading overflow for street segments with ponding, the calculation sheet from the February 2014 City of Ottawa Technical Bulletin ISDTB-2014-01 was employed. The major system flow results are summarized in **Table 5.2** and **Table 5.3** and presented in full in **Appendix F**, along with supporting model files.

At one location, R137B, major flow from rear yards cascades to the street between units, utilizing the side lot. At the City's request, the cross-section of the side lot is enclosed in **Appendix F**, with the resulting water level during the 100 year event indicated, as well as the top of foundation wall. The top of foundation wall is greater than 0.15 m above the 100 year water level. It should be noted that 3H:1V side slopes were applied to the side lot cross-sections, considered a conservative approach.

Major flow from the majority of Phase 1 cascades south to future phases of development via Dagenham Street and Goldhawk Drive. The total major flow at each of these outlets is presented in the below tables. The flow has been accounted for in the overall CRT modeling at MH 207, along with flow from future phases of development.

The major flow outlet from Phase 1A is a walkway block to the existing Dry Pond 3. As previously noted, due to the allowable release rate to the existing storm sewer, minor system flow upstream of the walkway block was over-controlled. This results in the ponding at S145B being fully utilized during the 5 year event, with 185 l/s cascading to the dry pond. The designers of the existing dry pond, Novatech Engineering, were provided the hydrographs to the dry pond and have confirmed the dry pond's performance (refer to correspondence in **Appendix F**).

Table 5.2 Summary of Cascading Flow during the 100 year 3 hour Chicago Storm (Model files: 07-PH1-100CH.OUT, 07-PH1A-100CH.OUT and 27970VXD.OUT)

AREA ID (DUMMY SEGMENT IF APPLICABLE)	LONGITUDINAL SLOPE (%)	OVERFLOW (L/S)	VELOCITY (M/S)	MAX. STATIC PONDING DEPTH (WHERE APPLICABLE) (M)	DEPTH (DYNAMIC, WHERE APPLICABLE) (M)	MAX. DEPTH (STATIC + DYNAMIC, WHERE APPLICABLE) (M)	VXD (M^2/S)
Phase 1							
S153	1.33	29	0.62	0	0.037	0.037	0.02
S149A	0.53	43	0.49	0	0.052	0.052	0.03
S149C	0.53	104	0.90	0.080	0.083	0.163	0.08
S149B	0.55	71	0.66	0	0.081	0.081	0.05
S128A(D1)	0.51	0	N/A	0.140	0	0.140	N/A
S127B(D2)	0.69	0	N/A	0.220	0	0.220	N/A
S191B	0.69	57	0.58	0.060	0.054	0.114	0.03
S128B(D3)	0.53	0	N/A	0.210	0	0.210	N/A
S188	0.53	88	0.58	0	0.067	0.067	0.04
S189(D4)	0.54	36	0.46	0.110	0.061	0.171	0.03
S191A(D5)	0.97	45	0.61	0.150	0.066	0.216	0.04

AREA ID (DUMMY SEGMENT IF APPLICABLE)	LONGITUDINAL SLOPE (%)	OVERFLOW (L/S)	VELOCITY (M/S)	MAX. STATIC PONDING DEPTH (WHERE APPLICABLE) (M)	DEPTH (DYNAMIC, WHERE APPLICABLE) (M)	MAX. DEPTH (STATIC + DYNAMIC, WHERE APPLICABLE) (M)	VXD (M^2/S)
S186(D6)	1.14	58	0.70	0.140	0.072	0.212	0.05
S152A(D7)	0.69	0	N/A	0.220	0	0.220	N/A
S152B	0.52	32	0.54	0.060	0.060	0.120	0.03
S151B(D8)	0.61	113	0.65	0.050	0.094	0.144	0.06
S127A	0.51	41	0.48	0	0.051	0.051	0.02
S182A(D9)	1.04	49	0.64	0.230	0.068	0.298	0.04
S182B(D10)	1.14	42	0.64	0.130	0.064	0.194	0.04
S183(D11)	0.7	0	N/A	0.280	0	0.280	N/A
S190	0.62	10	0.43	0.050	0.038	0.088	0.02
S177	0.52	45	0.57	0	0.067	0.067	0.04
S176	0.52	53	0.61	0	0.072	0.072	0.04
S175(D12)	0.55	141	0.70	0.110	0.102	0.212	0.07
S174(D13)	0.55	98	0.67	0.155	0.089	0.244	0.06
S173(D14)	0.81	143	0.83	0.145	0.102	0.247	0.08
S172(D15)	0.73	134	0.79	0.165	0.101	0.266	0.08
S135A	0.56	37	0.57	0	0.063	0.063	0.04
S135B	0.91	70	0.80	0.070	0.072	0.142	0.06
S134C	0.51	15	0.44	0	0.045	0.045	0.02
S136A	0.56	29	0.54	0	0.057	0.057	0.03
S134B	0.56	57	0.64	0	0.073	0.073	0.05
S134A(D16)	1	123	0.80	0.115	0.096	0.211	0.08
S151A	0.52	25	0.51	0	0.055	0.055	0.03
S150A	0.79	91	0.68	0	0.063	0.063	0.04
S150B	1	12	0.53	0.060	0.036	0.096	0.02
S140(D17)	0.86	188	0.84	0.180	0.113	0.293	0.09
S125(D18)	0.55	8	0.32	0.160	0.035	0.195	0.01
S124(D19)	0.66	185	0.76	0.160	0.113	0.273	0.09
S130(D20)	0.66	71	0.60	0.170	0.079	0.249	0.05
S180A(D21)	1.17	186	0.95	0.140	0.112	0.252	0.11
S180B(D22)	1.12	97	0.79	0.150	0.088	0.238	0.07
S181(D23)	0.73	0	N/A	0.230	0	0.230	N/A
S170A(D24)	0.92	5	0.39	0.155	0.029	0.184	0.01
S171(D25)	0.73	69	0.72	0.205	0.078	0.283	0.06
Total Major Flow to Phase 2 via Dagenham*	0.73	195	0.80	0	0.085	0.085	0.07
S132(D26)	0.67	0	N/A	0.240	0	0.240	N/A
S112(D27)	0.67	21	0.44	0.140	0.050	0.190	0.02
S113(D28)	0.99	36	0.58	0.095	0.061	0.156	0.04
S114(D29)	0.83	101	0.71	0.180	0.089	0.269	0.06
S122(D30)	0.83	0	N/A	0.200	0	0.200	N/A
S120(D31)	0.7	36	0.51	0.220	0.061	0.281	0.03
S110(D32)	0.55	20	0.49	0.120	0.049	0.169	0.02
S102(D33)	0.55	14	0.45	0.120	0.043	0.163	0.02
S103(D34)	0.71	0	N/A	0.230	0	0.230	N/A
S104(D35)	0.7	114	0.69	0.140	0.095	0.235	0.06
S105A(D36)	0.55	203	0.73	0.160	0.117	0.277	0.09

AREA ID (DUMMY SEGMENT IF APPLICABLE)	LONGITUDINAL SLOPE (%)	OVERFLOW (L/S)	VELOCITY (M/S)	MAX. STATIC PONDING DEPTH (WHERE APPLICABLE) (M)	DEPTH (DYNAMIC, WHERE APPLICABLE) (M)	MAX. DEPTH (STATIC + DYNAMIC, WHERE APPLICABLE) (M)	VXD (M^2/S)
S105B(D37)	0.6	164	0.71	0.160	0.108	0.268	0.08
S107(D38)	0.6	122	0.66	0.200	0.097	0.297	0.06
S109(D39)	0.68	106	0.67	0.110	0.092	0.202	0.06
S170B	0.68	9	0.36	0.050	0.026	0.076	0.01
Total Major Flow to Phase 2 via Goldhawk*	0.65	168	0.74	0.200	0.082	0.282	0.06
Phase 1A Major flow tributary to existing Dry Pond 3							
S143	1.65	82	0.88	0	0.053	0.053	0.05
S136E	0.83	143	0.78	0	0.074	0.074	0.06
S136B	2.58	67	0.97	0	0.045	0.045	0.04
S144	0.83	392	1.00	0	0.108	0.108	0.11
S160B	0.89	82	0.69	0	0.059	0.059	0.04
S136D	0.78	18	0.53	0	0.044	0.044	0.02
S160A	1.25	96	0.82	0	0.059	0.059	0.05
S145A	2.75	547	1.12	0	0.121	0.121	0.14
S136C	0.78	30	0.61	0	0.055	0.055	0.03
S137A	0.51	125	0.75	0	0.100	0.100	0.07
S137B(D1)	1.61	99	1.08	0.070	0.088	0.158	0.09
S138	1.61	128	1.15	0	0.082	0.082	0.09
S148	1.43	160	0.98	0	0.069	0.069	0.07
S145B	3.30	688	1.48	0.190	0.107	0.297	0.16
Total Major Flow to Dry Pond 3 via BLK335	2.00	741	1.50	0	0.111	0.111	0.17

** Street cross-section and profile assumed, to be confirmed at detailed design*

Table 5.3 Summary of Cascading Flow during the 100 year 3 hour Chicago Storm + 20% (Model file: 07-PH1-120CH.OUT, 07-PH1A-120CH.OUT and 27970VXD.OUT)

AREA ID (DUMMY SEGMENT IF APPLICABLE)	LONGITUDINAL SLOPE (%)	OVERFLOW (L/S)	VELOCITY (M/S)	MAX. STATIC PONDING DEPTH (WHERE APPLICABLE) (M)	DEPTH (DYNAMIC, WHERE APPLICABLE) (M)	MAX. DEPTH (STATIC + DYNAMIC, WHERE APPLICABLE) (M)	VXD (M^3/S)
Phase 1							
S153	1.33	40	0.67	0	0.042	0.042	0.03
S149A	0.53	62	0.53	0	0.059	0.059	0.03
S149C	0.53	182	1.04	0.080	0.103	0.183	0.11
S149B	0.55	118	0.75	0	0.097	0.097	0.07
S128A(D1)	0.51	55	0.51	0.140	0.072	0.212	0.04
S127B(D2)	0.69	44	0.54	0.220	0.066	0.286	0.04
S191B	0.69	93	0.65	0.060	0.065	0.125	0.04
S128B(D3)	0.53	16	0.37	0.210	0.045	0.255	0.02
S188	0.53	119	0.63	0.000	0.075	0.075	0.05
S189(D4)	0.54	63	0.53	0.110	0.076	0.186	0.04
S191A(D5)	0.97	164	0.85	0.150	0.107	0.257	0.09
S186(D6)	1.14	241	0.99	0.140	0.124	0.264	0.12
S152A(D7)	0.69	13	0.39	0.220	0.042	0.262	0.02
S152B	0.52	50	0.60	0.060	0.070	0.130	0.04
S151B(D8)	0.61	189	0.74	0.050	0.114	0.164	0.08
S127A	0.51	58	0.51	0	0.057	0.057	0.03
S182A(D9)	1.04	156	0.86	0.230	0.105	0.335	0.09
S182B (D10)	1.14	158	0.89	0.130	0.106	0.236	0.09
S183(D11)	0.7	357	0.91	0.280	0.145	0.425	0.13
S190	0.62	16	0.48	0.050	0.045	0.095	0.02
S177	0.52	59	0.61	0	0.075	0.075	0.05
S176	0.52	72	0.65	0	0.081	0.081	0.05
S175(D12)	0.55	362	0.86	0.110	0.146	0.256	0.13
S174(D13)	0.55	531	0.94	0.155	0.168	0.323	0.16
S173(D14)	0.81	483	1.06	0.145	0.161	0.306	0.17
S172(D15)	0.73	812	1.16	0.165	0.192	0.357	0.22
S135A	0.56	50	0.61	0	0.070	0.070	0.04
S135B	0.91	118	0.91	0.070	0.088	0.158	0.08
S134C	0.51	21	0.48	0	0.051	0.051	0.02
S136A	0.56	39	0.58	0	0.064	0.064	0.04
S134B	0.56	80	0.69	0	0.083	0.083	0.06
S134A (D16)	1	214	0.92	0.115	0.118	0.233	0.11
S151A	0.52	35	0.55	0	0.062	0.062	0.03
S150A	0.79	125	0.73	0	0.070	0.070	0.05
S150B	1	20	0.61	0.060	0.044	0.104	0.03
S140(D17)	0.86	332	0.97	0.180	0.140	0.320	0.14
S125(D18)	0.55	65	0.55	0.160	0.077	0.237	0.04
S124(D19)	0.66	388	0.92	0.160	0.146	0.306	0.13
S130(D20)	0.66	119	0.68	0.170	0.096	0.266	0.07
S180A (D21)	1.17	453	1.18	0.140	0.153	0.293	0.18
S180B (D22)	1.12	355	1.09	0.150	0.141	0.291	0.15

AREA ID (DUMMY SEGMENT IF APPLICABLE)	LONGITUDINAL SLOPE (%)	OVERFLOW (L/S)	VELOCITY (M/S)	MAX. STATIC PONDING DEPTH (WHERE APPLICABLE) (M)	DEPTH (DYNAMIC, WHERE APPLICABLE) (M)	MAX. DEPTH (STATIC + DYNAMIC, WHERE APPLICABLE) (M)	VXD (M^2/S)
S181(D23)	0.73	268	0.87	0.230	0.130	0.360	0.11
S170A (D24)	0.92	38	0.69	0.155	0.062	0.217	0.04
S171(D25)	0.73	422	0.99	0.205	0.155	0.360	0.15
Total Major Flow to Phase 2 via Dagenham*	0.73	1346	1.44	0	0.171	0.171	0.25
S132(D26)	0.67	144	0.72	0.240	0.103	0.343	0.07
S112(D27)	0.67	48	0.55	0.140	0.068	0.208	0.04
S113(D28)	0.99	131	0.81	0.095	0.098	0.193	0.08
S114(D29)	0.83	208	0.85	0.180	0.117	0.297	0.10
S122(D30)	0.83	13	0.42	0.200	0.041	0.241	0.02
S120(D31)	0.7	133	0.71	0.220	0.100	0.320	0.07
S110(D32)	0.55	34	0.56	0.120	0.060	0.180	0.03
S102(D33)	0.55	32	0.55	0.120	0.059	0.179	0.03
S103(D34)	0.71	33	0.51	0.230	0.059	0.289	0.03
S104(D35)	0.7	196	0.79	0.140	0.116	0.256	0.09
S105A (D36)	0.55	411	0.87	0.160	0.153	0.313	0.13
S105B (D37)	0.6	367	0.87	0.160	0.147	0.307	0.13
S107(D38)	0.6	330	0.85	0.200	0.141	0.341	0.12
S109(D39)	0.68	327	0.90	0.110	0.140	0.250	0.13
S170B	0.68	15	0.41	0.050	0.032	0.082	0.01
Total Major Flow to Phase 2 via Goldhawk*	0.65	369	0.90	0.200	0.110	0.310	0.10
Phase 1A Major flow tributary to existing Dry Pond 3							
S143	1.65	112	0.94	0	0.059	0.059	0.06
S136E	0.83	210	0.85	0	0.085	0.085	0.07
S136B	2.58	93	1.07	0	0.051	0.051	0.06
S144	0.83	574	1.10	0	0.125	0.125	0.14
S160B	0.89	124	0.77	0	0.069	0.069	0.05
S136D	0.78	25	0.58	0	0.051	0.051	0.03
S160A	1.25	131	0.89	0	0.066	0.066	0.06
S145A	2.75	805	1.27	0	0.138	0.138	0.18
S136C	0.78	40	0.66	0	0.061	0.061	0.04
S137A	0.51	191	0.83	0	0.118	0.118	0.10
S137B(D1)	1.61	172	1.24	0.070	0.108	0.178	0.13
S138	1.61	213	1.31	0	0.099	0.099	0.13
S148	1.43	262	1.11	0	0.084	0.084	0.09
S145B	3.3	1054	1.61	0.190	0.132	0.322	0.21
Total Major Flow to Dry Pond 3 via BLK335	2.00	1147	1.64	0	0.137	0.137	0.22

** Street cross-section and profile assumed, to be confirmed at detailed design*

During the 100 year 3 hour Chicago design storm, the maximum depth of cascading flow on the street is less than the maximum allowable 300 mm, and the velocity by depth product is less than the allowable 0.6 m^2/s.

During the 100 year Chicago design storm event increased by 20%, the maximum depth of cascading flow is less than 0.30 m across the majority of the site. However, there are locations where the total depth exceeds 0.30 m. The following table summarizes the elevation of the cascading flow at these critical locations and compares it to the adjacent property line elevation as well as critical elevations (such as garage opening, rear yard building envelope, or park).

Table 5.4 Critical Ponding Locations during the Stress Test and Adjacent Property Elevations

CRITICAL PONDING LOCATION	MAX. DEPTH (STATIC + DYNAMIC, WHERE APPLICABLE) (M)	(1) CORRESPONDING ELEVATION (M)	(2) ADJACENT PROPERTY LINE ELEVATION (M)	DIFFERENCE (2) – (1)	(3) ADJACENT CRITICAL ELEVATION (M)		DIFFERENCE (3) – (1)
S182A	0.335	108.20	108.16	-0.04	Garage	108.35	0.15
S183	0.425	107.79	107.66	-0.13	Garage	107.88	0.09
S174	0.323	107.70	107.63	-0.07	Garage	107.9	0.20
S173	0.306	107.55	107.5	-0.05	Garage	107.75	0.20
S172	0.357	107.44	107.35	-0.09	Garage	107.55	0.11
S140	0.320	108.06	108.05	-0.01	RY	108.33	0.27
S124	0.306	107.95	107.91	-0.04	Garage	108.16	0.21
S181	0.360	107.38	107.27	-0.11	Park	107.32	-0.06
S171	0.360	107.39	107.31	-0.08	Garage	107.55	0.16
S132	0.343	107.83	107.88	0.05	RY	108.27	0.44
S120	0.320	107.67	107.65	-0.02	Garage	107.85	0.18
S105A	0.313	107.73	107.72	-0.01	RY	107.91	0.18
S105B	0.307	107.67	107.66	-0.01	Park	107.66	-0.01
S107	0.341	107.58	107.54	-0.04	Park	107.54	-0.04
S145B	0.322	105.68	105.60	-0.08	Garage	105.95	0.27

At three locations (S181, S105B, and S107) major flow will cascade to the adjacent park area during the stress test. Otherwise, across the remainder of the site, the maximum depth of flow will encroach the lowest property line but remains below the adjacent garage elevation during the stress test.

5.4.3 Hydraulic Grade Line Analysis

The existing XPSWMM hydraulic model for Pond 5 has been revised to include the detailed design of Phase 1, which is tributary to Pond 5, and Phase 1A, tributary to Pond 6. Minor system hydrographs generated from the DDSWMM model were exported to the XPSWMM model. Minor system losses were accounted for in accordance with Appendix 6-B of the City of Ottawa Sewer Design Guidelines (October 2012).

Simulations were performed for various storms to confirm the hydraulic grade line (HGL) through Phase 1 and Phase 1A of the development. With respect to Phase 1, simulations were also performed to evaluate the impact on the receiving Pond 5.

Phase 1A ties into an existing storm sewer, the design of which was completed by Novatech. Novatech provided IBI the boundary condition for this node, as well as the maximum allowable release rate to the sewer. Correspondence is enclosed in **Appendix F**.

The XPSWMM model schematic is enclosed in **Appendix F**.

5.4.4 Results of Hydraulic Evaluation

The hydraulic grade line was analyzed using the XPSWMM dynamic model for the 100 year 3 hour Chicago storm. A sensitivity analysis was completed with the 100 year 3 hour Chicago storm + 20% increase in intensity, as well as three historical storms (July 1979, August 1988 and August 1996). The results of the 100 year 3 hour Chicago storm, stress test and July 1979 events are presented in the below **Table 5.5**, results of the remaining storm events are enclosed in **Appendix F**, along with model files. For the evaluation of the impact on the downstream Pond 5, the 100 year 24 hour SCS Type II event was also simulated, as it is the design storm for the SWM facility. A comparison of HGL values at locations along the storm trunk for the 100 year 24 hour SCSC Type II storm are presented in **Table 5.6**. The complete results are enclosed in **Appendix F**.

The HGL elevations are presented in the following **Table 5.5**, along with a comparison of under-side of footing (USF) elevations, where available, and proposed ground elevations otherwise. Locations at which there is no surcharge are indicated with 'N/A.' Freeboard is calculated from either USF or proposed ground elevation.

Table 5.5 Summary of Hydraulic Grade Line Elevations

MH	USF (*PROPOSED GROUND*) (M)	100 YEAR 3 HOUR CHICAGO *27970PH1O_100CH_2017-07-11_REV.OUT*		STRESS TEST *27970PH1O_120CH_2017-07-11_REV.OUT*		JULY 1979 *27970PH1O_JUL79_2017-07-11_REV.OUT*	
		HGL	CLEARANCE (M)	HGL	CLEARANCE (M)	HGL	CLEARANCE (M)
PHASE 1							
MH110	*107.52*	104.69	2.83	104.75	2.77	104.71	2.81
MH109	*107.45*	104.71	2.74	104.77	2.68	104.72	2.73
MH107	*107.41*	104.73	2.68	104.80	2.61	104.75	2.66
MH105	105.65	104.76	0.89	104.83	0.82	104.79	0.86
MH104	105.85	104.80	1.05	104.87	0.98	104.83	1.02
MH103	105.75	104.81	0.94	104.89	0.86	104.85	0.90
MH102	105.95	104.82	1.13	104.89	1.06	104.85	1.10
MH110C	*107.93*	N/A	N/A	N/A	N/A	N/A	N/A
MH170	105.50	104.86	0.64	104.94	0.56	104.87	0.63
MH171	105.35	104.96	0.39	105.04	0.31	104.96	0.39
MH172	105.50	105.03	0.47	105.12	0.38	105.03	0.47
MH173	105.65	105.07	0.58	105.17	0.48	105.08	0.57
MH174	105.80	105.13	0.67	105.24	0.56	105.14	0.66
MH175	106.00	105.18	0.82	105.28	0.72	105.19	0.81
MH176	106.10	105.23	0.87	105.33	0.77	105.24	0.86
MH177	*106.55*	105.28	1.27	105.34	1.21	105.30	1.25
MH181	105.65	105.19	0.46	105.28	0.37	105.06	0.59
MH180	105.85	105.42	0.43	105.52	0.33	105.18	0.67
MH184	105.68	105.19	0.49	105.30	0.38	105.20	0.48
MH183	105.95	105.32	0.63	105.42	0.53	105.34	0.61
MH182	106.19	105.83	0.36	105.96	0.23	105.86	0.33
MH187	105.75	105.37	0.38	105.47	0.28	105.39	0.36
MH186	106.05	105.53	0.52	105.68	0.37	105.57	0.48
MH191	106.02	105.61	0.41	105.78	0.24	105.67	0.35
MH185	106.45	105.66	0.79	105.82	0.63	105.72	0.73
MH127	106.70	105.80	0.90	105.99	0.71	105.87	0.83
MH190	106.35	105.26	1.09	105.36	0.99	105.26	1.09
MH189	106.05	105.31	0.74	105.41	0.64	105.31	0.74
MH188	106.55	105.44	1.11	105.58	0.97	105.46	1.09

MH	USF (*PROPOSED GROUND*) (M)	100 YEAR 3 HOUR CHICAGO *27970PH1O_100CH_2017-07-11_REV.OUT*		STRESS TEST *27970PH1O_120CH_2017-07-11_REV.OUT*		JULY 1979 *27970PH1O_JUL79_2017-07-11_REV.OUT*	
		HGL	CLEARANCE (M)	HGL	CLEARANCE (M)	HGL	CLEARANCE (M)
MH128	106.65	N/A	N/A	105.78	0.87	N/A	N/A
MH120	105.70	104.87	0.83	104.95	0.75	104.90	0.80
MH121	105.70	104.88	0.82	104.96	0.74	104.92	0.78
MH122	105.90	N/A	N/A	104.98	0.92	104.94	0.96
MH123	106.00	N/A	N/A	105.01	0.99	104.97	1.03
MH124	106.10	N/A	N/A	105.07	1.03	N/A	N/A
MH125	106.20	N/A	N/A	105.13	1.07	N/A	N/A
MH126	106.35	N/A	N/A	105.17	1.18	N/A	N/A
MH129	*109.23*	N/A	N/A	N/A	N/A	N/A	N/A
MH114	106.00	104.97	1.03	105.08	0.92	105.03	0.97
MH113	106.05	105.09	0.96	105.21	0.84	105.17	0.88
MH112	106.10	105.16	0.94	105.28	0.82	105.25	0.85
MH111	*108.19*	N/A	N/A	105.28	2.91	105.25	2.94
MH132	106.15	N/A	N/A	105.34	0.81	105.30	0.85
MH130	106.25	105.02	1.23	105.12	1.13	105.09	1.16
MH131	106.15	N/A	N/A	105.14	1.01	105.13	1.03
MH140	106.25	N/A	N/A	N/A	N/A	N/A	N/A
MH134	106.40	N/A	N/A	N/A	N/A	N/A	N/A
MH141	*108.40*	N/A	N/A	N/A	N/A	N/A	N/A
MH135	106.76	N/A	N/A	N/A	N/A	N/A	N/A
MH150	106.65	N/A	N/A	N/A	N/A	N/A	N/A
MH152	107.40	N/A	N/A	N/A	N/A	N/A	N/A
MH153	107.25	N/A	N/A	N/A	N/A	N/A	N/A
MH151	107.00	N/A	N/A	N/A	N/A	N/A	N/A
MH149	106.71	N/A	N/A	N/A	N/A	N/A	N/A
PHASE 1A							
CRT1	*103.30*	100.89	N/A	100.89	N/A	100.89	N/A
MH162	*N/A*	N/A	N/A	N/A	N/A	N/A	N/A
MH161	*104.20*	N/A	N/A	N/A	N/A	N/A	N/A
MH146	103.61	N/A	N/A	N/A	N/A	N/A	N/A
MH147	104.06	N/A	N/A	N/A	N/A	N/A	N/A
MH148	104.56	N/A	N/A	N/A	N/A	N/A	N/A
MH138	106.01	N/A	N/A	N/A	N/A	N/A	N/A
MH145	103.61	102.75	0.86	102.76	0.85	N/A	N/A
MH160	105.53	N/A	N/A	N/A	N/A	N/A	N/A
MH137	106.61	N/A	N/A	N/A	N/A	N/A	N/A
MH136	106.71	N/A	N/A	N/A	N/A	N/A	N/A
MH144	104.81	N/A	N/A	N/A	N/A	N/A	N/A
MH143	105.11	N/A	N/A	N/A	N/A	N/A	N/A
MH142	106.11	N/A	N/A	N/A	N/A	N/A	N/A

The above table indicates that minimum 0.3 m clearance between the USF and HGL is maintained across the subject site during the 100 year 3 hour Chicago storm event. It should be noted that the above results also indicate that there would be no severe flooding to properties during the 100 year 3 hour Chicago storm with a 20% increase in intensity, nor during the July 1 1979 historical storms. The results indicate that the HGL would be above the 0.3 m freeboard at three locations during the stress test, but below the USF across the site. The results of the remainder of the storm events are presented in **Appendix F**.

Phase 1, tributary to Pond 5, was also simulated with the 100 year 24 hour SCS Type II storm event, the design storm of the SWM facility. A comparison of HGL along the storm trunk is presented in **Table 5.6**. There is negligible impact on the HGL as a result of the revisions related to Phase 1 detailed design.

Table 5.6 100 year 24 hour SCS Type II HGL Comparison: Pond 5 Submission and Phase 1 Detailed Design

LOCATION		HGL (M)			
		100 YEAR 24 HOUR SCS TYPE II		100 YEAR 24 HOUR SCS TYPE II + 20%	
		POND 5 SUBMISSION MAY 2016	PHASE 1 DETAILED DESIGN *27970PH1_100SCS_2017-07-11_REV.OUT*	POND 5 SUBMISSION MAY 2016	PHASE 1 DETAILED DESIGN *27970PH1_120SCS_2017-07-11_REV.OUT*
Pond 5	D/S Cell	104.32	104.26	104.52	104.47
	U/S Cell	104.33	104.26	104.53	104.48
MH300		104.37	104.26	104.58	104.49
MH207		104.45	104.49	104.63	104.67
MH206		104.48	104.53	104.64	104.72
MH205		104.52	104.57	104.67	104.78
MH110 (Phase 1)		104.58	104.64	104.74	104.86

In addition, an evaluation of the hydraulic grade line was undertaken assuming that those storm sewer pipes that are partially permanently submerged have 25% accumulation of sediment. At the request of the City, the evaluation was undertaken using the 100 year 3 hour Chicago storm event. The results of the hydraulic evaluation are presented in **Table 5.7**.

Table 5.7 Hydraulic Grade Line for 25% Sediment Accumulation in Permanently Partially Submerged Storm Sewers (Phase 1)

MH	USF (*PROPOSED GROUND*) (M)	100 YEAR 3 HOUR CHICAGO *27970PH1O_100CH_2017-07-11_REV_SED.XP*	
		HGL	CLEARANCE (M)
MH110	*107.52*	105.35	2.17
MH109	*107.45*	105.38	2.07
MH107	*107.41*	105.43	1.98
MH105	105.65	105.48	0.17
MH104	105.85	105.54	0.31
MH103	105.75	105.61	0.14
MH102	105.95	105.67	0.28
MH110C	*107.93*	105.82	2.11
MH170	105.50	105.56	-0.06
MH171	105.35	105.67	-0.32
MH172	105.50	105.75	-0.25
MH173	105.65	105.80	-0.15
MH174	105.80	105.87	-0.07
MH175	106.00	105.91	0.09
MH176	106.10	105.96	0.14
MH177	*106.55*	106.04	0.51
MH181	105.65	105.90	-0.25
MH180	105.85	106.14	-0.29
MH184	105.68	105.92	-0.24
MH183	105.95	106.05	-0.10
MH182	106.19	106.55	-0.36

MH	USF (*PROPOSED GROUND*) (M)	100 YEAR 3 HOUR CHICAGO *27970PH1O_100CH_2017-07-11_REV_SED.XP*	
		HGL	CLEARANCE (M)
MH187	105.75	106.10	-0.35
MH186	106.05	106.26	-0.21
MH191	106.02	106.35	-0.33
MH185	106.45	106.44	0.01
MH127	106.70	106.68	0.02
MH190	106.35	105.98	0.37
MH189	106.05	106.04	0.01
MH188	106.55	106.35	0.20
MH120	105.70	105.67	0.03
MH121	105.70	105.71	-0.01
MH122	105.90	105.74	0.16
MH123	106.00	105.79	0.21
MH124	106.10	105.92	0.18
MH125	106.20	106.14	0.06
MH126	106.35	106.31	0.04
MH128	106.65	106.91	-0.26
MH129	*109.23*	106.91	2.32
MH114	106.00	105.79	0.21
MH113	106.05	105.90	0.15
MH112	106.10	106.06	0.04
MH111	*108.19*	106.08	2.11
MH132	106.15	106.06	0.09
MH130	106.25	105.89	0.36
MH131	106.15	106.09	0.06
MH140	106.25	106.00	0.25
MH134	106.40	106.39	0.01
MH141	*108.40*	106.56	1.84
MH135	106.76	106.33	0.43
MH136	106.71	106.39	0.32
MH150	106.65	106.22	0.43
MH152	107.40	106.39	1.01
MH153	107.25	106.59	0.66
MH151	107.00	106.60	0.40
MH149	106.71	106.80	-0.09

The modeling results of the permanently partially submerged storm sewers assuming 25% sediment accumulation indicate that the HGL is below the USF but the clearance between the USF and HGL is less than 0.3 m at 21 locations (indicated in red). At nine locations, the HGL is above the USF but below the basement slab (indicated in yellow). And at three locations, the HGL is above the basement slab. It should be emphasized that the sediment accumulation simulation has been completed under the 100 year storm event, considered a compounding sensitivity analysis. It is recommended that regular sewer clean out be performed prior to 25% accumulation.

5.5 Summary of Model Output Files

The following is a reference list of the model output files including file names and storm event evaluated. The files are included on the CD enclosed in **Appendix F**.

DDSWMM:

- 5 year 3 hour Chicago: 07-PH1-5CH.DAT, 07-PH1A-5CH.DAT
- 100 year 3 hour Chicago: 07-PH1-100CH.DAT, 07-PH1A-100CH.DAT
- 100 year 3 hour Chicago +20%: 07-PH1-120CH.DAT, 07-PH1A-120CH.DAT
- July 1979: 07-PH1-JUL79.DAT, 07-PH1A-JUL79.DAT
- August 1988: 07-PH1-AUG88.DAT, 07-PH1A-AUG88.DAT
- August 1996: 07-PH1-Aug96.DAT, 07-PH1A-Aug96.DAT

SWMHYMO:

- 27970VXD.OUT

XPSWMM:

- 100 year 3 hour Chicago: 27970PH1O_100CH_2017-07-11_REV.xp
- 100 year 3 hour Chicago +20% increase in intensity: 27970PH1O_120CH_2017-07-11_REV.xp
- July 1979: 27970PH1O_JUL79_2017-07-11_REV.xp
- August 1988: 27970PH1O_AUG88_2017-07-11_REV.xp
- August 1996: 27970PH1O_AUG96_2017-07-11_REV.xp
- 100 year 24 hour SCS Type II: 27970PH1_100SCS_2017-07-11.xp
- 100 year 24 hour SCS Type II + 20%: 27970PH1_120SCS_2017-07-11.xp
- 25% Sediment Accumulation: 27970PH1O_100CH_2017-07-11_REV_SED.xp

5.6 Erosion and Sedimentation Control

Development of a subdivision such as CRT Lands Phase 1 can potentially create deleterious material which can enter the natural environment and gain access to fish habitat. In order to prevent site generated sediments from entering the environment, an Erosion and Sedimentation Control Plan will be implemented prior to development.

The erosion and sedimentation strategy for the subject site will include erection of silt fences around the entire perimeter of the subject site. The silt fences will ensure protection of both adjacent developments and the natural environment.

A copy of the Erosion and Sedimentation Control Plan is included in **Appendix G**.

5.7 Miscellaneous Elements

The following section includes brief comments for items indicated in the current Servicing Study Guidelines for which the proposed development will have little or no impact. These include:

- Setbacks
- Drainage catchment diversions
- Municipal Drains
- 100 year flood lands

- Floodplains

There are no watercourses or hazard land setbacks applicable to the development. Mitigation measures of potential impacts to downstream watercourses such as Flewellyn Drain will include implementation of an Erosion and Sedimentation Control Plan.

There are no drainage catchment diversions proposed by the development.

Any runoff from the site, as with all developments in the Fernbank Community, has end-of-pipe quality and quantity treatment. Any impacts to receiving watercourses have been previously addressed.

The only municipal drain in the vicinity of the subject development is Flewellyn Drain. The drain is proposed to be deepened for about 650 m downstream of Fernbank Road and improved for about another 800 m up to Flewellyn Road. Permit No. RV5-11/15T dated July 9, 2015 from the Rideau Valley Conservation Authority has been obtained by the Owners. The drain improvements have been approved by the MOECC.

There are no flood plains in the vicinity of the CRT Lands.

6 APPROVALS AND PERMIT REQUIREMENTS

6.1 City of Ottawa

The City of Ottawa reviews all development documents including this report and working drawings. Upon completion, the City will approve the local watermains, under Permit NO. 008-202, submit the sewer MOE application to the province, and eventually issue a Commence Work Notification.

6.2 Province of Ontario

The Ministry of Environment and Climate Change (MOECC) will approve the local sewers and the stormwater facilities under Section 53 of the Ontario Water Resources Act and issue the Environment Compliance Approvals. A Permit To Take Water will also be required from the MOE.

6.3 Conservation Authority

Flewellyn Drain will be impacted by the proposed development. About 1450 m of the municipal drain is proposed to be improved. The Rideau Valley Conservation Authority has issued a permit (Permit No.RV5-11/15T) for the proposed improvements.

6.4 Federal Government

There are no permits, authorizations or approvals needed expressly for this development from the federal government.

7 CONCLUSIONS AND RECOMMENDATIONS

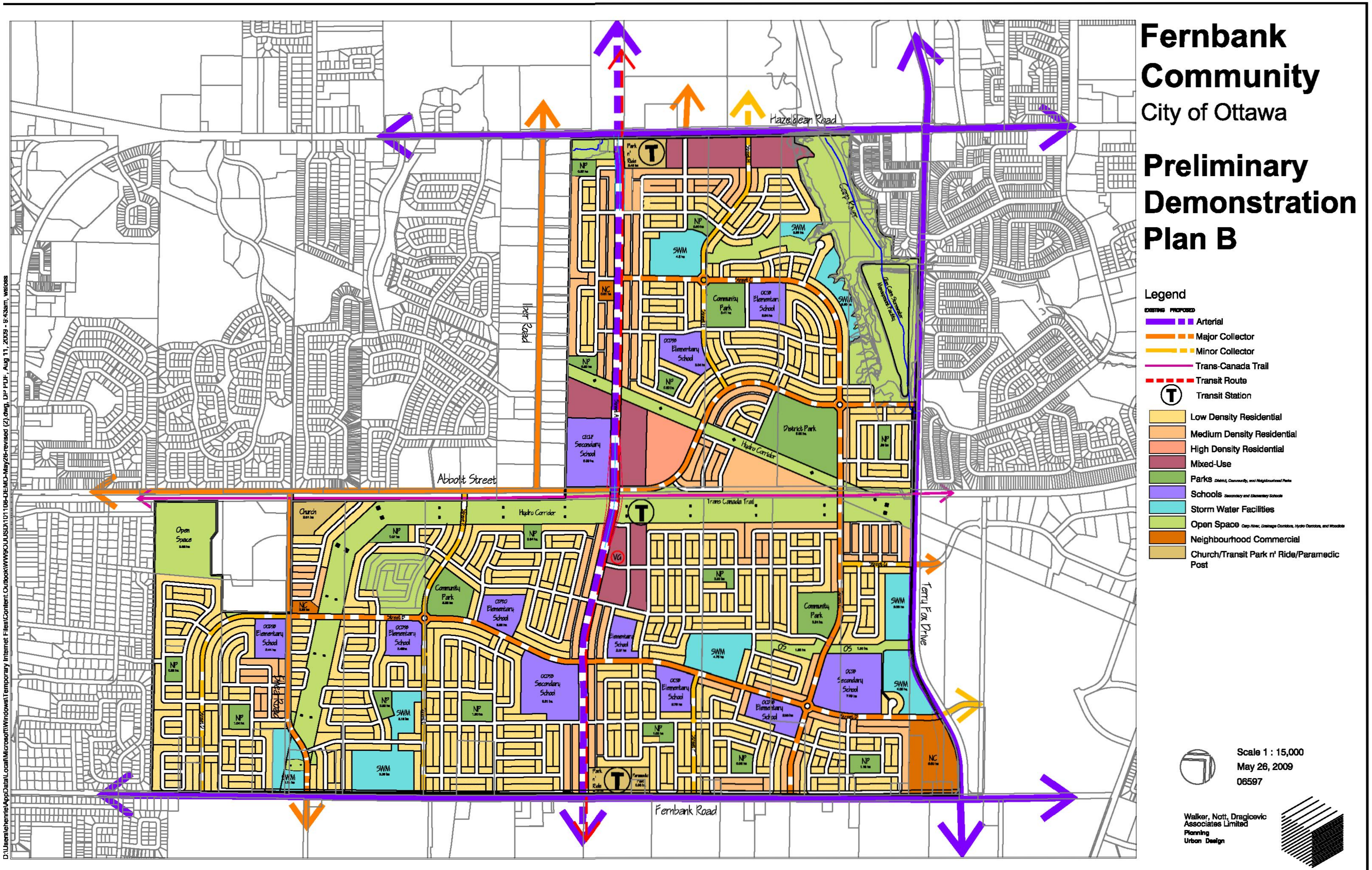
7.1 Conclusions

This report and the accompanying working drawings clearly indicate that the proposed development meets the requirements of the stakeholder regulators, including the City of Ottawa, provincial MOECC and RVCA. With minor exceptions, the proposed development is in general conformance with the 2009 Master Servicing Report and current City of Ottawa design standards. Because of the 2012 change in the City of Ottawa's stormwater management criteria, most minor storm sewers are now proposed to be larger than those recommended in the 2009 Master Servicing Studies.

Downstream sanitary sewers were designed with the proposed development area included. There is a reliable water supply available adjacent to the proposed development.

7.2 Recommendations

It is recommended that the regulators review this submission with an aim of providing the requisite approvals to permit the owners to proceed to the development stage of the subject site.

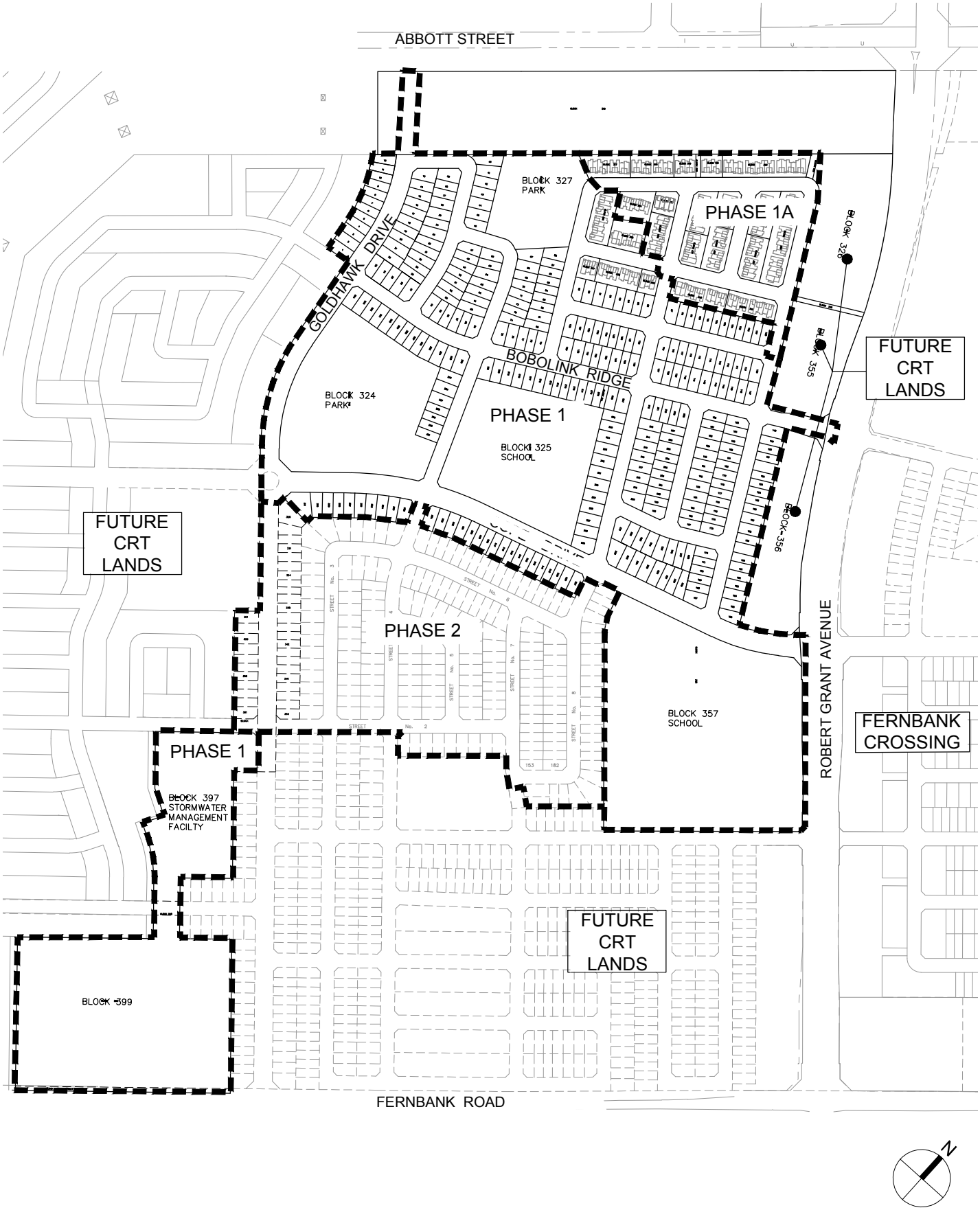


Scale N.T.S.

Project Title
DESIGN BRIEF
CRT LANDS-PHASE 1
FERNBANK COMMUNITY

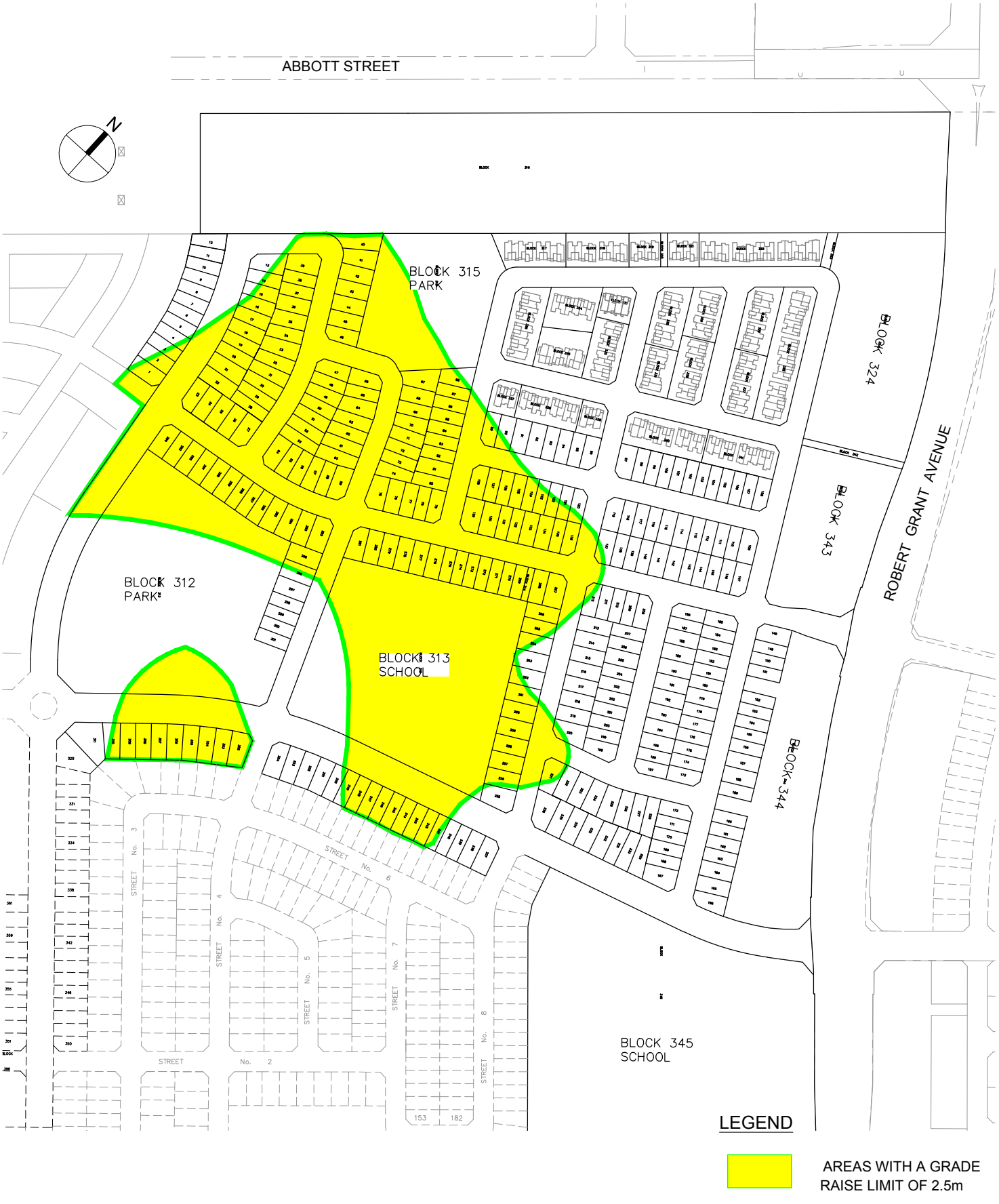
Drawing Title
FERNBANK COMMUNITY
PRELIMINARY DEMONSTRATION
PLAN

Sheet No.
FIGURE 1.1



J:\27970-FernbankPlan\5.9 Drawings\59civil\current\Design Brief\2017-07-14\27970-Fig1.3 PHASING PLAN.dwg Layout Name: Figure 1.3

Project Title	Drawing Title	Sheet No.
DESIGN DRIEF CRT LANDS-PHASE 1 FERNBANK COMMUNITY	PHASING PLAN	FIGURE 1.3



J: \27970-FernbankPlan\5.9 Drawings\59civil\current\Design Brief\2017-07-14\27970-Fig1.4 GRADE RAISE LIMITS.dwg Layout Name: Figure 1.4

IBI

Project Title

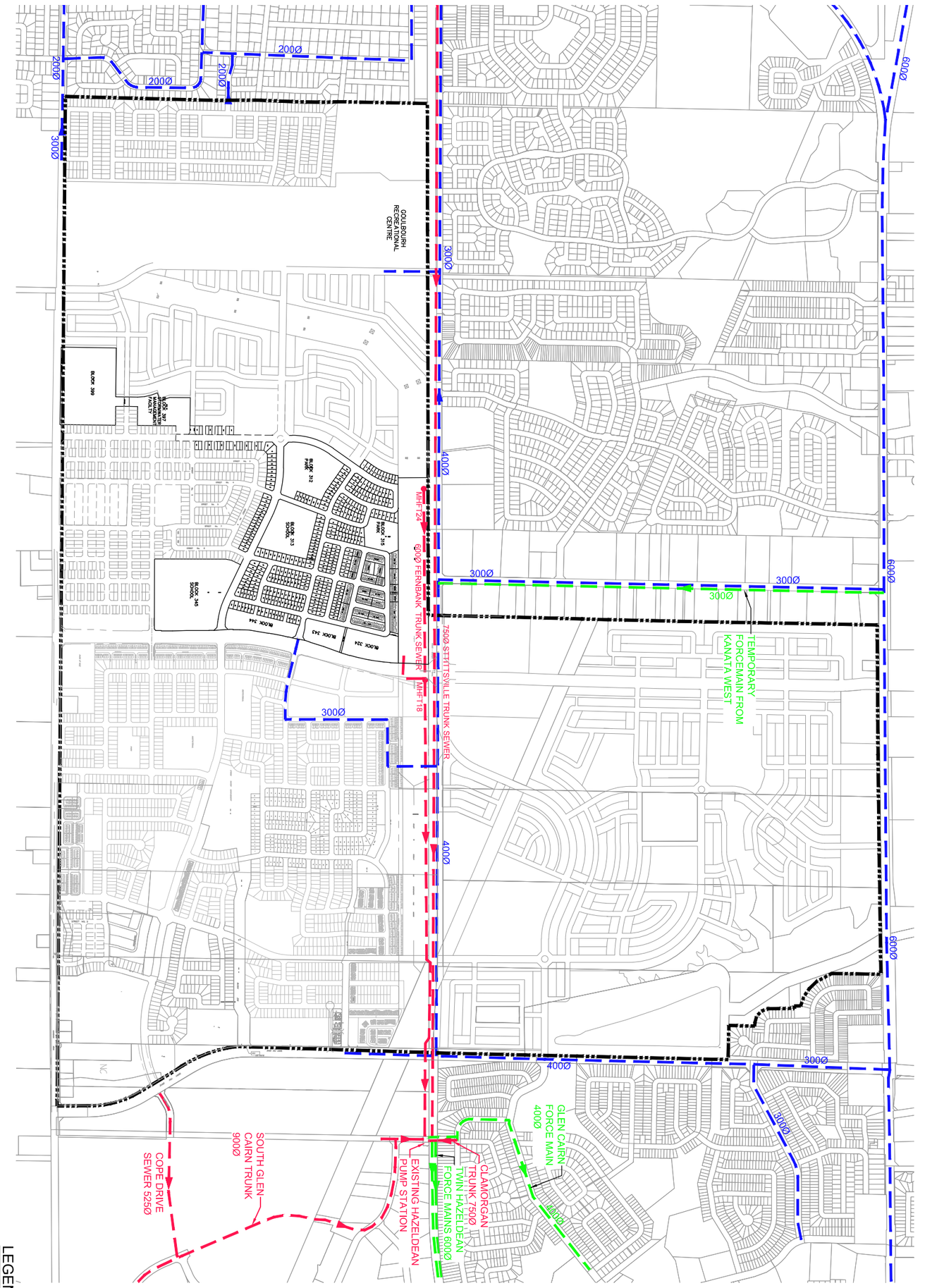
DESIGN DRIEF
CRT LANDS-PHASE 1
FERNBANK COMMUNITY

Drawing Title

GRADE RAISE
LIMITS

Sheet No.

FIGURE 1.4

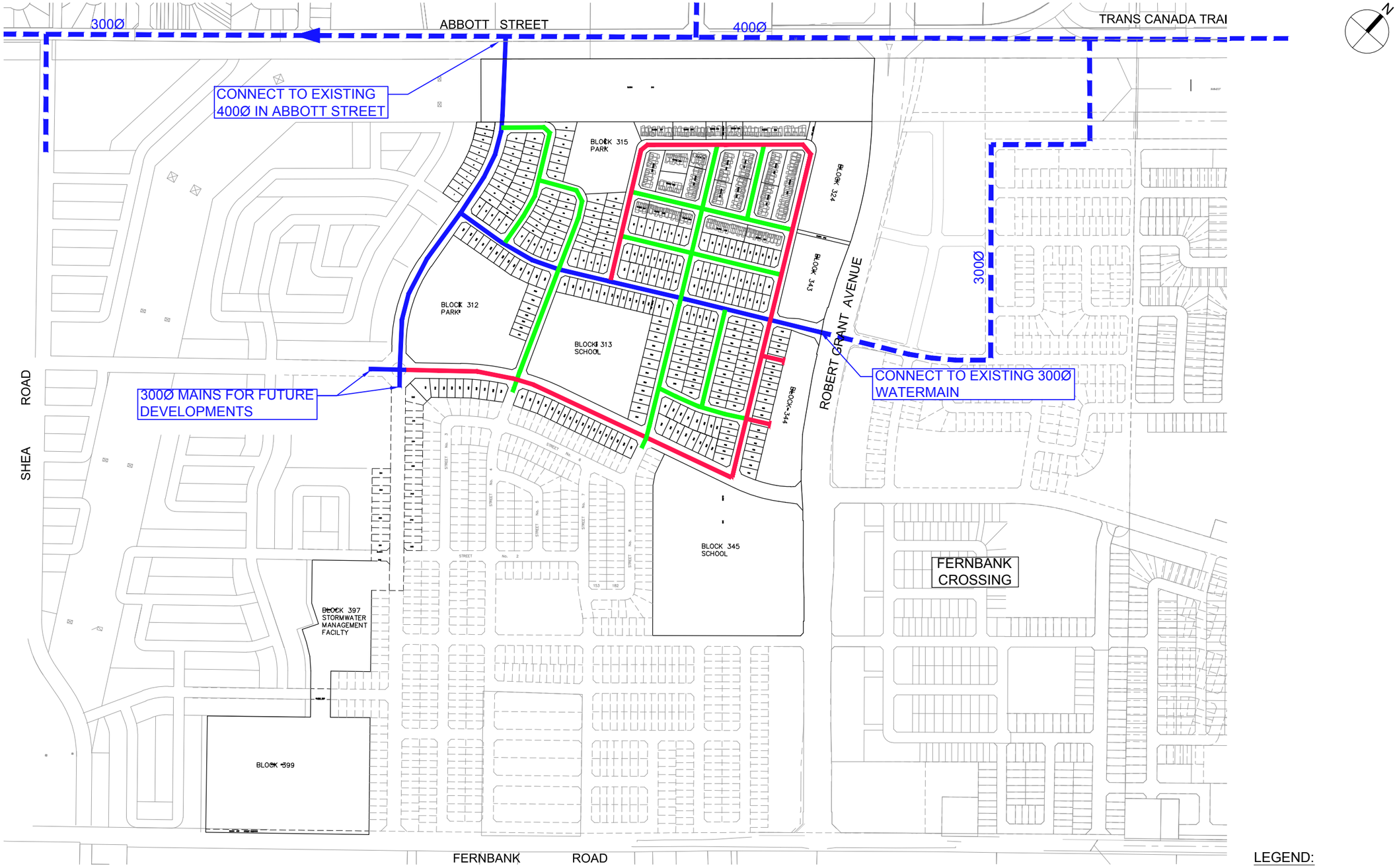


LEGEND:

- 300Ø EXISTING WATERMAIN AND DIAMETER
- 300Ø EXISTING SANITARY SEWER, SIZE AND FLOW DIRECTION
- 300Ø EXISTING FORCEMAINS, SIZE AND FLOW DIRECTION
- LIMITS OF FERNBANK COMMUNITY CONCEPT PLAN

Sheet No.	Drawing Title	Project Title	Scale
FIGURE 2.1	EXISTING WATERMAINS AND SANITARY SEWERS	DESIGN BRIEF CRT LANDS-PHASE 1 FERNBANK COMMUNITY	N.T.S.

IBI



LEGEND:

- 300Ø EXISTING WATERMAIN AND SIZE
- PROPOSED 300Ø WATERMAIN
- PROPOSED 200Ø WATERMAIN
- PROPOSED 150Ø WATERMAIN

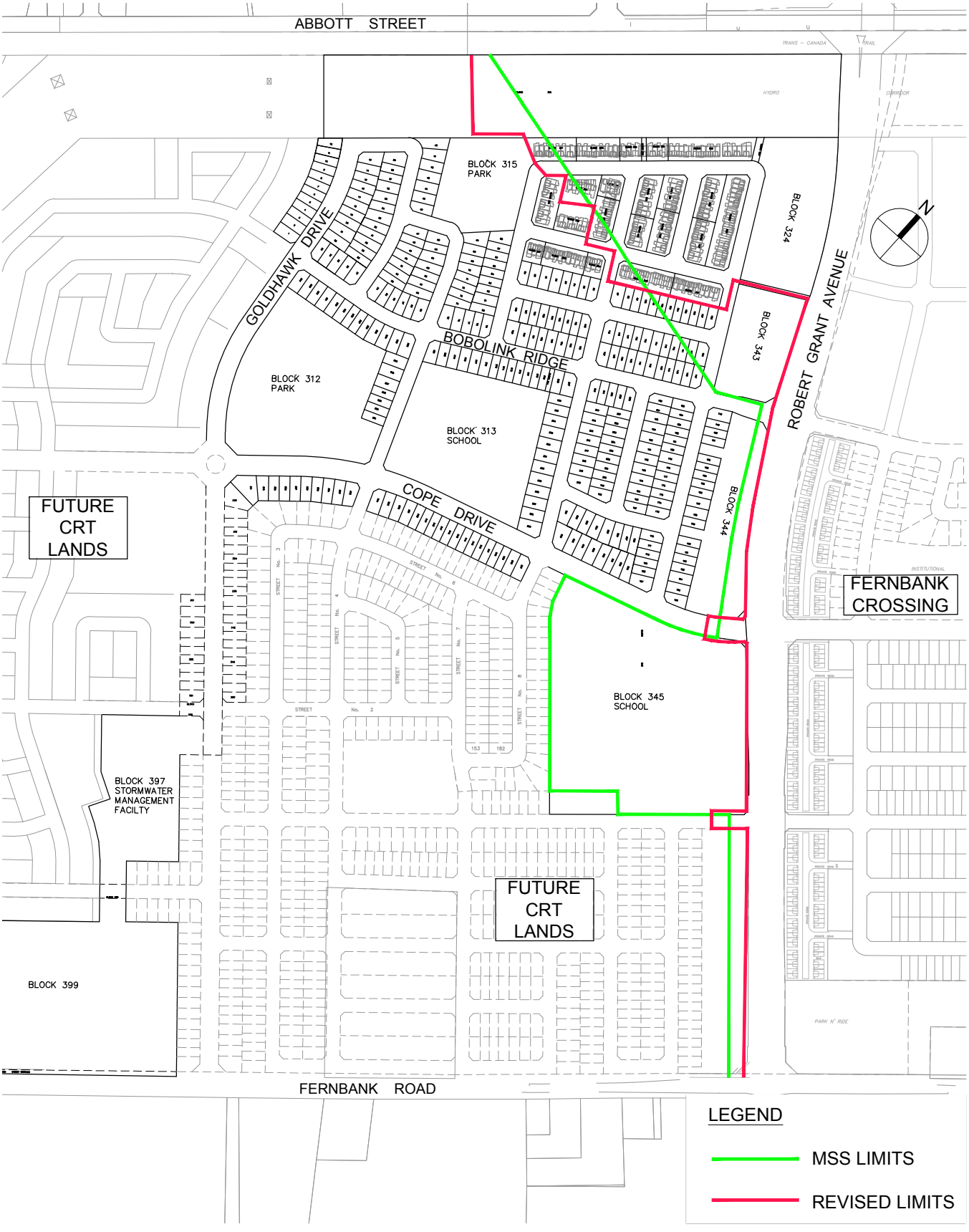
IBI

Scale N.T.S.

Project Title
DESIGN BRIEF
CRT LANDS-PHASE 1
FERNBANK COMMUNITY

Drawing Title
PROPOSED WATER PLAN

Sheet No.
FIGURE 2.2



J:\27970-FernbankPlan\5.9 Drawings\59civil\current\Design Brief\2017-07-14\27970-Fig3.1 SANITARY DRAINAGE LIMITS.dwg Layout Name: Figure 3.2

IBI

Project Title

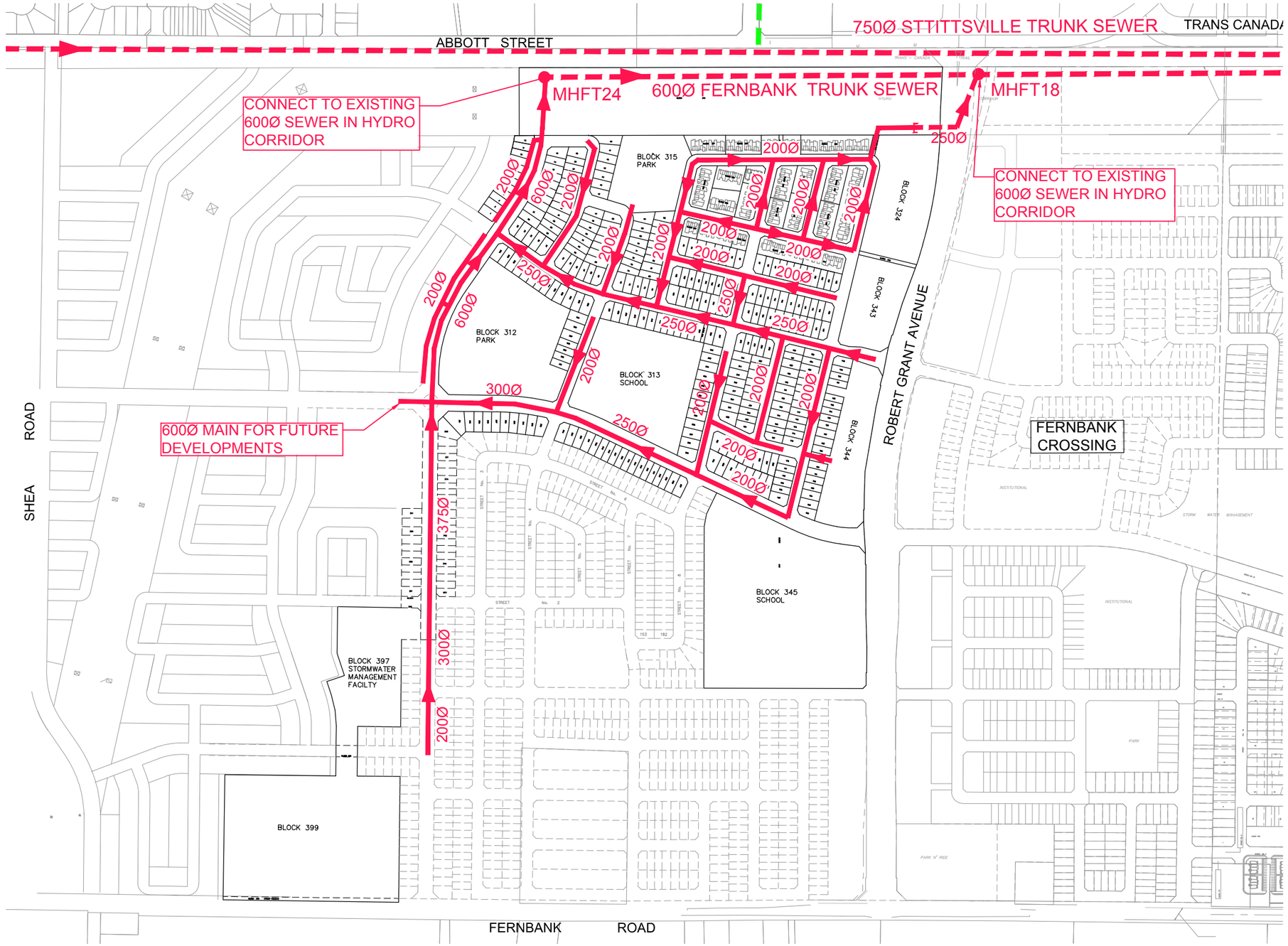
DESIGN DRIEF
CRT LANDS-PHASE 1
FERNBANK COMMUNITY

Drawing Title

PROPOSED CHANGES
TO SANITARY DRAINAGE
LIMITS

Sheet No.

FIGURE 3.1



LEGEND

600Ø EXISTING SANITARY SEWER AND DIAMETER

300Ø PROPOSED SANITARY SEWER AND DIAMETER

IBI

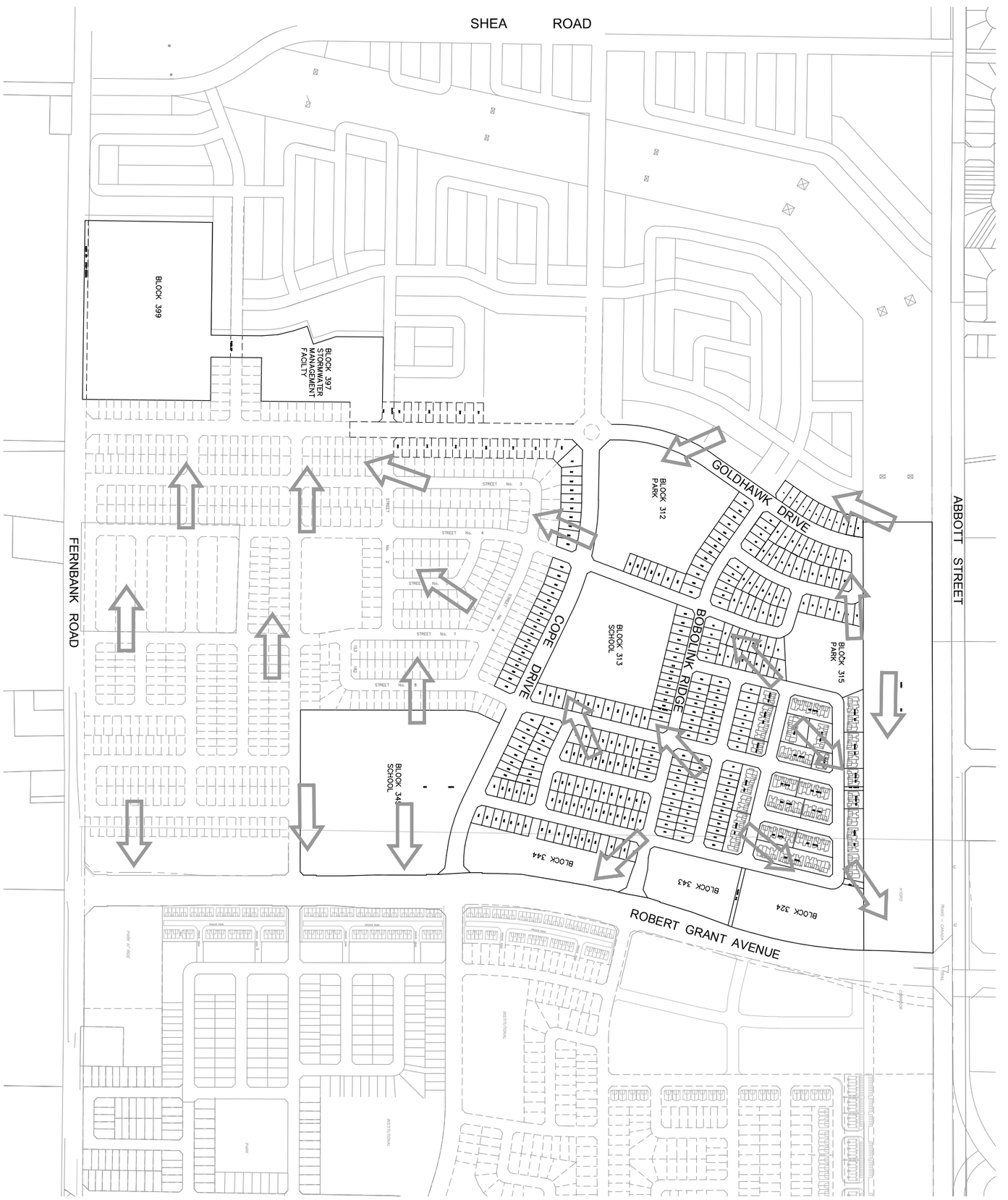
Scale N.T.S.

Project Title
DESIGN BRIEF
CRT LANDS-PHASE 1
FERNBANK COMMUNITY

Drawing Title
PROPOSED WASTEWATER PLAN

Sheet No.
FIGURE 3.2

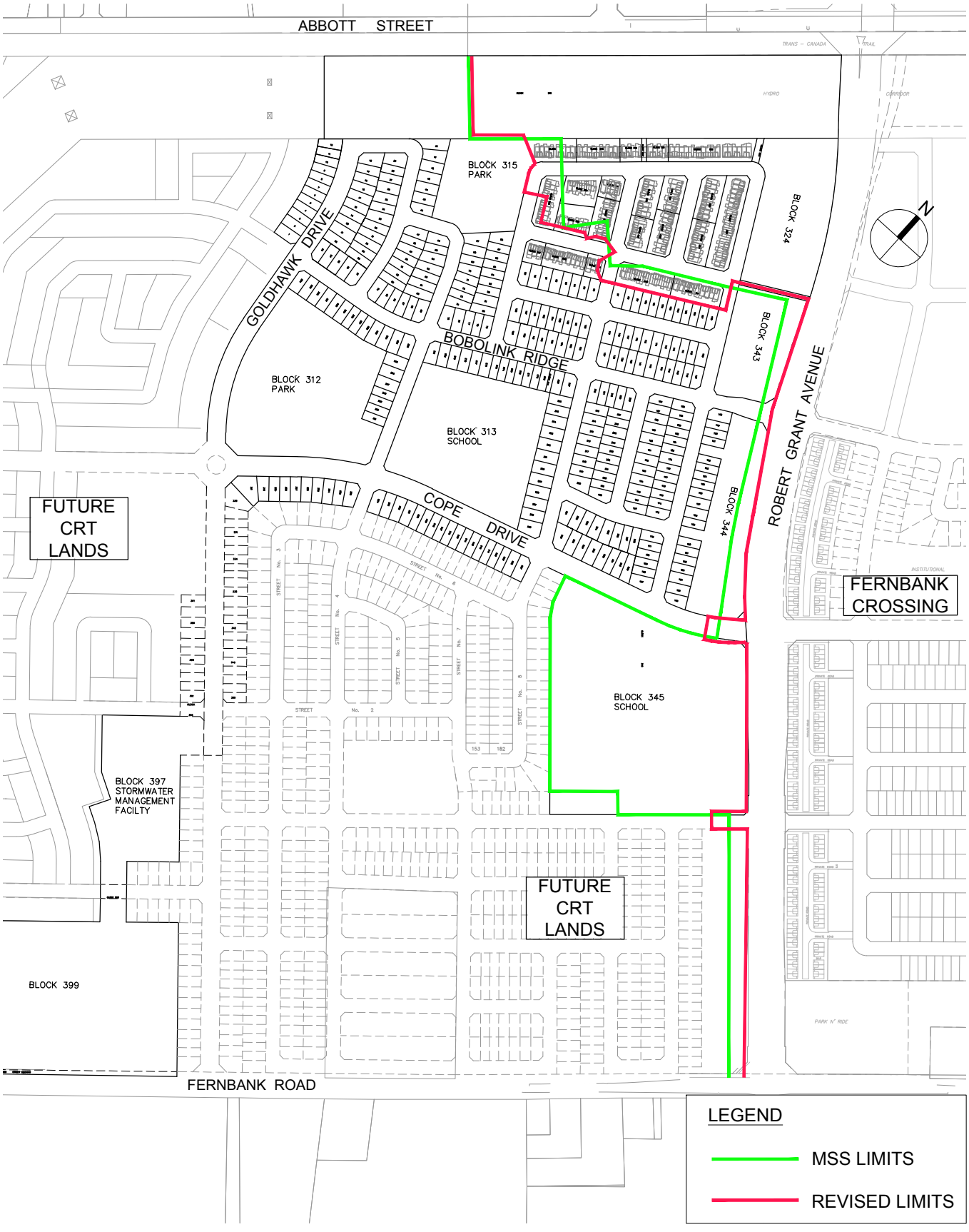
J:\27970-FernbankPlan\5.9 Drawings\59civil\current\Design Brief\2017-07-14\27970-Fig3.2 PROPOSED WASTEWATER.dwg Layout Name: Figure 3.2 Plot Style: ---- Plot Scale: 1:2.5849 Plotted At: 7/13/2017 11:54 AM Last Saved By: mmline
Last Saved At: Jul. 13, 17



EXISTING DRAINAGE PATTERNS

Sheet No.	Drawing Title	Project Title	Scale
FIGURE 4.1	EXISTING DRAINAGE PATTERNS	DESIGN BRIEF CRT LANDS-PHASE 1 FERNBANK COMMUNITY	N.T.S.

IBI



J:\27970-FernbankPlan\5.9 Drawings\59civil\current\Design Brief\2017-02-10\27970-Fig4.2 MINOR STORM DRAINAGE LIMITS.dwg Layout Name: Figure 4.2

IBI

Project Title

DESIGN DRIEF
CRT LANDS-PHASE 1
FERNBANK COMMUNITY

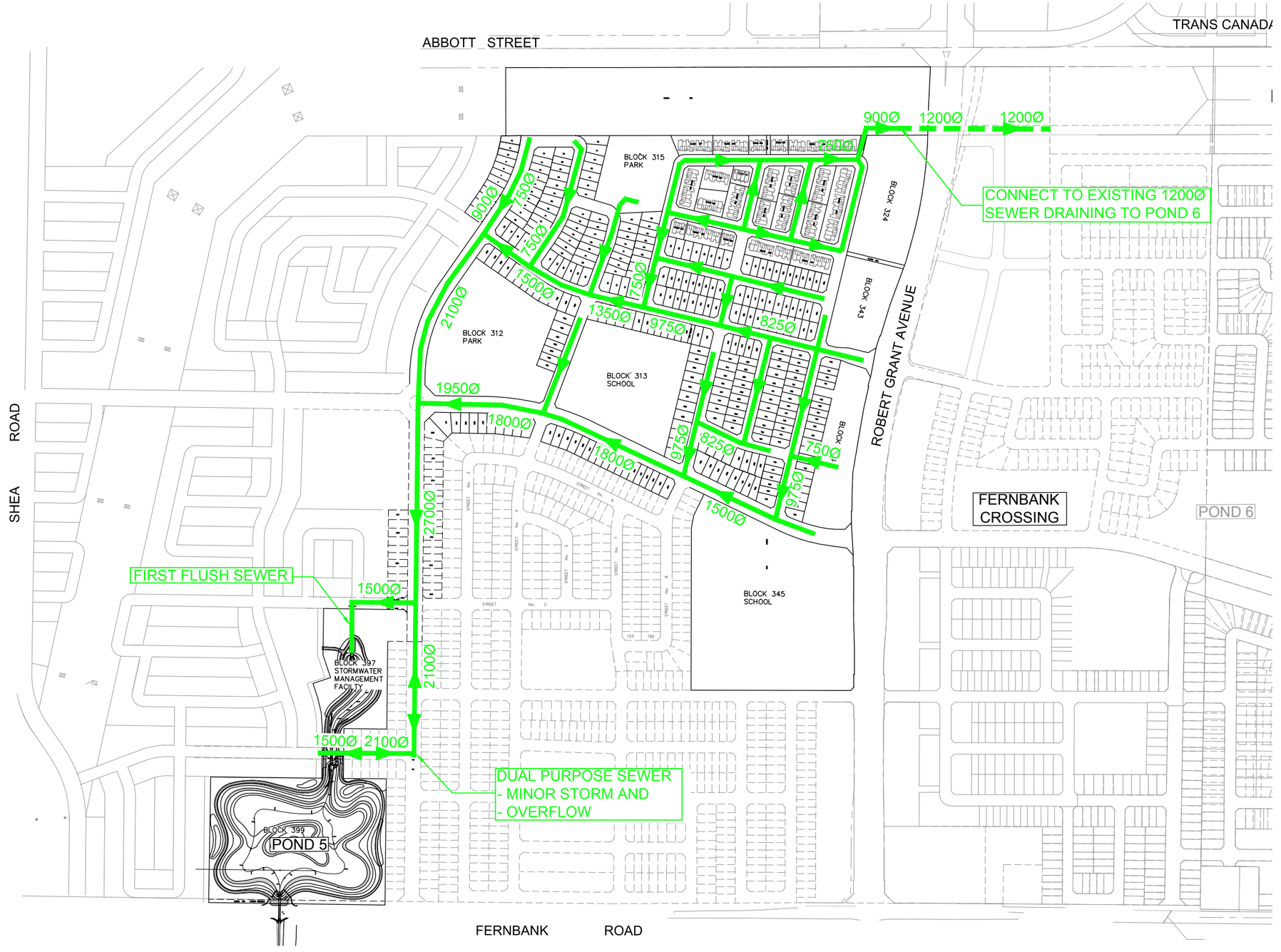
Drawing Title

PROPOSED CHANGES
TO MINOR STORM
DRAINAGE LIMITS

Sheet No.

FIGURE 4.2

PROPOSED CHANGE TO MINOR STORM LIMITS



LEGEND

12000 EXISTING STORM SEWER AND DIAMETER

900Ø PROPOSED STORM SEWER AND DIAMETER

PROPOSED MINOR STORM PLAN

IBI

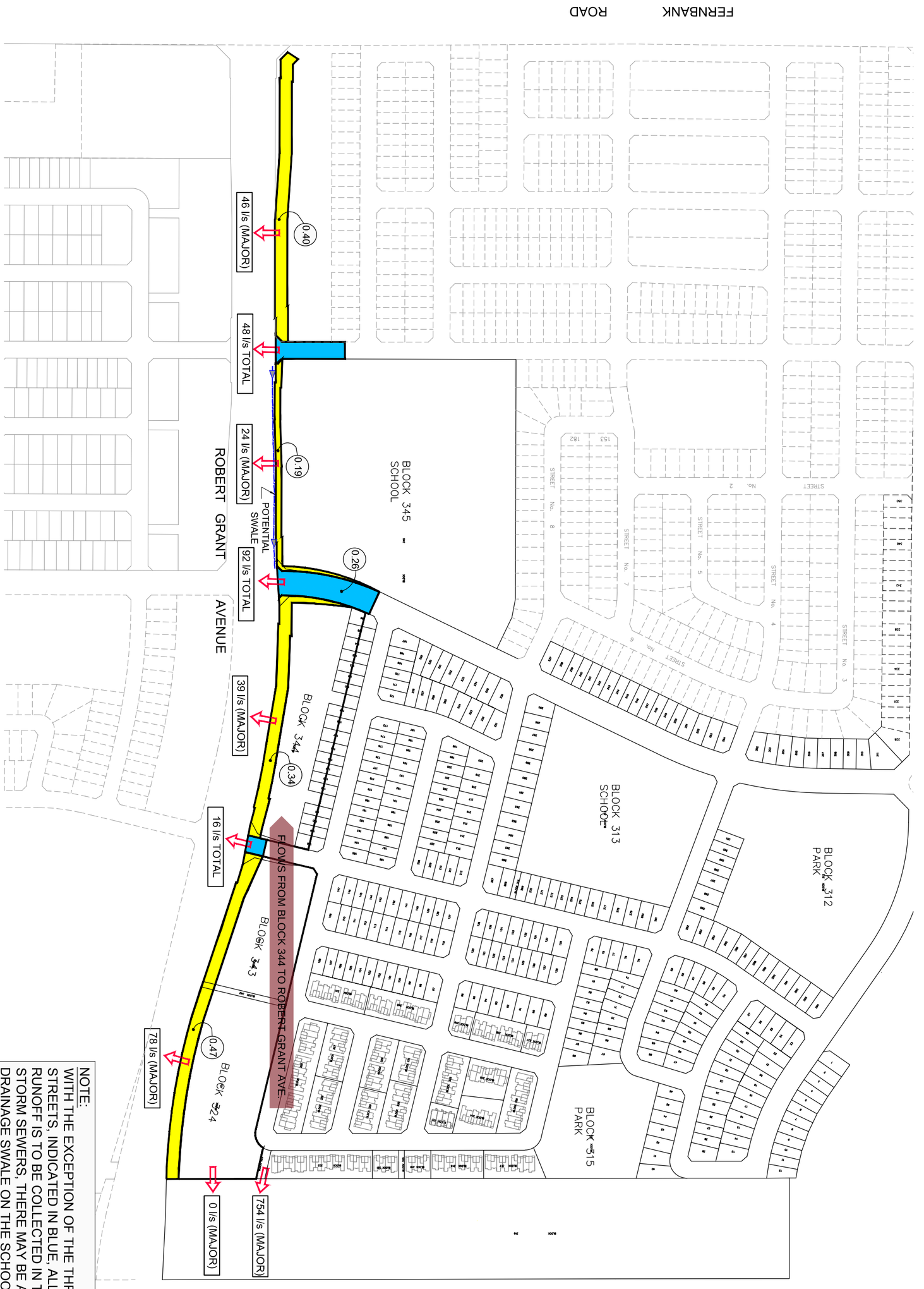
Scale N.T.S.

Project Title
DESIGN BRIEF
CRT LANDS-PHASE 1
FERNBANK COMMUNITY

Drawing Title
PROPOSED MINOR STORM PLAN

Sheet No.
FIGURE 4.3

J:\27970-FernbankPlan\5.9 Drawings\59civil\current\Design Brief\2017-07-14\27970-Fig4.3 PROPOSED MINOR STORM PLAN.dwg Layout Name: Figure 4.3 Plot Style: ---- Plot Scale: 1:2.5849 Plotted At: 7/13/2017 1:06 PM Last Saved By: mmilne Last Saved At: Jul. 13, 17



NOTE:
WITH THE EXCEPTION OF THE THREE SIDE STREETS, INDICATED IN BLUE, ALL MINOR STORM RUNOFF IS TO BE COLLECTED IN THE CRT MINOR STORM SEWERS. THERE MAY BE A FUTURE DRAINAGE SWALE ON THE SCHOOL BLOCK 357 DIRECTED TOWARDS THE ROBERT GRANT AVENUE MINOR SYSTEM. FLOWS CORRESPOND TO THE 100 YEAR 3 HOUR CHICAGO STORM EVENT.

Sheet No.	Drawing Title	Project Title	Scale
FIGURE 4.4	DRAINAGE FROM CRT LANDS TO ROBERT GRANT AVENUE	DESIGN BRIEF CRT LANDS-PHASE 1 FERNBANK COMMUNITY	N.T.S.

IBI

APPENDIX A

- **Development Servicing Study Checklist**
- **Figure 1.2 – Draft Plan**

General Content

	ITEM DESCRIPTION	LOCATION
	Executive Summary (for larger reports only)	N/A
√	Date and revision number of the report	Front Cover
√	Location Map and plan showing municipal address, boundary, and layout of proposed development.	Figure 1 and 3
√	Plan showing the site and location of all existing services.	Figure 4
√	Development statistics, land use, density, adherence to zoning and official plan, and reference to applicable subwatershed and watershed plans that provide context to which individual developments must adhere.	Section 1.3, 2.3, 3.3 & 4.3
√	Summary of Pre-consultation Meeting with City and other approval agencies.	Appendix B
√	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.	Section 1.5
√	Statement of objectives and servicing criteria	Section 2.3, 3.3 & 4.3
√	Identification of existing and proposed infrastructure available in the immediate area.	Figure 4
√	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).	Section 1.6
√	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.	Grading Plans
	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.	N/A
√	Proposed phasing of the development, if applicable.	Figure 3
√	Reference to geotechnical studies and recommendations concerning servicing.	Section 1.8
√	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	Design Drawings

Development Servicing Report: Water

	ITEM DESCRIPTION	LOCATION
√	Confirm consistency with Master Servicing Study, if available	Section 2.2
√	Availability of public infrastructure to service proposed development	Section 2.1, 2.4
√	Identification of system constraints – external water needed	Section 2.1
√	Identify boundary conditions	Section 2.3
√	Confirmation of adequate domestic supply and pressure	Section 2.4
√	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.	Section 2.3
√	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.	Section 2.3
√	Definition of phasing constraints. Hydraulic modeling is required to confirm servicing for all defining phases of the project including the ultimate design.	Section 2.4
√	Address reliability requirements such as appropriate location of shut-off valves.	Design Drawings
	Check on the necessity of a pressure zone boundary modification.	N/A
√	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.	Section 2.3 Appendix C
√	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.	Section 2.4 Figure 5 Appendix C
√	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.	Section 2.1 Figure 5
√	Confirmation that water demands are calculated based on the City of Ottawa Design Guidelines.	Section 2.3
√	Provision of a model schematic showing the boundary conditions locations, streets, parcels, and building locations for reference.	Section 2.4 Appendix C

Development Servicing Report: Wastewater

	ITEM DESCRIPTION	LOCATION
√	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 3.3
√	Confirm consistency with Master Servicing Study and/or justifications for deviations.	Section 3.2
√	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 condition of sewers.	Section 3.6
√	Description of existing sanitary sewer available for discharge of wastewater from proposed development.	Section 3.2, 3.4 Figure 4
√	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)	Section 3.2, 3.4
√	Calculations related to dry-weather and wet-weather flow rates from the development in standard MOE sanitary sewer design table (Appendix "C") format.	Section 3.3 & 3.7 Appendix D
√	Description of proposed sewer network including sewers, pumping stations and forcemains.	Section 3.4 Figure 6
√	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).	Section 1.6, 3.8
√	Pumping stations: impacts of proposed development on existing pumping stations or requirements for new pumping station to service development.	Section 3.5
	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.	Section 3.9
√	Special considerations such as contamination, corrosive environment, check soils, etc.	Section 1.8

Development Servicing Report: Stormwater Checklist

	ITEM DESCRIPTION	LOCATION
√	Description of drainage outlets and downstream constraints including legality of outlets (i.e. municipal drain, right-of-way, watercourse, or private property)	Section 1.6, 4.1
	Analysis of available capacity in existing public infrastructure.	Section 4.5
√	A drawing showing the subject lands, its surroundings, the receiving watercourse, existing drainage patterns, and proposed drainage pattern.	Figure 2.8 Grading Plans
√	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.	Section 5.3
√	Water quality control objective (basic, normal or enhanced level of protection based on the sensitivities of the receiving watercourse) and storage requirements.	Section 5.3
√	Description of the stormwater management concept with facility locations and descriptions with references and supporting information.	Section 5
	Set-back from private sewage disposal systems.	N/A
	Watercourse and hazard lands setbacks.	N/A
√	Record of pre-consultation with the Ontario Ministry of Environment and the Conservation Authority that has jurisdiction on the affected watershed.	Section 1.6
√	Confirm consistency with sub-watershed and Master Servicing Study, if applicable study exists.	Section 4.2
√	Storage requirements (complete with calculations) and conveyance capacity for minor events (1:5 year return period) and major events (1:100 year return period).	Section 5.5
√	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 1.6, 6.3
√	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.	Section 5.3, 5.5
√	Any proposed diversion of drainage catchment areas from one outlet to another.	Section 4.2
√	Proposed minor and major systems including locations and sizes of stormwater trunk sewers, and stormwater management facilities.	Section 4.4 Design Drawings
	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.	N/A
√	Identification of potential impacts to receiving watercourses	Section 1.6, 6.3
√	Identification of municipal drains and related approval requirements.	Section 1.6, 6.3

√	Descriptions of how the conveyance and storage capacity will be achieved for the development.	Section 5.4, 5.6
√	100 year flood levels and major flow routing to protect proposed development from flooding for establishing minimum building elevations (MBE) and overall grading.	Grading Plans
√	Inclusion of hydraulic analysis including hydraulic grade line elevations.	Section 5.6
√	Description of approach to erosion and sediment control during construction for the protection of receiving watercourse or drainage corridors.	Section 5.6
√	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.	Section 5.7
	Identification of fill constraints related to floodplain and geotechnical investigation.	N/A

Approval and Permit Requirements: Checklist

	ITEM DESCRIPTION	LOCATION
√	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 Act. 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 6.3
√	Application for Certification of Approval (CofA) under the Ontario Water resources Act.	Section 6.2
√	Changes to Municipal Drains	Section 1.6
√	Other permits (National Capital Commission, Parks Canada, Public Works and Government Services Canada, Ministry of Transportation etc.)	Section 6.4

Conclusion Checklist

	ITEM DESCRIPTION	LOCATION
√	Clearly stated conclusions and recommendations	Section 7
	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 professional Engineer registered in Ontario.	Done

ABBOTT STREET

BLOCK 327
PARK

BLOCK 326

BLOCK 355

ROBERT GRANT AVENUE

BLOCK 324
PARK

BLOCK 325
SCHOOL

BLOCK 356

BLOCK 357
SCHOOL

BLOCK 397
STORMWATER
MANAGEMENT
FACILTY

BLOCK 399

FERNBANK ROAD

Scale
IBI
1:3000

Project Title
DESIGN BRIEF
CRT LANDS-PHASE 1
FERNBANK COMMUNITY

Drawing Title
DRAFT PLAN

Sheet No.
FIGURE 1.2

APPENDIX B

- **Figure 3.2 Existing Conditions – Fernbank Community Design Plan – Environmental Management Plan**
- **Municipal Drain By-Law**
- **January 31, 2017 E-mail from City of Ottawa**
- **December 9, 2013 E-mail from Rideau Valley Conservation Authority**
- **November 28, 2013 E-mail with the provincial Ministry of Environment Ottawa Office**
- **PTTW No. 3238-9TLP82**

FERNBANK COMMUNITY DESIGN PLAN

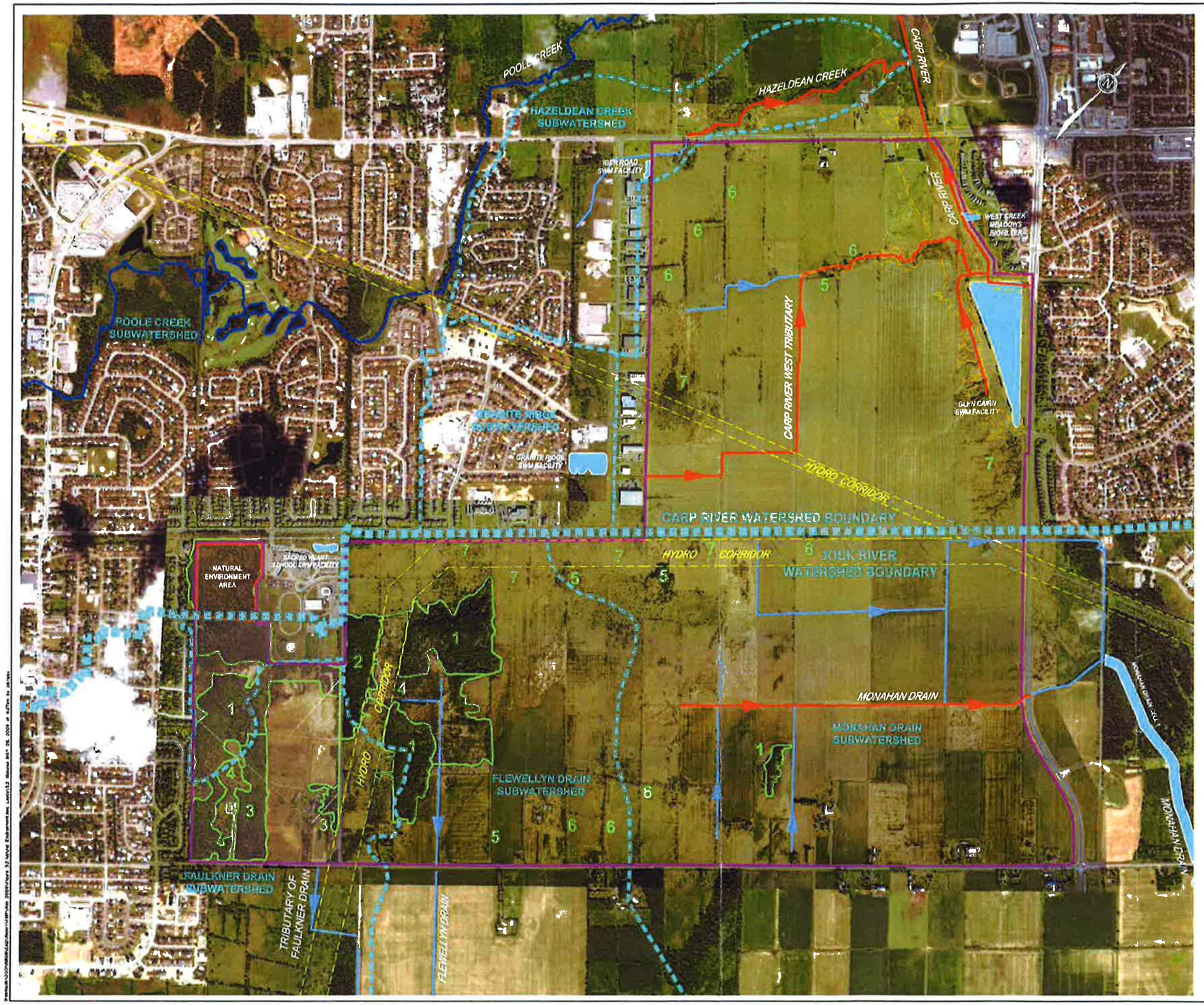
City of Ottawa

ENVIRONMENTAL MANAGEMENT PLAN

FIGURE 3.2

Existing Conditions

Natural Environment Features



STUDY AREA

AQUATIC FEATURES

- WARM WATER FORAGE FISH HABITAT
- DRAINAGE CHANNEL
  NOTE: OTHER ON-SITE CHANNELS CONTRIBUTE FLOW TO DOWNSTREAM FISH HABITAT
- CARP RIVER FLOOD PLAIN
- WATERSHED BOUNDARY

TERRESTRIAL FEATURES

- NATURAL ENVIRONMENT AREA
- AREA OF TERRESTRIAL FEATURE
- 1 WOODED AREA (CONIFEROUS)
- 2 WOODED AREA (MIXED SPECIES)
- 3 PINE PLANTATION
- 4 SCRUB AND THICKET
- 5 REMNANT HIGHER QUALITY TREES MAPLE, ASH and BASSWOOD
- 6 DECIDUOUS HEDGEROWS
- 7 MEADOW HABITAT
  USED BY FIELD SPECIES SUCH AS BOBOLINK, SAVANNAH SPARROWS, and UPLAND SANDPIPERS

SOURCE AND DATE OF AERIAL PHOTOS:
a) RENAISSANCE CDP LANDS, BASE MAPPING DG (JUNE 2008)
b) BACKGROUND COMMUNITY: DIGIDO IF EARTH MAP (YEAR VARIES)

0 50 100 200 400 600 Metres

SCALE : 1:6000 -B1 Sheet SEPTEMBER 2008
SCALE : Not to Scale -Report

NOVATECH ENGINEERING CONSULTANTS LTD.
ENGINEERS & PLANNERS

BY-LAW NO. 2011 - 311

A by-law of the City of Ottawa to provide for the partial abandonment of drainage works in the City of Ottawa - Flewellyn Municipal Drain.

WHEREAS the Flewellyn Municipal Drain By-law, being By-law 12-71 of the former Township of Goulbourn was passed pursuant to the *Drainage Act* (now R.S.O. 1990, D.17);

AND WHEREAS the lands of the former Township of Goulbourn are now included in the City of Ottawa by virtue of the *City of Ottawa Act, 1999*, S.O. 1999, c.14, Sch.E;

AND WHEREAS every by-law of the Township of Goulbourn is deemed to be a by-law of the City of Ottawa pursuant to Section 5(6) of the said *City of Ottawa Act, 1999*;

AND WHEREAS the City of Ottawa has received a request under Subsection 84(1) of the *Drainage Act* from not less than three-quarters of the owners of land assessed for benefit and owning not less than three-quarters of the area assessed for benefit, as shown in the Flewellyn Municipal Drain By-law, being By-law 12-71, asking for the abandonment of part of the drainage works, being that part of Branch #1 of the Flewellyn Municipal Drain between Stations 0+00 and 31+00;

AND WHEREAS all of the owners of the land assessed for the drainage works have been notified of the City's intention to abandon part of the drainage works pursuant to Subsection 84(1) of the *Drainage Act*;

AND WHEREAS no request for an engineer's report with respect to the part of the drainage works that is to be abandoned has been received pursuant to Subsections 84(1) and 84(3) of the *Drainage Act*;

AND WHEREAS Subsection 84(5) of the *Drainage Act* states that if no request for an engineer's report on the proposed abandonment is received by the clerk of the municipality, the council may by by-law abandon the drainage works and thereafter the municipality has no further obligation with respect to the abandoned drainage works;

AND WHEREAS there are no costs associated with respect to the part of the drainage works that is to be abandoned;

THEREFORE the Council of the City of Ottawa enacts as follows:

1. Branch #1 of the Flewellyn Municipal Drain from Station 0+00 and 31+00 is hereby abandoned and, pursuant to Subsection 84(5) of the *Drainage Act*, the City of Ottawa has no further obligation with respect thereto.

2. This by-law comes into force on the passing thereof and may be cited as the "Abandonment of Part of the Flewellyn Municipal Drain By-law, 2011".

ENACTED AND PASSED this 25th day of August, 2011.

CITY CLERK MAYOR

BY-LAW NO. 2011 - 311

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A by-law of the City of Ottawa to provide for the partial abandonment of drainage works in the City of Ottawa – Flewellyn Municipal Drain.

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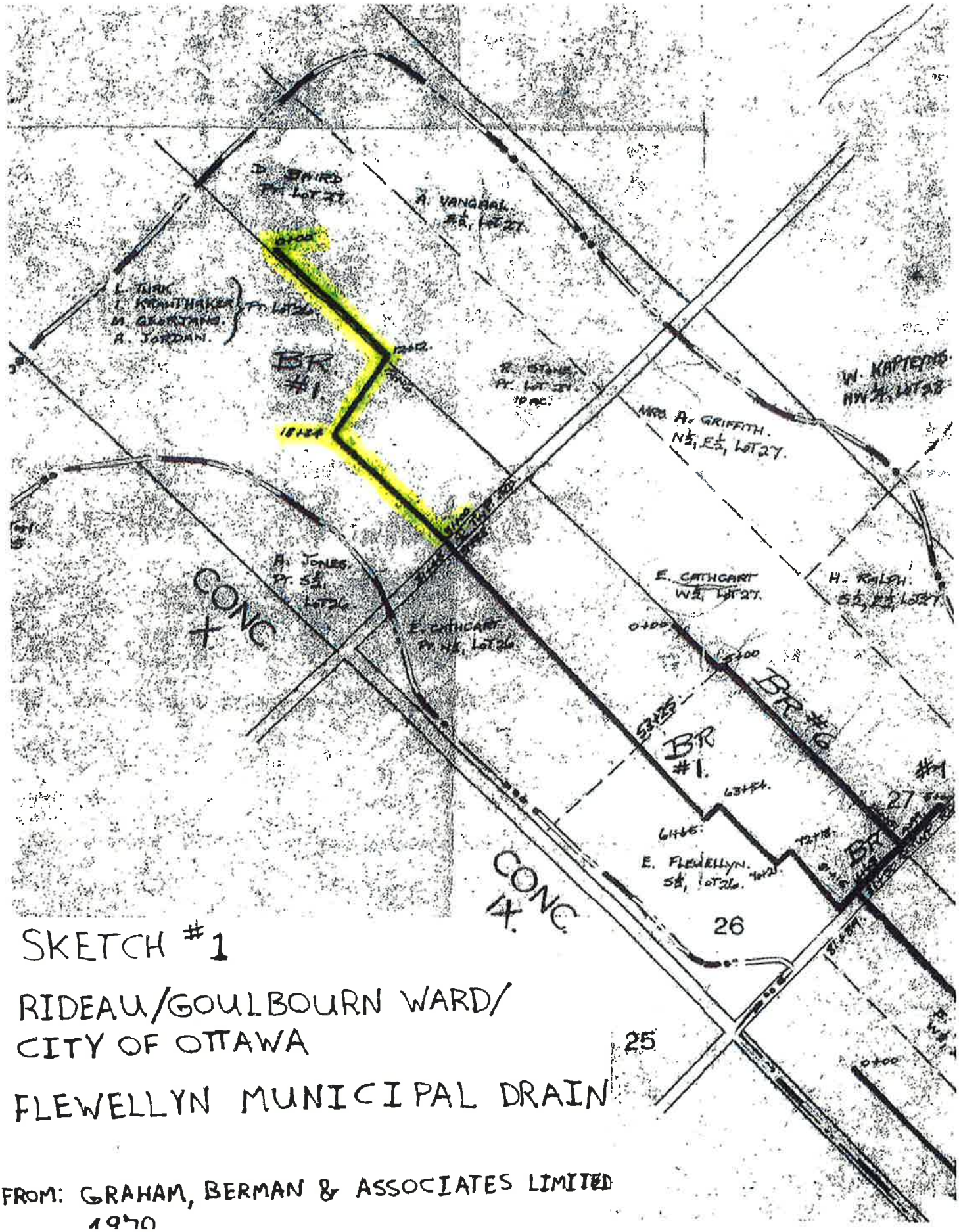
Enacted by City Council at its meeting of August 25, 2011.

-o-o-o-o-o-o-o-o-o-o-o-o-o-o-o-o-o-o-o-o-o-o-o-o-o-o-

LEGAL SERVICES
CLC/ G04-01 DRAIN

COUNCIL AUTHORITY:
Drainage Act, R.S.O. 1990, c. D.17, s. 84
(as amended by 2010, c.16, Sched.1, s.2)



SKETCH #1

RIDEAU/GOULBOURN WARD/
CITY OF OTTAWA

FLEWELLYN MUNICIPAL DRAIN

FROM: GRAHAM, BERMAN & ASSOCIATES LIMITED
1970

Jim Moffatt

To: Jim Moffatt
Subject: FW: 27970 - PDFs and Design sheet for City

Jim Moffatt

From: Balima, Nadege [mailto:Nadege.Balima@ottawa.ca]
Sent: Tuesday, January 31, 2017 3:39 PM
To: Jim Moffatt <jmoffatt@IBIGroup.com>
Cc: Jim Burghout <jim.burghout@claridgehomes.com>; Shawn Malhotra <shawn.malhotra@claridgehomes.com>; Karlinda Hinds <Karlinda.Hinds@ibigroup.com>; Shepherd, Jennifer <Jennifer.Shepherd@ottawa.ca>; Sweet, Louise <louise.sweet@ottawa.ca>
Subject: RE: 27970 - PDFs and Design sheet for City

Good morning Jim,
Sorry for the delay in responding. Below are the answers following our conversation a couple of weeks ago:

I – Sanitary Flows
The future flow allowance must consider at least 192 l/s (Liard PS rated capacity =108 l/s plus Area 6/Stittsville South Pump station rated capacity of 84 l/s). The total flow that was provided considered future flows beyond the current urban boundary.
CRT may therefore proceed if the future flow allowance is reduced to 192 l/s to alleviate current issues with the design.

Please let me know if you have questions.
Regards,

Nadège Balima, P.Eng., M.P.M., LEED Green Assoc.
Project Manager, Infrastructure Approvals
Development Review Services (West)
613.580.2424 ext. 13477

Jim Moffatt

From: Jim Moffatt
Sent: Monday, December 09, 2013 1:03 PM
To: 'Hal Stimson'
Cc: Jim Burghout
Subject: RE: CRT Developments

The planner on the file is Louise Sweet-Lindsey and the engineer reviewer is Eris Surprenant.
The City has the stormwater management report which includes the proposed pond 5 and improvements to the Flewellyn Drain. The first submission comments included the one relating to contact with the CA. The drain is a municipal drain and we have started the engineer's update report process. Thanks.
We'll make application for an extension of the current permit.

Jim Moffatt
Associate

IBI Group
400-333 Preston Street
Ottawa ON K1S 5N4 Canada

tel 613 225 1311
fax 613 225 9868
email jmoffatt@IBIGroup.com
web www.ibigroup.com

From: Hal Stimson [mailto:hal.stimson@rvca.ca]
Sent: Thursday, December 05, 2013 2:22 PM
To: Jim Moffatt
Cc: Jim Burghout
Subject: RE: CRT Developments

Hi Jim,
I have forwarded your e-mail to our Planning department staff in regard to the request from the City for assurance that RVCA has been involved. I'll let you know if there are any outstanding issues. Is there a particular contact person at the City?

In regards to the permits for drainage. The work for the new application would be an Alteration to a Watercourse application (assumes there is an existing watercourse) otherwise drainage & ditching if new and outleting to an existing watercourse. Based on the project description the fee should fall in the Major Project category of our Schedule B fee schedule ($2,185.00) which includes multiple residential units and stormwater management pond/cell. There could be additional technical report review fees depending on the need to review stormwater or other reports (if we haven't already). There is the possibility of breaking projects into multiple applications depending on timing of phasing/construction (pond, downstream channel improvements, etc.) Has the City reviewed the proposal to deepen the channel downstream of Fernbank? Is this still the Flewellyn Municipal Drain downstream? If so, it could require amendment to the engineers drainage report.

To reactive a permit that has expired I will need a new application form and submission of a letter confirming the project has not changed and all design drawings are the same as previously approved. The review fee is half of the current level for that type of project – in this instance $1,092.50.

As the previous permit was for abandonment and/or infill of the drains, one possible option would be to place plugs in the drains prior to the expiry of the permit. We would then consider them abandoned, however, this may not be feasible if outlet drainage is still required as a plug could result in standing water possibly impacting development or on-going agriculture. Just an option to think about – otherwise we can easily issue a new permit.

I hope this helps.

Regards,

Hal Stimson
Inspector,
Rideau Valley Conservation Authority
Box 599, 3889 Rideau Valley Drive
MANOTICK, Ont K4M 1A5
e-mail: hal.stimson@rvca.ca
613-692-3571 ext 1127 1-800-267-3504

From: Jim Moffatt [mailto:jmoffatt@IBIGroup.com]
Sent: Thursday, December 05, 2013 9:07 AM
To: Hal Stimson
Cc: Jim Burghout
Subject: CRT Developemnts

Hi Hal. As per my voice message, we have submitted our design package to the City for the first phase of the CRT Lands in Fernbank. Among other comments, the City wants insurances that the CA has reviewed the design package and are aware of the development. We are currently revising the drawings in accordance with the city comments and will copy you with the new package. I assume there are some draft conditions that RVCA in time must clear.
The works include a residential development consisting of about 350 units, a stormwater facility (Pond 5 as per the Fernbank MSS documents) and improvements to the outlet watercourse which is the Flewellyn Drain. As per the MSS report, the drain is proposed to be deepened for a distance of about 550m south of Fernbank Road to accommodate the development.
We are completing an application for the drain improvements, and am not sure what box to check in the Description of Works section: Drainage Works and ditching? Alteration to a watercourse? Etc. Also what the review fee might be.
We had earlier obtained a permit (No. RV5-04/12T) to fill existing ditches within the Flewellyn drainage basin north of Fernbank Road. That permit has an expire date of Feb 16, 2014. Since no works have yet started on the development we propose to apply for an extension and would like to confirm that process.
If any questions, just contact me.
Thanks.

Jim Moffatt
Associate

IBI Group
400-333 Preston Street
Ottawa ON K1S 5N4 Canada

tel 613 225 1311

Jim Moffatt

From: Jim Moffatt
Sent: Thursday, November 28, 2013 2:15 PM
To: 'Larkin, Lance (ENE)'
Subject: RE: CRT Development Fernbank Community Ottawa

Thanks. Appreciated.

Jim Moffatt
Associate

IBI Group
400-333 Preston Street
Ottawa ON K1S 5N4 Canada

tel 613 225 1311
fax 613 225 9868
email jmoffatt@IBIGroup.com
web www.ibigroup.com

From: Larkin, Lance (ENE) [mailto:Lance.Larkin@ontario.ca]
Sent: Thursday, November 28, 2013 11:22 AM
To: Jim Moffatt
Cc: MacDonald, Tara (ENE)
Subject: RE: CRT Development Fernbank Community Ottawa

Jim,

I believe one of our Drinking Water Inspectors provided some advice to IBI. I will look into to it will have someone call you back within 1 week. As for the PTTW, approval, I will flag the appropriate District Environmental Officer about this application.

Regards,

Lance Larkin | Senior Environmental Officer / Agent principal de l'environnement (#723)

Ontario Ministry of the Environment / Ministère de l'environnement de l'Ontario

Ottawa District Office / Bureau du district d'Ottawa

2430 Don Reid Drive / 2430, promenade Don Reid, Ottawa ON K1H 1E1

☎ 613-521-3450 x229 | 🖷 613-521-5437 | Toll free / sans frais: 1-800-860-2195 | Spill or Emergencies/ déversements ou urgences : 1 800 268-6060 | Pollution Hotline/ Ligne-info antipollution : 1 866 MOE-TIPS (1 866 663-8477)

From: Jim Moffatt [mailto:jmoffatt@IBIGroup.com]
Sent: November 26, 2013 8:27 AM
To: Larkin, Lance (ENE)
Cc: Surprenant, Eric; Jim Burghout
Subject: CRT Development Fernbank Community Ottawa

Hi Lance, you were referenced to me as a local MOE contact. IBI Group is assisting CRT Development Inc. (Claridge, Richcraft and Tamarack) with plans to develop its property in the Fernbank Community in Stittsville. Please refer to the attached information. We recently submitted engineering documents in support of the development application seeking approvals for sewers, watermains and a stormwater facility, including improvements to Flewellyn Drain, which is the proposed outlet for the pond. The works are in general accordance with the MSS document completed for the Fernbank Community. The City has asked that IBI contact the local MOE office to confirm what approvals are needed from the MOE for this development. We assume that the pond and Flewellyn Drain will need an ECA as a direct submission and that the sewers will require an ECA through the transfer program and that the watermains can be approved by the City as per Form 1 under MOE authorization 008-202. We are also in the process of submitting an application for a PTTW. If you like we can provide you with relevant background information and can meet with you as needed.
Cheers.

Jim Moffatt
Associate

IBI Group
400-333 Preston Street
Ottawa ON K1S 5N4 Canada

tel 613 225 1311
fax 613 225 9868
email jmoffatt@IBIGroup.com
web www.ibigroup.com

Ontario

Ministry of the Environment and Climate Change
Ministère de l'Environnement et de l'Action en matière de changement climatique

PERMIT TO TAKE WATER
Surface and Ground Water
NUMBER 3238-9TLP82

Pursuant to Section 34.1 of the Ontario Water Resources Act, R.S.O. 1990 this Permit To Take Water is hereby issued to:

CRT Development Inc.
Suite 2001 - 210 Gladstone Avenue
Ottawa, Ontario K2P 0Y6
Canada

For the water taking from:
Excavation Sump — Site Servicing — Phase 1,
Stormwater Management Pond,
Excavation Sump — Residential Basement Excavations,
Miscellaneous Site Ponding,
Excavation Sump — Site Servicing — Phase 2,
Excavation Sump — Site Servicing — Phase 3,
Excavation Sump — Site Servicing — Phase 4,
Excavation Sump — Site Servicing — Phase 5,
Excavation Sump — Site Servicing — Phase 6.

Located at: Lot 26 27 and 28, Concession 10 Goulbourn, Geographic Township of Goulbourn Ottawa

For the purposes of this Permit, and the terms and conditions specified below, the following definitions apply:

DEFINITIONS

(a) "Director" means any person appointed in writing as a Director pursuant to section 5 of the OWRA for the purposes of section 34.1, OWRA.

(b) "Provincial Officer" means any person designated in writing by the Minister as a Provincial Officer pursuant to section 5 of the OWRA.

(c) "Ministry" means Ontario Ministry of the Environment and Climate Change.

(d) "District Office" means the Ottawa District Office.

(e) "Permit" means this Permit to Take Water No. 3238-9TLP82 including its Schedules, if any, issued in accordance with Section 34.1 of the OWRA.

(f) "Permit Holder" means CRT Development Inc..

(g) "OWRA " means the *Ontario Water Resources Act,* R.S.O. 1990, c. O. 40, as amended.

You are hereby notified that this Permit is issued subject to the terms and conditions outlined below:

TERMS AND CONDITIONS

1. Compliance with Permit

1.1 Except where modified by this Permit, the water taking shall be in accordance with the application for this Permit To Take Water, dated September 30, 2014 and signed by Subhash Malhotra, and all Schedules included in this Permit.

1.2 The Permit Holder shall ensure that any person authorized by the Permit Holder to take water under this Permit is provided with a copy of this Permit and shall take all reasonable measures to ensure that any such person complies with the conditions of this Permit.

1.3 Any person authorized by the Permit Holder to take water under this Permit shall comply with the conditions of this Permit.

1.4 This Permit is not transferable to another person.

1.5 This Permit provides the Permit Holder with permission to take water in accordance with the conditions of this Permit, up to the date of the expiry of this Permit. This Permit does not constitute a legal right, vested or otherwise, to a water allocation, and the issuance of this Permit does not guarantee that, upon its expiry, it will be renewed.

1.6 The Permit Holder shall keep this Permit available at all times at or near the site of the taking, and shall produce this Permit immediately for inspection by a Provincial Officer upon his or her request.

1.7 The Permit Holder shall report any changes of address to the Director within thirty days of any such change. The Permit Holder shall report any change of ownership of the property for which this Permit is issued within thirty days of any such change. A change in ownership in the property shall cause this Permit to be cancelled.

2. General Conditions and Interpretation

2.1 Inspections
The Permit Holder must forthwith, upon presentation of credentials, permit a Provincial Officer to carry out any and all inspections authorized by the OWRA, the *Environmental Protection Act* , R.S.O. 1990, the *Pesticides Act* , R.S.O. 1990, or the *Safe Drinking Water Act,* S. O. 2002.

2.2 Other Approvals

The issuance of, and compliance with this Permit, does not:

(a) relieve the Permit Holder or any other person from any obligation to comply with any other applicable legal requirements, including the provisions of the *Ontario Water Resources Act* , and the *Environmental Protection Act* , and any regulations made thereunder; or

(b) limit in any way any authority of the Ministry, a Director, or a Provincial Officer, including the authority to require certain steps be taken or to require the Permit Holder to furnish any further information related to this Permit.

2.3 Information

The receipt of any information by the Ministry, the failure of the Ministry to take any action or require any person to take any action in relation to the information, or the failure of a Provincial Officer to prosecute any person in relation to the information, shall not be construed as:

(a) an approval, waiver or justification by the Ministry of any act or omission of any person that contravenes this Permit or other legal requirement; or

(b) acceptance by the Ministry of the information's completeness or accuracy.

2.4 Rights of Action

The issuance of, and compliance with this Permit shall not be construed as precluding or limiting any legal claims or rights of action that any person, including the Crown in right of Ontario or any agency thereof, has or may have against the Permit Holder, its officers, employees, agents, and contractors.

2.5 Severability

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

2.6 Conflicts

Where there is a conflict between a provision of any submitted document referred to in this Permit, including its Schedules, and the conditions of this Permit, the conditions in this Permit shall take precedence.

3. Water Takings Authorized by This Permit

3.1 **Expiry**

This Permit expires on **February 10, 2025**. No water shall be taken under authority of this Permit after the expiry date.

3.2 Amounts of Taking Permitted

The Permit Holder shall only take water from the source, during the periods and at the rates and amounts of taking specified in Table A. Water takings are authorized only for the purposes specified in Table A.

Table A

	Source Name / Description:	Source: Type:	Taking Specific Purpose:	Taking Major Category:	Max. Taken per Minute (litres):	Max. Num. of Hrs Taken per Day:	Max. Taken per Day (litres):	Max. Num. of Days Taken per Year:	Zone/ Easting/ Northing:
1	Excavation Sump — Site Servicing — Phase 1	Pond Dugout	Construction	Dewatering Construction	12,000	24	1,500,000	275	18 429650 5013140
2	SWMP	Pond Dugout	Construction	Dewatering Construction	10,000	24	4,500,000	250	18 429800 5012130
3	Excavation Sump — Residential Basement Excavations	Pond Dugout	Construction	Dewatering Construction	2,800	24	150,000	275	18 429650 5013140
4	Misc. Site Ponding	Pond Dugout	Construction	Dewatering Construction	2,800	24	150,000	175	18 429650 5013140
5	Excavation Sump — Site Servicing — Phase 2	Pond Dugout	Construction	Dewatering Construction	6,500	24	1,000,000	275	18 429875 5012805
6	Excavation Sump — Site Servicing — Phase 3	Pond Dugout	Construction	Dewatering Construction	6,500	24	1,000,000	275	18 430120 5012640
7	Excavation Sump — Site Servicing — Phase 4	Pond Dugout	Construction	Dewatering Construction	6,500	24	1,000,000	275	18 429090 5012965
8	Excavation Sump — Site Servicing — Phase 5	Pond Dugout	Construction	Dewatering Construction	6,500	24	1,000,000	275	18 429320 5012540
9	Excavation Sump — Site Servicing — Phase 6	Pond Dugout	Construction	Dewatering Construction	6,500	24	1,000,000	275	18 429475 5012340
						Total Taking:	7,300,000		

3.3 Notwithstanding Table A above, the Permit Holder shall ensure the total combined rate of water taking for all Phase 1 and the SWMP water takings do not exceed 7,300,000 litres per day.

3.4 Notwithstanding Table A above the Permit Holder shall ensure the total combined rate of water taking for Phase 2, Phase 3, Phase 4, Phase 5 and Phase 6 does not exceed 1,300,000 litres per day.

4. Monitoring

4.1 The Permit Holder shall maintain a record of all water takings. This record shall include the dates and times of water takings, the rates of taking and an estimated calculation of the total amounts of water taken per day for each day that water is taken under the authorization of this Permit. A separate record shall be maintained for each source. The Permit Holder shall keep all required records up to date and available at or near the site of the taking and shall produce the records immediately for inspection by a Provincial Officer upon his or her request.

5. Impacts of the Water Taking

5.1 Notification
The Permit Holder shall immediately notify the local District Office of any complaint arising from the taking of water authorized under this Permit and shall report any action which has been taken or is proposed with regard to such complaint. The Permit Holder shall immediately notify the local District Office if the taking of water is observed to have any significant impact on the surrounding waters. After hours, calls shall be directed to the Ministry's Spills Action Centre at 1-800-268-6060.

5.2 For Surface-Water Takings
The taking of water (including the taking of water into storage and the subsequent or simultaneous withdrawal from storage) shall be carried out in such a manner that streamflow is not stopped and is not reduced to a rate that will cause interference with downstream uses of water or with the natural functions of the stream.

For Groundwater Takings
If the taking of water is observed to cause any negative impact to other water supplies obtained from any adequate sources that were in use prior to initial issuance of a Permit for this water taking, the Permit Holder shall take such action necessary to make available to those affected, a supply of water equivalent in quantity and quality to their normal takings, or shall compensate such persons for their reasonable costs of so doing, or shall reduce the rate and amount of taking to prevent or alleviate the observed negative impact. Pending permanent restoration of the affected supplies, the Permit Holder shall provide, to those affected, temporary water supplies adequate to meet their normal requirements, or shall compensate such persons for their

reasonable costs of doing so.

If permanent interference is caused by the water taking, the Permit Holder shall restore the water supplies of those permanently affected.

5.3 Prevention of Adverse Effects:
The Permit Holder shall ensure the taking of water under authority of this Permit does not result in an adverse effect in area waters.

5.4 The taking of water shall be carried out in such a manner as to prevent the disruption or removal of any fish, invertebrates or sediment from the watercourse.

5.5 Prevention of Structural Adverse Effects:
The Permit Holder shall take all measures necessary to prevent damage to buildings, bridges, structures, roads and/or railway lines that may be impacted either directly or indirectly by this taking.

5.6 Discharge Control Measures:
Any discharge of water to the land surface shall use a multi-barrier approach to control erosion and run-off prior to the discharge water entering a watercourse. Siltation control measures shall be installed at the discharge site(s) and shall be sufficient to control the volumes. Continuous care shall be taken to properly maintain the siltation control devices.

5.7 The discharge of water shall be controlled in such a way as to avoid erosion and sedimentation in any receiving stream.

5.8 The Permit Holder shall ensure that any water discharged to the natural environment does not result in scouring, erosion or physical alteration of stream channels or banks and that there is no flooding in the receiving area or water body, downstream water bodies, ditches or properties caused or worsened by this discharge.

5.9 The Permit Holder shall not discharge turbid water to any watercourse. Turbid water shall be defined as any discharge water from the excavation or diverted water with a maximum increase of 8 NTUs above the receiving stream's background levels.

5.10 Discharged Water to the Sanitary or Storm Sewer System:
The Permit Holder shall ensure that any water that is taken for dewatering purposes and discharged to the City of Ottawa sewer system is in accordance with a City of Ottawa Sewer Use Agreement.

6. Director May Amend Permit
The Director may amend this Permit by letter requiring the Permit Holder to suspend or reduce

the taking to an amount or threshold specified by the Director in the letter. The suspension or reduction in taking shall be effective immediately and may be revoked at any time upon notification by the Director. This condition does not affect your right to appeal the suspension or reduction in taking to the Environmental Review Tribunal under the *Ontario Water Resources Act* , Section 100 (4).

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

1. Condition 1 is included to ensure that the conditions in this Permit are complied with and can be enforced.

2. Condition 2 is included to clarify the legal interpretation of aspects of this Permit.

3. Conditions 3 through 6 are included to protect the quality of the natural environment so as to safeguard the ecosystem and human health and foster efficient use and conservation of waters. These conditions allow for the beneficial use of waters while ensuring the fair sharing, conservation and sustainable use of the waters of Ontario. The conditions also specify the water takings that are authorized by this Permit and the scope of this Permit.

*In accordance with Section 100 of the Ontario Water Resources Act, R.S.O. 1990, you may by written notice served upon me, the Environmental Review Tribunal and the Environmental Commissioner, **Environmental Bill of Rights**, R.S.O. 1993, Chapter 28, within 15 days after receipt of this Notice, require a hearing by the Tribunal. The Environmental Commissioner will place notice of your appeal on the Environmental Registry. Section 101 of the Ontario Water Resources Act, as amended provides that the Notice requiring a hearing shall state:*

1. The portions of the Permit or each term or condition in the Permit in respect of which the hearing is required, and;
2. The grounds on which you intend to rely at the hearing in relation to each portion appealed.

In addition to these legal requirements, the Notice should also include:

3. The name of the appellant;
4. The address of the appellant;
5. The Permit to Take Water number;
6. The date of the Permit to Take Water;
7. The name of the Director;
8. The municipality within which the works are located;

This notice must be served upon:

The Secretary
Environmental Review Tribunal
655 Bay Street, 15th Floor
Toronto ON
M5G 1E5
Fax: (416) 314-4506
Email:
ERTTribunalsecretary@ontario.ca

AND

The Environmental Commissioner
1075 Bay Street
6th Floor, Suite 605
Toronto, Ontario M5S 2W5

AND

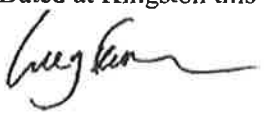
The Director, Section 34.1,
Ministry of the Environment and Climate Change
1259 Gardiners Rd, PO Box 22032
Kingston, ON
K7P 3J6

Further information on the Environmental Review Tribunal's requirements for an appeal can be obtained directly from the Tribunal:

by telephone at (416) 314-4600 ***by fax at (416) 314-4506*** ***by e-mail at www.ert.gov.on.ca***

*This instrument is subject to Section 38 of the **Environmental Bill of Rights** that allows residents of Ontario to seek leave to appeal the decision on this instrument. Residents of Ontario may seek to appeal for 15 days from the date this decision is placed on the Environmental Registry. By accessing the Environmental Registry, you can determine when the leave to appeal period ends.*

Dated at Kingston this 13th day of March, 2015.



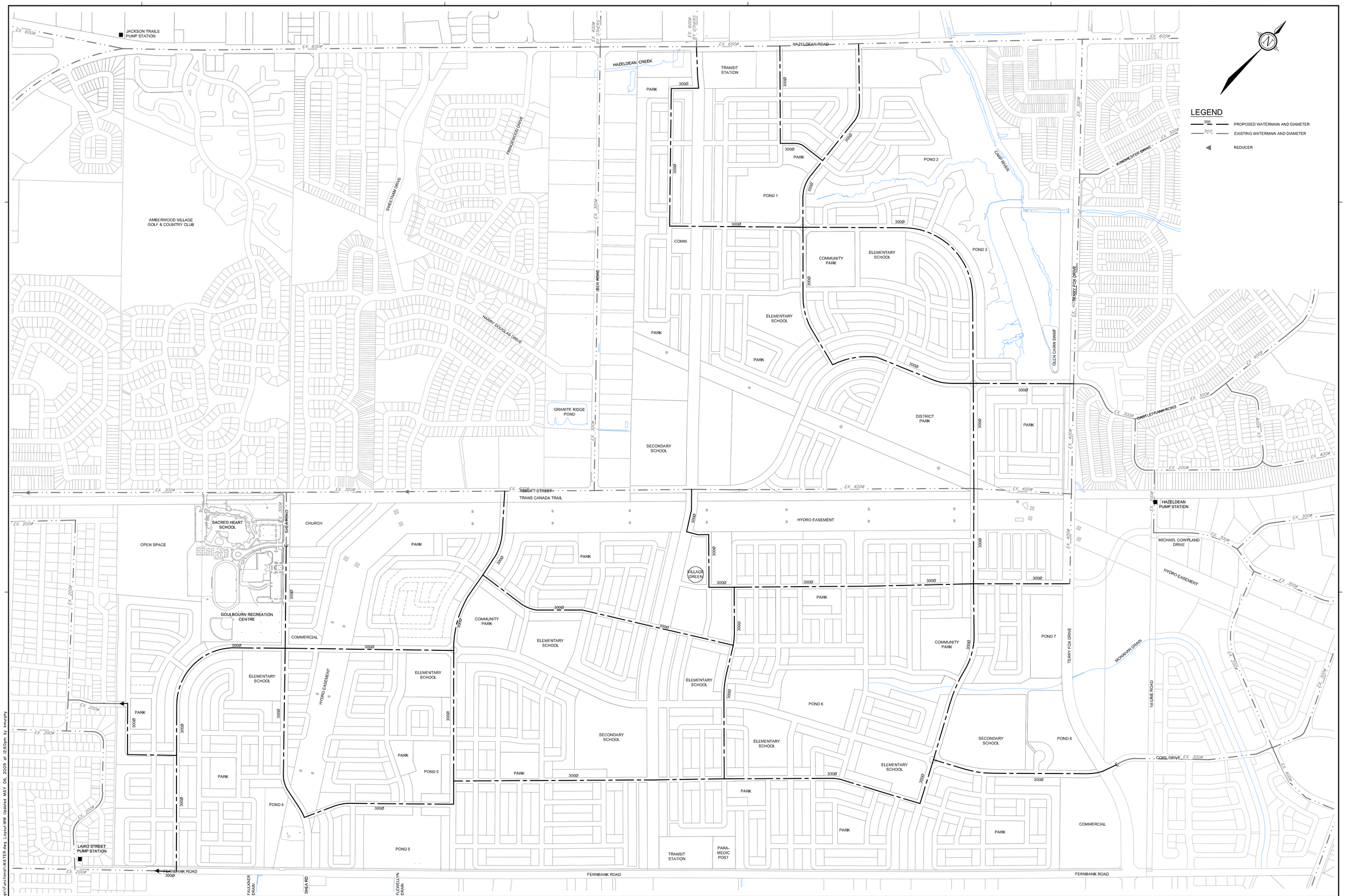
Greg Faaren
Director, Section 34.1
Ontario Water Resources Act , R.S.O. 1990

Schedule A

This Schedule "A" forms part of Permit To Take Water 3238-9TLP82, dated March 13, 2015.

APPENDIX C

- **MSS Water Plan**
- **Hydraulic Analysis**
- **Boundary Conditions**



NOTE:
THE POSITION OF ALL POLE LINES, CONDUITS, WATERMAINS, SEWERS AND OTHER UNDERGROUND AND OVERGROUND UTILITIES AND STRUCTURES IS NOT NECESSARILY SHOWN ON THE CONTRACT DRAWINGS, AND WHERE SHOWN, THE ACCURACY OF THE POSITION OF SUCH UTILITIES AND STRUCTURES IS NOT GUARANTEED. BEFORE STARTING WORK, DETERMINE THE EXACT LOCATION OF ALL SUCH UTILITIES AND STRUCTURES AND ASSUME ALL LIABILITY FOR DAMAGE TO THEM.

No.	REVISION	DATE	BY
3	ISSUED WITH MASTER SERVICING STUDY	MAY 25/09	MAB
2	UPDATED WITH DRAFT MASTER SERVICING STUDY	SEP 12/08	MAB
1	ISSUED WITH DRAFT MASTER SERVICING STUDY	MAY 02/08	MAB

LICENSED PROFESSIONAL ENGINEER M.A. BISSETT PROVINCE OF ONTARIO

REGISTERED PROFESSIONAL ENGINEER J.G. RIDDELL PROVINCE OF ONTARIO

NOVATECH ENGINEERING CONSULTANTS LTD.
ENGINEERS & PLANNERS
Suite 200, 240 Michael Cowpland Drive
Ottawa, Ontario, Canada
K2M 1P6
Telephone (613) 254-9643
Facsimile (613) 254-5867
Email novainfo@novatech-eng.com

DESIGN	KJM
CHECKED	MAB
DRAWN	KJM
CHECKED	MAB
APPROVED	JGR

SCALE
1 : 5000

CITY OF OTTAWA
FERNBANK CDP

WATERMAIN LAYOUT

PROJECT No. 101108-00
DATE OCTOBER 2007
DRAWING No. 101108-WM

PLANELDWG - 1000mmX700mm

Drawing:M:\2001\01008\CAD\design\Functional\WATER.dwg Layout:WM Updated: May 06, 2009 at 12:50pm by kmurphy

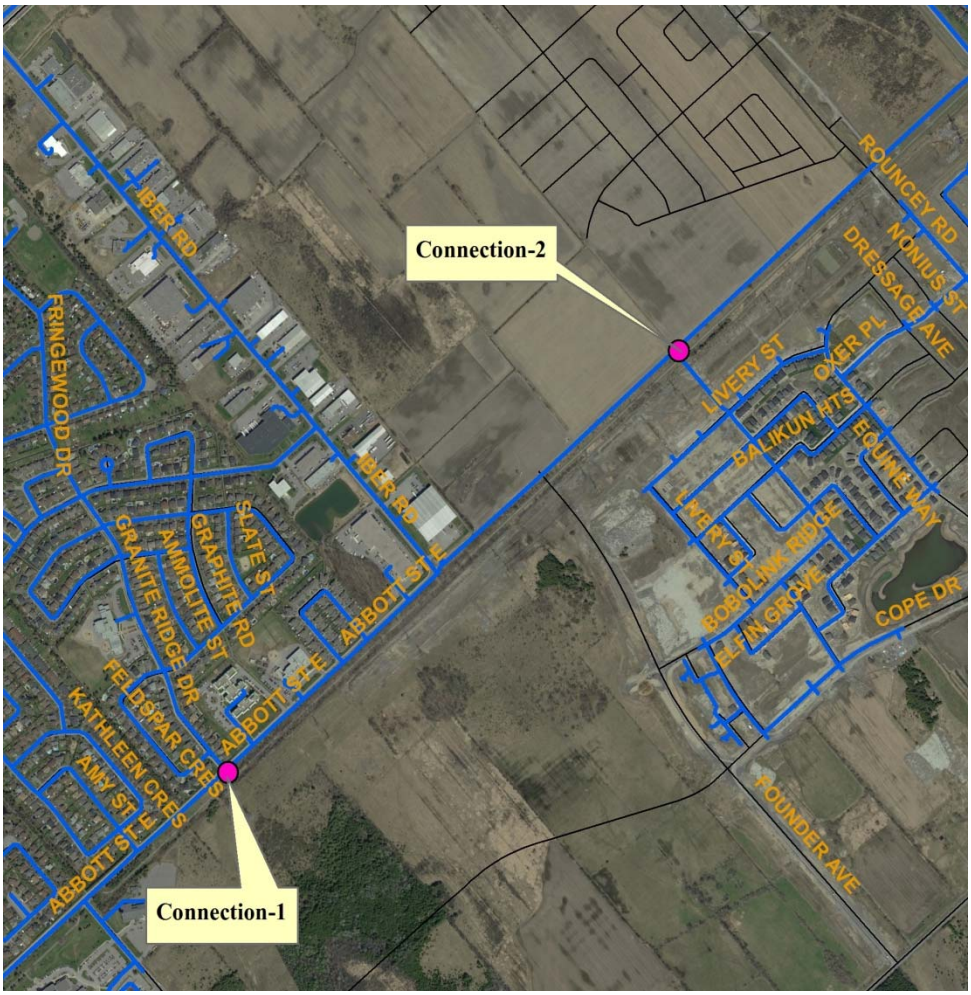
Boundary Conditions at CRT Lands

Information Provided:

Date provided: 16 Nov 2016

Criteria	Demand (L/s)
Average Demand	16.9
Maximum Daily Demand	36.9
Peak Hourly Demand	77.8
Fire Flow Demand	167
Fire Flow Demand	225
Maximum Daily + Fire Flow Demand	204 & 262

Location:



Results

Connection1:

Criteria	Head (m)	Pressure (psi)
Max HGL	161.1	75.8
PKHR	154.7	66.7
MXDY + Fire Flow (204 L/s)	152.8	64
MXDY + Fire Flow (262 L/s)	150.6	60.9

Connection2:

Criteria	Head (m)	Pressure (psi)
Max HGL	161.4	85.4
PKHR	154.8	76.0
MXDY + Fire Flow (204 L/s)	153	73.4
MXDY + Fire Flow (262 L/s)	150.9	70.5

Considerations

1. According to the City of Ottawa Water Design Guidelines as well as the Ontario Building Code, the maximum pressure at any point within a distribution system shall not exceed 80 psi in occupied areas. Measures should be taken to try to reduce the residual pressure below 80 psi without the use of special pressure control equipment. In circumstances where the residual pressure cannot be reduced below 80 psi without the use of pressure control equipment, a pressure reducing valve (**PRV**) should be installed at site.

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.

IBI GROUP
333 PRESTON STREET
OTTAWA, ON
K1S 5N4

WATERMAIN DEMAND CALCULATION SHEET

PROJECT : **CRT LANDS**
LOCATION : **CITY OF OTTAWA**
DEVELOPER : **CRT DEVELOPMENT INC.**

FILE: 27970.5.7
DATE: 2/9/2017
DESIGN: LME

NODE	RESIDENTIAL UNITS SF	RESIDENTIAL UNITS TH	RESIDENTIAL POP'N	NON-RESIDENTIAL COM (Ha)	NON-RESIDENTIAL IND (Ha)	NON-RESIDENTIAL INS (Ha)	AVERAGE DAILY DEMAND (l/s) Res.	AVERAGE DAILY DEMAND (l/s) Non-res.	AVERAGE DAILY DEMAND (l/s) Total	MAXIMUM DAILY DEMAND (l/s) Res.	MAXIMUM DAILY DEMAND (l/s) Non-res.	MAXIMUM DAILY DEMAND (l/s) Total	MAXIMUM HOURLY DEMAND (l/s) Res.	MAXIMUM HOURLY DEMAND (l/s) Non-res.	MAXIMUM HOURLY DEMAND (l/s) Total	FIRE DEMAND (l/s)
CLA-02	15		51				0.21		0.21	0.52		0.52	1.14		1.14	166.7
CLA-03	14		48				0.19		0.19	0.48		0.48	1.06		1.06	166.7
CLA-04	9		31				0.12		0.12	0.31		0.31	0.68		0.68	166.7
CLA-05	8		27				0.11		0.11	0.28		0.28	0.61		0.61	166.7
CLA-06		17	46				0.19		0.19	0.46		0.46	1.02		1.02	166.7
CLA-07	2	15	47				0.19		0.19	0.48		0.48	1.05		1.05	166.7
CLA-08	17		58				0.23		0.23	0.59		0.59	1.29		1.29	166.7
CLA-09	9		31				0.12		0.12	0.31		0.31	0.68		0.68	166.7
CLA-10	17		58				0.23		0.23	0.59		0.59	1.29		1.29	166.7
CLA-11	16		54				0.22		0.22	0.55		0.55	1.21		1.21	166.7
CLA-12	11		37				0.15		0.15	0.38		0.38	0.83		0.83	166.7
CLA-13	20		68				0.28		0.28	0.69		0.69	1.52		1.52	166.7
CLA-14		28	76				0.31		0.31	0.77		0.77	1.68		1.68	166.7
CLA-15		30	81				0.33		0.33	0.82		0.82	1.80		1.80	166.7
CLA-16			170				0.69		0.69	1.72		1.72	3.79		3.79	166.7
CLA-20		24	65				0.26		0.26	0.66		0.66	1.44		1.44	166.7
CLA-21		13	35				0.14		0.14	0.36		0.36	0.78		0.78	166.7
CLA-22	14		48				0.19		0.19	0.48		0.48	1.06		1.06	166.7
CLA-23		9	24				0.10		0.10	0.25		0.25	0.54		0.54	166.7
CLA-24	13		44				0.18		0.18	0.45		0.45	0.98		0.98	166.7
CLA-25	6		20				0.08		0.08	0.21		0.21	0.45		0.45	166.7
CLA-26			109				0.44		0.44	1.10		1.10	2.43		2.43	166.7
CLA-27	9		31				0.12		0.12	0.31		0.31	0.68		0.68	166.7
CLA-28	18		61				0.25		0.25	0.62		0.62	1.36		1.36	166.7
CLA-28A			68				0.28		0.28	0.69		0.69	1.52		1.52	
CLA-29	7		24				0.10		0.10	0.24		0.24	0.53		0.53	166.7
CLA-30	10		34				0.14		0.14	0.34		0.34	0.76		0.76	166.7
CLA-31	12		41				0.17		0.17	0.41		0.41	0.91		0.91	166.7
CLA-32	15		51				0.21		0.21	0.52		0.52	1.14		1.14	166.7
CLA-32A			68				0.28		0.28	0.69		0.69	1.52		1.52	
CLA-33	12		41				0.17		0.17	0.41		0.41	0.91		0.91	166.7
CLA-34	16		54				0.22		0.22	0.55		0.55	1.21		1.21	166.7
CLA-35	5		17				0.07		0.07	0.17		0.17	0.38		0.38	166.7
CLA-36	13		44			2.88	0.18	1.67	1.85	0.45	2.50	2.95	0.98	4.50	5.48	225.0
CLA-37	16		54				0.22		0.22	0.55		0.55	1.21		1.21	166.7
CLA-38	8		27			6.53	0.11	3.78	3.89	0.28	5.67	5.94	0.61	10.20	10.81	225.0
CLA-54	11		37				0.15		0.15	0.38		0.38	0.83		0.83	166.7
CLA-55		30	81				0.33		0.33	0.82		0.82	1.80		1.80	166.7
TOTALS	**323**	**166**	**1962**			**9.41**			**13.39**			**28.04**			**58.41**	

ASSUMPTIONS

RESIDENTIAL DENSITIES

- SF 3.4 p/p/u
- TH 2.7 p/p/u
- High Density 90.0 p/p/ha

AVERAGE DAILY DEMAND

- Residential 350 l/cap/day
- Commercial 30,000 l/ha/day
- Industrial 35,000 l/ha/day
- Institutional 50,000 l/ha/day

MAXIMUM DAILY DEMAND

- Residential 875 l/cap/day
- Commercial 45,000 l/ha/day
- Industrial 52,500 l/ha/day
- Institutional 75,000 l/ha/day

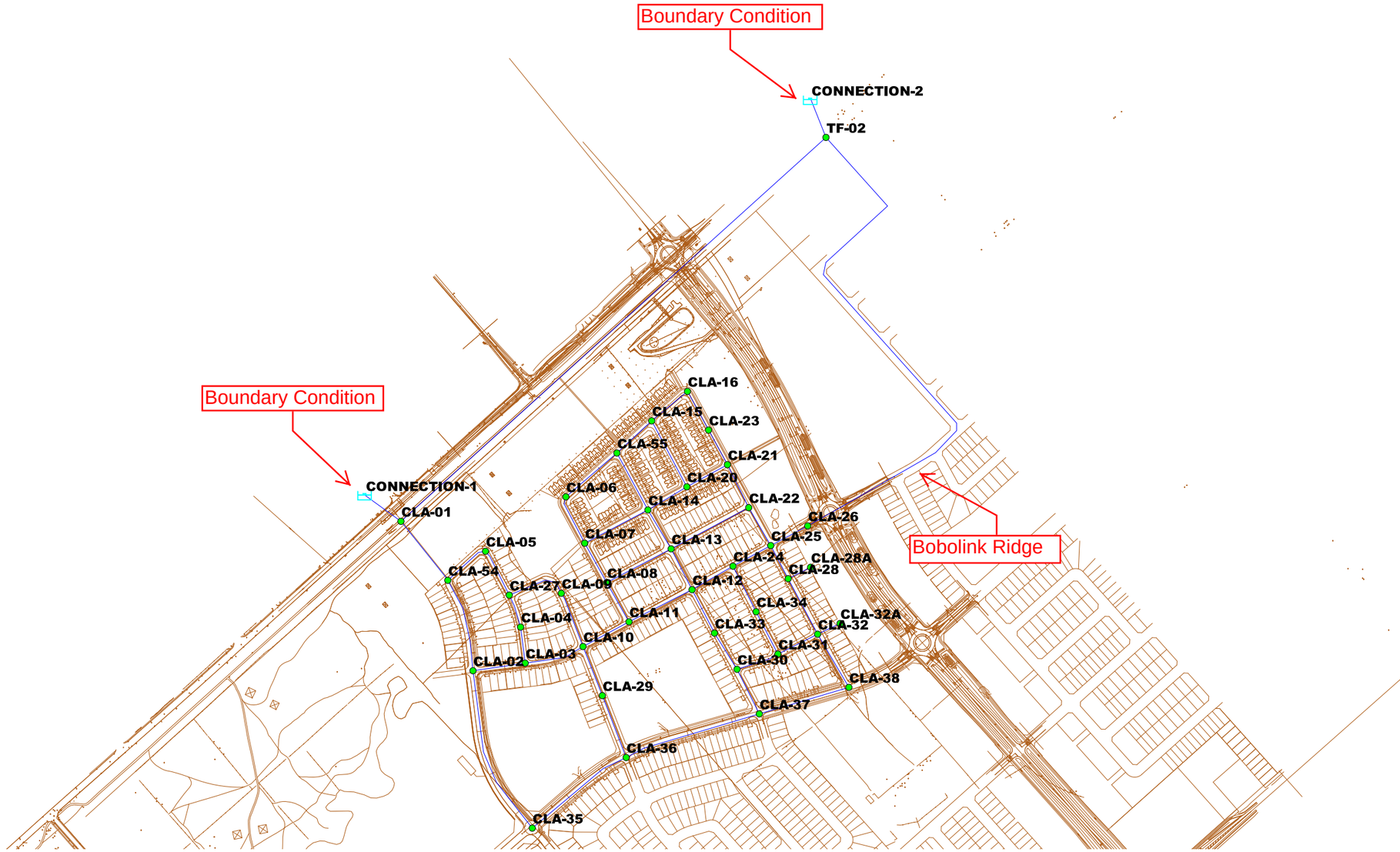
MAXIMUM HOURLY DEMAND

- Residential 1,925 l/cap/day
- Commercial 81,000 l/ha/day
- Industrial 94,500 l/ha/day
- Institutional 135,000 l/ha/day

FIRE DEMANDS

- SF 166.7 l/s
- TH 166.7 l/s
- ICI 225.0 l/s

Phase 1 Node ID's

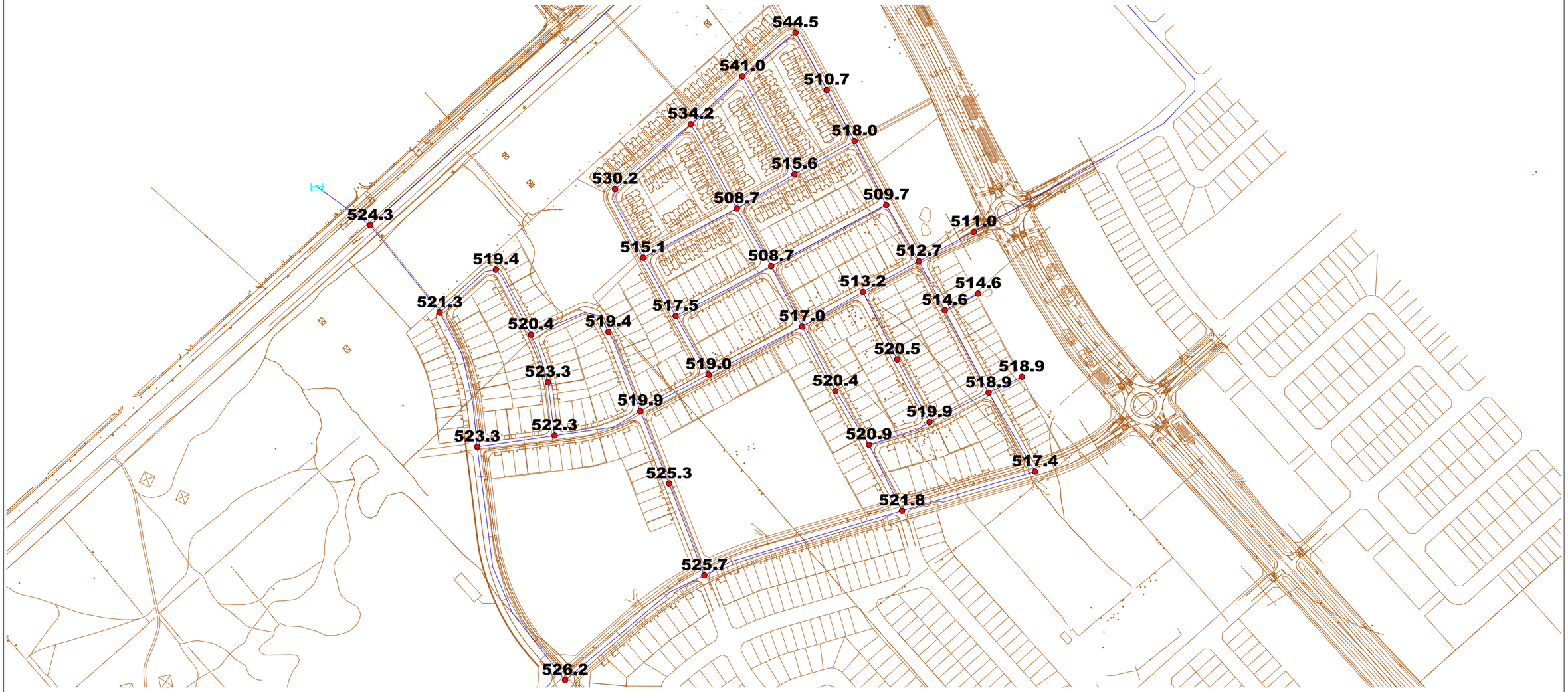


Date: Thursday, February 09, 2017

Phase 1 Pipe Sizes

Date: Thursday, February 09, 2017

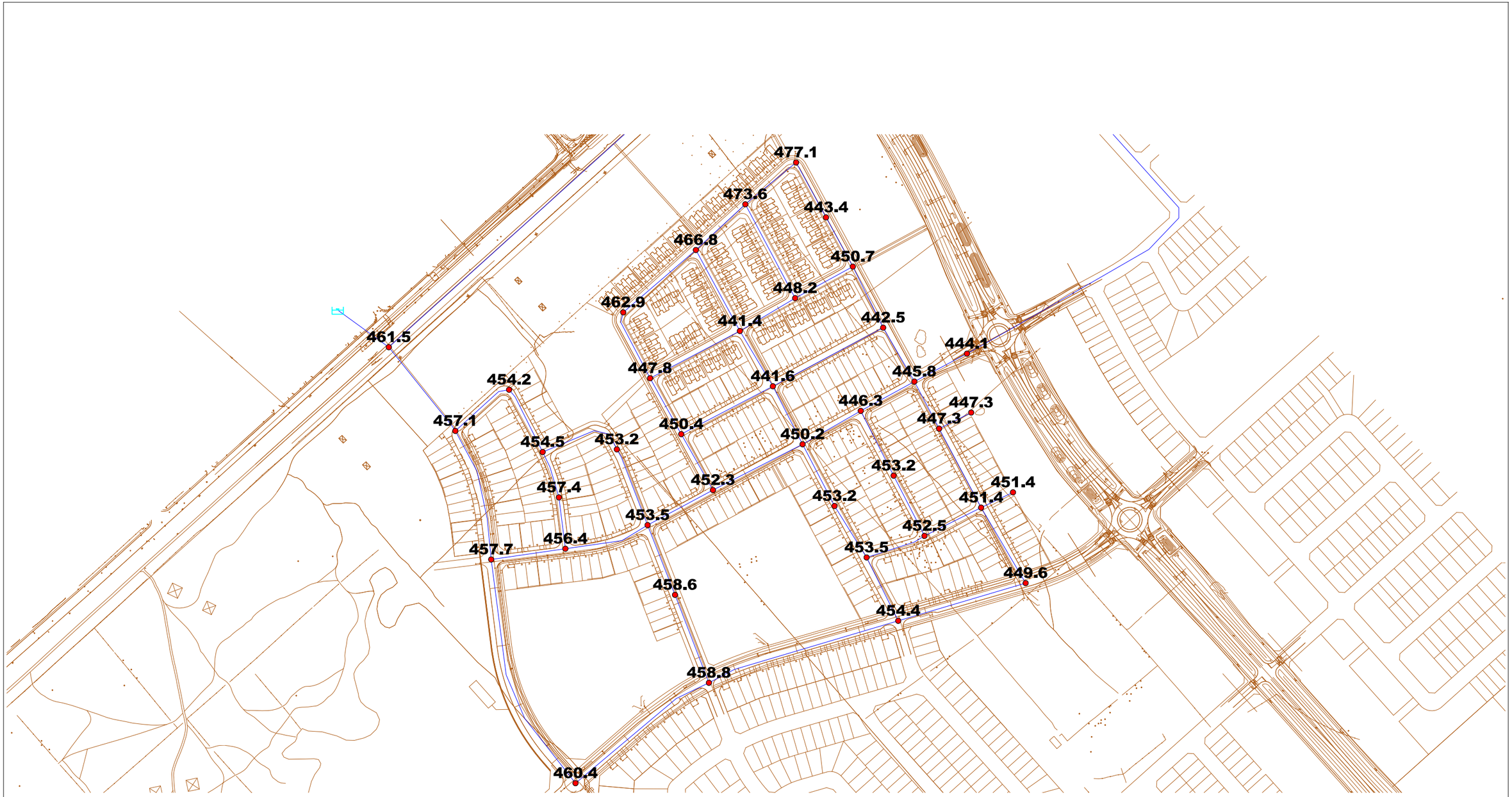
Basic Day (MAX HGL) Pressures (kPa)



Prepared By:

Date: Thursday, February 09, 2017

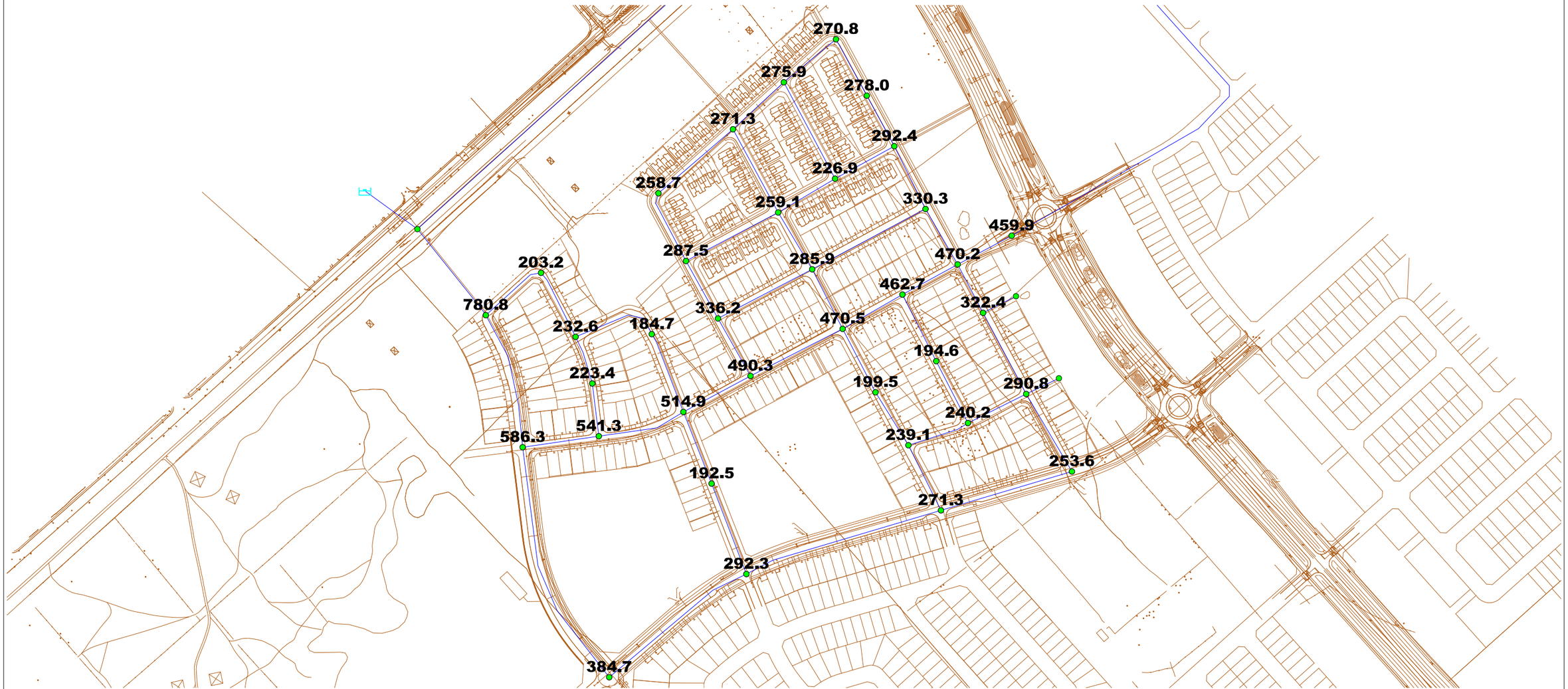
Peak Hour Pressures (kPa)



Prepared By:

Date: Thursday, February 09, 2017

Max Day + Fire - Residential Fire Flows (l/s)



Prepared By:

Date: Thursday, February 09, 2017

Max Day + Fire ICI - Fireflow Design Report (l/s)

Date: Thursday, February 09, 2017

Basic Day (Max HGL) - Junction Report

		ID	Demand (L/s)	Elevation (m)	Head (m)	Pressure (kPa)
1		CLA-01	0.00	107.60	161.10	524.26
2		CLA-02	0.21	107.70	161.10	523.30
3		CLA-03	0.19	107.80	161.10	522.34
4		CLA-04	0.12	107.70	161.10	523.32
5		CLA-05	0.11	108.10	161.10	519.38
6		CLA-06	0.19	107.00	161.11	530.24
7		CLA-07	0.19	108.55	161.11	515.05
8		CLA-08	0.23	108.30	161.11	517.50
9		CLA-09	0.12	108.10	161.10	519.40
10		CLA-10	0.23	108.05	161.11	519.91
11		CLA-11	0.22	108.15	161.11	518.97
12		CLA-12	0.15	108.35	161.11	517.05
13		CLA-13	0.28	109.20	161.11	508.70
14		CLA-14	0.31	109.20	161.11	508.69
15		CLA-15	0.33	105.90	161.11	541.03
16		CLA-16	0.69	105.55	161.11	544.46
17		CLA-20	0.26	108.50	161.11	515.55
18		CLA-21	0.14	108.25	161.11	518.03
19		CLA-22	0.19	109.10	161.12	509.72
20		CLA-23	0.10	109.00	161.11	510.67
21		CLA-24	0.18	108.75	161.12	513.17
22		CLA-25	0.08	108.80	161.12	512.74
23		CLA-26	0.44	109.00	161.14	510.95
24		CLA-27	0.12	108.00	161.10	520.37
25		CLA-28	0.25	108.60	161.12	514.62
26		CLA-28A	0.28	108.60	161.12	514.62
27		CLA-29	0.10	107.50	161.10	525.27
28		CLA-30	0.14	107.95	161.11	520.89
29		CLA-31	0.17	108.05	161.11	519.92
30		CLA-32	0.21	108.15	161.11	518.94
31		CLA-32A	0.28	108.15	161.11	518.94
32		CLA-33	0.17	108.00	161.11	520.43
33		CLA-34	0.22	108.00	161.11	520.45
34		CLA-35	0.07	107.40	161.10	526.24
35		CLA-36	1.85	107.45	161.10	525.72
36		CLA-37	0.22	107.85	161.10	521.81
37		CLA-38	3.89	108.30	161.10	517.38
38		CLA-54	0.15	107.90	161.10	521.33
39		CLA-55	0.33	106.60	161.11	534.17
40		TF-02	0.00	108.00	161.40	523.27

Peak Hour - Junction Report

		ID	Demand (L/s)	Elevation (m)	Head (m)	Pressure (kPa)
1		CLA-01	0.00	107.60	154.70	461.54
2		CLA-02	1.14	107.70	154.41	457.73
3		CLA-03	1.06	107.80	154.37	456.39
4		CLA-04	0.68	107.70	154.38	457.38
5		CLA-05	0.61	108.10	154.46	454.25
6		CLA-06	1.02	107.00	154.24	462.93
7		CLA-07	1.05	108.55	154.25	447.82
8		CLA-08	1.29	108.30	154.27	450.45
9		CLA-09	0.68	108.10	154.35	453.20
10		CLA-10	1.29	108.05	154.33	453.53
11		CLA-11	1.21	108.15	154.30	452.27
12		CLA-12	0.83	108.35	154.29	450.21
13		CLA-13	1.52	109.20	154.26	441.56
14		CLA-14	1.68	109.20	154.24	441.38
15		CLA-15	1.80	105.90	154.24	473.65
16		CLA-16	3.79	105.55	154.24	477.08
17		CLA-20	1.44	108.50	154.24	448.21
18		CLA-21	0.78	108.25	154.25	450.74
19		CLA-22	1.06	109.10	154.26	442.54
20		CLA-23	0.54	109.00	154.24	443.36
21		CLA-24	0.98	108.75	154.29	446.28
22		CLA-25	0.45	108.80	154.29	445.80
23		CLA-26	2.43	109.00	154.32	444.12
24		CLA-27	0.68	108.00	154.38	454.49
25		CLA-28	1.36	108.60	154.25	447.33
26		CLA-28A	1.52	108.60	154.25	447.31
27		CLA-29	0.53	107.50	154.30	458.61
28		CLA-30	0.76	107.95	154.23	453.47
29		CLA-31	0.91	108.05	154.23	452.48
30		CLA-32	1.14	108.15	154.21	451.37
31		CLA-32A	1.52	108.15	154.21	451.36
32		CLA-33	0.91	108.00	154.25	453.20
33		CLA-34	1.21	108.00	154.25	453.17
34		CLA-35	0.38	107.40	154.39	460.42
35		CLA-36	5.48	107.45	154.27	458.83
36		CLA-37	1.21	107.85	154.22	454.38
37		CLA-38	10.81	108.30	154.18	449.60
38		CLA-54	0.83	107.90	154.55	457.11
39		CLA-55	1.80	106.60	154.24	466.80
40		TF-02	0.00	108.00	154.80	458.60

Max Day + Fire - Fireflow Design Report

		ID	Total Demand (L/s)	Critical Node 1 ID	Critical Node 1 Pressure (kPa)	Critical Node 1 Head (m)	Adjusted Fire-Flow (L/s)	Available Flow @Hydrant (L/s)	Critical Node 2 ID	Critical Node 2 Pressure (kPa)	Critcal Node 2 Head (m)	Adjusted Available Flow (L/s)	Design Flow (L/s)
1		CLA-02	167.19	CLA-14	396.31	148.14	630.98	586.28	CLA-02	139.97	121.98	586.28	586.28
2		CLA-03	167.15	CLA-14	392.70	147.87	586.75	541.31	CLA-03	139.97	122.08	541.31	541.31
3		CLA-04	166.98	CLA-04	263.96	134.64	223.39	223.39	CLA-04	139.96	121.98	223.39	223.39
4		CLA-05	166.95	CLA-05	229.91	131.56	203.20	203.20	CLA-05	139.96	122.38	203.20	203.20
5		CLA-06	167.13	CLA-06	306.72	138.30	258.66	258.68	CLA-06	139.96	121.28	258.69	258.66
6		CLA-07	167.15	CLA-07	320.91	141.30	287.47	287.47	CLA-07	139.96	122.83	287.47	287.47
7		CLA-08	167.26	CLA-08	349.21	143.94	336.17	336.17	CLA-08	139.96	122.58	336.17	336.17
8		CLA-09	166.98	CLA-09	190.07	127.50	184.72	184.72	CLA-09	139.96	122.38	184.72	184.72
9		CLA-10	167.26	CLA-14	387.92	147.64	541.97	514.93	CLA-10	139.96	122.33	514.94	514.94
10		CLA-11	167.22	CLA-14	382.73	147.21	500.77	490.29	CLA-11	139.96	122.43	490.29	490.29
11		CLA-12	167.05	CLA-13	381.53	147.28	491.15	470.51	CLA-12	139.96	122.63	470.52	470.52
12		CLA-13	167.36	CLA-13	316.09	141.46	285.92	285.92	CLA-13	139.96	123.48	285.92	285.92
13		CLA-14	167.44	CLA-14	294.92	139.30	259.10	259.13	CLA-14	139.96	123.48	259.13	259.10
14		CLA-15	167.49	CLA-15	327.60	139.33	275.89	275.89	CLA-15	139.96	120.18	275.89	275.89
15		CLA-16	168.39	CLA-16	324.52	138.67	270.80	270.83	CLA-16	139.96	119.83	270.83	270.80
16		CLA-20	167.33	CLA-20	263.36	135.38	226.86	226.86	CLA-20	139.96	122.78	226.87	226.86
17		CLA-21	167.03	CLA-21	325.97	141.51	292.36	292.36	CLA-21	139.96	122.53	292.36	292.36
18		CLA-22	167.15	CLA-22	340.75	143.87	330.26	330.26	CLA-22	139.96	123.38	330.26	330.26
19		CLA-23	166.92	CLA-23	311.50	140.79	278.00	278.00	CLA-23	139.96	123.28	278.00	278.00
20		CLA-24	167.12	CLA-24	381.05	147.64	462.70	462.70	CLA-24	139.96	123.03	462.71	462.70
21		CLA-25	166.88	CLA-22	380.75	147.65	480.81	470.21	CLA-25	139.96	123.08	470.21	470.21
22		CLA-26	167.77	CLA-26	378.99	147.68	459.94	459.94	CLA-26	139.96	123.28	459.95	459.94
23		CLA-27	166.98	CLA-27	275.17	136.08	232.57	232.57	CLA-27	139.96	122.28	232.57	232.57
24		CLA-28	167.29	CLA-28	340.36	143.33	322.37	322.37	CLA-28	139.96	122.88	322.37	322.37
25		CLA-29	166.91	CLA-29	209.30	128.86	192.54	192.54	CLA-29	139.96	121.78	192.54	192.54
26		CLA-30	167.01	CLA-30	281.56	136.68	239.14	239.15	CLA-30	139.96	122.23	239.15	239.14
27		CLA-31	167.08	CLA-31	282.20	136.85	240.23	240.24	CLA-31	139.96	122.33	240.24	240.23
28		CLA-32	167.19	CLA-32	324.59	141.27	290.82	290.82	CLA-32	139.96	122.43	290.82	290.82
29		CLA-33	167.08	CLA-33	221.78	130.63	199.47	199.47	CLA-33	139.96	122.28	199.47	199.47
30		CLA-34	167.22	CLA-34	211.63	129.60	194.61	194.61	CLA-34	139.96	122.28	194.61	194.61
31		CLA-35	166.84	CLA-35	375.23	145.69	384.66	384.65	CLA-35	139.96	121.68	384.66	384.66
32		CLA-36	227.95	CLA-36	249.80	132.94	292.31	292.31	CLA-36	139.96	121.73	292.32	292.31
33		CLA-37	225.55	CLA-37	224.01	130.71	271.34	271.34	CLA-37	139.96	122.13	271.34	271.34
34		CLA-38	230.94	CLA-38	186.04	127.29	253.61	253.61	CLA-38	139.96	122.58	253.61	253.61
35		CLA-54	167.05	CLA-14	408.38	149.57	855.64	780.75	CLA-54	139.97	122.18	780.76	780.76
36		CLA-55	167.49	CLA-55	319.77	139.23	271.31	271.31	CLA-55	139.96	120.88	271.31	271.31

Max Day + Fire ICI Lands - Fireflow Design Report

		ID	Total Demand (L/s)	Critical Node 1 ID	Critical Node 1 Pressure (kPa)	Critical Node 1 Head (m)	Adjusted Fire-Flow (L/s)	Available Flow @Hydrant (L/s)	Critical Node 2 ID	Critical Node 2 Pressure (kPa)	Critcal Node 2 Head (m)	Adjusted Available Flow (L/s)	Design Flow (L/s)
1		CLA-36	227.95	CLA-36	228.55	130.77	280.83	280.83	CLA-36	139.96	121.73	280.83	280.83
2		CLA-37	225.55	CLA-37	202.79	128.54	260.40	260.41	CLA-37	139.96	122.13	260.41	260.40
3		CLA-38	230.94	CLA-38	164.84	125.12	243.39	243.39	CLA-38	139.96	122.58	243.39	243.39

Peak Hour - Pipe Report

		ID	From Node	To Node	Length (m)	Diameter (mm)	Roughness	Flow (L/s)	Velocity (m/s)	Headloss (m)	HL/1000 (m/km)
1		11	CLA-01	CLA-54	128.85	297.00	120.00	36.06	0.52	0.15	1.18
2		113	CLA-20	CLA-15	127.90	155.00	100.00	0.77	0.04	0.00	0.03
3		115	CLA-14	CLA-55	110.97	155.00	100.00	0.96	0.05	0.01	0.05
4		117	CLA-15	CLA-16	79.32	204.00	110.00	0.15	0.00	0.0000	0.000
5		125	CLA-21	CLA-23	67.41	204.00	110.00	1.98	0.06	0.00	0.04
6		127	CLA-22	CLA-23	71.93	155.00	100.00	2.20	0.12	0.02	0.22
7		13	CLA-02	CLA-03	90.19	297.00	120.00	20.27	0.29	0.04	0.41
8		131	CLA-28	CLA-32	107.62	204.00	110.00	6.37	0.19	0.04	0.35
9		135	CLA-29	CLA-10	90.22	155.00	100.00	-2.83	0.15	0.03	0.35
10		141	CLA-27	CLA-09	106.28	155.00	100.00	2.58	0.14	0.03	0.30
11		147	CLA-04	CLA-03	62.23	155.00	100.00	0.69	0.04	0.00	0.03
12		149	CLA-04	CLA-27	58.21	155.00	100.00	-1.37	0.07	0.01	0.09
13		15	CLA-03	CLA-10	104.89	297.00	120.00	19.90	0.29	0.04	0.39
14		151	CLA-06	CLA-55	115.19	204.00	110.00	2.02	0.06	0.00	0.04
15		159	CLA-01	TF-02	980.24	393.00	120.00	-20.02	0.17	0.10	0.10
16		161	CONNECTION-2	TF-02	1.00	393.00	130.00	42.34	0.35	0.000	0.35
17		17	CLA-10	CLA-11	89.30	297.00	120.00	17.68	0.26	0.03	0.32
18		19	CLA-10	CLA-09	98.50	155.00	100.00	-1.90	0.10	0.02	0.17
19		191	TF-02	CLA-26	980.99	297.00	120.00	22.32	0.32	0.48	0.49
20		193	CLA-54	CLA-02	162.86	297.00	120.00	29.99	0.43	0.14	0.84
21		195	CLA-54	CLA-05	83.15	155.00	100.00	5.23	0.28	0.09	1.10
22		197	CLA-07	CLA-06	88.38	204.00	110.00	3.04	0.09	0.01	0.09
23		199	CLA-55	CLA-15	81.06	204.00	110.00	1.18	0.04	0.00	0.02
24		205	CLA-34	CLA-24	87.49	155.00	100.00	-3.56	0.19	0.05	0.54
25		207	CLA-25	CLA-26	71.68	297.00	120.00	-19.89	0.29	0.03	0.39
26		21	CLA-11	CLA-08	77.39	204.00	110.00	7.48	0.23	0.04	0.47
27		211	CLA-23	CLA-16	75.34	204.00	110.00	3.64	0.11	0.01	0.12
28		213	CLA-33	CLA-12	83.72	155.00	100.00	-3.52	0.19	0.04	0.53
29		215	CLA-28A	CLA-28	43.13	204.00	110.00	-1.52	0.05	0.00	0.02
30		217	CLA-32A	CLA-32	42.54	204.00	110.00	-1.52	0.05	0.00	0.02
31		219	CONNECTION-1	CLA-01	1.00	393.00	120.00	16.04	0.13	0.0000	0.07
32		23	CLA-08	CLA-07	77.03	204.00	110.00	5.18	0.16	0.02	0.24
33		25	CLA-27	CLA-05	85.51	155.00	100.00	-4.62	0.24	0.08	0.88
34		29	CLA-07	CLA-14	122.11	155.00	100.00	1.09	0.06	0.01	0.06
35		31	CLA-14	CLA-20	77.44	155.00	100.00	0.78	0.04	0.00	0.03
36		33	CLA-20	CLA-21	79.13	155.00	100.00	-1.43	0.08	0.01	0.10
37		35	CLA-14	CLA-13	77.51	155.00	100.00	-2.33	0.12	0.02	0.25
38		37	CLA-08	CLA-13	124.48	155.00	100.00	1.01	0.05	0.01	0.05
39		39	CLA-11	CLA-12	121.20	297.00	120.00	8.99	0.13	0.01	0.09
40		41	CLA-12	CLA-13	78.38	155.00	100.00	3.06	0.16	0.03	0.41
41		43	CLA-12	CLA-24	80.77	297.00	120.00	1.57	0.02	0.000	0.00
42		45	CLA-24	CLA-25	73.62	297.00	120.00	-2.97	0.04	0.000	0.01
43		47	CLA-25	CLA-22	75.05	204.00	110.00	7.23	0.22	0.03	0.44
44		49	CLA-22	CLA-13	150.36	155.00	100.00	-0.22	0.01	0.000	0.00
45		51	CLA-21	CLA-22	82.10	204.00	110.00	-4.19	0.13	0.01	0.16
46		53	CLA-30	CLA-33	72.99	155.00	100.00	-2.61	0.14	0.02	0.31
47		55	CLA-30	CLA-31	74.77	155.00	100.00	0.53	0.03	0.00	0.02
48		57	CLA-31	CLA-34	81.48	155.00	100.00	-2.35	0.12	0.02	0.25
49		59	CLA-31	CLA-32	76.20	155.00	100.00	1.97	0.10	0.01	0.18
50		61	CLA-25	CLA-28	64.06	204.00	110.00	9.25	0.28	0.04	0.70
51		63	CLA-32	CLA-38	105.48	204.00	110.00	5.68	0.17	0.03	0.28
52		67	CLA-30	CLA-37	85.27	155.00	100.00	1.32	0.07	0.01	0.09
53		69	CLA-37	CLA-38	159.94	204.00	110.00	5.13	0.16	0.04	0.23
54		71	CLA-37	CLA-36	240.46	204.00	110.00	-5.02	0.15	0.05	0.22
55		73	CLA-36	CLA-29	113.49	155.00	100.00	-2.30	0.12	0.03	0.24
56		75	CLA-02	CLA-35	296.18	297.00	120.00	8.58	0.12	0.02	0.08
57		77	CLA-35	CLA-36	202.13	204.00	110.00	8.20	0.25	0.11	0.56

APPENDIX D

- **Fernbank Trunk Sewer Design**
- **MSS Sanitary Drainage Area Plan, (Drawing 101108-SAN)**
- **Figure 6.1 – MSS Sanitary HGL**
- **Sanitary Sewer Hydraulic Grade Line Analysis (2031) from MSS Report**
- **2017 Sanitary Sewer HGL Analysis**
- **Appendix 6 – B.1 City of Ottawa Sewer Design Guidelines**
- **Section 1.7 – MOE Design Guidelines**
- **Sanitary Sewer Design Sheets**
- **Drainage Area Plans 27970-501, 501A and 501B**

FERNBANK CDP LANDS - SANITARY TRUNK SEWER
PEAK FLOW DESIGN SHEET

AREA			RESIDENTIAL											MIXED USE		COMMERCIAL		INSTITUTIONAL		C+I	INFILTRATION				PIPE							
			LOW DENSITY		MEDIUM DENSITY		HIGH DENSITY		MIXED USE		TOTAL																					
ID	From	To	Area (ha)	Pop.	Area (ha)	Pop.	Area (ha)	Pop.	Area (ha)	Pop.	Pop.	Accum. Pop.	Peak Factor	Peak Flow (l/s)	Area (ha)	Accum. Area (ha)	Area (ha)	Accum. Area (ha)	Area (ha)	Accum. Area (ha)	Peak Flow (l/s)	Total Area (ha)	Accum. Area (ha)	Infil. Flow (l/s)	Total Flow (l/s)	Size (mm)	Type	Slope (%)	Length (m)	Capacity (l/s)	Full Flow Vel. (m/s)	Q/Qfull (%)	Actual Vel. (m/s)
F1			99.45	9189	8.31	1247	0.00	0	0.00	0	10436	10436	2.9	124.1	0.00	0.00	0.63	0.63	23.23	23.23	28.7	200.11	200.11	56.0	200.9								
	FT24	FT23									0	10436	2.9	124.1		0.00		0.63		23.23	28.7		200.11	56.0	200.9	600	C 100-D	0.39	107.5	400.0	1.37	50.2%	1.37
	FT23	FT22									0	10436	2.9	124.1		0.00		0.63		23.23	28.7		200.11	56.0	200.9	600	C 100-D	0.39	107.5	400.0	1.37	50.2%	1.37
	FT22	FT21									0	10436	2.9	124.1		0.00		0.63		23.23	28.7		200.11	56.0	200.9	600	C 100-D	0.39	107.5	400.0	1.37	50.2%	1.37
	FT21	FT20									0	10436	2.9	124.1		0.00		0.63		23.23	28.7		200.11	56.0	200.9	600	C 100-D	0.39	107.5	400.0	1.37	50.2%	1.37
	FT20	FT19									0	10436	2.9	124.1		0.00		0.63		23.23	28.7		200.11	56.0	200.9	600	C 100-D	0.39	107.5	400.0	1.37	50.2%	1.37
	FT19	FT18									0	10436	2.9	124.1		0.00		0.63		23.23	28.7		200.11	56.0	200.9	600	C 100-D	1.87	120.0	876.0	3.09	22.9%	2.34
F2			2.90	268	1.80	270	0.00	0	0.00	0	538	538	4.0	8.6	0.00	0.00	0.00	0.00	0.40	0.40	0.3	13.19	13.19	3.7	12.7								
F3			15.95	1474	14.90	2235	0.00	0	10.57	856	4565	4565	3.3	60.7	10.57	10.57	0.80	0.80	11.57	11.57	15.2	77.57	77.57	21.7	97.6								
	FT18	FT17									0	15539	2.8	173.9		10.57		1.23		35.20	36.2		290.87	81.4	291.6	750	C 100-D	0.20	113.4	519.4	1.14	56.1%	1.17
	FT17	FT16									0	15539	2.8	173.9		10.57		1.23		35.20	36.2		290.87	81.4	291.6	750	C 100-D	0.20	113.0	519.4	1.14	56.1%	1.17
	FT16	FT15									0	15539	2.8	173.9		10.57		1.23		35.20	36.2		290.87	81.4	291.6	750	C 100-D	0.20	113.0	519.4	1.14	56.1%	1.17
	FT15	FT14									0	15539	2.8	173.9		10.57		1.23		35.20	36.2		290.87	81.4	291.6	750	C 100-D	0.20	113.0	519.4	1.14	56.1%	1.17
	FT14	FT13									0	15539	2.8	173.9		10.57		1.23		35.20	36.2		290.87	81.4	291.6	750	C 100-D	0.20	113.0	519.4	1.14	56.1%	1.17
	FT13	FT12									0	15539	2.8	173.9		10.57		1.23		35.20	36.2		290.87	81.4	291.6	750	C 100-D	0.20	113.0	519.4	1.14	56.1%	1.17
	FT12	FT11									0	15539	2.8	173.9		10.57		1.23		35.20	36.2		290.87	81.4	291.6	750	C 100-D	0.20	113.0	519.4	1.14	56.1%	1.17
	FT11	FT10									0	15539	2.8	173.9		10.57		1.23		35.20	36.2		290.87	81.4	291.6	750	C 100-D	0.20	113.0	519.4	1.14	56.1%	1.17
	FT10	FT09									0	15539	2.8	173.9		10.57		1.23		35.20	36.2		290.87	81.4	291.6	750	C 100-D	0.58	84.1	884.5	1.94	33.0%	1.72
	FT09	FT08									0	15539	2.8	173.9		10.57		1.23		35.20	36.2		290.87	81.4	291.6	750	C 100-D	0.58	40.9	884.5	1.94	33.0%	1.72
F4			60.08	5551	16.71	2506	0.00	0	5.62	455	8512	8512	3.0	104.3	5.62	5.62	0.00	0.00	19.62	19.62	48.5	164.76	164.76	46.1	169.9								
F5			7.70	711	2.90	435	0.00	0	6.70	543	1689	1689	3.6	24.9	6.70	6.70	0.00	0.00	0.79	0.79	3.4	22.81	22.81	6.4	34.9								
F6			29.70	2744	9.95	1493	5.04	690	0.00	0	4917	4917	3.3	64.8	0.00	0.00	0.00	0.00	16.15	16.15	14.0	89.34	89.34	25.0	103.8								
	FT08	FT07									0	30658	2.5	306.5		22.89		1.23		71.76	73.3		567.78	159.0	538.8	1200	C 100-D	0.20	77.5	1819.0	1.56	29.6%	1.32
	FT07	FT06									0	30658	2.5	306.5		22.89		1.23		71.76	73.3		567.78	159.0	538.8	1200	C 100-D	0.20	77.5	1819.0	1.56	29.6%	1.32
	FT06	FT05									0	30658	2.5	306.5		22.89		1.23		71.76	73.3		567.78	159.0	538.8	1200	C 100-D	0.20	24.6	1819.0	1.56	29.6%	1.32
	FT05	FT04									0	30658	2.5	306.5		22.89		1.23		71.76	73.3		567.78	159.0	538.8	1200	C 100-D	0.20	95.0	1819.0	1.56	29.6%	1.32
	FT04	FT03									0	30658	2.5	306.5		22.89		1.23		71.76	73.3		567.78	159.0	538.8	1200	C 100-D	0.20	95.0	1819.0	1.56	29.6%	1.32
	FT03	FT02									0	30658	2.5	306.5		22.89		1.23		71.76	73.3		567.78	159.0	538.8	1200	C 100-D	0.20	107.5	1819.0	1.56	29.6%	1.32
	FT02	FT01									0	30658	2.5	306.5		22.89		1.23		71.76	73.3		567.78	159.0	538.8	1200	C 100-D	0.20	107.5	1819.0	1.56	29.6%	1.32
	FT01	OTT1									0	30658	2.5	306.5		22.89		1.23		71.76	73.3		567.78	159.0	538.8	1200	C 100-D	0.20	61.4	1819.0	1.56	29.6%	1.32
	OTT1	GC									0	30658	2.5	306.5		22.89		1.23		71.76	73.3		567.78	159.0	538.8	1200	C 100-D	0.20	19.1	1819.0	1.56	29.6%	1.32

Design Parameters:

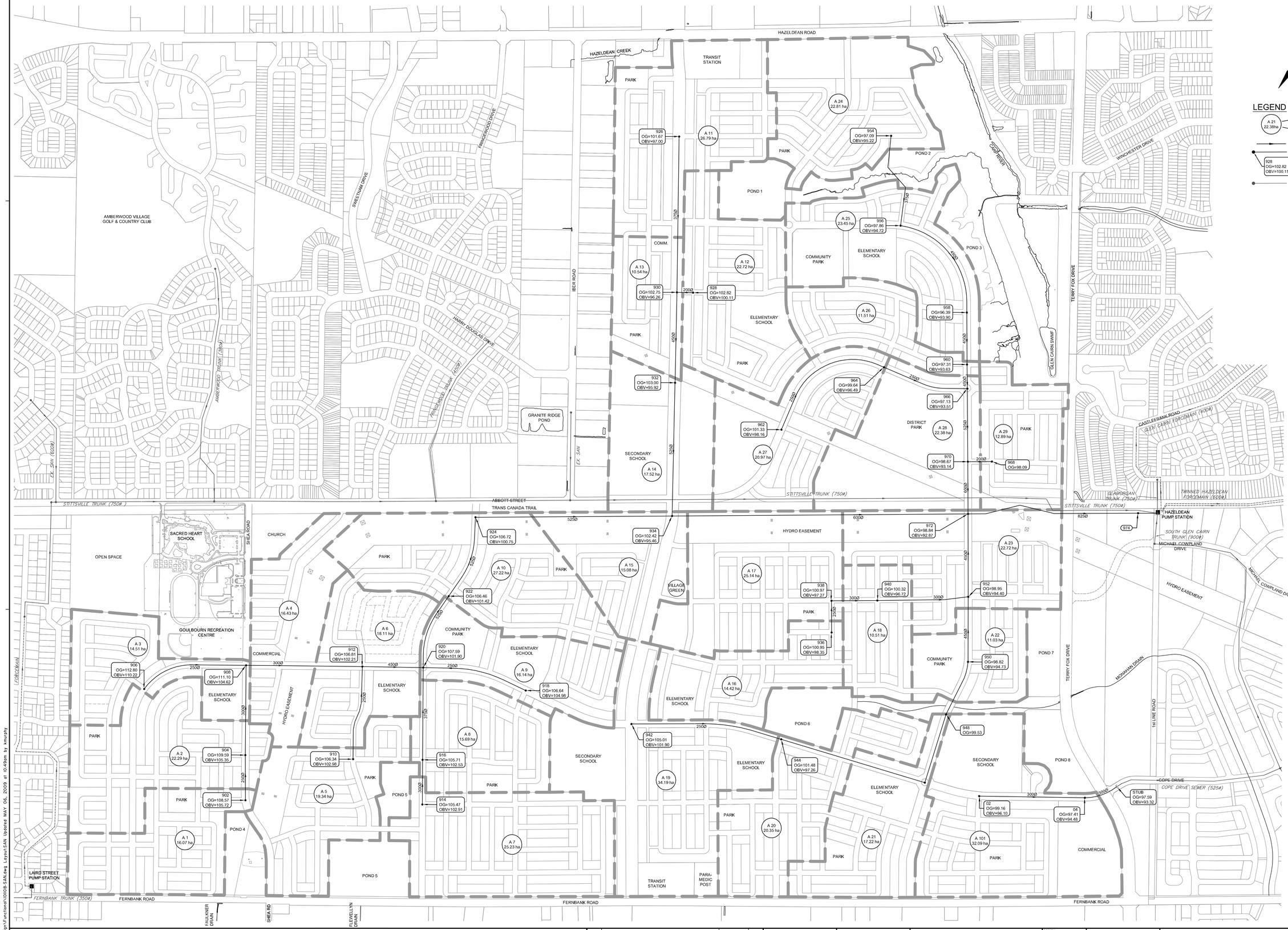
Avg. Flow/Person =	350	l/day	
Comm./Inst. Flow =	50,000	l/ha/day	
Infiltration =	0.28	l/s/ha	

Pipe Friction n = 0.013
Residential Peaking Factor = Harmon Equation (max 4, min 2)
Peaking Factor Comm./Inst. = 1.5

	Units/Net ha	Pop/Unit	
Low Density Residential =	28	3.30	
Medium Density Residential =	60	2.50	(Multi Family Residential)
High Density Residential =	75	1.80	
Mixed Use =	90	1.80	(50% of mixed use area is residential)

Project: Fernbank Sanitary Trunk (108180-05)
Designed: KJM
Checked: MAB
Dwg. Reference: 108180-FTS
Date: January 27, 2012

M:\2006\108180\DATA\Calculations\SAN\Trunk Sewer\Trunk Sewer Design Sheets (20120127).xlsx



NOTE:
THE POSITION OF ALL POLE LINES, CONDUITS, WATERMAINS, SEWERS AND OTHER UNDERGROUND AND OVERGROUND UTILITIES AND STRUCTURES IS NOT NECESSARILY SHOWN ON THE CONTRACT DRAWINGS, AND WHERE SHOWN, THE ACCURACY OF THE POSITION OF SUCH UTILITIES AND STRUCTURES IS NOT GUARANTEED. BEFORE STARTING WORK, DETERMINE THE EXACT LOCATION OF ALL SUCH UTILITIES AND STRUCTURES AND ASSUME ALL LIABILITY FOR DAMAGE TO THEM.

No.	REVISION	DATE	BY
3	ISSUED WITH MASTER SERVICING STUDY	MAY 25/09	MAB
2	UPDATED WITH DRAFT MASTER SERVICING STUDY	SEP 12/08	MAB
1	ISSUED WITH DRAFT MASTER SERVICING STUDY	MAY 02/08	MAB

LICENSED PROFESSIONAL ENGINEER M.A. BISSETT PROVINCE OF ONTARIO

REGISTERED PROFESSIONAL ENGINEER J.G. RIDDELL PROVINCE OF ONTARIO

NOVATECH ENGINEERING CONSULTANTS LTD.
ENGINEERS & PLANNERS
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Ottawa, Ontario, Canada
K2M 1P6
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Facsimile (613) 254-5867
Email: novatech@novatech-eng.com

DESIGN	KJM
CHECKED	MAB
DRAWN	KJM
CHECKED	MAB
APPROVED	JGR

SCALE: 1 : 5000

CITY OF OTTAWA
FERNBANK CDP

SANITARY DRAINAGE AREA PLAN

PROJECT No. 101108-0
DATE: AUGUST 2007
DRAWING No. 101108-SAN

PLANELOW3 - 1000mmx770mm

Drawing M:\2001\01108\CAD\design\Functional\01108-SAN.dwg Layout1(SAN Updated MAY 06, 2009 at 10:49am by kmurphy

TABLE D-2: FERNBANK CDP LANDS - NEW TRUNK SEWER
SANITARY SEWER HYDRAULIC GRADE LINE ANALYSIS (2031)

This spreadsheet uses the Darcy-Weisbach equation to calculate hydraulic losses through a pipe network with a specified flow rate. Minor losses are accounted for including both pipe bend losses and structure losses. The spreadsheet returns the upstream hydraulic grade line if surcharged, or the pipe obvert if free flow conditions exist. The HGL slope is calculated and the minimum USF is established +0.30m above the HGL.

Bend Coefficients

0	45	90	<---Bend (in degrees)
0.00	0.29	1.02	900 mm pipe or greater (benched)
0.00	0.40	1.32	825 mm pipe or smaller (sump)

MANHOLE		INVERT ELEV.		OBVERT ELEV.		GROUND ELEV.	COVER	PIPE PARAMETERS				TOTAL FLOW	Q_{cap} (m^3/s)	Q_p/Q_{cap}	COMPUTATIONAL COLUMNS					HEAD LOSS	SURCHARGE	HGL			PIPE
U/S	D/S	U/S (m)	D/S (m)	U/S (m)	D/S (m)	U/S (m)	U/S (m)	Dia (N) (mm)	Dia (A) (m)	Length (m)	'n'	(m^3/s)			Pipe Area (m^2)	L/D	Friction Factor (f)	Velocity V (m/s)	$V^2/2g$	HL (m)	U/S (m)	U/S (m)	D/S (m)	Slope (%)	Slope (%)
Hazeldean Pump Station																						98.00	<- 100yr Starting HGL		
974	HPS	90.88	90.74	91.70	91.57	99.50	7.80	825	838	66	0.013	0.528	0.677	0.78	0.552	79	0.02245	0.96	0.05	0.09	3.39	95.09	95.00	0.14%	0.20%
972	974	92.04	90.88	92.87	91.70	100.25	7.38	825	838	586	0.013	0.528	0.668	0.79	0.552	699	0.02245	0.96	0.05	0.82	3.04	95.91	95.09	0.14%	0.20%
970	972	92.54	92.27	93.14	92.87	99.65	6.51	600	610	178	0.013	0.133	0.249	0.53	0.292	292	0.02496	0.46	0.01	0.09	2.86	96.00	95.91	0.05%	0.15%
968	970	93.20	92.94	93.40	93.14	98.20	4.80	200	203	82	0.013	0.014	0.019	0.73	0.032	406	0.03600	0.43	0.01	0.15	2.75	96.15	96.00	0.18%	0.32%
966	970	92.98	92.61	93.51	93.14	98.35	4.84	525	533	249	0.013	0.122	0.173	0.70	0.223	466	0.02610	0.55	0.02	0.21	2.71	96.21	96.00	0.08%	0.15%
964	966	96.24	93.26	96.49	93.51	100.45	3.96	250	254	298	0.013	0.030	0.062	0.48	0.051	1171	0.03342	0.59	0.02	0.73	0.45	96.94	96.21	0.24%	1.00%
962	964	97.90	96.24	98.15	96.49	102.40	4.25	250	254	479	0.013	0.030	0.037	0.82	0.051	1884	0.03342	0.59	0.02	1.12	0.00	98.15	96.94	0.25%	0.35%
960	966	93.18	93.06	93.63	93.51	98.25	4.62	450	457	82	0.013	0.072	0.114	0.63	0.164	179	0.02747	0.44	0.01	0.05	2.63	96.26	96.21	0.06%	0.15%
958	960	93.45	93.18	93.90	93.63	97.95	4.05	450	457	177	0.013	0.060	0.116	0.51	0.164	387	0.02747	0.36	0.01	0.07	2.43	96.33	96.26	0.04%	0.15%
956	958	94.27	93.45	94.72	93.90	99.00	4.28	450	457	411	0.013	0.060	0.133	0.45	0.164	899	0.02747	0.36	0.01	0.18	1.79	96.51	96.33	0.04%	0.20%
954	956	94.83	94.34	95.21	94.72	98.15	2.95	375	381	330	0.013	0.035	0.070	0.50	0.114	866	0.02920	0.31	0.00	0.12	1.43	96.64	96.51	0.04%	0.15%
952	972	93.95	92.42	94.40	92.87	99.95	5.55	450	457	282	0.013	0.167	0.219	0.76	0.164	617	0.02747	1.02	0.05	0.98	2.48	96.88	96.91	0.35%	0.54%
950	952	94.28	93.95	94.73	94.40	100.30	5.57	450	457	221	0.013	0.097	0.115	0.85	0.164	483	0.02747	0.59	0.02	0.24	2.39	97.12	96.88	0.11%	0.15%
948	950	94.57	94.28	95.02	94.73	101.00	5.98	450	457	195	0.013	0.085	0.115	0.74	0.164	427	0.02747	0.52	0.01	0.17	2.27	97.29	97.12	0.09%	0.15%
946	948	95.86	94.64	96.24	95.02	100.60	4.36	375	381	243	0.013	0.085	0.130	0.66	0.114	638	0.02920	0.75	0.03	0.58	1.63	97.87	97.29	0.24%	0.50%
944	946	96.88	95.86	97.26	96.24	101.40	4.15	375	381	511	0.013	0.064	0.082	0.79	0.114	1340	0.02920	0.57	0.02	0.65	1.27	98.52	97.87	0.13%	0.20%
942	944	101.65	97.01	101.90	97.26	106.00	4.11	250	254	516	0.013	0.041	0.059	0.70	0.051	2033	0.03342	0.81	0.03	2.31	0.00	101.90	98.52	0.65%	0.90%
940	952	96.42	94.10	96.72	94.40	101.40	4.68	300	305	310	0.013	0.058	0.087	0.66	0.073	1017	0.03145	0.79	0.03	1.03	1.20	97.92	96.88	0.33%	0.75%
938	940	96.97	96.42	97.27	96.72	101.95	4.68	300	305	156	0.013	0.045	0.060	0.76	0.073	512	0.03145	0.62	0.02	0.36	1.00	98.27	97.92	0.23%	0.35%
936	938	98.10	97.02	98.35	97.27	102.20	3.85	250	254	108	0.013	0.019	0.062	0.30	0.051	425	0.03342	0.37	0.01	0.10	0.02	98.37	98.27	0.09%	1.00%
934	972	94.86	92.27	95.46	92.87	103.00	7.54	600	610	1007	0.013	0.283	0.325	0.87	0.292	1652	0.02496	0.97	0.05	2.05	2.50	97.96	95.91	0.20%	0.26%
932	934	95.39	94.93	95.92	95.46	103.80	7.88	525	533	455	0.013	0.098	0.143	0.68	0.223	853	0.02610	0.44	0.01	0.22	2.26	98.18	97.96	0.05%	0.10%
930	932	95.81	95.47	96.26	95.92	103.40	7.14	450	457	308	0.013	0.077	0.099	0.78	0.164	673	0.02747	0.47	0.01	0.21	2.13	98.39	98.18	0.07%	0.11%
928	930	99.91	96.06	100.11	96.26	103.20	3.09	200	203	55	0.013	0.031	0.091	0.34	0.032	271	0.03600	0.95	0.05	0.47	0.00	100.11	98.39	3.12%	7.00%
926	930	96.62	95.88	97.00	96.26	102.50	5.51	375	381	530	0.013	0.039	0.068	0.57	0.114	1391	0.02920	0.34	0.01	0.25	1.64	98.64	98.39	0.05%	0.14%
924	934	100.22	94.93	100.75	95.46	108.20	7.46	525	533	669	0.013	0.190	0.399	0.48	0.223	1254	0.02610	0.85	0.04	1.26	0.00	100.75	97.96	0.42%	0.79%
922	924	100.89	100.22	101.42	100.75	107.95	6.54	525	533	290	0.013	0.190	0.216	0.88	0.223	544	0.02610	0.85	0.04	0.53	0.00	101.42	100.75	0.23%	0.23%
920	922	101.37	100.89	101.90	101.42	107.60	5.70	525	533	265	0.013	0.169	0.191	0.89	0.223	497	0.02610	0.76	0.03	0.43	0.00	101.90	101.42	0.18%	0.18%
918	920	104.73	101.65	104.98	101.90	108.30	3.32	250	254	363	0.013	0.019	0.057	0.34	0.051	1430	0.03342	0.38	0.01	0.35	0.00	104.98	101.90	0.85%	0.85%
916	920	102.15	101.52	102.53	101.90	107.30	4.77	375	381	314	0.013	0.050	0.082	0.60	0.114	824	0.02920	0.43	0.01	0.24	0.00	102.53	101.90	0.20%	0.20%
914	916	102.61	102.23	102.91	102.53	107.25	4.34	300	305	152	0.013	0.032	0.050	0.63	0.073	498	0.03145	0.44	0.01	0.16	0.00	102.91	102.53	0.25%	0.25%
912	920	101.76	101.45	102.21	101.90	107.70	5.49	450	457	207	0.013	0.112	0.115	0.98	0.164	453	0.02747	0.68	0.02	0.35	0.04	102.25	101.90	0.17%	0.15%
910	912	102.73	101.96	102.98	102.21	107.10	4.12	250	254	320	0.013	0.021	0.030	0.69	0.051	1258	0.03342	0.41	0.01	0.37	0.00	102.98	102.25	0.23%	0.24%
908	912	104.32	101.91	104.62	102.21	111.70	7.08	300	305	396	0.013	0.076	0.079	0.97	0.073	1299	0.03145	1.04	0.06	2.35	0.00	104.62	102.25	0.60%	0.61%
906	908	109.97	104.37	110.22	104.62	113.65	3.43	250	254	373	0.013	0.017	0.076	0.23	0.051	1470	0.03342	0.34	0.01	0.30	0.00	110.22	104.62	1.50%	1.50%
904	908	105.05	104.32	105.35	104.62	110.20	4.85	300	305	306	0.013	0.048	0.049	0.97	0.073	1002	0.03145	0.66	0.02	0.70	0.00	105.35	104.62	0.24%	0.24%
902	904	105.47	105.10	105.72	105.35	109.60	3.88	250	254	154	0.013	0.020	0.030	0.66	0.051	605	0.03342	0.40	0.01	0.18	0.00	105.72	105.35	0.24%	0.24%

MANHOLE LOSS									
Diameter (mm)			Bend						HL$_{MH}$
U/S MH	Pipe In	Pipe Out	Angle	K_{in}	C_{in}	K_{out}	K_{MH}		(m)
1500	825	825	0	0.18	1.00	0.00	0.18		0.01
1500	600	825	90	0.18	2.60	1.32	1.79		0.08
1200	525	600	90	0.20	1.49	1.32	1.62		0.02
1200	200	200	0	0.60	1.00	0.00	0.60		0.01
1200	450	525	90	0.23	1.59	1.32	1.68		0.03
1200	250	250	90	0.48	1.00	1.32	1.80		0.03
1200	250	250	0	0.48	1.00	0.00	0.48		0.01
1200	450	450	0	0.27	1.00	0.00	0.27		0.00
1200	450	450	0	0.27	1.00	0.00	0.27		0.00
1200	375	450	90	0.27	1.73	1.32	1.78		0.01
1200	300	375	0	0.32	1.95	0.00	0.63		0.00
1200	450	450	90	0.27	1.00	1.32	1.59		0.08
1200	450	450	0	0.27	1.00	0.00	0.27		0.00
1200	375	450	0	0.27	1.73	0.00	0.46		0.01
1200	375	375	90	0.32	1.00	1.32	1.64		0.05
1200	250	375	0	0.32	3.38	0.00	1.08		0.02
1200	250	250	0	0.48	1.00	0.00	0.48		0.02
1200	300	300	0	0.40	1.00	0.00	0.40		0.01
1200	250	300	90	0.40	1.73	1.32	2.01		0.04
1200	250	250	0	0.48	1.00	0.00	0.48		0.00
1200	525	600	90	0.20	1.49	1.32	1.62		0.08
1200	450	525	0	0.23	1.59	0.00	0.36		0.00
1200	375	450	0	0.27	1.73	0.00	0.46		0.01
1200	200	200	0	0.60	1.00	0.00	0.60		0.03
1200	300	375	0	0.32	1.95	0.00	0.63		0.00
1200	525	525	90	0.23	1.00	1.32	1.55		0.06
1200	525	525	0	0.23	1.00	0.00	0.23		0.01
1200	450	525	90	0.23	1.59	1.32	1.68		0.05
1200	250	250	0	0.48	1.00	0.00	0.48		0.00
1200	300	375	0	0.32	1.95	0.00	0.63		0.01
1200	300	300	0	0.40	1.00	0.00	0.40		0.00
1200	300	450	90	0.27	3.38	1.32	2.22		0.05
1200	250	250	0	0.48	1.00	0.00	0.48		0.00
1200	300	300	90	0.40	1.00	1.32	1.72		0.10
1200	250	250	90	0.48	1.00	1.32	1.80		0.01
1200	250	300	0	0.40	1.73	0.00	0.69		0.02
1200	250	250	90	0.48	1.00	1.32	1.80		0.01

Average Daily Flow=	350 L/cap/day	Industrial Peak Factor= per MOE graph	HGL=Major + Minor Losses
Comm/Inst Flow=	50000 L/ha/day	Extraneous Flow= 0.28	Major Loss= Pipe Friction (Darcy-Weisbach)
Industrial Flow=	35000 L/ha/day	Minimum Velocity= 0.60	Minor Loss= Head loss correction for flow through MH, changes in pipe size, and pipe bends
Max Res Peak Factor=	4.00	Manning's n= 0.013	Friction Factor= 8g/c^2, where c=(1/n)*(D/4)^1/6
Comm Peak Factor=	1.50		
Indst Peak Factor=	1.50		

Designed: KJM	PROJECT: Fernbank CDP
Checked: MAB	CLIENT:
Dwg. Reference: 101108-SAN	Date: May 8, 2009

IBI GROUP

SANITARY HYDRAULIC GRADE LINE DESIGN SHEET
CRT LANDS - FERNBANK SANITARY TRUNK SEWER
CITY OF OTTAWA
CLARIDGE HOMES

JOB #: 27970 - 5.7
DATE: February 09 2017
DESIGN: WY

FRICTION LOSS	FROM MH	TO MH	PIPE ID
FERNBANK ROAD	HPS	FT01	
INVERT ELEVATION (m)	90.340	90.450	
OBVERT ELEVATION (m)	91.559	91.669	
DIAMETER (mm)			1219.2
LENGTH (m)			55.71
FLOW (l/s)			725.0
HGL (m) ***	95.371	95.389	0.018
MANHOLE COEF K= 0.05	LOSS (m)	0.0010	
TOTAL HGL (m)		95.390	
MAX. SURCHARGE (mm)		3721	

MANNING FORMULA - FLOWING FULL						
DIA (m)	Area (m2)	Perim. (m)	Slope (%)	Hyd.R. (m)	Vel. (m/s)	Q (l/s)
1.2192	1.17	3.83	0.200	0.305	1.55	1806.41
HYDRAULIC SLOPE =		0.03 %				

Head loss in manhole simplified method p. 71 (MWDM)
straight through flow $K_L = 0.05$
Velocity = Flow / Area = 0.62 m/s
$HL = K_L * V^2/2g$

FRICTION LOSS	FROM MH	TO MH	PIPE ID
FERNBANK ROAD	FT01	FT02	
INVERT ELEVATION (m)	90.440	90.620	
OBVERT ELEVATION (m)	91.659	91.839	
DIAMETER (mm)			1219.2
LENGTH (m)			107.50
FLOW (l/s)			725.0
HGL (m) ***	95.390	95.424	0.034
MANHOLE COEF K= 0.05	LOSS (m)	0.0010	
TOTAL HGL (m)		95.425	
MAX. SURCHARGE (mm)		3586	

MANNING FORMULA - FLOWING FULL						
DIA (m)	Area (m2)	Perim. (m)	Slope (%)	Hyd.R (m)	Vel. (m/s)	Q (l/s)
1.2192	1.17	3.83	0.170	0.305	1.43	1663.48
HYDRAULIC SLOPE =		0.03 %				

Head loss in manhole simplified method p. 71 (MWDM)
straight through flow $K_L = 0.05$
Velocity = Flow / Area = 0.62 m/s
$HL = K_L * V^2/2g$

FRICTION LOSS	FROM MH	TO MH	PIPE ID
FERNBANK ROAD	FT02	FT03	
INVERT ELEVATION (m)	90.640	90.910	
OBVERT ELEVATION (m)	91.859	92.129	
DIAMETER (mm)			1219.2
LENGTH (m)			107.5
FLOW (l/s)			725.0
HGL (m) ***	95.425	95.459	0.034
MANHOLE COEF K= 0.05	LOSS (m)	0.001	
TOTAL HGL (m)		95.460	
MAX. SURCHARGE (mm)		3331	

MANNING FORMULA - FLOWING FULL						
DIA (m)	Area (m2)	Perim. (m)	Slope (%)	Hyd.R (m)	Vel. (m/s)	Q (l/s)
1.2192	1.17	3.83	0.250	0.305	1.75	2037.34
HYDRAULIC SLOPE =		0.03 %				

Head loss in manhole simplified method p. 71 (MWDM)
straight through flow $K_L = 0.05$
Velocity = Flow / Area = 0.62 m/s
$HL = K_L * V^2/2g$

FRICTION LOSS	FROM MH	TO MH	PIPE ID
FERNBANK ROAD	FT03	FT04	
INVERT ELEVATION (m)	90.920	91.100	
OBVERT ELEVATION (m)	92.139	92.319	
DIAMETER (mm)			1219.2
LENGTH (m)			95.00
FLOW (l/s)			725.0
HGL (m) ***	95.460	95.490	0.030
MANHOLE COEF K= 0.05	LOSS (m)	0.001	
TOTAL HGL (m)		95.491	
MAX. SURCHARGE (mm)		3172	

MANNING FORMULA - FLOWING FULL						
DIA (m)	Area (m2)	Perim. (m)	Slope (%)	Hyd.R (m)	Vel. (m/s)	Q (l/s)
1.2192	1.17	3.83	0.190	0.30	1.52	1769.541032
HYDRAULIC SLOPE =		0 %				

Head loss in manhole simplified method p. 71 (MWDM)
straight through flow $K_L = 0.05$
Velocity = Flow / Area = 0.62 m/s
$HL = K_L * V^2/2g$

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CITY OF OTTAWA
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JOB #: 27970 - 5.7
DATE: February 09 2017
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FRICTION LOSS	FROM MH	TO MH	PIPE ID
FERNBANK ROAD	FT04	FT05	
INVERT ELEVATION (m)	91.110	91.250	
OBVERT ELEVATION (m)	92.329	92.469	
DIAMETER (mm)			1219.2
LENGTH (m)			89.00
FLOW (l/s)			725.0
HGL (m) ***	95.491	95.520	0.029
MANHOLE COEF K= 0.40	LOSS (m)	0.008	
TOTAL HGL (m)		95.527	
MAX. SURCHARGE (mm)		3058	

MANNING FORMULA - FLOWING FULL						
DIA (m)	Area (m2)	Perim. (m)	Slope (%)	Hyd.R. (m)	Vel. (m/s)	Q (l/s)
1.2192	1.17	3.83	0.150	0.30	1.38	1612.334705
HYDRAULIC SLOPE =		0.04 %				

Head loss in manhole simplified method p. 71 (MWDM)
45 degree bend K_L=0.40
Velocity = Flow / Area = 0.62 m/s
HL = K_L * V^2/ 2g

FRICTION LOSS	FROM MH	TO MH	PIPE ID
FERNBANK ROAD	FT05	FT06	
INVERT ELEVATION (m)	91.320	91.370	
OBVERT ELEVATION (m)	92.539	92.589	
DIAMETER (mm)			1219.2
LENGTH (m)			24.60
FLOW (l/s)			725.0
HGL (m) ***	95.527	95.535	0.008
MANHOLE COEF K= 0.40	LOSS (m)	0.008	
TOTAL HGL (m)		95.543	
MAX. SURCHARGE (mm)		2954	

MANNING FORMULA - FLOWING FULL						
DIA (m)	Area (m2)	Perim. (m)	Slope (%)	Hyd.R. (m)	Vel. (m/s)	Q (l/s)
1.2192	1.17	3.83	0.200	0.30	1.57	1832.751722
HYDRAULIC SLOPE =		0.06 %				

Head loss in manhole simplified method p. 71 (MWDM)
45 degree bend K_L=0.40
Velocity = Flow / Area = 0.62 m/s
HL = K_L * V^2/ 2g

FRICTION LOSS	FROM MH	TO MH	PIPE ID
FERNBANK ROAD	FT06	FT07	
INVERT ELEVATION (m)	91.400	91.510	
OBVERT ELEVATION (m)	92.619	92.729	
DIAMETER (mm)			1219.2
LENGTH (m)			83.50
FLOW (l/s)			725.0
HGL (m) ***	95.543	95.570	0.027
MANHOLE COEF K= 0.05	LOSS (m)	0.001	
TOTAL HGL (m)		95.571	
MAX. SURCHARGE (mm)		2841	

MANNING FORMULA - FLOWING FULL						
DIA (m)	Area (m2)	Perim. (m)	Slope (%)	Hyd.R. (m)	Vel. (m/s)	Q (l/s)
1.2192	1.17	3.83	0.130	0.30	1.26	1475.500267
HYDRAULIC SLOPE =		0.03 %				

Head loss in manhole simplified method p. 71 (MWDM)
straight through flow K_L=0.05
Velocity = Flow / Area = 0.62 m/s
HL = K_L * V^2/ 2g

FRICTION LOSS	FROM MH	TO MH	PIPE ID
FERNBANK ROAD	FT07	FT08	
INVERT ELEVATION (m)	91.520	91.690	
OBVERT ELEVATION (m)	92.739	92.909	
DIAMETER (mm)			1219.2
LENGTH (m)			77.50
FLOW (l/s)			725.0
HGL (m) ***	95.571	95.595	0.025
MANHOLE COEF K= 0.05	LOSS (m)	0.001	
TOTAL HGL (m)		95.596	
MAX. SURCHARGE (mm)		2687	

MANNING FORMULA - FLOWING FULL						
DIA (m)	Area (m2)	Perim. (m)	Slope (%)	Hyd.R. (m)	Vel. (m/s)	Q (l/s)
1.2192	1.17	3.83	0.220	0.30	1.63	1903.968667
HYDRAULIC SLOPE =		0.03 %				

Head loss in manhole simplified method p. 71 (MWDM)
Straight through K_L= 0.05
Velocity = Flow / Area = 0.62 m/s
HL = K_L * V^2/ 2g

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FRICTION LOSS	FROM MH	TO MH	PIPE ID
FERNBANK ROAD	FT08	FT09	
INVERT ELEVATION (m)	92.120	92.350	
OBVERT ELEVATION (m)	92.882	93.112	
DIAMETER (mm)			762
LENGTH (m)			40.90
FLOW (l/s)			479.8
HGL (m) ***	95.596	95.666	0.070
MANHOLE COEF K= 1.32	LOSS (m)	0.075	
TOTAL HGL (m)		95.741	
MAX. SURCHARGE (mm)		2829	

MANNING FORMULA - FLOWING FULL						
DIA (m)	Area (m2)	Perim. (m)	Slope (%)	Hyd.R. (m)	Vel (m/s)	Q (l/s)
0.762	0.46	2.39	0.560	0.19	1.91	870.4994435
HYDRAULIC SLOPE =			0.35 %			

Head loss in manhole simplified method p. 71 (MWDM)
45 degree bend — K_b = 0.40
from figure 1.7.2, Qu =480, Qo =725; Qu/Qo = 0.660 — K_L = 0.92
Velocity = Flow / Area = 1.05 m/s
HL = K_L * V^2/ 2g

FRICTION LOSS	FROM MH	TO MH	PIPE ID
FERNBANK ROAD	FT09	FT10	
INVERT ELEVATION (m)	92.400	92.780	
OBVERT ELEVATION (m)	93.162	93.542	
DIAMETER (mm)			762
LENGTH (m)			84.06
FLOW (l/s)			479.8
HGL (m) ***	95.741	95.884	0.144
MANHOLE COEF K= 0.40	LOSS (m)	0.023	
TOTAL HGL (m)		95.907	
MAX. SURCHARGE (mm)		2365	

MANNING FORMULA - FLOWING FULL						
DIA (m)	Area (m2)	Perim. (m)	Slope (%)	Hyd.R. (m)	Vel (m/s)	Q (l/s)
0.762	0.46	2.39	0.450	0.19	1.71	780.48
HYDRAULIC SLOPE =			0.20 %			

Head loss in manhole simplified method p. 71 (MWDM)
45 degree bend — K_L=0.40
Velocity = Flow / Area = 1.05 m/s
HL = K_L * V^2/ 2g

FRICTION LOSS	FROM MH	TO MH	PIPE ID
FERNBANK ROAD	FT10	FT11	
INVERT ELEVATION (m)	92.780	92.960	
OBVERT ELEVATION (m)	93.542	93.722	
DIAMETER (mm)			762
LENGTH (m)			100.79
FLOW (l/s)			479.8
HGL (m) ***	95.907	96.079	0.172
MANHOLE COEF K= 0.05	LOSS (m)	0.003	
TOTAL HGL (m)		96.082	
MAX. SURCHARGE (mm)		2360	

MANNING FORMULA - FLOWING FULL						
DIA (m)	Area (m2)	Perim. (m)	Slope (%)	Hyd.R. (m)	Vel (m/s)	Q (l/s)
0.762	0.46	2.39	0.180	0.19	1.08	490.56
HYDRAULIC SLOPE =			0.17 %			

Head loss in manhole simplified method p. 71 (MWDM)
Straight through — K_L=0.05
Velocity = Flow / Area = 1.05 m/s
HL = K_L * V^2/ 2g

FRICTION LOSS	FROM MH	TO MH	PIPE ID
FERNBANK ROAD	FT11	FT12	
INVERT ELEVATION (m)	92.960	93.160	
OBVERT ELEVATION (m)	93.722	93.922	
DIAMETER (mm)			762
LENGTH (m)			108.60
FLOW (l/s)			479.8
HGL (m) ***	96.082	96.267	0.186
MANHOLE COEF K= 0.05	LOSS (m)	0.003	
TOTAL HGL (m)		96.270	
MAX. SURCHARGE (mm)		2348	

MANNING FORMULA - FLOWING FULL						
DIA (m)	Area (m2)	Perim (m)	Slope (%)	Hyd.R (m)	Vel (m/s)	Q (l/s)
0.762	0.46	2.39	0.180	0.19	1.09	498.16
HYDRAULIC SLOPE =			0.17 %			

Head loss in manhole simplified method p. 71 (MWDM)
straight through — K_L=0.05
Velocity = Flow / Area = 1.05 m/s
HL = K_L * V^2/ 2g

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FRICTION LOSS	FROM MH	TO MH	PIPE ID
FERNBANK ROAD	FT12	FT13	
INVERT ELEVATION (m)	93.170	93.450	
OBVERT ELEVATION (m)	93.932	94.212	
DIAMETER (mm)			762
LENGTH (m)			129.2
FLOW (l/s)			479.8
HGL (m) ***	96.270	96.491	0.221
MANHOLE COEF K= 0.05	LOSS (m)	0.003	
TOTAL HGL (m)		96.494	
MAX. SURCHARGE (mm)		2282	

MANNING FORMULA - FLOWING FULL

DIA (m)	Area (m2)	Perim. (m)	Slope (%)	Hyd.R (m)	Vel. (m/s)	Q (l/s)
0.762	0.46	2.39	0.220	0.19	1.19	540.40

HYDRAULIC SLOPE = 0.17 %

Head loss in manhole simplified method p. 71 (MWDM)
straight through K_L=0.05
Velocity = Flow / Area = 1.05 m/s
$HL = K_L * V^2/ 2g$

FRICTION LOSS	FROM MH	TO MH	PIPE ID
FERNBANK ROAD	FT13	FT14	
INVERT ELEVATION (m)	93.460	93.660	
OBVERT ELEVATION (m)	94.222	94.422	
DIAMETER (mm)			762
LENGTH (m)			115.27
FLOW (l/s)			479.8
HGL (m) ***	96.494	96.691	0.197
MANHOLE COEF K= 0.05	LOSS (m)	0.003	
TOTAL HGL (m)		96.694	
MAX. SURCHARGE (mm)		2272	

MANNING FORMULA - FLOWING FULL

DIA (m)	Area (m2)	Perim. (m)	Slope (%)	Hyd.R (m)	Vel. (m/s)	Q (l/s)
0.762	0.46	2.39	0.170	0.19	1.06	483.53

HYDRAULIC SLOPE = 0.17 %

Head loss in manhole simplified method p. 71 (MWDM)
straight through K_L = 0.05
Velocity = Flow / Area = 1.05 m/s
$HL = K_L * V^2/ 2g$

FRICTION LOSS	FROM MH	TO MH	PIPE ID
FERNBANK ROAD	FT14	FT15	
INVERT ELEVATION (m)	93.670	93.880	
OBVERT ELEVATION (m)	94.432	94.642	
DIAMETER (mm)			762
LENGTH (m)			118.1
FLOW (l/s)			479.8
HGL (m) ***	96.694	96.896	0.202
MANHOLE COEF K= 0.05	LOSS (m)	0.003	
TOTAL HGL (m)		96.898	
MAX. SURCHARGE (mm)		2256	

MANNING FORMULA - FLOWING FULL

DIA (m)	Area (m2)	Perim. (m)	Slope (%)	Hyd.R. (m)	Vel. (m/s)	Q (l/s)
0.762	0.46	2.39	0.180	0.19	1.07	489.50

HYDRAULIC SLOPE = 0.17 %

Head loss in manhole simplified method p. 71 (MWDM)
straight through K_L=0.05
Velocity = Flow / Area = 1.05 m/s
$HL = K_L * V^2/ 2g$

FRICTION LOSS	FROM MH	TO MH	PIPE ID
FERNBANK ROAD	FT15	FT16	
INVERT ELEVATION (m)	93.890	94.170	
OBVERT ELEVATION (m)	94.652	94.932	
DIAMETER (mm)			762
LENGTH (m)			110.6
FLOW (l/s)			479.8
HGL (m) ***	96.898	97.087	0.189
MANHOLE COEF K= 0.05	LOSS (m)	0.003	
TOTAL HGL (m)		97.090	
MAX. SURCHARGE (mm)		2158	

MANNING FORMULA - FLOWING FULL

DIA (m)	Area (m2)	Perim. (m)	Slope (%)	Hyd.R (m)	Vel. (m/s)	Q (l/s)
0.762	0.46	2.39	0.250	0.19	1.28	584.07

HYDRAULIC SLOPE = 0.17 %

Head loss in manhole simplified method p. 71 (MWDM)
straight through K_L = 0.05
Velocity = Flow / Area = 1.05 m/s
$HL = K_L * V^2/ 2g$

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FRICTION LOSS	FROM MH	TO MH	PIPE ID
FERNBANK ROAD	FT16	FT17	
INVERT ELEVATION (m)	94.190	94.480	
OBVERT ELEVATION (m)	94.952	95.242	
DIAMETER (mm)			762
LENGTH (m)			126.4
FLOW (l/s)			479.8
HGL (m) ***	97.090	97.306	0.216
MANHOLE COEF K= 0.05	LOSS (m)	0.003	
TOTAL HGL (m)		97.309	
MAX. SURCHARGE (mm)		2067	

MANNING FORMULA - FLOWING FULL						
DIA (m)	Area (m2)	Perim. (m)	Slope (%)	Hyd.R. (m)	Vel. (m/s)	Q (l/s)
0.762	0.46	2.39	0.230	0.19	1.22	556.02
HYDRAULIC SLOPE =		0.17 %				

Head loss in manhole simplified method p. 71 (MWDM)
straight through $K_L = 0.05$
Velocity = Flow / Area = 1.05 m/s
$HL = K_L * V^2/ 2g$

FRICTION LOSS	FROM MH	TO MH	PIPE ID
FERNBANK ROAD	FT17	FT18	
INVERT ELEVATION (m)	94.510	94.690	
OBVERT ELEVATION (m)	95.272	95.452	
DIAMETER (mm)			762
LENGTH (m)			88.5
FLOW (l/s)			479.8
HGL (m) ***	97.309	97.460	0.151
MANHOLE COEF K= 0.63	LOSS (m)	0.036	
TOTAL HGL (m)		97.495	
MAX. SURCHARGE (mm)		2043	

MANNING FORMULA - FLOWING FULL						
DIA (m)	Area (m2)	Perim. (m)	Slope (%)	Hyd.R. (m)	Vel. (m/s)	Q (l/s)
0.762	0.46	2.39	0.200	0.19	1.15	523.52
HYDRAULIC SLOPE =		0.21 %				

Head loss in manhole simplified method p. 71 (MWDM)
from figure 1.7.2, Qu =387, Qo =480; Qu/Qo = 0.80 K_L=0.63
Velocity = Flow / Area = 1.05 m/s
$HL = K_L * V^2/ 2g$

BRANCH FROM MH FT18 TO MH 221

FRICTION LOSS	FROM MH	TO MH	PIPE ID
ROBERT GRANT AVE	FT18	MH 221	
INVERT ELEVATION (m)	98.294	98.610	
OBVERT ELEVATION (m)	98.548	98.864	
DIAMETER (mm)			254
LENGTH (m)			90.3
FLOW (l/s)			11.6
HGL (m) ***	98.548	98.579	0.031
MANHOLE COEF K= 1.50	LOSS (m)	0.004	
TOTAL HGL (m)		98.583	
MAX. SURCHARGE (mm)		-281	

MANNING FORMULA - FLOWING FULL						
DIA (m)	Area (m2)	Perim. (m)	Slope (%)	Hyd.R. (m)	Vel. (m/s)	Q (l/s)
0.254	0.05	0.80	0.350	0.06	0.72	36.68
HYDRAULIC SLOPE =		0.04 %				

Head loss in manhole simplified method p. 71 (MWDM)
outlet at right angles to inlet $K_L = 1.5$
Velocity = Flow / Area = 0.23 m/s
$HL = K_L * V^2/ 2g$

FRICTION LOSS	FROM MH	TO MH	PIPE ID
ROBERT GRANT AVE	MH 221	MH 211	
INVERT ELEVATION (m)	98.771	99.000	
OBVERT ELEVATION (m)	99.025	99.254	
DIAMETER (mm)			254
LENGTH (m)			32.8
FLOW (l/s)			11.6
HGL (m) ***	99.025	99.036	0.011
MANHOLE COEF K= 1.50	LOSS (m)	0.004	
TOTAL HGL (m)		99.040	
MAX. SURCHARGE (mm)		-214	

MANNING FORMULA - FLOWING FULL						
DIA (m)	Area (m2)	Perim. (m)	Slope (%)	Hyd.R. (m)	Vel. (m/s)	Q (l/s)
0.254	0.05	0.80	0.700	0.06	1.02	51.83
HYDRAULIC SLOPE =		0.05 %				

Head loss in manhole simplified method p. 71 (MWDM)
outlet at right angles to inlet $K_L = 1.5$
Velocity = Flow / Area = 0.23 m/s
$HL = K_L * V^2/ 2g$

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FRICTION LOSS	FROM MH	TO MH	PIPE ID
ROBERT GRANT AVE	MH 211	MH 209	
INVERT ELEVATION (m)	99.010	99.388	
OBVERT ELEVATION (m)	99.264	99.642	
DIAMETER (mm)			254
LENGTH (m)			54.0
FLOW (l/s)			11.6
HGL (m) ***	99.040	99.059	0.019
MANHOLE COEF K= 0.05	LOSS (m)	0.000	
TOTAL HGL (m)		99.060	
MAX. SURCHARGE (mm)		-582	

MANNING FORMULA - FLOWING FULL

DIA (m)	Area (m2)	Perim. (m)	Slope (%)	Hyd.R. (m)	Vel. (m/s)	Q (l/s)
0.254	0.05	0.80	0.700	0.06	1.02	51.86

HYDRAULIC SLOPE = 0.04 %

Head loss in manhole simplified method p. 71 (MWDM)
straight through — $K_L = 0.05$
Velocity = Flow / Area = 0.23 m/s
$HL = K_L * V^2/ 2g$

FRICTION LOSS	FROM MH	TO MH	PIPE ID
ROBERT GRANT AVE	MH 209	MH 161A	
INVERT ELEVATION (m)	100.315	100.690	
OBVERT ELEVATION (m)	100.518	100.893	
DIAMETER (mm)			203.2
LENGTH (m)			53.6
FLOW (l/s)			8.3
HGL (m) ***	100.518	100.550	0.032
MANHOLE COEF K= 0.83	LOSS (m)	0.003	
TOTAL HGL (m)		100.552	
MAX. SURCHARGE (mm)		-341	

MANNING FORMULA - FLOWING FULL

DIA (m)	Area (m2)	Perim. (m)	Slope (%)	Hyd.R. (m)	Vel. (m/s)	Q (l/s)
0.2032	0.03	0.64	0.700	0.05	0.88	28.61

HYDRAULIC SLOPE = 0.06 %

Head loss in manhole simplified method p. 71 (MWDM)
from figure 1.7.2, Qu =8.3, Qo =11.6; Qu/Qo = 0.72 — $K_L = 0.83$
Velocity = Flow / Area = 0.26 m/s
$HL = K_L * V^2/ 2g$

FRICTION LOSS	FROM MH	TO MH	PIPE ID
ROBERT GRANT AVE	MH 161A	MH 146A	
INVERT ELEVATION (m)	100.741	101.014	
OBVERT ELEVATION (m)	100.944	101.217	
DIAMETER (mm)			203.2
LENGTH (m)			39.0
FLOW (l/s)			6.8
HGL (m) ***	100.944	100.959	0.015
MANHOLE COEF K= 1.62	LOSS (m)	0.004	
TOTAL HGL (m)		100.963	
MAX. SURCHARGE (mm)		-254	

MANNING FORMULA - FLOWING FULL

DIA (m)	Area (m2)	Perim. (m)	Slope (%)	Hyd.R. (m)	Vel. (m/s)	Q (l/s)
0.2032	0.03	0.64	0.700	0.05	0.88	28.62

HYDRAULIC SLOPE = 0.05 %

Head loss in manhole simplified method p. 71 (MWDM)
from figure 1.7.2, Qu =6.8, Qo =8.3; Qu/Qo = 0.82 — $K_L = 0.62$
outlet at 77 degree bend to inlet — Kb = 1.00
Velocity = Flow / Area = 0.21 m/s
$HL = K_L * V^2/ 2g$

BRANCH FROM MH FT18 TO FT19

FRICTION LOSS	FROM MH	TO MH	PIPE ID
FERNBANK ROAD	FT18	FT19	
INVERT ELEVATION (m)	94.800	95.930	
OBVERT ELEVATION (m)	95.410	96.540	
DIAMETER (mm)			609.6
LENGTH (m)			124.5
FLOW (l/s)			367.0
HGL (m) ***	97.495	97.950	0.455
MANHOLE COEF K= 0.05	LOSS (m)	0.004	
TOTAL HGL (m)		97.955	
MAX. SURCHARGE (mm)		1415	

MANNING FORMULA - FLOWING FULL

DIA (m)	Area (m2)	Perim. (m)	Slope (%)	Hyd.R. (m)	Vel. (m/s)	Q (l/s)
0.6096	0.29	1.91	0.910	0.15	2.09	609.95

HYDRAULIC SLOPE = 0.37 %

Head loss in manhole simplified method p. 71 (MWDM)
straight through — $K_L = 0.05$
Velocity = Flow / Area = 1.33 m/s
$HL = K_L * V^2/ 2g$

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FRICTION LOSS	FROM MH	TO MH	PIPE ID
FERNBANK ROAD	FT19	FT20	
INVERT ELEVATION (m)	95.950	96.420	
OBVERT ELEVATION (m)	96.560	97.030	
DIAMETER (mm)			609.6
LENGTH (m)			103.6
FLOW (l/s)			387.0
HGL (m) ***	97.955	98.333	0.379
MANHOLE COEF K= 0.05	LOSS (m)	0.004	
TOTAL HGL (m)		98.338	
MAX. SURCHARGE (mm)		1308	

MANNING FORMULA - FLOWING FULL						
DIA (m)	Area (m2)	Perim. (m)	Slope (%)	Hyd.R. (m)	Vel. (m/s)	Q (l/s)
0.6096	0.29	1.91	0.450	0.15	1.48	431.23
HYDRAULIC SLOPE =		0.37 %				

Head loss in manhole simplified method p. 71 (MWDM)
straight through K_L=0.05
Velocity = Flow / Area = 1.33 m/s
HL = K_L * V^2/ 2g

FRICTION LOSS	FROM MH	TO MH	PIPE ID
FERNBANK ROAD	FT20	FT21	
INVERT ELEVATION (m)	96.460	96.940	
OBVERT ELEVATION (m)	97.070	97.550	
DIAMETER (mm)			609.6
LENGTH (m)			108.34
FLOW (l/s)			387.0
HGL (m) ***	98.338	98.726	0.389
MANHOLE COEF K= 0.05	LOSS (m)	0.004	
TOTAL HGL (m)		98.731	
MAX. SURCHARGE (mm)		1181	

MANNING FORMULA - FLOWING FULL						
DIA (m)	Area (m2)	Perim. (m)	Slope (%)	Hyd.R. (m)	Vel. (m/s)	Q (l/s)
0.6096	0.29	1.91	0.450	0.15	1.47	430.14
HYDRAULIC SLOPE =		0.37 %				

Head loss in manhole simplified method p. 71 (MWDM)
straight through K_L=0.05
Velocity = Flow / Area = 1.33 m/s
HL = K_L * V^2/ 2g

FRICTION LOSS	FROM MH	TO MH	PIPE ID
FERNBANK ROAD	FT21	FT22	
INVERT ELEVATION (m)	96.980	97.350	
OBVERT ELEVATION (m)	97.570	97.960	
DIAMETER (mm)			609.6
LENGTH (m)			108.6
FLOW (l/s)			387.0
HGL (m) ***	98.731	99.128	0.397
MANHOLE COEF K= 0.05	LOSS (m)	0.004	
TOTAL HGL (m)		99.132	
MAX. SURCHARGE (mm)		1173	

MANNING FORMULA - FLOWING FULL						
DIA (m)	Area (m2)	Perim. (m)	Slope (%)	Hyd.R. (m)	Vel. (m/s)	Q (l/s)
0.6096	0.29	1.91	0.360	0.15	1.32	383.67
HYDRAULIC SLOPE =		0.37 %				

Head loss in manhole simplified method p. 71 (MWDM)
straight through K_L=0.05
Velocity = Flow / Area = 1.33 m/s
HL = K_L * V^2/ 2g

FRICTION LOSS	FROM MH	TO MH	PIPE ID
FERNBANK ROAD	FT22	FT23	
INVERT ELEVATION (m)	97.370	97.760	
OBVERT ELEVATION (m)	97.980	98.390	
DIAMETER (mm)			609.6
LENGTH (m)			106.2
FLOW (l/s)			387.0
HGL (m) ***	99.132	99.520	0.388
MANHOLE COEF K= 0.05	LOSS (m)	0.004	
TOTAL HGL (m)		99.525	
MAX. SURCHARGE (mm)		1135	

MANNING FORMULA - FLOWING FULL						
DIA (m)	Area (m2)	Perim. (m)	Slope (%)	Hyd.R. (m)	Vel. (m/s)	Q (l/s)
0.6096	0.29	1.91	0.390	0.15	1.36	397.80
HYDRAULIC SLOPE =		0.37 %				

Head loss in manhole simplified method p. 71 (MWDM)
straight through K_L=0.05
Velocity = Flow / Area = 1.33 m/s
HL = K_L * V^2/ 2g

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FRICTION LOSS	FROM MH	TO MH	PIPE ID
FERNBANK ROAD	FT23	FT24	
INVERT ELEVATION (m)	97.790	98.160	
OBVERT ELEVATION (m)	98.400	98.770	
DIAMETER (mm)			609.6
LENGTH (m)			108.9
FLOW (l/s)			387.0
HGL (m) ***	99.525	99.923	0.398
MANHOLE COEF K= 0.05	LOSS (m)	0.004	
TOTAL HGL (m)		99.927	
MAX. SURCHARGE (mm)		1157	

MANNING FORMULA - FLOWING FULL						
DIA (m)	Area (m2)	Perim. (m)	Slope (%)	Hyd.R. (m)	Vel. (m/s)	Q (l/s)
0.6096	0.29	1.91	0.340	0.15	1.28	373.19
HYDRAULIC SLOPE =		0.37 %				

Head loss in manhole simplified method p. 71 (MWDM)
straight through K_L=0.05
Velocity = Flow / Area = 1.33 m/s
$HL = K_L * V^2/ 2g$

BRANCH FROM MH FT24 TO MH 102A

FRICTION LOSS	FROM MH	TO MH	PIPE ID
GOLDHAWK DRIVE	FT24	MH 102A	
INVERT ELEVATION (m)	98.180	98.842	
OBVERT ELEVATION (m)	98.790	99.452	
DIAMETER (mm)			609.6
LENGTH (m)			102.59
FLOW (l/s)			387.0
HGL (m) ***	99.927	100.302	0.375
MANHOLE COEF K= 1.50	LOSS (m)	0.135	
TOTAL HGL (m)		100.436	
MAX. SURCHARGE (mm)		985	

MANNING FORMULA - FLOWING FULL						
DIA (m)	Area (m2)	Perim. (m)	Slope (%)	Hyd.R. (m)	Vel. (m/s)	Q (l/s)
0.6096	0.29	1.91	0.645	0.15	1.76	514.30
HYDRAULIC SLOPE =		0.50 %				

Head loss in manhole simplified method p. 71 (MWDM)
outlet at right angles to inlet K_L = 1.5
Velocity = Flow / Area = 1.33 m/s
$HL = K_L * V^2/ 2g$

FRICTION LOSS	FROM MH	TO MH	PIPE ID
GOLDHAWK DRIVE	MH 102A	MH 103A	
INVERT ELEVATION (m)	98.872	99.030	
OBVERT ELEVATION (m)	99.482	99.640	
DIAMETER (mm)			609.6
LENGTH (m)			45.00
FLOW (l/s)			385.0
HGL (m) ***	100.436	100.599	0.163
MANHOLE COEF K= 0.05	LOSS (m)	0.004	
TOTAL HGL (m)		100.604	
MAX. SURCHARGE (mm)		964	

MANNING FORMULA - FLOWING FULL						
DIA (m)	Area (m2)	Perim. (m)	Slope (%)	Hyd.R. (m)	Vel. (m/s)	Q (l/s)
0.6096	0.29	1.91	0.351	0.15	1.30	379.37
HYDRAULIC SLOPE =		0.37 %				

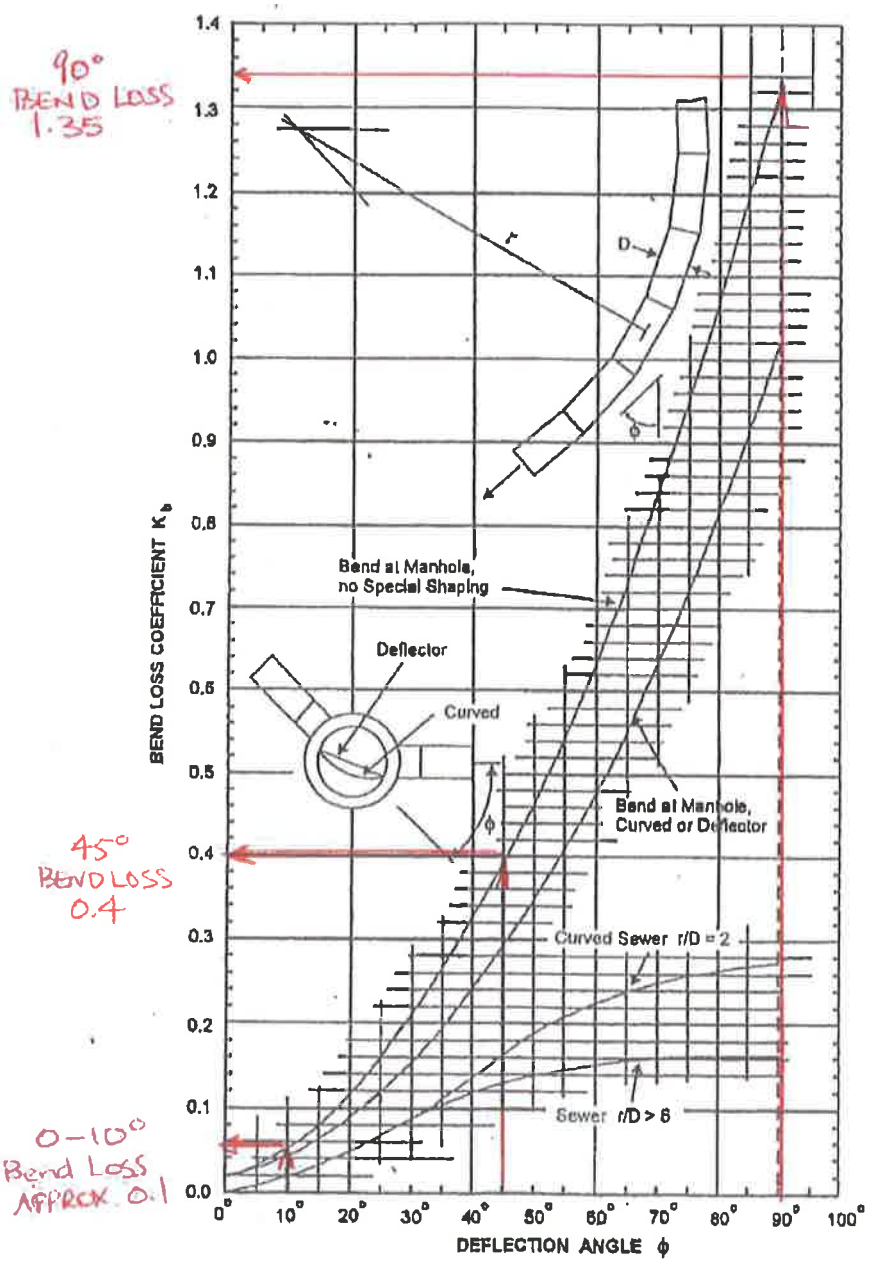
Head loss in manhole simplified method p. 71 (MWDM)
straight through K_L = 0.05
Velocity = Flow / Area = 1.32 m/s
$HL = K_L * V^2/ 2g$

FRICTION LOSS	FROM MH	TO MH	PIPE ID
GOLDHAWK DRIVE	MH 103A	MH 104A	
INVERT ELEVATION (m)	99.060	99.230	
OBVERT ELEVATION (m)	99.670	99.840	
DIAMETER (mm)			609.6
LENGTH (m)			48.77
FLOW (l/s)			385.0
HGL (m) ***	100.604	100.780	0.176
MANHOLE COEF K= 0.05	LOSS (m)	0.004	
TOTAL HGL (m)		100.784	
MAX. SURCHARGE (mm)		945	

MANNING FORMULA - FLOWING FULL						
DIA (m)	Area (m2)	Perim. (m)	Slope (%)	Hyd.R. (m)	Vel. (m/s)	Q (l/s)
0.6096	0.29	1.91	0.349	0.15	1.30	377.99
HYDRAULIC SLOPE =		0.37 %				

Head loss in manhole simplified method p. 71 (MWDM)
straight through K_L = 0.05
Velocity = Flow / Area = 1.32 m/s
$HL = K_L * V^2/ 2g$

Design Chart : Sewer Bend Loss Coefficients

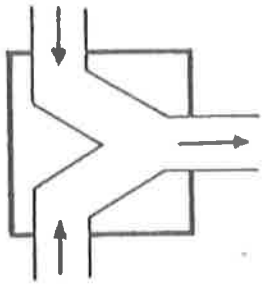


Source: American Iron and Steel Institute (1980)

1.7.3.2 Junctions

Tee - outlet at right angles to inlets and no deflector between inlets $K_L = 1.5$

- deflector between inlets for full height and width of incoming flows $K_L = 1.0$



Side and Cross Junctions - value of K_L is obtained from the following graph:

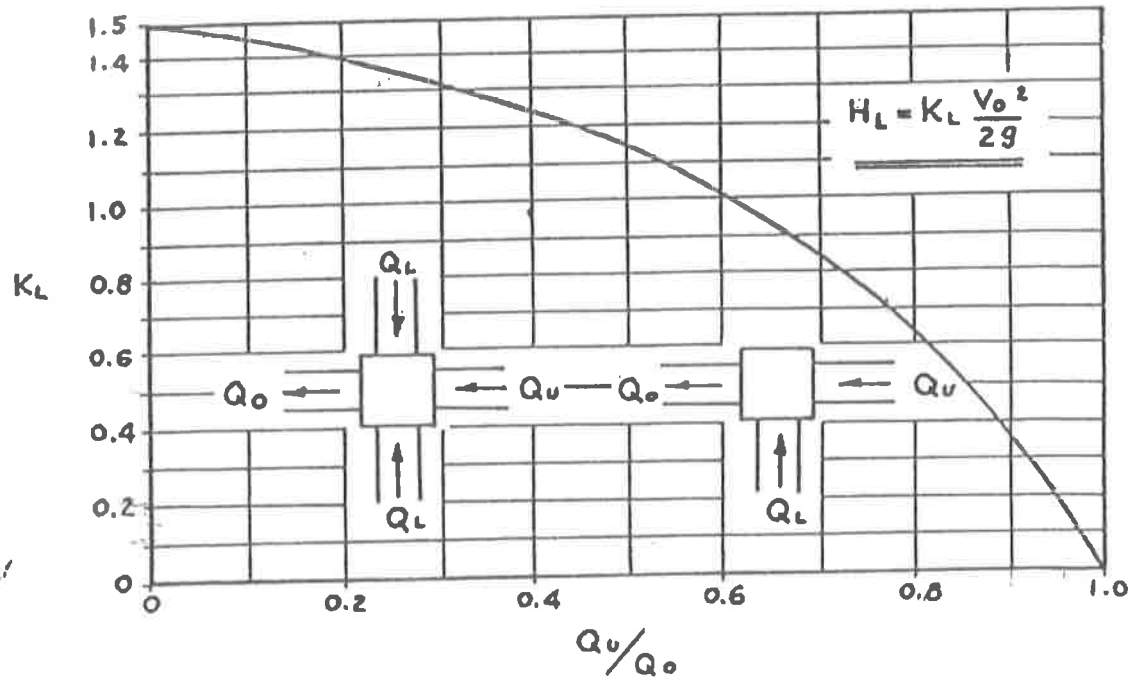
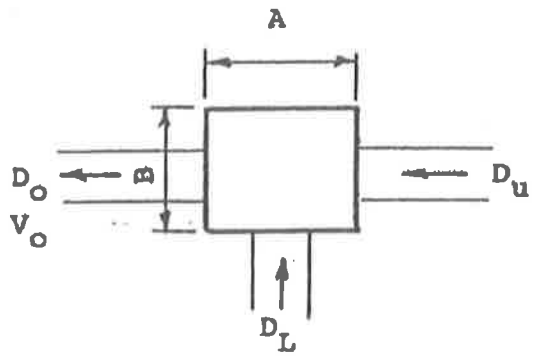


FIGURE 1.7.2.

1.7.4 Accurate Method of Head Loss Calculations

In this method, the head loss is calculated for each incoming sewer and is allowed for in the individual sewers as outlined in Section 1.7.2.2.

1.7.4.1 Manhole Abbreviations



1.7.4.2 Upstream In-line Sewer Head Loss

$$H_L = K_u \frac{V_o^2}{2g}$$

$$= \bar{K}_u \times \frac{K_u}{\bar{K}_u} \times \frac{V_o^2}{2g}$$

$\bar{K}_u$ is obtained from Figure 1.7.3

$\frac{K_u}{\bar{K}_u}$ is obtained from Figure 1.7.4

$\frac{V_o^2}{2g}$ is obtained from Figure 1.7.5

1.7.4.3 Upstream Lateral Sewer Head Loss

$$H_L = K_L \frac{V_o^2}{2g}$$

$$= \bar{K}_L \left[1 - \left(\frac{Qu}{Qo} \cdot \frac{Do}{Du} \right)^{\frac{2\,Do}{D_L}} \right] \frac{V_o^2}{2g}$$

1.7 HEAD LOSSES IN MANHOLES, CURVED SEWERS AND JUNCTION CHAMBERS

1.7.1 General

Where a manhole is placed on a sewer line, where two or more sewers meet in a manhole, where sewers meet in a specially designed junction chamber or where a sewer is placed on a curve there is a loss of energy greater than that of a straight length of sewer. These losses can be negligible as in the cases of small diameter sanitary sewers flowing partially full at minimum velocities or substantial as in the case of large diameter storm sewers turning 90° in a manhole at a high velocity.

The designer's responsibility is to ensure that he provides additional head energy in the sewer design to allow for the losses to be incurred. In cases where the head available is limited, he will have to adjust the design to provide for a system which is hydraulically smoother. This will require less head to be provided to overcome the energy losses.

The most complete study of this subject which has been undertaken to date has been done by Sangster, Wood, Smerdon and Bossy at the University of Missouri and published in their Bulletin No. 41 entitled "Pressure Changes at Storm Drain Junctions" and in the A.S.C.E. Journal of the Hydraulics Division entitled "Pressure Changes at Open Junctions in Conduits" - HY6 - #2057.

To facilitate the rapid determination of head losses in manholes, a number of typical manhole bends and junctions were studied. From this, a "simplified method" was established. This method has been found to be quite adequate for the vast majority of manholes and is outlined in Section 1.7.3.

An "accurate method" is also outlined in Section 1.7.4. This method is taken directly from the study with the addition of curves which aid in the solution of the formulas.

The head losses in radius pipe and in junction chambers are also described in Sections 1.7.5 and 1.7.6. For this purpose, a junction chamber is considered to be a manhole where two or more sewers enter the manhole with one or more entering at an angle other than 90^{o} or 180^{o} to the outlet sewer.

1.7.2 Addition of Energy to the System

1.7.2.1 Change in Pipe Size

In addition of energy to systems, the first point to keep in mind is that no energy is added when the crown of the inlet and outlet sewers are at the same elevation. Therefore, at changes in sewer size, the crown(s) of the incoming sewer(s) are to be at the same elevation where no energy is added or higher than the crown of the outgoing sewer where energy is to be added.

1.7.2.2 Addition of Energy

Energy is added to a system in two ways:

- Small Losses - where the head loss is 0.15m or less, the crown of the outlet pipe is dropped below the lowest incoming crown by the amount of the head loss.
- Larger Losses - where the head loss is greater than 0.15m, the crown of the outlet pipe is dropped below the lowest incoming crown by the amount of the head loss, and the upstream incoming crowns are dropped to the same elevation as the outlet crown. Sewers entering the manhole at 90^{o} to the outlet need not be lowered.

The upstream sewers will be on a grade equal to the grade required to overcome the friction in the sewer plus the grade required to overcome the head loss in the downstream manhole.

1.7.3 Simplified Method of Head Loss Calculation

The head loss coefficient (K_L) for the particular bend or junction in the manhole is multiplied by the velocity head of the outlet sewer.

$$H_L = K_L \frac{Vo^2}{2g}$$

Head loss coeficients (K_L) to be used are:

1.7.3.1 Bends

90° - No benching or deflector, or where they are only up to the springline $K_L = 1.5$

90° - Benching or deflector to crown of sewers $K_L = 1.0$

Less than 90° - Multiply the head loss coefficient for a 90° bend by a head loss ratio factor from the following curve:

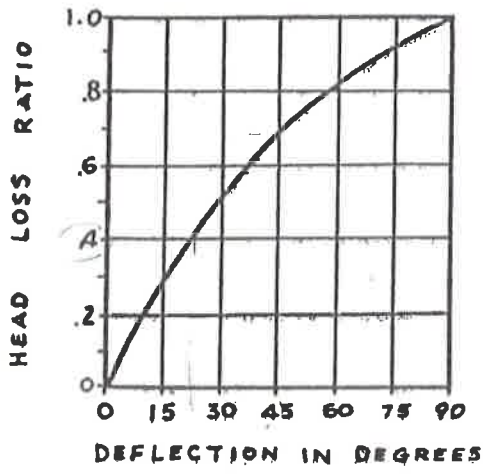


FIGURE 1.7.1.

IBI Group
400-333 Preston Street
Ottawa, Ontario
K1S 5N4

SANITARY SEWER DESIGN SHEET

PROJECT: CRT DEVELOPMENT
LOCATION: CITY OF OTTAWA
CLIENT: CRT DEVELOPMENT INC.

LOCATION				RESIDENTIAL									ICI AREAS							INFILTRATION ALLOWANCE			TOTAL FLOW	PROPOSED SEWER DESIGN						
				UNIT TYPES				AREA	POPULATION		PEAK FACTOR	PEAK FLOW	AREA (Ha)						PEAK FLOW	AREA (Ha)		FLOW		CAPACITY	LENGTH	DIA	SLOPE	VELOCITY	AVAILABLE CAPACITY	
STREET	AREA ID	FROM MH	TO MH	SF	SD	TH	APT	(Ha)	IND	CUM		(L/s)	INSTITUTIONAL		COMMERCIAL		INDUSTRIAL		(L/s)	IND	CUM	(L/s)	(L/s)	(L/s)	(m)	(mm)	(%)	(full) (m/s)	L/s	(%)
													IND	CUM	IND	CUM	IND	CUM												
PUTNEY CRESCENT	141A	141A	142A			1		0.06	2.5	2.5	4.00	0.04		0.00		0.00		0.00	0.00	0.06	0.06	0.02	0.06	24.19	9.07	200	0.50	0.746	24.14	99.76
PUTNEY CRESCENT	142A	142A	143A			11		0.35	27.5	30.0	4.00	0.49		0.00		0.00		0.00	0.00	0.35	0.41	0.11	0.60	47.16	55.56	200	1.90	1.454	46.56	98.73
PUTNEY CRESCENT	143A	143A	144A			17		0.49	42.5	72.5	4.00	1.17		0.00		0.00		0.00	0.00	0.49	0.90	0.25	1.43	41.91	64.86	200	1.50	1.292	40.48	96.60
FINSBURY AVENUE	136AA	136A	144A			21		0.65	52.5	52.5	4.00	0.85		0.00		0.00		0.00	0.00	0.65	0.65	0.18	1.03	53.56	110.44	200	2.45	1.652	52.52	98.07
PUTNEY CRESCENT	144A	144A	145A			10		0.36	25.0	150.0	4.00	2.43		0.00		0.00		0.00	0.00	0.36	1.91	0.53	2.97	32.46	80.25	200	0.90	1.001	29.50	90.86
CLAPHAM TERRACE	136AB	136A	137A			10		0.37	25.0	25.0	4.00	0.41		0.00		0.00		0.00	0.00	0.37	0.37	0.10	0.51	24.19	78.00	200	0.50	0.746	23.69	97.90
BRIXTON WAY	137AA	137A	160A			12		0.35	30.0	55.0	4.00	0.89		0.00		0.00		0.00	0.00	0.35	0.72	0.20	1.09	41.91	50.77	200	1.50	1.292	40.81	97.39
BRIXTON WAY	160A	160A	145A			18		0.54	45.0	100.0	4.00	1.62		0.00		0.00		0.00	0.00	0.54	1.26	0.35	1.97	52.45	78.53	200	2.35	1.617	50.48	96.24
PUTNEY CRESCENT	145A	145A	146A			11		0.34	27.5	277.5	4.00	4.50		0.00		0.00		0.00	0.00	0.34	3.51	0.98	5.48	39.76	70.87	200	1.35	1.226	34.28	86.22
CLAPHAM WAY	137AB	137A	138A			9		0.38	22.5	22.5	4.00	0.36		0.00		0.00		0.00	0.00	0.38	0.38	0.11	0.47	37.48	78.00	200	1.20	1.156	37.01	98.74
PUTNEY CRESCENT	138A	138A	148A			10		0.35	25.0	47.5	4.00	0.77		0.00		0.00		0.00	0.00	0.35	0.73	0.20	0.97	40.49	77.95	200	1.40	1.248	39.51	97.59
PUTNEY CRESCENT	148A	148A	147A			7		0.26	17.5	65.0	4.00	1.05		0.00		0.00		0.00	0.00	0.26	0.99	0.28	1.33	55.70	59.50	200	2.65	1.718	54.37	97.61
PUTNEY CRESCENT	147A	147A	146A			0		0.03	0.0	65.0	4.00	1.05		0.00		0.00		0.00	0.00	0.03	1.02	0.29	1.34	55.70	12.47	200	2.65	1.718	54.36	97.60
BLOCK 323	146A	146A	161A			0		0.03	0.0	342.5	4.00	5.55		0.00		0.00		0.00	0.00	0.03	4.56	1.28	6.83	28.63	38.97	200	0.70	0.883	21.80	76.15
BLOCK 316	HYD. 2	161A	*Ex.209*			0		5.12	0.0	342.5	4.00	5.55		0.00		0.00		0.00	0.00	5.12	9.68	2.71	8.26	28.63	53.67	200	0.70	0.883	20.37	71.15
BLOCK 324	RES.1	BULKHEAD	*Ex.209*					1.89	170.1	170.1	4.00	2.76		0.00		0.00		0.00	0.00	1.89	1.89	0.53	3.29	43.87	8.00	250	0.50	0.866	40.58	92.51
				Refer to ECA No. 9079-9LNNZC dated July 9, 2014 for description of existing sewers.																											

Design Parameters:

Residential			ICI Areas			
						Peak Factor
SF	3.3	p/p/u	INST	50,000	L/Ha/day	1.5
TH/SD	2.5	p/p/u	COM	50,000	L/Ha/day	1.5
APT	1.8	p/p/u	IND	35,000	L/Ha/day	MOE Chart
Low	60	p/p/Ha				
Med	75	p/p/Ha				
High	90	p/p/Ha				

Notes:
1. Mannings coefficient (n) = 0.013
2. Demand (per capita): 350 L/day
3. Infiltration allowance: 0.28 L/s/Ha
4. Residential Peaking Factor:
   Harmon Formula = 1+(14/(4+P^0.5))
   where P = population in thousands

Designed: J.I.M.
Checked: P.K.
Dwg. Reference: 27970 - 501, 501A, 501B

No.	Revision	Date
1.	Submission No. 1 to City of Ottawa	2013-08-29
2.	Submission No. 2 to City of Ottawa	2014-01-22
3.	Submission No. 3 to City of Ottawa	2014-08-22
4.	Submission No. 4 to City of Ottawa	2015-06-15
5.	Submission No. 5 to City of Ottawa	2016-11-10
6.	Submission for MOE Approval	2017-02-10
7.	Resubmission for MOE Approval	2017-07-14

File Reference:	Date:	Sheet No:
27970.5.7.1	2017-07-14	1 of 4

IBI GROUP
IBI Group
400-333 Preston Street
Ottawa, Ontario
K1S 5N4

SANITARY SEWER DESIGN SHEET

PROJECT: CRT DEVELOPMENT
LOCATION: CITY OF OTTAWA
CLIENT: CRT DEVELOPMENT INC.

LOCATION				RESIDENTIAL									ICI AREAS							INFILTRATION ALLOWANCE			TOTAL FLOW	PROPOSED SEWER DESIGN						
				UNIT TYPES				AREA	POPULATION		PEAK FACTOR	PEAK FLOW	AREA (Ha)						PEAK FLOW	AREA (Ha)		FLOW		CAPACITY	LENGTH	DIA	SLOPE	VELOCITY	AVAILABLE CAPACITY	
STREET	AREA ID	FROM MH	TO MH	SF	SD	TH	APT	(Ha)	IND	CUM		(L/s)	INSTITUTIONAL IND	INSTITUTIONAL CUM	COMMERCIAL IND	COMMERCIAL CUM	INDUSTRIAL IND	INDUSTRIAL CUM	(L/s)	IND	CUM	(L/s)	(L/s)	(L/s)	(m)	(mm)	(%)	(full) (m/s)	L/s	(%)
CLAPHAM TERRACE	136AC	136A	135A			11		0.41	27.5	27.5	4.00	0.45		0.00		0.00		0.00	0.00	0.41	0.41	0.11	0.56	27.59	65.31	200	0.65	0.851	27.03	97.97
CLAPHAM TERRACE	135A	135A	134A			9		0.31	22.5	50.0	4.00	0.81		0.00		0.00		0.00	0.00	0.31	0.72	0.20	1.01	27.59	57.36	200	0.65	0.851	26.57	96.33
PUTNEY CRESCENT	141A	141A	134A			9		0.34	22.5	22.5	4.00	0.36		0.00		0.00		0.00	0.00	0.34	0.34	0.10	0.46	32.46	75.02	200	0.90	1.001	32.00	98.58
PUTNEY CRESCENT	134A	134A	140A	6				0.34	19.8	92.3	4.00	1.50		0.00		0.00		0.00	0.00	0.34	1.40	0.39	1.89	32.46	78.00	200	0.90	1.001	30.57	94.18
OSTERLEY WAY	153A	153A	152A	8				0.51	26.4	26.4	4.00	0.43		0.00		0.00		0.00	0.00	0.51	0.51	0.14	0.57	29.63	49.25	200	0.75	0.914	29.06	98.07
OSTERLEY WAY	152A	152A	151A	17				0.78	56.1	82.5	4.00	1.34		0.00		0.00		0.00	0.00	0.78	1.29	0.36	1.70	29.63	95.75	200	0.75	0.914	27.93	94.27
OSTERLEY WAY	151A	151A	150A	10				0.47	33.0	115.5	4.00	1.87		0.00		0.00		0.00	0.00	0.47	1.76	0.49	2.36	29.63	59.68	200	0.75	0.914	27.27	92.02
OSTERLEY WAY	150A	150A	140A	9				0.42	29.7	145.2	4.00	2.35		0.00		0.00		0.00	0.00	0.42	2.18	0.61	2.96	29.63	62.98	200	0.75	0.914	26.67	90.00
PUTNEY CRESCENT	140A	140A	124A	3				0.24	9.9	247.4	4.00	4.01		0.00		0.00		0.00	0.00	0.24	3.82	1.07	5.08	32.46	78.00	200	0.90	1.001	27.38	84.36
BLOCK 343	RES.2	BLKHD	129A					1.21	108.9	108.9	4.00	1.76		0.00		0.00		0.00	0.00	1.21	1.21	0.34	2.10	20.24	19.00	200	0.35	0.624	18.14	89.61
BOBOLINK RIDGE	129A	129A	128A	0				0.09	0.0	108.9	4.00	1.76		0.00		0.00		0.00	0.00	0.09	1.30	0.36	2.13	31.02	45.00	250	0.25	0.612	28.89	93.14
BOBOLINK RIDGE	128AA	128A	127A	6				0.41	19.8	128.7	4.00	2.09		0.00		0.00		0.00	0.00	0.41	1.71	0.48	2.56	31.02	78.00	250	0.25	0.612	28.46	91.73
BOBOLINK RIDGE	127AA	127A	126A	10				0.53	33.0	161.7	4.00	2.62		0.00		0.00		0.00	0.00	0.53	2.24	0.63	3.25	31.02	78.00	250	0.25	0.612	27.77	89.53
BOBOLINK RIDGE	126A	126A	125A	5				0.33	16.5	178.2	4.00	2.89		0.00		0.00		0.00	0.00	0.33	2.57	0.72	3.61	31.02	47.81	250	0.25	0.612	27.41	88.37
BOBOLINK RIDGE	125A	125A	124A	12				0.56	39.6	217.8	4.00	3.53		0.00		0.00		0.00	0.00	0.56	3.13	0.88	4.41	31.02	74.85	250	0.25	0.612	26.61	85.80
BOBOLINK RIDGE	124A	124A	123A	11				0.61	36.3	501.5	3.97	8.07		0.00		0.00		0.00	0.00	0.61	7.56	2.12	10.19	31.02	88.85	250	0.25	0.612	20.83	67.15
DAGENHAM STREET	PARK1, 131A	131A	130A	7				1.70	23.1	23.1	4.00	0.37		0.00		0.00		0.00	0.00	1.70	1.70	0.48	0.85	34.22	43.00	200	1.00	1.055	33.37	97.51
DAGENHAM STREET	130A	130A	123A	8				0.46	26.4	49.5	4.00	0.80		0.00		0.00		0.00	0.00	0.46	2.16	0.60	1.41	34.22	87.11	200	1.00	1.055	32.81	95.89
BOBOLINK RIDGE	123A	123A	122A	2				0.14	6.6	557.6	3.95	8.92		0.00		0.00		0.00	0.00	0.14	9.86	2.76	11.68	31.02	25.98	250	0.25	0.612	19.34	62.34
BOBOLINK RIDGE	122A	122A	121A	5				0.26	16.5	574.1	3.94	9.17		0.00		0.00		0.00	0.00	0.26	10.12	2.83	12.00	31.02	36.36	250	0.25	0.612	19.02	61.31
BOBOLINK RIDGE	121A	121A	120A	6				0.30	19.8	593.9	3.93	9.47		0.00		0.00		0.00	0.00	0.30	10.42	2.92	12.38	31.02	40.43	250	0.25	0.612	18.64	60.08
ANGEL HEIGHTS	111A	111A	112A	1				0.08	3.3	3.3	4.00	0.05		0.00		0.00		0.00	0.00	0.08	0.08	0.02	0.08	28.63	12.92	200	0.70	0.883	28.55	99.73
ANGEL HEIGHTS	112A	112A	113A	13				0.77	42.9	46.2	4.00	0.75		0.00		0.00		0.00	0.00	0.77	0.85	0.24	0.99	28.63	95.21	200	0.70	0.883	27.64	96.55
ANGEL HEIGHTS	113A	113A	114A	6				0.29	19.8	66.0	4.00	1.07		0.00		0.00		0.00	0.00	0.29	1.14	0.32	1.39	28.63	38.92	200	0.70	0.883	27.24	95.15
ANGEL HEIGHTS	114A	114A	120A	6				0.35	19.8	85.8	4.00	1.39		0.00		0.00		0.00	0.00	0.35	1.49	0.42	1.81	28.63	70.46	200	0.70	0.883	26.82	93.69
BOBOLINK RIDGE	120A	120A	105A	11				0.62	36.3	716.0	3.89	11.28		0.00		0.00		0.00	0.00	0.62	12.53	3.51	14.79	36.70	90.60	250	0.35	0.724	21.91	59.71

Design Parameters:

Residential			ICI Areas			
						Peak Factor
SF	3.3	p/p/u				
TH/SD	2.5	p/p/u	INST	50,000	L/Ha/day	1.5
APT	1.8	p/p/u	COM	50,000	L/Ha/day	1.5
Low	60	p/p/Ha	IND	35,000	L/Ha/day	MOE Chart
Med	75	p/p/Ha				
High	90	p/p/Ha				

Notes:

1. Mannings coefficient (n) = 0.013
2. Demand (per capita): 350 L/day
3. Infiltration allowance: 0.28 L/s/Ha
4. Residential Peaking Factor:
   Harmon Formula = 1+(14/(4+P^0.5))
   where P = population in thousands

Designed: J.I.M.

Checked: P.K.

Dwg. Reference: 27970 - 501, 501A, 501B

No.	Revision	Date
1.	Submission No. 1 to City of Ottawa	2013-08-29
2.	Submission No. 2 to City of Ottawa	2014-01-22
3.	Submission No. 3 to City of Ottawa	2014-08-22
4.	Submission No. 4 to City of Ottawa	2015-06-15
5.	Submission No. 5 to City of Ottawa	2016-11-10
6.	Submission for MOE Approval	2017-02-10
7.	Resubmission for MOE Approval	2017-07-14

File Reference: 27970.5.7.1 | **Date:** 2017-07-14 | **Sheet No:** 2 of 4

IBI GROUP
IBI Group
400-333 Preston Street
Ottawa, Ontario
K1S 5N4

SANITARY SEWER DESIGN SHEET

PROJECT: CRT DEVELOPMENT
LOCATION: CITY OF OTTAWA
CLIENT: CRT DEVELOPMENT INC.

LOCATION				RESIDENTIAL									ICI AREAS							INFILTRATION ALLOWANCE			TOTAL FLOW	PROPOSED SEWER DESIGN						
				UNIT TYPES				AREA	POPULATION		PEAK FACTOR	PEAK FLOW	AREA (Ha)						PEAK FLOW	AREA (Ha)		FLOW		CAPACITY	LENGTH	DIA	SLOPE	VELOCITY	AVAILABLE CAPACITY	
STREET	AREA ID	FROM MH	TO MH	SF	SD	TH	APT	(Ha)	IND	CUM		(L/s)	INSTITUTIONAL		COMMERCIAL		INDUSTRIAL		(L/s)	IND	CUM	(L/s)	(L/s)	(L/s)	(m)	(mm)	(%)	(full) (m/s)	L/s	(%)
													IND	CUM	IND	CUM	IND	CUM												
EMBANKMENT STREET	128AB	128A	188A	16				0.74	52.8	52.8	4.00	0.86		0.00		0.00		0.00	0.00	0.74	0.74	0.21	1.06	27.59	98.00	200	0.65	0.851	26.52	96.15
EMBANKMENT STREET	188A	188A	189A	11				0.52	36.3	89.1	4.00	1.44		0.00		0.00		0.00	0.00	0.52	1.26	0.35	1.80	27.59	74.80	200	0.65	0.851	25.79	93.49
BLOCK 344	RES.3	192A	189A					1.52	136.8	136.8	4.00	2.22		0.00		0.00		0.00	0.00	1.52	1.52	0.43	2.64	20.24	40.00	200	0.35	0.624	17.60	86.95
EMBANKMENT STREET	189A	189A	190A	14				0.69	46.2	272.1	4.00	4.41		0.00		0.00		0.00	0.00	0.69	3.47	0.97	5.38	20.24	92.53	200	0.35	0.624	14.86	73.42
EMBANKMENT STREET		190A	176A	0				0.00	0.0	272.1	4.00	4.41		0.00		0.00		0.00	0.00	0.00	3.47	0.97	5.38	20.24	10.78	200	0.35	0.624	14.86	73.42
BLOCK 345	INST.2	BULKHEAD	176A	0				0.00	0.0	0.0	4.00	0.00	6.53	6.53		0.00		0.00	5.67	6.53	6.53	1.83	7.50	20.24	21.00	200	0.35	0.624	12.75	62.97
COPE DRIVE	176A	176A	175A	3				0.63	9.9	282.0	4.00	4.57		6.53		0.00		0.00	5.67	0.63	10.63	2.98	13.21	20.24	76.03	200	0.35	0.624	7.03	34.72
COPE DRIVE	175A	175A	174A	5				0.46	16.5	298.5	4.00	4.84		6.53		0.00		0.00	5.67	0.46	11.09	3.11	13.61	20.24	84.94	200	0.35	0.624	6.63	32.76
BELSIZE WAY	127AB	127A	185A	11				0.53	36.3	36.3	4.00	0.59		0.00		0.00		0.00	0.00	0.53	0.53	0.15	0.74	27.59	88.50	200	0.65	0.851	26.85	97.33
BELSIZE WAY	185A	185A	186A	13				0.59	42.9	79.2	4.00	1.28		0.00		0.00		0.00	0.00	0.59	1.12	0.31	1.60	27.59	83.61	200	0.65	0.851	25.99	94.21
PINNER ROAD	191A	191A	186A	3				0.24	9.9	9.9	4.00	0.16		0.00		0.00		0.00	0.00	0.24	0.24	0.07	0.23	27.59	43.00	200	0.65	0.851	27.36	99.17
PINNER ROAD	186A	186A	187A	5				0.35	16.5	105.6	4.00	1.71		0.00		0.00		0.00	0.00	0.35	1.71	0.48	2.19	20.24	70.39	200	0.35	0.624	18.05	89.18
PINNER ROAD		187A	183A	0				0.00	0.0	105.6	4.00	1.71		0.00		0.00		0.00	0.00	0.00	1.71	0.48	2.19	20.24	9.00	200	0.35	0.624	18.05	89.18
FINSBURY AVENUE	182A	182A	183A	16				0.97	52.8	52.8	4.00	0.86		0.00		0.00		0.00	0.00	0.97	0.97	0.27	1.13	32.46	117.13	200	0.90	1.001	31.33	96.53
FINSBURY AVENUE	183A	183A	184A	4				0.33	13.2	171.6	4.00	2.78		0.00		0.00		0.00	0.00	0.33	3.01	0.84	3.62	20.24	65.71	200	0.35	0.624	16.62	82.10
FINSBURY AVENUE		184A	174A	0				0.00	0.0	171.6	4.00	2.78		0.00		0.00		0.00	0.00	0.00	3.01	0.84	3.62	20.24	17.89	200	0.35	0.624	16.62	82.10
COPE DRIVE	174A	174A	173A	7				0.47	23.1	493.2	3.98	7.95		6.53		0.00		0.00	5.67	0.47	14.57	4.08	17.69	31.02	82.90	250	0.25	0.612	13.33	42.96
COPE DRIVE	173A	173A	172A	6				0.41	19.8	513.0	3.97	8.25		6.53		0.00		0.00	5.67	0.41	14.98	4.19	18.11	31.02	76.02	250	0.25	0.612	12.91	41.62
BLOCK 313	INST.1	BULKHEAD	172A	0				0.00	0.0	0.0	4.00	0.00	2.88	2.88		0.00		0.00	2.50	2.88	2.88	0.81	3.31	20.24	16.00	200	0.35	0.624	16.94	83.67
COPE DRIVE	172A	172A	171B	3				0.23	9.9	522.9	3.96	8.40		9.41		0.00		0.00	8.17	0.23	18.09	5.07	21.63	31.02	36.96	250	0.25	0.612	9.39	30.27
COPE DRIVE	171B	171B	171A	2				0.22	6.6	529.5	3.96	8.50		9.41		0.00		0.00	8.17	0.22	18.31	5.13	21.79	31.02	41.21	250	0.25	0.612	9.23	29.75
DAGENHAM STREET	180A	180A	181A	7				0.50	23.1	23.1	4.00	0.37		0.00		0.00		0.00	0.00	0.50	0.50	0.14	0.51	20.24	90.00	200	0.35	0.624	19.73	97.46
DAGENHAM STREET	181A	181A	171A	0				0.11	0.0	23.1	4.00	0.37		0.00		0.00		0.00	0.00	0.11	0.61	0.17	0.55	20.24	67.50	200	0.35	0.624	19.70	97.31
COPE DRIVE	171A	171A	170B	1				0.17	3.3	555.9	3.95	8.90		9.41		0.00		0.00	8.17	0.17	19.09	5.35	22.41	45.12	37.91	300	0.20	0.618	22.71	50.33
COPE DRIVE	170B	170B	170A	3				0.25	9.9	565.8	3.95	9.04		9.41		0.00		0.00	8.17	0.25	19.34	5.42	22.63	45.12	43.98	300	0.20	0.618	22.49	49.84
BLOCK 312	RES.3A	BULKHEAD	sewer	0				3.26	195.6	195.6	4.00	3.17		0.00		0.00		0.00	0.00	3.26	3.26	0.91	4.08	20.24	16.22	200	0.35	0.624	16.16	79.83
COPE DRIVE	170A	170A	110A	6				0.62	19.8	781.2	3.87	12.24		9.41		0.00		0.00	8.17	0.62	23.22	6.50	26.91	45.12	120.00	300	0.20	0.618	18.21	40.36
GOLDHAWK DRIVE	306A	SOUTH	303A	31				1.83	102.3	102.3	4.00	1.66		0.00		0.00		0.00	0.00	1.83	1.83	0.51	2.17							
STREET NO. 26	304A	WEST	303A	14				0.69	46.2	46.2	4.00	0.75		0.00		0.00		0.00	0.00	0.69	0.69	0.19	0.94							
GOLDHAWK DRIVE	303A	303A	302A	10				0.62	33.0	181.5	4.00	2.94		0.00		0.00		0.00	0.00	0.62	3.14	0.88	3.82	20.24	94.58	200	0.35	0.624	16.42	81.13
Future Street	RES.5, 5A, Park3	EAST	302A					23.97	1421.4	1421.4	3.70	21.28		0.00		0.00		0.00	0.00	23.97	23.97	6.71	28.00							
GOLDHAWK DRIVE	302A	302A	301A	10				0.56	33.0	1635.9	3.65	24.20		0.00		0.00		0.00	0.00	0.56	27.67	7.75	31.95	50.44	70.68	300	0.25	0.691	18.49	36.66
GOLDHAWK DRIVE	301A	301A	207A	6				0.37	19.8	1655.7	3.65	24.47		0.00		0.00		0.00	0.00	0.37	28.04	7.85	32.32	50.44	70.00	300	0.25	0.691	18.12	35.93
STREET NO. 2	RES.4	EAST	207A					13.88	832.8	832.8	3.85	12.99		0.00		0.00		0.00	0.00	13.88	13.88	3.89	16.87							
GOLDHAWK DRIVE	207A	207A	206A	17				0.86	56.1	2544.6	3.50	36.10		0.00		0.00		0.00	0.00	0.86	42.78	11.98	48.08	70.84	107.19	375	0.15	0.621	22.76	32.13
GOLDHAWK DRIVE	206A	206A	205A	12				0.69	39.6	2584.2	3.50	36.60		0.00		0.00		0.00	0.00	0.69	43.47	12.17	48.78	70.84	106.61	375	0.15	0.621	22.07	31.15
GOLDHAWK DRIVE	205A	205A	110A	5				0.44	16.5	2600.7	3.49	36.81		0.00		0.00		0.00	0.00	0.44	43.91	12.29	49.11	70.84	100.61	375	0.15	0.621	21.73	30.68

Design Parameters:

Residential

SF	3.3	p/p/u
TH/SD	2.5	p/p/u
APT	1.8	p/p/u
Low	60	p/p/Ha
Med	75	p/p/Ha
High	90	p/p/Ha

ICI Areas

			Peak Factor
INST	50,000	L/Ha/day	1.5
COM	50,000	L/Ha/day	1.5
IND	35,000	L/Ha/day	MOE Chart

Notes:
1. Mannings coefficient (n) = 0.013
2. Demand (per capita): 350 L/day
3. Infiltration allowance: 0.28 L/s/Ha
4. Residential Peaking Factor:
   Harmon Formula = 1+(14/(4+P^0.5))
   where P = population in thousands

Designed: J.I.M.

Checked: P.K.

Dwg. Reference: 27970 - 501, 501A, 501B

No.	Revision	Date
1.	Submission No. 1 to City of Ottawa	2013-08-29
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File Reference: 27970.5.7.1
Date: 2017-07-14
Sheet No: 3 of 4

IBI GROUP
IBI Group
400-333 Preston Street
Ottawa, Ontario
K1S 5N4

SANITARY SEWER DESIGN SHEET

PROJECT: CRT DEVELOPMENT
LOCATION: CITY OF OTTAWA
CLIENT: CRT DEVELOPMENT INC.

LOCATION				RESIDENTIAL									ICI AREAS							INFILTRATION ALLOWANCE			TOTAL	PROPOSED SEWER DESIGN						
				UNIT TYPES				AREA	POPULATION		PEAK	PEAK	AREA (Ha)						PEAK	AREA (Ha)		FLOW	FLOW	CAPACITY	LENGTH	DIA	SLOPE	VELOCITY	AVAILABLE CAPACITY	
STREET	AREA ID	FROM MH	TO MH	SF	SD	TH	APT	(Ha)	IND	CUM	FACTOR	FLOW (L/s)	INSTITUTIONAL IND	INSTITUTIONAL CUM	COMMERCIAL IND	COMMERCIAL CUM	INDUSTRIAL IND	INDUSTRIAL CUM	FLOW (L/s)	IND	CUM	(L/s)	(L/s)	(L/s)	(m)	(mm)	(%)	(full) (m/s)	L/s	(%)
																							0.00							
	LSPS	Allowance						0.00	0.0	0.0													108.00							
	STITTSVILLE 6 PS		110A					0.00	0.0	0.0				0.00		0.00		0.00	0.00				84.00							
Future Street	INST.3	BLKHD	110A					0.00	0.0	0.0			2.47	2.47		0.00		0.00	2.14											
	PARK4	BLKHD	110A					0.83	0.0	0.0				0.00		0.00		0.00	0.00											
	PARK5	BLKHD	110A					1.04	0.0	0.0				0.00		0.00		0.00	0.00											
	RES.9	BLKHD	110A					34.81	2610.8	2610.8				0.00		0.00		0.00	0.00											
	RES.7	BLKHD	110A					4.24	318.0	318.0				0.00		0.00		0.00	0.00											
	RES.13	BLKHD	110A					2.22	133.2	133.2				0.00		0.00		0.00	0.00											
	RES.12	BLKHD	110A					43.89	2633.4	2633.4				0.00		0.00		0.00	0.00											
	INST.4	BLKHD	110A					0.00	0.0	0.0			2.44	2.44		0.00		0.00	2.12											
	COMM.	BLKHD	110A					0.00	0.0	0.0				0.00	0.63	0.63		0.00	0.55											
	HYD.4	BLKHD	110A					3.06	0.0	0.0				0.00		0.00		0.00	0.00											
	RES.8	BLKHD	110A					2.30	172.5	172.5				0.00		0.00		0.00	0.00											
	HYD.5	BLKHD	110A					5.20	0.0	0.0				0.00		0.00		0.00	0.00											
Future Street	RES.11	BLKHD	110A					6.91	414.6	414.6				0.00		0.00		0.00	0.00											
	PARK6	BLKHD	110A					1.19	0.0	0.0				0.00		0.00		0.00	0.00											
	RES.10	BLKHD	110A					1.92	115.2	115.2				0.00		0.00		0.00	0.00											
	HYD.3	BLKHD	110A					6.31	0.0	0.0				0.00		0.00		0.00	0.00											
TOTAL		**BLKHD**	**110A**					**113.92**		**6397.7**	**3.14**	**81.49**		**4.91**		**0.63**		**0.00**	**4.81**	**119.46**	**119.46**	**33.45**	**311.74**	**320.28**	**24.02**	**600**	**0.25**	**1.097**	**8.54**	**2.67**
GOLDHAWK DRIVE		**110A**	**109A**					**0.00**	**0.0**	**9779.6**	**2.96**	**117.43**		**14.32**		**0.63**		**0.00**	**12.98**	**0.00**	**186.59**	**52.25**	**374.66**	**378.96**	**61.28**	**600**	**0.35**	**1.298**	**4.30**	**1.14**
GOLDHAWK DRIVE	**110A**	**1101A**	**1092A**	**1**				**0.18**	**3.3**	**3.3**	**4.00**	**0.05**								**0.18**	**0.18**	**0.05**	**0.10**	**28.63**	**61.28**	**200**	**0.70**	**0.883**	**28.52**	**99.64**
GOLDHAWK DRIVE		**109A**	**108A**					**0.00**	**0.0**	**9782.9**	**2.96**	**117.47**		**14.32**		**0.63**		**0.00**	**12.98**	**0.00**	**186.77**	**52.30**	**374.74**	**378.96**	**57.50**	**600**	**0.35**	**1.298**	**4.22**	**1.11**
GOLDHAWK DRIVE	**109A**	**1091A**	**1082A**	5				**0.32**	**16.5**	**16.5**	**4.00**	**0.27**								**0.32**	**0.32**	**0.09**	**0.36**	**28.63**	**57.50**	**200**	**0.70**	**0.883**	**28.27**	**98.75**
GOLDHAWK DRIVE		**108A**	**107A**					**0.00**	**0.0**	**9799.4**	**2.96**	**117.64**		**14.32**		**0.63**		**0.00**	**12.98**	**0.00**	**187.09**	**52.39**	**375.00**	**378.96**	**53.32**	**600**	**0.35**	**1.298**	**3.96**	**1.05**
GOLDHAWK DRIVE	**108A**	**1081A**	**1072A**	**4**				**0.30**	**13.2**	**13.2**	**4.00**	**0.21**							**0.00**	**0.30**	**0.30**	**0.08**	**0.30**	**28.63**	**53.32**	**200**	**0.70**	**0.883**	**28.33**	**98.96**
GOLDHAWK DRIVE		**107A**	**106A**					**0.00**	**0.0**	**9812.6**	**2.96**	**117.77**		**14.32**		**0.63**		**0.00**	**12.98**	**0.00**	**187.39**	**52.47**	**375.22**	**378.96**	**62.94**	**600**	**0.35**	**1.298**	**3.74**	**0.99**
GOLDHAWK DRIVE	**107A**	**1071A**	**1062A**	**7**				**0.31**	**23.1**	**23.1**	**4.00**	**0.37**		**0.00**		**0.00**		**0.00**	**0.00**	**0.31**	**0.31**	**0.09**	**0.46**	**28.63**	**62.94**	**200**	**0.70**	**0.883**	**28.17**	**98.39**
GOLDHAWK DRIVE		**106A**	**105A**					**0.00**	**0.0**	**9835.7**	**2.96**	**118.01**		**14.32**		**0.63**		**0.00**	**12.98**	**0.00**	**187.70**	**52.56**	**375.54**	**378.96**	**60.09**	**600**	**0.35**	**1.298**	**3.42**	**0.90**
GOLDHAWK DRIVE	**106A**	**1061A**	**1052A**	**2**				**0.24**	**6.6**	**6.6**	**4.00**	**0.11**		**0.00**		**0.00**		**0.00**	**0.00**	**0.24**	**0.24**	**0.07**	**0.17**	**28.63**	**60.09**	**200**	**0.70**	**0.883**	**28.45**	**99.39**
		105A	**104A**					**0.00**	**0.0**	**10558.3**	**2.93**	**125.37**		**14.32**		**0.63**		**0.00**	**12.98**	**0.00**	**200.47**	**56.13**	**386.48**	**389.64**	**72.85**	**600**	**0.37**	**1.335**	**3.16**	**0.81**
GOLDHAWK DRIVE	**105A**	**1051A**	**1042A**	**7**				**0.45**	**23.1**	**23.1**	**4.00**	**0.37**								**0.45**	**0.45**	**0.13**	**0.50**	**27.59**	**72.85**	**200**	**0.65**	**0.851**	**27.09**	**98.19**
GOLDHAWK DRIVE		**104A**	**103A**					**0.00**	**0.0**	**10581.4**	**2.93**	**125.60**		**14.32**		**0.63**		**0.00**	**12.98**	**0.00**	**200.92**	**56.26**	**386.84**	**389.64**	**48.77**	**600**	**0.37**	**1.335**	**2.80**	**0.72**
GOLDHAWK DRIVE	**104A**	**1041A**	**1032A**	**9**				**0.47**	**29.7**	**29.7**	**4.00**	**0.48**							**0.00**	**0.47**	**0.47**	**0.13**	**0.61**	**27.59**	**48.77**	**200**	**0.65**	**0.851**	**26.97**	**97.78**
GOLDHAWK DRIVE		**103A**	**102A**					**0.00**	**0.0**	**10611.1**	**2.93**	**125.90**		**14.32**		**0.63**		**0.00**	**12.98**	**0.00**	**201.39**	**56.39**	**387.27**	**389.64**	**45.00**	**600**	**0.37**	**1.335**	**2.37**	**0.61**
GOLDHAWK DRIVE	**103A, HYD1**	**1031A**	**1021A**	**6**				**2.01**	**19.8**	**19.8**	**4.00**	**0.32**							**0.00**	**2.01**	**2.01**	**0.56**	**0.88**	**27.59**	**45.00**	**200**	**0.65**	**0.851**	**26.70**	**96.80**
GOLDHAWK DRIVE	**102A**	**102A**	***FT-24 (EX)***					**0.12**	**0.0**	**10630.9**	**2.93**	**126.10**		**14.32**		**0.63**		**0.00**	**12.98**	**0.12**	**203.52**	**56.99**	**388.07**	**389.64**	**102.59**	**600**	**0.37**	**1.335**	**1.57**	**0.40**
HYDRO EASEMENT		***FT-24 (EX)***	***FT-23 (EX)***					**0.00**	**0.0**	**10650.7**	**2.93**	**126.30**		**14.32**		**0.63**		**0.00**	**12.98**	**0.00**	**205.53**	**57.55**	**388.83**	**400.03**	**107.50**	**600**	**0.39**	**1.371**	**11.20**	**2.80**

Design Parameters:

Residential			ICI Areas			
SF	3.3	p/p/u				Peak Factor
TH/SD	2.5	p/p/u	INST	50,000	L/Ha/day	1.5
APT	1.8	p/p/u	COM	50,000	L/Ha/day	1.5
Low	60	p/p/Ha	IND	35,000	L/Ha/day	MOE Chart
Med	75	p/p/Ha				
High	90	p/p/Ha				

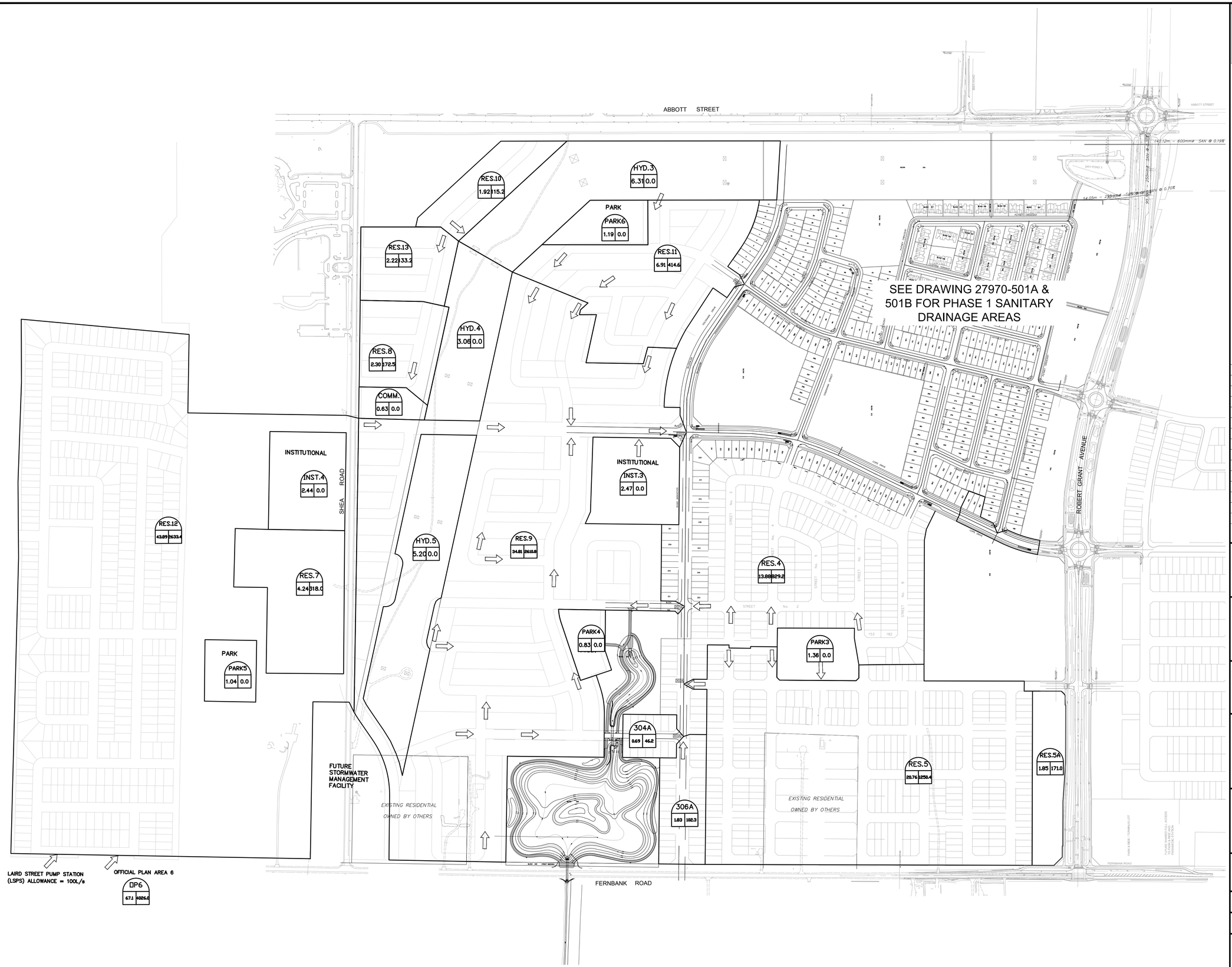
Notes:

1. Mannings coefficient (n) = 0.013
2. Demand (per capita): 350 L/day
3. Infiltration allowance: 0.28 L/s/Ha
4. Residential Peaking Factor:
   Harmon Formula = 1+(14/(4+P^0.5))
   where P = population in thousands

Designed: J.I.M.
Checked: P.K.
Dwg. Reference: 27970 - 501, 501A, 501B

No.	Revision	Date
1.	Submission No. 1 to City of Ottawa	2013-08-29
2.	Submission No. 2 to City of Ottawa	2014-01-22
3.	Submission No. 3 to City of Ottawa	2014-08-22
4.	Submission No. 4 to City of Ottawa	2015-06-15
5.	Submission No. 5 to City of Ottawa	2016-11-10
6.	Submission for MOE Approval	2017-02-10
7.	Resubmission for MOE Approval	2017-07-14

File Reference: 27970.5.7.1
Date: 2017-07-14
Sheet No: 4 of 4



REVIEWED BY
DEVELOPMENT REVIEW SERVICES BRANCH

Signed _____

Date _____ 2017

Plan Number _____

LEGEND :

145A / 0.38 / 27.5 — AREA IDENTIFICATION, POPULATION, AREA IN HECTARES

FUTURE MINOR FLOW DIRECTION

POPULATION :

SINGLE FAMILY	= 3.4 PPU
TOWNHOUSE / SEMIS	= 2.7 PPU

No.	REVISIONS	By	Date
14			
13			
12			
11			
10			
9			
8			
7	RESUBMISSION FOR MOE APPROVAL	JIM	17:07:14
6	SUBMISSION FOR MOE APPROVAL	JIM	17:02:10
5	SUBMISSION #5 FOR CITY REVIEW	JIM	16:11:10
4	SUBMISSION #4 FOR CITY REVIEW	JIM	15:06:15
3	SUBMISSION #3 FOR CITY REVIEW	JIM	14:08:22
2	SUBMISSION #2 FOR CITY REVIEW	JIM	14:01:22
1	SUBMISSION #1 FOR CITY REVIEW	JIM	13:08:29

CRT DEVELOPMENT INC.

IBI GROUP
400 – 333 Preston Street
Ottawa ON K1S 5N4 Canada
tel 613 225 1311 fax 613 225 9868
ibigroup.com

Project Title

CRT LANDS
FERNBANK COMMUNITY
PHASE 1

PROFESSIONAL ENGINEER — J. I. MOFFATT — 2017/07/14 — PROVINCE OF ONTARIO

Drawing Title

EXTERNAL SANITARY DRAINAGE

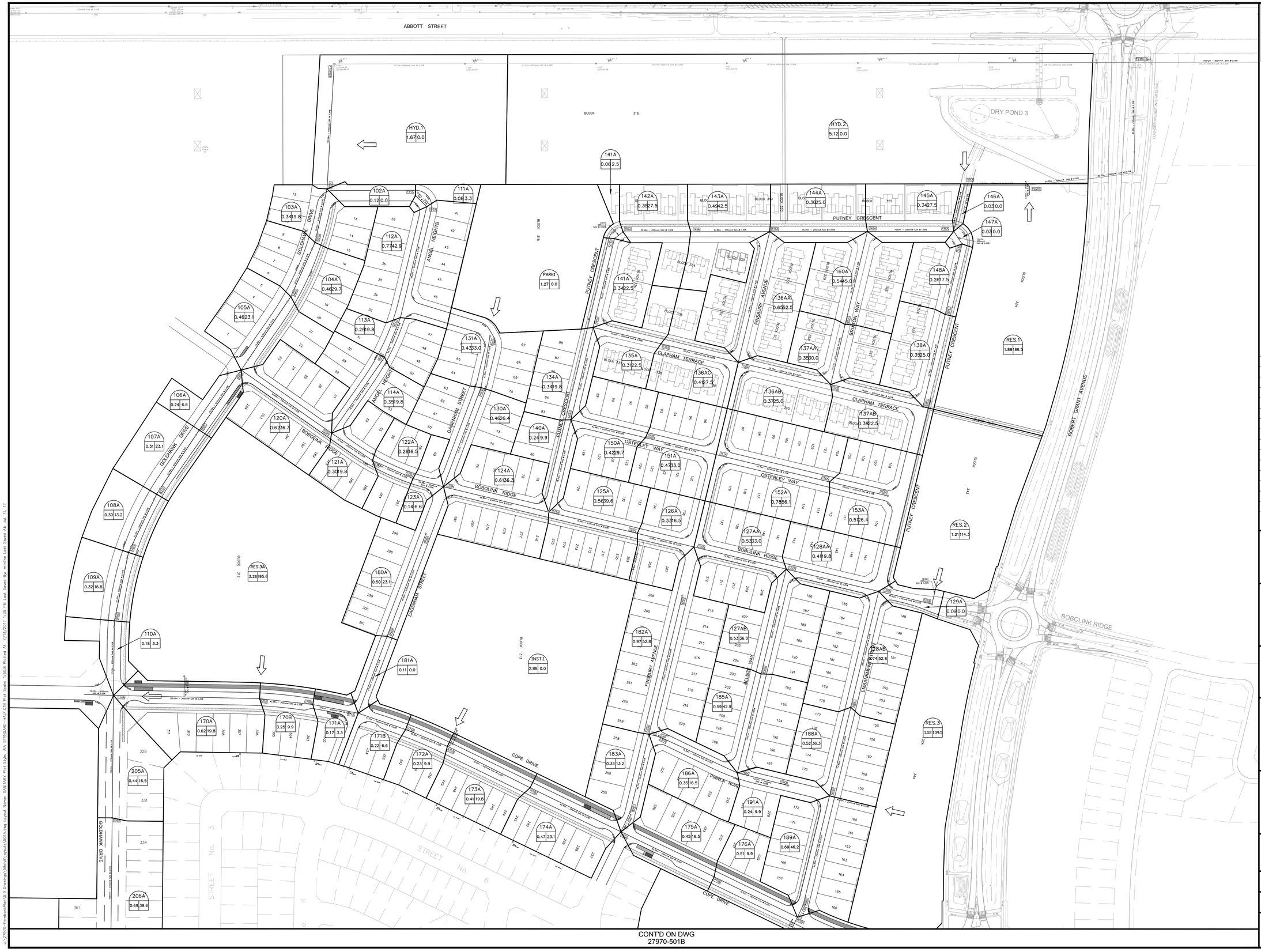
AREA PLAN

Scale: 1:3000

Design	Date
J.I.M.	OCTOBER '12
Drawn	Checked
M.M.	P.K.
Project No.	Drawing No.
27970	501

D07-16-11-0003

#17366



REVIEWED BY
DEVELOPMENT REVIEW SERVICES BRANCH

Signed _____

Date _____ 2017

Plan Number _____

LEGEND :

145A
0.34 27.5

- AREA ID #
- POPULATION
- AREA IN HECTARES
- FUTURE MINOR FLOW DIRECTION

NOTES:

1. THIS ALLOWANCE IS FOR OPA66 EXPANSION AREAS 6a, 6b AND 6c.

2. AN ALLOWANCE OF 100l/s HAS BEEN MADE FOR FLOWS TRIBUTARY TO THE LAIRD STREET PUMP STATION.

No.	REVISIONS	By	Date
14			
13			
12			
11			
10			
9			
8			
7	RESUBMISSION FOR MOE APPROVAL	JIM	17:07:14
6	SUBMISSION FOR MOE APPROVAL	JIM	17:02:10
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3	SUBMISSION #3 FOR CITY REVIEW	JIM	14:08:22
2	SUBMISSION #2 FOR CITY REVIEW	JIM	14:01:22
1	SUBMISSION #1 FOR CITY REVIEW	JIM	13:08:29

CRT DEVELOPMENT INC.

IBI GROUP
400 – 333 Preston Street
Ottawa ON K1S 5N4 Canada
tel 613 225 1311 fax 613 225 9868
ibigroup.com

Project Title

CRT LANDS
FERNBANK COMMUNITY
PHASE 1

PROFESSIONAL ENGINEER
J. I. MOFFATT
2017/07/14
PROVINCE OF ONTARIO

Drawing Title

SANITARY DRAINAGE
AREA PLAN

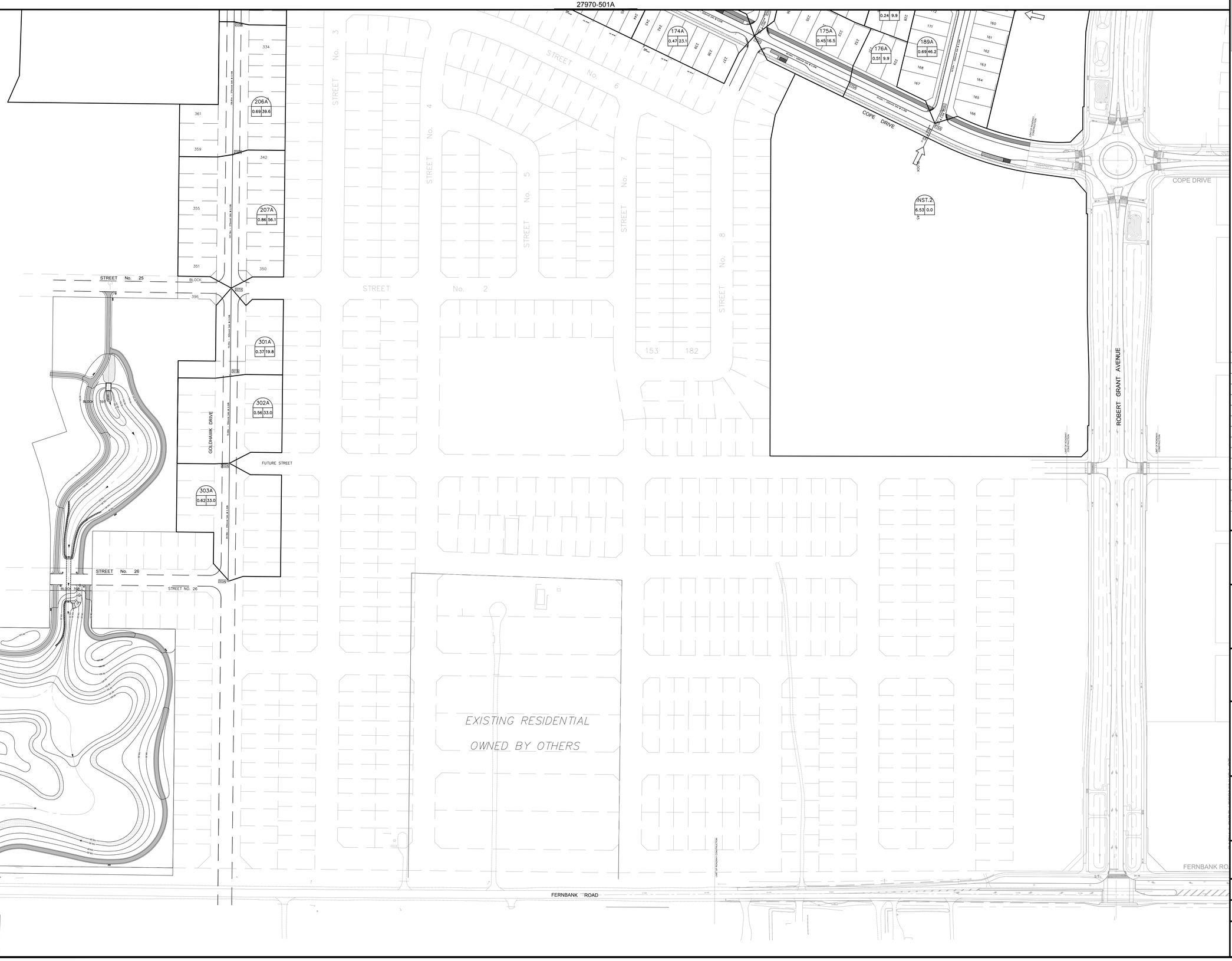
Scale
1:1250

Design	Date
J.I.M.	OCTOBER '12
Drawn	Checked
M.M.	P.K.
Project No.	Drawing No.
27970	501A

D07-16-11-0003

#17366

CONT'D ON DWG
27970-501A



REVIEWED BY
DEVELOPMENT REVIEW SERVICES BRANCH

Signed _____

Date _____ 2017

Plan Number _____

LEGEND :

145A
0.34 27.5

- AREA ID #
- POPULATION
- AREA IN HECTARES
- FUTURE MINOR FLOW DIRECTION

NOTES:

1. THIS ALLOWANCE IS FOR OPA66 EXPANSION AREAS 6a, 6b AND 6c.

2. AN ALLOWANCE OF 100l/s HAS BEEN MADE FOR FLOWS TRIBUTARY TO THE LAIRD STREET PUMP STATION.

No.	REVISIONS	By	Date
14			
13			
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7	RESUBMISSION FOR MOE APPROVAL	JIM	17:07:14
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1	SUBMISSION #1 FOR CITY REVIEW	JIM	13:08:29

IBI GROUP
400 – 333 Preston Street
Ottawa ON K1S 5N4 Canada
tel 613 225 1311 fax 613 225 9868
ibigroup.com

Project Title

CRT LANDS
FERNBANK COMMUNITY
PHASE 1

LICENSED PROFESSIONAL ENGINEER
J. I. MOFFATT
2017/07/14
PROVINCE OF ONTARIO

Drawing Title

SANITARY DRAINAGE
AREA PLAN

Scale
1:1250

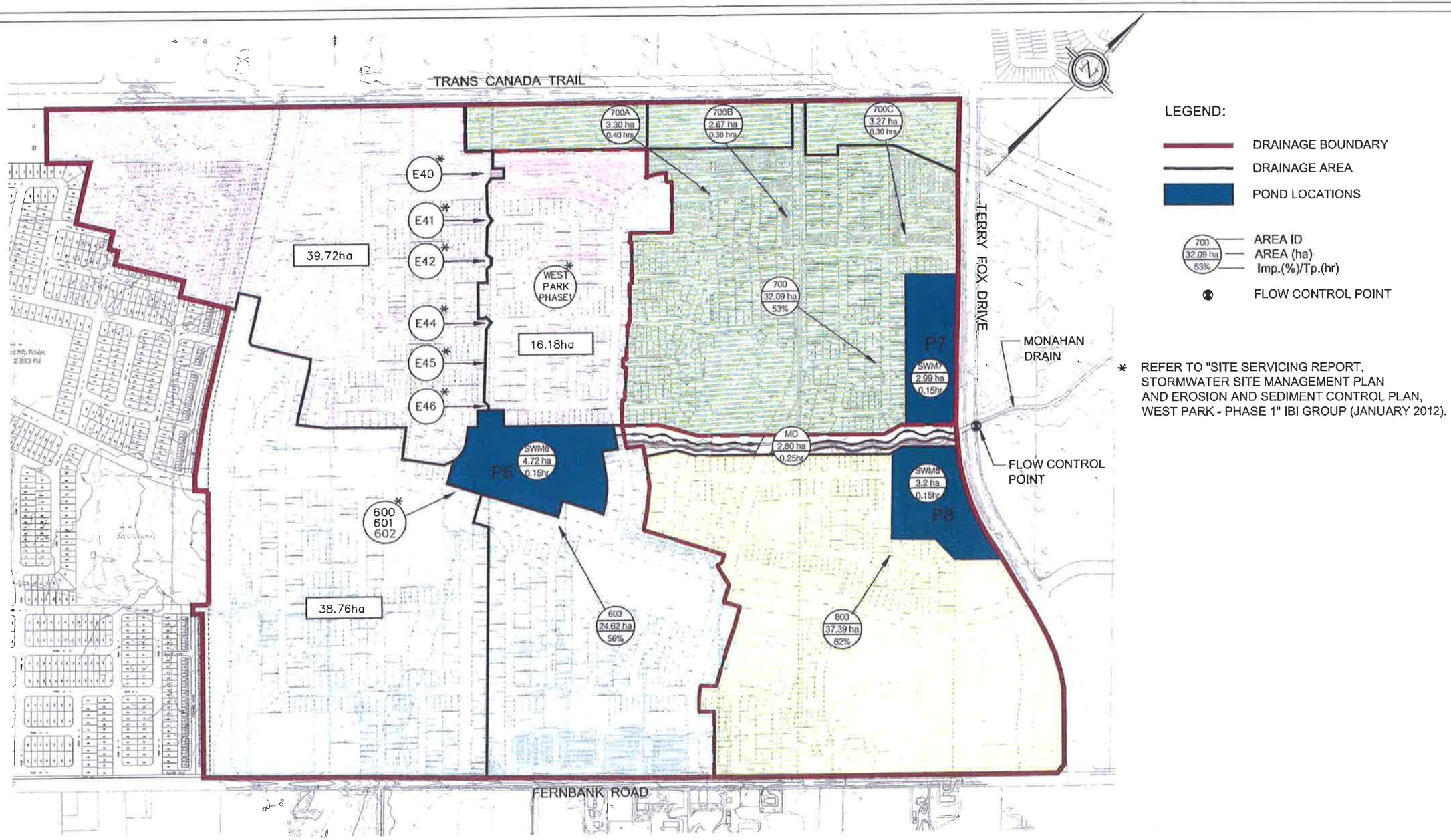
Design	Date
J.I.M.	OCTOBER '12
Drawn: M.M.	Checked: P.K.
Project No. 27970	Drawing No. 501B

D07-16-11-0003

#17366

APPENDIX E

- **Figure 2 – West Park Pond 6 Stormwater Management Report and Design Brief**
- **MSS Storm Drainage Area Plan Minor System Drainage (Drawing 101108-STM1)**
- **Storm Sewer Design Sheets**
- **Drainage Area Plans 500, 500A and 500B**



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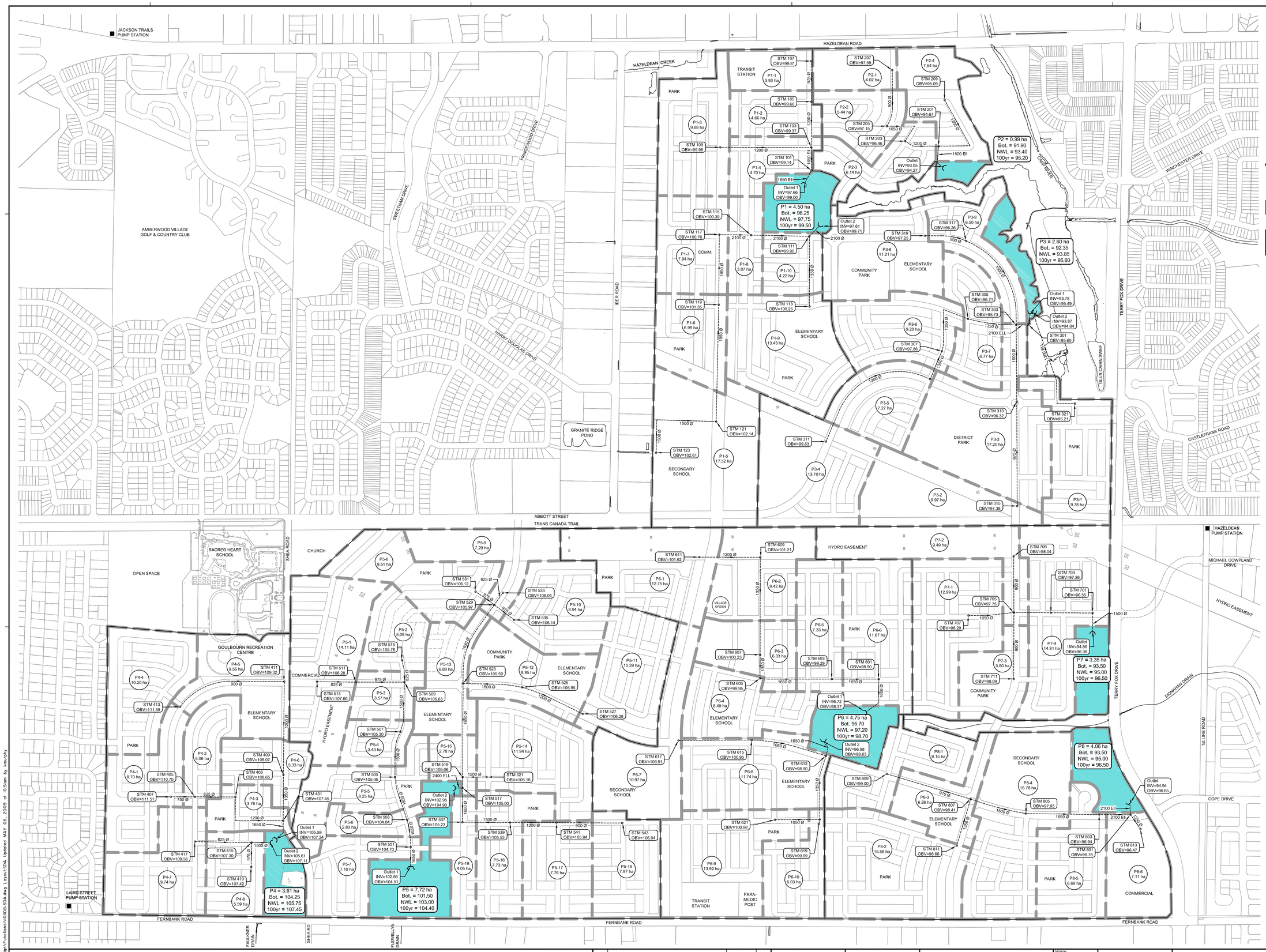
IBI GROUP

Scale
1:7500

Project Title
WEST PARK POND 6
STORMWATER MANAGEMENT
REPORT AND DESIGN BRIEF

Drawing Title
POST-DEVELOPMENT
DRAINAGE AREA PLAN

Sheet No.
FIGURE 2



NOTE:
THE POSITION OF ALL POLE LINES, CONDUITS, WATERMAINS, SEWERS AND OTHER UNDERGROUND AND OVERGROUND UTILITIES AND STRUCTURES IS NOT NECESSARILY SHOWN ON THE CONTRACT DRAWINGS, AND WHERE SHOWN, THE ACCURACY OF THE POSITION OF SUCH UTILITIES AND STRUCTURES IS NOT GUARANTEED. BEFORE STARTING WORK, DETERMINE THE EXACT LOCATION OF ALL SUCH UTILITIES AND STRUCTURES AND ASSUME ALL LIABILITY FOR DAMAGE TO THEM.

No.	REVISION	DATE	BY
3	ISSUED WITH MASTER SERVICING STUDY	MAY 25/09	MAB
2	UPDATED WITH DRAFT MASTER SERVICING STUDY	SEP 12/08	MAB
1	ISSUED WITH DRAFT MASTER SERVICING STUDY	MAY 02/08	MAB

LICENCED PROFESSIONAL ENGINEER — M.A. BISSETT — PROVINCE OF ONTARIO

REGISTERED PROFESSIONAL ENGINEER — J.G. RIDDELL — PROVINCE OF ONTARIO

NOVATECH ENGINEERING CONSULTANTS LTD.
ENGINEERS & PLANNERS
Suite 200, 240 Michael Cowpland Drive
Ottawa, Ontario, Canada
K2M 1P6
Telephone (613) 254-9643
Facsimile (613) 254-5867
Email: novainfo@novatech-eng.com

DESIGN	KJM
CHECKED	MAB
DRAWN	KJM
CHECKED	MAB
APPROVED	JGR

SCALE: 1 : 5000

CITY OF OTTAWA

FERNBANK CDP

STORM DRAINAGE AREA PLAN
MINOR SYSTEM DRAINAGE

PROJECT No. 101108-0

DATE: AUGUST 2007

DRAWING No. 101108-STM1

IBI GROUP
IBI Group
400-333 Preston Street
Ottawa, Ontario
K1S 5N4

STORM SEWER DESIGN SHEET

PROJECT: CRT DEVELOPMENT
LOCATION: CITY OF OTTAWA
CLIENT: CRT DEVELOPMENT INC.

LOCATION				AREA (Ha)										RATIONAL DESIGN FLOW											SEWER DATA								
STREET	AREA ID	FROM MH	TO MH	C= 0.20	C= 0.55	C= 0.65	C= 0.66	C= 0.75	C= 0.80	C= 0.90	C=	C=	C=	IND 2.78AC	CUM 2.78AC	INLET (min)	TIME IN PIPE	TOTAL (min)	i (5) (mm/hr)	i (10) (mm/hr)	i (100) (mm/hr)	5yr PEAK FLOW (L/s)	10yr PEAK FLOW (L/s)	100yr PEAK FLOW (L/s)	FIXED FLOW (L/s)	DESIGN FLOW (L/s)	CAPACITY (L/s)	LENGTH (m)	PIPE SIZE (mm) DIA	W	H	SLOPE (%)	VELOCITY (m/s)	AVAIL CAP (5yr) (L/s)	(%)
PUTNEY CRESCENT	---	141	142					0.00						0.00	0.00	10.00	0.12	10.12	104.19	122.14	178.56	0.00				0.00	62.04	8.84	250			1.00	1.224	62.04	100.00%
PUTNEY CRESCENT	R142A, B	142	143		0.33									0.50	0.50	10.12	0.48	10.60	103.56	121.40	177.47	52.25				52.25	139.06	54.71	300			1.90	1.906	86.80	62.42%
PUTNEY CRESCENT	S143	143	144					0.32						0.67	1.17	10.60	0.68	11.28	101.13	118.54	173.26	118.50				118.50	266.03	65.86	450			0.80	1.620	147.53	55.45%
FINSBURY AVENUE	S136B, E, R136A	136	144		0.27			0.44						1.33	1.33	10.00	0.87	10.87	104.19	122.14	178.56	138.60				138.60	154.65	110.07	300			2.35	2.119	16.05	10.38%
PUTNEY CRESCENT	S144, R144A, B, C	144	145		0.57			0.25						1.39	3.89	11.28	0.74	12.02	97.90	114.73	167.68	381.31				381.31	401.29	80.25	525			0.80	1.796	19.98	4.98%
CLAPHAM TERRACE	S136C, D, R136B	136	137		0.23			0.18						0.73	0.73	10.00	0.94	10.94	104.19	122.14	178.56	75.75				75.75	100.88	77.99	300			1.00	1.383	25.14	24.92%
BRIXTON WAY	R137A	137	160		0.11									0.17	0.90	10.94	0.42	11.36	99.48	116.59	170.40	89.05				89.05	224.02	50.00	375			1.50	1.965	134.97	60.25%
BRIXTON WAY	S160A, B	160	145					0.43						0.90	1.79	11.36	0.54	11.90	97.50	114.26	166.98	174.69				174.69	280.40	78.98	375			2.35	2.459	105.71	37.70%
PUTNEY CRESCENT	S145A, B, R145	145	146		0.30			0.55						1.61	7.29	12.02	0.70	12.72	94.61	110.85	161.98	689.86				689.86	821.24	75.47	750			0.50	1.801	131.38	16.00%
CLAPHAM TERRACE	S137A, B, R137B	137	138		0.30			0.27						1.02	1.02	10.00	1.19	11.19	104.19	122.14	178.56	106.45				106.45	129.34	81.01	375			0.50	1.134	22.89	17.70%
PUTNEY CRESCENT	S138, R138	138	148		0.14			0.15						0.53	1.55	11.19	0.67	11.86	98.30	115.20	168.37	152.21				152.21	220.25	78.01	375			1.45	1.932	68.04	30.89%
PUTNEY CRESCENT	S148	148	147					0.22						0.46	2.01	11.86	0.38	12.24	95.28	111.65	163.15	191.25				191.25	297.76	59.30	375			2.65	2.612	106.51	35.77%
PUTNEY CRESCENT	---	147	146					0.00						0.00	2.01	12.24	0.10	12.34	93.68	109.76	160.37	188.02				188.02	332.54	12.13	450			1.25	2.026	144.52	43.46%
BLOCK 324		146	161											0.00	9.30	12.72	0.40	13.12	91.73	107.47	157.01	853.01				853.01	944.29	34.88	900			0.25	1.438	91.28	9.67%
BLOCK 324	R146	161	*Ex. 180*		0.14									0.21	9.51	13.12	0.56	13.68	90.15	105.61	154.28	857.65				857.65	944.29	48.00	900			0.25	1.438	86.65	9.18%
BLOCK 324	RES.1, RES. 2B	BULKHEAD	*Ex. 180*						2.45					5.45	5.45	13.00	0.07	13.07	90.63	106.17	155.11	493.82				493.82	731.45	5.00	900			0.15	1.114	237.62	32.49%
														Refer to ECA No. 9079-9LNNZC dated July 9, 2014 for description of existing sewers.																				

Definitions:
Q = 2.78CiA, where:
Q = Peak Flow in Litres per Second (L/s)
A = Area in Hectares (Ha)
i = Rainfall intensity in millimeters per hour (mm/hr)
[i = 998.071 / (TC+6.053)^0.814] 5 YEAR
[i = 1174.184 / (TC+6.014)^0.816] 10 YEAR
[i = 1735.688 / (TC+6.014)^0.820] 100 YEAR

Notes:
1. Mannings coefficient (n) = 0.013

Designed: J.I.M.
Checked: P.K.
Dwg. Reference: 27970 - 500, 500A, 500B

No.	Revision	Date
1.	Submission No. 1 to City of Ottawa	2013-08-29
2.	Submission No. 2 to City of Ottawa	2014-01-22
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5.	Submission No. 5 to City of Ottawa	2016-11-10
6.	Submission for MOE Approval	2017-02-10
7.	Resubmission for MOE Approval	2017-07-14

File Reference: 27970.5.7.1
Date: 2017-07-14
Sheet No: 1 of 3

IBI Group
400-333 Preston Street
Ottawa, Ontario
K1S 5N4

STORM SEWER DESIGN SHEET

PROJECT: CRT DEVELOPMENT
LOCATION: CITY OF OTTAWA
CLIENT: CRT DEVELOPMENT INC.

LOCATION				AREA (Ha)										RATIONAL DESIGN FLOW											SEWER DATA									
STREET	AREA ID	FROM MH	TO MH	C= 0.20	C= 0.55	C= 0.65	C= 0.66	C= 0.75	C= 0.80	C= 0.90	C=	C=	C=	IND 2.78AC	CUM 2.78AC	INLET (min)	TIME IN PIPE	TOTAL (min)	i (5) (mm/hr)	i (10) (mm/hr)	i (100) (mm/hr)	5yr PEAK FLOW (L/s)	10yr PEAK FLOW (L/s)	100yr PEAK FLOW (L/s)	FIXED FLOW (L/s)	DESIGN FLOW (L/s)	CAPACITY (L/s)	LENGTH (m)	PIPE SIZE (mm) DIA	W	H	SLOPE (%)	VELOCITY (m/s)	AVAIL CAP (5yr) (L/s)	(%)
CLAPHAM TERRACE	S136A	136	135					0.17						0.35	0.35	10.00	1.03	11.03	104.19	122.14	178.56	36.93				36.93	50.02	61.00	250			0.65	0.987	13.09	26.16%
CLAPHAM TERRACE	S135A, B	135	134					0.26						0.54	0.90	11.03	1.08	12.11	99.05	116.08	169.66	88.80				88.80	108.21	61.66	375			0.35	0.949	19.41	17.94%
PUTNEY CRESCENT	---	141	134		0.00									0.00	0.00	10.00	1.31	11.31	104.19	122.14	178.56	0.00				0.00	108.21	74.74	375			0.35	0.949	108.21	100.00%
PUTNEY CRESCENT	S134A, B, C, R134	134	140		0.21			0.39						1.13	2.03	12.11	1.10	13.21	94.22	110.39	161.31	191.34				191.34	265.43	78.10	525			0.35	1.188	74.09	27.91%
OSTERLEY WAY	S153	153	152					0.12						0.25	0.25	10.00	1.04	11.04	104.19	122.14	178.56	26.07				26.07	43.87	53.80	250			0.50	0.866	17.80	40.57%
OSTERLEY WAY	S152A, B	152	151					0.40						0.83	1.08	11.04	1.82	12.85	99.02	116.05	169.61	107.36				107.36	148.72	98.72	450			0.25	0.906	41.36	27.81%
OSTERLEY WAY	S151A, R151A	151	150		0.18			0.10						0.48	1.57	12.85	0.96	13.81	91.21	106.85	156.10	143.00				143.00	170.86	59.71	450			0.33	1.041	27.86	16.30%
OSTERLEY WAY	S150A, B	150	140					0.32						0.67	2.24	13.81	0.91	14.72	87.62	102.63	149.90	195.83				195.83	257.73	63.00	525			0.33	1.153	61.90	24.02%
PUTNEY CRESCENT	S140, R140	140	124		0.21			0.25						0.84	5.11	14.72	0.91	15.63	84.48	98.93	144.48	431.53				431.53	636.13	76.57	750			0.30	1.395	204.60	32.16%
PUTNEY CRESCENT	S149A, B, S129C	149	128					0.22						0.46	0.46	10.00	0.61	10.61	104.19	122.14	178.56	47.79				47.79	62.04	45.00	250			1.00	1.224	14.25	22.96%
BLOCK 343	RES.2A	BULKHEAD	129						0.65					1.45	1.45	13.00	0.27	13.27	90.63	106.17	155.11	131.01				131.01	303.78	13.50	675			0.12	0.822	172.76	56.87%
BOBOLINK RIDGE		129	128					0.00						0.00	1.45	13.00	0.91	13.91	90.63	106.17	155.11	131.01				131.01	303.78	45.00	675			0.12	0.822	172.76	56.87%
BOBOLINK RIDGE	S128A, R128A	128	127		0.14			0.18						0.59	2.49	13.91	1.57	15.49	87.25	102.19	149.26	217.56				217.56	473.55	81.00	825			0.10	0.858	255.99	54.06%
BOBOLINK RIDGE	S127A, R127A	127	126		0.19			0.17						0.64	3.14	15.49	1.51	17.00	82.02	96.05	140.25	257.44				257.44	473.55	78.00	825			0.10	0.858	216.11	45.64%
FINSBURY AVENUE	S151B, C, R151B	151	126		0.20			0.25						0.83	0.83	10.00	0.79	10.79	104.19	122.14	178.56	86.17				86.17	117.21	76.50	300			1.35	1.606	31.04	26.48%
BOBOLINK RIDGE	---	126	125					0.00						0.00	3.97	17.00	0.81	17.81	77.61	90.86	132.63	307.77				307.77	597.22	44.30	900			0.10	0.909	289.46	48.47%
BOBOLINK RIDGE	S125, R125A, B	125	124		0.35			0.39						1.35	5.31	17.81	1.39	19.20	75.45	88.32	128.91	400.95				400.95	739.33	80.07	975			0.10	0.959	338.38	45.77%
BOBOLINK RIDGE	S124, R124A, B	124	123		0.32			0.26						1.03	11.45	19.20	1.23	20.44	72.05	84.32	123.05	825.24				825.24	1,760.81	88.10	1350			0.10	1.192	935.57	53.13%
DAGENHAM STREET	R131	131	130		0.20									0.31	0.31	10.00	0.84	10.84	104.19	122.14	178.56	31.86				31.86	59.68	41.39	300			0.35	0.818	27.82	46.61%
DAGENHAM STREET	S130, R130A, B	130	123		0.33			0.36						1.26	1.56	10.84	1.75	12.59	99.94	117.13	171.20	156.00				156.00	179.46	84.37	525			0.16	0.803	23.46	13.07%
BOBOLINK RIDGE	---	123	122		0.00									0.00	13.01	20.44	0.30	20.74	69.31	81.11	118.33	902.05				902.05	1,760.81	21.46	1350			0.10	1.192	858.77	48.77%
BOBOLINK RIDGE	S122, R122	122	121		0.17			0.31						0.91	13.92	20.74	0.39	21.13	68.68	80.36	117.24	956.05				956.05	3,040.59	39.49	1500			0.17	1.667	2084.54	68.56%
BOBOLINK RIDGE	R121	121	120		0.13									0.20	14.12	21.13	0.37	21.50	67.86	79.41	115.84	958.22				958.22	3,040.59	36.84	1500			0.17	1.667	2082.37	68.49%
ANGEL HEIGHTS	---	111	112		0.00									0.00	0.00	10.00	0.27	10.27	104.19	122.14	178.56	0.00				0.00	42.08	13.58	250			0.46	0.830	42.08	100.00%
ANGEL HEIGHTS	S112, R112A, B	112	113		0.20			0.27						0.87	0.87	10.27	1.68	11.95	102.77	120.47	176.10	89.29				89.29	139.51	85.60	450			0.22	0.850	50.22	36.00%
DAGENHAM STREET	PARK1	DICB	132	1.27										0.71	0.71	12.00	0.29	12.29	94.70	110.96	162.13	66.87				66.87	100.88	23.70	300			1.00	1.383	34.02	33.72%
DAGENHAM STREET	S132	132	113					0.24						0.50	1.21	12.29	0.55	12.83	93.49	109.54	160.05	112.80				112.80	210.32	42.00	450			0.50	1.281	97.52	46.37%
ANGEL HEIGHTS	S113	113	114					0.30						0.63	1.49	12.83	0.85	13.68	91.29	106.94	156.24	136.40				136.40	248.09	43.13	600			0.15	0.850	111.69	45.02%
ANGEL HEIGHTS	S114, R114	114	120		0.50			0.24						1.26	2.76	13.68	1.43	15.11	88.09	103.18	150.72	243.05				243.05	367.27	69.17	750			0.10	0.805	124.22	33.82%
BOBOLINK RIDGE	S120	120	105					0.28						0.58	17.46	21.50	0.96	22.45	67.13	78.54	114.57	1,172.18				1,172.18	3,040.59	95.64	1500			0.17	1.667	1868.41	61.45%
ANGEL HEIGHTS	S101	101	102					0.20						0.42	0.42	10.00	0.52	10.52	104.19	122.14	178.56	43.45				43.45	129.34	35.48	375			0.50	1.134	85.89	66.41%
GOLDHAWK DRIVE	R102	102	103		0.21									0.32	0.74	10.52	0.83	11.35	101.52	118.99	173.93	74.93				74.93	126.19	38.36	450			0.18	0.769	51.26	40.62%
GOLDHAWK DRIVE	S103, R103A, B	103	104		0.50			0.34						1.47	2.21	11.35	1.01	12.36	97.55	114.32	167.07	215.73				215.73	303.78	49.62	675			0.12	0.822	88.05	28.98%
GOLDHAWK DRIVE	S104, R104A, B, C	104	105		0.59			0.30						1.53	3.74	12.36	1.35	13.71	93.19	109.19	159.53	348.45				348.45	473.55	69.59	825			0.10	0.858	125.10	26.42%
GOLDHAWK DRIVE	S105A, S105B, R105	105	107		0.13	0.90								1.83	23.03	22.45	1.31	23.77	65.29	76.38	111.40	1,503.33				1,503.33	5,720.16	126.10	2100			0.10	1.600	4216.82	73.72%
GOLDHAWK DRIVE	S107	107	109			0.61								1.10	24.13	23.77	1.17	24.94	62.94	73.62	107.36	1,518.58				1,518.58	5,720.16	112.64	2100			0.10	1.600	4201.58	73.45%
GOLDHAWK DRIVE	S109	109	110			0.52								0.94	25.07	24.94	0.67	25.62	60.99	71.33	104.01	1,528.92				1,528.92	5,720.16	64.64	2100			0.10	1.600	4191.24	73.27%

Definitions:
Q = 2.78CiA, where:
Q = Peak Flow in Litres per Second (L/s)
A = Area in Hectares (Ha)
i = Rainfall intensity in millimeters per hour (mm/hr)
[i = 998.071 / (TC+6.053)^0.814] 5 YEAR
[i = 1174.184 / (TC+6.014)^0.816] 10 YEAR
[i = 1735.688 / (TC+6.014)^0.820] 100 YEAR

Notes:
1. Mannings coefficient (n) = 0.013

Designed: J.I.M.
Checked: P.K.
Dwg. Reference: 27970 - 500, 500A, 500B

No.	Revision	Date
1.	Submission No. 1 to City of Ottawa	2013-08-29
2.	Submission No. 2 to City of Ottawa	2014-01-22
3.	Submission No. 3 to City of Ottawa	2014-08-22
4.	Submission No. 4 to City of Ottawa	2015-06-15
5.	Submission No. 5 to City of Ottawa	2016-11-10
6.	Submission for MOE Approval	2017-02-10
7.	Resubmission for MOE Approval	2017-07-14

File Reference: 27970.5.7.1
Date: 2017-07-14
Sheet No: 2 of 3

IBI Group
400-333 Preston Street
Ottawa, Ontario
K1S 5N4

STORM SEWER DESIGN SHEET

PROJECT: CRT DEVELOPMENT
LOCATION: CITY OF OTTAWA
CLIENT: CRT DEVELOPMENT INC.

LOCATION				AREA (Ha)										RATIONAL DESIGN FLOW											SEWER DATA									
STREET	AREA ID	FROM MH	TO MH	C= 0.20	C= 0.55	C= 0.65	C= 0.66	C= 0.75	C= 0.80	C= 0.90	C=	C=	C=	IND 2.78AC	CUM 2.78AC	INLET (min)	TIME IN PIPE	TOTAL (min)	i (5) (mm/hr)	i (10) (mm/hr)	i (100) (mm/hr)	5yr PEAK FLOW (L/s)	10yr PEAK FLOW (L/s)	100yr PEAK FLOW (L/s)	FIXED FLOW (L/s)	DESIGN FLOW (L/s)	CAPACITY (L/s)	LENGTH (m)	PIPE SIZE (mm) DIA	W	H	SLOPE (%)	VELOCITY (m/s)	AVAIL CAP (5yr) (L/s)	(%)
EMBANKMENT STREET	S128B, R128B	128	188		0.09			0.31						0.78	0.78	10.00	1.76	11.76	104.19	122.14	178.56	81.68				81.68	108.21	100.00	375			0.35	0.949	26.53	24.52%
EMBANKMENT STREET	S188, R188A, B	188	189		0.19			0.30						0.92	1.70	11.76	0.97	12.72	95.75	112.20	163.96	162.77				162.77	210.32	74.32	450			0.50	1.281	47.54	22.61%
BLOCK 344	RES.3	BULKHEAD	189						1.58					3.51	3.51	*13.95*	0.66	14.61	87.11	102.03	149.03	306.10	5YR FLOW - BLOCK 344			306.10	402.33	35.00	750			0.12	0.882	96.23	23.92%
EMBANKMENT STREET	S189, R189	189	190		0.09			0.28						0.72	5.94	14.61	1.69	16.30	84.83	99.35	145.10	503.52				503.52	739.33	97.00	975			0.10	0.959	235.81	31.89%
EMBANKMENT STREET	S190	190	176					0.05						0.10	6.04	16.30	0.20	16.50	79.59	93.19	136.05	480.69				480.69	739.33	11.54	975			0.10	0.959	258.64	34.98%
COPE DRIVE	S177, R177	177	176		0.08			0.14						0.41	0.41	10.00	1.17	11.17	104.19	122.14	178.56	43.16				43.16	59.68	57.46	300			0.35	0.818	16.52	27.69%
BLOCK 345 (SCHOOL)	INST.2	BULKHEAD	176						6.57					14.61	14.61	12.00	0.15	12.15	94.70	110.96	162.13	1,383.66				1,383.66	1,575.26	12.00	1200			0.15	1.349	191.60	12.16%
COPE DRIVE	S176	176	175					0.14						0.29	21.36	16.50	1.05	17.55	79.01	92.51	135.05	1,687.52				1,687.52	2,332.02	80.65	1500			0.10	1.278	644.51	27.64%
COPE DRIVE	S175, R175	175	174		0.36			0.42						1.43	22.78	17.55	1.12	18.67	76.14	89.13	130.09	1,734.64				1,734.64	2,332.02	86.28	1500			0.10	1.278	597.38	25.62%
FINSBURY AVENUE	S182A,B, R182A,B,C	182	183		0.58			0.58						2.10	2.10	10.00	1.57	11.57	104.19	122.14	178.56	218.40				218.40	283.76	119.30	525			0.40	1.270	65.35	23.03%
PINNER ROAD	S191, R191A	191	186		0.19			0.60						1.54	1.54	10.00	0.55	10.55	104.19	122.14	178.56	160.61				160.61	378.96	43.00	600			0.35	1.298	218.35	57.62%
BELSIZE WAY	S127B, R127B, C	127	185		0.41			0.26						1.17	1.17	10.00	1.31	11.31	104.19	122.14	178.56	121.80				121.80	188.11	90.00	450			0.40	1.146	66.31	35.25%
BELSIZE WAY	---	185	186											0.00	1.17	11.31	1.29	12.60	97.75	114.56	167.42	114.27				114.27	175.96	82.92	450			0.35	1.072	61.69	35.06%
PINNER ROAD	S186, R186	186	187		0.23			0.23						0.83	3.54	12.60	1.38	13.97	92.21	108.04	157.85	326.60				326.60	473.55	70.83	825			0.10	0.858	146.95	31.03%
PINNER ROAD	---	187	183					0.00						0.00	3.54	13.97	0.19	14.17	87.03	101.93	148.88	308.22				308.22	473.55	10.00	825			0.10	0.858	165.33	34.91%
FINSBURY AVENUE	S183, R183	183	184		0.22			0.24						0.84	6.47	14.17	1.14	15.30	86.34	101.13	147.71	559.05				559.05	900.87	68.70	1050			0.10	1.008	341.82	37.94%
FINSBURY AVENUE	---	184	174					0.00						0.00	6.47	15.30	0.32	15.62	82.59	96.71	141.22	534.72				534.72	900.87	19.07	1050			0.10	1.008	366.15	40.64%
COPE DRIVE	S174, R174	174	173		0.12			0.25						0.70	29.96	18.67	0.94	19.61	73.30	85.80	125.21	2,196.41				2,196.41	3,792.13	81.44	1800			0.10	1.444	1595.72	42.08%
COPE DRIVE	S173	173	172					0.29						0.60	30.57	19.61	0.84	20.46	71.11	83.22	121.43	2,173.69				2,173.69	3,792.13	73.01	1800			0.10	1.444	1618.44	42.68%
BLOCK 313 (SCHOOL)	INST.1	BULKHEAD	172						2.88					6.41	6.41	12.00	0.25	12.25	94.70	110.96	162.13	606.54				606.54	755.43	17.02	900			0.16	1.150	148.90	19.71%
COPE DRIVE	S172	172	171					0.23						0.48	37.45	20.46	0.93	21.39	69.27	81.05	118.25	2,594.13				2,594.13	3,792.13	80.84	1800			0.10	1.444	1198.00	31.59%
DAGENHAM STREET	S180A,B, R180A	180	181		0.09			0.37						0.91	0.91	10.00	1.42	11.42	104.19	122.14	178.56	94.72				94.72	245.74	94.00	525			0.30	1.100	151.02	61.46%
DAGENHAM STREET	S181, R181	181	171		0.09			0.14						0.43	1.34	11.42	1.23	12.66	97.23	113.94	166.51	130.14				130.14	286.47	72.50	600			0.20	0.982	156.32	54.57%
COPE DRIVE	S171	171	170					0.26						0.54	39.33	21.39	0.94	22.33	67.34	78.79	114.94	2,648.73				2,648.73	3,792.13	81.06	1800			0.10	1.444	1143.40	30.15%
BLOCK 312	RES.3A	CBMH549	sewer				3.26							5.98	5.98	12.00	0.22	12.22	94.70	110.96	162.13	566.42				566.42	844.60	16.74	900			0.20	1.286	278.18	32.94%
COPE DRIVE	S170A,B	170	110					0.33						0.69	46.00	22.33	1.33	23.66	65.53	76.66	111.82	3,014.45				3,014.45	4,694.42	121.89	1950			0.10	1.523	1679.97	35.79%
GOLDHAWK DRIVE	S110B	110	205			0.47								0.85	71.92	25.62	0.83	26.45	59.93	70.09	102.19	4,310.29				4,310.29	11,180.46	94.32	2700			0.10	1.892	6870.17	61.45%
														0.00																					
GOLDHAWK DRIVE	INST.3	BULKHEAD	205						2.47					5.49	5.49	12.00	0.17	12.17	94.70	110.96	162.13	520.19				520.19	620.09	17.00	675			0.50	1.679	99.90	16.11%
GOLDHAWK DRIVE	205A, 205B	205	206			1.46								2.64	80.05	26.45	0.94	27.39	58.68	68.62	100.04	4,697.53				4,697.53	11,180.46	107.00	2700			0.10	1.892	6482.93	57.98%
GOLDHAWK DRIVE	S206	206	207			0.84								1.52	81.57	27.39	0.90	28.29	57.33	67.04	97.72	4,676.48				4,676.48	11,726.17	107.16	2700			0.11	1.984	7049.69	60.12%
														0.00																					
STREET NO. 2	RES. 4, 6 & 7		207			22.96			1.89					45.69	45.69	10.00	0.83	10.83	104.19	122.14	178.56	4,760.80				4,760.80	5,720.16	80.00	2100			0.10	1.600	959.36	16.77%
STREET NO. 2	S305	305	CULVERT			0.03								0.05	0.05												13,335.43	22.00	1500			3.27	7.311	13335.43	100.00%
STREET NO. 26	S304	304	CULVERT			0.03								0.05	0.05												12,579.97	22.00	1500			2.91	6.896	12579.97	100.00%
FUTURE STREET	S304B	304	303			0.69								1.25	1.25												5,720.16	98.94	2100			0.10	1.600	5720.16	100.00%
GOLDHAWK DRIVE	S303, S306	303	302			3.19								5.76	7.01												5,720.16	94.58	2100			0.10	1.600	5720.16	100.00%
GOLDHAWK DRIVE	S302,Park3,Res 5	302	301	1.36		10.06								18.93	25.95	These pipes are sized by stormwater modeling (See Design Brief-Fernbank Pond 5 Stormwater Management Facility Report)										5,720.16	70.65	2100			0.10	1.600	5720.16	100.00%
GOLDHAWK DRIVE	S301	301	207			0.49								0.89	26.83												5,720.16	70.00	2100			0.10	1.600	5720.16	100.00%
STREET NO. 25	---	207	300											0.00	154.09												2,332.02	93.73	1500			0.10	1.278	2332.02	100.00%
POND		300	HEADWALL	9.21		52.74								100.42	254.51												3,006.86	75.63	1650			0.10	1.362	3006.86	100.00%

Definitions:
Q = 2.78CiA, where:
Q = Peak Flow in Litres per Second (L/s)
A = Area in Hectares (Ha)
i = Rainfall intensity in millimeters per hour (mm/hr)
[i = 998.071 / (TC+6.053)^0.814] 5 YEAR
[i = 1174.184 / (TC+6.014)^0.816] 10 YEAR
[i = 1735.688 / (TC+6.014)^0.820] 100 YEAR

Notes:
1. Mannings coefficient (n) = 0.013

Designed: J.I.M.
Checked: P.K.
Dwg. Reference: 27970 - 500, 500A, 500B

No.	Revision	Date
1.	Submission No. 1 to City of Ottawa	2013-08-29
2.	Submission No. 2 to City of Ottawa	2014-01-22
3.	Submission No. 3 to City of Ottawa	2014-08-22
4.	Submission No. 4 to City of Ottawa	2015-06-15
5.	Submission No. 5 to City of Ottawa	2016-11-10
6.	Submission for MOE Approval	2017-02-10
7.	Resubmission for MOE Approval	2017-07-14

File Reference: 27970.5.7.1
Date: 2017-07-14
Sheet No: 3 of 3

REVIEWED BY
DEVELOPMENT REVIEW SERVICES BRANCH

Signed _____

Date _____ 2017

Plan Number _____

LEGEND :

22 — AREA NUMBER
6.53|0.80 — RUN OFF COEFFICIENT
AREA IN HECTARES

FUTURE MINOR FLOW DIRECTION

No.	REVISIONS	By	Date
14			
13			
12			
11			
10			
9			
8			
7	RESUBMISSION FOR MOE APPROVAL	JIM	17:07:14
6	SUBMISSION FOR MOE APPROVAL	JIM	17:02:10
5	SUBMISSION #5 FOR CITY REVIEW	JIM	16:11:10
4	SUBMISSION #4 FOR CITY REVIEW	JIM	15:06:15
3	SUBMISSION #3 FOR CITY REVIEW	JIM	14:08:22
2	SUBMISSION #2 FOR CITY REVIEW	JIM	14:01:22
1	SUBMISSION #1 FOR CITY REVIEW	JIM	13:08:29

CRT DEVELOPMENT INC.

IBI GROUP
400 – 333 Preston Street
Ottawa ON K1S 5N4 Canada
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ibigroup.com

Project Title

CRT LANDS
FERNBANK COMMUNITY
PHASE 1

PROFESSIONAL ENGINEER
J. I. MOFFATT
2017/07/14
PROVINCE OF ONTARIO

Drawing Title

EXTERNAL STORM DRAINAGE AREA PLAN

Scale 1:2500

Design	Date
J.I.M.	OCTOBER '12
Drawn	Checked
M.M.	P.K.
Project No.	Drawing No.
27970	500

D07-16-11-0003

#17366

REVIEWED BY
DEVELOPMENT REVIEW SERVICES BRANCH

Signed _____

Date _____ 2017

Plan Number _____

LEGEND :

S145 — AREA ID #
0.34 0.75 — RUN OFF COEFFICIENT
AREA IN HECTARES

FUTURE MINOR FLOW DIRECTION

NOTES:

1. THIS ALLOWANCE IS FOR OPA66 EXPANSION AREAS 6a, 6b AND 6c.

2. AN ALLOWANCE OF 100l/s HAS BEEN MADE FOR FLOWS TRIBUTARY TO THE LAIRD STREET PUMP STATION.

No.	REVISIONS	By	Date
14			
13			
12			
11			
10			
9			
8	RESUBMISSION FOR MOE APPROVAL	JIM	17: 07: 14
7	SUBMISSION FOR MOE APPROVAL	JIM	17: 02: 10
6	SUBMISSION #5 FOR CITY REVIEW	JIM	16: 11: 10
5	SUBMISSION #4 FOR CITY REVIEW	JIM	15: 06: 15
4	SUBMISSION #3 FOR CITY REVIEW	JIM	14: 08: 22
3	SUBMISSION #2 FOR CITY REVIEW	JIM	14: 01: 22
2	REVISIONS AS PER RELOCATION OF FOUNDER AVENUE	JIM	13: 12: 12
1	SUBMISSION #1 FOR CITY REVIEW	JIM	13: 08: 29

CRT DEVELOPMENT INC.

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Project Title

CRT LANDS
FERNBANK COMMUNITY
PHASE 1

LICENSED PROFESSIONAL ENGINEER
J. I. MOFFATT
2017/07/14
PROVINCE OF ONTARIO

Drawing Title

STORM DRAINAGE
AREA PLAN

Scale
1:1250

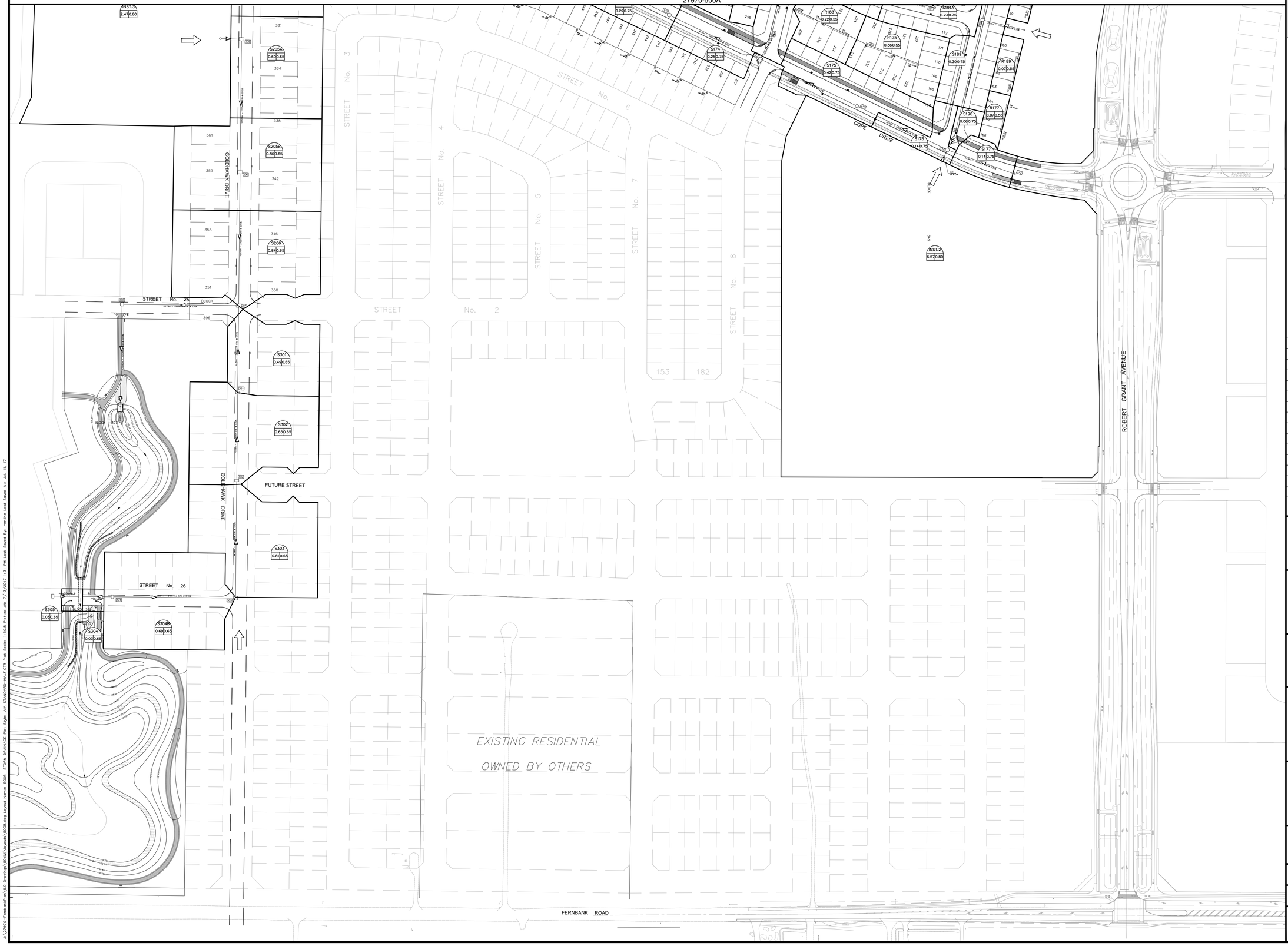
Design	Date
J.I.M.	OCTOBER '12
Drawn	Checked
M.M.	P.K.
Project No.	Drawing No.
27970	500A

D07-16-11-0003

#17366

J:\27970-FernbankPhase1\5.0 Drawings\5f0cv\Layouts\500A.dwg Layout Name: 500A STORM DRAINAGE Plot Style: AIA STANDARD-HALF.CTB Plot Scale: 1:50.8 Plotted At: 7/13/2017 1:29 PM Last Saved By: mmine Last Saved At: Jul. 11, 17

CONT'D ON DWG
27970-500A



REVIEWED BY
DEVELOPMENT REVIEW SERVICES BRANCH

Signed _____

Date _____ 2017

Plan Number _____

LEGEND :

S145 — AREA ID #
0.34|0.75 — RUN OFF COEFFICIENT
AREA IN HECTARES

FUTURE MINOR FLOW DIRECTION

NOTES:

1. THIS ALLOWANCE IS FOR OPA66 EXPANSION AREAS 6a, 6b AND 6c.

2. AN ALLOWANCE OF 100l/s HAS BEEN MADE FOR FLOWS TRIBUTARY TO THE LAIRD STREET PUMP STATION.

No.	REVISIONS	By	Date
14			
13			
12			
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8			
7	RESUBMISSION FOR MOE APPROVAL	JIM	17:07:14
6	SUBMISSION FOR MOE APPROVAL	JIM	17:02:10
5	SUBMISSION #5 FOR CITY REVIEW	JIM	16:11:10
4	SUBMISSION #4 FOR CITY REVIEW	JIM	15:06:15
3	SUBMISSION #3 FOR CITY REVIEW	JIM	14:08:22
2	SUBMISSION #2 FOR CITY REVIEW	JIM	14:01:22
1	SUBMISSION #1 FOR CITY REVIEW	JIM	13:08:29

CRT DEVELOPMENT INC.

IBI GROUP
400 – 333 Preston Street
Ottawa ON K1S 5N4 Canada
tel 613 225 1311 fax 613 225 9868
ibigroup.com

Project Title

CRT LANDS
FERNBANK COMMUNITY
PHASE 1

PROFESSIONAL ENGINEER
J. I. MOFFATT
2017/07/14
PROVINCE OF ONTARIO

Drawing Title

STORM DRAINAGE
AREA PLAN

Scale
1:1250

Design	Date
J.I.M.	OCTOBER '12
Drawn: M.M.	Checked: P.K.
Project No.: 27970	Drawing No.: 500B

D07-16-11-0003

#17366

J:\27970-Fernbank\Plan\5.0 Drawings\3\civil\layouts\5008.dwg Layout Name: 500B STORM DRAINAGE Plot Style: AIA STANDARD-HALF.CTB Plot Scale: 1:50.8 Plotted At: 7/13/2017 1:31 PM Last Saved By: mmilne Last Saved At: Jul. 11, 17

APPENDIX F

- **Drawings 27970-750A, 750B, 751A, 751B**
- **Phase 1A: Correspondence with Novatech confirming maximum allowable release rate and boundary condition**
- **Depth and Velocity Results**
- **Cross-sections of side lots**
- **XPSWMM schematic**
- **Summary of HGL**
- **CD of model files**

REVIEWED BY
DEVELOPMENT REVIEW SERVICES BRANCH

Signed ____________________

Date ____________________ 2017

Plan Number ____________________

LEGEND:

(solid line)	DRAINAGE BOUNDARIES
S188 / 0.30 / 75	AREA ID; Imp.(%); AREA (ha)
(green dashed line)	MINOR SYSTEM: DRAINAGE AREA TRIBUTARY TO POND 5 - PHASE 1A
(orange dashed line)	MINOR SYSTEM: DRAINAGE AREA TRIBUTARY TO POND 6 - PHASE 1
(arrow)	MAJOR FLOW
(arrow)	TOTAL FLOW
(red arrow)	EMERGENCY FLOW

No.	REVISIONS	By	Date
14			
13			
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4			
3	RESUBMISSION FOR MOE APPROVAL	M.B.	17:07:14
2	SUBMISSION FOR MOE APPROVAL	M.B.	17:02:10
1	SUBMISSION No. 5 FOR CITY REVIEW	M.B.	16/11/10

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Project Title

CRT LANDS
FERNBANK COMMUNITY
PHASE 1

LICENSED PROFESSIONAL ENGINEER
M.S.BLACK
100101736
2017/07/14
PROVINCE OF ONTARIO

N

Drawing Title

DDSWMM DRAINAGE
AREA PLAN

Scale

1:1250

Design	M.B.	Date	NOV. 2016
Drawn	S.V.	Checked	P.S.
Project No.	27970	Drawing No.	750A

D07-16-11-0003

#17366

CONT'D ON DWG
27970-750A

REVIEWED BY
DEVELOPMENT REVIEW SERVICES BRANCH

Signed _____

Date _____ 2017

Plan Number _____

LEGEND:

- DRAINAGE BOUNDARIES
- S188 / 0.30 / 75 — AREA ID, Imp.(%), AREA (ha)
- MINOR SYSTEM: DRAINAGE AREA TRIBUTARY TO POND 5 - PHASE 1A
- MINOR SYSTEM: DRAINAGE AREA TRIBUTARY TO POND 6 - PHASE 1
- MAJOR FLOW
- TOTAL FLOW
- EMERGENCY FLOW

No.	REVISIONS	By	Date
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4			
3	RESUBMISSION FOR MOE APPROVAL	M.B.	17:07:14
2	SUBMISSION FOR MOE APPROVAL	M.B.	17:02:10
1	SUBMISSION No. 5 FOR CITY REVIEW	M.B.	16/11/10

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CRT LANDS
FERNBANK COMMUNITY
PHASE 1

LICENCED PROFESSIONAL ENGINEER
M.S.BLACK
100101736
2017/07/14
PROVINCE OF ONTARIO

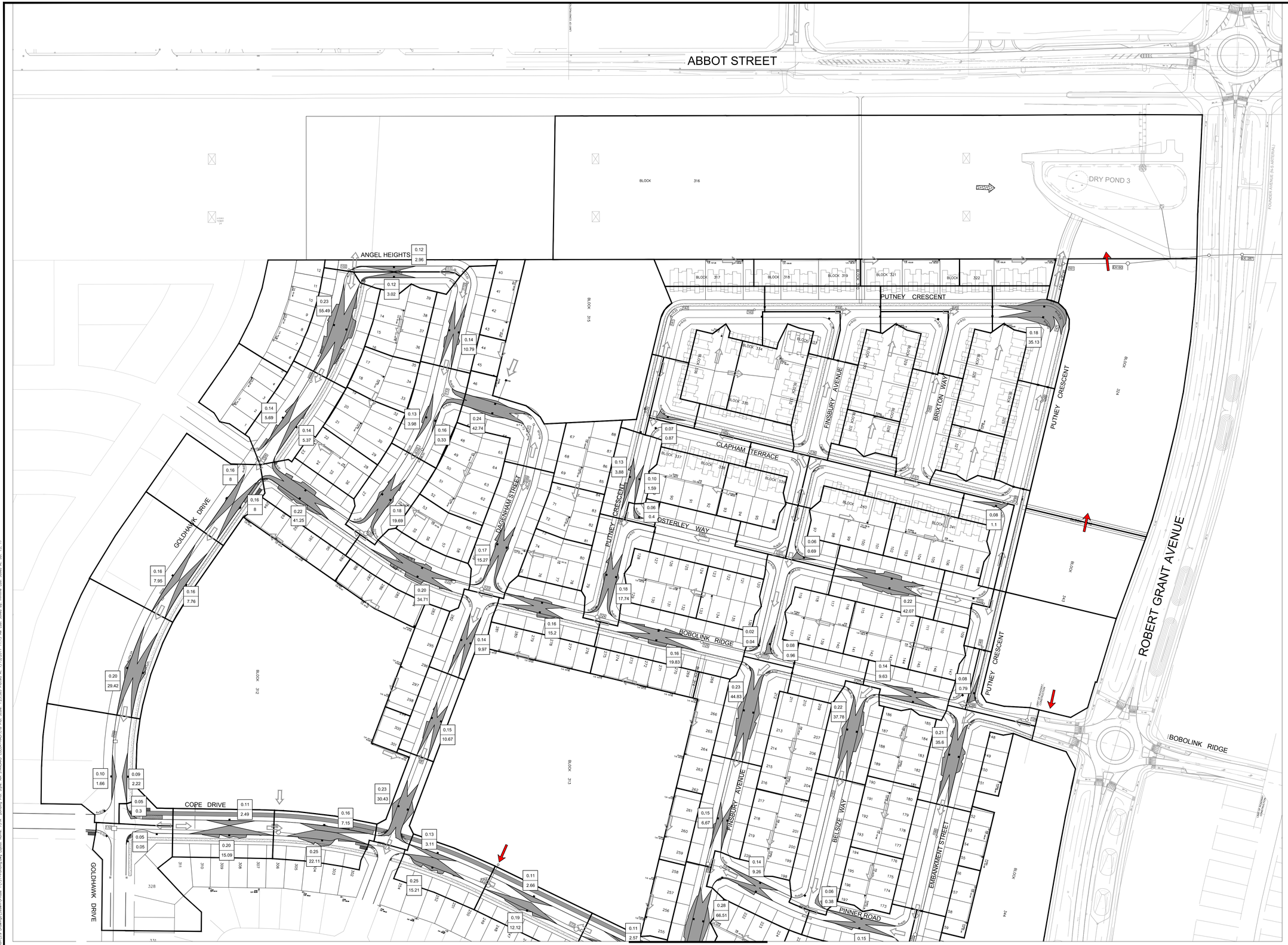
Drawing Title
DDSWMM DRAINAGE AREA PLAN

Scale
1:1250

Design	Date
M.B.	NOV. 2016
Drawn	Checked
S.V.	P.S.
Project No.	Drawing No.
27970	750B

D07-16-11-0003

#17366



CONT'D ON DWG
27970-751B

REVIEWED BY
DEVELOPMENT REVIEW SERVICES BRANCH

Signed _____

Date _____ 2017

Plan Number _____

LEGEND:

- DRAINAGE BOUNDARIES
- 0.12 / 3.02 — DEPTH (m) / VOLUME (m³)
- STATIC PONDING
- MAJOR FLOW
- TOTAL FLOW
- EMERGENCY FLOW

No.	REVISIONS	By	Date
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7			
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5			
4			
3	RESUBMISSION FOR MOE APPROVAL	JIM	17:07:14
2	SUBMISSION FOR MOE APPROVAL	JIM	17:02:10
1	SUBMISSION No. 5 FOR CITY REVIEW	M.B.	16/11/10

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Project Title
CRT LANDS
FERNBANK COMMUNITY
PHASE 1

LICENSED PROFESSIONAL ENGINEER
J. I. MOFFATT
2017/07/14
PROVINCE OF ONTARIO

Drawing Title
PONDING

Scale
1:1250

Design	Date
J.I.M.	NOV. 2016
Drawn	Checked
S.V.	J.I.M.
Project No.	Drawing No.
27970	751A

D07-16-11-0003

#17366

CONT'D ON DWG
27970-751A

REVIEWED BY
DEVELOPMENT REVIEW SERVICES BRANCH

Signed ______________________

Date ______________________ 2017

Plan Number ______________________

LEGEND:

- DRAINAGE BOUNDARIES
- 0.12 — DEPTH (m)
- 3.02 — VOLUME (m³)
- STATIC PONDING
- MAJOR FLOW
- TOTAL FLOW
- EMERGENCY FLOW

No.	REVISIONS	By	Date
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CRT LANDS
FERNBANK COMMUNITY
PHASE 1

LICENSED PROFESSIONAL ENGINEER
J. I. MOFFATT
2017/07/14
PROVINCE OF ONTARIO

N

Drawing Title

PONDING

Scale

1:1250

Design	Date
J.I.M.	NOV. 2016
Drawn	**Checked**
S.V.	J.I.M.
Project No.	**Drawing No.**
27970	751B

D07-16-11-0003

#17366

Meghan Black

From: Mike Petepiece <m.petepiece@novatech-eng.com>
Sent: Monday, November 07, 2016 1:59 PM
To: Meghan Black
Subject: RE: Major flow hydrograph to dry pond

Hi Meghan,
I added your major system hydrograph to our model and can confirm that the dry pond will have sufficient storage to accommodate the major system runoff volume and peak flow. Let me know what you need from us to satisfy the City's review requirements.
Regards,

Michael Petepiece, P.Eng Project Manager
NOVATECH Engineers, Planners & Landscape Architects
240 Michael Cowpland Drive, Suite 200, Ottawa, ON, K2M 1P6 | Tel: 613.254.9643 x235 | Fax: 613.254.5867

From: Meghan Black [mailto:mblack@IBIGroup.com]
Sent: Monday, November 07, 2016 12:45 PM
To: Mike Petepiece <m.petepiece@novatech-eng.com>
Subject: Major flow hydrograph to dry pond

Hi Mike,

Please find attached the major flow hydrograph to the existing dry pond (100 year peak flow 1.25 cms). Can you please confirm this flow is acceptable?

With respect to the minor system, PH1A is restricted to 1200 l/s, the allowable release rate to the existing storm outlet. The corresponding boundary condition is 100.59 m.

Thank you,
Meghan

Meghan Black P.Eng., LEED® AP

Associate | Manager, Water/Wastewater
email mblack@IBIGroup.com web www.ibigroup.com

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Ottawa ON K1S 5N4 Canada
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Velocity x Depth Calculation

Iteration equation:

Velocity:

$$v_x = v_{min} + \frac{Q_x - Q_{min}}{Q_{max} - Q_{min}} (v_{max} - v_{min})$$

Depth:

$$d_x = d_{min} + \frac{Q_x - Q_{min}}{Q_{max} - Q_{min}} (d_{max} - d_{min})$$

100 Year 3 Hour Chicago Storm Phase 1																				
					SWMHYMO PH1VXD.out					Sawtooth Profile: Calculation Sheet: Overflow for Typical Road Ponding Area					Continuous Grade Profile: SWMHYMO PH1VXD.out					
Area ID (Dummy Segment, if applicable)	ROW (for Street Segments)	Longitudinal Slope (%)	Overflow Flowrate		Flowrate (cms)		Velocity (m/s)			Flowrate (cms)		Dynamic Depth (m)			Dynamic Depth (m)			Ponding Depth (m)		Velocity x Depth
			Qx (l/s)	Qx (cms)	Qmin	Qmax	vmin	vmax	vx	Qmin	Qmax	dmin	dmax	dx	dmin	dmax	dx	Static	Maximum	(m^2/s)
S153	18	1.33	**29**	**0.029**	0.011	0.032	0.488	0.639	**0.617**	0.029	0.036	0.055	0.060	**0.055**	0.026	0.039	**0.037**	0.000	**0.037**	0.023
S149A	18	0.53	**43**	**0.043**	0.043	0.078	0.489	0.566	**0.489**	0.042	0.051	0.065	0.070	**0.066**	0.052	0.064	**0.052**	0.000	**0.052**	0.025
S149C	18	0.53	**104**	**0.104**	0.096	0.119	0.886	0.935	**0.903**	0.100	0.115	0.090	0.095	**0.091**	0.081	0.088	**0.083**	0.080	**0.163**	0.075
S149B	18	0.55	**71**	**0.071**	0.057	0.072	0.621	0.658	**0.656**	0.061	0.073	0.075	0.080	**0.079**	0.074	0.081	**0.081**	0.000	**0.081**	0.053
S128A(D1)	18	0.51	**0**	**0.000**	N/A	N/A	N/A	N/A	**N/A**	N/A	N/A	N/	N/A	**N/A**	N/A	N/A	**N/A**	0.140	**0.140**	N/A
S127B(D2)	18	0.69	**0**	**0.000**	N/A	N/A	N/A	N/A	**N/A**	N/A	N/A	N/	N/A	**N/A**	N/A	N/A	**N/A**	0.220	**0.220**	N/A
S191B	18	0.69	**57**	**0.057**	0.049	0.089	0.558	0.646	**0.576**	0.051	0.061	0.070	0.075	**0.073**	0.052	0.064	**0.054**	0.060	**0.114**	0.031
S128B(D3)	18	0.53	**0**	**0.000**	N/A	N/A	N/A	N/A	**N/A**	N/A	N/A	N/	N/A	**N/A**	N/A	N/A	**N/A**	0.210	**0.210**	N/A
S188	18	0.53	**88**	**0.088**	0.078	0.127	0.566	0.639	**0.581**	0.086	0.100	0.085	0.090	**0.086**	0.064	0.077	**0.067**	0.000	**0.067**	0.039
S189(D4)	18	0.54	**36**	**0.036**	0.020	0.043	0.403	0.489	**0.463**	0.034	0.042	0.060	0.065	**0.061**	N/A	N/A	**N/A**	0.110	**0.171**	0.028
S191A(D5)	18	0.97	**45**	**0.045**	0.027	0.058	0.543	0.658	**0.610**	0.043	0.053	0.065	0.070	**0.066**	N/A	N/A	**N/A**	0.150	**0.216**	0.040
S186(D6)	18	1.14	**58**	**0.058**	0.029	0.063	0.592	0.717	**0.699**	0.053	0.063	0.070	0.075	**0.072**	N/A	N/A	**N/A**	0.140	**0.212**	0.051
S152A(D7)	18	0.69	**0**	**0.000**	N/A	N/A	N/A	N/A	**N/A**	N/A	N/A	N/	N/A	**N/A**	N/A	N/A	**N/A**	0.220	**0.220**	N/A
S152B	18	0.52	**32**	**0.032**	0.024	0.033	0.502	0.543	**0.538**	0.027	0.034	0.055	0.060	**0.059**	0.054	0.061	**0.060**	0.060	**0.120**	0.032
S151B(D8)	18	0.61	**113**	**0.113**	0.084	0.137	0.607	0.686	**0.650**	0.100	0.115	0.090	0.095	**0.094**	N/A	N/A	**N/A**	0.050	**0.144**	0.061
S127A	18	0.51	**41**	**0.041**	0.020	0.042	0.396	0.479	**0.475**	0.034	0.042	0.060	0.065	**0.064**	0.039	0.052	**0.051**	0.000	**0.051**	0.024
S182A(D9)	18	1.04	**49**	**0.049**	0.028	0.060	0.565	0.685	**0.644**	0.043	0.053	0.065	0.070	**0.068**	N/A	N/A	**N/A**	0.230	**0.298**	0.044
S182B(D10)	18	1.14	**42**	**0.042**	0.029	0.063	0.592	0.717	**0.640**	0.035	0.043	0.060	0.065	**0.064**	N/A	N/A	**N/A**	0.130	**0.194**	0.041
S183(D11)	18	0.7	**0**	**0.000**	N/A	N/A	N/A	N/A	**N/A**	N/A	N/A	N/	N/A	**N/A**	N/A	N/A	**N/A**	0.280	**0.280**	N/A
S190	18	0.62	**10**	**0.010**	0.007	0.012	0.395	0.446	**0.426**	0.008	0.011	0.035	0.040	**0.038**	0.034	0.040	**0.038**	0.050	**0.088**	0.016
S177	26	0.52	**45**	**0.045**	0.030	0.064	0.528	0.621	**0.569**	0.042	0.051	0.065	0.070	**0.067**	0.059	0.078	**0.067**	0.000	**0.067**	0.038
S176	26	0.52	**53**	**0.053**	0.051	0.063	0.600	0.633	**0.606**	0.051	0.061	0.070	0.075	**0.071**	0.071	0.077	**0.072**	0.000	**0.072**	0.044
S175(D12)	26	0.55	**141**	**0.141**	0.115	0.198	0.682	0.755	**0.705**	0.132	0.150	0.100	0.105	**0.102**	N/A	N/A	**N/A**	0.110	**0.212**	0.072
S174(D13)	26	0.55	**98**	**0.098**	0.065	0.115	0.639	0.682	**0.667**	0.086	0.100	0.085	0.090	**0.089**	N/A	N/A	**N/A**	0.155	**0.244**	0.060
S173(D14)	26	0.81	**143**	**0.143**	0.140	0.241	0.828	0.917	**0.831**	0.136	0.155	0.100	0.105	**0.102**	N/A	N/A	**N/A**	0.145	**0.247**	0.085
S172(D15)	26	0.73	**134**	**0.134**	0.133	0.228	0.786	0.870	**0.787**	0.132	0.150	0.100	0.105	**0.101**	N/A	N/A	**N/A**	0.165	**0.266**	0.079
S135A	18	0.56	**37**	**0.037**	0.034	0.045	0.559	0.599	**0.570**	0.034	0.042	0.060	0.065	**0.062**	0.061	0.067	**0.063**	0.000	**0.063**	0.036
S135B	18	0.91	**70**	**0.070**	0.058	0.074	0.764	0.814	**0.802**	0.063	0.075	0.075	0.080	**0.078**	0.067	0.074	**0.072**	0.070	**0.142**	0.058
S134C	18	0.51	**15**	**0.015**	0.011	0.017	0.407	0.452	**0.437**	0.011	0.016	0.040	0.045	**0.044**	0.040	0.047	**0.045**	0.000	**0.045**	0.020
S136A	18	0.56	**29**	**0.029**	0.025	0.034	0.516	0.559	**0.535**	0.027	0.034	0.055	0.060	**0.057**	0.054	0.061	**0.057**	0.000	**0.057**	0.031
S134B	18	0.56	**57**	**0.057**	0.045	0.058	0.599	0.639	**0.636**	0.051	0.061	0.070	0.075	**0.073**	0.067	0.074	**0.073**	0.000	**0.073**	0.047
S134A(D16)	18	1	**123**	**0.123**	0.108	0.175	0.778	0.878	**0.800**	0.119	0.136	0.095	0.100	**0.096**	N/A	N/A	**N/A**	0.115	**0.211**	0.077

100 Year 3 Hour Chicago Storm Phase 1																				
					SWMHYMO PH1VXD.out					Sawtooth Profile: Calculation Sheet: Overflow for Typical Road Ponding Area					Continuous Grade Profile: SWMHYMO PH1VXD.out					
Area ID (Dummy Segment, if applicable)	ROW (for Street Segments)	Longitudinal Slope (%)	Overflow Flowrate		Flowrate (cms)		Velocity (m/s)			Flowrate (cms)		Dynamic Depth (m)			Dynamic Depth (m)			Ponding Depth (m)		Velocity x Depth
			Qx (l/s)	Qx (cms)	Qmin	Qmax	vmin	vmax	vx	Qmin	Qmax	dmin	dmax	dx	dmin	dmax	dx	Static	Maximum	(m^2/s)
S151A	18	0.52	**25**	**0.025**	0.024	0.033	0.502	0.543	**0.507**	0.021	0.027	0.050	0.055	**0.053**	0.054	0.061	**0.055**	0.000	**0.055**	0.028
S150A	18	0.79	**91**	**0.091**	0.053	0.096	0.597	0.691	**0.680**	0.088	0.103	0.085	0.090	**0.086**	0.052	0.064	**0.063**	0.000	**0.063**	0.043
S150B	18	1	**12**	**0.012**	0.010	0.015	0.505	0.571	**0.531**	0.012	0.016	0.040	0.045	**0.040**	0.034	0.040	**0.036**	0.060	**0.096**	0.019
S140(D17)	18	0.86	**188**	**0.188**	0.162	0.245	0.814	0.902	**0.842**	0.176	0.198	0.110	0.115	**0.113**	N/A	N/A	**N/A**	0.180	**0.293**	0.095
S125(D18)	18	0.55	**8**	**0.008**	0.007	0.021	0.316	0.415	**0.323**	0.005	0.008	0.030	0.035	**0.035**	N/A	N/A	**N/A**	0.160	**0.195**	0.011
S124(D19)	18	0.66	**185**	**0.185**	0.142	0.214	0.713	0.791	**0.760**	0.170	0.192	0.110	0.115	**0.113**	N/A	N/A	**N/A**	0.160	**0.273**	0.086
S130(D20)	18	0.66	**71**	**0.071**	0.048	0.087	0.545	0.632	**0.596**	0.061	0.073	0.075	0.080	**0.079**	N/A	N/A	**N/A**	0.170	**0.249**	0.047
S180A(D21)	18	1.17	**186**	**0.186**	0.116	0.189	0.841	0.950	**0.946**	0.176	0.198	0.110	0.115	**0.112**	N/A	N/A	**N/A**	0.140	**0.252**	0.106
S180B(D22)	18	1.12	**97**	**0.097**	0.063	0.114	0.710	0.823	**0.785**	0.088	0.103	0.085	0.090	**0.088**	N/A	N/A	**N/A**	0.150	**0.238**	0.069
S181(D23)	18	0.73	**0**	**0.000**	N/A	N/A	N/A	N/A	**N/A**	N/A	N/A	N/	N/A	**N/A**	N/A	N/A	**N/A**	0.230	**0.230**	N/A
S170A(D24)	26	0.92	**5**	**0.005**	0.002	0.014	0.338	0.536	**0.388**	0.003	0.006	0.025	0.030	**0.029**	N/A	N/A	**N/A**	0.155	**0.184**	0.011
S171(D25)	26	0.73	**69**	**0.069**	0.036	0.075	0.625	0.736	**0.719**	0.061	0.073	0.075	0.080	**0.078**	N/A	N/A	**N/A**	0.205	**0.283**	0.056
S132(D26)	18	0.67	**0**	**0.000**	N/A	N/A	N/A	N/A	**N/A**	N/A	N/A	N/	N/A	**N/A**	N/A	N/A	**N/A**	0.240	**0.240**	N/A
S112(D27)	18	0.67	**21**	**0.021**	0.008	0.022	0.344	0.450	**0.442**	0.021	0.027	0.050	0.055	**0.050**	N/A	N/A	**N/A**	0.140	**0.190**	0.022
S113(D28)	18	0.99	**36**	**0.036**	0.028	0.059	0.554	0.671	**0.584**	0.035	0.043	0.060	0.065	**0.061**	N/A	N/A	**N/A**	0.095	**0.156**	0.035
S114(D29)	18	0.83	**101**	**0.101**	0.098	0.159	0.708	0.800	**0.713**	0.088	0.103	0.085	0.090	**0.089**	N/A	N/A	**N/A**	0.180	**0.269**	0.064
S122(D30)	18	0.83	**0**	**0.000**	N/A	N/A	N/A	N/A	**N/A**	N/A	N/A	N/	N/A	**N/A**	N/A	N/A	**N/A**	0.200	**0.200**	N/A
S120(D31)	18	0.7	**36**	**0.036**	0.023	0.049	0.460	0.558	**0.509**	0.034	0.042	0.060	0.065	**0.061**	N/A	N/A	**N/A**	0.220	**0.281**	0.031
S110(D32)	18	0.55	**20**	**0.020**	0.017	0.025	0.473	0.516	**0.489**	0.016	0.021	0.045	0.050	**0.049**	N/A	N/A	**N/A**	0.120	**0.169**	0.024
S102(D33)	18	0.55	**14**	**0.014**	0.012	0.017	0.427	0.473	**0.445**	0.011	0.016	0.040	0.045	**0.043**	N/A	N/A	**N/A**	0.120	**0.163**	0.019
S103(D34)	24	0.71	**0**	**0.000**	N/A	N/A	N/A	N/A	**N/A**	N/A	N/A	N/	N/A	**N/A**	N/A	N/A	**N/A**	0.230	**0.230**	N/A
S104(D35)	24	0.7	**114**	**0.114**	0.071	0.129	0.613	0.711	**0.686**	0.100	0.115	0.090	0.095	**0.095**	N/A	N/A	**N/A**	0.140	**0.235**	0.065
S105A(D36)	24	0.55	**203**	**0.203**	0.186	0.280	0.712	0.789	**0.726**	0.192	0.215	0.115	0.120	**0.117**	N/A	N/A	**N/A**	0.160	**0.277**	0.085
S105B(D37)	24	0.6	**164**	**0.164**	0.119	0.194	0.658	0.743	**0.709**	0.150	0.170	0.105	0.110	**0.108**	N/A	N/A	**N/A**	0.160	**0.268**	0.077
S107(D38)	24	0.6	**122**	**0.122**	0.119	0.194	0.658	0.743	**0.661**	0.115	0.132	0.095	0.100	**0.097**	N/A	N/A	**N/A**	0.200	**0.297**	0.064
S109(D39)	24	0.68	**106**	**0.106**	0.071	0.129	0.613	0.711	**0.672**	0.100	0.115	0.090	0.095	**0.092**	N/A	N/A	**N/A**	0.110	**0.202**	0.062
S170B	26	0.68	**9**	**0.009**	0.002	0.011	0.244	0.387	**0.355**	0.008	0.011	0.035	0.040	**0.036**	0.015	0.029	**0.026**	0.050	**0.076**	0.009

Velocity x Depth Calculation

Iteration equation:

Velocity:

$$v_x = v_{min} + \frac{Q_x - Q_{min}}{Q_{max} - Q_{min}} (v_{max} - v_{min})$$

Depth:

$$d_x = d_{min} + \frac{Q_x - Q_{min}}{Q_{max} - Q_{min}} (d_{max} - d_{min})$$

Phase 1A
100 Year 3 Hour Chicago Storm

					SWMHYMO PH1VXD.out					Sawtooth Profile: Calculation Sheet: Overflow for Typical Road Ponding Area					Continuous Grade Profile: SWMHYMO PH1VXD.out					
Area ID (Dummy Segment, if applicable)	**ROW (for Street Segments)**	**Longitudinal Slope (%)**	**Overflow Flowrate**		**Flowrate (cms)**		**Velocity (m/s)**			**Flowrate (cms)**		**Dynamic Depth (m)**			**Dynamic Depth (m)**			**Ponding Depth (m)**		**Velocity x Depth**
			Qx (l/s)	**Qx (cms)**	**Qmin**	**Qmax**	**vmin**	**vmax**	**vx**	**Qmin**	**Qmax**	**dmin**	**dmax**	**dx**	**dmin**	**dmax**	**dx**	**Static**	**Maximum**	**(m^2/s)**
S143	18	1.65	**82**	**0.082**	0.076	0.138	0.862	0.999	**0.875**	0.078	0.091	0.080	0.085	**0.082**	0.052	0.064	**0.053**	0.000	**0.053**	0.047
S136E	18	0.83	**143**	**0.143**	0.098	0.159	0.708	0.800	**0.776**	0.136	0.155	0.100	0.105	**0.102**	0.064	0.077	**0.074**	0.000	**0.074**	0.057
S136B	18	2.58	**67**	**0.067**	0.044	0.095	0.890	1.078	**0.975**	0.065	0.078	0.075	0.080	**0.076**	0.039	0.052	**0.045**	0.000	**0.045**	0.044
S144	18	0.83	**392**	**0.392**	0.343	0.470	0.969	1.048	**0.999**	0.390	0.430	0.145	0.150	**0.145**	0.103	0.116	**0.108**	0.000	**0.108**	0.108
S160B	18	0.89	**82**	**0.082**	0.056	0.101	0.633	0.734	**0.691**	0.075	0.088	0.080	0.085	**0.083**	0.052	0.064	**0.059**	0.000	**0.059**	0.041
S136D	18	0.78	**18**	**0.018**	0.014	0.021	0.504	0.558	**0.535**	0.016	0.021	0.045	0.050	**0.047**	0.040	0.047	**0.044**	0.000	**0.044**	0.024
S160A	18	1.25	**96**	**0.096**	0.066	0.120	0.751	0.869	**0.817**	0.091	0.106	0.085	0.090	**0.087**	0.052	0.064	**0.059**	0.000	**0.059**	0.048
S145A	18	2.75	**547**	**0.547**	0.486	0.647	1.085	1.170	**1.117**	0.533	0.580	0.160	0.165	**0.162**	0.116	0.129	**0.121**	0.000	**0.121**	0.135
S136C	18	0.78	**30**	**0.030**	0.029	0.040	0.609	0.659	**0.614**	0.028	0.035	0.055	0.060	**0.057**	0.054	0.061	**0.055**	0.000	**0.055**	0.034
S137A	18	0.51	**125**	**0.125**	0.106	0.127	0.716	0.749	**0.746**	0.115	0.132	0.095	0.100	**0.098**	0.094	0.101	**0.100**	0.000	**0.100**	0.075
S137B(D1)	18	1.61	**99**	**0.099**	0.099	0.125	1.083	1.147	**1.083**	0.091	0.106	0.085	0.090	**0.088**	N/A	N/A	**N/A**	0.070	**0.158**	0.095
S138	18	1.61	**128**	**0.128**	0.125	0.154	1.147	1.210	**1.154**	0.123	0.141	0.095	0.100	**0.096**	0.081	0.088	**0.082**	0.000	**0.082**	0.094
S148	18	1.43	**160**	**0.160**	0.129	0.209	0.930	1.050	**0.977**	0.141	0.160	0.100	0.105	**0.105**	0.064	0.077	**0.069**	0.000	**0.069**	0.067
S145B	18	3.3	**688**	**0.688**	0.638	0.739	1.458	1.502	**1.480**	0.680	0.734	0.175	0.180	**0.176**	0.103	0.111	**0.107**	0.190	**0.297**	0.158
BLK335	N/A	2	**741**	**0.741**	0.739	0.848	1.502	1.543	**1.503**	0.734	0.789	0.180	0.185	**0.181**	0.111	0.118	**0.111**	0.000	**0.111**	0.167

Velocity x Depth Calculation

Iteration equation:

Velocity:

$$v_x = v_{min} + \frac{Q_x - Q_{min}}{Q_{max} - Q_{min}} (v_{max} - v_{min})$$

Depth:

$$d_x = d_{min} + \frac{Q_x - Q_{min}}{Q_{max} - Q_{min}} (d_{max} - d_{min})$$

100 Year 3 Hour Chicago Storm + 20% Phase 1																				
					SWMHYMO PH1VXD.out					Sawtooth Profile: Calculation Sheet: Overflow for Typical Road Ponding Area					Continuous Grade Profile: SWMHYMO PH1VXD.out					
Area ID (Dummy Segment, if applicable)	ROW (for Street Segments)	Longitudinal Slope (%)	Overflow Flowrate		Flowrate (cms)		Velocity (m/s)			Flowrate (cms)		Dynamic Depth (m)			Dynamic Depth (m)			Ponding Depth (m)		Velocity x Depth
			Qx (l/s)	Qx (cms)	Qmin	Qmax	vmin	vmax	vx	Qmin	Qmax	dmin	dmax	dx	dmin	dmax	dx	Static	Maximum	(m^2/s)
S153	18	1.33	**40**	**0.040**	0.032	0.068	0.639	0.774	**0.669**	0.036	0.045	0.060	0.065	**0.062**	0.039	0.052	**0.042**	0.000	**0.042**	0.028
S149A	18	0.53	**62**	**0.062**	0.043	0.078	0.489	0.566	**0.531**	0.061	0.073	0.075	0.080	**0.075**	0.052	0.064	**0.059**	0.000	**0.059**	0.031
S149C	18	0.53	**182**	**0.182**	0.175	0.207	1.028	1.073	**1.038**	0.170	0.192	0.110	0.115	**0.113**	0.101	0.108	**0.103**	0.080	**0.183**	0.106
S149B	18	0.55	**118**	**0.118**	0.108	0.130	0.730	0.764	**0.745**	0.115	0.132	0.095	0.100	**0.096**	0.094	0.101	**0.097**	0.000	**0.097**	0.072
S128A(D1)	18	0.51	**55**	**0.055**	0.042	0.077	0.479	0.555	**0.507**	0.051	0.061	0.070	0.075	**0.072**	N/A	N/A	**N/A**	0.140	**0.212**	0.036
S127B(D2)	18	0.69	**44**	**0.044**	0.023	0.049	0.460	0.558	**0.539**	0.042	0.051	0.065	0.070	**0.066**	N/A	N/A	**N/A**	0.220	**0.286**	0.036
S191B	18	0.69	**93**	**0.093**	0.089	0.145	0.646	0.729	**0.652**	0.086	0.100	0.085	0.090	**0.088**	0.064	0.077	**0.065**	0.060	**0.125**	0.042
S128B(D3)	18	0.53	**16**	**0.016**	0.007	0.020	0.308	0.403	**0.374**	0.016	0.021	0.045	0.050	**0.045**	N/A	N/A	**N/A**	0.210	**0.255**	0.017
S188	18	0.53	**119**	**0.119**	0.078	0.127	0.566	0.639	**0.627**	0.115	0.132	0.095	0.100	**0.096**	0.064	0.077	**0.075**	0.000	**0.075**	0.047
S189(D4)	18	0.54	**63**	**0.063**	0.043	0.078	0.489	0.566	**0.533**	0.061	0.073	0.075	0.080	**0.076**	N/A	N/A	**N/A**	0.110	**0.186**	0.040
S191A(D5)	18	0.97	**164**	**0.164**	0.105	0.171	0.762	0.860	**0.850**	0.155	0.176	0.105	0.110	**0.107**	N/A	N/A	**N/A**	0.150	**0.257**	0.091
S186(D6)	18	1.14	**241**	**0.241**	0.187	0.282	0.937	1.039	**0.995**	0.222	0.247	0.120	0.125	**0.124**	N/A	N/A	**N/A**	0.140	**0.264**	0.123
S152A(D7)	18	0.69	**13**	**0.013**	0.008	0.023	0.351	0.460	**0.387**	0.011	0.016	0.040	0.045	**0.042**	N/A	N/A	**N/A**	0.220	**0.262**	0.016
S152B	18	0.52	**50**	**0.050**	0.044	0.057	0.583	0.621	**0.601**	0.042	0.051	0.065	0.070	**0.069**	0.067	0.074	**0.070**	0.060	**0.130**	0.042
S151B(D8)	18	0.61	**189**	**0.189**	0.137	0.206	0.686	0.760	**0.742**	0.170	0.192	0.110	0.115	**0.114**	N/A	N/A	**N/A**	0.050	**0.164**	0.085
S127A	18	0.51	**58**	**0.058**	0.042	0.077	0.479	0.555	**0.514**	0.051	0.061	0.070	0.075	**0.073**	0.052	0.064	**0.057**	0.000	**0.057**	0.030
S182A(D9)	18	1.04	**156**	**0.156**	0.110	0.178	0.793	0.895	**0.862**	0.155	0.176	0.105	0.110	**0.105**	N/A	N/A	**N/A**	0.230	**0.335**	0.091
S182B(D10)	18	1.14	**158**	**0.158**	0.115	0.187	0.830	0.937	**0.894**	0.155	0.176	0.105	0.110	**0.106**	N/A	N/A	**N/A**	0.130	**0.236**	0.094
S183(D11)	18	0.7	**357**	**0.357**	0.313	0.428	0.884	0.956	**0.912**	0.356	0.390	0.145	0.150	**0.145**	N/A	N/A	**N/A**	0.280	**0.425**	0.132
S190	18	0.62	**16**	**0.016**	0.012	0.018	0.446	0.494	**0.478**	0.016	0.021	0.045	0.050	**0.045**	0.040	0.047	**0.045**	0.050	**0.095**	0.021
S177	26	0.52	**59**	**0.059**	0.030	0.064	0.528	0.621	**0.607**	0.051	0.061	0.070	0.075	**0.074**	0.059	0.078	**0.075**	0.000	**0.075**	0.046
S176	26	0.52	**72**	**0.072**	0.063	0.077	0.633	0.665	**0.654**	0.061	0.073	0.075	0.080	**0.080**	0.077	0.083	**0.081**	0.000	**0.081**	0.053
S175(D12)	26	0.55	**362**	**0.362**	0.320	0.486	0.837	0.920	**0.858**	0.356	0.390	0.145	0.150	**0.146**	N/A	N/A	**N/A**	0.110	**0.256**	0.125
S174(D13)	26	0.55	**531**	**0.531**	0.486	0.703	0.920	1.002	**0.937**	0.504	0.556	0.165	0.170	**0.168**	N/A	N/A	**N/A**	0.155	**0.323**	0.157
S173(D14)	26	0.81	**483**	**0.483**	0.388	0.590	1.015	1.116	**1.063**	0.479	0.520	0.160	0.165	**0.161**	N/A	N/A	**N/A**	0.145	**0.306**	0.171
S172(D15)	26	0.73	**812**	**0.812**	0.810	1.159	1.155	1.289	**1.156**	0.791	0.856	0.190	0.195	**0.192**	N/A	N/A	**N/A**	0.165	**0.357**	0.221
S135A	18	0.56	**50**	**0.050**	0.045	0.058	0.599	0.639	**0.614**	0.042	0.051	0.065	0.070	**0.069**	0.067	0.074	**0.070**	0.000	**0.070**	0.043
S135B	18	0.91	**118**	**0.118**	0.116	0.141	0.910	0.956	**0.914**	0.103	0.119	0.090	0.095	**0.095**	0.088	0.094	**0.088**	0.070	**0.158**	0.081
S134C	18	0.51	**21**	**0.021**	0.017	0.024	0.452	0.493	**0.475**	0.021	0.027	0.050	0.055	**0.050**	0.047	0.054	**0.051**	0.000	**0.051**	0.024
S136A	18	0.56	**39**	**0.039**	0.034	0.045	0.559	0.599	**0.577**	0.034	0.042	0.060	0.065	**0.063**	0.061	0.067	**0.064**	0.000	**0.064**	0.037
S134B	18	0.56	**80**	**0.080**	0.074	0.091	0.677	0.714	**0.690**	0.073	0.086	0.080	0.085	**0.083**	0.081	0.088	**0.083**	0.000	**0.083**	0.058
S134A(D16)	18	1	**214**	**0.214**	0.175	0.264	0.878	0.973	**0.920**	0.198	0.222	0.115	0.120	**0.118**	N/A	N/A	**N/A**	0.115	**0.233**	0.109

100 Year 3 Hour Chicago Storm + 20% Phase 1																				
					SWMHYMO PH1VXD.out					Sawtooth Profile: Calculation Sheet: Overflow for Typical Road Ponding Area					Continuous Grade Profile: SWMHYMO PH1VXD.out					
Area ID (Dummy Segment, if applicable)	ROW (for Street Segments)	Longitudinal Slope (%)	Overflow Flowrate		Flowrate (cms)		Velocity (m/s)			Flowrate (cms)		Dynamic Depth (m)			Dynamic Depth (m)			Ponding Depth (m)		Velocity x Depth
			Qx (l/s)	Qx (cms)	Qmin	Qmax	vmin	vmax	vx	Qmin	Qmax	dmin	dmax	dx	dmin	dmax	dx	Static	Maximum	(m^2/s)
S151A	18	0.52	**35**	**0.035**	0.033	0.044	0.543	0.583	**0.550**	0.034	0.042	0.060	0.065	**0.061**	0.061	0.067	**0.062**	0.000	**0.062**	0.034
S150A	18	0.79	**125**	**0.125**	0.096	0.155	0.691	0.780	**0.735**	0.119	0.136	0.095	0.100	**0.097**	0.064	0.077	**0.070**	0.000	**0.070**	0.052
S150B	18	1	**20**	**0.020**	0.015	0.023	0.571	0.632	**0.609**	0.016	0.021	0.045	0.050	**0.049**	0.040	0.047	**0.044**	0.060	**0.104**	0.027
S140(D17)	18	0.86	**332**	**0.332**	0.245	0.349	0.902	0.986	**0.972**	0.304	0.335	0.135	0.140	**0.140**	N/A	N/A	**N/A**	0.180	**0.320**	0.136
S125(D18)	18	0.55	**65**	**0.065**	0.044	0.080	0.502	0.582	**0.549**	0.061	0.073	0.075	0.080	**0.077**	N/A	N/A	**N/A**	0.160	**0.237**	0.042
S124(D19)	18	0.66	**388**	**0.388**	0.306	0.419	0.864	0.935	**0.916**	0.377	0.417	0.145	0.150	**0.146**	N/A	N/A	**N/A**	0.160	**0.306**	0.134
S130(D20)	18	0.66	**119**	**0.119**	0.087	0.142	0.632	0.713	**0.679**	0.115	0.132	0.095	0.100	**0.096**	N/A	N/A	**N/A**	0.170	**0.266**	0.065
S180A(D21)	18	1.17	**453**	**0.453**	0.407	0.558	1.151	1.244	**1.179**	0.430	0.473	0.150	0.155	**0.153**	N/A	N/A	**N/A**	0.140	**0.293**	0.180
S180B(D22)	18	1.12	**355**	**0.355**	0.279	0.399	1.030	1.126	**1.091**	0.351	0.390	0.140	0.145	**0.141**	N/A	N/A	**N/A**	0.150	**0.291**	0.153
S181(D23)	18	0.73	**268**	**0.268**	0.225	0.322	0.831	0.909	**0.866**	0.240	0.269	0.125	0.130	**0.130**	N/A	N/A	**N/A**	0.230	**0.360**	0.112
S170A(D24)	26	0.92	**38**	**0.038**	0.014	0.040	0.536	0.702	**0.689**	0.035	0.043	0.060	0.065	**0.062**	N/A	N/A	**N/A**	0.155	**0.217**	0.043
S171(D25)	26	0.73	**422**	**0.422**	0.368	0.560	0.964	1.060	**0.991**	0.390	0.425	0.150	0.155	**0.155**	N/A	N/A	**N/A**	0.205	**0.360**	0.153
S132(D26)	18	0.67	**144**	**0.144**	0.142	0.214	0.713	0.791	**0.715**	0.132	0.150	0.100	0.105	**0.103**	N/A	N/A	**N/A**	0.240	**0.343**	0.074
S112(D27)	18	0.67	**48**	**0.048**	0.048	0.087	0.545	0.632	**0.545**	0.042	0.051	0.065	0.070	**0.068**	N/A	N/A	**N/A**	0.140	**0.208**	0.037
S113(D28)	18	0.99	**131**	**0.131**	0.108	0.175	0.778	0.878	**0.812**	0.119	0.136	0.095	0.100	**0.098**	N/A	N/A	**N/A**	0.095	**0.193**	0.080
S114(D29)	18	0.83	**208**	**0.208**	0.159	0.240	0.800	0.886	**0.852**	0.198	0.222	0.115	0.120	**0.117**	N/A	N/A	**N/A**	0.180	**0.297**	0.100
S122(D30)	18	0.83	**13**	**0.013**	0.009	0.025	0.385	0.505	**0.415**	0.012	0.016	0.040	0.045	**0.041**	N/A	N/A	**N/A**	0.200	**0.241**	0.017
S120(D31)	18	0.7	**133**	**0.133**	0.089	0.145	0.646	0.729	**0.711**	0.132	0.150	0.100	0.105	**0.100**	N/A	N/A	**N/A**	0.220	**0.320**	0.071
S110(D32)	18	0.55	**34**	**0.034**	0.034	0.045	0.559	0.599	**0.559**	0.034	0.042	0.060	0.065	**0.060**	N/A	N/A	**N/A**	0.120	**0.180**	0.034
S102(D33)	18	0.55	**32**	**0.032**	0.025	0.034	0.516	0.559	**0.549**	0.027	0.034	0.055	0.060	**0.059**	N/A	N/A	**N/A**	0.120	**0.179**	0.032
S103(D34)	24	0.71	**33**	**0.033**	0.033	0.071	0.507	0.613	**0.507**	0.027	0.034	0.055	0.060	**0.059**	N/A	N/A	**N/A**	0.230	**0.289**	0.030
S104(D35)	24	0.7	**196**	**0.196**	0.129	0.210	0.711	0.803	**0.787**	0.192	0.215	0.115	0.120	**0.116**	N/A	N/A	**N/A**	0.140	**0.256**	0.091
S105A(D36)	24	0.55	**411**	**0.411**	0.400	0.548	0.862	0.933	**0.867**	0.390	0.425	0.150	0.155	**0.153**	N/A	N/A	**N/A**	0.160	**0.313**	0.133
S105B(D37)	24	0.6	**367**	**0.367**	0.293	0.418	0.824	0.901	**0.870**	0.356	0.390	0.145	0.150	**0.147**	N/A	N/A	**N/A**	0.160	**0.307**	0.128
S107(D38)	24	0.6	**330**	**0.330**	0.293	0.418	0.824	0.901	**0.847**	0.324	0.356	0.140	0.145	**0.141**	N/A	N/A	**N/A**	0.200	**0.341**	0.119
S109(D39)	24	0.68	**327**	**0.327**	0.316	0.452	0.890	0.973	**0.897**	0.324	0.356	0.140	0.145	**0.140**	N/A	N/A	**N/A**	0.110	**0.250**	0.126
S170B	26	0.68	**15**	**0.015**	0.011	0.033	0.387	0.507	**0.409**	0.011	0.016	0.040	0.045	**0.044**	0.029	0.044	**0.032**	0.050	**0.082**	0.013

Velocity x Depth Calculation

Iteration equation:

Velocity:

$$v_x = v_{min} + \frac{Q_x - Q_{min}}{Q_{max} - Q_{min}} (v_{max} - v_{min})$$

Depth:

$$d_x = d_{min} + \frac{Q_x - Q_{min}}{Q_{max} - Q_{min}} (d_{max} - d_{min})$$

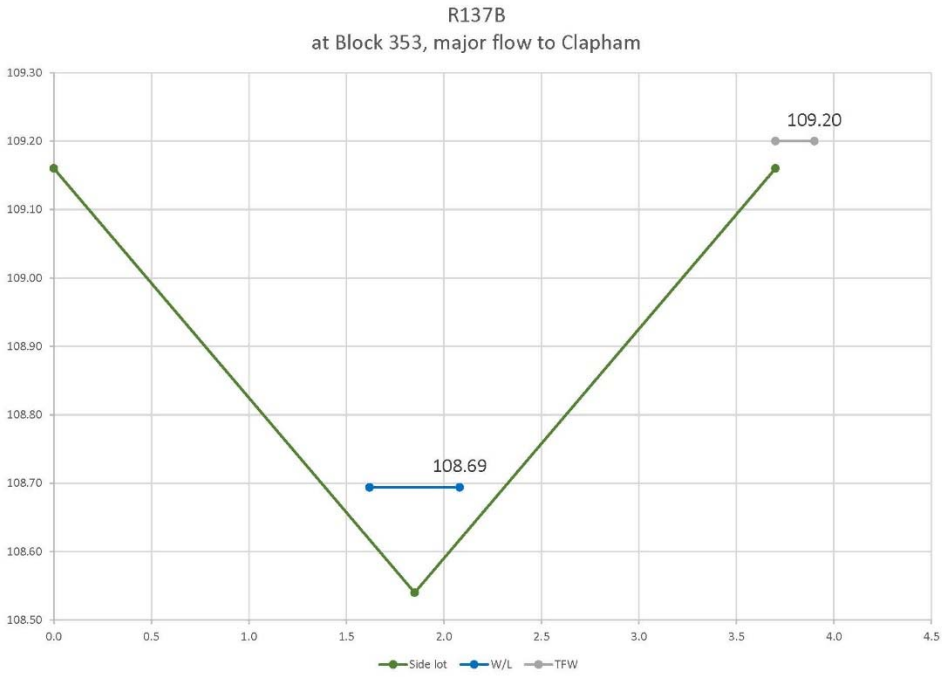
Phase 1A
100 Year 3 Hour Chicago Storm + 20%

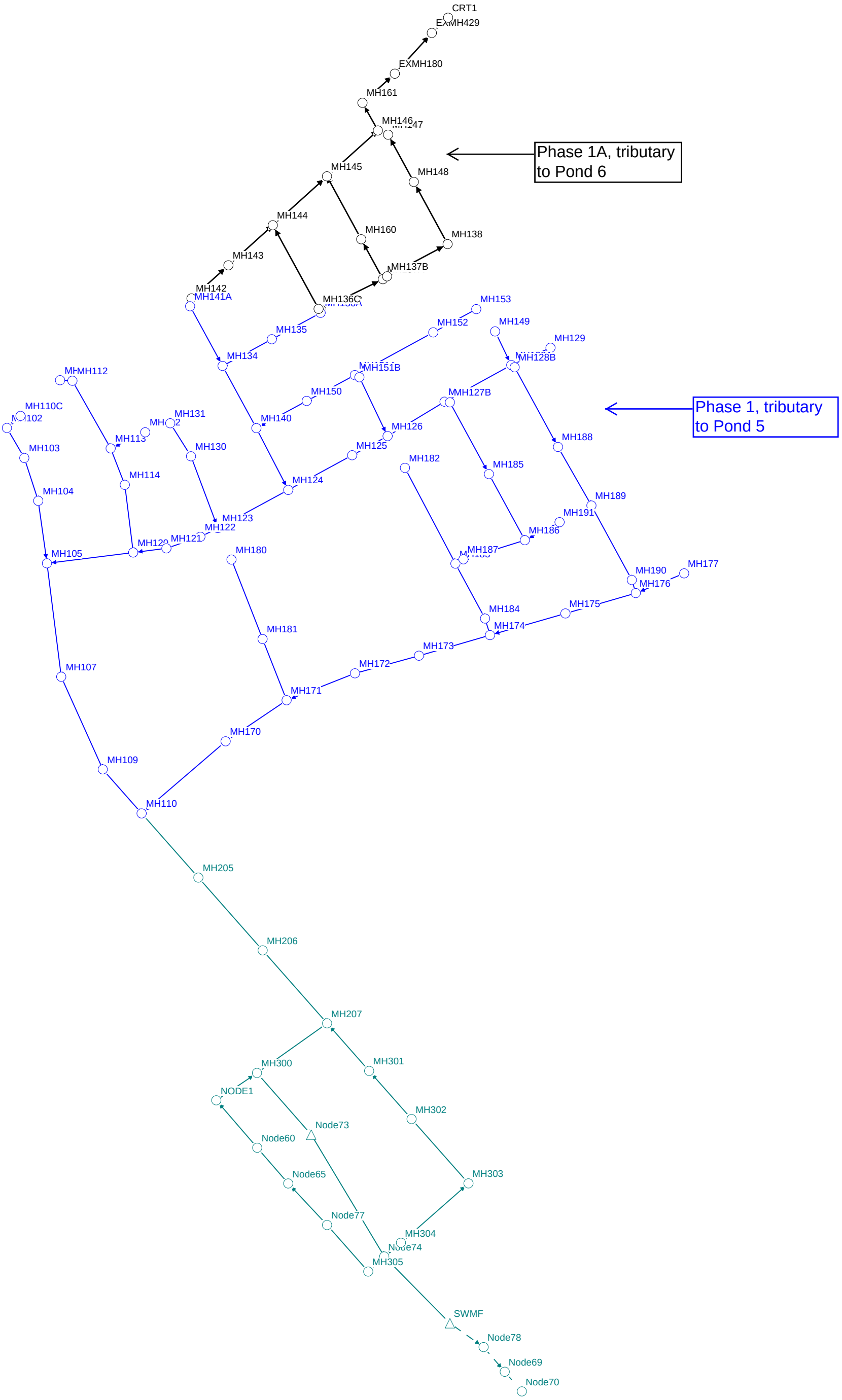
					SWMHYMO PH1VXD.out					Sawtooth Profile: Calculation Sheet: Overflow for Typical Road Ponding Area					Continuous Grade Profile: SWMHYMO PH1VXD.out					
Area ID (Dummy Segment, if applicable)	ROW (for Street Segments)	Longitudinal Slope (%)	Overflow Flowrate		Flowrate (cms)		Velocity (m/s)			Flowrate (cms)		Dynamic Depth (m)			Dynamic Depth (m)			Ponding Depth (m)		Velocity x Depth
			Qx (l/s)	Qx (cms)	Qmin	Qmax	vmin	vmax	vx	Qmin	Qmax	dmin	dmax	dx	dmin	dmax	dx	Static	Maximum	(m^2/s)
S143	18	1.65	**112**	**0.112**	0.076	0.138	0.862	0.999	**0.942**	0.106	0.123	0.090	0.095	**0.092**	0.052	0.064	**0.059**	0.000	**0.059**	0.056
S136E	18	0.83	**210**	**0.210**	0.159	0.240	0.800	0.886	**0.854**	0.198	0.222	0.115	0.120	**0.118**	0.077	0.090	**0.085**	0.000	**0.085**	0.073
S136B	18	2.58	**93**	**0.093**	0.044	0.095	0.890	1.078	**1.071**	0.091	0.106	0.085	0.090	**0.086**	0.039	0.052	**0.051**	0.000	**0.051**	0.055
S144	18	0.83	**574**	**0.574**	0.470	0.625	1.048	1.130	**1.103**	0.563	0.610	0.165	0.170	**0.166**	0.116	0.129	**0.125**	0.000	**0.125**	0.138
S160B	18	0.89	**124**	**0.124**	0.101	0.165	0.734	0.828	**0.768**	0.119	0.136	0.095	0.100	**0.096**	0.064	0.077	**0.069**	0.000	**0.069**	0.053
S136D	18	0.78	**25**	**0.025**	0.021	0.029	0.558	0.609	**0.584**	0.021	0.028	0.050	0.055	**0.053**	0.047	0.054	**0.051**	0.000	**0.051**	0.029
S160A	18	1.25	**131**	**0.131**	0.120	0.195	0.869	0.982	**0.886**	0.123	0.141	0.095	0.100	**0.097**	0.064	0.077	**0.066**	0.000	**0.066**	0.058
S145A	18	2.75	**805**	**0.805**	0.647	0.875	1.170	1.320	**1.274**	0.789	0.846	0.185	0.190	**0.186**	0.129	0.142	**0.138**	0.000	**0.138**	0.176
S136C	18	0.78	**40**	**0.040**	0.040	0.053	0.659	0.707	**0.659**	0.035	0.043	0.060	0.065	**0.063**	0.061	0.067	**0.061**	0.000	**0.061**	0.040
S137A	18	0.51	**191**	**0.191**	0.178	0.207	0.815	0.846	**0.829**	0.170	0.192	0.110	0.115	**0.115**	0.115	0.121	**0.118**	0.000	**0.118**	0.098
S137B(D1)	18	1.61	**172**	**0.172**	0.154	0.188	1.210	1.272	**1.243**	0.160	0.181	0.105	0.110	**0.108**	N/A	N/A	**N/A**	0.070	**0.178**	0.134
S138	18	1.61	**213**	**0.213**	0.188	0.226	1.272	1.331	**1.311**	0.204	0.229	0.115	0.120	**0.117**	0.094	0.101	**0.099**	0.000	**0.099**	0.129
S148	18	1.43	**262**	**0.262**	0.209	0.315	1.050	1.164	**1.107**	0.255	0.287	0.125	0.130	**0.126**	0.077	0.090	**0.084**	0.000	**0.084**	0.092
S145B	18	3.3	**1054**	**1.054**	0.966	1.093	1.583	1.621	**1.609**	1.032	1.098	0.205	0.210	**0.207**	0.126	0.134	**0.132**	0.190	**0.322**	0.212
BLK335	N/A	2	**1147**	**1.147**	1.093	1.228	1.621	1.658	**1.636**	1.098	1.166	0.210	0.215	**0.214**	0.134	0.142	**0.137**	0.000	**0.137**	0.224

Appendix F

Major flow at side lots

There is one location, R137B, where major flow from rear yards cascades to the street via a side lot. The water surface elevation has been evaluated and is presented below at the cross-section of the side lot. Top of foundation wall elevation is indicated. The water surface elevation is more than the 0.15 m below top of foundation wall, the requested clearance. It should be noted that a conservative 3H:1V has been applied to the cross-section side slopes.





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HGL SUMMARY PHASE 1 AND PHASE 1A

PHASE	MH	USF or Proposed Ground		100 year 3 hour Chicago		100 year 3 hour Chicago + 20%		July 1979		August 1988		August 1996	
			Elevation (m)	HGL (m)	Freeboard (m)	HGL (m)	Freeboard (m)	HGL (m)	Freeboard (m)	HGL (m)	Freeboard (m)	HGL (m)	Freeboard (m)
Trunk to Pond 5	MH207	Proposed Ground	107.17	104.53	2.64	104.58	2.59	104.55	2.62	104.54	2.63	104.23	2.94
	MH206	Proposed Ground	107.15	104.57	2.58	104.63	2.52	104.60	2.55	104.58	2.57	104.25	2.90
	MH205	Proposed Ground	107.28	104.62	2.66	104.68	2.60	104.64	2.64	104.62	2.66	104.28	3.00
1	MH110	Proposed Ground	107.52	104.69	2.83	104.75	2.77	104.71	2.81	104.69	2.83	104.33	3.19
1	MH109	Proposed Ground	107.45	104.71	2.74	104.77	2.68	104.72	2.73	104.71	2.74	104.33	3.12
1	MH107	Proposed Ground	107.41	104.73	2.68	104.80	2.61	104.75	2.66	104.73	2.68	Free flow	N/A
1	MH105	USF	105.65	104.76	0.89	104.83	0.82	104.79	0.86	104.77	0.88	Free flow	N/A
1	MH104	USF	105.85	104.80	1.05	104.87	0.98	104.83	1.02	104.81	1.04	Free flow	N/A
1	MH103	USF	105.75	104.81	0.94	104.89	0.86	104.85	0.90	104.83	0.92	Free flow	N/A
1	MH102	USF	105.95	104.82	1.13	104.89	1.06	104.85	1.10	104.84	1.11	Free flow	N/A
1	MH110C	Proposed Ground	107.93	Free flow	N/A	Free flow	N/A	Free flow	N/A	Free flow	N/A	Free flow	N/A
1	MH170	USF	105.50	104.86	0.64	104.94	0.56	104.87	0.63	104.86	0.64	104.43	1.07
1	MH171	USF	105.35	104.96	0.39	105.04	0.31	104.96	0.39	104.96	0.39	104.48	0.87
1	MH172	USF	105.50	105.03	0.47	105.12	0.38	105.03	0.47	105.05	0.45	Free flow	N/A
1	MH173	USF	105.65	105.07	0.58	105.17	0.48	105.08	0.57	105.10	0.55	Free flow	N/A
1	MH174	USF	105.80	105.13	0.67	105.24	0.56	105.14	0.66	105.18	0.62	Free flow	N/A
1	MH175	USF	106.00	105.18	0.82	105.28	0.72	105.19	0.81	105.22	0.78	Free flow	N/A
1	MH176	USF	106.10	105.23	0.87	105.33	0.77	105.24	0.86	105.27	0.83	Free flow	N/A
1	MH177	Proposed Ground	106.55	105.28	1.27	105.34	1.21	105.30	1.25	105.34	1.21	Free flow	N/A
1	MH181	USF	105.65	105.19	0.46	105.28	0.37	105.06	0.59	105.06	0.59	Free flow	N/A
1	MH180	USF	105.85	105.42	0.43	105.52	0.33	105.18	0.67	105.19	0.66	Free flow	N/A
1	MH184	USF	105.68	105.19	0.49	105.30	0.38	105.20	0.48	105.24	0.44	Free flow	N/A
1	MH183	USF	105.95	105.32	0.63	105.42	0.53	105.34	0.61	105.38	0.57	Free flow	N/A
1	MH182	USF	106.19	105.83	0.36	105.96	0.23	105.86	0.33	105.92	0.27	Free flow	N/A
1	MH187	USF	105.75	105.37	0.38	105.47	0.28	105.39	0.36	105.44	0.31	Free flow	N/A
1	MH186	USF	106.05	105.53	0.52	105.68	0.37	105.57	0.48	105.63	0.42	Free flow	N/A
1	MH191	USF	106.02	105.61	0.41	105.78	0.24	105.67	0.35	105.73	0.29	Free flow	N/A
1	MH185	USF	106.45	105.66	0.79	105.82	0.63	105.72	0.73	105.77	0.68	Free flow	N/A
1	MH127	USF	106.70	105.80	0.90	105.99	0.71	105.87	0.83	105.92	0.78	Free flow	N/A
1	MH190	USF	106.35	105.26	1.09	105.36	0.99	105.26	1.09	105.30	1.05	Free flow	N/A
1	MH189	USF	106.05	105.31	0.74	105.41	0.64	105.31	0.74	105.34	0.71	Free flow	N/A
1	MH188	USF	106.55	105.44	1.11	105.58	0.97	105.46	1.09	105.49	1.06	Free flow	N/A
1	MH128	USF	106.65	Free flow	N/A	105.78	0.87	Free flow	N/A	Free flow	N/A	Free flow	N/A
1	MH120	USF	105.70	104.87	0.83	104.95	0.75	104.90	0.80	104.87	0.83	Free flow	N/A
1	MH121	USF	105.70	104.88	0.82	104.96	0.74	104.92	0.78	104.88	0.82	Free flow	N/A
1	MH122	USF	105.90	Free flow	N/A	104.98	0.92	104.94	0.96	Free flow	N/A	Free flow	N/A
1	MH123	USF	106.00	Free flow	N/A	105.01	0.99	104.97	1.03	Free flow	N/A	Free flow	N/A
1	MH124	USF	106.10	Free flow	N/A	105.07	1.03	Free flow	N/A	Free flow	N/A	Free flow	N/A
1	MH125	USF	106.20	Free flow	N/A	105.13	1.07	Free flow	N/A	Free flow	N/A	Free flow	N/A
1	MH126	USF	106.35	Free flow	N/A	105.17	1.18	Free flow	N/A	Free flow	N/A	Free flow	N/A
1	MH129	Proposed Ground	109.23	Free flow	N/A	Free flow	N/A	Free flow	N/A	Free flow	N/A	Free flow	N/A
1	MH114	USF	106.00	104.97	1.03	105.08	0.92	105.03	0.97	104.98	1.02	Free flow	N/A
1	MH113	USF	106.05	105.09	0.96	105.21	0.84	105.17	0.88	105.12	0.93	Free flow	N/A
1	MH112	USF	106.10	105.16	0.94	105.28	0.82	105.25	0.85	105.19	0.91	Free flow	N/A
1	MH111	Proposed Ground	108.19	Free flow	N/A	105.28	2.91	105.25	2.94	105.20	2.99	Free flow	N/A
1	MH132	USF	106.15	Free flow	N/A	105.34	0.81	105.30	0.85	Free flow	N/A	Free flow	N/A
1	MH130	USF	106.25	105.02	1.23	105.12	1.13	105.09	1.16	105.02	1.23	Free flow	N/A
1	MH131	USF	106.15	Free flow	N/A	105.14	1.01	105.13	1.03	Free flow	N/A	Free flow	N/A
1	MH140	USF	106.25	Free flow	N/A	Free flow	N/A	Free flow	N/A	Free flow	N/A	Free flow	N/A
1	MH134	USF	106.40	Free flow	N/A	Free flow	N/A	Free flow	N/A	Free flow	N/A	Free flow	N/A

HGL SUMMARY PHASE 1 AND PHASE 1A

PHASE	MH	USF or Proposed Ground		100 year 3 hour Chicago		100 year 3 hour Chicago + 20%		July 1979		August 1988		August 1996	
			Elevation (m)	HGL (m)	Freeboard (m)	HGL (m)	Freeboard (m)	HGL (m)	Freeboard (m)	HGL (m)	Freeboard (m)	HGL (m)	Freeboard (m)
1	MH141	Proposed Ground	108.40	Free flow	N/A	Free flow	N/A	Free flow	N/A	Free flow	N/A	Free flow	N/A
1	MH135	USF	106.76	Free flow	N/A	Free flow	N/A	Free flow	N/A	Free flow	N/A	Free flow	N/A
1	MH150	USF	106.65	Free flow	N/A	Free flow	N/A	Free flow	N/A	Free flow	N/A	Free flow	N/A
1	MH152	USF	107.40	Free flow	N/A	Free flow	N/A	Free flow	N/A	Free flow	N/A	Free flow	N/A
1	MH153	USF	107.25	Free flow	N/A	Free flow	N/A	Free flow	N/A	Free flow	N/A	Free flow	N/A
1	MH151	USF	107.00	Free flow	N/A	Free flow	N/A	Free flow	N/A	Free flow	N/A	Free flow	N/A
1	MH149	USF	106.71	Free flow	N/A	Free flow	N/A	Free flow	N/A	Free flow	N/A	Free flow	N/A
1A	CRT1	Proposed Ground	103.30	100.89	N/A	100.89	N/A	100.89	N/A	100.89	N/A	100.89	N/A
1A	MH162	Proposed Ground	N/A	Free flow	N/A	Free flow	N/A	Free flow	N/A	Free flow	N/A	Free flow	N/A
1A	MH161	Proposed Ground	104.20	Free flow	N/A	Free flow	N/A	Free flow	N/A	Free flow	N/A	Free flow	N/A
1A	MH146	USF	103.61	Free flow	N/A	Free flow	N/A	Free flow	N/A	Free flow	N/A	Free flow	N/A
1A	MH147	USF	104.06	Free flow	N/A	Free flow	N/A	Free flow	N/A	Free flow	N/A	Free flow	N/A
1A	MH148	USF	104.56	Free flow	N/A	Free flow	N/A	Free flow	N/A	Free flow	N/A	Free flow	N/A
1A	MH138	USF	106.01	Free flow	N/A	Free flow	N/A	Free flow	N/A	Free flow	N/A	Free flow	N/A
1A	MH145	USF	103.61	102.75	0.86	102.76	0.85	Free flow	N/A	Free flow	N/A	Free flow	N/A
1A	MH160	USF	105.53	Free flow	N/A	Free flow	N/A	Free flow	N/A	Free flow	N/A	Free flow	N/A
1A	MH137	USF	106.26	Free flow	N/A	Free flow	N/A	Free flow	N/A	Free flow	N/A	Free flow	N/A
1A	MH136	USF	106.71	Free flow	N/A	Free flow	N/A	Free flow	N/A	Free flow	N/A	Free flow	N/A
1A	MH144	USF	104.81	Free flow	N/A	Free flow	N/A	Free flow	N/A	Free flow	N/A	Free flow	N/A
1A	MH143	USF	105.11	Free flow	N/A	Free flow	N/A	Free flow	N/A	Free flow	N/A	Free flow	N/A
1A	MH142	USF	106.11	Free flow	N/A	Free flow	N/A	Free flow	N/A	Free flow	N/A	Free flow	N/A

HGL SUMMARY PHASE 1
(TRIB. TO POND 5)

PHASE	MH	USF or Proposed Ground		100 year 24 hour SCS		100 year 24 hour SCS + 20%	
			Elevation (m)	HGL (m)	Freeboard (m)	HGL (m)	Freeboard (m)
Trunk to Pond 5	MH207	Proposed Ground	107.17	104.49	2.68	104.67	2.50
	MH206	Proposed Ground	107.15	104.53	2.62	104.73	2.42
	MH205	Proposed Ground	107.28	104.57	2.71	104.78	2.50
1	MH110	Proposed Ground	107.52	104.64	2.88	104.86	2.66
1	MH109	Proposed Ground	107.45	104.65	2.80	104.88	2.57
1	MH107	Proposed Ground	107.41	104.68	2.73	104.90	2.51
1	MH105	USF	105.65	104.71	0.94	104.94	0.71
1	MH104	USF	105.85	104.75	1.10	104.98	0.87
1	MH103	USF	105.75	104.76	0.99	105.00	0.75
1	MH102	USF	105.95	Free flow	N/A	105.00	0.95
1	MH110C	Proposed Ground	107.93	Free flow	N/A	105.01	2.92
1	MH170	USF	105.50	104.79	0.71	105.05	0.45
1	MH171	USF	105.35	104.87	0.48	105.16	0.19
1	MH172	USF	105.50	104.93	0.57	105.23	0.27
1	MH173	USF	105.65	104.97	0.68	105.28	0.37
1	MH174	USF	105.80	105.02	0.78	105.35	0.45
1	MH175	USF	106.00	105.06	0.94	105.39	0.61
1	MH176	USF	106.10	105.10	1.00	105.44	0.66
1	MH177	Proposed Ground	106.55	Free flow	N/A	105.45	1.10
1	MH181	USF	105.65	105.00	0.65	105.40	0.25
1	MH180	USF	105.85	105.23	0.62	105.63	0.22
1	MH184	USF	105.68	105.06	0.62	105.41	0.27
1	MH183	USF	105.95	105.14	0.81	105.54	0.41
1	MH182	USF	106.19	105.62	0.57	106.05	0.14
1	MH187	USF	105.75	105.16	0.59	105.59	0.16
1	MH186	USF	106.05	105.27	0.78	105.76	0.29
1	MH191	USF	106.02	105.33	0.69	105.84	0.18
1	MH185	USF	106.45	105.42	1.03	105.91	0.54
1	MH127	USF	106.70	Free flow	N/A	106.05	0.65
1	MH190	USF	106.35	105.13	1.22	105.47	0.88
1	MH189	USF	106.05	105.17	0.88	105.52	0.53
1	MH188	USF	106.55	Free flow	N/A	105.67	0.88
1	MH128	USF	106.65	Free flow	N/A	105.90	0.75
1	MH120	USF	105.70	104.81	0.89	105.05	0.65
1	MH121	USF	105.70	Free flow	N/A	105.07	0.63
1	MH122	USF	105.90	Free flow	N/A	105.09	0.81
1	MH123	USF	106.00	Free flow	N/A	105.12	0.88
1	MH124	USF	106.10	Free flow	N/A	105.16	0.94
1	MH125	USF	106.20	Free flow	N/A	105.21	0.99
1	MH126	USF	106.35	Free flow	N/A	105.25	1.10
1	MH129	Proposed Ground	109.23	Free flow	N/A	Free flow	N/A
1	MH114	USF	106.00	104.93	1.07	105.18	0.82
1	MH113	USF	106.05	105.05	1.00	105.32	0.73
1	MH112	USF	106.10	105.12	0.98	105.39	0.71
1	MH111	Proposed Ground	108.19	Free flow	N/A	105.40	2.79
1	MH132	USF	106.15	Free flow	N/A	105.46	0.69
1	MH130	USF	106.25	104.98	1.27	105.22	1.03
1	MH131	USF	106.15	Free flow	N/A	105.26	0.89
1	MH140	USF	106.25	Free flow	N/A	105.33	0.92
1	MH134	USF	106.40	Free flow	N/A	Free flow	N/A
1	MH141	Proposed Ground	108.40	Free flow	N/A	Free flow	N/A
1	MH135	USF	106.76	Free flow	N/A	Free flow	N/A
1	MH150	USF	106.65	Free flow	N/A	Free flow	N/A
1	MH152	USF	107.40	Free flow	N/A	Free flow	N/A
1	MH153	USF	107.25	Free flow	N/A	Free flow	N/A
1	MH151	USF	107.00	Free flow	N/A	Free flow	N/A
1	MH149	USF	106.71	Free flow	N/A	Free flow	N/A

HGL SUMMARY PHASE 1
(TRIB. TO POND 5)
25% SEDIMENT ACCUMULATION

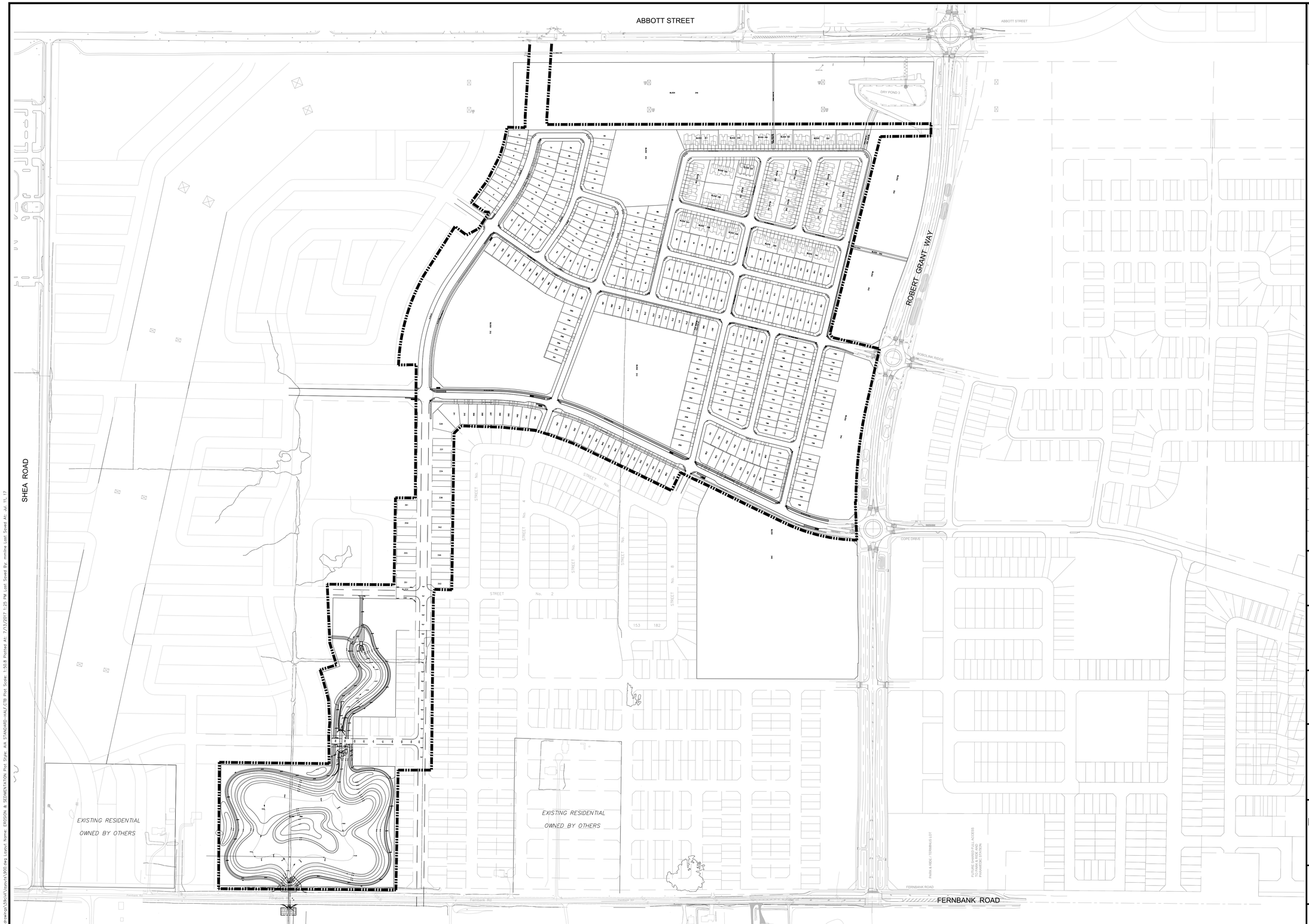
PHASE	MH	USF or Proposed Ground		100 year 3 hour Chicago	
			Elevation (m)	HGL (m)	Freeboard (m)
Trunk to Pond 5	MH207	Proposed Ground	107.17	105.00	2.17
	MH206	Proposed Ground	107.15	105.10	2.05
	MH205	Proposed Ground	107.28	105.20	2.08
1	MH110	Proposed Ground	107.52	105.35	2.17
1	MH109	Proposed Ground	107.45	105.38	2.07
1	MH107	Proposed Ground	107.41	105.43	1.98
1	MH105	USF	105.65	105.48	0.17
1	MH104	USF	105.85	105.54	0.31
1	MH103	USF	105.75	105.61	0.14
1	MH102	USF	105.95	105.67	0.28
1	MH110C	Proposed Ground	107.93	105.82	2.11
1	MH170	USF	105.50	105.56	-0.06
1	MH171	USF	105.35	105.67	-0.32
1	MH172	USF	105.50	105.75	-0.25
1	MH173	USF	105.65	105.80	-0.15
1	MH174	USF	105.80	105.87	-0.07
1	MH175	USF	106.00	105.91	0.09
1	MH176	USF	106.10	105.96	0.14
1	MH177	Proposed Ground	106.55	106.04	0.51
1	MH181	USF	105.65	105.90	-0.25
1	MH180	USF	105.85	106.14	-0.29
1	MH184	USF	105.68	105.92	-0.24
1	MH183	USF	105.95	106.05	-0.10
1	MH182	USF	106.19	106.55	-0.36
1	MH187	USF	105.75	106.10	-0.35
1	MH186	USF	106.05	106.26	-0.21
1	MH191	USF	106.02	106.35	-0.33
1	MH185	USF	106.45	106.44	0.01
1	MH127	USF	106.70	106.68	0.02
1	MH190	USF	106.35	105.98	0.37
1	MH189	USF	106.05	106.04	0.01
1	MH188	USF	106.55	106.35	0.20
1	MH120	USF	105.70	105.67	0.03
1	MH121	USF	105.70	105.71	-0.01
1	MH122	USF	105.90	105.74	0.16
1	MH123	USF	106.00	105.79	0.21
1	MH124	USF	106.10	105.92	0.18
1	MH125	USF	106.20	106.14	0.06
1	MH126	USF	106.35	106.31	0.04
1	MH128	USF	106.65	106.91	-0.26
1	MH129	Proposed Ground	109.23	106.91	2.32
1	MH114	USF	106.00	105.79	0.21
1	MH113	USF	106.05	105.90	0.15
1	MH112	USF	106.10	106.06	0.04
1	MH111	Proposed Ground	108.19	106.08	2.11
1	MH132	USF	106.15	106.06	0.09
1	MH130	USF	106.25	105.89	0.36
1	MH131	USF	106.15	106.09	0.06
1	MH140	USF	106.25	106.00	0.25

HGL SUMMARY PHASE 1
(TRIB. TO POND 5)
25% SEDIMENT ACCUMULATION

PHASE	MH	USF or Proposed Ground		100 year 3 hour Chicago	
			Elevation (m)	HGL (m)	Freeboard (m)
1	MH134	USF	106.40	106.39	0.01
1	MH141	Proposed Ground	108.40	106.56	1.84
1	MH135	USF	106.76	106.33	0.43
1	MH136	USF	106.71	106.39	0.32
1	MH150	USF	106.65	106.22	0.43
1	MH152	USF	107.40	106.39	1.01
1	MH153	USF	107.25	106.59	0.66
1	MH151	USF	107.00	106.60	0.40
1	MH149	USF	106.71	106.80	-0.09

APPENDIX G

- **Erosion and Sedimentation Control Plan - (Drawing 27970-900)**



REVIEWED BY
DEVELOPMENT REVIEW SERVICES BRANCH

Signed _____

Date _____ 2017

Plan Number _____

LEGEND:

LIGHT DUTY SILT FENCE PER OPSD 219.110

STRAW BALE BARRIER PER OPSD 219.100

No.	REVISIONS	By	Date
14			
13			
12			
11			
10			
9			
8			
7	RESUBMISSION FOR MOE APPROVAL	JIM	17: 07: 14
6	SUBMISSION FOR MOE APPROVAL	JIM	17: 02: 10
5	SUBMISSION #5 FOR CITY REVIEW	JIM	16: 11: 10
4	SUBMISSION #4 FOR CITY REVIEW	JIM	15: 06: 15
3	SUBMISSION #3 FOR CITY REVIEW	JIM	14: 08: 22
2	SUBMISSION #2 FOR CITY REVIEW	JIM	14: 01: 22
1	SUBMISSION #1 FOR CITY REVIEW	JIM	13: 08: 29

CRT DEVELOPMENT INC.

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Project Title

CRT LANDS
FERNBANK COMMUNITY
PHASE 1

PROFESSIONAL ENGINEER
J. I. MOFFATT
2017/07/14
PROVINCE OF ONTARIO

Drawing Title

EROSION & SEDIMENTATION CONTROL PLAN

Scale

50 0 50 100
1:1500

Design	Date
J.I.M.	OCTOBER '12
Drawn	Checked
M.M.	P.K.
Project No.	Drawing No.
27970	900

D07-16-11-0003

#17366