DCR/PHOENIX GROUP OF COMPANIES

REPORT
PROJECT: 122508-6.2.1

DESIGN BRIEF
115 LUSK STREET
C/O DCR/PHOENIX GROUP OF COMPANIES
WEST BARRHAVEN - CITY OF OTTAWA

Prepared for DCR/PHOENIX GROUP OF COMPANIES
by IBI GROUP

MARCH 2020

CLIENT:	DCR/PHOENIX GROUP OF COMPANIES
PROJECT NAME:	
REPORT TITLE:	DESIGN BRIEF 115 LUSK STREET C/O DCR/PHOENIX GROUP OF COMPANIES WEST BARRHAVEN - CITY OF OTTAWA
IBI REFERENCE:	PROJECT: 122508-6.2.1
VERSION:	
DIGITAL MASTER:	[File Location]
ORIGINATOR:	[Name]
REVIEWER:	[Name]
AUTHORIZATION:	[Name]
CIRCULATION LIST:	
HISTORY:	

Table of Contents

Table of Contents (continued)

List of Appendices

Table of Contents (continued)

1 INTRODUCTION

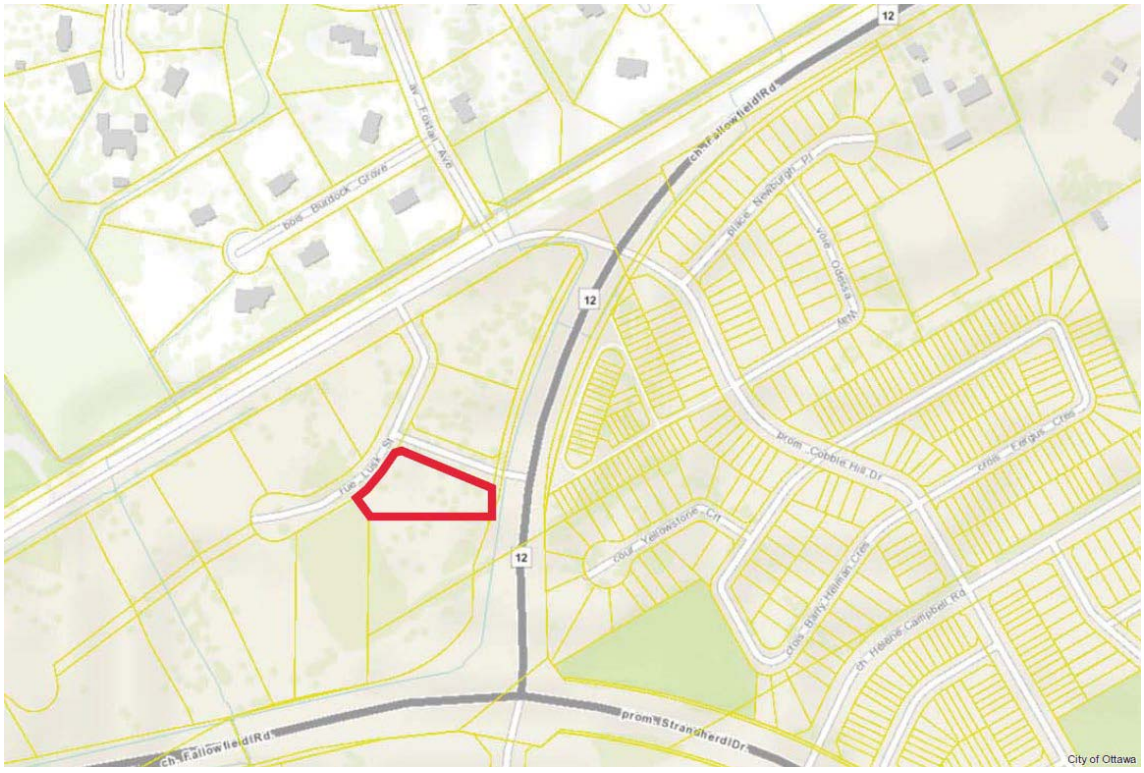
1.1 Purpose

IBI has been retained by the owner (DCR Phoenix) to prepare detail design of municipal services to support the Site Plan Application (SPA) for 115 Lusk Street. The site is located in O'Keefe Court commercial development located at the north east quadrant of the intersection of Fallowfield Road and Strandherd Drive. The development is located in the growth area of West Barrhaven in the City of Ottawa within Areas 9 & 10 Barrhaven Secondary Plan, which identified these lands for commercial Business Park development. The subject site is approximately 0.40 ha and the proposed site plan consists of a medical building and a restaurant.

The site is bounded by Forager Street to the north, vacant lands to the south, Fallowfield Road to the west and Lusk Street to the east. Its civic address is 115 Lusk Street. Refer to key plan on Figure 1.1 for property location.

A copy of the proposed site plan prepared by Colizza Architects is provided in **Appendix A**.

Figure 1.1 Site Location



The proposed servicing design conforms to current City of Ottawa and MECP design criteria, and no pre-consultation meetings were requested from the Rideau Valley Conservation Authority (RVCA) or the Ontario Ministry of Environment, Conservation and Parks (MECP), as the site is serviced by existing municipal infrastructure.

2 WATER DISTRIBUTION

2.1 Existing Conditions

The subject property is located in the City of Ottawa Barrhaven Water Pressure Zone. An existing 300mm diameter watermain runs along Lusk Street frontage; an existing 200mm is located along Forager Street frontage; and an existing 406mm diameter watermain is located along Fallowfield Road east of the site.

As part of the development of the subdivision, a 200 mm diameter water service was constructed along the Lusk Street frontage to service this site.

2.2 Design Criteria

2.2.1 Water Demands

Water demands have been calculated based on Table 4.2 – Ottawa Design Guidelines – Water Distribution. A consumption rate of 25,000 l/hectare/day is used for the commercial lands in the subject site.

A watermain demand calculation sheet is included in **Appendix A** and the total water demands are summarized as follows:

Average Daily	0.23 l/s
Maximum Daily	0.35 l/s
Peak Hourly	0.42 l/s

2.2.2 System Pressure

The 2010 City of Ottawa Water Distribution Guidelines 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 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 may be required for buildings where it is not possible/feasible to maintain the system pressure below 552 kPa.

2.2.3 Fire Flow Rate

As per the Ottawa Design Guidelines, fire flow requirements are to be calculated using the Fire Underwriters Survey (FUS) method. The FUS method requires the building area, type of construction, type of occupancy, use of sprinklers and exposures to adjacent buildings. A FUS calculation has been done for the medical building which is the largest building resulting in a fire flow demand of 7,000 l/min (117 l/s); a copy of the FUS calculation is included in **Appendix A**.

2.2.4 Existing Hydraulic Model

As part of the O'Keefe Court – 416 Lands development, watermains were constructed on Lusk and Forager Streets which are connected to existing watermains on Fallowfield Road and O'Keefe Court. A hydraulic model was prepared for this project in the 'Design Brief O'Keefe Court – 416 Lands c/o DCR/Phoenix Group of Companies West Barrhaven – City of Ottawa' prepared by IBI Group May 2018. For the hydraulic analysis, the City of Ottawa provided boundary conditions at the three locations where connections to the existing watermain are made. A copy of the boundary conditions is included in **Appendix A** and summarized as follows:

BOUNDARY CONDITIONS			
SCENARIO	HGL (m) O'Keefe Court (Near Highway 416)	HGL (m) O'Keefe Court (Near Fallowfield Road)	HGL (m) Fallowfield Road
Maximum HGL (Basic Day)	154.0	154.4	154.5
Minimum HGL (Peak Hour)	150.2	149.9	149.8
Max Day + Fire Flow	148.5	146.5	146.0

In the hydraulic water model for O'Keefe Court – 416 Lands, the location where the water services for the two buildings connect to the existing watermain on Lusk Street is represented by Node J-35 in the model. A copy of the model schematic and model output is included in **Appendix A**. As the services to the buildings are for 'domestic' water supply and not for fire protection, the service pipes do not have to be modelled. The water demands used in the hydraulic model are similar to the water demands calculated in Section 2.2.1.

Fire protection to the two buildings is provided by adjacent hydrants on Lusk Street directly opposite the medical building and on Forager Street. In the hydraulic model Nodes J-35 and J-40 represent the available fire flow for the proposed building.

2.3 Hydraulic Model Results

As stated in the above section, the water model schematic and results for the O'Keefe Court – 416 Lands project are included in **Appendix A**. A comparison of the results for the proposed building is summarized as follows:

Maximum Pressure: At node J-35 under the basic day scenario, the pressure at the road elevation is 495.4 kPa. As this pressure is less than 552 kPa, pressure reducing control is not required for these buildings.

Minimum Pressure: The pressure at Node J-35 under the peak hour scenario is 488.9 kPa which is well above the minimum 276 kPa pressure.

Fire Flow: Under the max day plus fire scenario, the design fire flow at nodes J-35 and J-40 is 799.1 l/s and 843.5 l/s respectively, well above the required 117 l/s fire flow per the FUS calculation.

3 WASTEWATER

3.1 Existing Conditions and Studies

The O'Keefe Court Commercial Development is located in the Tributary of the future South Nepean Collector (SNC). A high level master report prepared for the City by Dillon provided a functional design for the SNC. The report "South Nepean Collector (SNC) Wastewater Servicing Study and Functional Design" dated October 2003, identifies the preliminary size, slope and elevation of the SNC up to the intersection of Strandherd Drive and the former Temporary Road. The report also notes the requirement for a sub trunk "G" to be located within the West Barrhaven Community to support the growth node.

In addition, IBI prepared a Servicing Report in 2006 and subsequently updated in 2013 titled 'Sanitary Servicing Brief, Tartan-Claridge (Jockvale Heights) DCR Phoenix (Maravista Heights)'. Future Residential lands West Barrhaven, identifying how this growth node and the adjacent lands can be serviced in advance of the SNC and provided details on the location, size and elevation of sub trunk "G". This servicing strategy has been followed to date allowing all of the following downstream developments to be constructed: DCR Phoenix West Barrhaven Phases 1 to 4, Claridge Homes West Pointe Village Phases 1 to 3, Tartan Homes Havencrest and DCR Phoenix Maravista Heights. The subject lands were not originally included in sub trunk "G"; however, the 2013 servicing report identified sufficient residual capacity within the sub-trunk sewer to accommodate the subject lands. Subsequent agreement with the City allowed for the connection of the City Gate and O'Keefe Court Commercial Development to share the residual capacity until the SNC was fully constructed.

As part of the subdivision works, a 250 mm diameter sanitary service was constructed along the Lusk Street frontage to service this site.

3.2 Verification of Existing Sanitary Sewer Capacity

The sanitary sewers for O'Keefe Court was designed using the criteria of 50,000 L/Ha/day with a Peaking factor of 1.5 for the commercial lands. The sanitary design sheet and the conceptual sanitary sewer layout and tributary areas for the O'Keefe Court dated September 2017 are provided in the **Appendix B**. The area for the site remains unchanged. The updated City of Ottawa design criteria uses 28,000 l/ha/day for commercial lands. Therefore, the existing sanitary sewer has adequate capacity for the subject site, and there will be no negative effect to the downstream sanitary system.

3.3 Design Criteria

All on-site sewers have been designed to City of Ottawa and MOE design criteria which include but are not limited to the below listed criteria. A copy of the detailed sanitary tributary area plan C-400 and the sanitary sewer design sheets are included in **Appendix B**; refer to the General Plan in **Appendix A** for sewer locations and details.

Institutional/Commercial:	28,000 l/d/Ha
Institutional/Commercial Peak Factor:	1.5
Extraneous Flow:	0.33 l/s/Ha
Minimum Pipe Size:	200 mm diameter
Maximum Velocity	3.0 m/s
Minimum Velocity	0.6 m/s

4 STORMWATER MANAGEMENT

4.1 Background

O'Keefe subdivision is tributary to the O'Keefe Drain which is tributary to the Jock River. The subdivision included the design and construction of an end of pipe SWM Facility to provide both quantity and quality control. The facility is operational and service the subdivision including the subject site. The design of the SWM facility is outlined in the Draft "O'Keefe Court 416 Lands Stormwater Management Report and Design Brief" (IBI, May 2018).

As part of the subdivision works, a 375 mm diameter service was constructed along the Lusk Street frontage to service this site.

4.2 Objective

The purpose of this evaluation is to prepare the dual drainage design, including the minor and major system, for 115 Lusk Street development. The design includes the assignment of inlet control devices, on-site storage and maximum depth of surface ponding. The evaluation takes into consideration the design requirement of the existing stormwater management pond, City of Ottawa Sewer Design Guidelines (OSDG) (October 2012), the February 2014 Technical Bulletin ISDTB-2014-01, the September 2016 Technical Bulletin PIEDTB-2016-01 and the June 2018 Technical Bulletin ISTB-2018-04.

4.3 Design Criteria

The stormwater system was designed following the principles of dual drainage, making accommodations for both major and minor flow.

Some of the key criteria include the following:

- Design Storm — 1:2 year return (Ottawa)
- Rational Method Sewer Sizing
- Initial Time of Concentration — 10 minutes
- Runoff Coefficients
  - Landscaped Areas — C = 0.25
  - Building and Roof Area — C = 0.90
  - Parking Area and Driveway — C = 0.90
  - Overall Runoff Coefficient — C = 0.77

  (See Figure 2.0 in Appendix C for detailed runoff C calculation)
- Pipe Velocities — 0.80 m/s to 3.0 m/s
- Minimum Pipe Size — 250 mm diameter (200 mm CB Leads)

4.4 System Concept

According to the detail design report of the subdivision prepared by IBI Group dated May 2018, the development of the downstream system included the expected stormwater servicing needs of the subject property. The existing storm sewers constructed adjacent to the site were oversized to provide the needed capacity for minor storm runoff from the subject site. Minor storm runoff from the subject site will connect to the existing 375 mmØ sewer stub that connects to the existing 825mmØ storm sewer in Lusk Street.

According to the IBI Report dated May 2018, the design flow associated with the site is 61.0 l/s. Based on the proposed servicing plan, the design flow of the subject site is calculated to be 60.80 l/s. Therefore, the existing storm sewer has adequate capacity for the subject site, and there will be no negative effect to the downstream storm system. Copies of the subdivision storm design sheet and tributary areas plan are provided in **Appendix C**.

4.4.1 Dual Drainage Design

The dual drainage system proposed for the subject site will accommodate both major and minor stormwater runoff. Minor flow from the subject site will be conveyed through the storm sewer network and discharge into the existing 825mmØ storm sewer in Lusk Street.

The balance of the surface flow not captured by the minor system will be conveyed via the major system. Where possible, storage will be provided in surface sags or low points within the parking lot and landscaped area. Underground storage will also be provided within oversized storm pipes. Once the maximum storage is utilized, the excess flow will cascade to the next downstream sag. Major flow up to 100-year storm event will be restricted and detained on-site. Emergency overflow will be directed towards Lusk Street.

4.4.2 Proposed Minor System

Using the criteria identified in Section 4.3, the proposed on-site storm sewers were sized accordingly. A detailed storm sewer design sheet and the associated storm sewer drainage area plan C-500 is included in **Appendix C**. The general plan of services, depicting all on-site storm sewers can be found in **Appendix A**.

The owner of the site will be responsible for regular maintenance of the on-site sewers, catch basins and inlet control devices (ICDs). Maintenance includes but is not limited to the cost of regular cleaning of the structures and ICDs as necessary. The site owner will also be responsible for replacement of damaged or missing catch basin structures, grates or ICDs as needed.

4.5 Stormwater Management

The stormwater management strategy for the subdivision was outlined in the following reports:

• Jock River Reach One Subwatershed Study (Stantec 2007)

• O'Keefe Drain Environmental and Stormwater Management Plan Final Report (June 2013)

• O'Keefe Court Stormwater Management Report and Design Brief (IBI, May 2018)

• O'Keefe Court Design Brief (IBI, May 2018)

The subject site is limited to a maximum minor system release rate of 61.0 l/s according to the IBI Design Brief dated May 2018. Based on the final legal plan of the site, this will be achieved through a combination of inlet control devices (ICD's) at inlet locations, surface storage where possible and underground storage in oversized storm pipes where required.

Surface flows in excess of the site's allowable release rate will be stored on site in strategic surface storage areas or oversized underground pipes and gradually released into the minor system to respect the site's allowable release rate. The maximum surface retention depth located within the developed areas will be limited to 300mm during a 1:100 year event as show on the ponding plan C-600 located in **Appendix C** and grading plan C-200 located in **Appendix D.** Overland flow routes will be provided in the grading to permit emergency overland flow.

Along the eastern limits of the property, there is an elevation drop from the site to Forager Street and Fallowfield Road, the opportunity to capture and store runoff in this area is limited due to grading constraints and building geometry. As per the subdivision design, these areas will discharge to Fallowfield Road uncontrolled. The 416 Lands Design Brief by IBI Group date May 2018 assumed a total of 0.03 ha of uncontrolled area discharging to the Fallowfield Right of Way. Based on the proposed site plan and the use of retaining walls, the total uncontrolled area has been reduced to 0.02 ha, which is less than what has been previously approved. Therefore, runoff from the uncontrolled area will have no negative impact on the Fallowfield storm sewer system. Refer to Drawing C-500 in **Appendix D** for the detailed storm drainage area plan for the site.

Based on the previously noted factors, the site will be limited to 61.0 l/s discharging into the existing minor system. To achieve this, the on-site storm sewer system servicing sloped roofs (medical building), parking lot and landscape area will be controlled with an orifice, and flows from flat roofs (restaurant) will be controlled with roof inlets.

The following table identifies the ICD type for each drainage area and corresponding storage requirements as noted in the modified rational method calculation included in **Appendix D**. A detailed calculation of the underground storage volume is also included in **Appendix D**.

DRAINAGE AREA	ICD TYPE	RESTRICTED FLOW (L/s)		STORAGE REQUIRED (m^3)		STORAGE PROVIDED (m^3)	
		2 YEAR	100 YEAR	2 YEAR	100 YEAR	2 YEAR	100 YEAR
ROOF	R-100	1.575	1.575	2.49	10.26	10.50	10.50
PARKING LOT	TEMPEST LMF	59.425*	59.425*	17.68	99.61	23.27	111.24

* While the ICD will be sized for 59.425 l/s with 2.085m head, a reduction of 50% was applied to the flow rate when calculating the storage requirement, per city requirements when using modified rational method.

5 SOURCE CONTROLS

5.1 General

Since an end of pipe treatment facility is provided for the subdivision development, stormwater site management for the subject lands will focus on site level or source control management of runoff. Such controls or mitigative measures are proposed for this site not only for final development but also during construction. Some of these measures are:

- flat site grading;
- vegetation planting; and
- groundwater recharge in landscaped areas.

5.2 Lot Grading

In accordance with local municipal standards, all grading will be between 0.5 and 6.0 percent for hard surfaces and 2.0 and 6.0 percent for all landscaped areas. Significant pre-development elevation changes exist from west to east. The use of a retaining wall combined terracing (3:1 maximum slope) between the east side of the proposed restaurant and Fallowfield Road allows the remainder of the site to be graded relatively flat. A copy of the grading plan has been included in **Appendix D.**

5.3 Vegetation

As with most site plan agreements, the developer will be required to complete a vegetation and planting program. Vegetation will be provided where opportunities exist to re-create lost vegetation.

6 CONVEYANCE CONTROLS

6.1 General

Besides source controls, the site plan also proposes to use several conveyance control measures to improve runoff quality. These will include:

- flat vegetated swales; and
- catchbasin sumps.

6.2 Flat Vegetated Swales

The site plan will make use of relatively flat vegetated swales where possible to encourage infiltration and runoff treatment.

6.3 Catchbasins and Maintenance Hole Sumps

All catchbasins within the development will be constructed with minimum 600 mm deep sumps. These sumps trap pollutants, sand, grit and debris which can be mechanically removed prior to being flushed into the minor pipe system. Catchbasins will be to OPSD 705.02. All storm sewer maintenance holes on site shall be constructed with a 300 mm sump as per City standards.

6.4 Pervious Landscaped Area Drainage

Some of the landscaped area swales make use of a filter wrapped perforated drainage pipe constructed below the swales. This perforated system is designed to provide some ground water recharge and generally reduce both volumetric and pollutant loadings that enter the minor pipe system.

7 SEDIMENT AND EROSION CONTROL PLAN

7.1 General

During construction, existing stream and conveyance systems can be exposed to significant sediment loadings. Although construction is only a temporary situation, it is proposed to introduce a number of mitigative construction techniques to reduce unnecessary construction sediment loadings. These will include:

- groundwater in trench will be pumped into a filter mechanism prior to release to the environment;
- bulkhead barriers will be installed in the existing manholes which connect to the existing downstream sewers;
- seepage barriers will be constructed in any temporary drainage ditches;
- filter cloths will remain on open surface structure such as manholes and catchbasins until these structures are commissioned and put into use; and
- Silt fence on the site perimeter.

7.2 Trench Dewatering

Although little groundwater is expected during construction of municipal services, any trench dewatering using pumps will be discharged into a filter trap made up of geotextile filters and straw bales similar in design to the OPSD 219.240 Dewatering Trap. These will be constructed in a bowl shape with the fabric forming the bottom and the straw bales forming the sides. Any pumped groundwater will be filtered prior to release to the existing surface runoff. The contractor will inspect and maintain the filters as needed including sediment removal and disposal and material replacement as needed.

7.3 Bulkhead Barriers

Temporary ½ diameter bulkhead barriers will be constructed for the existing manholes at the property limits. This bulkhead will trap any sediment carrying flows thus preventing any construction-related contamination of the existing sewers. The bulkheads will be inspected and maintained including periodic sediment removal as needed and removed prior to top course asphalt being laid.

7.4 Seepage Barriers

The presence of road side ditches along Fallowfield Drive and Strandherd Drive and the proximity of the O'Keefe drain necessitate the installation of seepage barriers. These barriers will consist of both the Light Duty Straw Bale Barrier as per OPSD 219.100 or the Light Duty Silt Fence Barrier as per OPSD 219.110 and will be installed in accordance with Drawing C-900 in **Appendix G**. The barriers are typically made of layers of straw bales or geotextile fabric staked in place. All seepage barriers will be inspected and maintained as needed.

7.5 Surface Structure Filters

All catchbasins, and to a lesser degree manholes, convey surface water to sewers. However, until the surrounding surface has been completed these structures should be covered in some fashion to prevent sediment from entering the minor storm sewer system. Until landscaped areas are sodded or until parking lot is asphalted and curbed, all catchbasins and manholes will be constructed with a geotextile filter fabric located between the structure frame and cover. These

will stay in place and be maintained during construction and build until it is appropriate to remove same.

7.6 Stockpile Management

During construction of any development similar to that proposed by the Owner, both imported and native soils are stockpiled. Mitigative measures and proper management to prevent these materials entering the sewer systems or natural stream systems is needed.

During construction of the deeper municipal services, water, sewers and service connections, imported granular bedding materials are temporarily stockpiled on site. These materials are however quickly used up and generally before any catchbasins are installed.

Contamination of the environment as a result of stockpiling of imported construction materials is generally not a concern provided the previous noted seepage barriers are installed.

The parking lot granular materials are not stockpiled on site. They are immediately placed in the parking lot and have little opportunity of contamination. Lot grading sometimes generates stockpiles of native materials. However, this is only a temporary event since the materials are quickly moved off site.

8 SOILS AND ROADS

Kollaard Associates was retained to prepare a geotechnical investigation for the proposed mixed use development for the subdivision including the subject site. The objectives of the investigation were to prepare a report to:

- Determine the subsoil and groundwater conditions at the site by means of test pits and boreholes and;
- To provide geotechnical recommendations pertaining to design of the proposed development including construction considerations.

The geotechnical report was prepared by Kollaard Associates in August 2006 and an updated memo in 2013. Copies of the report and memo are included in **Appendix D**. The report contains recommendations which include but are not limited to the following:

- Material used to raise the approved subgrade to within 150mm of the underside of the concrete slab should consist of sand or OPSS Granular B Type I or Type II
- A 150mm base course of OPSS Granular A should be provided immediately beneath the floor slab
- All of the granular materials should be placed in maximum 250mm thick loose lifts and be compacted to at least 95% SPMDD

Local Pavement Structure:

LOCAL ROAD	THICKNESS
Asphaltic Concrete	80mm
OPSS Granular A Base	150mm
OPSS Granular B Type II Subbase	300mm

- Pipe bedding and cover; bedding to be minimum 150 mm OPSS Granular 'A' up to spring line of pipe. Cover to be 300 mm OPSS A or Granular B Type I. Both bedding and cover to be placed in maximum 200 mm lifts compacted to 95% SPMDD.

In general the grading plan for 115 Lusk Street adheres to geotechnical recommendations noted above. A copy of the grading plan C-200 is included in **Appendix D**.

Vehicular access to 115 Lusk Street is provided by two private entrances from Lusk Street and Forager Street. There are 54 parking spaces provided, including 3 accessible parking spaces.

9 CONCLUSIONS

Water, wastewater and stormwater systems required to develop 115 Lusk Street are designed in accordance with MOE and City of Ottawa's current level of service requirements.

The use of lot level control outlined in the report will result in effective treatment of surface stormwater runoff from the site. Adherence to the proposed sediment and erosion control plan during construction will minimize harmful impacts on surface water.

Final detail design will be subject to governmental approval prior to construction, including but not limited to the following:

- Site Plan Approval: City of Ottawa
- Water Data Card: City of Ottawa

Report Prepared By:

Demetrius Yannoulopoulos, P.Eng.
Director

Amy Zhuang,
Project Designer

J:\122508_115LuskSt\6.0_Technical\6.2_Civil_Eng_Muni_Transp\6.2.1_Brief\Submission # 2\CTR-Design Brief-2020-03-03.docx\

APPENDIX A

Draft Plan of Subdivision
Phoenix Homes Site Plan for 416 Lands Block
Watermain Demand Calculation Sheet
FUS Fireflow Calculation
Water Model Schematic and Results from O'Keefe Court – 416 Lands Design Brief
122508-001 - General Plan of Services

AREA SCHEDULE

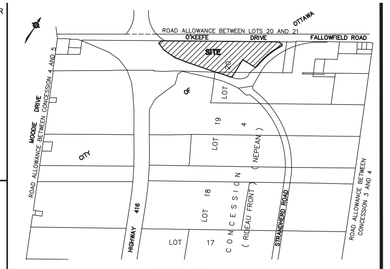
BLOCK	Area :S□m□
1	□952
2	4595
3	813□
4	8501
5	□28
6	□543
□	6202
8	8433
9	4048
10	4048
11	□899
12	4049
13	6591
14	4689
15	5090
16	4048
1□	6088
18	606
18	440
STREET No. 1	5351
STREET No. 2	1651
STREET No. 3	3168
TOTAL □	10.986 Ha

SUB□ECT TO THE CONDITIONS, IF ANY, SET FORTH IN OUR LETTER DATED

_____.

THIS DRAFT PLAN IS APPROVED BY THE CITY OF OTTAWA UNDER SECTION 51 OF THE PLANNING ACT.
THIS ____ DAY OF _____.

_____
DERRICK MOODIE, MANAGER
DEVELOPMENT REVIEW, SUBURBAN SERVICES
PLANNING AND GROWTH MANAGEMENT DEPARTMENT
PLANNING AND INFRASTRUCTURE PORTFOLIO
CITY OF OTTAWA



KEY MAP
NOT TO SCALE

DRAFT PLAN OF SUBDIVISION OF

PART OF LOT 20
CONCESSION 4 (Rideau Front)

Geographic Township of Nepean

CITY OF OTTAWA

Prepared by Annis, O'Sullivan, Vollebekk Ltd.
□anuary 16, 2013.
Revised February 2□, 2013
Revised March 14, 2013
Revised □une 23, 2014
Revised □uly □, 2014
Revised April 24, 2015
Revised December 1, 2015
Revised December 18, 2015
Revised □anuary 12, 201□

Scale 1 : 1250

50 3□5 25 12.5 0 25 50 Metres

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

SURVEYOR'S CERTIFICATE

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

Date _____ EDWARD M. LANCASTER
ONTARIO LAND SURVEYOR

OWNER'S CERTIFICATE

This is to certify that I am the owner □agent of the lands to be subdivided and that this plan was prepared in accordance with my instructions.

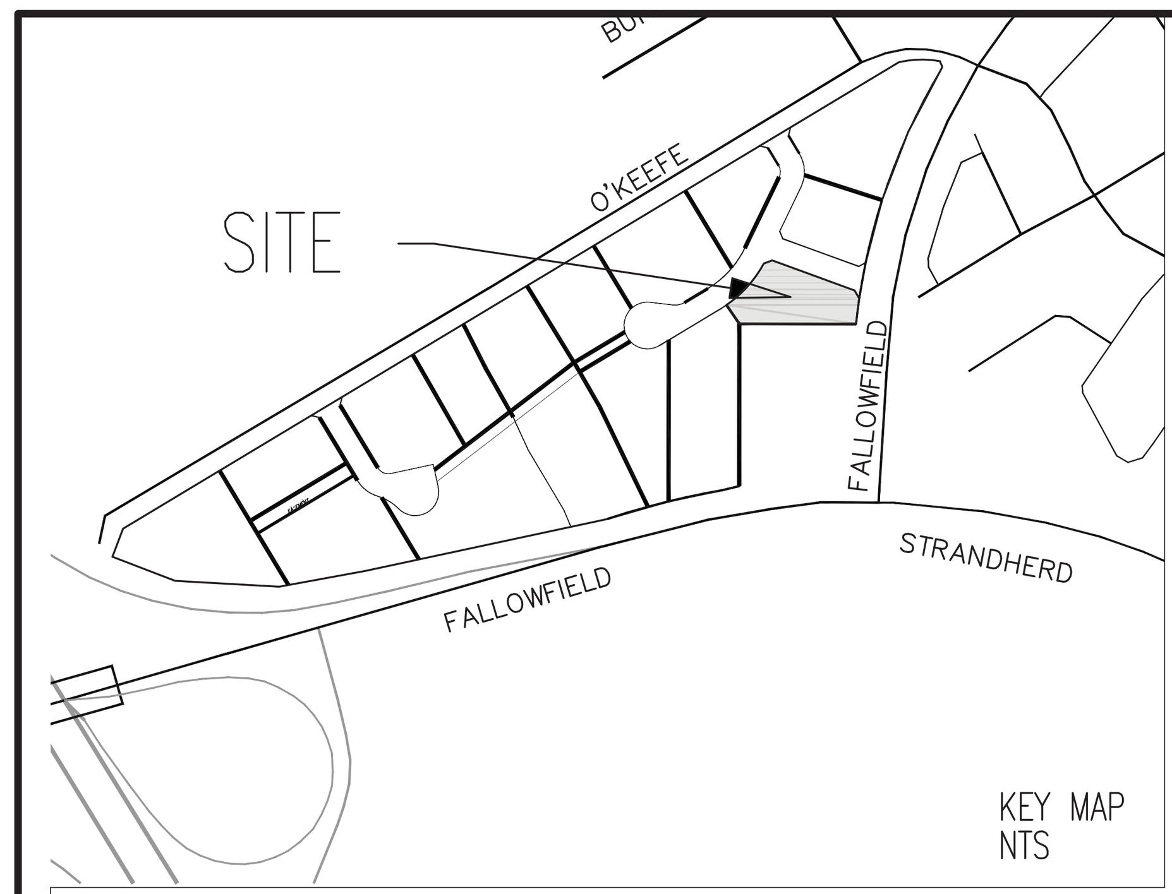
Date _____ Michael Boucher □Manager of Planning □
Phoenix Properties Inc.
I have the authority to bind the corporation

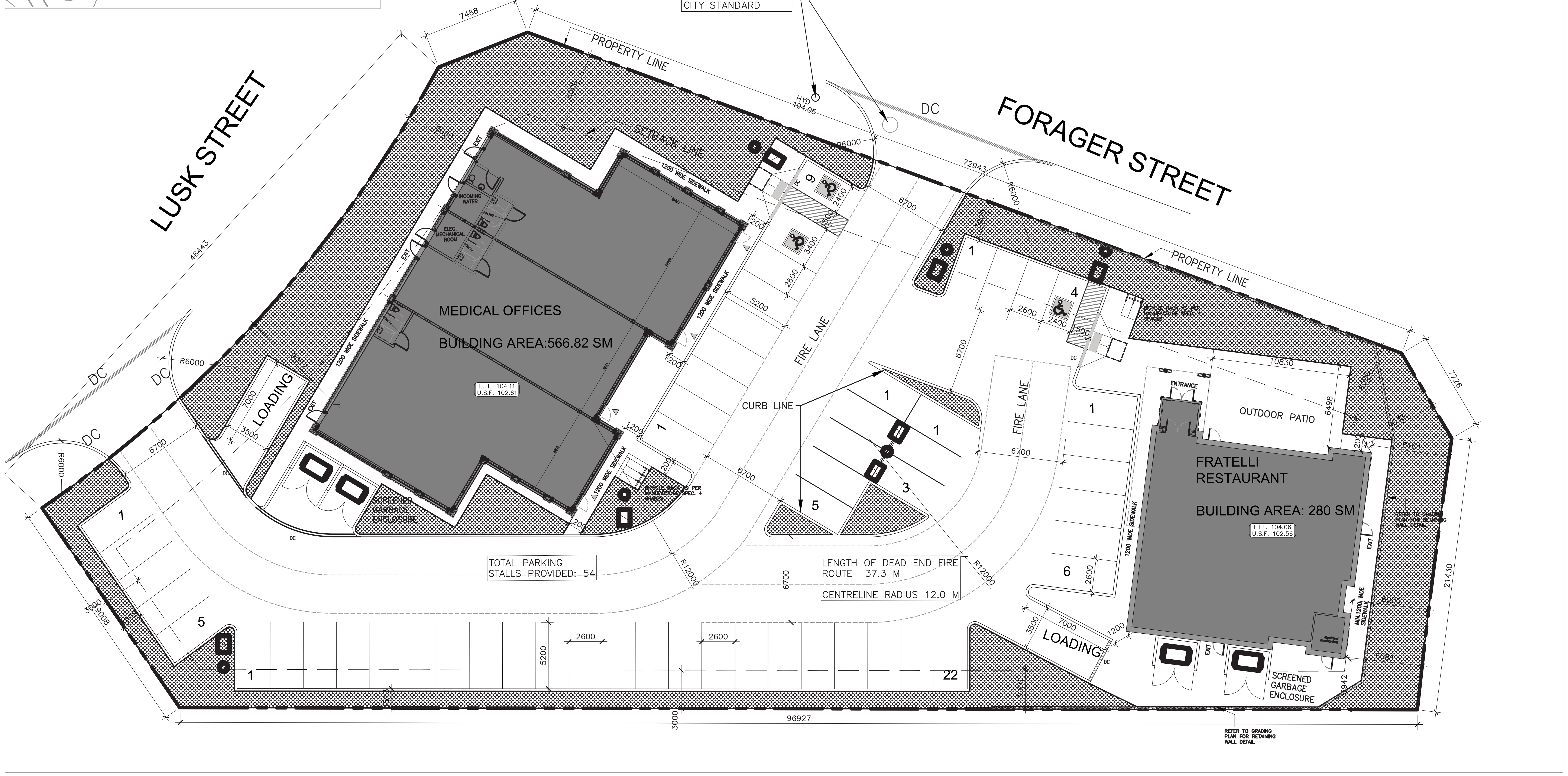
ADDITIONAL INFORMATION RE□UIRED UNDER SECTION 51□1□ OF THE PLANNING ACT

□a□ see plan
□b□ see plan
□c□ see plan
□d□ employment area □business park □and storm water management
□e□ see plan
□f□ see plan
□g□ see plan
□h□ City of Ottawa
□i□ see soils report
□□ see plan
□k□ sanitary, storm sewers, municipal water, bell, hydro, cable and gas to be available
□l□ see plan

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

Job No. 14992-14 Phoenix Pl L1 20 C4 RF NP DPS F3 D2 S





1 SITE PLAN
SP1 SCALE: 1:200

PLAN OF SUBDIVISION OF

PART OF LOT 20
CONCESSION 4 (Rideau Front)
Geographic Township of Nepean
CITY OF OTTAWA
Surveyed by Annis , O'Sullivan , Vollebekk Ltd.

UTILITY NOTES

1. This drawing cannot be accepted as acknowledging all of the utilities and it will be the responsibility of the user to contact the respective utility authorities for confirmation.
2. A field location of underground plant by the pertinent utility authority is mandatory before any work involving breaking ground, probing, excavating etc.
3. Underground utilities shown on this plan are derived from City of Ottawa Department of Public Works and Services utility drawings.

GENERAL NOTES

1. Refer to Landscape drawings for information on trees to be retained.
2. Refer to Civil drawings for existing services and new service connections, and new grading and drainage information.

ZONING INFORMATION

ZONE DESIGNATION

IP [2265] H(16)

ZONING REQUIREMENTS:

NOTE: ZONING REQUIREMENTS PROVIDED IN ACCORDANCE WITH CITY OF OTTAWA BY-LAW IP[2265] H(16) CONSOLIDATION DATE: SEPTEMBER 26, 2018

MIN. LOT WIDTH REQUIRED:	NO MIN.
MIN. LOT AREA REQUIRED (M^2):	$750M^2$
LOT AREA PROVIDED:	$4047.9M^2$
MAX. BUILDING HEIGHT:	16.0M
BUILDING HEIGHT: FROM AVERAGE GRADE	±12.2M
MIN. FRONT YARD SETBACK:	6.0M
FRONT YARD SETBACK	6.00
MIN. REAR YARD SETBACK:	6.0M
REAR YARD SETBACK:	6.0M
MAX. INTERIOR SIDE YARD SETBACK: (ON THE SOUTH SIDE OF PROPERTY)	3.0M
INTERIOR SIDE YARD SETBACK:	3.0M
MIN. CORNER YARD SETBACK: (ON THE NORTH SIDE OF PROPERTY)	6.0M
BUILDING CORNER YARD SETBACK:	6.0M

PARKING REQUIREMENTS

NOTE: PARKING SPACE RATES PROVIDED IN ACCORDANCE WITH CITY OF OTTAWA BY-LAW 2008-250 SECTIONS 101 - 102, TABLES 101 - 102 & 106

MIN. PARKING STALLS REQUIRED FOR MEDICAL OFFICES PER $100M^2$ GFA	4.0
MIN. PARKING STALLS REQUIRED FOR RESTAURANT PER $100M^2$ GFA	10.0
MINIMUM BICYCLE PARKING PER $250M^2$ GFA	1.0

DEVELOPMENT INFORMATION

PROPOSED:

LOT AREA: $4047.9M^2$

BUILDING AREA		
RESTAURANT :	$3.014FT^2$	$280.00M^2$
MEDICAL OFFICES :	$6,101FT^2$	$566.82M^2$
TOTAL BUILDING AREA:	$9,115FT^2$	$846.82M^2$
GROSS FLOOR AREA		
RESTAURANT (GROUND + MEZZANINE):	$2,626FT^2$	$244.00M^2$
MEDICAL OFFICES :	$5,382FT^2$	$500.00M^2$
TOTAL G.F.A. (PROPOSED):	$8,008FT^2$	$744.00M^2$

LOT COVERAGE PROVIDED:
PHARMACY+CLINIC+OFFICES: $846.82M^2$: 20.9%

LANDSCAPED AREA PROVIDED:
PROPOSED LANDSCAPED AREA: $838.40M^2$ 20.7%

PROPOSED PARKING:

PARKING SPACE DIMENSIONS: 2.6 M X 5.2 M
ACCESSIBLE PARKING SPACE: TYPE A: 3.4 M X 5.2 M, TYPE B: 2.4 M X 5.2 M
LOADING BAY DIMENSIONS (PER 113B)
WIDTH: 3.5 M
LENGTH: 7 M

REQUIRED PARKING RESTAURANT: (10 STALLS PER $100M^2$ G.F.A.) $244M^2$	25 STALLS
REQUIRED PARKING MEDICAL OFFICES: (4 STALLS PER $100M^2$ G.F.A.) $500M^2$	20 STALLS
TOTAL OF REQUIRED PARKING:	45 STALLS
TOTAL ACCESSIBLE PARKING REQUIRED:	3 STALLS

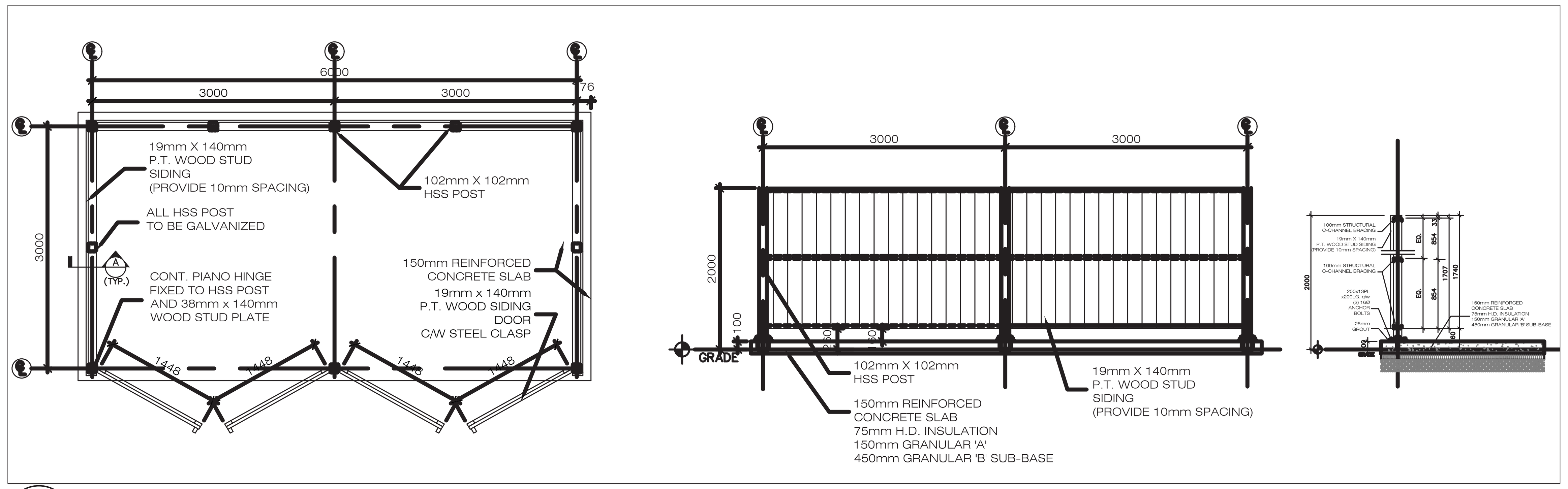
FOUR PERCENT (4%) OF THE TOTAL NUMBER OF PARKING SPACES TO BE ACCESSIBLE

TOTAL ACCESSIBLE PARKING PROVIDED:
TYPE A (3400 MM WIDE): 1 STALLS
TYPE B (2400 MM WIDE): 2 STALLS
3 STALLS

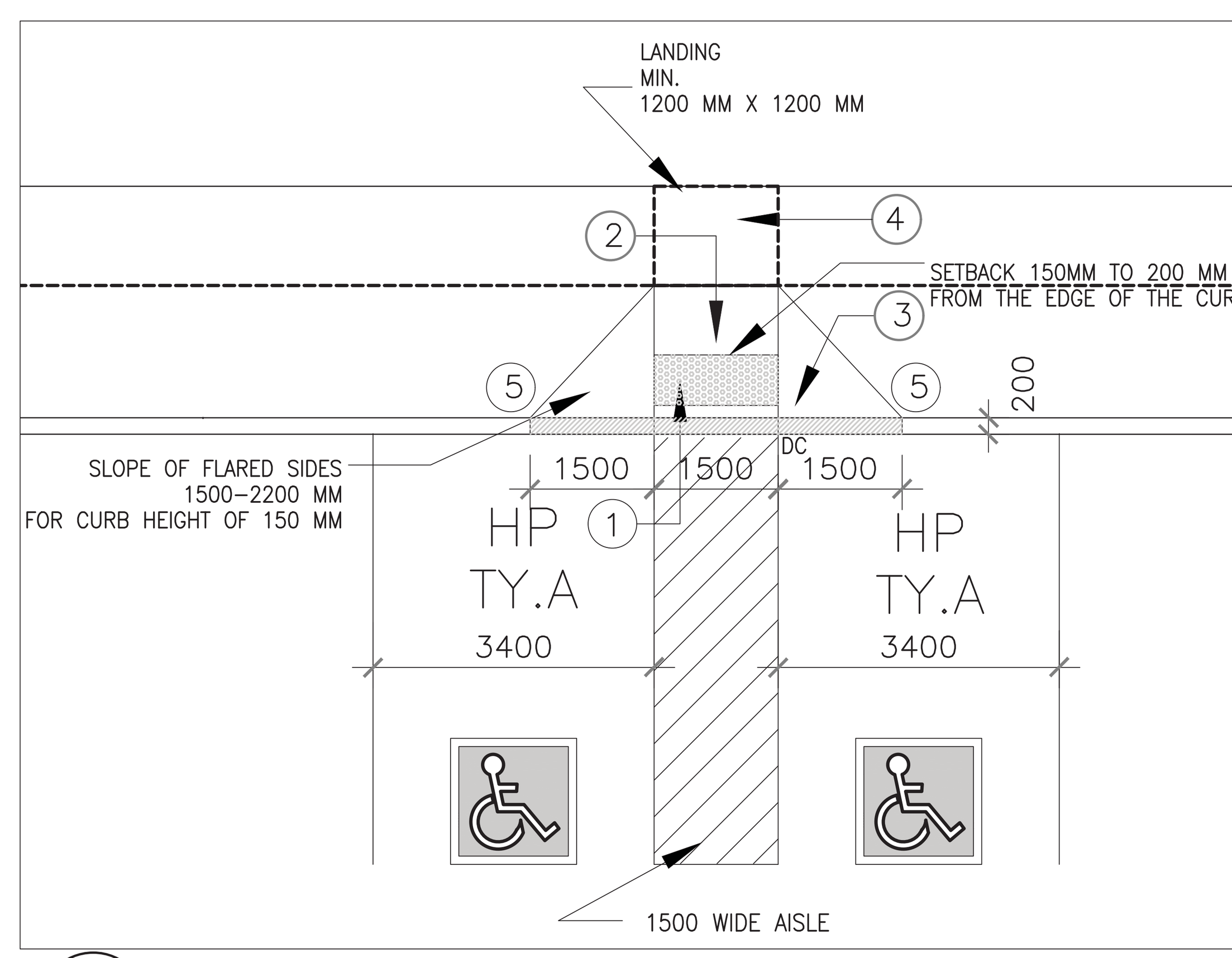
TOTAL ON GRADE PARKING PROVIDED: 54 STALLS

BICYCLE PARKING REQUIRED:

RESTAURANT: (1 SPACE PER $250M^2$ G.F.A.) $244M^2$	1 SPACES
MEDICAL OFFICES: (1 SPACE PER $250M^2$ G.F.A.) $500M^2$	2 SPACES
TOTAL OF REQUIRED BICYCLE PARKING:	3 SPACES
TOTAL BICYCLE PARKING PROVIDED:	5 SPACES



2 GARBAGE ENCLOSURE DETAIL
SP1 SCALE: 1:50



1. Tactile Walking Surface Indicator
   610 mm (min.) extending the full width of the curb ramp
   Set back 150 mm to200 mm from the edge of the curb
2. Running Slope of Curb Ramp 1:12 (8.33%) (max.) for new
3. Slope of Flared Sides 1:15 to 1:10 (6.67 – 10%)
4. Landing 1200 mm by 1200 (min.)
5. Vertical Signage

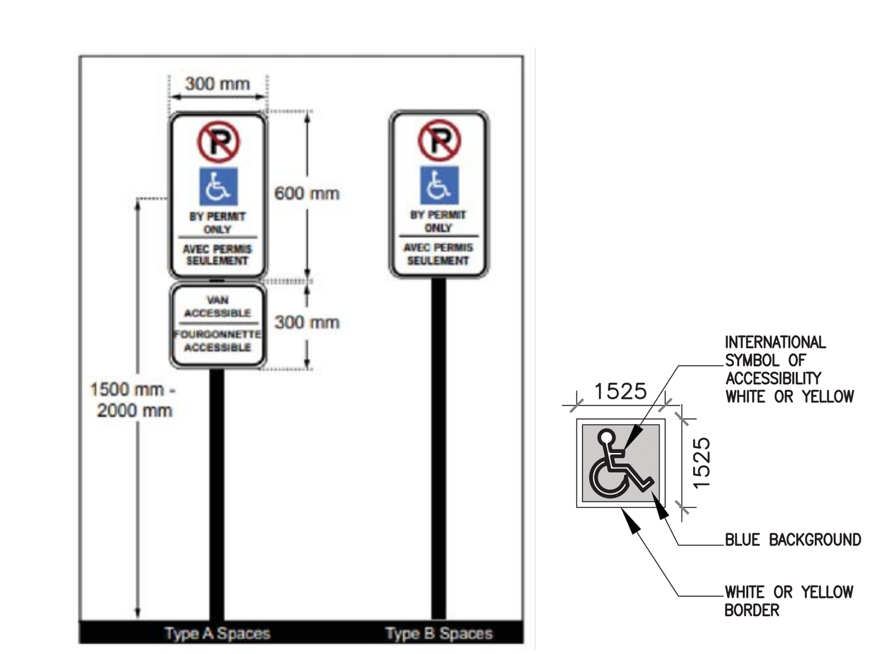


FIG. Vertical Signage

Pavement Marking

3 ACCESSIBLE PARKING CURB DETAIL
SP1 SCALE: 1:50

APPROVED ☐ REFUSED ☐

DATE:______ ______________________

REVISIONS

No.	DESCRIPTION	DATE	CHD
2	ISSUED FOR SITE PLAN APPROVAL	20/01/13	VPC
1	ISSUED FOR REVIEW	19/12/18	VPC
		YY/MM/DD	

CONTRACTOR SHALL CHECK AND VERIFY ALL DIMENSIONS AND REPORT ANY OMMISSIONS OR DISCREPANCIES TO THE ARCHITECT BEFORE PROCEEDING WITH THE WORK.

DO NOT SCALE THE DRAWINGS

N

THIS DRAWING SHALL NOT BE USED FOR CONSTRUCTION PURPOSES UNTIL SIGNED BY THE ARCHITECT.

DATE

DRAWN RM

DATE 2019-12-12

CHECKED

DATE PRINTED –

VINCENT P. COLIZZA ARCHITECT INCORPORATED

MEDICAL OFFICE & RESTAURANT
115 LUSK ST., OTTAWA, ONT.

DWG. TITLE
SITE PLAN

SCALE 1:200

DWG. NO. SP1

PROJ. NO. 2319

Drawing name: J:\22508_115LuskSt\7.0_Production\7.1_Sent-Received\Received\Vincent Colizza (Architect)\2020-01-13\115 Lusk Street-Site Plan- 2020-01-13\1. Design Development\115 Lusk Street-Site Plan- 2020-01-13.dwg Mar 06, 2020 - 11:48am

IBI GROUP
333 PRESTON STREET
OTTAWA, ONTARIO
K1S 5N4

WATERMAIN DEMAND CALCULATION SHEET

PROJECT : 115 Lusk St.
CLIENT : DCR Phoenix

FILE: 122508
DATE PRINTED: 04-Mar-20
DESIGN: W.Z.
PAGE: 1 OF 1

NODE	RESIDENTIAL				NON-RESIDENTIAL (ICI)			AVERAGE DAILY DEMAND (l/s)			MAXIMUM DAILY DEMAND (l/s)			MAXIMUM HOURLY DEMAND (l/s)			FIRE DEMAND (l/min)
	SINGLE FAMILY UNITS	TOWN HOUSE UNITS	MEDIUM DENSITY (ha)	POPULATION	INDUST. (ha)	COMM. (ha)	INSTIT. (ha)	RESIDENTIAL	ICI	TOTAL	RESIDENTIAL	ICI	TOTAL	RESIDENTIAL	ICI	TOTAL	
Site						0.4040			0.23	0.23		0.35	0.35		0.42	0.42	7,000

POPULATION DENSITY

Single Family	3.4 persons/unit
Semi Detached & Townhouse	2.7 persons/unit
Medium Density	1.8 persons/unit

WATER DEMAND RATES

Residential	350 l/cap/day
Shopping Center	2,500 L/(1000m2)/day
Commerical	50,000 L/ha/day

PEAKING FACTORS

Maximum Daily	
Residential	2.5 x avg. day
Commercial	1.5 x avg. day
Maximum Hourly	
Residential	2.2 x avg. day
Commercial	1.8 x avg. day

Fire Flow Requirement from Fire Underwriters Survey - 115 Lusk Street

Building

Floor Area of Medical Office	574	m^2
Storeys	1	
Total Floor Area	574	m^2

$F = 220C\sqrt{A}$

C	1.0		C =	1.5 wood frame
A	574	m^2		1.0 ordinary
				0.8 non-combustible
F	5,270	l/min		0.6 fire-resistive
use	5,000	l/min		

Occupancy Adjustment

		-25%	non-combustible
		-15%	limited combustible
Use	0%	0%	combustible
		+15%	free burning
Adjustment	0 l/min	+25%	rapid burning
Fire flow	5,000 l/min		

Sprinkler Adjustment

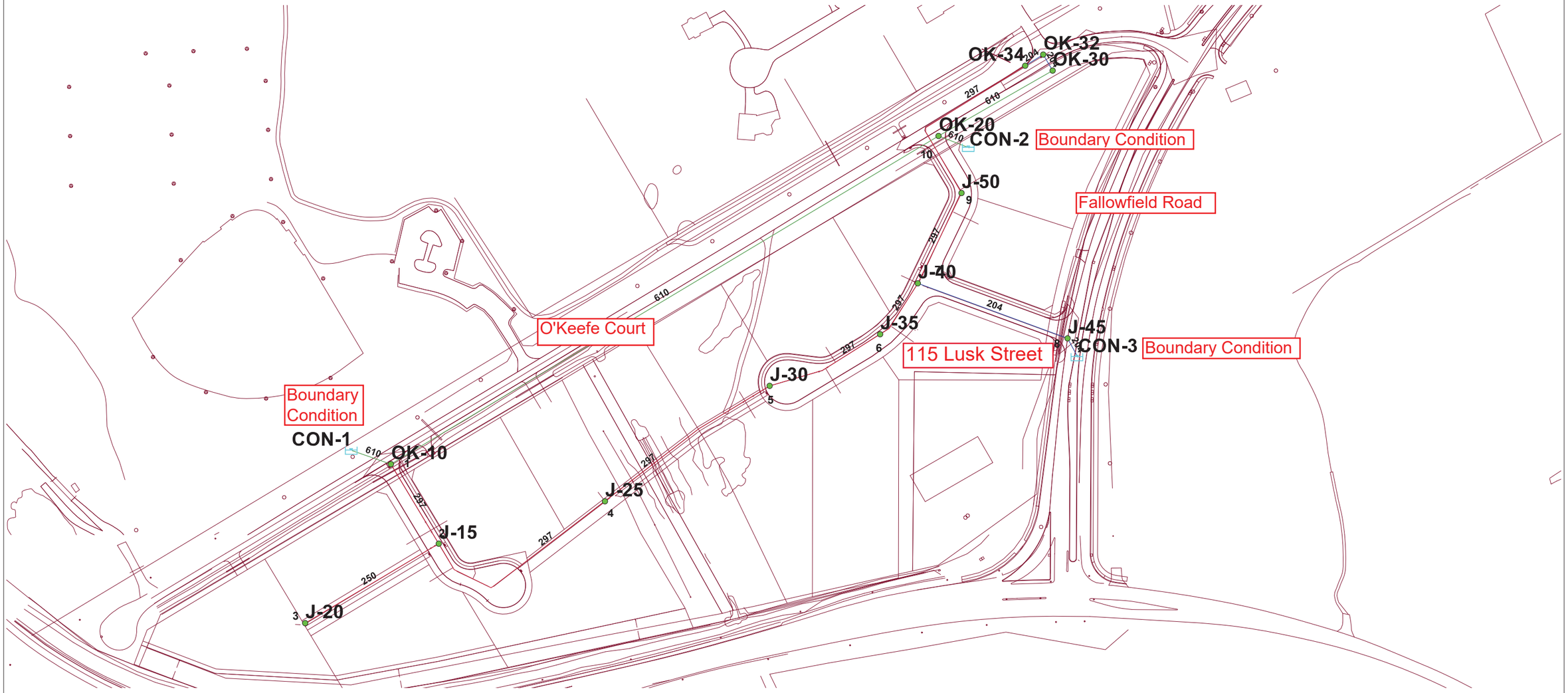
		-30%	system conforming to NFPA 13
		-50%	complete automatic system
Use	0%		
Adjustment	0 l/min		

Exposure Adjustment

Building Face	Separation (m)	Adjacent Exposed Wall			Exposure Charge *
		Length	Stories	L*H Factor	
north	29.0	20.8	1	21	8%
east	35.8	16.3	1	16	5%
south	18.0	20.8	1	21	12%
west	30.2	31.0	1	31	5%
Total					30%

Adjustment	1,500	l/min
Total adjustments	1,500	l/min
Fire flow	6,500	l/min
Use	**7,000**	**l/min**
	117	**l/s**

O'Keefe Court - 416 Lands - Pipe Sizes and Node ID's



Date: Thursday, September 28, 2017

417 Lands (O'Keefe Court) Boundary Conditions

Information Provided:
Date provided: April 2017

Scenario	Demand	
	L/min	L/s
Average Daily Demand	266.4	4.44
Maximum Daily Demand	399.6	6.66
Peak Hour	718.8	11.98
Fire Flow Demand	15000	250

Location:

Results:

Connection 1 - O'Keefe Court (near HWY 416)

Demand Scenario	Head (m)	Pressure[1] (psi)
Maximum HGL	154.0	68.2
Peak Hour	150.2	62.9
Max Day plus Fire (15,000 l/min)	148.5	60.5

[1] Ground Elevation = 106.0 m

Connection 2 - O'Keefe Court (near Fallowfield)

Demand Scenario	Head (m)	Pressure[1] (psi)
Maximum HGL	154.4	73.3
Peak Hour	149.9	66.8
Max Day plus Fire (15,000 l/min)	146.5	62.1

[1] Ground Elevation = 102.8 m

Connection 3 - Fallowfield Road

Demand Scenario	Head (m)	Pressure[1] (psi)
Maximum HGL	154.5	75.0
Peak Hour	149.8	68.4
Max Day plus Fire (15,000 l/min)	146.0	63.0

[1] Ground Elevation = 101.7 m

Notes:

1) Service connections off the 610 mm backbone watermain should be avoided (refer Section 4.6.5 of the Ottawa Water Design Guidelines).
2) Connection locations to the backbone 610 mm watermain on O'Keefe Court should be discussed with Environmental Services.

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.

Basic Day (Max HGL) - Junction Report

		ID	Demand (L/s)	Elevation (m)	Head (m)	Pressure (kPa)
1		J-15	1.09	104.71	154.04	483.37
2		J-20	0.46	105.05	154.04	480.04
3		J-25	0.23	103.50	154.13	496.15
4		J-30	0.63	103.60	154.22	496.05
5		J-35	0.87	103.72	154.28	495.44
6		J-40	0.47	104.00	154.31	493.00
7		J-45	0.00	101.08	154.48	523.25
8		J-50	0.69	104.03	154.32	492.85
9		OK-10	0.00	103.05	154.00	499.28
10		OK-20	0.00	104.03	154.40	493.58
11		OK-30	0.00	103.80	154.40	495.82
12		OK-32	0.00	103.80	154.38	495.62
13		OK-34	0.00	103.80	154.35	495.39

Peak Hour - Junction Report

		ID	Demand (L/s)	Elevation (m)	Head (m)	Pressure (kPa)
1		J-15	2.94	104.71	150.08	444.61
2		J-20	1.25	105.05	150.08	441.27
3		J-25	0.63	103.50	149.86	454.25
4		J-30	1.70	103.60	149.65	451.24
5		J-35	2.34	103.72	149.53	448.92
6		J-40	1.27	104.00	149.48	445.64
7		J-45	0.00	101.08	146.41	444.21
8		J-50	1.86	104.03	149.54	445.99
9		OK-10	0.00	103.05	150.20	462.02
10		OK-20	0.00	104.03	149.90	449.49
11		OK-30	0.00	103.80	149.90	451.72
12		OK-32	0.00	103.80	149.80	450.75
13		OK-34	0.00	103.80	149.68	449.63

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		J-15	251.63	J-20	401.63	145.70	1,164.24	1,171.67	J-20	136.64	118.65	1,164.24	1,164.24
2		J-20	250.69	J-20	280.31	133.66	367.49	367.49	J-20	139.96	119.33	367.49	367.49
3		J-25	250.35	J-25	397.16	144.03	803.24	803.17	J-25	139.97	117.78	803.18	803.18
4		J-30	250.95	J-30	390.48	143.45	761.00	760.98	J-30	139.97	117.88	760.99	760.99
5		J-35	251.30	J-35	391.16	143.64	799.07	799.08	J-35	139.97	118.00	799.09	799.07
6		J-40	250.70	J-40	391.12	143.91	843.48	843.49	J-40	139.97	118.28	843.51	843.48
7		J-50	251.03	J-50	386.81	143.50	794.67	794.69	J-50	139.97	118.31	794.70	794.67

Servicing study guidelines for development applications

4. Development Servicing Study Checklist

The following section describes the checklist of the required content of servicing studies. It is expected that the proponent will address each one of the following items for the study to be deemed complete and ready for review by City of Ottawa Infrastructure Approvals staff.

The level of required detail in the Servicing Study will increase depending on the type of application. For example, for Official Plan amendments and re-zoning applications, the main issues will be to determine the capacity requirements for the proposed change in land use and confirm this against the existing capacity constraint, and to define the solutions, phasing of works and the financing of works to address the capacity constraint. For subdivisions and site plans, the above will be required with additional detailed information supporting the servicing within the development boundary.

4.1 General Content

- ☐ Executive Summary (for larger reports only).
- ☒ Date and revision number of the report.
- ☒ Location map and plan showing municipal address, boundary, and layout of proposed development.
- ☒ Plan showing the site and location of all existing services.
- ☐ 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.
- ☐ Summary of Pre-consultation Meetings with City and other approval agencies.
- ☐ 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.
- ☒ Statement of objectives and servicing criteria.
- ☒ Identification of existing and proposed infrastructure available in the immediate area.
- ☒ 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).
- ☒ 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.
- ☐ 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.
- ☐ Proposed phasing of the development, if applicable.

☒ Reference to geotechnical studies and recommendations concerning servicing.

☒ 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

4.2 Development Servicing Report: Water

☐ Confirm consistency with Master Servicing Study, if available
☒ Availability of public infrastructure to service proposed development
☒ Identification of system constraints
☒ Identify boundary conditions
☒ Confirmation of adequate domestic supply and pressure
☒ 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.
☒ 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.
☐ Definition of phasing constraints. Hydraulic modeling is required to confirm servicing for all defined phases of the project including the ultimate design
☒ Address reliability requirements such as appropriate location of shut-off valves
☐ Check on the necessity of a pressure zone boundary modification.
☒ 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

- ☒ 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.
- ☐ 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.
- ☒ Confirmation that water demands are calculated based on the City of Ottawa Design Guidelines.
- ☒ Provision of a model schematic showing the boundary conditions locations, streets, parcels, and building locations for reference.

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).
- ☒ Confirm consistency with Master Servicing Study and/or justifications for deviations.
- ☐ 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.
- ☒ Description of existing sanitary sewer available for discharge of wastewater from proposed development.
- ☒ 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)
- ☐ Calculations related to dry-weather and wet-weather flow rates from the development in standard MOE sanitary sewer design table (Appendix ‘C’) format.
- ☒ Description of proposed sewer network including sewers, pumping stations, and forcemains.
- ☐ 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).
- ☐ Pumping stations: impacts of proposed development on existing pumping stations or requirements for new pumping station to service development.
- ☐ Forcemain capacity in terms of operational redundancy, surge pressure and maximum flow velocity.
- ☐ Identification and implementation of the emergency overflow from sanitary pumping stations in relation to the hydraulic grade line to protect against basement flooding.
- ☒ Special considerations such as contamination, corrosive environment etc.

4.4 Development Servicing Report: Stormwater Checklist

- ☒ Description of drainage outlets and downstream constraints including legality of outlets (i.e. municipal drain, right-of-way, watercourse, or private property)
- ☒ Analysis of available capacity in existing public infrastructure.
- ☒ A drawing showing the subject lands, its surroundings, the receiving watercourse, existing drainage patterns, and proposed drainage pattern.
- ☒ 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.
- ☒ Water Quality control objective (basic, normal or enhanced level of protection based on the sensitivities of the receiving watercourse) and storage requirements.
- ☒ Description of the stormwater management concept with facility locations and descriptions with references and supporting information.
- ☐ Set-back from private sewage disposal systems.
- ☐ Watercourse and hazard lands setbacks.
- ☐ Record of pre-consultation with the Ontario Ministry of Environment and the Conservation Authority that has jurisdiction on the affected watershed.
- ☐ Confirm consistency with sub-watershed and Master Servicing Study, if applicable study exists.
- ☒ Storage requirements (complete with calculations) and conveyance capacity for minor events (1:5 year return period) and major events (1:100 year return period).
- ☐ Identification of watercourses within the proposed development and how watercourses will be protected, or, if necessary, altered by the proposed development with applicable approvals.
- ☒ 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.
- ☐ Any proposed diversion of drainage catchment areas from one outlet to another.
- ☒ Proposed minor and major systems including locations and sizes of stormwater trunk sewers, and stormwater management facilities.
- ☒ 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.
- ☐ Identification of potential impacts to receiving watercourses
- ☐ Identification of municipal drains and related approval requirements.
- ☒ Descriptions of how the conveyance and storage capacity will be achieved for the development.
- ☒ 100 year flood levels and major flow routing to protect proposed development from flooding for establishing minimum building elevations (MBE) and overall grading.

- ☐ Inclusion of hydraulic analysis including hydraulic grade line elevations.
- ☒ Description of approach to erosion and sediment control during construction for the protection of receiving watercourse or drainage corridors.
- ☐ 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.
- ☒ Identification of fill constraints related to floodplain and geotechnical investigation.

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.
- ☐ Application for Certificate of Approval (CofA) under the Ontario Water Resources Act.
- ☐ Changes to Municipal Drains.
- ☐ Other permits (National Capital Commission, Parks Canada, Public Works and Government Services Canada, Ministry of Transportation etc.)

4.6 Conclusion Checklist

- ☒ Clearly stated conclusions and recommendations
- ☒ 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.
- ☒ All draft and final reports shall be signed and stamped by a professional Engineer registered in Ontario

SAN STRUCTURE TABLE

NAME	RIM ELEV.	INVERT IN	INVERT IN AS–BUILT	INVERT OUT	INVERT OUT AS–BUILT	DESCRIPTION
EXMH09A	101.41	SE99.848 S99.858		NW99.828		1200ø OPSD 701.010
MH1A	103.34	E101.753		W101.623		1200ø OPSD 701.010
MH2A	103.49	E101.029		N99.924		1200ø OPSD 701.010

CROSSING SCHEDULE

1. 200 mm ø W/M 1.000 m CLEARANCE OVER 200 mm ø SAN
2. 200 mm ø W/M 0.250 m CLEARANCE OVER 375 mm ø STM
3. 375 mm ø STM 0.974 m CLEARANCE OVER 250 mm ø SAN
4. 200 mm ø W/M 0.250 m CLEARANCE OVER 200 mm ø SAN
5. 200 mm ø STM 0.521 m CLEARANCE OVER 200 mm ø SAN
6. 300 mm ø STM 0.260 m CLEARANCE OVER 200 mm ø STM
7. 250 mm ø STM 0.255 m CLEARANCE OVER 200 mm ø SAN

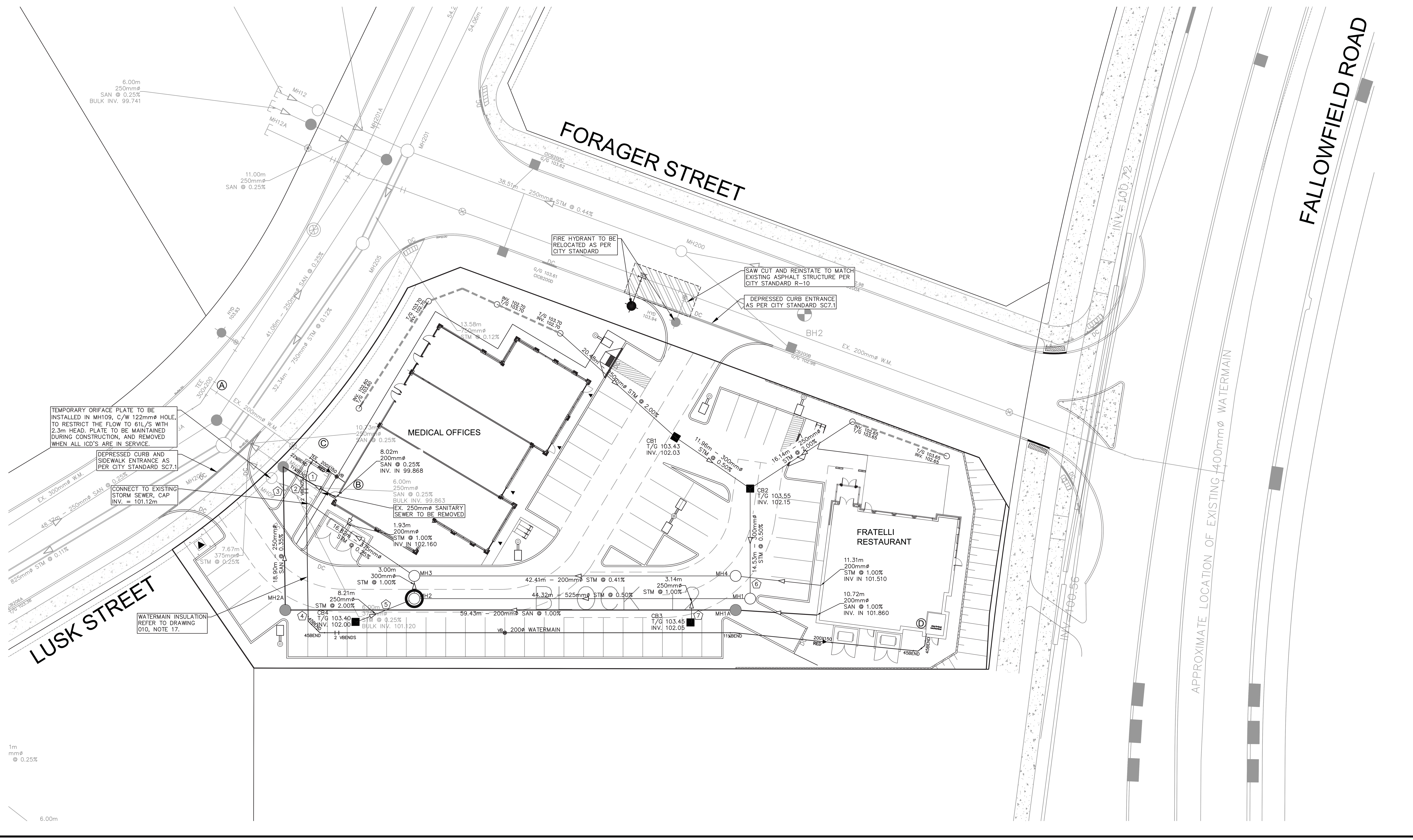
REVISED 2020-01-16

WATERAIN SCHEDULE

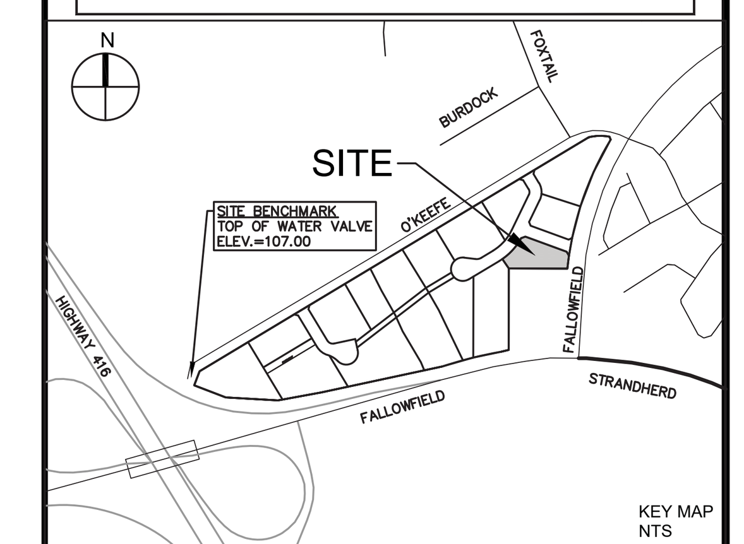
	Station	Description	Finished Grade	Top of Waterain	As Built Waterain
A	0+000.00	EXISTING 300X200TEE	103.68	101.28	
	0+013.30	EXISTING V&VB	103.83	101.43	
C	0+016.55	TEE	103.81	101.41	
	0+019.30	RED 200X150	103.89	101.49	
	0+020.35	VB	103.90	101.50	
B	0+021.64	BUILDING SERVICE	103.89	101.49	
C	0+000.00	TEE	103.81	101.41	
	0+001.11	22.5 BEND	103.67	101.27	
	0+002.36	11.25 BEND	103.67	101.27	
	0+004.07	V BEND	103.67	101.27	
	0+00457	V BEND	103.69	101.96	
	0+021.51	45 BEND	103.46	101.73	
	0+023.67	45 BEND	103.48	101.74	
	0+025.67	V BEND	103.47	101.72	
	0+026.17	V BEND	103.47	101.07	
	0+048.08	VB	103.57	101.17	
	0+078.45	11.25 BEND	103.78	101.38	
	0+090.59	RED 200X150	103.83	101.43	
	0+102.73	45 BEND	104.00	101.60	
	0+103.88	45 BEND	104.02	101.62	
D	0+105.44	BUILDING SERVICE	104.05	101.65	

STM STRUCTURE TABLE

NAME	RIM ELEV.	INVERT IN	INVERT IN AS–BUILT	INVERT OUT	INVERT OUT AS–BUILT	DESCRIPTION
EXMH09	102.79	SE101.105		NW101.085		1200ø OPSD 701.010
MH1	103.70	N101.877		W101.677		1200ø OPSD 701.010
MH2	103.51	E101.455 W101.816		N101.395		1200ø OPSD 701.010
MH3	103.61	E101.192 S101.365		NW101.162		1200ø OPSD 701.010
MH4	103.70	E101.397		W101.367		1200ø OPSD 701.010



SEE 010 FOR NOTES, LEGEND, CB TABLE AND DETAILS



No.	REVISIONS	By	Date
14			
13			
12			
11			
10			
9			
8			
7			
6			
5			
4			
3			
2			
1	ISSUED FOR SPA	DGY	2020:03:06

DCR/PHOENIX GROUP OF COMPANIES
18A BENTLEY AVE, OTTAWA ONT K2E 6T8

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

Project Title
115 LUSK STREET

LICENSED PROFESSIONAL ENGINEER D. G. Yannoulopoulos 2020/03/06 PROVINCE OF ONTARIO

Drawing Title
SERVICING PLAN

Scale 1:250

Design	Date
WZ/RM	NOVEMBER 2019
Drawn	**Checked**
EH	DGY
Project No.	**Drawing No.**
122508	001

CITY PLAN No.####

CITY FILE No. ####

APPENDIX B

Sanitary Sewer Design Sheet
122508-400 - Sanitary Drainage Plan
416 Lands Sanitary Design Sheet
416 Lands Sanitary Drainage Area Plan

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

SANITARY SEWER DESIGN SHEET

115 Lusk Street
City of Ottawa
DCR Phoenix

LOCATION				RESIDENTIAL										ICI AREAS								INFILTRATION ALLOWANCE			FIXED FLOW (L/s)		TOTAL FLOW	PROPOSED SEWER DESIGN						
				AREA w/ Units (Ha)	UNIT TYPES				AREA w/o Units (Ha)	POPULATION		RES PEAK FACTOR	PEAK FLOW (L/s)	AREA (Ha)						ICI PEAK FACTOR	PEAK FLOW (L/s)	AREA (Ha)		FLOW				CAPACITY	LENGTH	DIA	SLOPE	VELOCITY (full)	AVAILABLE CAPACITY	
STREET	AREA ID	FROM MH	TO MH		SF	SD	TH	APT		IND	CUM			INSTITUTIONAL		COMMERCIAL		INDUSTRIAL				IND	CUM	(L/s)	IND	CUM	(L/s)	(L/s)	(m)	(mm)	(%)	(m/s)	L/s	(%)
														IND	CUM	IND	CUM	IND	CUM															
Parking Lot		MH1A	MH2A	0.000					0.000	0.0	0.0	3.80	0.00	0.00	0.00	0.106	0.106	0.00	0.00	1.50	0.05	0.106	0.106	0.03	0.00	0.00	0.09	34.22	59.43	200	1.00	1.055	34.13	99.75%
Parking Lot		MH2A	EX. MH109A	0.000					0.000	0.0	0.0	3.80	0.00	0.00	0.00	0.174	0.280	0.00	0.00	1.50	0.14	0.174	0.280	0.09	0.00	0.00	0.23	36.70	18.90	250	0.35	0.724	36.47	99.38%
Lusk Street		EX. MH109A	EX. MH2016A	0.000					0.000	0.0	0.0	3.80	0.00	0.00	0.00	0.124	0.404	0.00	0.00	1.50	0.20	0.124	0.404	0.13	0.00	0.00	0.33	31.02	10.73	250	0.25	0.612	30.69	98.94%
																														250				

Design Parameters:

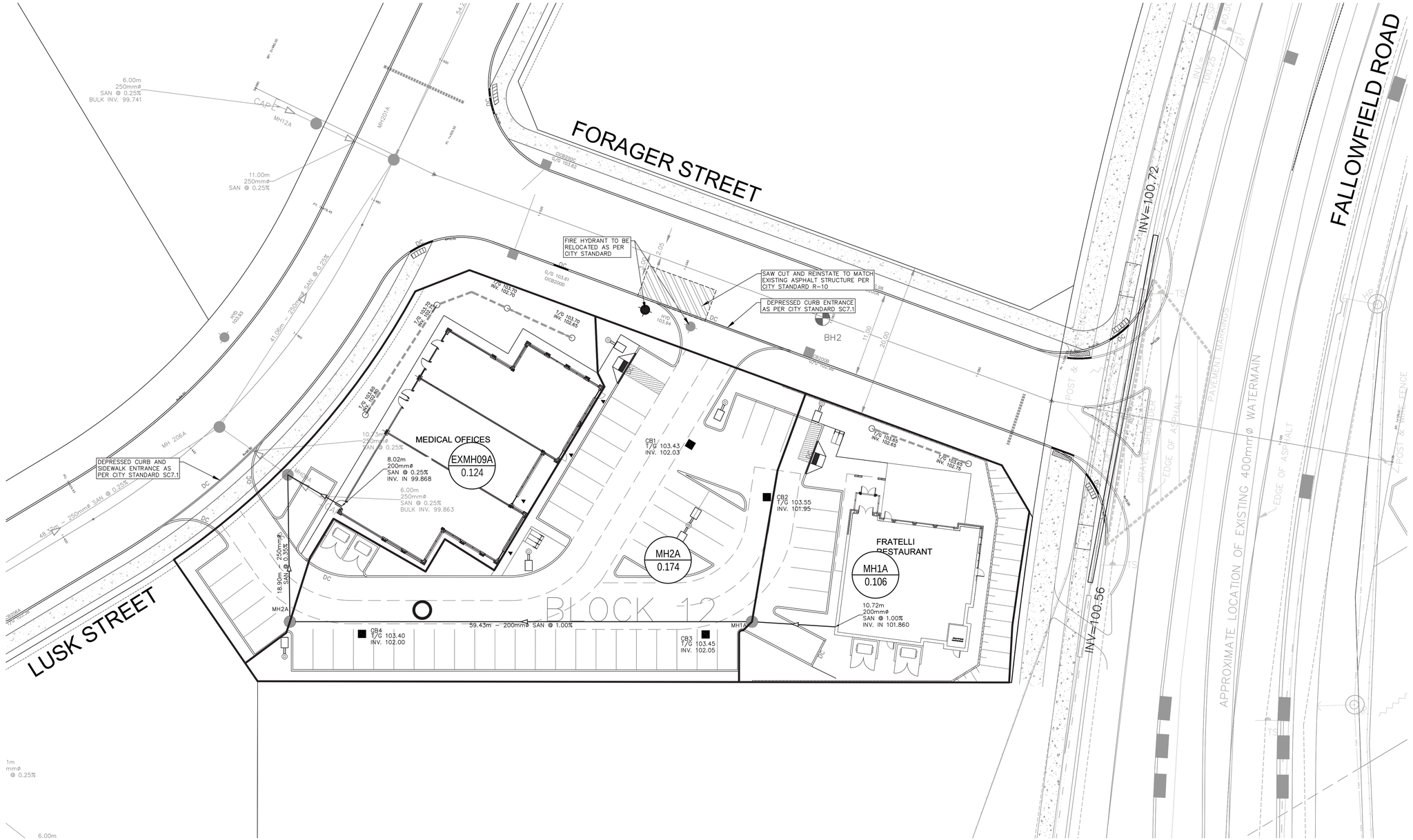
Residential			ICI Areas			
SF	3.4	p/p/u				
TH/SD	2.7	p/p/u	INST	28,000	L/Ha/day	
APT	1.8	p/p/u	COM	28,000	L/Ha/day	
Other	60	p/p/Ha	IND	35,000	L/Ha/day	MOE Chart
				17000	L/Ha/day	

Notes:
1. Mannings coefficient (n) = 0.013
2. Demand (per capita): 280 L/day 200 L/day
3. Infiltration allowance: 0.33 L/s/Ha
4. Residential Peaking Factor:
   Harmon Formula = 1+(14/(4+(P/1000)^0.5))0.8
   where K = 0.8 Correction Factor
5. Commercial and Institutional Peak Factors based on total area, 1.5 if greater than 20%, otherwise 1.0

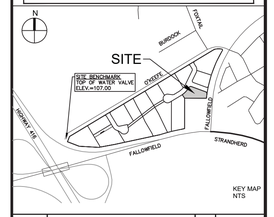
Designed: W.Z.
Checked: D.G.Y.
Dwg. Reference: 122508-400

No.	Revision	Date
1.	Servicing Brief - Submission No. 1	2020-03-06

File Reference: 122508.6.2.4
Date: 2020-03-06
Sheet No: 1 of 1



SEE 010 FOR NOTES, LEGEND, CB TABLE AND DETAILS



No.	REVISIONS	By	Date
14			
13			
12			
11			
10			
9			
8			
7			
6			
5			
4			
3			
2			
1	ISSUED FOR SPA	DGY	2020:03:06

DCR/PHOENIX GROUP OF COMPANIES
18A BENTLEY AVE,
OTTAWA ONT
K2E 6T8

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

Project Title

115 LUSK STREET

LICENSED PROFESSIONAL ENGINEER
D. G. Yannoulopoulos
2020/03/06
PROVINCE OF ONTARIO

N

Drawing Title

SANITARY TRIBUTARY PLAN

Scale

2.5 0 2.5 5
1:250

Design	Date
WZ/RM	NOVEMBER 2019
Drawn	Checked
EH	DGY
Project No.	Drawing No.
122508	400

CITY FILE No. ####

CITY PLAN No.####

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

SANITARY SEWER DESIGN SHEET

416 Lands
CITY OF OTTAWA
DCR Phoenix

LOCATION				RESIDENTIAL										ICI AREAS							INFILTRATION ALLOWANCE			FIXED FLOW (L/s)		TOTAL FLOW	PROPOSED SEWER DESIGN						
				AREA	UNIT TYPES				AREA	POPULATION		PEAK	PEAK	AREA (Ha)						PEAK	AREA (Ha)		FLOW				CAPACITY	LENGTH	DIA	SLOPE	VELOCITY	AVAILABLE CAPACITY	
STREET	AREA ID	FROM MH	TO MH	w/ Units (Ha)	SF	SD	TH	APT	w/o Units (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)	IND	CUM	(L/s)	(L/s)	(m)	(mm)	(%)	(full) (m/s)	L/s	(%)
BLOCK 2	02A	STUB W	MH02A							0.0	0.0	4.00	0.00			0.46	0.46			0.40	0.46	0.46	0.13			0.53	31.02	6.00	250	0.25	0.612	30.49	98.30%
STREET NO. 3		MH02A	MH 305A							0.0	0.0	4.00	0.00			0	0.46			0.40	0.00	0.46	0.13			0.53	31.02	11.00	250	0.25	0.612	30.49	98.30%
BLOCK 17	17A	STUB E	MH17A							0.0	0.0	4.00	0.00			0.61	0.61			0.53	0.61	0.61	0.17			0.70	31.02	6.00	250	0.25	0.612	30.32	97.74%
STREET NO. 3		MH17A	MH 305A							0.0	0.0	4.00	0.00			0	0.61			0.53	0.00	0.61	0.17			0.70	31.02	11.00	250	0.25	0.612	30.32	97.74%
STREET NO. 3	305A	MH 305A	MH 304A	0.11						0.0	0.0	4.00	0.00			0	1.07			0.93	0.11	1.18	0.33			1.26	31.02	16.58	250	0.25	0.612	29.76	95.94%
BLOCK 1	01A	STUB NW	MH01A							0.0	0.0	4.00	0.00			0.8	0.8			0.69	0.80	0.80	0.22			0.92	31.02	6.00	250	0.25	0.612	30.10	97.04%
EASEMENT		MH01A	MH 304A							0.0	0.0	4.00	0.00			0	0.8			0.69	0.00	0.80	0.22			0.92	31.02	105.01	250	0.25	0.612	30.10	97.04%
STREET NO. 3	304A	MH 304A	MH 303A	0.04						0.0	0.0	4.00	0.00			0	1.87			1.62	0.04	2.02	0.57			2.19	31.02	19.16	250	0.25	0.612	28.83	92.94%
BLOCK 3	03A	STUB W	MH03A							0.0	0.0	4.00	0.00			0.81	0.81			0.70	0.81	0.81	0.23			0.93	31.02	6.00	250	0.25	0.612	30.09	97.00%
STREET NO. 3		MH03A	MH 303A							0.0	0.0	4.00	0.00			0	0.81			0.70	0.00	0.81	0.23			0.93	31.02	9.91	250	0.25	0.612	30.09	97.00%
STREET NO. 3	303A	MH 303A	MH 302A	0.07						0.0	0.0	4.00	0.00			0	2.68			2.33	0.07	2.90	0.81			3.14	31.02	30.74	250	0.25	0.612	27.88	89.88%
STREET NO. 3 / BLOCK 5	302A	MH 302A	MH 301A	0.16						0.0	0.0	4.00	0.00			0	2.68			2.33	0.16	3.06	0.86			3.18	31.02	102.15	250	0.25	0.612	27.84	89.74%
BLOCK 16	16A	STUB N	MH16A							0.0	0.0	4.00	0.00			0.4	0.4			0.35	0.40	0.40	0.11			0.46	31.02	6.00	250	0.25	0.612	30.56	98.52%
BLOCK 5		MH16A	MH 301A							0.0	0.0	4.00	0.00			0	0.4			0.35	0.00	0.40	0.11			0.46	31.02	5.50	250	0.25	0.612	30.56	98.52%
BLOCK 18	301A	MH 301A	MH 210A	0.07						0.0	0.0	4.00	0.00			0	3.08			2.67	0.07	3.53	0.99			3.66	31.02	77.32	250	0.25	0.612	27.36	88.19%
BLOCK 19	210A	MH 210A	MH209A	0.04						0.0	0.0	4.00	0.00			0	3.08			2.67	0.04	3.57	1.00			3.67	31.02	39.94	250	0.25	0.612	27.35	88.16%
BLOCK 14	14A	STUB N	MH14A							0.0	0.0	4.00	0.00			0.47	0.47			0.41	0.47	0.47	0.13			0.54	31.02	6.00	250	0.25	0.612	30.48	98.26%
BLOCK 19		MH14A	MH209A							0.0	0.0	4.00	0.00			0	0.47			0.41	0.00	0.47	0.13			0.54	31.02	5.50	250	0.25	0.612	30.48	98.26%
BLOCK 7	07A	STUB S	MH07A							0.0	0.0	4.00	0.00			0.62	0.62			0.54	0.62	0.62	0.17			0.71	31.02	6.00	250	0.25	0.612	30.31	97.71%
BLOCK 19		MH07A	MH209A							0.0	0.0	4.00	0.00			0	0.62			0.54	0.00	0.62	0.17			0.71	31.02	5.50	250	0.25	0.612	30.31	97.71%
BLOCK 19	209A	MH209A	MH208A	0.01						0.0	0.0	4.00	0.00			0	4.17			3.62	0.01	4.67	1.31			4.93	31.02	16.67	250	0.25	0.612	26.09	84.12%
STREET NO. 1	208A	MH208A	MH 207A	0.15						0.0	0.0	4.00	0.00			0	4.17			3.62	0.15	4.82	1.35			4.97	31.02	37.15	250	0.25	0.612	26.05	83.98%
BLOCK 8	08A	STUB S	MH08A							0.0	0.0	4.00	0.00			0.84	0.84			0.73	0.84	0.84	0.24			0.96	31.02	6.00	250	0.25	0.612	30.06	96.89%
STREET NO. 1		MH08A	MH 207A							0.0	0.0	4.00	0.00			0	0.84			0.73	0.00	0.84	0.24			0.96	31.02	11.51	250	0.25	0.612	30.06	96.89%
STREET NO. 1	207A	MH 207A	MH207B	0.01						0.0	0.0	4.00	0.00			0	5.01			4.35	0.01	5.67	1.59			5.94	31.02	6.00	250	0.25	0.612	25.08	80.86%
BLOCK 13	13A	STUB NE	MH13A							0.0	0.0	4.00	0.00			0.66	0.66			0.57	0.66	0.66	0.18			0.76	31.02	6.00	250	0.25	0.612	30.26	97.56%
STREET NO. 1		MH13A	MH207B							0.0	0.0	4.00	0.00			0	0.66			0.57	0.00	0.66	0.18			0.76	31.02	13.00	250	0.25	0.612	30.26	97.56%
STREET NO. 1	207B	MH207B	MH 206A	0.10						0.0	0.0	4.00	0.00			0	5.67			4.92	0.10	6.43	1.80			6.72	31.02	48.37	250	0.25	0.612	24.30	78.33%
BLOCK 9	09A	STUB SE	MH09A							0.0	0.0	4.00	0.00			0.4	0.4			0.35	0.40	0.40	0.11			0.46	31.02	6.00	250	0.25	0.612	30.56	98.52%
STREET NO. 9		MH09A	MH 206A							0.0	0.0	4.00	0.00			0	0.4			0.35	0.00	0.40	0.11			0.46	31.02	10.73	250	0.25	0.612	30.56	98.52%
STREET NO. 1	206A	MH 206A	MH201A	0.09						0.0	0.0	4.00	0.00			0	6.07			5.27	0.09	6.92	1.94			7.21	31.02	41.06	250	0.25	0.612	23.81	76.77%
BLOCK 12	12A	STUB NW	MH12A							0.0	0.0	4.00	0.00			0.41	0.41			0.36	0.41	0.41	0.11			0.47	31.02	6.00	250	0.25	0.612	30.55	98.48%
STREET NO. 1		MH12A	MH201A							0.0	0.0	4.00	0.00			0	0.41			0.36	0.00	0.41	0.11			0.47	31.02	11.00	250	0.25	0.612	30.55	98.48%
STREET NO. 1	201A	MH201A	MH202A	0.11						0.0	0.0	4.00	0.00			0	6.48			5.63	0.11	7.44	2.08			7.71	31.02	54.28	250	0.25	0.612	23.31	75.15%
BLOCK 10	10A	STUB SE	MH10A							0.0	0.0	4.00	0.00			0.4	0.4			0.35	0.40	0.40	0.11			0.46	31.02	6.00	250	0.25	0.612	30.56	98.52%
STREET NO. 1		MH10A	MH202A							0.0	0.0	4.00	0.00			0	0.4			0.35	0.00	0.40	0.11			0.46	31.02	11.86	250	0.25	0.612	30.56	98.52%
STREET NO. 1	202A	MH202A	MH203A	0.03						0.0	0.0	4.00	0.00			0	6.88			5.97	0.03	7.87	2.20			8.18	31.02	13.57	250	0.25	0.612	22.84	73.64%
BLOCK 11	11A	STUB E	MH11A							0.0	0.0	4.00	0.00			0.79	0.79			0.69	0.79	0.79	0.22			0.91	31.02	6.98	250	0.25	0.612	30.11	97.08%
STREET NO. 1		MH11A	MH203A							0.0	0.0	4.00	0.00			0	0.79			0.69	0.00	0.79	0.22			0.91	31.02	9.49	250	0.25	0.612	30.11	97.08%
STREET NO. 1	203A	MH203A	MH104A	0.06						0.0	0.0	4.00	0.00			0	7.67			6.66	0.06	8.72	2.44			9.10	31.02	48.91	250	0.25	0.612	21.92	70.66%
O'KEEFE COURT		MH104A	MH103A							0.0	0.0	4.00	0.00			0	7.67			6.66	0.00	8.72	2.44			9.10	31.02	93.50	250	0.25	0.612	21.92	70.66%
O'KEEFE COURT		MH103A	MH102A							0.0	0.0	4.00	0.00			0	7.67			6.66	0.00	8.72	2.44			9.10	31.02	32.00	250	0.25	0.612	21.92	70.66%
O'KEEFE COURT		MH102A	MH101A							0.0	0.0	4.00	0.00			0	7.67			6.66	0.00	8.72	2.44			9.10	31.02	38.00	250	0.25	0.612	21.92	70.66%
O'KEEFE COURT		MH101A	MH100A							0.0	0.0	4.00	0.00			0	7.67			6.66	0.00	8.72	2.44			9.10	31.02	18.08	250	0.25	0.612	21.92	70.66%
FALLOWFIELD ROAD		MH100A	EXMH1A							0.0	0.0	4.00	0.00			0	7.67			6.66	0.00	8.72	2.44			9.10	116.06	31.50	250	3.50	2.291	106.96	92.16%
		EXMH1A								0.0	0.0	4.00	0.00			0	7.67			6.66	0.00	8.72	2.44			9.10	124.08	29.99	250	4.00	2.449	114.98	92.67%

Design Parameters:

Residential

SF	3.4	p/p/u
TH/SD	2.7	p/p/u
APT	1.8	p/p/u
Other	60	p/p/Ha

ICI Areas

INST	50,000	L/Ha/day	1.5
COM	50,000	L/Ha/day	1.5
IND	35,000	L/Ha/day	MOE Chart
	17000	L/Ha/day	

Notes:

1. Mannings coefficient (n) = 0.013
2. Demand (per capita): 350 L/day 300 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: KH

Checked: RM

Dwg. Reference: 39744-501

No.	Revision	Date
1.	Servicing Brief - Submission No. 1	2017-05-05
2.	Revised per City Comments - Submission No. 2	2017-09-27

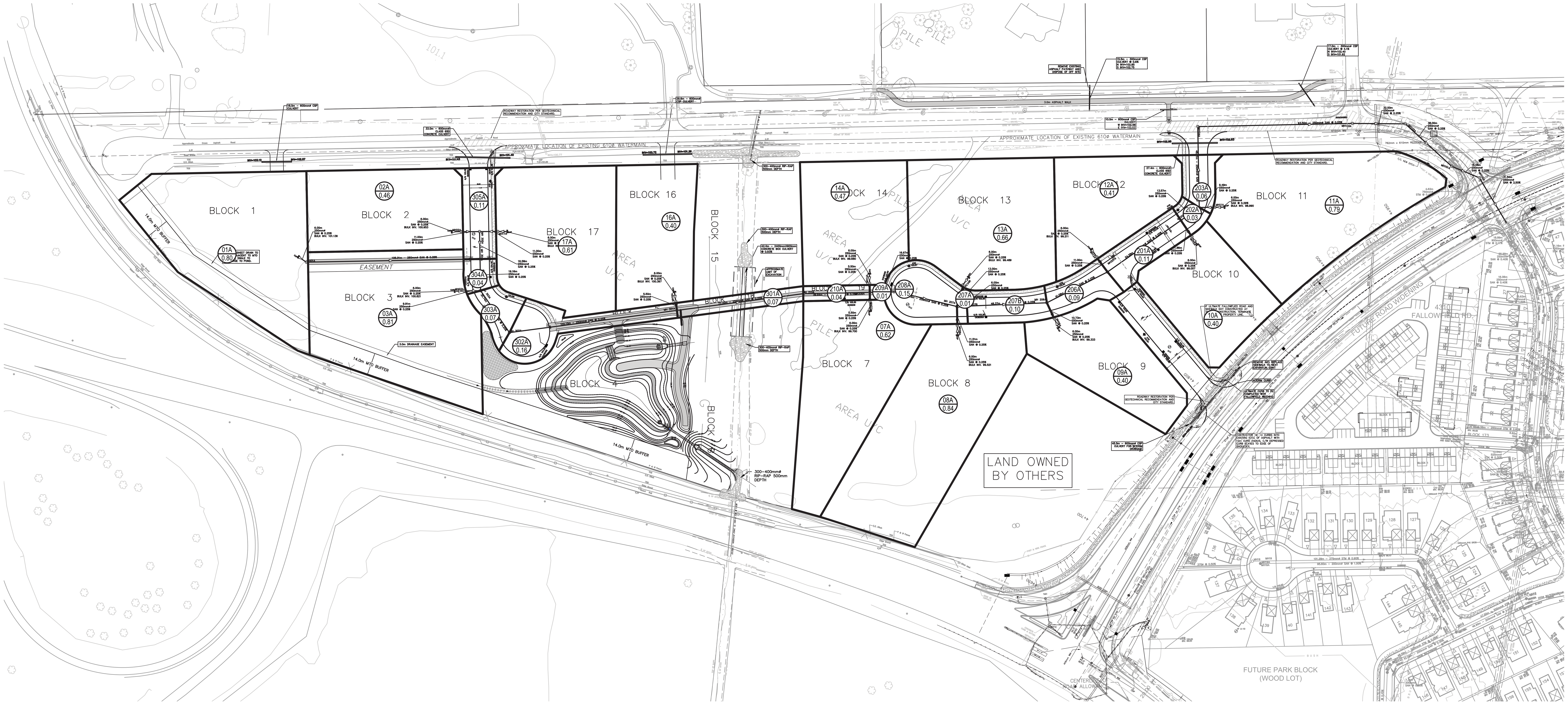
File Reference: 39744.5.7.1
Date: 2017-05-05
Sheet No: 1 of 1

REVIEWED BY
DEVELOPMENT REVIEW SERVICES BRANCH

Signed ______________________

Date ______________________ 2017

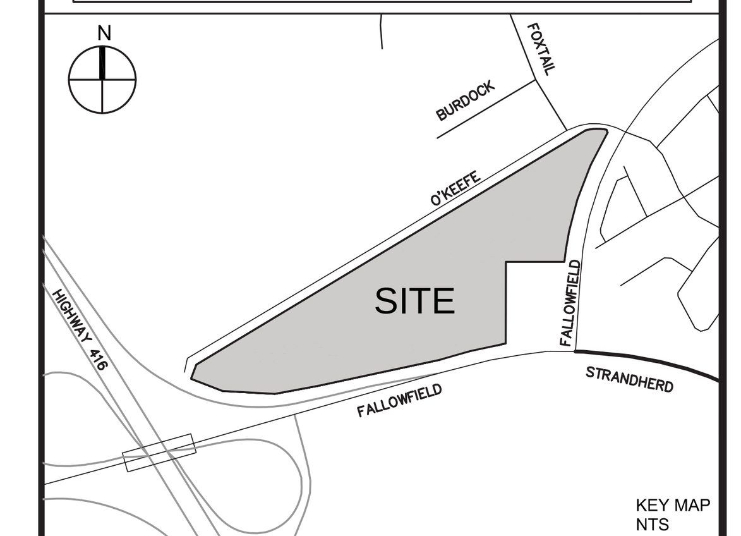
Plan Number ______________________



LEGEND :

204 / 0.07 — AREA NUMBER / AREA IN HECTARES

SEE 010, 011, 012 FOR NOTES, LEGEND, CB TABLE, STREET SECTIONS AND DETAILS



No.	REVISIONS	By	Date
14			
13			
12			
11			
10			
9			
8			
7			
6			
5	REVISED PER CITY COMMENTS	DGY	18:05:22
4	REVISED PER CITY COMMENTS	DGY	18:04:06
3	REVISED PER CITY COMMENTS	DGY	18:01:10
2	REVISED PER CITY COMMENTS	DGY	17:09:26
1	ISSUED FOR CITY REVIEW	DGY	17:05:04

DCR/PHOENIX GROUP OF COMPANIES
18A BENTLEY AVE,
OTTAWA ONT
K2E 6T8

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

Project Title

416 LANDS
4401 FALLOWFIELD ROAD

LICENSED PROFESSIONAL ENGINEER
D. G. Yannoulopoulos
22/05/2018
PROVINCE OF ONTARIO

Drawing Title

SANITARY DRAINAGE
AREA PLAN

Scale 1:1250

Design	Date
MB/RM	MARCH 2016
Drawn	**Checked**
EH	DGY
Project No.	**Drawing No.**
39744	501

CITY PLAN No. 17492

CITY FILE No. D07-16-13-0013

APPENDIX C

Storm Sewer Design Sheet
Storm Runoff Coefficient Calculation
122508-500 - Storm Drainage Plan
122508-600 - Ponding Plan
416 Lands Storm Design Sheet
416 Lands Storm Drainage Area Plan
On-site Underground Storage Calculations

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

STORM SEWER DESIGN SHEET

115 Lusk Street
City of Ottawa
DCR Phoenix

LOCATION				AREA (Ha)										RATIONAL DESIGN FLOW												SEWER DATA								
STREET	AREA ID	FROM	TO	C= 0.20	C= 0.25	C= 0.40	C= 0.50	C= 0.57	C= 0.65	C= 0.69	C= 0.70	C= 0.77	C= 0.90	IND 2.78AC	CUM 2.78AC	INLET (min)	TIME IN PIPE	TOTAL (min)	i (2) (mm/hr)	i (5) (mm/hr)	i (10) (mm/hr)	i (100) (mm/hr)	2yr PEAK FLOW (L/s)	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 (2yr) (L/s)	(%)
	ECB 1	ECB 1	CB 1									0.063		0.13	0.13	10.00	0.20	10.20	76.81	104.19	122.14	178.56	10.36	14.05	16.47	24.08		10.36	87.74	20.48	250			2.00	1.731	77.38	88.19%
	CB 1	CB 1	CB 2									0.073		0.16	0.29	10.20	0.20	10.40	76.06	103.16	120.93	176.78	22.14	30.03	35.20	51.46		22.14	71.33	11.96	300			0.50	0.978	49.19	68.96%
	ECB 5	ECB 5	CB 2									0.020		0.04	0.04	10.00	0.16	10.16	76.81	104.19	122.14	178.56	3.29	4.46	5.23	7.64		3.29	87.74	16.14	250			2.00	1.731	84.45	96.25%
	CB 2	CB 2	MH1									0.030		0.06	0.40	10.40	0.25	10.65	75.30	102.12	119.70	174.97	29.98	40.66	47.66	69.67		29.98	71.33	14.53	300			0.50	0.978	41.35	57.97%
	CB 3	CB 3	MAIN									0.051		0.11	0.11	10.65	0.04	10.69	74.40	100.89	118.25	172.84	8.12	11.01	12.91	18.87		8.12	62.04	3.14	250			1.00	1.224	53.92	86.91%
		MH 1	MH 2											0.00	0.51	10.69	0.52	11.21	74.25	100.68	118.00	172.48	37.67	51.08	59.86	87.50		37.67	317.25	44.32	525			0.50	1.420	279.58	88.13%
	CB 4	CB 4	MH 2									0.124		0.27	0.27	10.00	0.08	10.08	76.81	104.19	122.14	178.56	20.39	27.66	32.42	47.40		20.39	87.74	8.21	250			2.00	1.731	67.35	76.76%
		MH 2	MH 3											0.00	0.77	11.21	0.04	11.25	72.45	98.20	115.08	168.19	55.98	75.88	88.93	129.97		55.98	100.88	3.00	300			1.00	1.383	44.90	44.51%
	ROOF	MH 4	MH 3										0.028	0.07	0.07	10.00	1.04	11.04	76.81	104.19	122.14	178.56	5.38	7.30	8.56	12.51		5.38	21.96	42.41	200			0.41	0.677	16.58	75.50%
		MH 3	*MH 09*											0.00	0.84	11.25	0.47	11.72	72.32	98.03	114.89	167.90	60.96	82.62	96.83	141.51		60.96	91.46	22.82	375			0.25	0.802	30.50	33.35%
												TOTAL	0.389	0.84	TRUE																375						

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 = 732.951 / (TC+6.199)^0.810] 2 YEAR
[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: W.Z.

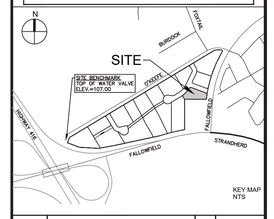
Checked: D.G.Y.

Dwg. Reference: 122508-500

No.	Revision	Date
1.	Servicing Brief - Submission No. 1	2020-03-06

File Reference:	Date:	Sheet No:
122508-6.2.4	2020-03-06	1 of 1

SEE 010 FOR NOTES, LEGEND, CB TABLE AND DETAILS



No.	REVISIONS	By	Date
14			
13			
12			
11			
10			
9			
8			
7			
6			
5			
4			
3			
2			
1	ISSUED FOR SPA	DGY	2020:03:06

DCR/PHOENIX GROUP OF COMPANIES
18A BENTLEY AVE,
OTTAWA ONT
K2E 6T8

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

Project Title
115 LUSK STREET

LICENSED PROFESSIONAL ENGINEER
D. G. Yannoulopoulos
2020/03/06
PROVINCE OF ONTARIO

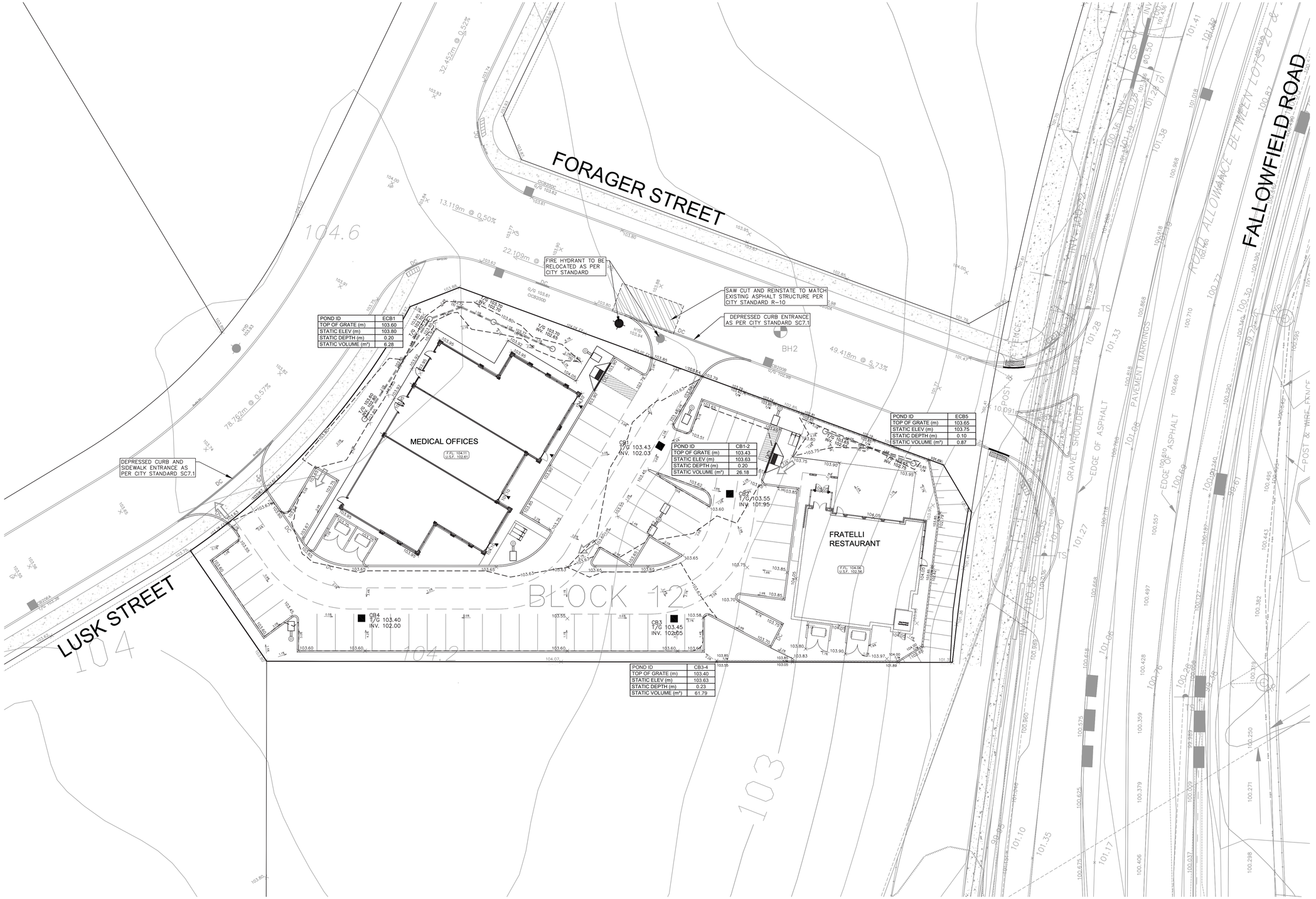
N

Drawing Title
STORM DRAINAGE
AREA PLAN

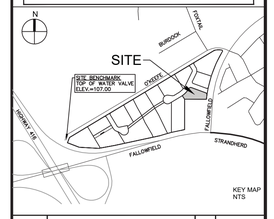
Scale
2.5 0 2.5 5
1:250

Design	Date
WZ/RM	NOVEMBER 2019
Drawn	Checked
EH	DGY
Project No.	Drawing No.
122508	500

CITY FILE No. ####
CITY PLAN No.####



SEE 010 FOR NOTES, LEGEND, CB TABLE AND DETAILS



No.	REVISIONS	By	Date
14			
13			
12			
11			
10			
9			
8			
7			
6			
5			
4			
3			
2			
1	ISSUED FOR SPA	DGY	2020:03:06

DCR/PHOENIX GROUP OF COMPANIES
18A BENTLEY AVE,
OTTAWA ONT
K2E 6T8

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

Project Title
115 LUSK STREET

LICENSED PROFESSIONAL ENGINEER
D. G. Yannoulopoulos
2020/03/06
PROVINCE OF ONTARIO

N

Drawing Title
PONDING PLAN

Scale
2.5 0 2.5 5
1:250

Design	Date
WZ/RM	NOVEMBER 2019
Drawn	Checked
EH	DGY
Project No.	Drawing No.
122508	600

CITY FILE No. #### CITY PLAN No.####

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

STORM SEWER DESIGN SHEET

416 Lands
City of Ottawa
DCR Phoenix

LOCATION				AREA (Ha)							RATIONAL DESIGN FLOW													SEWER DATA								
STREET	AREA ID	FROM	TO	C= 0.20	C= 0.25	C= 0.40	C= 0.50	C= 0.57	C= 0.80	C= 0.90	IND 2.78AC	CUM 2.78AC	INLET (min)	TIME IN PIPE	TOTAL (min)	i (2) (mm/hr)	i (5) (mm/hr)	i (10) (mm/hr)	i (100) (mm/hr)	2yr PEAK FLOW (L/s)	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 (2yr) (L/s)	(%)
STREET NO. 3	S305A	CB305A	MH 305							0.04	0.10	0.10	10.00	0.57	10.57	76.81	104.19	122.14	178.56	7.69	10.43	12.22	17.87		7.69	34.22	35.99	200			1.00	1.055	26.53	77.54%
STREET NO. 3	S305B	CB305B	MH 305							0.04	0.10	0.10	10.00	0.58	10.58	76.81	104.19	122.14	178.56	7.69	10.43	12.22	17.87		7.69	34.22	36.45	200			1.00	1.055	26.53	77.54%
BLOCK 2	2	STUB W	MH02						0.43		0.96	0.96	10.00	0.12	10.12	76.81	104.19	122.14	178.56	73.45	99.64	116.81	170.76		73.45	133.02	6.00	450			0.20	0.810	59.57	44.78%
STREET NO. 3		MH02	MH 305								0.00	0.96	10.12	0.20	10.32	76.33	103.55	121.38	177.44	73.00	99.02	116.08	169.69		73.00	133.02	9.49	450			0.20	0.810	60.02	45.12%
BLOCK 17	17	STUB E	MH17						0.58		1.29	1.29	10.00	0.12	10.12	76.81	104.19	122.14	178.56	99.07	134.40	157.55	230.33		99.07	133.02	6.00	450			0.20	0.810	33.94	25.52%
STREET NO. 3		MH17	MH 305								0.00	1.29	10.12	0.26	10.38	76.33	103.55	121.38	177.44	98.46	133.56	156.57	228.88		98.46	133.02	12.51	450			0.20	0.810	34.55	25.98%
STREET NO. 3		MH 305	MH 304								0.00	2.45	10.58	0.42	11.00	74.66	101.25	118.67	173.46	182.65	247.69	290.32	424.36		182.65	239.68	20.70	600			0.14	0.821	57.02	23.79%
BLOCK 1	1	STUB NW	MH01						0.55		1.22	1.22	10.00	0.12	10.12	76.81	104.19	122.14	178.56	93.95	127.45	149.40	218.41		93.95	133.02	6.00	450			0.20	0.810	39.07	29.37%
EASEMENT		MH01	MH 304								0.00	1.22	10.12	2.13	12.25	76.33	103.55	121.38	177.44	93.37	126.66	148.47	217.04		93.37	133.02	103.51	450			0.20	0.810	39.64	29.80%
STREET NO. 3	S304A, S304B	MH 304	MH 303							0.28	0.70	4.37	12.25	0.38	12.63	69.12	93.63	109.70	160.29	302.05	409.18	479.42	700.50		302.05	385.20	19.16	750			0.11	0.845	83.14	21.58%
BLOCK 3	3	STUB W	MH03						0.51		1.13	1.13	10.00	0.12	10.12	76.81	104.19	122.14	178.56	87.12	118.18	138.54	202.53		87.12	179.46	6.00	525			0.16	0.803	92.35	51.46%
STREET NO. 3		MH03	MH 303								0.00	1.13	10.12	0.16	10.29	76.33	103.54	121.37	177.43	86.58	117.44	137.67	201.25		86.58	179.46	7.77	525			0.16	0.803	92.89	51.76%
STREET NO. 3		MH 303	MH 302								0.00	5.50	12.63	0.57	13.20	67.99	92.09	107.89	157.62	374.25	506.87	593.84	867.61		374.25	496.66	31.01	825			0.11	0.900	122.42	24.65%
STREET NO. 3	302	MH 302	MH 301							0.07	0.18	5.68	13.20	1.96	15.16	66.36	89.84	105.25	153.75	376.87	510.27	597.76	873.23		376.87	496.66	105.60	825			0.11	0.900	119.79	24.12%
BLOCK 16	16	STUB N	MH16						0.36		0.80	0.80	10.00	0.12	10.12	76.81	104.19	122.14	178.56	61.49	83.42	97.79	142.96		61.49	91.46	6.00	375			0.25	0.802	29.96	32.76%
BLOCK 5		MH16	MH 301								0.00	0.80	10.12	0.16	10.28	76.33	103.54	121.37	177.43	61.11	82.90	97.17	142.06		61.11	91.46	7.59	375			0.25	0.802	30.34	33.18%
BLOCK 11	11	STUB E	MH11						0.71		1.58	1.58	10.00	0.14	10.14	76.81	104.19	122.14	178.56	121.28	164.52	192.87	281.95		121.28	133.02	6.98	450			0.20	0.810	11.74	8.82%
STREET NO. 1		MH11	MH203								0.00	1.58	10.14	0.13	10.28	76.26	103.44	121.25	177.26	120.41	163.34	191.47	279.89		120.41	133.02	6.56	450			0.20	0.810	12.60	9.47%
STREET NO. 1		MH203	MH202								0.00	1.58	10.28	0.24	10.52	75.75	102.74	120.43	176.05	119.61	162.24	190.17	277.99		119.61	133.02	11.83	450			0.20	0.810	13.40	10.08%
BLOCK 10	10	STUB SE	MH10						0.36		0.80	0.80	10.00	0.12	10.12	76.81	104.19	122.14	178.56	61.49	83.42	97.79	142.96		61.49	91.46	6.00	375			0.25	0.802	29.96	32.76%
STREET NO. 1		MH10	MH202								0.00	0.80	10.12	0.19	10.31	76.33	103.54	121.37	177.43	61.11	82.90	97.17	142.06		61.11	91.46	8.91	375			0.25	0.802	30.34	33.18%
STREET NO. 1	S202A, S202B	MH202	MH201							0.20	0.50	2.88	10.52	1.10	11.62	74.86	101.51	118.99	173.92	215.59	292.37	342.69	500.92		215.59	239.68	54.06	600			0.14	0.821	24.08	10.05%
BLOCK 12	12	STUB NW	MH12						0.41		0.91	0.91	10.00	0.12	10.12	76.81	104.19	122.14	178.56	70.03	95.01	111.37	162.82		70.03	91.46	6.00	375			0.25	0.802	21.42	23.42%
STREET NO. 1		MH12	MH201								0.00	0.91	10.12	0.27	10.39	76.33	103.54	121.37	177.43	69.60	94.41	110.67	161.79		69.60	91.46	12.98	375			0.25	0.802	21.86	23.90%
STREET NO. 1	S200A	CB200A	MH200							0.02	0.05	0.05	10.00	0.20	10.20	76.81	104.19	122.14	178.56	3.84	5.21	6.11	8.94		3.84	50.75	18.33	200			2.20	1.565	46.91	92.43%
STREET NO. 1	S200B	CB200B	MH200							0.02	0.05	0.05	10.00	0.21	10.21	76.81	104.19	122.14	178.56	3.84	5.21	6.11	8.94		3.84	49.23	19.52	200			2.07	1.518	45.39	92.19%
STREET NO. 1	S200C, S200D	MH200	MH201							0.06	0.15	0.25	10.21	0.79	11.00	75.99	103.07	120.82	176.62	19.01	25.79	30.23	44.19		19.01	41.15	38.51	250			0.44	0.812	22.14	53.80%
STREET NO. 1		MH201	MH205								0.00	4.04	11.62	0.26	11.88	71.10	96.35	112.91	165.00	287.40	389.47	456.39	666.95		287.40	402.33	13.58	750			0.12	0.882	114.93	28.57%
STREET NO. 1		MH205	MH206								0.00	4.04	11.88	0.61	12.49	70.28	95.23	111.59	163.06	284.09	384.93	451.05	659.09		284.09	402.33	32.34	750			0.12	0.882	118.24	29.39%
BLOCK 9	9	STUB SE	MH09						0.37		0.82	0.82	10.00	0.12	10.12	76.81	104.19	122.14	178.56	63.20	85.74	100.51	146.93		63.20	91.46	6.00	375			0.25	0.802	28.25	30.89%
STREET NO. 1		MH09	MH206								0.00	0.82	10.12	0.16	10.28	76.33	103.54	121.37	177.43	62.81	85.20	99.87	146.00		62.81	91.46	7.67	375			0.25	0.802	28.65	31.32%
STREET NO. 1	S206A, S206B	MH206	MH207							0.27	0.68	5.54	12.49	1.03	13.51	68.41	92.67	108.57	158.63	379.06	513.42	601.54	878.88		379.06	496.66	55.51	825			0.11	0.900	117.61	23.68%
BLOCK 8	8	STUB S	MH08						0.75		1.67	1.67	10.00	0.12	10.12	76.81	104.19	122.14	178.56	128.11	173.79	203.73	297.84		128.11	179.46	6.00	525			0.16	0.803	51.35	28.61%
STREET NO. 1		MH08	MH207								0.00	1.67	10.12	0.20	10.32	76.33	103.54	121.37	177.43	127.32	172.70	202.45	295.95		127.32	179.46	9.50	525			0.16	0.803	52.14	29.06%
BLOCK 13	13	STUB NE	MH13						0.66		1.47	1.47	10.00	0.12	10.12	76.81	104.19	122.14	178.56	112.74	152.94	179.28	262.10		112.74	179.46	6.00	525			0.16	0.803	66.73	37.18%
STREET NO. 1		MH13	MH207								0.00	1.47	10.12	0.34	10.47	76.33	103.54	121.37	177.43	112.04	151.98	178.16	260.44		112.04	179.46	16.62	525			0.16	0.803	67.42	37.57%
STREET NO. 1		MH207	MH208								0.00	8.68	13.51	0.62	14.13	65.51	88.68	103.88	151.75	568.40	769.46	901.33	1,316.62		568.40	775.41	37.18	975			0.11	1.006	207.01	26.70%
BLOCK 19	S208	MH208	MH209							0.06	0.15	8.83	14.13	0.21	14.34	63.90	86.48	101.28	147.93	564.00	763.28	893.99	1,305.72		564.00	775.41	12.54	975			0.11	1.006	211.41	27.26%
BLOCK 14	14	STUB N	MH14						0.44		0.98	0.98	10.00	0.12	10.12	76.81	104.19	122.14	178.56	75.16	101.96	119.52	174.73		75.16	133.02	6.00	450			0.20	0.810	57.86	43.50%
BLOCK 19		MH14	MH209								0.00	0.98	10.12	0.15	10.28	76.33	103.55	121.38	177.44	74.70	101.33	118.78	173.63		74.70	133.02	7.50	450			0.20	0.810	58.32	43.84%
BLOCK 7	7	STUB S	MH07						0.57		1.27	1.27	10.00	0.12	10.12	76.81	104.19	122.14	178.56	97.36	132.08	154.84	226.36		97.36	133.02	6.00	450			0.20	0.810	35.65	26.80%
BLOCK 19		MH07	MH209								0.00	1.27	10.12	0.07	10.20	76.33	103.55	121.38	177.44	96.77	131.26	153.87	224.94		96.77	133.02	3.50	450			0.20	0.810	36.25	27.25%
BLOCK 19	S209	MH209	MH210							0.04	0.10	11.17	14.34	0.67	15.01	63.37	85.76	100.44	146.69	708.07	958.16	1,122.20	1,638.97		708.07	775.41	40.55	975			0.11	1.006	67.34	8.68%
BLOCK 18		MH210	MH 301								0.00	11.17	15.01	1.27	16.28	61.74	83.52	97.81	142.84	689.85	933.21	1,092.86	1,595.91		689.85	775.41	76.48	975			0.11	1.006	85.56	11.03%
BLOCK 4		MH 301	MH 300								0.00	17.65	16.28	0.26	16.54	58.91	79.65	93.25	136.15	1,039.93	1,406.00	1,646.20	2,403.40		1,039.93	1,348.97	18.34	1200			0.11	1.155	309.04	22.91%
BLOCK 4		MH 300	HW1								0.00	17.65	16.54	0.16	16.70	58.35	78.89	92.36	134.84	1,030.12	1,392.59	1,630.43	2,380.26		1,030.12	1,348.97	10.75	1200			0.11	1.155	318.85	23.64%
										Total:	17.65																					

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 = 732.951 / (TC+6.199)^0.810] 2 YEAR
[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) = 0.01

Designed: KH
Checked: RM
Dwg. Reference: 39744-500

No.	Revision	Date
1.	Servicing Brief - Submission No. 1	2017-05-05
2.	Revised per City Comments - Submission No. 2	2017-09-27

File Reference: 39744.5.7.1
Date: 2017-05-05
Sheet No: 1 of 1

REVIEWED BY
DEVELOPMENT REVIEW SERVICES BRANCH

Signed ______________________

Date ______________________ 2017

Plan Number ______________________

LEGEND :

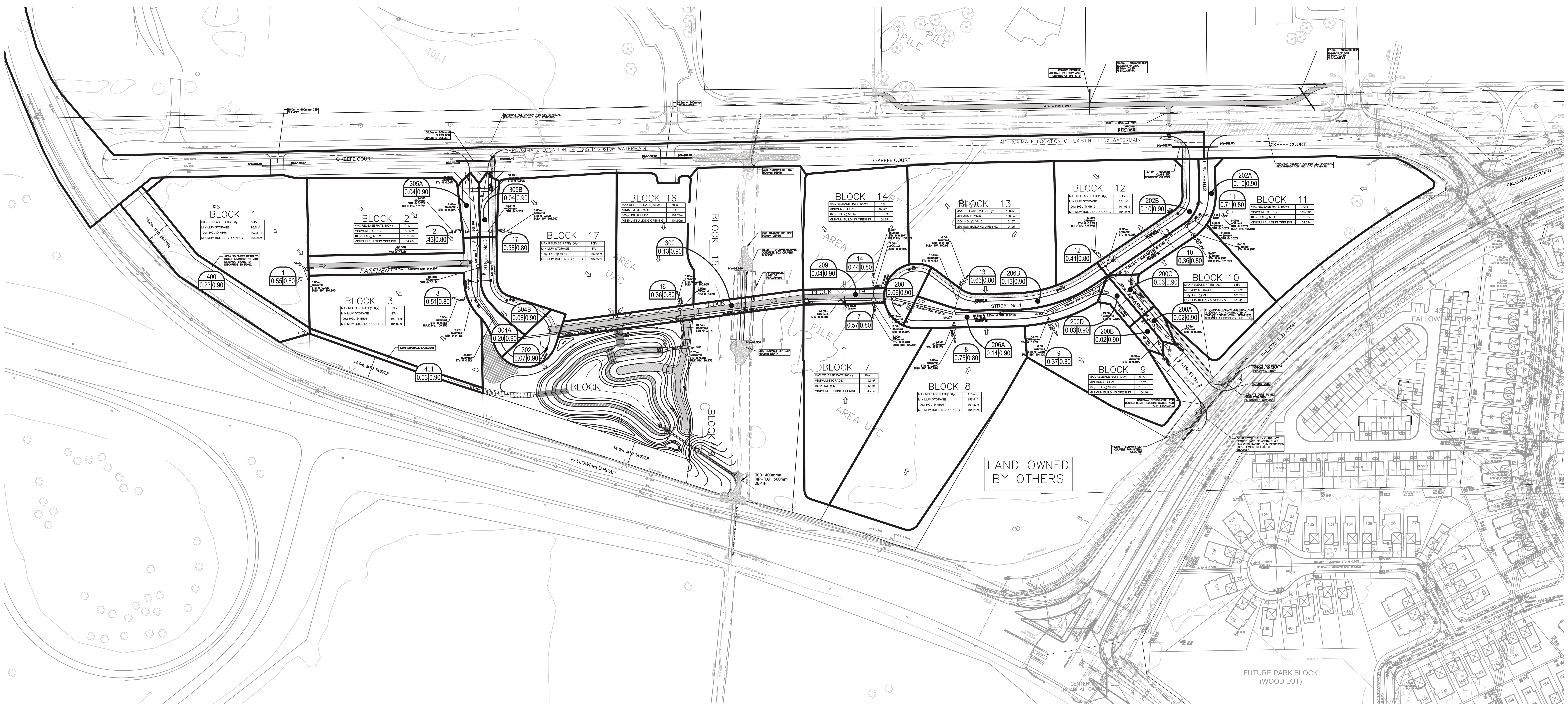
S168 / 2.01 / 0.80 — AREA NUMBER; RUNOFF COEFFICIENT; AREA IN HECTARES

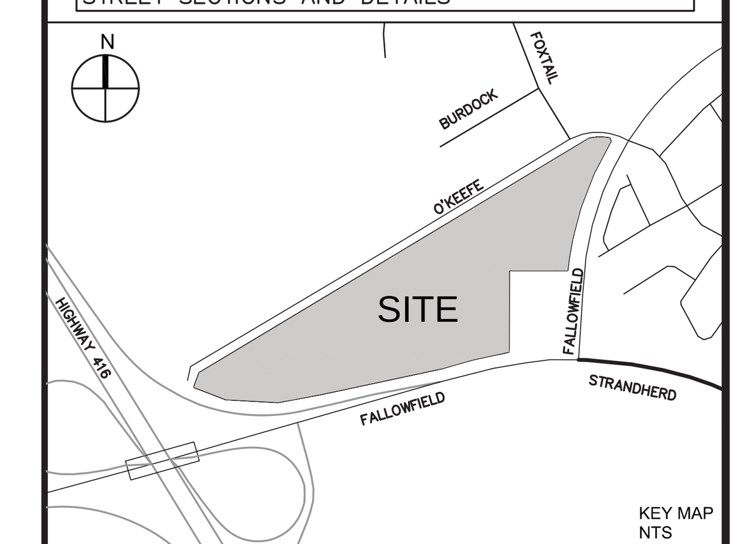
⇨ EMERGENCY FLOW ROUTE

NOTE :

* MINIMUM BUILDING OPENING TO BE CONFIRMED AT SITE PLAN STAGE.

SEE 010, 011, 012 FOR NOTES, LEGEND, CB TABLE, STREET SECTIONS AND DETAILS





No.	REVISIONS	By	Date
14			
13			
12			
11			
10			
9			
8			
7			
6			
5	REVISED PER CITY COMMENTS	DGY	18:05:22
4	REVISED PER CITY COMMENTS	DGY	18:04:06
3	REVISED PER CITY COMMENTS	DGY	18:01:10
2	REVISED PER CITY COMMENTS	DGY	17:09:26
1	ISSUED FOR CITY REVIEW	DGY	17:05:04

DCR/PHOENIX GROUP OF COMPANIES
18A BENTLEY AVE,
OTTAWA ONT
K2E 6T8

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

Project Title

416 LANDS
4401 FALLOWFIELD ROAD

LICENSED PROFESSIONAL ENGINEER
D. G. Yannoulopoulos
22/05/2018
PROVINCE OF ONTARIO

N

Drawing Title

STORM DRAINAGE
AREA PLAN

Scale: 1:1250

Design: MB/RM | Date: MARCH 2016

Drawn: EH | Checked: DGY

Project No.: 39744 | Drawing No.: 500

CITY PLAN No. 17492

CITY FILE No. D07-16-13-0013

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

PROJECT: 115 Lusk Street
DATE: 2020-03-06
FILE: 122508-6.2
REV #: -
DESIGNED BY: R.M. & W.Z.
CHECKED BY: D.G.Y.

STORMWATER MANAGEMENT

Maximum Allowable Release Rate

Restricted Flowrate (based on 39744 - 416 Lands Design Brief)

A_{site} = 0.388 Ha

$Q_{restricted}$ = 61.00 L/s

Maximum Allowable Release Rate ($Q_{max\ allowable} = Q_{restricted} - Q_{uncontrolled}$)

$Q_{max\ allowable}$ = 61.00 L/s

Formulas and Descriptions

i_{2yr} = 1:2 year Intensity = $732.951 / (T_c+6.199)^{0.810}$
i_{5yr} = 1:5 year Intensity = $998.071 / (T_c+6.053)^{0.814}$
i_{100yr} = 1:100 year Intensity = $1735.688 / (T_c+6.014)^{0.820}$
T_c = Time of Concentration (min)
C = Average Runoff Coefficient
A = Area (Ha)
Q = Flow = 2.78CiA (L/s)

MODIFIED RATIONAL METHOD (100-Year, 5-Year & 2-Year Ponding)

Drainage Area	Roof Area
Area (Ha)	0.028
C =	1.00

Restricted Flow Q_r (L/s)= 1.575

100-Year Ponding

T_c Variable (min)	i_{100yr} (mm/hour)	Peak Flow $Q_p = 2.78xCi_{100yr}A$ (L/s)	Q_r (L/s)	$Q_p - Q_r$ (L/s)	Volume 100yr (m^3)
31	89.83	6.99	1.58	5.42	10.08
36	80.96	6.30	1.58	4.73	10.21
41	73.83	5.75	1.58	4.17	**10.26**
46	67.96	5.29	1.58	3.72	10.25
56	58.83	4.58	1.58	3.00	10.10

Storage (m^3)

Overflow	Required	Surface	Sub-surface	Balance
0.00	10.26	10.50	0	0.00

Overflows to: Parking Lot

Drainage Area	Roof Area
Area (Ha)	0.028
C =	0.90

Restricted Flow Q_r (L/s)= 1.575

5-Year Ponding

T_c Variable (min)	i_{5yr} (mm/hour)	Peak Flow $Q_p = 2.78xCi_{5yr}A$ (L/s)	Q_r (L/s)	$Q_p - Q_r$ (L/s)	Volume 5yr (m^3)
14	86.93	6.09	1.58	4.52	3.79
19	72.53	5.08	1.58	3.51	4.00
24	62.54	4.38	1.58	2.81	**4.04**
29	55.18	3.87	1.58	2.29	3.99
34	49.50	3.47	1.58	1.89	3.86

Storage (m^3)

Overflow	Required	Surface	Sub-surface	Balance
0.00	4.04	10.50	0	0.00

Overflows to: Parking Lot

Drainage Area	Roof Area
Area (Ha)	0.028
C =	0.90

Restricted Flow Q_r (L/s)= 1.575

2-Year Ponding

T_c Variable (min)	i_{2yr} (mm/hour)	Peak Flow $Q_p = 2.78xCi_{2yr}A$ (L/s)	Q_r (L/s)	$Q_p - Q_r$ (L/s)	Volume 2yr (m^3)
9	80.87	5.67	1.58	4.09	2.21
14	64.23	4.50	1.58	2.92	2.46
19	53.70	3.76	1.58	2.19	**2.49**
24	46.37	3.25	1.58	1.67	2.41
34	36.78	2.58	1.58	1.00	2.04

Storage (m^3)

Overflow	Required	Surface	Sub-surface	Balance
0.00	2.49	10.50	0	0.00

Overflows to: Parking Lot

Drainage Area	115 Luck St		
Area (Ha)	0.360	ICD Size (L/s)=	59.425
C =	0.92	Reduced Restricted Flow Q_r (L/s)=	29.713

100-Year Ponding

T_c Variable (min)	i_{100yr} (mm/hour)	Peak Flow $Q_p = 2.78xCi_{100yr}A$ (L/s)	Q_r (L/s)	$Q_p - Q_r$ (L/s)	Volume 100yr (m^3)
18	128.08	118.44	29.71	88.73	95.83
23	109.68	101.43	29.71	71.71	98.97
26	101.18	93.56	29.71	63.85	**99.61**
29	94.01	86.94	29.71	57.23	99.57
34	84.27	77.93	29.71	48.21	98.35

Storage (m^3)

Overflow	Required	Surface	Sub-surface	Balance
0.00	99.61	87.97	23.27	0.00
	77.7 MIN.			
			Overflows to:	Luck Street

	Area	Flow	
Roof	0.028	1.575	
Site	0.360	59.425	
	0.388	**61.00**	0.00
Allowable		**61.00**	

Drainage Area	115 Luck St		
Area (Ha)	0.360	ICD Size (L/s)=	59.425
C =	0.77	Reduced Restricted Flow Q_r (L/s)=	29.713

5-Year Ponding

T_c Variable (min)	i_{5yr} (mm/hour)	Peak Flow $Q_p = 2.78xCi_{5yr}A$ (L/s)	Q_r (L/s)	$Q_p - Q_r$ (L/s)	Volume 5yr (m^3)
10	104.19	80.29	29.71	50.58	30.35
12	94.70	72.97	29.71	43.26	31.15
14	86.93	66.99	29.71	37.28	**31.32**
16	80.46	62.00	29.71	32.29	31.00
18	74.97	57.77	29.71	28.06	30.31

Storage (m^3)

Overflow	Required	Surface	Sub-surface	Balance
0.00	31.32	87.97	23.27	0.00
			Overflows to:	Luck Street

Drainage Area	115 Luck St		
Area (Ha)	0.360	ICD Size (L/s)=	59.425
C =	0.77	Reduced Restricted Flow Q_r (L/s)=	29.713

2-Year Ponding

T_c Variable (min)	i_{2yr} (mm/hour)	Peak Flow $Q_p = 2.78xCi_{2yr}A$ (L/s)	Q_r (L/s)	$Q_p - Q_r$ (L/s)	Volume 2yr (m^3)
8	85.46	65.85	29.71	36.14	17.35
9	80.87	62.32	29.71	32.61	17.61
10	76.81	59.19	29.71	29.47	**17.68**
11	73.17	56.38	29.71	26.67	17.60
12	69.89	53.86	29.71	24.15	17.39

Storage (m^3)

Overflow	Required	Surface	Sub-surface	Balance
0.00	17.68	87.97	23.27	0.00
			Overflows to:	Luck Street

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

PROJECT:	115 Lusk Street
DATE:	2020-03-06
FILE:	122508-6.2
REV #:	-
DESIGNED BY:	W.Z.
CHECKED BY:	D.G.Y. & R.M.

UNDERGROUND STORAGE CALCULATIONS

Pipe Storage ***115 Lusk St.***

From	To	Length	Diameter	X-sec Area	Volume
ECB 1	CCB 2	16.88	250	0.049	0.83
CCB 2	TCB 3	7.96	250	0.049	0.39
TCB 3	CCB 4	9.18	250	0.049	0.45
CCB 4	CB 1	20.48	250	0.049	1.01
CB 1	CB 2	11.96	300	0.071	0.85
ECB 5	CCB 6	13.24	250	0.049	0.65
CCB 6	CB 2	16.14	250	0.049	0.79
CB 2	MH 1	14.53	300	0.071	1.03
CB 3	MAIN	3.14	250	0.049	0.15
CB 4	MH 2	8.21	250	0.049	0.40
MH 1	MH 2	44.32	525	0.216	9.59
				Total	16.14

Structure Storage ***115 Lusk St.***

	Base	Top	Height	diameter	X-sec Area	Volume
ECB 1	102.800	103.61	0.81	300	0.071	0.06
CCB 2	102.750	103.61	0.86	300	0.071	0.06
TCB 3	102.700	103.61	0.91	300	0.071	0.06
CCB 4	102.650	103.61	0.96	300	0.071	0.07
ECB 5	102.750	103.61	0.86	300	0.071	0.06
CCB 6	102.650	103.61	0.96	300	0.071	0.07
CB 1	102.050	103.45	1.40	600	0.360	0.50
CB 2	101.950	103.55	1.60	600	0.360	0.58
CB 3	102.050	103.45	1.40	600	0.360	0.50
CB 4	101.980	103.38	1.40	600	0.360	0.50
MH 1	101.677	103.70	2.02	1200	1.131	2.29
MH 2	101.395	103.49	2.10	1200	1.131	2.37
					Total	7.12

TOTAL STORAGE	**23.27**

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

PROJECT:	115 Lusk Street
DATE:	2020-03-06
FILE:	122508-6.2
REV #:	-
DESIGNED BY:	W.Z.
CHECKED BY:	D.G.Y.

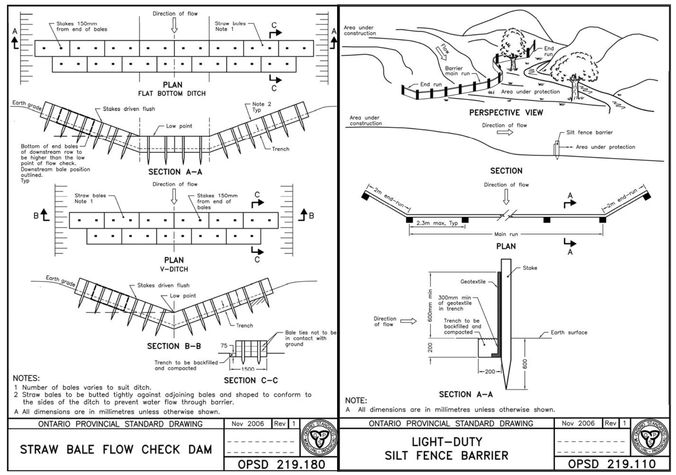
ORIFICE SIZING

Orifice coefficients	
Cv =	0.60
Cv =	0.65

							Theoretical		Recommended	
	Invert	Diameter	Centre ICD	Max. Pond Elevation	Hydraulic Slope	Target Flow	Orifice	Actual Flow	Orifice	Actual Flow
	(m)	(mm)	(m)	(m)	(m)	(l/s)	(m)	(l/s)	(m)	(l/s)
Area 1	101.395	300	101.545	103.63	2.085	59.425	0.124	59.42	0.124	59.425
						59.425				**59.425**

APPENDIX D

122508-900 - Erosion and Sediment Control Plan
122508-200 - Grading Plan
Geotechnical Report

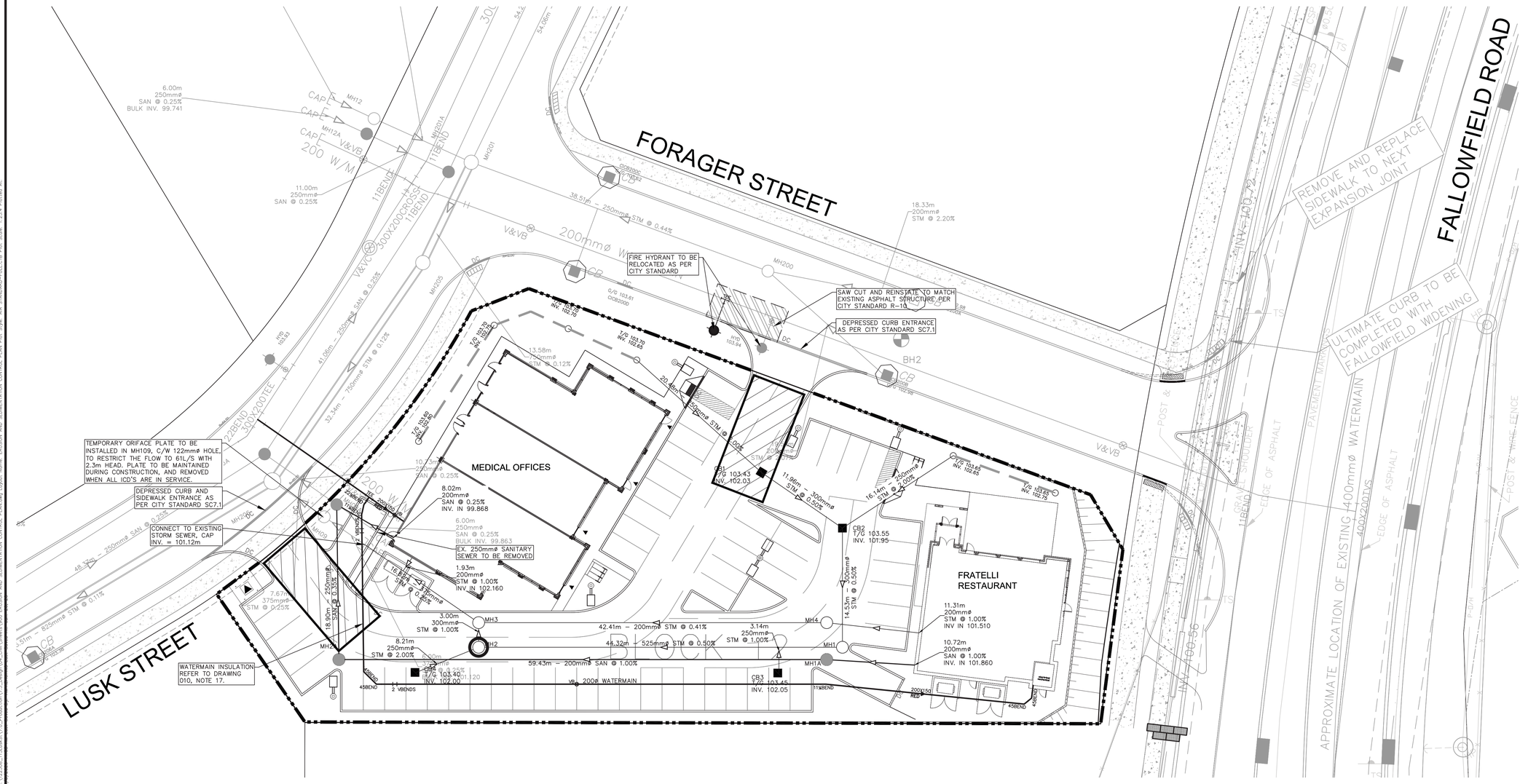


ONTARIO PROVINCIAL STANDARD DRAWING	Nov 2006	Rev 1
STRAW BALE FLOW CHECK DAM		OPSD 219.180

ONTARIO PROVINCIAL STANDARD DRAWING	Nov 2006	Rev 1
LIGHT–DUTY SILT FENCE BARRIER		OPSD 219.110

NOTES:

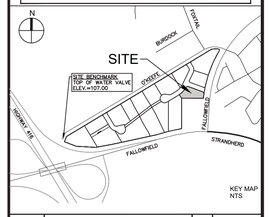
1. SILT FENCE TO BE ERECTED PRIOR TO EARTH WORKS BEING COMMENCED. SILT FENCE TO BE MAINTAINED UNTIL VEGETATION IS ESTABLISHED OR UNTIL START OF SUBSEQUENT PHASE.
2. STRAW BALE SEDIMENT TRAPS TO BE CONSTRUCTED IN EXISTING ROAD SIDE DITCHES. TRAPS TO REMAIN AND BE MAINTAINED UNTIL VEGETATION IS ESTABLISHED.
3. SILT SACK TO BE PLACED AND MAINTAINED UNDER COVER OF ALL CATCHBASINS. GEOTEXTILE SILT SACK IN STREET CBs TO REMAIN UNTIL ALL CURBS ARE CONSTRUCTED. GEOTEXTILE FABRIC IN RYCBs TO REMAIN UNTIL VEGETATION IS ESTABLISHED. ALL CATCHBASINS TO BE REGULARLY INSPECTED AND CLEANED, AS NECESSARY, UNTIL SOD AND CURBS ARE CONSTRUCTED.
4. WORKS NOTED ABOVE ARE TO BE INSTALLED, INSPECTED, MAINTAINED AND ULTIMATELY REMOVED BY SERVICING CONTRACTOR.
5. THIS IS A "LIVING DOCUMENT" AND MAY BE MODIFIED IN THE EVENT THE PROPOSED CONTROL MEASURES ARE INSUFFICIENT



LEGEND :

- LIGHT DUTY SILT FENCE AS PER OPSD-219.110
- SNOW FENCE
- STRAW BALE CHECK DAM AS PER OPSD-219.180
- ROCK CHECK DAM AS PER OPSD-219.210
- SILT SACK PLACED UNDER EXISTING CB COVER
- TEMPORARY MUD MAT 0.15m THICK 50mm CLEAR STONE ON NON WOVEN FILTER CLOTH (2.0 × 15.0)

SEE 010 FOR NOTES, LEGEND, CB TABLE AND DETAILS



No.	REVISIONS	By	Date
14			
13			
12			
11			
10			
9			
8			
7			
6			
5			
4			
3			
2			
1	ISSUED FOR SPA	DGY	2020.03.06

DCR/PHOENIX GROUP OF COMPANIES
18A BENTLEY AVE,
OTTAWA ONT
K2E 6T8

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

Project Title
115 LUSK STREET

LICENSED PROFESSIONAL ENGINEER
D. G. Yannoulopoulos
2020/03/06
PROVINCE OF ONTARIO

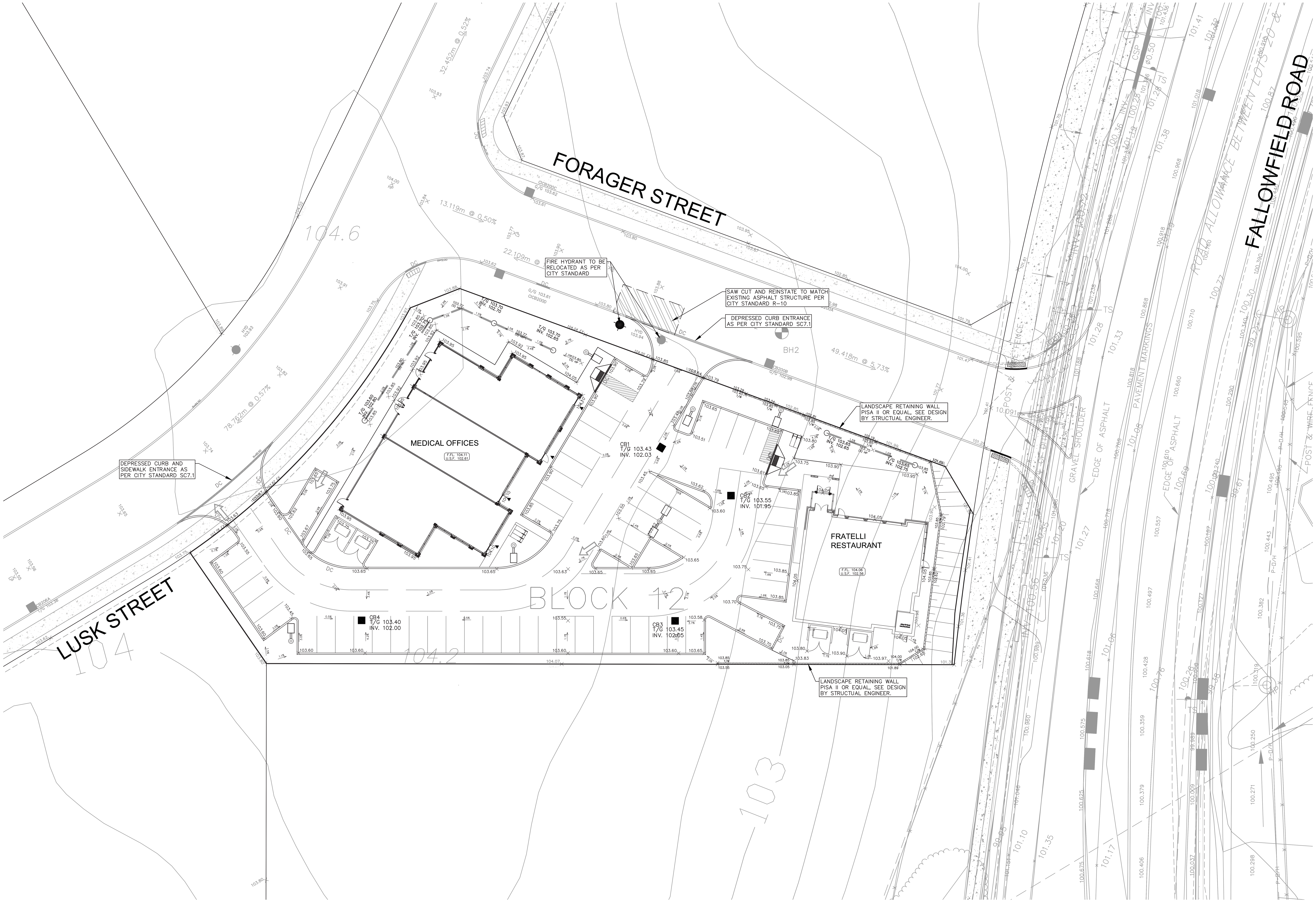
N

Drawing Title
EROSION AND SEDIMENTATION CONTROL PLAN

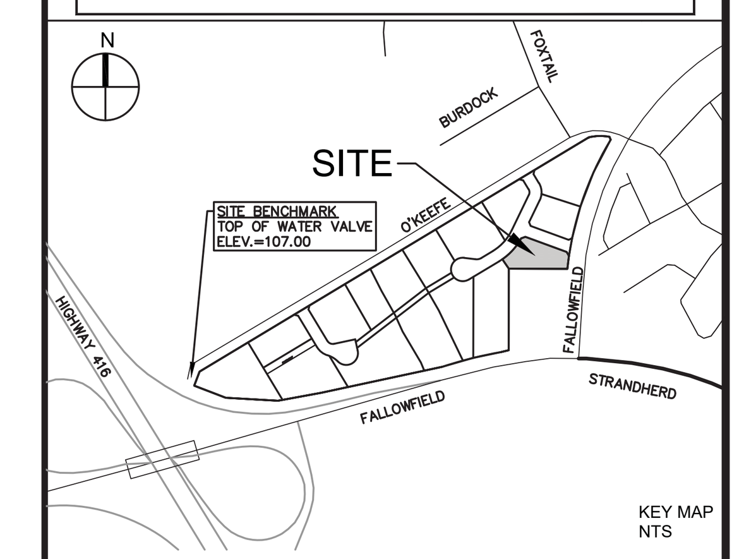
Scale
1:250

Design	Date
WZ/RM	NOVEMBER 2019
Drawn	Checked
EH	DGY
Project No.	Drawing No.
122508	900

CITY FILE No. ##### CITY PLAN No.#####



SEE 010 FOR NOTES, LEGEND, CB TABLE AND DETAILS



No.	REVISIONS	By	Date
14			
13			
12			
11			
10			
9			
8			
7			
6			
5			
4			
3			
2			
1	ISSUED FOR SPA	DGY	2020:03:06

DCR/PHOENIX GROUP OF COMPANIES
18A BENTLEY AVE,
OTTAWA ONT
K2E 6T8

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

Project Title

115 LUSK STREET

LICENSED PROFESSIONAL ENGINEER
D. G. Yannoulopoulos
2020/03/06
PROVINCE OF ONTARIO

N

Drawing Title

GRADING PLAN

Scale

1:250

Design	Date
WZ/RM	NOVEMBER 2019
Drawn	Checked
EH	DGY
Project No.	Drawing No.
122508	200

CITY PLAN No. ####

CITY FILE No. ####

Kollaard Associates
Engineers
210 Prescott Street, Unit 1
P.O. Box 189
Kemptville, Ontario K0G 1J0

Civil • Geotechnical •
Structural • Environmental •
Hydrogeology
(613) 860-0923
FAX: (613) 258-0475

June 17, 2013 130399

DCR Phoenix Homes
18 Bentley Avenue
Nepean, Ontario
K0A 2Z0

Attention: Mr. Mike Boucher

RE: ADDITIONAL GEOTECHNICAL GUIDELINES
PROPOSED CHANGE OF USE FROM RESIDENTIAL AND COMMERCIAL DEVELOPMENT TO BUSINESS PARK INDUSTRIAL ZONE
O'KEEFE COURT AND FALLOWFIELD ROAD
OTTAWA, ONTARIO

Dear Sirs:

This letter is intended to provide additional guidelines for the proposed development at the site between O'Keefe Court and Fallowfield Road in the City of Ottawa, Ontario further to the preliminary subsurface investigation in August 2006 and additional subsurface investigation in March 2008. Based on information provided by Ms. Meredith Lynes, a planner for MMM Group Limited, the proposed development for the site will change from residential and commercial development to commercial/business park development.

Kollaard Associates previously completed the preliminary subsurface investigation report and additional subsurface investigation letter for a development at the above location consisting of proposed residential and commercial development. Since the preparation of that report and letter, it is understood that revised plans for development have been made to consist of Commercial / Business Park Development, including office uses, hotel and associated secondary uses, and a place of worship. The proposed developments seek to include building structures between 4 to 12 storeys in height. In view of the proposed development changes, the City of Ottawa requested that a review of the geotechnical investigations provided by Kollaard Associates be carried out to verify if the proposed development changes might influence the conclusions of the geotechnical reports.

Soil Background Information

The results of the above mentioned preliminary subsurface investigation and additional subsurface investigation letter are provided in the Kollaard Associates Inc. Report No. 060445, entitled "Preliminary Subsurface Investigation, Proposed Residential and Commercial Development, O'Keefe Court and Fallowfield Road, Ottawa, Ontario", dated August 2006 and Additional Subsurface Investigation, Report No. 080069, Proposed Residential and Commercial Development, O'Keefe Court and Fallowfield Road, Ottawa, Ontario, dated March 5, 2008 should be read in conjunction with this present letter. That report and letter indicate, in general, the site is underlain by shallow bedrock, glacial till and silty clay. Based on the results of the test pits and boreholes put down at the site for the investigations, the silty clay is stiff to very stiff in consistency. Beneath the silty clay, both boreholes encountered a deposit of glacial till. The glacial till is in a loose to compact state of packing. Refusal to auger advancement and/or practical refusal was encountered on the surface of bedrock or on large boulders within the boreholes and test pits at depths ranging between about 1.3 to 5.5 metres below the existing ground surface.

Geotechnical Considerations

A review of a planning rationale for this project was provided by Ms. Meredith Lynes, planner for MMM Group Limited. The planning rationale illustrated a proposed plan of subdivision along with a height strategy figure that identifies proposed building heights within each proposed lot within the business park. The review of the planning rationale provided general development information that could influence design considerations from a geotechnical point of view.

As such, Kollaard Associates considers that the following letter provide supplemental Geotechnical Guidelines for the proposed changes to the development at the above noted site.

Proposed Commercial / Business Park Development

Foundations for Proposed Commercial Buildings

From a geotechnical point of view, with the exception of the fill materials and topsoil, the subsurface conditions, in general, encountered at the test pits and boreholes advanced during the investigations are suitable for the support of the proposed commercial buildings on conventional spread footing foundations bearing on either the overburden or the underlying bedrock. It is considered that the excavations for the foundations should be taken down through any surficial fill, topsoil or otherwise deleterious material to expose the undisturbed silty clay, glacial till and/or bedrock.

For the proposed commercial buildings founded beneath the fill and topsoil on the undisturbed native silty clay or glacial till a maximum allowable bearing pressure of 150 kilopascals for serviceability limit states and 350 kilopascals for the factored ultimate bearing resistance.

For the proposed commercial buildings founded beneath the fill and topsoil on the undisturbed bedrock or on engineered fill placed on bedrock an allowable bearing pressure of 500 to 800 kilopascals for serviceability limit states and 1500 kilopascals for the factored ultimate bearing resistance may be used for both strip and pad footings.

As the types of developments and foundation requirements have not been determined at this stage, These preliminary allowable bearing pressures and factored ultimate bearing resistances are subject to changed with more detailed, site specific geotechnical investigations for site specific design purposes.

Seismic Design for the Proposed Commercial Buildings

Based on the limited information from the test pits and the boreholes put down at the site and from information obtained from adjacent sites, for seismic design purposes, in accordance with the 2006 OBC Section 4.1.8.4, Table 4.1.8.4.A., the site classification for seismic site response is Site Class A or B. For building permit application purposes, site specific investigations should be carried out to confirm the seismic site response for each lot.

Site Services
No changes

Roadways
No changes

Construction Considerations
No changes

Conclusions

In summary, Kollaard Associates has considered the proposed changes to the development as indicated by MMM Group Limited from a geotechnical point of view. Kollaard Associates considers the proposed Commercial / Business Park Development is feasible from a geotechnical point of view. Kollaard Associates strongly suggests that additional subsurface investigations be carried out on a site per site basis for the final design of each of the proposed buildings.

We trust this letter provides sufficient information for your purposes. If you have any questions concerning this letter please do not hesitate to contact our office.

Yours truly,

Kollaard Associates Inc.

Dean Tataryn, B.E.S, EP.

Reviewed by Steve deWit, P. Eng.

14712 3.9

Kollaard Associates
Engineers
215 Sanders Street, Unit 1
P.O. Box 189
Kemptville, Ontario K0G 1J0

Civil • Geotechnical •
Structural • Environmental •
Industrial Health & Safety

(613) 860-0923

FAX: (613) 258-0475

August 10, 2006

060445

Phoenix Homes
18 Bentley Avenue
Nepean, Ontario
K2E 6T8

Attention: Mr. Bill Buchanan

RE: PRELIMINARY SUBSURFACE INVESTIGATION
PROPOSED RESIDENTIAL AND
COMMERCIAL DEVELOPMENT
O'KEEFE COURT AND FALLOWFIELD ROAD
OTTAWA, ONTARIO

Dear Sirs:

This report presents the results of a preliminary subsurface investigation carried out at the site of the proposed residential and commercial development between O'Keefe Court and Fallowfield Road in the City of Ottawa, Ontario. The purpose of the investigation was to determine the general subsurface conditions at the site by means of a limited number of test pits and, based on the factual information obtained, to provide engineering guidelines on the geotechnical aspects of the preliminary design of the project, including construction considerations, which could influence design decisions.

PROJECT DESCRIPTION AND SITE

The development site in question consists of about a 10 hectare, triangular shaped property located on the south side of O'Keefe Court and bordered on the southeast and southwest by Fallowfield

Road, in the City of Ottawa, Ontario (see Key Plan, Figure 1). It is understood that a yet determined portion of the site will be developed for the construction of single family dwellings and/or rowhouses with the remaining portion used for commercial development. The dwellings are likely to be of wood frame construction with full depth conventional concrete foundations. Details regarding the proposed commercial development at the site was not available at the time of this report. The development will be provided with full municipal services and local roadways.

The ground surface across the site is relatively flat with most of the site being open grassed fields with scattered young trees and shrubs. Wooded areas exist at the west end of the site and in the central portion of the site near the south property line. A water course runs north/south through about the middle of the site

Based on a review of the surficial geology map for the site area and the results of previous geotechnical investigations carried out in proximity of the site, it is expected that the site is underlain by glacial till deposits in the east portion and marine deposited sensitive silty clay over glacial till in the west.

SUBSURFACE INVESTIGATION

The fieldwork for this investigation was carried out on July 7, 2006 at which time twenty test pits were put down across the site. The test pits were advanced to depths of some 0.6 to 3.8 metres below the existing ground surface. The subsurface conditions encountered in the test pits were classified based on visual and tactile examination of the materials exposed on the sides and bottom of the test pits. In situ vane shear testing was carried out within the softer portions of silty clay material encountered to measure the undrained shear strength of that material. The groundwater conditions were observed in the open test pits at the time of excavating.

The field work was supervised throughout by a member of our field engineering staff who directed the test pitting operation, cared for the samples obtained and logged the test pits.

A detailed account of the subsurface conditions encountered at each of the test pits is provided in the attached Table I Record of Test Pits following the text of this report. The approximate locations of the test pits are shown on the Site Plan, Figure 2.

SUBSURFACE CONDITIONS

General

As previously indicated, the soil and groundwater conditions encountered at the test pits put down for this investigation are given in Table 1 Record of Test Pits following the text of this report. The test pit logs indicate the subsurface conditions at the specific test locations only. Boundaries between zones on the logs are often not distinct, but rather are transitional and have been interpreted. Subsurface conditions at other than the test pit locations may vary from the conditions encountered in the test pits. In addition to soil and bedrock variability, fill of variable physical and chemical composition may be present over portions of the site.

The soil and bedrock descriptions in this report are based on commonly accepted methods of classification and identification employed in geotechnical practice. Classification and identification of soil involves judgement and Kollaard Associates Inc. does not guarantee descriptions as exact, but infers accuracy to the extent that is common in current geotechnical practice.

The groundwater conditions described in this report refer only to those observed at the location and date of observations noted in the report and on the test pit logs. Groundwater conditions may vary seasonally, or may be affected by construction activities on or in the vicinity of the site.

The following presents an overview of the subsurface conditions encountered in the test holes advanced during this investigation.

Fill

Test pits 8 to 20 inclusive encountered a layer of fill from the surface. At the test pit locations the fill is some 0.3 to 2.7 metres in thickness and in general consists of grey brown silty clay, sand, gravel, and cobbles with topsoil, concrete, asphaltic concrete, bricks and wire.

Topsoil

From the surface or beneath the fill materials all of the test pits except test pits 8 and 9 encountered a layer of topsoil. The topsoil thickness varies across the site and ranges in thickness from about 0.1 to 0.5 metres at the test pit locations. The material was classified as topsoil based on colour and the presence of organic materials and is intended as identification for geotechnical purposes only and does not constitute a statement as to the suitability of this layer for cultivation and sustaining plant growth.

Sand/Silty Sand

Beneath the fill materials or topsoil, test pits 4, 5, 6, 7 and 14 encountered a layer of red brown to yellow brown sand to silty sand. The sand/silty sand layer is some 0.4 to 0.7 metres in thickness at the test pits. The sand/silty sand layer was full penetrated at the test pit locations at depths of some 0.7 to 1.8 metres below the existing ground surface.

Silty Clay

A deposit of grey brown to grey silty clay was encountered beneath the fill, topsoil, sand and/or silty sand at test pits 2, 3 and 9 to 19 inclusive. Where fully penetrated at test pits 2, 3, 10 and 19 the silty clay deposit is some 0.2 to 1.5 metres in thickness. Test pits 9 and 11 to 18 were terminated in the silty

clay material at depths of some 3.2 to 3.8 metres below the existing ground surface. In situ vane shear tests were carried out in the softer silty clay material encountered and gave undrained shear strength values ranging from 52 to 110 kilopascals indicating a stiff to very stiff consistency.

Glacial Till

Beneath the fill, topsoil, sands and/or silty clay test pits 1 to 8 inclusive and 10, 19 and 20 encountered a deposit of yellow brown to grey brown glacial till. The glacial till consists of gravel, cobbles and

boulders in a matrix of silty sand with a trace to some clay. All of the test pits, except test pit 8, were terminated in the glacial till at depths of some 1.3 to 3.3 metres below the existing ground surface. Based on tactile examination of the glacial till in the walls and bottom of the test pits and on the difficulty to advance the test pits in the glacial till it is considered that the glacial till is in a compact to dense state of packing.

Bedrock

Bedrock was encountered beneath the glacial till at test pit 8 at a depth of about 0.6 metres below the existing ground surface.

Groundwater

Seepage was encountered into most of the test pits during excavating on July 7, 2006 at depths of about 1.4 to 3.3 metres below the existing ground surface. It should be noted that the groundwater levels may be higher during wet periods of the year such as the early spring.

PROPOSED RESIDENTIAL AND COMMERCIAL DEVELOPMENT

General

This section of the report provides engineering guidelines on the geotechnical aspects of the project based on our interpretation of the test hole information and project requirements. It is stressed that the information in the following sections is provided for the guidance of the designers for the preliminary design of the project and is intended for this project only. Contractors bidding on or undertaking the works should examine the factual results of the investigation, satisfy themselves as to the adequacy of the information for construction, and make their own interpretation of the factual data as it affects their construction techniques, schedule, safety and equipment capabilities.

The professional services retained for this project include only the geotechnical aspects of the subsurface conditions at this site. The presence or implications of possible surface and/or subsurface

contamination resulting from previous uses or activities at this site or adjacent properties, and/or resulting from the introduction onto the site from materials from off site sources are outside the terms of reference for this report and have not been investigated or addressed.

Foundations for Proposed Rowhouses, Single Family Dwellings and Commercial Buildings

From a geotechnical point of view with regards to preliminary foundation design, the site can be divided into three areas: east, central and west, respectively. The east and west areas are represented by test pits 1 to 8 , 10, 19 and 20. The east and west areas are underlain by native materials consisting of relatively thin layers of sands and silty clay overlying glacial till or bedrock. The central area is represented by test pits 9 and 11 to 18. The central area is underlain by a significant layer of fill materials together with a deposit of silty clay. Due to the combined thickness of the fill materials and silty clay deposit the total thickness of the silty clay was not penetrated at the test pits in the central area.

East and West Areas

For the proposed rowhouses, single family dwellings and light commercial buildings founded beneath the fill and topsoil in the undisturbed, sands, silty clay, glacial till or bedrock, or on engineered fill used to replace existing fill materials, a maximum allowable bearing pressure of 150 kilopascals may be used for preliminary design of footings using the total dead and live loads which will be carried by the footings. Provided that any loose and disturbed soil is removed from the bearing surfaces prior to pouring concrete, the settlement of the footings should be less than 25 millimetres.

No grade raise restrictions adjacent to foundations or limit for footing size are necessary for the east and west areas from a geotechnical point of view.

For seismic design purposes for the east and west areas a foundation factor, F, of 1.0 should be used in accordance with the 1997 OBC Section 4.1.9.1, Table 4.1.9.1.C.

Central Area

The central area is characterized by a surficial layer of fill materials typically some 1.0 to 2.7 metres in thickness and an underlying deposit of silty clay of unknown total thickness. For areas underlain by silty clay it is usual that footing size and the height of landscape fill adjacent to foundations would be restricted and that the allowable bearing pressure for foundation design would be limited. The limited information obtained from the test pits indicate that the silty clay deposit within the central area is stiff to very stiff in consistency and based on that information the design of foundations would be similar as indicated above for the east and west areas. However, in view of the unknown depth of the silty clay deposit and that silty clay deposits typically decrease in strength with depth, it is possible that firm to soft silty clay exists within the central area. Should soft to firm silty clay exist, it will likely have a restrictive affect on the design of foundations and allowable landscape grade raises adjacent to foundations within the central area Accordingly, it is considered that information on the

thickness and consistency of the silty clay deposit within the central area should be determined prior to final design planning.

All exterior footings and those in any unheated parts of the structures at this site should be provided with at least 1.5 metres of earth cover for normal frost protection purposes. Where it is not possible to provide at least 1.5 metres of earth cover, frost protection should be provided with the use of a suitable rigid insulation. All structures with a basement should be provided with a conventional, perforated perimeter exterior drain within a 150 millimetre thick surround of 20 millimetre minus crushed stone installed at founding level and positively drained to a storm sewer.

For predictable performance of concrete floor slabs on grade all exiting fill and topsoil and any deleterious materials should be removed from within the proposed building areas. The subgrade should then be inspected by geotechnical personnel and any soft of loose areas observed should be subexcavated and replaced with suitable granular materials. Material used to raise the approved subgrade to within 150 millimetres of the underside of the concrete slab should consist of sand or sand and gravel meeting the Ontario Provincial Standards Specifications (OPSS) for Granular B Type I or crushed stone meeting OPSS grading requirements for Granular B Type II. A 150 millimetre base course of OPSS Granular A should be provided immediately beneath the floor slab. All of the granular materials should be placed in maximum 250 millimetre thick loose lifts and be compacted to at least 95 percent of the standard Proctor maximum dry density for the materials used.

The native soils at this site are considered to be highly frost susceptible. As such, to prevent possible foundation frost jacking, the backfill against unheated walls or isolated walls or piers should consist of free draining, non-frost susceptible material such as sand or sand and gravel meeting OPSS

Granular B Type I grading requirements. Alternatively, foundations could be backfilled with native material in conjunction with the use of an approved proprietary drainage layer system against the foundation wall. It is pointed out that there is potential for possible frost jacking of the upper portion of some types of these drainage layer systems if frost susceptible material is used as backfill. This

could be mitigated by using non-frost susceptible granular material for the upper about 0.6 metre portion of backfill.

Where the backfill will ultimately support a pavement structure or walkway, it is suggested that the foundation wall backfill material be compacted in 250 millimetre thick lifts to 95 percent of the standard Proctor maximum dry density value.

In view of the substantial thickness of the existing fill materials at the site, it is expected that engineered fill will be required to replace the existing fill and raise the subgrade to proposed footing founding levels. In preparation for engineered fill construction all of the existing fill and topsoil, and any alluvium (in the area of the existing water course), should be removed to expose the underlying undisturbed native sand, silty clay or glacial. The engineered fill should consist of crushed stone meeting OPSS requirements for Granular A or Granular B Type II and should be compacted in maximum 200 millimetre thick lifts to at least 95 percent of the standard Proctor maximum dry density. To allow the spread of load beneath the footings, the engineered fill should extend down and out from the edges of the footings at 1 horizontal to 1 vertical, or flatter. The excavations for the structures should be sized to accommodate this fill placement. Currently, OPSS documents allow recycled asphaltic concrete to be used in Granular A and Granular B Type II materials. Since the source of recycled material cannot be determined, it is suggested that any granular materials used below founding level be composed of virgin material only.

Groundwater inflow from the native soils into the building excavations during construction, if any, should be handled by pumping from sumps within the excavations.

SITE SERVICES

Excavation

The excavations for the site services will be carried out through fill, topsoil, sands, silty clay, glacial till and depending on depths, possibly bedrock. The sides of the excavations in overburden materials

should be sloped in accordance with the requirements in Ontario Regulation 213/91 under the Ontario Occupational Health and Safety Act. That is, open cut excavations within overburden deposits should be carried out with side slopes of 1 horizontal to 1 vertical, or flatter. Where space constraints dictate, the excavation and backfilling operations should be carried out within a tightly fitting, braced steel trench box. If excavations extend below the water table in silty sand or sandy soil, some loss of ground and groundwater inflow may occur, requiring flatter side slopes to be used. Cobbles and boulders, some of which could be large may exist within the glacial till.

Bedrock was encountered in test pit 8 at about 0.6 metres depth and practical refusal was encountered in most of the test pits in the east area of the site at depths of about 2.6 to 3.1 metres below the existing ground surface. As such, it is expected that bedrock may be encountered during excavating for site services. Small amounts of bedrock removal, if required, can most likely be carried out by hoe ramming. If larger amounts of bedrock removal are required it may be more economically feasible to use drill and blasting techniques and should be carried out under the supervision of a blasting specialist engineer. Monitoring of the blasting should be carried out throughout the blasting period to ensure that the blasting meets the limiting vibration criteria established by the specialist engineer. Pre-blast condition surveys of nearby structures and existing utilities are essential.

Groundwater seepage into the excavations, if any, should be handled by pumping from sumps in the excavation.

Pipe Bedding and Cover Materials

It is suggested that the service pipe bedding material consist of at least 150 millimetres of granular material meeting OPSS requirements for Granular A. A provisional allowance should, however, be made for sub-excavation of any disturbed material encountered at subgrade level. Granular material meeting OPSS specifications for Granular B Type II could be used as a sub-bedding material. The use of clear crushed stone as a bedding or sub-bedding material should not be permitted.

Cover material, from pipe spring line to at least 300 millimetres above the top of the pipe, should consist of granular material, such as OPSS Granular A or Granular B Type I (with a maximum particle size of 25 millimetres).

The sub-bedding, bedding and cover materials should be compacted in maximum 200 millimetre thick lifts to at least 95 percent of the standard Proctor maximum dry density using suitable vibratory compaction equipment.

Trench Backfill

The general backfilling procedures should be carried out in a manner that is compatible with the future use of the area above the service trenches.

In areas where the service trench will be located below or in close proximity to existing or future roadway areas, acceptable native materials should be used as backfill between the roadway subgrade level and the depth of seasonal frost penetration (i.e., 1.8 metres below finished grade) in order to reduce the potential for differential frost heaving between the area over the trench and the adjacent section of roadway. Where native backfill is used, it should match the native materials exposed on the trench walls. Backfill below the zone of seasonal frost penetration could consist of either acceptable native material or imported granular material conforming to OPSS Granular B Type I. In general, the existing fill materials could be used as trench backfill provided all deleterious materials such as any soft clay, topsoil, large boulders, asphaltic concrete , wood, wire, styrofoam, etc. are culled prior to use.

The silty clay and glacial till overburden deposits at this site are sensitive to changes in moisture content. In addition, some of the native materials from the lower part of the trench excavations may be wet of optimum for compaction. Depending on the weather conditions encountered during construction, some drying of materials and/or recompaction may be required. Any wet materials

that cannot be compacted to the required density should either be wasted from the site or should be used outside of existing or future roadway areas.

To minimize future settlement of the backfill and achieve an acceptable subgrade for the roadways, sidewalks, etc., the trench backfill should be compacted in maximum 300 millimetre thick lifts to at least 95 percent of the standard Proctor maximum dry density. The specified density may be reduced where the trench backfill is not located below or in close proximity to existing or future roadways, driveways, sidewalks, or any other type of permanent structure.

The permanent lowering of the groundwater level at the site can be caused by drainage through the granular bedding/backfill within the sewer trenches. Groundwater lowering can cause stress within any softer silty clay materials which may underlie a portion of the site and in turn result in settlement of underlying footings/foundations. To minimize the possibility of groundwater lowering at this site due to the presence of the proposed sewers, it is considered that clay dykes should be provided within sewer trenches at about 150 metre spacing. Details for construction of the proposed clay dykes are shown in the attached Figure 3.

ROADWAYS

Subgrade Preparation

In preparation for roadway construction, the topsoil and any soft, wet or deleterious material should be removed from the roadway area. It may be possible to leave in place any existing fill materials provided that they do not contain significant amounts of organic or deleterious materials and that the materials have been inspected and approved by the geotechnical engineer. The subgrade surface should then be proof rolled with a large steel drum roller and inspected and approved by geotechnical personnel. Any soft areas evident from the proof rolling should be subexcavated and replaced with suitable earth borrow material.

Fill sections along the proposed roadway should be brought up to proposed roadway subgrade level using acceptable earth borrow material. The earth borrow should be placed in maximum 300 millimetre thick lifts and should be compacted to at least 95 percent of the standard Proctor maximum dry density using suitable compaction equipment.

The subgrade surface should be shaped and crowned to promote drainage of the roadway granulars.

Pavement Structure

It is suggested that provision be made for the following minimum pavement structure for local residential roadways:

80 millimetres of Asphaltic Concrete
(40 millimetres of HL3 over 40 millimetre of HL8), over

150 millimetres of OPSS Granular A base, over

300 millimetres of OPSS Granular B Type II subbase
(50 or 100 millimetre minus crushed stone)

Where the pavement structure will carry buses or heavy truck traffic, the subbase thickness should be increased to 450 millimetres and the asphaltic concrete thickness increased to 100 millimetres.

The pavement granular materials should be compacted in maximum 300 millimetre thick lifts to at least 100 percent of the standard Proctor maximum dry density using suitable vibratory compaction equipment.

In areas where the new pavement will abut existing pavement, the depths of the granular materials should taper up or down at 5 horizontal to 1 vertical, or flatter, to match the depths of the granular material(s) exposed in the existing pavement.

The above pavement structure assumes that the trench backfill is adequately compacted and that the roadway subgrade surface is prepared as described in this report. If the roadway subgrade surface is disturbed or wetted due to construction operations or precipitation, the granular thicknesses given above may not be adequate and it may be necessary to increase the thickness of the Granular B Type II subbase and/or to incorporate a non-woven geotextile separator between the roadway subgrade surface and the granular subbase material. The adequacy of the design pavement thickness should be assessed by geotechnical personnel at the time of construction.

TREE PLANTING

It should be noted that any soft silty clay soils at the site are highly sensitive to water depletion by trees of high water demand during periods of dry weather. When trees draw water from the silty clay, the silty clay undergoes shrinkage which can result in settlement of adjacent structures. The zone of influence of a tree is considered to be approximately equal to the mature height of the tree. Therefore trees, which have a high water demand, should not be planted closer to structures than the ultimate height of the trees. Table II provides a list of the common trees in decreasing order of water demand and, accordingly, decreasing risk of potential effects on structures.

WATER COURSE SLOPE STABILITY EVALUATION

As mentioned above a water course exists running north/south through about the centre of the site. A reconnaissance of the slopes of the water course was carried out to observe the general condition of the slopes. At the time of the reconnaissance visit the height and inclination of the water course slopes were measured using a hand clinometre and level and the degree of erosion of the water course channel was observed. The results of the measurements indicate that the water course slopes are typically some 3.5 metres high and inclined at about 10 to 15 degrees to the horizontal on the east side and some 2. metres high and inclined at about 10 to 12 degrees to the horizontal on the west side The water course channel walls are near vertical and some 1 to 1.5 metres high. A relatively wide flood plain exists between the water course channel and the toe of the slopes. The slopes

including the relatively steep water course channel walls are well vegetated. Some minor localized erosion of the water course channel walls was observed.

Based on the results of the slope reconnaissance it is considered that the water course side slopes are stable and have a factor of safety greater than 1.5. In view of the stable condition of the slopes and the minor erosion conditions, no construction set back from the crest of the existing water course slopes is considered necessary for the design of the proposed development.

ADDITIONAL INVESTIGATION AND CONSTRUCTION OBSERVATIONS

As indicated above it is considered that the central portion of the site may be underlain by softer silty clay materials. Accordingly, prior to final design planning it is strongly suggested that additional subsurface investigation be carried out by means of a series of boreholes to determine if any soft or firm silty clay exists at depth in the central area of the site.

In view of the relatively wide spacing between test pits and the substantial thickness of fill encountered at the site, it is suggested that additional site specific investigations be carried out for the final design of each of the proposed commercial buildings.

The engagement of the services of the geotechnical consultant during construction is recommended to confirm that the subsurface conditions throughout the proposed development do not materially differ from those given in the preliminary and final reports and that the construction activities do not adversely affect the intent of the design.

All footing areas and any engineered fill areas for the proposed single family dwellings, rowhouses and commercial buildings should be inspected by Kollaard Associates Inc. to ensure that a suitable subgrade has been reached and properly prepared. The placing and compaction of any granular materials beneath the foundations should be inspected to ensure that the materials used conform to the grading and compaction specifications.

The subgrade surfaces for the site services and roadways should be inspected by geotechnical personnel. In situ density testing should be carried out on the service pipe bedding and backfill and the roadway granular materials.

The native soils at this site will be sensitive to disturbance from construction operations, from rainwater or snow melt, and frost. In order to minimize disturbance, construction traffic operating directly on the subgrade should be kept to an absolute minimum and the subgrade should be protected from below freezing temperatures.

We trust that this report provides sufficient information for your present purposes. If you have any questions concerning this information or if we can be of further assistance to you for the final design investigations at this site, please do not hesitate to contact our office.

Yours truly,

KOLLAARD ASSOCIATES INC.

C.R. Morey, P. Eng.

Attachments: Table I, Record of Test pits
Table II, Order of Water Demand for Common Trees
Figures 1 to 3

TABLE I

RECORD OF TEST PITS
PRELIMINARY GEOTECHNICAL INVESTIGATION
O'KEEFE COURT
CITY OF OTTAWA, ONTARIO

TEST PIT NUMBER	DEPTH (METRES)	DESCRIPTION
TP1	0.00 – 0.30	TOPSOIL
	0.30 – 1.32	Grey brown silty sand, some gravel, cobbles, boulders, trace clay (GLACIAL TILL)
	1.32	End of test pit
Test pit dry, July 7, 2006.		
TP2	0.00 – 0.33	TOPSOIL
	0.33 – 0.76	Very stiff grey brown SILTY CLAY
	0.76 – 2.80	Grey brown silty sand, some gravel, cobbles, boulders, trace clay (GLACIAL TILL)
	2.80	End of test pit, refusal on large boulder or bedrock
Water observed in test pit at about 2.8 metres below existing ground surface, July 7, 2006.		
TP3	0.00 – 0.38	TOPSOIL
	0.38 – 0.69	Very stiff grey brown SILTY CLAY
	0.69 – 2.60	Grey brown silty sand, gravel, cobbles, trace clay (GLACIAL TILL)
	2.60	End of test pit, refusal on large boulder or bedrock
Water observed in test pit at about 2.0 metres below existing ground surface, July 7, 2006.		

TABLE I (CONTINUED)

TEST PIT NUMBER	DEPTH (METRES)	DESCRIPTION
TP4	0.00 – 0.33	TOPSOIL
	0.33 – 0.74	Red brown SILTY SAND, some gravel, trace clay
	0.74 – 3.10	Grey brown silty sand, some gravel, cobbles, trace clay (GLACIAL TILL)
	3.10	End of test pit, refusal on large boulder or bedrock

Water observed in test pit at about 2.1 metres below existing ground surface, July 7, 2006.

TP5	0.00 – 0.30	TOPSOIL
	0.30 – 1.02	Red brown to yellow brown SILTY SAND, trace gravel
	1.02 – 3.00	Grey brown silty sand, some gravel, cobbles, boulders, trace clay (GLACIAL TILL)
	3.00	End of test pit, refusal on large boulder or bedrock

Water observed in test pit at about 1.4 metres below existing ground surface, July 7, 2006.

TP6	0.00 – 0.30	TOPSOIL
	0.30 – 1.00	Red brown fine SAND, trace silt, some gravel
	1.00 – 2.80	Grey brown silty sand, some gravel, cobbles (GLACIAL TILL)
	2.80	End of test pit, refusal on large boulder or bedrock

Test pit dry, July 7, 2006.

TABLE I (CONTINUED)

TEST PIT NUMBER	DEPTH (METRES)	DESCRIPTION
TP7	0.00 – 0.36	TOPSOIL
	0.36 – 0.79	Red brown fine SAND, trace gravel
	0.79 – 2.70	Grey brown silty sand, some gravel (GLACIAL TILL)
	2.70	End of test pit, refusal on large boulder or bedrock
Test pit dry, July 7, 2006.		
TP8	0.00 – 0.61	Topsoil, gravel, wire, asphaltic concrete (FILL)
	0.61	Refusal, BEDROCK
Test pit dry, July 7, 2006.		
TP9	0.00 – 0.28	Topsoil, gravel, cobbles, styrofoam, wood, clay tile, brick, asphaltic concrete, boulders (FILL)
	0.28 – 3.60	Very stiff grey brown SILTY CLAY
	3.60	End of test pit
Test pit dry, July 7, 2006.		

TABLE I (CONTINUED)

TEST PIT NUMBER	DEPTH (METRES)	DESCRIPTION
TP10	0.00 – 2.30	Grey brown silty clay, some topsoil, gravel, boulders, concrete, asphaltic concrete (FILL)
	2.30 – 2.40	TOPSOIL
	2.40 – 2.60	Very stiff grey brown SILTY CLAY
	2.60 – 3.30	Grey brown silty clay, some gravel, boulders (GLACIAL TILL)
	3.30	End of test pit

Test pit dry, July 7, 2006.

TP11	0.00 – 1.80	Grey brown silty clay, gravel, cobbles (FILL)
	1.80 – 1.90	TOPSOIL
	1.90 – 3.60	Very stiff grey brown SILTY CLAY
	3.60	End of test pit

Water observed in test pit at about 3.3 metres below existing ground surface, July 7, 2006.

TP12	0.00 – 2.74	Topsoil, clay, gravel, asphaltic concrete (FILL)
	2.74 – 2.90	TOPSOIL
	2.90 – 3.80	Stiff grey SILTY CLAY
	3.80	End of test pit

In Situ Undrained Shear Strength Test Results

Depth (metres)	Cu (kilopascals)
2.90	52

Water observed in test pit at about 3.5 metres below existing ground surface, July 7, 2006.

TABLE I (CONTINUED)

TEST PIT NUMBER	DEPTH (METRES)	DESCRIPTION
TP16	0.00 – 2.13	Topsoil, sand, clay, gravel, asphaltic concrete (FILL)
	2.13 – 2.44	TOPSOIL
	2.44 – 3.30	Stiff grey SILTY CLAY
	3.30	End of test pit

In Situ Undrained Shear Strength Test Results

Depth (metres)	Cu (kilopascals)
2.44	90

Water observed in test pit at about 2.7 metres below existing ground surface, July 7, 2006.

TP17	0.00 – 2.13	Grey brown silty sand, topsoil, cobbles, asphaltic concrete, wire, concrete, glass (FILL)
	2.13 – 2.44	TOPSOIL
	2.44 – 3.20	Grey SILTY CLAY
	3.20	End of test pit

Water observed in test pit at about 2.7 metres below existing ground surface, July 7, 2006.

TP18	0.00 – 2.13	Topsoil, clay, gravel, cobbles, boulders (FILL)
	2.13 – 2.60	TOPSOIL
	2.60 – 3.40	Grey SILTY CLAY
	3.40	End of test pit

Water observed in test pit at about 2.4 metres below existing ground surface, July 7, 2006.

TABLE I (CONTINUED)

TEST PIT NUMBER	DEPTH (METRES)	DESCRIPTION
TP13	0.00 – 1.90	Grey brown silty clay, topsoil, asphaltic concrete, brick (FILL)
	1.90 – 2.20	TOPSOIL
	2.20 – 3.50	Very stiff grey brown SILTY CLAY
	3.50	End of test pit

Water observed in test pit at about 2.6 metres below existing ground surface, July 7, 2006.

TP14	0.00 – 1.02	Topsoil, gravel, clay, asphaltic concrete, wood, brick (FILL)
	1.02 – 1.22	TOPSOIL
	1.22 – 1.83	Grey brown fine to medium SAND
	1.83 – 3.30	Very stiff grey brown SILTY CLAY
	3.30	End of test pit

Water observed in test pit at about 1.5 metres below existing ground surface, July 7, 2006.

TP15	0.00 – 2.10	Topsoil, clay, gravel, boulders, brick (FILL)
	2.10 – 2.20	TOPSOIL
	2.20 – 3.40	Very stiff grey SILTY CLAY
	3.40	End of test pit

In Situ Undrained Shear Strength Test Results

Depth (metres)	Cu (kilopascals)
3.40	110

Water observed in test pit at about 3.0 metres below existing ground surface, July 7, 2006.

TABLE I (CONTINUED)

TEST PIT NUMBER	DEPTH (METRES)	DESCRIPTION
TP19	0.00 – 1.22	Topsoil, sand, clay, gravel, boulders, wood (FILL)
	1.22 – 1.52	TOPSOIL
	1.52 – 2.01	Very stiff grey brown SILTY CLAY
	2.01 – 3.30	Grey brown silty sand, some clay, gravel, cobbles, boulders (GLACIAL TILL)
	3.30	End of test pit

Water observed in test pit at about 2.1 metres below existing ground surface, July 7, 2006.

TP20	0.00 – 0.48	Topsoil, gravel (FILL)
	0.48 – 0.79	TOPSOIL
	0.79 – 2.40	Yellow brown to grey brown silty sand, gravel, cobbles, trace clay (GLACIAL TILL)
	2.40	End of test pit

Test pit dry, July 7, 2006.

TABLE II

ORDER OF WATER DEMAND FOR COMMON TREES

Some common trees in decreasing order of water demand:

Broad Leaved Deciduous

Poplar
Alder
Aspen
Willow
Elm
Maple
Birch
Ash
Beech
Oak

Deciduous Conifer

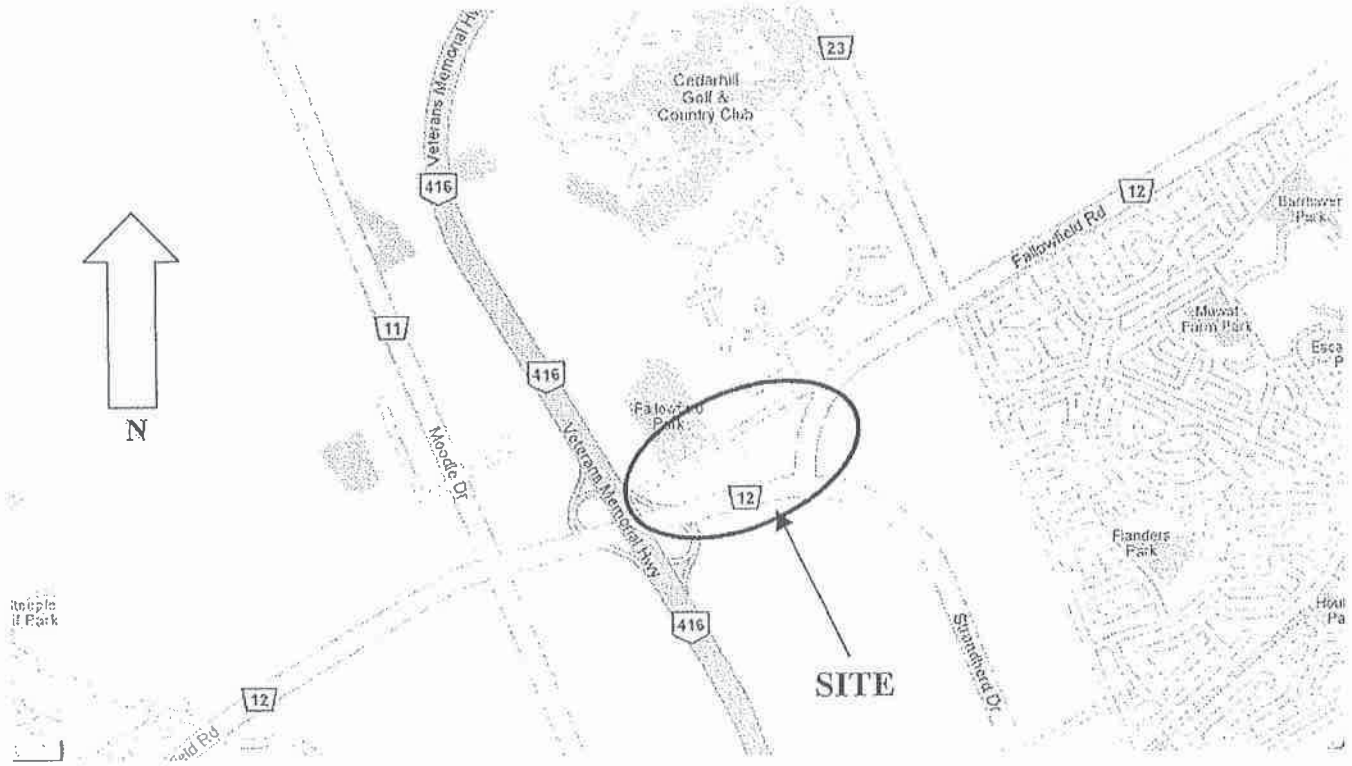
Larch

Evergreen Conifers

Spruce
Fir
Pine

KEY PLAN

FIGURE 1



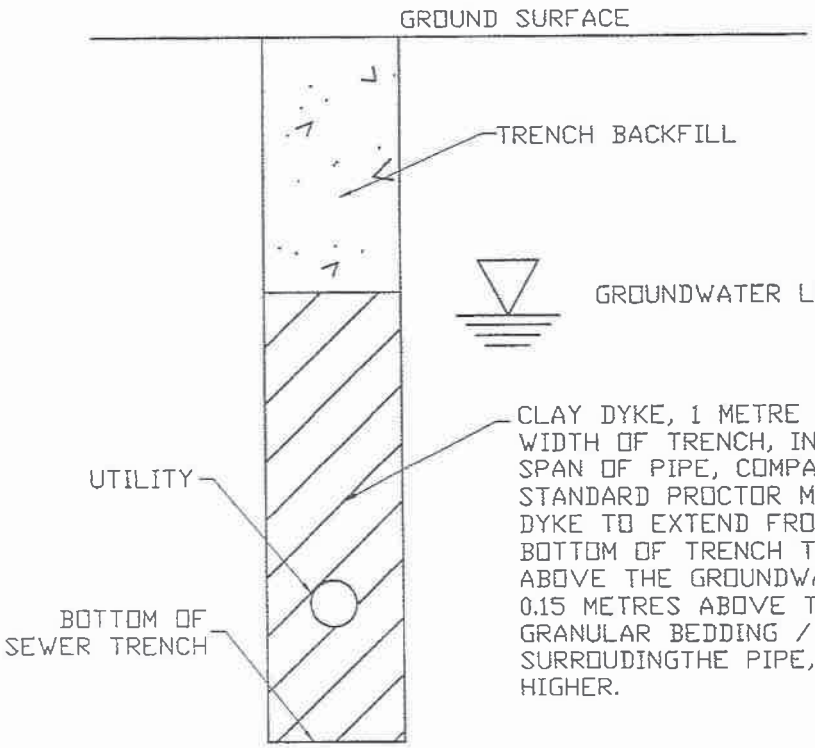
NOT TO SCALE

Kollaard Associates
Engineers

Project No. 060445

Date August 2006

FIGURE 3



REV.	NAME	DATE	DESCRIPTION

Kollaard Associates
Engineers
PO. BOX 189, 215 SANDERS ST
KEMPTVILLE ONTARIO
K0G 1J0 FAX (613) 258-0475
http://www.kollaard.ca
(613) 860-0923
info@kollaard.ca

CLIENT: PHOENIX HOMES

PROJECT: GEOTECHNICAL INVESTIGATION

LOCATION: O'KEEFE COURT AND FALLOWFIELD ROAD OTTAWA, ONTARIO

DESIGNED BY:	DATE:
DM	AUGUST 2006
DRAWN BY:	SCALE:
DM	NTS

KOLLAARD FILE NUMBER: 060445

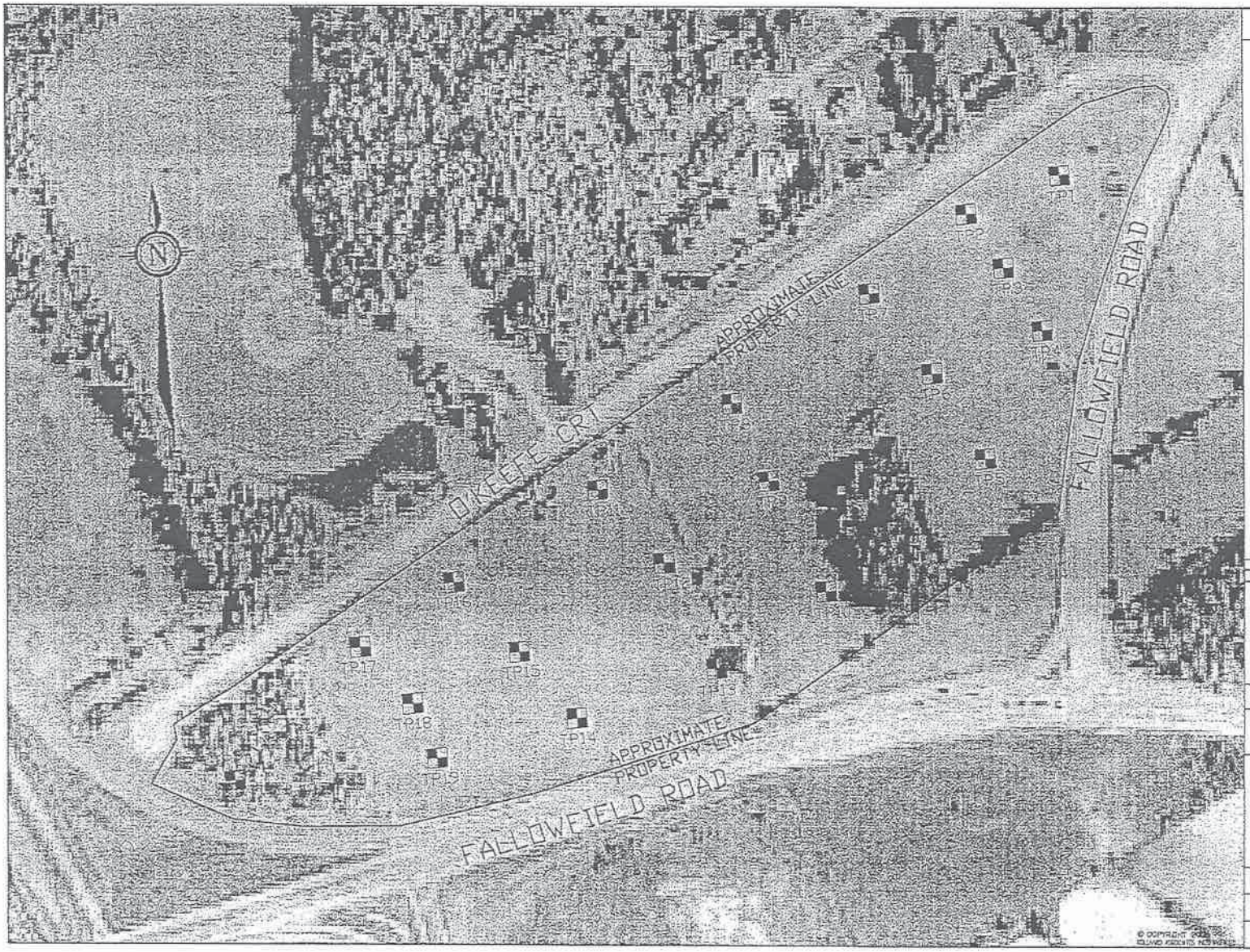


FIGURE 2

LEGEND

Approximate Test Pit Location

Plan supplied by City of Ottawa mapping website.

REV.	NAME	DATE	DESCRIPTION

Kollaard Associates
Engineers
PO. BOX 189, 215 SANDERS ST
KEMPTVILLE ONTARIO
K0G 1J0 FAX (613) 258-0475
http://www.kollaard.ca
(613) 860-0923
mail@kollaard.ca

CLIENT: PHOENIX HOMES

PROJECT: PRELIMINARY GEOTECHNICAL INVESTIGATION

LOCATION: O'KEEFE COURT CITY OF OTTAWA ONTARIO

DESIGNED BY:	DATE:
DT	JULY 28, 2005
DRAWN BY:	SCALE:
DM	1:2500

KOLLAARD FILE NUMBER: 050445

Kollaard Associates
Engineers
215 Sanders Street, Unit 1
P.O. Box 189
Kemptville, Ontario K0G 1J0

Civil • Geotechnical •
Structural • Environmental •
Industrial Health & Safety
(613) 860-0923
FAX: (613) 258-0475

March 5, 2008

080069

Phoenix Homes
18 Bentley Avenue
Nepean, Ontario
K2E 6T8

Attention: Mr. Bill Buchanan

RE: ADDITIONAL SUBSURFACE INVESTIGATION
PROPOSED RESIDENTIAL AND
COMMERCIAL DEVELOPMENT
O'KEEFE COURT AND FALLOWFIELD ROAD
OTTAWA, ONTARIO

Dear Sirs:

This letter presents the results of an additional subsurface investigation carried out at the site of the proposed residential and commercial development between O'Keefe Court and Fallowfield Road in the City of Ottawa, Ontario further to the preliminary subsurface investigation carried out at the site by Kollaard Associates Inc. in August 2006. The purpose of this present investigation was to check for the presence of any firm to soft silty clay in the area of the site identified during the preliminary subsurface investigation as underlain by a silty clay deposit.

BACKGROUND

The results of the above mentioned preliminary subsurface investigation are provided in the Kollaard Associates Inc. Report No. 060445, entitled "Preliminary Subsurface Investigation, Proposed Residential and Commercial Development, O'Keefe Court and Fallowfield Road, Ottawa, Ontario" dated August 2006. That report should be read in conjunction with this present letter.

A series of some 20 test pits were put down at the site for the previous subsurface investigation. Nine of those test pits, numbered 9 and 11 to 18, put down within the "central" portion of the site encountered silty clay material and were terminated in the silty clay at depths of some 3.2 to 3.8 metres below the existing ground surface. Although, the silty clay material is stiff in consistency to the depth encountered at the test pits, in view that the full depth of the silty clay was not penetrated and that silty clay deposits typically decrease in strength with depth, it was considered possible that firm to soft clay exits within the "central" area of the site.

PROCEDURE

To check for the presence of any firm to soft silty clay material within the "central portion" of the site, two boreholes were put down at the site on February 15, 2008, using a truck mounted drill rig supplied and operated by OGS Inc. of Almonte, Ontario. The boreholes, numbered 1 and 2, were advance to some 5.5 and 4.4 metres, respectively, below the existing ground surface. Borehole 1 was put down in close proximity of previous test pit 12 and borehole 2 was put down in close proximity of previous test pit 15, as shown on the attached site plan, Figure 1.

The boreholes were detailed sampled and tested below the level at which the adjacent previous test pits had been terminated, using a conventional 50 millimetre OD split spoon sampler in conjunction with standard penetration testing. A standpipe was installed in each of the boreholes for subsequent water level measuring and sampling.

Water levels were measured and water samples obtained at the standpipes on February 27, 2008. A water sample from each standpipe was delivered to Accutest Laboratories Ltd. in Ottawa, Ontario for sulphate testing.

A detailed account of the subsurface conditions encountered at the boreholes is provided in the attached Record of Borehole sheets.

SUBSURFACE CONDITIONS

General

As previously indicated, the soil and groundwater conditions encountered at the boreholes put down for this investigation are given on the attached Record of Borehole Sheets. The borehole logs indicate the subsurface conditions at the specific test locations only. Boundaries between zones on the logs are often not distinct, but rather are transitional and have been interpreted.

Silty Clay

As indicated above the boreholes were sampled and tested below about the level at which the adjacent previous test pits were terminated. Accordingly, borehole 1 was sampled and tested below about 4.0 metres depth and borehole 2 was sampled and tested below about 2.4 metres depth. Boreholes 1 and 2 encountered stiff to very stiff, grey brown to grey silty clay to depths of some 4.0 to 5.0 metres and 2.4 to 3.4 metres, respectively below the existing ground surface.

Glacial Till

Beneath the silty clay both of the boreholes encountered a deposit of glacial till. The glacial till consist of gravel, cobbles and boulders in a matrix of silty sand with a trace of clay. Standard penetration tests carried out in the glacial till material gave values of 8 and 37 blows for 0.3 metres, indicating a loose to compact state of packing.

Borehole 2 was terminated in the glacial till at depth of about 4.4 metres below the existing ground surface. Borehole 1 was terminated at a depth of about 5.5 metres below the existing ground surface on refusal to auger advancement on a large boulder or the upper surface of the bedrock.

Groundwater

The water level was measured at the borehole standpipes on February 19, 2008. At that time the water level at borehole 1 was measured at about 2.7 metres below the existing ground surface and at borehole 2 at about 1.0 metre below the existing ground surface.

The results of the laboratory testing of the water samples obtained from the standpipes gave values of 88 and 169 milligrams per litre for sulphate. Based on the above test results a negligible to mild attack of groundwater on concrete can be expected. Accordingly, normal Portland cement in a ratio of 0.5 water to cement may be used for buried concrete elements.

DISCUSSION

Based on the results of this additional investigation no presence of soft or firm silty clay material is indicated for the site, and no laboratory consolidation testing of the silty clay material is considered warranted. Accordingly, it is considered that the guidelines for foundation design for the "east and west areas" of the site outlined in our preliminary subsurface investigation report mentioned above can also be used for foundation design for rowhouses, single family dwellings and light commercial buildings within the "central area" of the site.

As suggested in the preliminary subsurface investigation report, for final design of any proposed commercial buildings, site/building specific subsurface investigation should be considered in view of the potential for substantial fill thicknesses within proposed building areas.

We trust this letter provides sufficient information for your present purposes. If you have any questions concerning this letter please do not hesitate to contact our office.

Yours truly,

Kollaard Associates Inc.

C. R. Morey, P. Eng.

REGISTERED PROFESSIONAL ENGINEER
C. R. MOREY
PROVINCE OF ONTARIO

Attachments: Record of Borehole Sheets
Figure 1

File 080069

Kollaard Associates
Engineers
PO. BOX 189, 215 SANDERS ST
KEMPTVILLE, ONTARIO
K0C 1J0 FAX (613) 258-0475
http://www.kollaard.ca
(613) 860-0923
info@kollaard.ca

RECORD OF BOREHOLE BH1

CLIENT: PHOENIX HOMES

ADDITIONAL SUBSURFACE INVESTIGATION
PROPOSED DEVELOPMENT
FALLOWFIELD ROAD AND O'KEEFE COURT, OTTAWA, ON.

PROJECT No.: 080069
DATE OF DRILLING
FEBRUARY 15, 2008

LOCATION: SEE FIGURE 1

DEPTH (m) / WATER LEVEL	STRATA DESCRIPTION	STRATA PLOT	ELEV. / DEPTH	MOISTURE CONTENT (%) 20 40 60 80	SAMPLE & TEST DEPTH	N-VALUE BLOWS/0.3m	SHEAR VANE kPa	VANE REMOLD kPa	COMMENTS
	Probably topsoil, clay, gravel, asphaltic concrete (FILL)		0.00						Auger cuttings
	Probably TOPSOIL								
	Probably stiff grey brown SILTY CLAY								
	Stiff grey SILTY CLAY, trace sand and gravel		3.96		3.96-4.56	7			Water level in standpipe at about 2.7 metres depth, February 15, 2008.
	Compact, grey silty sand, some gravel, cobbles and boulders, trace clay (GLACIAL TILL)		5.02		5.20-5.50	16 / 0.15m 50 / 0.15m			
	End of Borehole -Refusal to advance in glacial till or bedrock at about 5.5 metres below existing ground surface, backfilled with auger cuttings.		5.50						

DRILL RIG: TRACK MOUNTED CME 55 AUGER: 200 mm HOLLOW STEM

Kollaard Associates
Engineers
PO. BOX 189, 215 SANDERS ST
KEMPTVILLE, ONTARIO
K0C 1J0 FAX (613) 258-0475
http://www.kollaard.ca
(613) 860-0923
info@kollaard.ca

RECORD OF BOREHOLE BH2

CLIENT: PHOENIX HOMES

ADDITIONAL SUBSURFACE INVESTIGATION
PROPOSED DEVELOPMENT
FALLOWFIELD ROAD AND O'KEEFE COURT, OTTAWA, ON.

PROJECT No.: OB0069
DATE OF DRILLING
FEBRUARY 15, 2008

LOCATION: SEE FIGURE 1

DEPTH (m) / WATER LEVEL	STRATA DESCRIPTION	STRATA PLOT	ELEV. / DEPTH	MOISTURE CONTENT (%) 20 40 60 80	SAMPLE / TEST & DEPTH	N-VALUE BLOWS/0.3m	SHEAR VANE kPa	VANE REMOLD kPa	COMMENTS
	Probably topsoil, clay, gravel, boulders and brick (FILL)		0.00						Auger cuttings
	Probably TOPSOIL		2.20						
	Probably very stiff grey brown SILTY CLAY		2.30						
	Very stiff grey brown SILTY CLAY (WEATHERED CRUST)		2.44		2.44 -3.05	13			
					3.05 -3.65	8			
	Compact, grey silty sand, some gravel, cobbles and boulders, trace clay (GLACIAL TILL)		3.35		3.81 -4.42	37			
	End of Borehole -backfilled with auger cuttings.		4.42						Water level in standpipe at about 1.0 metre depth, February 19, 2008.

DRILL RIG: TRACK MOUNTED CME 55 AUGER: 200 mm HOLLOW STEM.

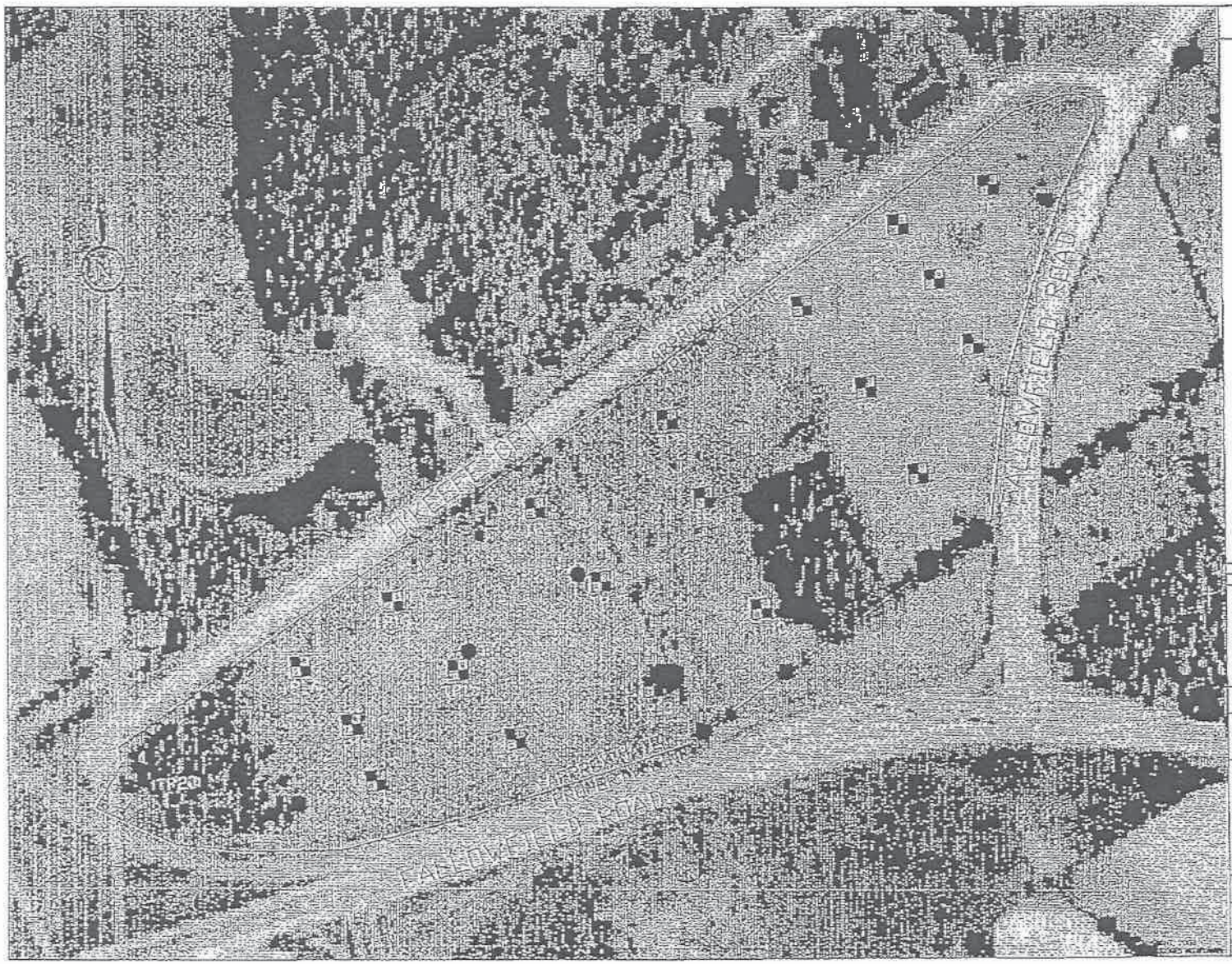


FIGURE 1

LEGEND

Approximate Borehole Location Present Investigation

Approximate Test Pit Location previous investigation by Kollaard Associates Inc., August 2006.

REFERENCE PLAN:
City of Ottawa mapping website.

SPECIAL NOTE:
This drawing to be read in conjuction with accompanying letter.

REV.	NAME	DATE	DESCRIPTION

Kollaard Associates
Engineers
PO Box 189, 215 Chapel St
Kemptville Ontario
K0G 1J0 FAX (613) 258-3475
(613) 860-0923
http://www.kollaard.ca

CLIENT: PHOENIX HOMES

PROJECT: ADDITIONAL SUBSURFACE INVESTIGATION

LOCATION: FALLOWFIELD ROAD AND O'KEEFE COURT CITY OF OTTAWA ONTARIO

DESIGNED BY:	DATE:
DT	FEBRUARY 21, 2008
DRAWN BY:	SCALE:
DT	1:2500

KOLLAARD FILE NUMBER: 080069