# Servicing and Stormwater Management Report – 114 Richmond Road Phase 2

Project #160400864

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Prepared for:

Ashcroft Homes

Prepared by:

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# 1.0 INTRODUCTION

Stantec Consulting Ltd. has been commissioned by Ashcroft Homes to prepare the following servicing study in support of a proposal to develop Phase 2 of the 114 Richmond Road property. The property is situated on the south side of Richmond Road at the southwest quadrant at the intersection of Richmond Road and Leighton Terrace, and terminating at Byron Avenue. The site is located in the City of Ottawa and is indicated in **Figure 1**. The 2.22 ha site was previously convent land. The existing convent building and much of the land has been deemed a heritage site and is to be preserved. The site development plan used for the purpose of this servicing brief consists of two (2) development phases as indicated on **Drawing SP-1**. Phase 1 of the site plan has been previously approved and constructed, and consists of three 9-storey condominium towers and renovation of the existing convent building into a primarily commercial facility. The current site plan for **Phase 2** consists of three multi-storey residential buildings.

**Figure 1: Overall Development Location Plan**

# 2.0 BACKGROUND

Documents referenced in preparation of the design for the 114 Richmond Road (Phase 2) Development include:

- Geotechnical Investigation – Proposed Residential Development – 114 Richmond Road, Patersongroup Consulting Engineers, August 4, 2010.
- City of Ottawa Sewer Design Guidelines, City of Ottawa, October 2012.
- City of Ottawa Design Guidelines – Water Distribution, City of Ottawa, July 2010.
- Assessment of Adequacy of Public Services Report – Proposed Development at 114 Richmond Road, Trow Associates Inc., March 12, 2010.
- 114 Richmond Road – Potable Water Servicing Analysis, Stantec Consulting Ltd., August 2011.
- Serviceability Report – Ashcroft Homes – 114 Richmond Road, Stantec Consulting Ltd., June 26, 2013.

# 3.0 WATER SUPPLY SERVICING

## 3.1 BACKGROUND

The proposed development is Phase 2 of a multi-phased development as indicated in **Figure 1**. The site is located on the south side of Richmond Road and north of the intersection of Byron and Kensington Avenue. The proposed development comprises two residential apartment buildings, a 9-storey addition to the existing on-site convent building, and subsurface parking areas. The site is to be serviced via 200mm watermain stub constructed as part of Phase 1. The full development is fed by the 300mm watermains on Richmond Road and Byron Avenue, and looped internally through on-site buildings. Connection to Richmond Road was completed with the approved Phase 1 of the development, and connection to the Byron Avenue main is proposed along with Phase 2.

The site is located within the City's Pressure Zone 1W. Proposed ground elevations of the site vary from approximately 67.7m to 71.5m. Under normal operating conditions, hydraulic gradelines vary from approximately 114.1m to 108.4m based on boundary conditions previously provided by the City of Ottawa. A potable water servicing analysis was previously performed by Stantec for Phase 1 of the development, and is detailed in **Appendix A.2**

## 3.2 WATER DEMANDS

Water demands for the development were estimated using the Ministry of Environment's Design Guidelines for Drinking Water Systems (2008) and the City of Ottawa's Water Distribution Guidelines (2010). A daily rate of 2.5 l/m$^2$ of commercial space was used for the proposed site. It is predicted that such facilities will be operated 12 hours per day. Residential demands were estimated at 350 L/cap/day in consideration of an average apartment population density of 1.8. See **Appendix A.1** for detailed domestic water demand estimates.

The average day demand (AVDY) for the entire site (including the existing Phase 1) was determined to be 5.57 L/s. The maximum daily demand (MXDY) is estimated to be 13.93 L/s. The peak hour demand (PKHR) totals 30.64 L/s.

The previous potable water servicing analysis based assumptions for fire flow requirements on calculations per the FUS Guidelines (**Appendix A.2**), and had determined the maximum required fire flows for on-site buildings to be 250L/s. Recent direction from City of Ottawa staff has been made to apply building code requirements for fire flows (as per Office of the Fire Marshal (OFM) Guidelines for part 3 of the Ontario Building Code) for private sites without on-site hydrants. Based on the OFM guidelines, the maximum required fire flow for the site would be 150L/s, which is well within the previously assessed fire flow requirements.

## 3.3 HYDRAULIC MODEL RESULTS

A hydraulic model of the water supply system was previously created by Stantec based on boundary conditions at Phase 1 of the development to assess the proposed watermain layout under the above demands and during fire flow scenarios. Results of the hydraulic modeling demonstrate that adequate flows are available for the subject site, with on-site pressures ranging from **52 psi** to **66 psi** under normal operating conditions. These values are within the normal operating pressure range as defined by MOECC and City of Ottawa design guidelines (desired 50 to 70 psi and not less than 40 psi). Results of the hydraulic model analysis can be found in **Appendix A.2**.

A fire flow analysis was carried out using the hydraulic model to determine the anticipated amount of flow that could be provided for the proposed development under maximum day demands and fire flow requirements. Results of the modeling analysis indicate that flows in excess of 15,000L/min (250 l/sec) can be delivered while still maintaining a residual pressure of 140 kPa (20 psi). Results of the hydraulic modeling are included for reference in **Appendix A.2**.

## 3.4 SUMMARY OF FINDINGS

Based on the results of the hydraulic analysis, the proposed water servicing will provide sufficient capacity to sustain required domestic demands and fire flows such that normal operating pressures remain within City of Ottawa required limits. The model indicates that this rate can be achieved at all locations while still maintaining the minimum residual pressure per City requirements.

# 4.0 WASTEWATER SERVICING

## 4.1 BACKGROUND

The proposed development is Phase 2 of a multi-phased development as indicated in **Figure 1**. The site is located on the south side of Richmond Road and west of Leighton Terrace. Wastewater servicing for Phase 2 of the development will be extended from the 375mm diameter sewer constructed as part of Phase 1 (**Drawing SSP-1**). The sanitary sewer within the development lands discharges to an existing 375mm diameter sanitary sewer running along Richmond Road, which outlets in turn to the 450mm diameter sewer running north on Patricia Avenue.

For detailed information regarding the wastewater servicing for the Phase 1 area, please refer to the *Serviceability Report – Ashcroft Homes – 114 Richmond Road* (Stantec, June 2013).

## 4.2 DESIGN CRITERIA

As outlined in the City of Ottawa Sewer Design Guidelines and the MOECP's Design Guidelines for Sewage Works, the following criteria were used to calculate estimated wastewater flow rates and to size the sanitary sewers:

- Minimum Velocity – 0.6 m/s (0.8 m/s for upstream sections)
- Maximum Velocity – 3.0 m/s
- Manning roughness coefficient for all smooth wall pipes – 0.013
- Minimum size – 200mm dia. for residential areas, 250mm for commercial areas
- Average Wastewater Generation (Commercial) – 28,000L/ha/day
- Average Wastewater Generation (Residential) – 280L/cap/day
- Peak Factor (Commercial) – 1.5 (if Commercial over 25%+ contributing area, 1.0 otherwise)
- Peak Factor (Residential) – Per Harmon's w/ correction factor of 0.8
- Extraneous Flow Allowance – 0.33 l/s/ha (conservative value)
- Manhole Spacing – 120 m
- Minimum Cover – 2.5m

## 4.3 PROPOSED SERVICING

The proposed site will be serviced by gravity sewers which will direct the wastewater flows from the entire development site (approx. 15.0 L/s with allowance for infiltration) to the existing 375mm diameter sanitary sewer. The proposed drainage pattern is detailed on **Drawing SA-1**. A sanitary sewer design sheet for the proposed service lateral is included in **Appendix B.1**. Full port backwater valves are to be installed on all sanitary services within the site to prevent any potential surcharge from the downstream sanitary sewer from impacting the proposed property.

Wastewater Servicing
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As outlined in the Serviceability Report for Phase 1 of the 114 Richmond Road site, an anticipated peak flow rate from the development was determined to be 21.5L/s, which was well within the available capacity within downstream sewers on Patricia Avenue. Based on revised sanitary sewer peak flow parameters per updates to the City's Sewer Design Guidelines, the estimated peak flow rate from the development is well within that of the approved serviceability study (see excerpts in **Appendix B.2**).

# 5.0 STORMWATER MANAGEMENT

## 5.1 OBJECTIVES

The objective of this stormwater management plan is to determine the measures necessary to control the quantity/quality of stormwater released from the proposed development to criteria established within the previously approved serviceability report for the site, and to provide sufficient detail for approval and construction.

## 5.2 SWM CRITERIA AND CONSTRAINTS

Criteria were established by combining current design practices outlined by the City of Ottawa Design Guidelines (2012), through the report titled Assessment of Adequacy of Public Services Report" by Trow Associates (March 2010), and through consultation with City of Ottawa staff. The following summarizes the criteria, with the source of each criterion indicated in brackets:

**General**

- Use of the dual drainage principle (City of Ottawa).
- Wherever feasible and practical, site-level measures should be used to reduce and control the volume and rate of runoff. (City of Ottawa)
- Assess impact of 100-year event outlined in the City of Ottawa Sewer Design Guidelines on major & minor drainage system (City of Ottawa)
- No quality control criteria have been previously identified for the subject site (Stantec, Trow)

**Storm Sewer & Inlet Controls**

- Size storm sewers to convey 5-year storm event under free-flow conditions using City of Ottawa I-D-F parameters (City of Ottawa).
- Site discharge rates for each storm event to be restricted to 5-year storm event pre-development rates with a maximum pre-development C coefficient of 0.45, and time of concentration of 23.8 minutes (**205L/s**) (Stantec, Trow).
- Proposed site to discharge the existing 300mm diameter storm sewer within the Daly Avenue ROW at the northern boundary of the subject site (City of Ottawa).
- 100-year Storm HGL to be a minimum of 0.30 m below building foundation footing (City of Ottawa).

**Surface Storage & Overland Flow**

- Building openings to be a minimum of 0.15m above the 100-year water level (City of Ottawa)
- Maximum depth of flow under either static or dynamic conditions shall be less than 0.35m (City of Ottawa)

- Balance of flows in excess of allowable release rate up to and including the 100-year storm event to be detained on-site. (Stantec, Trow)
- Provide adequate emergency overflow conveyance off-site for events beyond the 100-year storm (City of Ottawa)
- Where possible, major flow from the site is to be safely conveyed by surface routing towards Leighton Terrace and Richmond Road. (Stantec)

## 5.3 STORMWATER MANAGEMENT

The Modified Rational Method was employed to assess the rate and volume of runoff generated during post-development conditions. The site was subdivided into subcatchments (subareas) tributary to stormwater controls as defined by the location of inlet control devices. A summary of subareas and runoff coefficients is provided in **Appendix C.2**, and **Drawing SD-1** indicates the stormwater management subcatchments. C coefficient values have been increased by 25% for the post-development 100-year storm event based on MTO Drainage Manual recommendations. Rational method storm sewer design sheets have been supplied as part of **Appendix C.1**.

### 5.3.1 Allowable Release Rate

Based on prior consultation with City of Ottawa staff during Phase 1 of the development, the peak post-development discharge from the subject site is to be limited to that of the 5-year event discharge under pre-development conditions, to a maximum discharge coefficient C of 0.45 at a time of concentration of 23.8 minutes (see report excerpts in **Appendix C.3**) Peak flow rates have been calculated using the rational method as follows:

Q = 2.78 CiA
Where: Q = peak flow rate, L/s
A = drainage area, ha
I = rainfall intensity, mm/hr (per Ottawa IDF curves)
C = site runoff coefficient

The target release rate for the site is summarized in **Table 1** below:

**Table 1: Target Release Rates**

| Design Storm | Target Flow Rate (L/s) |
|---|---|
| All Events | 205 |

## 5.3.2 Storage Requirements

The site requires quantity control measures to meet the restrictive stormwater release criteria. It is proposed that rooftop storage via restricted roof release in combination with the subsurface storage pipe constructed in Phase 1, as well as a proposed storage cistern to reduce site peak outflow to target rates.

### 5.3.2.1 Rooftop Storage

It is proposed to retain stormwater on the building rooftops by installing restricted flow roof drains. The following calculations assume the proposed roofs will be equipped with standard Watts Model R1100 Accuflow Roof Drains. Design for Roof A is as per the approved Phase 1 Stormwater Management Report for the development.

Watts Drainage "Accutrol" roof drain weir data has been used to calculate a practical roof release rate and detention storage volume for the rooftops. It should be noted that the "Accutrol" weir has been used as an example only, and that other products may be specified for use, provided that the total roof drain release rate is restricted to match the maximum rate of release indicated in Table 2, and that sufficient roof storage is provided to meet (or exceed) the resulting volume of detained stormwater. Proposed drain release rates have been calculated based on the Accutrol weir setting at ¼ open. Storage volume and controlled release rate are summarized in **Table 2**:

**Table 2: Roof Control Areas**

| Design Storm | Roof Area ID | Depth (mm) | Discharge (L/s) | Volume Stored ($m^3$) |
|---|---|---|---|---|
| 5-Year | ROOF A (Existing) | 27 | 9.2 | 44.2 |
| | ROOF B1 | 110 | 4.9 | 17.9 |
| | ROOF C | 108 | 8.9 | 27.6 |
| | ROOF D | 109 | 9.8 | 33.4 |
| | | | | |
| 100-Year | ROOF A (Existing) | 51 | 17.4 | 83.6 |
| | ROOF B1 | 147 | 5.6 | 41.8 |
| | ROOF C | 145 | 10.2 | 65.7 |
| | ROOF D | 146 | 11.2 | 78.4 |
| | | | | |

### 5.3.2.2 Uncontrolled Catchments

Due to grading constraints, some subcatchments were designed without a storage component. These areas flow offsite uncontrolled to Richmond Road and Byron Avenue, and are not tributary to the on-site storm sewer outlet. Areas that discharge offsite without entering the proposed stormwater management system must be compensated for in areas with controls, as drainage will re-enter storm sewers tributary

to Richmond Road further downstream of the site. **Table 3** summarizes the peak uncontrolled 5 and 100-year catchment release rates for areas that are non-tributary to the outlet sewer:

### Table 3: Peak Uncontrolled (Non-Tributary) Release Rate

| Design Storm | Roof Area ID | Area (ha) | C | Tc (min) | Intensity (mm/hr) | Qrelease (L/s) |
|---|---|---|---|---|---|---|
| 5-Year | UNC1, UNC2 | 0.15 | 0.75 | 10 | 104.19 | 32.5 |
| 100-Year | UNC1, UNC2 | 0.15 | 0.94 | 10 | 178.56 | 69.7 |

#### 5.3.2.3 Subsurface Storage

Per the modified rational method calculations included as part of **Appendix C.2**, the remainder of the site is to be directed towards either the existing 3000mm x 1500mm storage pipe, or a proposed subsurface cistern sized to meet the target peak discharge rate for the during the 100-year event.

Storage volumes for the existing storage pipe and associated structures were previously determined within the approved development Phase 1 stormwater management report. A change in diameter to the ICD downstream of the superpipe is required to suit the current development plan catchment area and imperviousness.

It is anticipated that the subsurface cistern will be located below the outlet sewer invert elevation, and will be required to be pumped to the gravity sewer outlet at the discharge rate specified. Storage volumes and controlled release rates for the two systems are summarized below:

### Table 4: Controlled Tributary Area (3000mm x 1500mm Superpipe)

| Design Storm | Area IDs | Tributary Area (ha) | Design Head (m) | Discharge (L/s) | $V_{required}$ ($m^3$) | $V_{available}$ ($m^3$) |
|---|---|---|---|---|---|---|
| 5-Year | A1, A3, A4, EXT2 | 1.00 | 0.58 | 29.5 | 106.7 | 106.7 |
| 100-Year | A1, A3, A4, EXT2 | 1.00 | 1.50 | 47.4 | 271.3 | 275.3 |

### Table 5: Controlled Tributary Area (Cistern)

| Design Storm | Area IDs | Tributary Area (ha) | Design Head (m) | Discharge (L/s) | $V_{required}$ ($m^3$) | $V_{available}$ ($m^3$) |
|---|---|---|---|---|---|---|
| 5-Year | COURT1-3, A2, A5, B2, EXT1 | 0.99 | - | 44.0 | 69.8 | 223 |
| 100-Year | COURT1-3, A2, A5, B2, EXT1 | 0.99 | - | 44.0 | 222.4 | 223 |

### 5.3.3 Results

**Table 6** demonstrates the proposed stormwater management plan and demonstrates adherence to target peak outflow rates for the site.

**Table 6: Summary of Total 5 and 100-Year Event Release Rates**

| | 5-Year Peak Discharge (L/s) | 100-Year Peak Discharge (L/s) |
|---|---|---|
| Uncontrolled | 33 | 70 |
| Controlled - Roof | 33 | 44 |
| Controlled – Surface / Subsurface | 73 | 92 |
| **Total** | **139** | **205** |
| **Target** | **205** | **205** |

# 6.0 GRADING AND DRAINAGE

The proposed development including Phase 1 measures approximately 2.23ha in area. The topography across the site is a gradual slope draining from south to north with a difference in elevation of approximately 3m. A detailed grading plan (see **Drawing GP-1**) has been provided to satisfy the stormwater management requirements, adhere to any permissible grade raise restrictions (see **Section 10.0**) for the site, and provide for minimum cover requirements for storm and sanitary sewers where possible. Site grading has been established to provide emergency overland flow routes required for stormwater management in accordance with City of Ottawa requirements.

The subject site maintains emergency overland flow routes for flows deriving from storm events in excess of the maximum design event to the proposed municipal rights-of-way at the southern and northern boundaries of the development, and ultimately to Richmond Road and Byron Avenue as depicted in **Drawing GP-1.** Existing rear yards along the western and eastern boundary of the site that previously drained onto the subject site area will be maintained.

# 7.0 UTILITIES

As the subject site is bound to the east and west by an existing residential area / commercial main street, and by municipal right-of-ways to the north, south, and east, Hydro, Bell, Gas and Cable servicing for the proposed development should be readily available. Pole mounted Hydro infrastructure may exist along the western property line, and will be relocated prior to development. It is anticipated that existing infrastructure will be sufficient to provide a means of distribution for the proposed site. Exact size, location and routing of utilities will be finalized after design circulation.

# 8.0 APPROVALS

Environmental Compliance Approval (ECAs, formerly Certificates of Approval (CofA)) under the Ontario Water Resources Act are not expected to be a requirement for Phase 2 of the development as approval was previously obtained for storm and sanitary sewers connecting to Richmond Road / Leighton Terrace as part of Phase 1. The Phase 2 property is of non-industrial use, and discharges to approved sewer stubs constructed as part of Phase 1 designed to accommodate the current phase. Conservation Authority clearance will be required along with site plan approval for the development.

# 9.0 EROSION CONTROL DURING CONSTRUCTION

Erosion and sediment controls must be in place during construction. The following recommendations to the contractor will be included in contract documents.

1. Implement best management practices to provide appropriate protection of the existing and proposed drainage system and the receiving water course(s).
2. Limit extent of exposed soils at any given time.
3. Re-vegetate exposed areas as soon as possible.
4. Minimize the area to be cleared and grubbed.
5. Protect exposed slopes with plastic or synthetic mulches.
6. Provide sediment traps and basins during dewatering.
7. Install sediment traps (such as SiltSack® by Terrafix) between catch basins and frames.
8. Plan construction at proper time to avoid flooding.

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

9. Verification that water is not flowing under silt barriers.
10. Clean and change silt traps at catch basins.

Refer to **Drawing ECDS-1** for the proposed location of silt fences, straw bales and other erosion control structures.

# 10.0 GEOTECHNICAL INVESTIGATION AND ENVIRONMENTAL ASSESSMENT

A geotechnical Investigation Report was prepared by Patersongroup dated August, 2010. The report summarizes the existing soil conditions within the entirety of the development and construction recommendations. For details which are not summarized below, please see the original Paterson report.

Subsurface soil conditions within the subject area were determined from 5 boreholes distributed across the development. In general, soil stratigraphy consisted of topsoil underlain by glacial till, followed by limestone bedrock. Bedrock/inferred bedrock elevations range from depths of 8.7 to 10.7m below ground surface. Groundwater Levels were measured in July 2010, and vary in elevation from 1.02m to 2.90m below ground surface.

No grade raise limitations were identified for the subject site.

The required pavement structure for proposed hard surfaced areas are outlined in **Table 7 and 8** below:

**Table 7: Pavement Structure – Car only Parking Areas**

| Thickness (mm) | Material Description |
|---|---|
| 50 | Wear Course – HL 3 or Superpave 12.5 Asphaltic Concrete |
| 150 | Base – OPSS Granular A Crushed Stone |
| 300 | Subbase - OPSS Granular B Type II |
| - | Subgrade – Either fill, in situ soil, or OPSS Granular B Type I or II material placed over in situ soil or bedrock. |

**Table 8: Pavement Structure – Access Lanes and Heavy Truck Parking Areas**

| Thickness (mm) | Material Description |
|---|---|
| 40 | Wear Course – HL-3 or Superpave 12.5 Asphaltic Concrete |
| 50 | Binder Course – HL-8 or Superpave 19.0 Asphaltic Concrete |
| 150 | Base – OPSS Granular A Crushed Stone |
| 400 | Subbase - OPSS Granular B Type II |
| - | Subgrade – Either fill, in situ soil or OPSS Granular B Type I or II material placed over in situ soil or bedrock. |

# 11.0 CONCLUSIONS

## 11.1 WATER SERVICING

Based on the supplied boundary conditions for existing watermains and estimated domestic and fire flow demands for the subject site, it is anticipated that the proposed servicing in this development will provide sufficient capacity to sustain the required domestic demands and emergency fire flow demands of the proposed site. Fire flows greater than those required per OFM Guidelines are available for this development.

## 11.2 SANITARY SERVICING

The proposed sanitary sewer network is sufficiently sized to provide gravity drainage of the site. The proposed development will be serviced by a network of gravity sewers which will direct wastewater flows to the existing 375mm dia. sanitary sewer stub constructed as part of Phase 1. The proposed drainage outlet to the north has sufficient capacity to receive sanitary discharge from the site based on the findings of the Serviceability Report for Phase 1 of the development.

## 11.3 STORMWATER SERVICING

The proposed stormwater management plan is in compliance with the goals specified previously through consultation with the City of Ottawa for Phase 1 of the development. An on-site subsurface storage cistern, superpipe, and associated ICDs have been proposed to limit peak storm sewer inflows to downstream storm sewers to 205L/s as determined by background reports. The downstream receiving sewer has sufficient capacity to receive runoff volumes from the site based on the findings of the Serviceability Report for Phase 1 of the development.

## 11.4 GRADING

Grading for the site has been designed to provide an emergency overland flow route as per City requirements and reflects the recommendations made in the Geotechnical Investigation Report prepared by Patersongroup. Erosion and sediment control measures will be implemented during construction to reduce the impact on existing facilities.

## 11.5 UTILITIES

Utility infrastructure exists within the Richmond Road and Byron Avenue ROWs at the northern and southern boundaries of the proposed site. It is anticipated that existing infrastructure will be sufficient to provide a means of distribution for the entirety of the development. Exact size, location and routing of utilities will be finalized after design circulation.

## 11.6 APPROVALS/PERMITS

An MOECP Environmental Compliance Approval is not expected to be required as approval was obtained for the receiving storm and sanitary sewers as part of Phase 1. No other approval requirements from other regulatory agencies are anticipated.