Mixed-Use Development at
1294 Kingston Road & 1848-1852
Liverpool Road
Pickering, ON

Functional Servicing and Stormwater Management Report

Prepared for:
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Stantec Project #160622705

May 22, 2019

Sign-off Sheet

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Prepared by 

(signature)

Alex Hahn, B.Eng.

Reviewed by 

(signature)

Mario Bon, P.Eng.

MIXED-USE DEVELOPMENT AT
1294 KINGSTON ROAD & 1848-1852 LIVERPOOL ROAD
PICKERING, ON

May 22, 2019

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1.0 INTRODUCTION

Stantec Consulting Limited has been retained by Altona Group to prepare a Functional Servicing and Stormwater Management Report (FSSWMR) for the property located at 1294 Kingston Road and 1848-1852 Liverpool Road in the City of Pickering. The purpose of this FSSWMR is to provide a servicing opinion regarding the availability of existing municipal infrastructure to support a Mixed-Use Development on the subject lands, as well as provide methodology to meet stormwater management criteria.

This document has been prepared based on reviews of available Records from the City of Pickering and the Region of Durham as well as correspondence with City and Region staff.

2.0 SITE LOCATION AND DESCRIPTION

The subject site is located on the northwest corner of Kingston Road and Liverpool Road in the City of Pickering (City) and has a total area of 0.91 hectares. The site is currently occupied by three buildings and surface parking *(See Figure 1)*.

Building 1: Old Liverpool House (Restaurant)
Building 2: Commercial Plaza
Building 3: Daycare Center (Residential conversion)

Figure 1: Subject Site *(image provided by Urban Strategies Inc.)*.

The site is located within the limits of the Pickering City Center neighborhood as shown in **Figure 2**, which is planned for Intensification.

Figure 2: Pickering City Center limits *(image provided by Urban Strategies Inc.)*.

The subject site is relatively flat, with elevations generally ranging from 89.5 at the north end of the site and 88m to the south. This can be observed on the topographical survey provided by Mandarin Surveyors Limited recorded November 30, 2017, as shown in **Appendix A**.

With reliance on the above-mentioned survey in combination with record drawings provided by the Region and City; the following services exist in the vicinity of the Subject Site:

<u>Sewers</u>

- A 600mm diameter storm sewer at a depth of approximately 2.9m, flowing westward in the Kingston Road right-of-way.
- A 450mm diameter concrete storm sewer at a depth of approximately 2.8m, flowing southward in the Liverpool Road Right of Way.
- A 250mm diameter concrete sanitary sewer at a depth of approximately 4.0m, flowing Northward in the Liverpool Road right-of-way.

Watermains

- A 200mm diameter PVC watermain in both the Liverpool Road and Kingston Road right of ways along the site frontages.

3.0 DEVELOPMENT PROPOSAL

Altona Group, owner of the site known municipally as 1294 Kingston Road, 1848 Liverpool Road, and 1852 Liverpool Road ("subject site"), is proposing the redevelopment and intensification of the subject site with a mixed-use development that incorporates a 25-storey tower, a 12-storey midrise building, and a row of 3-storey townhouses. The proposal also commits to the restoration and adaptive reuse of the Old Liverpool House as well as new publicly accessible open space and improvements to the public realm.

The proposed development adds 391 residential units (with an additional 8 retail units) to the 0.91 hectare site with a total residential gross floor area of 32,350 square metres. Active at grade retail and commercial uses make up 850 square metres along the Liverpool and Kingston Road frontages of the new buildings and the retained Old Liverpool House. A total gross floor area of 33,200 square metres is proposed at a density of 3.6 FSI over the subject site. A total of 512 parking spaces will be provided, mostly within 3 levels of underground parking with 10 spaces provided at-grade to support the retail.

The architectural concept and project statistics have been included as **Appendix B**.

4.0 STORM DRAINAGE

4.1 STORM SERVICING

A 450mm diameter municipal concrete storm sewer at a depth of approximately 2.8m exists in the Liverpool Road right-of-way to the east of the site, flowing southward. A 300mm diameter storm connection from the site to this municipal sewer exists within the existing northern vehicular access. Further downstream, the municipal sewer changes direction and flows in a westerly direction on the north side of Kingston Road, where it increases in diameter to 600mm with a depth of approximately 2.9m. A second 300mm diameter storm connection exists at the southwest corner of the site. This connection services the south parcel of the site (Old Liverpool House parcel) and is connected to the municipal storm sewer in the Kingston Road right of way. Downstream of the site, the municipal storm sewer continues in a westerly direction on the north side of Kingston Road until approximately 90m west of Bowler Dr where it is diverted to a culvert that outlets to an existing watercourse immediately south of Kingston Road. See the record drawings included in **Appendix A** for reference.

Storm servicing for the proposed development can be provided by the two existing connections in conjunction with the stormwater management (SWM) plan which is detailed in **Section 4.3** (Stormwater Management Plan). A conceptual configuration of the storm servicing design is provided by **Figure 3.0** *(page F.1 at the end of the report)*.

4.2 STORMWATER MANAGEMENT CRITERIA

The Toronto Regional Conservation Authority (TRCA) has made regulated mapping within its jurisdiction available to the public. Regulated areas are of special concern to the TRCA due to the presence of natural features and hazards. As stipulated by the TRCA the regulated areas indicate the following:

- Development within the regulated area will need to take into account possible constraints from natural hazards or features
- A permit is required from the TRCA before a regulated activity can occur.

Based on a review of the TRCA's Draft Regulation Mapping, the Site is outside of the TRCA regulated area, as shown in **Figure 4**. On this basis a permit is currently not required to perform works within the site limits.

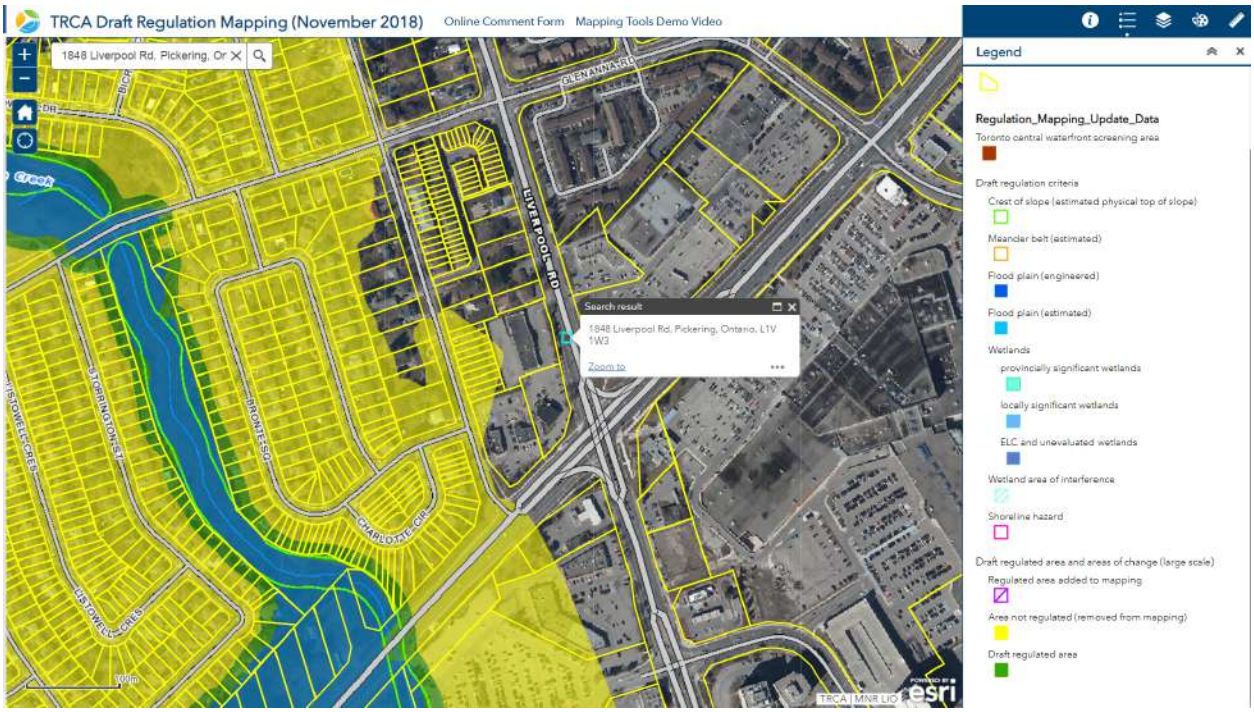


Figure 4: TRCA Regulated Area Map

The site is subject to the criteria as laid out in the Pickering City Center Stormwater Management Strategy (April 2015) and confirmed through correspondence with City staff. The following summarizes the guidelines:

1. **Erosion Control**: For small infill sites less than 5 ha, the minimum erosion criteria is to retain a rainfall depth of 5mm across all impervious surfaces.

2. **Water Balance**: Retention of the runoff from up to a 5 mm storm event on site for infiltration or re-use (i.e. no minor or major system flow from a site for up to a 5 mm storm); As shown on **Figure 5**, the TRCA mapping indicates that the site is in a Low Volume Groundwater Recharge Area (LVGRA) and therefore a site-specific water balance is not required.

Figure C 10: Recharge Area Classification

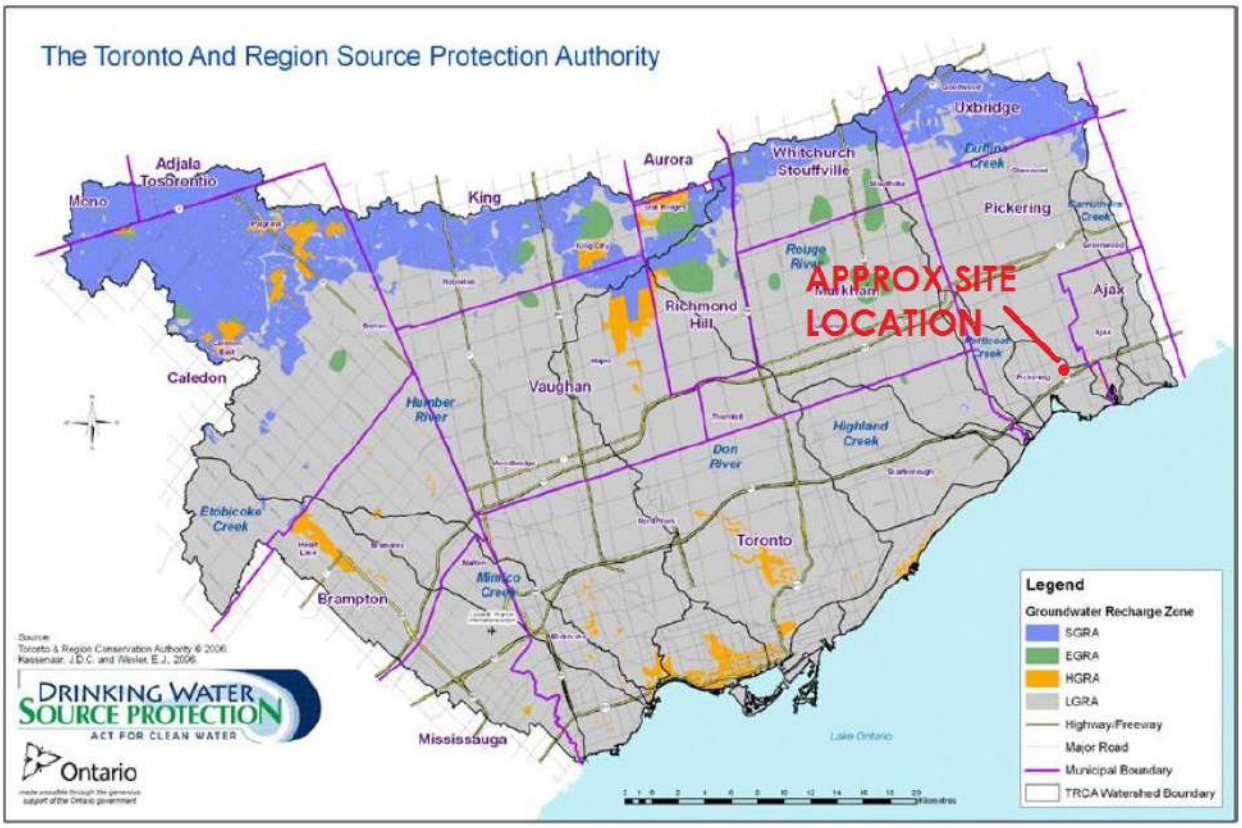
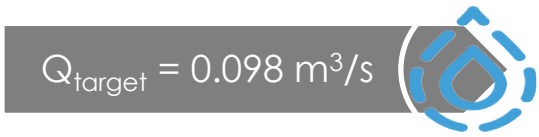


Figure 5: TRCA Groundwater Recharge Area Classification.

Therefore, the retention target of 5 mm applies:

5 mm
45.5 m^3

3. **Water Quantity**: Post-development peak flow rates are to be controlled to pre-development levels, for the 2-year to 100-year storms, and the site must detain up to 100-year storm on site. A maximum runoff coefficient of 0.5 should be used to represent predevelopment conditions, regardless of impervious cover currently existing on the site. Drainage areas for pre and post development conditions are represented on **Figures 6.0 & 7.0** respectively *(pages F.2 & F.3 at the end of the report)*. The 2-year target flow is:



4. **Water Quality**: 80% total suspended solids (TSS) removal (Enhanced Level) on an annual loading basis from all runoff leaving the site (based on the post development level of imperviousness). A stand-alone ETV Canada© verified OGS unit will be credited for 50% removal, therefore a treatment train approach (i.e. LIDs) or an ETV verified filter (e.g., Baysaver® or Jellyfish®) will be required to provide 80% TSS removal.

4.3 STORMWATER MANAGEMENT PLAN

The following summarizes the proposed Stormwater Management plan that will be implemented to meet the criteria established above. Refer to **Appendix C** for calculations.

Stormwater detention tanks are proposed to satisfy water balance requirements for the site by providing sump storage for stormwater reuse and to provide active storage to satisfy the stormwater quantity control requirements. An ETV Canada© verified filter unit will be provided to address water quality criteria. The locations of the stormwater detention tanks and filter will be finalized with input from the mechanical engineer and architect. A preliminary servicing concept showing proposed locations is shown on **Figure 3.0** *(page F.1 at the end of the report)*.

4.3.1 Erosion control/Water Balance

The proposed underground parking structure covers most of the site area making infiltration unfavourable. Therefore, in order to meet the water balance requirements of 5mm retention, a combination of the following strategies can be implemented:

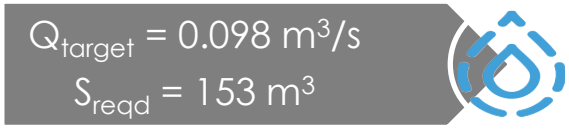
- Irrigation to landscaped areas and terrace/ rooftop landscape features using retained stormwater.
- Green roofs.
- Reuse of rainwater for the building mechanical systems with input from the mechanical engineer (i.e. evaporative cooling).

Detailed analysis of the above strategies to achieve the water balance targets will be conducted as the architectural and mechanical system design concepts evolve.

4.3.2 Quantity Control

The Pickering City Center Stormwater Management Strategy (April 2015), requires control of post-development peak flow rates to pre-development levels for the 2-year to 100-year storm events, and to detain up to the100-year storm event volumes onsite.

Detention storage tanks with orifice controls will be used to achieve the allowable release rate. Based on the target release rate, the required quantity storage for the site is:



As a result, the total volume to be provided by the detention tanks to accommodate both water balance and quantity control is estimated to be **199 m³** (46m^3 for water balance & 153m^3 for quantity control).

The final location and geometry of the tanks will be determined during detailed design with input from the mechanical and architectural design teams. The initial concept is shown on **Figure 3.0** *(page F.1 at the end of the report)*.

4.3.3 Quality Control

Runoff from the rooftop and landscaped areas, is considered clean and will therefore not require treatment prior to being discharged from the site. Flows from asphalt and road areas will require treatment to achieve the TSS removal targets.

Clean flows from the roofs and landscaped areas will be conveyed directly to the north tank where flow will be attenuated and discharged to the municipal storm sewer. Discharge from the tank will be controlled to pre-development rates using orifice controls within the storm tanks. The preliminary configuration is shown on **Figure 3.0** *(page F.1 at the end of the report)*. Irrigation will be pumped from the sump of this detention tank to achieve water balance, as described in **Section 4.3.1.**

Flows from the asphalt areas requiring quality treatment will be discharged to an approved Jellyfish quality control unit to achieve 80% TSS removal prior to entering a stormwater tank at the south end of the site (sizing and model to be confirmed at detailed design stage). Similarly, discharge from the south tank will also be controlled to pre-development rates using orifice controls within the storm tanks. Water will be pumped from the southern detention tank for additional irrigation and/or mechanical use, as described in **Section 4.3.1.**

5.0 WATER SUPPLY & SERVICING

5.1 WATERMAIN

200mm diameter PVC watermains exists on both the Liverpool Road and Kingston Road frontages of the site. Water supply for the property would be provided by connection to this municipal watermain. A 200mm diameter connection with domestic and fire supply will be split at the property line.

Two municipal fire hydrants exist along the site frontage in the Liverpool Road right-of-way at approximately 18m and 93m north of the existing southern site access. Building siamese connections, if required, will be located with input from the mechanical and architectural design teams at the detailed design stage. A conceptual configuration of the water servicing design is shown on **Figure 3.0** *(page F.1 at the end of the report)***.**

5.2 WATERMAIN DESIGN CRITERIA

The Region of Durham, per Ministry of Environment (MOE) Guidelines, requires that water demand meet the greater of the following:

A) Maximum day demand + *Fire Flow, *or*
B) Maximum hour demand

**NOTE: Fire flow is to be calculated as outlined in the current edition of "Water Supply for Fire Protection, " issued by the Fire Underwriters Survey.*

The watermain system must also operate under the following conditions:

1) Minimum pressure → Maximum day demand + Fire flow = 140 kPa (20 PSI)
2) Minimum pressure → Max hour demand = 275 kPa (40 PSI)
3) Maximum sustained operating pressure = 700 kPa (100 PSI)
4) Per Ontario Building Code (OBC), Pressure reducing valves are required when static pressures exceed 550kPa (80PSI)

Demand calculations were calculated based on the inputs shown in **Table 1** and are detailed in **Appendix D.**

PARAMETER	VALUE	SOURCE
Persons/ unit	Varies	Durham Design Specifications for Sanitary Sewers
Comm. Equivalent population	86 pers./ha	Durham Design Specifications for Watermains
Flow rate per capita	450L/cap	MOECC Design Guidelines 2008
Max day Peaking Factor	1.65	MOECC Design Guidelines 2008
Max hour Peaking Factor	2.48	MOECC Design Guidelines 2008

Table 1: Water Demand Calculation inputs.

5.3 WATERMAIN DEMAND RESULTS

Per the requirements stipulated by the Region, a detailed fire flow calculation was prepared using the Fire Underwriters Survey recommendations (FUS). The fire flow calculation indicates that the recommended fire flow for this development is approximately 4,000 L/min (1,057 USGPM, 880 IGPM) (refer to **Appendix D**).

Combining the maximum daily demand (417 L/min) and the fire flow (4,000 L/min), exceeds the peak hourly demand (627 L/min), therefore the design water demand for the proposed development is **4,417 L/min**.

A hydrant flow/pressure test was conducted by the Region on December 13, 2018 (refer to **Appendix D**) on the two hydrants fronting the site on Liverpool Road. The flow test indicates the following:

1) Q_{20PSI} = 3,732 IGPM = 16,966 L/min
   Therefore, at the minimum allowable pressure for the "max day + fire flow" scenario, the available supply provided by the existing system is more than 3.8 times the calculated water demand for the proposed development.

2) Q_{40PSI} = 2,960 IGPM = 13,456 L/min
   Therefore, at the minimum allowable pressure for the "max hour" scenario, the available supply provided by the existing system is more than 21 times the calculated water demand for the proposed development.

3) The static pressure is 530 kPa (76.9 PSI), below the maximum threshold of 700kPa (100 PSI) for sustained operating pressure.

4) Static pressure is below 550 kPa (80 PSI), therefore per OBC, no pressure reducing valve is required.

The hydrant flow test results indicate that available pressure and flow in the surrounding municipal watermains will satisfy the water demand of the proposed development.

6.0 SANITARY SERVICING

6.1 SANITARY SEWER SYSTEM

A 250mm diameter municipal concrete sanitary sewer exists at a depth of approximately 4.0m, flowing Northward in the Liverpool Road right-of-way. A 150mm diameter sanitary connection to the municipal sanitary sewer (with property line control manhole) exists at the south end of the property and currently services the Old Liverpool House Restaurant. A second similar 150mm diameter sanitary connection exists adjacent to the existing northern vehicular access servicing the existing commercial plaza. It is assumed that the daycare conversion is serviced via a standard single-family dwelling sanitary service connection per Durham Standard Detail S-100.010. Existing service connections are to be verified in the field.

A new 200mm diameter sanitary connection per Region Standards is proposed at the north end of the site. This service connection will connect at the underground parking structure and will service both mixed-use buildings and the townhouse block.

The existing150mm sanitary connection currently servicing the Old Liverpool House is to be maintained and will continue to service the Old Liverpool House Restaurant after it is re-located. A conceptual configuration of the sanitary servicing design is shown on **Figure 3.0** *(page F.1 at the end of the report)*.

6.2 DOWNSTREAM SANITARY SEWER ANALYSIS

As requested by the Region, a downstream analysis of sanitary sewer capacity was conducted to confirm that the receiving sewer system can accommodate the proposed development. Three scenarios were analyzed:

Scenario 1: Downstream system under existing conditions
Scenario 2: Downstream system under proposed conditions
Scenario 3: Downstream system under proposed conditions with potential future developments added.

As stipulated by the Region in response to the Terms of Reference prepared for this analysis (January 11, 2019), the catchment area delineated in **Appendix E.1.2** was analyzed. The study assessed the existing downstream sanitary sewer beginning with the sewer fronting the subject site (MH H6-0029, Liverpool Rd.) and ending immediately upstream of the 525mm diameter trunk sewer on Bronte Sq. (MH H6-0113, at Glenanna Rd.).

Sanitary design sheets were prepared for each Scenario based on contributing areas and expected flows calculated per the "Regional Municipality of Durham Design Specifications for Sanitary Sewers", which are summarized in **Appendix E.2**.

Results of the analysis are tabulated in **Appendix E.3**.

Under existing conditions, the downstream sewer lengths were found to be flowing at or below 47% capacity.

With the addition of flows from the proposed development, sewer length H6-0136 to H6-0137 was found to be flowing at the highest percent of capacity (65%). All other sewer lengths were at or below 60% capacity.

The addition of the potential future development of properties north of the subject site at 1854 & 1858 Liverpool Rd. (as advised by the City of Pickering Development Department), increased the flows in H6-0136 to H6-0137 to 74% of capacity. All other sewer runs in this scenario were at or below 65% of capacity.

Based on the results of the downstream analysis, the proposed development can be accommodated by the existing municipal sanitary sewer system with a minimum of 35% residual capacity remaining in all pipe lengths between the site and the downstream 525mm diameter trunk sewer.

7.0 GRADING

The subject site is relatively flat, with elevations generally ranging from 89.5m to 88m. The existing topography of the site slopes downward to the south towards Kingston Road with a fall of approximately 1.5m from the north to the south limit, generally matching the centerline profile of Liverpool Road. The site also slopes marginally downward to the west with a fall of approximately 0.5m from the east to west limits, generally matching the centerline profile of Kingston Road.

Given the relatively flat nature of the site, there are no significant grading constraints. The proposed grading design considers the following criteria:

- Match to existing elevations at the property limits;
- Ensure that drainage is self-contained;
- Respect the stormwater management requirements;
- Abide by the City criteria for maximum and minimum sloping. No walkable surfaces exceed 5% slope and no grading exceeds 3:1 sloping.
- Minimize the need for retaining walls. A toe wall will be implemented along the shared boundary with the existing commercial block west of the subject site.
- Minimize the need for engineered fill;
- Minimize the cut/fill operations; and
- Achieve the required cover for services.

The preliminary grading concept is shown on **Figure 8.0** *(page F.4 at the end of the report)*.

8.0 EROSION AND SEDIMENT CONTROL

Erosion and sediment control will be implemented onsite in accordance with The Erosion and Sediment Control guidelines for Urban Construction (2006). Measures will be implemented according to the approved design prior to any construction works and will be maintained and modified to suit conditions as construction progresses for the duration of works until all disturbed areas are stabilized.

The following measures will be implemented, as shown on **Figure 9.0** *(page F.5 at the end of the report)*:

- Siltation control fence will be installed around the perimeter of the site.
- A mud mat will be installed at the site access to mitigate mud tracking onto municipal and/or regional roads.
- A sediment trap will be installed in accordance with OPSD 219.220 complete with a hickenbottom outlet controlling flows to the municipal storm sewer as well as an emergency overflow weir.
- Catch basins siltation "sacks" will be placed in the catch basins adjacent to the site within the Liverpool Road right of way.

It is also noted that the building construction will create a significant excavation (depression) onsite. During construction, water that collects in the depression will be directed through a gravel filter ring to a pump that will direct flow to the sediment trap prior to being discharged into the municipal storm sewer.

The erosion and sediment control strategies outlined above are not static and may need to be upgraded/amended as site conditions change to prevent sediment releases beyond the site limits. Failed erosion and sediment control measures should be repaired within 48 hours. Temporary controls will not be removed until all areas they serve are fully restored/ stabilized.

9.0 CONCLUSIONS

Based on the foregoing, it can be concluded that:

- In conjunction with the stormwater management plan, Storm servicing for the site can be provided by existing connections to the 450mm and 600mm diameter storm sewers located in the Liverpool Rd. and Kingston Rd. rights-of-ways respectfully.
- The site is subject to stormwater management requirements as outlined by the Pickering City Center Stormwater Management Strategy (April 2015). The requirements necessitate compliance with water balance, water quantity control and water quality control.

- Water balance onsite can be achieved through the implementation of initial abstractions along with underground detention tanks to facilitate water reuse through a combination of irrigation and mechanical reuse in the buildings. Compliance with the water balance criteria will require that at a minimum, 5mm of runoff be retained onsite through a combination of the above-mentioned methods.

- Stormwater quantity control can be achieved through the implementation of detention tanks with orifice flow restriction to provide active storage and limit the rate of discharge from the site into the municipal storm sewer.

- Quality control is to be provided for the development to reduce downstream sediment loading, and to prevent oil and floating pollutants from leaving the site. All runoff from asphalt and walkway areas will be treated via a Jellyfish® filter unit to achieve the required 80% TSS removal.

- The hydrant flow test provided by the Region indicates that the existing municipal watermain system can accommodate the demands of the proposed development.

- Based on the sanitary downstream analysis conducted, the existing municipal sanitary sewer can accommodate the proposed development.

- Grading for the site is generally free of significant constraints given the flat nature of the site.

All information presented within this report is based on preliminary information for the Subject Site and is accurate to the best of our knowledge based on the information made available to the design team at this time.

Should you have any questions or concerns regarding the information enclosed, please do not hesitate to contact the undersigned.

Sincerely,

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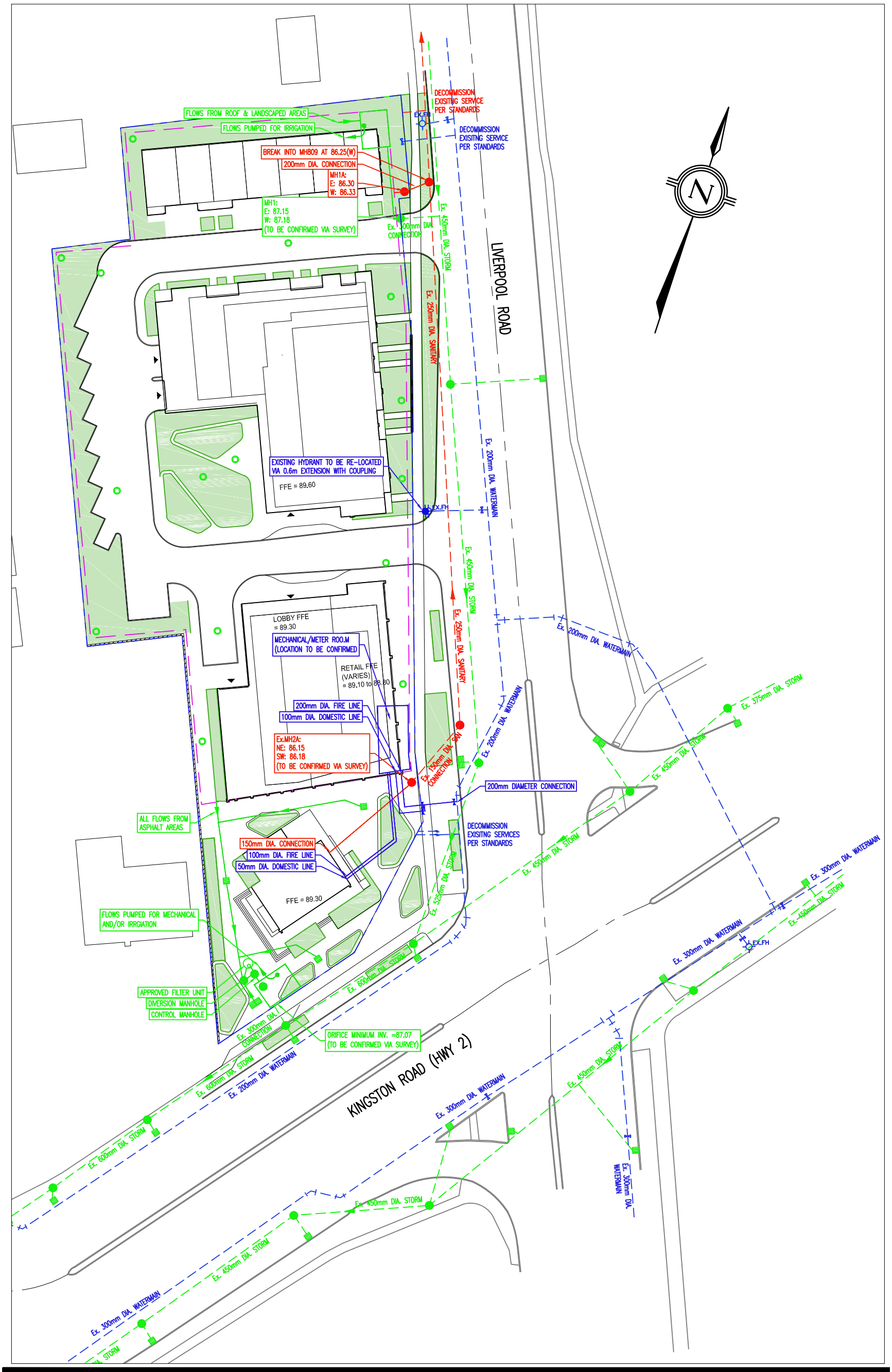

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LEGEND:

- EXISTING WATERMAIN
- PROPOSED WATERMAIN
- EXISTING SANITARY SEWER
- PROPOSED SANITARY SEWER
- EXISTING STORM SEWER
- PROPOSED STORM SEWER
- PROPERTY LIMIT
- UNDERGROUND PARKING LIMIT

Client/Project
ALTONA GROUP

1294 KINGSTON RD. &
1848-1852 LIVERPOOL RD.

Project No.
1606 22705

Title
SERVICING CONCEPT

1: 750

Date
MAR 2019

Figure No.
3.0

F.1

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2019/05/13 1:45 PM By: Hahn, Alex

LEGEND:

- LANDSCAPE
- ROOF
- HARDSCAPE
- PROPERTY BOUNDARY

AREA ID: 101 | 0.10 (AREA (ha)) | 0.90 (RUNOFF COEFFICIENT)

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Client/Project
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1294 KINGSTON RD. &
1848-1852 LIVERPOOL RD.

Project No.
1606 22705

Title
EXISTING DRAINAGE AREA PLAN

1:750

Date
MAY 2019

Figure No.
6.0

F.2

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LEGEND:

- LANDSCAPE
- POTENTIAL GREEN ROOF
- ROOF
- HARDSCAPE
- PROPERTY BOUNDARY
- UNDERGROUND PARKING LIMIT

AREA ID: 101 | AREA (ha): 0.10 | RUNOFF COEFFICIENT: 0.90

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1294 KINGSTON RD. &
1848-1852 LIVERPOOL RD.

Project No.
1606 22705

Title
PROPOSED DRAINAGE
AREA PLAN

1 : 750

Date
MAY 2019

Figure No.
7.0

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Client/Project
ALTONA GROUP

1294 KINGSTON RD. &
1848 - 1852 LIVERPOOL RD.

PICKERING ONTARIO

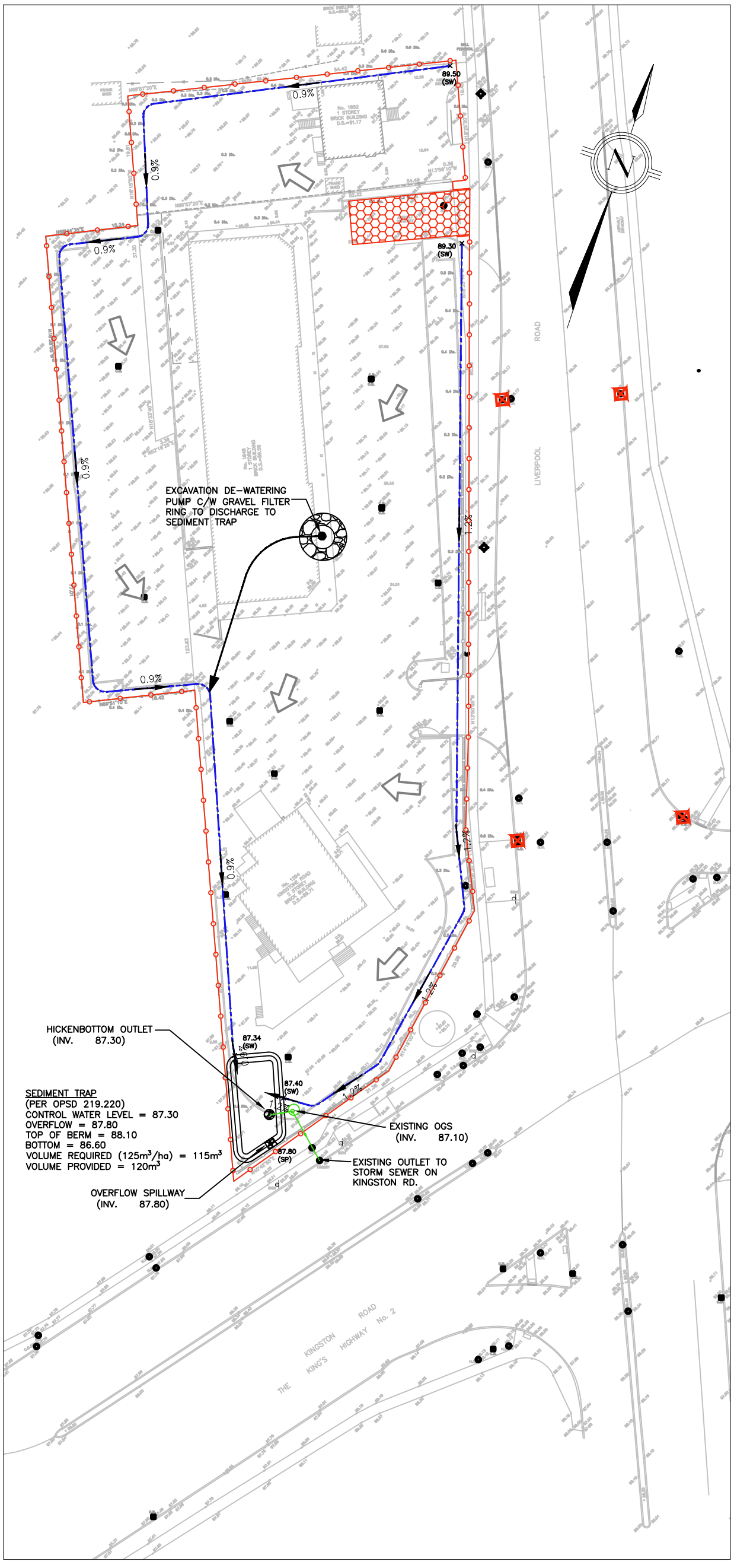
LEGEND:

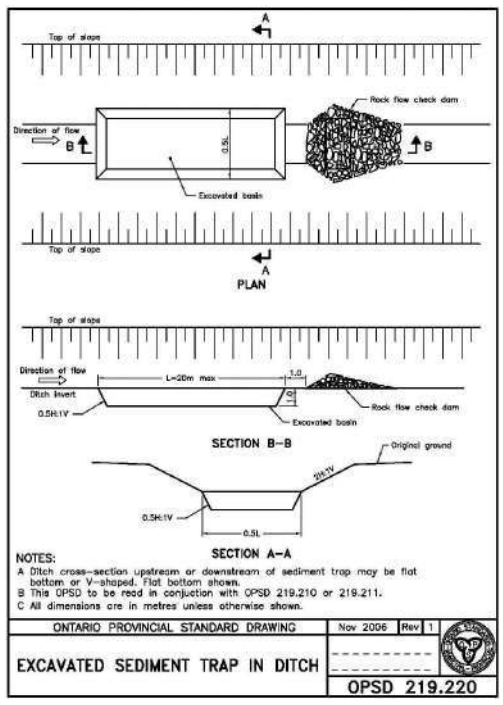
- 89.00 × PROPOSED ELEVATION
- 89.00 × EXISTING ELEVATION TO BE MAINTAINED
- HARDSCAPE BREAKLINE
- INTERCEPTOR SWALE
- LIMIT OF UNDERGROUND PARKING
- PROPERTY LIMIT
- AREA DRAIN
- CATCH BASIN

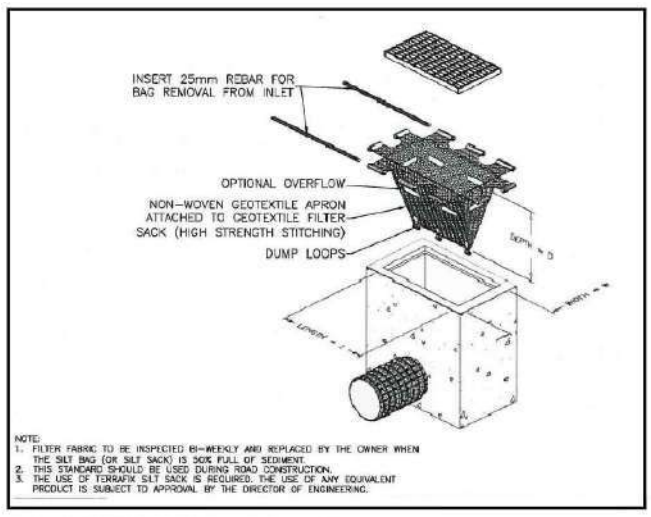
GRADING CONCEPT

1: 300

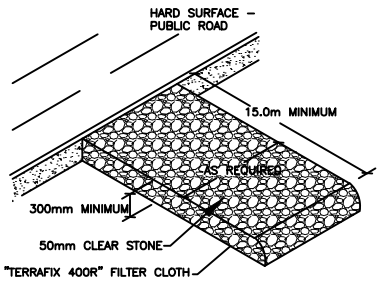
Figure No.
8.0







CATCHBASIN SILT SACK DETAIL
SCALE: N.T.S.



NOTE:

UPON OBSERVATION OF MUD TRACKING OCCURRING ONTO ADJACENT STREET, THE MUD MAT IS TO BE CLEANED AND/OR REINSTATED AT THE DISCRETION OF THE CONTRACT ADMINISTRATOR

MUD MAT
SCALE: N.T.S.

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Stantec
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300W-675 Cochrane Drive
Markham ON L3R 0B8
Tel: (905) 944-7777
www.stantec.com

LEGEND:
- MUD MAT
- CATCH BASIN SILT SACK
- OVERLAND FLOW DIRECTION
- INTERCEPTOR SWALE
- SILTATION CONTROL FENCE

Client/Project
ALTONA GROUP

1294 KINGSTON RD. &
1848-1852 LIVERPOOL RD.

Project No.
1606 22705

Title
EROSION AND SEDIMENT CONTROL PLAN

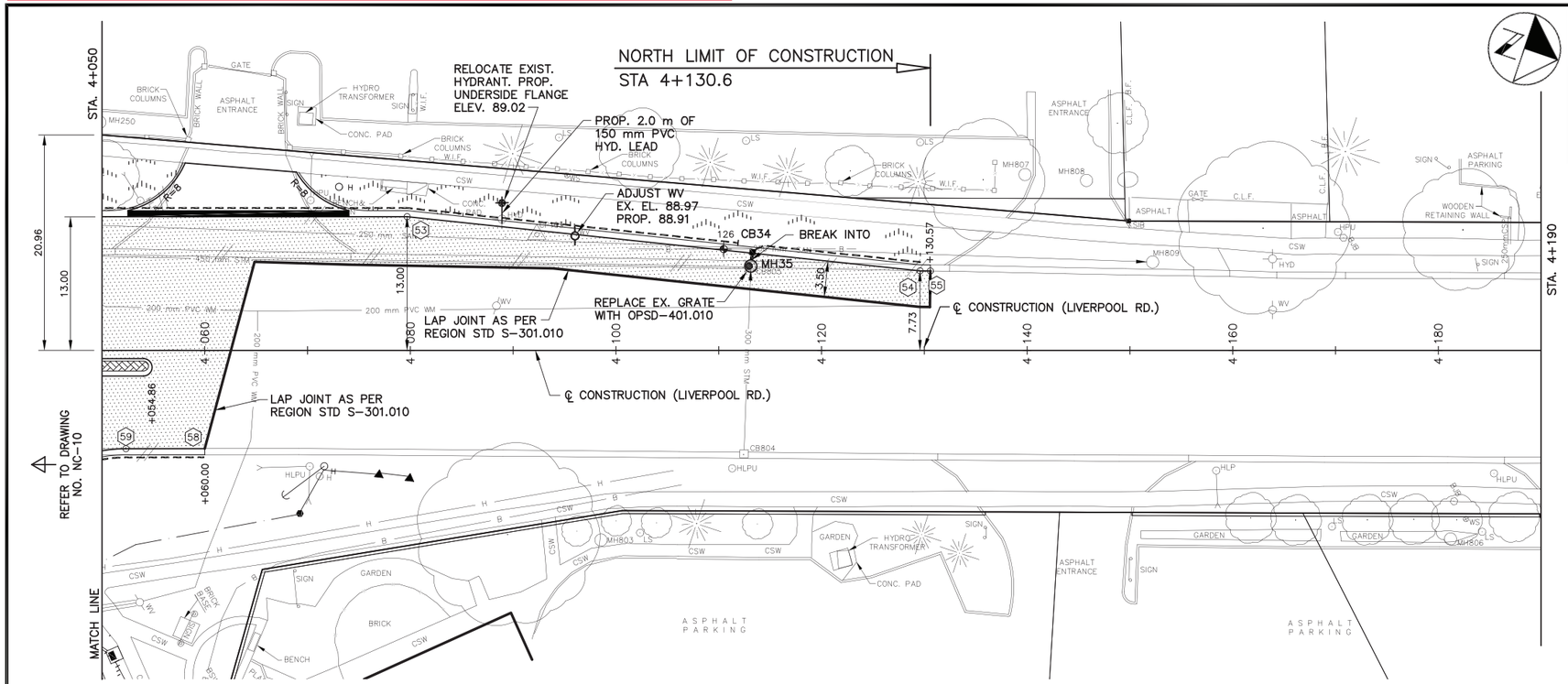
1: 750

Date
MAR 2019

Figure No.
9.0

Appendix A RECORD DRAWINGS

APPENDIX A.1: Durham Record Drawings



CATCH BASIN DATA						C.B. CONNECTION DATA			
OPSD	INV. NO.	CHAINAGE	GRATE EP. ELEV.	INVERT ELEV. IN	INVERT ELEV. OUT	LEN. (m)	DIA. (mm)	CLASS OF PIPE	GRADE %
705.010,400.020	CB34	4+113.26	89.07		87.47	1.4	250	SDR35	1.0

NO.	CHAINAGE	EP ELEV.	RADIUS (m)	LENGTH (m)	GRADE (%)	OFFSET
51	14+638.01	88.58	15.00	16.09	VARIES	14.90 NORTH
52	4+018.81	88.54				13.00 WEST
53	4+079.68	88.76		60.87	VARIES	13.00 WEST
54	4+129.58	89.23		50.18	0.8	7.73 WEST
55	4+130.58	89.24		1.00	0.4	7.72 WEST
58	4+060.00	88.65		7.68	VARIES	9.55 EAST
59	4+052.92	88.62	14.00	23.21	VARIES	9.55 EAST
60	14+693.22	88.71				22.15 NORTH

NO.	DATE	NAME	REVISIONS

AECOM

AECOM Canada Ltd.
300 Water Street, Whitby, Ontario, Canada L1N 9J2
T905.668.9363 F905.668.0221

UTILITIES VERIFIED

CABLE T.V.	2011 MAR. 28	HYDRO	2011 JULY 14
BELL CANADA	2011 APR. 28		
ENBRIDGE	2011 FEB. 23		

CONTRACTOR TO BE RESPONSIBLE FOR LOCATION OF ALL EXISTING U/G & OVERHEAD UTILITIES. VARIOUS UTILITIES REQUIRE ADVANCE NOTICE PRIOR TO DIGGING, FOR STAKE OUT.
THE REGION ASSUMES NO RESPONSIBILITY FOR THE ACCURACY OF THE LOCATION OF EXISTING UTILITIES AS INDICATED ON THIS DRAWING.

LICENSED PROFESSIONAL ENGINEER J. R. NEWMAN AUG 18/14 PROVINCE OF ONTARIO

SURVEY DATA DATE: 2012 04

SCALE
HORIZONTAL 5m 0 5m
VERTICAL 1m 0 1m

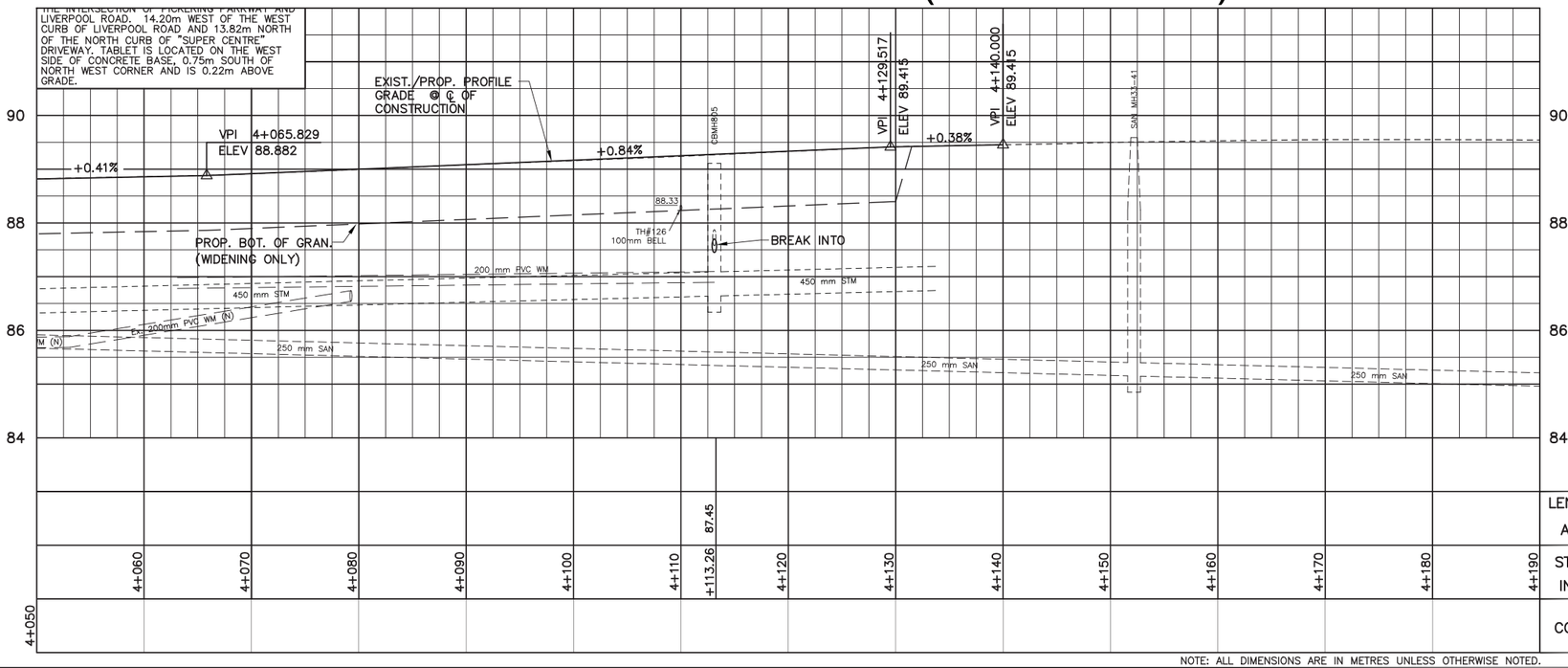
DRAWN:	E. MEIJERINK	DATE: 2014 06
DESIGN:	R. AUGER	DATE: 2014 06
CHECKED:	J. NEWMAN	DATE: 2014 06
APPROVED:	J. NEWMAN	DATE: 2014 06

THE REGIONAL MUNICIPALITY OF DURHAM
WORKS DEPARTMENT
WHITBY ONTARIO

LIVERPOOL ROAD (REG. RD. 29)
NEW CONSTRUCTION
FROM 50m N. OF HWY 2 TO 131m N. OF HWY 2

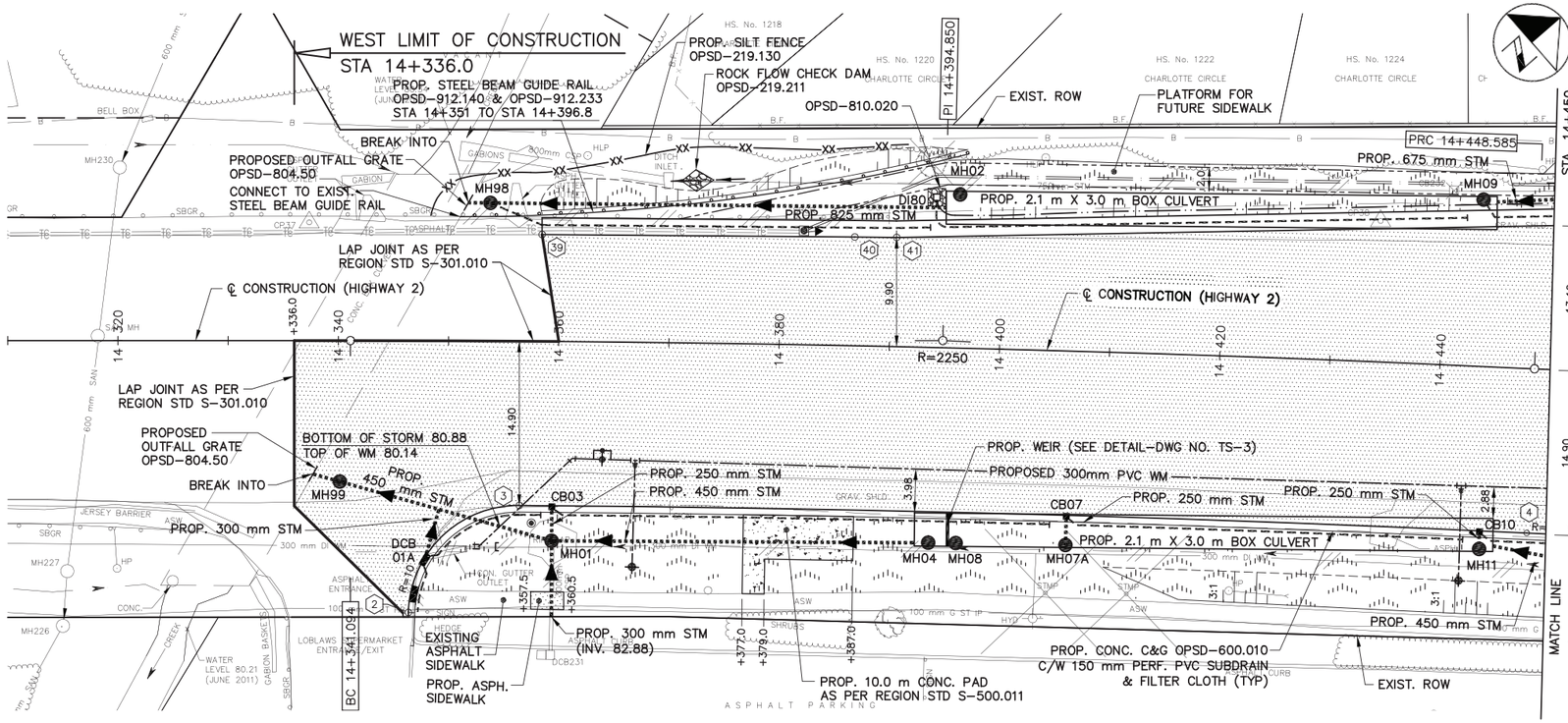
CONCESSION	REG. RD. NO.	AREA MUNICIPALITY
1	29	CITY OF PICKERING

DRAWING NUMBER	CONTRACT NUMBER	SHEET NUMBER
NC-11	D2014-016	24 OF 74



NOTE: ALL DIMENSIONS ARE IN METRES UNLESS OTHERWISE NOTED.

Plotted: Aug 15, 2014 — 3:52pm, Name: 60196264-C-LIVERPOOL_NC-10_12.dwg



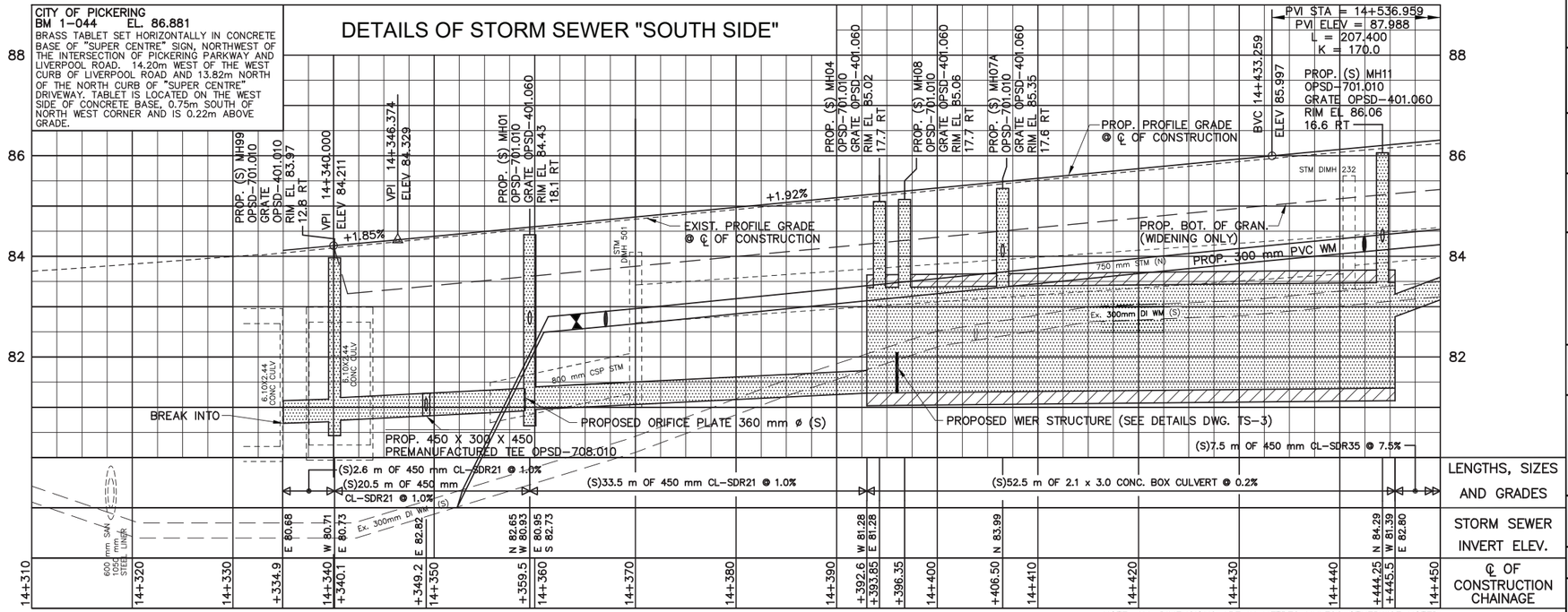
CATCH BASIN DATA						C.B. CONNECTION DATA			
OPSD	INV. NO.	CHAINAGE	GRATE EP. ELEV.	INVERT ELEV. IN	INVERT ELEV. OUT	LEN. (m)	DIA. (mm)	CLASS OF PIPE	GRADE %
705.010,400.020	CB03	14+359.50	84.28		82.68	2.8	250	SDR35	1.0
705.010,400.020	CB07	14+407.74	85.21		84.01	2.5	250	SDR35	1.0
705.010,400.020	CB10	14+444.27	85.91		84.31	1.6	250	SDR35	1.0
705.020,400.020	CB01A	14+355.00	83.24		82.95	4.5	300	SDR35	2.0

NO.	CHAINAGE	EP ELEV.	RADIUS (m)	LENGTH (m)	GRADE (%)	OFFSET
1	14+346.62	84.18		3.02	1.66	27.66 SOUTH
2	14+346.41	84.13				24.65 SOUTH
3	14+356.51	84.27	10.00	15.39	VARIES	14.90 SOUTH
4	14+448.58	85.98	2235.10	91.46	VARIES	14.90 SOUTH
5	14+454.11	86.08	3014.90	5.56	VARIES	14.90 SOUTH
39	14+358.42	84.35		28.37	1.52	
40	14+386.66	84.78		3.80	2.0	9.85 NORTH
41	14+390.45	84.96		86.00	VARIES	9.90 NORTH
42	14+476.15	86.47				14.67 NORTH

KINGSTON ROAD - HIGHWAY 2

CITY OF PICKERING
BM 1-044 EL. 86.881
BRASS TABLET SET HORIZONTALLY IN CONCRETE BASE OF "SUPER CENTRE" SIGN, NORTHWEST OF THE INTERSECTION OF PICKERING PARKWAY AND LIVERPOOL ROAD, 14.20m WEST OF THE WEST CURB OF LIVERPOOL ROAD AND 13.82m NORTH OF THE NORTH CURB OF "SUPER CENTRE" DRIVEWAY. TABLET IS LOCATED ON THE WEST SIDE OF CONCRETE BASE, 0.75m SOUTH OF NORTH WEST CORNER AND IS 0.22m ABOVE GRADE.

DETAILS OF STORM SEWER "SOUTH SIDE"



NOTE: ALL DIMENSIONS ARE IN METRES UNLESS OTHERWISE NOTED.

NO.	DATE	NAME	REVISIONS

AECOM

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300 Water Street, Whitby, Ontario, Canada L1N 9J2
T905.668.9363 F905.668.0221

UTILITIES VERIFIED

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BELL CANADA	2011 APR. 28		
ENBRIDGE	2011 FEB. 23		

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LICENSED PROFESSIONAL ENGINEER
J. R. NEWMAN
AUG 18/14
PROVINCE OF ONTARIO

SURVEY DATA DATE
2012 04

SCALE
HORIZONTAL
5m 0 5m
VERTICAL
1m 0 1m

DRAWN:	E. MEIJERINK	DATE:	2014 06
DESIGN:	R. AUGER	DATE:	2014 06
CHECKED:	J. NEWMAN	DATE:	2014 06
APPROVED:	J. NEWMAN	DATE:	2014 06

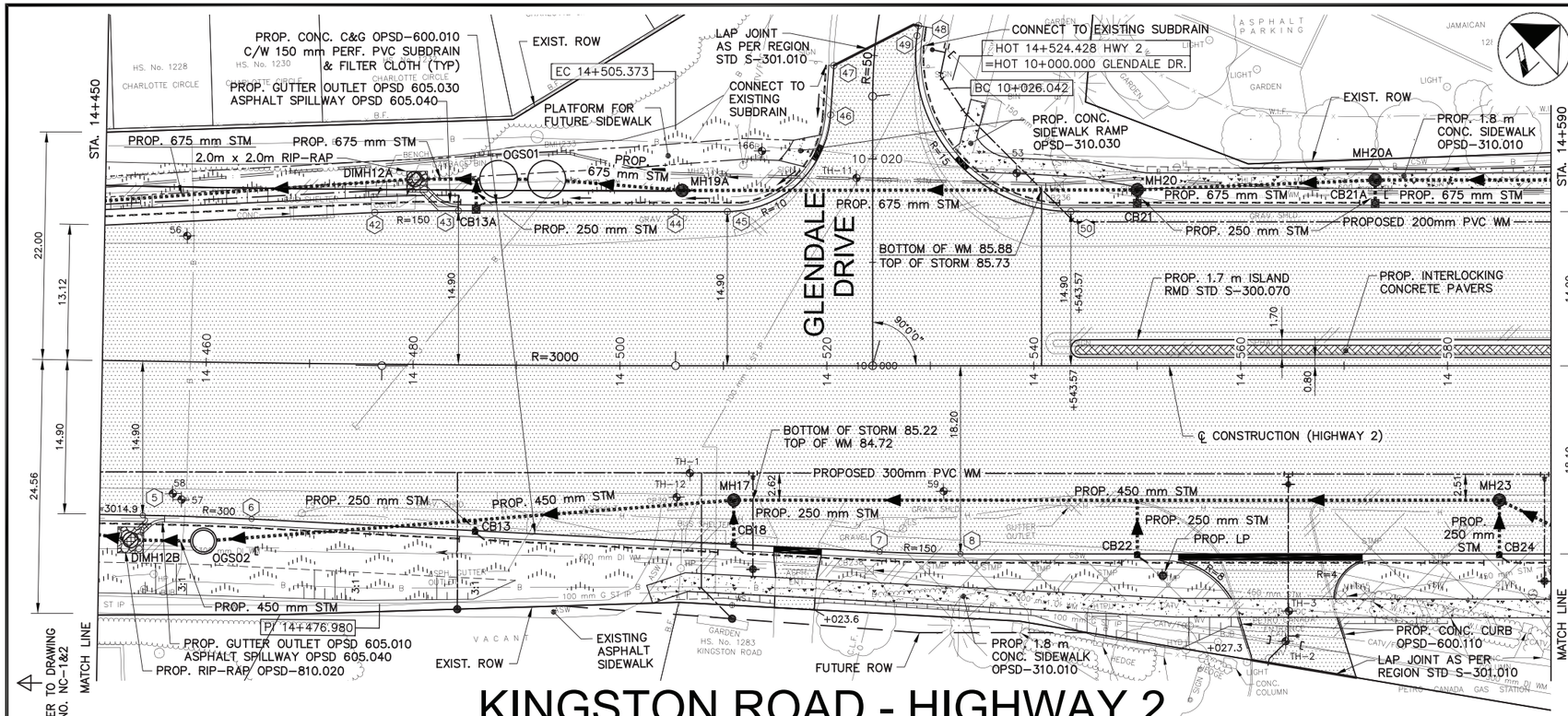
THE REGIONAL MUNICIPALITY
OF DURHAM
WORKS DEPARTMENT
WHITBY ONTARIO

HIGHWAY 2 – KINGSTON ROAD
NEW CONSTRUCTION
FROM 214m W. OF GLENDALE DR. TO 74m W. OF GLENDALE DR.

CONCESSION	REG. RD. NO.	AREA MUNICIPALITY
1	HWY-2	CITY OF PICKERING

DRAWING NUMBER	CONTRACT NUMBER	SHEET NUMBER
NC-2	D2014-016	15 OF 74

Plotted: Aug 15, 2014 - 4:06pm, Name: 60196264-C-LIVERPOOL_NC-01_09.dwg



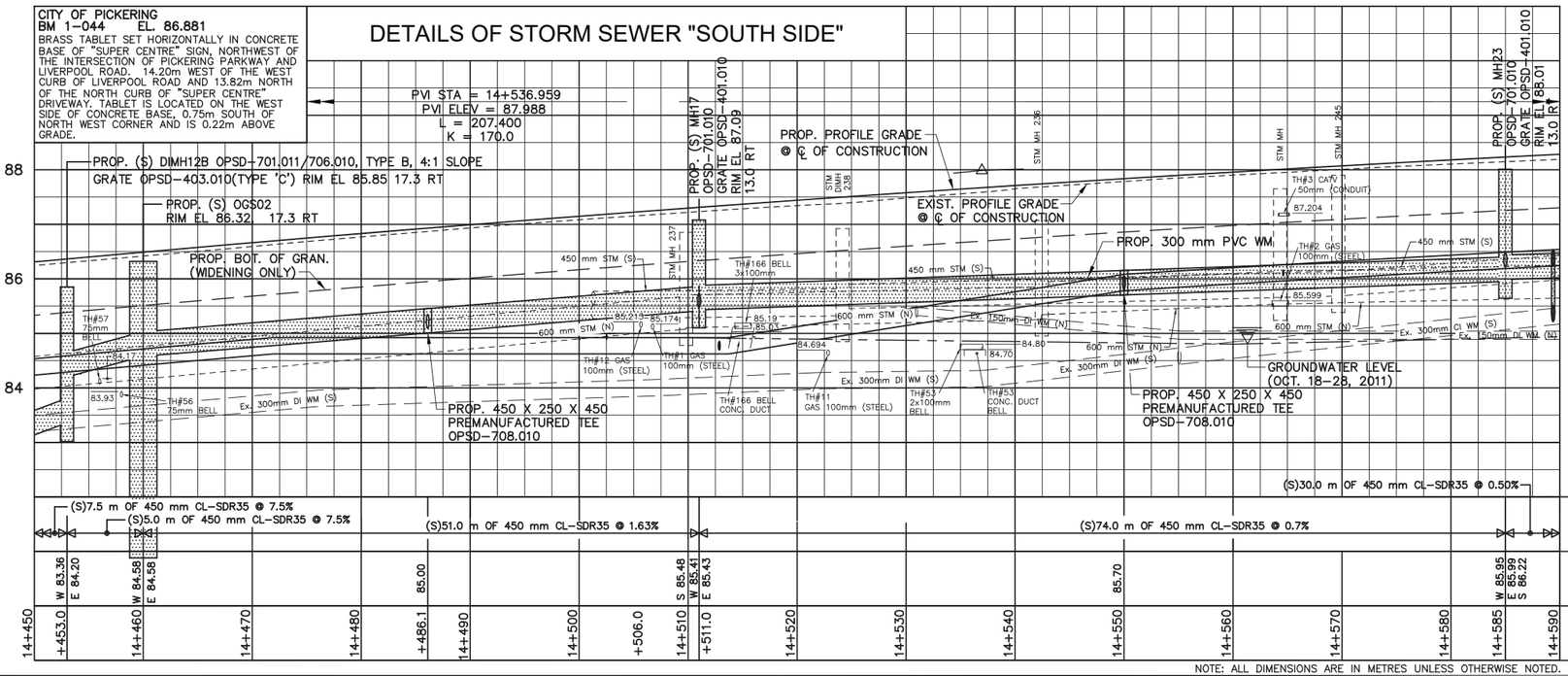
KINGSTON ROAD - HIGHWAY 2

CATCH BASIN DATA						C.B. CONNECTION DATA			
OPSD	INV. NO.	CHAINAGE	GRATE EP. ELEV.	INVERT ELEV. IN	INVERT ELEV. OUT	LEN. (m)	DIA. (mm)	CLASS OF PIPE	GRADE %
705.010,400.020	CB13	14+486.11	86.61		85.05	1.1	250	SDR35	1.0
705.010,400.020	CB18	14+511.00	86.97		85.52	4.3	250	SDR35	1.0
705.010,400.082	CB21	14+543.57	87.46		85.86	2.3	250	SDR35	1.0
705.010,400.082	CB21A	14+573.00	87.81		86.21	2.3	250	SDR35	1.0
705.010,400.020	CB22	14+550.00	87.47		85.87	5.3	250	SDR35	1.0
705.010,400.020	CB24	14+585.00	87.87		86.27	5.3	250	SDR35	1.0
705.010,400.082	CB13A	14+486.00	86.63		85.03	2.5	250	SDR35	1.0

EP DATA						
NO.	CHAINAGE	EP ELEV.	RADIUS (m)	LENGTH (m)	GRADE (%)	OFFSET
4	14+448.58	85.98	3014.9	5.56	VARIES	14.90 SOUTH
5	14+454.11	86.08				14.90 SOUTH
6	14+464.59	86.22	300.00	10.53	VARIES	15.10 SOUTH
7	14+525.09	87.09		60.79	VARIES	18.00 SOUTH
8	14+532.92	87.19	150.00	7.83	VARIES	18.20 SOUTH
9	14+959.55	87.93		62.63	VARIES	18.20 SOUTH
41	14+390.45	84.96		86.01	VARIES	9.90 NORTH
42	14+476.15	86.47				14.67 NORTH
43	14+484.27	86.60	150.00	8.08	VARIES	14.90 NORTH
44	14+505.37	86.93	2985.10	21.00	VARIES	14.90 NORTH
45	14+510.38	87.00		5.01	VARIES	14.90 NORTH
46	10+024.24	87.06	10.00	15.05	VARIES	4.07 WEST
47	10+028.81	87.04		4.79	VARIES	3.83 WEST
48	10+033.49	87.03	46.21	1.00	VARIES	3.92 EAST
49	10+032.41	87.03	15.00	25.56	VARIES	3.91 EAST
50	14+543.57	87.48		94.44	VARIES	14.90 NORTH
51	14+638.01	88.58				14.90 NORTH

CITY OF PICKERING
BM 1-044 EL. 86.881
BRASS TABLET SET HORIZONTALLY IN CONCRETE BASE OF "SUPER CENTRE" SIGN, NORTHWEST OF THE INTERSECTION OF PICKERING PARKWAY AND LIVERPOOL ROAD. 14.20m WEST OF THE WEST CURB OF LIVERPOOL ROAD AND 13.82m NORTH OF THE NORTH CURB OF "SUPER CENTRE" DRIVEWAY. TABLET IS LOCATED ON THE WEST SIDE OF CONCRETE BASE, 0.75m SOUTH OF NORTH WEST CORNER AND IS 0.22m ABOVE GRADE.

DETAILS OF STORM SEWER "SOUTH SIDE"



NOTE: ALL DIMENSIONS ARE IN METRES UNLESS OTHERWISE NOTED.

NO.	DATE	NAME	REVISIONS

AECOM

AECOM Canada Ltd.
300 Water Street, Whitby, Ontario, Canada L1N 9J2
T 905.668.9363 F 905.668.0221

UTILITIES VERIFIED

CABLE T.V.	2011 MAR. 28	HYDRO	2011 JULY 14
BELL CANADA	2011 APR. 28		
ENBRIDGE	2011 FEB. 23		

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THE REGION ASSUMES NO RESPONSIBILITY FOR THE ACCURACY OF THE LOCATION OF EXISTING UTILITIES AS INDICATED ON THIS DRAWING.

LICENSED PROFESSIONAL ENGINEER
Y. R. NEWMAN
Aug 19/14
PROVINCE OF ONTARIO

SURVEY DATA DATE
2012 04

SCALE
HORIZONTAL
5m 0 5m
VERTICAL
1m 0 1m

DRAWN:	E. MEIJERINK	DATE: 2014 06
DESIGN:	R. AUGER	DATE: 2014 06
CHECKED:	J. NEWMAN	DATE: 2014 06
APPROVED:	J. NEWMAN	DATE: 2014 06

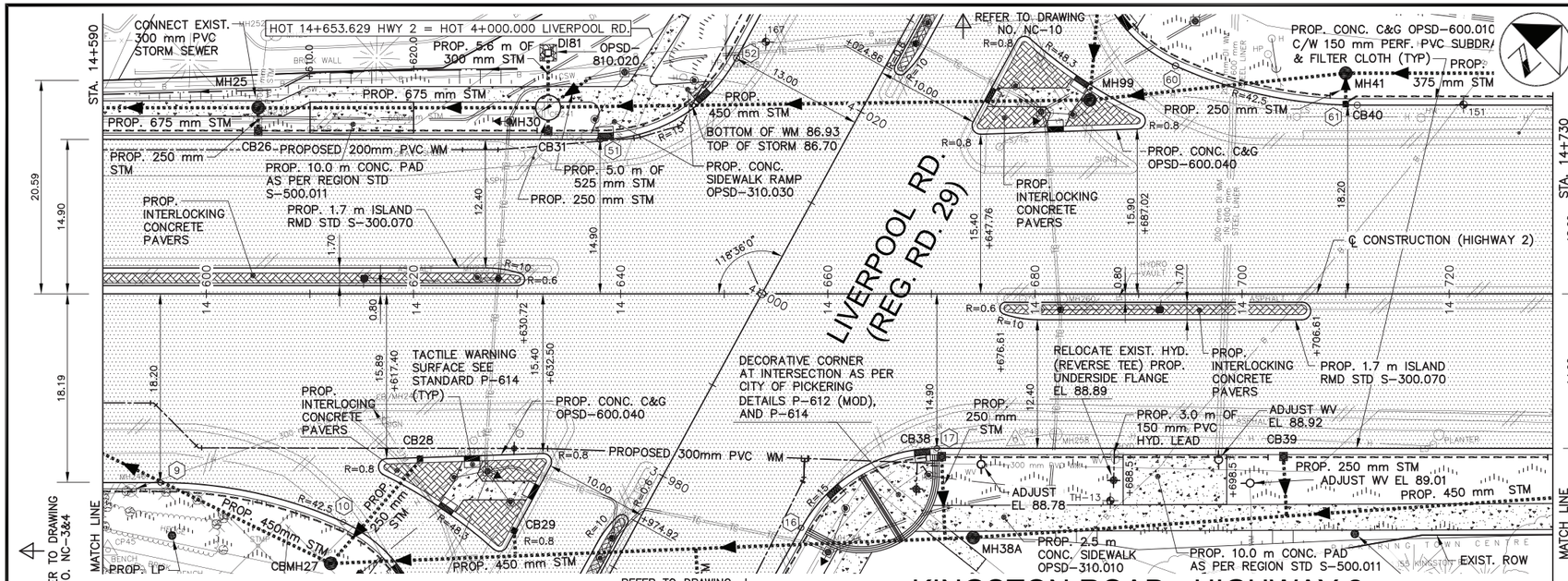
THE REGIONAL MUNICIPALITY
OF DURHAM
WORKS DEPARTMENT
WHITBY ONTARIO

HIGHWAY 2 – KINGSTON ROAD
NEW CONSTRUCTION
FROM 74m W. OF GLENDALE DR. TO 63m W. OF LIVERPOOL RD.

CONCESSION	REG. RD. NO.	AREA MUNICIPALITY
1	HWY-2	CITY OF PICKERING

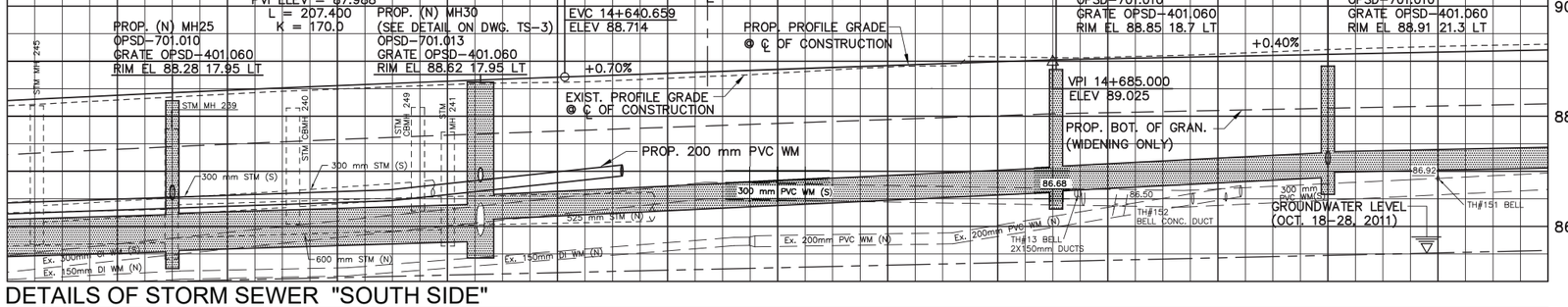
DRAWING NUMBER	CONTRACT NUMBER	SHEET NUMBER
NC-4	D2014-016	17 OF 74

Plotted: Aug 15, 2014 - 4:04pm, Name: 60196264-C-LIVERPOOL_NC-01_09.dwg

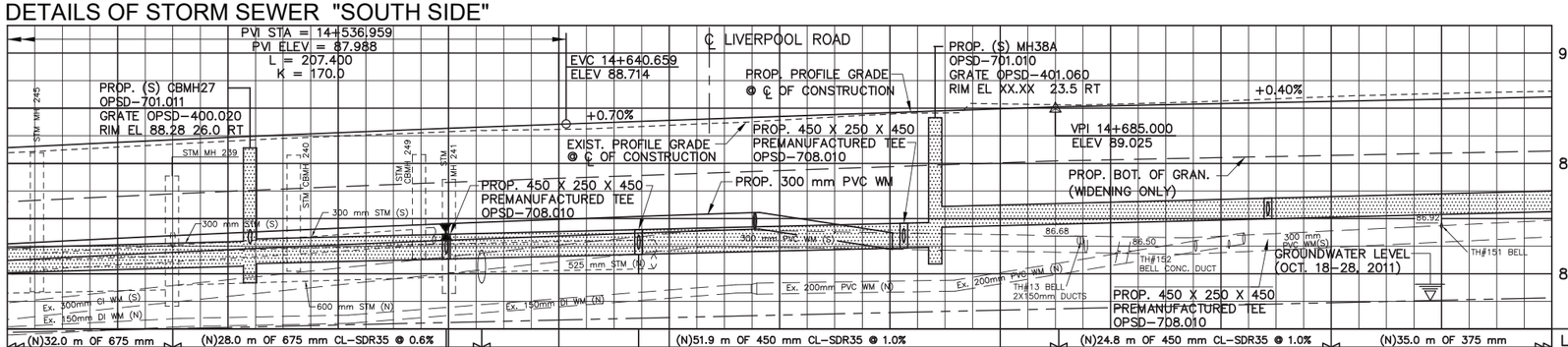


KINGSTON ROAD - HIGHWAY 2

DETAILS OF STORM SEWER "NORTH SIDE"



DETAILS OF STORM SEWER "SOUTH SIDE"



(N)32.0 m OF 675 mm CL-SDR35 @ 0.6%
(S)30.0 m OF 450 mm CL-SDR35 @ 0.50%
(N)28.0 m OF 675 mm CL-SDR35 @ 0.6%
(S)62.1.0 m OF 450 mm CL-SDR35 @ 0.50%
(N)51.9 m OF 450 mm CL-SDR35 @ 1.0%
(S)57.1 m OF 375 mm CL-SDR35 @ 0.50%
(N)24.8 m OF 450 mm CL-SDR35 @ 1.0%
(N)35.0 m OF 375 mm CL-SDR35 @ 0.40%

LENGTHS, SIZES AND GRADES

STORM SEWER INVERT ELEV.

14+590	14+600	+605.0	14+610	14+612	14+620	+629.8	14+630	+633.0	14+640	+647.2	14+650	14+660	14+670	+671.3	+674.1	14+680	+685.3	14+690	14+700	+704.3	14+710	14+720	14+730
		W 85.54 E 85.56 S 86.49 N 86.48		W 86.14 E 86.18 N 86.55		86.27	N 86.45 W 85.73 E 86.86 NE 85.83			86.35				86.47	W 86.49 E 86.84		86.62 86.64			86.99	W 86.89 E 86.98 N 87.12		

℄ OF CONSTRUCTION CHAINAGE

NOTE: ALL DIMENSIONS ARE IN METRES UNLESS OTHERWISE NOTED.

CATCH BASIN DATA						C.B. CONNECTION DATA			
OPSD	INV. NO.	CHAINAGE	GRATE EP. ELEV.	INVERT ELEV. IN	INVERT ELEV. OUT	LEN. (m)	DIA. (mm)	CLASS OF PIPE	GRADE %
705.010,400.082	CB26	14+605.00	88.13		86.51	2.3	250	SDR35	1.0
705.010,400.020	CB28	14+620.62	88.27		86.68	13.3	250	SDR35	1.0
705.010,400.082	CB31	14+633.00	88.47		86.88	2.3	250	SDR35	1.0
705.010,400.082	CB38	14+671.00	88.74		87.14	7.1	250	SDR35	1.0
705.010,400.082	CB39	14+704.00	88.81		87.21	5.4	250	SDR35	1.0
705.010,400.020	CB40	14+710.00	88.75		87.15	3.0	250	SDR35	1.0
705.010,400.020	CB29	3+068.00	88.24		86.64	2.0	250	SDR35	1.0
705.030,403.010 TYPE 'A' 3:1	DI81	14+633.00	87.86		86.50	5.0	300	SDR35	1.0

EP DATA					
NO.	CHAINAGE	EP ELEV.	RADIUS (m)	LENGTH (m)	GRADE (%)	OFFSET
8	14+532.92	87.19		62.63	VARIES	18.20 SOUTH
9	14+595.55	87.93			VARIES	18.20 SOUTH
10	14+613.54	88.12	42.5	18.57	VARIES	22.16 SOUTH
11	3+946.84	87.97	14.0	23.21	VARIES	10.00 WEST
15	3+937.00	87.82		44.99	VARIES	13.57 EAST
16	3+981.99	88.46			VARIES	14.13 EAST
17	14+670.53	88.74	15.00	15.91	VARIES	14.90 SOUTH
18	14+874.88	89.47		204.36	0.4	14.90 SOUTH
50	14+543.57	87.48		94.44	VARIES	14.90 NORTH
51	14+638.01	88.58			VARIES	14.90 NORTH
52	4+018.81	88.54	15.00	16.09	VARIES	13.00 WEST
53	4+079.68	88.76		60.87	VARIES	13.00 WEST
59	4+052.92	88.62	14.00	23.21	VARIES	9.55 EAST
60	14+693.22	88.71	42.5	17.54	VARIES	22.15 NORTH
61	14+710.19	88.76		69.85	0.4	18.20 NORTH
62	14+780.04	89.02				18.20 NORTH

CITY OF PICKERING
BM 1-044 EL. 86.881
BRASS TABLET SET HORIZONTALLY IN CONCRETE BASE OF "SUPER CENTRE" SIGN, NORTHWEST OF THE INTERSECTION OF PICKERING PARKWAY AND LIVERPOOL ROAD. 14.20m WEST OF THE WEST CURB OF LIVERPOOL ROAD AND 13.82m NORTH OF THE NORTH CURB OF "SUPER CENTRE" DRIVEWAY. TABLET IS LOCATED ON THE WEST SIDE OF CONCRETE BASE, 0.75m SOUTH OF NORTH WEST CORNER AND IS 0.22m ABOVE GRADE.

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LICENSED PROFESSIONAL ENGINEER J. R. NEWMAN Aug 18/14 PROVINCE OF ONTARIO

SURVEY DATA DATE 2012 04

SCALE HORIZONTAL 5m 0 5m
VERTICAL 1m 0 1m

DRAWN:	E. MEIJERINK	DATE: 2014 06
DESIGN:	R. AUGER	DATE: 2014 06
CHECKED:	J. NEWMAN	DATE: 2014 06
APPROVED:	J. NEWMAN	DATE: 2014 06

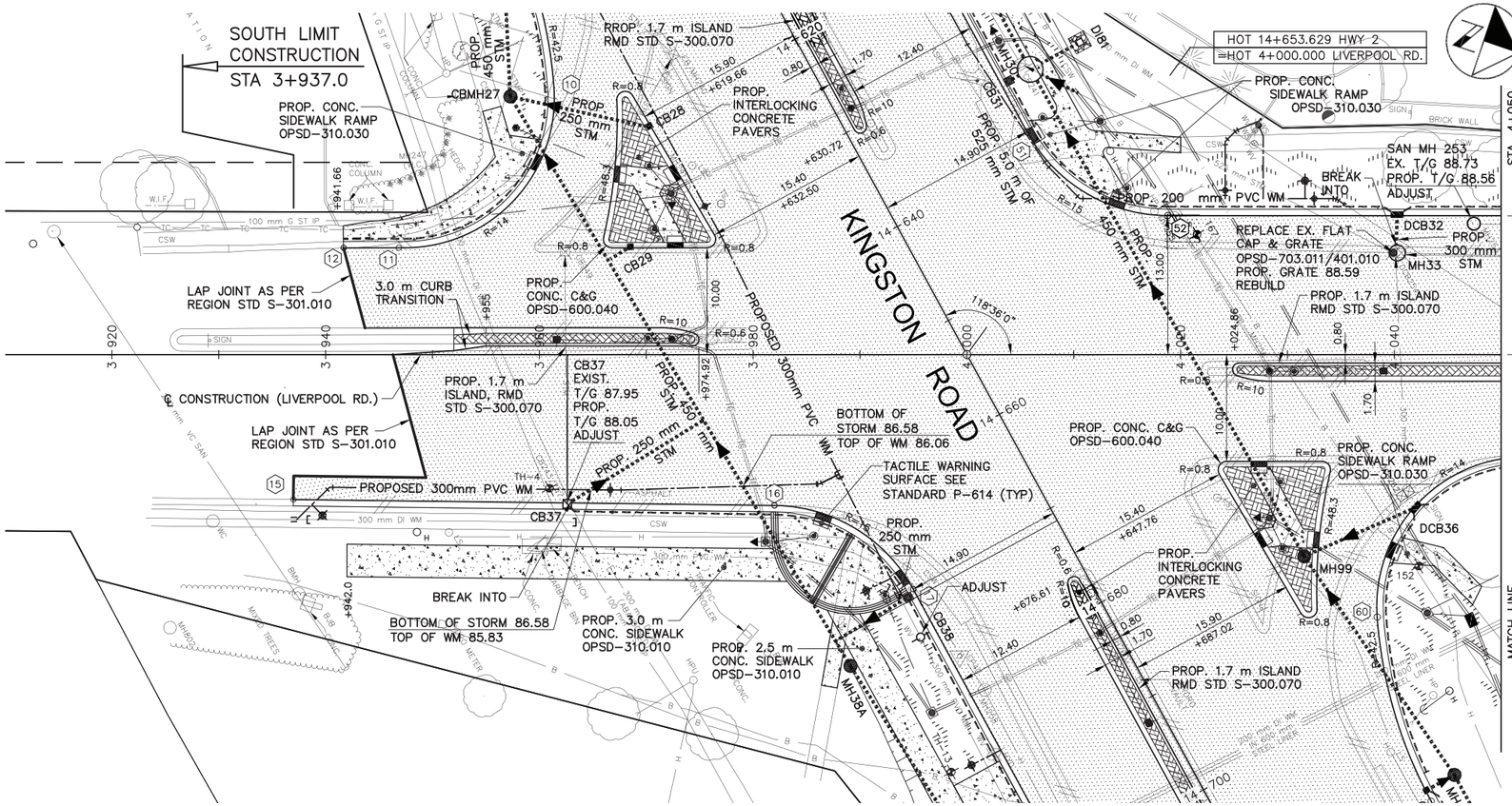
THE REGIONAL MUNICIPALITY OF DURHAM
WORKS DEPARTMENT
WHITBY ONTARIO

HIGHWAY 2 – KINGSTON ROAD
NEW CONSTRUCTION
FROM 63m W. OF LIVERPOOL RD. TO 76m E. OF LIVERPOOL RD.

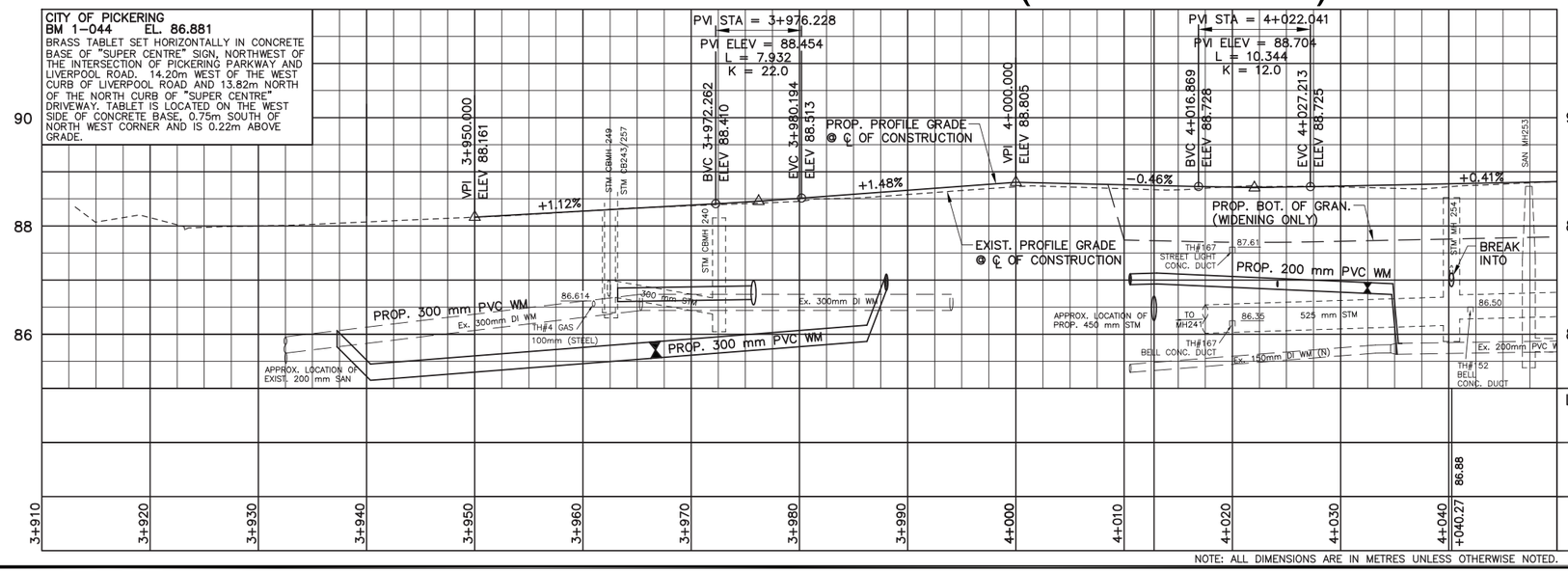
CONCESSION	REG. RD. NO.	AREA MUNICIPALITY
1	HWY-2	CITY OF PICKERING

DRAWING NUMBER	CONTRACT NUMBER	SHEET NUMBER
NC-5	D2014-016	18 OF 74

Plotted: Aug 15, 2014 - 4:03pm, Name: 60196264-C-LIVERPOOL_NC-01_08.dwg



LIVERPOOL ROAD (REG. RD. 29)



NOTE: ALL DIMENSIONS ARE IN METRES UNLESS OTHERWISE NOTED.

CATCH BASIN DATA						C.B. CONNECTION DATA			
OPSD	INV. NO.	CHAINAGE	GRATE EP. ELEV.	INVERT ELEV. IN	INVERT ELEV. OUT	LEN. (m)	DIA. (mm)	CLASS OF PIPE	GRADE %
705.020,400.020	DCB32	4+040.27	88.52		86.92	3.6	300	SDR35	1.0
705.020,400.020	DCB36	4+041.97	88.54		86.94	11.4	300	SDR35	1.0
	CB37	3+962.61	88.05		86.65	15.5	250	SDR35	1.0

NO.	CHAINAGE	EP ELEV.	RADIUS (m)	LENGTH (m)	GRADE (%)	OFFSET
9	14+595.55	87.93				18.20 SOUTH
10	14+613.54	88.12	42.5	18.57	VARIES	22.16 SOUTH
11	3+946.84	87.97	14.0	23.21	VARIES	10.00 WEST
12	3+941.66	87.96		5.18	VARIES	9.98 WEST
15	3+937.00	87.82				13.57 EAST
16	3+981.99	88.46		44.99	VARIES	14.13 EAST
17	14+670.53	88.74	15.00	15.91	VARIES	14.90 SOUTH
18	14+874.88	89.47		204.36	0.4	14.90 SOUTH
50	14+543.57	87.48				14.90 NORTH
51	14+638.01	88.58		94.44	VARIES	14.90 NORTH
52	4+018.81	88.54	15.00	16.09	VARIES	13.00 WEST
53	4+079.68	88.76		60.87	VARIES	13.00 WEST
59	4+052.92	88.62	14.00	23.21	VARIES	9.55 EAST
60	14+693.22	88.71	42.5	17.54	VARIES	22.15 NORTH
61	14+710.19	88.76				18.20 NORTH

NO.	DATE	NAME	REVISIONS

AECOM
AECOM Canada Ltd.
300 Water Street, Whitby, Ontario, Canada L1N 9J2
T905.668.9363 F905.668.0221

UTILITIES VERIFIED

CABLE T.V.	2011 MAR. 28	HYDRO	2011 JULY 14
BELL CANADA	2011 APR. 28		
ENBRIDGE	2011 FEB. 23		

CONTRACTOR TO BE RESPONSIBLE FOR LOCATION OF ALL EXISTING U/G & OVERHEAD UTILITIES. VARIOUS UTILITIES REQUIRE ADVANCE NOTICE PRIOR TO DIGGING, FOR STAKE OUT. THE REGION ASSUMES NO RESPONSIBILITY FOR THE ACCURACY OF THE LOCATION OF EXISTING UTILITIES AS INDICATED ON THIS DRAWING.

LICENSED PROFESSIONAL ENGINEER J. R. NEWMAN Aug 18/14 PROVINCE OF ONTARIO

SURVEY DATA DATE 2012 04

SCALE HORIZONTAL 5m 0 5m VERTICAL 1m 0 1m

DRAWN:	E. MEIJERINK	DATE: 2014 06
DESIGN:	R. AUGER	DATE: 2014 06
CHECKED:	J. NEWMAN	DATE: 2014 06
APPROVED:	J. NEWMAN	DATE: 2014 06

THE REGIONAL MUNICIPALITY OF DURHAM
WORKS DEPARTMENT
WHITBY ONTARIO

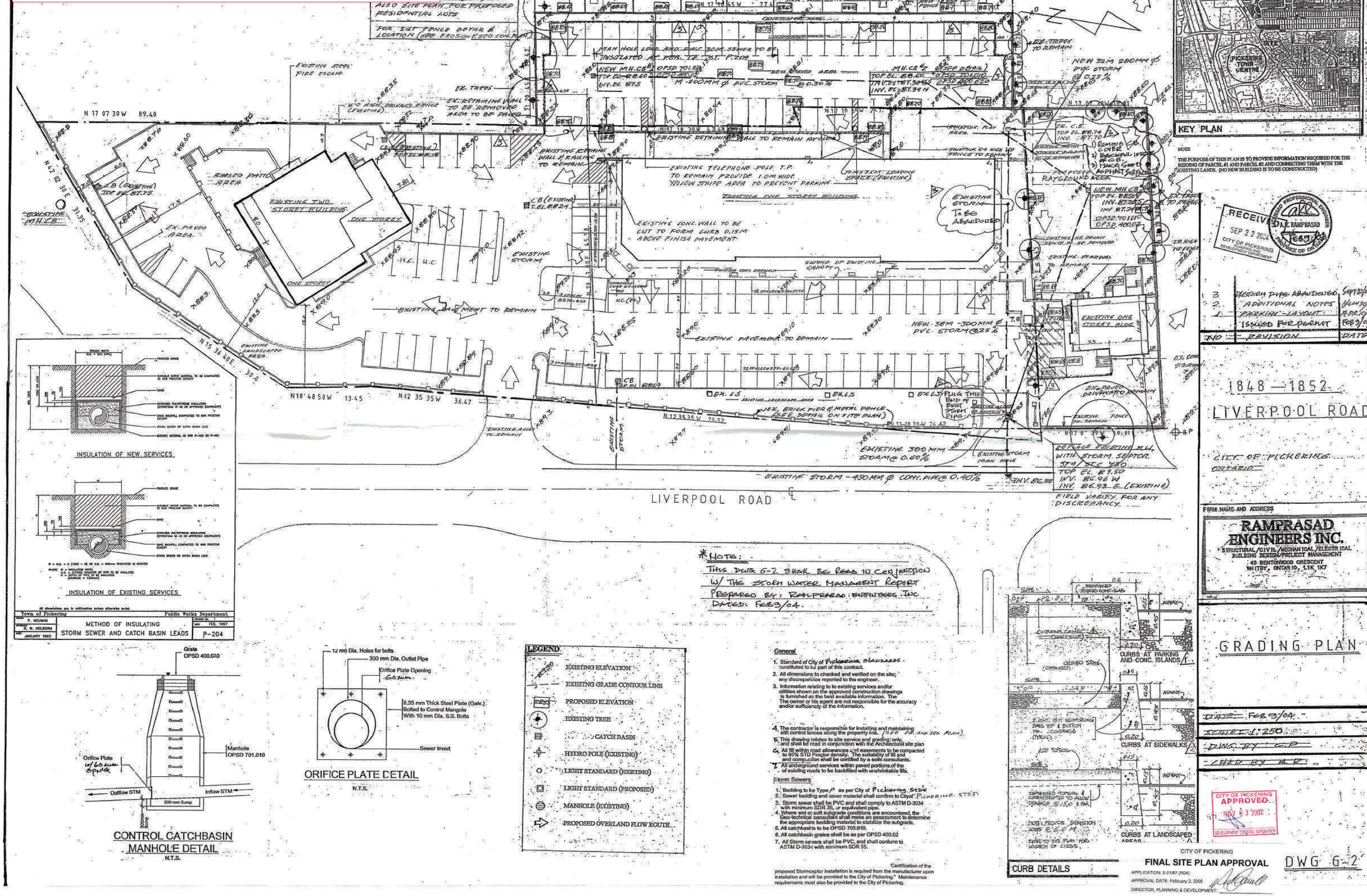
LIVERPOOL ROAD (REG. RD. 29)
NEW CONSTRUCTION
FROM 90m SOUTH OF HWY 2 TO 50m NORTH OF HWY 2

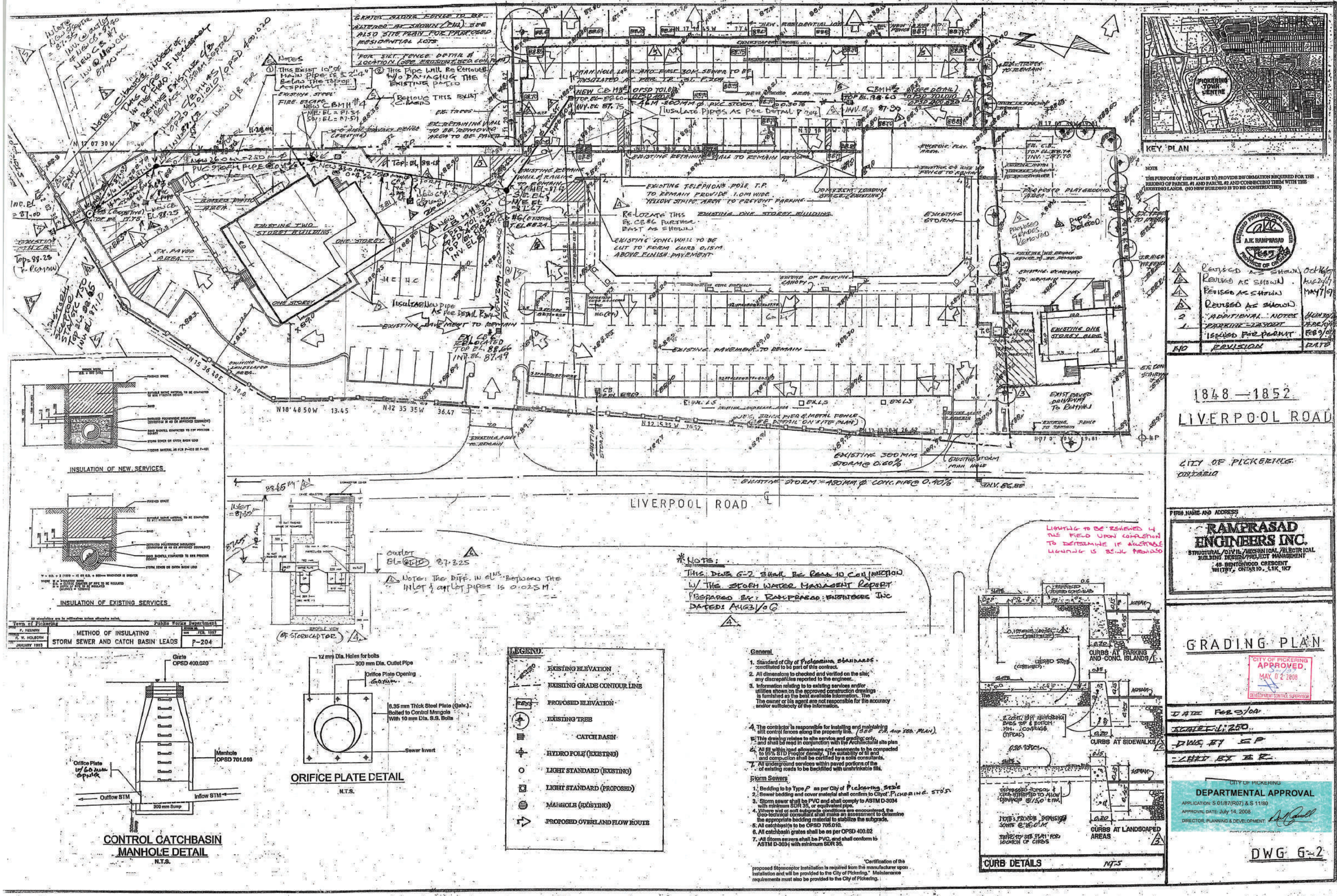
CONCESSION	REG. RD. NO.	AREA MUNICIPALITY
1	29	CITY OF PICKERING

DRAWING NUMBER	CONTRACT NUMBER	SHEET NUMBER
NC-10	D2014-016	23 OF 74

Plotted: Aug 15, 2014 - 3:53pm, Name: 60196264-C-LIVERPOOL_NC-10_12.dwg

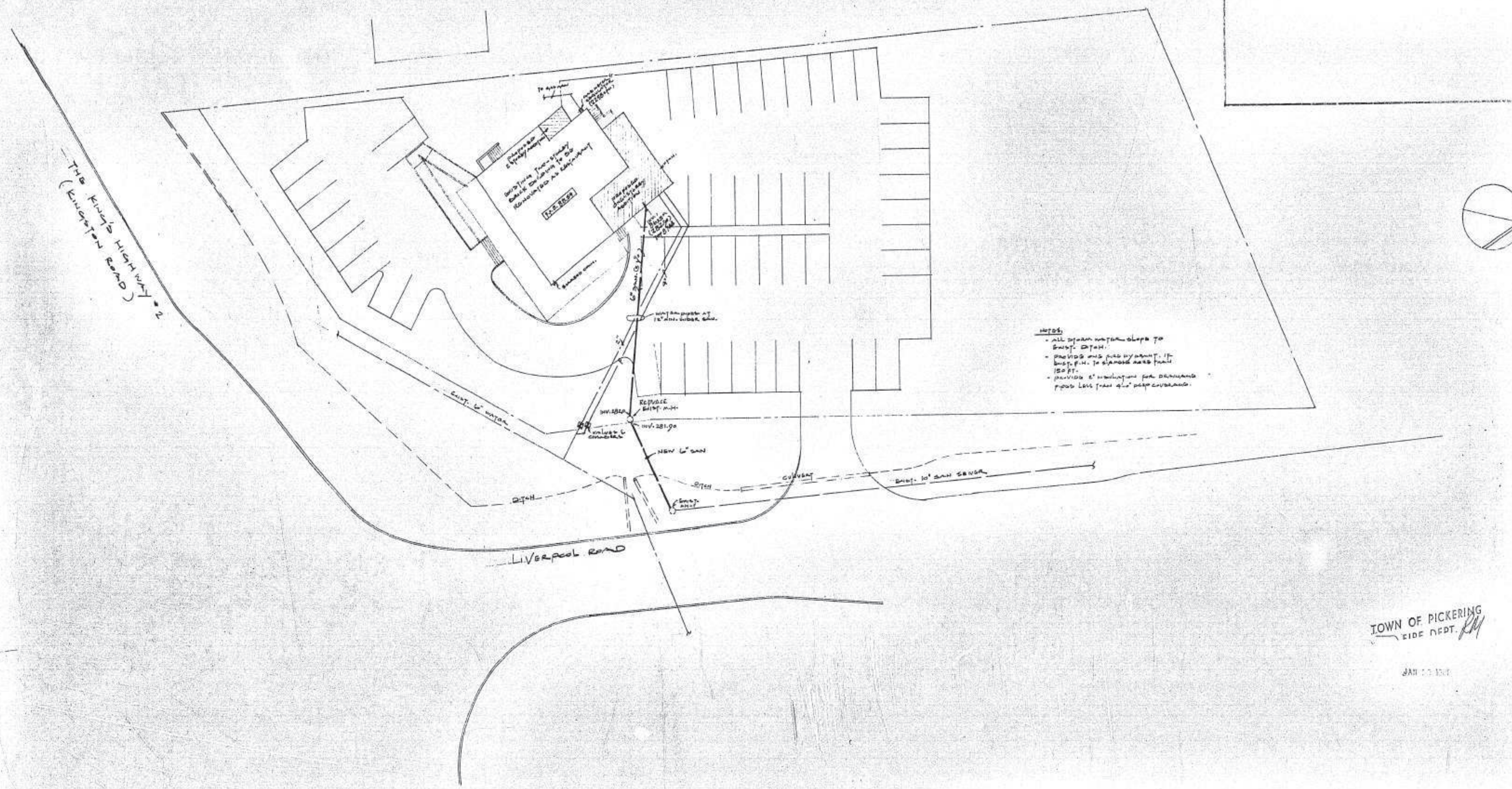
APPENDIX A.2: Pickering Record Drawings




GRADING PLAN
1848 — 1852
LIVERPOOL ROAD
CITY OF PICKERING
ONTARIO
FIRM NAME AND ADDRESS
RAMPRASAD ENGINEERS INC.
STRUCTURAL/CIVIL/MECHANICAL/ELECTRICAL
BUILDING DESIGN/PROJECT MANAGEMENT
45 BENTONWOOD CRESCENT
WHITBY, ONTARIO, L1K 1K7
DATE FEB 9/04
SCALE 1:250
DWG BY GP
CHKD BY BR
DWG G-2
KEY PLAN
PICKERING TOWN CENTRE
SITE
NOTE
THE PURPOSE OF THIS PLAN IS TO PROVIDE INFORMATION REQUIRED FOR THE REJOING OF PARCEL #1 AND PARCEL #2 AND CONNECTING THEM WITH THE EXISTING LANDS. (NO NEW BUILDING IS TO BE CONSTRUCTED)
A.R. RAMPRASAD
LICENSED PROFESSIONAL ENGINEER
PROVINCE OF ONTARIO
6 REVISED AS SHOWN Oct 16/07
5 REVISED AS SHOWN AUG 20/07
4 REVISED AS SHOWN MAY 7/07
3 REVISED AS SHOWN
2 ADDITIONAL NOTES JUN 30/06
1 PARKING LAYOUT APR 10/06
ISSUED FOR PERMIT FEB 9/04
NO REVISION DATE
CITY OF PICKERING APPROVED MAY 02 2008 DEVELOPMENT CONTROL SUPERVISOR
CITY OF PICKERING
DEPARTMENTAL APPROVAL
APPLICATION: S 01/87(R07) & S 11/80
APPROVAL DATE: July 14, 2008
DIRECTOR, PLANNING & DEVELOPMENT
LIGHTING TO BE REVIEWED IN THE FIELD UPON COMPLETION TO DETERMINE IF ACCEPTABLE LIGHTING IS BEING PROVIDED
*NOTE:
THIS DWG G-2 SHALL BE READ IN CONJUNCTION W/ THE STORM WATER MANAGEMENT REPORT PREPARED BY: RAMPRASAD ENGINEERS INC DATED: AUG 31/06
General
1. Standard of City of Pickering standards constituted to be part of this contract.
2. All dimensions to checked and verified on the site; any discrepancies reported to the engineer.
3. Information relating to to existing services and/or utilities shown on the approved construction drawings is furnished as the best available information. The The owner or his agent are not responsible for the accuracy and/or sufficiency of the information.
4. The contractor is responsible for installing and maintaining silt control fences along the property line. (SEE E.R. AND SED. PLAN)
5. This drawing relates to site service and grading only, and shall be read in conjunction with the Architectural site plan
6. All fill within road allowances and easements to be compacted to 95% STD Proctor density. The suitability of fill and and compaction shall be certified by a soils consultants.
7. All underground services within paved portions of the of existing roads to be backfilled with unshrinkable fills.
Storm Sewers
1. Bedding to be Type P as per City of Pickering std's
2. Sewer bedding and cover material shall confirm to City of Pickering std's
3. Storm sewer shall be PVC and shall comply to ASTM D-3034 with minimum SDR 35, or equilivalent pipe.
4. Where wet or soft subgrade conditions are encountered, the Geo-technical consultant shall make an assessment to determine the appropriate bedding material to stabilize the subgrade.
5. All catchbasins to be OPSD 705.010.
6. All catchbasin grates shall be as per OPSD 400.02
7. All Storm sewers shall be PVC, and shall conform to ASTM D-3034 with minimum SDR 35.
"Certification of the proposed Stormceptor installation is required from the manufacturer upon installation and will be provided to the City of Pickering." Maintenance requirements must also be provided to the City of Pickering.
LEGEND
EXISTING ELEVATION
EXISTING GRADE CONTOUR LINE
PROPOSED ELEVATION
EXISTING TREE
CATCH BASIN
HYDRO POLE (EXISTING)
LIGHT STANDARD (EXISTING)
LIGHT STANDARD (PROPOSED)
MANHOLE (EXISTING)
PROPOSED OVERLAND FLOW ROUTE
CURB DETAILS N.T.S
CURBS AT PARKING AND CONC. ISLANDS
CURBS AT SIDEWALKS
CURBS AT LANDSCAPED AREAS
ORIFICE PLATE DETAIL
N.T.S.
12 mm Dia. Holes for bolts
300 mm Dia. Outlet Pipe
Orifice Plate Opening
6.35 mm Thick Steel Plate (Galv.). Bolted to Control Mangole With 10 mm Dia. S.S. Bolts
Sewer Invert
CONTROL CATCHBASIN MANHOLE DETAIL
N.T.S.
Grate OPSD 400.020
Manhole OPSD 701.010
Outflow STM
Inflow STM
300 mm Sump
INSULATION OF NEW SERVICES
INSULATION OF EXISTING SERVICES
Town of Pickering Public Works Department
METHOD OF INSULATING STORM SEWER AND CATCH BASIN LEADS
P-204
JANUARY 1993
PROFILE VIEW (OF STORMCEPTOR)
OUTLET EL= 87.325
NOTE: THE DIFF. IN ELNS BETWEEN THE INLET & OUTLET PIPES IS 0.025 M.
LIVERPOOL ROAD
EXISTING STORM = 450MM Ø CONC. PIPE @ 0.40%
EXISTING 300 MM STORM @ 0.60%
EXISTING TWO STOREY BUILDING
ONE STOREY
EXISTING ONE STOREY BLDG
EXISTING PAVEMENT TO REMAIN
EXISTING TELEPHONE POLE T.P. TO REMAIN PROVIDE 1.0M WIDE YELLOW STRIPE AREA TO PREVENT PARKING
RE-LOCATE THIS EX. CB #6 FURTHER EAST AS SHOWN
EXISTING CONC. WALL TO BE CUT TO FORM CURB 0.15M ABOVE FINISH PAVEMENT
NEW CBMH#1 OPSD 701.010 OPSD 400.020 TOP EL. 88.60 INV. EL. 87.75
46M - 200MM Ø PVC STORM @ 0.30%
INSULATE PIPES AS PER DETAIL P-204
MANHOLE LEAD AND FIRST 30M SEWER TO BE INSULATED AS PER T.P. 131 P.204
CBMH#2 TOP EL. 88.60 INV. EL. 87.90
NEW CBMH#4
EX. CB #6 RELOCATED TOP EL. 88.66 INV. EL. 87.49
EXIST PAVED DRIVEWAY TO REMAIN
PROPOSED PLAYGROUND AREA
EX. TREES TO REMAIN

LEGEND

———	STORM DRAIN BURIED
———	STORM DRAIN ABOVE GROUND
———	SANITARY DRAIN BURIED
———	SANITARY DRAIN ABOVE GROUND
———	COLD WATER LINE
———	HOT WATER LINE
——— V ———	VENT LINE
——— G ———	GAS LINE
——— F ———	FIRE LINE
□ F.D.	FLOOR DRAIN
⊚ R.D.	ROOF DRAIN
—K N.F.W.H.	NON FREEZE WALL HYDRANT.



NOTES:
- ALL STORM WATER SLOPE TO EXIST. DITCH.
- PROVIDE ONE FIRE HYDRANT, IF EXIST. F.H. TO SIAMESE MORE THAN 150 FT.
- PROVIDE 2" INSULATION FOR DRAINAGE PIPES LESS THAN 4'-0" DEEP COVERAGE.

TOWN OF PICKERING FIRE DEPT.

JAN 20 1981

- ALL DRAWINGS ARE THE PROPERTY OF THE ARCHITECT AND MAY NOT BE USED OR REPRODUCED WITHOUT HIS PERMISSION.
- CONTRACTOR SHALL CHECK AND VERIFY ALL DIMENSIONS ON SITE.
- THIS DRAWING ...
- THIS DRAWING ... UNTIL ...

SIGNED

DATED

PROJECT TITLE

PROPOSED RESTAURANT RENOVATION & ADDITION TO EXIST. BUILDING NORTH WEST CORNER OF LIVERPOOL ROAD & KING'S HIGHWAY #2 PICKERING, ONTARIO, FOR M SKENTZOS

SHEET TITLE

SITE PLAN

CONSULTANTS

RAYMOND KWOK & ASSOCIATES ENGINEERING LTD.
Consulting Engineers

MARTIN T. K. TSE — ONTARIO ASSOCIATION OF ARCHITECTS — MEMBER — ARCHITECT

Martin Tse Architect & Planner

REVISIONS		MARK VOID ALL COPIES PREVIOUS TO FINAL DATE
No.	DESCRIPTION	DATE
1		
2		
3		
4		
5		

DRAWN BY: T.L.
CHECKED BY: R.K.
SCALE: 1" = 20'-0"
DATE: SEP./80
DRAWING No.: M-1
PROJECT No.:

APPENDIX A.3: Topographic Survey (January 20, 2017)

Appendix B ARCHITECTURAL PLANS AND STATISTICS

Survey 2
NTS Z1.2

PROJECT STATISTICS

1294 Kingston Rd & 1848-1852 Liverpool Rd
TORONTO
RESIDENTIAL DEVELOPMENT SITE
May 16, 2019 Project No. 18-044

1.0 LOT AREA

Phase No.	m²	ft²	acres	hectares
Phase 1	9,123	98,199	2.25	0.91
Lot Area	**9,123**	**98,199**	**2.25**	**0.91**

2.0 PROJECT FLOOR AREAS

2.1 GFA PROPOSED

GFA PROPOSED RESIDENTIAL

"Gross Floor Area" means the total area of each floor whether located above, at or below grade, measured between the exterior faces of the exterior walls of the building at each floor level but excluding any porch, veranda, cellar, mechanical room or penthouse, or areas dedicated to parking within the building. For the purposes of this definition, the walls of an inner court shall be deemed to be exterior walls.

NORTH BLOCK TOWN HOUSE DWELLINGS

Floor Levels	no. floors	m²	ft²
Level 1	1	410	4,413
Level 2	1	544	5,856
Level 3	1	544	5,856
TOTAL	3	1,498	16,124

BUILDING A

Floor Levels	no. floors	m²	ft²
Level 1	1	1,510	16,255
Level 2	1	1,492	16,062
Level 3-4	2	2,221	23,905
Level 5-6	2	1,834	19,737
Level 7-12	6	4,042	43,503
TOTAL	12	11,098	119,462

BUILDING B

Floor Levels	no. floors	m²	ft²
Level 1	1	725	7,803
Level 2	1	1,110	11,952
Level 3	1	1,107	11,918
Level 4-8	5	5,143	55,354
Level 9-20	12	8,508	91,577
Level 21	1	676	7,272
Level 22	1	659	7,093
Level 23	1	630	6,777
Level 24	1	611	6,571
Level 25	1	586	6,302
TOTAL	25	19,753	34,015

GFA PROPOSED NON-RESIDENTIAL

Floor Levels	no. floors	m²	ft²
Level 1 (Building B) - Retail	1	430	4,626
Level 1 (Old Liverpool House) - Non Residential	1	208	2,236
Level 2 (Old Liverpool House) - Non Residential	1	208	2,236
TOTAL		845	9,098

GRAND TOTAL PROPOSED GFA	**33,195**	**357,303**

3.0 RESIDENTIAL AMENITY SPACE

3.1 REQUIRED AMENITY SPACE

4.3 Amenity Space Requirements for Apartment Dwellings minimum – 2.0 square metres of indoor amenity space is required per apartment dwelling unit. minimum – 2.0 square metres of outdoor amenity space is required per apartment dwelling unit (aminimum contiguous area of 40.0 square metres must be provided in a common location)

BUILDING A & B
Indoor Amenity

Floor Levels	no. units	m²/u	m²	ft²
Building A	130	2	260	2799
Building B	238	2	476	5124
Total Indoor Amenity Space Required			**736**	**5,124**

BUILDING A & B
Outdoor Amenity

Floor Levels	no. units	m²/u	m²	ft²
Building A	130	2	260	2799
Building B	238	2	476	5124
Total Outdoor Amenity Space Required			**736**	**5,124**

3.2 RESIDENTIAL AMENITY SPACE PROVIDED

BUILDING A & B
Indoor Amenity

Floor Levels	no. floors	m²/fl	m²	ft²
Level 2 (Building A)	1	301	300.8	3236
Level 9 (Building B)	1	508	507.7	5465
Total Indoor Amenity Space Provided			**808**	**8,700**

Outdoor Amenity

Floor Levels	no. floors	m²/fl	m²	ft²
Level 1	1	458	458	4930
Level 9 (Building B)	1	264	263.8	2840
Balconies (Building A)		709	709.27	7635
Balconies(Building B)		1633	1632.7	17574
Total Outdoor Amenity Space Provided			**3,064**	**32,978**
Total Amenity Space Provided (Building A & B)			**3,872**	**41,679**

4.0 FLOOR SPACE INDEX (Based on GFA)

GFA of Site divided by LOT AREA	**3.64**

5.0 UNIT COUNT

NORTH BLOCK TOWN HOUSE DWELLINGS

Floor Levels	no. floors	unit/fl	Total units
Level 1	1	7	7 units
Total Units			**7 units**

BUILDING A

Floor Levels	no. floors	unit/fl	Total units
Level 1 - (2 Storey Townhouses)	1	11	11 units
Level 2	1	3	3 units
Level 3-4	2	16	32 units
Level 5-6	2	12	24 units
Level 7-12	6	10	60 units
Total Units			**130 units**

BUILDING B

Floor Levels	no. floors	unit/fl	Total units
Level 1	1	0	0 units
Level 2	1	10	10 units
Level 3	1	11	11 units
Level 4-8	5	11	55 units
Level 9	1	2	2 units
Level 10-25	16	11	176 units
Total Units			**254 units**

6.0 PARKING

6.1 PARKING REQUIRED

Parking Type (Condominium)	unit type	parking ratio		no. units	parking spaces
Resident	Residential	0.80	space/unit	373	298
	Town Houses	1.75	space/unit	18	32
	Retail	3.50	space/100m²	8	29
Visitor		0.15	space/unit	384	58
Total Parking Required					**417**

6.2 PARKING RATE PROVIDED

Parking Type (Condominium)	unit type	parking ratio		no. units	parking spaces
Resident	Residential	0.80	space/unit	373	298
	Town Houses	1.75	space/unit	18	32
	Retail	3.50	space/100m²	8	29
Visitor		0.15	space/unit	384	58
Total Parking					**417**

6.3 PARKING PROVIDED

Parking Type (Condominium)	Car Share	Multiplier	parking spaces
Parking at grade			10
Town House Parking			14
P1 Visitor / Residential			150
P2 Resident			169
P3 Resident			169
Total			**512**

6.4 BICYCLE PARKING REQUIRED

Bicycle Parking Space Requirements for Dwelling Units **Bicycle parking space** *requirements for* **dwelling units** *in a* **apartment building** *or* **mixed use building** *are 0.5 bicycle parking spaces per dwelling unit. For* **non-residential uses:** *the greater of 2 or 0.5 bicycle parking space for each 1,000 square metres of gross leasable floor area or portion thereof. For* **Stacked Dwelling:** *1.0 bicycle parking space per dwelling unit.*

Parking Type (Condominium)	parking ratio		no. units	parking spaces
Resident (Dwelling Units)	0.50	space/unit	373	187
Resident (Town Houses)	1.00	space/unit	18	18
Non- Resident	2.00	space/unit	2	2
Total Parking Required				**207**

6.5 BICYCLE PARKING PROVIDED

Parking Type (Condominium)	parking spaces
Level P1	116
Parking at grade	40
Level 1 (Ground Floor)	98
Total Bicycle Parking Provided	**254**

Project Statistics 1
NTS Z1.2

Date:

ONTARIO ASSOCIATION OF ARCHITECTS
DAVID RUTTENWORTH
LICENCE
DATE

KIRKOR ARCHITECTS + PLANNERS

20 De Boers Dr. # 400 Toronto ON M3J 0H1
TEL 416 665 6060 kirkorarchitects.com

No.:	Revision:	Date:
01	Rezoning	May 16, 2019

Drawing Title:

Site Survey & Statistics

Project:

OLD LIVERPOOL HOUSE

1294 Kingston Rd & 1848-1852 Liverpool Rd

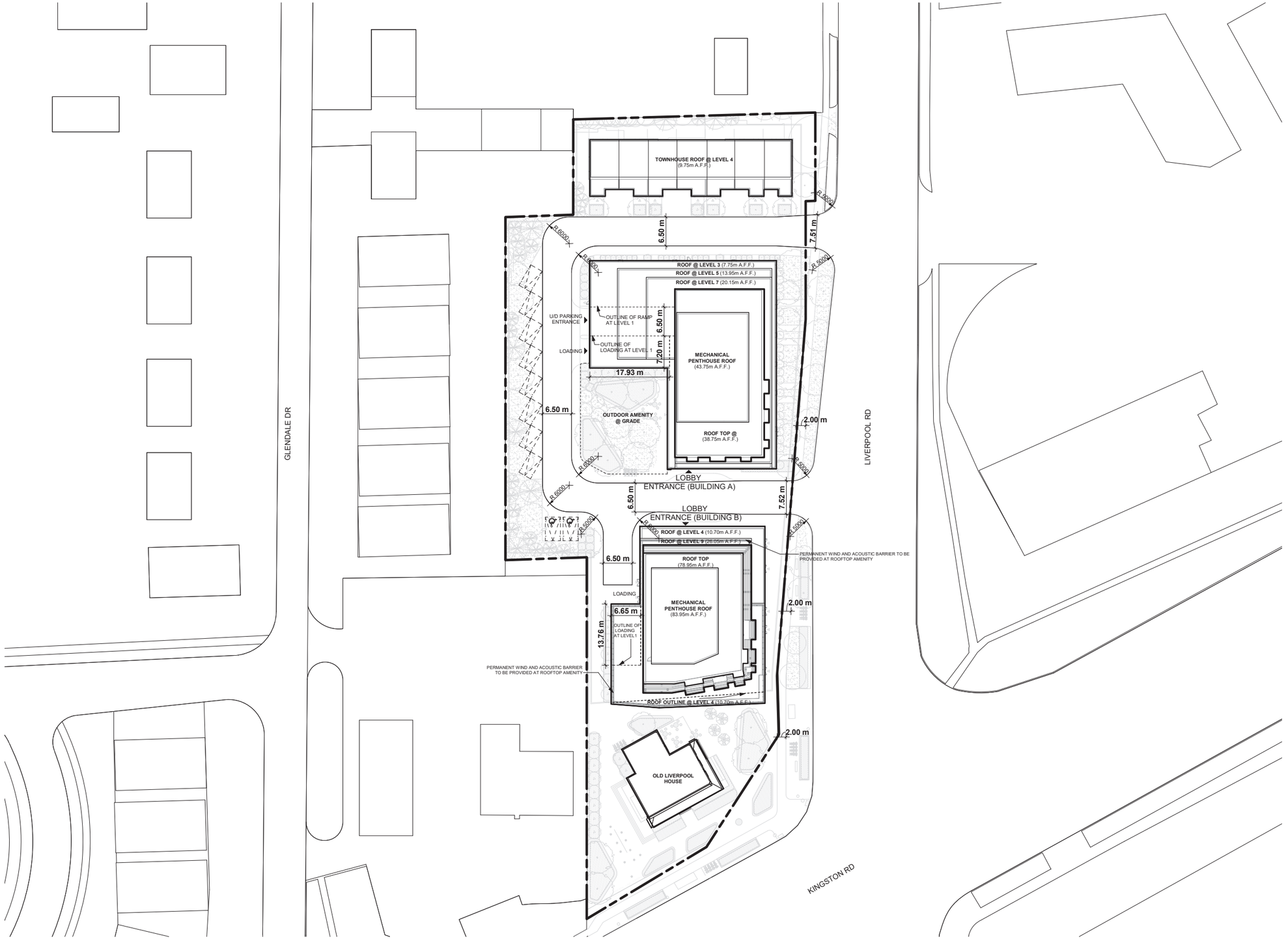
Scale:

N

Drawn by: TA
Checked by: DB
Project No.: 18-044
Date: 05/16/19

Drawing No.:

Z1.2



Site Plan
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Z1.3

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Date:

ONTARIO ASSOCIATION OF ARCHITECTS
DAVID RUTTENWORTH
LICENCE
0676

KIRKOR ARCHITECTS + PLANNERS

20 De Boers Dr. # 400 Toronto ON M3J 0H1
TEL 416 665 6060 kirkorarchitects.com

No.:	Revision:	Date:
01	Rezoning	May 16, 2019

Drawing Title:

Site Plan

Project:

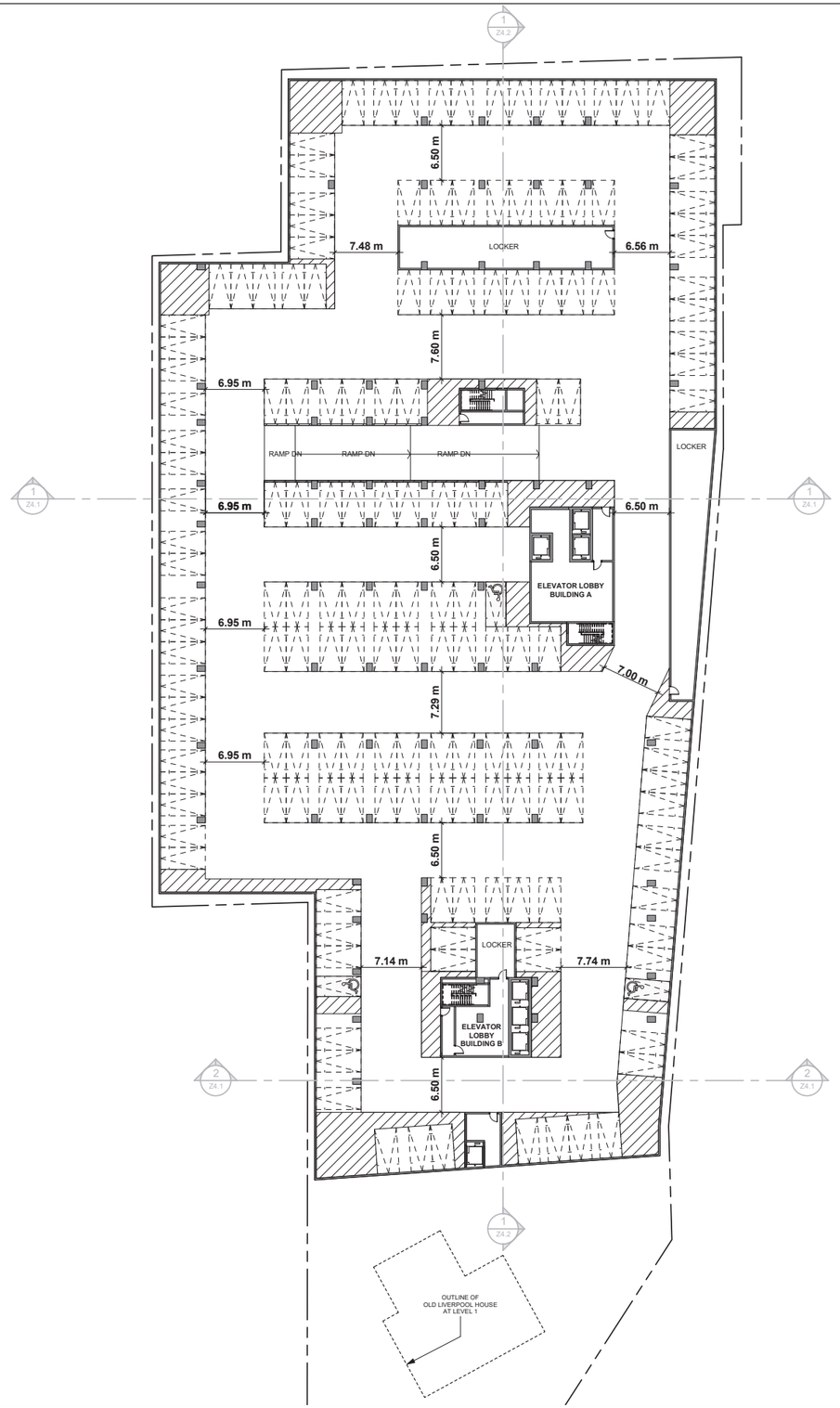
OLD LIVERPOOL HOUSE

1294 Kingston Rd & 1848-1852 Liverpool Rd

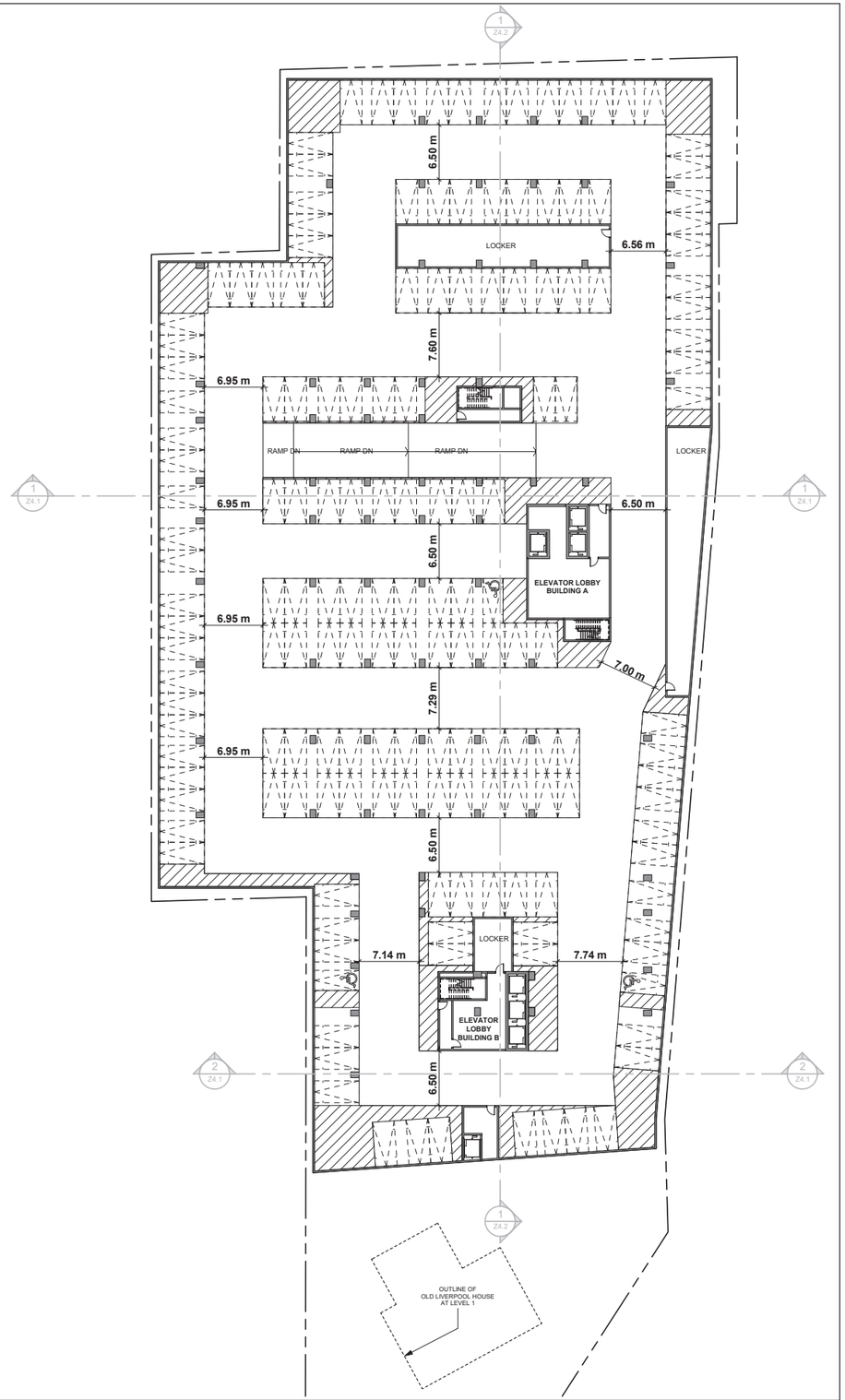
Scale: 1 : 400
Drawn by: TA
Checked by: DB
Project No.: 18-044
Date: 05/16/19

Drawing No.:

Z1.3



Floor Plan - Level P2 (1 / Z2.0)
Scale: 1 : 300



Floor Plan - Level P3 (2 / Z2.0)
Scale: 1 : 300

Date:

ONTARIO ASSOCIATION OF ARCHITECTS
DAVID RUTTENWORTH
LICENCE
0476

KIRKOR ARCHITECTS + PLANNERS

20 De Boers Dr. # 400 Toronto ON M3J 0H1
TEL 416 665 6060 kirkorarchitects.com

No.:	Revision:	Date:
01	Rezoning	May 16, 2019
No	Issued For:	Date:

Drawing Title:

Floor Plan - Level P2-P3

Project:

OLD LIVERPOOL HOUSE

1294 Kingston Rd & 1848-1852 Liverpool Rd

Scale: 1 : 300
Drawn by: TA
Checked by: DB
Project No.: 18-044
Date: 05/16/19
Drawing No.: Z2.0

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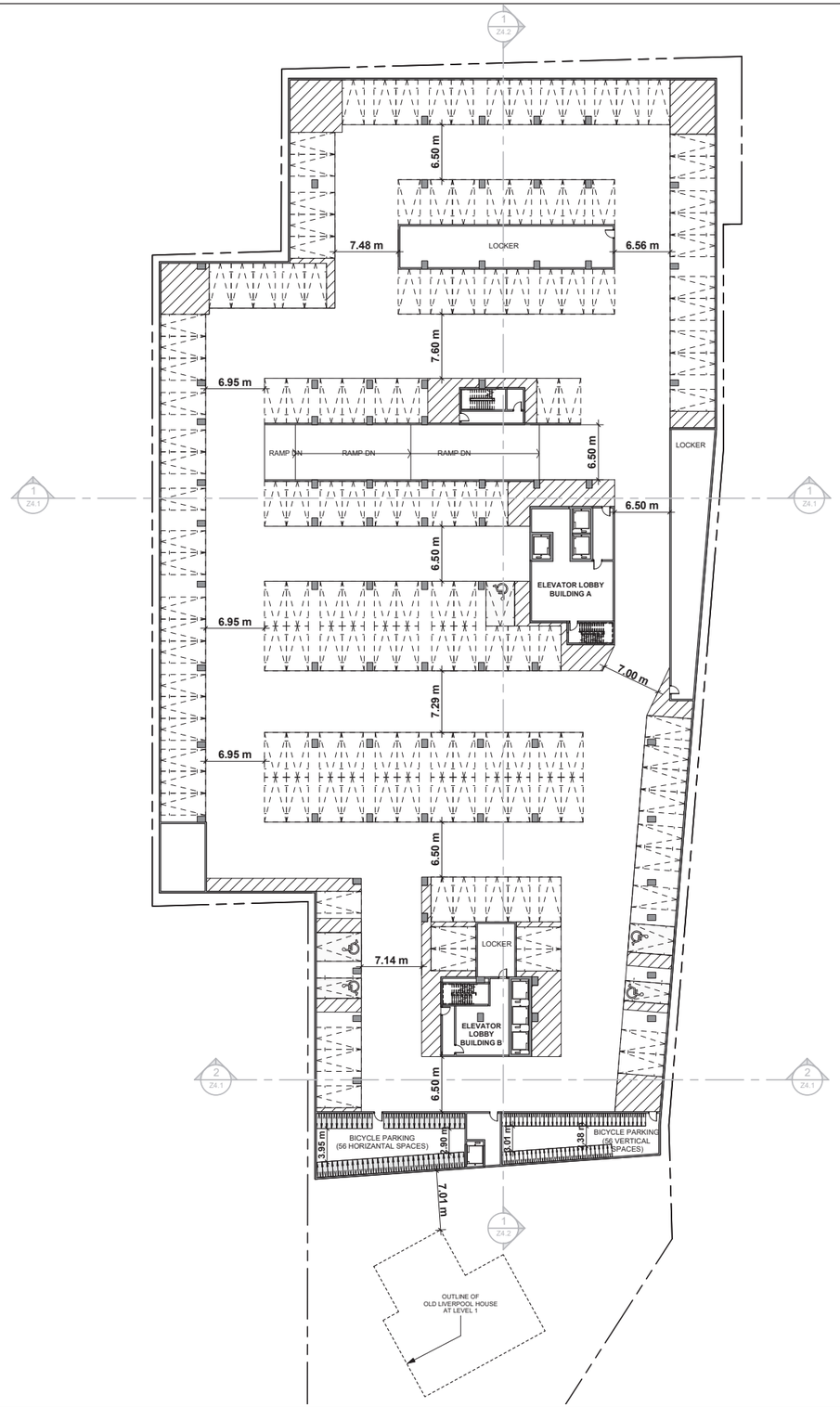
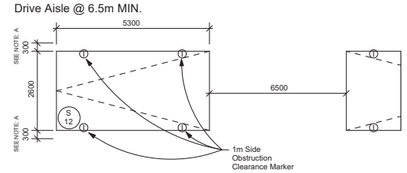


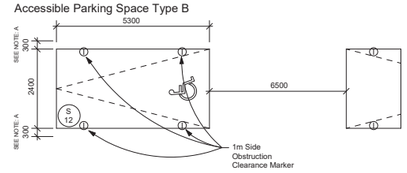
Floor Plan - Level P1 (1 / Z2.1)
Scale: 1 : 300

TYPICAL PARKING SPACE:

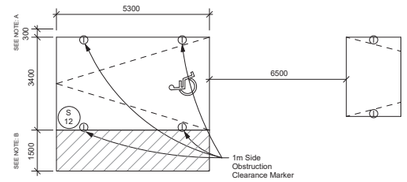
Drive Aisle @ 6.5m MIN.



Accessible Parking Space Type B



Accessible Parking Space Type A

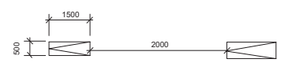


NOTES:
A - PROVIDE AN ADDITIONAL 300mm FOR PARKING SPACE WIDTH WHEN OBSTRUCTIONS OCCUR BETWEEN THE FRONT AND REAR 1000mm.
B - PROVIDE A 1500mm WALKWAY ON AT LEAST ONE SIDE OF A HANDICAP PARKING STALL. THIS WALKWAY MAY BE SHARED WITH ADJOINING HANDICAP SPACE.

TYPICAL BICYCLE PARKING SPACE:

Horizantal Parking Space

Vertical Parking Space



Date:

ONTARIO ASSOCIATION OF ARCHITECTS
DAVID RUTTERWORTH
LICENCE
date

KIRKOR ARCHITECTS + PLANNERS

20 De Boers Dr. # 400 Toronto ON M3J 0H1
TEL 416 665 6060 kirkorarchitects.com

No.:	Revision:	Date:
01	Rezoning	May 16, 2019

Drawing Title:

Floor Plan - Level P1

Project:

OLD LIVERPOOL HOUSE

1294 Kingston Rd & 1848-1852 Liverpool Rd

Scale: 1 : 300
Drawn by: TA
Checked by: DB
Project No.: 18-044
Date: 05/16/19
Drawing No.: Z2.1

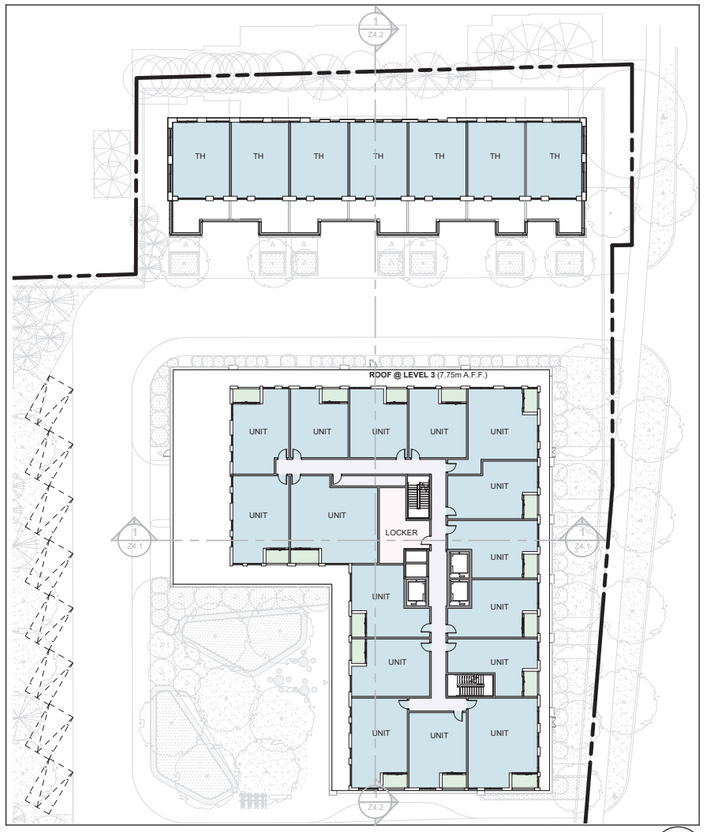
Plot Date: 5/16/2019 2:51:17 PM File Path: C:\Revit\2019\18044P11-Old Liverpool House-Master_RVT2019_talimohammadi.rvt

Floor Plan - Level 1 (Building A) 1 Z2.2

Scale: 1 : 300

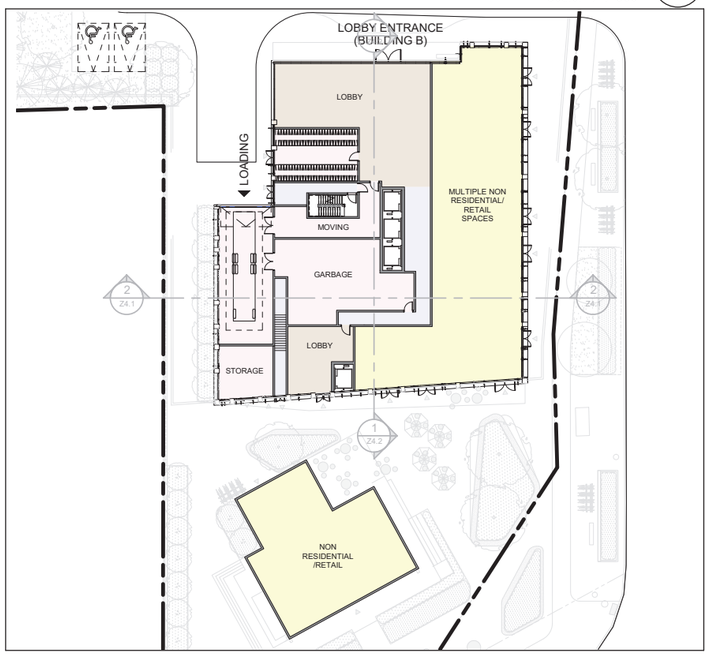
Floor Plan - Level 2 (Building A) 3 Z2.2

Scale: 1 : 300



Floor Plan - LEVEL 3-4 (Building A) 5 Z2.2

Scale: 1 : 300



Floor Plan - Level 1 (Building B) 2 Z2.2

Scale: 1 : 300

Floor Plan - Level 2 (Building B) 4 Z2.2

Scale: 1 : 300

Floor Plan - LEVEL 3 (Building B) 6 Z2.2

Scale: 1 : 300

Date:

ONTARIO ASSOCIATION OF ARCHITECTS
DAVID BUTTERWORTH
LICENCE
0476

KIRKOR ARCHITECTS + PLANNERS

20 De Boers Dr. # 400 Toronto ON M3J 0H1
TEL 416 665 6060 kirkorarchitects.com

No.:	Revision:	Date:
01	Rezoning	May 16, 2019

Drawing Title:

Floor Plan - Level 1 - 4 (Building A) & Level 1-3 (Building B)

Project:

OLD LIVERPOOL HOUSE

1294 Kingston Rd & 1848-1852 Liverpool Rd

Scale: 1 : 300

Drawn by: TA

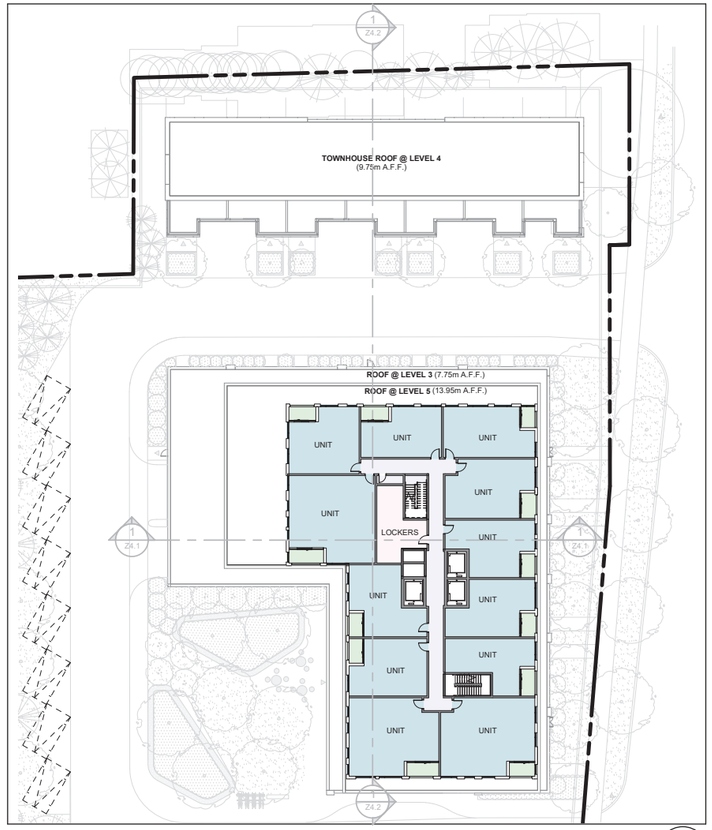
Checked by: DB

Project No.: 18-044

Date: 05/16/19

Drawing No.: Z2.2

Plot Date: 5/16/2019 2:51:38 PM File Path: C:\Revit\2019\18044P11-Old Liverpool House-Master_RVT2019_talimohammadi.rvt



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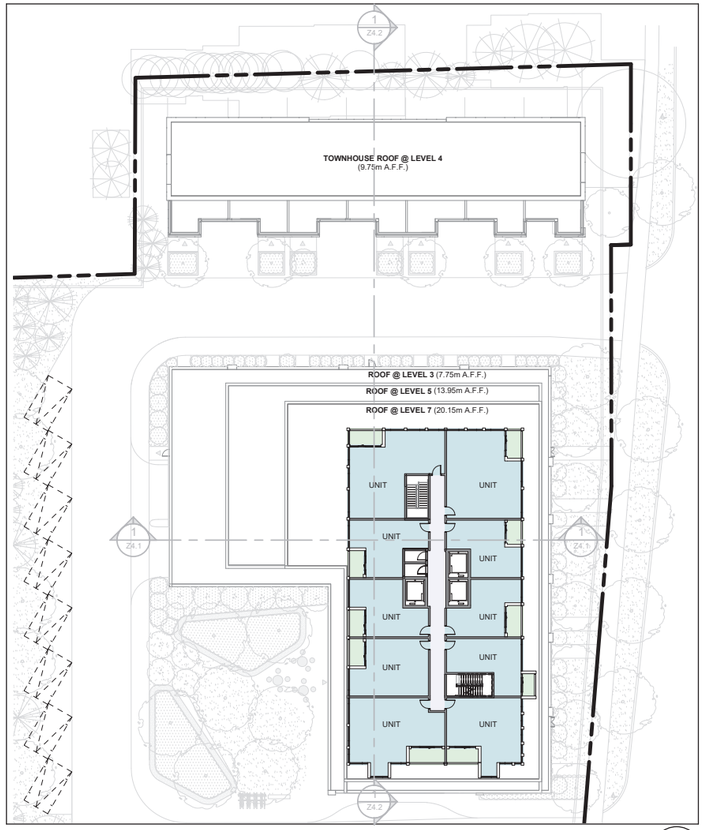
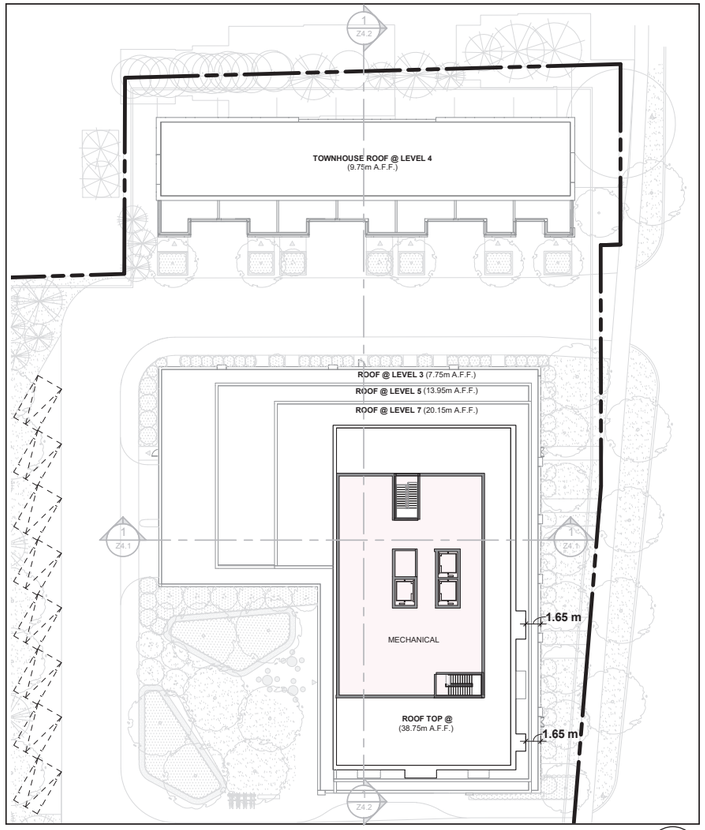
Scale: 1 : 300



Floor Plan - LEVEL 7-10 (Building A) 9 Z2.3

Scale: 1 : 300

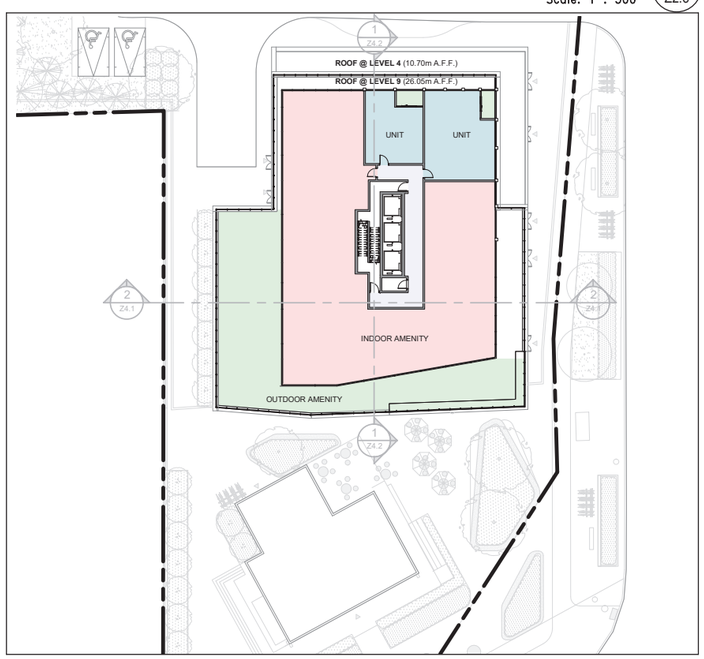


Mechanical Penthouse (BUILDING A) 11 Z2.3

Scale: 1 : 300

Floor Plan - LEVEL 4-8 (Building B) 8 Z2.3

Scale: 1 : 300



Floor Plan - LEVEL 9 (Building B) 10 Z2.3

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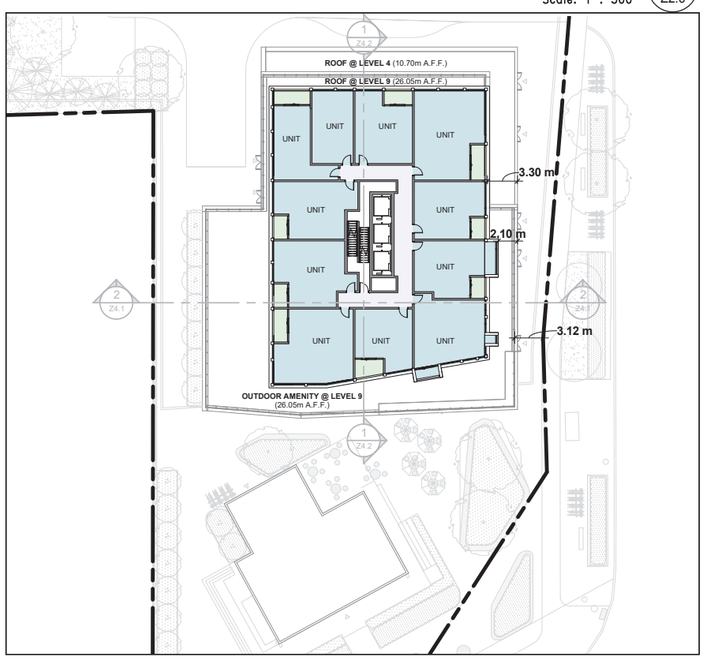

Floor Plan - LEVEL 10-20 (Building B) 12 Z2.3

Scale: 1 : 300

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No.:	Revision:	Date:
01	Rezoning	May 16, 2019

Drawing Title:

Floor Plan - Level 3-Mechanical Penthouse (Building A) & Level 4-20 (Building B)

Project:

OLD LIVERPOOL HOUSE

1294 Kingston Rd & 1848-1852 Liverpool Rd

Scale: 1 : 300

Drawn by: TA

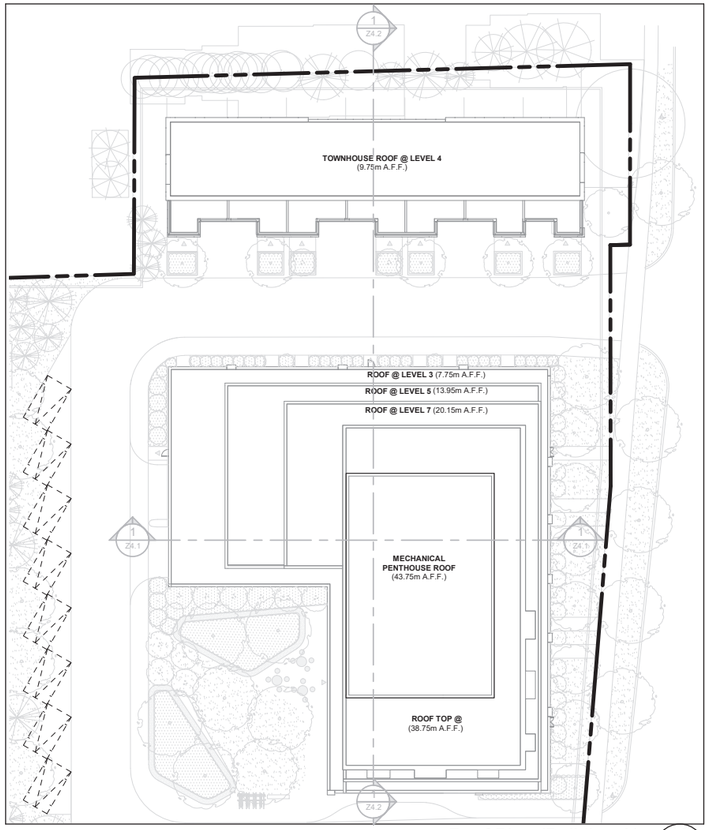
Checked by: DB

Project No.: 18-044

Date: 05/16/19

Drawing No.: Z2.3

Plot Date: 5/16/2019 2:52:05 PM File Path: C:\Revit\2019\18044P11-Old Liverpool House-Master_RVT2019_talimohammadi.rvt



Roof Plan (Building A) 13 Z2.4
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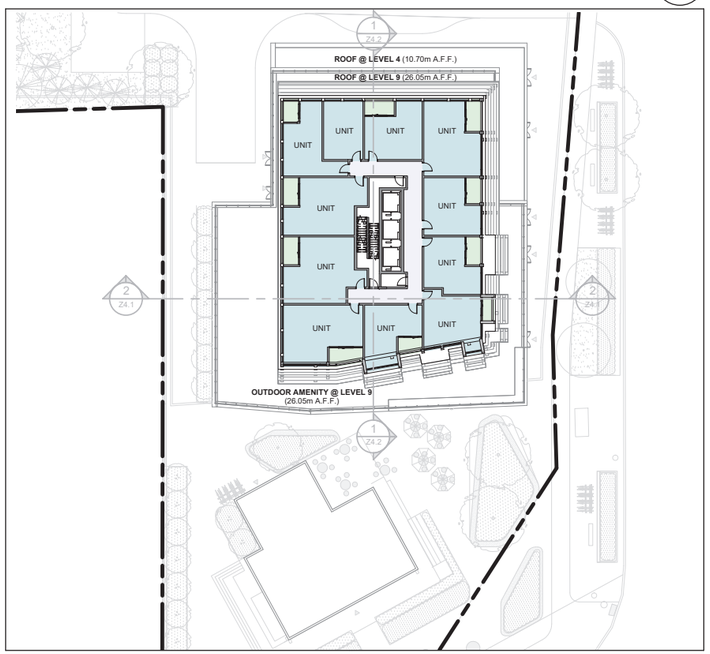

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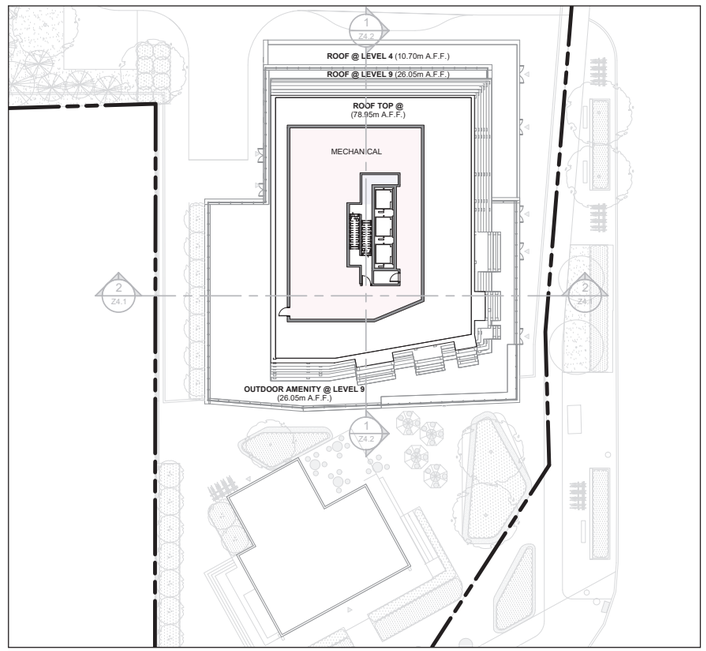

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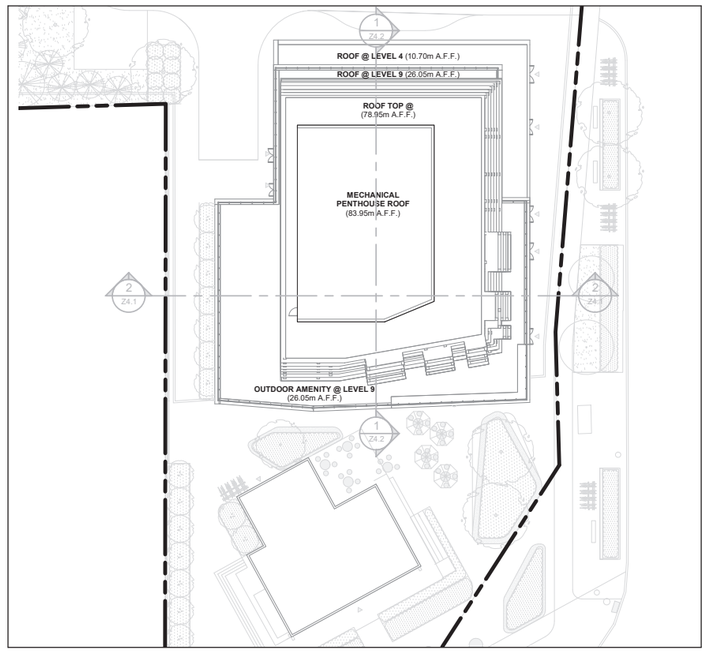

Roof Plan (Building B) 16 Z2.4
Scale: 1 : 300

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No.:	Revision:	Date:
01	Rezoning	May 16, 2019

Drawing Title:

Floor Plan - Mech/
Penthouse & Roof Plan

Project:

OLD LIVERPOOL HOUSE

1294 Kingston Rd & 1848-1852 Liverpool Rd

Scale: 1 : 300
Drawn by: TA
Checked by: DB
Project No.: 18-044
Date: 05/16/19
Drawing No.: Z2.4

Plot Date: 5/16/2019 2:52:34 PM File Path: C:\Revit\2019\18044P11-Old Liverpool House-Master_RVT2019_talimohammadi.rvt

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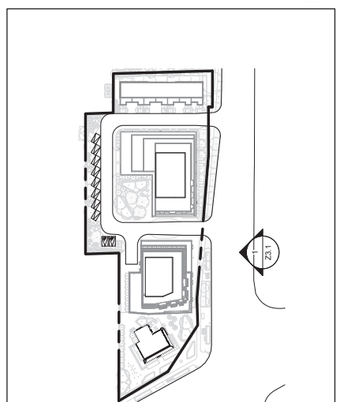

Key Plan - East Elevation 2
NTS Z3.1

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01	Rezoning	May 16, 2019
No	Issued For:	Date:

Drawing Title:

East Elevation

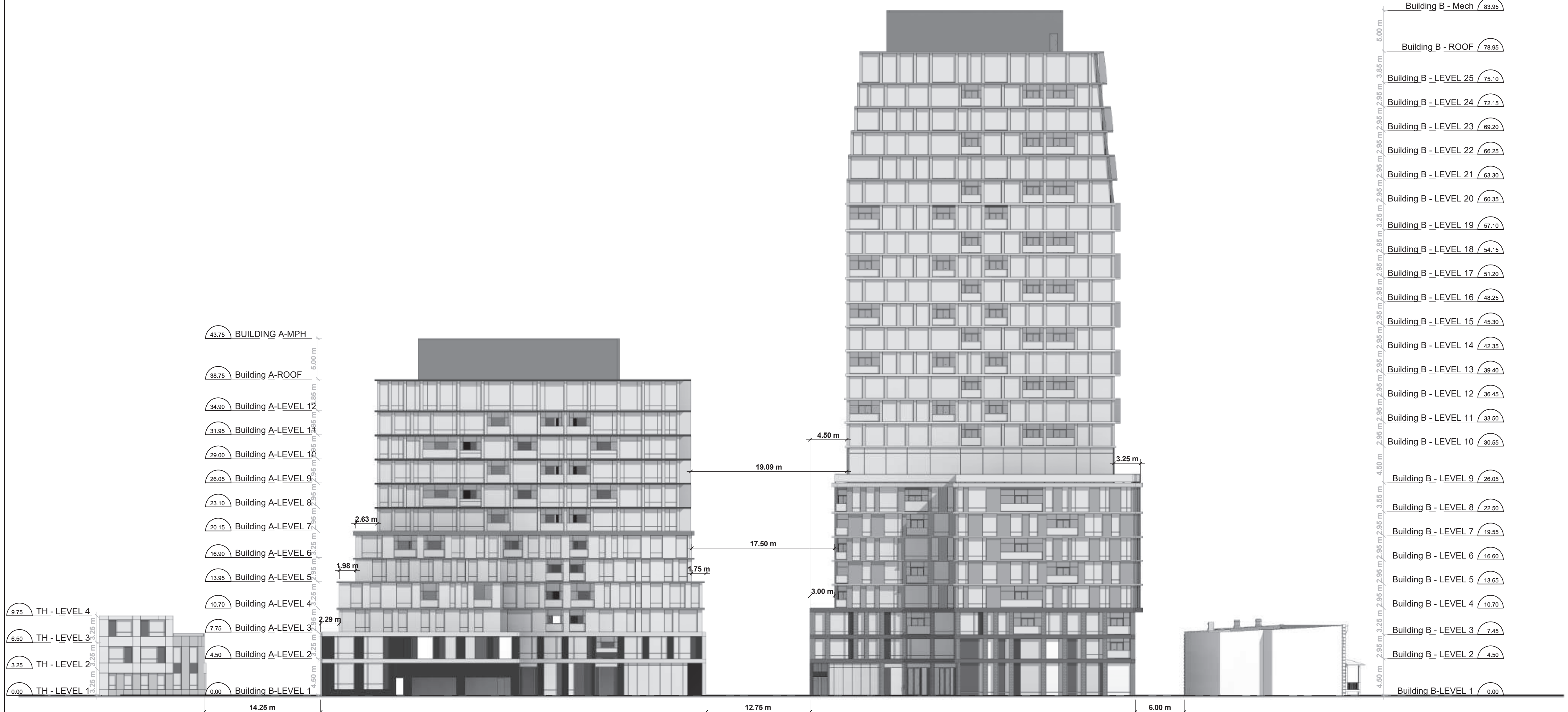
Project:

OLD LIVERPOOL HOUSE

1294 Kingston Rd & 1848-1852 Liverpool Rd

Scale: As indicated
Drawn by: TA
Checked by: DB
Project No.: 18-044
Date: 05/16/19
Drawing No.:

Z3.1



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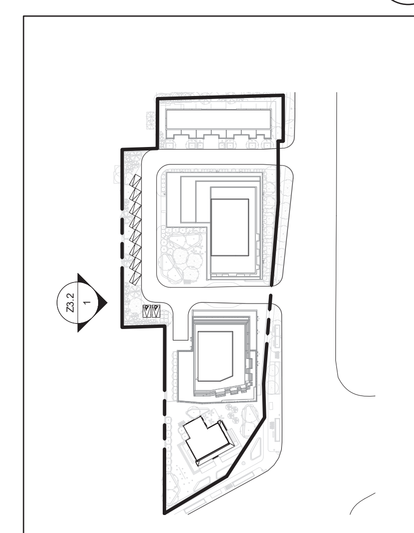

Key Plan - West Elevation 2 Z3.2
NTS

Contractor Must Check And Verify All Dimensions On The Job.

Do Not Scale The Drawings.

This Drawing Is Not To Be Used For Construction Until Signed ByThe Architect.

Date:

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No.:	Revision:	Date:

No	Issued For:	Date:
01	Rezoning	May 16, 2019

Drawing Title:
West Elevation

Project:
OLD LIVERPOOL HOUSE
1294 Kingston Rd & 1848-1852 Liverpool Rd

Scale: As indicated
Drawn by: TA
Checked by: DB
Project No.: 18-044
Date: 05/16/19
Drawing No.: Z3.2

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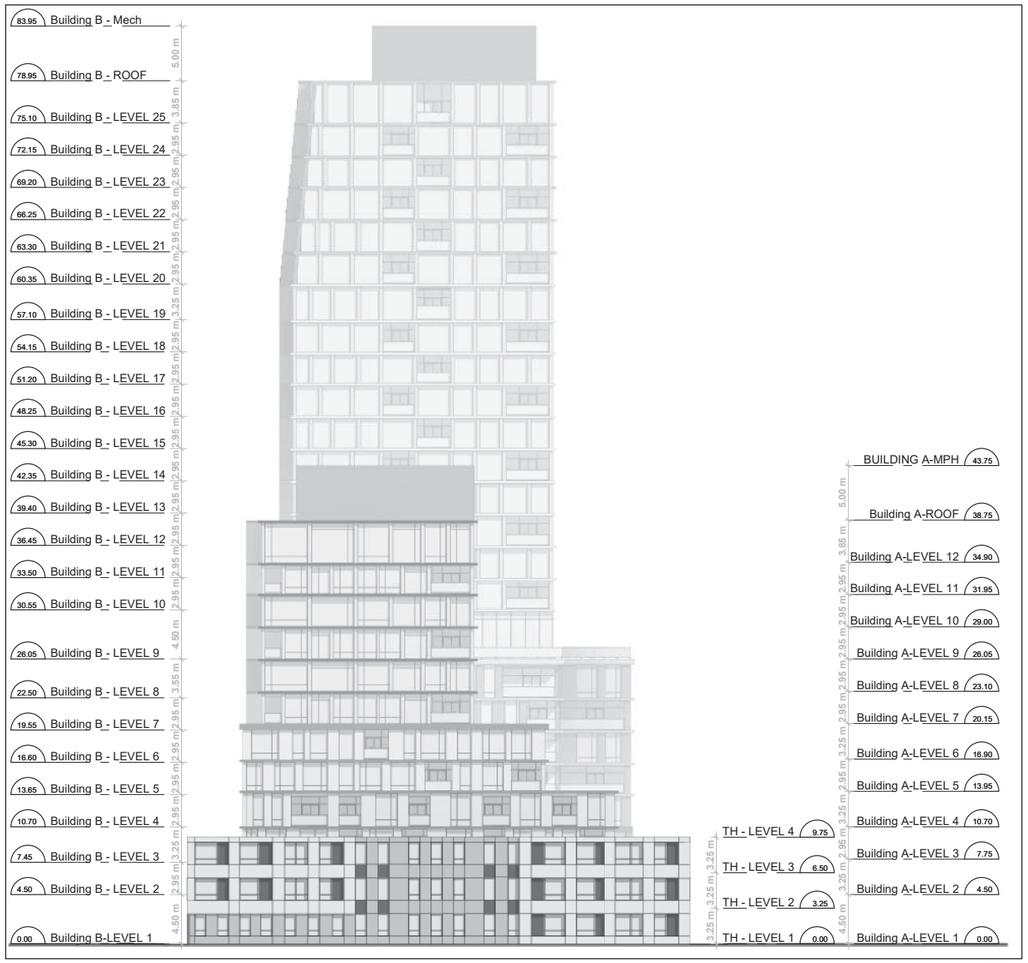

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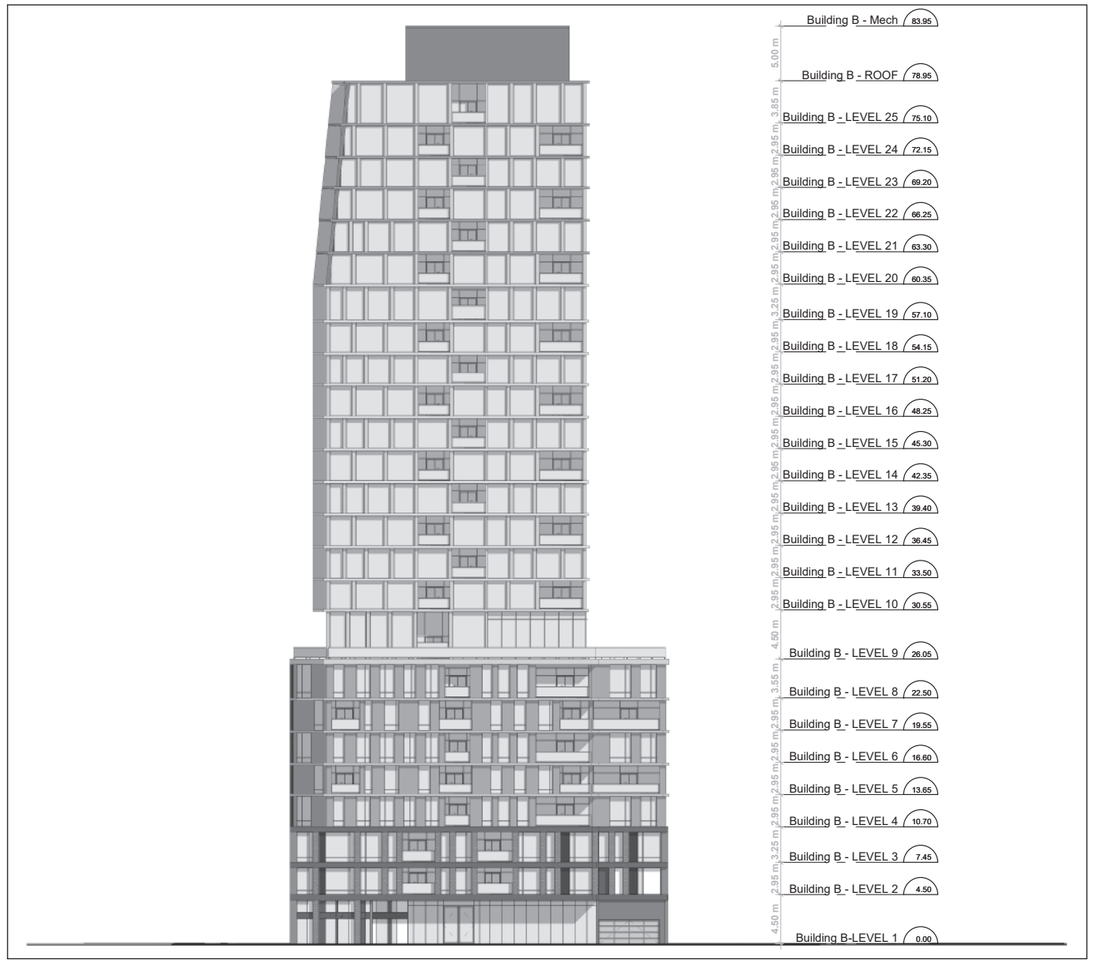

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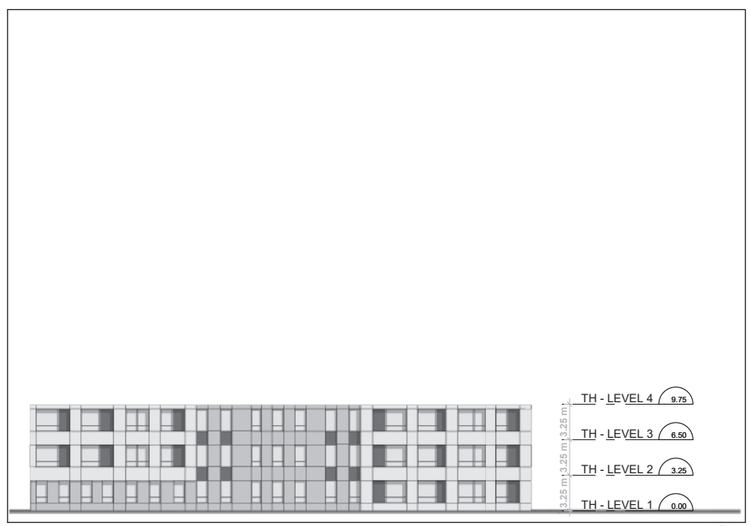
North Elevation - Building A 2
Scale: 1 : 250 Z3.3



North Elevation - TH 4
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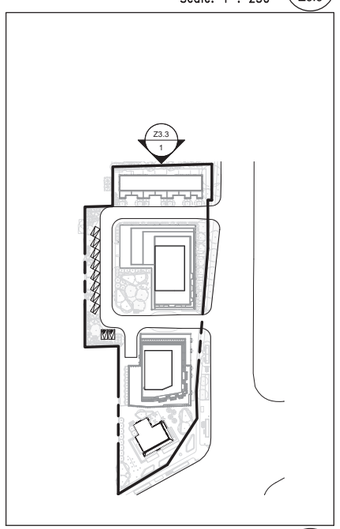

Key Plan - North Elevation 5
NTS Z3.3

Date:

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01	Rezoning	May 16, 2019

Drawing Title:

North Elevation

Project:

OLD LIVERPOOL HOUSE

1294 Kingston Rd & 1848-1852 Liverpool Rd

Scale: As indicated
Drawn by: TA
Checked by: DB
Project No.: 18-044
Date: 05/16/19
Drawing No.: Z3.3

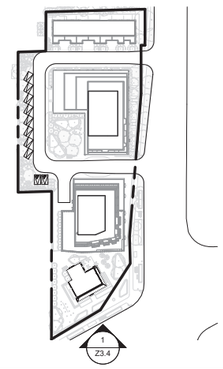
Plot Date: 5/16/2019 3:47:41 PM File Path: C:\Revit\2019\18044P11-Old Liverpool House-Master_RVT2019_talimohammadi.rvt

South Elevation 1
Scale: 1 : 250 Z3.4

South Elevation - Building B 3
Scale: 1 : 250 Z3.4

South Elevation - Building A 2
Scale: 1 : 250 Z3.4

South Elevation - TH 4
Scale: 1 : 250 Z3.4



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NTS Z3.4

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01	Rezoning	May 16, 2019

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Drawing Title:

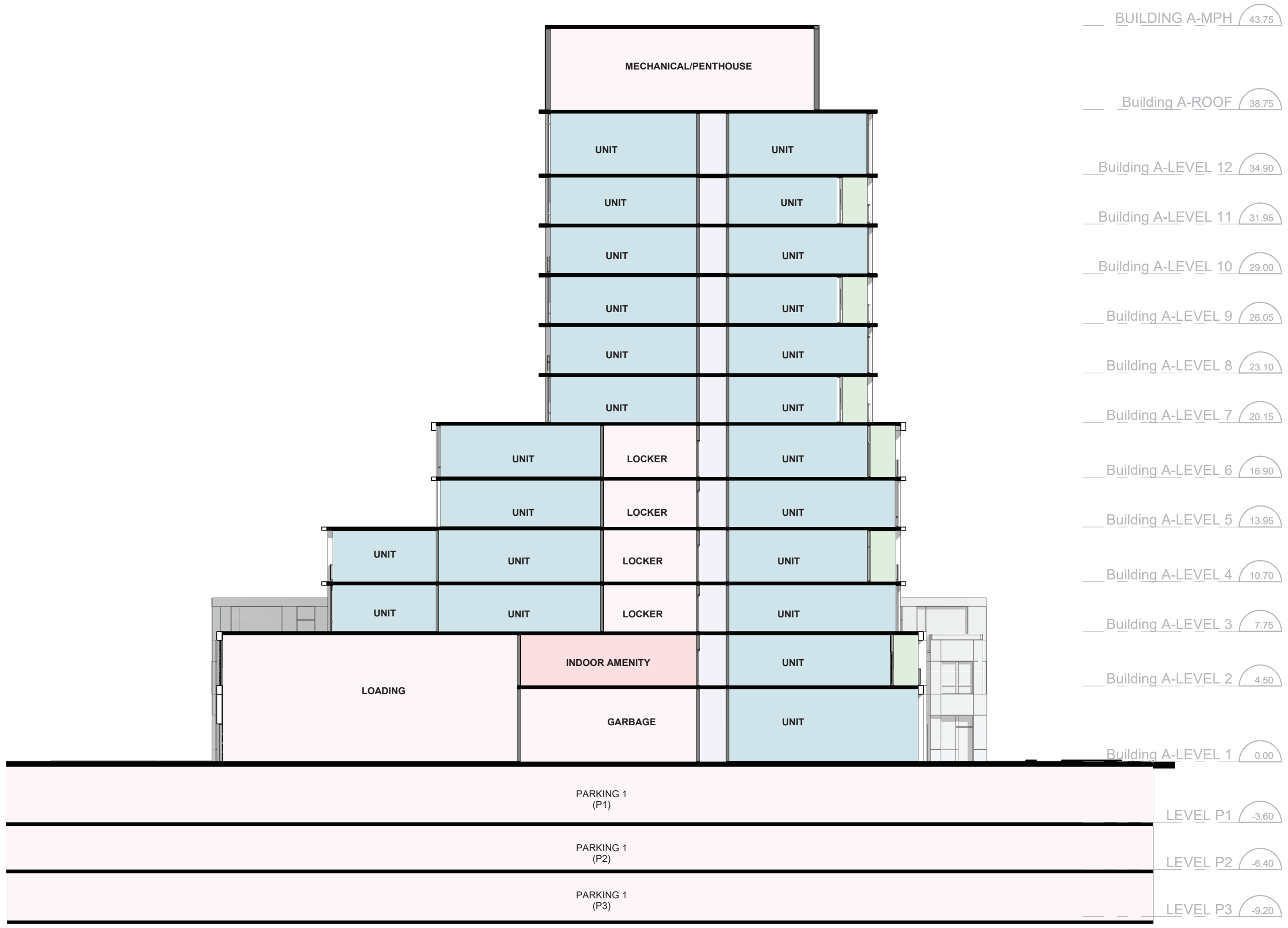
South Elevation

Project:

OLD LIVERPOOL HOUSE

1294 Kingston Rd & 1848-1852 Liverpool Rd

Scale: As indicated
Drawn by: TA
Checked by: DB
Project No.: 18-044
Date: 05/16/19
Drawing No.: Z3.4



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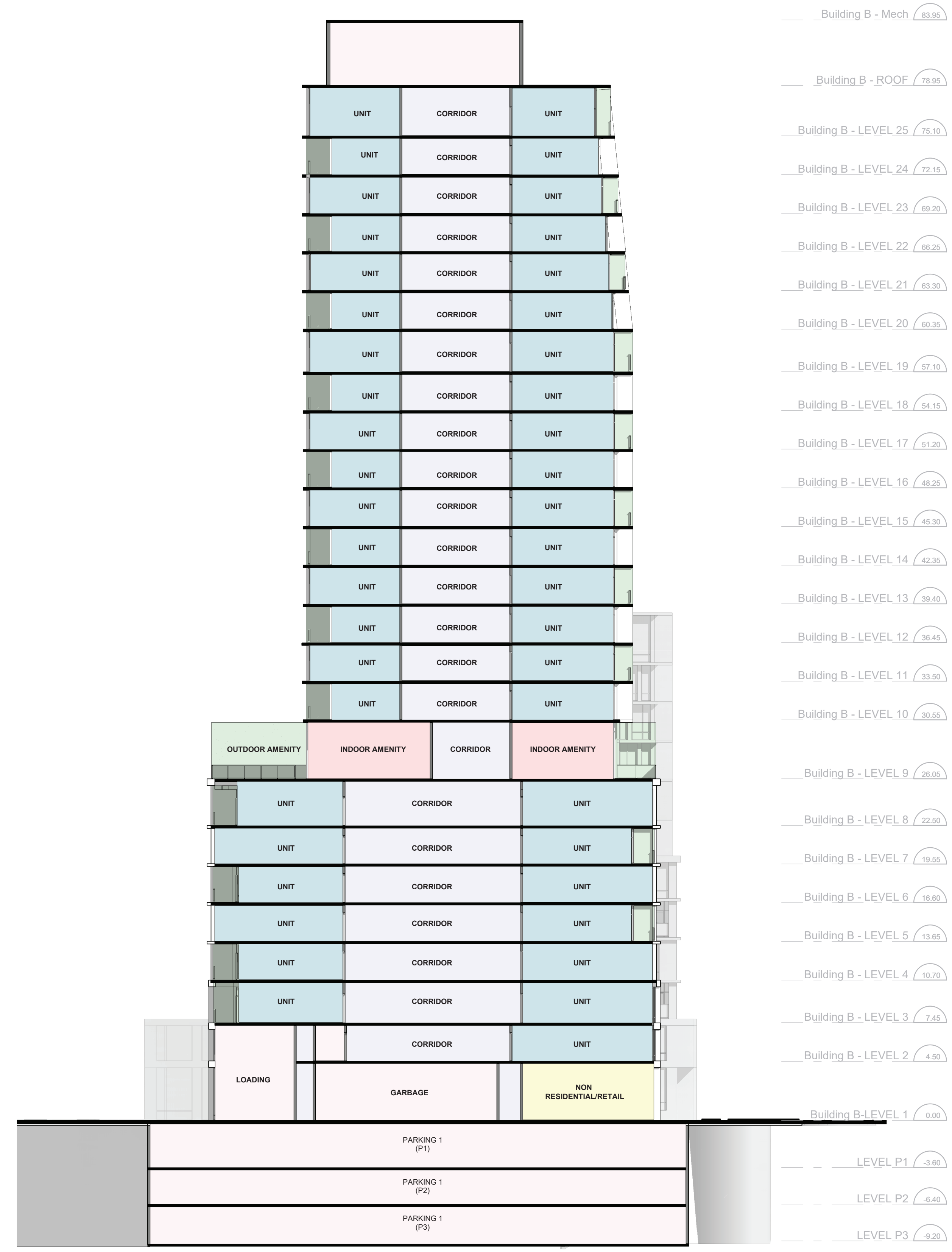

Section Eats/West (Building B) 2 Z4.1
Scale: 1 : 200

Date:

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No.:	Revision:	Date:

No	Issued For:	Date:
01	Rezoning	May 16, 2019

Drawing Title:
Section - East/West

Project:
OLD LIVERPOOL HOUSE
1294 Kingston Rd & 1848-1852 Liverpool Rd

Scale:	1 : 200
Drawn by:	TA
Checked by:	DB
Project No.:	18-044
Date:	05/16/19
Drawing No.:	Z4.1

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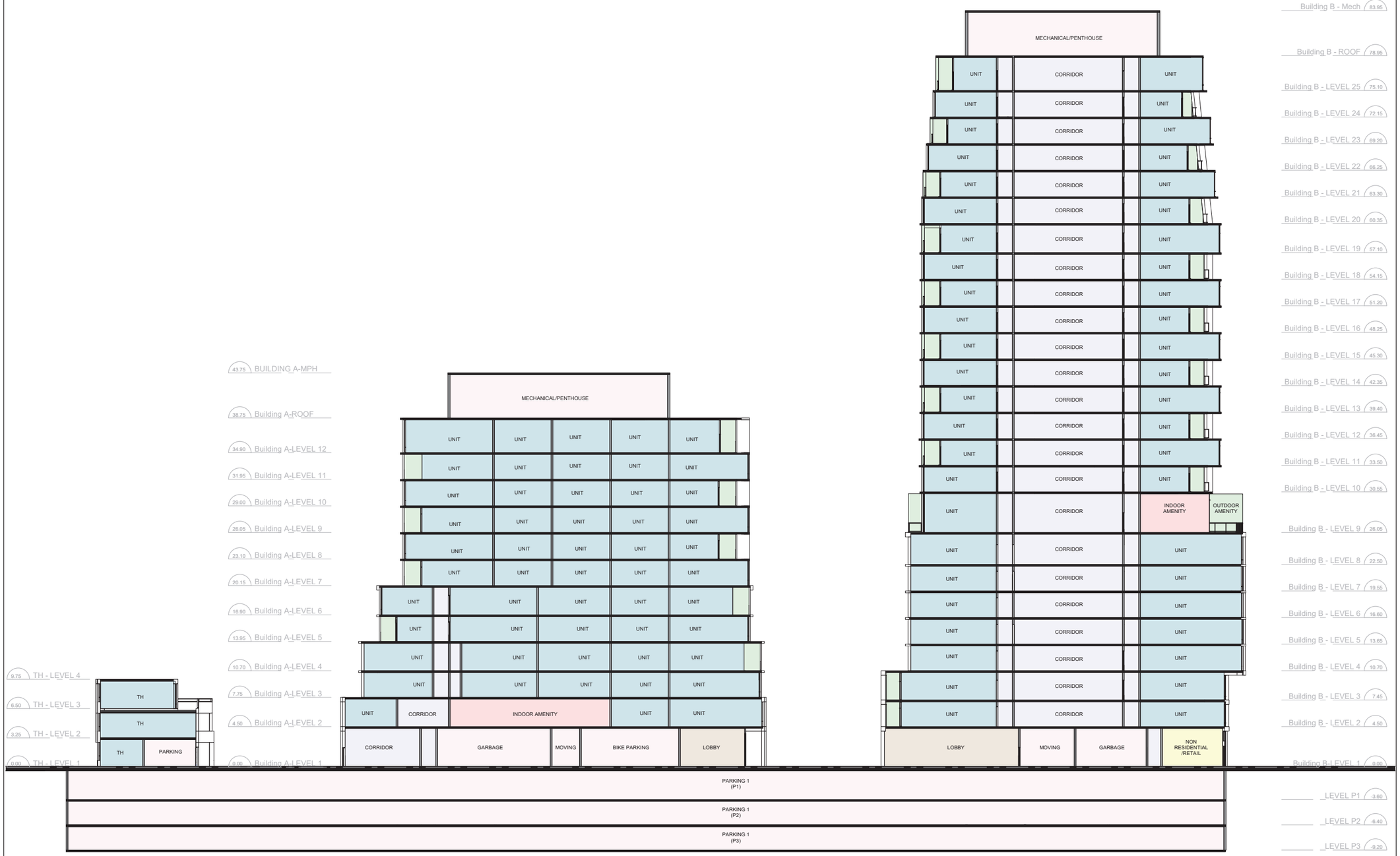

Section North/South

Scale: 1 : 200

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Z4.2

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No.:	Revision:	Date:
01	Rezoning	May 16, 2019
No	Issued For:	Date:

Drawing Title:

Section - North/South

Project:

OLD LIVERPOOL HOUSE

1294 Kingston Rd & 1848-1852 Liverpool Rd

Scale: 1 : 200
Drawn by: TA
Checked by: DB
Project No.: 18-044
Date: 05/16/19
Drawing No.: Z4.2

View from Liverpool Rd 1 Z6.1

View from Kingston Rd 3 Z6.1

Ground view at Kingron Rd & Liverpool Rd 2 Z6.1

View from Liverpool Rd 4 Z6.1

Date:

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No.:	Revision:	Date:
01	Rezoning	May 16, 2019

Drawing Title:

Perspectives

Project:

OLD LIVERPOOL HOUSE

1294 Kingston Rd & 1848-1852 Liverpool Rd

Scale:

Drawn by: TA

Checked by: DB

Project No.: 18-044

Date: 05/16/19

Drawing No.:

Z6.1

Plot Date: 5/16/2019 2:55:45 PM File Path: C:\Revit\2019\18044P11-Old Liverpool House-Master_RVT2019_talimohammadi.rvt

Corner view along Liverpool Rd 5 Z6.2

Ground view of retail corner along Kingston Rd 7 Z6.2

Ground view of retail along Liverpool Rd 6 Z6.2

View from Kingston Rd 8 Z6.2

Date:

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No.:	Revision:	Date:
01	Rezoning	May 16, 2019

Drawing Title:

Perspectives

Project:

OLD LIVERPOOL HOUSE

1294 Kingston Rd & 1848-1852 Liverpool Rd

Scale:

Drawn by: TA

Checked by: DB

Project No.: 18-044

Date: 05/16/19

Drawing No.:

Z6.2

Plot Date: 5/16/2019 2:55:51 PM File Path: C:\Revit\2019\18044P11-Old Liverpool House-Master_RVT2019_talimohammadi.rvt

Appendix C STORMWATER MANAGEMENT CALCULATIONS

APPENDIX C.1: Storm Water Balance Calculations

Stantec

WWF Water Balance Calculations *

Project Name: Liverpool House
Project Number: 1606 22705

Site Characteristics

Site Area	0.91	ha
C pre-development	0.6	pre-development runoff coefficient
C post-development	0.9	post-development runoff coefficient
C governing	0.6	governing runoff coefficient
Equiv Impervious	61	C converted to Imperviousness; as per Schueler, 1987

Retention Requirements

Assume	661.6	mm of rainfall/year (source:Canadian Climate Normals 1971-2000 Lester B. Pearson)
Soil Type	CD	
Governing Imperviousness	61	%
Use only minimum 5 mm	Yes	
Retain Depth of	5.00	mm for total site area, as per WWF requirements Figure 2
% of Annual Rain	47	%
Event Retention Requirement	**45**	m^3
Site Req't	**2824**	m^3/year

Tabular Format of WWF Figure 1A
% of Total Average Annual Rainfall Depth *

Rainfall (mm) (a)	% Annual (b)
0	0
2.5	30
5	47
10	70
15	82
20	90
25	94
30	97
35	99
40	100

Surface Type	Initial Abstraction	TSS Removal	Runoff Coefficient
Impervious roof	1mm	80%	0.90
Asphalt pavement	1mm	0%	0.90
Landscape	5mm	80%	0.25
Green Roof	7mm max for intensive roofs otherwise 5mm	80%	0.45-0.5
Permeable Pavers	5mm	80% with storage bed otherwise 50%	0.40
Concrete pavers	1mm	0%	0.9
Grassed swale	5mm	50% for a min length of 16m	0.25

Best Management Practices Evaluation

Catchment Area Characteristics			Capture Event Characteristics			Initial Abstraction/Source Characteristics					Retention System Characteristics						Totals	
WB Catchment ID	Area (ha)	Runoff Source Type	Capture Event (mm)	% of Annual Rain	Total Annual Volume (m^3)	Initial Abstraction (mm)	% of Annual Rain	Source Volume (m^3)	Source Annual Volume (m^3)	% of Target	Overflow to Retention System?	Overflow Depth to Tank (mm)	% of Annual Rain	Tank Volume (m^3)	Tank Annual Volume (m^3)	% of Target	Total Annual Volume (m3)	% of Total Target
201	0.20	Landscape	5.00	47	609	5.00	47	10	609	22%	Yes	0.00	0	0	0	0%	609	22%
202	0.26	Impervious Roof	5.00	47	809	1.00	14	3	233	8%	Yes	4.00	33	10	575	20%	809	29%
203	0.36	Asphalt	5.00	47	1127	1.00	14	4	325	12%	Yes	4.00	33	15	802	28%	1127	40%
204	0.09	Potential Green Roof	5.00	47	280	5.00	47	5	280	10%	Yes	0.00	0	0	0	0%	280	10%
Total	**0.91**		**Initial Abstraction**	**21**	**1447**	**51%**					**Retention System**	**25**	**1377**	**49%**	**2825**	**100%**		
														Target	**2824**	**m^3**		

Appendix C.2: Storm Water Quantity Calculations

Stantec

Project: Liverpool House
Project Number: 160622705
Project Location: Pickering, ON

Rainfal Intensity and Existing and Proposed Catchment Parameters

Rainfall Intensity Parameters*

Storm	A	B	C
2 Year	715.076	5.262	0.815
5 Year	1082.901	6.01	0.837
10 Year	1313.979	6.026	0.845
25 Year	1581.718	6.007	0.848
50 Year	1828.009	6.19	0.856
100 Year	2096.425	9.485	0.863

* Rainfall Intensity Parameters as per City of Pickering SWM Guidelines, Table 12

Pre-Devleopment Areas

Catchment Description	Catchment ID	Area (ha)	C x A	Runoff Coefficient	[1]C x A	[1]Scaled (25 Yr)	[2]C x A	[2]Scaled (100 Yr)
Grass	101	0.10	0.025	0.25	0.03	0.28	0.03	0.31
Roof	102	0.16	0.152	0.95	0.16	1.00	0.16	1.00
Asphalt	103	0.65	0.585	0.90	0.64	0.99	0.65	1.00
Total		**0.91**	0.762	**0.84**	0.83	**0.91**	0.84	**0.92**

Controlled Post-Development Areas

Catchment Description	Catchment ID	Area (ha)	C x A	Runoff Coefficient	[1]C x A	[1]Scaled (25 Yr)	[2]C x A	[2]Scaled (100 Yr)
Grass	201	0.20	0.05	0.25	0.05	0.28	0.06	0.31
Roof	202	0.26	0.25	0.95	0.26	1.00	0.26	1.00
Asphalt	203	0.36	0.33	0.90	0.36	0.99	0.36	1.00
Potential Green Roof	204	0.09	0.05	0.55	0.06	0.66	0.06	0.69
Total		**0.91**	0.67	**0.74**	0.73	**0.81**	0.75	**0.82**

Runoff Coefficients Scaled as Per The MTO Design Chart 1.07
[1]Note 25 Year Runoff Coefficient is 2/5 Year Runoff Coefficient x 1.25
[2]Note 100 Year Runoff Coefficient is 2/5 Year Runoff Coefficient x 1.25
Total Post Imp 0.69

Project: Liverpool House
Project Number: 160622705
Project Location: Pickering, ON

Target Flows

Rational Method

Q = 2.78*C*i*A

Where:

C = Runoff Coefficient [1]

A = Site Drainage Area (ha)

i = Rain Intensity (mm/hr) [2]

Q = Flow (m^3/s)

Storm	A	B	C
2 Year	715.076	5.26	0.815

Pre-Development Conditions

Catchment Description	Catchment ID	Area (ha)	C x A	Runoff Coefficient	Time of Concentration (mins)	i (mm/hr) [2]	Q (m^3/s)
Total		**0.91**	0.76	**0.50**	10	77.57	**0.098**

Outlet Location: To be determined with detailed design

Target Flow = **0.098** m^3/s Based upon 2-year at C = 0.50 max

Project: Liverpool House
Project Number: 160622705
Project Location: Pickering, ON

100 Year Storage Stormwater Management Calculations

Rational Method

Q = 2.78*C*i*A

Where:

C = Runoff Coefficient [1]

A = Site Drainage Area (ha)

i = Rain Intensity (mm/hr) [2]

Q = Flow (m^3/s)

Storm	A	B	C
100 Year	2096.425	9.485	0.863

Target Flow = **0.098** m^3/s

Post Development Conditions

Catchment ID =	201		
Area =	0.91	ha	
Runoff Coefficient =	0.82		modified for 100 year to maximum value
Time of Conc =	10.0	min	
Time Increment =	5.0	min	
Design Release Rate =	0.098	m^3/s	Based upon 2-year at C = 0.50 max
Maximum Storage =	163	m^3	

Water Quantity Storage Requirements not Accounting for Water Balance Storage

Time (min)	Rainfall Intensity (mm/hr)	Storm Runoff (m^3/s)	Runoff Volume (m^3)	Volume Released (m^3)	Storage Required (m^3)	
10.0	161.6	0.335	201.0	58.9	142.1	
15.0	132.7	0.275	247.5	88.3	159.2	
20.0	113.0	0.234	281.1	117.7	163.4	<<<<
25.0	98.7	0.205	307.0	147.2	159.8	
30.0	87.9	0.182	327.8	176.6	151.1	
35.0	79.3	0.164	345.0	206.1	138.9	
40.0	72.3	0.150	359.7	235.5	124.2	
45.0	66.5	0.138	372.4	264.9	107.4	
50.0	61.7	0.128	383.5	294.4	89.2	
55.0	57.5	0.119	393.5	323.8	69.7	
60.0	53.9	0.112	402.5	353.2	49.3	
65.0	50.8	0.105	410.7	382.7	28.0	
70.0	48.0	0.100	418.1	412.1	6.0	
75.0	45.6	0.094	425.0	441.5	0.0	
80.0	43.4	0.090	431.4	471.0	0.0	
85.0	41.4	0.086	437.4	500.4	0.0	
90.0	39.6	0.082	442.9	529.9	0.0	
95.0	37.9	0.079	448.2	559.3	0.0	
100.0	36.4	0.076	453.1	588.7	0.0	
105.0	35.1	0.073	457.8	618.2	0.0	
110.0	33.8	0.070	462.2	647.6	0.0	

STANDARD OFFLINE
Jellyfish Filter Sizing Report

NOTE: Model and size to be confirmed at detailed design stage

Project Information

Date	Wednesday, March 13, 2019
Project Name	Pickering
Project Number	
Location	Pickering

Jellyfish Filter Design Overview

This report provides information for the sizing and specification of the Jellyfish Filter. When designed properly in accordance to the guidelines detailed in the Jellyfish Filter Technical Manual, the Jellyfish Filter will exceed the performance and longevity of conventional horizontal bed and granular media filters.

Please see ***www.ImbriumSystems.com*** *for more information.*

Jellyfish Filter System Recommendation

The Jellyfish Filter model JF6-5-1 is recommended to meet the water quality objective by treating a flow of 27.8 L/s, which meets or exceeds 90% of the average annual rainfall runoff volume based on 18 years of TORONTO CENTRAL rainfall data for this site. This model has a sediment capacity of 313 kg, which meets or exceeds the estimated average annual sediment load.

Jellyfish Model	Number of High-Flo Cartridges	Number of Draindown Cartridges	Manhole Diameter (m)	Treatment Flow Rate (L/s)	Sediment Capacity (kg)
JF6-5-1	5	1	1.8	27.8	313

The Jellyfish Filter System

The patented Jellyfish Filter is an engineered stormwater quality treatment technology featuring unique membrane filtration in a compact stand-alone treatment system that removes a high level and wide variety of stormwater pollutants. Exceptional pollutant removal is achieved at high treatment flow rates with minimal head loss and low maintenance costs. Each lightweight Jellyfish Filter cartridge contains an extraordinarily large amount of membrane surface area, resulting in superior flow capacity and pollutant removal capacity.

Maintenance

Regular scheduled inspections and maintenance is necessary to assure proper functioning of the Jellyfish Filter. The maintenance interval is designed to be a minimum of 12 months, but this will vary depending on site loading conditions and upstream pretreatment measures. Quarterly inspections and inspections after all storms beyond the 5-year event are recommended until enough historical performance data has been logged to comfortably initiate an alternative inspection interval.

Please see ***www.ImbriumSystems.com*** *for more information.*

Thank you for the opportunity to present this information to you and your client.

Performance

Jellyfish efficiently captures a high level of Stormwater pollutants, including:

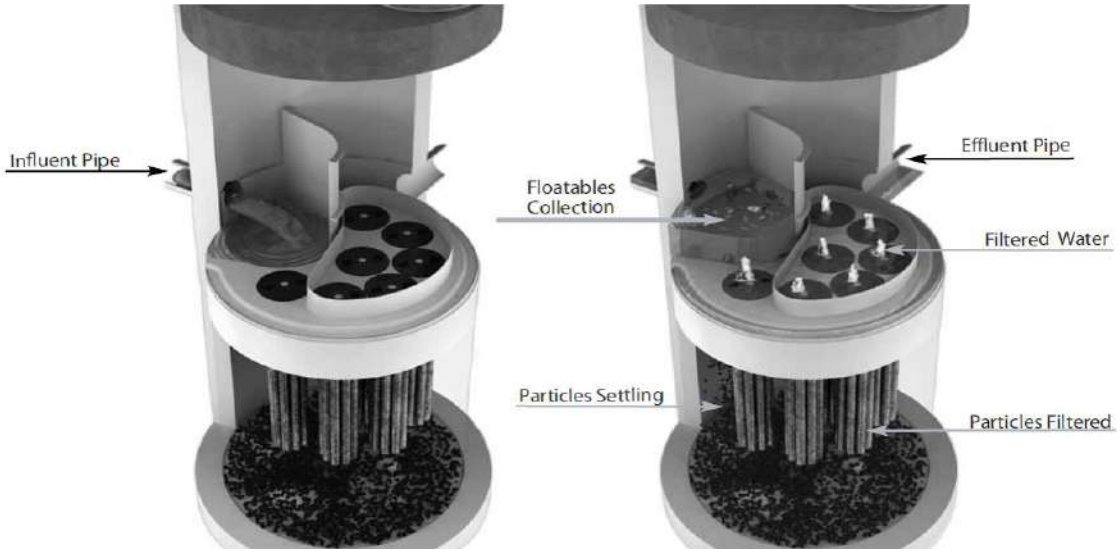
- ☑ 89% of the total suspended solids (TSS) load, including particles less than 5 microns
- ☑ 59% TP removal & 51% TN removal
- ☑ 90% Total Copper, 81% Total Lead, 70% Total Zinc
- ☑ Particulate-bound pollutants such as nutrients, toxic metals, hydrocarbons and bacteria
- ☑ Free oil, Floatable trash and debris

Field Proven Peformance

The Jellyfish filter has been field-tested on an urban site with 25 TARP qualifying rain events and field monitored according to the TARP field test protocol, demonstrating:

- A median TSS removal efficiency of 89%, and a median SSC removal of 99%;
- The ability to capture fine particles as indicated by an effluent d50 median of 3 microns for all monitotred storm events, and a median effluent turbidity of 5 NTUs;
- A median Total Phosphorus removal of 59%, and a median Total Nitrogen removal of 51%.

Jellyfish Filter Treatment Functions



Pre-treatment and Membrane Filtration

Jellyfish® Filter

Project Information

Date:	Wednesday, March 13, 2019
Project Name:	Pickering
Project Number:	
Location:	Pickering

Designer Information

Company:	Stantec Consulting Ltd.
Contact:	Karlo Bobinac
Phone #:	

Notes

Rainfall

Name:	TORONTO CENTRAL
State:	ON
ID:	100
Record:	1982 to 1999
Co-ords:	45°30'N, 90°30'W

Drainage Area

Total Area:	0.91 ha
Imperviousness:	90%

Upstream Detention

Peak Release Rate:	n/a
Pretreatment Credit:	n/a

Design System Requirements

Flow Loading	90% of the Average Annual Runoff based on 18 years of TORONTO CENTRAL rainfall data:	**22.2 L/s**
Sediment Loading	Treating 90% of the average annual runoff volume, 4883 m³, with a suspended sediment concentration of 60 mg/L.	**293 kg***

** Indicates that sediment loading is the limiting parameter in the sizing of this Jellyfish system*

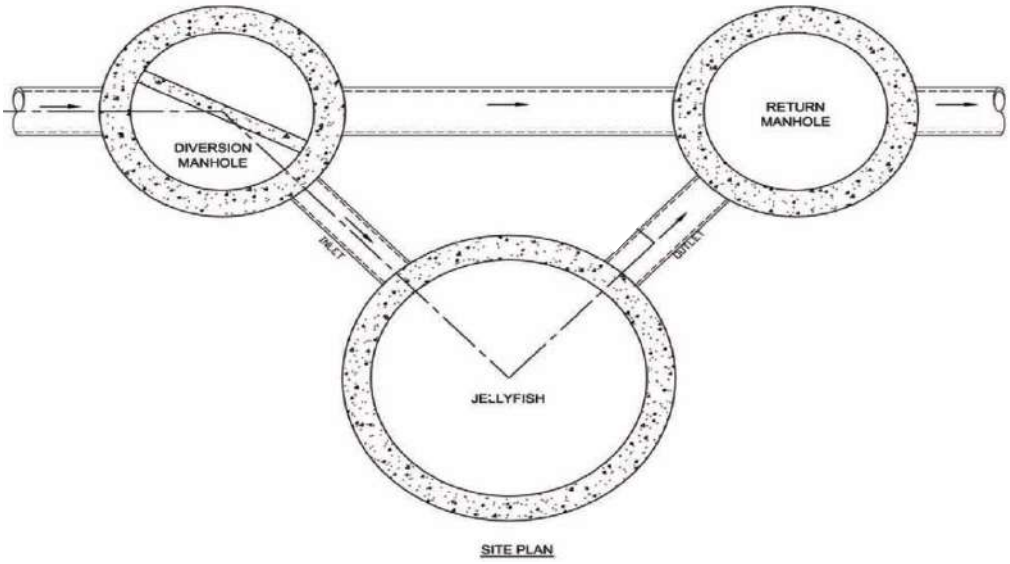
Recommendation

The Jellyfish Filter model JF6-5-1 is recommended to meet the water quality objective by treating a flow of 27.8 L/s, which meets or exceeds 90% of the average annual rainfall runoff volume based on 18 years of TORONTO CENTRAL rainfall data for this site. This model has a sediment capacity of 313 kg, which meets or exceeds the estimated average annual sediment load.

Jellyfish Model	Number of High-Flo Cartridges	Number of Draindown Cartridges	Manhole Diameter (m)	Wet Vol Below Deck (L)	Sump Storage (m³)	Oil Capacity (L)	Treatment Flow Rate (L/s)	Sediment Capacity (kg)
JF4-1-1	1	1	1.2	2313	0.34	379	7.6	85
JF4-2-1	2	1	1.2	2313	0.34	379	12.6	142
JF6-3-1	3	1	1.8	5205	0.79	848	17.7	199
JF6-4-1	4	1	1.8	5205	0.79	848	22.7	256
JF6-5-1	**5**	**1**	**1.8**	**5205**	**0.79**	**848**	**27.8**	**313**
JF6-6-1	6	1	1.8	5205	0.79	848	28.6	370
JF8-6-2	6	2	2.4	9252	1.42	1469	35.3	398
JF8-7-2	7	2	2.4	9252	1.42	1469	40.4	455
JF8-8-2	8	2	2.4	9252	1.42	1469	45.4	512
JF8-9-2	9	2	2.4	9252	1.42	1469	50.5	569
JF8-10-2	10	2	2.4	9252	1.42	1469	50.5	626
JF10-11-3	11	3	3.0	14456	2.21	2302	63.1	711
JF10-12-3	12	3	3.0	14456	2.21	2302	68.2	768
JF10-12-4	12	4	3.0	14456	2.21	2302	70.7	796
JF10-13-4	13	4	3.0	14456	2.21	2302	75.7	853
JF10-14-4	14	4	3.0	14456	2.21	2302	78.9	910
JF10-15-4	15	4	3.0	14456	2.21	2302	78.9	967
JF10-16-4	16	4	3.0	14456	2.21	2302	78.9	1024
JF10-17-4	17	4	3.0	14456	2.21	2302	78.9	1081
JF10-18-4	18	4	3.0	14456	2.21	2302	78.9	1138
JF10-19-4	19	4	3.0	14456	2.21	2302	78.9	1195
JF12-20-5	20	5	3.6	20820	3.2	2771	113.6	1280
JF12-21-5	21	5	3.6	20820	3.2	2771	113.7	1337
JF12-22-5	22	5	3.6	20820	3.2	2771	113.7	1394
JF12-23-5	23	5	3.6	20820	3.2	2771	113.7	1451
JF12-24-5	24	5	3.6	20820	3.2	2771	113.7	1508
JF12-25-5	25	5	3.6	20820	3.2	2771	113.7	1565
JF12-26-5	26	5	3.6	20820	3.2	2771	113.7	1622
JF12-27-5	27	5	3.6	20820	3.2	2771	113.7	1679

Jellyfish Filter Design Notes

- Typically the Jellyfish Filter is designed in an offline configuration, as all stormwater filter systems will perform for a longer duration between required maintenance services when designed and applied in off-line configurations. Depending on the design parameters, an optional internal bypass may be incorporated into the Jellyfish Filter, however note the inspection and maintenance frequency should be expected to increase above that of an off-line system. Speak to your local representative for more information.



Jellyfish Filter Typical Layout

- Typically, 18 inches (457 mm) of driving head is designed into the system, calculated as the difference in elevation between the top of the diversion structure weir and the invert of the Jellyfish Filter outlet pipe. Alternative driving head values can be designed as 12 to 24 inches (305 to 610mm) depending on specific site requirements, requiring additional sizing and design assistance.
- Typically, the Jellyfish Filter is designed with the inlet pipe configured 6 inches (150 mm) above the outlet invert elevation. However, depending on site parameters this can vary to an optional configuration of the inlet pipe entering the unit below the outlet invert elevation.
- The Jellyfish Filter can accommodate multiple inlet pipes within certain restrictions.
- While the optional inlet below deck configuration offers 0 to 360 degree flexibility between the inlet and outlet pipe, typical systems conform to the following:

Model Diameter (m)	Minimum Angle Inlet / Outlet Pipes	Minimum Inlet Pipe Diameter (mm)	Minimum Outlet Pipe Diameter (mm)
1.2	62º	150	200
1.8	**59º**	**200**	**250**
2.4	52º	250	300
3.0	48º	300	450
3.6	40º	300	450

- The Jellyfish Filter can be built at all depths of cover generally associated with conventional stormwater conveyance systems. For sites that require minimal depth of cover for the stormwater infrastructure, the Jellyfish Filter can be applied in a shallow application using a hatch cover. The general minimum depth of cover is 36 inches (915 mm) from top of the underslab to outlet invert.
- If driving head caclulations account for water elevation during submerged conditions the Jellyfish Filter will function effectively under submerged condtions.
- Jellyfish Filter systems may incorporate grated inlets depending on system configuration.
- For sites with water quality treatment flow rates or mass loadings that exceed the design flow rate of the largest standard Jellyfish Filter manhole models, systems can be designed that hydraulically connect multiple Jellyfish Filters in series or alternatively Jellyfish Vault units can be designed.

STANDARD SPECIFICATION
STORMWATER QUALITY – MEMBRANE FILTRATION TREATMENT DEVICE

PART 1 – GENERAL

1.1 WORK INCLUDED

Specifies requirements for construction and performance of an underground stormwater quality membrane filtration treatment device that removes pollutants from stormwater runoff through the unit operations of sedimentation, floatation, and membrane filtration.

1.2 REFERENCE STANDARDS

ASTM C 891: Specification for Installation of Underground Precast Concrete Utility Structures
ASTM C 478: Specification for Precast Reinforced Concrete Manhole Sections
ASTM C 443: Specification for Joints for Concrete Pipe and Manholes, Using Rubber Gaskets
ASTM D 4101: Specification for Copolymer steps construction

CAN/CSA-A257.4-M92
Joints for Circular Concrete Sewer and Culvert Pipe, Manhole Sections and Fittings Using Rubber Gaskets

CAN/CSA-A257.4-M92
Precast Reinforced Circular Concrete Manhole Sections, Catch Basins and Fittings

Canadian Highway Bridge Design Code

1.3 SHOP DRAWINGS

Shop drawings for the structure and performance are to be submitted with each order to the contractor. Contractor shall forward shop drawing submittal to the consulting engineer for approval. Shop drawings are to detail the structure's precast concrete and call out or note the fiberglass (FRP) internals/components.

1.4 PRODUCT SUBSTITUTIONS

No product substitutions shall be accepted unless submitted 10 days prior to project bid date, or as directed by the engineer of record. Submissions for substitutions require review and approval by the Engineer of Record, for hydraulic performance, impact to project designs, equivalent treatment performance, and any required project plan and report (hydrology/hydraulic, water quality, stormwater pollution) modifications that would be required by the approving jurisdictions/agencies. Contractor to coordinate with the Engineer of Record any applicable modifications to the project estimates of cost, bonding amount determinations, plan check fees for changes to approved documents, and/or any other regulatory requirements resulting from the product substitution.

1.5 HANDLING AND STORAGE

Prevent damage to materials during storage and handling.

PART 2 – PRODUCTS

2.1 GENERAL

2.1.1 The device shall be a cylindrical or rectangular, all concrete structure (including risers), constructed from precast concrete riser and slab components or monolithic precast structure(s), installed to conform to ASTM C 891 and to any required state highway, municipal or local specifications; whichever is more stringent. The device shall be watertight.

2.1.2 Cartridge Deck The cylindrical concrete device shall include a fiberglass deck. The rectangular concrete device shall include a coated aluminum deck. In either instance, the insert shall be bolted and sealed watertight inside the precast concrete chamber. The deck shall serve as: (a) a horizontal divider between the lower treatment zone and the upper treated effluent zone; (b) a deck for attachment of filter cartridges such that the membrane filter elements of each cartridge extend into the lower treatment zone; (c) a platform for maintenance workers to service the filter cartridges (maximum manned weight = 450 pounds (204 kg)); (d) a conduit for conveyance of treated water to the effluent pipe.

2.1.3 Membrane Filter Cartridges Filter cartridges shall be comprised of reusable cylindrical membrane filter elements connected to a perforated head plate. The number of membrane filter elements per cartridge shall be a minimum of eleven 2.75-inch (70-mm) diameter elements. The length of each filter element shall be a minimum 15 inches (381 mm). Each cartridge shall be fitted into the cartridge deck by insertion into a cartridge receptacle that is permanently mounted into the cartridge deck. Each cartridge shall be secured by a cartridge lid that is threaded onto the receptacle, or similar mechanism to secure the cartridge into the deck. The maximum treatment flow rate of a filter cartridge shall be controlled by an orifice in the cartridge lid, or on the individual cartridge itself, and based on a design flux rate (surface loading rate) determined by the maximum treatment flow rate per unit of filtration membrane surface area. The maximum design flux rate shall be 0.21 gpm/ft² (0.142 lps/m²).

Each membrane filter cartridge shall allow for manual installation and removal. Each filter cartridge shall have filtration membrane surface area and dry installation weight as follows (if length of filter cartridge is between those listed below, the surface area and weight shall be proportionate to the next length shorter and next length longer as shown below):

Filter Cartridge Length (in / mm)	Minimum Filtration Membrane Surface Area (ft2 / m2)	Maximum Filter Cartridge Dry Weight (lbs / kg)
15	106 / 9.8	10.5 / 4.8
27	190 / 17.7	15.0 / 6.8
40	282 / 26.2	20.5 / 9.3
54	381 / 35.4	25.5 / 11.6

2.1.4 Backwashing Cartridges The filter device shall have a weir extending above the cartridge deck, or other mechanism, that encloses the high flow rate filter cartridges when placed in their respective cartridge receptacles within the cartridge deck. The weir, or other mechanism, shall collect a pool of filtered water during inflow events that backwashes the high flow rate cartridges when the inflow

event subsides. All filter cartridges and membranes shall be reusable and allow for the use of filtration membrane rinsing procedures to restore flow capacity and sediment capacity; extending cartridge service life.

2.1.5 Maintenance Access to Captured Pollutants The filter device shall contain an opening(s) that provides maintenance access for removal of accumulated floatable pollutants and sediment, removal of and replacement of filter cartridges, cleaning of the sump, and rinsing of the deck. Access shall have a minimum clear vertical clear space over all of the filter cartridges. Filter cartridges shall be able to be lifted straight vertically out of the receptacles and deck for the entire length of the cartridge.

2.1.6 Bend Structure The device shall be able to be used as a bend structure with minimum angles between inlet and outlet pipes of 90-degrees or less in the stormwater conveyance system.

2.1.7 Double-Wall Containment of Hydrocarbons The cylindrical precast concrete device shall provide double-wall containment for hydrocarbon spill capture by a combined means of an inner wall of fiberglass, to a minimum depth of 12 inches (305 mm) below the cartridge deck, and the precast vessel wall.

2.1.8 Baffle The filter device shall provide a baffle that extends from the underside of the cartridge deck to a minimum length equal to the length of the membrane filter elements. The baffle shall serve to protect the membrane filter elements from contamination by floatables and coarse sediment. The baffle shall be flexible and continuous in cylindrical configurations, and shall be a straight concrete or aluminum wall in rectangular configurations.

2.1.9 Sump The device shall include a minimum 24 inches (610 mm) of sump below the bottom of the cartridges for sediment accumulation, unless otherwise specified by the design engineer. Depths less than 24 inches may have an impact on the total performance and/or longevity between cartridge maintenance/replacement of the device.

2.2 PRECAST CONCRETE SECTIONS

All precast concrete components shall be manufactured to a minimum live load of HS-20 truck loading or greater based on local regulatory specifications, unless otherwise modified or specified by the design engineer, and shall be watertight.

2.3 JOINTS All precast concrete manhole configuration joints shall use nitrile rubber gaskets and shall meet the requirements of ASTM C443, Specification C1619, Class D or engineer approved equal to ensure oil resistance. Mastic sealants or butyl tape are not an acceptable alternative.

2.4 GASKETS Only profile neoprene or nitrile rubber gaskets in accordance to CSA A257.3-M92 will be accepted. Mastic sealants, butyl tape or Conseal CS-101 are not acceptable gasket materials.

2.5 FRAME AND COVER Frame and covers must be manufactured from cast-iron or other composite material tested to withstand H-20 or greater design loads, and as approved by the

local regulatory body. Frames and covers must be embossed with the name of the device manufacturer or the device brand name.

2.6 DOORS AND HATCHES If provided shall meet designated loading requirements or at a minimum for incidental vehicular traffic.

2.7 CONCRETE All concrete components shall be manufactured according to local specifications and shall meet the requirements of ASTM C 478.

2.8 FIBERGLASS The fiberglass portion of the filter device shall be constructed in accordance with the following standard: ASTM D-4097: Contact Molded Glass Fiber Reinforced Chemical Resistant Tanks.

2.9 STEPS Steps shall be constructed according to ASTM D4101 of copolymer polypropylene, and be driven into preformed or pre-drilled holes after the concrete has cured, installed to conform to applicable sections of state, provincial and municipal building codes, highway, municipal or local specifications for the construction of such devices.

2.10 INSPECTION All precast concrete sections shall be inspected to ensure that dimensions, appearance and quality of the product meet local municipal specifications and ASTM C 478.

PART 3 – PERFORMANCE

3.1 GENERAL

3.1.1 Verification – The stormwater quality filter must be verified in accordance with ISO 14034:2016 Environmental management – Environmental technology verification (ETV).

3.1.2 Function - The stormwater quality filter treatment device shall function to remove pollutants by the following unit treatment processes; sedimentation, floatation, and membrane filtration.

3.1.3 Pollutants - The stormwater quality filter treatment device shall remove oil, debris, trash, coarse and fine particulates, particulate-bound pollutants, metals and nutrients from stormwater during runoff events.

3.1.4 Bypass - The stormwater quality filter treatment device shall typically utilize an external bypass to divert excessive flows. Internal bypass systems shall be equipped with a floatables baffle, and must avoid passage through the sump and/or cartridge filtration zone.

3.1.5 Treatment Flux Rate (Surface Loading Rate) – The stormwater quality filter treatment device shall treat 100% of the required water quality treatment flow based on a maximum design treatment flux rate (surface loading rate) across the membrane filter cartridges of 0.21 gpm/ft² (0.142 lps/m²).

3.2 FIELD TEST PERFORMANCE

At a minimum, the stormwater quality filter device shall have been field tested and verified with a minimum 25 TARP qualifying storm events and field monitoring shall have been conducted according to the TARP 2009 NJDEP TARP field test protocol, and have received NJCAT verification.

3.2.1 Suspended Solids Removal - The stormwater quality filter treatment device shall have demonstrated a minimum median TSS removal efficiency of 85% and a minimum median SSC removal efficiency of 95%.

3.2.2 Runoff Volume – The stormwater quality filter treatment device shall be engineered, designed, and sized to treat a minimum of 90 percent of the annual runoff volume determined from use of a minimum 15-year rainfall data set.

3.2.3 Fine Particle Removal - The stormwater quality filter treatment device shall have demonstrated the ability to capture fine particles as indicated by a minimum median removal efficiency of 75% for the particle fraction less than 25 microns, an effluent d_{50} of 15 microns or lower for all monitored storm events.

3.2.4 Turbidity Reduction - The stormwater quality filter treatment device shall have demonstrated the ability to reduce the turbidity from influent from a range of 5 to 171 NTU to an effluent turbidity of 15 NTU or lower.

3.2.5 Nutrient (Total Phosphorus & Total Nitrogen) Removal - The stormwater quality filter treatment device shall have demonstrated a minimum median Total Phosphorus removal of 55%, and a minimum median Total Nitrogen removal of 50%.

3.2.6 Metals (Total Zinc & Total Copper) Removal - The stormwater quality filter treatment device shall have demonstrated a minimum median Total Zinc removal of 55%, and a minimum median Total Copper removal of 85%.

3.3 INSPECTION and MAINTENANCE

The stormwater quality filter device shall have the following features:

3.3.1 Durability of membranes are subject to good handling practices during inspection and maintenance (removal, rinsing, and reinsertion) events, and site specific conditions that may have heavier or lighter loading onto the cartridges, and pollutant variability that may impact the membrane structural integrity. Membrane maintenance and replacement shall be in accordance with manufacturer's recommendations.

3.3.2 Inspection which includes trash and floatables collection, sediment depth determination, and visible determination of backwash pool depth shall be easily conducted from grade (outside the structure).

3.3.3 Manual rinsing of the reusable filter cartridges shall promote restoration of the flow capacity and sediment capacity of the filter cartridges, extending cartridge service life.

3.3.4 The filter device shall have a minimum 12 inches (305 mm) of sediment storage depth, and a minimum of 12 inches between the top of the sediment storage and bottom of the filter cartridge tentacles, unless otherwise specified by the design engineer. Variances may have an impact on the total performance and/or longevity between cartridge maintenance/replacement of the device.

3.3.5 Sediment removal from the filter treatment device shall be able to be conducted using a standard maintenance truck and vacuum apparatus, and a minimum one point of entry to the sump that is unobstructed by filter cartridges.

3.3.6 Maintenance access shall have a minimum clear height that provides suitable vertical clear space over all of the filter cartridges. Filter cartridges shall be able to be lifted straight vertically out of the receptacles and deck for the entire length of the cartridge.

3.3.7 Filter cartridges shall be able to be maintained without the requirement of additional lifting equipment.

PART 4 – EXECUTION

4.1 INSTALLATION

4.1.1 PRECAST DEVICE CONSTRUCTION SEQUENCE

The installation of a watertight precast concrete device should conform to ASTM C 891 and to any state highway, municipal or local specifications for the construction of manholes, whichever is more stringent. Selected sections of a general specification that are applicable are summarized below.

4.1.1.1 The watertight precast concrete device is installed in sections in the following sequence:

- aggregate base
- base slab
- treatment chamber and cartridge deck riser section(s)
- bypass section
- connect inlet and outlet pipes
- concrete riser section(s) and/or transition slab (if required)
- maintenance riser section(s) (if required)
- frame and access cover

4.1.2 The precast base should be placed level at the specified grade. The entire base should be in contact with the underlying compacted granular material. Subsequent sections, complete with joint seals, should be installed in accordance with the precast concrete manufacturer's recommendations.

4.1.3 Adjustment of the stormwater quality treatment device can be performed by lifting the upper sections free of the excavated area, re-leveling the base, and re-installing the sections. Damaged sections and gaskets should be repaired or replaced as necessary to restore original condition and watertight seals. Once the stormwater quality treatment device has been constructed, any/all lift holes must be plugged watertight with mortar or non-shrink grout.

4.1.4 Inlet and Outlet Pipes Inlet and outlet pipes should be securely set into the device using approved pipe seals (flexible boot connections, where applicable) so that the structure is watertight, and such that any pipe intrusion into the device does not impact the device functionality.

4.1.5 Frame and Cover Installation Adjustment units (e.g. grade rings) should be installed to set the frame and cover at the required elevation. The adjustment units should be laid in a full bed of mortar with successive units being joined using sealant recommended by the manufacturer. Frames for the cover should be set in a full bed of mortar at the elevation specified.

4.2 MAINTENANCE ACCESS WALL
In some instances the Maintenance Access Wall, if provided, shall require an extension attachment and sealing to the precast wall and cartridge deck at the job site, rather than at the precast facility. In this instance, installation of these components shall be performed according to instructions provided by the manufacturer.

4.3 FILTER CARTRIDGE INSTALLATION Filter cartridges shall be installed in the cartridge deck only after the construction site is fully stabilized and in accordance with the manufacturer's guidelines and recommendations. Contractor to contact the manufacturer to schedule cartridge delivery and review procedures/requirements to be completed to the device prior to installation of the cartridges and activation of the system.

PART 5 – QUALITY ASSURANCE

5.1 FILTER CARTRIDGE INSTALLATION Manufacturer shall coordinate delivery of filter cartridges and other internal components with contractor. Filter cartridges shall be delivered and installed complete after site is stabilized and unit is ready to accept cartridges. Unit is ready to accept cartridges after is has been cleaned out and any standing water, debris, and other materials have been removed. Contractor shall take appropriate action to protect the filter cartridge receptacles and filter cartridges from damage during construction, and in accordance with the manufacturer's recommendations and guidance. For systems with cartridges installed prior to full site stabilization and prior to system activation, the contractor can plug inlet and outlet pipes to prevent stormwater and other influent from entering the device. Plugs must be removed during the activation process.

5.2 INSPECTION AND MAINTENANCE

5.2.1 The manufacturer shall provide an Owner's Manual upon request.

5.2.2 After construction and installation, and during operation, the device shall be inspected and cleaned as necessary based on the manufacturer's recommended inspection and maintenance guidelines and the local regulatory agency/body.

5.3 REPLACEMENT FILTER CARTRIDGES When replacement membrane filter elements and/or other parts are required, only membrane filter elements and parts approved by the manufacturer for use with the stormwater quality filter device shall be installed.

END OF SECTION

Appendix D WATER DEMAND CALCULATIONS AND HYDRANT FLOW TEST

APPENDIX D.1: Water Demand Calculations

PRELIMINARY ESTIMATE of Expected Water Demand ***February 2019***

1294 Kingston Rd. *Project #160622705*

Pickering, Ontario

Program Details

	Unit Type	# of Units	*Persons per Unit	Equivalent Population
Residential:	1 Bedroom	281	1.5	421.5
	2 Bedroom	72	2.5	180
	3 Bedroom	31	3.5	108.5
	Townhouse	7	3	21
			Total Residential Population	**731**
			Unit Count	**391**

Source: Regional Municipality of Durham Design Specifications for Sanitary Sewers

Commercial/Retail: **Equivalent population = 86 Persons/ ha
Site area = 0.91ha
Equivalent pop. = **78**

***Source: Regional Municipality of Durham Design Specifications for Watermains*

TOTAL DESIGN POPULATION = 809

Flow Calculation

Required flow to be greater of the following:

1) Max daily demand + Fire Flow

or

2) Peak hourly demand

*Flow Rate =	**450**	litres/capita/day		*Source: MOECC Design Guidelines 2008*
For a total population of	**809**	people,		
The total flow is:	**364,167**	litres/day		
**Applying a peaking factor of	**1.65**	(maximum day)		**Source: MOECC Design Guidelines 2008*
Maximum Day Demand =	**600,876**	litres/day		
or,	**417**	litres/minute	**(A)**	
***Fire Flow Demand	**4,000**	litres/minute	**(B)**	

*** Refer to FUS calculation. Per The Regional Muncipality of Durham Design Sepcifications for Watermains - Section 2: "Fire flow shall be calculated as outlined in the current edition of 'Water Supply for Fire Protection, a Guide to Reccomended Practice' issued by the Fire underwriters Survey of the Insurance Board of Canada."

1) Total Flow = (A) + (B) = 4,417 litres/minute (maximum day demand plus fire flow)

Check peak hour demand:

	The total flow is:	**364,167**	litres/day	
	or,	**253**	litres/minute	
	*Applying a peaking factor of	**2.48**	(peak hour)	**Source: MOECC Design Guidelines 2008*
2)	Peak Hourly Demand =	**627**	litres/minute	

4,417 L/min > 627 L/min, Therefore:

Total water demand (on basis of maximum day demand plus fire flow) = **4,417** **litres/minute**

APPENDIX D.2: Fire Underwriters Survey Calculation

PRELIMINARY ESTIMATE of Required Fire Flow ***February 2019***
Fire Underwriters Survey "Water Supply for Public Fire Protection", 1999 *Project #160622705*

Assumptions:
1) Largest building analyzed only (Building A). Adequate separation present.
2) Fire resistive construction (fully protected frame, floors and roof)
3) Vertical openings and exterior vertical communications are properly protected (one hour rating)

F = 220 · C · √A

where,

F = the required fire flow in litres per minute

C = 0.6 for fire resistive construction (fully protected frame, floors, roof)

= **0.60**

A = The total floor area in square metres (including all storeys, but excluding basements at least 50% below grade) in the building being considered. Note: for fire-resistive buildings, consider the two largest adjoining floors plus 50% of each of any floors immediately above them up to eight, when the vertical openings are inadequately protected. If the vertical openings and exterior vertical communications are properly protected (one hour rating), consider only the area of the largest floor plus 25% of each of the two immediately adjoining floors. *

*** <u>vertical openings and exterior vertical communications properly protected (minimum one hour rating):</u>**

	***Bldgs A Gross Floor Area (North tower)**				
Level 2 (largest)	1,447	sq.m.	(ground floor)		
Level 1 (adjoining)	1,420	sq.m.	(adjoining floor)	@	25%
Level 3 (adjoining)	1,228	sq.m.	(adjoining floor)	@	25%

A = **2,109** **sq.m.**

F = 220 · (C) · √(A)

= **6,062** **Lpm**

= **6,000** **Lpm** (Rounded to the nearest 1,000 L/min)

The value obtained above may be reduced by as much as 25% for occupancies having a low contents fire hazard or may be increased by up to 25% surcharge for occupancies having a high fire hazard.

Apply a reduction of **25%** (Apartments/Dwellings = LOW HAZARD occupancy), or **-1,500** **Lpm**

F = **4,500** **Lpm**

The value obtained above may be reduced by up to 50% for complete automatic sprinkler protection depending upon the adequacy of the system. The credit for the system will be a maximum of 30% for an adequately designed system conforming to NFPA 13 and other NFPA sprinkler standards. Additional credit of up to 10% may be granted if the water supply is standard for both the system and fire department hose lines required.

Apply a reduction of **50%** or **-2,250** **Lpm**

(per the OBC, a fully supervised NFPA 13 sprinkler system is required for this building)

Reduction = **-2,250** **Lpm**

To the value obtained, a percentage should be added for structures exposed within 45 metres:

North side	-	16	m	-	**15%**
East side	-	48	m	-	**0%**
South side	-	13	m	-	**15%**
West side	-	12	m	-	**15%**
					45% (not to exceed 75%)

Increase = **2,025** **Lpm**

F	**=**	6,000	Lpm	
		-1,500		
		-2,250		
		2,025		
		4,275	**Lpm**	

F	**=**	**4,000**	**Lpm**	(Rounded to the nearest 1,000 L/min)
	=	67	**Lps**	
	=	1057	USGPM	

APPENDIX D.3: Hydrant Flow Test

THE REGIONAL MUNICIPALITY OF DURHAM

WORKS DEPARTMENT

FLOW TEST SUMMARY AND RESULTS

Requested by: Alex Hahn, B.Eng. Account No.:

Company: Stantec

Address: 300W - 675 Cochrane Dr, Markham ON, L3R 0B8 Telephone: (647) 669-2423

E-mail: Alex.Hahn@stantec.com

Test Location: Liverpool Rd @ Kingston Rd

Municipality: City of Pickering

Date: 13-Dec-18 Time: 11:00pm Conducted by: K.J

Flow Hydrant: PB138

Monitoring Hydrant: PB82

Nozzle Size (in.)	Residual Pressure (p.s.i.)		Pitot Guage	
	Field Reading @ Monitoring Hydrant	Actual @ Flow Hydrant (adjusted)*	Pressure (p.s.i.)	Flow (i.g.p.m.)
STATIC	78.3	76.9		0.0
1-1/2	75.5	74.1	73.4	476.1
1-3/4	75.4	74.0	71.7	640.5
2-1/2	72.0	70.6	66.0	1137.4
2 x 2-1/2				

* Calculation based on gain/loss in pressure due to elevation difference between flow & monitoring hydrants

Hydrant Elevations (ft.)	
Flow Hydrant:	295.3
Static Hydrant:	292
Difference:	3.3
Pressure Diff. (p.s.i.):	1.4

Comments:

Flow for 1-1/2 & 1-3/4 nozzle calculated using Discharge of smooth nozzles

Flow for 2-1/2 nozzle calculated using Discharge for circular outlets

Results	
Static Pressure	76.9
Flow at 20 p.s.i. (I.g.p.m.):	3732 (approx.)
Checked by:	

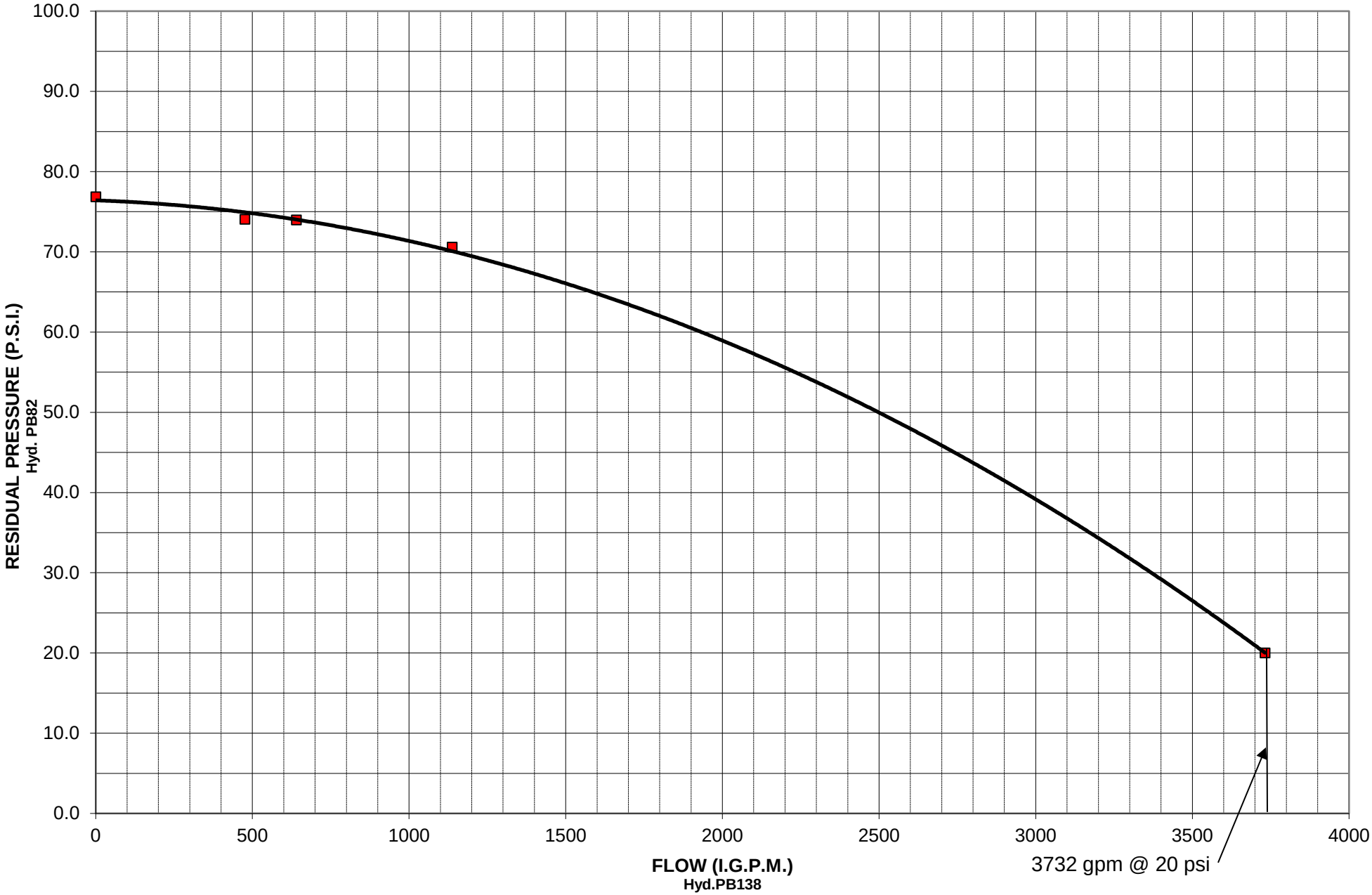
Disclaimer for Fire Flow Tests

While the Regional Municipality of Durham (hereinafter referred to as the "Region") makes every effort to ensure that the information contained herein is accurate and up to date, the Region shall not be held liable for improper or incorrect use of the data and information described and/or contained herein. The user must make his/her own determination as to its accuracy and suitability for the user's own use. The data, information and related graphics contained herein are not legal documents and are not intended to be used as such. The user hereby recognizes that the information and data are dynamic and may change over time without notice. The Region makes no commitment to update the information or data contained herein. The user recognizes and acknowledges that the data and information provided by the Region was acquired by the Region for a specific purpose and this information may be inaccurate or unreliable if used for other purposes. The Region is not responsible for your use or reliance upon this information. The Region does not warrant or guarantee the results of the use of the information provided to you by the Region in terms of correctness, accuracy, reliability, completeness, usefulness, timeliness or otherwise. The entire risk as to the results of any information obtained from the Region is entirely assumed by the recipient.

Location: Liverpool Rd @ Kingston Rd
Municipality: City of Pickering
Date: Dec 13, 2018

FIRE FLOW TEST

(Graph of Residual Pressure vs. Hydrant Flow)



Appendix E SANITARY DOWNSTREAM ANALYSIS

APPENDIX E.1.1: Sanitary Downstream Analysis Terms of Reference

Stantec

Terms of Reference

To:	Peter Castellan (Durham Region) 605 Rossland Road East, Whitby ON L1N 6A3	From:	Stantec Consulting Ltd. 300W-675 Cochrane Drive, Markham ON L3R 0B8
File:	160622705	Date:	January 11, 2019

Reference: **1294 Kingston Road, 1848-1852 Liverpool Road, Pickering, Ontario**
Downstream Sanitary Capacity Analysis

BACKGROUND

On behalf of our client, Altona Group, Stantec Consulting Ltd (Stantec) has prepared the following Terms of Reference (ToR) outlining the analysis methodology and deliverable to be completed as part of the downstream sanitary sewer analysis requested by the Region of Durham (Region) in support of the development application for the above noted site.

The site is located at the northwest corner of Liverpool Road and Kingston Road, is approximately 0.9 ha in size, and currently occupied by 3 buildings and surface parking. Our client plans to redevelop the property into a mixed-use development.

As requested by the Region, the analysis will consider active development applications within the study limits in addition to potential future intensification land parcels. The City of Pickering (City) has advised that the only proposed development within these boundaries was a mixed-use building consisting of approximately 75 units at 1854-1858 Liverpool Road, immediately north of the subject site. 1864-1868 Liverpool Road will also be considered as potential future intensification land parcels.

In preparation for this analysis, the relevant Sanitary Sewer System Maps were obtained from the Region to determine the existing sewer information as well as the existing sanitary drainage boundaries *(see Figure 1)*.

METHODOLOGY

General

Figure 1 illustrates the approximate study limits and location of the proposed site. As shown, the 1st phase of the analysis will be calculating the downstream capacity and flows (inclusive of proposed developments & potential future intensification parcels) to the 300mm diameter sewer on Glenanna Road, immediately upstream of the 525mm diameter sewer on Bronte Square Road. The drainage boundaries contributing to this sewer line are highlighted in **blue** on *Figure 1*. If the full flow capacity of this sewer line is calculated to be less than 90%, the existing sanitary sewer system will be assumed to have adequate capacity to accommodate the proposed development.

If the full flow capacity at the 300mm diameter sewer noted above is greater than or equal to 90%, a Phase 2 analysis will be completed to analyze capacity and flows downstream to the 1050mm trunk sanitary sewer immediately north of Hwy 401. The additional drainage boundaries contributing to this trunk sewer line are highlighted in **yellow** on *Figure 1*.

Reference: **1294 Kingston Road, 1848-1852 Liverpool Road, Pickering, Ontario**
Downstream Sanitary Capacity Analysis

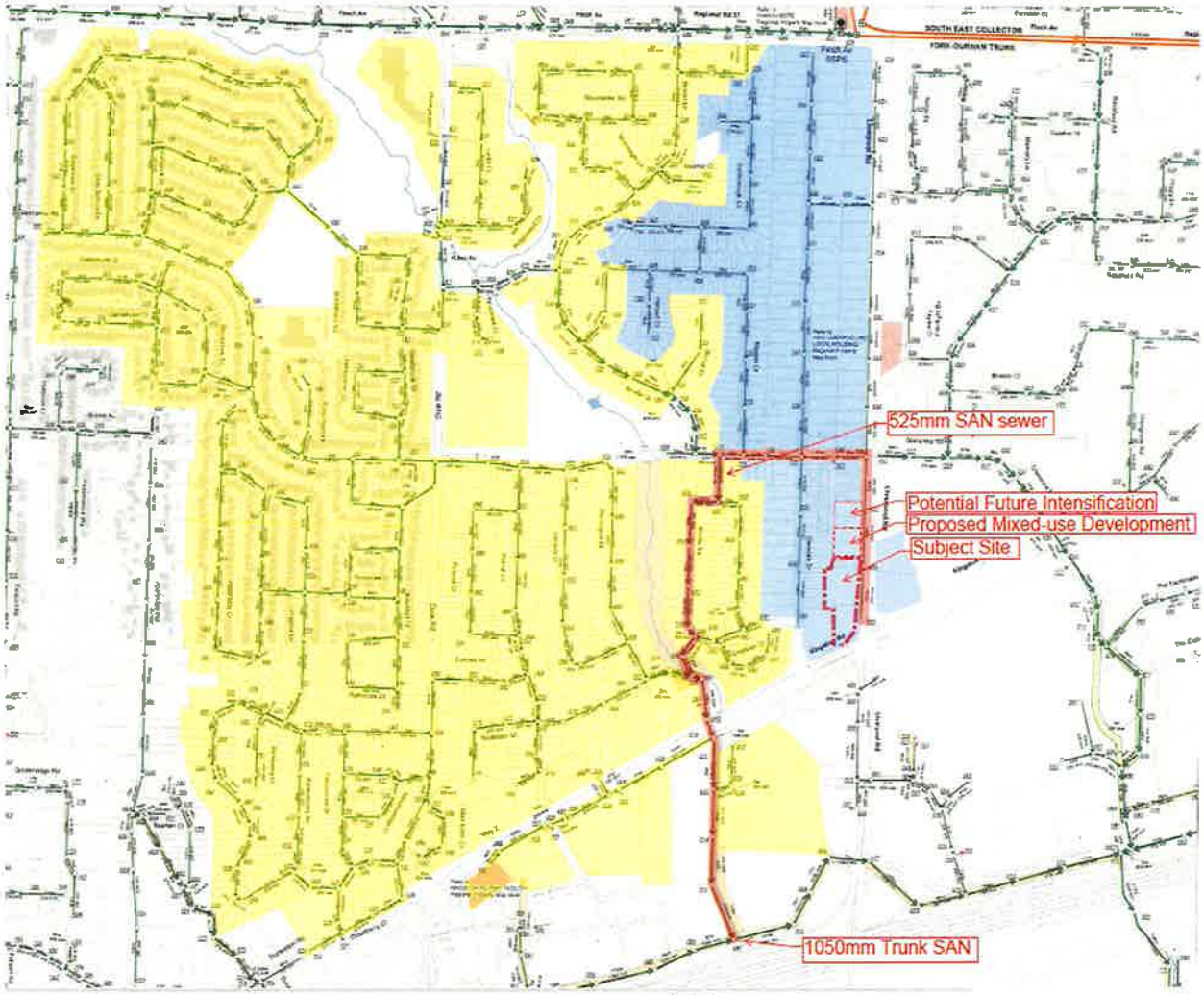


Figure 1: Region of Durham annotated Sanitary Sewer System Map.

Capacity & Flow Calculations

Capacity and flows will be calculated per "The Regional Municipality of Durham Design Specifications for Sanitary Sewers" manual. To summarize:

Capacities will be calculated using Manning's Formula on the basis of pipe flowing full (ie. full flow capacity), with all pipes assigned a roughness coefficient of n=0.013. Record plan and profile drawings will be used to establish existing sewer pipe data.

Reference: 1294 Kingston Road, 1848-1852 Liverpool Road, Pickering, Ontario
Downstream Sanitary Capacity Analysis

Flows will be calculated as follows:

Peak Flow = (Average daily flow x Harmon's Peaking Factor) + Infiltration

Average daily flows will be equivalent to:

- Residential: 364L/person/day
- Commercial: 18L/m² GFA/day* (ie. 180m³/ ha GFA/day)
- Schools & Institutions: 112,000L/ha/day*
- Industrial: 180,000L/ha/day*

*Note: *Peaking factor and infiltration included for ICI land parcels.*

Harmon's peaking factor: $$PF = 1 + \frac{14}{4 + \sqrt{P}}$$

Where p = population in thousands, and $1.5 \leq PF \leq 3.8$

Population in residential areas will be calculated as follows where unit counts are available**:

Type of Housing	Persons/Unit
Single Family Dwelling, Semi-Detached and Links	3.5
Townhouses/Stacked Townhouses	3.0
Apartment(s)	
-1 Bedroom or smaller (Bachelor)	1.5
-2 Bedroom	2.5
-3 Bedroom	3.5
-4 Bedroom or larger	4.5

**Note: Unit counts will be established using both current aerial imagery and site reconnaissance.*

Where unit counts are not available, population will be calculated as follows:

Type of Housing	Persons/Hectare
Single Family Dwelling	60
Semi-detached & Duplex	100
Townhouse	125
Apartment	
-Low Density (62 u/ha)	150
-Med-Low Density (86 u/ha)	210
-Med Density (124 u/ha)	300
-High Density (274 u/ha)	600

Reference: **1294 Kingston Road, 1848-1852 Liverpool Road, Pickering, Ontario**
Downstream Sanitary Capacity Analysis

DEILVERABLES

A report detailing Stantec's findings will be issued to the Region for review that will include the following:

- Summary of findings.
- Sanitary design sheet indicating full flow capacities of the relevant downstream sewer lines.
- Spreadsheets detailing population and flow calculations associated with each sewer line on the design sheet.
- Report recommendations.

We trust the information included herein is complete. Should you have any questions or concerns, please contact the undersigned.

Regards,
STANTEC CONSULTING LTD.

Alex Hahn, B. Eng.
Land Development EIT
(647) 669-2423
Alex.Hahn@stantec.com

Nathan Jamieson, P.Eng.
Senior Principal, Community Development
(905) 944-6275
Nathan.Jamieson@stantec.com

Attachments: City of Pickering future development correspondence

CC. Muky Rajadurai (Altona Group)
Tatjana Trebic (Urban Strategies)
Melanie Hare (urban Strategies)

From: Surti, Nilesh
To: Hahn, Alex
Subject: RE: Pickering future development projects
Date: Thursday, January 3, 2019 9:29:12 AM
Attachments: image006.png
image010.png
image002.png
image004.png
image013.png
image014.png

Happy New Year Alex,

We currently do not have any activate development proposals within your catchment area. However we recently had a pre-consultation meeting for the two properties immediately to the north (1854 and 1858 Liverpool Road). The abutting landowner to the north is proposing an 11-storey mixed use building containing commercial uses on the ground floor and a total of 65 units. I would recommend that you also include this proposal in your analysis or coordinate your review with the engineering consultant for the landowner to the north. For further information regarding this proposal, please contact Grant Morris, who is the retained planning consultant. He can be reached at 905-420-3990 or via email at grant.morris@rogers.com.

Regards,

Nilesh Surti, MCIP, RPP
Manager, Development Review & Urban Design | City Development Department
905.420.4660 ext. 2035 | 1.866.683.2760
nsurti@pickering.ca

City of PICKERING
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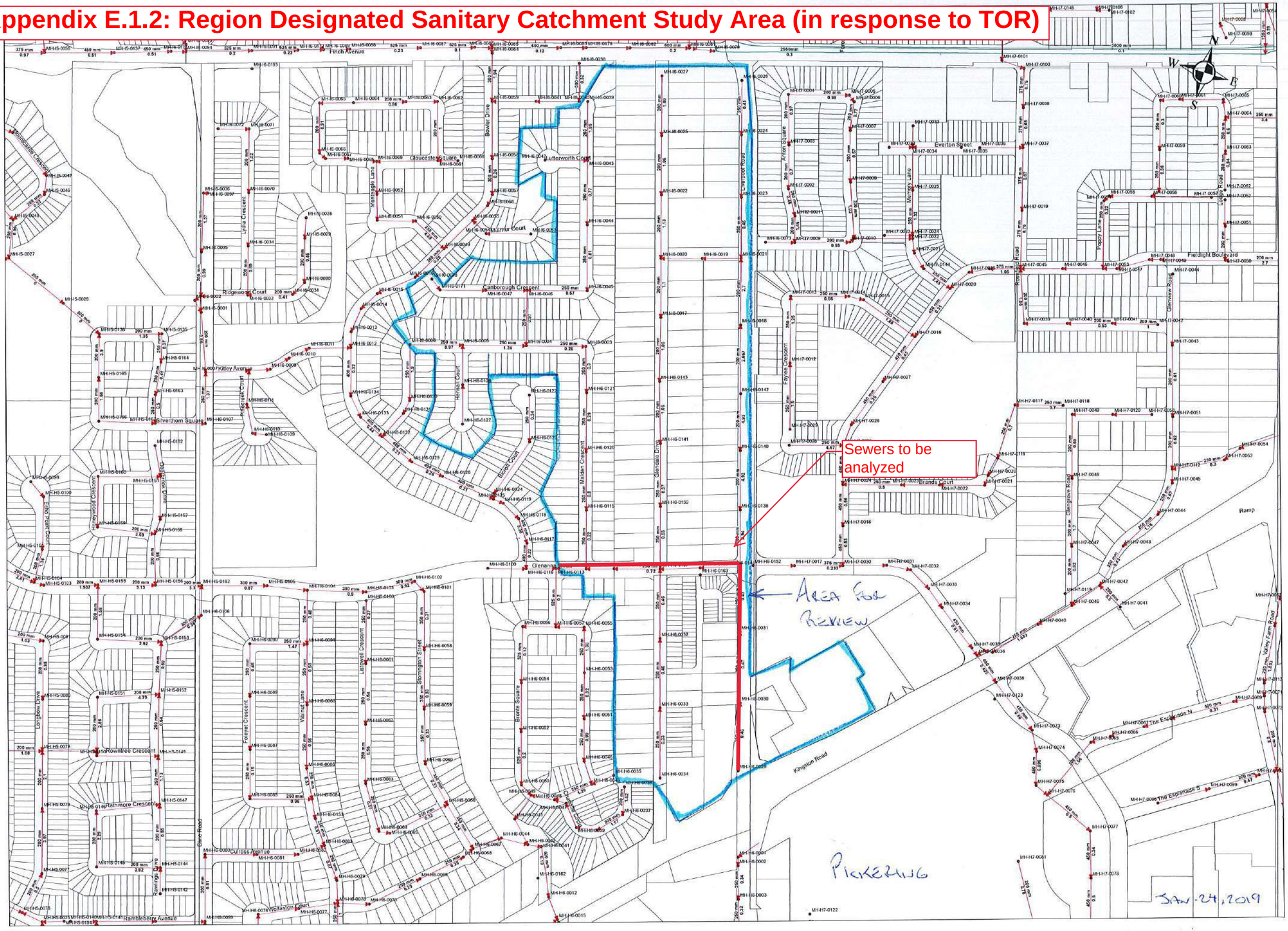
cingstreet

Appendix E.1.2: Region Designated Sanitary Catchment Study Area (in response to TOR)



APPENDIX E.2: Regional Design Specifications for Sanitary Sewers (summary)

FLOW CALCULTATIONS

Based on The Regional Municipality of Durham Design Specifications for Sanitary Sewers

Residential Flows

$$PEAK\ FLOW = INFILTRATION + (AVERAGE\ FLOW * PEAKING\ FACTOR)$$

Where: INFILTRATION = 0.26L/s/ha

AVERAGE FLOW = 364L/person/day

PEAKING FACTOR = $1 + \frac{14}{4+P^{1/2}}$

Note: Peaking factor has a minimum value of 1.5 and a maximum value of 3.8.

Where: P = population in thousands

Given existing residential structures within the study area consisted of only single family and townhomes, population was determined by unit count using aerial photography supplied by First Base Solutions Inc. Persons/ unit were applied as follows:

Single family:	3.5 Persons/unit
Townhouse:	3.0 Persons/ unit
*1 Bedroom Apt:	1.5 Persons/ Unit
*2 Bedroom Apt:	2.5 Persons/ unit

**Applies to proposed developments only*

Commercial Flows

$$PEAK\ FLOW = 2.08L/s\ /\text{ha GFA}$$

For existing structures, GFA was determined using site plans provided by the City of Pickering or by measurement using aerial photography supplied by First Base Solutions Inc. Number of stories was confirmed using Google Street View where structures exceed 1 storey.

Where proposed structures without data were incorporated: GFA = 0.5 * GROSS LOT AREA

Industrial/ Institutional Flows

No industrial or institutional land parcels exist within the catchment area designated by the Region (Appendix 6A).

Sewer Capacities

Sewer capacities were calculated by using Manning's Formula of the basis of pipe flowing full (ie. full flow capacity).

$$Q = \left(\frac{1}{n}\right) * \left(AR^{\frac{2}{3}}\right) * \sqrt{S}$$

Where: Q = Full Flow Capacity
n = 0.013 (roughness coefficient)
A = Pipe cross section
R = Hydraulic Radius
S = Pipe Slope

$$CAPACITY = \frac{PEAK\ FLOW}{FULL\ FLOW\ CAPACITY} * 100\%$$

Stantec

DOWNSTREAM SANITARY SEWER ANALYSIS
OLD LIVERPOOL HOUSE SITE
PROPOSED MIXED-USE DEVELOPMENT
STANTEC FILE #160622705

SCENARIO 1: EXISTING

April 26, 2019

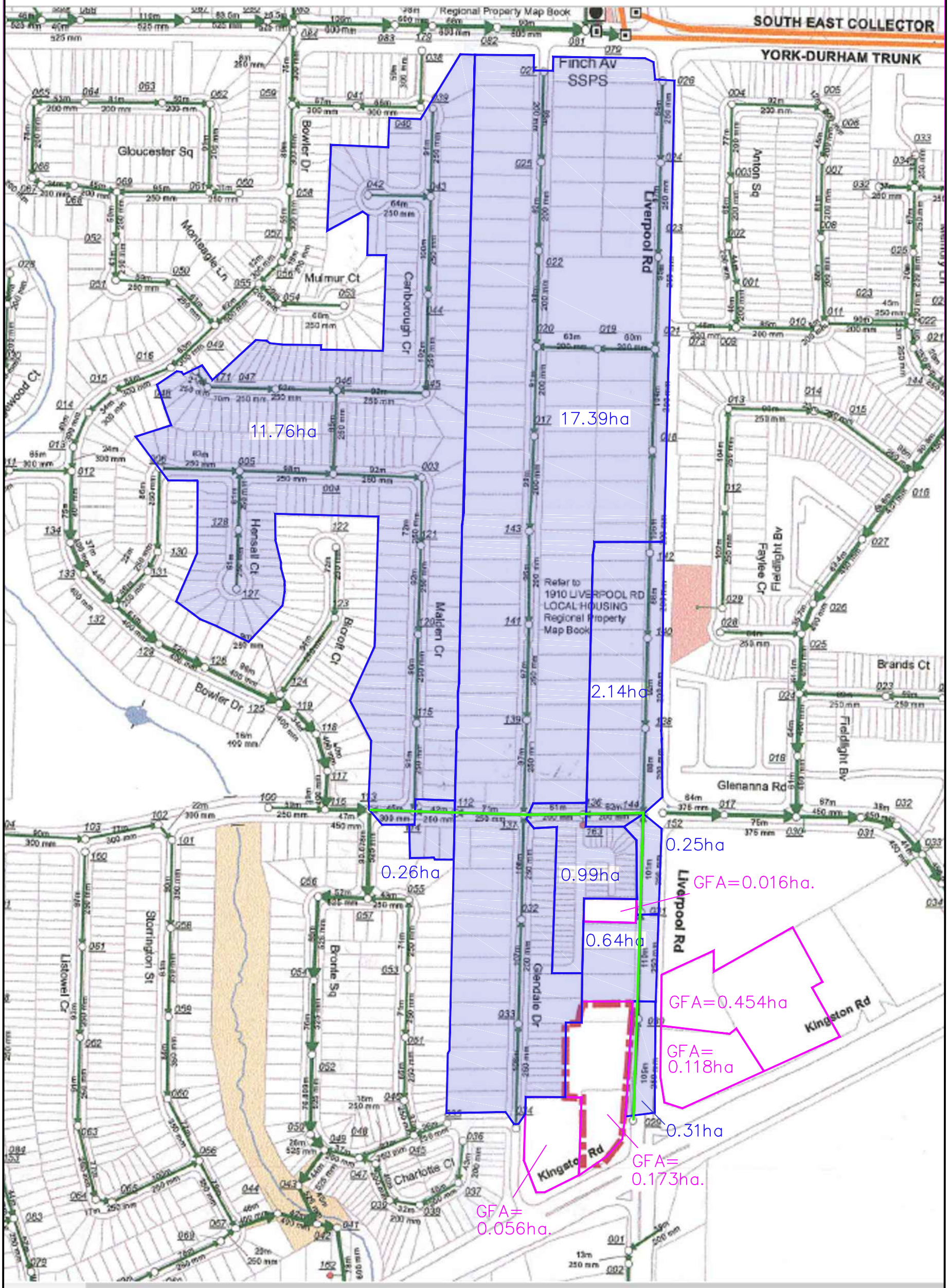
Prepared by: AH
Checked by: MB

LOCATION			RESIDENTIAL																	COMMERCIAL			IND./ INST.	SEWER CAPACITY						
			INFILTRATION FLOW			AVREAGE FLOW												TOTAL RESIDENTIAL FLOW													
						UNIT TYPE																									
						SINGLE FAMILY		TOWNHOUSE		1 Bdr. Aprt.		2 Bdr. Aprt.		3 Bdr. Aprt.																	
STREET	UPST. MANHOLE	DOWNST. MANHOLE	CONTR. AREA (ha)	CUMM. CONTR. AREA (ha)	INFIL. (L/s)	No. OF UNITS	P.P.U.	No. OF UNITS	P.P.U.	No. OF UNITS	P.P.U.	No. OF UNITS	P.P.U.	No. OF UNITS	P.P.U.	RES. POP.	CUMM.. RES. POP.	AVE. FLOW (L/s)	PEAK. FACT.	PEAK RES. FLOW (L/s)	TOTAL RES. FLOW (L/s)	GFA (ha)	CUMM. GFA (ha)	PEAK COMM. FLOW (L/s)		TOTAL PEAK LFOW (L/s)	SLOPE (%)	PIPE DIA. (mm)	LENGTH (m)	FULL FLOW CAP. (L/s)	FULL FLOW VEL. (m/s)	FULL FLOW %
Liverpool Rd.	H6-0029	H6-0030	0.31	0.31	0.08		3.5		3.0		1.5		2.5		3.5	0.0	0.0	0.00	3.80	0.00	0.08	0.405	0.405	0.84	NA	0.92	0.46	250	105	40.3	0.82	2%
Liverpool Rd.	H6-0030	H6-0031	0.64	0.95	0.25	3	3.5		3.0		1.5		2.5		3.5	10.5	10.5	0.04	3.80	0.17	0.42	0.454	0.859	1.79	NA	2.20	0.47	250	110	40.8	0.83	5%
Liverpool Rd.	H6-0031	H6-0144	0.25	1.20	0.31		3.5		3.0		1.5		2.5		3.5	0.0	10.5	0.04	3.80	0.17	0.48	0.016	0.875	1.82	NA	2.30	0.43	250	101	39.0	0.79	6%
Glenanna Rd.	H6-0144	H6-0136	2.14	3.34	0.87	11	3.5		3.0		1.5		2.5		3.5	38.5	49.0	0.21	3.80	0.78	1.65	0.000	0.875	1.82	NA	3.47	0.57	200	63	24.8	0.79	14%
Glenanna Rd.	H6-0136	H6-0137	0.99	4.33	1.13		3.5	45.0	3.0		1.5		2.5		3.5	135.0	184.0	0.78	3.80	2.95	4.07	0.000	0.875	1.82	NA	5.89	0.57	200	61	24.8	0.79	24%
Glenanna Rd.	H6-0137	H6-0112	17.39	21.72	5.65	101	3.5	17.0	3.0		1.5		2.5		3.5	404.5	588.5	2.48	3.80	9.42	15.07	0.056	0.931	1.94	NA	17.01	0.63	250	71	47.2	0.96	36%
Glenanna Rd.	H6-0112	H6-0114	0.26	21.98	5.71	3	3.5		3.0		1.5		2.5		3.5	10.5	599.0	2.52	3.80	9.59	15.30	0.000	0.931	1.94	NA	17.24	1.34	250	42	68.8	1.40	25%
Glenanna Rd.	H6-0114	H6-0113	11.76	33.74	8.77	207	3.5		3.0		1.5		2.5		3.5	724.5	1323.5	5.58	3.72	20.73	29.50	0.000	0.931	1.94	NA	31.44	0.48	300	45	67.0	0.95	47%

EXISTING SUBJECT SITE: Contributes 0.173ha GFA of commercial space.

ROUGHNESS COEFFICIENT	**n=0.013**	
RESIDENTIAL AVE. FLOW RATE	**364**	**Lpcd**
INFILTRATION ALLOWANCE	**0.26**	**L/s/ha**
****COMMERCIAL FLOW RATE**	**2.08**	**L/s/ha GFA**

***Including peaking factor and infitration.*



Stantec

Stantec Consulting Ltd.
300W-675 Cochrane Drive
Markham ON L3R 0B8
Tel: (905) 944-7777
www.stantec.com

LEGEND

- SUBJECT SITE
- RESIDENTIAL CATCHMENT AREA BOUNDARY
- COMMERCIAL CATCHMENT AREA BOUNDARY
- RESIDENTIAL INFILTRATION
- SEWERS ANALYZED

NOTES

INFILTRATION ALLOWANCE = 0.26 L/s/ha (RESIDENTIAL/ MISED USE ONLY)
COMMERCIAL FLOW = 2.08 L/s/ha GFA (INCLUDES INFILTRATION AND PEAKING)
GFA = 50% OF GROSS LOT AREA

Client/Project
ALTONA GROUP

OLD LIVERPOOL HOUSE SITE

Project No.
160622705

Title
CATCHMENT AREA - EXISTING (SCENARIO 1)

Date
FEB 2019

1:4000

Figure No.
1

Stantec

DOWNSTREAM SANITARY SEWER ANALYSIS
OLD LIVERPOOL HOUSE SITE
PROPOSED MIXED-USE DEVELOPMENT
STANTEC FILE #160622705

SCENARIO 2: PROPOSED

April 26, 2019

Prepared by: AH
Checked by: MB

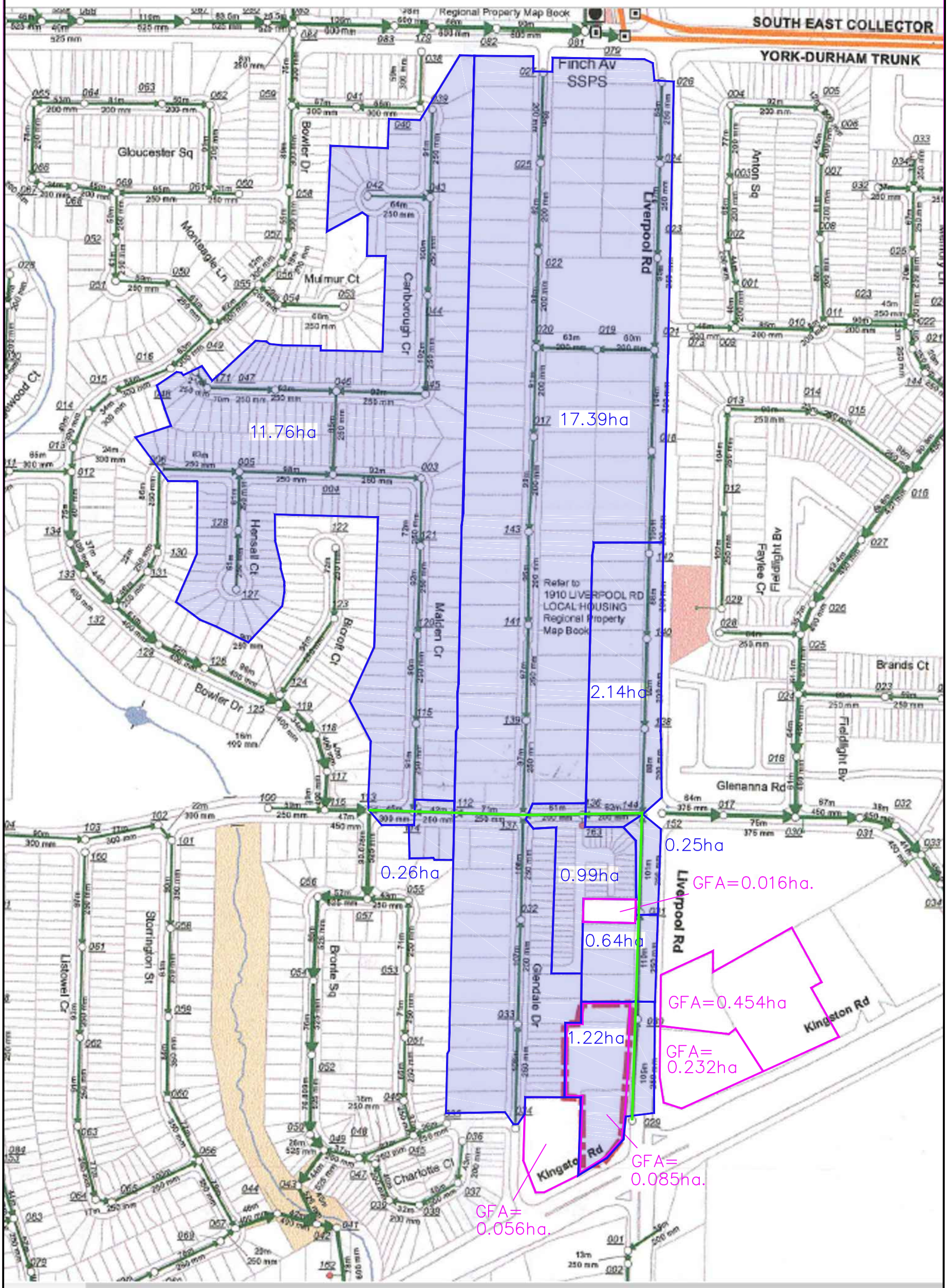
LOCATION			RESIDENTIAL																	COMMERCIAL			IND./ INST.	SEWER CAPACITY						
			INFILTRATION FLOW			AVREAGE FLOW											TOTAL RESIDENTIAL FLOW													
						UNIT TYPE																								
						SINGLE FAMILY		TOWNHOUSE		1 Bdr. Aprt.		2 Bdr. Aprt.		3 Bdr. Aprt.																
STREET	UPST. MANHOLE	DOWNST. MANHOLE	CONTR. AREA (ha)	CUMM. CONTR. AREA (ha)	INFIL. (L/s)	No. OF UNITS	P.P.U.	No. OF UNITS	P.P.U.	No. OF UNITS	P.P.U.	No. OF UNITS	P.P.U.	No. OF UNITS	P.P.U.	RES. POP.	CUMM. RES. POP.	AVE. FLOW (L/s)	PEAK. FACT.	PEAK RES. FLOW (L/s)	TOTAL RES. FLOW (L/s)	GFA (ha)	CUMM. GFA (ha)	PEAK COMM. FLOW (L/s)		TOTAL PEAK LFOW (L/s)	SLOPE (%)	PIPE DIA. (mm)	LENGTH (m)	FULL FLOW CAP. (L/s)	FULL FLOW VEL. (m/s)	FULL FLOW %
Liverpool Rd.	H6-0029	H6-0030	1.22	1.22	0.32		3.5	7.0	3.0	281.0	1.5	72.0	2.5	31.0	3.5	622.5	622.5	2.62	3.80	9.97	10.28	0.317	0.317	0.66	NA	10.94	0.46	250	105	40.3	0.82	27%
Liverpool Rd.	H6-0030	H6-0031	0.64	1.86	0.48	3	3.5		3.0		1.5		2.5		3.5	10.5	633.0	2.67	3.80	10.13	10.62	0.454	0.771	1.60	NA	12.22	0.47	250	110	40.8	0.83	30%
Liverpool Rd.	H6-0031	H6-0144	0.25	2.11	0.55		3.5		3.0		1.5		2.5		3.5	0.0	633.0	2.67	3.80	10.13	10.68	0.016	0.787	1.64	NA	12.32	0.43	250	101	39.0	0.79	32%
Glenanna Rd.	H6-0144	H6-0136	2.14	4.25	1.11	11	3.5		3.0		1.5		2.5		3.5	38.5	671.5	2.83	3.80	10.75	11.86	0.000	0.787	1.64	NA	13.49	0.57	200	63	24.8	0.79	54%
Glenanna Rd.	H6-0136	H6-0137	0.99	5.24	1.36		3.5	45.0	3.0		1.5		2.5		3.5	135.0	806.5	3.40	3.86	13.11	14.47	0.000	0.787	1.64	NA	16.11	0.57	200	61	24.8	0.79	65%
Glenanna Rd.	H6-0137	H6-0112	17.39	22.63	5.88	101	3.5	17.0	3.0		1.5		2.5		3.5	404.5	1211.0	5.10	3.74	19.11	24.99	0.056	0.843	1.75	NA	26.74	0.63	250	71	47.2	0.96	57%
Glenanna Rd.	H6-0112	H6-0114	0.26	22.89	5.95	3	3.5		3.0		1.5		2.5		3.5	10.5	1221.5	5.15	3.74	19.26	25.21	0.000	0.843	1.75	NA	26.96	1.34	250	42	68.8	1.40	39%
Glenanna Rd.	H6-0114	H6-0113	11.76	34.65	9.01	207	3.5		3.0		1.5		2.5		3.5	724.5	1946.0	8.20	3.59	29.47	38.48	0.000	0.843	1.75	NA	40.24	0.48	300	45	67.0	0.95	60%

*PROPOSED SUBJECT SITE

*0.085ha GFA commercial also contributed from subject site. Remaining from other land parcels.

ROUGHNESS COEFFICIENT	n=0.013	
RESIDENTIAL AVE. FLOW RATE	364	Lpcd
INFILTRATION ALLOWANCE	0.26	L/s/ha
**COMMERCIAL FLOW RATE	2.08	L/s/ha GFA

**Including peaking factor and infitration.



Stantec

Stantec Consulting Ltd.
300W-675 Cochrane Drive
Markham ON L3R 0B8
Tel: (905) 944-7777
www.stantec.com

LEGEND

- SUBJECT SITE
- RESIDENTIAL CATCHMENT AREA BOUNDARY
- COMMERCIAL CATCHMENT AREA BOUNDARY
- RESIDENTIAL INFILTRATION
- SEWERS ANALYZED

NOTES

INFILTRATION ALLOWANCE = 0.26 L/s/ha (RESIDENTIAL/ MISED USE ONLY)
COMMERCIAL FLOW = 2.08 L/s/ha GFA (INCLUDES INFILTRATION AND PEAKING)

Client/Project
ALTONA GROUP

OLD LIVERPOOL HOUSE SITE

Project No.
160622705

Title
CATCHMENT AREA - PROPOSED (SCENARIO 2)

1:4000

Date
FEB 2019

Figure No.
2

Stantec

April 26, 2019

DOWNSTREAM SANITARY SEWER ANALYSIS
OLD LIVERPOOL HOUSE SITE
PROPOSED MIXED-USE DEVELOPMENT
STANTEC FILE #160622705

SCENARIO 3: PROPOSED (INCLUDING POTENTIAL FUT. DEVELOPMENTS)

Prepared by: AH
Checked by: MB

LOCATION			RESIDENTIAL																		COMMERCIAL			IND./ INST.	SEWER CAPACITY						
			INFILTRATION FLOW			AVREAGE FLOW												TOTAL RESIDENTIAL FLOW													
						UNIT TYPE																									
						SINGLE FAMILY		TOWNHOUSE		1 Bdr. Aprt.		2 Bdr. Aprt.		3 Bdr. Aprt.																	
STREET	UPST. MANHOLE	DOWNST. MANHOLE	CONTR. AREA (ha)	CUMM. CONTR. AREA (ha)	INFIL. (L/s)	No. OF UNITS	P.P.U.	No. OF UNITS	P.P.U.	No. OF UNITS	P.P.U.	No. OF UNITS	P.P.U.	No. OF UNITS	P.P.U.	RES. POP.	CUMM. RES. POP.	AVE. FLOW (L/s)	PEAK. FACT.	PEAK RES. FLOW (L/s)	TOTAL RES. FLOW (L/s)	GFA (ha)	CUMM. GFA (ha)	PEAK COMM. FLOW (L/s)		TOTAL PEAK LFOW (L/s)	SLOPE (%)	PIPE DIA. (mm)	LENGTH (m)	FULL FLOW CAP. (L/s)	FULL FLOW VEL. (m/s)	FULL FLOW %
Liverpool Rd.	H6-0029	H6-0030	1.22	1.22	0.32		3.5	7.0	3.0	281.0	1.5	72.0	2.5	31.0	3.5	622.5	622.5	2.62	3.80	9.97	10.28	0.317	0.317	0.66	NA	10.94	0.46	250	105	40.3	0.82	27%
Liverpool Rd.	H6-0030	H6-0031	0.64	1.86	0.48	1	3.5		3.0	30.0	1.5	35.0	2.5		3.5	136.0	758.5	3.20	3.87	12.38	12.86	0.587	0.904	1.88	NA	14.74	0.47	250	110	40.8	0.83	36%
Liverpool Rd.	H6-0031	H6-0144	0.25	2.11	0.55		3.5		3.0		1.5		2.5		3.5	0.0	758.5	3.20	3.87	12.38	12.93	0.016	0.920	1.91	NA	14.84	0.43	250	101	39.0	0.79	38%
Glenanna Rd.	H6-0144	H6-0136	2.14	4.25	1.11	11	3.5		3.0		1.5		2.5		3.5	38.5	797.0	3.36	3.86	12.97	14.07	0.000	0.920	1.91	NA	15.98	0.57	200	63	24.8	0.79	65%
Glenanna Rd.	H6-0136	H6-0137	0.99	5.24	1.36		3.5	45.0	3.0		1.5		2.5		3.5	135.0	932.0	3.93	3.82	15.00	16.36	0.000	0.920	1.91	NA	18.27	0.57	200	61	24.8	0.79	74%
Glenanna Rd.	H6-0137	H6-0112	17.39	22.63	5.88	101	3.5	17.0	3.0		1.5		2.5		3.5	404.5	1336.5	5.63	3.72	20.92	26.80	0.056	0.976	2.03	NA	28.83	0.63	250	71	47.2	0.96	61%
Glenanna Rd.	H6-0112	H6-0114	0.26	22.89	5.95	3	3.5		3.0		1.5		2.5		3.5	10.5	1347.0	5.67	3.71	21.07	27.02	0.000	0.976	2.03	NA	29.05	1.34	250	42	68.8	1.40	42%
Glenanna Rd.	H6-0114	H6-0113	11.76	34.65	9.01	207	3.5		3.0		1.5		2.5		3.5	724.5	2071.5	8.73	3.57	31.19	40.20	0.000	0.976	2.03	NA	42.23	0.48	300	45	67.0	0.95	63%

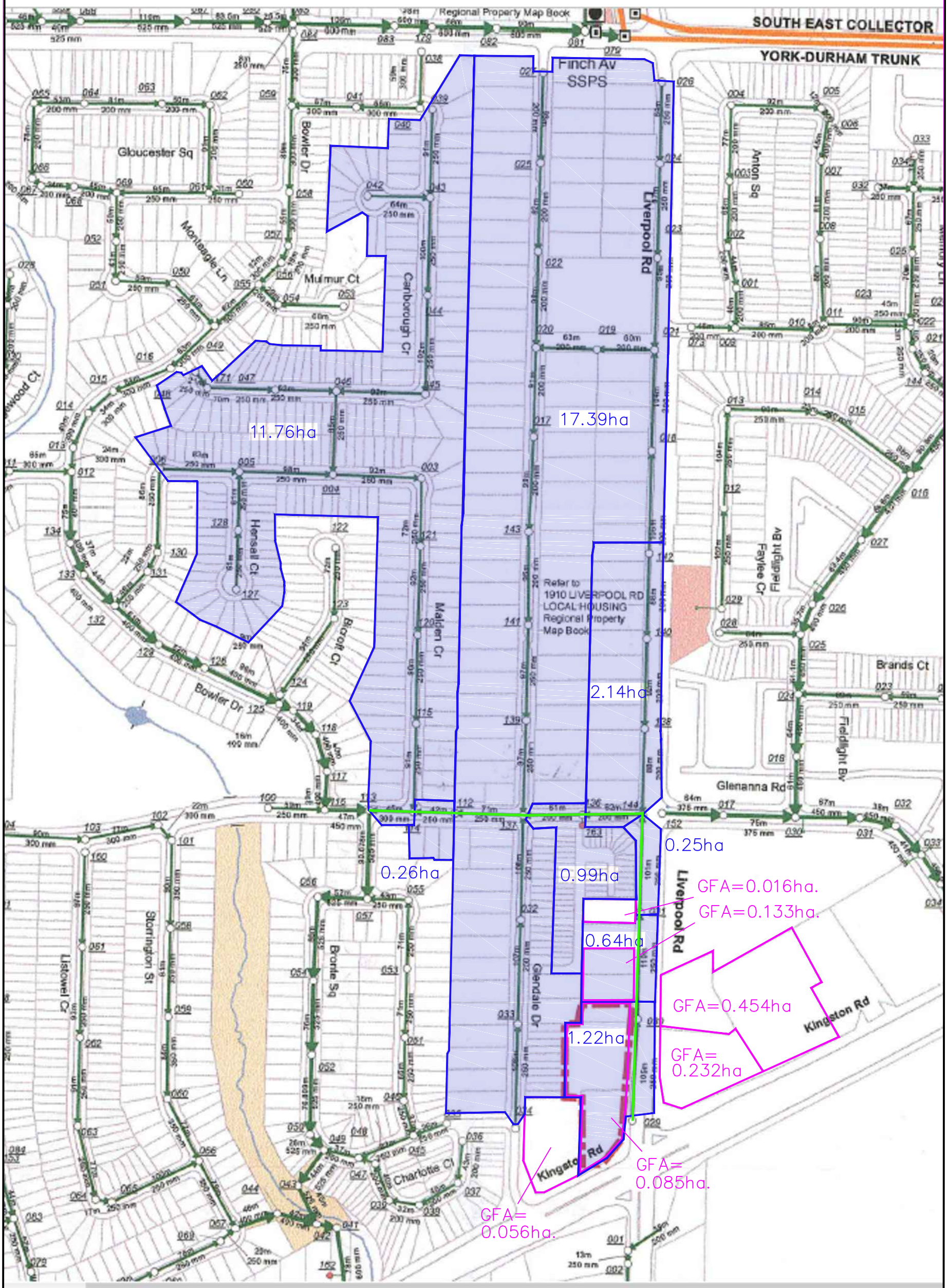
*PROPOSED SUBJECT SITE
**0.085ha GFA commercial also contributed from subject site. Remaining from other land parcels.*

*POTENTIAL FUTURE DEVELOPMENT
**0.133ha GFA commercial also contributed from the potential future development. Remaining from other land parcels.*

ASSUMPTIONS:
2) FUTURE DEVELOPMENT INCLUDES 30 1Bdr. UNITS AND 35 2Bdr. UNITS (REPLACING TWO SINGLE FAMILY UNITS)

ROUGHNESS COEFFICIENT	**n=0.013**	
RESIDENTIAL AVE. FLOW RATE	**364**	**Lpcd**
INFILTRATION ALLOWANCE	**0.26**	**L/s/ha**
****COMMERCIAL FLOW RATE**	**2.08**	**L/s/ha GFA**

***Including peaking factor and infitration.*



Stantec

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LEGEND

- SUBJECT SITE
- RESIDENTIAL CATCHMENT AREA BOUNDARY
- COMMERCIAL CATCHMENT AREA BOUNDARY
- RESIDENTIAL INFILTRATION
- SEWERS ANALYZED

NOTES

INFILTRATION ALLOWANCE = 0.26 L/s/ha (RESIDENTIAL/ MISED USE ONLY)
COMMERCIAL FLOW = 2.08 L/s/ha GFA (INCLUDES INFILTRATION AND PEAKING)

Client/Project
ALTONA GROUP

OLD LIVERPOOL HOUSE SITE

Project No.
160622705

Title
CATCHMENT AREA - PROPOSED + FUTURE (SCENARIO 3)

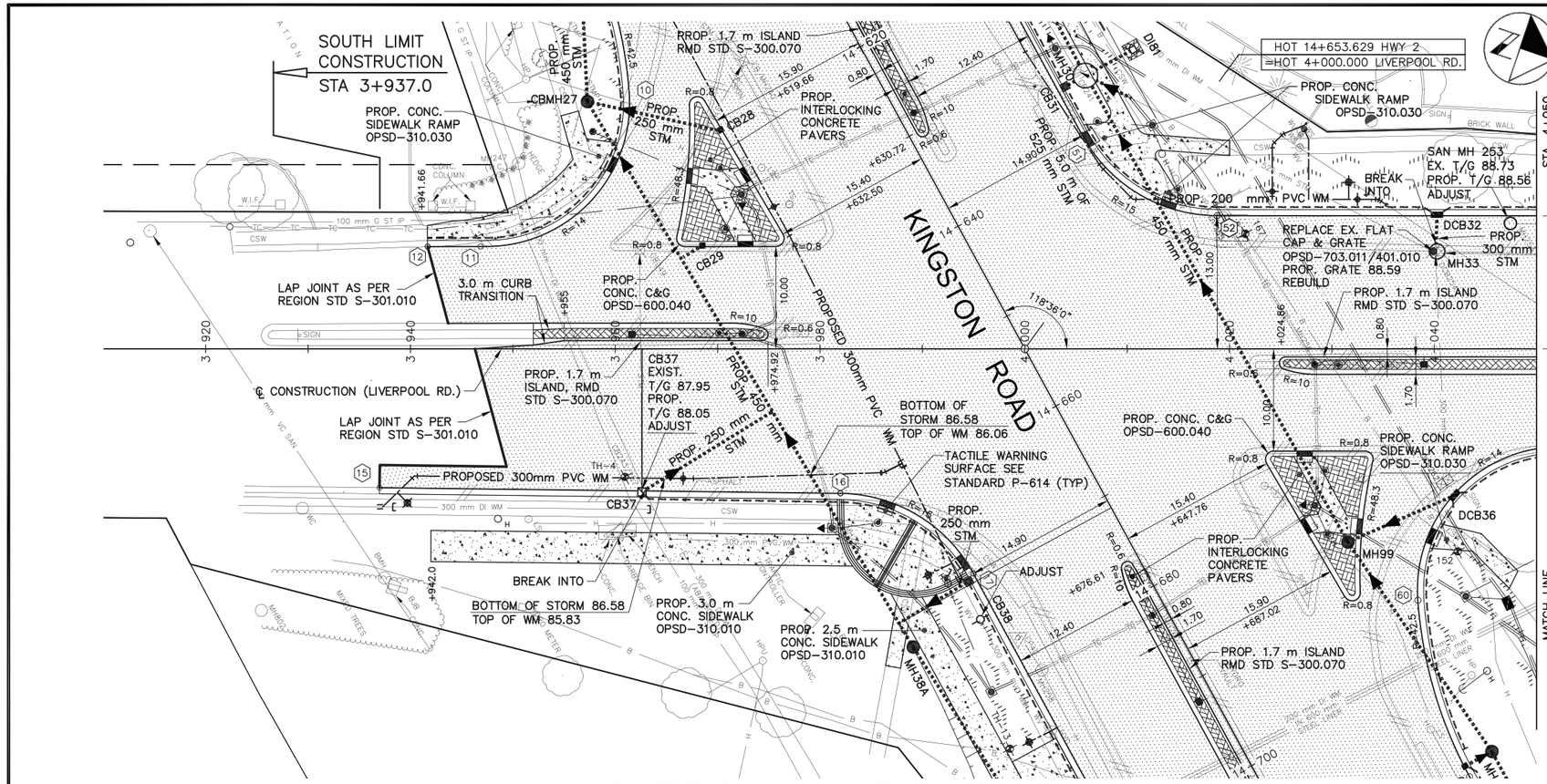
Date
FEB 2019

1:4000

Figure No.
3

APPENDIX E.4: Existing pipe data

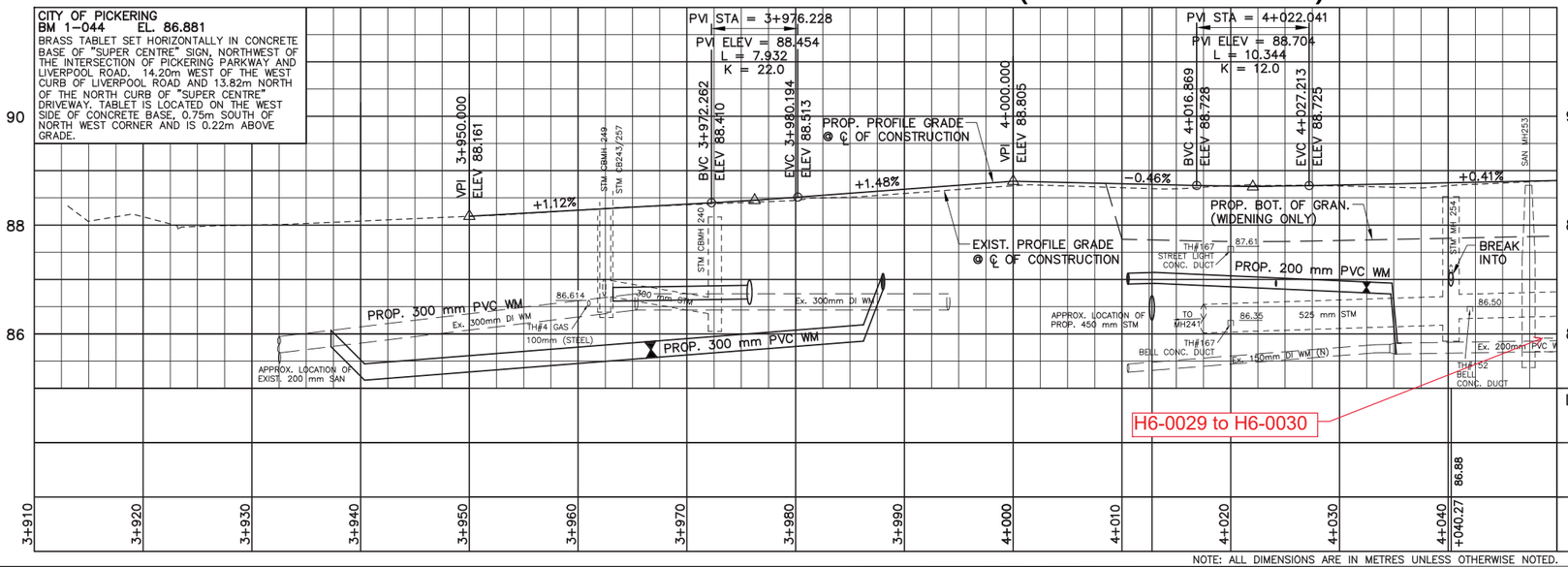
The sanitary Sewerage map was used in conjunction with the plan and profile drawings provided by the Region to prepare the sanitary downstream analysis. We note that H6-0031 to H6-0144 is listed as 0.45% on Region Drawing PIC-1329 and at 0.43% on the sanitary sewerage map. We note that the lower value of 0.43% was used for this analysis to be conservative.



CATCH BASIN DATA						C.B. CONNECTION DATA			
OPSD	INV. NO.	CHAINAGE	GRATE EP. ELEV.	INVERT ELEV. IN	INVERT ELEV. OUT	LEN. (m)	DIA. (mm)	CLASS OF PIPE	GRADE %
705.020,400.020	DCB32	4+040.27	88.52		86.92	3.6	300	SDR35	1.0
705.020,400.020	DCB36	4+041.97	88.54		86.94	11.4	300	SDR35	1.0
	CB37	3+962.61	88.05		86.65	15.5	250	SDR35	1.0

NO.	CHAINAGE	EP ELEV.	RADIUS (m)	LENGTH (m)	GRADE (%)	OFFSET
9	14+595.55	87.93				18.20 SOUTH
10	14+613.54	88.12	42.5	18.57	VARIES	22.16 SOUTH
11	3+946.84	87.97	14.0	23.21	VARIES	10.00 WEST
12	3+941.66	87.96		5.18	VARIES	9.98 WEST
15	3+937.00	87.82				13.57 EAST
16	3+981.99	88.46		44.99	VARIES	14.13 EAST
17	14+670.53	88.74	15.00	15.91	VARIES	14.90 SOUTH
18	14+874.88	89.47		204.36	0.4	14.90 SOUTH
50	14+543.57	87.48				14.90 NORTH
51	14+638.01	88.58		94.44	VARIES	14.90 NORTH
52	4+018.81	88.54	15.00	16.09	VARIES	13.00 WEST
53	4+079.68	88.76		60.87	VARIES	13.00 WEST
59	4+052.92	88.62	14.00	23.21	VARIES	9.55 EAST
60	14+693.22	88.71	42.5	17.54	VARIES	22.15 NORTH
61	14+710.19	88.76				18.20 NORTH

LIVERPOOL ROAD (REG. RD. 29)



H6-0029 to H6-0030

LENGTHS, SIZES AND GRADES

STORM SEWER INVERT ELEV.

℄ OF CONSTRUCTION CHAINAGE

NOTE: ALL DIMENSIONS ARE IN METRES UNLESS OTHERWISE NOTED.

NO.	DATE	NAME	REVISIONS

AECOM
AECOM Canada Ltd.
300 Water Street, Whitby, Ontario, Canada L1N 9J2
T905.668.9363 F905.668.0221

UTILITIES VERIFIED

CABLE T.V.	2011 MAR. 28	HYDRO	2011 JULY 14
BELL CANADA	2011 APR. 28		
ENBRIDGE	2011 FEB. 23		

CONTRACTOR TO BE RESPONSIBLE FOR LOCATION OF ALL EXISTING U/G & OVERHEAD UTILITIES. VARIOUS UTILITIES REQUIRE ADVANCE NOTICE PRIOR TO DIGGING, FOR STAKE OUT. THE REGION ASSUMES NO RESPONSIBILITY FOR THE ACCURACY OF THE LOCATION OF EXISTING UTILITIES AS INDICATED ON THIS DRAWING.

LICENSED PROFESSIONAL ENGINEER J. R. NEWMAN Aug 18/14 PROVINCE OF ONTARIO

SURVEY DATA DATE 2012 04

SCALE HORIZONTAL 5m 0 5m VERTICAL 1m 0 1m

DRAWN:	E. MEIJERINK	DATE: 2014 06
DESIGN:	R. AUGER	DATE: 2014 06
CHECKED:	J. NEWMAN	DATE: 2014 06
APPROVED:	J. NEWMAN	DATE: 2014 06

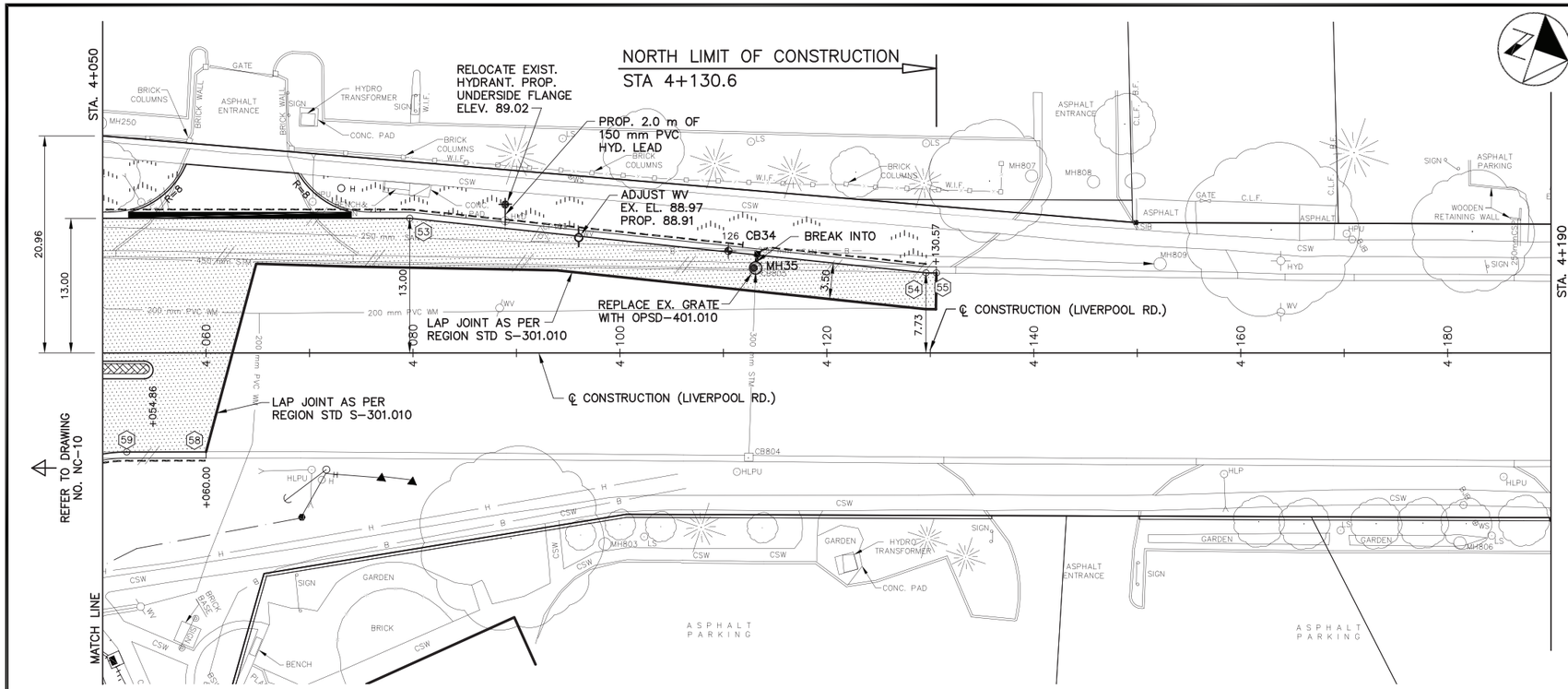
THE REGIONAL MUNICIPALITY OF DURHAM
WORKS DEPARTMENT
WHITBY ONTARIO

LIVERPOOL ROAD (REG. RD. 29)
NEW CONSTRUCTION
FROM 90m SOUTH OF HWY 2 TO 50m NORTH OF HWY 2

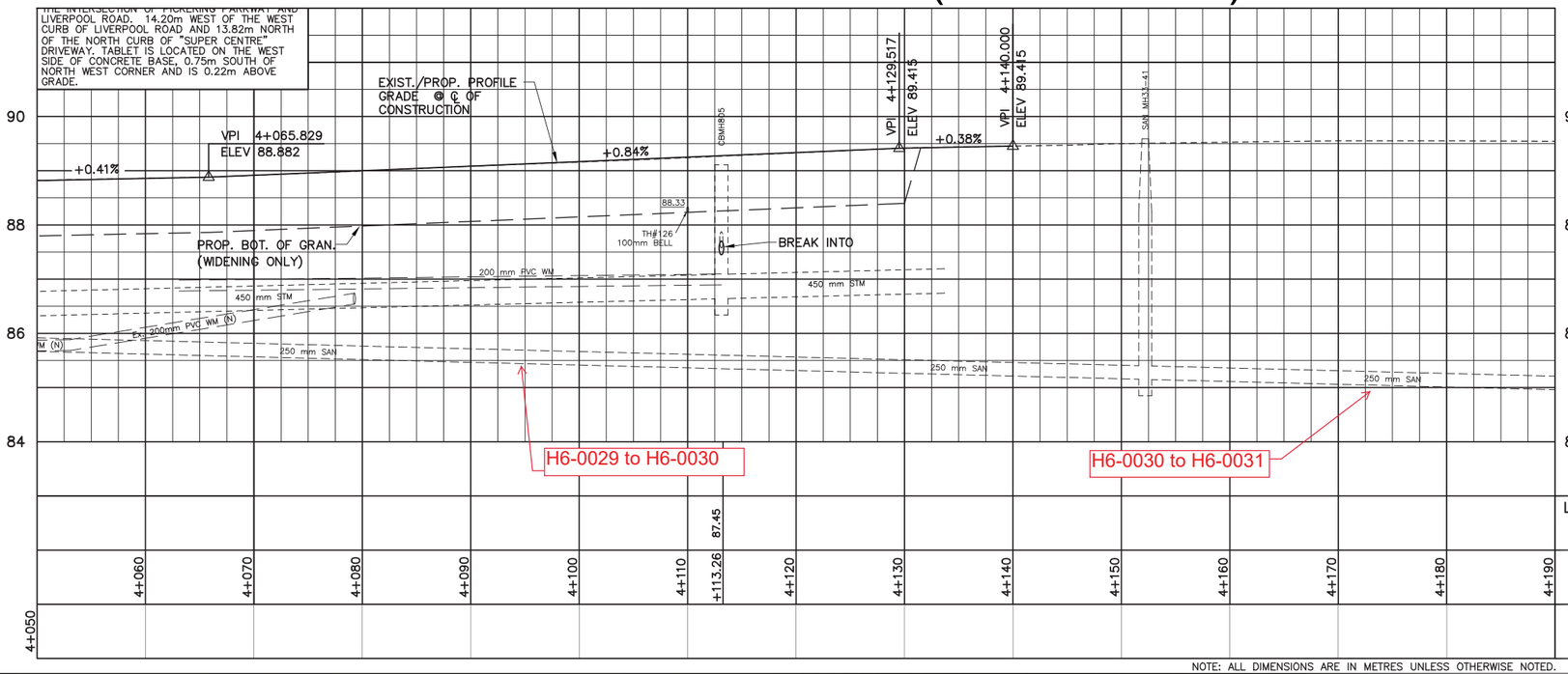
CONCESSION	REG. RD. NO.	AREA MUNICIPALITY
1	29	CITY OF PICKERING

DRAWING NUMBER	CONTRACT NUMBER	SHEET NUMBER
NC-10	D2014-016	23 OF 74

Plotted: Aug 15, 2014 - 3:53pm, Name: 60196264-C-LIVERPOOL_NC-10_12.dwg



LIVERPOOL ROAD (REG. RD. 29)



NOTE: ALL DIMENSIONS ARE IN METRES UNLESS OTHERWISE NOTED.

CATCH BASIN DATA						C.B. CONNECTION DATA			
OPSD	INV. NO.	CHAINAGE	GRATE EP. ELEV.	INVERT ELEV. IN	INVERT ELEV. OUT	LEN. (m)	DIA. (mm)	CLASS OF PIPE	GRADE %
705.010,400.020	CB34	4+113.26	89.07		87.47	1.4	250	SDR35	1.0

NO.	CHAINAGE	EP ELEV.	RADIUS (m)	LENGTH (m)	GRADE (%)	OFFSET
51	14+638.01	88.58	15.00	16.09	VARIES	14.90 NORTH
52	4+018.81	88.54				13.00 WEST
53	4+079.68	88.76		60.87	VARIES	13.00 WEST
54	4+129.58	89.23		50.18	0.8	7.73 WEST
55	4+130.58	89.24		1.00	0.4	7.72 WEST
58	4+060.00	88.65		7.68	VARIES	9.55 EAST
59	4+052.92	88.62	14.00	23.21	VARIES	9.55 EAST
60	14+693.22	88.71				22.15 NORTH

NO.	DATE	NAME	REVISIONS

AECOM

AECOM Canada Ltd.
300 Water Street, Whitby, Ontario, Canada L1N 9J2
T905.668.9363 F905.668.0221

UTILITIES VERIFIED

CABLE T.V.	2011 MAR. 28	HYDRO	2011 JULY 14
BELL CANADA	2011 APR. 28		
ENBRIDGE	2011 FEB. 23		

CONTRACTOR TO BE RESPONSIBLE FOR LOCATION OF ALL EXISTING U/G & OVERHEAD UTILITIES. VARIOUS UTILITIES REQUIRE ADVANCE NOTICE PRIOR TO DIGGING, FOR STAKE OUT.
THE REGION ASSUMES NO RESPONSIBILITY FOR THE ACCURACY OF THE LOCATION OF EXISTING UTILITIES AS INDICATED ON THIS DRAWING.

LICENSED PROFESSIONAL ENGINEER J. R. NEWMAN AUG 18/14 PROVINCE OF ONTARIO

SURVEY DATA DATE: 2012 04

SCALE
HORIZONTAL 5m 0 5m
VERTICAL 1m 0 1m

DRAWN:	E. MEIJERINK	DATE: 2014 06
DESIGN:	R. AUGER	DATE: 2014 06
CHECKED:	J. NEWMAN	DATE: 2014 06
APPROVED:	J. NEWMAN	DATE: 2014 06

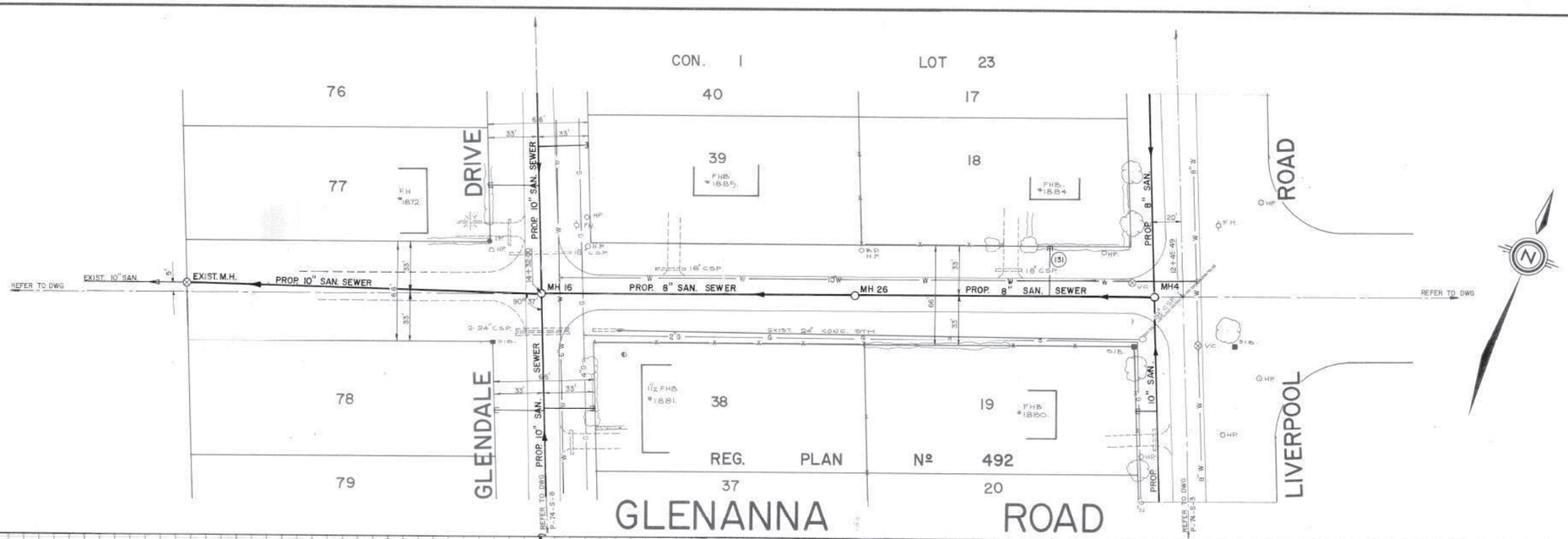
THE REGIONAL MUNICIPALITY OF DURHAM
WORKS DEPARTMENT
WHITBY ONTARIO

LIVERPOOL ROAD (REG. RD. 29)
NEW CONSTRUCTION
FROM 50m N. OF HWY 2 TO 131m N. OF HWY 2

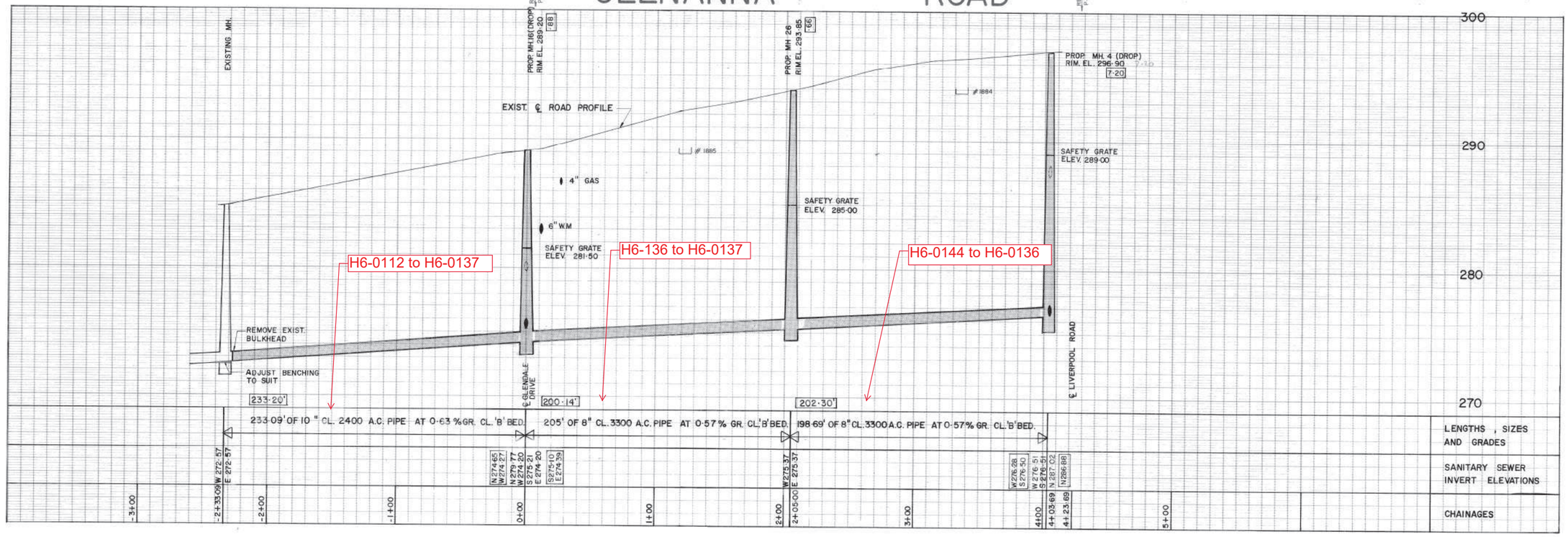
CONCESSION	REG. RD. NO.	AREA MUNICIPALITY
1	29	CITY OF PICKERING

DRAWING NUMBER	CONTRACT NUMBER	SHEET NUMBER
NC-11	D2014-016	24 OF 74

Plotted: Aug 15, 2014 - 3:52pm, Name: 60196264-C-LIVERPOOL_NC-10_12.dwg



NOTE : FOR HSE. CONNECTION DATA SEE DWG. Nº P-74-S-12.



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REGISTERED PROFESSIONAL ENGINEER C. S. LEE PROVINCE OF ONTARIO

NO.	DATE	NAME	REVISIONS
2	3/11/75	A.K.	AS CONSTRUCTED
1	28/8/'75	H.K.	PIPE SIZE BETWEEN MH. 16 AND EXIST. MH

DRAWN H.K DATE AUG '74
DESIGN H.K DATE APR '75
CHECKED B.J.B DATE MAY '75
APPROVED C.S.L. DATE JUN '75

SCALE HORIZ. 1"=40' VERT. 1"=4'

FIELD BOOK NO. 382

THE REGIONAL MUNICIPALITY OF DURHAM
DEPARTMENT OF WORKS
WHITBY ONTARIO

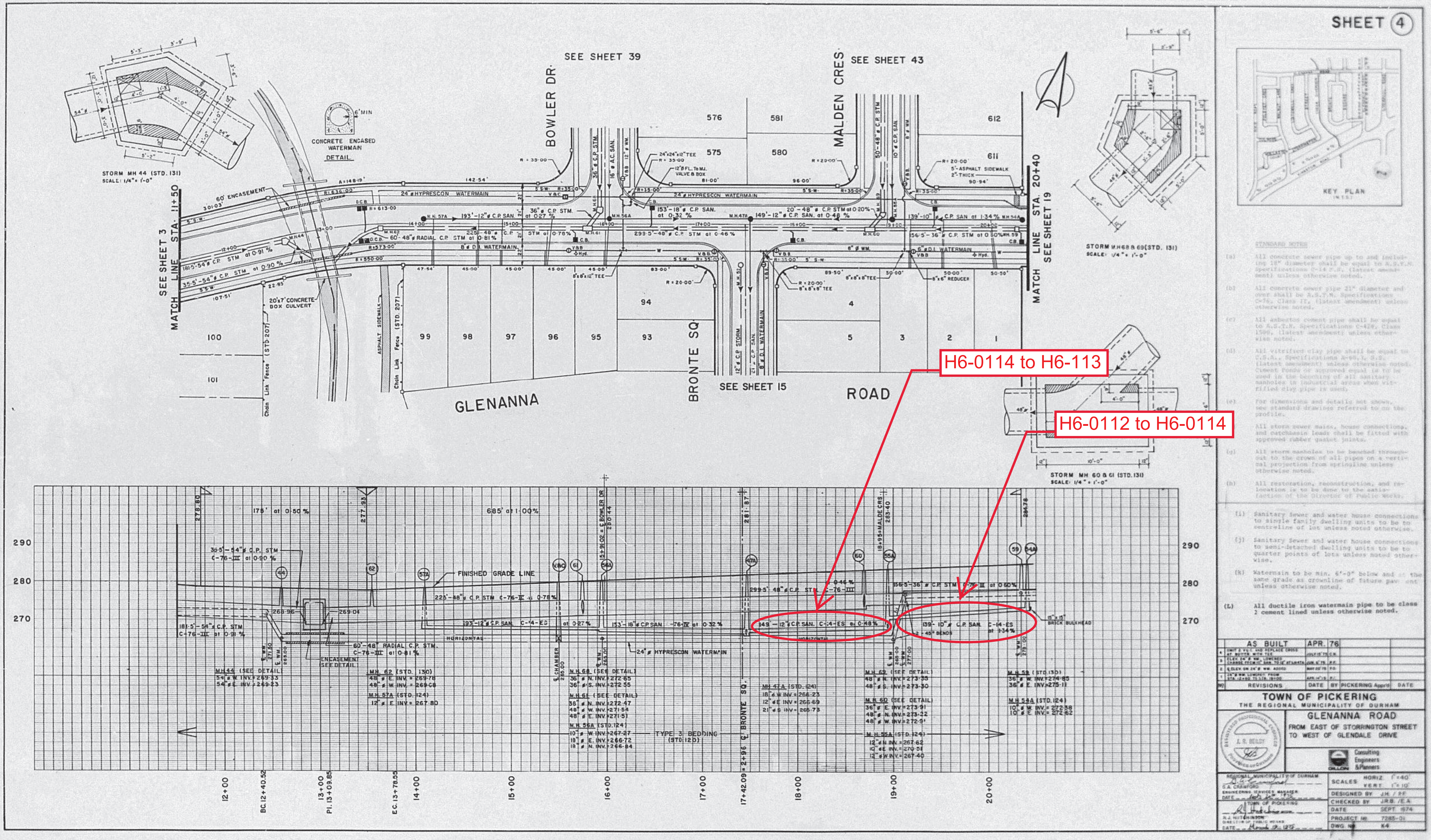
GLENANNA ROAD
FROM GLENDALE DR TO LIVERPOOL RD

RD. NO. LOT NO. 23 CON. I TWP. AREA MUN. PICKERING

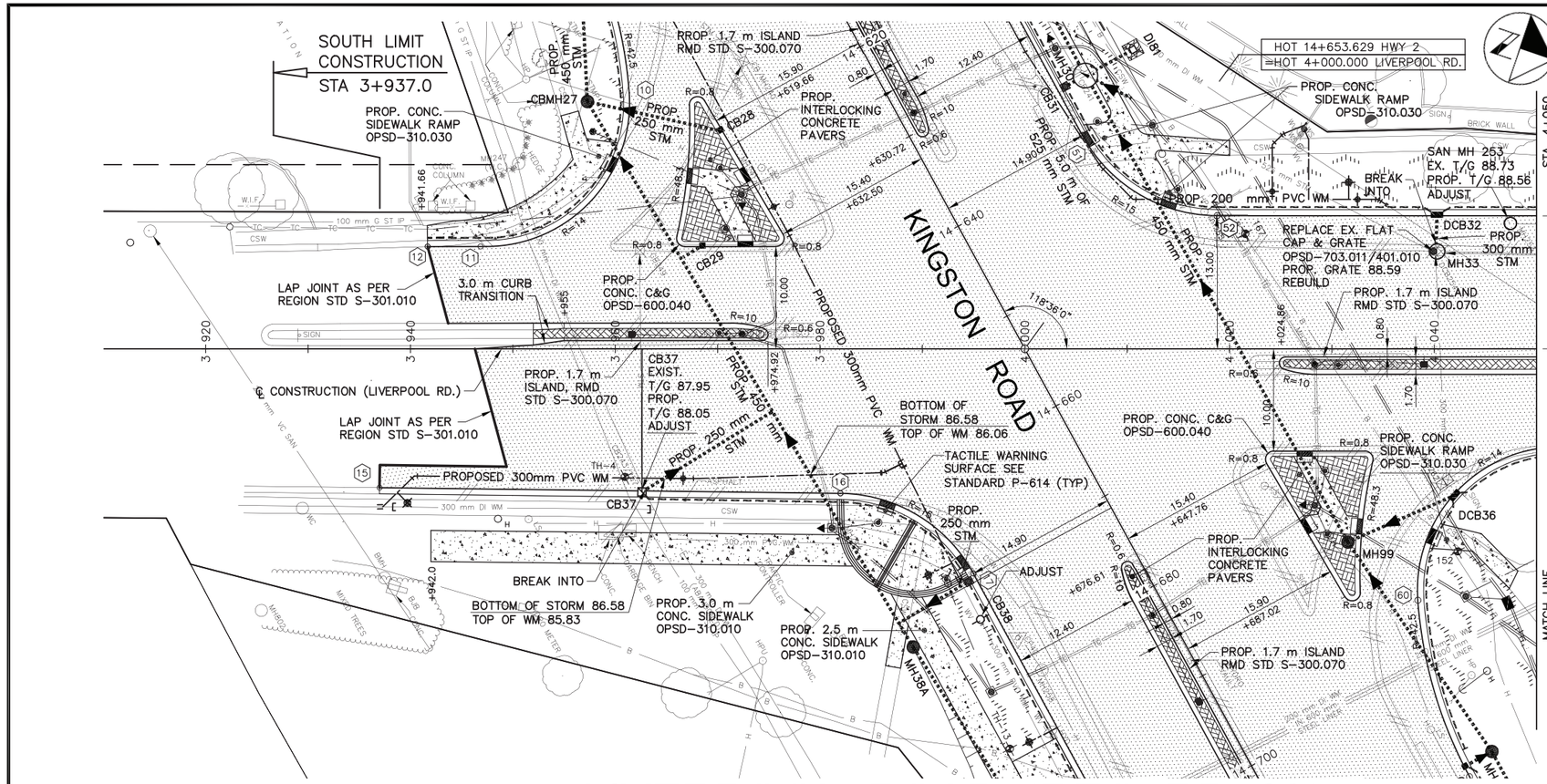
CONTRACT NO. D75-17

DRAWING NO. P-74-S-11

SHEET 12 OF 13



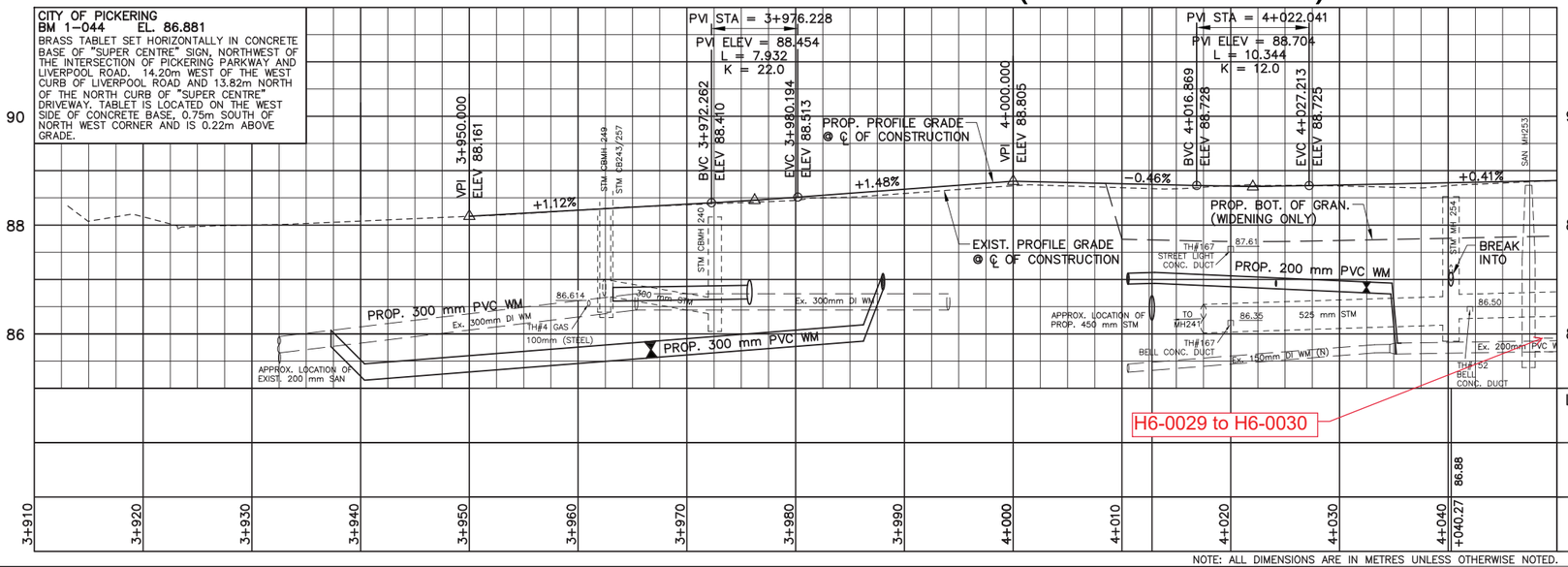
SHEET 4
SEE SHEET 39
SEE SHEET 43
SEE SHEET 15
BOWLER DR.
MALDEN CRES.
BRONTE SQ.
GLENANNA
ROAD
MATCH LINE STA. 11+50 SEE SHEET 3
MATCH LINE STA. 20+40 SEE SHEET 19
STORM MH 44 (STD. 131) SCALE: 1/4" = 1'-0"
CONCRETE ENCASED WATERMAIN DETAIL
STORM MH 68 & 69 (STD. 131) SCALE: 1/4" = 1'-0"
STORM MH 60 & 61 (STD. 131) SCALE: 1/4" = 1'-0"
KEY PLAN
24" ø HYPRESCON WATERMAIN
20'x7' CONCRETE BOX CULVERT
FINISHED GRADE LINE
TYPE 3 BEDDING (STD. 12 D)
H6-0114 to H6-113
H6-0112 to H6-0114
AS BUILT APR. 76
TOWN OF PICKERING
THE REGIONAL MUNICIPALITY OF DURHAM
GLENANNA ROAD
FROM EAST OF STORRINGTON STREET TO WEST OF GLENDALE DRIVE
Consulting Engineers & Planners



CATCH BASIN DATA						C.B. CONNECTION DATA			
OPSD	INV. NO.	CHAINAGE	GRATE EP. ELEV.	INVERT ELEV. IN	INVERT ELEV. OUT	LEN. (m)	DIA. (mm)	CLASS OF PIPE	GRADE %
705.020,400.020	DCB32	4+040.27	88.52		86.92	3.6	300	SDR35	1.0
705.020,400.020	DCB36	4+041.97	88.54		86.94	11.4	300	SDR35	1.0
	CB37	3+962.61	88.05		86.65	15.5	250	SDR35	1.0

NO.	CHAINAGE	EP ELEV.	RADIUS (m)	LENGTH (m)	GRADE (%)	OFFSET
9	14+595.55	87.93				18.20 SOUTH
10	14+613.54	88.12	42.5	18.57	VARIES	22.16 SOUTH
11	3+946.84	87.97	14.0	23.21	VARIES	10.00 WEST
12	3+941.66	87.96		5.18	VARIES	9.98 WEST
15	3+937.00	87.82				13.57 EAST
16	3+981.99	88.46		44.99	VARIES	14.13 EAST
17	14+670.53	88.74	15.00	15.91	VARIES	14.90 SOUTH
18	14+874.88	89.47		204.36	0.4	14.90 SOUTH
50	14+543.57	87.48				14.90 NORTH
51	14+638.01	88.58		94.44	VARIES	14.90 NORTH
52	4+018.81	88.54	15.00	16.09	VARIES	13.00 WEST
53	4+079.68	88.76		60.87	VARIES	13.00 WEST
59	4+052.92	88.62	14.00	23.21	VARIES	9.55 EAST
60	14+693.22	88.71	42.5	17.54	VARIES	22.15 NORTH
61	14+710.19	88.76				18.20 NORTH

LIVERPOOL ROAD (REG. RD. 29)



H6-0029 to H6-0030

LENGTHS, SIZES AND GRADES

STORM SEWER INVERT ELEV.

℄ OF CONSTRUCTION CHAINAGE

NOTE: ALL DIMENSIONS ARE IN METRES UNLESS OTHERWISE NOTED.

NO.	DATE	NAME	REVISIONS

AECOM
AECOM Canada Ltd.
300 Water Street, Whitby, Ontario, Canada L1N 9J2
T905.668.9363 F905.668.0221

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LICENSED PROFESSIONAL ENGINEER J. R. NEWMAN Aug 18/14 PROVINCE OF ONTARIO

SURVEY DATA DATE 2012 04

SCALE HORIZONTAL 5m 0 5m VERTICAL 1m 0 1m

DRAWN:	E. MEIJERINK	DATE: 2014 06
DESIGN:	R. AUGER	DATE: 2014 06
CHECKED:	J. NEWMAN	DATE: 2014 06
APPROVED:	J. NEWMAN	DATE: 2014 06

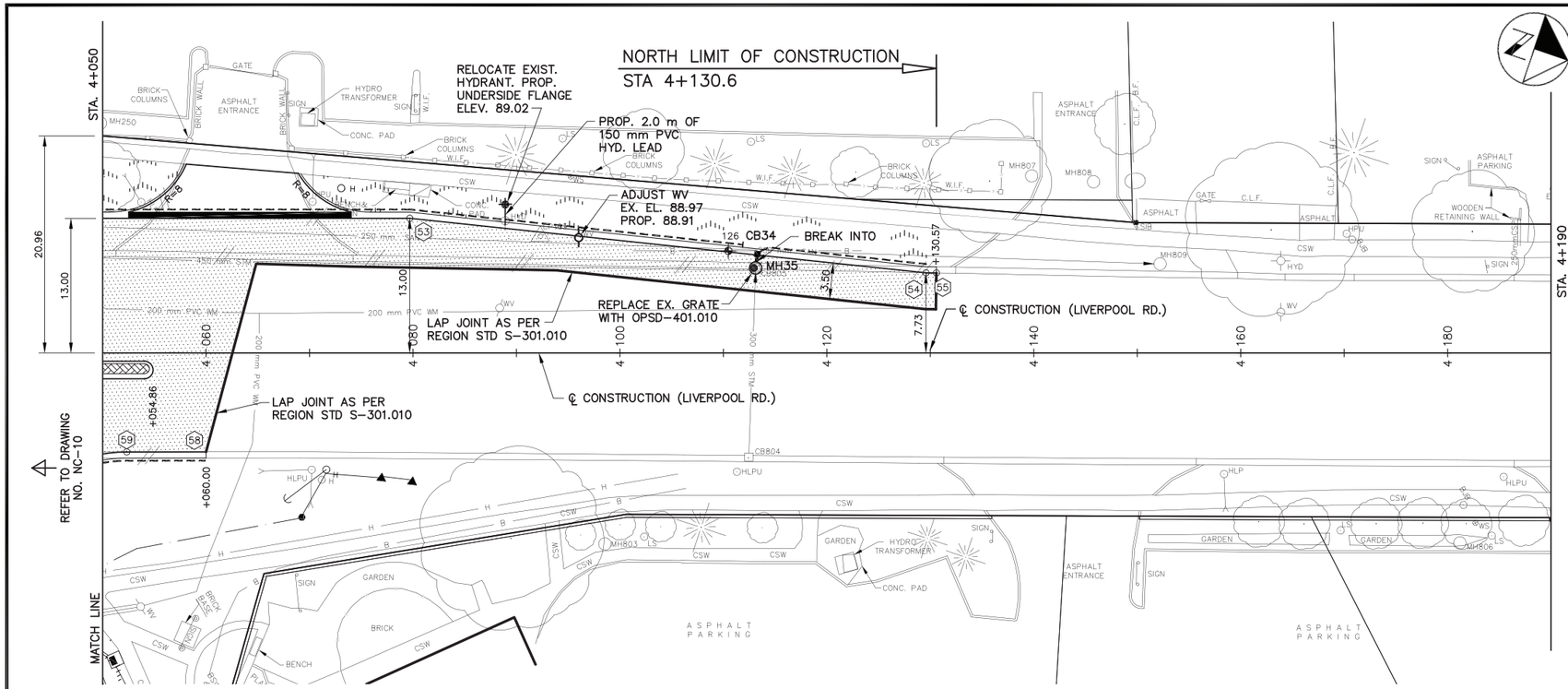
THE REGIONAL MUNICIPALITY OF DURHAM
WORKS DEPARTMENT
WHITBY ONTARIO

LIVERPOOL ROAD (REG. RD. 29)
NEW CONSTRUCTION
FROM 90m SOUTH OF HWY 2 TO 50m NORTH OF HWY 2

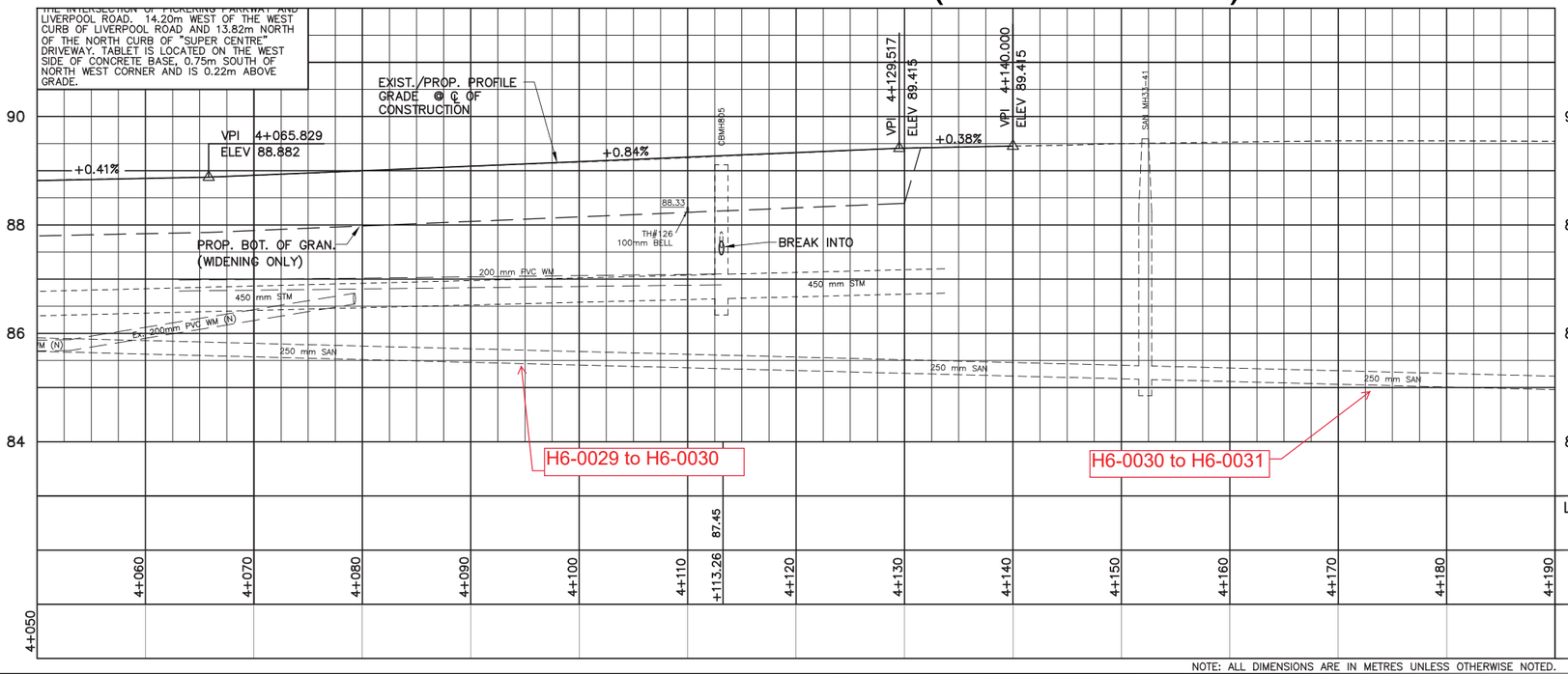
CONCESSION	REG. RD. NO.	AREA MUNICIPALITY
1	29	CITY OF PICKERING

DRAWING NUMBER	CONTRACT NUMBER	SHEET NUMBER
NC-10	D2014-016	23 OF 74

Plotted: Aug 15, 2014 - 3:53pm, Name: 60196264-C-LIVERPOOL_NC-10_12.dwg



LIVERPOOL ROAD (REG. RD. 29)



NOTE: ALL DIMENSIONS ARE IN METRES UNLESS OTHERWISE NOTED.

CATCH BASIN DATA						C.B. CONNECTION DATA			
OPSD	INV. NO.	CHAINAGE	GRATE EP. ELEV.	INVERT ELEV. IN	INVERT ELEV. OUT	LEN. (m)	DIA. (mm)	CLASS OF PIPE	GRADE %
705.010,400.020	CB34	4+113.26	89.07		87.47	1.4	250	SDR35	1.0

NO.	CHAINAGE	EP ELEV.	RADIUS (m)	LENGTH (m)	GRADE (%)	OFFSET
51	14+638.01	88.58	15.00	16.09	VARIES	14.90 NORTH
52	4+018.81	88.54				13.00 WEST
53	4+079.68	88.76		60.87	VARIES	13.00 WEST
54	4+129.58	89.23		50.18	0.8	7.73 WEST
55	4+130.58	89.24		1.00	0.4	7.72 WEST
58	4+060.00	88.65		7.68	VARIES	9.55 EAST
59	4+052.92	88.62	14.00	23.21	VARIES	9.55 EAST
60	14+693.22	88.71				22.15 NORTH

NO.	DATE	NAME	REVISIONS

AECOM

AECOM Canada Ltd.
300 Water Street, Whitby, Ontario, Canada L1N 9J2
T905.668.9363 F905.668.0221

UTILITIES VERIFIED

CABLE T.V.	2011 MAR. 28	HYDRO	2011 JULY 14
BELL CANADA	2011 APR. 28		
ENBRIDGE	2011 FEB. 23		

CONTRACTOR TO BE RESPONSIBLE FOR LOCATION OF ALL EXISTING U/G & OVERHEAD UTILITIES. VARIOUS UTILITIES REQUIRE ADVANCE NOTICE PRIOR TO DIGGING, FOR STAKE OUT.
THE REGION ASSUMES NO RESPONSIBILITY FOR THE ACCURACY OF THE LOCATION OF EXISTING UTILITIES AS INDICATED ON THIS DRAWING.

LICENSED PROFESSIONAL ENGINEER J. R. NEWMAN AUG 18/14 PROVINCE OF ONTARIO

SURVEY DATA DATE: 2012 04

SCALE
HORIZONTAL 5m 0 5m
VERTICAL 1m 0 1m

DRAWN:	E. MEIJERINK	DATE: 2014 06
DESIGN:	R. AUGER	DATE: 2014 06
CHECKED:	J. NEWMAN	DATE: 2014 06
APPROVED:	J. NEWMAN	DATE: 2014 06

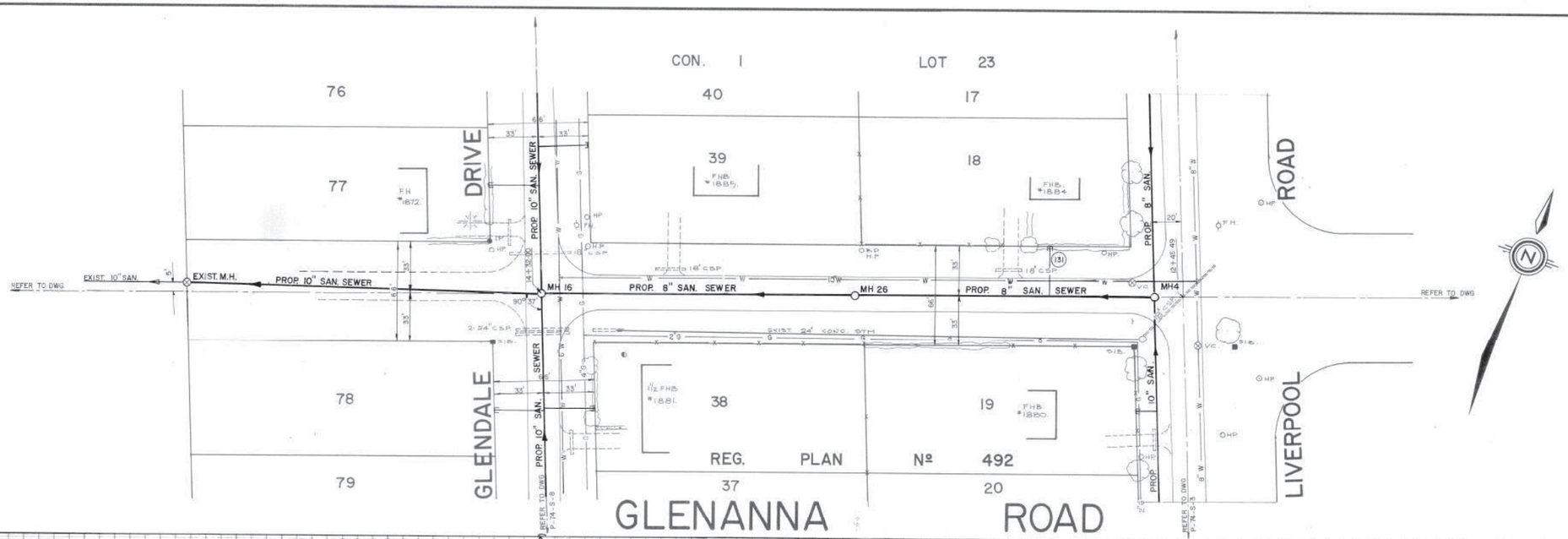
THE REGIONAL MUNICIPALITY OF DURHAM
WORKS DEPARTMENT
WHITBY ONTARIO

LIVERPOOL ROAD (REG. RD. 29)
NEW CONSTRUCTION
FROM 50m N. OF HWY 2 TO 131m N. OF HWY 2

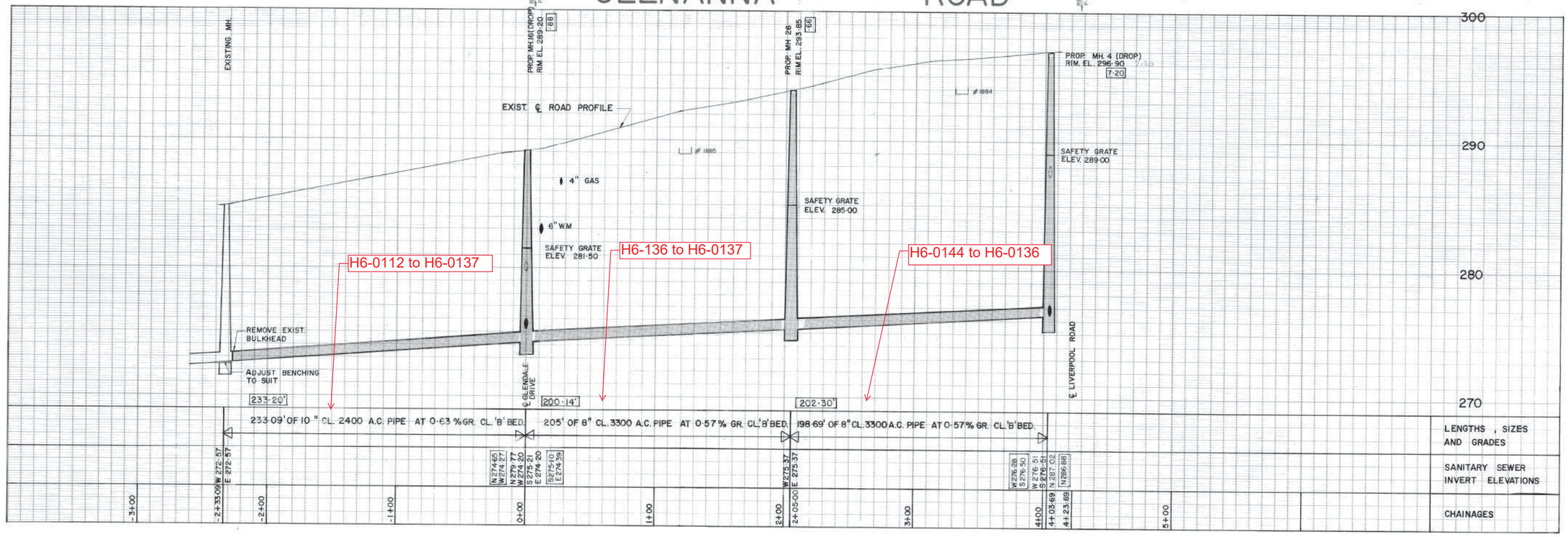
CONCESSION	REG. RD. NO.	AREA MUNICIPALITY
1	29	CITY OF PICKERING

DRAWING NUMBER	CONTRACT NUMBER	SHEET NUMBER
NC-11	D2014-016	24 OF 74

Plotted: Aug 15, 2014 - 3:52pm, Name: 60196264-C-LIVERPOOL_NC-10_12.dwg



NOTE : FOR HSE. CONNECTION DATA SEE DWG. Nº P-74-S-12.



CONTRACTOR TO BE RESPONSIBLE FOR LOCATION OF ALL EXISTING U/G & OVERHEAD UTILITIES. VARIOUS UTILITIES CONCERNED TO BE GIVEN REQUIRED ADVANCE NOTICE PRIOR TO ANY DIGGING, FOR STAKE OUT. THE REGION ASSUMES NO RESPONSIBILITY FOR THE ACCURACY OF THE LOCATION OF EXISTING UTILITIES AS INDICATED ON THIS DRAWING.

REGISTERED PROFESSIONAL ENGINEER C. S. LEE PROVINCE OF ONTARIO

NO.	DATE	NAME	REVISIONS
2	3/11/75	A.K.	AS CONSTRUCTED
1	28/8/'75	H.K.	PIPE SIZE BETWEEN MH. 16 AND EXIST. MH

DRAWN H.K DATE AUG '74
DESIGN H.K DATE APR '75
CHECKED B.J.B DATE MAY '75
APPROVED C.S.L. DATE JUN '75

SCALE HORIZ. 1"=40' VERT. 1"=4'

FIELD BOOK NO. 382

THE REGIONAL MUNICIPALITY OF DURHAM
DEPARTMENT OF WORKS
WHITBY ONTARIO

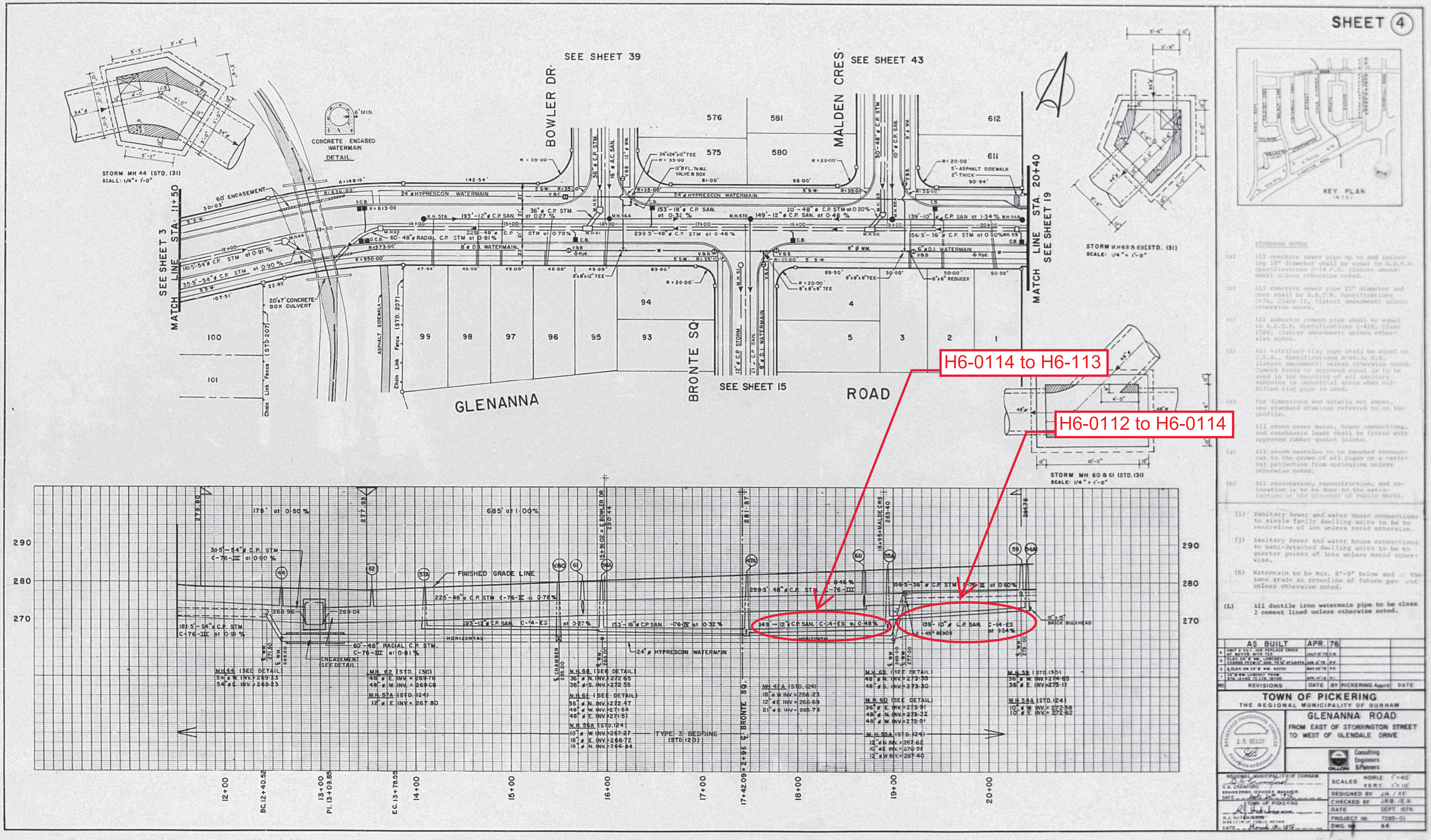
GLENANNA ROAD
FROM GLENDALE DR TO LIVERPOOL RD

RD. NO. LOT NO. 23 CON. I TWP. AREA MUN. PICKERING

CONTRACT NO. D75-17

DRAWING NO. P-74-S-11

SHEET 12 OF 13



SHEET 4
SEE SHEET 39
SEE SHEET 43
SEE SHEET 15
SEE SHEET 3
MATCH LINE STA. 11+50
MATCH LINE STA. 20+40 SEE SHEET 19
BOWLER DR.
MALDEN CRES.
BRONTE SQ
GLENANNA
ROAD
CONCRETE ENCASED WATERMAIN DETAIL
STORM MH 44 (STD. 131) SCALE: 1/4" = 1'-0"
STORM MH 68 & 69 (STD. 131) SCALE: 1/4" = 1'-0"
STORM MH 60 & 61 (STD. 131) SCALE: 1/4" = 1'-0"
KEY PLAN
24" ø HYPRESCON WATERMAIN
20'x7' CONCRETE BOX CULVERT
60' ENCASEMENT
FINISHED GRADE LINE
TYPE 3 BEDDING (STD.12D)
BRICK BULKHEAD
H6-0114 to H6-113
H6-0112 to H6-0114
AS BUILT APR. 76
REVISIONS
TOWN OF PICKERING
THE REGIONAL MUNICIPALITY OF DURHAM
GLENANNA ROAD
FROM EAST OF STORRINGTON STREET TO WEST OF GLENDALE DRIVE
DILLON Consulting Engineers & Planners
SCALES HORIZ. 1"=40' VERT. 1"=10'
DESIGNED BY J.H. / P.F.
CHECKED BY J.R.B. / E.A.
DATE SEPT. 1974
PROJECT No. 7285-01

APPENDIX E.4: Existing pipe data

The sanitary Sewerage map was used in conjunction with the plan and profile record drawings provided by the Region to prepare the sanitary downstream analysis. We note that H6-0031 to H6-0144 is listed as 0.45% slope on Region Drawing PIC-1329 and as 0.43% slope on the sanitary sewerage map. We note that the lower value of 0.43% was used for this analysis to be conservative.

Hahn, Alex

From: Tahoora Alimohammadi <talimohammadi@kirkorarchitects.com>
Sent: Thursday, April 25, 2019 12:14 PM
To: Tatjana Trebic; Hahn, Alex; David Butterworth; Gus Maurano; Sanaz@mbtw.com; Janice Quieta; Emma Cohlmeyer; Anatole Kung
Cc: Altona Group; Melanie Hare; Bon, Mario
Subject: RE: Grading Concept (Liverpool House)

Hi Tatjana,

-Unit breakdown: (please consider that they might change according to the unit layouts)

Townhouses: (7 Units)

Building A & B: (384 Units)
60 - Bachelor Unit
136 - One Bedroom
85 - One Bedroom + Den
72 - Two Bedroom
31 - Three Bedroom

281 1-Bdr units

Please let us know if you have any questions.

Thanks.

Regards,

TAHOORA ALIMOHAMMADI
Intern Architect

talimohammadi@kirkorarchitects.com

20 De Boers Dr. Suite #400 Toronto ON M3J 0H1
416.665.6060 x 2355