

BEECHWOOD DRIVE DEVELOPMENT

**508 BEECHWOOD DRIVE ,
WATERLOO, ONTARIO**

FUNCTIONAL SERVICING REPORT

December 08, 2017



REINDERS + RIEDER LTD.

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RRL # 17015

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1.0 Background

RRL has been retained by Concept Development Group Inc. to prepare a Functional Servicing Report for the 508 Beechwood Drive, a residential redevelopment located on the north side of Beechwood Drive in city of Waterloo.

The purpose of the Functional Servicing Report (FSR) is to evaluate the servicing demands and propose feasible connection and disposal points for municipal services. The report also evaluates the impact of proposed development in terms of stormwater requirements as per city and region criteria.

The subject site is bounded by Beechwood Drive to the south, walkway/easement on the west side, water course on the north and existing residential area on the east side. Refer to location shown below as Figure 1.



Figure 1 - Site Location Plan

Existing Site Condition

Land Use & Legal Description

The project site area is 1.83 acres (0.74 hectares). Currently the site has a multistory residential building, parking lot and green area covered by grass and trees.

The subject site's legal description is Part of Block '10', Registered Plan 1516 and part of Lots 1 through 14 (Refer to Plan of Survey dated August 01, 2017 attached in Appendix A).

Drainage & Topography

Existing topography shows that the south-west corner slopes towards north-east corner of the site. The difference between elevations of south-west to north-east is around 5m.

Existing Services

Existing water, storm and sanitary services are located on Beechwood Drive. Record drawings obtained from City of Waterloo show existing services in plan and profile as summarized below. The City of Waterloo drawings 5-1115 & 5-1374 are attached in Appendix A.

Table 1 – Existing Services Summary

Service	Size & Material	Location
Water	200mm PVC	Beechwood Drive, West Easement
Storm	300,450mm CONC	Beechwood Drive, West Easement
Sanitary	200mm PVC	Beechwood Drive

2.0 Proposed Development

The development proposal is for a multistory residential development with below ground parking levels and above ground residential tower. The site layout is shown on Figure C02 in Appendix C. Below ground parking garage footprint extends in the parking area as shown in site plan.

3.0 Design Criteria

The following design criteria has been used for the water demand and sanitary flow calculations expected from the proposed development.

Table 2 – Water & Sanitary Design Criteria

WATER SYSTEM DESIGN CRITERIA ¹	
Residential	225 Lpcd
Max Day Factor	1.44
Peak Flow	Max Day + Fire Flow
Fire Flow Calculation Method	FUS Method
Min System Pressure	20 psi under Max day +
WASTEWATER SYSTEM DESIGN CRITERIA²	
Residential Generation Rate	275 Lpcd
Peaking Factor	Use Harmon Formula
Extraneous Flows (I/I)	0.25 L/s/ha
POPULATION DENSITY (PPU – Persons per unit)	
High Density (Family Style Apartments)	3 ppu

1 Water System Design Criteria as per:

- *Region of Waterloo and Area Municipalities Design Guidelines and Supplemental Specifications for Municipal Servicing (DGSSMS)*
- *Tri-City Distribution Master Plan, May 2009.*

2 Sanitary System Design Criteria as per:

- *Region of Waterloo and Area Municipalities Design Guidelines and Supplemental Specifications for Municipal Servicing (DGSSMS)*
- *Development Engineering Manual 2013, City of Waterloo*

4.0 Servicing Demand Calculations

Project Population

The project population is based on the following units data provided by the developer.

No. of Residential Units : Existing Building units + Proposed development units
 $= 41 + 140 = 181 \text{ units}$

Based on an average number of 3 persons per unit, the total residential population will be 543 persons.

Domestic Water Demands

Based on the City's average residential and commercial water demand, domestic water demand is 1.41 L/sec. Domestic water demands are shown in Table B1, Appendix B.

Fire Flow

Fire flow demands for the proposed building has been calculated as per guidelines of Fire Underwriter Survey. Based on the type of construction, total floor areas and other fire suppression related information, fire flow demands have been calculated as 8,000 L/min (133 l/sec). Refer to Table B2, Appendix B for detailed analysis.

Peak Flow

The peak flow calculated by adding Max Day Flow + Fire Flow = $133 + 2.3 = 135.3 \text{ /sec.}$

The site is in Zone 6 of the Waterloo water supply pressure zones. This zone has higher pressures available (50-80 psi) in the water network as per Tri-City Distribution Master Plan, May 2009, therefore adequate pressures are expected to be available for the new development. A hydrant test will be carried out to confirm the available pressure and flow on Beechwood Drive.

Waste Water Generation

Based on the City's average residential waste water generation rate of 275 Lpcd , waste water flow from residential areas including infiltration allowance is calculated as 606,528 L/day (7.02 L/sec). Sanitary demands are shown in Table B3, Appendix B.

5.0 Proposed Servicing

The following service connections are proposed from the existing municipal infrastructure on Beechwood Drive. The services will be installed according to city standards.

5.1 New Sanitary Connection

A new sanitary connection will be provided from the existing 200mm diameter sanitary main by constructing a manhole. The location of proposed water service connections are shown in Figure C02, Appendix C.

5.2 New Domestic / Fire Water Connection

New 200mm service connections are proposed to be installed using tap in sleeve and valves from the existing 200mm watermain on Beechwood Drive. The location of proposed water service connections are shown on Figure C02, Appendix C. The new service connections will also provide services to the existing apartment building.

6.0 Stormwater Management

The preliminary storm water development is based on the requirements of the City of Waterloo Engineering Design Manual.

Table 3 – Storm Design Criteria

STORM MANAGEMENT DESIGN CRITERIA	
Quantity Control	Post Development 100 yr. flows to be controlled to 5yr. pre-development levels
Quality Control	MOE Level 1 Enhanced Protection
Water Balance	5.0mm over entire site area

The following storm water management approach is proposed for the development.

- Post Development Flows to be controlled to pre-development levels with the help of onsite detention. Quality improvement to be achieved using oil/grit separator.
- Water Balance to be achieved through landscape areas and infiltration chambers.

6.1 Proposed Quantity Control

The pre-development land use breakdown and runoff coefficient calculation is as per Table 4 below. Pre-development landuse are shown in figure DR101, Appendix C.

Table 4 – Pre-Development Runoff Coefficient Calculations

Area type	Area (ha)	Runoff Coefficient "R"	Area x R
Existing Roof	0.07	0.90	0.06
Conc /Asphalt	0.39	0.90	0.35
Landscape Area	0.27	0.25	0.07
Total:		0.74	0.49
Weighted "R" =			0.66

Post development land use breakdown and runoff coefficient calculation is as per Table 5 below.
Post-development landuse are shown in figure DR102, Appendix C.

Table 5 – Post Development Runoff Coefficient Calculations

Area type	Area (ha)	Runoff Coefficient “R”	Area x R
Conventional Roof	0.324	0.90	0.29
Conc /Asphalt	0.202	0.90	0.18
Landscape Area	0.211	0.25	0.05
Total:	0.74		0.53
Weighted “R” =			0.71

Quantity control through onsite detention (roof control) and onsite storage chambers will limit the post-development runoff release to the allowable 5-yr levels. To provide quantity control of up to 100-year design storm, the controlled release rate shall be less than or equal to an existing 5-year peak level (i.e. $Q_{5\text{year Existing}} = 0.195 \text{ m}^3/\text{s}$). Refer Table B4, Appendix B for flow calculations using rational method. Hydraulic modelling using Visual Othymo software will be carried out in the detailed design stage.

Table 6 – Comparison of Existing and Proposed Release Rates

Return Period	Existing (m ³ /s)	Proposed Uncontrolled (m ³ /s)	Proposed Controlled (m ³ /s)
Q 5 year	0.149	0.160	0.149
Q 100 year	0.349	0.287	0.149

Required Onsite Detention

The overall controlled release is calculated as $0.195 \text{ m}^3/\text{s}$; and detention storage volume required is **86.72 m³**. (Refer to Table B5 in Appendix B)

6.2 Water Balance

The site requires 5.0mm of rainfall to be stored for reuse or infiltration/ evapotranspiration.

Required water balance Volume : $0.74\text{ha} \times 0.005\text{mm} \times 0.71$ (runoff coefficient)= **26.27 m³**.

Water Balance Available:

Landscaped Areas: $2109\text{ m}^2 \times 5\text{mm} = 2.10\text{ m}^3$

Conc/Asphalt Areas: $2019\text{ m}^2 \times 1\text{mm} = 2.01\text{ m}^3$

Roof Top: $3240\text{ m}^2 \times 1\text{mm} = 16.20\text{ m}^3$

Total: $= 20.31\text{ m}^3$

Total Water Balance Deficit: **5.96 m³**

Water balance deficit will be met through the infiltration chambers proposed on the north-east driveway as shown in Drawing C02, Appendix C.

6.3 Storm Network Outlet and Stormwater Management Area

The existing storm sewer network on site is 250mm diameter and it does not have adequate capacity to accept storm flows from the proposed development. A new storm sewer network is proposed to provide service to the site as show in C03, Appendix C.

7.0 Erosion and Sediment Control During Construction

The following erosion and sediment control practices are recommended during construction:

- Staging construction activities in a manner to minimize disturbed area and duration of soil disturbance;
- Implementation of multi-barrier practices i.e. source controls, conveyance and outlet controls to enhance effectiveness of sediment controls;
- Installation of mud mat at construction access;
- Installation and maintenance of sediment traps at catch basins within the subject site; as well as in the immediate vicinity.

- Installation and maintenance of silt fences around the perimeter of any construction/disturbed areas;
- Periodically removal of sediments accumulated behind silt fences and sediment traps when 50% of its individual design capacity has been reached;
- After disturbed areas have been restored; paving, landscaping or other stabilization measures have been completed, erosion and sediment control practices to be decommissioned.

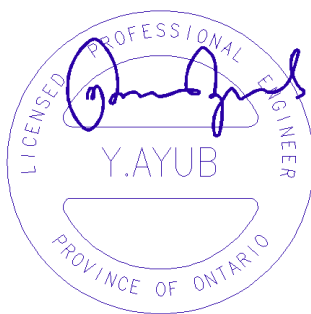
8.0 Summary & Conclusions

The report presents analysis of existing infrastructure, proposed development concept and servicing demands. The surrounding streets contains water and sanitary services at adequate depths. A stormwater management strategy has been proposed which provides the required quality and quantity controls.

Conceptual servicing and stormwater management plan have been included in support of the proposed development.

Respectfully submitted,

Reinders + Rieder Ltd.

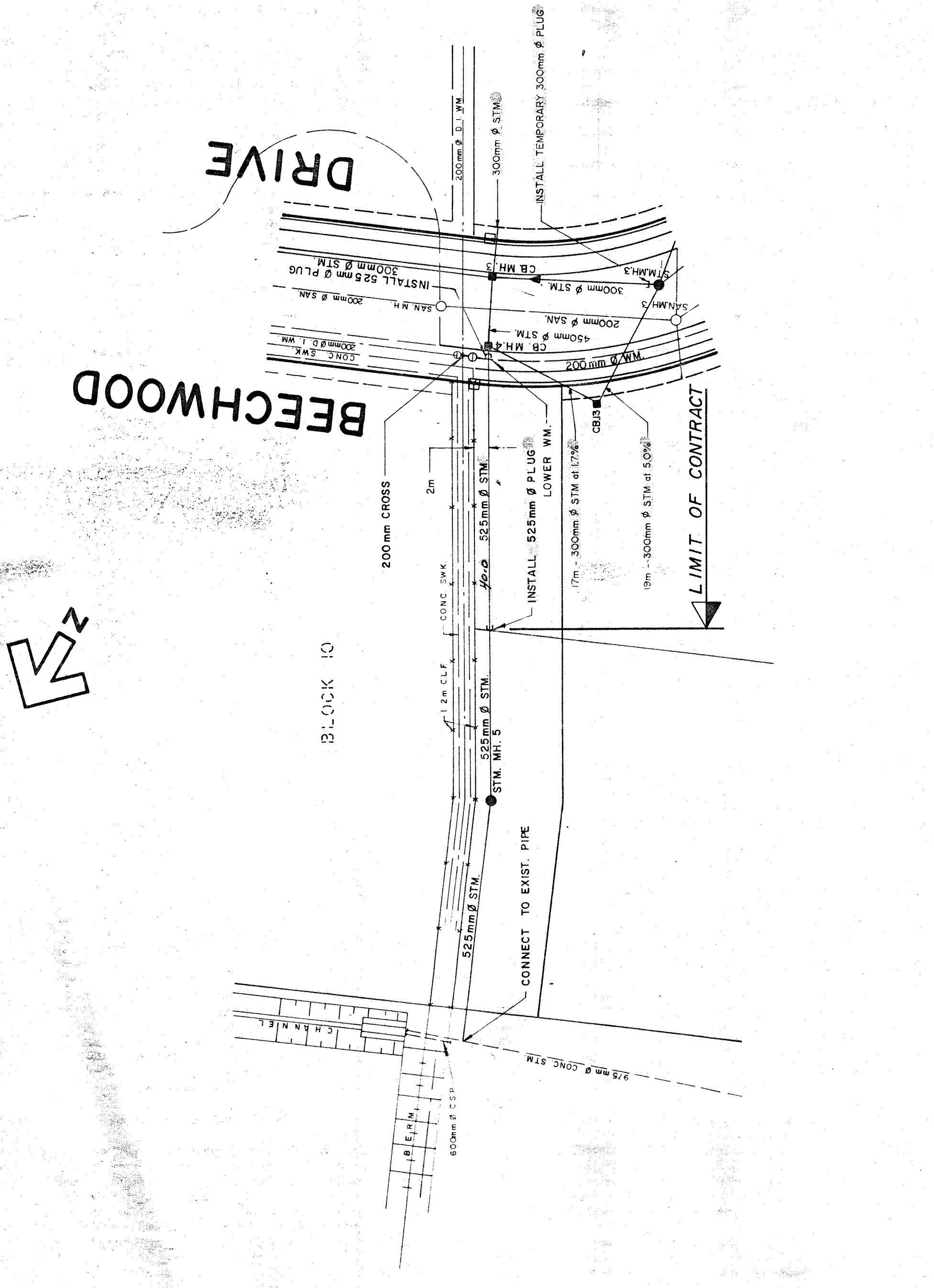
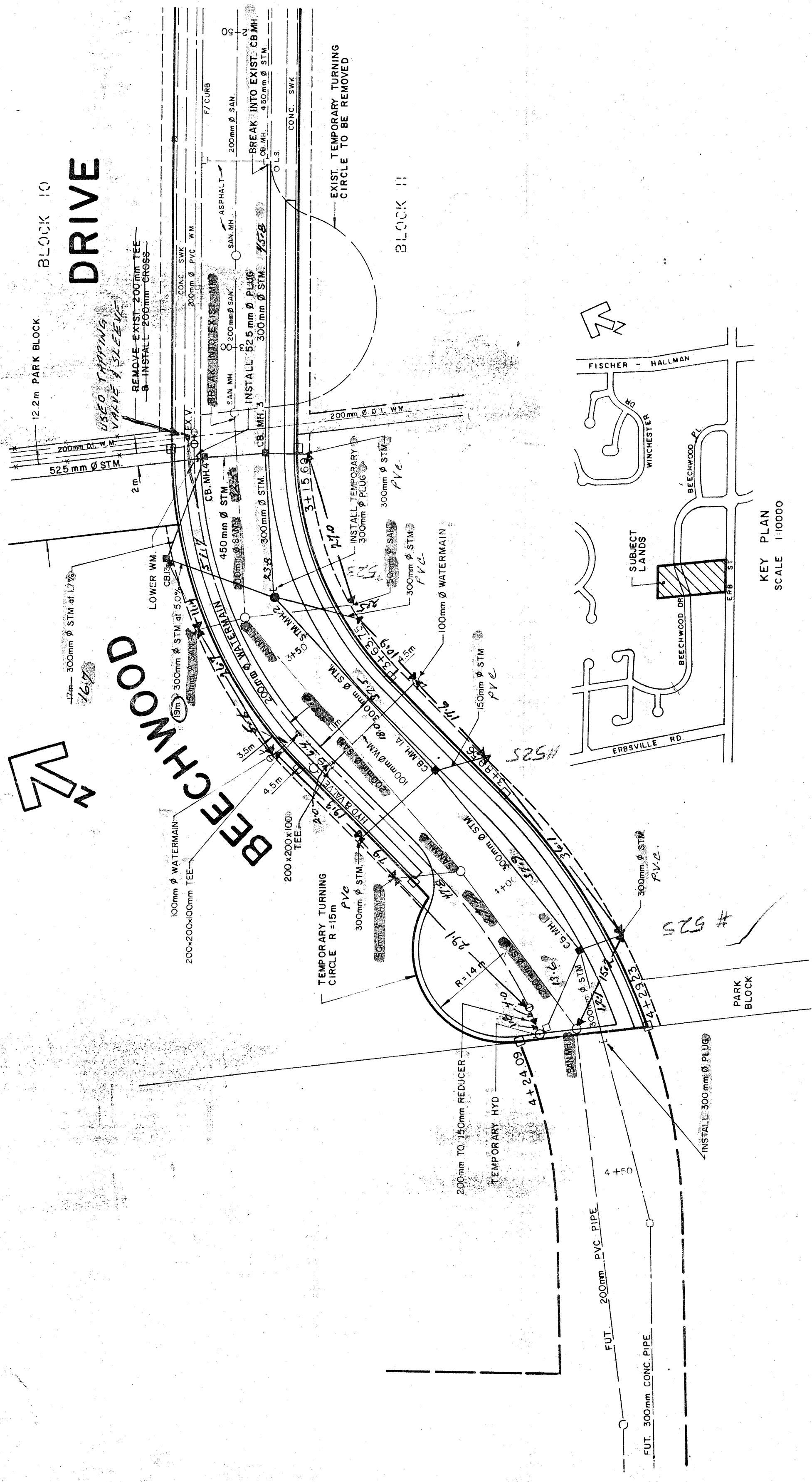


Yasar Ayub, M.Eng., P.Eng.

Senior Municipal Engineer

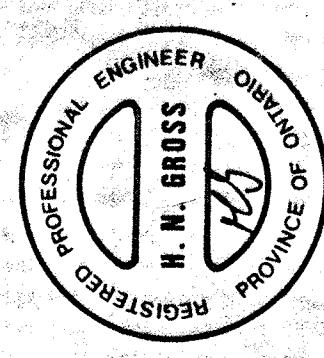
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Appendix A



- NOTES:
1. CROSSFALL - BEECHWOOD DRIVE - 1.75 mm
 2. PAVEMENT STRUCTURE
 - 10 mm AL.3 SURFACE ASPHALT
 - 10 mm AL.4 BINDER ASPHALT
 - 10 mm C.B.C. 40
 - 10 mm C.B.C. 40
 3. WATERMAIN - CLASS 150 PVC PIPE, MINIMUM COVER 2.0 METRES
 4. VALVE BOX INSTALLATION - 16.102 M
 5. HYDRANT INSTALLATION - 16.102 M
 6. SANITARY & STORM CONNECTIONS - PVC SDR 28
 7. SANITARY SEWER - PVC SDR 33
 8. SAN. MH. 1, 2 - CPD 100L/01
 9. ST. MH. 1, 2 - CPD 70L/03 (MODIFIED)
 10. CATCHBASIN LEADS - 200 mm DIA. 1.5 mm CSP AT 10% SLOPE (MIN) UNLESS OTHERWISE NOTED
 11. STORM & SANITARY CONNECTIONS TO PROPERTY LINES AT 200% MATCH OBVERTS AT MANHOLES

KEY PLAN
SCALE 1:10000



DATE	87 08 15	DESIGNED BY	H. N. G.
SCALE	HORIZ 1:500	DRAWN BY	F. P. S.
FIELD BK/PAGE	1-50	CHECKED BY	M. J.
DATE		DRAWING NO.	

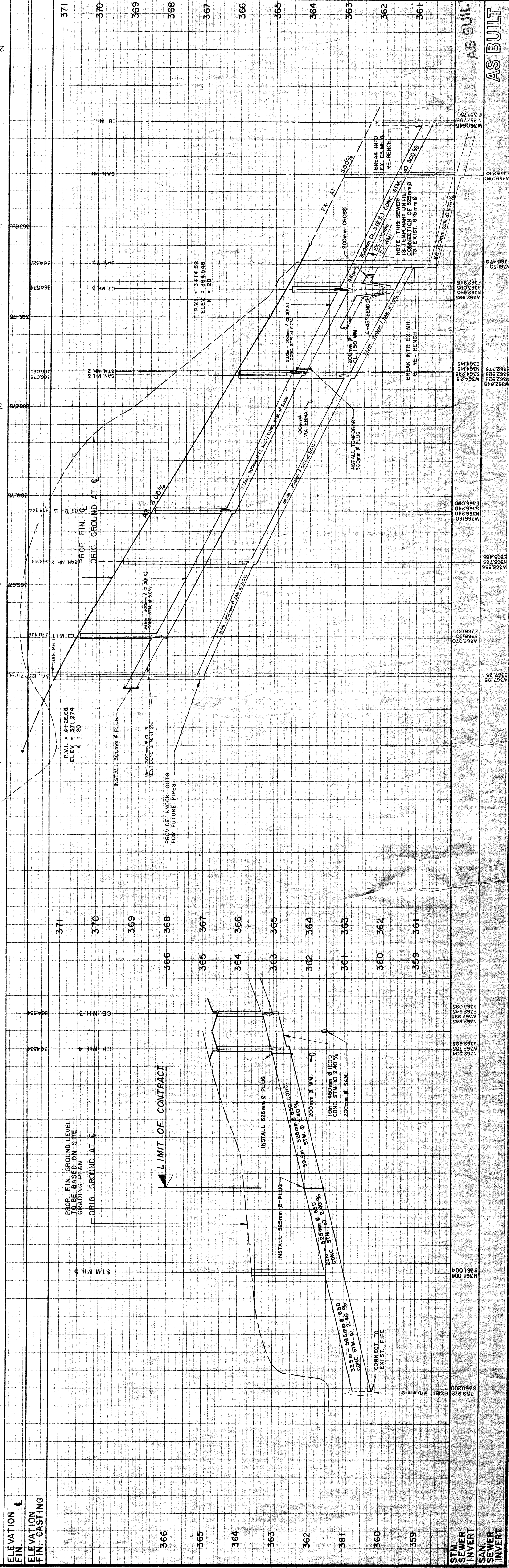
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DATE	87 07 24	REVISIONS FOR CONTRACT	
DATE	87 07 24	GENERAL REVISION	

DATE	87 07 24	REVISIONS	
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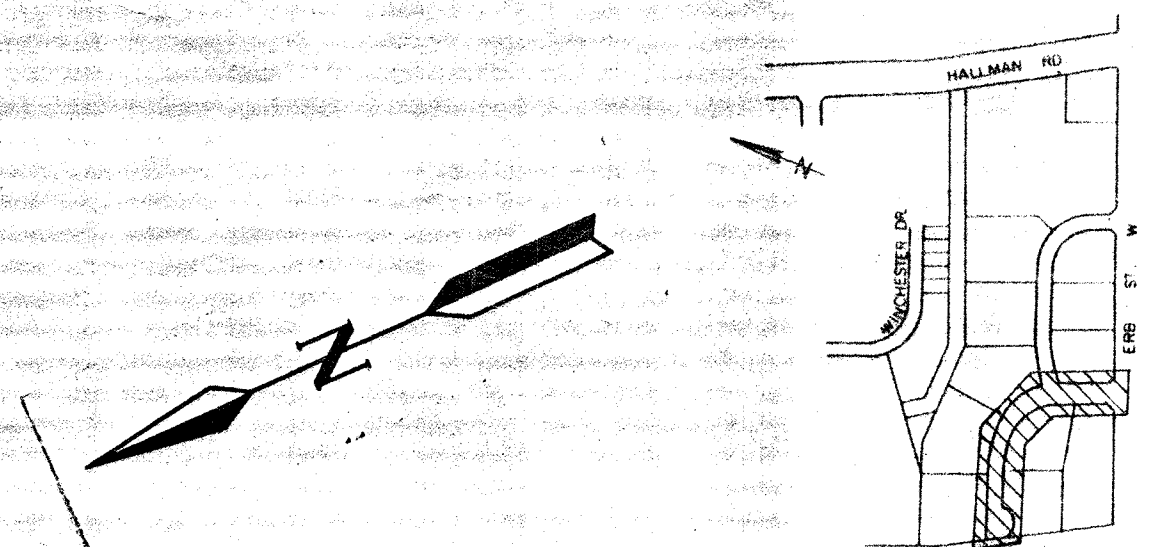
CITY OF WATERLOO
PUBLIC WORKS DEPARTMENT

87-18
BEECHWOOD DR.
& EASEMENT

SEAL

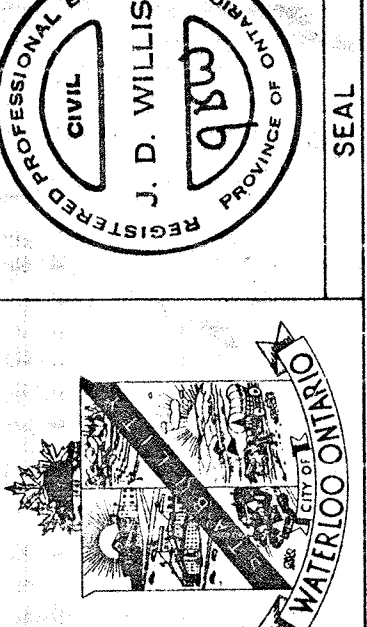


- NOTES
1. WATERMAIN TO BE CL-32 CEMENT LINED DUCTILE IRON PIPE - PVC
 2. MINIMUM COVER TO BE 2.0 METRES.
 3. ALL HEADS TO BE 250mm Ø 16mm CSP AT 1.0% SLOPE (MIN).
 4. PAVEMENT TO CONSIST OF:
 - 40mm SURFACE ASPHALT
 - 40mm BINDER ASPHALT
 - 275mm 6" C. "6" (MIN)
 5. ALL SANITARY SEWER TO BE S.D.R. 35 P.V.C. PIPE.



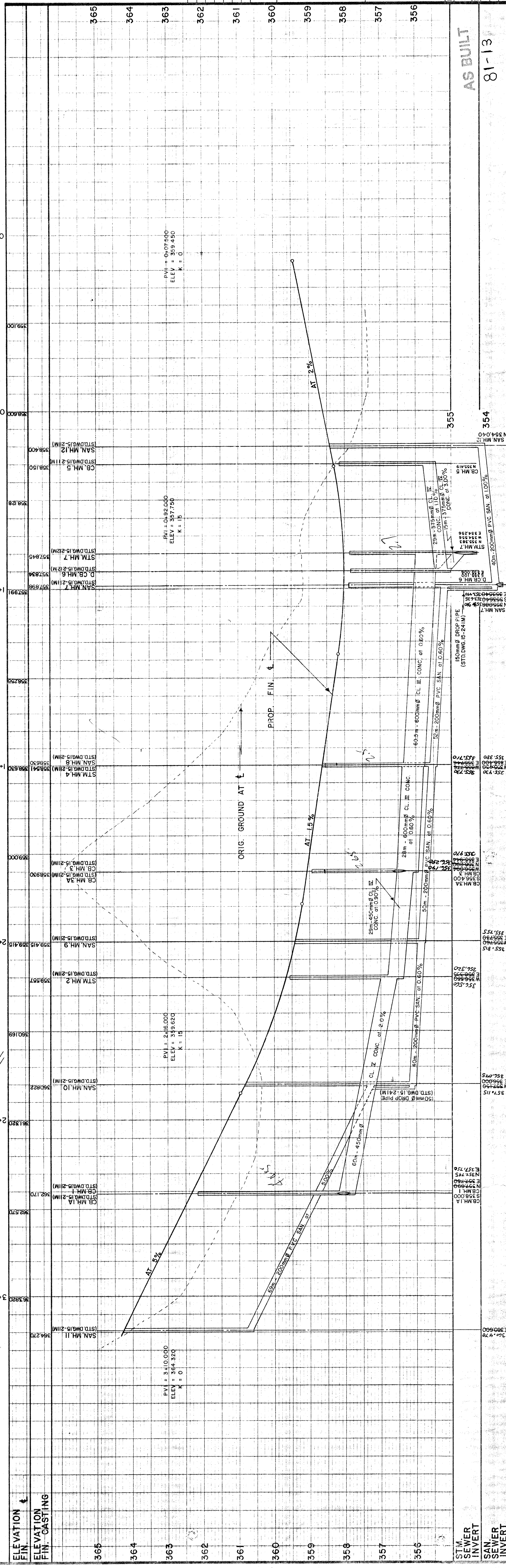
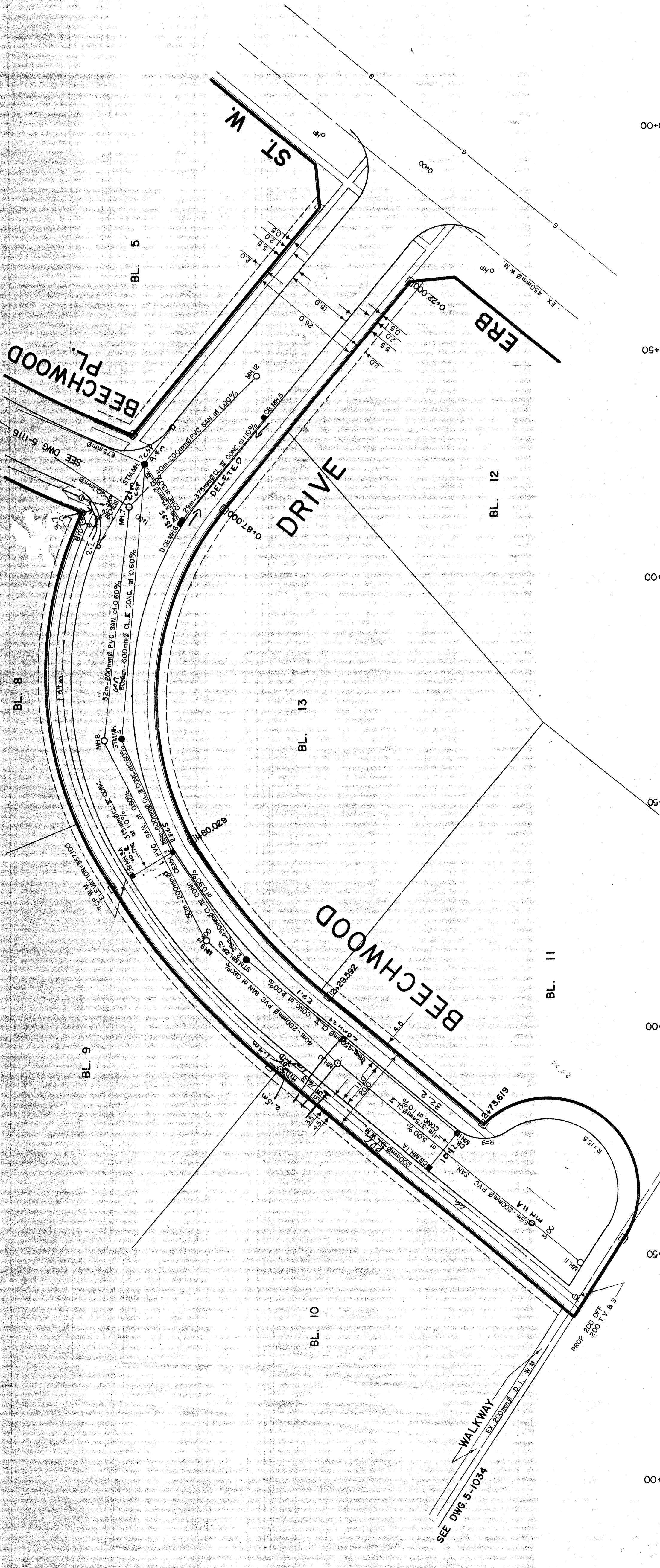
KEY PLAN
SCALE 1:10000

CITY OF WATERLOO
ENGINEERING DEPARTMENT

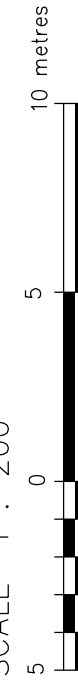


TITLE:
BEECHWOOD DRIVE

DATE: 81.03.31	DESIGNED BY: W.P.A.
SCALE: HORIZ. 1:500	DRAWN BY: R.D. L.T.C.
VERT. 1:50	CHECKED BY: W.P.A.
FIELD BK PAGE	DATE
	DRAWING NO.
	5-1115



TOPOGRAPHIC SKETCH OF
PART OF BLOCK 10,
REGISTERED PLAN 1516
CITY OF WATERLOO
REGIONAL MUNICIPALITY OF WATERLOO
SCALE 1" = 200'
MacDONALD TAMBLYN LORD SURVEYING



METRIC DISTANCES AND/OR COORDINATES SHOWN ON THIS PLAN ARE IN METRES. METRIC METRES AND CAN BE CONVERTED TO FEET BY DIVIDING BY 0.3048

ELEVATION NOTE
ELEVATIONS SHOWN ON THIS PLAN ARE RELATED TO GEODETIC DATUM 1984. ELEVATIONS ARE NOT TO BE USED FOR ANY OTHER PURPOSES. ELEVATIONS ARE TO BE USED FOR THE PURPOSES OF THE PLAN ONLY. ELEVATIONS ARE TO BE USED FOR THE PURPOSES OF THE PLAN ONLY. ELEVATIONS ARE TO BE USED FOR THE PURPOSES OF THE PLAN ONLY.

NOTE
EASEMENTS NOT SHOWN ON PLAN AS BOTH PROPERTIES UNDER SAME OWNERSHIP.

- LEGEND**
- CE CONCRETE CATCHER
 - HEB HYDRO-ELECTRIC BOX
 - WM WASTE MANAGEMENT
 - MANHOLE MANHOLE
 - BM BENCH MARK
 - LS LIGHT STAND
 - US UNDERGROUND SERVICES
 - FEED FEED
 - HT HYDRO-ELECTRIC TOWER
 - FW FIRE WATER
 - WV WATER VALVE
 - ET ELECTRICAL TOWER

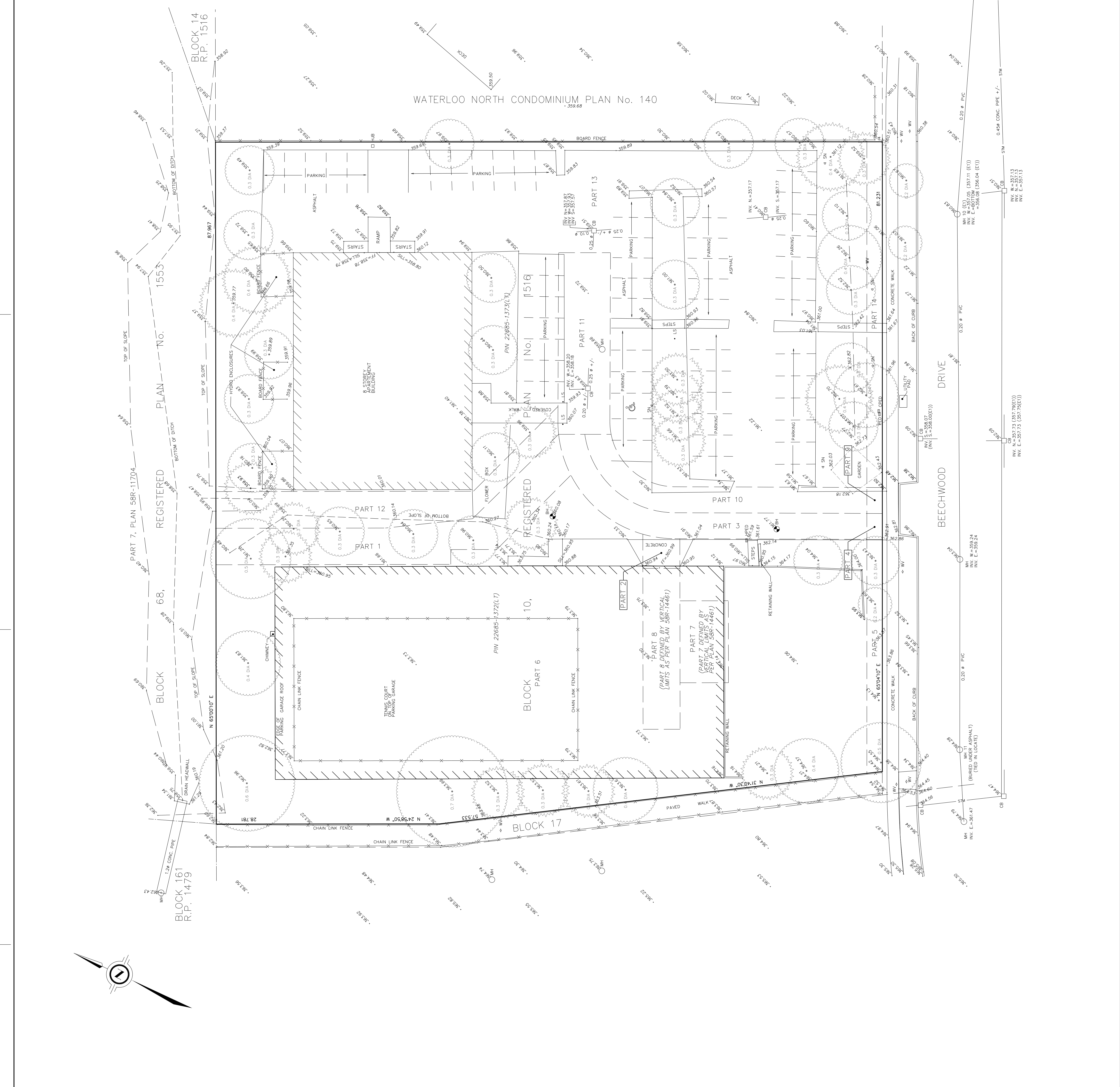
DATE: 2015-11-15

PROJECT: WATERLOO NORTH CONDOMINIUM PLAN No. 140

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Appendix B

TABLE B1. DOMESTIC WATER DEMANDS CALCULATIONS

Landuse	Units/GFA	No of persons	Demand Criteria	Unit	Daily Demand	Unit	Comments	
Residential	181	543	225	l/d	122175			
Total:					122175	l/d	(Av. Daily Demand)	
					1.41	l/sec		
		Max. Day Factor:		1.44	175932	l/d	(Max. Daily Demand)	
					2.04	l/sec		

Fire Demand : 133 l/sec
Max Day + Fire : 135.04 l/sec

TABLE B2.

**FIRE FLOW CALCULATION as per
FIRE UNDERWRITERS SURVEY (1999)**

PROJECT: 508 Beechwood Drive
City of Waterloo

1. Fire Flow Equation

$$F = 220 C \sqrt{A}$$

where F is the required fire flow [LPM]
C is the coefficient determined by type of construction [unitless]
A is the total protection area [sq.m]

2. Architecture Information

Type of Construction	Fire-resistive
Fire Rating, Vertical Separation	Inadequate
Sprinkler Provided (Y/N)	Yes
Total Floor Area [sq.m]	4150
Coefficient, C [1]	0.6
Fire Flow, F [LPM]	8503
Fire Flow, F [LPM]	9000

Largest Floor +25% of two immediate Floors

Round to nearest 1000

3. Occupancy Reduction

Occupancy Adjustment	0.85
Fire Flow, F [LPM]	7650

Limited Combustible

4. Sprinkler Reduction

Sprinkler Reduction	0.30
Sprinkler Reduction [LPM]	2295

Conform to NFPA 13 (30% Reduction)

5. Exposure Adjustment

North	5%
East	15%
South	5%
West	10%
Total	35%
Exposure Adjustment [LPM]	2678

6. Required Fire Flow, Duration & Volume

Fire Flow, F [LPM]	7650
Sprinkler Reduction [LPM]	2295
Exposure Adjustment [LPM]	2678
Required Fire Flow [LPM]	8033
Required Fire Flow [LPM]	8000
Required Fire Flow [LPS]	133

Round to nearest 1000

Project: 508 Beechwood Drive
Date: Dec 08,2017

Table E3
City of Waterloo
Engineering Department
SANITARY SEWER DESIGN SHEET

LOCATION	FROM	TO	Residential Flow ¹				Commercial flow ²			Q Infiltr ³ (l/s)	Peak Flow 1+2+3 (l/sec)	size (mm)	slope (%)	length (m)	Q full (l/s)	V full (m/s)
			Area (ha)	No. of Units	Persons per unit	Population	Peaking Factor	Peak Flow (l/s)	Flow (l/s)	Peaking Factor	Peak Flow (l/s)					
SITE	SITE	City Sewer	0.74	181	3	543	4.0	6.84	0.00	2.5	-	200	1.00	22	32.80	1.04

Design Criteria:

1 - RESIDENTIAL:

Peak Factor: $1 + 14/(4 + \sqrt{P})$ P=Population/1000

Average Flow: 275 l/person/day

Manning's n: 0.013

Unit Densities 3 persons/unit

3 - INFILTRATION ALLOWANCE

Infiltration: 0.25 l/s/ha

**TABLE B4. PEAK FLOWS CALCULATION USING RATIONAL METHOD
EXISTING AND PROPOSED CONDITIONS**

Project: 508 Beechwood Drive, Waterloo
RRL No: 17750

Date: 22-Nov-17
By: AZ

TABLE C1.1 Intensity-Duration-Frequency Parameters, City of Brantford

	IDF Parameters			Intensity (mm/hr)			
	A	B	C	Tc 10 min	Tc 15 min	Tc 30 min	Tc 1 hour
2 year	743	6	0.7989	81.1	65.3	42.4	26.1
5 year	1593	11	0.8789	109.7	90.9	60.9	37.6
10 year	2221	12	0.908	134.2	111.4	74.6	45.7
25 year	3158	15	0.9355	155.5	131.1	89.7	55.6
50 year	3886	16	0.9495	176.2	149.1	102.5	63.6
100 year	4688	17	0.9624	196.5	166.9	115.3	71.7

TABLE C1.2 Peak Flows - Existing Condition

Existing Condition			Area (ha.)	R	A x R	
			0.74	0.66	0.49	
T c = 10 minutes						
Storm Event						
2 year	5 year	10 year	25 year	50 year	100 year	
Intensity (mm/hr)						
81.1	109.7	134.2	155.5	176.2	196.5	
Peak Flow (cms)						
0.110	0.149	0.182	0.211	0.239	0.267	

TABLE C2.3 Peak Flows - Proposed Condition (Uncontrolled)

Proposed Condition			Area (ha.)	R	A x R
			0.74	0.71	0.53
T c = 10 minutes					
Storm Event					
2 year	5 year	10 year	25 year	50 year	100 year
Intensity (mm/hr)					
81.1	109.7	134.2	155.5	176.2	196.5
Peak Flow (cms)					
0.118	0.160	0.196	0.227	0.257	0.287

TABLE C2.4 Peak Flows - Proposed Condition (Controlled)

Storm Event					
2 year	5 year	10 year	25 year	50 year	100 year
Peak Flow (cms)					
0.149	0.149	0.149	0.149	0.149	0.149

TABLE C2.5 Change in Peak Flows (Reduction -ve; Increase +ve)

Percent Change (%)					
35.2%	0.0%	-18.2%	-29.5%	-37.8%	-44.2%

Table B5 - **On-Site Storage Calculation**

Project: 508 Beechwood Drive

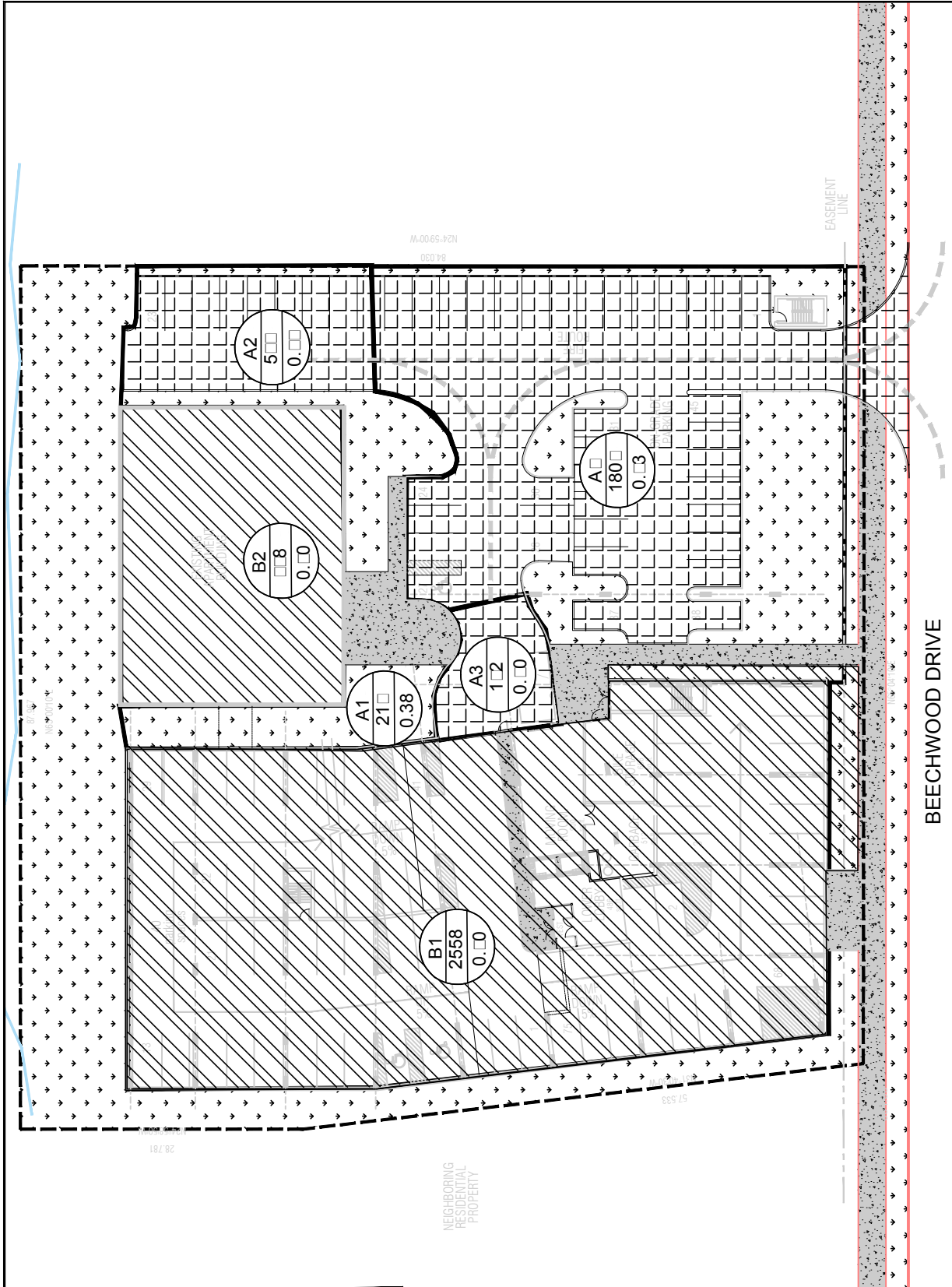
Project No.: 17750

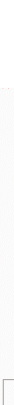
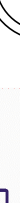
By: AZ

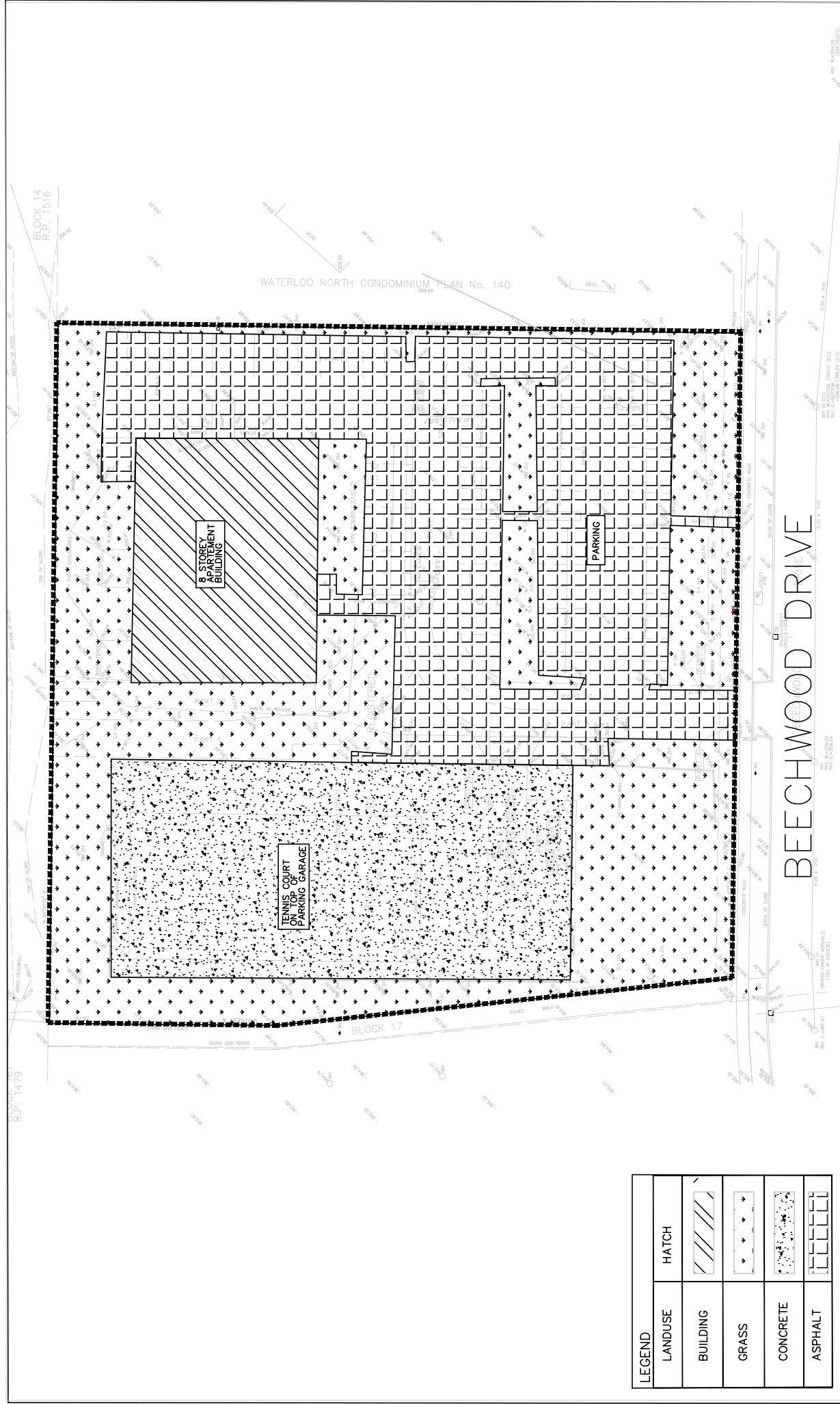
Date: 24-Nov-17

R = 0.71 (weighted) A = 0.74 ha $Q_{release}$ = 0.148 m³/s 148.00 L/S $i_{100} = \frac{4688}{(t_d + 17)^{0.9624}}$				
t _c (min)	i ₁₀₀ (mm/hr)	Q ₁₀₀ (m ³ /s)	Q _{stored} (m ³ /s)	Peak Volume (m ³)
10	196.536	0.287	0.139	83.300
11	189.777	0.277	0.129	85.119
12	183.475	0.268	0.120	86.235
13	177.585	0.259	0.111	86.717 ***
14	172.068	0.251	0.103	86.624
15	166.890	0.244	0.096	86.010
16	162.020	0.236	0.088	84.921
17	157.432	0.230	0.082	83.398
18	153.100	0.223	0.075	81.477
19	149.005	0.217	0.069	79.190
20	145.128	0.212	0.064	76.567
21	141.450	0.206	0.058	73.633
22	137.958	0.201	0.053	70.412
23	134.637	0.196	0.048	66.924
24	131.475	0.192	0.044	63.189
25	128.461	0.187	0.039	59.223
26	125.585	0.183	0.035	55.043
27	122.837	0.179	0.031	50.663
28	120.209	0.175	0.027	46.096
29	117.693	0.172	0.024	41.353
30	115.282	0.168	0.020	36.445
31	112.969	0.165	0.017	31.383
32	110.750	0.162	0.014	26.176
33	108.617	0.159	0.011	20.831
34	106.567	0.156	0.008	15.358
35	104.594	0.153	0.005	9.763
36	102.694	0.150	0.002	4.052
37	100.863	0.147	-	-
38	99.097	0.145	-	-
39	97.394	0.142	-	-
40	95.749	0.140	-	-
41	94.160	0.137	-	-
42	92.623	0.135	-	-
43	91.137	0.133	-	-

Appendix C

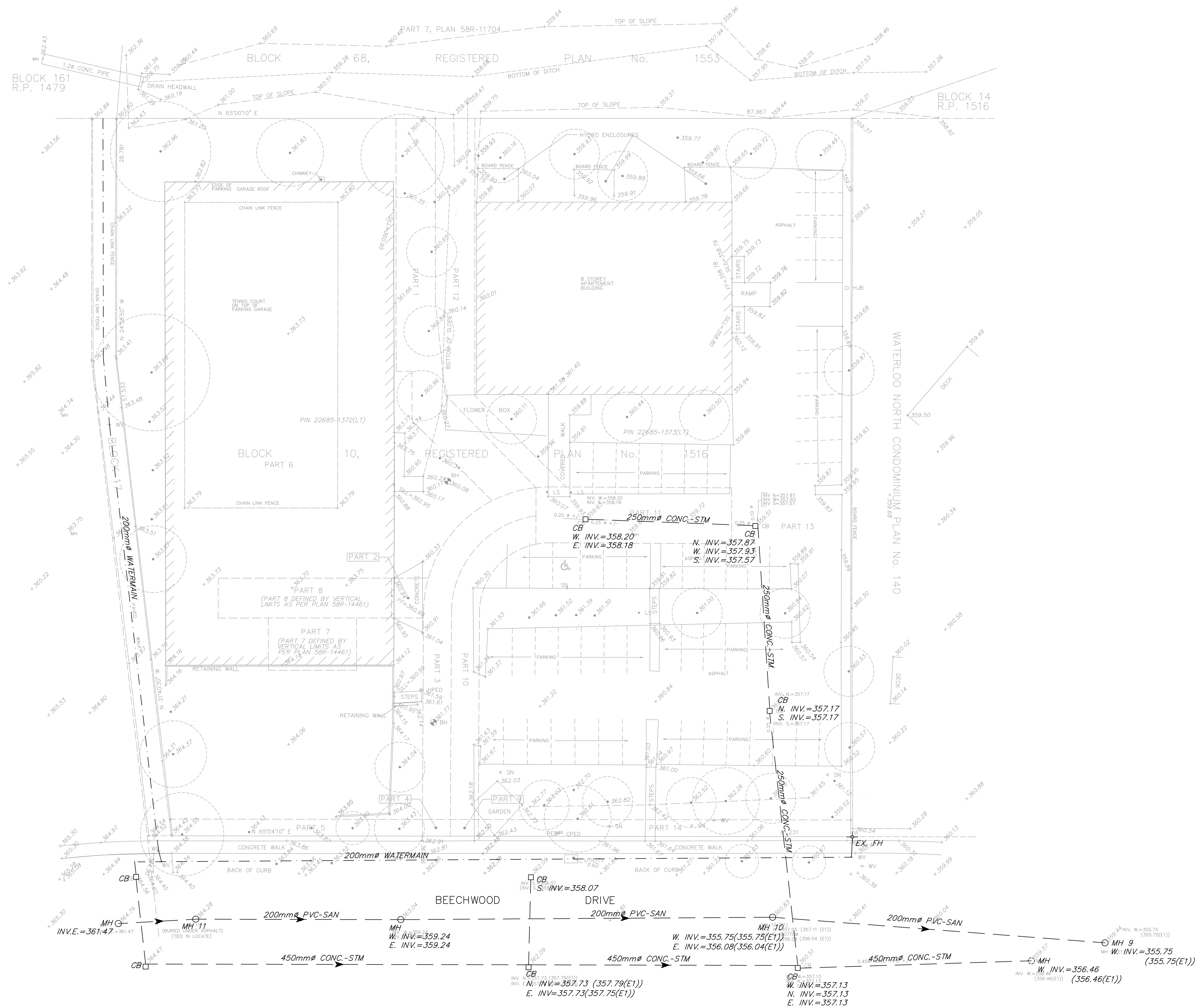


PROJECT: 508 BEECHWOOD DRIVE WATERLOO, ONTARIO	TITLE: POST-DEVELOPMENT LANDUSE AND DRAINAGE AREA	 REINDERS RIEDER 	<table><tr><td>DATE</td><td>Nov 22, 2017</td></tr><tr><td>SACLE</td><td>N.T.S.</td></tr><tr><td>DWN BY:</td><td>A.Z.</td></tr><tr><td>PROJECT No.</td><td>17750</td></tr></table>	DATE	Nov 22, 2017	SACLE	N.T.S.	DWN BY:	A.Z.	PROJECT No.	17750	DR102
DATE	Nov 22, 2017											
SACLE	N.T.S.											
DWN BY:	A.Z.											
PROJECT No.	17750											

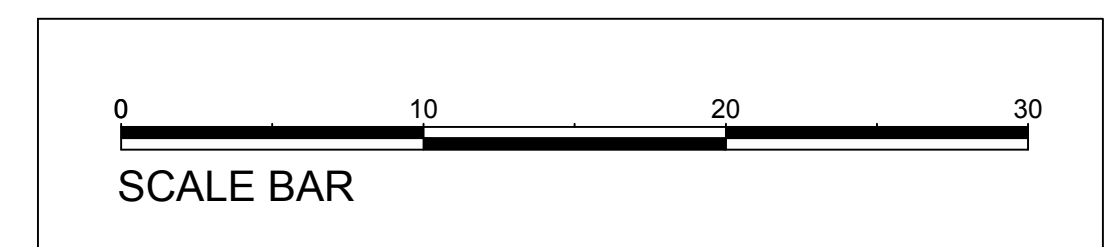


LEGEND	
LANDUSE	HATCH
BUILDING	
GRASS	
CONCRETE	
ASPHALT	

PROJECT:	508 BEECHWOOD DRIVE WATERLOO, ONTARIO	
	TITLE: PRE-DEVELOPMENT LANDUSE	
DATE	Nov 22, 2017	DR101
SCALE	N.T.S.	
DWN. BY.	A.Z.	
PROJECT NO.	17-750	



LEGEND	
	EXISTING MANHOLE
	EXISTING FIRE HYDRANT
 CB	EXISTING CATCH BASIN



C01

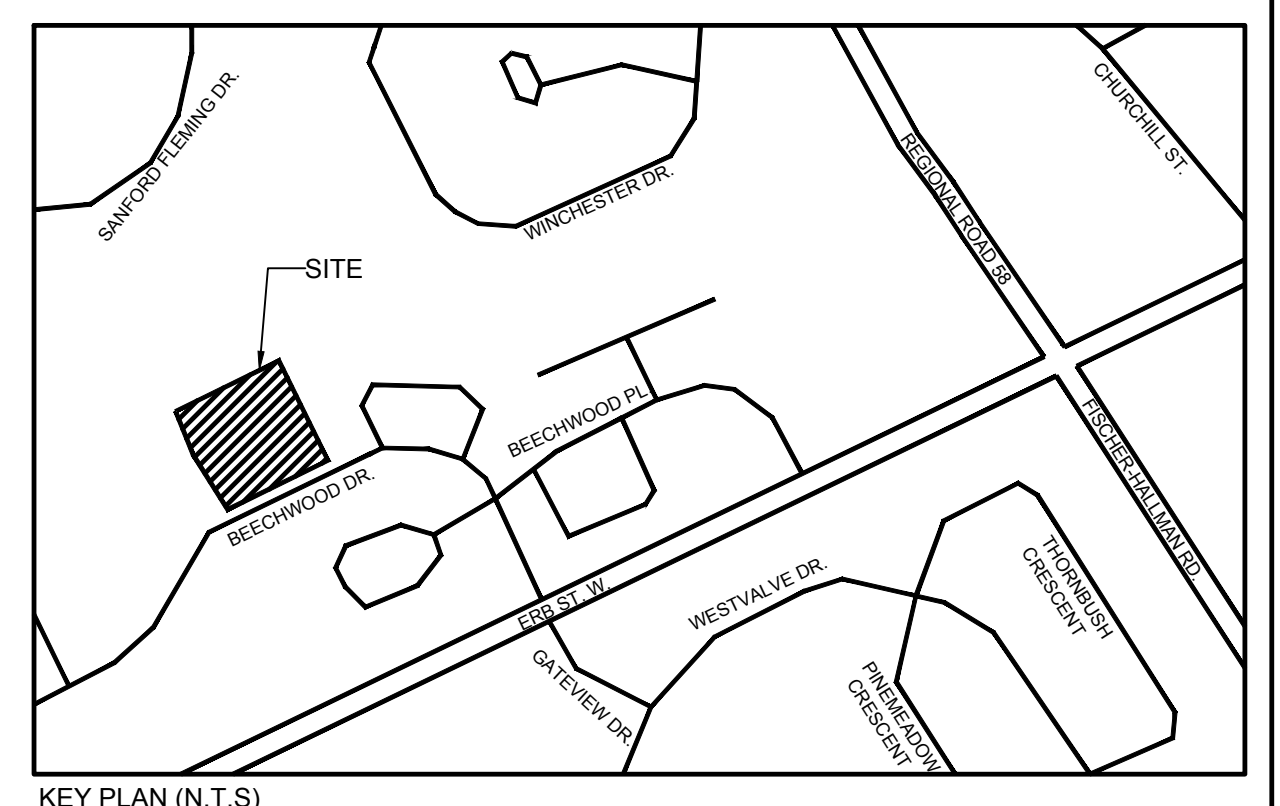
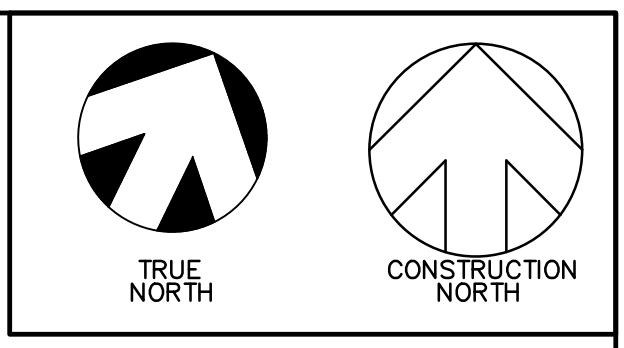
508 BEECHWOOD DRIVE

EXISTING CONDITIONS

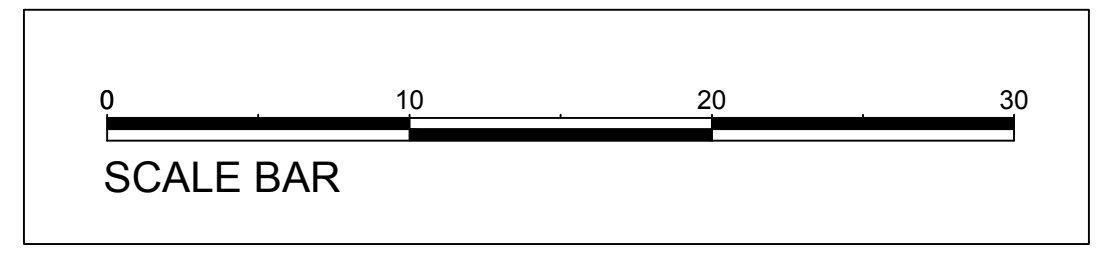
WATERLOO, ON

JOB # 17015

DATE: NOV. 23, 2017
SCALE 1:250 (24x36)



LEGEND	
SYMBOL	DESCRIPTION
	PROPOSED SANITARY MANHOLE
	PROPOSED FIRE HYDRANT
	EXISTING SANITARY MANHOLE
	EXISTING FIRE HYDRANT
	PROPOSED WATER MAIN PIPE
	PROPOSED SANITARY PIPE
	EXISTING WATER MAIN PIPE
	EXISTING SANITARY PIPE
	VALVE AND BOX

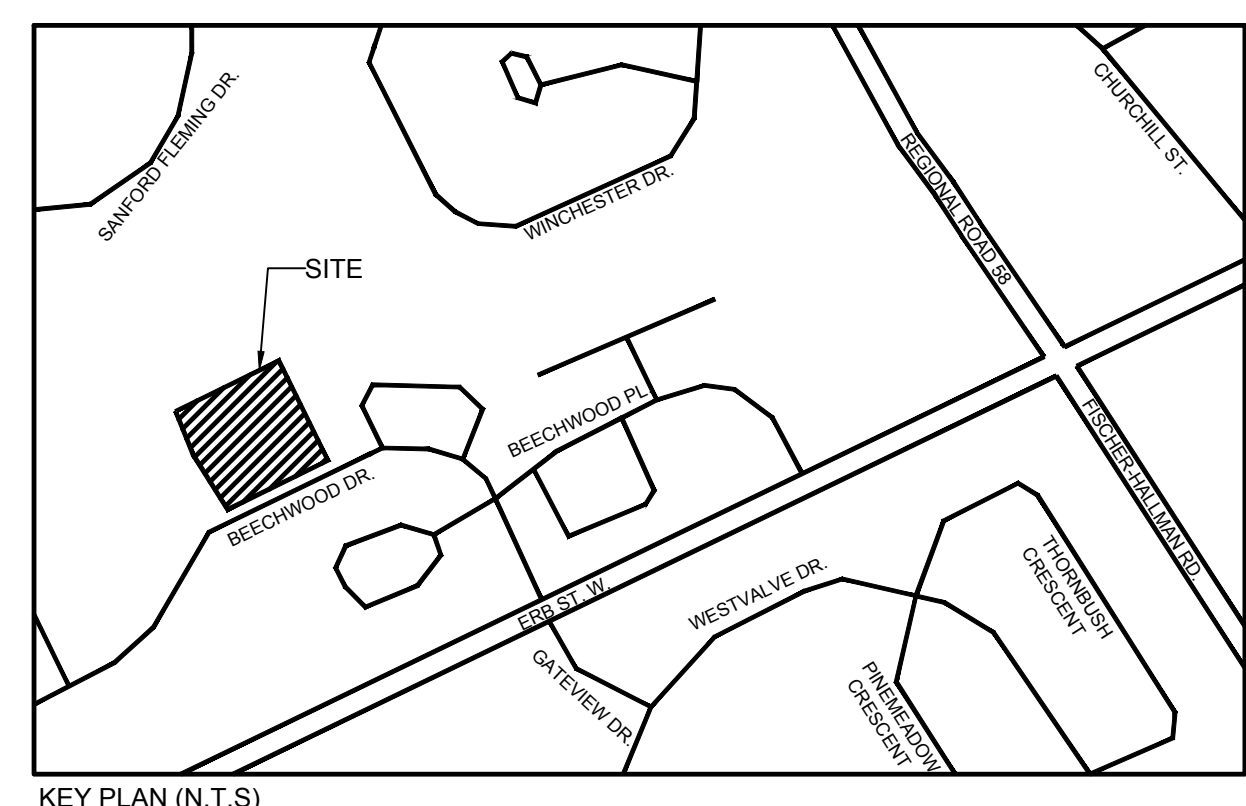
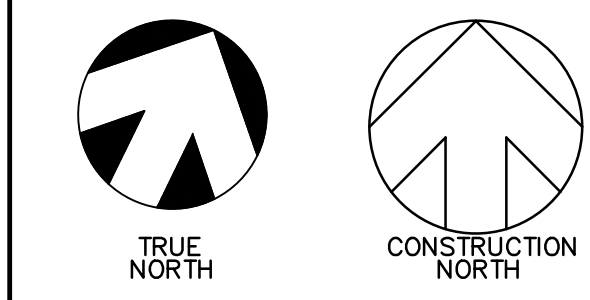


508 BEECHWOOD DRIVE

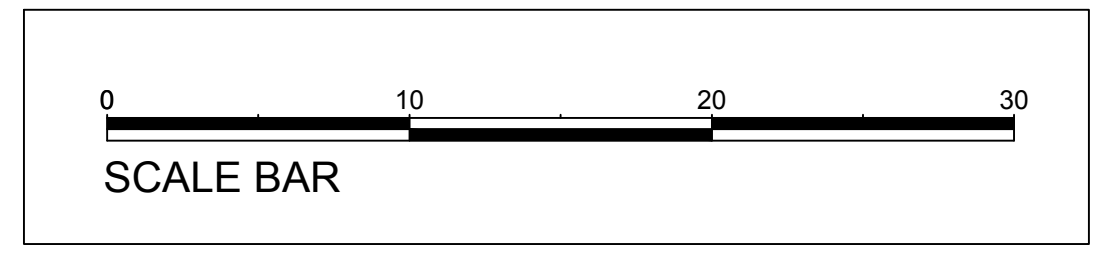
SITE SERVICING PLAN



C02



LEGEND	
SYMBOL	DESCRIPTION
	PROPOSED STORM WATER MANHOLE
	PROPOSED CATCH BASIN MANHOLE
	PROPOSED CATCH BASIN
	PROPOSED OIL GRIT SEPARATOR
	EXISTING STORM WATER MANHOLE
	EXISTING CATCH BASIN
	PROPOSED SANITARY PIPE
	EXISTING SANITARY PIPE



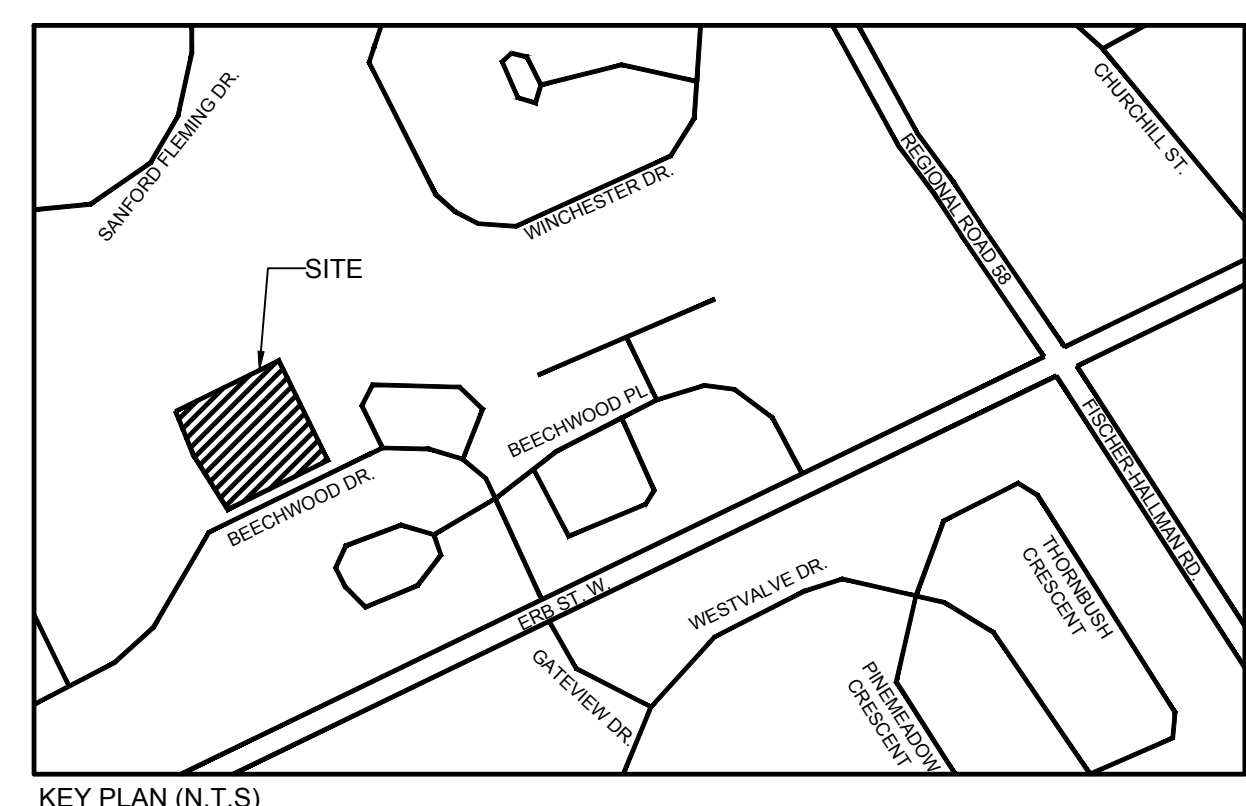
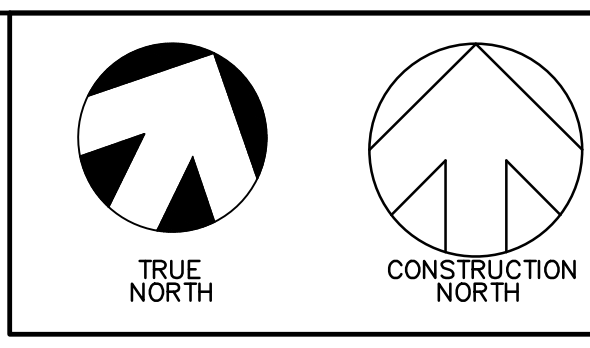
C03

508 BEECHWOOD DRIVE

STORM DRAINAGE PLAN

WATERLOO, ON JOB # 17015

DATE: NOV. 23, 2017
SCALE 1:250 (24x36)



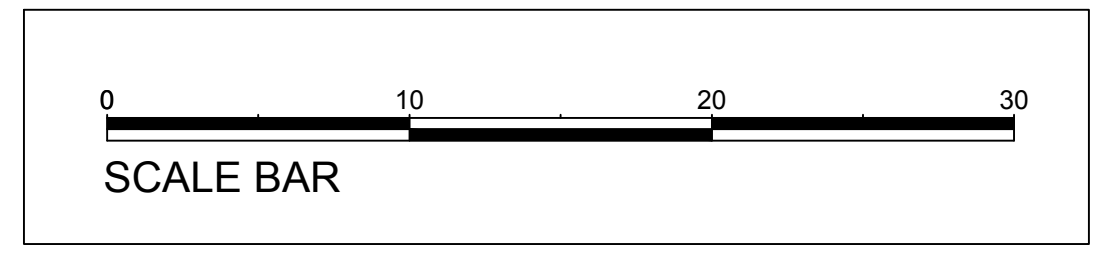
LEGEND	
SYMBOL	DESCRIPTION
	PROPOSED STORM WATER MANHOLE
	PROPOSED CATCH BASIN MANHOLE
	PROPOSED CATCH BASIN
	PROPOSED OIL GRIT SEPARATOR
	PROPOSED SANITARY MANHOLE
	PROPOSED FIRE HYDRANT
	EXISTING MANHOLE
	EXISTING FIRE HYDRANT
	EXISTING CATCH BASIN
	EXISTING ELEVATION
	TOP OF PAVEMENT/ CONCRETE ELEVATION
	GRADING SLOPE AND DIRECTION
	BUILDING ENTRANCE

508 BEECHWOOD DRIVE

SITE GRADING PLAN

WATERLOO, ON JOB # 17015

DATE: NOV. 23, 2017
SCALE 1:250 (24x36)



C04