
FUNCTIONAL SERVICING REPORT

COOK GROUP

GATEWAY EMPLOYMENT LANDS - 730 KING STREET NORTH,
58 REGIONAL ROAD 15, AND 985 BRIDGE STREET WEST,
TOWNSHIP OF WOOLWICH

Project No.: 2025-0494-10

January 30, 2026

WALTERFEDY

DISCLAIMER AND LIMITATION OF LIABILITY

This document was prepared by WalterFedy for **Cook Group** ("Client") for the specific purpose and use by the client, as described in the report and subsequent scope of work agreement. This report was completed based on the information that was available at the time of the report preparation and completion, and is subject to all limitations, assumptions and qualifications contained herein. Any events or circumstances that have occurred since the date on which the report was prepared, are the responsibility of the client, and WalterFedy accepts no responsibility to update the report to reflect these changes.

WalterFedy agrees that this report represents its professional judgement and any estimates or opinions regarding probable costs, schedules, or technical estimates provided represent the professional judgement in light of WalterFedy's experience as well as the information available at the time of report preparation. In addition, WalterFedy accepts no responsibilities for changes in market or economic conditions, price fluctuations for labour and material costs, and therefore makes no representations, guarantees or warranties for the estimates in this report. Persons relying on such estimates or opinions do so at their own risk. WalterFedy agrees with the Client that it will provide under this Agreement the standards of care, skill and diligence normally provided in the performance of services in respect of work similar to that contemplated by this Agreement.

This report may not be disclosed or referred to in any public document without the prior formal written consent of WalterFedy. Any use which a third party makes of the report is at the sole responsibility and risk of the third party.

ISSUANCE AND REVISION RECORD					
REV	DATE	WRITTEN BY	QA BY	SEALED BY	ISSUED FOR
1	21 Jan 2026	ZS/DF	RB		Owner Review
2	30 Jan 2026	ZS/DF	RB	DF/JO/ZS	Final Submission



**Dan Ferguson, MBA,
P.Eng., PMP**
Director, Civil
Partner

dferguson@walterfedy.com
519.576.2150 Ext.260



John Oreskovic, P.Eng.
Senior Water Resources
Engineer

joreskovic@walterfedy.com
289.799.3547 Ext.364



Zack Schnurr, P.Eng.
Project Engineer

zschnurr@walterfedy.com
519.576.2150 Ext.329

Kwun Yuen Pang
Water Resources
Engineering Intern

kpang@walterfedy.com
519.576.2150 Ext.382

COOK GROUP

FUNCTIONAL SERVICING AND STORMWATER MANAGEMENT REPORT

Gateway Employment Lands - 730 King Street North, 58 Regional Road 15, and 985 Bridge Street West, Township of Woolwich

Table of Contents

	Page
1.0 INTRODUCTION.....	1
1.1 Background.....	1
1.2 Proposed Conceptual Plans	1
1.3 Reference Reports and Drawings	2
2.0 EXISTING INFORMATION.....	3
2.1 Topography and Land Use.....	3
2.2 Geological and Hydrogeological Conditions.....	3
2.3 Traffic Impact Study	5
2.4 Environmental Impact Study.....	5
2.5 Archaeological Assessment Report	5
2.6 Servicing.....	5
3.0 REVIEW AGENCIES.....	7
3.1 Township of Woolwich	7
3.2 City of Waterloo.....	8
3.3 Region of Waterloo.....	8
3.4 Grand River Conservation Authority.....	8
3.5 Ministry of Environment, Conservation, and Parks.....	8
3.6 Ministry of Transportation	8
4.0 PROPOSED DEVELOPMENT.....	8
5.0 SOURCE WATER PROTECTION	9
6.0 SANITARY SERVICING	10
6.1 Design Criteria	10
6.2 Sanitary Demands	10
6.3 Local Sanitary Capacity Assessment	10
6.4 Proposed Sanitary Pump Station	11
6.5 Sanitary Sewer Hydraulic Modelling	11
7.0 WATER SERVICING	12
7.1 Design Criteria	12

7.2	Domestic Demand	12
7.3	Fire Flow Demand.....	13
7.4	Service Design and Modelling Results	13
7.5	Region of Waterloo Water Capacity	15
8.0	STORM SERVICING	15
8.1	Stormwater Management Design	15
8.2	Stormwater Management Design Criteria	15
9.0	GRADING	15
9.1	Compliance with On-Site and Excess Soil Management Provincial Regulations	16
10.0	EROSION AND SEDIMENT CONTROL	16
10.1	Preliminary Erosion and Sediment Control Plan	16
11.0	CONCLUSIONS	17

FIGURES

APPENDICES

Appendix A	Concept Plan 2 and GRCA Mapping
Appendix B	Sanitary Design Sheet and Modelling
Appendix C	Domestic Demand and FUS Fire Flow Calculations
Appendix D	Storm Servicing Design
Appendix E	Drawings

1.0 INTRODUCTION

WalterFedy was retained by a local landowner group, referred to as the “Cook Group”, to provide civil engineering consulting services in support of an Official Plan Amendment for three contiguous parcels of land located at 730 King Street North (Part 1), 58 Regional Road 15 (Part 2), and 985 Bridge Street West (Part 3), in the Township of Woolwich (hereafter referred to as the Subject Lands). Refer to Figure 1.0 for the location of the Subject Lands.

The purpose of this report is to provide a preliminary overview of how the development can be serviced and identify connections to existing municipal infrastructure. The report presents a discussion of the existing boundary servicing conditions, the capacity of the municipal systems, and identifies how the development can be accommodated with storm and sanitary sewers and watermain. Preliminary sanitary, storm sewer, and watermain sizing are presented to demonstrate compliance with the Township of Woolwich and City of Waterloo Design Criteria. Design of the stormwater management system for the development has been included under separate cover.

1.1 Background

The 43.47 ha Subject Lands (also referred to as the Gateway Employment Lands) are in the Township of Woolwich along its southern border with the City of Waterloo. The lands are bound by Bridge Street West to the south, Regional Road 15/Martin Grove Road and King Street North to the west, Martin Creek and existing agricultural lands to the north, and an aggregate pit to the east. A portion of the lands on 985 Bridge Street West are within a Grand River Conservation Authority (GRCA) regulated area, floodplain, and contain an existing wetland; mapping is available in Appendix A. Refer to drawing C100 for the Existing Conditions Plan.

1.2 Proposed Conceptual Plans

The Gateway Employment Lands are envisioned to provide a mix of prestige employment uses and flexibility for large and smaller blocks of land for future employment uses. The employment uses are planned to be high-value, sustainably built, large-scale users to provide a significant number of jobs in this gateway location to Woolwich and Waterloo. Input from pre-application meetings and initial findings/recommendations from technical reports have led to an updated development concept for the Subject Lands.

The updated concept plan, referred to as Concept Plan 2, was prepared by MHBC and can be found in Appendix A. The concept plan proposes four industrial blocks ranging in size from approximately 3.09 ha to 14.2 ha, a 4.02 ha stormwater management (SWM) and pump station block, an approximately 4.60 ha open space block (adjacent Martin Creek), and an approximately 0.53 ha park block.

Concept Plan 2 includes an internal road network, complete with two connections to Bridge Street West, one connection to Regional Road 15/ Martin Grove Road, and a direct connection to the Highway 85/ King Street North interchange. A realignment of Bridge Street West (proposed Street ‘A’) is proposed to align with the interchange. A link to allow for continued horse and buggy movement on Bridge Street West from Martin’s Mennonite Church is also proposed.

For the purposes of this submission, a pump station has been illustrated to collect and convey sanitary drainage from the entirety of the development. Two alternative sanitary servicing options have been studied independently and were found to be feasible. These options are a full gravity sanitary sewer approach draining to Bridge Street West, and a pumping station designed to accommodate lands immediately west and east of the Subject Lands. The ultimate servicing strategy will be further refined through subsequent development approval stages.

1.3 Reference Reports and Drawings

The following reports and drawings were referenced in the preparation of this Functional Servicing Report:

1. Stormwater Management Report, by WalterFedy, dated January 30, 2026
2. Hydraulic/Hydraulic Modeling Floodplain Analysis Report, by WalterFedy, dated January 30, 2026
3. Fluvial Geomorphological and Meander Belt Width Assessment Report, by Water's Edge, dated September 5, 2025
4. Geological, Hydrogeological and Geotechnical Assessment Report, by GHD, dated January 30, 2026
5. Hydrogeological Assessment Memo, by GHD, dated January 30, 2026
6. Environmental Impact Study, by GHD, dated January 30, 2026
7. Dry Utility Service Availability Report, by GHD, dated January 2026
8. City of Waterloo Cross-Border Servicing Agreement Supporting Letter, by Mr. Tim Anderson, P.Eng., dated November 27, 2024.
9. Stage 2 Archaeological Assessment Report, by Irvine Heritage Inc., dated September 19, 2024.
10. Legal and Topographic Survey, by GHD, dated November 9, 2023.
11. Topographic Survey, by WalterFedy, dated November 4 & 7, 2025.
12. Concept Plan 2, by MHBC, dated January 22, 2026.
13. Traffic Impact Study and Feasibility Study Report, by GHD, January 30, 2026.
14. Northland Business Park Phase IV Sewage Pumping Station Design Brief and Supporting Drawings, by Paragon Engineering Limited Consulting Engineers, dated July 17, 1997.
15. G.C.T. Atlas Sanitary Layout Drawings, by the City of Waterloo, dated July 2, 2025.
16. G.C.T. Atlas Watermain Layout Drawings, by the City of Waterloo, dated February 21, 2024.
17. G.C.T. Atlas Storm Layout Drawings, by the City of Waterloo, dated July 2, 2025.
18. Engineering Development and Infrastructure Manual, by the Township of Woolwich, dated March 28, 2022.
19. Memorandum – Internal Gateway Employment Lands, by the City of Waterloo, dated September 19, 2025
20. Comprehensive Engineering and Landscape Manual, by the City of Waterloo, dated May 2024.
21. Design Guidelines and Supplemental Specifications for Municipal Services (DGSSMS), by the Region of Waterloo and Area Municipalities, dated January 2025.
22. Waterloo Sanitary Master Plan City of Waterloo Sanitary Master Plan Update, by Stantec Consulting Ltd., dated September 30, 2024.

23. Stormwater Management Planning and Design Manual, by the Ministry of the Environment, Conservation and Parks (MECP), dated November 2023.
24. Design Guidelines for Drinking Water Systems, by the Ministry of the Environment, Conservation and Parks (MECP), dated May 2023.

2.0 EXISTING INFORMATION

2.1 Topography and Land Use

The Subject Lands contain a residential home on the 730 King Street North parcel (which will be demolished as part of the development), while the remainder of the lands have been historically used for agriculture. It is understood that a portion of the Subject Lands on 985 Bridge Street West contain an authorized aggregate pit (ALPS ID: 5722). Legal and Topographic information was obtained from a plan prepared by GHD in November 2023. In 2025, WalterFedy undertook supplemental topographic survey work to verify datum of the GHD survey, and to obtain detailed creek cross-sections of Martin Creek to support hydraulic modeling of the watercourse.

The lands are bound by Bridge Street West to the south, Regional Road 15/ Martin Grove Road, and King Street North to the west, Martin Creek and agricultural lands to the north, and an aggregate pit to the east. A portion of the lands on 985 Bridge Street West are within a Grand River Conservation Authority (GRCA) regulated area, floodplain, and contain an existing wetland.

The topography of the Subject Lands varies from an approximate grade of 339.50 m above mean sea level (AMSL) across Bridge Street West (fronting the Lands) to an elevation of approximately 335.00 +/- m AMSL at the rear of the lands, before sloping towards Martin Creek. The creek flows west-to-east from an elevation of approximately 327.00 +/- m AMSL at Regional Road 15/Martin Grove Road (within the Subject Lands), to an elevation of 325.00 +/- m AMSL just beyond the northeastern property line of the proposed development. The elevation of the Subject Lands at the northeastern property corner is approximately 327.50 m AMSL. Regional Road 15/ Martin Grove Road varies in elevation from approximately 342.00 m AMSL at the intersection with King Street North at the southwestern corner of the Subject Lands, to an elevation of 329.50 m AMSL at the bridge crossing Martin Creek.

An additional topographic survey was completed by WalterFedy on November 4 and 7, 2025. The purpose of this survey was to compare three cross-sections of Martin Creek for use in floodplain modelling, provide vertical surface datum verification from the original drone survey completed, and to survey key storm and watermain infrastructure on Bridge Street West and McMurray Road.

2.2 Geological and Hydrogeological Conditions

A geological, hydrogeological, and geotechnical assessment report for the Site was updated by GHD in January 2026 and has been submitted in a separate report in support of the OPA application for the Subject Lands. The updated report includes the results of a recently completed (October through December 2025) Site-specific hydrogeological investigation. The Site-specific hydrogeological investigation was undertaken concurrently with an investigation to define environmental Site conditions consistent with a Record of Site Condition (RSC) assessment. The recently completed investigation activities are summarized in a hydrogeological assessment memo prepared by GHD in January 2026. This memo is included as an appendix in the updated geological, hydrogeological and geotechnical assessment report.

The geological, hydrogeological and geotechnical assessment report provided the following observations and opinions with respect to the hydrogeological and geotechnical conditions related to the development at the Subject Lands (Site):

1. The following surficial materials and geologic deposits underlie the Site:
 - Surficial Materials – Topsoil
 - Fill (to a depth of 0.46 to 3.81 mBGS) – Sand, gravel and silt – Southern portion of the Site where the sand and gravel was extracted from the gravel pit
 - Glaciofluvial Deposits – Sand and gravel to fine grained sand and silt
 - Silty Clay Mixture – Fine grained silty clay to lean clay
 - Till – Sand, gravel, silt
2. The groundwater table was observed at depths ranging from 1.77 to 5.28 mBGS, with groundwater elevations ranging from 326.48 to 335.30 mAMSL. Most of the development zone has groundwater elevations ranging between 4 and 5 m BGS. Groundwater at the Site is interpreted to flow in a predominantly northward direction toward Martin Creek. Martin Creek flows west to east.
3. Building Foundations:
 - The generally compact to dense or stiff to hard native soils and deep groundwater levels are suitable for slab-on-grade or conventional shallow foundation with footings.
 - No perched groundwater conditions were observed in the fill within Part 3 of the Site and the fill is relatively shallow (2 to 3 m). Conventional footings can be founded on the underlying compact to dense or stiff to hard native soils. If dewatering is required, groundwater seepage can be managed during construction, using typical construction dewatering techniques such as gravity drainage and pumping from open sumps with filtration with appropriate sampling, treatment, and approvals, as required.
 - A full basement level with conventional footings can be placed on native soils. A basement floor is expected to approach the seasonal high-water levels. Seasonal water level monitoring across the Site will determine the feasibility for a basement level and/or dewatering requirements.
4. If thick layers of fill in Part 3 of the Site or soft surficial material is encountered at the surface, or heavily loaded structures are proposed, alternative foundation options, such as deep compaction before construction, or deep foundations, may be required and are feasible at the Site.
5. The Site is suitable for installation of below ground services (e.g., storm and sanitary sewers) to support the development of the Gateway Employment Lands.
6. The existing clean fill materials on Part 3 of the Site and any remaining unmined sand and gravel from the gravel pit, or other areas of the Site, are anticipated to be suitable for re-use on Site as grading or backfill material (e.g., to support roads and landscaping) provided it is free of organic material.

Hydrogeological and geotechnical challenges with the development of the Site are expected to be minimal and Site conditions are suitable for development and construction of the Gateway Employment Lands.

It is recommended that long-term water level monitoring (e.g., two years of quarterly monitoring) be completed at the Site, as recommended by the Township of Woolwich, to better define hydrogeologic and conditions as they relate to proposed development of the Site. Additionally, in-situ infiltration tests may be required for low impact design requirements on a lot-specific basis, if required.

It is also recommended that additional geotechnical investigation be conducted once preliminary Site plans are finalized, addressing any existing data gaps and providing further geotechnical design recommendations tailored to the proposed development, as required.

2.3 Traffic Impact Study

GHD completed a Traffic Impact Study and Feasibility Study Report (TIS/FSR) of the Subject Lands in January 2026. The report concluded that the proposed access road at the Highway 85 ramp terminal (within Ministry of Transportation [MTO] jurisdiction) is feasible from safety, design, and operational perspectives. The internal roadways of the proposed concept have been developed to address the expected operational and geometric constraints adjacent the Highway 85 interchange. The TIS/FSR also concluded that the access road does not inhibit the ability of the ramp terminal to accommodate long-term corridor growth or future traffic demand and can be implemented without adverse impacts to current ramp terminal operations.

2.4 Environmental Impact Study

An Environmental Impact Study (EIS) was completed by GHD in January 2026. GHD has concluded that the proposed development will not impact any Species at Risk and has delineated the limits of a previously-unevaluated wetland within the northwestern corner of the property with the GRCA on August 27, 2025. A 15 m buffer is proposed surrounding the wetland and will be maintained through development. The EIS also notes that Martin Creek is located within the northern portion of the Subject Lands, and that no permanent impacts to the wetland or creek are anticipated.

Finally, GHD notes that, as the development concept progresses, further consultation with the GRCA and the Township is recommended. Section 7 of the report provides an impact assessment and mitigation measures which include, but are not limited to: a 15 m protective buffer from the delineated wetland limits, installation and maintenance of heavy-duty ESC measures, off-site or dedicated vehicle fueling/storage/maintenance areas, wildlife exclusionary fencing, stockpiling a minimum of 30 m from any waterbody, etc. See Section 7 of the EIS for the full list of mitigation measures. If the measures are maintained, "it is GHD's opinion that the proposed development will not result in notable impacts to the natural environment, including associated species, features, or functions."

2.5 Archaeological Assessment Report

A Stage 2 Archaeological Assessment has recently been completed on the Subject Lands. The Stage 2 Archaeological Assessment was completed by Irvin Heritage Inc. and submitted to the Ministry of Citizenship and Multiculturalism in September 2024. The assessment report recommended the Subject Lands have been sufficiently assessed and are free of further archaeological concern. In a letter dated February 2025, the Ministry acknowledged receipt of the assessment and were satisfied that the fieldwork and reporting for the archaeological assessment are consistent with the Ministry's 2011 Standards and Guidelines for Consultant Archaeologists and the terms and conditions for archaeological licences. The Ministry has entered the assessment report into the Ontario Public Register of Archaeological Reports.

2.6 Servicing

The information contained in the following subsections was compiled based on G.C.T. Atlas Layout Drawings provided by the City of Waterloo, the Dry Utility Service Availability Assessment Report prepared by GHD in January 2026, and the Northland Business Park Phase IV Sewage Pumping Station Design Brief and Supporting Drawings prepared by Paragon Engineering Limited Consulting Engineers in July 1987. The G.C.T. Atlas Layout drawings can be found in Appendix B (sanitary), Appendix C (water), and Appendix D (storm), respectively.

2.6.1 Sanitary Servicing

There is no sanitary infrastructure fronting the development on Bridge Street West, Regional Road 15/ Martin Grove Road, or King Street North. It is understood that servicing of the Subject Lands would depend upon approval of a Cross-Border Servicing Agreement between the Township of Woolwich and City of Waterloo. Per

a letter prepared by Mr. Tim Anderson, P. Eng., the Chief Administrative Officer (CAO) of the City of Waterloo (found in Appendix B), the City is supportive, in principle, of this development and the proposed cross boundary servicing scheme, provided the land use remains as Employment.

To the east of the Subject Lands, there is a 200-mm-diameter sanitary sewer on McMurray Road in the City of Waterloo, flowing north-to-south. The sewer upsizes to 300-mm-diameter at the intersection of McMurray Road and Bathurst Drive, and 525-mm-diameter (noted as 500 mm on the G.C.T Atlas drawings) at the intersection of McMurray Road and Northland Road. Based on the inverts of this sewer, a gravity connection is feasible but requires significant filling ($\sim 700,000 \text{ m}^3$) of the Subject Lands to provide sufficient cover over the sewer network. A forcemain connection for all or a portion of the Subject Lands is also possible and would reduce the amount of fill necessary to provide the required depth of cover for the sanitary network.

Further east of the Subject Lands, there is a 200-mm-diameter sanitary sewer on Bridge Street West, servicing the property at 815 Bridge Street West. This sewer is located within a separate catchment area, which drains southeast to the intersection of Bridge Street West and University Avenue East, before draining east into the Frobisher Pumping Station. Details of the Frobisher Pumping Station are summarized below.

Details on the Frobisher Pumping Station are provided in the Northland Business Park Phase IV Sewage Pumping Station Design Brief prepared by Paragon Engineering Limited Consulting Engineers in July 1997. This report can be found in Appendix B. It's understood that the pump station was developed in support of the Pillers warehouse located at 250 Frobisher Drive, as well as the full buildout of the Northland Business Park.

The Frobisher Pumping Station was designed to collect flows from a 30.81 ha catchment area, which includes the Pillers facility (7.47 ha), additional industrial lands (11.24 ha), Waterloo North Hydro Lands (9.10 ha), and road rights-of-way (3.00 ha, infiltration only). Figure 1 in the Paragon report best illustrates this catchment area. A flow rate of 9.858 L/s was applied for the Pillers facility, while an industrial flow rate of 0.46 L/s/ha and an infiltration flow rate of 0.15 L/s/ha were used to determine an overall design peak flow of 39.50 L/s. Section 6.5 provides more details on the preferred sanitary routing and modelling for the Subject Lands.

2.6.2 Water Servicing

There is no watermain infrastructure fronting the development on Bridge Street West, Regional Road 15/Martin Grove Road, or King Street North. Based on pre-application comments from the Township of Woolwich and Region of Waterloo, it is understood that two watermain feeds are required to service the development.

Based on G.C.T. Atlas Layout Drawings provided by the City of Waterloo (found in Appendix C), the watermain infrastructure surrounding the Subject Lands is as follows:

- A 300-mm-diameter looped watermain at the intersection of King Street North, Northland Road, and Wyman Road, southwest of the Subject Lands. A 300-mm-diameter stub extends north on King Street North.
 - It is understood that the Region of Waterloo plans to resurface this portion of King Street North in the future (timing is unknown at this time). Any upgrade of below-grade infrastructure would be led by the City of Waterloo, either in conjunction with Regional resurfacing or independently.
- A 300-mm-diameter dead-end watermain on the western side of McMurray Road, extending to the intersection of Bridge Street West and McMurray Road.
- A 300-mm-diameter PVC watermain on the southern side of Rankin Road south of the Subject Lands, with looping on Rupert Street, and dead-ending within the Rankin Street cul-de-sac.
- A 300-mm-diameter dead-end watermain on Bridge Street West, just west of the intersection with University Avenue East. The watermain extends to service a hydrant and provide a service to 815 Bridge Street West.

There are multiple options to provide two watermain feeds to the Subject Lands based on existing infrastructure. Three hydrant flow tests were requested to better understand available flow and pressure surrounding the Subject Lands. The results of these tests are discussed in Section 7.4. Supporting water modelling simulations from the Region of Waterloo have also been requested to better understand available flow and pressure to accommodate the development, however, have not been received at this time.

2.6.3 Storm Servicing and Drainage

The site grading slopes towards the north into Martin Creek and does not connect to the City of Waterloo's stormwater system located on Bridge Street West along the southern property line of the Subject Lands. This storm sewer system conveys drainage eastwards via a 525-mm-diameter storm sewer to McMurray Road, where it is then conveyed southwards, into a SWM pond located near the intersection of McMurray Road and Bathurst Drive. The SWM pond outlets to Martin Creek before ultimately discharging to the Conestogo River.

Martin Creek is classified as a warmwater watercourse, and the regulatory floodplain encroaches slightly onto the Subject Lands' northern boundary. A portion of the Subject Lands falls within a Significant Groundwater Recharge Area and Wellhead Protection Area - Quantity 1 and 2 (Q1 and Q2). This will be further described in Section 5.0 below.

As mentioned, G.C.T. Atlas Layout drawings for the storm sewer system in the surrounding area of the Subject Lands can be found in Appendix D.

2.6.4 Other Utilities

Information on utilities surrounding the Subject Lands was obtained via the Utility Service Availability Assessment Report prepared by GHD in January 2026.

There are 50-mm-diameter Enbridge gas mains on both Regional Road 15/Martin Grove Road and along King Street North. For an estimated demand up to 100M BTU/hour, it is understood that an approximately 450-m-long gas main extension from the Bridge Street West creek crossing would be required to service the development via the southeastern corner.

The Subject Lands are serviceable by Enova Power Corp. which has pole lines with 27.6 kV feeder circuits along both Bridge Street West and King Street North, one of which extends approximately 150 m along Regional Road 15/Martin Grove Road. Based on the estimated full development buildout demand of 22 MVA, Enova advised their feeders have limited spare capacity, which could be sufficient only for the initial servicing of the Subject Lands. Further consultation with Enova will be required during the detailed design stage.

Finally, Rogers Communications has confirmed the presence of fibre lines along King Street North and Regional Road 15/ Martin Grove Road (along with coaxial cables adjacent the emergency access on Martin Grove Road). Bell Canada fibre infrastructure is located at King Street North and Northland Road; however, there is a Bell Canada manhole system which extends along King Street North to Bridge Street West. Therefore, approximately 950 m of additional fibre would need to be pulled through this system to service the development (assuming capacity in existing ducts).

3.0 REVIEW AGENCIES

3.1 Township of Woolwich

The Township of Woolwich will be responsible for the review and approval of the Official Plan Amendment, as well as detailed grading, servicing, and SWM designs and reports (through an external peer review consultant) for the overall development. This will include the issuance of the necessary CLI-ECA approvals for the proposed SWM ponds.

3.2 City of Waterloo

The City of Waterloo will be responsible for the review and approval of the sanitary and water servicing design, as specified in the cross-border servicing agreement (CBSA). This will include the issuance of the necessary CLI-ECA approvals for the proposed sanitary and water servicing works.

3.3 Region of Waterloo

The Region of Waterloo will be circulated by the Township as a commenting agency on this development application. The Region of Waterloo's primary review focus will be on the TIS.

3.4 Grand River Conservation Authority

The lands located at 985 Bridge Street West are partially within the GRCA's regulated area and floodplain. A wetland is also located on a portion of the lands. As such, the GRCA will act as a commenting and permitting agency on this development application to ensure that the development proposed aligns with watershed management and natural hazard protections.

3.5 Ministry of Environment, Conservation, and Parks

The MECP is no longer involved in the Environmental Compliance Approval (ECA) process. As mentioned, both the Township of Woolwich and the City of Waterloo are in possession of a CLI-ECA.

3.6 Ministry of Transportation

A portion of the Subject Lands falls within the Ministry of Transportation (MTO)'s Permit Control Area. MTO Permits will be required prior to the commencement of any demolition, grading, construction, or site alteration works.

4.0 PROPOSED DEVELOPMENT

The updated concept plan, Concept Plan 2, was prepared by MHBC and can be found in Appendix A. Concept Plan 2 proposes four industrial blocks ranging in size from approximately 3.09 ha to 14.2 ha, a 4.02 ha SWM and pump station block, an approximately 4.60 ha open space block (adjacent Martin Creek), and an approximately 0.53 ha park block.

Concept Plan 2 includes an internal road network, complete with two connections to Bridge Street West, one connection to Regional Road 15/ Martin Grove Road, and a direct connection to the Highway 85/ King Street North interchange. A realignment of Bridge Street West (proposed Street 'A') is proposed to align with the interchange. A link to allow for continued horse and buggy movement on Bridge Street West from Martin's Mennonite Church is also proposed. It is proposed that the Subject Lands will expand the Township of Woolwich's current Settlement Area Boundary to include the lands for designation as "Urban Employment Area" in the Township's Official Plan.

For the purposes of this report, preliminary sizing of the sanitary and storm sewers and watermain are presented to demonstrate compliance with the Township of Woolwich/City of Waterloo Design Criteria. A pump station has been illustrated to collect and convey sanitary drainage from the entirety of the development at this time. Independently, a full gravity sanitary sewer approach, as well as a hybrid gravity sewer and partial pumping station approach have been studied to confirm alternative servicing options are available. Table 1 below summarizes the proposed areas for each block of the Concept.

Table 1 – Subject Lands Block Area Summary

Block Number	Area (ha)	Proposed Use
Block 1	3.09	Industrial
Block 2	14.16	Industrial
Block 3	6.26	Industrial
Block 4	7.12	Industrial
Block 5	4.02	Stormwater Management
Block 6	4.60	Open Space
Block 7	0.53	Park
TOTAL	39.78	-

The total area of all blocks in the Concept is approximately 39.78 ha, not including proposed roadways.

Given the scale of the development, it is expected that construction will occur over multiple phases. Exact phasing is unknown at this time, but it is expected that phasing will be strategically coordinated to align with market demand, municipal approvals, and optimized for on-site and off-site servicing construction.

5.0 SOURCE WATER PROTECTION

According to the Province of Ontario's Source Protection Information Atlas, the Subject Lands are part of a Significant Groundwater Recharge Area; however, the score is noted as N/A. The Subject Lands are not located within any water quality-related source protection zone or water quantity-related source protection area. Table 2 provides the source protection details for the Subject Lands.

Table 2 - Source Protection Details

Source Protection Area	Grand River
Water Quality	
Wellhead Protection Area	No
Wellhead Protection Area E (WHPA-E):	No
Issue Contributing Area:	No
Significant Groundwater Recharge Area:	Yes; score of N/A
Highly Vulnerable Aquifer:	No
Event Based Area:	No
Water Quantity	
Wellhead Protection Area Q1:	Yes, Low Stress
Wellhead Protection Area Q2:	Yes, Low Stress
Intake Protection Zone Q:	No

A water balance analysis will be completed to determine the impact of development. Further consultation will be required with the GRCA to confirm if there are any further requirements, given the score of N/A. The full Source Protection Plan should be referenced for detailed requirements.

Additionally, an EIS was completed by GHD for the wetlands associated with Martin Creek. The GRCA attended a Site Walk with GHD staff on August 27, 2025, to confirm the wetland boundary. In November 2025, a hydraulic analysis was completed by WalterFedy to determine the flood hazard extents on the Subject Lands, and in September 2025, a geomorphological assessment was completed by Water's Edge to establish the erosion hazard associated with the Martin Creek system. Both of these assessments are provided under separate cover.

6.0 SANITARY SERVICING

6.1 Design Criteria

In accordance with the City of Waterloo's *Comprehensive Engineering and Landscape Manual* and the DGSSMS 2025, the sanitary flows from the subject development were calculated based on flows for industrial lands as further detailed below:

- An average daily flow of 0.20-0.64 L/s/ha. 0.40 L/s/ha was chosen given the actual tenants and industrial use(s) within the Subject Lands are not currently known. Pre-application comments from the City of Waterloo Development Planning discourages heavy water users on the Lands as well;
- Peaking using a factor of 2.0 and 4.0. 3.0 was chosen as an average; and
- An infiltration allowance of 0.25 L/s/ha was applied based on the extraneous site area.

6.2 Sanitary Demands

The sanitary demands for the subdivision were calculated on a block-by-block basis, with the overall site area applied accordingly to calculate extraneous flows (with the exception of the stormwater management and open space blocks, which, topographically, would not have any infiltration potential). Refer to Table 3 below for the proposed sanitary demands by block for the proposed concept. The block areas were obtained from Table 1 above.

Table 3 – Proposed Peak Sanitary Flow

Block Number	Area (ha)	Average Sanitary Flow (L/s/ha)	Peaking Factor (-)	Peak Dry-Weather Sanitary Demand (L/s)
Block 1	3.09	0.40	3	3.71
Block 2	14.16	0.40	3	16.99
Block 3	6.28	0.40	3	7.54
Block 4	7.12	0.40	3	8.54
Industrial Sanitary Peak Demand (Dry-Weather)				36.78 L/s
Extraneous Site Area (not including Blocks 5 and 6)				38.84 ha
Extraneous Flow Allowance				0.25 L/s/ha
Extraneous Flow				9.71 L/s
Peak Sanitary Demand				46.49 L/s

While the industrial uses are currently unknown, it is expected that all discharges will meet the requirements of the City of Waterloo's Sanitary and Stormwater Service Bylaw. Please refer to the sanitary design sheet and catchment area plan in Appendix B for detailed calculations.

6.3 Local Sanitary Capacity Assessment

Based on preliminary discussions with the Township of Woolwich, it is proposed that an on-site sanitary pumping station is constructed (likely at the northeastern corner of the Subject Lands), which will pump flows to the sanitary sewer on McMurray Road via a forcemain. The sanitary sewer is a 200-mm-diameter pipe at the intersection with Bridge Street West, upsizing to 300-mm-diameter at the intersection with Bathurst Drive. The connection point of the forcemain would be driven by hydraulic modelling completed by the City of Waterloo, as will be detailed below. Schematically, a connection to the 300-mm-diameter portion of the sewer at the intersection with Bathurst Drive has been shown.

6.4 Proposed Sanitary Pump Station

At this time, a sanitary pump station is contemplated for the development. It will be further evaluated against the other servicing alternatives considered and if selected, the SPS design will be further detailed during the draft plan of subdivision stage, once the final design and layout of the Subject Lands are better understood.

The SPS will be designed to pump flows to the sanitary sewer on McMurray Road (location further clarified below). At this time, a dry-weather flow of 36.78 L/s and a total wastewater flow of 46.49 L/s is anticipated to be pumped.

A wet-well will be designed based on the active depth required for the pumping station and to provide 1-hour of on-site emergency storage per the Township of Woolwich's adopted standards. The depth/layout of the wet-well will be driven by physical constraints such as site area and groundwater, constructability considerations, and agency comments. Buoyancy calculations will be completed during detailed design, and additional measures to secure the SPS will be added (should they be required).

The proposed configuration of the SPS will be two constant-speed, submersible pumps (one duty, one standby) in a single wet-well. The lead and lag configuration of the pumps allows for future flexibility to increase flows to the pump station.

Hydraulic design of the pump intake shall conform to the manufacturer's requirements as well as the American National Standard for Pump Intake Design. In addition to hydraulic considerations, wet well configuration is to be confirmed with the prefabricated system manufacturer and will consider equipment size and maintenance access requirements. Pump hatch size requirements will be coordinated with the SPS manufacturer/supplier.

Discharge piping for the pump station will provide a piping/valve arrangement that will enable the following:

- Connection of a temporary pump to the existing forcemain when fixed pumps are out of service.
- Maintenance personnel to use fixed pumps to fill a truck or pump to a downstream manhole.

An above-grade electrical/control panel located within the building is proposed. It is recommended that the pump station control panel be outfitted with audible and visual alarms and that it be mobile-enabled to notify maintenance staff of a failure. Considerations for emergency backup power will be made through design. The SPS will operate with lead and lag pumps with duty pump rotating to promote even wear on station equipment. Controls will be float based with manual over-rides to accommodate service and maintenance. An emergency overflow will be directed to the SWM pond.

Specific pump and forcemain sizing will be completed during detailed design once the total wastewater flow is better understood.

6.5 Sanitary Sewer Hydraulic Modelling

The City of Waterloo maintains a comprehensive City-wide PCSWMM model that can be used to determine available capacity within the system. A preliminary sanitary flow of 50 L/s was provided to the City for modelling purposes; results of the modelling were provided within a memo, which can be found in Appendix B. The City of Waterloo completed sanitary modelling simulating a 2051 wet-weather conditions scenario. A flow rate of 50 L/s was applied to MH LE58-16 (located at the intersection of McMurray Road and Bathurst Drive). The modelling determined the system has the capacity to accommodate the proposed flows, with a maximum depth of 77% full being noted in the downstream system.

The City also completed a similar modelling scenario for the Frobisher Pumping Station. The proposed flow of 50 L/s was added to the “FR-2” flows upstream of the pump station. A maximum depth of 90% full is noted with no surcharging occurring. However, the memo notes that the “Frobisher SPS has an ECA pumping capacity rated at 35 L/s, and a maximum rated pumping capacity of only 60 L/s and is, therefore, not ideally suited for the additional high flows.”

Based on the above, a connection to the McMurray Road sanitary sewer at the intersection of Bathurst Drive has been shown.

The City does not reserve capacity for future development, and capacity allocation is based on a first-come, first-served basis.

7.0 WATER SERVICING

7.1 Design Criteria

The Region of Waterloo requires that watermain distribution systems be able to convey the larger of maximum daily demand and fire flow or the peak hourly demand. Additionally, the Region of Waterloo DGSSMS recommends that the average daily flow from any development be conveyed with a resulting pressure within the range of 350 kPa (50 psi) to 550 kPa (80 psi).

The Region also stipulates that the minimum resultant pressure under any non-fire demand scenario shall not be less than 275 kPa (40 psi). With the inclusion of fire flows, the minimum residual pressure in the distribution system shall not be less than 140 kPa (20 psi) and shall not cause velocities in the system to be greater than 5 m/s.

Should static pressures in the system exceed 550 kPa (80 psi), the Region requires the use of individual pressure-reducing valves for new developments. The distribution system is also required to be designed to ensure that pressures do not exceed 700 kPa (100 psi) at any point in the system.

7.2 Domestic Demand

Calculations of the water demand for the proposed development have been performed using the DGSSMS and Design Guidelines for Drinking-Water Systems.

As the actual use within the buildings was not known at the time of writing, in accordance with the MECP design guidelines, an allowance of 35 m³/(ha.d) was utilized for light industrial uses, with peaking factors of between 2 and 4. A peaking factor of 1.42 was used to convert the average daily demand into a maximum day demand. This peaking factor is in accordance with the Tri-City Water Distribution Masterplan. Similarly, a peaking factor of 3.0 was used as an average peaking factor in accordance with MECP requirements.

Table 4 below summarizes the water demand of each block. Supporting calculations are provided in Appendix C.

Table 4 – Subject Lands Water Demand

Block Number	Block Area (ha)	Demand (m3/ha.day)	Maximum Day Peaking Factor	Peak Hour Peaking Factor	Average Daily Demand (L/s)	Max Daily Demand (L/s)	Peak Hourly Demand (L/s)
Block 1	3.092	35	1.42	3	1.3	1.8	3.8
Block 2	14.161	35	1.42	3	5.7	8.2	17.2
Block 3	6.267	35	1.42	3	2.5	3.6	7.6
Block 4	7.119	35	1.42	3	2.9	4.1	8.7
TOTAL	30.639	-	-	-	12.4	17.7	37.3

The maximum daily demand for the Subject Lands was determined to be 17.7 L/s, while the peak hourly demand was calculated at 37.3 L/s.

7.3 Fire Flow Demand

In addition to the daily domestic demand for the proposed development, fire flow demands were calculated to assess the adequacy of the proposed watermain system. The Region of Waterloo specifies that all fire flow requirements shall be determined in accordance with the current issue of Water Supply for Public Fire Protection published by the Fire Underwriters Survey (FUS), and the Ontario Building Code.

A fire and life safety report was not available for review at the time of writing; however, based on our experience, such buildings are typically classified as non-combustible construction in accordance with the Ontario Building Code.

The *Fire Protection Water Supply Guidelines for Part 3 in the Ontario Building Code* (October 1999) requires that the buildings shall be provided with a supply of water not less than the total volume of the building, multiplied by the water supply coefficient from Table 1 of the technical bulletin, and the spatial coefficient values obtained from Figure 1 of the technical bulletin. Regardless of the size of the building, the maximum fire flow resulting from this methodology is 9,000 L/min, or 150 L/s.

The Region of Waterloo requires that fire flows be calculated based on the latest edition of the FUS report. Appendix C provides the calculations in accordance with the 2020 version of this document.

A FUS calculation was completed for the northernmost building of Block 2 of the development, at the rear of the Subject Lands. The building, as shown schematically, has an area of 35,000 m² and was chosen given it is the largest. Assuming a non-combustible construction type, limited-combustible contents (occupancy charge), automated sprinkler protection, and no exposure charges (>30 m), a fire flow of 233 L/s is noted.

In lieu of detailed information regarding the construction of each block, a conservative fire flow of 233 L/s was assumed to be required for each block based on the above.

7.4 Service Design and Modelling Results

As per the MECP, the water distribution system shall be able to convey the combination of the Maximum Day Demand and the Fire Demand, within the pressure and velocity ranges specified. The total flow that needs to be conveyed to the Subject Lands is 250.7 L/s.

There are several options to provide water servicing to the development; however, it is known that redundancy is required per the aforementioned pre-application comments. Therefore, the following connection locations are proposed:

Firstly, a connection from the proposed Street 'C' to the existing 300-mm-diameter watermain located on McMurray Road is proposed. The existing watermain on McMurray Road dead-ends just south of the intersection. The 300 mm watermain network on McMurray extends down Rankin Street which could provide a second connection to the development. Such a connection would have to be further explored with the City of Waterloo. A second watermain connection from the proposed Street 'A' is suggested to connect to the future watermain extension on King Street North (assumed 300-mm-diameter) via Bridge Street West.

Alternatively, a connection to the Region of Waterloo's transmission main (on the eastern side of Highway 85) could be explored; however, further consultation with the Region is required to understand the feasibility of this option.

Internal to the development, it is proposed that a 300-mm-diameter pipe is carried throughout to provide servicing and a looped connection for all blocks. Further looping could be accommodated if required. Refer to the General Servicing Plan for the system layout.

Spira Fire Protection Ltd. completed fire hydrant flow tests on October 2, 2025, at the following hydrants:

1. At the limits of the watermain on McMurray Road (south of the Subject Lands);
2. At the intersection of King Street North and Northland Road (southwest of the Subject Lands); and
3. At the intersection of Rankin Street and Rupert Street (south of the Subject Lands).

The results of each flow test were plotted on hydraulic graphs (N 1.85 graphs) with the flow on a logarithmic scale with base 1.85 to reflect the relationship between pressure and flow in the Hazen-Williams equation.

Based on the results of the flow tests, it is estimated that:

1. 151 L/s (2400 USgpm) is available at 275 kPa (40 psi) and 236 L/s (3750 USgpm) is available at 140 kPa (20 psi) on McMurray Road;
2. 201 L/s (3200 USgpm) is available at 275 kPa (40 psi) and 362 L/s (5750 USgpm) is available at 140 kPa (20 psi) on King Street North/Northland Road; and
3. 208 L/s (3300 USgpm) is available at 275 kPa (40 psi) and 340 L/s (5400 USgpm) is available at 140 kPa (20 psi) on Rankin Street and Rupert Street.

The flow test results and the N 185 graphs are provided in Appendix C for reference.

At this time, watermain connections are proposed to both McMurray Road and King Street North/Northland Road. Water metering is to be provided at entrances to the development, which will be owned by the City of Waterloo.

Further consultation with the Region of Waterloo will be required to determine if available fire flows can be achieved in current conditions. A modelling request was submitted to the Region of Waterloo in August of 2025. At the time of writing, no formal modelling has been received. If it is deemed through modelling that the 250.7 L/s of maximum required fire flow and concurrent maximum day demand flows across the Subject Lands cannot be achieved, supplemental on-site fire suppression in the form of tanks, ponds, or booster pumps may need to be considered and implemented on a block-by-block basis. It is further recommended that an EPA-NET model is created once modelling simulations are provided by the Region of Waterloo. This will aid in better modelling the effects of the dual watermain services/looping required internally to the Subject Lands.

Individual service connections are to comply with the requirements of the *Safe Drinking Water Act* and the DGSSMS.

7.5 Region of Waterloo Water Capacity

Through ongoing work and updates to the Water Supply Strategy, the Region recently identified a water capacity constraint for the Mannheim Service Area associated with residential development. This service area supplies water to Kitchener, Waterloo, parts of Cambridge, Wilmot, and Woolwich.

While the nature and extent of this constraint is still being evaluated it is anticipated that development approval processes for the Official Plan Amendment may continue to be advanced outside of this issue, and that water capacity will be addressed through the CBSA policy and through any future conditions of approval for a plan of subdivision or site plan carried forward as a condition of approval.

8.0 STORM SERVICING

8.1 Stormwater Management Design

A comprehensive assessment of Stormwater Management is provided under a separate cover. The following section offers a brief summary of key considerations to support the overall understanding of the site's servicing strategy.

8.2 Stormwater Management Design Criteria

The SWM facility has been designed to meet the "Enhanced" protection level (Level 1), targeting 80% removal of total suspended solids (TSS). Pond sizing follows the MECP Stormwater Management Design Manual (2023). A sediment forebay will be incorporated in the full design.

The design includes both a permanent pool and extended detention storage, sized to meet MECP's "Enhanced" level criteria. The proposed pond exceeds the minimum required volumes for both components and also satisfies the storage requirements for the 25 mm water quality event, ensuring compliance with provincial water quality objectives. The detention time for the 25 mm storm event has been calculated to be 35 hours, satisfying the 24-48-hour drawdown target outlined by MECP guidelines. Refer to Section 6.0 of the Stormwater Management Report for more details, provided under separate cover.

The minor system has been designed in accordance with Township of Woolwich standards, ensuring adequate sizing and depth to support upstream land development and designated drainage areas. All storm sewers will meet the 300-mm-diameter minimum requirement, will be sized for a 1 in 5-year return storm event, and are limited to 90% of full pipe capacity to maintain hydraulic efficiency.

Storm sewers on Street 'D' enter the system on Street 'A,' conveying flows east to the Street 'B' storm sewer network. The sewers on Street 'B' drain south to north, before draining east to the SWM facility along the northern limits of Blocks 3 and 4. A storm sewer network on Street 'C' also drains south to north, ultimately entering the Street 'B' network.

The peak flow rate of the system entering the SWM facility is approximately 7.09 m³/s. An 1800-mm-diameter pipe installed at a minimum slope of 0.50% (full flow capacity of 8.1 m³/s, full velocity of 3.2 m/s) has been proposed to convey the flow, with the pipe operating under 90% capacity.

9.0 GRADING

The proposed development will have four vehicular access points. Two accesses are provided via Bridge Street West/Street "A", a third access is provided via Regional Road 15/Martin Grove Road, and a fourth is provided at the Highway 85/King Street North interchange.

The grading strategy for the proposed development will ensure compliance with the Township of Woolwich Design Criteria. The grading will respect existing grades along all property lines, with all proposed vehicular accesses matching edge-of-asphalt grades on Bridge Street West, King Street North, and Regional Road 15/Martin Grove Road, respectively.

Minor system flows will be collected and conveyed via storm sewers to the proposed SWM facility at the northeastern corner of Street "B," and a storm outlet located at the northeastern corner of the SWM facility towards Martin Creek. Major overland flows from the blocks will generally be directed towards the proposed internal roadways where possible. The roadways will convey the runoff to the proposed SWM facility.

Elsewhere, grades are proposed to address the following:

- to minimize grading and cut/fill;
- to minimize changes to surface hydrology and hydrogeology of the area;
- to match to existing elevations at the limits of development;
- to provide major overland flow route(s) to the stormwater conveyance features and maintain existing drainage patterns;
- to maintain sheet flow and minimize concentrated flows; and
- to capture and contain runoff from the development.

9.1 Compliance with On-Site and Excess Soil Management Provincial Regulations

The MECP has introduced a new regulation, O.Reg. 406/19 titled "On-Site and Excess Soil Management" under the Environmental Protection Act. The excavation of excess material, and subsequent off-site disposal of excess soils from this Site, will require compliance with this new regulation should it be in force during construction of the blocks.

A Qualified Person (QP), as defined within the O.Reg, should be retained to provide site specific guidance related to the Excess Soil regulation.

Refer to Drawings C201 to C204 in Appendix E for the grading design of the development.

10.0 EROSION AND SEDIMENT CONTROL

In order to control erosion and transportation of sediment offsite, an erosion and sediment control strategy will be developed during the detailed design and implemented during the construction process. This plan will focus on the protection of downstream receivers, namely Martin Creek, and other neighbouring properties. The plan will also be completed in adherence with the EIS prepared by GHD.

10.1 Preliminary Erosion and Sediment Control Plan

The details of the Erosion and Sediment Control Plan will be provided with the submission of the pre-grading application and/or detailed design submission for the development and will be based on the preliminary erosion and sediment control measures recommended herein. It is recommended that the Erosion and Sediment Control Plan incorporate the following measures:

- Erect heavy-duty silt fences prior to grading or construction adjacent to the regulated areas, and existing road rights-of-way that are down-gradient along the perimeter of the property to protect adjacent and downstream areas from the migration of sediment in any overland flow (in consultation with the environmental Consultant).

- Erect additional (tiered) silt fence along minor down-gradient slope areas.
- Provide sediment control basins sized to accommodate 250 m³/ha of sediment storage at key locations during grading or construction operations in addition to the proposed SWM facility locations. These facilities shall be relocated as operations proceed to mitigate sediment transfer.
- Provide erosion control berms/swales in appropriate/critical areas to divert flows to temporary storage locations (sedimentation basins). Note the clean out of accumulated sediment to set limits (ex. 1/3 of silt fence height, etc.).
- Provide a construction entrance feature ("mud mat") to minimize the offsite transport of sediment from construction vehicles. A road sweeping regimen will also be developed.
- Install temporary rock check dams in swales, where appropriate, to help attenuate flows and encourage sediment deposition.
- Install erosion control matting on steep (greater than 3:1) slopes.
- Stabilize disturbed areas according to OPSS 572.
- During construction, catchbasins are to be sealed, as applicable, until roads are paved to prevent sediment deposition in the catchbasin sumps and conveyance of silt to the SWM facilities.
- Storm service outlets will be installed during servicing and roadworks construction to provide lot level dead and live storage.
- An Erosion Control Implementation Schedule will be included with the Detailed Erosion and Sedimentation Control Plan prepared in conjunction with the pre-grading application and/or detailed engineering design.

To ensure the effectiveness of the various erosion and sediment control measures, an appropriate inspection and maintenance program is necessary. The inspection activities during construction will include:

- Inspections of the erosion and sediment controls bi-weekly and after each significant rainfall event (greater than 25 mm).
- Inspections should include silt fence installations, sediment traps and basins, outlets, and vegetation.
- Submission of bi-weekly monitoring reports to the Township of Woolwich, City of Waterloo, and the GRCA during active construction periods.

All erosion and sediment control measures will be removed at the end of construction upon written approval/direction of the consulting engineer, GRCA and Township of Woolwich.

11.0 CONCLUSIONS

Based on the analysis presented in this report, it is concluded that:

- Sanitary servicing is proposed through an internal sewer network, which will collect flows from the individual blocks. Flows will be directed to an on-site sewage pumping station located in the northeastern corner of the Subject Lands. The on-site sewage pumping station would convey flows to the gravity network on McMurray Road. A proposed flow exceeding that generated from the development has been provided to the City of Waterloo who has confirmed sufficient capacity exists to accommodate the development. Alternative SPS and gravity servicing options for the Subject Lands have been evaluated and are feasible alternatives.

- Anticipated domestic water demand and anticipated required fire flow have been calculated and presented in this draft report. The maximum daily demand for the Subject Lands was calculated to be 17.7 L/s and the peak hourly demand was calculated to be 37.3 L/s. The maximum fire flow demand was calculated to be 233 L/s. Hydrant flow testing and Region of Waterloo modeling results have been requested to demonstrate available fire flow.
- The Region of Waterloo has identified a water quantity capacity constraint in the Mannheim Service Area. It's understood that the Official Plan Amendment processes may continue to be advanced outside of this issue, and that water capacity will be carried forward as a condition of approval.
- Stormwater servicing has been designed to service the Subject Lands and will convey stormwater to a centralized stormwater management facility. The stormwater management design for this development has been completed under separate cover.
- Erosion and Sediment control measures will be required and designed per Township of Woolwich, City of Waterloo, and GRCA requirements.

APPENDIX A

Concept Plan 2 and GRCA Mapping

Concept Plan 2

985 Bridge St E, 58 Regional Rd 15
& 730 King St N
Township of Woolwich
Region of Waterloo

LEGEND

- Subject Lands (434,737.93 m²)
- Watercourse
- Wetland
- Buffer from Wetland
- Floodplain (Walter Fedy, Nov 2025)
- Potential Pumping Station Location

Total GFA: 138,500 m²
Total Industrial Area: 306,404.6 m²

Notes:
- Bing Imagery
- Survey provided by J.D. Barnes Limited, January 17, 2024
- Watercourse & Buffers by Waters Edge Environmental Solutions Team Ltd.
- Conceptual only

Date: January 22, 2026

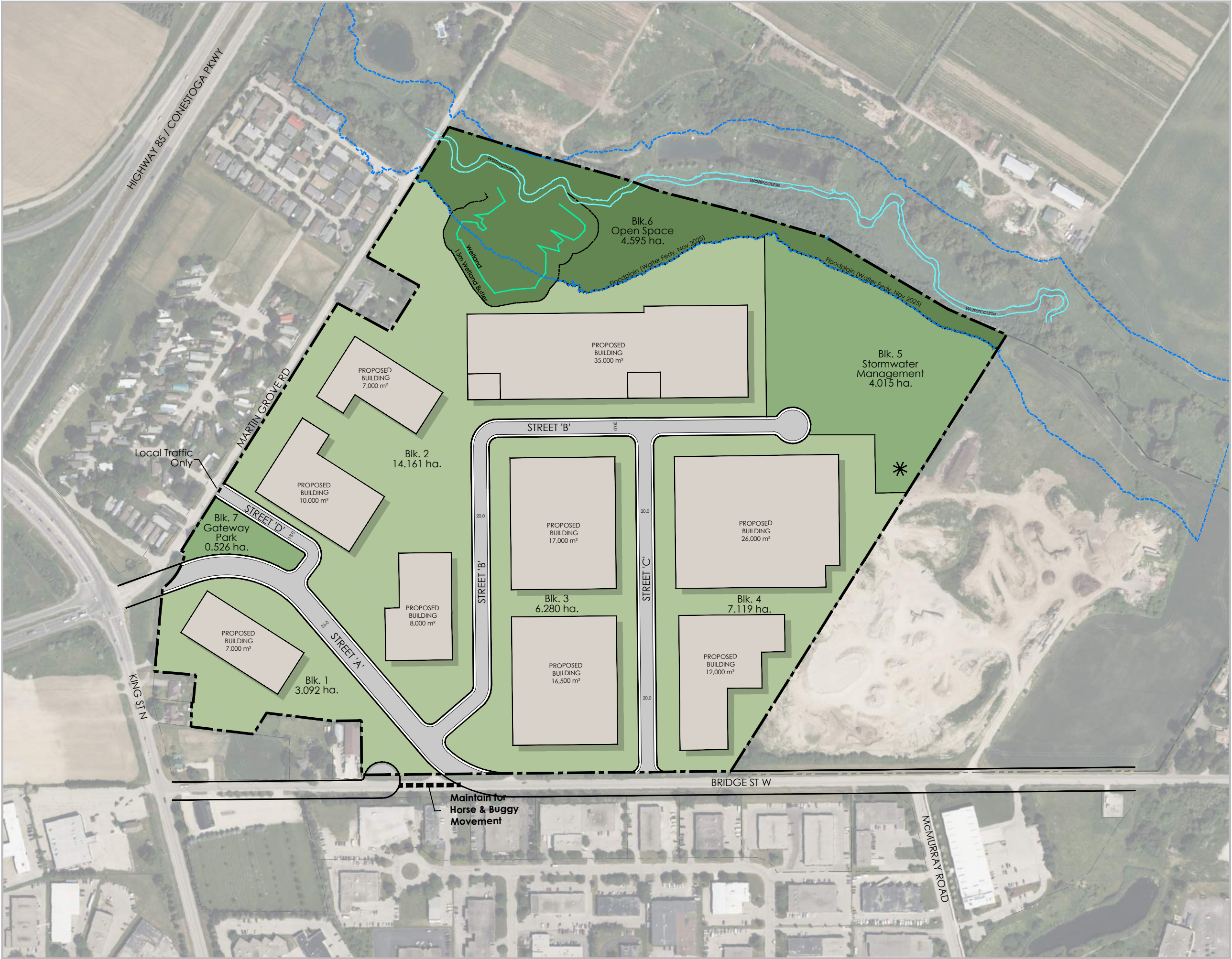
0 50 100

Scale: 1:4,000

File: 21207D

Drawn: DS

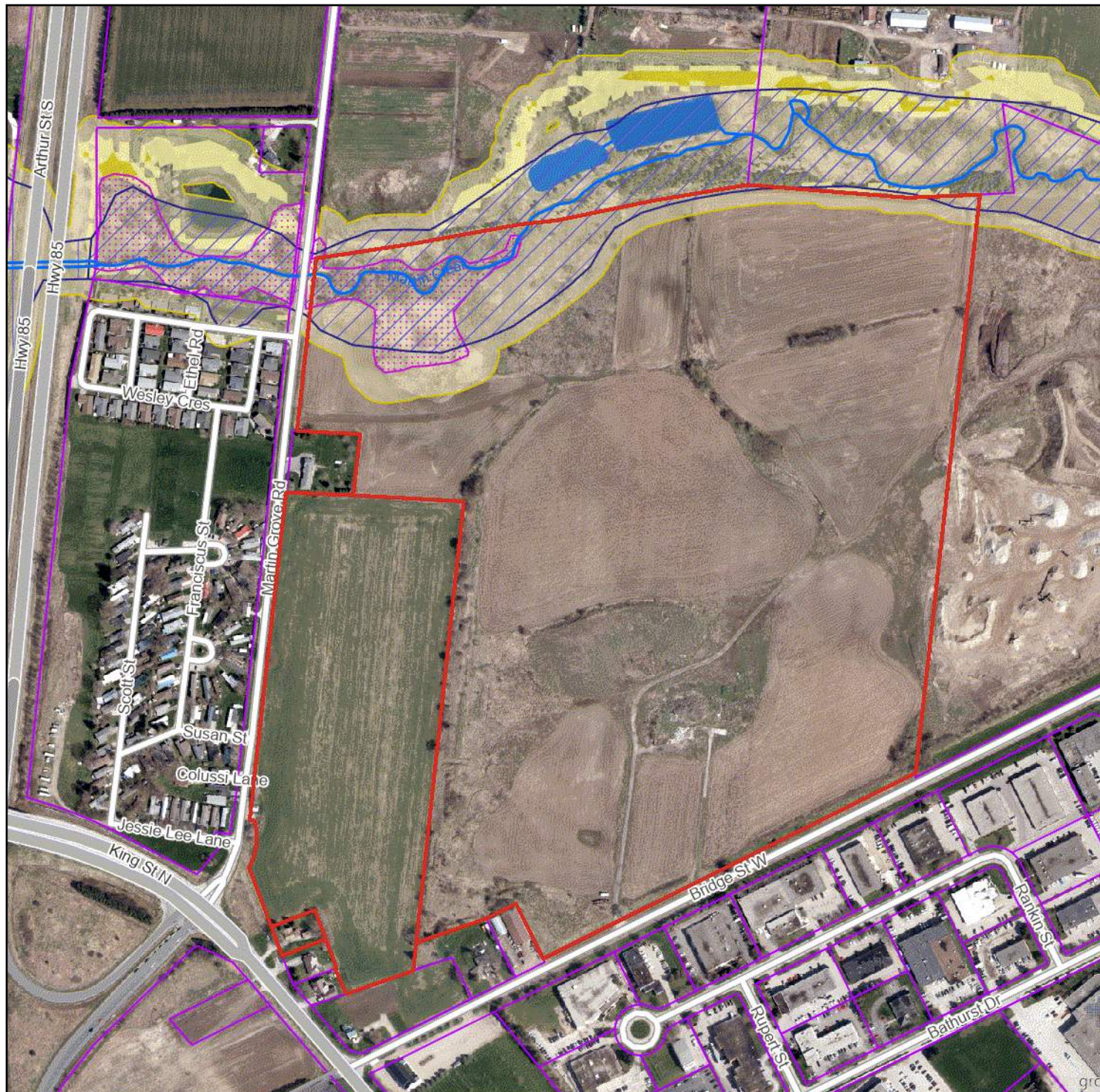
K:\21207D - CRA LANDS\CP\CP2_22\JAN2026.DWG





Legend

- Regulation Limit (GRCA)
- Floodplain (GRCA)
 - Engineered
 - Estimated
 - Approximate
- Floodplain - Special Policy Area (GRCA)
- Slope Erosion (GRCA)
 - Steep
 - Oversteep
 - Toe
- Slope Valley (GRCA)
 - Steep
 - Oversteep
- Regulated Watercourse (GRCA)
- Regulated Waterbody (GRCA)
- Wetland (GRCA)
- Lake Erie Flood (GRCA)
- Lake Erie Shoreline Reach (GRCA)
- Lake Erie Dynamic Beach (GRCA)
- Lake Erie Erosion (GRCA)
- Parcel - Assessment (MPAC/MNRF)
- Conservation Area Boundary (GRCA)



Copyright Grand River Conservation Authority, 2025.

Disclaimer: This map is for illustrative purposes only. Information contained herein is not a substitute for professional review or a site survey and is subject to change without notice. The Grand River Conservation Authority takes no responsibility for, nor guarantees, the accuracy of the information contained on this map. Any interpretations or conclusions drawn from this map are the sole responsibility of the user.
The source for each data layer is shown in parentheses in the map legend. See [Sources and Citations](#) for details.



APPENDIX B

Sanitary Design Sheet and Modelling



November 27, 2024

Ed Roberts on behalf of the "The Cook Group"
Waterloo Ontario

RE: Cook Group Lands – Woolwich Township

Dear Mr. Roberts,

Please accept this letter as a follow-up to our in-person meeting in June 2024. As you indicated, the CRA Lands (107 acres) are currently owned by four former Conestoga Rovers partners and Ian Cook. You also noted that the consortium has access to an adjacent parcel of approximately 40 acres owned by Kuntz Sand and Gravel, referred to as the "Kuntz Lands." Collectively, you refer to this combined property area as the "Cook Group Lands," and the owners as "The Cook Group." We also understand that any redesignation of the Cook Group Lands would depend on the approval of a cross-border servicing agreement by the City of Waterloo and Woolwich Township.

The City of Waterloo administration continues to be supportive, in principle, of the ultimate vision of redesignating these lands for employment uses that are context sensitive and complement the needs of both the City of Waterloo and the Township of Woolwich. We also recognize that The Cook Group and the Township may need to consider these lands through a settlement boundary expansion process – the details of which should be explored with Woolwich Township staff. However, if deemed appropriate, any settlement boundary expansion must be limited to the Cook Group Lands or part thereof, and advanced on the basis of distinct rationale so as not to create a precedent for others.

Should the planning process enable employment uses, ideally these employment uses would be limited to high value, sustainably built, large-scale users that align with our broader municipal goals, provide a significant number of jobs, reflect a high standard of design in this gateway location to Waterloo and Woolwich, and strategically manage expansion of the urban boundary. Demonstrable community benefits should be provided, along with parkland, trails, and open space. New large floorplate employment opportunities at Highway 85 would, if well designed, be beneficial to the community fabric of both the City of Waterloo and the Township of Woolwich. For clarity, the City of Waterloo administration is not supportive of commercial, retail, or residential uses on these lands.

As your team moves forward with the planning process, we expect that the Highway 85 interchange will be leveraged to its fullest extent, including to mitigate traffic and noise impacts on existing landowners in both the City of Waterloo and the Township of

Woolwich. Other areas of interest include understanding the overall servicing approach for the area, the capacity needs for The Cook Lands, potential environmental impacts, and any potential upgrades required to Waterloo services and transportation infrastructure. As such, the City would expect to be included in pre-scoping of technical studies and engineering consulting work. Based on our recent experience in land development at Highway 85 interchange locations, the Ontario Ministry of Transportation is now requiring detailed traffic analysis and supporting information beyond that which was required in the past. Additionally, the City would need to understand the financial commitments of The Cook Group and the Township toward any necessary infrastructure upgrades or operating costs in Waterloo.

We would also like to draw your attention to the planned regional reconstruction of King Street between Northfield and Highway 85, currently slated for design in 2027. The Cook Group should consider engaging with this project to explore complementary upgrades, such as active transportation connections and other enhancements.

In closing, please accept this letter as a conditional letter of in-principle administrative support from the City of Waterloo. We understand there will be an extensive planning process ahead and we welcome updates on The Cook Group progress in this regard. Ultimately, cross border servicing agreements need the approval of the respective Councils, and as noted above, are contingent upon future service capacity and the ability to coordinate upgrades to supporting infrastructure that will be required. These lands offer great opportunities for both communities and the broader region, and we look forward to further discussions with The Cook Group and Township of Woolwich representatives.

Sincerely,

Tim Anderson

Tim Anderson, P.Eng.
Chief Administrative Officer
City of Waterloo
T (519) 747-8702
tim.anderson@waterloo.ca

c.c. David Brenneman
Ron Ormson
Joel Cotter
Justin McFadden

Jim Kay
Ian Cook
Ian Richardson
Glenn Turchan

SANITARY LAYOUT

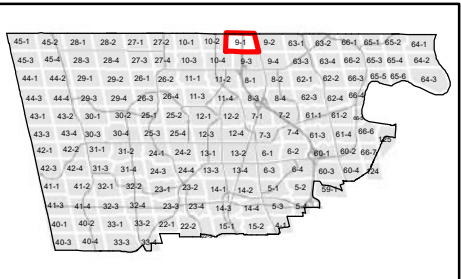
G.C.T. NO: 9-1

Date: 2 July, 2025

- Trunk Manhole
- Local Manhole
- Local Manhole (Private)
- Local Manhole (Region of W.)
- Local Manhole (Kitchener)
- Local Manhole (UoW)
- Local Manhole (Proposed)

- Trunk Main
- Trunk Main (Kitchener)
- Local Main
- Local Main (Private)
- Local Main (Region of W.)
- Local Main (Kitchener)
- Local Main (UoW)
- Forcemain
- Local Main (Proposed)

- Fitting
- Valve
- Chamber
- Clean Out
- Discharge Structure
- Meter Chamber
- Pumping Station
- Treatment Plant
- Storage Basin
- Easement



Map © 2018, City of Waterloo

Revision Date: 23 Mar 2018

Produced by: Engineering Services, IPPW

Imagery: May 2014

Property Information © 2001-2015

Teranet Land Information Services Inc. and its Licensors.

May Not Be Reproduced Without Permission.

THIS IS NOT A PLAN OF SURVEY

SANITARY LAYOUT

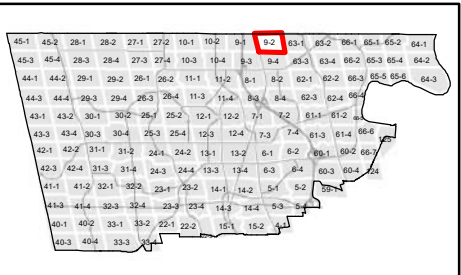
G.C.T. NO: 9-2

Date: 2 July, 2025

- Trunk Manhole
- Local Manhole
- Local Manhole (Private)
- Local Manhole (Region of W.)
- Local Manhole (Kitchener)
- Local Manhole (UoW)
- Local Manhole (Proposed)

- Trunk Main
- Trunk Main (Kitchener)
- Local Main
- Local Main (Private)
- Local Main (Region of W.)
- Local Main (Kitchener)
- Local Main (UoW)
- Forcemain
- Local Main (Proposed)

- Fitting
- Valve
- Chamber
- Clean Out
- Discharge Structure
- Meter Chamber
- Pumping Station
- Treatment Plant
- Storage Basin
- Easement



Map © 2018, City of Waterloo
Revision Date: 23 Mar 2018
Produced by: Engineering Services, IPPW
Imagery: May 2014
Property Information © 2001-2015
Teranet Land Information Services Inc. and its Licensors.
May Not Be Reproduced Without Permission.
THIS IS NOT A PLAN OF SURVEY

SANITARY LAYOUT

G.C.T. NO: 63-1

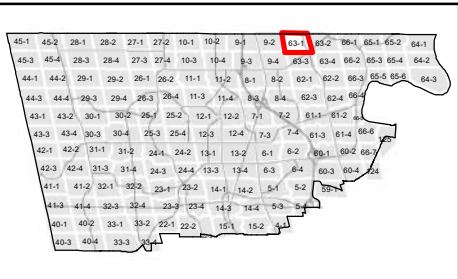
Date: 2 July, 2025

- Trunk Manhole
- Local Manhole
- Local Manhole (Private)
- Local Manhole (Region of W.)
- Local Manhole (Kitchener)
- Local Manhole (UoW)
- Local Manhole (Proposed)

- Trunk Main
- Trunk Main (Kitchener)
- Local Main
- Local Main (Private)
- Local Main (Region of W.)
- Local Main (Kitchener)
- Local Main (UoW)
- Forcemain
- Local Main (Proposed)

- Fitting
- Valve
- Chamber
- Clean Out
- Discharge Structure
- Meter Chamber
- Pumping Station
- Treatment Plant
- Storage Basin

Easement



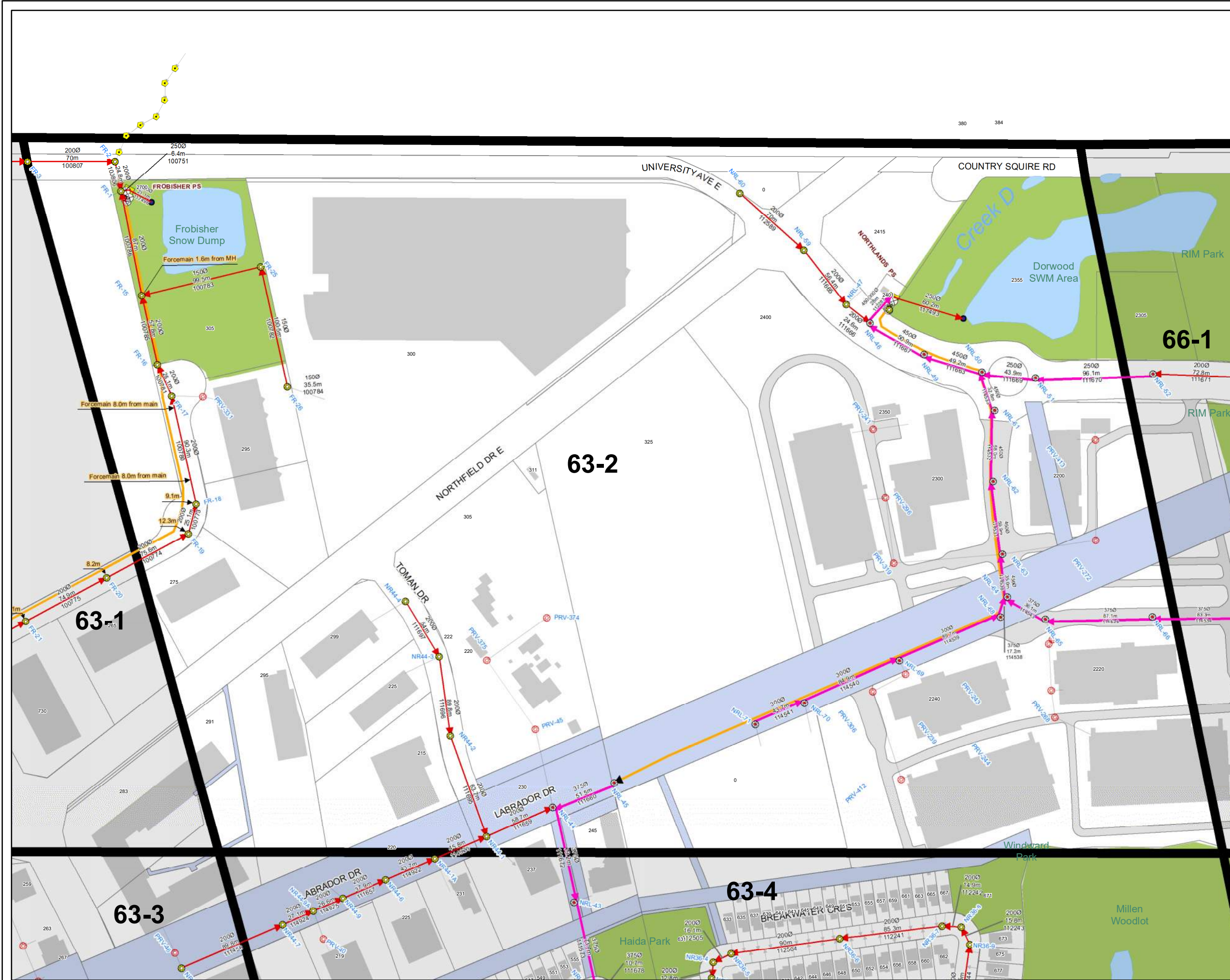
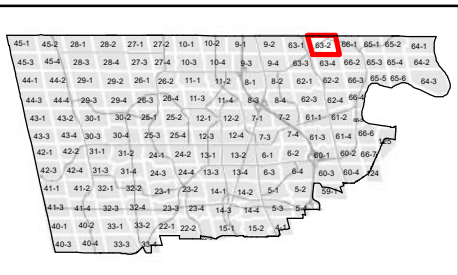
Map © 2018, City of Waterloo
Revision Date: 23 Mar 2018
Produced by: Engineering Services, IPPW
Imagery: May 2014
Property Information © 2001-2015
Teranet Land Information Services Inc. and its licensees.
May Not Be Reproduced Without Permission.
THIS IS NOT A PLAN OF SURVEY

SANITARY LAYOUT
G.C.T. NO: 63-2
Date: 2 July, 2025

- Trunk Manhole
- Local Manhole
- Local Manhole (Private)
- Local Manhole (Region of W.)
- Local Manhole (Kitchener)
- Local Manhole (UoW)
- Local Manhole (Proposed)

- Trunk Main
- Trunk Main (Kitchener)
- Local Main
- Local Main (Private)
- Local Main (Region of W.)
- Local Main (Kitchener)
- Local Main (UoW)
- Forcemain
- Local Main (Proposed)

- Fitting
- Valve
- Chamber
- Clean Out
- Discharge Structure
- Meter Chamber
- Pumping Station
- Treatment Plant
- Storage Basin
- Easement



PE RP

7428

Paragon

Div. 11 ~~File~~
Library.

EM 223



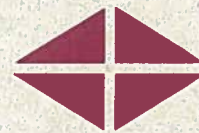
Corporation of the City of Waterloo

Northland Business Park Phase IV Sewage Pumping Station

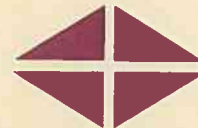
Design Brief

7428

Jul 97



**PARAGON
ENGINEERING
LIMITED**
CONSULTING ENGINEERS



**PARAGON
ENGINEERING
LIMITED**
CONSULTING ENGINEERS

11-7428/30

July 17, 1997

Mr. Sunda Siva, P.Eng.
City of Waterloo
Works Department
265 Lexington Court
Waterloo, Ontario
N2J 4A8

Dear Mr. Siva:

Northland Business Park, Phase IV
Sewage Pumping Station

We are pleased to present the Design Brief for the above noted project. This document will be used to obtain the necessary MOEE approvals which are being forwarded to you for processing under separate cover.

If you have any questions, or require additional information, please contact our office.

Yours very truly,

PARAGON ENGINEERING LIMITED

Guy Le Patourel, P.Eng.

GHL/Im
encl.



Corporation of the City
of Waterloo

***Northland Business Park Phase IV
Sewage Pumping Station***

Design Brief

7428

Jul 97

PARAGON

**CITY OF WATERLOO
NORTHLAND BUSINESS PARK PHASE IV
SEWAGE PUMPING STATION**

DESIGN BRIEF

TABLE OF CONTENTS

1.0	INTRODUCTION AND BACKGROUND	1
2.0	EXISTING CONDITIONS	2
3.0	DESIGN DATA	4
3.1	Service Area and Design Flows	4
3.2	Forcemain Sizing	4
4.0	SYSTEM REQUIREMENTS AND PUMP SELECTION	6
4.1	Wet Well Sizing	6
4.2	System Characteristics	6
4.3	Pump Selection	8
5.0	SITE PLAN AND STATION LAYOUT	9
6.0	MECHANICAL AND PROCESS EQUIPMENT	13
6.1	Pumps and Discharge Piping	13
6.2	Wet Well Configuration and Pump Removal	13
6.3	Ventilation	13
6.4	Miscellaneous Mechanical Systems	14
7.0	ELECTRICAL	15
7.1	Main Service	15
7.2	Power Distribution	15
7.3	Control/Instrumentation/Alarms	15
7.4	Building/Site Services	16
7.5	Standby Power	16
8.0	EMERGENCY CONDITIONS	17
APPENDIX A	Design Calculations	
APPENDIX B	Equipment Data	

LIST OF TABLES

Table 1	Service Areas and Design Flows	4
Table 2	Summary of Forcemain Calculations	4
Table 3	Elevation Summary	6

LIST OF FIGURES

Figure 1	Location Plan	3
Figure 2	System Operating Curves	7
Figure 3	Station Site Plan	10
Figure 4	Station Layout	11
Figure 5	Typical Cross Section	12

1.0 INTRODUCTION AND BACKGROUND

The City of Waterloo continues to develop a northeast area of the city known as the Northland Business Park. Although a large portion of the Business Park is serviced and developed, Phase IV remains only partly serviced. Interest by a major local industry has prompted the City of Waterloo to develop and service these remaining 21.71 ha of land in Phase IV.

The proposed development is too low to be serviced by extending the existing sanitary sewer system. A sewage pumping station and gravity sanitary collection system within the development will be necessary.

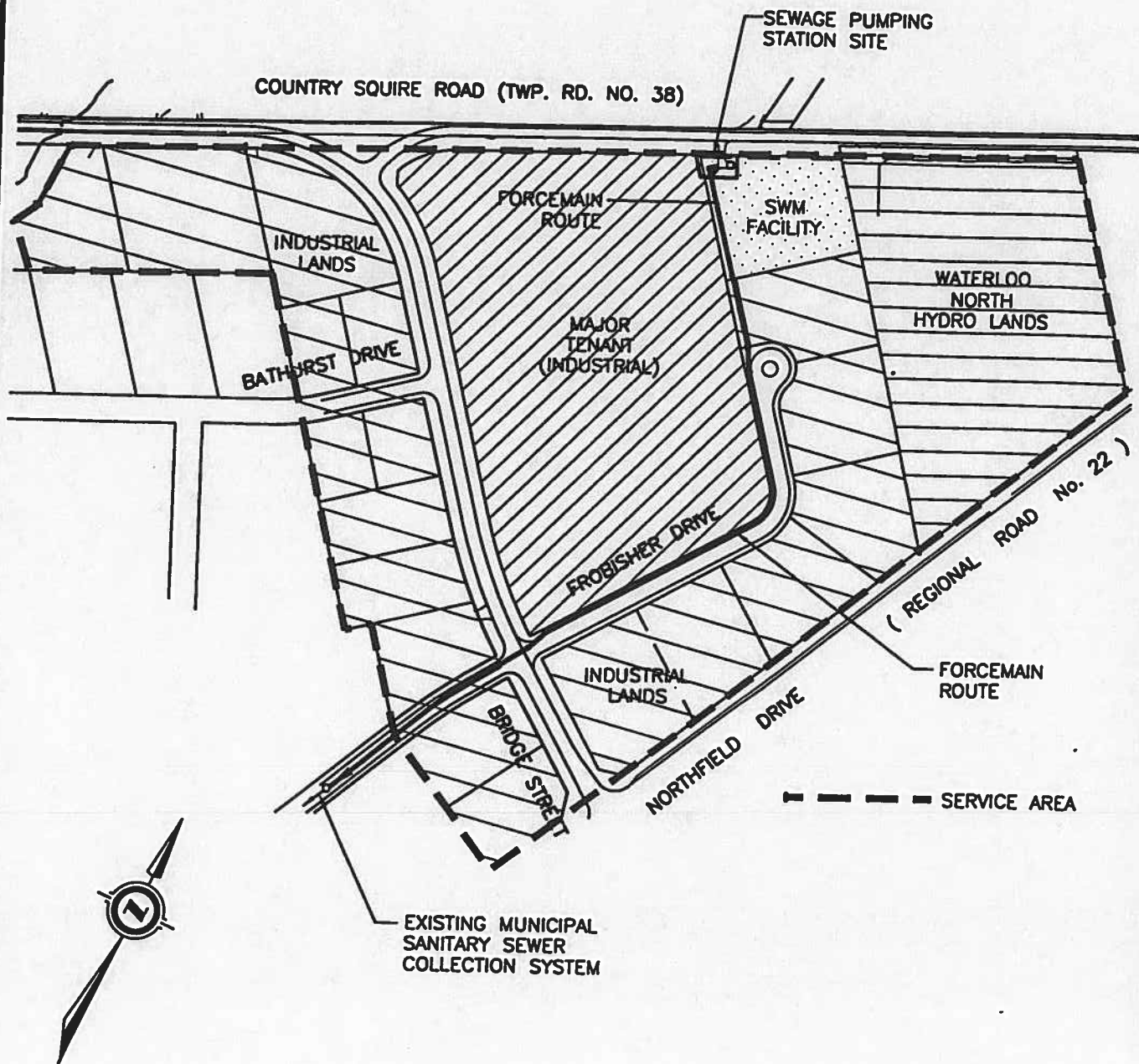
In addition to the proposed development, the pumping station will also service an adjacent 9.10 ha of industrial land currently occupied by Waterloo North Hydro.

Paragon Engineering Limited was retained in December of 1996 to provide engineering services related to the pre-design, design, tendering and contract administration for the Northland IV Business Park Development.

2.0 EXISTING CONDITIONS

An overall plan of the development, including the location of the pumping station, are shown in Figure 1. The site is bordered by Country Squire Road to the north, Waterloo North Hydro to the east, Northfield Drive to the south and Bridge Street to the west. The pumping station site is located in the northeast area of the development with frontage on Country Squire Road. The limits of gravity servicing of the existing sanitary collection system is approximately 100 m west of Bridge Street. All other services such as water, gas and hydro at the limits of existing development and will be extended as required. Overhead hydro is currently available at the pumping station site.

The overall site topography is generally sloping down towards the northeast from a high point at elevation 336.00 to elevation 329.00 at the proposed pumping station.



3.0 DESIGN DATA

3.1 Service Area and Design Flows

It is expected that more than 50% of the development will be occupied within a few years and as such, the station will be designed and constructed for peak ultimate flows and no phasing of the pumping station will be required. The service area, as shown in Figure 1, will be comprised of industrial land.

The major tenant of the development has provided their initial and ultimate flows for average flow conditions. An allowance has been made for the future expansion of the Waterloo North Hydro property as per their comments.

Hydraulic criteria for unit flow rates, peaking factors and infiltration allowances are all as per current City of Waterloo design standards. The service areas and design flows are presented in Table 1.

Table 1 Service Areas and Design Flows					
Land Type	Area (ha)	Flow Rate (L/s/ha)	Avg. Flow (L/s)	Peaking Factor	Peak Flow (L/s)
Horizon					
Major Tenant	7.47	—	5.258	1.8	9.464
Industrial	7.40	0.46	3.404	1.8	6.127
Waterloo North Hydro	6.40	0.46	2.944	1.8	5.299
Road Rights-of-Way	3.00	—	—	—	—
Infiltration	24.27	0.15	3.641	—	3.641
TOTAL			15.247		24.531
Ultimate					
Major Tenant	7.47	—	9.858	1.8	17.744
Industrial	11.24	0.46	5.170	1.8	9.307
Waterloo North Hydro	9.10	0.46	4.186	1.8	7.535
Road Rights-of-Way	3.00	—	—	—	—
Infiltration	30.81	0.15	4.623	—	4.623
TOTAL			23.837		39.209

The station will be designed for a peak flow of 39.50 L/s.

3.2 Forcemain Sizing

A single forcemain will connect the pumping station to the existing gravity sewer line on Frobisher Drive. There are no high or low points in topography between these two points and as such, the forcemain will be installed at a continuous rise in grade from the station to the outlet. Selection of the forcemain size was based on a length of 660 m, a friction coefficient of 120, a flow of 39.5 L/s, and a velocity range of 0.9 m/s to 2.5 m/s. Based on the summary of forcemain calculations presented in Table 2, the forcemain will be 200 mm.

Table 2 Summary of Forcemain Calculations				
Size (mm)	Length (m)	Friction Coefficient	Headloss (m)	Velocity (m/s)
100	660	120	189.0	5.00
150	660	120	26.20	2.23
200	660	120	6.46	1.26
250	660	120	2.18	0.80

4.0 SYSTEM REQUIREMENTS AND PUMP SELECTION

4.1 Wet Well Sizing

The station will operate in a standard duplex fashion with either pump capable of pumping the peak design flow. Based on MOEE standards, the wet well volume and depth would be as follows:

Pump Capacity	=	39.5 L/s
Minimum Cycle Time	=	10 minutes
Wet Well Diameter	=	2.40 m
Volume (m ³)	=	0.15 x Q _{pump} (L/s)
	=	0.15 x 39.5
	=	5.925 m ³
Depth (m)	=	Volume / Area
	=	5.925 m ³ / 4.909 m ²
	=	1.30 m (between pump start and pump stop)

In the 2,400 mm diameter wet well, the depth between pump start and pump stop will be 1.30 m. Based on proposed ground elevations and other MOEE criteria, a summary of elevations associated with the pumping station is presented in Table 3.

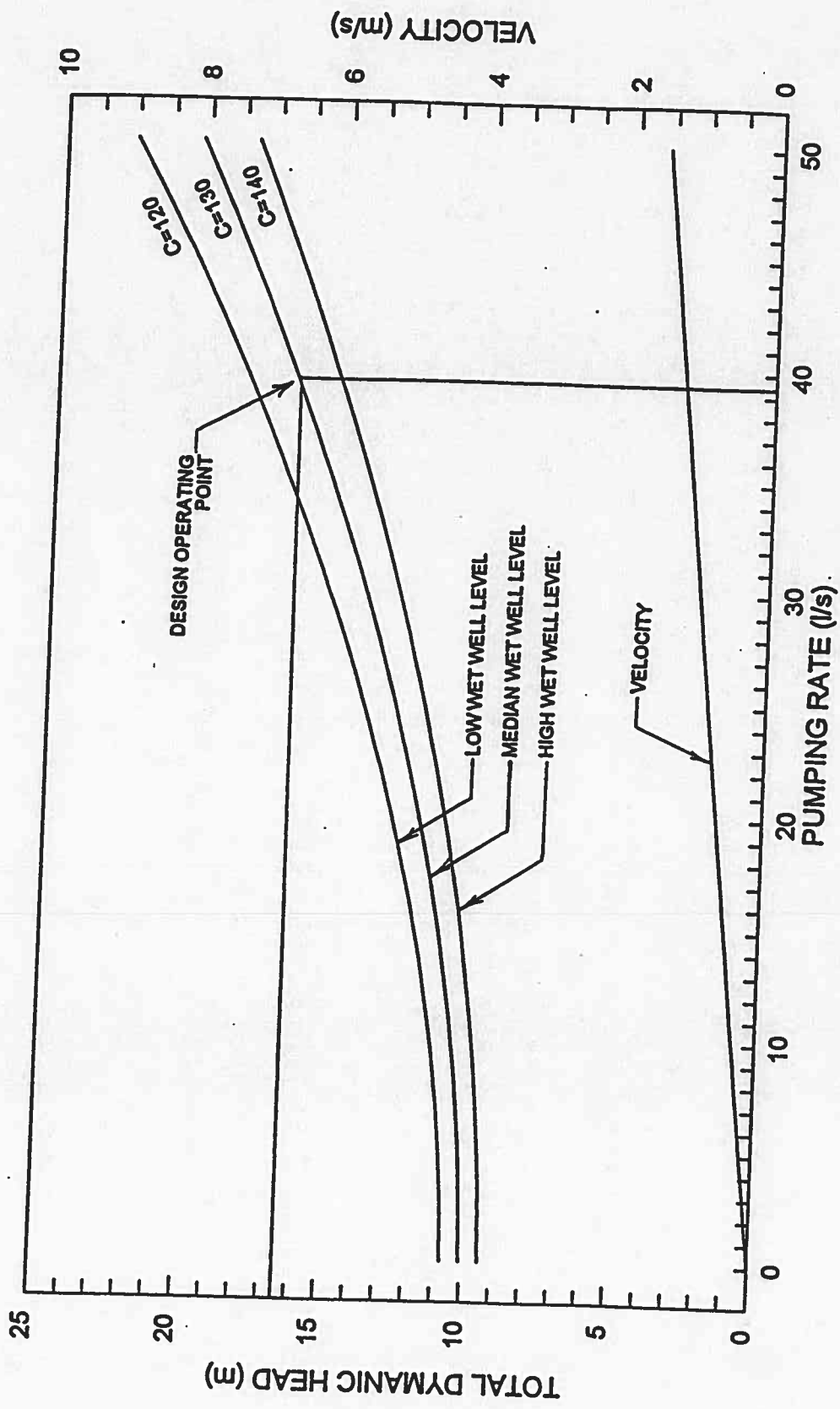
Table 3 Elevation Summary	
Item	Elevation
Forcemain Outlet	334.30
Top of Station	330.50
Ground at Station	330.20
Centreline Discharge Header	327.20
Safety Platform	325.70
Inlet Sewer	325.36
High Level Alarm	325.21
Start Lag Pump	325.06
Start Lead Pump	324.91
Stop Pumps	323.61
Low Level Cut-Off	323.51
Base of Wet Well	322.98

4.2 System Characteristics

In accordance with MOEE guidelines, system operating curves were developed for the following conditions:

- Friction Factor = 120 and Low wet well level (323.60)
- Friction Factor = 130 and Medium wet well level (324.25)
- Friction Factor = 140 and High wet well level (324.90)

The equivalent length method was used for determining the station losses and the resulting system curves are presented in Figure 2. Based on a design flow of 39.5 L/s and using the median friction factor of 130, the Total Dynamic Head of the pump will be 16.66 m.



CITY OF WATERLOO
NORTHLAND IV BUSINESS PARK
SEWAGE PUMPING STATION
SYSTEM OPERATING CURVES

SCALE: NTS

DATE: 97.06.11

PROJECT No.: 7428

FIGURE 2

MC-97.06.04-MBX11

4.3 Pump Selection

The pumps will be non-clog submersible fixed speed pumps operating in standard duplex mode. A preliminary pump selection was completed and a Flygt Model CP3152 with a #432 impeller was selected. Details regarding the pump are attached as Appendix B.

5.0 SITE PLAN AND STATION LAYOUT

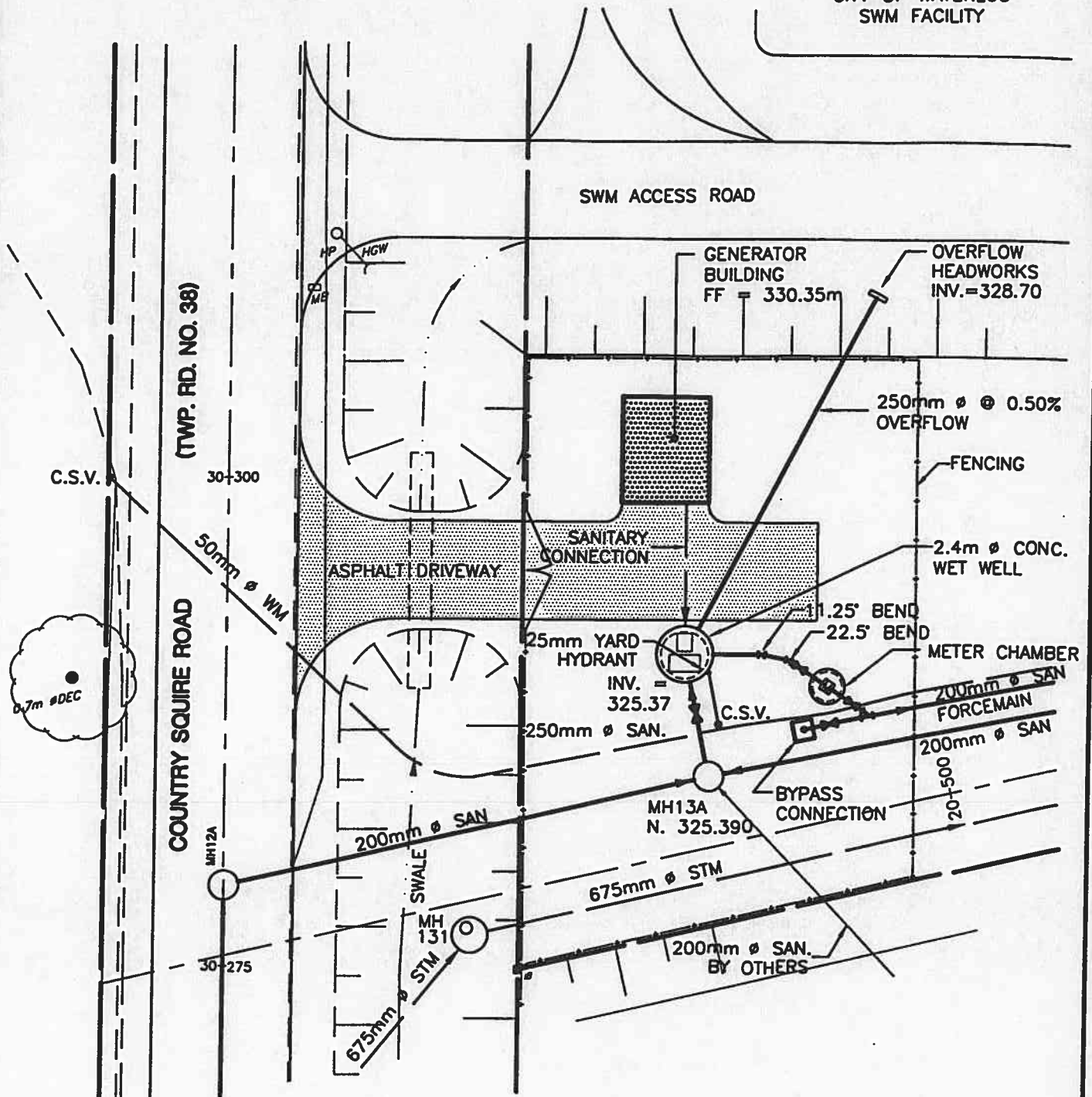
The pumping station will be located on the south side of Country Squire Road adjacent to the proposed storm water management facility. The precast concrete 2,400 mm wet well will be 7.50 m deep and be anchored to a monolithic poured-in-place base that will be designed to resist any uplift forces. A separate control building housing the electrical controls and the standby generator will be located approximately 10.0 m from the wet well. The pumping station site will be accessed by a paved driveway and a chain link fence around the site will provide security.

The control building will be set on a standard 1.2 m deep foundation wall and strip footing. The building will be constructed of 200 mm decor-block and a wood frame gable type roof. A double door will provide access to the building and allow the generator to be installed or removed.

A site plan is presented in Figure 3, and station layout is presented in Figure 4. A detailed geotechnical report was prepared for the wet well and control building construction. Excavation for the wet well is expected to encounter a perched water table problem, and various construction methods for handling the water will have to be employed. A typical cross section of the proposed excavation is presented in Figure 5.



CITY OF WATERLOO
SWM FACILITY



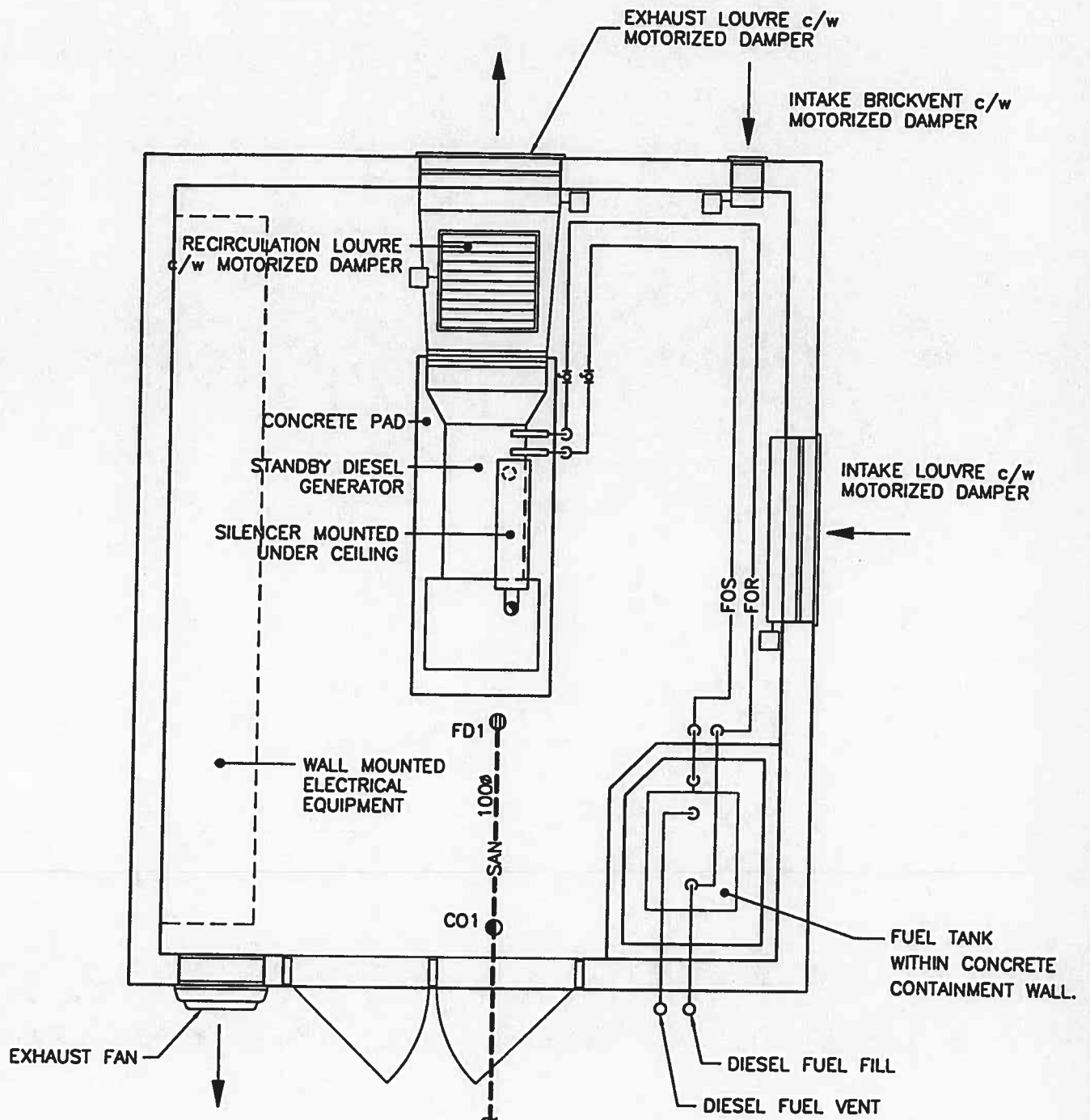
CITY OF WATERLOO
NORTHLAND IV BUSINESS PARK
SEWAGE PUMPING STATION
SITE PLAN

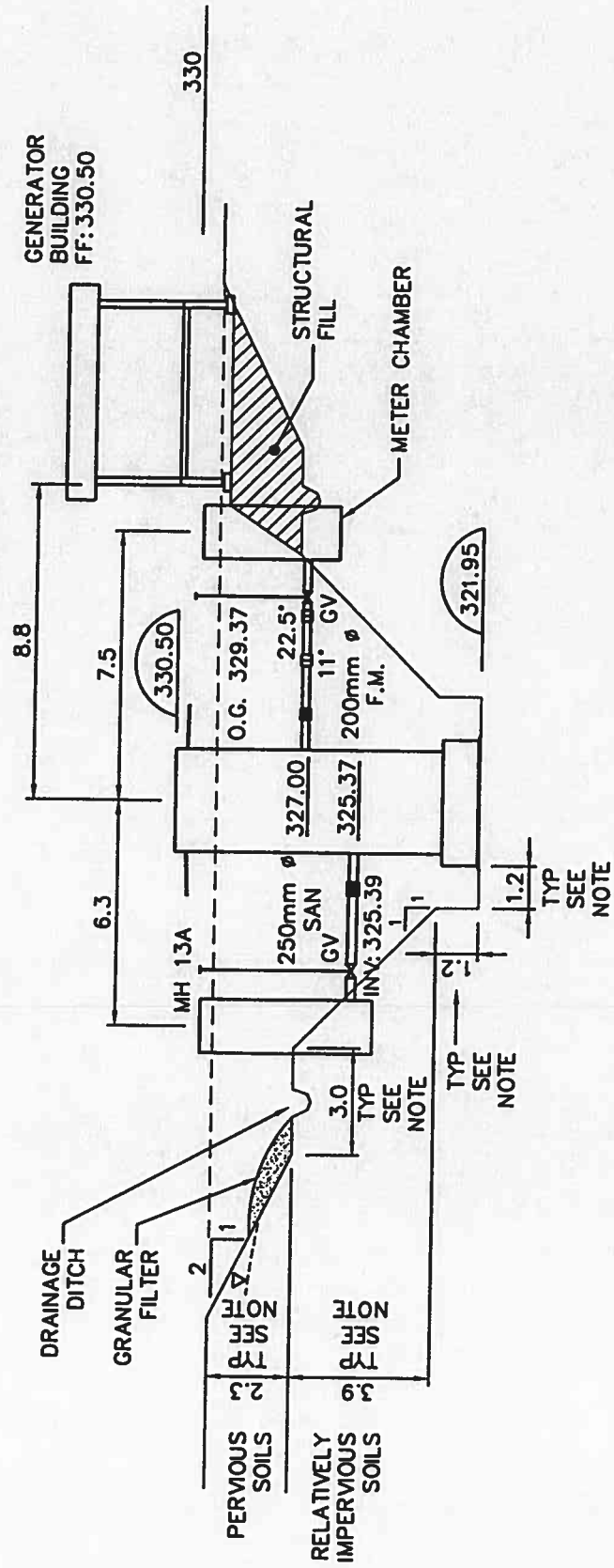
SCALE: 1:300

DATE: 97.06.11

PROJECT No.:
7428

FIGURE 3





NOTES:
 REFER TO ENGLAND NAYLOR ENGINEERING LTD
 SOILS REPORT FOR DISCUSSION CONCERNING
 DEWATERING AND THE EXCAVATION PROFILE.

CITY OF WATERLOO
 NORTHLAND IV BUSINESS PARK
 SEWAGE PUMPING STATION
 EXCAVATION CROSS SECTION

SCALE: 1: 200

DATE: 97.06.11

PROJECT No.: 7428

FIGURE 5



6.0 MECHANICAL AND PROCESS EQUIPMENT

6.1 Pumps and Discharge Piping

The pumps will be non-clog submersible sewage pumps capable of handling solids up to 75 mm in diameter and have a rated capacity of 39.5 L/s at 16.66 m TDH. The pumps will be supported by discharge elbows permanently mounted in the base of the wet well. The pumps will connect to the base elbows by means of self-sealing quick-disconnect flange that will allow pump removal without entering the wet well. A lift-out rail system will guide the pump during removal or reinstallation. The base elbows will support the pumps, support for the discharge piping and serve as an anchor for the guide rails.

Discharge piping will be 200 mm ductile iron Class 53 piping and each pump discharge line will be equipped with a check valve and an isolating plug valve. The pump discharge piping will connect to common discharge header that will connect to the forcemain 1.0 m outside the station by means of a coupling. The forcemain will be either ductile iron Class 52 or PVC Series 160 pipe.

The pumps will be equipped with "flush valves" to prevent sedimentation and accumulation of solids on the wet well floor.

A flow meter on the forcemain will be housed within a 1,500 mm diameter precast concrete chamber located 5.0 m from the wet well. For purposes of isolating the flow meter for servicing, one isolating valve will be located a minimum of 10 pipe diameters upstream of the meter and another will be located a minimum of 5 pipe diameters downstream of the meter. A spool piece will be stored on-site that can be installed in the forcemain in order to return the forcemain to service while the meter is being serviced.

6.2 Wet Well Configuration and Pump Removal

Aluminum hatch covers will be provided in the wet well top slab for both personnel access and pump removal. The safety platform will be constructed of aluminum grating and be equipped with a removable panel to allow access to the bottom of the wet well. Aluminum ladder rungs secured to the station wall will be installed from the access hatch down to the base of the wet well. The safety platform will also provide access to the manual isolation valves and the check valves on each pump discharge.

A lift-out rail system will be installed for each pump to allow pump removal without entering the wet well. The rails will be constructed of galvanized steel and have intermediate and top supports to prevent deflection of the rails.

6.3 Ventilation

Natural ventilation of the wet well will be provided by installing two 150 mm diameter vents. One vent pipe will extend down to 300 mm above the invert of the inlet sewer and the other will terminate 50 mm below the underside of the roof slab.

The control building will be heated by means of a ceiling hung thermostat controlled electric unit heater. Cooling will be provided by circulating exterior air through the station by means of a thermostatically controlled exhaust fan and a motorized intake damper. A rise in temperature will engage the exhaust fan and open the intake damper.

Adequately sized intake and exhaust motorized dampers will be installed to accommodate the diesel generator. The exhaust ductwork will also be equipped with a modulating return air damper that will direct heated air back into the control room and the exhaust damper will modulate closed. When the generator starts, the intake damper will open, the exhaust damper will remain closed and the return damper will open. On a rise in room temperature, the return air damper and exhaust dampers will modulate to maintain the room temperature setpoint.

6.4 Miscellaneous Mechanical Systems

The site will be equipped with a 25 mm yard hydrant. No water service is required within the control building.

The diesel generator will be equipped with a silencer, exhaust piping and piping insulation. The generator fuel system will consist of a 450 litre steel storage tank installed in the control building complete with a containment curb. Accessories include supply/return fuel lines, volume gauge and tank fill line. The storage tank will provide 40 hours of generator operation at full power and 50 hours at 75% power.

7.0 ELECTRICAL

7.1 Main Service

A 100 amp, 600 volt, 3 phase, 4 wire electrical service with half capacity neutral will be installed into the pumping station control building. Waterloo North Hydro will supply and install a 100 kVa, 3 phase pole mount transformer complete with transformer grounding and all transformer connections. This transformer will be located on the existing pole line adjacent to the frontage of the site on the south side of Country Squire Road.

The main incoming service conductors will be installed by Waterloo North Hydro, and they will become responsible for all future maintenance or replacement of the cables. The City of Waterloo will arrange with Waterloo North Hydro to have the main service conductors installed. The City's contractor will provide PVC conduits from the transformer pole to the main switch for installation of the service conductors by Waterloo North Hydro.

A 50 mm PVC duct will be installed from the station's property line into the control building for the incoming telephone service. The telephone line will enable various station alarms to be annunciated to the City's remote monitoring location, and the telephone duct will be installed in the same trench as the secondary service.

7.2 Power Distribution

A 100 amp, 600 volt, 3 pole main service disconnect switch and metering cabinet will be installed inside the control building. The main switch will supply a 100 amp, 600 volt, 4 pole splitter trough which will distribute power to the pump starters, the electrical heaters, and step-down transformer. The step-down transformer will be a 15 kVa, 600-120/208 volt, 3 phase, 4 wire dry type and will service the lighting panel and the pump control panel. A surge arrestor will be connected at the main switch to provide lightening protection.

Two wall mounted solid state starters will be provided for the two fixed speed sewage pumps. Solid state starters are recommended to reduce the in-rush current on start-up in both normal operation and in standby power operation. Power for the control building is 120/240 volt equipment (lighting, controls, etc.) will be supplied from the circuit breaker panelboard LP-A1.

7.3 Control/Instrumentation/Alarms

An ultrasonic level transmitter will monitor levels within the wet well and operate the sewage pumps. An alternating duplex control panel will be provided for the two fixed speed sewage pumps and the pump control panel will be equipped with a selector switch to assign either pump as "lead" if one pump is out of service for maintenance or repair.

A TeleSAFE 6000 remote programmable unit will be installed to provide station control. The RPU will operate the sewage pumps based on level measurements provided by the Milltronics ultrasonic level transmitter located in the wet well. The RPU will also monitor station status and enunciate various alarms, as required. The City of Waterloo does not currently have a SCADA type system installed and therefore, the RPU will not be remotely monitored. Encapsulated float switches will be installed to provide back-up indication of wet well high water level, and low level cut-off protection for the pumps.

Various fault and alarm conditions regarding the wet well levels, sewage pump operation, and standby generator status is monitored by the RPU. Any faults or alarm condition generated by the RPU will active an autodialler which will enunciate a general alarm signal to the City's central monitoring facility. City personnel will respond to this general alarm condition, and determine the exact cause of the alarm upon arrival at the station. A printer connected to the RPU will print out an alarm status report, including a chronology of events preceding the alarm condition.

7.4 Building/Site Services

The station will be heated by a 7.5 kW electric unit heater. The lighting panel will provide power to fluorescent ceiling fixtures, exhaust fans, and service receptacles. The station will also be equipped with exterior lighting and an exterior receptacle. The exterior lighting will also include a pole mounted lighting fixture located adjacent to the wet well. This pole mounted fixture will be controlled manually by a switch located within the control building.

7.5 Standby Power

The station will be equipped with a standby power generator that will provide back-up power to the pumps and miscellaneous building loads during a commercial power failure. The standby generator will be a 35 kW, 600 volt, 3 phase, diesel powered, air cooled unit, and will be constructed in general accordance with the MOEE standard specifications for diesel engine generator sets. The generator will be a complete unit, including automatic transfer switch, silencer, exhaust ductwork, and fuel storage/delivery system. As noted in the previous section, the radiant heat from the generator will be recirculated back into the control building to provide heating requirements and the exhaust ductwork will be connected to the exhaust louvre/damper.

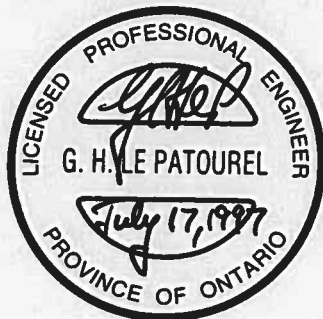
If commercial power fails, or if any one of the three incoming phases drops below 420 volts, the standby power system transfer switch will signal the generator to start. The transfer switch will automatically change state from the normal supply to emergency supply when the diesel generator output is at least 90% of normal voltage and frequency. The generator set will continue to deliver power until the normal supply returns for at least three minutes, at which time the load will be transferred back to normal power. The transfer switch will feature a time delay during transfer sufficient to cause all motor starters to de-energize. Indication of the transfer switch position will be enunciated back to the RPU.

8.0 EMERGENCY CONDITIONS

To allow the station to be bypassed during emergencies or major modifications, the station will be equipped with a bypass connection and valving to permit the connection of a portable pump. When the bypass is required, the valves on the influent sewer and the discharge forcemain are closed. The suction piping of the portable pump is placed into the sanitary manhole directly upstream of the station and the discharge piping of the pump is connected to the bypass coupling. The bypass valve is then opened and the portable pump started. Figure 3 shows the location of the bypass connection and valves.

All of which is respectfully submitted,

PARAGON ENGINEERING LIMITED



Guy Le Patourel, P.Eng.

GHL/Im

APPENDIX A



Design Calculations

NORTHLANDS ~~WASTE~~ PUMPING STATION

1. DESIGN FLOWS

PRESENT

LAND TYPE	AREA (ha)	FLOW RATE (l/sec/ha)	Avg Flow (l/sec)	PEAK Flow (l/sec)
PILLERS	7.47	-	5.258	9.464
INDUSTRIAL	7.40	0.46	3.404	6.127
W.N.H.	6.4	0.46	2.944	5.299
INFILTRATION	24.27	0.15	3.641	3.641
		TOTALS	15.247	24.531

ULTIMATE

PILLERS	7.47	-	9.858	17.744
INDUSTRIAL	11.24	0.46	5.170	9.307
W.N.H.	9.10	0.46	4.186	7.535
INFILTRATION	30.81	0.15	4.623	4.623
		TOTALS	23.837	39.209

SAY 39.5 l/sec
(520 lpm, 675 usgpm)

2. WET WELL

PUMP CAPACITY = 39.5 l/sec
 MIN CYCLE TIME = 10 minutes
 WET WELL DIA. = 2.4m

$$\begin{aligned} \text{VOLUME REQUIRED (MOFF)} \cdot m^3 &= 0.15 \times \text{PUMP CAP l/sec} \\ &= 0.15 \times 39.5 \\ &= 5.925 m^3 \end{aligned}$$

$$\begin{aligned} \text{DEPTH} &= \frac{\text{VOLUME}}{\text{AREA}} \\ &= \frac{5.925}{\left(\frac{2.4}{2}\right)^2 \pi} = 1.3m \end{aligned}$$

SIZE PUMP TO HANDLE PEAK FLOW OF 39.5 l/sec.
 CHECK VOLUME REQUIRED FOR MINIMUM 2 MINUTE RUN TIME

$$\text{VOL} = 2 \times 60 \text{ sec/min} \times 39.5 \text{ l/sec} = 4.74 m^3 < 5.925 m^3 \text{ OK}$$



**PARAGON
ENGINEERING
LIMITED**
CONSULTING ENGINEERS

Project
NORTHLANDS BUSINESS PARK - S.P.S.

File No
7428

Calculated by
Checked By BM

Date
FEB 13/97

Page 1 of

3 STATIC LIFT

① DEPTH TO L.W.L. (LOW WATER LEVEL)

INLET INVERT	325.355
DEPTH TO HIGH LEVEL ALARM	- .15
DEPTH TO LAB PUMP ON	- .15
DEPTH TO LEND PUMP ON	- .15
DEPTH TO PUMP STOP	-1.30

ELEV @ L.W.L. 323.605

② OUTLET ELEV.

INVERT @ MANHOLE	334.10
HEIGHT TO F.M.	.20

ELEV @ F.M. OUTLET 334.3

③ STATIC LIFT = $334.30 - 323.605$
= 10.695 SAY 10.7

A. FORCEMAIN

LENGTH = 660m
C factor = 120
DIAMETER = 100mm OR 150mm OR 200mm
FLOW = 39.5 l/sec

CHECK FRICTION LOSSES

100mm $h = 10.7 \times 660 \times \left(\frac{0.0395}{120} \right)^{1.85} \times (0.10)^{-4.87} = 189m$
Too HIGH

150mm $h = 10.7 \times 660 \times \left(\frac{0.0395}{120} \right)^{1.85} \times (0.15)^{-4.87} = 262m$
Too HIGH

200mm $h = 10.7 \times 660 \times \left(\frac{0.0395}{120} \right)^{1.85} \times (0.20)^{-4.87} = 6.40m$
OK

SAY 6.50m



**PARAGON
ENGINEERING
LIMITED**
CONSULTING ENGINEERS

Project

File No.

Calculated by

Checked By

Date

Page 2 of

CHECK VELOCITIES

$$V = Q/A \quad \text{FOR } 100 \text{ mm } \phi \quad V = 0.0395 / 0.007854 = 5.0 \text{ m/sec}$$

$$150 \text{ mm } \phi \quad V = 0.0395 / 0.017671 = 2.23 \text{ m/sec}$$

$$200 \text{ mm } \phi \quad V = 0.0395 / 0.031416 = 1.26 \text{ m/sec}$$

VELOCITIES SHOULD BE BETWEEN 0.76 m/sec & 2.3 m/sec

∴ 200 ϕ OK. USE PVC SERIES 160 PIPE

5. STATION LOSSES - EQUIVALENT LENGTH METHOD

ASSUME 200 mm ϕ (PUMP DISCHARGE SIZE)

PIPING	=	7.0
CHECK VALVE	=	16.0
90° BENDS (3 @ 6.2)	=	18.6
GATE VALVE (2 @ 1.3)	=	2.6

$$\text{TOTAL} = 44.2$$

$$\text{HEAD LOSS } h = 10.7 \times 44.2 \left(\frac{0.0395}{120} \right)^{4.85} \times (1.20)^{-4.87} = 0.43$$

SAY 0.5 m

6. PUMP SELECTION

T.D.H. = STATIC LIFT + FRICTION LOSSES + STATION LOSSES

$$= 10.70 \text{ m} + 6.5 \text{ m} + 0.5 \text{ m}$$

$$= 17.7 \text{ m (58.1')}$$

PRELIMINARY PUMP SELECTION - FLYGT PUMPS

625 USGPM @ 65' MODEL CP 352 MT 20 HP MP# 432

INCLUDE FLUSH VALVE OPTION ON PUMPS.



**PARAGON
ENGINEERING
LIMITED**
CONSULTING ENGINEERS

Project

File No.

Calculated by

Checked By

Date

Page 3 of

7. PROCESS PIPING AND VALVING / ACCESSORIES

- DUCTILE IRON PIPING
- PLUG TYPE ISOLATION VALVES
- CONTROLLED CLOSING CHECK VALVES (G & A #250XH)
- COMBINATION AIR RELIEF ON HEADER
- ULTRASONIC LEVEL INDICATOR WITH FLOAT BACKUPS

8. STANDBY GENERATOR

$$\text{MOTOR LOAD} = \frac{1 \times 20 \text{ HP} \times 1.50 \frac{\text{W}}{\text{HP}} \times 1.25}{1000 \frac{\text{W}}{\text{KW}}} \text{ EFFICIENCY} = 19.0 \text{ KW}$$

$$\text{BUILDING SERVICES} = 5 \text{ KW}$$

$$\text{TOTAL} = 19.0 + 5 = 24.0 \text{ KW} \quad \text{SAY } 35 \text{ KW (STANDARD SIZE)}$$

GENERATOR WOULD BE DIESEL POWERED OR
ALTERNATIVELY POWERED WITH NATURAL GAS IF
GAS IS AVAILABLE

ADVANTAGE OF NATURAL GAS

- CAN BE USED FOR EFFICIENT HEATING OF
CONTROL BUILDING
- NO NEED FOR AN ON-SITE FUEL STORAGE TANK
- COST EFFECTIVE.

9. INSTRUMENTATION / CONTROLS / ALARMS

- ULTRASONIC LEVEL INDICATOR
- FLOAT BACKUP SYSTEM
- ALARM AUTO-DIALER CONNECTED TO CITY OF
WATERLOO ALARM SERVICE (ADT)
- RUN-TIME METERS ON PUMPS
- AUTOMATIC DUPLEXING OF PUMPS



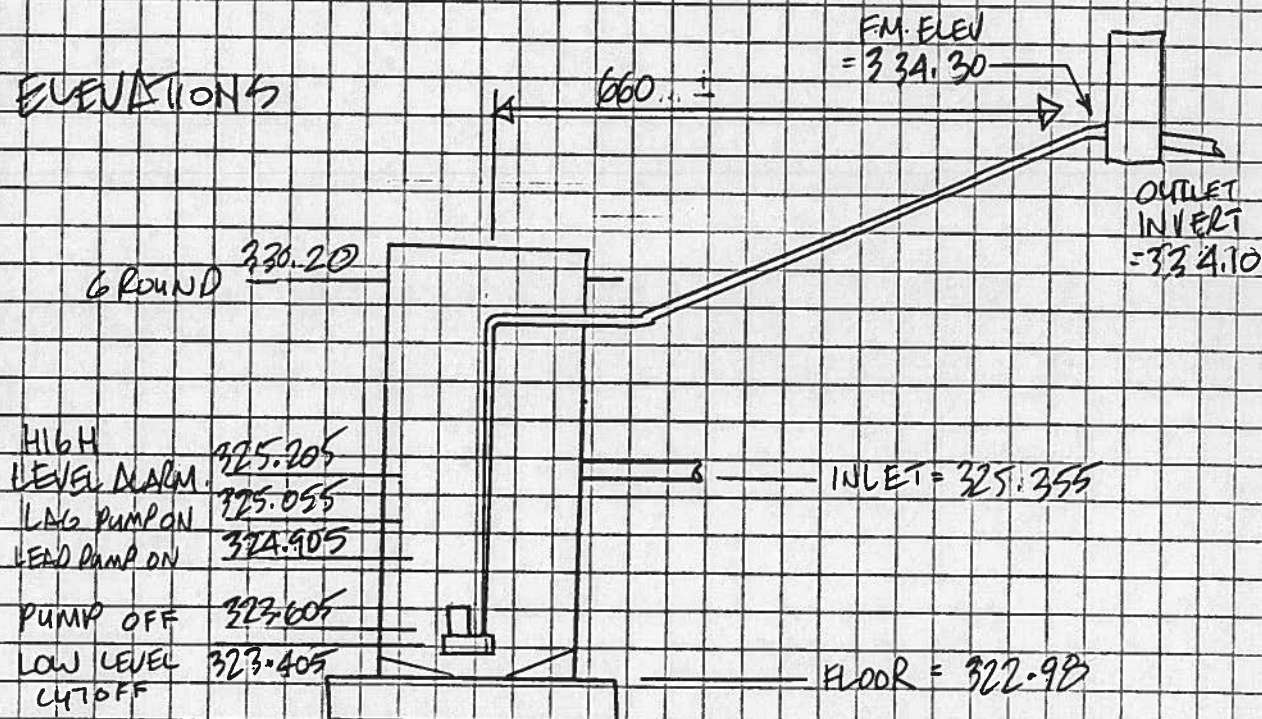
10. STRUCTURAL WET WELL

- 2400 PRECAST MANHOLE
- CUSTOM PRECAST MANHOLE CAP
- MISC. METALS TO BE ALUMINUM
 - ACCESS HATCHES
 - VENTS
 - LADDERS
 - PLATFORMS
- POURED IN PLACE BECHING TO SUIT PUMPS
- POURED IN PLACE OR PRECAST BASE SIZED TO RESIST BOUYANCY FORCES

CONTROL BUILDING

- STANDARD FROST FOOTING WITH SLAB ON GRADE FLOOR
- CAVITY WALL CONSTRUCTION (CONCRETE BLOCK/BRICK VENEER)
- WOOD TRUSS ROOF

11. ELEVATIONS



**PARAGON
ENGINEERING
LIMITED**
CONSULTING ENGINEERS

Project

File No.

Calculated by

Checked By

Date

Page 5 of

APPENDIX B



Equipment Data



C 3152 MT

Individual Curves

SECTION	PAGE
C 3152	7
SUPERSEDES	ISSUED
01/92	01/97



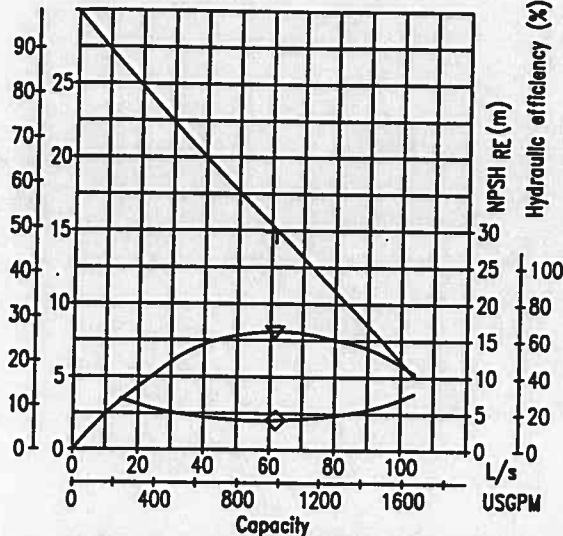
1 Vane

Impeller 432



CP/CS/CT

Head
ft m

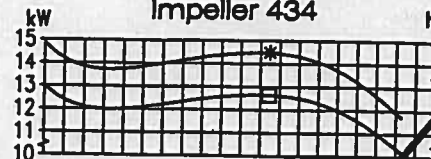


Volute	Throughlet	Motor Rating	Phase	r/min.
6"	100 mm (4")	15 kW 20 hp	3	1750



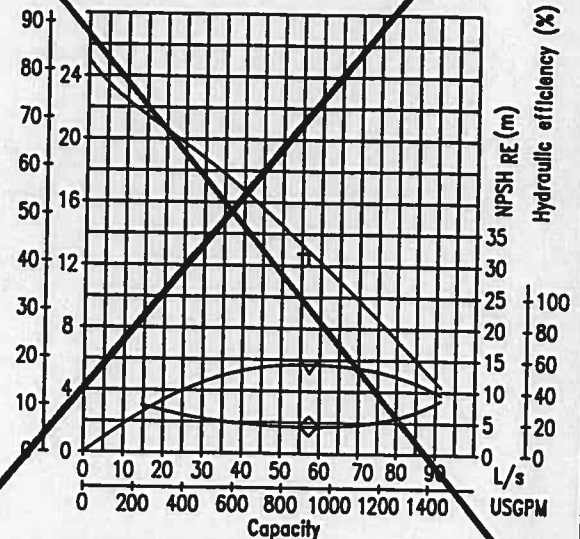
1 Vane

Impeller 434



CP/CS/CT

Head
ft m

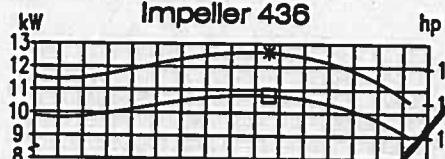


Volute	Throughlet	Motor Rating	Phase	r/min.
6"	100 mm (4")	15 kW 20 hp	3	1750



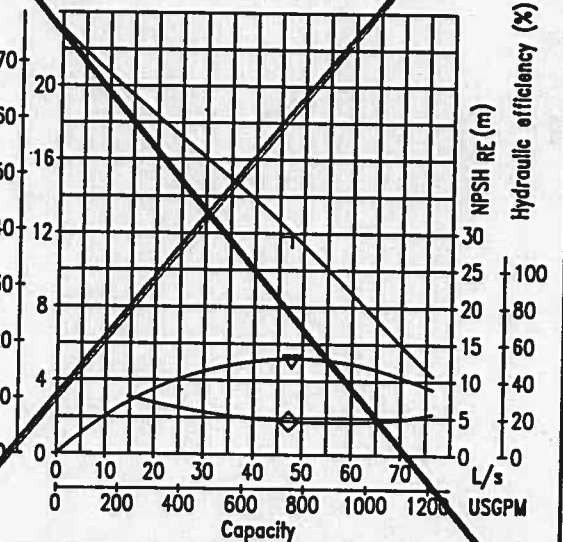
1 Vane

Impeller 436



CP/CS/CT

Head
ft m



Volute	Throughlet	Motor Rating	Phase	r/min.
6"	93 mm (3.6")	11 kW 15 hp	3	1755

P = Power limit
 ▽ = Best efficiency point
 ◇ = NPSH required

C = Cavitation limit
 ▽ = Hydraulic efficiency

* = Input power
 □ = Output power

Curves are in accordance with Hydraulic Institute, Acceptance Level A, and show performance with clear water at 20°C



CP 3152

Dimensional Drawing

SECTION

PAGE

C3152

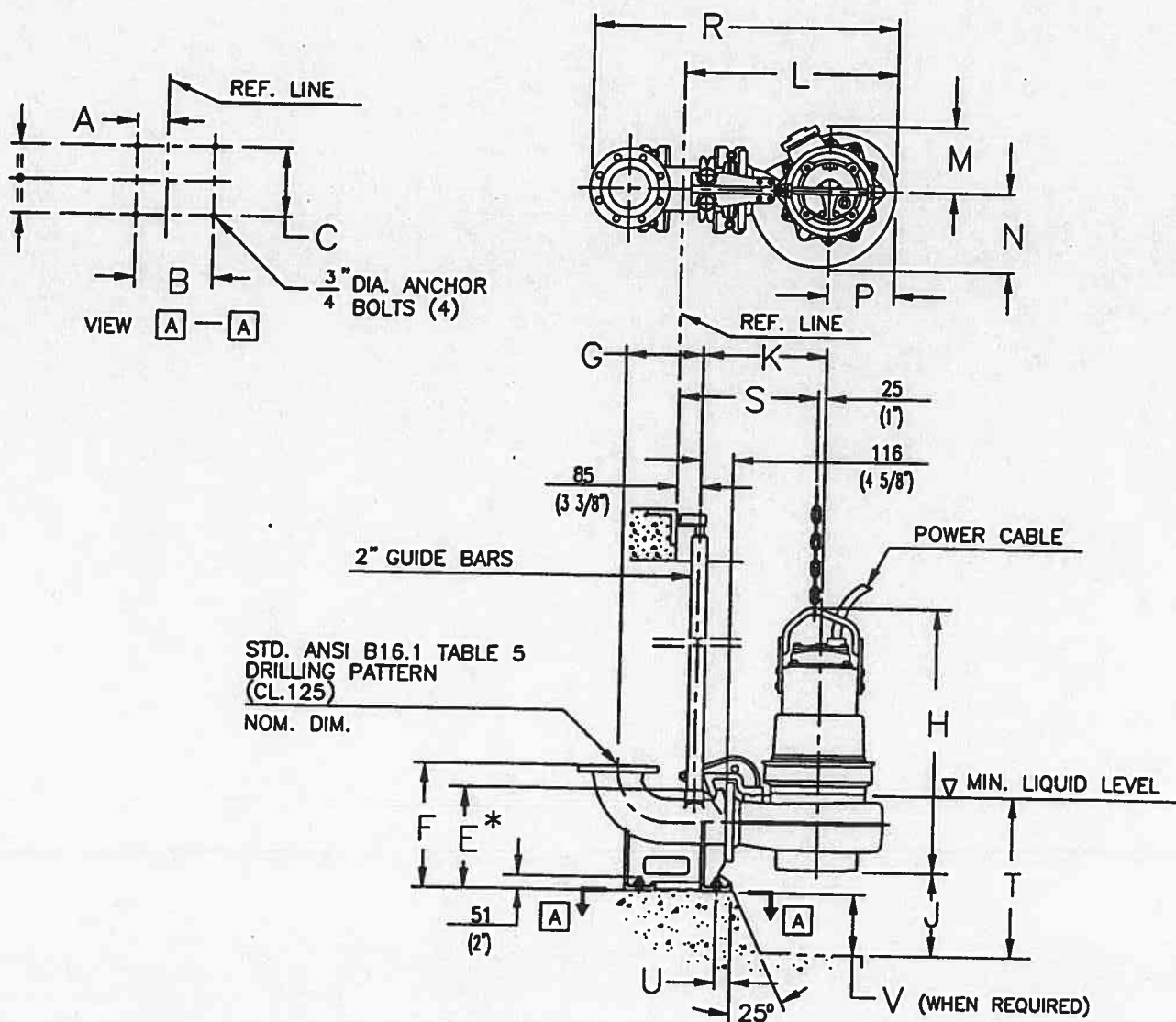
10

SUPERSEDES

ISSUED

01/92

01/97



* DIM. TO ENDS OF GUIDE BARS.

(ALL DIMENSIONS SHOWN IN MILLIMETERS & INCHES)

Version	Nom. Dim.	Dimensional Chart																	Weight		
		A	B	C	E	F	G	H	J	K	L	M	N	P	R	S	T	U	V	Pump	Disch
MT		109	280	250	365	450	279	950	150	446	771	235	270	240	1110	506	425	55	70	284 kg	53 kg
		4 1/4"	11"	9 7/8"	14 3/8"	17 3/4"	11"	37 3/8"	5 7/8"	17 1/2"	30 3/8"	9 1/4"	10 5/8"	9 1/2"	43 3/4"	19 7/8"	16 3/4"	2 1/8"	2 3/4"	626 lb	117 lb
		139	280	250	380	450	309	950	150	446	771	235	270	240	1165	506	430	55	60	284 kg	64 kg
		5 1/2"	11"	9 7/8"	15"	17 3/4"	12 1/8"	37 3/8"	5 7/8"	17 1/2"	30 3/8"	9 1/4"	10 5/8"	9 1/2"	45 7/8"	19 7/8"	16 7/8"	2 1/8"	2 3/8"	626 lb	141 lb
LT		359	500	250	400	450	359	1054	270	566	964	255	370	315	1440	626	650	55	250	300 kg	98 kg
		4 1/8"	19 5/8"	9 7/8"	15 3/4"	17 3/4"	14 1/8"	41 1/2"	10 5/8"	22 1/4"	38"	10"	14 5/8"	12 3/8"	56 3/4"	24 5/8"	25 5/8"	2 1/8"	9 7/8"	661 lb	216 lb
		244	500	500	675	800	434	1055	295	566	964	255	370	315	1555	626	675	75	0	300 kg	205 kg
		9 5/8"	19 5/8"	19 5/8"	26 5/8"	31 1/2"	17 1/8"	41 1/2"	11 5/8"	22 1/4"	38"	10"	14 5/8"	12 3/8"	61 1/4"	24 5/8"	26 5/8"	3"	0"	661 lb	452 lb



STATION EQUIPMENT

Dimensions Of Pumps
With Mix Flush Valve Model 4901

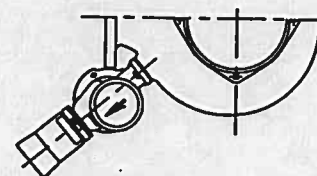
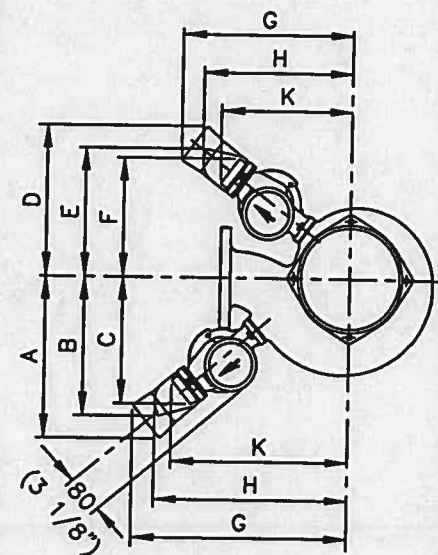
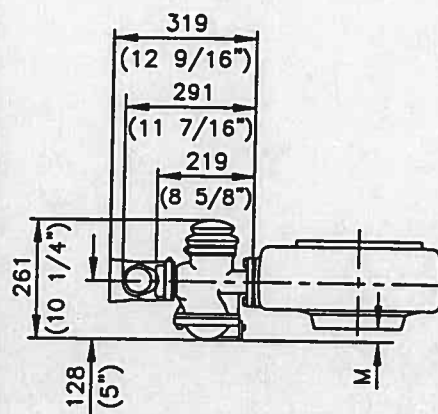
SECTION	PAGE
STATION EQUIPMENT	52
SUPERSEDES	ISSUED
06/95	01/97

Pump	Impeller(s)	Volute	A	B	C	D	E	F	G	H	K	M
3085	HT 252		391	351	293	—	—	—	315	284	267	68
			15 3/8"	13 7/8"	11 1/2"	—	—	—	12 3/8"	11 1/8"	10 1/2"	2 5/8"
	MT 434, 436 438, (440)*		382	336	295	—	—	—	398	355	328	45
			15"	13 1/4"	11 5/8"	—	—	—	15 5/8"	14"	12 7/8"	1 3/4"
3102	LT 414		387	345	291	—	—	—	380	346	327	18
			15 1/4"	13 5/8"	11 1/2"	—	—	—	15"	13 5/8"	12 7/8"	3/4"
	HT 254		374	346	274	—	—	—	296	296	296	—
			14 3/4"	13 5/8"	10 3/4"	—	—	—	11 5/8"	11 5/8"	11 5/8"	—
3127	MT 432, 433, 434 435		332	283	265	—	—	—	463	417	374	22
			13 1/8"	11 1/8"	10 3/8"	—	—	—	18 1/4"	16 3/8"	14 3/4"	7/8"
	LT 411, 412 441, 442	4"	352	303	279	—	—	—	479	433	395	30
			13 7/8"	11 7/8"	11"	—	—	—	18 7/8"	17"	15 1/2"	1 1/8"
3140	HT 481, 483 484, 485		412	363	338	—	—	—	452	405	367	14
			16 1/4"	14 1/4"	13 1/4"	—	—	—	17 3/4"	16"	14 1/2"	1/2"
	MT 432, 433 434, 436	4"	367	318	293	—	—	—	464	417	380	7
			14 1/2"	12 1/2"	11 1/2"	—	—	—	18 1/4"	16 3/8"	15"	1/4"
3152	HT 452, 454	4"	395	346	321	—	—	—	480	433	396	2
			15 1/2"	13 5/8"	12 5/8"	—	—	—	18 7/8"	17"	15 5/8"	1/8"
	LT 411, 412, 442		—	—	—	363	314	289	397	350	313	—
			—	—	—	14 1/4"	12 3/8"	11 3/8"	15 5/8"	13 3/4"	12 3/8"	—
3170	HT 480, 481		412	363	338	—	—	—	450	403	366	—
			16 1/4"	14 1/4"	13 1/4"	—	—	—	17 3/4"	15 7/8"	14 3/8"	—
	MT 436		395	346	326	—	—	—	548	500	459	—
			15 1/2"	13 5/8"	12 7/8"	—	—	—	21 5/8"	19 5/8"	18 1/8"	—
3201	LT 612, 614		—	—	—	382	333	313	450	402	361	—
			—	—	—	15"	13 1/8"	12 3/8"	17 3/4"	15 7/8"	14 1/4"	—
	SH 266, 267 268, 269		386	337	312	—	—	—	490	443	406	14
			15 1/4"	13 1/4"	12 1/4"	—	—	—	19 1/4"	17 1/2"	16"	1/2"
3201	HT 452, 454	4"	386	337	312	—	—	—	490	443	406	14
			15 1/4"	13 1/4"	12 1/4"	—	—	—	19 1/4"	17 1/2"	16"	1/2"
	MT 432, 434, 436	6"	353	304	288	—	—	—	527	479	436	—
			13 7/8"	12"	11 3/8"	—	—	—	20 3/4"	18 7/8"	17 1/8"	—
3201	LT 620, 622, 624		395	346	326	—	—	—	548	500	459	—
			15 1/2"	13 5/8"	12 7/8"	—	—	—	21 5/8"	19 5/8"	18 1/8"	—
			—	—	—	432	384	352	432	386	352	—
			—	—	—	17"	15 1/8"	13 7/8"	17"	15 1/4"	13 7/8"	—
3201	HT 463, 464		—	—	—	444	396	364	444	398	364	—
			—	—	—	17 1/2"	15 5/8"	14 3/8"	17 1/2"	15 5/8"	14 3/8"	—
	MT 442, 443		—	—	—	432	383	355	459	412	377	—
			—	—	—	17"	15 1/8"	14"	18 1/8"	16 1/4"	14 7/8"	—
3201	LT 603, 604 606, 607		447	398	381	—	—	—	671	623	581	—
			17 5/8"	15 5/8"	15"	—	—	—	26 3/8"	24 1/2"	22 7/8"	—
	HT 452, 454, 457 458		—	—	—	388	339	318	494	446	407	—
			—	—	—	15 1/4"	13 3/8"	12 1/2"	19 1/2"	17 1/2"	16"	—
3201	MT 632, 634, 636 637, 638		439	390	375	—	—	—	675	627	584	—
			17 1/4"	15 3/8"	14 3/4"	—	—	—	26 5/8"	24 5/8"	23"	—
	LT 821, 822, 823 824, 825		477	428	411	—	—	—	751	703	661	—
			18 3/4"	16 7/8"	16 1/8"	—	—	—	29 5/8"	27 5/8"	26"	—
3300	HT 454, 461, 462 463, 464, 465 466, 467, 468		429	381	349	—	—	—	599	553	519	—
			16 7/8"	15"	13 3/4"	—	—	—	23 5/8"	21 3/4"	20 3/8"	—
	MT 636, 638, 640 642, 644, 646 648		—	—	—	418	368	354	572	525	481	—
			—	—	—	16 1/2"	14 1/2"	13 7/8"	22 1/2"	20 5/8"	18 7/8"	—
3300	LT 804, 805, 806 807, 808, 809		—	—	—	415	366	345	529	481	441	—
			—	—	—	16 3/8"	14 3/8"	13 5/8"	20 7/8"	18 7/8"	17 3/8"	—

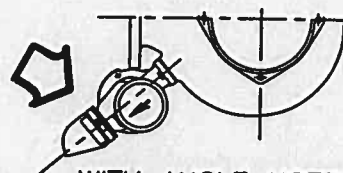
* SPECIAL APPLICATION

DIMENSIONS ARE IN mm (INCHES)

ITT Flvat



WITH STRAIGHT NOZZLE
(REFER TO DIM. A, D & G)



WITH ANGLE NOZZLE
(REFER TO DIM. B, E & H)



C 3152

Motor Data

SECTION

PAGE

C 3152

13

SUPERSEDES

ISSUED

01/92

01/97

Rated Power		Voltage V	Speed r/min	Rated Current A	No Load Current A	Locked Rotor Current A	Starting		EEMAC Code	Efficiency %			Power Factor				Design EEMAC	Motor Code
kW	hp						Current A	kVA		100% Load	75% Load	50% Load	100% Load	75% Load	50% Load	Start		
CP/CS/CT																		
17.2	23.0	600	3510	20.0	6.1	154.0	154.0	159.3	H	88.0	88.5	88.0	92.0	89.0	82.0	52.0	25-14-2AF	
17.2	23.0	460	3500	26.0	6.6	168.0	168.0	159.3	H	87.5	88.5	88.5	93.0	91.0	86.0	52.0	25-14-2AF	
17.2	23.0	230	3500	53.0	13.0	335.0	335.0	159.3	H	87.5	88.5	88.5	93.0	91.0	86.0	52.0	25-14-2AF	
17.2	23.0	208	3510	59.0	17.0	455.0	455.0	159.3	H	88.0	89.0	88.0	92.0	89.0	83.0	53.0	25-14-2AF	

Rated Power		Voltage V	Speed r/min	Rated Current A	No Load Current A	Locked Rotor Current A	Starting		EEMAC Code	Efficiency %			Power Factor				EEMAC Design	Motor Code
kW	hp						Current A	kVA		100% Load	75% Load	50% Load	100% Load	75% Load	50% Load	Start		
CP/CS/CT																		
11.0	14.8	600	1745	15.0	5.9	85.0	85.0	92.4	G	84.0	84.5	83.0	85.0	81.0	72.0	55.0	B	25-11-4AA
11.0	14.8	460	1745	19.0	7.7	105.0	105.0	92.4	G	84.0	84.5	83.0	85.0	81.0	71.0	55.0	B	25-11-4AA
11.0	14.8	230	1745	39.0	15.0	209.0	209.0	92.4	G	84.0	84.5	83.0	85.0	81.0	72.0	55.0	B	25-11-4AA
11.0	14.8	208	1745	43.0	17.0	252.0	252.0	92.4	G	84.0	84.5	83.5	85.0	81.0	71.0	55.0	B	25-11-4AA
CP/CS/CT																		
14.9	20.0	600	1755	20.0	8.4	121.0	121.0	126.7	H	87.0	87.5	86.0	83.0	79.0	68.0	48.0	A	25-15-4AA
14.9	20.0	460	1750	26.0	11.0	142.0	142.0	126.7	H	87.0	87.0	86.0	84.0	79.0	69.0	48.0	A	25-15-4AA
14.9	20.0	230	1750	51.0	21.0	285.0	285.0	126.7	H	87.0	87.0	86.0	84.0	79.0	69.0	48.0	A	25-15-4AA
14.9	20.0	208	1750	56.0	23.0	330.0	330.0	126.7	H	87.0	87.5	86.5	84.0	80.0	70.0	48.0	A	25-15-4AA
SINGLE PHASE CP/CS																		
12.0	16.0	230	1750	63.0									96.0				25-15-4AA	

Rated Power		Voltage V	Speed r/min	Rated Current A	No Load Current A	Locked Rotor Current A	Starting		EEMAC Code	Efficiency %			Power Factor				EEMAC Design	Motor Code
kW	hp						Current A	kVA		100% Load	75% Load	50% Load	100% Load	75% Load	50% Load	Start		
CP/CS/CT																		
10.5	14.0	600	1160	15.0	4.8	73.0	73.0	76.5	F	83.5	84.0	82.0	87.0	84.0	76.0	53.0	B	25-15-6AA
10.5	14.0	460	1160	19.0	7.5	98.0	98.0	76.5	F	84.0	84.0	81.5	85.0	80.0	71.0	53.0	B	25-15-6AA
10.5	14.0	230	1160	38.0	15.0	196.0	196.0	76.5	F	84.0	84.0	81.5	85.0	80.0	71.0	53.0	B	25-15-6AA
10.5	14.0	208	1160	42.0	14.0	217.0	217.0	76.5	F	83.5	84.0	82.0	86.0	83.0	75.0	53.0	B	25-15-6AA

Notes:

○ See "Station Equipment" for cable data.

○ All motors are insulated according to class F.

○ These motors should be provided with MINI-CAS II monitoring, which monitors the stator temperature (thermocontacts) and leakage into the stator housing (FLS).

○ All motors are for 3 phase, 60 Hz service, unless otherwise stated.

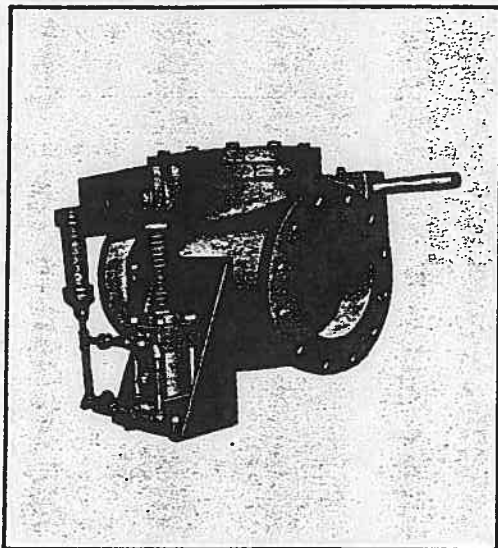
○ ITT Flygt recommends the use of a control system specifically designed for pumping stations, such as supplied by ITT Flygt ex.: MACTEC, LOGIMAC, etc., to ensure a maximum degree of protection and assurance of continuity of service.



9025 MARSHALL ROAD, MARS, PA 16046
PHONE (412) 776-1020 TELEX 86-6490

GOLDEN-ANDERSON CONTROLLED CLOSING SWING CHECK VALVES

Fig. Number 25-DXH



SPECIFY AND USE the "Controlled Closing" Swing Check Valve. This valve is designed to open smoothly on pump start-up, provide full pipe line flow, permit minimum head loss AND close at a controlled speed for the final predetermined (adjustable) portion of its stroke following the pump shutdown. **PROTECT YOUR SYSTEM FROM SURGE AND HAMMER.**

FEATURES:

1. Adjustable final, closing speed
2. Adjustable cushioned closing stroke
3. Rapid initial closing
4. Minimum resistance to flow
5. No electric required
6. No outside power source
7. Tight closing
8. Renewable Seat Washer
9. Flush port (optional)

DESCRIPTION

Controlled Closing Swing Check Valves, Fig. 25-DXH, are designed for installations on the discharge of a pump to minimize normal shut-down surges.

SPECIFICATIONS:

The function of the Controlled Closing Check Valve is to open smoothly on the start-up of a pump and close at a controlled rate of speed for the final predetermined portion of its stroke, following the pump shut-down. The valve shall be installed in a (horizontal or vertical) position, and shall be of the Swing Check Design such that the hinge shaft is above the water way.

The valve body shall be Cast Iron ASTM A126-B. The disc arm and chamber level shall be of heavy steel construction and keyed to the hinge shaft. The hinge shaft shall be of 18-8 stainless steel and of adequate diameter to withstand a complete hydraulic unbalance pressure of 125 psi on the valve disc. A single cushioning device mounted on the external side of the valve shall control the valve closure by way of the interchange of oil to and from an oil reservoir. The use of air or gas pressurized oil reservoir shall not be permitted. The oil plunger assembly shall be rigidly attached to the valve body by shoulder bolts or dowel pins to prevent fretting.

The manufacturer, if required by the engineer, shall submit design calculations of principle component stresses to substantiate the integrity of the valve for the working pressure involved.

On the start-up of the pump, the check valve disc shall open in response to the flow and then afford the minimum resistance to the flow.

Upon the pump shut-down, the valve's counterweight shall initiate the valve closure at an unrestricted rate until the valve disc reaches the pre-selected point of closure. The point at which the adjustable closing speed occurs may be modified in the field. The closing speed shall also be adjustable in the field, and shall be by way of a micrometer type needle valve.

The valve when closed shall be tight seating by way of a resilient replaceable seat against a bronze seat ring in the body.

Material and workmanship shall be first class throughout and the valve shall be as manufactured by GA Industries of Mars, PA and shall be their _____ size Fig. 25-DXH.

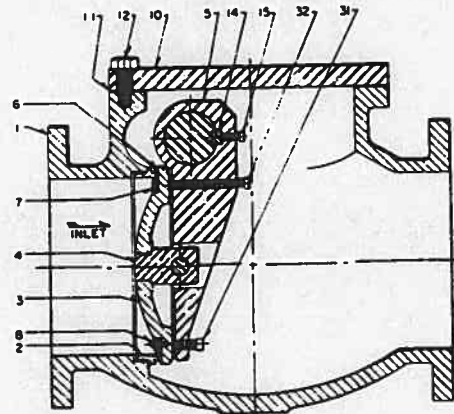
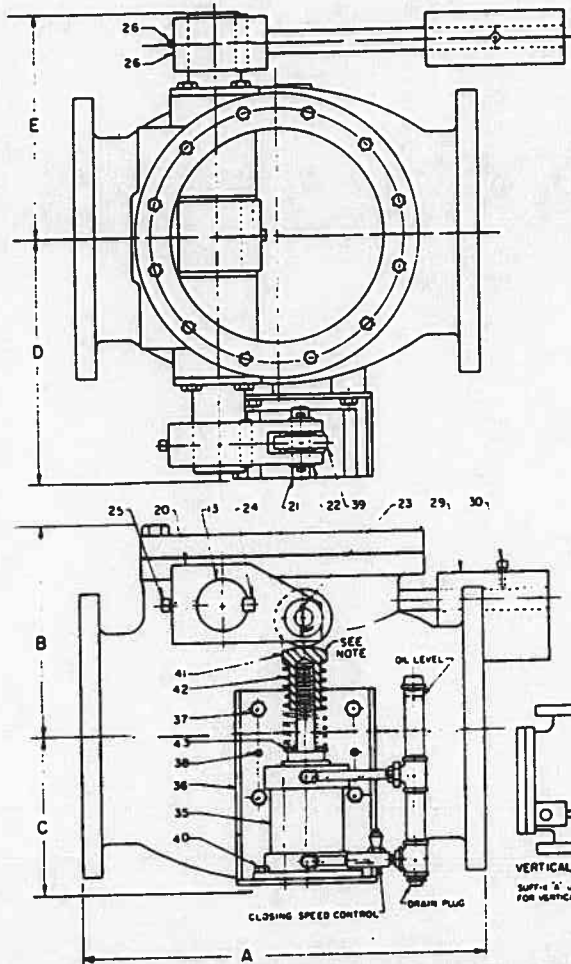
MATERIALS OF CONSTRUCTION

PART	MATERIAL	ASTM or SAE
Body, Cover Disc, Levers	Cast Iron (semi-steel) or	A 126 C1. B.
Disc Arm	Cast Steel	A 216 C1. WCB
Seat	Bronze or Stainless Steel	B 62 A-157-C 9
Seat Ring	Rubber or Metal to Suit	80 Dur.
Yoke Gasket	Composition or Composition	Garlock 660 7021 or equal
Hinge Shaft	Stainless Steel	Type 303
Studs, Bolts, Nuts	Steel	Commercial
Shhhockless Chamber Assembly	Steel	Commercial
Stuffing Box Packing	Composition	Garlock 234 or equal

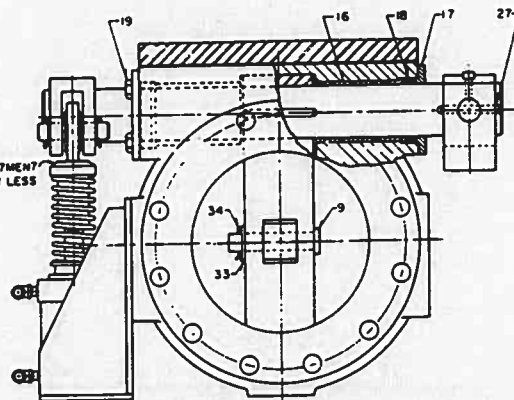
GOLDEN-ANDERSON CONTROLLED CLOSING SWING CHECK VALVES



9025 MARSHALL ROAD, MARS, PA 16046
PHONE (412) 776-1020 TELEX 86-6490



NOTE
CLOSING POINT ADJUSTMENT
(TURN CLOCKWISE FOR LESS
CUSHIONING)



Drawing No. C-1044

GENERAL DIMENSIONS — Inches & Millimeters

VALVE SIZE	IN	2	2½	3	4	6	8	10	12	14	16
	MM	50	63	76	101	152	203	254	304	355	406
A	IN	12	12	12	13	17½	18	23	28	33	36
	MM	305	305	305	330	445	457	584	711	838	914
B	IN	8	8	8	9	10	12	15	15	27	27
	MM	203	203	203	229	254	305	381	381	686	686
C	IN	11	11	11	12	12	14	14	12	19	19
	MM	279	279	279	305	305	356	356	305	483	483
D	IN	10	10	10	11	11	13	15	17	20	21
	MM	254	254	254	279	279	330	381	432	508	533
E	IN	7	7	7	8	9	11	13	15	20	21
	MM	178	178	178	203	229	279	330	381	508	533
Shipping Weight	LBS	145	147	150	200	300	400	550	1100	1650	1995
	KG	65	66	68	90	136	180	249	498	748	904

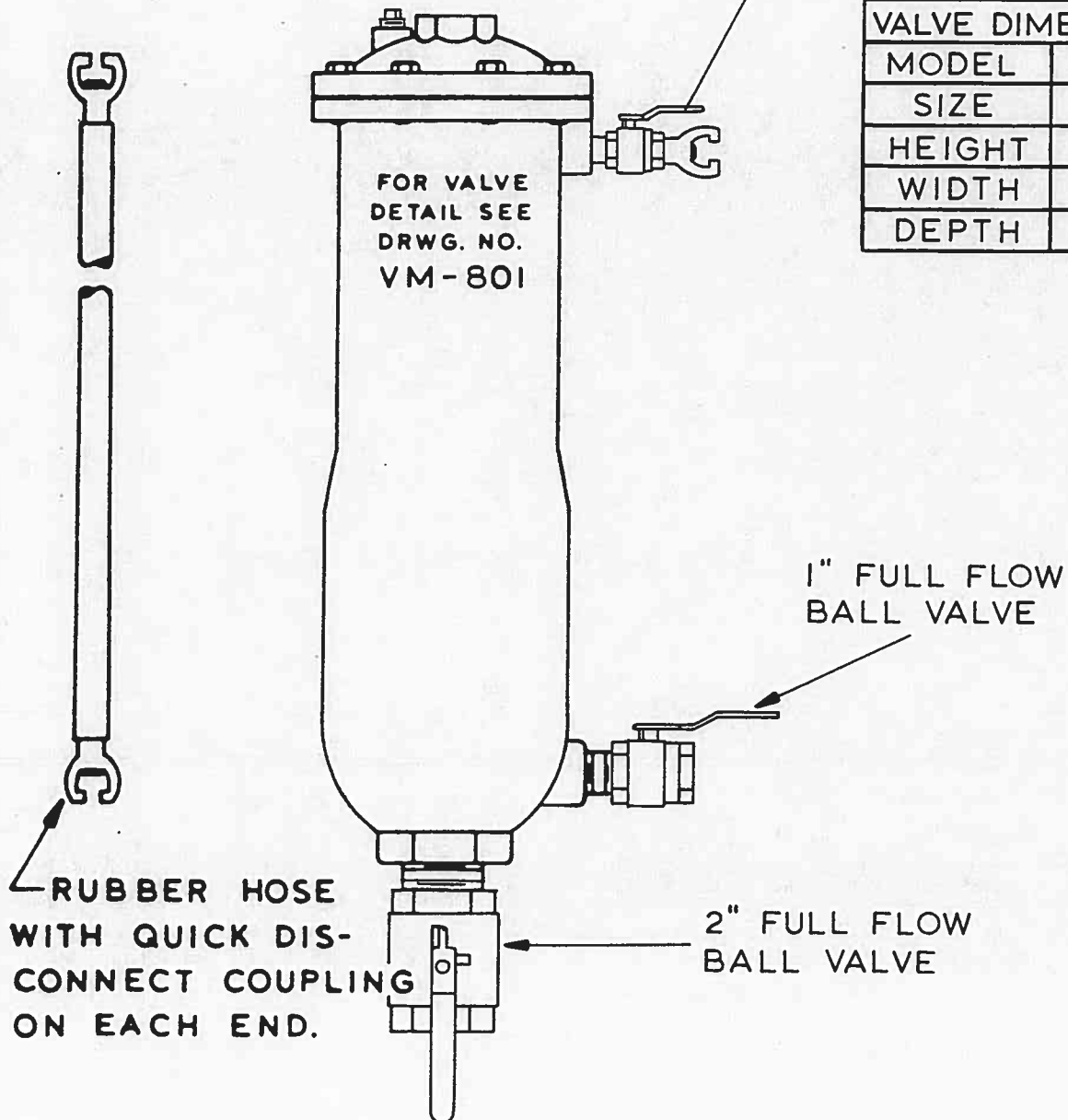
Notes: Flanges per ANSI B16.1, unless otherwise called out on customer's order. For valves larger than shown consult factory.

LIST OF PARTS

1	BODY	24	LEVER KEY
2	SEAT	25	LEVER SET SCREW
3	DISC	26	COUNTERWEIGHT ARM
4	DISC CLEVIS	27	CWT ARM KEY
5	DISC ARM	28	CWT ARM SET SCREW
6	SEAT WASHER	29	COUNTERWEIGHT
7	SEAT FOLLOWER	30	CWT SET SCREW
8	SEAT FOLLOWER SCREWS	31	LOWER DISC ARM SCREW
9	DISC CLEVIS PIN	32	UPPER DISC ARM SCREW
10	COVER	33	DISC CLEVIS WASHER
11	COVER GASKET	34	DISC CLEVIS COTTER PIN
12	COVER BOLTS	35	ADJ. HYDRAULIC CLOSING SPEED UNIT
13	SHAFT	36	BRACKET
14	DISC ARM KEY	37	BRACKET BOLTS
15	DISC ARM SET SCREW	38	BRACKET DOWEL PINS
16	SHAFT BUSHING	39	CAM ROLLER
17	PACKING GLAND	40	HYDRAULIC UNIT
18	PACKING		MOUNTING BOLTS
19	GLAND BOLTS	41	ADJUSTABLE STRIKER
20	LEVER	42	SPRING
21	LEVER PIN	43	SPRING WASHER
22	LEVER WASHER		
23	LEVER COTTER PINS		

1/2" FULL FLOW
BALL VALVE WITH
QUICK DISCONNECT
COUPLING.

VALVE DIMENSIONS	
MODEL	801 BW
SIZE	2"x1"
HEIGHT	25 1/2"
WIDTH	10 1/2"
DEPTH	7"



REV. 7-17-89

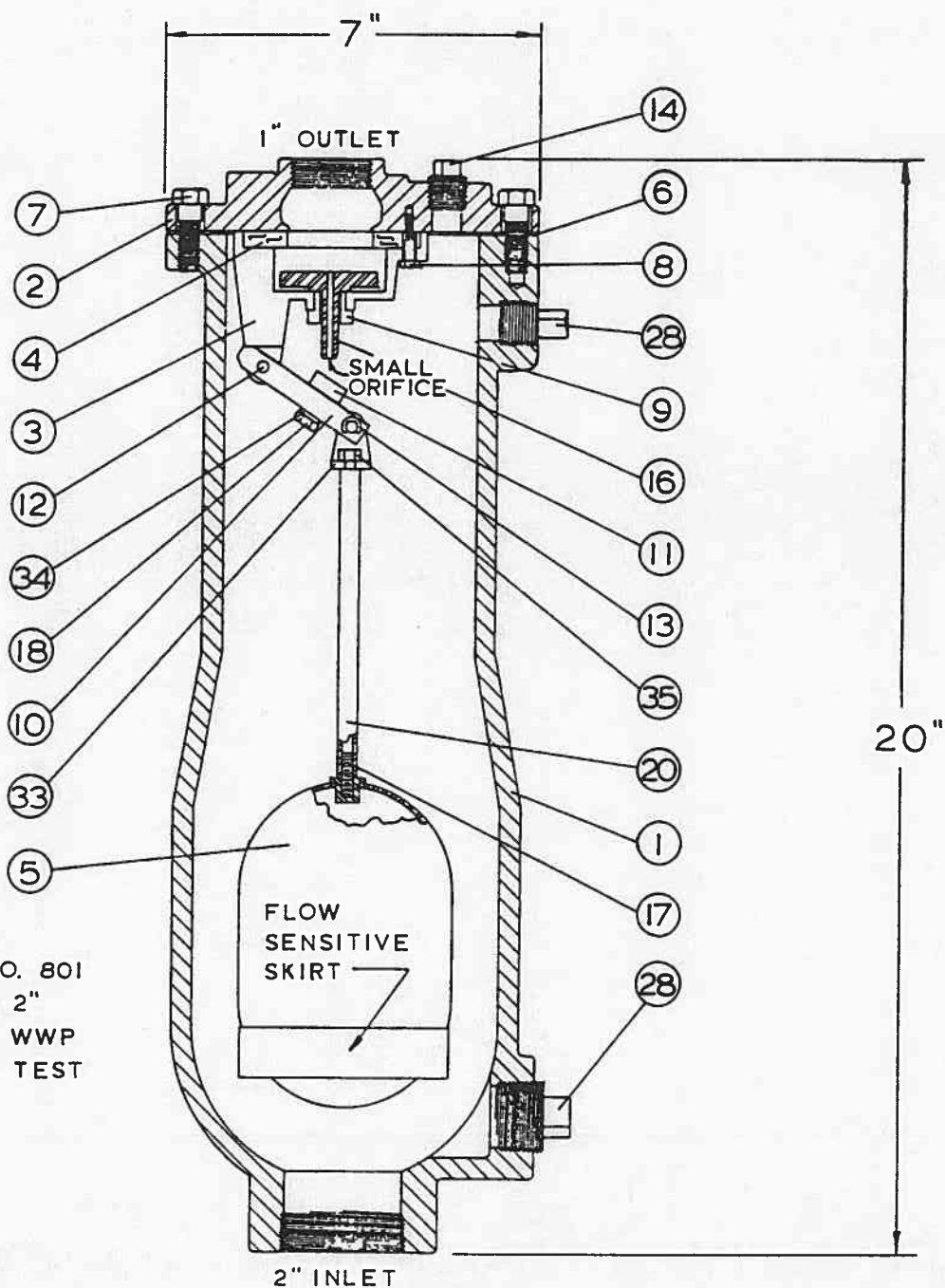
SEWAGE COMBINATION AIR RELEASE & AIR/VACUUM VALVE W/ACCESS.

DATE
9-8-86

VAL-MATIC

VALVE AND MANUFACTURING CORP.

DRWG. NO.
VM-801BW



MODEL NO. 801
 SIZE 1" x 2"
 150 P.S.I. WWP
 225 P.S.I. TEST

- | | | |
|--------------------|---------------------|--------------------|
| 1. BODY | 9. BUSHING | 18. LOCK NUT |
| 2. COVER | 10. FLOAT ARM | 20. GUIDE SHAFT |
| 3. BAFFLE | 11. ORIFICE BUTTON | 28. BODY PIPE PLUG |
| 4. SEAT | 12. PIVOT PIN | 33. CLEVIS |
| 5. FLOAT | 13. RETAINING RING | 34. LOCK WASHER |
| 6. GASKET | 14. COVER PIPE PLUG | |
| 7. COVER BOLT | 16. PLUG | |
| 8. RETAINING SCREW | 17. FLOAT RETAINER | |

REV. 6-30-89

SEWAGE COMBINATION AIR RELEASE AND AIR/VACUUM VALVE

DATE 9-8-86

VAL-MATIC

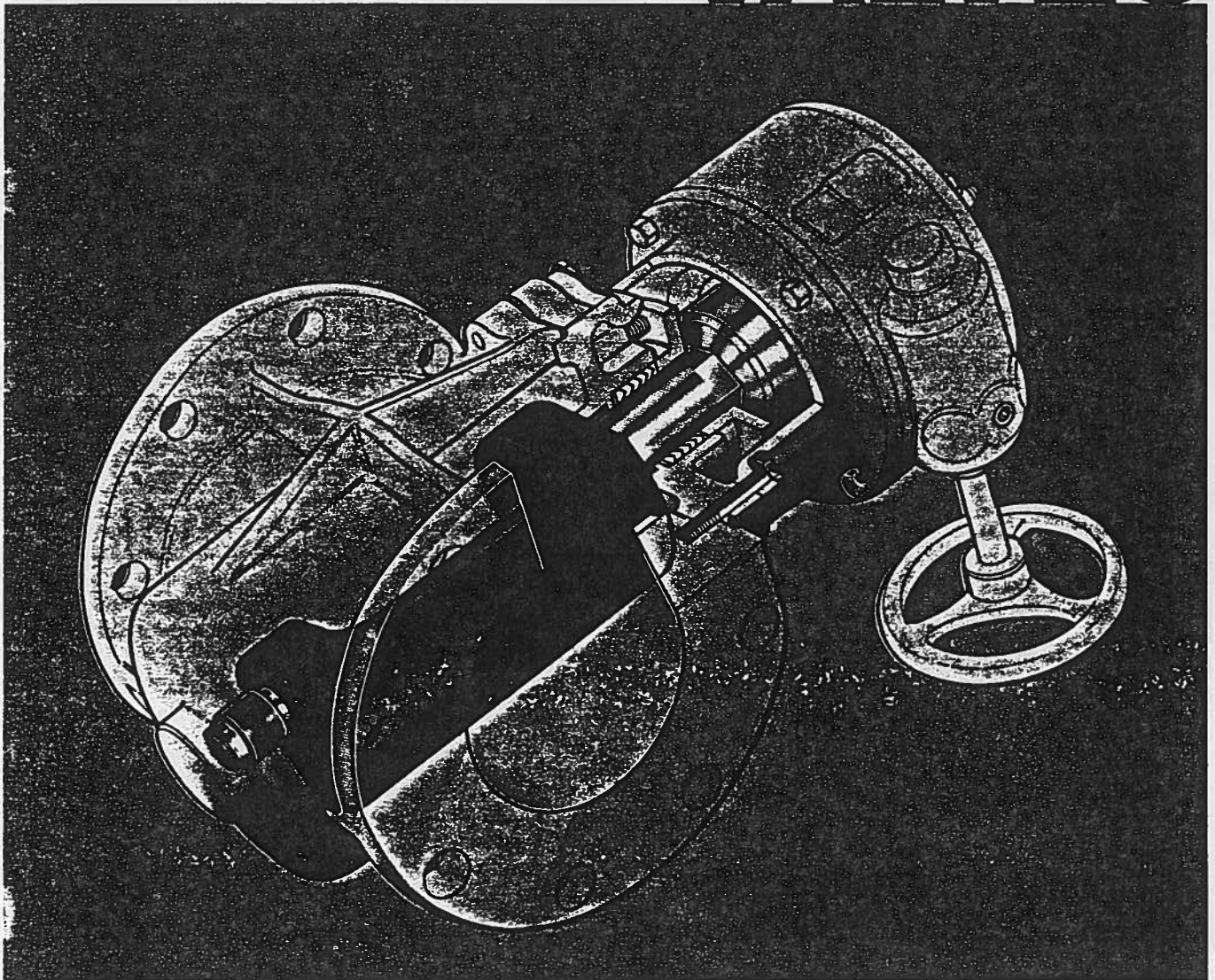
VALVE AND MANUFACTURING CORP.

DRWG. NO.

VM-801

BULLETIN 12.00-1
JULY 1982

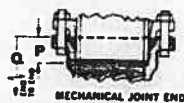
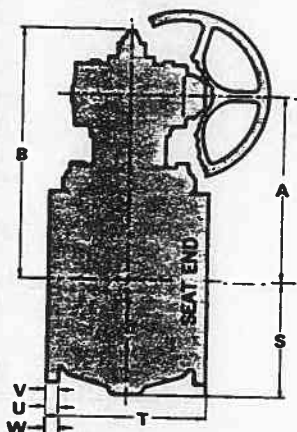
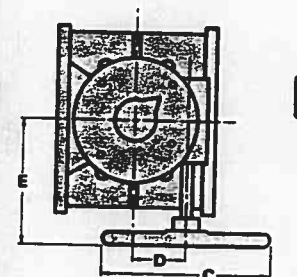
DeZURIK® SERIES 100 ECCENTRIC VALVES



dimensions handwheel actuated valves

All dimensions are subject to change without notice. Request certified drawings for use in preparing piping layouts.

4"-20" VALVES WITH AGG6H and AGG12H HANDWHEEL ACTUATORS



VALVE SIZE (inches)	ACTUATOR	DIMENSIONS (inches/mm)															
		A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P
4	AGG6H6	9 62	14 38	6 00	3 75	6 88	8 00	6 88	17 00	2 50	14 25	10 25	5 38	9 00	0 69	0 94	0 75
		244 5	365 1	152 4	95 2	174 6	203 2	174 6	431 8	63 5	362 0	260 4	136 5	228 6	17 5	23 8	19 0
5 & 6	AGG6H6	11 81	16 62	6 00	3 75	8 75	8 00	8 75	18 50	2 50	15 75	12 50	6 50	10 50	0 75	1 00	.88
		300 1	422 3	152 4	95 2	222 2	203 2	222 2	469 9	63 5	400 0	317 5	165 1	266 7	19 0	25 4	22 2
8	AGG6H6	13 63	18 50	6 00	3 75	8 75	8 00	8 75	19 50	2 50	17 38	13 50	8 25	11 50	0 81	1 12	1 00
		346 1	469 9	152 4	95 2	222 2	203 2	222 2	495 3	63 5	441 3	342 9	209 6	292 1	20 6	28 6	25 4
	AGG6H12	13 63	18 50	12 00	3 75	9 38	16 00	8 75	19 50	2 50	17 38	13 50	8 25	11 50	0 81	1 12	1 00
		346 1	469 9	304 8	95 2	238 1	304 8	222 2	495 3	63 5	441 3	342 9	209 6	292 1	20 6	28 6	25 4
	AGG6H8	15 12	19 88	8 00	3 75	11 12	8 00	11 12	21 00	2 50	19 38	16 00	9 88	13 00	0 88	1 19	1 06
		384 2	504 8	203 2	95 2	282 6	203 2	282 6	533 4	63 5	492 1	406 4	250 8	330 2	22 2	30 2	27 0
	AGG6H12	15 12	19 88	12 00	3 75	11 62	16 00	11 12	21 00	2 50	19 38	16 00	9 88	13 00	0 88	1 19	1 06
		384 2	504 8	304 8	95 2	295 3	304 8	282 6	533 4	63 5	492 1	406 4	250 8	330 2	22 2	30 2	27 0
10	AGG12H12	15 12	19 88	12 00	7 00	17 88	16 00	17 38	21 00	2 50	19 38	16 00	9 88	13 00	0 88	1 19	1 06
		384 2	504 8	304 8	177 8	454 2	304 8	441 5	533 4	63 5	492 1	406 4	250 8	330 2	22 2	30 2	27 0
	AGG12H16	15 12	19 88	16 00	7 00	17 88	20 00	17 38	21 00	2 50	19 38	16 00	9 88	13 00	0 88	1 19	1 06
		384 2	504 8	406 4	177 8	454 2	508 0	441 5	533 4	63 5	492 1	406 4	250 8	330 2	22 2	30 2	27 0
	AGG6H8	16 75	21 50	8 00	3 75	11 88	8 00	11 88	22 00	2 50	20 75	17 00	11 63	14 00	0 94	1 25	1 12
		419 5	540 1	203 2	95 2	301 6	203 2	301 6	558 8	63 5	527 0	431 8	296 9	355 6	23 8	31 8	28 6
	AGG6H12	16 75	21 50	12 00	3 75	12 38	12 00	11 88	22 00	2 50	20 75	17 00	11 63	14 00	0 94	1 25	1 12
		419 5	540 1	304 8	95 2	314 3	304 8	301 6	558 8	63 5	527 0	431 8	296 9	355 6	23 8	31 8	28 6
12	AGG12H12	16 75	24 12	12 00	7 00	17 88	12 00	17 38	22 00	2 50	20 75	17 00	11 63	14 00	0 94	1 25	1 12
		419 5	540 1	304 8	177 8	454 2	304 8	441 5	558 8	63 5	527 0	431 8	296 9	355 6	23 8	31 8	28 6
	AGG12H16	16 75	24 12	16 00	7 00	18 25	20 00	17 38	22 00	2 50	20 75	17 00	11 63	14 00	0 94	1 25	1 12
		419 5	540 1	406 4	177 8	463 6	508 0	441 5	558 8	63 5	527 0	431 8	296 9	355 6	23 8	31 8	28 6
	AGG12H20	16 75	24 12	20 00	7 00	18 25	20 00	17 38	22 00	2 50	20 75	17 00	11 63	14 00	0 94	1 25	1 12
		419 5	540 1	508 0	177 8	463 6	508 0	441 5	558 8	63 5	527 0	431 8	296 9	355 6	23 8	31 8	28 6
	AGG12H12	15 74	25 18	12 00	7 00	17 88	12 00	17 38	25 00	3 50	24 50	21 62	12 94	17 00	1 00	1 44	1 25
		476 3	638 2	304 8	177 8	454 0	304 8	441 3	635 0	88 9	622 3	549 3	328 6	431 8	25 4	36 5	31 8
14	AGG12H16	15 74	25 18	16 00	7 00	18 25	20 00	17 38	25 00	3 50	24 50	21 62	12 94	17 00	1 00	1 44	1 25
		476 3	638 2	406 4	177 8	463 6	508 0	441 3	635 0	88 9	622 3	549 3	328 6	431 8	25 4	36 5	31 8
	AGG12H20	15 74	25 18	20 00	7 00	18 25	20 00	17 38	25 00	3 50	24 50	21 62	12 94	17 00	1 00	1 44	1 25
		476 3	638 2	508 0	177 8	463 6	508 0	441 3	635 0	88 9	622 3	549 3	328 6	431 8	25 4	36 5	31 8
	AGG12H24	15 74	25 18	24 00	7 00	21 75	30 00	17 38	25 00	3 50	24 50	21 62	12 94	17 00	1 00	1 44	1 25
		476 3	638 2	609 6	177 8	552 4	762 0	441 3	635 0	88 9	622 3	549 3	328 6	431 8	25 4	36 5	31 8
16	AGG12H12	20 24	26 62	12 00	7 00	17 88	12 00	17 38	25 75	3 50	27 25	22 50	14 31	17 75	1 06	1 50	1 31
		514 1	676 1	304 8	177 8	454 0	304 8	441 3	654 0	88 9	692 2	571 5	363 5	450 8	27 0	38 1	33 3
	AGG12H16	20 24	26 62	16 00	7 00	18 25	20 00	17 38	25 75	3 50	27 25	22 50	14 31	17 75	1 06	1 50	1 31
		514 1	676 1	406 4	177 8	463 6	508 0	441 3	654 0	88 9	692 2	571 5	363 5	450 8	27 0	38 1	33 3
	AGG12H20	20 24	26 62	20 00	7 00	18 25	20 00	17 38	25 75	3 50	27 25	22 50	14 31	17 75	1 06	1 50	1 31
		514 1	676 1	508 0	177 8	463 6	508 0	441 3	654 0	88 9	692 2	571 5	363 5	450 8	27 0	38 1	33 3
	AGG12H24	20 24	26 62	24 00	7 00	21 75	30 00	17 38	25 75	3 50	27 25	22 50	14 31	17 75	1 06	1 50	1 31
		514 1	676 1	609 6	177 8	552 4	762 0	441 3	654 0	88 9	692 2	571 5	363 5	450 8	27 0	38 1	33 3
18	AGG12H12	21 12	27 50	12 00	7 00	17 88	12 00	17 38	29 50	3 50	29 25	22 50	15 69	21 50	1 12	1 62	1 44
		536 4	698 5	304 8	177 8	454 0	304 8	441 3	749 3	88 9	743 0	—	398 5	546 1	28 6	41 3	36 5
	AGG12H16	21 12	27 50	16 00	7 00	18 25	20 00	17 38	29 50	3 50	29 25	22 50	15 69	21 50	1 12	1 62	1 44
		536 4	698 5	406 4	177 8	463 6	508 0	441 3	749 3	88 9	743 0	—	398 5	546 1	28 6	41 3	36 5
	AGG12H20	21 12	27 50	20 00	7 00	18 25	20 00	17 38	29 50	3 50	29 25	22 50	15 69	21 50	1 12	1 62	1 44
		536 4	698 5	508 0	177 8	463 6	508 0	441 3	749 3	88 9	743 0	—	398 5	546 1	28 6	41 3	36 5
	AGG12H24	21 12	27 50	24 00	7 00	21 75	30 00	17 38	29 50	3 50	29 25	22 50	15 69	21 50	1 12	1 62	1 44
		536 4	698 5	609 6	177 8	552 4	762 0	441 3	749 3	88 9	743 0	—	398 5	546 1	28 6	41 3	36 5
20	AGG12H12	23 12	29 50	12 00	7 00	17 88	12 00	17 38	31 50	3 50	31 00	—	17 19	23 50	1 19	1 75	1 75
		587 2	749 3	304 8	177 8	454 0	304 8	441 3	800 1	88 9	787 4	—	436 6	596 9	30 2	44 4	44 4
	AGG12H16	23 12	29 50	16 00	7 00	18 25	20 00	17 38	31 50	3 50	31 00	—	17 19	23 50	1 19	1 75	1 75
		587 2	749 3	406 4	177 8	463 6	508 0	441 3	800 1	88 9	787 4	—	436 6	596 9	30 2	44 4	44 4
	AGG12H20	23 12	29 50	20 00	7 00	18 25	20 00	17 38	31 50	3 50	31 00	—	17 19	23 50	1 19	1 75	1 75
		587 2	749 3	508 0	177 8	463 6	508 0	441 3	800 1	88 9	787 4	—	436 6	596 9	30 2	44 4	44 4
	AGG12H24	23 12	29 50	24 00	7 00	21 75	30 00	17 38	31 50	3 50	31 00	—	17 19	23 50	1 19	1 75	1 75
		587 2	749 3	609 6	177 8	552 4	762 0	441 3	800 1	88 9	787 4	—	436 6	596 9	30 2	44 4	44 4

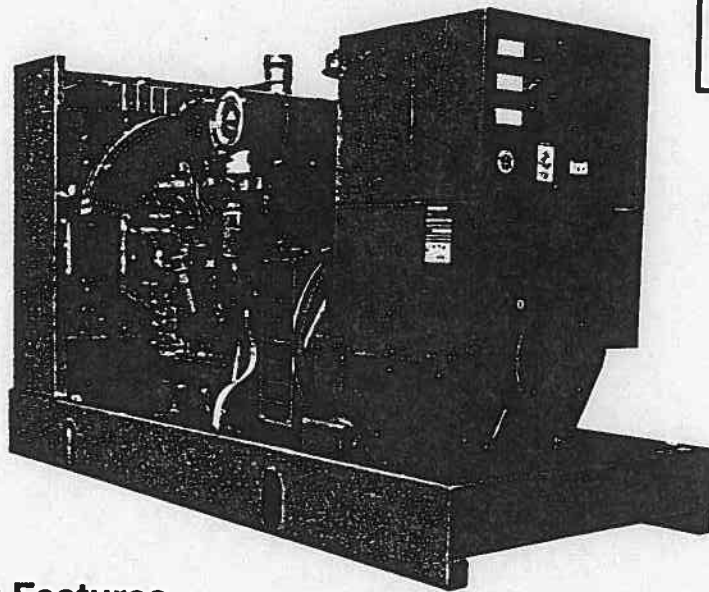
"V" Dimension is for carbon steel valves. "U" Dimension is for all others except stainless steel and rubber lined. "W" Dimension is for stainless steel. "T" Dimension is for metal body valves. For rubber lined valves add 1/4 Inch. "F" Dimension is Chainwheel Diameter and "G" Dimension is distance from centerline of valve to outside of chainwheel hub. Handwheel turns to open valve—AGG6 = 13, AGG12 = 19.



Onan

35 DGBB 60 Hz 28 DGBB 50 Hz Diesel-Fueled Generator Set

	STANDBY	PRIME
60 Hz	35 kW 44 kVA	32 kW 40 kVA
50 Hz	28 kW 35 kVA	25 kW 31 kVA



Generator Set Features

- Single-source design, manufacturing and testing of all set components and accessories by Onan Corporation.
- Accepts 100% of nameplate kW rating in one step, in compliance with NFPA 110, Paragraph 5-13.2.6.
- Engine torque-matched excitation system provides quick recovery from transient speed dips.
- Low reactance generator design offers low waveform distortion with non-linear loads and provides excellent motor starting capabilities.

Standard Equipment

ENGINE

Cummins 4-cycle diesel engine.

ALTERNATOR

Brushless Onan AC alternator provides broad range reconnectable output. Designed for service in severe environments.

CONTROL PANEL

Vibration isolated control with analog instrumentation.

VOLTAGE REGULATOR

Electronic voltage regulator provides precise regulation and underfrequency compensation.

COOLING SYSTEM

High ambient 122° F (50° C) system.

SKID BASE

Supports the alternator and engine. Battery rack and cooling system mount to the skid base. Integral vibration isolation

Generator Set Testing



The Prototype Test Support (PTS) program is our commitment to verifying the integrity of our designs and products.

Before the generator sets are put into production, prototype models are subjected to demanding tests with typical/atypical loads and transients anticipated in service.

Production models earn the PTS seal only after meeting the performance criteria established by the program.

Single-Source Warranty

All generator set components and systems are covered by a limited one-year warranty. Optional two- and five-year extended programs are available.



Standard Models are CSA certified.

Generator Set Performance

Voltage Regulation

Under load from no load to 100% load will be within $\pm 1\%$.

Random Voltage Variation

For constant loads, from no load to 100% load will not exceed $\pm 1\%$ of its mean value.

Frequency Regulation

Under varying loads from no load to 100% load: 5%. (Isochronous with optional electronic governor).

Random Frequency Variation

Will not exceed $\pm 0.5\%$ of its mean value for constant loads from no load to full load.

Electromagnetic Interference Attenuation

Meets requirements of most industrial and commercial applications.

AC Waveform Total Harmonic Distortion

Less than 5% total no load to full linear load, and less than 3% for any single harmonic.

Telephone Influence Factor (TIF)

Less than 50 per NEMA MG1-22.43.

Telephone Harmonic Factor (THF) Less than 3.

Alternator Temperature Rise

At rated load is less than 125° C at standby rating, per NEMA MG1.22.40, IEEE115 and IEC 34-1.

Radio Interference

Alternator and voltage regulator with optional PMG Excitation operate in compliance with BS800 and VDE level G and N. Addition of optional RFI Protection Kit allows operation per MIL-STD 461 and VDE Level K.

Engine: Cummins 4B 3.9 in-line, 4-cylinder, direct injection diesel

Design: 4-cycle, water-cooled, natural aspiration.

Bore: 4.02" (102 mm) **Stroke:** 4.72" (120 mm).

Piston Displacement: 239 cubic inches (3.9 liters).

Valves: Two per cylinder, single springs.

Crankshaft: Forged steel, integral counterweight-type.

Connecting Rods: Forged steel with i-beam design.

Compression Ratio: 17.3:1.

Starting: 24-volt, negative ground.

Cranking Current: 400 amps at ambient temperature of 32° F (0° C).

Battery Charging Alternator: 45-amp.

Cylinder Block: Cast iron.

Fuel System: Direct injection; number 2 diesel fuel; fuel filters; automatic electric fuel shutoff; fuel/water separator; distributor injection pump with integral mechanical governor.

Air Cleaner: Dry-element, with restriction indicator.

Lube Oil Capacity: 12 US quarts (11 liters).

Lube Oil Required: API CD 15W-40.

Lube Oil Filter: Single spin-on, full flow.

Cooling System: High ambient 122° F (50° C) radiator.

Alternator: Onan

Design:

Revolving field, single bearing, 4-pole, brushless, drip-proof construction. Standard 125° C temperature rise at standby power rating. Class H insulation system per NEMA MG1-1.65 and BS2757. The main alternator and exciter insulation systems are impregnated for operation in severe environments where sand, salt sea spray and chemical corrosion are installation factors.

Stator:

Skewed stator and 2/3 pitch windings minimize field heating and voltage harmonics.

Rotor:

Dynamically balanced assembly. Direct coupled to engine by a flexible drive disc. Complete amortisseur (damper) windings help minimize voltage deviations and heating effects under unbalanced loads. The rotor is supported by a pre-lubricated, maintenance-free ball bearing.

Torque-Matched Voltage Regulation:

The voltage regulator provides torque-matched underfrequency compensation to optimize motor starting performance and assist the engine during transient load conditions. The brushless exciter armature powers the main alternator field winding through shaft-mounted, three-phase, full wave silicon diode rectifiers. Semi-conductor surge suppressors protect the diodes from transient overvoltages induced by load surges.

Shunt Excitation:

The excitation system derives its power from the main output of the generator, eliminating the need for a separate excitation power source. This excitation system, combined with the Onan low reactance generator, comprise a system that provides sufficient short circuit current for selective clearing of instantaneous overcurrent devices.

Phase Rotation: A (U), B (V), C (W).

Alternator Cooling: Direct drive centrifugal blower.

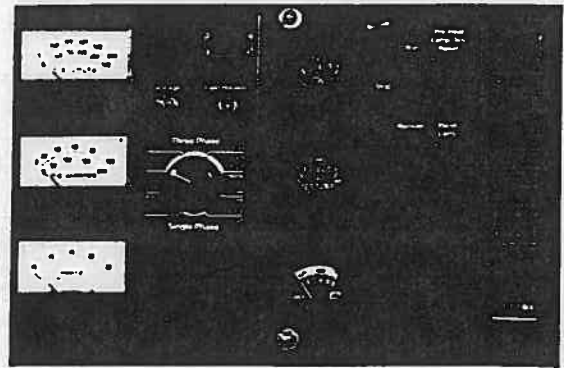
35 DGBB 60 Hz Operating Data

	80°C Alternator				105°C Alternator				125°C Alternator			
Voltage Ranges	120/208 Thru 139/240 240/416	120/208 Thru 139/240 240/416	220/380	347/600	120/208 Thru 139/240 240/416	120/208 Thru 139/240 240/416	220/380	347/600	120/208 Thru 139/240 240/416	120/208 Thru 139/240 240/416	220/380	347/600
• The broad range alternator can supply single phase output up to 2/3 of the set rated 3-phase kVA at 1.0 power factor.												
** The optional extended stack alternator can supply single phase output at full set rated kW at 1.0 power factor.	277/480 120/240**	277/480 120/240*			277/480 120/240**	277/480 120/240*			277/480 120/240**	277/480 120/240*		
Motor Starting												
Maximum Surge kW	44	44	44	44	44	43	43	43	44	43	43	43
Maximum kVA (Shunt)	188	163	163	163	163	131	131	131	163	131	131	131
(90% Sustained Voltage) (PMG)	221	191	191	191	191	155	155	155	191	155	155	155
Feature Code	B269	B257	B386	B305	B268	B256	B385	B304	B267	B255	B384	B303
Alternator Data Sheet Number	203	202	202	202	202	201	201	201	202	201	201	201
Full Load Current	120/208 127/220 139/240 240/416 254/440 277/480 347/600 120/240* 120/240**											
(Amps @ Standby Rating)	121	115	105	61	57	53	42	121	146			

Fuel		STANDBY				PRIME			
Fuel Consumption	Load kW	1/4 9	1/2 18	3/4 26	Full 35	1/4 8	1/2 16	3/4 24	Full 32
	US gph	1.4	1.9	2.5	3.2	1.4	1.8	2.3	2.9
	L/hr	5	7	9	12	5	7	9	11
Maximum Fuel Flow		12 US gph	45 L/hr			12 US gph	45 L/hr		
Maximum Inlet Restriction		4.0 in. Hg	102 mm Hg			4.0 in. Hg	102 mm Hg		
Maximum Return Restriction		20.0 in. Hg	508 mm Hg			20.0 in. Hg	508 mm Hg		
Cooling									
Heat Rejection To Coolant		2100 Btu/Min	2.2 MJ/Min			1950 Btu/Min	2.1 MJ/Min		
Heat Radiated To Room		680 Btu/Min	0.7 MJ/Min			630 Btu/Min	0.7 MJ/Min		
Coolant Capacity (with radiator)		5.5 US Gal	21 L			5.5 US Gal	21 L		
Coolant Flow Rate		45 Gal/Min	170 L/Min			45 Gal/Min	170 L/Min		
Maximum Coolant Friction Head		5.0 psi	34 kPa			5.0 psi	34 kPa		
Maximum Coolant Static Head		46 ft	14.0 m			46 ft	14.0 m		
Radiator Fan Load		2.5 HP	1.9 kW			2.5 HP	1.9 kW		
Air									
Combustion Air		105 cfm	3.0 cu m/min			105 cfm	3.0 cu m/min		
Maximum Air Cleaner Restriction		25 in. H ₂ O	6.2 kPa			25 in. H ₂ O	6.2 kPa		
Alternator Cooling Air		572 cfm	16.2 cu m/min			572 cfm	16.2 cu m/min		
Radiator Cooling Air		4000 scfm	113 cu m/min			4000 scfm	113 cu m/min		
Minimum Air Opening to Room		7.2 sq ft	0.7 sq m			7.2 sq ft	0.7 sq m		
Minimum Discharge Opening		5.8 sq ft	0.5 sq m			5.8 sq ft	0.5 sq m		
Max. Allowable Static Restriction		0.25 in. H ₂ O	62 Pa			0.25 in. H ₂ O	62 Pa		
Exhaust									
Gas Flow (Full Load)		325 cfm	9.2 cu m/min			300 cfm	8.5 cu m/min		
Gas Temperature		1100 °F	593 °C			1000 °F	538 °C		
Maximum Back Pressure		41 in. H ₂ O	10.2 kPa			41 in. H ₂ O	10.2 kPa		
Engine									
Gross Engine Power Output		68 bhp	51 kWm			60 bhp	45 kWm		
BMEP		103 psi	712 kPa			95 psi	653 kPa		
Piston Speed		1417 ft/min	7.20 m/s			1417 ft/min	7.20 m/s		
Overspeed Limit		2100 ±50 rpm				2100 ±50 rpm			
Regenerative Power		18 kW				18 kW			
Derating Factors		Rated power available up to 6600 ft (2013 m) at ambient temperatures up to 77°F (25°C). Above 6600 ft (2013 m), derate at 3% per 1000 ft (305 m) and 1% per 10°F (2% per 11°C) above 77°F (25°C).							

Detector™ Control System

- Monitors engine performance and AC power output.
- Controls generator set start and shutdown.
- Automatic remote start.
- DC panel lighting.
- Vibration Isolators protect control panel electronics and circuitry from generator set vibration.
- Analog Instrumentation displays performance trends Rugged. Non-fluctuating, easy to read.



Control panel shown includes optional AC Meters and 12-Light Monitoring System.

☐ Standard Control Features

- Run-stop-remote switch
- Remote starting, 24-volt, 2 wire
- Coolant temperature gauge
- Field circuit breaker
- DC voltmeter
- Running time meter
- Lamp test switch
- 7-light engine monitor with individual 1/2 amp relay signals and a common alarm contact for each of the following conditions:
- RUN (green light)
- PRE-WARNING FOR LOW OIL PRESSURE (yellow light)
- PRE-WARNING FOR HIGH COOLANT TEMP (yellow light)
- LOW OIL PRESSURE SHUTDOWN (red light)
- HIGH COOLANT TEMPERATURE SHUTDOWN (red light)
- OVERCRANK SHUTDOWN (red light)
- OVERSPEED SHUTDOWN (red light)
- Oil pressure gauge
- Fault reset switch
- Cycle cranking

☐ Optional NFPA 110 12-Light Monitor

Engine monitor with individual 1/2 amp relay signals and common external alarm contact for each of the following conditions:

- RUN (green light)
- PRE-WARNING FOR LOW OIL PRESSURE (yellow light)
- PRE-WARNING FOR HIGH COOLANT TEMP (yellow light)
- LOW OIL PRESSURE SHUTDOWN (red light)
- HIGH COOLANT TEMPERATURE SHUTDOWN (red light)
- OVERCRANK SHUTDOWN (red light)
- OVERSPEED SHUTDOWN (red light)
- SWITCH OFF (flashing red light – indicates generator set not in automatic start mode)
- LOW COOLANT TEMPERATURE (yellow light)
- LOW FUEL (yellow light)
- TWO CUSTOMER SELECTED FAULTS (red light)

☐ Optional AC Meter Package

Order with NFPA 110 monitor to meet code requirements.

- AC voltmeter (dual range)
- AC ammeter (dual range)
- Voltmeter/ammeter phase selector switch with an off position
- Dual scale frequency meter/tachometer
- AC Rheostat (panel mounted) for $\pm 5\%$ voltage adjust

Generator Set Options

Engine

- ☐ Heavy-duty air cleaner with safety element
- ☐ 120-volt 1000 W coolant heater (thermostatically controlled)
- ☐ 240-volt 1000 W coolant heater (thermostatically controlled)
- ☐ 120-volt 150 W lube oil heater
- ☐ 240-volt 150 W lube oil heater
- ☐ Electronic governor

Cooling System

- ☐ Remote radiator cooling

Alternator

- ☐ Anti-condensation heater
- ☐ PMG Excitation
- ☐ Extended stack (full single phase output)
- ☐ 80° C rise alternator
- ☐ 105° C rise alternator

Control Panel

- ☐ Run/common alarm relay package
- ☐ Run/common alarm relay package with 12 form C remote annunciation relays
- ☐ Low coolant level shutdown
- ☐ Low coolant level alarm
- ☐ Time delay start/stop
- ☐ Control anti-condensation space heater
- ☐ Oil temperature gauge
- ☐ Tachometer
- ☐ Wattmeter
- ☐ Power factor meter
- ☐ Panel mount engine speed control potentiometer
- ☐ Emergency stop
- ☐ Over/under voltage relay
- ☐ Over/under frequency relay

Exhaust System

- ☐ Industrial-grade exhaust silencer
- ☐ Residential-grade exhaust silencer
- ☐ Critical-grade exhaust silencer

Fuel System

- ☐ 100 gallon (379 liter) sub-base tank
- ☐ 60 gallon (227 liter) dual wall sub-base tank
- ☐ 125 gallon (474 liter) dual wall sub-base tank
- ☐ 8 gallon (30 liter) in-skid day tank
- ☐ Day tank rupture basin

Generator Set

- ☐ Main line circuit breaker
- ☐ AC entrance box
- ☐ Battery charger, equalizer, float-type
- ☐ Batteries
- ☐ Spring isolators
- ☐ Remote annunciator panel
- ☐ Weather-protective enclosure with mounted silencer
- ☐ 2-year standby warranty
- ☐ 2-year prime power warranty
- ☐ 5-year standby power warranty
- ☐ Export box packaging

Outline Drawing

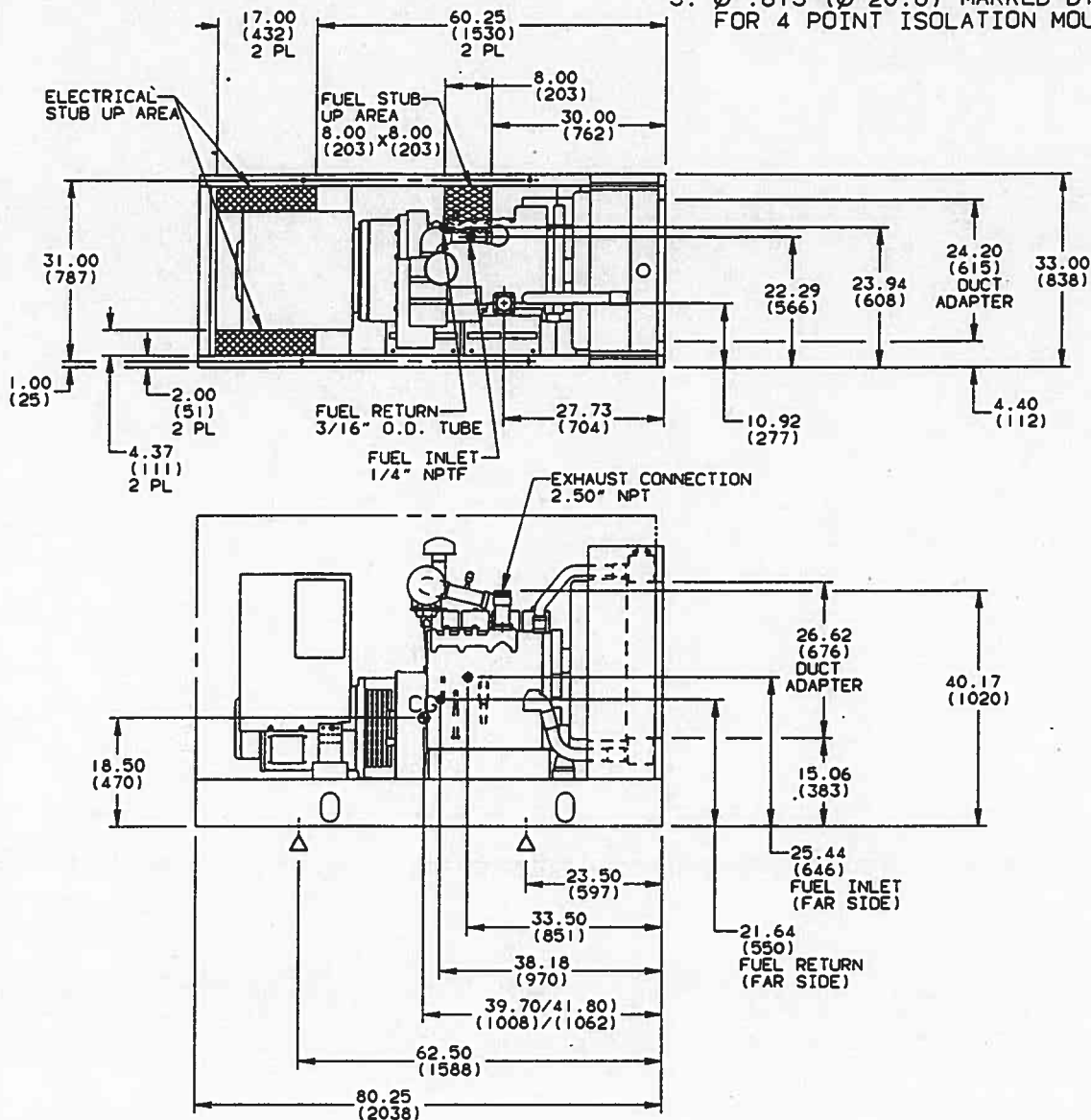
60 Hz: 35 DGBB

50 Hz: 28 DGBB

THIS DRAWING IS FOR INFORMATIONAL PURPOSES ONLY. FOR SPECIFIC CONSTRUCTION DETAILS, OBTAIN INSTALLATION OUTLINE DRAWING 500-2863 FROM YOUR DISTRIBUTOR.

NOTES:

1. DIMENSIONS SHOWN IN () ARE MILLIMETERS.
2. GEN SET APPROXIMATE WEIGHT:
 DRY 1900 lbs (863 kg)
 WET 1970 lbs (894 kg)
3. $\varnothing .813$ ($\varnothing 20.6$) MARKED BY Δ FOR 4 POINT ISOLATION MOUNTING.



See your distributor for more information.



Onan

Onan Corporation
 1400 73rd Avenue N. E.
 Minneapolis, MN 55432
 612-574-5000
 Telex: 275477
 Fax: 612-574-8087

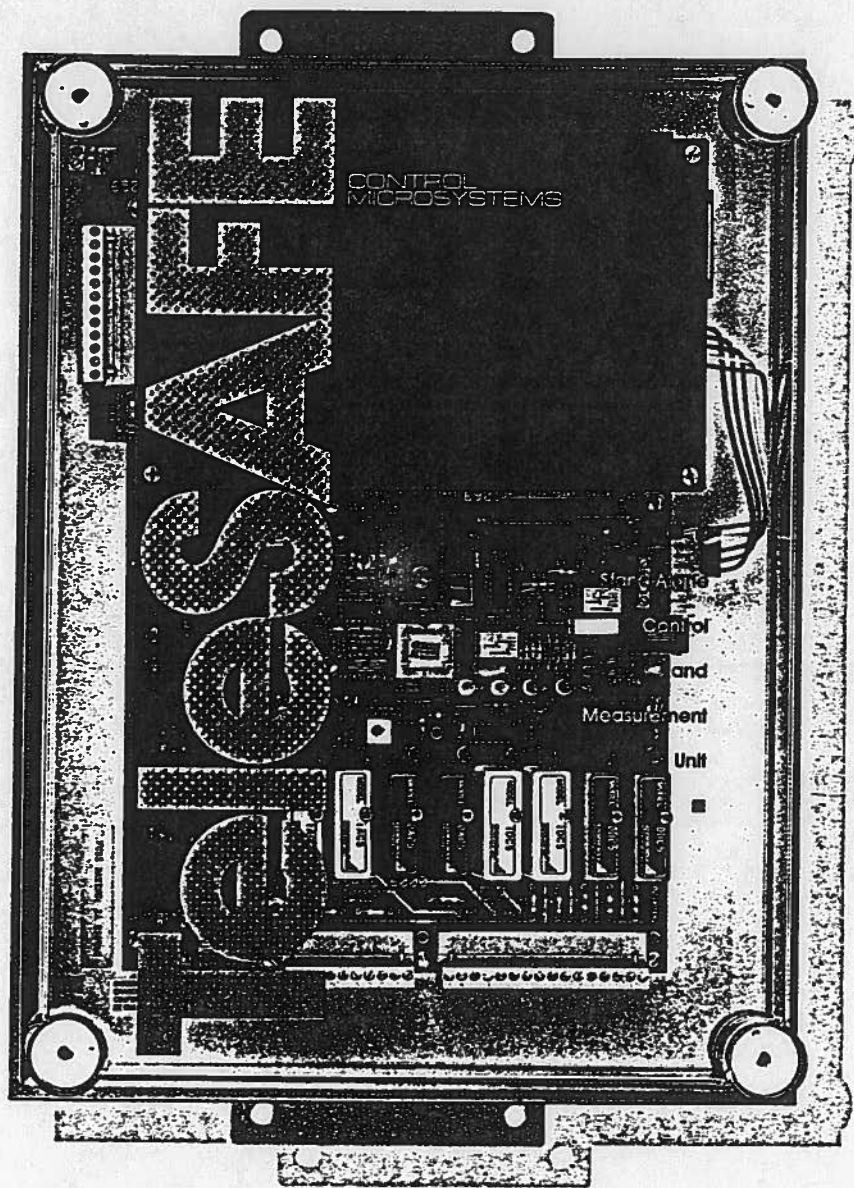
Onan is a registered trademark of Onan Corporation

Backfeed to a utility system can cause electrocution and/or property damage. Do not connect to any building's electrical system except through an approved device or after building main switch is opened.

Cummins is a registered trademark of Cummins Engine Company

TeleSAFE

REMOTE CONTROL
AND MEASUREMENT UNIT



CONTROL
MICROSYSTEMS

PROGRAMMING LANGUAGES OVERVIEW

TeleSAFE can be programmed in either BASIC or C, with the power and versatility for virtually any application from simple telemetry to sophisticated control.

The programming language of your choice is an extended version incorporating the features and functions most often needed, for example, PID algorithms, timers, concurrent communications, interrupts, protocol emulations and on-line diagnostics.

Whereas many other RTUs use proprietary programming methods, or are not programmable at all, TeleSAFE uses industry standard programming languages, which are familiar to a broad range of people from computer professionals and engineers to end users. TeleSAFE's languages are efficient and easy to use, requiring only a personal computer for program development. Meaningful results are quickly achieved.

Popular algorithms such as PID, AGA-3, AGA-7 and AGA-8, are

available, as are off-the-shelf programs for cable reduction, data acquisition, remote monitoring and multi-loop PID control. Advanced users, requiring direct access to memory, processor registers, etc., can take advantage of a machine language monitor (debug) program that comes with the system.

SAFE BASIC is ROM resident in the TeleSAFE so that programs can be developed and tested directly. It

provides editing, debugging and trace facilities. SAFE C programs are developed on a personal computer using a cross compiler. With TeleSAFE's comprehensive documentation, all information for program creation and support is available.

TeleSAFE programming languages are fully described in separate technical brochures. Please request more information.

SPECIFICATIONS OVERVIEW

Input/Output	• DIO - 8 Isolated high level DIO, expandable to 128 • AI - 8 counter/accumulators • AO - 4 channels, differential, expandable to 240 • AO - optional 4 or 8 channels
Communications	• 1 RS-232, 300 to 19200 bps • 1 Modem port (Bell 212 dialup or Bell 202 leased line/radio or RS-232/RS-485 Serial adapter) • TeleSAFE 6000-16EX adds: • 1 RS-232 port, 300 to 19200 bps • 1 RS-485 port, 300 to 19200 bps
Memory	• 512K total, 256K RAM, 256K ROM (TeleSAFE 6000-16EX) • 128K total, 64K RAM, 64K ROM (TeleSAFE 6000)
Languages	• SAFE BASIC extended interpreter • SAFE C Cross-Compiler • Cross-Assembler
Power Supply	• Isolated switch mode supply • 12-40 VDC, 9-29 VAC • U.P.S. battery charger
Enclosure	• optional NEMA 4 — 12" W x 16" H x 4" D • optional NEMA 4 — 24" W x 16" H x 4.5" D
Ambient	• -40° to 60°C/140°F • RH non-condensing
Warranty	• 3 years

TeleSAFE conforms to the following standards and certifications:

UL 508 - Electrical Safety
 CSA C22.2 / 142 - Electrical Safety
 CSA Class 1 Division 2 - Hazardous Area Classification
 FCC Part 15, Subpart J, Class A - Radio Emissions
 FCC Telecom Part 68 - Telephone Compatibility
 DDC Telecom CS03 - Telephone Compatibility
 CSA / DOC C108.8 - Radio Emissions
 ANSI / IEEE C37.90 (formerly IEEE 472) - Surge Withstand Capability
 ANSI / IPC-S-815A - Quality Control

For detailed technical information and specifications, please contact Control Microsystems, or consult your sales representative. Specifications are subject to change without notice.

The following trademarks are acknowledged:

Modbus is a trademark of Gould/Modicon. Allen-Bradley is a trademark of Allen-Bradley. The Fix is a trademark of Intellution. Fix DMACS is a trademark of Intellution. Screenware is a trademark of Computer Technology Corp. SAFE BASIC and TeleSAFE are trademarks of Control Microsystems Inc. All rights are reserved.



Call for information on other products such as the VS/x Series of very small RTUs.

CONTROL MICROSYSTEMS INC.

28 Steacie Drive
Kanata, Ontario, Canada
K2K 2A9

Telephone: (613) 591-1943
Facsimile: (613) 591-1022

One Operation & Maintenance Manual supplied per unit

Please Issue Purchase Orders To:

**Elsag Bailey Inc.,
c/o ACI Instrumentation Limited**


Mickey Vank
ACI Instrumentation Limited

F.O.B. Downsview, Ontario; freight and taxes extra; net 30 days
This quotation is subject to ACI Instrumentation Limited standard terms and conditions of sale
Prices valid for 30 days, E. & O.E.

GUARD-IT

SINCE 1948
RACO
REMOTE ALARMS AND CONTROLS

**...a new
low-cost autodialer
with flexible features
for dependable
Alarm Autodialing
and Remote
Monitoring.**



GUARD-IT delivers the functionality you need, and it's backed by RACO's reputation for dependability, quality, service, and factory support.

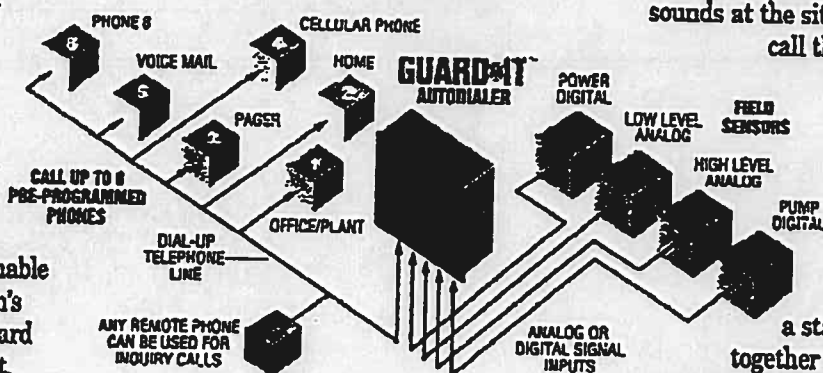
Analogue or Digital Inputs

GUARD-IT monitors 4 input channels. Each channel can be configured for an analog or digital signal input. The system utilizes the public telephone network as a basic medium for transmission of alarm messages and status calls. It is field programmable by the user at the system's control panel via a standard touch tone phone handset.

Automatic Alarm Reporting

Upon detection of an alarm condition, GUARD-IT automatically calls a list of up to 8 pre-programmed phone numbers over the standard dial-up telephone network, calling until it gets an acknowledgement. When a connection is made, the system reports the station identity

and the specific alarm condition in the form of a digitally pre-recorded voice message. In addition to



phone. When acknowledging an alarm, a built-in microphone permits the caller to listen for background sounds at the site. The user can also call the system from any remote phone for a status report of all points being monitored.

Voice Messaging

The voice transmission consists of a station identification together with an alarm message giving details on the fault. The station identification and alarm messages are digitally recorded by the user. RACO pioneered the concept of using digitally-recorded and synthesized voice messages in autodialers. By using electronic voice reporting technology, GUARD-IT eliminates the need for often-unreliable audio tape autodialers.

standard phones in office, plant, or home, the alarm calling sequence can also include calls to pagers, cellular phones, and voice mail.

Alarm Acknowledgment

An alarm is acknowledged simply by pressing a button on the called

(Continued on back page)

GUARD-IT™

Set-up and Programming

System set-up, voice recording, and programming is accomplished via an external touch tone phone which plugs into a standard phone jack on the system's front panel. The user simply follows voice instructions given over the phone.

System Controls

System operating status is provided by front panel LED indicators. System off/disarm/ready controls are provided on front panel. Surge protection and noise suppression are standard.

A Truly Modern Autodialer

GUARD-IT fills the requirement of a modern autodialer—it should be extremely reliable and be able to tell the called party as much information about the nature of an alarm as possible so that the right personnel can respond quickly and appropriately. Many other autodialers don't meet these requirements.

Compare GUARD-IT with all the others and you will see that this multi-featured system offers a way to get RACO flexibility, quality, and dependability at a price you'd expect to pay for one of the budget models.

Specifications

ELECTRICAL

Power Requirements: User supplied 10-14 VDC, 500 mA max.

Power consumption:

200 mA minimum standby
500 mA maximum active

Power failure: Automatic alarm for external power failure.

Battery Charging: Precision voltage controlled, automatic rapid recharge after drain.

Universal Signal Inputs:

Digital Inputs; open contacts see 5VDC, closed contacts see 5 mA DC

Analog Inputs; 4-20 mA, single ended.
Maximum voltage drop 10 VDC.
Resolution 0.2%; absolute accuracy 0.5%

Local Alarm Relay: Transistor output for TTL or relay drive (500 mA 24 VDC max) activated during unacknowledged alarm.

RJ11 Telephone line jack for connection to public telephone network.

PHYSICAL

Surge protection: Solid state protectors on phone, power, and signal lines.

Enclosure: Single circuit card in durable steel cabinet designed for mounting on control panel wall or flush mounted inside a larger control panel with faceplate visible.

Weight: 4 pounds, 6 pounds with battery

Dimensions: 6.85"H x 8.85"W x 2.85"D

Mounting Centers: 3.6"H x 9"W

ENVIRONMENTAL

Temperature range: 20° to 130°F.

Humidity: 0 to 95%, noncondensing.

TELEPHONE

Rotary pulse or tone dialing.

Dials up to 8 different numbers, each up to 60 digits long.

Time between alarm phone calls programmable 0.1 to 99.9 minutes.

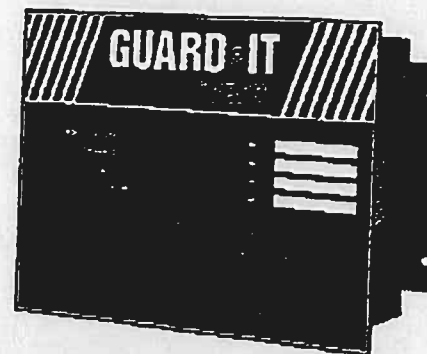
Smart calling call progress monitoring detects dial tone, basic ringback and busy signal.

Alarm acknowledgement by touch tone key or callback.

Compatible with most pager, cellular, and voicemail systems.
User-furnished standard touch tone handset required for programming.
FCC Registered.

PROGRAMMING

Standard phone jack on front panel for programming phone. Voice menu instructions guide programming.



SPEECH MESSAGES

User digitally records five messages, Station ID and four channel alarm messages. High definition digital recordings up to 12 seconds per message. Resident synthesized voice vocabulary for programming guidance.

FACTORY OPTIONS

Power Supply, UL Class 2 120 VAC 50/60 Hz adaptor.

Battery backup, internal 6 volt; 4 AH gel cell provides 20 hours operation during power failure.

NEMA 4X enclosure.

Cellular cellular communication system.

WARRANTY

Two year parts and labor warranty. See separate warranty card for details.

For ordering information, call toll free at... 800-722-6999

SINCE 1948

RACO

REMOTE ALARMS AND CONTROLS

RACO MANUFACTURING
AND ENGINEERING CO.

Quality Service



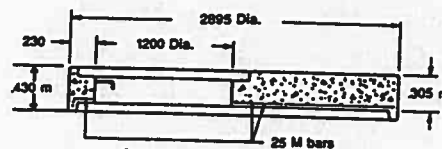
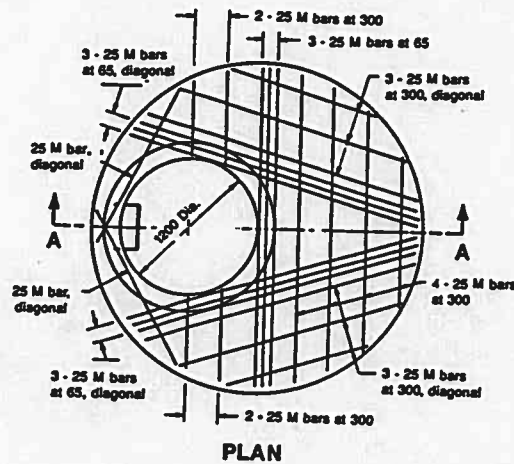
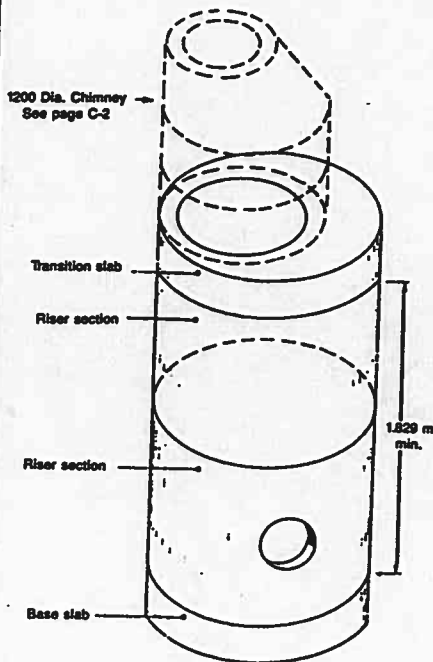
Summa Engineering Limited
6423 Northam Drive
MISSISSAUGA, Ontario
Canada L4V 1J2
Tel: (905) 678-3388
Fax: (905) 678-0444

WATERLOO CONCRETE PRODUCTS

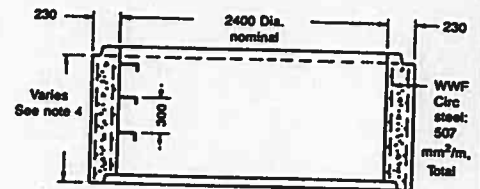
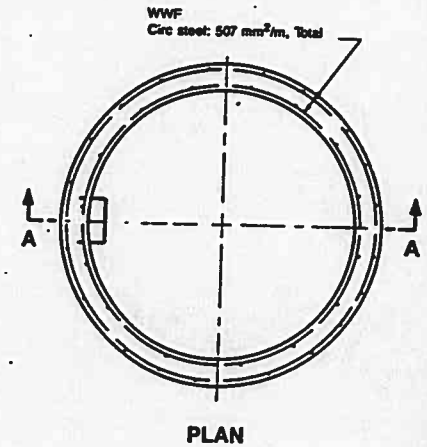
TEL. 519/653-2391

R.R. #2, CAMBRIDGE, ONTARIO N1R 5S3
INWATS 1-800/265-8624

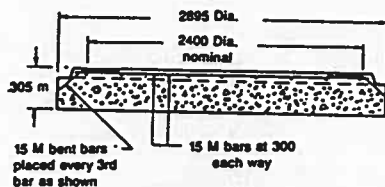
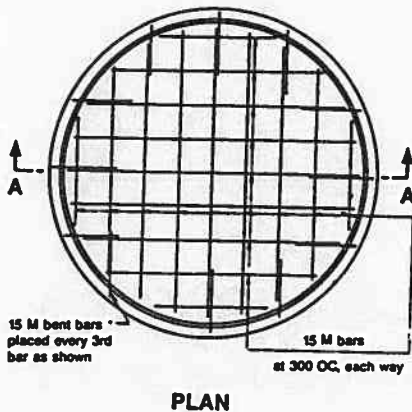
FAX ENG. OFF.: 519/621-7750 MAIN OFF.: 519/621-8233



SECTION A - A
TRANSITION SLAB
(Mass — 4210 kg/pc)



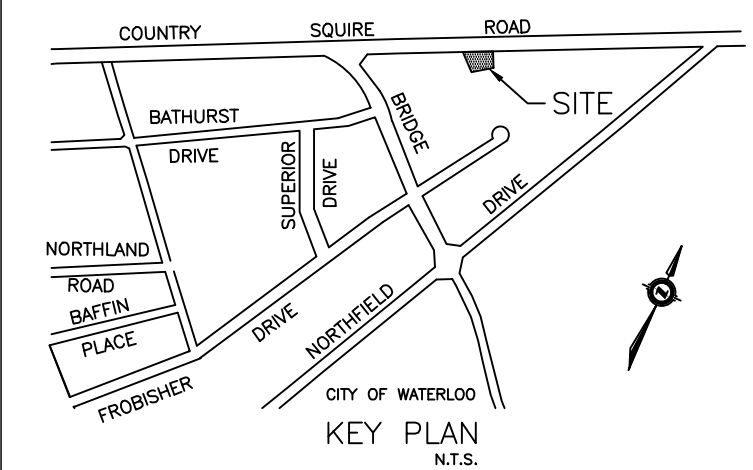
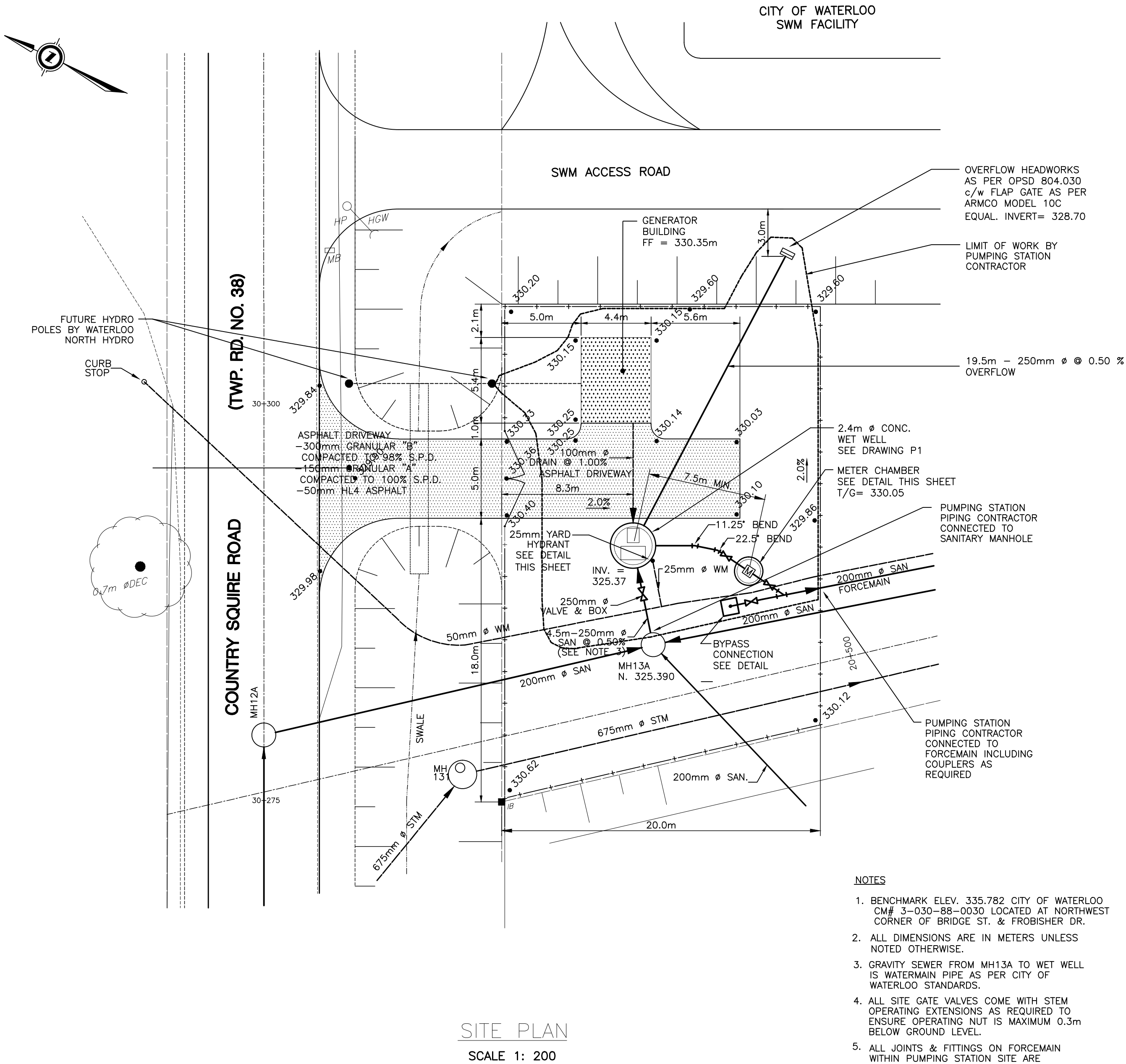
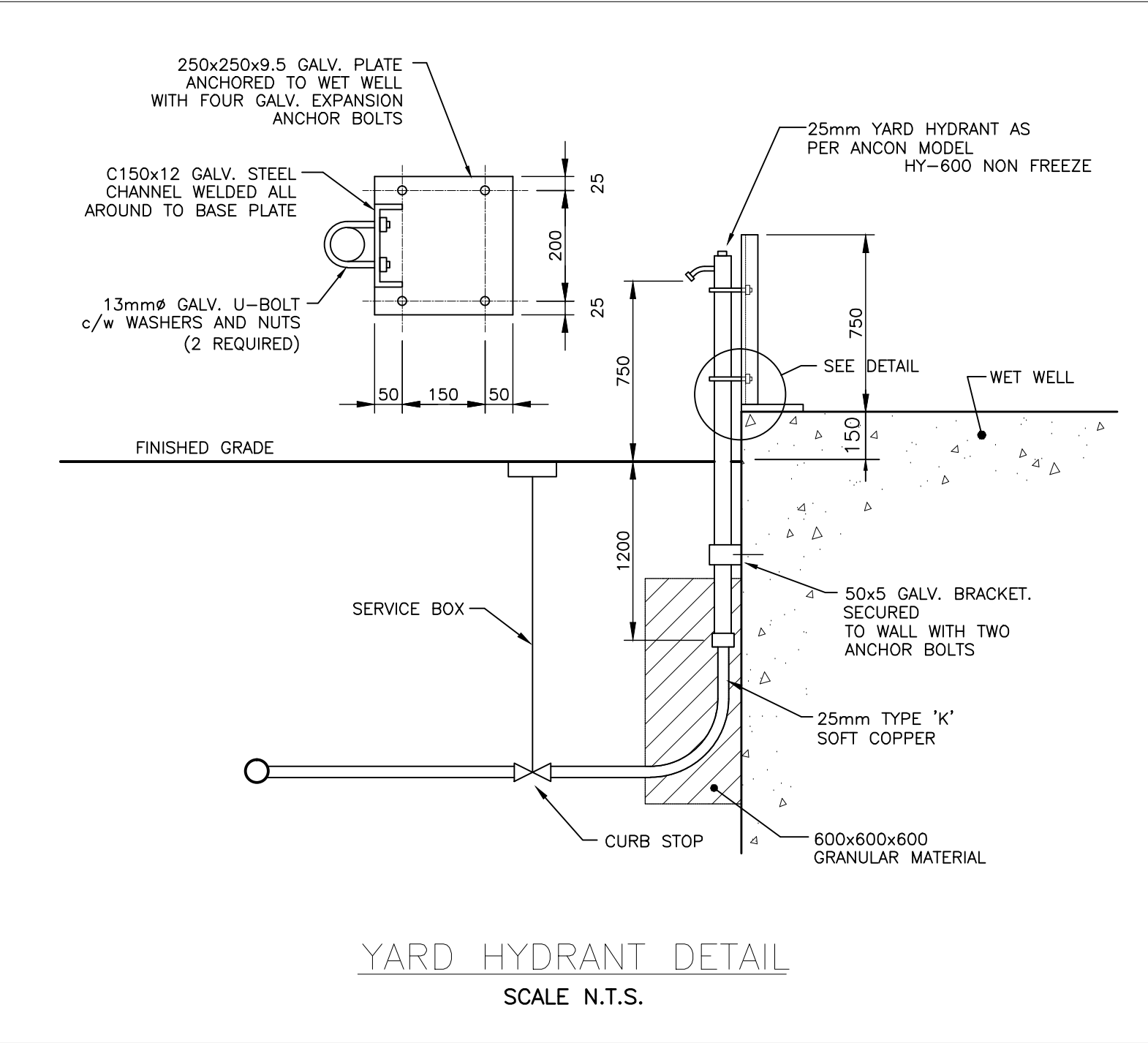
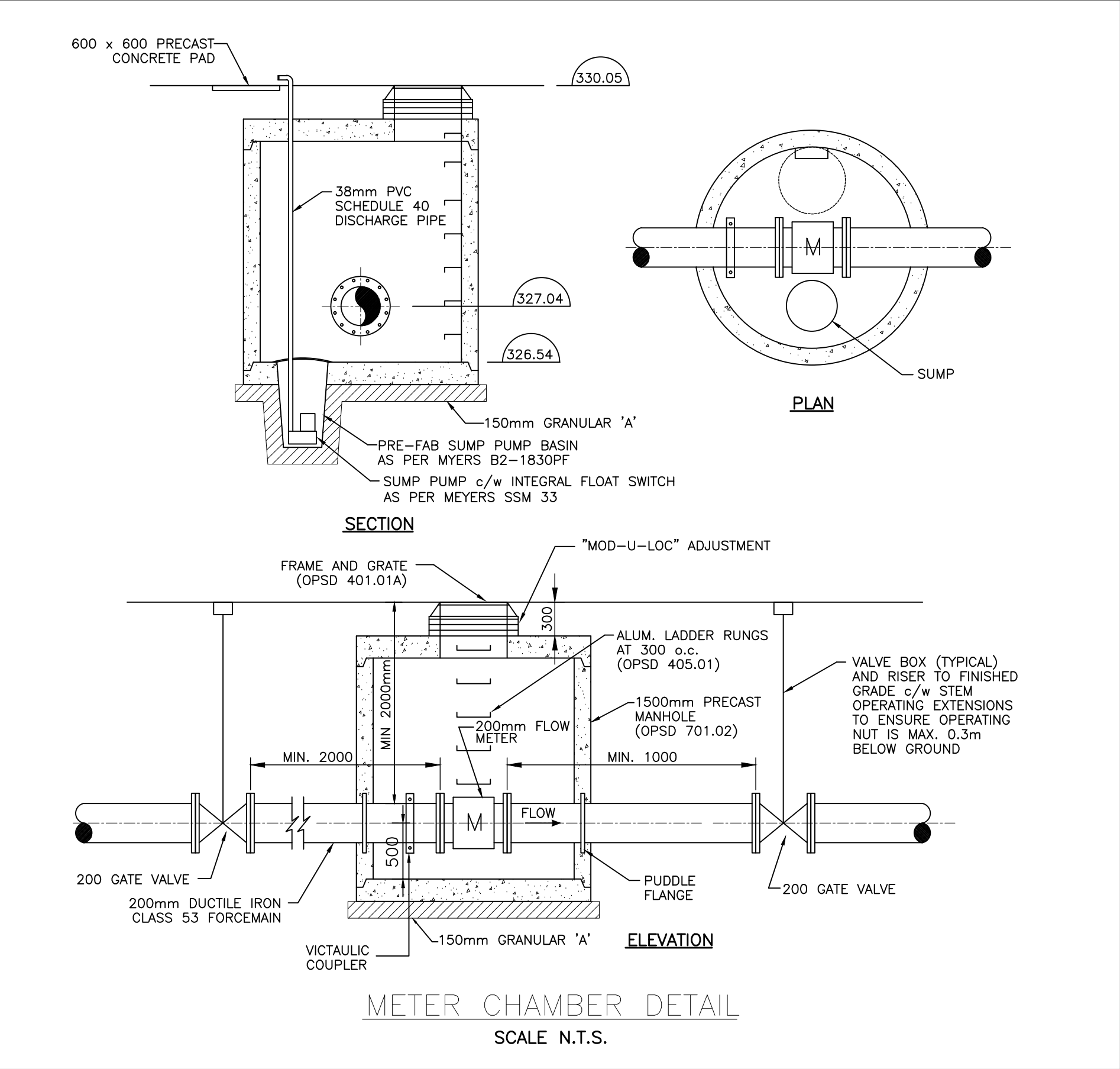
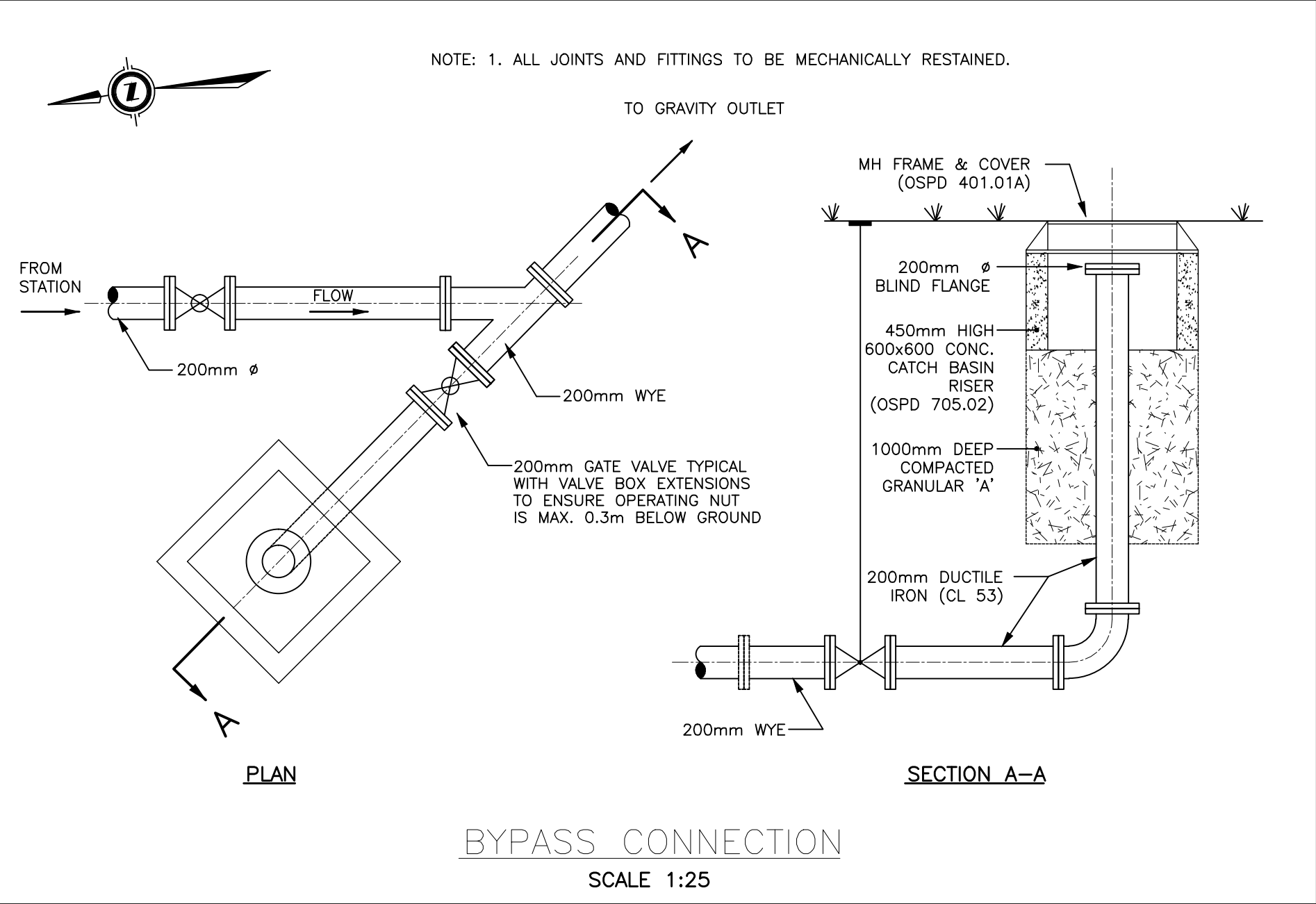
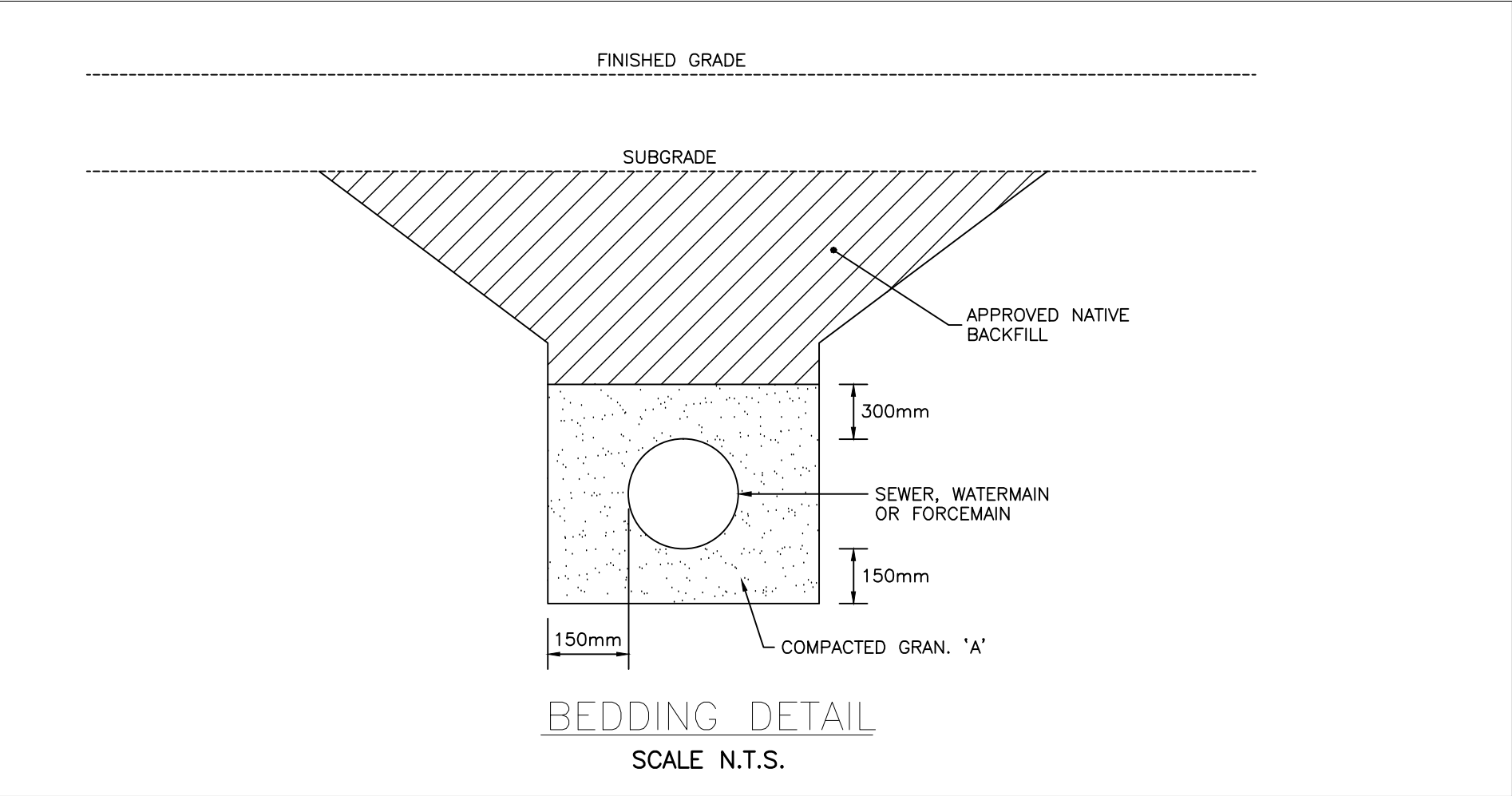
SECTION A - A
RISER SECTION
(Mass — 4598 kg/m)



SECTION A - A
BASE SLAB
(Mass — 4620 kg/pc)

NOTES:

1. Manufactured in accordance with OPSD #701.06.
2. Maximum hole sizes:
Straight Through — 1930 mm diameter
Right Angle — 1420 mm diameter.
3. All reinforcing steel has 25 mm minimum cover.
4. Available riser heights are: .610, .914, 1.219, 1.524, 1.829 and 2.438 m.
5. See page C-11 for Flat Cap details.
6. See page C-19 for recommended installation procedure.
7. All dimensions are in millimetres, unless otherwise shown.

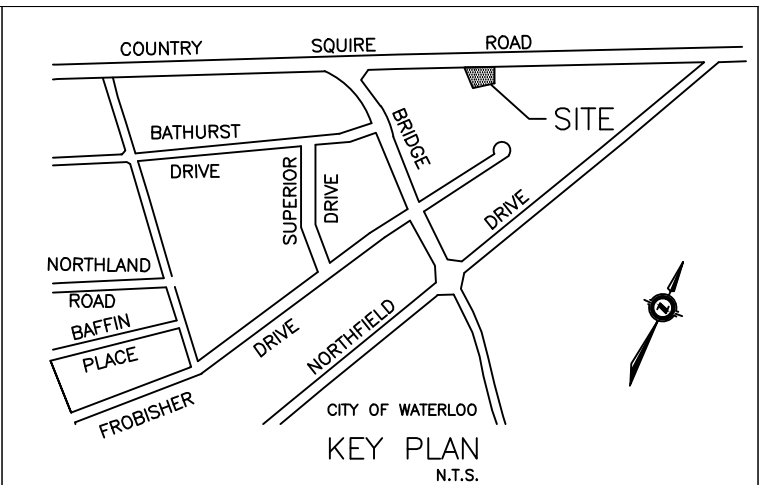
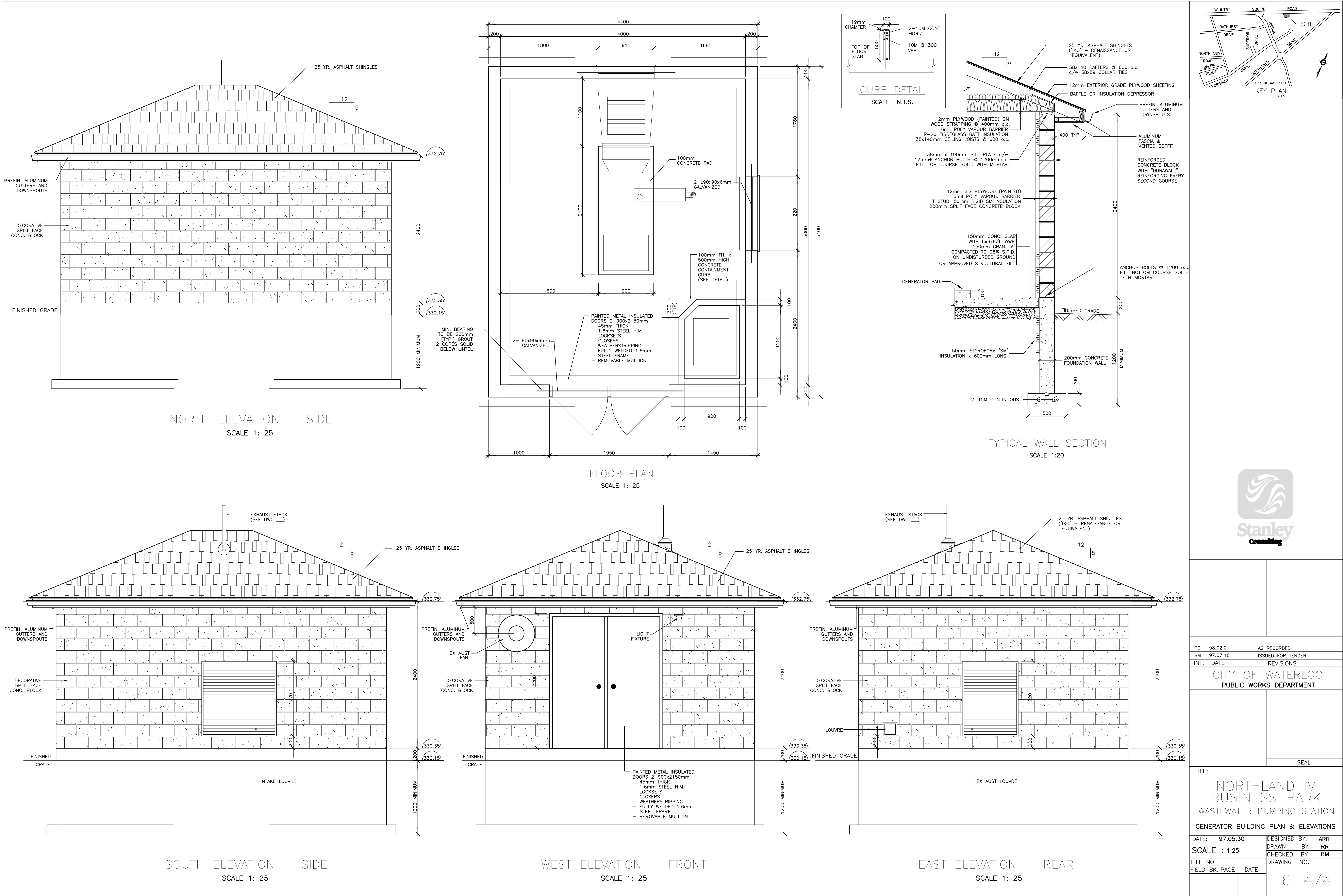


PC	98.02.01	AS RECORDED
BM	97.07.18	ISSUED FOR TENDER
INT.	DATE	REVISIONS

CITY OF WATERLOO
PUBLIC WORKS DEPARTMENT

TITLE:	
NORTHLAND IV BUSINESS PARK WASTEWATER PUMPING STATION	
SITE PLAN AND DETAILS	
DATE: 97.05.26	DESIGNED BY: ARR
SCALE : 1:200	DRAWN BY: RR
FILE NO.	CHECKED BY: BM
FIELD BK	PAGE
DATE	DRAWING NO.

6-473



PC	98.02.01	AS RECORDED
BM	97.07.18	ISSUED FOR TENDER
INT.	DATE	REVISIONS

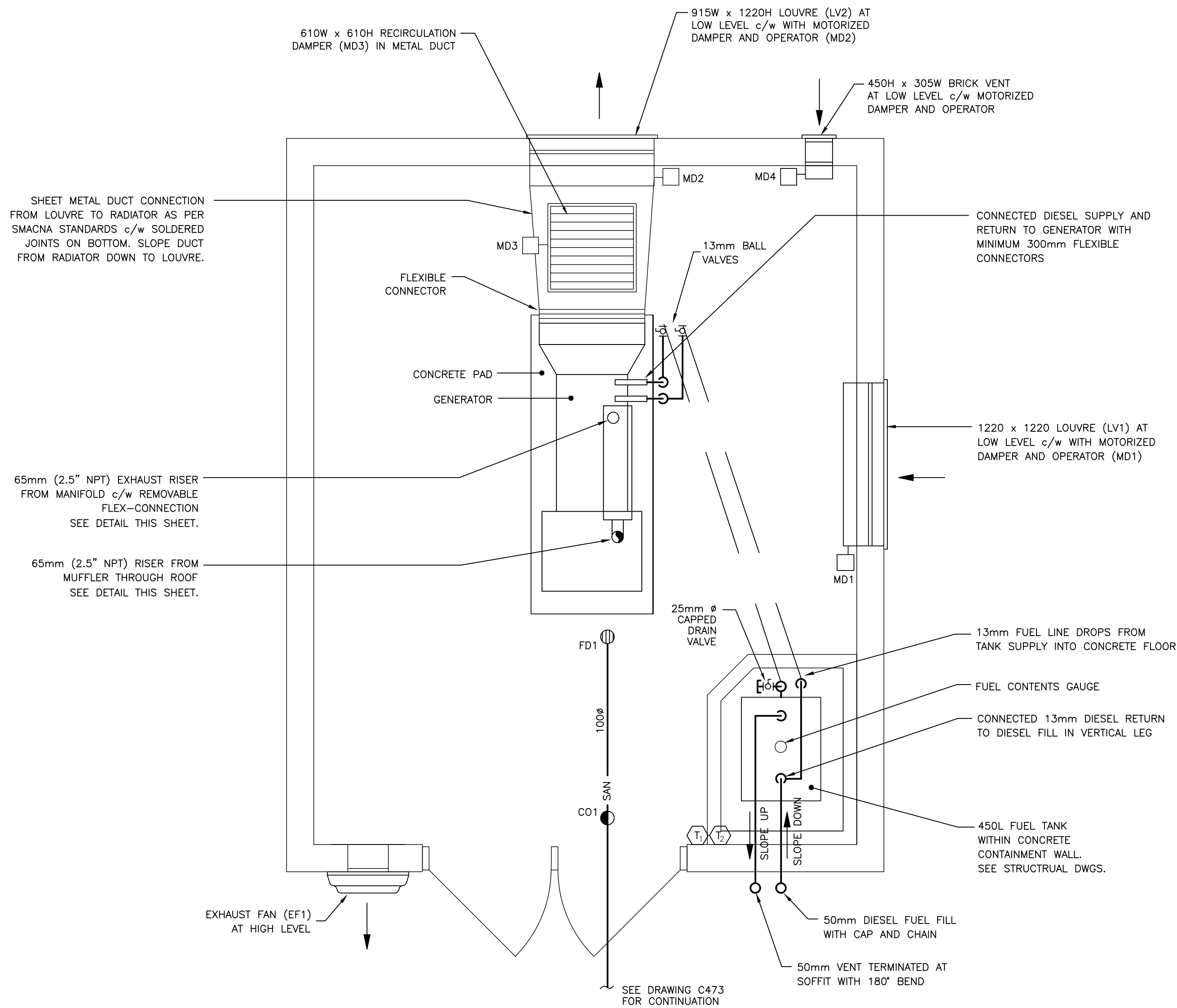
CITY OF WATERLOO
PUBLIC WORKS DEPARTMENT

TITLE:
NORTHLAND IV
BUSINESS PARK
WASTEWATER PUMPING STATION

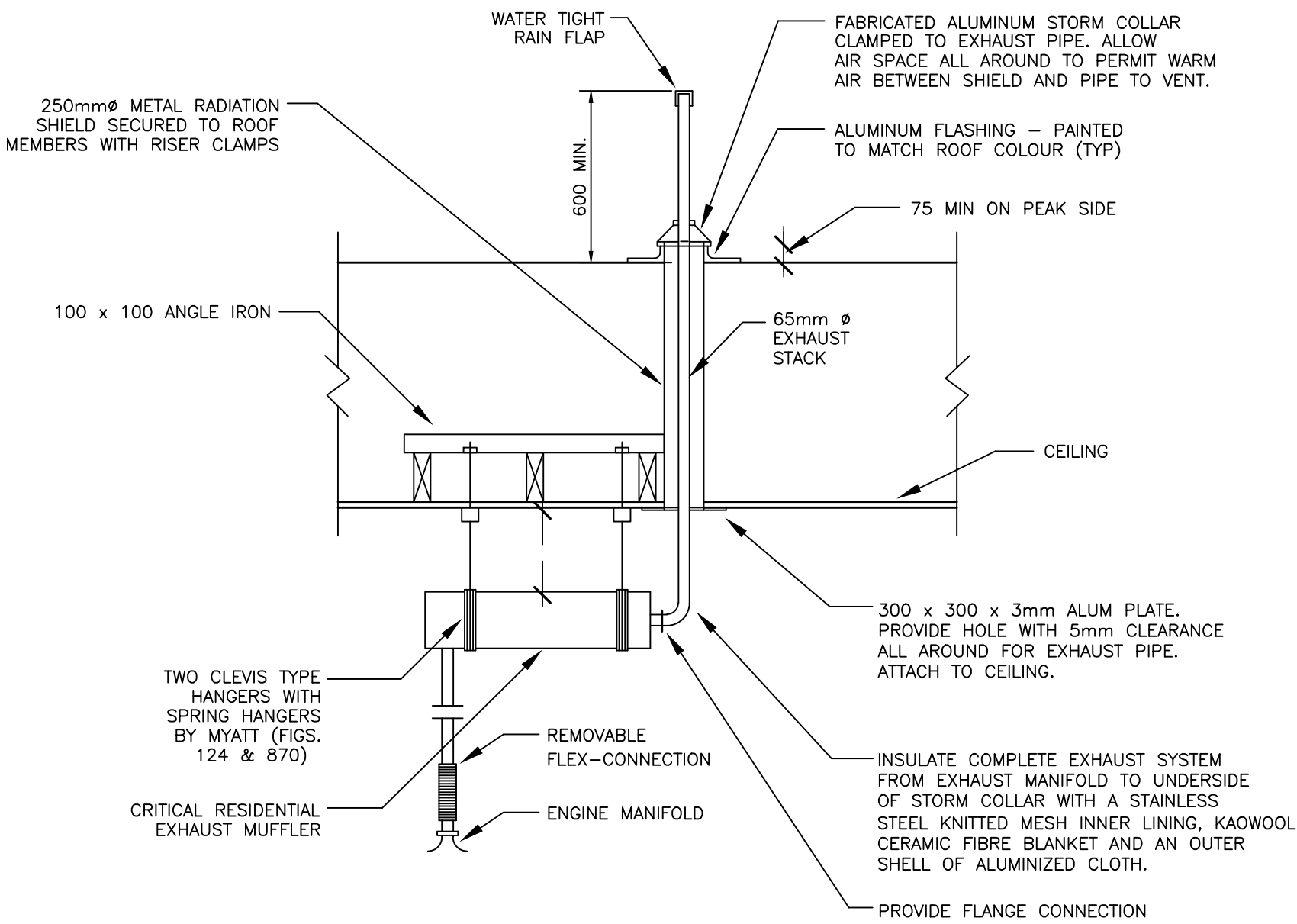
GENERATOR BUILDING PLAN & ELEVATIONS

DATE:	97.05.30	DESIGNED BY:	ARR
SCALE :	1:25	DRAWN BY:	RR
FILE NO.		CHECKED BY:	BM
FIELD BK.	PAGE	DATE	DRAWING NO.

6-474



MECHANICAL LAYOUT
SCALE 1: 25



EXHAUST STACK DETAIL
SCALE N.T.S.

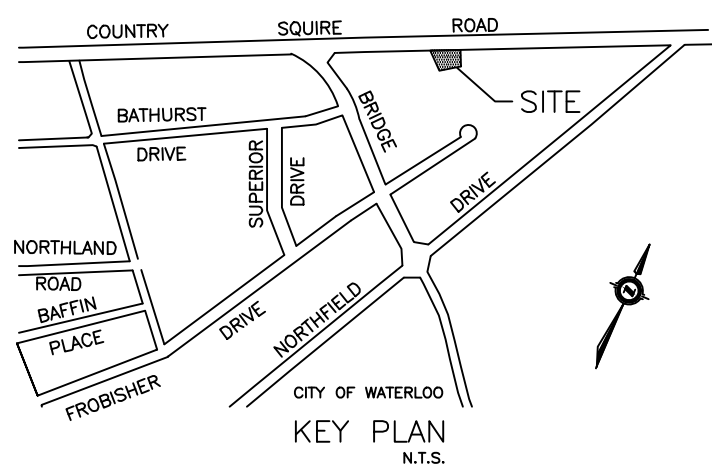
MECHANICAL EQUIPMENT SCHEDULE

EXHAUST FAN EF1	MANUFACTURER: PENN MODEL: WXR60 CAPACITY: 92 L/s (195 CFM) @ 32 Pa (0.125"WC) MOTOR: 30 WATTS (1/25 Hp) 110V/1PH/60Hz ACCESSORIES: INLET GUARD, BACKDRAFT DAMPER
INTAKE LOUVRE LV1	PENN MODEL S8 100mm STORMPROOF. SIZE AS SHOWN c/w INSECT SCREEN, MOUNTING FLANGE AND CONCEALED SCREWS.
EXHAUST LOUVRE LV2	PENN MODEL S8 100mm STORMPROOF. SIZE AS SHOWN c/w INSECT SCREEN, MOUNTING FLANGE AND CONCEALED SCREWS.
BRICKVENT	E.H. PRICE, ALL ALUMINIUM. SIZE AS SHOWN c/w INSECT SCREEN.
MOTORIZED DAMPER MD1, 2 & 4	TAMCO SERIES 9000 INSULATED
MOTORIZED DAMPER MD3	TAMCO SERIES 1000 NON-INSULATED

NOTE: REFER TO ELECTRICAL DRAWINGS FOR DAMPER MOTORS, ELECTRIC ACTUATORS, AND CONTROLS.

PLUMBING FIXTURE SCHEDULE

FD1	FLOOR DRAIN ANCON FD-220-C-10-7 C/W INTEGRAL TRAP, BUFFED AND CLEAR EPOXY DURASEAL FINISHED TOP & TRAP PRIMER TAPPING
CO1	CLEANOUT ANCON MODEL CO-200-RX



PC	98.02.01	AS RECORDED
BM	97.07.18	ISSUED FOR TENDER
INT.	DATE	REVISIONS

CITY OF WATERLOO
PUBLIC WORKS DEPARTMENT

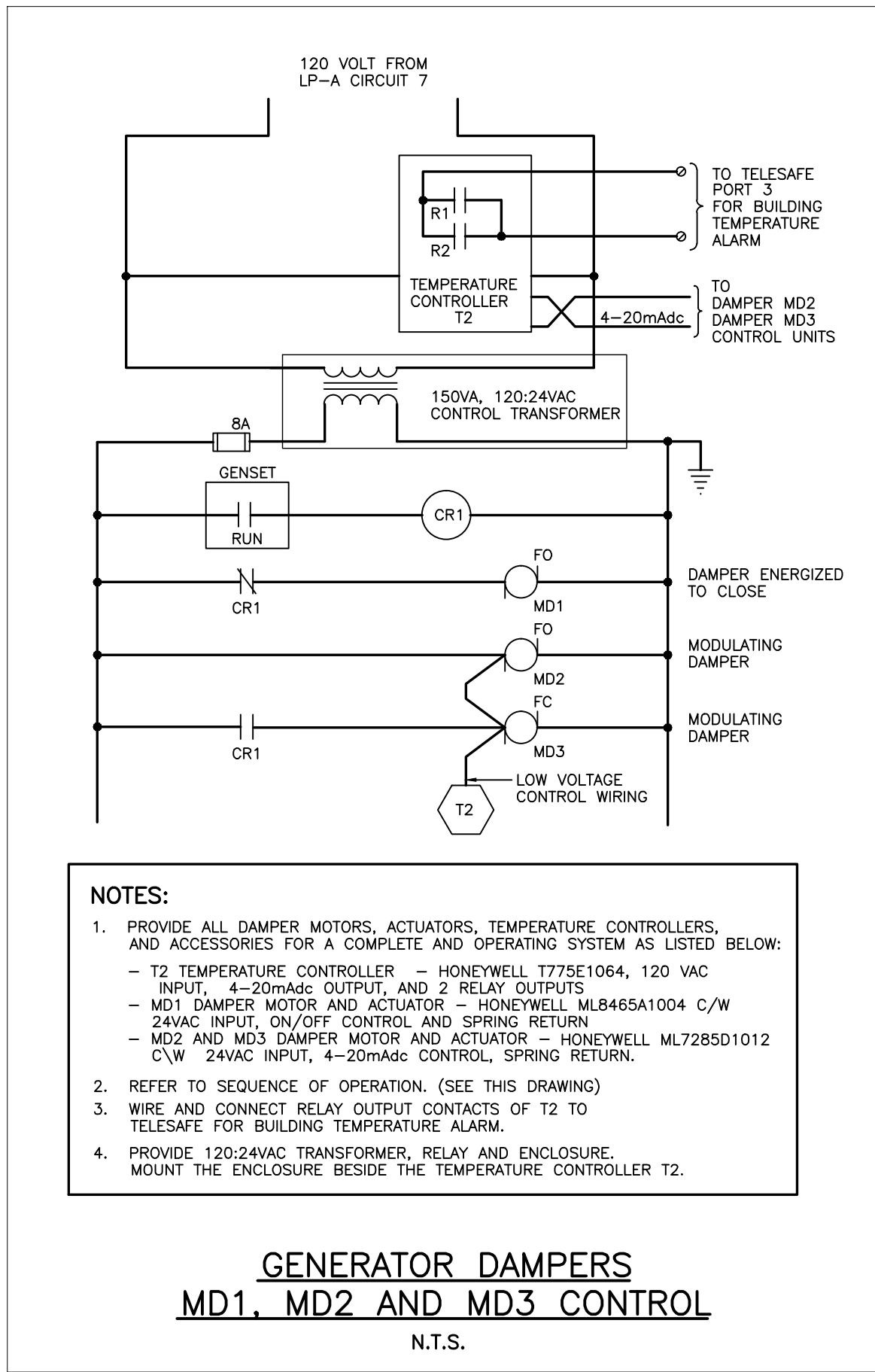
SEAL

TITLE:
NORTHLAND IV
BUSINESS PARK
WASTEWATER PUMPING STATION
MECHANICAL LAYOUT AND DETAILS

DATE:	97.05.30	DESIGNED BY:	ARR
SCALE :	1:25	DRAWN BY:	RR
		CHECKED BY:	BM
FILE NO.		DRAWING NO.	

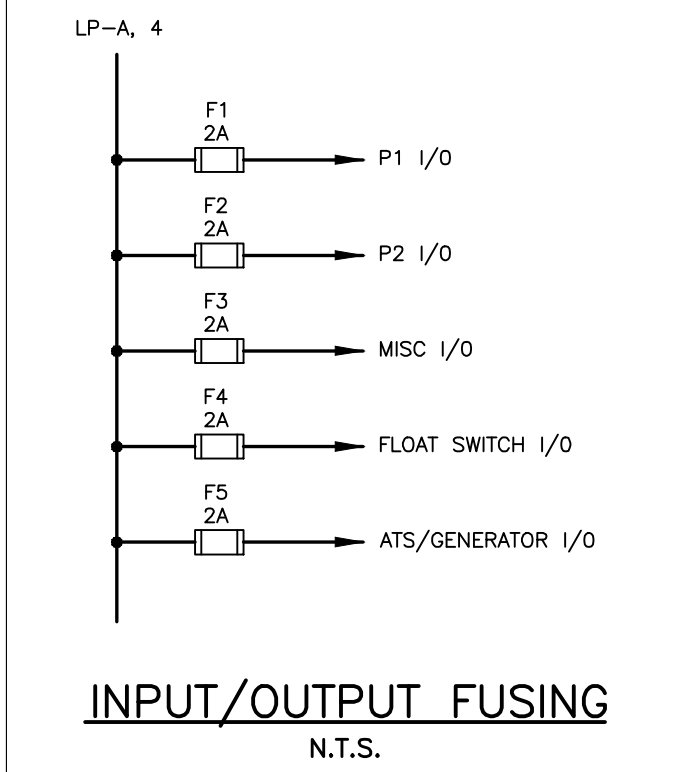
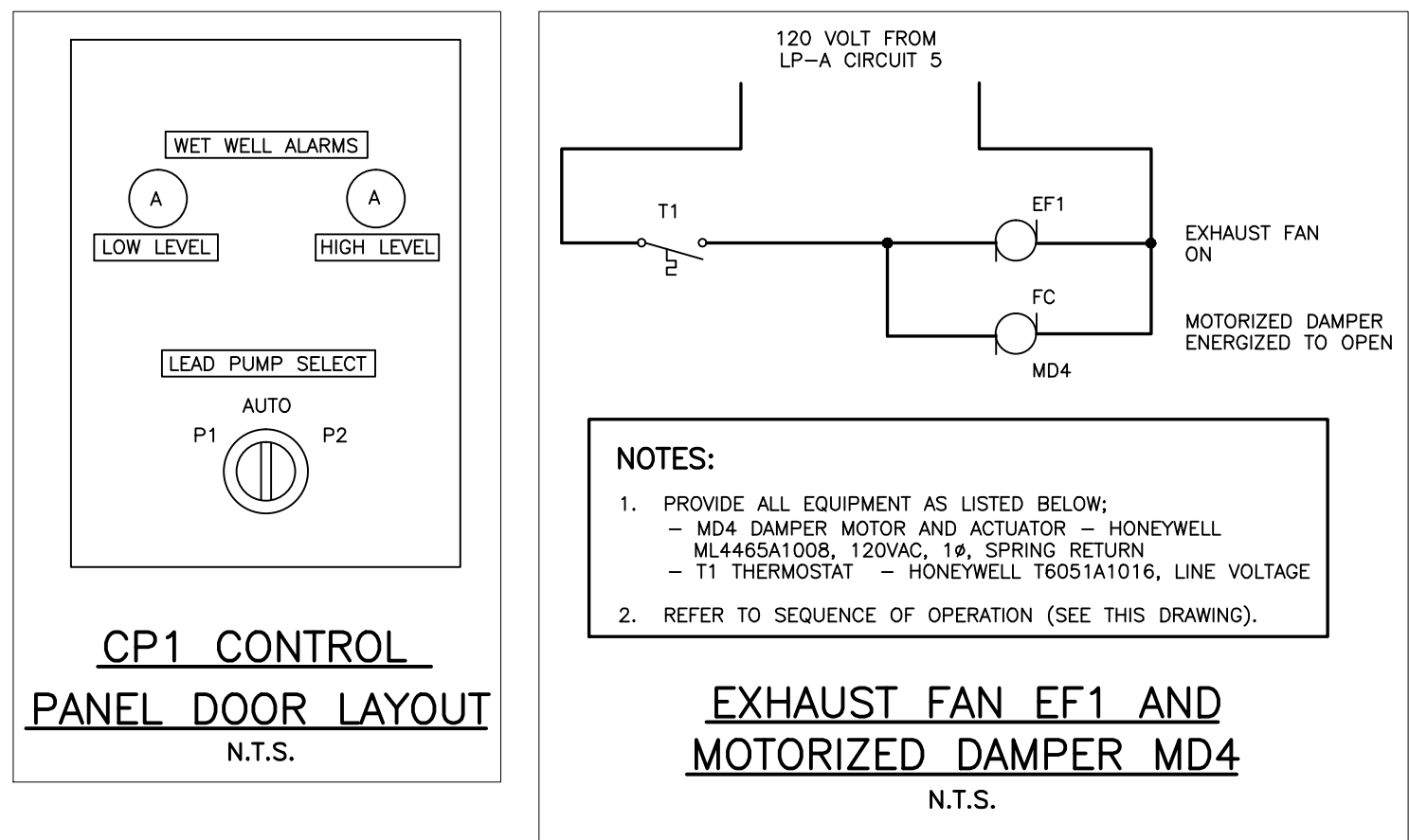
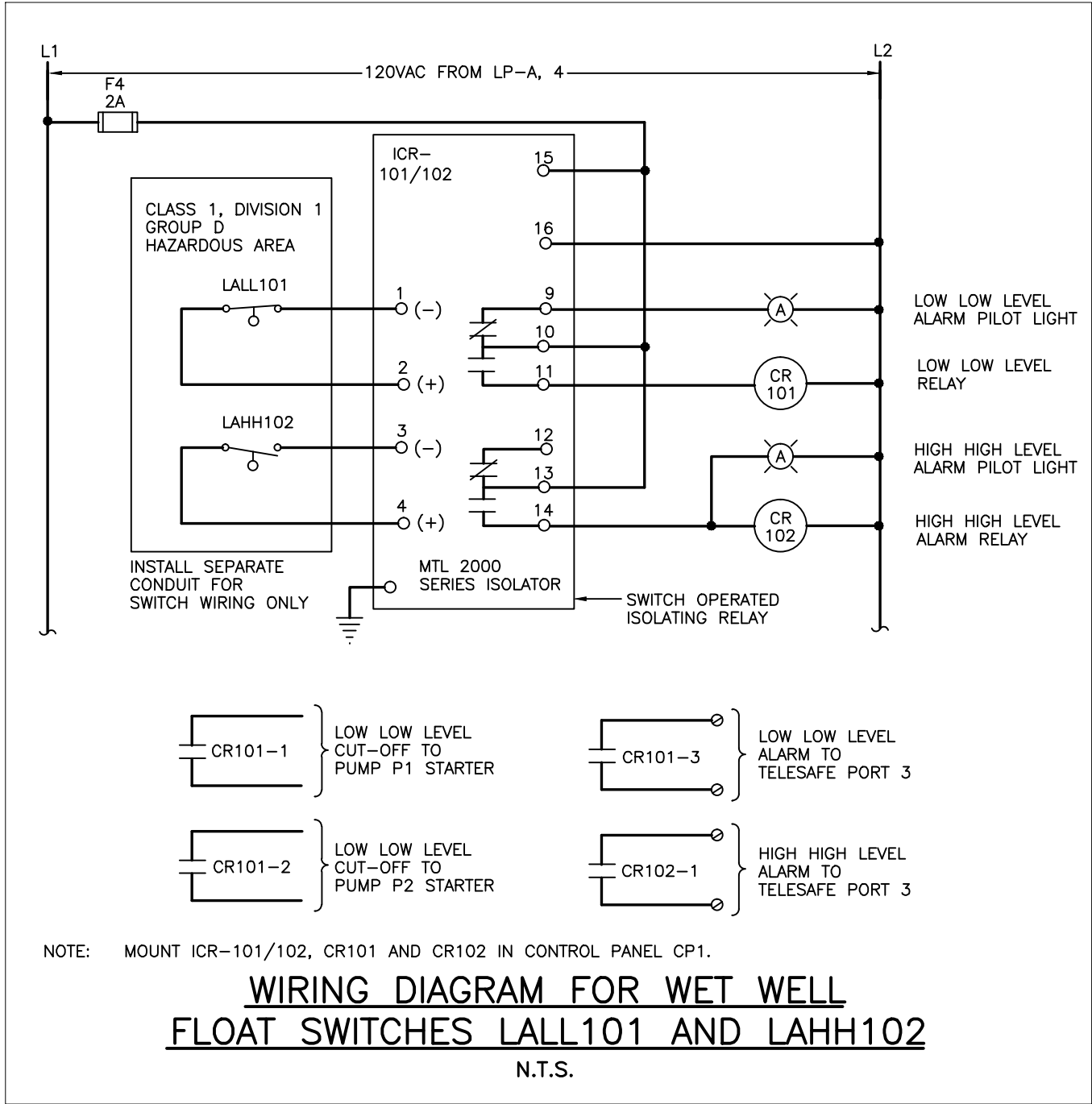
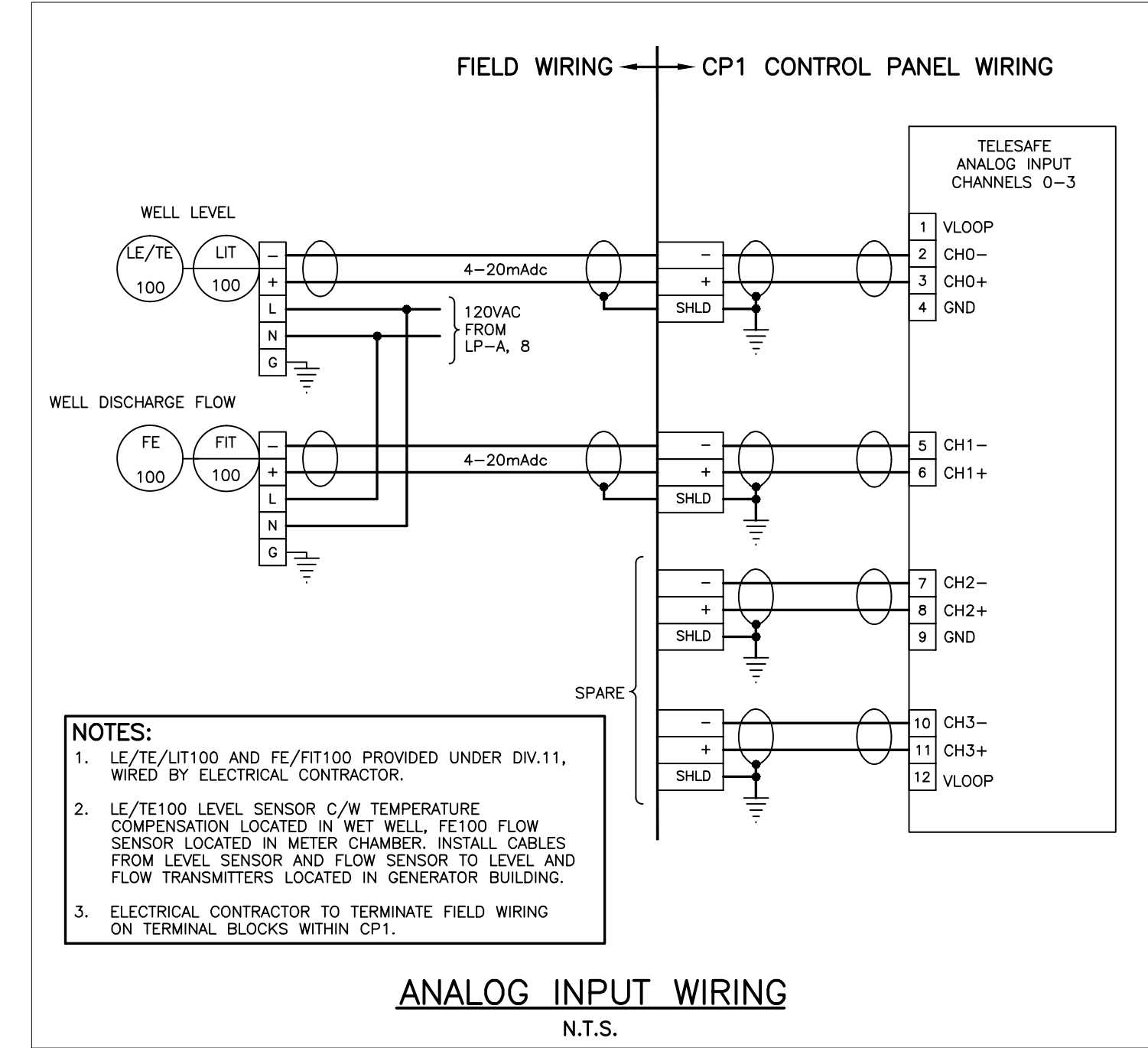
FIELD BK.	PAGE	DATE

6-476



DIGITAL PORT	BIT							NOTES
	0	1	2	3	4	5	6	
3	P1 RUN	P2 RUN	P1 LEAD SELECT	P2 LEAD SELECT	LOW LOW LEVEL ALARM	HIGH HIGH LEVEL ALARM	STATION GENERAL ALARM TO AUTODIALER	BUILDING TEMPERATURE ALARM
5	P1 POWER ON	P1 REMOTE MODE	P1 RUNNING STATUS	P1 FAULT ALARM	P2 POWER ON	P2 REMOTE MODE	P2 RUNNING STATUS	P2 FAULT ALARM
6	ATS NORMAL POSITION	ATS EMERGENCY POSITION	GENSET RUNNING STATUS	GENSET COMMON ALARM	SPARE	SPARE	SPARE	SPARE

EXPANSION BOARD C/W 6402 I/O MODULE.



OPERATING SEQUENCE FOR GENERATOR BUILDING VENTILATION SYSTEM

- EF1 AND MD4 - ON TEMPERATURE RISE ABOVE SETPOINT ON THERMOSTAT T1, MD4 OPERATES, TO OPEN THE LOUVER AND EF1 STARTS.
- DAMPERS
 - MD1 - FAIL SAFE OPEN (SPRING RETURN)
 - MD2 - FAIL SAFE OPEN (SPRING RETURN)
 - MD3 - FAIL SAFE CLOSED (SPRING RETURN)
- NORMAL OPERATION (GENERATOR NOT RUNNING)
 - MD1 - ENERGIZED CLOSED
 - MD2 - ENERGIZED CLOSED
 - MD3 - DE-ENERGIZED CLOSED
- GENERATOR STARTS
 - MD1 - DE-ENERGIZES AND OPENS
 - MD2 - CLOSED DUE TO TEMPERATURE CONTROLLER T2 SETPOINT NOT BEING ACHIEVED
 - MD3 - ENERGIZED TO OPEN
- GENERATOR RUNNING
 - ON TEMPERATURE RISE IN BUILDING SENSED BY TEMPERATURE CONTROLLER T2, MD2 AND MD3 MODULATE TO MAINTAIN SETPOINT.

ANALOG PORT ASSIGNMENTS

ANALOG PORT	INPUT
0	LIT100 WET WELL LEVEL
1	FIT100 WELL DISCHARGE FLOW
2	SPARE
3	SPARE



BM 97.07.18 ISSUED FOR TENDER
INT. DATE REVISIONS

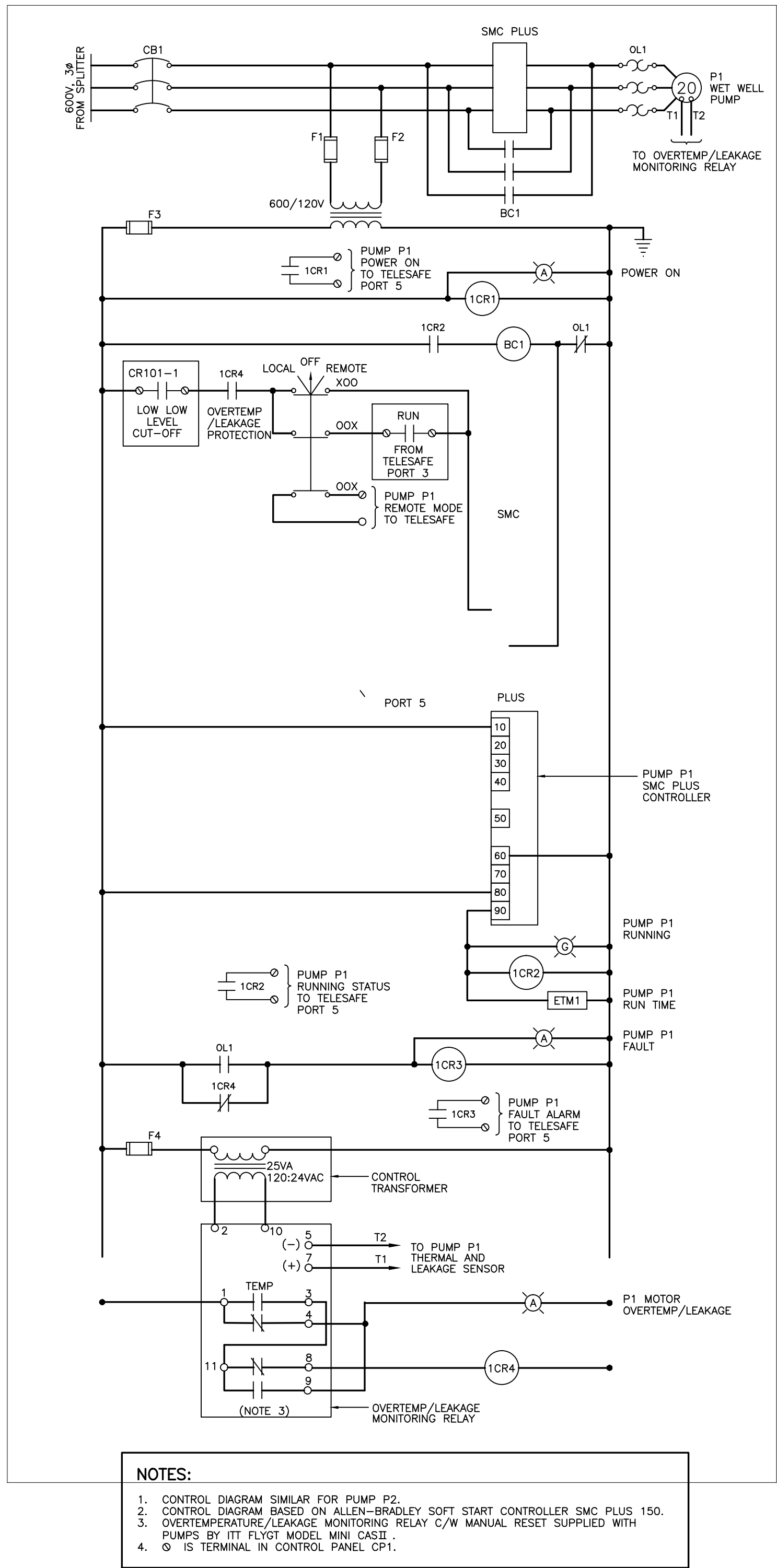
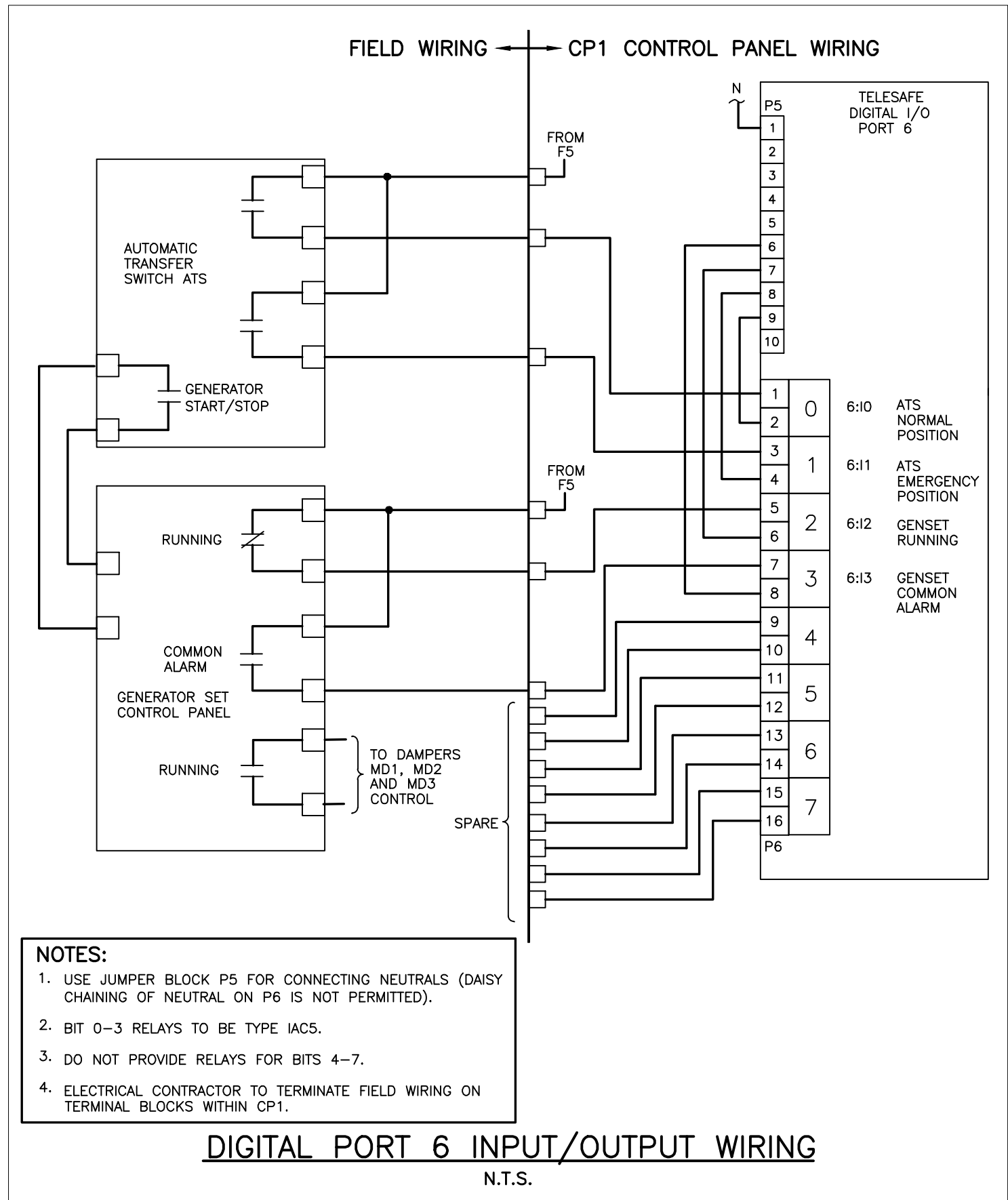
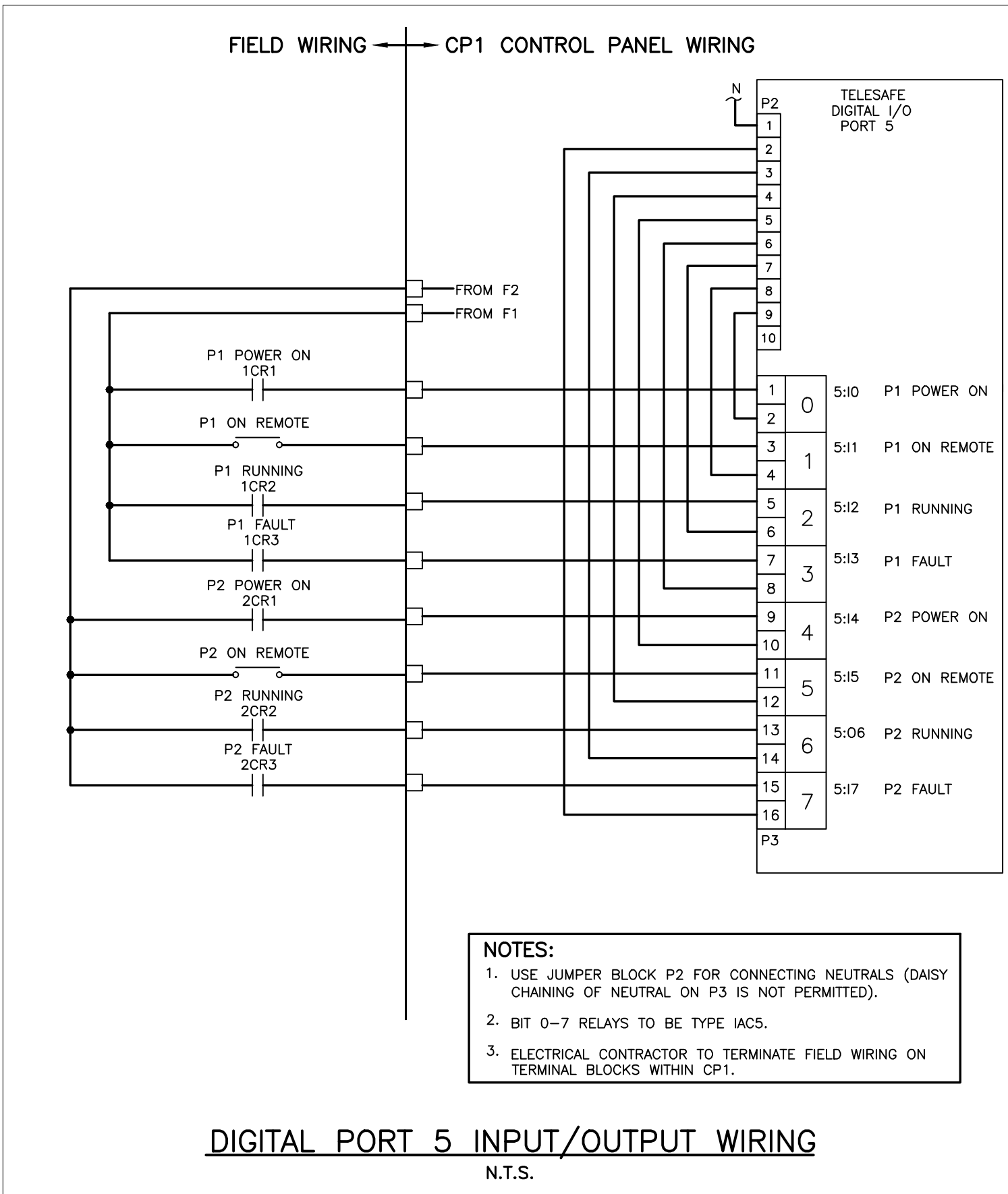
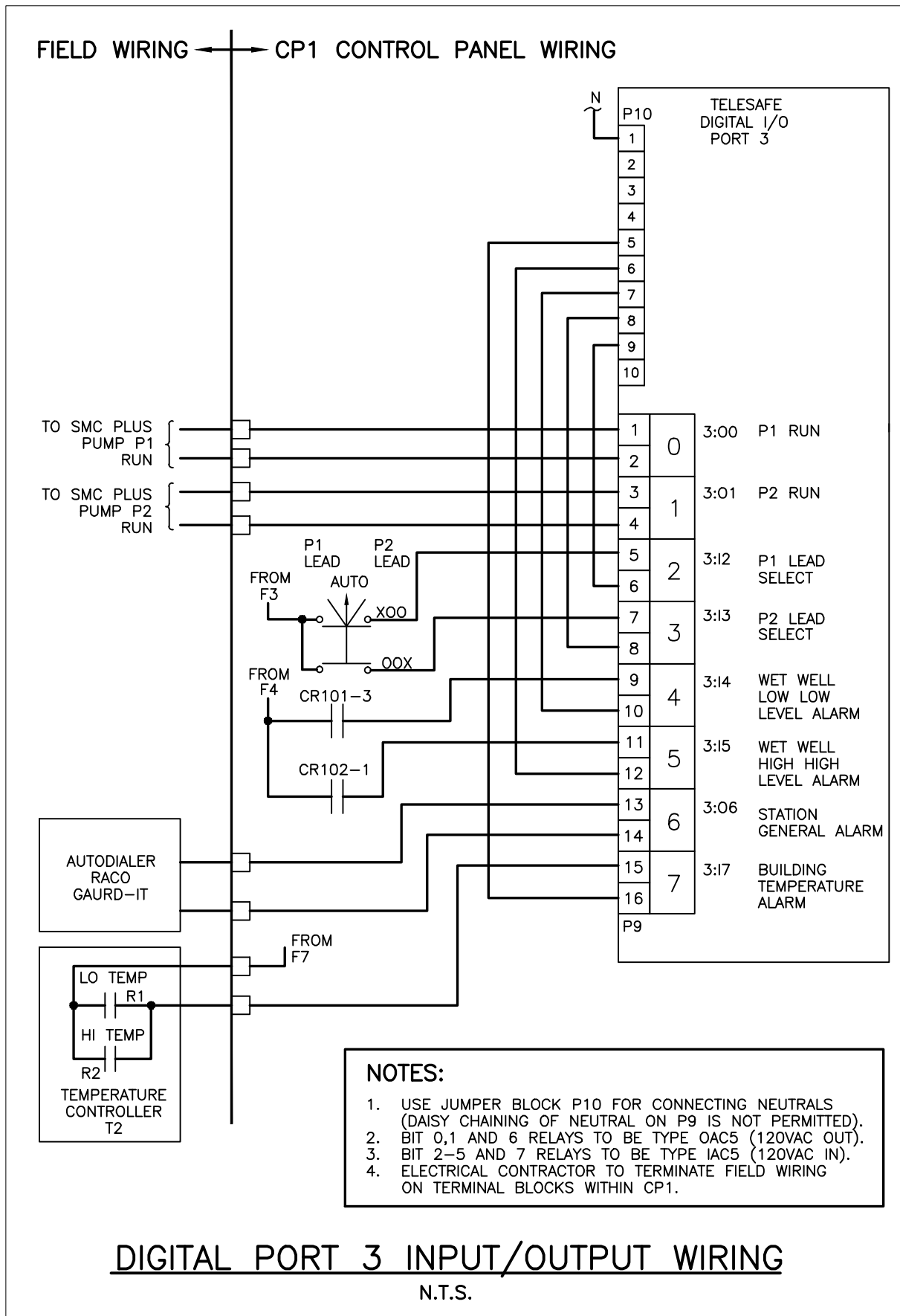
**CITY OF WATERLOO
PUBLIC WORKS DEPARTMENT**

TITLE:
**NORTHLAND IV
BUSINESS PARK
WASTEWATER PUMPING STATION**

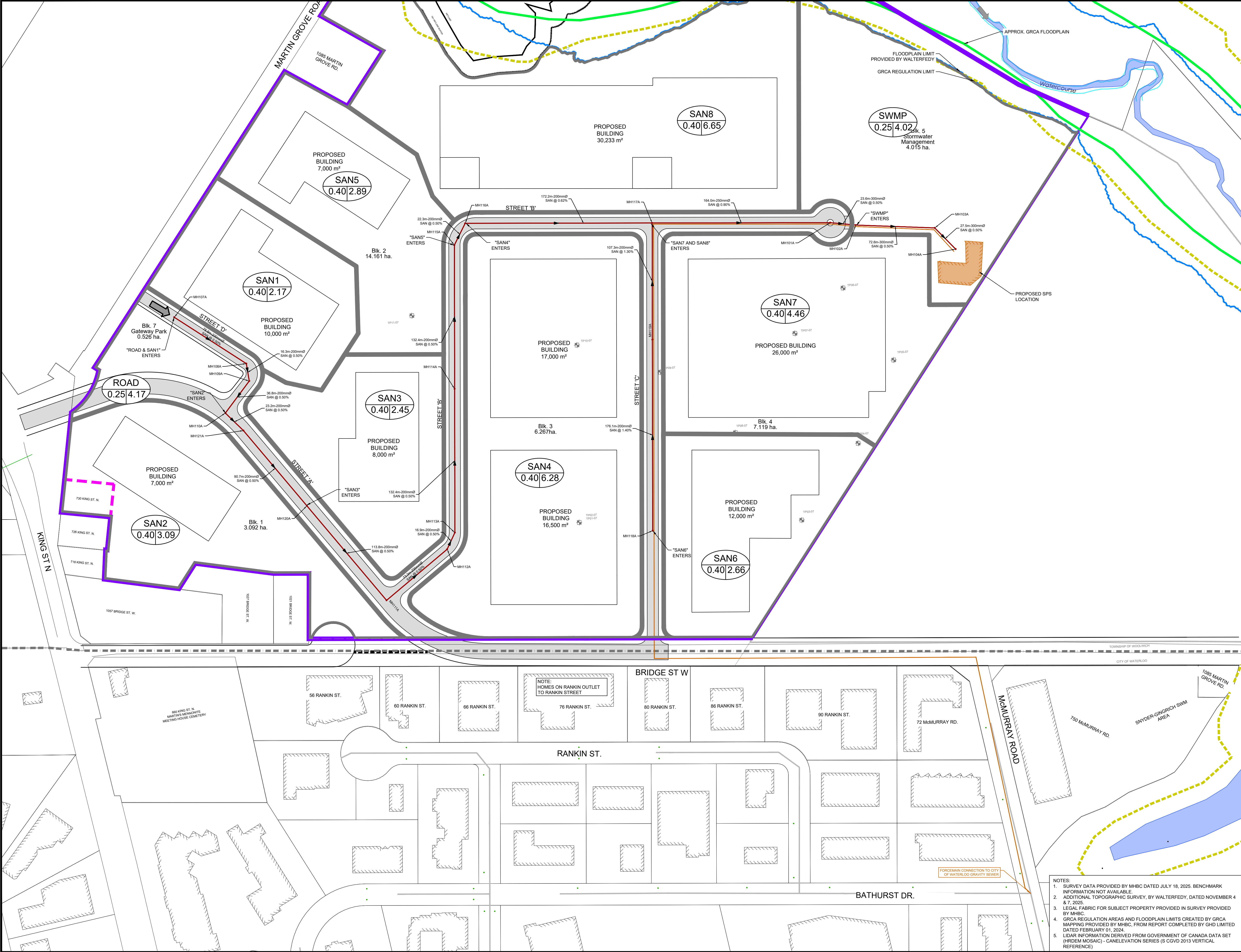
ELECTRICAL CONTROL SCHEMATICS

DATE: 97.06.09	DESIGNED BY: TR
SCALE : N.T.S.	DRAWN BY: RR
FILE NO.	CHECKED BY: TT/BAW
FIELD BK/PAGE	DRAWING NO.

6-478



C:\Users\amoreau\OneDrive\Waterfedy\2025-0494-10_Gateway_Employment_Lands\Project_Files\1_Published\105_Civil\105.1_Plot_Files\2025-0494-10_SAN(2)_P11_BLANK_Note Andrew Moreau 1/26/2026 10:18:57 AM



KEY PLAN

North

DATE: 2025.09.12
2026.01.30

ISSUANCE: PROGRESS UPDATE
ISSUED FOR OPA SUBMISSION

NO: 1
2

LEGEND

- MH: PROPOSED SANITARY MANHOLE
- PROPOSED SANITARY SEWER/SERVICE
- PROPOSED SANITARY SEWER/SERVICE
- SANITARY DRAINAGE AREA
- CATCHMENT AREA #
- AREA IN HECTARES
- FLOW RATE (L/S/ha)
- PROPERTY BOUNDARY

1:1500

0 15.0 30.0 75.0

CLIENT

PROJECT

GATEWAY EMPLOYMENT LANDS
TOWNSHIP OF WOOLWICH

TITLE

SANITARY SEWER CATCHMENT PLAN

WALTERFEDY

TORONTO|CALGARY|EDMONTON|KITCHENER|HAMILTON

800.685.1378 waterfedy.com

NOTES

- SURVEY DATA PROVIDED BY MHBC DATED JULY 18, 2025. BENCHMARK INFORMATION NOT AVAILABLE.
- ADDITIONAL TOPOGRAPHIC SURVEY, BY WALTERFEDY, DATED NOVEMBER 4 & 7, 2025.
- LEGAL FABRIC FOR SUBJECT PROPERTY PROVIDED IN SURVEY PROVIDED BY MHBC.
- GRCA REGULATION AREAS AND FLOODPLAIN LIMITS CREATED BY GRCA MAPPING PROVIDED BY MHBC, FROM REPORT COMPLETED BY GHD LIMITED DATED FEBRUARY 01, 2024.
- LIDAR INFORMATION DERIVED FROM GOVERNMENT OF CANADA DATA SET (HRODEM MCHS40C) - CANELEVATION SERIES (S CGVD 2013 VERTICAL REFERENCE)

REPRODUCTION OR DISTRIBUTION FOR PURPOSES OTHER THAN AUTHORIZED BY WALTERFEDY, A PART OF WF GROUP, IS FORBIDDEN. CONTRACTORS SHALL VERIFY AND BE RESPONSIBLE FOR ALL DIMENSIONS AND CONDITIONS ON THE JOB AND REPORT ANY VARIATIONS FROM THE DIMENSIONS AND CONDITIONS SHOWN ON DRAWINGS TO WALTERFEDY, A PART OF WF GROUP. - DO NOT SCALE THIS DRAWING -

COPYRIGHT © 2026 WalterFedy, A Part of WF Group Inc.

SCALE: 1:1500
DATE: 1/23/2026
PROJECT NO.: 2025-0494-10
DRAWN BY: AM
CHECKED BY: BV

SHEET NO.:
C302



MEMORANDUM - INTERNAL

DATE: September 19, 2025
TO: Michael Stewart, Development Engineering
FROM: Veronica Kroess, Engineering Infrastructure
SUBJECT: Gateway Employment Lands

I have conducted a preliminary assessment of the sanitary capacity in relation to the Gateway Employment lands.

The information provided notes that the proposed development will have a sanitary discharge of nearly 50 L/s, summarized in Table 1.

Table 1 – Sanitary Servicing anticipated maximum peak flow rates:

Source	Peak Flow (L/s)
Proposed Site	50

2051 Modelling Scenario

The future conditions PCSWMM sanitary sewer model includes loading rates that are projected to reflect 2051 conditions. The projected 2051 model estimated flows do not account for flows from the proposed development. To be conservative, the flows resulting from the proposed development were added to the sanitary sewer model flows to determine the effects of the proposed development on the sanitary sewer system. The analysis was conducted for the wet weather modelling scenario as it is more conservative, using the Sanitary Hydraulic model developed for the 2024 Sanitary Master Plan update.

McMurray Road Sanitary Sewer System

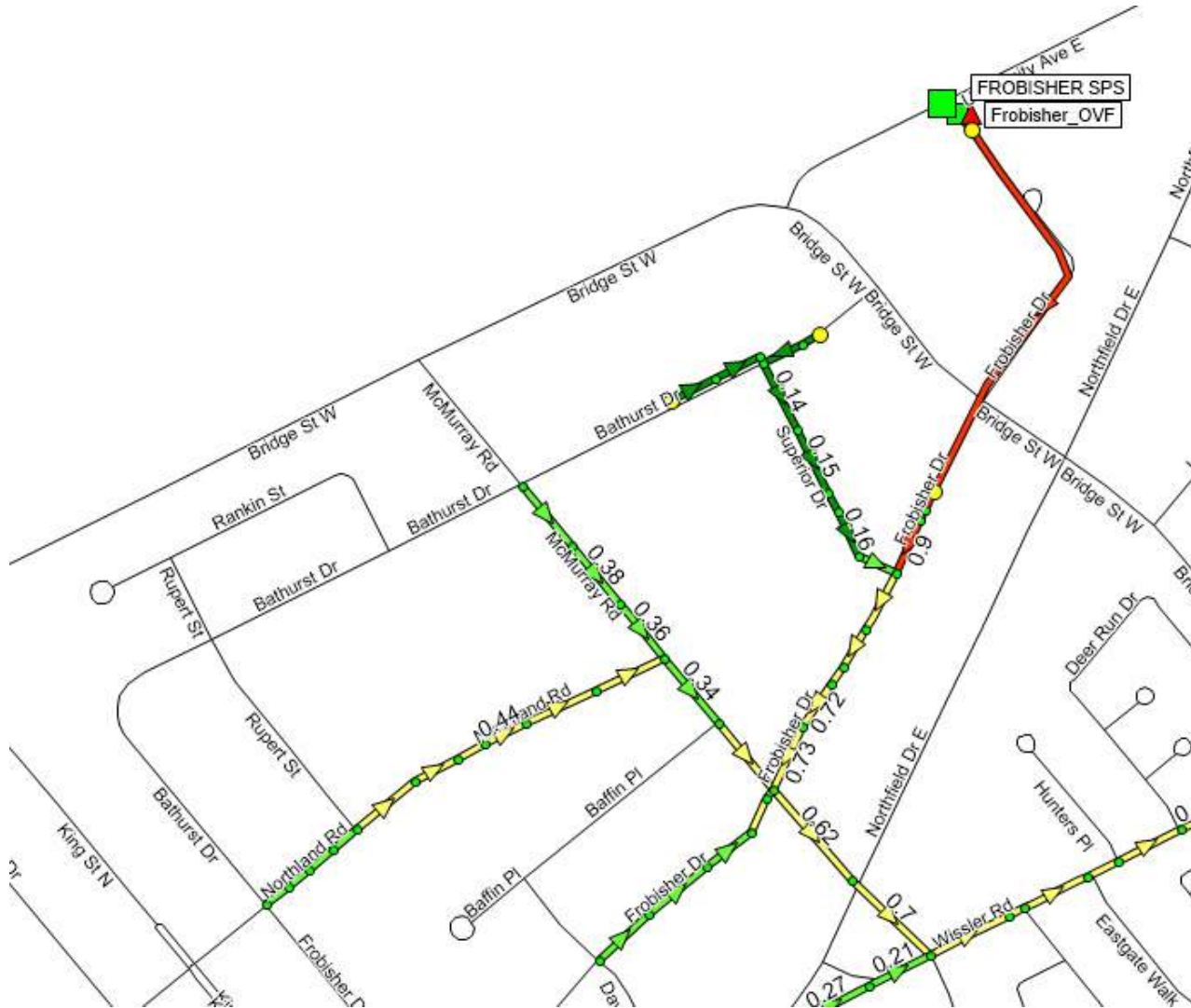
The proposed flow of 50 L/s was first accounted for in the MH LE58-16 flows. The 2051 projected ‘post-development’ modelling results indicate that the sanitary sewer on McMurray Road downstream of the proposed development appears to have available capacity under wet weather modelling scenarios, reaching a depth of 77 percent full, as shown on the figure below.



Projected 2051 Wet Weather modelling results – McMurray Road

Frobisher Drive Sanitary Sewer System

The proposed flow of 50 L/s was also added to the FR-2 flows, upstream of the Frobisher SPS. The 2051 projected 'post-development' modelling results indicate that the sanitary sewer on Frobisher Drive downstream of the proposed development exceeds the maximum preferred flow depth of 80 percent under wet weather modelling scenarios, reaching a depth of 90 percent full, as shown on the figure below. The model does indicate that there is no surcharging under the added flows. However, the Frobisher SPS has an ECA pumping capacity rated at 35 L/s, and a maximum rated pumping capacity of only 60 L/s, and is therefore not ideally suited for the additional high flows.



Projected 2051 Wet Weather modelling results – Frobisher Drive

Legend:

Sanitary Sewers (fraction full):

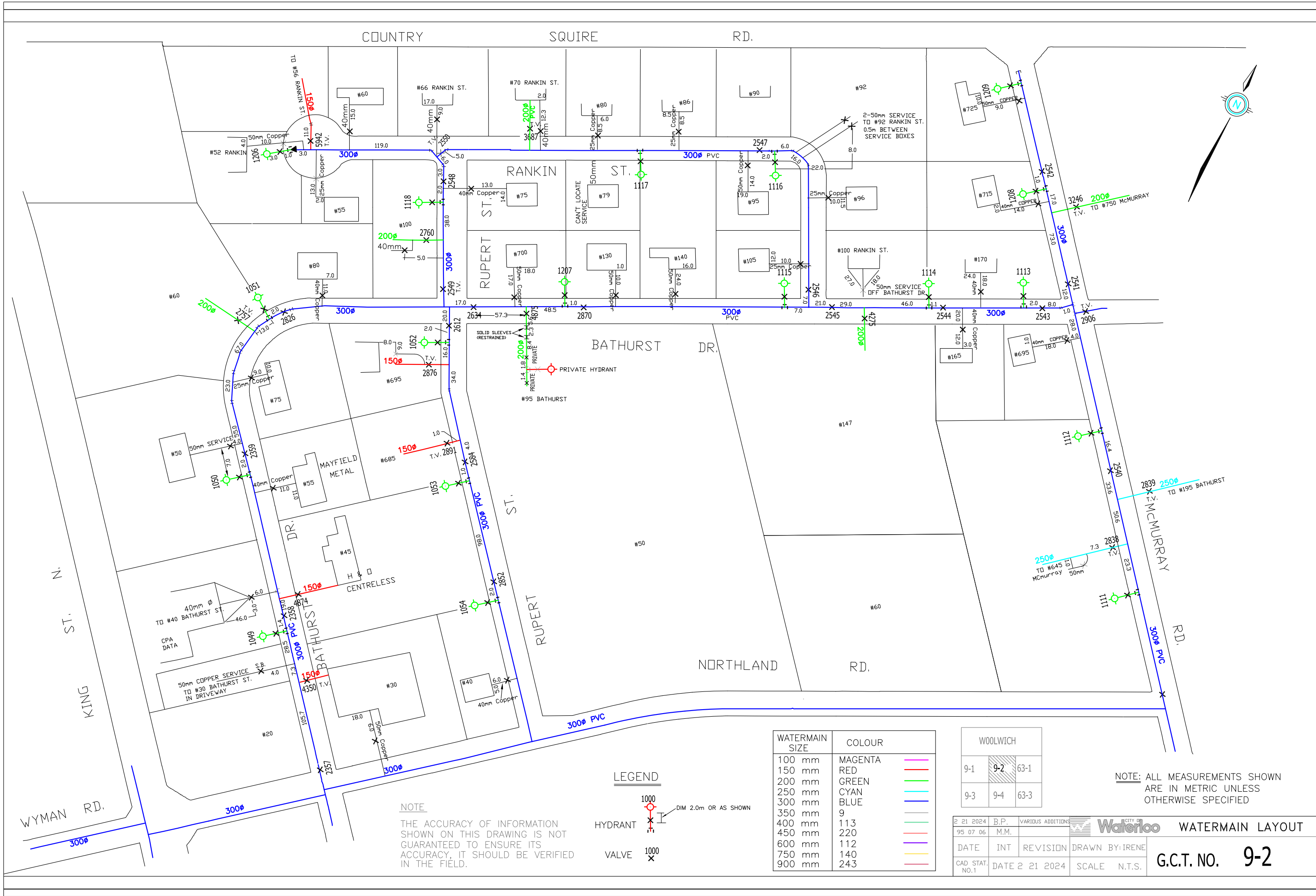
■	< 0.2 CapDepth < 0.2
■	0.2 - 0.4 CapDepth >= 0.2 AND CapDepth < 0.4
■	0.4 - 0.8 CapDepth >= 0.4 AND CapDepth < 0.8
■	> 0.8 CapDepth >= 0.8

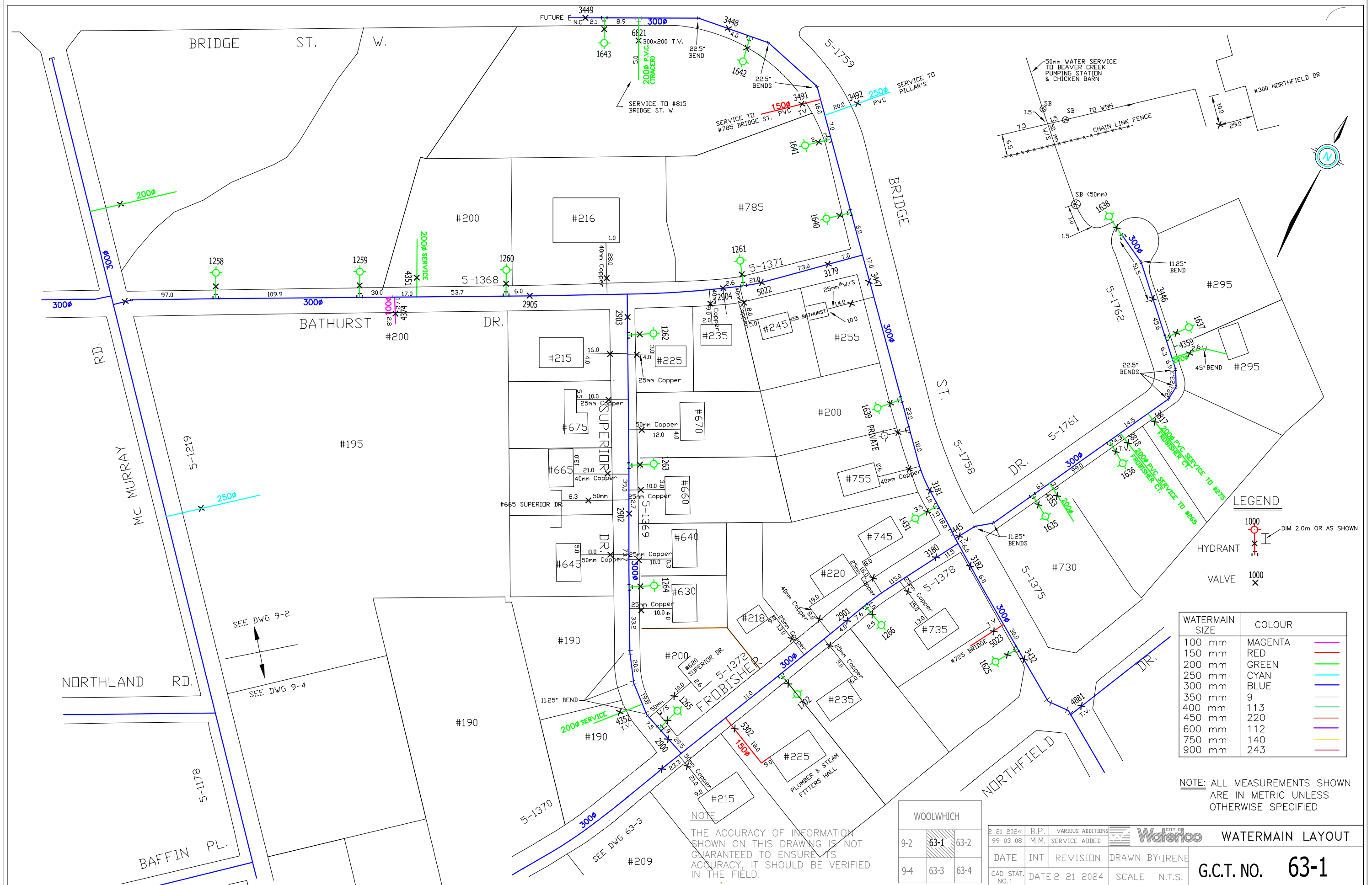
Maintenance Holes (depth to rim):

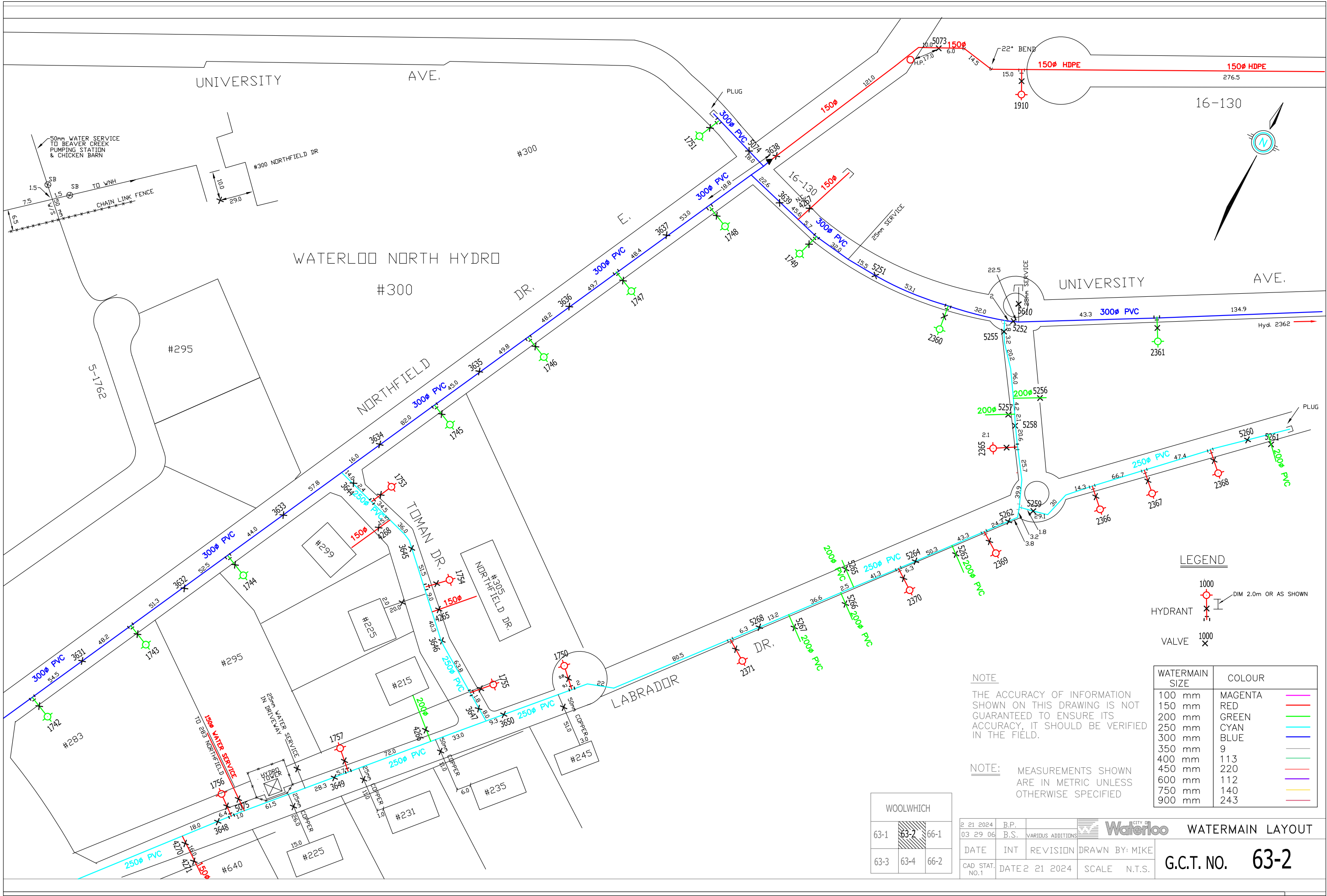
■	>= 1.8 MinDepthBR >= 1.8
■	0 m to 1.8 m MinDepthBR > 0.0 and MinDepthBR < 1.8
■	= 0.0 m MinDepthBR = 0

APPENDIX C

Domestic Demand and FUS Fire Flow Calculations







REQUIRED DOMESTIC FLOW
MECP 2008 AND ONTARIO BUILDING CODE

WALTERFEDY

Project	Gateway Employment Lands
Project #	2025-0494-10
Designer	ZS
Address	Woolwich, Ontario
Description	Overall Domestic Flows

Building Description	Block Area (ha)	Demand (m ³ /ha/day)	Maximum Day Peak Factor	Peak Hour Peaking Factor	Max Daily Demand (L/s)	Peak Hourly Demand (L/s)	Required Fire Flow (L/s)*	Water Service Size (mm)	Peak Hour Water Service Velocity (m/s)	Fire Water + MDD Service Velocity (m/s)
Block 1	3.092	35	1.42	3	1.78	3.76	233	300	0.053	3.321
Block 2	14.161	35	1.42	3	8.15	17.21	233	300	0.243	3.412
Block 3	6.267	35	1.42	3	3.60	7.62	233	300	0.108	3.347
Block 4	7.119	35	1.42	3	4.10	8.65	233	300	0.122	3.354
Total					17.62	37.23				

* A maximum fire flow of 233 L/s has been assumed at this time.

REQUIRED FIRE FLOW

Water Supply for Public Fire Protection (FUS 2020)

WALTERFEDY

Project Gateway Employment Lands
Project # 2025-0494-10
Designer ZS
Address 985 Bridge Street West, Woolwich
Description Fire Demand - Block 2, North Building

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

F = Required fire flow (LPM)

C = Coefficient related to type of construction

A = Total floor area (including all storeys but excluding any basement levels at least 50% below grade)

Type of Construction Non-Combustible Construction C = 0.8
Description Unprotected Metal Structural Components, Masonry or Metal Walls. All Structural Members are Non-Combustible but does not qualify as Fire-Resistive

Total Floor Area 35000 m²
Storeys 1
Fire Resistant Building? NO
Vertical Openings and Exterior Vertical Communications protected with minimum one (1) hr rating? NO
Area 35000 m²
Description
Required Fire Flow 33000 L/min

Occupancy Charge Limited-Combustible Contents
Fire Flow Reduction -15% OR -4950 L/min
Required Fire Flow 28050 L/min

Automated Sprinkler Protection YES
Designed to NFPA 13 Standard YES -30%
Standard Water Supply to Sprinklers and Standpipes YES -10%
Fully Supervised System YES -10%
Fire Flow Adjustment -14025 L/min

Exposure 1 (East) Distance m Charge 0%
Description

Exposure 2 (South) Distance m Charge 0%
Description

Exposure 3 (North) Distance m Charge 0%
Description

Exposure 4 (West) Distance m Charge 0%
Description

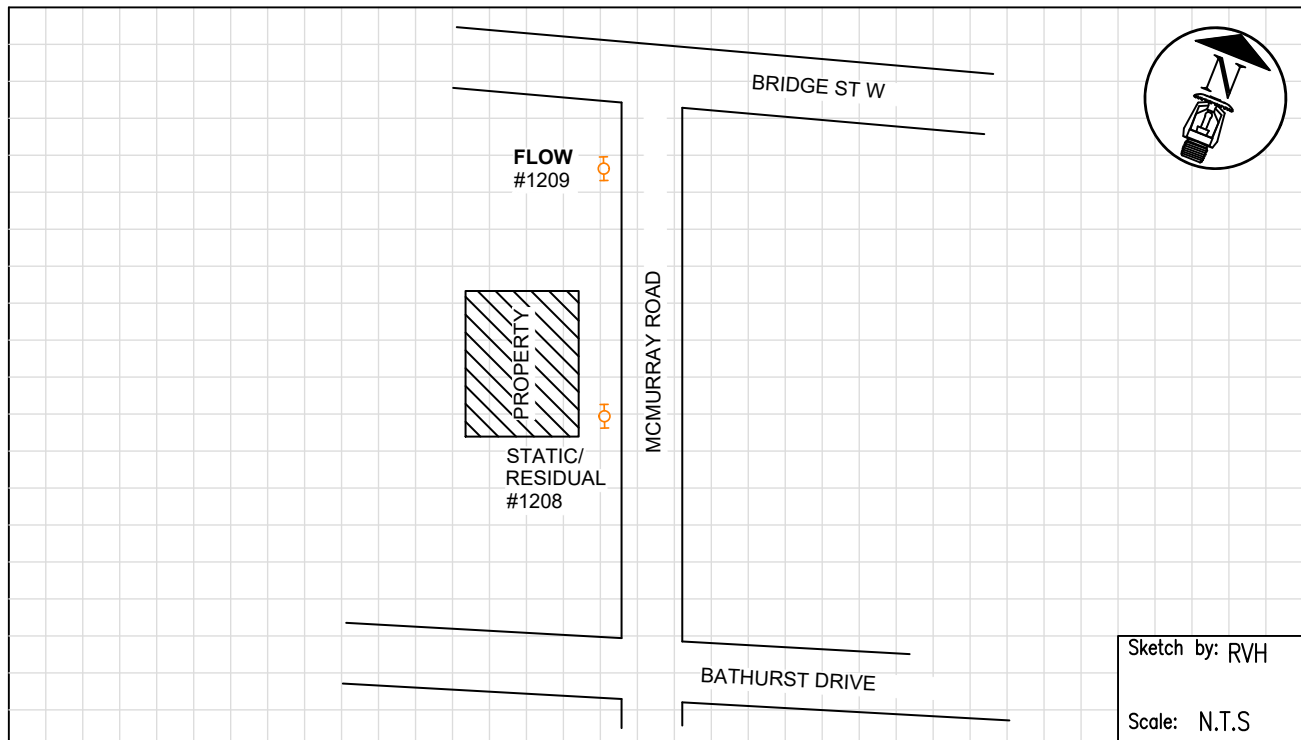
Total Exposure Charge 0%
Fire Flow Adjustment 0 L/min

Total Required Fire Flow 14000 L/min
Total Required Fire Flow 3698 U.S. GPM
Total Required Fire Flow 233 L/s

WATER SUPPLY TEST

Facility Name: Proposed Development		File/Project #: 58734					
Facility Address: 715 McMurray Road, Waterloo, Ontario							
Tested by: Ron Van Hulst		Witnessed by: Waterloo Waterworks					
Size of Main: ø12" (300mm)	Comments:						
☒ Dead End ☐ Two Ways ☐ Loop							
Flow Hydrant Location: Hydrant Located On The West Of McMurray Road South Of Bridge Street West							
Residual Hydrant Location: Hydrant Located On The West Side Of McMurray Road In Front Of Property							
Static Pressure: 56 psi		Date: Oct 2, 2025	Time: 9:30 ☒ AM ☐ PM				
Test No.	No. of Outlets	Orifice Size (in.)	Pitot Reading (psi)	Equivalent Flow gpm (U.S.)	Total Flow gpm (U.S.)	Residual Pressure (psi)	Comments
1	1	2½"	36	1119	1119	51	
2	2	2½"	18	2(791)	1582	49	
3							
4							

Site Map:



Name and Address of authority who should receive a copy.

City Of Waterloo Waterworks Dept. Att: Scott Donelle (scott.donelle@waterloo.ca) & Jeff Schultz (jeff.schultz@waterloo.ca)



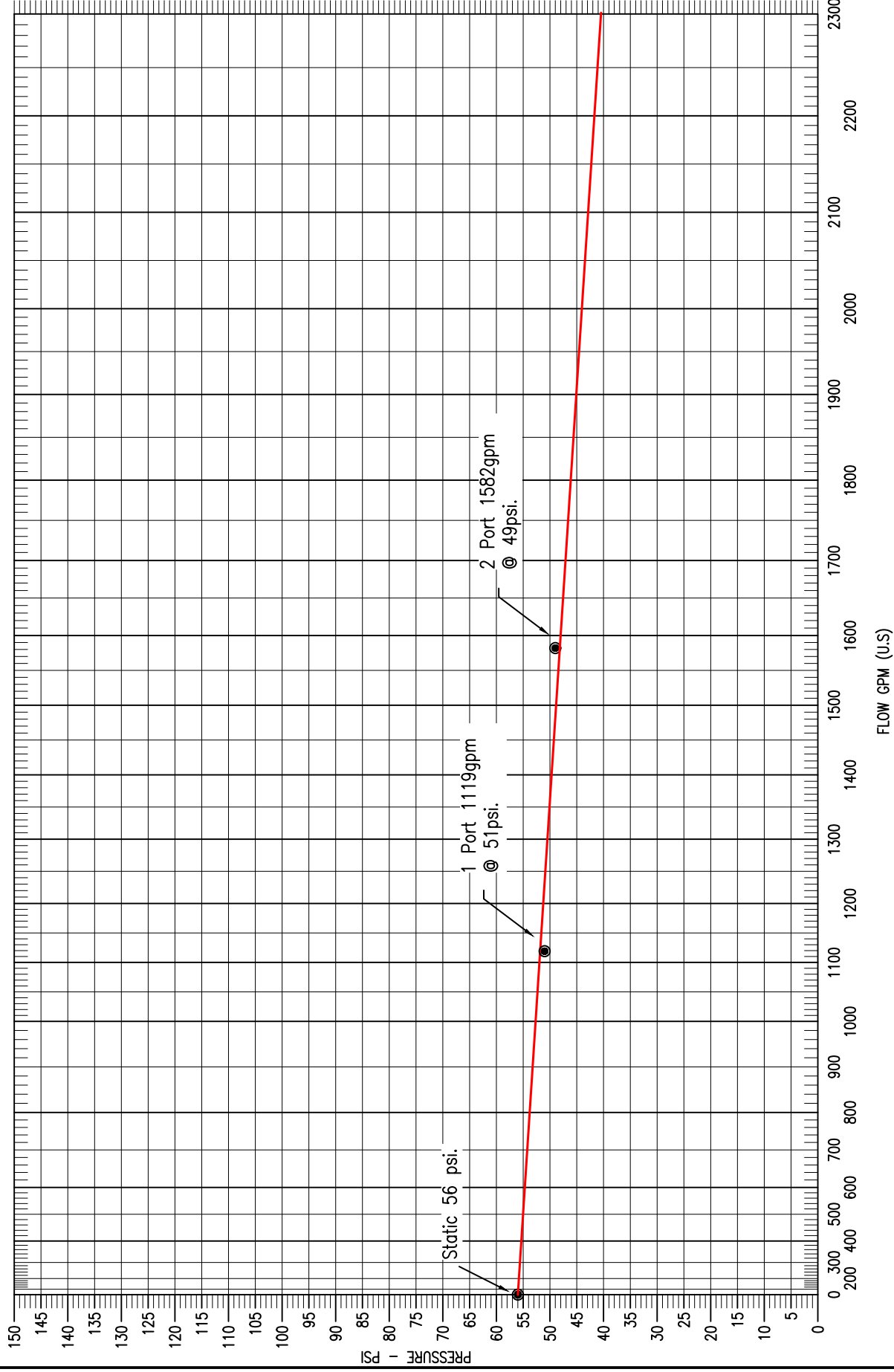
FIRE PROTECTION LTD.

31 HAYES AVE., GUELPH, ONTARIO N1E 5V6 Phone: (519) 823-1150 Fax: (519) 822-7752

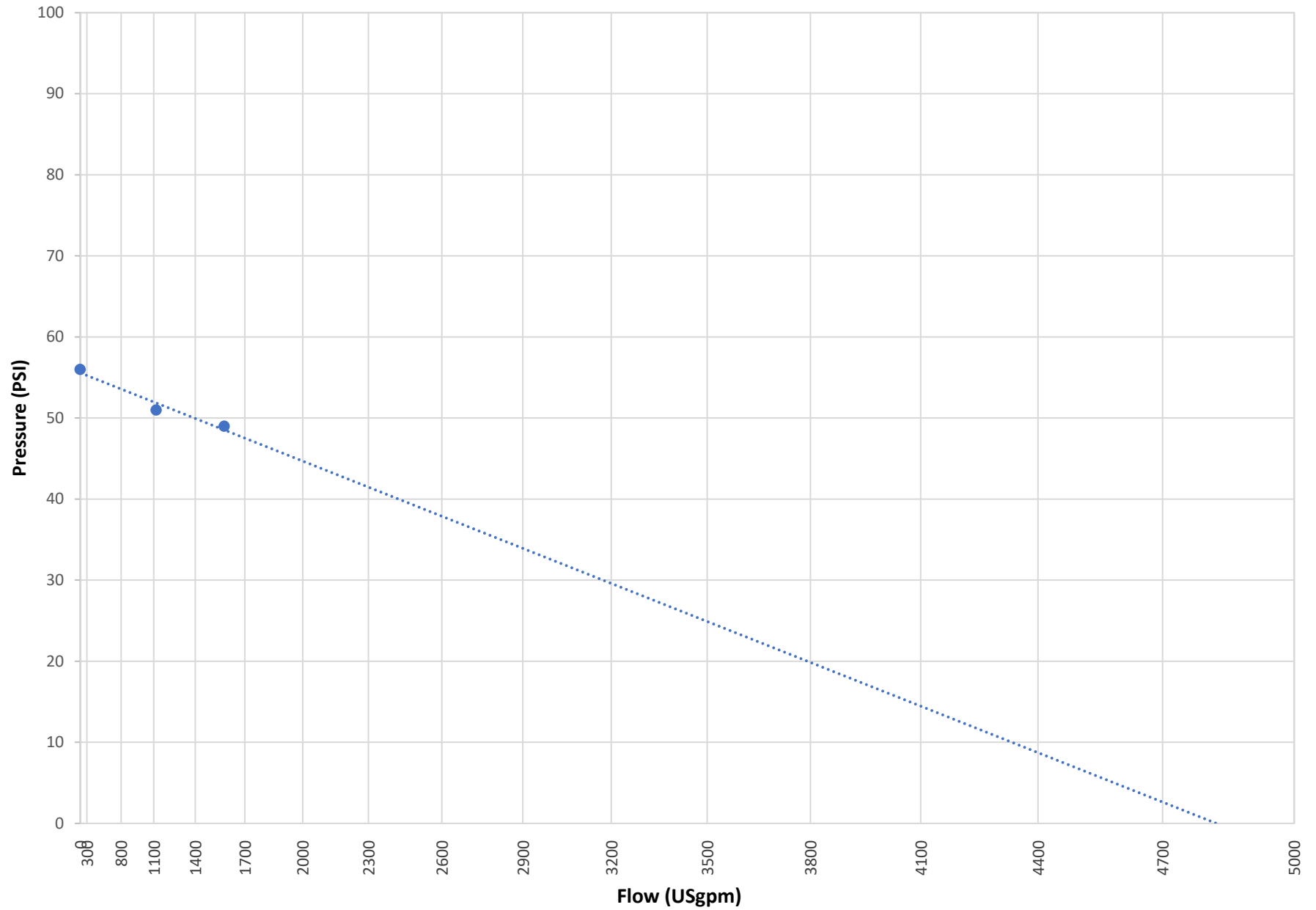
Facility Name: Proposed Development File/Project # 58734

Facility Address: 715 McMurray Road, Waterloo, Ontario

Tested by: Ron Van Hulst Date: Oct 2, 2025



N185 Residual Pressure vs. Hydrant Flow - McMurray Road



WATER SUPPLY TEST

Facility Name: Proposed Development File/Project #: 58734

Facility Address: King Street North & Northland Road, Waterloo, Ontario

Tested by: Ron Van Hulst Witnessed by: Waterloo Waterworks

Size of Main: $\phi 12''$ (300mm) Comments:

☐ Dead End
☐ Two Ways
☒ Loop

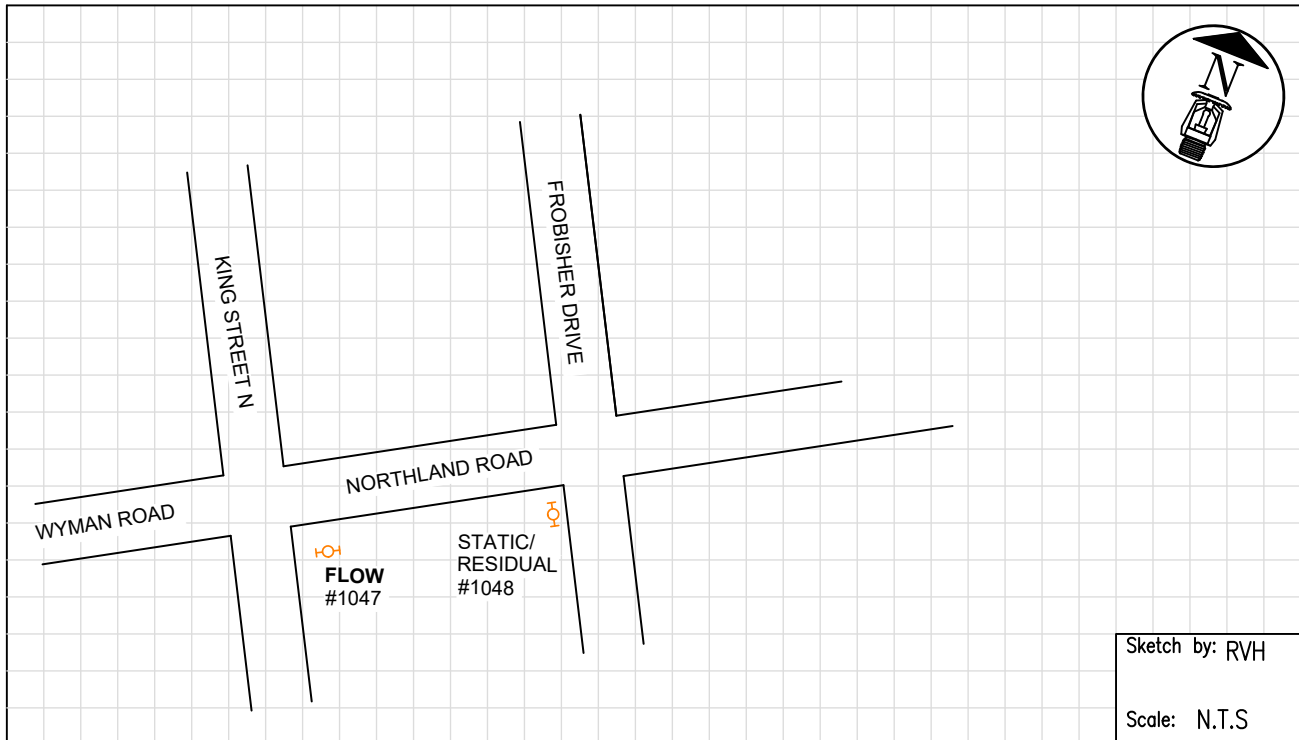
Flow Hydrant Location: Hydrant Located On The South Side Of Northland Road East Of King Street North

Residual Hydrant Location: Hydrant Located On The South Side Of Northland Road West Of Frobisher Drive

Static Pressure: 50 psi Date: Oct 2, 2025 Time: 10:30 ☐ AM ☒ PM

Test No.	No. of Outlets	Orifice Size (in.)	Pitot Reading (psi)	Equivalent Flow gpm (U.S.)	Total Flow gpm (U.S.)	Residual Pressure (psi)	Comments
1	1	2½"	28	987	987	49	
2	2	2½"	20	2(834)	1668	47	
3							
4							

Site Map:



Name and Address of authority who should receive a copy.

City Of Waterloo Waterworks Dept. Att: Scott Donelle (scott.donelle@waterloo.ca) & Jeff Schultz (jeff.schultz@waterloo.ca)



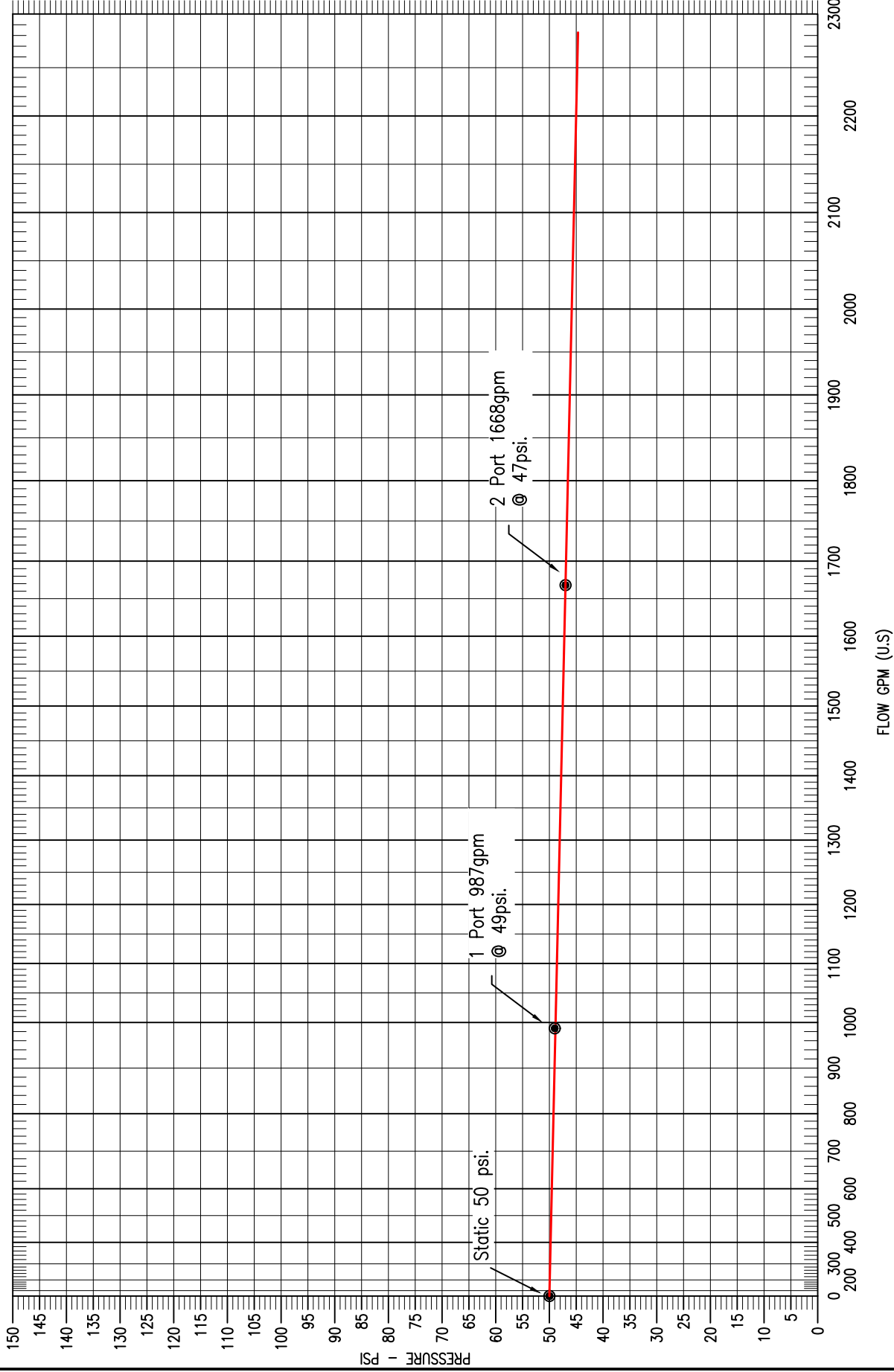
FIRE PROTECTION LTD.

31 HAYES AVE., GUELPH, ONTARIO N1E 5V6 Phone: (519) 823-1150 Fax: (519) 822-7752

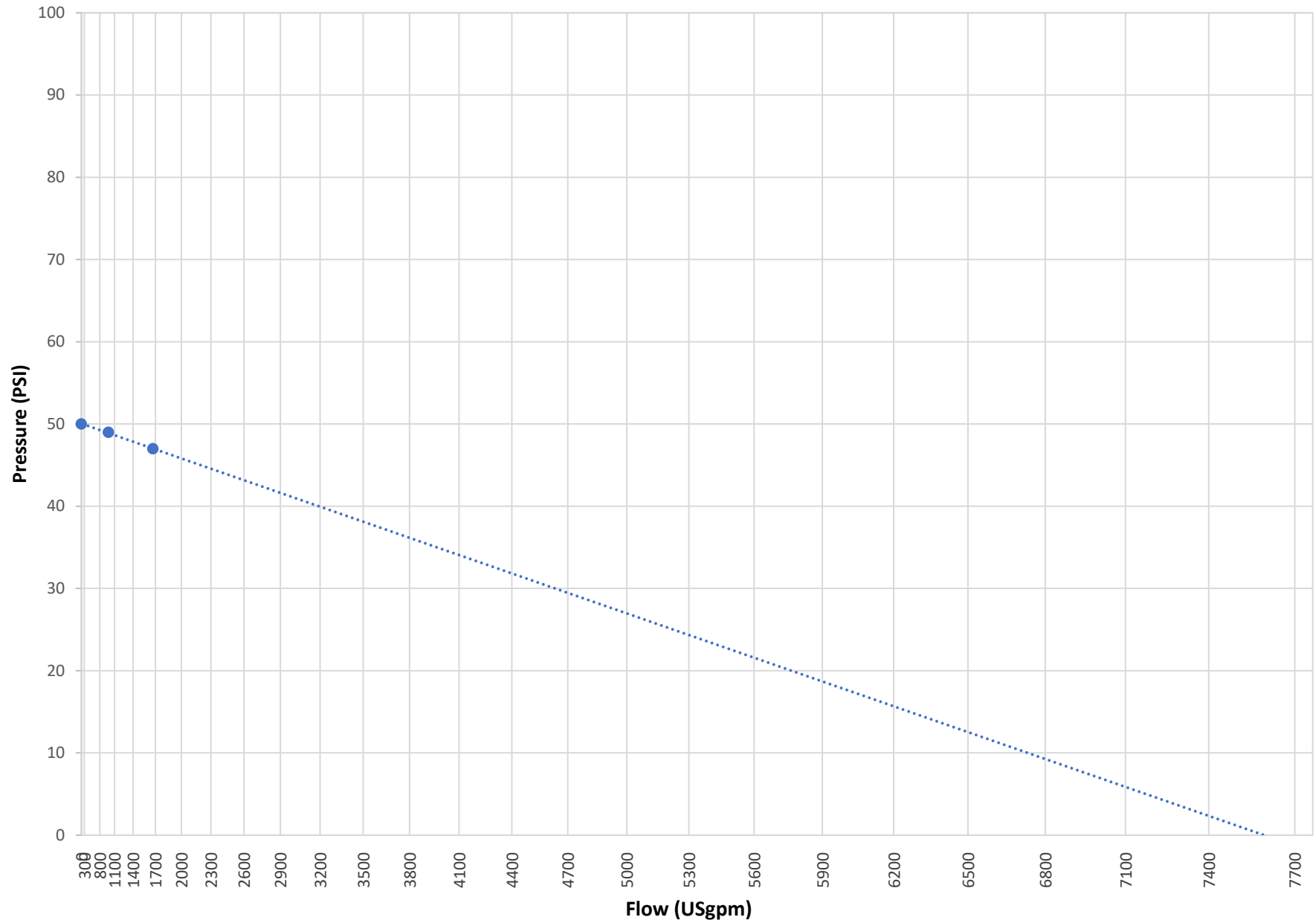
Facility Name: Proposed Development File/Project # 58734

Facility Address: King Street North & Northland Road, Waterloo, Ontario

Tested by: Ron Van Hulst Date: Oct 2, 2025



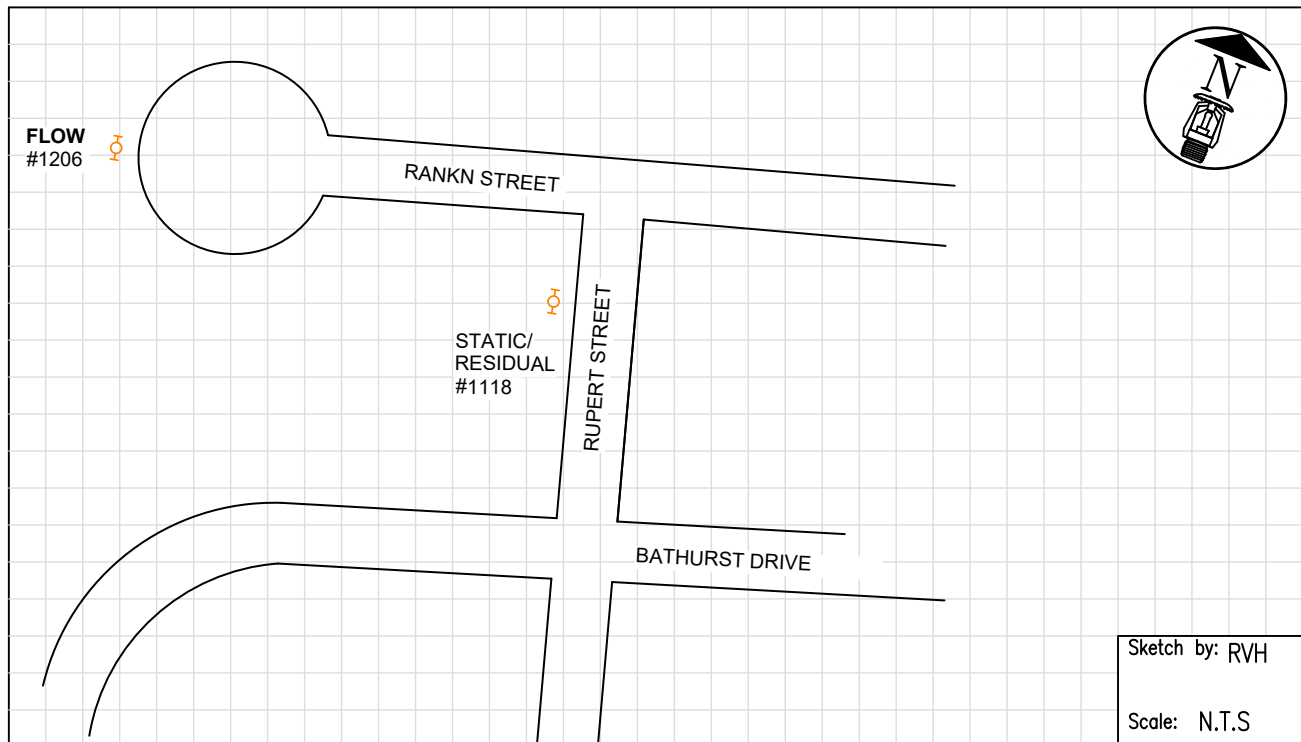
N185 Residual Pressure vs. Hydrant Flow - King Street North & Northland Road



WATER SUPPLY TEST

Facility Name: Proposed Development		File/Project #: 58734					
Facility Address: 66 Rankin Street, Waterloo, Ontario							
Tested by: Ron Van Hulst		Witnessed by: Waterloo Waterworks					
Size of Main: Ø12" (300mm)	Comments:						
☐ Dead End ☐ Two Ways ☒ Loop							
Flow Hydrant Location: Hydrant Located On The West Side Of Rankin Cul De Sac							
Residual Hydrant Location: Hydrant Located On The South Side Of Rankin Street West Of Rupert St							
Static Pressure: 54 psi		Date: Oct 2, 2025					
		Time 10:00 ☒ AM ☐ PM					
Test No.	No. of Outlets	Orifice Size (in.)	Pitot Reading (psi)	Equivalent Flow gpm (U.S.)	Total Flow gpm (U.S.)	Residual Pressure (psi)	Comments
1	1	2½"	28	987	987	51	
2	2	2½"	20	2(834)	1668	50	
3							
4							

Site Map:



Name and Address of authority who should receive a copy.

City Of Waterloo Waterworks Dept. Att: Scott Donelle (scott.donelle@waterloo.ca) & Jeff Schultz (jeff.schultz@waterloo.ca)



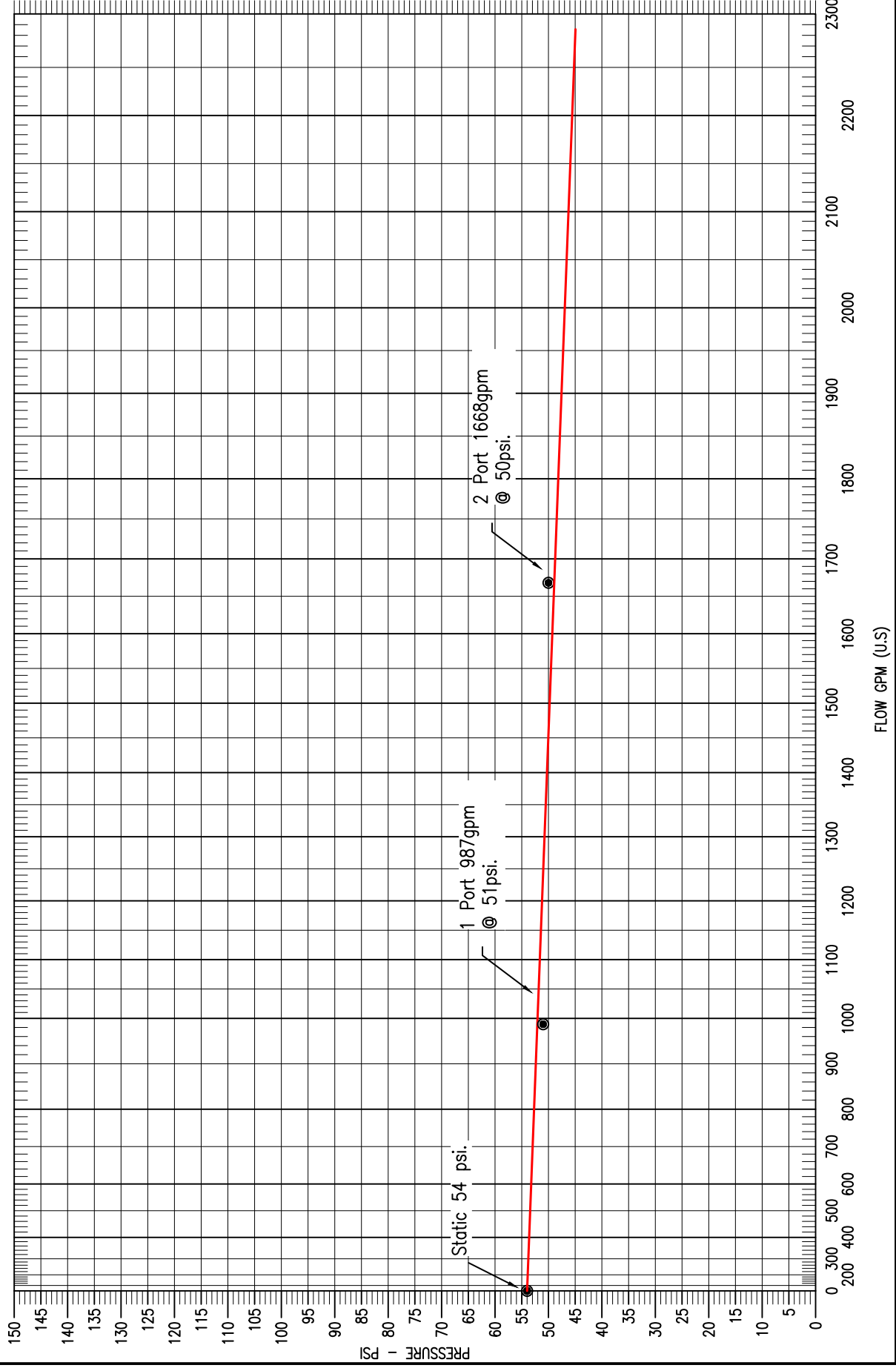
FIRE PROTECTION LTD.

31 HAYES AVE., GUELPH, ONTARIO N1E 5V6 Phone: (519) 823-1150 Fax: (519) 822-7752

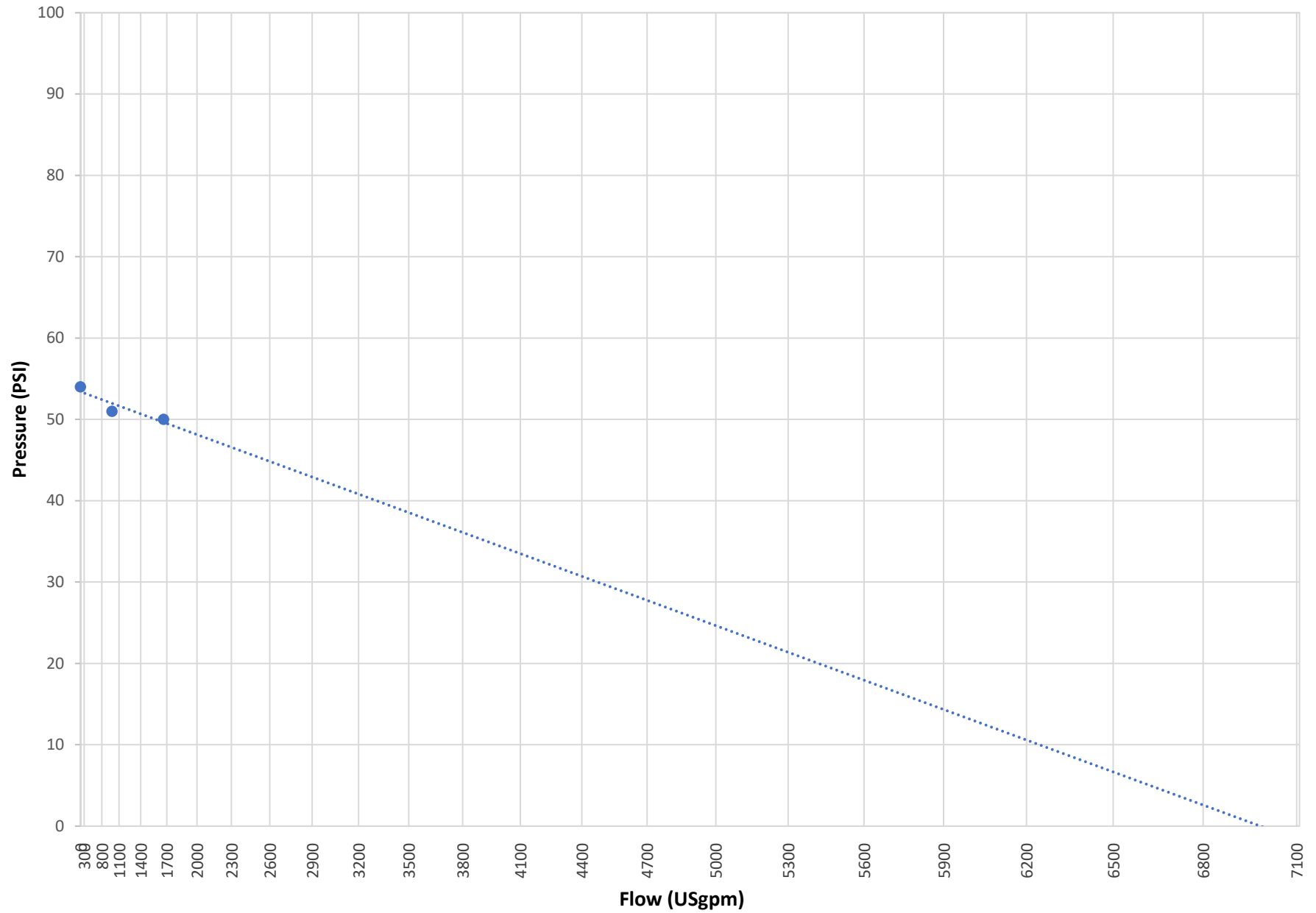
Facility Name: Proposed Development File/Project # 58734

Facility Address: 66 Rankin Street, Waterloo, Ontario

Tested by: Ron Van Hulst Date: Oct 2, 2025



N185 Residual Pressure vs. Hydrant Flow - Rankin Street



APPENDIX D

Storm Servicing Design

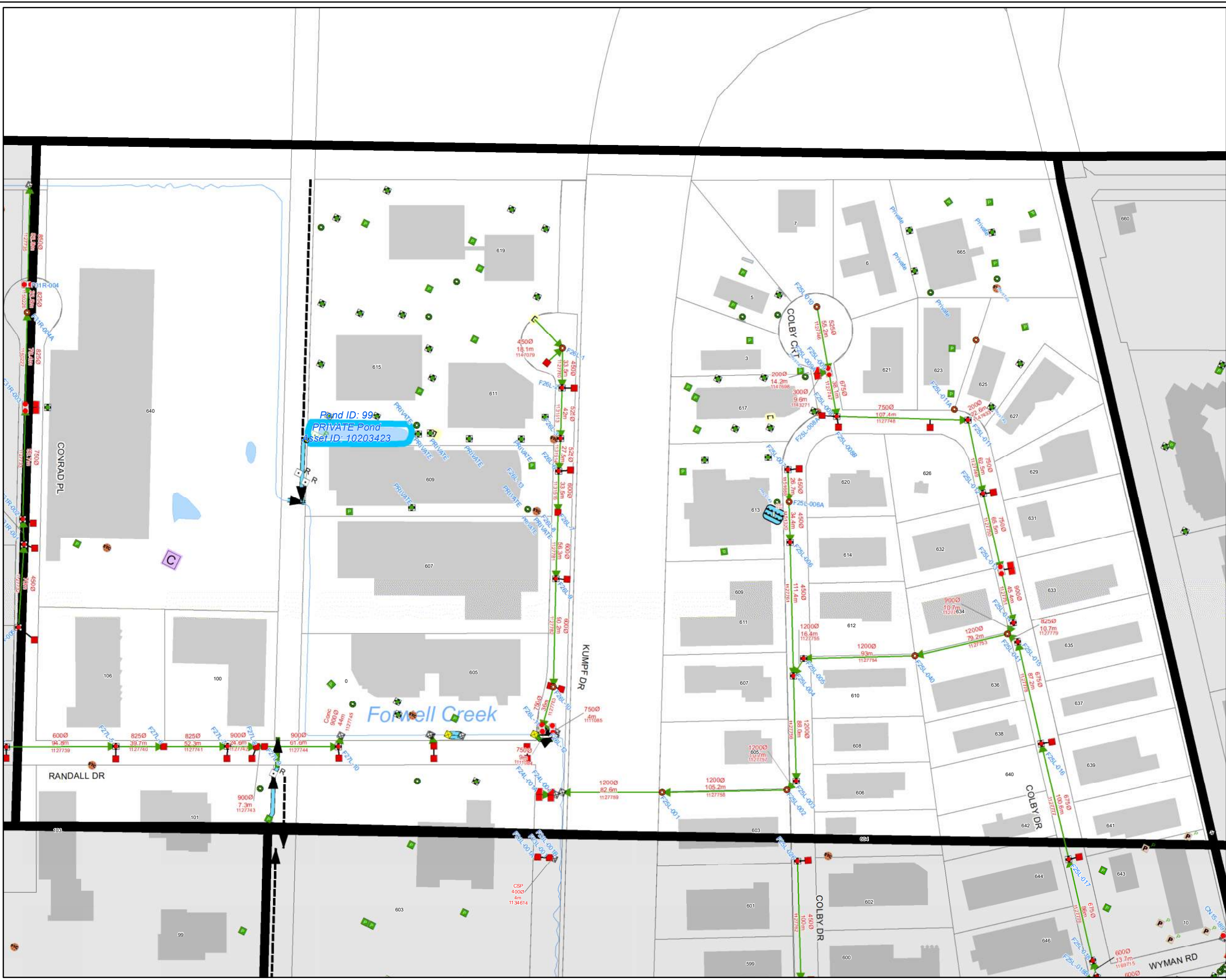
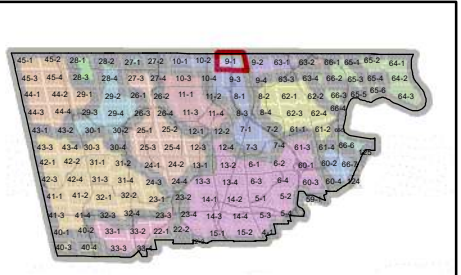


STORM LAYOUT

G.C.T. NO: 9-1

Date: 2 July, 2025

- Single Catchbasin
- Single Catchbasin (Private)
- Single Catchbasin, (Region of W.)
- Single Catchbasin, (Kitchener)
- Double Catchbasin
- Double Catchbasin (Private)
- Double Catchbasin, (Region of W.)
- Double Catchbasin, (Kitchener)
- Inlet
- Single Ditch Inlet Catchbasin
- Single Ditch Inlet Catchbasin (Prv)
- OGS
- OGS (others)
- Manhole
- Manhole, (Private)
- Manhole, (Region of W.)
- Manhole, (Kitchener)
- CWC Manhole
- Catchbasin Manhole
- Catchbasin Manhole (Private)
- Catchbasin Manhole, (Region of W.)
- Double Catchbasin Manhole
- Double Catchbasin Manhole (Prv)
- Double Catchbasin Manhole, (Region of W.)
- Ditch Inlet Catchbasin Manhole
- Ditch Inlet Catchbasin Manhole (Prv)
- Ditch Inlet Catchbasin Manhole, (Region of W.)
- Collector
- Collector (Private)
- Collector, (Region of W.)
- Collector, (Kitchener)
- Culvert
- Ditch
- Infiltration Pipe
- Infiltration/Infra Facility
- Infiltration Gallery
- Soakaway Pit
- Chamber
- Cleanout
- Discharge Structure
- Underground Storage
- SWM Pond
- Easement



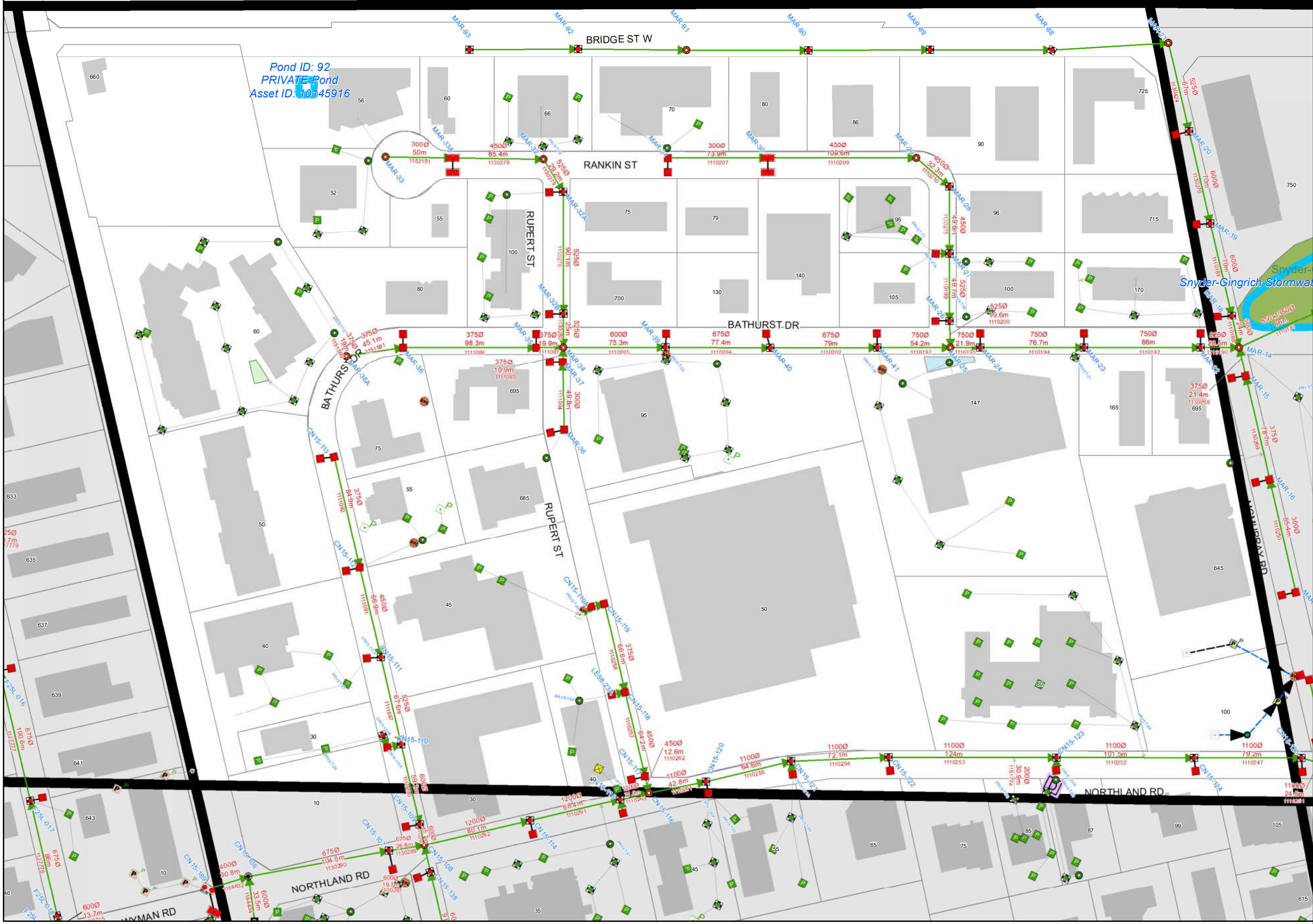
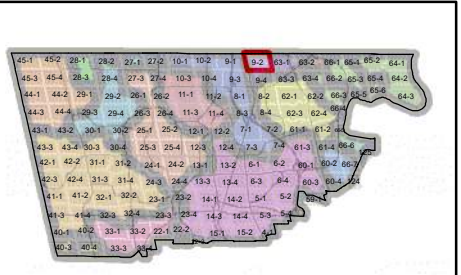


STORM LAYOUT

G.C.T. NO: 9-2

Date: 2 July, 2025

- Single Catchbasin
- Single Catchbasin (Private)
- Single Catchbasin, (Region of W.)
- Single Catchbasin, (Kitchener)
- Double Catchbasin
- Double Catchbasin (Private)
- Double Catchbasin, (Region of W.)
- Double Catchbasin, (Kitchener)
- Inlet
- Single Ditch Inlet Catchbasin
- Single Ditch Inlet Catchbasin (Prv)
- OGS
- OGS (others)
- Manhole
- Manhole, (Private)
- Manhole, (Region of W.)
- Manhole, (Kitchener)
- CWC Manhole
- Catchbasin Manhole
- Catchbasin Manhole (Private)
- Catchbasin Manhole, (Region of W.)
- Double Catchbasin Manhole
- Double Catchbasin Manhole (Prv)
- Double Catchbasin Manhole, (Region of W.)
- Ditch Inlet Catchbasin Manhole
- Ditch Inlet Catchbasin Manhole (Prv)
- Ditch Inlet Catchbasin Manhole, (Region of W.)
- Collector
- Collector (Private)
- Collector, (Region of W.)
- Collector, (Kitchener)
- Culvert
- Ditch
- Infiltration Pipe
- Infiltration/Infra Facility
- Infiltration Gallery
- Soakaway Pit
- Chamber
- Cleanout
- Discharge Structure
- Underground Storage
- SWM Pond
- Easement



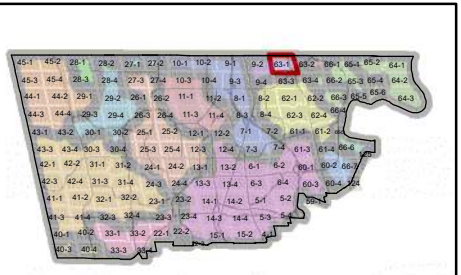


STORM LAYOUT

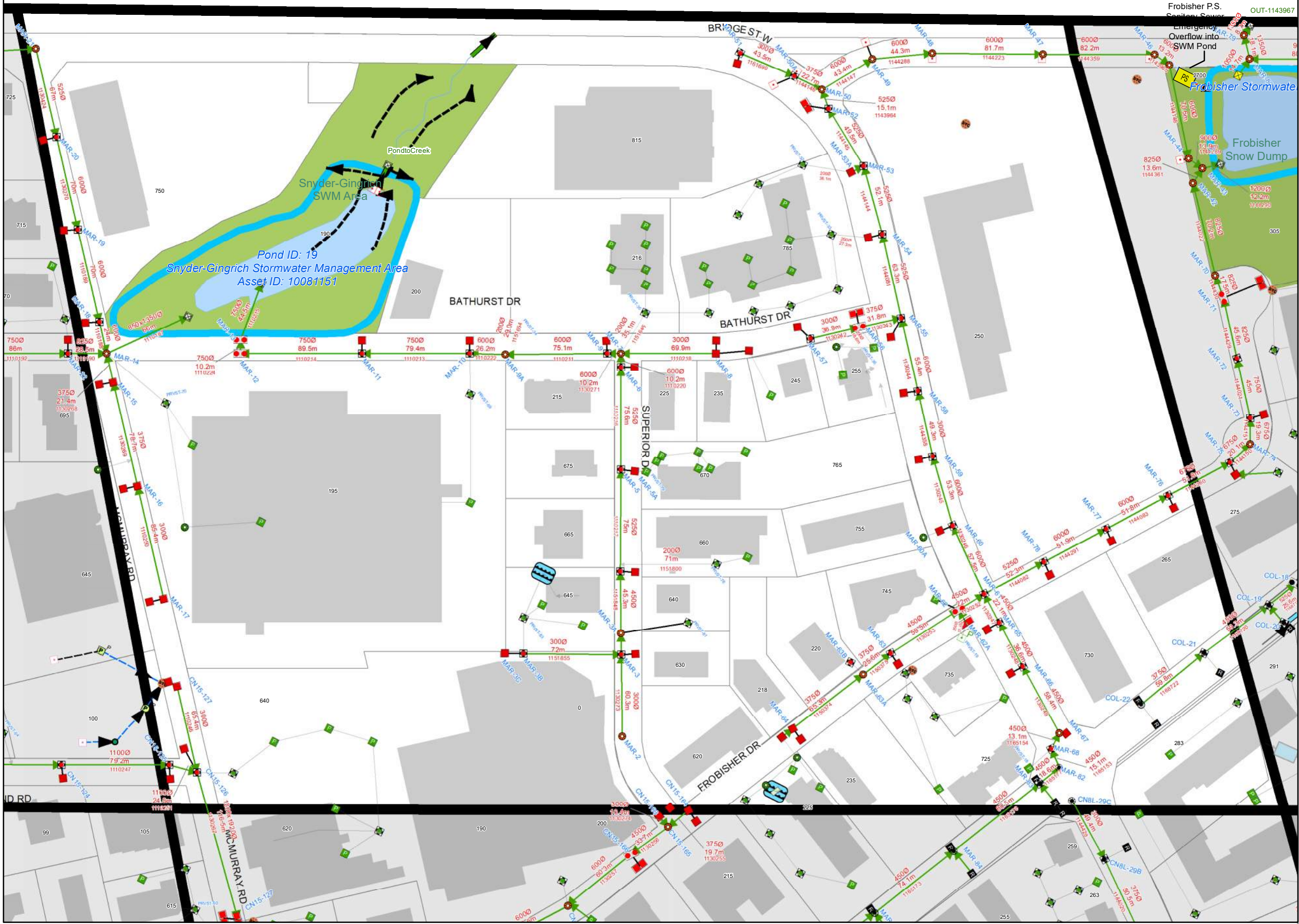
G.C.T. NO: 63-1

Date: 2 July, 2025

- Single Catchbasin
- Single Catchbasin (Private)
- Single Catchbasin, (Region of W.)
- Single Catchbasin, (Kitchener)
- Double Catchbasin
- Double Catchbasin (Private)
- Double Catchbasin, (Region of W.)
- Double Catchbasin, (Kitchener)
- Inlet
- Single Ditch Inlet Catchbasin
- Single Ditch Inlet Catchbasin (Prv)
- OGS
- OGS (others)
- Manhole
- Manhole, (Private)
- Manhole, (Region of W.)
- Manhole, (Kitchener)
- CWC Manhole
- Catchbasin Manhole
- Catchbasin Manhole (Private)
- Catchbasin Manhole, (Region of W.)
- Double Catchbasin Manhole
- Double Catchbasin Manhole (Prv)
- Double Catchbasin Manhole, (Region of W.)
- Ditch Inlet Catchbasin Manhole
- Ditch Inlet Catchbasin Manhole (Prv)
- Ditch Inlet Catchbasin Manhole, (Region of W.)
- Collector
- Collector (Private)
- Collector, (Region of W.)
- Collector, (Kitchener)
- Culvert
- Ditch
- Infiltration Pipe
- Infiltration Infra Facility
- Infiltration Gallery
- Soakaway Pit
- Chamber
- Cleanout
- Discharge Structure
- Underground Storage
- SWM Pond
- Easement



Map © 2018, City of Waterloo
Revision Date: 23 March 2018
Produced by: Engineering Services, IPPW
Imagery: May 2014
Property Information © 2001-2015
Teranet Land Information Services Inc. and its licensees.
May Not Be Reproduced Without Permission.
THIS IS NOT A PLAN OF SURVEY

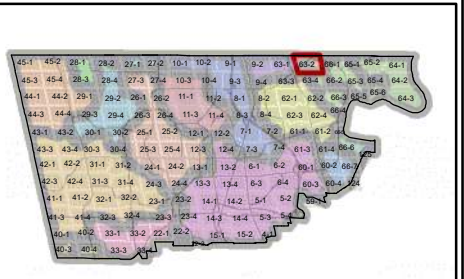


STORM LAYOUT

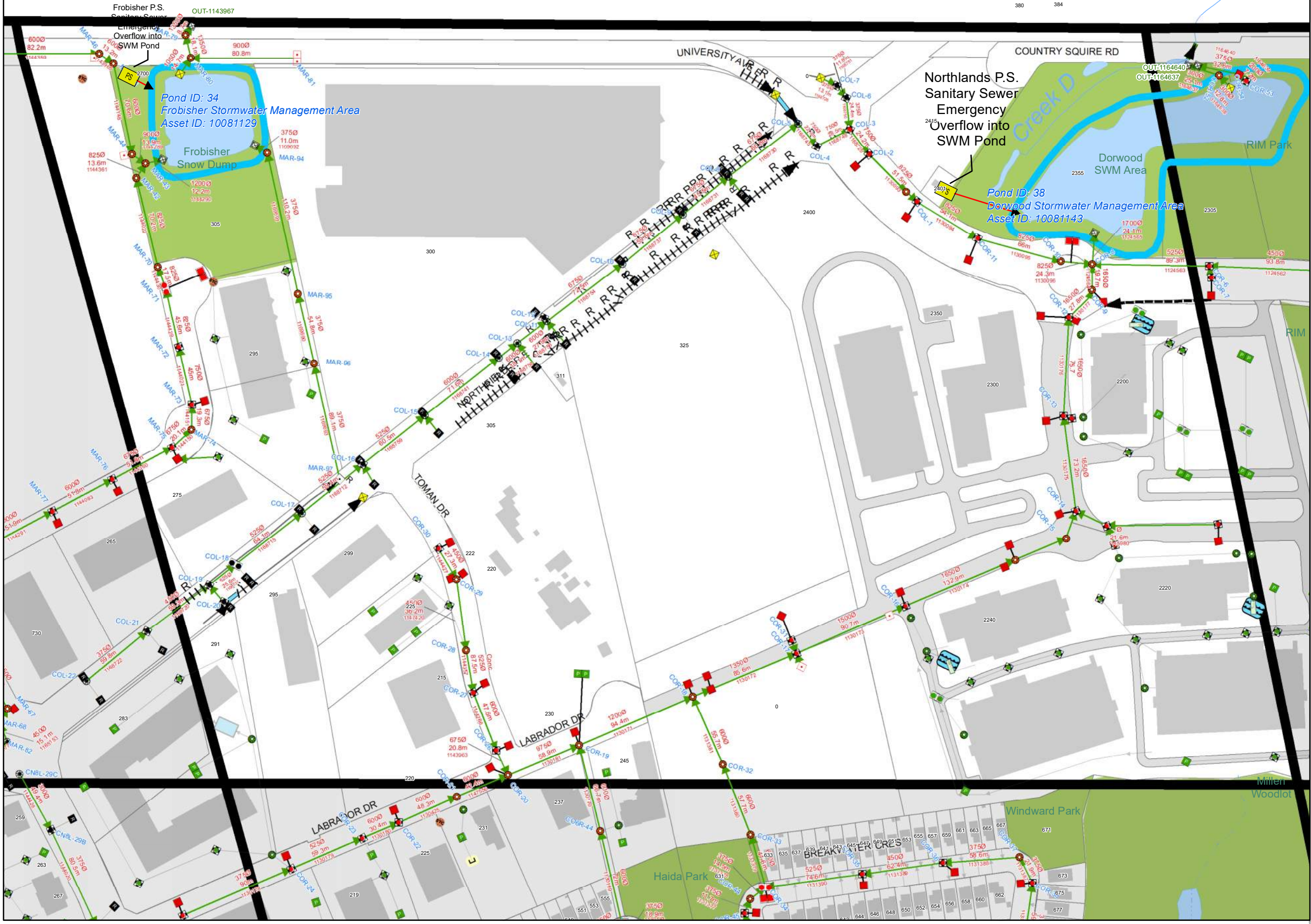
G.C.T. NO: 63-2

Date: 2 July, 2025

- Single Catchbasin
- Single Catchbasin (Private)
- Single Catchbasin, (Region of W.)
- Single Catchbasin, (Kitchener)
- Double Catchbasin
- Double Catchbasin (Private)
- Double Catchbasin, (Region of W.)
- Double Catchbasin, (Kitchener)
- Inlet
- Single Ditch Inlet Catchbasin
- Single Ditch Inlet Catchbasin (Prv)
- OGS
- OGS (others)
- Manhole
- Manhole, (Private)
- Manhole, (Region of W.)
- Manhole, (Kitchener)
- CWC Manhole
- Catchbasin Manhole
- Catchbasin Manhole (Private)
- Catchbasin Manhole, (Region of W.)
- Double Catchbasin Manhole
- Double Catchbasin Manhole (Prv)
- Double Catchbasin Manhole, (Region of W.)
- Ditch Inlet Catchbasin Manhole
- Ditch Inlet Catchbasin Manhole (Prv)
- Ditch Inlet Catchbasin Manhole, (Region of W.)
- Collector
- Collector (Private)
- Collector, (Region of W.)
- Collector, (Kitchener)
- Culvert
- Ditch
- Infiltration Pipe
- Infiltration/Infra Facility
- Infiltration Gallery
- Soakaway Pit
- Chamber
- Cleanout
- Discharge Structure
- Underground Storage
- SWM Pond
- Easement

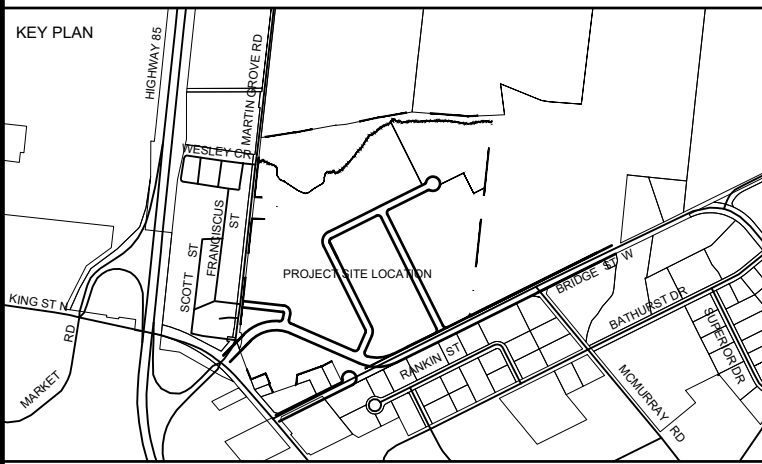


Map © 2018, City of Waterloo
Revision Date: 23 March 2018
Produced by: Engineering Services, IPPW
Imagery: May 2014
Property Information © 2001-2015
Teranet Land Information Services Inc. and its licensees.
May Not Be Reproduced Without Permission.
THIS IS NOT A PLAN OF SURVEY



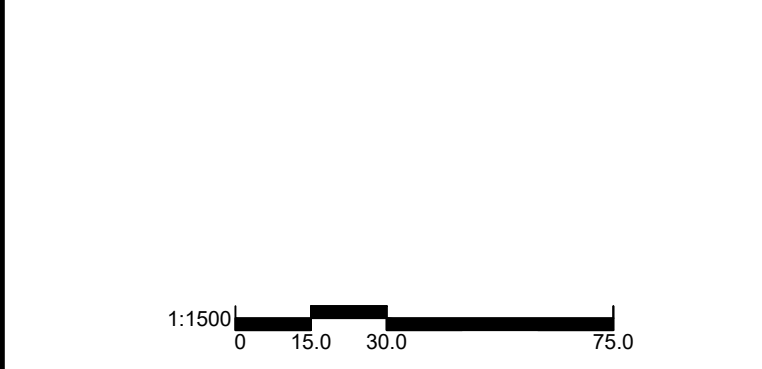
WALTERFEDY

Project: Project No: Date: Designed By:		GATEWAY EMPLOYMENT LANDS							Storm Parameters			STORM SEWER DESIGN CALCULATIONS												
		2025-0494-10																						
		28-Jan-26							A	1593	Design Frequency			5	Maximum Permitted Full Flow Velocity (m/s)				6.00					
		AM	Checked By:	ZS		C	0.879	Manning's 'n'	0.013	Minimum Permitted Full Flow Velocity (m/s)				0.80										
Pipe Data				Drainage Area					Time			Design Flow		Pipe Stats			Pipe Flow					Remarks		
Alignment	Phase	From	To	Area ID	Area (ha)	C	AC	ΣAC	Inlet (min)	Outlet (min)	System (min)	I (mm/hr)	Q (cu.m/s)	Length (m)	Slope (%)	Diameter (mm)	Q _{FULL} (cu.m/s)	Q/Q _{FULL} (%)	V _{FULL} (m/s)	V (m/s)	Flow Time (min)			
		128	129	503	1.45	0.90	1.305	1.305	10.00						98.6	0.50%	675	0.59	66.9%	1.66	1.78	0.92	No Surcharge	
		129	130	-	0.00	0.45	0.000	1.305			10.92	10.00	109.68	0.40		11.8	0.50%	675	0.59	64.4%	1.66	1.76	0.11	No Surcharge
		130	131	-	0.00	0.45	0.000	1.305			11.04	10.92	105.61	0.38		17.0	1.00%	675	0.84	45.3%	2.35	2.29	0.12	No Surcharge
		131	132	502	0.27	0.65	0.176	1.481			11.16	11.04	105.14	0.38		16.8	0.50%	675	0.59	72.4%	1.66	1.81	0.15	No Surcharge
											11.31	11.16	104.62	0.43										
		133	152	-	0.00	0.45	0.000	0.000	10.00	10.00	10.00	109.68	0.00		37.8	0.50%	300	0.07	0.0%	0.97	0.00	0.00	No Surcharge	
		152	132	-	0.00	0.45	0.000	0.000			10.00	10.00	109.68	0.00		35.6	0.50%	300	0.07	0.0%	0.97	0.00	0.00	No Surcharge
		132	134	504	0.97	0.55	0.534	2.015	11.31	11.55	11.31	103.98	0.58		27.8	0.50%	750	0.79	73.9%	1.78	1.95	0.24	No Surcharge	
		134	135	-	0.00	0.45	0.000	2.015			12.07	11.55	103.02	0.58		61.0	0.50%	750	0.79	73.2%	1.78	1.95	0.52	No Surcharge
		135	136	508	6.02	0.90	5.418	7.433			12.95	12.07	100.97	2.08		140.5	0.50%	1200	2.76	75.6%	2.44	2.68	0.87	No Surcharge
		138	136	509	0.20	0.65	0.130	0.130	10.00	10.64	10.00	109.68	0.04		38.5	0.50%	300	0.07	57.9%	0.97	1.00	0.64	No Surcharge	
		136	139	-	0.00	0.45	0.000	7.563	12.95	13.38	12.95	97.72	2.05		70.0	0.50%	1200	2.76	74.5%	2.44	2.67	0.44	No Surcharge	
		139	140	-	0.00	0.45	0.000	7.563			13.47	13.38	96.18	2.02		14.4	0.50%	1200	2.76	73.3%	2.44	2.66	0.09	No Surcharge
		140	142	505	3.62	0.90	3.258	10.821			14.01	13.47	95.87	2.88		93.5	0.50%	1350	3.77	76.4%	2.64	2.90	0.54	No Surcharge
		142	126	501	4.72	0.90	4.248	15.069			14.70	14.01	94.06	3.94		151.2	0.75%	1350	4.62	85.2%	3.23	3.63	0.69	No Surcharge
		125	126	500	1.85	0.90	1.665	1.665	10.00	10.40	10.00	109.68	0.51		87.9	2.92%	525	0.73	69.1%	3.39	3.66	0.40	No Surcharge	
		126	143	-	0.00	0.45	0.000	16.734	14.70	14.81	14.70	91.82	4.27		20.2	0.50%	1500	5.00	85.4%	2.83	3.18	0.11	No Surcharge	
		143	144	-	0.00	0.45	0.000	16.734			14.95	14.81	91.49	4.25		25.7	0.50%	1500	5.00	85.1%	2.83	3.18	0.13	No Surcharge
		144	145	-	0.00	0.45	0.000	16.734			15.01	14.95	91.07	4.23		11.5	0.50%	1500	5.00	84.7%	2.83	3.17	0.06	No Surcharge
		145	146	-	0.00	0.45	0.000	16.734			15.56	15.01	90.89	4.22		159.2	1.44%	1500	8.47	49.9%	4.79	4.79	0.55	No Surcharge
		148	149	510	3.03	0.90	2.727	2.727	10.00	10.82	10.00	109.68	0.83		167.4	1.75%	675	1.11	74.7%	3.11	3.41	0.82	No Surcharge	
		149	150	506	4.82	0.90	4.338	7.065			11.91	10.82	106.05	2.08		175.2	0.50%	1200	2.76	75.5%	2.44	2.68	1.09	No Surcharge
		150	146	-	0.00	0.45	0.000	7.065			11.98	11.91	101.60	1.99		22.0	3.00%	1200	6.75	29.5%	5.97	5.20	0.07	No Surcharge
		146	147	507	5.34	0.90	4.806	28.605	15.56	16.08	15.56	89.22	7.09		145.8	1.00%	1650	9.11	77.8%	4.26	4.71	0.52	No Surcharge	
		147	116	-	0.00	0.45	0.000	28.605			16.21	16.08	87.73	6.97		28.6	0.50%	1800	8.13	85.8%	3.19	3.59	0.13	No Surcharge
		116	117	-	0.00	0.45	0.000	28.605			16.40	16.21	87.35	6.94		41.1	0.50%	1800	8.13	85.4%	3.19	3.59	0.19	No Surcharge



North	
DATE	ISSUANCE
2025.09.12	PROGRESS UPDATE
2026.01.30	ISSUED FOR OPA SUBMISSION

- LEGEND**
- BOREHOLE No.
 - TEST PIT No.
 - PIEZOMETER No.
 - EXISTING CONTOUR
 - EXISTING LIDAR CONTOUR
 - REMOVALS
 - EXISTING EDGE OF WATER
 - MARTIN CREEK
 - APPROXIMATE GRCA FLOODPLAIN
 - APPROXIMATE GRCA REGULATED AREA
 - EXISTING GIS DERIVED STORM SEWER
 - EXISTING GIS DERIVED SANITARY SEWER
 - EXISTING GIS DERIVED WATERMAIN
 - PROPOSED SANITARY SEWER OPTION 1
 - PROPOSED SANITARY SEWER OPTION 2
 - PROPOSED WATERMAIN



CLIENT

PROJECT

GATEWAY EMPLOYMENT LANDS
TOWNSHIP OF WOOLWICH

TITLE

STORM SEWER CATCHMENT PLAN

WALTERFEDY

TORONTO|CALGARY|EDMONTON|KITCHENER|HAMILTON

800.685.1378 walterfedy.com

- NOTES**
- SURVEY DATA PROVIDED BY MHBC DATED JULY 18, 2025. BENCHMARK INFORMATION NOT AVAILABLE.
 - ADDITIONAL TOPOGRAPHIC SURVEY, BY WALTERFEDY, DATED NOVEMBER 4 & 7, 2025.
 - LEGAL FABRIC FOR SUBJECT PROPERTY PROVIDED IN SURVEY PROVIDED BY MHBC.
 - GRCA REGULATION AREAS AND FLOODPLAIN LIMITS CREATED BY GRCA MAPPING PROVIDED BY MHBC, FROM REPORT COMPLETED BY GHD LIMITED DATED FEBRUARY 01, 2024.
 - LIDAR INFORMATION DERIVED FROM GOVERNMENT OF CANADA DATA SET (HRODEM M30A00) - CANELEVATION SERIES (S CGVD 2013 VERTICAL REFERENCE).

SCALE	1:1500	SHEET NO.
DATE	1/20/2026	
PROJECT NO.	2025-0494-10	
DRAWN BY	AM	
CHECKED BY	BV	

C303

APPENDIX E

Drawings (Separate File)