SERVICING BRIEF
214 HENRY STREET

Project No.: CCO-21-2542

Prepared for:

Grizzly Homes
163 Foster Road
Ashton, ON K0A 1B0

Prepared by:

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APPENDICES

1.0 INTRODUCTION

Egis has been retained to prepare servicing details and reporting in support of a Development Permit for the potential redevelopment of the property at 214 Henry Street in Carleton, Ontario.

The purpose of this document is to describe how the site will be serviced with water and sanitary. The report will also describe the site grading and stormwater details including overland drainage patterns but will not include quantity and quality controls.

The work proposed consists of the construction of a four-unit townhouse building, to be located on the subject property, fronting on Henry Street. Proposed units are proposed to be serviced via new services from new mains on Henry Street, connecting to existing mains on Park Avenue, with separate services for each unit. The sanitary servicing is proposed to be individual low-pressure sanitary sewers for each unit, with each unit possessing a pump chamber on the subject property.

1.1 Site Description

The "subject property" referred to herein consists of Part 2 Plan 26R-3215, Lot 15 Concession 11, Geographic Township of Beckwith, Town of Carleton Place, County of Lanark, and comprising All of PIN 05114-0029 (LT), as per the Plan of Survey by McIntosh Perry Surveying Inc.

The property is located near the southeast corner of the Henry Street and Park Avenue intersection in Carleton Place, Ontario. The site is bounded by Henry Street to the north - which terminates just east of the property - undeveloped lands to the east, and residential property fronting on Park Avenue to the west and south. The Carleton Place water tower is located just southeast of the site. The subject property is currently approximately 0.09 ha.

The current property consists of undeveloped grassed area with some trees.

The existing site is not currently serviced via municipal water and sanitary services, with the closest mains being located on Park Avenue, west of the site. There is an overhead hydro line located on Henry Street in front of the site. Proposed buildings on the subject property are proposed to be serviced via new water and sanitary mains extending east from existing mains on Park Avenue.

1.2 Background Studies

The following plans and data were provided, reviewed and utilized in the design:

- Plan of Survey by McIntosh Perry Surveying Inc., dated September 25, 2023;
- Topographic survey data by McIntosh Perry Surveying Inc.;
- Plan 26 R-3215 by Sury, Rowe & Kasprzak Limited dated Oct. 29, 1991;
- Concept Plans by Grizzly Homes;
- Detailed design plans for an adjacent development (Johanne's Garden);
- Existing plan & profile drawings for Park Avenue in the vicinity of the site;
- Town of Carleton Place Water, Sanitary Sewer and Storm Sewer Collection System schematics;
- Communication and concept drawing from Carleton Place staff re: servicing;
- Carleton Place Water & Wastewater Master Plan – Phase 2 Report by Stantec Consulting Ltd. dated May 30, 2022 (Water & Wastewater Master Plan).

The following reports, guidelines and criteria were reviewed and utilized in the design:

- Applicable guidelines and criteria from the City of Ottawa including technical bulletins, Town of Carleton Place (the Town), the Ministry of Environment, Conservation and Parks (MECP), the Fire Underwriters Survey (FUS) and the Ontario Building Code (OBC), as well as general guidelines outlining low pressure sanitary sewer system and force main design.

2.0 EXISTING SERVICES

The following services are located within and near to the subject property:

2.1 Existing Water Servicing

An existing 300mm diameter watermain is located along the west side of Park Avenue approximately 40m west of the subject site. The closest hydrant is located on the southwest corner of the Park Avenue and Henry Street intersection. There is currently no existing water main on Henry Street adjacent to the site.

2.2 Existing Sanitary Servicing

An existing 300mm diameter sanitary sewer is located along Park Avenue west of the site, adjacent to and on the east side of the water main. The sanitary main drains north along Park Avenue.

2.3 Existing Storm Servicing

The subject site currently drains southeast via overland flow to a wooded area east of the site. A shallow grassed ditch is also located north of the site on the south side of Henry Street, flowing east along Henry Street before entering the wooded area east of the site. The inlet to an existing 375mm storm pipe is located southeast of site, along the north side of the water tower property, flowing east to Coleman Street.

As per plans for the Johanne's Garden development, the above noted grassed ditch is proposed to be connected via grassed ditch to the above noted storm inlet as part of that development, prior to the development of the subject site. The proposed grassed ditch is proposed to be located immediately east of the subject site and is anticipated to accept flows from the subject site.

3.0 SERVICING PLAN

3.1 Proposed Servicing Overview

Services for the proposed residential units will generally be extended from proposed sanitary and water mains on Henry Street, to be extended from existing services on Park Avenue. Each unit is proposed to be serviced via its own sanitary and water services.

Due to the relative elevation of the sanitary main on Park Avenue, the sanitary services for each unit are proposed to be equipped with a grinder pump outletting to individual force mains within the Park Avenue ROW. Details of the services, pumps and force main including anticipated flow of the proposed building and proposed sizing of the services and force main is included in **Appendix B**.

Each unit is proposed to be equipped with a 25mm water service extending from a new 150mm diameter main to be installed within the Park Avenue ROW and extended from the existing 300mm diameter main on Park Avenue. The new main is proposed to be capped with Park Avenue on the east side of the subject site for potential future expansion. Anticipated water demands including fire flow demands have been included in **Appendix B**.

3.2 Proposed Water Design

3.2.1 Design Criteria

Guidelines and criteria from the MECP and City of Ottawa design guidelines and technical bulletins were used to compile the following design criteria. Factors for maximum daily demand and peak hourly demand were interpolated based on Table 3-3 from the MECP Design Guidelines for Drinking-Water Systems. It is noted that this provides conservative results relative to the Water & Wastewater Master Plan. Detailed calculations have been provided in **Appendix B**.

Table 1: Water Design Criteria

Design Parameter	Value
Population Factor – Townhouse	2.7 persons/unit
Residential Average Daily Demand	280 L/d/person
Residential Maximum Daily Demand	6.1 x avg. day
Residential Peak Hourly	9.3 x avg. day

3.2.2 Design Overview

New water services for the proposed residential townhouse will be extended from the proposed water main on Henry Street to each unit. Anticipated fire flow and domestic water demands have been provided herein. See Table 2 for a breakdown of anticipated demands and detailed calculations in **Appendix B**.

3.2.2.1 Fire Flow Demands

The FUS method (Water Supply for Public Fire Protection, A Guide to Recommended Practice in Canada, 2020) was utilized to determine the required fire flow for the new residential building. A calculation using the OBC method is also included for comparison. The new building is anticipated to utilize wood frame construction with firewalls between each of the units.

Appropriate increases have been applied for exposure to surrounding buildings. The location, area and height of the building is based on concept plans by Grizzly Homes.

Based on these assumptions and utilizing the FUS method, the proposed development will require a fire flow of 4,000 L/min. While flow data from nearby hydrants has not been provided, in review of the Water & Wastewater Master Plan and considering the proximity of the site to the water tower and other larger proposed developments in the immediate vicinity of the site, it is anticipated that the system has adequate capacity to service the proposed development.

3.2.2.2 Domestic Water Demands

Population has been calculated assuming an average population of 2.7 persons per unit based on The City of Ottawa guidelines for semi-detached residential units. The 2-storey 4-unit townhouse shown on the current conceptual site plans results in a population total of 11 persons. The average daily demand, maximum day flow and maximum hour flow are shown in Table 2. See **Appendix B** for detailed calculations.

Based on a review of the Town of Carleton Place Water & Wastewater Master Plan, it appears that the development is supportable on a typical water demand basis based on system capacity and the location and size of the proposed development.

Table 2: Water Demands Summary

Location	Unit Type	Average Daily Demand (L/s)	Maximum Daily Demand (L/s)	Peak Hourly Demand (L/s)	Fire Flow Demand (L/s)
Post-Development					
Proposed Townhouse	4-Unit Residence	0.04	0.22	0.33	100
Total		**0.04**	**0.22**	**0.33**	

3.3 Proposed Sanitary Design

3.3.1 Design Criteria

Guidelines and criteria from City of Ottawa guidelines were used to compile the following design criteria.

Table 3: Sanitary Design Criteria

Design Parameter	Value
Population Factor – Residential Apartment (Average)	2.7 persons/unit
Residential Average Daily Demand	350 L/d/person
Peaking Factor (Harmon Formula)	3.73
Dry Weather Extraneous Flow	0.05 L/s/ha
Wet Weather Extraneous Flow	0.28 L/s/ha

3.3.2 Design Overview

Grading of the proposed residential development and the existing Henry Street do not allow for a new gravity sewer to be installed along the road with connection to the Park Avenue sanitary sewer. To service the proposed development, new sanitary services will be extended to an existing manhole on the City main within Park Avenue.

Each lot will require an interior or exterior sanitary lift station with a 2 hp simplex pump discharging through a 50mm diameter forcemain/service lateral. In total, four (4) new forcemains are proposed to be installed within the Henry Street ROW in a common trench. Each unit is proposed to have a separate service connection to its own forcemain, complete with backflow preventer and residential sanitary pump for each unit.

Based on typical municipal guidelines for a residential pumped system, each unit is to be equipped with a grinder pump with a minimum holding capacity of 265 L and be able to accommodate flows of at least 2,650 L/d.

The pumps and forcemains to be installed will be designed to be capable of transmitting the estimated peak wet weather flow for each unit (0.05 L/s) over a maximum of 67m horizontally with an elevation gain of 2.3m.

Further detailed design calculations and information is available in **Appendix B**.

Maintenance requirements associated with the individual grinder pumps will be the responsibility of each individual owner, pursuant to the maintenance specifications provided by the pump’s manufacturer. A concrete chamber has been proposed for each unit downstream of the pump chamber, containing a backflow preventer as well as shut off valves and other appurtenances for maintenance purposes. In addition, a valve chamber has been proposed in the public ROW on Henry Street for maintenance of the forcemains.

3.3.3 Proposed Design

City of Ottawa guidelines have been used to calculate anticipated sanitary flow from the proposed buildings. See Table 4 for a summary of flows and **Appendix B** for detailed calculations.

Based on a review of the Town of Carleton Place Water & Wastewater Master Plan, it appears that the development is supportable on a wastewater basis based on system capacity and the location and size of the proposed development.

Table 4: Sanitary Flow Summary

Location	Calculated Flow (L/s)	Calculated Flow (L/d)
Per Unit		
Average Residential Flow	0.01	963
Peak Residential Flow	0.04	3,589
Per Unit Estimated Average Dry Weather Flow	**0.01**	**1,057**
Per Unit Estimated Peak Dry Weather Flow	**0.04**	**3.683**
Total Estimated Peak Wet Weather Flow	**0.05**	**4,212**
Full Development		
Average Residential Flow	0.04	3,850
Peak Residential Flow	0.17	14,355
Per Unit Estimated Average Dry Weather Flow	**0.05**	**4,228**
Per Unit Estimated Peak Dry Weather Flow	**0.17**	**14,733**
Total Estimated Peak Wet Weather Flow	**0.20**	**16,849**

To service the above noted flows, each dwelling will be equipped with a sanitary lift station and 50mm forcemain connection to the municipal sewer.

The following recommendations are for exterior wet well installations:

Table 5: Sanitary Wet Well Summary

Design Element/Dimension	Unit A	Unit B	Unit C	Unit D
Bottom of Wet Well (mASL)=	130.40	130.40	130.40	130.40
Pump-off (mASL)=	130.70	130.70	130.70	130.70
Pump-on (mASL)=	130.75	130.75	130.75	130.75
$D_{effective}$ (m)=	0.05	0.05	0.05	0.05
Ground Surface (mASL) =	134.40	134.40	134.40	134.40
Top of Wet Well (mASL)=	134.40	134.40	134.40	134.40
Total Depth (m)	3.0	3.0	3.0	3.0

Gravity Main Invert (mASL)=	131.10	131.10	131.10	131.10
Gravity Main Diameter (mm)=	100	100	100	100
Forcemain Discharge Invert @ MH 1 (mASL)=	132.70	132.70	132.60	132.60
Forcemain Diameter (mASL)=	50	50	50	50
Forcemain Length (m)=	54	64	68	76
Static Head (m)=	2.0	2.0	1.90	1.90
Pump Starts (Total) / Hour =	1.4-2	1.4-2	1.4-2	1.4-2
Pump Discharge Rate (l/s)	2 – 3	2 – 3	2 – 3	2 – 3
Pump (Dynamic) Head (m) (Based on above Pump Rate)	3.8 – 5.9	4.0 – 6.4	4.0 – 6.5	4.2 – 6.9
Recommended Pump	Zoeller 820 – 2HP, 200-230 Volt/1 Phase, 14.5 FLA			

3.3.1 Pump Selection

For the 214 Henry Street lift stations, Zoeller Shark 820 grinder pumps are proposed for each unit to service the design flows of 2 litres/second.

In addition to the recommended float controls for the pump on and off functions, a high level and low level alarm is recommended for use in the exterior wet well.

3.3.2 Electrical Equipment

The proposed sanitary submersible pumps have been selected assuming a single phase motor and an available electrical supply of 200-230 Volts from the electrical panel.

Backup power is recommended to be provided through optional home use portable generators, not included under this design.

3.3.3 Forcemain Design

The proposed wet wells and pumps are proposed to be serviced with a 50mm diameter PVC DR21 forcemain pipe, approximately 64-76m in length and a pressure rating equal to or greater than 1,100 kPa. The forcemain has been designed to provide a minimum velocity of 0.87 m/s based on the assumed pumping rate of 2 L/s.

The hydraulic design and selection of the proposed forcemain system has been conducted using the appropriate Hazen-Williams factor 'C' values ranging from 120 to 150. The design point for Lot A was 2 L/s, with a static head of 2.00m and total dynamic head of 3.80 and 3.39m for the 'C' = 120 and 150 values respectively.

The proposed forcemains will be supplied with a separate check valve and gate valve at the property line as well as a separate chamber approximately 30m from the proposed gravity sewer connection point in Park Ave.

Forcemain hydraulic calculations are provided in **Appendix B**.

3.4 Proposed Storm Servicing

Stormwater servicing for the subject site is proposed to be provided via overland flow to a grassed ditch north and east of the site, draining south and east and ultimately discharging to municipal infrastructure on Christie Street. See Section 2.3 above for additional details. Though acknowledged that the site will produce an increase in pervious surfaces on site, impacts to surrounding properties are anticipated to be minimal and no designed quality or quantity controls are proposed at this time. Stormwater quantity and/or quantity controls will explored at a later date as necessary.

3.5 Site Utilities

Electrical, gas and telecommunications services for the proposed building on site is intended to come from existing infrastructure on Henry Street. Layout and design will ultimately be provided by the electrical engineer during detailed design and by Hydro One prior to construction.

4.0 SUMMARY

The proposed residential buildings are to be serviced via proposed infrastructure on Henry Street, to be extended from existing services on Park Avenue. Anticipated water and sanitary servicing demands/flow have been provided to demonstrate the requirements of the proposed building.

5.0 RECOMMENDATIONS

Based on the information presented in this report, we recommend that the Town of Carleton Place review the enclosed information in support of the Development Permit for the subject property.

Sincerely,

Egis

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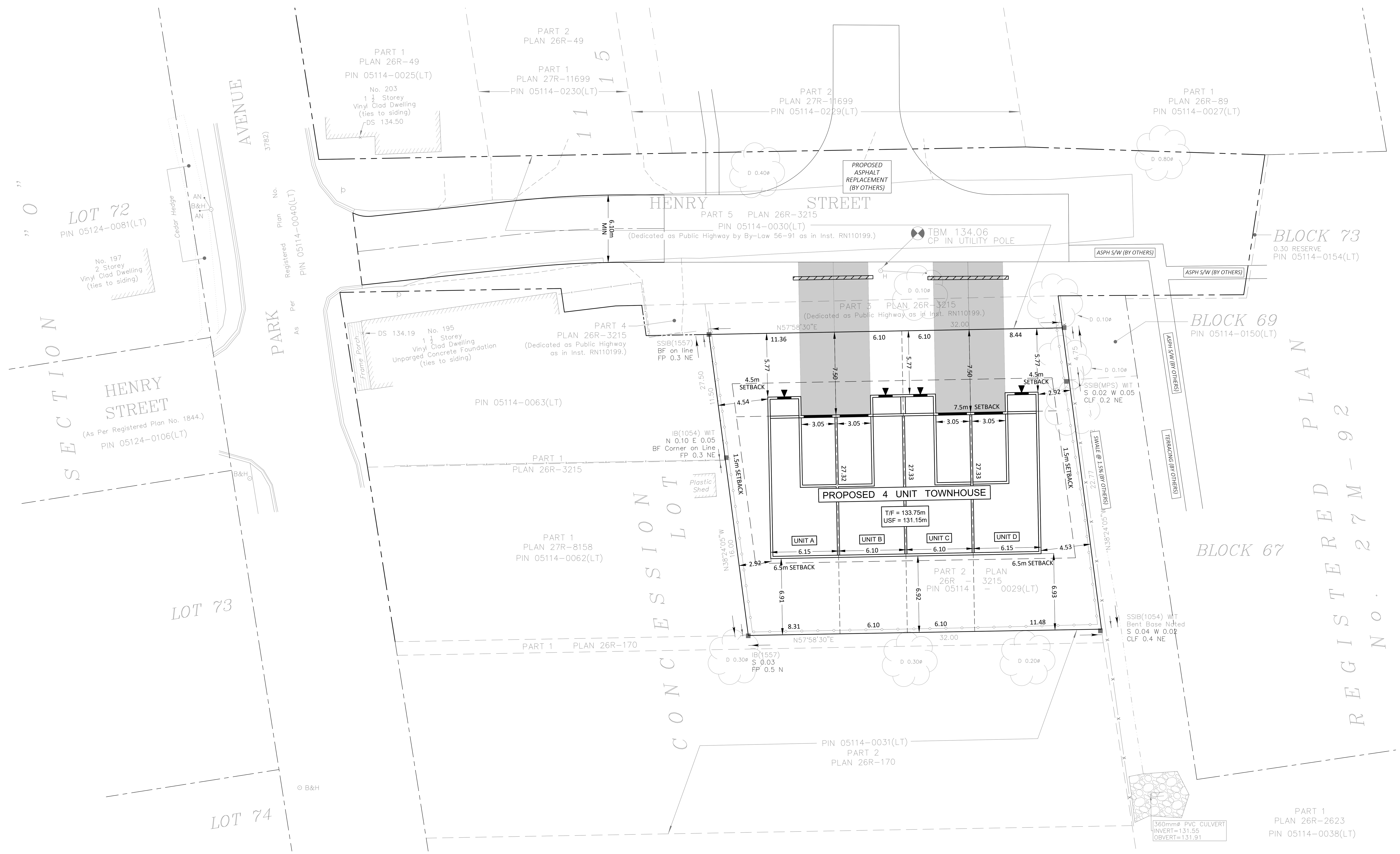
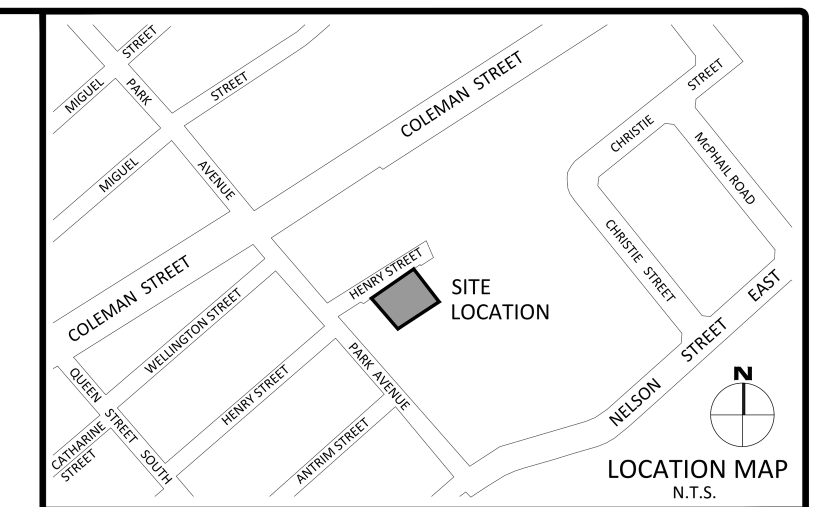
214 HENRY STREET

APPENDIX A





FOR REVIEW ONLY
NOT FOR CONSTRUCTION

BENCHMARKS:

No.	DESCRIPTION	ELEVATION
TBM#1	CONCRETE PIN IN UTILITY POLE	134.06m

No.	Revisions	Date
2	ISSUED FOR SPA	JUL/17/2024
1	ISSUED FOR REVIEW	FEB/13/2024

Check and verify all dimensions before proceeding with the work

Do not scale drawings

SCALE 1 : 200 (0 – 10 – 20 Metres)

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Client:
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Project:
214 HENRY STREET

Drawing Title:
SITE PLAN

Scale: 1:200
Project Number: CCO-21-2542
Drawn By: DL
Checked By: AM
Designed By: AM/DL
Drawing Number: 01

214 Henry Street - Site Statistics
Town of Carleton Place - Development Permit By-Law 15-2015
Residential District

6.3.7 Development Standards - Townhome Dwellings

Site Provision	Requirement	Provided						Compliant (Yes/No)
		Measurement Unit	Full Site	Unit A	Unit B	Unit C	Unit D	
Lot Area (Minimum)	Nil	Square Metres	874.13	268.67	166.58	166.60	272.28	**Yes**
Lot Coverage (Maximum)	60%	Percentage	38%	31%	50%	50%	31%	**Yes**
Front Yard Build Within Area	4.5 metres, minimum 7.5 metres maximum	Metres	5.7 (MIN.) 7.5 (MAX.)	5.7 (MIN.) 7.5 (MAX.)	5.7 (MIN.) 7.5 (MAX.)	5.7 (MIN.) 7.5 (MAX.)	5.7 (MIN.) 7.5 (MAX.)	**Yes**
Exterior Side Yard Build Within	4.5 metres, minimum 7.5 metres maximum	Metres	N/A	N/A	N/A	N/A	N/A	**Yes**
Interior Side Yard (Minimum) No side yard shall be required along the common property line or common wall	1.5 metres	Metres	2.92	2.92	N/A	N/A	2.92	**Yes**
Rear Yard Depth (Minimum)	6.5 metres	Metres	6.92	6.94	6.92	6.92	6.93	**Yes**
Usable Landscaped Open Space in the rear yard (minimum)	30.0 square metres	Square Metres	42.2	60.1	42.2	42.2	76.9	**Yes**
Building Height	11.0 metres	Metres	10.3	10.3	10.3	10.3	10.3	**Yes**
Minimum Dwelling Unit Area	83.1 square metres	Square Metres	83.7	84.5	83.7	83.7	84.5	**Yes**
No Encroachment Area from front or exterior side lot line	2.5 metres	Metres	5.7	5.7	5.7	5.7	5.7	**Yes**
Parking Spaces	2 spaces per dwelling unit, one of which may be provided within the garage	N/A	2 minimum (1 in garage)	2 minimum (1 in garage)	2 minimum (1 in garage)	2 minimum (1 in garage)	2 minimum (1 in garage)	**Yes**

214 Henry Street - Site Statistics
Town of Carleton Place - Development Permit By-Law 15-2015
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6.3.8 Additional Provisions - Townhome Dwellings

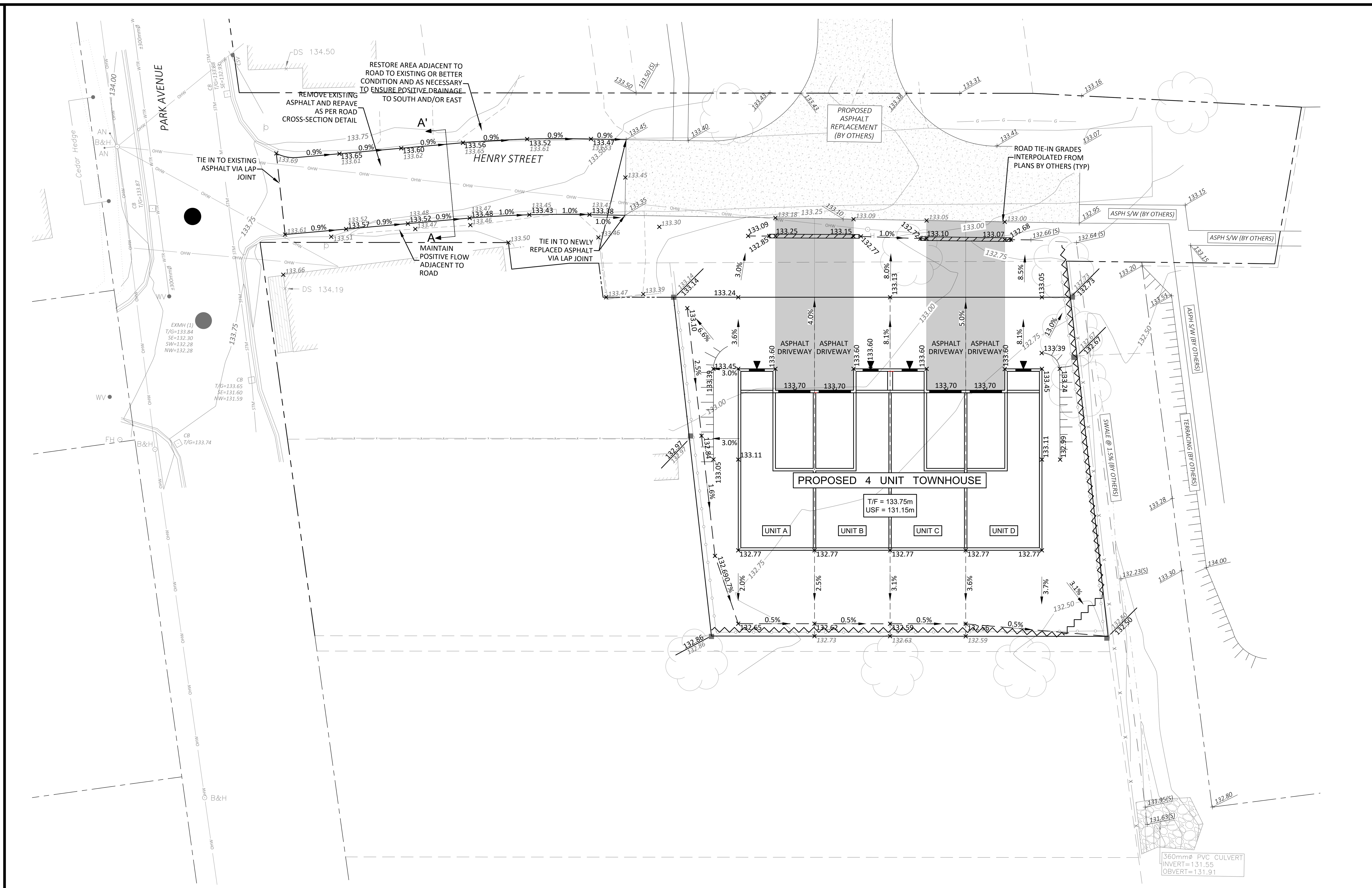
Site Provision	Requirement	Provided						Compliant (Yes/No)
		Measurement Unit	Full Site	Unit A	Unit B	Unit C	Unit D	
1. The interior width of the garage shall not exceed 70% of the overall lot frontage	70% maximum	Percentage	50%	27%	50%	50%	36%	**Yes**
2. The main garage foundation shall be set back a minimum of 6.0 metres (19.6 feet) from the front or exterior side lot line and shall be even with or set back from the front of the dwelling	6.0m minimum	Metres	7.5	7.5	7.5	7.5	7.5	**Yes**
3. The driveway must not extend further than the exterior wall of the garage and shall be constructed as per Section 3.30.	N/A	N/A	N/A	N/A	N/A	N/A	N/A	**Yes**
4. At least twenty-five (25%) of the total front yard of all townhouse units must have soft/green landscape elements such as trees and shrubbery.	25% minimum	Percentage	42%	66%	42%	42%	58%	**Yes**

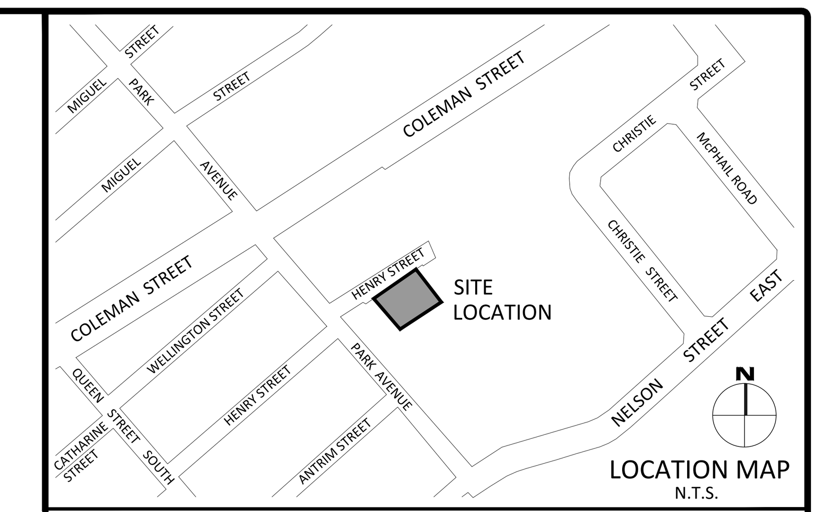
GENERAL NOTES:

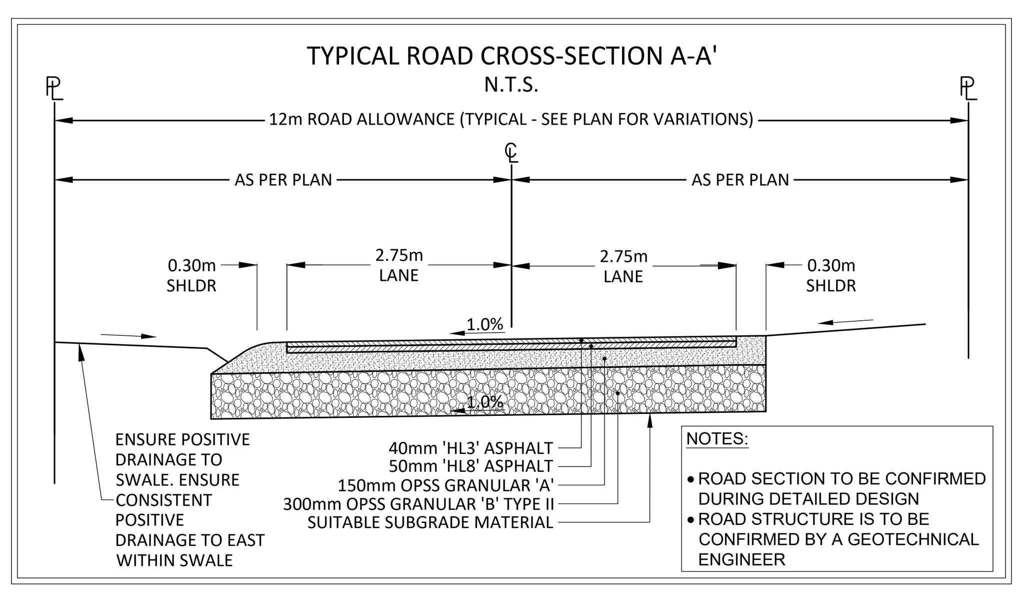
1. ORIGINAL TOPOGRAPHY, GROUND ELEVATION DATA AND LEGAL SURVEY INFORMATION SHOWN ON THE PLANS WERE DERIVED FROM PLAN OF SURVEY BY McINTOSH PERRY SURVEYING INC. DATED SEPTEMBER 25, 2023.
2. PROPOSED BUILDING DIMENSIONS, LAYOUT, ELEVATIONS & DETAILS SHOWN ON THE DRAWINGS WERE DERIVED FROM ARCHITECTURAL DRAWINGS PROVIDED BY THE BUILDER/OWNER. ALL DIMENSIONS, ELEVATIONS AND SITE LAYOUT SHALL BE VERIFIED BY THE BUILDER/OWNER PRIOR TO CONSTRUCTION.
3. BUILDER/OWNER IS RESPONSIBLE TO DETERMINE THE EXACT LOCATION, SIZE, MATERIAL AND ELEVATION OF ALL EXISTING SERVICES & UTILITIES PRIOR TO COMMENCING CONSTRUCTION. PROTECT AND ASSUME ALL RESPONSIBILITY FOR EXISTING UNDERGROUND SERVICES & UTILITIES WHETHER OR NOT SHOWN ON THESE DRAWINGS. IF THERE IS ANY DISCREPANCY THE BUILDER/OWNER IS TO NOTIFY THE ENGINEER PROMPTLY.
4. THE BUILDER SHALL OBTAIN AND PAY FOR ALL APPLICABLE PERMITS AND APPROVALS FROM THE TOWN BEFORE COMMENCING CONSTRUCTION.
5. PROPOSED GRADING SHALL NOT REVISED WITHOUT WRITTEN PERMISSION OF THE TOWN.
6. PROPOSED SERVICES SHALL BE INSTALLED AS PER TOWN OF CARLETON PLACE AND/OR OPSD STANDARDS.
7. BUILDER/OWNER SHALL CONFIRM ALL UTILITY SERVICING WITH THE APPROPRIATE UTILITY PROVIDER PRIOR TO CONSTRUCTION.
8. BUILDER/OWNER SHALL PROVIDE POSITIVE DRAINAGE AWAY FROM THE DWELLING.
9. BUILDER TO ENSURE ALL DOWNSPOUTS ARE DIRECTED TOWARD ROADWAY OR REAR YARD SWALE.
10. BUILDER/OWNER IS RESPONSIBLE FOR ALL LAYOUT.
11. ALL PERVIOUS/LAWN AREAS TO BE TREATED WITH 100mm TOPSOIL & SOD AS SOON AS FEASIBLE, EXCEPT WHERE NOTED.
12. RESTORE ANY TRENCHES AND DISTURBED SURFACES OF PUBLIC ROAD ALLOWANCES TO CONDITION EQUAL OR BETTER THAN ORIGINAL CONDITION AND TO THE SATISFACTION OF TOWN AUTHORITIES.
13. EXCAVATE AND DISPOSE OF ALL EXCESS EXCAVATED MATERIAL, SUCH AS ASPHALT, CURBING AND DEBRIS, OFF SITE.
14. TOPSOIL TO BE STRIPPED AND STOCKPILED FOR REHABILITATION. CLEAN FILL TO BE PLACED IN FILL AREAS AND COMPACTED TO 95% STANDARD PROCTOR DENSITY.
15. THE BUILDER/OWNER SHALL BE RESPONSIBLE FOR ANY TRAFFIC CONTROL AND SAFETY MEASURES DURING THE CONSTRUCTION PERIOD, INCLUDING THE SUPPLY, INSTALLATION, AND REMOVAL OF ANY NECESSARY SIGNAGE, DELINEATORS, MARKERS AND BARRIERS.
16. ALL ROADWAY, PARKING LOT, AND GRADING WORKS TO BE UNDERTAKEN IN ACCORDANCE WITH APPROPRIATE TOWN STANDARDS AND SPECIFICATIONS.
17. CONTACT THE PROJECT ENGINEER FOR INSPECTION OF ROUGH GRADING OF LOT & ROADWAY PRIOR TO PLACEMENT OF ASPHALT AND TOPSOIL. ANY DEFICIENCIES NOTED SHALL BE RECTIFIED TO THE SATISFACTION OF THE TOWN PRIOR TO PLACEMENT OF ANY ASPHALT, TOPSOIL, SEED AND/OR SOD.
18. UTILITY SERVICE LOCATIONS ARE SUBJECT TO APPROVAL BY THE APPLICABLE UTILITY PROVIDER. UTILITY INSTALLATION SHALL BE IN ACCORDANCE WITH THE CURRENT CODES AND STANDARDS OF THE APPLICABLE UTILITY PROVIDER AND THE TOWN.
19. TEMPORARY SEDIMENT CONTROL TO BE IMPLEMENTED BY BUILDER/OWNER DURING CONSTRUCTION ON ALL ROAD CATCHBASINS, REARYARD CATCHBASINS, AND CATCHBASIN MANHOLES. SILT SACKS SHALL BE INSTALLED IN ALL CATCHBASINS. SILT SACKS SHALL BE MONITORED WEEKLY AND AFTER ANY MAJOR STORM EVENT. ANY ACCUMULATED DEBRIS SHALL BE DISPOSED OF OFF-SITE. SILT SACKS SHALL REMAIN IN PLACE UNTIL VEGETATION HAS BEEN ESTABLISHED. NO RECYCLED GEOTEXTILE MATERIAL SHALL BE PERMITTED FOR USE ON SITE.
20. SHOULD CONSTRUCTION OF ANY PROPOSED RETAINING WALLS REQUIRE THE USE OF THE ADJACENT PROPERTIES THE DEVELOPER WILL REQUIRE WRITTEN PERMISSION FROM APPLICABLE PRIVATE PROPERTY OWNER(S) PRIOR TO ENTERING PRIVATE PROPERTY.
21. THE BUILDER/OWNER SHALL SHALL OBTAIN AN EXCAVATION PERMIT PRIOR TO ANY EXCAVATING WITHIN THE TOWN'S RIGHT OF WAY.

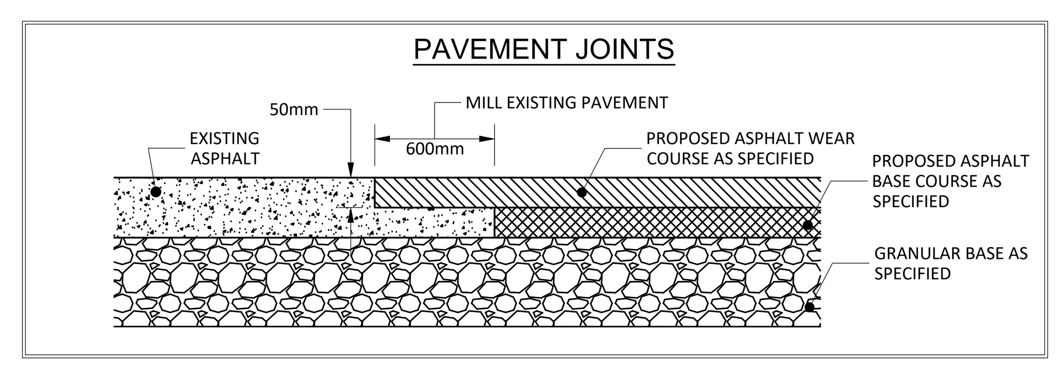
EROSION AND SEDIMENT CONTROL NOTES:

1. THE CONTRACTOR SHALL IMPLEMENT BEST MANAGEMENT PRACTICES, TO PROVIDE FOR PROTECTION OF THE AREA DRAINAGE SYSTEM AND THE RECEIVING WATERCOURSE, DURING CONSTRUCTION ACTIVITIES. THIS INCLUDES LIMITING THE AMOUNT OF EXPOSED SOIL, TEMPORARY SEDIMENT CONTROL (GEOSOCK INSERTS WITH AN OVERFLOW UNDER GRATE OR COVER) TO BE IMPLEMENTED DURING CONSTRUCTION ON ALL PROPOSED ROAD CATCHBASINS, REARYARD CATCHBASINS AND CATCHBASIN MANHOLES AND OTHER SEDIMENT TRAPS. NO RECYCLED GEOSOCK MATERIAL SHALL BE PERMITTED FOR USE ON SITE.
2. AT THE DISCRETION OF THE PROJECT MANAGER OR MUNICIPAL STAFF, ADDITIONAL SILT CONTROL DEVICES SHALL BE INSTALLED AT DESIGNATED LOCATIONS.
3. FOR SILT FENCE BARRIER, USE OPSD 219.110. GEOTEXTILE FOR SILT FENCE AS PER OPSS 1860, TABLE 3.
4. EXCEPT AS PROVIDED IN PARAGRAPHS 4.1., AND 4.2. BELOW, STABILIZATION MEASURES SHALL BE INITIATED AS SOON AS FEASIBLE IN PORTIONS OF THE SITE WHERE CONSTRUCTION ACTIVITIES HAVE TEMPORARILY OR PERMANENTLY CEASED, BUT IN NO CASE MORE THAN 14 DAYS AFTER THE CONSTRUCTION ACTIVITY HAS TEMPORARILY OR PERMANENTLY CEASED.
   - 4.1. WHERE THE INITIATION OF STABILIZATION MEASURES BY THE 14TH DAY AFTER CONSTRUCTION ACTIVITY TEMPORARILY OR PERMANENTLY CEASE IS PRECLUDED BY SNOW COVER, STABILIZATION MEASURES SHALL BE INITIATED AS SOON AS FEASIBLE.
   - 4.2. WHERE CONSTRUCTION ACTIVITY WILL RESUME ON A PORTION OF THE SITE WITHIN 21 DAYS FROM WHEN ACTIVITIES CEASED, (E.G. THE TOTAL TIME PERIOD THAT CONSTRUCTION ACTIVITY IS TEMPORARILY CEASED IS LESS THAN 21 DAYS) THEN STABILIZATION MEASURES DO NOT HAVE TO BE INITIATED ON THAT PORTION OF SITE BY THE 14TH DAY AFTER CONSTRUCTION ACTIVITY TEMPORARILY CEASED.
5. SEDIMENT THAT IS ACCUMULATED BY THE TEMPORARY EROSION AND SEDIMENT CONTROL MEASURES SHALL BE REMOVED IN A MANNER THAT AVOIDS ESCAPE OF THE SEDIMENT TO THE DOWNSTREAM SIDE OF THE CONTROL MEASURE AND AVOIDS DAMAGE TO THE CONTROL MEASURE. SEDIMENT SHALL BE REMOVED TO THE LEVEL OF THE GRADE EXISTING AT THE TIME THE CONTROL MEASURE WAS CONSTRUCTED AND BE ACCORDING TO THE FOLLOWING:
   - 5.1. FOR LIGHT-DUTY SEDIMENT BARRIERS, ACCUMULATED SEDIMENT SHALL BE REMOVED ONCE IT REACHES THE LESSER OF THE FOLLOWING:
     - 5.1.1. A DEPTH OF ONE-HALF THE EFFECTIVE HEIGHT OF THE CONTROL MEASURE.
     - 5.1.2. A DEPTH OF 300 MM IMMEDIATELY UPSTREAM OF THE CONTROL MEASURE.
   - 5.2. FOR ALL CONTROL MEASURES, ACCUMULATED SEDIMENT SHALL BE REMOVED AS NECESSARY TO PERFORM MAINTENANCE REPAIRS.
   - 5.3. ACCUMULATED SEDIMENT SHALL BE REMOVED PRIOR TO THE REMOVAL OF THE CONTROL MEASURE.
   - 5.4. ACCUMULATED SEDIMENT IS TO BE REMOVED AND DISPOSED OF AS PER OPSS 180.
6. ALL TEMPORARY EROSION AND SEDIMENT CONTROL MEASURES SHALL BE MONITORED TO ENSURE THEY ARE IN EFFECTIVE WORKING ORDER. THE CONDITION OF THE CONTROL MEASURES SHALL BE MONITORED PRIOR TO ANY FORECAST STORM EVENT AND FOLLOWING A STORM EVENT.
7. DUST CONTROL MEASURES SHOULD BE CONSIDERED PRIOR TO CLEARING AND GRADING. THE USE OF WATER, CALCIUM CHLORIDE FLAKES/SOLUTION OR MAGNESIUM CHLORIDE FLAKES/SOLUTION SHALL BE USED AS DUST SUPPRESSANTS AS PER OPSS 506. THIS IS TO LIMIT WIND EROSION OF SOILS WHICH MAY TRANSPORT SEDIMENTS OFFSITE, WHERE THEY MAY BE WASHED INTO THE RECEIVING WATER BY THE NEXT RAINSTORM.
8. ALL 'GREEN AREAS' TO BE TREATED WITH 100mm TOPSOIL AND SOD AS SOON AS FEASIBLE, AS PER OPSS 570.
9. TOPSOIL TO BE STRIPPED AND STOCKPILED FOR REHABILITATION. CLEAN FILL TO BE PLACED IN FILL AREAS AND COMPACTED TO 95% STANDARD PROCTOR DENSITY.
10. ALL DISTURBED AREAS TO BE RESTORED TO ORIGINAL CONDITION OR BETTER UNLESS OTHERWISE SPECIFIED.
11. STOCKPILED MATERIAL IS TO BE STORED AWAY FROM POTENTIAL RECEIVERS (E.G. STORM CATCHBASINS, MANHOLES), AND BE SURROUNDED BY EROSION CONTROL MEASURES WHERE MATERIAL IS LEFT IN PLACE IN EXCESS OF 14 DAYS.
12. IF REQUIRED, DEWATERING/SETTLING BASINS SHALL BE CONSTRUCTED AS PER OPSD 219.240 AND LOCATED ON FLAT GRADE UPSTREAM OF OTHER EXISTING MITIGATION MEASURES. WATERCOURSES SHALL NOT BE DIVERTED, OR BLOCKED, AND TEMPORARY WATERCOURSES CROSSINGS SHALL NOT BE CONSTRUCTED OR UTILIZED, UNLESS OTHERWISE SPECIFIED IN THE CONTRACT. IF CLOSURE OF ANY PERMANENT WATER PASSAGE IS NECESSARY, THE CONTRACTOR SHALL RELEASE ANY STRANDED FISH TO THE OPEN PORTION OF THE WATERCOURSE WITHOUT HARM.
13. ALL EROSION AND SEDIMENT CONTROL MEASURES SHALL CONFORM TO OPSS 577
14. WHERE DEWATERING IS REQUIRED, THE DISCHARGED WATER SHALL BE CONTROLLED IN ACCORDANCE WITH OPSS 518.









LEGEND

- LEGAL BOUNDARY
- EX. ASPHALT
- EX. GRAVEL
- EX. FENCE
- LOT CORNER GRADE
- EX. GRADE
- PROPOSED LOT LINE
- PROPOSED CENTRELINE
- PROPOSED ASPHALT
- PROPOSED GRAVEL
- PROPOSED DITCH
- PROPOSED FENCE
- PROPOSED TOP OF SLOPE
- PROPOSED SPOT GRADE
- BUILDING ENTRANCE
- PROPOSED SILT FENCE
- EXISTING STORM PIPE — XX.XXm - XXXmmØ STM @ X.XX%
- EXISTING SANITARY PIPE — XX.XXm - XXXmmØ SAN @ X.XX%
- EXISTING WATER PIPE — XX.XXm - XXXmmØ WTR @ X.XX%
- PROPOSED STORM PIPE — XX.XXm - XXXmmØ STM @ X.XX%
- PROPOSED SANITARY PIPE — XX.XXm - XXXmmØ SAN @ X.XX%
- PROPOSED WATER PIPE — XX.XXm - XXXmmØ WTR @ X.XX%
- EXISTING STORM MANHOLE
- EXISTING CATCHBASIN
- EXISTING CATCHBASIN MANHOLE
- EXISTING SANITARY MANHOLE
- PROPOSED STORM MANHOLE
- PROPOSED CATCHBASIN
- PROPOSED CATCHBASIN MANHOLE
- PROPOSED SANITARY MANHOLE

FOR REVIEW ONLY
NOT FOR CONSTRUCTION

BENCHMARKS:

No.	DESCRIPTION	ELEVATION
TBM#1	CONCRETE PIN IN UTILITY POLE	134.06m

No.	Revisions	Date
2	ISSUED FOR SPA	JUL/17/2024
1	ISSUED FOR REVIEW	FEB/13/2024

Check and verify all dimensions before proceeding with the work — Do not scale drawings

SCALE 1 : 200
0 10 20 Metres

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www.egis-group.com

LICENSED PROFESSIONAL ENGINEER
C. A. MACLEOD
100159106
JULY 17/2024
PROVINCE OF ONTARIO

Client:
GRIZZLY HOMES
163 FOSTER ROAD
ASHTON ON K0A 1B0

Project:
214 HENRY STREET

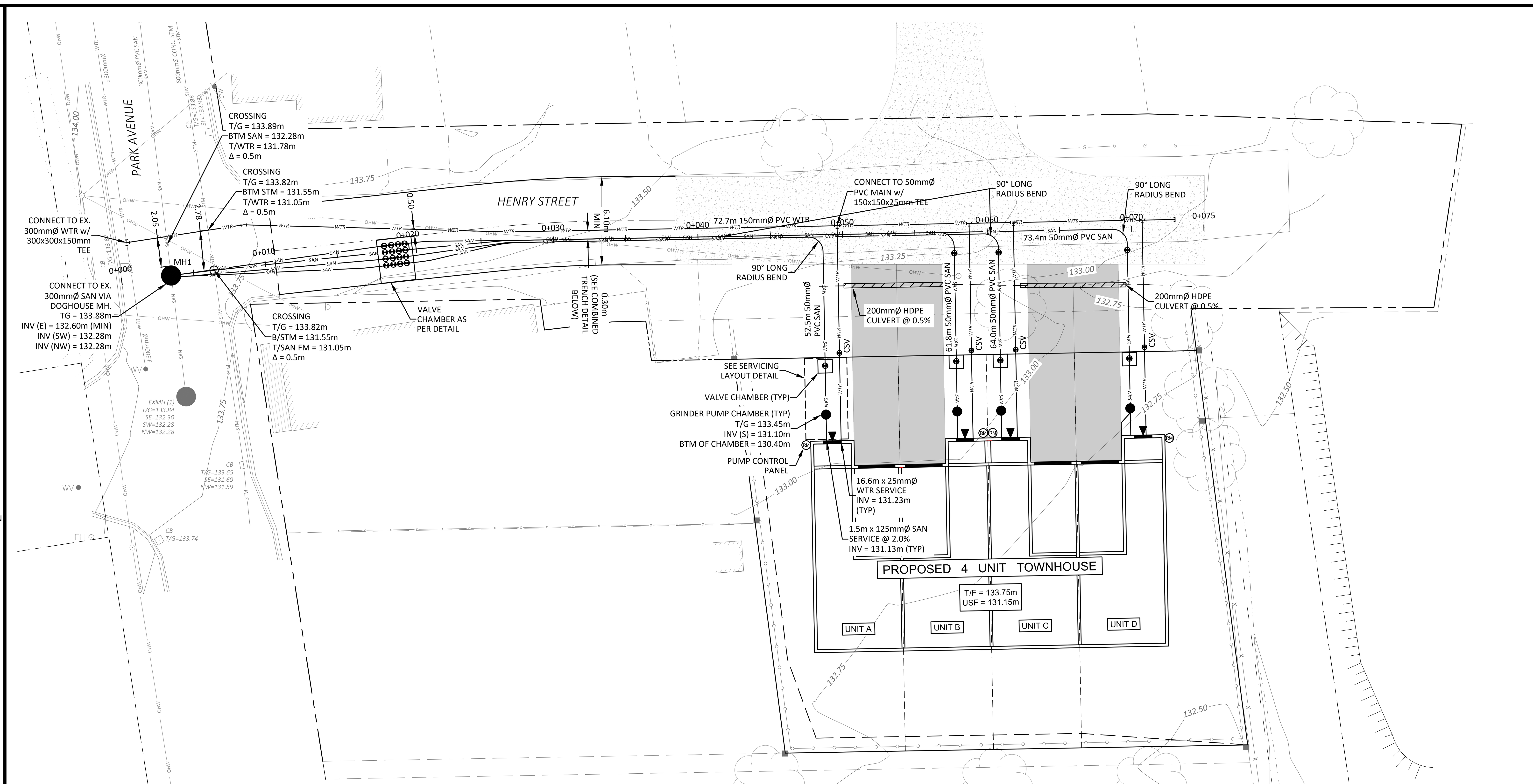
Drawing Title:
GRADING PLAN

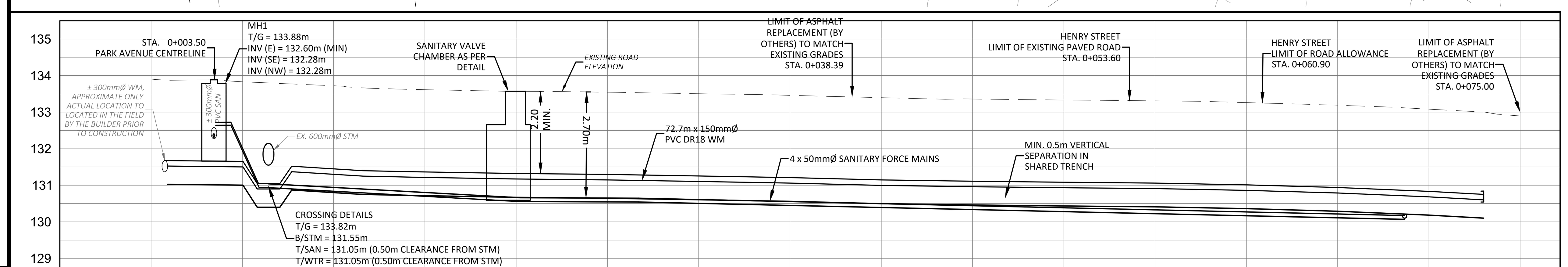
Scale: 1:200	Project Number: CCO-21-2542
Drawn By: DL	
Checked By: AM	Drawing Number: 02
Designed By: AM/DL	

GENERAL NOTES:
1. ORIGINAL TOPOGRAPHY, GROUND ELEVATION DATA AND LEGAL SURVEY INFORMATION SHOWN ON THE PLANS WERE DERIVED FROM PLAN OF SURVEY BY McINTOSH PERRY SURVEYING INC. DATED SEPTEMBER 25, 2023.
2. PROPOSED BUILDING DIMENSIONS, LAYOUT, ELEVATIONS & DETAILS SHOWN ON THE DRAWINGS WERE DERIVED FROM ARCHITECTURAL DRAWINGS PROVIDED BY THE BUILDER/OWNER. ALL DIMENSIONS, ELEVATIONS AND SITE LAYOUT SHALL BE VERIFIED BY THE BUILDER/OWNER PRIOR TO CONSTRUCTION.
3. BUILDER/OWNER IS RESPONSIBLE TO DETERMINE THE EXACT LOCATION, SIZE, MATERIAL AND ELEVATION OF ALL EXISTING SERVICES & UTILITIES PRIOR TO COMMENCING CONSTRUCTION. PROTECT AND ASSUME ALL RESPONSIBILITY FOR EXISTING UNDERGROUND SERVICES & UTILITIES WHETHER OR NOT SHOWN ON THESE DRAWINGS. IF THERE IS ANY DISCREPANCY THE BUILDER/OWNER IS TO NOTIFY THE ENGINEER PROMPTLY.
4. THE BUILDER SHALL OBTAIN AND PAY FOR ALL APPLICABLE PERMITS AND APPROVALS FROM THE TOWN BEFORE COMMENCING CONSTRUCTION.
5. PROPOSED GRADING SHALL NOT REVISED WITHOUT WRITTEN PERMISSION OF THE TOWN.
6. PROPOSED SERVICES SHALL BE INSTALLED AS PER TOWN OF CARLETON PLACE AND/OR OPSD STANDARDS.
7. BUILDER/OWNER SHALL CONFIRM ALL UTILITY SERVICING WITH THE APPROPRIATE UTILITY PROVIDER PRIOR TO CONSTRUCTION.
8. BUILDER/OWNER SHALL PROVIDE POSITIVE DRAINAGE AWAY FROM THE DWELLING.
9. BUILDER TO ENSURE ALL DOWNSPOUTS ARE DIRECTED TOWARD ROADWAY OR REAR YARD SWALE.
10. BUILDER/OWNER IS RESPONSIBLE FOR ALL LAYOUT.
11. ALL PERVIOUS/LAWN AREAS TO BE TREATED WITH 100mm TOPSOIL & SOD AS SOON AS FEASIBLE, EXCEPT WHERE NOTED.
12. RESTORE ANY TRENCHES AND DISTURBED SURFACES OF PUBLIC ROAD ALLOWANCES TO CONDITION EQUAL OR BETTER THAN ORIGINAL CONDITION AND TO THE SATISFACTION OF TOWN AUTHORITIES.
13. EXCAVATE AND DISPOSE OF ALL EXCESS EXCAVATED MATERIAL, SUCH AS ASPHALT, CURBING AND DEBRIS, OFF SITE.
14. TOPSOIL TO BE STRIPPED AND STOCKPILED FOR REHABILITATION. CLEAN FILL TO BE PLACED IN FILL AREAS AND COMPACTED TO 95% STANDARD PROCTOR DENSITY.
15. THE BUILDER/OWNER SHALL BE RESPONSIBLE FOR ANY TRAFFIC CONTROL AND SAFETY MEASURES DURING THE CONSTRUCTION PERIOD, INCLUDING THE SUPPLY, INSTALLATION, AND REMOVAL OF ANY NECESSARY SIGNAGE, DELINEATORS, MARKERS AND BARRIERS.
16. ALL ROADWAY, PARKING LOT, AND GRADING WORKS TO BE UNDERTAKEN IN ACCORDANCE WITH APPROPRIATE TOWN STANDARDS AND SPECIFICATIONS.
17. CONTACT THE PROJECT ENGINEER FOR INSPECTION OF ROUGH GRADING OF LOT & ROADWAY PRIOR TO PLACEMENT OF ASPHALT AND TOPSOIL. ANY DEFICIENCIES NOTED SHALL BE RECTIFIED TO THE SATISFACTION OF THE TOWN PRIOR TO PLACEMENT OF ANY ASPHALT, TOPSOIL, SEED AND/OR SOD.
18. UTILITY SERVICE LOCATIONS ARE SUBJECT TO APPROVAL BY THE APPLICABLE UTILITY PROVIDER. UTILITY INSTALLATION SHALL BE IN ACCORDANCE WITH THE CURRENT CODES AND STANDARDS OF THE APPLICABLE UTILITY PROVIDER AND THE TOWN.
19. TEMPORARY SEDIMENT CONTROL TO BE IMPLEMENTED BY BUILDER/OWNER DURING CONSTRUCTION ON ALL ROAD CATCHBASINS, REARYARD CATCHBASINS, AND CATCHBASIN MANHOLES. SILT SACKS SHALL BE INSTALLED IN ALL CATCHBASINS. SILT SACKS SHALL BE MONITORED WEEKLY AND AFTER ANY MAJOR STORM EVENT. ANY ACCUMULATED DEBRIS SHALL BE DISPOSED OF OFF-SITE. SILT SACKS SHALL REMAIN IN PLACE UNTIL VEGETATION HAS BEEN ESTABLISHED. NO RECYCLED GEOTEXTILE MATERIAL SHALL BE PERMITTED FOR USE ON SITE.
20. SHOULD CONSTRUCTION OF ANY PROPOSED RETAINING WALLS REQUIRE THE USE OF THE ADJACENT PROPERTIES THE DEVELOPER WILL REQUIRE WRITTEN PERMISSION FROM APPLICABLE PRIVATE PROPERTY OWNER(S) PRIOR TO ENTERING PRIVATE PROPERTY.
21. THE BUILDER/OWNER SHALL SHALL OBTAIN AN EXCAVATION PERMIT PRIOR TO ANY EXCAVATING WITHIN THE TOWN'S RIGHT OF WAY.

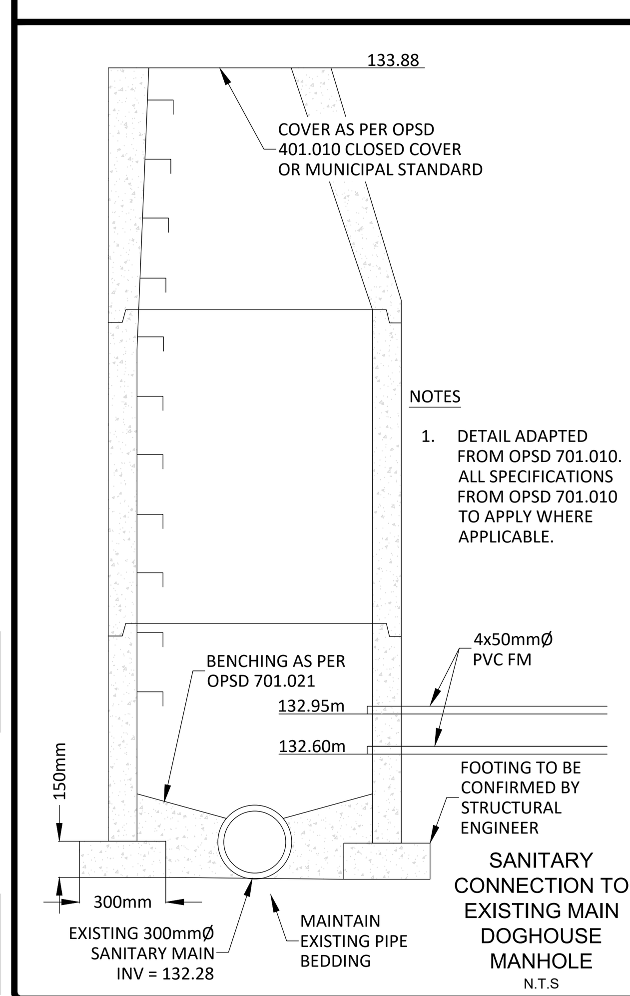
SEWER NOTES:
1. CONSTRUCT ALL SEWER AND APPURTENANCES TO ONTARIO PROVINCIAL STANDARD SPECIFICATIONS AND DRAWINGS, AS WELL AS THE TOWN OF CARLETON PLACE STANDARDS AS INDICATED.
2. SEWER TRENCHING AND BEDDING SHALL CONFORM TO OPSD 802.010 AND 802.013 UNLESS NOTED OTHERWISE:
   - 2.1. BEDDING SHALL BE A MINIMUM 150mm OF GRANULAR "A", COMPACTED TO MINIMUM 95% STANDARD PROCTOR DRY DENSITY. CLEAR STONE BEDDING SHALL NOT BE PERMITTED.
   - 2.2. SUB-BEDDING, IF REQUIRED SHALL BE AS PER THE DIRECTION GEOTECHNICAL ENGINEER.
   - 2.3. BACKFILL TO AT LEAST 300mm ABOVE TOP OF PIPE WITH GRANULAR "A" OR SAND.
   - 2.4. TO MINIMIZE DIFFERENTIAL FROST HEAVING, TRENCH BACKFILL (FROM PAVEMENT SUBGRADE TO 2 METRES BELOW FINISHED GRADE) SHALL MATCH EXISTING SOIL CONDITIONS.
3. LOW PRESSURE SEWERS AND CONNECTIONS 150mm DIAMETER AND SMALLER TO BE PVC SDR 28 OR APPROVED EQUIVALENT.
4. SEWERS AND CONNECTIONS 200mm DIAMETER AND LARGER TO BE PVC SDR 35 OR APPROVED EQUIVALENT.
5. ALL CATCH BASINS SHALL GRATES AS PER OPSD 400.020.
6. ALL SANITARY MAINTENANCE HOLE LIDS SHALL BE AS PER OPSD 401.010.
7. INSULATE ALL STORM AND SANITARY SEWERS/SERVICES THAT HAVE LESS THAN 1.5m OF COVER WITH THERMAL INSULATION.
8. SUPPLY AND INSTALL ALL PIPING AND APPURTENANCES AS SHOWN AND DETAILED TO WITHIN 1m OF BUILDING. ALL ENDS OF SERVICES TO BE PROPERLY CAPPED AND LOCATED WITH 2"x4"x8' LONG MARKER.
9. BACKWATER VALVES SHALL BE INSTALLED BY THE BUILDER/OWNER FOR ALL SEWER SERVICES.
10. EACH LOT WILL REQUIRE AN INTERIOR OR EXTERIOR SANITARY LIFT STATION WITH A 2 HP SIMPLEX PUMP DISCHARGING THROUGH A 50MM DIAMETER FORCEMAIN/SERVICE LATERAL COMPLETE WITH BACKFLOW PREVENTER.
11. EACH UNIT IS TO BE EQUIPPED WITH A GRINDER PUMP WITH A MINIMUM HOLDING CAPACITY OF 265 L AND BE ABLE TO ACCOMMODATE FLOWS OF AT LEAST 2,650 L/D.
12. THE PUMPS AND FORCEMAINS TO BE INSTALLED WILL BE DESIGNED TO BE CAPABLE OF TRANSMITTING THE ESTIMATED PEAK WET WEATHER FLOW FOR EACH UNIT (0.05 L/S) OVER A MAXIMUM OF 67M HORIZONTALLY WITH AN ELEVATION GAIN OF 2.3M.

WATERMAIN NOTES:
1. CONSTRUCT ALL WATERMAINS AND APPURTENANCES IN ACCORDANCE WITH OPSD STANDARDS AND SPECIFICATIONS AS WELL AS TOWN STANDARDS AS INDICATED.
2. RESIDENTIAL SERVICE CONNECTIONS TO BE 25mm COPPER OR APPROVED EQUIVALENT AND SHALL CONFORM TO ONTARIO PROVINCIAL STANDARDS AND SPECIFICATIONS.
3. EXCAVATION, INSTALLATION, CONNECTION TO EXISTING, BACKFILL AND RESTORATION OF ALL WATERMAIN AND SERVICES WILL BE COMPLETED BY THE DEVELOPER'S CONTRACTOR. CONNECTIONS TO THE EXISTING WATERMAIN SHALL BE COMPLETED IN THE PRESENCE OF A DESIGNATED MUNICIPAL WATER OPERATOR AND THE SELECTED CONTRACTOR SHALL PROVE TO THE SATISFACTION OF THE TOWN THAT THEY ARE COMPETENT TO PERFORM THE WORKS PRIOR TO INITIATING CONSTRUCTION.
4. WATERMAINS AND/OR WATER SERVICES ARE TO HAVE A MINIMUM COVER OF 2.2m.
5. IF THE WATERMAIN OR WATER SERVICE MUST BE DEFLECTED TO MEET ALIGNMENT, ENSURE THAT THE AMOUNT OF DEFLECTION USED IS EQUAL TO OR LESS THAN THAT WHICH IS RECOMMENDED BY THE MANUFACTURER.
6. WATERMAINS TO BE PVC DR 18 OR APPROVED EQUIVALENT.
7. ALL WATERMAINS TO BE EQUIPPED WITH TRACER WIRE.
8. USE SADDLE CONNECTIONS WITH MAIN (CORPORATION) STOPS FOR SIZES 50mm AND SMALLER.
9. WATER QUALITY TESTING FOLLOWING CONSTRUCTION IS TO MEET TOWN OF CARLETON PLACE WATERMAIN COMMISSIONING PROTOCOL. BUILDER/OWNER IS RESPONSIBLE FOR COMPLETING THE WORK.
10. WATER METERS SHALL BE SUPPLIED BY THE TOWN AND INSTALLED BY THE CONTRACTOR AS PER TOWN STANDARDS.



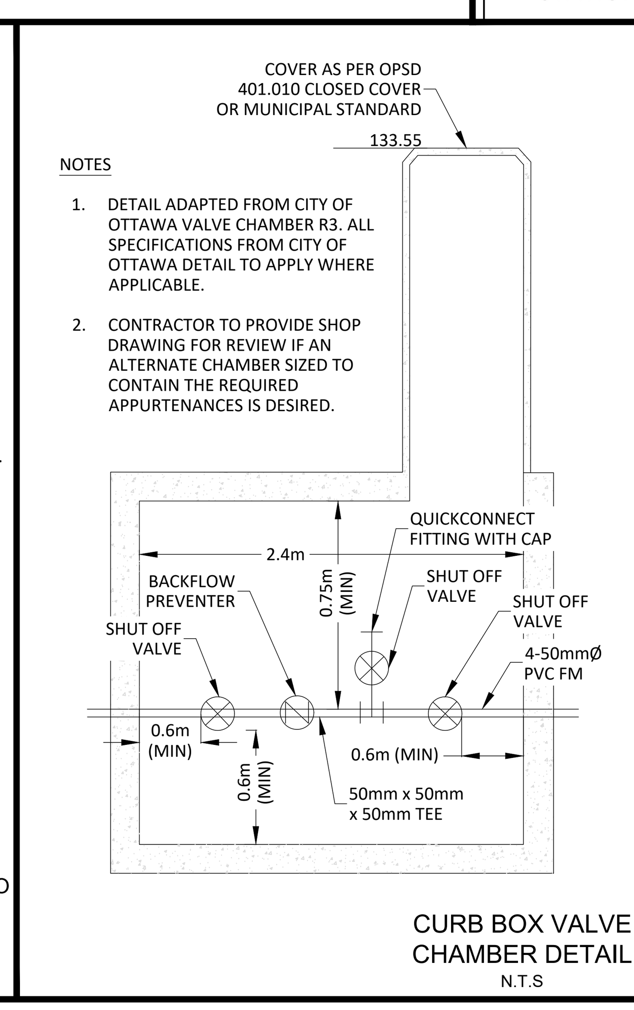


	0+000	0+010	0+020	0+030	0+040	0+050	0+060	0+070
ROAD ELEV. EXISTING	133.90	133.72	133.57	133.50	133.40	133.33	133.26	133.08
ROAD ELEV. PROPOSED	133.90	133.72	133.57	133.50	133.40	133.33	133.26	133.08
TOP OF SANITARY SERVICE		131.03	130.99	130.89	130.79	130.69	130.59	130.49
TOP OF WATERMAIN		131.45	131.32	131.25	131.15	131.08	131.01	130.83
STATION	0+000	0+010	0+020	0+030	0+040	0+050	0+060	0+070



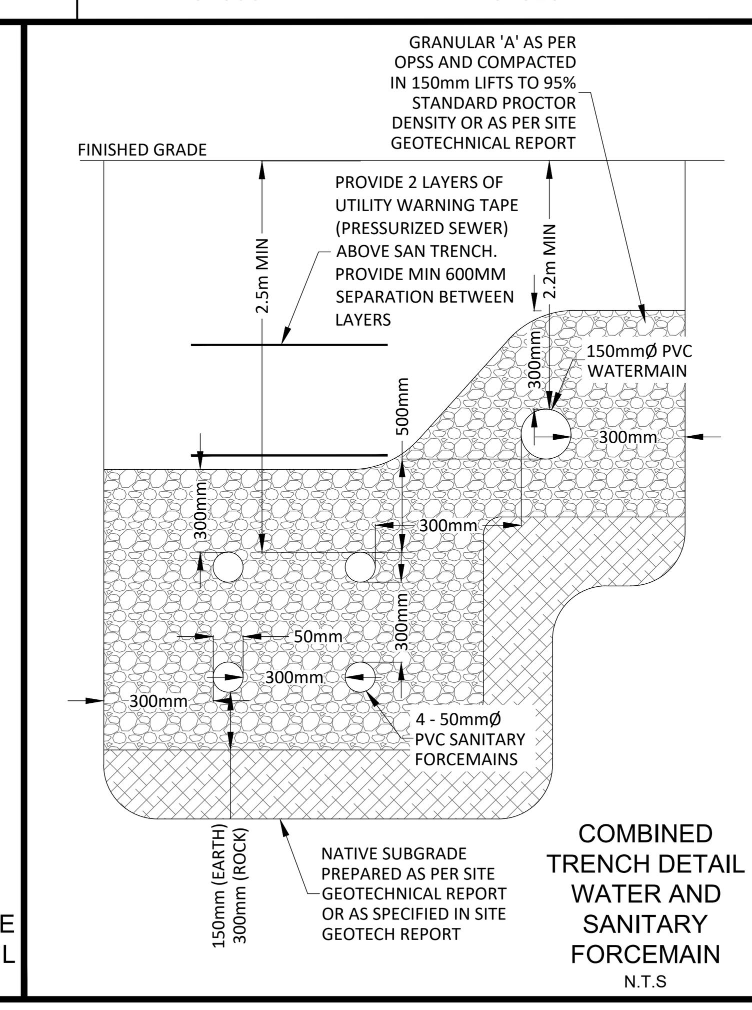
NOTES
1. DETAIL ADAPTED FROM OPSD 701.010. ALL SPECIFICATIONS FROM OPSD 701.010 TO APPLY WHERE APPLICABLE.

SANITARY CONNECTION TO EXISTING MAIN DOGHOUSE MANHOLE
N.T.S

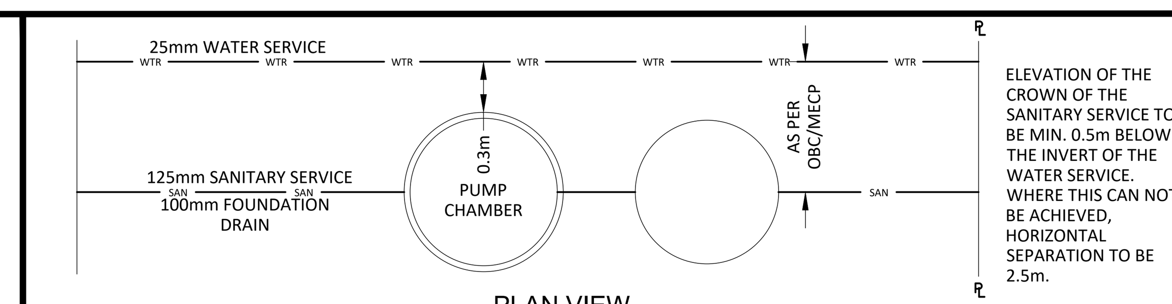


NOTES
1. DETAIL ADAPTED FROM CITY OF OTTAWA VALVE CHAMBER R3. ALL SPECIFICATIONS FROM CITY OF OTTAWA DETAIL TO APPLY WHERE APPLICABLE.
2. CONTRACTOR TO PROVIDE SHOP DRAWING FOR REVIEW IF AN ALTERNATE CHAMBER SIZED TO CONTAIN THE REQUIRED APPURTENANCES IS DESIRED.

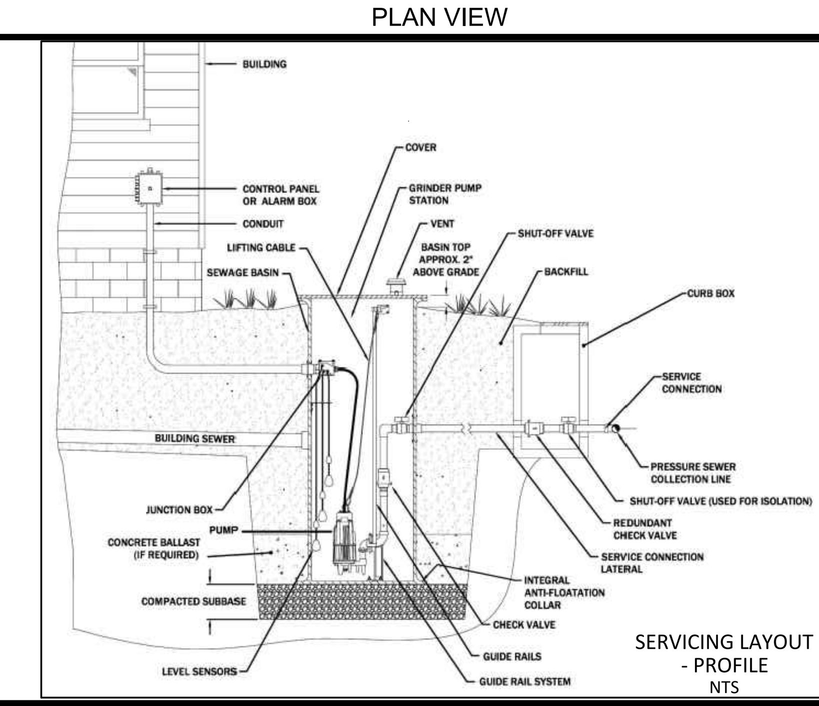
CURB BOX VALVE CHAMBER DETAIL
N.T.S



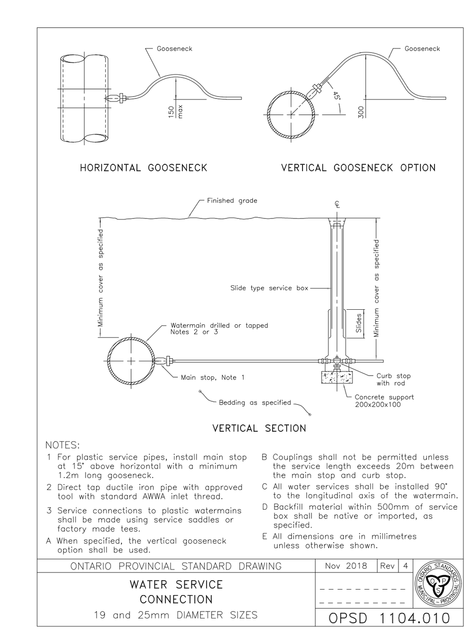
COMBINED TRENCH DETAIL WATER AND SANITARY FORCEMAIN
N.T.S



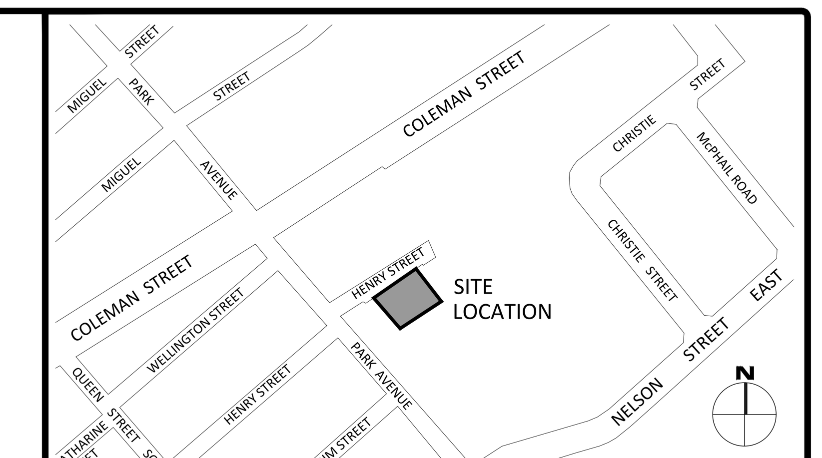
PLAN VIEW



SERVICING LAYOUT - PROFILE
NTS



LEGEND
- LEGAL BOUNDARY
- EX. ASPHALT
- EX. GRAVEL
- EX. FENCE
- LOT CORNER GRADE
- EX. GRADE
- PROPOSED LOT LINE
- PROPOSED CENTRELINE
- PROPOSED ASPHALT
- PROPOSED GRAVEL
- PROPOSED DITCH
- PROPOSED FENCE
- PROPOSED TOP OF SLOPE
- PROPOSED SPOT GRADE
- BUILDING ENTRANCE
- PROPOSED SILT FENCE
- EXISTING STORM PIPE — XX.XXm - XXXmmØ STM @ X.XX%
- EXISTING SANITARY PIPE — XX.XXm - XXXmmØ SAN @ X.XX%
- EXISTING WATER PIPE — XX.XXm - XXXmmØ WTR @ X.XX%
- PROPOSED STORM PIPE — XX.XXm - XXXmmØ STM @ X.XX%
- PROPOSED SANITARY PIPE — XX.XXm - XXXmmØ SAN @ X.XX%
- PROPOSED WATER PIPE — XX.XXm - XXXmmØ WTR @ X.XX%
- EXISTING STORM MANHOLE
- EXISTING CATCHBASIN
- EXISTING CATCHBASIN MANHOLE
- EXISTING SANITARY MANHOLE
- PROPOSED STORM MANHOLE
- PROPOSED CATCHBASIN
- PROPOSED CATCHBASIN MANHOLE
- PROPOSED SANITARY MANHOLE



LOCATION MAP
N.T.S.

FOR REVIEW ONLY
NOT FOR CONSTRUCTION

BENCHMARKS:

No.	DESCRIPTION	ELEVATION
TBM#1	CONCRETE PIN IN UTILITY POLE	134.06m

No.	Revisions	Date
2	ISSUED FOR SPA	JUL/17/2024
1	ISSUED FOR REVIEW	FEB/13/2024

Check and verify all dimensions before proceeding with the work — Do not scale drawings

SCALE 1 : 200 (0 — 10 — 20 Metres)

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www.egis-group.com

LICENSED PROFESSIONAL ENGINEER — C. A. MACLEOD — 100159100 — JULY 17/2024 — PROVINCE OF ONTARIO

Client: GRIZZLY HOMES
163 FOSTER ROAD
ASHTON ON K0A 1B0

Project: 214 HENRY STREET

Drawing Title: SERVICING PLAN

Scale: 1:200	Project Number: CCO-21-2542
Drawn By: DL	
Checked By: AM	Drawing Number: 02
Designed By: AM/DL	

FILENAME: \\Ottawa\01 Project - Proposals\2021 Jobs\CCO\CCO-21-2542 - 214 Henry St_Grizzly Homes_Carleton Place\12 - Dwgs\CCO-21-2542 - 214 Henry.dwg
LAST SAVED: Tuesday, July 16, 2024
LAST PLOTTED: Tuesday, July 16, 2024

214 HENRY STREET

APPENDIX B

CCO-23-0299 - 214 Henry Street - Town of Carleton Place, Ontario - Water Demands

Project:	214 Henry Street - Town of Carleton Place, Ontario
Project No.:	CCO-23-0299
Designed By:	AM
Checked By:	DL
Date:	February 13, 2024
Site Area:	0.09 gross ha

Residential	NUMBER OF UNITS		UNIT RATE	
Single Family		homes	3.4	persons/unit
Semi-detached		homes	2.7	persons/unit
Townhouse	4	homes	2.7	persons/unit
Bachelor Apartment		units	1.4	persons/unit
1 Bedroom Apartment	0	units	1.4	persons/unit
2 Bedroom Apartment	0	units	2.1	persons/unit
3 Bedroom Apartment	0	units	3.1	persons/unit
Average Apartment		units	1.8	persons/unit
Total Population	11	persons		
Commercial		m2		
Industrial - Light		m2		
Industrial - Heavy		m2		

AVERAGE DAILY DEMAND

DEMAND TYPE	AMOUNT	UNITS	
Residential	280	L/c/d	
Industrial - Light	35,000	L/gross ha/d	
Industrial - Heavy	55,000	L/gross ha/d	
Shopping Centres	2,500	L/(1000m² /d	
Hospital	900	L/(bed/day)	
Schools	70	L/(Student/d)	
Trailer Park with no Hook-Ups	340	L/(space/d)	
Trailer Park with Hook-Ups	800	L/(space/d)	
Campgrounds	225	L/(campsite/d)	
Mobile Home Parks	1,000	L/(Space/d)	
Motels	150	L/(bed-space/d)	
Hotels	225	L/(bed-space/d)	
Tourist Commercial	28,000	L/gross ha/d	
Other Commercial	28,000	L/gross ha/d	
AVERAGE DAILY DEMAND	Residential	0.04	L/s
	Commercial/Industrial/Institutional	0.00	L/s

MAXIMUM DAILY DEMAND

DEMAND TYPE	AMOUNT		UNITS
Residential	6.1	x avg. day	L/c/d
Industrial	1.5	x avg. day	L/gross ha/d
Commercial	1.5	x avg. day	L/gross ha/d
Institutional	1.5	x avg. day	L/gross ha/d
MAXIMUM DAILY DEMAND	Residential	0.22	L/s
	Commercial/Industrial/Institutional	0.00	L/s

MAXIMUM HOUR DEMAND

DEMAND TYPE	AMOUNT		UNITS
Residential	9.3	x avg. day	L/c/d
Industrial	1.8	x max. day	L/gross ha/d
Commercial	1.8	x max. day	L/gross ha/d
Institutional	1.8	x max. day	L/gross ha/d
MAXIMUM HOUR DEMAND	Residential	0.33	L/s
	Commercial/Industrial/Institutional	0.00	L/s

WATER DEMAND DESIGN FLOWS PER UNIT COUNT
CITY OF OTTAWA - WATER DISTRIBUTION GUIDELINES, JULY 2010

AVERAGE DAILY DEMAND	0.04	L/s
MAXIMUM DAILY DEMAND	0.22	L/s
MAXIMUM HOUR DEMAND	0.33	L/s

CCO-23-0299 - 214 Henry Street - Town of Carleton Place, Ontario - OBC Fire Calculations

Project:	214 Henry Street
Project No.:	CCO-23-0299
Designed By:	DL
Checked By:	AM
Date:	February 6, 2024

Ontario 2006 Building Code Compendium (Div. B - Part 3)

Water Supply for Fire-Fighting - Apartment Building

Building is classified as Group : C - Residential

Building is of noncombustible construction with fire separations and fire-resistance ratings provided in accordance with subsections 3.2.2., including loadbearing walls, columns and arches

From Div. B A-3.2.5.7. of the Ontario Building Code - 3. Building On-Site Water Supply:

(a) Q = K x V x Stot

where:

Q = minimum supply of water in litres

K = water supply coefficient from Table 1

V = total building volume in cubic metres

Stot = total of spatial coefficient values from the property line exposures on all sides as obtained from the formula:

Stot = 1.0 + [Sside1+Sside2+Sside3+...etc.]

K	23	
V	2,010	(Total building volume in m³.)
Stot	1.0	(From figure 1 pg A-32)
Q =	46,230.00	L

			From Figure 1 (A-32)
Snorth	100.0	m	0.0
Seast	15.0	m	0.0
Ssouth	100.0	m	0.0
Swest	15.0	m	0.0

*approximate distances

From Table 2: Required Minimum Water Supply Flow Rate (L/s)

2700	L/min	if Q < 108,000 L
713	gpm	

CCO-21-2542 - 214 Henry Street - Fire Underwriters Survey

Project:	214 Henry Street
Project No.:	CCO-21-2542
Designed By:	AM
Checked By:	DL
Date:	February 13, 2024

From the Fire Underwriters Survey (2020)

From Part II – Guide for Determination of Required Fire Flow Copyright I.S.O.:
City of Ottawa Technical Bulletin ISTB-2018-02 Applied Where Applicable

A. BASE REQUIREMENT (Rounded to the nearest 1000 L/min)

F = 220 x C x √A Where:
- F = Required fire flow in liters per minute
- C = Coefficient related to the type of construction.
- A = The total floor area in square meters (including all storey's, but excluding basements at least 50 percent below grade) in the building being considered.

Construction Type Wood Frame

C 1.5 A 335.0 m^2

Total Floor Area (per the 2020 FUS Page 20 - Total Effective Area) 167.5 m^2

Calculated Fire Flow	4,270.9 L/min
	4,000.0 L/min

B. REDUCTION FOR OCCUPANCY TYPE (No Rounding)

From Page 24 of the Fire Underwriters Survey:
Limited Combustible -15%

Fire Flow	3,400.0 L/min

C. REDUCTION FOR SPRINKLER TYPE (No Rounding)

Non-Sprinklered 0%

Reduction	0.0 L/min

D. INCREASE FOR EXPOSURE (No Rounding)

	Separation Distance (m)	Cons.of Exposed Wall	Length Exposed Adjacent Wall (m)	Height (Stories)	Length-Height Factor	
Exposure 1 (N)	Over 30 m	Wood frame	24.5	2	49.0	0%
Exposure 2 (E)	10.1 to 20	Wood frame	15	1	15.0	10%
Exposure 3 (S)	Over 30 m	Wood frame	20	2	40.0	0%
Exposure 4 (W)	10.1 to 20	Wood frame	15	2	30.0	11%
					% Increase*	21%

Increase*	714.0 L/min

E. Total Fire Flow (Rounded to the Nearest 1000 L/min)

Fire Flow	4,114.0 L/min
Fire Flow Required**	4,000.0 L/min

*In accordance with Part II, Section 4, the Increase for separation distance is not to exceed 75%
**In accordance with Section 4 the Fire flow is not to exceed 45,000 L/min or be less than 2,000 L/min
***If both the subject building and the exposed building are fully protected with automatic sprinkler systems, no Exposure Adjustment Charge should be applied.

CCO-23-0299 - 214 Henry Street - Town of Carleton Place, Ontario - Sanitary Demands

Project:	214 Henry Street - Town of Carleton Place, Ontario			
Project No.:	CCO-23-3469			
Designed By:	AM			
Checked By:				
Date:	Jun-24			
Site Area	0.09	Gross ha		
Townhouse	4	homes	2.7	persons/unit
1 Bedroom	0	units	1.4	persons/unit
2 Bedroom	0	units	2.1	persons/unit
3 Bedroom	0	units	3.1	persons/unit
Total Population	11	Persons		
Amenity Space	0.00	m^2		

DESIGN PARAMETERS

Institutional/Commercial Peaking Factc	1.0	
Residential Peaking Factor	3.73	** Using Harmon Formula =* 1+(14/(4+P^0.5))*0.8 *where P = population in thousands, Harmon's Correction Factor = 0.8*
Mannings coefficient (n)	0.013	
Demand (per capita)	350	L/day
Infiltration allowance	0.33	L/s/Ha

EXTRANEOUS FLOW ALLOWANCES

Infiltration / Inflow	Flow (L/s)
Dry	0.00
Wet	0.02
Total	**0.03**

AVERAGE DAILY DEMAND

DEMAND TYPE	AMOUNT	UNITS	POPULATION / AREA	Flow (L/s)
Residential	350	L/c/d	11	0.04
Industrial - Light**	35,000	L/gross ha/d		0
Industrial - Heavy**	55,000	L/gross ha/d		0
Commercial / Amenity	2,800	L/(1000m² /d)	0.00	0.00
Hospital	900	L/(bed/day)		0
Schools	70	L/(Student/d)		0
Trailer Parks no Hook-Ups	340	L/(space/d)		0
Trailer Park with Hook-Ups	800	L/(space/d)		0
Campgrounds	225	L/(campsite/d)		0
Mobile Home Parks	1,000	L/(Space/d)		0
Motels	150	L/(bed-space/d)		0
Hotels	225	L/(bed-space/d)		0
Office	75	L/7.0m²/d		0
Tourist Commercial	28,000	L/gross ha/d		0
Other Commercial	28,000	L/gross ha/d		0

	L/s	L/d
AVERAGE RESIDENTIAL FLOW	0.04	3850
PEAK RESIDENTIAL FLOW	0.17	14355
AVERAGE ICI FLOW	0.00	0
PEAK INSTITUTIONAL/COMMERCIAL FLOW	0.00	0
PEAK INDUSTRIAL FLOW	0.00	0
TOTAL PEAK ICI FLOW	0.00	0
TOTAL ESTIMATED AVERAGE DRY WEATHER FLOW	0.05	4228
TOTAL ESTIMATED PEAK DRY WEATHER FLOW	0.17	14733
TOTAL ESTIMATED PEAK WET WEATHER FLOW	0.20	16849
PER UNIT AVERAGE DRY WEATHER FLOW	0.01	1057
PER UNIT ESTIMATED PEAK DRY WEATHER FLOW	0.04	3683
PER UNIT ESTIMATED PEAK WET WEATHER FLOW	0.05	4212

214 Henry Street

Lot A

Proposed Sanitary Flow Into the Pumpstation (From Sanitary Sewer Design Sheet)	Q_{in} =	0.01 l/s	Note: Excludes 'M' Peaking Factor
	Q_{out} / Q_{in} =	163.4815516	
Proposed Sanitary Flow Out Of the Pumpstation (Hydraulic Analysis/Pump Curve)	Q_{out} =	2.00 l/s	Note: From Forcemain Hydraulics Tab; 0.6 m/s design flow rate

From the MOE Sewage Design Guidelines 2008

$Volume_{min}$ = 0.0122338 l/s x 1.5 = 0.01835 L (min)

Volume = DA = $\frac{D\pi d^2}{4}$

Therefore, $D_{effective} = \frac{4V}{\pi d^2}$ where d = diameter of Wet Well; d = 0.9 m

$D_{effective} = \frac{0.073402778}{2.827433388 \text{ m}}$

$D_{effective}$ = 0.0260 m * Use 0.05m

Invert Elevation of Gravity Sanitary Main from Subdivision = 131.1 m USF = 131.15 m
(Pump-on to be 0.35 m below sanitary invert)

Pump-on = 130.75 m Pump-Off = Pump-On - $D_{effective}$ = 130.70 m

And, 0.0122338 l/s = 1.2E-05 cms x 86,400 s/day = 1.057 m3/day

Therefore, time to fill the station = $\frac{V}{Q_{in}} = \frac{0.02 \text{ m3}}{1.22\text{E-05 cms}} \times \frac{1 \text{ min}}{60 \text{ s}}$ = 25 min

Low Level Alarm minimum = 0.3 m from the bottom of the wet well

Therefore, the minimum bottom of station = 130.70 m - 0.3 m = 130.40 m
But, provide a storage buffer of: 0 m and a depth buffer of: 0.00 m to increase retention time

Therefore,

Bottom of Wet Well =	**130.40 m**	Float Switch		Basin Selection:
Pump-off =	**130.70 m**		130.60 m	ller QLS Series
Pump-on =	**130.75 m**		99.46 m	36" x 120"
$D_{effective}$ =	**0.05 m**			
Ground Surface =	**133.45 m**	Max bottom of wet well	131.01	
Top of Wet Well =	**133.40 m**	Min Elev for Sanitary Conr	131.71	
Total Depth	**3.00 m**	FFE (approx)	134.36	
Gravity Main Invert =	**131.10 m**			
Gravity Main Diameter =	**100 mm**			
Forcemain Discharge Invert =	**132.70 m**			
Forcemain Diameter =	**50 mm**			
Static Head =	**2.00 m**			
Pump Starts (Total) / Hour =	**1.4**			

Volume = DA = $\frac{D\pi d^2}{4}$ # of Pumps 1

Pump Cycle Time = 43.60 Mins/Cycle

Volume = $\frac{2.16 \times \pi \times 3.6^2}{4}$

Volume = 0.03 m^3

Therefore, $\frac{1 \text{ m3/day}}{0.03 \text{ m3}}$ = 33 times per day the pumpstation starts

Residence Time = $\frac{V}{Q_{in}} = \frac{0.03}{1.2\text{E-05 cms}} \times \frac{1 \text{ min}}{60 \text{ s}}$ = 43.33 min

Pump Time = $\frac{V}{Q_{out}} = \frac{0.03}{0.002 \text{ cms}} \times \frac{1 \text{ min}}{60 \text{ s}}$ = 0.27 min

Pump Cycle Time = Residence + Pump = 43.33 min + 0.27 min = 43.60 min

214 HENRY ST Lot A FORCEMAIN HYDRAULIC ANALYSIS

HYDRAULIC ANALYSIS OF PUMP STATION C=150

BERNOULLI'S EQUATION (reduced) H(tdh) = Hstatic + Hfs + Hfd + Hms + Hmd

WHERE:

Hfs = Friction Losses - suction, m
Hfd = Friction Losses - discharge, m
Hms = Minor Losses - suction, m
Hmd = Minor Losses - discharge, m
Hstatic = Total Static Head, m
H(tdh) = Total Dynamic Head, m

Ls = length of suction pipe, m
Ld = length of discharge, m
Ds = Diameter of suction pipe, m
Dd = Diameter of discharge pipe, m
Q = Pump Discharge, m3/s

C = Hazen-Williams Coefficient
= **150** (Overflow Condition)

Hf = 10.7*L*Q^1.85 / C^1.85 * D^4.87
Hm = K * V^2 / 2g

Datum	Pump Off	Discharge	Hstatic
133.40	130.70	132.70	2.00

Hfs = 10.7*L*Q^1.85 / C^1.85 * D^4.87
= 0 * Q^1.85

Hms = K * V^2 / 2g
= 0 * Q^2

Hfd = 10.7*L*Q^1.85 / C^1.85 * D^4.87
= 79053.86 * Q^1.85

Hmd = K * V^2 / 2g
= 139816.7 * Q^2

Ls = 0
Ds = 0
Vs = Q/A

Suction	K Value	Unit	Sum
bend-45	0.4	0	0
coupling	0.2	0	0
entrance bell	1	0	0
contraction	0.35	0	0
		Total	0

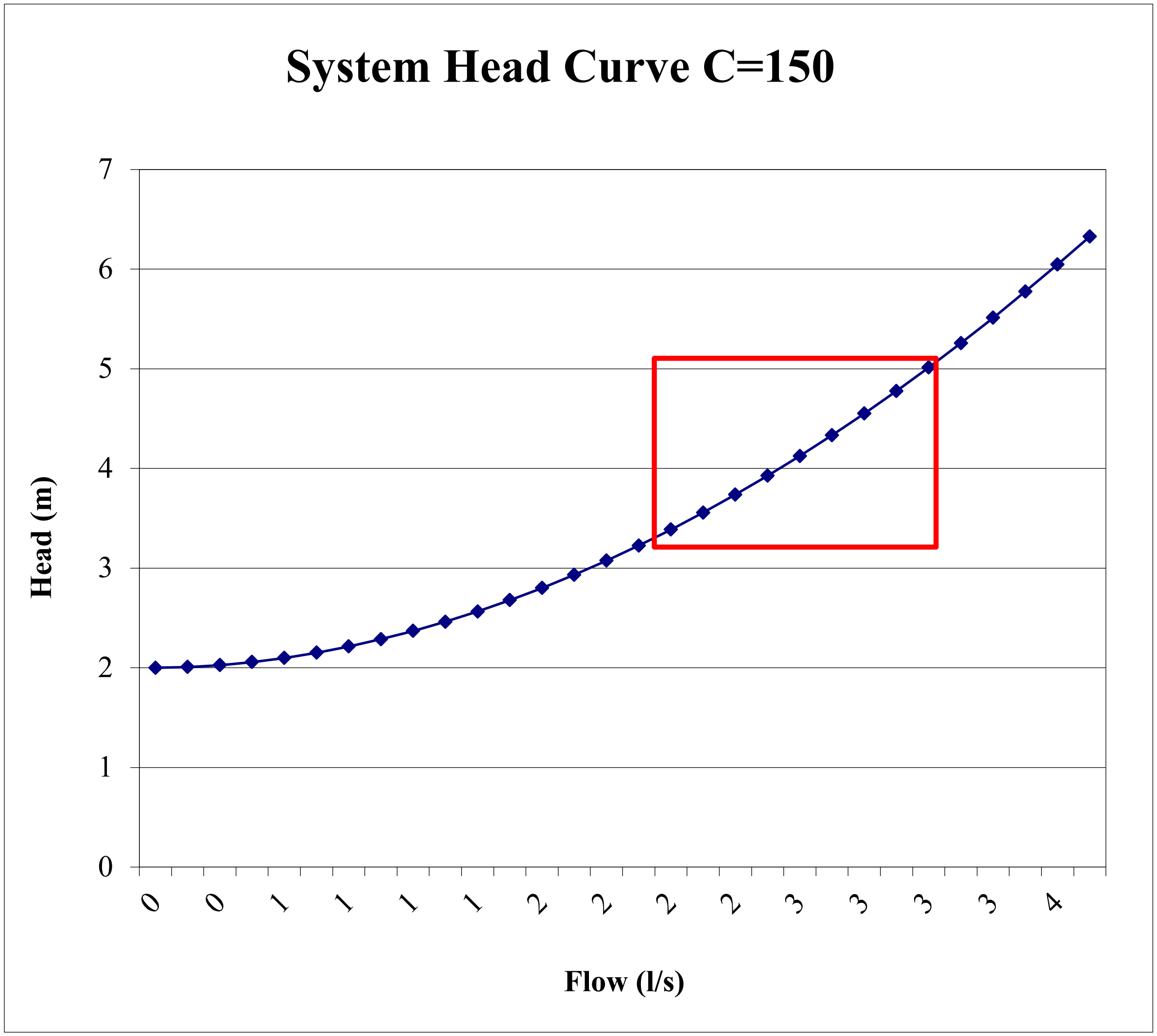
Ld = 54
PVC Dd(id) = 0.05429
Vd = Q/A

Discharge	K Value	Unit	Sum
inlet	1	1	1
bend-90	0.9	2	1.8
flange	0.2	3	0.6
reducer	0.25	0	0
ball checkvalve	2	4	8
ball plug valve	0.6	2	1.2
tee	1.8	0	0
flow lateral (y)	0.15	0	0
bend-45	0.4	2	0.8
bend-22.5	0.25	0	0
bend-11.25	0.15	2	0.3
exit	1	1	1
		Total	14.7

214 HENRY ST Lot A FORCEMAIN HYDRAULIC ANALYSIS

SOLVE FOR PUMP HEAD H(tdh) = 2.00 + 79053.86 Q^1.85 + 139816.75 Q^2 + 0 Q^1.85 + 0 Q^2 m

Discharge			Pump Head		Pipe Velocity
US-gpm	l/s	m3/s	m	ft	m/s
0	0.00	0	2.00	6.56	0.00
2	0.13	1.26E-04	2.01	6.58	0.05
4	0.25	2.52E-04	2.03	6.65	0.11
6	0.38	3.79E-04	2.06	6.75	0.16
8	0.50	5.05E-04	2.10	6.88	0.22
10	0.63	6.31E-04	2.15	7.06	0.27
12	0.76	7.57E-04	2.21	7.26	0.33
14	0.88	8.83E-04	2.29	7.50	0.38
16	1.01	1.01E-03	2.37	7.77	0.44
18	1.14	1.14E-03	2.46	8.08	0.49
20	1.26	1.26E-03	2.57	8.42	0.55
22	1.39	1.39E-03	2.68	8.79	0.60
24	1.51	1.51E-03	2.80	9.19	0.65
26	1.64	1.64E-03	2.93	9.62	0.71
28	1.77	1.77E-03	3.07	10.09	0.76
30	1.89	1.89E-03	3.23	10.58	0.82
32	2.02	2.02E-03	3.39	11.11	0.87
34	2.15	2.15E-03	3.56	11.67	0.93
36	2.27	2.27E-03	3.74	12.26	0.98
38	2.40	2.40E-03	3.93	12.88	1.04
40	2.52	2.52E-03	4.13	13.53	1.09
42	2.65	2.65E-03	4.33	14.22	1.14
44	2.78	2.78E-03	4.55	14.93	1.20
46	2.90	2.90E-03	4.78	15.67	1.25
48	3.03	3.03E-03	5.01	16.45	1.31
50	3.15	3.15E-03	5.26	17.25	1.36
52	3.28	3.28E-03	5.51	18.08	1.42
54	3.41	3.41E-03	5.77	18.95	1.47
56	3.53	3.53E-03	6.05	19.84	1.53
58	3.66	3.66E-03	6.33	20.76	1.58



214 HENRY ST Lot A FORCEMAIN HYDRAULIC ANALYSIS

HYDRAULIC ANALYSIS OF PUMP STATION C=130

BERNOULLI'S EQUATION (reduced) H(tdh) = Hstatic + Hfs + Hfd + Hms + Hmd

WHERE:

Hfs = Friction Losses - suction, m
Hfd = Friction Losses - discharge, m
Hms = Minor Losses - suction, m
Hmd = Minor Losses - discharge, m
Hstatic = Total Static Head, m
H(tdh) = Total Dynamic Head, m

Ls = length of suction pipe, m
Ld = length of discharge, m
Ds = Diameter of suction pipe, m
Dd = Diameter of discharge pipe, m
Q = Pump Discharge, m3/s

C = Hazen-Williams Coefficient
= **130** (Normal Operations)

Hf = 10.7*L*Q^1.85 / C^1.85 * D^4.87
Hm = K * V^2 / 2g

Datum	Pump Off	Discharge	Hstatic
133.40	130.70	132.70	2.00

Hfs = 10.7*L*Q^1.85 / C^1.85 * D^4.87
= 0 * Q^1.85

Hms = K * V^2 / 2g
= 0 * Q^2

Hfd = 10.7*L*Q^1.85 / C^1.85 * D^4.87
= 103014.1 * Q^1.85

Hmd = K * V^2 / 2g
= 139816.7 * Q^2

Ls = 0
Ds = 0
Vs = Q/A

Suction	K Value	Unit	Sum
bend-45	0.4	0	0
coupling	0.2	0	0
entrance bell	1	0	0
contraction	0.35	0	0
		Total	0

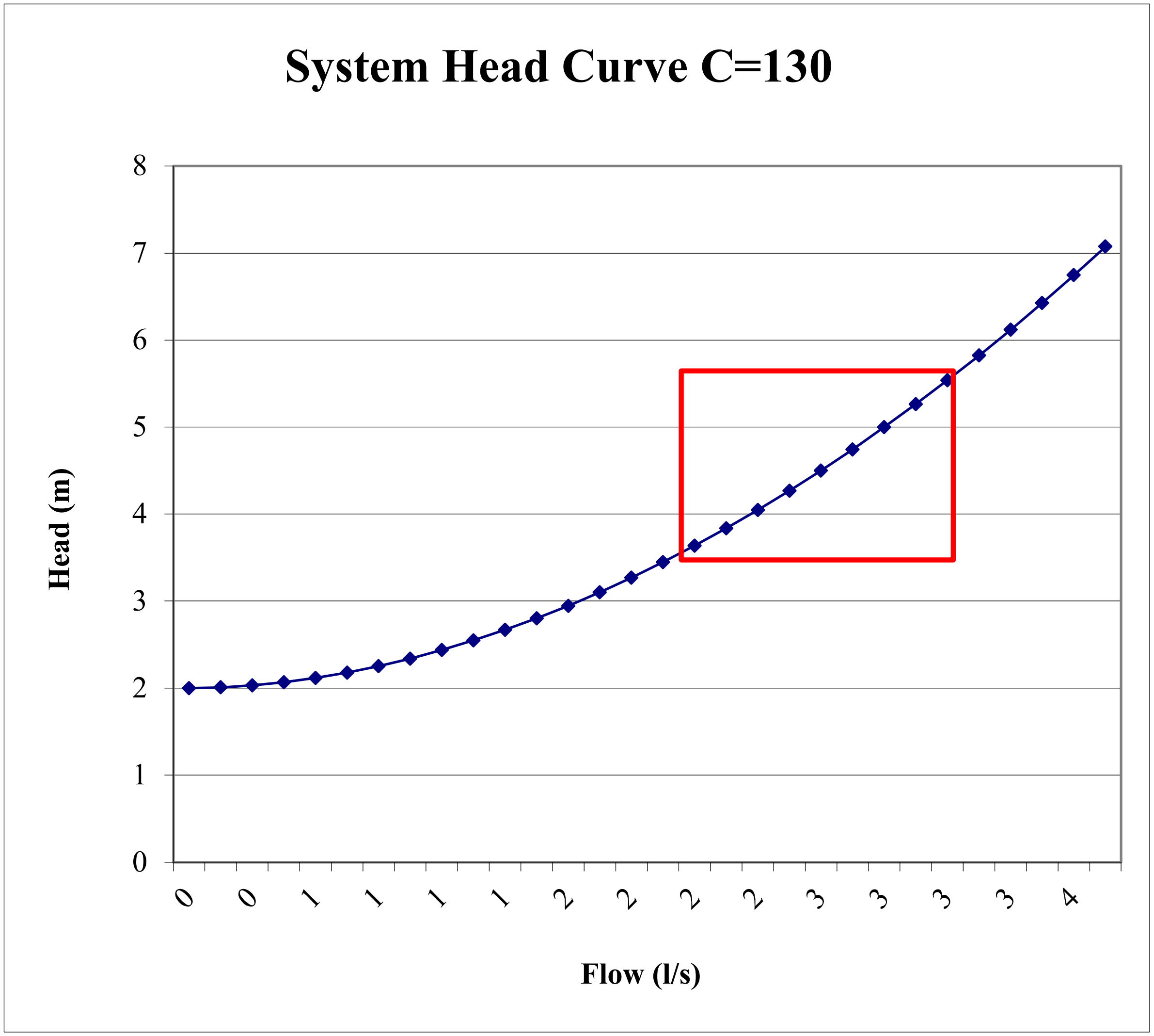
Ld = 54
Dd(id) = 0.05429
Vd = Q/A

Discharge	K Value	Unit	Sum
inlet	1	1	1
bend-90	0.9	2	1.8
flange	0.2	3	0.6
reducer	0.25	0	0
ball checkvalve	2	4	8
ball plug valve	0.6	2	1.2
tee	1.8	0	0
flow lateral (y)	0.15	0	0
bend-45	0.4	2	0.8
bend-22.5	0.25	0	0
bend-11.25	0.15	2	0.3
exit	1	1	1
		Total	14.7

214 HENRY ST Lot A FORCEMAIN HYDRAULIC ANALYSIS

SOLVE FOR PUMP HEAD H(tdh) = 2.00 + 103014.1 Q^1.85 + 139816.75 Q^2 + 0 Q^1.85 + 0 Q^2 m

Discharge			Pump Head		Pipe Velocity
US-gpm	l/s	m3/s	m	ft	m/s
0	0.00	0	2.00	6.56	0.00
2	0.13	1.26E-04	2.01	6.59	0.05
4	0.25	2.52E-04	2.03	6.67	0.11
6	0.38	3.79E-04	2.07	6.79	0.16
8	0.50	5.05E-04	2.12	6.95	0.22
10	0.63	6.31E-04	2.18	7.15	0.27
12	0.76	7.57E-04	2.25	7.39	0.33
14	0.88	8.83E-04	2.34	7.68	0.38
16	1.01	1.01E-03	2.44	8.00	0.44
18	1.14	1.14E-03	2.55	8.36	0.49
20	1.26	1.26E-03	2.67	8.76	0.55
22	1.39	1.39E-03	2.80	9.19	0.60
24	1.51	1.51E-03	2.95	9.67	0.65
26	1.64	1.64E-03	3.10	10.18	0.71
28	1.77	1.77E-03	3.27	10.72	0.76
30	1.89	1.89E-03	3.45	11.31	0.82
32	2.02	2.02E-03	3.63	11.93	0.87
34	2.15	2.15E-03	3.83	12.58	0.93
36	2.27	2.27E-03	4.05	13.27	0.98
38	2.40	2.40E-03	4.27	14.00	1.04
40	2.52	2.52E-03	4.50	14.76	1.09
42	2.65	2.65E-03	4.74	15.56	1.14
44	2.78	2.78E-03	5.00	16.39	1.20
46	2.90	2.90E-03	5.26	17.26	1.25
48	3.03	3.03E-03	5.54	18.17	1.31
50	3.15	3.15E-03	5.82	19.10	1.36
52	3.28	3.28E-03	6.12	20.08	1.42
54	3.41	3.41E-03	6.43	21.08	1.47
56	3.53	3.53E-03	6.74	22.13	1.53
58	3.66	3.66E-03	7.07	23.20	1.58



214 HENRY ST Lot A FORCEMAIN HYDRAULIC ANALYSIS

HYDRAULIC ANALYSIS OF PUMP STATION C=120

BERNOULLI'S EQUATION (reduced) H(tdh) = Hstatic + Hfs + Hfd + Hms + Hmd

WHERE:

Hfs = Friction Losses - suction, m
Hfd = Friction Losses - discharge, m
Hms = Minor Losses - suction, m
Hmd = Minor Losses - discharge, m
Hstatic = Total Static Head, m
H(tdh) = Total Dynamic Head, m

Ls = length of suction pipe, m
Ld = length of discharge, m
Ds = Diameter of suction pipe, m
Dd = Diameter of discharge pipe, m
Q = Pump Discharge, m3/s

C = Hazen-Williams Coefficient
= **120** (Low Level Condition)

Hf = 10.7*L*Q^1.85 / C^1.85 * D^4.87
Hm = K * V^2 / 2g

Datum	Pump Off	Discharge	Hstatic
133.40	130.70	132.70	2.00

Hfs = 10.7*L*Q^1.85 / C^1.85 * D^4.87
= 0 * Q^1.85

Hms = K * V^2 / 2g
= 0 * Q^2

Hfd = 10.7*L*Q^1.85 / C^1.85 * D^4.87
= 119455.6 * Q^1.85

Hmd = K * V^2 / 2g
= 139816.7 * Q^2

Ls = 0
Ds = 0
Vs = Q/A

Suction	K Value	Unit	Sum
bend-45	0.4	0	0
coupling	0.2	0	0
entrance bell	1	0	0
contraction	0.35	0	0
		Total	0

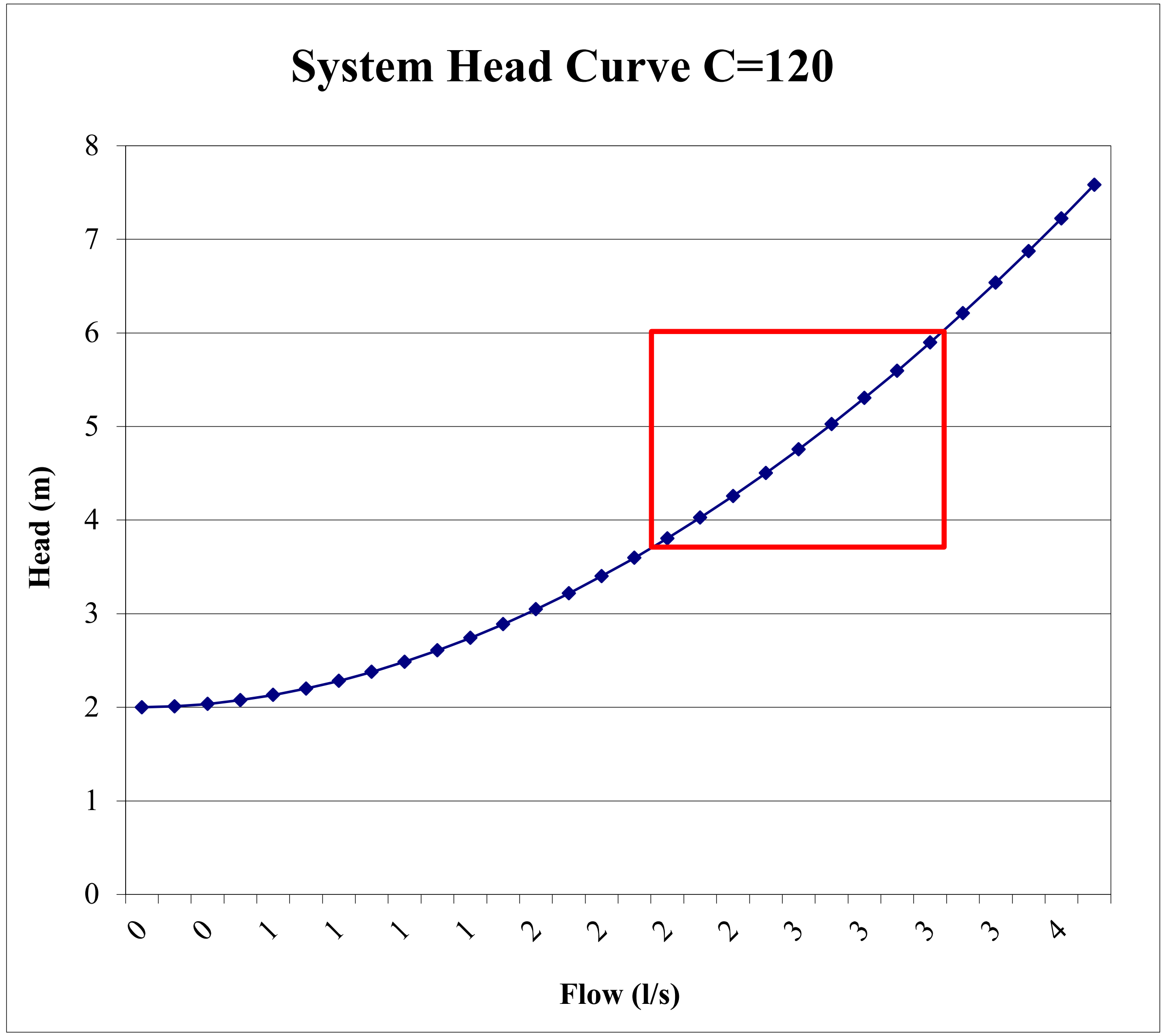
Ld = 54
Dd(id) = 0.05429
Vd = Q/A

Discharge	K Value	Unit	Sum
inlet	1	1	1
bend-90	0.9	2	1.8
flange	0.2	3	0.6
reducer	0.25	0	0
ball checkvalve	2	4	8
ball plug valve	0.6	2	1.2
tee	1.8	0	0
flow lateral (y)	0.15	0	0
bend-45	0.4	2	0.8
bend-22.5	0.25	0	0
bend-11.25	0.15	2	0.3
exit	1	1	1
		Total	14.7

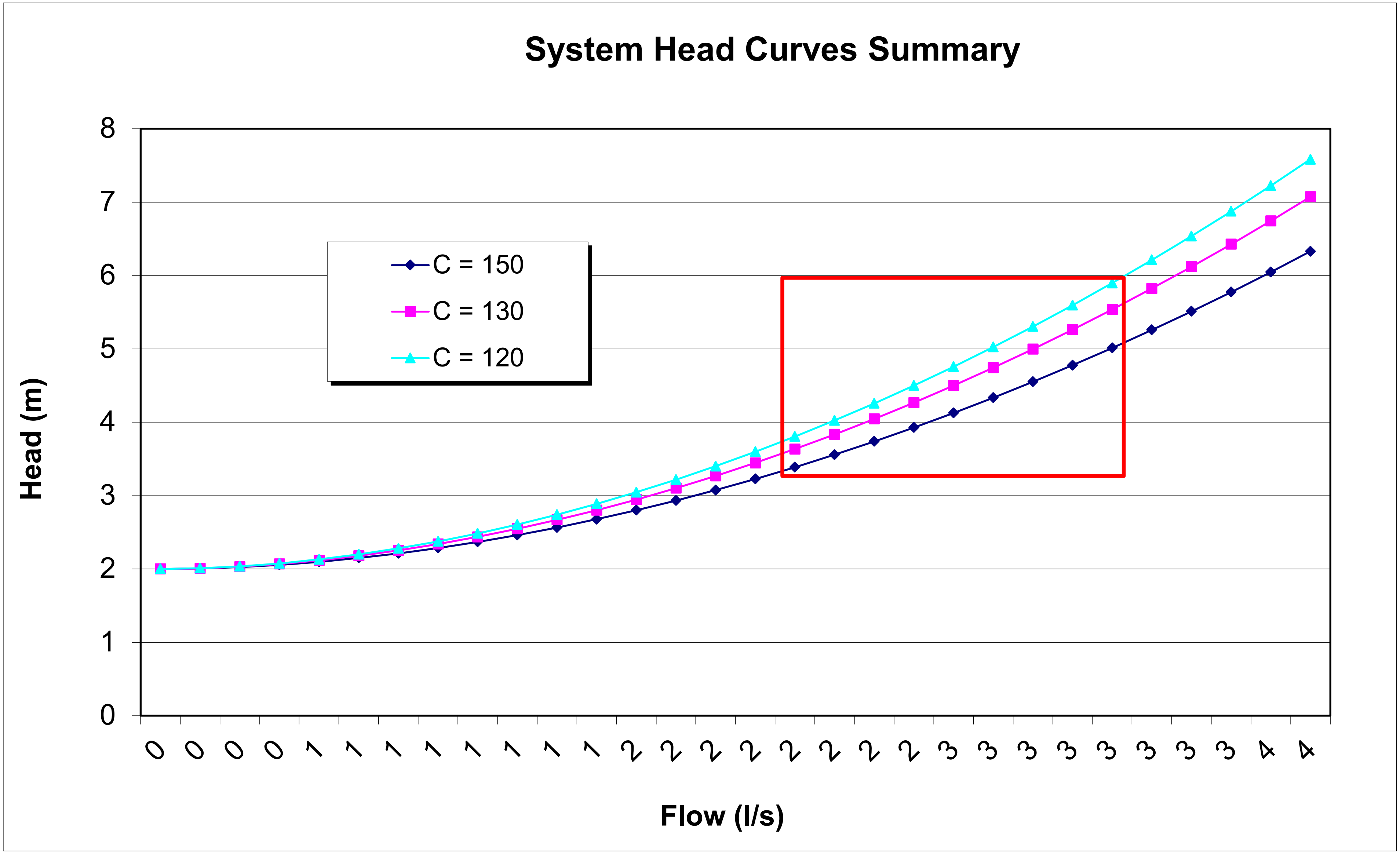
214 HENRY ST Lot A FORCEMAIN HYDRAULIC ANALYSIS

SOLVE FOR PUMP HEAD H(tdh) = 2.00 + 119455.6 Q^1.85 + 139816.75 Q^2 + 0 Q^1.85 + 0 Q^2 m

Discharge			Pump Head		Pipe Velocity
US-gpm	l/s	m3/s	m	ft	m/s
0	0.00	0	2.00	6.56	0.00
2	0.13	1.26E-04	2.01	6.59	0.05
4	0.25	2.52E-04	2.04	6.68	0.11
6	0.38	3.79E-04	2.08	6.81	0.16
8	0.50	5.05E-04	2.13	6.99	0.22
10	0.63	6.31E-04	2.20	7.22	0.27
12	0.76	7.57E-04	2.28	7.48	0.33
14	0.88	8.83E-04	2.38	7.80	0.38
16	1.01	1.01E-03	2.49	8.15	0.44
18	1.14	1.14E-03	2.61	8.55	0.49
20	1.26	1.26E-03	2.74	8.99	0.55
22	1.39	1.39E-03	2.89	9.47	0.60
24	1.51	1.51E-03	3.05	9.99	0.65
26	1.64	1.64E-03	3.22	10.56	0.71
28	1.77	1.77E-03	3.40	11.16	0.76
30	1.89	1.89E-03	3.60	11.80	0.82
32	2.02	2.02E-03	3.80	12.48	0.87
34	2.15	2.15E-03	4.02	13.21	0.93
36	2.27	2.27E-03	4.26	13.97	0.98
38	2.40	2.40E-03	4.50	14.77	1.04
40	2.52	2.52E-03	4.76	15.61	1.09
42	2.65	2.65E-03	5.02	16.48	1.14
44	2.78	2.78E-03	5.30	17.40	1.20
46	2.90	2.90E-03	5.59	18.35	1.25
48	3.03	3.03E-03	5.90	19.35	1.31
50	3.15	3.15E-03	6.21	20.38	1.36
52	3.28	3.28E-03	6.54	21.45	1.42
54	3.41	3.41E-03	6.87	22.55	1.47
56	3.53	3.53E-03	7.22	23.70	1.53
58	3.66	3.66E-03	7.58	24.88	1.58



214 HENRY ST Lot A FORCEMAIN HYDRAULIC ANALYSIS



214 Henry Street

Lot B

Proposed Sanitary Flow Into the Pumpstation (From Sanitary Sewer Design Sheet)	Q_{in} =	0.01 l/s	Note: Excludes 'M' Peaking Factor
	Q_{out} / Q_{in} =	163.4815516	
Proposed Sanitary Flow Out Of the Pumpstation (Hydraulic Analysis/Pump Curve)	Q_{out} =	2.00 l/s	Note: From Forcemain Hydraulics Tab; 0.6 m/s design flow rate

From the MOE Sewage Design Guidelines 2008

$Volume_{min}$ = 0.0122338 l/s x 1.5 = 0.01835 L (min)

Volume = DA = $\frac{D \prod d^2}{4}$

Therefore, $D_{effective} = \frac{4V}{\prod d^2}$ where d = diameter of Wet Well; d = 0.9 m

$D_{effective} = \frac{0.073402778}{2.827433388 \text{ m}}$

$D_{effective}$ = 0.0260 m * Use 0.050m

Invert Elevation of Gravity Sanitary Main from Subdivision = 131.1 m USF = 131.15 m
(Pump-on to be 0.35 m below sanitary invert)

Pump-on = 130.75 m Pump-Off = Pump-On - $D_{effective}$ = 130.70 m

And, 0.0122338 l/s = 1.2E-05 cms x 86,400 s/day = 1.057 m3/day

Therefore, time to fill the station = $\frac{V}{Q_{in}} = \frac{0.02 \text{ m3}}{1.22\text{E-05 cms}} \times \frac{1 \text{ min}}{60 \text{ s}}$ = 25 min

Low Level Alarm minimum = 0.3 m from the bottom of the wet well

Therefore, the minimum bottom of station = 130.70 m - 0.3 m = 130.40 m
But, provide a storage buffer of: 0 m and a depth buffer of: 0.00 m to increase retention time

Therefore,

Bottom of Wet Well =	**130.40 m**			Basin Selection:
Pump-off =	**130.70 m**			Zoeller QLS Series
Pump-on =	**130.75 m**			36" x 120"
$D_{effective}$ =	**0.05 m**			
Ground Surface =	**133.45 m**	Max bottom of wet well	131.01	
Top of Wet Well =	**133.40 m**	Min Elev for Sanitary Conr	131.71	
Total Depth	**3.00 m**	FFE (approx)	134.36	
Gravity Main Invert =	**131.10 m**			
Gravity Main Diameter =	**100 mm**			
Forcemain Discharge Invert =	**132.70 m**			
Forcemain Diameter =	**50 mm**			
Static Head =	**2.00 m**			
Pump Starts (Total) / Hour =	**1.4**			

Volume = DA = $\frac{D \prod d^2}{4}$ # of Pumps 1; Pump Cycle Time = 43.60 Mins/Cycle

Volume = $\frac{2.16 \times \prod \times 3.6^2}{4}$

Volume = **0.03 m^3**

Therefore, $\frac{1 \text{ m3/day}}{0.03 \text{ m3}}$ = 33 times per day the pumpstation starts

Residence Time = $\frac{V}{Q_{in}} = \frac{0.03}{1.2\text{E-05 cms}} \times \frac{1 \text{ min}}{60 \text{ s}}$ = 43.33 min

Pump Time = $\frac{V}{Q_{out}} = \frac{0.03}{0.002 \text{ cms}} \times \frac{1 \text{ min}}{60 \text{ s}}$ = 0.27 min

Pump Cycle Time = Residence + Pump = 43.33 min + 0.27 min = 43.60 min

Res Lot B

214 HENRY ST Lot B FORCEMAIN HYDRAULIC ANALYSIS

HYDRAULIC ANALYSIS OF PUMP STATION C=150

BERNOULLI'S EQUATION (reduced) H(tdh) = Hstatic + Hfs + Hfd + Hms + Hmd

WHERE:

Hfs = Friction Losses - suction, m
Hfd = Friction Losses - discharge, m
Hms = Minor Losses - suction, m
Hmd = Minor Losses - discharge, m
Hstatic = Total Static Head, m
H(tdh) = Total Dynamic Head, m

Ls = length of suction pipe, m
Ld = length of discharge, m
Ds = Diameter of suction pipe, m
Dd = Diameter of discharge pipe, m
Q = Pump Discharge, m3/s

C = Hazen-Williams Coefficient
= **150** (Overflow Condition)

Hf = 10.7*L*Q^1.85 / C^1.85 * D^4.87
Hm = K * V^2 / 2g

Datum	Pump Off	Discharge	Hstatic
133.40	130.70	132.70	2.00

Hfs = 10.7*L*Q^1.85 / C^1.85 * D^4.87
= 0 * Q^1.85

Hms = K * V^2 / 2g
= 0 * Q^2

Hfd = 10.7*L*Q^1.85 / C^1.85 * D^4.87
= 93693.46 * Q^1.85

Hmd = K * V^2 / 2g
= 139816.7 * Q^2

Ls = 0
Ds = 0
Vs = Q/A

Suction	K Value	Unit	Sum
bend-45	0.4	0	0
coupling	0.2	0	0
entrance bell	1	0	0
contraction	0.35	0	0
		Total	0

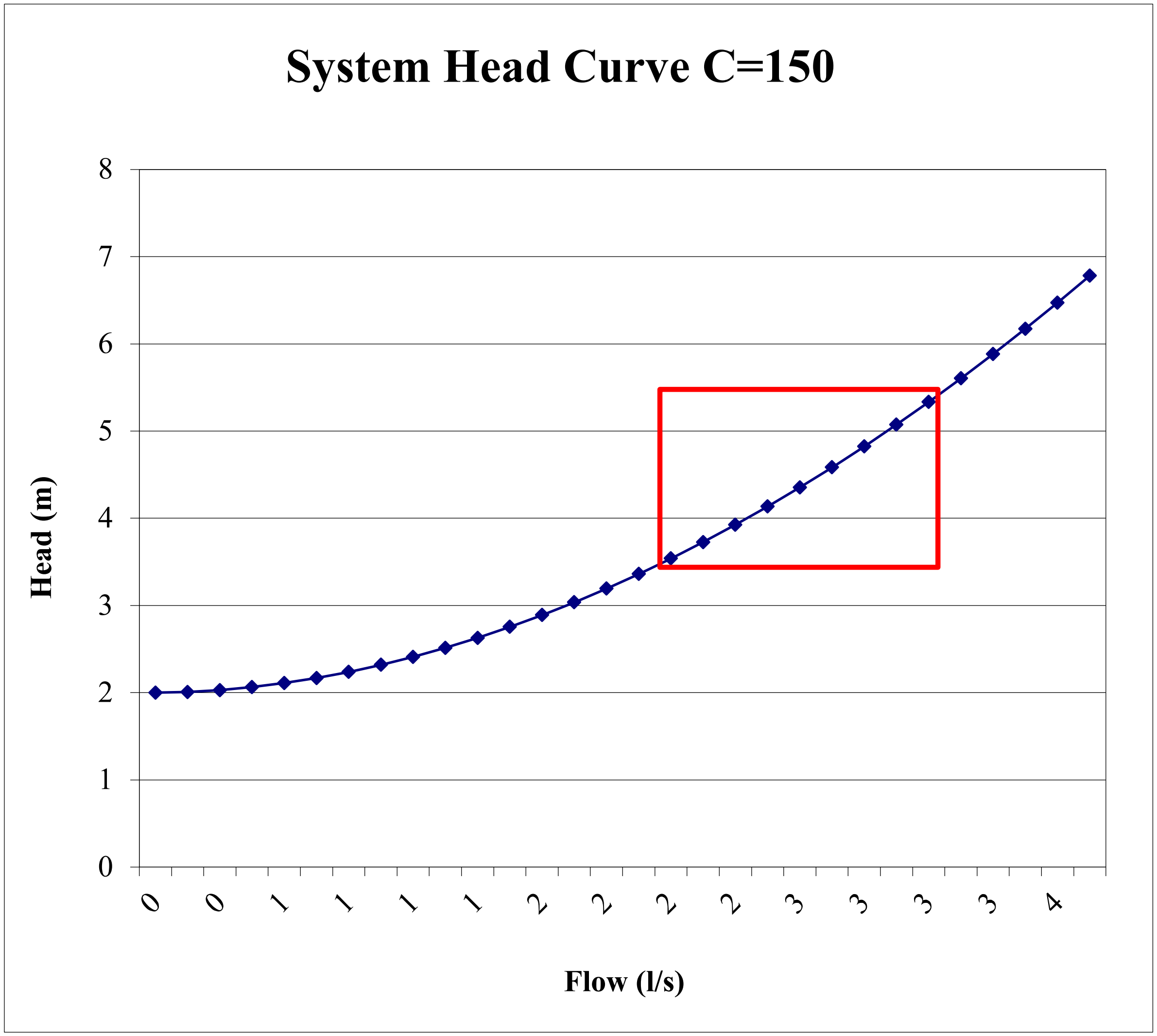
Ld = 64
PVC Dd(id) = 0.05429
Vd = Q/A

Discharge	K Value	Unit	Sum
inlet	1	1	1
bend-90	0.9	2	1.8
flange	0.2	3	0.6
reducer	0.25	0	0
ball checkvalve	2	4	8
ball plug valve	0.6	2	1.2
tee	1.8	0	0
flow lateral (y)	0.15	0	0
bend-45	0.4	2	0.8
bend-22.5	0.25	0	0
bend-11.25	0.15	2	0.3
exit	1	1	1
		Total	14.7

214 HENRY ST Lot B FORCEMAIN HYDRAULIC ANALYSIS

SOLVE FOR PUMP HEAD H(tdh) = 2.00 + 93693.46 Q^1.85 + 139816.75 Q^2 + 0 Q^1.85 + 0 Q^2 m

Discharge			Pump Head		Pipe Velocity
US-gpm	l/s	m3/s	m	ft	m/s
0	0.00	0	2.00	6.56	0.00
2	0.13	1.26E-04	2.01	6.59	0.05
4	0.25	2.52E-04	2.03	6.66	0.11
6	0.38	3.79E-04	2.06	6.77	0.16
8	0.50	5.05E-04	2.11	6.92	0.22
10	0.63	6.31E-04	2.17	7.11	0.27
12	0.76	7.57E-04	2.24	7.34	0.33
14	0.88	8.83E-04	2.32	7.61	0.38
16	1.01	1.01E-03	2.41	7.91	0.44
18	1.14	1.14E-03	2.51	8.25	0.49
20	1.26	1.26E-03	2.63	8.62	0.55
22	1.39	1.39E-03	2.75	9.03	0.60
24	1.51	1.51E-03	2.89	9.48	0.65
26	1.64	1.64E-03	3.04	9.96	0.71
28	1.77	1.77E-03	3.19	10.48	0.76
30	1.89	1.89E-03	3.36	11.03	0.82
32	2.02	2.02E-03	3.54	11.61	0.87
34	2.15	2.15E-03	3.73	12.23	0.93
36	2.27	2.27E-03	3.93	12.88	0.98
38	2.40	2.40E-03	4.13	13.57	1.04
40	2.52	2.52E-03	4.35	14.29	1.09
42	2.65	2.65E-03	4.58	15.04	1.14
44	2.78	2.78E-03	4.82	15.82	1.20
46	2.90	2.90E-03	5.07	16.64	1.25
48	3.03	3.03E-03	5.33	17.50	1.31
50	3.15	3.15E-03	5.60	18.38	1.36
52	3.28	3.28E-03	5.88	19.30	1.42
54	3.41	3.41E-03	6.17	20.25	1.47
56	3.53	3.53E-03	6.47	21.24	1.53
58	3.66	3.66E-03	6.78	22.25	1.58



214 HENRY ST Lot B FORCEMAIN HYDRAULIC ANALYSIS

HYDRAULIC ANALYSIS OF PUMP STATION C=130

BERNOULLI'S EQUATION (reduced) H(tdh) = Hstatic + Hfs + Hfd + Hms + Hmd

WHERE:

Hfs = Friction Losses - suction, m
Hfd = Friction Losses - discharge, m
Hms = Minor Losses - suction, m
Hmd = Minor Losses - discharge, m
Hstatic = Total Static Head, m
H(tdh) = Total Dynamic Head, m

Ls = length of suction pipe, m
Ld = length of discharge, m
Ds = Diameter of suction pipe, m
Dd = Diameter of discharge pipe, m
Q = Pump Discharge, m3/s

C = Hazen-Williams Coefficient
= **130** (Normal Operations)

Hf = 10.7*L*Q^1.85 / C^1.85 * D^4.87
Hm = K * V^2 / 2g

Datum	Pump Off	Discharge	Hstatic
133.40	130.70	132.70	2.00

Hfs = 10.7*L*Q^1.85 / C^1.85 * D^4.87
= 0 * Q^1.85

Hms = K * V^2 / 2g
= 0 * Q^2

Hfd = 10.7*L*Q^1.85 / C^1.85 * D^4.87
= 122090.8 * Q^1.85

Hmd = K * V^2 / 2g
= 139816.7 * Q^2

Ls = 0
Ds = 0
Vs = Q/A

Suction	K Value	Unit	Sum
bend-45	0.4	0	0
coupling	0.2	0	0
entrance bell	1	0	0
contraction	0.35	0	0
		Total	0

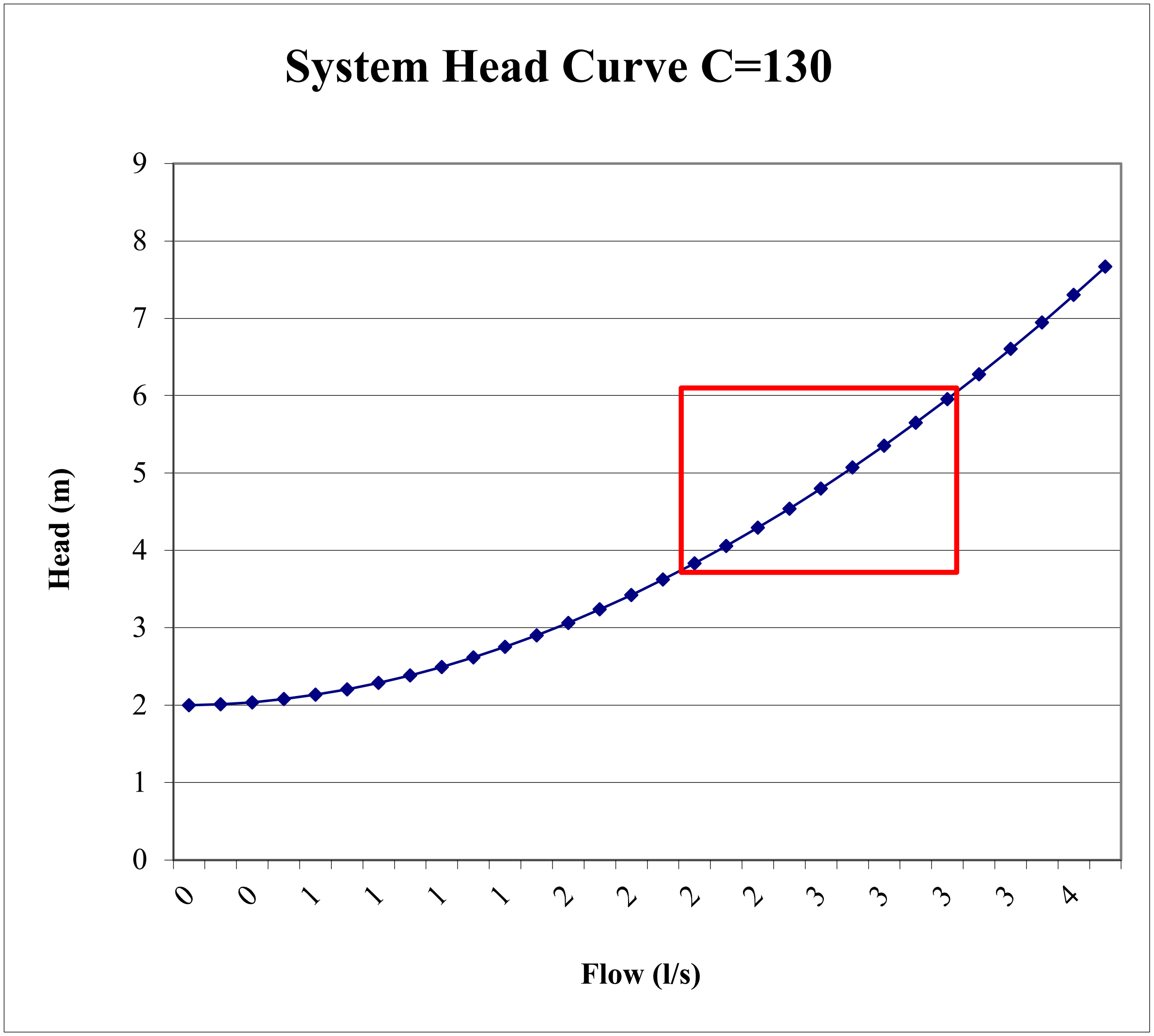
Ld = 64
Dd(id) = 0.05429
Vd = Q/A

Discharge	K Value	Unit	Sum
inlet	1	1	1
bend-90	0.9	2	1.8
flange	0.2	3	0.6
reducer	0.25	0	0
ball checkvalve	2	4	8
ball plug valve	0.6	2	1.2
tee	1.8	0	0
flow lateral (y)	0.15	0	0
bend-45	0.4	2	0.8
bend-22.5	0.25	0	0
bend-11.25	0.15	2	0.3
exit	1	1	1
		Total	14.7

214 HENRY ST Lot B FORCEMAIN HYDRAULIC ANALYSIS

SOLVE FOR PUMP HEAD H(tdh) = 2.00 + 122090.8 Q^1.85 + 139816.75 Q^2 + 0 Q^1.85 + 0 Q^2 m

Discharge			Pump Head		Pipe Velocity
US-gpm	l/s	m3/s	m	ft	m/s
0	0.00	0	2.00	6.56	0.00
2	0.13	1.26E-04	2.01	6.59	0.05
4	0.25	2.52E-04	2.04	6.68	0.11
6	0.38	3.79E-04	2.08	6.81	0.16
8	0.50	5.05E-04	2.13	7.00	0.22
10	0.63	6.31E-04	2.20	7.23	0.27
12	0.76	7.57E-04	2.29	7.50	0.33
14	0.88	8.83E-04	2.38	7.82	0.38
16	1.01	1.01E-03	2.49	8.18	0.44
18	1.14	1.14E-03	2.62	8.58	0.49
20	1.26	1.26E-03	2.75	9.03	0.55
22	1.39	1.39E-03	2.90	9.52	0.60
24	1.51	1.51E-03	3.06	10.05	0.65
26	1.64	1.64E-03	3.24	10.62	0.71
28	1.77	1.77E-03	3.42	11.23	0.76
30	1.89	1.89E-03	3.62	11.88	0.82
32	2.02	2.02E-03	3.83	12.57	0.87
34	2.15	2.15E-03	4.06	13.31	0.93
36	2.27	2.27E-03	4.29	14.08	0.98
38	2.40	2.40E-03	4.54	14.89	1.04
40	2.52	2.52E-03	4.80	15.74	1.09
42	2.65	2.65E-03	5.07	16.63	1.14
44	2.78	2.78E-03	5.35	17.56	1.20
46	2.90	2.90E-03	5.65	18.53	1.25
48	3.03	3.03E-03	5.95	19.54	1.31
50	3.15	3.15E-03	6.27	20.58	1.36
52	3.28	3.28E-03	6.60	21.67	1.42
54	3.41	3.41E-03	6.95	22.79	1.47
56	3.53	3.53E-03	7.30	23.95	1.53
58	3.66	3.66E-03	7.66	25.15	1.58



214 HENRY ST Lot B FORCEMAIN HYDRAULIC ANALYSIS

HYDRAULIC ANALYSIS OF PUMP STATION C=120

BERNOULLI'S EQUATION (reduced) H(tdh) = Hstatic + Hfs + Hfd + Hms + Hmd

WHERE:

Hfs = Friction Losses - suction, m
Hfd = Friction Losses - discharge, m
Hms = Minor Losses - suction, m
Hmd = Minor Losses - discharge, m
Hstatic = Total Static Head, m
H(tdh) = Total Dynamic Head, m

Ls = length of suction pipe, m
Ld = length of discharge, m
Ds = Diameter of suction pipe, m
Dd = Diameter of discharge pipe, m
Q = Pump Discharge, m3/s

C = Hazen-Williams Coefficient
= **120** (Low Level Condition)

Hf = 10.7*L*Q^1.85 / C^1.85 * D^4.87
Hm = K * V^2 / 2g

Datum	Pump Off	Discharge	Hstatic
133.40	130.70	132.70	2.00

Hfs = 10.7*L*Q^1.85 / C^1.85 * D^4.87
= 0 * Q^1.85

Hms = K * V^2 / 2g
= 0 * Q^2

Hfd = 10.7*L*Q^1.85 / C^1.85 * D^4.87
= 141577 * Q^1.85

Hmd = K * V^2 / 2g
= 139816.7 * Q^2

Ls = 0
Ds = 0
Vs = Q/A

Suction	K Value	Unit	Sum
bend-45	0.4	0	0
coupling	0.2	0	0
entrance bell	1	0	0
contraction	0.35	0	0
		Total	0

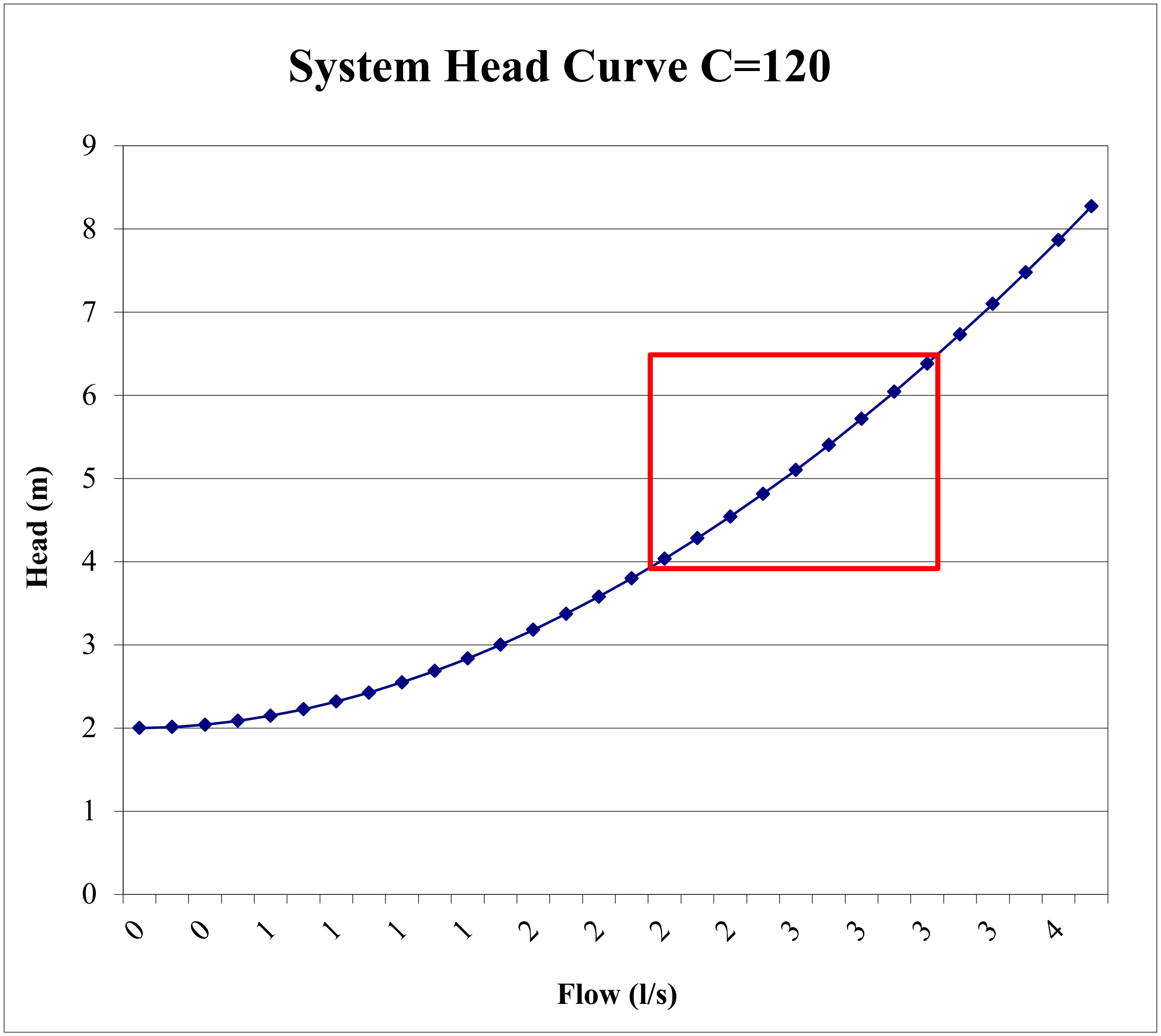
Ld = 64
Dd(id) = 0.05429
Vd = Q/A

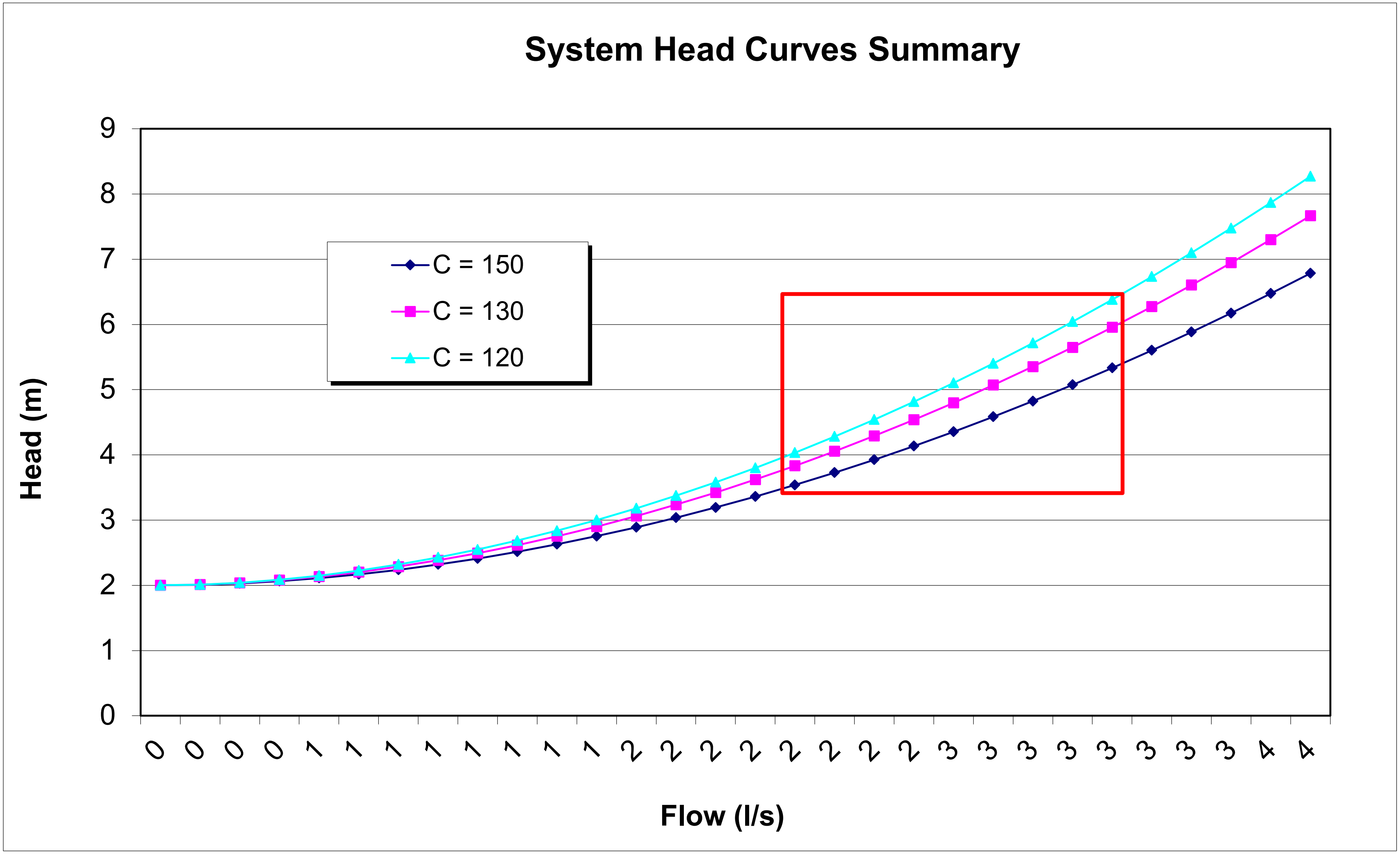
Discharge	K Value	Unit	Sum
inlet	1	1	1
bend-90	0.9	2	1.8
flange	0.2	3	0.6
reducer	0.25	0	0
ball checkvalve	2	4	8
ball plug valve	0.6	2	1.2
tee	1.8	0	0
flow lateral (y)	0.15	0	0
bend-45	0.4	2	0.8
bend-22.5	0.25	0	0
bend-11.25	0.15	2	0.3
exit	1	1	1
		Total	14.7

214 HENRY ST Lot B FORCEMAIN HYDRAULIC ANALYSIS

SOLVE FOR PUMP HEAD H(tdh) = 2.00 + 141577 Q^1.85 + 139816.75 Q^2 + 0 Q^1.85 + 0 Q^2 m

Discharge			Pump Head		Pipe Velocity
US-gpm	l/s	m3/s	m	ft	m/s
0	0.00	0	2.00	6.56	0.00
2	0.13	1.26E-04	2.01	6.60	0.05
4	0.25	2.52E-04	2.04	6.69	0.11
6	0.38	3.79E-04	2.09	6.84	0.16
8	0.50	5.05E-04	2.15	7.05	0.22
10	0.63	6.31E-04	2.23	7.30	0.27
12	0.76	7.57E-04	2.32	7.61	0.33
14	0.88	8.83E-04	2.43	7.96	0.38
16	1.01	1.01E-03	2.55	8.36	0.44
18	1.14	1.14E-03	2.69	8.81	0.49
20	1.26	1.26E-03	2.84	9.30	0.55
22	1.39	1.39E-03	3.00	9.85	0.60
24	1.51	1.51E-03	3.18	10.43	0.65
26	1.64	1.64E-03	3.37	11.07	0.71
28	1.77	1.77E-03	3.58	11.74	0.76
30	1.89	1.89E-03	3.80	12.47	0.82
32	2.02	2.02E-03	4.03	13.23	0.87
34	2.15	2.15E-03	4.28	14.04	0.93
36	2.27	2.27E-03	4.54	14.90	0.98
38	2.40	2.40E-03	4.82	15.80	1.04
40	2.52	2.52E-03	5.10	16.74	1.09
42	2.65	2.65E-03	5.40	17.72	1.14
44	2.78	2.78E-03	5.72	18.75	1.20
46	2.90	2.90E-03	6.04	19.82	1.25
48	3.03	3.03E-03	6.38	20.94	1.31
50	3.15	3.15E-03	6.73	22.09	1.36
52	3.28	3.28E-03	7.10	23.29	1.42
54	3.41	3.41E-03	7.48	24.53	1.47
56	3.53	3.53E-03	7.87	25.81	1.53
58	3.66	3.66E-03	8.27	27.13	1.58




System Head Curves Summary
C = 150
C = 130
C = 120
Head (m)
Flow (l/s)
9
8
7
6
5
4
3
2
1
0
0 0 0 0 1 1 1 1 1 1 1 1 2 2 2 2 2 2 2 2 3 3 3 3 3 3 3 3 4 4

214 Henry Street

Lot C

Proposed Sanitary Flow Into the Pumpstation
(From Sanitary Sewer Design Sheet)

Q_{in} = 0.01 l/s   Note: Excludes 'M' Peaking Factor

Q_{out}/Q_{in} = 163.4815516

Proposed Sanitary Flow Out Of the Pumpstation
(Hydraulic Analysis/Pump Curve)

Q_{out} = 2.00 l/s   Note: From Forcemain Hydraulics Tab; 0.6 m/s design flow rate

From the MOE Sewage Design Guidelines 2008

$Volume_{min}$ = 0.0122338 l/s x 1.5 = 0.01835 L (min)

Volume = DA = $\frac{D∏d^2}{4}$

Therefore, $D_{effective}$ = $\frac{4V}{∏d^2}$ where d = diameter of Wet Well; d = 0.9 m

$D_{effective}$ = $\frac{0.073402778}{2.827433388\ m}$

$D_{effective}$ = 0.0260 m * Use 0.050m

Invert Elevation of Gravity Sanitary Main from Subdivision = 131.1 m   USF = 131.15 m
(Pump-on to be 0.35 m below sanitary invert)

Pump-on = 130.75 m   Pump-Off = Pump-On - $D_{effective}$ = 130.70 m

And, 0.0122338 l/s = 1.2E-05 cms x 86,400 s/day = 1.057 m3/day

Therefore, time to fill the station = $\frac{V}{Q_{in}}$ = $\frac{0.02\ m3}{1.22E-05\ cms}$ x $\frac{1\ min}{60\ s}$ = 25 min

Low Level Alarm minimum = 0.3 m from the bottom of the wet well

Therefore, the minimum bottom of station = 130.70 m - 0.3 m = 130.40 m
But, provide a storage buffer of: 0 m and a depth buffer of: 0.00 m to increase retention time

Therefore,

Bottom of Wet Well =	**130.40 m**			Basin Selection:
Pump-off =	**130.70 m**			Zoeller QLS Series
Pump-on =	**130.75 m**			36" x 120"
$D_{effective}$ =	**0.05 m**			
Ground Surface =	**133.45 m**	Max bottom of wet well	131.01	
Top of Wet Well =	**133.40 m**	Min Elev for Sanitary Conr	131.71	
Total Depth	**3.00 m**	FFE (approx)	134.36	
Gravity Main Invert =	**131.10 m**			
Gravity Main Diameter =	**100 mm**			
Forcemain Discharge Invert =	**132.60 m**			
Forcemain Diameter =	**50 mm**			
Static Head =	**1.90 m**			
Pump Starts (Total) / Hour =	**1.4**			

Volume = DA = $\frac{D∏d^2}{4}$ # of Pumps 1; Pump Cycle Time = 43.60 Mins/Cycle

Volume = $\frac{2.16 \times ∏ \times 3.6^2}{4}$

Volume = 0.03 m^3

Therefore, $\frac{1\ m3/day}{0.03\ m3}$ = 33 times per day the pumpstation starts

Residence Time = $\frac{V}{Q_{in}}$ = $\frac{0.03}{1.2E-05\ cms}$ x $\frac{1\ min}{60\ s}$ = 43.33 min

Pump Time = $\frac{V}{Q_{out}}$ = $\frac{0.03}{0.002\ cms}$ x $\frac{1\ min}{60\ s}$ = 0.27 min

Pump Cycle Time = Residence + Pump = 43.33 min + 0.27 min = 43.60 min

Res Lot C

214 HENRY ST Lot C FORCEMAIN HYDRAULIC ANALYSIS

HYDRAULIC ANALYSIS OF PUMP STATION C=150

BERNOULLI'S EQUATION (reduced) H(tdh) = Hstatic + Hfs + Hfd + Hms + Hmd

WHERE:

Hfs = Friction Losses - suction, m
Hfd = Friction Losses - discharge, m
Hms = Minor Losses - suction, m
Hmd = Minor Losses - discharge, m
Hstatic = Total Static Head, m
H(tdh) = Total Dynamic Head, m

Ls = length of suction pipe, m
Ld = length of discharge, m
Ds = Diameter of suction pipe, m
Dd = Diameter of discharge pipe, m
Q = Pump Discharge, m3/s

C = Hazen-Williams Coefficient
= **150** (Overflow Condition)

Hf = 10.7*L*Q^1.85 / C^1.85 * D^4.87
Hm = K * V^2 / 2g

Datum	Pump Off	Discharge	Hstatic
133.40	130.70	132.60	1.90

Hfs = 10.7*L*Q^1.85 / C^1.85 * D^4.87
= 0 * Q^1.85

Hms = K * V^2 / 2g
= 0 * Q^2

Hfd = 10.7*L*Q^1.85 / C^1.85 * D^4.87
= 99549.3 * Q^1.85

Hmd = K * V^2 / 2g
= 139816.7 * Q^2

Ls = 0
Ds = 0
Vs = Q/A

Suction	K Value	Unit	Sum
bend-45	0.4	0	0
coupling	0.2	0	0
entrance bell	1	0	0
contraction	0.35	0	0
		Total	0

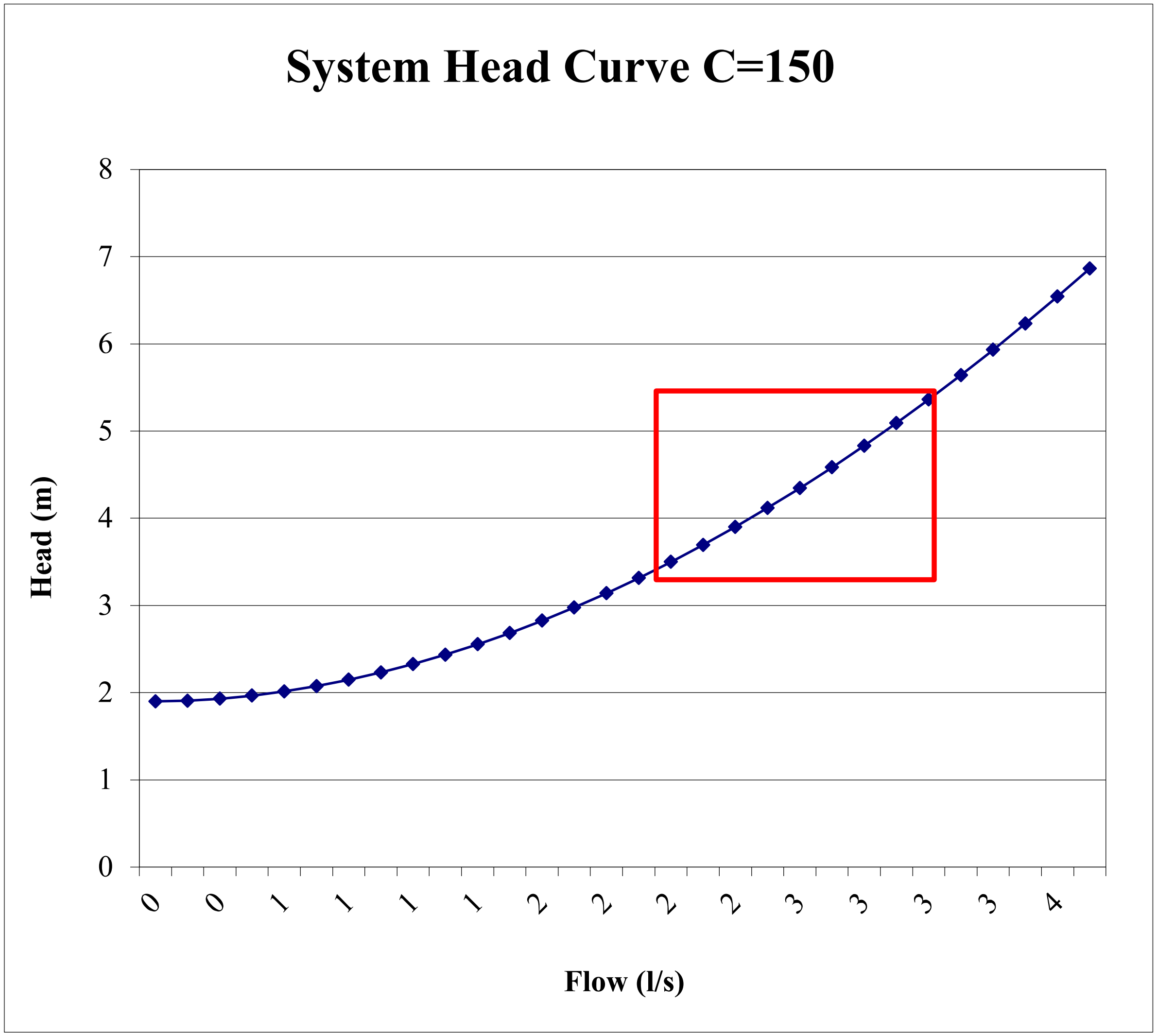
Ld = 68
PVC Dd(id) = 0.05429
Vd = Q/A

Discharge	K Value	Unit	Sum
inlet	1	1	1
bend-90	0.9	2	1.8
flange	0.2	3	0.6
reducer	0.25	0	0
ball checkvalve	2	4	8
ball plug valve	0.6	2	1.2
tee	1.8	0	0
flow lateral (y)	0.15	0	0
bend-45	0.4	2	0.8
bend-22.5	0.25	0	0
bend-11.25	0.15	2	0.3
exit	1	1	1
		Total	14.7

214 HENRY ST Lot C FORCEMAIN HYDRAULIC ANALYSIS

SOLVE FOR PUMP HEAD   H(tdh) =   1.90 +   99549.3 Q^1.85 +   139816.75 Q^2 + 0 Q^1.85 + 0 Q^2 m

Discharge			Pump Head		Pipe Velocity
US-gpm	l/s	m3/s	m	ft	m/s
0	0.00	0	1.90	6.23	0.00
2	0.13	1.26E-04	1.91	6.26	0.05
4	0.25	2.52E-04	1.93	6.33	0.11
6	0.38	3.79E-04	1.97	6.45	0.16
8	0.50	5.05E-04	2.01	6.61	0.22
10	0.63	6.31E-04	2.08	6.81	0.27
12	0.76	7.57E-04	2.15	7.05	0.33
14	0.88	8.83E-04	2.23	7.32	0.38
16	1.01	1.01E-03	2.33	7.64	0.44
18	1.14	1.14E-03	2.44	7.99	0.49
20	1.26	1.26E-03	2.55	8.38	0.55
22	1.39	1.39E-03	2.68	8.81	0.60
24	1.51	1.51E-03	2.82	9.27	0.65
26	1.64	1.64E-03	2.98	9.77	0.71
28	1.77	1.77E-03	3.14	10.30	0.76
30	1.89	1.89E-03	3.31	10.87	0.82
32	2.02	2.02E-03	3.50	11.48	0.87
34	2.15	2.15E-03	3.69	12.12	0.93
36	2.27	2.27E-03	3.90	12.80	0.98
38	2.40	2.40E-03	4.12	13.51	1.04
40	2.52	2.52E-03	4.35	14.26	1.09
42	2.65	2.65E-03	4.58	15.04	1.14
44	2.78	2.78E-03	4.83	15.85	1.20
46	2.90	2.90E-03	5.09	16.70	1.25
48	3.03	3.03E-03	5.36	17.59	1.31
50	3.15	3.15E-03	5.64	18.51	1.36
52	3.28	3.28E-03	5.93	19.46	1.42
54	3.41	3.41E-03	6.23	20.45	1.47
56	3.53	3.53E-03	6.54	21.47	1.53
58	3.66	3.66E-03	6.86	22.52	1.58



214 HENRY ST Lot C FORCEMAIN HYDRAULIC ANALYSIS

HYDRAULIC ANALYSIS OF PUMP STATION C=130

BERNOULLI'S EQUATION (reduced) H(tdh) = Hstatic + Hfs + Hfd + Hms + Hmd

WHERE:

Hfs = Friction Losses - suction, m
Hfd = Friction Losses - discharge, m
Hms = Minor Losses - suction, m
Hmd = Minor Losses - discharge, m
Hstatic = Total Static Head, m
H(tdh) = Total Dynamic Head, m

Ls = length of suction pipe, m
Ld = length of discharge, m
Ds = Diameter of suction pipe, m
Dd = Diameter of discharge pipe, m
Q = Pump Discharge, m3/s

C = Hazen-Williams Coefficient
= **130** (Normal Operations)

Hf = 10.7*L*Q^1.85 / C^1.85 * D^4.87
Hm = K * V^2 / 2g

Datum	Pump Off	Discharge	Hstatic
133.40	130.70	132.60	1.90

Hfs = 10.7*L*Q^1.85 / C^1.85 * D^4.87
= 0 * Q^1.85

Hms = K * V^2 / 2g
= 0 * Q^2

Hfd = 10.7*L*Q^1.85 / C^1.85 * D^4.87
= 129721.5 * Q^1.85

Hmd = K * V^2 / 2g
= 139816.7 * Q^2

Ls = 0
Ds = 0
Vs = Q/A

Suction	K Value	Unit	Sum
bend-45	0.4	0	0
coupling	0.2	0	0
entrance bell	1	0	0
contraction	0.35	0	0
		Total	0

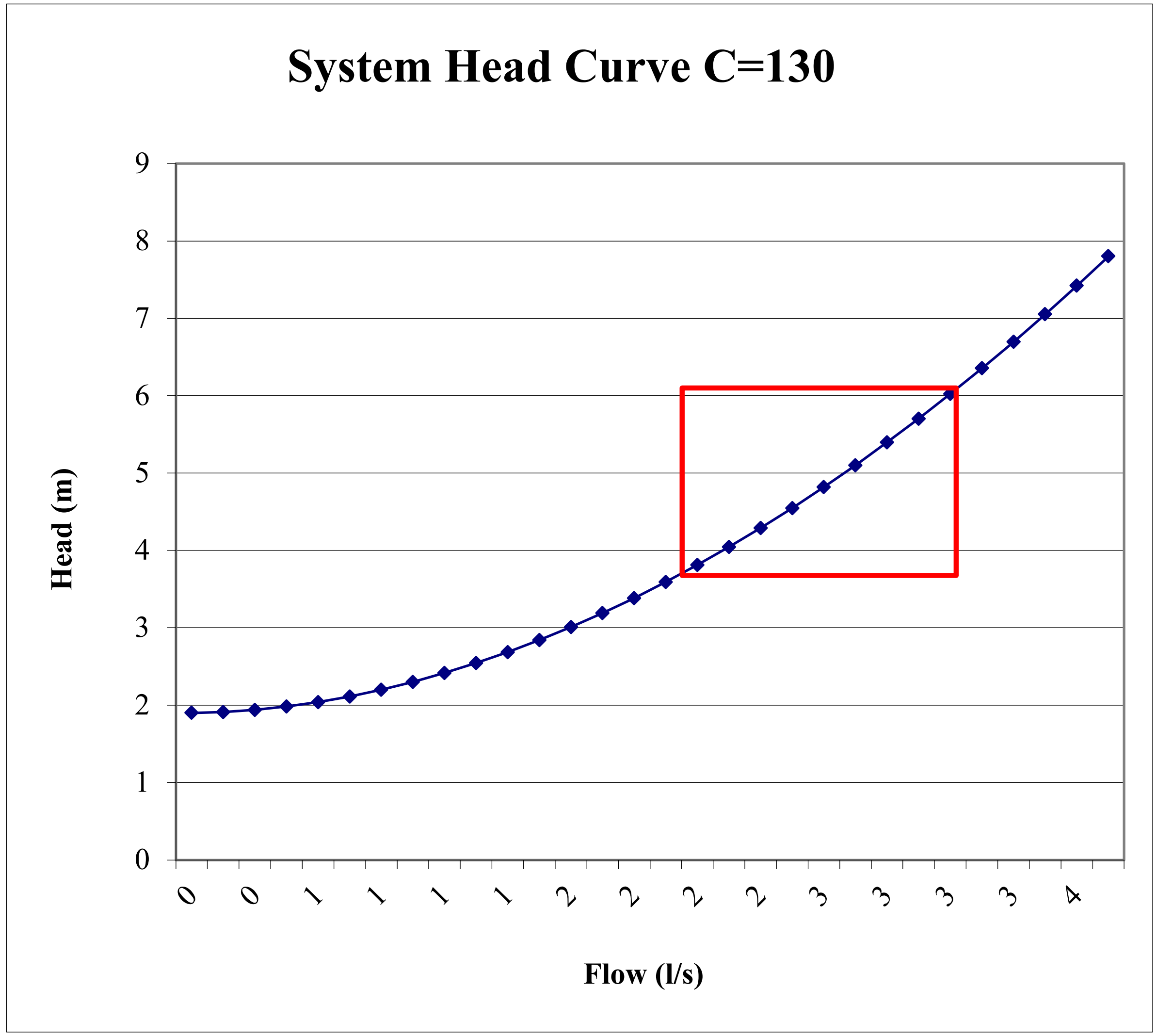
Ld = 68
Dd(id) = 0.05429
Vd = Q/A

Discharge	K Value	Unit	Sum
inlet	1	1	1
bend-90	0.9	2	1.8
flange	0.2	3	0.6
reducer	0.25	0	0
ball checkvalve	2	4	8
ball plug valve	0.6	2	1.2
tee	1.8	0	0
flow lateral (y)	0.15	0	0
bend-45	0.4	2	0.8
bend-22.5	0.25	0	0
bend-11.25	0.15	2	0.3
exit	1	1	1
		Total	14.7

214 HENRY ST Lot C FORCEMAIN HYDRAULIC ANALYSIS

SOLVE FOR PUMP HEAD H(tdh) = 1.90 + 129721.5 Q^1.85 + 139816.75 Q^2 + 0 Q^1.85 + 0 Q^2 m

Discharge			Pump Head		Pipe Velocity
US-gpm	l/s	m3/s	m	ft	m/s
0	0.00	0	1.90	6.23	0.00
2	0.13	1.26E-04	1.91	6.27	0.05
4	0.25	2.52E-04	1.94	6.36	0.11
6	0.38	3.79E-04	1.98	6.50	0.16
8	0.50	5.05E-04	2.04	6.69	0.22
10	0.63	6.31E-04	2.11	6.93	0.27
12	0.76	7.57E-04	2.20	7.21	0.33
14	0.88	8.83E-04	2.30	7.54	0.38
16	1.01	1.01E-03	2.41	7.92	0.44
18	1.14	1.14E-03	2.54	8.34	0.49
20	1.26	1.26E-03	2.68	8.81	0.55
22	1.39	1.39E-03	2.84	9.32	0.60
24	1.51	1.51E-03	3.01	9.87	0.65
26	1.64	1.64E-03	3.19	10.46	0.71
28	1.77	1.77E-03	3.38	11.10	0.76
30	1.89	1.89E-03	3.59	11.78	0.82
32	2.02	2.02E-03	3.81	12.50	0.87
34	2.15	2.15E-03	4.04	13.27	0.93
36	2.27	2.27E-03	4.29	14.07	0.98
38	2.40	2.40E-03	4.55	14.92	1.04
40	2.52	2.52E-03	4.82	15.80	1.09
42	2.65	2.65E-03	5.10	16.73	1.14
44	2.78	2.78E-03	5.39	17.70	1.20
46	2.90	2.90E-03	5.70	18.71	1.25
48	3.03	3.03E-03	6.02	19.76	1.31
50	3.15	3.15E-03	6.35	20.84	1.36
52	3.28	3.28E-03	6.70	21.97	1.42
54	3.41	3.41E-03	7.05	23.14	1.47
56	3.53	3.53E-03	7.42	24.35	1.53
58	3.66	3.66E-03	7.80	25.60	1.58



214 HENRY ST Lot C FORCEMAIN HYDRAULIC ANALYSIS

HYDRAULIC ANALYSIS OF PUMP STATION C=120

BERNOULLI'S EQUATION (reduced) H(tdh) = Hstatic + Hfs + Hfd + Hms + Hmd

WHERE:

Hfs = Friction Losses - suction, m
Hfd = Friction Losses - discharge, m
Hms = Minor Losses - suction, m
Hmd = Minor Losses - discharge, m
Hstatic = Total Static Head, m
H(tdh) = Total Dynamic Head, m

Ls = length of suction pipe, m
Ld = length of discharge, m
Ds = Diameter of suction pipe, m
Dd = Diameter of discharge pipe, m
Q = Pump Discharge, m3/s

C = Hazen-Williams Coefficient
= **120** (Low Level Condition)

Hf = 10.7*L*Q^1.85 / C^1.85 * D^4.87
Hm = K * V^2 / 2g

Datum	Pump Off	Discharge	Hstatic
133.40	130.70	132.60	1.90

Hfs = 10.7*L*Q^1.85 / C^1.85 * D^4.87
= 0 * Q^1.85

Hms = K * V^2 / 2g
= 0 * Q^2

Hfd = 10.7*L*Q^1.85 / C^1.85 * D^4.87
= 150425.6 * Q^1.85

Hmd = K * V^2 / 2g
= 139816.7 * Q^2

Ls = 0
Ds = 0
Vs = Q/A

Suction	K Value	Unit	Sum
bend-45	0.4	0	0
coupling	0.2	0	0
entrance bell	1	0	0
contraction	0.35	0	0
		Total	0

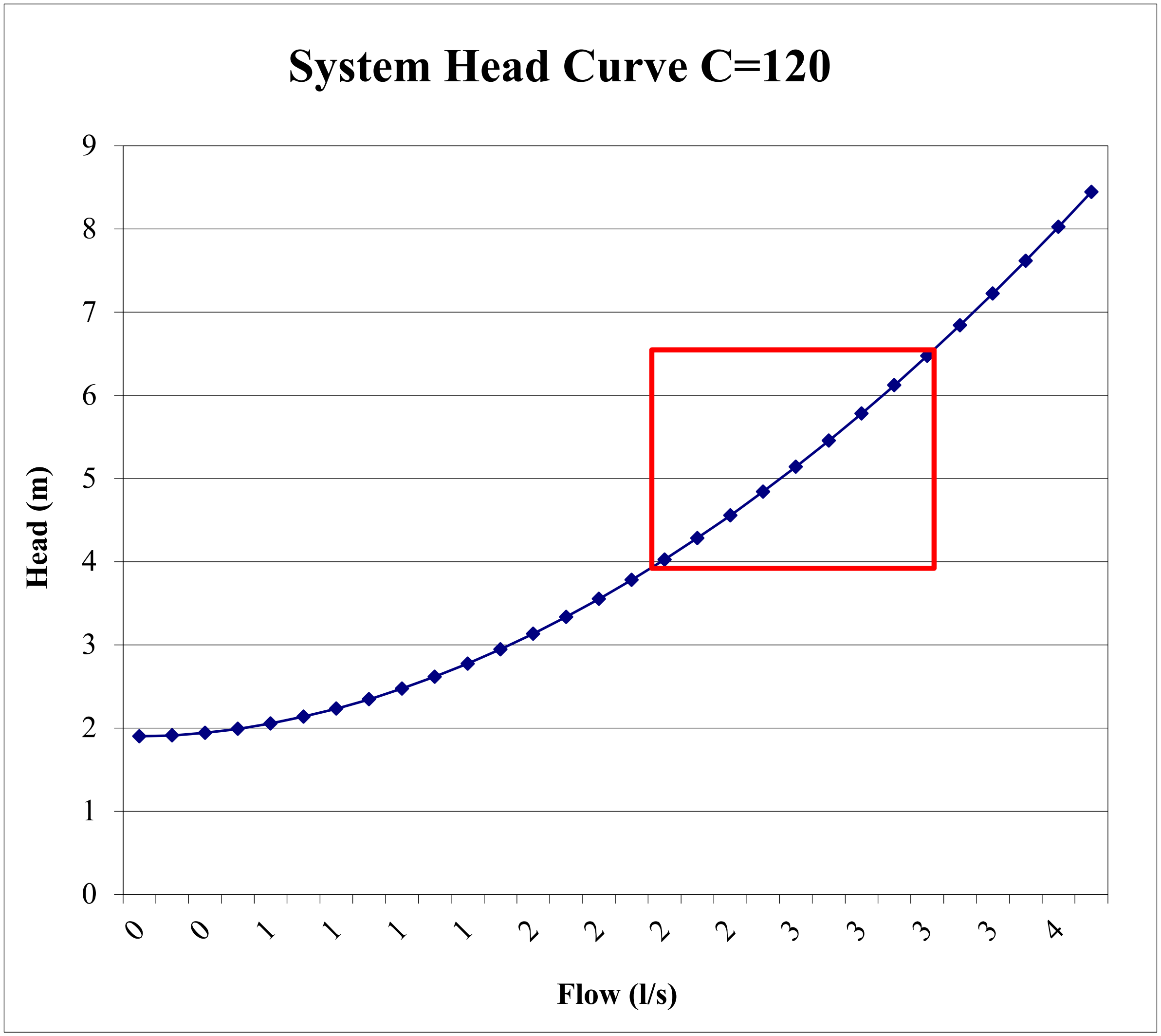
Ld = 68
Dd(id) = 0.05429
Vd = Q/A

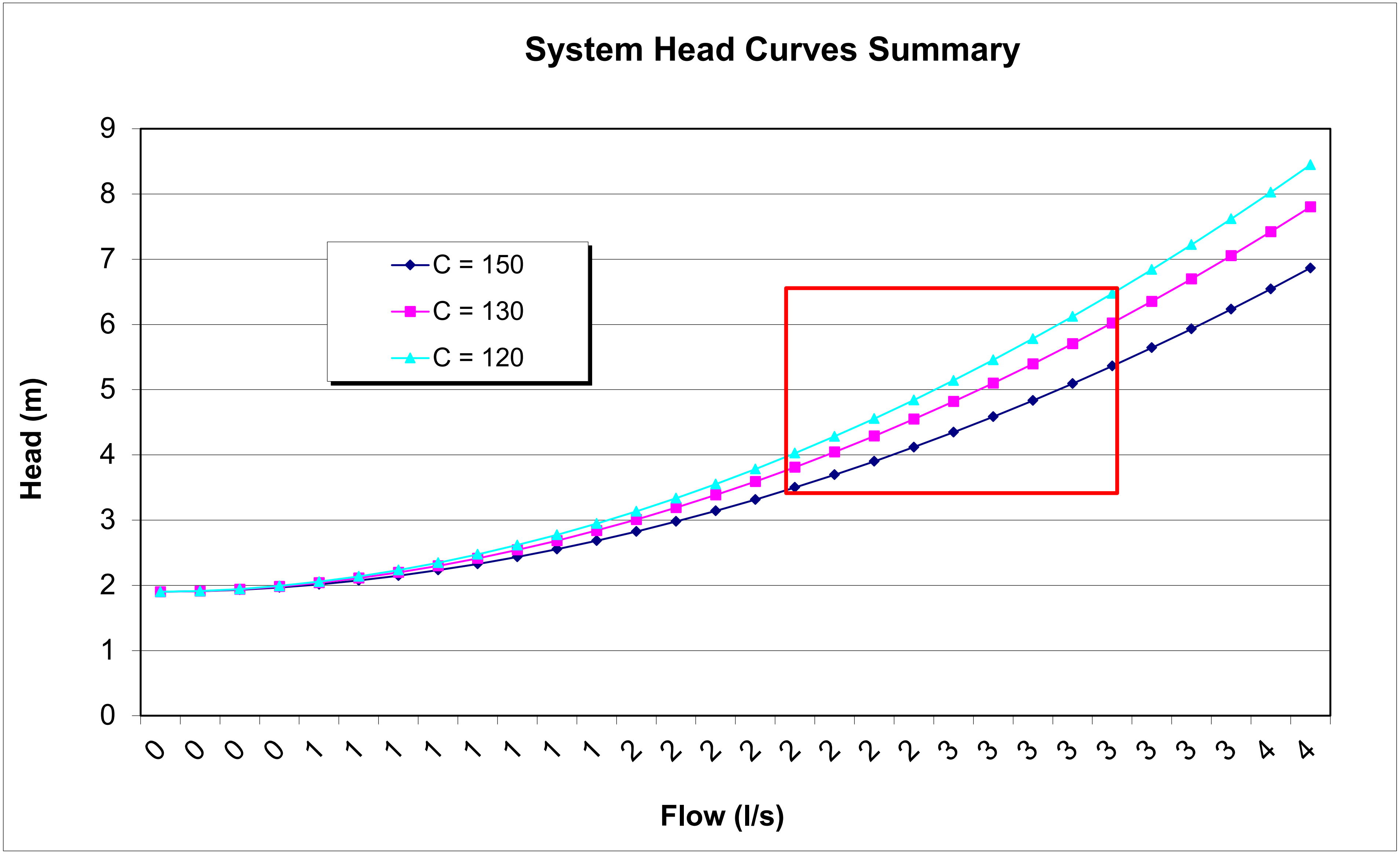
Discharge	K Value	Unit	Sum
inlet	1	1	1
bend-90	0.9	2	1.8
flange	0.2	3	0.6
reducer	0.25	0	0
ball checkvalve	2	4	8
ball plug valve	0.6	2	1.2
tee	1.8	0	0
flow lateral (y)	0.15	0	0
bend-45	0.4	2	0.8
bend-22.5	0.25	0	0
bend-11.25	0.15	2	0.3
exit	1	1	1
		Total	14.7

214 HENRY ST Lot C FORCEMAIN HYDRAULIC ANALYSIS

SOLVE FOR PUMP HEAD H(tdh) = 1.90 + 150425.6 Q^1.85 + 139816.75 Q^2 + 0 Q^1.85 + 0 Q^2 m

Discharge			Pump Head		Pipe Velocity
US-gpm	l/s	m3/s	m	ft	m/s
0	0.00	0	1.90	6.23	0.00
2	0.13	1.26E-04	1.91	6.27	0.05
4	0.25	2.52E-04	1.94	6.37	0.11
6	0.38	3.79E-04	1.99	6.53	0.16
8	0.50	5.05E-04	2.06	6.74	0.22
10	0.63	6.31E-04	2.14	7.01	0.27
12	0.76	7.57E-04	2.23	7.33	0.33
14	0.88	8.83E-04	2.35	7.70	0.38
16	1.01	1.01E-03	2.47	8.12	0.44
18	1.14	1.14E-03	2.62	8.59	0.49
20	1.26	1.26E-03	2.77	9.10	0.55
22	1.39	1.39E-03	2.95	9.67	0.60
24	1.51	1.51E-03	3.13	10.28	0.65
26	1.64	1.64E-03	3.34	10.94	0.71
28	1.77	1.77E-03	3.55	11.65	0.76
30	1.89	1.89E-03	3.78	12.40	0.82
32	2.02	2.02E-03	4.03	13.21	0.87
34	2.15	2.15E-03	4.28	14.05	0.93
36	2.27	2.27E-03	4.56	14.94	0.98
38	2.40	2.40E-03	4.84	15.88	1.04
40	2.52	2.52E-03	5.14	16.86	1.09
42	2.65	2.65E-03	5.45	17.89	1.14
44	2.78	2.78E-03	5.78	18.96	1.20
46	2.90	2.90E-03	6.12	20.08	1.25
48	3.03	3.03E-03	6.47	21.24	1.31
50	3.15	3.15E-03	6.84	22.45	1.36
52	3.28	3.28E-03	7.22	23.70	1.42
54	3.41	3.41E-03	7.62	24.99	1.47
56	3.53	3.53E-03	8.02	26.33	1.53
58	3.66	3.66E-03	8.45	27.71	1.58





System Head Curves Summary
Head (m)
9
8
7
6
5
4
3
2
1
0
C = 150
C = 130
C = 120
0 0 0 0 1 1 1 1 1 1 1 1 2 2 2 2 2 2 2 2 3 3 3 3 3 3 3 3 4 4
Flow (l/s)

214 Henry Street

Lot D

Proposed Sanitary Flow Into the Pumpstation (From Sanitary Sewer Design Sheet) — Q_{in} = 0.01 l/s — Note: Excludes 'M' Peaking Factor

Q_{out}/Q_{in} = 163.4815516

Proposed Sanitary Flow Out Of the Pumpstation (Hydraulic Analysis/Pump Curve) — Q_{out} = 2.00 l/s — Note: From Forcemain Hydraulics Tab; 0.6 m/s design flow rate

From the MOE Sewage Design Guidelines 2008

$Volume_{min}$ = 0.0122338 l/s x 1.5 = 0.01835 L (min)

Volume = DA = $\frac{D\prod d^2}{4}$

Therefore, $D_{effective} = \frac{4V}{\prod d^2}$ — where d = diameter of Wet Well; d = 0.9 m

$D_{effective} = \frac{0.073402778}{2.827433388\ m}$

$D_{effective}$ = 0.0260 m * — Use 0.050m

Invert Elevation of Gravity Sanitary Main from Subdivision = 131.1 m — USF = 131.15 m

(Pump-on to be 0.35 m below sanitary invert)

Pump-on = 130.75 m — Pump-Off = Pump-On - $D_{effective}$ = 130.70 m

And, 0.0122338 l/s = 1.2E-05 cms x 86,400 s/day = 1.057 m3/day

Therefore, time to fill the station = $\frac{V}{Q_{in}}$ = $\frac{0.02\ m3}{1.22E\text{-}05\ cms}$ x $\frac{1\ min}{60\ s}$ = 25 min

Low Level Alarm minimum = 0.3 m from the bottom of the wet well

Therefore, the minimum bottom of station = 130.70 m - 0.3 m = 130.40 m

But, provide a storage buffer of: 0 m and a depth buffer of: 0.00 m to increase retention time

Therefore,

Bottom of Wet Well =	**130.40 m**
Pump-off =	**130.70 m**
Pump-on =	**130.75 m**
$D_{effective}$ =	**0.05 m**
Ground Surface =	**133.45 m**
Top of Wet Well =	**133.40 m**
Total Depth	**3.00 m**
Gravity Main Invert =	**131.10 m**
Gravity Main Diameter =	**100 mm**
Forcemain Discharge Invert =	**132.60 m**
Forcemain Diameter =	**50 mm**
Static Head =	**1.90 m**
Pump Starts (Total) / Hour =	**1.4**

Basin Selection:
Zoeller QLS Series
36" x 120"

Max bottom of wet well	131.01
Min Elev for Sanitary Conr	131.71
FFE (approx)	134.36

Volume = DA = $\frac{D\prod d^2}{4}$

Volume = $\frac{2.16 \times \prod \times 3.6^2}{4}$

Volume = **0.03 m^3**

# of Pumps: 1

Pump Cycle Time = 43.60 Mins/Cycle

Therefore, $\frac{1\ m3/day}{0.03\ m3}$ = 33 times per day the pumpstation starts

Residence Time = $\frac{V}{Q_{in}}$ = $\frac{0.03}{1.2E\text{-}05\ cms}$ x $\frac{1\ min}{60\ s}$ = 43.33 min

Pump Time = $\frac{V}{Q_{out}}$ = $\frac{0.03}{0.002\ cms}$ x $\frac{1\ min}{60\ s}$ = 0.27 min

Pump Cycle Time = Residence + Pump = 43.33 min + 0.27 min = 43.60 min

214 HENRY ST - Lot D FORCEMAIN HYDRAULIC ANALYSIS

HYDRAULIC ANALYSIS OF PUMP STATION C=150

BERNOULLI'S EQUATION (reduced) H(tdh) = Hstatic + Hfs + Hfd + Hms + Hmd

WHERE:

Hfs = Friction Losses - suction, m
Hfd = Friction Losses - discharge, m
Hms = Minor Losses - suction, m
Hmd = Minor Losses - discharge, m
Hstatic = Total Static Head, m
H(tdh) = Total Dynamic Head, m

Ls = length of suction pipe, m
Ld = length of discharge, m
Ds = Diameter of suction pipe, m
Dd = Diameter of discharge pipe, m
Q = Pump Discharge, m3/s

C = Hazen-Williams Coefficient
= **150** (Overflow Condition)

Hf = 10.7*L*Q^1.85 / C^1.85 * D^4.87
Hm = K * V^2 / 2g

Datum	Pump Off	Discharge	Hstatic
133.40	130.70	132.60	1.90

Hfs = 10.7*L*Q^1.85 / C^1.85 * D^4.87
= 0 * Q^1.85

Hms = K * V^2 / 2g
= 0 * Q^2

Hfd = 10.7*L*Q^1.85 / C^1.85 * D^4.87
= 111261 * Q^1.85

Hmd = K * V^2 / 2g
= 139816.7 * Q^2

Ls = 0
Ds = 0
Vs = Q/A

Suction	K Value	Unit	Sum
bend-45	0.4	0	0
coupling	0.2	0	0
entrance bell	1	0	0
contraction	0.35	0	0
		Total	0

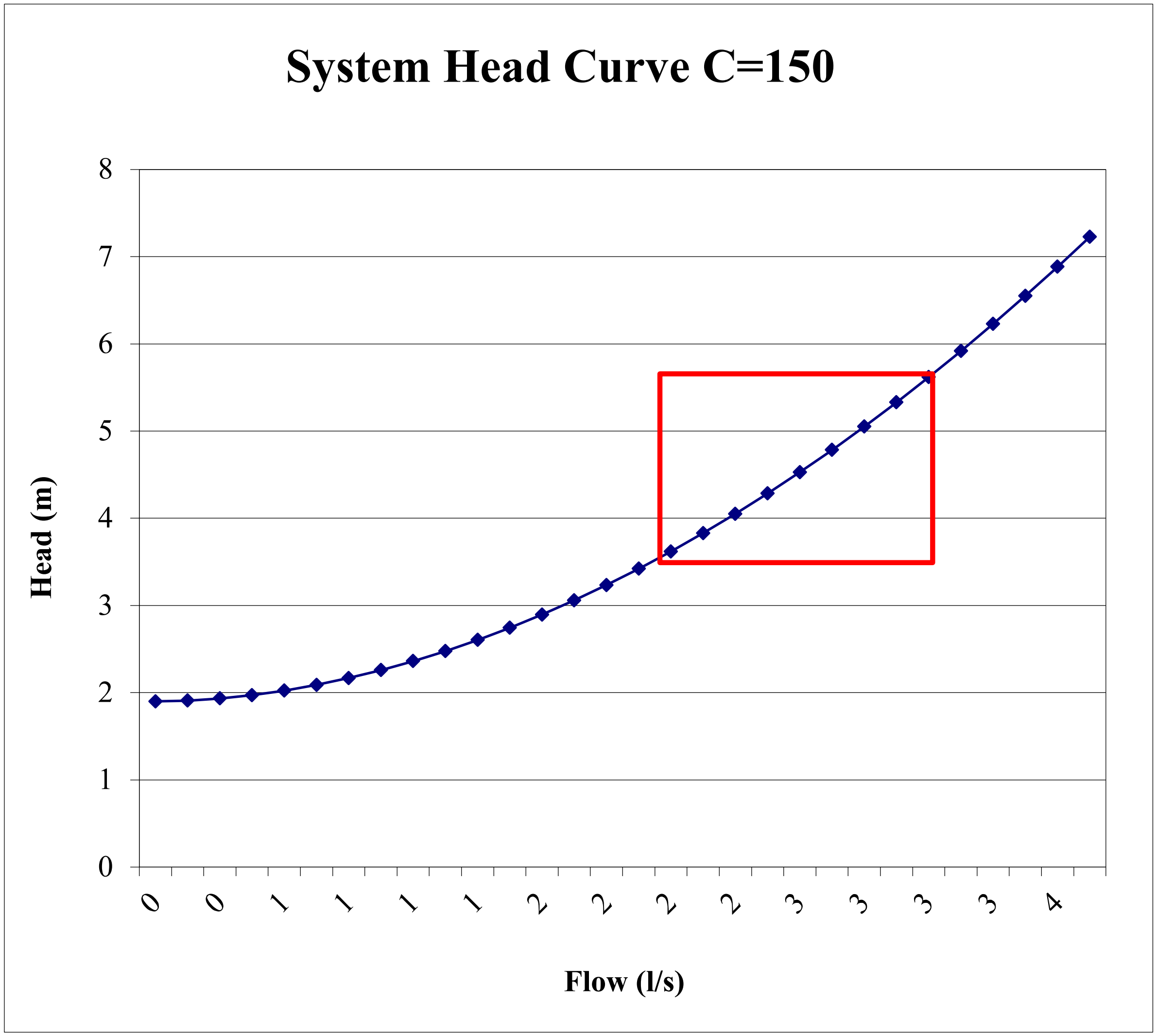
Ld = 76
PVC Dd(id) = 0.05429
Vd = Q/A

Discharge	K Value	Unit	Sum
inlet	1	1	1
bend-90	0.9	2	1.8
flange	0.2	3	0.6
reducer	0.25	0	0
ball checkvalve	2	4	8
ball plug valve	0.6	2	1.2
tee	1.8	0	0
flow lateral (y)	0.15	0	0
bend-45	0.4	2	0.8
bend-22.5	0.25	0	0
bend-11.25	0.15	2	0.3
exit	1	1	1
		Total	14.7

214 HENRY ST - Lot D FORCEMAIN HYDRAULIC ANALYSIS

SOLVE FOR PUMP HEAD H(tdh) = 1.90 + 111261 Q^1.85 + 139816.75 Q^2 + 0 Q^1.85 + 0 Q^2 m

Discharge			Pump Head		Pipe Velocity
US-gpm	l/s	m3/s	m	ft	m/s
0	0.00	0	1.90	6.23	0.00
2	0.13	1.26E-04	1.91	6.26	0.05
4	0.25	2.52E-04	1.93	6.34	0.11
6	0.38	3.79E-04	1.97	6.47	0.16
8	0.50	5.05E-04	2.02	6.64	0.22
10	0.63	6.31E-04	2.09	6.85	0.27
12	0.76	7.57E-04	2.17	7.11	0.33
14	0.88	8.83E-04	2.26	7.41	0.38
16	1.01	1.01E-03	2.36	7.75	0.44
18	1.14	1.14E-03	2.48	8.13	0.49
20	1.26	1.26E-03	2.60	8.55	0.55
22	1.39	1.39E-03	2.74	9.00	0.60
24	1.51	1.51E-03	2.90	9.50	0.65
26	1.64	1.64E-03	3.06	10.04	0.71
28	1.77	1.77E-03	3.23	10.61	0.76
30	1.89	1.89E-03	3.42	11.23	0.82
32	2.02	2.02E-03	3.62	11.88	0.87
34	2.15	2.15E-03	3.83	12.57	0.93
36	2.27	2.27E-03	4.05	13.29	0.98
38	2.40	2.40E-03	4.28	14.06	1.04
40	2.52	2.52E-03	4.53	14.86	1.09
42	2.65	2.65E-03	4.78	15.70	1.14
44	2.78	2.78E-03	5.05	16.57	1.20
46	2.90	2.90E-03	5.33	17.48	1.25
48	3.03	3.03E-03	5.62	18.43	1.31
50	3.15	3.15E-03	5.92	19.42	1.36
52	3.28	3.28E-03	6.23	20.44	1.42
54	3.41	3.41E-03	6.55	21.49	1.47
56	3.53	3.53E-03	6.88	22.59	1.53
58	3.66	3.66E-03	7.23	23.72	1.58



214 HENRY ST - Lot D FORCEMAIN HYDRAULIC ANALYSIS

HYDRAULIC ANALYSIS OF PUMP STATION C=130

BERNOULLI'S EQUATION (reduced)   H(tdh) = Hstatic + Hfs + Hfd + Hms + Hmd

WHERE:

Hfs = Friction Losses - suction, m
Hfd = Friction Losses - discharge, m
Hms = Minor Losses - suction, m
Hmd = Minor Losses - discharge, m
Hstatic = Total Static Head, m
H(tdh) = Total Dynamic Head, m

Ls = length of suction pipe, m
Ld = length of discharge, m
Ds = Diameter of suction pipe, m
Dd = Diameter of discharge pipe, m
Q = Pump Discharge, m3/s

C = Hazen-Williams Coefficient
= **130** (Normal Operations)

Hf = 10.7*L*Q^1.85 / C^1.85 * D^4.87
Hm = K * V^2 / 2g

Datum	Pump Off	Discharge	Hstatic
133.40	130.70	132.60	1.90

Hfs = 10.7*L*Q^1.85 / C^1.85 * D^4.87
= 0 * Q^1.85

Hms = K * V^2 / 2g
= 0 * Q^2

Hfd = 10.7*L*Q^1.85 / C^1.85 * D^4.87
= 144982.8 * Q^1.85

Hmd = K * V^2 / 2g
= 139816.7 * Q^2

Ls = 0
Ds = 0
Vs = Q/A

Suction	K Value	Unit	Sum
bend-45	0.4	0	0
coupling	0.2	0	0
entrance bell	1	0	0
contraction	0.35	0	0
		Total	0

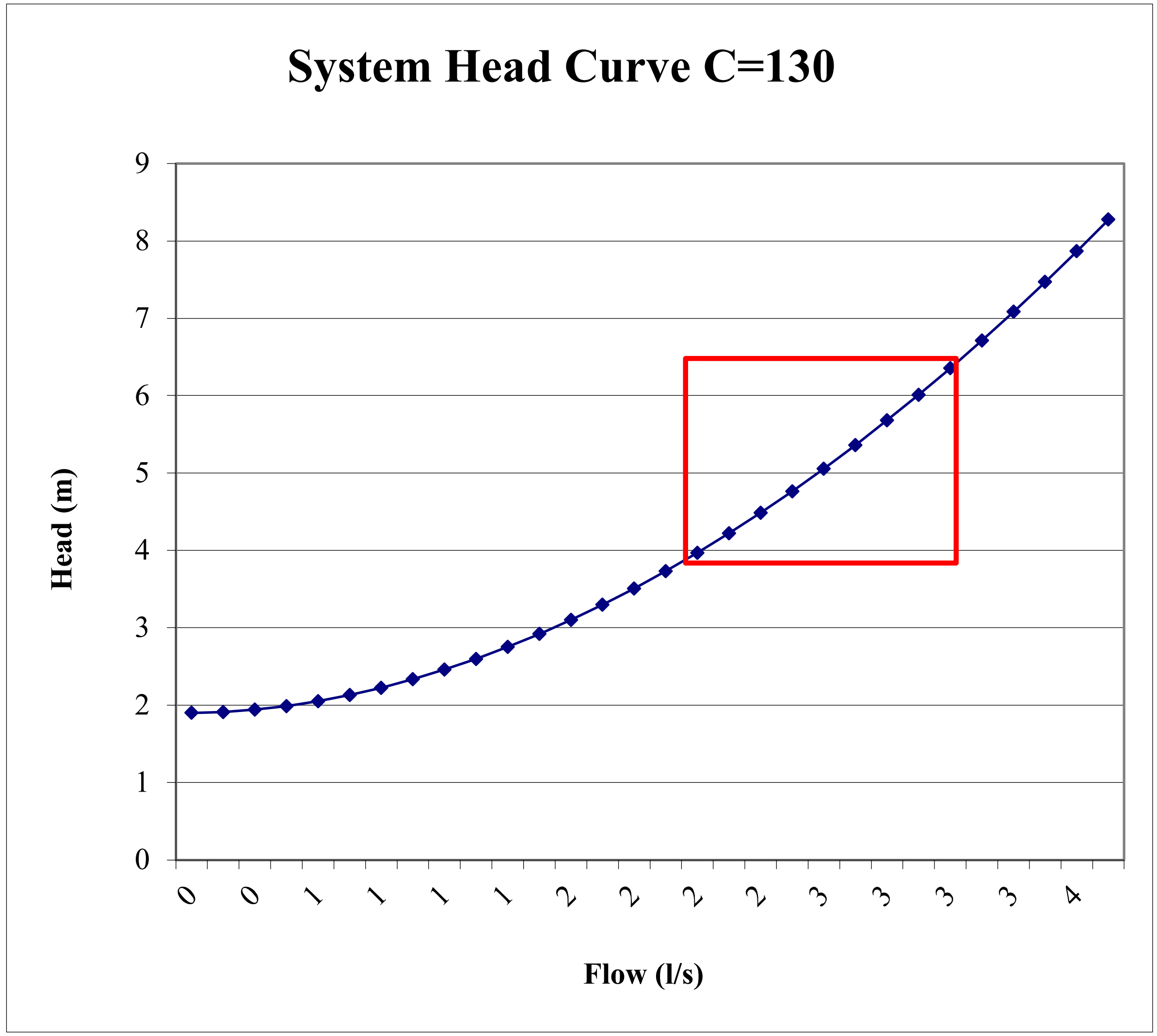
Ld = 76
Dd(id) = 0.05429
Vd = Q/A

Discharge	K Value	Unit	Sum
inlet	1	1	1
bend-90	0.9	2	1.8
flange	0.2	3	0.6
reducer	0.25	0	0
ball checkvalve	2	4	8
ball plug valve	0.6	2	1.2
tee	1.8	0	0
flow lateral (y)	0.15	0	0
bend-45	0.4	2	0.8
bend-22.5	0.25	0	0
bend-11.25	0.15	2	0.3
exit	1	1	1
		Total	14.7

214 HENRY ST - Lot D FORCEMAIN HYDRAULIC ANALYSIS

SOLVE FOR PUMP HEAD H(tdh) = 1.90 + 144982.8 Q^1.85 + 139816.75 Q^2 + 0 Q^1.85 + 0 Q^2 m

Discharge			Pump Head		Pipe Velocity
US-gpm	l/s	m3/s	m	ft	m/s
0	0.00	0	1.90	6.23	0.00
2	0.13	1.26E-04	1.91	6.27	0.05
4	0.25	2.52E-04	1.94	6.37	0.11
6	0.38	3.79E-04	1.99	6.52	0.16
8	0.50	5.05E-04	2.05	6.73	0.22
10	0.63	6.31E-04	2.13	6.99	0.27
12	0.76	7.57E-04	2.22	7.30	0.33
14	0.88	8.83E-04	2.33	7.66	0.38
16	1.01	1.01E-03	2.46	8.07	0.44
18	1.14	1.14E-03	2.60	8.52	0.49
20	1.26	1.26E-03	2.75	9.03	0.55
22	1.39	1.39E-03	2.92	9.58	0.60
24	1.51	1.51E-03	3.10	10.17	0.65
26	1.64	1.64E-03	3.30	10.82	0.71
28	1.77	1.77E-03	3.51	11.51	0.76
30	1.89	1.89E-03	3.73	12.24	0.82
32	2.02	2.02E-03	3.97	13.02	0.87
34	2.15	2.15E-03	4.22	13.85	0.93
36	2.27	2.27E-03	4.49	14.71	0.98
38	2.40	2.40E-03	4.76	15.63	1.04
40	2.52	2.52E-03	5.06	16.59	1.09
42	2.65	2.65E-03	5.36	17.59	1.14
44	2.78	2.78E-03	5.68	18.63	1.20
46	2.90	2.90E-03	6.01	19.72	1.25
48	3.03	3.03E-03	6.36	20.85	1.31
50	3.15	3.15E-03	6.71	22.03	1.36
52	3.28	3.28E-03	7.08	23.24	1.42
54	3.41	3.41E-03	7.47	24.50	1.47
56	3.53	3.53E-03	7.87	25.81	1.53
58	3.66	3.66E-03	8.28	27.15	1.58



214 HENRY ST - Lot D FORCEMAIN HYDRAULIC ANALYSIS

HYDRAULIC ANALYSIS OF PUMP STATION C=120

BERNOULLI'S EQUATION (reduced) H(tdh) = Hstatic + Hfs + Hfd + Hms + Hmd

WHERE:

Hfs = Friction Losses - suction, m
Hfd = Friction Losses - discharge, m
Hms = Minor Losses - suction, m
Hmd = Minor Losses - discharge, m
Hstatic = Total Static Head, m
H(tdh) = Total Dynamic Head, m

Ls = length of suction pipe, m
Ld = length of discharge, m
Ds = Diameter of suction pipe, m
Dd = Diameter of discharge pipe, m
Q = Pump Discharge, m3/s

C = Hazen-Williams Coefficient
= **120** (Low Level Condition)

Hf = 10.7*L*Q^1.85 / C^1.85 * D^4.87
Hm = K * V^2 / 2g

Datum	Pump Off	Discharge	Hstatic
133.40	130.70	132.60	1.90

Hfs = 10.7*L*Q^1.85 / C^1.85 * D^4.87
= 0 * Q^1.85

Hms = K * V^2 / 2g
= 0 * Q^2

Hfd = 10.7*L*Q^1.85 / C^1.85 * D^4.87
= 168122.7 * Q^1.85

Hmd = K * V^2 / 2g
= 139816.7 * Q^2

Ls = 0
Ds = 0
Vs = Q/A

Suction	K Value	Unit	Sum
bend-45	0.4	0	0
coupling	0.2	0	0
entrance bell	1	0	0
contraction	0.35	0	0
		Total	0

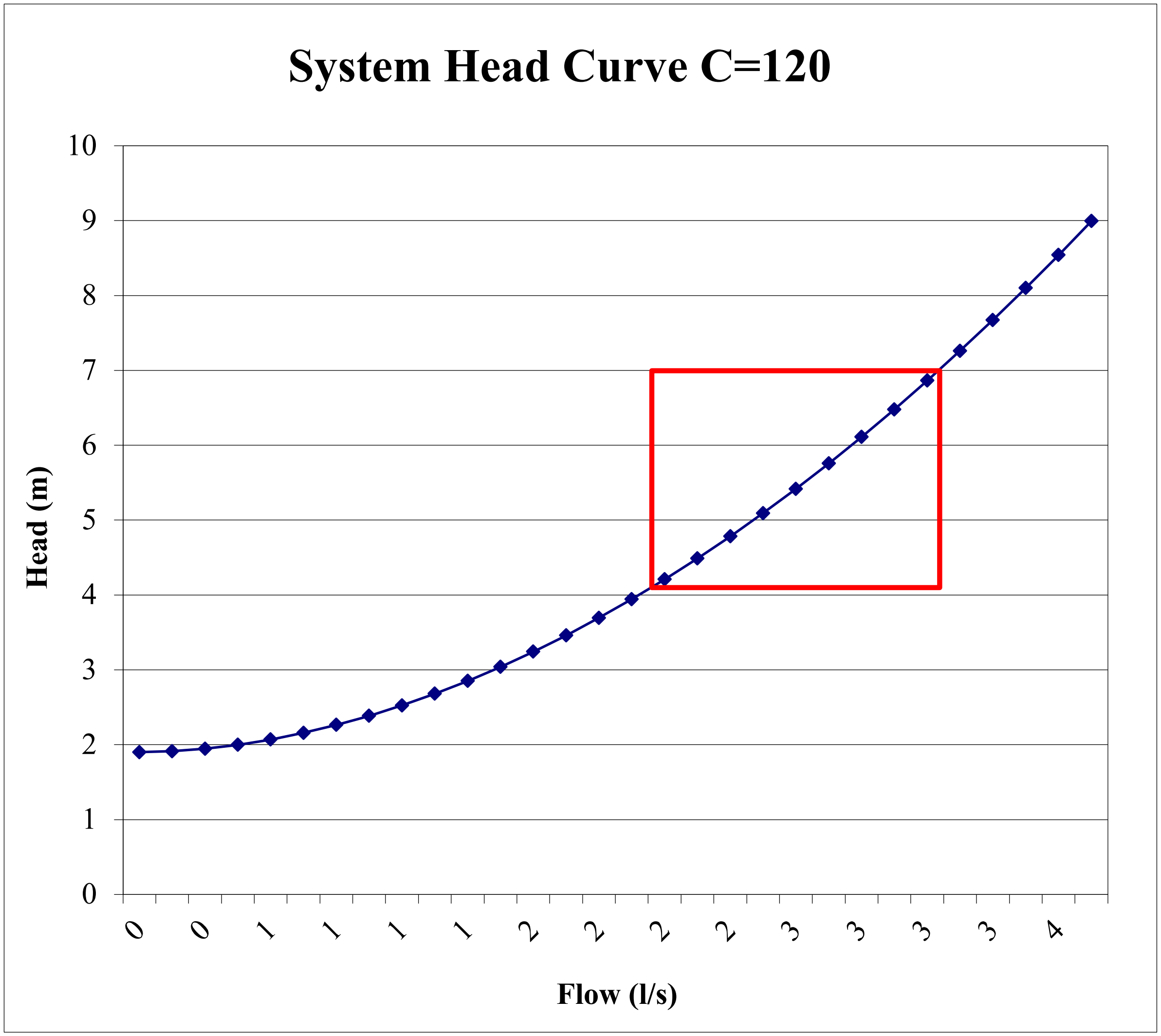
Ld = 76
Dd(id) = 0.05429
Vd = Q/A

Discharge	K Value	Unit	Sum
inlet	1	1	1
bend-90	0.9	2	1.8
flange	0.2	3	0.6
reducer	0.25	0	0
ball checkvalve	2	4	8
ball plug valve	0.6	2	1.2
tee	1.8	0	0
flow lateral (y)	0.15	0	0
bend-45	0.4	2	0.8
bend-22.5	0.25	0	0
bend-11.25	0.15	2	0.3
exit	1	1	1
		Total	14.7

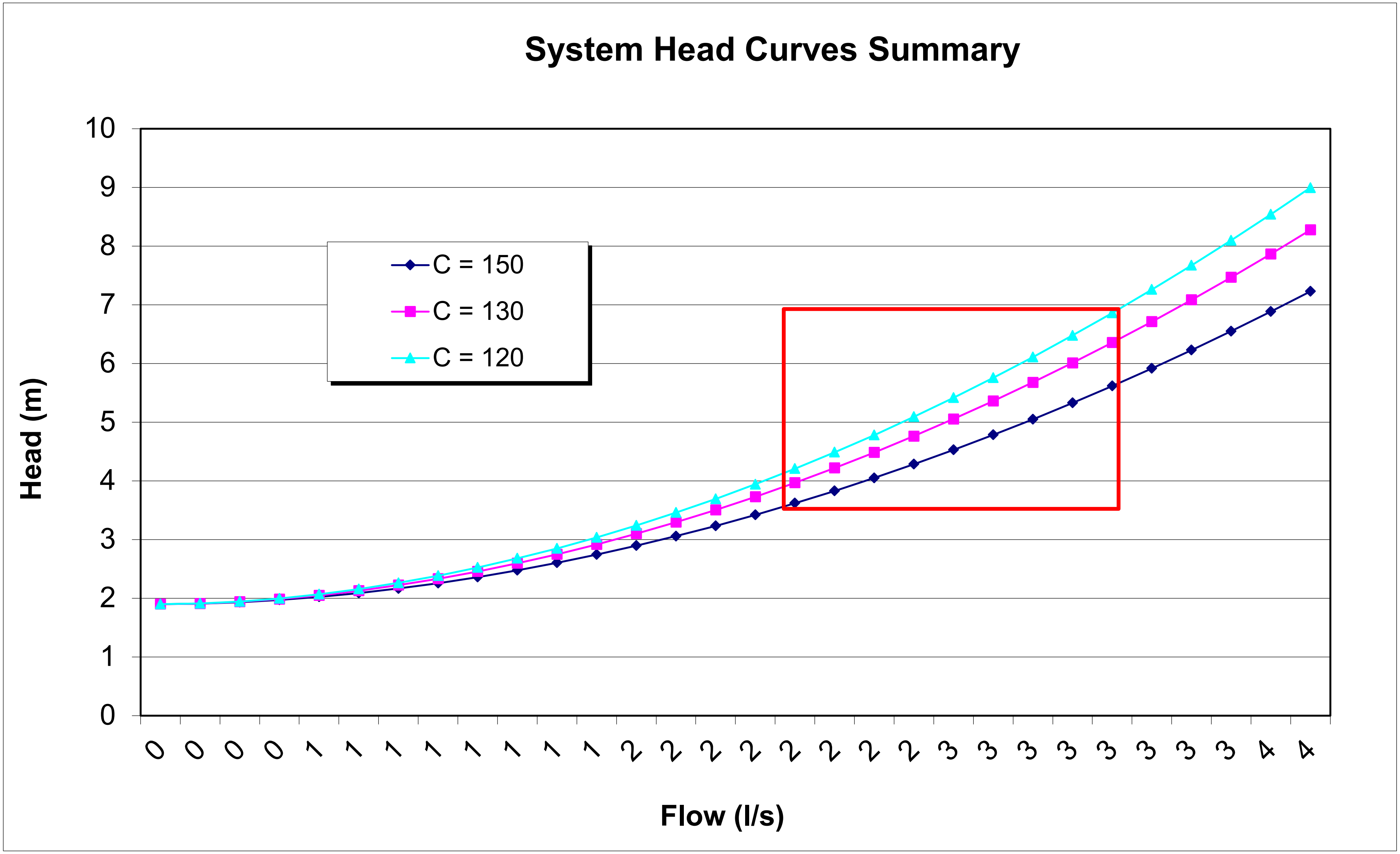
214 HENRY ST - Lot D FORCEMAIN HYDRAULIC ANALYSIS

SOLVE FOR PUMP HEAD H(tdh) = 1.90 + 168122.7 Q^1.85 + 139816.75 Q^2 + 0 Q^1.85 + 0 Q^2 m

Discharge			Pump Head		Pipe Velocity
US-gpm	l/s	m3/s	m	ft	m/s
0	0.00	0	1.90	6.23	0.00
2	0.13	1.26E-04	1.91	6.27	0.05
4	0.25	2.52E-04	1.95	6.38	0.11
6	0.38	3.79E-04	2.00	6.56	0.16
8	0.50	5.05E-04	2.07	6.79	0.22
10	0.63	6.31E-04	2.16	7.08	0.27
12	0.76	7.57E-04	2.26	7.43	0.33
14	0.88	8.83E-04	2.39	7.83	0.38
16	1.01	1.01E-03	2.52	8.28	0.44
18	1.14	1.14E-03	2.68	8.79	0.49
20	1.26	1.26E-03	2.85	9.35	0.55
22	1.39	1.39E-03	3.04	9.97	0.60
24	1.51	1.51E-03	3.24	10.63	0.65
26	1.64	1.64E-03	3.46	11.35	0.71
28	1.77	1.77E-03	3.69	12.12	0.76
30	1.89	1.89E-03	3.94	12.94	0.82
32	2.02	2.02E-03	4.21	13.81	0.87
34	2.15	2.15E-03	4.49	14.72	0.93
36	2.27	2.27E-03	4.78	15.69	0.98
38	2.40	2.40E-03	5.09	16.71	1.04
40	2.52	2.52E-03	5.42	17.77	1.09
42	2.65	2.65E-03	5.76	18.89	1.14
44	2.78	2.78E-03	6.11	20.05	1.20
46	2.90	2.90E-03	6.48	21.26	1.25
48	3.03	3.03E-03	6.86	22.51	1.31
50	3.15	3.15E-03	7.26	23.82	1.36
52	3.28	3.28E-03	7.67	25.17	1.42
54	3.41	3.41E-03	8.10	26.57	1.47
56	3.53	3.53E-03	8.54	28.02	1.53
58	3.66	3.66E-03	8.99	29.51	1.58



214 HENRY ST - Lot D FORCEMAIN HYDRAULIC ANALYSIS



214 HENRY STREET

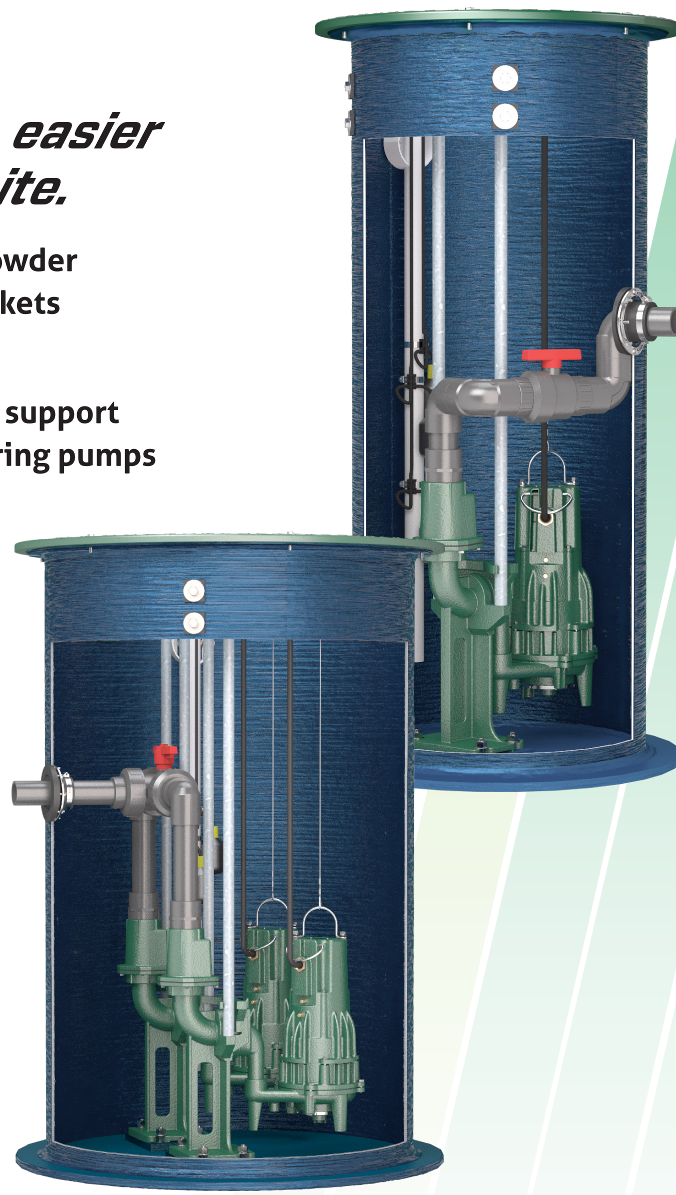
APPENDIX C

QLS Series®

Prefabricated Lift Stations With Z-Rail® Technology

ZOELLER® PUMP COMPANY

Complete lift station packages are factory assembled for quicker, easier installation at the jobsite.



Zoeller's Z-Rail® Technology with powder coated, ductile iron elbows and brackets provides longer life and reliability.

Dual guiderail system offers greater support and stability while raising and lowering pumps compared with single rail systems.

A wide variety of basin diameters and depths are stocked to accommodate almost any job.

Cover choices include solid fiberglass and either steel or aluminum hatches.

Built for grinders, effluent, or sewage pumps!

Don't see what you need? Custom systems with Z-Rail® Technology are available.
Contact our experts at zcotechnical@zoeller.com

QLS Series™

Prefabricated Lift Stations With Z-Rail® Technology

SHARK Series *Grinder Pumps*

Built With The Contractor In Mind

Pumps:

- Zoeller commercial effluent, sewage, and Shark® grinder pumps, 1/2 - 2 HP
- Durable, Class 30, cast iron construction
- Corrosion-resistant, powder coated epoxy finish
- Oil-filled, hermetically-sealed motor with thermal overload protection and integral cooling fins
- Upper and lower bearings provide smooth operation and durability in the harshest environments
- 440C stainless steel cutter and disc hardened to Rockwell C50-60 for long lasting dependability with Zoeller Tri-Slice® cutter technology on grinder pumps
- Non-clogging vortex impellers on centrifugal units for reliability
- Stainless steel lifting handle, screws, and bolts

100% FACTORY TESTED

Grinder models 810, 815

Grinder models 818, 819, 820

Grinder models 840, 841, 842

Models 282 - 295 for sewage

Models 161 - 191 for effluent

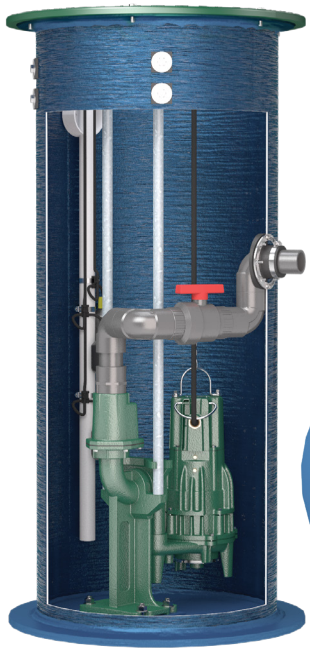
Control Panel: Zoeller will make sure the panel you receive is exactly what you need for the pump you have selected. We have you covered.

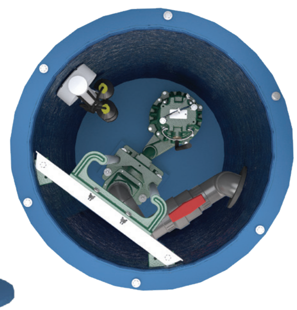
Features include:

- Simplex and duplex operation
- NEMA 4X watertight enclosure
- Green pump run pilot light for each pump
- High water alarm (audible horn and visual red beacon)
- Auxiliary dry contact
- Magnetic starter for each pump
  - Alternating feature for duplex systems
  - Numbered terminal strip for connecting pumps and variable level float switches
  - 840 panel comes standard with start components and auto-reversing feature

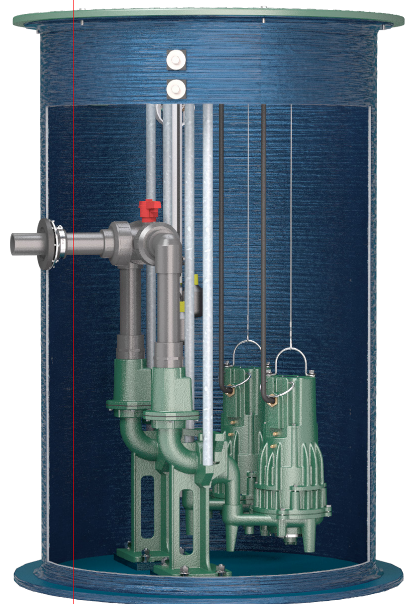
Float Tree: Factory mounted in the basin. The required float switches are pre-set at elevations suitable for most installations and rarely require adjustment. The tree is pre-mounted on a support bracket for ease and convenience during float maintenance.

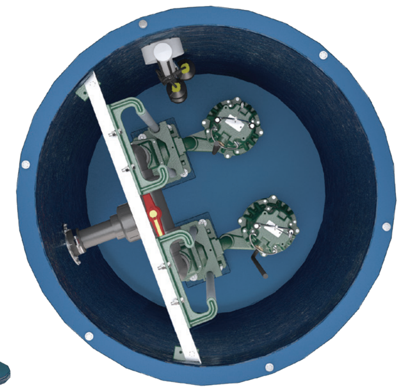
What Sets **QLS Series™** *Lift Stations With Z-Rail® Technology Apart?*





Simplex System



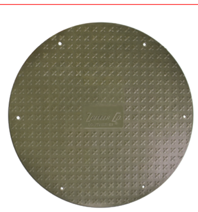


Duplex System

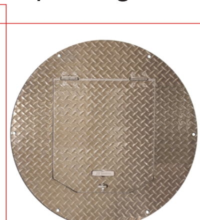
QLS Series™ systems are prefabricated including all piping and rail system components.

Z-Rail® System: Both the disconnect portion and the upper guide rail supports are made of domestic epoxy powder coated ductile iron, providing superior strength. Dual guide rails add stability, ensuring that the pump will not spin on the rail during installation or removal.

Basin: Zoeller Company stocks many different basin and cover options to fit a multitude of wastewater collection projects. Basin sizes from 24″ x 48″ to 48″ x 120″ meet most application needs. Customized packages available.



Fiberglass



Aluminum Hatch

Steel Hatch

Basin Cover: Solid fiberglass, aluminum hatch, and steel hatch covers are stocked for QLS Series™ packages.

Three Way Ball Valve: The QLS Series™ systems utilize a 3-way ball valve in duplex configurations. The valve is positioned so that the service providers can easily isolate pumps without entering the basin.

Pipe Seal Hub: A 4″ pipe seal is provided as a convenient field-installed inlet hub.

AFD: QLS Series™ basins come with an anti-floatation collar to resist bouyancy in high groundwater locations.

Flex-Boot Discharge: Connection: A flexible, stable discharge seal remains watertight despite external pressures due to pipe settling.

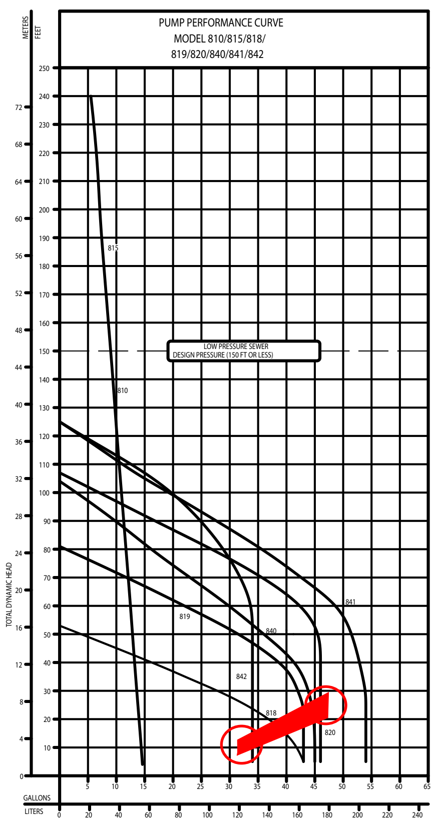
Schedule 80 PVC Piping: Schedule 80 PVC discharge piping provides greater support and dependability with its thicker walls and higher pressure rating.

QLS Pump Selection Chart

Table 2: Available Power Codes by Pump Model

	Grinder Pumps								Effluent Pumps w/ 3/4"solids passing*								Sewage Pumps w/ 2"solids passing					
	810	815	818	819	820	840	841	842	161	163	165	185	186	188	189	191*	282	284	292	293	294	295
N 115V, 1PH			X						X	X							X	X	X			
E 230V, 1PH	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
I 200-208V, 1PH			X	X	X	X	X	X	X	X	X	X	X	X	X		X	X	X	X	X	X
J 200-208V, 3PH			X	X	X	X	X	X	X	X	X	X	X	X	X		X	X	X	X	X	X
F 230V, 3PH			X	X	X	X	X	X	X	X	X	X	X	X	X		X	X	X	X	X	X
G 460V, 3PH			X	X	X	X	X	X	X	X	X	X	X	X	X		X	X	X	X	X	X
Discharge Pipe Size	1-1/4"	1-1/4"	2"	2"	2"	2"	2"	2"	2"	2"	2"	2"	2"	2"	2"	2"	2"	2"	2"	2"	2"	2"

* Model 191 passes 5/8" solids



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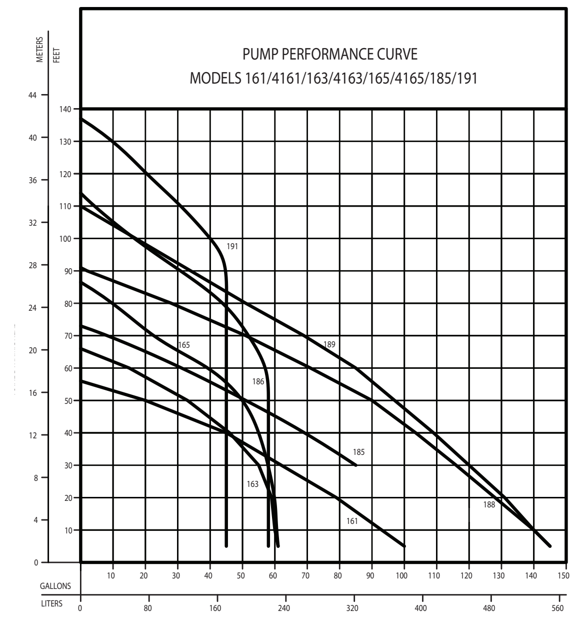

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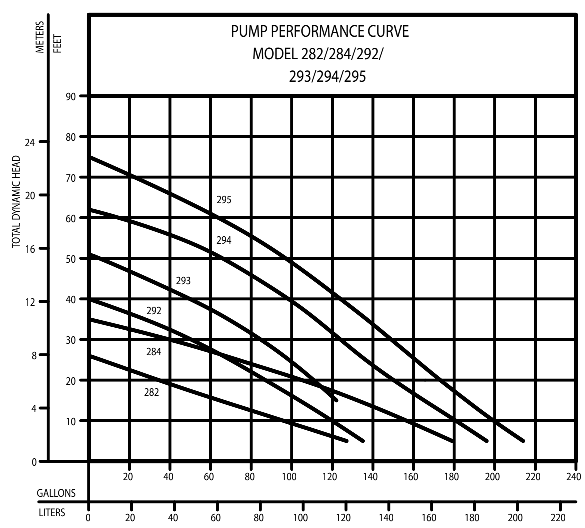

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ZOELLER PUMP COMPANY

MAIL TO: *P.O. BOX 16347 • Louisville, KY 40256-0347*
SHIP TO: *3649 Cane Run Road • Louisville, KY 40211-1961*
(502) 778-2731 • 1 (800) 928-PUMP • FAX (502) 774-3624

zoellerpumps.com

Trusted. Tested. Tough.®

APak® Alarm Systems

91104-0001 Apak® Outdoor Alarm

SPECIFICATIONS:

- APak Outdoor Alarm System Features
- NEMA 4X Outdoor use per UL 864 for US and Canada
- Alarm system (horn & light) operates to warn of a high-water condition
- Horn is rated 82 decibels at 10' (3 m)
- Auxiliary dry contacts for high level alarm, 5 Amps
- Operates on separate circuit from pump, 115 VAC
- Alarm test and horn silence switch with automatic reset
- Terminal connections for a pump and float switch (Model 91104-0001)
- Can be used with liquids to 140 °F (60 °C)
- 15' (5 m) float switch (Model 91104-0001)
- 20' (6 m) float switch, 6' (2 m) power cord, watertight cord connectors (Model 10-0682)
- 3 year limited warranty (Model 10-2614, 10-0682, 91104-0001)

NOTE: All variable level float switches in this section are mechanically activated and do not contain mercury.

Tested to UL Standard UL 508 & Certified to CSA Standard C22.2 No. 205

91104-0002 Apak® Outdoor Alarm

SPECIFICATIONS:

Same standard features of our 91104-0001 with:

- 20' (6 m) alarm (12 V) tethered switch
- 6' (2 m), 115 V power cord with water-tight cord connectors

Flood Alert®

10-0763 High Water Alarm

SPECIFICATIONS:

- Operates on (3) AAA batteries
- Low battery alarm
- Warns you when sensor contacts water
- Loud intermittent horn rated at 103 +/- 3 db at 1' (30 cm)
- On/Off silence switch
- Stainless steel sensor contacts
- Easy to install, portable and safe!
- Compact design (3-1/4" x 2-1/4" [8.3 x 5.7 cm])
- No adjustments needed
- Solid state electronic components
- 5' (1.5 m) of lead wire
- 12-month limited warranty
- AC power adapter capability. Requires Class 2 transformer, Input: 120 VAC/60 Hz, output: 4.5 VDC/150 mA, tip positive, type B plug. (Not included, but available at most electronics stores)

Flexible sensor wire allows this alert to be used in many applications. Alerts you of overflowing:

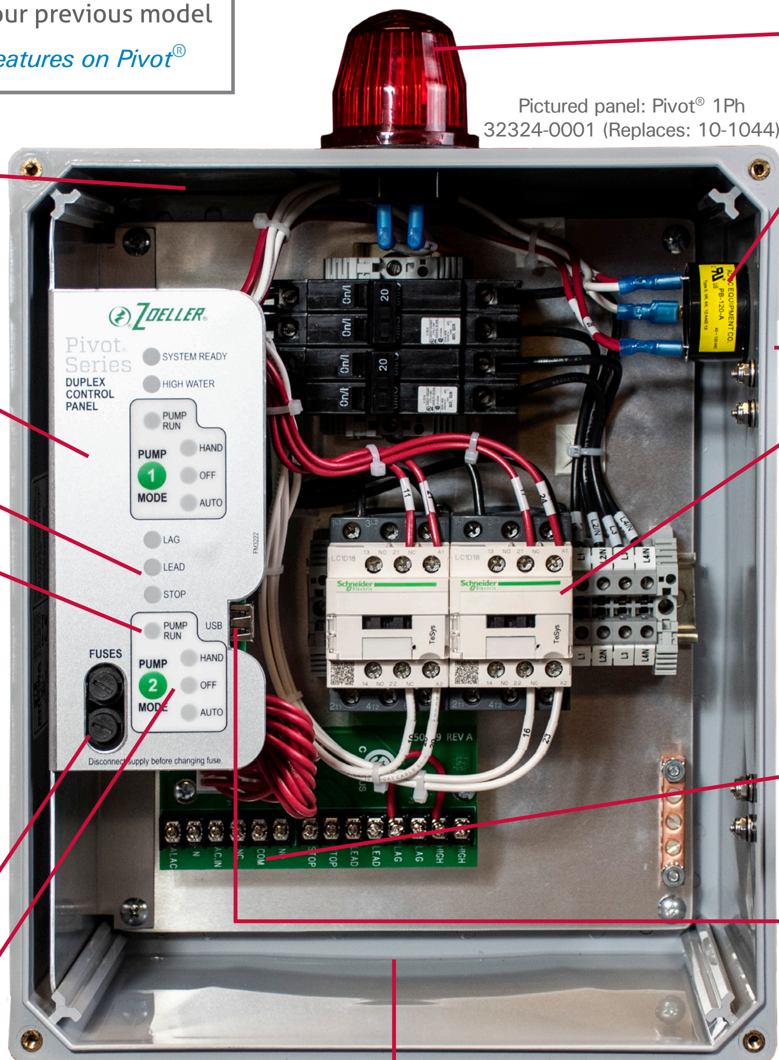
- Sump pump • Toilets • Broken pipes
- Dishwashers or washing machines • Laundry sinks
- Air conditioning pans • Bath tubs or hot tubs

Simplex Control Panels

Pivot® 1Ph Control Panel

Text Key:
Features common with our previous model
Additional STANDARD features on Pivot®

Pictured panel: Pivot® 1Ph
32324-0001 (Replaces: 10-1044)



Pivot®: 115/200/230
Simplex and Duplex models

Limited 5 year warranty

c UL US LISTED

Touch-safe user interface
LED indicators:
-System Ready
-Float switch LED indicators
-float switch faults
-Pump Run LED indicator(s)
Latching globe and horn feature

3 or 4 float switch operation
-choice of multiple float logic and orders
-built in switch redundancy
-configurable float switch operation
-choose between Smart and Relay Switch Logic

Separate fuses for alarm and control circuits

Smart HOA:
-prevents accidental On or Off
-Off mode reminder

Top mount globe
-varying globe patterns for distinct alarm conditions

Side mount horn

Side mount Test/Silence switch
Test switch tests all LEDs, globe, and horn

NEMA 4X enclosure, locking hasp, dead front.
12x10x6 Pivot™

Motor contactor(s), breakers (1Ph)
-staggered pump start

Alarms for:
-high water alarm
-continuous pump run
-incorrect control voltage
-disabled alarm circuit
-failed contactor
-overload
-float fault
-HOA Off timeout

Auxiliary output, form C (aka dry contacts)

USB features:
-pump starts counter
-elapsed time meter
-custom configurations
-update firmware

Factory Reset for clearing and troubleshooting

Set of 5 PCB jumpers for selection of preferences

Ample room for field wiring

c UL US LISTED

Common Control Panels

ACCESSORIES AND CONTROLS

Panel	Category	Item Number	Description
10-0125	Pivot	31354-0001	Control,Pivot/Sim/1Ph/115/200/230V/0-20FLA/Standard
10-1036 10-4463	Pivot	31314-0001	Control,Pivot/Sim/1Ph/115/200/230V/0-7FLA/Standard
10-1037 10-4465	Pivot	31324-0001	Control,Pivot/Sim/1Ph/115/200/230V/7-15FLA/Standard
10-1038	Pivot	31334-0001	Control,Pivot/Sim/1Ph/115/200/230V/15-20FLA/Standard
10-1201	Pivot	31344-0001	Control,Pivot/Sim/1Ph/115/200/230V/20-30FLA/Standard
10-0092 10-0093	Pivot	32354-0001	Control,Pivot/Dup/1Ph/115/200/230V/0-20FLA/Standard
10-1039 10-1041	Pivot	32124-0001	Control,Pivot/Dup/1Ph/115V/7-15FLA/Standard
10-1040 10-1042	Pivot	32134-0001	Control,Pivot/Dup/1Ph/115V/15-20FLA/Standard
10-1043 10-4462	Pivot	32314-0001	Control,Pivot/Dup/1Ph/115/200/230V/0-7A/Standard
10-1044 10-4464	Pivot	32324-0001	Control,Pivot/Dup/1Ph/115/200/230V/7-15FLA/Standard
10-1045	Pivot	32334-0001	Control,Pivot/Dup/1Ph/115/200/230V/15-20FLA/Standard
10-1046	Pivot	32344-0001	Control,Pivot/Dup/1Ph/115/200/230V/20-30FLA/Standard
10-1074	Pivot Pro	114A4-0001	Control,Pivot Pro/Sim/3Ph/200/230/460V/1.0-1.6FLA/Standard
10-1076	Pivot Pro	114B4-0001	Control,Pivot Pro/Sim/3Ph/200/230/460V/1.6-2.5FLA/Standard
10-1078	Pivot Pro	114C4-0001	Control,Pivot Pro/Sim/3Ph/200/230/460V/2.5-4.0FLA/Standard
10-1080	Pivot Pro	114D4-0001	Control,Pivot Pro/Sim/3Ph/200/230/460V/4.0-6.3FLA/Standard
10-1082	Pivot Pro	114E4-0001	Control,Pivot Pro/Sim/3Ph/200/230/460V/6-10FLA/Standard
10-1083	Pivot Pro	114F4-0001	Control,Pivot Pro/Sim/3Ph/200/230/460V/9-14FLA/Standard
10-1084	Pivot Pro	114G4-0001	Control,Pivot Pro/Sim/3Ph/200/230/460V/13-18FLA/Standard
10-1086	Pivot Pro	114H4-0001	Control,Pivot Pro/Sim/3Ph/200/230/460V/17-23FLA/Standard
10-1087	Pivot Pro	114Q4-0001	Control,Pivot Pro/Sim/3Ph/200/230/460V/20-25 FLA/Standard
10-1102	Pivot Pro	124A4-0001	Control,Pivot Pro/Dup/3Ph/200/230/460V/1.0-1.6FLA/Standard
10-1104	Pivot Pro	124B4-0001	Control,Pivot Pro/Dup/3Ph/200/230/460V/1.6-2.5FLA/Standard
10-1106	Pivot Pro	124C4-0001	Control,Pivot Pro/Dup/3Ph/200/230/460V/2.5-4.0FLA/Standard
10-1108	Pivot Pro	124D4-0001	Control,Pivot Pro/Dup/3Ph/200/230/460V/4.0-6.3FLA/Standard
10-1110	Pivot Pro	124E4-0001	Control,Pivot Pro/Dup/3Ph/200/230/460V/6-10FLA/Standard
10-1111	Pivot Pro	124F4-0001	Control,Pivot Pro/Dup/3Ph/200/230/460V/9-14FLA/Standard
10-1112	Pivot Pro	124G4-0001	Control,Pivot Pro/Dup/3Ph/200/230/460V/13-18FLA/Standard
10-1114	Pivot Pro	124H4-0001	Control,Pivot Pro/Dup/3Ph/200/230/460V/17-23FLA/Standard
10-1115	Pivot Pro	124Q4-0001	Control,Pivot Pro/Dup/3Ph/200/230/460V/20-25FLA/Standard
10-1183	Pivot Pro	124R4-0001	Control,Pivot Pro/Dup/3Ph/200/230/460V/23-32FLA/Standard
10-1184	Pivot Pro	12404-0001	Control,Pivot Pro/Dup/3Ph/200/230/460V/30-40FLA/Standard
n/a	Pivot Pro	11354-0001	Control,Pivot Pro/Sim/1Ph/115/200/230V/0-20A
n/a	Pivot Pro	11314-0001	Control,Pivot Pro/Sim/1Ph/115/200/230V/0-7A
n/a	Pivot Pro	11324-0001	Control,Pivot Pro/Sim/1Ph/115/200/230V/7-15A
n/a	Pivot Pro	11334-0001	Control,Pivot Pro/Sim/1Ph/115/200/230V/15-20A
n/a	Pivot Pro	11344-0001	Control,Pivot Pro/Sim/1Ph/115/200/230V/20-30A
n/a	Pivot Pro	12354-0001	Control,Pivot Pro/Dup/1Ph/115/200/230V/0-20A
n/a	Pivot Pro	12124-0001	Control,Pivot Pro/Dup/1Ph/115V/7-15A
n/a	Pivot Pro	12134-0001	Control,Pivot Pro/Dup/1Ph/115V/15-20A
n/a	Pivot Pro	12314-0001	Control,Pivot Pro/Dup/1Ph/115/200/230V/0-7A
n/a	Pivot Pro	12324-0001	Control,Pivot Pro/Dup/1Ph/115/200/230V/7-15A
n/a	Pivot Pro	12334-0001	Control,Pivot Pro/Dup/1Ph/115/200/230V/15-20A
n/a	Pivot Pro	12344-0001	Control,Pivot Pro/Dup/1Ph/115/200/230V/20-30A

For many other variations, see FM3459, Pivot Selection Guide for ZPC Pumps.

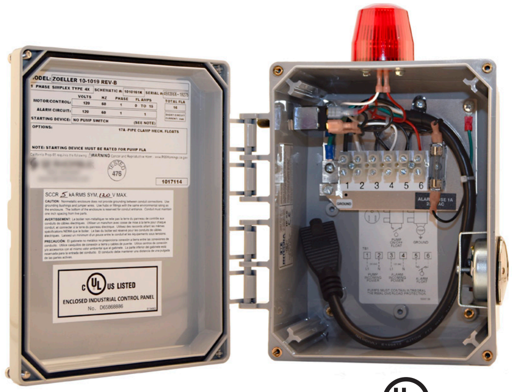
Control Panels

An electrical control panel is used on a simplex pump application where automatic electrical cycling of the pump is desired for added protection in residential or commercial applications. A control panel is required for all systems using a nonautomatic pump. The built-in alarm system, a standard feature, will activate when the water level becomes unusually high. All electrical systems must be installed by a qualified electrician and according to the National Electrical Code (see Section 430-71 though 430-113, plus any others that apply).

Plug-in Control Panel Single Phase

SPECIFICATIONS:

- **115V (10-1019) or 230V (10-1023)**
- **NEMA 4X enclosure with hinged cover**
- **Corded plug for use with piggyback pump switch**
- **Alarm horn (83 to 85 decibel rating)**
- **Terminal strip**
- **Horn silence switch to turn alarm on or off**
- **Alarm float only**



c UL US LISTED

Simplex and Duplex with Intrinsically-Safe Relays For Explosion-Proof Pumps

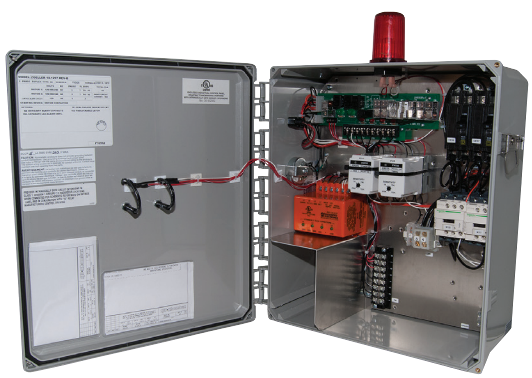
These intrinsically-safe control panels are used on pump applications defined as a hazardous duty location. Lift stations in some regions fall under this classification. The intrinsically-safe panel, in conjunction with an explosion- proof pump, will provide a system that will not allow ignition of explosive gases. The purpose of the control panel is to cycle a pump automatically. Each panel comes standard with pump run light(s), a high water audible and visual alarm, seal fail indicator(s), and a UL Listing. All panels come standard with a NEMA 4X rating for indoor or outdoor use.

These panels MUST NOT be in the space classified as needing explosion-proof equipment. Special fittings that either prevent the passage of hot gases, in the case of an explosion in a Class I area, or the passage of combustible dust, fibers, or flyings in a Class II or III area (NEC 501-5 and 502-5) are required. A qualified electrician must install all electrical systems. National Electrical Code (NEC) Articles 500 through 503 explain in detail the requirements for the installation of wiring or electrical equipment in hazardous locations. These articles, along with other applicable regulations, local governing inspection authorities, insurance representatives, and qualified engineering/technical assistance, should be your guides to the installation of wiring or electrical equipment in any hazardous or potentially hazardous location.

SPECIFICATIONS:

- Intrinsically-safe relays
- NEMA 4X enclosure
- Top-mounted alarm light
- Hands-off-auto toggle switch for each pump
- UL Listed
- Alarm horn with silence switch
- Magnetic motor contactor
- Lockable Latch
- Auxiliary dry contact/high water alarm
- Circuit breaker pump disconnect
- 3 or 4 variable float switch control operation
- Off-the-shelf components provide for relatively easy field maintenance and repair
- Green pump run pilot light for each pump
- Seal fail indicator light(s)
- Thermal cutouts for 3 phase
- Duplex only - lead/lag alternating circuit

Tested to UL Standard UL 508



STANDARD ENCLOSURE DIMENSIONS		
Panel	**Phase**	**Dimensions (HxWxD)**
Simplex	1	16″ x 14″ x 6″ (41 x 36 x 15 cm)
Duplex	1	16″ x 14″ x 6″ (41 x 36 x 15 cm)
Simplex	3	16″ x 14″ x 6″ (41 x 36 x 15 cm)
Duplex	3	16″ x 14″ x 6″ (41 x 36 x 15 cm)

Products may not be exactly as pictured.

Disconnect & Rail Systems

Z-Rail® Threaded Rail Systems
1-1/4" - 3" NPT Discharge Pumps

SPECIFICATIONS:

- Sewage, storm water, effluent and grinder pump systems
- For use in concrete, steel, or fiberglass tanks
- Allows for removal of pumps from ground level
- No confined space entry to service pump
- No pull rods or hold down rods
- Disconnect fitting with positive machine fit and o-ring provides a reliable seal
- Seals up to 370' TDH (160 psi) and supports a weight up to 300 lbs
- Guide rails direct the pump to and from the disconnect fitting. Systems are supplied complete with disconnect fitting, guide plate, rail guide, and upper rail support bracket
- All systems use 3/4" schedule 40 pipe rails (not included)

2" Z-Rail® unit shown.

3" & 4" Flanged Rail Systems
Horizontal Discharge

SPECIFICATIONS:

- For 600 and X600 Series solids-handling pumps
- For basins of any depth
- Cast iron construction with stainless steel hardware
- Easy engagement and disengagement of pump from ground level
- Suitable for most horizontal discharge pumps having a 3" or 4" ANSI flange
- Seals up to 100' TDH (43.9 psi) and supports a weight up to 500 lbs
- Includes base elbow, pump adaptor plate, sealing gasket, rail guide and upper rail support
- All systems use 2" schedule 40 rail pipes (not included)

4" Non-sparking unit shown.

EZ Pull Quick Disconnect

The EZ-Pull quick disconnect is a convenient accessory to use when installing or removing a pump from a tank.

Features

- Two-piece tapered male and female connection that locks itself into place when sliding the two pieces together
- Injection molded, glass filled thermoplastic with an o-ring which provides a watertight seal even under high head conditions
- Available in 1-1/4", 1-1/2" and 2" FPT

Disconnect Only
1-1/4" - 2" Discharge

SPECIFICATIONS:

- Brass or thermoplastic
- Economical, reduces time and cost of removing pump
- Safety: keeps personnel out of pits & out of contact with contaminants
- Used for shallow systems where guide rails are not necessary (pull rod not included)

