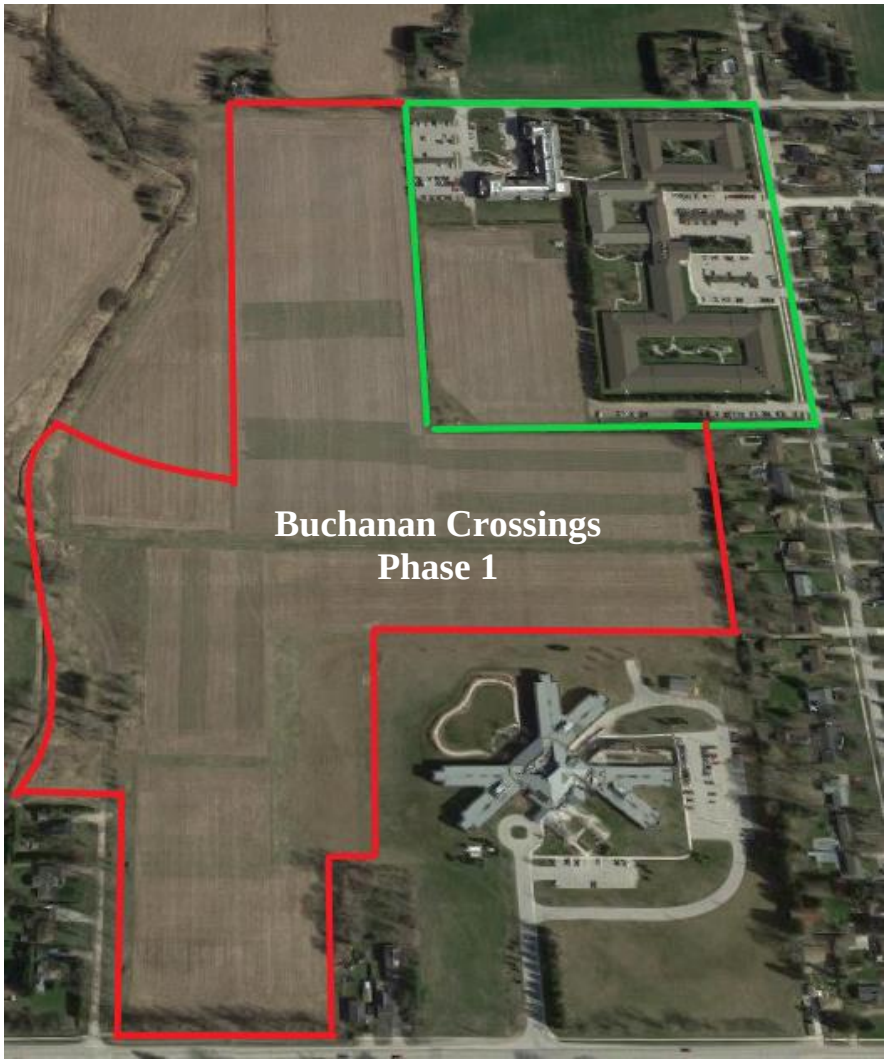
Appendix ‘K’

Functional Servicing Report

Municipality of Strathroy-Caradoc
Functional Servicing Report
Proposed Draft Plan of Subdivision Application



Part of Lot 20 Concession 4, Geographic Municipality of Strathroy-Caradoc
Registered Plan 33R-19731
Municipality of Strathroy-Caradoc
November 22, 2022

Prepared by B. M. Ross and Associates Limited
on behalf of SLD Group Inc.

BMROSS
engineering better communities

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APPENDICES

B. M. ROSS AND ASSOCIATES LIMITED
Engineers and Planners
2695 Hamilton Rd. Brights Grove, Ont. N0N 1C0
p. (519) 908-9564
www.bmross.net

File No. 21020

SLD GROUP INC.
BUCHANAN CROSSINGS

FUNCTIONAL SERVICING REPORT
DRAFT PLAN OF SUBDIVISION
MUNICIPALITY OF STRATHROY-CARADOC

1.0 INTRODUCTION

This report has been prepared on behalf of SLD Group Inc. in support of a proposed Draft Plan of Subdivision application in the Municipality of Strathroy-Caradoc to create a 359-lot residential subdivision with access from Albert Street and Saulsbury Street. Refer to the attached drawing set included in Appendix A:

- 21020- Buchanan Crossings - Conceptual Servicing Plans

The conceptual servicing layout is based on the Draft Plan of Subdivision prepared by Archibald, Gray & McKay Ltd. (AGM) on August 18, 2022. The proposed development has an area of 15.14 hectares and is proposed to be developed with 359 dwelling units, including 12 single detached dwelling lots, 103 semi-detached dwelling lots, 19 street townhouse dwelling lots, and two condominium blocks with 225 townhouse dwelling lots. The development also includes a parkland / open space block with an area of 2.37 hectares, which will be used for parkland and a stormwater management facility.

To clarify for reference throughout this report, Middlesex County Road 39 is known as Albert Street within the Municipality of Strathroy-Caradoc, and is known as Napperton Drive west of the Strathroy-Caradoc limits in Adelaide-Metcalfe.

The purpose of this Functional Servicing Report is to provide a description of the proposed municipal infrastructure for use by the County Planner and Municipal Engineering staff in evaluating the Draft Plan of Subdivision application.

2.0 ROADS

The proposed site access shall be through a 20.117m wide road allowance from the existing Saulsbury Street right-of-way extending south through the south limit of the proposed subdivision with a connection to the existing Albert Street right-of-way.

The proposed roads within the subdivision are yet to be named. Therefore, the streets have been named alphabetically until names are given for ease of reference and shall be constructed to current Strathroy-Caradoc standards (Rev. August 2022) for a Local classification with an 8m asphalt width and semi-mountable curb and gutter as per OPSD-600.060 providing a total width of 8.55m gutter to gutter.

The proposed roads within the condo development in Blocks 135 and 136 shall be constructed to the typical R.O.W. section as shown on page 5 of the drawing set in Appendix A, for a Local classification with a 6.3m asphalt width and semi-mountable curb and gutter as per OPSD-600.060 providing a total width of 6.85m gutter to gutter.

A geotechnical investigation was completed by EXP Services Inc. to explore the subsurface soil and groundwater conditions, and a geotechnical report was prepared to provide recommendations for foundation design and construction, site servicing, excavations, pavements and construction, and inspection testing requirements. The pavement structure for the proposed local road shall consist of 300mm Granular 'B' subbase, 150mm Granular 'A' base, 50mm HL8 hot mix asphalt binder course, and 40mm HL3 hot mix asphalt surface course paving.

3.0 WATER

Water servicing for the proposed development will be by conventional PVC municipal watermains complete with isolation gate valves, hydrants, and individual 25mm Series 160 HDPE water service connections to each residential lot all in accordance with the current Strathroy-Caradoc Standards.

The proposed PVC 300mm watermain on Street A will connect to the existing PVC 300mm municipal watermain on Albert Street with a 300x300 tee. Additionally, the developer of the lands north of Saulsbury Street will complete the extension of the existing 300mm watermain on Saulsbury Street in which a connection to the proposed Plan of Subdivision will be made to provide a 300mm looped watermain through the development along Street A from Saulsbury Street to Albert Street. The proposed Plan of Subdivision will be serviced with proposed 200mm diameter PVC watermains in accordance with the latest Strathroy-Caradoc Standards.

4.0 SANITARY

Sanitary servicing within the development will be by conventional PVC gravity sewers with an outlet to a proposed sewage pumping station wet well located in the SE corner of Block 137.

The lots in the Plan of Subdivision will be provided with individual 150mm diameter PVC sanitary service connections with cleanouts at the property line in accordance with the current Strathroy-Caradoc Standards.

The subject lands are tributary to the existing municipal sewage treatment plant located on Pike Road

The proposed sewage pumping station wet well will collect all sanitary flows from the proposed and future Plan of Subdivision. The pumping station will discharge via 344m of 150mm

diameter PVC sanitary forcemain outletting into the existing 300mm diameter municipal gravity sanitary sewer at an existing sanitary maintenance hole in front of municipal #615 on Albert Street.

A Sanitary Design Sheet for the gravity sewer and proposed wet well is included in Appendix B for the proposed 359-lot proposed Plan of Subdivision and a future 209 lots in the lands west and northwest of the proposed Plan of Subdivision.

5.0 STORM DRAINAGE

5.1 Existing Drainage Outlets

The existing Cable Municipal Drain running south from Pike Road and Saulsbury Street towards Napperton Drive is currently the legal outlet for all the development lands. The predevelopment conditions are overland flow through most of the development areas. However, some of the flow is tributary into existing storm sewers along the north edge of Napperton Drive and conveyed to the Cable Drain at the Napperton Drive culvert crossing. The property of Strathmere Lodge adjacent to the proposed Plan of Subdivision has an existing SWMF basin and outlet on and crossing the proposed Plan of Subdivision. This existing stormwater management infrastructure will be removed, and the stormwater management of Strathmere Lodge will be achieved through the SWMF of the proposed Plan of Subdivision.

Block 136 and lots 144-152 will be utilized by filling in the required area to the regional floodline elevation of 227.71m from the flood hazard assessment prepared by Greck and Associates. The SCRCA has approved the concept of replacing the filled volume with a cut volume equal to what was filled elsewhere along the Cable Drain. The volume of flood storage filled is approximately 700 cubic meters. This will be replaced with 700 cubic meters cut from the southernmost section of Block 137. A letter from Greck and Associates Limited, with the analysis and assessment of the effect of the cut and fill on the flow regime of the Cable Drain can be found in Appendix C. In summary of this letter, the cut and fill will have no adverse effects on the Cable Drain and it will improve the flow regime of the Cable Drain.

There are existing municipal storm sewers on Napperton Drive. However, analysis has confirmed that they will not meet the requirement for the outlet from Block 136 SWMF. A proposed 450mm storm sewer will be added to meet the requirements for discharge from Block 136 SWMF.

The receiver of the Cable Drain is the Sydenham River and ultimately the receiver of storm runoff from the development lands is the St. Clair River.

5.2 Storm Sewers

Storm drainage within the proposed development will be by conventional gravity sewers, discharging to the existing Cable Municipal Drain.

The storm sewers shall be designed using a 5-year design storm for the minor system in accordance with the current MECP Guidelines and current Strathroy-Caradoc Standards. Each residential lot shall be provided with a 150mm PVC storm service connection and a rear yard catchbasin connected to the storm service. Sump pump discharges, complete with check valves, shall be connected to the individual storm service laterals.

The existing outlet for the SWMF of Strathmere Lodge will be removed and routed to the proposed SWMF in block 137. The storm sewers used to reroute the existing storm sewer will match the capacity of the existing storm sewer at the point that the sewer will be rerouted.

A 375mm diameter storm sewer has been provided to The Board of Strathroy & District Christian Retirement Association Inc. (also known as Trillium Village) for the use of a pipe stormwater outlet from the proposed SWMF for Trillium Village's proposed expansion. As outlined in the oversizing report the storm sewer in the affected area will be upsized to accommodate the additional flows from the Trillium Village property.

A System Layout and Storm Design Sheet are included in Appendix A and Appendix C respectively.

5.3 Stormwater Management

The existing lands of the proposed Plan of Subdivision and the adjacent properties have been analyzed to determine the proper catchment areas and predevelopment flow rates that are tributary to the Cable Drain. The adjacent properties on Dominion Street, Strathmere Lodge, and Trillium Village were all analyzed to determine the impact on the development of the proposed Plan of Subdivision. In coordination with the Municipality of Strathroy-Caradoc, the adjacent properties of Dominion Street will have no effect on the storm sewer or stormwater management design.

Within the proposed Plan of Subdivision, there is an existing SWMF for Strathmere Lodge developed in 2004 which will be removed, and flows will be routed through the proposed SWMF in Block 137. The development report was provided by the municipality and the rates in the model were used as a target to develop the unit catchment parameters within the proposed SWMF model.

A report prepared by Spriet Associates for the proposed stormwater outlet and the stormwater management strategy for Trillium Village. The proposed storm sewer will be used as the outlet for Trillium Village's proposed SWM system. However, the stormwater from Trillium Village will not be considered for the proposed SWMF in Block 137 since runoff from the site will have been treated before entering the storm sewer system of the proposed subdivision.

The proposed SWMFs will be designed to provide storage for surplus runoff from a 100-yr storm event for the entirety of the proposed Plan of Subdivision. The SWMF located in Block 137 will be an extended detention wet pond with a sediment forebay and permanent pool sized for Enhanced 80% long-term TSS removal under 60% imperviousness. The SWMF will consist of a control structure with a reverse slope pipe and orifice plates to restrict flow to predevelop rates

and achieve a 24hr draw-down time for the treatment events. The SWMF basin will utilize stepped side slopes of 3:1 and 7:1 for safety as per MECP guidelines.

The infiltration basin located in Block 136 will have 4:1 side slopes, an inlet headwall with energy dissipation features, and rip rap protection over the basin bottom to reduce erosion potential and protect the soils from compaction during rainfall events. The outlet from the SWM basin will consist of a grated outlet structure with an outlet pipe with an orifice sized as a flow restrictor to control discharge to the downstream system to predevelopment levels. The minor storm events will be infiltrated through the bottom of the pond with major events using the orifice to control flows to within predevelopment rates.

The hydrograph of the two (2) SWMFs will be used to determine that the cumulative flows are restricted to the predevelopment flow rates.

To address stormwater quality control, it is proposed to implement a combination of lot level and end-of-pipe quality control measures in the development. Roof drainage shall be discharged to the ground surface and directed to flow overland through landscaped areas towards rear yard catchbasins and the road to promote filtration and absorption of runoff. The catchbasins on the proposed road shall be provided with appropriate sumps per Strathroy-Caradoc Standards. The gravity collection sewers tributary to SWMF in Block 136 shall flow through an oil-grit-separator (OGS) to collect suspended sediments, oils, and floatable debris and reduce the potential for the conveyance of contaminants to the downstream receiver. The proposed OGS unit will be a Stormceptor® EF-8 unit or approved equivalent sized to provide an 80% TSS removal rate meeting the Enhanced level of treatment.

The sizing calculations for the Stormceptor® unit are included in Appendix C.

The multi-component SWM approach will be designed to meet MECP guidelines for quantity and quality control for the proposed residential development. The storm sewer infrastructure will be designed to capture and convey runoff for the minor system. Major storm runoff in excess of what can be accommodated by the minor collection system will flow overland along the road allowances to the SWMF.

In order to ensure the stormwater quality control features continue to function properly, the catchbasins, manholes, and Stormceptor® devices shall be inspected annually to monitor the amount of oil and sediment collected. The catchbasin and OGS sumps should be pumped out and accumulated deleterious materials disposed of as required. The inlet and outlet devices in the OGS unit shall also be checked for any trapped debris or blockages and be cleaned as required.

6.0 UTILITIES

Utility servicing of the development will consist of an underground primary and secondary hydro distribution system designed by Hydro One Networks Inc. and Entegrus Inc., communication infrastructure by Rogers Communications and Bell Canada, and natural gas servicing by Enbridge.

Street lighting shall be provided using LED fixtures on direct bury poles. The poles shall be Holophane 4" factory standard black, Cat. #AB4RS18ELV-4 c/w 8: square base plate on the bottom. The post-top luminaires shall be Light Emitting Diode (LED) fixtures in black paint finish or standard aluminum, installed with a 90-degree bracket arm (also black paint finish or standard aluminum). The appropriate fixtures shall be LED Roadway Lighting Ltd. NXT SERIES LUMINAIRES, or equivalent, with the following wattages: 50, 60, 80, 100, 113, and 158 Watts, as per the current Strathroy-Caradoc Standards

7.0 CONSTRUCTION

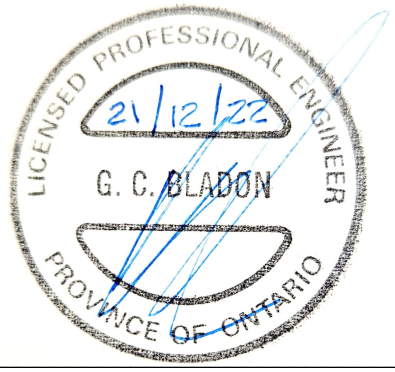
The municipal servicing and road construction aspects of the project will be constructed by a general contractor selected through a tendering process. Construction review and contract administration services shall be provided by B.M. Ross and Associates Limited.

We trust that this Conceptual Servicing Summary is sufficient for your present requirements in support of an application for Draft Approval of the development. Should any point require clarification, please contact the undersigned.

All of which is respectfully submitted.

B. M. ROSS AND ASSOCIATES LIMITED

Per _____
Simon Van Reenen, P.Eng.

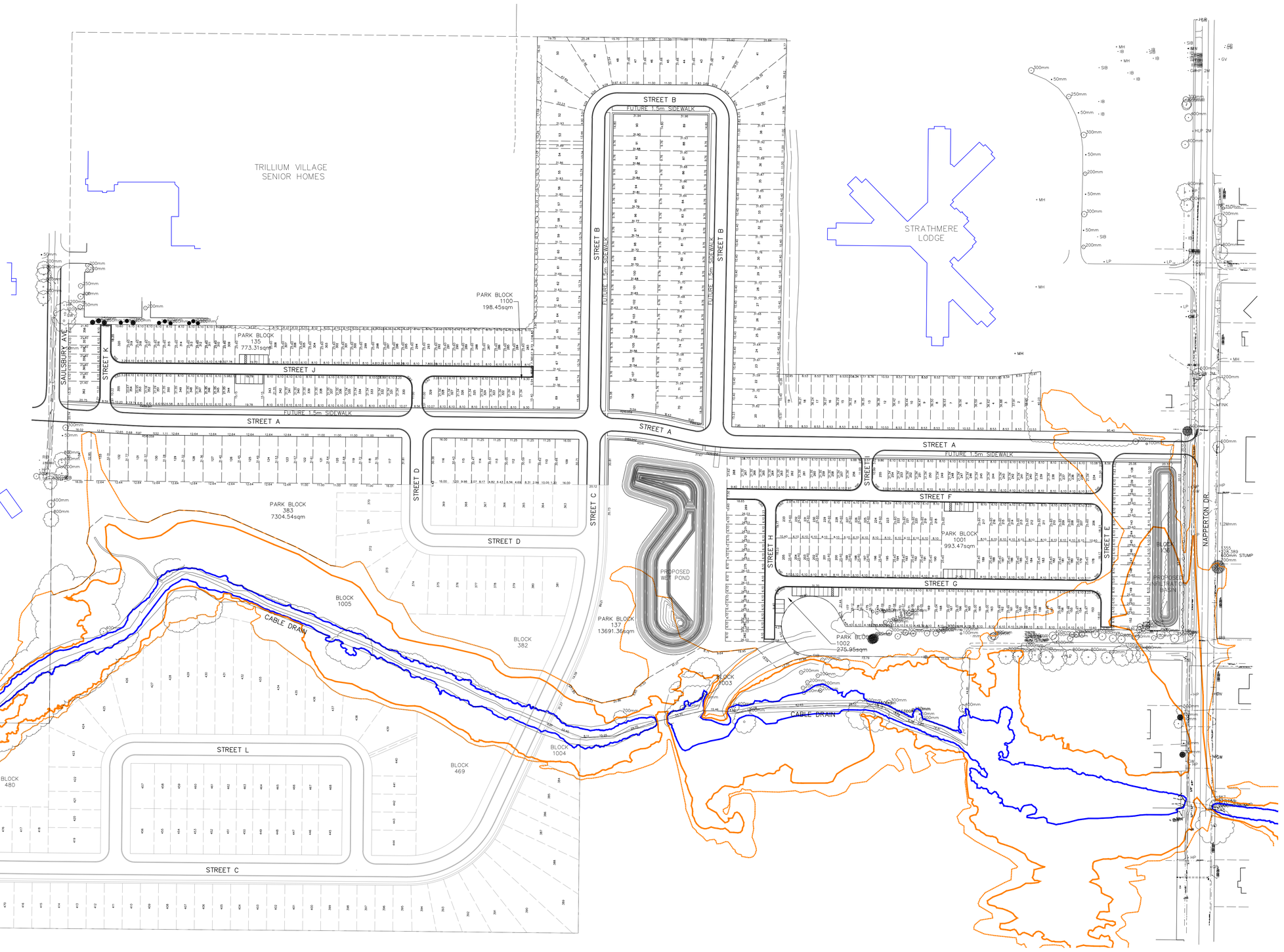


Per _____
Curt Bladon, P.Eng.

:lr

APPENDIX A

Conceptual Servicing Plans



LEGEND

- SAN. or STM. — EXISTING SEWERS, SANITARY or STORM
- MH, CB — MANHOLE and CATCHBASIN
- —W— FIRE HYDRANT — WATERMAIN,
- —G— GASMAIN
- —T— UNDERGROUND TELEPHONE
- —H— UNDERGROUND HYDRO
- —TV— UNDERGROUND T.V. CABLE
- H, B, T, H–B, LP — UTILITY POLES
- GRUBBING
- REMOVE EXISTING CONC. SIDEWALK AND DRIVES
- REMOVE AND PLACE CONC. SIDEWALK AND DRIVES
- PLACE CONC. SIDEWALK AND DRIVES
- REMOVE EXISTING ASPHALT PAVT
- PLACE HOT MIX ASPHALT (50mm HL-3 HOT MIX MISC. UNLESS NOTED OTHERWISE)
- REMOVE EXISTING CONC. CURB

NOTE

The locations of existing underground utilities are shown in an approximate way only and have not been independently verified by the owner or its representative. The contractor shall determine the exact location of all existing utilities before commencing work and agrees to be fully responsible for any damages which might be occasioned by the contractor's failure to exactly locate and preserve any and all underground utilities.

BENCHMARK INFORMATION

B.M. Elev.

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-
-
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Design By: SV

Checked By: GCB

LICENSED PROFESSIONAL ENGINEER
21/12/22
S. S. VAN REENEN
100211196
PROVINCE OF ONTARIO

LICENSED PROFESSIONAL ENGINEER
21/12/22
G. C. GLADON
PROVINCE OF ONTARIO

No.	DATE	REVISION
1.	12/22	Functional Servicing Report

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Goderich | Mount Forest | Sarnia

SLD Group Inc

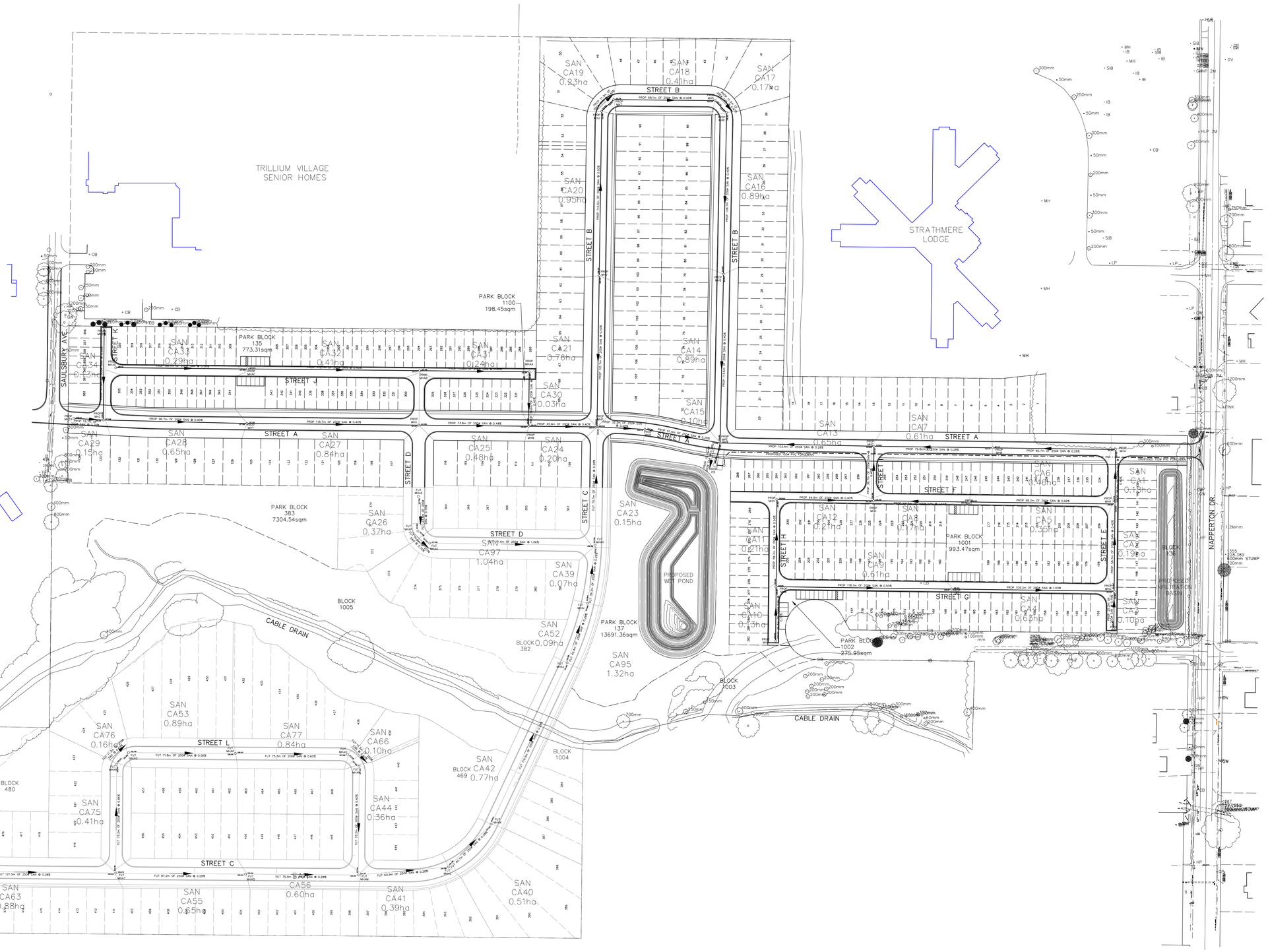
Buchanan Crossings

Overall Road Layout

Project No. 21020

Scale (24x36) 1:1250

Drawing No. 1 of 5



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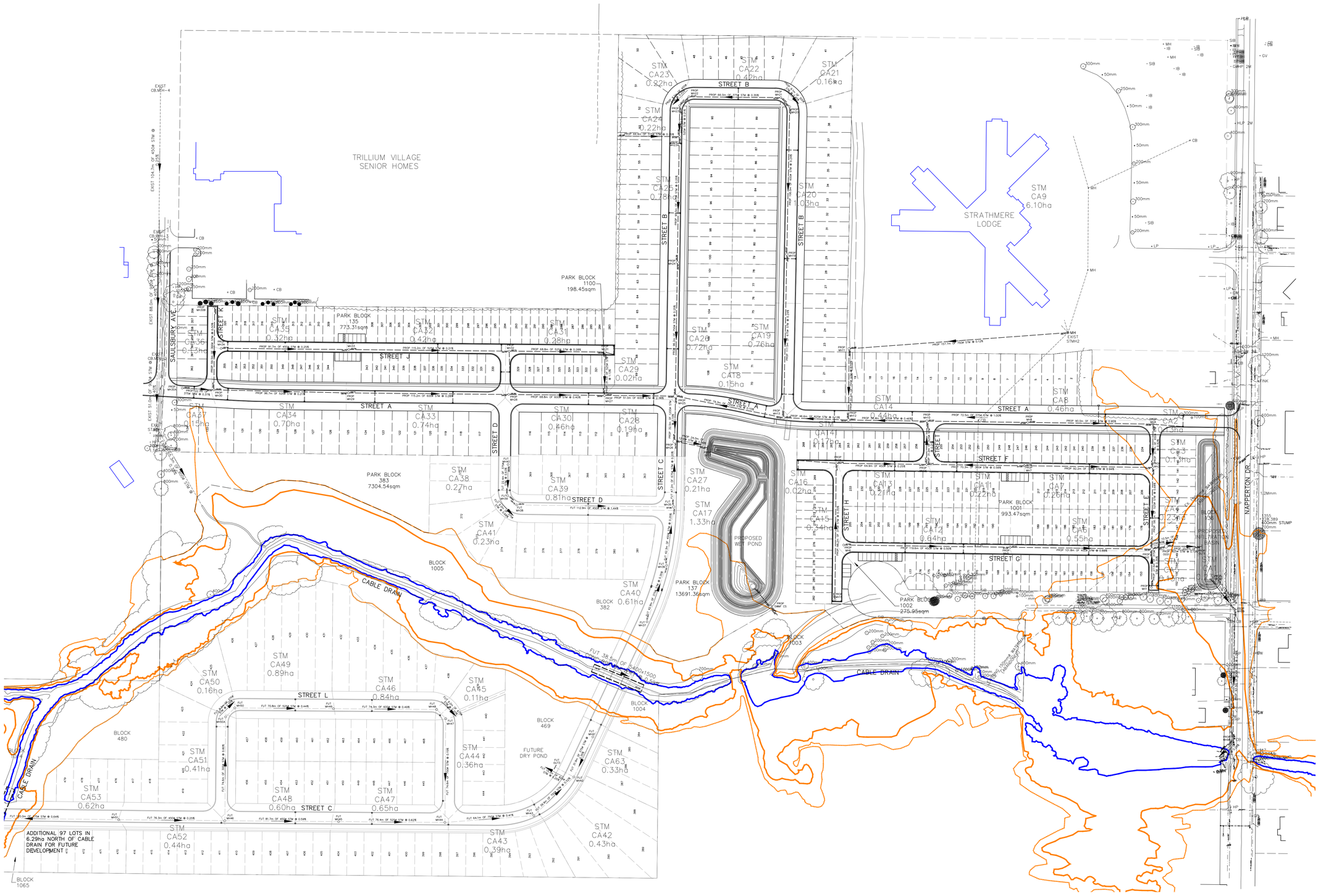
Buchanan Crossings

Overall Sanitary Sewer Layout

Project No. 21020

Scale (24x36) 1:1250

Drawing No. 2 of 5



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No.	DATE	REVISION
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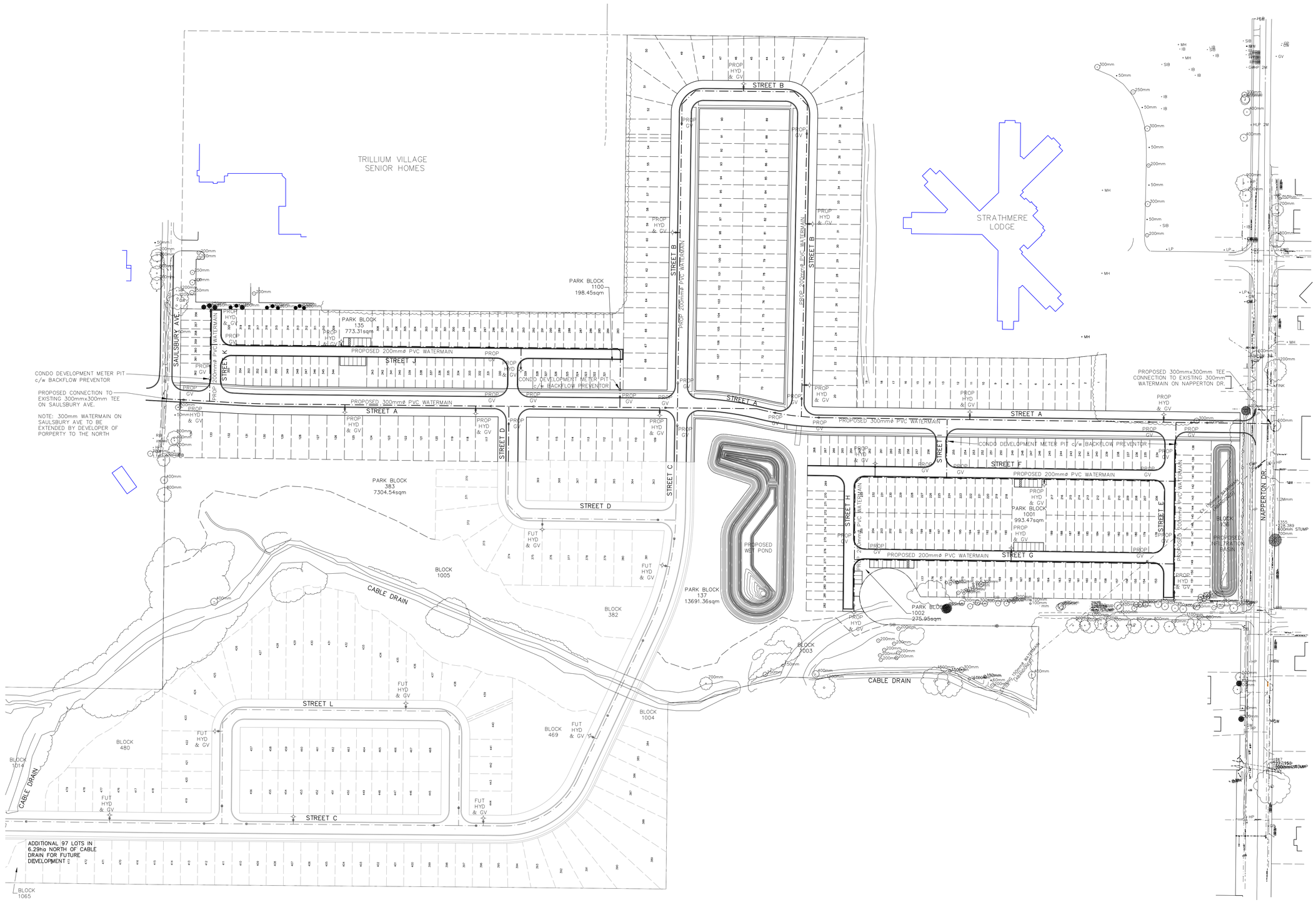
Buchanan Crossings

Overall Storm Sewer Layout

Project No. 21020

Scale (24x36) 1:1250

Drawing No. 3 of 5



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21/12/22
S. S. VAN REENEN
100211196
PROVINCE OF ONTARIO

LICENSED PROFESSIONAL ENGINEER
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Buchanan Crossings

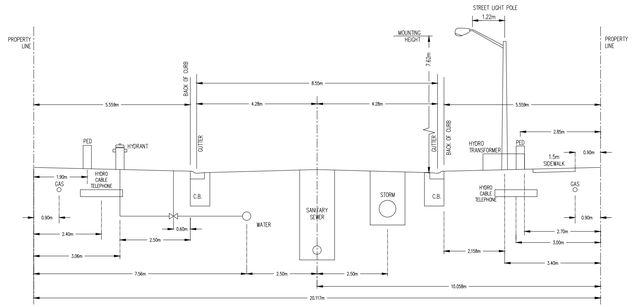
Overall Watermain Layout

Project No. 21020

Scale (24x36) 1:1250

Drawing No. 4 of 5

MUNICIPALITY OF STRATHROY-CARADOC: LOCAL ROAD



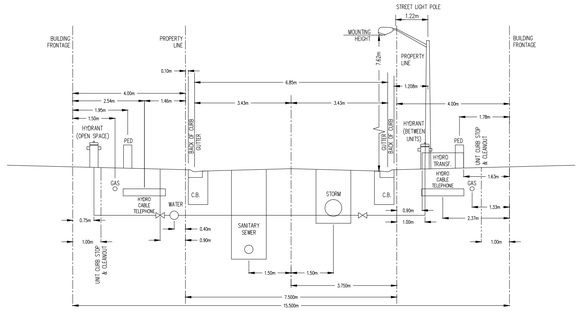
NOTES:

1. Curb Stops shall be located on the property line.
2. Bell telephone, Hydro, TV-Cable and Lighting shall be located in a joint trench on either side of roadway.
3. Utility and service trenches located around cul-de-sacs offset shall be dimensioned off of back of curb.
4. Utility and service trenches shall be backfilled with compacted Granular underneath all sidewalks.

NEW SUBDIVISIONS: Centre Line Location of Utility Trenches on a Local Road Allowance

Descriptions	Curb Stops	Gas	Hydro/Bell T.V.Cable	Hydrants	Poles	Peds		Water
Distance to Centre Line From Property Line	0.0	0.90	2.4/3.0	3.06	3.4	0.45		7.56
Minimum Depth of Cover	1.8	1.00	1.00	--	--	--		1.80

BUCHANAN CROSSINGS: CONDO ROAD



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NEW SUBDIVISIONS: Centre Line Location of Utility Trenches on a Local Road Allowance

Descriptions	Curb Stops	Gas	Hydro/Bell T.V.Cable	Hydrants	Poles	Peds		Water
Distance to Centre Line From Building Foundation	1.0	1.5/1.33	2.54/2.37	0.75/3.0	2.89	1.95/1.78		5.15
Minimum Depth of Cover	1.8	1.00	1.00	--	--	--		1.80

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Design By: SV Checked By: GCB

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Buchanan Crossings

Overall Details

Project No. 21020

Scale (24x36)
N.T.S.

Drawing No. 5 of 5

APPENDIX B

Sanitary Design Sheet-Phase 1
Sanitary Pump Station Design Sheet-Phase 1
Sanitary Design Sheet-Ultimate
Sanitary Pump Station Design Sheet-Ultimate

q = avg. daily per capita flow — 300 L/cap. d
I = peak extraneous flow — 0.08 L/ha. s
P = population in 1000's
Q (p) = peak population flow L/s

$$Q(p) = \frac{PqM}{86.4}$$

$$M = 1 + \frac{14}{4 + p^{0.5}} * 1.1$$

Q (i) = peak extraneous flow L/s — Q(i) = IA
Q (d) = peak design flow — Q(d) = Q(p) + Q(i)

Population Density — 2.4 Persons/unit

Date: November 22, 2022
Project No.: 21020

SANITARY SEWER DESIGN SHEET (PHASE 1)

DRAINAGE AREA			SANITARY DRAINAGE AREA DATA									SEWER DATA									
			INDIVIDUAL AREA			CUMULATIVE AREA		PEAK FACTOR	POP.FLOW Q(p)	PEAK EXT Q(i)	PEAK DES Q(D)	TYPE OF	DIA.	SLOPE	LENGTH	CAPACITY (L/s)	FULL FLOW VELOCITY	SEWER INVERT ELEVATION		GROUND ELEVATION	
STREET	FROM	TO	Num Lots	POP	(ha)	POP	(ha)	M	L/s	L/s	L/s	PIPE	(mm)	(%)	(m)	n=0.013	(m/s)	UPPER	LOWER	UPPER	LOWER
Southern Condo Development																					
Street G	MHM'	MHI	26	63	0.61	63	0.61	4.722	1.033	0.05	1.1	PVC	200	0.50	118.10	23.2	0.74				
Street G	MHI	MHG	27	65	0.63	128	1.24	4.634	2.060	0.10	2.2	PVC	200	1.03	109.30	33.3	1.06				
Street F	MHJ	MHH	12	29	0.35	29	0.35	4.793	0.483	0.03	0.5	PVC	200	0.92	98.20	31.5	1.00				
Street E	MHF	MHG	3	8	0.09	8	0.09	4.865	0.135	0.01	0.1	PVC	200	0.70	25.20	27.4	0.87				
Street E	MHG	MHH	8	20	0.19	156	1.52	4.604	2.494	0.12	2.6	PVC	200	0.40	58.70	20.7	0.66				
Street E	MHH	MHA	4	10	0.20	195	2.07	4.567	3.092	0.17	3.3	PVC	200	0.40	36.60	20.7	0.66				
Street H	MHL	MHM	6	15	0.13	15	0.13	4.836	0.252	0.01	0.3	PVC	200	0.70	36.40	27.4	0.87				
Street H	MHM	MHN	8	20	0.21	35	0.34	4.778	0.581	0.03	0.6	PVC	200	0.50	58.70	23.2	0.74				
Street F	MHN	MHK	9	22	0.21	57	0.55	4.733	0.937	0.04	1.0	PVC	200	0.40	64.90	20.7	0.66				
Street F	MHJ	MHK	7	17	0.17	17	0.17	4.829	0.285	0.01	0.3	PVC	200	1.64	64.30	42.0	1.34				
Street I	MHK	MHC	0	0	0.00	74	0.72	4.705	1.209	0.06	1.3	PVC	200	0.40	36.70	20.7	0.66				
Street A	MHA	MHB	15	36	0.46	231	2.53	4.538	3.639	0.20	3.8	PVC	250	0.28	82.70	31.5	0.64				
Street A	MHB	MHC	19	46	0.62	277	3.15	4.502	4.330	0.25	4.6	PVC	250	0.28	79.80	31.5	0.64				
Street A	MHC	MHE	18	44	0.64	395	4.51	4.428	6.072	0.36	6.4	PVC	250	0.28	103.40	31.5	0.64				
East Loop Development																					
Street C	MHV	MHP	16	39	0.75	39	0.75	4.769	0.646	0.06	0.7	PVC	200	0.50	101.70	23.2	0.74				
Street C	MHV	MHU	21	51	0.96	51	0.96	4.744	0.840	0.08	0.9	PVC	200	0.50	110.50	23.2	0.74				
Street B	MHU	MHT	3	8	0.23	59	1.19	4.730	0.969	0.10	1.1	PVC	200	0.40	11.30	20.7	0.66				

DRAINAGE AREA			INDIVIDUAL AREA			CUMULATIVE AREA		PEAK FACTOR	POP.FLOW Q(p)	PEAK EXT Q(i)	PEAK DES Q(D)	TYPE OF	DIA.	SLOPE	LENGTH	CAPACITY (L/s)	FULL FLOW VELOCITY	SEWER INVERT ELEVATION		GROUND ELEVATION	
STREET	FROM	TO	Num Lots	POP	(ha)	POP	(ha)	M	L/s	L/s	L/s	PIPE	(mm)	(%)	(m)	n=0.013	(m/s)	UPPER	LOWER	UPPER	LOWER
Street B	MHT	MHS	7	17	0.41	76	1.60	4.701	1.241	0.13	1.4	PVC	200	0.40	68.10	20.7	0.66				
Street B	MHS	MHR	2	5	0.17	81	1.77	4.695	1.320	0.14	1.5	PVC	200	0.40	11.20	20.7	0.66				
Street B	MHR	MHQ	20	48	0.89	129	2.66	4.633	2.075	0.21	2.3	PVC	200	0.40	108.70	20.7	0.66				
Street B	MHQ	MHE	20	48	0.89	177	3.55	4.584	2.817	0.28	3.1	PVC	200	0.40	113.60	20.7	0.66				
Trillium Village Condo																					
Street J	MHAD	MHAC	12	29	0.32	29	0.32	4.793	0.483	0.03	0.5	PVC	200	0.50	88.70	23.2	0.74				
Street J	MHAC	MHAB	15	36	0.38	65	0.70	4.719	1.065	0.06	1.1	PVC	200	0.40	115.70	20.7	0.66				
Street J	MHAB	MHAA	10	24	0.26	89	0.96	4.683	1.447	0.08	1.5	PVC	200	0.40	73.80	20.7	0.66				
Easement	MHAA	MHW	0	0	0.03	89	0.99	4.683	1.447	0.08	1.5	PVC	200	0.40	36.60	20.7	0.66				
Street K	MHZB	MHZ	6	15	0.13	15	0.13	4.836	0.252	0.01	0.3	PVC	200	0.50	61.90	23.2	0.74				
Street A	MHZA	MHZ	2	5	0.15	5	0.15	4.883	0.085	0.01	0.1	PVC	200	0.70	19.70	27.4	0.87				
Street A	MHZ	MHY	20	48	0.70	68	0.98	4.715	1.113	0.08	1.2	PVC	200	0.40	96.70	20.7	0.66				
Street A	MHY	MHX	21	51	0.85	119	1.83	4.644	1.919	0.15	2.1	PVC	200	0.40	115.70	20.7	0.66				
Street A	MHX	MHW	14	34	0.47	153	2.30	4.607	2.447	0.18	2.6	PVC	200	0.48	73.80	22.7	0.72				
Street A	MHW	MHP	3	8	0.20	250	3.49	4.522	3.925	0.28	4.2	PVC	200	0.40	45.90	20.7	0.66				
Street A	MHP	MHO	0	0	0.06	289	4.30	4.494	4.509	0.34	4.9	PVC	250	0.28	32.3	31.5	0.64				
Street A	MHO	MHE	0	0	0.10	289	4.40	4.494	4.509	0.35	4.9	PVC	250	0.28	51.4	31.5	0.64				
Street B	MHE	PS	0	0	0.00	861	12.46	4.225	12.631	1.00	13.6	PVC	250	0.28	15.2	31.5	0.64				

BMROSS engineering better communities

Township Criteria: Increasiong Harmon Peaking factor by 10% (x1.1)
Township Criteria: Daily per capita sewage flows to be 300 litres, excluding infiltration
Township Criteria: Infiltration of 3370 litres per hectare per day in clay till (0.039 L/ha.sec)
Population Density: Medium-Low Density (30-75 units/ha) @ 2.4 people/unit

Municipality of Strathroy-Caradoc

DESIGN SV

CHECKED GCB

B. M. ROSS AND ASSOCIATES LIMITED
Consulting Engineers
62 North Street, Goderich, ON N7A 2T4
p. (519) 524-2641 • f. (519) 524-4403
www.bmross.net

Project: 21020
Date: 2022-11-22

Wetwell Active Volume Calculation Sheets

Design Flow:	13.6	L/s	
Length of Forcemain	345	m	
Target Pipe nominal Size:	150	mm	*155mm ID, Ipex Cycletough*
Elevation of CL @ Outlet:	227	m	
Ground Elevation @ PS:	229.500	m	
Invert Elevation @ PS:	223.140	m	
PS Sump	2.05	m	
Elevation of Wetwell Inv	221.09	m	
Vertical Pipe	6.61	m	
PS to VC Length	6	m	

Level Phase 20-22	*C*	*Elevation*	*Static head*
Pump Start	140	222.29 m	4.710m
Mid Level	130	221.840 m	5.160m
Pump Stop	120	221.39 m	5.610m

Required Active Storage

Phase 1

Pump Selection : **NP 3069 MT3~ Adaptive 432**

Q_{design}=	13.6	L/s	*From Sanitary Design Sheet*
Q=	15.4	L/s	*From Pump Curve with C=130*
A_{pipe}=	0.01767	m^2	
V=	0.87146173	m/s	*0.6m/s > V > 3.0 m/s*

MECP Dual pump Active Storage

Q*0.15=	**2.31**	**m^3 Active Storage**

Available Active Storage Calculations

Nominal Wet well Diameter=	2500	mm	Min Diameter MECP 2500 nominal
Dia=	2.438	m	Actual Dimeter
R=	1.219	m	Radius
A=	4.668	m^2	

Pipe diplacement Volume

A=	0.0176715	m^2
Num Pipe	2	
Total A	0.0353429	m^2

Sewage Volume

Angle of benching=	45		
Dia benching at pumps=	1.116	m	
Radius=	0.558	m	
CL Offset Distance:	0.942	m	*CL of Conic Benching to CL of Wetwell*
R-H relationship	1.00:1		

Sewage volume using Series step: 0.05

Equations of Circles are used to find the point where to 2 circles intercept.

PS circle Equation: $x^2 + y^2 = a^2$ (1) *Where: a=PS radius*

Benching Cone Eq: $(x - b)^2 + y^2 = c^2$ (2) *b=CL offset*

c=Cone Radius

Find intercept Coordinates (PS circle center at (0,0)

EQ (2) - EQ (1) =

simplified $x = \frac{c^2 - a^2 - b^2}{-2b}$

sub into Eq (1) $y = \pm\sqrt{a^2 - x^2}$

set Values:

a= 1.219 *Radius Pump Station*

b= 0.942 *CL Offset*

Area for segment of circle

$$A = R^2 \cos^{-1}\left(\frac{R - h}{R}\right) - (R - h)\sqrt{2Rh - h^2}$$

Where R=Radius of cirle

h=height of segment=R-x

Note: The CL offset between benching and PS must be less than radius of PS

Table 1: Stage-Storage Relationships

Height	Elevation	Area Sewage	Increment Vol	Cum. Vol	Active Storage	Phase 20-22
0	221.090	0.712	0.000	0.000		
0.05	221.140	0.817	0.038	0.038		
0.1	221.190	0.927	0.044	0.082		
0.15	221.240	1.042	0.049	0.131		
0.2	221.290	1.160	0.055	0.186		
0.25	221.340	1.282	0.061	0.247		
0.3	221.390	1.408	0.067	0.314	0.000	Pump Stop
0.35	221.440	1.537	0.074	0.388	0.074	
0.4	221.490	1.669	0.080	0.468	0.154	
0.45	221.540	1.804	0.087	0.555	0.241	
0.5	221.590	1.941	0.094	0.649	0.334	
0.55	221.640	2.080	0.101	0.749	0.435	
0.55	221.640	2.080	0.000	0.749	0.435	
0.6	221.690	2.221	0.108	0.857	0.542	
0.65	221.740	2.363	0.115	0.971	0.657	
0.7	221.790	2.507	0.122	1.093	0.779	
0.75	221.840	2.651	0.129	1.222	0.908	
0.8	221.890	2.795	0.136	1.358	1.044	
0.85	221.940	2.939	0.143	1.501	1.187	
0.9	221.990	3.083	0.151	1.652	1.338	
0.95	222.040	3.225	0.158	1.810	1.495	
1	222.090	3.366	0.165	1.974	1.660	
1.05	222.140	3.505	0.172	2.146	1.832	
1.1	222.190	3.641	0.179	2.325	2.010	
1.15	222.240	3.774	0.185	2.510	2.196	
1.2	222.290	3.902	0.192	2.702	2.388	Pump Start
1.25	222.340	4.026	0.198	2.900	2.586	
1.3	222.390	4.144	0.204	3.105	2.790	
1.35	222.440	4.255	0.210	3.315	3.000	Lag Pump Start
1.4	222.490	4.358	0.215	3.530	3.216	
1.45	222.540	4.451	0.220	3.750	3.436	
1.5	222.590	4.531	0.225	3.975	3.660	High Alarm
1.55	222.640	4.595	0.228	4.203	3.888	
1.6	222.690	4.632	0.231	4.434	4.119	
1.65	222.740	4.633	0.232	4.665	4.351	
1.7	222.790	4.633	0.232	4.897	4.582	
1.75	222.840	4.633	0.232	5.129	4.814	
1.8	222.890	4.633	0.232	5.360	5.046	
1.85	222.940	4.633	0.232	5.592	5.277	
1.9	222.990	4.633	0.232	5.823	5.509	
1.95	223.040	4.633	0.232	6.055	5.741	
2	223.090	4.633	0.232	6.287	5.972	
2.05	223.140	4.633	0.232	6.518	6.204	Invert

Product specification

	Van Reenen, Simon BM Ross and Associates 2695 Hamilton Rd, P.O. Box 400 CANADA-N0N1C0 Brights Grove

Quant.	Item no.	Description	Price	Subtotal
		Block: 1		
1		Pump: NP 3069 MT 3~ Adaptive 432		
		Block: 2		
1		Pump: NP 3069 MT 3~ Adaptive 432		
		Block: 3		
1		Pump: NP 3069 MT 3~ Adaptive 432		
			Total price	

Project	**21020 - Buchanan Crossings-Phase1**	**Created by**	**Simon Van Reenen**	**Last update**	**11/21/2022**
Project		**Created on**	**11/21/2022**		

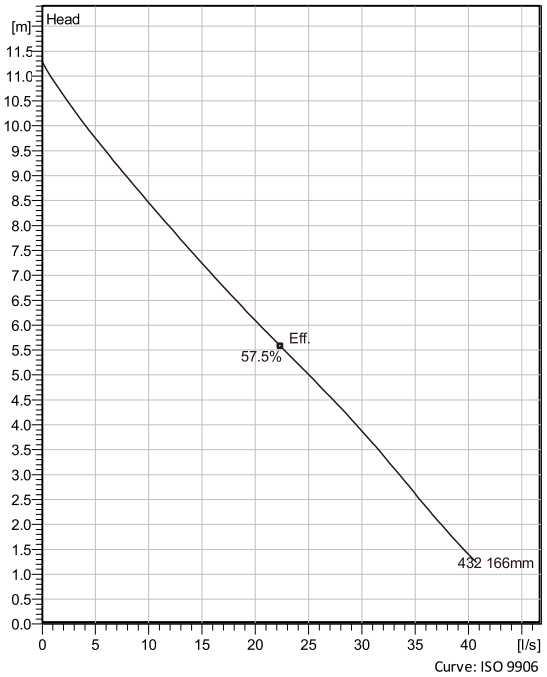
Price list	Currency	Price base from	Country reference
	CAD Canadian Dollar	(No data available.)	

NP 3069 MT 3~ Adaptive 432

Patented self cleaning semi-open channel impeller, ideal for pumping in most waste water applications. Modular based design with high adaptation grade.

Technical specification

Curves according to: Human wastewater [100%],4 °C,1 kg/dm³,1.569 mm²/s



Curve: ISO 9906

Configuration

Motor number
N3069.060 13-10-4BB-W 3.2hp

Installation type
P - Semi permanent, Wet

Impeller diameter
166 mm

Discharge diameter
80 mm

Pump information

Impeller diameter
166 mm

Discharge diameter
80 mm

Inlet diameter
113 mm

Maximum operating speed
1660 1/min

Number of blades
2

Max. fluid temperature
40 °C

Materials

Impeller
Hard-Iron

Stator housing material
Grey cast iron

Project	21020 - Buchanan Crossings-Phase1	**Created by**	Simon Van Reenen	
Block	0	**Created on**	11/21/2022 **Last update**	11/21/2022

NP 3069 MT 3~ Adaptive 432

Technical specification

Motor - General

Motor number N3069.060 13-10-4BB-W 3.2hp	**Phases** 3~	**Rated speed** 1660 1/min	**Rated power** 2.4 kW
Approval No	**Number of poles** 4	**Rated current** 11 A	**Stator variant** 7
Frequency 60 Hz	**Rated voltage** 200 V	**Insulation class** F	**Type of Duty** S1
Version code 060			

Motor - Technical

Power factor - 1/1 Load 0.85	**Motor efficiency - 1/1 Load** 74.3 %	**Total moment of inertia** 0.0132 kg m²	**Starts per hour max.** 15
Power factor - 3/4 Load 0.78	**Motor efficiency - 3/4 Load** 76.4 %	**Starting current, direct starting** 51 A	
Power factor - 1/2 Load 0.65	**Motor efficiency - 1/2 Load** 75.2 %	**Starting current, star-delta** 17 A	

Project	21020 - Buchanan Crossings-Phase1	**Created by**	Simon Van Reenen		
Block	0	**Created on**	11/21/2022	**Last update**	11/21/2022

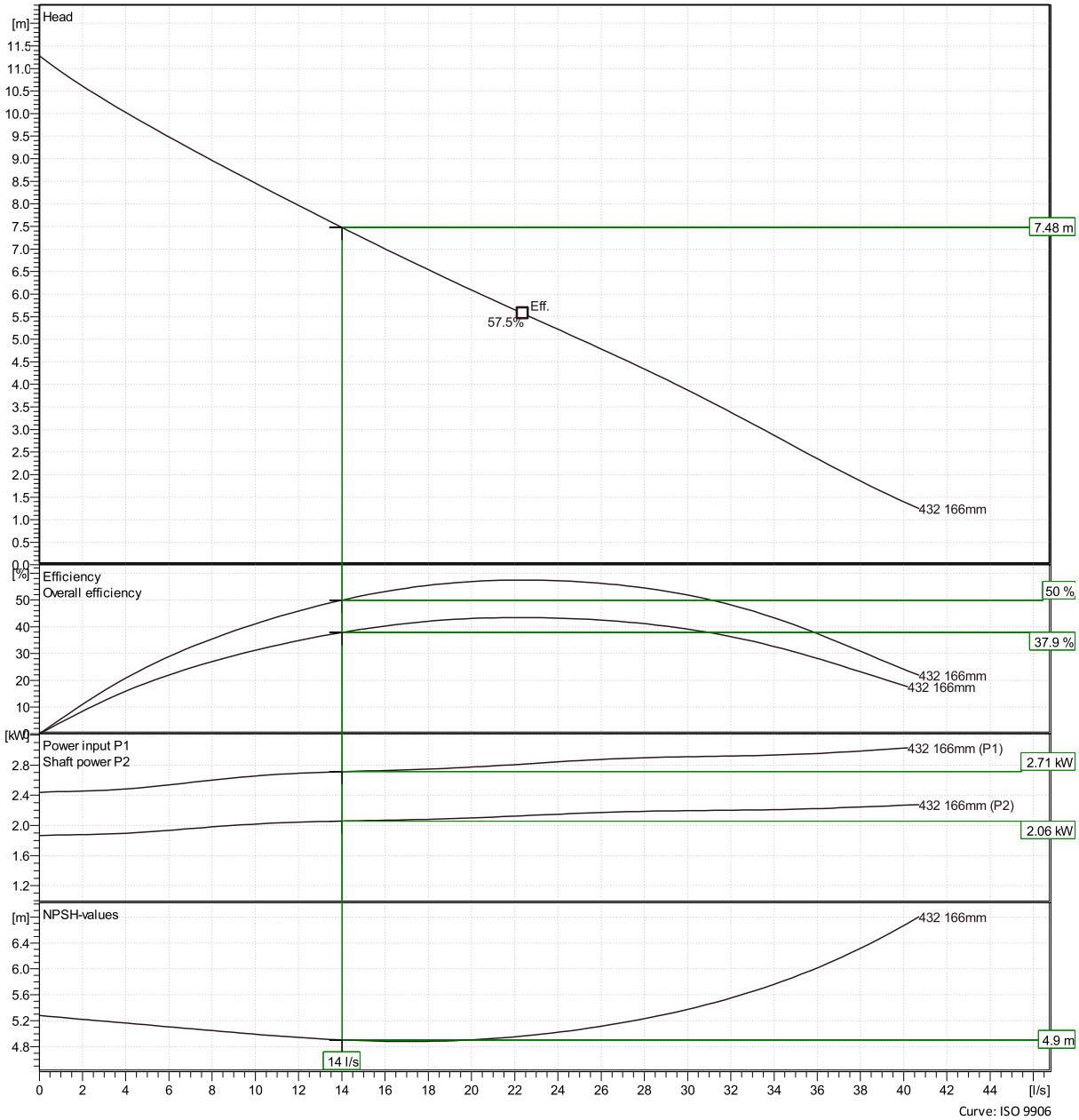
NP 3069 MT 3~ Adaptive 432

Performance curve

Duty point

Flow	Head
14 l/s	7.48 m

Curves according to: Human wastewater [100%],4 °C,1 kg/dm³,1.569 mm²/s

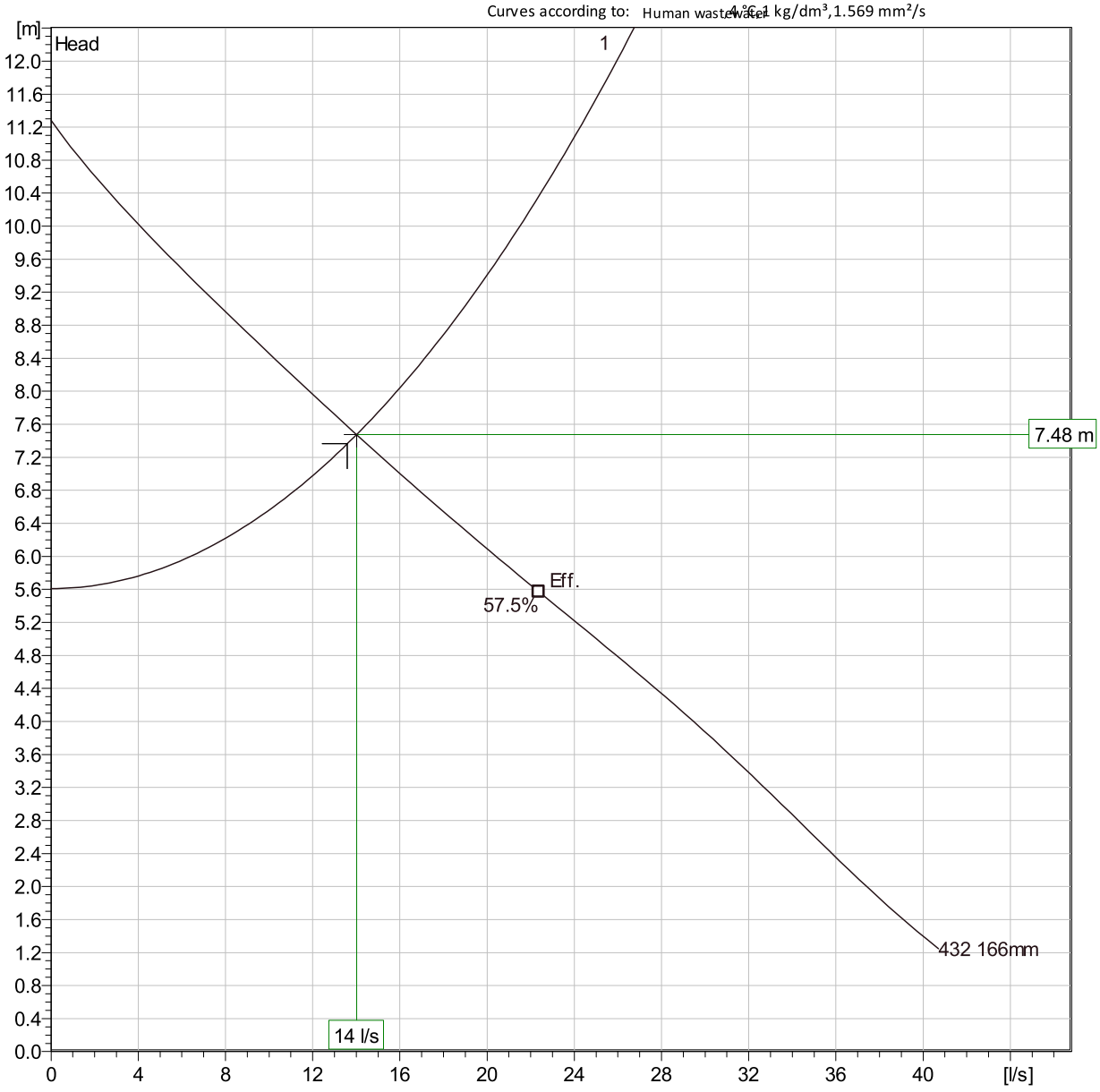


Curve: ISO 9906

Project	21020 - Buchanan Crossings-Phase1	**Created by**	Simon Van Reenen		
Block	0	**Created on**	11/21/2022	**Last update**	11/21/2022

NP 3069 MT 3~ Adaptive 432

Duty Analysis



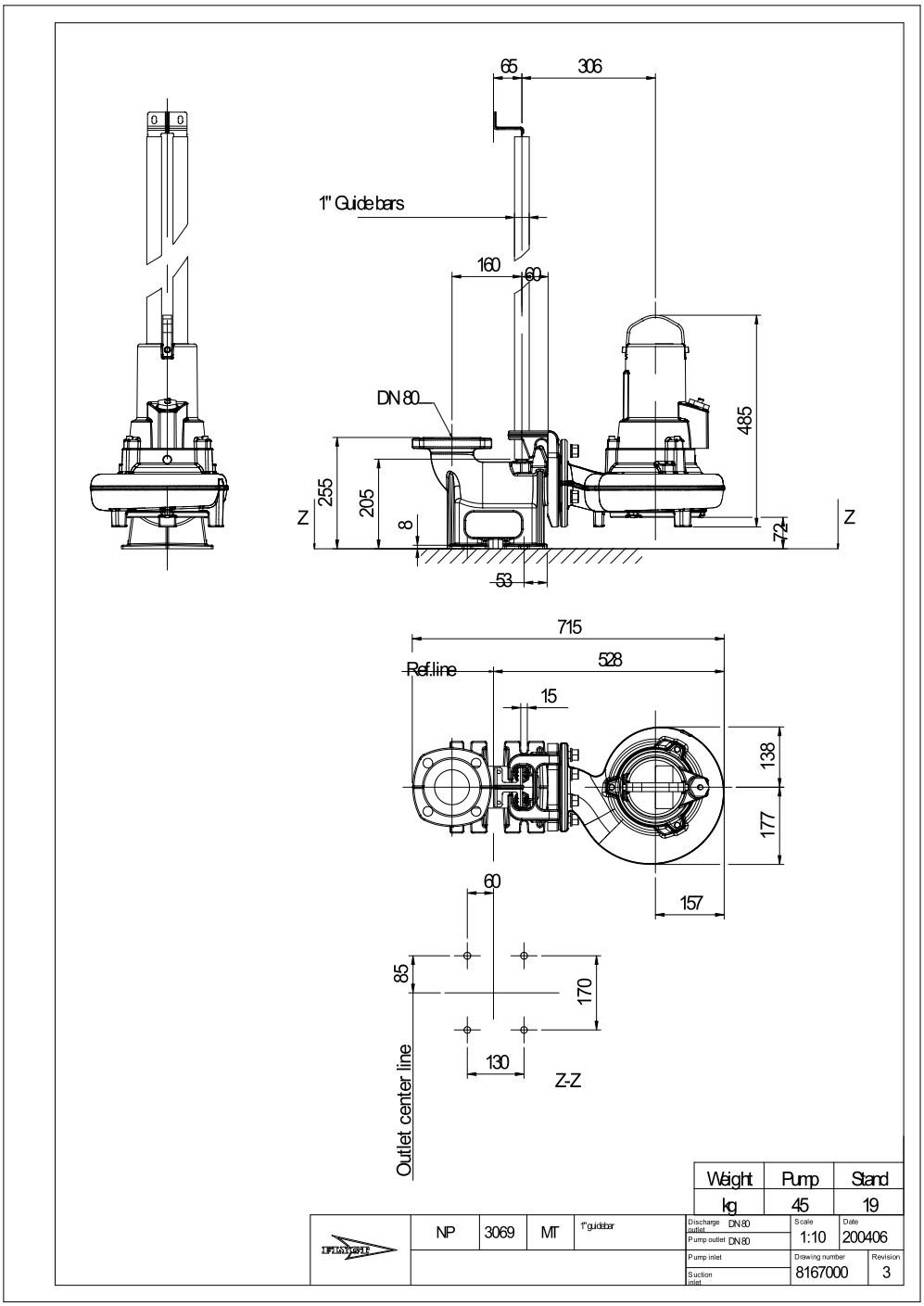
Operating characteristics

Pumps / Systems	Flow	Head	Shaft power	Flow	Head	Shaft power	Hydr.eff.	Specific Energy	NPSHre
1	14 l/s	7.48 m	2.06 kW	14 l/s	7.48 m	2.06 kW	50 %	5.38E-5 kWh/l	4.9 m

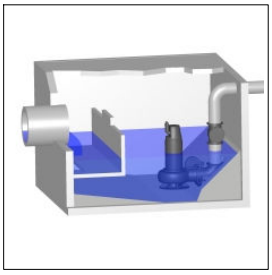
Project	21020 - Buchanan Crossings-Phase1	**Created by**	Simon Van Reenen		
Block	0	**Created on**	11/21/2022	**Last update**	11/21/2022

NP 3069 MT 3~ Adaptive 432

Dimensional drawing



Project	21020 - Buchanan Crossings-Phase1	**Created by**	Simon Van Reenen
Block	0	**Created on**	11/21/2022 **Last update** 11/21/2022



Friction loss calculation

Pumped fluid
Human wastewater

Static head
5.61

Layout
Wet well installation

Flow
13.6 l/s

Number of pumps
1

Calculation model
Colebrook-White

Viscosity
1.569 mm²/s

Nature of system
Single head pump

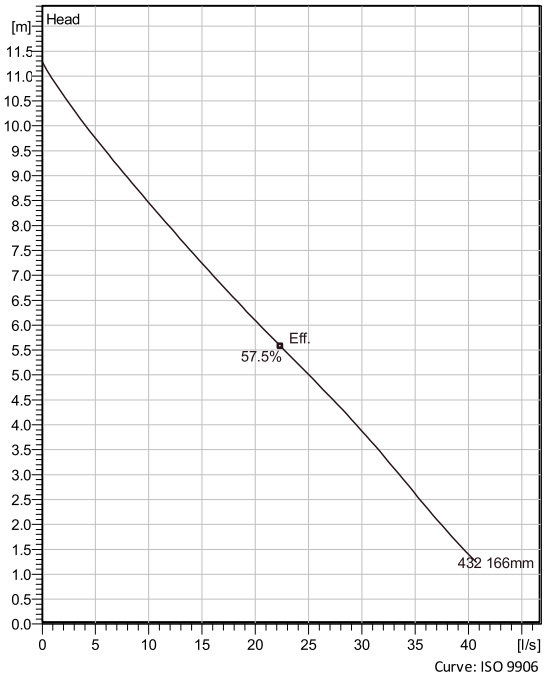
Type	Ø (mm)	? or L	Qty.	v (m/s)	k (mm)	ΔH (m)
Ø = Diameter v = Velocity k = Pipe roughness ΔH = Head loss						
Common discharge side pipe - Metal / Ductile iron ciment lining Thickness class 51 / 6" / ANSI/AWWA C150						
Pipe length	161	10.5 m	1	0.6677	1.2	0.05247
Discharge Connection	161	0.3	1	0.6677		0.006818
Elbows	161	0.9	3	0.6677		0.02045
Non-return valves	161	0.9	1	0.6677		0.02045
T-piece	161	0.4	1	0.6677		0.00909
Valve	161	0.3	1	0.6677		0.006818
Total friction head						**0.1161**
Common discharge side pipe - Plastic / PVC ASME Sch 40 / 6" / ANSI/AWWA C150						
Pipe length	155	345 m	1	0.7208	0.04	1.203
Elbows	155	1.5	5	0.7208		0.03972
Valve	155	0.3	1	0.7208		0.007943
Total friction head						**1.25**
Friction loss head						1.367 m
Total static head						5.61 m
Total head						**6.977 m**

NP 3069 MT 3~ Adaptive 432

Patented self cleaning semi-open channel impeller, ideal for pumping in most waste water applications. Modular based design with high adaptation grade.

Technical specification

Curves according to: Human wastewater [100%],4 °C,1 kg/dm³,1.569 mm²/s



Curve: ISO 9906

Configuration

Motor number
N3069.060 13-10-4BB-W 3.2hp

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Pump information

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1660 1/min

Number of blades
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Max. fluid temperature
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Materials

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Hard-Iron

Stator housing material
Grey cast iron

Project	21020 - Buchanan Crossings-Phase1	**Created by**	Simon Van Reenen		
Block	0	**Created on**	11/21/2022	**Last update**	11/21/2022

NP 3069 MT 3~ Adaptive 432

Technical specification

Motor - General

Motor number N3069.060 13-10-4BB-W 3.2hp	**Phases** 3~	**Rated speed** 1660 1/min	**Rated power** 2.4 kW
Approval No	**Number of poles** 4	**Rated current** 11 A	**Stator variant** 7
Frequency 60 Hz	**Rated voltage** 200 V	**Insulation class** F	**Type of Duty** S1
Version code 060			

Motor - Technical

Power factor - 1/1 Load 0.85	**Motor efficiency - 1/1 Load** 74.3 %	**Total moment of inertia** 0.0132 kg m²	**Starts per hour max.** 15
Power factor - 3/4 Load 0.78	**Motor efficiency - 3/4 Load** 76.4 %	**Starting current, direct starting** 51 A	
Power factor - 1/2 Load 0.65	**Motor efficiency - 1/2 Load** 75.2 %	**Starting current, star-delta** 17 A	

Project	21020 - Buchanan Crossings-Phase1	**Created by**	Simon Van Reenen		
Block	0	**Created on**	11/21/2022	**Last update**	11/21/2022

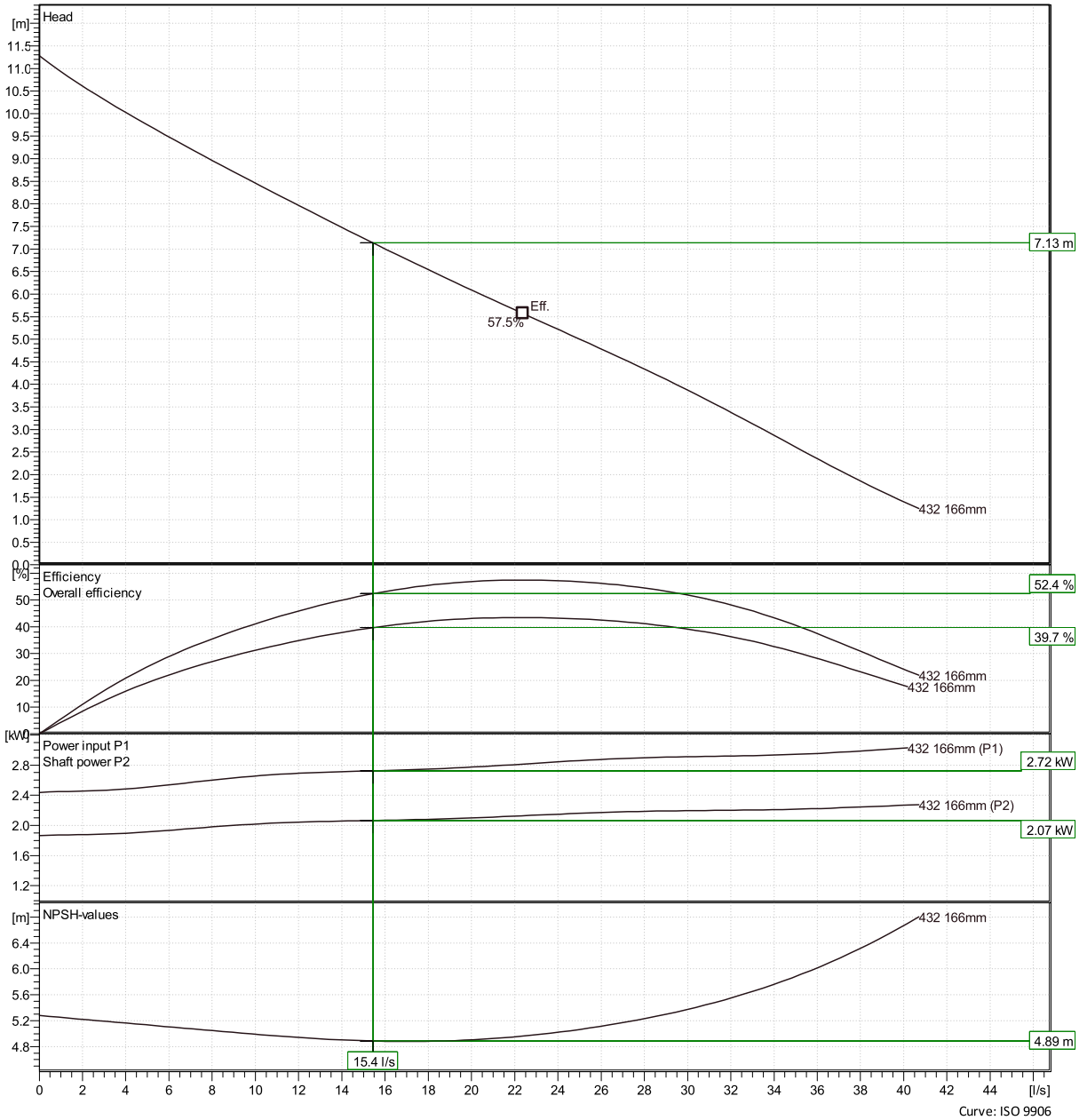
NP 3069 MT 3~ Adaptive 432

Performance curve

Duty point

Flow	Head
15.4 l/s	7.13 m

Curves according to: Human wastewater [100%],4 °C,1 kg/dm³,1.569 mm²/s



Curve: ISO 9906

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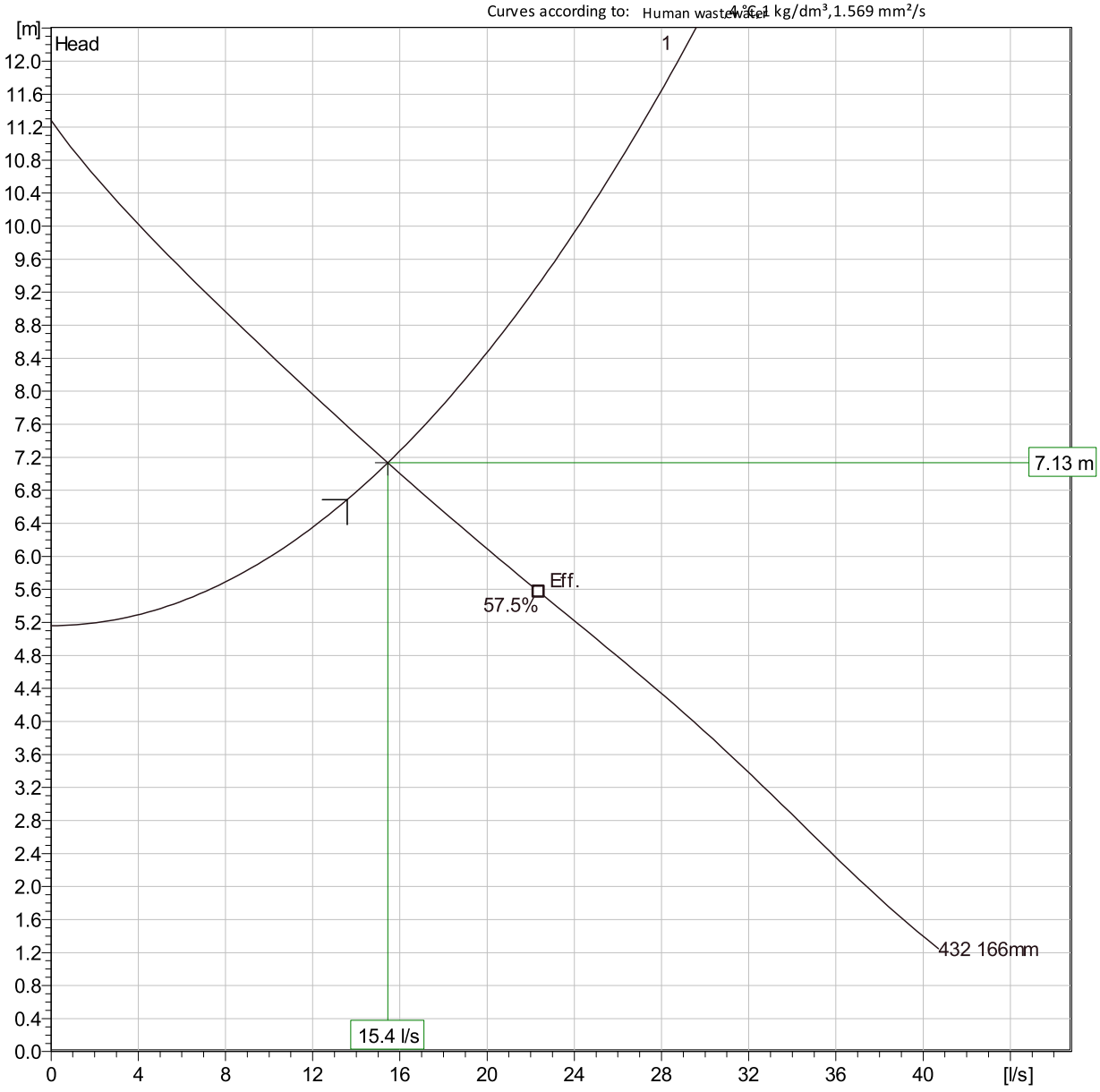
Block	0	**Created on**	11/21/2022	**Last update**	11/21/2022

NP 3069 MT 3~ Adaptive 432

Duty Analysis



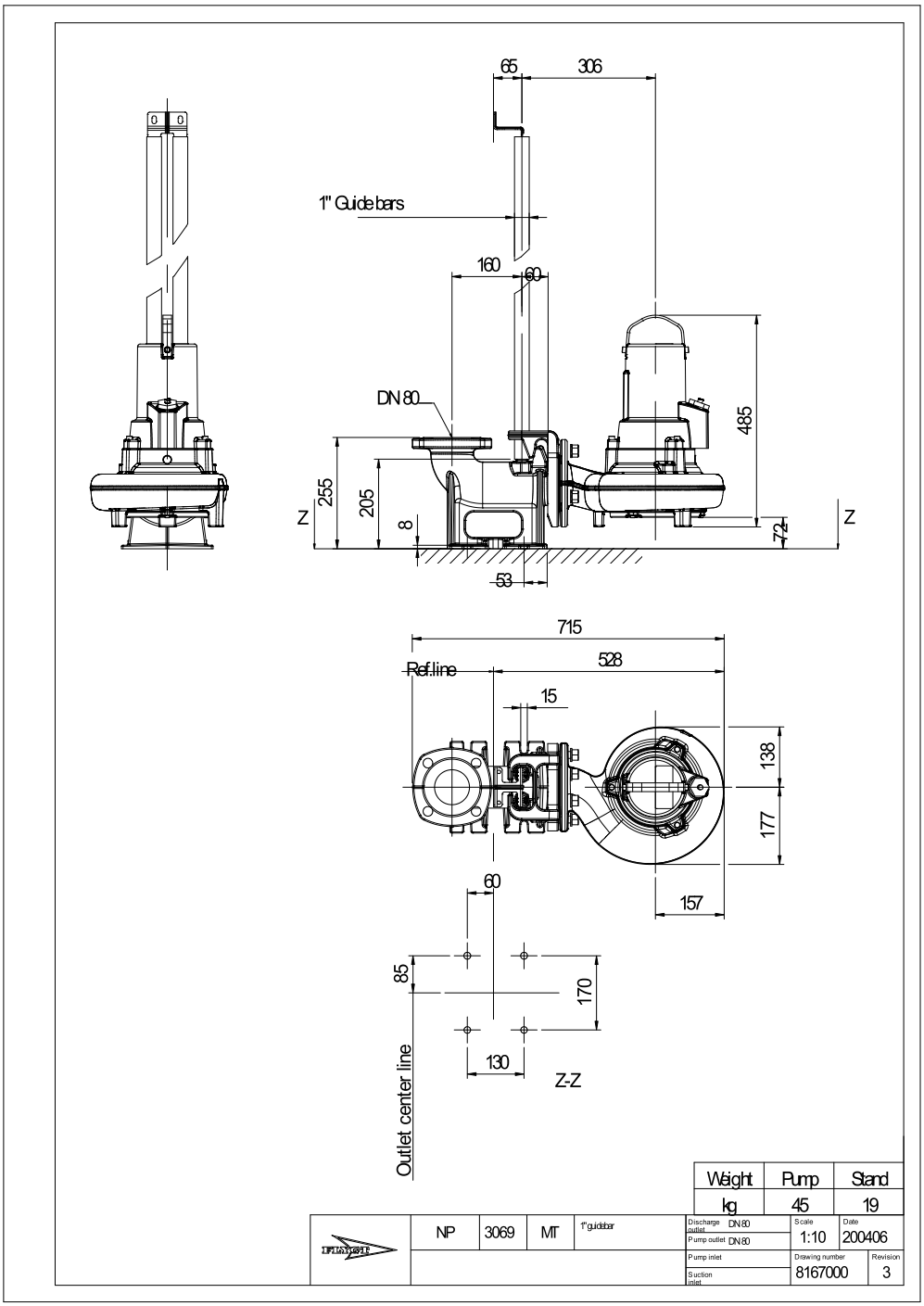
Operating characteristics

Pumps / Systems	Flow	Head	Shaft power	Flow	Head	Shaft power	Hydr.eff.	Specific Energy	NPSHre
1	15.4 l/s	7.13 m	2.07 kW	15.4 l/s	7.13 m	2.07 kW	52.4 %	4.9E-5 kWh/l	4.89 m

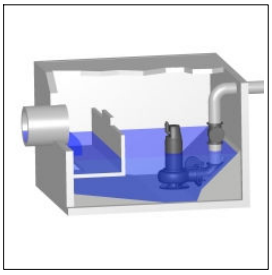
Project	21020 - Buchanan Crossings-Phase1	**Created by**	Simon Van Reenen		
Block	0	**Created on**	11/21/2022	**Last update**	11/21/2022

NP 3069 MT 3~ Adaptive 432

Dimensional drawing



Project	21020 - Buchanan Crossings-Phase1	**Created by**	Simon Van Reenen
Block	0	**Created on**	11/21/2022 **Last update** 11/21/2022



Friction loss calculation

Pumped fluid Human wastewater	**Static head** 5.16	**Layout** Wet well installation
Flow 13.6 l/s	**Number of pumps** 1	**Calculation model** Colebrook-White
Viscosity 1.569 mm²/s	**Nature of system** Single head pump	

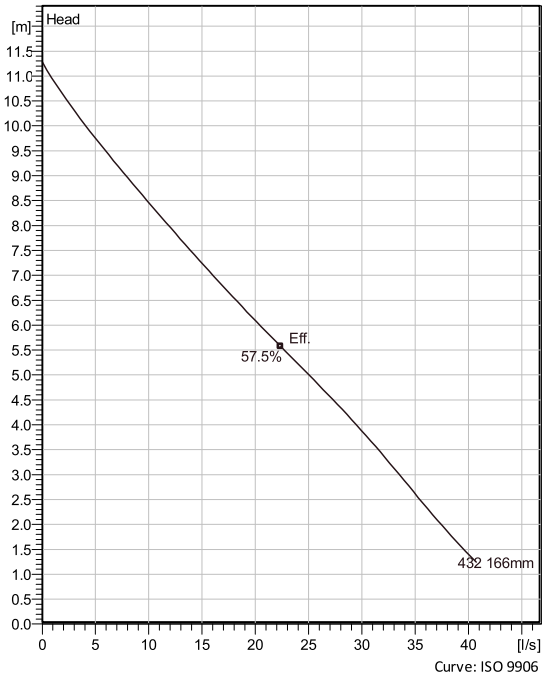
Type	Ø (mm)	? or L	Qty.	v (m/s)	k (mm)	ΔH (m)
Ø = Diameter v = Velocity k = Pipe roughness ΔH = Head loss						
Common discharge side pipe - Metal / Ductile iron ciment lining Thickness class 51 / 6" / ANSI/AWWA C150						
Pipe length	161	10.5 m	1	0.6677	1.2	0.05247
Discharge Connection	161	0.3	1	0.6677		0.006818
Elbows	161	0.9	3	0.6677		0.02045
Non-return valves	161	0.9	1	0.6677		0.02045
T-piece	161	0.4	1	0.6677		0.00909
Valve	161	0.3	1	0.6677		0.006818
Total friction head						**0.1161**
Common discharge side pipe - Plastic / PVC ASME Sch 40 / 6" / ANSI/AWWA C150						
Pipe length	155	345 m	1	0.7208	0.04	1.203
Elbows	155	1.5	5	0.7208		0.03972
Valve	155	0.3	1	0.7208		0.007943
Total friction head						**1.25**
Friction loss head						1.367 m
Total static head						5.16 m
Total head						**6.527 m**

NP 3069 MT 3~ Adaptive 432

Patented self cleaning semi-open channel impeller, ideal for pumping in most waste water applications. Modular based design with high adaptation grade.

Technical specification

Curves according to: Human wastewater [100%],4 °C,1 kg/dm³,1.569 mm²/s



Curve: ISO 9906

Configuration

Motor number
N3069.060 13-10-4BB-W 3.2hp

Installation type
P - Semi permanent, Wet

Impeller diameter
166 mm

Discharge diameter
80 mm

Pump information

Impeller diameter
166 mm

Discharge diameter
80 mm

Inlet diameter
113 mm

Maximum operating speed
1660 1/min

Number of blades
2

Max. fluid temperature
40 °C

Materials

Impeller
Hard-Iron

Stator housing material
Grey cast iron

Project	21020 - Buchanan Crossings-Phase1	**Created by**	Simon Van Reenen		
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NP 3069 MT 3~ Adaptive 432

Technical specification

Motor - General

Motor number N3069.060 13-10-4BB-W 3.2hp	**Phases** 3~	**Rated speed** 1660 1/min	**Rated power** 2.4 kW
Approval No	**Number of poles** 4	**Rated current** 11 A	**Stator variant** 7
Frequency 60 Hz	**Rated voltage** 200 V	**Insulation class** F	**Type of Duty** S1
Version code 060			

Motor - Technical

Power factor - 1/1 Load 0.85	**Motor efficiency - 1/1 Load** 74.3 %	**Total moment of inertia** 0.0132 kg m²	**Starts per hour max.** 15
Power factor - 3/4 Load 0.78	**Motor efficiency - 3/4 Load** 76.4 %	**Starting current, direct starting** 51 A	
Power factor - 1/2 Load 0.65	**Motor efficiency - 1/2 Load** 75.2 %	**Starting current, star-delta** 17 A	

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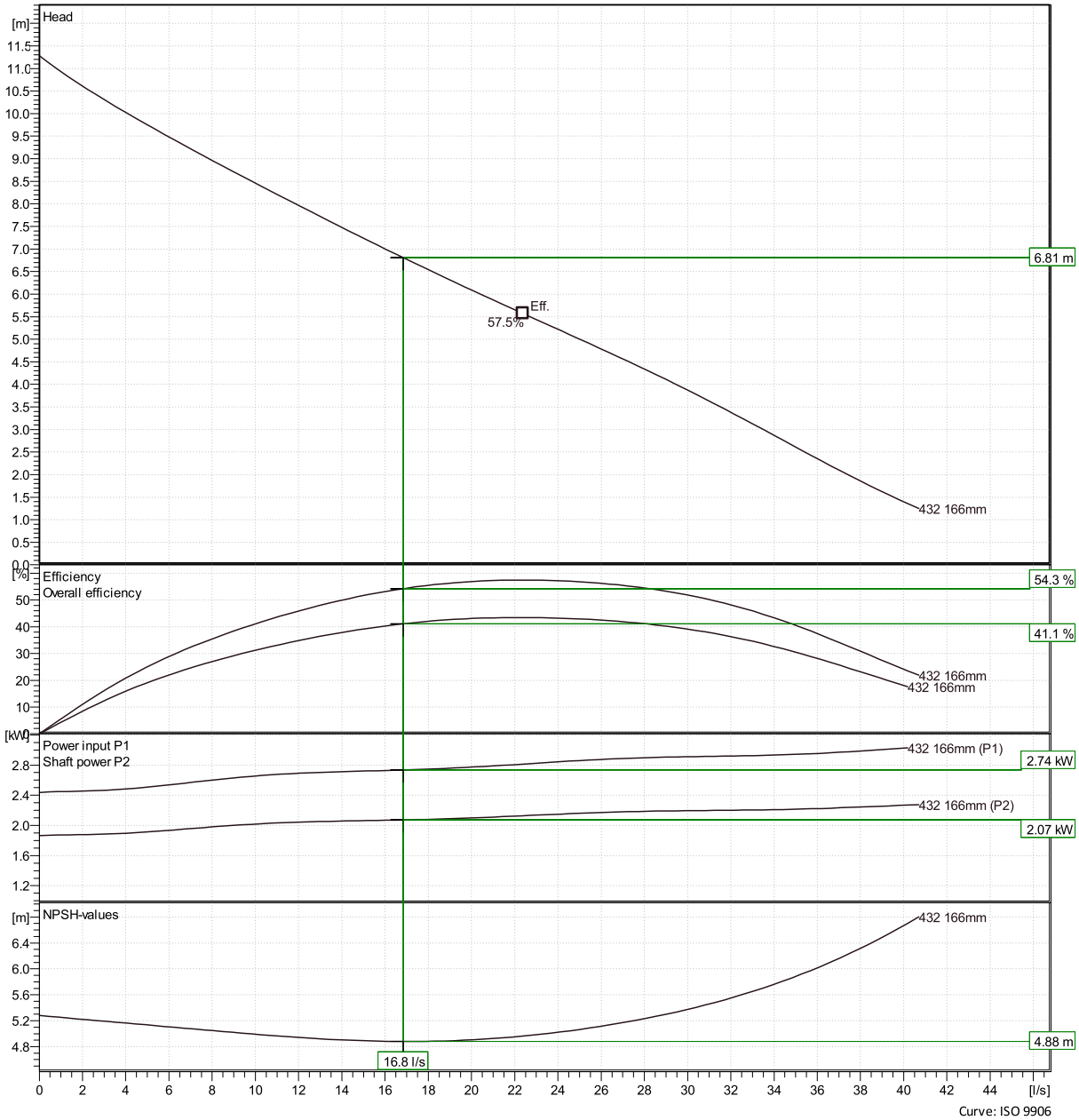
NP 3069 MT 3~ Adaptive 432

Performance curve

Duty point

Flow	Head
16.8 l/s	6.81 m

Curves according to: Human wastewater [100%],4 °C,1 kg/dm³,1.569 mm²/s



Curve: ISO 9906

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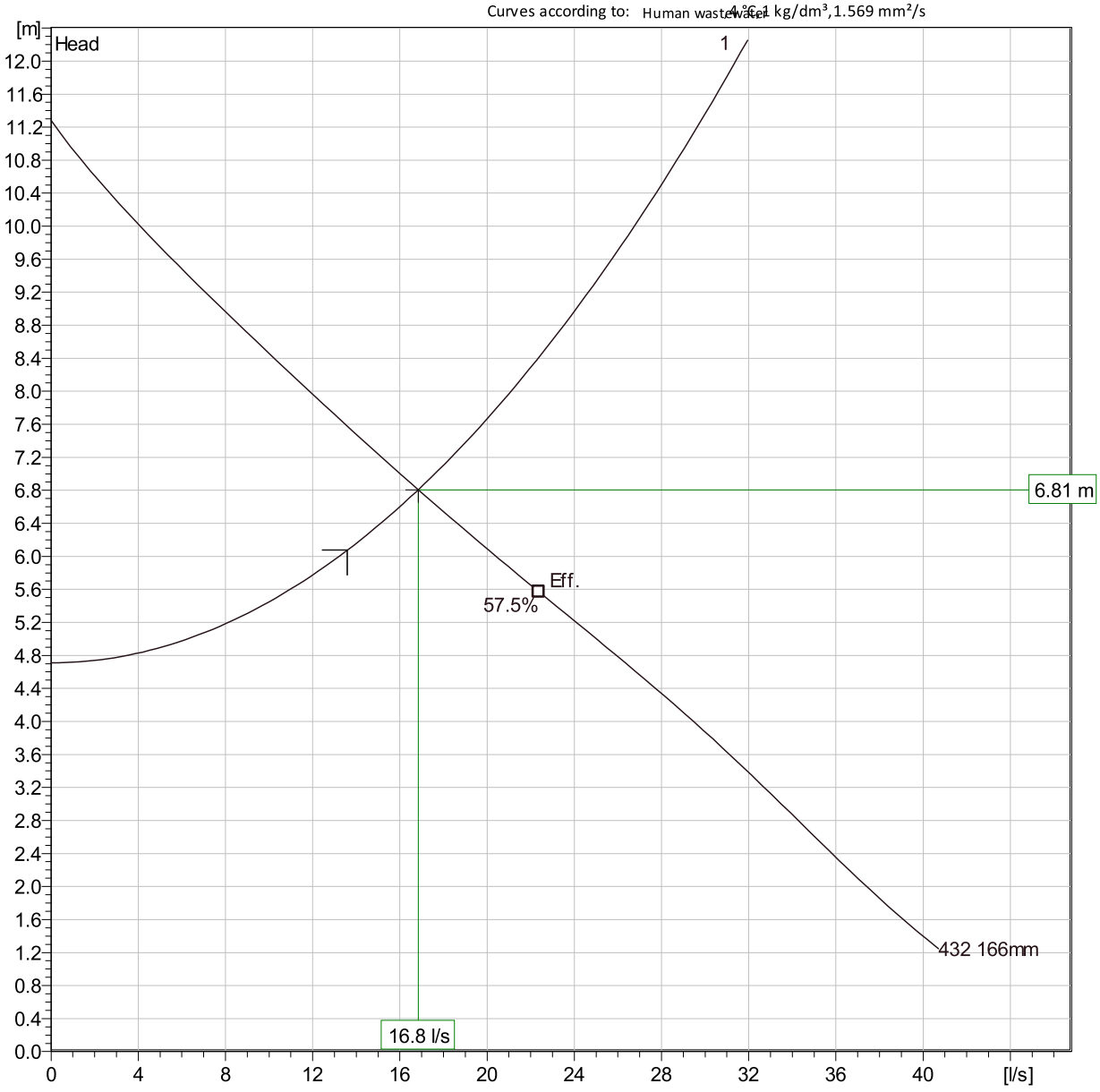
NP 3069 MT 3~ Adaptive 432

Duty Analysis

Curves according to: Human wastewater 4.3 kg/dm³, 1.569 mm²/s



Operating characteristics

Pumps / Systems	Flow	Head	Shaft power	Flow	Head	Shaft power	Hydr.eff.	Specific Energy	NPSHre
1	16.8 l/s	6.81 m	2.07 kW	16.8 l/s	6.81 m	2.07 kW	54.3 %	4.51E-5 kWh/l	4.88 m

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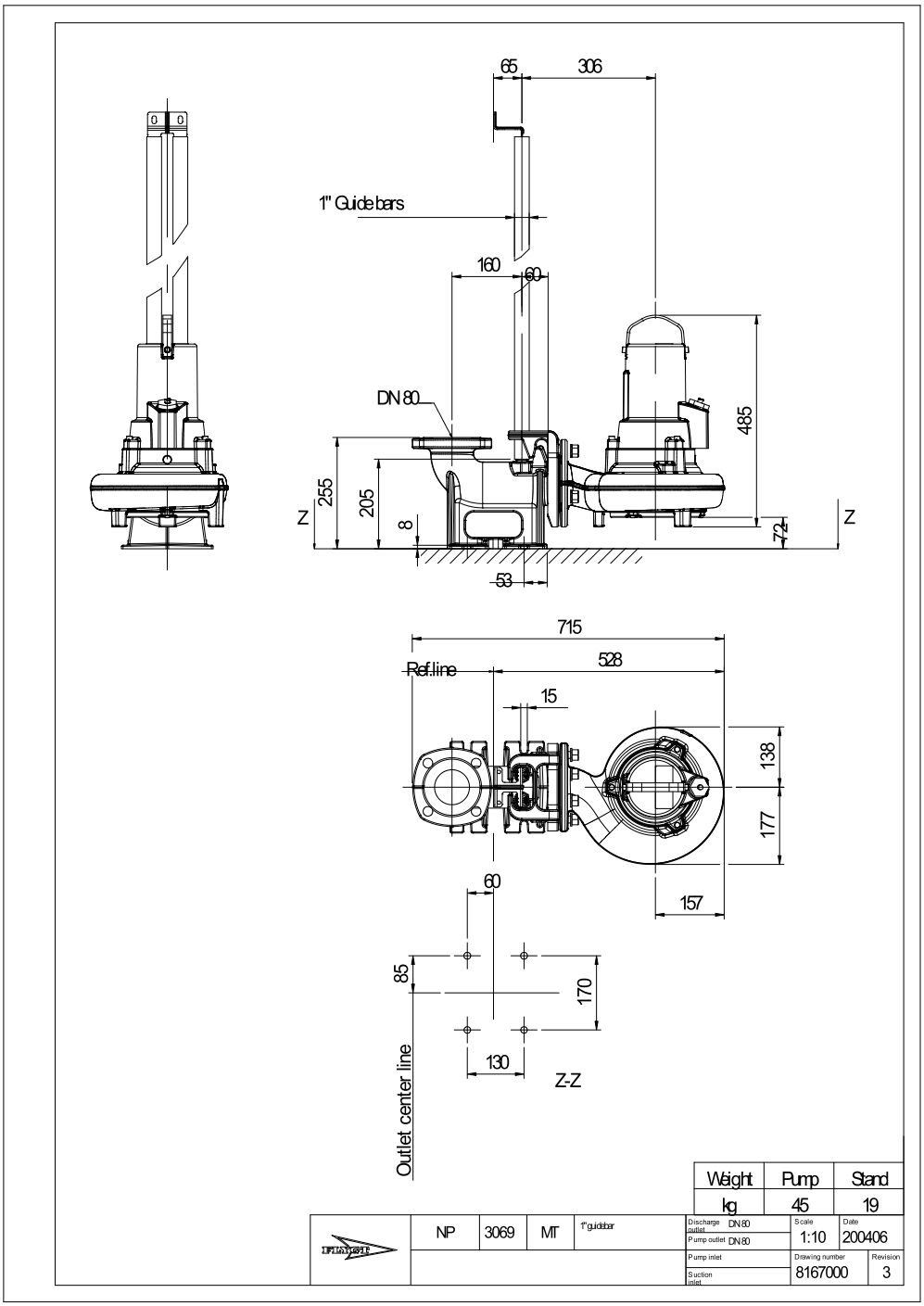
NP 3069 MT 3~ Adaptive 432

Dimensional drawing



Project	21020 - Buchanan Crossings-Phase1	**Created by**	Simon Van Reenen
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q = avg. daily per capita flow 300 L/cap. d

I = peak extraneous flow 0.08 L/ha. s

P = population in 1000's

Q (p) = peak population flow L/s

$$Q(p) = \frac{PqM}{86.4}$$

Q (i) = peak extraneous flow L/s $Q(i) = IA$

Q (d) = peak design flow $Q(d) = Q(p) + Q(i)$

$$M = 1 + \frac{14}{4 + P^{0.5}} * 1.1$$

Date: November 22, 2022

Project No.: 21020

Population Density 2.4 Persons/unit

SANITARY SEWER DESIGN SHEET (Future Development)

DRAINAGE AREA			SANITARY DRAINAGE AREA DATA									SEWER DATA									
			INDIVIDUAL AREA			CUMULATIVE AREA		PEAK FACTOR	POP.FLOW Q(p)	PEAK EXT Q(i)	PEAK DES Q(D)	TYPE OF	DIA.	SLOPE	LENGTH	CAPACITY (L/s)	FULL FLOW VELOCITY	SEWER INVERT ELEVATION		GROUND ELEVATION	
STREET	FROM	TO	Num Lots	POP	(ha)	POP	(ha)	M	L/s	L/s	L/s	PIPE	(mm)	(%)	(m)	n=0.013	(m/s)	UPPER	LOWER	UPPER	LOWER
Southern Condo Development																					
Street G	MHM'	MHI	26	63	0.61	63	0.61	4.722	1.033	0.05	1.1	PVC	200	0.50	118.1	23.2	0.74				
Street G	MHI	MHG	27	65	0.63	128	1.24	4.634	2.060	0.10	2.2	PVC	200	1.03	109.3	33.3	1.06				
Street F	MHJ	MHH	12	29	0.35	29	0.35	4.793	0.483	0.03	0.5	PVC	200	0.92	98.2	31.5	1.00				
Street E	MHF	MHG	3	8	0.09	8	0.09	4.865	0.135	0.01	0.1	PVC	200	0.70	25.2	27.4	0.87				
Street E	MHG	MHH	8	20	0.19	156	1.52	4.604	2.494	0.12	2.6	PVC	200	0.40	58.7	20.7	0.66				
Street E	MHH	MHA	4	10	0.20	195	2.07	4.567	3.092	0.17	3.3	PVC	200	0.40	36.6	20.7	0.66				
Street H	MHL	MHM	6	15	0.13	15	0.13	4.84	0.252	0.01	0.3	PVC	200	0.70	36.4	27.4	0.87				
Street H	MHM	MHN	8	20	0.21	35	0.34	4.78	0.581	0.03	0.6	PVC	200	0.50	58.7	23.2	0.74				
Street F	MHN	MHK	9	22	0.21	57	0.55	4.73	0.937	0.04	1.0	PVC	200	0.40	64.9	20.7	0.66				
Street F	MHJ	MHK	7	17	0.17	17	0.17	4.83	0.285	0.01	0.3	PVC	200	1.64	64.3	42.0	1.34				
Street I	MHK	MHC	0	0	0.00	74	0.72	4.70	1.209	0.06	1.3	PVC	200	0.40	36.7	20.7	0.66				
Street A	MHA	MHB	15	36	0.46	231	2.53	4.538	3.639	0.20	3.8	PVC	250	0.28	82.7	31.5	0.64				
Street A	MHB	MHC	19	46	0.62	277	3.15	4.502	4.330	0.25	4.6	PVC	250	0.28	79.8	31.5	0.64				
Street A	MHC	MHE	18	44	0.64	395	4.51	4.428	6.072	0.36	6.4	PVC	250	0.28	103.4	31.5	0.64				
East Loop Development																					
Street C	MHV	MHP	16	39	0.75	39	0.75	4.769	0.646	0.06	0.7	PVC	200	0.50	101.7	23.2	0.74				
Street C	MHV	MHU	21	51	0.96	51	0.96	4.744	0.840	0.08	0.9	PVC	200	0.50	110.5	23.2	0.74				
Street B	MHU	MHT	3	8	0.23	59	1.19	4.730	0.969	0.10	1.1	PVC	200	0.40	11.3	20.7	0.66				

DRAINAGE AREA			INDIVIDUAL AREA			CUMULATIVE AREA		PEAK FACTOR	POP.FLOW Q(p)	PEAK EXT Q(i)	PEAK DES Q(D)	TYPE OF	DIA.	SLOPE	LENGTH	CAPACITY (L/s)	FULL FLOW VELOCITY	SEWER INVERT ELEVATION		GROUND ELEVATION	
STREET	FROM	TO	Num Lots	POP	(ha)	POP	(ha)	M	L/s	L/s	L/s	PIPE	(mm)	(%)	(m)	n=0.013	(m/s)	UPPER	LOWER	UPPER	LOWER
Street B	MHT	MHS	7	17	0.41	76	1.60	4.701	1.241	0.13	1.4	PVC	200	0.40	68.1	20.7	0.66				
Street B	MHS	MHR	2	5	0.17	81	1.77	4.695	1.320	0.14	1.5	PVC	200	0.40	11.2	20.7	0.66				
Street B	MHR	MHQ	20	48	0.89	129	2.66	4.633	2.075	0.21	2.3	PVC	200	0.40	108.7	20.7	0.66				
Street B	MHQ	MHE	20	48	0.89	177	3.55	4.584	2.817	0.28	3.1	PVC	200	0.40	113.6	20.7	0.66				
Trillium Village Condo																					
Street J	MHAD	MHAC	12	29	0.32	29	0.32	4.793	0.483	0.03	0.5	PVC	200	0.50	88.7	23.2	0.74				
Street J	MHAC	MHAB	15	36	0.38	65	0.70	4.719	1.065	0.06	1.1	PVC	200	0.40	115.7	20.7	0.66				
Street J	MHAB	MHAA	10	24	0.26	89	0.96	4.683	1.447	0.08	1.5	PVC	200	0.40	73.8	20.7	0.66				
Easement	MHAA	MHW	0	0	0.03	89	0.99	4.683	1.447	0.08	1.5	PVC	200	0.40	36.6	20.7	0.66				
Street K	MHZB	MHZ	6	15	0.13	15	0.13	4.836	0.252	0.01	0.3	PVC	200	0.50	61.9	23.2	0.74				
Street A	MHZA	MHZ	2	5	0.15	5	0.15	4.883	0.085	0.01	0.1	PVC	200	0.70	19.7	27.4	0.87				
Street A	MHZ	MHY	20	48	0.70	68	0.98	4.715	1.113	0.08	1.2	PVC	200	0.40	96.7	20.7	0.66				
Street A	MHY	MHX	21	51	0.85	119	1.83	4.644	1.919	0.15	2.1	PVC	200	0.40	115.7	20.7	0.66				
Street A	MHX	MHW	14	34	0.47	153	2.30	4.607	2.447	0.18	2.6	PVC	200	0.48	73.8	22.7	0.72				
Street A	MHW	MHP	3	8	0.20	250	3.49	4.522	3.925	0.28	4.2	PVC	200	0.40	45.9	20.7	0.66				
Street D Cresent																					
Street D	MHAE	MHAF	3	8	0.37	8	0.37	4.865	0.135	0.03	0.2	PVC	200	0.70	23.4	27.4	0.87				
Street D	MHAF	MHAG	0	0	0.00	8	0.37	4.865	0.135	0.03	0.2	PVC	200	0.70	11.3	27.4	0.87				
Street D	MHAG	MHAH	16	39	1.04	47	1.41	4.752	0.776	0.11	0.9	PVC	200	1.06	111.4	33.8	1.07				
Future North Development																					
Street R	*Potential Fut*	*MHBE*	*13*	*32*	*0.78*	*32*	*0.78*	*4.785*	*0.532*	*0.06*	*0.6*										
Street C	MHBE	MHBC	11	27	0.64	59	1.42	4.730	0.969	0.11	1.1	PVC	200	0.85	73.2	30.2	0.96				
Street Q	*Potential Fut*	*MHBC*	*8*	*20*	*0.53*	*20*	*0.53*	*4.818*	*0.335*	*0.04*	*0.4*										
Street C	MHBC	MHBA	11	27	0.61	106	2.56	4.661	1.715	0.21	1.9	PVC	200	2.93	81.1	56.1	1.79				
Street Q	*Potential Fut*	*MHBA*	*8*	*20*	*0.56*	*20*	*0.56*	*4.818*	*0.335*	*0.05*	*0.4*										
Street C	MHBA	MHAY	12	29	0.65	155	3.77	4.605	2.478	0.30	2.8	PVC	200	1.08	91.1	34.1	1.08				
Street O	MHAZ	MHAY	11	27	0.65	27	0.65	4.798	0.450	0.05	0.5	PVC	200	0.63	93.9	26.0	0.83				

DRAINAGE AREA			INDIVIDUAL AREA			CUMULATIVE AREA		PEAK FACTOR	POP.FLOW Q(p)	PEAK EXT Q(i)	PEAK DES Q(D)	TYPE OF	DIA.	SLOPE	LENGTH	CAPACITY (L/s)	FULL FLOW VELOCITY	SEWER INVERT ELEVATION		GROUND ELEVATION	
STREET	FROM	TO	Num Lots	POP	(ha)	POP	(ha)	M	L/s	L/s	L/s	PIPE	(mm)	(%)	(m)	n=0.013	(m/s)	UPPER	LOWER	UPPER	LOWER
Street C	MHAY	MHAW	8	20	0.47	202	4.89	4.561	3.199	0.39	3.6	PVC	200	0.72	86.1	27.8	0.89				
Street N	MHAX	MHAW	11	27	0.81	27	0.81	4.798	0.450	0.07	0.5	PVC	200	0.53	60.0	23.9	0.76				
Street C	MHAW	MHAU	4	10	0.59	239	6.29	4.531	3.760	0.50	4.3	PVC	250	0.28	127.8	31.5	0.64				
Future West Development																					
Street L	MHAT'	MHAR	5	12	0.41	12	0.41	4.848	0.202	0.03	0.2	PVC	200	0.84	73.2	30.1	0.96				
Street L	MHAR	MHAQ	2	5	0.16	17	0.57	4.829	0.285	0.05	0.3	PVC	200	0.63	11.3	26.0	0.83				
Street L	MHAQ	MHAP	12	29	0.89	46	1.46	4.754	0.759	0.12	0.9	PVC	200	0.56	71.8	24.5	0.78				
Street L	MHAP	MHAO	13	32	0.84	78	2.30	4.699	1.273	0.18	1.5	PVC	200	0.60	75.3	25.4	0.81				
Street L	MHAO	MHAN	1	3	0.10	81	2.40	4.695	1.320	0.19	1.5	PVC	200	0.40	11.3	20.7	0.66				
Street L	MHAN	MHAM	5	12	0.36	93	2.76	4.677	1.510	0.22	1.7	PVC	200	0.40	73.2	20.7	0.66				
Street C	MHAU	MHAT	17	41	0.88	280	7.17	4.500	4.375	0.57	4.9	PVC	250	0.28	121.5	31.5	0.64				
Street C	MHAT	MHAS	13	32	0.65	312	7.82	4.478	4.851	0.63	5.5	PVC	250	0.28	87.2	31.5	0.64				
Street C	MHAS	MHAM	12	29	0.60	341	8.42	4.459	5.280	0.67	6.0	PVC	250	0.28	75.9	31.5	0.64				
Street C	MHAM	MHAL	6	15	0.39	449	11.57	4.398	6.856	0.93	7.8	PVC	250	0.28	60.9	31.5	0.64				
Street C	MHAL	MHAK	4	10	0.51	459	12.08	4.392	7.000	0.97	8.0	PVC	250	0.28	40.7	31.5	0.64				
Street C	MHAK	MHAJ	3	8	0.77	467	12.85	4.388	7.115	1.03	8.1	PVC	250	0.28	119.9	31.5	0.64				
Street C	MHAJ	MHAI	0	0	0.90	467	13.75	4.388	7.115	1.10	8.2	PVC	250	0.28	42.4	31.5	0.64				
Street C	MHAI	MHAH	0	0	0.07	467	13.82	4.388	7.115	1.11	8.2	PVC	250	0.28	39.9	31.5	0.64				
Street C	MHAH	MHP	0	0	0.15	514	15.38	4.365	7.790	1.23	9.0	PVC	250	0.28	79.7	31.5	0.64				
Street A	MHP	MHO	0	0	0.06	803	19.68	4.245	11.836	1.57	13.4	PVC	250	0.28	32.3	31.5	0.64				
Street A	MHO	MHE	0	0	0.10	803	19.78	4.245	11.836	1.58	13.4	PVC	250	0.28	51.4	31.5	0.64				
Street B	MHE	PS	0	0	0.00	1375	27.84	4.078	19.468	2.23	21.7	PVC	250	0.28	15.2	31.5	0.64				

BMROSS engineering better communities

Township Criteria: Increasiong Harmon Peaking factor by 10% (x1.1)
Township Criteria: Daily per capita sewage flows to be 300 litres, excluding infiltration
Township Criteria: Infiltration of 3370 litres per hectare per day in clay till (0.039 L/ha.sec)
Population Density: Medium-Low Density (30-75 units/ha) @ 2.4 people/unit

Municipality of Strathroy-Caradoc

DESIGN SV

CHECKED GCB

B. M. ROSS AND ASSOCIATES LIMITED
Consulting Engineers
62 North Street, Goderich, ON N7A 2T4
p. (519) 524-2641 • f. (519) 524-4403
www.bmross.net

Project: 21020
Date: 2022-11-22

Wetwell Active Volume Calculation Sheets

Design Flow:	20.6	L/s	
Length of Forcemain	345	m	
Target Pipe nominal Size:	150	mm	*155mm ID, Ipex Cycletough*
Elevation of CL @ Outlet:	227	m	
Ground Elevation @ PS:	229.500	m	
Invert Elevation @ PS:	223.140	m	
PS Sump	2.05	m	
Elevation of Wetwell Inv	221.09	m	
Vertical Pipe	6.61	m	
PS to VC Length	6	m	

Level Phase 20-22	*C*	*Elevation*	*Static head*
Pump Start	140	222.54 m	4.460m
Mid Level	130	221.965 m	5.035m
Pump Stop	120	221.39 m	5.610m

Required Active Storage

Phase 1 and Future development

Pump Selection : **NP 3102 MT3~ Adaptive 464**

Q_{design}=	20.6	L/s	*From Sanitary Design Sheet*
Q=	21.8	L/s	*From Pump Curve with C=130*
A_{pipe}=	0.01767	m^2	
V=	1.23362765	m/s	*0.6m/s > V > 3.0 m/s*

MECP Dual pump Active Storage

Q*0.15=	**3.27**	**m^3 Active Storage**

Available Active Storage Calculations

Nominal Wet well Diameter=	2500	mm	Min Diameter MECP 2500 nominal
Dia=	2.438	m	Actual Dimeter
R=	1.219	m	Radius
A=	4.668	m^2	

Pipe diplacement Volume

A=	0.0176715	m^2
Num Pipe	2	
Total A	0.0353429	m^2

Sewage Volume

Angle of benching=	45		
Dia benching at pumps=	1.116	m	
Radius=	0.558	m	
CL Offset Distance:	0.942	m	*CL of Conic Benching to CL of Wetwell*
R-H relationship	1.00:1		

Sewage volume using Series step: 0.05

Equations of Circles are used to find the point where to 2 circles intercept.

PS circle Equation: $x^2 + y^2 = a^2$ (1) *Where: a=PS radius*

Benching Cone Eq: $(x - b)^2 + y^2 = c^2$ (2) *b=CL offset*

c=Cone Radius

Find intercept Coordinates (PS circle center at (0,0)

EQ (2) - EQ (1) =

simplified $x = \frac{c^2 - a^2 - b^2}{-2b}$

sub into Eq (1) $y = \pm\sqrt{a^2 - x^2}$

set Values:

a= 1.219 *Radius Pump Station*

b= 0.942 *CL Offset*

Area for segment of circle

$$A = R^2 \cos^{-1}\left(\frac{R - h}{R}\right) - (R - h)\sqrt{2Rh - h^2}$$

Where R=Radius of cirle

h=height of segment=R-x

Note: The CL offset between benching and PS must be less than radius of PS

Table 1: Stage-Storage Relationships

Height	Elevation	Area Sewage	Increment Vol	Cum. Vol	Active Storage	Phase 20-22
0	221.090	0.712	0.000	0.000		
0.05	221.140	0.817	0.038	0.038		
0.1	221.190	0.927	0.044	0.082		
0.15	221.240	1.042	0.049	0.131		
0.2	221.290	1.160	0.055	0.186		
0.25	221.340	1.282	0.061	0.247		
0.3	221.390	1.408	0.067	0.314	0.000	Pump Stop
0.35	221.440	1.537	0.074	0.388	0.074	
0.4	221.490	1.669	0.080	0.468	0.154	
0.45	221.540	1.804	0.087	0.555	0.241	
0.5	221.590	1.941	0.094	0.649	0.334	
0.55	221.640	2.080	0.101	0.749	0.435	
0.55	221.640	2.080	0.000	0.749	0.435	
0.6	221.690	2.221	0.108	0.857	0.542	
0.65	221.740	2.363	0.115	0.971	0.657	
0.7	221.790	2.507	0.122	1.093	0.779	
0.75	221.840	2.651	0.129	1.222	0.908	
0.8	221.890	2.795	0.136	1.358	1.044	
0.85	221.940	2.939	0.143	1.501	1.187	
0.9	221.990	3.083	0.151	1.652	1.338	
0.95	222.040	3.225	0.158	1.810	1.495	
1	222.090	3.366	0.165	1.974	1.660	
1.05	222.140	3.505	0.172	2.146	1.832	
1.1	222.190	3.641	0.179	2.325	2.010	
1.15	222.240	3.774	0.185	2.510	2.196	
1.2	222.290	3.902	0.192	2.702	2.388	
1.25	222.340	4.026	0.198	2.900	2.586	
1.3	222.390	4.144	0.204	3.105	2.790	
1.35	222.440	4.255	0.210	3.315	3.000	
1.4	222.490	4.358	0.215	3.530	3.216	
1.45	222.540	4.451	0.220	3.750	3.436	Pump Start
1.5	222.590	4.531	0.225	3.975	3.660	
1.55	222.640	4.595	0.228	4.203	3.888	
1.6	222.690	4.632	0.231	4.434	4.119	Lag Pump Start
1.65	222.740	4.633	0.232	4.665	4.351	
1.7	222.790	4.633	0.232	4.897	4.582	
1.75	222.840	4.633	0.232	5.129	4.814	High Alarm
1.8	222.890	4.633	0.232	5.360	5.046	
1.85	222.940	4.633	0.232	5.592	5.277	
1.9	222.990	4.633	0.232	5.823	5.509	
1.95	223.040	4.633	0.232	6.055	5.741	
2	223.090	4.633	0.232	6.287	5.972	
2.05	223.140	4.633	0.232	6.518	6.204	Invert

Product specification

	Van Reenen, Simon BM Ross and Associates 2695 Hamilton Rd, P.O. Box 400 CANADA-N0N1C0 Brights Grove

Quant.	Item no.	Description	Price	Subtotal
		Block: 1		
1		Pump: NP 3102 MT 3~ Adaptive 464		
		Block: 2		
1		Pump: NP 3102 MT 3~ Adaptive 464		
		Block: 3 kW		
1		Pump: NP 3102 MT 3~ Adaptive 464		

	Total price

Project	**21020 - Buchanan Crossings**	**Created by**	**Simon Van Reenen**	**Last update**	**10/28/2022**
Project		**Created on**	**10/28/2022**		

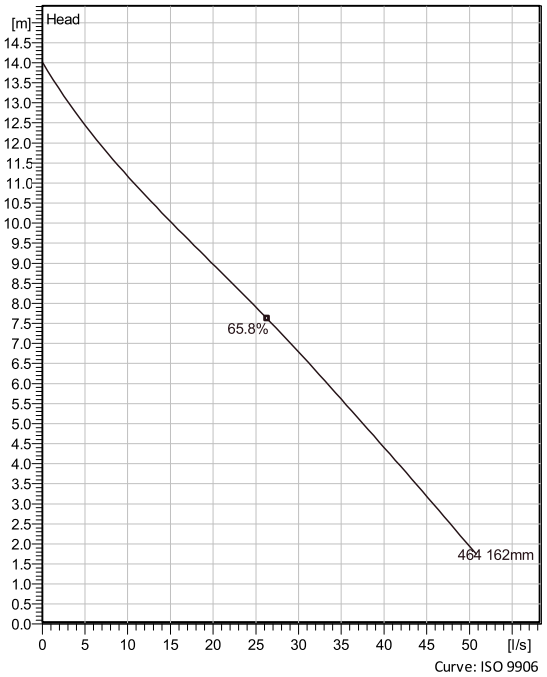
Price list	Currency	Price base from	Country reference
	CAD Canadian Dollar	(No data available.)	

NP 3102 MT 3~ Adaptive 464

Patented self cleaning semi-open channel impeller, ideal for pumping in most waste water applications. Modular based design with high adaptation grade.

Technical specification

Curves according to: Human wastewater Human wastewater [100%], 4 °C, 1 kg/dm³, 1.569 mm²/s



Curve: ISO 9906

Configuration

Motor number
N3102.900 18-11-4AS-W IE3 5.5hp

Installation type
P - Semi permanent, Wet

Impeller diameter
162 mm

Discharge diameter
100 mm

Pump information

Impeller diameter
162 mm

Discharge diameter
100 mm

Inlet diameter
100 mm

Maximum operating speed
1800 1/min

Number of blades
2

Max. fluid temperature
40 °C

Configuration

Material

Impeller
Grey cast iron

Stator housing material
Grey cast iron

Project	21020 - Buchanan Crossings	**Created by**	Simon Van Reenen	
Block	0	**Created on**	10/28/2022 **Last update**	10/28/2022

NP 3102 MT 3~ Adaptive 464

Technical specification

Motor - General

Motor number N3102.900 18-11-4AS-W IE3 5.5hp	**Phases** 3~	**Rated speed** 1800 1/min	**Rated power** 4.1 kW
Approval No	**Number of poles** 4	**Rated current** 15 A	**Stator variant** 71
Frequency 60 Hz	**Rated voltage** 200 V	**Insulation class** H	**Type of Duty** S1
Version code 900			

Motor - Technical

Power factor - 1/1 Load 0.89	**Motor efficiency - 1/1 Load** 91.8 %	**Total moment of inertia** 0.0273 kg m²	**Starts per hour max.** 30
Power factor - 3/4 Load 0.84	**Motor efficiency - 3/4 Load** 91.3 %	**Starting current, direct starting** 99 A	
Power factor - 1/2 Load 0.72	**Motor efficiency - 1/2 Load** 89.4 %	**Starting current, star-delta** 33 A	

Project	21020 - Buchanan Crossings	**Created by**	Simon Van Reenen		
Block	0	**Created on**	10/28/2022	**Last update**	10/28/2022

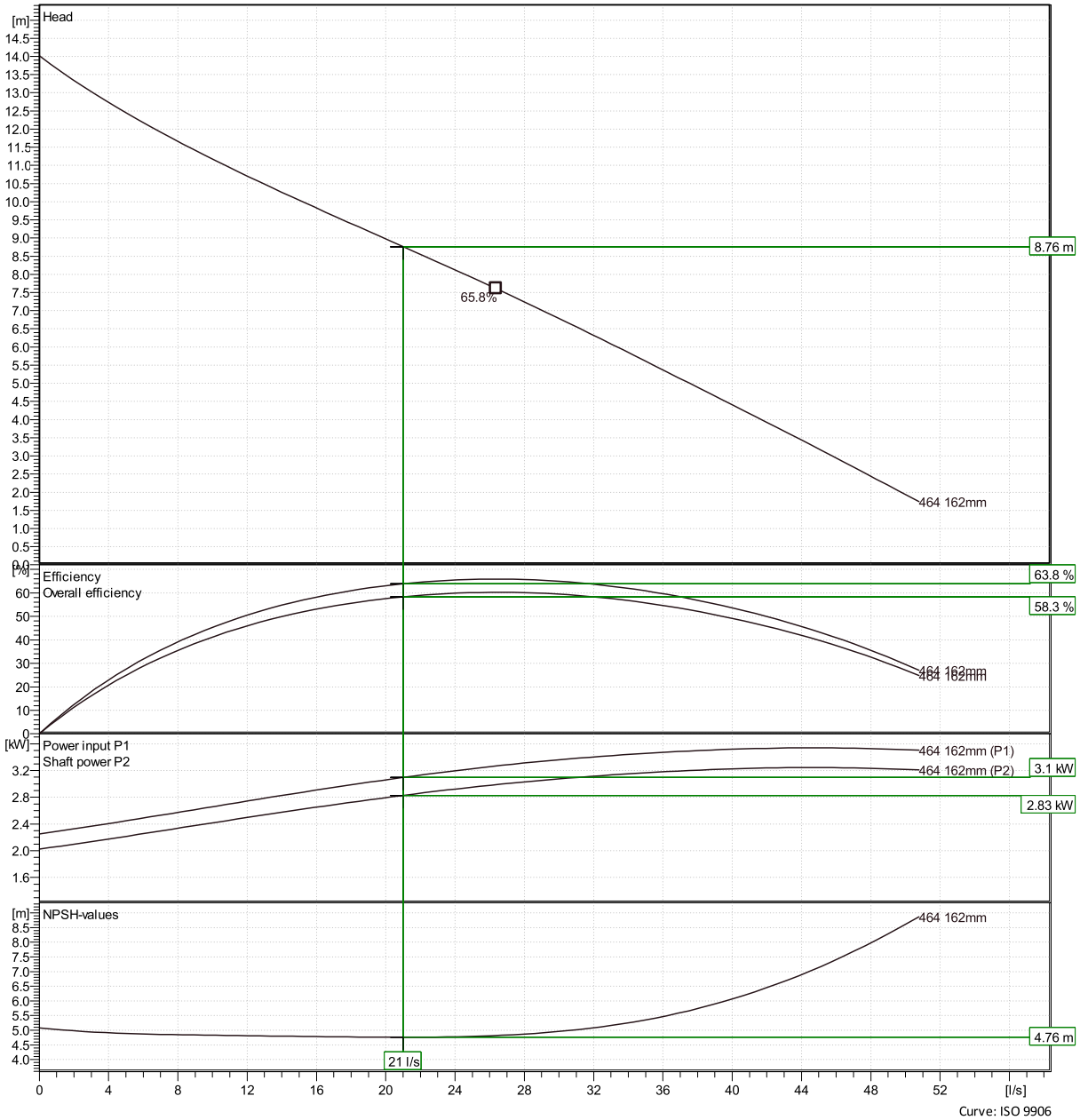
NP 3102 MT 3~ Adaptive 464

Performance curve

Duty point

Flow	Head
21 l/s	8.76 m

Curves according to: Human wastewater [100%],4 °C,1 kg/dm³,1.569 mm²/s



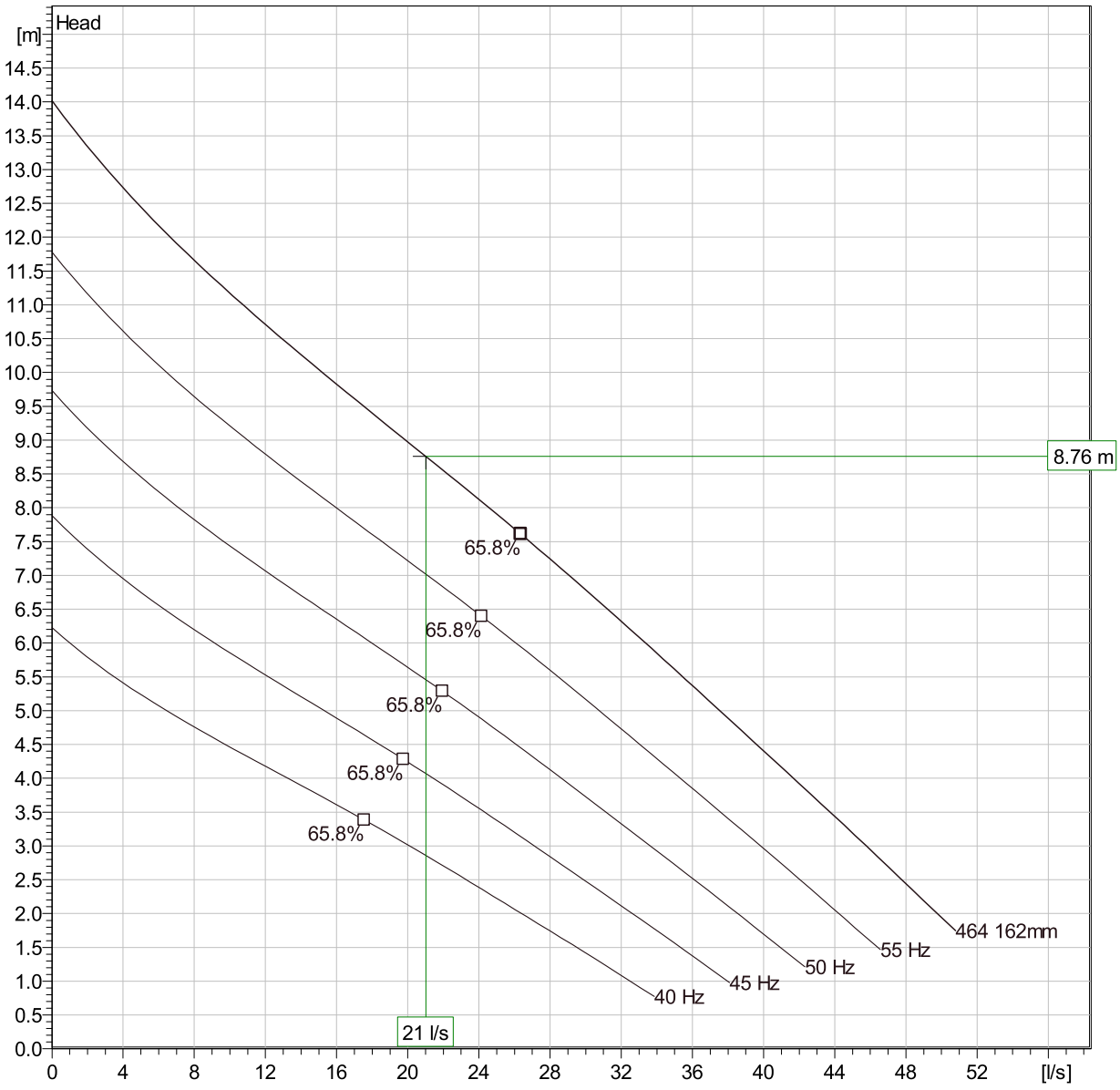
Curve: ISO 9906

21020 - Buchanan Crossings			Simon Van Reenen		
0		**Created on**	10/28/2022	**Last update**	10/28/2022

NP 3102 MT 3~ Adaptive 464

Duty Analysis

Curves according to: Water, pure [100%] ; 4°C; 1kg/dm³; 1.569mm²/s



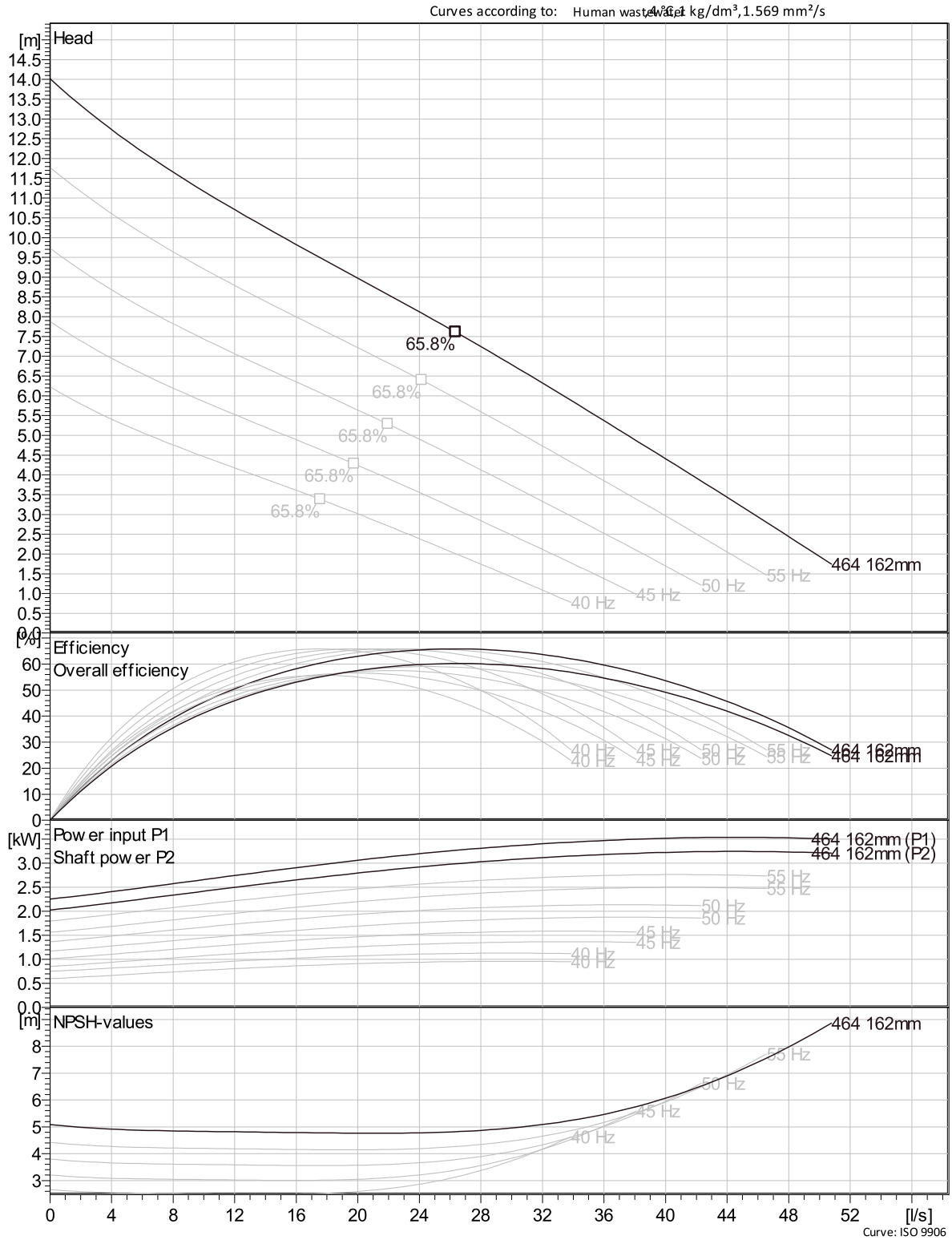
Operating characteristics

Pumps / Systems	Flow	Head	Shaft power	Flow	Head	Shaft power	Hydr.eff.	Spec. Energy	NPSHre
	l/s	m	kW	l/s	m	kW		kWh/l	m
1	21	8.76	2.83	21	8.76	2.83	63.8 %	4.09E-5	4.76

Project		**Created by**	Simon Van Reenen		
Block	21020 - Buchanan Crossings	**Created on**	10/28/2022	**Last update**	10/28/2022

NP 3102 MT 3~ Adaptive 464

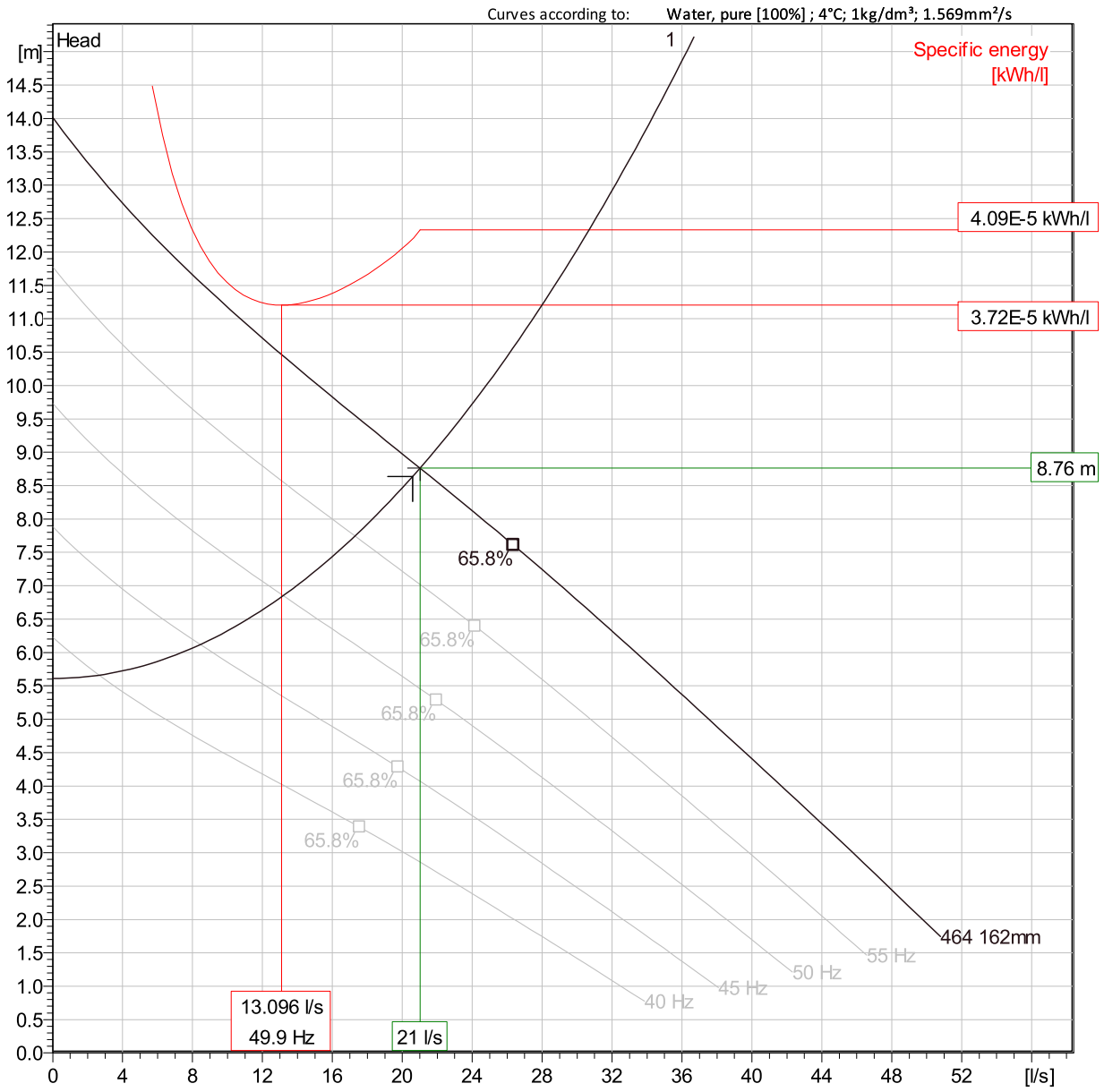
VFD Curve



Project	21020 - Buchanan Crossings	**Created by**	Simon Van Reenen
Block	0	**Created on**	10/28/2022 **Last update** 10/28/2022

NP 3102 MT 3~ Adaptive 464

VFD Analysis



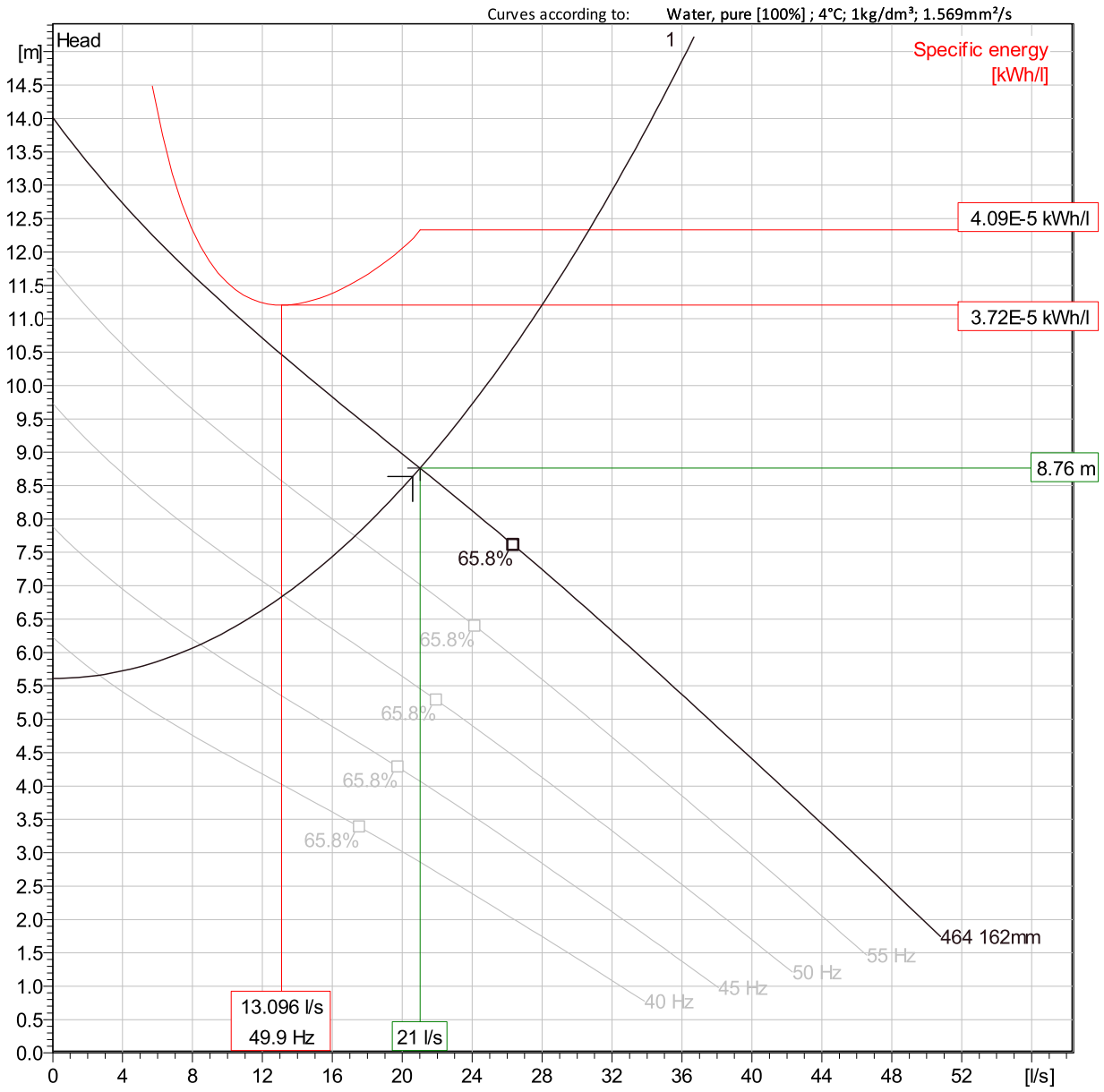
Operating Characteristics

Pumps / Systems	Frequency	Flow	Head	Shaft power	Flow	Head	Shaft power	Hydr.eff.	Specific energy	NPSHre
		l/s	m	kW	l/s	m	kW		kWh/l	m
1	60 Hz	21	8.76	2.83	21	8.76	2.83	63.8 %	4.09E-5	4.76
1	55 Hz	17.3	7.74	2.12	17.3	7.74	2.12	61.9 %	3.84E-5	4.15
1	50 Hz	13.2	6.85	1.53	13.2	6.85	1.53	57.9 %	3.72E-5	3.58
1	45 Hz	8.44	6.12	1.04	8.44	6.12	1.04	48.7 %	4.01E-5	3.04

Project	21020 - Buchanan Crossings	**Created by**	Simon Van Reenen		
Block	0	**Created on**	10/28/2022	**Last update**	10/28/2022

NP 3102 MT 3~ Adaptive 464

VFD Analysis



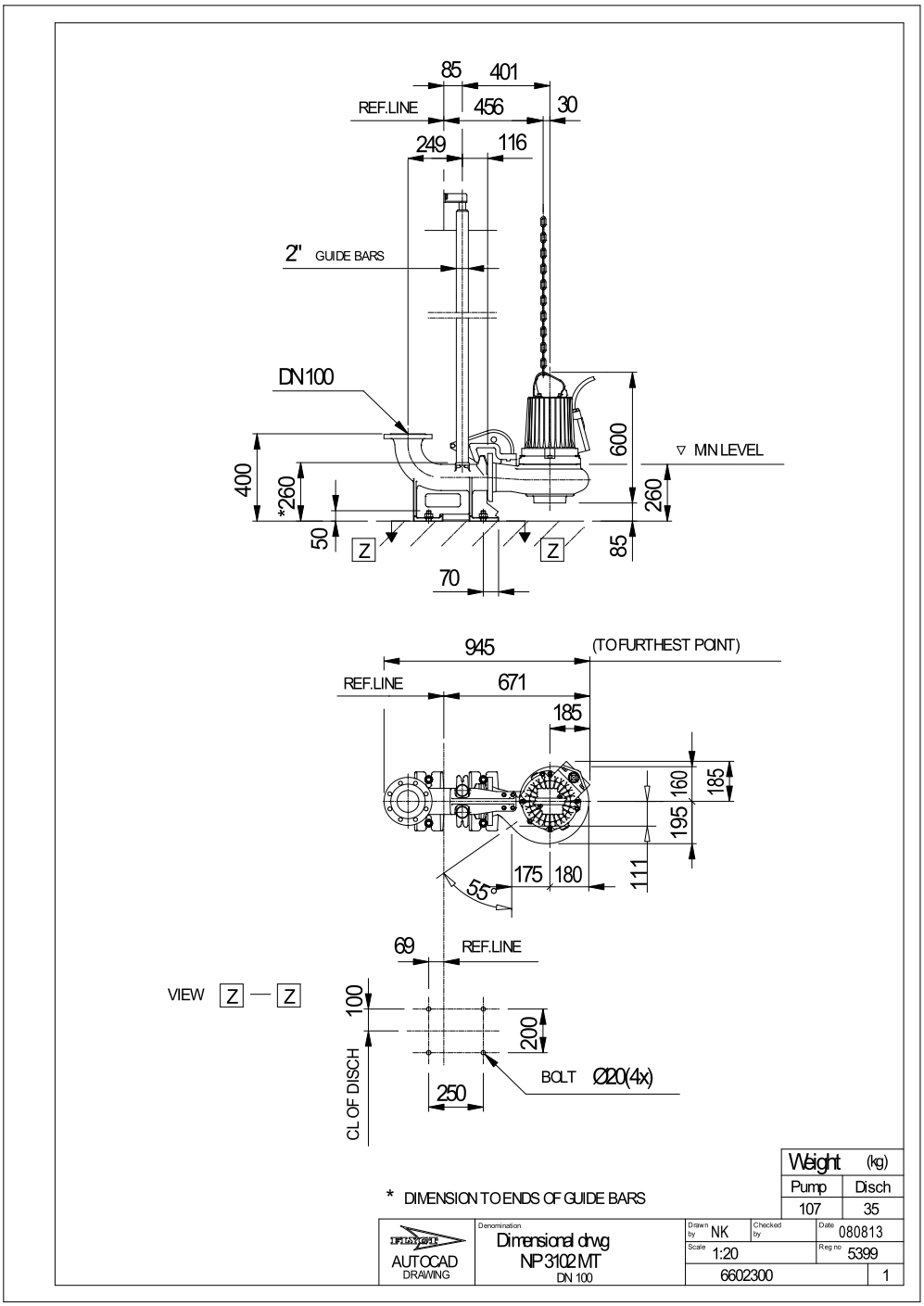
Operating Characteristics

Pumps / Systems	Frequency	Flow	Head	Shaft power	Flow	Head	Shaft power	Hydr.eff.	Specific energy	NPSHre
		l/s	m	kW	l/s	m	kW		kWh/l	m
1	40 Hz	2.66	5.66	0.644	2.66	5.66	0.644	22.9 %	8.31E-5	2.57

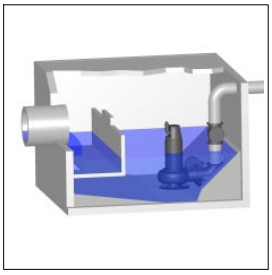
Project	21020 - Buchanan Crossings	**Created by**	Simon Van Reenen		
Block	0	**Created on**	10/28/2022	**Last update**	10/28/2022

NP 3102 MT 3~ Adaptive 464

Dimensional drawing



Project	21020 - Buchanan Crossings	**Created by**	Simon Van Reenen		
Block	0	**Created on**	10/28/2022	**Last update**	10/28/2022



Friction loss calculation

Pumped fluid Human wastewater	**Static head** 5.61	**Layout** Wet well installation
Flow 20.6 l/s	**Number of pumps** 1	**Calculation model** Colebrook-White
Viscosity 1.569 mm²/s	**Nature of system** Single head pump	

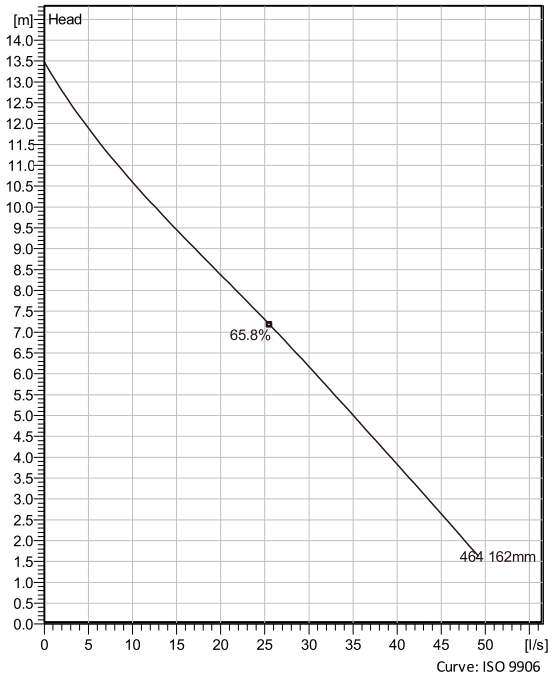
Type	Ø (mm)	? or L	Qty.	v (m/s)	k (mm)	ΔH (m)
Ø = Diameter v = Velocity k = Pipe roughness ΔH = Head loss						
Common discharge side pipe - Metal / Ductile iron ciment lining Thickness class 51 / 6" / ANSI/AWWA C150						
Pipe length	161	10.5 m	1	1.011	1.2	0.1192
Discharge Connection	161	0.3	1	1.011		0.01564
Elbows	161	0.9	3	1.011		0.04693
Non-return valves	161	0.9	1	1.011		0.04693
T-piece	161	0.4	1	1.011		0.02086
Valve	161	0.3	1	1.011		0.01564
Total friction head						**0.2652**
Common discharge side pipe - Plastic / PVC ASME Sch 40 / 6" / ANSI/AWWA C150						
Pipe length	163	345 m	1	0.9872	0.04	2.012
Elbows	163	1.5	5	0.9872		0.07451
Valve	163	0.3	1	0.9872		0.0149
Total friction head						**2.101**
Friction loss head						2.367 m
Total static head						5.61 m
Total head						**7.977 m**

NP 3102 MT 3~ Adaptive 464

Patented self cleaning semi-open channel impeller, ideal for pumping in most waste water applications. Modular based design with high adaptation grade.

Technical specification

Curves according to: Human wastewater Human wastewater [100%], 4 °C, 1 kg/dm³, 1.569 mm²/s



Curve: ISO 9906

Configuration

Motor number
N3102.760 18-11-4AL-W 5hp

Installation type
P - Semi permanent, Wet

Impeller diameter
162 mm

Discharge diameter
100 mm

Pump information

Impeller diameter
162 mm

Discharge diameter
100 mm

Inlet diameter
100 mm

Maximum operating speed
1720 1/min

Number of blades
2

Max. fluid temperature
40 °C

Configuration

Material

Impeller
Stainless steel

Stator housing material
Grey cast iron

Project	21020 - Buchanan Crossings	**Created by**	Simon Van Reenen		
Block	0	**Created on**	10/28/2022	**Last update**	10/28/2022

NP 3102 MT 3~ Adaptive 464

Technical specification

Motor - General

Motor number N3102.760 18-11-4AL-W 5hp	**Phases** 3~	**Rated speed** 1720 1/min	**Rated power** 3.7 kW
Approval No	**Number of poles** 4	**Rated current** 15 A	**Stator variant** 66
Frequency 60 Hz	**Rated voltage** 200 V	**Insulation class** H	**Type of Duty** S1
Version code 760			

Motor - Technical

Power factor - 1/1 Load 0.88	**Motor efficiency - 1/1 Load** 83.3 %	**Total moment of inertia** 0.0273 kg m²	**Starts per hour max.** 30
Power factor - 3/4 Load 0.86	**Motor efficiency - 3/4 Load** 85.6 %	**Starting current, direct starting** 67 A	
Power factor - 1/2 Load 0.80	**Motor efficiency - 1/2 Load** 86.2 %	**Starting current, star-delta** 22.4 A	

Project	21020 - Buchanan Crossings	**Created by**	Simon Van Reenen		
Block	0	**Created on**	10/28/2022	**Last update**	10/28/2022

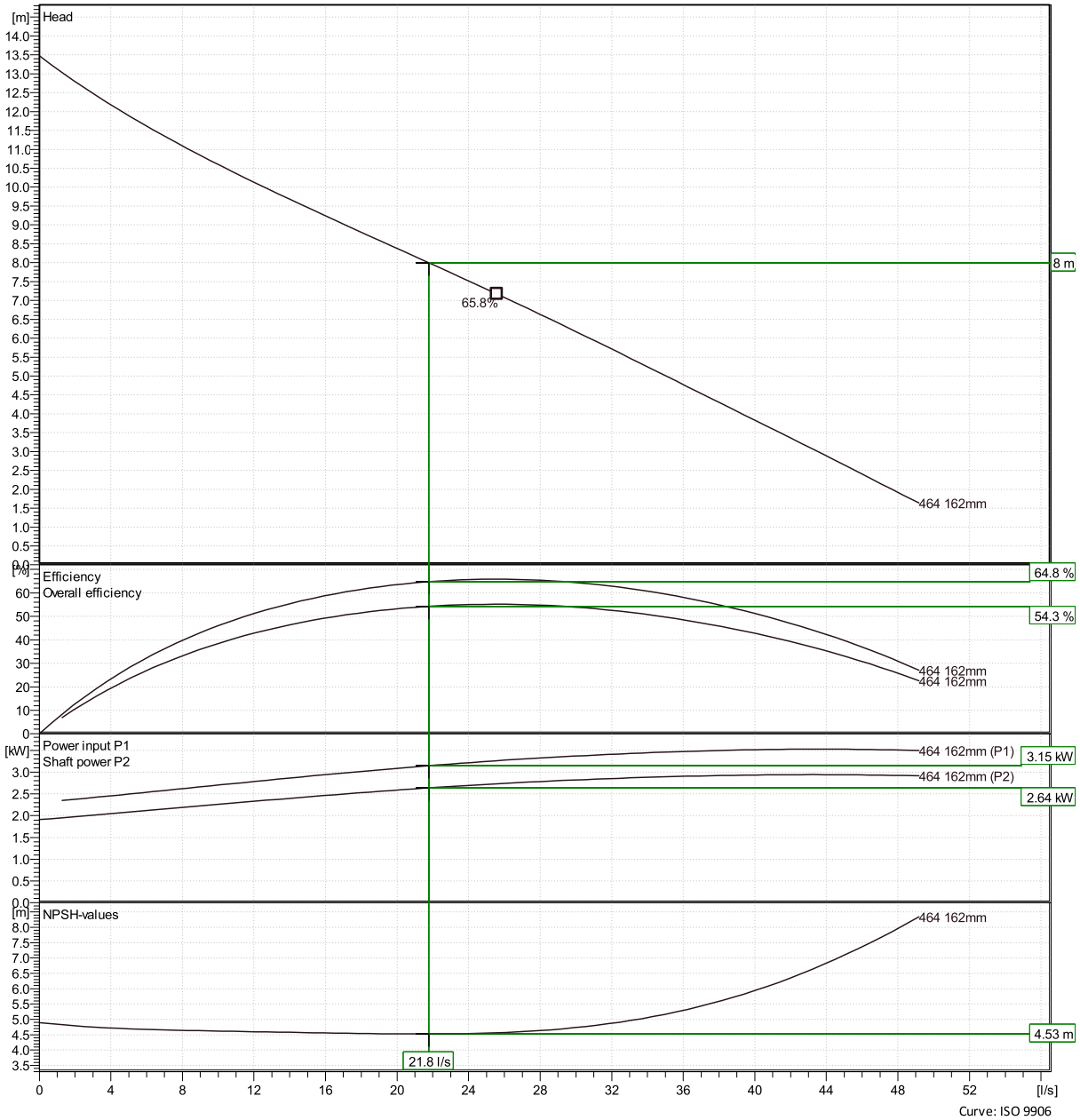
NP 3102 MT 3~ Adaptive 464

Performance curve

Duty point

Flow	Head
21.8 l/s	8 m

Curves according to: Human wastewater [100%],4 °C,1 kg/dm³,1.569 mm²/s



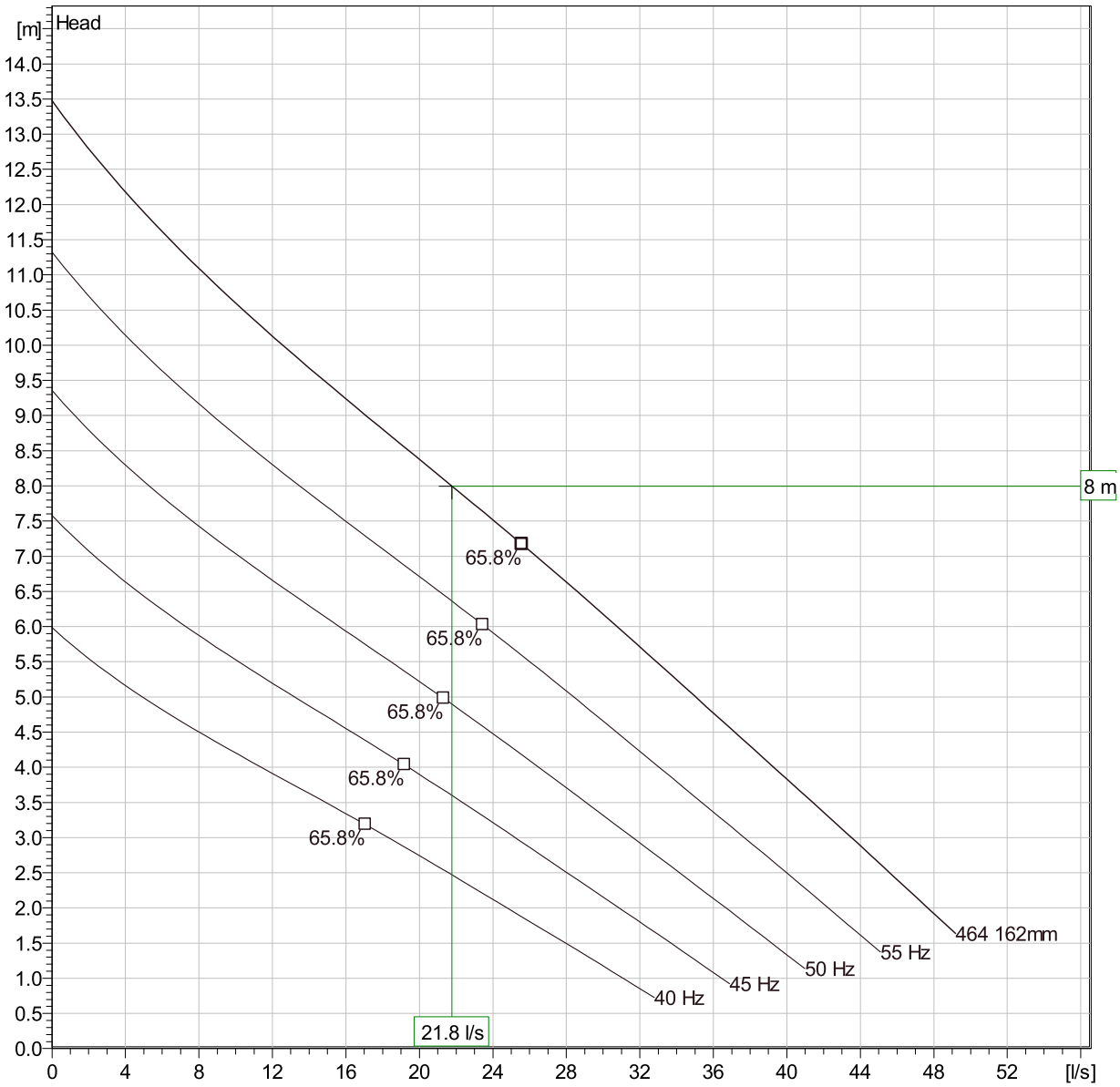
Curve: ISO 9906

21020 - Buchanan Crossings			Simon Van Reenen		
0		**Created on**	10/28/2022	**Last update**	10/28/2022

NP 3102 MT 3~ Adaptive 464

Duty Analysis

Curves according to: Water, pure [100%] ; 4°C; 1kg/dm³; 1.569mm²/s



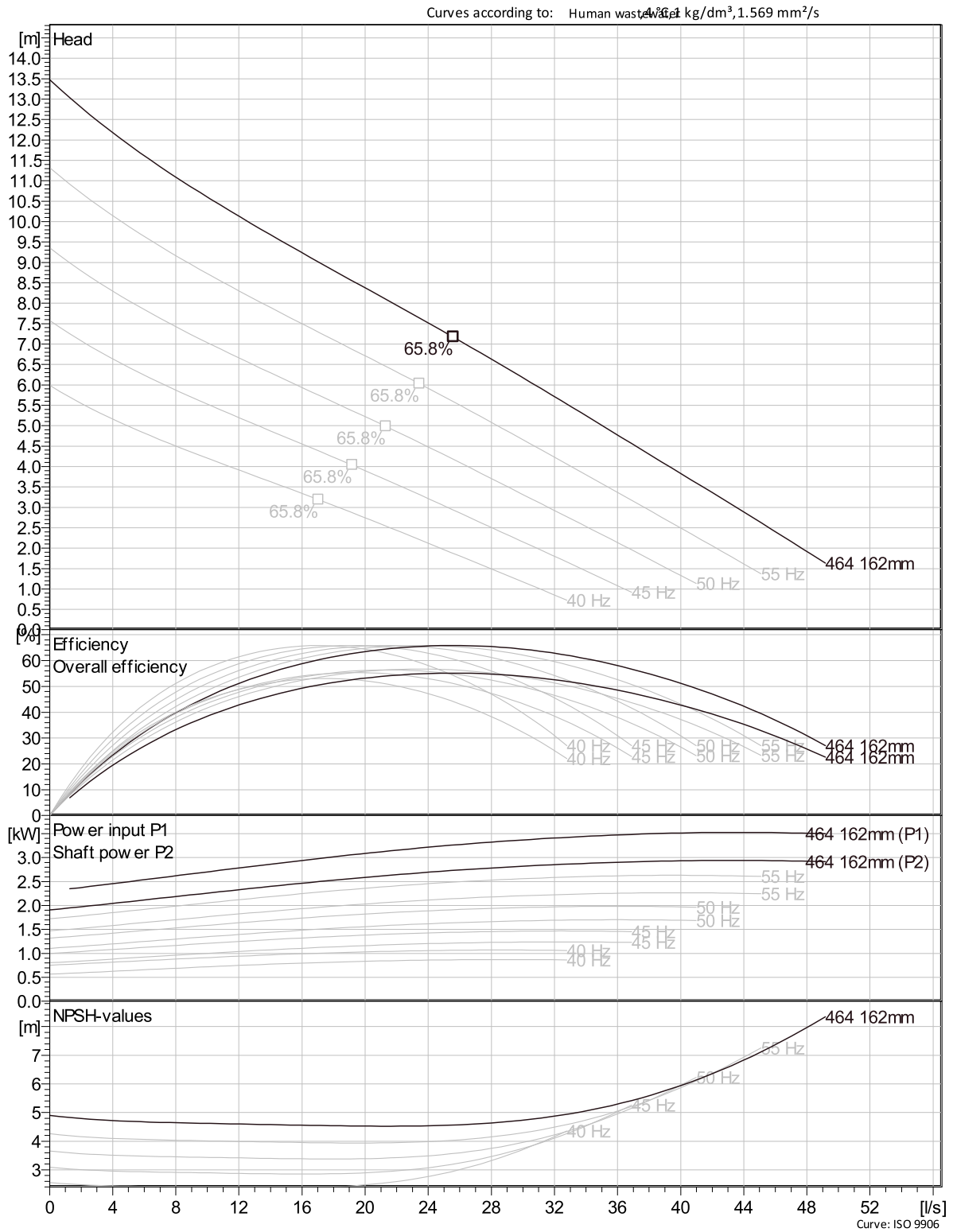
Operating characteristics

Pumps / Systems	Flow	Head	Shaft power	Flow	Head	Shaft power	Hydr.eff.	Spec. Energy	NPSHre
	l/s	m	kW	l/s	m	kW		kWh/l	m
1	21.8	8	2.64	21.8	8	2.64	64.8 %	4.02E-5	4.53

Project		**Created by**	Simon Van Reenen		
Block	21020 - Buchanan Crossings	**Created on**	10/28/2022	**Last update**	10/28/2022

NP 3102 MT 3~ Adaptive 464

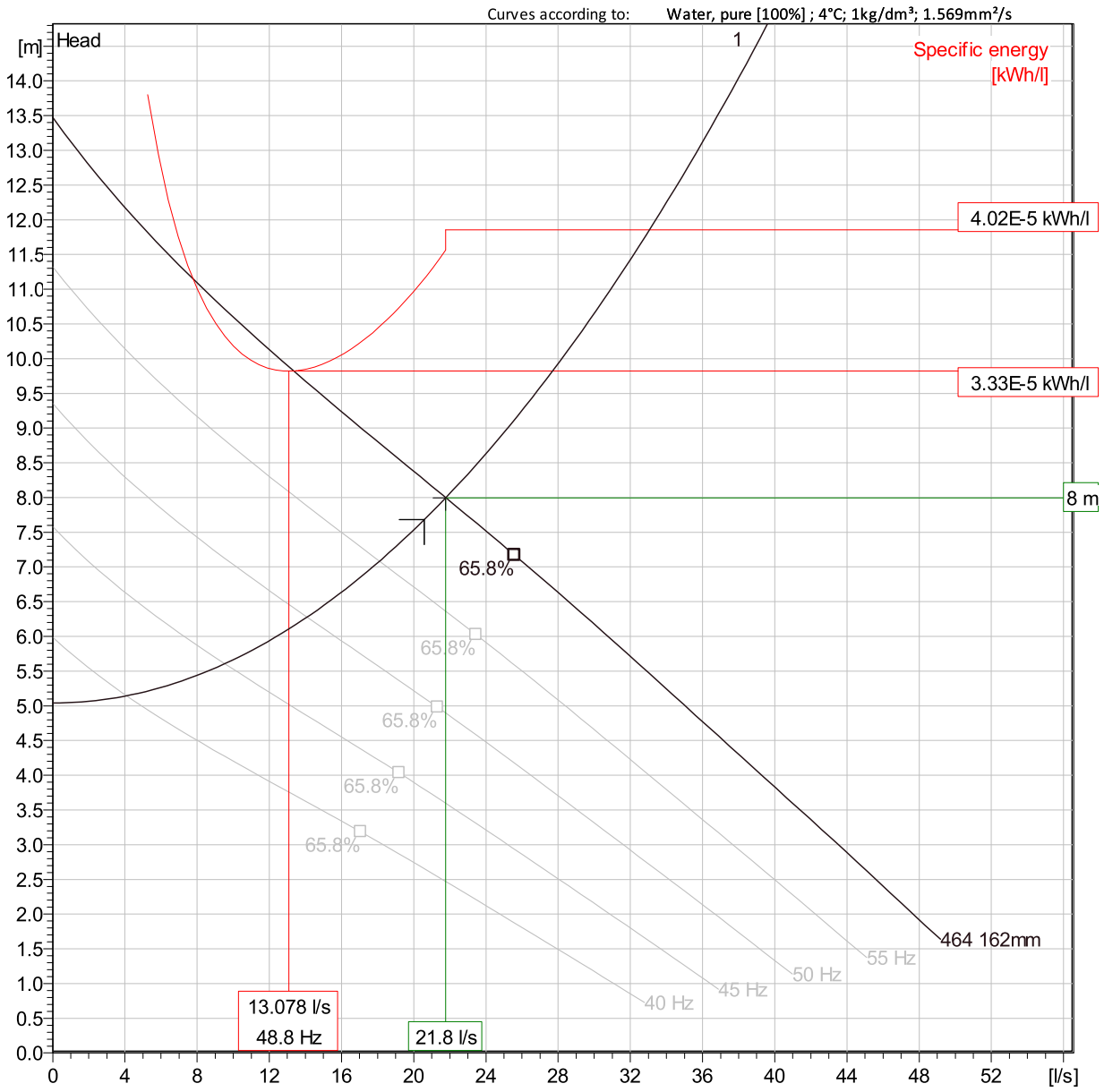
VFD Curve



Project	21020 - Buchanan Crossings	**Created by**	Simon Van Reenen
Block	0	**Created on**	10/28/2022 **Last update** 10/28/2022

NP 3102 MT 3~ Adaptive 464

VFD Analysis



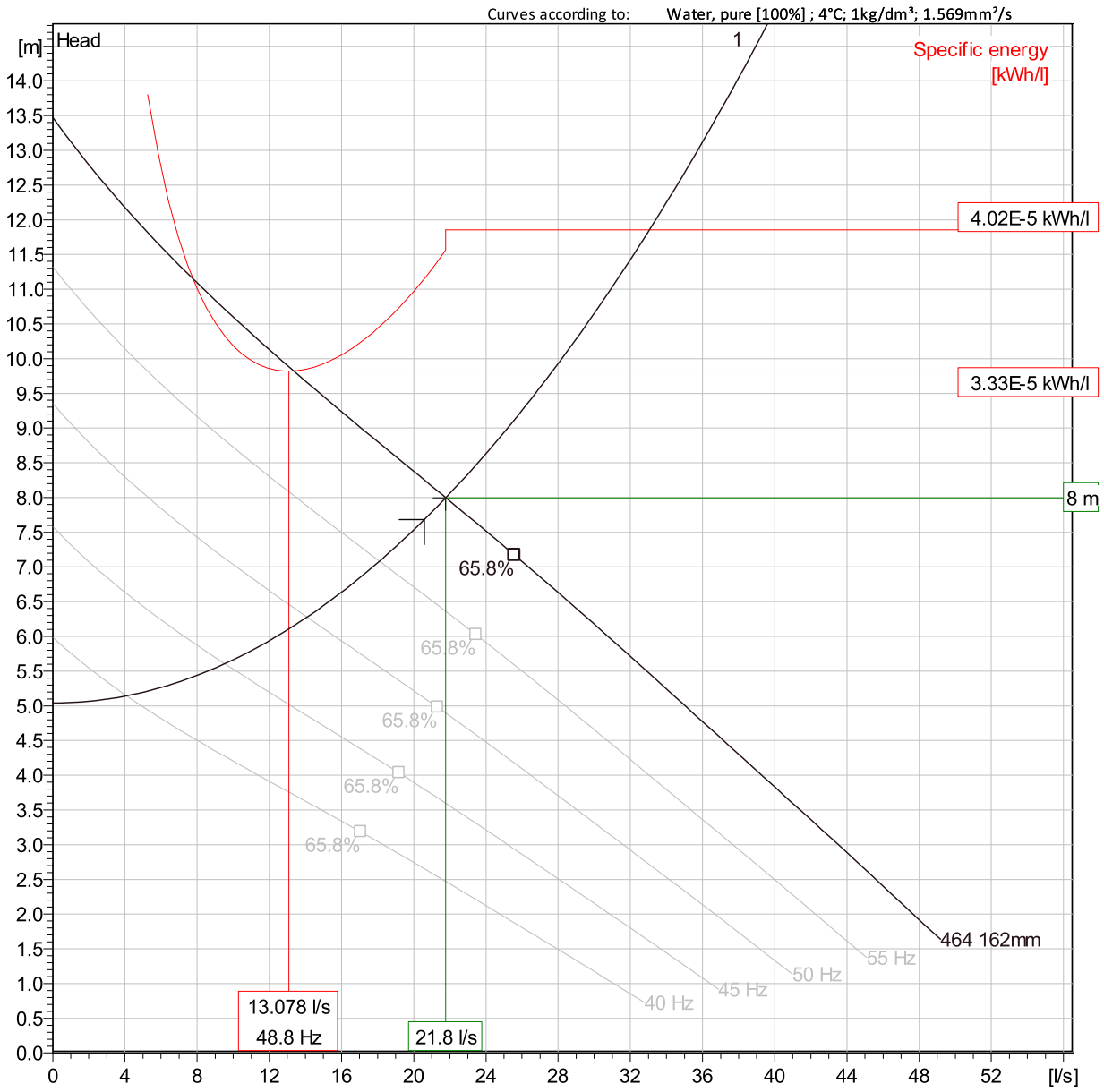
Operating Characteristics

Pumps / Systems	Frequency	Flow	Head	Shaft power	Flow	Head	Shaft power	Hydr.eff.	Specific energy	NPSHre
		l/s	m	kW	l/s	m	kW		kWh/l	m
1	60 Hz	21.8	8	2.64	21.8	8	2.64	64.8 %	4.02E-5	4.53
1	55 Hz	18.1	7.08	1.99	18.1	7.08	1.99	63.3 %	3.54E-5	3.94
1	50 Hz	14.1	6.28	1.44	14.1	6.28	1.44	60.1 %	3.34E-5	3.4
1	45 Hz	9.53	5.61	0.994	9.53	5.61	0.994	52.8 %	3.5E-5	2.9

Project	21020 - Buchanan Crossings	**Created by**	Simon Van Reenen		
Block	0	**Created on**	10/28/2022	**Last update**	10/28/2022

NP 3102 MT 3~ Adaptive 464

VFD Analysis



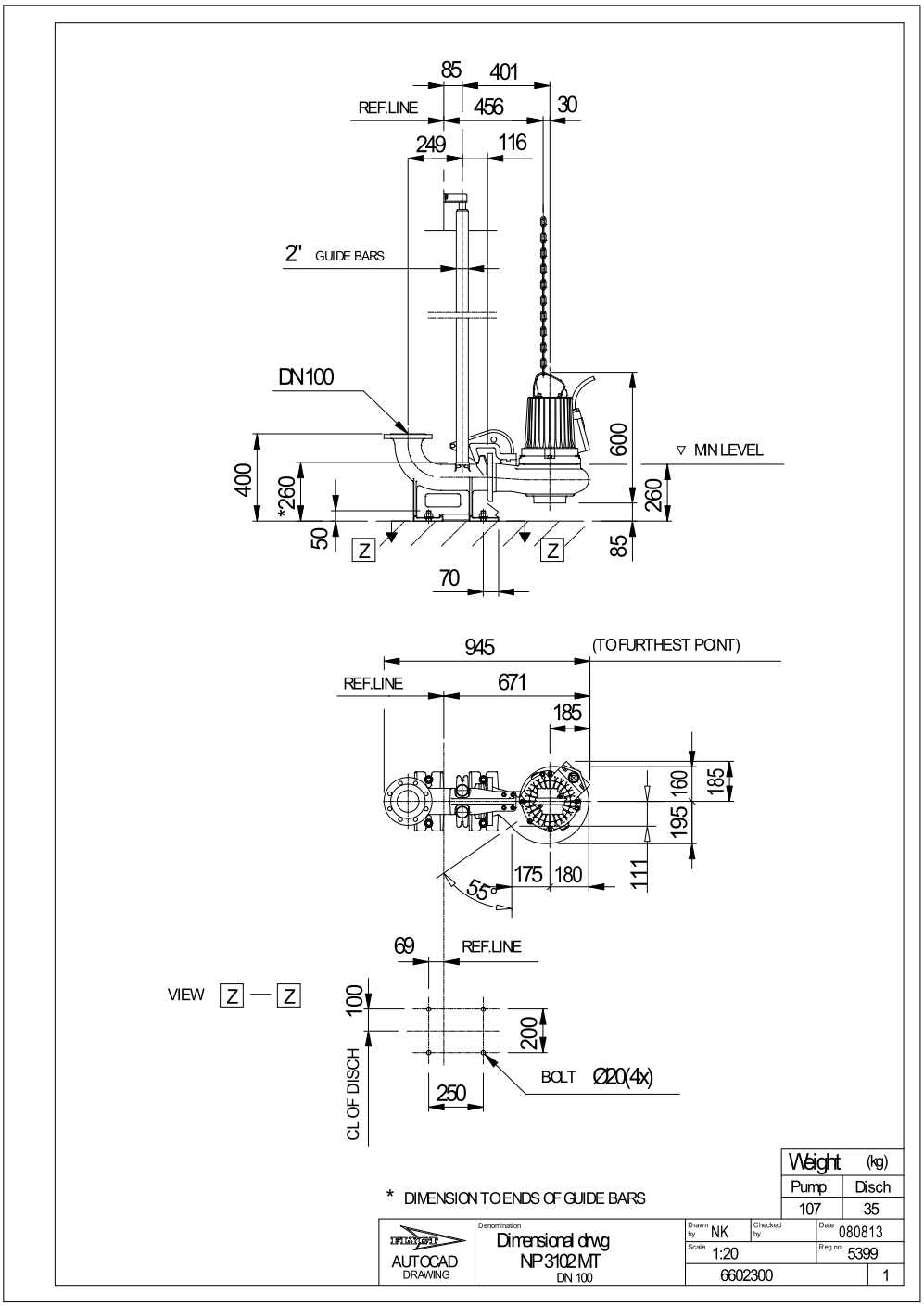
Operating Characteristics

Pumps / Systems	Frequency	Flow	Head	Shaft power	Flow	Head	Shaft power	Hydr.eff.	Specific energy	NPSHre
		l/s	m	kW	l/s	m	kW		kWh/l	m
1	40 Hz	4.1	5.14	0.628	4.1	5.14	0.628	32.9 %	5.55E-5	2.44

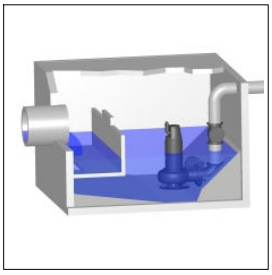
Project	21020 - Buchanan Crossings	**Created by**	Simon Van Reenen		
Block	0	**Created on**	10/28/2022	**Last update**	10/28/2022

NP 3102 MT 3~ Adaptive 464

Dimensional drawing



Project	21020 - Buchanan Crossings	**Created by**	Simon Van Reenen		
Block	0	**Created on**	10/28/2022	**Last update**	10/28/2022



Friction loss calculation

Pumped fluid Human wastewater	**Static head** 5.04	**Layout** Wet well installation
Flow 20.6 l/s	**Number of pumps** 1	**Calculation model** Colebrook-White
Viscosity 1.569 mm²/s	**Nature of system** Single head pump	

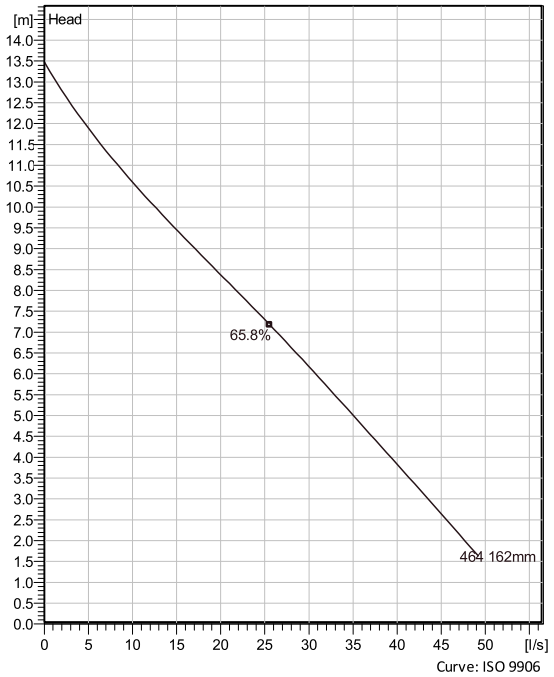
Type	Ø (mm)	? or L	Qty.	v (m/s)	k (mm)	ΔH (m)
Ø = Diameter v = Velocity k = Pipe roughness ΔH = Head loss						
Common discharge side pipe - Metal / Ductile iron ciment lining Thickness class 51 / 6" / ANSI/AWWA C150						
Pipe length	161	10.5 m	1	1.011	1.2	0.1192
Discharge Connection	161	0.3	1	1.011		0.01564
Elbows	161	0.9	3	1.011		0.04693
Non-return valves	161	0.9	1	1.011		0.04693
T-piece	161	0.4	1	1.011		0.02086
Valve	161	0.3	1	1.011		0.01564
Total friction head						**0.2652**
Common discharge side pipe - Plastic / PVC ASME Sch 40 / 6" / ANSI/AWWA C150						
Pipe length	163	345 m	1	0.9872	0.04	2.012
Elbows	163	1.5	5	0.9872		0.07451
Valve	163	0.3	1	0.9872		0.0149
Total friction head						**2.101**
Friction loss head						2.367 m
Total static head						5.04 m
Total head						**7.407 m**

NP 3102 MT 3~ Adaptive 464

Patented self cleaning semi-open channel impeller, ideal for pumping in most waste water applications. Modular based design with high adaptation grade.

Technical specification

Curves according to: Human wastewater Human wastewater [100%], 4 °C, 1 kg/dm³, 1.569 mm²/s



Curve: ISO 9906

Configuration

Motor number
N3102.760 18-11-4AL-W 5hp

Installation type
P - Semi permanent, Wet

Impeller diameter
162 mm

Discharge diameter
100 mm

Pump information

Impeller diameter
162 mm

Discharge diameter
100 mm

Inlet diameter
100 mm

Maximum operating speed
1720 1/min

Number of blades
2

Max. fluid temperature
40 °C

Configuration

Material

Impeller
Stainless steel

Stator housing material
Grey cast iron

Project	21020 - Buchanan Crossings	**Created by**	Simon Van Reenen		
Block	0	**Created on**	10/28/2022	**Last update**	10/28/2022

NP 3102 MT 3~ Adaptive 464

Technical specification

Motor - General

Motor number N3102.760 18-11-4AL-W 5hp	**Phases** 3~	**Rated speed** 1720 1/min	**Rated power** 3.7 kW
Approval No	**Number of poles** 4	**Rated current** 15 A	**Stator variant** 66
Frequency 60 Hz	**Rated voltage** 200 V	**Insulation class** H	**Type of Duty** S1
Version code 760			

Motor - Technical

Power factor - 1/1 Load 0.88	**Motor efficiency - 1/1 Load** 83.3 %	**Total moment of inertia** 0.0273 kg m²	**Starts per hour max.** 30
Power factor - 3/4 Load 0.86	**Motor efficiency - 3/4 Load** 85.6 %	**Starting current, direct starting** 67 A	
Power factor - 1/2 Load 0.80	**Motor efficiency - 1/2 Load** 86.2 %	**Starting current, star-delta** 22.4 A	

Project	21020 - Buchanan Crossings	**Created by**	Simon Van Reenen		
Block	0	**Created on**	10/28/2022	**Last update**	10/28/2022

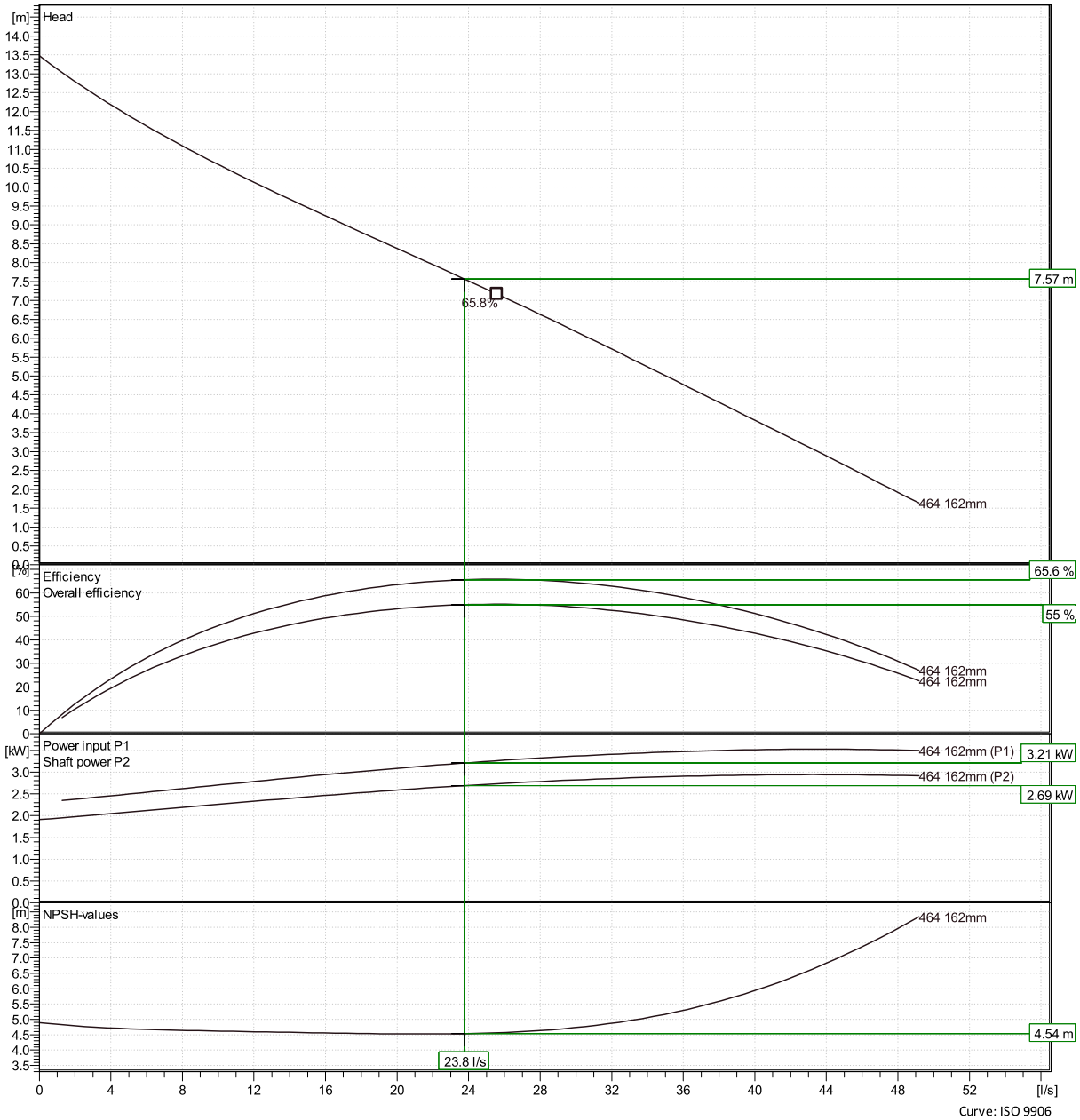
NP 3102 MT 3~ Adaptive 464

Performance curve

Duty point

Flow	Head
23.8 l/s	7.57 m

Curves according to: Human wastewater [100%],4 °C,1 kg/dm³,1.569 mm²/s



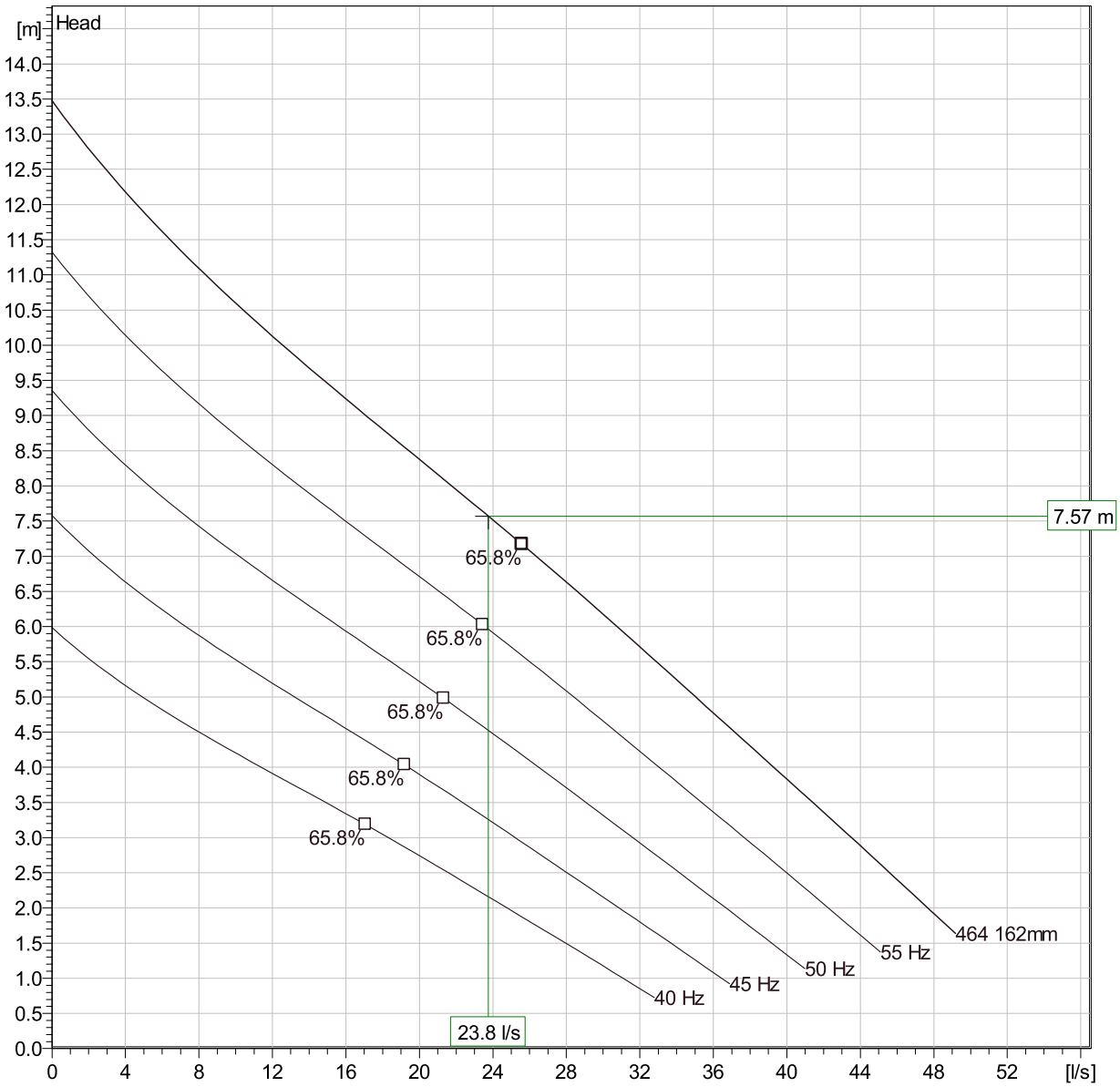
Curve: ISO 9906

21020 - Buchanan Crossings			Simon Van Reenen		
0		**Created on**	10/28/2022	**Last update**	10/28/2022

NP 3102 MT 3~ Adaptive 464

Duty Analysis

Curves according to: Water, pure [100%] ; 4°C; 1kg/dm³; 1.569mm²/s



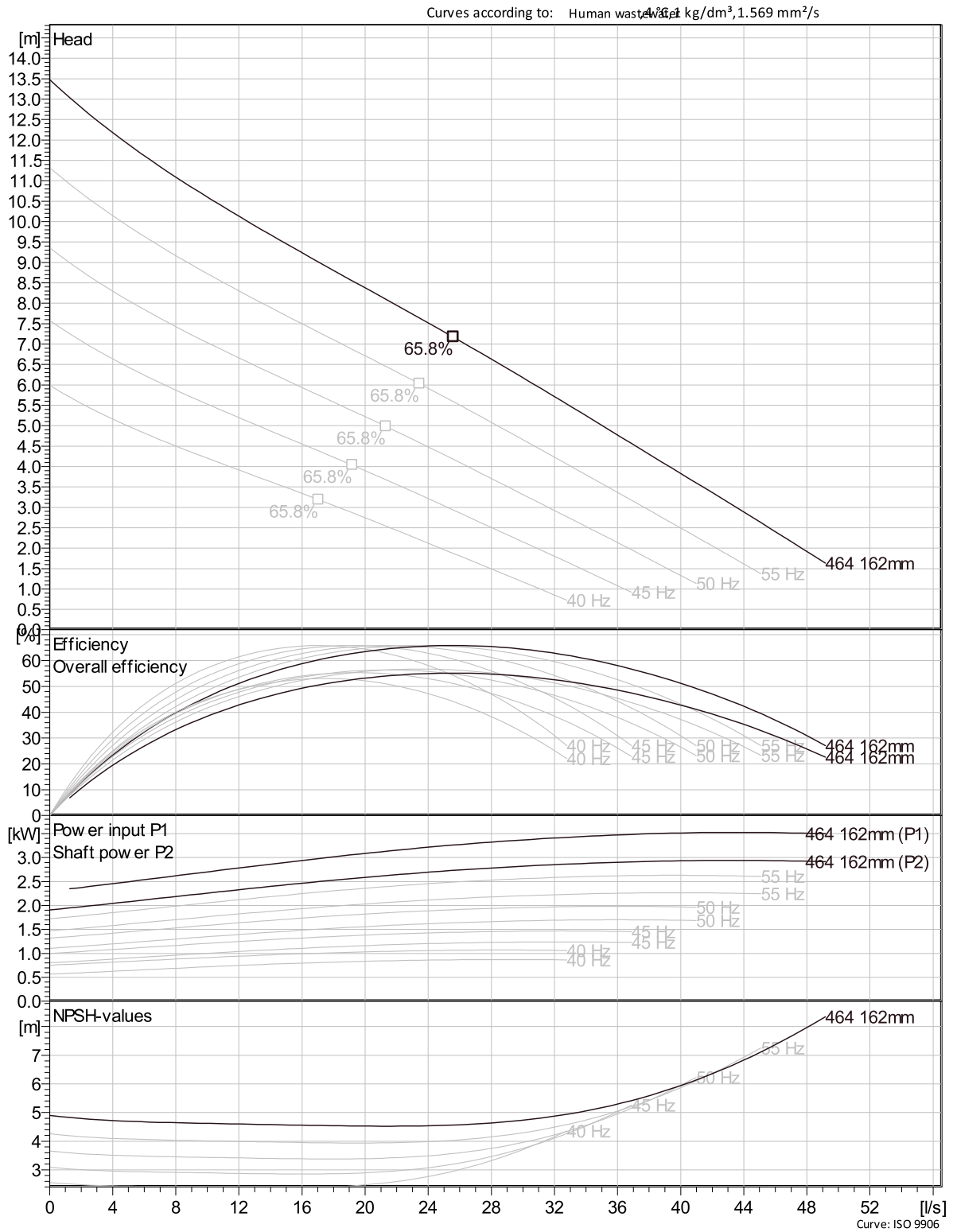
Operating characteristics

Pumps / Systems	Flow	Head	Shaft power	Flow	Head	Shaft power	Hydr.eff.	Spec. Energy	NPSHre
	l/s	m	kW	l/s	m	kW		kWh/l	m
1	23.8	7.57	2.69	23.8	7.57	2.69	65.6 %	3.75E-5	4.54

Project		**Created by**	Simon Van Reenen		
Block	21020 - Buchanan Crossings	**Created on**	10/28/2022	**Last update**	10/28/2022

NP 3102 MT 3~ Adaptive 464

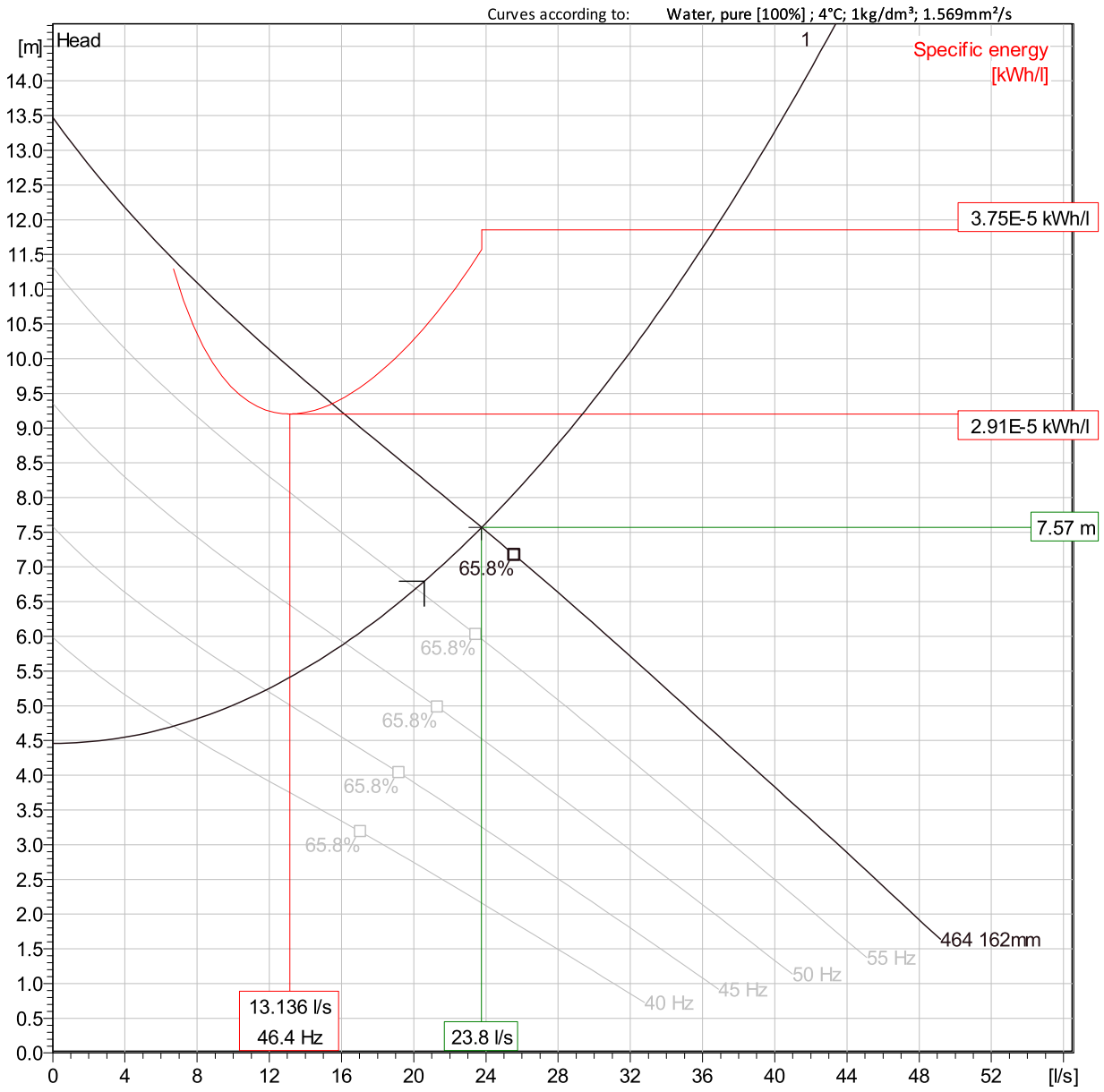
VFD Curve



Project	21020 - Buchanan Crossings	**Created by**	Simon Van Reenen
Block	0	**Created on**	10/28/2022 **Last update** 10/28/2022

NP 3102 MT 3~ Adaptive 464

VFD Analysis



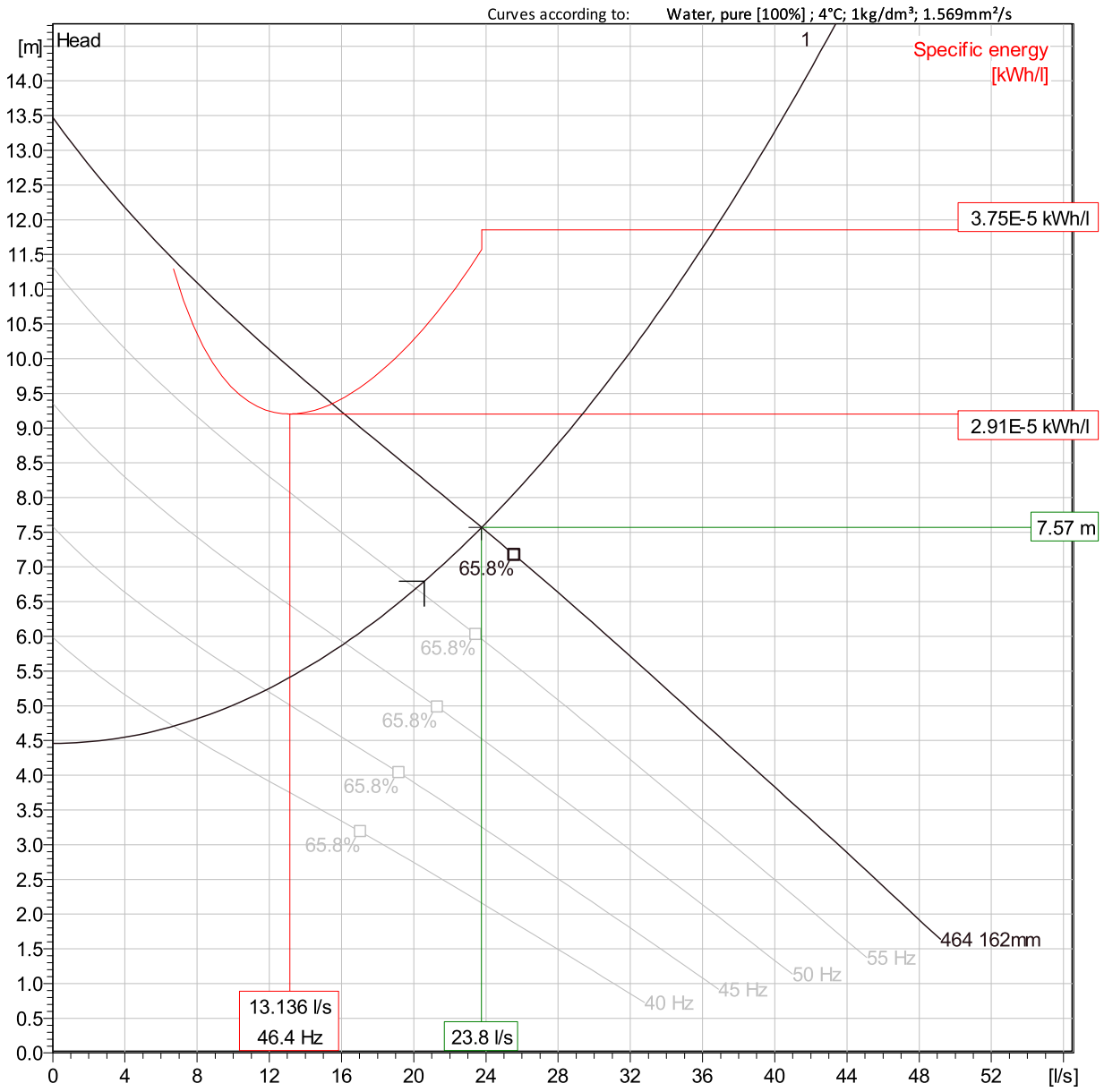
Operating Characteristics

Pumps / Systems	Frequency	Flow	Head	Shaft power	Flow	Head	Shaft power	Hydr.eff.	Specific energy	NPSHre
		l/s	m	kW	l/s	m	kW		kWh/l	m
1	60 Hz	23.8	7.57	2.69	23.8	7.57	2.69	65.6 %	3.75E-5	4.54
1	55 Hz	20.1	6.69	2.04	20.1	6.69	2.04	64.9 %	3.26E-5	3.94
1	50 Hz	16.2	5.9	1.49	16.2	5.9	1.49	63 %	2.99E-5	3.38
1	45 Hz	11.8	5.23	1.04	11.8	5.23	1.04	58.4 %	2.93E-5	2.88

Project	21020 - Buchanan Crossings	**Created by**	Simon Van Reenen		
Block	0	**Created on**	10/28/2022	**Last update**	10/28/2022

NP 3102 MT 3~ Adaptive 464

VFD Analysis



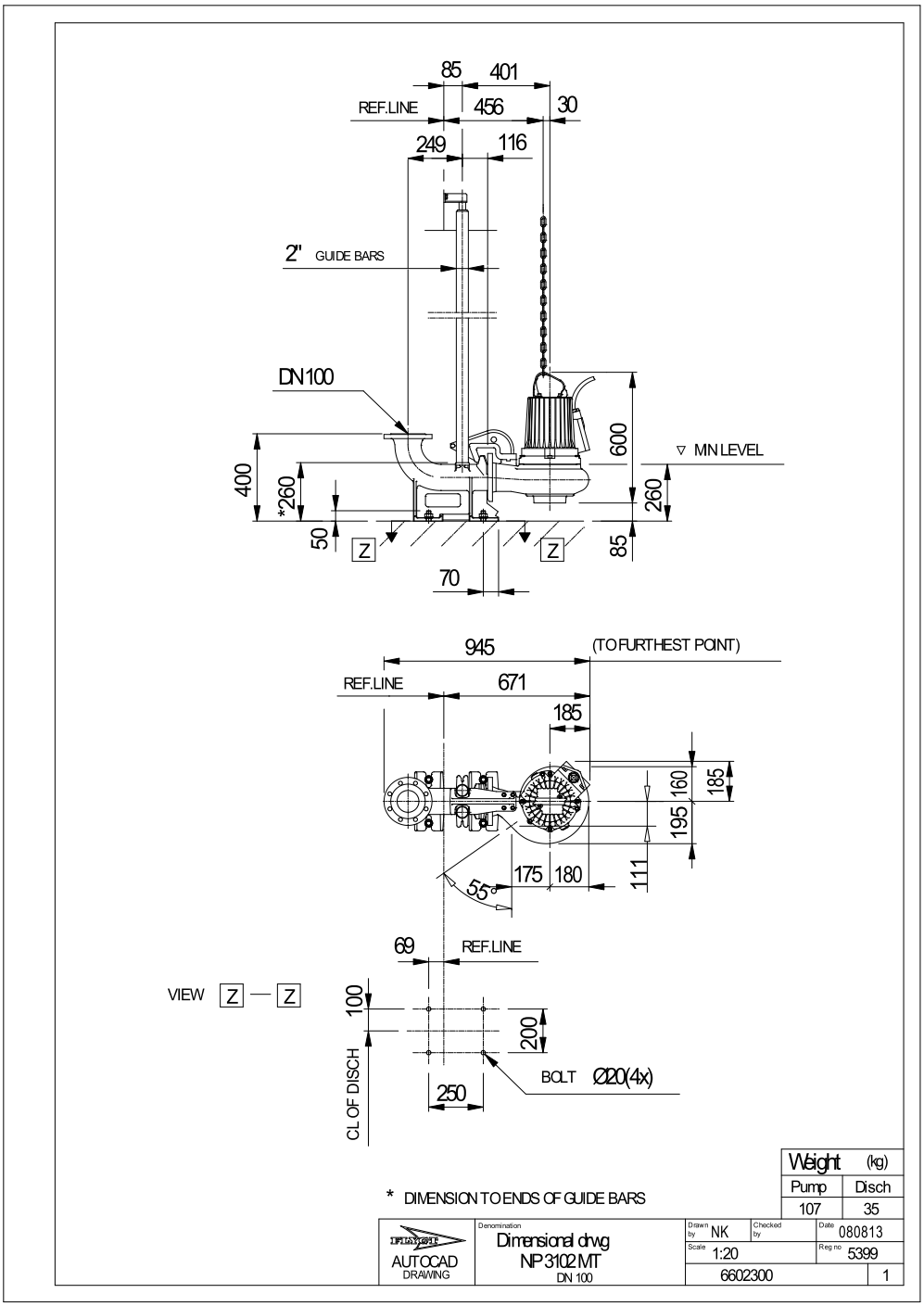
Operating Characteristics

Pumps / Systems	Frequency	Flow	Head	Shaft power	Flow	Head	Shaft power	Hydr.eff.	Specific energy	NPSHre
		l/s	m	kW	l/s	m	kW		kWh/l	m
1	40 Hz	6.69	4.71	0.67	6.69	4.71	0.67	46.1 %	3.58E-5	2.41

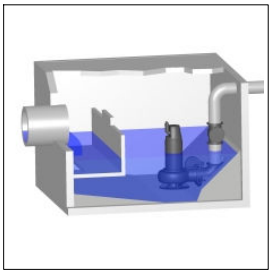
Project	21020 - Buchanan Crossings	**Created by**	Simon Van Reenen		
Block	0	**Created on**	10/28/2022	**Last update**	10/28/2022

NP 3102 MT 3~ Adaptive 464

Dimensional drawing



Project	21020 - Buchanan Crossings	**Created by**	Simon Van Reenen		
Block	0	**Created on**	10/28/2022	**Last update**	10/28/2022



Friction loss calculation

Pumped fluid Human wastewater	**Static head** 4.46	**Layout** Wet well installation
Flow 20.6 l/s	**Number of pumps** 1	**Calculation model** Colebrook-White
Viscosity 1.569 mm²/s	**Nature of system** Single head pump	

Type	Ø (mm)	? or L	Qty.	v (m/s)	k (mm)	ΔH (m)
Ø = Diameter v = Velocity k = Pipe roughness ΔH = Head loss						
Common discharge side pipe - Metal / Ductile iron ciment lining Thickness class 51 / 6" / ANSI/AWWA C150						
Pipe length	161	10.5 m	1	1.011	1.2	0.1192
Discharge Connection	161	0.3	1	1.011		0.01564
Elbows	161	0.9	3	1.011		0.04693
Non-return valves	161	0.9	1	1.011		0.04693
T-piece	161	0.4	1	1.011		0.02086
Valve	161	0.3	1	1.011		0.01564
Total friction head						**0.2652**
Common discharge side pipe - Plastic / PVC ASME Sch 40 / 6" / ANSI/AWWA C150						
Pipe length	163	345 m	1	0.9872	0.04	2.012
Elbows	163	1.5	5	0.9872		0.07451
Valve	163	0.3	1	0.9872		0.0149
Total friction head						**2.101**
Friction loss head						2.367 m
Total static head						4.46 m
Total head						**6.827 m**

Project		**Created by**	Simon Van Reenen	**Last update**	10/28/2022
Block	Block: 3 kW	**Created on**	10/28/2022		

APPENDIX C

Storm Sewer Design Sheet
Stormceptor OGS Sizing Calculations
Cut Fill Assessment Letter – Greck and Associates

STORM SEWER DESIGN SHEET

Date: 19-Dec-22
Project No.: 21020
Contract No.:

5 Year Storm Q = 2.78 A I R
Tc min. = 10 R = runoff coefficient

DRAINAGE AREA			RUN - OFF DATA							SEWER DATA												
STREET	FROM	TO	TIME OF CONC.	RAINFALL INTENSITY mm/h	AREA (ha)	R	INDLV 2.78 AR	ACCUM. 2.78 AR	PEAK FLOW Q(L/s)	TYPE OF PIPE	DIA. (mm)	SLOPE %	LENGTH (m)	CAPACITY (L/s) n=0.013	VELOCITY (m/s)	TIME OF FLOW (min)	TIME @ END (min)	SEWER INVERT ELEVATION UPPER	SEWER INVERT ELEVATION LOWER	GROUND ELEVATION UPPER	GROUND ELEVATION LOWER	Ratio Q/Q full
SWMF 1 (BLOCK 136)																						
Street G	MH6	MH5	10.00	107.33	0.64	0.65	1.156	1.156	124.12	CONC	450	0.50	119.6	201.60	1.3	1.570	11.570					0.6157
Street G	MH5	MH2	11.57	99.82	0.55	0.65	0.994	2.150	214.64	CONC	450	0.88	101.8	267.45	1.7	1.010	12.579					0.8025
Street F	MH7	MH3	10.00	107.33	0.26	0.65	0.470	0.470	50.42	PVC	300	0.94	92.2	93.75	1.3	1.155	11.155					0.5379
Street A	MH8	MH4	10.00	107.33	0.46	0.65	0.831	0.831	89.21	PVC	375	0.95	90.0	170.89	1.6	0.968	10.968					0.522
Street E	MH4	MH3	10.97	102.55	0.26	0.65	0.470	1.301	133.43	CONC	450	0.42	31.1	184.77	1.2	0.447	11.415					0.7221
Street E	MH3	MH2	11.41	100.51	0.23	0.65	0.416	2.186	219.75	CONC	525	0.68	58.7	354.64	1.6	0.597	12.011					0.6196
Street E	MH1	MH2	10.00	107.33	0.13	0.65	0.235	0.235	25.21	PVC	375	0.35	28.5	103.73	0.9	0.505	10.505					0.2431
SWMF Lead	MH2	OGS	12.58	95.56	0.00	0.60	0.000	4.572	436.89	CONC	825	0.13	11.3	517.55	1.0	0.194	12.774					0.8441
SWMF Lead	OGS	OUTLET1	12.77	94.79	0.00	0.60	0.000	4.572	433.36	CONC	825	0.13	25.6	517.55	1.0	0.440	13.213					0.8373
Subtotals					*2.53*	*ha*											*12.774*	*min*				
SWMF 2 (BLOCK 137)																						
Condo Block																						
Street H	MH15	MH16	10.00	107.33	0.34	0.65	0.614	0.614	65.94	PVC	375	0.35	98.2	103.73	0.9	1.741	11.741					0.6357
Street F	MH7	MH14	10.00	107.33	0.22	0.95	0.581	0.581	62.36	PVC	300	0.58	70.3	73.65	1.0	1.127	11.127					0.8467
Street F	MH17	MH16	10.00	107.33	0.02	0.65	0.036	0.036	3.88	PVC	250	1.00	25.3	59.47	1.2	0.348	10.348					0.0652
Street F	MH16	MH14	11.74	99.06	0.21	0.65	0.379	1.030	102.04	CONC	450	0.25	64.9	142.55	0.9	1.202	12.943					0.7158
Street I	MH14	MH10	12.94	94.13	0.00	0.65	0.000	1.611	151.64	CONC	525	0.21	64.9	197.08	0.9	1.189	14.132					0.7694
Strathmere Lodge (Street A)																						
Match Capacity of 525mm dia @ 0.45% = 288.5 L/s																						
Strathmere Lod	*EX. STMH2*	MH11	51.91	38.50	6.10	0.35	5.935	5.935	228.50	CONC	750	0.12	157.7	385.65	0.9	3.021	54.931					0.5925
Easement	MH11	MH12	54.93	36.94	0.00	0.00	0.000	5.935	219.25	CONC	750	0.12	51.2	385.65	0.9	0.981	55.912					0.5685
Street A	MH8	MH10	10.00	107.33	0.58	0.65	1.048	1.048	112.48	PVC	375	1.00	72.5	175.33	1.6	0.760	10.760					0.6416
Street A	MH10	MH12	14.13	89.75	0.44	0.65	0.795	3.454	310.01	CONC	600	0.46	102.0	416.44	1.5	1.156	15.288					0.7444
Street A	MH12	MH13	55.91	36.46	0.17	0.65	0.307	9.697	353.57	CONC	825	0.12	102.0	497.25	0.9	1.828	57.740					0.7111

STORM SEWER DESIGN SHEET

Date: 19-Dec-22
Project No.: 21020
Contract No.:

5 Year Storm Q = 2.78 A I R
Tc min. = 10 R = runoff coefficient

DRAINAGE AREA			RUN - OFF DATA							SEWER DATA													
STREET	FROM	TO	TIME OF CONC.	RAINFALL INTENSITY mm/h	AREA (ha)	R	INDLV 2.78 AR	ACCUM. 2.78 AR	PEAK FLOW Q(L/s)	TYPE OF PIPE	DIA. (mm)	SLOPE %	LENGTH (m)	CAPACITY (L/s) n=0.013	VELOCITY (m/s)	TIME OF FLOW (min)	TIME @ END (min)	SEWER INVERT ELEVATION UPPER	SEWER INVERT ELEVATION LOWER	GROUND ELEVATION UPPER	GROUND ELEVATION LOWER	Ratio Q/Q full
East Loop Development																						
Street B	*MH23B*	*MH23A*	*Trillium Village STM outlet*				*0.363*	*0.363*	*39.00*	*PVC*	*375*	*0.35*	*44.4*	*103.73*	*0.9*							*0.376*
Street B	MH21	MH22	10.00	107.33	0.42	0.60	0.701	0.701	75.19	PVC	375	0.35	66.0	103.73	0.9	1.170	11.170					0.7248
Street B	MH22	MH23	11.17	101.62	0.22	0.60	0.367	1.068	108.48	CONC	450	0.25	9.2	142.55	0.9	0.170	11.341					0.761
Street B	MH23	MH23A	11.34	100.84	0.22	0.60	0.367	1.434	144.65	CONC	525	0.21	22.2	197.08	0.9	0.407	11.747					0.734
Street B	MH23A	MH24	11.75	99.04	0.79	0.60	1.318	3.116	308.56	CONC	675	0.25	90.3	420.29	1.2	1.286	13.034					0.7342
Street B	MH24	MH25	13.03	93.78	0.71	0.60	1.184	4.300	403.24	CONC	750	0.25	96.2	556.64	1.3	1.272	14.306					0.7244
Street B	MH21	MH20	10.00	107.33	0.16	0.60	0.267	0.267	28.64	PVC	300	0.45	9.1	64.87	0.9	0.165	10.165					0.4415
Street B	MH20	MH19	10.16	106.48	1.03	0.60	1.718	1.985	211.35	CONC	600	0.24	106.0	300.80	1.1	1.667	11.832					0.7026
Street B	MH19	MH13	11.83	98.67	0.76	0.60	1.268	3.253	320.94	CONC	675	0.24	117.5	411.80	1.2	1.703	13.534					0.7794
Street B	MH13	MH25	57.74	35.61	0.15	0.60	0.250	13.199	470.02	CONC	1050	0.10	19.9	863.53	1.0	0.332	58.072					0.5443
Street C	MH25	MH26	58.07	35.46	0.00	0.60	0.000	23.358	828.26	CONC	1200	0.10	32.5	1232.89	1.1	0.497	58.568					0.6718
Trillium Village Condo																						
Street J	MH34	MH33	10.00	107.33	0.32	0.65	0.578	0.578	62.06	CONC	450	0.25	91.7	142.55	0.9	1.698	11.698					0.4354
Street J	MH33	MH32	11.70	99.25	0.42	0.65	0.759	1.337	132.72	CONC	525	0.21	115.2	197.08	0.9	2.110	13.808					0.6734
Street J	MH32	MH31	13.81	90.90	0.28	0.65	0.506	1.843	167.54	CONC	525	0.28	68.8	227.57	1.1	1.092	14.900					0.7362
Easement	MH31	MH27	14.90	87.15	0.02	0.80	0.044	1.888	164.51	CONC	525	1.17	30.1	465.18	2.2	0.233	15.133					0.3536
Street I	MH30B	MH30	10.00	107.33	0.13	0.65	0.235	0.235	25.21	PVC	300	0.50	59.5	68.38	1.0	1.022	11.022					0.3687
Street A	MH30A	MH30	10.00	107.33	0.15	0.60	0.250	0.250	26.85	PVC	375	0.35	23.7	103.73	0.9	0.420	10.420					0.2589
Street A	MH30	MH29	11.02	102.30	0.70	0.60	1.168	1.653	169.07	CONC	525	0.21	95.7	197.08	0.9	1.753	12.775					0.8579
Street A	MH29	MH28	12.78	94.79	0.74	0.60	1.234	2.887	273.65	CONC	600	0.28	115.2	324.90	1.2	1.670	14.445					0.8423
Street A	MH28	MH27	14.44	88.67	0.46	0.60	0.767	3.654	324.03	CONC	600	0.40	68.8	388.33	1.4	0.837	15.282					0.8344
Street A	MH27	MH25	15.28	85.92	0.19	0.60	0.317	5.859	503.40	CONC	600	2.38	51.0	947.25	3.4	0.254	15.535					0.5314

STORM SEWER DESIGN SHEET

Date: 19-Dec-22
Project No.: 21020
Contract No.:

5 Year Storm Q = 2.78 A I R
Tc min. = 10 R = runoff coefficient

DRAINAGE AREA			RUN - OFF DATA							SEWER DATA													
STREET	FROM	TO	TIME OF CONC.	RAINFALL INTENSITY mm/h	AREA (ha)	R	INDLV 2.78 AR	ACCUM. 2.78 AR	PEAK FLOW Q(L/s)	TYPE OF PIPE	DIA. (mm)	SLOPE %	LENGTH (m)	CAPACITY (L/s) n=0.013	VELOCITY (m/s)	TIME OF FLOW (min)	TIME @ END (min)	SEWER INVERT ELEVATION UPPER	SEWER INVERT ELEVATION LOWER	GROUND ELEVATION UPPER	GROUND ELEVATION LOWER	Ratio Q/Q full
Street D Cresent																						
Street D	MH40	MH39	10.00	107.33	0.27	0.60	0.450	0.450	48.34	PVC	375	0.63	22.4	139.16	1.3	0.296	10.296					0.3473
Street D	MH39	MH38	10.30	105.81	0.22	0.60	0.367	0.817	86.48	PVC	375	0.68	9.2	144.58	1.3	0.117	10.413					0.5982
Street D	MH38	MH35	10.41	105.23	0.81	0.60	1.351	2.168	228.18	CONC	450	1.44	112.9	342.13	2.2	0.875	11.289					0.6669
Street C	MH37	MH36	10.00	107.33	0.61	0.35	0.594	0.594	63.70	PVC	375	0.35	42.9	103.73	0.9	0.761	10.761					0.6141
Street C	MH36	MH35	10.00	107.33	0.00	0.00	0.000	0.594	63.70	CONC	450	0.25	42.3	142.55	0.9	0.783	10.783					0.4469
Street C	MH35	MH26	11.29	101.07	0.21	0.60	0.350	3.112	314.57	CONC	675	0.20	79.7	375.92	1.1	1.265	12.554					0.8368
SWMF Lead	MH26	OUTLET2	58.57	35.24	0.00	0.60	0.000	26.470	932.72	CONC	1200	0.56	24.0	2917.54	2.6	0.155	58.724					0.293
SWMF	SWMF OUT	DRAIN	From SWMF (235L/s 100yr predevelopment flow)						235.62	CONC	675	0.10		265.82	0.7							0.8864
Subtotals					*18.07*	*ha*																
																	58.724	*min*				

B. M. ROSS AND ASSOCIATES LIMITED
Consulting Engineers
62 North Street, Goderich, ON N7A 2T4
p. (519) 524-2641 • f. (519) 524-4403
www.bmross.net

REMARKS
City of Strathroy IDF curve for 5-year Storm

PROJECT

SHEET No. 1 of 1
DESIGN SV
CHECKED CB

Stormceptor®

FORTERRA

Stormceptor® EF Sizing Report

STORMCEPTOR®
ESTIMATED NET ANNUAL SEDIMENT (TSS) LOAD REDUCTION

11/15/2022

Province:	Ontario
City:	Strathroy-Caradoc
Nearest Rainfall Station:	LONDON CS
Climate Station Id:	6144478
Years of Rainfall Data:	20

Site Name:	Block 136 SWM

Drainage Area (ha):	2.56
Runoff Coefficient 'c':	0.65

Particle Size Distribution:	Fine
Target TSS Removal (%):	80.0

Required Water Quality Runoff Volume Capture (%):	90.00
Estimated Water Quality Flow Rate (L/s):	60.76
Oil / Fuel Spill Risk Site?	No
Upstream Flow Control?	No
Peak Conveyance (maximum) Flow Rate (L/s):	437.07
Site Sediment Transport Rate (kg/ha/yr):	480.00
Estimated Average Annual Sediment Load (kg/yr):	798.72

Project Name:	Buchanan Crossings
Project Number:	21020
Designer Name:	Simon Van Reenen
Designer Company:	B.M. Ross and Associates Ltd
Designer Email:	svanreenen@bmross.net
Designer Phone:	519-331-0367
EOR Name:	
EOR Company:	
EOR Email:	
EOR Phone:	

Net Annual Sediment (TSS) Load Reduction Sizing Summary

Stormceptor Model	TSS Removal Provided (%)
EF4	67
EF6	79
EF8	86
EF10	90
EF12	92

Recommended Stormceptor EF Model: EF8

Estimated Net Annual Sediment (TSS) Load Reduction (%): 86

Water Quality Runoff Volume Capture (%): > 90

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THIRD-PARTY TESTING AND VERIFICATION

►**Stormceptor® EF and Stormceptor® EFO** are the latest evolutions in the Stormceptor® oil-grit separator (OGS) technology series, and are designed to remove a wide variety of pollutants from stormwater and snowmelt runoff. These technologies have been third-party tested in accordance with the Canadian ETV **Procedure for Laboratory Testing of Oil-Grit Separators** and performance has been third-party verified in accordance with the **ISO 14034 Environmental Technology Verification (ETV)** protocol.

PERFORMANCE

►**Stormceptor® EF and EFO** remove stormwater pollutants through gravity separation and floatation, and feature a patent-pending design that generates positive removal of total suspended solids (TSS) throughout each storm event, including high-intensity storms. Captured pollutants include sediment, free oils, and sediment-bound pollutants such as nutrients, heavy metals, and petroleum hydrocarbons. Stormceptor is sized to remove a high level of TSS from the frequent rainfall events that contribute the vast majority of annual runoff volume and pollutant load. The technology incorporates an internal bypass to convey excessive stormwater flows from high-intensity storms through the device without resuspension and washout (scour) of previously captured pollutants. Proper routine maintenance ensures high pollutant removal performance and protection of downstream waterwavs.

PARTICLE SIZE DISTRIBUTION (PSD)

►The **Canadian ETV PSD** shown in the table below was used, or in part, for this sizing. This is the identical PSD that is referenced in the Canadian ETV ***Procedure for Laboratory Testing of Oil-Grit Separators*** for both sediment removal testing and scour testing. The Canadian ETV PSD contains a wide range of particle sizes in the sand and silt fractions, and is considered reasonably representative of the particle size fractions found in typical urban stormwater runoff.

Particle Size (µm)	Percent Less Than	Particle Size Fraction (µm)	Percent
1000	100	500-1000	5
500	95	250-500	5
250	90	150-250	15
150	75	100-150	15
100	60	75-100	10
75	50	50-75	5
50	45	20-50	10
20	35	8-20	15
8	20	5-8	10
5	10	2-5	5
2	5	<2	5

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Stormceptor® EF Sizing Report

Rainfall Intensity (mm / hr)	Percent Rainfall Volume (%)	Cumulative Rainfall Volume (%)	Flow Rate (L/s)	Flow Rate (L/min)	Surface Loading Rate (L/min/m²)	Removal Efficiency (%)	Incremental Removal (%)	Cumulative Removal (%)
0.5	9.0	9.0	2.31	139.0	30.0	100	9.0	9.0
1	18.9	27.8	4.63	278.0	59.0	100	18.9	27.8
2	15.3	43.2	9.25	555.0	118.0	95	14.5	42.3
3	10.8	53.9	13.88	833.0	177.0	87	9.4	51.7
4	7.8	61.7	18.50	1110.0	236.0	82	6.4	58.1
5	5.8	67.5	23.13	1388.0	295.0	79	4.6	62.6
6	4.5	72.0	27.76	1665.0	354.0	76	3.4	66.0
7	3.6	75.6	32.38	1943.0	413.0	74	2.6	68.7
8	3.5	79.1	37.01	2220.0	472.0	73	2.6	71.2
9	3.3	82.4	41.63	2498.0	531.0	72	2.4	73.6
10	2.6	85.0	46.26	2776.0	591.0	71	1.9	75.4
11	1.7	86.7	50.89	3053.0	650.0	70	1.2	76.7
12	1.7	88.4	55.51	3331.0	709.0	70	1.2	77.8
13	1.5	89.8	60.14	3608.0	768.0	70	1.0	78.9
14	1.2	91.0	64.76	3886.0	827.0	69	0.8	79.7
15	1.3	92.3	69.39	4163.0	886.0	69	0.9	80.5
16	0.8	93.0	74.01	4441.0	945.0	68	0.5	81.0
17	0.8	93.8	78.64	4718.0	1004.0	68	0.5	81.6
18	1.2	95.0	83.27	4996.0	1063.0	69	0.8	82.4
19	0.7	95.7	87.89	5274.0	1122.0	70	0.5	82.9
20	0.9	96.6	92.52	5551.0	1181.0	71	0.7	83.5
21	0.2	96.8	97.14	5829.0	1240.0	72	0.1	83.7
22	0.0	96.8	101.77	6106.0	1299.0	73	0.0	83.7
23	0.4	97.2	106.40	6384.0	1358.0	74	0.3	84.0
24	0.4	97.7	111.02	6661.0	1417.0	75	0.3	84.3
25	0.0	97.7	115.65	6939.0	1476.0	72	0.0	84.3
30	1.3	99.0	138.78	8327.0	1772.0	60	0.8	85.1
35	0.6	99.6	161.91	9714.0	2067.0	51	0.3	85.4
40	0.4	100.0	185.04	11102.0	2362.0	45	0.2	85.6
45	0.0	100.0	208.17	12490.0	2657.0	41	0.0	85.6
Estimated Net Annual Sediment (TSS) Load Reduction =								**86 %**

Climate Station ID: 6144478 *Years of Rainfall Data*: 20

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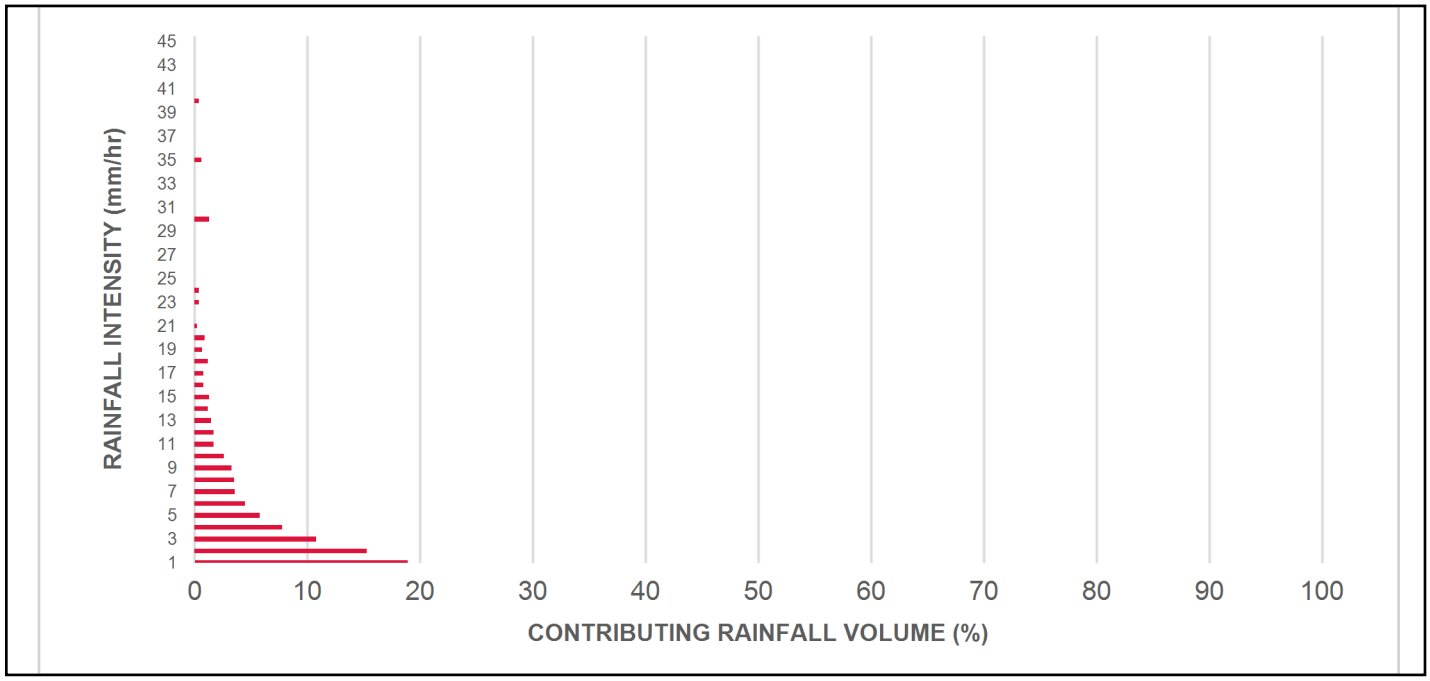
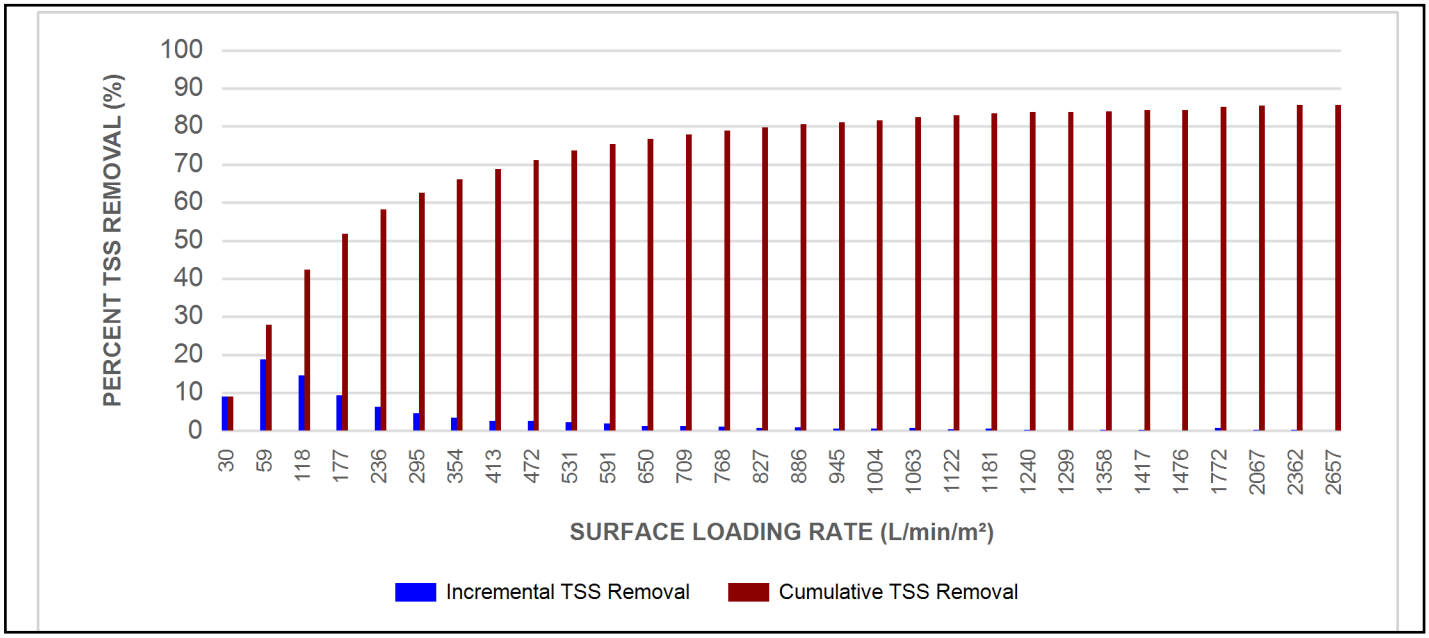
RAINFALL DATA FROM LONDON CS RAINFALL STATION



INCREMENTAL AND CUMULATIVE TSS REMOVAL FOR THE RECOMMENDED STORMCEPTOR® MODEL



Maximum Pipe Diameter / Peak Conveyance

Stormceptor EF / EFO	Model Diameter		Min Angle Inlet / Outlet Pipes	Max Inlet Pipe Diameter		Max Outlet Pipe Diameter		Peak Conveyance Flow Rate	
	(m)	(ft)		(mm)	(in)	(mm)	(in)	(L/s)	(cfs)
EF4 / EFO4	1.2	4	90	609	24	609	24	425	15
EF6 / EFO6	1.8	6	90	914	36	914	36	990	35
EF8 / EFO8	2.4	8	90	1219	48	1219	48	1700	60
EF10 / EFO10	3.0	10	90	1828	72	1828	72	2830	100
EF12 / EFO12	3.6	12	90	1828	72	1828	72	2830	100

SCOUR PREVENTION AND ONLINE CONFIGURATION

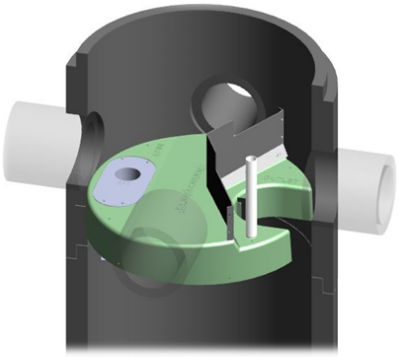
►**Stormceptor® EF and EFO** feature an internal bypass and superior scour prevention technology that have been demonstrated in third-party testing according to the scour testing provisions of the Canadian ETV **Procedure for Laboratory Testing of Oil-Grit Separators**, and the exceptional scour test performance has been third-party verified in accordance with the ISO 14034 ETV protocol. As a result, Stormceptor EF and EFO are approved for online installation, eliminating the need for costly additional bypass structures, piping, and installation expense.

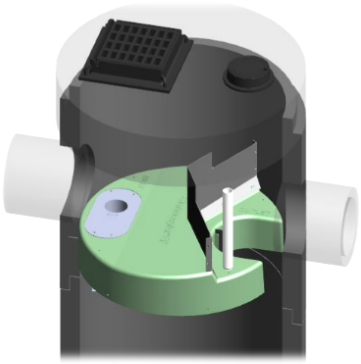
DESIGN FLEXIBILITY

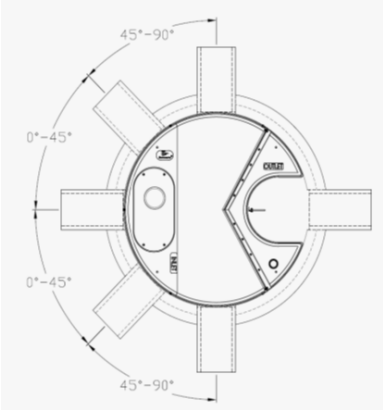
►**Stormceptor® EF** and **EFO** offers design flexibility in one simplified platform, accepting stormwater flow from a single inlet pipe or multiple inlet pipes, and/or surface runoff through an inlet grate. The device can also serve as a junction structure, accommodate a 90-degree inlet-to-outlet bend angle, and can be modified to ensure performance in submerged conditions.

OIL CAPTURE AND RETENTION

►While Stormceptor® EF will capture and retain oil from dry weather spills and low intensity runoff, **Stormceptor® EFO** has demonstrated superior oil capture and greater than 99% oil retention in third-party testing according to the light liquid re-entrainment testing provisions of the Canadian ETV **Procedure for Laboratory Testing of Oil-Grit Separators**. Stormceptor EFO is recommended for sites where oil capture and retention is a requirement.







INLET-TO-OUTLET DROP

Elevation differential between inlet and outlet pipe inverts is dictated by the angle at which the inlet pipe(s) enters the unit.

0° - 45° : The inlet pipe is 1-inch (25mm) higher than the outlet pipe.

45° - 90° : The inlet pipe is 2-inches (50mm) higher than the outlet pipe.

HEAD LOSS

The head loss through Stormceptor EF is similar to that of a 60-degree bend structure. The applicable K value for calculating minor losses through the unit is 1.1. For submerged conditions the applicable K value is 3.0.

Pollutant Capacity

Stormceptor EF / EFO	Model Diameter		Depth (Outlet Pipe Invert to Sump Floor)		Oil Volume		Recommended Sediment Maintenance Depth *		Maximum Sediment Volume *		Maximum Sediment Mass **	
	(m)	(ft)	(m)	(ft)	(L)	(Gal)	(mm)	(in)	(L)	(ft^3)	(kg)	(lb)
EF4 / EFO4	1.2	4	1.52	5.0	265	70	203	8	1190	42	1904	5250
EF6 / EFO6	1.8	6	1.93	6.3	610	160	305	12	3470	123	5552	15375
EF8 / EFO8	2.4	8	2.59	8.5	1070	280	610	24	8780	310	14048	38750
EF10 / EFO10	3.0	10	3.25	10.7	1670	440	610	24	17790	628	28464	78500
EF12 / EFO12	3.6	12	3.89	12.8	2475	655	610	24	31220	1103	49952	137875

*Increased sump depth may be added to increase sediment storage capacity

** Average density of wet packed sediment in sump = 1.6 kg/L (100 lb/ft^3)

Feature	Benefit	Feature Appeals To
Patent-pending enhanced flow treatment and scour prevention technology	Superior, verified third-party performance	Regulator, Specifying & Design Engineer
Third-party verified light liquid capture and retention for EFO version	Proven performance for fuel/oil hotspot locations	Regulator, Specifying & Design Engineer, Site Owner
Functions as bend, junction or inlet structure	Design flexibility	Specifying & Design Engineer
Minimal drop between inlet and outlet	Site installation ease	Contractor
Large diameter outlet riser for inspection and maintenance	Easy maintenance access from grade	Maintenance Contractor & Site Owner

STANDARD STORMCEPTOR EF/EFO DRAWINGS

For standard details, please visit http://www.imbriumsystems.com/stormwater-treatment-solutions/stormceptor-ef

STANDARD STORMCEPTOR EF/EFO SPECIFICATION

For specifications, please visit http://www.imbriumsystems.com/stormwater-treatment-solutions/stormceptor-ef

STANDARD PERFORMANCE SPECIFICATION FOR "OIL GRIT SEPARATOR" (OGS) STORMWATER QUALITY TREATMENT DEVICE

PART 1 – GENERAL

1.1 WORK INCLUDED

This section specifies requirements for selecting, sizing, and designing an underground Oil Grit Separator (OGS) device for stormwater quality treatment, with third-party testing results and a Statement of Verification in accordance with ISO 14034 Environmental Management – Environmental Technology Verification (ETV).

1.2 REFERENCE STANDARDS & PROCEDURES

ISO 14034:2016 Environmental management – Environmental technology verification (ETV)

Canadian Environmental Technology Verification (ETV) Program's **Procedure for Laboratory Testing of Oil-Grit Separators.**

1.3 SUBMITTALS

1.3.1 All submittals, including sizing reports & shop drawings, shall be submitted upon request with each order to the contractor then forwarded to the Engineer of Record for review and acceptance. Shop drawings shall detail all OGS components, elevations, and sequence of construction.

1.3.2 Alternative devices shall have features identical to or greater than the specified device, including: treatment chamber diameter, treatment chamber wet volume, sediment storage volume, and oil storage volume.

1.3.3 Unless directed otherwise by the Engineer of Record, OGS stormwater quality treatment product substitutions or alternatives submitted within ten days prior to project bid shall not be accepted. All alternatives or substitutions submitted shall be signed and sealed by a local registered Professional Engineer, based on the exact same criteria detailed in Section 3, in entirety, subject to review and approval by the Engineer of Record.

PART 2 – PRODUCTS

2.1 OGS POLLUTANT STORAGE

The OGS device shall include a sump for sediment storage, and a protected volume for the capture and storage of petroleum hydrocarbons and buoyant gross pollutants. The **minimum** sediment & petroleum hydrocarbon storage capacity shall be as follows:

2.1.1

4 ft (1219 mm) Diameter OGS Units:	1.19 m^3 sediment / 265 L oil
6 ft (1829 mm) Diameter OGS Units:	3.48 m^3 sediment / 609 L oil
8 ft (2438 mm) Diameter OGS Units:	8.78 m^3 sediment / 1,071 L oil
10 ft (3048 mm) Diameter OGS Units:	17.78 m^3 sediment / 1,673 L oil
12 ft (3657 mm) Diameter OGS Units:	31.23 m^3 sediment / 2,476 L oil

PART 3 – PERFORMANCE & DESIGN

3.1 GENERAL

The OGS stormwater quality treatment device shall be verified in accordance with ISO 14034:2016 Environmental management – Environmental technology verification (ETV). The OGS stormwater quality treatment device shall remove oil, sediment and gross pollutants from stormwater runoff during frequent wet weather events, and retain these pollutants during less frequent high flow wet weather events below the insert within the OGS for later removal during maintenance. The Manufacturer shall have at least ten (10) years of local experience, history and success in engineering design, manufacturing and production and supply of OGS stormwater quality treatment device systems, acceptable to the Engineer of Record.

3.2 SIZING METHODOLOGY

The OGS device shall be engineered, designed and sized to provide stormwater quality treatment based on treating a minimum of 90 percent of the average annual runoff volume and a minimum removal of an annual average 60% of the sediment (TSS) load based on the Particle Size Distribution (PSD) specified in the sizing report for the specified device. Sizing of the OGS shall be determined by use of a minimum ten (10) years of local historical rainfall data provided by Environment Canada. Sizing shall also be determined by use of the sediment removal performance data derived from the ISO 14034 ETV third-party verified laboratory testing data from testing conducted in accordance with the Canadian ETV protocol Procedure for Laboratory Testing of Oil-Grit Separators, as follows:

3.2.1 Sediment removal efficiency for a given surface loading rate and its associated flow rate shall be based on sediment removal efficiency demonstrated at the seven (7) tested surface loading rates specified in the protocol, ranging 40 L/min/m^2 to 1400 L/min/m^2, and as stated in the ISO 14034 ETV Verification Statement for the OGS device.

3.2.2 Sediment removal efficiency for surface loading rates between 40 L/min/m^2 and 1400 L/min/m^2 shall be based on linear interpolation of data between consecutive tested surface loading rates.

3.2.3 Sediment removal efficiency for surface loading rates less than the lowest tested surface loading rate of 40 L/min/m^2 shall be assumed to be identical to the sediment removal efficiency at 40 L/min/m^2. No extrapolation shall be allowed that results in a sediment removal efficiency that is greater than that demonstrated at 40 L/min/m^2.

3.2.4 Sediment removal efficiency for surface loading rates greater than the highest tested surface loading rate of 1400 L/min/m^2 shall assume zero sediment removal for the portion of flow that exceeds 1400 L/min/m^2, and shall be calculated using a simple proportioning formula, with 1400 L/min/m^2 in the numerator and the higher surface loading rate in the denominator, and multiplying the resulting fraction times the sediment removal efficiency at 1400 L/min/m^2.

The OGS device shall also have sufficient annual sediment storage capacity as specified and calculated in Section 2.1.

3.3 CANADIAN ETV or ISO 14034 ETV VERIFICATION OF SCOUR TESTING

The OGS device shall have Canadian ETV or ISO 14034 ETV Verification of third-party scour testing conducted in accordance with the Canadian ETV Program's **Procedure for Laboratory Testing of Oil-Grit Separators.**

3.3.1 To be acceptable for on-line installation, the OGS device must demonstrate an average scour test effluent concentration less than 10 mg/L at each surface loading rate tested, up to and including 2600 L/min/m^2.

December 19, 2022

Reference: 21-769
SCRCA Reference No#2020-0846

St. Clair Region Conservation Authority
205 Mill Pond Crescent
Strathroy, Ontario

Attention: Rashida Naznin, P.Eng., Engineering Technician
Reference: Strathroy Development – Buchanan Crossings - Cut/Fill Analysis

Dear Ms. Naznin,

Greck and Associates Limited (Greck) is pleased to provide this letter to detail an updated hydraulic assessment to the Buchanan Crossings subdivision, located within Strathroy, Ontario, referred to as Pt. Lot 19, Concession 4. A previous flood study had been completed and submitted on December 8th, 2021, as to which this letter includes an update of the works utilizing more accurate topographic survey, as well as a review and discussion on proposed cut/fill works. Details of this assessment are provided under a separate cover.

Under the previous assessment, regulatory flood hazard limits were confirmed by developing a hydrologic and hydraulic model of the Cable Drain, which bisects the proposed subdivision. The assessment concluded that regulatory floodplain limits should be defined by the Regional Storm event, referred to as “Hurricane Hazel”.

Hydraulic Modelling Updates

The hydraulic model was updated using topographic survey completed by BM. Ross dated November 16,2021. Where topographic survey was not available, the previous LiDAR DEM geometry was maintained.

Various cross sections were re-positioned to more appropriately define watercourse geometry where future watercourse crossings are anticipated (i.e. two upstream and downstream bounding cross sections). It should be noted that recommended culvert/bridge geometries have not been provided as part of this submission and will be included during detailed design stages of the subdivision. Updated HEC-RAS hydraulic modeling is provided as an attachment to this letter for review.

Provided below in **Figure 1** and **Figure 2** is an outline of the HEC-RAS modelling schematic overlain on Google Earth Aerial imagery and the extents of the topographic survey Digital Elevation model.

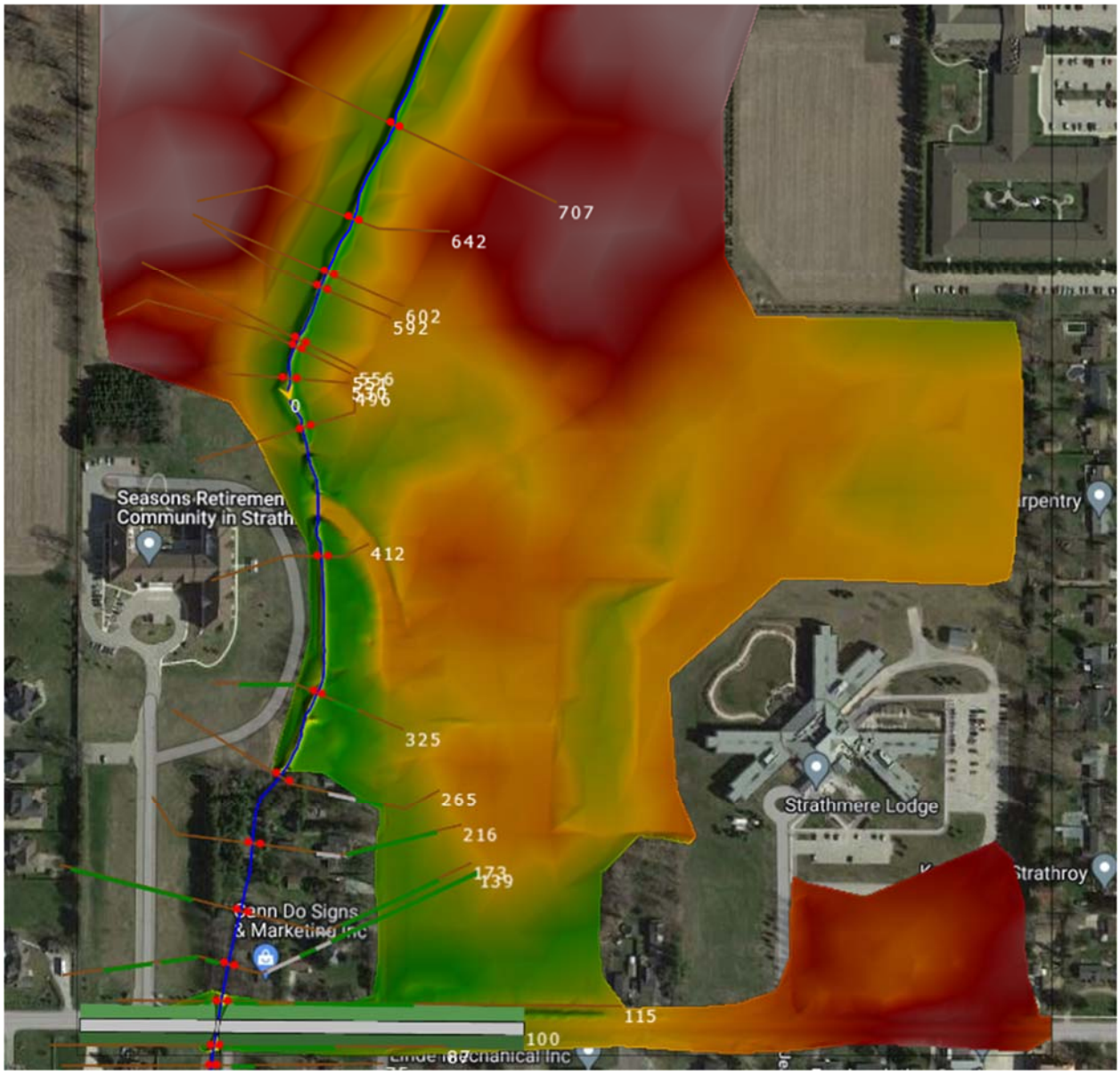


FIGURE 1: HEC-RAS MODELLING SCHEMATIC & TOPOGRAPHIC SURVEY LIMITS (A)

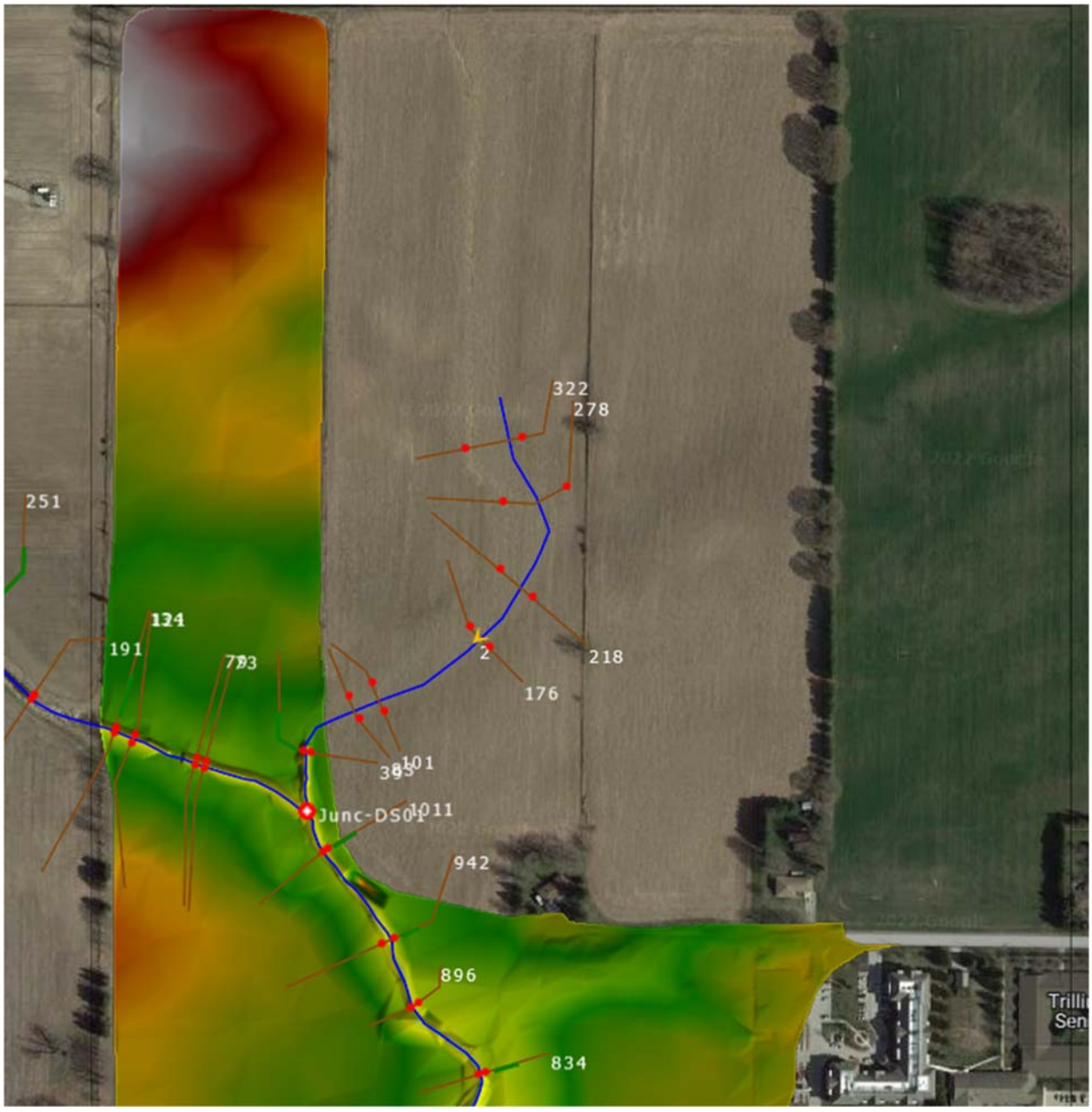


FIGURE 2: HEC-RAS MODELLING SCHEMATIC & TOPOGRAPHIC SURVEY LIMITS (B)

Proposed Cut/Fill Works

Conceptual grading has been proposed by BM. Ross to accommodate development. As such, a proposed hydraulic modelling scenario has been included. This assessment has been completed to determined floodplain impacts (if any) due to any grading measures, as well as determined impacts of proposed cut/fill works.

To service the subdivision, various stormwater management ponds are proposed to provide various quality, quantity and erosion control measures. Due to grading

constraints, one of the stormwater management ponds and several lots are proposed within the southern limits of the property, directly adjacent to Napperton Drive. This area is noted as a low lying area within the Regulatory floodplain. This area can be considered “ineffective” as it does not convey any flow due to floodwaters being in a backwater condition upstream of the Napperton Culvert.

While the conveyance of the channel would not be impacted due to the fill within the area of the proposed stormwater management facility, best efforts were made to complete a compensatory cut within the valley to ensure there is no loss in flood storage occurs within the channel. Compensatory “cuts” were made along the west limit of the development, located at the HEC-RAS Cross Section 325, where fill was incorporated along section 115, as indicated below in as indicated in **Figure 1**. Details of the cut-fill calculations are provided in the appendices, completed by BM. Ross and Associated Limited (BM Ross). Provided in **Figure 4** is the overall concept of the cut-fill at Section 323.

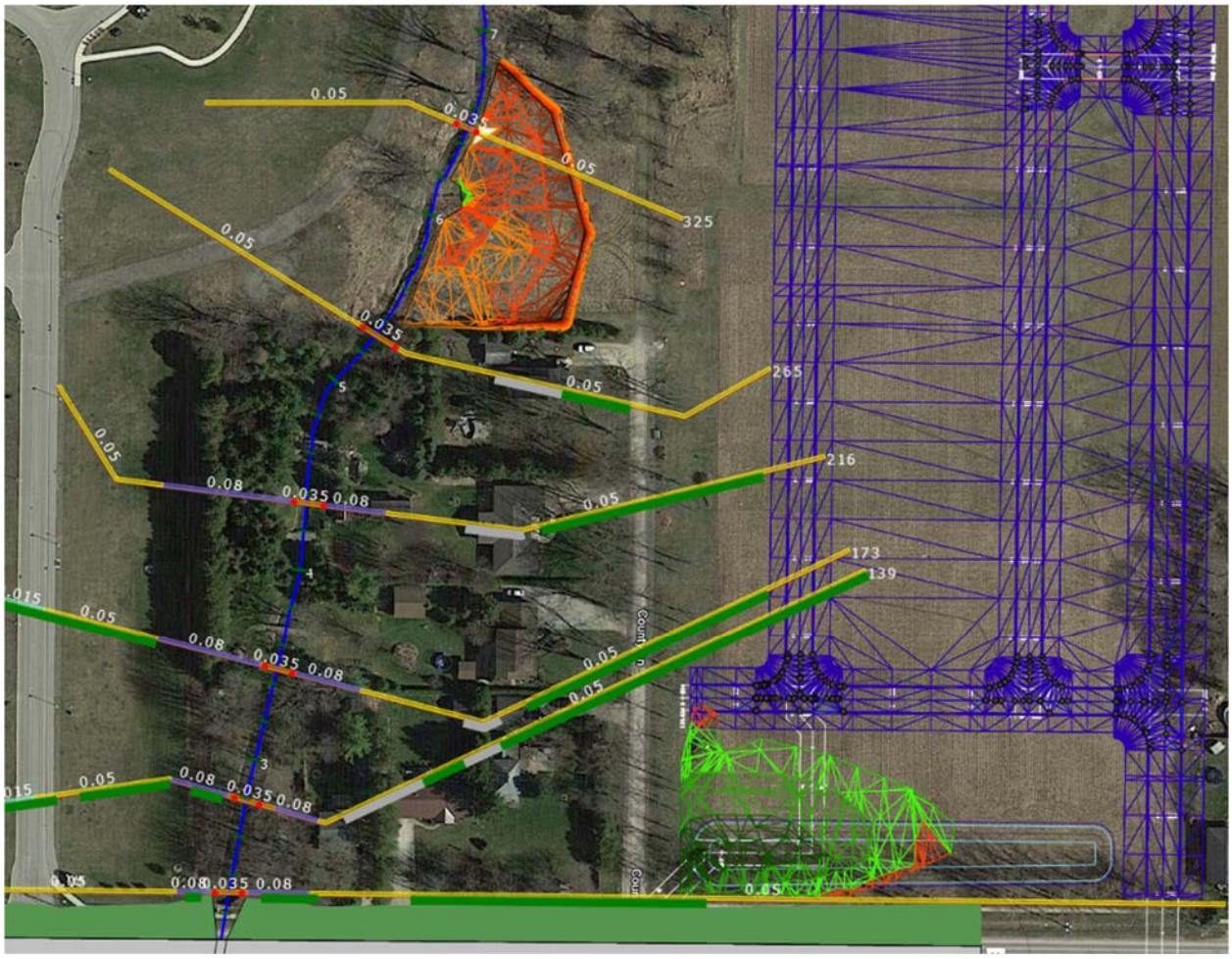


FIGURE 3: CUT-FILL PLAN

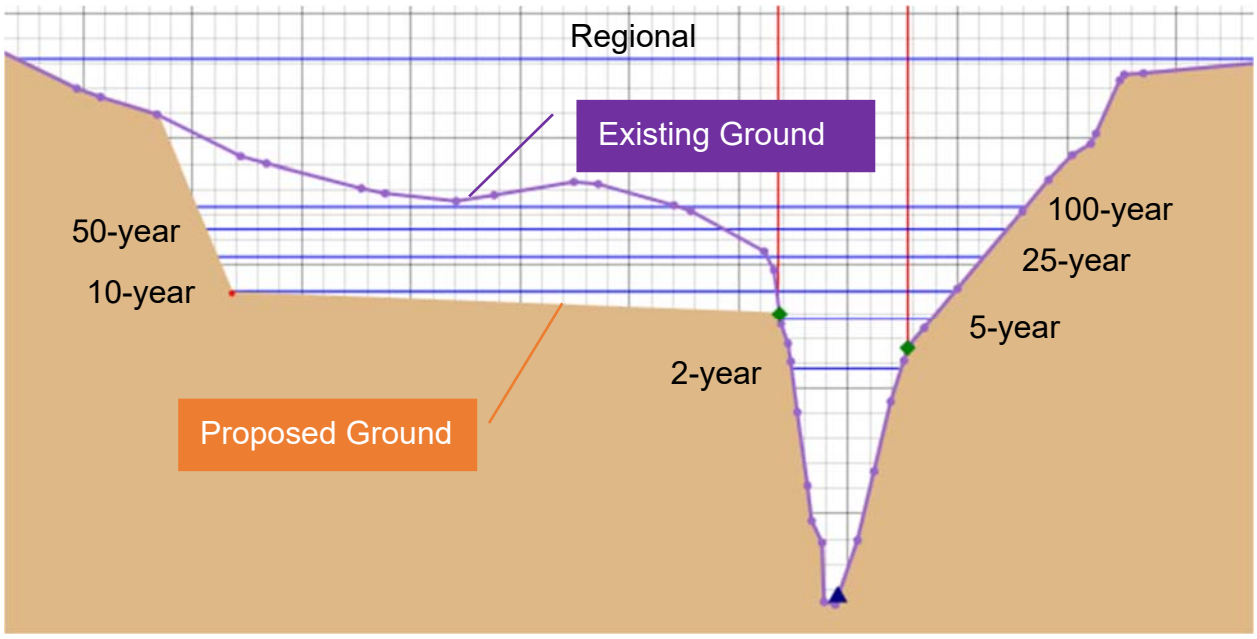


FIGURE 4: CUT-FILL CONCEPT AT SECTION 325

From the above, it is demonstrated that the 2-year (and 5-year) storms are still contained within the banks of the channel, representative of an overly conservative bankfull flow condition (typically,~1.5-year storm event). This allows for a greater factor of safety, should future channel enlargement occur.

From the above, it can be seen that the existing Cable Drain provides little to no floodplain access (entrenched channel, where floodplain access is only provided for the 50-year storm event and above). This improved floodplain access allows for erosion mitigation, improve channel stability and provide improved riparian habitat features, as it is more representative of natural channel system.

At the location of the pond and adjacent lots, fill is only proposed to accommodate the proposed stormwater management facility (infiltration basin). Only fill is placed within approximately the 100-year flood elevation (227.11m) and Regional (227.71m) and has no impacts on the smaller storm events. The fill placed in this area is only activated during backwater effects, where water would back up through ditch drainage, driveway culverts etc. As such, this filled area can be considered ineffective and would have no impact to flood constraints.

The above is a favorable approach, as the cut works provide improved conveyance area for smaller storm events (i.e., 10-year and above), and fill within higher return period floodplains, backwater areas where conveyance is not provided at all.

Provided below in **Table 1** is a summary of the existing and proposed flood elevations due to the conceptual cut/fill works.

TABLE 1: EXISTING AND PROPOSED CUT-FILL FLOOD IMPACTS (REACH 0)

Section	10 year			25 year			50 year			100 year			Regional		
	Ex.	Pr.	Delta	Ex.	Pr.	Delta	Ex.	Pr.		Ex.	Pr.		Ex.	Pr.	Pr.
38	226.29	226.29	0.00	226.38	226.38	0.00	226.45	226.45	0.00	226.51	226.51	0.00	227.01	227.01	0.00
75	226.40	226.40	0.00	226.48	226.48	0.00	226.54	226.54	0.00	226.59	226.59	0.00	227.01	227.01	0.00
87	226.50	226.50	0.00	226.59	226.59	0.00	226.66	226.66	0.00	226.72	226.72	0.00	227.25	227.25	0.00
100	Napperton Drive														
115	226.71	226.71	0.00	226.87	226.87	0.00	227.00	227.00	0.00	227.11	227.11	0.00	227.72	227.72	0.00
139	226.73	226.73	0.00	226.89	226.89	0.00	227.02	227.02	0.00	227.13	227.13	0.00	227.71	227.71	0.00
173	226.78	226.78	0.00	226.93	226.93	0.00	227.05	227.05	0.00	227.16	227.16	0.00	227.74	227.74	0.00
216	226.82	226.82	0.00	226.96	226.96	0.00	227.08	227.08	0.00	227.18	227.18	0.00	227.77	227.77	0.00
265	226.85	226.85	0.00	227.00	227.00	0.00	227.11	227.11	0.00	227.21	227.21	0.00	227.79	227.79	0.00
325	226.88	226.88	0.00	227.02	227.02	0.00	227.12	227.12	0.00	227.21	227.21	0.00	227.80	227.80	0.00
412	227.04	227.04	0.00	227.17	227.17	0.00	227.26	227.26	0.00	227.34	227.34	0.00	227.89	227.89	0.00
496	227.20	227.20	0.00	227.31	227.31	0.00	227.40	227.40	0.00	227.47	227.47	0.00	228.01	228.01	0.00
530	227.27	227.27	0.00	227.38	227.38	0.00	227.47	227.47	0.00	227.54	227.54	0.00	228.12	228.12	0.00
551	227.28	227.28	0.00	227.38	227.38	0.00	227.47	227.47	0.00	227.53	227.53	0.00	228.11	228.11	0.00
556	227.30	227.30	0.00	227.41	227.41	0.00	227.50	227.50	0.00	227.56	227.56	0.00	228.14	228.14	0.00
592	227.45	227.45	0.00	227.55	227.55	0.00	227.62	227.62	0.00	227.68	227.68	0.00	228.25	228.25	0.00
602	227.47	227.47	0.00	227.57	227.57	0.00	227.64	227.64	0.00	227.70	227.70	0.00	228.27	228.27	0.00
642	227.55	227.55	0.00	227.65	227.65	0.00	227.73	227.73	0.00	227.79	227.79	0.00	228.33	228.33	0.00
707	227.67	227.67	0.00	227.77	227.77	0.00	227.85	227.85	0.00	227.91	227.91	0.00	228.44	228.44	0.00
834	228.01	228.01	0.00	228.11	228.11	0.00	228.19	228.19	0.00	228.25	228.25	0.00	228.71	228.71	0.00
896	228.16	228.16	0.00	228.25	228.25	0.00	228.33	228.33	0.00	228.39	228.39	0.00	228.90	228.90	0.00
942	228.35	228.35	0.00	228.45	228.45	0.00	228.53	228.53	0.00	228.59	228.59	0.00	229.11	229.11	0.00
1011	228.52	228.52	0.00	228.59	228.59	0.00	228.64	228.64	0.00	228.68	228.68	0.00	229.31	229.31	0.00

From the above, it is demonstrated that there are no impacts due to such cut/fill works, and that the proposed grading works by BM. Ross will have no adverse impacts to upstream and downstream landowners.

Conclusions

This letter summarizes the updated hydraulic modelling completed within the Buchanan Crossings development within the town of Strathroy, Ontario. The assessment included an updated the hydraulic modelling using refined topography, as well as anticipation for future development (watercourse crossings etc.) as well as an assessment of cut and fill implications throughout the property.

Fill works were required to accommodate a proposed stormwater management-infiltration basin and adjacent lots, where fill was placed in a low-lying area that becomes inundated by the regulatory floodplain. The fill works are localized in an isolated ineffective flow area which becomes flooded only due to backwater effects through ditch drainage.

Compensatory cuts are proposed upstream within the development limits, where the cuts will provide improved flood conveyance and improved floodplain access, resulting in an overall benefit to flood and erosion conditions associated with the Cable Drain.

As such, it can be concluded that the proposed cut-fill works provide a net improvement throughout the property limits, and will have no adverse effects to watershed wide hydrology and hydraulics of the Cable Drain.

We trust this letter is sufficient to receive approval for the updated floodline, and as such, approval from SCRCA.

If you have questions or require further details, please feel free to contact me at (289) 657-9797 ext. 229 or ssexton@greck.ca.

Sincerely,
GRECK AND ASSOCIATES LIMITED

Scott Sexton, P.Eng.
Water Resources Engineer – Project Manager

APPENDICES

TRILLIUM VILLAGE
SENIOR HOMES

STRATHMERE
LODGE

PARK BLOCK
1100
198.45sqm

PARK BLOCK
135
773.31sqm

PARK BLOCK
383
7304.54sqm

PARK BLOCK
137
13691.36sqm

PARK BLOCK
1001
993.47sqm

PARK BLOCK
1002
275.95sqm

PROPOSED
WET POND

PROPOSED
INFILTRATION
BASIN

SAULSBURY AVE

STREET A
STREET B
STREET C
STREET D
STREET E
STREET F
STREET G
STREET H
STREET J
STREET K
STREET L

FUTURE 1.5m SIDEWALK

NAPPERTON DR.

CABLE DRAIN

BLOCK 1005
BLOCK 382
BLOCK 1003
BLOCK 1004
BLOCK 469
BLOCK 480
BLOCK 1065

ADDITIONAL 97 LOTS IN
2.29ha NORTH OF CABLE
DRAIN FOR FUTURE
DEVELOPMENT

Cut Fill Earthworks

Num	Colour	Min Depth	Max Depth	Vol (m³)
1		−1.00	−0.75	409.99
2		−0.75	−0.50	456.10
3		−0.50	−0.25	275.34
4		−0.25	0.00	59.13
5		0.00	0.25	1.49
6		0.25	0.50	0.45
7		0.50	0.75	0.01

Cut Fill Earthworks

Num	Colour	Min Depth	Max Depth	Vol (m³)
1		−0.25	0.00	262.98
2		0.00	0.25	418.97
3		0.25	0.50	212.46
4		0.50	0.75	43.97
5		0.75	1.00	0.16

LEGEND

- EXISTING SEWERS, SANITARY or STORM
- MANHOLE and CATCHBASIN
- WATERMAIN, FIRE HYDRANT
- GASMAIN
- UNDERGROUND TELEPHONE
- UNDERGROUND HYDRO
- UNDERGROUND T.V. CABLE
- UTILITY POLES
- GRUBBING
- REMOVE EXISTING CONC. SIDEWALK AND DRIVES
- REMOVE AND PLACE CONC. SIDEWALK AND DRIVES
- PLACE CONC. SIDEWALK AND DRIVES
- REMOVE EXISTING ASPHALT PAVT
- PLACE HOT MIX ASPHALT (50mm HL-3 HOT MIX MISC. UNLESS NOTED OTHERWISE)
- REMOVE EXISTING CONC. CURB

NOTE

The locations of existing underground utilities are shown in an approximate way only and have not been independently verified by the owner or its representative. The contractor shall determine the exact location of all existing utilities before commencing work and agrees to be fully responsible for any damages which might be occasioned by the contractor's failure to exactly locate and preserve any and all underground utilities.

BENCHMARK INFORMATION

B.M. Elev.
-
-
-
-

Design By: - Checked By: -

PRELIMINARY

No.	DATE	REVISION
1.	12/22	Functional Servicing Report

BMROSS
engineering better communities

Goderich | Mount Forest | Sarnia

SLD Group Limited

Buchanan Crossings

Flood Cut-Fill

Project No. 21020

Scale (24x36)
1:1250

Drawing No. 1 of 1

Cut/Fill Report

Generated: 2022-12-19 09:21:08

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Drawing: Z:\21020-SC-Land_Development_Strathroy\Projects\Cad_Drawings\Preliminary\Model Drawings\Z:\21020-SC-Land_Development_Strathroy\Projects\Cad_Drawings\Preliminary\Model Drawings\21020 SCLD-Corridor.dwg

Volume Summary

Name	Type	Cut Factor	Fill Factor	2d Area (sq.m)	Cut (Cu. M.)	Fill (Cu. M.)	Net (Cu. M.)
Block137 Cut	full	1.000	1.000	2094.14	782.60	1.95	780.65<Cut>
Block136 Fill	full	1.000	1.000	2257.18	4.70	676.50	671.80<Fill>

Totals

	2d Area (sq.m)	Cut (Cu. M.)	Fill (Cu. M.)	Net (Cu. M.)
Total	4351.33	787.30	678.45	108.84<Cut>

* Value adjusted by cut or fill factor other than 1.0