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The Town of Picture Butte

Final Report

Infrastructure Assessment

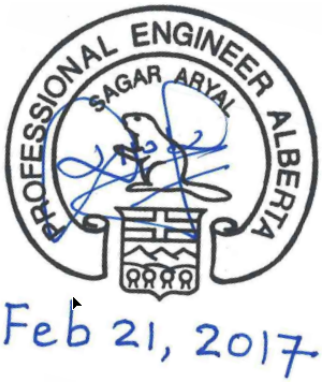
February 2017

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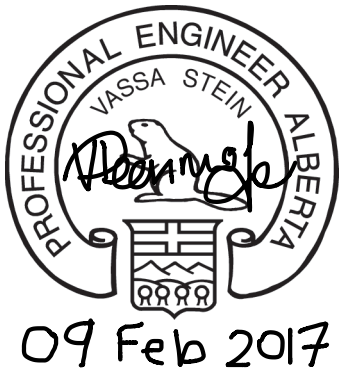
ISL Engineering and Land Services Ltd. is an award-winning full-service consulting firm dedicated to working with all levels of government and the private sector to deliver planning and design solutions for transportation, water, and land projects.

Corporate Authorization

This document entitled “The Town of Picture Butte Infrastructure Assessment” has been prepared by ISL Engineering and Land Services Ltd. (ISL) for the use of the Town of Picture Butte. The information and data provided herein represent ISL’s professional judgment at the time of preparation. ISL denies any liability whatsoever to any other parties who may obtain this report and use it, or any of its contents, without prior written consent from ISL.



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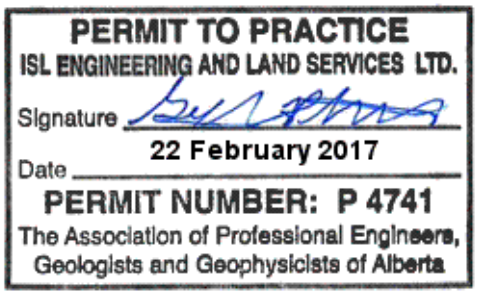
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Executive Summary

ISL Engineering and Land Services Ltd. (ISL) was commissioned by the Town of Picture Butte (Town) to develop an infrastructure assessment and condition analysis for the Town. The project was initiated as an investment in the infrastructure of the Town. The infrastructure assessment focuses on the water storage, pumping, and distribution system, wastewater collection and treatment system, stormwater drainage system, and the roadway and sidewalk networks.

There are four main reasons for developing an infrastructure assessment:

1. To inventory and analyze the existing Town infrastructure under existing conditions;
2. To determine what, if any, upgrades are needed for the existing Town infrastructure to meet present Town needs;
3. To develop plans for future infrastructure rehabilitation and upgrades; and
4. To develop a 10-year Capital Plan for the Town.

The review of the existing infrastructure including the water storage, pumping, and distribution system, wastewater collection and treatment system, stormwater drainage system and the roadway and sidewalk networks under existing development conditions is summarized below.

Existing Infrastructure Review

Water Storage and Pumping System Review

The existing potable water distribution and pumping system was reviewed based on the visual assessment, available technical information, and operator's input. Upgrades and priorities have been identified and recommendations provided to address the issues and risks associated with each key component.

Water Distribution System Review

The existing water distribution system was modeled using WaterCAD V8i (SELECT series 5).

Deficiencies and priorities were determined from the model results based on average day demand, peak hour demand pressures, available fire flow, record drawings and the break history.

Wastewater Treatment System Review

The existing wastewater treatment system was reviewed based on the visual assessment, available technical information, and operator's input. Upgrades and priorities have been identified and recommendations provided to address the issues and risks associated with each key component.

Wastewater Collection System Review

The sanitary evaluation was prepared to achieve the following objectives:

- To develop a hydrodynamic MIKE URBAN model of the Town's existing wastewater collection system and calibrate it to provide accurate capacity assessment.
- To use the calibrated model to prepare a capacity assessment of the existing wastewater servicing system and its ability to perform under existing and growth conditions.
- To determine what, if any, upgrades for existing Town infrastructure are required to meet servicing objectives under existing conditions.
- To determine what, if any, upgrades for existing Town infrastructure are required to meet servicing objectives under future conditions.
- To provide a framework for future wastewater capital planning.
- To provide costs related to infrastructure requirements.

The existing sanitary system generally performs adequately, however upgrades are recommended for the main line from 6 Street North, 5 Street South, Rogers Avenue, to the 3A Street South lift station. The future sanitary system also generally performs adequately, however the main line from the north is recommended for further upgrades, along with the line which future southern developments will connect to.

Stormwater Drainage System Review

The stormwater drainage system in the Town of Picture Butte was evaluated to address existing stormwater issues and provide upgrading priorities as well as potential stormwater projects for future Town development. Within the Town, the stormwater conveyance system consists of both gravity driven pipe drainage as well as surface drainage that conveys the Town's runoff to Piyami Coulee to the southeast.

An inventory and condition assessment of the stormwater drainage system was performed as part of the evaluation. Overall drainage patterns were determined using GPS field survey combined with LiDAR data, which was used in combination with pipe network information to assess the system. Both surface and piped drainage networks were incorporated into a hydrodynamic model in the form of XP-SWMM to assess current pipe and storage capacities. This model was also utilized to determine potential stormwater projects for the Town's future development.

Roadway and Sidewalk Network Review

ISL performed a condition assessment, dividing up the Town's roadway and sidewalk systems into single segments and individually rating each segment. The segments were typically broken up between intersections, or on long stretches of road, were broken up at would-be apparent intersections or dead ends.

Along with the above mentioned condition assessment, physical measurements of roadway and sidewalk widths and visual properties and deficiencies were recorded.

10 Year Capital Plan

The summary table below provides an overview of the 10-year Capital Plan for the Town of Picture Butte. The recommended upgrades for the water storage, pumping, and distribution system, wastewater collection and treatment system, stormwater drainage and management system, and the roadway and sidewalk networks are combined into projects in four different infrastructure categories for each year. This summary gives an excellent overview of the budget required for each year for planning purposes. It is recommended that the 10-year Capital Plan be revisited and updated every 5 years to reflect actual growth patterns and demands.

10-year Capital Plan Summary

Year	Category	Projects	Project Cost
2017	Water and Wastewater Building Upgrades	Testing fire pump; Reconfigure existing MCC and back up generator, upgrade SCADA system, replacing EMT conduit; and installing security fencing and locks to hatches and building, relocate we-well access hatch, upgrade power distribution equipment, install CO gas detector, water quality assessment.	$346,000
2018		No work this year.	
2019	Water Distribution System	Upgrade existing water pipes (including pavement) to meet the current standard.	$850,000
2020	Water Storage/Pumping and Distribution System	Remove abandoned control panels and cables, upgrade existing pumps control panel PLC; Replace chlorine analyzer probe	$68,000
2021	Sewage Collection and Treatment System	Remove/Upgrade Sanitary main from Lift Station to north side of Rogers Avenue.	$640,000
2022	Water Storage/Pumping and Pipe Maintenance	Replacement of lab equipment and sewage system flushing/cleaning.	$23,000
2023	Water Storage/Pumping and Pipe Maintenance	Replacing chlorine analyzer controller; replacing Turbidity Analyzer and system flushing/cleaning.	$26,500
	Sewage Collection and Treatment System	Remove/Upgrade Sanitary main from north side of Rogers Avenue to Highway Avenue.	$750,000
2024	Water Storage/Pumping and Pipe Maintenance	Replace existing lighting and replacement of EMT conduits to RPVC and sewage system flushing/cleaning.	$30,000
2025	Water Storage/Pumping and Pipe Maintenance	Replacement of a back-up distribution pump motor, suitable for operation with VFD, and equip existing MCC with VFD drive and sewage system flushing/cleaning.	$50,000
	Sewage Collection and Treatment System	Remove/Upgrade Sanitary main from Highway Avenue to Crescent Avenue.	$475,000
	Storm Water System	Install catch basins at Crescent Avenue and 6th Street North	$68,000
2026	Sewage Collection and Treatment System	Remove/Upgrade Sanitary main from 7th Street to 6th Street on Crescent Avenue and sewage system flushing/cleaning.	$670,000

Year	Category	Projects	Project Cost
Beyond 10 years	Water Storage/Pumping and Distribution System	Replacing water pump 402; replacing supplementary equipment (piping, valving, etc.); expanding industrial and residential areas for future.	$4,780,000
	Sewage Collection and Treatment System	Replacing supplementary equipment (piping, valving, etc.); upgrade of an existing sewage collection system at various locations.	$3,380,000
	Storm Water System	Future stormwater conveyance network; future ponds for storm management.	$5,166,000

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1.0 Project Introduction

1.1 Authorization

ISL Engineering and Land Services Ltd. (ISL) was commissioned by the Town of Picture Butte (Town) to develop an infrastructure assessment and condition analysis for the Town. A comprehensive condition assessment and capacity analysis of the Town's infrastructure provides a road map to Council and its Administration for assessing the status of the existing infrastructure and its capability to accommodate growth in the short and longer term. The detailed assessment will be used in order for the Town to plan and budget for capital rehabilitation and replacements in order to meet the Town's needs and to satisfy residents' and businesses' expectations of the Town.

It is recommended that this report be revisited on a regular basis in order for the Town of Picture Butte to effectively plan and maintain its infrastructure. In addition, this report should be updated as future growth and development occurs, changing demands and priorities of the Town. Updates would typically occur every 5 years to provide a new 5-year rehabilitation plan, about one year prior to completion of the prior plan. Four year cycles may also be appropriate, if needed to align with budget planning for each Council term.

1.2 Purpose of Study

There are four main reasons for developing an infrastructure assessment:

1. To inventory and analyze the existing Town infrastructure under existing level of service conditions.
2. To determine what, if any, upgrades are needed for the infrastructure to meet the Town's present needs.
3. To analyze and develop plans for infrastructure rehabilitation and upgrades based on population growth and continued wear on assets.
4. To develop a 10-year Capital Plan for the Town such that the minimum levels of service can be achieved.

1.3 Background

Location

The Town of Picture Butte is located in Lethbridge County approximately 30 kilometers north of the City of Lethbridge. Alberta Highway 25, runs east-northwest through the Town and connects to Highway 25/843 north and Alberta Highway 519, runs east-west through the Town.

Population

The Town's population has remained relatively steady over the last few years. The 2016 census results have not been released at this time but is expected to follow the trend. The highest population projection in The Municipal Development Plan (September 2004) is 2,528 in 2021 based on 2% annual growth using the 2001 population. By applying a 2% annual growth to the 2011 population census results in 2,221 people in 2026. For the purposes of this study, the more conservative figure of 2,528 for the future population was assumed. Table 1.1 below shows the historical population census results for the Town.

Table 1.1: Town of Picture Butte Population Data

Year	Population
1996	1,669
2001	1,701
2006	1,592
2011	1,650

Population Distribution

Aerial imagery, Google's Street View and land use divisions indicate that there are 689 dwellings in Picture Butte, this includes 8 dwellings at 612 Rogers Ave. Public data indicates the Piyami Health Centre at 300 Rogers Avenue has 63 residences. Subtracting off the Piyami population and distributing the remaining 2011 population of 1,650 into the dwellings results in 2.3 people/dwelling this is a typical population distribution average per dwelling.

For future population distributions, where residential areas were already divided into lots, 2.3 people/dwelling were assumed. The remaining anticipated population growth was evenly distributed into the designated residential areas, a rate working out to 10 people/ha.

Land Use

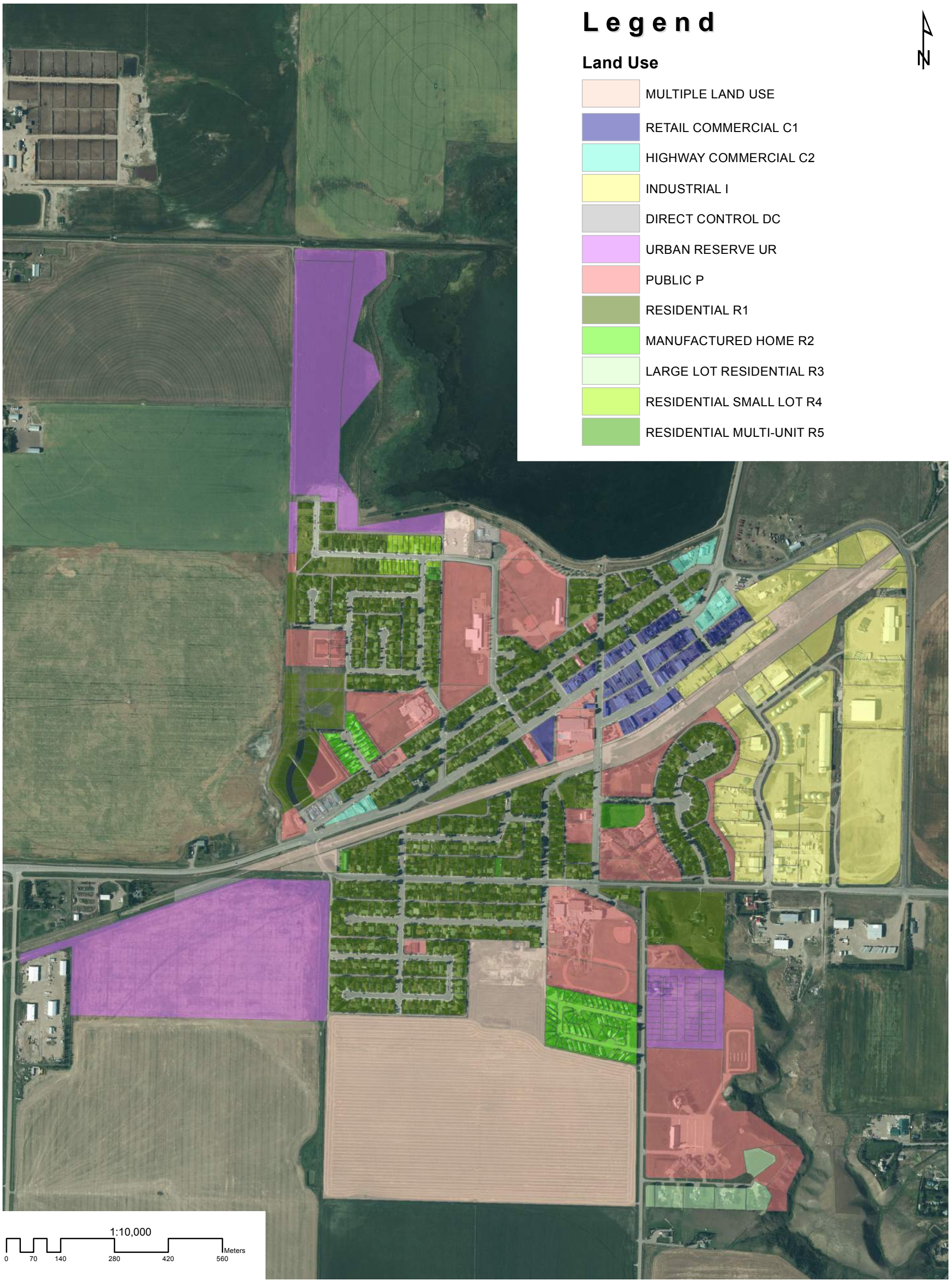
In terms of land use, the Town of Picture Butte is divided into primarily residential, recreational, commercial, industrial or institutional areas. The type of land use influences wastewater generation rates and imperviousness values, therefore for the purpose of constructing accurate hydraulic models, obtaining an appropriate classification was vital.

When determining land use classification for existing areas in the Town, a zoning shapefile was created. In this shapefile, the Town is classified by a number of unique zoning districts. These districts are listed below:

- Commercial Development
  - C1: Retail Commercial
  - C2: Highway Commercial
- Industrial Development
  - I: Industrial
- Other Areas
  - DC: Direct Control
  - UR: Urban Reserve
  - P: Public
  - MLU: Multiple Land Use
- Residential Development
  - R1: Residential
  - R2: Manufactured Home
  - R3: Large Lot Residential
  - R4: Residential Small Lot
  - R5: Residential Multi-Unit

A zoning map is illustrated in Figure 1.1.

FIGURE 1



TOWN OF PICTURE BUTTE
INFRASTRUCTURE ASSESSMENT

EXISTING LAND USE

Engineering and Land Services

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2.0 Potable Water Storage and Pumping

2.1 Background

The following section details the findings of the structural, process mechanical, and electrical equipment assessment of potable water storage and pumping system completed by ISL on June 10, 2016 and provides the town with the actions required to address the issues and risks associated with each key component.

Along with ISL's visual inspection of the components, input from the Town's Operator was utilized in assessing the condition of the process components. In order to supplement the assessment, photographs were taken during the site visit. These are provided in Appendix A of this report.

2.2 Condition Assessment

The Town of Picture Butte previously employed an ultrafiltration membrane water treatment plant to produce potable water for its residents. However, approximately 4 years ago, the Town moved away from producing their own potable water and instead now receives potable water through the Lethbridge Regional Water Services Commission.

The potable water is stored in two underground treated water reservoirs. The North reservoir has a capacity of 1.38 ML and was constructed in 2001 (the draft preliminary drawing – WWT Reservoir Upgrade is dated June 2000). The South reservoir is older (year of construction is unknown) and has a capacity of 2.27 ML, bringing the total treated water capacity to 3.65 ML (3,650 m3). During normal operation, treated water from the reservoirs is sent to the clearwell from where the high lift pumps (HLP 401/402/403/404) pump to distribution. A high lift pump (405) is provided in the north reservoir, which can be used for bypassing the clearwell, in the event the clearwell is undergoing maintenance.

There is currently no treatment or chlorination of the potable water received from regional system, at the plant. The pumphouse, which was part of the WTP, still houses some of old and un-used equipment, which was part of the water treatment process. The original membrane treatment plant control panel (from Zenon) has been abandoned in place.

2.2.1 Process Mechanical

The reservoirs are shown in Figure 2.1. Treated water flows by gravity into the clearwell from where it is pumped to distribution.

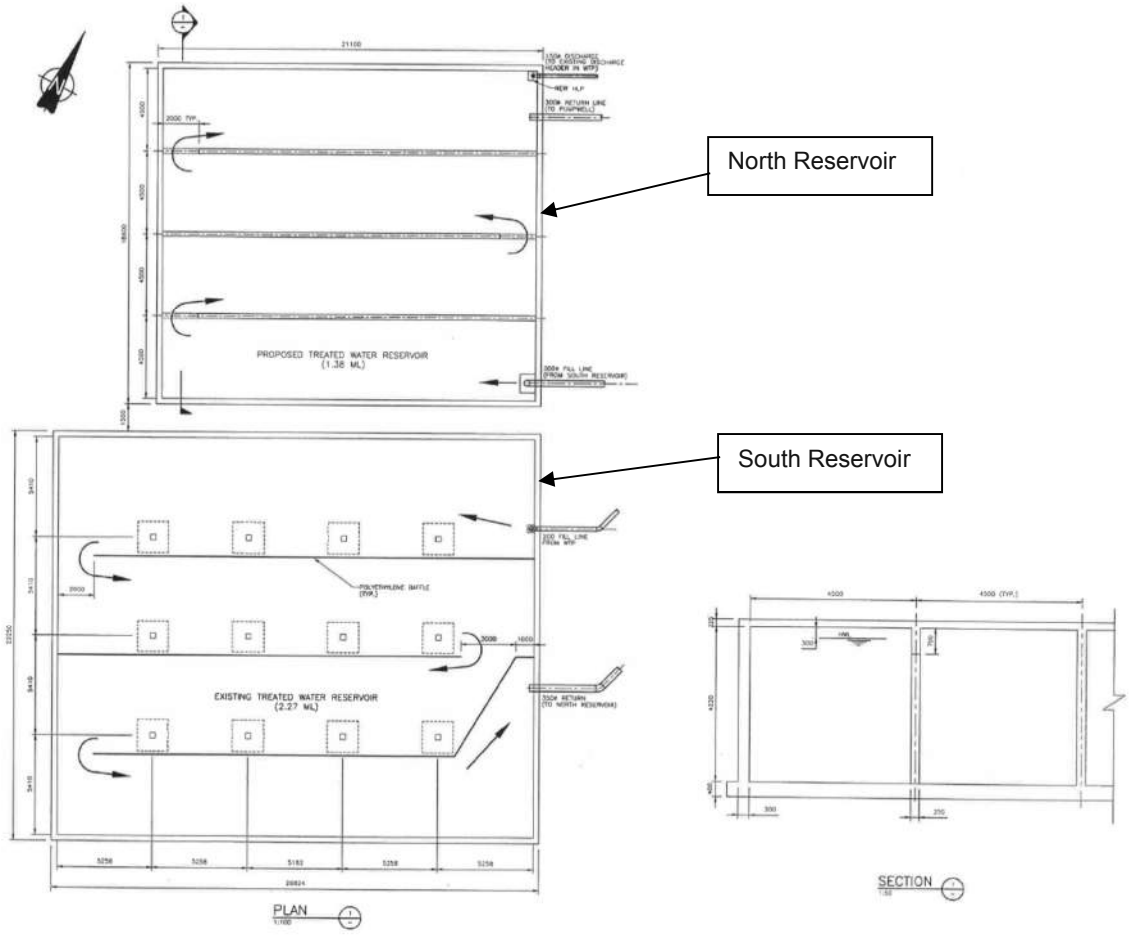


Figure 2.1: Treated Water North and South Reservoirs

The Town receives potable water via a regional water line from Diamond City. There is a pressure reducing control valve along with a flow meter and a pressure transmitter on the feeder line accessible through the regional supply line vault located to the west of the pumphouse. The line splits into two downstream of the vault feeding each reservoir. There is an isolation valve on each line prior to discharging into each reservoir. The two reservoirs are connected with a common line, which is equipped with an isolation valve and can be used in the event either of the reservoirs needs to be taken off line. Each reservoir is equipped with a level indicating transmitter and switch. The outlets from each reservoir into the clearwell are equipped with an isolation valve each. In addition to the isolation valve, the outlet from the north reservoir also has a level control valve. A high lift pump is provided in the north reservoir, which can be used for bypassing the clearwell, in the event the clearwell is undergoing maintenance. The bypass from the north reservoir is provided with a pressure and flow transmitters.

The information obtained from the site assessment is summarized in a Table 2.1 on the following page.

Item	ISL's Comments	Remaining Service Life	Recommendations
Pump 401	- 30 HP constant speed* - 159 m^3/hr (44.2 L/s) at 35 m* - Pump is turned on and off automatically by set pressure points - Surface rust, grease build up and scaling observed on pump - Coating chipped off in some areas of the pump pad and floor near the pump - Pump performance could not be tested at the time of inspection Information from the pump plate was used to track down the pump from the supplier to get information on its installation date. Supplier could not find any records of installation of this pump in the Town of Picture Butte. They, in fact, traced the pump serial number provided to somewhere in the USA instead of the Town of Picture Butte. Therefore, no information on the year of installation of this pump is known.	Based on the Distribution Pumping Assessment Memorandum (MPE Engineering, 2011) supplied by the Town to ISL, Pump 402 ran for 69,328.2 hours before it failed and Pump 401 ran for 6,008.5 hours up until 2011. Using a maximum run time of 69,328.2 hours for all pumps, Pump 401 could possibly operate for approximately another 16 years (on the basis that Pump 401 is operated for equal durations every year, Pump 401 is operated for the same duration per year as Pump 402, the 2011 run times, and no change in condition and performance of Pump 401 between 2011, now (2016) and 16 years (2032)). However, based on ISL's assessment of the existing condition of the pump, recent overhaul, input from operator, and typical operating life of pumps recommended by pump manufacturers, ISL believes that the Town should plan for upgrade of Pump 401 in approximately 10 years (2026). ISL strongly recommends that Pump 401 (internals, externals and performance) be inspected by a third party to confirm the remaining life of Pump 401.	- Implement rust control strategies such as clean up and preventative measures - Conduct routine maintenance of pump to prevent scaling - Plan for refurbishment /replacement in **10 years, confirm remaining life of pump by third party inspection of internals, externals and performance.**
Pump 402	- 30 HP variable speed* - 141 m^3/hr (39 L/s) at 45 m* - Pump operates as the base duty pump to maintain the operator defined distribution pressure set point - Grease build up - Coating chipped off in some areas of the pump pad and floor near the pump - Only pump running during inspection - Pump performance could not be tested at the time of inspection Information obtained from the pump plate was used to track down the pump from the supplier to get information on its installation date and specifications of the pump. No information on the pump curve could be obtained from the supplier. The flow meter reading during ISL's inspection was 49.68 m^3/hr (13.8 L/s). Based on the Water Distribution Data supplied by the Town from 2013-2014 and considering this pump was being operated as the base duty pump (as per Operator) during this period, the maximum volume of water processed by the Town was below the flow capacity of this pump. However, as no information on the historical head/pressures for these years were provided, no comment can be made if this pump was being operated within the operating range of the pump.	As per the information provided by the Town, Pump 402 has ran for 14,500 hours since its installation in 2011. Based on a maximum run time of 69,328.2 hours, Pump 402 could possibly operate for approximately another 19 years (on the basis that Pump 402 is operated for equal durations every year, the 2011 run times, and no change in condition and performance of Pump 402 between 2011, now (2016) and 19 years (2035)). However, based on ISL's assessment of the existing condition of the pump, input from operator, and typical operating life of pumps recommended by pump manufacturers, ISL believes that the Town should plan for upgrade of Pump 402 in 15 years (2031). ISL strongly recommends that Pump 402 (internals, externals and performance) be inspected by a third party to confirm the remaining life of Pump 402.	- Plan for refurbishment/ replacement in **15 years, confirm remaining life of pump by third party inspection of internals, externals and performance.**
Pump 403	- 30 HP constant speed* - 159 m^3/hr (44.2 L/s) at 35 m* - Pump is turned on and off automatically by set pressure points - Surface rust and grease build up observed on pump - Coating chipped off in some areas of the pump pad and floor near the pump - Visual inspection indicates that the pump has not been run in a while due to accumulation of cob webs - Pump performance could not be tested at the time of inspection	As per the information provided by the Town, Pump 403 has ran for 5,313.6 hours up until 2011. Based on a maximum run time of 69,328.2 hours, Pump 403 could possibly operate for approximately another 17 years (on the basis that Pump 403 is operated for equal durations every year, Pump 403 is operated for the same duration per year as Pump 402, the 2011 run times, and no change in condition and performance of Pump 403 between 2011, now (2016) and 17 years (2033). However, based on ISL's	- Run pump to ensure that -the pump works - Implement rust control strategies such as clean up and preventative measures - ensure that all pumps are run for equal durations to maintain operability of the pump - plan for refurbishment /replacement in **5 years, confirm remaining life of pump by third party inspection of internals, externals and performance.**

Item	ISL's Comments	Remaining Service Life	Recommendations
	Information from the pump plate was used to track down the pump from the supplier to get information on its installation date. Supplier could not find any records of installation of this pump in the Town of Picture Butte. They in fact traced the pump serial number provided to somewhere in the USA instead of the Town of Picture Butte. Therefore, no information on the year of installation of this pump is known.	assessment of the existing condition of the pump, input from operator, and typical operating life of pumps recommended by pump manufacturers, ISL believes that the Town should plan for upgrade of Pump 403 in 5 years (2021) as pump has not been refurbished/overhauled/replaced as per the Operator and looks like it has not been run in a while. ISL strongly recommends that Pump 403 (internals, externals and performance) be inspected by a third party to confirm the remaining life of Pump 403.	
Pump 404	- 15 HP - Pump is turned on and off automatically by set pressure points - Some surface rust buildup at bolts and grease build up observed - Coating chipped off in some areas of the pump pad and floor near the pump - Pump performance could not be tested at the time of inspection Information from the pump plate was used to track down the pump from the supplier to get information on its installation date and specifications. As per the supplier, this pump was installed in 1993. Supplier indicated that parts of this pump are still available and therefore can be replaced.	As per the information provided by the Town, Pump 404 has ran for 3,830 hours up until 2011. Based on a maximum run time of 69,328.2 hours, Pump 404 could possibly operate for approximately another 17 years (on the basis that Pump 404 is operated for equal durations every year, Pump 404 is operated for the same duration per year as Pump 402, the 2011 run times, no change in condition and performance of Pump 404 between 2011, now (2016) and 17 years (2033). However, based on ISL's assessment of the existing condition of the pump, input from operator, and typical operating life of pumps recommended by pump manufacturers, ISL believes that the Town should plan for upgrade of Pump 404 in 5 years (2021) as pump has not been refurbished/overhauled/replaced as per the Operator. ISL strongly recommends that Pump 404 (internals, externals and performance) be inspected by a third party to confirm the remaining life of Pump 404.	- Implement rust control strategies such as clean up and preventative measures - plan for refurbishment /replacement in **5 years, confirm remaining life of pump by third party inspection of internals, externals and performance.**
Pump 501- Fire Pump	- 100 HP Floway electric pump - 568 m^3/hr (157.8 L/s) at 36.6 m* - Chipping of coating observed in small areas of the pump Information from the pump plate was used to track down the pump from the supplier to get information on its installation date and pump curve. Supplier could not find any records of installation of this pump in the Town of Picture Butte. They in fact traced the pump serial number provided to somewhere in the USA instead of the Town of Picture Butte. Therefore, no information on the year of installation and pump curve of this pump was known. As no historical operating data was provided for this pump and no pump curve was provided, a capacity assessment of this pump could not be conducted.	As per the information provided by the Town, Pump 501 has ran for 3.6 hours up until 2011. Based on a maximum run time of 69,328.2 hours, Pump 501 could possibly operate for approximately another 19 years (on the basis that Pump 501 is operated for equal durations every year, Pump 501 is operated for the same duration per year as Pump 402, the 2011 run times, no change in condition and performance of Pump 501 between 2011, now (2016) and 19 years (2035). However, based on ISL's assessment of the existing condition of the pump, input from operator, and typical operating life of pumps recommended by pump manufacturers, ISL believes that the Town should plan for upgrade of Pump 501 in 5 years (2021) as pump has not been refurbished/overhauled/replaced as per the Operator and has not been operated since 2010. ISL strongly recommends that Pump 501 (internals, externals and performance) be inspected by a third party to confirm the remaining life of Pump 501.	- Test pump to ensure that it works - Continue with servicing of fire pump, as required - Plan for replacement/refurbishment in **5 years, confirm remaining life of pump by third party inspection of internals, externals and performance.**

Item	ISL's Comments	Remaining Service Life	Recommendations
Supplementary Equipment	- Some rusting observed on piping	20+	- Implement rust control strategies such as clean up and preventative measures - Plan for replacement in **20 years**
Rodent Issues	- A number of rodent holes were observed near the pump house and regional water line vault		- Initiate a rodent control program at the facility
In House Testing and Monitoring	- In house lab space and equipment in good and clean condition - Operators follow a schedule to conduct routine sampling, monitoring and inspections	5+	- Plan for replacement in **5 years** as lab equipment typically needs to be updated every 5 years. - Chlorimeter should be upgraded to Hach 4000.
Security	- Pump house is locked - No lock on regional water line hatch - No fencing around facility - No cameras - As per the Alberta Guidelines for Municipal Waterworks, fencing should be considered for distribution pump stations		- Add a lock on the regional water line hatch - Add fencing around pump house
Regional Supply Line Vault/Hatch	- Could not enter the vault during the inspection - Visual review of the above ground structure shows that the hatch and ladder are in good condition - Visual inspection of below ground structure from outside indicated that everything is in good condition	- Unable to comment on below ground structure as no interior inspection of the below ground structure could be conducted.	- No actions required on above ground structure
North and South Reservoir and associated components	*Could not complete assessment as these are below ground reservoirs.*		

**Operating parameters are solely based on the information from the pump plate and the pump curve (wherever available) provided by the operator*
**No inspection of Pump 405 could be conducted as it is located within the treated water reservoir.*

Item	ISL's Comments	Remaining Service Life	Action
Motor Control Centre (MCC)	- Existing MCC has the majority of starters, except distribution pumps motor starters, locked out - Manufactured by Cutler Hammer - Date of installation March 06, 2002, as per electrical permit - Main circuit breaker is rated as 600 AF / 500 AT - (ATS) is rated for 400 Amps - Visual inspection indicate Surge Protection Device (SPD) and Digital Power Meter (DPM) to be in working condition	6 years	- Reconfigure existing MCC, to eliminate un-used starters - Equip existing MCC with VFD drive
Standby Generator	- Existing standby power generator is still in use - Manufactured by Cummins - Tested annually by Cummins, as well as monthly by operator using plant load - Positioning of ATS in the MCC line-up allows generator power back-up for *2 out of 5* pumps	6 years	- Provide generator back-up for all distribution pumps in use
Pumps HLP 401/402/403/404 and FP 501	- Pumps designated as HLP 402/404 (30/15 HP) are on standby power - Pumps designated as HLP 401/403/405 (30/30/20 HP) are NOT on standby power - Visual inspection indicates that pumps designated as HLP 401/402/403/404 are selected to operate in AUTO mode - Pump designated as HLP 402 is operated by Variable Frequency Drive (VFD) and was the only pump running at time of inspection - Largest distribution pump (or fire pump) designated as FP 501 was selected as OFF - Pump designated as HLP 405 was locked out of operation - All distribution pumps have local emergency stops located beside each pump motor	- 10+ years (HLP 402) - 5+ years (HLP 401/403/404 and FP 501)	- Provide generator back-up for all distribution pumps in use - Test fire pump and distribution system pressure relief valve for operation, if necessary in presence of qualified technician - Replace back-up distribution pump motor, suitable for operation with VFD, and equip existing MCC with VFD drive - Replace pump motors in **5-8 years** (HLP 401/403/404) suitable for operation with VFD, and equip existing MCC with VFD drive - Replace fire pump motor in **5-8 years** (and FP 501) - Replace pump motor in **10 years** (HLP 402)
Air Compressor	- Air compressor (AC 91A) was operating in HAND mode at the time of inspection		
Lighting	- Plant lighting is fluorescent T8 type and appears to be working - Emergency lighting available throughout plant, but was not tested for operation at the time of inspection - No EXIT signage installed at the plant	5+ years	- install EXIT signage
Membrane Treatment Plant Control Panel	- The original membrane treatment plant control panel (from Zenon) has been abandoned in place	Not operational/ abandoned	- Remove abandoned control panels and cabling for ease of troubleshooting in the future
Distribution Pumps Control Panel	The existing distribution pumps control panel consists of: - Allen Bradley SLC 5/04 Programmable Logic Controller (PLC) - ProTalk B1270' alarm-dialer - PowerWare Uninterruptible Power Supply (UPS)	3 years	- Upgrade existing pumps control panel PLC (now obsolete) with current model
Regional Supply Control Panel	The regional commission panel (also located at the plant) consists of: - Modicon Momentum PLC - ABB flow-transmitter - Milltronics level transmitter - Freewave radio - Red-lion G308A2 touch-screen operator interface - GES 152N UPS	10+ years	

Item	ISL's Comments	Remaining Service Life	Action
Supervisory Control and Data Acquisition (SCADA)	The existing SCADA consists of: - desktop PC running Windows XP Pro SP3 operating system - GE Intellution iFix 4.0 application - SCADA graphics are very simple and display very limited plant information on screen - Distribution system pressure set-point was set at 65 psi, at the time of inspection	1-2 years	- Upgrade existing SCADA system (now obsolete) with current model c/w remote access capabilities
Turbidity Analyzer	- Appear in good condition - Last service date Feb 2016	5+ years	- Replace turbidity analyzer in **5-7 years**
Chlorine Analyzer	- Two units installed in 2010 - Appear to be in good condition - Last service date Feb 2016 - Current controller model has been discontinued, so it will have to be replaced with a new model in the future	5+ years	- Replace probe in **3 years** - Replace controller in **5-7 years**
EMT Electrical Conduit	- Used for outside wiring - Appears to be extensively corroded - Abandoned cable at the back of the plant (previously used for chemical tank instrumentation connection) is visible, sticking out of the ground	1 year	- Replace corroding EMT conduit outside the plant with RPVC conduit - Remove abandoned instrumentation cable
Regional Supply Line Vault/Hatch	- Fill system is maintained and operated by the plant operator	10+ years	

Item	ISL's Comments	Operators' Comments	Remaining Service Life	Action
Windows	- Windows and/or sealant appeared old and weathered - Lintels above windows appeared solid and properly installed - Drip-edge not provided for water evacuation, which could lead to later problems - Windows appeared to lack insulating properties		10+ years	- Recommend replacing caulking around windows
Insulation	- Based on building's age, insulation likely not energy efficient			
Exterior Walls	- Brick cladding appears in moderate condition - Brick walls appear weathered, with possible signs of efflorescence in some areas (calcium deposits from water migrating through the wall assembly) - No signs of leaking observed inside the building - Tooled mortar joints appear to be cracking - Visible expansion joint between new and old buildings (north wall)		5-10 years for older part of building	- Recommend having building envelope specialist inspect for potential issues - Monitor for any water leakage/entry into the building
Substructure	- Grade beam minor cracking observed - Concrete slab on grade in the electrical room appeared uneven in some areas, causing potential tripping hazards		10+ years	- Structure still functional, but should be monitored
Concrete Canopy above Main Double Doors	- Signs of moisture penetrating through concrete canopy - No sign of slope for water evacuation		10+ depending on weather conditions	
Garage Door	- Signs of sagging of structural members - Vertical frame members appear plumb and true		5 – 10	- Monitor for cracking of the structure above
Main Pumphouse Area	- Pipes, tools and overall clutter blocking north exit door - Pipe on top of tank hatch - Pipes may roll off and cause damage or injuries		10+ years	- Clear the clutter - Keep the area clear and organized
Electrical Room	- Unconnected cables hanging from pipe - Unconnected penetrations - Potential for water entry		10+ years	
Mezzanine Above Office	- Original Construction - Decking and joists appeared to be in good condition - No fire suppression system was observed		10+ years	

2.2.2 Electrical

The electrical equipment at the water storage and pumping facility is in good working condition, with the exception of the corroded wire as noted in the following table. The pump house, which was part of the WTP, still houses some of old and un-used equipment, which was part of the water treatment process. Some cleanup of abandoned equipment is required in order to create room in the pump house for future upgrades and for ease of troubleshooting.

Table 2.2 on the following page summarizes site assessment of the electrical components of the water storage and pumping system conducted by ISL.

2.2.3 Structural

The existing pumphouse is a single story structure approximately 1000 square feet, with no basement. The foundation and floor is of concrete construction, with the above grade areas of conventional brick masonry construction. The building was constructed in 1979, with the west extension constructed in 2001.

As can be expected over time, the structure has been exposed to the natural weather and material deterioration.

ISL's conditional assessment was based on a visual site review only i.e. no material samples were taken. The visual review of the property did not reveal any significant structural issues to the building's superstructure or substructure. The structures appeared to be stable and structurally sound. Differential settlement was observed in the exterior cladding, which caused cracking, however no structurally significant lateral or vertical displacement of the main building was observed. A leak in the roof was observed on the east side of the building where the old filters use to be located.

The details of the structural visual assessment are summarized in Table 2.3 on the following page.

3.0 Water Distribution System

3.1 Existing System

The Town of Picture Butte's water distribution system is shown in Figure 3.1 and Figure 3.2. The majority of the piping is PVC and Asbestos Cement (mostly old pipes), though some areas of town are cast iron and ductile iron. The distribution system consists of a network of 100 mm to 350 mm watermains.

Currently, the Town's potable water is supplied by Lethbridge Regional Water Services Commission and is stored in two water storage reservoirs. Total storage capacity of reservoirs is 3,650m^3. The entire Town's water distribution system is in one pressure zone. Currently there is one pressure relief valve (PRV) on the distribution header. The PRV is set at 448 kPa (65 psi).

Four pumps (401, 402, 403 & 404) are being used to distribute potable water in Town. There is also one fire pump (501) to meet water demand in the event of a fire. The details of pumps are in section 2.

The Town of Picture Butte's water distribution system is detailed with regards to both diameter and material, and can be found in Figures 3.1 and 3.2, respectively

Table 3.1: Water Distribution System Summary

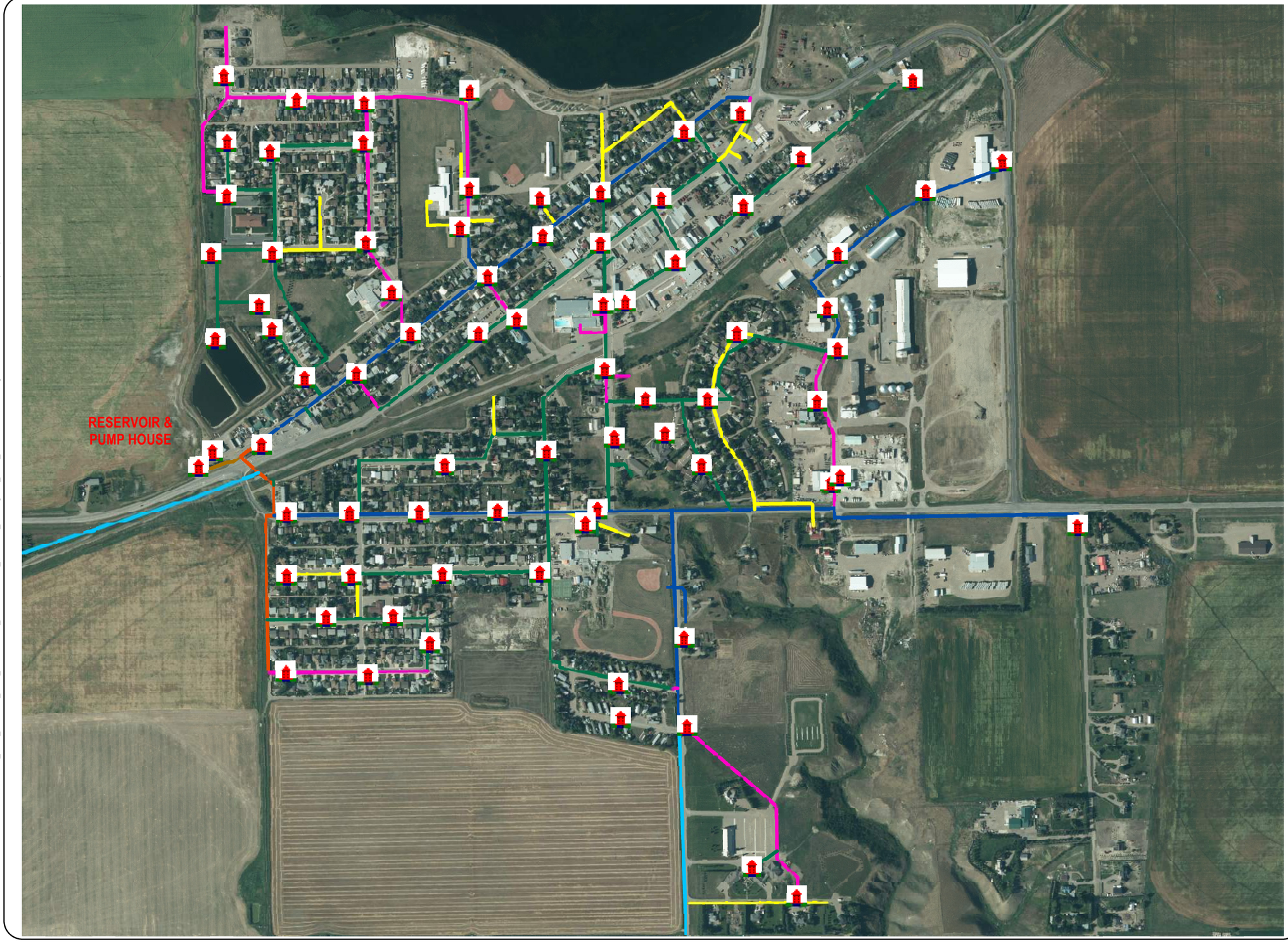
Diameter	Total Length		Material	Total Length
mm	m			m
Distribution Mains				
Less than 150	3,025		AC	4,617
150	6,968		PVC	9958
200	2,796		Cast Iron	125
250	4,179		Unknown	2833
300	515		Ductile Iron	0
350	50			
Total	**17,533**		**Total**	**17,533**

Table 3.2: Reservoir Characteristics

Reservoir	Capacity	Reservoir Slab Elevation	Normal Operating Pressure	Hydraulic Grade Line
	m^3	m	kPa	m
Main Reservoir	3,650	902.64	448	948.3

A topographic map of the Town is shown, along with the existing water distribution system, in Figure 3.3.

FIGURE 3.1



Legend

Pipe Diameter

- 75 mm
- 100 mm
- 150 mm
- 200 mm
- 250 mm
- 300 mm
- 350 mm

Fire Hydrant

1:7,500

0 45 90 180 270 360 Meters

PICTURE BUTTE ALBERTA

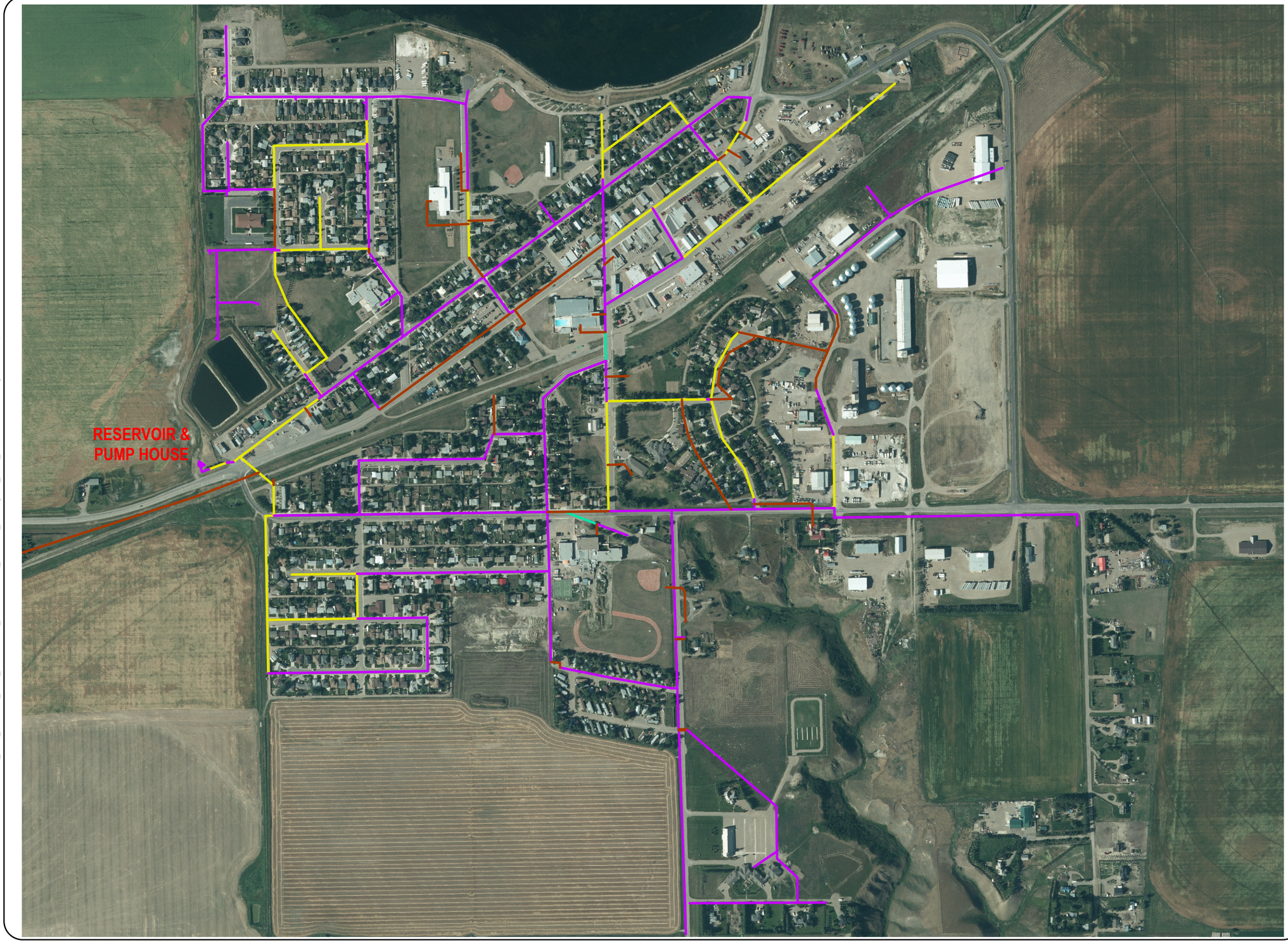
TOWN OF PICTURE BUTTE
INFRASTRUCTURE ASSESSMENT

WATER DISTRIBUTION SYSTEM
EXISTING WATER NETWORK
PIPE DIAMETER

ISL Engineering and Land Services

Date: 2/9/2017 Document: M:\26500\26566_Town_of Picture_Butte_Infrastructure_Assessment\02_CADD\20_Drafting\200_Xrefs_Global\SHP\Water\Figure 3.1 - Ex. Water Network (Diameter).mxd

FIGURE 3.2



Legend

MATERIAL

- Asbestos Cement
- Cast iron
- PVC
- Unknown

1:7,500

0 45 90 180 270 360 Meters

PICTURE BUTTE ALBERTA

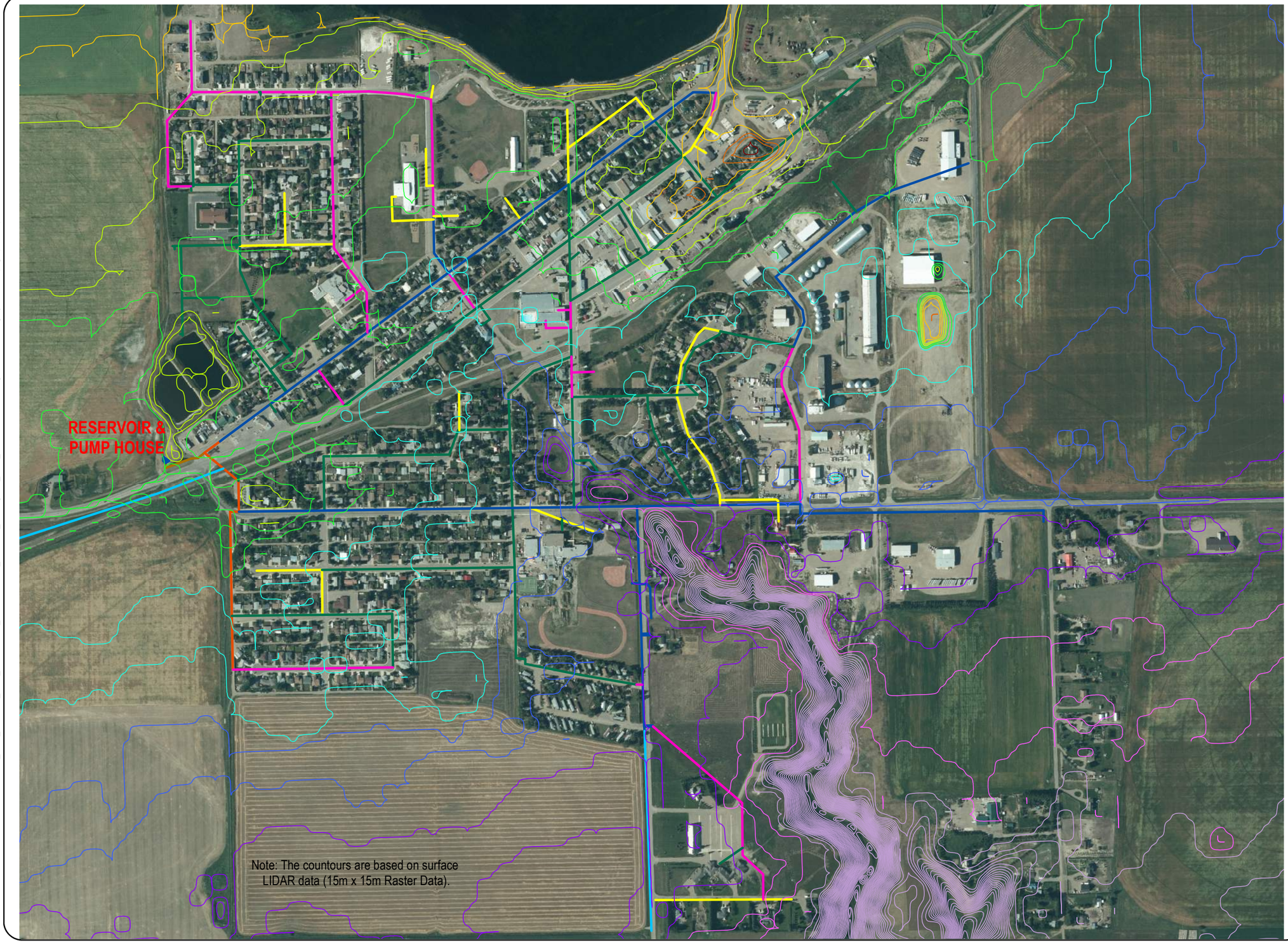
TOWN OF PICTURE BUTTE
INFRASTRUCTURE ASSESSMENT

WATER DISTRIBUTION SYSTEM
EXISTING PIPE MATERIALS

ISL Engineering and Land Services

Date: 1/31/2017 Document: M:\26500\26566_Town_of Picture_Butte_Infrastructure_Assessment\02_CADD\20_Drafting\200_Xrefs_Global\SHP\Water\Figure 3.2 - Pipe Materials.mxd

FIGURE 3.3



Legend

Pipe Diameter

- 75 mm
- 100 mm
- 150 mm
- 200 mm
- 250 mm
- 300 mm
- 350 mm

Contour

- ≤ 896 m
- 897 m - 898 m
- 899 m - 900 m
- 901 m - 902 m
- 903 m - 904 m
- 905 m - 906 m
- 907 m - 908 m
- 909 m - 910 m
- 911 m - 912 m
- ≥ 912 m

1:7,500

0 45 90 180 270 360 Meters

PICTURE BUTTE ALBERTA

TOWN OF PICTURE BUTTE
INFRASTRUCTURE ASSESSMENT

WATER DISTRIBUTION SYSTEM
EXISTING PIPE DIAMETER
WITH TOPOGRAPHIC MAP

ISL Engineering and Land Services

Date: 2/9/2017 Document: M:\26500\26566_Town_of Picture_Butte_Infrastructure_Assessment\02_CADD\20_Drafting\200_Xrefs_Global\SHP\Water\Figure 3.3 - Existing System & Topographic map.mxd

3.2 Hydraulic Model Development

3.2.1 Model Set-Up

A model was created using WaterCAD version 8i for assessing the performance of the Town's water distribution system. By creating a model and simulating flows, pressure results are obtained at any point within the system and available fire flows at any location in the system can be estimated.

The model was set-up based on the GIS data, pump information, record drawings and as-built information from the Town. Pipe location, material, and size were input based on this information. The Town was then divided into service areas based on the spatial location of the water distribution network. Areas were then calculated for these service areas, and land use was used to divide the area into different zones. Consumption rates for each zoning classification were determined based on total area in the Town for each zoning type, population data, and water billing records. To determine demand for residential areas, the average population density for the Town was used in conjunction with the per capita consumption rate determined from water production records. For commercial, industrial, and institutional development, the area of the development type, as well as demand for the zoning from water billing records was used to determine demand. These demands were then input into the model for each of the three scenarios simulated for the model:

1. Average Day Demand (ADD)
2. Maximum Day Demand (MDD)
3. Peak Hour Demand (PHD)

3.2.2 Design Criteria

The design parameters used in the model were derived from typical municipal servicing standards in the Province of Alberta, as well as fire flow requirements from the Insurer's Advisory Organization. In addition, water demands were determined based on the number of people in the Town as well as the total employment population in the Town.

Based upon water consumption records, the average day water consumption in the Town was determined to be approximately 9.2 L/s. It is noted that this includes unaccounted-for water loss, which is estimated at about almost a third of total water supply. The unaccounted-for water loss was determined by comparing the water production and metered water consumption data from 2010 to 2015. Taking the average day demand, as well as the current population of the Town and the current employment population against the demand, led to deriving rates for residential and employment populations on a per capita basis. The residential rate determined was roughly 380 L/p/d. This consumption rate compares favourably with other municipalities in Alberta as can be seen on the following page. On the basis of this rate, the non-residential water consumption rate was determined to be 3,235 L/ha/d. This compares favourably with non-residential water/wastewater consumption/generation rates of other similar size of towns in Alberta.

Table 3.3: Water Distribution System Standards Comparison

Standard	*Edmonton*	*Fort Saskatchewan*	*St. Albert*	*Morinville*	*Beaumont*	*MD Wood Buffalo*	*Rocky Mountain House*
Residential Consumption (L/p/d)	250	360	350	360	360	360	375
Max Day Demand Factor	2	2	2	2	2	2	2
Peak Hour Demand Factor	3	3	4	4	4	3	4
Single Family Residential Fire Flow (L/s)	100	76	76	115	100	83 - 100	76
Multiple Family Residential Fire Flow (L/s)	300	114 – 227	114 - 227	N/A	180	133 - 200	114 - 227
Commercial Fire Flow (L/s)	300	265	265	250	270	183 - 233	265
Industrial Fire Flow (L/s)	300	227	227	N/A	N/A	150 - 183	227
Institutional Fire Flow	300	114 - 227	114 - 227	N/A	180	167 - 317	114 - 227

Less detailed water distribution system standards and more specific on residential consumption rates only, other Southern Alberta comparisons include:

Bearspaw Village Water Co-Op – 617 L/p/d
Springbank County Estates – 458 L/p/d
Rocky View Water Co-Op – 247 L/p/d
Town of Okotoks – 266 L/p/d (based on 2010-2014)
Town of High River – 350 L/p/d
Langdon Waterworks – 300 L/p/d
City of Calgary – 330 L/p/d
Town of Strathmore – 371 L/p/d
Town of Chestermere – 338 L/p/d
City of Airdrie – 315 L/p/d

To establish maximum day and peak hour demand, as well as to determine water use for future development, the Town's development standards would normally be followed. Since the Town of Picture Butte does not presently have a set of municipal standards covering this information, a useful part of this assessment is to review typical standards and recommend an appropriate set of standards. Table 3.3 lists the standards for other selected municipalities in Alberta.

Based on this comparison, as well as the water consumption records for the Town, the following standards are recommended (these are the same values as determined for existing development):

For future development, the following per capita consumption are recommended:

2. Residential – 380 L/p/d (According to water consumption data of 2013, 2014 & 2015)
3. Non-residential – 3,235 L/ha/d (According to water consumption data of 2013, 2014 & 2015)

The following factors are recommended to establish Maximum Day and Peak Hour demand, in accordance with Alberta Environment requirements

1. Maximum Day Demand – 1.5 (current) or 2.0 (future) x Average Day Demand
2. Peak Hour Demand – 4.0 x Average Day Demand

Fire flow criteria for various development types is recommended as follows based on Insurer's Advisory Organization recommendations (Please note that fire flow requirements can be reduced by up to 50% for facilities equipped with sprinkler systems):

1. Single Family Residential – 83 L/s (up to 230 m^2 buildings for combustible structure)
2. Non-Residential – 166 L/s

In analyzing the water distribution system, the following criteria was used, in accordance with Alberta Environment, as well as related criteria:

- Minimum residual pressure in the system under Peak Hour Demand of 275 kPa;
- Minimum residual pressure in the system under Maximum Day Demand plus Fire Flow of 140 kPa;
- Maximum residual pressure in the system under Average Day Demand of 550 kPa, with lower values preferred to prevent leakage.

3.2.3 Hydrant Testing

To allow for development of a water model that is accurate, model calibration was required. To obtain flow and pressure data of the system, hydrant flow testing was undertaken in July of 2016. The overall data report for the 6 hydrant flow tests is attached in Appendix B and results are summarized in Table 3.4. Test locations were selected throughout Town, with residual monitoring stations set up near the flow hydrant location. Figure 3.4 shows the hydrant test locations as well as additional pressure logging sites.

Table 3.4: Hydrant Flow Test Locations

Hydrant No.	Hydrant ID	Flow Hydrant Location	Static Hydrant Pressure	Residual Hydrant Pressure	Total Flow (2 Open Ports)
1	2695	517 Centennial Avenue	345 kPa (50 psi)	207 kPa (30 psi)	117 L/s (1548 gpm)
2	2722	501 Centennial Avenue	345 kPa (50 psi)	207 kPa (30 psi)	117 L/s (1548 gpm)
3	3336	117 4 Street	483 kPa (70 psi)	310 kPa (45 psi)	133 L/s (1760 gpm)
4	3300	100 4 Street	483 kPa (70 psi)	310 kPa (45 psi)	133 L/s (1760 gpm)
5	3186	321 Butte Avenue (3A Street)	517 kPa (75 psi)	345 kPa (50 psi)	142 L/s (1878 gpm)
6	3234	3A Street	517 kPa (75 psi)	345 kPa (50 psi)	142 L/s (1878 gpm)
7	3206	2 Street S	448 kPa (65 psi)	276 kPa (40 psi)	137 L/s (1801 gpm)
8	3197	2 Street S	448 kPa (65 psi)	276 kPa (40 psi)	137 L/s (1801 gpm)
9	3428	Jamison Avenue	414 kPa (60 psi)	241 kPa (35 psi)	114 L/s (1490 gpm)
10	3487	Jamison Avenue	414 kPa (60 psi)	241 kPa (35 psi)	114 L/s (1490 gpm)
11	1044	Northridge Avenue	448 kPa (65 psi)	241 kPa (35 psi)	124 L/s (1637 gpm)
12	1334	Northridge Avenue	448 kPa (65 psi)	241 kPa (35 psi)	124 L/s (1637 gpm)

FIGURE 3.4

WH0003 (1012)
11
12
H62 (1094)
WH0002 (1044)
WH0001 (1334)
H58 (3487)
10
WH0011 (3707)
H39 (2052)
H01 (1458)
H11 (1308)
H57 (3428)
H56 (3479)
H03 (1375)
9
H19 (1115)
H25 (2237)
H28 (1990)
H37 (3680)
H42 (3406)
H55 (3498)
WH0007 (1430)
WH0004 (1168)
H26 (1958)
H29 (2235)
H12 (1275)
H53 (1490)
H46 (3228)
H38 (3376)
H52 (1589)
H21 (1196)
WH0005 (1200)
H30 (3336)
WH0010 (3364)
H44 (3217)
H51 (1653)
3
H65 (1712)
H23 (3584)
H63 (3085)
H54 (1678)
H14 (1851)
H20 (3570)
WH0009 (3214)
H05 (1692)
H09 (1813)
H31 (3300)
4
H36 (2665)
H41 (3086)
H43 (3206)
7
H61 (3110)
H02 (1766)
H27 (2800)
H70 (1800)
H18 (2903)
H33 (3277)
H40 (3867)
H66 (1700)
H60 (3198)
RESERVOIR &
PUMP HOUSE
8
H59 (3197)
WH0008 (3734)
H15 (3781)
H22 (3803)
H32 (3829)
H64 (3833)
H68 (3800)
H07 (3749)
H50 (2438)
H17 (2695)
1
H24 (2722)
2
H08 (2398)
H13 (2480)
H06 (2574)
H16 (2512)
H48 (3186)
5
WH0006 (2648)
H10 (2551)
H34 (3115)
H35 (3138)
H49 (3234)
6
H69 (3100)
H67 (3200)

Legend

Pipe Diameter

- 75 mm
- 100 mm
- 150 mm
- 200 mm
- 250 mm
- 300 mm
- 350 mm

Fire Hydrant

1:7,500

0 45 90 180 270 360 Meters

PICTURE BUTTE ALBERTA

TOWN OF PICTURE BUTTE
INFRASTRUCTURE ASSESSMENT

WATER DISTRIBUTION SYSTEM
EXISTING WATER NETWORK
HYDRANT TEST LOCATIONS

ISL Engineering and Land Services

Date: 2/9/2017 Document: M:\26500026566_Town_of Picture_Butte_Infrastructure_Assessment\02_CADD\20_Drafting\200_Xrefs_Global\SHP\Water\Figure 3.4 - Hydrant Test Locations.mxd

3.2.4 Model Calibration

Using the constructed computer model and the hydrant test results, the model was calibrated to ensure the proper Hazen-Williams "C" values for pipe roughness were correctly employed. Additionally, the calibration process was required to validate some uncertainty with the obtained pump curve data. The measured hydrant flows were input into the model and the "C" value for the pipes were adjusted to attempt to calibrate the model such that the model results matched the actual flow and pressure data achieved at the hydrants. The result of hydrant flow test for test 1 and 2 were dramatically different than the model value, so, it is not included. The reason of the difference could be due to closed valve or poor data reading or wrong hydrant elevation. An attempt to match the model pressures for the flow tests and it was determined that the majority of sites could be reasonably matched for both static and flowing conditions, although hydrant tests 3 and 4 yielded significant errors. The errors were relatively consistent between the static and flow conditions, which suggests that pipe roughness values are appropriate. Therefore, it was determined that the error was due to inaccurate pitot tube reading (least count 5 inch) and hydrant elevation. Generally speaking, the model calibration is considered acceptable since five of the six hydrant flow tests were reasonably matched, suggesting good model loss calibration.

The Hazen-Williams "C" values determined for model calibration were:
For Iron – C Value of 80
For Asbestos Cement – C Value of 110
For PVC – C Value of 140
Table 3.5 shows the model calibration results obtained from using the C values mentioned above.

Table 3.5: Calibrated Model Comparison to Hydrant Flow Tests

Test Type	Measurement Type	Hyd. Test 3	Hyd. Test 4	Hyd. Test 5	Hyd. Test 6	Hyd. Test 7	Hyd. Test 8	Hyd. Test 11	Hyd. Test 12
Static	Field Pressure (kPa)	483	483	517	517	448	448	448	448
	Model Pressure (kPa)	456	470	497	498	482	491	426	431
	Error (kPa)	-27.0	-13.0	-20.0	-19.0	34.0	43.0	-22.0	-17.0
Flow	Field Flow (L/s)	133.3	133.3	142.3	142.3	136.5	136.5	124.0	124.0
	Field Residual Pressure (kPa)	310	310	345	345	276	276	241	241
	Model Residual Pressure (kPa)	404	389	325	326	300	283	306	299
	Error (kPa)	94.0	79.0	-20.0	-19.0	24.0	7.0	-65.0	-58.0

3.2.5 Hydraulic Analysis of Existing Water Distribution System

The water distribution system model was analyzed to determine the system condition under three demand scenarios:

- Average Day demand throughout the system - The results of this analysis can be seen in Figure 3.5.
- Peak Hour demand throughout the system - The results of this analysis can be seen in Figure 3.6.
- Fire Flow at each junction during Maximum Day demand -The results of this analysis can be seen in Figure 3.7.

FIGURE 3.5

EXISTING WTP
& PUMP HOUSE

Legend

Diameter

- 75
- 100
- 150
- 200
- 250
- 300
- 350

Average Day Pressure

- Less than 275 kPa
- 275 - 350 kPa
- 350 - 450 kPa
- 450 - 550 kPa
- More than 550 kPa

1:7,500

0 45 90 180 270 360 Meters

PICTURE BUTTE ALBERTA

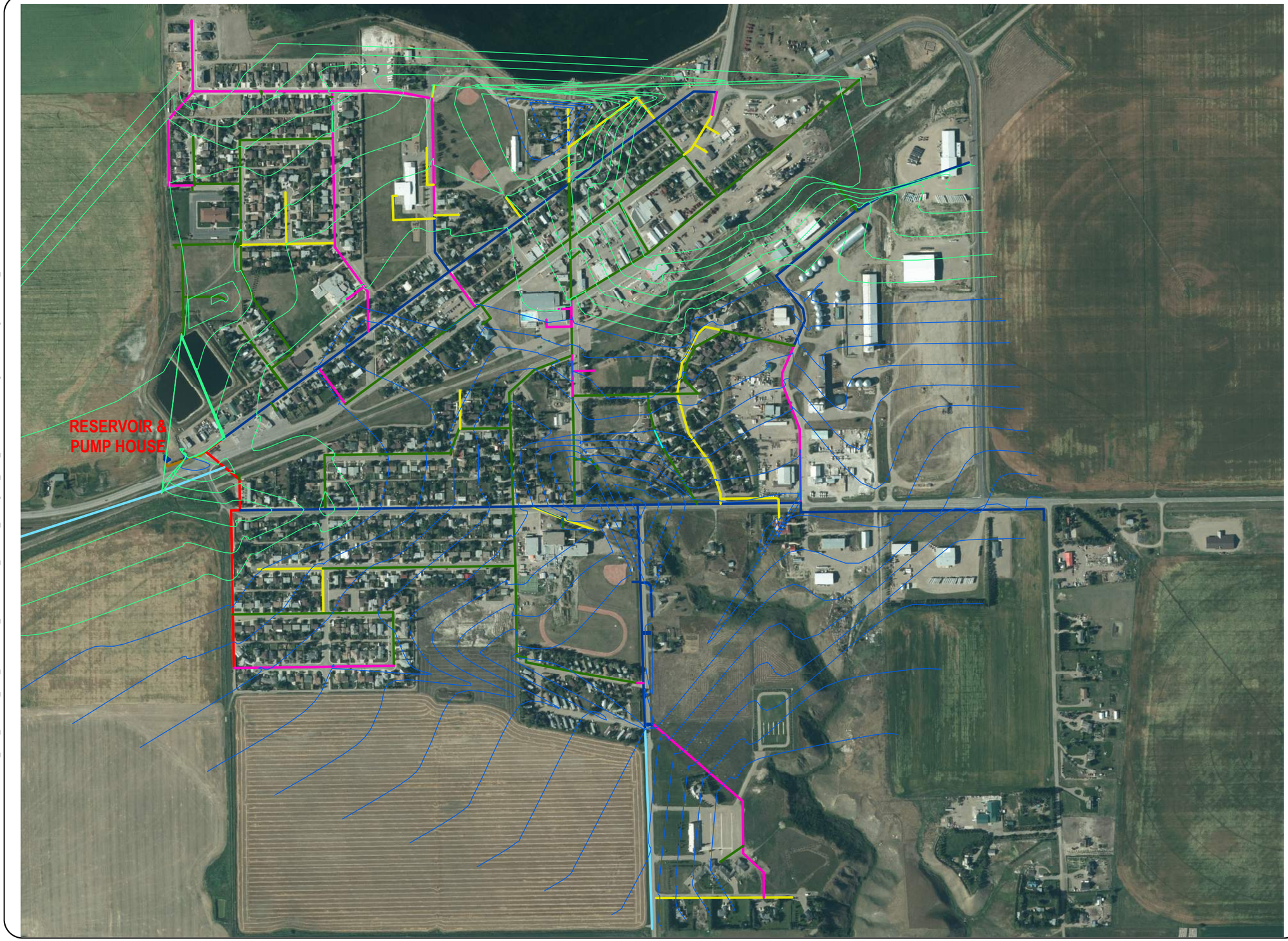
TOWN OF PICTURE BUTTE
INFRASTRUCTURE ASSESSMENT

WATER DISTRIBUTION SYSTEM
EXISTING SYSTEM ANALYSIS
AVERAGE DAY DEMAND

ISL Engineering and Land Services

Date: 2/9/2017 Document: M:\26500\26566_Town_of_Picture_Butte_Infrastructure_Assessment\02_CADD\20_Drafting\200_Xrefs_Global\SHP\Water\Figure 3.5 Existing Assessment_ADD.mxd

FIGURE 3.6



Legend

Diameter

- 75
- 100
- 150
- 200
- 250
- 300
- 350

Peak Hour Pressure

- Less than 275 kPa
- 275 - 350 kPa
- 350 - 450 kPa
- 450 - 550 kPa
- More than 550 kPa

1:7,500

0 45 90 180 270 360 Meters

PICTURE BUTTE ALBERTA

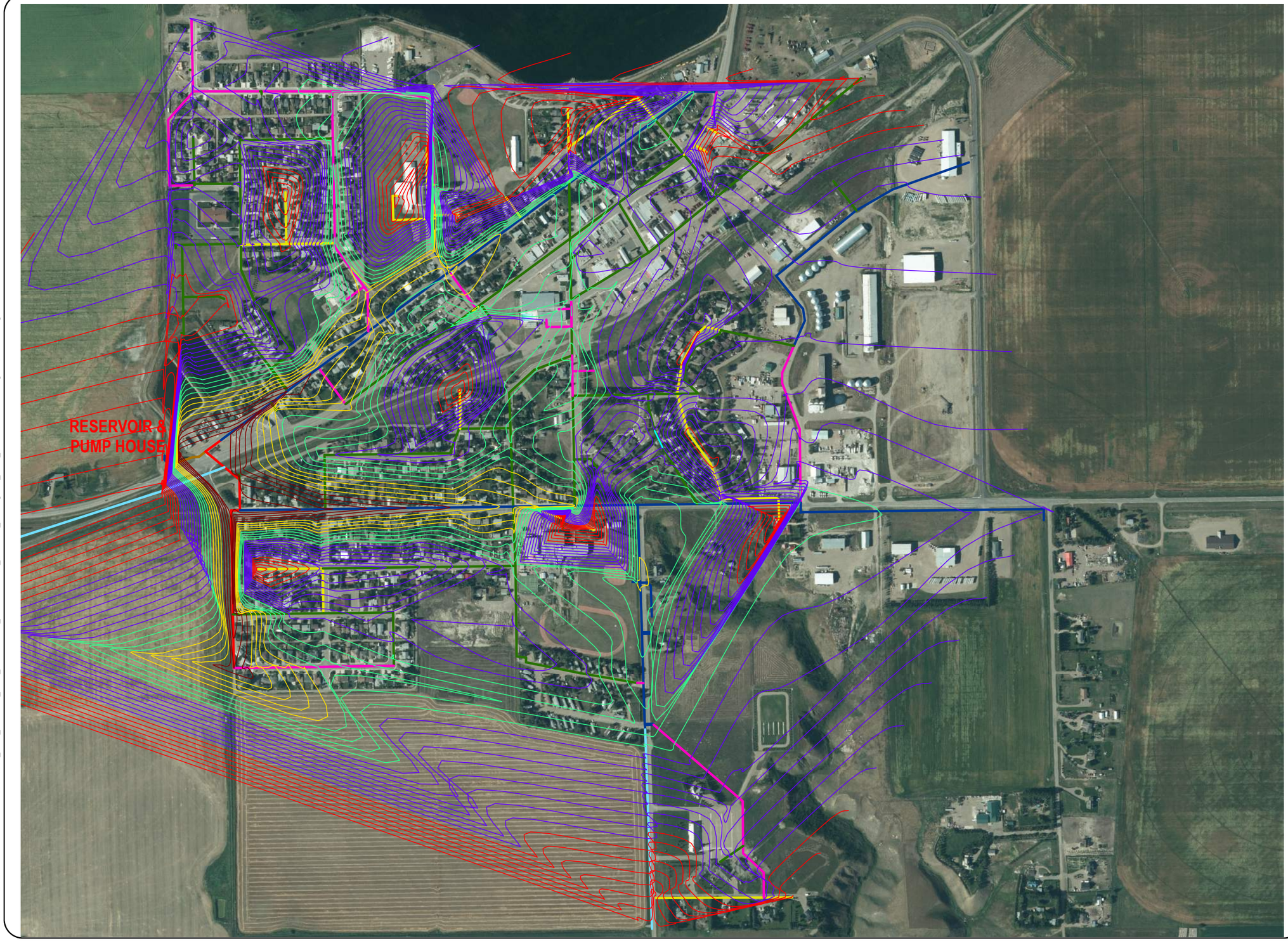
TOWN OF PICTURE BUTTE
INFRASTRUCTURE ASSESSMENT

WATER DISTRIBUTION SYSTEM
EXISTING SYSTEM ANALYSIS
PEAK HOURLY DEMAND

ISL Engineering and Land Services

Date: 2/9/2017 Document: M:\26500\26566_Town_of Picture_Butte_Infrastructure_Assessment\02_CADD\20_Drafting\200_Xrefs_Global\SHP\Water\Figure 3.6 Existing Assessment_PHD.mxd

FIGURE 3.7



Legend

Diameter

- 75
- 100
- 150
- 200
- 250
- 300
- 350

Fire Flow Available

- Less than 80 l/s
- 80 - 160 l/s
- 160 - 200 l/s
- 200 - 240 l/s
- 240 - 290 l/s

1:7,500

0 45 90 180 270 360 Meters

PICTURE BUTTE ALBERTA

TOWN OF PICTURE BUTTE
INFRASTRUCTURE ASSESSMENT

WATER DISTRIBUTION SYSTEM
EXISTING SYSTEM ANALYSIS
MAXIMUM DAILY DEMAND & FIRE FLOW

ISL Engineering and Land Services

Date: 1/31/2017 Document: M:\26500\26566_Town_of Picture_Butte_Infrastructure_Assessment\02_CADD\20_Drafting\200_Xrefs_Global\SHP\Water\Figure 3.7 - Existing Assessment MDD & Fire.mxd

3.3 Existing Model Assessment

3.3.1 Average Day Demand Conditions

The results of the average demand static conditions shown in Figure 3.5 suggest that there are neither excessively high nor low pressures in the Town under Average Day Demand conditions. Pressures range from just over 410 kPa to 500 kPa.

The average day demand system operational pressures as modelled are within operational tolerances for water distribution systems. That said, the pressures in the south are at the higher end of the range.

3.3.2 Peak Hour Demand Conditions

The results of the peak hour demand static conditions shown in Figure 3.6 suggest that there are no pressure deficiencies in the Town under Peak Hour Demand conditions. The operational system pressures under peak hour demand conditions are similar to those under average day conditions, albeit slightly lower. Pressures still range between 400 kPa and 495 kPa, though are 5-10 kPa lower than in average day demand conditions.

The peak hour demand system operational pressures as modelled are within operational tolerances for water distribution systems.

3.3.3 Fire Flow Results

Model results shown in Figure 3.7 indicate that there are a few minor concerns with respect to fire flow within the Town of Picture Butte. Fire flows appear to exceed 83 L/s within majority of the Town's system. The Town has a few water pipes that are 100 mm or less in diameter, which is not sufficient to support a minimum flow of 83 L/s at 140kPa residual pressure. These pipes need to be upgraded with pipes of larger diameter.

3.3.4 Existing Water Storage Reservoir

In terms of water storage in Town, the Alberta Environment formulation for water storage was reviewed. This calculation is summarized as follows:

S = (A + B + C) or D (where applicable)

Where
A = Fire Storage
B = Equalization Storage (25% of Maximum Day Demand)
C = Emergency Storage (15% of Average Day Demand)
D = Disinfection Contact Time (not applicable here)

Fire storage for the Town of Picture Butte, taken at the maximum fire flow rate specified in the Town's standards of 166L/s, for 2.0 hours is (based on Fire Underwriters Survey recommendations) is 1200m^3. Water leakage in Maximum and Average Demand has been accounted for.

As such, current storage required is:

S = 1,200 + 0.25(1,200) + 0.15(800) = 1,620 m^3

This compares with water storage available of 3,650 m^3. As such, no water storage upgrading is required at this time.

3.3.5 Recommended Existing System Upgrades

Following are the recommendations for Town's existing water system:

1. Some water distribution pipes (100 mm diameter) do not support fire demand requirements, those pipes need to be upgraded with 200 mm diameter pipes. Please see Figure 3.8 for detail.
2. Some parts of existing water distribution do not have closed loop system, so, it is recommended to complete the loops. Please see Figure 3.9 for detail.
3. ISL reviewed water supply and consumption data (for the years 2013-2015) and found that more than 35% of supplied water is unaccounted-for loss. Some of it could be due to water leakage from old (broken) pipes. If the majority of unaccounted-for loss is due to leakage, it is recommended to the Town to perform a study for leakage detection.
4. Some of the Town's pipes may be out of its life span, so, it is recommended to confirm the exact age of pipe and make a strategy to replace the older pipes. ISL has indicated the construction year of pipes based on data provided by Oldman River Regional Services Commission (ORRSC). There are still many pipes whose year of construction are unknown. The Town needs to obtain better information (approximate year of construction and in some cases, size verification) to have a better database and analyzed results.

3.3.6 Cost Estimates

Cost estimates were prepared for Town's 10-year Capital Plan. The costs for the new pipes, hydrants, pavement rehabilitation and isolation valves are summarized in Table 3.6.

Table 3.6: Summary of Cost Estimates for Upgrade of Existing Water Servicing System (Year 2019)

	Item	Quantity	Units	Unit Cost	Sub-Total	Contingency 30%	Engineering 15%	Total Cost
Existing Water Pipe Upgrade	150mm Distribution Main	500	Metres	$275	$137,500	$41,250	$20,625	$199,375
	Pavement Rehabilitation	500	Metres	$750	$375,000	$112,500	$56,250	$543,750
	Fire Hydrants	4	Each	$8,000	$32,000	$9,600	$4,800	$46,400
	Isolation Valves	5	Each	$5,000	$25,000	$7,500	$3,750	$36,250
	Total:				**$569,500**	**$170,850**	**$85,425**	**$825,775**

In terms of water distribution, as noted above, the estimated cost to update the existing water network is approximately $850,000 including engineering and construction contingencies. It also confirms that the existing pumps and reservoir will be able to meet the current standard of the Town and Province.

3.4 Future Model Assessment

3.4.1 Future System Concept

To address the adequacy of the existing water distribution system to handle expansion of the Town, a hypothetical future looping system around the Town was set up in the WaterCAD model. This system can be seen in Figure 3.9. In this system, a network of 250 mm and 300 mm watermains were used to provide a primary looping system for future development areas in the northeast, southwest, east and southeast areas of the Town. This system was then connected to the existing water distribution system at key points. In developing the water demands for this system, no additional water storage reservoir, PRV and pump was initially assumed.

Typical water demands for full development within the Town limits were input into the model for the future development areas with demands as specified in Section 3.3.2. Note that for future water demand, the Maximum Daily Demand Factor is 2, and Peak Hourly Demand Factor is 4 (as per Alberta Environment Standard). For non-residential area, water demand is taken 3,235 l/ha/day.

3.4.2 Average Day Demand Conditions

The model was run to assess average day demand conditions. The results of this analysis can be found in Figure 3.10. In this scenario, pressures in the entire town zone varied from 410 to 500kPa. This represents a good water distribution system. Since there is no high pressure in the system no new PRV or zone is introduced.

3.4.3 Peak Hour Demand Conditions

The model was run to assess peak hour demand conditions in the overall proposed water distribution system. Results can be seen in Figure 3.11. Under peak hour demand conditions, the pressures in the Town vary between 400 and 500kPa (roughly 10kPa lower than under average day conditions). All pressures are well within system operational tolerances, which validates the future water distribution system.

3.4.4 Maximum Daily Demand and Fire Flow Conditions

A fire flow analysis was performed on the proposed future water distribution system. Available fire flow for residential and non-residential area are more than 83L/s and 166L/s respectively with minimum 140 kPa (20 psi) residual pressure.

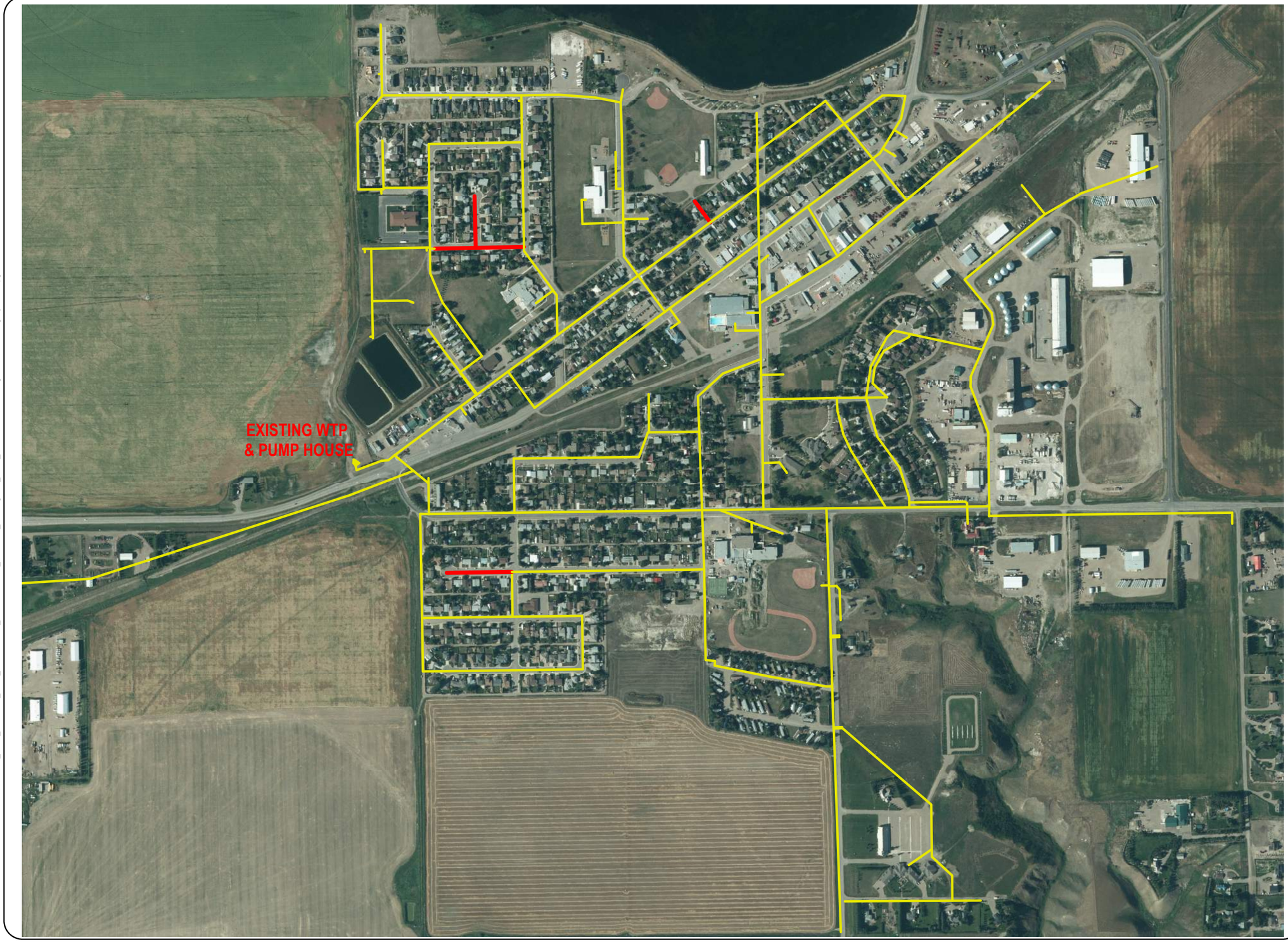


FIGURE 3.8

Legend

Upgrade

- Upgrade to 150mm Diameter
- No upgrade needed

1:7,500

0 45 90 180 270 360 Meters

PICTURE BUTTE ALBERTA

TOWN OF PICTURE BUTTE
INFRASTRUCTURE ASSESSMENT

WATER DISTRIBUTION SYSTEM
EXISTING SYSTEM
RECOMMENDED UPGRADES

ISL Engineering and Land Services

Date: 2/9/2017 Document: M:\26500\26566_Town_of_Picture_Butte_Infrastructure_Assessment\02_CADD\20_Drafting\200_Xrefs_Global\SHP\Water\Figure 3.8 - Existing System Upgrade.mxd

FIGURE 3.9

RESERVOIR &
PUMP HOUSE

Legend

Diameter

- 75
- 100
- 150
- 200
- 250
- 300
- 350

1:10,000

0 62.5 125 250 375 500 Meters

PICTURE BUTTE ALBERTA

TOWN OF PICTURE BUTTE
INFRASTRUCTURE ASSESSMENT

WATER DISTRIBUTION SYSTEM
FUTURE WATER NETWORK
PIPE DIAMETERS

ISL Engineering and Land Services

Date: 12/6/2016 Document: M:\26500\26566_Town_of_Picture_Butte_Infrastructure_Assessment\02_CADD\20_Drafting\200_Xrefs_Global\SHP\Water\Figure 3.9 - Future Pipe Diameter.mxd

FIGURE 3.10

RESERVOIR & PUMP HOUSE

Legend

Diameter

- 75
- 100
- 150
- 200
- 250
- 300
- 350

Average Day Pressure

- Less than 275 kPa
- 275 - 350 kPa
- 350 - 450 kPa
- 450 - 550 kPa
- More than 550 kPa

1:10,000

0 62.5 125 250 375 500 Meters

PICTURE BUTTE ALBERTA

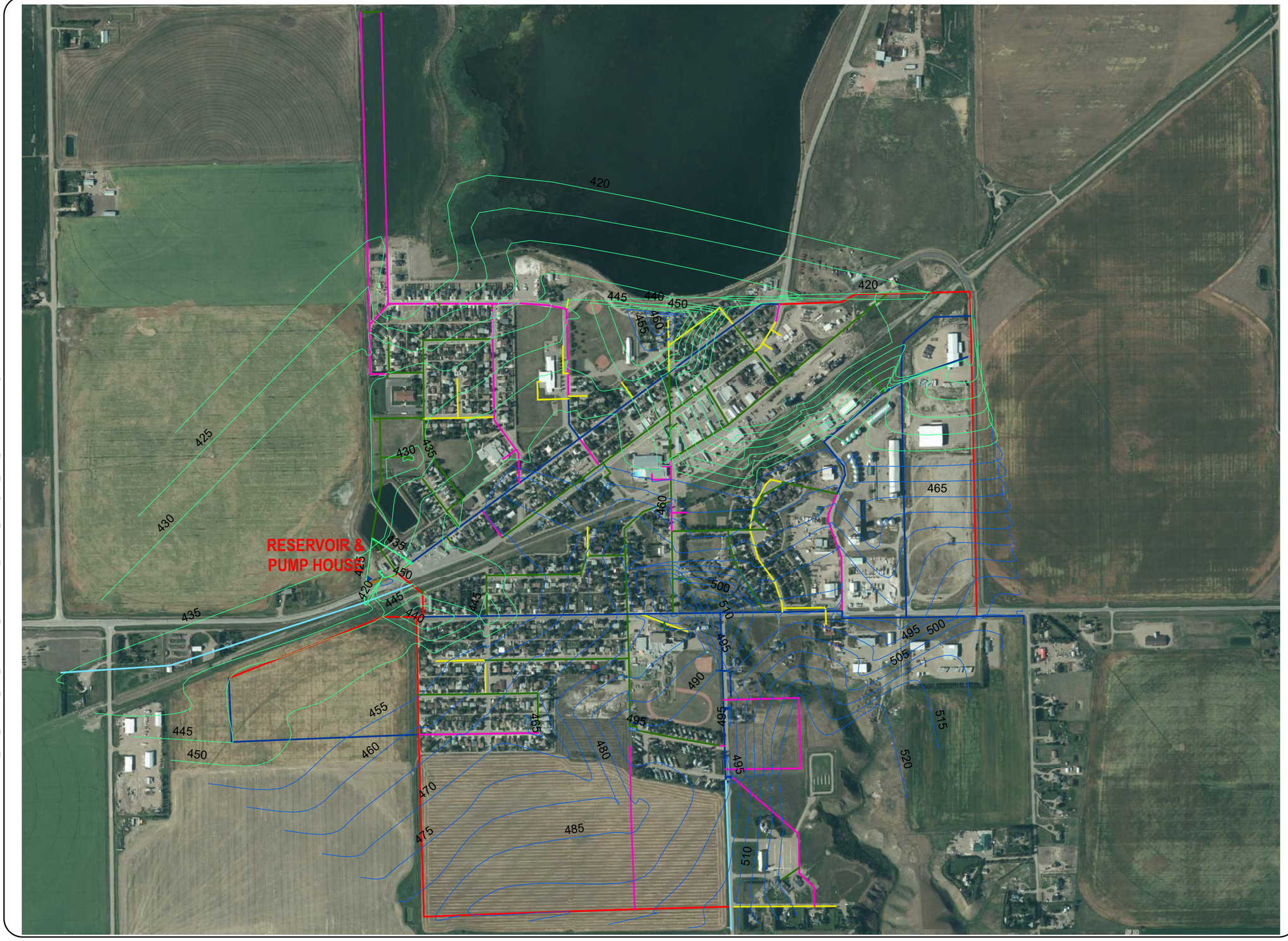
TOWN OF PICTURE BUTTE
INFRASTRUCTURE ASSESSMENT

WATER DISTRIBUTION SYSTEM
FUTURE SYSTEM ANALYSIS
AVERAGE DAY DEMAND

ISL Engineering and Land Services

Date: 2/9/2017 Document: M:\26500\26566_Town_of_Picture_Butte_Infrastructure_Assessment\02_CADD\20_Drafting\200_Xrefs_Global\SHP\Water\Figure 3.10 - Future Assessment ADD.mxd

FIGURE 3.11



Legend

Diameter

- 75
- 100
- 150
- 200
- 250
- 300
- 350

Peak Hour Pressure

- Less than 275 kPa
- 275 - 350 kPa
- 350 - 450 kPa
- 450 - 550 kPa
- More than 550 kPa

1:10,000

0 62.5 125 250 375 500 Meters

PICTURE BUTTE ALBERTA

TOWN OF PICTURE BUTTE
INFRASTRUCTURE ASSESSMENT

WATER DISTRIBUTION SYSTEM
FUTURE SYSTEM ANALYSIS
PEAK HOURLY DEMAND

ISL Engineering and Land Services

Date: 2/9/2017 Document: M:\26500\26566_Town_of Picture_Butte_Infrastructure_Assessment\02_CADD\20_Drafting\200_Xrefs_Global\SHP\Water\Figure 3.11 - Future Assessment PHD.mxd

FIGURE 3.12

RESERVOIR & PUMP HOUSE

Legend

Diameter

- 75
- 100
- 150
- 200
- 250
- 300
- 350

Fire Flow Available

- Less than 80 l/s
- 80 - 160 l/s
- 160 - 200 l/s
- 200 - 240 l/s
- More than 240 l/s

1:10,000

0 62.5 125 250 375 500 Meters

PICTURE BUTTE ALBERTA

TOWN OF PICTURE BUTTE
INFRASTRUCTURE ASSESSMENT

WATER DISTRIBUTION SYSTEM
FUTURE SYSTEM ANALYSIS
MAXIMUM DAILY DEMAND & FIRE FLOW

ISL Engineering and Land Services

Date: 1/31/2017 Document: M:\26500\26566_Town_of_Picture_Butte_Infrastructure_Assessment\02_CADD\20_Drafting\200_Xrefs_Global\SHP\WaterFigure 3.12 - Future Assessment MDD & Fire.mxd

3.4.5 Future Water Storage Reservoir

According to Alberta Environment formulation for water storage,

S = (A + B + C) or D (where applicable)
Where
A = Fire Storage
B = Equalization Storage (25% of Maximum Day Demand)
C = Emergency Storage (15% of Average Day Demand)
D = Disinfection Contact Time (not applicable here)

Fire storage for the Town of Picture Butte, taken at the maximum fire flow rate specified in the Town's standards of 166L/s, for 2.0 hours is 1200m^3 (based on Fire Underwriters Survey recommendations). Water leakage is accounted for as well.

As such, current storage required is:

$$S = 1,200 + 0.25(2,450) + 0.15(1225) = 3,038m^3$$

This compares with water storage available of 3,650m^3. As such, no water storage appears to be required to meet this horizon.

3.4.6 Upgrading Recommendations - Future Conditions

Upgrading to the water network for future 10-year development conditions is generally limited to construction of new watermains, fire hydrants, and isolation valves. To supply the future water demand, it is not necessary to upgrade (or add) the existing pumps (in terms of pumping capacity), storage reservoir and pressure reducing valves.

3.4.7 Cost Estimates

Cost estimates were prepared for the Town's future water distribution loop system. The costs for the new water distribution pipes can be seen in Table 3.7. Please note that all costs are in 2016 dollars. These costs may be developer funded. Typical policies that are employed by other municipalities include:

- The developer funds their distribution piping and looping pipes to provide flows to adjacent lands.
- The developer funds off-site improvements implemented to provide flows to their development area from the existing water distribution system at the time of development.

The Town could make a policy decision to help fund some of the off-site costs as an incentive to development.

Table 3.7 Summary of Cost Estimates for Upgrade of Existing Water Servicing System

	Item	Quantity	Units	Unit Cost	Sub-Total	Contingency 30%	Engineering 15%	Total Cost
East Industrial Zone	300mm Distribution Main	1,377	Metres	$ 424	$583,848	$175,154	$87,577	$846,580
	250mm Distribution Main	1,128	Metres	$ 350	$394,800	$118,440	$59,220	$572,460
	Fire Hydrants	10	Items	$ 8,000	$80,000	$24,000	$12,000	$116,000
	Isolation Valves	5	Items	$ 5,000	$25,000	$7,500	$3,750	$36,250
				Total 1:	**$1,083,648**	**$325,094**	**$162,547**	**$1,571,290**
Northwest Residential Zone	**Item**	**Quantity**	**Units**	**Unit Cost**	**Sub-Total**	**Contingency 30%**	**Engineering 15%**	**Total Cost**
	200mm Distribution Main	1,457	Metres	$ 300	$437,100	$131,130	$65,565	$633,795
	150mm Distribution Main	315	Metres	$ 275	$86,625	$25,988	$12,994	$125,606
	Fire Hydrants	2	Items	$ 8,000	$16,000	$4,800	$2,400	$23,200
	Isolation Valves	2	Items	$ 5,000	$10,000	$3,000	$1,500	$14,500
				Total 2:	**$549,725**	**$164,918**	**$82,459**	**$797,101**
Southwest Residential Zone	**Item**	**Quantity**	**Units**	**Unit Cost**	**Sub-Total**	**Contingency 30%**	**Engineering 15%**	**Total Cost**
	300mm Distribution Main	1,825	Metres	$ 424	$773,800	$232,140	$116,070	$1,122,010
	250mm Distribution Main	666	Metres	$ 350	$233,100	$69,930	$34,965	$337,995
	200mm Distribution Main	431	Metres	$ 300	$129,300	$38,790	$19,395	$187,485
	Fire Hydrants	5	Items	$ 8,000	$40,000	$12,000	$6,000	$58,000
	Isolation Valves	5	Items	$ 5,000	$25,000	$7,500	$3,750	$36,250
				Total 3:	**$1,201,200**	**$360,360**	**$180,180**	**$1,741,740**
Southeast Area	**Item**	**Quantity**	**Units**	**Unit Cost**	**Sub-Total**	**Contingency 30%**	**Engineering 15%**	**Total Cost**
	250mm Distribution Main	335	Metres	$ 350	$117,250	$35,175	$17,588	$170,013
	Fire Hydrants	1	Items	$ 8,000	$8,000	$2,400	$1,200	$11,600
	Isolation Valves	2	Items	$ 5,000	$10,000	$3,000	$1,500	$14,500
				Total 4:	**$135,250**	**$40,575**	**$20,288**	**$196,113**
				Grand Total:	**$3,032,823**	**$909,847**	**$454,923**	**$4,306,243**

In terms of water distribution, as noted above, the estimated cost for the future water network construction is approximately $4.3M including GST, engineering and construction contingencies. It also assumes that the existing pumps, pipe size and reservoir will be suitable for future use without further upgrading.

4.0 Wastewater Lift Station and Lagoons

4.1 Background

The following section details the findings of the structural, process mechanical, and electrical equipment assessment of the wastewater lift station and lagoon completed by ISL on June 10, 2016 and provides the town with the actions required to address the issues and risks associated with each key component.

Along with ISL's visual inspection of the components, input from the Town's Operator was utilized in assessing the condition of the process components. In order to supplement the assessment, photographs were taken during the site visit. These are provided in Appendix C of this report.

4.2 Condition Assessment

Sewage flows by gravity into the wet well of the sewage lift station located in the south side of the Town. From the wet well, it is pumped by a lift pump into the lagoon. The lift station consists of a shallow wet well (approximately 3 m deep) and above-ground centrifugal sewage-lift pumps. The pump header and valves are located in a drywell, accessible from inside the lift station. There is an access hatch to the wet well located inside the lift station.

The aerated lagoon is located to the south of the sewage lift station. There is a small building on the north side of the lagoon that houses the aeration blowers and underground aeration-piping to the lagoon cells. The lagoon system consists of 4 cells: primary sedimentation pond, pond 1, pond 2, and a polishing cell.

4.2.1 Process Mechanical

Based on the current approval for effluent water quality from Alberta Environment and Parks (AEP), the Carbonaceous Biochemical Oxygen Demand (CBOD) of the effluent must be less or equal to 25 mg/L (monthly arithmetic mean of weekly samples) and raw wastewater flow must be less or equal to 1,394 m^3 (monthly average of daily measurements). There are no other limits for the effluent quality at this time. However, with the license renewal coming up in 2017, there is a high probability that there will be other limits introduced that the wastewater treatment facility (WWTF) will have to comply with. ISL Engineering, after consulting with AEP believes that there will be a requirement to complete a receiving water quality assessment as part of the revised license. Introduction of any new limits will be determined by the results of this assessment. AEP will work closely with the Town to establish any new requirement that might result from the assessment.

The Town is also required to monitor the wastewater system by collecting weekly samples of BOD_5 and TSS of untreated wastewater prior to aerated lagoon and samples of CBOD and TSS of treated wastewater prior to discharge into the Oldman River.

The lagoon was designed in 1975 with design capacity of 20-day retention time for cells 2 and 3 each, and 9-day retention for cell 4 for a flow of 341 L/c/d at a projected population of 2,700. Town's current population is approximately 1,650 with an average wastewater flow of 340 L/c/d. Assuming a 2% annual population growth, to reach lagoon's capacity (population of 2,700) will take approximately 25 years assuming the same per capita flow. That being said, the lagoon has enough capacity and does not require a capacity upgrade in the near future.

The survey was performed to determine the volume of wastewater and sludge in each cell of the lagoon. The results are presented in Table 4.1 below.

Table 4.1: Lagoons

	Approximated Design Volume (m^3)	Volume (m^3) Based on survey	Sludge Volume (m^3) Based on survey
Cell 1	2,950	2,892	10
Cell 2	17,290	15,941	1,029
Cell 3	18,850	15,165	2,112
Cell 4	6,726	5,651	597

According to the operator, the lagoon has been desludged approximately 3 years ago. Typically, a lagoon needs to be desludged every 5-10 years depending on the rate of sludge accumulation. Based on the data presented in Table 4.1, the rate of sludge accumulation in cell 2 and cell 3 of the lagoon at Picture Butte wastewater treatment facility is 343 m^3/yr and 704 m^3/yr respectively. That means that the spare sludge capacity of cell 2 is approximately 15 years and cell 3 is approximately 8 years based on the approximated design volume. It is recommended that the amount of sludge accumulated in the lagoon be measured every year to plan for desludging accordingly. However, with a number of variables that determine sludge production and septicity, the effluent quality from the lagoons will also provide a good indication if the cells are filling with sludge thus reducing their treatment capacity and should be monitored.

A visual assessment of the existing sewage lift station is summarized on the following page in Table 4.2 and assessment of the WWTF is summarized in Table 4.3. It includes ISL's observations supplemented by the input from the Operators.

4.2.2 Electrical

The lift station consists of a wet well and a dry well that houses centrifugal sewage lift pumps. There is an access hatch to the wet-well, located inside lift station, and H2S leakage into the lift station is clearly evident. There are gas detectors installed inside lift station, but there is no service or calibration record and these did not appear to be working at the time of inspection. ***The wet-well access inside the pump station is violating the Canadian Electrical Code, with regards to rating of the electrical equipment at the pump station. Under the existing configuration of pump station, the pump station building would constitute as a hazardous area and the electrical equipment must be rated to suit. The options for upgrade include; either relocating the wet-well access hatch outside the building or relocating all electrical outside the building.***

The lift station's existing electrical equipment has been assessed by ISL and summary is presented in Table 4.4 below.

The aerated lagoon is located to the south of the sewage lift station. There is a small building on the north side of the lagoon that houses the aeration blowers and underground aeration-piping to the lagoon cells. There is no continuous measurement of dissolved oxygen (DO) at the lagoon, as it is typically done with operator sampling. The lagoon level is checked visually, and there is no continuous level measurement instrument. As per operator, previously installed mixers in the lagoon cells were removed and replaced with aeration piping in all cells. Electrical conduits for mixers power are abandoned in place.

The lagoon's existing electrical equipment has been assessed by ISL and summary is presented in Table 4.5 on the following page.

Item	ISL's Comments	Remaining Service Life	Action
Pump 1	- Operating point of 148 (41.1L/s) m^3/hr at 12.8 m - Centrifugal pump - Surface corrosion - Chipping of coating in some areas of the pump and base - Pump manufacturers indicated that parts are easily available - Pump performance could not be tested at the time of inspection - No pump run times available since installation. As per the pump curve provided by the Operator, the operating point of the pump is 148 m^3/hr at 12.8 m of head. This operating point corresponds to a speed of 1050 RPM as the pumps are operated using VFDs. The 2013 and 2015 sewage lift station flow data supplied by the Town indicate that a minimum flow of 47.8 m^3/hr and a maximum flow of 251 m^3/hr have been encountered within those 2 years, which may/may not have been beyond the operating range of the pumps depending on the speed and head the pumps were being operated at that time. The remaining flow data suggests that the flows encountered during the two years were close to the flow to the operating point of the pumps. Due to the insufficient information available to ISL in terms of flows, heads, and operating speed, the operation, capacity and interior condition (impeller) of the pumps could not be further investigated.	5 years (solely based on existing condition, low run hours, input from operator, and typical operating life of pumps). ISL strongly recommends that Pump 1 (internals, externals and performance) be inspected by a third party to confirm the remaining life of Pump 1.	- Implement rust control strategies such as clean up and preventative measures - plan for refurbishment/replacement/in **5 years, confirm remaining life of pump by third party inspection of internals, externals and performance.**
Pump 2	- Operating point of 148 m^3/hr (41.1L/s) at 12.8 m - Centrifugal pump - Chipping of coating in some areas of the pump and base - Pump manufacturers indicated that parts are easily available - Pump performance could not be tested at the time of inspection - No pump run times available since installation. As per the pump curve provided by the Operator, the operating point of the pump is 148 m^3/hr at 12.8 m of head. This operating point corresponds to a speed of 1050 RPM as the pumps are operated using VFDs. The 2013 and 2015 sewage lift station flow data supplied by the Town indicate that a minimum flow of 47.8 m^3/hr and a maximum flow of 251 m^3/hr have been encountered within those 2 years, which may have been beyond the operating range of the pumps depending on the speed and head the pumps were being operated at that time. The remaining flow data suggests that the flows encountered during the two years were close to the flow corresponding to the operating point of the pumps. Due to the insufficient information available to ISL in terms of flows, heads, and operating speed, the operation, capacity and interior condition (impeller) of the pumps could be further investigated.	5 years (solely based on existing condition, low run hours, input from operator, and typical operating life of pumps). ISL strongly recommends that Pump 2 (internals, externals and performance) be inspected by a third party to confirm the remaining life of Pump 2.	- Plan for refurbishment/replacement/ in **5 years, confirm remaining life of pump by third party inspection of internals, externals and performance.**
Supplementary Equipment	- Exhaust, gas detection equipment, level transmitter and flowmeter not in working condition at the time of inspection. - No continuous measurement of DO (Dissolved Oxygen) and level is available	To be replaced in the near future.	- Gas detection equipment upgrade required.
Security	- Pump house is locked - No fencing around facility - No cameras - As per the Alberta Wastewater System Guidelines for Design, Operating and Monitoring, security fencing is recommended		- Install fencing around facility

Item	ISL's Comments	Remaining Service Life	Action
Lagoons	- Berms are in good condition - Estimated sludge volume: ▪ Cell 1: 10 m^3 ▪ Cell 2: 1030 m^3 ▪ Cell 3: 2112 m^3 ▪ Cell 4: 597 m^3		- No actions required
Blower 1	- Visual observations indicate no significant deterioration of the blower - Chipped coating in some areas Blower performance could not be tested at the time of inspection. No information on the blower specifications or capacity could be obtained from the operator or supplier. Therefore a capacity assessment of this blower could not be conducted.	5+ years (Based on old age of blower and no upgrades have been done)	- Plan for replacement/refurbishment in **5 years** - In the meantime, blower should be subjected to regular servicing and maintenance
Blower 2	- Visual observations indicate no significant deterioration of the blower - Chipped coating in some areas Blower performance could not be tested at the time of inspection. No information on the blower specifications or capacity could be obtained from the operator or supplier. Therefore a capacity assessment of this blower could not be conducted.	5+ years (Based on old age of blower and no upgrades have been done)	- Plan for replacement/refurbishment in **5 years** - In the meantime, blower should be subjected to regular servicing and maintenance
Treatment Aids	- The facility makes use of two biological aids. - A product manufactured by Advanced Water Technologies (AWT) in Raymond, AB – LLMO-N3, which is added every 21 days to help with BOD and Ammonia removal - Another product caller Ecobac which is added to the lagoons every 3 days to control odor - They are both prepared and mixed via potable aerators in two 55 gallon drums, one for each aid, and added manually to the lagoons - No containment area/proper storage area is provided on site		- A small containment and storage area is recommended for these aids to allow for easy clean-up in the event of a spill
Supplementary Equipment	- No apparent deterioration of pipes, valves or instruments observed	5+ years (Based on old age of equipment and no upgrades have been done)	- Plan for replacement in **5 years**
Rodent Issues			- Initiate a rodent control program at the facility.
In House Testing and Monitoring	- No online monitoring or in house testing is performed at this facility		- No actions required
Security	- Blower house is locked - Fencing around facility and lagoons - No cameras		- No actions required
Forcemain Vault	- Doors to the vault have a significant amount of rust - Doors do not close properly - No locks have been provided on the door - Unable to conduct below ground inspection	- Cannot comment on below ground structure	- New hatch, similar to the one installed at the water pumping facility, is recommended to replace the existing doors - Lock should also be provided on the hatch

Item	ISL's Comments	Remaining Service Life	Action
Pump 1	- 25 HP electric motor - Operated using VFD - Controlled using Flygt proprietary control system - Installed in 2008 according to the label on the control panel	Controls installed in 2008, can be expected to provide reliable operation for another 7-10 years	- Plan for replacement/upgrade of controls in **10 years**
Pump 2	- 25 HP electric motor - Operated using VFD - Controlled using Flygt proprietary control system - Installed in 2008 according to the label on the control panel	Controls installed in 2008, can be expected to provide reliable operation for another 7-10 years	- Plan for replacement/upgrade of controls in **10 years**
Standby Pump	- Standby pump with a natural gas operated drive	10 years	- Provide permanent fix for standby pump battery charger related issues. - Standby pump should be replaced with backup generator.
Power Distribution Equipment	- Old and most likely obsolete - Utility power service has 600V, 250Amp, 3-Phase main circuit breaker	To be replaced in the near future	- Upgrade the existing obsolete power distribution equipment
Wet Well Blower	- Electrical ratings not visible - Located inside lift station - Running continuously	To be replaced in the near future	- Provide suitably designed wet well ventilation blower, located outside the building
Gas Detectors	- Number of gas detectors installed around the lift station - No service or calibration record - Don't appear to be working at the time of inspection	To be replaced in the near future	- Gas detectors need to be replaced - Provide regular maintenance and calibration
Lighting	- Fluorescent type T12 - In working condition - Emergency lighting fixture is installed at the station, but no testing record is available - Original EMT conduit inside the station is visibly corroded	7 years	- Upgrade existing lighting to fluorescent type T8 - Upgrade EMT conduits to RPVC conduits
Heating	- Natural gas furnace located inside lift station - No CO gas detector visible at the pump station		- Install CO gas detector - Provide regular maintenance and calibration
Wet Well Access	- **In violation of the Canadian Electrical Code** - Needs to be address immediately	**Address immediately**	- The options for upgrade include; either relocating the wet-well access hatch outside the building or relocating all electrical outside the building

Item	ISL's Comments	Remaining Service Life	Action
Power Distribution Equipment and Blower Starters	- Old and most likely obsolete - Roof-leak at the building power service penetration - Moisture seen above main breaker - Temporary fixed with duct tape	1 year	- Investigate and repair roof-leak for power service penetration - Upgrade existing obsolete power distribution and blower motor starting equipment
Blower 1	- Blower runs continuously for 6 months - Operator manually alternates duty blower semi-annually - No blower run times available since installation	5+ years (Based on old age of blower and no upgrades have been done). ISL strongly recommends that Blower 1 (internals, externals and performance) be inspected by a third party to confirm the remaining life of Blower 1, if possible.	- Plan for replacement/refurbishment in **5 years, confirm remaining life of blower by third party inspection of internals, externals and performance (if possible).** - In the meantime, blower should be subjected to regular servicing and maintenance
Blower 2	- Blower runs continuously for 6 months - Operator manually alternates duty blower semi-annually - No blower run times available since installation	5+ years (Based on old age of blower and no upgrades have been done). ISL strongly recommends that Blower 2 (internals, externals and performance) be inspected by a third party to confirm the remaining life of Blower 2 if possible.	- Plan for replacement/refurbishment in **5 years, confirm remaining life of blower by third party inspection of internals, externals and performance (if possible).** - In the meantime, blower should be subjected to regular servicing and maintenance
Lighting	- fluorescent type T12 - No emergency lighting noted	7 years	- Upgrade existing lighting to fluorescent type T8 - Provide emergency lighting

4.2.3 Structural

The objective of ISL's conditional engineering assessment is to identify any structural or safety issues, as well as to make note of any characteristics that will affect the potential occupants comfort. If there are any issues detected, ISL is to provide recommendations and an estimate of engineering and construction costs to remediate the issues.

ISL's conditional assessment was based on a visual site review. The visual review of the property did not reveal any significant structural issues to the building's superstructure or substructure. The structures appeared to be stable and structurally sound.

The details of the structural visual assessment are summarized in Table 4.6 on the following page.

Item	ISL's Comments	Remaining Service Life	Action
Lift Station Building	- No apparent damage to superstructure or substructure - Roof/ceiling structure appeared in good condition	10+ years	
Lift Station Building Roof	- Signs of water entry through roof assembly - No signs of ponding or pooling within the building - Building poorly insulated	2-3 years	- Recommend having building envelope / roofing specialist inspect for potential issues. - Monitor for any water leakage/entry into the building
Lift Station Interior Wall/Window	- Signs of moisture penetration through window frame/assembly - Potential of mortar cracking - Window frame splitting and cracking due to freeze/thaw, moisture migration	2-5 years	
Blower Building	- Signs of cracking from possible expansion/contraction from freeze/thaw cycles - Does not appear to affect the structure - Paint chipping/spalling from potential moisture migration and/or poorly insulated exterior walls - Damage to slab on grade and curb - Slab thickness unknown - Absence of housekeeping pads - Signs of parapet damage - No signs of roof drains, which could allow ponding - High parapet has potential of additional loads on the superstructure due to snow drift accumulation	5-10 years	- Housekeeping pads are recommended to reduce vibrations of machinery, help transfer extra loads, and reduce cracking of slab on grade - Install roof drain - Remediation should be done to mitigate water/moisture migration and further damage

5.0 Sewage Collection System

5.1 Existing System

5.1.1 Existing Sanitary Trunk Sewer System

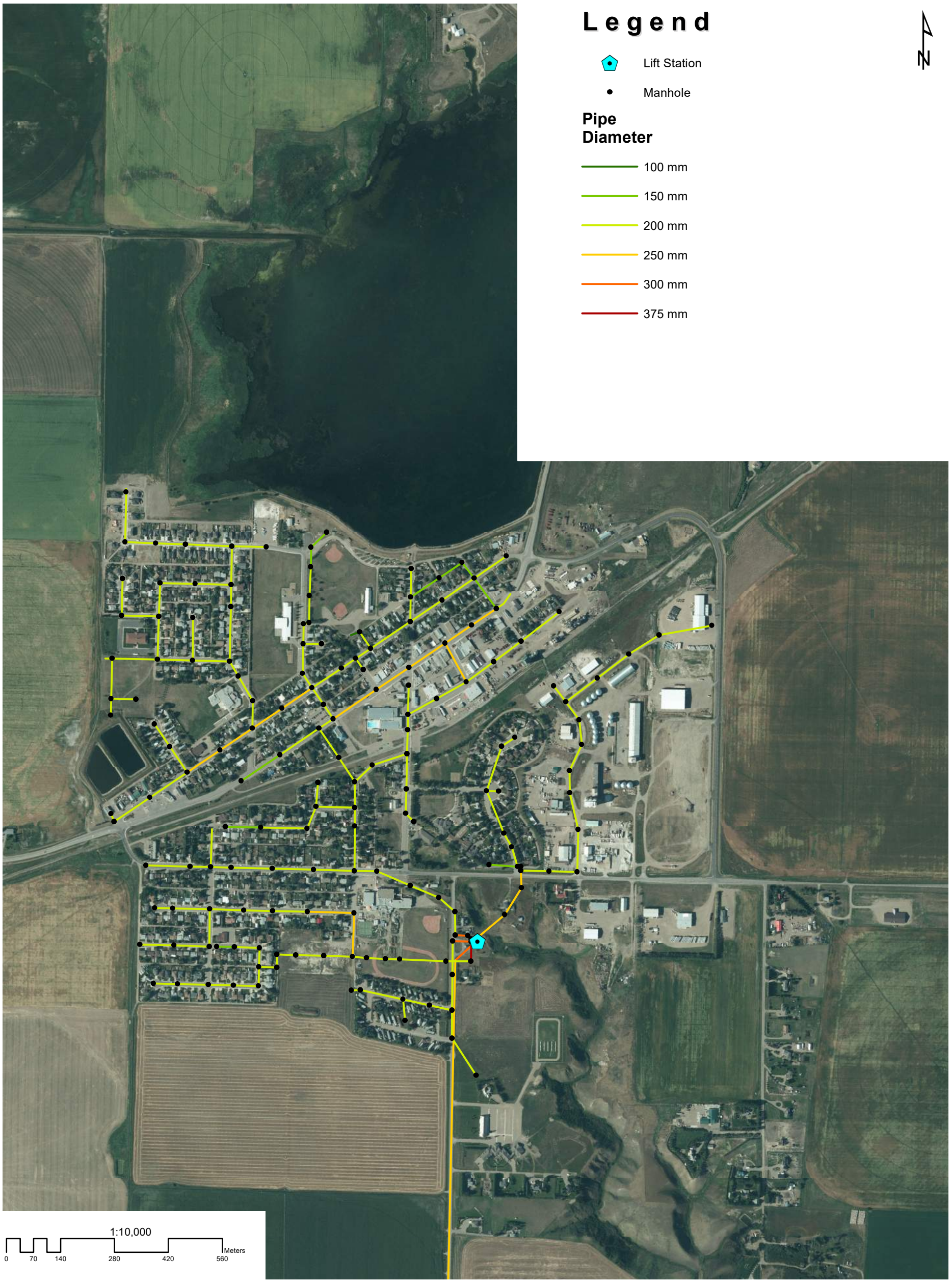
The Town's wastewater system is composed of a number of manholes, pipes, and forcemains that convey sewage to the Town's wastewater treatment plant. One lift station is located off 3A Street S. All pipe sizes have been included for the purposes of this study, however, sanitary service connections have been excluded. Pipes range in diameter from 150 mm to 375 mm, with the majority being 200 mm. In all, there is a total of 14 km of sanitary sewers in the Town.

Drawings of the sanitary pipe network can be found in Figures 5.1 to 5.3 in terms of pipe diameter, lift station locations and pipe installation year and pipe material. A summary of the total lengths with respect to pipe diameter as surveyed is detailed below in Table 5.1.

Table 5.1: Town of Picture Butte Wastewater System Statistics

Diameter	Total Length
mm	m
150	749
200	10,457
250	3,136
300	169
375	60
Total	**14,572**

FIGURE 5.1



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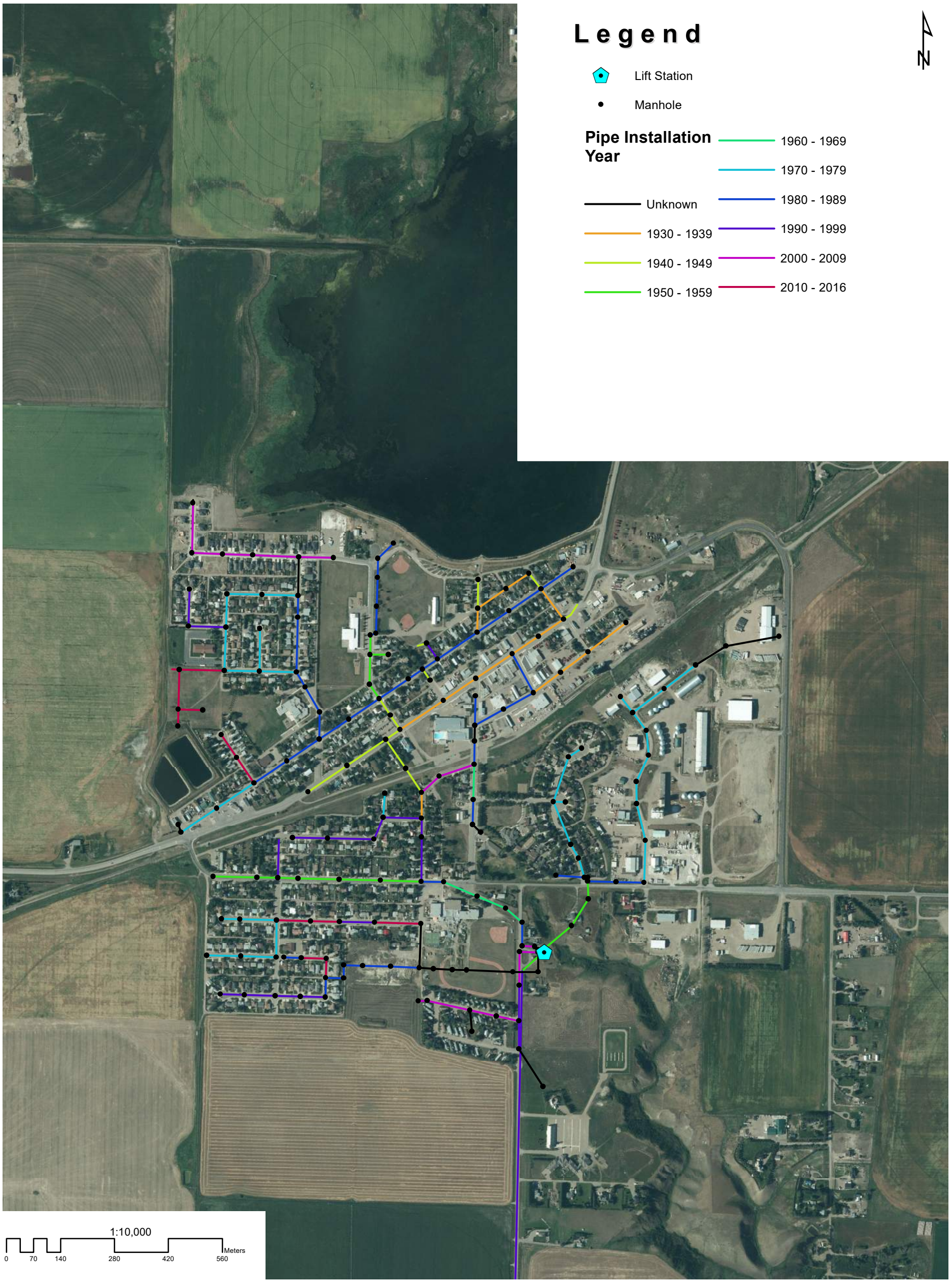
PICTURE BUTTE
ALBERTA

TOWN OF PICTURE BUTTE
INFRASTRUCTURE ASSESSMENT

SANITARY COLLECTION SYSTEM
PIPE DIAMETERS

ISL Engineering and Land Services

FIGURE 5.2



TOWN OF PICTURE BUTTE
INFRASTRUCTURE ASSESSMENT

SANITARY COLLECTION SYSTEM
PIPE INSTALLATION YEAR

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FIGURE 5.3



TOWN OF PICTURE BUTTE
INFRASTRUCTURE ASSESSMENT

SANITARY COLLECTION SYSTEM
PIPE MATERIAL

PICTURE BUTTE ALBERTA

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One lift station on the south edge of Town collects all the Town's flows and transports it through the forcemain to the treatment lagoons. The forcemain is 300 mm PVC from the lift station to 3A Street. From the vacuum release to lagoon the pipe reduces to 250 mm Sclairpipe series 60 HDPE. The lift station uses two 25 HP Gorman-Rupp model T6A3-B pumps. The tables below summarize characteristics of the lift stations (Table 5.2), set points (Table 5.3) and pump curves (Table 5.4).

Table 5.2: Lift Station Parameters and Capacities

Wet Well Area	Forcemain Size	Forcemain Length	Operating Flow Rate	Operating Total Dynamic Head
m^2	mm	m	l/s	m
9.303	250	1,697.448	41.1	12.8

Table 5.3: Wet Well Level Control Settings

Stockton Level Control Settings		
Pump	Start	Stop
	m	m
1	894.21	892.72
2	894.35	892.72

Table 5.4: Pump Curve

Head (m)	Flow (m^3/s)
36.97224	0.00000
35.90544	0.00631
34.8996	0.01262
33.9852	0.01893
32.9184	0.02524
32.06496	0.03155
30.9372	0.03786
29.68752	0.04417
28.37688	0.05048
26.94432	0.05679
26.18232	0.0631
24.384	0.06941
22.58568	0.07572
21.00072	0.08203
19.41576	0.08834
17.6784	0.09465
0.0000	0.152702

5.1.2 Analysis of Sanitary System CCTV Inspection

The Town's existing sanitary system was flushed and inspected by Closed Circuit TV (CCTV) for failures in the system. ISL has reviewed the reports and videos provided, our ranking system for the assessment consists of three categories:

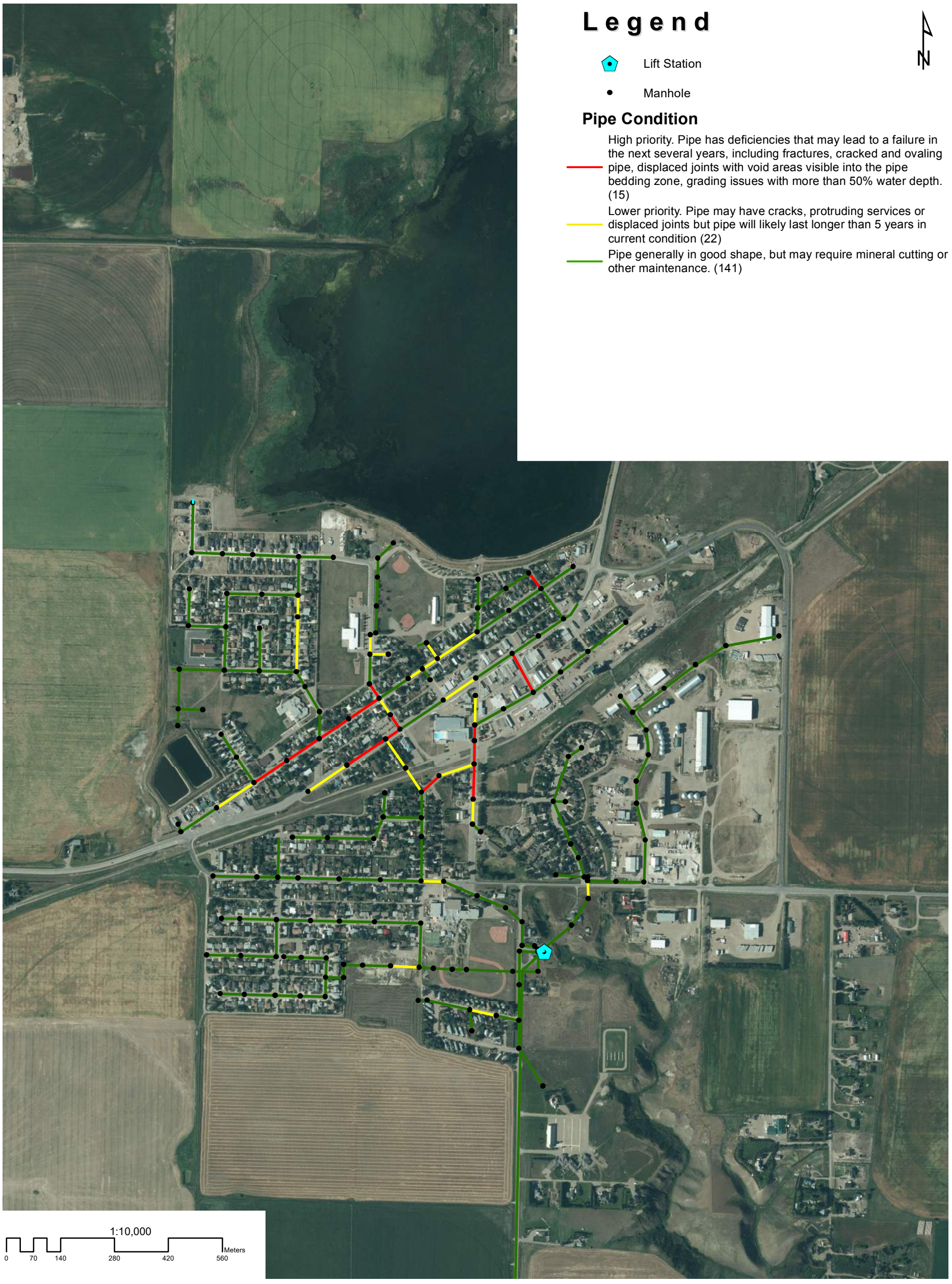
1. Low Priority (Attention required beyond 10 years)
2. Medium Priority (Attention required within 5-10 years)
3. High Priority (Immediate attention required – within 1 to 5 years)

Sections identified as high priority either have a pipe break, severe deformation or they are holding sanitary waste in more than 50% of the pipe area which would indicate that the pipe is either flat or back grading. All of the pipes identified for immediate attention are Vitrified Clay (VC) material. The high priority sections based on pipe condition are listed below:

- Crescent Avenue from Piron Place to 6th Street North (SAMHCC003 – SAMHCC007)
- 6th Street North from Crescent Avenue to Lane (SAMHCC007 – SAMH6N002)
- 2nd Street North from Crescent Avenue to Lane (SAMHCC013 – SAMH2N001)
- 4th Street South from Jamieson Avenue to Cowan Avenue (SAMH4S004 – SAMH4S002)
- 3rd Street North from Highway Avenue to Jamieson Avenue (SAMHHW007 – SAMHJM002)
- 6th Street North from Highway Avenue to mid-block Lane (SAMHHW004 – SAMH6N001)
- Highway Avenue (SAMHHW002 – SAMHHW003)
- 5th Street South (SAMH5S003 – SAMH5S004)

These sections are highlighted in Figure 5.4 on the following page.

FIGURE 5.4



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PICTURE BUTTE ALBERTA

TOWN OF PICTURE BUTTE
INFRASTRUCTURE ASSESSMENT

SANITARY COLLECTION SYSTEM
PIPE CONDITON

ISL Engineering and Land Services

5.2 Hydraulic Model Development

5.2.1 Model Construction

The computer model that was utilized for assessing the sewer system was MIKE URBAN 2016 SP3 by DHI. MIKE URBAN is a powerful analysis tool that computes inflow from sewage generation rates and rainfall dependent inflow-infiltration, and routes it through the hydraulics system. Based on the hydraulic simulation the model can be used to evaluate which locations have surcharge or flooding conditions. Pipe flows are also determined, and based on peak flows, over-capacity pipes can be identified. The MIKE URBAN model is built upon the ArcGIS platform and this was used to assist in the construction of the model.

To set-up the model, all available GIS data relevant to the sanitary sewer system in the study area received from the Town was reviewed in detail. Data that appeared inconsistent (a negative slope for instance) was checked against available block profiles. Where block profiles were unavailable, corrections were made based on the most likely in-ground scenario. Manholes and pipes were then imported into the MIKE URBAN model. Losses were calculated using Weighted Inlet Energy formulation where links came together or where a sharp turn was involved, otherwise flow-through was assumed. For pipe roughness, Manning's coefficient was assigned as below.

Table 5.5: Hydraulic Model Pipe Roughness Coefficients

Material	Manning's Co-Efficient
Concrete	0.013
PVC	0.011
VCT	0.015
Unknown	0.013

The lift station was also added into the model. The lift station sites include a storage node representing a wet well, two pumps, a 'dummy' node at the downstream end of the pumps, and a forcemain. Wet well dimensions, level control settings, pump curves, forcemain diameters and all required inverts were then populated from provided engineering drawings. Pump curves were obtained from the Gorman-Rupp T3A3-B Installation, Operation, and Maintenance Manual (1983) (Appendix D).

5.2.2 Catchment Development

Following the setup of the physical sanitary sewer system model, it was necessary to delineate the study area into catchments for the purpose of generating dry weather flow (DWF) and wet weather flow (WWF). The catchments were delineated based on individual lots and the zoning districts. Depending on which zoning district the lots resided in, the catchments were classified as either residential, commercial, industrial, recreational or institutional.

The area was then divided into catchment areas based on the spatial location of the sanitary system, land use, and locations of flow monitors in the sewer system in 2016. Overall residential, commercial, industrial, recreational, and institutional areas, as well as the total population, were calculated for each of these larger catchment areas.

For the sanitary system, the Piyami buildings were considered institutional. Multiple Land Use categories were sorted into the most appropriate land use through the use of aerial imagery and Google's Street View application. The new residential area to the west was not complete at the time of flow monitoring, and so has been considered as part of the future scenario.

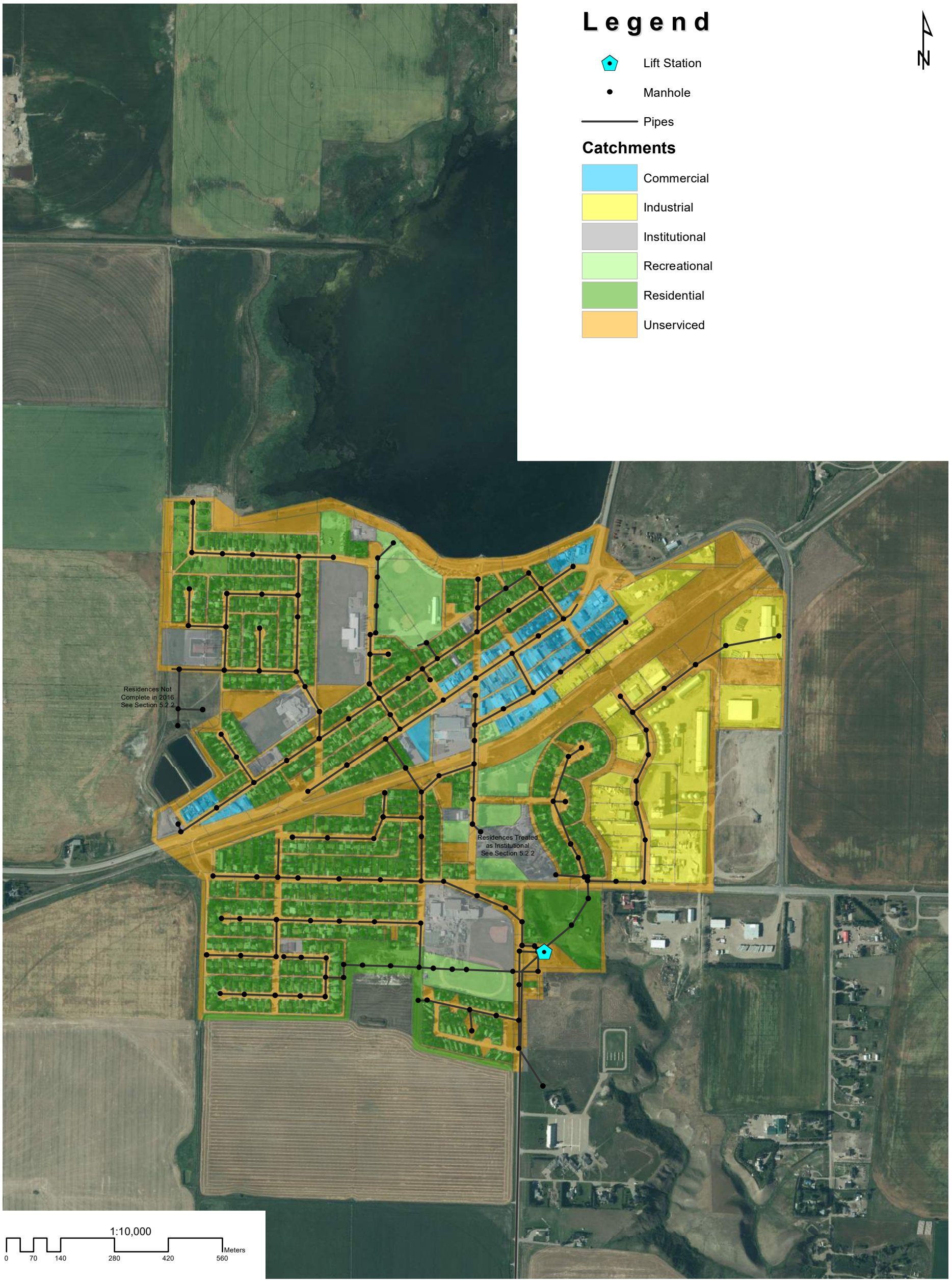
A summary of the individual sanitary catchments is found in Table 5.6 on the following page, and in Figures 5.5 and 5.6.

Table 5.6: Summary of Existing Sanitary Catchments

Land Use Type	Number of Lots	Total Population	Total Area (ha)
Residential	677	1573	54.8
Industrial	28	0	20.1
Recreation	9	0	9.2
Commercial	102	0	6.8
Institutional	34	63	16.6

Following delineation of catchment areas, each catchment was assigned to the nearest downstream manhole. All MIKE URBAN files developed as part of the SMP Update can be found in Appendix E.

FIGURE 5.5



TOWN OF PICTURE BUTTE
INFRASTRUCTURE ASSESSMENT

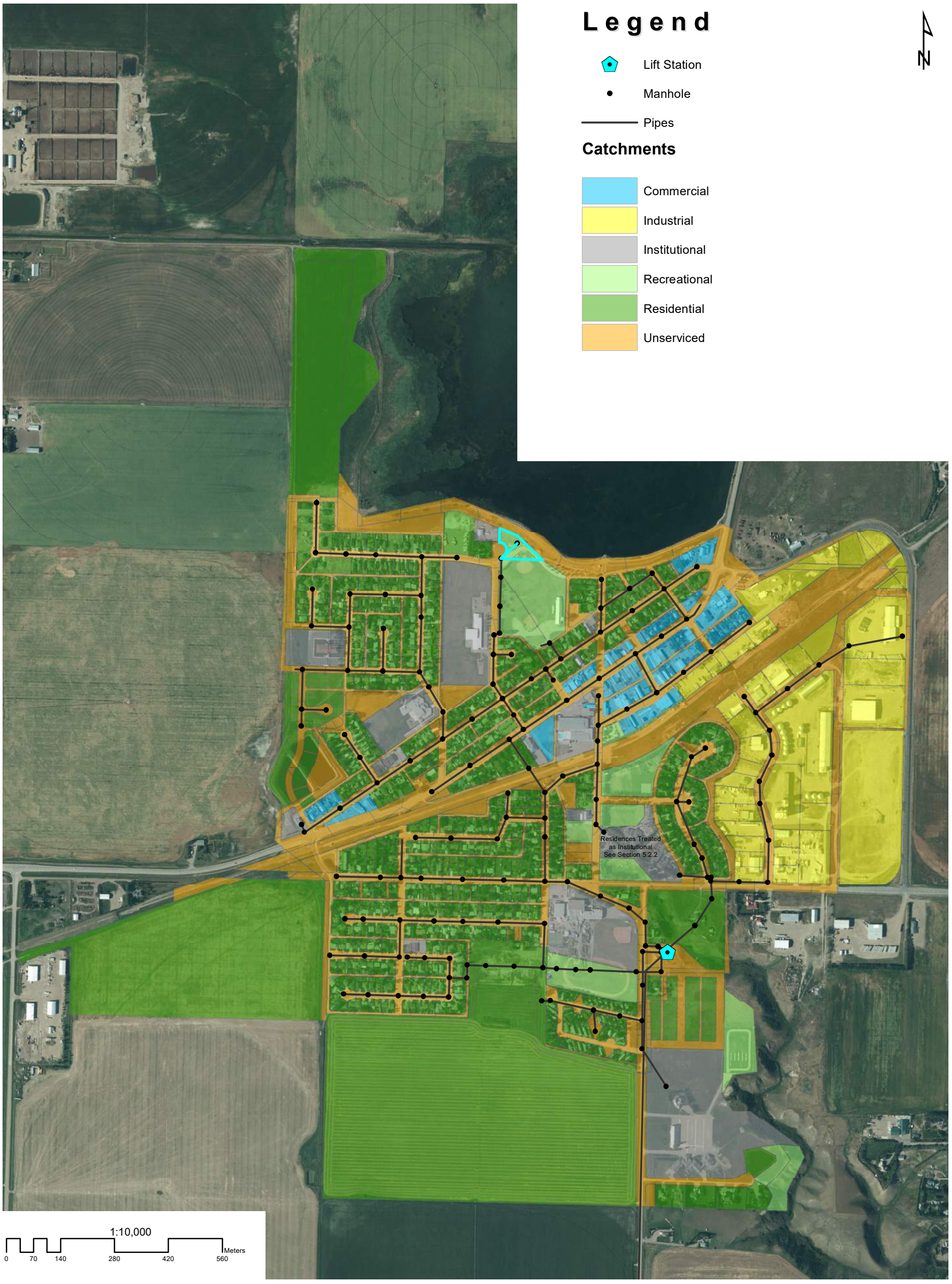
SANITARY COLLECTION SYSTEM
EXISTING CATCHMENTS

PICTURE BUTTE ALBERTA

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FIGURE 5.6



TOWN OF PICTURE BUTTE
INFRASTRUCTURE ASSESSMENT

SANITARY COLLECTION SYSTEM
FUTURE CATCHMENTS

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5.2.3 Model Calibration

Flow Monitoring

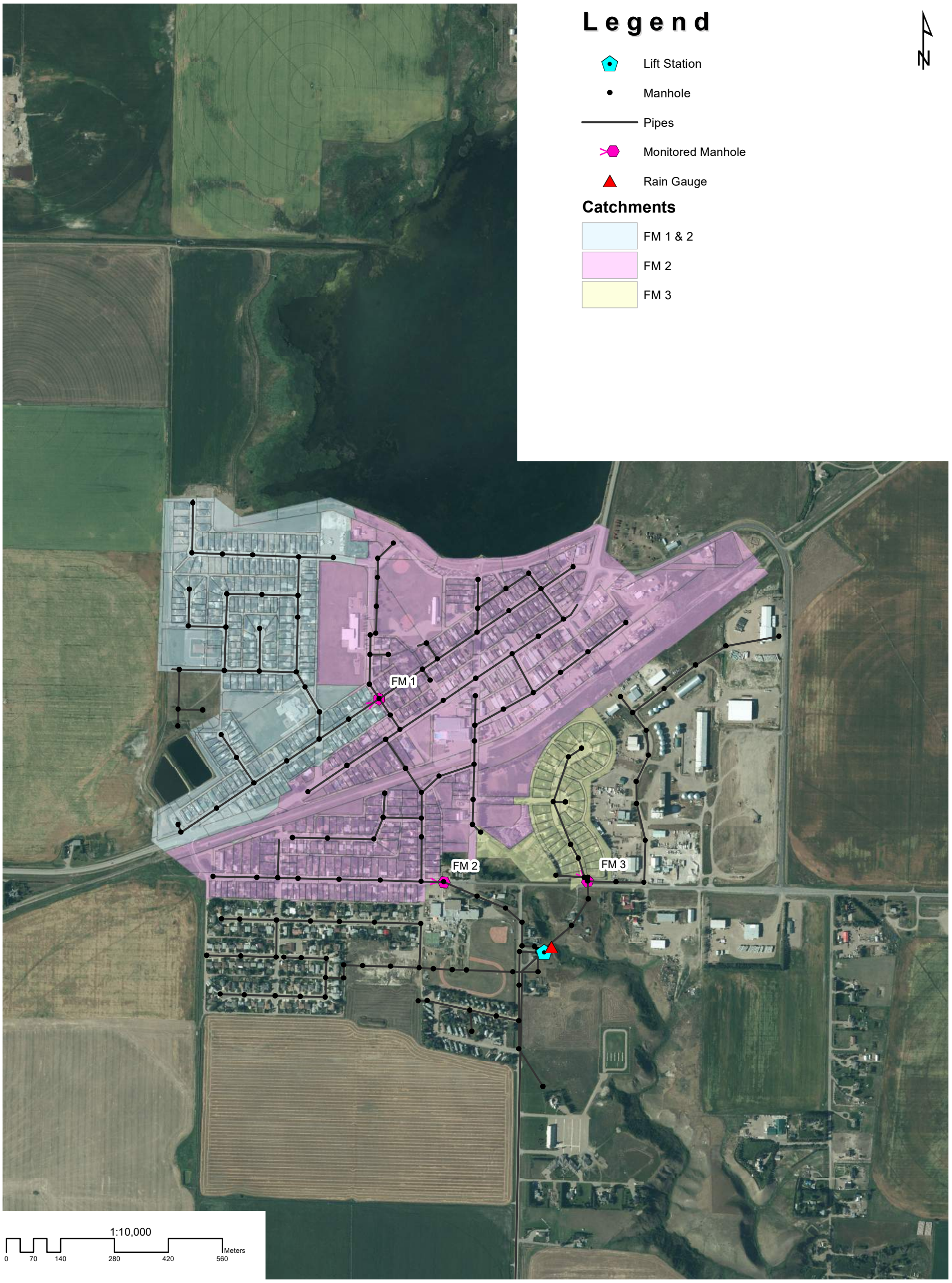
Using the catchments delineated from the study area, the next step was to establish dry and wet weather flows for the study area. To assist in developing realistic sewer flows, a total of three flow monitors were installed at various locations in the Town in 2016. A rain gauge was also installed near the lift station. This data could then be used for model calibration.

The three flow monitoring sites within the study area are summarized below and are shown in Figure 5.7:

- FM 1 – This flow monitor is located at Crescent Ave and 6th St N. The majority of the upstream service area are residential developments, however a few commercial and institutional developments are present.
- FM 2 – This flow monitor is located at 406 Rogers Ave. The upstream service area includes FM 1. Development include residential, commercial, recreational, institutional and industrial.
- FM 3 – This flow monitor was installed at 3rd St S and Rogers Ave. Upstream catchments include mostly residential developments, as well as a section of the Piyami buildings.

Flow monitoring and rainfall data was compiled for use in the subsequent calibration of the MIKE URBAN hydraulic model of the sanitary sewer trunk system in the Town of Picture Butte.

FIGURE 5.7



TOWN OF PICTURE BUTTE
INFRASTRUCTURE ASSESSMENT

SANITARY COLLECTION SYSTEM
FLOW MONITORING

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5.2.4 Dry Weather Model Calibration

Following the hydraulic model construction and compilation of the flow monitoring data, calibration of the wastewater model was initiated. Calibration of the model was crucial such that the simulated flows represent the actual flow data from the flow monitoring sites.

The first step was to determine a period from the flow monitoring with little to no rainfall influence on the network for each of the flow monitoring sites. The following time frames were chosen to represent the wastewater system under dry weather flow conditions:

- May 13th to 20th 2016 – used to calibrate FM 1 and FM 2
- May 17th to 20th 2016 – used to calibrate FM 3

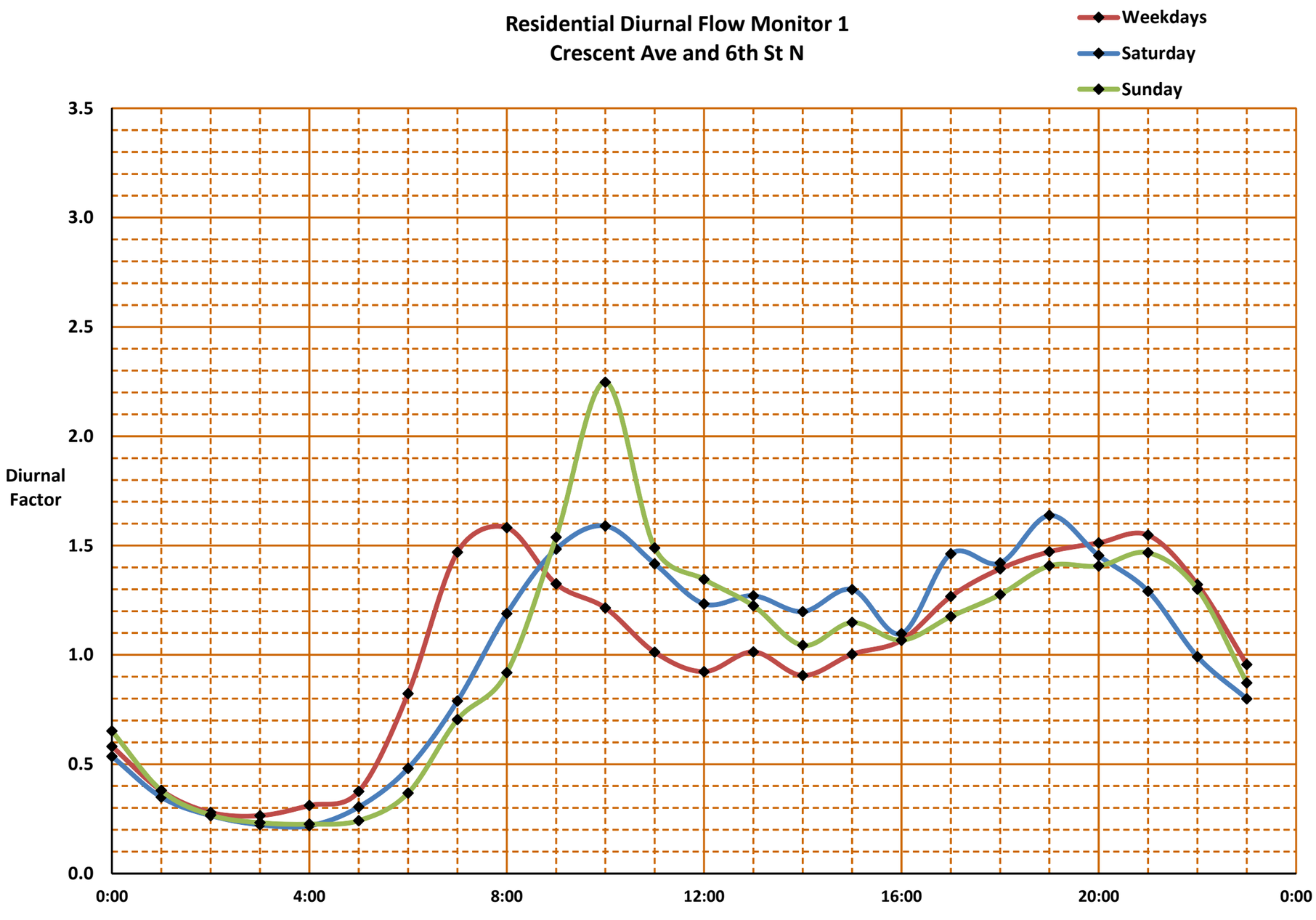
These time periods showed minimal rainfall and a stable base flow.

After the dry weather flow dates were deduced, it was necessary to establish residential, commercial, industrial and institutional diurnal pattern, or the variations in flow over the course of the day. This first involved determining baseflows that generally represent infiltration to the system. Baseflows were initially assumed to be 80% of minimum monitored flows (typically nighttime flows), and were adjusted as needed in order to derive accurate diurnals.

Following the establishment of baseflows, to further proceed towards dry weather flow calibration, diurnals were developed. Diurnals were derived by taking at each hour of the day the difference between recorded flow rates and the determined baseflow, dividing this value by the average flow from each day, and deducing the average per hour. With this, weekday, Saturday, and Sunday diurnals were produced for the flow monitoring sites. Diurnals were adjusted slightly in some cases in order to meet the peak flows that were observed in the monitored data. Graphical representations of the diurnals can be found in Figures 5.8 to 5.11.

FIGURE 5.8

Residential Diurnal Flow Monitor 1
Crescent Ave and 6th St N



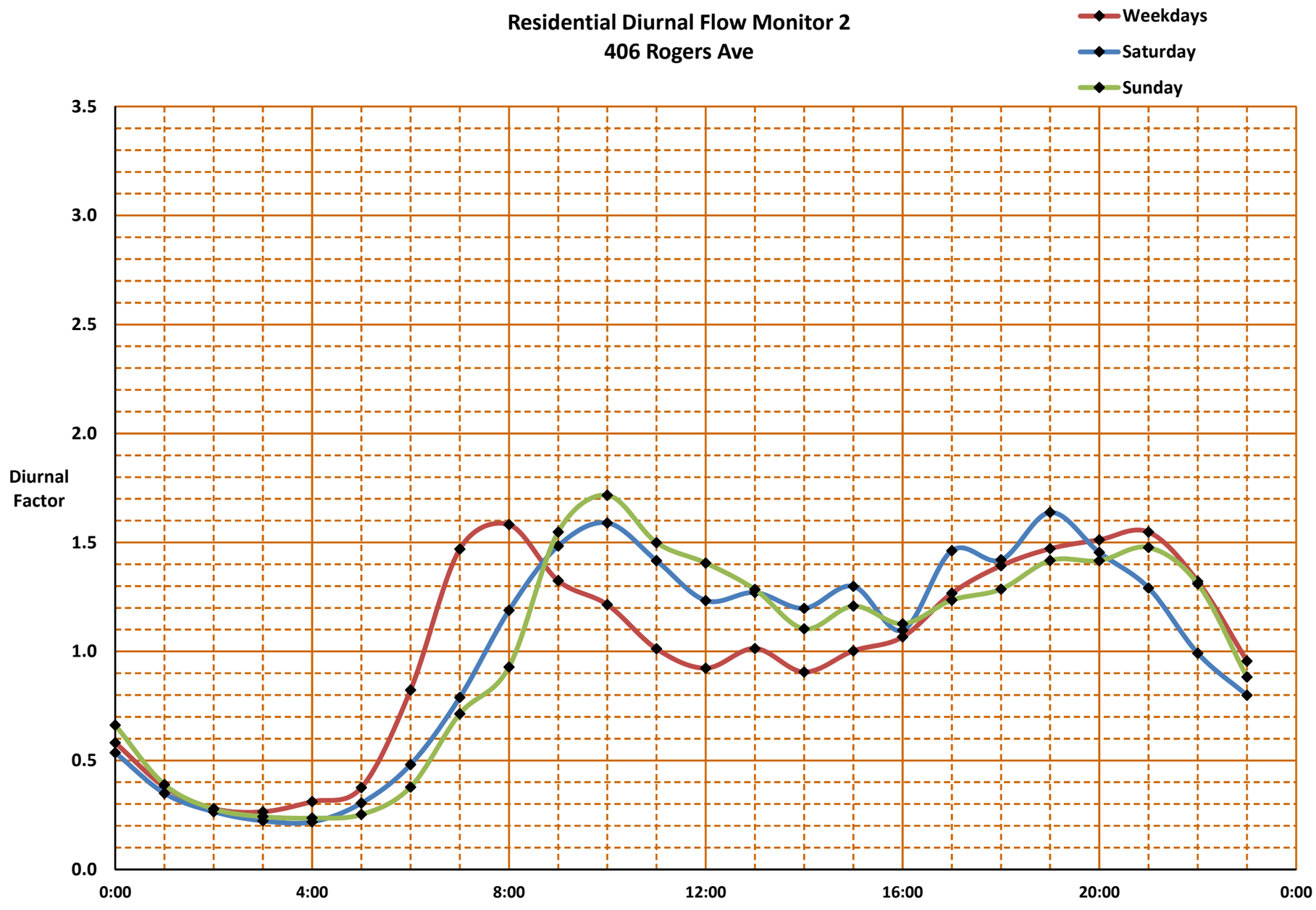
TOWN OF PICTURE BUTTE
INFRASTRUCTURE ASSESSMENT

SANITARY COLLECTION SYSTEM
RESIDENTIAL DIURNAL FM 1

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FIGURE 5.9



TOWN OF PICTURE BUTTE
INFRASTRUCTURE ASSESSMENT

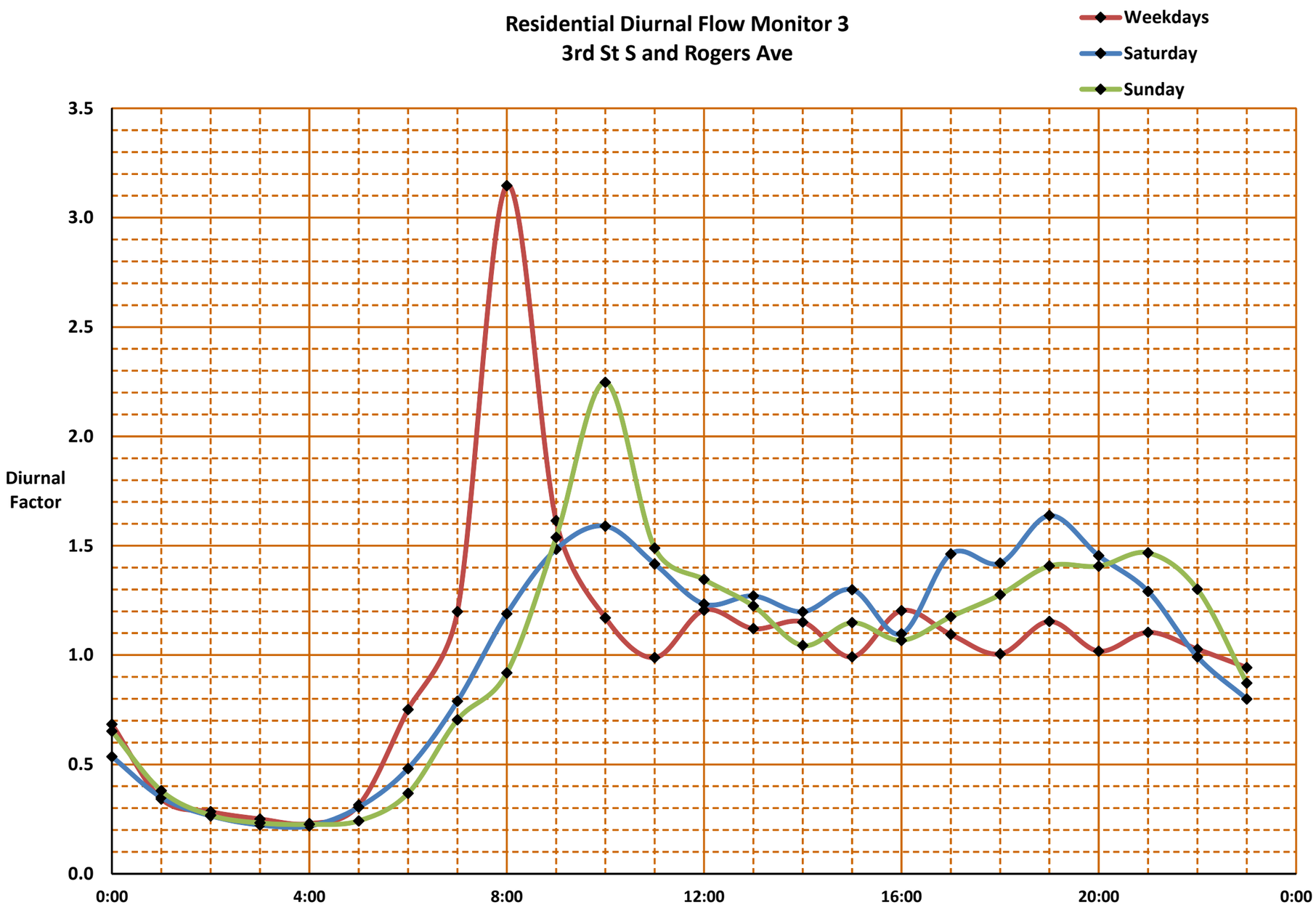
SANITARY COLLECTION SYSTEM
RESIDENTIAL DIURNAL FM 2

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FIGURE 5.10

Residential Diurnal Flow Monitor 3
3rd St S and Rogers Ave



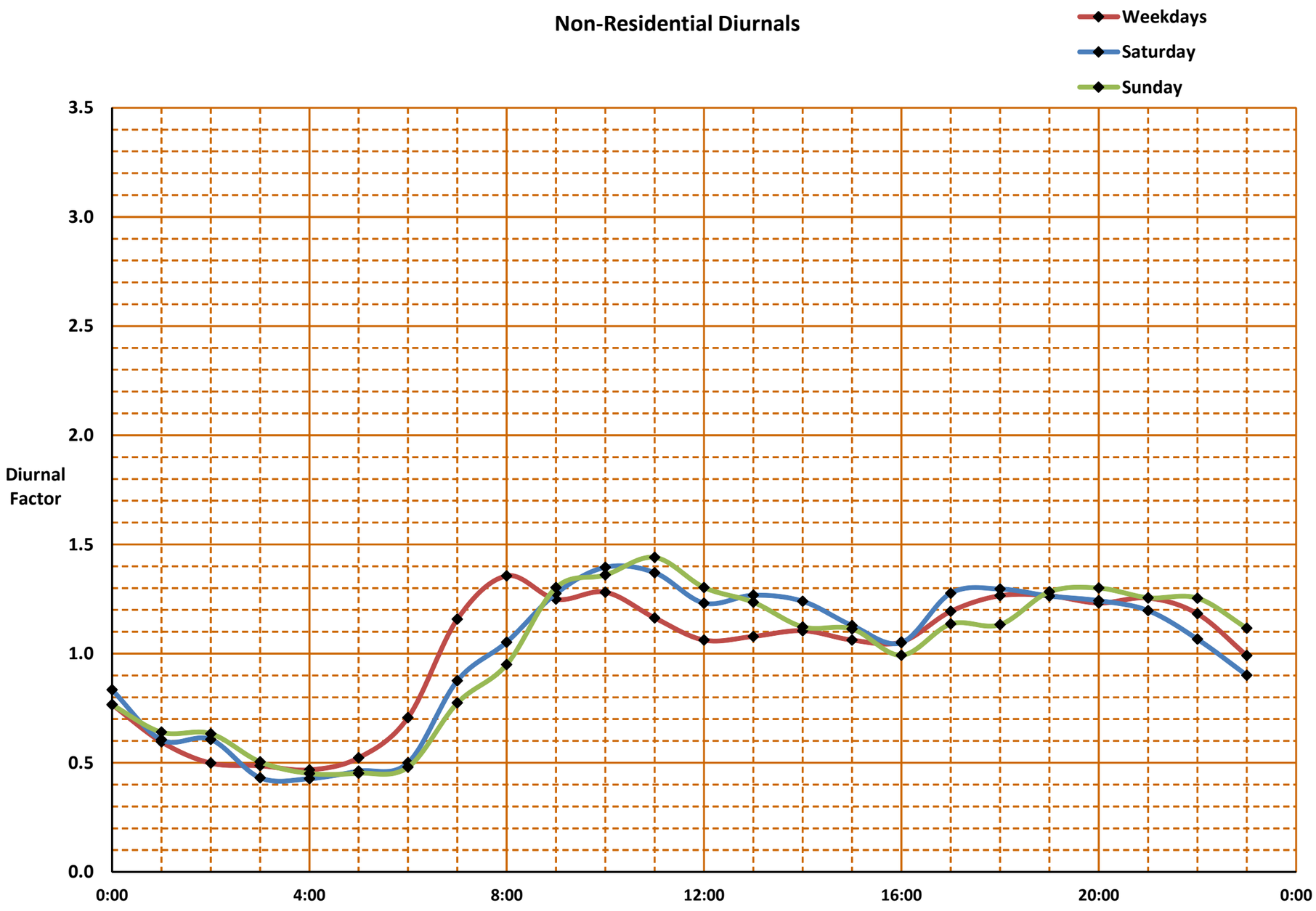
TOWN OF PICTURE BUTTE
INFRASTRUCTURE ASSESSMENT

SANITARY COLLECTION SYSTEM
RESIDENTIAL DIURNAL FM 3

ISL Engineering and Land Services

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FIGURE 5.11



TOWN OF PICTURE BUTTE
INFRASTRUCTURE ASSESSMENT

SANITARY COLLECTION SYSTEM
NON-RESIDENTIAL

ISL Engineering and Land Services

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Once the baseflows and diurnals were defined, to further proceed towards dry weather flow calibration, a combination of determination and adjustment of diurnals as well as identification and adjustment of dry weather sewage flow generation rates was undertaken.

Dry weather flow sewage generation rates were estimated by considering the difference between the average flow rates and the defined baseflows, then taking the difference and dividing it by upstream residential populations and non-residential (commercial, industrial and institutional) areas based on anticipated flow rates, where applicable.

Catchments were then grouped sequentially based on the next downstream flow monitor. That is to say that once a dry weather flow rate was estimated for catchments upstream of one flow monitor, this information was used, in conjunction with data from the next downstream flow monitor to determine dry weather flow rates for catchments downstream of the upstream flow monitor.

On this basis, residential dry weather flow rates were estimated at 340 L/p/d. Commercial and industrial rates were assumed at 5 m3/ha/d and institutional and recreational at 1 m3/ha/d. Small catchments complicated further detailing of the rates.

Successful calibration results will produce volume and peak flow errors less than ±10%. The following table, Table 5.7, indicates compliance with this. Graphical representations of those sites indicate that there is good agreement between the observed and modelled data, and that the calibration results are sufficient. At this point, the dry weather flow calibration of the model was deemed to be complete. Final dry weather week flow comparison plots are shown in Figures 5.12 to 5.14, and final dry weather flow generation rates employed for the study are shown in Figure 5.15.

Table 5.7: Dry Weather Flow Calibration Results

Flow Monitor			Site 1	Site 2	Site 3
DWF Period			May 13, 2016 to May 20, 2016	May 13, 2016 to May 20, 2016	May 17, 2016 to May 20, 2016
Generalized	Min. Flow	(L/s)	1.10	1.90	1.60
Baseflow		(L/s)	0.66	0.76	1.44
Baseflow	Flow Rate	(L/s/ha)	0.01977	0.01076	0.17320
Upstream Total Contributing Area		(ha)	33.39	70.62	8.31
Upstream Total Contributing Population			511	550	92
Residential	DWF Rate	(L/p/d)	340.00	340.00	340.00
		(m3/p/d)	0.340	0.340	0.340
Commercial	DWF Rate	(m3/ha/d)	5.00	5.00	5.00
		(L/s/ha)	0.05787	0.05787	0.05787
Industrial	DWF Rate	(m3/ha/d)	5.00	5.00	5.00
		(L/s/ha)	0.05787	0.05787	0.05787
Institutional	DWF Rate	(m3/ha/d)	1.00	1.00	50.00
		(L/s/ha)	0.01157	0.01157	0.57870
Recreational	DWF Rate	(m3/ha/d)	1.00000	1.00000	1.00000
		(L/s/ha)	0.01157	0.01157	0.01157
Peak Flow	Monitored	(L/s)	4.90	9.99	3.90
	Mike	(L/s)	4.87	10.29	3.64
	Difference	(%)	-0.53	2.93	-7.16
Volume	Monitored	(m3)	1,588	3,673	638
	Mike	(m3)	1,607	3,856	681
	Difference	(%)	1.19	4.75	6.33

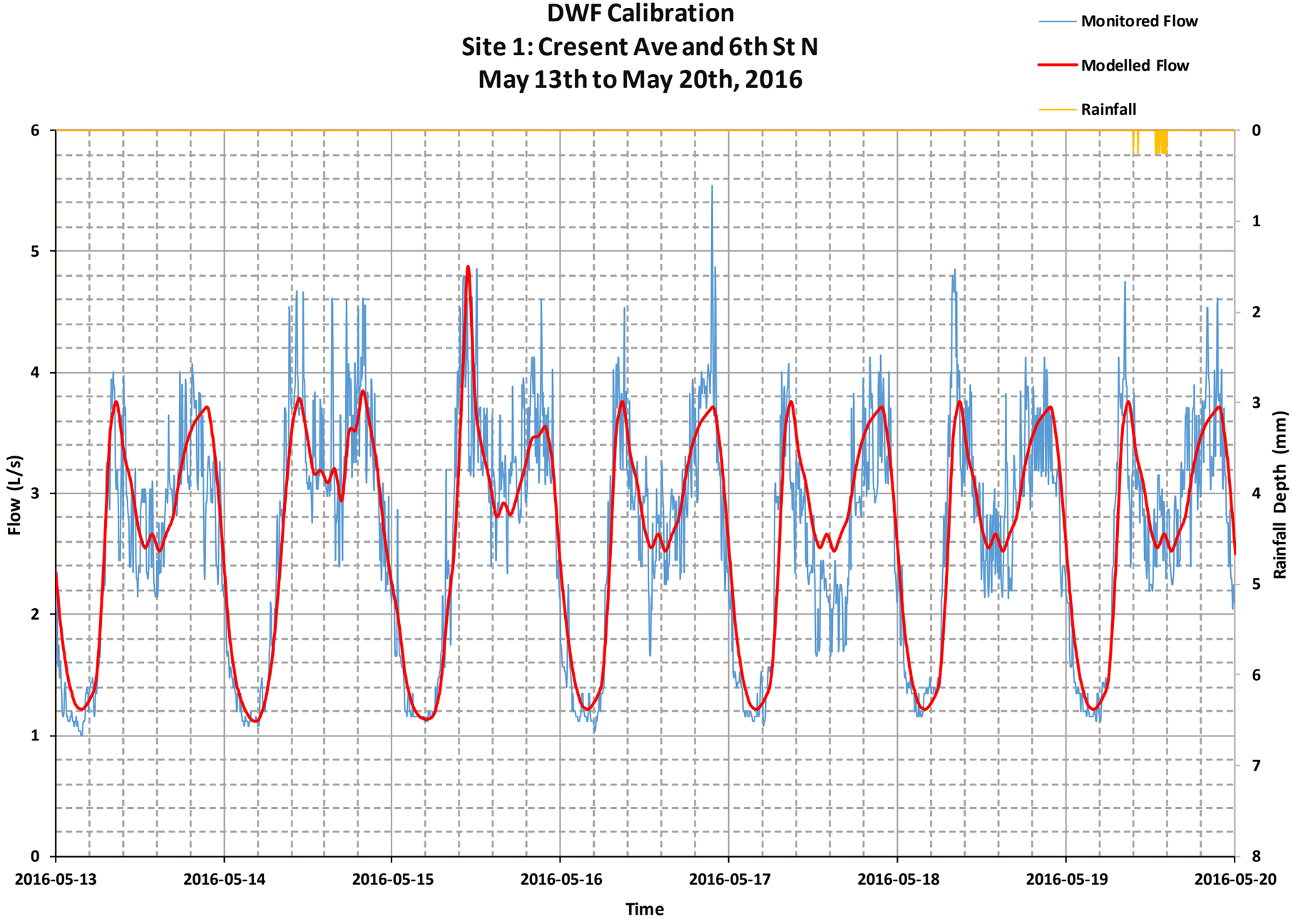
Note:

- Altered BFs
- Generalized Peak Flows
- Within +/- 10% Error Margin
- Upstream FMs

Future baseflows were assumed to be 0.033 L/s/ha, residential flows 315 L/p/d and non-residential flows 10,505 L/ha/d, based on The City of Calgary guidelines. Diurnals selected were the most conservative. Lethbridge generation rates were not used as they are significantly more conservative than most other suggested rates in southern Alberta.

FIGURE 5.12

DWF Calibration
Site 1: Cresent Ave and 6th St N
May 13th to May 20th, 2016



TOWN OF PICTURE BUTTE
INFRASTRUCTURE ASSESSMENT

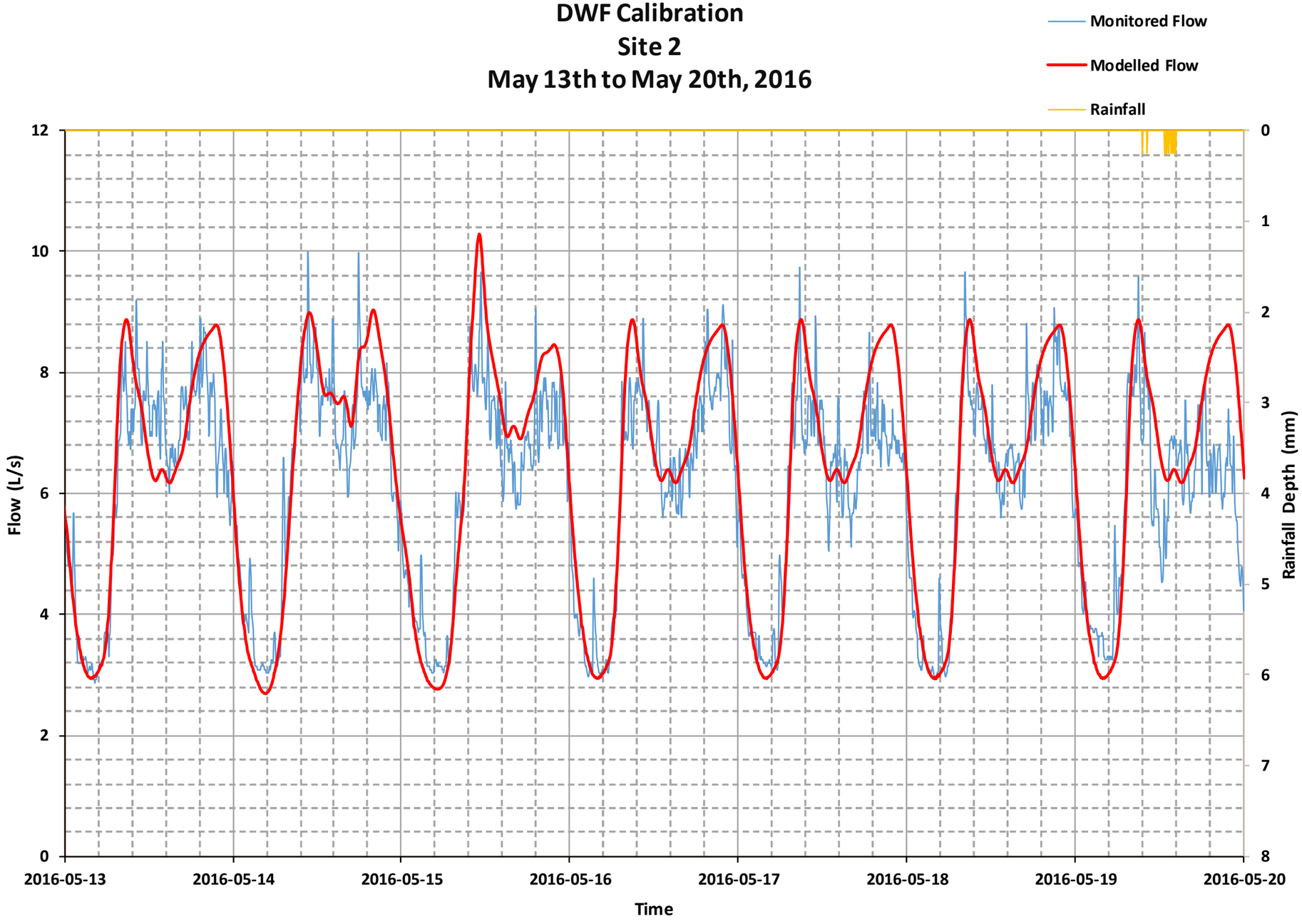
SANITARY COLLECTION SYSTEM
RESIDENTIAL DIURNAL FM 1

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FIGURE 5.13

DWF Calibration
Site 2
May 13th to May 20th, 2016



TOWN OF PICTURE BUTTE
INFRASTRUCTURE ASSESSMENT

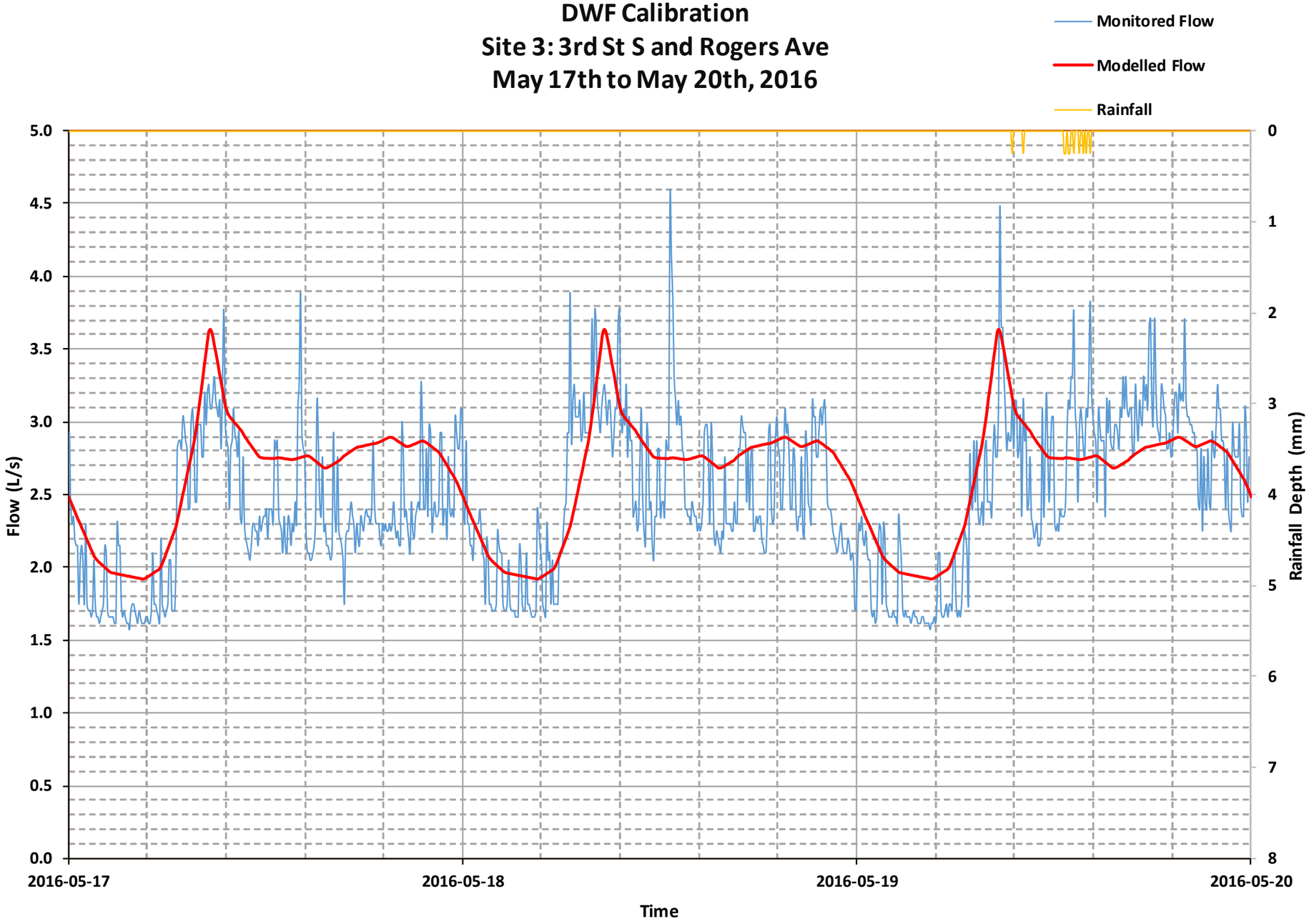
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DRY WEATHER FLOW CALIBRATION FM 1

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FIGURE 5.14

DWF Calibration
Site 3: 3rd St S and Rogers Ave
May 17th to May 20th, 2016



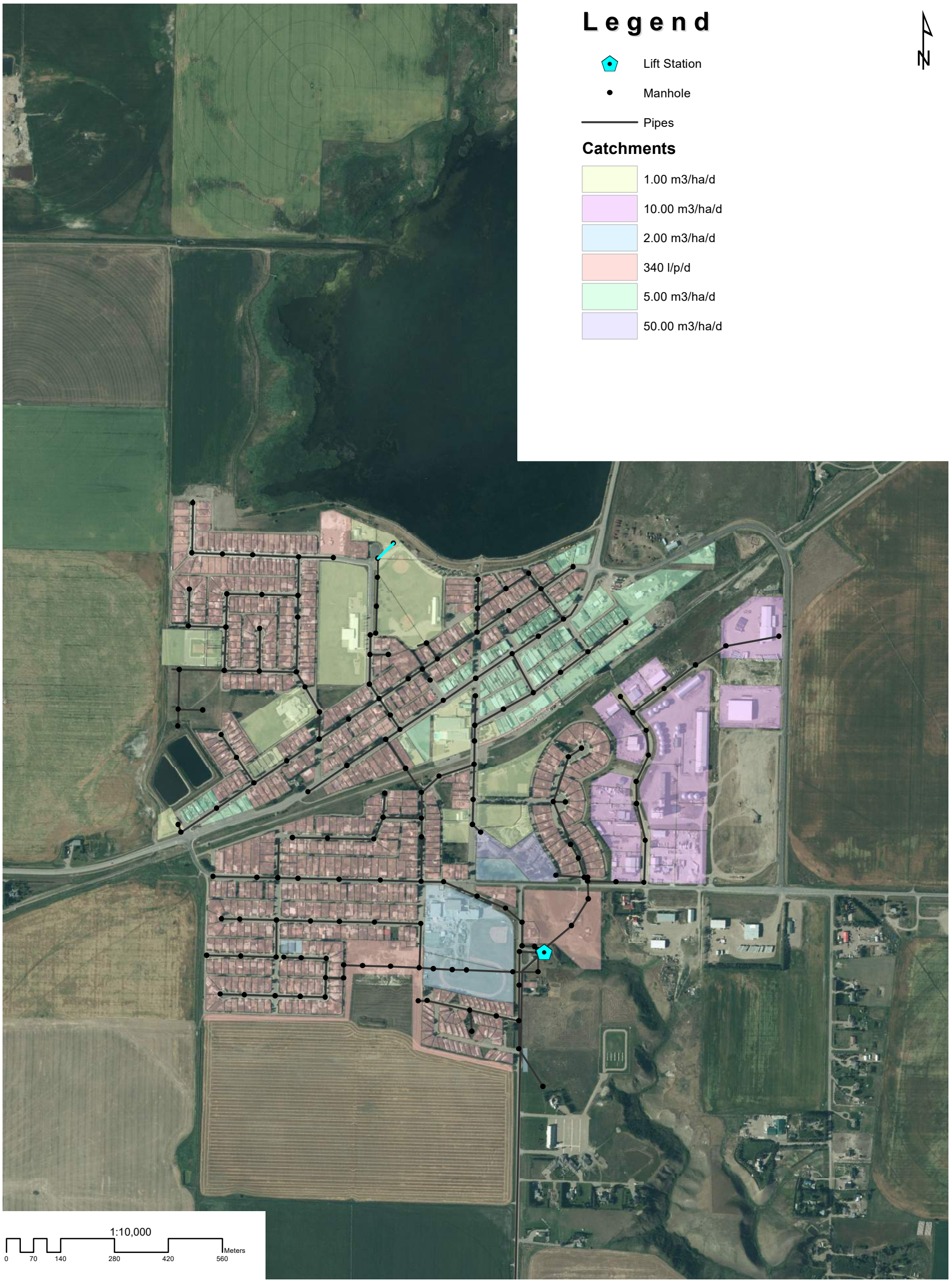
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DRY WEATHER FLOW CALIBRATION FM 3

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FIGURE 5.15



TOWN OF PICTURE BUTTE
INFRASTRUCTURE ASSESSMENT

SANITARY COLLECTION SYSTEM
EXISTING CATCHMENTS

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Wet Weather Model

After completion of dry weather flow calibration, inflow/infiltration (I-I) to the sanitary sewer system during wet weather events needed to be added. 0.28 L/s/ha was assumed as per Alberta Standards and Guidelines for Municipal Waterworks, Wastewater and Storm Drainage Systems (March 2013). This is considered conservative. Under this scenario, the model is set-up and run for a constant 0.28L/s/ha I-I rate on top of the existing dry weather flows. In this fashion, system utilization can be determined by taking the defined peak dry weather flow plus 0.28L/s/ha of I-I divided by the sewer capacity. This was done due to the fact that observed wet weather flow rates were well below this standard, plus there was limited good quality data. Accordingly, this conservative analysis approach was selected.

Site	Area (ha)	Peak DWF (L/s)	Peak WWF (L/s)	Difference (L/s)	I-I Rate (L/s/ha)
FM 1	33.39	4.90	12.88	7.98	0.239
FM 2	70.62	9.99	33.04	23.05	0.326
FM 3	8.31	3.90	22.59	18.69	2.249

5.3 System Analysis

5.3.1 Gravity Network

The performance of the existing network was assessed in terms of two relationships as follows:

- **Peak Hydraulic Grade Line (HGL) Elevation Relative to the Ground** – the amount of freeboard between the maximum water elevation and ground elevation at each manhole at the moment when maximum flow passes through. Hence, the Peak HGL Elevation Relative to the Ground with a value of:
  - Greater than 0.00 m is denoted as a red dot – indicating a surcharge/back-up to surface;
  - Between -2.50 m and 0.00 m is denoted as an orange dot – maximum HGL peaks within 2.5 m below the ground indicating possible basement back-ups;
  - Between -3.50 m and -2.50 m is denoted as a yellow dot – maximum HGL peaks within 2.5m and 3.5 m below the ground indicating no basement back-ups but possibly elevated HGL;
  - Less than -3.50 m is denoted as a green dot – maximum HGL peaks below 3.5 m below the ground.
- **Peak Discharge Relative to Pipe Capacity** – indicates the ratio peak flow to pipe capacity in wet weather conditions; as a corollary to this, the data can be interpreted to indicate the amount of spare capacity during peak flows. This is calculated by taking a ratio of a modelled flow in a pipe and its corresponding capacity. Pipes with ratios higher than one are considered to have no spare capacity, thus indicating a section of trunk that might require upgrading, particularly where the length of the section is long enough to cause surcharge conditions immediately in the upstream reach. Hence, the Peak Discharge Relative to Pipe Capacity with a ratio of:
  - Greater than 1.00 is denoted as a red line – no spare capacity;
  - Between 0.86 and 1.00 is denoted as an orange line – less than 14% of spare capacity available;
  - Less than 0.86 is denoted as a green line – spare capacity available.

Both relationships should be looked at in conjunction to pinpoint any potential capacity deficiencies in the system. For example:

- **The Peak HGL Elevation relative to the Ground** with a value that is between -2.50 m and 0.00 m (an orange dot) may indicate a location with a possible basement backup, however the **Peak Discharge Relative to Pipe Capacity** ratio at the same location could have a value of less than 0.86 (a green line) indicating the pipe is not surcharged. This could suggest a relatively shallow sewer. An exception to this rule are sewer trunks immediately upstream of both lift stations and siphons, where a possible backup could occur due to inadequate capacity of the lift station or siphon.

- Please note that the ratio of **Peak Discharge Relative to Pipe Capacity** for both forcemains and siphons is always above 1.0 as these operate under pressurized conditions by nature, and thus should not be of any concern.

In addition to these two scenarios, the **Spare Capacity** of each pipe was determined. This indicates the amount of additional flow each pipe can handle before it becomes completely utilized. The amount of **Spare Capacity** ranges from less than 0 L/s to over 100 L/s, with the least capacity illustrated in red and the most capacity illustrated in green. In determining the spare capacity, it becomes evident which pipes are available to handle any future development, and which pipes should remain untouched.

The results of the above scenarios are illustrated in Figures 5.16 to 5.18.

5.3.2 Forcemains

The performance of the forcemain was assessed in terms of its velocity. Velocities should be between 1.0 m/s and 2.0 m/s. A new design should aim for 1.5 m/s.

FIGURE 5.16



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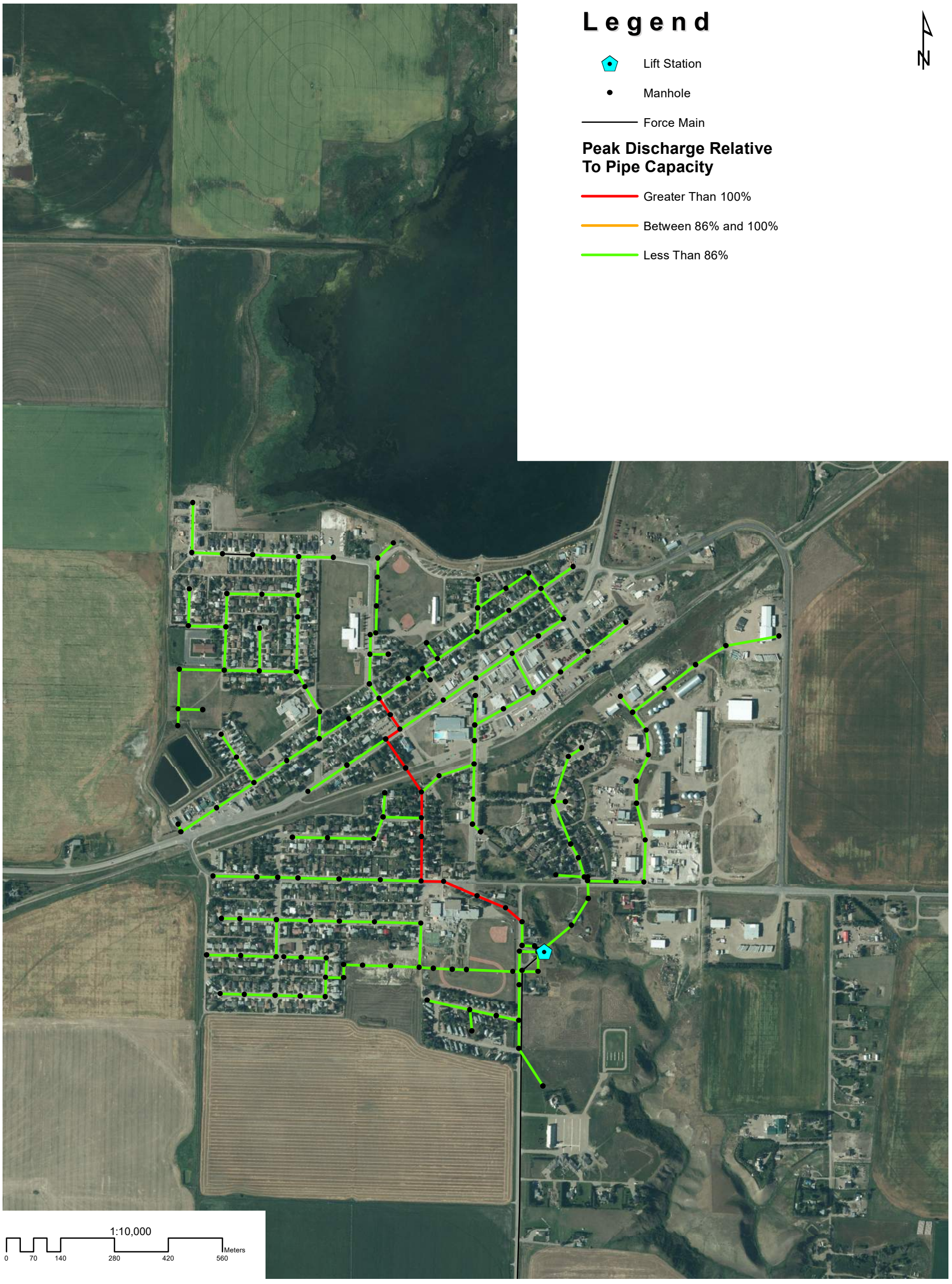
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TOWN OF PICTURE BUTTE
INFRASTRUCTURE ASSESSMENT

SANITARY COLLECTION SYSTEM
MAXIMUM ELEVATION RELATIVE TO GROUND
EXISTING CONDITIONS

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FIGURE 5.17



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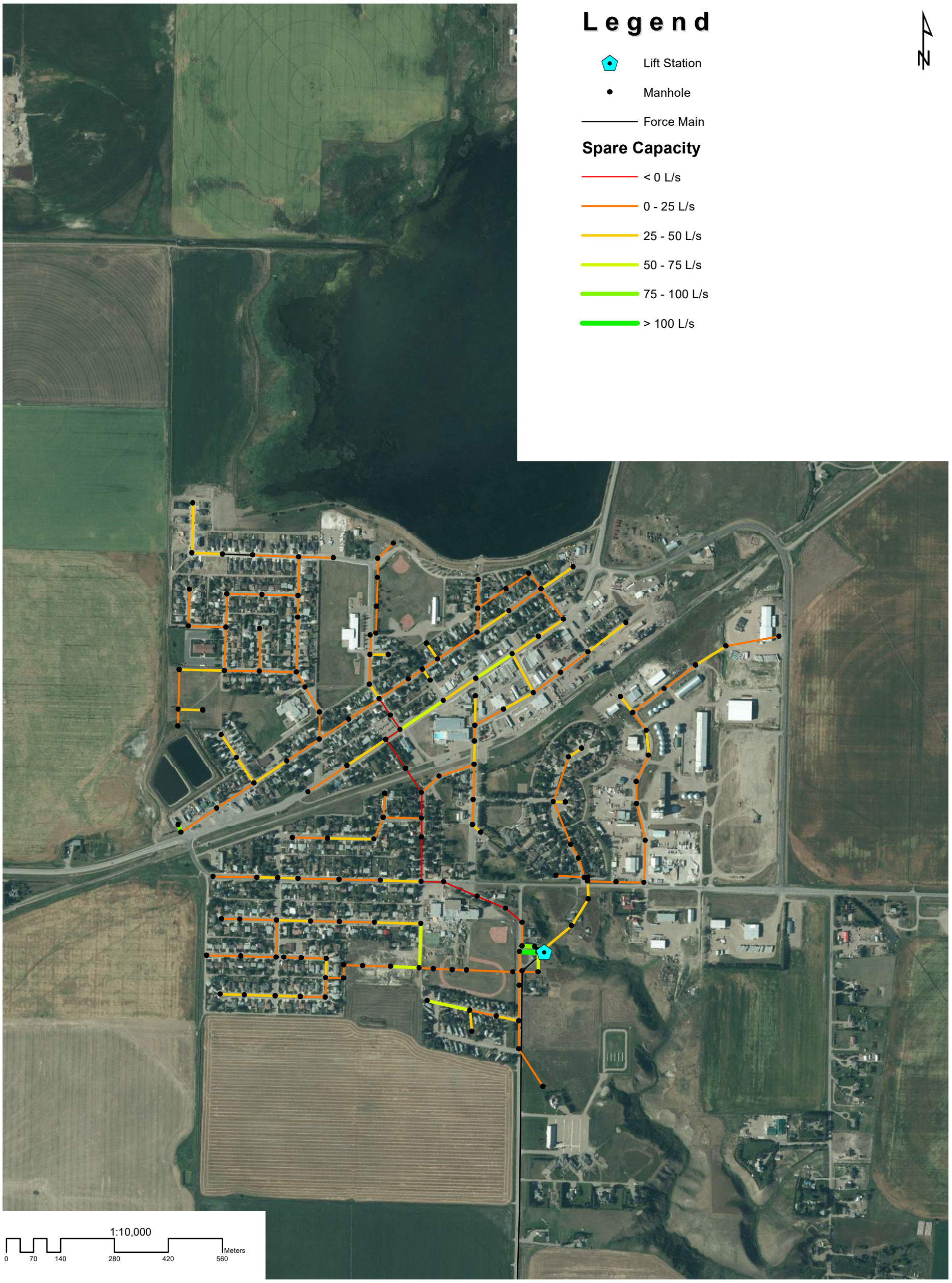
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TOWN OF PICTURE BUTTE
INFRASTRUCTURE ASSESSMENT

SANITARY COLLECTION SYSTEM
PEAK DISCHARGE RELATIVE TO PIPE CAPACITY
EXISTING CONDITIONS

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FIGURE 5.18



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TOWN OF PICTURE BUTTE
INFRASTRUCTURE ASSESSMENT

SANITARY COLLECTION SYSTEM
SPARE CAPACITY
EXISTING CONDITIONS

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5.4 Existing Model Assessment

5.4.1 Gravity System

The results of the existing model are illustrated in Figures 5.16 to 5.18 for maximum HGL, peak discharge relative to pipe capacity and spare capacity, respectively. One area of concern is the main between Crescent Ave and 6th St N and the lift station. Data indicates this section is 200 mm, however it receives significant flow contributions. Results show this constriction is resulting in elevated grade line levels within the main section and in upstream areas.

5.4.2 Pressurized System

The typical peak modelled velocity is 1.65 m/s, which is within the preferred 1.0 m/s to 2.0 m/s range. This indicates the forcemains are acceptable.

5.4.3 Pumps

Model results do not indicate backing up within the system, and the pump capacity seems acceptable.

5.4.4 Recommended Existing System Upgrades

On the basis of the existing system assessment, upgrades to rectify areas of concern were developed. Figure 5.19 shows the identified upgrades. It consists of upsizing the main running from the north to the lift station to a 300 mm diameter. Costs for this upgrade are estimated at $1,489,000. Details are provided in Appendix F.

Note that some of the pipes that are recommended for upgrading due to capacity issues are also categorized as being recommended for replacement due to pipe condition.

Importance of Implementing a Regular Maintenance Plan

The Town's sanitary system is one of the Town's most valuable assets, as such we would strongly recommend that a regular pipe flushing plan be implemented. Without on-going preventative maintenance, such as flushing, tree root cutting and mineral/grease cutting sanitary systems collect debris causing potential backups. Preventative maintenance is performed to improve and extend the service life of the system. The strategy of maintenance plan is to prevent debris build-up, emergency repairs and save money long-term. We would recommend that the Town set up a regular flushing maintenance plan that would begin in 5 years, as the entire system was flushed this year as part of our assessment in 2016. The plan would start with the older/most critical sections of Town first in year five (2022), and continue each year after.

FIGURE 5.19



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TOWN OF PICTURE BUTTE
INFRASTRUCTURE ASSESSMENT

SANITARY COLLECTION SYSTEM
EXISTING SYSTEM RECOMMENDED UPGRADES

ISL Engineering and Land Services

5.5 Future Model Assessment

5.5.1 Future Servicing Concepts

There are a number of possible future servicing concepts for the Town. It is not possible to cover them in complete detail given that some represent a major paradigm shift for the Town that would require extensive discussion to proceed with it. That said, the following sections detail a number of servicing options.

Before determining any of the servicing concepts that are essential to accommodate growth in the Town's annexed areas, it was necessary to locate any potential tie-in points to the existing system. In total, seventeen possible tie-in locations were determined, and are shown in Figure 5.20.

Most of these tie-ins are the only logical tie-in location. Tie-In 1 was selected instead of one further south due to being further below surface and having more spare capacity. The large catchment to the south was tied to 13 instead of a manhole further north due to elevation differences. These tie-ins locations are estimated, and may vary depending on exact development location.

FIGURE 5.20



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TOWN OF PICTURE BUTTE
INFRASTRUCTURE ASSESSMENT

SANITARY COLLECTION SYSTEM
FUTURE CATCHMENTS

ISL Engineering and Land Services

5.5.2 Gravity System

The results of the future model are illustrated in Figures 5.21 to 5.23 for maximum HGL, peak discharge relative to pipe capacity and spare capacity, respectively.

One area of concern is the main between Crescent Ave and 6th St N and the lift station. While this section was recommended to be upgraded to 300 mm to handle existing flows, with the addition of future flows 300 mm would still be too small and 375 mm is recommended. Results show this constriction is resulting in high water levels within the main section and in upstream areas.

Another area of concern is from Maple Estates and 3A St S to the crossing under 3A St S. This would be due to the additional development to the south. If different tie-in locations are selected for these new developments, this concern could be eliminated, however that would involve discussions with the developer.

5.5.3 Pressurized System

The typical peak modelled velocity is 1.72 m/s, which is within the preferred 1.0 m/s to 2.0 m/s range. This indicates the forcemains are acceptable.

5.5.4 Pumps

Model results do not indicate backing up within the system, and the pump capacity seems acceptable.

FIGURE 5.21



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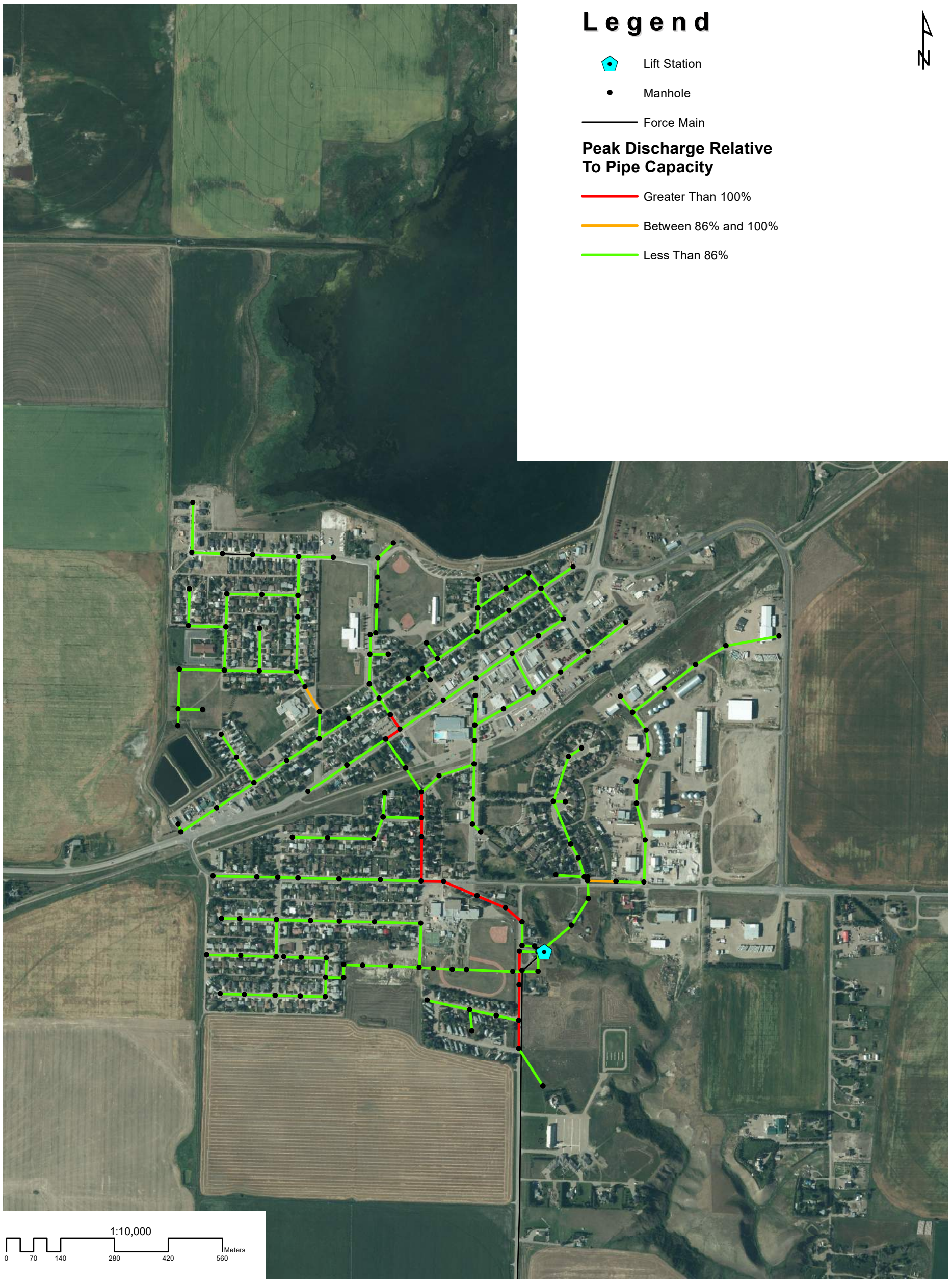
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TOWN OF PICTURE BUTTE
INFRASTRUCTURE ASSESSMENT

SANITARY COLLECTION SYSTEM
MAXIMUM ELEVATION RELATIVE TO GROUND
FUTURE CONDITIONS

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FIGURE 5.22



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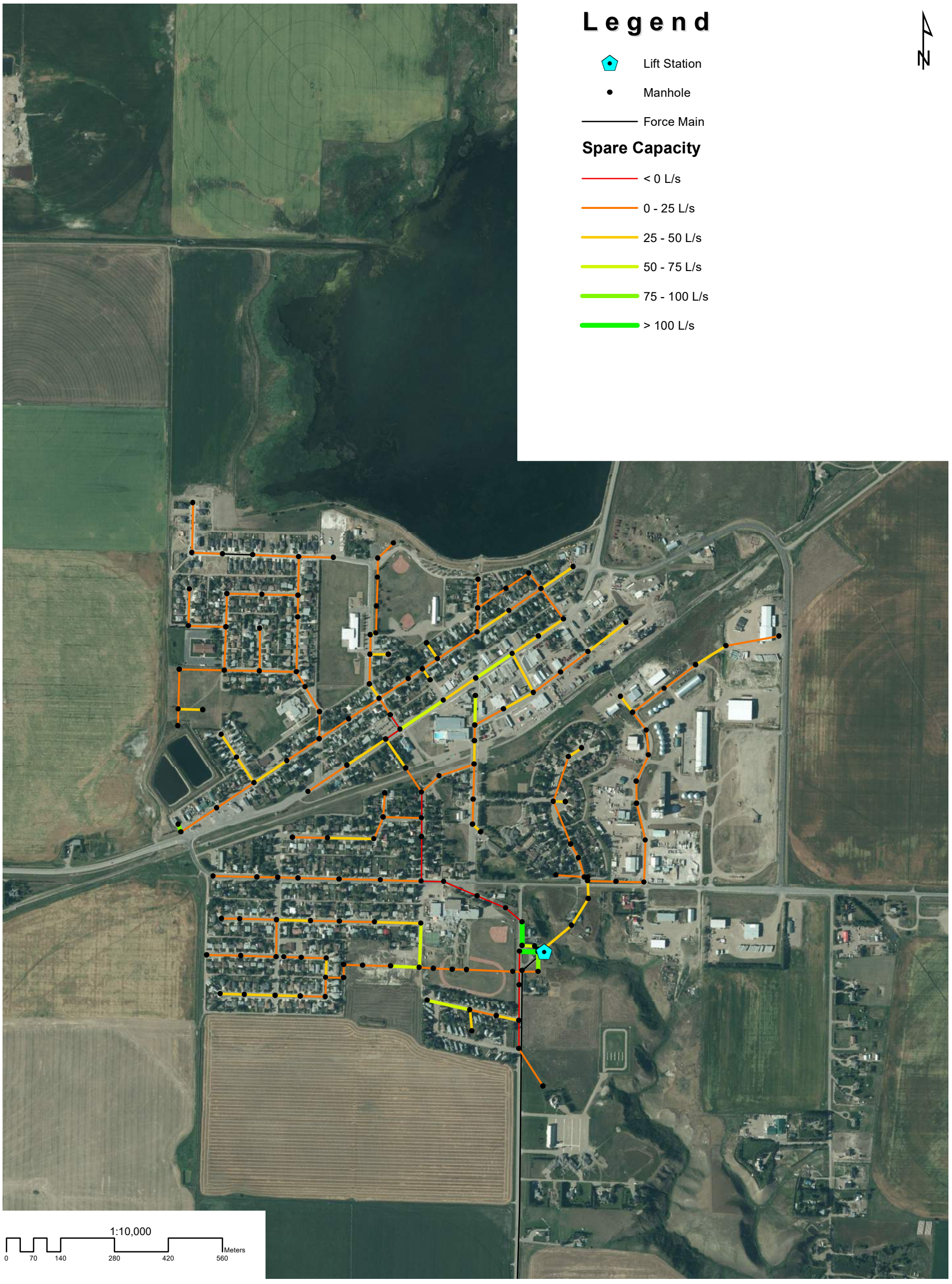
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TOWN OF PICTURE BUTTE
INFRASTRUCTURE ASSESSMENT

SANITARY COLLECTION SYSTEM
PEAK DISCHARGE RELATIVE TO PIPE CAPACITY
FUTURE CONDITIONS

ISL Engineering and Land Services

FIGURE 5.23



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TOWN OF PICTURE BUTTE
INFRASTRUCTURE ASSESSMENT

SANITARY COLLECTION SYSTEM
SPARE CAPACITY
FUTURE CONDITIONS

ISL Engineering and Land Services

5.5.5 Recommended Future System Upgrades

On the basis of the future system assessment, upgrades to rectify areas of concern were developed. Figure 5.24 shows the identified upgrades.

One upgrade consists of upsizing the main running from the north to the lift station to a 375 mm diameter. Costs for this upgrade would be estimated at $1,557,000. However, it should be noted that this area also requires upgrading under the existing system evaluation. It would be recommended that any upgrades take this section directly to 375 mm.

The other upgrade is to the south and involves increasing the diameter to 250 mm. This is estimated at $393,000. Alternatively, the expected south developments could be tied in to a different location, multiple locations or with entirely new construction, depending on the exact development locations.

Details are provided in Appendix F. Note that some of the pipes that are recommended for upgrading due to capacity issues are also categorized as being recommended for replacement due to pipe condition.

FIGURE 5.24



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TOWN OF PICTURE BUTTE
INFRASTRUCTURE ASSESSMENT

SANITARY COLLECTION SYSTEM
EXISTING SYSTEM RECOMMENDED UPGRADES

ISL Engineering and Land Services

6.0 Stormwater Drainage System

6.1 Existing System

The stormwater runoff within the Town of Picture Butte is conveyed entirely to Piyami Coulee located in the southeast quadrant of the Town. Runoff from the northwest and southwest quadrants is generally conveyed southeast; whereas, the northeast quadrant of the Town slopes to the southwest.

The Town's stormwater system consists of both minor and major drainage system. The minor system comprises of piped system operating under gravity conditions, while the major system consists of an overland conveyance features in a form of ditches and swales. The existing curb and gutter system as well as culverts form an interface between both piped and overland infrastructure, thus can be considered a part of both systems. Additionally, some overland drainage occurs primarily in undeveloped areas around the Town as well as parks and other recreational grassed areas within the Town boundary.

The piped drainage system includes storm sewers and culverts, with manhole connections and catchbasin flows. The curb and gutter system, as well as the ditch/swale drainage, make up the surface drainage infrastructure. These features convey stormwater to either downstream catchbasins and subsequently into the existing pipe network or directly to the coulee.

The existing drainage system has only two stormwater management facilities (SWMF) consisting of dry ponds that are located in the northeast corner of the intersection of 4th Street S and Rogers Avenue S and south of Dorothy Dalgliesh School. As a result, only a portion of the runoff is attenuated as it is conveyed through the Town, via piped and overland systems, to be ultimately discharged to the Piyami Coulee with virtually no stormwater treatment provided. There is a proposed retention pond as part of the Sunset Park Subdivision.

The gravity system consists of multiple localized minor systems, each of which having their own outfalls to Piyami Coulee. The pipe networks are comprised of a variety of materials and diameters. Sizes range between 50 mm and 900 mm pipes with the most predominant pipe materials being concrete and PVC. Pipe diameters and pipe materials are shown in Figure 6.1 and Figure 6.2 respectively. A summary of pipe lengths with respect to pipe diameter and pipe material is found in Table 6.1 below.

Table 6.1: Town of Picture Butte Stormwater System Statistics

Diameter (mm)	Total Length (m)	Material	Total Length (m)
75	10	Concrete (CON)	1,106
100	3	Reinforced Concrete (RCP)	3,384
150	58	Polyvinyl Chloride (PVC)	2,068
200	676	Corrugated Steel (CSP)	702
250	783	Steel (SP)	100
300	1,448	Unknown	941
350	100		
375	1,057		
400	74		
450	1,110		
600	1,169		
650	9		
675	314		
750	554		
800	33		
900	506		
Unknown	399		
Total	**8,302**		**8,302**

Note: Where pipe diameter or material information was unavailable, both attributes were considered to match that of the upstream pipe segment.



FIGURE 6.1

Legend

Diameter

- 75 mm
- 100 mm
- 150 mm
- 200 mm
- 250 mm
- 300 mm
- 350 mm
- 375 mm
- 400 mm
- 450 mm
- 600 mm
- 650 mm
- 675 mm
- 750 mm
- 800 mm
- 900 mm
- Unknown
- Ditch
- Culvert
- Drainage Course
- Manhole
- Outfall

1:10,000

0 50 100 200 300 400 Meters

TOWN OF PICTURE BUTTE
INFRASTRUCTURE ASSESSMENT

STORMWATER SYSTEM
EXISTING STORM NETWORK
PIPE DIAMETER

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FIGURE 6.2

Legend

- Manhole
- Outfall
- Drainage Course

Pipe Material

- Concrete (CON)
- Reinforced Concrete (RCP)
- Corrugated Steel (CSP)
- Polyvinyl Chloride (PVC)
- Steel (SP)
- Unknown
- Ditch

1:10,000

0 50 100 200 300 400 Meters

PICTURE BUTTE ALBERTA

TOWN OF PICTURE BUTTE
INFRASTRUCTURE ASSESSMENT

STORMWATER SYSTEM
EXISTING STORM NETWORK
PIPE MATERIAL

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6.2 Hydrologic/Hydraulic Model Development

6.2.1 Model Set-Up

XP-SWMM is a dynamic model capable of unsteady flow simulation that is more accurate than most models; thus it is capable of delivering more realistic conveyance results. XP-SWMM features an enhanced graphical user interface making for easy review of models created and allowing for customized graphical output. The XP Solutions online help system is referenced as the user manual for the software.

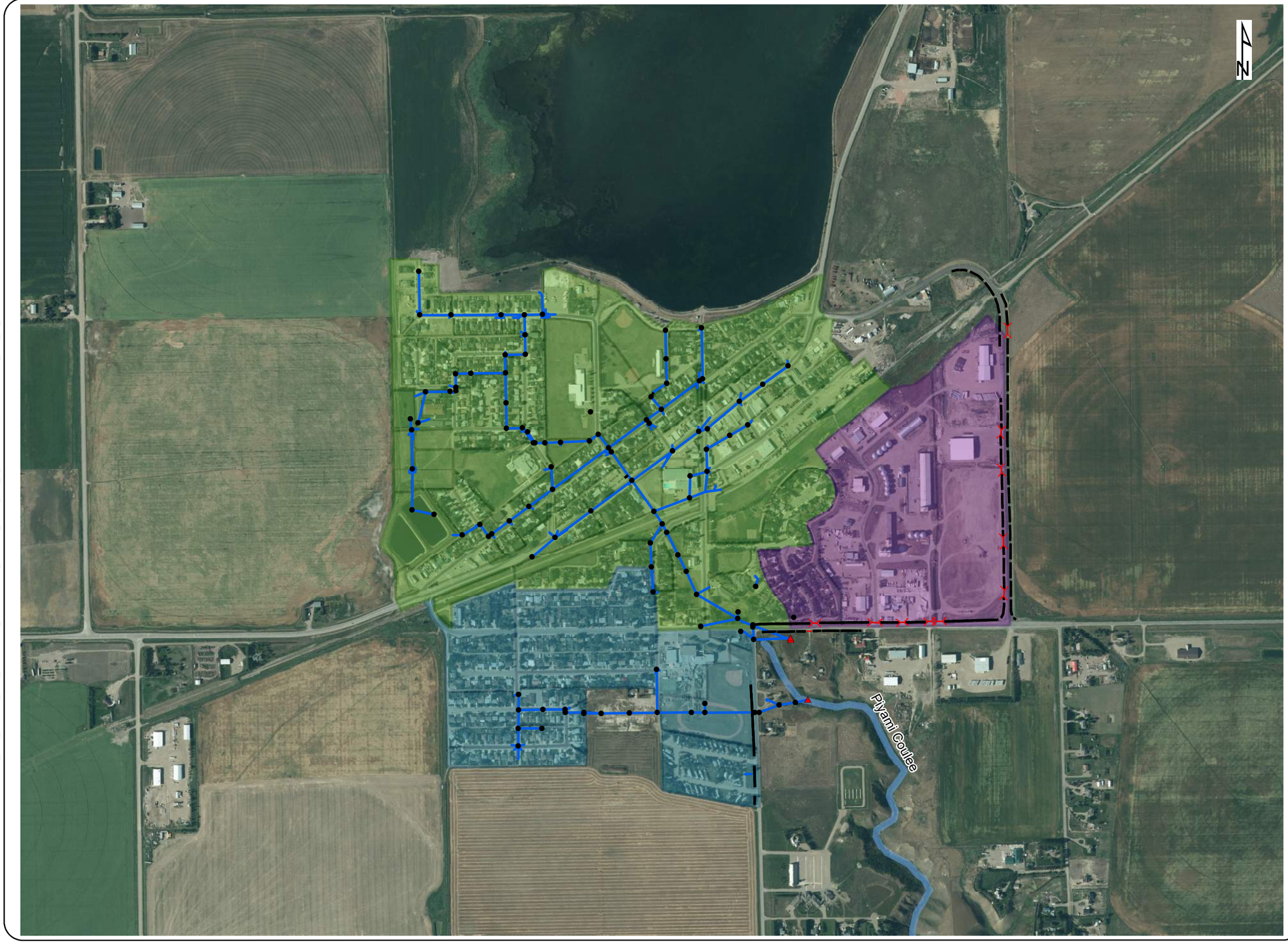
For the hydraulic portion of the model, existing pipe network data was obtained from survey data compiled by ISL and from the existing files provided by the Town, though ISL was advised the Town's data may be inaccurate. This data was used in conjunction with the LiDAR data provided by the Town to complete the model for the existing drainage system in the area. If the pipe data was missing, or if the material was not stated, a value was assumed. Any missing ground or invert elevations were interpolated using pipe length and adjoining invert levels.

Many individual features were excluded from the model. These features predominantly consisted of smaller culverts that did not influence a majority of the pipe network, i.e. drained almost directly to a watercourse. Ditches were included in situations where the ditch would lead to a pipe network, resulting in an additional flow to that portion of the model. Ditch cross-sections were generated using LiDAR data wherever possible and approximated when surface data could not be utilized for this purpose.

Stormwater catchments were delineated using the LiDAR data and the locations of existing manholes. Flow boundaries were created from the high points to each manhole in the Town. It should be noted that it was assumed that the catchments drain directly to the manholes, when in actuality they would be draining to the nearest catchbasins; this represents a conservative approach which is a typical industry best practice. The exception to this is if there are manholes with grated tops, which allows rainfall directly into the pipe network. Figure 6.3 depicts the existing overall catchments that were delineated.

The hydraulic design criteria, runoff parameters, catchment areas and imperviousness and the hydraulic model were combined to develop a full stormwater drainage system model. Details associated with the XP-SWMM simulations contained herein are described in subsequent sections of this report. The associated XP-SWMM model parameters as well as input and output data are provided in Appendix G and Appendix H respectively.

FIGURE 6.3



Legend

- Manhole
- Outfall
- Stormwater Pipe
- Ditch
- Culvert
- Drainage Course
- North Catchment
- East Catchment
- Southwest Catchment

1:10,000

0 50 100 200 300 400 Meters

PICTURE BUTTE ALBERTA

TOWN OF PICTURE BUTTE
INFRASTRUCTURE ASSESSMENT

STORMWATER SYSTEM
EXISTING CATCHMENTS

ISL Engineering and Land Services

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6.2.2 Design Criteria

The design criteria used to assess the stormwater system was based on a variety of sources including the 2016 City of Lethbridge Design Standards and 2009 County of Lethbridge Engineering Guidelines & Minimum Servicing Standards as well as other values typically used in Alberta. These guidelines were utilized based on the context that Lethbridge is the closest major city to Picture Butte.

The hydrologic data used is as follows:

- Hydrologic parameters

Table 6.2: Hydrologic Parameters

Hydrologic Parameters		Value
Depression Storage	Impervious Areas	2.16 mm
	Pervious Areas	1.08 mm
Manning's 'n'	Impervious Areas	0.013
	Pervious Areas	0.15
Green Ampt Infiltration	Average Capillary Suction	292.2 mm
	Initial Moisture Deficit	0.25
	Saturated Hydraulic Conductivity	0.5 mm/hr

Note: These values were obtained from City of Lethbridge Design Standards.

- Percent impervious values used for various types of land uses.

Table 6.3: Percent Impervious Values

Land Use	Imperviousness (%)
Parks/Cemeteries	7
Playgrounds	13
Gravel Road	15
Low Density/Country Residential	25**
Schools	50
Residential	55
Urban Residential	60
Commercial	85
Industrial	90

Note: These values were obtained from the City of Lethbridge Design Standards.
**The percent impervious value for Low Density/Country Residential areas, though not obtained from the City of Lethbridge Design Standards, has been utilized by ISL on similar projects in Alberta.

- Ground slopes as obtained from topographic data with a minimum value of 1%.
- Widths and areas generated from the catchments.
- A pre-development runoff rate of 1.16 L/s/ha was used as this release rate has been determined as part of a Lethbridge area project previously completed by ISL in 2009. Details pertaining to this analysis are presented in Appendix I.

6.2.3 Design Rainfall Event

In assessing the storm drainage system in the area, a design rainfall event is required in order to generate runoff that will subsequently enter the network. The City of Lethbridge Design Standards state that the minor (piped) storm sewer system is to be designed for a storm of 1:5 year return period. Additionally, the major storm system is to be designed for a storm of 1:100 year return period. These return periods are consistent with many other municipalities for the respective systems; therefore, they will be utilized in assessing the stormwater system. The storms are set in five-minute time steps, with the peak intensity set to the five-minute duration for the selected storm return period.

The 1:5 year storm is a four- hour Chicago rainfall distribution. This storm tests the stormwater drainage system's capability of accommodating short duration, high intensity storm events – it is typically a critical event to review the minor drainage system. The 1:100 year storm is a twenty-four hour Chicago rainfall distribution.

Due to the age of the stormwater infrastructure in the Town, it is possible that the system was designed prior to the 1:5 year minor system guideline. It was common to design stormwater systems with a smaller event, such as a 1:2 year return period or a 1:1 year return period storm; therefore, this should be considered when evaluating results. In fact, the Lethbridge County standards stipulate a design storm with 1:2 year return period to be used when sizing a piped system.

Derivation of the Chicago distribution is dependent on Lethbridge's IDF parameters. Table 6.4 below summarizes the 'a', 'b', and 'c' parameters necessary to produce the curves. Table 6.5 notes the rainfall intensities at a time of concentration of five minutes and the total volume of rainfall over the duration of the design storm.

Table 6.4: Lethbridge IDF Parameter Values

Parameter	1:5 Year Storm	1:100 Year Storm
a	440.7	1019.2
b	0.000	0.000
c	0.696	0.731

Table 6.5: Rainfall Values

Storm Return Period	Rainfall Intensity (mm/hr)	Rainfall Depth (mm)
1:5 Year Storm	143.76	39.01
1:100 Year Storm	314.28	120.06

Note: Intensity values were taken at a time of concentration of 5 minutes and rainfall volume is the total volume over the duration of the design storm.

6.3 System Analysis

6.3.1 Hydraulic Analysis of Existing Storm Drainage System

To assess the capacity of the Town's existing storm drainage system, the hydraulic model was run using the rainfall events mentioned above. In assessing the stormwater network, two parameters were considered. The first is the resulting maximum water level (i.e. hydraulic grade line (HGL) relative to the manhole rim elevation, colour coded to three different levels. The green nodes represent areas where the depths are considered acceptable, the yellow represents water levels that are within 0.3 m of ground level, and the red

nodes indicate manholes that experience surface flooding. The second parameter is pipe utilization, representing the percentage of the pipe capacity being occupied by stormwater flow as the peak flow is conveyed through the piped system. Pipes that are green are underutilized, while red pipes are flowing at full capacity and surcharging. Surcharging above ground level indicates a relatively high risk of surface flooding due to inadequate capacity in the storm sewer system. For ditch drainage systems, surcharging above ground level means that the ditch has overtopped its banks.

This model has been simulated based on the premise that the inlet capacity (catchbasin capacity) is not a limiting factor in the system, and that all catchment flows reach the storm sewers. Although this is generally not the case, the focus for this analysis is to address the capabilities of the storm sewer performance, not the overland system or stormwater capture. This approach is considered conservative and follows stormwater best practices for assessing the performance of the piped drainage system at a Master Planning level.

6.4 Existing Model Assessment

6.4.1 1:5 Year Event Result Summary

The results of the 1:5 year 4-hour Chicago distribution assessment are shown in Figure 6.4. Model results indicate that a large portion of the Town experiences surface flooding under this event based on pipe capacity. The majority of the Town also shows flows exceeding the pipe capacity. It is noted that the Town has highlighted only two specific areas of surface flooding problems with the stormwater drainage system. These locations are at the intersection of 6th Street N and Crescent Avenue as well as at Highway 519 just northeast of Highway 843. The minimal flooding issues noted suggest that while the piped drainage system is generally inadequate for a 1:5 year event, the overland drainage system in the Town is effective, and manages overland flow effectively. Please keep in mind that the existing system could have been originally designed to meet a lower level of service. Hence, these results are meant to be used as a guidance to indicate which sections of the system would need replacement, should the Town decide to upgrade the existing system to currently accepted standards (by a number of major municipalities in Alberta) at some point in the future.

6.4.2 1:100 Year Event Result Summary

The results of the 1:100 year Chicago distribution assessment are shown in Figure 6.5. The model indicates that the majority of the Town continues to experience flows exceeding pipe capacities under this event, and significant surcharging resulting in surface flooding in many cases. These results are not unexpected from a 1:100 year 24-hour return period event, as the overland system is expected to be utilized; this event is more typically used to evaluate stormwater management facilities.

6.4.3 Recommended Existing System Upgrades

The overland system within the Town of Picture Butte tends to drain adequately toward Piyami Coulee. Though the models have highlighted numerous areas where issues are likely to occur, the Town has noted minimal concerns regarding their existing stormwater system. For this reason, upgrades to the existing system will focus on alleviating the pressure of surface flooding due to high flow rates in the two areas of primary concern as well as other localized areas throughout the Town experiencing notable capacity issues or suggested flooding based on model results.

Reducing the flooding issues at the intersection of 6th Street N and Crescent Avenue may be accomplished by relocating the four existing catchbasins to low points in the intersection where surface flooding is most likely to occur. By grading the area around the catchbasins to form a trap low, surface water can be temporarily stored until a point in which it can be captured by the inlets. Additional regrading of the roadway along Crescent Avenue may be required to ensure flows from both sides of 6th Street N reach these catchbasins as a number of pavement issues may be impacting flooding in this area as well. Additional

storage at the existing dry pond located south of Doroth Dalgliesh School is recommended to accommodate the pipe capacity issues highlighted at this intersection as well. These options will not solve the issues the Town is currently experiencing entirely, but will aide in mitigating the problem.

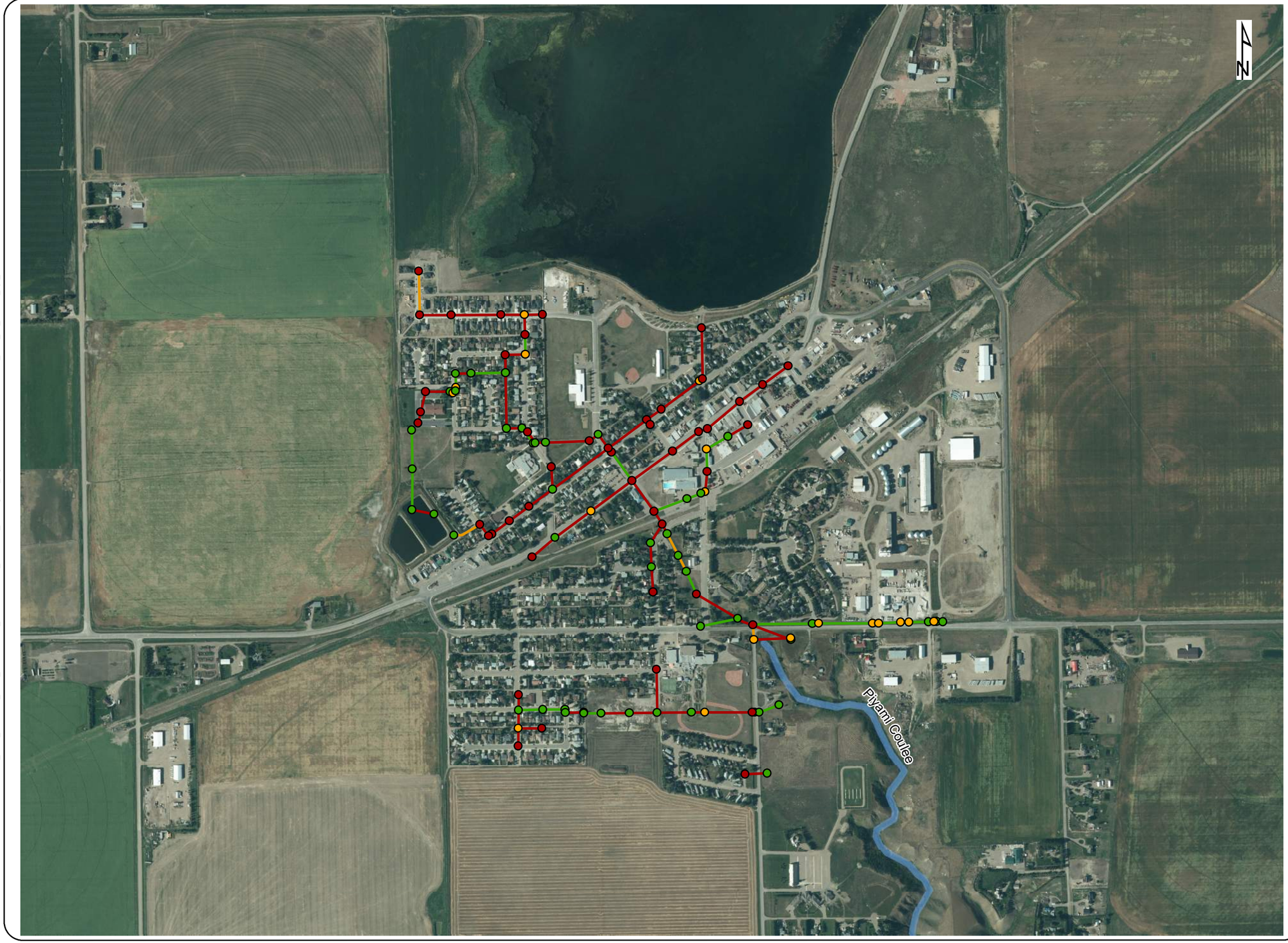
To reduce the flooding issues at Highway 519 just northeast of Highway 843, it may be necessary to increase the storage capacity of the existing dry pond directly across from Highway 843 on the north side of Highway 519. It may also be necessary to upsize the pipe running under Highway 519 from the dry pond to Piyami Coulee be upsized to accommodate the additional flows . Further analysis of this area may be required to mitigate this flooding issue.

Based on the condition assessment documents received to date, there are three highlighted pipe sections recommended for future upgrades to the existing system. The sections are as follows:

- Jamieson Avenue from STMHJM001 to SMH4S001A
- 7th Street N from STMHCC004 to STMH7N001C
- 7th Street N from STMH7001 to STMHGB001

Areas noted as experiencing flooding issues as well as those pipes sections with condition issues have been highlighted in Figure 6.6.

FIGURE 6.4



Legend

Maximum HGL Below the Ground

- No Flooding
- Within 0.3m of Surface
- Surface Flooding

Pipe Utilization

- Under 85%
- 85% to100%
- Over 100%

Drainage Course

1:10,000

0 50 100 200 300 400 Meters

PICTURE BUTTE ALBERTA

TOWN OF PICTURE BUTTE
INFRASTRUCTURE ASSESSMENT

STORMWATER SYSTEM
EXISTING ASSESSMENT SYSTEM RESULTS
1:5 YEAR, 4-HOUR DESIGN STORM

ISL Engineering and Land Services

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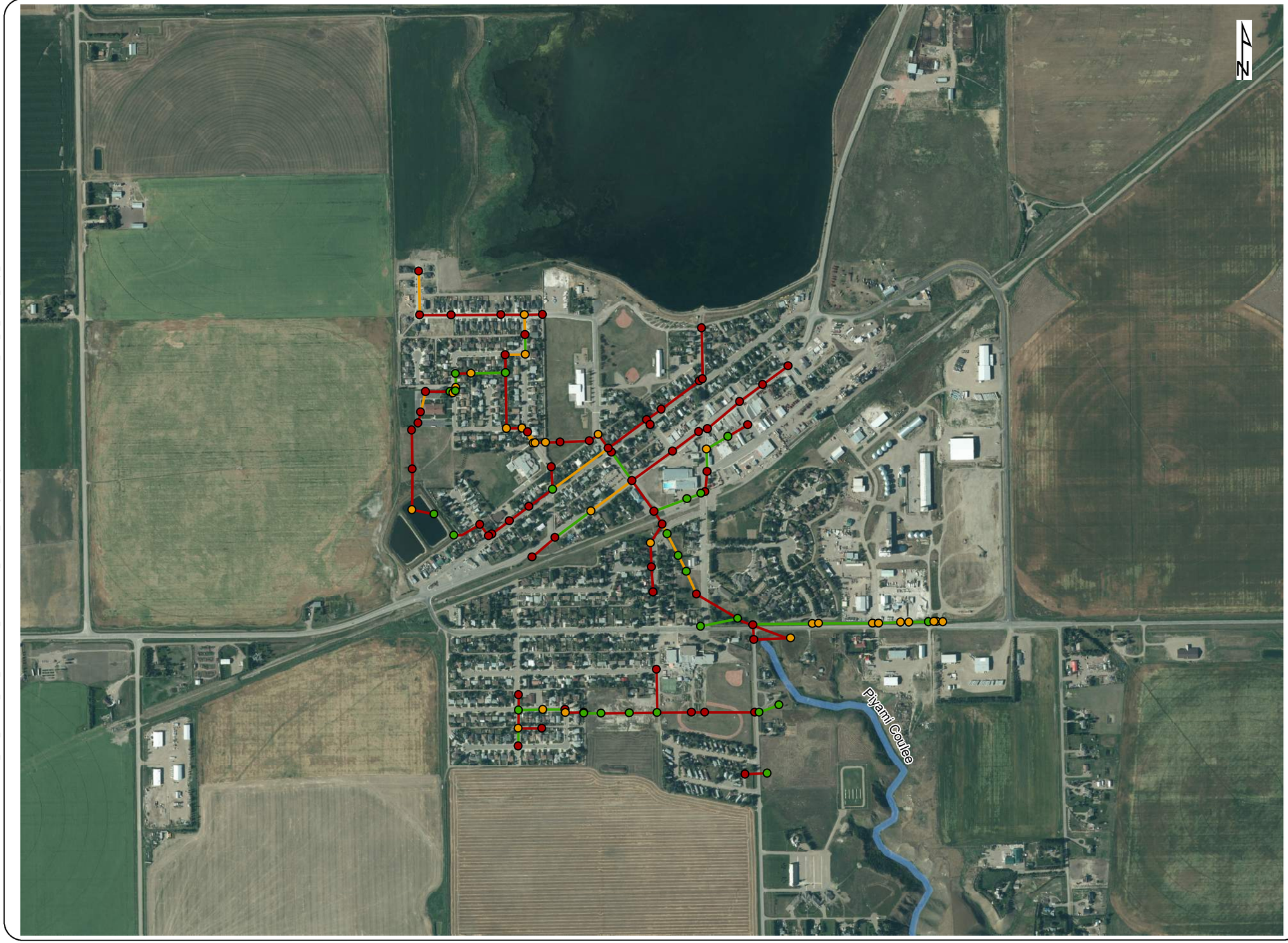


FIGURE 6.5

Legend

Maximum HGL Below the Ground

- No Flooding
- Within 0.3m of Surface
- Surface Flooding

Pipe Utilization

- Under 85%
- 85% to 100%
- Over 100%
- Drainage Course

1:10,000

0 50 100 200 300 400 Meters

PICTURE BUTTE ALBERTA

TOWN OF PICTURE BUTTE
INFRASTRUCTURE ASSESSMENT

STORMWATER SYSTEM
EXISTING ASSESSMENT SYSTEM RESULTS
1:100 YEAR, 24-HOUR DESIGN STORM

ISL Engineering and Land Services

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6.5 Future Development Stormwater System

6.5.1 Future Drainage Patterns

Six zones have been selected as areas for future development growth in the Town of Picture Butte as outlined in Figure 6.7. Within these zones, there is over 90 hectares of undeveloped land at present. In order to develop these sections of land, a stormwater drainage system is required. The drainage system is responsible for collecting and controlling the runoff in these areas, as well as providing some stormwater treatment through the use of stormwater ponds. The best measure to achieve this is by collecting stormwater runoff in major trunk sewers and conveying it to a stormwater pond, where the release rate to the coulee or existing system can be controlled to the determined pre-development release rate of 1.16L/s/ha. Future drainage basins were established, with discharge generally being independent of existing conditions.

The drainage patterns for the future development areas are described below:

- The runoff from the industrial development area along the east boundary of the Town and north of Highway 519 is to be directed to a stormwater management facility (SWMF) or pond prior to discharging to the existing ditch system along the highway.
- The runoff from the residential development area north of the Town and west of the existing reservoir is to be captured by a SWMF prior to discharge to the existing pipe system.
- The runoff from the future Sunset Park Subdivision is to be captured by the proposed pond and discharged to the existing pipe system.
- The remaining residential development areas to the south area to be captured and controlled by a series of SWMFs and directed east toward the coulee.

6.5.2 Future Stormwater Drainage System

A pre-development flow rate of 1.16 L/s/ha was utilized as noted above, in order to determine pre-development flows. Based on this, the future stormwater drainage systems will be designed via the following:

- The minor drainage system, including storm sewers, will be sized for 1:5 year return period events;
- The major system, including ponds, will be sized to control drainage from a 100 year, 24 hour return period, Chicago distribution storm with approximately a 1.5 metre rise from pond bottom to high water level given a dry pond is specified;
- Pond outlet structures will be sized to restrict post-development flows to the 1:100 year pre-development flow rate of 1.16L /s/ha prior to discharge to the coulee.

Based upon this design criteria, trunk storm sewers and ponds were sized for new development areas within the Town of Picture Butte. The conceptual design for the development scenario is outlined in Figure 6.8.

The future stormwater drainage system results of both the 1:5 year 4-hour and 1:100 year 24-hour Chicago distribution assessments are shown in Figure 6.9 and 6.10 respectively.

6.6 Stormwater System Cost Estimates

Cost estimates were prepared for the existing system upgrades as well as future system development. Costs for the conveyance network and the ponds are summarized below in Table 6.6 and Table 6.7 respectively and highlighted in Figure 6.11. More detailed stormwater system cost estimates are included in Appendix J.

Table 6.6: Stormwater Conveyance Network Cost Estimates

	Item	Quantity	Units	Unit Cost	Sub-Total	Engineering (15%)	Contingency (30%)	Total Cost
Along Existing System	300mm Catchbasin Lead	60	m	$420	$25,200	$4,000	$8,000	$37,000
	375mm Sewer	120	m	$480	$57,600	$9,000	$17,000	$84,000
	675mm Sewer	50	m	$800	$40,000	$6,000	$12,000	$58,000
	Single C Catchbasin	4	item	$5,000	$20,000	$3,000	$6,000	$29,000
	Pavement Rehabilitation	230	m	$750	$172,500	$26,000	$52,000	$251,000
				Total:	**$315,300**	**$48,000**	**$95,000**	**$458,000**
Undeveloped Areas	200mm Sewer	30	m	$372	$11,160	$2,000	$3,000	$16,000
	300mm Sewer	1,140	m	$420	$478,800	$72,000	$144,000	$695,000
	750mm Sewer	355	m	$984	$349,320	$52,000	$105,000	$506,000
	Pavement Rehabilitation	185	m	$750	$138,750	$21,000	$42,000	$202,000
	Ladnscape Rehabilitation	1,000	m	$8	$8,000	$1,000	$2,000	$11,000
				Total:	**$986,030**	**$148,000**	**$296,000**	**$1,430,000**
				Grand-Total:	**$1,301,330**	**$196,000**	**$391,000**	**$1,888,000**

Table 6.7: Stormwater Pond Cost Estimates

Pond No.	Stripping, Excavation & Landscaping Cost	Outlet Control Structure	Oil and Grit Separator	Subtotal	Engineering (15%)	Contingency (30%)	Total Cost
1	$189,880	$150,000	$16,500	$356,380	$53,000	$107,000	$516,000
2	$325,574	$150,000		$475,574	$71,000	$143,000	$690,000
3	$69,166	$150,000		$219,166	$33,000	$66,000	$318,000
4	$522,175	$150,000	$100,000	$772,175	$116,000	$232,000	$1,120,000
5	$297,750	$150,000	$100,000	$547,750	$82,000	$164,000	$794,000
Total:	**$1,404,545**	**$750,000**	**$216,500**	**$2,371,045**	**$355,000**	**$712,000**	**$3,438,000**

FIGURE 6.6



Legend

- Manhole
- Outfall

Condition Assessment

- No Noted Issues
- Condition Issues
- Area Surface Flooding Issues

1:10,000

0 50 100 200 300 400 Meters

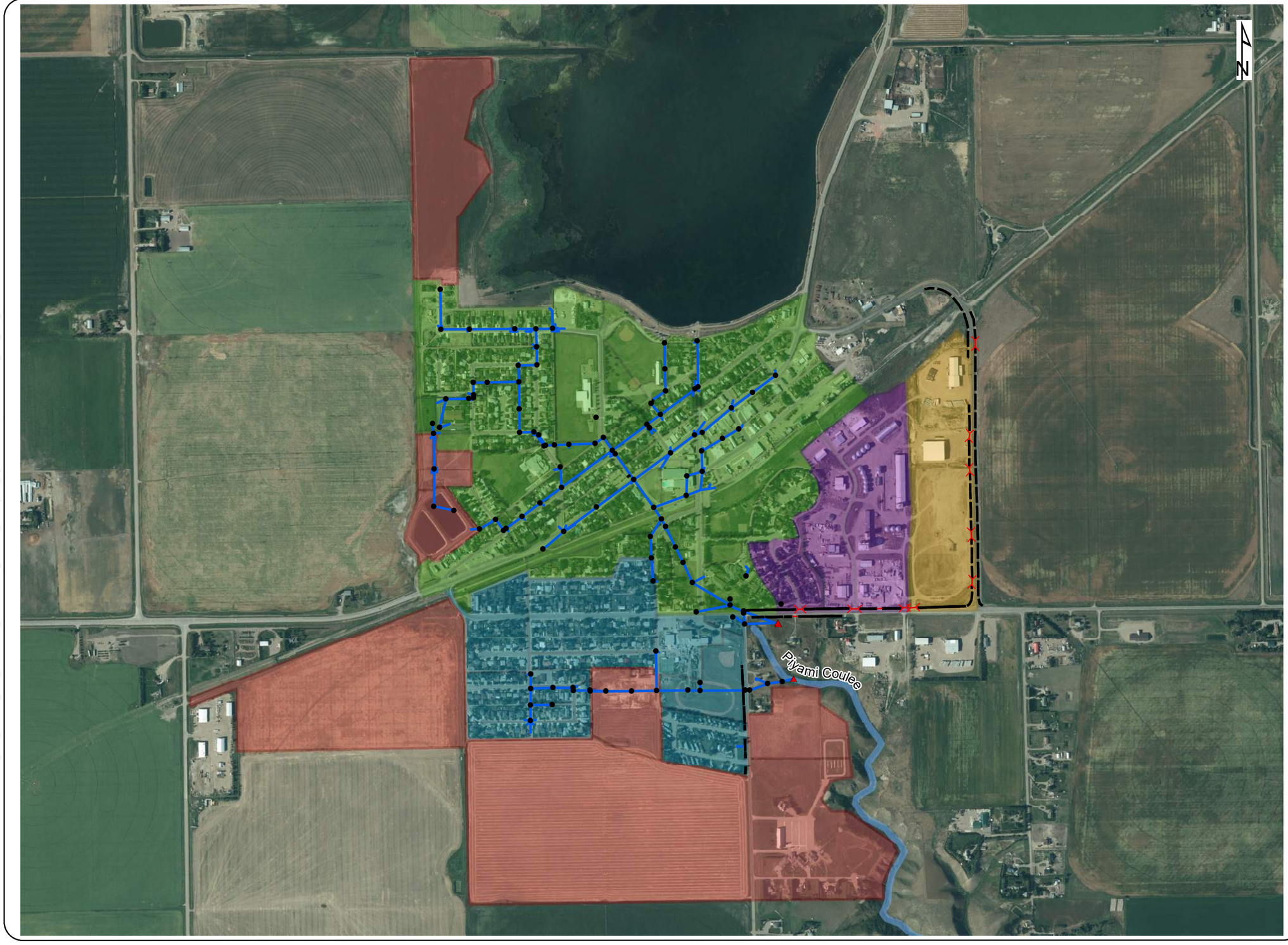
TOWN OF PICTURE BUTTE
INFRASTRUCTURE ASSESSMENT

STORMWATER SYSTEM
CONDITION ASSESSMENT RESULTS

ISL Engineering and Land Services

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FIGURE 6.7



Legend

- Manhole
- Outfall
- Culvert
- Stormwater Pipe
- Ditch
- Drainage Course
- North Catchment
- East Catchment
- Southwest Catchment
- Future Residential Development
- Future Industrial Development

1:11,000

0 55 110 220 330 440 Meters

PICTURE BUTTE ALBERTA

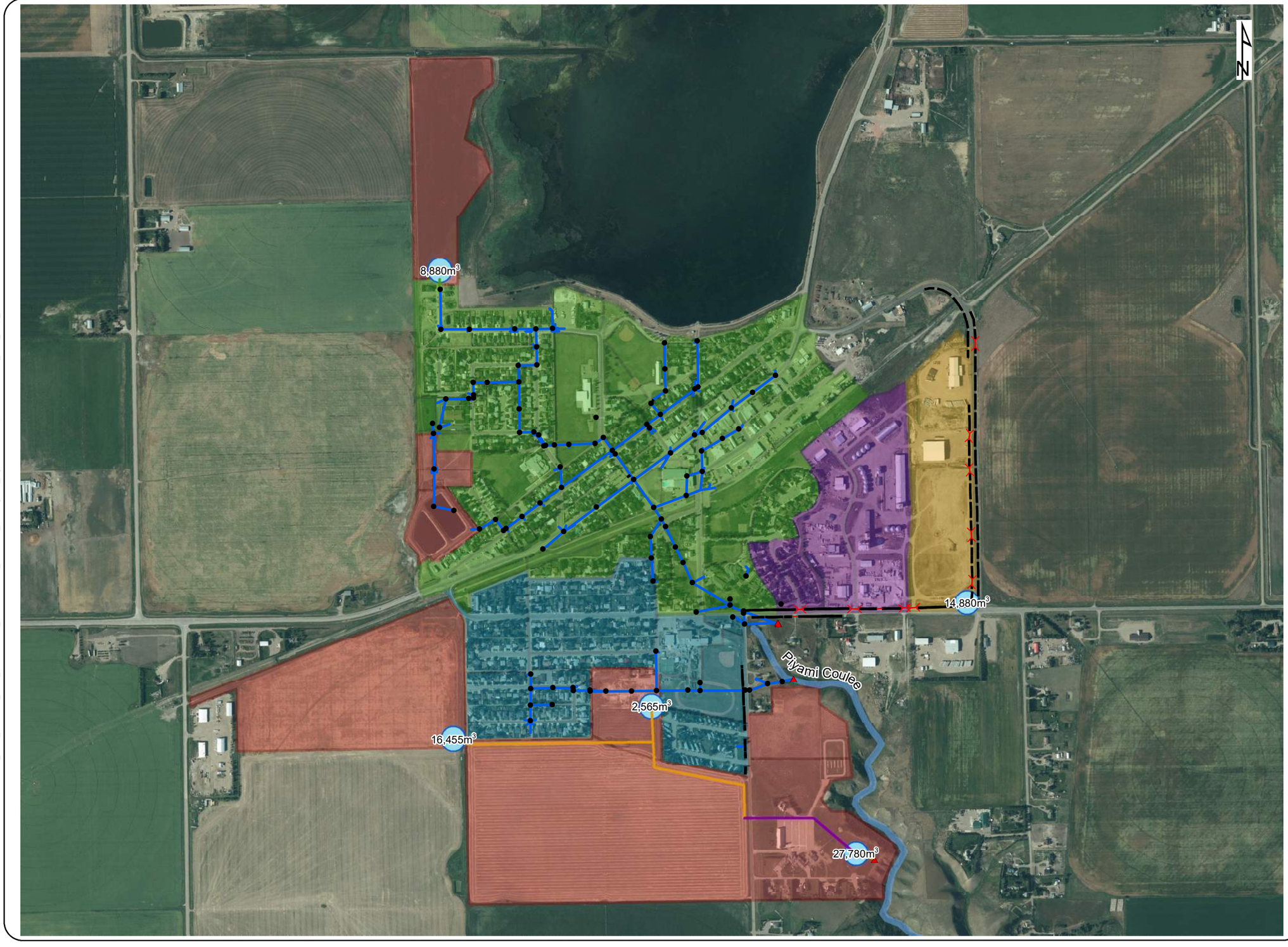
TOWN OF PICTURE BUTTE
INFRASTRUCTURE ASSESSMENT

STORMWATER SYSTEM
PROPOSED CATCHMENTS

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FIGURE 6.8



Legend

- North Catchment
- East Catchment
- Southwest Catchment
- Future Residential Development
- Future Industrial Development
- Manhole
- Outfall
- Culvert
- Stormwater Pipe
- Ditch
- Drainage Course

Future Stormwater Network

- 200mm
- 300mm
- 750mm
- Proposed Dry Pond (Active Storage Volume Required)

1:11,000

0 55 110 220 330 440 Meters

PICTURE BUTTE ALBERTA

TOWN OF PICTURE BUTTE
INFRASTRUCTURE ASSESSMENT

STORMWATER SYSTEM
PROPOSED STORMWATER NETWORK
POND LOCATIONS AND SEWER NETWORK

ISL Engineering and Land Services

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FIGURE 6.9

Legend

Maximum HGL Below the Ground

- No Flooding
- Within 0.3m of Surface
- Surface Flooding

Pipe Utilization

- Under 85%
- 85% to 100%
- Over 100%

- Drainage Course

1:10,000

0 50 100 200 300 400 Meters

PICTURE BUTTE ALBERTA

TOWN OF PICTURE BUTTE
INFRASTRUCTURE ASSESSMENT

STORMWATER SYSTEM
PROPOSED SYSTEM RESULTS
1:5 YEAR, 4-HOUR DESIGN STORM

ISL Engineering and Land Services

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FIGURE 6.10

Legend

Maximum HGL Below the Ground

- No Flooding
- Within 0.3m of Surface
- Surface Flooding

Pipe Utilization

- Under 85%
- 85% to 100%
- Over 100%

- Drainage Course

1:10,000

0 50 100 200 300 400 Meters

PICTURE BUTTE ALBERTA

TOWN OF PICTURE BUTTE
INFRASTRUCTURE ASSESSMENT

STORMWATER SYSTEM
PROPOSED SYSTEM RESULTS
1:100 YEAR, 24-HOUR DESIGN STORM

ISL Engineering and Land Services

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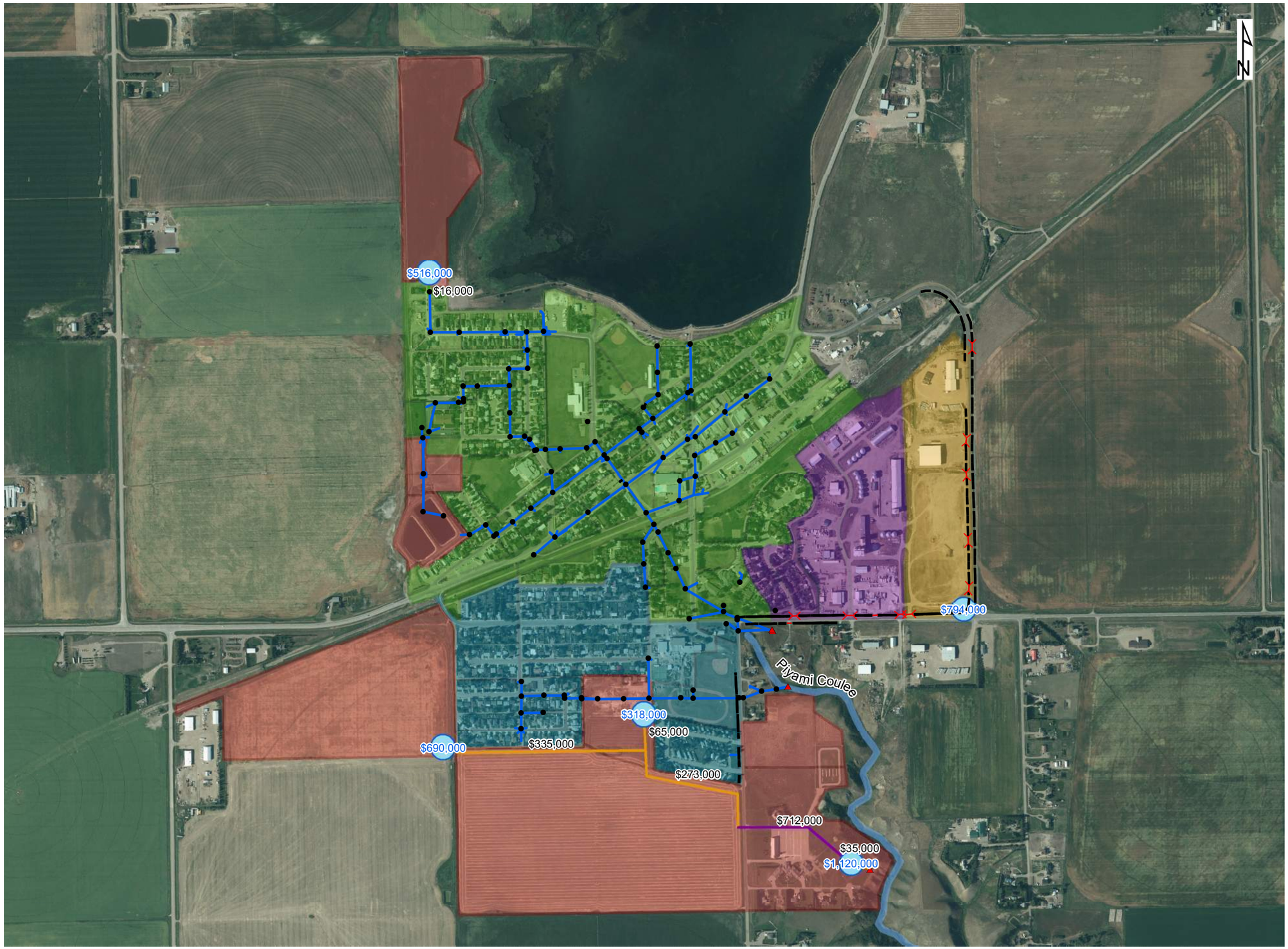


FIGURE 6.11

Legend

- North Catchment
- East Catchment
- Southwest Catchment
- Future Residential Development
- Future Industrial Development
- Manhole
- Outfall
- Culvert
- Stormwater Pipe
- Ditch
- Drainage Course

Future Stormwater Network

- 200mm
- 300mm
- 750mm
- Proposed Pond

1:11,000

0 55 110 220 330 440 Meters

PICTURE BUTTE ALBERTA

TOWN OF PICTURE BUTTE
INFRASTRUCTURE ASSESSMENT

STORMWATER SYSTEM
PROPOSED STORMWATER NETWORK
COST ESTIMATES

ISL Engineering and Land Services

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7.0 Roadways and Sidewalks

7.1 Background

This section of the report presents the results of the condition assessment completed by ISL and provides a rehabilitation strategy for the Town going forward. This report will provide a "road map" for public works, administration and Council to assess the current condition of the Town of Picture Butte roadway and sidewalk infrastructure and develop priorities for rehabilitation as part of its ongoing budget planning process.

7.1.1 Roadways

The existing roadway network in the Town is generally composed of a numbered grid system of streets and avenues. In most cases, streets run north-south and avenues run east-west. The remaining roadways are commonly named after the associated neighborhood names and features.

Alberta Highway 25 (Highway Avenue North), runs east-northwest through the Town and connects to Highway 25/843 north. Alberta Highway 519 (Rogers Avenue South), runs east-west through the Town. Both highways are maintained by Alberta Transportation, however the Town maintains the sidewalks on both sides of each highway.

A roadway segment identification map can be seen in Figure 7.1.

7.1.2 Sidewalks

The existing sidewalk system in the Town is generally a mix of combined curb/sidewalk and separate concrete walkways. The sidewalk system is mostly complete on both sides of each roadway, with a few exceptions in the industrial areas of the Town. The majority of the sidewalk system is wheelchair accessible and in satisfactory condition.

A sidewalk segment identification map can be seen in Figure 7.2.

7.2 Condition Assessment

7.2.1 Roadways

Roadway and Sidewalk visual condition assessments were carried out by ISL in July and August 2016. The assessments were performed on the following dates, all with favorable weather conditions:

- July 27, 2016
- July 28, 2016
- August 2, 2016
- August 4, 2016

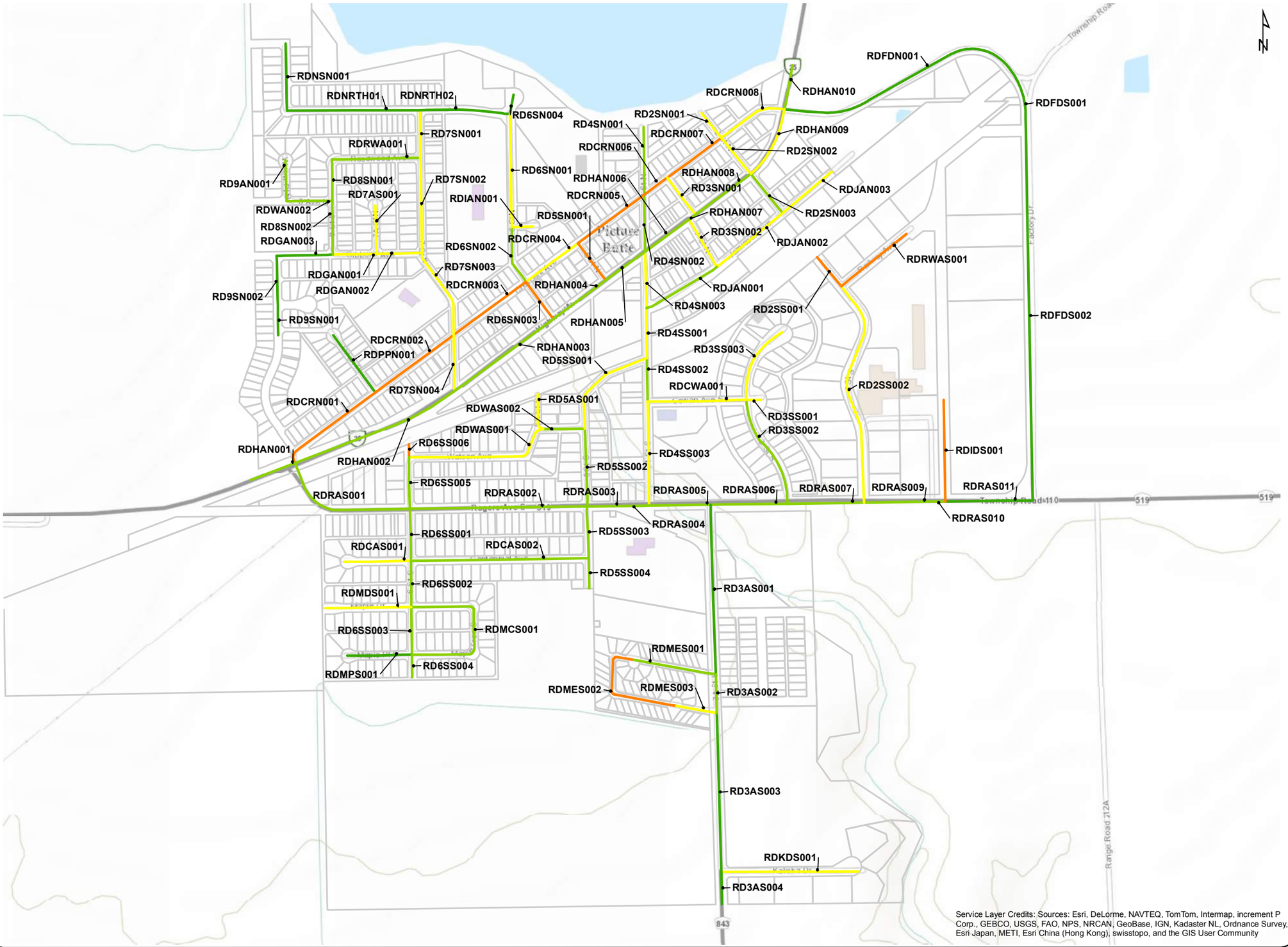
ISL utilized a combination of field surveyed data combined with GIS data provided by the Town to divide the roadways into 102 individual segments. The segments were typically broken up between intersections, or on long stretches of roadway where surface conditions have changed. ISL rated each segment individually. The digital information provided also included roadway widths, roadway lengths, and an ID number for each segment of roadway.

The highways running through the Town were evaluated as part of our assessment, however they were given a low user priority rating as they are generally in good condition and as they are maintained by others. The Adjusted Overall Condition reflects our rating as the highways are rated low priority.
Visual properties and deficiencies were noted by ISL. The conditions of the roadways and sidewalks are determined by a number of evaluation criteria, including:

- Surface Appearance, Texture and Type
- Surface and Subsurface Strength
- Drainage and Roadway Cross-Section
- Ride Quality and Smoothness.

Each individual criteria was rated on a 1 through 5 scale, with 5 representing a roadway component in very good condition and 1 representing a roadway component in poor and/or in dire need of replacement or rehabilitation.

FIGURE 7.1



Legend

OVERALL CONDITION

- 1 - Very Poor (0)
- 2 - Poor (13)
- 3 - Fair (32)
- 4 - Good (43)
- 5 - Very Good (16)

1:8,000

0 50 100 200 300 400 Meters

PICTURE BUTTE ALBERTA

TOWN OF PICTURE BUTTE

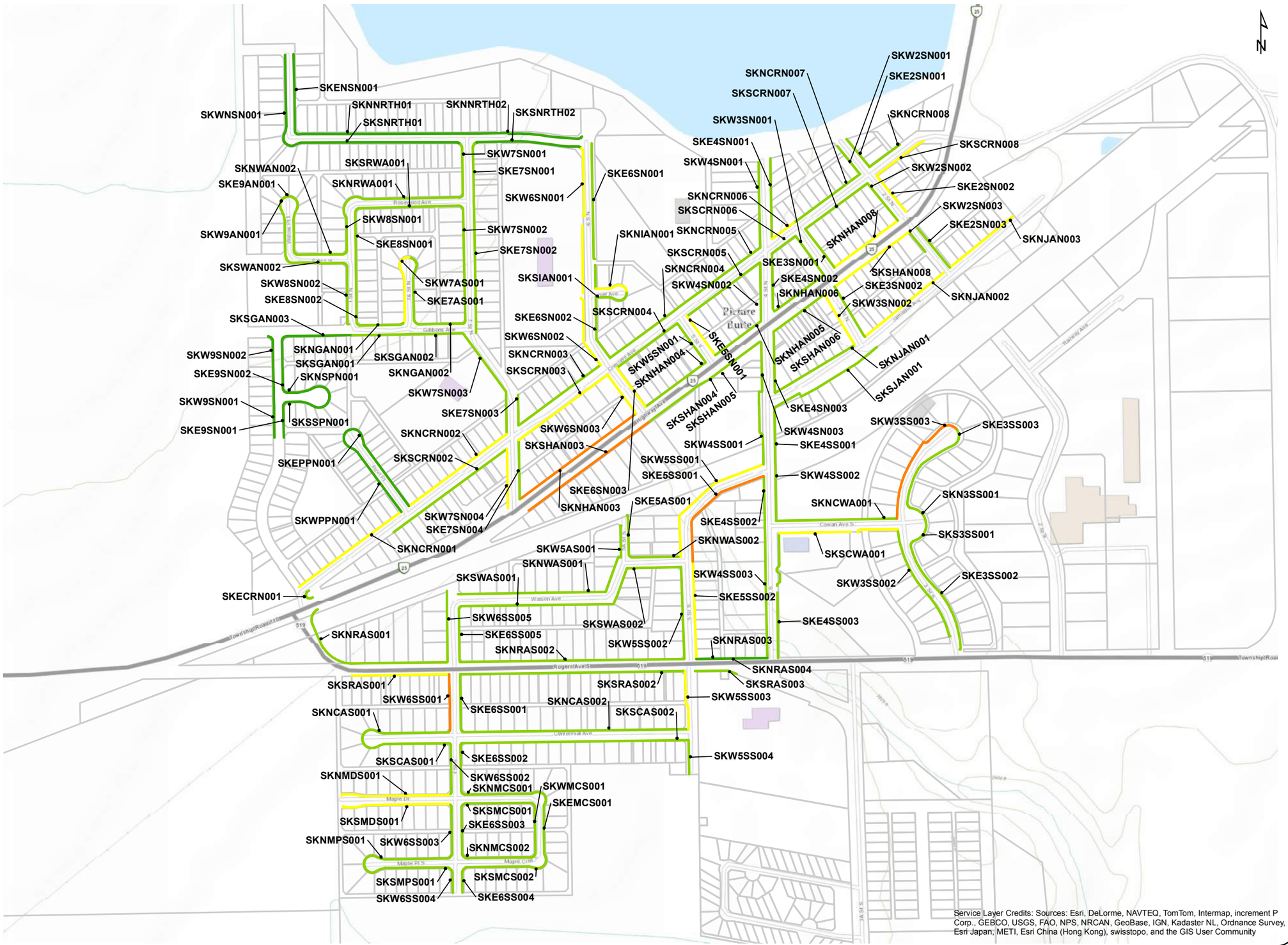
CONDITION RAITING
ROADS

ISL Engineering and Land Services

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FIGURE 7.2



Legend

OVERALL CONDITION

- 1 - Very Poor (0)
- 2 - Poor (5)
- 3 - Fair (26)
- 4 - Good (104)
- 5 - Very Good (17)

1:6,000

0 35 70 140 210 280 Meters

TOWN OF PICTURE BUTTE

CONDITION RAITING
SIDEWALKS

ISL Engineering and Land Services

Service Layer Credits: Sources: Esri, DeLorme, NAVTEQ, TomTom, Intermap, increment P Corp., GEBCO, USGS, FAO, NPS, NRCAN, GeoBase, IGN, Kadaster NL, Ordnance Survey, Esri Japan, METI, Esri China (Hong Kong), swisstopo, and the GIS User Community

Date: 1/23/2017 Document: M:\26500\26566_Town_of_Picture_Butte_Infrastructure_Assessment\02_CADD\20_Drafting\202_Figures\MXD\26566_SidewalkAssessment_ConditionRating_20161216.mxd

7.2.2 Roadway Criteria

Table 7.1: Surface Appearance, Texture and Type

Score	Ranking	Description
5	Hot Mix Asphalt	Hot Mix asphalt road in very good condition. No evidence of aggregate loss from surface, uniform distribution of surface material. No bleeding.
4	Hot Mix Asphalt/ Oil Bound	Hot Mix asphalt or oil bound road in good condition. Minor evidence of aggregate loss from surface, uniform distribution of surface material. Minor evidence of bleeding.
3	Hot Mix Asphalt/ Oil Bound	Hot Mix asphalt road in poor condition or oil bound road in fair condition. Slight evidence of aggregate loss from surface. Slight bleeding.
2	Oil Bound	Cold Mix asphalt or oil bound road in poor condition. Moderate evidence of aggregate loss from surface. Minor bare patches on surface. Minor bleeding.
1	Gravel / Oil Bound	Oil bound road in poor condition or gravel road. Severe evidence of aggregate loss and bleeding.

Table 7.2: Surface and Subsurface Strength

Score	Ranking	Description
5	None	No evidence of cracking. No potholes or patches on segment of roadway. No evidence of any rutting or shape loss.
4	Minor	Slight longitudinal and transverse cracking. 1-3 potholes or patches per 100 m segment of roadway. Minor visible ruts (1-5 mm) throughout the segment of roadway.
3	Slight	Minor longitudinal and transverse cracking. 4-6 potholes or patches per 100 m segment of roadway. Slight visible ruts (6-10 mm) throughout the segment of roadway.
2	Moderate	Alligator cracking. Structural fatigue. Major longitudinal and transverse cracking. 7-9 potholes or patches per 100 m segment of roadway. Large patches or failures. Moderate visible ruts (11-15 mm) throughout the segment of roadway.
1	Severe	Large areas of structural fatigue. More than 10 potholes or patches per 100 m segment of roadway. Large full width patches or failures. Severe visible ruts (greater than 15 mm) throughout the segment of roadway.

Table 7.3: Drainage and Roadway Cross-Section

Score	Ranking	Description
5	Good	Roadway and shoulders have good cross fall and roadside drains (if equipped) are functional. Water drains away freely from the side of the road.
4	Adequate	Adequate roadway and shoulder cross fall observed which will enable water to drain away to the edge of the roadway. Water should still be able to drain away freely from the side of the road.
3	Slight	Adequate roadway and shoulder cross fall observed which will enable water to drain away to the edge of the roadway, but minor shoulder erosion or build-up may be observed. Generally water should be able to drain away from the side of the road, but some small puddles may remain.
2	Moderate	Adequate roadway and shoulder cross fall observed which will enable water to drain away to the edge of the roadway, but major shoulder erosion or build-up may be observed. Generally water should be able to drain away from the side of the road, but some large puddles may remain.
1	Severe	Inadequate road and/or should cross fall observed. Shoulder erosion or build-up may be noticeable. Roadside drains (if equipped) appear non-functioning and roadway will remain flooded for a significant amount of time after a rainfall event.

Table 7.4: Ride Quality and Smoothness

Score	Ranking	Description
5	Good	Ride quality is good and smooth.
4	Adequate	Ride quality is adequate.
3	Fair	Ride quality is fair, few minor dips and humps are noticeable.
2	Fair-Poor	Ride quality is fair-poor, many minor dips and humps are noticeable.
1	Poor	Ride quality is poor, major dips and humps are evident.

An Overall Condition Rating was developed using a weighted average of the individual rating components shown in the tables above. The following weighting system was used:

Table 7.5: Overall Roadway Condition Weighting

Criteria	Weighting
Surface Appearance, Texture and Type	35%
Surface and Subsurface Strength	30%
Drainage and Roadway Cross-Section	20%
Ride Quality and Smoothness	15%
Total: -	***100%***

The overall condition rating of a roadway can generally relate to the following table:

Table 7.6: Overall Roadway Condition Rating

Score	Ranking	Description
5	Very Good	Roadway is in very good condition. No upgrades required.
4	Good	Roadway is in good condition. Upgrades may need to be considered several years in the future as part of a long-term road upgrade strategy.
3	Fair	Roadway is in fair condition and shows some signs of deterioration. Upgrades are suggested, but not required. Roadway segments can be could be planned for upgrades in the medium-term.
2	Poor	Roadway is in poor condition and is quite badly deteriorated. Upgrades are recommended in the short-term.
1	Very Poor	Roadway is in very poor condition and is badly deteriorated. Upgrades are required in the short-term and should be undertaken as soon as possible.

The results of the roadway condition assessment, including the Overall Condition Rating, physical measurements and visual properties and deficiencies can be found in Appendix K. The results of the roadway condition assessment are sorted by the Overall Condition Rating.

Adjusted Overall Condition Rating

In order to better understand the priorities for rehabilitation and develop a roadway rehabilitation plan for the Town, each segment of roadway was assigned a User Need Priority ranking. The User Need Priority was rated on a 2 through 5 scale. 5 representing an arterial roadway or highway in an urban area and a 2 representing an alley lane, driveway, trail or park road with low traffic volumes. User Need Priority criteria is as follows:

Table 7.7: User Need Priority

Score	Ranking	Description
5	Arterial / Highway	Arterial roadway. High traffic volumes. High priority for rehabilitation.
4	Collector	Collector roadway. High traffic volumes. High priority for rehabilitation.
3	Street	Streets or avenues. Serves moderate amount of users.
2	Alley / Park Road / Trails / Driveway	Alley lanes, park roads, trails and driveways. Low traffic volumes. Serves few users.

An Adjusted Overall Condition Rating was developed by taking the Overall Condition Rating, on a 1 through 5 scale, and dividing it by the User Need Priority. The Adjusted Overall Condition rating for each segment of roadway would then factor in traffic volumes, roadway classification and public user need.

By applying the User Need Priority factor to the Overall Condition Rating, the Adjusted Overall Condition Rating helps bring the most heavily utilized roadways to the top of the priority list.

The results of the roadway condition assessment, sorted by the Adjusted Overall Condition Ratings, from lowest to highest, can be found in Appendix K. The lower rating signifies higher need.

7.2.3 Sidewalks Criteria

ISL performed a condition assessment by dividing up the Town sidewalk system on a block by block basis and individually rating each sidewalk on both sides of the roadway. The sidewalks are evaluated based on the following evaluation criteria:

- aggregate loss
- settlement
- cracking
- vegetation
- drainage

Settlement, cracking, and drainage criteria were rated on a 1 through 5 scale, with 5 representing a sidewalk component in very good condition and 1 representing a sidewalk component in poor and/or in dire need of replacement of rehabilitation. Aggregate loss and vegetation were based on observed or not observed basis. The overall condition rating is determined from the criteria in Tables on the following page.

Table 7.8: Overall Sidewalk Condition Rating

Score	Ranking	Description
5	Very Good	Sidewalk is in very good condition. No upgrades required.
4	Good	Sidewalk is in good condition. Upgrades may need to be considered several years in the future as part of a long-term road upgrade strategy.
3	Fair	Sidewalk is in fair condition and shows some signs of deterioration. Upgrades are suggested, but not required. Sidewalk segments can be could be planned for upgrades in the medium-term.
2	Poor	Sidewalk is in poor condition and is quite badly deteriorated. Upgrades are recommended in the short-term.
1	Very Poor	Sidewalk is in very poor condition and is badly deteriorated. Upgrades are required in the short-term and should be undertaken as soon as possible.

Aggregate Loss

- Observed
- Not Observed

Table 7.9: Overall Sidewalk Settlement Rating

Score	Ranking	Description
5	None	Sidewalk is in very good condition. No settlement observed.
4	Minor	Sidewalk is in good condition. Minor settlement observed in isolated panels.
3	Slight	Sidewalk is in fair condition however there is multiple isolated areas of settlement. Upgrades are suggested, but not required. Sidewalk segments can be could be planned for upgrades in the medium-term.
2	Moderate	Sidewalk has frequent panel settlement. Upgrades are recommended in the short-term.
1	Severe	Sidewalk is in very poor condition and settlement is severe. Upgrades are required in the short-term and should be undertaken as soon as possible.

Table 7.10: Overall Sidewalk Cracking Rating

Score	Ranking	Description
5	None	Sidewalk is in very good condition. No cracking observed.
4	Minor	Sidewalk is in good condition. Minor cracking observed in isolated panels.
3	Slight	Sidewalk is in fair condition however there is multiple isolated areas of cracking. Upgrades are suggested, but not required. Sidewalk segments can be could be planned for upgrades in the medium-term.
2	Moderate	Sidewalk has frequent panel cracking. Upgrades are recommended in the short-term.
1	Severe	Sidewalk is in very poor condition and cracking is severe. Upgrades are required in the short-term and should be undertaken as soon as possible.

Vegetation

- Observed
- Not Observed

Table 7.11: Drainage

Score	Ranking	Description
5	Good	Sidewalks have good slope and roadside drains (if equipped) are functional. Water drains away freely from the side of the road.
4	Adequate	Adequate sidewalk slope observed which will enable water to drain to catch basins. Water should still be able to drain away freely from the side of the road.
3	Slight	Adequate sidewalk slope observed which will enable water to drain away to catch basins, but minor pooling or build-up may be observed. Generally water should be able to drain away from the side of the road, but some small puddles may remain.
2	Moderate	Adequate sidewalk slope observed which will enable water to drain away to catch basins, but major pooling or build-up may be observed. Generally water should be able to drain away from the side of the road, but some large puddles may remain.
1	Severe	Inadequate sidewalk drainage observed. Shoulder pooling or build-up may be noticeable. Catch basins (if equipped) appear non-functioning and sidewalk will remain flooded for a significant amount of time after a rainfall event.

The results of the sidewalk condition assessment are presented in Appendix M. The lower rating signifies higher need.

7.3 Roadway Rehabilitation Plan

7.3.1 Surfaced Roadway Network

When completing roadway improvements, it is important to consider the condition and future upgrades of the underground infrastructure, including; the water distribution system, wastewater collection system and stormwater drainage system. The Ten Year Capital Plan will need to identify priorities and develop the Surfaced Roadway Rehabilitation Plan by grouping projects together along the same segments of roadway or within close proximity to one another, while considering other infrastructure needs.

Below is the summary of the Town's roadway infrastructure and associated costs to replace/rehabilitate all of the Town's roadways. The detailed list of roadways recommended for replacement/rehabilitation in priority order can be found in the executive summary as well as in the 10 Year Capital Plan in Section 8.

7.3.2 Importance of Preventative Maintenance

Surfaced roadways are among the Town's most valuable assets, and are among those most visible and used by the general public in the day-to-day routine. Without on-going preventative maintenance, such as crack filling, spray patching, asphalt overlays or mill and inlays, roadways fall into disrepair and require complete reconstruction. Preventative maintenance is performed to improve and extend the functional service life of a roadway. The strategy of rehabilitation is to prevent progressive failures and emergency repairs and save money long-term. Reconstruction of a roadway is approximately three times more expensive than a standard overlay (no curb and gutter) and approximately two times more expensive than a mill and inlay (with curb and gutter). In addition, reconstruction may affect deep and shallow utilities, adds disruption to the travelling public and usually requires roadway closures for extended periods of time.

7.3.3 Replacement of all Surfaced Roadways and Future Funding Considerations

The approximate value to rehabilitate every surfaced roadway within the Town's roadway network is between $10 Million and $15 Million depending on rehabilitation requirements (excluding sidewalk replacement). This range is based on the following rehabilitation costs:

- Overlay paved roadways $360,000 per km
- Mill and overlay paved roadways $480,000 per km
- Partial rebuild of paved roadways $700,000 per km
- Complete rebuild of paved roadways $1,340,000 per km

The rehabilitation program is recommended to focus on overlaying or mill and inlaying roadways prior to failure, thereby minimizing the requirement to completely rebuild roadways. As the program will be initiated in 2017, it is expected that there will be some additional road failures prior to the overlay program reaching them.

Assuming a maximum asphalt roadway lifespan of 30 years and approximately $12.5 Million for rehabilitation, the Town would need to budget $420,000.00 per year based on 2016 dollars, in order to maintain an acceptable level of service for all surfaced roadways. It should be noted that the typical design life of an asphalt surface is 20 years. Future funding should also consider the rate of inflation to ensure adequate budget is available.

A graveling program for the Town's gravel roadways network is recommended to ensure an adequate and consistent level of service. Priorities for the gravelling program should consider traffic volume, roadway usage, location and access requirements.

Underground infrastructure, including; water distribution, wastewater collection and stormwater drainage systems are generally not located beneath gravel roadways, therefore, coordination for underground utility upgrades may not be necessary.

It is recommended that the Town's gravel roadways be put on a 3 year graveling program using Alberta Transportations Re-graveling Standard of a minimum of 400-500 t/km for gravel roadways.

If on-going rehabilitation and preventative maintenance does not occur and additional roadways fall into disrepair, the future reconstruction and rehabilitation costs will increase and fall into the higher end of the budget range identified above.

The Town has a significant surfaced roadway network for its population and there are roadways with low traffic volumes that may not warrant surfacing even though surfacing is currently in place. If the Town is unable to completely fund a rehabilitation program for the existing roadway network it may be necessary to reevaluate the classification and surfacing requirements for some roadways in order to remove them from the proposed surface roadway rehabilitation program.

7.3.4 Surface Condition Reassessment

It is recommended that this report be revisited and updated on a regular basis in order for the Town of Picture Butte to effectively plan and maintain its roadway infrastructure. This report should be updated every four to five years or as future growth and development occurs resulting in changing demands and priorities for the Town of Picture Butte roadway network.

7.4 Sidewalk Rehabilitation Plan

7.4.1 Replacement of all Sidewalks and Future Funding Considerations

Overall the Town of Picture Butte's sidewalks are in good condition, with very few walkways requiring immediate attention. The costs below provide the Town with a figure of what the replacement costs would be for all of the sidewalks within the Town, however as mentioned above a large portion of the sidewalks are in good condition.

The approximate value to replace every sidewalk within the Town's roadway network is between $4 Million and $5 Million. This range is based on the following rehabilitation costs:

- Replacement of Existing Sidewalk: $250,000 per km

Assuming a maximum sidewalk lifespan of 50 years and approximately $4.5 Million for replacement, the Town would need to budget $80,000.00 per year based on 2016 dollars, in order to maintain an acceptable level of service for all sidewalks. It should be noted that the typical design life of a concrete sidewalk may be less than 50 years. Future funding should also consider the rate of inflation to ensure adequate budget is available.

8.0
10 Year Capital Plan

Based on the infrastructure assessment and analysis presented in this report, a 10-year Capital Plan has been developed. A detailed breakdown is presented in Table 8.1. All prices are in 2016 dollars. It is recommended that the Infrastructure Capital Plan be revisited and updated every 5 years to reflect actual growth patterns, demands, and costs.

Infrastructure Category	Category	Project	2017	2018	2019	2020	2021	2022	2023	2024	2025	2026	Beyond	TOTAL
Water Storage and Distribution	Process Mechanical	Pump 401 replacement / Refurbishment											$80,000	$80,000
		Pump 402 replacement / Refurbishment											$80,000	$80,000
		Pump 403 replacement / Refurbishment											$80,000	$80,000
		Pump 404 replacement / Refurbishment											$80,000	$80,000
		Pump 501 replacement / Refurbishment											$50,000	$50,000
		Test fire pump and distribution system pressure relief valve for operation, if necessary in presence of qualified technician	$2,000											$2,000
		Replacing supplementary equipment (piping, valving, etc.)											$80,000	$80,000
	Electrical	Reconfigure existing MCC, to eliminate un-used starters and provide generator back-up for all distribution pumps in use	$75,000											$75,000
		Remove abandoned control panels and cabling				$15,000								$15,000
		Upgrade existing pumps control panel PLC (now obsolete) with current model				$50,000								$50,000
		Replacement of a back-up distribution pump motor, suitable for operation with VFD, and equip existing MCC with VFD drive									$30,000			$30,000
		Upgrade existing SCADA system (now obsolete) with current model c/w remote access capabilities.	$15,000											$15,000
		Replace corroding EMT conduit outside the plant with RPVC conduit	$5,000											$5,000
		Replace chlorine analyzer probe				$3,000								$3,000

Infrastructure Category	Category	Project	2017	2018	2019	2020	2021	2022	2023	2024	2025	2026	Beyond	TOTAL
		Replace chlorine analyzer controller							$2,500					$2,500
		Replace Turbidity Analyzer							$4,000					$4,000
	Building	Install security fencing and locks to hatches and building	$15,000											$15,000
		Replacement of lab equipment						$3,000						$3,000
Wastewater Lift Station	Process Mechanical	Pump 1 replacement / Refurbishment											$50,000	$50,000
		Pump 2 replacement / Refurbishment											$50,000	$50,000
		Replacement of supplementary equipment (piping, valving, etc.)											$30,000	$30,000
	Building	Installation of security fencing	$7,500											$7,500
	Electrical	Relocating the wet-well access hatch outside the building	$75,000											$75,000
		Installation of a suitably designed wet-well ventilation blower, located outside the building	$25,000											$25,000
		Upgrade the existing obsolete power distribution equipment	$25,000											$25,000
		Replacement of an existing hazardous gases detector	$10,000											$10,000
		Installation of a CO gas detector inside the building	$2,000											$2,000
		Replacement of existing lighting with fluorescent type T8 and replacement of EMT conduits to RPVC conduits								$5,000				$5,000
Wastewater Treatment Facility	Process Mechanical	Blower 1 replacement / Refurbishment											$75,000	$75,000

Infrastructure Category	Category	Project	2017	2018	2019	2020	2021	2022	2023	2024	2025	2026	Beyond	TOTAL
		Blower 2 replacement / Refurbishment											$75,000	$75,000
		Installation of a small containment and storage area for treatment aids to allow for easy clean-up in the event of a spill	$2,000											$2,000
		Replacement of supplementary equipment (piping, valving, etc.)											$40,000	$40,000
		Installation of a new hatch with a lock to replace the existing doors to the forcemain vault	$2,500											$2,500
		Receiving Water Quality Assessment	$35,000											$35,000
	Electrical	Provide rat-screens and proper ventilation for blower building	$10,000											$10,000
		Investigate and repair roof-leak for power service penetration	$5,000											$5,000
		Upgrade existing obsolete power distribution and blower motor starting equipment	$35,000											$35,000
		Upgrade existing lighting to fluorescent type T8 and provide emergency lighting								$5,000				$5,000
Water Distribution Pipe Network	PVC Water Pressure Pipe	Water leak detection test and water pipe database											$100,000	$100,000
		Upgrading existing water pipes (including pavement) to meet the current standard			$850,000									$850,000
		Expanding East industrial area for future											$1,570,000	$1,570,000
		Expanding Northeast residential area for future											$800,000	$800,000
		Expanding Southwest residential area for future											$1,740,000	$1,740,000
		Southeast Area											$200,000	$200,000

Infrastructure Category	Category	Project	2017	2018	2019	2020	2021	2022	2023	2024	2025	2026	Beyond	TOTAL
Sewage Collection Pipe Network	Gravity Sanitary Pipe	Crescent from Piron to 752, Crescent from 752 to 7th St. N., Crescent from 7th St. N. to 650, Crescent from 650 to 6th St. N.											$215,000	$215,000
		6th St. N. from Crescent to 2nd back alley, 6th St. N. from Hwy Ave to 1st back alley, 6th St. N. from Hwy Ave to 1st back alley									$195,000			$195,000
		3rd St. N. from Jamieson to Hwy Ave											$65,000	$65,000
		2nd St. N. from Crescent to Lane											$28,000	$28,000
		4th St. S. from Jamieson to 5th St. S., 4th St. S. from 5th St. S. to Cowan,											$105,000	$105,000
		Hwy Ave from 610 to 6th St. N., Hwy Ave from 624 to 610									$280,000			$280,000
		From 613 Hwy Ave to back alley, From 5th St. S. to back alley of Hwy Ave							$300,000					$300,000
		5th St. S. form 107 to Watson, 5th St. S. from Watson to 119, 5th St. S. from 119 to Rogers, 5th St. S. from 103 to 107							$450,000					$450,000
		Rogers Ave from 5th St. S. to 5th St. back alley, Rogers Ave from 5th St. S. back alley to behind 333 Rogers, Behind 333 Rogers Ave to 3A St.					$400,000							$400,000
		3A St. from 315 to 321, 3A St. to lift station comes from SAL3A001, Lift station from SALXXX12					$240,000							$240,000
		3rd St. S. from Rogers to 139, From Rogers to E side of 315											$95,000	$95,000
		7th St. N. from 415 to Rosewood, 7th St. N. from 305 to 415											$325,000	$325,000
		Hwy Ave from 720 to 624											$200,000	$200,000

Infrastructure Category	Category	Project	2017	2018	2019	2020	2021	2022	2023	2024	2025	2026	Beyond	TOTAL
		Crescent from 852 to Piron											$195,000	$195,000
		Crescent from 454 to 4th St. N., Crescent from 5th St. N. to 454, Crescent from 540 to 5th St. N., Right of way from Crescent between 456 & 454											$440,000	$440,000
Sewage Collection Pipe Network	Gravity Sanitary Pipe	Runs E/W through Chroniks to N/S pipe going to trailer park											$125,000	$125,000
		Trailer park from 3 to 8											$115,000	$115,000
		5th St. S. from 4th St. S. to 103											$155,000	$155,000
		Inlet Ave, 6th St. N. from Inlet to Inlet's back alley											$170,000	$170,000
		Hwy Ave from 5th St. N. to 4th St. N.											$170,000	$170,000
		4th St. N. from Jamieson to Cactus											$125,000	$125,000
		4th St. S. from Cowan to 300											$105,000	$105,000
		3A St. from N. ent. To S. ent. Of trailer park, 3A St from past Pitt St. to N. ent. Of Trailer park, 3A St from 327 to past Pitt St.											$420,000	$420,000
		Crescent Avenue from 6th Street to 7th Street. Complete rebuild including; sanitary pipe, roadway, sidewalks and drainage infrastructure										$650,000		$650,000
		Regular maintenance						$10,000	$10,000	$10,000	$10,000	$10,000		$50,000
Stormwater Drainage System	Conveyance (Piped) System	Crescent Ave and 6 St N 4 Single C Catchbasins c/w 300mm Catchbasin Leads									$68,000			$68,000
		Jamieson Ave and 4 St N STMHJM001 to STMH4S001A 50m of 300mm storm sewer replacement											$86,000	$86,000

Infrastructure Category	Category	Project	2017	2018	2019	2020	2021	2022	2023	2024	2025	2026	Beyond	TOTAL
		Crescent Ave and 7 St N STMHCC004 to STMH7N001C 60m of 400mm storm sewer replacement											$110,000	$110,000
		Gibbons Ave and 7 St N STMH7N001 to STMHGB001 50m of 600mm storm sewer replacement											$109,000	$109,000
Storm Water Drainage System	Conveyance (Piped) System	Future stormwater conveyance network											$1,430,000	$1,430,000
		Regular maintenance						$10,000	$10,000	$10,000	$10,000	$10,000		$50,000
	Stormwater Management Facility	Future Pond 1											$516,000	$516,000
		Future Pond 2											$690,000	$690,000
		Future Pond 3											$318,000	$318,000
		Future Pond 4											$1,120,000	$1,120,000
		Future Pond 5											$794,000	$794,000
TOTAL			$346,000	$0	$850,000	$68,000	$640,000	$23,000	$776,500	$30,000	$593,000	$670,000	$13,326,000	$17,322,500

The 10-year Capital Plan is summarized by combining required upgrades into projects in four different infrastructure categories for each year. This summary gives an excellent overview of the budget required for each year for planning purposes. The summary is presented in Table 8.2 below.

Table 8.2: 10-year Capital Plan Summary

Year	Category	Projects	Project Cost
2017	Water and Wastewater Building Upgrades	Testing fire pump; Reconfigure existing MCC and back-up generator, upgrade SCADA system, replacing EMT conduit; and installing security fencing and locks to hatches and building, relocate we-well access hatch, upgrade power distribution equipment, install CO gas detector, water quality assessment.	$346,000
2018		No work this year.	
2019	Water Distribution System	Upgrade existing water pipes (including pavement) to meet the current standard.	$850,000
2020	Water Storage/Pumping and Distribution System	Remove abandoned control panels and cables, upgrade existing pumps control panel PLC; Replace chlorine analyzer probe	$68,000
2021	Sewage Collection and Treatment System	Remove/Upgrade Sanitary main from Lift Station to north side of Rogers Avenue.	$640,000
2022	Water Storage/Pumping and Pipe Maintenance	Replacement of lab equipment and sewage system flushing/cleaning.	$23,000
2023	Water Storage/Pumping and Pipe Maintenance	Replacing chlorine analyzer controller; replacing Turbidity Analyzer and system flushing/cleaning.	$26,500
	Sewage Collection and Treatment System	Remove/Upgrade Sanitary main from north side of Rogers Avenue to Highway Avenue.	$750,000
2024	Water Storage/Pumping and Pipe Maintenance	Replace existing lighting and replacement of EMT conduits to RPVC and sewage system flushing/cleaning.	$30,000
2025	Water Storage/Pumping and Pipe Maintenance	Replacement of a back-up distribution pump motor, suitable for operation with VFD, and equip existing MCC with VFD drive and sewage system flushing/cleaning.	$50,000
	Sewage Collection and Treatment System	Remove/Upgrade Sanitary main from Highway Avenue to Crescent Avenue.	$475,000
	Storm Water System	Install catch basins at Crescent Avenue and 6th Street North	$68,000

Year	Category	Projects	Project Cost
2026	Sewage Collection and Treatment System	Remove/Upgrade Sanitary main from 7th Street to 6th Street on Crescent Avenue and sewage system flushing/cleaning.	$670,000
Beyond 10 years	Water Storage/Pumping and Distribution System	Replacing water pump 402; replacing supplementary equipment (piping, valving, etc.); expanding industrial and residential areas for future	$4,780,000
	Sewage Collection and Treatment System	Replacing supplementary equipment (piping, valving, etc.); upgrade of an existing sewage collection system at various locations	$3,380,000
	Storm Water System	Future stormwater conveyance network; future ponds for storm management	$5,166,000

9.0 Conclusion

ISL has developed an infrastructure assessment and condition analysis for the Town of Picture Butte that focused on the water storage, pumping, and distribution system, wastewater collection and treatment system, stormwater drainage system, and the roadway and sidewalk networks. A number of recommendations have been provided as a result of the assessment and modeling.

A 10-year Capital Plan, developed as a result of the recommendations, provides a “road map” to Council and Administration for improvements to the existing system under current demands and accommodating future development. The information contained within this report is useful for both administration and elected officials in carrying out short and long term planning and budgeting. As previously mentioned, the 10-year Capital Plan should be revisited and updated on a regular basis or as growth pressures demand.

Appendix A

Potable Water Storage and Pumping Assessment - Photographs



Water Pumping Facility



Water Pumping Facility Standby Generator



Water Pumping Facility Pumps



Pump 401



Pump 401 Condition - Corrosion and Chipped off coating



Chipped off coating from floor and pump pads



Pump 402



Pump 402 Grease Accumulation



Pump 403



Pump 403 Corrosion and Grease Accumulation



Pump 403 Pad Coating



Pump 404 Condition



Pump 404



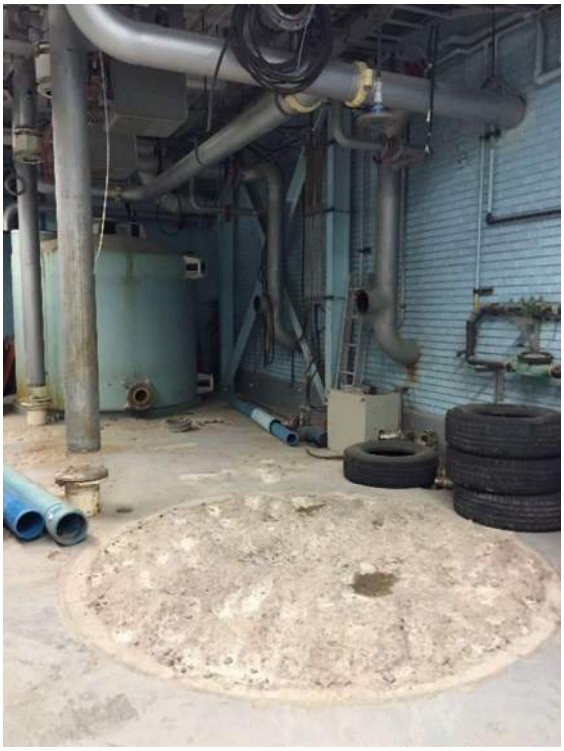
Fire Pump



Fire Pump Condition



Chemical Dosing System from Old WTP



Chemical Tanks from Old WTP



In House Laboratory at Water Pumping Facility



Regional Water Vault Hatch



Regional Water Vault Contents



PHOTOGRAPH NO. 2	
LOCATION	Garage Door
DESCRIPTION/COMMENTS • Signs of sagging of structural members • Vertical frame members appeared plumb and true	



PHOTOGRAPH NO. 3	
LOCATION	North Wall
DESCRIPTION/COMMENTS • Brick cladding appeared in moderate condition • Signs of possible efflorescence (white staining) • Tooled mortar joints appear to be cracking	



PHOTOGRAPH NO. 4	
LOCATION	North Wall
DESCRIPTION/COMMENTS • Signs of efflorescence • Visible expansion joint between new and old buildings	



PHOTOGRAPH NO. 5	
LOCATION	East Wall / Canopy
DESCRIPTION/COMMENTS • Signs of moisture penetrating through concrete canopy • No sign of slope for water evacuation	



PHOTOGRAPH NO. 6	
LOCATION	East Wall Near Main Entrance

DESCRIPTION/COMMENTS

- Lintels above windows appeared solid and properly installed
- Windows and/or sealant appeared old and weathered
- Drip-edge not provided for water evacuation, which could lead to later problems
- Windows appeared to lack insulating properties



PHOTOGRAPH NO. 7	
LOCATION	Main Shop Area

DESCRIPTION/COMMENTS

- Pipes, tools and overall clutter blocking north exit door
- Pipe on top of tank hatch
- Pipes may roll off and cause damage or injuries



PHOTOGRAPH NO. 8	
LOCATION	Electrical Room
DESCRIPTION/COMMENTS • Unconnected cables hanging from pipe • Pipe not connected	



PHOTOGRAPH NO. 9	
LOCATION	Electrical Room
DESCRIPTION/COMMENTS • Unconnected penetrations • Potential for water entry	



PHOTOGRAPH NO. 10	
LOCATION	Mezzanine Above Office

DESCRIPTION/COMMENTS

- Original Construction
- Decking and joists appeared to be in good condition
- Sprinkler pipes did not appear to be in working order

Appendix B

Hydrant Flow Test Results

HYDRANT FIRE FLOW TEST REPORT

P.O.# _____

ML HOT TAPS LTD
256 MAUNSELL CLOSE NE
CALGARY, AB T2E 7C2
PH: (403) 606-4039
EMAIL: mlhottaps@shaw.ca

ADDRESS TOWN OF PICTURE BUTTE

DATE JULY 28, 2016

CONTRACTOR ISL ENGINEERING.

HYDRANT FIRE FLOW TEST

Pipe Diameter (mm)	150 mm ——— 6"			
Hydrant Type	McAVITY # 2695		McAVITY # 2722	
Static Pressure (psi)	# 2695 50 PSI		# 2722 50 PSI	
SIZES Number of Ports	1 @ 2"	2 @ 2"	3 @ 2"	4 @ 2"
Residual Pressure	35 P.S.I	30 P.S.I	35 P.S.I	30 P.S.I
Pitot Tube Reading	45	40	45	40
Flow at each port (gpm)	797	751	797	751
TOTAL GPM	1548 GPM		1548 GPM	

COMMENTS:

CONTRACTOR SIGNATURE:

GST # 864331277RT0001

HYDRANT FIRE FLOW TEST REPORT

P.O.# _____

ML HOT TAPS LTD
256 MAUNSELL CLOSE NE
CALGARY, AB T2E 7C2
PH: (403) 606-4039
EMAIL: mlhottaps@shaw.ca

ADDRESS TOWN OF PICTURE BUTTE

DATE JULY 28, 2016

CONTRACTOR ISL ENGINEERING

HYDRANT FIRE FLOW TEST

Pipe Diameter (mm)	150 MM — 6"			
Hydrant Type	McAVITY # 3336		McAVITY # 3300	
Static Pressure (psi)	# 3336 70 PSI		# 3300 70 PSI	
SIZES Number of Ports	1 @ 2"	2 @ 2"	3 @ 2"	4 @ 2"
Residual Pressure	50 P.S.I	45 P.S.I	50 P.S.I	45 P.S.I
Pitot Tube Reading	60	50	60	50
Flow at each port (gpm)	920	840	920	840
TOTAL GPM	1760 GPM		1760 GPM	

COMMENTS:

CONTRACTOR SIGNATURE:

GST # 864331277RT0001

HYDRANT FIRE FLOW TEST REPORT

P.O.# _____

ML HOT TAPS LTD
256 MAUNSELL CLOSE NE
CALGARY, AB T2E 7C2
PH: (403) 606-4039
EMAIL: mlhottaps@shaw.ca

ADDRESS TOWN OF PICTURE BUTTE

DATE JULY 28, 2016

CONTRACTOR ISL ENGINEERING

HYDRANT FIRE FLOW TEST

Pipe Diameter (mm)	150 MM — 6"			
Hydrant Type	McAVITY # 3186		McAVITY # 3234	
Static Pressure (psi)	# 3186 75 PSI		# 3234 75 PSI	
SIZES Number of Ports	1 @ 2"	2 @ 2"	3 @ 2"	4 @ 2"
Residual Pressure	55 P.S.I	50 P.S.I	55 P.S.I	50 P.S.I
Pitot Tube Reading	65	60	65	60
Flow at each port (gpm)	958	920	958	920
TOTAL GPM	1878 GPM		1878 GPM	

COMMENTS:

CONTRACTOR SIGNATURE:

GST # 864331277RT0001

HYDRANT FIRE FLOW TEST REPORT

P.O.# _____

ML HOT TAPS LTD
256 MAUNSELL CLOSE NE
CALGARY, AB T2E 7C2
PH: (403) 606-4039
EMAIL: mlhottaps@shaw.ca

ADDRESS TOWN OF PICTURE BUTTE

DATE JULY 28, 2016

CONTRACTOR ISL ENGINEERING.

HYDRANT FIRE FLOW TEST

Pipe Diameter (mm)	150 MM — 6"			
Hydrant Type	McAVITY # 3206		McAVITY # 3197	
Static Pressure (psi)	# 3206 65PSI		# 3197 65PSI	
SIZES Number of Ports	1 @ 2"	2 @ 2"	3 @ 2"	4 @ 2"
Residual Pressure	50 P.S.I	40 P.S.I	50 P.S.I	40 P.S.I
Pitot Tube Reading	60	55	60	55
Flow at each port (gpm)	920	881	920	881
TOTAL GPM	1801 GPM		1801 GPM	

COMMENTS: McAVITY # 3197 IS OUT OF ORDER NEED TO BE REBUILT CITY WO 38.

CONTRACTOR SIGNATURE:

GST # 864331277RT0001

HYDRANT FIRE FLOW TEST REPORT

P.O.# _____

ML HOT TAPS LTD
256 MAUNSELL CLOSE NE
CALGARY, AB T2E 7C2
PH: (403) 606-4039
EMAIL: mlhottaps@shaw.ca

ADDRESS TOWN OF PICTURE BUTTE

DATE JULY 28, 2016

CONTRACTOR ISL ENGINEERING

HYDRANT FIRE FLOW TEST

Pipe Diameter (mm)	150 MM — 6"			
Hydrant Type	MCAVITY #3428		MCAVITY #3487	
Static Pressure (psi)	#3428 60 PSI		#3487 60 PSI	
SIZES Number of Ports	1 @ 2"	2 @ 2"	3 @ 2"	4 @ 2"
Residual Pressure	40 P.S.I	35 P.S.I	40 P.S.I	35 P.S.I
Pitot Tube Reading	45	35	45	35
Flow at each port (gpm)	797	703	797	703
TOTAL GPM	1490 GPM		1490 GPM	

COMMENTS:

CONTRACTOR SIGNATURE:

GST # 864331277RT0001

HYDRANT FIRE FLOW TEST REPORT

P.O.# _____

ML HOT TAPS LTD
256 MAUNSELL CLOSE NE
CALGARY, AB T2E 7C2
PH: (403) 606-4039
EMAIL: mlhottaps@shaw.ca

ADDRESS TOWN OF PICTURE BUTTE

DATE JULY 28, 2016

CONTRACTOR ISL ENGINEERING

HYDRANT FIRE FLOW TEST

Pipe Diameter (mm)	150 mm — 6"			
Hydrant Type	McAVITY #1044		McAVITY #1334	
Static Pressure (psi)	#1044 65 PSI		#1334 65 PSI	
SIZES Number of Ports	1 @ 2"	2 @ 2"	3 @ 2"	4 @ 2"
Residual Pressure	40 P.S.I	35 P.S.I	40 P.S.I	35 P.S.I
Pitot Tube Reading	50	40	50	40
Flow at each port (gpm)	840	797	840	797
TOTAL GPM	1637 GPM		1637 GPM	

COMMENTS:

CONTRACTOR SIGNATURE:

GST # 864331277RT0001

FTI
EVAN

415

FLOW TEST INVOICE

P/O # _____

ML HOT TAPS LTD.
532 Mariposa Drive NE
CALGARY, AB. T2E 5V8
Cell # (403) 606 4039

HYDRANT FLOW TEST

ADDRESS: TOWN OF PICTURE BUTTE

DATE: JULY 15, 2016

CONTRACTOR: ISL ENGINEERING

Pipe Diameter (mm)	150 MM — 6"
Flow Meter Reading (gpm)	1548 GPM
Hydrant Type	MCAVITY
Static Pressure (psi)	65 PSI

Number of Ports	1 @ 50 mm	2 @ 50 mm
Pitot Tube Reading	1 @ 45	1 @ 45
		2 @ 40
Flow at each Port	1 @ 797	1 @ 797
		2 @ 751
Total Flow (gpm)	Approx	1548

TOTAL $ _____

GST $ _____

INVOICE TOTAL $ _____

COMMENTS: HYD NOT ON MAP
IN FRONT OF ST. CATHERINE'S
SCHOOL

CONTRACTOR SIGANTURE:

GST # 864331277RT0001

FTT
EVAN

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FLOW TEST INVOICE

P/O # _____

ML HOT TAPS LTD.
532 Mariposa Drive NE
CALGARY, AB. T2E 5V8
Cell # (403) 606 4039

HYDRANT FLOW TEST

ADDRESS: TOWN OF PICTURE BUTTE

DATE: JULY 15, 2016

CONTRACTOR: ISL ENGINEERING

Pipe Diameter (mm)	150 MM — 6"
Flow Meter Reading (gpm)	1548 GPM
Hydrant Type	McAVITY # 1012
Static Pressure (psi)	65 PSI

Number of Ports	1 @ 50 mm	2 @ 50 mm
Pitot Tube Reading	1 @ 45	1 @ 45
		2 @ 40
Flow at each Port	1 @ 797	1 @ 797
		2 @ 751
Total Flow (gpm)	Approx	1548

TOTAL $ _____

GST $ _____

INVOICE TOTAL $ _____

COMMENTS:

CONTRACTOR SIGANTURE:

GST # 864331277RT0001

TTT
EVAN

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FLOW TEST INVOICE

P/O # _____

ML HOT TAPS LTD.
532 Mariposa Drive NE
CALGARY, AB. T2E 5V8
Cell # (403) 606 4039

HYDRANT FLOW TEST

ADDRESS: TOWN OF PICTURE BUTTE

DATE: JULY 15, 2016

CONTRACTOR: ISL ENGINEERING

Pipe Diameter (mm)	150 MM — 6"
Flow Meter Reading (gpm)	1548 GPM
Hydrant Type	McAVITY #1044
Static Pressure (psi)	65 PSI

Number of Ports	1 @ 50 mm	2 @ 50 mm
Pitot Tube Reading	1 @ 45	1 @ 45
		2 @ 40
Flow at each Port	1 @ 797	1 @ 797
		2 @ 751
Total Flow (gpm)	Approx	1548

TOTAL $ _____

GST $ _____

INVOICE TOTAL $ _____

COMMENTS:

CONTRACTOR SIGANTURE:

GST # 864331277RT0001

TT
EVAN

415

FLOW TEST INVOICE

P/O # _____

ML HOT TAPS LTD.
532 Mariposa Drive NE
CALGARY, AB. T2E 5V8
Cell # (403) 606 4039

HYDRANT FLOW TEST

ADDRESS: TOWN OF PICTURE BUTTE

DATE: JULY 15, 2016

CONTRACTOR: ISL ENGINEERING

Pipe Diameter (mm)	150 MM — 6"
Flow Meter Reading (gpm)	1548 GPM
Hydrant Type	MCAUITY # 1334
Static Pressure (psi)	65 PSI

Number of Ports	1 @ 50 mm	2 @ 50 mm
Pitot Tube Reading	1 @ 45	1 @ 45
		2 @ 40
Flow at each Port	1 @ 797	1 @ 797
		2 @ 751
Total Flow (gpm)	Approx	1548

TOTAL $ _____

GST $ _____

INVOICE TOTAL $ _____

COMMENTS:

CONTRACTOR SIGANTURE:

GST # 864331277RT0001

FTT
EVAN

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FLOW TEST INVOICE

P/O # _____

ML HOT TAPS LTD.
532 Mariposa Drive NE
CALGARY, AB. T2E 5V8
Cell # (403) 606 4039

HYDRANT FLOW TEST

ADDRESS: TOWN OF PICTURE BUTTE

DATE: JULY 15, 2016

CONTRACTOR: ISL ENGINEERING

Pipe Diameter (mm)	150 mm — 6"
Flow Meter Reading (gpm)	1548 GPM
Hydrant Type	McAUITY # 1094
Static Pressure (psi)	65 PSI

Number of Ports	1 @ 50 mm	2 @ 50 mm
Pitot Tube Reading	1 @ 45	1 @ 45
		2 @ 40
Flow at each Port	1 @ 797	1 @ 797
		2 @ 751
Total Flow (gpm)	Approx	1548

TOTAL $ _____

GST $ _____

INVOICE TOTAL $ _____

COMMENTS:

CONTRACTOR SIGANTURE:

GST # 864331277RT0001

HTT
EVAN

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FLOW TEST INVOICE

P/O # _____

ML HOT TAPS LTD.
532 Mariposa Drive NE
CALGARY, AB. T2E 5V8
Cell # (403) 606 4039

HYDRANT FLOW TEST

ADDRESS: TOWN OF PICTURE BUTTE

DATE: JULY 15, 2016

CONTRACTOR: ISL ENGINEERING

Pipe Diameter (mm)	150 MM — 6"
Flow Meter Reading (gpm)	1548 GPM
Hydrant Type	MCAVITY #1115
Static Pressure (psi)	65 PSI

Number of Ports	1 @ 50 mm	2 @ 50 mm
Pitot Tube Reading	1 @ 45	1 @ 45
		2 @ 40
Flow at each Port	1 @ 797	1 @ 797
		2 @ 751
Total Flow (gpm)	Approx	1548

TOTAL $ _____

GST $ _____

INVOICE TOTAL $ _____

COMMENTS:

CONTRACTOR SIGANTURE:

GST # 864331277RT0001

FTT
EVAN

415

FLOW TEST INVOICE

P/O # _____

ML HOT TAPS LTD.
532 Mariposa Drive NE
CALGARY, AB. T2E 5V8
Cell # (403) 606 4039

HYDRANT FLOW TEST

ADDRESS: TOWN OF PICTURE BUTTE

DATE: JULY 15, 2016

CONTRACTOR: ISL ENGINEERING

Pipe Diameter (mm)	150 MM — 6"
Flow Meter Reading (gpm)	1548 GPM
Hydrant Type	MCAVITY # 1168
Static Pressure (psi)	65 PSI

Number of Ports	1 @ 50 mm	2 @ 50 mm
Pitot Tube Reading	1 @ 45	1 @ 45
		2 @ 40
Flow at each Port	1 @ 797	1 @ 797
		2 @ 751
Total Flow (gpm)	Approx	1548

TOTAL $ _____

GST $ _____

INVOICE TOTAL $ _____

COMMENTS:

CONTRACTOR SIGANTURE:

GST # 864331277RT0001

FTT
EVAN
415

FLOW TEST INVOICE

P/O # _____

ML HOT TAPS LTD.
532 Mariposa Drive NE
CALGARY, AB. T2E 5V8
Cell # (403) 606 4039

HYDRANT FLOW TEST

ADDRESS: TOWN OF PICTURE BUTTE

DATE: JULY 15, 2016

CONTRACTOR: ISL ENGINEERING

Pipe Diameter (mm)	150 MM — 6"
Flow Meter Reading (gpm)	1548 GPM
Hydrant Type	MCAVITY #1458
Static Pressure (psi)	65 PSI

Number of Ports	1 @ 50 mm	2 @ 50 mm
Pitot Tube Reading	1 @ 45	1 @ 45
		2 @ 40
Flow at each Port	1 @ 797	1 @ 797
		2 @ 751
Total Flow (gpm)	Approx	1548

TOTAL $ _____

GST $ _____

INVOICE TOTAL $ _____

COMMENTS:

CONTRACTOR SIGANTURE:

GST # 864331277RT0001

FTT
EVAN
415

FLOW TEST INVOICE

P/O # _____

ML HOT TAPS LTD.
532 Mariposa Drive NE
CALGARY, AB. T2E 5V8
Cell # (403) 606 4039

HYDRANT FLOW TEST

ADDRESS: TOWN OF PICTURE BUTTE

DATE: JULY 15, 2016

CONTRACTOR: ISL ENGINEERING

Pipe Diameter (mm)	150 MM — 6"
Flow Meter Reading (gpm)	1548 GPM
Hydrant Type	TERMINAL CITY #1375
Static Pressure (psi)	65 PSI

Number of Ports	1 @ 50 mm	2 @ 50 mm
Pitot Tube Reading	1 @ 45	1 @ 45
		2 @ 40
Flow at each Port	1 @ 797	1 @ 797
		2 @ 751
Total Flow (gpm)	Approx	1548

TOTAL $ _____

GST $ _____

INVOICE TOTAL $ _____

COMMENTS:
SLOW DRAINING
NEEDS TO BE PUMP DOWN.

CONTRACTOR SIGANTURE:

GST # 864331277RT0001

FTT
EVAN

415

FLOW TEST INVOICE

P/O # _____

ML HOT TAPS LTD.
532 Mariposa Drive NE
CALGARY, AB. T2E 5V8
Cell # (403) 606 4039

HYDRANT FLOW TEST

ADDRESS: TOWN OF PICTURE BUTTE

DATE: JULY 15, 2016

CONTRACTOR: ISL ENGINEERING

Pipe Diameter (mm)	150 mm — 6"
Flow Meter Reading (gpm)	1548 GPM
Hydrant Type	TERMINAL CITY # 1308
Static Pressure (psi)	65 PSI

Number of Ports	1 @ 50 mm	2 @ 50 mm
Pitot Tube Reading	1 @ 45	1 @ 45
		2 @ 40
Flow at each Port	1 @ 797	1 @ 797
		2 @ 751
Total Flow (gpm)	Approx	1548

TOTAL $ _____

GST $ _____

INVOICE TOTAL $ _____

COMMENTS:
SLOW DRAWING.
NEED TO BE PUMP DOWN

CONTRACTOR SIGANTURE:

GST # 864331277RT0001

TTT
EVAN

415

FLOW TEST INVOICE

P/O # _____

ML HOT TAPS LTD.
532 Mariposa Drive NE
CALGARY, AB. T2E 5V8
Cell # (403) 606 4039

HYDRANT FLOW TEST

ADDRESS: TOWN OF PICTURE BUTTE

DATE: JULY 15, 2016

CONTRACTOR: ISL ENGINEERING

Pipe Diameter (mm)	150 mm — 6"
Flow Meter Reading (gpm)	1548 GPM
Hydrant Type	McAUITY # 1430
Static Pressure (psi)	65 PSI

Number of Ports	1 @ 50 mm	2 @ 50 mm
Pitot Tube Reading	1 @ 45	1 @ 45
		2 @ 40
Flow at each Port	1 @ 797	1 @ 797
		2 @ 751
Total Flow (gpm)	Approx	1548

TOTAL $ _____

GST $ _____

INVOICE TOTAL $ _____

COMMENTS:

CONTRACTOR SIGANTURE:

GST # 864331277RT0001

TTT
EVAN

415

FLOW TEST INVOICE

P/O # _____

ML HOT TAPS LTD.
532 Mariposa Drive NE
CALGARY, AB. T2E 5V8
Cell # (403) 606 4039

HYDRANT FLOW TEST

ADDRESS: TOWN OF PICTURE BUTTE

DATE: JULY 15, 2016

CONTRACTOR: ISL ENGINEERING

Pipe Diameter (mm)	150 MM — 6"
Flow Meter Reading (gpm)	1548 GPM
Hydrant Type	MCAVITY #1589
Static Pressure (psi)	65 PSI

Number of Ports	1 @ 50 mm	2 @ 50 mm
Pitot Tube Reading	1 @ 45	1 @ 45
		2 @ 40
Flow at each Port	1 @ 797	1 @ 797
		2 @ 751
Total Flow (gpm)	Approx	1548

TOTAL $ _____

GST $ _____

INVOICE TOTAL $ _____

COMMENTS:

CONTRACTOR SIGANTURE:

GST # 864331277RT0001

FTT
EVAN
415

FLOW TEST INVOICE

P/O # _____

ML HOT TAPS LTD.
532 Mariposa Drive NE
CALGARY, AB. T2E 5V8
Cell # (403) 606 4039

HYDRANT FLOW TEST

ADDRESS: TOWN OF PICTURE BUTTE

DATE: JULY 15, 2016

CONTRACTOR: ISL ENGINEERING

Pipe Diameter (mm)	150 mm — 6"
Flow Meter Reading (gpm)	1548 GPM
Hydrant Type	MCAVITY # 1490
Static Pressure (psi)	65 PSI

Number of Ports	1 @ 50 mm	2 @ 50 mm
Pitot Tube Reading	1 @ 45	1 @ 45
		2 @ 40
Flow at each Port	1 @ 797	1 @ 797
		2 @ 751
Total Flow (gpm)	Approx	1548

TOTAL $ _____

GST $ _____

INVOICE TOTAL $ _____

COMMENTS: POWER OFF
POWER ON
LOCK PINS ON 2" PORT BROKEN.

CONTRACTOR SIGANTURE:

GST # 864331277RT0001

TTT
EVAN

415

FLOW TEST INVOICE

P/O # _____

ML HOT TAPS LTD.
532 Mariposa Drive NE
CALGARY, AB. T2E 5V8
Cell # (403) 606 4039

HYDRANT FLOW TEST

ADDRESS: TOWN OF PICTURE BUTTE

DATE: JULY 15, 2016

CONTRACTOR: ISL ENGINEERING

Pipe Diameter (mm)	150 MM — 6"
Flow Meter Reading (gpm)	1548 GPM
Hydrant Type	McAVITY #1275
Static Pressure (psi)	65 PSI

Number of Ports	1 @ 50 mm	2 @ 50 mm
Pitot Tube Reading	1 @ 45	1 @ 45
		2 @ 40
Flow at each Port	1 @ 797	1 @ 797
		2 @ 751
Total Flow (gpm)	Approx	1548

TOTAL $ _____

GST $ _____

INVOICE TOTAL $ _____

COMMENTS:

CONTRACTOR SIGANTURE:

GST # 864331277RT0001

FTT
EVAW

415

FLOW TEST INVOICE

P/O # _____

ML HOT TAPS LTD.
532 Mariposa Drive NE
CALGARY, AB. T2E 5V8
Cell # (403) 606 4039

HYDRANT FLOW TEST

ADDRESS: TOWN OF PICTURE BUTTE

DATE: JULY 15, 2016

CONTRACTOR: ISL ENGINEERING

Pipe Diameter (mm)	150 MM — 6"
Flow Meter Reading (gpm)	1548 GPM
Hydrant Type	MCAUITY # 1653
Static Pressure (psi)	65 PSI

Number of Ports	1 @ 50 mm	2 @ 50 mm
Pitot Tube Reading	1 @ 45	1 @ 45
		2 @ 40
Flow at each Port	1 @ 797	1 @ 797
		2 @ 751
Total Flow (gpm)	Approx	1548

TOTAL $ _____

GST $ _____

INVOICE TOTAL $ _____

COMMENTS:

CONTRACTOR SIGANTURE:

GST # 864331277RT0001

TTT
EVAN

415

FLOW TEST INVOICE

P/O # _____

ML HOT TAPS LTD.
532 Mariposa Drive NE
CALGARY, AB. T2E 5V8
Cell # (403) 606 4039

HYDRANT FLOW TEST

ADDRESS: TOWN OF PICTURE BUTTE

DATE: JULY 15, 2016

CONTRACTOR: ISL ENGINEERING

Pipe Diameter (mm)	150 MM — 6"
Flow Meter Reading (gpm)	1548 GPM
Hydrant Type	MCAVITY # 1678
Static Pressure (psi)	65 PSI

Number of Ports	1 @ 50 mm	2 @ 50 mm
Pitot Tube Reading	1 @ 45	1 @ 45
		2 @ 40
Flow at each Port	1 @ 797	1 @ 797
		2 @ 751
Total Flow (gpm)	Approx	1548

TOTAL $ _____

GST $ _____

INVOICE TOTAL $ _____

COMMENTS:

CONTRACTOR SIGANTURE:

GST # 864331277RT0001

FTT
EVAN

415

FLOW TEST INVOICE

P/O # _____

ML HOT TAPS LTD.
532 Mariposa Drive NE
CALGARY, AB. T2E 5V8
Cell # (403) 606 4039

HYDRANT FLOW TEST

ADDRESS: TOWN OF PICTURE BUTTE

DATE: JULY 15, 2016

CONTRACTOR: ISL ENGINEERING

Pipe Diameter (mm)	150 MM — 6"
Flow Meter Reading (gpm)	1548 GPM
Hydrant Type	MCAVITY #1712
Static Pressure (psi)	65 PSI

Number of Ports	1 @ 50 mm	2 @ 50 mm
Pitot Tube Reading	1 @ 45	1 @ 45
		2 @ 40
Flow at each Port	1 @ 797	1 @ 797
		2 @ 751
Total Flow (gpm)	Approx	1548

TOTAL $ _____

GST $ _____

INVOICE TOTAL $ _____

COMMENTS:

CONTRACTOR SIGANTURE:

GST # 864331277RT0001

FTT
EVAN
415

FLOW TEST INVOICE

P/O # _____

ML HOT TAPS LTD.
532 Mariposa Drive NE
CALGARY, AB. T2E 5V8
Cell # (403) 606 4039

HYDRANT FLOW TEST

ADDRESS: TOWN OF PICTURE BUTTE

DATE: JULY 15, 2016

CONTRACTOR: ISL ENGINEERING

Pipe Diameter (mm)	150 MM — 6"
Flow Meter Reading (gpm)	1354 GPM
Hydrant Type	McAVITY # 1766
Static Pressure (psi)	55 PSI

Number of Ports	1 @ 50 mm	2 @ 50 mm
Pitot Tube Reading	1 @ 35	1 @ 35
		2 @ 30
Flow at each Port	1 @ 703	1 @ 703
		2 @ 651
Total Flow (gpm)	Approx	1354

TOTAL $ _____

GST $ _____

INVOICE TOTAL $ _____

COMMENTS:

CONTRACTOR SIGANTURE:

GST # 864331277RT0001

TTT
EVAN

415

FLOW TEST INVOICE

P/O # _____

ML HOT TAPS LTD.
532 Mariposa Drive NE
CALGARY, AB. T2E 5V8
Cell # (403) 606 4039

HYDRANT FLOW TEST

ADDRESS: TOWN OF PICTURE BUTTE

DATE: JULY 15, 2016

CONTRACTOR: ISL ENGINEERING

Pipe Diameter (mm)	150 MM — 6"
Flow Meter Reading (gpm)	1354 GPM
Hydrant Type	MCAUITY #1692
Static Pressure (psi)	55 PSI

Number of Ports	1 @ 50 mm	2 @ 50 mm
Pitot Tube Reading	1 @ 35	1 @ 35
		2 @ 30
Flow at each Port	1 @ 703	1 @ 703
		2 @ 651
Total Flow (gpm)	Approx	1354

TOTAL $ _____

GST $ _____

INVOICE TOTAL $ _____

COMMENTS:

CONTRACTOR SIGANTURE:

GST # 864331277RT0001

HTT
EVAN

415

FLOW TEST INVOICE

P/O # _____

ML HOT TAPS LTD.
532 Mariposa Drive NE
CALGARY, AB. T2E 5V8
Cell # (403) 606 4039

HYDRANT FLOW TEST

ADDRESS: TOWN OF PICTURE BUTTE

DATE: JULY 15, 2016

CONTRACTOR: ISL ENGINEERING

Pipe Diameter (mm)	150 MM — 6"
Flow Meter Reading (gpm)	1354 GPM
Hydrant Type	MCAVITY # 1813
Static Pressure (psi)	55 PSI

Number of Ports	1 @ 50 mm	2 @ 50 mm
Pitot Tube Reading	1 @ 35	1 @ 35
		2 @ 30
Flow at each Port	1 @ 703	1 @ 703
		2 @ 651
Total Flow (gpm)	Approx	1354

TOTAL $ _____

GST $ _____

INVOICE TOTAL $ _____

COMMENTS:

CONTRACTOR SIGANTURE:

GST # 864331277RT0001

FTT
EVAN

415

FLOW TEST INVOICE

P/O # _____

ML HOT TAPS LTD.
532 Mariposa Drive NE
CALGARY, AB. T2E 5V8
Cell # (403) 606 4039

HYDRANT FLOW TEST

ADDRESS: TOWN OF PICTURE BUTTE

DATE: JULY 15, 2016

CONTRACTOR: ISL ENGINEERING

Pipe Diameter (mm)	150 MM — 6"
Flow Meter Reading (gpm)	1637 GPM.
Hydrant Type	MCAVITY OLD STYLE # 1851
Static Pressure (psi)	70 PSI

Number of Ports	1 @ 50 mm	2 @ 50 mm
Pitot Tube Reading	1 @ 50	1 @ 50
		2 @ 45
Flow at each Port	1 @ 840	1 @ 840
		2 @ 797
Total Flow (gpm)	Approx	1637

TOTAL $ _____

GST $ _____

INVOICE TOTAL $ _____

COMMENTS:

CONTRACTOR SIGANTURE:

GST # 864331277RT0001

TTT
EVAN
415

FLOW TEST INVOICE

P/O # _____

ML HOT TAPS LTD.
532 Mariposa Drive NE
CALGARY, AB. T2E 5V8
Cell # (403) 606 4039

HYDRANT FLOW TEST

ADDRESS: TOWN OF PICTURE BUTTE

DATE: JULY 15, 2016

CONTRACTOR: ISL ENGINEERING

Pipe Diameter (mm)	150 MM — 6"
Flow Meter Reading (gpm)	1637 GPM
Hydrant Type	MCAVITY # 1196
Static Pressure (psi)	70 PSI

Number of Ports	1 @ 50 mm	2 @ 50 mm
Pitot Tube Reading	1 @ 50	1 @ 50
		2 @ 45
Flow at each Port	1 @ 840	1 @ 840
		2 @ 797
Total Flow (gpm)	Approx	1637

TOTAL $ _____

GST $ _____

INVOICE TOTAL $ _____

COMMENTS:

CONTRACTOR SIGANTURE:

GST # 864331277RT0001

FTT
EVAN

415

FLOW TEST INVOICE

P/O # _____

ML HOT TAPS LTD.
532 Mariposa Drive NE
CALGARY, AB. T2E 5V8
Cell # (403) 606 4039

HYDRANT FLOW TEST

ADDRESS: TOWN OF PICTURE BUTTE

DATE: JULY 15, 2016

CONTRACTOR: ISL ENGINEERING

Pipe Diameter (mm)	150 MM — 6"
Flow Meter Reading (gpm)	1637 GPM
Hydrant Type	MCAVITY # 1958
Static Pressure (psi)	70 PSI

Number of Ports	1 @ 50 mm	2 @ 50 mm
Pitot Tube Reading	1 @ 50	1 @ 50
		2 @ 45
Flow at each Port	1 @ 840	1 @ 840
		2 @ 797
Total Flow (gpm)	Approx	1637

TOTAL $ _____

GST $ _____

INVOICE TOTAL $ _____

COMMENTS:

CONTRACTOR SIGANTURE:

GST # 864331277RT0001

ATT.
EVAN

415

FLOW TEST INVOICE

P/O # _____

ML HOT TAPS LTD.
532 Mariposa Drive NE
CALGARY, AB. T2E 5V8
Cell # (403) 606 4039

HYDRANT FLOW TEST

ADDRESS: TOWN OF PICTURE BUTTE

DATE: JULY 15, 2016

CONTRACTOR: ISL ENGINEERING

Pipe Diameter (mm)	150 MM — 6"
Flow Meter Reading (gpm)	1637 GPM
Hydrant Type	MCAVITY #2237
Static Pressure (psi)	70 PSI

Number of Ports	1 @ 50 mm	2 @ 50 mm
Pitot Tube Reading	1 @ 50	1 @ 50
		2 @ 45
Flow at each Port	1 @ 840	1 @ 840
		2 @ 797
Total Flow (gpm)	Approx	1637

TOTAL $ _____

GST $ _____

INVOICE TOTAL $ _____

COMMENTS:

CONTRACTOR SIGANTURE:

GST # 864331277RT0001

TTT
EVAN

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FLOW TEST INVOICE

P/O # _____

ML HOT TAPS LTD.
532 Mariposa Drive NE
CALGARY, AB. T2E 5V8
Cell # (403) 606 4039

HYDRANT FLOW TEST

ADDRESS: TOWN OF PICTURE BUTTE

DATE: JULY 15, 2016

CONTRACTOR: ISL ENGINEERING

Pipe Diameter (mm)	150 mm — 6"
Flow Meter Reading (gpm)	1637 GPM
Hydrant Type	MUELLER #1940
Static Pressure (psi)	70 PSI

Number of Ports	1 @ 50 mm	2 @ 50 mm
Pitot Tube Reading	1 @ 50	1 @ 50
		2 @ 45
Flow at each Port	1 @ 840	1 @ 840
		2 @ 797
Total Flow (gpm)	Approx	1637

TOTAL $ _____

GST $ _____

INVOICE TOTAL $ _____

COMMENTS:

CONTRACTOR SIGANTURE:

GST # 864331277RT0001

HTT
EVAN

415

FLOW TEST INVOICE

P/O # _____

ML HOT TAPS LTD.
532 Mariposa Drive NE
CALGARY, AB. T2E 5V8
Cell # (403) 606 4039

HYDRANT FLOW TEST

ADDRESS: TOWN OF PICTURE BUTTE

DATE: JULY 15, 2016

CONTRACTOR: ISL ENGINEERING

Pipe Diameter (mm)	150 MM — 6"
Flow Meter Reading (gpm)	1637 GPM
Hydrant Type	MCAVITY #2052
Static Pressure (psi)	70 PSI

Number of Ports	1 @ 50 mm	2 @ 50 mm
Pitot Tube Reading	1 @ 50	1 @ 50
		2 @ 45
Flow at each Port	1 @ 840	1 @ 840
		2 @ 797
Total Flow (gpm)	Approx	1637

TOTAL $ _____

GST $ _____

INVOICE TOTAL $ _____

COMMENTS:

CONTRACTOR SIGANTURE:

GST # 864331277RT0001

FTT:
EVAN

415

FLOW TEST INVOICE

P/O # _____

ML HOT TAPS LTD.
532 Mariposa Drive NE
CALGARY, AB. T2E 5V8
Cell # (403) 606 4039

HYDRANT FLOW TEST

ADDRESS: TOWN OF PICTURE BUTTE

DATE: JULY 15, 2016

CONTRACTOR: ISL ENGINEERING

Pipe Diameter (mm)	150 MM — 6"
Flow Meter Reading (gpm)	1354 GPM.
Hydrant Type	MCAVITY #3707
Static Pressure (psi)	60 PSI

Number of Ports	1 @ 50 mm	2 @ 50 mm
Pitot Tube Reading	1 @ 35	1 @ 35
		2 @ 30
Flow at each Port	1 @ 703	1 @ 703
		2 @ 651
Total Flow (gpm)	Approx	1354

TOTAL $ _____

GST $ _____

INVOICE TOTAL $ _____

COMMENTS:

CONTRACTOR SIGANTURE:

GST # 864331277RT0001

FTT
EVAN

415

FLOW TEST INVOICE

P/O # _____

ML HOT TAPS LTD.
532 Mariposa Drive NE
CALGARY, AB. T2E 5V8
Cell # (403) 606 4039

HYDRANT FLOW TEST

ADDRESS: TOWN OF PICTURE BUTTE

DATE: JULY 15, 2016

CONTRACTOR: ISL ENGINEERING

Pipe Diameter (mm)	150 MM — 6"
Flow Meter Reading (gpm)	1354 GPM
Hydrant Type	MCAVITY #3487
Static Pressure (psi)	60 PSI

Number of Ports	1 @ 50 mm	2 @ 50 mm
Pitot Tube Reading	1 @ 35	1 @ 35
		2 @ 30
Flow at each Port	1 @ 703	1 @ 703
		2 @ 651
Total Flow (gpm)	Approx	

TOTAL $ _____

GST $ _____

INVOICE TOTAL $ _____

COMMENTS:

CONTRACTOR SIGANTURE:

GST # 864331277RT0001

ATT:
EVAN

415

FLOW TEST INVOICE

P/O # _____

ML HOT TAPS LTD.
532 Mariposa Drive NE
CALGARY, AB. T2E 5V8
Cell # (403) 606 4039

HYDRANT FLOW TEST

ADDRESS: TOWN OF PICTURE BUTTE

DATE: JULY 15, 2016

CONTRACTOR: ISL ENGINEERING

Pipe Diameter (mm)	150 MM — 6"
Flow Meter Reading (gpm)	1354 GPM
Hydrant Type	MCAUITY # 3428
Static Pressure (psi)	60 PSI

Number of Ports	1 @ 50 mm	2 @ 50 mm
Pitot Tube Reading	1 @ 35	1 @ 35
		2 @ 30
Flow at each Port	1 @ 703	1 @ 703
		2 @ 651
Total Flow (gpm)	Approx	1354

TOTAL $ _____

GST $ _____

INVOICE TOTAL $ _____

COMMENTS:

CONTRACTOR SIGANTURE:

GST # 864331277RT0001

FTT
EVAW
415

FLOW TEST INVOICE

P/O # _____

ML HOT TAPS LTD.
532 Mariposa Drive NE
CALGARY, AB. T2E 5V8
Cell # (403) 606 4039

HYDRANT FLOW TEST

ADDRESS: TOWN OF PICTURE BUTTE

DATE: JULY 15, 2016

CONTRACTOR: ISL ENGINEERING

Pipe Diameter (mm)	150 MM — 6"
Flow Meter Reading (gpm)	1354 GPM
Hydrant Type	MCAVITY #3406
Static Pressure (psi)	60 PSI

Number of Ports	1 @ 50 mm	2 @ 50 mm
Pitot Tube Reading	1 @ 35	1 @ 35
		2 @ 30
Flow at each Port	1 @ 703	1 @ 703
		2 @ 651
Total Flow (gpm)	Approx	1354

TOTAL $ _____

GST $ _____

INVOICE TOTAL $ _____

COMMENTS:

CONTRACTOR SIGANTURE:

GST # 864331277RT0001

FTT
EVAN
415

FLOW TEST INVOICE

P/O # _____

ML HOT TAPS LTD.
532 Mariposa Drive NE
CALGARY, AB. T2E 5V8
Cell # (403) 606 4039

HYDRANT FLOW TEST

ADDRESS: TOWN OF PICTURE BUTTE

DATE: JULY 15, 2016

CONTRACTOR: ISL ENGINEERING

Pipe Diameter (mm)	150 MM — 6"
Flow Meter Reading (gpm)	1354 GPM
Hydrant Type	MCAVITY #3680
Static Pressure (psi)	60 PSI

Number of Ports	1 @ 50 mm	2 @ 50 mm
Pitot Tube Reading	1 @ 35	1 @ 35
		2 @ 30
Flow at each Port	1 @ 703	1 @ 703
		2 @ 651
Total Flow (gpm)	Approx	1354

TOTAL $ _____

GST $ _____

INVOICE TOTAL $ _____

COMMENTS:

CONTRACTOR SIGANTURE:

GST # 864331277RT0001

FTT
EVAN
415

FLOW TEST INVOICE

P/O # _____

ML HOT TAPS LTD.
532 Mariposa Drive NE
CALGARY, AB. T2E 5V8
Cell # (403) 606 4039

HYDRANT FLOW TEST

ADDRESS: TOWN OF PICTURE BUTTE

DATE: JULY 15, 2016

CONTRACTOR: ISL ENGINEERING

Pipe Diameter (mm)	150 MM — 6"
Flow Meter Reading (gpm)	1354 GPM
Hydrant Type	TERMIWAL CITY #3376
Static Pressure (psi)	60 PSI

Number of Ports	1 @ 50 mm	2 @ 50 mm
Pitot Tube Reading	1 @ 35	1 @ 35
		2 @ 30
Flow at each Port	1 @ 703	1 @ 703
		2 @ 651
Total Flow (gpm)	Approx	1354

TOTAL $ _____

GST $ _____

INVOICE TOTAL $ _____

COMMENTS:
DRAWING SLOW
NEED TO BE PUMP DOWN.

CONTRACTOR SIGANTURE:

GST # 864331277RT0001

FTT
EVAN
415

FLOW TEST INVOICE

P/O # _____

ML HOT TAPS LTD.
532 Mariposa Drive NE
CALGARY, AB. T2E 5V8
Cell # (403) 606 4039

HYDRANT FLOW TEST

ADDRESS: TOWN OF PICTURE BUTTE

DATE: JULY 15, 2016

CONTRACTOR: ISL ENGINEERING

Pipe Diameter (mm)	150 MM — 6"
Flow Meter Reading (gpm)	1637 GPM.
Hydrant Type	MCAUITY OLD STYLE # 2235
Static Pressure (psi)	70 PSI

Number of Ports	1 @ 50 mm	2 @ 50 mm
Pitot Tube Reading	1 @ 50	1 @ 50
		2 @ 45
Flow at each Port	1 @ 840	1 @ 840
		2 @ 797
Total Flow (gpm)	Approx	1637

TOTAL $ _____

GST $ _____

INVOICE TOTAL $ _____

COMMENTS:

CONTRACTOR SIGANTURE:

GST # 864331277RT0001

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EVAN

415

FLOW TEST INVOICE

P/O # _____

ML HOT TAPS LTD.
532 Mariposa Drive NE
CALGARY, AB. T2E 5V8
Cell # (403) 606 4039

HYDRANT FLOW TEST

ADDRESS: TOWN OF PICTURE BUTTE

DATE: JULY 15, 2016

CONTRACTOR: ISL ENGINEERING

Pipe Diameter (mm)	150 MM — 6"
Flow Meter Reading (gpm)	1637 GPM
Hydrant Type	MCAVITY #3364
Static Pressure (psi)	70 PSI

Number of Ports	1 @ 50 mm	2 @ 50 mm
Pitot Tube Reading	1 @ 50	1 @ 50
		2 @ 45
Flow at each Port	1 @ 840	1 @ 840
		2 @ 797
Total Flow (gpm)	Approx	1637

TOTAL $ _____

GST $ _____

INVOICE TOTAL $ _____

COMMENTS:

CONTRACTOR SIGANTURE:

GST # 864331277RT0001

FTT
EVAN

415

FLOW TEST INVOICE

P/O # _____

ML HOT TAPS LTD.
532 Mariposa Drive NE
CALGARY, AB. T2E 5V8
Cell # (403) 606 4039

HYDRANT FLOW TEST

ADDRESS: TOWN OF PICTURE BUTTE

DATE: JULY 15, 2016

CONTRACTOR: ISL ENGINEERING

Pipe Diameter (mm)	150 mm — 6"
Flow Meter Reading (gpm)	1637 GPM
Hydrant Type	McAVITY #3336
Static Pressure (psi)	70 PSI

Number of Ports	1 @ 50 mm	2 @ 50 mm
Pitot Tube Reading	1 @ 50	1 @ 50
		2 @ 45
Flow at each Port	1 @ 840	1 @ 840
		2 @ 797
Total Flow (gpm)	Approx	1637

TOTAL $ _____

GST $ _____

INVOICE TOTAL $ _____

COMMENTS:

CONTRACTOR SIGANTURE:

GST # 864331277RT0001

FTT
EVAN
415

FLOW TEST INVOICE

P/O # _____

ML HOT TAPS LTD.
532 Mariposa Drive NE
CALGARY, AB. T2E 5V8
Cell # (403) 606 4039

HYDRANT FLOW TEST

ADDRESS: TOWN OF PICTURE BUTTE

DATE: JULY 15, 2016

CONTRACTOR: ISL ENGINEERING

Pipe Diameter (mm)	150 mm — 6"
Flow Meter Reading (gpm)	1637 GPM
Hydrant Type	TERMINAL CITY #3584
Static Pressure (psi)	70 PSI

Number of Ports	1 @ 50 mm	2 @ 50 mm
Pitot Tube Reading	1 @ 50	1 @ 50
		2 @ 45
Flow at each Port	1 @ 840	1 @ 840
		2 @ 797
Total Flow (gpm)	Approx	1637

TOTAL $ _____

GST $ _____

INVOICE TOTAL $ _____

COMMENTS:
SLOW DRAWG.
WEED TO BE PUMP DOWN.

CONTRACTOR SIGANTURE:

GST # 864331277RT0001

FTT
EVAN
415

FLOW TEST INVOICE

P/O # _____

ML HOT TAPS LTD.
532 Mariposa Drive NE
CALGARY, AB. T2E 5V8
Cell # (403) 606 4039

HYDRANT FLOW TEST

ADDRESS: TOWN OF PICTURE BUTTE

DATE: JULY 15, 2016

CONTRACTOR: ISL ENGINEERING

Pipe Diameter (mm)	150 MM — 6"
Flow Meter Reading (gpm)	1637 GPM.
Hydrant Type	MCAUITY OLD STYLE #3570
Static Pressure (psi)	70 PSI

Number of Ports	1 @ 50 mm	2 @ 50 mm
Pitot Tube Reading	1 @ 50	1 @ 50
		2 @ 45
Flow at each Port	1 @ 840	1 @ 840
		2 @ 797
Total Flow (gpm)	Approx	1637

TOTAL $ _____

GST $ _____

INVOICE TOTAL $ _____

COMMENTS:

CONTRACTOR SIGANTURE:

GST # 864331277RT0001

FTT
EVAN
415

FLOW TEST INVOICE

P/O # _____

ML HOT TAPS LTD.
532 Mariposa Drive NE
CALGARY, AB. T2E 5V8
Cell # (403) 606 4039

HYDRANT FLOW TEST

ADDRESS: TOWN OF PICTURE BUTTE

DATE: JULY 15, 2016

CONTRACTOR: ISL ENGINEERING

Pipe Diameter (mm)	150 MM — 6"
Flow Meter Reading (gpm)	1548 GPM
Hydrant Type	MCAUITY #3300
Static Pressure (psi)	65 PSI

Number of Ports	1 @ 50 mm	2 @ 50 mm
Pitot Tube Reading	1 @ 45	1 @ 45
		2 @ 40
Flow at each Port	1 @ 797	1 @ 797
		2 @ 751
Total Flow (gpm)	Approx	1548

TOTAL $ _____

GST $ _____

INVOICE TOTAL $ _____

COMMENTS:

CONTRACTOR SIGANTURE:

GST # 864331277RT0001

FTT
EVAN

415

FLOW TEST INVOICE

P/O # _____

ML HOT TAPS LTD.
532 Mariposa Drive NE
CALGARY, AB. T2E 5V8
Cell # (403) 606 4039

HYDRANT FLOW TEST

ADDRESS: TOWN OF PICTURE BUTTE

DATE: JULY 15, 2016

CONTRACTOR: ISL ENGINEERING

Pipe Diameter (mm)	150 MM — 6"
Flow Meter Reading (gpm)	1637 GPM
Hydrant Type	MUELLER #3479
Static Pressure (psi)	70 PSI

Number of Ports	1 @ 50 mm	2 @ 50 mm
Pitot Tube Reading	1 @ 50	1 @ 50
		2 @ 45
Flow at each Port	1 @ 840	1 @ 840
		2 @ 797
Total Flow (gpm)	Approx	1637

TOTAL $ _____

GST $ _____

INVOICE TOTAL $ _____

COMMENTS:

CONTRACTOR SIGANTURE:

GST # 864331277RT0001

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EVAN

415

FLOW TEST INVOICE

P/O # _____

ML HOT TAPS LTD.
532 Mariposa Drive NE
CALGARY, AB. T2E 5V8
Cell # (403) 606 4039

HYDRANT FLOW TEST

ADDRESS: TOWN OF PICTURE BUTTE

DATE: JULY 15, 2016

CONTRACTOR: ISL ENGINEERING

Pipe Diameter (mm)	150 mm — 6"
Flow Meter Reading (gpm)	1637 GPM
Hydrant Type	MUELLER # 3498
Static Pressure (psi)	70 PSI

Number of Ports	1 @ 50 mm	2 @ 50 mm
Pitot Tube Reading	1 @ 50	1 @ 50
		2 @ 45
Flow at each Port	1 @ 840	1 @ 840
		2 @ 797
Total Flow (gpm)	Approx	1637

TOTAL $ _____

GST $ _____

INVOICE TOTAL $ _____

COMMENTS:

CONTRACTOR SIGANTURE:

GST # 864331277RT0001

HTT
EVAN

415

FLOW TEST INVOICE

P/O # _____

ML HOT TAPS LTD.
532 Mariposa Drive NE
CALGARY, AB. T2E 5V8
Cell # (403) 606 4039

HYDRANT FLOW TEST

ADDRESS: TOWN OF PICTURE BUTTE

DATE: JULY 15, 2016

CONTRACTOR: ISL ENGINEERING

Pipe Diameter (mm)	150 MM — 6"
Flow Meter Reading (gpm)	1637 GPM
Hydrant Type	MCAVITY #3228
Static Pressure (psi)	70 PSI

Number of Ports	1 @ 50 mm	2 @ 50 mm
Pitot Tube Reading	1 @ 50	1 @ 50
		2 @ 45
Flow at each Port	1 @ 840	1 @ 840
		2 @ 797
Total Flow (gpm)	Approx	1637

TOTAL $ _____

GST $ _____

INVOICE TOTAL $ _____

COMMENTS:
SLOW DRAIN

CONTRACTOR SIGANTURE:

GST # 864331277RT0001

FTT
EVAN
415

FLOW TEST INVOICE

P/O # _____

ML HOT TAPS LTD.
532 Mariposa Drive NE
CALGARY, AB. T2E 5V8
Cell # (403) 606 4039

HYDRANT FLOW TEST

ADDRESS: TOWN OF PICTURE BUTTE

DATE: JULY 15, 2016

CONTRACTOR: ISL ENGINEERING

Pipe Diameter (mm)	150 mm — 6"
Flow Meter Reading (gpm)	1637 GPM
Hydrant Type	McAVITY #3217
Static Pressure (psi)	70 PSI

Number of Ports	1 @ 50 mm	2 @ 50 mm
Pitot Tube Reading	1 @ 50	1 @ 50
		2 @ 45
Flow at each Port	1 @ 840	1 @ 840
		2 @ 797
Total Flow (gpm)	Approx	1637

TOTAL $ _____

GST $ _____

INVOICE TOTAL $ _____

COMMENTS:

CONTRACTOR SIGANTURE:

GST # 864331277RT0001

FTT
EVAN

415

FLOW TEST INVOICE

P/O # _____

ML HOT TAPS LTD.
532 Mariposa Drive NE
CALGARY, AB. T2E 5V8
Cell # (403) 606 4039

HYDRANT FLOW TEST

ADDRESS: TOWN OF PICTURE BUTTE

DATE: JULY 15, 2016

CONTRACTOR: ISL ENGINEERING

Pipe Diameter (mm)	150 mm — 6"
Flow Meter Reading (gpm)	1637 GPM
Hydrant Type	MCAVITY # 3214
Static Pressure (psi)	70 PSI

Number of Ports	1 @ 50 mm	2 @ 50 mm
Pitot Tube Reading	1 @ 50	1 @ 50
		2 @ 45
Flow at each Port	1 @ 840	1 @ 840
		2 @ 797
Total Flow (gpm)	Approx	1637

TOTAL $ _____

GST $ _____

INVOICE TOTAL $ _____

COMMENTS:

CONTRACTOR SIGANTURE:

GST # 864331277RT0001

FTT
EVAN

415

FLOW TEST INVOICE

P/O # _____

ML HOT TAPS LTD.
532 Mariposa Drive NE
CALGARY, AB. T2E 5V8
Cell # (403) 606 4039

HYDRANT FLOW TEST

ADDRESS: TOWN OF PICTURE BUTTE

DATE: JULY 15, 2016

CONTRACTOR: ISL ENGINEERING

Pipe Diameter (mm)	150 MM — 6"
Flow Meter Reading (gpm)	1548 GPM
Hydrant Type	McAUITY #3206
Static Pressure (psi)	65 PSI

Number of Ports	1 @ 50 mm	2 @ 50 mm
Pitot Tube Reading	1 @ 45	1 @ 45
		2 @ 40
Flow at each Port	1 @ 797	1 @ 797
		2 @ 751
Total Flow (gpm)	Approx	1548

TOTAL $ _____

GST $ _____

INVOICE TOTAL $ _____

COMMENTS:

CONTRACTOR SIGANTURE:

GST # 864331277RT0001

FTT
EVAN

415

FLOW TEST INVOICE

P/O # _____

ML HOT TAPS LTD.
532 Mariposa Drive NE
CALGARY, AB. T2E 5V8
Cell # (403) 606 4039

HYDRANT FLOW TEST

ADDRESS: TOWN OF PICTURE BUTTE

DATE: JULY 15, 2016

CONTRACTOR: ISL ENGINEERING

Pipe Diameter (mm)	150 MM — 6"
Flow Meter Reading (gpm)	1548 GPM
Hydrant Type	MCAVITY #3198
Static Pressure (psi)	65 PSI

Number of Ports	1 @ 50 mm	2 @ 50 mm
Pitot Tube Reading	1 @ 45	1 @ 45
		2 @ 40
Flow at each Port	1 @ 797	1 @ 797
		2 @ 751
Total Flow (gpm)	Approx	1548

TOTAL $ _____

GST $ _____

INVOICE TOTAL $ _____

COMMENTS:

CONTRACTOR SIGANTURE:

GST # 864331277RT0001

FTT
EVAN
415

FLOW TEST INVOICE

P/O # _____

ML HOT TAPS LTD.
532 Mariposa Drive NE
CALGARY, AB. T2E 5V8
Cell # (403) 606 4039

HYDRANT FLOW TEST

ADDRESS: TOWN OF PICTURE BUTTE

DATE: JULY 15, 2016

CONTRACTOR: ISL ENGINEERING

Pipe Diameter (mm)	150 MM — 6"
Flow Meter Reading (gpm)	1548 GPM
Hydrant Type	MCAUITY #3197
Static Pressure (psi)	65 PSI

Number of Ports	1 @ 50 mm	2 @ 50 mm
Pitot Tube Reading	1 @ 45	1 @ 45
		2 @ 40
Flow at each Port	1 @ 797	1 @ 797
		2 @ 751
Total Flow (gpm)	Approx	1548

TOTAL $ _____

GST $ _____

INVOICE TOTAL $ _____

COMMENTS:

CONTRACTOR SIGANTURE:

GST # 864331277RT0001

ATT:
EVAN

415

FLOW TEST INVOICE

P/O # _____

ML HOT TAPS LTD.
532 Mariposa Drive NE
CALGARY, AB. T2E 5V8
Cell # (403) 606 4039

HYDRANT FLOW TEST

ADDRESS: TOWN OF PICTURE BUTTE

DATE: JULY 15, 2016

CONTRACTOR: ISL ENGINEERING

Pipe Diameter (mm)	150 mm — 6"
Flow Meter Reading (gpm)	1548 GPM
Hydrant Type	MCAVITY # 3867
Static Pressure (psi)	65 PSI

Number of Ports	1 @ 50 mm	2 @ 50 mm
Pitot Tube Reading	1 @ 45	1 @ 45
		2 @ 40
Flow at each Port	1 @ 797	1 @ 797
		2 @ 751
Total Flow (gpm)	Approx	1548

TOTAL $ _____

GST $ _____

INVOICE TOTAL $ _____

COMMENTS:
SLOW DRAW

CONTRACTOR SIGANTURE:

GST # 864331277RT0001

TTT
EVAN

415

FLOW TEST INVOICE

P/O # _____

ML HOT TAPS LTD.
532 Mariposa Drive NE
CALGARY, AB. T2E 5V8
Cell # (403) 606 4039

HYDRANT FLOW TEST

ADDRESS: TOWN OF PICTURE BUTTE

DATE: JULY 15, 2016

CONTRACTOR: ISL ENGINEERING

Pipe Diameter (mm)	150 mm — 6"
Flow Meter Reading (gpm)	1548 GPM
Hydrant Type	MCAVITY #3110
Static Pressure (psi)	65 PSI

Number of Ports	1 @ 50 mm	2 @ 50 mm
Pitot Tube Reading	1 @ 45	1 @ 45
		2 @ 40
Flow at each Port	1 @ 797	1 @ 797
		2 @ 751
Total Flow (gpm)	Approx	1548

TOTAL $ _____

GST $ _____

INVOICE TOTAL $ _____

COMMENTS:
SLOW DRAW

CONTRACTOR SIGANTURE:

GST # 864331277RT0001

TT
EVAN

415

FLOW TEST INVOICE

P/O # _____

ML HOT TAPS LTD.
532 Mariposa Drive NE
CALGARY, AB. T2E 5V8
Cell # (403) 606 4039

HYDRANT FLOW TEST

ADDRESS: TOWN OF PICTURE BUTTE

DATE: JULY 15, 2016

CONTRACTOR: ISL ENGINEERING

Pipe Diameter (mm)	150 MM — 6"
Flow Meter Reading (gpm)	1548 GPM
Hydrant Type	McAVITY # 3086
Static Pressure (psi)	65 PSI

Number of Ports	1 @ 50 mm	2 @ 50 mm
Pitot Tube Reading	1 @ 45	1 @ 45
		2 @ 40
Flow at each Port	1 @ 797	1 @ 797
		2 @ 751
Total Flow (gpm)	Approx	1548

TOTAL $ _____

GST $ _____

INVOICE TOTAL $ _____

COMMENTS:

CONTRACTOR SIGANTURE:

GST # 864331277RT0001

HTT
EVAN

415

FLOW TEST INVOICE

P/O # _____

ML HOT TAPS LTD.
532 Mariposa Drive NE
CALGARY, AB. T2E 5V8
Cell # (403) 606 4039

HYDRANT FLOW TEST

ADDRESS: TOWN OF PICTURE BUTTE

DATE: JULY 15, 2016

CONTRACTOR: ISL ENGINEERING

Pipe Diameter (mm)	150 MM — 6"
Flow Meter Reading (gpm)	1548 GPM
Hydrant Type	MUNICIPAL #3085
Static Pressure (psi)	65 PSI

Number of Ports	1 @ 50 mm	2 @ 50 mm
Pitot Tube Reading	1 @ 45	1 @ 45
		2 @ 40
Flow at each Port	1 @ 797	1 @ 797
		2 @ 751
Total Flow (gpm)	Approx	1548

TOTAL $ _____

GST $ _____

INVOICE TOTAL $ _____

COMMENTS:

CONTRACTOR SIGANTURE:

GST # 864331277RT0001

FTT
EVAN

415

FLOW TEST INVOICE

P/O # _____

ML HOT TAPS LTD.
532 Mariposa Drive NE
CALGARY, AB. T2E 5V8
Cell # (403) 606 4039

HYDRANT FLOW TEST

ADDRESS: TOWN OF PICTURE BUTTE

DATE: JULY 15, 2016

CONTRACTOR: ISL ENGINEERING

Pipe Diameter (mm)	150 MM — 6"
Flow Meter Reading (gpm)	1548 GPM
Hydrant Type	MCAVITY #2665
Static Pressure (psi)	65 PSI

Number of Ports	1 @ 50 mm	2 @ 50 mm
Pitot Tube Reading	1 @ 45	1 @ 45
		2 @ 40
Flow at each Port	1 @ 797	1 @ 797
		2 @ 751
Total Flow (gpm)	Approx	1548

TOTAL $ _____

GST $ _____

INVOICE TOTAL $ _____

COMMENTS:

CONTRACTOR SIGANTURE:

GST # 864331277RT0001

FTT
EVAN

415

FLOW TEST INVOICE

P/O # _____

ML HOT TAPS LTD.
532 Mariposa Drive NE
CALGARY, AB. T2E 5V8
Cell # (403) 606 4039

HYDRANT FLOW TEST

ADDRESS: TOWN OF PICTURE BUTTE

DATE: JULY 15, 2016

CONTRACTOR: ISL ENGINEERING

Pipe Diameter (mm)	150 mm — 6"
Flow Meter Reading (gpm)	1548 GPM
Hydrant Type	MCAVITY # 3277
Static Pressure (psi)	65 PSI

Number of Ports	1 @ 50 mm	2 @ 50 mm
Pitot Tube Reading	1 @ 45	1 @ 45
		2 @ 40
Flow at each Port	1 @ 797	1 @ 797
		2 @ 751
Total Flow (gpm)	Approx	1548

TOTAL $ _____

GST $ _____

INVOICE TOTAL $ _____

COMMENTS:

CONTRACTOR SIGANTURE:

GST # 864331277RT0001

FTT
EVAW

415

FLOW TEST INVOICE

P/O # _____

ML HOT TAPS LTD.
532 Mariposa Drive NE
CALGARY, AB. T2E 5V8
Cell # (403) 606 4039

HYDRANT FLOW TEST

ADDRESS: TOWN OF PICTURE BUTTE

DATE: JULY 15, 2016

CONTRACTOR: ISL ENGINEERING

Pipe Diameter (mm)	150 mm — 6"
Flow Meter Reading (gpm)	1354 GPM
Hydrant Type	MCAVITY #3829
Static Pressure (psi)	60 PSI

Number of Ports	1 @ 50 mm	2 @ 50 mm
Pitot Tube Reading	1 @ 35	1 @ 35
		2 @ 30
Flow at each Port	1 @ 703	1 @ 703
		2 @ 651
Total Flow (gpm)	Approx	1354

TOTAL $ _____

GST $ _____

INVOICE TOTAL $ _____

COMMENTS:

CONTRACTOR SIGANTURE:

GST # 864331277RT0001

FTT
EVAN

415

FLOW TEST INVOICE

P/O # _____

ML HOT TAPS LTD.
532 Mariposa Drive NE
CALGARY, AB. T2E 5V8
Cell # (403) 606 4039

HYDRANT FLOW TEST

ADDRESS: TOWN OF PICTURE BUTTE

DATE: JULY 15, 2016

CONTRACTOR: ISL ENGINEERING

Pipe Diameter (mm)	150 mm — 6"
Flow Meter Reading (gpm)	1354 GPM
Hydrant Type	MUELLER # 3833
Static Pressure (psi)	60 PSI

Number of Ports	1 @ 50 mm	2 @ 50 mm
Pitot Tube Reading	1 @ 35	1 @ 35
		2 @ 30
Flow at each Port	1 @ 703	1 @ 703
		2 @ 651
Total Flow (gpm)	Approx	1354

TOTAL $ _____

GST $ _____

INVOICE TOTAL $ _____

COMMENTS:

CONTRACTOR SIGANTURE:

GST # 864331277RT0001

FTT
EVAN
415

FLOW TEST INVOICE

P/O # _____

ML HOT TAPS LTD.
532 Mariposa Drive NE
CALGARY, AB. T2E 5V8
Cell # (403) 606 4039

HYDRANT FLOW TEST

ADDRESS: TOWN OF PICTURE BUTTE

DATE: JULY 15, 2016

CONTRACTOR: ISL ENGINEERING

Pipe Diameter (mm)	150 mm — 6"
Flow Meter Reading (gpm)	1354 GPM
Hydrant Type	MCAUITY #2722
Static Pressure (psi)	60 PSI

Number of Ports	1 @ 50 mm	2 @ 50 mm
Pitot Tube Reading	1 @ 35	1 @ 35
		2 @ 30
Flow at each Port	1 @ 703	1 @ 703
		2 @ 651
Total Flow (gpm)	Approx	1354

TOTAL $ _____

GST $ _____

INVOICE TOTAL $ _____

COMMENTS:

CONTRACTOR SIGANTURE:

GST # 864331277RT0001

TTT
EVAN

415

FLOW TEST INVOICE

P/O # _____

ML HOT TAPS LTD.
532 Mariposa Drive NE
CALGARY, AB. T2E 5V8
Cell # (403) 606 4039

HYDRANT FLOW TEST

ADDRESS: TOWN OF PICTURE BUTTE

DATE: JULY 15, 2016

CONTRACTOR: ISL ENGINEERING

Pipe Diameter (mm)	150 MM — 6"
Flow Meter Reading (gpm)	1548 GPM
Hydrant Type	McAVITY #2800
Static Pressure (psi)	65 PSI

Number of Ports	1 @ 50 mm	2 @ 50 mm
Pitot Tube Reading	1 @ 45	1 @ 45
		2 @ 40
Flow at each Port	1 @ 797	1 @ 797
		2 @ 751
Total Flow (gpm)	Approx	1548

TOTAL $ _____

GST $ _____

INVOICE TOTAL $ _____

COMMENTS:

CONTRACTOR SIGANTURE:

GST # 864331277RT0001

FTT
EVAN

415

FLOW TEST INVOICE

P/O # _____

ML HOT TAPS LTD.
532 Mariposa Drive NE
CALGARY, AB. T2E 5V8
Cell # (403) 606 4039

HYDRANT FLOW TEST

ADDRESS: TOWN OF PICTURE BUTTE

DATE: JULY 15, 2016

CONTRACTOR: ISL ENGINEERING

Pipe Diameter (mm)	150 MM — 6"
Flow Meter Reading (gpm)	1548 GPM
Hydrant Type	MCAUITY #3803
Static Pressure (psi)	65 PSI

Number of Ports	1 @ 50 mm	2 @ 50 mm
Pitot Tube Reading	1 @ 45	1 @ 45
		2 @ 40
Flow at each Port	1 @ 797	1 @ 797
		2 @ 751
Total Flow (gpm)	Approx	1548

TOTAL $ _____

GST $ _____

INVOICE TOTAL $ _____

COMMENTS:

CONTRACTOR SIGANTURE:

GST # 864331277RT0001

TT
EVAN

415

FLOW TEST INVOICE

P/O # _____

ML HOT TAPS LTD.
532 Mariposa Drive NE
CALGARY, AB. T2E 5V8
Cell # (403) 606 4039

HYDRANT FLOW TEST

ADDRESS: TOWN OF PICTURE BUTTE

DATE: JULY 15, 2016

CONTRACTOR: ISL ENGINEERING

Pipe Diameter (mm)	150 MM — 6"
Flow Meter Reading (gpm)	1548 GPM
Hydrant Type	MCAVITY # 2695
Static Pressure (psi)	65 PSI

Number of Ports	1 @ 50 mm	2 @ 50 mm
Pitot Tube Reading	1 @ 45	1 @ 45
		2 @ 40
Flow at each Port	1 @ 797	1 @ 797
		2 @ 751
Total Flow (gpm)	Approx	1548

TOTAL $ _____

GST $ _____

INVOICE TOTAL $ _____

COMMENTS:

CONTRACTOR SIGANTURE:

GST # 864331277RT0001

FTT
EVAN

415

FLOW TEST INVOICE

P/O # _____

ML HOT TAPS LTD.
532 Mariposa Drive NE
CALGARY, AB. T2E 5V8
Cell # (403) 606 4039

HYDRANT FLOW TEST

ADDRESS: TOWN OF PICTURE BUTTE

DATE: JULY 15, 2016

CONTRACTOR: ISL ENGINEERING

Pipe Diameter (mm)	150 MM — 6"
Flow Meter Reading (gpm)	1548 GPM
Hydrant Type	MCAVITY # 3781
Static Pressure (psi)	65 PSI

Number of Ports	1 @ 50 mm	2 @ 50 mm
Pitot Tube Reading	1 @ 45	1 @ 45
		2 @ 40
Flow at each Port	1 @ 797	1 @ 797
		2 @ 751
Total Flow (gpm)	Approx	1548

TOTAL $ _____

GST $ _____

INVOICE TOTAL $ _____

COMMENTS:

CONTRACTOR SIGANTURE:

GST # 864331277RT0001

FTT:
EVAN

415

FLOW TEST INVOICE

P/O # _____

ML HOT TAPS LTD.
532 Mariposa Drive NE
CALGARY, AB. T2E 5V8
Cell # (403) 606 4039

HYDRANT FLOW TEST

ADDRESS: TOWN OF PICTURE BUTTE

DATE: JULY 15, 2016

CONTRACTOR: ISL ENGINEERING

Pipe Diameter (mm)	150 MM — 6"
Flow Meter Reading (gpm)	1548 GPM
Hydrant Type	MCAUITY #2903
Static Pressure (psi)	65 PSI

Number of Ports	1 @ 50 mm	2 @ 50 mm
Pitot Tube Reading	1 @ 45	1 @ 45
		2 @ 40
Flow at each Port	1 @ 797	1 @ 797
		2 @ 751
Total Flow (gpm)	Approx	1548

TOTAL $ _____

GST $ _____

INVOICE TOTAL $ _____

COMMENTS:

CONTRACTOR SIGANTURE:

GST # 864331277RT0001

HTT
EVAN

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FLOW TEST INVOICE

P/O # _____

ML HOT TAPS LTD.
532 Mariposa Drive NE
CALGARY, AB. T2E 5V8
Cell # (403) 606 4039

HYDRANT FLOW TEST

ADDRESS: TOWN OF PICTURE BUTTE

DATE: JULY 15, 2016

CONTRACTOR: ISL ENGINEERING

Pipe Diameter (mm)	150 mm — 6"
Flow Meter Reading (gpm)	1548 GPM
Hydrant Type	McAVITY # 3749
Static Pressure (psi)	65 PSI

Number of Ports	1 @ 50 mm	2 @ 50 mm
Pitot Tube Reading	1 @ 45	1 @ 45
		2 @ 40
Flow at each Port	1 @ 797	1 @ 797
		2 @ 751
Total Flow (gpm)	Approx	1548

TOTAL $ _____

GST $ _____

INVOICE TOTAL $ _____

COMMENTS:

CONTRACTOR SIGANTURE:

GST # 864331277RT0001

TTT
EVAN

415

FLOW TEST INVOICE

P/O # _____

ML HOT TAPS LTD.
532 Mariposa Drive NE
CALGARY, AB. T2E 5V8
Cell # (403) 606 4039

HYDRANT FLOW TEST

ADDRESS: TOWN OF PICTURE BUTTE

DATE: JULY 15, 2016

CONTRACTOR: ISL ENGINEERING

Pipe Diameter (mm)	150 mm — 6"
Flow Meter Reading (gpm)	1548 GPM
Hydrant Type	MCAUITY # 3734
Static Pressure (psi)	65 PSI

Number of Ports	1 @ 50 mm	2 @ 50 mm
Pitot Tube Reading	1 @ 45	1 @ 45
		2 @ 40
Flow at each Port	1 @ 797	1 @ 797
		2 @ 751
Total Flow (gpm)	Approx	1548

TOTAL $ _____

GST $ _____

INVOICE TOTAL $ _____

COMMENTS:

CONTRACTOR SIGANTURE:

GST # 864331277RT0001

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EVAN

415

FLOW TEST INVOICE

P/O # _____

ML HOT TAPS LTD.
532 Mariposa Drive NE
CALGARY, AB. T2E 5V8
Cell # (403) 606 4039

HYDRANT FLOW TEST

ADDRESS: TOWN OF PICTURE BUTTE

DATE: JULY 15, 2016

CONTRACTOR: ISL ENGINEERING

Pipe Diameter (mm)	150 MM — 6"
Flow Meter Reading (gpm)	1548 GPM
Hydrant Type	MCAUITY # 2438
Static Pressure (psi)	65 PSI

Number of Ports	1 @ 50 mm	2 @ 50 mm
Pitot Tube Reading	1 @ 45	1 @ 45
		2 @ 40
Flow at each Port	1 @ 797	1 @ 797
		2 @ 751
Total Flow (gpm)	Approx	1548

TOTAL $ _____

GST $ _____

INVOICE TOTAL $ _____

COMMENTS:

CONTRACTOR SIGANTURE:

GST # 864331277RT0001

HTT
EVAN

415

FLOW TEST INVOICE

P/O # _____

ML HOT TAPS LTD.
532 Mariposa Drive NE
CALGARY, AB. T2E 5V8
Cell # (403) 606 4039

HYDRANT FLOW TEST

ADDRESS: TOWN OF PICTURE BUTTE

DATE: JULY 15, 2016

CONTRACTOR: ISL ENGINEERING

Pipe Diameter (mm)	150 MM — 6"
Flow Meter Reading (gpm)	1354 GPM
Hydrant Type	MCAUITY #2398
Static Pressure (psi)	60 PSI

Number of Ports	1 @ 50 mm	2 @ 50 mm
Pitot Tube Reading	1 @ 35	1 @ 35
		2 @ 30
Flow at each Port	1 @ 703	1 @ 703
		2 @ 651
Total Flow (gpm)	Approx	1354

TOTAL $ _____

GST $ _____

INVOICE TOTAL $ _____

COMMENTS: HARD TO OPERATE
BOLT MISSING ON FLANG

CONTRACTOR SIGANTURE:

GST # 864331277RT0001

FTT
EVAN

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FLOW TEST INVOICE

P/O # _____

ML HOT TAPS LTD.
532 Mariposa Drive NE
CALGARY, AB. T2E 5V8
Cell # (403) 606 4039

HYDRANT FLOW TEST

ADDRESS: TOWN OF PICTURE BUTTE

DATE: JULY 15, 2016

CONTRACTOR: ISL ENGINEERING

Pipe Diameter (mm)	150 mm — 6"
Flow Meter Reading (gpm)	1354 GPM
Hydrant Type	TERMINAL CITY #2574
Static Pressure (psi)	60 PSI

Number of Ports	1 @ 50 mm	2 @ 50 mm
Pitot Tube Reading	1 @ 35	1 @ 35
		2 @ 30
Flow at each Port	1 @ 703	1 @ 703
		2 @ 651
Total Flow (gpm)	Approx	1354

TOTAL $ _____

GST $ _____

INVOICE TOTAL $ _____

COMMENTS:
SLOW DRAW

CONTRACTOR SIGANTURE:

GST # 864331277RT0001

FTT
EVAN

415

FLOW TEST INVOICE

P/O # _____

ML HOT TAPS LTD.
532 Mariposa Drive NE
CALGARY, AB. T2E 5V8
Cell # (403) 606 4039

HYDRANT FLOW TEST

ADDRESS: TOWN OF PICTURE BUTTE

DATE: JULY 15, 2016

CONTRACTOR: ISL ENGINEERING

Pipe Diameter (mm)	150 MM — 6"
Flow Meter Reading (gpm)	1354 GPM
Hydrant Type	MCAUITY # 2480
Static Pressure (psi)	60 PSI

Number of Ports	1 @ 50 mm	2 @ 50 mm
Pitot Tube Reading	1 @ 35	1 @ 35
		2 @ 30
Flow at each Port	1 @ 703	1 @ 703
		2 @ 651
Total Flow (gpm)	Approx	1354

TOTAL $ _____

GST $ _____

INVOICE TOTAL $ _____

COMMENTS:

CONTRACTOR SIGANTURE:

GST # 864331277RT0001

HTT
EVAN

415

FLOW TEST INVOICE

P/O # _____

ML HOT TAPS LTD.
532 Mariposa Drive NE
CALGARY, AB. T2E 5V8
Cell # (403) 606 4039

HYDRANT FLOW TEST

ADDRESS: TOWN OF PICTURE BUTTE

DATE: JULY 15, 2016

CONTRACTOR: ISL ENGINEERING

Pipe Diameter (mm)	150 MM — 6"
Flow Meter Reading (gpm)	1354 GPM
Hydrant Type	MCAVITY #2648
Static Pressure (psi)	60 PSI

Number of Ports	1 @ 50 mm	2 @ 50 mm
Pitot Tube Reading	1 @ 35	1 @ 35
		2 @ 30
Flow at each Port	1 @ 703	1 @ 703
		2 @ 651
Total Flow (gpm)	Approx	1354

TOTAL $ _____

GST $ _____

INVOICE TOTAL $ _____

COMMENTS:

CONTRACTOR SIGANTURE:

GST # 864331277RT0001

TTT
EVAN

415

FLOW TEST INVOICE

P/O # _____

ML HOT TAPS LTD.
532 Mariposa Drive NE
CALGARY, AB. T2E 5V8
Cell # (403) 606 4039

HYDRANT FLOW TEST

ADDRESS: TOWN OF PICTURE BUTTE

DATE: JULY 15, 2016

CONTRACTOR: ISL ENGINEERING

Pipe Diameter (mm)	150 mm — 6"
Flow Meter Reading (gpm)	1354 GPM
Hydrant Type	McAVITY #2551
Static Pressure (psi)	60 PSI

Number of Ports	1 @ 50 mm	2 @ 50 mm
Pitot Tube Reading	1 @ 35	1 @ 35
		2 @ 30
Flow at each Port	1 @ 703	1 @ 703
		2 @ 651
Total Flow (gpm)	Approx	1354

TOTAL $ _____

GST $ _____

INVOICE TOTAL $ _____

COMMENTS:

CONTRACTOR SIGANTURE:

GST # 864331277RT0001

HTT
EVAN

415

FLOW TEST INVOICE

P/O # _____

ML HOT TAPS LTD.
532 Mariposa Drive NE
CALGARY, AB. T2E 5V8
Cell # (403) 606 4039

HYDRANT FLOW TEST

ADDRESS: TOWN OF PICTURE BUTTE

DATE: JULY 15, 2016

CONTRACTOR: ISL ENGINEERING

Pipe Diameter (mm)	150 MM — 6"
Flow Meter Reading (gpm)	OUT OF SERVICE
Hydrant Type	MCAVITY #2512
Static Pressure (psi)	

Number of Ports	1 @ 50 mm	2 @ 50 mm
Pitot Tube Reading	1 @	1 @
		2 @
Flow at each Port	1 @	1 @
		2 @
Total Flow (gpm)	Approx	

TOTAL $ _____

GST $ _____

INVOICE TOTAL $ _____

COMMENTS:
HYD POSE NOT
SHUT OFF ✓ OFF

CONTRACTOR SIGANTURE:

GST # 864331277RT0001

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EVAN

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FLOW TEST INVOICE

P/O # _____

ML HOT TAPS LTD.
532 Mariposa Drive NE
CALGARY, AB. T2E 5V8
Cell # (403) 606 4039

HYDRANT FLOW TEST

ADDRESS: TOWN OF PICTURE BUTTE

DATE: JULY 15, 2016

CONTRACTOR: ISL ENGINEERING

Pipe Diameter (mm)	150 MM — 6"
Flow Meter Reading (gpm)	1354 GPM
Hydrant Type	TERMINAL CITY #3115
Static Pressure (psi)	60 PSI

Number of Ports	1 @ 50 mm	2 @ 50 mm
Pitot Tube Reading	1 @ 35	1 @ 35
		2 @ 30
Flow at each Port	1 @ 703	1 @ 703
		2 @ 651
Total Flow (gpm)	Approx	1354

TOTAL $ _____

GST $ _____

INVOICE TOTAL $ _____

COMMENTS:
SLOW DRAW.

CONTRACTOR SIGANTURE:

GST # 864331277RT0001

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EVAN

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FLOW TEST INVOICE

P/O # _____

ML HOT TAPS LTD.
532 Mariposa Drive NE
CALGARY, AB. T2E 5V8
Cell # (403) 606 4039

HYDRANT FLOW TEST

ADDRESS: TOWN OF PICTURE BUTTE

DATE: JULY 15, 2016

CONTRACTOR: ISL ENGINEERING

Pipe Diameter (mm)	150 MM — 6"
Flow Meter Reading (gpm)	1351 GPM
Hydrant Type	MCAUITY # 3138
Static Pressure (psi)	60 PSI

Number of Ports	1 @ 50 mm	2 @ 50 mm
Pitot Tube Reading	1 @ 35	1 @ 35
		2 @ 30
Flow at each Port	1 @ 703	1 @ 703
		2 @ 651
Total Flow (gpm)	Approx	1354

TOTAL $ _____

GST $ _____

INVOICE TOTAL $ _____

COMMENTS:

CONTRACTOR SIGANTURE:

GST # 864331277RT0001

FTT
EVAN

415

FLOW TEST INVOICE

P/O # _____

ML HOT TAPS LTD.
532 Mariposa Drive NE
CALGARY, AB. T2E 5V8
Cell # (403) 606 4039

HYDRANT FLOW TEST

ADDRESS: TOWN OF PICTURE BUTTE

DATE: JULY 15, 2016

CONTRACTOR: ISL ENGINEERING

Pipe Diameter (mm)	150 MM — 6"
Flow Meter Reading (gpm)	1354 GPM
Hydrant Type	MCAVITY #3186
Static Pressure (psi)	60 PSI

Number of Ports	1 @ 50 mm	2 @ 50 mm
Pitot Tube Reading	1 @ 35	1 @ 35
		2 @ 30
Flow at each Port	1 @ 703	1 @ 703
		2 @ 651
Total Flow (gpm)	Approx	1354

TOTAL $ _____

GST $ _____

INVOICE TOTAL $ _____

COMMENTS:

CONTRACTOR SIGANTURE:

GST # 864331277RT0001

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EVAN
415

FLOW TEST INVOICE

P/O # _____

ML HOT TAPS LTD.
532 Mariposa Drive NE
CALGARY, AB. T2E 5V8
Cell # (403) 606 4039

HYDRANT FLOW TEST

ADDRESS: TOWN OF PICTURE BUTTE

DATE: JULY 15, 2016

CONTRACTOR: ISL ENGINEERING

Pipe Diameter (mm)	150 MM — 6"
Flow Meter Reading (gpm)	1354 GPM
Hydrant Type	MCAUITY #3234
Static Pressure (psi)	60 PSI

Number of Ports	1 @ 50 mm	2 @ 50 mm
Pitot Tube Reading	1 @ 35	1 @ 35
		2 @ 30
Flow at each Port	1 @ 703	1 @ 703
		2 @ 651
Total Flow (gpm)	Approx	1354

TOTAL $ _____

GST $ _____

INVOICE TOTAL $ _____

COMMENTS:

CONTRACTOR SIGANTURE:

GST # 864331277RT0001

Appendix C

Wastewater Lift Station and Lagoon Assessment - Photographs



Sewage Lift Station



Sewage Pump 1 with Natural Gas connection and standby battery



Sewage Pump 1 Corrosion



Sewage Pump 1 Corrosion



Sewage Pump 2



Peeling of Floor Coating



Sewage Pumps VFDs



Exhaust Fan on VFDs



Temporary Fan to prevent overheating of VFDs



Gas Detection, Level Transmitter and Flowmeter Equipment



Sewage Lift Station Exhaust



LLMO-N3 & Ecobac Aids for WW Treatment



Wastewater Blowers



WW Blower Piping



Old Heater used in the WW Blower facility



New Heating system for the WW Blower facility



Taping of Pipe to prevent Water & Rodent Intrusion at the Blower Facility



WW Blower Facility Condition



Forcemain Vault Hatch



Wastewater Lagoons



PHOTOGRAPH NO. 1	
LOCATION	Lift Station Building
DESCRIPTION/COMMENTS • No apparent damage to superstructure or substructure • Roof/ceiling structure appeared in good condition	



PHOTOGRAPH NO. 2	
LOCATION	Lift Station Building Roof

DESCRIPTION/COMMENTS

- Signs of water entry through roof assembly
- No signs of ponding or pooling within the building
- Building poorly insulated



PHOTOGRAPH NO. 3	
LOCATION	Lift Station Interior Wall/Window
DESCRIPTION/COMMENTS • Signs of moisture penetration through window frame/assembly • Potential of mortar cracking • Window frame splitting and cracking due to freeze/thaw, moisture migration	



PHOTOGRAPH NO. 4	
LOCATION	Blower Room / Lagoon
DESCRIPTION/COMMENTS • Signs of cracking from possible expansion/contraction from freeze/thaw cycles • Does not appear to affect the structure	



PHOTOGRAPH NO. 5	
LOCATION	Blower Room
DESCRIPTION/COMMENTS • Paint chipping/spalling from potential moisture migration and/or poorly insulated exterior walls	



PHOTOGRAPH NO. 6	
LOCATION	Blower Room
DESCRIPTION/COMMENTS • Damage to slab on grade and curb • Remediation should be done to mitigate water/moisture migration and further damage	



PHOTOGRAPH NO. 7	
LOCATION	Blower Room
DESCRIPTION/COMMENTS • Slab thickness unknown • Absence of housekeeping pads • Housekeeping pads are recommended to reduce vibrations of machinery, help transfer extra loads, and reduce cracking of slab on grade	



PHOTOGRAPH NO. 8	
LOCATION	Blower Room Building

DESCRIPTION/COMMENTS

- Signs of parapet damage
- No signs of roof drains, which could allow ponding
- High parapet has potential of additional loads on the superstructure due to snow drift accumulation



PHOTOGRAPH NO. 9	
LOCATION	Lagoon
DESCRIPTION/COMMENTS • New gate required • Potential fall hazard	

Appendix D

Sewage Lift Station Pump Manual

CDS

OM-01046—OB07
February 14, 1983
Rev. Q 03-06-2013

INSTALLATION, OPERATION, AND MAINTENANCE MANUAL

WITH PARTS LIST

GORMAN-RUPP PUMPS

T SERIES PUMPS

MODELS

T6A3-B

INCLUDING: /F, /FM

THE GORMAN-RUPP COMPANY • MANSFIELD, OHIO
www.grpumps.com
GORMAN-RUPP OF CANADA LIMITED • ST. THOMAS, ONTARIO, CANADA Printed in U.S.A.
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Register your new
Gorman-Rupp pump online at
www.grpumps.com

Valid serial number and e-mail address required.

RECORD YOUR PUMP MODEL AND SERIAL NUMBER

Please record your pump model and serial number in the spaces provided below. Your Gorman-Rupp distributor needs this information when you require parts or service.

Pump Model: _____

Serial Number: _____

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INTRODUCTION

Thank You for purchasing a Gorman-Rupp pump. **Read this manual** carefully to learn how to safely install and operate your pump. Failure to do so could result in personal injury or damage to the pump. This Installation, Operation, and Maintenance manual is designed to help you achieve the best performance and longest life from your Gorman-Rupp pump.

This pump is a T Series, semi-open impeller, self-priming centrifugal model with a suction check valve. The pump is designed for handling liquids containing large entrained solids and slurries. The basic material of construction is gray iron, with ductile iron impeller and steel wearing parts.

Because pump installations are seldom identical, this manual cannot possibly provide detailed instructions and precautions for every aspect of each specific application. Therefore, it is the responsibility of the owner/installer of the pump to ensure that applications not addressed in this manual are performed **only** after establishing that neither operator safety nor pump integrity are compromised by the installation. Pumps and related equipment **must** be installed and operated according to all national, local and industry standards.

If there are any questions regarding the pump or its application which are not covered in this manual or in other literature accompanying this unit, please contact your Gorman-Rupp distributor, or:

The Gorman-Rupp Company
P.O. Box 1217
Mansfield, Ohio 44901—1217
Phone: (419) 755—1011
or:
Gorman-Rupp of Canada Limited
70 Burwell Road
St. Thomas, Ontario N5P 3R7
Phone: (519) 631—2870

For information or technical assistance on the power source, contact the power source manufacturer's local dealer or representative.

The following are used to alert maintenance personnel to procedures which require special attention, to those which could damage equipment, and to those which could be dangerous to personnel:

DANGER!

Immediate hazards which WILL result in severe personal injury or death. These instructions describe the procedure required and the injury which will result from failure to follow the procedure.

WARNING!

Hazards or unsafe practices which COULD result in severe personal injury or death. These instructions describe the procedure required and the injury which could result from failure to follow the procedure.

CAUTION

Hazards or unsafe practices which COULD result in minor personal injury or product or property damage. These instructions describe the requirements and the possible damage which could result from failure to follow the procedure.

NOTE

Instructions to aid in installation, operation, and maintenance or which clarify a procedure.

SAFETY – SECTION A

This information applies to T Series basic pumps. Gorman-Rupp has no control over or particular knowledge of the power source which will be used. Refer to the manual accompanying the power source before attempting to begin operation.

Because pump installations are seldom identical, this manual cannot possibly provide detailed instructions and precautions for each specific application. Therefore, it is the owner/installer's responsibility to ensure that applications not addressed in this manual are performed only after establishing that neither operator safety nor pump integrity are compromised by the installation.



Before attempting to open or service the pump:

1. **Familiarize yourself with this manual.**
2. **Disconnect or lock out the power source to ensure that the pump will remain inoperative.**
3. **Allow the pump to completely cool if overheated.**
4. **Check the temperature before opening any covers, plates, or plugs.**
5. **Close the suction and discharge valves.**
6. **Vent the pump slowly and cautiously.**
7. **Drain the pump.**



This pump is designed to handle liquids containing large entrained solids or slurries. Do not attempt to pump volatile, corrosive, or flammable materials which may damage the pump or endanger personnel as a result of pump failure.



After the pump has been positioned, make certain that the pump and all piping connections are tight, properly supported and secure before operation.



Do not operate the pump without the guards in place over the rotating parts. Exposed rotating parts can catch clothing, fingers, or tools, causing severe injury to personnel.



Do not remove plates, covers, gauges, pipe plugs, or fittings from an overheated pump. Vapor pressure within the pump can cause parts being disengaged to be ejected with great force. Allow the pump to completely completely cool before servicing.



Do not operate the pump against a closed discharge valve for long periods of time. If operated against a closed discharge valve, pump components will deteriorate, and the liquid could come to a boil, build pressure, and cause the pump casing to rupture or explode.

WARNING!

Use lifting and moving equipment in good repair and with adequate capacity to prevent injuries to personnel or damage to equipment. Suction and discharge hoses and piping must be removed from the pump before lifting.

WARNING!

Do not attempt to disengage any part of an overheated pump unit. Vapor pressure within the pump casing can eject these parts with great force when they are disengaged. Allow the pump to completely cool before servicing it.

CAUTION

Pumps and related equipment must be installed and operated according to all national, local and industry standards.

WARNING!

Overheated pumps can cause severe burns and injury. If overheating of the pump occurs:

1. **Stop the pump immediately.**
2. **Allow the pump to completely cool.**
3. **Refer to instructions in this manual before restarting the pump.**

INSTALLATION – SECTION B

Review all SAFETY information in Section A.

Since pump installations are seldom identical, this section offers only general recommendations and practices required to inspect, position, and arrange the pump and piping.

Most of the information pertains to a standard **static lift application** where the pump is positioned above the free level of liquid to be pumped.

If installed in a **flooded suction application** where the liquid is supplied to the pump under pressure, some of the information such as mounting, line configuration, and priming must be tailored to the specific application. Since the pressure supplied to the pump is critical to performance and safety, **be sure** to limit the incoming pressure to **50%** of the maximum permissible operating pressure as shown on the pump performance curve.

For further assistance, contact your Gorman-Rupp distributor or the Gorman-Rupp Company.

Pump Dimensions

See Figure 1 for the approximate physical dimensions of this pump.

OUTLINE DRAWING

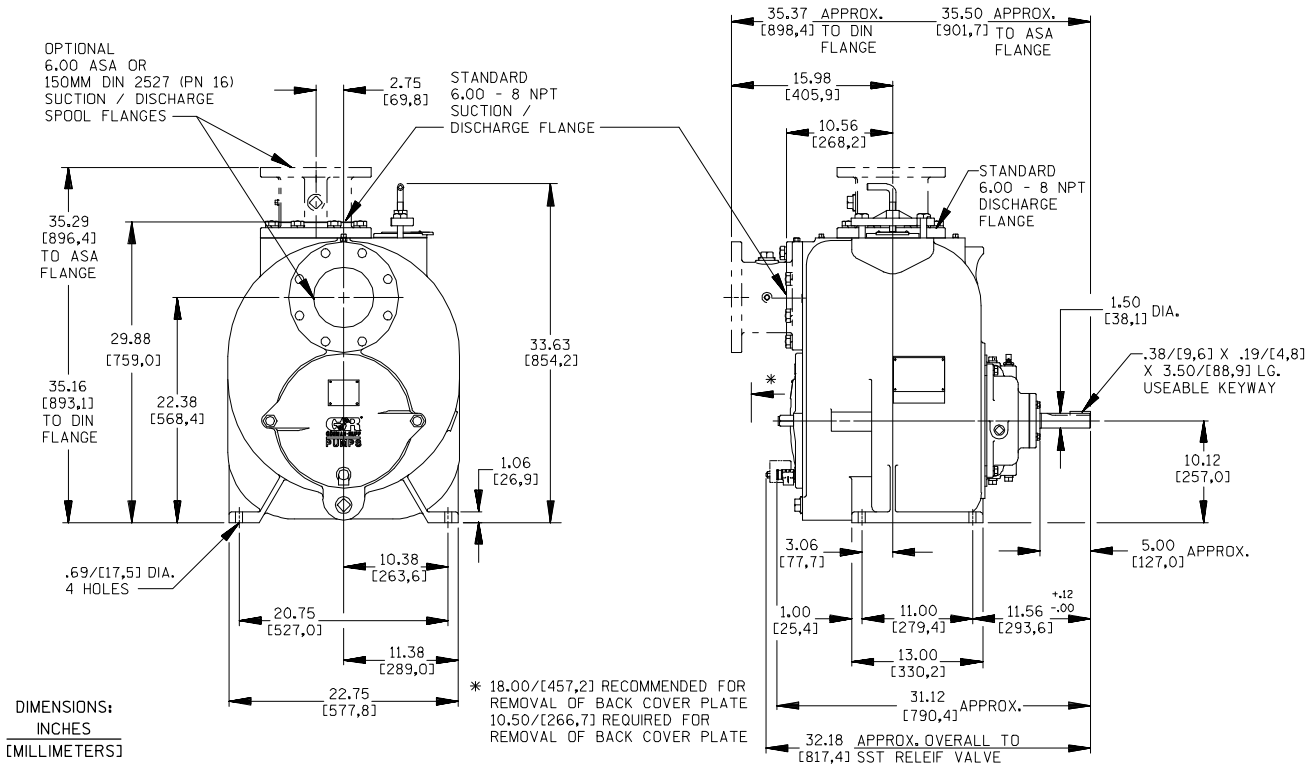


Figure 1. Pump Model T6A3-B, Including /F, /FM

PREINSTALLATION INSPECTION

The pump assembly was inspected and tested before shipment from the factory. Before installation, inspect the pump for damage which may have occurred during shipment. Check as follows:

a. Inspect the pump for cracks, dents, damaged threads, and other obvious damage.

b. Check for and tighten loose attaching hardware. Since gaskets tend to shrink after drying, check for loose hardware at mating surfaces.

c. Carefully read all warnings and cautions contained in this manual or affixed to the pump, and perform all duties indicated. Note the direction of rotation indicated on the pump. Check that the pump shaft rotates counterclockwise when facing the impeller.

CAUTION

Only operate this pump in the direction indicated by the arrow on the pump body and on the accompanying decal. Refer to **ROTATION** in **OPERATION**, Section C.

d. Check levels and lubricate as necessary. Refer to **LUBRICATION** in the **MAINTENANCE AND REPAIR** section of this manual and perform duties as instructed.

e. If the pump and power source have been stored for more than 12 months, some of the components or lubricants may have exceeded their maximum shelf life. These **must be inspected or replaced** to ensure maximum pump service.

If the maximum shelf life has been exceeded, or if anything appears to be abnormal, contact your Gorman-Rupp distributor or the factory to determine the repair or updating policy. **Do not** put the pump into service until appropriate action has been taken.

POSITIONING PUMP

Lifting

Pump unit weights will vary depending on the mounting and drive provided. Check the shipping tag on the unit packaging for the actual weight, and use lifting equipment with appropriate capacity. Drain the pump and remove all customer-installed equipment such as suction and discharge hoses or piping before attempting to lift existing, installed units.

CAUTION

The pump assembly can be seriously damaged if the cables or chains used to lift and move the unit are improperly wrapped around the pump.

Mounting

Locate the pump in an accessible place as close as practical to the liquid being pumped. Level mounting is essential for proper operation.

The pump may have to be supported or shimmed to provide for level operation or to eliminate vibration.

Clearance

When positioning the pump, allow a minimum clearance of **18 inches (457 mm)** in front of the back cover to permit removal of the cover and easy access to the pump interior.

SUCTION AND DISCHARGE PIPING

Pump performance is adversely effected by increased suction lift, discharge elevation, and friction losses. See the performance curve and operating range shown on Page E-1 to be sure your overall application allows pump to operate within the safe operation range.

Materials

Either pipe or hose maybe used for suction and discharge lines; however, the materials must be

compatible with the liquid being pumped. If hose is used in suction lines, it must be the rigid-wall, reinforced type to prevent collapse under suction. Using piping couplings in suction lines is not recommended.

Line Configuration

Keep suction and discharge lines as straight as possible to minimize friction losses. Make minimum use of elbows and fittings, which substantially increase friction loss. If elbows are necessary, use the long-radius type to minimize friction loss.

Connections to Pump

Before tightening a connecting flange, align it exactly with the pump port. Never pull a pipe line into place by tightening the flange bolts and/or couplings.

Lines near the pump must be independently supported to avoid strain on the pump which could cause excessive vibration, decreased bearing life, and increased shaft and seal wear. If hose-type lines are used, they should have adequate support to secure them when filled with liquid and under pressure.

Gauges

Most pumps are drilled and tapped for installing discharge pressure and vacuum suction gauges. If these gauges are desired for pumps that are not tapped, drill and tap the suction and discharge lines not less than 18 inches (457,2 mm) from the suction and discharge ports and install the lines. Installation closer to the pump may result in erratic readings.

SUCTION LINES

To avoid air pockets which could affect pump priming, the suction line must be as short and direct as possible. When operation involves a suction lift, the line must always slope upward to the pump from the source of the liquid being pumped; if the line slopes down to the pump at any point along the suction run, air pockets will be created.

Fittings

Suction lines should be the same size as the pump inlet. If reducers are used in suction lines, they should be the eccentric type, and should be installed with the flat part of the reducers uppermost to avoid creating air pockets. Valves are not normally used in suction lines, but if a valve is used, install it with the stem horizontal to avoid air pockets.

Strainers

If a strainer is furnished with the pump, be certain to use it; any spherical solids which pass through a strainer furnished with the pump will also pass through the pump itself.

If a strainer is not furnished with the pump, but is installed by the pump user, make certain that the total area of the openings in the strainer is at least three or four times the cross section of the suction line, and that the openings will not permit passage of solids larger than the solids handling capability of the pump.

This pump is designed to handle up to 3-inch (76,2 mm) diameter spherical solids.

Sealing

Since even a slight leak will affect priming, head, and capacity, especially when operating with a high suction lift, all connections in the suction line should be sealed with pipe dope to ensure an airtight seal. Follow the sealant manufacturer's recommendations when selecting and applying the pipe dope. The pipe dope should be compatible with the liquid being pumped.

Suction Lines In Sumps

If a single suction line is installed in a sump, it should be positioned away from the wall of the sump at a distance equal to 1 1/2 times the diameter of the suction line.

If there is a liquid flow from an open pipe into the sump, the flow should be kept away from the suction inlet because the inflow will carry air down into the sump, and air entering the suction line will reduce pump efficiency.

If it is necessary to position inflow close to the suction inlet, install a baffle between the inflow and the suction inlet at a distance 1 1/2 times the diameter of the suction pipe. The baffle will allow entrained air to escape from the liquid before it is drawn into the suction inlet.

If two suction lines are installed in a single sump, the flow paths may interact, reducing the efficiency of one or both pumps. To avoid this, position the suction inlets so that they are separated by a distance equal to at least 3 times the diameter of the suction pipe.

Suction Line Positioning

The depth of submergence of the suction line is critical to efficient pump operation. Figure 2 shows recommended minimum submergence vs. velocity.

NOTE

The pipe submergence required may be reduced by installing a standard pipe increaser fitting at the end of the suction line. The larger opening size will reduce the inlet velocity. Calculate the required submergence using the following formula based on the increased opening size (area or diameter).

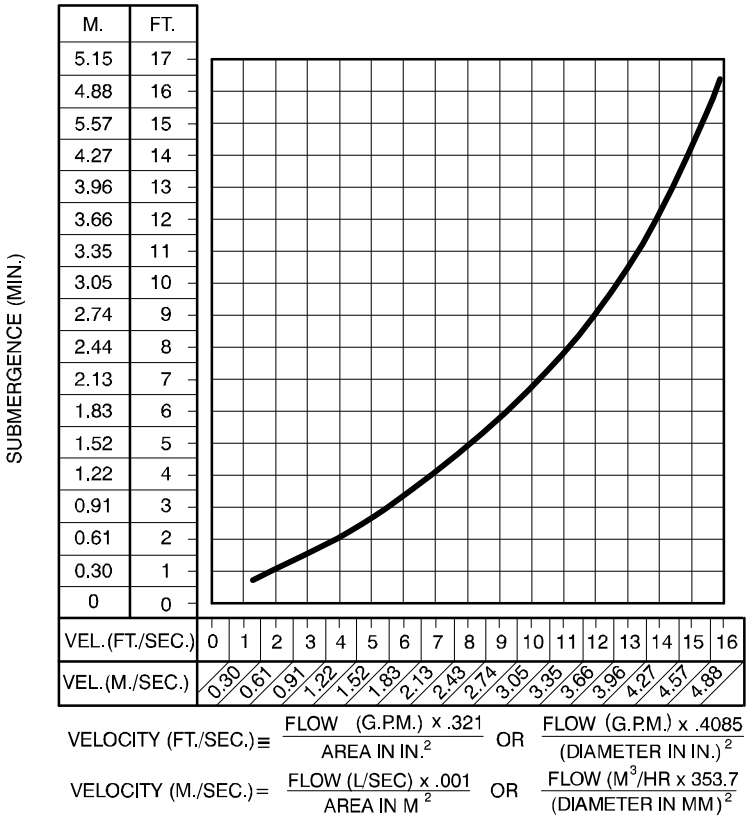


Figure 2. Recommended Minimum Suction Line Submergence vs. Velocity

DISCHARGE LINES

Siphoning

Do not terminate the discharge line at a level lower than that of the liquid being pumped unless a siphon breaker is used in the line. Otherwise, a siphoning action causing damage to the pump could result.

Valves

If a throttling valve is desired in the discharge line, use a valve as large as the largest pipe to minimize friction losses. Never install a throttling valve in a suction line.

With high discharge heads, it is recommended that a throttling valve and a system check valve be installed in the discharge line to protect the pump from excessive shock pressure and reverse rotation when it is stopped.

CAUTION

If the application involves a high discharge head, gradually close the discharge throttling valve before stopping the pump.

Bypass Lines

Self-priming pumps are not air compressors. During the priming cycle, air from the suction line must be vented to atmosphere on the discharge side. If the discharge line is open, this air will be vented through the discharge. However, if a check valve has been installed in the discharge line, the discharge side of the pump must be opened to atmospheric pressure through a bypass line installed between the pump discharge and the check valve. A self-priming centrifugal pump **will not prime** if there is sufficient static liquid head to hold the discharge check valve closed.

NOTE

The bypass line should be sized so that it does not affect pump discharge capacity; however, the bypass line should be at least 1 inch in diameter to minimize the chance of plugging.

In **low discharge head applications** (less than 30 feet or 9 meters), it is recommended that the bypass line be run back to the wet well, and located 6 inches below the water level or cut-off point of the low level pump. In some installations, this bypass line may be terminated with a six-to-eight foot length of 1 1/4 inch I.D. **smooth-bore** hose; air and liquid vented during the priming process will then agitate the hose and break up any solids, grease, or other substances likely to cause clogging.

CAUTION

A bypass line that is returned to a wet well must be secured against being drawn into the pump suction inlet.

It is also recommended that pipe unions be installed at each 90° elbow in a bypass line to ease disassembly and maintenance.

In **high discharge head applications** (more than 30 feet), an excessive amount of liquid may be bypassed and forced back to the wet well under the full working pressure of the pump; this will reduce overall pumping efficiency. **Therefore, it is recommended that a Gorman-Rupp Automatic Air Release Valve be installed in the bypass line.**

Gorman-Rupp Automatic Air Release Valves are reliable, and require minimum maintenance. See **AUTOMATIC AIR RELEASE VALVE** in this section for installation and theory of operation of the Automatic Air Release Valve. Consult your Gorman-Rupp distributor, or contact the Gorman-Rupp Company for selection of an Automatic Air Release Valve to fit your application.

If the installation involves a flooded suction such as a below-ground lift station. A pipe union and manual shut-off valve may be installed in the bleed line to allow service of the valve without shutting down the station, and to eliminate the possibility of flooding. If a manual shut-off valve is installed **anywhere** in the air release piping, it **must** be a full-opening **ball type** valve to prevent plugging by solids.

DANGER!

If a manual shut-off valve is installed in a bypass line, it must not be left closed during operation. A closed manual shut-off valve may cause a pump which has lost prime to continue to operate without reaching prime, causing dangerous overheating and possible explosive rupture of the pump casing. Personnel could be severely injured.

Allow an over-heated pump to cool before servicing. Do not remove plates, covers, gauges, or fittings from an overheated pump. Liquid within the pump can reach boiling temperatures, and vapor pressure within the pump can cause parts being disengaged to be ejected with great force. After the pump cools, drain the liquid from the pump by removing the casing drain plug. Use cau-

tion when removing the plug to prevent injury to personnel from hot liquid.

AUTOMATIC AIR RELEASE VALVE

When properly installed, a Gorman-Rupp Automatic Air Release Valve will permit air to escape through the bypass line and then close automatically when the pump is fully primed and pumping at full capacity.

WARNING!

Some leakage (1 to 5 gallons [3.8 to 19 liters] per minute) will occur when the valve is fully closed. Be sure the bypass line is directed back to the wet well or tank to prevent hazardous spills.

Consult the manual accompanying the Air Release Valve for additional information on valve installation and performance.

Air Release Valve Installation

The Automatic Air Release Valve must be independently mounted in a horizontal position between the pump discharge port and the inlet side of the discharge check valve (see Figure 3). The inlet opening in the Air Release Valve is equipped with standard 1-inch NPT pipe threads.

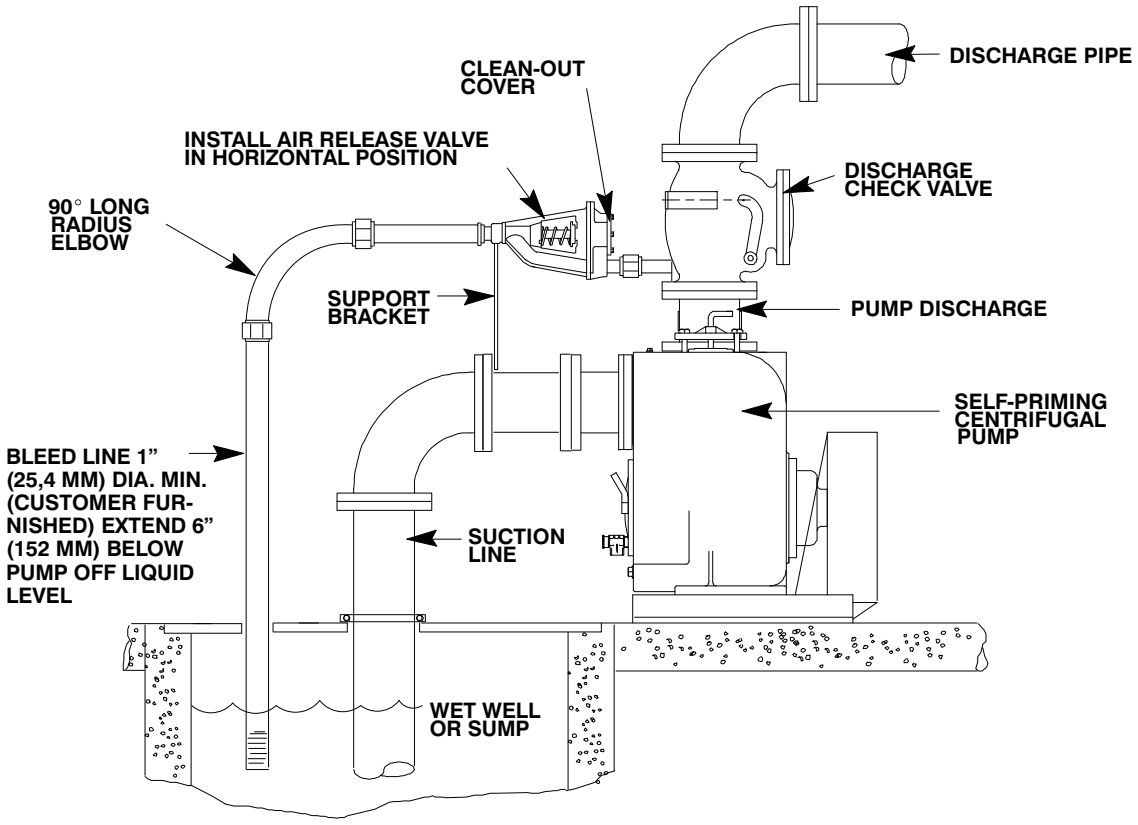


Figure 3. Typical Automatic Air Release Valve Installation

Connect the valve outlet to a bleed line which slopes back to the wet well or sump. The bleed line must be the same size as the outlet opening or larger, depending on which Air Release Valve is being used. If **piping** is used for the bleed line, avoid the use of elbows whenever possible.

NOTE

*For multiple pump installations, it is recommended that each Air Release Valve be fitted with an independent bleeder line directed back to the wet well. If multiple Air Release Valves are installed in a system, **do not** direct bleeder lines to a common manifold pipe. Contact your Gorman-Rupp distributor or the Gorman-Rupp Company for information about installation of an Automatic Air Release Valve for your specific application.*

ALIGNMENT

The alignment of the pump and its power source is critical for trouble-free mechanical operation. In either a flexible coupling or V-belt driven system, the driver and pump must be mounted so that their shafts are aligned with and parallel to each other. It is imperative that alignment be checked after the pump and piping are installed, and before operation.

NOTE

Check **Rotation***, Section C, before final alignment of the pump.*

When mounted at the Gorman-Rupp factory, driver and pump are aligned before shipment. Misalignment will occur in transit and handling. Pumps **must** be checked and realigned before operation. Before checking alignment, tighten the foundation bolts. The pump casing feet and/or pedestal feet, and the driver mounting bolts should also be tightly secured.

WARNING!

When checking alignment, disconnect the power source to ensure that the pump will remain inoperative.

CAUTION

Adjusting the alignment in one direction may alter the alignment in another direction. check each procedure after altering alignment.

Coupled Drives

When using couplings, the axis of the power source must be aligned to the axis of the pump shaft in both the horizontal and vertical planes. Most couplings require a specific gap or clearance between the driving and the driven shafts. Refer to the coupling manufacturer's service literature.

Align spider insert type couplings by using calipers to measure the dimensions on the circumference of the outer ends of the coupling hub every 90°. The coupling is in alignment when the hub ends are the same distance apart at all points (see Figure 4A).

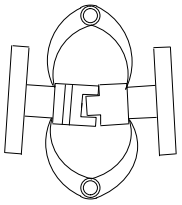


Figure 4A. Aligning Spider-Type Couplings

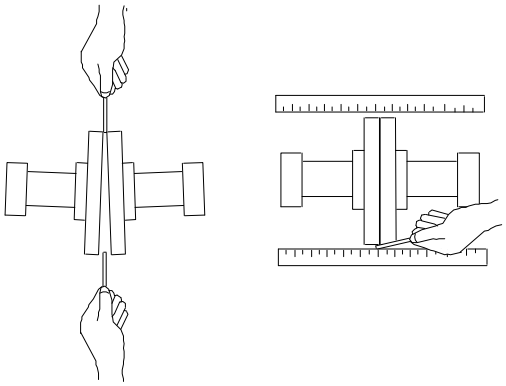


Figure 4B. Aligning Non-Spider Type Couplings

Align non-spider type couplings by using a feeler gauge or taper gauge between the coupling halves every 90°. The coupling is in alignment when the hubs are the same distance apart at all points (see Figure 4B).

Check parallel adjustment by laying a straightedge across both coupling rims at the top, bottom, and side. When the straightedge rests evenly on both halves of the coupling, the coupling is in horizontal parallel alignment. If the coupling is misaligned, use a feeler gauge between the coupling and the straightedge to measure the amount of misalignment.

V-Belt Drives

When using V-belt drives, the power source and the pump must be parallel. Use a straightedge along the sides of the pulleys to ensure that the pulleys are properly aligned (see Figure 4C). In drive systems using two or more belts, make certain that the belts are a matched set; unmatched sets will cause accelerated belt wear.

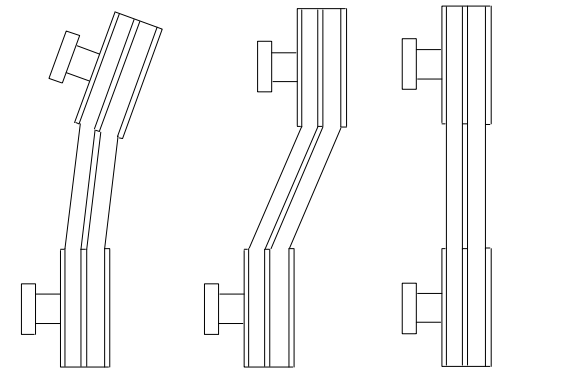


Figure 4C. Alignment of V-Belt Driven Pumps

Tighten the belts in accordance with the belt manufacturer's instructions. If the belts are too loose, they will slip; if the belts are too tight, there will be excessive power loss and possible bearing failure. Select pulleys that will match the proper speed ratio; overspeeding the pump may damage both pump and power source.

DANGER!

Do not operate the pump without the guard in place over the rotating parts. exposed rotating parts can catch clothing, fingers, or tools, causing severe injury to personnel.

DRIVE BELT TENSIONING

General Rules of Tensioning

For new drive belts, check the tension after 5, 20 and 50 hours of operation and re-tension as required (see the following procedure for measuring belt tension). Thereafter, check and re-tension if required monthly or at 500 hour intervals, whichever comes first.

Ideal drive belt tension is the **lowest** tension at which the belt will not slip under peak load conditions. Do not over-tension drive belts. Over-tensioning will shorten both drive belt and bearing life. Under-tensioning will cause belt slippage. Always keep belts free from dirt, grease, oil and other foreign material which may cause slippage.

OPERATION — SECTION C

Review all SAFETY information in Section A.

Follow the instructions on all tags, labels and decals attached to the pump.

WARNING!

This pump is designed to handle liquids containing large entrained solids and slurries. Do not attempt to pump volatile, corrosive, or flammable liquids which may damage the pump or endanger personnel as a result of pump failure.

CAUTION

Pump speed and operating conditions must be within the performance range shown on page E-1.

PRIMING

Install the pump and piping as described in **INSTALLATION**. Make sure that the piping connections are tight, and that the pump is securely mounted. Check that the pump is properly lubricated (see **LUBRICATION** in **MAINTENANCE AND REPAIR**).

This pump is self-priming, but the pump should never be operated unless there is liquid in the pump casing.

CAUTION

Never operate this pump unless there is liquid in the pump casing. The pump will not prime when dry. extended operation of a dry pump will destroy the seal assembly.

Add liquid to the pump casing when:

1. The pump is being put into service for the first time.
2. The pump has not been used for a considerable length of time.
3. The liquid in the pump casing has evaporated.

Once the pump casing has been filled, the pump will prime and reprime as necessary.

WARNING!

After filling the pump casing, reinstall and tighten the fill plug. Do not attempt to operate the pump unless all connecting piping is securely installed. Otherwise, liquid in the pump forced out under pressure could cause injury to personnel.

To fill the pump, remove the pump casing fill cover or fill plug in the top of the casing, and add clean liquid until the casing is filled. Replace the fill cover or fill plug before operating the pump.

STARTING

Consult the operations manual furnished with the power source.

Rotation

The correct direction of pump rotation is counterclockwise when facing the impeller. The pump could be damaged and performance adversely affected by incorrect rotation. If pump performance is not within the specified limits (see the curve on page E-1), check the direction of power source rotation before further troubleshooting.

If an electric motor is used to drive the pump, remove V-belts, couplings, or otherwise disconnect the pump from the motor before checking motor rotation. Operate the motor independently while observing the direction of the motor shaft, or cooling fan.

If rotation is incorrect on a three-phase motor, have a qualified electrician interchange any two of the three phase wires to change direction. If rotation is incorrect on a single-phase motor, consult the literature supplied with the motor for specific instructions.

OPERATION

Lines With a Bypass

If a Gorman-Rupp Automatic Air Release Valve has been installed, the valve will automatically open to allow the pump to prime, and automatically close after priming is complete (see **INSTALLATION** for Air Release Valve operation).

If the bypass line is open, air from the suction line will be discharged through the bypass line back to the wet well during the priming cycle. Liquid will then continue to circulate through the bypass line while the pump is in operation.

Lines Without a Bypass

Open all valves in the discharge line and start the power source. Priming is indicated by a positive reading on the discharge pressure gauge or by a quieter operation. The pump may not prime immediately because the suction line must first fill with liquid. If the pump fails to prime within five minutes, stop it and check the suction line for leaks.

After the pump has been primed, partially close the discharge line throttling valve in order to fill the line slowly and guard against excessive shock pressure which could damage pipe ends, gaskets, sprinkler heads, and any other fixtures connected to the line. When the discharge line is completely filled, adjust the throttling valve to the required flow rate.

WARNING!

Do not operate the pump against a closed discharge throttling valve for long periods of time. If operated against a closed discharge throttling valve, pump components will deteriorate, and the liquid could come to a boil, build pressure, and cause the pump casing to rupture or explode.

Leakage

No leakage should be visible at pump mating surfaces, or at pump connections or fittings. Keep all line connections and fittings tight to maintain maximum pump efficiency.

Liquid Temperature And Overheating

The **maximum** liquid temperature for this pump is 160° F (71° C). Do not apply it at a higher operating temperature.

Overheating can occur if operated with the valves in the suction or discharge lines closed. Operating against closed valves could bring the liquid to a boil, build pressure, and cause the pump to rupture or explode. If overheating occurs, stop the pump and allow it to cool before servicing it. Refill the pump casing with cool liquid.

DANGER!

Allow an over-heated pump to cool before servicing. Do not remove plates, covers, gauges, or fittings from an overheated pump. Liquid within the pump can reach boiling temperatures, and vapor pressure within the pump can cause parts being disengaged to be ejected with great force. After the pump cools, drain the liquid from the pump by removing the casing drain plug. Use caution when removing the plug to prevent injury to personnel from hot liquid.

As a safeguard against rupture or explosion due to heat, this pump is equipped with a pressure relief valve which will open if vapor pressure within the pump casing reaches a critical point. If overheating does occur, stop the pump immediately and allow it to cool before servicing it. **Approach any overheated pump cautiously**. It is recommended that

the pressure relief valve assembly be replaced at each overhaul, or any time the pump casing overheats and activates the valve. **Never** replace this valve with a substitute which has not been specified or provided by the Gorman-Rupp Company.

Strainer Check

If a suction strainer has been shipped with the pump or installed by the user, check the strainer regularly, and clean it as necessary. The strainer should also be checked if pump flow rate begins to drop. If a vacuum suction gauge has been installed, monitor and record the readings regularly to detect strainer blockage.

Never introduce air or steam pressure into the pump casing or piping to remove a blockage. This could result in personal injury or damage to the equipment. If backflushing is absolutely necessary, liquid pressure **must** be limited to 50% of the maximum permissible operating pressure shown on the pump performance curve.

Pump Vacuum Check

With the pump inoperative, install a vacuum gauge in the system, using pipe dope on the threads. Block the suction line and start the pump. At operating speed the pump should pull a vacuum of 20 inches (508,0 mm) or more of mercury. If it does not, check for air leaks in the seal, gasket, or discharge valve.

Open the suction line, and read the vacuum gauge with the pump primed and at operation speed. Shut off the pump. The vacuum gauge reading will immediately drop proportionate to static suction lift, and should then stabilize. If the vacuum reading falls off rapidly after stabilization, an air leak exists. Before checking for the source of the leak, check the point of installation of the vacuum gauge.

STOPPING

Never halt the flow of liquid suddenly. If the liquid being pumped is stopped abruptly, damaging shock waves can be transmitted to the pump and piping system. Close all connecting valves slowly.

On engine driven pumps, reduce the throttle speed slowly and allow the engine to idle briefly before stopping.



If the application involves a high discharge head, gradually close the discharge throttling valve before stopping the pump.

After stopping the pump, lock out or disconnect the power source to ensure that the pump will remain inoperative.



Do not operate the pump against a closed discharge throttling valve for long periods of time. If operated against a closed discharge throttling valve, pump components will deteriorate, and the liquid could come to a boil, build pressure, and cause the pump casing to rupture or explode.

Cold Weather Preservation

In below freezing conditions, drain the pump to prevent damage from freezing. Also, clean out any solids by flushing with a hose. Operate the pump for approximately one minute; this will remove any remaining liquid that could freeze the pump rotating parts. If the pump will be idle for more than a few hours, or if it has been pumping liquids containing a large amount of solids, drain the pump, and flush it thoroughly with clean water. To prevent large solids from clogging the drain port and preventing the pump from completely draining, insert a rod or stiff wire in the drain port, and agitate the liquid during the draining process. Clean out any remaining solids by flushing with a hose.

BEARING TEMPERATURE CHECK

Bearings normally run at higher than ambient temperatures because of heat generated by friction.

Temperatures up to 160°F (71° C) are considered normal for bearings, and they can operate safely to at least 180°F (82° C).

Checking bearing temperatures by hand is inaccurate. Bearing temperatures can be measured accurately by placing a contact-type thermometer against the housing. Record this temperature for future reference.

A sudden increase in bearing temperature is a warning that the bearings are at the point of failing to operate properly. Make certain that the bearing lubricant is of the proper viscosity and at the correct level (see **LUBRICATION** in **MAINTENANCE AND REPAIR**). Bearing overheating can also be caused by shaft misalignment and/or excessive vibration.

When pumps are first started, the bearings may seem to run at temperatures above normal. Continued operation should bring the temperatures down to normal levels.

TROUBLESHOOTING — SECTION D

Review all SAFETY information in Section A.



Before attempting to open or service the pump:

1. **Familiarize yourself with this manual.**
2. **Lock out or disconnect the power source to ensure that the pump will remain inoperative.**
3. **Allow the pump to completely cool if overheated.**
4. **Check the temperature before opening any covers, plates, or plugs.**
5. **Close the suction and discharge valves.**
6. **Vent the pump slowly and cautiously.**
7. **Drain the pump.**

TROUBLE	POSSIBLE CAUSE	PROBABLE REMEDY
PUMP FAILS TO PRIME	Not enough liquid in casing.	Add liquid to casing. See **PRIMING**.
	Suction check valve contaminated or damaged.	Clean or replace check valve.
	Air leak in suction line.	Correct leak.
	Lining of suction hose collapsed.	Replace suction hose.
	Leaking or worn seal or pump gasket.	Check pump vacuum. Replace leaking or worn seal or gasket.
	Suction lift or discharge head too high.	Check piping installation and install bypass line if needed. See **INSTALLATION**.
	Strainer clogged.	Check strainer and clean if necessary.
PUMP STOPS OR FAILS TO DELIVER RATED FLOW OR PRESSURE	Air leak in suction line.	Correct leak.
	Lining of suction hose collapsed.	Replace suction hose.
	Leaking or worn seal or pump gasket.	Check pump vacuum. Replace leaking or worn seal or gasket.

TROUBLE	POSSIBLE CAUSE	PROBABLE REMEDY
PUMP STOPS OR FAILS TO DELIVER RATED FLOW OR PRESSURE	Strainer clogged.	Check strainer and clean if necessary.
	Suction intake not submerged at proper level or sump too small.	Check installation and correct submergence as needed.
	Impeller or other wearing parts worn or damaged.	Replace worn or damaged parts. Check that impeller is properly centered and rotates freely.
	Impeller clogged.	Free impeller of debris.
	Pump speed too slow.	Check driver output; check belts or couplings for slippage.
	Discharge head too high.	Install bypass line.
	Suction lift too high.	Measure lift w/vacuum gauge. Reduce lift and/or friction losses in suction line.
PUMP REQUIRES TOO MUCH POWER	Pump speed too high.	Check driver output; check that sheaves or couplings are correctly sized.
	Discharge head too low.	Adjust discharge valve.
	Liquid solution too thick.	Dilute if possible.
	Bearing(s) frozen.	Disassemble pump and check bearing(s).
PUMP CLOGS FREQUENTLY	Liquid solution too thick.	Dilute if possible.
	Discharge flow too slow.	Open discharge valve fully to increase flow rate, and run power source at maximum governed speed.
	Suction check valve or foot valve clogged or binding.	Clean valve.
EXCESSIVE NOISE	Cavitation in pump.	Reduce suction lift and/or friction losses in suction line. Record vacuum and pressure gauge readings and consult local representative or factory.
	Pumping entrained air.	Locate and eliminate source of air bubble.
	Pump or drive not securely mounted.	Secure mounting hardware.
	Impeller clogged or damaged.	Clean out debris; replace damaged parts.

TROUBLE	POSSIBLE CAUSE	PROBABLE REMEDY
BEARINGS RUN TOO HOT	Bearing temperature is high, but within limits.	Check bearing temperature regularly to monitor any increase.
	Low or incorrect lubricant.	Check for proper type and level of lubricant.
	Suction and discharge lines not properly supported.	Check piping installation for proper support.
	Drive misaligned.	Align drive properly.

PREVENTIVE MAINTENANCE

Since pump applications are seldom identical, and pump wear is directly affected by such things as the abrasive qualities, pressure and temperature of the liquid being pumped, this section is intended only to provide general recommendations and practices for preventive maintenance. Regardless of the application however, following a routine preventive maintenance schedule will help assure trouble-free performance and long life from your Gorman-Rupp pump. For specific questions concerning your application, contact your Gorman-Rupp distributor or the Gorman-Rupp Company.

Record keeping is an essential component of a good preventive maintenance program. Changes in suction and discharge gauge readings (if so equipped) between regularly scheduled inspections can indicate problems that can be corrected before system damage or catastrophic failure occurs. The appearance of wearing parts should also be documented at each inspection for comparison as well. Also, if records indicate that a certain part (such as the seal) fails at approximately the same duty cycle, the part can be checked and replaced before failure occurs, reducing unscheduled down time.

For new applications, a first inspection of wearing parts at 250 hours will give insight into the wear rate for your particular application. Subsequent inspections should be performed at the intervals shown on the chart below. Critical applications should be inspected more frequently.

Preventive Maintenance Schedule

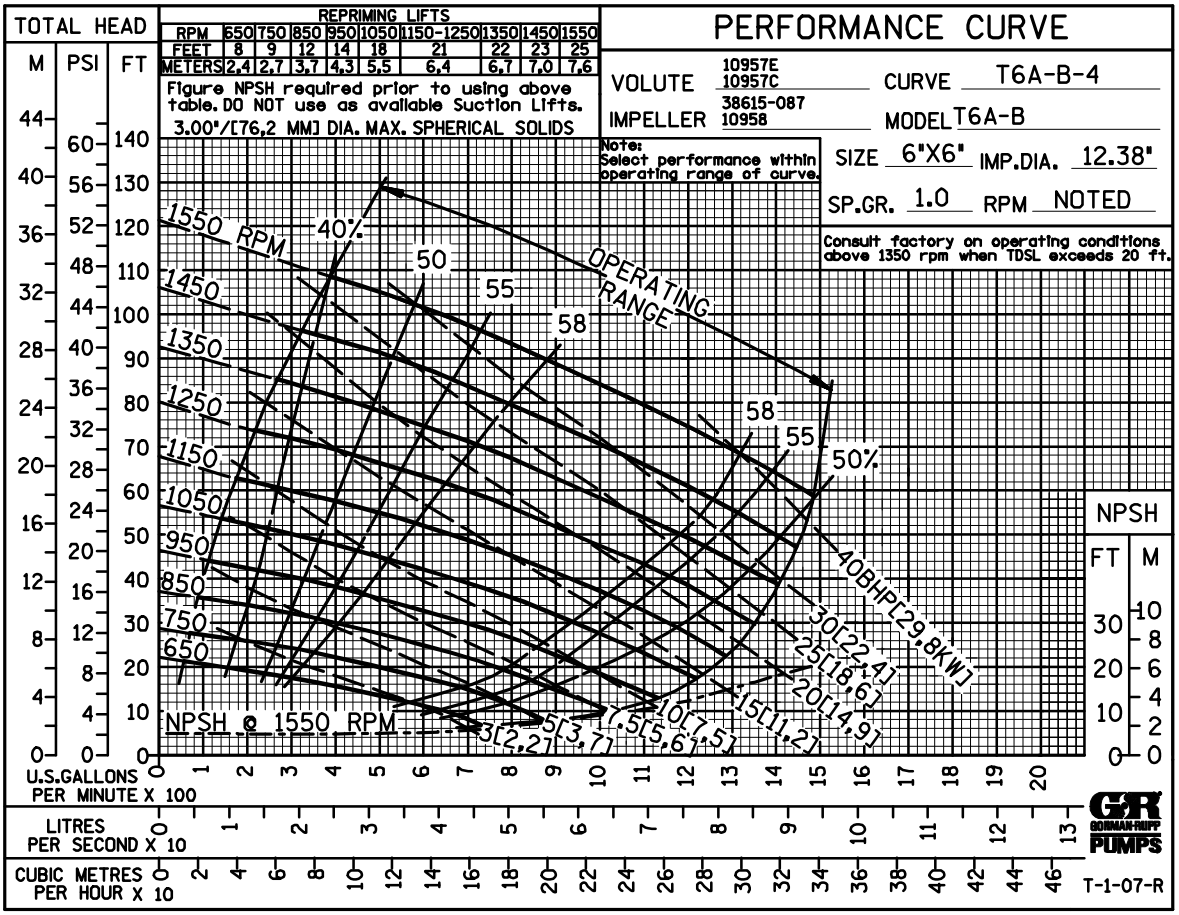
Item	Service Interval*				
	Daily	Weekly	Monthly	Semi-Annually	Annually
General Condition (Temperature, Unusual Noises or Vibrations, Cracks, Leaks, Loose Hardware, Etc.)	I				
Pump Performance (Gauges, Speed, Flow)	I				
Bearing Lubrication		I			R
Seal Lubrication (And Packing Adjustment, If So Equipped)		I			R
V-Belts (If So Equipped)			I		
Air Release Valve Plunger Rod (If So Equipped)			I	C	
Front Impeller Clearance (Wear Plate)				I	
Rear Impeller Clearance (Seal Plate)				I	
Check Valve					I
Pressure Relief Valve (If So Equipped)					C
Pump and Driver Alignment					I
Shaft Deflection					I
Bearings					I
Bearing Housing					I
Piping					I
Driver Lubrication – See Mfgr's Literature					

Legend:
I = Inspect, Clean, Adjust, Repair or Replace as Necessary
C = Clean
R = Replace

* Service interval based on an intermittent duty cycle equal to approximately 4000 hours annually. Adjust schedule as required for lower or higher duty cycles or extreme operating conditions.

PUMP MAINTENANCE AND REPAIR – SECTION E

MAINTENANCE AND REPAIR OF THE WEARING PARTS OF THE PUMP WILL MAINTAIN PEAK OPERATING PERFORMANCE.



✳ **STANDARD PERFORMANCE FOR PUMP MODEL T6A3-B, Including /F, /FM**

✳Based on 70° F (21° C) clear water at sea level with minimum suction lift. Since pump installations are seldom identical, your performance may be difference due to such factors as viscosity, specific gravity, elevation, temperature, and impeller trim.

If your pump serial number is followed by an "N", your pump is **NOT** a standard production model. Contact the Gorman-Rupp Company to verify performance or part numbers.

CAUTION

Pump speed and operating condition points must be within the continuous performance range shown on the curve.

SECTION DRAWING

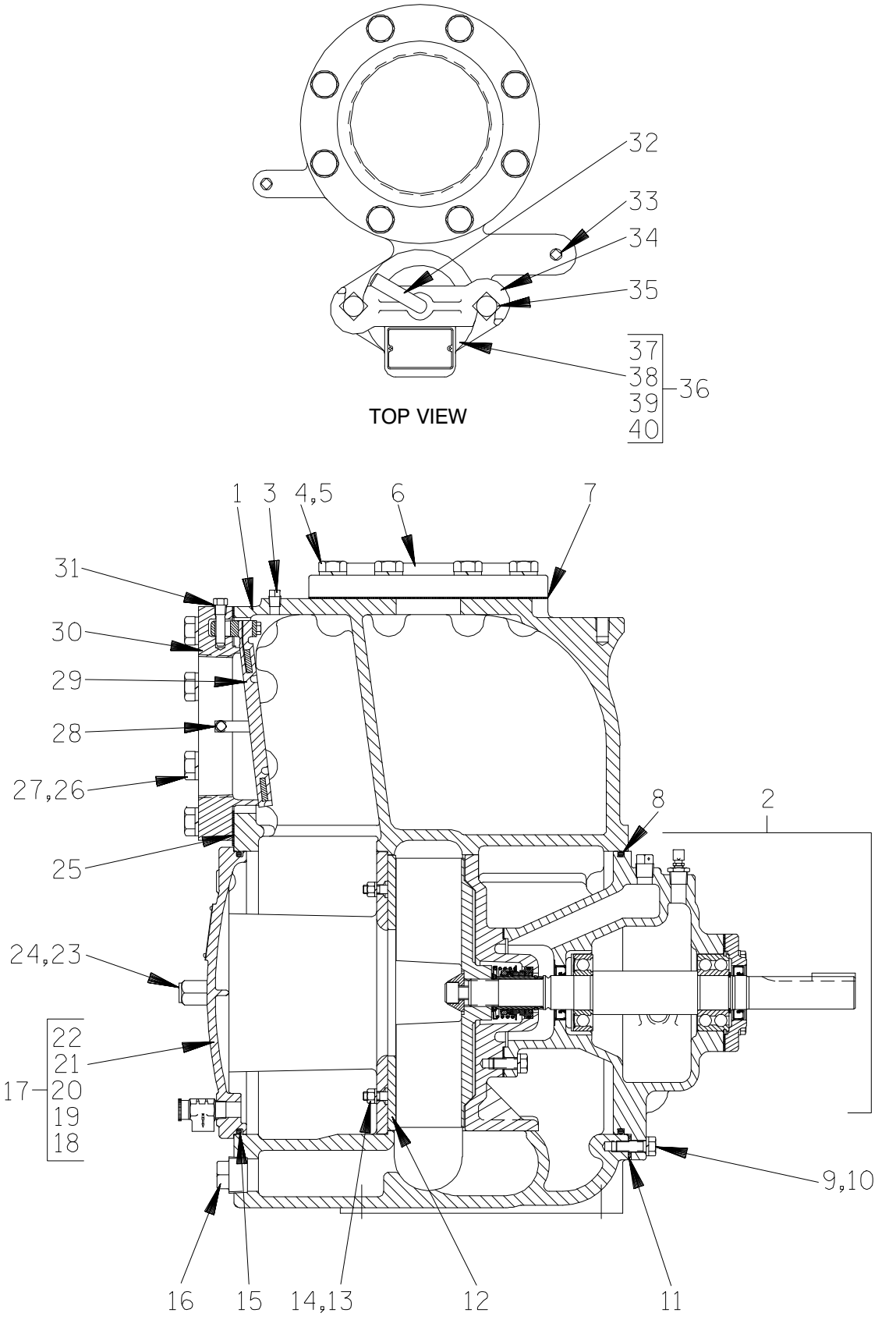


Figure 1. Pump Model T6A3–B, Including /F, /FM

PARTS LIST
Pump Model T6A3–B, Including /F, /FM
(From S/N 740693 Up)

If your pump serial number is followed by an "N", your pump is **NOT** a standard production model. Contact the Gorman-Rupp Company to verify part numbers.

ITEM NO.	PART NAME	PART NUMBER	MAT'L CODE	QTY
☞ 1	PUMP CASING	SEE NOTE BELOW		
2 ✳	REPAIR ROTATING ASSY	10956F	–––	1
✳	REPAIR ROTATING ASSY (WW MODEL ONLY)	44163–243	–––	1
✳	REPAIR ROTATING ASSY (WWS MODEL ONLY)	44163–202	–––	1
☞ 3	PIPE PLUG	P04	15079	1
4	HEX HD CAPSCREW	B1208	15991	8
5	LOCKWASHER	J12	15991	8
6	DISCHARGE FLANGE	1758	10010	1
7 ✳	DISCH FLANGE GSKT	25113–036	–––	1
8 ✳	ROTATING ASSY O-RING	S1676	–––	1
9	HEX HD CAPSCREW	B0806	15991	4
10	LOCKWASHER	J08	15991	4
11 ✳	ROT ASSY SHIM SET	13131	17040	4
12 ✳	WEAR PLATE ASSY	46451–723	24150	1
13	LOCKWASHER	J06	15991	4
14	HEX NUT	D06	15991	4
15 ✳	BACK COVER O-RING	S1676	–––	1
☞16	CASING DRAIN PLUG	P20	10009	1
17	BACK CVR PLATE ASSY	42111–905	–––	1
18	–DRIVE SCREW	BM#04–03	17000	4
19	–WARNING PLATE	2613EV	13990	1
20	–PRESS RELIEF VALVE	26662–005	–––	1
21	–BACK COVER PLATE	NOT AVAILABLE		1
22	–WARNING DECAL	38816–302	–––	1
☞23	STUD	C1211	15991	2
24	BACK COVER NUT	31871–073	15000	2
25 ✳	GASKET	11402G	19370	1
26	HEX HD CAPSCREW	B1211	15991	8
27	LOCKWASHER	J12	15991	8
28	PIPE PLUG	P04	15079	1
29 ✳	SUCT CHK VALVE ASSY	46411–064	–––	1
30	SUCTION FLANGE	11402	10010	1
31	CHECK VALVE PIN	11645	17010	1
32	CLAMP BAR SCREW	31912–009	15000	1
☞33	PIPE PLUG	P04	15079	1
34	CLAMP BAR	38111–004	11010	1
☞35	MACHINE BOLT	A1014	15991	2
36	FILL COVER ASSY	42111–344	–––	1
37	–DRIVE SCREW	BM#04–03	17000	2
38	–FILL COVER PLATE	NOT AVAILABLE		1
39	–WARNING PLATE	38816–097	13990	1
40 ✳	–GASKET	50G	19210	1
NOT SHOWN:				
	NAME PLATE	38818–040	13990	1
	DRIVE SCREW	BM#04–03	17000	4
	LUBE DECAL	11421	–––	1
	SUCTION STICKER	6588AG	–––	1
	DISCHARGE STICKER	6588BJ	–––	1
	PRIMING STICKER	6588AH	–––	1
	WARNING DECAL	2613FE	–––	1
	ROTATON DECAL	2613M	–––	1
OPTIONAL:				
	DISASSEMBLY TOOL	48711–020	–––	1
	/F FLANGE KIT	48213–041	–––	1
	–SUCTION	11402A	10010	1
	–DISCHARGE	11402B	10010	1
	/FM METRIC FLANGE KIT	48213–078	–––	1
	–SUCTION	38642–502	10000	1
	–DISCHARGE	38642–503	10000	1
	WEAR PLATES:			
	–SPA ALLOY	46451–729	24160	1
	–TUNGSTEN CARBIDE	46451–726	2415D	1
	–STAINLESS STEEL	46451–723	1718H	1
	CASING HEATERS:			
	–120V	47811–004	–––	1
	–240V	47811–005	–––	1
	CHECK VALVE ASSYS:			
	–NEO SOLID TYPE	46411–019	–––	1
✓	–VITON SOLID	46411–078	–––	1
✓	–VITON BLOW–OUT	46411–088	–––	1
	PRESS RELIEF VALVES:			
	–SEWAGE TYPE	46431–628	–––	1
	–STAINLESS STEEL	46431–629	–––	1
	HI TEMP SHUT–DOWN KITS:			
	–145°F	48313–186	–––	1
	–130°F	48313–256	–––	1
	–120°F	48313–257	–––	1
	HI TEMP SHUT–DOWN THERMOSTAT KIT 145°F	48313–172	–––	1
	AIR RELEASE VALVES:			
	–10# COMP SPRING	GRP33–07A	–––	1
	–25# COMP SPRING	GRP33–07	–––	1
	–80# COMP SPRING	GRP33–07B	–––	1
	A/R VALVE MTG KIT	46331–515	–––	1
	ROTATING ASSY AND BACK COVER O-RING			
✓	–VITON	25154–454	–––	1

✳ INDICATES PARTS RECOMMENDED FOR STOCK

☞ INCLUDED WITH REPAIR PUMP CASING ASSY 46472–708–––1

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SECTION DRAWING

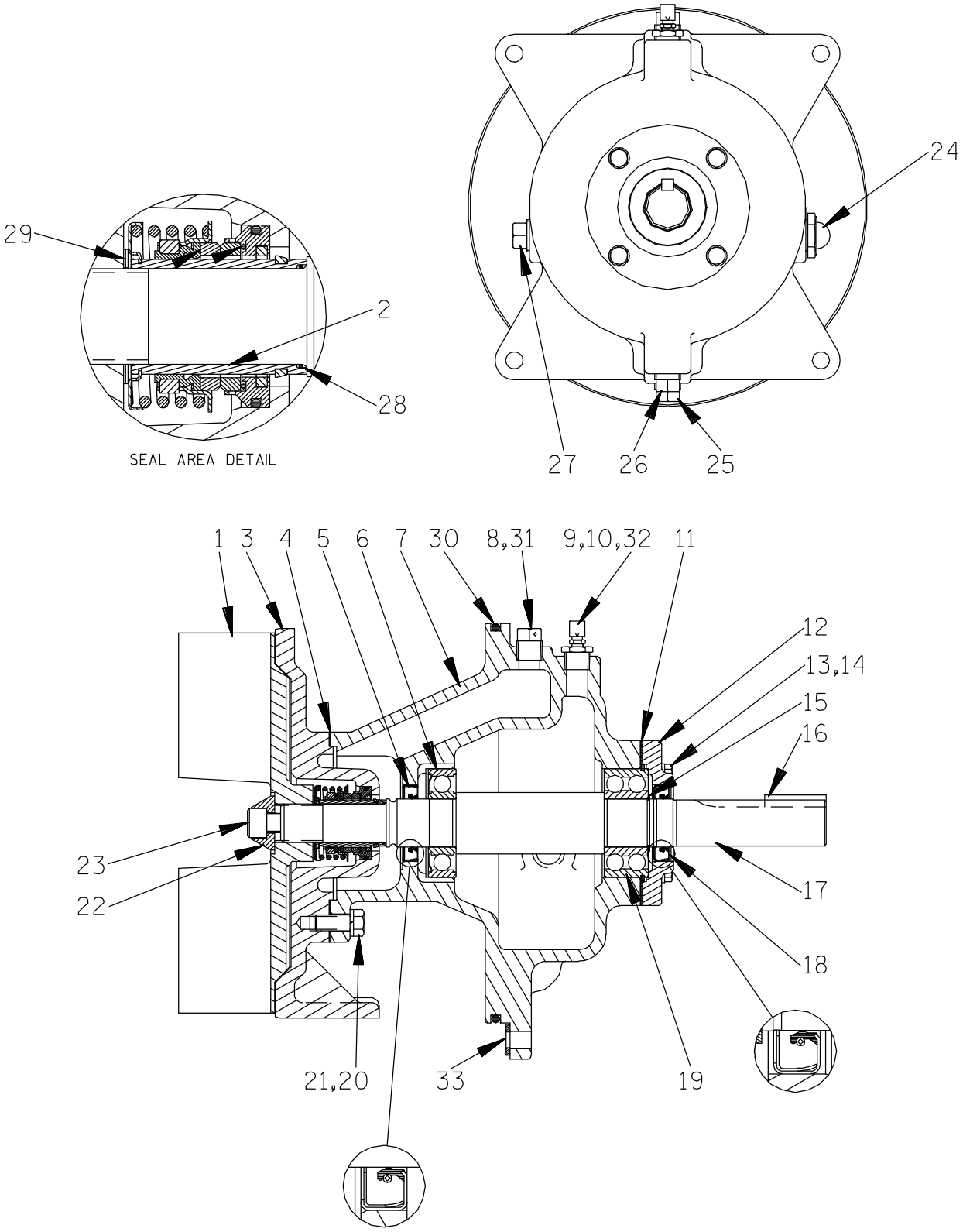


Figure 2. 10956F Repair Rotating Assembly

PARTS LIST
10956F Repair Rotating Assembly

ITEM NO.	PART NAME	PART NUMBER	MAT'L CODE	QTY
1 ✳	IMPELLER	10958	11010	1
2 ✳	SEAL ASSEMBLY	46513–150	–––	1
3	SEAL PLATE	11837E	10010	1
4 ✳	SEAL PLATE GASKET	10959G	20000	1
5 ✳	BEARING CAP OIL SEAL	S1352	–––	1
6 ✳	INBOARD BALL BEARING	23276–009	–––	1
7	BEARING HOUSING	10959B	10010	1
8	VENTED PLUG	4823A	15079	1
9	AIR VENT	S1530	–––	1
10	RED PIPE BUSHING	AP0802	15079	1
11 ✳✳	BEARING CAP GASKET	38683–248	18000	1
12	BEARING CAP	38322–215	10010	1
13	HEX HD CAPSCREW	B0605	15991	4
14	LOCKWASHER	J06	15991	4
15	BRG RETAINING RING	S244	–––	1
16 ✳	SHAFT KEY	N0612	15990	1
17 ✳	IMPELLER SHAFT	10529	16040	1
18 ✳	INBOARD OIL SEAL	S1352	–––	1
19 ✳	OUTBRD BALL BEARING	S1040	–––	1
20	HEX HD CAPSCREW	B0805 1/2	15991	4
21	LOCKWASHER	J08	15991	4
22	IMPELLER WASHER	10278	15030	1
23	SOCKET HD CAPSCREW	DM1004S	15991	1
24	SIGHT GAUGE	S1471	–––	1
25	SEAL CAV DRAIN PLUG	P08	15079	1
26	BRG HSG DRAIN PLUG	P08	15079	1
27	PIPE PLUG	P12	15079	1
28 ✳	O-RING	25154–022	–––	REF
29 ✳	IMPELLER ADJ SHIM SET	37J	17090	REF
30 ✳	ROTATING ASSY O-RING	S1676	–––	1
31	SHIPPING PLUG	11495B	15079	1
32	SHIPPING PLUG	11495B	15079	1
33 ✳	ROT ASSY ADJ SHIM SET	13131	17040	4
NOT SHOWN:				
	ROTATION DECAL	2613M	–––	1
	INSTRUCTION TAG	6588U	–––	1
OPTIONAL:				
	IMP CLEAN-OUT KIT	48783–003	–––	1
	STAINLESS STEEL PARTS:			
	IMP SHAFT LESS SLEEVE	10529B	1706H	1
	SPACER WASHER (FOR SST SHAFT)	38329–040	17130	1
	SEAL ASSY	112364D	–––	1
	IMPELLERS:			
	–ADI	10958	1102H	1
	–TUNG CARB COATED	10958A	11000	1
	SEAL PLATES:			
	–(TUNG CARB COATED)	11837F	10010	1
	–ADI	11837E	1102H	1
	SEAL ASSEMBLIES			
†	–STD MECHANICAL	12364A	–––	1
†	–PERMALON COATED	46512–150	–––	1
	METAL BELLOWS MECH SEAL ASSY			
	SEAL PLATE	38272–242	10010	1
	SEAL SLEEVE ASTL	11876B	16000	1
	SPACER WASHER	38329–040	17130	1
✓	–(VITON OR EQUAL)	46512–147	–––	1
✓	–(KALREZ)	46512–142	–––	1
†	MECHANICAL SEAL SHAFT SLEEVE	11876A	16000	1
† ★	AFLAS SEAL (W/SST SLEEVE OR SOLID SST SHAFT)	46512–194	–––	1
	ROTATING ASSEMBLY AND BACK COVER O-RINGS:			
✓	–VITON	25154–454	–––	1

✳ INDICATES PARTS RECOMMENDED FOR STOCK

✳✳ FOR PUMPS WITH SERIAL NUMBERS **BELOW** 864836, ORDER 10530G/18000 BEARING CAP GASKET. IF **BOTH** BEARING CAP AND GASKET MUST BE REPLACED, ORDER PARTS LISTED ABOVE.

† OPTIONAL MECHANICAL SEAL(S) **MUST** BE USED WITH MECHANICAL SEAL SHAFT SLEEVE OR SOLID SST SHAFT.

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PUMP AND SEAL DISASSEMBLY AND REASSEMBLY

Review all SAFETY information in Section A.

Follow the instructions on all tags, label and decals attached to the pump.

This pump requires little service due to its rugged, minimum-maintenance design. However, if it becomes necessary to inspect or replace the wearing parts, follow these instructions which are keyed to the sectional views (see Figures 1 and 2) and the accompanying parts lists.

As described on the following pages, this manual will alert personnel to known procedures which require special attention, to those which could damage equipment, and to those which could be dangerous to personnel. However, this manual cannot possibly anticipate and provide detailed precautions for every situation that might occur during maintenance of the unit. Therefore, it is the responsibility of the owner/maintenance personnel to ensure that **only** safe, established maintenance procedures are used, and that any procedures not addressed in this manual are performed **only** after establishing that neither personal safety nor pump integrity are compromised by such practices.

Many service functions may be performed by draining the pump and removing the back cover assembly. If major repair is required, the piping and/or power source must be disconnected. The following instructions assume complete disassembly is required.

Before attempting to service the pump, disconnect or lock out the power source and take precautions to ensure that it will remain inoperative. Close all valves in the suction and discharge lines.

For power source disassembly and repair, consult the literature supplied with the power source, or contact your local power source representative.

WARNING!

Before attempting to open or service the pump:

1. **Familiarize yourself with this manual.**
2. **Disconnect or lock out the power source to ensure that the pump will remain inoperative.**
3. **Allow the pump to completely cool if overheated.**
4. **Check the temperature before opening any covers, plates, or plugs.**
5. **Close the suction and discharge valves.**
6. **Vent the pump slowly and cautiously.**
7. **Drain the pump.**

WARNING!

Use lifting and moving equipment in good repair and with adequate capacity to prevent injuries to personnel or damage to equipment.

Back Cover And Wear Plate Removal

(Figure 1)

The wear plate (12) is easily accessible and may be serviced by removing the back cover assembly (17). Before attempting to service the pump, remove the pump casing drain plug (16) and drain the pump. Clean and reinstall the drain plug.

Remove the back cover nuts (24) and pull the back cover and assembled wear plate from the pump casing (1). Inspect the wear plate, and replace it if badly scored or worn. To remove the wear plate, disengage the hardware (13 and 14).

Inspect the back cover O-ring (15) and replace it if damaged or worn.

Suction Check Valve Removal

(Figure 1)

If the check valve assembly (29) is to be serviced, remove the check valve pin (31), reach through the back cover opening and pull the complete assembly from the suction flange (30).

NOTE

Further disassembly of the check valve is not required since it must be replaced as a complete unit.

Individual parts are not sold separately.

Rotating Assembly Removal

(Figure 2)

The rotating assembly may be serviced without disconnecting the suction or discharge piping; however, the power source must be removed to provide clearance.

The impeller (1) should be loosened while the rotating assembly is still secured to the pump casing. Before loosening the impeller, remove the seal cavity drain plug (25) and drain the seal lubricant. This will prevent the oil in the seal cavity from escaping when the impeller is loosened. Clean and reinstall the seal cavity drain plug.

Immobilize the impeller by wedging a block wood between the vanes and the pump casing, and remove the impeller capscrew and washer (22 and 23).

Install a lathe dog on the drive end of the shaft (17) with the "V" notch positioned over the shaft keyway.

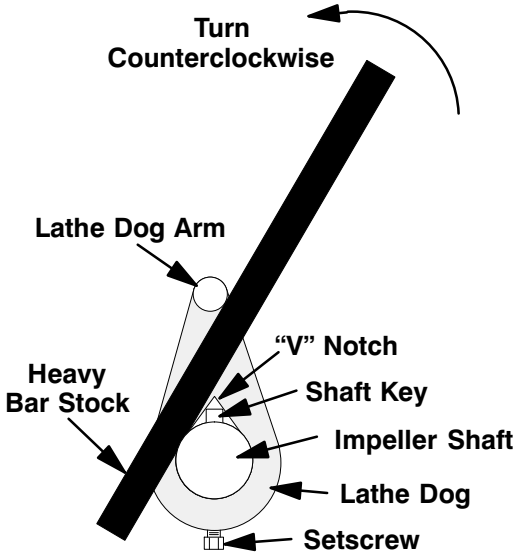


Figure 3. Loosening Impeller

With the impeller rotation still blocked, see Figure 3 and use a long piece of heavy bar stock to pry against the arm of the lathe dog in a counterclockwise direction (when facing the drive end of the shaft). **Use caution** not to damage the shaft or keyway. When the impeller breaks loose, remove the lathe dog and wood block.

NOTE

Do not remove the impeller until the rotating assembly has been removed from the pump casing.

(Figure 1)

Remove the hardware (9 and 10) securing the rotating assembly to the pump casing. Separate the rotating assembly by pulling straight away from the pump casing.

NOTE

An optional disassembly tool is available from the factory. If the tool is used, follow the instructions packed with it. A similar tool may be assembled using 1/2-inch pipe (schedule 80 steel or malleable iron) and a standard tee (see Figure 4). All threads are 1/2-inch NPT. ***Do not pre-assemble the tool.***

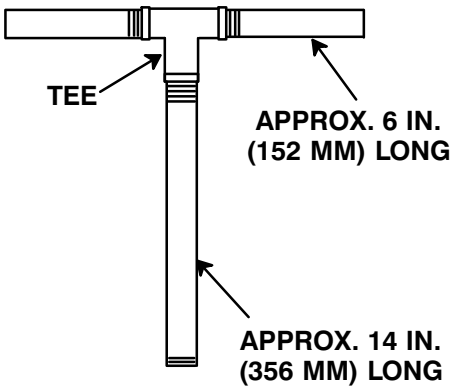


Figure 4. Rotating Assembly Tool

To install the tool, remove the air vent (9, Figure 2) from the bearing housing, and screw the longest length of pipe into the vent hole until fully engaged. Install the tee, and screw the handles into the tee. Use caution when lifting the rotating assembly to avoid injury to personnel or damage to the assembly.

Remove the bearing housing O-ring (8).

Impeller Removal

(Figure 2)

With the rotating assembly removed from the pump casing, unscrew the impeller from the shaft.

Use caution when unscrewing the impeller; tension on the shaft seal spring will be released as the impeller is removed. Inspect the impeller and replace if cracked or badly worn.

Remove the impeller adjusting shims (29); tie and tag the shims, or measure and record their thickness for ease of reassembly.

Seal Removal

(Figure 2)

Slide the integral shaft sleeve and rotating portion of the seal off the shaft as a unit.

Use a pair of stiff wires with hooked ends to remove the stationary element and seat.

An alternate method of removing the stationary seal components is to remove the hardware (20 and 21) and separate the seal plate (3) and gasket (4) from the bearing housing (7). Position the seal plate on a flat surface with the impeller side down. Use a wooden dowel or other suitable tool to press on the back side of the stationary seat until the seat, O-rings, and stationary element can be removed.

Remove the shaft sleeve O-ring (28).

If no further disassembly is required, refer to **Seal Installation**.

Shaft and Bearing Removal and Disassembly

(Figure 2)

When the pump is properly operated and maintained, the bearing housing should not require disassembly. Disassemble the shaft and bearings **only** when there is evidence of wear or damage.

CAUTION

Shaft and bearing disassembly in the field is not recommended. These operations should be performed only in a properly-equipped shop by qualified personnel.

Remove the bearing housing drain plug (26) and drain the lubricant. Clean and reinstall the drain plug.

Disengage the hardware (13 and14) and slide the bearing cap (12) and oil seal (18) off the shaft.Remove the bearing cap gasket (11), and press the oil seal from the bearing cap.

Place a block of wood against the impeller end of the shaft and tap the shaft and assembled bearings (6 and 19) from the bearing housing.

After removing the shaft and bearings, clean and inspect the bearings **in place** as follows.

CAUTION

To prevent damage during removal from the shaft, it is recommended that bearings be cleaned and inspected **in place**. It is **strongly** recommended that the bearings be replaced **any** time the shaft and bearings are removed.

Clean the bearing housing, shaft and all component parts (except the bearings) with a soft cloth soaked in cleaning solvent. Inspect the parts for wear or damage and replace as necessary.

WARNING!

Most cleaning solvents are toxic and flammable. Use them only in a well ventilated area free from excessive heat, sparks, and flame. Read and follow all precautions printed on solvent containers.

Clean the bearings thoroughly in **fresh** cleaning solvent. Dry the bearings with filtered compressed air and coat with light oil.

CAUTION

Bearings must be kept free of all dirt and foreign material. Failure to do so will greatly shorten bearing life. **DO NOT** spin dry bearings. This may scratch the balls or races and cause premature bearing failure.

Rotate the bearings by hand to check for roughness or binding and inspect the bearing balls. If ro-

tation is rough or the bearing balls are discolored, replace the bearings.

The bearing tolerances provide a tight press fit onto the shaft and a snug slip fit into the bearing housing. Replace the bearings, shaft, or bearing housing if the proper bearing fit is not achieved.

If bearing replacement is required, remove the outboard bearing retaining ring (15), and use a bearing puller to remove the bearings from the shaft.

Press the inboard oil seal (5) from the bearing housing.

Shaft and Bearing Reassembly and Installation

(Figure 2)

Clean the bearing housing, shaft and all component parts (except the bearings) with a soft cloth soaked in cleaning solvent. Inspect the parts for wear or damage as necessary.

WARNING!

Most cleaning solvents are toxic and flammable. Use them only in a well ventilated area free from excessive heat, sparks, and flame. Read and follow all precautions printed on solvent containers.

Inspect the shaft for distortion, nicks or scratches, or for thread damage on the impeller end. Dress small nicks and burrs with a fine file or emery cloth. Replace the shaft if defective.

Position the inboard oil seal (5) in the bearing housing bore with the lip positioned as shown in Figure 2. Press the oil seal into the housing until the face is **just flush** with the machined surface on the housing.

CAUTION

To prevent damage during removal from the shaft, it is recommended that bearings be cleaned and inspected **in place**. It is **strongly** recommended that the bearings be replaced **any** time the shaft and bearings are removed.

NOTE

Position the inboard bearing (6) on the shaft with the shielded side toward the impeller end of the shaft. Position the outboard bearing (19) on the shaft with the integral retaining ring on the bearing O.D. toward the drive end of the shaft.

The bearings may be heated to ease installation. An induction heater, hot oil bath, electric oven, or hot plate may be used to heat the bearings. Bearings should **never** be heated with a direct flame or directly on a hot plate.

NOTE

*If a hot oil bath is used to heat the bearings, both the oil and the container must be **absolutely** clean. If the oil has been previously used, it must be **thoroughly** filtered.*

Heat the bearings to a uniform temperature **no higher than** 250°F (120°C), and slide the bearings onto the shaft, one at a time, until they are fully seated. This should be done quickly, in one continuous motion, to prevent the bearings from cooling and sticking on the shaft.

After the bearings have been installed and allowed to cool, check to ensure that they have not moved away from the shaft shoulders in shrinking. If movement has occurred, use a suitable sized sleeve and a press to reposition the bearings against the shaft shoulders.

If heating the bearings is not practical, use a suitable sized sleeve, and an arbor (or hydraulic) press to install the bearings on the shaft.

CAUTION

When installing the bearings onto the shaft, **never** press or hit against the outer race, balls, or ball cage. Press **only** on the inner race.

Secure the outboard bearing on the shaft with the bearing retaining ring (15).

Slide the shaft and assembled bearings into the bearing housing until the retaining ring on the outboard bearing seats against the bearing housing.

CAUTION

When installing the shaft and bearings into the bearing bore, push against the outer race. **Never** hit the balls or ball cage.

Press the outboard oil seal (18) into the bearing cap (12) with the lip positioned as shown in Figure 2. Replace the bearing cap gasket (11), and secure the bearing cap with the hardware (13 and 14). **Be careful** not to damage the oil seal lip on the shaft keyway.

Install the bearing housing O-ring (30).

Lubricate the bearing housing as indicated in **LUBRICATION**.

Seal Installation

(Figures 2, 5, 6 and 7)

WARNING!

Most cleaning solvents are toxic and flammable. Use them only in a well ventilated area free from excessive heat, sparks, and flame. Read and follow all precautions printed on solvent containers.

Clean the seal cavity and shaft with a cloth soaked in fresh cleaning solvent. Inspect the stationary seat bore in the seal plate for dirt, nicks and burrs, and remove any that exist. The stationary seat bore **must** be completely clean before installing the seal.

CAUTION

A new seal assembly should be installed **any time** the old seal is removed from the pump. Wear patterns on the finished faces cannot be realigned during reassembly. Reusing an old seal could result in premature failure.

To ease installation of the seal, lubricate the shaft sleeve O-ring and the external stationary seat O-ring with a very **small** amount of light lubricating oil. See Figure 5 for seal part identification.

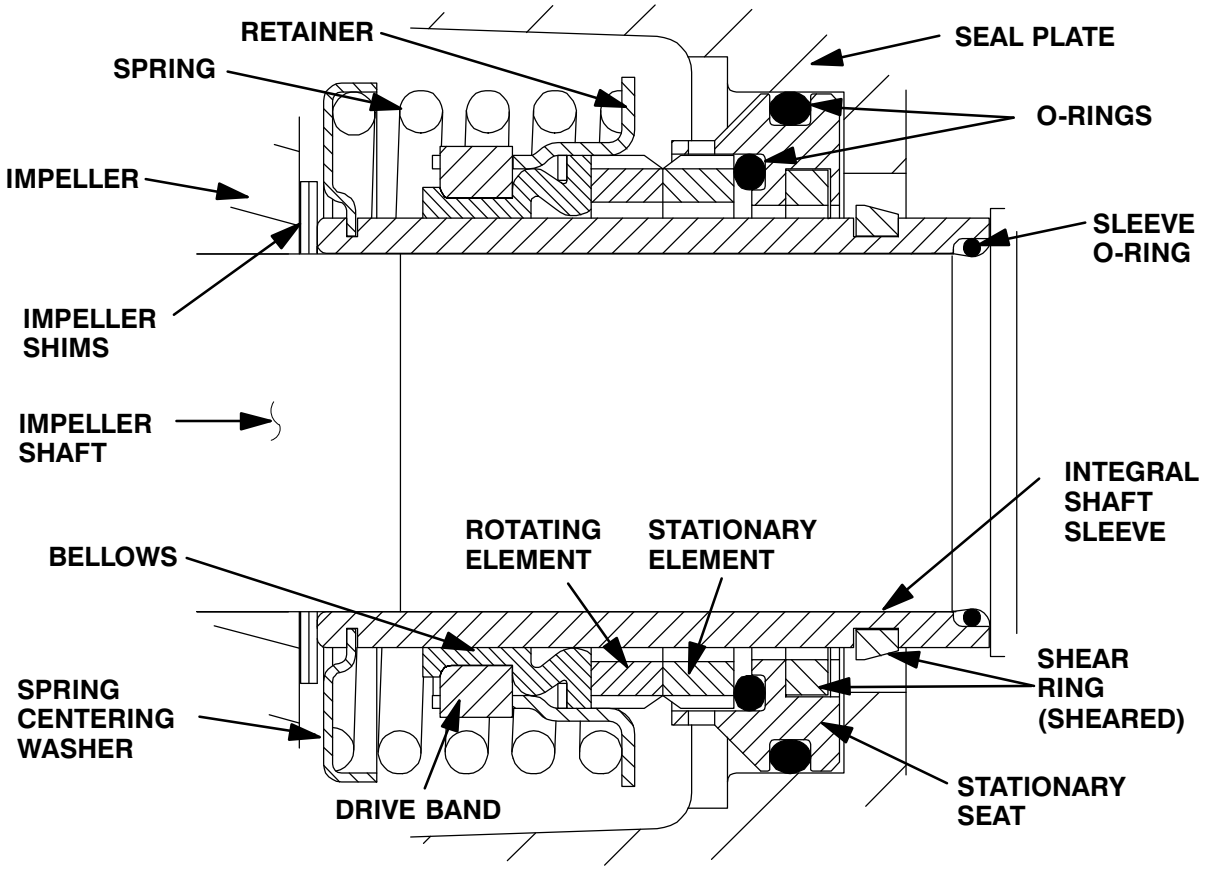


Figure 5. 46513—150 Cartridge Seal Assembly

CAUTION

This seal is not designed for operation at temperatures above 160°F (71°C). Do not use at higher operating temperatures.

If the seal plate was removed, install the seal plate gasket (4). Position the seal plate over the shaft and secure it to the intermediate with the hardware (20 and 21).

To prevent damaging the shaft sleeve O-ring (28) on the shaft threads, stretch the O-ring over a piece of tubing 1-1/4 I.D. x 1-1/2 O.D. x 2-inches long (32 mm x 38 mm x 51 mm). Slide the tube over the shaft threads, then slide the O-ring off the tube and onto the shaft. Remove the tube, and continue to slide the O-ring down the shaft until it seats against the shaft shoulder.

When installing a new cartridge seal assembly, remove the seal from the container, and remove the mylar storage tabs, if so equipped, from between the seal faces.

CAUTION

New cartridge seal assemblies may be equipped with mylar storage tabs between the seal faces. If so equipped, these storage tabs **must** be removed before installing the seal.

Lubricate the external stationary seat O-ring with light oil. Slide the seal assembly onto the shaft until the external stationary seat O-ring engages the bore in the seal plate.

Clean and inspect the impeller as described in **Impeller Installation and Adjustment**. Install the full set of impeller shims (29) provided with the seal, and screw the impeller onto the shaft until it is seated against the seal (see Figure 6).

Continue to screw the impeller onto the shaft. This will press the stationary seat into the seal plate bore.

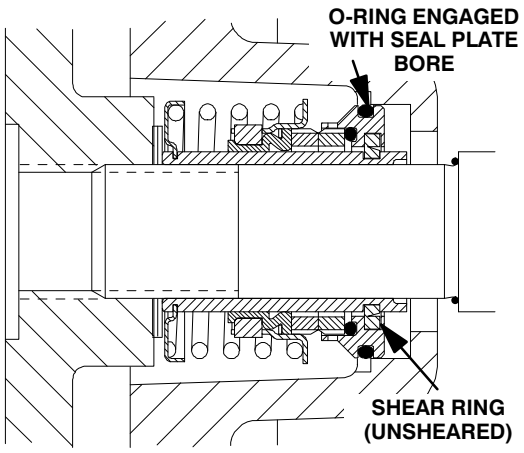


Figure 6. Seal Partially Installed

NOTE

A firm resistance will be felt as the impeller presses the stationary seat into the seal plate bore.

As the stationary seat becomes fully seated, the seal spring compresses, and the shaft sleeve will break the nylon shear ring. This allows the sleeve to slide down the shaft until seated against the shaft shoulder. Continue to screw the impeller onto the shaft until the impeller, shims, and sleeve are fully seated against the shaft shoulder (see Figure 7).

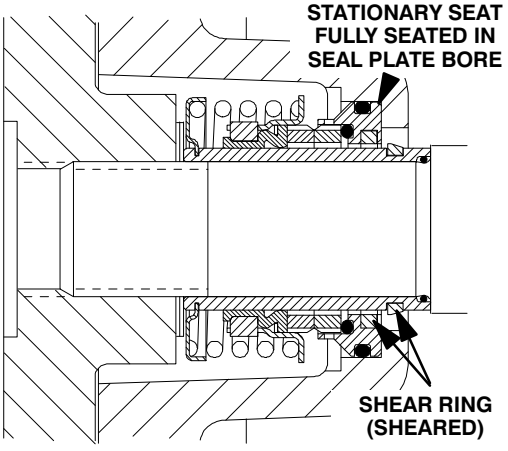


Figure 7. Seal Fully Installed

Measure the impeller-to-seal plate clearance, and remove impeller adjusting shims to obtain the proper clearance as described in **Impeller Installation and Adjustment**.

If necessary to reuse an old seal in an emergency, carefully separate the rotating and stationary seal faces from the bellows retainer and stationary seat.

CAUTION

A new seal assembly should be installed **any time** the old seal is removed from the pump. Wear patterns on the finished faces cannot be realigned during reassembly. Reusing an old seal could result in premature failure.

Handle the seal parts with extreme care to prevent damage. Be careful not to contaminate precision finished faces; even fingerprints on the faces can shorten seal life. If necessary, clean the faces with a non-oil based solvent and a clean, lint-free tissue. Wipe **lightly** in a concentric pattern to avoid scratching the faces.

Carefully wash all metallic parts in fresh cleaning solvent and allow to dry thoroughly.

CAUTION

Do not attempt to separate the rotating portion of the seal from the shaft sleeve when reusing an old seal. The rubber bellows will adhere to the sleeve during use, and attempting to separate them could damage the bellows.

Inspect the seal components for wear, scoring, grooves, and other damage that might cause leakage. Inspect the integral shaft sleeve for nicks or cuts on either end. If any components are worn, or the sleeve is damaged, replace the complete seal; **never mix old and new seal parts**.

Install the stationary seal element in the stationary seat. Press this stationary subassembly into the seal plate bore until it seats squarely against the bore shoulder. A push tube made from a piece of plastic pipe would aid this installation. The I.D. of

the pipe should be slightly larger than the O.D. of the shaft sleeve.

Slide the rotating portion of the seal (consisting of the integral shaft sleeve, spring centering washer, spring, bellows and retainer, and rotating element) onto the shaft until the seal faces contact.

Proceed with **Impeller Installation and Adjustment**.

Impeller Installation

(Figure 2)

Inspect the impeller, and replace it if cracked or badly worn. Inspect the impeller and shaft threads for dirt or damage, and clean or dress the threads as required.

CAUTION

The shaft and impeller threads **must** be completely clean before reinstalling the impeller. Even the slightest amount of dirt on the threads can cause the impeller to seize to the shaft, making future removal difficult or impossible without damage to the impeller or shaft.

Install the same thickness of impeller adjusting shims (29) as previously removed. Apply 'Never-Seez' or equivalent to the shaft threads and screw the impeller onto the shaft until tight.

NOTE

At the slightest sign of binding, immediately back the impeller off, and check the threads for dirt. ***Do not*** *try to force the impeller onto the shaft*.

A clearance of .025 to .040 inch (0,64 to 1,02 mm) between the impeller and the seal plate is recommended for maximum pump efficiency. Measure this clearance, and add or remove impeller adjusting shims as required.

NOTE

If the rotating assembly has been installed in the pump casing, this clearance may be measured by reaching through the priming port with a feeler gauge.

NOTE

Proceed with ***Rotating Assembly Installation*** *before installing the impeller capscrew and washer (22 and 23). The rotating assembly must be installed in the pump casing in order to torque the impeller capscrew.*

After the rotating assembly is installed in the pump casing, coat the threads of the impeller capscrew (23) with 'Never-Seez' or equivalent compound, and install the impeller washer (22) and capscrew; torque the capscrew to 90 ft. lbs. (1080 in. lbs. or 12,4 m. kg.).

Rotating Assembly Installation

(Figure 1)

NOTE

If the pump has been completely disassembled, it is recommended that the suction check valve and back cover assembly be reinstalled at this point. The back cover assembly must be in place to adjust the impeller face clearance.

Install the bearing housing and lubricate it with light grease. Ease the rotating assembly into the pump casing using the installation tool. **Be careful** not to damage the O-ring.

Install the four sets of rotating assembly adjusting shims (11) using the same thickness as previously removed. Secure the rotating assembly to the pump casing with the hardware (9 and 10). **Do not** fully tighten the capscrews until the back cover has been reinstalled and the impeller face clearance has been set.

A clearance of .010 to .020 inch (0,25 to 0,51 mm) between the impeller and the wear plate is also recommended for maximum pump efficiency. This clearance can be obtained by removing an equal amount of shims from each rotating assembly shim set until the impeller scrapes against the wear plate when the shaft is turned. After the impeller scrapes, add approximately .015 inch (0,4 mm) of shims to each shim set.

NOTE

An alternate method of adjusting this clearance is to

reach through the suction port with a feeler gauge and measure the gap. Add or subtract rotating assembly shims accordingly.

Suction Check Valve Installation

(Figure 1)

Inspect the check valve assembly (29), and replace it if badly worn.

NOTE

The check valve assembly must be replaced as a complete unit. Individual parts are not sold separately.

Reach through the back cover opening with the check valve (29), and position the check valve adaptor in the mounting slot in the suction flange (30). Align the adaptor with the flange hole, and secure the assembly with the check valve pin (31).

NOTE

If the suction or discharge flanges were removed, replace the respective gaskets, apply 'Permatex Aviation No. 3 Form-A-Gasket' or equivalent compound to the mating surfaces, and secure them to the pump casing with the attaching hardware.

Back Cover Installation

(Figure 1)

If the wear plate (12) was removed for replacement, carefully center it on the back cover and secure it with the hardware (13 and 14). The wear plate **must** be concentric to prevent binding when the back cover is installed.

Replace the back cover O-ring (15), and lubricate it with a generous amount of No. 2 grease. Clean any scale or debris from the contacting surfaces in the pump casing that might interfere or prevent a good seal with the back cover. Slide the back cover assembly into the pump casing. Be sure the wear plate does not bind against the impeller.

NOTE

To ease future disassembly, apply a film of grease or 'Never-Seez' on the back cover shoulder, or any surface which contacts the pump casing. This action will reduce rust and scale build-up.

Secure the back cover assembly by tightening the back cover nuts (24) evenly. **Do not** over-tighten the hand nuts; they should be just tight enough to ensure a good seal at the back cover shoulder. Be sure the wear plate does not bind against the casing.

PRESSURE RELIEF VALVE MAINTENANCE

(Figure 1)

The back cover is equipped with a pressure relief valve (20) to provide additional safety for the pump and operator (refer to **Liquid Temperature And Overheating** in **OPERATION**).

It is recommended that the pressure relief valve assembly be replaced at each overhaul, or any time the pump overheats and activates the valve. **Never** replace this valve with a substitute which has not been specified or provided by the Gorman-Rupp Company.

Periodically, the valve should be removed for inspection and cleaning. When reinstalling the relief valve, apply 'Loctite Pipe Sealant With Teflon No. 592', or equivalent compound, on the relief valve threads. Position the valve as shown in Figure 1 with the discharge port pointing down.

Final Pump Assembly

(Figure 1)

Install the shaft key (16, Figure 2) and reconnect the power source. Be sure to install any guards used over the rotating members.

WARNING!

Do not operate the pump without the guards in place over the rotating parts. Exposed rotating parts can catch clothing, fingers, or tools, causing severe injury to personnel.

Install the suction and discharge lines and open all valves. Make certain that all piping connections are tight, properly supported and secure.

Be sure the pump and power source have been properly lubricated, see **LUBRICATION**.

Remove the fill cover assembly (36) and fill the pump casing with clean liquid. Reinstall the fill cover and tighten it. Refer to **OPERATION**, Section C, before putting the pump back into service.

LUBRICATION

Seal Assembly

(Figure 2)

Before starting the pump, remove the vented plug (8) and fill the seal cavity with approximately 40 ounces (1,4 liters) of SAE No. 30 non-detergent oil, or to a level just below the tapped vented plug hole. Clean and reinstall the vented plug. Maintain the oil at this level.

Bearings

(Figure 2)

The bearing housing was fully lubricated when shipped from the factory. Check the oil level regularly through the sight gauge (24) and maintain it at the middle of the gauge. When lubrication is required, add SAE No. 30 non-detergent oil through the hole for the air vent (9). **Do not** over-lubricate. Over-lubrication can cause the bearings to overheat, resulting in premature bearing failure.

NOTE

The white reflector in the sight gauge must be positioned horizontally to provide proper drainage.

Under normal conditions, drain the bearing housing once each year and refill with approximately 32 ounces (1 liter) clean oil. Change the oil more frequently if the pump is operated continuously or installed in an environment with rapid temperature change.

CAUTION

Monitor the condition of the bearing lubricant regularly for evidence of rust or moisture condensation. This is especially important in areas where variable hot and cold temperatures are common.

For cold weather operation, consult the factory or a lubricant supplier for the recommended grade of oil.

Power Source

Consult the literature supplied with the power source, or contact your local power source representative.

For U.S. and International Warranty Information,
Please Visit www.grpumps.com/warranty
or call:
U.S.: 419—755—1280
International: +1—419—755—1352

For Canadian Warranty Information,
Please Visit www.grcanada.com/warranty
or call:
519—631—2870

THE GORMAN-RUPP COMPANY ● MANSFIELD, OHIO
GORMAN-RUPP OF CANADA LIMITED ● ST. THOMAS, ONTARIO, CANADA

Appendix E

MIKE URBAN Model Files (included on a flash drive)

Appendix F

Sanitary System Detailed Cost Estimate

ISL Engineering and Land Services

PROJECT CONSTRUCTION COST ESTIMATE

TOWN OF PICTURE BUTTE - SANITARY ASSESSMENT

Project	Timing	Location	Item	Units	Quantity	Unit Cost	Cost	Sub-Total	15% ENGINEERING	30% CONTINGENCIES	TOTAL
1	1 - 5 Years	Crescent from Piron to 752, Crescent from 752 to 7th St. N., Crescent from 7th St. N. to 650, Crescent from 650 to 6th St. N.	200 mm	m	390.9	$ 372	$ 145,430	$ 145,430	$ 21,814	$ 43,629	$ 210,873
2	1 - 5 Years	6th St. N. from Crescent to 2nd back alley, 6th St. N. from Hwy Ave to 1st back alley, 6th St. N. from Hwy Ave to 1st back alley	375 mm	m	97.3	$ 480	$ 46,714	$ 134,295	$ 20,144	$ 40,289	$ 194,728
			Road Repair	m	94.5	$ 750	$ 70,875				
			200 mm	m	44.9	$ 372	$ 16,707				
3	1 - 5 Years	3rd St. N. from Jamieson to Hwy Ave	200 mm	m	115.2	$ 372	$ 42,843	$ 42,843	$ 6,426	$ 12,853	$ 62,123
4	1 - 5 Years	2nd St. N. from Crescent to Lane	200 mm	m	51.2	$ 372	$ 19,032	$ 19,032	$ 2,855	$ 5,709	$ 27,596
5	1 - 5 Years	4th St. S. from Jamieson to 5th St. S., 4th St. S. from 5th St. S. to Cowan,	200 mm	m	192.1	$ 372	$ 71,472	$ 71,472	$ 10,721	$ 21,442	$ 103,635
6	1 - 5 Years	Hwy Ave from 610 to 6th St. N., Hwy Ave from 624 to 610	Road Repair	m	166.5	$ 750	$ 124,860	$ 191,574	$ 28,736	$ 57,472	$ 277,782
			200 mm	m	122.2	$ 372	$ 45,455				
			375 mm	m	44.3	$ 480	$ 21,259				
7	1 - 5 Years	From 613 Hwy Ave to back alley, From 5th St. S. to back alley of Hwy Ave	Road Repair	m	166.2	$ 750	$ 124,620	$ 204,377	$ 30,657	$ 61,313	$ 296,346
			375 mm	m	166.2	$ 480	$ 79,757				
8	1 - 5 Years	5th St. S. form 107 to Watson, 5th St. S. from Watson to 119, 5th St. S. from 119 to Rogers, 5th St. S. from 103 to 107	Road Repair	m	231.3	$ 750	$ 173,505	$ 308,021	$ 46,203	$ 92,406	$ 446,631
			375 mm	m	231.3	$ 480	$ 111,043				
			200 mm	m	63.1	$ 372	$ 23,473				
9	1 - 5 Years	Rogers Ave from 5th St. S. to 5th St. back alley, Rogers Ave from 5th St. S. back alley to behind 333 Rogers Behind 333 Rogers Ave to 3A St.	Road Repair	m	279.4	$ 750	$ 209,558	$ 343,674	$ 51,551	$ 103,102	$ 498,328
			375 mm	m	279.4	$ 480	$ 134,117				
10	1 - 5 Years	3A St. from 315 to 321, 3A St. to lift station comes from SAL3A001, Lift station from SALXXX12	Road Repair	m	133.8	$ 750	$ 100,335	$ 163,283	$ 24,493	$ 48,985	$ 236,761
			375 mm	m	112.7	$ 480	$ 54,086				
			300 mm	m	21.1	$ 420	$ 8,862				
11	1 - 5 Years	3rd St. S. from Rogers to 139, From Rogers to E side of 315	Road Repair	m	58.3	$ 750	$ 43,755	$ 65,457	$ 9,819	$ 19,637	$ 94,913
			200 mm	m	58.3	$ 372	$ 21,702				
12	5 - 10 Years	7th St. N. from 415 to Rosewood, 7th St. N. from 305 to 415	Road Repair	m	199.3	$ 750	$ 149,468	$ 223,603	$ 33,541	$ 67,081	$ 324,225
			200 mm	m	199.3	$ 372	$ 74,136				
13	5 - 10 Years	Hwy Ave from 720 to 624	Road Repair	m	121.7	$ 750	$ 91,260	$ 136,525	$ 20,479	$ 40,957	$ 197,961
			200 mm	m	121.7	$ 372	$ 45,265				
14	5 - 10 Years	Crescent from 852 to Piron	Road Repair	m	117.8	$ 750	$ 88,320	$ 132,127	$ 19,819	$ 39,638	$ 191,584
			200 mm	m	117.8	$ 372	$ 43,807				
15	5 - 10 Years	Crescent from 454 to 4th St. N., Crescent from 5th St. N. to 454, Crescent from 540 to 5th St. N., Right of way from Crescent between 456 & 454	Road Repair	m	267.9	$ 750	$ 200,948	$ 300,617	$ 45,093	$ 90,185	$ 435,895
			200 mm	m	267.9	$ 372	$ 99,670				
16	5 - 10 Years	Runs E/W through Chroniks to N/S pipe going to trailer park	Road Repair	m	74.4	$ 750	$ 55,770	$ 83,432	$ 12,515	$ 25,030	$ 120,976
			200 mm	m	74.4	$ 372	$ 27,662				
17	5 - 10 Years	Trailer park from 3 to 8	Road Repair	m	70.2	$ 750	$ 52,643	$ 78,753	$ 11,813	$ 23,626	$ 114,192
			200 mm	m	70.2	$ 372	$ 26,111				
18	5 - 10 Years	5th St. S. from 4th St. S. to 103	Road Repair	m	94.9	$ 750	$ 71,175	$ 106,478	$ 15,972	$ 31,943	$ 154,393
			200 mm	m	94.9	$ 372	$ 35,303				
19	5 - 10 Years	Inlet Ave, 6th St. N. from Inlet to Inlet's back alley	Road Repair	m	104.5	$ 750	$ 78,360	$ 117,227	$ 17,584	$ 35,168	$ 169,979
			200 mm	m	104.5	$ 372	$ 38,867				
20	5 - 10 Years	Hwy Ave from 5th St. N. to 4th St. N.	Road Repair	m	102.5	$ 750	$ 76,853	$ 114,971	$ 17,246	$ 34,491	$ 166,708
			200 mm	m	102.5	$ 372	$ 38,119				
21	5 - 10 Years	4th St. N. from Jamieson to Cactus	Road Repair	m	76.3	$ 750	$ 57,233	$ 85,620	$ 12,843	$ 25,686	$ 124,149
			200 mm	m	76.3	$ 372	$ 28,387				
22	5 - 10 Years	4th St. S. from Cowan to 300	Road Repair	m	63.7	$ 750	$ 47,738	$ 71,415	$ 10,712	$ 21,425	$ 103,552
			200 mm	m	63.7	$ 372	$ 23,678				
23	Beyond 10 Years	3A St. from N. ent. To S. ent. Of trailer park, 3A St from past Pitt St. to N. ent. Of Trailer park, 3A St from 32 to past Pitt St.	Road Repair	m	252.9	$ 750	$ 189,698	$ 286,823	$ 43,023	$ 86,047	$ 415,893
			250 mm	m	252.9	$ 384	$ 97,125				

Total	$ 4,969,223

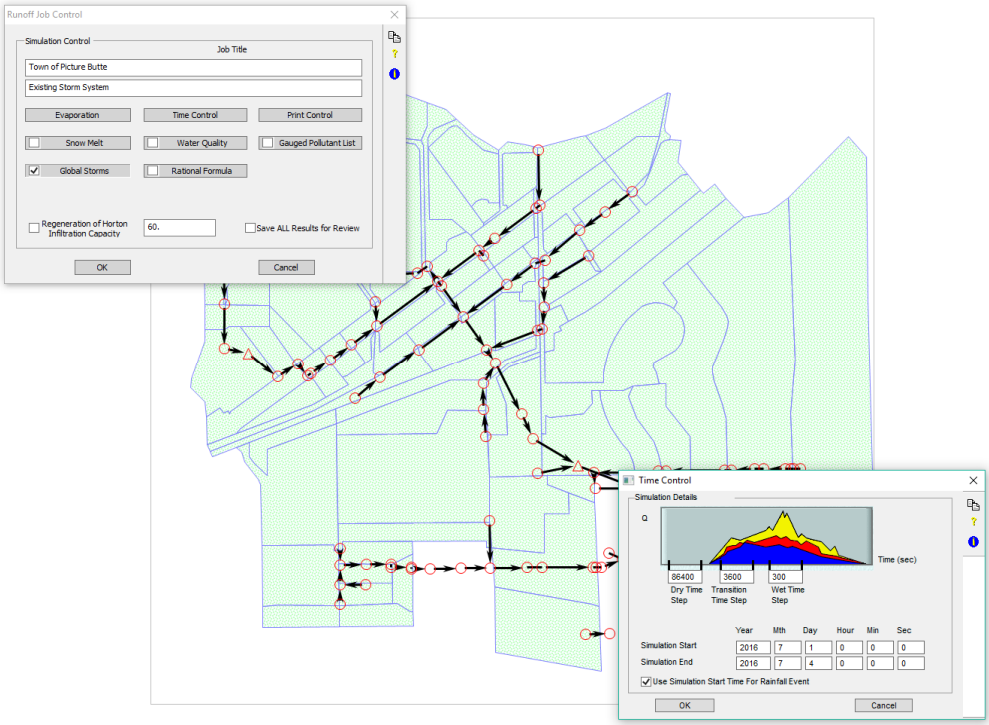
Prepared by: Shanna Daly, ISL

Checked by: Rafal Jadzinski, ISL

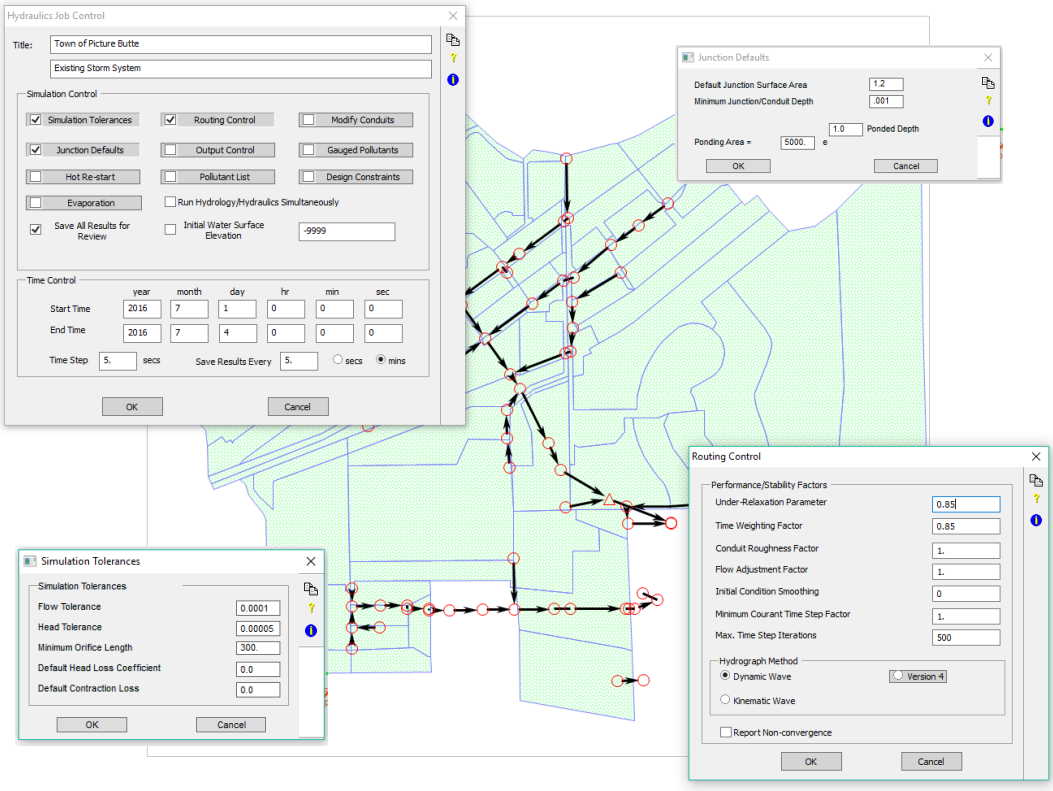
Appendix G

XP-SWMM Model Parameters

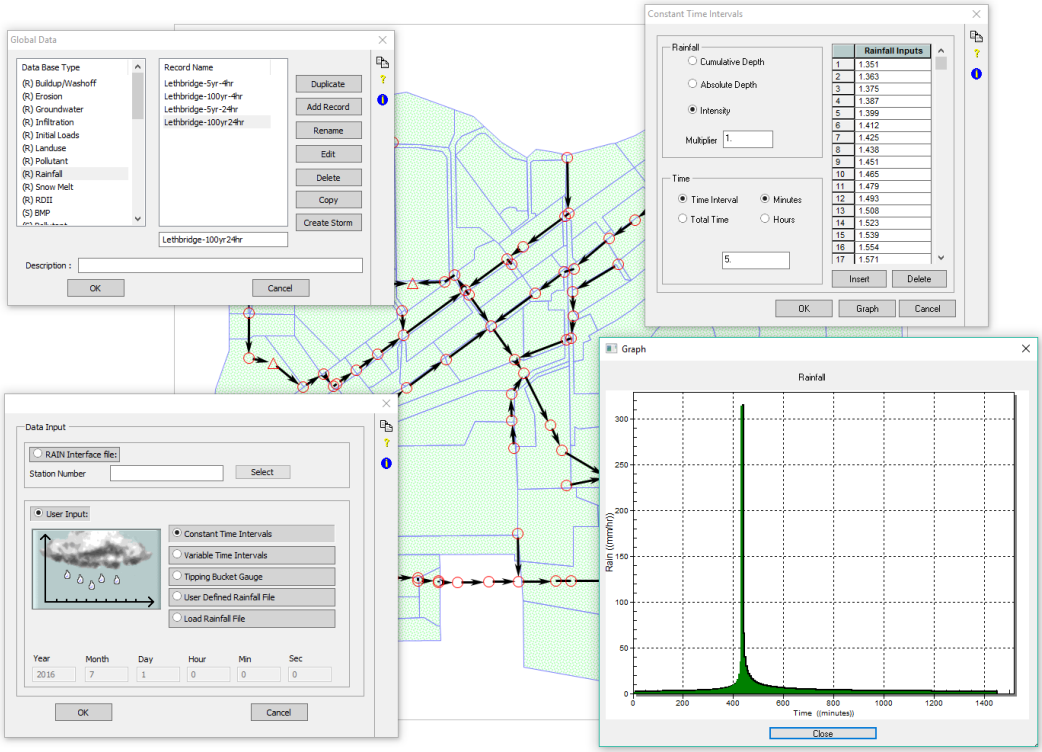
Runoff Job Control



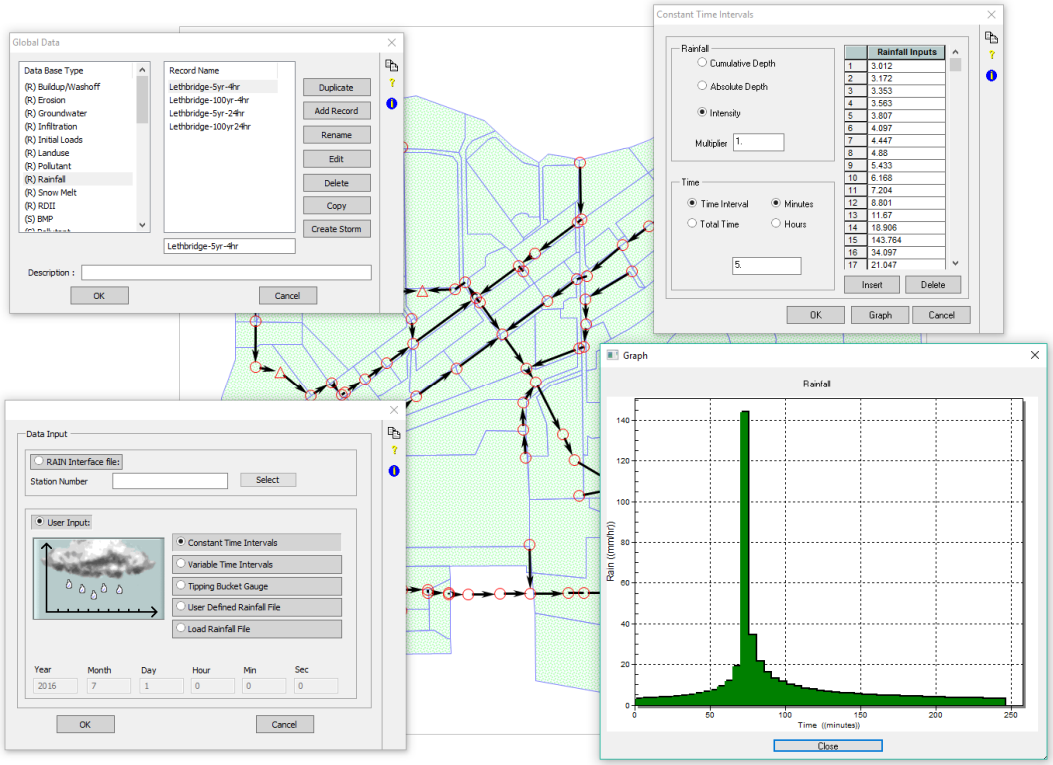
Hydraulics Job Control



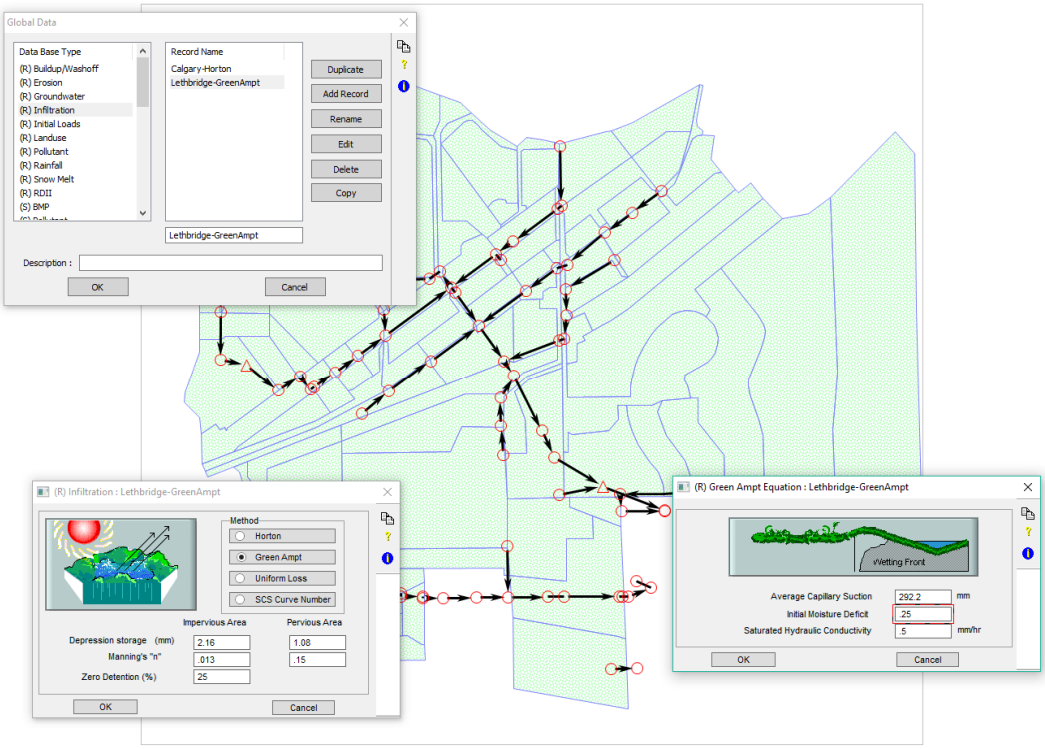
100 Year – 24 Hour Rainfall Event



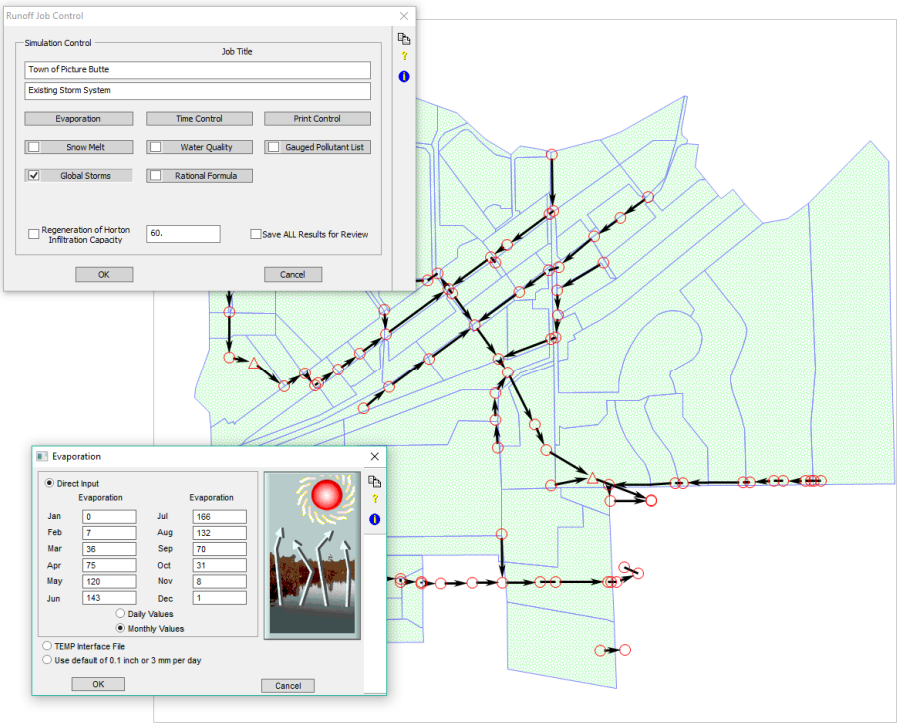
5 Year – 4 Hour Rainfall Event



Green Ampt Infiltration Data



Evaporation Parameters



Existing 100 Year Model Summary Overall Continuity Results

```
*=====================================================*
| Initial system volume         =         0.0000 Cu M  |
| Total system inflow volume    =    144898.0824 Cu M  |
| Inflow + Initial volume       =    144898.0824 Cu M  |
*=====================================================*
| Total system outflow          =    147793.7058 Cu M  |
| Volume left (Final volume)    =      2122.5029 Cu M  |
| Evaporation                   =         0.0000 Cu M  |
| Basin Infiltration            =         0.0000 Cu M  |
| Outflow + Final Volume        =    149916.2087 Cu M  |
*=====================================================*

*=============================================*
| Total Model Continuity Error                |
| Error in Continuity, Percent =        -3.4632 |
| Error in Continuity, m^3     =      -5018.126 |
| + Error means a continuity loss, - a gain     |
*=============================================*


#################################################
# Table E22. Numerical Model judgement section  #
#################################################

Overall error was (minimum of Table E18 & E21)            -3.4632 percent
Worst nodal error was in node STMH6S001        with       -5.2388 percent
Of the total inflow this loss was                          0.3811 percent
Your overall continuity error was                  Good
                                                  Excellent Efficiency
Efficiency of the simulation                       1.18
Most Number of Non Convergences at one Node       87.
Total Number Non Convergences at all Nodes       203.
Total Number of Nodes with Non Convergences       19.


#########################################################
# Table E23. New Basin Design Information               #
#            Maximum Hydraulic Grade Line,              #
#            Out Conduit Sizes and Maximum Flow         #
#########################################################

A) Resize d/s Pipes based on given HGL
B) Resize Basin based on given HGL
C) Resize d/s Pipes and Basin based on HGL and max discharge
D) Resize d/s pipes based on given max discharge

   Basin Name    Type    Max.HGL   Conduit         Depth   Width   Barrels   Max.Flow
                           (m)                     (m)     (m)               (m^3/s)
--------------- ------  --------- --------------- ------- ------- --------- ---------

 ===> Hydraulic model simulation ended normally.
 ===> XP-SWMM Simulation ended normally.
 ===> Your input file was named  : M:\26500\26566_Town_of Picture_Butte_Infrastructure_Assessment\01_Design\
10_By_Discipline\01_Storm\XP-SWMM\26566_Existing Storm Revised_Lethbridge 100 yr 24.DAT
 ===> Your output file was named : M:\26500\26566_Town_of Picture_Butte_Infrastructure_Assessment\01_Design\
10_By_Discipline\01_Storm\XP-SWMM\26566_Existing Storm Revised_Lethbridge 100 yr 24.out
```

Existing 5 Year Model Summary Overall Continuity Results

```
*=====================================================*
| Initial system volume         =         0.0000 Cu M  |
| Total system inflow volume    =     41564.5999 Cu M  |
| Inflow + Initial volume       =     41564.5999 Cu M  |
*=====================================================*
| Total system outflow          =     47673.5786 Cu M  |
| Volume left (Final volume)    =       288.8667 Cu M  |
| Evaporation                   =         0.0000 Cu M  |
| Basin Infiltration            =         0.0000 Cu M  |
| Outflow + Final Volume        =     47962.4453 Cu M  |
*=====================================================*

*================================================*
| Total Model Continuity Error                   |
| Error in Continuity, Percent =       -15.3925 |
| Error in Continuity, m^3     =      -6397.845 |
| + Error means a continuity loss, - a gain      |
*================================================*


#####################################################
# Table E22. Numerical Model judgement section      #
#####################################################

Overall error was (minimum of Table E18 & E21)            -15.3925 percent
Worst nodal error was in node STMHXXX001           with   -17.1117 percent
Of the total inflow this loss was                           2.0344 percent
Your overall continuity error was                          Poor
                                                          Excellent Efficiency
Efficiency of the simulation                               1.26
Most Number of Non Convergences at one Node               69.
Total Number Non Convergences at all Nodes               129.
Total Number of Nodes with Non Convergences               21.


#########################################################
# Table E23. New Basin Design Information               #
#            Maximum Hydraulic Grade Line,              #
#            Out Conduit Sizes and Maximum Flow         #
#########################################################

A) Resize d/s Pipes based on given HGL
B) Resize Basin based on given HGL
C) Resize d/s Pipes and Basin based on HGL and max discharge
D) Resize d/s pipes based on given max discharge

      Basin Name    Type    Max.HGL        Conduit          Depth   Width   Barrels   Max.Flow
                            (m)                              (m)     (m)               (m^3/s)
------------------- ------  --------- -------------------- ------- ------- --------- ---------

===> Hydraulic model simulation ended normally.
===> XP-SWMM Simulation ended normally.
===> Your input file was named  : M:\26500\26566_Town_of Picture_Butte_Infrastructure_Assessment\01_Design\
10_By_Discipline\01_Storm\XP-SWMM\26566_Existing Storm Revised_Lethbridge 5 yr 4 hr.DAT
===> Your output file was named : M:\26500\26566_Town_of Picture_Butte_Infrastructure_Assessment\01_Design\
10_By_Discipline\01_Storm\XP-SWMM\26566_Existing Storm Revised_Lethbridge 5 yr 4 hr.out
```

Proposed 100 Year Model Summary Overall Continuity Results

```
*=====================================================*
| Initial system volume         =         0.0000 Cu M  |
| Total system inflow volume    =    212491.8286 Cu M  |
| Inflow + Initial volume       =    212491.8286 Cu M  |
*=====================================================*
| Total system outflow          =    174800.5924 Cu M  |
| Volume left (Final volume)    =     43634.9202 Cu M  |
| Evaporation                   =         0.0000 Cu M  |
| Basin Infiltration            =         0.0000 Cu M  |
| Outflow + Final Volume        =    218435.5126 Cu M  |
*=====================================================*

*================================================*
| Total Model Continuity Error                   |
| Error in Continuity, Percent =        -2.7971 |
| Error in Continuity, m^3     =      -5943.684 |
| + Error means a continuity loss, - a gain      |
*================================================*


##################################################
# Table E22. Numerical Model judgement section   #
##################################################

Overall error was (minimum of Table E18 & E21)            -2.7971 percent
Worst nodal error was in node STMHXXX001           with   -19.6708 percent
Of the total inflow this loss was                           0.9142 percent
Your overall continuity error was                  Good
                                                  Excellent Efficiency
Efficiency of the simulation                       1.15
Most Number of Non Convergences at one Node      103.
Total Number Non Convergences at all Nodes       223.
Total Number of Nodes with Non Convergences       15.


##########################################################
# Table E23. New Basin Design Information                #
#            Maximum Hydraulic Grade Line,               #
#            Out Conduit Sizes and Maximum Flow          #
##########################################################

A) Resize d/s Pipes based on given HGL
B) Resize Basin based on given HGL
C) Resize d/s Pipes and Basin based on HGL and max discharge
D) Resize d/s pipes based on given max discharge

     Basin Name    Type    Max.HGL        Conduit          Depth   Width   Barrels   Max.Flow
                             (m)                             (m)     (m)               (m^3/s)
-------------------- ------  --------- -------------------- ------- ------- --------- ---------

===> Hydraulic model simulation ended normally.
===> XP-SWMM Simulation ended normally.
===> Your input file was named  : M:\26500\26566_Town_of Picture_Butte_Infrastructure_Assessment\01_Design\
10_By_Discipline\01_Storm\XP-SWMM\26566_Future Storm Revised_v16_Lethbridge 100 yr 24.DAT
===> Your output file was named : M:\26500\26566_Town_of Picture_Butte_Infrastructure_Assessment\01_Design\
10_By_Discipline\01_Storm\XP-SWMM\26566_Future Storm Revised_v16_Lethbridge 100 yr 24.out
```

Proposed 5 Year Model Summary Overall Continuity Results

```
*=====================================================*
| Initial system volume         =         0.0000 Cu M  |
| Total system inflow volume    =     57949.6961 Cu M  |
| Inflow + Initial volume       =     57949.6961 Cu M  |
*=====================================================*
| Total system outflow          =     55362.2077 Cu M  |
| Volume left (Final volume)    =      7414.7229 Cu M  |
| Evaporation                   =         0.0000 Cu M  |
| Basin Infiltration            =         0.0000 Cu M  |
| Outflow + Final Volume        =     62776.9306 Cu M  |
*=====================================================*

*================================================*
| Total Model Continuity Error                   |
| Error in Continuity, Percent =        -8.3300 |
| Error in Continuity, m^3     =      -4827.234 |
| + Error means a continuity loss, - a gain      |
*================================================*


####################################################
# Table E22. Numerical Model judgement section     #
####################################################

Overall error was (minimum of Table E18 & E21)             -8.3300 percent
Worst nodal error was in node STMHXXX027           with    -32.4265 percent
Of the total inflow this loss was                            0.9164 percent
Your overall continuity error was                  Fair
                                                  Excellent Efficiency
Efficiency of the simulation                        1.30
Most Number of Non Convergences at one Node       111.
Total Number Non Convergences at all Nodes        191.
Total Number of Nodes with Non Convergences        16.


#########################################################
# Table E23. New Basin Design Information               #
#            Maximum Hydraulic Grade Line,              #
#            Out Conduit Sizes and Maximum Flow         #
#########################################################

A) Resize d/s Pipes based on given HGL
B) Resize Basin based on given HGL
C) Resize d/s Pipes and Basin based on HGL and max discharge
D) Resize d/s pipes based on given max discharge

      Basin Name    Type    Max.HGL        Conduit          Depth   Width   Barrels   Max.Flow
                              (m)                             (m)     (m)               (m^3/s)
-------------------- ------  --------- -------------------- ------- ------- --------- ---------

===> Hydraulic model simulation ended normally.
===> XP-SWMM Simulation ended normally.
===> Your input file was named  : M:\26500\26566_Town_of Picture_Butte_Infrastructure_Assessment\01_Design\
10_By_Discipline\01_Storm\XP-SWMM\26566_Future Storm Revised_v16_Lethbridge 5 yr 4 hr.DAT
===> Your output file was named : M:\26500\26566_Town_of Picture_Butte_Infrastructure_Assessment\01_Design\
10_By_Discipline\01_Storm\XP-SWMM\26566_Future Storm Revised_v16_Lethbridge 5 yr 4 hr.out
```

Appendix H

XP-SWMM Input and Output Data
(XP-SWMM Model Files Included on a Flash Drive)

PRE-DEVELOPMENT – RUNOFF NODE INPUT

Name	Storm	Subcatchment	Node Name	Rainfall Reference	Routing Method	Infiltration Reference	Time of Concentration (or Parameter 2) min	Area ha	Impervious Percentage %	Slope	Width m
CB3A002W	5yr-4hr	1	CB3A002W	Lethbridge-5yr-4hr	RUNOFF	Lethbridge-GreenAmpt	0.000	4.196	13	0.01	205
CB3A002W	100yr-24hr	1	CB3A002W	Lethbridge-5yr-4hr	RUNOFF	Lethbridge-GreenAmpt	0.000	4.196	13	0.01	205
CBXXX025	5yr-4hr	1	CBXXX025	Lethbridge-5yr-4hr	RUNOFF	Lethbridge-GreenAmpt	0.000	4.026	55	0.01	25
CBXXX025	100yr-24hr	1	CBXXX025	Lethbridge-5yr-4hr	RUNOFF	Lethbridge-GreenAmpt	0.000	4.026	55	0.01	25
CBXXX026	5yr-4hr		CBXXX026	Lethbridge-5yr-4hr	RUNOFF	Lethbridge-GreenAmpt	0.000	0.531	85	0.01	55
CBXXX026	100yr-24hr		CBXXX026	Lethbridge-5yr-4hr	RUNOFF	Lethbridge-GreenAmpt	0.000	0.531	85	0.01	55
CBXXX027	5yr-4hr	1	CBXXX027	Lethbridge-5yr-4hr	RUNOFF	Lethbridge-GreenAmpt	0.000	0.352	55	0.01	10
CBXXX027		2		Lethbridge-5yr-4hr	RUNOFF	Lethbridge-GreenAmpt	0.000	0.394	55	0.01	50
CBXXX027		3		Lethbridge-5yr-4hr	RUNOFF	Lethbridge-GreenAmpt	0.000	0.531	85	0.01	55
CBXXX027	100yr-24hr	1	CBXXX027	Lethbridge-5yr-4hr	RUNOFF	Lethbridge-GreenAmpt	0.000	0.352	55	0.01	10
CBXXX027		2		Lethbridge-5yr-4hr	RUNOFF	Lethbridge-GreenAmpt	0.000	0.394	55	0.01	50
CBXXX027		3		Lethbridge-5yr-4hr	RUNOFF	Lethbridge-GreenAmpt	0.000	0.531	85	0.01	55
CBXXX038	5yr-4hr	1	CBXXX038	Lethbridge-5yr-4hr	RUNOFF	Lethbridge-GreenAmpt	0.000	0.255	55	0.01	25
CBXXX038	100yr-24hr	1	CBXXX038	Lethbridge-5yr-4hr	RUNOFF	Lethbridge-GreenAmpt	0.000	0.255	55	0.01	25
Dummy 1	5yr-4hr		Dummy 1		RUNOFF		0.000	0	0	0	0
Dummy 1	100yr-24hr		Dummy 1		RUNOFF		0.000	0	0	0	0
MHXXX011A	5yr-4hr		MHXXX011A		RUNOFF		0.000	0	0	0	0
MHXXX011A	100yr-24hr		MHXXX011A		RUNOFF		0.000	0	0	0	0
MHXXX012A	5yr-4hr		MHXXX012A		RUNOFF		0.000	0	0	0	0
MHXXX012A	100yr-24hr		MHXXX012A		RUNOFF		0.000	0	0	0	0
Node1109	5yr-4hr		Node1109		RUNOFF		0.000	0	0	0	0
Node1109	100yr-24hr		Node1109		RUNOFF		0.000	0	0	0	0
Node1117	5yr-4hr		Node1117		RUNOFF		0.000	0	0	0	0
Node1117	100yr-24hr		Node1117		RUNOFF		0.000	0	0	0	0
Node1118	5yr-4hr	1	Node1118	Lethbridge-5yr-4hr	RUNOFF	Lethbridge-GreenAmpt	0.000	0.034	55	0.01	24
Node1118		2		Lethbridge-5yr-4hr	RUNOFF	Lethbridge-GreenAmpt	0.000	0.644	55	0.01	80
Node1118	100yr-24hr	1	Node1118	Lethbridge-5yr-4hr	RUNOFF	Lethbridge-GreenAmpt	0.000	0.034	55	0.01	24
Node1118		2		Lethbridge-5yr-4hr	RUNOFF	Lethbridge-GreenAmpt	0.000	0.644	55	0.01	80
Node1120	5yr-4hr		Node1120		RUNOFF		0.000	0	0	0	0
Node1120	100yr-24hr		Node1120		RUNOFF		0.000	0	0	0	0
Node1121	5yr-4hr	1	Node1121	Lethbridge-5yr-4hr	RUNOFF	Lethbridge-GreenAmpt	0.000	1.493	55	0.01	80
Node1121	100yr-24hr	1	Node1121	Lethbridge-5yr-4hr	RUNOFF	Lethbridge-GreenAmpt	0.000	1.493	55	0.01	80
Node1122	5yr-4hr	1	Node1122	Lethbridge-5yr-4hr	RUNOFF	Lethbridge-GreenAmpt	0.000	1.859	55	0.01	105
Node1122	100yr-24hr	1	Node1122	Lethbridge-5yr-4hr	RUNOFF	Lethbridge-GreenAmpt	0.000	1.859	55	0.01	105
Node1123	5yr-4hr	1	Node1123	Lethbridge-5yr-4hr	RUNOFF	Lethbridge-GreenAmpt	0.000	5.437	95	0.01	130
Node1123	100yr-24hr	1	Node1123	Lethbridge-5yr-4hr	RUNOFF	Lethbridge-GreenAmpt	0.000	5.437	95	0.01	130
Node1124	5yr-4hr	1	Node1124	Lethbridge-5yr-4hr	RUNOFF	Lethbridge-GreenAmpt	0.000	11.411	95	0.01	190
Node1124	100yr-24hr	1	Node1124	Lethbridge-5yr-4hr	RUNOFF	Lethbridge-GreenAmpt	0.000	11.411	95	0.01	190
Node1125	5yr-4hr		Node1125		RUNOFF		0.000	0	0	0	0
Node1125	100yr-24hr		Node1125		RUNOFF		0.000	0	0	0	0
Node1126	5yr-4hr		Node1126		RUNOFF		0.000	0	0	0	0
Node1126	100yr-24hr		Node1126		RUNOFF		0.000	0	0	0	0
Node1127	5yr-4hr		Node1127		RUNOFF		0.000	0	0	0	0
Node1127	100yr-24hr		Node1127		RUNOFF		0.000	0	0	0	0
Node1128	5yr-4hr	1	Node1128	Lethbridge-5yr-4hr	RUNOFF	Lethbridge-GreenAmpt	0.000	14.236	38	0.01	180
Node1128	100yr-24hr	1	Node1128	Lethbridge-5yr-4hr	RUNOFF	Lethbridge-GreenAmpt	0.000	14.236	38	0.01	180
Node1129	5yr-4hr		Node1129		RUNOFF		0.000	0	0	0	0
Node1129	100yr-24hr		Node1129		RUNOFF		0.000	0	0	0	0
Node1130	5yr-4hr		Node1130		RUNOFF		0.000	0	0	0	0
Node1130	100yr-24hr		Node1130		RUNOFF		0.000	0	0	0	0
Node213	5yr-4hr		Node213		RUNOFF		0.000	0	0	0	0
Node213	100yr-24hr		Node213		RUNOFF		0.000	0	0	0	0
Node214	5yr-4hr		Node214		RUNOFF		0.000	0	0	0	0
Node214	100yr-24hr		Node214		RUNOFF		0.000	0	0	0	0
Node227	5yr-4hr		Node227		RUNOFF		0.000	0	0	0	0
Node227	100yr-24hr		Node227		RUNOFF		0.000	0	0	0	0
Node228	5yr-4hr		Node228		RUNOFF		0.000	0	0	0	0
Node228	100yr-24hr		Node228		RUNOFF		0.000	0	0	0	0
STMH3A001	5yr-4hr	1	STMH3A001	Lethbridge-5yr-4hr	RUNOFF	Lethbridge-GreenAmpt	0.000	0.516	55	0.01	10
STMH3A001	100yr-24hr	1	STMH3A001	Lethbridge-5yr-4hr	RUNOFF	Lethbridge-GreenAmpt	0.000	0.516	55	0.01	10
STMH3A002	5yr-4hr		STMH3A002		RUNOFF		0.000	0	0	0	0
STMH3A002	100yr-24hr		STMH3A002		RUNOFF		0.000	0	0	0	0
STMH3A003	5yr-4hr		STMH3A003		RUNOFF		0.000	0	0	0	0
STMH3A003	100yr-24hr		STMH3A003		RUNOFF		0.000	0	0	0	0
STMH3N001	5yr-4hr	1	STMH3N001	Lethbridge-5yr-4hr	RUNOFF	Lethbridge-GreenAmpt	0.000	1.781	95	0.01	50
STMH3N001	100yr-24hr	1	STMH3N001	Lethbridge-5yr-4hr	RUNOFF	Lethbridge-GreenAmpt	0.000	1.781	95	0.01	50
STMH4N001	5yr-4hr	1	STMH4N001	Lethbridge-5yr-4hr	RUNOFF	Lethbridge-GreenAmpt	0.000	0.931	55	0.01	96
STMH4N001	100yr-24hr	1	STMH4N001	Lethbridge-5yr-4hr	RUNOFF	Lethbridge-GreenAmpt	0.000	0.931	55	0.01	96
STMH4S001	5yr-4hr		STMH4S001		RUNOFF		0.000	0	0	0	0
STMH4S001	100yr-24hr		STMH4S001		RUNOFF		0.000	0	0	0	0
STMH5S001	5yr-4hr	1	STMH5S001	Lethbridge-5yr-4hr	RUNOFF	Lethbridge-GreenAmpt	0.000	2.758	50	0.01	135
STMH5S001		2		Lethbridge-5yr-4hr	RUNOFF	Lethbridge-GreenAmpt	0.000	8.656	55	0.01	50
STMH5S001	100yr-24hr	1	STMH5S001	Lethbridge-5yr-4hr	RUNOFF	Lethbridge-GreenAmpt	0.000	2.758	50	0.01	135
STMH5S001		2		Lethbridge-5yr-4hr	RUNOFF	Lethbridge-GreenAmpt	0.000	8.656	55	0.01	50
STMH5S002	5yr-4hr	1	STMH5S002	Lethbridge-5yr-4hr	RUNOFF	Lethbridge-GreenAmpt	0.000	2.919	55	0.01	50
STMH5S002	100yr-24hr	1	STMH5S002	Lethbridge-5yr-4hr	RUNOFF	Lethbridge-GreenAmpt	0.000	2.919	55	0.01	50
STMH5S003	5yr-4hr	1	STMH5S003	Lethbridge-5yr-4hr	RUNOFF	Lethbridge-GreenAmpt	0.000	2.928	55	0.01	10
STMH5S003	100yr-24hr	1	STMH5S003	Lethbridge-5yr-4hr	RUNOFF	Lethbridge-GreenAmpt	0.000	2.928	55	0.01	10
STMH6N001	5yr-4hr		STMH6N001		RUNOFF		0.000	0	0	0	0
STMH6N001	100yr-24hr		STMH6N001		RUNOFF		0.000	0	0	0	0
STMH6S001	5yr-4hr	1	STMH6S001	Lethbridge-5yr-4hr	RUNOFF	Lethbridge-GreenAmpt	0.000	0.685	55	0.01	50
STMH6S001		2		Lethbridge-5yr-4hr	RUNOFF	Lethbridge-GreenAmpt	0.000	0.922	55	0.01	50
STMH6S001		3		Lethbridge-5yr-4hr	RUNOFF	Lethbridge-GreenAmpt	0.000	2.73	55	0.01	165
STMH6S001		4		Lethbridge-5yr-4hr	RUNOFF	Lethbridge-GreenAmpt	0.000	0.978	55	0.01	50
STMH6S001	100yr-24hr	1	STMH6S001	Lethbridge-5yr-4hr	RUNOFF	Lethbridge-GreenAmpt	0.000	0.685	55	0.01	50
STMH6S001		2		Lethbridge-5yr-4hr	RUNOFF	Lethbridge-GreenAmpt	0.000	0.922	55	0.01	50
STMH6S001		3		Lethbridge-5yr-4hr	RUNOFF	Lethbridge-GreenAmpt	0.000	2.73	55	0.01	165
STMH6S001		4		Lethbridge-5yr-4hr	RUNOFF	Lethbridge-GreenAmpt	0.000	0.978	55	0.01	50
STMH6S002	5yr-4hr		STMH6S002		RUNOFF		0.000	0	0	0	0
STMH6S002	100yr-24hr		STMH6S002		RUNOFF		0.000	0	0	0	0
STMH6S003	5yr-4hr		STMH6S003		RUNOFF		0.000	0	0	0	0
STMH6S003	100yr-24hr		STMH6S003		RUNOFF		0.000	0	0	0	0
STMH6S004	5yr-4hr	1	STMH6S004	Lethbridge-5yr-4hr	RUNOFF	Lethbridge-GreenAmpt	0.000	1.727	55	0.01	50
STMH6S004		2		Lethbridge-5yr-4hr	RUNOFF	Lethbridge-GreenAmpt	0.000	4.946	55	0.01	50
STMH6S004	100yr-24hr	1	STMH6S004	Lethbridge-5yr-4hr	RUNOFF	Lethbridge-GreenAmpt	0.000	1.727	55	0.01	50
STMH6S004		2		Lethbridge-5yr-4hr	RUNOFF	Lethbridge-GreenAmpt	0.000	4.946	55	0.01	50
STMH7N001	5yr-4hr		STMH7N001		RUNOFF		0.000	0	0	0	0
STMH7N001	100yr-24hr		STMH7N001		RUNOFF		0.000	0	0	0	0
STMH7N001B	5yr-4hr		STMH7N001B		RUNOFF		0.000	0	0	0	0
STMH7N001B	100yr-24hr		STMH7N001B		RUNOFF		0.000	0	0	0	0
STMH7N002	5yr-4hr	1	STMH7N002	Lethbridge-5yr-4hr	RUNOFF	Lethbridge-GreenAmpt	0.000	1.388	55	0.01	55

STMH7N002		2		Lethbridge-5yr-4hr	RUNOFF	Lethbridge-GreenAmpt	0.000	2.77	55	0.01	55
STMH7N002		3		Lethbridge-5yr-4hr	RUNOFF	Lethbridge-GreenAmpt	0.000	1.466	55	0.01	55
STMH7N002	100yr-24hr	1	STMH7N002	Lethbridge-5yr-4hr	RUNOFF	Lethbridge-GreenAmpt	0.000	1.388	55	0.01	55
STMH7N002		2		Lethbridge-5yr-4hr	RUNOFF	Lethbridge-GreenAmpt	0.000	2.77	55	0.01	55
STMH7N002		3		Lethbridge-5yr-4hr	RUNOFF	Lethbridge-GreenAmpt	0.000	1.466	55	0.01	55
STMH7N003	5yr-4hr		STMH7N003		RUNOFF		0.000	0	0	0	0
STMH7N003	100yr-24hr		STMH7N003		RUNOFF		0.000	0	0	0	0
STMH7N004	5yr-4hr	1	STMH7N004	Lethbridge-5yr-4hr	RUNOFF	Lethbridge-GreenAmpt	0.000	0.115	55	0.01	34
STMH7N004		2		Lethbridge-5yr-4hr	RUNOFF	Lethbridge-GreenAmpt	0.000	0.23	55	0.01	55
STMH7N004	100yr-24hr	1	STMH7N004	Lethbridge-5yr-4hr	RUNOFF	Lethbridge-GreenAmpt	0.000	0.115	55	0.01	34
STMH7N004		2		Lethbridge-5yr-4hr	RUNOFF	Lethbridge-GreenAmpt	0.000	0.23	55	0.01	55
STMH7N005	5yr-4hr		STMH7N005		RUNOFF		0.000	0	0	0	0
STMH7N005	100yr-24hr		STMH7N005		RUNOFF		0.000	0	0	0	0
STMH7N006	5yr-4hr	1	STMH7N006	Lethbridge-5yr-4hr	RUNOFF	Lethbridge-GreenAmpt	0.000	0.28	55	0.01	17
STMH7N006		2		Lethbridge-5yr-4hr	RUNOFF	Lethbridge-GreenAmpt	0.000	0.097	55	0.01	31
STMH7N006		3		Lethbridge-5yr-4hr	RUNOFF	Lethbridge-GreenAmpt	0.000	2.799	50	0.01	100
STMH7N006	100yr-24hr	1	STMH7N006	Lethbridge-5yr-4hr	RUNOFF	Lethbridge-GreenAmpt	0.000	0.28	55	0.01	17
STMH7N006		2		Lethbridge-5yr-4hr	RUNOFF	Lethbridge-GreenAmpt	0.000	0.097	55	0.01	31
STMH7N006		3		Lethbridge-5yr-4hr	RUNOFF	Lethbridge-GreenAmpt	0.000	2.799	50	0.01	100
STMH8N001	5yr-4hr		STMH8N001		RUNOFF		0.000	0	0	0	0
STMH8N001	100yr-24hr		STMH8N001		RUNOFF		0.000	0	0	0	0
STMH8N002	5yr-4hr	1	STMH8N002	Lethbridge-5yr-4hr	RUNOFF	Lethbridge-GreenAmpt	0.000	1.199	55	0.01	55
STMH8N002		2		Lethbridge-5yr-4hr	RUNOFF	Lethbridge-GreenAmpt	0.000	0.212	55	0.01	46
STMH8N002	100yr-24hr	1	STMH8N002	Lethbridge-5yr-4hr	RUNOFF	Lethbridge-GreenAmpt	0.000	1.199	55	0.01	55
STMH8N002		2		Lethbridge-5yr-4hr	RUNOFF	Lethbridge-GreenAmpt	0.000	0.212	55	0.01	46
STMH8N003	5yr-4hr		STMH8N003		RUNOFF		0.000	0	0	0	0
STMH8N003	100yr-24hr		STMH8N003		RUNOFF		0.000	0	0	0	0
STMH8N004	5yr-4hr		STMH8N004		RUNOFF		0.000	0	0	0	0
STMH8N004	100yr-24hr		STMH8N004		RUNOFF		0.000	0	0	0	0
STMH9N001	5yr-4hr	1	STMH9N001	Lethbridge-5yr-4hr	RUNOFF	Lethbridge-GreenAmpt	0.000	0.555	0	0.01	55
STMH9N001		2		Lethbridge-5yr-4hr	RUNOFF	Lethbridge-GreenAmpt	0.000	0.572	0	0.01	55
STMH9N001		3		Lethbridge-5yr-4hr	RUNOFF	Lethbridge-GreenAmpt	0.000	0.292	0	0.01	55
STMH9N001	100yr-24hr	1	STMH9N001	Lethbridge-5yr-4hr	RUNOFF	Lethbridge-GreenAmpt	0.000	0.555	0	0.01	55
STMH9N001		2		Lethbridge-5yr-4hr	RUNOFF	Lethbridge-GreenAmpt	0.000	0.572	0	0.01	55
STMH9N001		3		Lethbridge-5yr-4hr	RUNOFF	Lethbridge-GreenAmpt	0.000	0.292	0	0.01	55
STMH9N002	5yr-4hr		STMH9N002		RUNOFF		0.000	0	0	0	0
STMH9N002	100yr-24hr		STMH9N002		RUNOFF		0.000	0	0	0	0
STMHCC001	5yr-4hr	1	STMHCC001	Lethbridge-5yr-4hr	RUNOFF	Lethbridge-GreenAmpt	0.000	1.46	55	0.01	55
STMHCC001	100yr-24hr	1	STMHCC001	Lethbridge-5yr-4hr	RUNOFF	Lethbridge-GreenAmpt	0.000	1.46	55	0.01	55
STMHCC002	5yr-4hr	1	STMHCC002	Lethbridge-5yr-4hr	RUNOFF	Lethbridge-GreenAmpt	0.000	0.33	55	0.01	57
STMHCC002		2		Lethbridge-5yr-4hr	RUNOFF	Lethbridge-GreenAmpt	0.000	0.3	55	0.01	55
STMHCC002	100yr-24hr	1	STMHCC002	Lethbridge-5yr-4hr	RUNOFF	Lethbridge-GreenAmpt	0.000	0.33	55	0.01	57
STMHCC002		2		Lethbridge-5yr-4hr	RUNOFF	Lethbridge-GreenAmpt	0.000	0.3	55	0.01	55
STMHCC003	5yr-4hr	1	STMHCC003	Lethbridge-5yr-4hr	RUNOFF	Lethbridge-GreenAmpt	0.000	0.181	55	0.01	43
STMHCC003		2		Lethbridge-5yr-4hr	RUNOFF	Lethbridge-GreenAmpt	0.000	0.446	55	0.01	55
STMHCC003	100yr-24hr	1	STMHCC003	Lethbridge-5yr-4hr	RUNOFF	Lethbridge-GreenAmpt	0.000	0.181	55	0.01	43
STMHCC003		2		Lethbridge-5yr-4hr	RUNOFF	Lethbridge-GreenAmpt	0.000	0.446	55	0.01	55
STMHCC004	5yr-4hr		STMHCC004		RUNOFF		0.000	0	0	0	0
STMHCC004	100yr-24hr		STMHCC004		RUNOFF		0.000	0	0	0	0
STMHCC005	5yr-4hr	1	STMHCC005	Lethbridge-5yr-4hr	RUNOFF	Lethbridge-GreenAmpt	0.000	1.233	55	0.01	10
STMHCC005	100yr-24hr	1	STMHCC005	Lethbridge-5yr-4hr	RUNOFF	Lethbridge-GreenAmpt	0.000	1.233	55	0.01	10
STMHCC006	5yr-4hr	1	STMHCC006	Lethbridge-5yr-4hr	RUNOFF	Lethbridge-GreenAmpt	0.000	0.781	55	0.01	88
STMHCC006	100yr-24hr	1	STMHCC006	Lethbridge-5yr-4hr	RUNOFF	Lethbridge-GreenAmpt	0.000	0.781	55	0.01	88
STMHCC007	5yr-4hr	1	STMHCC007	Lethbridge-5yr-4hr	RUNOFF	Lethbridge-GreenAmpt	0.000	1.258	13	0.01	36
STMHCC007		2		Lethbridge-5yr-4hr	RUNOFF	Lethbridge-GreenAmpt	0.000	0.244	15	0.01	55
STMHCC007		3		Lethbridge-5yr-4hr	RUNOFF	Lethbridge-GreenAmpt	0.000	0.344	55	0.01	10
STMHCC007		4		Lethbridge-5yr-4hr	RUNOFF	Lethbridge-GreenAmpt	0.000	1.989	13	0.01	100
STMHCC007		5		Lethbridge-5yr-4hr	RUNOFF	Lethbridge-GreenAmpt	0.000	0.314	55	0.01	55
STMHCC007	100yr-24hr	1	STMHCC007	Lethbridge-5yr-4hr	RUNOFF	Lethbridge-GreenAmpt	0.000	1.258	13	0.01	36
STMHCC007		2		Lethbridge-5yr-4hr	RUNOFF	Lethbridge-GreenAmpt	0	0.244	15	0.01	55
STMHCC007		3		Lethbridge-5yr-4hr	RUNOFF	Lethbridge-GreenAmpt	0	0.344	55	0.01	10
STMHCC007		4		Lethbridge-5yr-4hr	RUNOFF	Lethbridge-GreenAmpt	0	1.989	13	0.01	100
STMHCC007		5		Lethbridge-5yr-4hr	RUNOFF	Lethbridge-GreenAmpt	0	0.314	55	0.01	55
STMHCC008	5yr-4hr	1	STMHCC008	Lethbridge-5yr-4hr	RUNOFF	Lethbridge-GreenAmpt	0	0.058	55	0.01	10
STMHCC008		2		Lethbridge-5yr-4hr	RUNOFF	Lethbridge-GreenAmpt	0	0.058	55	0.01	10
STMHCC008		3		Lethbridge-5yr-4hr	RUNOFF	Lethbridge-GreenAmpt	0	1.187	55	0.01	50
STMHCC008		4		Lethbridge-5yr-4hr	RUNOFF	Lethbridge-GreenAmpt	0	0.863	55	0.01	93
STMHCC008	100yr-24hr	1	STMHCC008	Lethbridge-5yr-4hr	RUNOFF	Lethbridge-GreenAmpt	0	0.058	55	0.01	10
STMHCC008		2		Lethbridge-5yr-4hr	RUNOFF	Lethbridge-GreenAmpt	0	0.058	55	0.01	10
STMHCC008		3		Lethbridge-5yr-4hr	RUNOFF	Lethbridge-GreenAmpt	0	1.187	55	0.01	50
STMHCC008		4		Lethbridge-5yr-4hr	RUNOFF	Lethbridge-GreenAmpt	0	0.863	55	0.01	93
STMHCC009	5yr-4hr	1	STMHCC009	Lethbridge-5yr-4hr	RUNOFF	Lethbridge-GreenAmpt	0	2.858	55	0.01	100
STMHCC009	100yr-24hr	1	STMHCC009	Lethbridge-5yr-4hr	RUNOFF	Lethbridge-GreenAmpt	0	2.858	55	0.01	100
STMHCC009	5yr-4hr	1	STMHCC009	Lethbridge-5yr-4hr	RUNOFF	Lethbridge-GreenAmpt	0	2.858	55	0.01	100
STMHCC009	100yr-24hr	1	STMHCC009	Lethbridge-5yr-4hr	RUNOFF	Lethbridge-GreenAmpt	0	2.858	55	0.01	100
STMHCC010	5yr-4hr	1	STMHCC010	Lethbridge-5yr-4hr	RUNOFF	Lethbridge-GreenAmpt	0	1.17	85	0.01	108
STMHCC010		2		Lethbridge-5yr-4hr	RUNOFF	Lethbridge-GreenAmpt	0	0.337	55	0.01	55
STMHCC010	100yr-24hr	1	STMHCC010	Lethbridge-5yr-4hr	RUNOFF	Lethbridge-GreenAmpt	0	1.17	85	0.01	108
STMHCC010		2		Lethbridge-5yr-4hr	RUNOFF	Lethbridge-GreenAmpt	0	0.337	55	0.01	55
STMHCC011	5yr-4hr	1	STMHCC011	Lethbridge-5yr-4hr	RUNOFF	Lethbridge-GreenAmpt	0	0.596	55	0.01	55
STMHCC011		2		Lethbridge-5yr-4hr	RUNOFF	Lethbridge-GreenAmpt	0	1.226	55	0.01	55
STMHCC011		3		Lethbridge-5yr-4hr	RUNOFF	Lethbridge-GreenAmpt	0	0.882	55	0.01	94
STMHCC011	100yr-24hr	1	STMHCC011	Lethbridge-5yr-4hr	RUNOFF	Lethbridge-GreenAmpt	0	0.596	55	0.01	55
STMHCC011		2		Lethbridge-5yr-4hr	RUNOFF	Lethbridge-GreenAmpt	0	1.226	55	0.01	55
STMHCC011		3		Lethbridge-5yr-4hr	RUNOFF	Lethbridge-GreenAmpt	0	0.882	55	0.01	94
STMHGB001	5yr-4hr		STMHGB001		RUNOFF		0	0	0	0	0
STMHGB001	100yr-24hr		STMHGB001		RUNOFF		0	0	0	0	0
STMHGB002	5yr-4hr		STMHGB002		RUNOFF		0	0	0	0	0
STMHGB002	100yr-24hr		STMHGB002		RUNOFF		0	0	0	0	0
STMHGB003	5yr-4hr	1	STMHGB003	Lethbridge-5yr-4hr	RUNOFF	Lethbridge-GreenAmpt	0	0.742	0	0.01	10
STMHGB003		2		Lethbridge-5yr-4hr	RUNOFF	Lethbridge-GreenAmpt	0	0.49	0	0.01	55
STMHGB003		3		Lethbridge-5yr-4hr	RUNOFF	Lethbridge-GreenAmpt	0	0.089	0	0.01	10
STMHGB003	100yr-24hr	1	STMHGB003	Lethbridge-5yr-4hr	RUNOFF	Lethbridge-GreenAmpt	0	0.742	0	0.01	10
STMHGB003		2		Lethbridge-5yr-4hr	RUNOFF	Lethbridge-GreenAmpt	0	0.49	0	0.01	55
STMHGB003		3		Lethbridge-5yr-4hr	RUNOFF	Lethbridge-GreenAmpt	0	0.089	0	0.01	10
STMHHW001	5yr-4hr		STMHHW001		RUNOFF		0	0	0	0	0
STMHHW001	100yr-24hr		STMHHW001		RUNOFF		0	0	0	0	0
STMHHW002	5yr-4hr	1	STMHHW002	Lethbridge-5yr-4hr	RUNOFF	Lethbridge-GreenAmpt	0	1.458	55	0.01	10
STMHHW002		2		Lethbridge-5yr-4hr	RUNOFF	Lethbridge-GreenAmpt	0	0.601	55	0.01	55
STMHHW002		3		Lethbridge-5yr-4hr	RUNOFF	Lethbridge-GreenAmpt	0	0.992	55	0.01	55
STMHHW002	100yr-24hr	1	STMHHW002	Lethbridge-5yr-4hr	RUNOFF	Lethbridge-GreenAmpt	0	1.458	55	0.01	10
STMHHW002		2		Lethbridge-5yr-4hr	RUNOFF	Lethbridge-GreenAmpt	0	0.601	55	0.01	55
STMHHW002		3		Lethbridge-5yr-4hr	RUNOFF	Lethbridge-GreenAmpt	0	0.992	55	0.01	55
STMHHW003	5yr-4hr		STMHHW003		RUNOFF		0	0	0	0	0
STMHHW003	100yr-24hr		STMHHW003		RUNOFF		0	0	0	0	0
STMHHW004	5yr-4hr	1	STMHHW004	Lethbridge-5yr-4hr	RUNOFF	Lethbridge-GreenAmpt	0	0.664	55	0.01	55
STMHHW004		2		Lethbridge-5yr-4hr	RUNOFF	Lethbridge-GreenAmpt	0	0.666	55	0.01	55

STMHHW004		3		Lethbridge-5yr-4hr	RUNOFF	Lethbridge-GreenAmpt	0	1.722	55	0.01	10
STMHHW004	100yr-24hr	1	STMHHW004	Lethbridge-5yr-4hr	RUNOFF	Lethbridge-GreenAmpt	0	0.664	55	0.01	55
STMHHW004		2		Lethbridge-5yr-4hr	RUNOFF	Lethbridge-GreenAmpt	0	0.666	55	0.01	55
STMHHW004		3		Lethbridge-5yr-4hr	RUNOFF	Lethbridge-GreenAmpt	0	1.722	55	0.01	10
STMHHW005	5yr-4hr	1	STMHHW005	Lethbridge-5yr-4hr	RUNOFF	Lethbridge-GreenAmpt	0	0.248	55	0.01	10
STMHHW005		2		Lethbridge-5yr-4hr	RUNOFF	Lethbridge-GreenAmpt	0	0.425	55	0.01	21
STMHHW005		3		Lethbridge-5yr-4hr	RUNOFF	Lethbridge-GreenAmpt	0	1.119	85	0.01	55
STMHHW005	100yr-24hr	1	STMHHW005	Lethbridge-5yr-4hr	RUNOFF	Lethbridge-GreenAmpt	0	0.248	55	0.01	10
STMHHW005		2		Lethbridge-5yr-4hr	RUNOFF	Lethbridge-GreenAmpt	0	0.425	55	0.01	21
STMHHW005		3		Lethbridge-5yr-4hr	RUNOFF	Lethbridge-GreenAmpt	0	1.119	85	0.01	55
STMHHW006	5yr-4hr	1	STMHHW006	Lethbridge-5yr-4hr	RUNOFF	Lethbridge-GreenAmpt	0	0.47	85	0.01	50
STMHHW006		2		Lethbridge-5yr-4hr	RUNOFF	Lethbridge-GreenAmpt	0	0.128	55	0.01	55
STMHHW006	100yr-24hr	1	STMHHW006	Lethbridge-5yr-4hr	RUNOFF	Lethbridge-GreenAmpt	0	0.47	85	0.01	50
STMHHW006		2		Lethbridge-5yr-4hr	RUNOFF	Lethbridge-GreenAmpt	0	0.128	55	0.01	55
STMHHW007	5yr-4hr	1	STMHHW007	Lethbridge-5yr-4hr	RUNOFF	Lethbridge-GreenAmpt	0	0.701	85	0.01	50
STMHHW007	100yr-24hr	1	STMHHW007	Lethbridge-5yr-4hr	RUNOFF	Lethbridge-GreenAmpt	0	0.701	85	0.01	50
STMHHW008	5yr-4hr	1	STMHHW008	Lethbridge-5yr-4hr	RUNOFF	Lethbridge-GreenAmpt	0	0.626	85	0.01	50
STMHHW008		2		Lethbridge-5yr-4hr	RUNOFF	Lethbridge-GreenAmpt	0	1.117	55	0.01	10
STMHHW008	100yr-24hr	1	STMHHW008	Lethbridge-5yr-4hr	RUNOFF	Lethbridge-GreenAmpt	0	0.626	85	0.01	50
STMHHW008		2		Lethbridge-5yr-4hr	RUNOFF	Lethbridge-GreenAmpt	0	1.117	55	0.01	10
STMHHW009	5yr-4hr		STMHHW009		RUNOFF		0	0	0	0	0
STMHHW009	100yr-24hr		STMHHW009		RUNOFF		0	0	0	0	0
STMHHW010	5yr-4hr	1	STMHHW010	Lethbridge-5yr-4hr	RUNOFF	Lethbridge-GreenAmpt	0	1.015	85	0.01	50
STMHHW010	100yr-24hr	1	STMHHW010	Lethbridge-5yr-4hr	RUNOFF	Lethbridge-GreenAmpt	0	1.015	85	0.01	50
STMHJM001	5yr-4hr	1	STMHJM001	Lethbridge-5yr-4hr	RUNOFF	Lethbridge-GreenAmpt	0	0.744	85	0.01	50
STMHJM001		2		Lethbridge-5yr-4hr	RUNOFF	Lethbridge-GreenAmpt	0	2.722	95	0.01	50
STMHJM001	100yr-24hr	1	STMHJM001	Lethbridge-5yr-4hr	RUNOFF	Lethbridge-GreenAmpt	0	0.744	85	0.01	50
STMHJM001		2		Lethbridge-5yr-4hr	RUNOFF	Lethbridge-GreenAmpt	0	2.722	95	0.01	50
STMHMC001	5yr-4hr	1	STMHMC001	Lethbridge-5yr-4hr	RUNOFF	Lethbridge-GreenAmpt	0	0.609	55	0.01	50
STMHMC001	100yr-24hr	1	STMHMC001	Lethbridge-5yr-4hr	RUNOFF	Lethbridge-GreenAmpt	0	0.609	55	0.01	50
STMHMC002	5yr-4hr	1	STMHMC002	Lethbridge-5yr-4hr	RUNOFF	Lethbridge-GreenAmpt	0	0.894	55	0.01	50
STMHMC002		2		Lethbridge-5yr-4hr	RUNOFF	Lethbridge-GreenAmpt	0	0.586	55	0.01	50
STMHMC002	100yr-24hr	1	STMHMC002	Lethbridge-5yr-4hr	RUNOFF	Lethbridge-GreenAmpt	0	0.894	55	0.01	50
STMHMC002		2		Lethbridge-5yr-4hr	RUNOFF	Lethbridge-GreenAmpt	0	0.586	55	0.01	50
STMHMC003	5yr-4hr		STMHMC003		RUNOFF		0	0	0	0	0
STMHMC003	100yr-24hr		STMHMC003		RUNOFF		0	0	0	0	0
STMHNA001	5yr-4hr	1	STMHNA001	Lethbridge-5yr-4hr	RUNOFF	Lethbridge-GreenAmpt	0	2.335	80	0.01	60
STMHNA001	100yr-24hr	1	STMHNA001	Lethbridge-5yr-4hr	RUNOFF	Lethbridge-GreenAmpt	0	2.335	80	0.01	60
STMHNA002	5yr-4hr	1	STMHNA002	Lethbridge-5yr-4hr	RUNOFF	Lethbridge-GreenAmpt	0	0.167	55	0.01	55
STMHNA002	100yr-24hr	1	STMHNA002	Lethbridge-5yr-4hr	RUNOFF	Lethbridge-GreenAmpt	0	0.167	55	0.01	55
STMHNA003	5yr-4hr	1	STMHNA003	Lethbridge-5yr-4hr	RUNOFF	Lethbridge-GreenAmpt	0	0.766	55	0.01	88
STMHNA003		2		Lethbridge-5yr-4hr	RUNOFF	Lethbridge-GreenAmpt	0	0.614	55	0.01	78
STMHNA003	100yr-24hr	1	STMHNA003	Lethbridge-5yr-4hr	RUNOFF	Lethbridge-GreenAmpt	0	0.766	55	0.01	88
STMHNA003		2		Lethbridge-5yr-4hr	RUNOFF	Lethbridge-GreenAmpt	0	0.614	55	0.01	78
STMHNA004	5yr-4hr	1	STMHNA004	Lethbridge-5yr-4hr	RUNOFF	Lethbridge-GreenAmpt	0	0.356	55	0.01	60
STMHNA004		2		Lethbridge-5yr-4hr	RUNOFF	Lethbridge-GreenAmpt	0	0.595	55	0.01	55
STMHNA004	100yr-24hr	1	STMHNA004	Lethbridge-5yr-4hr	RUNOFF	Lethbridge-GreenAmpt	0	0.356	55	0.01	60
STMHNA004		2		Lethbridge-5yr-4hr	RUNOFF	Lethbridge-GreenAmpt	0	0.595	55	0.01	55
STMHNA005	5yr-4hr	1	STMHNA005	Lethbridge-5yr-4hr	RUNOFF	Lethbridge-GreenAmpt	0	1.332	55	0.01	80
STMHNA005		2		Lethbridge-5yr-4hr	RUNOFF	Lethbridge-GreenAmpt	0	0.584	60	0.01	76
STMHNA005	100yr-24hr	1	STMHNA005	Lethbridge-5yr-4hr	RUNOFF	Lethbridge-GreenAmpt	0	1.332	55	0.01	80
STMHNA005		2		Lethbridge-5yr-4hr	RUNOFF	Lethbridge-GreenAmpt	0	0.584	60	0.01	76
STMHNS001	5yr-4hr		STMHNS001		RUNOFF		0	0	0	0	0
STMHNS001	100yr-24hr		STMHNS001		RUNOFF		0	0	0	0	0
STMHPR001	5yr-4hr	1	STMHPR001	Lethbridge-5yr-4hr	RUNOFF	Lethbridge-GreenAmpt	0	0.602	55	0.01	25
STMHPR001		2		Lethbridge-5yr-4hr	RUNOFF	Lethbridge-GreenAmpt	0	0.743	55	0.01	55
STMHPR001	100yr-24hr	1	STMHPR001	Lethbridge-5yr-4hr	RUNOFF	Lethbridge-GreenAmpt	0	0.602	55	0.01	25
STMHPR001		2		Lethbridge-5yr-4hr	RUNOFF	Lethbridge-GreenAmpt	0	0.743	55	0.01	55
STMHRG001	5yr-4hr		STMHRG001		RUNOFF		0	0	0	0	0
STMHRG001	100yr-24hr		STMHRG001		RUNOFF		0	0	0	0	0
STMHRG002	5yr-4hr		STMHRG002		RUNOFF		0	0	0	0	0
STMHRG002	100yr-24hr		STMHRG002		RUNOFF		0	0	0	0	0
STMHRW001	5yr-4hr	1	STMHRW001	Lethbridge-5yr-4hr	RUNOFF	Lethbridge-GreenAmpt	0	1.107	55	0.01	55
STMHRW001		2		Lethbridge-5yr-4hr	RUNOFF	Lethbridge-GreenAmpt	0	0.704	55	0.01	55
STMHRW001	100yr-24hr	1	STMHRW001	Lethbridge-5yr-4hr	RUNOFF	Lethbridge-GreenAmpt	0	1.107	55	0.01	55
STMHRW001		2		Lethbridge-5yr-4hr	RUNOFF	Lethbridge-GreenAmpt	0	0.704	55	0.01	55
STMHXXX001	5yr-4hr		STMHXXX001		RUNOFF		0	0	0	0	0
STMHXXX001	100yr-24hr		STMHXXX001		RUNOFF		0	0	0	0	0
STMHXXX002	5yr-4hr		STMHXXX002		RUNOFF		0	0	0	0	0
STMHXXX002	100yr-24hr		STMHXXX002		RUNOFF		0	0	0	0	0
STMHXXX003	5yr-4hr	1	STMHXXX003	Lethbridge-5yr-4hr	RUNOFF	Lethbridge-GreenAmpt	0	0.518	55	0.01	72
STMHXXX003	100yr-24hr	1	STMHXXX003	Lethbridge-5yr-4hr	RUNOFF	Lethbridge-GreenAmpt	0	0.518	55	0.01	72
STMHXXX004	5yr-4hr		STMHXXX004		RUNOFF		0	0	0	0	0
STMHXXX004	100yr-24hr		STMHXXX004		RUNOFF		0	0	0	0	0
STMHXXX005	5yr-4hr		STMHXXX005		RUNOFF		0	0	0	0	0
STMHXXX005	100yr-24hr		STMHXXX005		RUNOFF		0	0	0	0	0
STMHXXX006	5yr-4hr		STMHXXX006		RUNOFF		0	0	0	0	0
STMHXXX006	100yr-24hr		STMHXXX006		RUNOFF		0	0	0	0	0
STMHXXX007	5yr-4hr		STMHXXX007		RUNOFF		0	0	0	0	0
STMHXXX007	100yr-24hr		STMHXXX007		RUNOFF		0	0	0	0	0
STMHXXX008	5yr-4hr		STMHXXX008		RUNOFF		0	0	0	0	0
STMHXXX008	100yr-24hr		STMHXXX008		RUNOFF		0	0	0	0	0
STMHXXX009	5yr-4hr		STMHXXX009		RUNOFF		0	0	0	0	0
STMHXXX009	100yr-24hr		STMHXXX009		RUNOFF		0	0	0	0	0
STMHXXX010	5yr-4hr		STMHXXX010		RUNOFF		0	0	0	0	0
STMHXXX010	100yr-24hr		STMHXXX010		RUNOFF		0	0	0	0	0
STMHXXX011	5yr-4hr	1	STMHXXX011	Lethbridge-5yr-4hr	RUNOFF	Lethbridge-GreenAmpt	0	2.02	7	0.01	20
STMHXXX011		2		Lethbridge-5yr-4hr	RUNOFF	Lethbridge-GreenAmpt	0	0.73	55	0.01	10
STMHXXX011	100yr-24hr	1	STMHXXX011	Lethbridge-5yr-4hr	RUNOFF	Lethbridge-GreenAmpt	0	2.02	7	0.01	20
STMHXXX011		2		Lethbridge-5yr-4hr	RUNOFF	Lethbridge-GreenAmpt	0	0.73	55	0.01	10
STMHXXX012	5yr-4hr		STMHXXX012		RUNOFF		0	0	0	0	0
STMHXXX012	100yr-24hr		STMHXXX012		RUNOFF		0	0	0	0	0
STMHXXX013	5yr-4hr	1	STMHXXX013	Lethbridge-5yr-4hr	RUNOFF	Lethbridge-GreenAmpt	0	4.014	55	0.01	10
STMHXXX013		2		Lethbridge-5yr-4hr	RUNOFF	Lethbridge-GreenAmpt	0	5.272	7	0.01	75
STMHXXX013	100yr-24hr	1	STMHXXX013	Lethbridge-5yr-4hr	RUNOFF	Lethbridge-GreenAmpt	0	4.014	55	0.01	10
STMHXXX013		2		Lethbridge-5yr-4hr	RUNOFF	Lethbridge-GreenAmpt	0	5.272	7	0.01	75
STMHXXX014	5yr-4hr	1	STMHXXX014	Lethbridge-5yr-4hr	RUNOFF	Lethbridge-GreenAmpt	0	2.987	55	0.01	50
STMHXXX014	100yr-24hr	1	STMHXXX014	Lethbridge-5yr-4hr	RUNOFF	Lethbridge-GreenAmpt	0	2.987	55	0.01	50
STMHXXX016	5yr-4hr		STMHXXX016		RUNOFF		0	0	0	0	0
STMHXXX016	100yr-24hr		STMHXXX016		RUNOFF		0	0	0	0	0
STMHXXX025	5yr-4hr		STMHXXX025		RUNOFF		0	0	0	0	0
STMHXXX025	100yr-24hr		STMHXXX025		RUNOFF		0	0	0	0	0
STMHXXX026	5yr-4hr		STMHXXX026		RUNOFF		0	0	0	0	0
STMHXXX026	100yr-24hr		STMHXXX026		RUNOFF		0	0	0	0	0
STMHXXX027	5yr-4hr	1	STMHXXX027	Lethbridge-5yr-4hr	RUNOFF	Lethbridge-GreenAmpt	0	0.578	55	0.01	55

STMHXXX027	100yr-24hr	1	STMHXXX027	Lethbridge-5yr-4hr	RUNOFF	Lethbridge-GreenAmpt	0	0.578	55	0.01	55
STMHXXX028	5yr-4hr	1	STMHXXX028	Lethbridge-5yr-4hr	RUNOFF	Lethbridge-GreenAmpt	0	0.144	55	0.01	25
STMHXXX028	100yr-24hr	1	STMHXXX028	Lethbridge-5yr-4hr	RUNOFF	Lethbridge-GreenAmpt	0	0.144	55	0.01	25
STMHXXX035	5yr-4hr	1	STMHXXX035	Lethbridge-5yr-4hr	RUNOFF	Lethbridge-GreenAmpt	0	4.006	50	0.01	135
STMHXXX035	100yr-24hr	1	STMHXXX035	Lethbridge-5yr-4hr	RUNOFF	Lethbridge-GreenAmpt	0	4.006	50	0.01	135
STMHXXX037	5yr-4hr		STMHXXX037		RUNOFF		0	0	0	0	0
STMHXXX037	100yr-24hr		STMHXXX037		RUNOFF		0	0	0	0	0

PRE-DEVELOPMENT – HYDRAULIC NODE INPUT

Name	Storm	Approach Depth Reference	Inlet Capacity Rating Curve Reference	Inlet Capacity Type	Ponding Type	Ground Elevation (Spill Crest) m	Invert Elevation m	Maximum Crown Elevation m	Measure Depth From:	Storage Node Data Flag	Storage Method	Constant Area Storage m^2	Inlet Capacity Flag
CB3A002W	5yr-4hr			Maximum Capacity	Allowed	898.988	897.008	898.988	Node Invert	0	Constant	0	0
CB3A002W	100yr-24hr			Maximum Capacity	Allowed	898.988	897.008	898.988	Node Invert	0	Constant	0	0
CBXXX025	5yr-4hr			Maximum Capacity	Allowed	899.679	899.184	899.679	Node Invert	0	Constant	0	0
CBXXX025	100yr-24hr			Maximum Capacity	Allowed	899.679	899.184	899.679	Node Invert	0	Constant	0	0
CBXXX026	5yr-4hr			Maximum Capacity	Allowed	904.203	902.815	904.203	Node Invert	0	Constant	0	0
CBXXX026	100yr-24hr			Maximum Capacity	Allowed	904.203	902.815	904.203	Node Invert	0	Constant	0	0
CBXXX027	5yr-4hr			Maximum Capacity	Allowed	904.661	902.782	904.661	Node Invert	0	Constant	0	0
CBXXX027	100yr-24hr			Maximum Capacity	Allowed	904.661	902.782	904.661	Node Invert	0	Constant	0	0
CBXXX038	5yr-4hr			Maximum Capacity	Allowed	905.576	904.961	905.576	Node Invert	0	Constant	0	0
CBXXX038	100yr-24hr			Maximum Capacity	Allowed	905.576	904.961	905.576	Node Invert	0	Constant	0	0
Dummy 1	5yr-4hr			Maximum Capacity	Allowed	900	899.184	900	Node Invert	0	Constant	0	0
Dummy 1	100yr-24hr			Maximum Capacity	Allowed	900	899.184	900	Node Invert	0	Constant	0	0
MHXXX011A	5yr-4hr			Maximum Capacity	None	902	898.072	898.972	Node Invert	0	Constant	0	0
MHXXX011A	100yr-24hr			Maximum Capacity	None	902	898.072	898.972	Node Invert	0	Constant	0	0
MHXXX012A	5yr-4hr			Maximum Capacity	Allowed	902.665	894.949	902.665	Node Invert	0	Constant	0	0
MHXXX012A	100yr-24hr			Maximum Capacity	Allowed	902.665	894.949	902.665	Node Invert	0	Constant	0	0
Node1109	5yr-4hr			Maximum Capacity	Allowed	902.5	899	902.5	Node Invert	0	Constant	0	0
Node1109	100yr-24hr			Maximum Capacity	Allowed	902.5	899	902.5	Node Invert	0	Constant	0	0
Node1117	5yr-4hr			Maximum Capacity	Allowed	898	891.44	898	Node Invert	0	Constant	0	0
Node1117	100yr-24hr			Maximum Capacity	Allowed	898	891.44	898	Node Invert	0	Constant	0	0
Node1118	5yr-4hr			Maximum Capacity	Allowed	904.1	902.269	904.1	Node Invert	0	Constant	0	0
Node1118	100yr-24hr			Maximum Capacity	Allowed	904.1	902.269	904.1	Node Invert	0	Constant	0	0
Node1120	5yr-4hr			Maximum Capacity	None	904.79	903.6	903.9	Node Invert	0	Constant	0	0
Node1120	100yr-24hr			Maximum Capacity	None	904.79	903.6	903.9	Node Invert	0	Constant	0	0
Node1121	5yr-4hr			Maximum Capacity	None	899.28	898.28	899.28	Node Invert	0	Constant	0	0
Node1121	100yr-24hr			Maximum Capacity	None	899.28	898.28	899.28	Node Invert	0	Constant	0	0
Node1122	5yr-4hr			Maximum Capacity	None	900.16	898.364	899.364	Node Invert	0	Constant	0	0
Node1122	100yr-24hr			Maximum Capacity	None	900.16	898.364	899.364	Node Invert	0	Constant	0	0
Node1123	5yr-4hr			Maximum Capacity	None	900.079	899.079	900.079	Node Invert	0	Constant	0	0
Node1123	100yr-24hr			Maximum Capacity	None	900.079	899.079	900.079	Node Invert	0	Constant	0	0
Node1124	5yr-4hr			Maximum Capacity	None	900.16	899.16	900.16	Node Invert	0	Constant	0	0
Node1124	100yr-24hr			Maximum Capacity	None	900.16	899.16	900.16	Node Invert	0	Constant	0	0
Node1125	5yr-4hr			Maximum Capacity	None	900.449	899.449	900.449	Node Invert	0	Constant	0	0
Node1125	100yr-24hr			Maximum Capacity	None	900.449	899.449	900.449	Node Invert	0	Constant	0	0
Node1126	5yr-4hr			Maximum Capacity	None	900.559	899.559	900.559	Node Invert	0	Constant	0	0
Node1126	100yr-24hr			Maximum Capacity	None	900.559	899.559	900.559	Node Invert	0	Constant	0	0
Node1127	5yr-4hr			Maximum Capacity	None	900.925	899.925	900.925	Node Invert	0	Constant	0	0
Node1127	100yr-24hr			Maximum Capacity	None	900.925	899.925	900.925	Node Invert	0	Constant	0	0
Node1128	5yr-4hr			Maximum Capacity	None	901.008	900.008	901.008	Node Invert	0	Constant	0	0
Node1128	100yr-24hr			Maximum Capacity	None	901.008	900.008	901.008	Node Invert	0	Constant	0	0
Node1129	5yr-4hr			Maximum Capacity	None	900.82	899.82	900.82	Node Invert	0	Constant	0	0
Node1129	100yr-24hr			Maximum Capacity	None	900.82	899.82	900.82	Node Invert	0	Constant	0	0
Node1130	5yr-4hr			Maximum Capacity	None	900.389	899.889	900.389	Node Invert	0	Constant	0	0
Node1130	100yr-24hr			Maximum Capacity	None	900.389	899.889	900.389	Node Invert	0	Constant	0	0
Node213	5yr-4hr			Maximum Capacity	None	895.231	894.631	895.231	Node Invert	0	Constant	0	0
Node213	100yr-24hr			Maximum Capacity	None	895.231	894.631	895.231	Node Invert	0	Constant	0	0
Node214	5yr-4hr			Maximum Capacity	None	904.892	904.292	904.892	Node Invert	0	Constant	0	0
Node214	100yr-24hr			Maximum Capacity	None	904.892	904.292	904.892	Node Invert	0	Constant	0	0
Node227	5yr-4hr			Maximum Capacity	None	907	904.787	905.087	Node Invert	0	Constant	0	0
Node227	100yr-24hr			Maximum Capacity	None	907	904.787	905.087	Node Invert	0	Constant	0	0
Node228	5yr-4hr			Maximum Capacity	None	904	902.074	902.524	Node Invert	0	Constant	0	0
Node228	100yr-24hr			Maximum Capacity	None	904	902.074	902.524	Node Invert	0	Constant	0	0
STMH3A001	5yr-4hr			Maximum Capacity	Allowed	897.821	894.631	897.821	Node Invert	0	Constant	0	0
STMH3A001	100yr-24hr			Maximum Capacity	Allowed	897.821	894.631	897.821	Node Invert	0	Constant	0	0
STMH3A002	5yr-4hr			Maximum Capacity	Allowed	900.189	896.859	900.189	Node Invert	0	Constant	0	0
STMH3A002	100yr-24hr			Maximum Capacity	Allowed	900.189	896.859	900.189	Node Invert	0	Constant	0	0
STMH3A003	5yr-4hr			Maximum Capacity	Allowed	900.03	897.553	900.03	Node Invert	0	Constant	0	0
STMH3A003	100yr-24hr			Maximum Capacity	Allowed	900.03	897.553	900.03	Node Invert	0	Constant	0	0
STMH3N001	5yr-4hr			Maximum Capacity	Allowed	907.299	905.749	907.299	Node Invert	0	Constant	0	0
STMH3N001	100yr-24hr			Maximum Capacity	Allowed	907.299	905.749	907.299	Node Invert	0	Constant	0	0
STMH4N001	5yr-4hr			Maximum Capacity	Allowed	906.025	904.63	906.025	Node Invert	0	Constant	0	0
STMH4N001	100yr-24hr			Maximum Capacity	Allowed	906.025	904.63	906.025	Node Invert	0	Constant	0	0
STMH4S001	5yr-4hr			Maximum Capacity	Allowed	904.803	903.373	904.803	Node Invert	0	Constant	0	0
STMH4S001	100yr-24hr			Maximum Capacity	Allowed	904.803	903.373	904.803	Node Invert	0	Constant	0	0
STMH5S001	5yr-4hr			Maximum Capacity	Allowed	901.846	900.576	901.846	Node Invert	0	Constant	0	0
STMH5S001	100yr-24hr			Maximum Capacity	Allowed	901.846	900.576	901.846	Node Invert	0	Constant	0	0
STMH5S002	5yr-4hr			Maximum Capacity	Allowed	901.723	900.338	901.723	Node Invert	0	Constant	0	0
STMH5S002	100yr-24hr			Maximum Capacity	Allowed	901.723	900.338	901.723	Node Invert	0	Constant	0	0
STMH5S003	5yr-4hr			Maximum Capacity	Allowed	902.123	899.878	902.123	Node Invert	0	Constant	0	0
STMH5S003	100yr-24hr			Maximum Capacity	Allowed	902.123	899.878	902.123	Node Invert	0	Constant	0	0
STMH6N001	5yr-4hr			Maximum Capacity	Allowed	903.938	901.74	903.938	Node Invert	0	Constant	0	0
STMH6N001	100yr-24hr			Maximum Capacity	Allowed	903.938	901.74	903.938	Node Invert	0	Constant	0	0
STMH6S001	5yr-4hr			Maximum Capacity	Allowed	902.58	900.12	902.58	Node Invert	0	Constant	0	0
STMH6S001	100yr-24hr			Maximum Capacity	Allowed	902.58	900.12	902.58	Node Invert	0	Constant	0	0
STMH6S002	5yr-4hr			Maximum Capacity	Allowed	902.855	899.985	902.855	Node Invert	0	Constant	0	0
STMH6S002	100yr-24hr			Maximum Capacity	Allowed	902.855	899.985	902.855	Node Invert	0	Constant	0	0
STMH6S003	5yr-4hr			Maximum Capacity	Allowed	903.232	899.857	903.232	Node Invert	0	Constant	0	0
STMH6S003	100yr-24hr			Maximum Capacity	Allowed	903.232	899.857	903.232	Node Invert	0	Constant	0	0
STMH6S004	5yr-4hr			Maximum Capacity	Allowed	902.956	901.186	902.956	Node Invert	0	Constant	0	0
STMH6S004	100yr-24hr			Maximum Capacity	Allowed	902.956	901.186	902.956	Node Invert	0	Constant	0	0
STMH7N001	5yr-4hr			Maximum Capacity	Allowed	904.769	902.73	904.769	Node Invert	0	Constant	0	0
STMH7N001	100yr-24hr			Maximum Capacity	Allowed	904.769	902.73	904.769	Node Invert	0	Constant	0	0
STMH7N001B	5yr-4hr			Maximum Capacity	None	904.7	902.637	903.312	Node Invert	0	Constant	0	0
STMH7N001B	100yr-24hr			Maximum Capacity	None	904.7	902.637	903.312	Node Invert	0	Constant	0	0
STMH7N002	5yr-4hr			Maximum Capacity	Allowed	904.606	903.761	904.606	Node Invert	0	Constant	0	0
STMH7N002	100yr-24hr			Maximum Capacity	Allowed	904.606	903.761	904.606	Node Invert	0	Constant	0	0
STMH7N003	5yr-4hr			Maximum Capacity	Allowed	906.09	904.088	906.09	Node Invert	0	Constant	0	0
STMH7N003	100yr-24hr			Maximum Capacity	Allowed	906.09	904.088	906.09	Node Invert	0	Constant	0	0
STMH7N004	5yr-4hr			Maximum Capacity	Allowed	906.104	904.324	906.104	Node Invert	0	Constant	0	0
STMH7N004	100yr-24hr			Maximum Capacity	Allowed	906.104	904.324	906.104	Node Invert	0	Constant	0	0
STMH7N005	5yr-4hr			Maximum Capacity	Allowed	904.701	902.631	904.701	Node Invert	0	Constant	0	0
STMH7N005	100yr-24hr			Maximum Capacity	Allowed	904.701	902.631	904.701	Node Invert	0	Constant	0	0
STMH7N006	5yr-4hr			Maximum Capacity	Allowed	904.437	903.174	904.437	Node Invert	0	Constant	0	0
STMH7N006	100yr-24hr			Maximum Capacity	Allowed	904.437	903.174	904.437	Node Invert	0	Constant	0	0
STMH8N001	5yr-4hr			Maximum Capacity	None	905.476	903.721	905.181	Node Invert	0	Constant	0	0
STMH8N001	100yr-24hr			Maximum Capacity	None	905.476	903.721	905.181	Node Invert	0	Constant	0	0
STMH8N002	5yr-4hr			Maximum Capacity	Allowed	905.471	904.246	905.471	Node Invert	0	Constant	0	0
STMH8N002	100yr-24hr			Maximum Capacity	Allowed	905.471	904.246	905.471	Node Invert	0	Constant	0	0
STMH8N003	5yr-4hr			Maximum Capacity	Allowed	905.929	903.941	905.929	Node Invert	0	Constant	0	0
STMH8N003	100yr-24hr			Maximum Capacity	Allowed	905.929	903.941	905.929	Node Invert	0	Constant	0	0
STMH8N004	5yr-4hr			Maximum Capacity	Allowed	905.433	904.363	905.433	Node Invert	0	Constant	0	0
STMH8N004	100yr-24hr			Maximum Capacity	Allowed	905.433	904.363	905.433	Node Invert	0	Constant	0	0
STMH9N001	5yr-4hr			Maximum Capacity	Allowed	906.186	904.371	906.186	Node Invert	0	Constant	0	0
STMH9N001	100yr-24hr			Maximum Capacity	Allowed	906.186	904.371	906.186	Node Invert	0	Constant	0	0
STMH9N002	5yr-4hr			Maximum Capacity	Allowed	905.16	903.93	905.16	Node Invert	0	Constant	0	0

STMH9N002	100yr-24hr			Maximum Capacity	Allowed	905.16	903.93	905.16	Node Invert	0	Constant	0	0
STMHCC001	5yr-4hr			Maximum Capacity	Allowed	904.298	903.113	904.298	Node Invert	0	Constant	0	0
STMHCC001	100yr-24hr			Maximum Capacity	Allowed	904.298	903.113	904.298	Node Invert	0	Constant	0	0
STMHCC002	5yr-4hr			Maximum Capacity	Allowed	904.343	903.053	904.343	Node Invert	0	Constant	0	0
STMHCC002	100yr-24hr			Maximum Capacity	Allowed	904.343	903.053	904.343	Node Invert	0	Constant	0	0
STMHCC003	5yr-4hr			Maximum Capacity	Allowed	904.273	903.023	904.273	Node Invert	0	Constant	0	0
STMHCC003	100yr-24hr			Maximum Capacity	Allowed	904.273	903.023	904.273	Node Invert	0	Constant	0	0
STMHCC004	5yr-4hr			Maximum Capacity	Allowed	904.744	902.709	904.744	Node Invert	0	Constant	0	0
STMHCC004	100yr-24hr			Maximum Capacity	Allowed	904.744	902.709	904.744	Node Invert	0	Constant	0	0
STMHCC005	5yr-4hr			Maximum Capacity	Allowed	903.581	901.671	903.581	Node Invert	0	Constant	0	0
STMHCC005	100yr-24hr			Maximum Capacity	Allowed	903.581	901.671	903.581	Node Invert	0	Constant	0	0
STMHCC006	5yr-4hr			Maximum Capacity	Allowed	904.044	902.269	904.044	Node Invert	0	Constant	0	0
STMHCC006	100yr-24hr			Maximum Capacity	Allowed	904.044	902.269	904.044	Node Invert	0	Constant	0	0
STMHCC007	5yr-4hr			Maximum Capacity	Allowed	904.327	902.672	904.327	Node Invert	0	Constant	0	0
STMHCC007	100yr-24hr			Maximum Capacity	Allowed	904.327	902.672	904.327	Node Invert	0	Constant	0	0
STMHCC008	5yr-4hr			Maximum Capacity	Allowed	906.988	903.923	906.988	Node Invert	0	Constant	0	0
STMHCC008	100yr-24hr			Maximum Capacity	Allowed	906.988	903.923	906.988	Node Invert	0	Constant	0	0
STMHCC009	5yr-4hr			Maximum Capacity	Allowed	905.878	904.018	905.878	Node Invert	0	Constant	0	0
STMHCC009	100yr-24hr			Maximum Capacity	Allowed	905.878	904.018	905.878	Node Invert	0	Constant	0	0
STMHCC010	5yr-4hr			Maximum Capacity	Allowed	904.311	903.091	904.311	Node Invert	0	Constant	0	0
STMHCC010	100yr-24hr			Maximum Capacity	Allowed	904.311	903.091	904.311	Node Invert	0	Constant	0	0
STMHCC011	5yr-4hr			Maximum Capacity	Allowed	903.59	901.1	903.59	Node Invert	0	Constant	0	0
STMHCC011	100yr-24hr			Maximum Capacity	Allowed	903.59	901.1	903.59	Node Invert	0	Constant	0	0
STMHGB001	5yr-4hr			Maximum Capacity	Allowed	904.793	902.948	904.793	Node Invert	0	Constant	0	0
STMHGB001	100yr-24hr			Maximum Capacity	Allowed	904.793	902.948	904.793	Node Invert	0	Constant	0	0
STMHGB002	5yr-4hr			Maximum Capacity	Allowed	904.977	903.075	904.977	Node Invert	0	Constant	0	0
STMHGB002	100yr-24hr			Maximum Capacity	Allowed	904.977	903.075	904.977	Node Invert	0	Constant	0	0
STMHGB003	5yr-4hr			Maximum Capacity	Allowed	906.184	904.702	906.184	Node Invert	0	Constant	0	0
STMHGB003	100yr-24hr			Maximum Capacity	Allowed	906.184	904.702	906.184	Node Invert	0	Constant	0	0
STMHHW001	5yr-4hr			Maximum Capacity	Allowed	903.175	902.315	903.175	Node Invert	0	Constant	0	0
STMHHW001	100yr-24hr			Maximum Capacity	Allowed	903.175	902.315	903.175	Node Invert	0	Constant	0	0
STMHHW002	5yr-4hr			Maximum Capacity	Allowed	904.215	902.055	904.215	Node Invert	0	Constant	0	0
STMHHW002	100yr-24hr			Maximum Capacity	Allowed	904.215	902.055	904.215	Node Invert	0	Constant	0	0
STMHHW003	5yr-4hr			Maximum Capacity	Allowed	904.22	901.65	904.22	Node Invert	0	Constant	0	0
STMHHW003	100yr-24hr			Maximum Capacity	Allowed	904.22	901.65	904.22	Node Invert	0	Constant	0	0
STMHHW004	5yr-4hr			Maximum Capacity	Allowed	903.621	899.377	903.621	Node Invert	0	Constant	0	0
STMHHW004	100yr-24hr			Maximum Capacity	Allowed	903.621	899.377	903.621	Node Invert	0	Constant	0	0
STMHHW005	5yr-4hr			Maximum Capacity	Allowed	904.585	902.615	904.585	Node Invert	0	Constant	0	0
STMHHW005	100yr-24hr			Maximum Capacity	Allowed	904.585	902.615	904.585	Node Invert	0	Constant	0	0
STMHHW006	5yr-4hr			Maximum Capacity	Allowed	905.761	903.781	905.761	Node Invert	0	Constant	0	0
STMHHW006	100yr-24hr			Maximum Capacity	Allowed	905.761	903.781	905.761	Node Invert	0	Constant	0	0
STMHHW007	5yr-4hr			Maximum Capacity	Allowed	905.997	904.597	905.997	Node Invert	0	Constant	0	0
STMHHW007	100yr-24hr			Maximum Capacity	Allowed	905.997	904.597	905.997	Node Invert	0	Constant	0	0
STMHHW008	5yr-4hr			Maximum Capacity	Allowed	907.756	906.201	907.756	Node Invert	0	Constant	0	0
STMHHW008	100yr-24hr			Maximum Capacity	Allowed	907.756	906.201	907.756	Node Invert	0	Constant	0	0
STMHHW009	5yr-4hr			Maximum Capacity	Allowed	908.393	906.953	908.393	Node Invert	0	Constant	0	0
STMHHW009	100yr-24hr			Maximum Capacity	Allowed	908.393	906.953	908.393	Node Invert	0	Constant	0	0
STMHHW010	5yr-4hr			Maximum Capacity	Allowed	909.398	907.758	909.398	Node Invert	0	Constant	0	0
STMHHW010	100yr-24hr			Maximum Capacity	Allowed	909.398	907.758	909.398	Node Invert	0	Constant	0	0
STMHJM001	5yr-4hr			Maximum Capacity	Allowed	904.344	902.824	904.344	Node Invert	0	Constant	0	0
STMHJM001	100yr-24hr			Maximum Capacity	Allowed	904.344	902.824	904.344	Node Invert	0	Constant	0	0
STMHMC001	5yr-4hr			Maximum Capacity	Allowed	902.495	899.205	902.495	Node Invert	0	Constant	0	0
STMHMC001	100yr-24hr			Maximum Capacity	Allowed	902.495	899.205	902.495	Node Invert	0	Constant	0	0
STMHMC002	5yr-4hr			Maximum Capacity	Allowed	902.521	899.271	902.521	Node Invert	0	Constant	0	0
STMHMC002	100yr-24hr			Maximum Capacity	Allowed	902.521	899.271	902.521	Node Invert	0	Constant	0	0
STMHMC003	5yr-4hr			Maximum Capacity	Allowed	902.797	899.497	902.797	Node Invert	0	Constant	0	0
STMHMC003	100yr-24hr			Maximum Capacity	Allowed	902.797	899.497	902.797	Node Invert	0	Constant	0	0
STMHNA001	5yr-4hr			Maximum Capacity	Allowed	906.258	904.796	906.258	Node Invert	0	Constant	0	0
STMHNA001	100yr-24hr			Maximum Capacity	Allowed	906.258	904.796	906.258	Node Invert	0	Constant	0	0
STMHNA002	5yr-4hr			Maximum Capacity	Allowed	906.482	904.282	906.482	Node Invert	0	Constant	0	0
STMHNA002	100yr-24hr			Maximum Capacity	Allowed	906.482	904.282	906.482	Node Invert	0	Constant	0	0
STMHNA003	5yr-4hr			Maximum Capacity	Allowed	906.82	904.71	906.82	Node Invert	0	Constant	0	0
STMHNA003	100yr-24hr			Maximum Capacity	Allowed	906.82	904.71	906.82	Node Invert	0	Constant	0	0
STMHNA004	5yr-4hr			Maximum Capacity	Allowed	907.488	905.383	907.488	Node Invert	0	Constant	0	0
STMHNA004	100yr-24hr			Maximum Capacity	Allowed	907.488	905.383	907.488	Node Invert	0	Constant	0	0
STMHNA005	5yr-4hr			Maximum Capacity	Allowed	908.233	905.983	908.233	Node Invert	0	Constant	0	0
STMHNA005	100yr-24hr			Maximum Capacity	Allowed	908.233	905.983	908.233	Node Invert	0	Constant	0	0
STMHNS001	5yr-4hr			Maximum Capacity	Allowed	908.673	906.983	908.673	Node Invert	0	Constant	0	0
STMHNS001	100yr-24hr			Maximum Capacity	Allowed	908.673	906.983	908.673	Node Invert	0	Constant	0	0
STMHPR001	5yr-4hr			Maximum Capacity	Allowed	904.218	903.198	904.218	Node Invert	0	Constant	0	0
STMHPR001	100yr-24hr			Maximum Capacity	Allowed	904.218	903.198	904.218	Node Invert	0	Constant	0	0
STMHRG001	5yr-4hr			Maximum Capacity	Allowed	900.088	899.528	900.088	Node Invert	0	Constant	0	0
STMHRG001	100yr-24hr			Maximum Capacity	Allowed	900.088	899.528	900.088	Node Invert	0	Constant	0	0
STMHRG002	5yr-4hr			Maximum Capacity	Allowed	898.493	895.876	898.493	Node Invert	0	Constant	0	0
STMHRG002	100yr-24hr			Maximum Capacity	Allowed	898.493	895.876	898.493	Node Invert	0	Constant	0	0
STMHRW001	5yr-4hr			Maximum Capacity	Allowed	905.722	903.86	905.722	Node Invert	0	Constant	0	0
STMHRW001	100yr-24hr			Maximum Capacity	Allowed	905.722	903.86	905.722	Node Invert	0	Constant	0	0
STMHXXX001	5yr-4hr			Maximum Capacity	Allowed	905.681	903.931	905.681	Node Invert	0	Constant	0	0
STMHXXX001	100yr-24hr			Maximum Capacity	Allowed	905.681	903.931	905.681	Node Invert	0	Constant	0	0
STMHXXX002	5yr-4hr			Maximum Capacity	Allowed	905.953	903.583	905.953	Node Invert	0	Constant	0	0
STMHXXX002	100yr-24hr			Maximum Capacity	Allowed	905.953	903.583	905.953	Node Invert	0	Constant	0	0
STMHXXX003	5yr-4hr			Maximum Capacity	Allowed	903.374	901.6	903.374	Node Invert	0	Constant	0	0
STMHXXX003	100yr-24hr			Maximum Capacity	Allowed	903.374	901.6	903.374	Node Invert	0	Constant	0	0
STMHXXX004	5yr-4hr			Maximum Capacity	Allowed	902.238	900.338	902.238	Node Invert	0	Constant	0	0
STMHXXX004	100yr-24hr			Maximum Capacity	Allowed	902.238	900.338	902.238	Node Invert	0	Constant	0	0
STMHXXX005	5yr-4hr			Maximum Capacity	Allowed	902.061	899.081	902.061	Node Invert	0	Constant	0	0
STMHXXX005	100yr-24hr			Maximum Capacity	Allowed	902.061	899.081	902.061	Node Invert	0	Constant	0	0
STMHXXX006	5yr-4hr			Maximum Capacity	Allowed	903.286	898.45	903.286	Node Invert	0	Constant	0	0
STMHXXX006	100yr-24hr			Maximum Capacity	Allowed	903.286	898.45	903.286	Node Invert	0	Constant	0	0
STMHXXX007	5yr-4hr			Maximum Capacity	Allowed	902.329	898.399	902.329	Node Invert	0	Constant	0	0
STMHXXX007	100yr-24hr			Maximum Capacity	Allowed	902.329	898.399	902.329	Node Invert	0	Constant	0	0
STMHXXX008	5yr-4hr			Maximum Capacity	Allowed	901.495	898.145	901.495	Node Invert	0	Constant	0	0
STMHXXX008	100yr-24hr			Maximum Capacity	Allowed	901.495	898.145	901.495	Node Invert	0	Constant	0	0
STMHXXX009	5yr-4hr			Maximum Capacity	Allowed	900.442	897.717	900.442	Node Invert	0	Constant	0	0
STMHXXX009	100yr-24hr			Maximum Capacity	Allowed	900.442	897.717	900.442	Node Invert	0	Constant	0	0
STMHXXX010	5yr-4hr			Maximum Capacity	Allowed	901.977	898.855	901.977	Node Invert	0	Constant	0	0
STMHXXX010	100yr-24hr			Maximum Capacity	Allowed	901.977	898.855	901.977	Node Invert	0	Constant	0	0
STMHXXX011	5yr-4hr			Maximum Capacity	Allowed	900.87	898.755	900.87	Node Invert	0	Constant	0	0
STMHXXX011	100yr-24hr			Maximum Capacity	Allowed	900.87	898.755	900.87	Node Invert	0	Constant	0	0
STMHXXX012	5yr-4hr			Maximum Capacity	None	901	896.202	897.102	Node Invert	0	Constant	0	0
STMHXXX012	100yr-24hr			Maximum Capacity	None	901	896.202	897.102	Node Invert	0	Constant	0	0
STMHXXX013	5yr-4hr			Maximum Capacity	Allowed	897.72	893.215	897.72	Node Invert	0	Constant	0	0
STMHXXX013	100yr-24hr			Maximum Capacity	Allowed	897.72	893.215	897.72	Node Invert	0	Constant	0	0
STMHXXX014	5yr-4hr			Maximum Capacity	Allowed	896.68	891.44	896.68	Node Invert	1	Stepwise Linear	0	0
STMHXXX014	100yr-24hr			Maximum Capacity	Allowed	896.68	891.44	896.68	Node Invert	1	Stepwise Linear	0	0
STMHXXX016	5yr-4hr			Maximum Capacity	Allowed	897.199	893.362	897.199	Node Invert	0	Constant	0	0
STMHXXX016	100yr-24hr			Maximum Capacity	Allowed	897.199	893.362	897.199	Node Invert	0	Constant	0	0
STMHXXX025	5yr-4hr			Maximum Capacity	Allowed	900.162	897.612	900.162	Node Invert	0	Constant	0	0
STMHXXX025	100yr-24hr			Maximum Capacity	Allowed	900.162	897.612	900.162	Node Invert	0	Constant	0	0
STMHXXX026	5yr-4hr			Maximum Capacity	Allowed	902.172	899.662	902.172	Node Invert	0	Constant	0	0

STMHXXX026	100yr-24hr			Maximum Capacity	Allowed	902.172	899.662	902.172	Node Invert	0	Constant	0	0
STMHXXX027	5yr-4hr			Maximum Capacity	Allowed	905.551	904.656	905.551	Node Invert	0	Constant	0	0
STMHXXX027	100yr-24hr			Maximum Capacity	Allowed	905.551	904.656	905.551	Node Invert	0	Constant	0	0
STMHXXX028	5yr-4hr			Maximum Capacity	Allowed	905.607	905.082	905.607	Node Invert	0	Constant	0	0
STMHXXX028	100yr-24hr			Maximum Capacity	Allowed	905.607	905.082	905.607	Node Invert	0	Constant	0	0
STMHXXX035	5yr-4hr			Maximum Capacity	Allowed	903.213	902.538	903.213	Spill Crest	1	Stepwise Linear	0	0
STMHXXX035	100yr-24hr			Maximum Capacity	Allowed	903.213	902.538	903.213	Spill Crest	1	Stepwise Linear	0	0
STMHXXX037	5yr-4hr			Maximum Capacity	Allowed	905.15	903.25	905.15	Node Invert	1	Stepwise Linear	0	0
STMHXXX037	100yr-24hr			Maximum Capacity	Allowed	905.15	903.25	905.15	Node Invert	1	Stepwise Linear	0	0

PRE-DEVELOPMENT – HYDRAULIC NODE OUTPUT

Name	Storm	Node Name	Continuity Error %	Max Surface Area m^2	Max Volume m^3	Max Water Depth m	Max Water Elevation m	Duration of Flooding (min) sec	Surcharge at Max HGL m	Duration of Surcharge (min) sec
CB3A002W	5yr-4hr	CB3A002W	0.049	9510.09	4512.507	2.623	899.631	1062.8	1.823	1114.85
CB3A002W	100yr-24hr	CB3A002W	1.846	20855.82	15858.24	3.408	900.416	3983.9	2.608	4174.567
CBXXX025	5yr-4hr	CBXXX025	0.042	5194.33	194.937	0.533	899.717	183.6	0.283	184.817
CBXXX025	100yr-24hr	CBXXX025	0.003	5972.3	972.908	0.673	899.857	552.2	0.423	571.917
CBXXX026	5yr-4hr	CBXXX026	0	1.22	0.326	0.267	903.082	0	0	0
CBXXX026	100yr-24hr	CBXXX026	0	1.22	0.33	0.27	903.085	0	0	0
CBXXX027	5yr-4hr	CBXXX027	0.047	5021.05	23.341	1.883	904.665	7	1.18	47.633
CBXXX027	100yr-24hr	CBXXX027	0.023	5161	163.295	1.911	904.693	37	1.208	149
CBXXX038	5yr-4hr	CBXXX038	0.103	5107.11	107.857	0.636	905.597	261.5	0.373	269.25
CBXXX038	100yr-24hr	CBXXX038	0.013	5149.04	149.792	0.644	905.605	431.8	0.381	443.65
Dummy 1	5yr-4hr	Dummy 1	0	1.22	0.274	0.225	899.409	0	0	0
Dummy 1	100yr-24hr	Dummy 1	0	1.22	0.287	0.235	899.419	0	0	0
MHXXX011A	5yr-4hr	MHXXX011A	0.002	1.22	3.276	2.685	900.757	0	1.785	273.733
MHXXX011A	100yr-24hr	MHXXX011A	0.002	1.22	3.678	3.015	901.087	0	2.115	726.117
MHXXX012A	5yr-4hr	MHXXX012A	0.006	1.22	4.694	3.847	898.796	0	2.947	275.483
MHXXX012A	100yr-24hr	MHXXX012A	0.002	1.22	5.1	4.18	899.129	0	3.28	734.1
Node1109	5yr-4hr	Node1109	0.01	1.22	3.358	2.752	901.752	0	2.091	301.05
Node1109	100yr-24hr	Node1109	0.001	1.22	3.742	3.067	902.067	0	2.406	3896.3
Node1117	5yr-4hr	Node1117	0	1.22	0.873	0.716	892.156	0	0	0
Node1117	100yr-24hr	Node1117	0	1.22	0.896	0.734	892.174	0	0	0
Node1118	5yr-4hr	Node1118	0.006	5061.15	63.386	1.843	904.112	137.1	1.32	260.433
Node1118	100yr-24hr	Node1118	0.005	5354.5	356.738	1.9	904.168	685	1.377	719.45
Node1120	5yr-4hr	Node1120	0	1.22	0.015	0.012	903.612	0	0	0
Node1120	100yr-24hr	Node1120	0.009	1.22	0.446	0.366	903.966	0	0.066	304.033
Node1121	5yr-4hr	Node1121	0.01	1.22	0.721	0.591	898.871	0	0	0
Node1121	100yr-24hr	Node1121	0.002	1.22	0.885	0.726	899.006	0	0	0
Node1122	5yr-4hr	Node1122	0.084	1.22	2.05	1.68	900.044	0	0.68	77.533
Node1122	100yr-24hr	Node1122	0.027	1.22	2.191	1.796	900.16	1.4	0.796	182.9
Node1123	5yr-4hr	Node1123	0.049	1.22	1.195	0.98	900.059	0	0	0
Node1123	100yr-24hr	Node1123	0.017	1.22	1.22	1	900.079	23.5	0	0
Node1124	5yr-4hr	Node1124	0.017	1.22	1.22	1	900.16	50	0	0
Node1124	100yr-24hr	Node1124	0.003	1.22	1.22	1	900.16	94.1	0	0
Node1125	5yr-4hr	Node1125	0.013	1.22	0.945	0.774	900.223	0	0	0
Node1125	100yr-24hr	Node1125	0.002	1.22	0.941	0.771	900.22	0	0	0
Node1126	5yr-4hr	Node1126	0.01	1.22	0.904	0.741	900.3	0	0	0
Node1126	100yr-24hr	Node1126	0.002	1.22	0.908	0.744	900.303	0	0	0
Node1127	5yr-4hr	Node1127	0.002	1.22	0.621	0.509	900.434	0	0	0
Node1127	100yr-24hr	Node1127	0	1.22	0.717	0.587	900.512	0	0	0
Node1128	5yr-4hr	Node1128	0.001	1.22	0.852	0.698	900.706	0	0	0
Node1128	100yr-24hr	Node1128	0	1.22	1.22	1	901.008	9.1	0	0
Node1129	5yr-4hr	Node1129	0.008	1.22	0.61	0.5	900.32	0	0	0
Node1129	100yr-24hr	Node1129	0.002	1.22	0.61	0.5	900.32	0	0	0
Node1130	5yr-4hr	Node1130	0.001	1.22	0.61	0.5	900.389	41.7	0	0
Node1130	100yr-24hr	Node1130	0	1.22	0.61	0.5	900.389	131.5	0	0
Node213	5yr-4hr	Node213	0	1.22	0.594	0.487	895.118	0	0	0
Node213	100yr-24hr	Node213	0	1.22	0.6	0.492	895.123	0	0	0
Node214	5yr-4hr	Node214	0	1.22	0.732	0.6	904.892	112.6	0	0
Node214	100yr-24hr	Node214	0	1.22	0.732	0.6	904.892	260.4	0	0
Node227	5yr-4hr	Node227	0.002	1.22	0.273	0.224	905.011	0	0	0
Node227	100yr-24hr	Node227	0	1.22	0.406	0.333	905.119	0	0.033	275.35
Node228	5yr-4hr	Node228	0.005	1.22	0.578	0.474	902.548	0	0.024	1.783
Node228	100yr-24hr	Node228	0.001	1.22	0.588	0.482	902.556	0	0.032	27.8
STMH3A001	5yr-4hr	STMH3A001	0.001	1.22	3.796	3.111	897.742	0	2.461	233.833
STMH3A001	100yr-24hr	STMH3A001	0.003	5163.14	167.034	3.222	897.853	389.7	2.572	658.067
STMH3A002	5yr-4hr	STMH3A002	0	1.22	3.381	2.771	899.63	0	1.831	1115.972
STMH3A002	100yr-24hr	STMH3A002	0.154	6269.89	1273.956	3.556	900.415	3518.6	2.616	4176.6
STMH3A003	5yr-4hr	STMH3A003	0	1.22	0.13	0.107	897.66	0	0	0
STMH3A003	100yr-24hr	STMH3A003	0	1.22	0.143	0.117	897.67	0	0	0
STMH3N001	5yr-4hr	STMH3N001	0.428	5308.55	310.436	1.61	907.359	178.2	1.41	179.95
STMH3N001	100yr-24hr	STMH3N001	0.038	5591.32	593.212	1.662	907.411	344.1	1.462	354.55
STMH4N001	5yr-4hr	STMH4N001	0.495	5246.72	248.417	1.443	906.073	187.8	1.143	188.667
STMH4N001	100yr-24hr	STMH4N001	0.035	5514.5	516.203	1.493	906.123	501.3	1.193	503.717
STMH4S001	5yr-4hr	STMH4S001	0.005	1.22	1.499	1.228	904.601	0	0.758	413.767
STMH4S001	100yr-24hr	STMH4S001	0.001	1.22	1.727	1.416	904.789	0	0.946	1079.35
STMH5S001	5yr-4hr	STMH5S001	0.027	5286.62	288.173	1.326	901.902	77.7	0.876	78.883
STMH5S001	100yr-24hr	STMH5S001	0.112	7453.52	2455.066	1.669	902.245	335.2	1.219	337.917
STMH5S002	5yr-4hr	STMH5S002	0.48	5526.46	528.147	1.485	901.823	304.4	1.185	305.783
STMH5S002	100yr-24hr	STMH5S002	0.039	6805.79	1807.477	1.693	902.031	906.6	1.393	908.783
STMH5S003	5yr-4hr	STMH5S003	0.002	1.22	2.335	1.914	901.792	0	1.519	305.483
STMH5S003	100yr-24hr	STMH5S003	0.014	5161.67	164.41	2.277	902.155	116.6	1.882	910.067
STMH6N001	5yr-4hr	STMH6N001	0.004	1.22	2.306	1.89	903.63	0	1.099	243.833

STMH6N001	100yr-24hr	STMH6N001	0	1.22	2.562	2.1	903.84	0	1.309	606.1
STMH6S001	5yr-4hr	STMH6S001	0.39	5448.34	451.34	2.546	902.666	89.5	1.946	175.233
STMH6S001	100yr-24hr	STMH6S001	0.042	6530.51	1533.511	2.727	902.847	253	2.127	462.3
STMH6S002	5yr-4hr	STMH6S002	0.005	1.22	3.253	2.655	902.64	0	2.067	175.85
STMH6S002	100yr-24hr	STMH6S002	0.001	1.22	3.427	2.809	902.794	0	2.209	544.35
STMH6S003	5yr-4hr	STMH6S003	0.007	1.22	2.757	2.26	902.117	0	1.535	82.133
STMH6S003	100yr-24hr	STMH6S003	0.003	1.22	3.3	2.705	902.562	0	1.98	476.283
STMH6S004	5yr-4hr	STMH6S004	0.413	5826.81	828.973	1.923	903.109	374.5	1.723	378.883
STMH6S004	100yr-24hr	STMH6S004	0.014	7665.73	2667.887	2.197	903.383	1147.5	1.997	1174.4
STMH7N001	5yr-4hr	STMH7N001	0.002	1.22	1.818	1.49	904.22	0	0.815	242.5
STMH7N001	100yr-24hr	STMH7N001	0	1.22	2.058	1.687	904.417	0	1.012	618.983
STMH7N001B	5yr-4hr	STMH7N001B	0.001	1.22	1.818	1.491	904.128	0	0.816	253.667
STMH7N001B	100yr-24hr	STMH7N001B	0	1.22	2.07	1.697	904.334	0	1.022	643.033
STMH7N002	5yr-4hr	STMH7N002	0.598	5650.56	651.589	0.967	904.728	212.9	0.667	213.433
STMH7N002	100yr-24hr	STMH7N002	0.022	6903.84	1904.873	1.168	904.929	551.3	0.868	556.467
STMH7N003	5yr-4hr	STMH7N003	0.005	1.22	2.373	1.945	906.033	0	1.33	123.35
STMH7N003	100yr-24hr	STMH7N003	0	1.22	2.328	1.908	905.996	0	1.293	346.867
STMH7N004	5yr-4hr	STMH7N004	0.489	5215.02	217.193	1.815	906.139	56.9	1.122	116.167
STMH7N004	100yr-24hr	STMH7N004	0.008	5197.1	199.272	1.819	906.143	173.4	1.126	266.2
STMH7N005	5yr-4hr	STMH7N005	0.001	1.22	1.928	1.581	904.212	0	0.831	246.4
STMH7N005	100yr-24hr	STMH7N005	0	1.22	2.169	1.778	904.409	0	1.028	626.067
STMH7N006	5yr-4hr	STMH7N006	0.273	5270.09	271.629	1.316	904.49	115.6	0.941	154.55
STMH7N006	100yr-24hr	STMH7N006	0.006	5815.22	816.762	1.414	904.588	305	1.039	487.2
STMH8N001	5yr-4hr	STMH8N001	0.004	1.22	1.691	1.322	905.043	0	0	0
STMH8N001	100yr-24hr	STMH8N001	0.001	1.22	1.623	1.312	905.033	0	0	0
STMH8N002	5yr-4hr	STMH8N002	0.002	1.22	1.419	1.163	905.409	0	0.508	75.583
STMH8N002	100yr-24hr	STMH8N002	0.001	5011.42	12.919	1.227	905.473	4.7	0.572	260.033
STMH8N003	5yr-4hr	STMH8N003	0.001	1.22	1.712	1.377	905.318	0	0.595	113.683
STMH8N003	100yr-24hr	STMH8N003	0.001	1.22	1.854	1.52	905.461	0	0.712	262.1
STMH8N004	5yr-4hr	STMH8N004	0	1.22	0.715	0.584	904.947	0	0.189	285.433
STMH8N004	100yr-24hr	STMH8N004	0	1.22	0.704	0.569	904.932	0	0.18	547.25
STMH9N001	5yr-4hr	STMH9N001	0.007	1.22	0.306	0.251	904.622	0	0	0
STMH9N001	100yr-24hr	STMH9N001	0.088	5136.52	138.734	1.842	906.213	47.8	1.467	124.367
STMH9N002	5yr-4hr	STMH9N002	0.004	1.22	0.404	0.331	904.261	0	0	0
STMH9N002	100yr-24hr	STMH9N002	0	1.22	1.386	1.135	905.065	0	0.751	125.05
STMHCC001	5yr-4hr	STMHCC001	0.13	5252.8	254.249	1.234	904.347	210.9	0.934	245.617
STMHCC001	100yr-24hr	STMHCC001	0.088	5558.33	559.78	1.291	904.404	615.5	0.991	1366.8
STMHCC002	5yr-4hr	STMHCC002	0.1	5063.41	64.98	1.303	904.356	142.9	0.983	243.5
STMHCC002	100yr-24hr	STMHCC002	0.036	5233.09	234.662	1.336	904.389	385.7	1.016	1310.933
STMHCC003	5yr-4hr	STMHCC003	0.652	5266.3	267.827	1.302	904.325	141.9	0.927	210.733
STMHCC003	100yr-24hr	STMHCC003	0.011	5270.22	271.742	1.303	904.326	354.1	0.928	601.567
STMHCC004	5yr-4hr	STMHCC004	0.011	1.22	1.882	1.541	904.25	0	0.972	200.433
STMHCC004	100yr-24hr	STMHCC004	0.003	1.22	1.93	1.582	904.291	0	1.012	598.033
STMHCC005	5yr-4hr	STMHCC005	0.004	5138.36	140.689	1.937	903.608	47.3	1.112	244.133
STMHCC005	100yr-24hr	STMHCC005	0.036	5779.08	781.41	2.055	903.726	394.2	1.23	606.2
STMHCC006	5yr-4hr	STMHCC006	0.144	5151.34	153.501	1.805	904.074	173.9	1.282	259.65
STMHCC006	100yr-24hr	STMHCC006	0.012	5659.23	661.393	1.899	904.168	632	1.376	719.15
STMHCC007	5yr-4hr	STMHCC007	0.359	5829.24	831.259	1.808	904.48	259	1.418	260.367
STMHCC007	100yr-24hr	STMHCC007	0.06	7160.9	2162.92	2.014	904.686	714.2	1.624	721.433
STMHCC008	5yr-4hr	STMHCC008	0.001	1.22	3.457	2.832	906.755	0	2.458	259.65
STMHCC008	100yr-24hr	STMHCC008	0.141	5337.54	341.278	3.13	907.053	39.6	2.755	717.65
STMHCC009	5yr-4hr	STMHCC009	0.134	5403.82	406.089	1.938	905.956	174.8	1.628	260
STMHCC009	100yr-24hr	STMHCC009	0.03	6457.31	1459.575	2.116	906.134	473	1.806	724.367
STMHCC010	5yr-4hr	STMHCC010	0.182	5232.55	234.038	1.265	904.356	199.4	0.91	243.7
STMHCC010	100yr-24hr	STMHCC010	0.43	5495.86	497.347	1.315	904.406	606.4	0.96	1318.217
STMHCC011	5yr-4hr	STMHCC011	0.613	5191.66	194.699	2.518	903.618	31.4	1.258	244.417
STMHCC011	100yr-24hr	STMHCC011	0.053	5403.05	406.09	2.568	903.668	287	1.308	607.2
STMHGB001	5yr-4hr	STMHGB001	0.005	1.22	1.664	1.364	904.312	0	0.636	205.583
STMHGB001	100yr-24hr	STMHGB001	0	1.22	1.889	1.549	904.497	0	0.821	550.517
STMHGB002	5yr-4hr	STMHGB002	0.02	1.22	1.604	1.315	904.39	0	0.64	189.35
STMHGB002	100yr-24hr	STMHGB002	0.003	1.22	1.818	1.49	904.565	0	0.815	520.317
STMHGB003	5yr-4hr	STMHGB003	0.002	1.22	0.192	0.157	904.859	0	0	0
STMHGB003	100yr-24hr	STMHGB003	0.04	5275.72	277.53	1.536	906.238	122.9	1.236	124.133
STMHHW001	5yr-4hr	STMHHW001	0.515	5493.58	494.625	0.954	903.269	178.1	0.354	178.317
STMHHW001	100yr-24hr	STMHHW001	0.059	6170.75	1171.797	1.07	903.385	487.4	0.47	487.8
STMHHW002	5yr-4hr	STMHHW002	0.018	1.22	2.205	1.807	903.862	0	1.161	180.183
STMHHW002	100yr-24hr	STMHHW002	0.017	5062.01	64.646	2.172	904.227	10.9	1.525	490.35
STMHHW003	5yr-4hr	STMHHW003	0.009	1.22	2.884	2.355	904.005	0	1.888	243.65
STMHHW003	100yr-24hr	STMHHW003	0.001	1.22	2.925	2.397	904.047	0	1.918	606.383
STMHHW004	5yr-4hr	STMHHW004	1	5162.57	167.743	4.269	903.646	14.3	1.365	212.233
STMHHW004	100yr-24hr	STMHHW004	0.024	5067.3	72.477	4.257	903.634	16.3	1.353	600.933
STMHHW005	5yr-4hr	STMHHW005	0.068	5055.31	57.714	1.979	904.594	11.9	1.139	41.15
STMHHW005	100yr-24hr	STMHHW005	0.043	5279.01	281.415	2.024	904.639	44.1	1.184	123.45
STMHHW006	5yr-4hr	STMHHW006	0.062	5026	28.412	1.985	905.766	10.1	1.03	41.267
STMHHW006	100yr-24hr	STMHHW006	0.149	5246.04	248.452	2.028	905.809	51.3	1.073	123.017
STMHHW007	5yr-4hr	STMHHW007	0.094	5127.07	128.782	1.425	906.022	40.8	1.05	63.417

STMHHW007	100yr-24hr	STMHHW007	0.017	5411.74	413.452	1.479	906.076	122.6	1.104	144.55
STMHHW008	5yr-4hr	STMHHW008	0.282	5121.13	123.03	1.579	907.78	43.6	1.204	45.217
STMHHW008	100yr-24hr	STMHHW008	0.062	5310.32	312.215	1.615	907.816	117.2	1.24	123.567
STMHHW009	5yr-4hr	STMHHW009	0.173	5104.74	106.502	1.461	908.414	61.3	1.161	62.65
STMHHW009	100yr-24hr	STMHHW009	0.026	5164.01	165.762	1.472	908.425	143.1	1.172	144.017
STMHHW010	5yr-4hr	STMHHW010	0.256	5119.05	121.048	1.664	909.422	47.6	1.364	62.917
STMHHW010	100yr-24hr	STMHHW010	0.146	5371.28	373.277	1.712	909.47	120.5	1.412	144.15
STMHJM001	5yr-4hr	STMHJM001	0.076	5911.7	913.552	1.687	904.511	409.9	1.063	424.333
STMHJM001	100yr-24hr	STMHJM001	0.007	7177.02	2178.874	1.881	904.705	1050.3	1.257	1186.65
STMHMC001	5yr-4hr	STMHMC001	0.004	1.22	3.447	2.825	902.03	0	2.195	180.45
STMHMC001	100yr-24hr	STMHMC001	0.005	5021.42	25.431	3.294	902.499	14.2	2.664	3894.25
STMHMC002	5yr-4hr	STMHMC002	0.008	1.22	3.402	2.788	902.059	0	2.148	177.583
STMHMC002	100yr-24hr	STMHMC002	0.01	5093.59	97.55	3.269	902.54	17.8	2.629	3893.433
STMHMC003	5yr-4hr	STMHMC003	0.003	1.22	3.169	2.597	902.094	0	1.953	173.45
STMHMC003	100yr-24hr	STMHMC003	0.006	1.22	3.728	3.055	902.552	0	2.41	3891.933
STMHNA001	5yr-4hr	STMHNA001	0.566	5370.67	372.458	1.534	906.33	111.3	1.159	114.683
STMHNA001	100yr-24hr	STMHNA001	0.085	5744.39	746.169	1.601	906.397	234.6	1.226	261.7
STMHNA002	5yr-4hr	STMHNA002	0.005	1.22	2.57	2.098	906.38	0	1.281	114.817
STMHNA002	100yr-24hr	STMHNA002	0.001	1.22	2.452	2.01	906.292	0	1.185	262.617
STMHNA003	5yr-4hr	STMHNA003	0.026	5057.68	60.251	2.121	906.831	30.6	1.558	120.717
STMHNA003	100yr-24hr	STMHNA003	0.052	5336.59	339.167	2.175	906.885	113.6	1.612	311.117
STMHNA004	5yr-4hr	STMHNA004	0.019	5222.88	225.45	2.149	907.532	119.7	1.669	122.817
STMHNA004	100yr-24hr	STMHNA004	0.069	5717.92	720.493	2.239	907.622	341.5	1.759	348.767
STMHNA005	5yr-4hr	STMHNA005	0.013	5157.14	159.888	2.281	908.264	69.4	1.961	121.933
STMHNA005	100yr-24hr	STMHNA005	0.075	5683.86	686.604	2.378	908.361	229.7	2.058	346.4
STMHNS001	5yr-4hr	STMHNS001	0.188	5079.08	81.146	1.703	908.686	18.7	1.403	119.767
STMHNS001	100yr-24hr	STMHNS001	0.115	5151.61	153.675	1.718	908.701	42.9	1.418	341.867
STMHPR001	5yr-4hr	STMHPR001	0.119	5223.11	224.357	1.064	904.262	232.5	0.764	242.133
STMHPR001	100yr-24hr	STMHPR001	0.005	5547.78	549.026	1.124	904.322	626.6	0.824	1309.233
STMHRG001	5yr-4hr	STMHRG001	0	1.22	0	0	899.528	0	0	0
STMHRG001	100yr-24hr	STMHRG001	0	1.22	0	0	899.528	0	0	0
STMHRG002	5yr-4hr	STMHRG002	0.125	6542.82	1546.014	2.886	898.762	216.1	0.269	216.017
STMHRG002	100yr-24hr	STMHRG002	0.087	8130.63	3133.819	3.103	898.979	469.1	0.486	469.083
STMHRW001	5yr-4hr	STMHRW001	0.002	5229.61	231.878	1.907	905.767	113	1.287	126.267
STMHRW001	100yr-24hr	STMHRW001	0.025	5670.53	672.806	1.988	905.848	260.1	1.368	352.3
STMHXXX001	5yr-4hr	STMHXXX001	0.006	1.22	1.512	1.226	905.157	0	0.739	123.367
STMHXXX001	100yr-24hr	STMHXXX001	0.001	1.22	1.753	1.437	905.368	0	0.937	347.5
STMHXXX002	5yr-4hr	STMHXXX002	0.009	1.22	1.784	1.458	905.041	0	0.784	127.383
STMHXXX002	100yr-24hr	STMHXXX002	0.002	1.22	2.044	1.675	905.258	0	0.997	353.483
STMHXXX003	5yr-4hr	STMHXXX003	0.512	6896.54	1898.706	2.096	903.696	243.1	0.322	243.05
STMHXXX003	100yr-24hr	STMHXXX003	0.098	8759.89	3762.051	2.335	903.935	597.3	0.561	597.3
STMHXXX004	5yr-4hr	STMHXXX004	0.526	5481.88	484.195	1.992	902.33	173.6	1.692	174.9
STMHXXX004	100yr-24hr	STMHXXX004	0.031	5974.72	977.037	2.078	902.416	453.1	1.778	465.45
STMHXXX005	5yr-4hr	STMHXXX005	0.004	1.22	3.276	2.685	901.766	0	2.005	183.333
STMHXXX005	100yr-24hr	STMHXXX005	0.001	5103.77	107.402	3.001	902.082	28	2.321	3894.467
STMHXXX006	5yr-4hr	STMHXXX006	0	1.22	3.723	3.051	901.501	0	2.083	611.05
STMHXXX006	100yr-24hr	STMHXXX006	0.002	1.22	4.095	3.356	901.806	0	2.388	3901.95
STMHXXX007	5yr-4hr	STMHXXX007	0.003	1.22	3.278	2.686	901.085	0	2.062	1027.158
STMHXXX007	100yr-24hr	STMHXXX007	0.002	1.22	3.641	2.985	901.384	0	2.36	3983.2
STMHXXX008	5yr-4hr	STMHXXX008	0.005	1.22	3.078	2.522	900.667	0	0.143	4.633
STMHXXX008	100yr-24hr	STMHXXX008	0.003	1.22	3.449	2.827	900.972	0	0.447	381.533
STMHXXX009	5yr-4hr	STMHXXX009	0.002	1.22	2.891	2.37	900.087	0	1.53	1072.329
STMHXXX009	100yr-24hr	STMHXXX009	23.287	5360.24	363.562	2.787	900.504	3501.1	1.947	4021.933
STMHXXX010	5yr-4hr	STMHXXX010	0.417	5186.27	190.078	3.151	902.006	16.4	1.265	272.817
STMHXXX010	100yr-24hr	STMHXXX010	0.02	5028.19	31.998	3.127	901.982	16.7	1.241	723.4
STMHXXX011	5yr-4hr	STMHXXX011	0.064	6827.53	1830.115	2.427	901.182	272.5	1.437	273.083
STMHXXX011	100yr-24hr	STMHXXX011	0.077	9517.7	4520.277	2.759	901.514	721.1	1.769	724.533
STMHXXX012	5yr-4hr	STMHXXX012	0.003	1.22	4.148	3.4	899.602	0	2.5	274.5
STMHXXX012	100yr-24hr	STMHXXX012	0.002	1.22	4.55	3.729	899.931	0	2.829	730.083
STMHXXX013	5yr-4hr	STMHXXX013	0.012	5131.91	137.404	4.531	897.746	158.3	3.616	277.083
STMHXXX013	100yr-24hr	STMHXXX013	0.021	7193.09	2198.589	4.869	898.084	718.9	3.954	745.067
STMHXXX014	5yr-4hr	STMHXXX014	0.003	627.16	206.188	3.982	895.422	0	2.602	280.483
STMHXXX014	100yr-24hr	STMHXXX014	0.002	976.53	515.226	4.369	895.809	0	2.989	761.8
STMHXXX016	5yr-4hr	STMHXXX016	0	1.22	0.129	0.106	893.468	0	0	0
STMHXXX016	100yr-24hr	STMHXXX016	0.001	1.22	0.142	0.117	893.479	0	0	0
STMHXXX025	5yr-4hr	STMHXXX025	0.025	1.22	2.773	2.273	899.885	0	1.503	1079.142
STMHXXX025	100yr-24hr	STMHXXX025	0.212	6681.71	1684.824	2.84	900.452	3823.2	2.07	4048.783
STMHXXX026	5yr-4hr	STMHXXX026	0.002	1.22	2.372	1.944	901.606	0	1.564	305.967
STMHXXX026	100yr-24hr	STMHXXX026	0	1.22	2.776	2.275	901.937	0	1.895	913.25
STMHXXX027	5yr-4hr	STMHXXX027	0.102	5073.65	74.741	0.91	905.566	118.8	0.672	276.133
STMHXXX027	100yr-24hr	STMHXXX027	0.004	5159.44	160.535	0.926	905.582	251.4	0.688	462.483
STMHXXX028	5yr-4hr	STMHXXX028	0.333	5131.21	131.851	0.55	905.632	268	0.35	268.767
STMHXXX028	100yr-24hr	STMHXXX028	0.057	5046.53	47.174	0.534	905.616	435.2	0.334	442.4
STMHXXX035	5yr-4hr	STMHXXX035	0.01	1975.1	860.657	1.455	903.993	271.2	0.78	271.217
STMHXXX035	100yr-24hr	STMHXXX035	0.005	2620.29	1364.235	1.675	904.213	699.3	1	699.233
STMHXXX037	5yr-4hr	STMHXXX037	0.413	5589.7	1260.524	0.228	903.478	0	0	0

STMHXXX037	100yr-24hr	STMHXXX037	0.194	5837.08	4047.316	0.716	903.966	0	0	0

PRE-DEVELOPMENT – HYDRAULIC LINK INPUT

Name	Storm	Upstream Node Name	Downstream Node Name	Downstream Crown Elevation m	Upstream Crown Elevation m	Conduit Design Option	Shape	Bottom Width m	Diameter (Height) m	Length m	Conduit Slope	Roughness	Downstream Invert Elevation m	Upstream Invert Elevation m
Link756	5yr-4hr	CBXXX025	Dummy 1	899.434	899.434	Circular	Circular	0	0.25	16.975	0	0.013	899.184	899.184
Link756	100yr-24hr	CBXXX025	Dummy 1	899.434	899.434	Circular	Circular	0	0.25	16.975	0	0.013	899.184	899.184
Link791	5yr-4hr	Node1128	Node1127	900.925	901.008	Circular	Circular	0	1	16.65	0.5	0.025	899.925	900.008
Link791	100yr-24hr	Node1128	Node1127	900.925	901.008	Circular	Circular	0	1	16.65	0.5	0.025	899.925	900.008
Link792	5yr-4hr	Node1127	Node1130	900.389	900.425	Circular	Trapezoidal	1	0.5	7.24	0.5	0.025	899.889	899.925
Link792	100yr-24hr	Node1127	Node1130	900.389	900.425	Circular	Trapezoidal	1	0.5	7.24	0.5	0.025	899.889	899.925
Link793	5yr-4hr	Node1130	Node1129	900.32	900.389	Circular	Circular	0	0.5	13.77	0.5	0.013	899.82	899.889
Link793	100yr-24hr	Node1130	Node1129	900.32	900.389	Circular	Circular	0	0.5	13.77	0.5	0.013	899.82	899.889
Link795	5yr-4hr	Node1126	Node1125	899.949	900.059	Circular	Circular	0	0.5	22.02	0.5	0.013	899.449	899.559
Link795	100yr-24hr	Node1126	Node1125	899.949	900.059	Circular	Circular	0	0.5	22.02	0.5	0.013	899.449	899.559
Link797	5yr-4hr	Node1124	Node1123	899.579	899.66	Circular	Circular	0	0.5	16.1	0.5	0.013	899.079	899.16
Link797	100yr-24hr	Node1124	Node1123	899.579	899.66	Circular	Circular	0	0.5	16.1	0.5	0.013	899.079	899.16
Link799	5yr-4hr	Node1122	Node1121	898.78	898.864	Circular	Circular	0	0.5	16.75	0.5	0.013	898.28	898.364
Link799	100yr-24hr	Node1122	Node1121	898.78	898.864	Circular	Circular	0	0.5	16.75	0.5	0.013	898.28	898.364
STL3A001	5yr-4hr	STMHRG002	STMH3A001	895.281	896.476	Circular	Circular	0	0.6	38.989	3.065	0.024	894.681	895.876
STL3A001	100yr-24hr	STMHRG002	STMH3A001	895.281	896.476	Circular	Circular	0	0.6	38.989	3.065	0.024	894.681	895.876
STL4N001	5yr-4hr	STMH4N001	STMHCC009	904.328	904.93	Circular	Circular	0	0.3	134.093	0.449	0.011	904.028	904.63
STL4N001	100yr-24hr	STMH4N001	STMHCC009	904.328	904.93	Circular	Circular	0	0.3	134.093	0.449	0.011	904.028	904.63
STL4N003	5yr-4hr	STMH4S001	STMHJM001	903.199	903.748	Circular	Circular	0	0.375	58.917	0.932	0.013	902.824	903.373
STL4N003	100yr-24hr	STMH4S001	STMHJM001	903.199	903.748	Circular	Circular	0	0.375	58.917	0.932	0.013	902.824	903.373
STL4S001	5yr-4hr	STMHJM001	CBXXX027	903.032	903.448	Circular	Circular	0	0.25	53.597	0.776	0.013	902.782	903.198
STL4S001	100yr-24hr	STMHJM001	CBXXX027	903.032	903.448	Circular	Circular	0	0.25	53.597	0.776	0.013	902.782	903.198
STL5S001	5yr-4hr	Node228	STMHXXX010	900.195	902.524	Circular	Circular	0	0.45	100.916	2.308	0.013	899.745	902.074
STL5S001	100yr-24hr	Node228	STMHXXX010	900.195	902.524	Circular	Circular	0	0.45	100.916	2.308	0.013	899.745	902.074
STL5S001A	5yr-4hr	CBXXX026	Node228	902.474	903.215	Circular	Circular	0	0.4	32.101	2.308	0.013	902.074	902.815
STL5S001A	100yr-24hr	CBXXX026	Node228	902.474	903.215	Circular	Circular	0	0.4	32.101	2.308	0.013	902.074	902.815
STL5S001AA	5yr-4hr	CBXXX027	CBXXX026	903.102	903.485	Circular	Circular	0	0.25	11.994	3.193	0.013	902.852	903.235
STL5S001AA	100yr-24hr	CBXXX027	CBXXX026	903.102	903.485	Circular	Circular	0	0.25	11.994	3.193	0.013	902.852	903.235
STL5S002	5yr-4hr	STMHXXX026	STMHXXX011	899.745	899.962	Circular	Circular	0	0.3	59.585	0.364	0.013	899.445	899.662
STL5S002	100yr-24hr	STMHXXX026	STMHXXX011	899.745	899.962	Circular	Circular	0	0.3	59.585	0.364	0.013	899.445	899.662
STL5S003	5yr-4hr	STMH5S003	STMHXXX026	900.042	900.273	Circular	Circular	0	0.375	63.774	0.362	0.013	899.667	899.898
STL5S003	100yr-24hr	STMH5S003	STMHXXX026	900.042	900.273	Circular	Circular	0	0.375	63.774	0.362	0.013	899.667	899.898
STL5S004	5yr-4hr	STMH5S002	STMH5S003	900.178	900.638	Circular	Circular	0	0.3	66.241	0.694	0.013	899.878	900.338
STL5S004	100yr-24hr	STMH5S002	STMH5S003	900.178	900.638	Circular	Circular	0	0.3	66.241	0.694	0.013	899.878	900.338
STL6N006	5yr-4hr	STMH6N001	STMHCC005	902.346	902.531	Circular	Circular	0	0.675	44.995	0.411	0.013	901.671	901.856
STL6N006	100yr-24hr	STMH6N001	STMHCC005	902.346	902.531	Circular	Circular	0	0.675	44.995	0.411	0.013	901.671	901.856
STL6N007	5yr-4hr	STMHCC005	STMHCC011	902.36	902.496	Circular	Circular	0	0.75	13.705	0.992	0.013	901.61	901.746
STL6N007	100yr-24hr	STMHCC005	STMHCC011	902.36	902.496	Circular	Circular	0	0.75	13.705	0.992	0.013	901.61	901.746
STL6N008	5yr-4hr	STMHCC011	STMHHW004	900.711	901.85	Circular	Circular	0	0.75	92.882	1.226	0.013	899.961	901.1
STL6N008	100yr-24hr	STMHCC011	STMHHW004	900.711	901.85	Circular	Circular	0	0.75	92.882	1.226	0.013	899.961	901.1
STL6S002	5yr-4hr	STMH6S004	STMH6S003	900.582	901.386	Circular	Circular	0	0.2	40.534	1.984	0.013	900.382	901.186
STL6S002	100yr-24hr	STMH6S004	STMH6S003	900.582	901.386	Circular	Circular	0	0.2	40.534	1.984	0.013	900.382	901.186
STL7N001	5yr-4hr	STMH7N004	STMH7N003	904.703	905.017	Circular	Circular	0	0.6	52.294	0.6	0.013	904.103	904.417
STL7N001	100yr-24hr	STMH7N004	STMH7N003	904.703	905.017	Circular	Circular	0	0.6	52.294	0.6	0.013	904.103	904.417
STL7N002	5yr-4hr	STMH7N001	STMH7N005	903.381	903.405	Circular	Circular	0	0.675	4.704	0.51	0.013	902.706	902.73
STL7N002	100yr-24hr	STMH7N001	STMH7N005	903.381	903.405	Circular	Circular	0	0.675	4.704	0.51	0.013	902.706	902.73
STL7N003	5yr-4hr	STMH7N002	STMH7N005	902.931	904.061	Circular	Circular	0	0.3	35.724	3.163	0.013	902.631	903.761
STL7N003	100yr-24hr	STMH7N002	STMH7N005	902.931	904.061	Circular	Circular	0	0.3	35.724	3.163	0.013	902.631	903.761
STL7N004	5yr-4hr	STMHGB001	STMH7N001	903.405	903.623	Circular	Circular	0	0.675	49.197	0.443	0.013	902.73	902.948
STL7N004	100yr-24hr	STMHGB001	STMH7N001	903.405	903.623	Circular	Circular	0	0.675	49.197	0.443	0.013	902.73	902.948
STL7N005	5yr-4hr	STMH7N006	STMHCC004	903.279	903.549	Circular	Circular	0	0.375	59.367	0.455	0.013	902.904	903.174
STL7N005	100yr-24hr	STMH7N006	STMHCC004	903.279	903.549	Circular	Circular	0	0.375	59.367	0.455	0.013	902.904	903.174
STL8N001	5yr-4hr	STMH8N002	STMH8N003	904.749	904.846	Circular	Circular	0	0.6	35.772	0.271	0.013	904.149	904.246
STL8N001	100yr-24hr	STMH8N002	STMH8N003	904.749	904.846	Circular	Circular	0	0.6	35.772	0.271	0.013	904.149	904.246
STL8N002	5yr-4hr	STMH8N001	STMH8N002	904.901	905.181	Circular	Circular	0	0.45	9.53	2.938	0.013	904.451	904.731
STL8N002	100yr-24hr	STMH8N001	STMH8N002	904.901	905.181	Circular	Circular	0	0.45	9.53	2.938	0.013	904.451	904.731
STL9S001	5yr-4hr	STMHGB003	STMH9N001	904.696	905.002	Circular	Circular	0	0.3	103.439	0.296	0.011	904.396	904.702
STL9S001	100yr-24hr	STMHGB003	STMH9N001	904.696	905.002	Circular	Circular	0	0.3	103.439	0.296	0.011	904.396	904.702
STL9S002	5yr-4hr	STMH9N001	STMH9N002	904.315	904.746	Circular	Circular	0	0.375	107.863	0.4	0.011	903.94	904.371
STL9S002	100yr-24hr	STMH9N001	STMH9N002	904.315	904.746	Circular	Circular	0	0.375	107.863	0.4	0.011	903.94	904.371
STLCC002	5yr-4hr	STMHCC010	STMHCC002	903.353	903.391	Circular	Circular	0	0.3	57.919	0.066	0.013	903.053	903.091
STLCC002	100yr-24hr	STMHCC010	STMHCC002	903.353	903.391	Circular	Circular	0	0.3	57.919	0.066	0.013	903.053	903.091
STLCC003	5yr-4hr	STMHCC002	STMHCC003	903.373	903.373	Circular	Circular	0	0.3	64.717	0	0.013	903.073	903.073
STLCC003	100yr-24hr	STMHCC002	STMHCC003	903.373	903.373	Circular	Circular	0	0.3	64.717	0	0.013	903.073	903.073
STLCC004	5yr-4hr	STMHCC003	STMHCC004	903.084	903.398	Circular	Circular	0	0.375	77.557	0.405	0.013	902.709	903.023
STLCC004	100yr-24hr	STMHCC003	STMHCC004	903.084	903.398	Circular	Circular	0	0.375	77.557	0.405	0.013	902.709	903.023
STLCC006	5yr-4hr	STMHCC004	STMHCC005	902.226	903.224	Circular	Circular	0	0.45	183.378	0.54	0.013	901.776	902.774
STLCC006	100yr-24hr	STMHCC004	STMHCC005	902.226	903.224	Circular	Circular	0	0.45	183.378	0.54	0.013	901.776	902.774
STLCC007	5yr-4hr	STMHCC006	STMHCC005	902.126	902.719	Circular	Circular	0	0.45	125.422	0.473	0.013	901.676	902.269
STLCC007	100yr-24hr	STMHCC006	STMHCC005	902.126	902.719	Circular	Circular	0	0.45	125.422	0.473	0.013	901.676	902.269
STLCC009	5yr-4hr	STMHCC007	STMHCC006	902.689	903.047	Circular	Circular	0	0.375	48.471	0.739	0.013	902.314	902.672
STLCC009	100yr-24hr	STMHCC007	STMHCC006	902.689	903.047	Circular	Circular	0	0.375	48.471	0.739	0.013	902.314	902.672
STLCC010	5yr-4hr	STMHCC008	STMHCC007	903.062	904.298	Circular	Circular	0	0.375	124.945	0.989	0.013	902.687	903.923
STLCC010	100yr-24hr	STMHCC008	STMHCC007	903.062	904.298	Circular	Circular	0	0.375	124.945	0.989	0.013	902.687	903.923
STLCC011	5yr-4hr	STMHCC009	STMHCC008	904.233	904.268	Circular	Circular	0	0.25	10.661	0.328	0.013	903.983	904.018
STLCC011	100yr-24hr	STMHCC009	STMHCC008	904.233	904.268	Circular	Circular	0	0.25	10.661	0.328	0.013	903.983	904.018
STLGB002	5yr-4hr	STMHGB002	STMHGB001	903.676	903.75	Circular	Circular	0	0.675	41.767	0.177	0.013	903.001	903.075
STLGB002	100yr-24hr	STMHGB002	STMHGB001	903.676	903.75	Circular	Circular	0	0.675	41.767	0.177	0.013	903.001	903.075
STLHW001	5yr-4hr	STMHHW001	STMHHW002	902.702	902.915	Circular	Circular	0	0.6	79.316	0.269	0.013	902.102	902.315
STLHW001	100yr-24hr	STMHHW001	STMHHW002	902.702	902.915	Circular	Circular	0	0.6	79.316	0.269	0.013	902.102	902.315
STLHW002	5yr-4hr	STMHHW002	STMHHW003	902.13	902.505	Circular	Circular	0	0.45	118.529	0.32	0.013	901.68	902.055
STLHW002	100yr-24hr	STMHHW002	STMHHW003	902.13	902.505	Circular	Circular	0	0.45	118.529	0.32	0.013	901.68	902.055
STLHW003	5yr-4hr	STMHHW003	STMHHW004	901.501	902.05	Circular	Circular	0	0.4	134.679	0.408	0.013	901.101	901.65
STLHW003	100yr-24hr	STMHHW003	STMHHW004	901.501	902.05	Circular	Circular	0	0.4	134.679	0.408	0.013	901.101	901.65
STLHW004	5yr-4hr	STMHHW005	STMHHW004	902.281	903.215	Circular	Circular	0	0.6	132.965	0.702	0.011	901.681	902.615
STLHW004	100yr-24hr	STMHHW005	STMHHW004	902.281	903.215	Circular	Circular	0	0.6	132.965	0.702	0.011	901.681	902.615
STLHW005	5yr-4hr	STMHHW006	STMHHW005	903.455	904.231	Circular	Circular	0	0.45	86.751	0.895	0.013	903.005	903.781
STLHW005	100yr-24hr	STMHHW006	STMHHW005	903.455	904.231	Circular	Circular	0	0.45	86.751	0.895	0.013	903.005	903.781
STLHW006	5yr-4hr	STMHHW007	STMHHW006	904.736	904.972	Circular	Circular	0	0.375	23.543	1.002	0.013	904.361	904.597
STLHW006	100yr-24hr	STMHHW007	STMHHW006	904.736	904.972	Circular	Circular	0	0.375	23.543	1.002	0.013	904.361	904.597
STLHW007	5yr-4hr	STMHHW008	STMHHW007	904.972	906.576	Circular	Circular	0	0.375	108.055	1.484	0.013	904.597	906.201
STLHW007	100yr-24hr	STMHHW008	STMHHW007	904.972	906.576	Circular	Circular	0	0.375	108.055	1.484	0.013	904.597	906.201
STLHW008	5yr-4hr	STMHHW009	STMHHW008	906.501	907.253	Circular	Circular	0	0.3	76.568	0.982	0.013	906.201	906.953
STLHW008	100yr-24hr	STMHHW009	STMHHW008	906.501	907.253	Circular	Circular	0	0.3	76.568	0.982	0.013	906.201	906.953

STLHW009	5yr-4hr	STMHHW010	STMHHW009	907.253	908.058	Circular	Circular	0	0.3	82.485	0.976	0.013	906.953	907.758
STLHW009	100yr-24hr	STMHHW010	STMHHW009	907.253	908.058	Circular	Circular	0	0.3	82.485	0.976	0.013	906.953	907.758
STLJM002	5yr-4hr	Node227	STMH4S001	903.843	905.087	Circular	Circular	0	0.3	71.331	1.744	0.013	903.543	904.787
STLJM002	100yr-24hr	Node227	STMH4S001	903.843	905.087	Circular	Circular	0	0.3	71.331	1.744	0.013	903.543	904.787
STLJM002A	5yr-4hr	STMH3N001	Node227	904.987	905.949	Circular	Circular	0	0.2	55.197	1.743	0.013	904.787	905.749
STLJM002A	100yr-24hr	STMH3N001	Node227	904.987	905.949	Circular	Circular	0	0.2	55.197	1.743	0.013	904.787	905.749
STLMP004	5yr-4hr	STMH6S003	STMHMC003	900.142	900.457	Circular	Circular	0	0.6	63.889	0.493	0.011	899.542	899.857
STLMP004	100yr-24hr	STMH6S003	STMHMC003	900.142	900.457	Circular	Circular	0	0.6	63.889	0.493	0.011	899.542	899.857
STLMP005	5yr-4hr	STMHMC003	STMHMC002	899.911	900.097	Circular	Circular	0	0.6	59.044	0.315	0.011	899.311	899.497
STLMP005	100yr-24hr	STMHMC003	STMHMC002	899.911	900.097	Circular	Circular	0	0.6	59.044	0.315	0.011	899.311	899.497
STLMP006	5yr-4hr	STMHMC002	STMHMC001	899.835	899.871	Circular	Circular	0	0.6	8.497	0.424	0.011	899.235	899.271
STLMP006	100yr-24hr	STMHMC002	STMHMC001	899.835	899.871	Circular	Circular	0	0.6	8.497	0.424	0.011	899.235	899.271
STLPR001	5yr-4hr	STMHPR001	STMHCC001	903.413	903.498	Circular	Circular	0	0.3	38.938	0.218	0.011	903.113	903.198
STLPR001	100yr-24hr	STMHPR001	STMHCC001	903.413	903.498	Circular	Circular	0	0.3	38.938	0.218	0.011	903.113	903.198
STLRW002	5yr-4hr	STMH7N003	STMHRW001	904.48	904.688	Circular	Circular	0	0.6	53.588	0.388	0.013	903.88	904.088
STLRW002	100yr-24hr	STMH7N003	STMHRW001	904.48	904.688	Circular	Circular	0	0.6	53.588	0.388	0.013	903.88	904.088
STLURW01A	5yr-4hr	Node1109	STMHXXX006	899.05	899.6	Circular	Circular	0	0.6	45.832	1.2	0.011	898.45	899
STLURW01A	100yr-24hr	Node1109	STMHXXX006	899.05	899.6	Circular	Circular	0	0.6	45.832	1.2	0.011	898.45	899
STLURW01AA	5yr-4hr	STMHXXX005	Node1109	899.661	899.761	Circular	Circular	0	0.6	2.559	3.908	0.011	899.061	899.161
STLURW01AA	100yr-24hr	STMHXXX005	Node1109	899.661	899.761	Circular	Circular	0	0.6	2.559	3.908	0.011	899.061	899.161
STLURW02	5yr-4hr	STMHXXX006	STMHXXX007	899.024	899.418	Circular	Circular	0	0.6	74.671	0.528	0.011	898.424	898.818
STLURW02	100yr-24hr	STMHXXX006	STMHXXX007	899.024	899.418	Circular	Circular	0	0.6	74.671	0.528	0.011	898.424	898.818
STLURW03	5yr-4hr	STMHXXX007	STMHXXX008	898.755	898.999	Circular	Circular	0	0.6	73.12	0.334	0.011	898.155	898.399
STLURW03	100yr-24hr	STMHXXX007	STMHXXX008	898.755	898.999	Circular	Circular	0	0.6	73.12	0.334	0.011	898.155	898.399
STLWL001	5yr-4hr	Node214	STMH8N001	904.321	904.892	Circular	Circular	0	0.6	8.963	6.371	0.013	903.721	904.292
STLWL001	100yr-24hr	Node214	STMH8N001	904.321	904.892	Circular	Circular	0	0.6	8.963	6.371	0.013	903.721	904.292
STLXXX005	5yr-4hr	STMHHW004	STMHXXX010	900.741	900.127	Circular	Circular	0	0.75	99.749	-0.616	0.013	899.991	899.377
STLXXX005	100yr-24hr	STMHHW004	STMHXXX010	900.741	900.127	Circular	Circular	0	0.75	99.749	-0.616	0.013	899.991	899.377
STLXXX006	5yr-4hr	STMHXXX010	STMHXXX011	899.622	899.605	Circular	Circular	0	0.75	39.914	-0.043	0.013	898.872	898.855
STLXXX006	100yr-24hr	STMHXXX010	STMHXXX011	899.622	899.605	Circular	Circular	0	0.75	39.914	-0.043	0.013	898.872	898.855
STLXXX08	5yr-4hr	MHXXX012A	STMHXXX013	894.13	895.849	Circular	Circular	0	0.9	65.608	2.62	0.024	893.23	894.949
STLXXX08	100yr-24hr	MHXXX012A	STMHXXX013	894.13	895.849	Circular	Circular	0	0.9	65.608	2.62	0.024	893.23	894.949
STLXXX09	5yr-4hr	STMHXXX013	STMHXXX014	892.39	894.115	Circular	Circular	0	0.9	127.292	1.355	0.024	891.49	893.215
STLXXX09	100yr-24hr	STMHXXX013	STMHXXX014	892.39	894.115	Circular	Circular	0	0.9	127.292	1.355	0.024	891.49	893.215
STLXXX10	5yr-4hr	STMHXXX014	Node1117	892.34	892.34	Circular	Circular	0	0.9	151	0	0.024	891.44	891.44
STLXXX10	100yr-24hr	STMHXXX014	Node1117	892.34	892.34	Circular	Circular	0	0.9	151	0	0.024	891.44	891.44
STLXXX103	5yr-4hr	STMH9N002	STMHXXX037	904.232	904.305	Circular	Circular	0	0.375	59.275	0.123	0.011	903.857	903.93
STLXXX103	100yr-24hr	STMH9N002	STMHXXX037	904.232	904.305	Circular	Circular	0	0.375	59.275	0.123	0.011	903.857	903.93
STLXXX120	5yr-4hr	STMH8N004	Node214	904.707	904.763	Circular	Circular	0	0.4	7.734	0.724	0.013	904.307	904.363
STLXXX120	100yr-24hr	STMH8N004	Node214	904.707	904.763	Circular	Circular	0	0.4	7.734	0.724	0.013	904.307	904.363
STLXXX121	5yr-4hr	STMHXXX027	STMH8N004	904.688	904.856	Circular	Circular	0	0.2	65.72	0.256	0.013	904.488	904.656
STLXXX121	100yr-24hr	STMHXXX027	STMH8N004	904.688	904.856	Circular	Circular	0	0.2	65.72	0.256	0.013	904.488	904.656
STLXXX123	5yr-4hr	CBXXX038	STMHXXX027	904.894	905.224	Circular	Circular	0	0.2	55.038	0.6	0.013	904.694	905.024
STLXXX123	100yr-24hr	CBXXX038	STMHXXX027	904.894	905.224	Circular	Circular	0	0.2	55.038	0.6	0.013	904.694	905.024
STLXXX124	5yr-4hr	STMHXXX028	CBXXX038	905.161	905.282	Circular	Circular	0	0.2	29.99	0.403	0.013	904.961	905.082
STLXXX124	100yr-24hr	STMHXXX028	CBXXX038	905.161	905.282	Circular	Circular	0	0.2	29.99	0.403	0.013	904.961	905.082
STLXXX13	5yr-4hr	STMHRG001	STMHXXX014	892.82	899.878	Circular	Circular	0	0.35	100.44	7.027	0.013	892.47	899.528
STLXXX13	100yr-24hr	STMHRG001	STMHXXX014	892.82	899.878	Circular	Circular	0	0.35	100.44	7.027	0.013	892.47	899.528
STLXXX14	5yr-4hr	STMHXXX011	MHXXX011A	898.972	899.655	Circular	Circular	0	0.9	25.524	2.674	0.024	898.072	898.755
STLXXX14	100yr-24hr	STMHXXX011	MHXXX011A	898.972	899.655	Circular	Circular	0	0.9	25.524	2.674	0.024	898.072	898.755
STLXXX142	5yr-4hr	STMHCC001	STMHCC010	903.446	903.413	Circular	Circular	0	0.3	9.636	-0.342	0.011	903.146	903.113
STLXXX142	100yr-24hr	STMHCC001	STMHCC010	903.446	903.413	Circular	Circular	0	0.3	9.636	-0.342	0.011	903.146	903.113
STLXXX14A	5yr-4hr	MHXXX011A	STMHXXX012	897.102	898.972	Circular	Circular	0	0.9	69.954	2.674	0.024	896.202	898.072
STLXXX14A	100yr-24hr	MHXXX011A	STMHXXX012	897.102	898.972	Circular	Circular	0	0.9	69.954	2.674	0.024	896.202	898.072
STLXXX15	5yr-4hr	STMHXXX012	MHXXX012A	895.849	897.102	Circular	Circular	0	0.9	49.537	2.53	0.024	894.949	896.202
STLXXX15	100yr-24hr	STMHXXX012	MHXXX012A	895.849	897.102	Circular	Circular	0	0.9	49.537	2.53	0.024	894.949	896.202
STLXXX152	5yr-4hr	Node1118	STMHCC006	902.792	902.792	Circular	Circular	0	0.2	10.666	0	0.013	902.592	902.592
STLXXX152	100yr-24hr	Node1118	STMHCC006	902.792	902.792	Circular	Circular	0	0.2	10.666	0	0.013	902.592	902.592
STLXXX16	5yr-4hr	STMH5S001	STMHXXX008	900.525	901.026	Circular	Circular	0	0.45	114.322	0.438	0.011	900.075	900.576
STLXXX16	100yr-24hr	STMH5S001	STMHXXX008	900.525	901.026	Circular	Circular	0	0.45	114.322	0.438	0.011	900.075	900.576
STLXXX17	5yr-4hr	STMHXXX008	STMHXXX009	898.467	898.895	Circular	Circular	0	0.75	90.818	0.471	0.013	897.717	898.145
STLXXX17	100yr-24hr	STMHXXX008	STMHXXX009	898.467	898.895	Circular	Circular	0	0.75	90.818	0.471	0.013	897.717	898.145
STLXXX18	5yr-4hr	STMHXXX009	STMHXXX025	898.382	898.557	Circular	Circular	0	0.75	35.694	0.49	0.013	897.632	897.807
STLXXX18	100yr-24hr	STMHXXX009	STMHXXX025	898.382	898.557	Circular	Circular	0	0.75	35.694	0.49	0.013	897.632	897.807
STLXXX187	5yr-4hr	Node1120	STMHPR001	903.498	903.9	Circular	Circular	0	0.3	79.309	0.507	0.011	903.198	903.6
STLXXX187	100yr-24hr	Node1120	STMHPR001	903.498	903.9	Circular	Circular	0	0.3	79.309	0.507	0.011	903.198	903.6
STLXXX18A	5yr-4hr	STMHXXX025	CB3A002W	897.758	898.362	Circular	Circular	0	0.75	125.404	0.482	0.013	897.008	897.612
STLXXX18A	100yr-24hr	STMHXXX025	CB3A002W	897.758	898.362	Circular	Circular	0	0.75	125.404	0.482	0.013	897.008	897.612
STLXXX18AA	5yr-4hr	CB3A002W	STMH3A002	897.799	897.808	Circular	Circular	0	0.8	6.147	0.146	0.013	896.999	897.008
STLXXX18AA	100yr-24hr	CB3A002W	STMH3A002	897.799	897.808	Circular	Circular	0	0.8	6.147	0.146	0.013	896.999	897.008
STLXXX19	5yr-4hr	STMH3A002	STMH3A003	897.79	897.059	Circular	Circular	0	0.2	12.488	-5.854	0.013	897.59	896.859
STLXXX19	100yr-24hr	STMH3A002	STMH3A003	897.79	897.059	Circular	Circular	0	0.2	12.488	-5.854	0.013	897.59	896.859
STLXXX191	5yr-4hr	Node1121	STMHRG002	898.493	899.28	Circular	Trapezoidal	1	1	157.49	0.5	0.025	897.493	898.28
STLXXX191	100yr-24hr	Node1121	STMHRG002	898.493	899.28	Circular	Trapezoidal	1	1	157.49	0.5	0.025	897.493	898.28
STLXXX192	5yr-4hr	Node1123	Node1122	899.364	900.079	Circular	Trapezoidal	1	1	142.95	0.5	0.025	898.364	899.079
STLXXX192	100yr-24hr	Node1123	Node1122	899.364	900.079	Circular	Trapezoidal	1	1	142.95	0.5	0.025	898.364	899.079
STLXXX193	5yr-4hr	Node1125	Node1124	900.16	900.449	Circular	Trapezoidal	1	1	57.86	0.5	0.025	899.16	899.449
STLXXX193	100yr-24hr	Node1125	Node1124	900.16	900.449	Circular	Trapezoidal	1	1	57.86	0.5	0.025	899.16	899.449
STLXXX194	5yr-4hr	Node1129	Node1126	900.559	900.82	Circular	Trapezoidal	1	1	52.12	0.5	0.025	899.559	899.82
STLXXX194	100yr-24hr	Node1129	Node1126	900.559	900.82	Circular	Trapezoidal	1	1	52.12	0.5	0.025	899.559	899.82
STLXXX20	5yr-4hr	STMH3A003	STMHXXX016	894.112	898.303	Circular	Circular	0	0.75	55.579	7.541	0.013	893.362	897.553
STLXXX20	100yr-24hr	STMH3A003	STMHXXX016	894.112	898.303	Circular	Circular	0	0.75	55.579	7.541	0.013	893.362	897.553
STLXXX21	5yr-4hr	STMHMC001	STMHXXX005	899.681	899.805	Circular	Circular	0	0.6	49.084	0.253	0.011	899.081	899.205
STLXXX21	100yr-24hr	STMHMC001	STMHXXX005	899.681	899.805	Circular	Circular	0	0.6	49.084	0.253	0.011	899.081	899.205
STLXXX30	5yr-4hr	STMHRW001	STMHXXX002	904.116	904.31	Circular	Circular	0	0.45	47.696	0.407	0.013	903.666	903.86
STLXXX30	100yr-24hr	STMHRW001	STMHXXX002	904.116	904.31	Circular	Circular	0	0.45	47.696	0.407	0.013	903.666	903.86
STLXXX31	5yr-4hr	STMHXXX002	STMHGB002	903.71	904.261	Circular	Circular	0	0.6	146.923	0.375	0.013	903.11	903.661
STLXXX31	100yr-24hr	STMHXXX002	STMHGB002	903.71	904.261	Circular	Circular	0	0.6	146.923	0.375	0.013	903.11	903.661
STLXXX32	5yr-4hr	STMH8N003	STMHXXX001	904.419	904.391	Circular	Circular	0	0.45	40.874	-0.069	0.013	903.969	903.941
STLXXX32	100yr-24hr	STMH8N003	STMHXXX001	904.419	904.391	Circular	Circular	0	0.45	40.874	-0.069	0.013	903.969	903.941
STLXXX33	5yr-4hr	STMHXXX001	STMHXXX002	904.083	904.431	Circular	Circular	0	0.5	91.744	0.379	0.013	903.583	903.931
STLXXX33	100yr-24hr	STMHXXX001	STMHXXX002	904.083	904.431	Circular	Circular	0	0.5	91.744	0.379	0.013	903.583	903.931
STLXXX34	5yr-4hr	STMH7N005	STMH7N001B	903.312	903.374	Circular	Circular	0	0.675	25.906	0.239	0.013	902.637	902.699
STLXXX34	100yr-24hr	STMH7N005	STMH7N001B	903.312	903.374	Circular	Circular	0	0.675	25.906	0.239	0.013	902.637	902.699
STLXXX34A	5yr-4hr	STMH7N001B	STMHXXX035	903.213	903.312	Circular	Circular	0	0.675	41.433	0.239	0.013	902.538	902.637
STLXXX34A	100yr-24hr	STMH7N001B	STMHXXX035	903.213	903.312	Circular	Circular	0	0.675	41.433	0.239	0.013	902.538	902.637
STLXXX34B	5yr-4hr	STMHXXX003	STMHXXX035	903.213	903.374	Circular	Circular	0	0.675	76.677	0.21	0.013	902.538	902.699
STLXXX34B	100yr-24hr	STMHXXX003	STMHXXX035	903.213	903.374	Circular	Circular	0	0.675	76.677	0.21	0.013	902.538	902.699
STLXXX35	5yr-4hr	STMH6N001	STMHXXX003	902.275	902.415	Circular	Circular	0	0.675	29.622	0.473	0.013	901.6	901.74

STLXXX35	100yr-24hr	STMH6N001	STMHXXX003	902.275	902.415	Circular	Circular	0	0.675	29.622	0.473	0.013	901.6	901.74
STLXXX36	5yr-4hr	STMH6S002	STMH6S003	900.212	900.31	Circular	Circular	0	0.3	48.354	0.203	0.013	899.912	900.01
STLXXX36	100yr-24hr	STMH6S002	STMH6S003	900.212	900.31	Circular	Circular	0	0.3	48.354	0.203	0.013	899.912	900.01
STLXXX37	5yr-4hr	STMH6S001	STMH6S002	900.585	900.72	Circular	Circular	0	0.6	46.033	0.293	0.013	899.985	900.12
STLXXX37	100yr-24hr	STMH6S001	STMH6S002	900.585	900.72	Circular	Circular	0	0.6	46.033	0.293	0.013	899.985	900.12
STLXXX38	5yr-4hr	STMHXXX004	STMH6S002	900.45	900.638	Circular	Circular	0	0.3	62.85	0.299	0.013	900.15	900.338
STLXXX38	100yr-24hr	STMHXXX004	STMH6S002	900.45	900.638	Circular	Circular	0	0.3	62.85	0.299	0.013	900.15	900.338
STLXXX43	5yr-4hr	STMHNS001	STMHNA005	906.283	907.283	Circular	Circular	0	0.3	116.096	0.861	0.011	905.983	906.983
STLXXX43	100yr-24hr	STMHNS001	STMHNA005	906.283	907.283	Circular	Circular	0	0.3	116.096	0.861	0.011	905.983	906.983
STLXXX44	5yr-4hr	STMHNA005	STMHNA004	905.863	906.303	Circular	Circular	0	0.3	82.751	0.532	0.011	905.563	906.003
STLXXX44	100yr-24hr	STMHNA005	STMHNA004	905.863	906.303	Circular	Circular	0	0.3	82.751	0.532	0.011	905.563	906.003
STLXXX45	5yr-4hr	STMHNA004	STMHNA003	905.18	905.833	Circular	Circular	0	0.3	132.466	0.493	0.011	904.88	905.533
STLXXX45	100yr-24hr	STMHNA004	STMHNA003	905.18	905.833	Circular	Circular	0	0.3	132.466	0.493	0.011	904.88	905.533
STLXXX48	5yr-4hr	STMHNA003	STMHNA002	904.955	905.273	Circular	Circular	0	0.375	61.55	0.517	0.011	904.58	904.898
STLXXX48	100yr-24hr	STMHNA003	STMHNA002	904.955	905.273	Circular	Circular	0	0.375	61.55	0.517	0.011	904.58	904.898
STLXXX49	5yr-4hr	STMHNA001	STMHNA002	904.95	905.171	Circular	Circular	0	0.375	48.066	0.46	0.011	904.575	904.796
STLXXX49	100yr-24hr	STMHNA001	STMHNA002	904.95	905.171	Circular	Circular	0	0.375	48.066	0.46	0.011	904.575	904.796
STLXXX51	5yr-4hr	STMHNA002	STMH7N004	904.924	905.107	Circular	Circular	0	0.6	53.092	0.345	0.011	904.324	904.507
STLXXX51	100yr-24hr	STMHNA002	STMH7N004	904.924	905.107	Circular	Circular	0	0.6	53.092	0.345	0.011	904.324	904.507
STLXXX69	5yr-4hr	STMH3A001	Node213	895.231	895.231	Circular	Circular	0	0.6	97.815	0	0.024	894.631	894.631
STLXXX69	100yr-24hr	STMH3A001	Node213	895.231	895.231	Circular	Circular	0	0.6	97.815	0	0.024	894.631	894.631
W-1	5yr-4hr	STMHXXX037	Node1120											
W-1	100yr-24hr													

PRE-DEVELOPMENT – HYDRAULIC LINK OUTPUT

Name	Storm	Link Name	Upstream Node Name	Downstream Node Name	Inlet Control	Outlet Control	Design Full Flow cms	Design Velocity m/s	Max Depth m	Max Flow cms	Max Flow/Design Flow	Max Velocity m/s	Maximum Water Elevation	Maximum Water Elevation	Duration of Surcharged Flow min	Time to Peak hr
Link756	5yr-4hr	Link756	CBXXX025	Dummy 1	0	185	0	0.04	0.533	0.081	43.22	1.65	899.717	899.409	184.833	2.232
Link756	100yr-24hr	Link756	CBXXX025	Dummy 1	0	555	0	0.04	0.673	0.097	51.663	1.97	899.857	899.419	571.933	9.383
Link791	5yr-4hr	Link791	Node1128	Node1127	0	0	0.88	1.12	0.699	1.041	1.184	1.85	900.707	900.434	0	1.256
Link791	100yr-24hr	Link791	Node1128	Node1127	0	0	0.88	1.12	1	1.95	2.215	2.61	901.008	900.512	0	7.371
Link792	5yr-4hr	Link792	Node1127	Node1130	0	0	0.97	1.29	0.509	1.047	1.079	1.37	900.434	900.389	0	1.256
Link792	100yr-24hr	Link792	Node1127	Node1130	0	0	0.97	1.29	0.587	1.996	2.057	2.27	900.512	900.389	0	7.251
Link793	5yr-4hr	Link793	Node1130	Node1129	0	75	0.27	1.36	0.5	0.469	1.753	2.46	900.389	900.32	0.017	1.211
Link793	100yr-24hr	Link793	Node1130	Node1129	0	580	0.27	1.36	0.5	0.418	1.566	2.16	900.389	900.32	0.067	7.182
Link795	5yr-4hr	Link795	Node1126	Node1125	0	30	0.27	1.36	0.774	0.309	1.158	1.6	900.3	900.223	69.333	1.26
Link795	100yr-24hr	Link795	Node1126	Node1125	0	180	0.27	1.36	0.771	0.351	1.315	1.78	900.303	900.22	159.35	9.414
Link797	5yr-4hr	Link797	Node1124	Node1123	0	70	0.27	1.36	1	0.676	2.525	3.41	900.16	900.059	86.233	1.235
Link797	100yr-24hr	Link797	Node1124	Node1123	0	610	0.27	1.36	1	0.672	2.508	3.39	900.16	900.079	201.6	7.182
Link799	5yr-4hr	Link799	Node1122	Node1121	0	135	0.27	1.36	1.68	1.017	3.805	5.09	900.044	898.871	144.917	1.404
Link799	100yr-24hr	Link799	Node1122	Node1121	0	415	0.27	1.36	1.796	1.022	3.821	5.13	900.16	899.006	384.217	7.239
STL3A001	5yr-4hr	STL3A001	STMHRG002	STMH3A001	30	0	0.58	2.06	3.061	0.551	0.947	1.9	898.762	897.742	233.833	2.906
STL3A001	100yr-24hr	STL3A001	STMHRG002	STMH3A001	715	5	0.58	2.06	3.172	0.583	1.001	2.01	898.979	897.853	658.067	10.056
STL4N001	5yr-4hr	STL4N001	STMH4N001	STMHCC009	0	0	0.08	1.08	1.928	0.092	1.196	1.27	906.073	905.956	260	4.328
STL4N001	100yr-24hr	STL4N001	STMH4N001	STMHCC009	0	40	0.08	1.08	2.106	0.087	1.131	1.2	906.123	906.134	724.367	15.006
STL4N003	5yr-4hr	STL4N003	STMH4S001	STMHJM001	0	5	0.17	1.53	1.687	0.084	0.504	0.75	904.601	904.511	4293.021	7.979
STL4N003	100yr-24hr	STL4N003	STMH4S001	STMHJM001	0	75	0.17	1.53	1.881	0.071	0.417	0.63	904.789	904.705	4270.5	7.464
STL4S001	5yr-4hr	STL4S001	STMHJM001	CBXXX027	0	5	0.05	1.07	1.88E+00	0.087	1.657	1.73	9.05E+02	9.05E+02	4294.583	4.204
STL4S001	100yr-24hr	STL4S001	STMHJM001	CBXXX027	0	85	0.05	1.07	1.91E+00	0.094	1.791	1.86	9.05E+02	9.05E+02	4269.639	12.864
STL5S001	5yr-4hr	STL5S001	Node228	STMHXXX010	0	0	0.43	2.72	2.269	0.265	0.619	2.37	902.548	902.014	273.85	1.364
STL5S001	100yr-24hr	STL5S001	Node228	STMHXXX010	0	0	0.43	2.72	2.238	0.236	0.545	2.29	902.556	901.983	724.383	7.481
STL5S001A	5yr-4hr	STL5S001A	CBXXX026	Node228	0	0	0.32	2.52	4.74E-01	0.222	0.703	2.65	9.03E+02	9.03E+02	3.2	1.296
STL5S001A	100yr-24hr	STL5S001A	CBXXX026	Node228	0	0	0.32	2.52	0.482	0.223	0.704	2.58	903.085	902.556	34.417	7.483
STL5S001AA	5yr-4hr	STL5S001AA	CBXXX027	CBXXX026	0	0	0.11	2.16	1.43	0.219	2.062	4.35	904.665	903.102	47.633	1.275
STL5S001AA	100yr-24hr	STL5S001AA	CBXXX027	CBXXX026	0	0	0.11	2.16	1.458	0.221	2.082	4.39	904.693	903.102	149	7.376
STL5S002	5yr-4hr	STL5S002	STMHXXX026	STMHXXX011	0	30	0.06	0.83	1.944	0.141	2.413	1.95	901.606	901.182	306.967	5.768
STL5S002	100yr-24hr	STL5S002	STMHXXX026	STMHXXX011	0	185	0.06	0.83	2.275	0.138	2.373	1.93	901.937	901.514	918.033	19.14
STL5S003	5yr-4hr	STL5S003	STMH5S003	STMHXXX026	0	0	0.11	0.96	1.939	0.158	1.51	1.42	901.792	901.606	306.317	1.212
STL5S003	100yr-24hr	STL5S003	STMH5S003	STMHXXX026	0	0	0.11	0.96	2.27	0.127	1.206	1.14	902.155	901.937	913.233	7.218
STL5S004	5yr-4hr	STL5S004	STMH5S002	STMH5S003	0	0	0.08	1.14	1.914	0.132	1.636	1.83	901.823	901.792	306.483	1.21
STL5S004	100yr-24hr	STL5S004	STMH5S002	STMH5S003	0	0	0.08	1.14	2.277	0.114	1.418	1.58	902.031	902.155	913.15	19.174
STL6N006	5yr-4hr	STL6N006	STMH6N001	STMHCC005	0	0	0.54	1.51	1.937	0.693	1.286	1.93	903.63	903.608	244.517	5.271
STL6N006	100yr-24hr	STL6N006	STMH6N001	STMHCC005	0	0	0.54	1.51	2.055	0.588	1.091	1.62	903.84	903.726	607.683	13.761
STL6N007	5yr-4hr	STL6N007	STMHCC005	STMHCC011	0	40	1.11	2.51	2.008	0.967	0.872	2.62	903.608	903.618	244.417	4.604
STL6N007	100yr-24hr	STL6N007	STMHCC005	STMHCC011	0	700	1.11	2.51	2.058	0.943	0.853	2.65	903.726	903.668	607.2	11.947
STL6N008	5yr-4hr	STL6N008	STMHCC011	STMHHW004	0	15	1.23	2.79	3.685	0.987	0.801	2.21	903.628	903.646	284.8	1.219
STL6N008	100yr-24hr	STL6N008	STMHCC011	STMHHW004	0	70	1.23	2.79	3.673	0.962	0.781	2.16	903.668	903.634	786	7.108
STL6S002	5yr-4hr	STL6S002	STMH6S004	STMH6S003	0	0	0.05	1.47	1.923	0.086	1.856	2.59	903.109	902.117	378.9	2.556
STL6S002	100yr-24hr	STL6S002	STMH6S004	STMH6S003	0	135	0.05	1.47	2.197	0.09	1.949	2.7	903.383	902.562	1175.1	14.703
STL7N001	5yr-4hr	STL7N001	STMH7N004	STMH7N003	0	0	0.48	1.68	1.93	0.397	0.836	1.65	906.139	906.033	123.35	1.212
STL7N001	100yr-24hr	STL7N001	STMH7N004	STMH7N003	0	5	0.48	1.68	1.893	0.37	0.778	1.53	906.143	905.996	346.867	7.204
STL7N002	5yr-4hr	STL7N002	STMH7N001	STMH7N005	0	0	0.6	1.68	1.506	0.46	0.769	1.28	904.22	904.212	246.4	1.258
STL7N002	100yr-24hr	STL7N002	STMH7N001	STMH7N005	0	0	0.6	1.68	1.703	0.457	0.763	1.27	904.417	904.409	626.067	7.25
STL7N003	5yr-4hr	STL7N003	STMH7N002	STMH7N005	0	65	0.17	2.43	1.581	0.182	1.056	2.54	904.728	904.212	307.667	1.19
STL7N003	100yr-24hr	STL7N003	STMH7N002	STMH7N005	0	130	0.17	2.43	1.78E+00	0.159	0.925	2.22	9.05E+02	9.04E+02	1340.033	16.282
STL7N004	5yr-4hr	STL7N004	STMHGB001	STMH7N001	0	0	0.56	1.56	1.49E+00	0.463	0.828	1.29	9.04E+02	9.04E+02	242.5	1.258
STL7N004	100yr-24hr	STL7N004	STMHGB001	STMH7N001	0	0	0.56	1.56	1.687	0.459	0.82	1.27	904.497	904.417	618.967	7.249
STL7N005	5yr-4hr	STL7N005	STMH7N006	STMHCC004	0	0	0.12	1.07	1.347	0.221	1.878	1.97	904.49	904.251	201.083	1.208
STL7N005	100yr-24hr	STL7N005	STMH7N006	STMHCC004	0	0	0.12	1.07	1.414	0.127	1.073	1.17	904.588	904.291	598.033	8.04
STL8N001	5yr-4hr	STL8N001	STMH8N002	STMH8N003	0	0	0.32	1.13	1.195	0.226	0.707	1.23	905.409	905.344	113.683	1.232
STL8N001	100yr-24hr	STL8N001	STMH8N002	STMH8N003	0	0	0.32	1.13	1.312	0.153	0.479	1.01	905.473	905.461	262.1	7.24
STL8N002	5yr-4hr	STL8N002	STMH8N001	STMH8N002	0	0	0.49	3.07	0.958	-0.194	0.413	1.93	905.107	905.409	75.583	1.244
STL8N002	100yr-24hr	STL8N002	STMH8N001	STMH8N002	0	0	0.49	3.07	1.022	-0.472	0.967	-2.95	905.18	905.473	260.033	7.287
STL9S001	5yr-4hr	STL9S001	STMHGB003	STMH9N001	0	0	0.06	0.88	0.226	0.033	0.53	0.84	904.859	904.622	0	1.424
STL9S001	100yr-24hr	STL9S001	STMHGB003	STMH9N001	0	0	0.06	0.88	1.817	0.124	1.996	1.71	906.238	906.213	124.933	9.272
STL9S002	5yr-4hr	STL9S002	STMH9N001	STMH9N002	0	0	0.13	1.19	0.321	0.1	0.764	1.24	904.622	904.261	0	1.381
STL9S002	100yr-24hr	STL9S002	STMH9N001	STMH9N002	0	0	0.13	1.19	1.842	0.233	1.776	2.06	906.213	905.066	125.667	7.24
STLCC002	5yr-4hr	STLCC002	STMHCC010	STMHCC002	0	0	0.02	0.35	1.303	0.084	3.385	1.16	904.356	904.356	247.1	4.501
STLCC002	100yr-24hr	STLCC002	STMHCC010	STMHCC002	0	0	0.02	0.35	1.336	0.093	3.742	1.29	904.406	904.389	1387.967	17.325
STLCC003	5yr-4hr	STLCC003	STMHCC002	STMHCC003	0	25	0	0.04	1.283	0.107	35.032	1.49	904.356	904.325	243.5	1.19
STLCC003	100yr-24hr	STLCC003	STMHCC002	STMHCC003	0	190	0	0.04	1.316	0.094	30.68	1.31	904.389	904.326	1310.933	7.079
STLCC004	5yr-4hr	STLCC004	STMHCC003	STMHCC004	0	0	0.11	1.01	1.542	0.16	1.436	1.44	904.325	904.251	234.383	1.203
STLCC004	100yr-24hr	STLCC004	STMHCC003	STMHCC004	0	0	0.11	1.01	1.582	0.124	1.115	1.11	904.326	904.291	607.633	12.236
STLCC006	5yr-4hr	STLCC006	STMHCC004	STMHCC005	0	0	0.21	1.32	1.832	0.251	1.197	1.56	904.251	903.608	245	1.214
STLCC006	100yr-24hr	STLCC006	STMHCC004	STMHCC005	0	0	0.21	1.32	1.95	0.2	0.951	1.41	904.291	903.726	611.4	7.146
STLCC007	5yr-4hr	STLCC007	STMHCC006	STMHCC005	0	15	0.2	1.23	1.932	0.329	1.677	2.03	904.074	903.608	260	1.203
STLCC007	100yr-24hr	STLCC007	STMHCC006	STMHCC005	0	100	0.2	1.23	2.05	0.364	1.859	2.26	904.168	903.726	723.85	17.565
STLCC009	5yr-4hr	STLCC009	STMHCC007	STMHCC006	0	0	0.15	1.36	1.808	0.274	1.818	2.43	904.48	904.074	260.567	5.343
STLCC009	100yr-24hr	STLCC009	STMHCC007	STMHCC006	0	0	0.15	1.36	2.014	0.276	1.831	2.45	904.686	904.168	721.7	18.564
STLCC010	5yr-4hr	STLCC010	STMHCC008	STMHCC007	0	0	0.17	1.58	2.833	0.25	1.435	2.18	906.756	904.48	260.367	1.257
STLCC010	100yr-24hr	STLCC010	STMHCC008	STMHCC007	0	5	0.17	1.58	3.13	0.266	1.523	2.3	907.053	904.686	721.433	7.208
STLCC011	5yr-4hr	STLCC011	STMHCC009	STMHCC008	0	0	0.03	0.69	2.773	-0.177	5.188	-3.39	905.956	906.756	263.133	1.256
STLCC011	100yr-24hr	STLCC011	STMHCC009	STMHCC008	0	5	0.03	0.69	3.07	-0.204	5.987	-3.89	906.134	907.053	730.967	7.203
STLGB002	5yr-4hr	STLGB002	STMHGB002	STMHGB001	0	0	0.35	0.99	1.315	0.466	1.317	1.3	904.39	904.312	205.583	1.249
STLGB002	100yr-24hr	STLGB002	STMHGB002	STMHGB001	0	0	0.35	0.99	1.496	0.46	1.3	1.28	904.565	904.497	550.517	7.249
STLHW001	5yr-4hr	STLHW001	STMHHW001	STMHHW002	0	0	0.32	1.13	1.761	-0.478	1.504	-1.68	903.269	903.863	180.183	1.25
STLHW001	100yr-24hr	STLHW001	STMHHW001	STMHHW002	0	0	0.32	1.13	2.125	-0.702	2.208	-2.45	903.385	904.227	490.35	7.237
STLHW002	5yr-4hr	STLHW002	STMHHW002	STMHHW003	0	0	0.16	1.01	2.334	-0.179	1.127	-1.11	903.863	904.014	243.65	1.233
STLHW002	100yr-24hr	STLHW002	STMHHW002	STMHHW003	0	0	0.16	1.01	2.368	0.118	0.737	0.97	904.227	904.048	606.367	7.242
STLHW003	5yr-4hr	STLHW003	STMHHW003	STMHHW004	0	0	0.13	1.06	2.55E+00	-0.134	1.033	1.07	9.04E+02	9.04E+02	247.233	1.239
STLHW003	100yr-24hr	STLHW003	STMHHW003	STMHHW004	0	0	0.13	1.06	2.53E+00	0.118	0.886	0.96	9.04E+02	9.04E+02	666.583	7.249
STLHW004	5yr-4hr	STLHW004	STMHHW005	STMHHW004	0	95	0.61	2.15	1.979	0.815	1.34	2.84	904.594	903.653	212.25	1.363
STLHW004	100yr-24hr	STLHW004	STMHHW005	STMHHW004	0	20	0.61	2.15	2.024	0.702	1.159	2.45	904.639	903.634	600.933	7.481
STLHW005	5yr-4hr	STLHW005	STMHHW006	STMHHW005	0	0	0.27	1.7	1.985	0.4	1.485	2.48	905.766	904.596	45.067	1.225
STLHW005	100yr-24hr	STLHW005	STMHHW006	STMHHW005	0	0	0.27	1.7	2.028	0.45	1.671	2.78	905.809	904.639	123.467	7.929
STLHW006	5yr-4hr	STLHW006	STMHHW007	STMHHW006	0	5	0.18	1.59	1.425	0.362	2.061	3.22	906.022	905.766	63.433	1.904
STLHW006	100yr-24hr	STLHW006	STMHHW007	STMHHW006	0	0	0.18	1.59	1.479	0.363	2.072	3.23	906.076	905.809	144.55	8.05
STLHW007	5yr-4hr	STLHW007	STMHHW008	STMHHW007	0	0	0.21	1.93	1.579	0.268	1.253	2.38	907.78	906.022	63.417	1.914
STLHW007	100yr-24hr	STLHW007	STMHHW008	STMHHW007	0	0	0.21	1.93	1.615	0.229	1.07	2.12	907.816	906.076	144.55	7.207
STLHW008	5yr-4hr	STLHW008	STMHHW009	STMHHW008	0	15	0.1	1.36	1.579	0.157	1.643	2.18	908.414	907.78	63.2	2.136
STLHW008	100yr-24hr	STLHW008	STMHHW009	STMHHW008	0	15	0.1	1.36	1.62E+00	0.158	1.645	2.18	9.08E+02	9.08E+02	144.45	9.41
STLHW009	5yr-4hr	STLHW009	STMHHW010	STMHHW009	0	0	0.1	1.35	1.664	0.117	1.223	1.62	909.422	908.414	63.2	1.229
STLHW009	100yr-24hr	STLHW009	STMHHW010	STMHHW009	0	0	0.1	1.35	1.712	0.13	1.364	1.8	909.47	908.425	144.417	7.192
STLJM002	5yr-4hr	STLJM002	Node227	STMH4S001	0	0	0.13	1.81	1.058	0.071	0.553	1.35	905.011	904.601	413.767	2.006
STLJM002	100yr-24hr	STLJM002	Node227	STMH4S001	0	100	0.13	1.81	1.246	0.071	0.554	1.34	905.119	904.789	1079.333	7.46
STLJM002A	5yr-4hr	STLJM002A	STMH3N001	Node227	0	0	0.04	1.38	1.61	0.071	1.634	2.17	907.359	905.011	179.933	1.196
STLJM002A	100yr-24hr	STLJM002A	STMH3N001	Node227	0	5	0.04	1.38	1.66E+00	0.071	1.639	2.16	9.07E+02	9.05E+02	354.767	7.442
STLMP004	5yr-4hr	STLMP004	STMH6S003	STMHMC003	0	5	0.51	1.8	2.553	0.308	0.606	1.84	902.117	902.095	173.45	1.215
STLMP004	100yr-24hr	STLMP004	STMH6S003	STMHMC003	0	0	0.51	1.8	3.01E+00	0.278	0.545	1.74	9.03E+02	9.03E+02	3891.933	7.164
STLMP005	5yr-4hr	STLMP005	STMHMC003	STMHMC002	0	0	0.41	1.44	2.748	0.288	0.706	1.33	902.095	902.059	177.583	2.522
STLMP005	100yr-24hr	STLMP005	STMHMC003	STMHMC002	0	0	0.41	1.44	3.229	0.276	0.679	1.4	902.552	902.54	3893.433	7.165
STLMP006	5yr-4hr	STLMP006	STMHMC002	STMHMC001	0	50	0.47	1.67	2.795	0.459	0.979	1.6	902.059	902.03	180.467	1.236
STLMP006	100yr-24hr	STLMP006	STMHMC002	STMHMC001	0	370	0.47	1.67	3.269	0.612	1.317	2.1	902.54	902.499	3894.25	7.44
STLPR001	5yr-4hr	STLPR001	STMHPR001	STMHCC001	0	0	0.05	0.76	1.234	0.086	1.624	1.2	904.262	904.347	245.6	4.707
STLPR001	100yr-24hr	STLPR001	STMHPR001	STMHCC001	0	0	0.05	0.76	1.291	0.084	1.573	1.17	904.322	904.404	1366.8	17.369

STLRW002	5yr-4hr	STLRW002	STMH7N003	STMHRW001	0	0	0.38	1.35	1.945	0.389	1.016	1.36	906.033	905.767	126.267	1.243
STLRW002	100yr-24hr	STLRW002	STMH7N003	STMHRW001	0	0	0.38	1.35	1.97E+00	0.37	0.967	1.29	9.06E+02	9.06E+02	352.3	7.201
STLURW01A	5yr-4hr	STLURW01A	Node1109	STMHXXX006	0	45	0.79	2.81	3.051	0.556	0.7	1.92	901.752	901.501	1005.258	1.26
STLURW01A	100yr-24hr	STLURW01A	Node1109	STMHXXX006	0	70	0.79	2.81	3.356	0.593	0.746	2.04	902.067	901.806	3958.033	7.228
STLURW01AA	5yr-4hr	STLURW01AA	STMHXXX005	Node1109	0	40	1.43	5.07	2.691	0.558	0.389	3.27	901.766	901.752	301.05	1.26
STLURW01AA	100yr-24hr	STLURW01AA	STMHXXX005	Node1109	0	55	1.43	5.07	3.006	0.607	0.425	3.05	902.082	902.067	3896.3	7.207
STLURW02	5yr-4hr	STLURW02	STMHXXX006	STMHXXX007	0	5	0.53	1.86	2.683	0.554	1.051	1.92	901.501	901.086	1027.158	1.269
STLURW02	100yr-24hr	STLURW02	STMHXXX006	STMHXXX007	0	10	0.53	1.86	2.988	0.592	1.123	2.04	901.806	901.384	3983.183	7.226
STLURW03	5yr-4hr	STLURW03	STMHXXX007	STMHXXX008	0	0	0.42	1.48	2.69E+00	0.556	1.327	1.93	9.01E+02	9.01E+02	1066.621	1.271
STLURW03	100yr-24hr	STLURW03	STMHXXX007	STMHXXX008	0	25	0.42	1.48	2.985	0.592	1.413	2.05	901.384	900.972	4000.417	7.225
STLWL001	5yr-4hr	STLWL001	Node214	STMH8N001	0	10	1.55	5.48	1.386	-0.29	0.196	1.35	904.892	905.107	4273.35	1.242
STLWL001	100yr-24hr	STLWL001	Node214	STMH8N001	0	0	1.55	5.48	1.33	-0.472	0.305	-1.66	904.892	905.051	4216.438	7.239
STLXXX005	5yr-4hr	STLXXX005	STMHHW004	STMHXXX010	0	0	0.87	1.98	3.66E+00	1.519	1.739	3.35	9.04E+02	9.02E+02	324.967	1.235
STLXXX005	100yr-24hr	STLXXX005	STMHHW004	STMHXXX010	0	0	0.87	1.98	3.643	1.502	1.72	3.31	903.634	901.982	1798.283	7.197
STLXXX006	5yr-4hr	STLXXX006	STMHXXX010	STMHXXX011	0	0	0.23	0.52	3.142	1.752	7.626	3.89	902.014	901.182	276.05	1.307
STLXXX006	100yr-24hr	STLXXX006	STMHXXX010	STMHXXX011	0	0	0.23	0.52	3.111	1.706	7.423	3.79	901.983	901.514	739.4	7.224
STLXXX08	5yr-4hr	STLXXX08	MHXXX012A	STMHXXX013	0	0	1.59	2.49	4.516	1.332	0.839	2.34	898.796	897.746	277.083	5.289
STLXXX08	100yr-24hr	STLXXX08	MHXXX012A	STMHXXX013	0	5	1.59	2.49	4.854	1.295	0.816	2.27	899.129	898.084	745.067	7.115
STLXXX09	5yr-4hr	STLXXX09	STMHXXX013	STMHXXX014	0	0	1.14	1.79	4.531	1.462	1.28	2.24	897.746	895.422	284.617	1.251
STLXXX09	100yr-24hr	STLXXX09	STMHXXX013	STMHXXX014	0	0	1.14	1.79	4.869	1.448	1.269	2.22	898.084	895.809	794.517	7.187
STLXXX10	5yr-4hr	STLXXX10	STMHXXX014	Node1117	0	280	0.03	0.05	3.982	1.469	47.376	2.3	895.422	892.156	285.4	1.653
STLXXX10	100yr-24hr	STLXXX10	STMHXXX014	Node1117	0	760	0.03	0.05	4.369	1.557	50.198	2.42	895.809	892.174	854.233	7.624
STLXXX103	5yr-4hr	STLXXX103	STMH9N002	STMHXXX037	0	0	0.07	0.66	0.331	0.1	1.371	1	904.261	904.089	0	1.417
STLXXX103	100yr-24hr	STLXXX103	STMH9N002	STMHXXX037	0	90	0.07	0.66	1.136	0.24	3.3	2.16	905.066	904.202	125.267	7.233
STLXXX120	5yr-4hr	STLXXX120	STMH8N004	Node214	0	5	0.18	1.41	0.586	0.054	0.32	0.66	904.949	904.892	4262.1	1.244
STLXXX120	100yr-24hr	STLXXX120	STMH8N004	Node214	0	5	0.18	1.41	0.585	0.049	0.299	0.39	904.94	904.892	4162.65	7.189
STLXXX121	5yr-4hr	STLXXX121	STMHXXX027	STMH8N004	0	0	0.02	0.53	0.91	0.035	2.138	1.11	905.566	904.949	4262.517	1.238
STLXXX121	100yr-24hr	STLXXX121	STMHXXX027	STMH8N004	0	0	0.02	0.53	0.926	0.035	2.128	1.1	905.582	904.94	4164.933	7.181
STLXXX123	5yr-4hr	STLXXX123	CBXXX038	STMHXXX027	0	0	0.03	0.81	0.872	0.027	1.047	0.84	905.597	905.566	276.133	4.844
STLXXX123	100yr-24hr	STLXXX123	CBXXX038	STMHXXX027	0	0	0.03	0.81	0.888	0.025	0.984	0.79	905.605	905.582	462.467	14.307
STLXXX124	5yr-4hr	STLXXX124	STMHXXX028	CBXXX038	0	0	0.02	0.66	0.636	0.024	1.162	0.76	905.632	905.597	270.133	5.585
STLXXX124	100yr-24hr	STLXXX124	STMHXXX028	CBXXX038	0	0	0.02	0.66	0.644	0.022	1.058	0.69	905.616	905.605	446.967	14.318
STLXXX13	5yr-4hr	STLXXX13	STMHRG001	STMHXXX014	0	0	0.39	4.02	2.952	0	0	0	899.528	895.422	280.483	0
STLXXX13	100yr-24hr	STLXXX13	STMHRG001	STMHXXX014	0	0	0.39	4.02	3.339	0	0	0	899.528	895.809	761.8	0
STLXXX14	5yr-4hr	STLXXX14	STMHXXX011	MHXXX011A	0	0	1.6	2.52	2.685	1.61	1.005	2.86	901.182	900.757	273.733	1.214
STLXXX14	100yr-24hr	STLXXX14	STMHXXX011	MHXXX011A	0	0	1.6	2.52	3.015	1.313	0.82	2.71	901.514	901.087	726.117	7.111
STLXXX142	5yr-4hr	STLXXX142	STMHCC001	STMHCC010	0	0	0.07	0.95	1.243	0.101	1.509	1.4	904.347	904.356	245.617	4.496
STLXXX142	100yr-24hr	STLXXX142	STMHCC001	STMHCC010	0	0	0.07	0.95	1.293	0.134	2.031	1.86	904.404	904.406	1366.8	17.321
STLXXX14A	5yr-4hr	STLXXX14A	MHXXX011A	STMHXXX012	0	0	1.6	2.52	3.4	1.448	0.905	2.73	900.757	899.602	274.5	1.211
STLXXX14A	100yr-24hr	STLXXX14A	MHXXX011A	STMHXXX012	0	0	1.6	2.52	3.729	1.306	0.815	2.65	901.087	899.931	730.083	7.112
STLXXX15	5yr-4hr	STLXXX15	STMHXXX012	MHXXX012A	0	0	1.56	2.45	3.847	1.332	0.854	2.54	899.602	898.796	275.483	5.287
STLXXX15	100yr-24hr	STLXXX15	STMHXXX012	MHXXX012A	0	5	1.56	2.45	4.18	1.3	0.833	2.47	899.931	899.129	734.083	7.114
STLXXX152	5yr-4hr	STLXXX152	Node1118	STMHCC006	0	0	0	0.03	1.52	0.054	52.092	1.65	904.112	904.074	260.433	1.2
STLXXX152	100yr-24hr	STLXXX152	Node1118	STMHCC006	0	0	0	0.03	1.577	0.086	82.489	2.62	904.168	904.168	719.467	17.71
STLXXX16	5yr-4hr	STLXXX16	STMH5S001	STMHXXX008	0	75	0.22	1.4	1.326	0.382	1.711	2.38	901.902	900.668	78.867	1.71
STLXXX16	100yr-24hr	STLXXX16	STMH5S001	STMHXXX008	0	5	0.22	1.4	1.669	0.402	1.804	2.49	902.245	900.972	385.517	8.178
STLXXX17	5yr-4hr	STLXXX17	STMHXXX008	STMHXXX009	0	5	0.76	1.73	2.523	0.906	1.185	2.02	900.668	900.087	1075.912	1.271
STLXXX17	100yr-24hr	STLXXX17	STMHXXX008	STMHXXX009	0	30	0.76	1.73	2.827	0.922	1.206	2.05	900.972	900.512	4034.617	7.224
STLXXX18	5yr-4hr	STLXXX18	STMHXXX009	STMHXXX025	0	5	0.78	1.76	2.28	0.907	1.164	2.03	900.087	899.885	1079.142	1.269
STLXXX18	100yr-24hr	STLXXX18	STMHXXX009	STMHXXX025	0	30	0.78	1.76	2.82	0.921	1.182	2.06	900.504	900.452	4048.783	7.235
STLXXX187	5yr-4hr	STLXXX187	Node1120	STMHPR001	0	5	0.08	1.15	1.064	-0.071	0.867	-1.09	903.612	904.262	242.133	2.697
STLXXX187	100yr-24hr	STLXXX187	Node1120	STMHPR001	0	270	0.08	1.15	1.124	-0.085	1.042	-1.21	903.966	904.322	1309.233	14.057
STLXXX18A	5yr-4hr	STLXXX18A	STMHXXX025	CB3A002W	0	5	0.77	1.75	2.623	0.908	1.176	2.03	899.885	899.631	1121.378	1.268
STLXXX18A	100yr-24hr	STLXXX18A	STMHXXX025	CB3A002W	0	0	0.77	1.75	3.408	0.923	1.195	2.06	900.452	900.416	4191.483	7.218
STLXXX18AA	5yr-4hr	STLXXX18AA	CB3A002W	STMH3A002	0	0	0.51	1.01	2.631	0.133	0.263	0.26	899.631	899.63	1116	4.711
STLXXX18AA	100yr-24hr	STLXXX18AA	CB3A002W	STMH3A002	0	0	0.51	1.01	3.416	0.243	0.48	0.47	900.416	900.415	4176.6	13.428
STLXXX19	5yr-4hr	STLXXX19	STMH3A002	STMH3A003	0	770	0.08	2.53	2.04	0.133	1.677	3.95	899.63	897.79	4301.375	4.722
STLXXX19	100yr-24hr	STLXXX19	STMH3A002	STMH3A003	0	0	0.08	2.53	2.825	0.162	2.036	4.69	900.415	897.79	4283.528	64.085
STLXXX191	5yr-4hr	STLXXX191	Node1121	STMHRG002	0	0	3.67	1.83	1.269	1.151	0.314	1.2	898.871	898.762	0	1.328
STLXXX191	100yr-24hr	STLXXX191	Node1121	STMHRG002	0	0	3.67	1.83	1.486	1.742	0.475	1.31	899.006	898.979	0	7.265
STLXXX192	5yr-4hr	STLXXX192	Node1123	Node1122	0	0	3.67	1.83	1.68	1.236	0.337	1.12	900.059	900.044	0	1.256
STLXXX192	100yr-24hr	STLXXX192	Node1123	Node1122	0	0	3.67	1.83	1.796	1.444	0.394	0.98	900.079	900.16	0	7.222
STLXXX193	5yr-4hr	STLXXX193	Node1125	Node1124	0	0	3.67	1.83	1	0.411	0.112	0.57	900.223	900.16	0	1.249
STLXXX193	100yr-24hr	STLXXX193	Node1125	Node1124	0	0	3.67	1.83	1	0.405	0.111	0.64	900.22	900.16	0	7.201
STLXXX194	5yr-4hr	STLXXX194	Node1129	Node1126	0	0	3.67	1.84	0.741	0.437	0.119	0.91	900.32	900.3	0	1.217
STLXXX194	100yr-24hr	STLXXX194	Node1129	Node1126	0	0	3.67	1.84	0.744	0.348	0.095	0.76	900.32	900.303	0	9.392
STLXXX20	5yr-4hr	STLXXX20	STMH3A003	STMHXXX016	0	0	3.06	6.92	0.107	0.133	0.044	3.44	897.66	893.468	0	4.724
STLXXX20	100yr-24hr	STLXXX20	STMH3A003	STMHXXX016	0	0	3.06	6.92	0.117	0.162	0.053	3.66	897.67	893.479	0	64.086
STLXXX21	5yr-4hr	STLXXX21	STMHMC001	STMHXXX005	0	0	0.36	1.29	2.825	0.571	1.576	1.99	902.03	901.766	230.567	1.236
STLXXX21	100yr-24hr	STLXXX21	STMHMC001	STMHXXX005	0	0	0.36	1.29	3.294	0.699	1.916	2.4	902.499	902.082	3895.833	7.231
STLXXX30	5yr-4hr	STLXXX30	STMHRW001	STMHXXX002	0	0	0.18	1.14	1.907	0.512	2.819	3.16	905.767	905.045	133.883	1.222
STLXXX30	100yr-24hr	STLXXX30	STMHRW001	STMHXXX002	0	0	0.18	1.14	1.988	0.413	2.273	2.55	905.848	905.258	379.35	7.182
STLXXX31	5yr-4hr	STLXXX31	STMHXXX002	STMHGB002	0	0	0.38	1.33	1.384	0.468	1.247	1.65	905.045	904.39	198.267	1.232
STLXXX31	100yr-24hr	STLXXX31	STMHXXX002	STMHGB002	0	0	0.38	1.33	1.597	0.462	1.228	1.62	905.258	904.565	537.5	7.247
STLXXX32	5yr-4hr	STLXXX32	STMH8N003	STMHXXX001	0	0	0.07	0.47	1.375	0.179	2.396	1.11	905.344	905.17	125.783	1.226
STLXXX32	100yr-24hr	STLXXX32	STMH8N003	STMHXXX001	0	0	0.07	0.47	1.492	0.15	2.013	0.93	905.461	905.368	349.2	7.242
STLXXX33	5yr-4hr	STLXXX33	STMHXXX001	STMHXXX002	0	0	0.23	1.18	1.462	0.11	0.473	0.75	905.17	905.045	134.867	1.222
STLXXX33	100yr-24hr	STLXXX33	STMHXXX001	STMHXXX002	0	0	0.23	1.18	1.675	0.15	0.644	0.75	905.368	905.258	389.9	7.246
STLXXX34	5yr-4hr	STLXXX34	STMH7N005	STMH7N001B	0	0	0.41	1.15	1.513	0.608	1.48	1.69	904.212	904.128	253.667	1.243
STLXXX34	100yr-24hr	STLXXX34	STMH7N005	STMH7N001B	0	0	0.41	1.15	1.71	0.583	1.417	1.62	904.409	904.334	643.033	7.199
STLXXX34A	5yr-4hr	STLXXX34A	STMH7N001B	STMHXXX035	0	0	0.41	1.15	1.491	0.613	1.494	1.71	904.128	903.993	271.233	1.243
STLXXX34A	100yr-24hr	STLXXX34A	STMH7N001B	STMHXXX035	0	0	0.41	1.15	1.697	0.586	1.426	1.63	904.334	904.213	699.233	7.199
STLXXX34B	5yr-4hr	STLXXX34B	STMHXXX003	STMHXXX035	0	0	0.39	1.08	1.455	-0.53	1.377	-1.47	903.696	903.993	271.233	2.582
STLXXX34B	100yr-24hr	STLXXX34B	STMHXXX003	STMHXXX035	0	0	0.39	1.08	1.675	-0.717	1.86	-1.98	903.935	904.213	699.233	7.381
STLXXX35	5yr-4hr	STLXXX35	STMH6N001	STMHXXX003	0	0	0.58	1.61	2.096	-0.693	1.199	-1.92	903.63	903.696	244.75	5.271
STLXXX35	100yr-24hr	STLXXX35	STMH6N001	STMHXXX003	0	0	0.58	1.61	2.335	-0.599	1.037	-1.65	903.84	903.935	615.233	13.76
STLXXX36	5yr-4hr	STLXXX36	STMH6S002	STMH6S003	0	0	0.04	0.62	2.642	0.22	5.055	2.98	902.652	902.117	184.9	1.201
STLXXX36	100yr-24hr	STLXXX36	STMH6S002	STMH6S003	0	15	0.04	0.62	2.784	0.211	4.85	2.86	902.794	902.562	3918.117	7.142
STLXXX37	5yr-4hr	STLXXX37	STMH6S001	STMH6S002	0	0	0.33	1.18	2.667	0.364	1.103	1.26	902.666	902.652	175.85	1.197
STLXXX37	100yr-24hr	STLXXX37	STMH6S001	STMH6S002	0	0	0.33	1.18	2.809	0.263	0.793	0.91	902.847	902.794	544.517	7.16
STLXXX38	5yr-4hr	STLXXX38	STMHXXX004	STMH6S002	0	0	0.05	0.75	2.502	0.119	2.252	1.63	902.33	902.652	177.8	4.093
STLXXX38	100yr-24hr	STLXXX38	STMHXXX004	STMH6S002	0	0	0.05	0.75	2.644	0.104	1.974	1.42	902.416	902.794	2364.667	11.389
STLXXX43	5yr-4hr	STLXXX43	STMHNS001	STMHNA005	0	0	0.11	1.5	2.281	-0.102	0.972	-1.39	908.686	908.264	122.083	1.215
STLXXX43	100yr-24hr	STLXXX43	STMHNS001	STMHNA005	0	0	0.11	1.5	2.378	-0.085	0.811	1.44	908.701	908.361	346.6	7.179
STLXXX44	5yr-4hr	STLXXX44	STMHNA005	STMHNA004	0	0	0.08	1.18	2.261	0.113	1.355	1.53	908.264	907.532	122.817	1.424
STLXXX44	100yr-24hr	STLXXX44	STMHNA005	STMHNA004	0	0	0.08	1.18	2.358	0.115	1.384	1.56	908.361	907.622	348.75	7.656
STLXXX45	5yr-4hr	STLXXX45	STMHNA004	STMHNA003	0	0	0.08	1.14	1.999	0.15	1.868	2.06	907.532	906.831	123.2	3.201
STLXXX45	100yr-24hr	STLXXX45	STMHNA004	STMHNA003	0	0	0.08	1.14	2.089	0.155	1.937	2.12	907.622	906.885	349.467	12.369
STLXXX48	5yr-4hr	STLXXX48	STMHNA003	STMHNA002	0	0	0.15	1.35	1.933	0.292	1.963	2.6	906.831	906.388	120.817	1.215
STLXXX48	100yr-24hr	STLXXX48	STMHNA003	STMHNA002	0	0	0.15	1.35	1.987	0.217	1.455	1.91	906.885	906.292	311.133	7.503
STLXXX49	5yr-4hr	STLXXX49	STMHNA001	STMHNA002	0	5	0.14	1.27	1.813	0.202	1.438	1.81	906.33	906.388	120.467	1.215
STLXXX49	100yr-24hr	STLXXX49	STMHNA001	STMHNA002	0	40	0.14	1.27	1.717	0.149	1.06	1.32	906.397	906.292	284.05	10.075
STLXXX51	5yr-4hr	STLXXX51	STMHNA002	STMH7N004	0	85	0.43	1.51	1.881	0.461	1.094	1.57	906.388	906.146	119.917	1.214
STLXXX51	100yr-24hr	STLXXX51	STMHNA002	STMH7N004	0	520	0.43	1.51	1.819	0.395	0.927	1.38	906.292	906.143	284.117	7.254
STLXXX69	5yr-4hr	STLXXX69	STMH3A001	Node213	0	230	0.01	0.04	3.111	0.558	53.078	1.95	897.742	895.118	234.767	2.7
STLXXX69	100yr-24hr	STLXXX69	STMH3A001	Node213	0	555	0.01	0.04	3.222	0.57	54.238	1.99	897.853	895.123	720.067	11.538
W-1	5yr-4hr	Link217	STMHXXX037	Node1120	-9.00E+99	-9.00E+99	0	0	-9.00E+99	-0.071	0	0	-9.00E+99	-9.00E+99	0	2.726
W-1	100yr-24hr				-9.00E+99	-9.00E+99	0	0	-9.00E+99	0.175	0	0	-9.00E+99	-9.00E+99	0	17.528

POST-DEVELOPMENT – RUNOFF NODE INPUT

Name	Storm	Subcatchment	Node Name	Rainfall Reference	Routing Method	Infiltration Reference	Time of Concentration (or Parameter 2) min	Area ha	Impervious Percentage %	Slope	Width m
CB3A002W	5yr-4hr	1	CB3A002W	Lethbridge-5yr-4hr	RUNOFF	Lethbridge-GreenAmpt	0.000	4.196	13	0.01	205
CB3A002W	100yr-24hr	1	CB3A002W	Lethbridge-5yr-4hr	RUNOFF	Lethbridge-GreenAmpt	0.000	4.196	13	0.01	205
CBXXX025	5yr-4hr	1	CBXXX025	Lethbridge-5yr-4hr	RUNOFF	Lethbridge-GreenAmpt	0.000	4.026	55	0.01	25
CBXXX025	100yr-24hr	1	CBXXX025	Lethbridge-5yr-4hr	RUNOFF	Lethbridge-GreenAmpt	0.000	4.026	55	0.01	25
CBXXX026	5yr-4hr		CBXXX026	Lethbridge-5yr-4hr	RUNOFF	Lethbridge-GreenAmpt	0.000	0.531	85	0.01	55
CBXXX026	100yr-24hr		CBXXX026	Lethbridge-5yr-4hr	RUNOFF	Lethbridge-GreenAmpt	0.000	0.531	85	0.01	55
CBXXX027	5yr-4hr	1	CBXXX027	Lethbridge-5yr-4hr	RUNOFF	Lethbridge-GreenAmpt	0.000	0.352	55	0.01	10
CBXXX027		2		Lethbridge-5yr-4hr	RUNOFF	Lethbridge-GreenAmpt	0.000	0.394	55	0.01	50
CBXXX027		3		Lethbridge-5yr-4hr	RUNOFF	Lethbridge-GreenAmpt	0.000	0.531	85	0.01	55
CBXXX027	100yr-24hr	1	CBXXX027	Lethbridge-5yr-4hr	RUNOFF	Lethbridge-GreenAmpt	0.000	0.352	55	0.01	10
CBXXX027		2		Lethbridge-5yr-4hr	RUNOFF	Lethbridge-GreenAmpt	0.000	0.394	55	0.01	50
CBXXX027		3		Lethbridge-5yr-4hr	RUNOFF	Lethbridge-GreenAmpt	0.000	0.531	85	0.01	55
CBXXX038	5yr-4hr	1	CBXXX038	Lethbridge-5yr-4hr	RUNOFF	Lethbridge-GreenAmpt	0.000	0.255	55	0.01	25
CBXXX038	100yr-24hr	1	CBXXX038	Lethbridge-5yr-4hr	RUNOFF	Lethbridge-GreenAmpt	0.000	0.255	55	0.01	25
Dummy 1	5yr-4hr		Dummy 1		RUNOFF		0.000	0	0	0	0
Dummy 1	100yr-24hr		Dummy 1		RUNOFF		0.000	0	0	0	0
MHXXX011A	5yr-4hr		MHXXX011A		RUNOFF		0.000	0	0	0	0
MHXXX011A	100yr-24hr		MHXXX011A		RUNOFF		0.000	0	0	0	0
MHXXX012A	5yr-4hr		MHXXX012A		RUNOFF		0.000	0	0	0	0
MHXXX012A	100yr-24hr		MHXXX012A		RUNOFF		0.000	0	0	0	0
Node1109	5yr-4hr		Node1109		RUNOFF		0.000	0	0	0	0
Node1109	100yr-24hr		Node1109		RUNOFF		0.000	0	0	0	0
Node1117	5yr-4hr		Node1117		RUNOFF		0.000	0	0	0	0
Node1117	100yr-24hr		Node1117		RUNOFF		0.000	0	0	0	0
Node1118	5yr-4hr	1	Node1118	Lethbridge-5yr-4hr	RUNOFF	Lethbridge-GreenAmpt	0.000	0.034	55	0.01	24
Node1118		2		Lethbridge-5yr-4hr	RUNOFF	Lethbridge-GreenAmpt	0.000	0.644	55	0.01	80
Node1118	100yr-24hr	1	Node1118	Lethbridge-5yr-4hr	RUNOFF	Lethbridge-GreenAmpt	0.000	0.034	55	0.01	24
Node1118		2		Lethbridge-5yr-4hr	RUNOFF	Lethbridge-GreenAmpt	0.000	0.644	55	0.01	80
Node1120	5yr-4hr		Node1120		RUNOFF		0.000	0	0	0	0
Node1120	100yr-24hr		Node1120		RUNOFF		0.000	0	0	0	0
Node1121	5yr-4hr	1	Node1121	Lethbridge-5yr-4hr	RUNOFF	Lethbridge-GreenAmpt	0.000	1.493	55	0.01	80
Node1121	100yr-24hr	1	Node1121	Lethbridge-5yr-4hr	RUNOFF	Lethbridge-GreenAmpt	0.000	1.493	55	0.01	80
Node1122	5yr-4hr	1	Node1122	Lethbridge-5yr-4hr	RUNOFF	Lethbridge-GreenAmpt	0.000	1.859	55	0.01	105
Node1122	100yr-24hr	1	Node1122	Lethbridge-5yr-4hr	RUNOFF	Lethbridge-GreenAmpt	0.000	1.859	55	0.01	105
Node1123	5yr-4hr	1	Node1123	Lethbridge-5yr-4hr	RUNOFF	Lethbridge-GreenAmpt	0.000	5.437	95	0.01	130
Node1123	100yr-24hr	1	Node1123	Lethbridge-5yr-4hr	RUNOFF	Lethbridge-GreenAmpt	0.000	5.437	95	0.01	130
Node1124	5yr-4hr	1	Node1124	Lethbridge-5yr-4hr	RUNOFF	Lethbridge-GreenAmpt	0.000	11.411	95	0.01	190
Node1124	100yr-24hr	1	Node1124	Lethbridge-5yr-4hr	RUNOFF	Lethbridge-GreenAmpt	0.000	11.411	95	0.01	190
Node1125	5yr-4hr		Node1125		RUNOFF		0.000	0	0	0	0
Node1125	100yr-24hr		Node1125		RUNOFF		0.000	0	0	0	0
Node1126	5yr-4hr		Node1126		RUNOFF		0.000	0	0	0	0
Node1126	100yr-24hr		Node1126		RUNOFF		0.000	0	0	0	0
Node1127	5yr-4hr		Node1127		RUNOFF		0.000	0	0	0	0
Node1127	100yr-24hr		Node1127		RUNOFF		0.000	0	0	0	0
Node1128	5yr-4hr	1	Node1128	Lethbridge-5yr-4hr	RUNOFF	Lethbridge-GreenAmpt	0.000	14.236	95	0.01	180
Node1128	100yr-24hr	1	Node1128	Lethbridge-5yr-4hr	RUNOFF	Lethbridge-GreenAmpt	0.000	14.236	95	0.01	180
Node1129	5yr-4hr		Node1129		RUNOFF		0.000	0	0	0	0
Node1129	100yr-24hr		Node1129		RUNOFF		0.000	0	0	0	0
Node1130	5yr-4hr		Node1130		RUNOFF		0.000	0	0	0	0
Node1130	100yr-24hr		Node1130		RUNOFF		0.000	0	0	0	0
Node213	5yr-4hr	1	Node213	Lethbridge-100yr24hr	RUNOFF	Lethbridge-GreenAmpt	0.000	21.837	25	0.01	430
Node213	100yr-24hr	1	Node213	Lethbridge-100yr24hr	RUNOFF	Lethbridge-GreenAmpt	0.000	21.837	25	0.01	430
Node214	5yr-4hr	1	Node214	Lethbridge-100yr24hr	RUNOFF	Lethbridge-GreenAmpt	0.000	18.462	25	0.01	215
Node214	100yr-24hr	1	Node214	Lethbridge-100yr24hr	RUNOFF	Lethbridge-GreenAmpt	0.000	18.462	25	0.01	215
Node216	5yr-4hr	1	Node216	Lethbridge-100yr24hr	RUNOFF	Lethbridge-GreenAmpt	0.000	11.414	25	0.01	215
Node216	100yr-24hr	1	Node216	Lethbridge-100yr24hr	RUNOFF	Lethbridge-GreenAmpt	0.000	11.414	25	0.01	215
Node217	5yr-4hr		Node217		RUNOFF		0.000	0	0	0	0
Node217	100yr-24hr		Node217		RUNOFF		0.000	0	0	0	0
Node218	5yr-4hr	1	Node218	Lethbridge-100yr24hr	RUNOFF	Lethbridge-GreenAmpt	0.000	3.595	25	0.01	170
Node218	100yr-24hr	1	Node218	Lethbridge-100yr24hr	RUNOFF	Lethbridge-GreenAmpt	0.000	3.595	25	0.01	170
Node219	5yr-4hr		Node219		RUNOFF		0.000	0	0	0	0
Node219	100yr-24hr		Node219		RUNOFF		0.000	0	0	0	0
Node220	5yr-4hr	1	Node220	Lethbridge-100yr24hr	RUNOFF	Lethbridge-GreenAmpt	0.000	37.511	25	0.01	18.462
Node220	100yr-24hr	1	Node220	Lethbridge-100yr24hr	RUNOFF	Lethbridge-GreenAmpt	0.000	37.511	25	0.01	18.462
Node221	5yr-4hr		Node221		RUNOFF		0.000	0	0	0	0
Node221	100yr-24hr		Node221		RUNOFF		0.000	0	0	0	0
Node222	5yr-4hr		Node222		RUNOFF		0.000	0	0	0	0
Node222	100yr-24hr		Node222		RUNOFF		0.000	0	0	0	0
Node223	5yr-4hr		Node223		RUNOFF		0.000	0	0	0	0
Node223	100yr-24hr		Node223		RUNOFF		0.000	0	0	0	0
Node224	5yr-4hr		Node224		RUNOFF		0.000	0	0	0	0
Node224	100yr-24hr		Node224		RUNOFF		0.000	0	0	0	0
Node226	5yr-4hr		Node226		RUNOFF		0.000	0	0	0	0
Node226	100yr-24hr		Node226		RUNOFF		0.000	0	0	0	0
Node227	5yr-4hr		Node227		RUNOFF		0.000	0	0	0	0
Node227	100yr-24hr		Node227		RUNOFF		0.000	0	0	0	0
Node228	5yr-4hr		Node228		RUNOFF		0.000	0	0	0	0
Node228	100yr-24hr		Node228		RUNOFF		0.000	0	0	0	0
Node240	5yr-4hr		Node240		RUNOFF		0.000	0	0	0	0
Node240	100yr-24hr		Node240		RUNOFF		0.000	0	0	0	0
Node242	5yr-4hr		Node242		RUNOFF		0.000	0	0	0	0
Node242	100yr-24hr		Node242		RUNOFF		0.000	0	0	0	0
STMH3A001	5yr-4hr	1	STMH3A001	Lethbridge-5yr-4hr	RUNOFF	Lethbridge-GreenAmpt	0.000	0.516	55	0.01	10
STMH3A001	100yr-24hr	1	STMH3A001	Lethbridge-5yr-4hr	RUNOFF	Lethbridge-GreenAmpt	0.000	0.516	55	0.01	10
STMH3A002	5yr-4hr		STMH3A002		RUNOFF		0.000	0	0	0	0
STMH3A002	100yr-24hr		STMH3A002		RUNOFF		0.000	0	0	0	0
STMH3A003	5yr-4hr		STMH3A003		RUNOFF		0.000	0	0	0	0
STMH3A003	100yr-24hr		STMH3A003		RUNOFF		0.000	0	0	0	0
STMH3N001	5yr-4hr	1	STMH3N001	Lethbridge-5yr-4hr	RUNOFF	Lethbridge-GreenAmpt	0.000	1.781	95	0.01	50
STMH3N001	100yr-24hr	1	STMH3N001	Lethbridge-5yr-4hr	RUNOFF	Lethbridge-GreenAmpt	0.000	1.781	95	0.01	50
STMH4N001	5yr-4hr	1	STMH4N001	Lethbridge-5yr-4hr	RUNOFF	Lethbridge-GreenAmpt	0.000	0.931	55	0.01	96
STMH4N001	100yr-24hr	1	STMH4N001	Lethbridge-5yr-4hr	RUNOFF	Lethbridge-GreenAmpt	0.000	0.931	55	0.01	96
STMH4S001	5yr-4hr		STMH4S001		RUNOFF		0.000	0	0	0	0
STMH4S001	100yr-24hr		STMH4S001		RUNOFF		0.000	0	0	0	0
STMH5S001	5yr-4hr	1	STMH5S001	Lethbridge-5yr-4hr	RUNOFF	Lethbridge-GreenAmpt	0.000	2.758	50	0.01	135
STMH5S001		2		Lethbridge-5yr-4hr	RUNOFF	Lethbridge-GreenAmpt	0.000	8.656	55	0.01	50

STMH5S001	100yr-24hr	1	STMH5S001	Lethbridge-5yr-4hr	RUNOFF	Lethbridge-GreenAmpt	0.000	2.758	50	0.01	135
STMH5S001		2		Lethbridge-5yr-4hr	RUNOFF	Lethbridge-GreenAmpt	0.000	8.656	55	0.01	50
STMH5S002	5yr-4hr	1	STMH5S002	Lethbridge-5yr-4hr	RUNOFF	Lethbridge-GreenAmpt	0.000	2.919	55	0.01	50
STMH5S002	100yr-24hr	1	STMH5S002	Lethbridge-5yr-4hr	RUNOFF	Lethbridge-GreenAmpt	0.000	2.919	55	0.01	50
STMH5S003	5yr-4hr	1	STMH5S003	Lethbridge-5yr-4hr	RUNOFF	Lethbridge-GreenAmpt	0.000	2.928	55	0.01	10
STMH5S003	100yr-24hr	1	STMH5S003	Lethbridge-5yr-4hr	RUNOFF	Lethbridge-GreenAmpt	0.000	2.928	55	0.01	10
STMH6N001	5yr-4hr		STMH6N001		RUNOFF		0.000	0	0	0	0
STMH6N001	100yr-24hr		STMH6N001		RUNOFF		0.000	0	0	0	0
STMH6S001	5yr-4hr	1	STMH6S001	Lethbridge-5yr-4hr	RUNOFF	Lethbridge-GreenAmpt	0.000	0.685	55	0.01	50
STMH6S001		2		Lethbridge-5yr-4hr	RUNOFF	Lethbridge-GreenAmpt	0.000	0.922	55	0.01	50
STMH6S001		3		Lethbridge-5yr-4hr	RUNOFF	Lethbridge-GreenAmpt	0.000	2.73	55	0.01	165
STMH6S001		4		Lethbridge-5yr-4hr	RUNOFF	Lethbridge-GreenAmpt	0.000	0.978	55	0.01	50
STMH6S001	100yr-24hr	1	STMH6S001	Lethbridge-5yr-4hr	RUNOFF	Lethbridge-GreenAmpt	0.000	0.685	55	0.01	50
STMH6S001		2		Lethbridge-5yr-4hr	RUNOFF	Lethbridge-GreenAmpt	0.000	0.922	55	0.01	50
STMH6S001		3		Lethbridge-5yr-4hr	RUNOFF	Lethbridge-GreenAmpt	0.000	2.73	55	0.01	165
STMH6S001		4		Lethbridge-5yr-4hr	RUNOFF	Lethbridge-GreenAmpt	0.000	0.978	55	0.01	50
STMH6S002	5yr-4hr		STMH6S002		RUNOFF		0.000	0	0	0	0
STMH6S002	100yr-24hr		STMH6S002		RUNOFF		0.000	0	0	0	0
STMH6S003	5yr-4hr		STMH6S003		RUNOFF		0.000	0	0	0	0
STMH6S003	100yr-24hr		STMH6S003		RUNOFF		0.000	0	0	0	0
STMH6S004	5yr-4hr	1	STMH6S004	Lethbridge-5yr-4hr	RUNOFF	Lethbridge-GreenAmpt	0.000	1.727	55	0.01	50
STMH6S004		2		Lethbridge-5yr-4hr	RUNOFF	Lethbridge-GreenAmpt	0.000	4.946	55	0.01	50
STMH6S004	100yr-24hr	1	STMH6S004	Lethbridge-5yr-4hr	RUNOFF	Lethbridge-GreenAmpt	0.000	1.727	55	0.01	50
STMH6S004		2		Lethbridge-5yr-4hr	RUNOFF	Lethbridge-GreenAmpt	0.000	4.946	55	0.01	50
STMH7N001	5yr-4hr		STMH7N001		RUNOFF		0.000	0	0	0	0
STMH7N001	100yr-24hr		STMH7N001		RUNOFF		0.000	0	0	0	0
STMH7N001B	5yr-4hr		STMH7N001B		RUNOFF		0.000	0	0	0	0
STMH7N001B	100yr-24hr		STMH7N001B		RUNOFF		0.000	0	0	0	0
STMH7N002	5yr-4hr	1	STMH7N002	Lethbridge-5yr-4hr	RUNOFF	Lethbridge-GreenAmpt	0.000	1.388	55	0.01	55
STMH7N002		2		Lethbridge-5yr-4hr	RUNOFF	Lethbridge-GreenAmpt	0.000	2.77	55	0.01	55
STMH7N002		3		Lethbridge-5yr-4hr	RUNOFF	Lethbridge-GreenAmpt	0.000	1.466	55	0.01	55
STMH7N002	100yr-24hr	1	STMH7N002	Lethbridge-5yr-4hr	RUNOFF	Lethbridge-GreenAmpt	0.000	1.388	55	0.01	55
STMH7N002		2		Lethbridge-5yr-4hr	RUNOFF	Lethbridge-GreenAmpt	0.000	2.77	55	0.01	55
STMH7N002		3		Lethbridge-5yr-4hr	RUNOFF	Lethbridge-GreenAmpt	0.000	1.466	55	0.01	55
STMH7N003	5yr-4hr		STMH7N003		RUNOFF		0.000	0	0	0	0
STMH7N003	100yr-24hr		STMH7N003		RUNOFF		0.000	0	0	0	0
STMH7N004	5yr-4hr	1	STMH7N004	Lethbridge-5yr-4hr	RUNOFF	Lethbridge-GreenAmpt	0.000	0.115	55	0.01	34
STMH7N004		2		Lethbridge-5yr-4hr	RUNOFF	Lethbridge-GreenAmpt	0.000	0.23	55	0.01	55
STMH7N004	100yr-24hr	1	STMH7N004	Lethbridge-5yr-4hr	RUNOFF	Lethbridge-GreenAmpt	0.000	0.115	55	0.01	34
STMH7N004		2		Lethbridge-5yr-4hr	RUNOFF	Lethbridge-GreenAmpt	0.000	0.23	55	0.01	55
STMH7N005	5yr-4hr		STMH7N005		RUNOFF		0.000	0	0	0	0
STMH7N005	100yr-24hr		STMH7N005		RUNOFF		0.000	0	0	0	0
STMH7N006	5yr-4hr	1	STMH7N006	Lethbridge-5yr-4hr	RUNOFF	Lethbridge-GreenAmpt	0.000	0.28	55	0.01	17
STMH7N006		2		Lethbridge-5yr-4hr	RUNOFF	Lethbridge-GreenAmpt	0.000	0.097	55	0.01	31
STMH7N006		3		Lethbridge-5yr-4hr	RUNOFF	Lethbridge-GreenAmpt	0.000	2.799	50	0.01	100
STMH7N006	100yr-24hr	1	STMH7N006	Lethbridge-5yr-4hr	RUNOFF	Lethbridge-GreenAmpt	0.000	0.28	55	0.01	17
STMH7N006		2		Lethbridge-5yr-4hr	RUNOFF	Lethbridge-GreenAmpt	0.000	0.097	55	0.01	31
STMH7N006		3		Lethbridge-5yr-4hr	RUNOFF	Lethbridge-GreenAmpt	0.000	2.799	50	0.01	100
STMH8N001	5yr-4hr		STMH8N001		RUNOFF		0.000	0	0	0	0
STMH8N001	100yr-24hr		STMH8N001		RUNOFF		0.000	0	0	0	0
STMH8N002	5yr-4hr	1	STMH8N002	Lethbridge-5yr-4hr	RUNOFF	Lethbridge-GreenAmpt	0.000	1.199	55	0.01	55
STMH8N002		2		Lethbridge-5yr-4hr	RUNOFF	Lethbridge-GreenAmpt	0.000	0.212	55	0.01	46
STMH8N002	100yr-24hr	1	STMH8N002	Lethbridge-5yr-4hr	RUNOFF	Lethbridge-GreenAmpt	0.000	1.199	55	0.01	55
STMH8N002		2		Lethbridge-5yr-4hr	RUNOFF	Lethbridge-GreenAmpt	0.000	0.212	55	0.01	46
STMH8N003	5yr-4hr		STMH8N003		RUNOFF		0.000	0	0	0	0
STMH8N003	100yr-24hr		STMH8N003		RUNOFF		0.000	0	0	0	0
STMH8N004	5yr-4hr	1	STMH8N004	Lethbridge-5yr-4hr	RUNOFF	Lethbridge-GreenAmpt	0.000	1.093	55	0.01	55
STMH8N004	100yr-24hr	1	STMH8N004	Lethbridge-5yr-4hr	RUNOFF	Lethbridge-GreenAmpt	0.000	1.093	55	0.01	55
STMH9N001	5yr-4hr	1	STMH9N001	Lethbridge-5yr-4hr	RUNOFF	Lethbridge-GreenAmpt	0.000	0.555	55	0.01	55
STMH9N001		2		Lethbridge-5yr-4hr	RUNOFF	Lethbridge-GreenAmpt	0.000	0.572	55	0.01	55
STMH9N001		3		Lethbridge-5yr-4hr	RUNOFF	Lethbridge-GreenAmpt	0.000	0.292	55	0.01	55
STMH9N001	100yr-24hr	1	STMH9N001	Lethbridge-5yr-4hr	RUNOFF	Lethbridge-GreenAmpt	0.000	0.555	55	0.01	55
STMH9N001		2		Lethbridge-5yr-4hr	RUNOFF	Lethbridge-GreenAmpt	0.000	0.572	55	0.01	55
STMH9N001		3		Lethbridge-5yr-4hr	RUNOFF	Lethbridge-GreenAmpt	0.000	0.292	55	0.01	55
STMH9N002	5yr-4hr		STMH9N002		RUNOFF		0	0	0	0	0
STMH9N002	100yr-24hr		STMH9N002		RUNOFF		0	0	0	0	0
STMHCC001	5yr-4hr	1	STMHCC001	Lethbridge-5yr-4hr	RUNOFF	Lethbridge-GreenAmpt	0	1.46	55	0.01	55
STMHCC001	100yr-24hr	1	STMHCC001	Lethbridge-5yr-4hr	RUNOFF	Lethbridge-GreenAmpt	0	1.46	55	0.01	55
STMHCC002	5yr-4hr	1	STMHCC002	Lethbridge-5yr-4hr	RUNOFF	Lethbridge-GreenAmpt	0	0.33	55	0.01	57
STMHCC002		2		Lethbridge-5yr-4hr	RUNOFF	Lethbridge-GreenAmpt	0	0.3	55	0.01	55
STMHCC002	100yr-24hr	1	STMHCC002	Lethbridge-5yr-4hr	RUNOFF	Lethbridge-GreenAmpt	0	0.33	55	0.01	57
STMHCC002		2		Lethbridge-5yr-4hr	RUNOFF	Lethbridge-GreenAmpt	0	0.3	55	0.01	55
STMHCC003	5yr-4hr	1	STMHCC003	Lethbridge-5yr-4hr	RUNOFF	Lethbridge-GreenAmpt	0	0.181	55	0.01	43
STMHCC003		2		Lethbridge-5yr-4hr	RUNOFF	Lethbridge-GreenAmpt	0	0.446	55	0.01	55
STMHCC003	100yr-24hr	1	STMHCC003	Lethbridge-5yr-4hr	RUNOFF	Lethbridge-GreenAmpt	0	0.181	55	0.01	43
STMHCC003		2		Lethbridge-5yr-4hr	RUNOFF	Lethbridge-GreenAmpt	0	0.446	55	0.01	55
STMHCC004	5yr-4hr		STMHCC004		RUNOFF		0	0	0	0	0
STMHCC004	100yr-24hr		STMHCC004		RUNOFF		0	0	0	0	0
STMHCC005	5yr-4hr	1	STMHCC005	Lethbridge-5yr-4hr	RUNOFF	Lethbridge-GreenAmpt	0	1.233	55	0.01	10
STMHCC005	100yr-24hr	1	STMHCC005	Lethbridge-5yr-4hr	RUNOFF	Lethbridge-GreenAmpt	0	1.233	55	0.01	10
STMHCC006	5yr-4hr	1	STMHCC006	Lethbridge-5yr-4hr	RUNOFF	Lethbridge-GreenAmpt	0	0.781	55	0.01	88
STMHCC006	100yr-24hr	1	STMHCC006	Lethbridge-5yr-4hr	RUNOFF	Lethbridge-GreenAmpt	0	0.781	55	0.01	88
STMHCC007	5yr-4hr	1	STMHCC007	Lethbridge-5yr-4hr	RUNOFF	Lethbridge-GreenAmpt	0	1.258	13	0.01	36
STMHCC007		2		Lethbridge-5yr-4hr	RUNOFF	Lethbridge-GreenAmpt	0	0.244	15	0.01	55
STMHCC007		3		Lethbridge-5yr-4hr	RUNOFF	Lethbridge-GreenAmpt	0	0.344	55	0.01	10
STMHCC007		4		Lethbridge-5yr-4hr	RUNOFF	Lethbridge-GreenAmpt	0	1.989	13	0.01	100
STMHCC007		5		Lethbridge-5yr-4hr	RUNOFF	Lethbridge-GreenAmpt	0	0.314	55	0.01	55
STMHCC007	100yr-24hr	1	STMHCC007	Lethbridge-5yr-4hr	RUNOFF	Lethbridge-GreenAmpt	0	1.258	13	0.01	36
STMHCC007		2		Lethbridge-5yr-4hr	RUNOFF	Lethbridge-GreenAmpt	0	0.244	15	0.01	55
STMHCC007		3		Lethbridge-5yr-4hr	RUNOFF	Lethbridge-GreenAmpt	0	0.344	55	0.01	10
STMHCC007		4		Lethbridge-5yr-4hr	RUNOFF	Lethbridge-GreenAmpt	0	1.989	13	0.01	100
STMHCC007		5		Lethbridge-5yr-4hr	RUNOFF	Lethbridge-GreenAmpt	0	0.314	55	0.01	55
STMHCC008	5yr-4hr	1	STMHCC008	Lethbridge-5yr-4hr	RUNOFF	Lethbridge-GreenAmpt	0	0.058	55	0.01	10
STMHCC008		2		Lethbridge-5yr-4hr	RUNOFF	Lethbridge-GreenAmpt	0	0.058	55	0.01	10
STMHCC008		3		Lethbridge-5yr-4hr	RUNOFF	Lethbridge-GreenAmpt	0	1.187	55	0.01	50
STMHCC008		4		Lethbridge-5yr-4hr	RUNOFF	Lethbridge-GreenAmpt	0	0.863	55	0.01	93
STMHCC008	100yr-24hr	1	STMHCC008	Lethbridge-5yr-4hr	RUNOFF	Lethbridge-GreenAmpt	0	0.058	55	0.01	10
STMHCC008		2		Lethbridge-5yr-4hr	RUNOFF	Lethbridge-GreenAmpt	0	0.058	55	0.01	10
STMHCC008		3		Lethbridge-5yr-4hr	RUNOFF	Lethbridge-GreenAmpt	0	1.187	55	0.01	50
STMHCC008		4		Lethbridge-5yr-4hr	RUNOFF	Lethbridge-GreenAmpt	0	0.863	55	0.01	93
STMHCC009	5yr-4hr	1	STMHCC009	Lethbridge-5yr-4hr	RUNOFF	Lethbridge-GreenAmpt	0	2.858	55	0.01	100

STMHCC009	100yr-24hr	1	STMHCC009	Lethbridge-5yr-4hr	RUNOFF	Lethbridge-GreenAmpt	0	2.858	55	0.01	100
STMHCC010	5yr-4hr	1	STMHCC010	Lethbridge-5yr-4hr	RUNOFF	Lethbridge-GreenAmpt	0	1.17	85	0.01	108
STMHCC010		2		Lethbridge-5yr-4hr	RUNOFF	Lethbridge-GreenAmpt	0	0.337	55	0.01	55
STMHCC010	100yr-24hr	1	STMHCC010	Lethbridge-5yr-4hr	RUNOFF	Lethbridge-GreenAmpt	0	1.17	85	0.01	108
STMHCC010		2		Lethbridge-5yr-4hr	RUNOFF	Lethbridge-GreenAmpt	0	0.337	55	0.01	55
STMHCC011	5yr-4hr	1	STMHCC011	Lethbridge-5yr-4hr	RUNOFF	Lethbridge-GreenAmpt	0	0.596	55	0.01	55
STMHCC011		2		Lethbridge-5yr-4hr	RUNOFF	Lethbridge-GreenAmpt	0	1.226	55	0.01	55
STMHCC011		3		Lethbridge-5yr-4hr	RUNOFF	Lethbridge-GreenAmpt	0	0.882	55	0.01	94
STMHCC011	100yr-24hr	1	STMHCC011	Lethbridge-5yr-4hr	RUNOFF	Lethbridge-GreenAmpt	0	0.596	55	0.01	55
STMHCC011		2		Lethbridge-5yr-4hr	RUNOFF	Lethbridge-GreenAmpt	0	1.226	55	0.01	55
STMHCC011		3		Lethbridge-5yr-4hr	RUNOFF	Lethbridge-GreenAmpt	0	0.882	55	0.01	94
STMHGB001	5yr-4hr		STMHGB001		RUNOFF		0	0	0	0	0
STMHGB001	100yr-24hr		STMHGB001		RUNOFF		0	0	0	0	0
STMHGB002	5yr-4hr		STMHGB002		RUNOFF		0	0	0	0	0
STMHGB002	100yr-24hr		STMHGB002		RUNOFF		0	0	0	0	0
STMHGB003	5yr-4hr	1	STMHGB003	Lethbridge-5yr-4hr	RUNOFF	Lethbridge-GreenAmpt	0	0.742	55	0.01	10
STMHGB003		2		Lethbridge-5yr-4hr	RUNOFF	Lethbridge-GreenAmpt	0	0.49	55	0.01	55
STMHGB003		3		Lethbridge-5yr-4hr	RUNOFF	Lethbridge-GreenAmpt	0	0.089	55	0.01	10
STMHGB003	100yr-24hr	1	STMHGB003	Lethbridge-5yr-4hr	RUNOFF	Lethbridge-GreenAmpt	0	0.742	55	0.01	10
STMHGB003		2		Lethbridge-5yr-4hr	RUNOFF	Lethbridge-GreenAmpt	0	0.49	55	0.01	55
STMHGB003		3		Lethbridge-5yr-4hr	RUNOFF	Lethbridge-GreenAmpt	0	0.089	55	0.01	10
STMHHW001	5yr-4hr		STMHHW001		RUNOFF		0	0	0	0	0
STMHHW001	100yr-24hr		STMHHW001		RUNOFF		0	0	0	0	0
STMHHW002	5yr-4hr	1	STMHHW002	Lethbridge-5yr-4hr	RUNOFF	Lethbridge-GreenAmpt	0	1.458	55	0.01	10
STMHHW002		2		Lethbridge-5yr-4hr	RUNOFF	Lethbridge-GreenAmpt	0	0.601	55	0.01	55
STMHHW002		3		Lethbridge-5yr-4hr	RUNOFF	Lethbridge-GreenAmpt	0	0.992	55	0.01	55
STMHHW002	100yr-24hr	1	STMHHW002	Lethbridge-5yr-4hr	RUNOFF	Lethbridge-GreenAmpt	0	1.458	55	0.01	10
STMHHW002		2		Lethbridge-5yr-4hr	RUNOFF	Lethbridge-GreenAmpt	0	0.601	55	0.01	55
STMHHW002		3		Lethbridge-5yr-4hr	RUNOFF	Lethbridge-GreenAmpt	0	0.992	55	0.01	55
STMHHW003	5yr-4hr		STMHHW003		RUNOFF		0	0	0	0	0
STMHHW003	100yr-24hr		STMHHW003		RUNOFF		0	0	0	0	0
STMHHW004	5yr-4hr	1	STMHHW004	Lethbridge-5yr-4hr	RUNOFF	Lethbridge-GreenAmpt	0	0.664	55	0.01	55
STMHHW004		2		Lethbridge-5yr-4hr	RUNOFF	Lethbridge-GreenAmpt	0	0.666	55	0.01	55
STMHHW004		3		Lethbridge-5yr-4hr	RUNOFF	Lethbridge-GreenAmpt	0	1.722	55	0.01	10
STMHHW004	100yr-24hr	1	STMHHW004	Lethbridge-5yr-4hr	RUNOFF	Lethbridge-GreenAmpt	0	0.664	55	0.01	55
STMHHW004		2		Lethbridge-5yr-4hr	RUNOFF	Lethbridge-GreenAmpt	0	0.666	55	0.01	55
STMHHW004		3		Lethbridge-5yr-4hr	RUNOFF	Lethbridge-GreenAmpt	0	1.722	55	0.01	10
STMHHW005	5yr-4hr	1	STMHHW005	Lethbridge-5yr-4hr	RUNOFF	Lethbridge-GreenAmpt	0	0.248	55	0.01	10
STMHHW005		2		Lethbridge-5yr-4hr	RUNOFF	Lethbridge-GreenAmpt	0	0.425	55	0.01	21
STMHHW005		3		Lethbridge-5yr-4hr	RUNOFF	Lethbridge-GreenAmpt	0	1.119	85	0.01	55
STMHHW005	100yr-24hr	1	STMHHW005	Lethbridge-5yr-4hr	RUNOFF	Lethbridge-GreenAmpt	0	0.248	55	0.01	10
STMHHW005		2		Lethbridge-5yr-4hr	RUNOFF	Lethbridge-GreenAmpt	0	0.425	55	0.01	21
STMHHW005		3		Lethbridge-5yr-4hr	RUNOFF	Lethbridge-GreenAmpt	0	1.119	85	0.01	55
STMHHW006	5yr-4hr	1	STMHHW006	Lethbridge-5yr-4hr	RUNOFF	Lethbridge-GreenAmpt	0	0.47	85	0.01	50
STMHHW006		2		Lethbridge-5yr-4hr	RUNOFF	Lethbridge-GreenAmpt	0	0.128	55	0.01	55
STMHHW006	100yr-24hr	1	STMHHW006	Lethbridge-5yr-4hr	RUNOFF	Lethbridge-GreenAmpt	0	0.47	85	0.01	50
STMHHW006		2		Lethbridge-5yr-4hr	RUNOFF	Lethbridge-GreenAmpt	0	0.128	55	0.01	55
STMHHW007	5yr-4hr	1	STMHHW007	Lethbridge-5yr-4hr	RUNOFF	Lethbridge-GreenAmpt	0	0.701	85	0.01	50
STMHHW007	100yr-24hr	1	STMHHW007	Lethbridge-5yr-4hr	RUNOFF	Lethbridge-GreenAmpt	0	0.701	85	0.01	50
STMHHW008	5yr-4hr	1	STMHHW008	Lethbridge-5yr-4hr	RUNOFF	Lethbridge-GreenAmpt	0	0.626	85	0.01	50
STMHHW008		2		Lethbridge-5yr-4hr	RUNOFF	Lethbridge-GreenAmpt	0	1.117	55	0.01	10
STMHHW008	100yr-24hr	1	STMHHW008	Lethbridge-5yr-4hr	RUNOFF	Lethbridge-GreenAmpt	0	0.626	85	0.01	50
STMHHW008		2		Lethbridge-5yr-4hr	RUNOFF	Lethbridge-GreenAmpt	0	1.117	55	0.01	10
STMHHW009	5yr-4hr		STMHHW009		RUNOFF		0	0	0	0	0
STMHHW009	100yr-24hr		STMHHW009		RUNOFF		0	0	0	0	0
STMHHW010	5yr-4hr	1	STMHHW010	Lethbridge-5yr-4hr	RUNOFF	Lethbridge-GreenAmpt	0	1.015	85	0.01	50
STMHHW010	100yr-24hr	1	STMHHW010	Lethbridge-5yr-4hr	RUNOFF	Lethbridge-GreenAmpt	0	1.015	85	0.01	50
STMHJM001	5yr-4hr	1	STMHJM001	Lethbridge-5yr-4hr	RUNOFF	Lethbridge-GreenAmpt	0	0.744	85	0.01	50
STMHJM001		2		Lethbridge-5yr-4hr	RUNOFF	Lethbridge-GreenAmpt	0	2.722	95	0.01	50
STMHJM001	100yr-24hr	1	STMHJM001	Lethbridge-5yr-4hr	RUNOFF	Lethbridge-GreenAmpt	0	0.744	85	0.01	50
STMHJM001		2		Lethbridge-5yr-4hr	RUNOFF	Lethbridge-GreenAmpt	0	2.722	95	0.01	50
STMHMC001	5yr-4hr	1	STMHMC001	Lethbridge-5yr-4hr	RUNOFF	Lethbridge-GreenAmpt	0	0.609	55	0.01	50
STMHMC001	100yr-24hr	1	STMHMC001	Lethbridge-5yr-4hr	RUNOFF	Lethbridge-GreenAmpt	0	0.609	55	0.01	50
STMHMC002	5yr-4hr	1	STMHMC002	Lethbridge-5yr-4hr	RUNOFF	Lethbridge-GreenAmpt	0	0.894	55	0.01	50
STMHMC002		2		Lethbridge-5yr-4hr	RUNOFF	Lethbridge-GreenAmpt	0	0.586	55	0.01	50
STMHMC002	100yr-24hr	1	STMHMC002	Lethbridge-5yr-4hr	RUNOFF	Lethbridge-GreenAmpt	0	0.894	55	0.01	50
STMHMC002		2		Lethbridge-5yr-4hr	RUNOFF	Lethbridge-GreenAmpt	0	0.586	55	0.01	50
STMHMC003	5yr-4hr		STMHMC003		RUNOFF		0	0	0	0	0
STMHMC003	100yr-24hr		STMHMC003		RUNOFF		0	0	0	0	0
STMHNA001	5yr-4hr	1	STMHNA001	Lethbridge-5yr-4hr	RUNOFF	Lethbridge-GreenAmpt	0	2.335	80	0.01	60
STMHNA001	100yr-24hr	1	STMHNA001	Lethbridge-5yr-4hr	RUNOFF	Lethbridge-GreenAmpt	0	2.335	80	0.01	60
STMHNA002	5yr-4hr	1	STMHNA002	Lethbridge-5yr-4hr	RUNOFF	Lethbridge-GreenAmpt	0	0.167	55	0.01	55
STMHNA002	100yr-24hr	1	STMHNA002	Lethbridge-5yr-4hr	RUNOFF	Lethbridge-GreenAmpt	0	0.167	55	0.01	55
STMHNA003	5yr-4hr	1	STMHNA003	Lethbridge-5yr-4hr	RUNOFF	Lethbridge-GreenAmpt	0	0.766	55	0.01	88
STMHNA003		2		Lethbridge-5yr-4hr	RUNOFF	Lethbridge-GreenAmpt	0	0.614	55	0.01	78
STMHNA003	100yr-24hr	1	STMHNA003	Lethbridge-5yr-4hr	RUNOFF	Lethbridge-GreenAmpt	0	0.766	55	0.01	88
STMHNA003		2		Lethbridge-5yr-4hr	RUNOFF	Lethbridge-GreenAmpt	0	0.614	55	0.01	78
STMHNA004	5yr-4hr	1	STMHNA004	Lethbridge-5yr-4hr	RUNOFF	Lethbridge-GreenAmpt	0	0.356	55	0.01	60
STMHNA004		2		Lethbridge-5yr-4hr	RUNOFF	Lethbridge-GreenAmpt	0	0.595	55	0.01	55
STMHNA004	100yr-24hr	1	STMHNA004	Lethbridge-5yr-4hr	RUNOFF	Lethbridge-GreenAmpt	0	0.356	55	0.01	60
STMHNA004		2		Lethbridge-5yr-4hr	RUNOFF	Lethbridge-GreenAmpt	0	0.595	55	0.01	55
STMHNA005	5yr-4hr	1	STMHNA005	Lethbridge-5yr-4hr	RUNOFF	Lethbridge-GreenAmpt	0	1.332	55	0.01	80
STMHNA005		2		Lethbridge-5yr-4hr	RUNOFF	Lethbridge-GreenAmpt	0	0.584	60	0.01	76
STMHNA005	100yr-24hr	1	STMHNA005	Lethbridge-5yr-4hr	RUNOFF	Lethbridge-GreenAmpt	0	1.332	55	0.01	80
STMHNA005		2		Lethbridge-5yr-4hr	RUNOFF	Lethbridge-GreenAmpt	0	0.584	60	0.01	76
STMHNS001	5yr-4hr		STMHNS001		RUNOFF		0	0	0	0	0
STMHNS001	100yr-24hr		STMHNS001		RUNOFF		0	0	0	0	0
STMHPR001	5yr-4hr	1	STMHPR001	Lethbridge-5yr-4hr	RUNOFF	Lethbridge-GreenAmpt	0	0.602	55	0.01	25
STMHPR001		2		Lethbridge-5yr-4hr	RUNOFF	Lethbridge-GreenAmpt	0	0.743	55	0.01	55
STMHPR001	100yr-24hr	1	STMHPR001	Lethbridge-5yr-4hr	RUNOFF	Lethbridge-GreenAmpt	0	0.602	55	0.01	25
STMHPR001		2		Lethbridge-5yr-4hr	RUNOFF	Lethbridge-GreenAmpt	0	0.743	55	0.01	55
STMHRG001	5yr-4hr		STMHRG001		RUNOFF		0	0	0	0	0
STMHRG001	100yr-24hr		STMHRG001		RUNOFF		0	0	0	0	0
STMHRG002	5yr-4hr		STMHRG002		RUNOFF		0	0	0	0	0
STMHRG002	100yr-24hr		STMHRG002		RUNOFF		0	0	0	0	0
STMHRW001	5yr-4hr	1	STMHRW001	Lethbridge-5yr-4hr	RUNOFF	Lethbridge-GreenAmpt	0	1.107	55	0.01	55
STMHRW001		2		Lethbridge-5yr-4hr	RUNOFF	Lethbridge-GreenAmpt	0	0.704	55	0.01	55
STMHRW001	100yr-24hr	1	STMHRW001	Lethbridge-5yr-4hr	RUNOFF	Lethbridge-GreenAmpt	0	1.107	55	0.01	55
STMHRW001		2		Lethbridge-5yr-4hr	RUNOFF	Lethbridge-GreenAmpt	0	0.704	55	0.01	55
STMHXXX001	5yr-4hr		STMHXXX001		RUNOFF		0	0	0	0	0
STMHXXX001	100yr-24hr		STMHXXX001		RUNOFF		0	0	0	0	0

STMHXXX002	5yr-4hr		STMHXXX002		RUNOFF		0	0	0	0	0
STMHXXX002	100yr-24hr		STMHXXX002		RUNOFF		0	0	0	0	0
STMHXXX003	5yr-4hr	1	STMHXXX003	Lethbridge-5yr-4hr	RUNOFF	Lethbridge-GreenAmpt	0	0.518	55	0.01	72
STMHXXX003	100yr-24hr	1	STMHXXX003	Lethbridge-5yr-4hr	RUNOFF	Lethbridge-GreenAmpt	0	0.518	55	0.01	72
STMHXXX004	5yr-4hr		STMHXXX004		RUNOFF		0	0	0	0	0
STMHXXX004	100yr-24hr		STMHXXX004		RUNOFF		0	0	0	0	0
STMHXXX005	5yr-4hr		STMHXXX005		RUNOFF		0	0	0	0	0
STMHXXX005	100yr-24hr		STMHXXX005		RUNOFF		0	0	0	0	0
STMHXXX006	5yr-4hr		STMHXXX006		RUNOFF		0	0	0	0	0
STMHXXX006	100yr-24hr		STMHXXX006		RUNOFF		0	0	0	0	0
STMHXXX007	5yr-4hr		STMHXXX007		RUNOFF		0	0	0	0	0
STMHXXX007	100yr-24hr		STMHXXX007		RUNOFF		0	0	0	0	0
STMHXXX008	5yr-4hr		STMHXXX008		RUNOFF		0	0	0	0	0
STMHXXX008	100yr-24hr		STMHXXX008		RUNOFF		0	0	0	0	0
STMHXXX009	5yr-4hr		STMHXXX009		RUNOFF		0	0	0	0	0
STMHXXX009	100yr-24hr		STMHXXX009		RUNOFF		0	0	0	0	0
STMHXXX010	5yr-4hr		STMHXXX010		RUNOFF		0	0	0	0	0
STMHXXX010	100yr-24hr		STMHXXX010		RUNOFF		0	0	0	0	0
STMHXXX011	5yr-4hr	1	STMHXXX011	Lethbridge-5yr-4hr	RUNOFF	Lethbridge-GreenAmpt	0	2.02	7	0.01	20
STMHXXX011		2		Lethbridge-5yr-4hr	RUNOFF	Lethbridge-GreenAmpt	0	0.73	55	0.01	10
STMHXXX011	100yr-24hr	1	STMHXXX011	Lethbridge-5yr-4hr	RUNOFF	Lethbridge-GreenAmpt	0	2.02	7	0.01	20
STMHXXX011		2		Lethbridge-5yr-4hr	RUNOFF	Lethbridge-GreenAmpt	0	0.73	55	0.01	10
STMHXXX012	5yr-4hr		STMHXXX012		RUNOFF		0	0	0	0	0
STMHXXX012	100yr-24hr		STMHXXX012		RUNOFF		0	0	0	0	0
STMHXXX013	5yr-4hr	1	STMHXXX013	Lethbridge-5yr-4hr	RUNOFF	Lethbridge-GreenAmpt	0	4.014	55	0.01	10
STMHXXX013		2		Lethbridge-5yr-4hr	RUNOFF	Lethbridge-GreenAmpt	0	5.272	7	0.01	75
STMHXXX013	100yr-24hr	1	STMHXXX013	Lethbridge-5yr-4hr	RUNOFF	Lethbridge-GreenAmpt	0	4.014	55	0.01	10
STMHXXX013		2		Lethbridge-5yr-4hr	RUNOFF	Lethbridge-GreenAmpt	0	5.272	7	0.01	75
STMHXXX014	5yr-4hr	1	STMHXXX014	Lethbridge-5yr-4hr	RUNOFF	Lethbridge-GreenAmpt	0	2.987	55	0.01	50
STMHXXX014	100yr-24hr	1	STMHXXX014	Lethbridge-5yr-4hr	RUNOFF	Lethbridge-GreenAmpt	0	2.987	55	0.01	50
STMHXXX016	5yr-4hr		STMHXXX016		RUNOFF		0	0	0	0	0
STMHXXX016	100yr-24hr		STMHXXX016		RUNOFF		0	0	0	0	0
STMHXXX025	5yr-4hr		STMHXXX025		RUNOFF		0	0	0	0	0
STMHXXX025	100yr-24hr		STMHXXX025		RUNOFF		0	0	0	0	0
STMHXXX026	5yr-4hr		STMHXXX026		RUNOFF		0	0	0	0	0
STMHXXX026	100yr-24hr		STMHXXX026		RUNOFF		0	0	0	0	0
STMHXXX027	5yr-4hr	1	STMHXXX027	Lethbridge-5yr-4hr	RUNOFF	Lethbridge-GreenAmpt	0	0.578	55	0.01	55
STMHXXX027	100yr-24hr	1	STMHXXX027	Lethbridge-5yr-4hr	RUNOFF	Lethbridge-GreenAmpt	0	0.578	55	0.01	55
STMHXXX028	5yr-4hr	1	STMHXXX028	Lethbridge-5yr-4hr	RUNOFF	Lethbridge-GreenAmpt	0	0.144	55	0.01	25
STMHXXX028	100yr-24hr	1	STMHXXX028	Lethbridge-5yr-4hr	RUNOFF	Lethbridge-GreenAmpt	0	0.144	55	0.01	25
STMHXXX035	5yr-4hr	1	STMHXXX035	Lethbridge-5yr-4hr	RUNOFF	Lethbridge-GreenAmpt	0	4.006	50	0.01	135
STMHXXX035	100yr-24hr	1	STMHXXX035	Lethbridge-5yr-4hr	RUNOFF	Lethbridge-GreenAmpt	0	4.006	50	0.01	135
STMHXXX037	5yr-4hr		STMHXXX037		RUNOFF		0	0	0	0	0
STMHXXX037	100yr-24hr		STMHXXX037		RUNOFF		0	0	0	0	0

POST-DEVELOPMENT – HYDRAULIC NODE INPUT

Name	Storm	Approach Depth Reference	Inlet Capacity Rating Curve Reference	Inlet Capacity Type	Ponding Type	Ground Elevation (Spill Crest) m	Invert Elevation m	Maximum Crown Elevation m	Measure Depth From:	Storage Node Data Flag	Storage Method	Constant Area Storage m^2	Inlet Capacity Flag
CB3A002W	5yr-4hr			Maximum Capacity	Allowed	898.988	897.008	898.988	Node Invert	0	Constant	0	0
CB3A002W	100yr-24hr			Maximum Capacity	Allowed	898.988	897.008	898.988	Node Invert	0	Constant	0	0
CBXXX025	5yr-4hr			Maximum Capacity	Allowed	899.679	899.184	899.679	Node Invert	0	Constant	0	0
CBXXX025	100yr-24hr			Maximum Capacity	Allowed	899.679	899.184	899.679	Node Invert	0	Constant	0	0
CBXXX026	5yr-4hr			Maximum Capacity	Allowed	904.203	902.815	904.203	Node Invert	0	Constant	0	0
CBXXX026	100yr-24hr			Maximum Capacity	Allowed	904.203	902.815	904.203	Node Invert	0	Constant	0	0
CBXXX027	5yr-4hr			Maximum Capacity	Allowed	904.661	902.782	904.661	Node Invert	0	Constant	0	0
CBXXX027	100yr-24hr			Maximum Capacity	Allowed	904.661	902.782	904.661	Node Invert	0	Constant	0	0
CBXXX038	5yr-4hr			Maximum Capacity	Allowed	905.576	904.961	905.576	Node Invert	0	Constant	0	0
CBXXX038	100yr-24hr			Maximum Capacity	Allowed	905.576	904.961	905.576	Node Invert	0	Constant	0	0
Dummy 1	5yr-4hr			Maximum Capacity	Allowed	900	899.184	900	Node Invert	0	Constant	0	0
Dummy 1	100yr-24hr			Maximum Capacity	Allowed	900	899.184	900	Node Invert	0	Constant	0	0
MHXXX011A	5yr-4hr			Maximum Capacity	None	902	898.072	898.972	Node Invert	0	Constant	0	0
MHXXX011A	100yr-24hr			Maximum Capacity	None	902	898.072	898.972	Node Invert	0	Constant	0	0
MHXXX012A	5yr-4hr			Maximum Capacity	Allowed	902.665	894.949	902.665	Node Invert	0	Constant	0	0
MHXXX012A	100yr-24hr			Maximum Capacity	Allowed	902.665	894.949	902.665	Node Invert	0	Constant	0	0
Node1109	5yr-4hr			Maximum Capacity	Allowed	902.5	899	902.5	Node Invert	0	Constant	0	0
Node1109	100yr-24hr			Maximum Capacity	Allowed	902.5	899	902.5	Node Invert	0	Constant	0	0
Node1117	5yr-4hr			Maximum Capacity	Allowed	898	891.44	898	Node Invert	0	Constant	0	0
Node1117	100yr-24hr			Maximum Capacity	Allowed	898	891.44	898	Node Invert	0	Constant	0	0
Node1118	5yr-4hr			Maximum Capacity	Allowed	904.1	902.269	904.1	Node Invert	0	Constant	0	0
Node1118	100yr-24hr			Maximum Capacity	Allowed	904.1	902.269	904.1	Node Invert	0	Constant	0	0
Node1120	5yr-4hr			Maximum Capacity	None	904.79	903.6	903.9	Node Invert	0	Constant	0	0
Node1120	100yr-24hr			Maximum Capacity	None	904.79	903.6	903.9	Node Invert	0	Constant	0	0
Node1121	5yr-4hr			Maximum Capacity	None	899.28	898.28	899.28	Node Invert	0	Constant	0	0
Node1121	100yr-24hr			Maximum Capacity	None	899.28	898.28	899.28	Node Invert	0	Constant	0	0
Node1122	5yr-4hr			Maximum Capacity	None	900.16	898.364	899.364	Node Invert	0	Constant	0	0
Node1122	100yr-24hr			Maximum Capacity	None	900.16	898.364	899.364	Node Invert	0	Constant	0	0
Node1123	5yr-4hr			Maximum Capacity	None	900.079	899.079	900.079	Node Invert	0	Constant	0	0
Node1123	100yr-24hr			Maximum Capacity	None	900.079	899.079	900.079	Node Invert	0	Constant	0	0
Node1124	5yr-4hr			Maximum Capacity	None	900.16	899.16	900.16	Node Invert	0	Constant	0	0
Node1124	100yr-24hr			Maximum Capacity	None	900.16	899.16	900.16	Node Invert	0	Constant	0	0
Node1125	5yr-4hr			Maximum Capacity	None	900.449	899.449	900.449	Node Invert	0	Constant	0	0
Node1125	100yr-24hr			Maximum Capacity	None	900.449	899.449	900.449	Node Invert	0	Constant	0	0
Node1126	5yr-4hr			Maximum Capacity	None	900.559	899.559	900.559	Node Invert	0	Constant	0	0
Node1126	100yr-24hr			Maximum Capacity	None	900.559	899.559	900.559	Node Invert	0	Constant	0	0
Node1127	5yr-4hr			Maximum Capacity	None	900.925	899.925	900.425	Node Invert	0	Constant	0	0
Node1127	100yr-24hr			Maximum Capacity	None	900.925	899.925	900.425	Node Invert	0	Constant	0	0
Node1128	5yr-4hr			Maximum Capacity	None	901.008	900.008	900.508	Node Invert	0	Constant	0	0
Node1128	100yr-24hr			Maximum Capacity	None	901.008	900.008	900.508	Node Invert	0	Constant	0	0
Node1129	5yr-4hr			Maximum Capacity	None	900.82	899.82	900.82	Node Invert	0	Constant	0	0
Node1129	100yr-24hr			Maximum Capacity	None	900.82	899.82	900.82	Node Invert	0	Constant	0	0
Node1130	5yr-4hr			Maximum Capacity	None	900.389	899.889	900.389	Node Invert	0	Constant	0	0
Node1130	100yr-24hr			Maximum Capacity	None	900.389	899.889	900.389	Node Invert	0	Constant	0	0
Node213	5yr-4hr			Maximum Capacity	Allowed	902	900.5	902	Node Invert	1	Stepwise Linear	0	0
Node213	100yr-24hr			Maximum Capacity	Allowed	902	900.5	902	Node Invert	1	Stepwise Linear	0	0
Node214	5yr-4hr			Maximum Capacity	Allowed	896	894.5	896	Node Invert	1	Stepwise Linear	0	0
Node214	100yr-24hr			Maximum Capacity	Allowed	896	894.5	896	Node Invert	1	Stepwise Linear	0	0
Node216	5yr-4hr			Maximum Capacity	Allowed	908	906.5	908	Node Invert	1	Stepwise Linear	0	0
Node216	100yr-24hr			Maximum Capacity	Allowed	908	906.5	908	Node Invert	1	Stepwise Linear	0	0
Node217	5yr-4hr			Maximum Capacity	None	902	900.5	900.8	Node Invert	0	Constant	0	0
Node217	100yr-24hr			Maximum Capacity	None	902	900.5	900.8	Node Invert	0	Constant	0	0
Node218	5yr-4hr			Maximum Capacity	Allowed	901	899.5	901	Node Invert	1	Stepwise Linear	0	0
Node218	100yr-24hr			Maximum Capacity	Allowed	901	899.5	901	Node Invert	1	Stepwise Linear	0	0
Node219	5yr-4hr			Maximum Capacity	None	900	898.5	898.95	Node Invert	0	Constant	0	0
Node219	100yr-24hr			Maximum Capacity	None	900	898.5	898.95	Node Invert	0	Constant	0	0
Node220	5yr-4hr			Maximum Capacity	None	899	897.5	898.25	Node Invert	0	Constant	0	0
Node220	100yr-24hr			Maximum Capacity	None	899	897.5	898.25	Node Invert	0	Constant	0	0
Node221	5yr-4hr			Maximum Capacity	None	896	894.5	894.95	Node Invert	0	Constant	0	0
Node221	100yr-24hr			Maximum Capacity	None	896	894.5	894.95	Node Invert	0	Constant	0	0
Node222	5yr-4hr			Maximum Capacity	None	901	899.5	899.8	Node Invert	0	Constant	0	0
Node222	100yr-24hr			Maximum Capacity	None	901	899.5	899.8	Node Invert	0	Constant	0	0
Node223	5yr-4hr			Maximum Capacity	None	908	907.154	907.354	Node Invert	0	Constant	0	0
Node223	100yr-24hr			Maximum Capacity	None	908	907.154	907.354	Node Invert	0	Constant	0	0
Node224	5yr-4hr			Maximum Capacity	None	890	889	889.45	Node Invert	0	Constant	0	0
Node224	100yr-24hr			Maximum Capacity	None	890	889	889.45	Node Invert	0	Constant	0	0
Node226	5yr-4hr			Maximum Capacity	Allowed	900.158	900.008	900.158	Node Invert	1	Stepwise Linear	0	0
Node226	100yr-24hr			Maximum Capacity	Allowed	900.158	900.008	900.158	Node Invert	1	Stepwise Linear	0	0
Node227	5yr-4hr			Maximum Capacity	None	895.231	894.631	895.231	Node Invert	0	Constant	0	0
Node227	100yr-24hr			Maximum Capacity	None	895.231	894.631	895.231	Node Invert	0	Constant	0	0
Node228	5yr-4hr			Maximum Capacity	None	904.892	904.292	904.892	Node Invert	0	Constant	0	0
Node228	100yr-24hr			Maximum Capacity	None	904.892	904.292	904.892	Node Invert	0	Constant	0	0
Node240	5yr-4hr			Maximum Capacity	None	907	904.787	905.087	Node Invert	0	Constant	0	0
Node240	100yr-24hr			Maximum Capacity	None	907	904.787	905.087	Node Invert	0	Constant	0	0
Node242	5yr-4hr			Maximum Capacity	None	904	902.074	902.524	Node Invert	0	Constant	0	0
Node242	100yr-24hr			Maximum Capacity	None	904	902.074	902.524	Node Invert	0	Constant	0	0
STMH3A001	5yr-4hr			Maximum Capacity	Allowed	897.821	894.631	897.821	Node Invert	0	Constant	0	0
STMH3A001	100yr-24hr			Maximum Capacity	Allowed	897.821	894.631	897.821	Node Invert	0	Constant	0	0
STMH3A002	5yr-4hr			Maximum Capacity	Allowed	900.189	896.859	900.189	Node Invert	0	Constant	0	0
STMH3A002	100yr-24hr			Maximum Capacity	Allowed	900.189	896.859	900.189	Node Invert	0	Constant	0	0
STMH3A003	5yr-4hr			Maximum Capacity	Allowed	900.03	897.553	900.03	Node Invert	0	Constant	0	0
STMH3A003	100yr-24hr			Maximum Capacity	Allowed	900.03	897.553	900.03	Node Invert	0	Constant	0	0
STMH3N001	5yr-4hr			Maximum Capacity	Allowed	907.299	905.749	907.299	Node Invert	0	Constant	0	0
STMH3N001	100yr-24hr			Maximum Capacity	Allowed	907.299	905.749	907.299	Node Invert	0	Constant	0	0
STMH4N001	5yr-4hr			Maximum Capacity	Allowed	906.025	904.63	906.025	Node Invert	0	Constant	0	0
STMH4N001	100yr-24hr			Maximum Capacity	Allowed	906.025	904.63	906.025	Node Invert	0	Constant	0	0
STMH4S001	5yr-4hr			Maximum Capacity	Allowed	904.803	903.373	904.803	Node Invert	0	Constant	0	0
STMH4S001	100yr-24hr			Maximum Capacity	Allowed	904.803	903.373	904.803	Node Invert	0	Constant	0	0
STMH5S001	5yr-4hr			Maximum Capacity	Allowed	901.846	900.576	901.846	Node Invert	0	Constant	0	0
STMH5S001	100yr-24hr			Maximum Capacity	Allowed	901.846	900.576	901.846	Node Invert	0	Constant	0	0
STMH5S002	5yr-4hr			Maximum Capacity	Allowed	901.723	900.338	901.723	Node Invert	0	Constant	0	0
STMH5S002	100yr-24hr			Maximum Capacity	Allowed	901.723	900.338	901.723	Node Invert	0	Constant	0	0
STMH5S003	5yr-4hr			Maximum Capacity	Allowed	902.123	899.878	902.123	Node Invert	0	Constant	0	0
STMH5S003	100yr-24hr			Maximum Capacity	Allowed	902.123	899.878	902.123	Node Invert	0	Constant	0	0
STMH6N001	5yr-4hr			Maximum Capacity	Allowed	903.938	901.74	903.938	Node Invert	0	Constant	0	0
STMH6N001	100yr-24hr			Maximum Capacity	Allowed	903.938	901.74	903.938	Node Invert	0	Constant	0	0
STMH6S001	5yr-4hr			Maximum Capacity	Allowed	902.58	900.12	902.58	Node Invert	0	Constant	0	0
STMH6S001	100yr-24hr			Maximum Capacity	Allowed	902.58	900.12	902.58	Node Invert	0	Constant	0	0
STMH6S002	5yr-4hr			Maximum Capacity	Allowed	902.855	899.985	902.855	Node Invert	0	Constant	0	0
STMH6S002	100yr-24hr			Maximum Capacity	Allowed	902.855	899.985	902.855	Node Invert	0	Constant	0	0
STMH6S003	5yr-4hr			Maximum Capacity	Allowed	903.232	899.857	903.232	Node Invert	0	Constant	0	0
STMH6S003	100yr-24hr			Maximum Capacity	Allowed	903.232	899.857	903.232	Node Invert	0	Constant	0	0
STMH6S004	5yr-4hr			Maximum Capacity	Allowed	902.956	901.186	902.956	Node Invert	0	Constant	0	0
STMH6S004	100yr-24hr			Maximum Capacity	Allowed	902.956	901.186	902.956	Node Invert	0	Constant	0	0
STMH7N001	5yr-4hr			Maximum Capacity	Allowed	904.769	902.73	904.769	Node Invert	0	Constant	0	0
STMH7N001	100yr-24hr			Maximum Capacity	Allowed	904.769	902.73	904.769	Node Invert	0	Constant	0	0

STMH7N001B	5yr-4hr			Maximum Capacity	None	904.7	902.637	903.312	Node Invert	0	Constant	0	0
STMH7N001B	100yr-24hr			Maximum Capacity	None	904.7	902.637	903.312	Node Invert	0	Constant	0	0
STMH7N002	5yr-4hr			Maximum Capacity	Allowed	904.606	903.761	904.606	Node Invert	0	Constant	0	0
STMH7N002	100yr-24hr			Maximum Capacity	Allowed	904.606	903.761	904.606	Node Invert	0	Constant	0	0
STMH7N003	5yr-4hr			Maximum Capacity	Allowed	906.09	904.088	906.09	Node Invert	0	Constant	0	0
STMH7N003	100yr-24hr			Maximum Capacity	Allowed	906.09	904.088	906.09	Node Invert	0	Constant	0	0
STMH7N004	5yr-4hr			Maximum Capacity	Allowed	906.104	904.324	906.104	Node Invert	0	Constant	0	0
STMH7N004	100yr-24hr			Maximum Capacity	Allowed	906.104	904.324	906.104	Node Invert	0	Constant	0	0
STMH7N005	5yr-4hr			Maximum Capacity	Allowed	904.701	902.631	904.701	Node Invert	0	Constant	0	0
STMH7N005	100yr-24hr			Maximum Capacity	Allowed	904.701	902.631	904.701	Node Invert	0	Constant	0	0
STMH7N006	5yr-4hr			Maximum Capacity	Allowed	904.437	903.174	904.437	Node Invert	0	Constant	0	0
STMH7N006	100yr-24hr			Maximum Capacity	Allowed	904.437	903.174	904.437	Node Invert	0	Constant	0	0
STMH8N001	5yr-4hr			Maximum Capacity	None	905.476	903.721	905.181	Node Invert	0	Constant	0	0
STMH8N001	100yr-24hr			Maximum Capacity	None	905.476	903.721	905.181	Node Invert	0	Constant	0	0
STMH8N002	5yr-4hr			Maximum Capacity	Allowed	905.471	904.246	905.471	Node Invert	0	Constant	0	0
STMH8N002	100yr-24hr			Maximum Capacity	Allowed	905.471	904.246	905.471	Node Invert	0	Constant	0	0
STMH8N003	5yr-4hr			Maximum Capacity	Allowed	905.929	903.941	905.929	Node Invert	0	Constant	0	0
STMH8N003	100yr-24hr			Maximum Capacity	Allowed	905.929	903.941	905.929	Node Invert	0	Constant	0	0
STMH8N004	5yr-4hr			Maximum Capacity	Allowed	905.433	904.363	905.433	Node Invert	0	Constant	0	0
STMH8N004	100yr-24hr			Maximum Capacity	Allowed	905.433	904.363	905.433	Node Invert	0	Constant	0	0
STMH9N001	5yr-4hr			Maximum Capacity	Allowed	906.186	904.371	906.186	Node Invert	0	Constant	0	0
STMH9N001	100yr-24hr			Maximum Capacity	Allowed	906.186	904.371	906.186	Node Invert	0	Constant	0	0
STMH9N002	5yr-4hr			Maximum Capacity	Allowed	905.16	903.93	905.16	Node Invert	0	Constant	0	0
STMH9N002	100yr-24hr			Maximum Capacity	Allowed	905.16	903.93	905.16	Node Invert	0	Constant	0	0
STMHCC001	5yr-4hr			Maximum Capacity	Allowed	904.298	903.113	904.298	Node Invert	0	Constant	0	0
STMHCC001	100yr-24hr			Maximum Capacity	Allowed	904.298	903.113	904.298	Node Invert	0	Constant	0	0
STMHCC002	5yr-4hr			Maximum Capacity	Allowed	904.343	903.053	904.343	Node Invert	0	Constant	0	0
STMHCC002	100yr-24hr			Maximum Capacity	Allowed	904.343	903.053	904.343	Node Invert	0	Constant	0	0
STMHCC003	5yr-4hr			Maximum Capacity	Allowed	904.273	903.023	904.273	Node Invert	0	Constant	0	0
STMHCC003	100yr-24hr			Maximum Capacity	Allowed	904.273	903.023	904.273	Node Invert	0	Constant	0	0
STMHCC004	5yr-4hr			Maximum Capacity	Allowed	904.744	902.574	904.744	Node Invert	0	Constant	0	0
STMHCC004	100yr-24hr			Maximum Capacity	Allowed	904.744	902.574	904.744	Node Invert	0	Constant	0	0
STMHCC005	5yr-4hr			Maximum Capacity	Allowed	903.581	901.671	903.581	Node Invert	0	Constant	0	0
STMHCC005	100yr-24hr			Maximum Capacity	Allowed	903.581	901.671	903.581	Node Invert	0	Constant	0	0
STMHCC006	5yr-4hr			Maximum Capacity	Allowed	904.044	902.269	904.044	Node Invert	0	Constant	0	0
STMHCC006	100yr-24hr			Maximum Capacity	Allowed	904.044	902.269	904.044	Node Invert	0	Constant	0	0
STMHCC006	5yr-4hr			Maximum Capacity	Allowed	904.044	902.269	904.044	Node Invert	0	Constant	0	0
STMHCC006	100yr-24hr			Maximum Capacity	Allowed	904.044	902.269	904.044	Node Invert	0	Constant	0	0
STMHCC007	5yr-4hr			Maximum Capacity	Allowed	904.327	902.672	904.327	Node Invert	0	Constant	0	0
STMHCC007	100yr-24hr			Maximum Capacity	Allowed	904.327	902.672	904.327	Node Invert	0	Constant	0	0
STMHCC008	5yr-4hr			Maximum Capacity	Allowed	906.988	903.923	906.988	Node Invert	0	Constant	0	0
STMHCC008	100yr-24hr			Maximum Capacity	Allowed	906.988	903.923	906.988	Node Invert	0	Constant	0	0
STMHCC009	5yr-4hr			Maximum Capacity	Allowed	905.878	904.018	905.878	Node Invert	0	Constant	0	0
STMHCC009	100yr-24hr			Maximum Capacity	Allowed	905.878	904.018	905.878	Node Invert	0	Constant	0	0
STMHCC010	5yr-4hr			Maximum Capacity	Allowed	904.311	903.091	904.311	Node Invert	0	Constant	0	0
STMHCC010	100yr-24hr			Maximum Capacity	Allowed	904.311	903.091	904.311	Node Invert	0	Constant	0	0
STMHCC011	5yr-4hr			Maximum Capacity	Allowed	903.59	901.1	903.59	Node Invert	0	Constant	0	0
STMHCC011	100yr-24hr			Maximum Capacity	Allowed	903.59	901.1	903.59	Node Invert	0	Constant	0	0
STMHGB001	5yr-4hr			Maximum Capacity	Allowed	904.793	902.948	904.793	Node Invert	0	Constant	0	0
STMHGB001	100yr-24hr			Maximum Capacity	Allowed	904.793	902.948	904.793	Node Invert	0	Constant	0	0
STMHGB002	5yr-4hr			Maximum Capacity	Allowed	904.977	903.075	904.977	Node Invert	0	Constant	0	0
STMHGB002	100yr-24hr			Maximum Capacity	Allowed	904.977	903.075	904.977	Node Invert	0	Constant	0	0
STMHGB003	5yr-4hr			Maximum Capacity	Allowed	906.184	904.702	906.184	Node Invert	0	Constant	0	0
STMHGB003	100yr-24hr			Maximum Capacity	Allowed	906.184	904.702	906.184	Node Invert	0	Constant	0	0
STMHHW001	5yr-4hr			Maximum Capacity	Allowed	903.175	902.315	903.175	Node Invert	0	Constant	0	0
STMHHW001	100yr-24hr			Maximum Capacity	Allowed	903.175	902.315	903.175	Node Invert	0	Constant	0	0
STMHHW002	5yr-4hr			Maximum Capacity	Allowed	904.215	902.055	904.215	Node Invert	0	Constant	0	0
STMHHW002	100yr-24hr			Maximum Capacity	Allowed	904.215	902.055	904.215	Node Invert	0	Constant	0	0
STMHHW003	5yr-4hr			Maximum Capacity	Allowed	904.22	901.65	904.22	Node Invert	0	Constant	0	0
STMHHW003	100yr-24hr			Maximum Capacity	Allowed	904.22	901.65	904.22	Node Invert	0	Constant	0	0
STMHHW004	5yr-4hr			Maximum Capacity	Allowed	903.621	899.377	903.621	Node Invert	0	Constant	0	0
STMHHW004	100yr-24hr			Maximum Capacity	Allowed	903.621	899.377	903.621	Node Invert	0	Constant	0	0
STMHHW005	5yr-4hr			Maximum Capacity	Allowed	904.585	902.615	904.585	Node Invert	0	Constant	0	0
STMHHW005	100yr-24hr			Maximum Capacity	Allowed	904.585	902.615	904.585	Node Invert	0	Constant	0	0
STMHHW006	5yr-4hr			Maximum Capacity	Allowed	905.761	903.781	905.761	Node Invert	0	Constant	0	0
STMHHW006	100yr-24hr			Maximum Capacity	Allowed	905.761	903.781	905.761	Node Invert	0	Constant	0	0
STMHHW007	5yr-4hr			Maximum Capacity	Allowed	905.997	904.597	905.997	Node Invert	0	Constant	0	0
STMHHW007	100yr-24hr			Maximum Capacity	Allowed	905.997	904.597	905.997	Node Invert	0	Constant	0	0
STMHHW008	5yr-4hr			Maximum Capacity	Allowed	907.756	906.201	907.756	Node Invert	0	Constant	0	0
STMHHW008	100yr-24hr			Maximum Capacity	Allowed	907.756	906.201	907.756	Node Invert	0	Constant	0	0
STMHHW009	5yr-4hr			Maximum Capacity	Allowed	908.393	906.953	908.393	Node Invert	0	Constant	0	0
STMHHW009	100yr-24hr			Maximum Capacity	Allowed	908.393	906.953	908.393	Node Invert	0	Constant	0	0
STMHHW010	5yr-4hr			Maximum Capacity	Allowed	909.398	907.758	909.398	Node Invert	0	Constant	0	0
STMHHW010	100yr-24hr			Maximum Capacity	Allowed	909.398	907.758	909.398	Node Invert	0	Constant	0	0
STMHJM001	5yr-4hr			Maximum Capacity	Allowed	904.344	902.824	904.344	Node Invert	0	Constant	0	0
STMHJM001	100yr-24hr			Maximum Capacity	Allowed	904.344	902.824	904.344	Node Invert	0	Constant	0	0
STMHMC001	5yr-4hr			Maximum Capacity	Allowed	902.495	899.205	902.495	Node Invert	0	Constant	0	0
STMHMC001	100yr-24hr			Maximum Capacity	Allowed	902.495	899.205	902.495	Node Invert	0	Constant	0	0
STMHMC002	5yr-4hr			Maximum Capacity	Allowed	902.521	899.271	902.521	Node Invert	0	Constant	0	0
STMHMC001	100yr-24hr			Maximum Capacity	Allowed	902.495	899.205	902.495	Node Invert	0	Constant	0	0
STMHMC002	5yr-4hr			Maximum Capacity	Allowed	902.521	899.271	902.521	Node Invert	0	Constant	0	0
STMHMC002	100yr-24hr			Maximum Capacity	Allowed	902.521	899.271	902.521	Node Invert	0	Constant	0	0
STMHMC003	5yr-4hr			Maximum Capacity	Allowed	902.797	899.497	902.797	Node Invert	0	Constant	0	0
STMHMC003	100yr-24hr			Maximum Capacity	Allowed	902.797	899.497	902.797	Node Invert	0	Constant	0	0
STMHNA001	5yr-4hr			Maximum Capacity	Allowed	906.258	904.796	906.258	Node Invert	0	Constant	0	0
STMHNA001	100yr-24hr			Maximum Capacity	Allowed	906.258	904.796	906.258	Node Invert	0	Constant	0	0
STMHNA002	5yr-4hr			Maximum Capacity	Allowed	906.482	904.282	906.482	Node Invert	0	Constant	0	0
STMHNA002	100yr-24hr			Maximum Capacity	Allowed	906.482	904.282	906.482	Node Invert	0	Constant	0	0
STMHNA003	5yr-4hr			Maximum Capacity	Allowed	906.82	904.71	906.82	Node Invert	0	Constant	0	0
STMHNA003	100yr-24hr			Maximum Capacity	Allowed	906.82	904.71	906.82	Node Invert	0	Constant	0	0
STMHNA004	5yr-4hr			Maximum Capacity	Allowed	907.488	905.383	907.488	Node Invert	0	Constant	0	0
STMHNA004	100yr-24hr			Maximum Capacity	Allowed	907.488	905.383	907.488	Node Invert	0	Constant	0	0
STMHNA005	5yr-4hr			Maximum Capacity	Allowed	908.233	905.983	908.233	Node Invert	0	Constant	0	0
STMHNA005	100yr-24hr			Maximum Capacity	Allowed	908.233	905.983	908.233	Node Invert	0	Constant	0	0
STMHNS001	5yr-4hr			Maximum Capacity	Allowed	908.673	906.983	908.673	Node Invert	0	Constant	0	0
STMHNS001	100yr-24hr			Maximum Capacity	Allowed	908.673	906.983	908.673	Node Invert	0	Constant	0	0
STMHPR001	5yr-4hr			Maximum Capacity	Allowed	904.218	903.198	904.218	Node Invert	0	Constant	0	0
STMHPR001	100yr-24hr			Maximum Capacity	Allowed	904.218	903.198	904.218	Node Invert	0	Constant	0	0
STMHRG001	5yr-4hr			Maximum Capacity	Allowed	900.088	899.528	900.088	Node Invert	0	Constant	0	0
STMHRG001	100yr-24hr			Maximum Capacity	Allowed	900.088	899.528	900.088	Node Invert	0	Constant	0	0
STMHRG002	5yr-4hr			Maximum Capacity	Allowed	898.493	895.876	898.493	Node Invert	0	Constant	0	0
STMHRG002	100yr-24hr			Maximum Capacity	Allowed	898.493	895.876	898.493	Node Invert	0	Constant	0	0
STMHRW001	5yr-4hr			Maximum Capacity	Allowed	905.722	903.86	905.722	Node Invert	0	Constant	0	0
STMHRW001	100yr-24hr			Maximum Capacity	Allowed	905.722	903.86	905.722	Node Invert	0	Constant	0	0
STMHXXX001	5yr-4hr			Maximum Capacity	Allowed	905.681	903.931	905.681	Node Invert	0	Constant	0	0
STMHXXX001	100yr-24hr			Maximum Capacity	Allowed	905.681	903.931	905.681	Node Invert	0	Constant	0	0
STMHXXX002	5yr-4hr			Maximum Capacity	Allowed	905.953	903.583	905.953	Node Invert	0	Constant	0	0
STMHXXX002	100yr-24hr			Maximum Capacity	Allowed	905.953	903.583	905.953	Node Invert	0	Constant	0	0
STMHXXX003	5yr-4hr			Maximum Capacity	Allowed	903.374	901.6	903.374	Node Invert	0	Constant	0	0
STMHXXX003	100yr-24hr			Maximum Capacity	Allowed	903.374	901.6	903.374	Node Invert	0	Constant	0	0
STMHXXX004	5yr-4hr			Maximum Capacity	Allowed	902.238	900.338	902.238	Node Invert	0	Constant	0	0
STMHXXX004	100yr-24hr			Maximum Capacity	Allowed	902.238	900.338	902.238	Node Invert	0	Constant	0	0
STMHXXX005	5yr-4hr			Maximum Capacity	Allowed	902.061	899.081	902.061	Node Invert	0	Constant	0	0
STMHXXX005	100yr-24hr			Maximum Capacity	Allowed	902.061	899.081	902.061	Node Invert	0	Constant	0	0
STMHXXX006	5yr-4hr			Maximum Capacity	Allowed	903.286	898.45	903.286	Node Invert	0	Constant	0	0

STMHXXX006	100yr-24hr			Maximum Capacity	Allowed	903.286	898.45	903.286	Node Invert	0	Constant	0	0
STMHXXX007	5yr-4hr			Maximum Capacity	Allowed	902.329	898.399	902.329	Node Invert	0	Constant	0	0
STMHXXX007	100yr-24hr			Maximum Capacity	Allowed	902.329	898.399	902.329	Node Invert	0	Constant	0	0
STMHXXX008	5yr-4hr			Maximum Capacity	Allowed	901.495	898.145	901.495	Node Invert	0	Constant	0	0
STMHXXX008	100yr-24hr			Maximum Capacity	Allowed	901.495	898.145	901.495	Node Invert	0	Constant	0	0
STMHXXX009	5yr-4hr			Maximum Capacity	Allowed	900.442	897.717	900.442	Node Invert	0	Constant	0	0
STMHXXX009	100yr-24hr			Maximum Capacity	Allowed	900.442	897.717	900.442	Node Invert	0	Constant	0	0
STMHXXX010	5yr-4hr			Maximum Capacity	Allowed	901.977	898.855	901.977	Node Invert	0	Constant	0	0
STMHXXX010	100yr-24hr			Maximum Capacity	Allowed	901.977	898.855	901.977	Node Invert	0	Constant	0	0
STMHXXX011	5yr-4hr			Maximum Capacity	Allowed	900.87	898.755	900.87	Node Invert	0	Constant	0	0
STMHXXX011	100yr-24hr			Maximum Capacity	Allowed	900.87	898.755	900.87	Node Invert	0	Constant	0	0
STMHXXX012	5yr-4hr			Maximum Capacity	None	901	896.202	897.102	Node Invert	0	Constant	0	0
STMHXXX012	100yr-24hr			Maximum Capacity	None	901	896.202	897.102	Node Invert	0	Constant	0	0
STMHXXX013	5yr-4hr			Maximum Capacity	Allowed	897.72	893.215	897.72	Node Invert	0	Constant	0	0
STMHXXX013	100yr-24hr			Maximum Capacity	Allowed	897.72	893.215	897.72	Node Invert	0	Constant	0	0
STMHXXX014	5yr-4hr			Maximum Capacity	Allowed	896.68	891.44	896.68	Node Invert	1	Stepwise Linear	0	0
STMHXXX014	100yr-24hr			Maximum Capacity	Allowed	896.68	891.44	896.68	Node Invert	1	Stepwise Linear	0	0
STMHXXX016	5yr-4hr			Maximum Capacity	Allowed	897.199	893.362	897.199	Node Invert	0	Constant	0	0
STMHXXX016	100yr-24hr			Maximum Capacity	Allowed	897.199	893.362	897.199	Node Invert	0	Constant	0	0
STMHXXX025	5yr-4hr			Maximum Capacity	Allowed	900.162	897.612	900.162	Node Invert	0	Constant	0	0
STMHXXX025	100yr-24hr			Maximum Capacity	Allowed	900.162	897.612	900.162	Node Invert	0	Constant	0	0
STMHXXX026	5yr-4hr			Maximum Capacity	Allowed	902.172	899.662	902.172	Node Invert	0	Constant	0	0
STMHXXX026	100yr-24hr			Maximum Capacity	Allowed	902.172	899.662	902.172	Node Invert	0	Constant	0	0
STMHXXX027	5yr-4hr			Maximum Capacity	Allowed	905.551	904.656	905.551	Node Invert	0	Constant	0	0
STMHXXX027	100yr-24hr			Maximum Capacity	Allowed	905.551	904.656	905.551	Node Invert	0	Constant	0	0
STMHXXX028	5yr-4hr			Maximum Capacity	Allowed	905.607	905.082	905.607	Node Invert	0	Constant	0	0
STMHXXX028	100yr-24hr			Maximum Capacity	Allowed	905.607	905.082	905.607	Node Invert	0	Constant	0	0
STMHXXX035	5yr-4hr			Maximum Capacity	Allowed	903.213	902.538	903.213	Node Invert	1	Stepwise Linear	0	0
STMHXXX035	100yr-24hr			Maximum Capacity	Allowed	903.213	902.538	903.213	Node Invert	1	Stepwise Linear	0	0
STMHXXX037	5yr-4hr			Maximum Capacity	Allowed	905.15	903.25	905.15	Node Invert	1	Stepwise Linear	0	0
STMHXXX037	100yr-24hr			Maximum Capacity	Allowed	905.15	903.25	905.15	Node Invert	1	Stepwise Linear	0	0

POST-DEVELOPMENT – HYDRAULIC NODE OUTPUT

Name	Storm	Node Name	Continuity Error %	Max Surface Area m^2	Max Volume m^3	Max Water Depth m	Max Water Elevation m	Duration of Flooding (min) sec	Surcharge at Max HGL m	Duration of Surcharge (min) sec
CB3A002W	5yr-4hr	CB3A002W	0.035	9510.09	4512.507	2.623	899.631	1062.8	1.823	1114.85
CB3A002W	100yr-24hr	CB3A002W	1.259	20855.82	15858.24	3.408	900.416	3983.9	2.608	4174.567
CBXXX025	5yr-4hr	CBXXX025	0.03	5194.33	194.937	0.533	899.717	183.6	0.283	184.817
CBXXX025	100yr-24hr	CBXXX025	0.002	5972.3	972.908	0.673	899.857	552.2	0.423	571.917
CBXXX026	5yr-4hr	CBXXX026	0	1.22	0.305	0.25	903.065	0	0	0
CBXXX026	100yr-24hr	CBXXX026	0	1.22	0.33	0.27	903.085	0	0	0
CBXXX027	5yr-4hr	CBXXX027	0.034	5021.05	23.345	1.883	904.665	7	1.18	47.633
CBXXX027	100yr-24hr	CBXXX027	0.016	5161	163.295	1.911	904.693	37	1.208	149
CBXXX038	5yr-4hr	CBXXX038	0.043	5089.65	90.403	0.633	905.594	231.7	0.37	247.35
CBXXX038	100yr-24hr	CBXXX038	0.009	5149.1	149.846	0.644	905.605	437.6	0.381	449.55
Dummy 1	5yr-4hr	Dummy 1	0	1.22	0.274	0.225	899.409	0	0	0
Dummy 1	100yr-24hr	Dummy 1	0	1.22	0.287	0.235	899.419	0	0	0
MHXXX011A	5yr-4hr	MHXXX011A	0.001	1.22	3.223	2.642	900.714	0	1.742	256.783
MHXXX011A	100yr-24hr	MHXXX011A	0	1.22	3.681	3.017	901.09	0	2.117	725
MHXXX012A	5yr-4hr	MHXXX012A	0.002	1.22	4.676	3.832	898.781	0	2.932	258.85
MHXXX012A	100yr-24hr	MHXXX012A	0.003	1.22	5.105	4.185	899.134	0	3.285	733.933
Node1109	5yr-4hr	Node1109	0.007	1.22	3.358	2.752	901.752	0	2.091	301.05
Node1109	100yr-24hr	Node1109	0.001	1.22	3.742	3.067	902.067	0	2.406	3896.3
Node1117	5yr-4hr	Node1117	0	1.22	0.873	0.716	892.156	0	0	0
Node1117	100yr-24hr	Node1117	0.001	1.22	0.896	0.734	892.174	0	0	0
Node1118	5yr-4hr	Node1118	0.17	5138.2	140.43	1.858	904.127	243.8	1.335	279.933
Node1118	100yr-24hr	Node1118	0.005	5654.95	657.185	1.954	904.223	854.9	1.431	867.75
Node1120	5yr-4hr	Node1120	0	1.22	0.015	0.012	903.612	0	0	0
Node1120	100yr-24hr	Node1120	0.006	1.22	0.555	0.455	904.055	0	0.155	698.383
Node1121	5yr-4hr	Node1121	0.027	1.22	0.728	0.596	898.876	0	0	0
Node1121	100yr-24hr	Node1121	0.015	1.22	1.142	0.936	899.216	0	0	0
Node1122	5yr-4hr	Node1122	0.06	1.22	2.003	1.642	900.006	0	0.642	76.867
Node1122	100yr-24hr	Node1122	0.011	1.22	2.191	1.796	900.16	1.3	0.796	162.417
Node1123	5yr-4hr	Node1123	0.034	1.22	1.155	0.947	900.026	0	0	0
Node1123	100yr-24hr	Node1123	0.006	1.22	1.22	1	900.079	21.6	0	0
Node1124	5yr-4hr	Node1124	0.013	1.22	1.22	1	900.16	49.2	0	0
Node1124	100yr-24hr	Node1124	0.001	1.22	1.22	1	900.16	90.7	0	0
Node1125	5yr-4hr	Node1125	0.009	1.22	0.938	0.769	900.218	0	0	0
Node1125	100yr-24hr	Node1125	0.001	1.22	0.881	0.722	900.171	0	0	0
Node1126	5yr-4hr	Node1126	0.008	1.22	0.903	0.74	900.299	0	0	0
Node1126	100yr-24hr	Node1126	0.001	1.22	0.897	0.735	900.294	0	0	0
Node1127	5yr-4hr	Node1127	0.001	1.22	0.594	0.486	900.411	0	0	0
Node1127	100yr-24hr	Node1127	0	1.22	0.6	0.49	900.415	0	0	0
Node1128	5yr-4hr	Node1128	0	1.22	1.224	1.003	901.008	31.5	0.5	72.033
Node1128	100yr-24hr	Node1128	0	1.22	1.224	1.003	901.008	58.2	0.5	124.45
Node1129	5yr-4hr	Node1129	0.005	1.22	0.608	0.498	900.318	0	0	0
Node1129	100yr-24hr	Node1129	0.001	1.22	0.595	0.488	900.308	0	0	0
Node1130	5yr-4hr	Node1130	0.001	1.22	0.61	0.5	900.389	69.7	0	0
Node1130	100yr-24hr	Node1130	0	1.22	0.61	0.5	900.389	120.6	0	0
Node213	5yr-4hr	Node213	0.032	10970	4028.706	0.367	900.867	0	0.367	4319.833
Node213	100yr-24hr	Node213	0.032	10970	15742.27	1.435	901.935	0	1.435	4319.833
Node214	5yr-4hr	Node214	0.04	18390	5857.098	0.318	894.818	0	0	0
Node214	100yr-24hr	Node214	0.072	18390	27277.86	1.483	895.983	0	0.733	3747.65
Node216	5yr-4hr	Node216	0.018	5920	2179.857	0.368	906.868	0	0.368	4319.833
Node216	100yr-24hr	Node216	0.018	5920	8613.775	1.455	907.955	0	1.455	4319.833
Node217	5yr-4hr	Node217	0.001	1.22	0.11	0.09	900.587	0	0	0
Node217	100yr-24hr	Node217	0	1.22	0.167	0.137	900.634	0	0	0
Node218	5yr-4hr	Node218	0.006	1710	739.712	0.433	899.933	0	0.433	4319.833
Node218	100yr-24hr	Node218	0.004	1710	2517.038	1.472	900.972	0	1.472	4319.833
Node219	5yr-4hr	Node219	0.003	1.22	0.147	0.121	898.621	0	0	0
Node219	100yr-24hr	Node219	0.004	1.22	0.414	0.34	898.84	0	0	0
Node220	5yr-4hr	Node220	0.022	1.22	0.377	0.309	897.809	0	0	0
Node220	100yr-24hr	Node220	0.015	1.22	1.607	1.317	898.817	0	0.567	30.483
Node221	5yr-4hr	Node221	0	1.22	0.078	0.064	894.561	0	0	0
Node221	100yr-24hr	Node221	0.001	1.22	0.116	0.095	894.592	0	0	0
Node222	5yr-4hr	Node222	0.001	1.22	0.047	0.039	899.536	0	0	0
Node222	100yr-24hr	Node222	0	1.22	0.068	0.056	899.553	0	0	0
Node223	5yr-4hr	Node223	0	1.22	1.224	1.003	908	37	0.646	98.317
Node223	100yr-24hr	Node223	0	1.22	1.224	1.003	908	137.6	0.646	286.667
Node224	5yr-4hr	Node224	0.001	1.22	0.073	0.06	889.06	0	0	0
Node224	100yr-24hr	Node224	0	1.22	0.112	0.092	889.092	0	0	0
Node226	5yr-4hr	Node226	0.006	168	0.001	0	900.008	0	0	783.183
Node226	100yr-24hr	Node226	0.006	168	0.001	0	900.008	0	0	1931.967
Node227	5yr-4hr	Node227	0	1.22	0.594	0.487	895.118	0	0	0
Node227	100yr-24hr	Node227	0	1.22	0.6	0.492	895.123	0	0	0
Node228	5yr-4hr	Node228	0	1.22	0.732	0.6	904.892	104.9	0	0

Node228	100yr-24hr	Node228	0	1.22	0.732	0.6	904.892	247.2	0	0
Node240	5yr-4hr	Node240	0.002	1.22	0.273	0.224	905.011	0	0	0
Node240	100yr-24hr	Node240	0	1.22	0.406	0.333	905.119	0	0.033	275.35
Node242	5yr-4hr	Node242	0.004	1.22	0.428	0.351	902.425	0	0	0
Node242	100yr-24hr	Node242	0	1.22	0.589	0.482	902.557	0	0.032	27.533
STMH3A001	5yr-4hr	STMH3A001	0	1.22	3.799	3.114	897.745	0	2.464	258.55
STMH3A001	100yr-24hr	STMH3A001	0.003	5176.58	180.474	3.225	897.856	372.5	2.575	760.633
STMH3A002	5yr-4hr	STMH3A002	0	1.22	3.381	2.771	899.63	0	1.831	1115.972
STMH3A002	100yr-24hr	STMH3A002	0.105	6269.89	1273.956	3.556	900.415	3518.6	2.616	4176.6
STMH3A003	5yr-4hr	STMH3A003	0	1.22	0.13	0.107	897.66	0	0	0
STMH3A003	100yr-24hr	STMH3A003	0	1.22	0.143	0.117	897.67	0	0	0
STMH3N001	5yr-4hr	STMH3N001	0.307	5308.55	310.436	1.61	907.359	178.2	1.41	179.95
STMH3N001	100yr-24hr	STMH3N001	0.026	5591.32	593.212	1.662	907.411	344.1	1.462	354.55
STMH4N001	5yr-4hr	STMH4N001	0.163	5105.78	107.485	1.416	906.046	173.6	1.116	175.667
STMH4N001	100yr-24hr	STMH4N001	0.003	5486.72	488.417	1.488	906.118	493.5	1.188	496.967
STMH4S001	5yr-4hr	STMH4S001	0.004	1.22	1.499	1.228	904.601	0	0.758	413.767
STMH4S001	100yr-24hr	STMH4S001	0	1.22	1.727	1.416	904.789	0	0.946	1079.35
STMH5S001	5yr-4hr	STMH5S001	0.02	5286.62	288.173	1.326	901.902	77.7	0.876	78.883
STMH5S001	100yr-24hr	STMH5S001	0.076	7453.52	2455.066	1.669	902.245	335.2	1.219	337.917
STMH5S002	5yr-4hr	STMH5S002	0.345	5519.6	521.292	1.484	901.822	292.6	1.184	293.9
STMH5S002	100yr-24hr	STMH5S002	0.006	6770.29	1771.977	1.688	902.026	898.6	1.388	901.35
STMH5S003	5yr-4hr	STMH5S003	0.001	1.22	2.332	1.911	901.789	0	1.516	293.617
STMH5S003	100yr-24hr	STMH5S003	0.006	5154.24	156.976	2.275	902.153	114.1	1.88	903.2
STMH6N001	5yr-4hr	STMH6N001	0.003	1.22	2.304	1.867	903.607	0	1.1	211.967
STMH6N001	100yr-24hr	STMH6N001	0	1.22	2.529	2.073	903.813	0	1.282	606.583
STMH6S001	5yr-4hr	STMH6S001	0.28	5448.34	451.34	2.546	902.666	89.5	1.946	175.233
STMH6S001	100yr-24hr	STMH6S001	0.029	6530.51	1533.511	2.727	902.847	253	2.127	462.3
STMH6S002	5yr-4hr	STMH6S002	0.004	1.22	3.253	2.655	902.64	0	2.067	175.85
STMH6S002	100yr-24hr	STMH6S002	0	1.22	3.427	2.809	902.794	0	2.209	544.35
STMH6S003	5yr-4hr	STMH6S003	0.005	1.22	2.757	2.26	902.117	0	1.535	82.133
STMH6S003	100yr-24hr	STMH6S003	0.002	1.22	3.3	2.705	902.562	0	1.98	476.283
STMH6S004	5yr-4hr	STMH6S004	0.296	5826.81	828.973	1.923	903.109	374.5	1.723	378.883
STMH6S004	100yr-24hr	STMH6S004	0.009	7665.73	2667.887	2.197	903.383	1147.5	1.997	1174.4
STMH7N001	5yr-4hr	STMH7N001	0.003	1.22	1.66	1.361	904.091	0	0.686	221.233
STMH7N001	100yr-24hr	STMH7N001	0	1.22	1.995	1.635	904.365	0	0.96	609.317
STMH7N001B	5yr-4hr	STMH7N001B	0.003	1.22	1.65	1.351	903.988	0	0.677	245.167
STMH7N001B	100yr-24hr	STMH7N001B	0	1.22	2.008	1.646	904.283	0	0.971	629.183
STMH7N002	5yr-4hr	STMH7N002	0.41	5586.76	587.79	0.956	904.717	190.7	0.656	191.267
STMH7N002	100yr-24hr	STMH7N002	0.012	6814.7	1815.727	1.155	904.916	531.3	0.855	535.517
STMH7N003	5yr-4hr	STMH7N003	0.003	1.22	2.347	1.915	906.003	0	1.308	107.95
STMH7N003	100yr-24hr	STMH7N003	0	1.22	2.321	1.902	905.99	0	1.287	294.533
STMH7N004	5yr-4hr	STMH7N004	0.295	5184.8	186.976	1.81	906.134	57.9	1.117	104.783
STMH7N004	100yr-24hr	STMH7N004	0.003	5171.97	174.142	1.814	906.138	164.6	1.121	253.683
STMH7N005	5yr-4hr	STMH7N005	0.002	1.22	1.769	1.45	904.081	0	0.7	227.267
STMH7N005	100yr-24hr	STMH7N005	0	1.22	2.107	1.727	904.358	0	0.977	614.3
STMH7N006	5yr-4hr	STMH7N006	0.03	5181.37	182.915	1.299	904.473	89.6	0.924	106.967
STMH7N006	100yr-24hr	STMH7N006	0.036	5869.48	871.019	1.423	904.597	310.6	1.048	439.2
STMH8N001	5yr-4hr	STMH8N001	0.002	1.22	1.621	1.322	905.043	0	0	0
STMH8N001	100yr-24hr	STMH8N001	0.001	1.22	1.645	1.313	905.034	0	0	0
STMH8N002	5yr-4hr	STMH8N002	0.003	1.22	1.221	0.98	905.226	0	0.346	12.833
STMH8N002	100yr-24hr	STMH8N002	0	5008.38	9.874	1.227	905.473	4.1	0.572	246.45
STMH8N003	5yr-4hr	STMH8N003	0.001	1.22	1.649	1.344	905.285	0	0.543	103.883
STMH8N003	100yr-24hr	STMH8N003	0	1.22	1.85	1.516	905.457	0	0.708	249.167
STMH8N004	5yr-4hr	STMH8N004	0	1.22	0.762	0.624	904.987	0	0.224	273.85
STMH8N004	100yr-24hr	STMH8N004	0.008	5015.76	17.065	1.073	905.436	3.5	0.673	1043.983
STMH9N001	5yr-4hr	STMH9N001	0.044	5039.18	41.391	1.823	906.194	14.1	1.448	53.717
STMH9N001	100yr-24hr	STMH9N001	0.046	5280.09	282.306	1.87	906.241	63.8	1.495	185.867
STMH9N002	5yr-4hr	STMH9N002	0.001	1.22	1.429	1.161	905.091	0	0.786	54.417
STMH9N002	100yr-24hr	STMH9N002	0.001	1.22	1.398	1.143	905.073	0	0.76	187.567
STMHCC001	5yr-4hr	STMHCC001	0.42	5253.87	255.319	1.235	904.348	286.1	0.935	308.533
STMHCC001	100yr-24hr	STMHCC001	0.065	5555.9	557.343	1.29	904.403	613.5	0.99	1596.467
STMHCC002	5yr-4hr	STMHCC002	0.082	5074.78	76.356	1.305	904.358	106.1	0.985	306.517
STMHCC002	100yr-24hr	STMHCC002	0.015	5227.22	228.798	1.334	904.387	380.2	1.014	1540.617
STMHCC003	5yr-4hr	STMHCC003	0.243	5159.62	161.141	1.281	904.304	101.9	0.906	203.417
STMHCC003	100yr-24hr	STMHCC003	0.02	5285.08	286.603	1.305	904.328	352.9	0.93	596.567
STMHCC004	5yr-4hr	STMHCC004	0.013	1.22	2.052	1.682	904.256	0	0.977	184.167
STMHCC004	100yr-24hr	STMHCC004	0.001	1.22	2.099	1.72	904.294	0	1.015	575.9
STMHCC005	5yr-4hr	STMHCC005	0.166	5060.24	62.57	1.922	903.593	14	1.097	212.083
STMHCC005	100yr-24hr	STMHCC005	0.046	5694.93	697.263	2.04	903.711	341.9	1.215	606.6
STMHCC006	5yr-4hr	STMHCC006	0.002	5243.21	245.379	1.822	904.091	252.5	1.299	279.55
STMHCC006	100yr-24hr	STMHCC006	0.004	6015.41	1017.578	1.96	904.229	784	1.437	815.867
STMHCC007	5yr-4hr	STMHCC007	0.219	5847.81	849.831	1.812	904.484	278.5	1.422	279.917
STMHCC007	100yr-24hr	STMHCC007	0.015	7197.11	2199.133	2.019	904.691	804.4	1.629	813.517
STMHCC008	5yr-4hr	STMHCC008	0.001	1.22	3.461	2.836	906.759	0	2.462	278.983
STMHCC008	100yr-24hr	STMHCC008	0.087	5322.2	325.939	3.127	907.05	38.6	2.752	808.1
STMHCC009	5yr-4hr	STMHCC009	0.17	5430.17	432.444	1.943	905.961	174.1	1.633	279.133

STMHCC009	100yr-24hr	STMHCC009	0.019	6436.12	1438.392	2.112	906.13	469.2	1.802	812.533
STMHCC010	5yr-4hr	STMHCC010	1.132	5235.33	236.818	1.266	904.357	270.6	0.911	306.317
STMHCC010	100yr-24hr	STMHCC010	0.308	5492.94	494.429	1.314	904.405	592.1	0.959	1547.883
STMHCC011	5yr-4hr	STMHCC011	0.318	5116.6	119.64	2.513	903.613	13.1	1.253	212.717
STMHCC011	100yr-24hr	STMHCC011	0.032	5526.59	529.629	2.59	903.69	231.5	1.33	607.55
STMHGB001	5yr-4hr	STMHGB001	0.011	1.22	1.525	1.25	904.198	0	0.522	177.033
STMHGB001	100yr-24hr	STMHGB001	0.001	1.22	1.824	1.495	904.443	0	0.767	533.383
STMHGB002	5yr-4hr	STMHGB002	0.008	1.22	1.482	1.214	904.289	0	0.539	156.617
STMHGB002	100yr-24hr	STMHGB002	0.003	1.22	1.751	1.435	904.51	0	0.76	518.767
STMHGB003	5yr-4hr	STMHGB003	0.109	5136.27	138.077	1.509	906.211	52.4	1.209	53.667
STMHGB003	100yr-24hr	STMHGB003	0.11	5597.58	599.388	1.595	906.297	184.7	1.295	185.717
STMHHW001	5yr-4hr	STMHHW001	1.145	5757.8	758.847	1.001	903.316	203.6	0.401	203.783
STMHHW001	100yr-24hr	STMHHW001	0.142	6402.26	1403.312	1.107	903.422	512.7	0.507	512.95
STMHHW002	5yr-4hr	STMHHW002	0.017	1.22	2.247	1.842	903.897	0	1.195	205.017
STMHHW002	100yr-24hr	STMHHW002	0.012	5067.26	69.899	2.173	904.228	11.4	1.526	515.05
STMHHW003	5yr-4hr	STMHHW003	0.004	1.22	2.868	2.349	903.999	0	1.872	212.883
STMHHW003	100yr-24hr	STMHHW003	0.001	1.22	2.94	2.409	904.059	0	1.93	603.967
STMHHW004	5yr-4hr	STMHHW004	0.054	1.22	5.057	4.145	903.522	0	1.241	207.75
STMHHW004	100yr-24hr	STMHHW004	0.332	5197.84	203.021	4.276	903.653	49.2	1.372	591.783
STMHHW005	5yr-4hr	STMHHW005	0.03	5090.15	92.556	1.976	904.591	8.2	1.136	35.8
STMHHW005	100yr-24hr	STMHHW005	0.039	5302.28	304.687	2.029	904.644	50	1.189	148.567
STMHHW006	5yr-4hr	STMHHW006	0.029	5026.12	28.537	1.983	905.764	8.1	1.028	36.35
STMHHW006	100yr-24hr	STMHHW006	0.092	5240.72	243.134	2.027	905.808	56.8	1.072	148.25
STMHHW007	5yr-4hr	STMHHW007	0.07	5111.38	113.091	1.422	906.019	35.9	1.047	62.7
STMHHW007	100yr-24hr	STMHHW007	0.154	5635.11	636.815	1.52	906.117	147.9	1.145	148.867
STMHHW008	5yr-4hr	STMHHW008	0.201	5120.68	122.573	1.579	907.78	42.1	1.204	43.7
STMHHW008	100yr-24hr	STMHHW008	0.051	5330.51	332.411	1.619	907.82	123.3	1.244	145
STMHHW009	5yr-4hr	STMHHW009	0.124	5103.23	104.989	1.46	908.413	60.6	1.16	61.917
STMHHW009	100yr-24hr	STMHHW009	0.009	5150.05	151.804	1.47	908.423	143.6	1.17	144.567
STMHHW010	5yr-4hr	STMHHW010	0.184	5119.05	121.047	1.664	909.422	47.6	1.364	62.183
STMHHW010	100yr-24hr	STMHHW010	0.086	5346.74	348.743	1.707	909.465	115.3	1.407	144.633
STMHJM001	5yr-4hr	STMHJM001	0.054	5911.7	913.552	1.687	904.511	409.9	1.063	424.333
STMHJM001	100yr-24hr	STMHJM001	0.005	7177.02	2178.874	1.881	904.705	1050.3	1.257	1186.65
STMHMC001	5yr-4hr	STMHMC001	0.003	1.22	3.447	2.825	902.03	0	2.195	180.45
STMHMC001	100yr-24hr	STMHMC001	0.004	5021.42	25.431	3.294	902.499	14.2	2.664	3894.25
STMHMC002	5yr-4hr	STMHMC002	0.006	1.22	3.402	2.788	902.059	0	2.148	177.583
STMHMC002	100yr-24hr	STMHMC002	0.007	5093.59	97.55	3.269	902.54	17.8	2.629	3893.433
STMHMC003	5yr-4hr	STMHMC003	0.002	1.22	3.169	2.597	902.094	0	1.953	173.45
STMHMC003	100yr-24hr	STMHMC003	0.004	1.22	3.728	3.055	902.552	0	2.41	3891.933
STMHNA001	5yr-4hr	STMHNA001	0.027	5205.77	207.555	1.502	906.298	89.9	1.127	104.817
STMHNA001	100yr-24hr	STMHNA001	0.006	5663.55	665.332	1.587	906.383	222.4	1.212	247.867
STMHNA002	5yr-4hr	STMHNA002	0.004	1.22	2.547	2.068	906.35	0	1.262	104.45
STMHNA002	100yr-24hr	STMHNA002	0.001	1.22	2.443	1.998	906.28	0	1.179	248.783
STMHNA003	5yr-4hr	STMHNA003	0.134	5113.27	115.842	2.132	906.842	42	1.569	105.367
STMHNA003	100yr-24hr	STMHNA003	0.049	5360.75	363.322	2.18	906.89	117.4	1.617	289.7
STMHNA004	5yr-4hr	STMHNA004	0.014	5199	201.573	2.144	907.527	98.9	1.664	105.7
STMHNA004	100yr-24hr	STMHNA004	0.074	5723.01	725.576	2.24	907.623	287.1	1.76	294.767
STMHNA005	5yr-4hr	STMHNA005	0.003	5073.28	76.022	2.265	908.248	38.6	1.945	102.567
STMHNA005	100yr-24hr	STMHNA005	0.009	5420.45	423.195	2.331	908.314	138.7	2.011	292.283
STMHNS001	5yr-4hr	STMHNS001	0	1.22	1.562	1.28	908.263	0	0.98	98.933
STMHNS001	100yr-24hr	STMHNS001	0	1.22	1.572	1.288	908.271	0	0.989	287.317
STMHPR001	5yr-4hr	STMHPR001	0.085	5223.21	224.452	1.064	904.262	295.1	0.764	304.733
STMHPR001	100yr-24hr	STMHPR001	0.006	5551.02	552.261	1.125	904.323	634.7	0.825	1538.917
STMHRG001	5yr-4hr	STMHRG001	0	1.22	0	0	899.528	0	0	0
STMHRG001	100yr-24hr	STMHRG001	0	1.22	0	0	899.528	0	0	0
STMHRG002	5yr-4hr	STMHRG002	0.222	6583.67	1586.859	2.892	898.768	212.4	1.892	245.4
STMHRG002	100yr-24hr	STMHRG002	0.12	8300.36	3303.548	3.124	899	442.6	2.124	519.65
STMHRW001	5yr-4hr	STMHRW001	0.251	5299.56	301.835	1.92	905.78	103.3	1.3	110.483
STMHRW001	100yr-24hr	STMHRW001	0.01	5627.5	629.776	1.98	905.84	246.3	1.36	299.9
STMHXXX001	5yr-4hr	STMHXXX001	0.003	1.22	1.512	1.228	905.159	0	0.739	107.767
STMHXXX001	100yr-24hr	STMHXXX001	0.001	1.22	1.717	1.407	905.338	0	0.908	296.133
STMHXXX002	5yr-4hr	STMHXXX002	0.033	1.22	1.767	1.449	905.032	0	0.771	110.55
STMHXXX002	100yr-24hr	STMHXXX002	0.003	1.22	1.969	1.613	905.196	0	0.936	304.9
STMHXXX003	5yr-4hr	STMHXXX003	0.147	5824.22	826.387	1.927	903.527	210.7	0.153	210.633
STMHXXX003	100yr-24hr	STMHXXX003	0.075	8495.18	3497.344	2.304	903.904	590.5	0.53	590.467
STMHXXX004	5yr-4hr	STMHXXX004	0.377	5481.88	484.195	1.992	902.33	173.6	1.692	174.9
STMHXXX004	100yr-24hr	STMHXXX004	0.021	5974.72	977.037	2.078	902.416	453.1	1.778	465.45
STMHXXX005	5yr-4hr	STMHXXX005	0.003	1.22	3.276	2.685	901.766	0	2.005	183.333
STMHXXX005	100yr-24hr	STMHXXX005	0.001	5103.77	107.402	3.001	902.082	28	2.321	3894.467
STMHXXX006	5yr-4hr	STMHXXX006	0	1.22	3.723	3.051	901.501	0	2.083	611.05
STMHXXX006	100yr-24hr	STMHXXX006	0.001	1.22	4.095	3.356	901.806	0	2.388	3901.95
STMHXXX007	5yr-4hr	STMHXXX007	0.002	1.22	3.278	2.686	901.085	0	2.062	1027.158
STMHXXX007	100yr-24hr	STMHXXX007	0.002	1.22	3.641	2.985	901.384	0	2.36	3983.2
STMHXXX008	5yr-4hr	STMHXXX008	0.004	1.22	3.078	2.522	900.667	0	0.143	4.633
STMHXXX008	100yr-24hr	STMHXXX008	0.002	1.22	3.449	2.827	900.972	0	0.447	381.533
STMHXXX009	5yr-4hr	STMHXXX009	0.001	1.22	2.891	2.37	900.087	0	1.53	1072.329

STMHXXX009	100yr-24hr	STMHXXX009	15.88	5360.24	363.562	2.787	900.504	3501.1	1.947	4021.933
STMHXXX010	5yr-4hr	STMHXXX010	0.014	1.22	3.629	2.975	901.83	0	1.089	255.75
STMHXXX010	100yr-24hr	STMHXXX010	0.016	5050.92	54.732	3.132	901.987	98.1	1.246	721.75
STMHXXX011	5yr-4hr	STMHXXX011	0.082	6500.42	1503.003	2.377	901.132	255.4	1.387	256.183
STMHXXX011	100yr-24hr	STMHXXX011	0.063	9528.41	4530.99	2.76	901.515	719.1	1.77	722.933
STMHXXX012	5yr-4hr	STMHXXX012	0.001	1.22	4.115	3.373	899.575	0	2.473	257.817
STMHXXX012	100yr-24hr	STMHXXX012	0	1.22	4.555	3.734	899.936	0	2.834	728.383
STMHXXX013	5yr-4hr	STMHXXX013	0.023	5119.41	124.901	4.529	897.744	143.7	3.614	260.683
STMHXXX013	100yr-24hr	STMHXXX013	0.019	7205.13	2210.621	4.87	898.085	718.4	3.955	744.4
STMHXXX014	5yr-4hr	STMHXXX014	0.002	625.2	205.221	3.981	895.421	0	2.601	279.95
STMHXXX014	100yr-24hr	STMHXXX014	0.001	974.15	512.851	4.366	895.806	0	2.986	836.25
STMHXXX016	5yr-4hr	STMHXXX016	0	1.22	0.129	0.106	893.468	0	0	0
STMHXXX016	100yr-24hr	STMHXXX016	0.001	1.22	0.142	0.117	893.479	0	0	0
STMHXXX025	5yr-4hr	STMHXXX025	0.018	1.22	2.773	2.273	899.885	0	1.503	1079.142
STMHXXX025	100yr-24hr	STMHXXX025	0.145	6681.71	1684.824	2.84	900.452	3823.2	2.07	4048.783
STMHXXX026	5yr-4hr	STMHXXX026	0.001	1.22	2.359	1.934	901.596	0	1.554	294.1
STMHXXX026	100yr-24hr	STMHXXX026	0	1.22	2.777	2.276	901.938	0	1.896	906.4
STMHXXX027	5yr-4hr	STMHXXX027	0.022	5049.45	50.545	0.905	905.561	95.6	0.667	255.7
STMHXXX027	100yr-24hr	STMHXXX027	0.003	5166.46	167.549	0.928	905.584	257.6	0.69	471.117
STMHXXX028	5yr-4hr	STMHXXX028	0.24	5130.94	131.579	0.55	905.632	246.1	0.35	246.867
STMHXXX028	100yr-24hr	STMHXXX028	0.039	5043.02	43.665	0.534	905.616	440.8	0.334	448.25
STMHXXX035	5yr-4hr	STMHXXX035	0.014	3178.33	2186.76	1.285	903.823	0	0.61	270.467
STMHXXX035	100yr-24hr	STMHXXX035	0.005	3917.36	3392.856	1.625	904.163	0	0.95	722.883
STMHXXX037	5yr-4hr	STMHXXX037	0.44	5643.28	1858.972	0.334	903.584	0	0	0
STMHXXX037	100yr-24hr	STMHXXX037	0.165	5882.93	4570.425	0.805	904.055	0	0	0

POST-DEVELOPMENT – HYDRAULIC LINK INPUT

Name	Storm	Upstream Node Name	Downstream Node Name	Downstream Crown Elevation m	Upstream Crown Elevation m	Conduit Design Option	Shape	Bottom Width m	Diameter (Height) m	Length m	Conduit Slope	Roughness	Downstream Invert Elevation m	Upstream Invert Elevation m
Link208	5yr-4hr	Node217	Node219	898.8	900.8	Circular	Circular	0	0.3	539.99	0.37	0.013	898.5	900.5
Link208	100yr-24hr	Node217	Node219	898.8	900.8	Circular	Circular	0	0.3	539.99	0.37	0.013	898.5	900.5
Link209	5yr-4hr	Node219	Node220	897.95	898.95	Circular	Circular	0	0.45	533.8	0.187	0.013	897.5	898.5
Link209	100yr-24hr	Node219	Node220	897.95	898.95	Circular	Circular	0	0.45	533.8	0.187	0.013	897.5	898.5
Link210	5yr-4hr	Node220	Node214	895.25	898.25	Circular	Circular	0	0.75	371.45	0.808	0.013	894.5	897.5
Link210	100yr-24hr	Node220	Node214	895.25	898.25	Circular	Circular	0	0.75	371.45	0.808	0.013	894.5	897.5
Link213	5yr-4hr	Node222	Node219	898.8	899.8	Circular	Circular	0	0.3	104.93	0.953	0.013	898.5	899.5
Link213	100yr-24hr	Node222	Node219	898.8	899.8	Circular	Circular	0	0.3	104.93	0.953	0.013	898.5	899.5
Link214	5yr-4hr	Node223	STMHNS001	907.183	907.354	Circular	Circular	0	0.2	30.91	0.553	0.013	906.983	907.154
Link214	100yr-24hr	Node223	STMHNS001	907.183	907.354	Circular	Circular	0	0.2	30.91	0.553	0.013	906.983	907.154
Link215	5yr-4hr	Node221	Node224	889.45	894.95	Circular	Circular	0	0.45	45.03	12.214	0.013	889	894.5
Link215	100yr-24hr	Node221	Node224	889.45	894.95	Circular	Circular	0	0.45	45.03	12.214	0.013	889	894.5
Link756	5yr-4hr	CBXXX025	Dummy 1	899.434	899.434	Circular	Circular	0	0.25	16.975	0	0.013	899.184	899.184
Link756	100yr-24hr	CBXXX025	Dummy 1	899.434	899.434	Circular	Circular	0	0.25	16.975	0	0.013	899.184	899.184
Link791	5yr-4hr	Node1128	Node1127	900.425	900.508	Circular	Circular	0	0.5	16.65	0.5	0.013	899.925	900.008
Link791	100yr-24hr	Node1128	Node1127	900.425	900.508	Circular	Circular	0	0.5	16.65	0.5	0.013	899.925	900.008
Link792	5yr-4hr	Node1127	Node1130	900.389	900.425	Circular	Trapezoidal	1	0.5	7.24	0.5	0.025	899.889	899.925
Link792	100yr-24hr	Node1127	Node1130	900.389	900.425	Circular	Trapezoidal	1	0.5	7.24	0.5	0.025	899.889	899.925
Link793	5yr-4hr	Node1130	Node1129	900.32	900.389	Circular	Circular	0	0.5	13.77	0.5	0.013	899.82	899.889
Link793	100yr-24hr	Node1130	Node1129	900.32	900.389	Circular	Circular	0	0.5	13.77	0.5	0.013	899.82	899.889
Link795	5yr-4hr	Node1126	Node1125	899.949	900.059	Circular	Circular	0	0.5	22.02	0.5	0.013	899.449	899.559
Link795	100yr-24hr	Node1126	Node1125	899.949	900.059	Circular	Circular	0	0.5	22.02	0.5	0.013	899.449	899.559
Link797	5yr-4hr	Node1124	Node1123	899.579	899.66	Circular	Circular	0	0.5	16.1	0.5	0.013	899.079	899.16
Link797	100yr-24hr	Node1124	Node1123	899.579	899.66	Circular	Circular	0	0.5	16.1	0.5	0.013	899.079	899.16
Link799	5yr-4hr	Node1122	Node1121	898.78	898.864	Circular	Circular	0	0.5	16.75	0.5	0.013	898.28	898.364
Link799	100yr-24hr	Node1122	Node1121	898.78	898.864	Circular	Circular	0	0.5	16.75	0.5	0.013	898.28	898.364
Orifice1	5yr-4hr	Node213	Node217											
Orifice1	100yr-24hr													
Orifice2	5yr-4hr	Node216	Node223											
Orifice2	100yr-24hr													
Orifice3	5yr-4hr	Node218	Node222											
Orifice3	100yr-24hr													
Orifice4	5yr-4hr	Node214	Node221											
Orifice4	100yr-24hr													
Orifice5	5yr-4hr	Node226	Node1128											
Orifice5	100yr-24hr													
STL3A001	5yr-4hr	STMHRG002	STMH3A001	895.281	896.476	Circular	Circular	0	0.6	38.989	3.065	0.024	894.681	895.876
STL3A001	100yr-24hr	STMHRG002	STMH3A001	895.281	896.476	Circular	Circular	0	0.6	38.989	3.065	0.024	894.681	895.876
STL4N001	5yr-4hr	STMH4N001	STMHCC009	904.328	904.93	Circular	Circular	0	0.3	134.093	0.449	0.011	904.028	904.63
STL4N001	100yr-24hr	STMH4N001	STMHCC009	904.328	904.93	Circular	Circular	0	0.3	134.093	0.449	0.011	904.028	904.63
STL4N003	5yr-4hr	STMH4S001	STMHJM001	903.199	903.748	Circular	Circular	0	0.375	58.917	0.932	0.013	902.824	903.373
STL4N003	100yr-24hr	STMH4S001	STMHJM001	903.199	903.748	Circular	Circular	0	0.375	58.917	0.932	0.013	902.824	903.373
STL4S001	5yr-4hr	STMHJM001	CBXXX027	903.032	903.448	Circular	Circular	0	0.25	53.597	0.776	0.013	902.782	903.198
STL4S001	100yr-24hr	STMHJM001	CBXXX027	903.032	903.448	Circular	Circular	0	0.25	53.597	0.776	0.013	902.782	903.198
STL5S001	5yr-4hr	Node242	STMHXXX010	900.195	902.524	Circular	Circular	0	0.45	100.916	2.308	0.013	899.745	902.074
STL5S001	100yr-24hr	Node242	STMHXXX010	900.195	902.524	Circular	Circular	0	0.45	100.916	2.308	0.013	899.745	902.074
STL5S001A	5yr-4hr	CBXXX026	Node242	902.474	903.215	Circular	Circular	0	0.4	32.101	2.308	0.013	902.074	902.815
STL5S001A	100yr-24hr	CBXXX026	Node242	902.474	903.215	Circular	Circular	0	0.4	32.101	2.308	0.013	902.074	902.815
STL5S001AA	5yr-4hr	CBXXX027	CBXXX026	903.102	903.485	Circular	Circular	0	0.25	11.994	3.193	0.013	902.852	903.235
STL5S001AA	100yr-24hr	CBXXX027	CBXXX026	903.102	903.485	Circular	Circular	0	0.25	11.994	3.193	0.013	902.852	903.235
STL5S002	5yr-4hr	STMHXXX026	STMHXXX011	899.745	899.962	Circular	Circular	0	0.3	59.585	0.364	0.013	899.445	899.662
STL5S002	100yr-24hr	STMHXXX026	STMHXXX011	899.745	899.962	Circular	Circular	0	0.3	59.585	0.364	0.013	899.445	899.662
STL5S003	5yr-4hr	STMH5S003	STMHXXX026	900.042	900.273	Circular	Circular	0	0.375	63.774	0.362	0.013	899.667	899.898
STL5S003	100yr-24hr	STMH5S003	STMHXXX026	900.042	900.273	Circular	Circular	0	0.375	63.774	0.362	0.013	899.667	899.898
STL5S004	5yr-4hr	STMH5S002	STMH5S003	900.178	900.638	Circular	Circular	0	0.3	66.241	0.694	0.013	899.878	900.338
STL5S004	100yr-24hr	STMH5S002	STMH5S003	900.178	900.638	Circular	Circular	0	0.3	66.241	0.694	0.013	899.878	900.338
STL6N006	5yr-4hr	STMH6N001	STMHCC005	902.346	902.531	Circular	Circular	0	0.675	44.995	0.411	0.013	901.671	901.856
STL6N006	100yr-24hr	STMH6N001	STMHCC005	902.346	902.531	Circular	Circular	0	0.675	44.995	0.411	0.013	901.671	901.856
STL6N007	5yr-4hr	STMHCC005	STMHCC011	902.36	902.496	Circular	Circular	0	0.75	13.705	0.992	0.013	901.61	901.746
STL6N007	100yr-24hr	STMHCC005	STMHCC011	902.36	902.496	Circular	Circular	0	0.75	13.705	0.992	0.013	901.61	901.746
STL6N008	5yr-4hr	STMHCC011	STMHHW004	900.711	901.85	Circular	Circular	0	0.75	92.882	1.226	0.013	899.961	901.1
STL6N008	100yr-24hr	STMHCC011	STMHHW004	900.711	901.85	Circular	Circular	0	0.75	92.882	1.226	0.013	899.961	901.1
STL6S002	5yr-4hr	STMH6S004	STMH6S003	900.582	901.386	Circular	Circular	0	0.2	40.534	1.984	0.013	900.382	901.186
STL6S002	100yr-24hr	STMH6S004	STMH6S003	900.582	901.386	Circular	Circular	0	0.2	40.534	1.984	0.013	900.382	901.186
STL7N001	5yr-4hr	STMH7N004	STMH7N003	904.703	905.017	Circular	Circular	0	0.6	52.294	0.6	0.013	904.103	904.417
STL7N001	100yr-24hr	STMH7N004	STMH7N003	904.703	905.017	Circular	Circular	0	0.6	52.294	0.6	0.013	904.103	904.417
STL7N002	5yr-4hr	STMH7N001	STMH7N005	903.381	903.405	Circular	Circular	0	0.675	4.704	0.51	0.013	902.706	902.73
STL7N002	100yr-24hr	STMH7N001	STMH7N005	903.381	903.405	Circular	Circular	0	0.675	4.704	0.51	0.013	902.706	902.73
STL7N003	5yr-4hr	STMH7N002	STMH7N005	902.931	904.061	Circular	Circular	0	0.3	35.724	3.163	0.013	902.631	903.761
STL7N003	100yr-24hr	STMH7N002	STMH7N005	902.931	904.061	Circular	Circular	0	0.3	35.724	3.163	0.013	902.631	903.761
STL7N004	5yr-4hr	STMHGB001	STMH7N001	903.405	903.623	Circular	Circular	0	0.675	49.197	0.443	0.013	902.73	902.948
STL7N004	100yr-24hr	STMHGB001	STMH7N001	903.405	903.623	Circular	Circular	0	0.675	49.197	0.443	0.013	902.73	902.948
STL7N005	5yr-4hr	STMH7N006	STMHCC004	903.279	903.549	Circular	Circular	0	0.375	59.367	0.455	0.013	902.904	903.174
STL7N005	100yr-24hr	STMH7N006	STMHCC004	903.279	903.549	Circular	Circular	0	0.375	59.367	0.455	0.013	902.904	903.174
STL8N001	5yr-4hr	STMH8N002	STMH8N003	904.749	904.846	Circular	Circular	0	0.6	35.772	0.271	0.013	904.149	904.246
STL8N001	100yr-24hr	STMH8N002	STMH8N003	904.749	904.846	Circular	Circular	0	0.6	35.772	0.271	0.013	904.149	904.246
STL8N002	5yr-4hr	STMH8N001	STMH8N002	904.901	905.181	Circular	Circular	0	0.45	9.53	2.938	0.013	904.451	904.731
STL8N002	100yr-24hr	STMH8N001	STMH8N002	904.901	905.181	Circular	Circular	0	0.45	9.53	2.938	0.013	904.451	904.731
STL9S001	5yr-4hr	STMHGB003	STMH9N001	904.696	905.002	Circular	Circular	0	0.3	103.439	0.296	0.011	904.396	904.702
STL9S001	100yr-24hr	STMHGB003	STMH9N001	904.696	905.002	Circular	Circular	0	0.3	103.439	0.296	0.011	904.396	904.702
STL9S002	5yr-4hr	STMH9N001	STMH9N002	904.315	904.746	Circular	Circular	0	0.375	107.863	0.4	0.011	903.94	904.371
STL9S002	100yr-24hr	STMH9N001	STMH9N002	904.315	904.746	Circular	Circular	0	0.375	107.863	0.4	0.011	903.94	904.371
STLCC002	5yr-4hr	STMHCC010	STMHCC002	903.353	903.391	Circular	Circular	0	0.3	57.919	0.066	0.013	903.053	903.091
STLCC002	100yr-24hr	STMHCC010	STMHCC002	903.353	903.391	Circular	Circular	0	0.3	57.919	0.066	0.013	903.053	903.091
STLCC003	5yr-4hr	STMHCC002	STMHCC003	903.373	903.373	Circular	Circular	0	0.3	64.717	0	0.013	903.073	903.073
STLCC003	100yr-24hr	STMHCC002	STMHCC003	903.373	903.373	Circular	Circular	0	0.3	64.717	0	0.013	903.073	903.073
STLCC004	5yr-4hr	STMHCC003	STMHCC004	903.084	903.398	Circular	Circular	0	0.375	77.557	0.405	0.013	902.709	903.023
STLCC004	100yr-24hr	STMHCC003	STMHCC004	903.084	903.398	Circular	Circular	0	0.375	77.557	0.405	0.013	902.709	903.023
STLCC006	5yr-4hr	STMHCC004	STMHCC005	902.226	903.224	Circular	Circular	0	0.45	183.378	0.54	0.013	901.776	902.774
STLCC006	100yr-24hr	STMHCC004	STMHCC005	902.226	903.224	Circular	Circular	0	0.45	183.378	0.54	0.013	901.776	902.774
STLCC006.1	5yr-4hr	STMHCC006	STMHCC005	902.076	902.669	Circular	Circular	0	0.4	125.422	0.473	0.013	901.676	902.269
STLCC006.1	100yr-24hr	STMHCC006	STMHCC005	902.076	902.669	Circular	Circular	0	0.4	125.422	0.473	0.013	901.676	902.269
STLCC009	5yr-4hr	STMHCC007	STMHCC006	902.689	903.047	Circular	Circular	0	0.375	48.471	0.739	0.013	902.314	902.672
STLCC009	100yr-24hr	STMHCC007	STMHCC006	902.689	903.047	Circular	Circular	0	0.375	48.471	0.739	0.013	902.314	902.672

STLCC010	5yr-4hr	STMHCC008	STMHCC007	903.062	904.298	Circular	Circular	0	0.375	124.945	0.989	0.013	902.687	903.923
STLCC010	100yr-24hr	STMHCC008	STMHCC007	903.062	904.298	Circular	Circular	0	0.375	124.945	0.989	0.013	902.687	903.923
STLCC011	5yr-4hr	STMHCC009	STMHCC008	904.233	904.268	Circular	Circular	0	0.25	10.661	0.328	0.013	903.983	904.018
STLCC011	100yr-24hr	STMHCC009	STMHCC008	904.233	904.268	Circular	Circular	0	0.25	10.661	0.328	0.013	903.983	904.018
STLGB002	5yr-4hr	STMHGB002	STMHGB001	903.676	903.75	Circular	Circular	0	0.675	41.767	0.177	0.013	903.001	903.075
STLGB002	100yr-24hr	STMHGB002	STMHGB001	903.676	903.75	Circular	Circular	0	0.675	41.767	0.177	0.013	903.001	903.075
STLHW001	5yr-4hr	STMHHW001	STMHHW002	902.702	902.915	Circular	Circular	0	0.6	79.316	0.269	0.013	902.102	902.315
STLHW001	100yr-24hr	STMHHW001	STMHHW002	902.702	902.915	Circular	Circular	0	0.6	79.316	0.269	0.013	902.102	902.315
STLHW002	5yr-4hr	STMHHW002	STMHHW003	902.13	902.505	Circular	Circular	0	0.45	118.529	0.32	0.013	901.68	902.055
STLHW002	100yr-24hr	STMHHW002	STMHHW003	902.13	902.505	Circular	Circular	0	0.45	118.529	0.32	0.013	901.68	902.055
STLHW003	5yr-4hr	STMHHW003	STMHHW004	901.501	902.05	Circular	Circular	0	0.4	134.679	0.408	0.013	901.101	901.65
STLHW003	100yr-24hr	STMHHW003	STMHHW004	901.501	902.05	Circular	Circular	0	0.4	134.679	0.408	0.013	901.101	901.65
STLHW004	5yr-4hr	STMHHW005	STMHHW004	902.281	903.215	Circular	Circular	0	0.6	132.965	0.702	0.011	901.681	902.615
STLHW004	100yr-24hr	STMHHW005	STMHHW004	902.281	903.215	Circular	Circular	0	0.6	132.965	0.702	0.011	901.681	902.615
STLHW005	5yr-4hr	STMHHW006	STMHHW005	903.455	904.231	Circular	Circular	0	0.45	86.751	0.895	0.013	903.005	903.781
STLHW005	100yr-24hr	STMHHW006	STMHHW005	903.455	904.231	Circular	Circular	0	0.45	86.751	0.895	0.013	903.005	903.781
STLHW006	5yr-4hr	STMHHW007	STMHHW006	904.736	904.972	Circular	Circular	0	0.375	23.543	1.002	0.013	904.361	904.597
STLHW006	100yr-24hr	STMHHW007	STMHHW006	904.736	904.972	Circular	Circular	0	0.375	23.543	1.002	0.013	904.361	904.597
STLHW007	5yr-4hr	STMHHW008	STMHHW007	904.972	906.576	Circular	Circular	0	0.375	108.055	1.484	0.013	904.597	906.201
STLHW007	100yr-24hr	STMHHW008	STMHHW007	904.972	906.576	Circular	Circular	0	0.375	108.055	1.484	0.013	904.597	906.201
STLHW008	5yr-4hr	STMHHW009	STMHHW008	906.501	907.253	Circular	Circular	0	0.3	76.568	0.982	0.013	906.201	906.953
STLHW008	100yr-24hr	STMHHW009	STMHHW008	906.501	907.253	Circular	Circular	0	0.3	76.568	0.982	0.013	906.201	906.953
STLHW009	5yr-4hr	STMHHW010	STMHHW009	907.253	908.058	Circular	Circular	0	0.3	82.485	0.976	0.013	906.953	907.758
STLHW009	100yr-24hr	STMHHW010	STMHHW009	907.253	908.058	Circular	Circular	0	0.3	82.485	0.976	0.013	906.953	907.758
STLJM002	5yr-4hr	Node240	STMH4S001	903.843	905.087	Circular	Circular	0	0.3	71.331	1.744	0.013	903.543	904.787
STLJM002	100yr-24hr	Node240	STMH4S001	903.843	905.087	Circular	Circular	0	0.3	71.331	1.744	0.013	903.543	904.787
STLJM002A	5yr-4hr	STMH3N001	Node240	904.987	905.949	Circular	Circular	0	0.2	55.197	1.743	0.013	904.787	905.749
STLJM002A	100yr-24hr	STMH3N001	Node240	904.987	905.949	Circular	Circular	0	0.2	55.197	1.743	0.013	904.787	905.749
STLMP004	5yr-4hr	STMH6S003	STMHMC003	900.142	900.457	Circular	Circular	0	0.6	63.889	0.493	0.011	899.542	899.857
STLMP004	100yr-24hr	STMH6S003	STMHMC003	900.142	900.457	Circular	Circular	0	0.6	63.889	0.493	0.011	899.542	899.857
STLMP005	5yr-4hr	STMHMC003	STMHMC002	899.911	900.097	Circular	Circular	0	0.6	59.044	0.315	0.011	899.311	899.497
STLMP005	100yr-24hr	STMHMC003	STMHMC002	899.911	900.097	Circular	Circular	0	0.6	59.044	0.315	0.011	899.311	899.497
STLMP006	5yr-4hr	STMHMC002	STMHMC001	899.835	899.871	Circular	Circular	0	0.6	8.497	0.424	0.011	899.235	899.271
STLMP006	100yr-24hr	STMHMC002	STMHMC001	899.835	899.871	Circular	Circular	0	0.6	8.497	0.424	0.011	899.235	899.271
STLPR001	5yr-4hr	STMHPR001	STMHCC001	903.413	903.498	Circular	Circular	0	0.3	38.938	0.218	0.011	903.113	903.198
STLPR001	100yr-24hr	STMHPR001	STMHCC001	903.413	903.498	Circular	Circular	0	0.3	38.938	0.218	0.011	903.113	903.198
STLRW002	5yr-4hr	STMH7N003	STMHRW001	904.48	904.688	Circular	Circular	0	0.6	53.588	0.388	0.013	903.88	904.088
STLRW002	100yr-24hr	STMH7N003	STMHRW001	904.48	904.688	Circular	Circular	0	0.6	53.588	0.388	0.013	903.88	904.088
STLURW01A	5yr-4hr	Node1109	STMHXXX006	899.05	899.6	Circular	Circular	0	0.6	45.832	1.2	0.011	898.45	899
STLURW01A	100yr-24hr	Node1109	STMHXXX006	899.05	899.6	Circular	Circular	0	0.6	45.832	1.2	0.011	898.45	899
STLURW01AA	5yr-4hr	STMHXXX005	Node1109	899.661	899.761	Circular	Circular	0	0.6	2.559	3.908	0.011	899.061	899.161
STLURW01AA	100yr-24hr	STMHXXX005	Node1109	899.661	899.761	Circular	Circular	0	0.6	2.559	3.908	0.011	899.061	899.161
STLURW02	5yr-4hr	STMHXXX006	STMHXXX007	899.024	899.418	Circular	Circular	0	0.6	74.671	0.528	0.011	898.424	898.818
STLURW02	100yr-24hr	STMHXXX006	STMHXXX007	899.024	899.418	Circular	Circular	0	0.6	74.671	0.528	0.011	898.424	898.818
STLURW03	5yr-4hr	STMHXXX007	STMHXXX008	898.755	898.999	Circular	Circular	0	0.6	73.12	0.334	0.011	898.155	898.399
STLURW03	100yr-24hr	STMHXXX007	STMHXXX008	898.755	898.999	Circular	Circular	0	0.6	73.12	0.334	0.011	898.155	898.399
STLWL001	5yr-4hr	Node228	STMH8N001	904.321	904.892	Circular	Circular	0	0.6	8.963	6.371	0.013	903.721	904.292
STLWL001	100yr-24hr	Node228	STMH8N001	904.321	904.892	Circular	Circular	0	0.6	8.963	6.371	0.013	903.721	904.292
STLXXX005	5yr-4hr	STMHHW004	STMHXXX010	900.741	900.127	Circular	Circular	0	0.75	99.749	-0.616	0.013	899.991	899.377
STLXXX005	100yr-24hr	STMHHW004	STMHXXX010	900.741	900.127	Circular	Circular	0	0.75	99.749	-0.616	0.013	899.991	899.377
STLXXX006	5yr-4hr	STMHXXX010	STMHXXX011	899.622	899.605	Circular	Circular	0	0.75	39.914	-0.043	0.013	898.872	898.855
STLXXX006	100yr-24hr	STMHXXX010	STMHXXX011	899.622	899.605	Circular	Circular	0	0.75	39.914	-0.043	0.013	898.872	898.855
STLXXX08	5yr-4hr	MHXXX012A	STMHXXX013	894.13	895.849	Circular	Circular	0	0.9	65.608	2.62	0.024	893.23	894.949
STLXXX08	100yr-24hr	MHXXX012A	STMHXXX013	894.13	895.849	Circular	Circular	0	0.9	65.608	2.62	0.024	893.23	894.949
STLXXX09	5yr-4hr	STMHXXX013	STMHXXX014	892.39	894.115	Circular	Circular	0	0.9	127.292	1.355	0.024	891.49	893.215
STLXXX09	100yr-24hr	STMHXXX013	STMHXXX014	892.39	894.115	Circular	Circular	0	0.9	127.292	1.355	0.024	891.49	893.215
STLXXX10	5yr-4hr	STMHXXX014	Node1117	892.34	892.34	Circular	Circular	0	0.9	151	0	0.024	891.44	891.44
STLXXX10	100yr-24hr	STMHXXX014	Node1117	892.34	892.34	Circular	Circular	0	0.9	151	0	0.024	891.44	891.44
STLXXX103	5yr-4hr	STMH9N002	STMHXXX037	904.232	904.305	Circular	Circular	0	0.375	59.275	0.123	0.011	903.857	903.93
STLXXX103	100yr-24hr	STMH9N002	STMHXXX037	904.232	904.305	Circular	Circular	0	0.375	59.275	0.123	0.011	903.857	903.93
STLXXX120	5yr-4hr	STMH8N004	Node228	904.707	904.763	Circular	Circular	0	0.4	7.734	0.724	0.013	904.307	904.363
STLXXX120	100yr-24hr	STMH8N004	Node228	904.707	904.763	Circular	Circular	0	0.4	7.734	0.724	0.013	904.307	904.363
STLXXX121	5yr-4hr	STMHXXX027	STMH8N004	904.688	904.856	Circular	Circular	0	0.2	65.72	0.256	0.013	904.488	904.656
STLXXX121	100yr-24hr	STMHXXX027	STMH8N004	904.688	904.856	Circular	Circular	0	0.2	65.72	0.256	0.013	904.488	904.656
STLXXX123	5yr-4hr	CBXXX038	STMHXXX027	904.894	905.224	Circular	Circular	0	0.2	55.038	0.6	0.013	904.694	905.024
STLXXX123	100yr-24hr	CBXXX038	STMHXXX027	904.894	905.224	Circular	Circular	0	0.2	55.038	0.6	0.013	904.694	905.024
STLXXX124	5yr-4hr	STMHXXX028	CBXXX038	905.161	905.282	Circular	Circular	0	0.2	29.99	0.403	0.013	904.961	905.082
STLXXX124	100yr-24hr	STMHXXX028	CBXXX038	905.161	905.282	Circular	Circular	0	0.2	29.99	0.403	0.013	904.961	905.082
STLXXX13	5yr-4hr	STMHRG001	STMHXXX014	892.82	899.878	Circular	Circular	0	0.35	100.44	7.027	0.013	892.47	899.528
STLXXX13	100yr-24hr	STMHRG001	STMHXXX014	892.82	899.878	Circular	Circular	0	0.35	100.44	7.027	0.013	892.47	899.528
STLXXX14	5yr-4hr	STMHXXX011	MHXXX011A	898.972	899.655	Circular	Circular	0	0.9	25.524	2.674	0.024	898.072	898.755
STLXXX14	100yr-24hr	STMHXXX011	MHXXX011A	898.972	899.655	Circular	Circular	0	0.9	25.524	2.674	0.024	898.072	898.755
STLXXX142	5yr-4hr	STMHCC001	STMHCC010	903.446	903.413	Circular	Circular	0	0.3	9.636	-0.342	0.011	903.146	903.113
STLXXX142	100yr-24hr	STMHCC001	STMHCC010	903.446	903.413	Circular	Circular	0	0.3	9.636	-0.342	0.011	903.146	903.113
STLXXX14A	5yr-4hr	MHXXX011A	STMHXXX012	897.102	898.972	Circular	Circular	0	0.9	69.954	2.674	0.024	896.202	898.072
STLXXX14A	100yr-24hr	MHXXX011A	STMHXXX012	897.102	898.972	Circular	Circular	0	0.9	69.954	2.674	0.024	896.202	898.072
STLXXX15	5yr-4hr	STMHXXX012	MHXXX012A	895.849	897.102	Circular	Circular	0	0.9	49.537	2.53	0.024	894.949	896.202
STLXXX15	100yr-24hr	STMHXXX012	MHXXX012A	895.849	897.102	Circular	Circular	0	0.9	49.537	2.53	0.024	894.949	896.202
STLXXX152	5yr-4hr	Node1118	STMHCC006	902.792	902.792	Circular	Circular	0	0.2	10.666	0	0.013	902.592	902.592
STLXXX152	100yr-24hr	Node1118	STMHCC006	902.792	902.792	Circular	Circular	0	0.2	10.666	0	0.013	902.592	902.592
STLXXX16	5yr-4hr	STMH5S001	STMHXXX008	900.525	901.026	Circular	Circular	0	0.45	114.322	0.438	0.011	900.075	900.576
STLXXX16	100yr-24hr	STMH5S001	STMHXXX008	900.525	901.026	Circular	Circular	0	0.45	114.322	0.438	0.011	900.075	900.576
STLXXX17	5yr-4hr	STMHXXX008	STMHXXX009	898.467	898.895	Circular	Circular	0	0.75	90.818	0.471	0.013	897.717	898.145
STLXXX17	100yr-24hr	STMHXXX008	STMHXXX009	898.467	898.895	Circular	Circular	0	0.75	90.818	0.471	0.013	897.717	898.145
STLXXX18	5yr-4hr	STMHXXX009	STMHXXX025	898.382	898.557	Circular	Circular	0	0.75	35.694	0.49	0.013	897.632	897.807
STLXXX18	100yr-24hr	STMHXXX009	STMHXXX025	898.382	898.557	Circular	Circular	0	0.75	35.694	0.49	0.013	897.632	897.807
STLXXX187	5yr-4hr	Node1120	STMHPR001	903.498	903.9	Circular	Circular	0	0.3	79.309	0.507	0.011	903.198	903.6
STLXXX187	100yr-24hr	Node1120	STMHPR001	903.498	903.9	Circular	Circular	0	0.3	79.309	0.507	0.011	903.198	903.6
STLXXX18A	5yr-4hr	STMHXXX025	CB3A002W	897.758	898.362	Circular	Circular	0	0.75	125.404	0.482	0.013	897.008	897.612
STLXXX18A	100yr-24hr	STMHXXX025	CB3A002W	897.758	898.362	Circular	Circular	0	0.75	125.404	0.482	0.013	897.008	897.612
STLXXX18AA	5yr-4hr	CB3A002W	STMH3A002	897.799	897.808	Circular	Circular	0	0.8	6.147	0.146	0.013	896.999	897.008
STLXXX18AA	100yr-24hr	CB3A002W	STMH3A002	897.799	897.808	Circular	Circular	0	0.8	6.147	0.146	0.013	896.999	897.008
STLXXX19	5yr-4hr	STMH3A002	STMH3A003	897.79	897.059	Circular	Circular	0	0.2	12.488	-5.854	0.013	897.59	896.859
STLXXX19	100yr-24hr	STMH3A002	STMH3A003	897.79	897.059	Circular	Circular	0	0.2	12.488	-5.854	0.013	897.59	896.859
STLXXX191	5yr-4hr	Node1121	STMHRG002	896.876	899.28	Circular	Trapezoidal	1	1	157.49	1.526	0.025	895.876	898.28
STLXXX191	100yr-24hr	Node1121	STMHRG002	896.876	899.28	Circular	Trapezoidal	1	1	157.49	1.526	0.025	895.876	898.28
STLXXX192	5yr-4hr	Node1123	Node1122	899.364	900.079	Circular	Trapezoidal	1	1	142.95	0.5	0.025	898.364	899.079
STLXXX192	100yr-24hr	Node1123	Node1122	899.364	900.079	Circular	Trapezoidal	1	1	142.95	0.5	0.025	898.364	899.079
STLXXX193	5yr-4hr	Node1125	Node1124	900.16	900.449	Circular	Trapezoidal	1	1	57.86	0.5	0.025	899.16	899.449

STLXXX193	100yr-24hr	Node1125	Node1124	900.16	900.449	Circular	Trapezoidal	1	1	57.86	0.5	0.025	899.16	899.449
STLXXX194	5yr-4hr	Node1129	Node1126	900.559	900.82	Circular	Trapezoidal	1	1	52.12	0.5	0.025	899.559	899.82
STLXXX194	100yr-24hr	Node1129	Node1126	900.559	900.82	Circular	Trapezoidal	1	1	52.12	0.5	0.025	899.559	899.82
STLXXX20	5yr-4hr	STMH3A003	STMHXXX016	894.112	898.303	Circular	Circular	0	0.75	55.579	7.541	0.013	893.362	897.553
STLXXX20	100yr-24hr	STMH3A003	STMHXXX016	894.112	898.303	Circular	Circular	0	0.75	55.579	7.541	0.013	893.362	897.553
STLXXX21	5yr-4hr	STMHMC001	STMHXXX005	899.681	899.805	Circular	Circular	0	0.6	49.084	0.253	0.011	899.081	899.205
STLXXX21	100yr-24hr	STMHMC001	STMHXXX005	899.681	899.805	Circular	Circular	0	0.6	49.084	0.253	0.011	899.081	899.205
STLXXX30	5yr-4hr	STMHRW001	STMHXXX002	904.116	904.31	Circular	Circular	0	0.45	47.696	0.407	0.013	903.666	903.86
STLXXX30	100yr-24hr	STMHRW001	STMHXXX002	904.116	904.31	Circular	Circular	0	0.45	47.696	0.407	0.013	903.666	903.86
STLXXX31	5yr-4hr	STMHXXX002	STMHGB002	903.71	904.261	Circular	Circular	0	0.6	146.923	0.375	0.013	903.11	903.661
STLXXX31	100yr-24hr	STMHXXX002	STMHGB002	903.71	904.261	Circular	Circular	0	0.6	146.923	0.375	0.013	903.11	903.661
STLXXX32	5yr-4hr	STMH8N003	STMHXXX001	904.419	904.391	Circular	Circular	0	0.45	40.874	-0.069	0.013	903.969	903.941
STLXXX32	100yr-24hr	STMH8N003	STMHXXX001	904.419	904.391	Circular	Circular	0	0.45	40.874	-0.069	0.013	903.969	903.941
STLXXX33	5yr-4hr	STMHXXX001	STMHXXX002	904.083	904.431	Circular	Circular	0	0.5	91.744	0.379	0.013	903.583	903.931
STLXXX33	100yr-24hr	STMHXXX001	STMHXXX002	904.083	904.431	Circular	Circular	0	0.5	91.744	0.379	0.013	903.583	903.931
STLXXX34	5yr-4hr	STMH7N005	STMH7N001B	903.312	903.374	Circular	Circular	0	0.675	25.906	0.239	0.013	902.637	902.699
STLXXX34	100yr-24hr	STMH7N005	STMH7N001B	903.312	903.374	Circular	Circular	0	0.675	25.906	0.239	0.013	902.637	902.699
STLXXX34A	5yr-4hr	STMH7N001B	STMHXXX035	903.213	903.312	Circular	Circular	0	0.675	41.433	0.239	0.013	902.538	902.637
STLXXX34A	100yr-24hr	STMH7N001B	STMHXXX035	903.213	903.312	Circular	Circular	0	0.675	41.433	0.239	0.013	902.538	902.637
STLXXX34B	5yr-4hr	STMHXXX003	STMHXXX035	903.213	903.374	Circular	Circular	0	0.675	76.677	0.21	0.013	902.538	902.699
STLXXX34B	100yr-24hr	STMHXXX003	STMHXXX035	903.213	903.374	Circular	Circular	0	0.675	76.677	0.21	0.013	902.538	902.699
STLXXX35	5yr-4hr	STMH6N001	STMHXXX003	902.275	902.415	Circular	Circular	0	0.675	29.622	0.473	0.013	901.6	901.74
STLXXX35	100yr-24hr	STMH6N001	STMHXXX003	902.275	902.415	Circular	Circular	0	0.675	29.622	0.473	0.013	901.6	901.74
STLXXX36	5yr-4hr	STMH6S002	STMH6S003	900.212	900.31	Circular	Circular	0	0.3	48.354	0.203	0.013	899.912	900.01
STLXXX36	100yr-24hr	STMH6S002	STMH6S003	900.212	900.31	Circular	Circular	0	0.3	48.354	0.203	0.013	899.912	900.01
STLXXX37	5yr-4hr	STMH6S001	STMH6S002	900.585	900.72	Circular	Circular	0	0.6	46.033	0.293	0.013	899.985	900.12
STLXXX37	100yr-24hr	STMH6S001	STMH6S002	900.585	900.72	Circular	Circular	0	0.6	46.033	0.293	0.013	899.985	900.12
STLXXX38	5yr-4hr	STMHXXX004	STMH6S002	900.45	900.638	Circular	Circular	0	0.3	62.85	0.299	0.013	900.15	900.338
STLXXX38	100yr-24hr	STMHXXX004	STMH6S002	900.45	900.638	Circular	Circular	0	0.3	62.85	0.299	0.013	900.15	900.338
STLXXX43	5yr-4hr	STMHNS001	STMHNA005	906.283	907.283	Circular	Circular	0	0.3	116.096	0.861	0.011	905.983	906.983
STLXXX43	100yr-24hr	STMHNS001	STMHNA005	906.283	907.283	Circular	Circular	0	0.3	116.096	0.861	0.011	905.983	906.983
STLXXX44	5yr-4hr	STMHNA005	STMHNA004	905.863	906.303	Circular	Circular	0	0.3	82.751	0.532	0.011	905.563	906.003
STLXXX44	100yr-24hr	STMHNA005	STMHNA004	905.863	906.303	Circular	Circular	0	0.3	82.751	0.532	0.011	905.563	906.003
STLXXX45	5yr-4hr	STMHNA004	STMHNA003	905.18	905.833	Circular	Circular	0	0.3	132.466	0.493	0.011	904.88	905.533
STLXXX45	100yr-24hr	STMHNA004	STMHNA003	905.18	905.833	Circular	Circular	0	0.3	132.466	0.493	0.011	904.88	905.533
STLXXX48	5yr-4hr	STMHNA003	STMHNA002	904.955	905.273	Circular	Circular	0	0.375	61.55	0.517	0.011	904.58	904.898
STLXXX48	100yr-24hr	STMHNA003	STMHNA002	904.955	905.273	Circular	Circular	0	0.375	61.55	0.517	0.011	904.58	904.898
STLXXX49	5yr-4hr	STMHNA001	STMHNA002	904.95	905.171	Circular	Circular	0	0.375	48.066	0.46	0.011	904.575	904.796
STLXXX49	100yr-24hr	STMHNA001	STMHNA002	904.95	905.171	Circular	Circular	0	0.375	48.066	0.46	0.011	904.575	904.796
STLXXX51	5yr-4hr	STMHNA002	STMH7N004	904.924	905.107	Circular	Circular	0	0.6	53.092	0.345	0.011	904.324	904.507
STLXXX51	100yr-24hr	STMHNA002	STMH7N004	904.924	905.107	Circular	Circular	0	0.6	53.092	0.345	0.011	904.324	904.507
STLXXX69	5yr-4hr	STMH3A001	Node227	895.231	895.231	Circular	Circular	0	0.6	97.815	0	0.024	894.631	894.631
STLXXX69	100yr-24hr	STMH3A001	Node227	895.231	895.231	Circular	Circular	0	0.6	97.815	0	0.024	894.631	894.631
W-1	5yr-4hr	STMHXXX037	Node1120											
W-1	100yr-24hr													

POST-DEVELOPMENT – HYDRAULIC LINK OUTPUT

Name	Storm	Link Name	Upstream Node Name	Downstream Node Name	Inlet Control	Outlet Control	Design Full Flow cms	Design Velocity m/s	Max Depth m	Max Flow cms	Max Flow/Design Flow	Max Velocity m/s	Maximum Water Elevation	Maximum Water Elevation	Duration of Surcharged	Time to Peak hr
Link208	5yr-4hr	Link208	Node217	Node219	0	0	0.06	0.83	0.121	0.011	0.191	0.64	900.587	898.621	0	5.894
Link208	100yr-24hr	Link208	Node217	Node219	0	0	0.06	0.83	0.34	0.024	0.412	0.78	900.634	898.84	7.65	24.11
Link209	5yr-4hr	Link209	Node219	Node220	0	0	0.12	0.78	0.309	0.015	0.118	0.52	898.621	897.809	0	5.846
Link209	100yr-24hr	Link209	Node219	Node220	0	0	0.12	0.78	1.317	0.037	0.3	0.64	898.84	898.817	65.567	7.768
Link210	5yr-4hr	Link210	Node220	Node214	0	0	1	2.26	0.318	0.257	0.257	1.75	897.809	894.818	0	1.904
Link210	100yr-24hr	Link210	Node220	Node214	0	0	1	2.26	1.483	0.925	0.925	2.47	898.817	895.983	3778.1	7.826
Link213	5yr-4hr	Link213	Node222	Node219	0	0	0.09	1.34	0.121	0.003	0.036	0.59	899.536	898.621	0	4.754
Link213	100yr-24hr	Link213	Node222	Node219	0	0	0.09	1.34	0.34	0.006	0.067	0.62	899.553	898.84	7.667	19.079
Link214	5yr-4hr	Link214	Node223	STMHNS001	0	0	0.02	0.78	1.28	-0.057	2.336	-1.79	908	908.263	99.533	1.228
Link214	100yr-24hr	Link214	Node223	STMHNS001	0	0	0.02	0.78	1.288	-0.057	2.326	-1.78	908	908.271	287.85	7.19
Link215	5yr-4hr	Link215	Node221	Node224	0	0	1	6.27	0.061	0.039	0.039	3.02	894.561	889.06	0	8.524
Link215	100yr-24hr	Link215	Node221	Node224	0	0	1	6.27	0.092	0.091	0.091	3.9	894.592	889.092	0	28.39
Link756	5yr-4hr	Link756	CBXXX025	Dummy 1	0	185	0	0.04	0.533	0.081	43.22	1.65	899.717	899.409	184.833	2.232
Link756	100yr-24hr	Link756	CBXXX025	Dummy 1	0	555	0	0.04	0.673	0.097	51.663	1.97	899.857	899.419	571.933	9.383
Link791	5yr-4hr	Link791	Node1128	Node1127	0	125	0.27	1.36	1	0.725	2.721	3.68	901.008	900.412	72.033	1.225
Link791	100yr-24hr	Link791	Node1128	Node1127	0	905	0.27	1.36	1	0.726	2.721	3.68	901.008	900.417	124.467	7.185
Link792	5yr-4hr	Link792	Node1127	Node1130	0	0	0.97	1.29	0.5	0.726	0.748	1.01	900.412	900.389	0	1.217
Link792	100yr-24hr	Link792	Node1127	Node1130	0	0	0.97	1.29	0.5	0.728	0.75	1.01	900.417	900.389	0	7.176
Link793	5yr-4hr	Link793	Node1130	Node1129	0	70	0.27	1.36	0.5	0.47	1.76	2.47	900.389	900.319	0	1.2
Link793	100yr-24hr	Link793	Node1130	Node1129	0	820	0.27	1.36	0.5	0.411	1.537	2.15	900.389	900.308	0	7.082
Link795	5yr-4hr	Link795	Node1126	Node1125	0	25	0.27	1.36	7.69E-01	0.356	1.333	1.8	9.00E+02	9.00E+02	82.883	2.393
Link795	100yr-24hr	Link795	Node1126	Node1125	0	320	0.27	1.36	7.35E-01	0.344	1.289	1.75	9.00E+02	9.00E+02	147.333	7.086
Link797	5yr-4hr	Link797	Node1124	Node1123	0	90	0.27	1.36	1	0.679	2.534	3.42	900.16	900.026	100.117	1.232
Link797	100yr-24hr	Link797	Node1124	Node1123	0	460	0.27	1.36	1	0.683	2.549	3.44	900.16	900.079	194.133	7.149
Link799	5yr-4hr	Link799	Node1122	Node1121	0	120	0.27	1.36	1.64E+00	1.074	4.016	5.46	9.00E+02	8.99E+02	152.567	1.399
Link799	100yr-24hr	Link799	Node1122	Node1121	0	315	0.27	1.36	1.796	1.111	4.157	5.58	900.16	899.216	380.95	7.237
Orifice1	5yr-4hr	Link207	Node213	Node217	0	4220	0.01	0.15	0.367	0.011	1.666	26.22	900.867	900.587	4234.15	5.782
Orifice1	100yr-24hr				0	45	0.01	0.15	1.435	0.024	3.59	26.43	901.935	900.634	3888.367	24.072
Orifice2	5yr-4hr	Link206	Node216	Node223	0	0	0	0.15	1.003	0	0.112	-0.72	906.997	908	168	1.256
Orifice2	100yr-24hr				0	0	0	0.15	1.003	-0.011	3.908	-2.59	907.955	908	3888.783	7.937
Orifice3	5yr-4hr	Link212	Node218	Node222	0	4245	0	0.15	0.433	0.003	2.821	14.47	899.933	899.536	4245.117	4.742
Orifice3	100yr-24hr				0	2110	0	0.15	1.472	0.006	5.304	14.49	900.972	899.553	3943.533	19.058
Orifice4	5yr-4hr	Link211	Node214	Node221	0	765	0.03	0.15	0.318	0.039	1.158	49.74	894.818	894.561	2319.283	8.518
Orifice4	100yr-24hr				0	3865	0.03	0.15	1.483	0.091	2.691	59.71	895.983	894.592	3875.333	28.386
Orifice5	5yr-4hr	Link217	Node226	Node1128	0	0	0	0.15	1.003	0	0.087	-0.6	900.008	901.008	328.033	1.731
Orifice5	100yr-24hr				0	0	0	0.15	1.003	0	0.087	-0.6	900.008	901.008	1396.033	8.14
STL3A001	5yr-4hr	STL3A001	STMHRG002	STMH3A001	10	10	0.58	2.06	3.064	0.552	0.949	1.91	898.768	897.745	258.55	3.104
STL3A001	100yr-24hr	STL3A001	STMHRG002	STMH3A001	730	15	0.58	2.06	3.175	0.588	1.01	2.03	899	897.856	760.65	9.711
STL4N001	5yr-4hr	STL4N001	STMH4N001	STMHCC009	0	0	0.08	1.08	1.933	0.089	1.158	1.23	906.046	905.961	279.133	4.108
STL4N001	100yr-24hr	STL4N001	STMH4N001	STMHCC009	0	40	0.08	1.08	2.102	0.086	1.121	1.19	906.118	906.13	812.533	14.926
STL4N003	5yr-4hr	STL4N003	STMH4S001	STMHJM001	0	5	0.17	1.53	1.687	0.084	0.504	0.75	904.601	904.511	4293.021	7.979
STL4N003	100yr-24hr	STL4N003	STMH4S001	STMHJM001	0	75	0.17	1.53	1.881	0.071	0.417	0.63	904.789	904.705	4270.5	7.464
STL4S001	5yr-4hr	STL4S001	STMHJM001	CBXXX027	0	5	0.05	1.07	1.883	0.087	1.657	1.73	904.511	904.665	4294.583	4.204
STL4S001	100yr-24hr	STL4S001	STMHJM001	CBXXX027	0	85	0.05	1.07	1.911	0.094	1.791	1.86	904.705	904.693	4269.639	12.864
STL5S001	5yr-4hr	STL5S001	Node242	STMHXXX010	0	0	0.43	2.72	2.085	0.223	0.516	2.43	902.425	901.83	256.8	1.349
STL5S001	100yr-24hr	STL5S001	Node242	STMHXXX010	0	0	0.43	2.72	2.242	0.236	0.547	2.31	902.557	901.987	722.717	7.493
STL5S001A	5yr-4hr	STL5S001A	CBXXX026	Node242	0	0	0.32	2.52	0.351	0.22	0.694	2.67	903.065	902.425	0	1.246
STL5S001A	100yr-24hr	STL5S001A	CBXXX026	Node242	0	0	0.32	2.52	4.82E-01	0.223	0.704	2.59	9.03E+02	9.03E+02	34.133	7.496
STL5S001AA	5yr-4hr	STL5S001AA	CBXXX027	CBXXX026	0	0	0.11	2.16	1.43E+00	0.219	2.062	4.35	9.05E+02	9.03E+02	47.633	1.275
STL5S001AA	100yr-24hr	STL5S001AA	CBXXX027	CBXXX026	0	0	0.11	2.16	1.458	0.221	2.082	4.39	904.693	903.102	149	7.376
STL5S002	5yr-4hr	STL5S002	STMHXXX026	STMHXXX011	0	40	0.06	0.83	1.934	0.134	2.291	1.87	901.596	901.132	295.1	5.494
STL5S002	100yr-24hr	STL5S002	STMHXXX026	STMHXXX011	0	185	0.06	0.83	2.276	0.138	2.361	1.92	901.938	901.515	911.167	19.144
STL5S003	5yr-4hr	STL5S003	STMH5S003	STMHXXX026	0	0	0.11	0.96	1.929	0.158	1.51	1.42	901.789	901.596	294.45	1.212
STL5S003	100yr-24hr	STL5S003	STMH5S003	STMHXXX026	0	0	0.11	0.96	2.271	0.127	1.208	1.14	902.153	901.938	906.383	7.218
STL5S004	5yr-4hr	STL5S004	STMH5S002	STMH5S003	0	0	0.08	1.14	1.911	0.132	1.636	1.83	901.822	901.789	294.617	1.21
STL5S004	100yr-24hr	STL5S004	STMH5S002	STMH5S003	0	0	0.08	1.14	2.275	0.114	1.416	1.57	902.026	902.153	906.283	19.176
STL6N006	5yr-4hr	STL6N006	STMH6N001	STMHCC005	0	0	0.54	1.51	1.922	0.626	1.162	1.74	903.628	903.593	213.067	4.749
STL6N006	100yr-24hr	STL6N006	STMH6N001	STMHCC005	0	0	0.54	1.51	2.04	0.605	1.122	1.67	903.813	903.711	607.983	13.525
STL6N007	5yr-4hr	STL6N007	STMHCC005	STMHCC011	0	115	1.11	2.51	2.003	0.926	0.835	2.59	903.593	903.613	212.717	4.749
STL6N007	100yr-24hr	STL6N007	STMHCC005	STMHCC011	0	705	1.11	2.51	2.08	0.933	0.841	2.61	903.711	903.69	607.55	11.01
STL6N008	5yr-4hr	STL6N008	STMHCC011	STMHHW004	0	35	1.23	2.79	3.561	0.927	0.752	2.21	903.613	903.522	286.233	4.75
STL6N008	100yr-24hr	STL6N008	STMHCC011	STMHHW004	0	75	1.23	2.79	3.692	0.935	0.759	2.22	903.69	903.653	862.733	11.039
STL6S002	5yr-4hr	STL6S002	STMH6S004	STMH6S003	0	0	0.05	1.47	1.923	0.086	1.856	2.59	903.109	902.117	378.9	2.556
STL6S002	100yr-24hr	STL6S002	STMH6S004	STMH6S003	0	135	0.05	1.47	2.197	0.09	1.949	2.7	903.383	902.562	1175.1	14.703
STL7N001	5yr-4hr	STL7N001	STMH7N004	STMH7N003	0	0	0.48	1.68	1.909	0.386	0.811	1.63	906.134	906.012	107.95	1.212
STL7N001	100yr-24hr	STL7N001	STMH7N004	STMH7N003	0	10	0.48	1.68	1.887	0.371	0.779	1.52	906.138	905.99	294.533	7.204
STL7N002	5yr-4hr	STL7N002	STMH7N001	STMH7N005	0	0	0.6	1.68	1.375	0.496	0.827	1.38	904.091	904.081	227.283	1.283
STL7N002	100yr-24hr	STL7N002	STMH7N001	STMH7N005	0	0	0.6	1.68	1.652	0.483	0.804	1.34	904.365	904.358	614.3	7.253
STL7N003	5yr-4hr	STL7N003	STMH7N002	STMH7N005	0	95	0.17	2.43	1.45	0.2	1.16	2.79	904.717	904.081	436.6	1.192
STL7N003	100yr-24hr	STL7N003	STMH7N002	STMH7N005	0	145	0.17	2.43	1.727	0.163	0.948	2.28	904.916	904.358	1389.4	7.108
STL7N004	5yr-4hr	STL7N004	STMHGB001	STMH7N001	0	10	0.56	1.56	1.361	0.498	0.891	1.39	904.198	904.091	221.233	1.282
STL7N004	100yr-24hr	STL7N004	STMHGB001	STMH7N001	0	35	0.56	1.56	1.635	0.483	0.864	1.34	904.443	904.365	609.333	7.251
STL7N005	5yr-4hr	STL7N005	STMH7N006	STMHCC004	0	0	0.12	1.07	1.352	0.241	2.045	2.15	904.473	904.256	184.95	1.21
STL7N005	100yr-24hr	STL7N005	STMH7N006	STMHCC004	0	0	0.12	1.07	1.423	0.128	1.083	1.21	904.597	904.294	575.9	7.871
STL8N001	5yr-4hr	STL8N001	STMH8N002	STMH8N003	0	0	0.32	1.13	1.143	0.263	0.823	1.27	905.247	905.292	103.883	1.215
STL8N001	100yr-24hr	STL8N001	STMH8N002	STMH8N003	0	0	0.32	1.13	1.308	0.165	0.516	1.12	905.473	905.457	249.167	7.242
STL8N002	5yr-4hr	STL8N002	STMH8N001	STMH8N002	0	0	0.49	3.07	0.796	-0.14	0.288	2.51	905.05	905.247	12.85	1.239
STL8N002	100yr-24hr	STL8N002	STMH8N001	STMH8N002	0	5	0.49	3.07	1.022	-0.472	0.967	-2.95	905.18	905.473	246.45	7.251
STL9S001	5yr-4hr	STL9S001	STMHGB003	STMH9N001	0	0	0.06	0.88	1.798	0.124	1.989	1.71	906.211	906.194	54.283	2.087
STL9S001	100yr-24hr	STL9S001	STMHGB003	STMH9N001	0	0	0.06	0.88	1.845	0.128	2.058	1.77	906.297	906.241	186.683	10.003
STL9S002	5yr-4hr	STL9S002	STMH9N001	STMH9N002	0	0	0.13	1.19	1.823	0.24	1.837	2.13	906.194	905.101	54.967	1.218
STL9S002	100yr-24hr	STL9S002	STMH9N001	STMH9N002	0	0	0.13	1.19	1.87	0.235	1.797	2.08	906.241	905.076	187.567	7.187
STLCC002	5yr-4hr	STLCC002	STMHCC010	STMHCC002	0	0	0.02	0.35	1.31E+00	0.095	3.822	1.31	9.04E+02	9.04E+02	309.967	4.965
STLCC002	100yr-24hr	STLCC002	STMHCC010	STMHCC002	0	0	0.02	0.35	1.33E+00	0.088	3.552	1.22	9.04E+02	9.04E+02	1617.6	16.199
STLCC003	5yr-4hr	STLCC003	STMHCC002	STMHCC003	0	95	0	0.04	1.285	0.107	35.106	1.49	904.358	904.304	306.5	1.19
STLCC003	100yr-24hr	STLCC003	STMHCC002	STMHCC003	0	400	0	0.04	1.314	0.094	30.79	1.31	904.387	904.328	1540.633	7.103
STLCC004	5yr-4hr	STLCC004	STMHCC003	STMHCC004	0	0	0.11	1.01	1.547	0.161	1.446	1.45	904.304	904.256	214.85	1.204
STLCC004	100yr-24hr	STLCC004	STMHCC003	STMHCC004	0	0	0.11	1.01	1.585	0.129	1.157	1.15	904.328	904.294	601.8	12.35
STLCC006	5yr-4hr	STLCC006	STMHCC004	STMHCC005	0	5	0.21	1.32	1.817	0.275	1.307	1.71	904.256	903.593	215.15	1.218
STLCC006	100yr-24hr	STLCC006	STMHCC004	STMHCC005	0	0	0.21	1.32	1.935	0.202	0.962	1.46	904.294	903.711	609.95	7.115
STLCC006.1	5yr-4hr	STLCC006.1	STMHCC006	STMHCC005	0	15	0.14	1.14	1.917	0.266	1.858	2.07	904.091	903.593	280.867	4.983
STLCC006.1	100yr-24hr	STLCC006.1	STMHCC006	STMHCC005	0	100	0.14	1.14	2.035	0.275	1.922	2.14	904.229	903.711	820.567	17.399
STLCC009	5yr-4hr	STLCC009	STMHCC007	STMHCC006	0	0	0.15	1.36	1.812	0.231	1.536	2.05	904.484	904.091	280.633	5.432
STLCC009	100yr-24hr	STLCC009	STMHCC007	STMHCC006	0	0	0.15	1.36	2.02E+00	0.195	1.297	1.73	9.05E+02	9.04E+02	819.6	7.067
STLCC010	5yr-4hr	STLCC010	STMHCC008	STMHCC007	0	0	0.17	1.58	2.837	0.251	1.437	2.18	906.76	904.484	279.917	1.257
STLCC010	100yr-24hr	STLCC010	STMHCC008	STMHCC007	0	0	0.17	1.58	3.127	0.266	1.525	2.31	907.05	904.691	813.517	7.208
STLCC011	5yr-4hr	STLCC011	STMHCC009	STMHCC008	0	0	0.03	0.69	2.777	-0.176	5.178	-3.38	905.961	906.76	282.4	1.256
STLCC011	100yr-24hr	STLCC011	STMHCC009	STMHCC008	0	0	0.03	0.69	3.067	-0.204	5.98	-3.89	906.13	907.05	819.133	7.203
STLGB002	5yr-4hr	STLGB002	STMHGB002	STMHGB001	0	0	0.35	0.99	1.214	0.527	1.489	1.54	904.289	904.198	177.617	1.247
STLGB002	100yr-24hr	STLGB002	STMHGB002	STMHGB001	0	0	0.35	0.99	1.44E+00	0.484	1.369	1.35	9.05E+02	9.04E+02	533.367	7.25
STLHW001	5yr-4hr	STLHW001	STMHHW001	STMHHW002	0	0	0.32	1.13	1.795	-0.458	1.439	-1.6	903.316	903.897	205.017	1.256
STLHW001	100yr-24hr	STLHW001	STMHHW001	STMHHW002	0	0	0.32	1.13	2.13E+00	-0.692	2.175	-2.41	9.03E+02	9.04E+02	515.05	7.236
STLHW002	5yr-4hr	STLHW002	STMHHW002	STMHHW003	0	0	0.16	1.01	2.321	0.165	1.031	1.1	903.897	904.001	212.9	1.228
STLHW002	100yr-24hr	STLHW002	STMHHW002	STMHHW003	0	0	0.16	1.01	2.379	0.118	0.739	1.01	904.228	904.059	603.967	7.242
STLHW003	5yr-4hr	STLHW003	STMHHW003	STMHHW004	0	0	0.13	1.06	2.421	0.133	0.998	1.04	904.001	903.522	221.483	4.639
STLHW003	100yr-24hr	STLHW003	STMHHW003	STMHHW004	0	0	0.13	1.06	2.559	0.118	0.887	0.99	904.059	903.66	661.2	7.249

STLHW004	5yr-4hr	STLHW004	STMHHW005	STMHHW004	0	75	0.61	2.15	1.976	0.724	1.192	2.53	904.591	903.522	207.75	1.367
STLHW004	100yr-24hr	STLHW004	STMHHW005	STMHHW004	0	90	0.61	2.15	2.029	0.737	1.213	2.57	904.644	903.66	591.783	7.787
STLHW005	5yr-4hr	STLHW005	STMHHW006	STMHHW005	0	0	0.27	1.7	1.985	0.433	1.607	2.68	905.766	904.603	43.517	1.231
STLHW005	100yr-24hr	STLHW005	STMHHW006	STMHHW005	0	0	0.27	1.7	2.03E+00	0.451	1.673	2.78	9.06E+02	9.05E+02	148.583	8.085
STLHW006	5yr-4hr	STLHW006	STMHHW007	STMHHW006	0	10	0.18	1.59	1.422	0.366	2.085	3.26	906.019	905.764	62.7	1.822
STLHW006	100yr-24hr	STLHW006	STMHHW007	STMHHW006	0	0	0.18	1.59	1.52	0.365	2.089	3.25	906.117	905.808	148.867	8.14
STLHW007	5yr-4hr	STLHW007	STMHHW008	STMHHW007	0	0	0.21	1.93	1.579	0.267	1.252	2.38	907.78	906.019	62.7	1.832
STLHW007	100yr-24hr	STLHW007	STMHHW008	STMHHW007	0	0	0.21	1.93	1.619	0.226	1.057	2	907.82	906.117	148.867	7.389
STLHW008	5yr-4hr	STLHW008	STMHHW009	STMHHW008	0	15	0.1	1.36	1.579	0.157	1.642	2.18	908.413	907.78	62.467	2.135
STLHW008	100yr-24hr	STLHW008	STMHHW009	STMHHW008	0	0	0.1	1.36	1.619	0.135	1.405	1.86	908.423	907.82	145.667	9.257
STLHW009	5yr-4hr	STLHW009	STMHHW010	STMHHW009	0	0	0.1	1.35	1.66E+00	0.117	1.223	1.62	9.09E+02	9.08E+02	62.467	1.229
STLHW009	100yr-24hr	STLHW009	STMHHW010	STMHHW009	0	0	0.1	1.35	1.707	0.13	1.366	1.8	909.465	908.423	144.967	7.192
STLJM002	5yr-4hr	STLJM002	Node240	STMH4S001	0	0	0.13	1.81	1.058	0.071	0.553	1.35	905.011	904.601	413.767	2.006
STLJM002	100yr-24hr	STLJM002	Node240	STMH4S001	0	100	0.13	1.81	1.246	0.071	0.554	1.34	905.119	904.789	1079.333	7.46
STLJM002A	5yr-4hr	STLJM002A	STMH3N001	Node240	0	0	0.04	1.38	1.61E+00	0.071	1.634	2.17	9.07E+02	9.05E+02	179.933	1.196
STLJM002A	100yr-24hr	STLJM002A	STMH3N001	Node240	0	5	0.04	1.38	1.662	0.071	1.639	2.16	907.411	905.119	354.767	7.442
STLMP004	5yr-4hr	STLMP004	STMH6S003	STMHMC003	0	5	0.51	1.8	2.553	0.308	0.606	1.84	902.117	902.095	173.45	1.215
STLMP004	100yr-24hr	STLMP004	STMH6S003	STMHMC003	0	0	0.51	1.8	3.01	0.278	0.545	1.74	902.562	902.552	3891.933	7.164
STLMP005	5yr-4hr	STLMP005	STMHMC003	STMHMC002	0	0	0.41	1.44	2.748	0.288	0.706	1.33	902.095	902.059	177.583	2.522
STLMP005	100yr-24hr	STLMP005	STMHMC003	STMHMC002	0	0	0.41	1.44	3.229	0.276	0.679	1.4	902.552	902.54	3893.433	7.165
STLMP006	5yr-4hr	STLMP006	STMHMC002	STMHMC001	0	50	0.47	1.67	2.795	0.459	0.979	1.6	902.059	902.03	180.467	1.236
STLMP006	100yr-24hr	STLMP006	STMHMC002	STMHMC001	0	370	0.47	1.67	3.269	0.612	1.317	2.1	902.54	902.499	3894.25	7.44
STLPR001	5yr-4hr	STLPR001	STMHPR001	STMHCC001	0	0	0.05	0.76	1.235	0.086	1.605	1.19	904.262	904.348	308.517	5.978
STLPR001	100yr-24hr	STLPR001	STMHPR001	STMHCC001	0	0	0.05	0.76	1.29	0.087	1.633	1.21	904.323	904.403	1596.467	17.342
STLRW002	5yr-4hr	STLRW002	STMH7N003	STMHRW001	0	0	0.38	1.35	1.923	0.374	0.978	1.31	906.011	905.78	110.483	1.242
STLRW002	100yr-24hr	STLRW002	STMH7N003	STMHRW001	0	0	0.38	1.35	1.96	0.371	0.969	1.29	905.99	905.84	299.9	7.2
STLURW01A	5yr-4hr	STLURW01A	Node1109	STMHXXX006	0	45	0.79	2.81	3.051	0.556	0.7	1.92	901.752	901.501	1005.258	1.26
STLURW01A	100yr-24hr	STLURW01A	Node1109	STMHXXX006	0	70	0.79	2.81	3.356	0.593	0.746	2.04	902.067	901.806	3958.033	7.228
STLURW01AA	5yr-4hr	STLURW01AA	STMHXXX005	Node1109	0	40	1.43	5.07	2.691	0.558	0.389	3.27	901.766	901.752	301.05	1.26
STLURW01AA	100yr-24hr	STLURW01AA	STMHXXX005	Node1109	0	55	1.43	5.07	3.006	0.607	0.425	3.05	902.082	902.067	3896.3	7.207
STLURW02	5yr-4hr	STLURW02	STMHXXX006	STMHXXX007	0	5	0.53	1.86	2.683	0.554	1.051	1.92	901.501	901.086	1027.158	1.269
STLURW02	100yr-24hr	STLURW02	STMHXXX006	STMHXXX007	0	10	0.53	1.86	2.988	0.592	1.123	2.04	901.806	901.384	3983.183	7.226
STLURW03	5yr-4hr	STLURW03	STMHXXX007	STMHXXX008	0	0	0.42	1.48	2.687	0.556	1.327	1.93	901.086	900.668	1066.621	1.271
STLURW03	100yr-24hr	STLURW03	STMHXXX007	STMHXXX008	0	25	0.42	1.48	2.985	0.592	1.413	2.05	901.384	900.972	4000.417	7.225
STLWL001	5yr-4hr	STLWL001	Node228	STMH8N001	0	5	1.55	5.48	1.329	-0.232	0.15	1.37	904.892	905.05	4286.154	1.238
STLWL001	100yr-24hr	STLWL001	Node228	STMH8N001	0	5	1.55	5.48	1.349	-0.472	0.305	-1.66	904.892	905.07	4252.917	7.271
STLXXX005	5yr-4hr	STLXXX005	STMHHW004	STMHXXX010	0	0	0.87	1.98	3.531	1.487	1.703	3.28	903.522	901.83	457.867	1.253
STLXXX005	100yr-24hr	STLXXX005	STMHHW004	STMHXXX010	0	0	0.87	1.98	3.662	1.505	1.724	3.32	903.653	901.987	2234.958	7.199
STLXXX006	5yr-4hr	STLXXX006	STMHXXX010	STMHXXX011	0	0	0.23	0.52	2.958	1.696	7.382	3.77	901.83	901.132	258.7	1.256
STLXXX006	100yr-24hr	STLXXX006	STMHXXX010	STMHXXX011	0	0	0.23	0.52	3.115	1.707	7.431	3.79	901.987	901.515	737	7.225
STLXXX08	5yr-4hr	STLXXX08	MHXXX012A	STMHXXX013	0	0	1.59	2.49	4.514	1.323	0.834	2.31	898.781	897.744	260.683	4.822
STLXXX08	100yr-24hr	STLXXX08	MHXXX012A	STMHXXX013	0	5	1.59	2.49	4.855	1.292	0.814	2.27	899.134	898.085	744.4	15.751
STLXXX09	5yr-4hr	STLXXX09	STMHXXX013	STMHXXX014	0	0	1.14	1.79	4.529	1.465	1.284	2.25	897.744	895.421	288.9	1.253
STLXXX09	100yr-24hr	STLXXX09	STMHXXX013	STMHXXX014	0	0	1.14	1.79	4.87	1.456	1.275	2.23	898.085	895.806	918.717	7.187
STLXXX10	5yr-4hr	STLXXX10	STMHXXX014	Node1117	0	280	0.03	0.05	3.981	1.469	47.364	2.3	895.421	892.156	290.633	1.657
STLXXX10	100yr-24hr	STLXXX10	STMHXXX014	Node1117	0	835	0.03	0.05	4.366	1.556	50.181	2.42	895.806	892.174	924.833	7.626
STLXXX103	5yr-4hr	STLXXX103	STMH9N002	STMHXXX037	0	35	0.07	0.66	1.171	0.242	3.333	2.17	905.101	904.202	54.617	1.225
STLXXX103	100yr-24hr	STLXXX103	STMH9N002	STMHXXX037	0	80	0.07	0.66	1.145	0.241	3.316	2.17	905.075	904.202	187.917	7.193
STLXXX120	5yr-4hr	STLXXX120	STMH8N004	Node228	0	5	0.18	1.41	0.624	0.228	1.29	1.81	904.987	904.892	4273.067	1.254
STLXXX120	100yr-24hr	STLXXX120	STMH8N004	Node228	0	10	0.18	1.41	1.073	0.557	3.142	4.39	905.436	904.892	4204.917	7.26
STLXXX121	5yr-4hr	STLXXX121	STMHXXX027	STMH8N004	0	0	0.02	0.53	0.905	0.033	2.016	1.04	905.561	904.987	4273.55	1.919
STLXXX121	100yr-24hr	STLXXX121	STMHXXX027	STMH8N004	0	0	0.02	0.53	0.948	0.035	2.103	1.09	905.584	905.436	4208.667	11.407
STLXXX123	5yr-4hr	STLXXX123	CBXXX038	STMHXXX027	0	0	0.03	0.81	0.867	0.026	1.043	0.83	905.594	905.561	255.7	4.922
STLXXX123	100yr-24hr	STLXXX123	CBXXX038	STMHXXX027	0	0	0.03	0.81	0.89	0.025	0.98	0.78	905.605	905.584	471.133	14.399
STLXXX124	5yr-4hr	STLXXX124	STMHXXX028	CBXXX038	0	0	0.02	0.66	0.633	0.024	1.163	0.76	905.632	905.594	248.267	5.088
STLXXX124	100yr-24hr	STLXXX124	STMHXXX028	CBXXX038	0	0	0.02	0.66	0.644	0.022	1.055	0.69	905.616	905.605	453.033	14.408
STLXXX13	5yr-4hr	STLXXX13	STMHRG001	STMHXXX014	0	0	0.39	4.02	2.951	0	0	0	899.528	895.421	279.967	0
STLXXX13	100yr-24hr	STLXXX13	STMHRG001	STMHXXX014	0	0	0.39	4.02	3.336	0	0	0	899.528	895.806	836.25	0
STLXXX14	5yr-4hr	STLXXX14	STMHXXX011	MHXXX011A	0	5	1.6	2.52	2.642	1.672	1.043	2.86	901.132	900.714	256.783	1.219
STLXXX14	100yr-24hr	STLXXX14	STMHXXX011	MHXXX011A	0	5	1.6	2.52	3.017	1.294	0.807	2.71	901.515	901.09	725	7.147
STLXXX142	5yr-4hr	STLXXX142	STMHCC001	STMHCC010	0	0	0.07	0.95	1.244	0.144	2.164	2	904.348	904.357	308.533	4.815
STLXXX142	100yr-24hr	STLXXX142	STMHCC001	STMHCC010	0	0	0.07	0.95	1.292	0.129	1.935	1.79	904.403	904.405	1596.467	17.015
STLXXX14A	5yr-4hr	STLXXX14A	MHXXX011A	STMHXXX012	0	0	1.6	2.52	3.373	1.494	0.935	2.75	900.714	899.575	257.817	1.217
STLXXX14A	100yr-24hr	STLXXX14A	MHXXX011A	STMHXXX012	0	5	1.6	2.52	3.734	1.292	0.806	2.65	901.09	899.936	728.4	15.751
STLXXX15	5yr-4hr	STLXXX15	STMHXXX012	MHXXX012A	0	0	1.56	2.45	3.832	1.323	0.848	2.58	899.575	898.781	258.85	4.818
STLXXX15	100yr-24hr	STLXXX15	STMHXXX012	MHXXX012A	0	0	1.56	2.45	4.185	1.292	0.829	2.47	899.936	899.134	733.917	15.753
STLXXX152	5yr-4hr	STLXXX152	Node1118	STMHCC006	0	0	0	0.03	1.535	0.048	47.571	1.51	904.127	904.091	279.933	5.836
STLXXX152	100yr-24hr	STLXXX152	Node1118	STMHCC006	0	0	0	0.03	1.637	0.122	117.271	3.71	904.223	904.229	867.767	20.529
STLXXX16	5yr-4hr	STLXXX16	STMH5S001	STMHXXX008	0	75	0.22	1.4	1.326	0.382	1.711	2.38	901.902	900.668	78.867	1.71
STLXXX16	100yr-24hr	STLXXX16	STMH5S001	STMHXXX008	0	5	0.22	1.4	1.669	0.402	1.804	2.49	902.245	900.972	385.517	8.178
STLXXX17	5yr-4hr	STLXXX17	STMHXXX008	STMHXXX009	0	5	0.76	1.73	2.523	0.906	1.185	2.02	900.668	900.087	1075.912	1.271
STLXXX17	100yr-24hr	STLXXX17	STMHXXX008	STMHXXX009	0	30	0.76	1.73	2.827	0.922	1.206	2.05	900.972	900.512	4034.617	7.224
STLXXX18	5yr-4hr	STLXXX18	STMHXXX009	STMHXXX025	0	5	0.78	1.76	2.28	0.907	1.164	2.03	900.087	899.885	1079.142	1.269
STLXXX18	100yr-24hr	STLXXX18	STMHXXX009	STMHXXX025	0	30	0.78	1.76	2.82	0.921	1.182	2.06	900.504	900.452	4048.783	7.235
STLXXX187	5yr-4hr	STLXXX187	Node1120	STMHPR001	0	5	0.08	1.15	1.064	-0.071	0.867	-1.09	903.612	904.262	304.733	2.699
STLXXX187	100yr-24hr	STLXXX187	Node1120	STMHPR001	0	380	0.08	1.15	1.125	-0.087	1.067	-1.23	904.055	904.323	1538.933	12.083
STLXXX18A	5yr-4hr	STLXXX18A	STMHXXX025	CB3A002W	0	5	0.77	1.75	2.623	0.908	1.176	2.03	899.885	899.631	1121.378	1.268
STLXXX18A	100yr-24hr	STLXXX18A	STMHXXX025	CB3A002W	0	0	0.77	1.75	3.408	0.923	1.195	2.06	900.452	900.416	4191.483	7.218
STLXXX18AA	5yr-4hr	STLXXX18AA	CB3A002W	STMH3A002	0	0	0.51	1.01	2.631	0.133	0.263	0.26	899.631	899.63	1116	4.711
STLXXX18AA	100yr-24hr	STLXXX18AA	CB3A002W	STMH3A002	0	0	0.51	1.01	3.416	0.243	0.48	0.47	900.416	900.415	4176.6	13.428
STLXXX19	5yr-4hr	STLXXX19	STMH3A002	STMH3A003	0	640	0.08	2.53	2.04	0.133	1.677	3.95	899.63	897.79	4301.375	4.722
STLXXX19	100yr-24hr	STLXXX19	STMH3A002	STMH3A003	0	0	0.08	2.53	2.825	0.162	2.036	4.69	900.415	897.79	4283.528	64.085
STLXXX191	5yr-4hr	STLXXX191	Node1121	STMHRG002	0	60	6.41	3.21	2.892	1.531	0.239	1.26	898.876	898.768	0	2.831
STLXXX191	100yr-24hr	STLXXX191	Node1121	STMHRG002	0	65	6.41	3.21	3.124	-3.182	0.498	1.15	899.216	899	0	10.271
STLXXX192	5yr-4hr	STLXXX192	Node1123	Node1122	0	0	3.67	1.83	1.642	1.239	0.338	1.13	900.026	900.006	0	1.256
STLXXX192	100yr-24hr	STLXXX192	Node1123	Node1122	0	0	3.67	1.83	1.796	1.447	0.394	0.99	900.079	900.16	0	7.226
STLXXX193	5yr-4hr	STLXXX193	Node1125	Node1124	0	0	3.67	1.83	1	0.402	0.11	0.64	900.218	900.16	0	1.246
STLXXX193	100yr-24hr	STLXXX193	Node1125	Node1124	0	0	3.67	1.83	1	0.349	0.095	0.62	900.171	900.16	0	9.167
STLXXX194	5yr-4hr	STLXXX194	Node1129	Node1126	0	0	3.67	1.84	0.74	0.446	0.121	0.93	900.319	900.299	0	1.207
STLXXX194	100yr-24hr	STLXXX194	Node1129	Node1126	0	0	3.67	1.84	0.735	0.385	0.105	0.78	900.308	900.294	0	7.087
STLXXX20	5yr-4hr	STLXXX20	STMH3A003	STMHXXX016	0	0	3.06	6.92	0.107	0.133	0.044	3.44	897.66	893.468	0	4.724
STLXXX20	100yr-24hr	STLXXX20	STMH3A003	STMHXXX016	0	0	3.06	6.92	0.117	0.162	0.053	3.66	897.67	893.479	0	64.086
STLXXX21	5yr-4hr	STLXXX21	STMHMC001	STMHXXX005	0	0	0.36	1.29	2.825	0.571	1.576	1.99	902.03	901.766	230.567	1.236
STLXXX21	100yr-24hr	STLXXX21	STMHMC001	STMHXXX005	0	0	0.36	1.29	3.294	0.699	1.916	2.4	902.499	902.082	3895.833	7.231
STLXXX30	5yr-4hr	STLXXX30	STMHRW001	STMHXXX002	0	0	0.18	1.14	1.92	0.518	2.855	3.2	905.78	905.031	115.95	1.222
STLXXX30	100yr-24hr	STLXXX30	STMHRW001	STMHXXX002	0	0	0.18	1.14	1.98	0.395	2.172	2.44	905.84	905.197	364.617	7.181
STLXXX31	5yr-4hr	STLXXX31	STMHXXX002	STMHGB002	0	0	0.38	1.33	1.37	0.561	1.493	1.99	905.031	904.289	171.767	1.242
STLXXX31	100yr-24hr	STLXXX31	STMHXXX002	STMHGB002	0	0	0.38	1.33	1.536	0.485	1.29	1.7	905.197	904.51	532.333	7.249
STLXXX32	5yr-4hr	STLXXX32	STMH8N003	STMHXXX001	0	0	0.07	0.47	1.323	0.235	3.15	1.47	905.292	905.17	110.7	1.222
STLXXX32	100yr-24hr	STLXXX32	STMH8N003	STMHXXX001	0	0	0.07	0.47	1.488	0.161	2.17	1	905.457	905.339	299	7.243
STLXXX33	5yr-4hr	STLXXX33	STMHXXX001	STMHXXX002	0	0	0.23	1.18	1.448	0.185	0.796	0.97	905.17	905.031	115.983	1.222
STLXXX33	100yr-24hr	STLXXX33	STMHXXX001	STMHXXX002	0	0	0.23	1.18	1.614	0.161	0.694	0.81	905.339	905.197	380.633	7.247
STLXXX34	5yr-4hr	STLXXX34	STMH7N005	STMH7N001B	0	0	0.41	1.15	1.382	0.668	1.624	1.85	904.081	903.989	245.783	1.281
STLXXX34	100yr-24hr	STLXXX34	STMH7N005	STMH7N001B	0	0	0.41	1.15	1.659	0.621	1.509	1.72	904.358	904.283	629.2	7.253
STLXXX34A	5yr-4hr	STLXXX34A	STMH7N001B	STMHXXX035	0	0	0.41	1.15	1.352	0.661	1.609	1.81	903.989	903.823	272.883	1.283
STLXXX34A	100yr-24hr	STLXXX34A	STMH7N001B	STMHXXX035	0	0	0.41	1.15	1.646	0.62	1.511	1.73	904.283	904.163	722.867	7.193
STLXXX34B	5yr-4hr	STLXXX34B	STMHXXX003	STMHXXX035	0	0	0.39	1.08	1.285	-0.531	1.379	1.5	903.527	903.823	274.017	2.954
STLXXX34B	100yr-24hr	STLXXX34B	STMHXXX003	STMHXXX035	0	0	0.39	1.08	1.625	-0.534	1.387	-1.58	903.904	904.163	722.867	7.583
STLXXX35	5yr-4hr	STLXXX35	STMH6N001	STMHXXX003	0	0	0.58	1.61	1.927	-0.626	1.084	-1.73	903.628	903.527	215.033	4.749
STLXXX35	100yr-24hr	STLXXX35	STMH6N001	STMHXXX003	0	0	0.58	1.61	2.304	-0.605	1.047	-1.67	903.813	903.904	609.6	13.525
STLXXX36	5yr-4hr	STLXXX36	STMH6S002	STMH6S003	0	0	0.04	0.62	2.642	0.22	5.055	2.98	902.652	902.117	184.9	1.201

STLXXX36	100yr-24hr	STLXXX36	STMH6S002	STMH6S003	0	15	0.04	0.62	2.784	0.211	4.85	2.86	902.794	902.562	3918.117	7.142
STLXXX37	5yr-4hr	STLXXX37	STMH6S001	STMH6S002	0	0	0.33	1.18	2.667	0.364	1.103	1.26	902.666	902.652	175.85	1.197
STLXXX37	100yr-24hr	STLXXX37	STMH6S001	STMH6S002	0	0	0.33	1.18	2.809	0.263	0.793	0.91	902.847	902.794	544.517	7.16
STLXXX38	5yr-4hr	STLXXX38	STMHXXX004	STMH6S002	0	0	0.05	0.75	2.502	0.119	2.252	1.63	902.33	902.652	177.8	4.093
STLXXX38	100yr-24hr	STLXXX38	STMHXXX004	STMH6S002	0	0	0.05	0.75	2.644	0.104	1.974	1.42	902.416	902.794	2364.667	11.389
STLXXX43	5yr-4hr	STLXXX43	STMHNS001	STMHNA005	0	0	0.11	1.5	2.265	-0.105	0.995	-1.43	908.263	908.248	102.75	1.218
STLXXX43	100yr-24hr	STLXXX43	STMHNS001	STMHNA005	0	0	0.11	1.5	2.331	-0.099	0.937	1.42	908.271	908.314	292.5	7.182
STLXXX44	5yr-4hr	STLXXX44	STMHNA005	STMHNA004	0	5	0.08	1.18	2.245	0.112	1.349	1.53	908.248	907.527	105.7	1.279
STLXXX44	100yr-24hr	STLXXX44	STMHNA005	STMHNA004	0	0	0.08	1.18	2.311	0.112	1.348	1.53	908.314	907.623	294.75	7.414
STLXXX45	5yr-4hr	STLXXX45	STMHNA004	STMHNA003	0	0	0.08	1.14	1.994	0.128	1.601	1.76	907.527	906.842	106.55	2.731
STLXXX45	100yr-24hr	STLXXX45	STMHNA004	STMHNA003	0	0	0.08	1.14	2.09	0.151	1.884	2.07	907.623	906.89	295.5	11.832
STLXXX48	5yr-4hr	STLXXX48	STMHNA003	STMHNA002	0	0	0.15	1.35	1.944	0.291	1.956	2.59	906.842	906.369	106.7	1.215
STLXXX48	100yr-24hr	STLXXX48	STMHNA003	STMHNA002	0	0	0.15	1.35	1.992	0.218	1.464	1.92	906.89	906.286	289.7	7.503
STLXXX49	5yr-4hr	STLXXX49	STMHNA001	STMHNA002	0	5	0.14	1.27	1.794	0.2	1.432	1.8	906.298	906.369	106.283	1.215
STLXXX49	100yr-24hr	STLXXX49	STMHNA001	STMHNA002	0	10	0.14	1.27	1.709	0.149	1.064	1.33	906.383	906.284	275.95	9.926
STLXXX51	5yr-4hr	STLXXX51	STMHNA002	STMH7N004	0	100	0.43	1.51	1.862	0.458	1.08	1.56	906.369	906.14	105.733	1.214
STLXXX51	100yr-24hr	STLXXX51	STMHNA002	STMH7N004	0	930	0.43	1.51	1.814	0.387	0.908	1.35	906.284	906.138	276.217	7.254
STLXXX69	5yr-4hr	STLXXX69	STMH3A001	Node227	0	255	0.01	0.04	3.114	0.559	53.103	1.95	897.745	895.118	259.567	2.864
STLXXX69	100yr-24hr	STLXXX69	STMH3A001	Node227	0	605	0.01	0.04	3.225	0.571	54.265	1.99	897.856	895.123	840.7	11.226
W-1	5yr-4hr	Link229	STMHXXX037	Node1120	-9.00E+99	-9.00E+99	0	0	-9.00E+99	-0.071	0	0	-9.00E+99	-9.00E+99	0	2.728
W-1	100yr-24hr				-9.00E+99	-9.00E+99	0	0	-9.00E+99	0.307	0	0	-9.00E+99	-9.00E+99	0	17.663

Appendix I

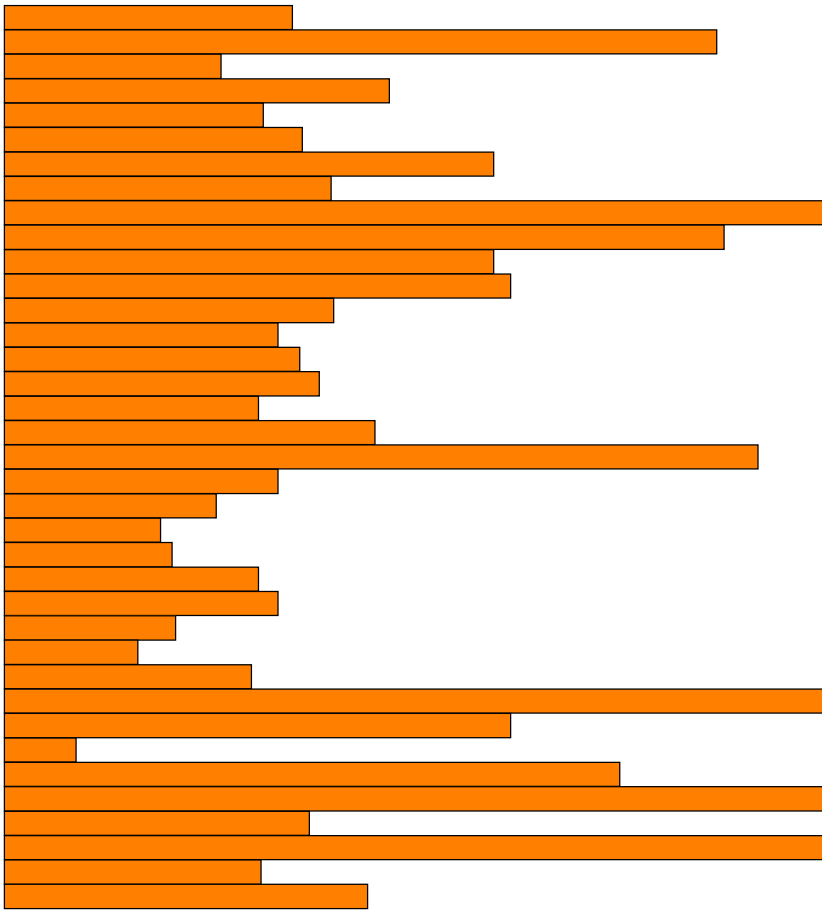
HydroStat Output Files

Project: PotHole Creek Peak Yealry DIscharge 1972-2008
User: ISL
Date: 9 February 2009, Monday
Time: 1:18 pm
Input: N:\12000\12674 - LETHBRIDGE HOLIDAY INN\01_DESIGN\01C_MUNI\WATER SURVEY OF CANADA\POTHOLE CREEK HYDRO STAT 19
Output: N:\12000\12674 - LETHBRIDGE HOLIDAY INN\01_DESIGN\01C_MUNI\WATER SURVEY OF CANADA\POTHOLE CREEK HYDRO STAT 19

This data is an ANNUAL MAXIMUM series.

DATA ENTERED

Water Year	PEAK DISCHARGE Q cms
1972	11.90
1973	29.40
1974	8.95
1975	15.90
1976	10.70
1977	12.30
1978	20.20
1979	13.50
1980	51.30
1981	29.70
1982	20.20
1983	20.90
1984	13.60
1985	11.30
1986	12.20
1987	13.00
1988	10.50
1989	15.30
1990	31.10
1991	11.30
1992	8.75
1993	6.46
1994	6.94
1995	10.50
1996	11.30
1997	7.08
1998	5.52
1999	10.20
2000	39.60
2001	20.90
2002	2.97
2003	25.40
2004	66.50
2005	12.60
2006	56.60
2007	10.60
2008	15.00



End of Data Series ==========
This series contains 37 years of data.

Project: PotHole Creek Peak Yealry DIscharge 1972-2008
User: ISL
Date: 9 February 2009, Monday
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Input: N:\12000\12674 - LETHBRIDGE HOLIDAY INN\01_DESIGN\01C_MUNI\WATER SURVEY OF CANADA\POTHOLE CREEK HYDRO STAT 19
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DATA AS CONTAINED IN: N:\12000\12674 - LETHBRIDGE HOLIDAY INN\01_DESIGN\01C_MUNI\WATER SURVEY OF CANADA\POTHOLE CREEK HY

UNSORTED				SORTED			
Q (cms)	Rank	Plotting Position	Plotted Period (yrs)	Q (cms)	Rank	Plotting Position	Plotted Period (yrs)
11.90	0	.0000	0.000	25.80	1	.0263	38.000
29.40	0	.0000	0.000	22.90	2	.0526	19.000
8.95	0	.0000	0.000	10.90	3	.0789	12.667
15.90	0	.0000	0.000	10.70	4	.1053	9.500
10.70	4	.1053	9.500	9.90	5	.1316	7.600
12.30	4	.1053	9.500	9.20	6	.1579	6.333
20.20	4	.1053	9.500	8.88	7	.1842	5.429
13.50	4	.1053	9.500	8.60	8	.2105	4.750
51.30	4	.1053	9.500	8.03	9	.2368	4.222
29.70	4	.1053	9.500	6.60	10	.2632	3.800
20.20	4	.1053	9.500	6.04	11	.2895	3.455
20.90	4	.1053	9.500	4.99	12	.3158	3.167
13.60	4	.1053	9.500	4.99	13	.3421	2.923
11.30	4	.1053	9.500	4.22	14	.3684	2.714
12.20	4	.1053	9.500	4.22	15	.3947	2.533
13.00	4	.1053	9.500	3.94	16	.4211	2.375
10.50	4	.1053	9.500	3.86	17	.4474	2.235
15.30	4	.1053	9.500	3.59	18	.4737	2.111
31.10	4	.1053	9.500	3.57	19	.5000	2.000
11.30	4	.1053	9.500	3.55	20	.5263	1.900
8.75	4	.1053	9.500	3.44	21	.5526	1.810
6.46	4	.1053	9.500	2.94	22	.5789	1.727
6.94	4	.1053	9.500	2.78	23	.6053	1.652
10.50	4	.1053	9.500	2.69	24	.6316	1.583
11.30	4	.1053	9.500	2.67	25	.6579	1.520
7.08	4	.1053	9.500	2.67	26	.6842	1.462
5.52	4	.1053	9.500	2.63	27	.7105	1.407
10.20	4	.1053	9.500	2.61	28	.7368	1.357
39.60	4	.1053	9.500	2.59	29	.7632	1.310
20.90	4	.1053	9.500	2.55	30	.7895	1.267
2.97	4	.1053	9.500	2.49	31	.8158	1.226
25.40	4	.1053	9.500	2.46	32	.8421	1.188
66.50	4	.1053	9.500	2.45	33	.8684	1.152
12.60	4	.1053	9.500	2.31	34	.8947	1.118
56.60	4	.1053	9.500	2.25	35	.9211	1.086
10.60	4	.1053	9.500	1.55	36	.9474	1.056
15.00	4	.1053	9.500	1.16	37	.9737	1.027

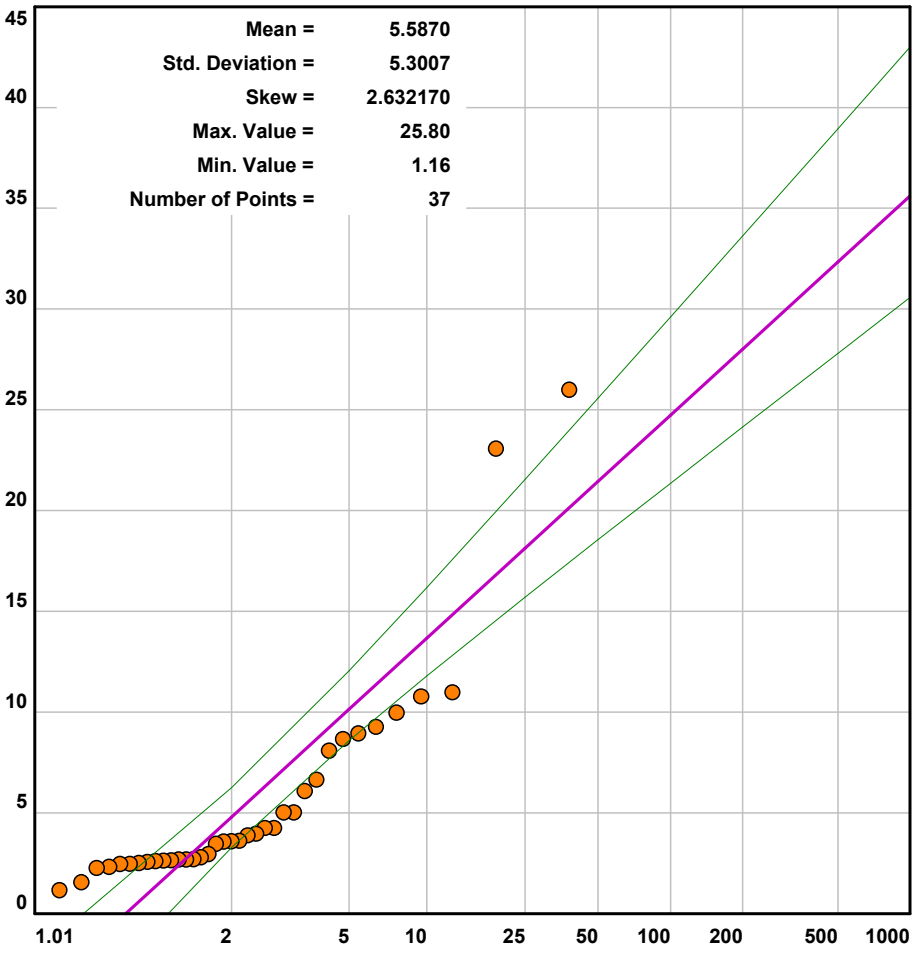
Note that the UNSORTED listing will give the same rank to identical values occuring in the input data file. The SORTED listing shows all ranks.

Project: PotHole Creek Peak Yealry DIscharge 1972-2008
User: ISL
Date: 9 February 2009, Monday
Time: 1:18 pm
Input: N:\12000\12674 - LETHBRIDGE HOLIDAY INN\01_DESIGN\01C_MUNI\WATER SURVEY OF CANADA\POTHOLE CREEK HYDRO STAT 19
Output: N:\12000\12674 - LETHBRIDGE HOLIDAY INN\01_DESIGN\01C_MUNI\WATER SURVEY OF CANADA\POTHOLE CREEK HYDRO STAT 19

EXTREME VALUE TYPE I (GUMBEL) DISTRIBUTION

PEAK DISCHARGE (cms)

Tr (yrs)	Q cms
1.01	-4.09
2	4.77
5	10.07
10	13.57
25	18.00
50	21.29
100	24.55
200	27.80
500	32.09
1000	35.33



FAILED
Chi-Square Test

PotHole Creek Peak Yealry DIscharge 1972-2008

RETURN PERIOD (yrs)

Project: PotHole Creek Peak Yealry DIscharge 1972-2008
User: ISL
Date: 9 February 2009, Monday
Time: 1:18 pm
Input: N:\12000\12674 - LETHBRIDGE HOLIDAY INN\01_DESIGN\01C_MUNI\WATER SURVEY OF CANADA\POTHOLE CREEK HYDRO STAT 19
Output: N:\12000\12674 - LETHBRIDGE HOLIDAY INN\01_DESIGN\01C_MUNI\WATER SURVEY OF CANADA\POTHOLE CREEK HYDRO STAT 19

Mean =	5.5870	Maximum Input Value =	25.80
Std. Deviation =	5.3007	Minimum Input Value =	1.16
Skew =	2.63217000	Number of Points =	37

EXTREME VALUE TYPE I (GUMBEL) DISTRIBUTION

RETURN PERIOD (yrs)	Q (cms)	FREQUENCY FACTOR	Q 90% CONFIDENCE LIMITS Lower (cms)	Upper (cms)
1.01	-4.09	-1.8257	-6.90	-2.03
2	4.77	-0.1544	3.27	6.21
5	10.07	0.8448	8.52	11.96
10	13.57	1.5064	11.71	16.06
25	18.00	2.3423	15.59	21.38
50	21.29	2.9624	18.42	25.39
100	24.55	3.5779	21.20	29.38
200	27.80	4.1912	23.96	33.38
500	32.09	5.0003	27.59	38.66
1,000	35.33	5.6118	30.33	42.66

NOTE: Negative values are shown for verification purposes only. Obviously, negative values will not occur. Frequently the lower return periods will have negative values resulting from the statistical fit.

Project: PotHole Creek Peak Yealry DIscharge 1972-2008
User: ISL
Date: 9 February 2009, Monday
Time: 1:18 pm
Input: N:\12000\12674 - LETHBRIDGE HOLIDAY INN\01_DESIGN\01C_MUNI\WATER SURVEY OF CANADA\POTHOLE CREEK HYDRO STAT 19
Output: N:\12000\12674 - LETHBRIDGE HOLIDAY INN\01_DESIGN\01C_MUNI\WATER SURVEY OF CANADA\POTHOLE CREEK HYDRO STAT 19

Mean =	5.5870	Maximum Input Value =	25.80
Std. Deviation =	5.3007	Minimum Input Value =	1.16
Skew =	2.63217000	Number of Points =	37

EXTREME VALUE TYPE I (GUMBEL) DISTRIBUTION
CHI-SQUARE TEST FOR GOODNESS-OF-FIT

	CLASS LIMITS		NUMBER OF VALUES		
CLASS	Lower (cms)	Upper (cms)	Expected "Ei"	Observed "Oi"	$(Oi-Ei)^2$ / Ei
1	0.00	-1.20	3.0833	0	3.0833
2	-1.20	0.33	3.0833	0	3.0833
3	0.33	1.53	3.0833	1	1.4077
4	1.53	2.62	3.0833	9	11.3536
5	2.62	3.68	3.0833	10	15.5158
6	3.68	4.77	3.0833	4	0.2725
7	4.77	5.94	3.0833	2	0.3806
8	5.94	7.27	3.0833	2	0.3806
9	7.27	8.88	3.0833	2	0.3806
10	8.88	11.01	3.0833	5	1.1914
11	11.01	14.47	3.0833	0	3.0833
12	14.47	Infinity	3.0833	2	0.3806
				COMPUTED CHI-SQUARE =	40.5135
				CHI-SQUARE FROM TABLE =	14.7000

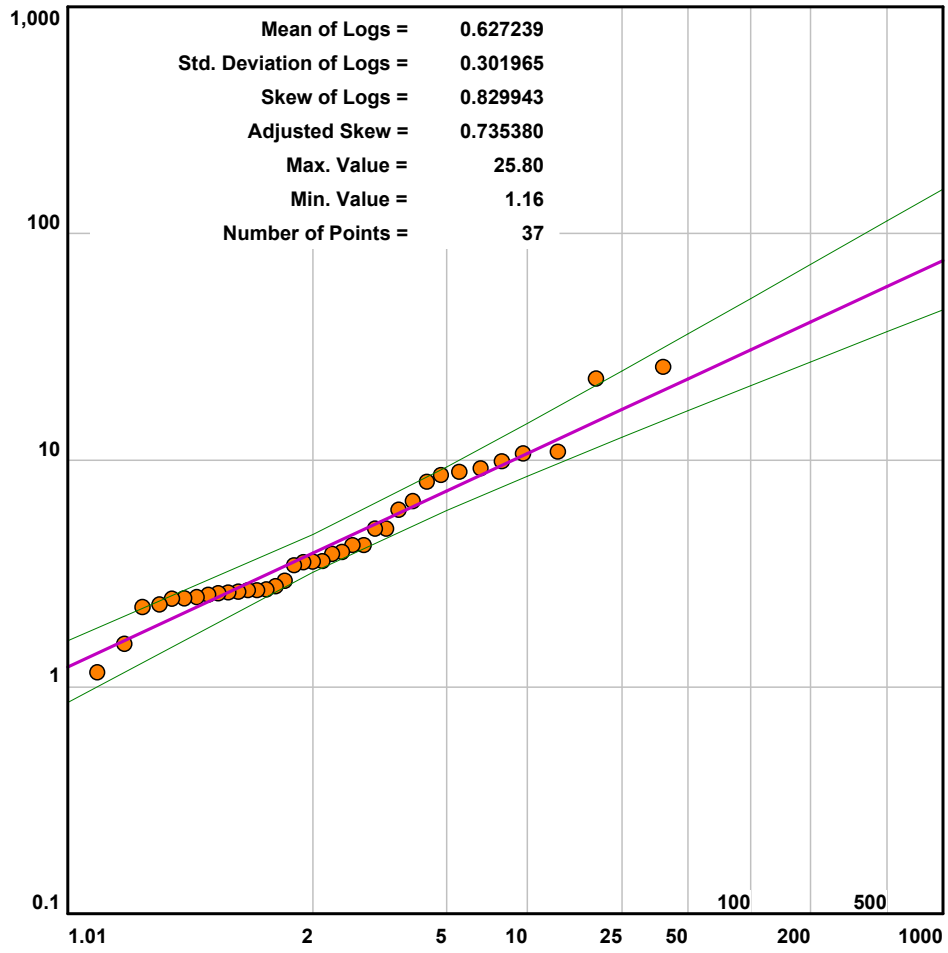
CONCLUDE: Based on Chi-Square (Goodness-of-Fit) results,
the EXTREME VALUE TYPE I (GUMBEL) DISTRIBUTION does NOT apply to the input data.
Note that Chi-Square results are dependent upon the number of class intervals used.

Project: PotHole Creek Peak Yealry DIscharge 1972-2008
User: ISL
Date: 9 February 2009, Monday
Time: 1:18 pm
Input: N:\12000\12674 - LETHBRIDGE HOLIDAY INN\01_DESIGN\01C_MUNI\WATER SURVEY OF CANADA\POTHOLE CREEK HYDRO STAT 19
Output: N:\12000\12674 - LETHBRIDGE HOLIDAY INN\01_DESIGN\01C_MUNI\WATER SURVEY OF CANADA\POTHOLE CREEK HYDRO STAT 19

LOG-PEARSON TYPE III DISTRIBUTION

PEAK DISCHARGE (cms)

Tr (yrs)	Q cms
1.01	1.23
2	3.90
5	7.32
10	10.72
25	16.75
50	22.85
100	30.69
200	40.74
500	58.38
1000	75.99



FAILED
Chi-Square Test

PotHole Creek Peak Yealry DIscharge 1972-2008

RETURN PERIOD (yrs)

Project: PotHole Creek Peak Yealry DIscharge 1972-2008
User: ISL
Date: 9 February 2009, Monday
Time: 1:18 pm
Input: N:\12000\12674 - LETHBRIDGE HOLIDAY INN\01_DESIGN\01C_MUNI\WATER SURVEY OF CANADA\POTHOLE CREEK HYDRO STAT 19
Output: N:\12000\12674 - LETHBRIDGE HOLIDAY INN\01_DESIGN\01C_MUNI\WATER SURVEY OF CANADA\POTHOLE CREEK HYDRO STAT 19

Mean of Logs =	0.627239	Maximum Input Value =	25.80
Std. Deviation of Logs =	0.301965	Minimum Input Value =	1.16
Skew of Logs =	0.829943	Number of Points =	37
Adjusted Skew =	0.735380	Generalized Map Skew =	0.6

LOG-PEARSON TYPE III DISTRIBUTION

RETURN PERIOD (yrs)	Q (cms)	FREQUENCY FACTOR	Q 90% CONFIDENCE LIMITS Lower (cms)	Upper (cms)
1.01	1.23	-1.7825	0.85	1.60
2	3.90	-0.1215	3.20	4.71
5	7.32	0.7864	6.00	9.33
10	10.72	1.3342	8.50	14.52
25	16.75	1.9760	12.62	24.74
50	22.85	2.4231	16.53	36.04
100	30.69	2.8474	21.30	51.62
200	40.74	3.2545	27.14	72.96
500	58.38	3.7721	36.87	113.46
1,000	75.99	4.1512	46.12	156.89

Project: PotHole Creek Peak Yealry DIscharge 1972-2008
User: ISL
Date: 9 February 2009, Monday
Time: 1:18 pm
Input: N:\12000\12674 - LETHBRIDGE HOLIDAY INN\01_DESIGN\01C_MUNI\WATER SURVEY OF CANADA\POTHOLE CREEK HYDRO STAT 19
Output: N:\12000\12674 - LETHBRIDGE HOLIDAY INN\01_DESIGN\01C_MUNI\WATER SURVEY OF CANADA\POTHOLE CREEK HYDRO STAT 19

Mean of Logs =	0.627239	Maximum Input Value =	25.80
Std. Deviation of Logs =	0.301965	Minimum Input Value =	1.16
Skew of Logs =	0.829943	Number of Points =	37
Adjusted Skew =	0.735380	Generalized Map Skew =	0.6

LOG-PEARSON TYPE III DISTRIBUTION
CHI-SQUARE TEST FOR GOODNESS-OF-FIT

	CLASS LIMITS		NUMBER OF VALUES		
CLASS	Lower (cms)	Upper (cms)	Expected "Ei"	Observed "Oi"	$\frac{(Oi-Ei)^2}{Ei}$
1	0.00	1.77	3.0833	2	0.3806
2	1.77	2.17	3.0833	0	3.0833
3	2.17	2.56	3.0833	6	2.7590
4	2.56	2.95	3.0833	8	7.8401
5	2.95	3.39	3.0833	0	3.0833
6	3.39	3.90	3.0833	5	1.1914
7	3.90	4.51	3.0833	3	0.0023
8	4.51	5.32	3.0833	2	0.3806
9	5.32	6.45	3.0833	1	1.4077
10	6.45	8.31	3.0833	2	0.3806
11	8.31	12.01	3.0833	6	2.7590
12	12.01	Infinity	3.0833	2	0.3806
				COMPUTED CHI-SQUARE =	23.6487
				CHI-SQUARE FROM TABLE =	13.4000

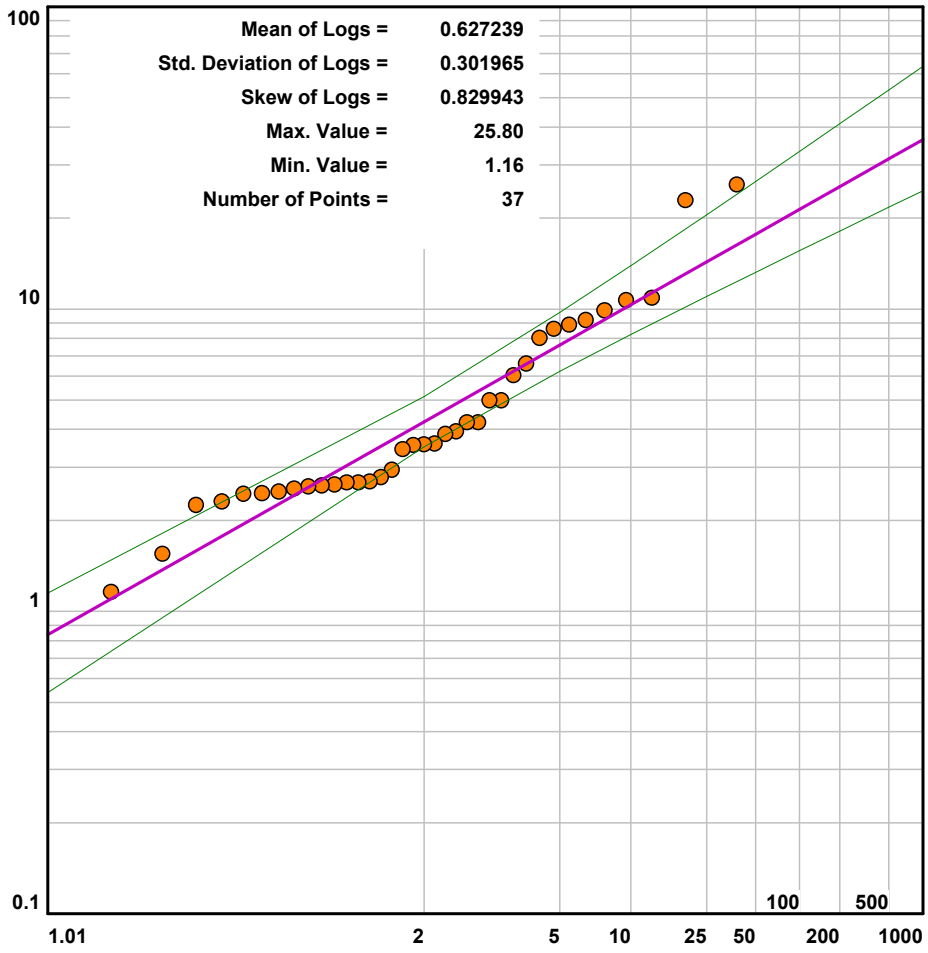
CONCLUDE: Based on Chi-Square (Goodness-of-Fit) results,
the LOG-PEARSON TYPE III DISTRIBUTION does NOT apply to the input data.
Note that Chi-Square results are dependent upon the number of class intervals used.

Project: PotHole Creek Peak Yealry DIscharge 1972-2008
User: ISL
Date: 9 February 2009, Monday
Time: 1:18 pm
Input: N:\12000\12674 - LETHBRIDGE HOLIDAY INN\01_DESIGN\01C_MUNI\WATER SURVEY OF CANADA\POTHOLE CREEK HYDRO STAT 19
Output: N:\12000\12674 - LETHBRIDGE HOLIDAY INN\01_DESIGN\01C_MUNI\WATER SURVEY OF CANADA\POTHOLE CREEK HYDRO STAT 19

LOG-NORMAL DISTRIBUTION

PEAK DISCHARGE (cms)

Tr (yrs)	Q cms
1.01	0.84
2	4.24
5	7.61
10	10.33
25	14.32
50	17.68
100	21.37
200	25.42
500	31.37
1000	36.35



FAILED
Chi-Square Test

PotHole Creek Peak Yealry DIscharge 1972-2008

RETURN PERIOD (yrs)

Project: PotHole Creek Peak Yealry DIscharge 1972-2008
User: ISL
Date: 9 February 2009, Monday
Time: 1:18 pm
Input: N:\12000\12674 - LETHBRIDGE HOLIDAY INN\01_DESIGN\01C_MUNI\WATER SURVEY OF CANADA\POTHOLE CREEK HYDRO STAT 19
Output: N:\12000\12674 - LETHBRIDGE HOLIDAY INN\01_DESIGN\01C_MUNI\WATER SURVEY OF CANADA\POTHOLE CREEK HYDRO STAT 19

Mean of Logs =	0.627239	Maximum Input Value =	25.80
Std. Deviation of Logs =	0.301965	Minimum Input Value =	1.16
Skew of Logs =	0.829943	Number of Points =	37

LOG-NORMAL DISTRIBUTION

RETURN PERIOD (yrs)	Q (cms)	FREQUENCY FACTOR	Q 90% CONFIDENCE LIMITS Lower (cms)	Upper (cms)
1.01	0.84	-2.3305	0.54	1.15
2	4.24	0.0000	3.50	5.13
5	7.61	0.8415	6.22	9.75
10	10.33	1.2817	8.23	13.91
25	14.32	1.7511	11.00	20.50
50	17.68	2.0542	13.23	26.42
100	21.37	2.3268	15.60	33.23
200	25.42	2.5762	18.12	41.02
500	31.37	2.8785	21.70	53.00
1,000	36.35	3.0905	24.62	63.46

Project: PotHole Creek Peak Yealry DIscharge 1972-2008
User: ISL
Date: 9 February 2009, Monday
Time: 1:18 pm
Input: N:\12000\12674 - LETHBRIDGE HOLIDAY INN\01_DESIGN\01C_MUNI\WATER SURVEY OF CANADA\POTHOLE CREEK HYDRO STAT 19
Output: N:\12000\12674 - LETHBRIDGE HOLIDAY INN\01_DESIGN\01C_MUNI\WATER SURVEY OF CANADA\POTHOLE CREEK HYDRO STAT 19

Mean of Logs =	0.627239	Maximum Input Value =	25.80
Std. Deviation of Logs =	0.301965	Minimum Input Value =	1.16
Skew of Logs =	0.829943	Number of Points =	37

LOG-NORMAL DISTRIBUTION
CHI-SQUARE TEST FOR GOODNESS-OF-FIT

	CLASS LIMITS		NUMBER OF VALUES		
CLASS	Lower (cms)	Upper (cms)	Expected "Ei"	Observed "Oi"	$\frac{(Oi-Ei)^2}{Ei}$
1	0.00	1.62	3.0833	2	0.3806
2	1.62	2.16	3.0833	0	3.0833
3	2.16	2.65	3.0833	9	11.3536
4	2.65	3.14	3.0833	5	1.1914
5	3.14	3.66	3.0833	4	0.2725
6	3.66	4.24	3.0833	4	0.2725
7	4.24	4.91	3.0833	0	3.0833
8	4.91	5.72	3.0833	2	0.3806
9	5.72	6.77	3.0833	2	0.3806
10	6.77	8.31	3.0833	1	1.4077
11	8.31	11.09	3.0833	6	2.7590
12	11.09	Infinity	3.0833	2	0.3806
				COMPUTED CHI-SQUARE =	24.9460
				CHI-SQUARE FROM TABLE =	14.7000

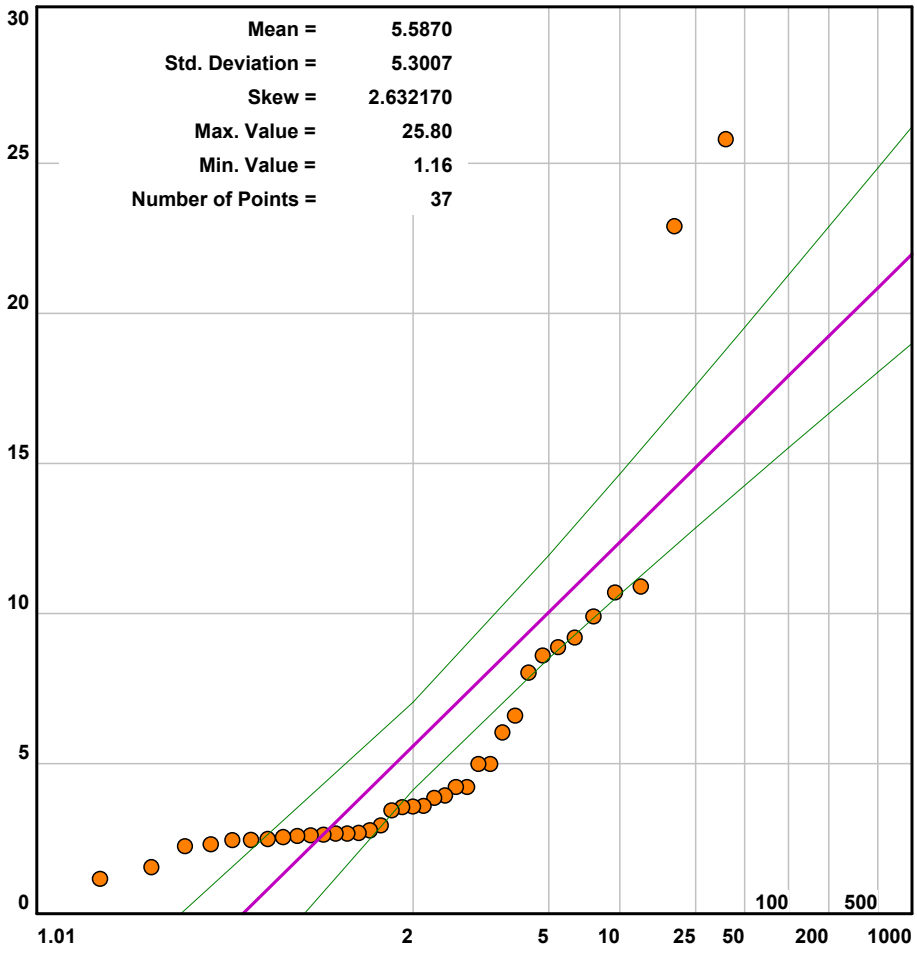
CONCLUDE: Based on Chi-Square (Goodness-of-Fit) results,
the LOG-NORMAL DISTRIBUTION does NOT apply to the input data.
Note that Chi-Square results are dependent upon the number of class intervals used.

Project: PotHole Creek Peak Yealry DIscharge 1972-2008
User: ISL
Date: 9 February 2009, Monday
Time: 1:18 pm
Input: N:\12000\12674 - LETHBRIDGE HOLIDAY INN\01_DESIGN\01C_MUNI\WATER SURVEY OF CANADA\POTHOLE CREEK HYDRO STAT 19
Output: N:\12000\12674 - LETHBRIDGE HOLIDAY INN\01_DESIGN\01C_MUNI\WATER SURVEY OF CANADA\POTHOLE CREEK HYDRO STAT 19

NORMAL DISTRIBUTION

PEAK DISCHARGE (cms)

Tr (yrs)	Q cms
1.01	-6.77
2	5.59
5	10.05
10	12.38
25	14.87
50	16.48
100	17.92
200	19.24
500	20.85
1000	21.97



FAILED
Chi-Square Test

PotHole Creek Peak Yealry DIscharge 1972-2008

RETURN PERIOD (yrs)

Project: PotHole Creek Peak Yealry DIscharge 1972-2008
User: ISL
Date: 9 February 2009, Monday
Time: 1:18 pm
Input: N:\12000\12674 - LETHBRIDGE HOLIDAY INN\01_DESIGN\01C_MUNI\WATER SURVEY OF CANADA\POTHOLE CREEK HYDRO STAT 19
Output: N:\12000\12674 - LETHBRIDGE HOLIDAY INN\01_DESIGN\01C_MUNI\WATER SURVEY OF CANADA\POTHOLE CREEK HYDRO STAT 19

Mean =	5.5870	Maximum Input Value =	25.80
Std. Deviation =	5.3007	Minimum Input Value =	1.16
Skew =	2.63217000	Number of Points =	37

NORMAL DISTRIBUTION

RETURN PERIOD (yrs)	Q (cms)	FREQUENCY FACTOR	Q 90% CONFIDENCE LIMITS Lower (cms)	Upper (cms)
1.01	-6.77	-2.3305	-10.13	-4.36
2	5.59	0.0000	4.13	7.05
5	10.05	0.8415	8.51	11.94
10	12.38	1.2817	10.64	14.65
25	14.87	1.7511	12.86	17.60
50	16.48	2.0542	14.27	19.54
100	17.92	2.3268	15.52	21.28
200	19.24	2.5762	16.66	22.89
500	20.85	2.8785	18.04	24.84
1,000	21.97	3.0905	19.00	26.22

NOTE: Negative values are shown for verification purposes only. Obviously, negative values will not occur. Frequently the lower return periods will have negative values resulting from the statistical fit.

Project: PotHole Creek Peak Yealry DIscharge 1972-2008
User: ISL
Date: 9 February 2009, Monday
Time: 1:18 pm
Input: N:\12000\12674 - LETHBRIDGE HOLIDAY INN\01_DESIGN\01C_MUNI\WATER SURVEY OF CANADA\POTHOLE CREEK HYDRO STAT 19
Output: N:\12000\12674 - LETHBRIDGE HOLIDAY INN\01_DESIGN\01C_MUNI\WATER SURVEY OF CANADA\POTHOLE CREEK HYDRO STAT 19

Mean =	5.5870	Maximum Input Value =	25.80
Std. Deviation =	5.3007	Minimum Input Value =	1.16
Skew =	2.63217000	Number of Points =	37

NORMAL DISTRIBUTION
CHI-SQUARE TEST FOR GOODNESS-OF-FIT

	CLASS LIMITS		NUMBER OF VALUES		
CLASS	Lower (cms)	Upper (cms)	Expected "Ei"	Observed "Oi"	$\frac{(Oi-Ei)^2}{Ei}$
1	0.00	-1.75	3.0833	0	3.0833
2	-1.75	0.46	3.0833	0	3.0833
3	0.46	2.01	3.0833	2	0.3806
4	2.01	3.31	3.0833	14	38.6509
5	3.31	4.47	3.0833	8	7.8401
6	4.47	5.59	3.0833	2	0.3806
7	5.59	6.70	3.0833	2	0.3806
8	6.70	7.87	3.0833	0	3.0833
9	7.87	9.16	3.0833	3	0.0023
10	9.16	10.71	3.0833	3	0.0023
11	10.71	12.92	3.0833	1	1.4077
12	12.92	Infinity	3.0833	2	0.3806
				COMPUTED CHI-SQUARE =	58.6757
				CHI-SQUARE FROM TABLE =	14.7000

CONCLUDE: Based on Chi-Square (Goodness-of-Fit) results,
the NORMAL DISTRIBUTION does NOT apply to the input data.
Note that Chi-Square results are dependent upon the number of class intervals used.

Project: PotHole Creek Peak Yealry DIscharge 1972-2008
User: ISL
Date: 9 February 2009, Monday
Time: 1:18 pm
Input: N:\12000\12674 - LETHBRIDGE HOLIDAY INN\01_DESIGN\01C_MUNI\WATER SURVEY OF CANADA\POTHOLE CREEK HYDRO STAT 19
Output: N:\12000\12674 - LETHBRIDGE HOLIDAY INN\01_DESIGN\01C_MUNI\WATER SURVEY OF CANADA\POTHOLE CREEK HYDRO STAT 19

Mean =	5.5870	Maximum Input Value =	25.80
Std. Deviation =	5.3007	Minimum Input Value =	1.16
Skew =	2.63217000	Number of Points =	37
Mean of Logs =	0.627239	Generalized Map Skew =	0.6
Std. Deviation of Logs =	0.301965		
Skew of Logs =	0.829943		
Adjusted Skew =	0.735380		

COMPARISON OF STATISTICAL DISTRIBUTIONS

Number of Chi-Square class intervals used = 12

DISTRIBUTION	CHI-SQUARE COMPUTED	CHI-SQUARE TABULATED	
EXTREME VALUE TYPE I (GUMBEL)	40.514	14.700	FAILED
LOG-PEARSON TYPE III	23.649	13.400	FAILED
LOG-NORMAL	24.946	14.700	FAILED
NORMAL	58.676	14.700	FAILED

BASED ON A 10-PERCENT SIGNIFICANCE LEVEL, THE
LOG-NORMAL
DISTRIBUTION RESULTS IN THE BEST FIT OF THE DATA.
HOWEVER, NOTE THAT ALL DISTRIBUTIONS FAILED THE CHI-SQUARE GOODNESS-OF-FIT TEST.

Appendix J

Stormwater Detailed Cost Estimates

ISL Engineering and Land Services

PROJECT CONSTRUCTION COST ESTIMATE

TOWN OF PICTURE BUTTE - STORMWATER ASSESSMENT

PROJECT	TIMING	LOCATION	ITEM	UNIT	QUANTITY	UNIT PRICE	SUB-TOTAL	15% ENGINEERING	30% CONTINGENCIES	TOTAL
1	1 - 5 Years	Intersection of Crescent Ave and 6th St N	Single C Catchbasin	item	4	$5,000.00	$20,000	$3,000	$6,000	$29,000
			300mm Catchbasin Lead	m	60	$420.00	$25,200	$4,000	$8,000	$37,000
			Road Repair	m	60	$750.00	$45,000	$7,000	$14,000	$66,000
							$90,200	**$14,000**	**$27,000**	**$131,000**
2	5 - 10 Years	Jamieson Ave from STMHJM001 to SMH4S001A	375mm	m	60	$480.00	$28,800	$4,000	$9,000	$42,000
			Road Repair	m	60	$750.00	$45,000	$7,000	$14,000	$66,000
							$73,800	**$11,000**	**$22,000**	**$107,000**
3	5 - 10 Years	7 St N from STMHCC004 to STMH7N001C	375mm	m	60	$480.00	$28,800	$4,000	$9,000	$42,000
			Road Repair	item	60	$750.00	$45,000	$7,000	$14,000	$66,000
							$73,800	**$11,000**	**$22,000**	**$107,000**
4	5 - 10 Years	7 St N from STMH7001 to STMHGB001	675mm	m	50	$800.00	$40,000	$6,000	$12,000	$58,000
			Road Repair	m	50	$750.00	$37,500	$6,000	$11,000	$55,000
							$77,500	**$12,000**	**$23,000**	**$113,000**
5	Beyond 10 Years	Proposed Stormwater Conveyance Network	200mm	m	30	$372.00	$11,160	$2,000	$3,000	$16,000
			300mm	m	1,140	$420.00	$478,800	$72,000	$144,000	$695,000
			750mm	m	355	$984.00	$349,320	$52,000	$105,000	$506,000
			Road Repair	m	185	$750.00	$138,750	$21,000	$42,000	$202,000
			Landscape Rehab	m	1,000	$8.00	$8,000	$1,000	$2,000	$11,000
							$986,030	**$148,000**	**$296,000**	**$1,430,000**
6	Beyond 10 Years	Proposed Pond 1	Stripping	m^3	7,910	$4.00	$31,640	$5,000	$9,000	$46,000
			Excavation	m^3	11,866	$13.00	$154,258	$23,000	$46,000	$223,000
			Landscaping	m^2	1,991	$2.00	$3,982	$1,000	$1,000	$6,000
			Outlet Structure	item	1	$150,000.00	$150,000	$23,000	$45,000	$218,000
			Oil and Grit Separator	item	1	$16,500.00	$16,500	$2,000	$5,000	$24,000
							$356,380	**$53,000**	**$107,000**	**$516,000**
7	Beyond 10 Years	Proposed Pond 2	Stripping	m^2	13,628	$4.00	$54,512	$8,000	$16,000	$79,000
			Excavation	m^3	20,442	$13.00	$265,746	$40,000	$80,000	$386,000
			Landscaping	m^2	2,658	$2.00	$5,316	$1,000	$2,000	$8,000
			Outlet Structure	item	1	$150,000.00	$150,000	$23,000	$45,000	$218,000
							$475,574	**$71,000**	**$143,000**	**$690,000**
8	Beyond 10 Years	Proposed Pond 3	Stripping	m^2	2,846	$4.00	$11,384	$2,000	$3,000	$16,000
			Excavation	m^3	4,270	$13.00	$55,510	$8,000	$17,000	$81,000
			Landscaping	m^2	1,136	$2.00	$2,272	$0	$1,000	$3,000
			Outlet Structure	item	1	$150,000.00	$150,000	$23,000	$45,000	$218,000
							$219,166	**$33,000**	**$66,000**	**$318,000**
9	Beyond 10 Years	Proposed Pond 4	Stripping	m^2	21,930	$4.00	$87,720	$13,000	$26,000	$127,000
			Excavation	m^3	32,895	$13.00	$427,635	$64,000	$128,000	$620,000
			Landscaping	m^2	3,410	$2.00	$6,820	$1,000	$2,000	$10,000
			Outlet Structure	item	1	$150,000.00	$150,000	$23,000	$45,000	$218,000
			Oil and Grit Separator	item	1	$100,000.00	$100,000	$15,000	$30,000	$145,000
							$772,175	**$116,000**	**$232,000**	**$1,120,000**
10	Beyond 10 Years	Proposed Pond 5	Stripping	m^2	12,454	$4.00	$49,816	$7,000	$15,000	$72,000
			Excavation	m^3	18,682	$13.00	$242,866	$36,000	$73,000	$352,000
			Landscaping	m^2	2,534	$2.00	$5,068	$1,000	$2,000	$8,000
			Outlet Structure	item	1	$150,000.00	$150,000	$23,000	$45,000	$218,000
			Oil and Grit Separator	item	1	$100,000.00	$100,000	$15,000	$30,000	$145,000
							$547,750	**$82,000**	**$164,000**	**$794,000**

Prepared by: Krista Kruschel, ISL

Checked by: Rafal Jadzinski, ISL

TOTAL PROJECT ESTIMATE: **$5,326,000**

Appendix K

Roadway Condition Assessment

ISL Engineering and Land Services

TOWN OF PICTURE BUTTE
ROADWAY VISUAL CONDITION ASSESSMENT

PICTURE BUTTE ALBERTA

STREET NAME	FROM ROADWAY	TO ROADWAY	SURFACE MATERIAL	ROADWAY CLASSIFICATION	SURFACE APPEARANCE/ TEXTURE/TYPE (1-5) 35%	SURFACE/SUBSURFACE STRENGTH (1-5) 30%	DRAINAGE/ROADWAY CROSS SECTION (1-5) 20%	RIDE QUALITY AND SMOOTHNESS (1-5) 15%	OVERALL CONDITION RATING (1-5)	OVERALL CONDITION RATING (FIELD) (1-5)	USER NEED PRIORITY (1-5)	ADJUSTED OVERALL CONDITION RATING	VISUAL DEFICIENCY: BARE SURFACING GRAVEL	VISUAL DEFICIENCY: WASH BOARDING	VISUAL DEFICIENCY: LOOSE MATERIAL	VISUAL DEFICIENCY: LOSS OF AGGREGATE	ROADWAY WIDTH (M)	CURB AND GUTTER (Y/N)	SIDEWALK (1 = ONE SIDE, 2 = BOTH SIDES) (1/2/N)	ROADWAY IDENTIFICATION	COMMENTS
MAPLE ESTATES S			Cold Mix	Driveway	1	2	2	1	**1.5**	2	3	**0.50**					12	No	N	RDMES002	Pot Holes. Some Asphalt, Mostly Large Gravel.
CRESCENT AVE N	7 ST N	6 ST N	Asphalt	Collector	2	2	3	2	**2.2**	2	4	**0.55**					12.5	No	2	RDCRN003	Major aggregate loss and ravelling in areas. Cracking throughout. Ponding areas.
CRESCENT AVE N	3 ST N	2 ST N	Asphalt	Collector	3	2	2	2	**2.4**	2	4	**0.59**					12.5	No	2	RDCRN007	Old Asphalt. Isolated Ponding.
CRESCENT AVE N	4 ST N	3 ST N	Asphalt	Collector	2	2	3	3	**2.4**	2	4	**0.59**					12.5	No	2	RDCRN006	Old Asphalt. Ponding. Rough Ride.
CRESCENT AVE N	5 ST N	4 ST N	Asphalt	Collector	2	2	3	3	**2.4**	3	4	**0.59**					12.5	No	2	RDCRN005	Cracks recently sealed. Isolated ponding. Utility patching.
CRESCENT AVE N	PIRON PL	7 ST N	Asphalt	Collector	3	2	2	3	**2.5**	2	4	**0.63**					12.5	No	2	RDCRN002	Areas of major ponding. Areas of major alligator cracking.
CRESCENT AVE N	HIGHWAY AVE N & ROGERS AVE S	PIRON PL	Asphalt	Collector	3	2	2	3	**2.5**	2	4	**0.63**					9	No	1	RDCRN001	Major structure failures in parking lane. Significant aggregate loss.
CRESCENT AVE N	6 ST N	5 ST N	Asphalt	Collector	3	3	2	3	**2.8**	3	4	**0.70**					12.5	No	2	RDCRN004	Ponding areas. Lots of cracking near concrete swale.
CRESCENT AVE N	2 ST N	FACTORY DR N & HIGHWAY AVE N	Asphalt	Collector	3	2	3	4	**2.9**	2	4	**0.71**					10.5	No	2	RDCRN008	Drainage Swale. Areas of alligator cracking.
6 ST N	CRESCENT AVE N	HIGHWAY AVE N	Asphalt	Street	2	2	3	3	**2.4**	2	3	**0.78**					11.5	Yes	2	RD6SN003	Scarring in road. Structure failures along curb on West side.
5 ST N	HIGHWAY AVE N	CRESCENT AVE N	Asphalt	Street	3	2	2	3	**2.5**	2	3	**0.83**					9	No	2	RD5SN001	Large ponding area. Potholes and patching.
KALISKA DR S	3A ST S		Asphalt	Street	1	3	4	3	**2.5**	4	3	**0.83**					7	No	N	RDKDS001	Large Surface Gravel.
JAMIESON AVE N		2 ST N	Asphalt	Street	2	2	4	3	**2.6**	2	3	**0.85**					10.5	No	1	RDJAN003	Cracking along south edge of road where no sidewalk is present. Bare gravel patches.
7 ST N	CRESCENT AVE N	HIGHWAY AVE N	Asphalt	Street	2	3	3	3	**2.7**	3	3	**0.88**					11.5	Yes	2	RD7SN004	Major aggregate loss and scarring on road. Patching over potholes.
6 ST N	NORTHRIDGE AVE	INLET AVE N	Asphalt	Street	2	3	3	3	**2.7**	3	3	**0.88**					11	Yes	2	RD6SN001	Portions of road have been re-paved. Severe aggregate loss in road swale.
4 ST S	COWAN AVE S	ROGERS AVE S	Asphalt	Street	2	2	4	4	**2.7**	3	3	**0.90**					13.5	Yes	2	RD4SS003	Portion of road is currently under construction. Aggregate loss and scarring observed.
JAMIESON AVE N	2 ST N	3 ST N	Asphalt	Street	2	2	4	4	**2.7**	3	3	**0.90**					13.5	No	1	RDJAN002	Cracking along south edge of road where no sidewalk is present.
7A ST N		GIBBONS AVE N	Asphalt	Street	3	2	3	3	**2.7**	2	3	**0.90**					10.5	Yes	2	RD7AS001	Significant patching throughout. Significant aggregate loss.
MAPLE ESTATES S	3A ST S		Asphalt	Street	3	2	3	3	**2.7**	3	3	**0.90**					11	No	N	RDMES003	Broken Asphalt. Isolated Repairs.
3 ST N	HIGHWAY AVE N	CRESCENT AVE N	Asphalt	Street	3	2	3	3	**2.7**	3	3	**0.90**					12.5	No	2	RD3SN001	Older Asphalt. Isolated Patches.
INLET AVE N	6 ST N		Asphalt	Street	2	3	3	4	**2.8**	3	3	**0.93**					11.5	No	2	RDIAN001	Major aggregate loss. Moderate cracking.
7 ST N	GIBBONS AVE N	CRESCENT AVE N	Asphalt	Street	2	3	4	3	**2.9**	3	3	**0.95**					10	Yes	1	RD7SN003	Concerts Swale on East side of road. Significant ravelling in centerline seam and near concrete swale. Utility patches. Parts of road have been re-paved.
3 ST N	JAMIESON AVE N	HIGHWAY AVE N	Asphalt	Street	3	3	3	3	**3.0**	3	3	**1.00**					13	No	2	RD3SN002	Potholes and rutting. Major aggregate loss.
7 ST N	NORTHRIDGE AVE & NORTHRIDGE ST	ROSEWOOD AVE N	Asphalt	Street	2	3	4	4	**3.0**	3	3	**1.00**					13	Yes	2	RD7SN001	Half newer asphalt and half older. Potholes near curbs. Patchwork near curbs.
3 ST S	COWAN AVE S		Asphalt	Street	3	3	3	3	**3.0**	3	3	**1.00**					13.5	Yes	1	RD3SS001	Multiple Patches. Poor Drainage.
7 ST N	ROSEWOOD AVE N	GIBBONS AVE N	Asphalt	Street	2	3	4	4	**3.0**	3	3	**1.00**					13.5	Yes	2	RD7SN002	Utility patching. Patching around manholes.
4 ST N	HIGHWAY AVE N	4 ST & JAMIESON AVE N	Asphalt	Street	2	3	4	4	**3.0**	3	3	**1.00**					16	No	2	RD4SN003	Rutting and potholes. Significant aggregate loss.
5 ST S	WATSON AVE S	4 ST	Asphalt	Street	3	3	3	3	**3.0**	3	3	**1.00**					11.5	Yes	2	RD5SS001	Isolated Ponding. Isolated Patches.
6 ST N	INLET AVE N	CRESCENT AVE N	Asphalt	Street	3	2	4	4	**3.1**	4	3	**1.02**					16	No	2	RD6SN002	Lanes patched separately. Minor cracking.
GIBBONS AVE N	7 ST N	7A ST N	Asphalt	Street	3	3	3	4	**3.2**	3	3	**1.05**					12	Yes	2	RDGAN002	Utility patching. Minor transverse cracking.
COWAN AVE S	4 ST S	3 ST S	Asphalt	Street	3	3	3	4	**3.2**	3	3	**1.05**					14	Yes	2	RDCWA001	Older Asphalt. Isolated Patches.
5A ST S		WATSON AVE S	Asphalt	Street	3	3	4	3	**3.2**	3	3	**1.07**					9	Yes	2	RD5AS001	Older Asphalt with Patch Work. Isolated Ponding.
3 ST S	COWAN AVE S		Asphalt	Street	3	3	4	3	**3.2**	3	3	**1.07**					13.5	Yes	2	RD3SS003	Older Asphalt.
GIBBONS AVE N	7A ST N	8 ST N	Asphalt	Street	2	4	4	4	**3.3**	3	3	**1.10**					11.5	Yes	2	RDGAN001	Minor transverse cracks. Significant aggregate loss. Patching around manhole.
4 ST	4 ST N & JAMIESON AVE N	4 ST S & 5 ST S	Asphalt	Street	3	3	4	4	**3.4**	3	3	**1.12**					11.5	Yes	2	RD4SS001	Few potholes near swale. Minor cracking throughout.
WATSON AVE S	6 ST S	5A ST S	Asphalt	Street	3	3	4	4	**3.4**	3	3	**1.12**					11.5	Yes	2	RDWAS001	Older Asphalt. Isolated Ponding.
2 ST N	CRESCENT AVE N	HIGHWAY AVE N	Asphalt	Street	3	3	4	4	**3.4**	3	3	**1.12**					16	No	2	RD2SN002	Older Asphalt.
CENTENNIAL AVE S		6 ST S	Asphalt	Street	3	3	4	4	**3.4**	3	3	**1.12**					9	No	2	RDCAS001	Old Asphalt. Vegetation Growing Through.
MAPLE DR S		6 ST S & MAPLE CRES S	Asphalt	Street	3	3	4	4	**3.4**	3	3	**1.12**					10.5	Yes	2	RDMDS001	Older Asphalt. Isolated Patches.
2 ST N		CRESCENT AVE N	Asphalt	Street	3	4	3	4	**3.5**	3	3	**1.15**					12	No	2	RD2SN001	Older Asphalt.
WATSON AVE S	5A ST S	5 ST S	Asphalt	Street	4	3	3	4	**3.5**	3	3	**1.17**					11.5	Yes	2	RDWAS002	Isolated Ponding.
3 ST S	COWAN AVE S	ROGERS AVE S	Asphalt	Street	3	4	4	3	**3.5**	3	3	**1.17**					12	Yes	2	RD3SS002	Older Asphalt.
2 ST N	HIGHWAY AVE N	JAMIESON AVE N	Asphalt	Street	3	4	4	3	**3.5**	3	3	**1.17**					11.5	Yes	2	RD2SN003	Minor cracking and patching.
8 ST N	WILLOW AVE N	GIBBONS AVE N	Asphalt	Street	4	3	3	4	**3.5**	3	3	**1.17**					10	Yes	2	RD8SN002	Isolated ponding areas in road. Longitudinal cracking throughout.
6 ST S	ROGERS AVE S	WATSON AVE S	Asphalt	Street	3	4	4	3	**3.5**	3	3	**1.17**					11.5	Yes	2	RD6SS005	Older Asphalt.
WILLOW AVE N	WILLOW PLACE N	8 ST N	Asphalt	Street	4	3	3	4	**3.5**	4	3	**1.17**					10	Yes	2	RDWAN002	Utility patching. Minor longitudinal cracking.

ISL Engineering and Land Services

TOWN OF PICTURE BUTTE
ROADWAY VISUAL CONDITION ASSESSMENT

PICTURE BUTTE ALBERTA

STREET NAME	FROM ROADWAY	TO ROADWAY	SURFACE MATERIAL	ROADWAY CLASSIFICATION	SURFACE APPEARANCE/ TEXTURE/TYPE (1-5) 35%	SURFACE/SUBSURFACE STRENGTH (1-5) 30%	DRAINAGE/ROADWAY CROSS SECTION (1-5) 20%	RIDE QUALITY AND SMOOTHNESS (1-5) 15%	OVERALL CONDITION RATING (1-5)	OVERALL CONDITION RATING (FIELD) (1-5)	USER NEED PRIORITY (1-5)	ADJUSTED OVERALL CONDITION RATING	VISUAL DEFICIENCY: BARE SURFACING GRAVEL	VISUAL DEFICIENCY: WASH BOARDING	VISUAL DEFICIENCY: LOOSE MATERIAL	VISUAL DEFICIENCY: LOSS OF AGGREGATE	ROADWAY WIDTH (M)	CURB AND GUTTER (Y/N)	SIDEWALK (1 = ONE SIDE, 2 = BOTH SIDES) (1/2/N)	ROADWAY IDENTIFICATION	COMMENTS
ROSEWOOD AVE N	7 ST N	8 ST N	Asphalt	Street	4	3	3	4	**3.5**	4	3	**1.17**					10	Yes	2	RDRWA001	Minor ponding areas near curbs. Utility patching.
5 ST S	ROGERS AVE S	CENTENNIAL AVE S	Asphalt	Street	3	4	4	4	**3.7**	3	3	**1.22**					14.5	No	1	RD5SS003	Older Asphalt with Patch Work.
6 ST S	CENTENNIAL AVE S	ROGERS AVE S	Asphalt	Street	3	4	4	4	**3.7**	3	3	**1.22**					15	No	2	RD6SS001	Isolated Ponding.
5 ST S	CENTENNIAL AVE S		Asphalt	Street	3	4	4	4	**3.7**	3	3	**1.22**					10.5	Yes	1	RD5SS004	Older Asphalt with Patch Work.
4 ST S	4 ST & 5 ST S	COWAN AVE S	Asphalt	Street	3	4	4	4	**3.7**	4	3	**1.22**					11.5	Yes	2	RD4SS002	Minor ponding.
JAMIESON AVE N	3 ST N	4 ST & 4 ST N	Asphalt	Street	3	4	4	4	**3.7**	4	3	**1.22**					22	No	2	RDJAN001	Some ravelling in swale.
6 ST S	CENTENNIAL AVE S	MAPLE CRES S & MAPLE DR S	Asphalt	Street	4	3	4	4	**3.7**	3	3	**1.23**					12	Yes	2	RD6SS002	Older Asphalt. Isolated Pot Holes.
6 ST S	MAPLE CRES S & MAPLE DR S	MAPLE CRES S & MAPLE PL S	Asphalt	Street	4	3	4	4	**3.7**	3	3	**1.23**					12	Yes	2	RD6SS003	Older Asphalt.
FACTORY DR S	FACTORY DR	ROGERS AVE S & HWY519	Asphalt	Highway	5	5	5	5	**5.0**	5	4	**1.25**					9.5	No	N	RDFDS002	Good Condition
FACTORY DR N	CRESCENT AVE N & HIGHWAY AVE N	FACTORY DR S & TR110B	Asphalt	Highway	5	5	5	5	**5.0**	5	4	**1.25**					9.5	No	N	RDFDN001	Good Condition
FACTORY DR S	FACTORY DR N & TR110B	FACTORY DR	Asphalt	Highway	5	5	5	5	**5.0**	5	4	**1.25**					9.5	No	N	RDFDS001	Good Condition.
4 ST N		CRESCENT AVE N	Asphalt	Street	4	4	3	4	**3.8**	3	3	**1.27**					15.5	No	2	RD4SN001	Older Asphalt. Isolated Ponding.
4 ST N	CRESCENT AVE N	HIGHWAY AVE N	Asphalt	Street	4	4	3	4	**3.8**	4	3	**1.27**					15.5	Yes	2	RD4SN002	Monowalk on West side of road. Isolated ponding.
WILLOW PLACE N		WILLOW AVE N	Asphalt	Street	4	4	4	4	**4.0**	4	3	**1.33**					10	Yes	2	RD9AN001	Isolated patching near curb and gutter. Minor cracking.
5 ST S	WATSON AVE S	ROGERS AVE S	Asphalt	Street	4	4	4	4	**4.0**	4	3	**1.33**					11.5	Yes	2	RD5SS002	Older Asphalt.
6 ST S	MAPLE CRES S & MAPLE PL S		Asphalt	Street	4	4	4	4	**4.0**	4	3	**1.33**					12	Yes	2	RD6SS004	Older Asphalt.
8 ST N	ROSEWOOD AVE N	WILLOW AVE N	Asphalt	Street	4	4	4	4	**4.0**	4	3	**1.33**					10	Yes	2	RD8SN001	Minor cracking around manhole. Utility patch.
MAPLE CRES S	6 ST S & MAPLE DR S	6 ST S & MAPLE PL S	Asphalt	Street	4	4	5	4	**4.2**	4	3	**1.40**					10.5	Yes	2	RDMCS001	Newer Asphalt.
CENTENNIAL AVE S	6 ST S	5 ST S	Asphalt	Street	4	4	5	5	**4.4**	4	3	**1.45**					9	No	2	RDCAS002	Newer Road with Isolated Older Sections.
MAPLE ESTATES S		3A ST S	Asphalt	Street	4	4	5	5	**4.4**	5	3	**1.45**					11	No	N	RDMES001	Good Condition.
MAPLE PL S	MAPLE CRES S & 6 ST S		Asphalt	Street	4	5	5	5	**4.7**	4	3	**1.55**					10.5	Yes	2	RDMPS001	Newer Asphalt.
NORTHRIDGE ST		7 ST N & NORTHRIDGE AVE	Asphalt	Street	5	4	5	5	**4.7**	5	3	**1.57**					9.5	No	N	RDNRTH01	Minor cracking. Good condition
NORTHRIDGE AVE	7 ST N & NORTHRIDGE ST	6 ST N	Asphalt	Street	5	4	5	5	**4.7**	5	3	**1.57**					9.5	Yes	1	RDNRTH02	Minor cracking. Isolated ponding near catch basins. Good condition.
9 ST N			Asphalt	Street	5	4	5	5	**4.7**	5	3	**1.57**					10.5	Yes	2	RD9SN001	Utility patching. New and in good condition.
NORTHRIDGE ST	NORTH AVE		Asphalt	Street	5	4	5	5	**4.7**	5	3	**1.57**	X	X	X	X	9.5	Yes	2	RDNSN001	Minor cracking. Good condition
9 ST N	GIBBONS AVE N		Asphalt	Street	5	4	5	5	**4.7**	5	3	**1.57**					10.5	Yes	2	RD9SN002	Utility patching on each end of road. New and in good condition.
GIBBONS AVE N	8 ST N	9 ST N	Asphalt	Street	5	5	5	5	**5.0**	5	3	**1.67**					10.5	Yes	1	RDGAN003	New and in good condition.
PIRON PL		CRESCENT AVE N	Asphalt	Street	5	5	5	5	**5.0**	5	3	**1.67**					11	Yes	2	RDPPN001	New road in good condition.
6 ST N	NORTHRIDGE AVE		Asphalt	Driveway	5	5	5	5	**5.0**	5	2	**2.50**					13	Yes	N	RD6SN004	New road. Good condition.
HIGHWAY AVE N	2 ST N	CRESCENT AVE N & FACTORY DR N	Asphalt	Arterial	4	2	4	4	**3.4**	3	1	**3.40**					15	Yes	N	RDHAN009	Minor cracking and rutting. Alligator cracking evident.
HIGHWAY AVE N	3 ST N	2 ST N	Asphalt	Arterial	4	4	3	4	**3.8**	4	1	**3.80**					20	Yes	2	RDHAN008	Minor cracking and rutting.
HIGHWAY AVE N	7 ST N	6 ST N	Asphalt	Arterial	4	4	3	4	**3.8**	4	1	**3.80**					9.5	No	2	RDHAN003	Minor cracking and rutting. Cracks previously sealed. Areas of ponding.
ROGERS AVE S	2 ST S	3 ST S	Asphalt	Highway	3	4	4	5	**3.8**	4	1	**3.80**					9	No	N	RDRAS007	Good Condition. Isolated Ponding At Approaches.
HIGHWAY AVE N	4 ST N	3 ST N	Asphalt	Arterial	4	4	3	4	**3.8**	4	1	**3.80**					20	Yes	2	RDHAN006	Minor cracking and rutting.
HIGHWAY AVE N	6 ST N	5 ST N	Asphalt	Arterial	4	4	4	4	**4.0**	4	1	**4.00**					16.5	No	2	RDHAN004	Minor cracking and rutting. Cracks previously sealed.
HIGHWAY AVE N	5 ST N	4 ST N	Asphalt	Arterial	4	4	4	4	**4.0**	4	1	**4.00**					20	Yes	2	RDHAN005	Minor cracking and rutting. Cracks previously sealed.
HIGHWAY AVE N	3 ST N	3 ST N	Asphalt	Arterial	4	4	4	4	**4.0**	4	1	**4.00**					20	Yes	2	RDHAN007	Minor cracking and rutting.
HIGHWAY AVE N		CRESCENT AVE N & ROGERS AVE S	Asphalt	Arterial	4	4	4	4	**4.0**	4	1	**4.00**					17	No	N	RDHAN001	Minor cracking and rutting. Cracks previously sealed.
HIGHWAY AVE N	CRESCENT AVE N & ROGERS AVE S	7 ST N	Asphalt	Arterial	4	4	4	4	**4.0**	4	1	**4.00**					15.5	No	N	RDHAN002	Minor cracking and rutting. Cracks previously sealed.
HIGHWAY AVE N	CRESCENT AVE N & FACTORY DR N		Asphalt	Arterial	4	4	4	4	**4.0**	4	1	**4.00**					15.5	No	N	RDHAN010	Minor transverse cracking.
ROGERS AVE S	2 ST S		Asphalt	Highway	3	4	5	5	**4.0**	4	1	**4.00**					9	No	N	RDRAS009	Good Condition. Some aggregate Loss.
ROGERS AVE S	3 ST S	3A ST S	Asphalt	Highway	3	5	5	4	**4.2**	4	1	**4.15**					9	No	N	RDRAS006	Good Condition.
3A ST S	MAPLE ESTATES S	MAPLE ESTATES S	Asphalt	Highway	4	4	5	5	**4.4**	5	1	**4.35**					8	No	N	RD3AS002	Good Condition
ROGERS AVE S	INDUSTRIAL DR S		Asphalt	Highway	4	4	5	5	**4.4**	4	1	**4.35**					9.5	No	N	RDRAS010	Good Condition.
ROGERS AVE S		5 ST S	Asphalt	Highway	4	5	5	4	**4.5**	4	1	**4.50**					16.5	No	2	RDRAS003	Good Condition.
ROGERS AVE S	3A ST S	4 ST S	Asphalt	Highway	4	5	5	4	**4.5**	4	1	**4.50**					9	No	N	RDRAS005	Good Condition.

ISL Engineering and Land Services

TOWN OF PICTURE BUTTE
ROADWAY VISUAL CONDITION ASSESSMENT

STREET NAME	FROM ROADWAY	TO ROADWAY	SURFACE MATERIAL	ROADWAY CLASSIFICATION	SURFACE APPEARANCE/ TEXTURE/TYPE	SURFACE/SUBSURFACE STRENGTH	DRAINAGE/ROADWAY CROSS SECTION	RIDE QUALITY AND SMOOTHNESS	OVERALL CONDITION RATING	OVERALL CONDITION RATING (FIELD)	USER NEED PRIORITY	ADJUSTED OVERALL CONDITION RATING	VISUAL DEFICIENCY				ROADWAY WIDTH	CURB AND GUTTER	SIDEWALK (1 = ONE SIDE, 2 = BOTH SIDES)	ROADWAY IDENTIFICATION	COMMENTS
					(1-5)	(1-5)	(1-5)	(1-5)	(1-5)	(1-5)	(1-5)		BARE SURFACING GRAVEL	WASH BOARDING	LOOSE MATERIAL	LOSS OF AGGREGATE	(M)	(Y/N)	(1/2/N)		
					35%	30%	20%	15%													
ROGERS AVE S	4 ST S		Asphalt	Highway	4	5	5	4	4.5	4	1	4.50					9	No	2	RDRAS004	Good Condition.
ROGERS AVE S	5 ST S	6 ST S	Asphalt	Highway	4	5	5	4	4.5	4	1	4.50					17	No	2	RDRAS002	Good Condition.
ROGERS AVE S	6 ST S	CRESCENT AVE N & HIGHWAY AVE N	Asphalt	Highway	4	5	5	4	4.5	4	1	4.50					16.5	No	2	RDRAS001	Good Condition.
3A ST S	KALISKA DR S	MAPLE ESTATES S	Asphalt	Highway	4	5	5	5	4.7	5	1	4.65					8	No	N	RD3AS003	Good Condition.
3A ST S	KALISKA DR S		Asphalt	Highway	4	5	5	5	4.7	5	1	4.65					8	No	N	RD3AS004	Good Condition.
3A ST S	ROGERS AVE S	MAPLE ESTATES S	Asphalt	Highway	4	5	5	5	4.7	5	1	4.65					8	No	N	RD3AS001	Good Condition
ROGERS AVE S	FACTORY DR S & HWY519	INDUSTRIAL DR S	Asphalt	Highway	4	5	5	5	4.7	5	1	4.65					9.5	No	N	RDRAS011	Good Condition

Appendix L

Granular Roadway Condition Assessment

TOWN OF PICTURE BUTTE
ROADWAY VISUAL CONDITION ASSESSMENT
GRAVEL

STREET NAME	FROM ROADWAY	TO ROADWAY	SURFACE MATERIAL	ROADWAY CLASSIFICATION	SURFACE APPEARANCE/ TEXTURE/TYPE	SURFACE/SUBSURFACE STRENGTH	DRAINAGE/ROADWAY CROSS SECTION	RIDE QUALITY AND SMOOTHNESS	OVERALL CONDITION RATING	OVERALL CONDITION RATING (FIELD)	USER NEED PRIORITY	ADJUSTED OVERALL CONDITION RATING	BARE SURFACING GRAVEL	WASH BOARDING	LOOSE MATERIAL	LOSS OF AGGREGATE	ROADWAY WIDTH	CURB AND GUTTER	SIDEWALK (1 = ONE SIDE, 2 = BOTH SIDES)	ROADWAY IDENTIFICATION	COMMENTS
					(1-5)	(1-5)	(1-5)	(1-5)	(1-5)	(1-5)	(1-5)		VISUAL DEFICIENCY				(M)	(Y/N)	(1/2/N)		
					35%	30%	20%	15%													
2 ST S	ROGERS AVE S	RAILWAY AVE	Gravel	Street	1	4	4	3	**2.8**	4	3	**0.93**	X	X	X	X	9	No	N	RD2SS002	Isolated Ponding
RAILWAY AVE		2 ST S	Gravel	Alley Lane	1	3	2	2	**2.0**	3	2	**0.98**	X	X	X	X	8	No	N	RDRWAS001	Isolated Ponding. Large Surface Gravel.
INDUSTRIAL DR S	ROGERS AVE S		Gravel	Alley Lane	1	3	2	3	**2.1**	3	2	**1.05**	X	X	X	X	12	No	N	RDIDS001	fair condition with isolated drainage issues
2 ST S		RAILWAY AVE	Gravel	Alley Lane	1	3	2	3	**2.1**	4	2	**1.05**	X	X	X	X	10	No	N	RD2SS001	Isolated Ponding.

Appendix M

Sidewalk Condition Assessment

ISL Engineering and Land Services

TOWN OF PICTURE BUTTE
SIDEWALK VISUAL CONDITION ASSESSMENT

STREET NAME	FROM STREET	TO STREET	SIDE OF STREET	SURFACE MATERIAL	SETTLEMENT (1-5) 30%	CRACKING (1-5) 30%	DRAINAGE (1-5) 20%	SURFACE DETERIORATION (1-5) 20%	OVERALL CONDITION RATING (1-5)	OVERALL CONDITION RATING (FIELD) (1-5)	VISUAL DEFICIENCY: AGGREGATE LOSS	VISUAL DEFICIENCY: VEGETATION	SIDEWALK IDENTIFICATION	COMMENTS
5 ST S	WATSON AVE S	4 ST	East Side	Concrete	2	2	3	2	2.2	3	Observed	Observed	SKE5SS001	Older Walk. Aggregate Loss.
6 ST S	CENTENNIAL AVE S	ROGERS AVE S	West Side	Concrete	2	2	3	2	2.2	3	Observed	Observed	SKW6SS001	Older Walk. Aggregate Loss.
HIGHWAY AVE N	7 ST N	6 ST N	North Side	Concrete	1	3	3	3	2.4	3	Observed	Observed	SKNHAN003	Isolated tree roots causing heaving in sidewalk. Minor ponding.
HIGHWAY AVE N	7 ST N	6 ST N	South Side	Concrete	1	3	3	3	2.4	3	Observed	Observed	SKSHAN003	Isolated tree roots causing heaving in sidewalk. Minor ponding.
3 ST S	COWAN AVE S		West Side	Concrete	2	2	3	3	2.4	3	Observed	Observed	SKW3SS003	Older Walk. Isolated Panel Replacement.
6 ST N	INLET AVE N	CRESCENT AVE N	West Side	Concrete	3	3	2	2	2.6	2	Observed	Observed	SKW6SN002	Old walk. Areas of major erosion. Ponding on sidewalk. Paved over walk in alley entry.
JAMIESON AVE N	2 ST N	3 ST N	North Side	Concrete	2	2	4	3	2.6	2	Observed	Observed	SKNJAN002	Old walk. Areas of settlement and major cracking.
6 ST N	NORTHRIDGE AVE	INLET AVE N	West Side	Concrete	2	2	4	3	2.6	2	Observed	Observed	SKW6SN001	Old walk. Areas of sidewalk breaking. Some areas of major settlement in front of school. North past school is new mono walk and curb in good condition.
INLET AVE N	6 ST N		North Side	Concrete	3	2	4	2	2.7	2	Observed	Observed	SKNIAN001	Old walk. Broken portions of walk.
CRESCENT AVE N	PIRON PL	7 ST N	North Side	Concrete	3	3	2	3	2.8	3	Observed	Observed	SKNCRN002	Area of ponding on sidewalk. Old walk.
7A ST N		GIBBONS AVE N	West Side	Concrete	3	2	3	4	2.9	3	Not observed	Observed	SKW7AS001	Mono curb and walk. Isolated ponding in curb and gutter. Significant cracking.
6 ST N	CRESCENT AVE N	HIGHWAY AVE N	East Side	Concrete	3	3	3	3	3.0	3	Observed	Observed	SKE6SN003	Old walk. Minor ponding.
CRESCENT AVE N	HIGHWAY AVE N & ROGERS AVE S	PIRON PL	North Side	Concrete	3	3	3	3	3.0	3	Observed	Observed	SKNCRN001	Area of significant cracking in front on auto repair shop. Old walk.
5 ST S	ROGERS AVE S	CENTENNIAL AVE S	West Side	Concrete	3	3	3	3	3.0	3	Observed	Observed	SKW5SS003	Old Walk.
HIGHWAY AVE N	4 ST N	3 ST N	North Side	Concrete	3	3	3	3	3.0	3	Observed	Observed	SKNHAN006	Old walk. Areas of erosion.
4 ST N		CRESCENT AVE N	West Side	Concrete	3	3	3	3	3.0	4	Observed	Observed	SKW4SN001	Isolated cracking at alley entries.
5 ST N	HIGHWAY AVE N	CRESCENT AVE N	East Side	Concrete	4	3	2	3	3.1	3	Observed	Observed	SKE5SN001	Isolated panel replacement. Isolated ponding. Old walk.
CRESCENT AVE N	2 ST N	FACTORY DR N & HIGHWAY AVE N	South Side	Concrete	3	2	4	4	3.1	3	Observed	Observed	SKSCRN008	Recent Panel Replacement.
2 ST N	CRESCENT AVE N	HIGHWAY AVE N	East Side	Concrete	3	3	4	3	3.2	3	Observed	Observed	SKE2SN002	Old Walk.
5 ST S	WATSON AVE S	ROGERS AVE S	East Side	Concrete	3	3	4	3	3.2	4	Observed	Observed	SKE5SS002	Older Walk.
JAMIESON AVE N		2 ST N	North Side	Concrete	3	3	4	3	3.2	3	Observed	Observed	SKNJAN003	Panel replacement. Old walk.
CRESCENT AVE N	7 ST N	6 ST N	South Side	Concrete	2	4	4	3	3.2	3	Observed	Observed	SKSCRN003	Old walk. Major settlement over utility patch.
5 ST S	WATSON AVE S	4 ST	West Side	Concrete	3	3	4	3	3.2	3	Observed	Observed	SKW5SS001	Older Walk. Isolated Replacement.
7 ST N	CRESCENT AVE N	HIGHWAY AVE N	West Side	Concrete	4	2	4	3	3.2	3	Observed	Observed	SKW7SN004	Area of major cracking in alley entry. Old walk.
COWAN AVE S	4 ST S	3 ST S	South Side	Concrete	3	3	3	4	3.2	3	Not observed	Observed	SKSCWA001	Older Walk. Drainage Issues.
3 ST N	JAMIESON AVE N	HIGHWAY AVE N	West Side	Concrete	3	4	4	2	3.3	3	Observed	Observed	SKW3SN002	Areas of significant erosion. Old walk.
6 ST N	CRESCENT AVE N	HIGHWAY AVE N	West Side	Concrete	4	3	4	2	3.3	3	Observed	Observed	SKW6SN003	Old walk. Isolated panel replacement.
HIGHWAY AVE N	3 ST N	2 ST N	North Side	Concrete	4	3	3	3	3.3	3	Observed	Observed	SKNHAN008	Old mono walk and curb.
HIGHWAY AVE N	3 ST N	2 ST N	South Side	Concrete	4	3	3	3	3.3	3	Observed	Observed	SKSHAN008	Old mono curb and walk.
CRESCENT AVE N	4 ST N	3 ST N	North Side	Concrete	3	3	4	4	3.4	3	Observed	Not observed	SKNCRN006	Older Walk.
ROGERS AVE S	6 ST S	CRESCENT AVE N & HIGHWAY AVE N	South Side	Concrete	3	3	4	4	3.4	4	Observed	Observed	SKSRAS001	Older Walk. Isolated Panel Replacement.
4 ST N		CRESCENT AVE N	East Side	Concrete	3	4	4	3	3.5	4	Observed	Observed	SKE4SN001	Isolated cracking at alley entries.
4 ST N	HIGHWAY AVE N	4 ST & JAMIESON AVE N	East Side	Concrete	4	3	4	3	3.5	3	Observed	Observed	SKE4SN003	Areas of significant erosion. Old walk.
CRESCENT AVE N	7 ST N	6 ST N	North Side	Concrete	4	3	4	3	3.5	3	Observed	Observed	SKNCRN003	Old walk.
CRESCENT AVE N	6 ST N	5 ST N	North Side	Concrete	3	4	4	3	3.5	3	Observed	Observed	SKNCRN004	Areas of settlement. Old walk.
HIGHWAY AVE N	5 ST N	4 ST N	North Side	Concrete	3	4	4	3	3.5	3	Observed	Observed	SKNHAN005	Mono walk and curb. Areas of significant erosion.
4 ST N	CRESCENT AVE N	HIGHWAY AVE N	West Side	Concrete	4	3	4	3	3.5	3	Observed	Observed	SKW4SN002	Mono walk and curb.
5 ST S	WATSON AVE S	ROGERS AVE S	West Side	Concrete	4	3	4	3	3.5	3	Observed	Observed	SKW5SS002	Older Walk.
7 ST N	NORTHRIDGE AVE & NORTHRIDGE ST	ROSEWOOD AVE N	West Side	Concrete	4	3	4	3	3.5	4	Not observed	Not observed	SKW7SN001	Isolated cracks. Isolated panel cracking.
3 ST N	HIGHWAY AVE N	CRESCENT AVE N	East Side	Concrete	3	4	3	4	3.5	4	Not observed	Observed	SKE3SN001	Older Walk.
ROSEWOOD AVE N	7 ST N	8 ST N	North Side	Concrete	3	4	3	4	3.5	4	Not observed	Observed	SKNRWA001	Minor ponding in curb and gutters. Mono curb and walk.
CRESCENT AVE N	3 ST N	2 ST N	South Side	Concrete	4	3	3	4	3.5	4	Not observed	Observed	SKSCRN007	Old Walk. Good Condition.

ISL Engineering and Land Services

TOWN OF PICTURE BUTTE
SIDEWALK VISUAL CONDITION ASSESSMENT

STREET NAME	FROM STREET	TO STREET	SIDE OF STREET	SURFACE MATERIAL	SETTLEMENT (1-5) 30%	CRACKING (1-5) 30%	DRAINAGE (1-5) 20%	SURFACE DETERIORATION (1-5) 20%	OVERALL CONDITION RATING (1-5)	OVERALL CONDITION RATING (FIELD) (1-5)	AGGREGATE LOSS (VISUAL DEFICIENCY)	VEGETATION (VISUAL DEFICIENCY)	SIDEWALK IDENTIFICATION	COMMENTS
ROSEWOOD AVE N	7 ST N	8 ST N	South Side	Concrete	4	3	3	4	3.5	4	Not observed	Observed	SKSRWA001	Minor ponding in curb and gutters. Isolated panel replacement. Mono curb and walk.
2 ST N	CRESCENT AVE N	HIGHWAY AVE N	West Side	Concrete	3	4	3	4	3.5	4	Observed	Observed	SKW2SN002	Older Walk.
7 ST N	GIBBONS AVE N	CRESCENT AVE N	West Side	Concrete	4	4	3	3	3.6	3	Not observed	Not observed	SKW7SN003	Mono curb and walk for portion. Sidewalk only for portion. Minor ponding in curb and gutter.
3 ST N	JAMIESON AVE N	HIGHWAY AVE N	East Side	Concrete	4	3	4	4	3.7	4	Observed	Observed	SKE3SN002	Isolated cracking in alley entry.
6 ST S	CENTENNIAL AVE S	MAPLE CRES S & MAPLE DR S	East Side	Concrete	4	3	4	4	3.7	4	Not observed	Not observed	SKE6SS002	Mono Curb and Walk.
7 ST N	GIBBONS AVE N	CRESCENT AVE N	East Side	Concrete	3	4	4	4	3.7	3	Observed	Observed	SKE7SN003	Settlement at end of walk.
CENTENNIAL AVE S		6 ST S	North Side	Concrete	4	3	4	4	3.7	4	Not observed	Not observed	SKNCAS001	Older Walk.
CENTENNIAL AVE S	6 ST S	5 ST S	North Side	Concrete	4	3	4	4	3.7	3	Not observed	Observed	SKNCAS002	Older Walk. Cracking and Vegetation Noted.
MAPLE DR S		6 ST S & MAPLE CRES S	North Side	Concrete	4	3	4	4	3.7	4	Not observed	Observed	SKNMDS001	Older Walk. Lots of Cracking.
CRESCENT AVE N	PIRON PL	7 ST N	South Side	Concrete	4	3	4	4	3.7	4	Observed	Observed	SKSCRN002	Old walk.
CRESCENT AVE N	4 ST N	3 ST N	South Side	Concrete	4	3	4	4	3.7	4	Not observed	Not observed	SKSCRN006	Older Walk. Good Condition.
MAPLE DR S		6 ST S & MAPLE CRES S	South Side	Concrete	4	3	4	4	3.7	4	Not observed	Observed	SKSMDS001	Older Walk. Lots of Cracking.
ROGERS AVE S	5 ST S	6 ST S	South Side	Concrete	3	4	4	4	3.7	3	Observed	Observed	SKSRAS002	Older Walk. Isolated Panel Replacement.
ROGERS AVE S		5 ST S	South Side	Concrete	4	3	4	4	3.7	3	Not observed	Not observed	SKSRAS003	Older Walk.
7A ST N		GIBBONS AVE N	East Side	Concrete	4	4	3	4	3.8	3	Not observed	Observed	SKE7AS001	Mono curb and walk. Isolated ponding in curb and gutter.
GIBBONS AVE N	7A ST N	8 ST N	North Side	Concrete	4	4	3	4	3.8	3	Not observed	Observed	SKNGAN001	Mono curb and walk. Minor ponding near concrete swale. Minor cracking.
GIBBONS AVE N	7 ST N	7A ST N	North Side	Concrete	4	4	3	4	3.8	4	Not observed	Observed	SKNGAN002	Mono curb and walk. Panel replacement. Minor ponding around catch basin.
WILLOW AVE N	WILLOW PLACE N	8 ST N	North Side	Concrete	4	4	3	4	3.8	4	Observed	Observed	SKNWAN002	Mono curb and walk. Isolated ponding in curb and gutter.
3 ST S	COWAN AVE S		South Side	Concrete	4	4	5	2	3.8	4	Not observed	Observed	SKS3SS001	Older Walkway.
GIBBONS AVE N	7A ST N	8 ST N	South Side	Concrete	4	4	3	4	3.8	3	Not observed	Observed	SKSGAN001	Mono curb and walk. Minor ponding in curb and gutter.
GIBBONS AVE N	7 ST N	7A ST N	South Side	Concrete	4	4	3	4	3.8	4	Not observed	Observed	SKSGAN002	Mono curb and walk. Panel replacement. Minor ponding around catch basin.
WILLOW AVE N	WILLOW PLACE N	8 ST N	South Side	Concrete	5	3	3	4	3.8	4	Not observed	Observed	SKSWAN002	Mono curb and walk for portion. Curb and gutter only for potion. Minor ponding.
5 ST N	HIGHWAY AVE N	CRESCENT AVE N	West Side	Concrete	4	4	3	4	3.8	4	Observed	Observed	SKW5SN001	Old walk.
2 ST N		CRESCENT AVE N	East Side	Concrete	4	4	4	3	3.8	3	Observed	Observed	SKE2SN001	Old Walk. No Curb
2 ST N	HIGHWAY AVE N	JAMIESON AVE N	East Side	Concrete	4	4	4	3	3.8	4	Observed	Observed	SKE2SN003	Minor cracking in alley entry.
4 ST N	CRESCENT AVE N	HIGHWAY AVE N	East Side	Concrete	4	4	4	3	3.8	4	Observed	Observed	SKE4SN002	Old walk.
4 ST	4 ST N & JAMIESON AVE N	4 ST S & 5 ST S	East Side	Concrete	4	4	4	3	3.8	4	Observed	Observed	SKE4SS001	Old walk.
4 ST S	4 ST & 5 ST S	COWAN AVE S	East Side	Concrete	4	4	4	3	3.8	4	Observed	Observed	SKE4SS002	Mono walk and curb.
4 ST S	COWAN AVE S	ROGERS AVE S	East Side	Concrete	4	4	4	3	3.8	4	Observed	Observed	SKE4SS003	Old walk. Good condition.
7 ST N	NORTHRIDGE AVE & NORTHRIDGE ST	ROSEWOOD AVE N	East Side	Concrete	4	4	4	3	3.8	4	Not observed	Not observed	SKE7SN001	Isolated cracking. Isolated panel replacement.
7 ST N	CRESCENT AVE N	HIGHWAY AVE N	East Side	Concrete	4	4	4	3	3.8	4	Observed	Observed	SKE7SN004	Minor cracking in alley entry. Old walk.
CRESCENT AVE N	5 ST N	4 ST N	North Side	Concrete	4	4	4	3	3.8	4	Observed	Observed	SKNCRN005	Isolated panel replacement. Old walk.
JAMIESON AVE N	3 ST N	4 ST	North Side	Concrete	4	4	4	3	3.8	4	Observed	Observed	SKNJAN001	Old walk. Isolated cracking in parking lot entrance.
WATSON AVE S	5A ST S	5 ST S	North Side	Concrete	4	4	4	3	3.8	4	Not observed	Observed	SKNWAS002	Older Walk.
CRESCENT AVE N	6 ST N	5 ST N	South Side	Concrete	4	4	4	3	3.8	4	Observed	Observed	SKSCRN004	Old walk.
CRESCENT AVE N	5 ST N	4 ST N	South Side	Concrete	4	4	4	3	3.8	3	Observed	Observed	SKSCRN005	Old walk. Isolated area of settlement over utility patching.
HIGHWAY AVE N	6 ST N	5 ST N	South Side	Concrete	4	4	4	3	3.8	3	Observed	Observed	SKSHAN004	Old walk. Areas of significant erosion.
INLET AVE N	6 ST N		South Side	Concrete	4	4	4	3	3.8	4	Observed	Observed	SKSIAN001	Old walk.
JAMIESON AVE N	3 ST N	4 ST	South Side	Concrete	4	4	4	3	3.8	4	Observed	Observed	SKSJAN001	Old walk.
2 ST N	HIGHWAY AVE N	JAMIESON AVE N	West Side	Concrete	4	4	4	3	3.8	4	Observed	Observed	SKW2SN003	Mono walk and curb.
4 ST	4 ST N & JAMIESON AVE N	4 ST S & 5 ST S	West Side	Concrete	4	4	4	3	3.8	4	Observed	Observed	SKW4SS001	Isolated panel replacement. Old walk.
4 ST S	4 ST & 5 ST S	COWAN AVE S	West Side	Concrete	4	4	4	3	3.8	4	Observed	Observed	SKW4SS002	Old walk.

ISL Engineering and Land Services

TOWN OF PICTURE BUTTE
SIDEWALK VISUAL CONDITION ASSESSMENT

STREET NAME	FROM STREET	TO STREET	SIDE OF STREET	SURFACE MATERIAL	SETTLEMENT (1-5) 30%	CRACKING (1-5) 30%	DRAINAGE (1-5) 20%	SURFACE DETERIORATION (1-5) 20%	OVERALL CONDITION RATING (1-5)	OVERALL CONDITION RATING (FIELD) (1-5)	AGGREGATE LOSS (VISUAL DEFICIENCY)	VEGETATION (VISUAL DEFICIENCY)	SIDEWALK IDENTIFICATION	COMMENTS
3 ST S	COWAN AVE S		East Side	Concrete	4	4	4	4	4.0	4	Not observed	Observed	SKE3SS003	Good Condition Older Walk.
5A ST S		WATSON AVE S	East Side	Concrete	4	4	4	4	4.0	4	Not observed	Observed	SKE5AS001	Older Mono Curb and Walk.
6 ST N	NORTHRIDGE AVE	INLET AVE N	East Side	Concrete	4	4	4	4	4.0	4	Observed	Observed	SKE6SN001	Sidewalk ends South of alley. Old walk. Good condition.
6 ST N	INLET AVE N	CRESCENT AVE N	East Side	Concrete	4	4	4	4	4.0	4	Observed	Observed	SKE6SN002	Old walk.
6 ST S	CENTENNIAL AVE S	ROGERS AVE S	East Side	Concrete	4	4	4	4	4.0	4	Not observed	Not observed	SKE6SS001	Older Walk.
6 ST S	MAPLE CRES S & MAPLE DR S	MAPLE CRES S & MAPLE PL S	East Side	Concrete	4	4	4	4	4.0	4	Not observed	Not observed	SKE6SS003	Mono Curb with Walk.
6 ST S	ROGERS AVE S & ROGERS AVE S	WATSON AVE S	East Side	Concrete	4	4	4	4	4.0	4	Not observed	Observed	SKE6SS005	Older Walk.
7 ST N	ROSEWOOD AVE N	GIBBONS AVE N	East Side	Concrete	4	4	4	4	4.0	3	Not observed	Observed	SKE7SN002	Good condition. Mono curb and gutter. Panel replacement.
8 ST N	WILLOW AVE N	GIBBONS AVE N	East Side	Concrete	4	4	4	4	4.0	4	Not observed	Observed	SKE8SN002	Mono curb and walk.
WILLOW PLACE N		WILLOW AVE N & WILLOW AVE N	East Side	Concrete	4	4	4	4	4.0	4	Not observed	Observed	SKE9AN001	Mono curb and walk. Minor cracking.
MAPLE CRES S	6 ST S & MAPLE DR S	6 ST S & MAPLE PL S	East Side	Concrete	4	4	4	4	4.0	4	Not observed	Observed	SKEMCS001	Half of Walk New.
3 ST S	COWAN AVE S		North Side	Concrete	4	4	4	4	4.0	4	Not observed	Observed	SKN3SS001	Older Sidewalk
CRESCENT AVE N	3 ST N	2 ST N	North Side	Concrete	4	4	4	4	4.0	4	Observed	Observed	SKNCRN007	Older Walk. Good Condition.
COWAN AVE S	4 ST S	3 ST S	North Side	Concrete	4	4	4	4	4.0	4	Not observed	Observed	SKNCWA001	Older Walk.
HIGHWAY AVE N	6 ST N	5 ST N	North Side	Concrete	4	4	4	4	4.0	4	Observed	Observed	SKNHAN004	Old walk. Good condition.
MAPLE PL S	MAPLE CRES S & 6 ST S		North Side	Concrete	4	4	4	4	4.0	4	Not observed	Not observed	SKNMPS001	Newer Mono Curb and Walk.
ROGERS AVE S	5 ST S	6 ST S	North Side	Concrete	4	4	4	4	4.0	4	Not observed	Observed	SKNRAS002	Newer Walk.
WATSON AVE S	6 ST S	5A ST S	North Side	Concrete	4	4	4	4	4.0	4	Not observed	Not observed	SKNWAS001	Older Walk.
CENTENNIAL AVE S		6 ST S	South Side	Concrete	4	4	4	4	4.0	4	Not observed	Not observed	SKSCAS001	Older Walk.
CENTENNIAL AVE S	6 ST S	5 ST S	South Side	Concrete	4	4	4	4	4.0	4	Not observed	Observed	SKSCAS002	Isolated Sidewalk Replacement.
HIGHWAY AVE N	5 ST N	4 ST N	South Side	Concrete	4	4	4	4	4.0	4	Observed	Observed	SKSHAN005	Mono walk and curb.
HIGHWAY AVE N	4 ST N	3 ST N	South Side	Concrete	4	4	4	4	4.0	4	Observed	Observed	SKSHAN006	Mono curb and walk.
MAPLE PL S	MAPLE CRES S & 6 ST S		South Side	Concrete	4	4	4	4	4.0	4	Not observed	Not observed	SKSMPS001	Newer Mono Curb and Walk.
WATSON AVE S	6 ST S	5A ST S	South Side	Concrete	4	4	4	4	4.0	4	Not observed	Not observed	SKSWAS001	Older Walk. Isolated Replacements.
WATSON AVE S	5A ST S	5 ST S	South Side	Concrete	4	4	4	4	4.0	4	Not observed	Not observed	SKSWAS002	Good Shape Older Walk.
2 ST N		CRESCENT AVE N	West Side	Concrete	4	4	4	4	4.0	4	Not observed	Not observed	SKW2SN001	Older Walk in Good Condition.
3 ST N	HIGHWAY AVE N	CRESCENT AVE N	West Side	Concrete	4	4	4	4	4.0	4	Not observed	Not observed	SKW3SN001	Older Walk. Good Condition.
4 ST N	HIGHWAY AVE N	4 ST & JAMIESON AVE N	West Side	Concrete	4	4	4	4	4.0	4	Observed	Observed	SKW4SN003	Panel replacement. Old walk.
4 ST S	COWAN AVE S	ROGERS AVE S	West Side	Concrete	4	4	4	4	4.0	4	Observed	Observed	SKW4SS003	Mono walk and curb. Portion of walk missing in construction area.
5A ST S		WATSON AVE S	West Side	Concrete	4	4	4	4	4.0	4	Not observed	Observed	SKW5AS001	Older Mono Curb and Walk.
5 ST S	CENTENNIAL AVE S		West Side	Concrete	4	4	3	5	4.0	4	Not observed	Observed	SKW5SS004	Isolated Walk Replacement.
6 ST S	CENTENNIAL AVE S	MAPLE CRES S & MAPLE DR S	West Side	Concrete	4	4	4	4	4.0	4	Observed	Observed	SKW6SS002	Mono Curb and Walk.
6 ST S	MAPLE CRES S & MAPLE DR S	MAPLE CRES S & MAPLE PL S	West Side	Concrete	4	4	4	4	4.0	4	Not observed	Not observed	SKW6SS003	Mono Curb with Walk.
6 ST S	ROGERS AVE S	WATSON AVE S	West Side	Concrete	4	4	4	4	4.0	4	Not observed	Not observed	SKW6SS005	Older Walk.
7 ST N	ROSEWOOD AVE N	GIBBONS AVE N	West Side	Concrete	4	4	4	4	4.0	4	Not observed	Observed	SKW7SN002	Good condition. Mono curb and gutter. Panel replacement.
8 ST N	WILLOW AVE N	GIBBONS AVE N	West Side	Concrete	4	4	4	4	4.0	4	Not observed	Observed	SKW8SN002	Mono curb and walk. Isolated panel replacement.
WILLOW PLACE N		WILLOW AVE N	West Side	Concrete	4	4	4	4	4.0	4	Not observed	Observed	SKW9AN001	Mono curb and walk. Minor cracking.
CRESCENT AVE N	HIGHWAY AVE N & ROGERS AVE S	PIRON PL	East Side	Concrete	5	3	5	4	4.2	4	Observed	Observed	SKECRN001	Isolated break on mono walk and curb.
MAPLE CRES S	6 ST S & MAPLE DR S	6 ST S & MAPLE PL S	West Side	Concrete	4	4	4	5	4.2	4	Not observed	Observed	SKWMCS001	Half of Walk New.
8 ST N	ROSEWOOD AVE N	WILLOW AVE N	East Side	Concrete	4	5	4	4	4.3	4	Not observed	Observed	SKE8SN001	Mono curb and walk. Isolated panel replacement.
ROGERS AVE S	6 ST S	CRESCENT AVE N & HIGHWAY AVE N & HIGH	North Side	Concrete	5	4	4	4	4.3	4	Not observed	Not observed	SKNRAS001	Newer Walk.
8 ST N	ROSEWOOD AVE N	WILLOW AVE N	West Side	Concrete	5	4	4	4	4.3	4	Not observed	Observed	SKW8SN001	Mono curb and walk.

ISL Engineering and Land Services

TOWN OF PICTURE BUTTE
SIDEWALK VISUAL CONDITION ASSESSMENT

STREET NAME	FROM STREET	TO STREET	SIDE OF STREET	SURFACE MATERIAL	SETTLEMENT (1-5) 30%	CRACKING (1-5) 30%	DRAINAGE (1-5) 20%	SURFACE DETERIORATION (1-5) 20%	OVERALL CONDITION RATING (1-5)	OVERALL CONDITION RATING (FIELD) (1-5)	AGGREGATE LOSS (VISUAL DEFICIENCY)	VEGETATION (VISUAL DEFICIENCY)	SIDEWALK IDENTIFICATION	COMMENTS
3 ST S	COWAN AVE S	ROGERS AVE S	East Side	Concrete	4	4	5	5	4.4	4	Not observed	Observed	SKE3SS002	Good Condition.
6 ST S	MAPLE CRES S & MAPLE PL S		East Side	Concrete	4	4	5	5	4.4	4	Not observed	Not observed	SKE6SS004	Newer Mono Curb and Walk.
CRESCENT AVE N	2 ST N	FACTORY DR N & HIGHWAY AVE N	North Side	Concrete	4	4	5	5	4.4	4	Not observed	Observed	SKNCRN008	Separate sidewalk.
3 ST S	COWAN AVE S	ROGERS AVE S	West Side	Concrete	4	4	5	5	4.4	4	Not observed	Observed	SKW3SS002	Isolated Panel Replacement.
6 ST S	MAPLE CRES S & MAPLE PL S		West Side	Concrete	4	4	5	5	4.4	4	Not observed	Not observed	SKW6SS004	Newer Mono Curb and Walk.
9 ST N			East Side	Concrete	5	4	5	5	4.7	5	Not observed	Not observed	SKE9SN001	Mono curb and walk. Panel replacement due to utilities. New and in good condition.
9 ST N	GIBBONS AVE N		East Side	Concrete	5	4	5	5	4.7	5	Observed	Not observed	SKE9SN002	Mono curb and walk. Panel replacement at each end due to utilities. New and in good condition.
ROGERS AVE S	4 ST S		North Side	Concrete	5	4	5	5	4.7	5	Not observed	Not observed	SKNRAS004	New Walk.
		9 ST N	North Side	Concrete	5	4	5	5	4.7	5	Not observed	Not observed	SKNSPN001	Mono curb and walk. Panel replacement due to utilities. New and in good condition.
		9 ST N	South Side	Concrete	5	4	5	5	4.7	5	Not observed	Not observed	SKSSPN001	Mono curb and walk. Panel replacement due to utilities. New and in good condition.
9 ST N			West Side	Concrete	5	4	5	5	4.7	5	Not observed	Not observed	SKW9SN001	Mono curb and walk. Panel replacement due to utilities. New and in good condition.
9 ST N	GIBBONS AVE N		West Side	Concrete	5	4	5	5	4.7	5	Not observed	Not observed	SKW9SN002	Mono curb and walk. Panel replacement at each end due to utilities. New and in good condition.
NORTHRIDGE ST	NORTH AVE		West Side	Concrete	5	4	5	5	4.7	5	Not observed	Not observed	SKWNSN001	Good condition. Mono curb and gutter.
NORTHRIDGE ST	NORTH AVE		East Side	Concrete	5	5	5	5	5.0	5	Not observed	Not observed	SKENSN001	Good condition. Mono curb and gutter.
PIRON PL		CRESCENT AVE N	East Side	Concrete	5	5	5	5	5.0	5	Not observed	Not observed	SKEPPN001	New mono walk and curb in good condition.
NORTHRIDGE ST		7 ST N & NORTHRIDGE AVE	North Side	Concrete	5	5	5	5	5.0	5	Not observed	Not observed	SKNNRTH01	Good condition. Mono curb and gutter.
NORTHRIDGE AVE	7 ST N & NORTHRIDGE ST	6 ST N	North Side	Concrete	5	5	5	5	5.0	5	Not observed	Not observed	SKNNRTH02	Good condition. Mono curb and gutter for portion. Curb only for portion.
ROGERS AVE S		5 ST S	North Side	Concrete	5	5	5	5	5.0	5	Not observed	Not observed	SKNRAS003	New Walk.
GIBBONS AVE N	8 ST N	9 ST N	South Side	Concrete	5	5	5	5	5.0	5	Not observed	Not observed	SKSGAN003	New and in good condition.
NORTHRIDGE ST		7 ST N & NORTHRIDGE AVE	South Side	Concrete	5	5	5	5	5.0	5	Not observed	Not observed	SKSNRTH01	Good condition. Mono curb and gutter.
NORTHRIDGE AVE	7 ST N & NORTHRIDGE ST	6 ST N	South Side	Concrete	5	5	5	5	5.0	5	Not observed	Not observed	SKSNRTH02	Good condition. Mono curb and gutter.
PIRON PL		CRESCENT AVE N	West Side	Concrete	5	5	5	5	5.0	5	Not observed	Not observed	SKWPPN001	New mono walk and curb in good condition.

Appendix N

WaterCAD Files

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Label	Elevation (m)	Zone	Demand (L/s)	Hydraulic Grade (m)	Pressure (kPa)	X (m)	Y (m)
FH 1	902.6	Zone - 1	0.2226	950.77	471.3	371772.8	5525921.8
FH 2	902	Zone - 1	0	950.77	480.2	371966.2	5525916.3
FH 3	904	Zone - 1	0	950.77	455.8	372118.5	5526438.2
FH 4	903	Zone - 1	0	950.77	469.5	372115.6	5526311.8
FH 5	899.99	Zone - 1	0.0000	950.77	496.9	372232.6	5525771.2
FH 6	899.94	Zone - 1	0	950.77	497.4	372231.3	5525592.7
FH 7	901.50	Zone - 1	0	950.76	482.1	372538	5526231.5
FH 8	900.6	Zone - 1	0	950.77	491	372558.6	5526065.7
FH 9	909.50	Zone - 1	0	950.77	403.9	372523.7	5526711.5
FH 10	907.00	Zone - 1	0.1104	950.77	428.4	372711.0	5526853.5
FH 11	907.2	Zone - 1	0.0000	950.77	426.4	371521.6	5526874.8
FH 12	906.70	Zone - 1	0.0000	950.77	431.3	371661.5	5526858.1
J-9	899.83	Zone - 1	0.0000	950.77	498.5	372231	5525582.1
J-11	906.7	Zone - 1	0	950.77	431.3	371428.6	5526468.3
J-12	906.7	Zone - 1	0.000	950.77	431.3	371428.6	5526468.3
J-20	905.9	Zone - 1	0	950.77	439.1	371381.3	5526696.9
J-21	908.5	Zone - 1	0	950.77	413.7	371385.5	5526922.6
J-22	908.5	Zone - 1	0	950.77	413.7	371386.4	5526922.6
J-23	908.2	Zone - 1	0	950.77	416.6	371384.8	5526877.5
J-24	908.20	Zone - 1	0.0000	950.77	417	371385.4	5526878.2
J-25	905.90	Zone - 1	0	950.77	439.1	371377	5526694.3
J-26	905.9	Zone - 1	0	950.77	439.1	371381.2	5526694.2
J-27	906.7	Zone - 1	0	950.77	431.3	371660.2	5526858.1
J-29	905.5	Zone - 1	0.0000	950.77	443.0	371468.7	5526580.9
J-30	905.5	Zone - 1	0	950.77	443.0	371468.6	5526579.3
J-31	908.20	Zone - 1	0	950.77	416.6	371385.5	5526880.1
J-32	908.70	Zone - 1	0.0000	950.77	411.7	371388.6	5527018.3
J-33	908.70	Zone - 1	0.0810	950.77	411.7	371388.7	5527020.3
J-34	907.20	Zone - 1	0	950.77	426.4	371521.5	5526872.7
J-36	905.9	Zone - 1	0	950.77	439.1	371345.6	5526403.1
J-37	905.9	Zone - 1	0	950.77	439.1	371343.4	5526403.1
J-38	905.5	Zone - 1	0	950.77	443.0	371468.5	5526574.8
J-39	905.5	Zone - 1	0	950.77	443.0	371468.4	5526572.6
J-40	906	Zone - 1	0.0000	950.77	443.0	371477.6	5526572.4
J-41	906	Zone - 1	0	950.77	443.0	371475	5526572.4
J-42	905.5	Zone - 1	0.0000	950.77	443.0	371462	5526571.6
J-43	905.5	Zone - 1	0	950.77	443.0	371461.9	5526569.0
J-44	905.9	Zone - 1	0	950.77	439.1	371348.2	5526403.0
J-45	906.7	Zone - 1	0	950.77	431.3	371431.2	5526467.2
J-46	905.8	Zone - 1	0.0000	950.77	440.1	371339	5526570.9
J-47	905.8	Zone - 1	0.0000	950.77	440.1	371339.1	5526573.8
J-48	905.9	Zone - 1	0	950.77	439.1	371348.1	5526400.0

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J-49	905.5	Zone - 1	0	950.77	443.0	371462.0	5526575.0
J-50	905.5	Zone - 1	0	950.77	443.0	371465.1	5526574.9
J-51	905.5	Zone - 1	0	950.77	443.0	371471.6	5526572.5
J-52	907.2	Zone - 1	0.0000	950.77	426.4	371521.4	5526869.3
J-53	905.8	Zone - 1	0.0000	950.77	440.1	371339.2	5526577.4
J-54	906.7	Zone - 1	0.0000	950.77	431.3	371656.4	5526858.2
J-55	905.80	Zone - 1	0.0000	950.77	440.1	371335.4	5526577.5
J-56	906	Zone - 1	0	950.77	439.1	371376.6	5526690.2
J-57	909	Zone - 1	0	950.77	411.7	371388	5527014.0
J-58	909	Zone - 1	0.0000	950.77	413.7	371381.1	5526922.8
J-59	906	Zone - 1	0	950.77	439.1	371376.8	5526685.5
J-60	900	Zone - 1	0.1214	950.77	497.8	372231.2	5525588.6
J-61	906	Zone - 1	0	950.77	439.1	371349.8	5526473.6
J-62	905.90	Zone - 1	0	950.77	439.1	371349.6	5526467.6
J-63	905.80	Zone - 1	0.0000	950.77	440.1	371346.1	5526577.2
J-64	905.80	Zone - 1	0	950.77	440.1	371352.1	5526577.1
J-65	905.8	Zone - 1	0	950.77	440.1	371351.9	5526570.9
J-66	903.3	Zone - 1	0	950.76	464.5	372411.0	5526359.7
J-67	903.3	Zone - 1	0.1012	950.76	464.5	372412.6	5526365.9
J-68	904.8	Zone - 1	0	950.77	449.9	371655.1	5526568.6
J-69	904.8	Zone - 1	0	950.77	449.9	371654.9	5526560.6
J-70	906.7	Zone - 1	0	950.77	431.3	371420.0	5526472.1
J-71	900.1	Zone - 1	0	950.77	496.2	372233	5525866.9
J-72	904.8	Zone - 1	0	950.78	450.2	371447.3	5526118.6
J-73	905.1	Zone - 1	0	950.78	447.3	371447.0	5526108.4
J-74	905.9	Zone - 1	0	950.77	439.1	371361.0	5526473.4
J-75	904.8	Zone - 1	0	950.77	449.9	371856.0	5526691.9
J-76	904.8	Zone - 1	0	950.77	449.9	371856.0	5526698.6
J-77	908.9	Zone - 1	0.2721	950.77	410.2	372390.5	5526839.6
J-78	908.8	Zone - 1	0	950.77	410.5	372378.0	5526839.9
J-79	904.8	Zone - 1	0	950.77	449.9	371843	5526676.4
J-80	904.8	Zone - 1	0	950.77	449.9	371855.6	5526676.3
J-81	905.0	Zone - 1	0	950.79	448.2	371355.5	5526156.4
J-82	905.0	Zone - 1	0	950.79	448.1	371369.1	5526157.1
J-83	906.0	Zone - 1	0	950.77	438.5	372112.4	5526660.4
J-84	905.9	Zone - 1	0.2024	950.77	438.7	372123.8	5526668.2
J-85	903.9	Zone - 1	0	950.77	459.1	372067.7	5526385.8
J-86	904.02	Zone - 1	0.0535	950.77	457.5	372068.0	5526400.4
J-87	900.1	Zone - 1	0.0000	950.77	496.2	372233.2	5525872.6
J-88	899.6	Zone - 1	0	950.77	500.4	372248.2	5525872.5
J-89	900.2	Zone - 1	0	950.77	494.8	372218.1	5525874.8
J-90	900.1	Zone - 1	0	950.77	496.2	372233.3	5525874.4
J-91	905.0	Zone - 1	0	950.79	448.1	371382.0	5526166.7
J-92	899.2	Zone - 1	0	950.77	504.7	372247.9	5525592.6

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J-94	908.2	Zone - 1	0	950.77	416.6	371386	5526897.0
J-96	899.6	Zone - 1	0.000	950.77	500.8	372249.6	5525771.1
J-97	899.6	Zone - 1	0	950.77	500.8	372249.7	5525774.3
J-98	900.0	Zone - 1	0.0000	950.77	496.9	372233	5525774.4
J-99	899.9	Zone - 1	0	950.77	497.6	372231.2	5525590.6
J-100	900.0	Zone - 1	0	950.77	497.3	372248.4	5525590.5
J-101	906.0	Zone - 1	0	950.78	438.3	371428.2	5526048.0
J-102	906.0	Zone - 1	0	950.78	438.3	371445.4	5526047.5
J-103	909.5	Zone - 1	0	950.77	403.7	372354	5526715.7
J-104	909.7	Zone - 1	0	950.77	401.5	372368.2	5526725.5
J-105	905.9	Zone - 1	0	950.77	438.8	372138	5526678.0
J-106	903.3	Zone - 1	0	950.76	464.5	372368.2	5526361.8
J-107	903.3	Zone - 1	0	950.76	464.5	372381.9	5526373.8
J-108	905.3	Zone - 1	0	950.77	445.5	372124	5526687.1
J-109	904.5	Zone - 1	0	950.78	452.9	371516.2	5526257.4
J-110	904.5	Zone - 1	0	950.78	452.9	371527	5526241.6
J-111	900.6	Zone - 1	0	950.77	491.5	372399.1	5526042.1
J-112	900.24	Zone - 1	0	950.77	494.5	372398.6	5526022.3
J-113	902.0	Zone - 1	0.0000	950.76	477.2	372530.0	5526256.5
J-114	902.00	Zone - 1	0	950.76	477.2	372531.2	5526276.6
J-115	901.4	Zone - 1	0	950.77	483.2	372084.5	5526005.4
J-116	901.4	Zone - 1	0	950.77	483.2	372084.3	5525985.3
J-117	903.6	Zone - 1	0	950.77	462.0	371940	5526396.2
J-118	903.59	Zone - 1	0	950.77	461.7	371957.8	5526407.5
J-119	905.32	Zone - 1	0	950.77	444.8	372120.5	5526518.2
J-120	905.42	Zone - 1	0	950.77	443.8	372139	5526532.3
J-123	903	Zone - 1	0.0000	950.76	463	372579.9	5526377.8
J-124	904	Zone - 1	0.0000	950.76	461.1	372577.6	5526401.1
J-125	904	Zone - 1	0	950.77	455.5	372093.3	5526420.4
J-126	904	Zone - 1	0	950.77	455.6	372118	5526420.0
J-127	901	Zone - 1	0	950.77	491.8	372144.5	5526121.6
J-128	899	Zone - 1	0	950.77	502.5	372158.7	5526100.6
J-129	906	Zone - 1	0	950.77	443.0	371858.4	5526847.1
J-130	905.50	Zone - 1	0	950.77	443.0	371864.0	5526873.0
J-131	903.02	Zone - 1	0.0000	950.77	467.3	372263.6	5526244.8
J-132	902.6	Zone - 1	0	950.77	472	372263.9	5526218.8
J-133	910.0	Zone - 1	0	950.77	399.0	372422.5	5526754.7
J-134	909.9	Zone - 1	0.0000	950.77	400	372398.6	5526770.7
J-135	910.0	Zone - 1	0.0000	950.77	399	372398.6	5526719.1
J-136	909.8	Zone - 1	0	950.77	401	372375	5526735.1
J-140	902.5	Zone - 1	0	950.76	472	372336	5526270.8
J-141	903.3	Zone - 1	0	950.76	465	372340.9	5526301.3
J-142	901.2	Zone - 1	0	950.77	485	372331.3	5526078.7
J-143	900.1	Zone - 1	0	950.77	496	372345.4	5526023.6

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J-144	899.6	Zone - 1	0	950.77	501	372111.5	5526121.6
J-145	904.0	Zone - 1	0	950.77	458	371939.2	5526435.6
J-146	902.1	Zone - 1	0	950.77	476	371987	5526033.2
J-147	901.5	Zone - 1	0	950.77	482	372022.4	5526032.3
J-148	905.0	Zone - 1	0	950.79	448	371413.6	5526188.1
J-149	903.30	Zone - 1	0	950.76	464.5	372361.0	5526334.5
J-150	902.50	Zone - 1	0.0000	950.77	472.4	372363.1	5526242.1
J-151	902.50	Zone - 1	0.0000	950.77	472	372321.5	5526243.0
J-152	904.50	Zone - 1	0	950.77	452.8	371709.4	5526480.0
J-153	904.5	Zone - 1	0.0936	950.77	452.8	371674.6	5526456.7
J-154	905.9	Zone - 1	0	950.77	439.1	371660.5	5526824.9
J-156	903.1	Zone - 1	0	950.77	466.3	372160	5526295.7
J-157	902.9	Zone - 1	0	950.77	468.3	372115.3	5526296.3
J-159	903.9	Zone - 1	0	950.77	458.5	372118	5526393.0
J-160	906.0	Zone - 1	0	950.77	438	371331.3	5526695.6
J-161	904.0	Zone - 1	0	950.77	458	371879.3	5526502.9
J-162	904.0	Zone - 1	0	950.77	458	371852.7	5526542.4
J-163	904.8	Zone - 1	0.000	950.77	450	371854.3	5526615.9
J-164	904.8	Zone - 1	0.0607	950.77	450	371902.6	5526614.8
J-165	904.80	Zone - 1	0.0405	950.77	449.9	371781.7	5526657.4
J-166	904.80	Zone - 1	0	950.77	449.9	371772.6	5526609.6
J-167	905.50	Zone - 1	0	950.77	443.1	371467.0	5526523.7
J-168	905.9	Zone - 1	0	950.77	439.1	371659.5	5526775.9
J-169	903.00	Zone - 1	0	950.78	467.6	371738.3	5525727.9
J-170	902.70	Zone - 1	0.0506	950.78	470.6	371740	5525776.9
J-171	904	Zone - 1	0.0000	950.77	459.8	372117.3	5526384.7
J-172	901	Zone - 1	0.0000	950.77	484.4	372288	5526138.3
J-173	903	Zone - 1	0	950.77	467.2	371866.5	5526143.8
J-174	903	Zone - 1	0.0000	950.77	470.0	371886.2	5526191.6
J-175	905	Zone - 1	0.0000	950.77	448.9	372026.7	5526602.5
J-176	905	Zone - 1	0	950.77	448.1	371997.5	5526645.5
J-177	904	Zone - 1	0.0000	950.77	457.2	372125.5	5526739.2
J-178	905	Zone - 1	0.0000	952.28	462.8	371342.2	5526154.4
J-179	903	Zone - 1	0	950.76	472.4	372556.4	5526329.0
J-180	905	Zone - 1	0.0000	950.78	452.9	371517.9	5526325.2
J-181	905	Zone - 1	0	950.77	452.9	371563.0	5526355.7
J-183	902	Zone - 1	0	950.78	473.2	371741.1	5525833.6
J-184	908.47	Zone - 1	0	950.77	414.0	372299.8	5526787.1
J-185	906.36	Zone - 1	0	950.77	434.6	372264.7	5526833.5
J-186	899.78	Zone - 1	0	950.77	499.0	372253.9	5525865.6
J-187	900.00	Zone - 1	0	950.77	496.8	372253.5	5525804.9
J-188	903.30	Zone - 1	0.0000	950.76	464.5	372333.3	5526304.1
J-189	901.18	Zone - 1	0	950.76	485.3	372382.3	5526102.3
J-190	905.50	Zone - 1	0	950.77	443.1	371489.2	5526464.9

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J-191	904.59	Zone - 1	0	950.79	452.1	371423.2	5526129.7
J-192	905.00	Zone - 1	0	950.79	448.1	371422.3	5526193.9
J-193	903.2	Zone - 1	0.0000	950.77	465.2	372116.0	5526327.6
J-194	901	Zone - 1	0	950.77	483.2	372145.2	5525980.7
J-195	902	Zone - 1	0	950.77	473.6	372040.0	5526302.2
J-196	902.02	Zone - 1	0.0000	950.77	477.1	371988.3	5526258.8
J-197	901.6	Zone - 1	0.1214	950.77	480.8	371988.0	5526189.0
J-198	906.5	Zone - 1	0	950.77	433.3	371334	5526825.7
J-199	905.3	Zone - 1	0	950.77	445.0	371857.9	5526769.6
J-200	905.3	Zone - 1	0	950.77	445.0	371844	5526749.3
J-201	906.4	Zone - 1	0	950.77	434.2	371736.2	5526867.3
J-202	902.0	Zone - 1	0.1012	950.76	477.3	372341.0	5526164.5
J-203	902.7	Zone - 1	0	950.77	470.2	371888.5	5526191.6
J-204	903.2	Zone - 1	0.0607	950.77	465.8	371890.8	5526267.1
J-205	902.7	Zone - 1	0	950.77	470.9	372127	5526815.4
J-206	904.50	Zone - 1	0	950.78	452.9	371549	5526279.5
J-207	904.0	Zone - 1	0.0000	950.77	457.8	371608	5526319.5
J-208	904.50	Zone - 1	0.0000	950.77	452.9	371716.0	5526470.1
J-209	903.09	Zone - 1	0	950.77	466.7	371714.2	5526391.3
J-210	902.45	Zone - 1	0	950.77	472.9	372114.2	5526247.7
J-211	909.98	Zone - 1	0.0545	950.77	399.2	372413.1	5526792.4
J-212	905.00	Zone - 1	0	950.77	447.9	371559.1	5526570.7
J-213	905	Zone - 1	0	950.77	449.9	371854.2	5526609.4
J-214	904	Zone - 1	0.1565	950.76	457.7	372526.7	5526468.8
J-217	906.70	Zone - 1	0	950.77	431.3	371474.7	5526779.8
J-218	905.60	Zone - 1	0	950.77	442.1	371472.1	5526693.6
J-219	900.0	Zone - 1	0	950.77	496.9	372109.2	5526030.0
J-220	903.2	Zone - 1	0.1012	950.78	465.7	371603.0	5525837.3
J-221	903.34	Zone - 1	0	950.77	464	371605.5	5525926.2
J-222	904.00	Zone - 1	0	950.77	457.8	371663.4	5526249.1
J-223	904.0	Zone - 1	0.2834	950.77	457.8	371613.3	5526323.1
J-224	904.00	Zone - 1	0	950.77	457.7	371929.3	5526428.8
J-225	906.50	Zone - 1	0.121	950.77	433	371382.7	5526790.1
J-227	901.00	Zone - 1	0.1498	950.76	487.0	372561.4	5526163.8
J-228	905.7	Zone - 1	0.1417	950.77	441.1	371561	5526673.2
J-229	904.00	Zone - 1	0	950.78	457.8	371423.5	5525842.1
J-230	903.30	Zone - 1	0	950.78	464.7	371421.0	5525736.3
J-231	909.5	Zone - 1	0.0397	950.77	403.9	372417.3	5526631.1
J-232	904.7	Zone - 1	0	950.77	451.4	371617.9	5526150.4
J-233	905.3	Zone - 1	0	950.78	445.1	371615.0	5526043.0
J-234	905.7	Zone - 1	0	950.77	440.7	372121.3	5526558.6
J-235	907.49	Zone - 1	0.0278	950.77	423.6	372220.9	5526625.9
J-236	907.74	Zone - 1	0.0442	950.77	421.1	372276.2	5526524.9
J-237	901.70	Zone - 1	0.0506	950.77	480.2	371987	5525916.0

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J-238	899.69	Zone - 1	0	950.76	499.8	372513.3	5525985.3
J-239	900.39	Zone - 1	0	950.77	493.0	372398.9	5526032.2
J-240	898.00	Zone - 1	0	950.77	516.4	372234.3	5526026.8
J-241	904	Zone - 1	0	950.77	457.7	371476.0	5525929.7
J-242	907	Zone - 1	0	950.77	426.4	371518	5526874.9
J-243	901	Zone - 1	0.0000	950.77	487.0	372558	5526018.1
J-245	900.07	Zone - 1	0.0000	950.77	496.2	372233	5525877.7
J-246	904.50	Zone - 1	0	950.78	452.9	371550.7	5526280.7
J-247	905.40	Zone - 1	0.1619	950.78	444.1	371458.9	5526412.7
J-248	906.0	Zone - 1	0.0101	950.78	438.3	371291	5526085.4
J-249	904.5	Zone - 1	0	950.77	452.9	371715.8	5526458.7
J-250	904.58	Zone - 1	0.0685	950.76	452.0	372690	5526591.5
J-251	900.0	Zone - 1	0	950.77	497.3	372200.2	5525679.6
J-252	899.71	Zone - 1	0	950.77	499.7	371984.2	5525730.1
J-254	905.0	Zone - 1	0.0000	952.29	462.8	371335.6	5526166.5
J-255	902.6	Zone - 1	0	950.78	471.5	371617.0	5525731.1
J-256	903.5	Zone - 1	0.1316	950.78	462.7	371539.5	5525839.0
J-257	903.30	Zone - 1	0	950.78	464.7	371456.8	5525735.4
J-259	899.86	Zone - 1	0	950.77	498.2	372105.3	5525700.8
J-260	904.94	Zone - 1	0	950.78	448.6	371593.8	5526043.6
J-261	906.00	Zone - 1	0.1012	950.78	438.3	371469.4	5526046.9
J-262	904	Zone - 1	0.1417	950.77	457.8	371731.5	5526040.0
J-263	903	Zone - 1	0	950.77	469.5	371887.8	5526035.8
J-264	903.8	Zone - 1	0	950.77	460	371786.7	5526145.9
J-265	901.77	Zone - 1	0	950.77	479.5	371987.9	5526152.2
J-266	902.05	Zone - 1	0	950.77	476.8	372112.8	5526174.4
J-268	903.00	Zone - 1	0	950.77	467.5	372190.8	5526246.0
J-270	903.82	Zone - 1	0	950.76	459.4	372564.3	5526418.6
J-271	904.80	Zone - 1	0	950.76	449.8	372587.3	5526514.4
J-272	907.87	Zone - 1	0.0000	950.77	419.8	372238.5	5526637.7
J-273	909.87	Zone - 1	0	950.77	400.3	372402.0	5526619.5
J-274	904.00	Zone - 1	0.2024	950.77	457.7	371867.4	5526387.0
J-277	906.50	Zone - 1	0	950.77	433.3	371661.8	5526869.0
J-278	904.46	Zone - 1	0	950.77	453.2	371996.4	5526581.9
J-279	908.25	Zone - 1	0	950.77	416.1	372286.0	5526777.7
J-280	907.43	Zone - 1	0	950.77	424.1	372261.3	5526516.6
J-281	905.08	Zone - 1	0	950.77	447.1	372150.3	5526455.3
J-282	905	Zone - 1	0	950.77	449.9	371835.0	5526609.3
J-283	903	Zone - 1	0.0000	950.78	469.5	371672.9	5525835.2
J-285	900.41	Zone - 1	0	950.77	493	372085.4	5526030.5
J-286	901.25	Zone - 1	0	950.77	485	372301.1	5526115.8
J-287	902.56	Zone - 1	0.0000	950.77	471.8	372313.2	5526243.2
J-291	910.00	Zone - 1	0	950.77	399.0	372423.4	5526837.1
J-297	901.00	Zone - 1	0	950.77	487.0	372726.2	5525986.5

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J-298	907.00	Zone - 1	0	950.76	428.3	372739.3	5526632.9
J-309	900.31	Zone - 1	0	950.77	493.8	371985.1	5525750.4
J-310	899.95	Zone - 1	0	950.77	497.3	372230.9	5525675.0
J-311	902.7	Zone - 1	0.0000	950.78	470.8	371599.4	5525731.4
J-312	900.01	Zone - 1	0.0000	950.77	496.8	372232.9	5525795.7
J-319	896.00	Zone - 1	0	950.77	536.0	372509.2	5525238.4
J-320	899.00	Zone - 1	0	950.77	507	372229.7	5525248.1
J-321	899.00	Zone - 1	0	950.77	506.6	372229.2	5525187.1
J-322	899.95	Zone - 1	0.0000	950.77	497.4	372230.9	5525612.1
J-328	901.84	Zone - 1	0	950.77	478.8	372273.8	5526172.2
J-329	901.9	Zone - 1	0	950.77	478.3	372227.0	5526171.0
J-332	906.0	Zone - 1	0	950.77	438.2	371808.0	5526859.1
J-333	907.00	Zone - 1	0.0000	950.76	428.3	372928.0	5526676.4
J-334	905.00	Zone - 1	0.0000	950.77	447.9	372113.1	5526438.2
J-335	903.5	Zone - 1	0	950.77	462.6	372110.5	5526311.9
J-336	897	Zone - 1	0	950.77	526.2	372384.6	5525441.9
J-337	897	Zone - 1	0	950.77	526.2	372384.7	5525318.7
J-338	897	Zone - 1	0	950.77	526	372448.2	5525279.3
J-339	897	Zone - 1	0	950.77	526.2	372448.5	5525253.8
J-340	897	Zone - 1	0	950.77	530	372448.3	5525240.5
J-341	897	Zone - 1	0	950.77	526	372441.3	5525254.1
J-342	897	Zone - 1	0	950.77	526	372384.7	5525331.7
J-343	897	Zone - 1	0	950.77	526	372368.7	5525315.8
J-344	899	Zone - 1	0	950.77	508	372245.7	5525247.4
J-345	906	Zone - 1	0	950.78	438	370724.2	5525916.4
J-346	906	Zone - 1	0	950.78	438	370475.7	5525887.1

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Label	Elevation (m)	Zone	Demand (L/s)	Hydraulic Grade (m)	Pressure (kPa)	X (m)	Y (m)
FH 1	902.6	Zone - 1	0.2226	950.76	471.2	371772.8	5525921.8
FH 2	902	Zone - 1	0	950.76	480.1	371966.2	5525916.3
FH 3	904	Zone - 1	0	950.76	455.7	372118.5	5526438.2
FH 4	903	Zone - 1	0	950.76	469.4	372115.6	5526311.8
FH 5	899.99	Zone - 1	0.0000	950.76	496.8	372232.6	5525771.2
FH 6	899.94	Zone - 1	0	950.76	497.3	372231.3	5525592.7
FH 7	901.50	Zone - 1	0	950.76	482.1	372538	5526231.5
FH 8	900.6	Zone - 1	0	950.76	491	372558.6	5526065.7
FH 9	909.50	Zone - 1	0	950.76	403.8	372523.7	5526711.5
FH 10	907.00	Zone - 1	0.1104	950.76	428.2	372711.0	5526853.5
FH 11	907.2	Zone - 1	0.0000	950.76	426.3	371521.6	5526874.8
FH 12	906.70	Zone - 1	0.0000	950.76	431.2	371661.5	5526858.1
FUT J-292	908.00	Zone - 1	0.0000	950.76	418.5	372588	5526836.5
FUT J-293	908.0	Zone - 1	0	950.76	418.5	372627.6	5526855.6
FUT J-294	907.0	Zone - 1	0.000	950.76	428.2	372930.2	5526849.6
FUT J-295	907.0	Zone - 1	0	950.76	428.2	372930.2	5526785.5
FUT J-296	899.0	Zone - 1	0	950.76	506.5	372915.5	5525984.9
FUT J-299	907.0	Zone - 1	0	950.76	428.2	372742.4	5526686.8
FUT J-300	907.0	Zone - 1	0	950.76	428.2	372749.9	5526726.0
FUT J-301	907.00	Zone - 1	0.0000	950.76	428	372831.4	5526787.0
FUT J-302	905.00	Zone - 1	0	950.77	447.9	371338	5526051.5
FUT J-303	905.0	Zone - 1	0	950.77	447.9	370923.4	5525906.3
FUT J-304	905.0	Zone - 1	0	950.77	447.9	370924.1	5525736.9
FUT J-305	901.0	Zone - 1	0.6600	950.76	487.0	371415.7	5525254.3
FUT J-306	900.0	Zone - 1	0	950.76	496.8	371599.9	5525253.9
FUT J-307	900.00	Zone - 1	1	950.76	496.8	371975.9	5525251.5
FUT J-308	901.00	Zone - 1	0.0000	950.76	487.0	371976.1	5525505.4
FUT J-313	897.00	Zone - 1	0.4858	950.76	526.1	372432.9	5525793.4
FUT J-314	896.00	Zone - 1	0	950.76	535.9	372431.1	5525606.5
FUT J-323	899.0	Zone - 1	0	950.76	506.5	373038.0	5525983.9
FUT J-324	910.0	Zone - 1	0	950.76	398.9	371398.4	5527653.3
FUT J-325	906.0	Zone - 1	0	950.77	438.2	371318.2	5526262.7
FUT J-326	905.0	Zone - 1	0	950.77	447.9	371177.0	5525993.5
FUT J-327	904	Zone - 1	0.1980	950.76	456.4	371177.3	5525736.9
FUT J-330	910	Zone - 1	0	950.76	398.9	371344	5527653.7
J-9	899.8	Zone - 1	0.0000	950.76	498.4	372231	5525582.1
J-11	906.7	Zone - 1	0	950.77	431.3	371428.6	5526468.3
J-12	906.7	Zone - 1	0	950.77	431.3	371428.6	5526468.3
J-20	905.9	Zone - 1	0	950.76	439.1	371381.3	5526696.9
J-21	908.5	Zone - 1	0.0000	950.76	413.6	371386	5526922.6
J-22	908.5	Zone - 1	0.0000	950.76	413.6	371386.4	5526922.6
J-23	908.2	Zone - 1	0	950.76	416.5	371384.8	5526877.5
J-24	908.2	Zone - 1	0	950.76	416.5	371385.4	5526878.2
J-25	905.9	Zone - 1	0	950.76	439.1	371376.6	5526694.3
J-26	905.9	Zone - 1	0	950.76	439.1	371381.2	5526694.2
J-27	906.7	Zone - 1	0.0000	950.76	431.2	371660.2	5526858.1

J-29	905.5	Zone - 1	0.0000	950.77	443.0	371468.7	5526580.9
J-30	905.5	Zone - 1	0.0000	950.77	443.0	371468.6	5526579.3
J-31	908.20	Zone - 1	0.1417	950.76	416.5	371385.5	5526880.1
J-32	909	Zone - 1	0	950.76	411.6	371388.6	5527018.3
J-33	909	Zone - 1	0	950.76	411.6	371389	5527020.3
J-34	907	Zone - 1	0.0000	950.76	426.3	371521.5	5526872.7
J-36	906	Zone - 1	0	950.77	439.1	371345.6	5526403.1
J-37	906	Zone - 1	0.0000	950.77	439.1	371343.4	5526403.1
J-38	906	Zone - 1	0	950.77	443.0	371468.5	5526574.8
J-39	905.50	Zone - 1	0	950.77	443.0	371468.4	5526572.6
J-40	905.50	Zone - 1	0.0000	950.77	443.0	371477.6	5526572.4
J-41	905.50	Zone - 1	0	950.77	443.0	371475.0	5526572.4
J-42	905.5	Zone - 1	0	950.77	443.0	371462.0	5526571.6
J-43	905.5	Zone - 1	0	950.77	443.0	371461.9	5526569.0
J-44	905.9	Zone - 1	0.1417	950.77	439.1	371348.2	5526403.0
J-45	906.7	Zone - 1	0	950.77	431.3	371431.2	5526467.2
J-46	905.8	Zone - 1	0	950.77	440.1	371339.0	5526570.9
J-47	905.8	Zone - 1	0	950.77	440.1	371339.1	5526573.8
J-48	905.9	Zone - 1	0	950.77	439.1	371348	5526400.0
J-49	905.5	Zone - 1	0	950.77	443.0	371462.0	5526575.0
J-50	905.5	Zone - 1	0	950.77	443.0	371465.1	5526574.9
J-51	905.5	Zone - 1	0	950.77	443.0	371471.6	5526572.5
J-52	907.2	Zone - 1	0	950.76	426.3	371521.4	5526869.3
J-53	905.8	Zone - 1	0	950.77	440.1	371339.2	5526577.4
J-54	906.7	Zone - 1	0.0000	950.76	431.2	371656.4	5526858.2
J-55	905.8	Zone - 1	0	950.77	440.1	371335.4	5526577.5
J-56	905.9	Zone - 1	0	950.76	439.1	371377	5526690.2
J-57	908.7	Zone - 1	0	950.76	411.6	371388.5	5527014.0
J-58	908.5	Zone - 1	0	950.76	413.6	371381.1	5526922.8
J-59	905.9	Zone - 1	0	950.76	439.1	371376.8	5526685.5
J-60	899.9	Zone - 1	0	950.76	497.7	372231.2	5525588.6
J-61	905.9	Zone - 1	0.0000	950.77	439.1	371349.8	5526473.6
J-62	905.9	Zone - 1	0	950.77	439.1	371349.6	5526467.6
J-63	905.80	Zone - 1	0.0000	950.77	440.1	371346.1	5526577.2
J-64	905.8	Zone - 1	0.0607	950.77	440.1	371352.1	5526577.1
J-65	905.8	Zone - 1	0	950.77	440.1	371351.9	5526570.9
J-66	903.3	Zone - 1	0	950.76	464.4	372411.0	5526359.7
J-67	903.3	Zone - 1	0	950.76	464.4	372412.6	5526365.9
J-68	904.8	Zone - 1	0	950.76	449.8	371655.1	5526568.6
J-69	904.8	Zone - 1	0	950.76	449.8	371654.9	5526560.6
J-70	906.7	Zone - 1	0	950.77	431.3	371420	5526472.1
J-71	900.1	Zone - 1	0.000	950.76	496.1	372233.2	5525866.9
J-72	904.8	Zone - 1	0	950.77	450.1	371447.3	5526118.6
J-73	905.1	Zone - 1	0.0000	950.77	447.2	371447	5526108.4
J-74	905.9	Zone - 1	0	950.77	439.1	371361.0	5526473.4
J-75	904.8	Zone - 1	0	950.76	449.8	371856.0	5526691.9
J-76	904.8	Zone - 1	0	950.76	449.8	371856.0	5526698.6
J-77	908.9	Zone - 1	0	950.76	410.0	372390.5	5526839.6

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J-78	908.8	Zone - 1	0	950.76	410.4	372378	5526839.9
J-79	904.8	Zone - 1	0	950.76	449.8	371842.9	5526676.4
J-80	904.8	Zone - 1	0	950.76	449.8	371856	5526676.3
J-81	905.0	Zone - 1	0	950.78	448.1	371355.5	5526156.4
J-82	905.0	Zone - 1	0	950.78	448.1	371369.1	5526157.1
J-83	906.0	Zone - 1	0	950.76	438.4	372112	5526660.4
J-84	905.9	Zone - 1	0	950.76	438.6	372123.8	5526668.2
J-85	903.9	Zone - 1	0	950.76	459.0	372068	5526385.8
J-86	904.0	Zone - 1	0	950.76	457.4	372068.0	5526400.4
J-87	900.07	Zone - 1	0	950.76	496.1	372233.2	5525872.6
J-88	899.6	Zone - 1	0.0000	950.76	500.3	372248.2	5525872.5
J-89	900.21	Zone - 1	0	950.76	494.7	372218.1	5525874.8
J-90	900.1	Zone - 1	0	950.76	496.1	372233.3	5525874.4
J-91	905.0	Zone - 1	0	950.78	448.0	371382.0	5526166.7
J-92	899.2	Zone - 1	0	950.76	504.6	372248	5525592.6
J-94	908.20	Zone - 1	0	950.76	416.5	371386.1	5526897.0
J-96	899.60	Zone - 1	0	950.76	500.7	372249.6	5525771.1
J-97	899.60	Zone - 1	0	950.76	500.7	372250	5525774.3
J-98	900	Zone - 1	0.0000	950.76	497	372232.6	5525774.4
J-99	900	Zone - 1	0.0000	950.76	497.5	372231.2	5525590.6
J-100	900	Zone - 1	0	950.76	497.2	372248.4	5525590.5
J-101	906	Zone - 1	0	950.77	438.1	371428	5526048.0
J-102	906	Zone - 1	0	950.77	438.1	371445.4	5526047.5
J-103	910	Zone - 1	0	950.76	403.6	372353.7	5526715.7
J-104	910	Zone - 1	0	950.76	401.4	372368.2	5526725.5
J-105	905.93	Zone - 1	0	950.76	438.7	372138.5	5526678.0
J-106	903.30	Zone - 1	0.0000	950.76	464.4	372368.2	5526361.8
J-107	903.3	Zone - 1	0	950.76	464	372381.9	5526373.8
J-108	905.3	Zone - 1	0	950.76	445.4	372124.3	5526687.1
J-109	904.5	Zone - 1	0.1320	950.77	453	371516.2	5526257.4
J-110	904.5	Zone - 1	0.0131	950.77	453	371526.8	5526241.6
J-111	900.6	Zone - 1	0	950.76	491	372399	5526042.1
J-112	900.2	Zone - 1	0	950.76	494	372399	5526022.3
J-113	902.0	Zone - 1	0	950.76	477	372530.0	5526256.5
J-114	902.0	Zone - 1	0	950.76	477	372531.2	5526276.6
J-115	901.4	Zone - 1	0	950.76	483	372084.5	5526005.4
J-116	901.4	Zone - 1	0	950.76	483	372084.3	5525985.3
J-117	903.6	Zone - 1	0	950.76	462	371940.2	5526396.2
J-118	903.6	Zone - 1	0	950.76	462	371958	5526407.5
J-119	905.3	Zone - 1	0	950.76	445	372120.5	5526518.2
J-120	905.4	Zone - 1	0	950.76	444	372138.8	5526532.3
J-123	903.49	Zone - 1	0	950.76	462.6	372579.9	5526377.8
J-124	903.65	Zone - 1	0.0000	950.76	461.0	372577.6	5526401.1
J-125	904.23	Zone - 1	0.0000	950.76	455	372093.3	5526420.4
J-126	904.22	Zone - 1	0	950.76	455.5	372118.1	5526420.0
J-127	900.5	Zone - 1	0.0000	950.76	491.7	372144.5	5526121.6
J-128	899.4	Zone - 1	0	950.76	502.4	372158.7	5526100.6
J-129	905.5	Zone - 1	0	950.76	443.0	371858	5526847.1

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J-130	905.5	Zone - 1	0	950.76	443.0	371864.0	5526873.0
J-131	903.0	Zone - 1	0	950.76	467.2	372264	5526244.8
J-132	902.6	Zone - 1	0	950.76	472	372263.9	5526218.8
J-133	910.0	Zone - 1	0	950.76	399	372422.5	5526754.7
J-134	909.9	Zone - 1	0	950.76	400	372398.6	5526770.7
J-135	910.0	Zone - 1	0.000	950.76	399	372398.6	5526719.1
J-136	909.8	Zone - 1	0.0000	950.76	401	372374.7	5526735.1
J-140	902.50	Zone - 1	0.0000	950.76	472.3	372335.7	5526270.8
J-141	903.30	Zone - 1	0	950.76	464.4	372340.9	5526301.3
J-142	901.24	Zone - 1	0	950.76	484.6	372331.3	5526078.7
J-143	900.1	Zone - 1	0	950.76	495.4	372345.4	5526023.6
J-144	899.57	Zone - 1	0	950.76	501.0	372111.5	5526121.6
J-145	904.00	Zone - 1	0.1012	950.76	457.6	371939	5526435.6
J-146	902	Zone - 1	0.0000	950.76	475.9	371987.4	5526033.2
J-147	901	Zone - 1	0.0000	950.76	482.3	372022	5526032.3
J-148	905	Zone - 1	0	950.78	448.0	371413.6	5526188.1
J-149	903	Zone - 1	0.0000	950.76	464.4	372361.0	5526334.5
J-150	903	Zone - 1	0.0000	950.76	472.3	372363.1	5526242.1
J-151	903	Zone - 1	0	950.76	472.3	372321.5	5526243.0
J-152	905	Zone - 1	0.0000	950.76	452.8	371709.4	5526480.0
J-153	905	Zone - 1	0.0936	950.76	452.8	371674.6	5526456.7
J-154	906	Zone - 1	0	950.76	439.1	371660.5	5526824.9
J-156	903	Zone - 1	0.0000	950.76	466.2	372159.6	5526295.7
J-157	903	Zone - 1	0	950.76	468.2	372115.3	5526296.3
J-159	904	Zone - 1	0	950.76	458.4	372117.5	5526393.0
J-160	906.00	Zone - 1	0	950.76	438.1	371331.3	5526695.6
J-161	904.00	Zone - 1	0	950.76	457.6	371879.3	5526502.9
J-162	904.00	Zone - 1	0	950.76	457.6	371852.7	5526542.4
J-163	904.80	Zone - 1	0	950.76	449.8	371854.3	5526615.9
J-164	904.80	Zone - 1	0.0607	950.76	449.8	371902.6	5526614.8
J-165	904.80	Zone - 1	0	950.76	449.8	371781.7	5526657.4
J-166	904.80	Zone - 1	0	950.76	449.8	371772.6	5526609.6
J-167	905.50	Zone - 1	0	950.77	443.0	371467.0	5526523.7
J-168	905.90	Zone - 1	0	950.76	439.1	371659.5	5526775.9
J-169	903.0	Zone - 1	0.1012	950.76	467.5	371738.3	5525727.9
J-170	903	Zone - 1	0	950.76	470.4	371739.6	5525776.9
J-171	904	Zone - 1	0	950.76	459.7	372117.3	5526384.7
J-172	901.27	Zone - 1	0.0000	950.76	484.3	372288.2	5526138.3
J-173	903.0	Zone - 1	0.1012	950.76	467.1	371866.5	5526143.8
J-174	902.8	Zone - 1	0	950.76	469.9	371886	5526191.6
J-175	904.9	Zone - 1	0	950.76	448.8	372026.7	5526602.5
J-176	905.0	Zone - 1	0	950.76	448.0	371998	5526645.5
J-177	904.1	Zone - 1	0	950.76	457.1	372125.5	5526739.2
J-178	905.0	Zone - 1	0.0000	952.27	462.6	371342.2	5526154.4
J-179	902.5	Zone - 1	0	950.76	472.3	372556.4	5526329.0
J-180	904.5	Zone - 1	0.0000	950.77	452.8	371517.9	5526325.2
J-181	904.5	Zone - 1	0	950.77	452.8	371563	5526355.7
J-183	902.43	Zone - 1	0	950.76	473.0	371741	5525833.6

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J-184	908.5	Zone - 1	0.2024	950.76	413.9	372300	5526787.1
J-185	906.36	Zone - 1	0.0607	950.76	434.5	372264.7	5526833.5
J-186	899.78	Zone - 1	0	950.76	498.9	372253.9	5525865.6
J-187	900.00	Zone - 1	0	950.76	496.7	372253.5	5525804.9
J-188	903.30	Zone - 1	0.0000	950.76	464.4	372333.3	5526304.1
J-189	901.18	Zone - 1	0	950.76	485.2	372382.3	5526102.3
J-190	906	Zone - 1	0	950.77	443.0	371489.2	5526464.9
J-191	905	Zone - 1	0.0000	950.78	452.0	371423.2	5526129.7
J-192	905.00	Zone - 1	0	950.78	448.0	371422.3	5526193.9
J-193	903.23	Zone - 1	0	950.76	465.1	372116.0	5526327.6
J-194	901.4	Zone - 1	0	950.76	483.0	372145.2	5525980.7
J-195	902.4	Zone - 1	0.0202	950.76	473.5	372040.0	5526302.2
J-196	902.02	Zone - 1	0	950.76	477	371988.3	5526258.8
J-197	901.64	Zone - 1	0	950.76	480.7	371988.0	5526189.0
J-198	906.5	Zone - 1	0.0000	950.76	433.2	371334.3	5526825.7
J-199	905.30	Zone - 1	0	950.76	444.9	371857.9	5526769.6
J-200	905.30	Zone - 1	0.000	950.76	445	371844.5	5526749.3
J-201	906.40	Zone - 1	0.0607	950.76	434.2	371736.2	5526867.3
J-202	902.0	Zone - 1	0.1012	950.76	477.2	372341	5526164.5
J-203	902.73	Zone - 1	0	950.76	470.0	371888.5	5526191.6
J-204	903.18	Zone - 1	0	950.76	465.6	371890.8	5526267.1
J-205	902.7	Zone - 1	0.0810	950.76	470.8	372127.2	5526815.4
J-206	904.5	Zone - 1	0	950.77	452.8	371548.9	5526279.5
J-207	904.0	Zone - 1	0	950.77	457.7	371608.1	5526319.5
J-208	904.5	Zone - 1	0	950.76	452.8	371716.0	5526470.1
J-209	903.09	Zone - 1	0.0000	950.76	466.6	371714.2	5526391.3
J-210	902.45	Zone - 1	0.0506	950.76	472.8	372114.2	5526247.7
J-211	909.98	Zone - 1	0.0545	950.76	399.1	372413	5526792.4
J-212	905.00	Zone - 1	0	950.76	447.9	371559.1	5526570.7
J-213	904.80	Zone - 1	0	950.76	449.8	371854.2	5526609.4
J-214	904.00	Zone - 1	0	950.76	457.6	372526.7	5526468.8
J-217	907	Zone - 1	0	950.76	431.2	371474.7	5526779.8
J-218	906	Zone - 1	0	950.76	442.0	371472	5526693.6
J-219	900	Zone - 1	0.0405	950.76	496.8	372109	5526030.0
J-220	903.20	Zone - 1	0.1012	950.76	465.5	371603	5525837.3
J-221	903.34	Zone - 1	0	950.76	464.1	371605.5	5525926.2
J-222	904.00	Zone - 1	0.0000	950.77	457.7	371663.4	5526249.1
J-223	904.0	Zone - 1	0.2834	950.77	457.7	371613	5526323.1
J-224	904.0	Zone - 1	0	950.76	457.6	371929.3	5526428.8
J-225	906.50	Zone - 1	0.1214	950.76	433.2	371383	5526790.1
J-227	901.0	Zone - 1	0	950.76	487.0	372561.4	5526163.8
J-228	905.70	Zone - 1	0	950.76	441.0	371561.2	5526673.2
J-229	904.0	Zone - 1	0.0000	950.77	457.7	371423.5	5525842.1
J-230	903.3	Zone - 1	0	950.76	464.5	371421.0	5525736.3
J-231	909.5	Zone - 1	0.0397	950.76	403.8	372417.3	5526631.1
J-232	904.65	Zone - 1	0	950.76	451.3	371617.9	5526150.4
J-233	905.30	Zone - 1	0	950.76	444.9	371615.0	5526043.0
J-234	905.74	Zone - 1	0	950.76	440.6	372121.3	5526558.6

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J-235	907.49	Zone - 1	0.0278	950.76	423.5	372220.9	5526625.9
J-236	908	Zone - 1	0.0442	950.76	421.0	372276.2	5526524.9
J-237	902	Zone - 1	0	950.76	480.1	371987.0	5525916.0
J-238	899.7	Zone - 1	0	950.75	500	372513.3	5525985.3
J-239	900.39	Zone - 1	0	950.76	492.9	372398.9	5526032.2
J-240	898.00	Zone - 1	0	950.76	516.3	372234.3	5526026.8
J-241	904.00	Zone - 1	0	950.76	457.6	371476.0	5525929.7
J-242	907.20	Zone - 1	0	950.76	426.3	371518.4	5526874.9
J-243	901.00	Zone - 1	0	950.76	487.0	372557.5	5526018.1
J-245	900.07	Zone - 1	0.0000	950.76	496.1	372233.3	5525877.7
J-246	904.50	Zone - 1	0	950.77	452.8	371550.7	5526280.7
J-247	905.40	Zone - 1	0.1619	950.77	444.0	371458.9	5526412.7
J-248	906.00	Zone - 1	0	950.77	438.2	371290.9	5526085.4
J-249	904.50	Zone - 1	0	950.76	452.8	371715.8	5526458.7
J-250	904.58	Zone - 1	0	950.76	451.9	372689.8	5526591.5
J-251	899.95	Zone - 1	0	950.76	497.2	372200.2	5525679.6
J-252	899.71	Zone - 1	0	950.76	499.6	371984.2	5525730.1
J-254	905	Zone - 1	0	952.27	462.6	371335.6	5526166.5
J-255	903	Zone - 1	0.1012	950.76	471.4	371617.0	5525731.1
J-256	903.50	Zone - 1	0	950.76	463	371539.5	5525839.0
J-257	903.30	Zone - 1	0	950.76	465	371456.8	5525735.4
J-259	899.86	Zone - 1	0.2226	950.76	498.1	372105.3	5525700.8
J-260	904.94	Zone - 1	0	950.76	448.5	371593.8	5526043.6
J-261	906.00	Zone - 1	0	950.77	438.1	371469.4	5526046.9
J-262	904.00	Zone - 1	0	950.76	457.7	371731.5	5526040.0
J-263	902.80	Zone - 1	0	950.76	469.4	371887.8	5526035.8
J-264	903.78	Zone - 1	0	950.76	459.8	371786.7	5526145.9
J-265	901.8	Zone - 1	0.1214	950.76	479.4	371987.9	5526152.2
J-266	902.05	Zone - 1	0.0000	950.76	476.7	372112.8	5526174.4
J-268	903.00	Zone - 1	0	950.76	467.4	372190.8	5526246.0
J-270	903.82	Zone - 1	0	950.76	459	372564.3	5526418.6
J-271	904.80	Zone - 1	0	950.76	449.8	372587.3	5526514.4
J-272	907.87	Zone - 1	0.0000	950.76	419.7	372238.5	5526637.7
J-273	909.87	Zone - 1	0	950.76	400.2	372402.0	5526619.5
J-274	904.0	Zone - 1	0	950.76	457.7	371867.4	5526387.0
J-277	906.5	Zone - 1	0	950.76	433.2	371661.8	5526869.0
J-278	904.46	Zone - 1	0.1012	950.76	453.1	371996.4	5526581.9
J-279	908.25	Zone - 1	0.0000	950.76	416.0	372286.0	5526777.7
J-280	907.4	Zone - 1	0	950.76	424.0	372261.3	5526516.6
J-281	905	Zone - 1	0	950.76	447.0	372150.3	5526455.3
J-282	905	Zone - 1	0	950.76	449.8	371835.0	5526609.3
J-283	903	Zone - 1	0	950.76	469	371672.9	5525835.2
J-285	900	Zone - 1	0	950.76	493	372085.4	5526030.5
J-286	901	Zone - 1	0	950.76	485	372301.1	5526115.8
J-287	903	Zone - 1	0	950.76	472	372313.2	5526243.2
J-291	910	Zone - 1	0	950.76	399	372423.4	5526837.1
J-297	901	Zone - 1	0	950.76	487	372726.2	5525986.5
J-298	907	Zone - 1	0	950.76	428	372739.3	5526632.9
J-309	900	Zone - 1	0	950.76	494	371985.1	5525750.4

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J-310	900	Zone - 1	0	950.76	497	372230.9	5525675.0
J-311	903	Zone - 1	0	950.76	471	371599.4	5525731.4
J-312	900	Zone - 1	0	950.76	497	372232.9	5525795.7
J-319	896	Zone - 1	0	950.76	536	372509.2	5525238.4
J-320	899	Zone - 1	0	950.76	507	372229.7	5525248.1
J-321	899	Zone - 1	0	950.76	507	372229.2	5525187.1
J-322	900	Zone - 1	0	950.76	497	372230.9	5525612.1
J-328	902	Zone - 1	0	950.76	479	372273.8	5526172.2
J-329	902	Zone - 1	0	950.76	478	372227.0	5526171.0
J-332	906	Zone - 1	0	950.76	438	371808.0	5526859.1
J-333	907	Zone - 1	0	950.76	428	372928.0	5526676.4
J-334	905	Zone - 1	0	950.76	448	372113.1	5526438.2
J-335	904	Zone - 1	0	950.76	463	372110.5	5526311.9
J-336	897	<None>	0	950.76	526	372384.6	5525441.9
J-337	897	<None>	0	950.76	526	372384.7	5525318.7
J-338	897	<None>	0	950.76	526	372448.2	5525279.3
J-339	897	<None>	0	950.76	526	372448.5	5525253.8
J-340	897	<None>	0	950.76	530	372448.3	5525240.5
J-341	897	<None>	0	950.76	526	372441.3	5525254.1
J-342	897	<None>	0	950.76	526	372384.7	5525331.7
J-343	897	<None>	0	950.76	526	372368.7	5525315.8
J-344	899	<None>	0	950.76	508	372245.7	5525247.4
J-345	906	<None>	0	950.77	438	370724.2	5525916.4
J-346	906	<None>	0	950.77	438	370475.7	5525887.1

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Label	Length (m)	Dia. (mm)	Material	Start Node	Stop Node	Hazen-Will. C	Flow (l/s)	Velocity (m/s)
P-8	8.0	250	PVC	R-1	Fire Pump	140.0	5.308	0.11
P-9	9	250	PVC	Fire Pump	J-254	140.0	5.308	0.11
P-10	14	300	PVC	J-254	J-178	140.0	9.918	0.14
P-11	7	250	PVC	R-1	PMP-401	140.0	1.537	0.03
P-12	7.00	250	PVC	PMP-401	J-254	140.0	1.537	0.03
P-13	6.00	250	PVC	R-1	PMP-402	140.0	1.537	0.03
P-14	8.00	250	PVC	PMP-402	J-254	140	1.537	0.03
P-15	8.0	250	PVC	R-1	PMP-403	140.0	1.536	0.03
P-16	9.00	250	PVC	PMP-403	J-254	140.0	1.536	0.03
P-17	6.00	250	PVC	J-207	J-223	140.0	3.592	0.07
P-19	121.0	200	PVC	J-255	J-169	140.0	0.508	0.02
P-20	116.00	150	Asbestos Cement	J-229	J-256	110.0	0.506	0.03
P-21	64.00	150	Asbestos Cement	J-256	J-220	110	0.375	0.02
P-22	36.0	200	PVC	J-230	J-257	140.0	0.741	0.02
P-24	167.0	150	PVC	J-221	FH 1	140.0	0.306	0.02
P-26	97.0	150	PVC	J-251	J-259	140.0	-0.172	0.01
P-27	125.0	150	PVC	J-259	J-252	140.0	-0.395	0.02
P-29	21.0	250	PVC	J-260	J-233	140.0	3.849	0.08
P-30	24.0	250	PVC	J-102	J-261	140.0	4.011	0.08
P-31	124.00	250	PVC	J-261	J-260	140.0	3.910	0.08
P-32	116.00	250	PVC	J-233	J-262	140	3.020	0.06
P-34	156.0	250	PVC	J-262	J-263	140.0	2.878	0.06
P-35	100.0	250	PVC	J-263	J-146	140.0	2.736	0.06
P-36	169.0	150	PVC	J-232	J-264	140.0	0.728	0.04
P-37	80.0	150	PVC	J-264	J-173	140.0	0.566	0.03
P-38	37.00	150	PVC	J-197	J-265	140.0	-0.119	0.01
P-39	119.00	150	PVC	J-265	J-146	140.0	-0.240	0.01
P-40	73.00	150	Asbestos Cement	J-210	J-266	110.0	0.123	0.01
P-43	77.00	150	Asbestos Cement	J-268	J-210	110.0	-0.440	0.02
P-44	71.0	200	PVC	J-227	FH 7	140.0	0.594	0.02
P-45	26.0	200	PVC	FH 7	J-113	140.0	0.594	0.02
P-46	22.0	250	PVC	J-124	J-270	140.0	0.660	0.01
P-47	63.0	250	PVC	J-270	J-214	140.0	0.660	0.01
P-48	76	250	PVC	J-214	J-271	140.0	0.503	0.01
P-49	128	250	PVC	J-271	J-250	140	0.503	0.01
P-50	21.0	150	Asbestos Cement	J-235	J-272	110	0.033	0
P-51	139.0	150	Asbestos Cement	J-272	J-103	110.0	0.033	0
P-52	157.0	150	Asbestos Cement	J-236	J-273	110.0	0.069	0
P-53	19.0	150	Asbestos Cement	J-273	J-231	110.0	0.069	0
P-54	246.0	150	Unknown	J-222	J-274	120	0.532	0.03
P-55	75.0	150	Unknown	J-274	J-224	120.0	0.330	0.02
P-56	149.0	250	PVC	J-245	J-240	140.0	-0.345	0.01
P-57	3.0	200	PVC	J-242	FH 11	140.0	-0.242	0.01
P-58	140.0	200	PVC	FH 11	J-277	140.0	-0.243	0.01
P-59	2.0	150	PVC	J-34	FH 11	140.0	0.000	0
P-60	33.0	200	PVC	J-154	FH 12	140.0	0.180	0.01

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P-61	11.0	200	PVC	FH 12	J-277	140.0	0.180	0.01
P-62	1.0	150	PVC	J-27	FH 12	140.0	0.000	0
P-63	3.00	250	PVC	J-245	J-90	140.0	0.345	0.01
P-64	2	250	PVC	J-90	J-87	140.0	0.345	0.01
P-65	6	250	PVC	J-87	J-71	140	0.345	0.01
P-66	10	100	PVC	J-111	J-239	140.0	-0.113	0.01
P-67	10	100	PVC	J-239	J-112	140.0	-0.472	0.06
P-68	40	150	PVC	J-234	J-119	140.0	0.274	0.02
P-69	80	150	PVC	J-119	FH 3	140.0	0.274	0.02
P-72	18.00	200	PVC	FH 3	J-126	140.0	0.287	0.01
P-73	27.00	200	PVC	J-126	J-159	140.0	0.287	0.01
P-74	53.00	150	Asbestos Cement	J-266	J-144	110.0	0.123	0.01
P-75	92.0	150	Asbestos Cement	J-144	J-219	110.0	-0.204	0.01
P-76	12.0	150	PVC	J-224	J-145	140.0	0.427	0.02
P-77	220.0	150	Unknown	J-145	J-234	120.0	0.326	0.02
P-79	49.0	200	PVC	J-157	J-210	140.0	0.614	0.02
P-80	8.0	200	PVC	J-159	J-171	140.0	0.287	0.01
P-81	57.0	150	Cast iron	J-171	J-193	80.0	0.233	0.01
P-82	9.0	250	Unknown	J-88	J-186	120	0.000	0
P-83	10.0	250	Asbestos Cement	J-148	J-192	110.0	4.500	0.09
P-85	100.0	150	PVC	J-197	J-203	140.0	-0.405	0.02
P-86	2.0	150	PVC	J-203	J-174	140.0	-0.465	0.03
P-87	6.0	250	Asbestos Cement	J-163	J-213	110.0	-0.285	0.01
P-88	67.0	250	Asbestos Cement	J-213	J-162	110.0	-0.326	0.01
P-92	2.0	250	PVC	J-99	J-60	140.0	0.165	0
P-94	2.0	250	PVC	FH 6	J-99	140.0	0.294	0.01
P-95	2.0	250	PVC	J-206	J-246	140	3.754	0.08
P-96	69.0	250	PVC	J-246	J-207	140.0	3.592	0.07
P-97	16.0	200	PVC	J-75	J-80	140.0	-0.225	0.01
P-98	60.0	200	Asbestos Cement	J-80	J-163	110.0	-0.225	0.01
P-99	97.0	200	PVC	J-69	J-152	140.0	-0.789	0.03
P-100	12.0	200	PVC	J-152	J-208	140.0	-0.883	0.03
P-101	11.0	200	PVC	J-208	J-249	140.0	-0.883	0.03
P-102	67.00	200	PVC	J-249	J-209	140.0	-0.883	0.03
P-103	12.0	100	Asbestos Cement	J-104	J-136	110.0	-0.014	0
P-108	3.0	250	PVC	J-98	FH 5	140.0	0.345	0.01
P-109	113.0	250	Asbestos Cement	J-192	J-109	110.0	4.486	0.09
P-110	39.0	250	Asbestos Cement	J-109	J-206	110.0	4.341	0.09
P-112	73.0	150	Asbestos Cement	J-131	J-268	110.0	-0.440	0.02
P-113	43.0	100	Asbestos Cement	J-136	J-134	110.0	-0.014	0
P-114	26.0	100	Asbestos Cement	J-134	J-211	110	-0.014	0
P-115	141.0	250	PVC	J-161	J-278	140.0	1.289	0.03
P-116	37.0	250	PVC	J-278	J-175	140.0	1.187	0.02
P-117	6.0	300	PVC	J-178	PRV-1	140	9.918	0.14
P-118	8.0	300	Asbestos Cement	PRV-1	J-81	110.0	9.920	0.14
P-119	178.0	250	PVC	J-105	J-279	140.0	0.738	0.02
P-120	17.0	250	PVC	J-279	J-184	140.0	0.738	0.02
P-122	17.0	150	PVC	J-280	J-236	140.0	-0.013	0

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P-123	36.0	150	PVC	FH 3	J-281	140	-0.013	0
P-124	127.0	150	PVC	J-281	J-280	140.0	-0.013	0
P-125	62.0	100	Unknown	J-166	J-282	120	-0.041	0.01
P-126	19.0	100	Unknown	J-282	J-213	120.0	-0.041	0.01
P-127	70.0	150	PVC	J-220	J-283	110.0	-0.255	0.01
P-128	68.0	150	PVC	J-283	J-183	110	-0.255	0.01
P-129	193.0	150	PVC	FH 1	FH 2	110.0	0.083	0
P-130	21.0	150	PVC	FH 2	J-237	140	0.083	0
P-131	63.0	250	Unknown	J-147	J-285	120.0	2.065	0.04
P-132	24.00	250	Unknown	J-285	J-219	120.0	2.065	0.04
P-133	26.0	150	Unknown	J-172	J-286	120.0	-0.105	0.01
P-134	48.00	150	Unknown	J-286	J-142	120.0	-0.105	0.01
P-135	8.0	150	PVC	J-151	J-287	140.0	-0.508	0.03
P-136	50.0	150	Asbestos Cement	J-287	J-131	110.0	-0.508	0.03
P-137	16.0	200	PVC	J-193	FH 4	140	0.614	0.02
P-138	15.00	200	PVC	FH 4	J-157	140.0	0.614	0.02
P-139	98.00	200	Asbestos Cement	J-227	FH 8	110.0	-0.744	0.02
P-140	48.00	200	Asbestos Cement	FH 8	J-243	110	-0.744	0.02
P-141	133	150	Asbestos Cement	J-231	FH 9	110.0	0.162	0.01
P-142	235	150	Asbestos Cement	FH 9	FH 10	110.0	0.110	0.01
P-143	33	250	PVC	J-77	J-291	140.0	0.069	0
P-150	189	250	PVC	FUT J-296	J-297	140	0.000	0
P-151	198	250	PVC	J-297	J-243	140.0	0.000	0
P-165	166	150	Unknown	J-237	J-309	120.0	0.395	0.02
P-166	20	150	Unknown	J-309	J-252	120.0	0.395	0.02
P-168	96.00	250	PVC	FH 5	J-310	140.0	0.345	0.01
P-170	31.00	200	PVC	J-251	J-310	140.0	-0.051	0
P-171	143.0	200	PVC	J-257	J-311	140.0	0.609	0.02
P-172	18.0	200	PVC	J-311	J-255	140.0	0.609	0.02
P-174	71.0	250	PVC	J-71	J-312	140.0	0.345	0.01
P-175	21.0	250	PVC	J-312	J-98	140.0	0.345	0.01
P-184	334.0	75	PVC	J-320	J-9	140	-0.044	0.01
P-185	61.0	75	PVC	J-320	J-321	140	0.044	0.01
P-186	63.0	250	PVC	J-310	J-322	140.0	0.294	0.01
P-187	19.0	250	PVC	J-322	FH 6	140.0	0.294	0.01
P-189	65.0	250	PVC	J-250	J-298	140.0	0.435	0.01
P-190	46.0	200	PVC	J-211	J-291	140.0	-0.069	0
P-191	123.0	250	PVC	FUT J-296	FUT J-323	140.0	0.000	0
P-200	48.0	150	Unknown	J-132	J-328	120	-0.068	0
P-201	37.0	150	Unknown	J-328	J-172	120.0	-0.105	0.01
P-204	47.0	150	Unknown	J-329	J-328	120.0	-0.037	0
P-210	72.00	200	PVC	J-201	J-332	140.0	-0.184	0.01
P-211	52.00	200	PVC	J-332	J-129	140.0	-0.184	0.01
P-212	194.00	250	PVC	J-298	J-333	140.0	0.000	0
P-216	5.00	150	PVC	FH 3	J-334	140.0	0.000	0
P-217	5.0	150	PVC	FH 4	J-335	140.0	0.000	0
P-218	202.0	200	PVC	J-100	J-336	130.0	0.129	0
P-220	75.0	200	PVC	J-337	J-338	130	0.041	0

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P-221	26.0	200	PVC	J-338	J-339	130.0	0.041	0
P-222	61.0	100	PVC	J-319	J-340	140	-0.020	0
P-224	13.0	200	PVC	J-339	J-340	130.0	0.041	0
P-225	7.0	150	PVC	J-339	J-341	130.0	0.000	0
P-226	110.0	200	PVC	J-336	J-342	130.0	0.129	0
P-227	13.0	152.4	PVC	J-342	J-337	130.0	0.041	0
P-228	22.0	150	PVC	J-342	J-343	130.0	0.088	0
P-229	203.00	100	PVC	J-340	J-344	140.0	0.020	0
P-231	591.00	75	PVC	J-248	J-345	130.0	0.081	0.02
P-232	250.00	75	PVC	J-345	J-346	130.0	0.030	0.01
P-233	32.0	300	Ductile Iron	J-73	J-191	110.0	-5.329	0.08
P-234	55.00	300	Ductile Iron	J-191	J-91	110.0	-5.420	0.08
P-235	111.00	250	Ductile Iron	J-240	J-143	140	1.475	0.03
P-236	53	250	Ductile Iron	J-143	J-112	140.0	1.332	0.03
Pipe_1	7	150	PVC	J-53	J-63	140	0.000	0
Pipe_2	11	150	PVC	J-61	J-74	140.0	0.112	0.01
Pipe_3	6	150	PVC	J-64	J-65	140.0	0.254	0.01
Pipe_4	65	150	PVC	J-62	J-44	140.0	0.142	0.01
Pipe_5	97	150	PVC	J-65	J-61	140.0	0.254	0.01
Pipe_6	59	150	PVC	J-74	J-70	140.0	0.112	0.01
Pipe_7	110	150	PVC	J-64	J-49	140.0	-0.315	0.02
Pipe_8	3	150	PVC	J-49	J-50	140.0	-0.315	0.02
Pipe_9	3	150	PVC	J-46	J-47	140.0	0.000	0
Pipe_10	4	150	PVC	J-47	J-53	140.0	0.000	0
Pipe_13	9	150	PVC	J-70	J-11	140.0	0.000	0
Pipe_14	0.00	150	PVC	J-11	J-12	140.0	0.000	0
Pipe_15	3.00	150	PVC	J-11	J-45	140.0	0.000	0
Pipe_16	3.00	150	PVC	J-50	J-38	140.0	-0.315	0.02
Pipe_17	3.00	150	PVC	J-49	J-42	140.0	0.000	0
Pipe_18	3.00	150	PVC	J-42	J-43	140.0	0.000	0
Pipe_19	3.00	150	PVC	J-52	J-34	140.0	0.000	0
Pipe_21	4.00	150	PVC	J-54	J-27	140.0	0.000	0
Pipe_24	74.00	200	PVC	J-277	J-201	140.0	-0.123	0
Pipe_26	133.00	200	PVC	J-242	J-31	140.0	0.242	0.01
Pipe_27	17.0	200	PVC	J-31	J-94	140.0	0.081	0
Pipe_28	26	200	PVC	J-94	J-22	140.0	0.081	0
Pipe_29	91	200	PVC	J-22	J-57	140.0	0.081	0
Pipe_30	2.00	150	PVC	J-24	J-31	140.0	-0.020	0
Pipe_31	4.0	150	PVC	J-58	J-21	140.0	0.000	0
Pipe_32	72.0	200	PVC	J-23	J-198	140	0.020	0
Pipe_33	130.0	200	PVC	J-198	J-160	140.0	0.020	0
Pipe_34	45.0	200	PVC	J-160	J-25	140	0.020	0
Pipe_35	5.0	150	PVC	J-25	J-26	140.0	0.020	0
Pipe_36	4.0	150	PVC	J-25	J-56	140.0	0.000	0
Pipe_37	3.0	150	PVC	J-20	J-26	140.0	-0.020	0
Pipe_39	5.0	150	PVC	J-56	J-59	140.0	0.000	0
Pipe_40	4.0	200	PVC	J-57	J-32	140	0.081	0
Pipe_41	1.00	150	PVC	J-21	J-22	140	0.000	0

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Pipe_42	2.0	200	PVC	J-32	J-33	140	0.081	0
Pipe_43	1.00	150	PVC	J-23	J-24	140.0	-0.020	0
Pipe_55	161.00	150	Asbestos Cement	J-246	J-247	110.0	0.162	0.01
Pipe_56	68.00	100	Cast iron	J-115	J-147	80.0	-0.069	0.01
Pipe_57	66.00	100	PVC	J-194	J-115	140.0	-0.032	0
Pipe_58	57.00	150	PVC	J-170	J-183	140.0	0.356	0.02
Pipe_59	49	150	PVC	J-169	J-170	140.0	0.407	0.02
Pipe_60	76	100	Unknown	J-203	J-204	120.0	0.061	0.01
Pipe_64	38.00	300	Asbestos Cement	J-91	J-148	110.0	4.500	0.06
Pipe_65	14.00	250	PVC	J-83	J-84	140.0	1.187	0.02
Pipe_66	103.0	250	PVC	J-175	J-83	140.0	1.187	0.02
Pipe_68	18.0	250	PVC	J-84	J-105	140.0	0.738	0.02
Pipe_69	19.00	100	PVC	J-108	J-84	140.0	-0.101	0.01
Pipe_70	52.00	100	Asbestos Cement	J-177	J-108	110.0	-0.101	0.01
Pipe_71	71.0	200	Unknown	J-199	J-76	120.0	-0.225	0.01
Pipe_72	77.00	200	Unknown	J-129	J-199	120.0	-0.225	0.01
Pipe_73	157.00	100	Unknown	J-238	J-239	120.0	-0.359	0.05
Pipe_74	56.00	100	Unknown	J-165	J-166	120.0	-0.041	0.01
Pipe_75	113.0	150	Unknown	J-218	J-29	120	-0.191	0.01
Pipe_76	82.00	100	Asbestos Cement	J-212	J-40	110.0	-0.081	0.01
Pipe_77	96.00	100	Asbestos Cement	J-68	J-212	110.0	0.151	0.02
Pipe_78	207.0	200	PVC	J-168	J-68	140.0	-0.638	0.02
Pipe_79	185.0	150	Asbestos Cement	J-217	J-168	110.0	-0.154	0.01
Pipe_80	86.0	150	Asbestos Cement	J-217	J-218	110.0	-0.008	0
Pipe_81	91.0	150	PVC	J-218	J-20	140.0	0.102	0.01
Pipe_82	49.00	200	Asbestos Cement	J-154	J-168	110.0	-0.484	0.02
Pipe_83	103.00	100	Asbestos Cement	J-228	J-212	110.0	-0.142	0.02
Pipe_84	8.00	200	Unknown	J-68	J-69	120	-0.789	0.03
Pipe_86	49.00	150	Asbestos Cement	J-39	J-167	110.0	-0.587	0.03
Pipe_89	54.00	150	Asbestos Cement	J-180	J-181	110.0	0.587	0.03
Pipe_90	55.00	150	PVC	J-180	J-206	140.0	-0.587	0.03
Pipe_91	132	150	Asbestos Cement	J-190	J-181	110.0	-0.587	0.03
Pipe_92	63	150	Asbestos Cement	J-190	J-167	110	0.587	0.03
Pipe_93	16	300	Asbestos Cement	J-82	J-91	110	9.920	0.14
Pipe_94	199.00	250	PVC	J-209	J-161	140	1.894	0.04
Pipe_95	48.00	250	Unknown	J-161	J-162	120.0	0.326	0.01
Pipe_97	48.00	100	Unknown	J-163	J-164	120.0	0.061	0.01
Pipe_99	7.0	200	PVC	J-75	J-76	140	0.225	0.01
Pipe_100	27.0	100	Unknown	J-129	J-130	120.0	0.041	0.01
Pipe_102	52.00	100	PVC	J-175	J-176	140	0.000	0
Pipe_103	89.0	200	PVC	J-224	J-161	140.0	-0.097	0
Pipe_106	89.00	200	PVC	J-222	J-223	140.0	-0.532	0.02
Pipe_107	122.0	250	PVC	J-223	J-209	140.0	2.776	0.06
Pipe_108	110.0	150	PVC	J-84	J-234	140.0	0.146	0.01
Pipe_111	120.0	150	Asbestos Cement	J-234	J-235	110.0	0.187	0.01
Pipe_112	115.00	150	PVC	J-235	J-236	140.0	0.126	0.01
Pipe_114	106.00	150	Asbestos Cement	J-231	J-103	110.0	-0.133	0.01
Pipe_118	18.00	100	Unknown	J-103	J-104	120.0	-0.014	0

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Pipe_119	94.00	250	PVC	J-184	J-78	140.0	0.371	0.01
Pipe_120	13	250	PVC	J-77	J-78	140.0	-0.341	0.01
Pipe_121	76	100	Asbestos Cement	J-205	J-177	110.0	-0.081	0.01
Pipe_122	58.0	100	Asbestos Cement	J-184	J-185	110.0	0.041	0.01
Pipe_123	89.00	150	PVC	J-103	J-184	140.0	-0.124	0.01
Pipe_124	168.00	100	Asbestos Cement	J-177	J-185	110.0	0.020	0
Pipe_125	80.00	150	PVC	J-195	J-193	140.0	0.381	0.02
Pipe_126	68.00	150	PVC	J-195	J-196	140.0	-0.402	0.02
Pipe_127	70.00	150	PVC	J-196	J-197	140.0	-0.402	0.02
Pipe_129	42.00	150	Unknown	J-150	J-151	120.0	-0.321	0.02
Pipe_131	17.00	300	Asbestos Cement	J-101	J-102	110.0	-1.247	0.02
Pipe_134	52.00	150	PVC	J-173	J-174	140.0	0.465	0.03
Pipe_136	107.00	150	PVC	J-232	J-233	140.0	-0.830	0.05
Pipe_137	35.00	250	Unknown	J-146	J-147	120.0	2.134	0.04
Pipe_138	206.00	300	Asbestos Cement	J-101	J-229	110.0	1.247	0.02
Pipe_140	10.00	150	Unknown	J-72	J-73	120.0	0.000	0
Pipe_143	61.00	300	Asbestos Cement	J-73	J-102	110.0	5.329	0.08
Pipe_146	106	300	Asbestos Cement	J-229	J-230	110.0	0.741	0.01
Pipe_147	89	100	Asbestos Cement	J-220	J-221	110.0	0.529	0.07
Pipe_149	130.00	100	Asbestos Cement	J-241	J-221	110.0	-0.121	0.02
Pipe_151	117.00	150	PVC	J-146	J-237	140.0	0.362	0.02
Pipe_155	125.00	250	PVC	J-219	J-240	140.0	1.820	0.04
Pipe_158	159.00	250	PVC	J-112	J-243	140.0	0.744	0.02
Pipe_160	63.00	100	Asbestos Cement	J-111	J-189	110.0	0.113	0.01
Pipe_161	75.00	100	Asbestos Cement	J-189	J-202	110.0	0.012	0
Pipe_162	81.00	100	Asbestos Cement	J-202	J-151	110.0	-0.090	0.01
Pipe_163	62.00	100	Asbestos Cement	J-151	J-188	110.0	0.097	0.01
Pipe_167	23.0	250	Unknown	J-123	J-124	120.0	0.660	0.01
Pipe_168	54.00	250	Unknown	J-123	J-179	120.0	-0.660	0.01
Pipe_169	20.00	200	Unknown	J-113	J-114	120.0	0.594	0.02
Pipe_171	39.00	150	Unknown	J-141	J-149	120.0	0.220	0.01
Pipe_172	31.00	150	Unknown	J-140	J-141	120.0	0.321	0.02
Pipe_173	67.00	100	Asbestos Cement	J-188	J-106	110.0	0.097	0.01
Pipe_174	18.00	100	Asbestos Cement	J-106	J-107	110.0	0.097	0.01
Pipe_175	40.0	150	Unknown	J-150	J-140	120.0	0.321	0.02
Pipe_176	56.0	150	Unknown	J-149	J-66	120.0	0.220	0.01
Pipe_177	32.00	100	Unknown	J-107	J-67	120.0	0.097	0.01
Pipe_178	58.00	200	Unknown	J-179	J-114	120.0	-0.594	0.02
Pipe_179	6.0	150	Unknown	J-66	J-67	120.0	0.220	0.01
Pipe_180	148	150	Unknown	J-67	J-179	120.0	0.216	0.01
Pipe_181	93	150	PVC	J-225	J-20	140.0	-0.121	0.01
Pipe_182	14	300	PVC	J-81	J-82	140.0	9.920	0.14
Pipe_184	139	75	Unknown	J-248	J-191	120.0	-0.091	0.02
Pipe_186	19	150	Unknown	J-109	J-110	120.0	0.013	0
Pipe_187	42	200	PVC	J-152	J-153	140.0	0.094	0
Pipe_189	13	100	Unknown	J-79	J-80	120.0	0.000	0
Pipe_190	73	100	Unknown	J-200	J-79	120.0	0.000	0
Pipe_191	34	150	Unknown	J-118	J-145	120.0	0.000	0
Pipe_192	21	150	Unknown	J-117	J-118	120.0	0.000	0

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Pipe_193	23	150	Unknown	J-119	J-120	120.0	0.000	0
Pipe_194	29	100	Unknown	J-133	J-134	120.0	0.000	0
Pipe_195	29	100	Unknown	J-135	J-136	120.0	0.000	0
Pipe_196	50	200	Unknown	J-85	J-171	120.0	-0.054	0
Pipe_197	25	200	Unknown	J-125	J-126	120.0	0.000	0
Pipe_198	15	200	Unknown	J-85	J-86	120.0	0.054	0
Pipe_199	44	200	Unknown	J-156	J-157	120.0	0.000	0
Pipe_200	26	150	Unknown	J-131	J-132	120.0	-0.068	0
Pipe_203	57	150	Unknown	J-142	J-143	120.0	-0.105	0.01
Pipe_204	33	150	Unknown	J-127	J-144	120.0	-0.277	0.02
Pipe_205	25	150	Unknown	J-127	J-128	120.0	0.277	0.02
Pipe_206	20	150	Unknown	J-115	J-116	120.0	0.037	0
Pipe_207	15	250	Unknown	J-89	J-90	120.0	0.000	0
Pipe_208	61	250	Unknown	J-186	J-187	120.0	0.000	0
Pipe_210	15	150	PVC	J-87	J-88	140.0	0.002	0
Pipe_211	15	250	Unknown	J-87	J-88	120.0	-0.002	0
Pipe_212	17	250	Unknown	FH 5	J-96	120.0	0.000	0
Pipe_213	17	250	PVC	J-97	J-98	140.0	0.000	0
Pipe_214	17	250	Unknown	J-92	FH 6	120.0	0.000	0
Pipe_215	17	250	Unknown	J-99	J-100	120.0	0.129	0
Pipe_216	7	250	PVC	J-60	J-9	140.0	0.044	0
Pipe_219	2	150	PVC	J-38	J-39	140.0	-0.506	0.03
Pipe_220	3	150	PVC	J-44	J-36	140.0	0.000	0
Pipe_221	2	150	PVC	J-36	J-37	140.0	0.000	0
Pipe_222	6	150	PVC	J-61	J-62	140.0	0.142	0.01
Pipe_223	3	150	PVC	J-44	J-48	140.0	0.000	0
Pipe_224	6	150	PVC	J-63	J-64	140.0	-0.001	0
Pipe_225	4	150	PVC	J-55	J-53	140.0	0.000	0
Pipe_226	3	100	PVC	J-51	J-39	140.0	-0.081	0.01
Pipe_227	4	150	PVC	J-30	J-38	140.0	-0.191	0.01
Pipe_228	2	150	PVC	J-29	J-30	140.0	-0.191	0.01
Pipe_229	3	100	PVC	J-41	J-51	140.0	-0.081	0.01
Pipe_230	3	100	PVC	J-40	J-41	140.0	-0.081	0.01

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Label	Length (m)	Dia. (mm)	Material	Start Node	Stop Node	Hazen-Will. C	Flow (l/s)	Velocity (m/s)
FUT P-197	253.0	250	PVC	FUT J-304	FUT J-327	140.0	0.999	0.02
FUT P-198	244	250	PVC	FUT J-327	J-230	140.0	0.801	0.02
FUT P-205	225	200	PVC	FUT J-308	J-252	140.0	0.691	0.02
FUT P-206	254	300	PVC	FUT J-307	J-320	140.0	0.142	0
FUT P-207	55.00	150	PVC	FUT J-324	FUT J-330	140.0	-0.259	0.01
FUT P-213	109.00	300	PVC	FUT J-295	J-333	140.0	0.600	0.01
FUT P-214	692.00	300	PVC	J-333	FUT J-296	140	0.242	0
FUT P-215	828.0	200	PVC	FUT J-330	J-198	140.0	-0.259	0.01
P-8	8.00	250	PVC	R-1	Fire Pump	140.0	7.444	0.15
P-9	9.00	250	PVC	Fire Pump	J-254	140.0	7.444	0.15
P-10	14.0	300	PVC	J-254	J-178	140.0	13.853	0.2
P-11	7.00	250	PVC	R-1	PMP-401	140.0	2.138	0.04
P-12	7.00	250	PVC	PMP-401	J-254	140	2.138	0.04
P-13	6.0	250	PVC	R-1	PMP-402	140.0	2.137	0.04
P-14	8.0	250	PVC	PMP-402	J-254	140.0	2.137	0.04
P-15	8.0	250	PVC	R-1	PMP-403	140.0	2.135	0.04
P-16	9.0	250	PVC	PMP-403	J-254	140.0	2.135	0.04
P-17	6.0	250	PVC	J-207	J-223	140.0	3.776	0.08
P-19	121.0	200	PVC	J-255	J-169	140.0	0.378	0.01
P-20	116.00	150	Asbestos Cement	J-229	J-256	110.0	0.464	0.03
P-21	64.00	150	Asbestos Cement	J-256	J-220	110	0.332	0.02
P-22	36.0	200	PVC	J-230	J-257	140.0	0.611	0.02
P-24	167.0	150	PVC	J-221	FH 1	140.0	0.134	0.01
P-26	97.0	150	PVC	J-251	J-259	140.0	-0.432	0.02
P-27	125.0	150	PVC	J-259	J-252	140.0	-0.655	0.04
P-29	21.00	250	PVC	J-260	J-233	140.0	3.258	0.07
P-30	24.00	250	PVC	J-102	J-261	140.0	3.420	0.07
P-31	124.00	250	PVC	J-261	J-260	140.0	3.319	0.07
P-32	116.00	250	PVC	J-233	J-262	140.0	2.535	0.05
P-34	156.0	250	PVC	J-262	J-263	140.0	2.393	0.05
P-35	100.0	250	PVC	J-263	J-146	140.0	2.251	0.05
P-36	169.0	150	PVC	J-232	J-264	140.0	0.622	0.04
P-37	80.0	150	PVC	J-264	J-173	140.0	0.461	0.03
P-38	37	150	PVC	J-197	J-265	140.0	-0.131	0.01
P-39	119	150	PVC	J-265	J-146	140	-0.252	0.01
P-40	73.0	150	Asbestos Cement	J-210	J-266	110	0.248	0.01
P-43	77.0	150	Asbestos Cement	J-268	J-210	110.0	-0.230	0.01
P-44	71.0	200	PVC	J-227	FH 7	140.0	0.045	0
P-45	26.0	200	PVC	FH 7	J-113	140.0	0.045	0
P-46	22.0	250	PVC	J-124	J-270	140	-0.130	0
P-47	63.0	250	PVC	J-270	J-214	140.0	-0.130	0
P-48	76.0	250	PVC	J-214	J-271	140.0	-0.286	0.01
P-49	128.0	250	PVC	J-271	J-250	140.0	-0.286	0.01
P-50	21.0	150	Asbestos Cement	J-235	J-272	110.0	0.168	0.01
P-51	139.0	150	Asbestos Cement	J-272	J-103	110.0	0.168	0.01
P-52	157.0	150	Asbestos Cement	J-236	J-273	110.0	0.156	0.01

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P-53	19.0	150	Asbestos Cement	J-273	J-231	110.0	0.156	0.01
P-54	246.0	150	Unknown	J-222	J-274	120.0	0.619	0.04
P-55	75.00	150	Unknown	J-274	J-224	120.0	0.417	0.02
P-56	149	250	PVC	J-245	J-240	140.0	-0.915	0.02
P-57	3	200	PVC	J-242	FH 11	140	-0.312	0.02
P-58	140	200	PVC	FH 11	J-277	140.0	-0.313	0.02
P-59	2	150	PVC	J-34	FH 11	140.0	0.000	0
P-60	33	200	PVC	J-154	FH 12	140.0	0.529	0.02
P-61	11	200	PVC	FH 12	J-277	140.0	0.528	0.02
P-62	1.00	150	PVC	J-27	FH 12	140.0	0.000	0
P-63	3.00	250	PVC	J-245	J-90	140.0	0.915	0.02
P-64	2.00	250	PVC	J-90	J-87	140.0	0.914	0.02
P-65	6.0	250	PVC	J-87	J-71	140.0	0.914	0.02
P-66	10.0	100	PVC	J-111	J-239	140.0	-0.072	0.01
P-67	10.0	100	PVC	J-239	J-112	140.0	-0.431	0.05
P-68	40.0	150	PVC	J-234	J-119	140.0	0.386	0.02
P-69	80.0	150	PVC	J-119	FH 3	140.0	0.386	0.02
P-72	18.0	200	PVC	FH 3	J-126	140.0	0.295	0.01
P-73	27.0	200	PVC	J-126	J-159	140	0.295	0.01
P-74	53.0	150	Asbestos Cement	J-266	J-144	110.0	0.095	0.01
P-75	92.0	150	Asbestos Cement	J-144	J-219	110.0	-0.233	0.01
P-76	12.0	150	PVC	J-224	J-145	140.0	0.625	0.04
P-77	220.0	150	Unknown	J-145	J-234	120.0	0.523	0.03
P-79	49.0	200	PVC	J-157	J-210	140.0	0.529	0.02
P-80	8.0	200	PVC	J-159	J-171	140.0	0.295	0.01
P-81	57.0	150	Cast iron	J-171	J-193	80.0	0.241	0.01
P-82	9.0	250	Unknown	J-88	J-186	120	0.000	0
P-83	10.0	250	Asbestos Cement	J-148	J-192	110.0	4.198	0.09
P-85	100.0	150	PVC	J-197	J-203	140.0	-0.299	0.02
P-86	2.0	150	PVC	J-203	J-174	140.0	-0.359	0.02
P-87	6.0	250	Asbestos Cement	J-163	J-213	110.0	-0.007	0
P-88	67.0	250	Asbestos Cement	J-213	J-162	110.0	-0.047	0.01
P-92	2.0	250	PVC	J-99	J-60	140.0	0.023	0
P-94	2.00	250	PVC	FH 6	J-99	140.0	0.152	0
P-95	2.0	250	PVC	J-206	J-246	140.0	3.938	0.08
P-96	69.0	250	PVC	J-246	J-207	140.0	3.776	0.08
P-97	16.0	200	PVC	J-75	J-80	140.0	0.054	0.01
P-98	60.0	200	Asbestos Cement	J-80	J-163	110.0	0.054	0.01
P-99	97.0	200	PVC	J-69	J-152	140.0	-0.882	0.03
P-100	12.0	200	PVC	J-152	J-208	140.0	-0.976	0.03
P-101	11.0	200	PVC	J-208	J-249	140	-0.976	0.03
P-102	67.0	200	PVC	J-249	J-209	140.0	-0.369	0.01
P-103	12.0	100	Asbestos Cement	J-104	J-136	110.0	0.097	0.01
P-108	3.0	250	PVC	J-98	FH 5	140	0.397	0.01
P-109	113.0	250	Asbestos Cement	J-192	J-109	110.0	4.092	0.08
P-110	39.0	250	Asbestos Cement	J-109	J-206	110.0	3.947	0.08
P-112	73.0	150	Asbestos Cement	J-131	J-268	110.0	-0.230	0.01
P-113	43.0	100	Asbestos Cement	J-136	J-134	110.0	0.097	0.01

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P-114	26.0	100	Asbestos Cement	J-134	J-211	110	0.097	0.01
P-115	141.0	250	PVC	J-161	J-278	140.0	2.067	0.04
P-116	37.0	250	PVC	J-278	J-175	140	1.966	0.04
P-117	6.0	300	PVC	J-178	PRV-1	140.0	13.853	0.2
P-118	8.0	300	Asbestos Cement	PRV-1	J-81	110.0	13.855	0.2
P-119	178.0	250	PVC	J-105	J-279	140	1.435	0.03
P-120	17.0	250	PVC	J-279	J-184	140.0	1.435	0.03
P-122	17.0	150	PVC	J-280	J-236	140	0.091	0.01
P-123	36.0	150	PVC	FH 3	J-281	140.0	0.091	0.01
P-124	127.00	150	PVC	J-281	J-280	140.0	0.091	0.01
P-125	62.0	100	Unknown	J-166	J-282	120.0	-0.041	0.01
P-126	19.00	100	Unknown	J-282	J-213	120.0	-0.041	0.01
P-127	70.0	150	PVC	J-220	J-283	110.0	-0.125	0.01
P-128	68.0	150	PVC	J-283	J-183	110.0	-0.125	0.01
P-129	193.0	150	PVC	FH 1	FH 2	110	-0.089	0.01
P-130	21.00	150	PVC	FH 2	J-237	140.0	-0.089	0.01
P-131	63.00	250	Unknown	J-147	J-285	120.0	1.752	0.04
P-132	24.00	250	Unknown	J-285	J-219	120	1.752	0.04
P-133	26	150	Unknown	J-172	J-286	120.0	0.037	0
P-134	48	150	Unknown	J-286	J-142	120.0	0.037	0
P-135	8	150	PVC	J-151	J-287	140.0	-0.308	0.02
P-136	50	150	Asbestos Cement	J-287	J-131	110	-0.308	0.02
P-137	16	200	PVC	J-193	FH 4	140.0	0.529	0.02
P-138	15	200	PVC	FH 4	J-157	140.0	0.529	0.02
P-139	98	200	Asbestos Cement	J-227	FH 8	110.0	-0.195	0.01
P-140	48.00	200	Asbestos Cement	FH 8	J-243	110.0	-0.195	0.01
P-141	133.00	150	Asbestos Cement	J-231	FH 9	110.0	0.200	0.01
P-142	235.0	150	Asbestos Cement	FH 9	FH 10	110.0	0.149	0.01
P-143	33.0	250	PVC	J-77	J-291	140.0	0.888	0.02
P-150	189.0	250	PVC	FUT J-296	J-297	140.0	0.242	0
P-151	198.0	250	PVC	J-297	J-243	140.0	0.178	0
P-165	166.0	150	Unknown	J-237	J-309	120	-0.037	0
P-166	20.0	150	Unknown	J-309	J-252	120	-0.037	0
P-168	96.0	250	PVC	FH 5	J-310	140.0	0.397	0.01
P-170	31.0	200	PVC	J-251	J-310	140.0	0.209	0.01
P-171	143.0	200	PVC	J-257	J-311	140.0	0.480	0.02
P-172	18.0	200	PVC	J-311	J-255	140.0	0.480	0.02
P-174	71.0	250	PVC	J-71	J-312	140.0	0.914	0.02
P-175	21.0	250	PVC	J-312	J-98	140	0.398	0.01
P-184	334.0	75	PVC	J-320	J-9	140.0	0.098	0.02
P-185	61.0	75	PVC	J-320	J-321	140.0	0.044	0.01
P-186	63.00	250	PVC	J-310	J-322	140.0	0.607	0.01
P-187	19.00	250	PVC	J-322	FH 6	140.0	0.152	0
P-189	65.00	250	PVC	J-250	J-298	140.0	-0.355	0.01
P-190	46.00	200	PVC	J-211	J-291	140.0	0.042	0
P-191	123.0	250	PVC	FUT J-296	FUT J-323	140.0	0.000	0
P-200	48.0	150	Unknown	J-132	J-328	120.0	-0.078	0
P-201	37.0	150	Unknown	J-328	J-172	120	0.037	0

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P-204	47.0	150	Unknown	J-329	J-328	120.0	0.115	0.01
P-210	72.0	200	PVC	J-201	J-332	140	0.094	0.01
P-211	52.0	200	PVC	J-332	J-129	140.0	0.094	0.01
P-212	194.0	250	PVC	J-298	J-333	140.0	-0.358	0.01
P-216	5.0	150	PVC	FH 3	J-334	140.0	0.000	0
P-217	5.0	150	PVC	FH 4	J-335	140.0	0.000	0
P-218	202.0	200	PVC	J-100	J-336	130.0	0.129	0
P-220	75.00	200	PVC	J-337	J-338	130.0	0.041	0
P-221	26.00	200	PVC	J-338	J-339	130.0	0.041	0
P-222	61.00	100	PVC	J-319	J-340	140.0	-0.020	0
P-224	13.0	200	PVC	J-339	J-340	130.0	0.041	0
P-225	7.00	150	PVC	J-339	J-341	130.0	0.000	0
P-226	110.00	200	PVC	J-336	J-342	130	0.129	0
P-227	13	152.4	PVC	J-342	J-337	130.0	0.041	0
P-228	22	150	PVC	J-342	J-343	130	0.088	0
P-229	203	100	PVC	J-340	J-344	140.0	0.020	0
P-231	591	75	PVC	J-248	J-345	130.0	0.081	0.02
P-232	250	75	PVC	J-345	J-346	130.0	0.030	0.01
P-233	32	300	Ductile Iron	J-73	J-191	110.0	(N/A)	(N/A)
P-234	55	300	Ductile Iron	J-191	J-91	110.0	(N/A)	(N/A)
P-235	111	250	Ductile Iron	J-240	J-143	140.0	(N/A)	(N/A)
P-236	53	250	Ductile Iron	J-143	J-112	140.0	(N/A)	(N/A)
Pipe_1	7	150	PVC	J-53	J-63	140.0	0.000	0
Pipe_2	11	150	PVC	J-61	J-74	140.0	0.112	0.01
Pipe_3	6	150	PVC	J-64	J-65	140.0	-0.630	0.04
Pipe_4	65.00	150	PVC	J-62	J-44	140.0	-0.741	0.04
Pipe_5	97.00	150	PVC	J-65	J-61	140.0	-0.630	0.04
Pipe_6	59.00	150	PVC	J-74	J-70	140.0	0.112	0.01
Pipe_7	110.00	150	PVC	J-64	J-49	140.0	0.569	0.03
Pipe_8	3.00	150	PVC	J-49	J-50	140.0	0.569	0.03
Pipe_9	3.00	150	PVC	J-46	J-47	140.0	0.000	0
Pipe_10	4.00	150	PVC	J-47	J-53	140.0	0.000	0
Pipe_13	9.00	150	PVC	J-70	J-11	140.0	0.000	0
Pipe_14	0.00	150	PVC	J-11	J-12	140.0	0.000	0
Pipe_15	3.0	150	PVC	J-11	J-45	140.0	0.000	0
Pipe_16	3	150	PVC	J-50	J-38	140.0	0.569	0.03
Pipe_17	3	150	PVC	J-49	J-42	140.0	0.000	0
Pipe_18	3.00	150	PVC	J-42	J-43	140.0	0.000	0
Pipe_19	3.0	150	PVC	J-52	J-34	140.0	0.000	0
Pipe_21	4.0	150	PVC	J-54	J-27	140	0.000	0
Pipe_24	74.0	200	PVC	J-277	J-201	140.0	0.155	0.01
Pipe_26	133.0	200	PVC	J-242	J-31	140	0.312	0.02
Pipe_27	17.0	200	PVC	J-31	J-94	140.0	0.273	0.02
Pipe_28	26.0	200	PVC	J-94	J-22	140.0	0.273	0.02
Pipe_29	91.0	200	PVC	J-22	J-57	140.0	0.273	0.02
Pipe_30	2.0	150	PVC	J-24	J-31	140.0	0.103	0.01
Pipe_31	4.0	150	PVC	J-58	J-21	140	0.000	0
Pipe_32	72.00	200	PVC	J-23	J-198	140	-0.103	0.01

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Pipe_33	130.0	200	PVC	J-198	J-160	140	-0.361	0.02
Pipe_34	45.00	200	PVC	J-160	J-25	140.0	-0.361	0.02
Pipe_35	5.00	150	PVC	J-25	J-26	140.0	-0.361	0.02
Pipe_36	4.00	150	PVC	J-25	J-56	140.0	0.000	0
Pipe_37	3.00	150	PVC	J-20	J-26	140.0	0.361	0.02
Pipe_39	5.00	150	PVC	J-56	J-59	140.0	0.000	0
Pipe_40	4	200	PVC	J-57	J-32	140.0	0.273	0.02
Pipe_41	1	150	PVC	J-21	J-22	140.0	0.000	0
Pipe_42	2.00	200	PVC	J-32	J-33	140.0	0.273	0.02
Pipe_43	1.00	150	PVC	J-23	J-24	140.0	0.103	0.01
Pipe_55	161.0	150	Asbestos Cement	J-246	J-247	110.0	0.162	0.02
Pipe_56	68.0	100	Cast iron	J-115	J-147	80.0	-0.144	0.02
Pipe_57	66.00	100	PVC	J-194	J-115	140.0	-0.069	0.01
Pipe_58	57.00	150	PVC	J-170	J-183	140.0	0.227	0.01
Pipe_59	49.0	150	PVC	J-169	J-170	140.0	0.277	0.02
Pipe_60	76.00	100	Unknown	J-203	J-204	120.0	0.061	0
Pipe_64	38.00	300	Asbestos Cement	J-91	J-148	110.0	4.198	0.06
Pipe_65	14.00	250	PVC	J-83	J-84	140.0	1.966	0.04
Pipe_66	103.0	250	PVC	J-175	J-83	140	1.966	0.04
Pipe_68	18.00	250	PVC	J-84	J-105	140.0	1.435	0.03
Pipe_69	19.00	100	PVC	J-108	J-84	140.0	-0.149	0.02
Pipe_70	52.0	100	Asbestos Cement	J-177	J-108	110.0	-0.149	0.02
Pipe_71	71.0	200	Unknown	J-199	J-76	120.0	0.054	0
Pipe_72	77.0	200	Unknown	J-129	J-199	120.0	0.054	0.01
Pipe_73	157.0	100	Unknown	J-238	J-239	120.0	-0.359	0.05
Pipe_74	56.00	100	Unknown	J-165	J-166	120.0	-0.041	0.01
Pipe_75	113.00	150	Unknown	J-218	J-29	120.0	-0.708	0.04
Pipe_76	82.00	100	Asbestos Cement	J-212	J-40	110	-0.200	0.03
Pipe_77	96.00	100	Asbestos Cement	J-68	J-212	110.0	0.032	0
Pipe_78	207.00	200	PVC	J-168	J-68	140.0	-0.850	0.03
Pipe_79	185.00	150	Asbestos Cement	J-217	J-168	110.0	-0.018	0
Pipe_80	86	150	Asbestos Cement	J-217	J-218	110.0	-0.144	0.01
Pipe_81	91	150	PVC	J-218	J-20	140	0.483	0.03
Pipe_82	49	200	Asbestos Cement	J-154	J-168	110	-0.832	0.03
Pipe_83	103.00	100	Asbestos Cement	J-228	J-212	110	-0.142	0.02
Pipe_84	8.00	200	Unknown	J-68	J-69	120.0	-0.882	0.03
Pipe_86	49.00	150	Asbestos Cement	J-39	J-167	110.0	-0.340	0.02
Pipe_89	54.0	150	Asbestos Cement	J-180	J-181	110	0.947	0.05
Pipe_90	55.0	150	PVC	J-180	J-206	140.0	-0.009	0
Pipe_91	132.00	150	Asbestos Cement	J-190	J-181	110	-0.340	0.02
Pipe_92	63.0	150	Asbestos Cement	J-190	J-167	110.0	0.340	0.02
Pipe_93	16.00	300	Asbestos Cement	J-82	J-91	110.0	12.035	0.17
Pipe_94	199.0	250	PVC	J-209	J-161	140.0	2.505	0.05
Pipe_95	48.0	250	Unknown	J-161	J-162	120.0	0.047	0.01
Pipe_97	48.0	100	Unknown	J-163	J-164	120.0	0.061	0.01
Pipe_99	7.00	200	PVC	J-75	J-76	140.0	-0.054	0
Pipe_100	27.00	100	Unknown	J-129	J-130	120.0	0.041	0.01
Pipe_102	52.00	100	PVC	J-175	J-176	140.0	0.000	0

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Pipe_103	89.00	200	PVC	J-224	J-161	140.0	-0.208	0.01
Pipe_106	89	200	PVC	J-222	J-223	140.0	-0.619	0.02
Pipe_107	122	250	PVC	J-223	J-209	140.0	2.874	0.06
Pipe_108	110.0	150	PVC	J-84	J-234	140.0	0.179	0.01
Pipe_111	120.00	150	Asbestos Cement	J-234	J-235	110.0	0.305	0.02
Pipe_112	115.00	150	PVC	J-235	J-236	140.0	0.110	0.01
Pipe_114	106.00	150	Asbestos Cement	J-231	J-103	110.0	-0.083	0
Pipe_118	18.00	100	Unknown	J-103	J-104	120.0	0.097	0.01
Pipe_119	94.00	250	PVC	J-184	J-78	140.0	1.190	0.02
Pipe_120	13.00	250	PVC	J-77	J-78	140.0	-1.160	0.02
Pipe_121	76.00	100	Asbestos Cement	J-205	J-177	110.0	-0.081	0.01
Pipe_122	58.00	100	Asbestos Cement	J-184	J-185	110.0	-0.007	0
Pipe_123	89.00	150	PVC	J-103	J-184	140.0	-0.051	0
Pipe_124	168.00	100	Asbestos Cement	J-177	J-185	110.0	0.068	0.01
Pipe_125	80.00	150	PVC	J-195	J-193	140.0	0.288	0.02
Pipe_126	68.00	150	PVC	J-195	J-196	140.0	-0.308	0.02
Pipe_127	70.00	150	PVC	J-196	J-197	140.0	-0.308	0.02
Pipe_129	42	150	Unknown	J-150	J-151	120.0	-0.141	0.01
Pipe_131	17	300	Asbestos Cement	J-101	J-102	110.0	-4.346	0.06
Pipe_134	52.00	150	PVC	J-173	J-174	140.0	0.359	0.02
Pipe_136	107.00	150	PVC	J-232	J-233	140.0	-0.724	0.04
Pipe_137	35.00	250	Unknown	J-146	J-147	120.0	1.896	0.04
Pipe_138	206.00	300	Asbestos Cement	J-101	J-229	110.0	2.709	0.04
Pipe_140	10.00	150	Unknown	J-72	J-73	120.0	0.000	0
Pipe_143	61.00	300	Asbestos Cement	J-73	J-102	110.0	7.837	0.11
Pipe_146	106.00	300	Asbestos Cement	J-229	J-230	110.0	2.245	0.03
Pipe_147	89.00	100	Asbestos Cement	J-220	J-221	110.0	0.357	0.05
Pipe_149	130.0	100	Asbestos Cement	J-241	J-221	110.0	-0.121	0.02
Pipe_151	117.00	150	PVC	J-146	J-237	140.0	0.103	0.01
Pipe_155	125.00	250	PVC	J-219	J-240	140.0	1.479	0.03
Pipe_158	159.00	250	PVC	J-112	J-243	140.0	0.017	0
Pipe_160	63.00	100	Asbestos Cement	J-111	J-189	110.0	0.072	0.01
Pipe_161	75.00	100	Asbestos Cement	J-189	J-202	110.0	-0.029	0
Pipe_162	81.00	100	Asbestos Cement	J-202	J-151	110.0	-0.130	0.02
Pipe_163	62.0	100	Asbestos Cement	J-151	J-188	110.0	0.037	0
Pipe_167	23.0	250	Unknown	J-123	J-124	120.0	-0.130	0
Pipe_168	54.00	250	Unknown	J-123	J-179	120.0	0.130	0
Pipe_169	20.00	200	Unknown	J-113	J-114	120.0	0.045	0
Pipe_171	39.0	150	Unknown	J-141	J-149	120.0	0.040	0
Pipe_172	31	150	Unknown	J-140	J-141	120.0	0.141	0.01
Pipe_173	67	100	Asbestos Cement	J-188	J-106	110.0	0.037	0
Pipe_174	18	100	Asbestos Cement	J-106	J-107	110.0	0.037	0
Pipe_175	40	150	Unknown	J-150	J-140	120.0	0.141	0.01
Pipe_176	56	150	Unknown	J-149	J-66	120.0	0.040	0
Pipe_177	32	100	Unknown	J-107	J-67	120.0	0.037	0
Pipe_178	58	200	Unknown	J-179	J-114	120.0	-0.045	0
Pipe_179	6	150	Unknown	J-66	J-67	120.0	0.040	0
Pipe_180	148	150	Unknown	J-67	J-179	120.0	-0.025	0
Pipe_181	93	150	PVC	J-225	J-20	140.0	-0.121	0.01

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Pipe_182	14	300	PVC	J-81	J-82	140.0	12.035	0.17
Pipe_184	139	75	Unknown	J-248	J-191	120.0	-0.091	0.02
Pipe_186	19	150	Unknown	J-109	J-110	120.0	0.013	0
Pipe_187	42	200	PVC	J-152	J-153	140.0	0.094	0
Pipe_189	13	100	Unknown	J-79	J-80	120.0	0.000	0
Pipe_190	73	100	Unknown	J-200	J-79	120.0	0.000	0
Pipe_191	34	150	Unknown	J-118	J-145	120.0	0.000	0
Pipe_192	21	150	Unknown	J-117	J-118	120.0	0.000	0
Pipe_193	23	150	Unknown	J-119	J-120	120.0	0.000	0
Pipe_194	29	100	Unknown	J-133	J-134	120.0	0.000	0
Pipe_195	29	100	Unknown	J-135	J-136	120.0	0.000	0
Pipe_196	50	200	Unknown	J-85	J-171	120.0	-0.054	0
Pipe_197	25	200	Unknown	J-125	J-126	120.0	0.000	0
Pipe_198	15	200	Unknown	J-85	J-86	120.0	0.054	0
Pipe_199	44	200	Unknown	J-156	J-157	120.0	0.000	0
Pipe_200	26	150	Unknown	J-131	J-132	120.0	-0.078	0
Pipe_203	57	150	Unknown	J-142	J-143	120.0	0.037	0
Pipe_204	33	150	Unknown	J-127	J-144	120.0	-0.277	0.02
Pipe_205	25	150	Unknown	J-127	J-128	120.0	0.277	0.02
Pipe_206	20	150	Unknown	J-115	J-116	120.0	0.075	0
Pipe_207	15	250	Unknown	J-89	J-90	120.0	0.000	0
Pipe_208	61	250	Unknown	J-186	J-187	120.0	0.000	0
Pipe_210	15	150	PVC	J-87	J-88	140.0	0.002	0
Pipe_211	15	250	Unknown	J-87	J-88	120.0	-0.002	0
Pipe_212	17	250	Unknown	FH 5	J-96	120.0	0.000	0
Pipe_213	17	250	PVC	J-97	J-98	140.0	0.000	0
Pipe_214	17	250	Unknown	J-92	FH 6	120.0	0.000	0
Pipe_215	17	250	Unknown	J-99	J-100	120.0	0.129	0
Pipe_216	7	250	PVC	J-60	J-9	140.0	-0.098	0
Pipe_219	2	150	PVC	J-38	J-39	140.0	-0.139	0.01
Pipe_220	3	150	PVC	J-44	J-36	140.0	0.000	0
Pipe_221	2	150	PVC	J-36	J-37	140.0	0.000	0
Pipe_222	6	150	PVC	J-61	J-62	140.0	-0.741	0.04
Pipe_223	3	150	PVC	J-44	J-48	140.0	-0.883	0.05
Pipe_224	6	150	PVC	J-63	J-64	140.0	0.000	0
Pipe_225	4	150	PVC	J-55	J-53	140.0	0.000	0
Pipe_226	3	100	PVC	J-51	J-39	140.0	-0.200	0.03
Pipe_227	4	150	PVC	J-30	J-38	140.0	-0.708	0.04
Pipe_228	2	150	PVC	J-29	J-30	140.0	-0.708	0.04
Pipe_229	3	100	PVC	J-41	J-51	140.0	-0.200	0.03
Pipe_230	3	100	PVC	J-40	J-41	140.0	-0.200	0.03