Town of Crossfield
Master Sanitary Servicing Study
2020 Update

Prepared For:	Town of Crossfield
Submitted By:	Allnorth 300–8 Manning Close NE Calgary, AB T2E 7N5 Canada Phone: 403-717-2370
Allnorth Contact:	Mirren Turnbull mturnbull@allnorth.com
Project Number:	2000069
Date:	February 16, 2021

DOCUMENT INFORMATION

Project Number:	2000069
File Number:	2000069
Filename:	210216-AM-Crossfield Master Sanitary Servicing Study 2020 Update.docx
Document Revision:	2

REVISION HISTORY

Rev.#	Date of Issue	Written By	Reviewed By	Approved By	Description
0	2020-09-14	EP	AM	RM	Final Issue
1	2021-02-02	MT	AM	RM	Final Issue – Revision 1
2	2021-02-16	MT	AM	RM	Final Issue – Revision 2

TABLE OF CONTENTS

APPENDICES

LIST OF TABLES

LIST OF FIGURES

EXECUTIVE SUMMARY

Objective & Study Area

The Town of Crossfield (the Town) commissioned Allnorth to prepare an updated Master Sanitary Servicing Study (MSSS). This MSSS is the fourth version in a series of MSSS studies, which have been previously prepared by Allnorth and others. This MSSS is a standalone document and supersedes all previous documents.

The main objective of this study was to expand the master planning horizon to include a large proposed annexation of 22 quarter-sections, in addition to the current town area of 25 quarter-sections, for a total of 47 quarter-sections covering approximately 2,550 ha. The limits of the proposed annexation are as per the Town of Crossfield Land Use Bylaw Map (September, 2018).

This study presents the preliminary sizing, pricing and recommended phasing for the proposed infrastructure additions and upgrades to services the Study Area.

Existing Sanitary Sewer Infrastructure

The existing sanitary sewer infrastructure covers the land within the current Town boundary which encompasses eighteen quarter sections of land (1,183 ha). The Town currently maintains approximately 22.5 km of sanitary sewer gravity plus 1.7 km of forcemain, with pipe diameters ranging from 100 mm to 600 mm. Waste outfall is managed by a series of holding cells and a lagoon, and treated sewage is discharged into Nose Creek once per year.

Model Development

XPSWMM dynamic computer model was used to build upon the previous MSSS study (Allnorth, 2017) sanitary model for the additional land areas. Sewershed areas were mapped out for each proposed trunk, as well as for the existing Town and in total there at 16 sewershed catchments.

Design parameters used to estimate population density and determine the flows for Future Development are included in **Table 3-1** as summarized below.

- Residential Population Density: 40.5 people/ha
- House Density: 2.7 persons/unit
- Commercial Population Density: 6.5 people/ha
- Industrial Population Density: 7.8 people/ha
- Residential Sewer Generation Rate: 268 L/s/ha
- Commercial Sewer Generation Rate: 0.10 L/s/ha
- Industrial Sewer Generation Rate: 0.10 L/s/ha

Dry weather and wet weather flows were assigned to each of the sewersheds based on catchment size, expected land use and expected population, as follows:

- Dry Weather Flow was applied as a factor of the water consumption average daily demand (ADD) with respect to the Master Water Servicing Study (Allnorth, 2020). For residential, this was 85% of the ADD based on litres / capita / day. For commercial and industrial this was 100% of the ADD based on litres / second / hectare.

  - Sewershed size and boundary was assigned based on existing LIDAR topography with respect to the sanitary trunk concept alignment prepared by Allnorth as part of this study.
  - Land use was applied with reference to Town of Crossfield Land Use Bylaw Map (September, 2018).
  - Population is expected to increase at 6% average annual growth. Existing population (2018) is 3,895 and the full buildout population in 2062 is estimated to be 42,640 people.
- Wet Weather Flow, as a function of infiltration and inflow, was applied based on a 1 in 10 year City of Calgary design storm. Inflow and Infiltration allowance was generated equivalent to 0.28 L/s/ha as per Alberta Environment Standards and Guidelines for Municipal Waterworks, Wastewater and Storm Drainage Systems (Alberta Government, March 2013) in the XPSWMM model using RDII module.

- Peaking factor computed by Harmon's equation was applied to new development residential areas (in Annexation and JASP areas) and peaking factor related to average flow rate was applied for commercial and industrial land uses (in Annexation and JASP areas) as per Alberta Environment Standards and Guidelines (Alberta Government, March 2013). The peaking factors are shown in Appendix C - DWF Input Data, should be multiplied by 1.57.

The Town does not currently have any flow monitoring in place within the sanitary system, other than pump logs from lift stations, hence this could not be directly applied to determine sewage generation information for individual catchments.

Ultimate Servicing Concept

A concept servicing map was generated for the full build out of the town, including trunk sizing and lengths. In total there are proposed 14 new trunks and four new lift stations and forcemains. In the west, 6.6 km of new trunks ranging from 300 to 450 mm diameter is required to discharge to Range Road 12 (RR12) Trunk. RR12 Trunk is required to be upsized to a minimum 675 – 750 mm diameter based on the flows estimated by this study, as shown on the table below. In the north, 5.1 km of 200 – 450 mm diameter trunks, plus two lift stations and 4.2 km of forcemain of 450 mm diameter is required. In the east, 7.0 km of 300 – 600 mm diameter trunks, plus two lift stations and 2.9 km of forcemain of 300 – 375 mm diameter is required.

In the central area (existing Town), 2.7 km of 200 - 600 mm diameter trunks is required to service the existing town area, including the proposed north subdivisions (Hawks Landing and Iron Landing), and increased flow capacity of the Laut Avenue trunk to allow the eastern developments to connect in.

- A re-route of the Iron Landing lift station forcemain to the west through Hawks Landing is required as proposed by Stantec (Stantec, March 2016) to decrease flows on Railway Street and Laut Avenue trunk.
- This study utilized the recently constructed Iron Landing lift station information (Lee Mahar, October 2015), and the forcemain re-routing to the west through Hawks Landing subdivision utilized design information by Stantec.

The distribution of the Trunks and the corresponding area it serves is summarized in the Table below.

Trunk Location	Trunk ID	Cumulative Sewershed Area (ha)	Pipe Diameter (mm)	Length (m)	Remark
West	W1	64.1	300	780	
	W1	110.62	375	1300	
	W1	143.47	450	610	
	W2	89.07	300	800	
	W2	125.98	450	840	
	W2	173.26	450	120	
	W3	85.49	300	900	
	W4	64.80	450	924	
	W4	129.70	450	316	
East	E1		525	1600	Flow from E3 SFM
	E1	101.01	525	1410	Plus flow from E3 SFM
	E1	163.85	525	1050	Plus flow from E3 SFM
	E1	348.61	600	260	Plus flow from E3 SFM
	E2	79.67	300	970	
	E2	154.97	450	790	
	E2	63.10	300	53	
	E2 SFM		300	1730	Flows from Trunk E2
	E3	125.80	375	870	
	E3	116.80	350	30	
	E3 SFM		300	1140	Flows from Trunk E3
Central	C1	54.18	200	442	
	C1		375	1110	Flows from part of Hawks Landing and Iron Landing
	C4		250	510	Designed by HMR Engineering Inc. (HMR (a), December 2018).
	C5		600	622	Flows from existing system and Crossfield-Rocky View Joint ASP
	RR12		675	1126	Originally this Trunk designed by Exp is proposed to be upsized from 525 to 675 mm diameter.
	RR12		750	74	Originally this Trunk designed by Exp is proposed to be upsized from 525 to 750 mm diameter.
North	N1	64.40	200	850	
	N1	125.50	300	780	
	N1	180.40	375	581	
	N1	54.90	300	43	
	N1 SFM		450	840	Flows from Trunk N1
	N2	137.85	375	1365	
	N2	237.41	450	610	
	N3	36.10	300	800	

Trunk Location	Trunk ID	Cumulative Sewershed Area (ha)	Pipe Diameter (mm)	Length (m)	Remark
	North SFM		450	3310	Flows from N1 SFM and Trunk N2
IL New FM	IL New FM		200	1486	New Iron Landing Forcemain to be re-routed to discharge to 525 mm diameter pipe as proposed by Stantec.

Notes:

- See Figure 5-1 for the Full Buildout Sanitary Collection Network.
- Trunk C4 was designed by HMR Engineering Inc. (HMR (a), December 2018).
- Iron Landing lift station sizing was completed by Lee Maher Engineering Associates Ltd. (Lee Maher, October 2015).
- Trunk designed by EXP Services Inc. is proposed to be upsized from 525 to 675 - 750 mm diameter.

Phasing and Budgetary Cost Estimate

A suggested development sequence and budgetary cost estimate were prepared for the 14 new trunks, which were split into 17 projects. The prediction of development sequence, beyond areas already in negotiations with a specific developer, is subject to a great deal of uncertainty. For the purposes of this study, the assumed development sequence is based on the Town's best estimate for probable development of specific areas within the next 10 years. For the remainder, we have assumed development will proceed generally outwards, beginning with areas closest to major highways and the existing town.

1. Near Term to Year 2030 (Phase 1): Contains two projects including Range Road 12 trunk and the second project is Trunk C4. Range Road 12 Trunk that accommodates flows from West Trunks (W1, W2, and W3), Vista Crossing development, Iron Landing Forcemain and North SFM has been re-sized based on this study estimated flows. The new sizing to be considered for construction are 1,200 m of Ø 675 mm and 74 m of Ø 750 mm. The total budget for Range Road 12 trunk and Trunk C4 is estimated at $3.46 million.
2. Year 2030 to 2040 (Phase 2): Contains three projects valued at a total of $3.76 million. This project requires re-routing of forcemain, as designed by Stantec, to discharge west through Hawks Landing subdivision to 525 mm diameter pipe.
3. Year 2040 to 2050 (Phase 3): Contains seven projects valued at a total of $23.12 million, plus one lift station.
4. Beyond year 2050 (Phase 4): Contains four projects valued at a total of $$47.7 million, plus three lift stations.

Conclusion & Recommendations

A conceptual servicing strategy was prepared for the full build out scenario for the Town of Crossfield, including phasing and budgeting, to assist the Town in future planning of sanitary infrastructure. Several recommendations were made for the next project steps, the most significant recommendations are as follows:

1. EXP Services Inc. should consider now the future connections of the North SFM and the West proposed trunks to the RR12 Trunk, so that RR12 Trunk manholes could potentially be re-sized to larger Type 1S manholes to facilitate the future proposed connections. Trunk RR12 has been re-sized to accommodate the current estimated flows, the new trunk sizing to be considered for construction are 1,200 m of Ø 675 mm and 74 m of Ø 750 mm. This will avoid significant re-work in the future if larger manhole and pipes are needed.
2. This study utilized the recently constructed Iron Landing lift station information (Lee Mahar, October 2015), and the forcemain re-routing to discharge west through Hawks Landing subdivision to 525 mm diameter pipe, utilized design information by Stantec.
3. Investigate the capacities of the sanitary outfall system, treatment system and phasing plan of any required upgrades. These were not considered as part of this study.

1 INTRODUCTION

1.1 Background

The Master Sanitary Servicing Study (MSSS) is a document to assist the Town of Crossfield (Town) plan determine how it will service the sanitary capacity requirements of the future development of the Town.

The Town has an existing Master Sanitary Servicing Study (MSSS) prepared in 2017 by Allnorth.

This 2020 update to the MSSS builds upon previous studies (detailed in Section 1.3) and provides an up-to-date assessment of the Town's sanitary servicing needs with respect to capacity, including a master servicing concept for key development stages and for build-out, proposed capital projects to service anticipated near and medium-term developments, and cost estimates.

1.2 Objectives

The objectives of this study is to provide an update for the MSSS to include the new annexation areas, as follows:

- Identification of potential capacity within the existing system to accommodate additional flows from the additional annexation areas.
- Development of an expanded build-out sanitary servicing concept to include the proposed annexation areas.
- Update the current sanitary XPSWMM hydraulic model to facilitate future additions and analysis.
- Provide cost effective recommendations for the servicing of all lands within the expanded town boundary.
- Prepare preliminary sizing, cost estimates and a phasing plan for the proposed infrastructure upgrades.
- Combine the results of the last two MSSS, Crossfield Master Sanitary Servicing Study (Allnorth, 2016) and Crossfield-Rocky View Joint ASP Master Sanitary Servicing Study (Allnorth, 2017), to create a standalone master study document.

The following are excluded from this scope:

1. Analysis of the current condition of system elements (e.g. CCTV investigation to identify any physical damage of pipes or manholes, current efficiency of pumps) – This was a separate study done by Allnorth with CCTV 16CG0091 Sanitary Sewer Condition Assessment (Allnorth, June 2018) for oldest and trunks, for the existing sanitary system built before 1983.
2. Analysis of the capacity of existing sewer pipes within residential areas that are not trunks.
3. Any interfacing of the sanitary system with other services, such as water and stormwater.
4. Detailed design of sanitary infrastructure for future areas, including pipes, manholes or lift stations.
5. Quality treatment performance of the outfall system, i.e. the quality of final treated effluent that is discharged to Nose Creek

6. Capacity of the West pump in the West Lift Station.
7. Urban density increase of existing Town areas (e.g. single family residential lots changed to apartment building)
8. Incorporation of any new flow monitoring data

1.3 Previous Studies

1.3.1 Master Sanitary Servicing Study (D.A Watt Consulting, 2009)

In June 2009, a Master Sanitary Servicing Study was completed by D.A Watt Consulting that assessed the capacity for development within the Town of Crossfield's (Town) current boundaries, plus the proposed 2010 annexation territory. The study area is shown in **Figure 1-1**, which has been extracted from the previous report.

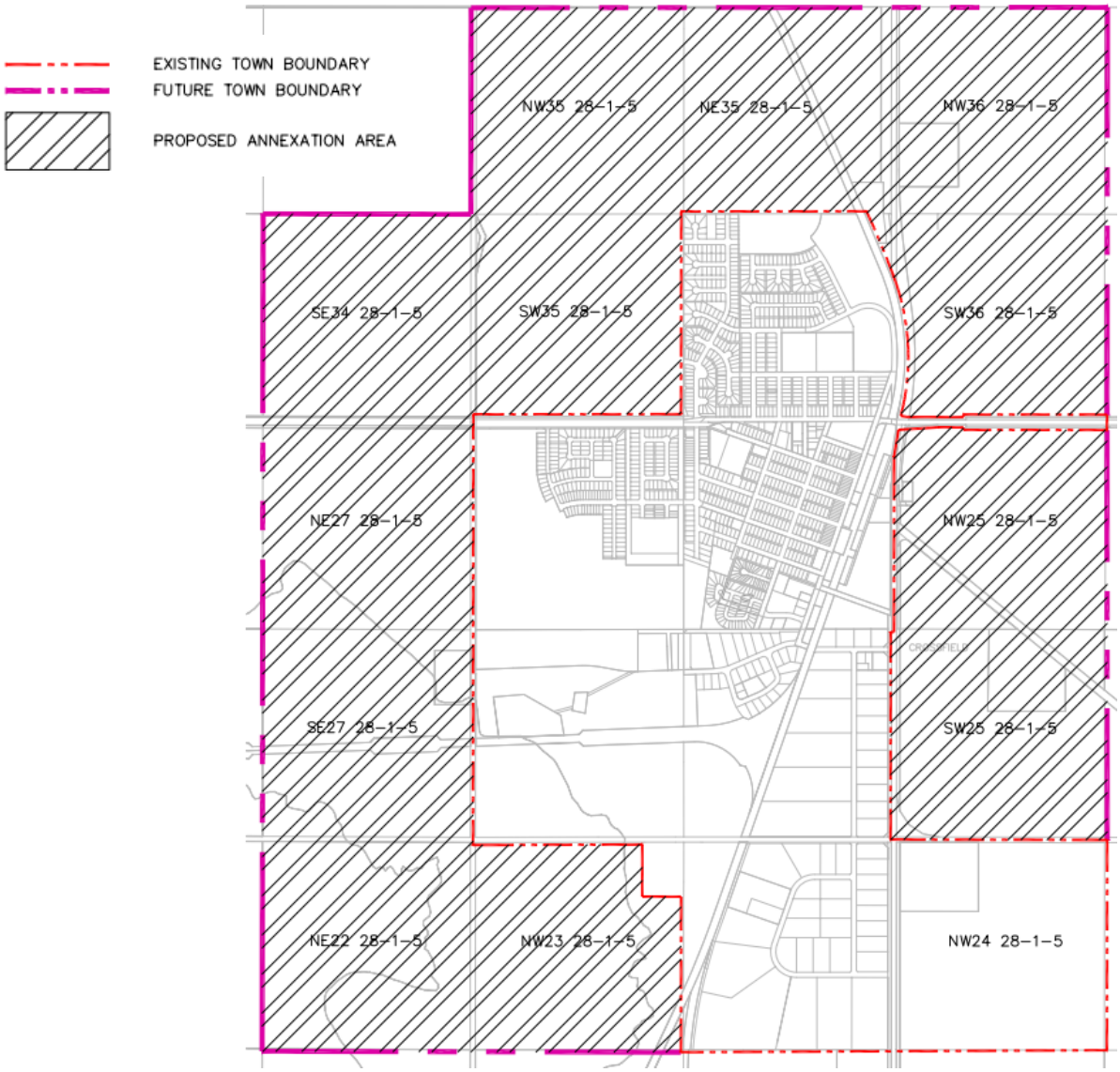


Figure 1-1: Town of Crossfield 2009 MSSS Boundary

1.3.2 Master Sanitary Servicing Study for the Town (Allnorth, October 2016)

In 2016, Allnorth prepared a Master Sanitary Servicing Study (MSSS) for the Town to accommodate annexation lands from Rocky View County, for the development area shown in **Figure 1-2,** which has been extracted from the report.

This study consisted of:

- Review and consolidation of pipe and manhole network data.
- Delineation of sanitary sewersheds.
- Development of a sanitary design basis using existing sewage generation data, sewersheds, and infiltration and inflow (I & I) estimates.
- Development of a sanitary hydraulic modeling tool for long-term use in assisting decision support and implementation planning.
- Evaluation of the existing sanitary sewer system capacity under both dry and wet weather flows, and identification of areas at or below hydraulic capacity.
- Development of a future sanitary servicing concept based on estimated future sewer flows resulting from development of all lands within the Town boundary.

This study identified system deficiencies and proposed a master servicing concept to accommodate Town expansion since the previous study by D.A Watt Consulting in 2009. The proposed concept system consisted of five sanitary sewer trunks, two new lift stations, an upgraded Iron Landing Lift Station with a new discharge location towards Range Road 12, and an upgraded South Lift Station. In addition, the existing sanitary sewer system running along Railway Street was identified as requiring an upsize to 450 mm diameter, to service the land to the east of the existing town.

1.3.3 Joint ASP Boundary Rockyview County (Allnorth, August 2017)

In 2017, Allnorth completed an expansion of the 2016 MSSS to incorporate the Crossfield-Rocky View Joint ASP (JASP) lands. This JASP MSSS, which is a standalone master servicing study based upon the 2016 Crossfield MSSS, was prepared to provide a comprehensive plan and growth strategy for the future development of the area. It covers five-quarter sections within the Town of Crossfield boundary (NW36 28-1 W5M; SW36 28-1 W5M; NW25 28-1 W5M; SW25 28-1 W5M and NW24 28-1 W5M). As well as an additional, approximately six quarter sections within the County (NE 36 28-1 W5M; SE 36 28-1 W5M; NE 25 28-1 W5M; SE 25 28-1 W5M; NE 24 28-1 W5M; SW 24 28-1 W5M and SE 24 28-1 W5M). The Joint Planning Area and proposed servicing concept is shown in **Figure 1-3**, which has been extracted from the report.

The 2017 Joint ASP MSSS:

- Determined expected Joint ASP sanitary flows based on the land use scenario provided, and the 2016 Town of Crossfield MSSS design basis;
- Analysed effects of the additional Joint ASP sewage on the Town's existing and proposed future sanitary systems, as described in the 2016 Town of Crossfield MSSS;

- Developed an updated sanitary servicing concept to incorporate the additional Joint ASP sewage, based on the 2016 Town of Crossfield MSSS concept, to include the collection, treatment, and disposal systems.
- Recommended changes, conceptual analysis, project phasing and cost estimates to the 2016 Town of Crossfield MSSS future sanitary servicing concept, as required to service the Joint ASP lands.

The study also recommended expanding the 60-day treatment cell by approximately 29,000 m^3, as the anaerobic cells are likely to have capacity for at least 10 years of population growth at 2% per year.

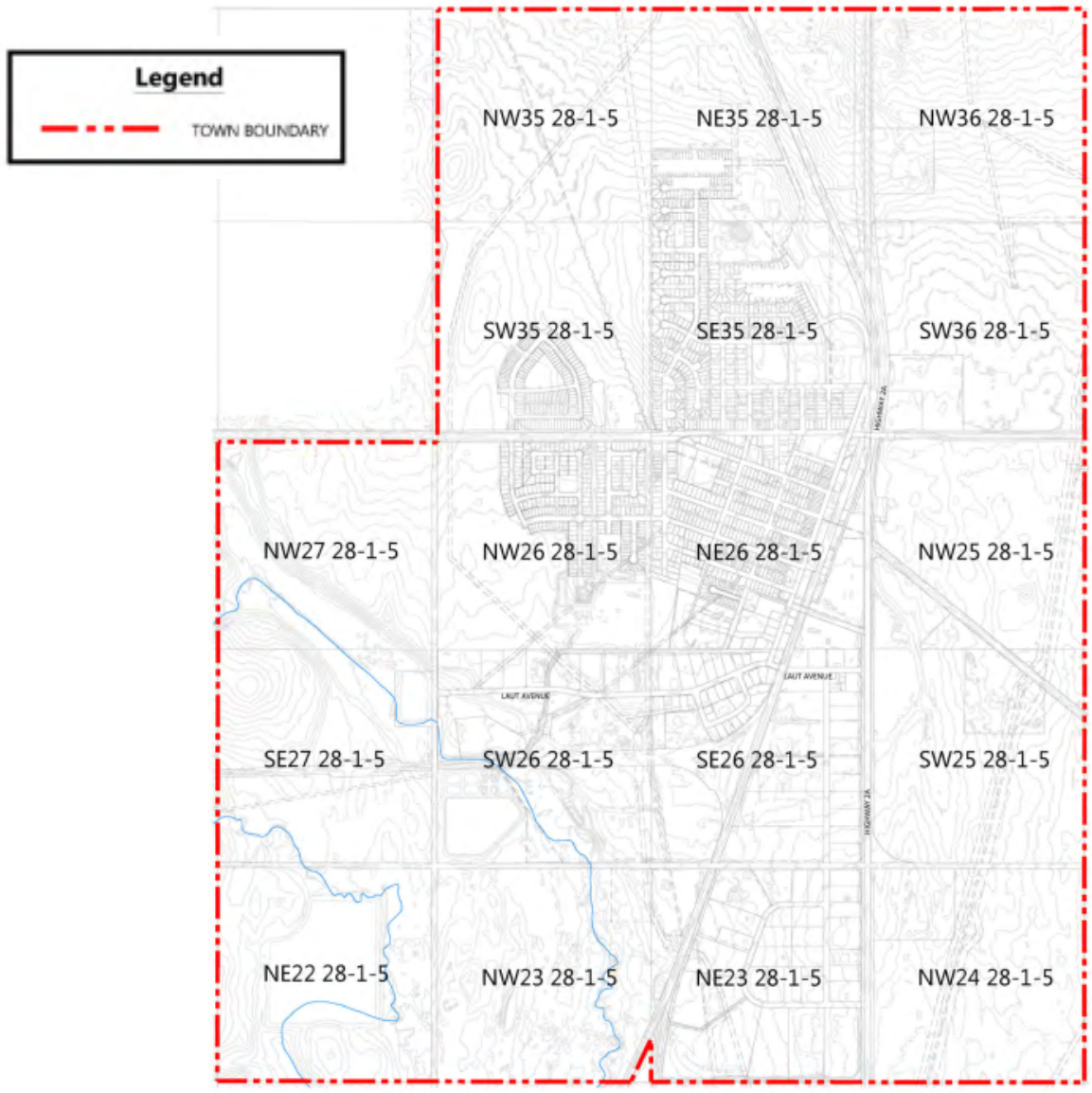


Figure 1-2: Town of Crossfield 2016 MSSS Boundary

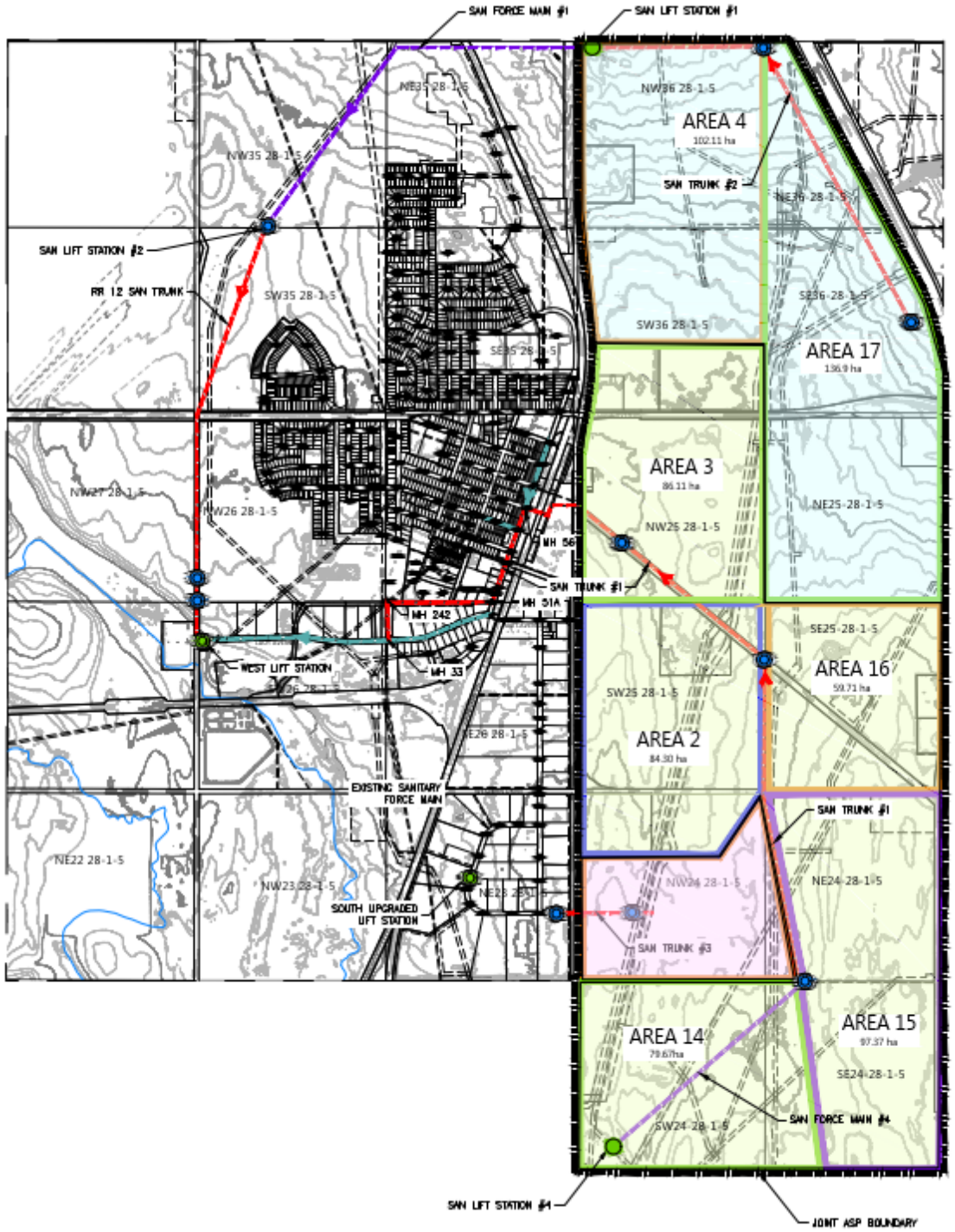


Figure 1-3: JASP Boundary Showing Proposed Servicing

2 DEVELOPMENT STATISTICS

The proposed development area is shown in **Figure 2-1**.

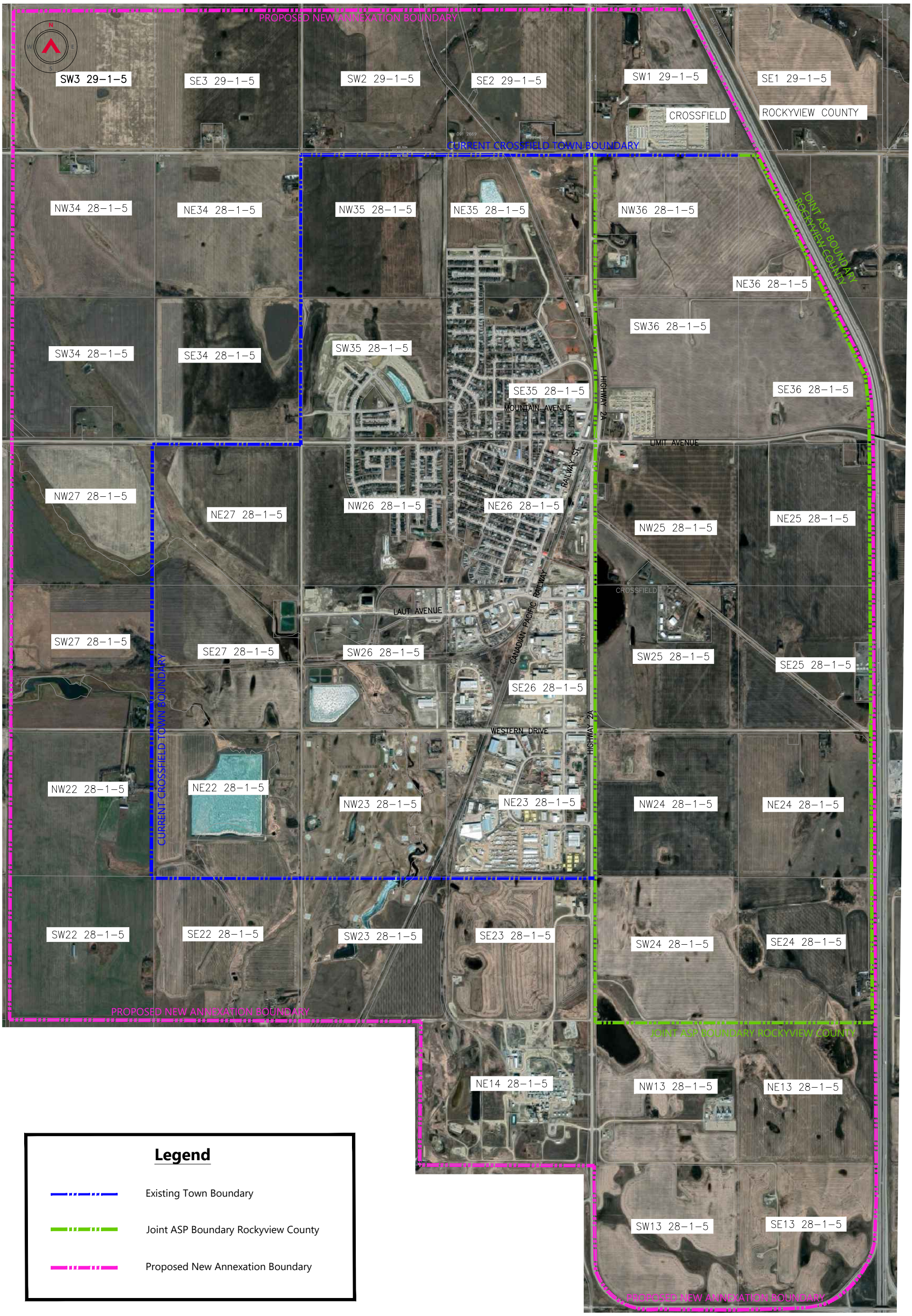
2.1 Study Area and Land Use

Similar to the Water Master Plan (Allnorth, July 2020), the study area for the MSSS includes the following areas, and covers a total of 45 quarter-sections for a total area of approximately 2,550 ha. Proposed land uses within the Study Area are shown in Figure 2-2. This is based on the Town of Crossfield Land Use Bylaw Map (September, 2018) and development objectives as presented in annexations agreements (2009), approved Crossfield-Rocky View Joint ASP (MPE, 2017) and Inter-municipal Development Plan (Rocky View and Town of Crossfield, June 2013), and the latest Master Development Plan (MDP) (Town of Crossfield, 2018).

Within the study area, nine quarter-sections are developed, three have approved ASPs with development underway, and several further developments are expected to proceed in the near to medium term. The detailed land descriptions for the study area are as follows:

- **Within existing town boundary:**
  - Existing developed land: SE35-28-1-5 (residential/municipal), NW26-28-1-5 (Sunset Ridge, partially developed), NE26-28-1-5 (residential/downtown), SW26-28-1-5, SE26-28-1-5 (industrial), NE22-28-1-5 (wastewater storage cell), NW23-28-1-5 (golf course), NE23-28-1-5 (industrial);
  - Area Structure Plans (ASPs) under development:
    - Iron Landing (NE35 28-1 W5M, Bylaw No. 2011–11),
    - Vista Crossing (SW35 28-1 W5M, Bylaw No. 2015–07),
    - Hawks Landing (NW35 28-1 W5M, Bylaw No. 2016–12),
    - Sunset Ridge (NW26 28-1 W5M, partially developed, currently on hold);
  - Urban Reserve (Joint ASP): NW36-28-1-5, SW36-28-1-5, NW25-28-1-5, SW25-28-1-5, NW24-28-1-5;
  - Urban Reserve (no ASP): NE27-28-1-5, SE27-28-1-5;
- **Crossfield-Rocky View Joint ASP (2017):**
  - Five quarter-sections within the Town of Crossfield boundary (see above);
  - Six quarter-sections within Rocky View County: NE36-28-1-5, SE36-28-1-5, NE25-28-1-5, SE25-28-1-5, NE24-28-1-5, SW24-28-1-5, SE24-28-1-5;
- **Proposed future annexation areas, covering 22 quarter-sections:**
  - North of existing town: SW3-29-1-5, SE3-29-1-5, SW2-29-1-5, SE2-29-1-5, SW1-29-1-5, SE1-29-1-5;
  - West of existing town: NW34-28-1-5, NE34-28-1-5, SW34-28-1-5, SE34-28-1-5, NW27-28-1-5, SW27-28-1-5, NW22-28-1-5;
  - South of existing town: SW22-28-1-5, SE22-28-1-5, SW23-28-1-5, SE23-28-1-5, NE14-28-1-5, NW13-28-1-5, NE13-28-1-5, SW13-28-1-5, SE13-28-1-5.

Date: 2021/01/31 | User: Michelle Hover | File: P:\CG\2020\0-99\2000069 - Crossfield 2020 MSSS Update\1000-Drawings\2000069_Figures_REV_change | Layout: Fig 2-1 | Paper Size: 431.8mm x 558.8mm



Legend

- Existing Town Boundary
- Joint ASP Boundary Rockyview County
- Proposed New Annexation Boundary

CLIENT: THIS is CROSSFIELD EST 1907

CONSULTANT: Allnorth

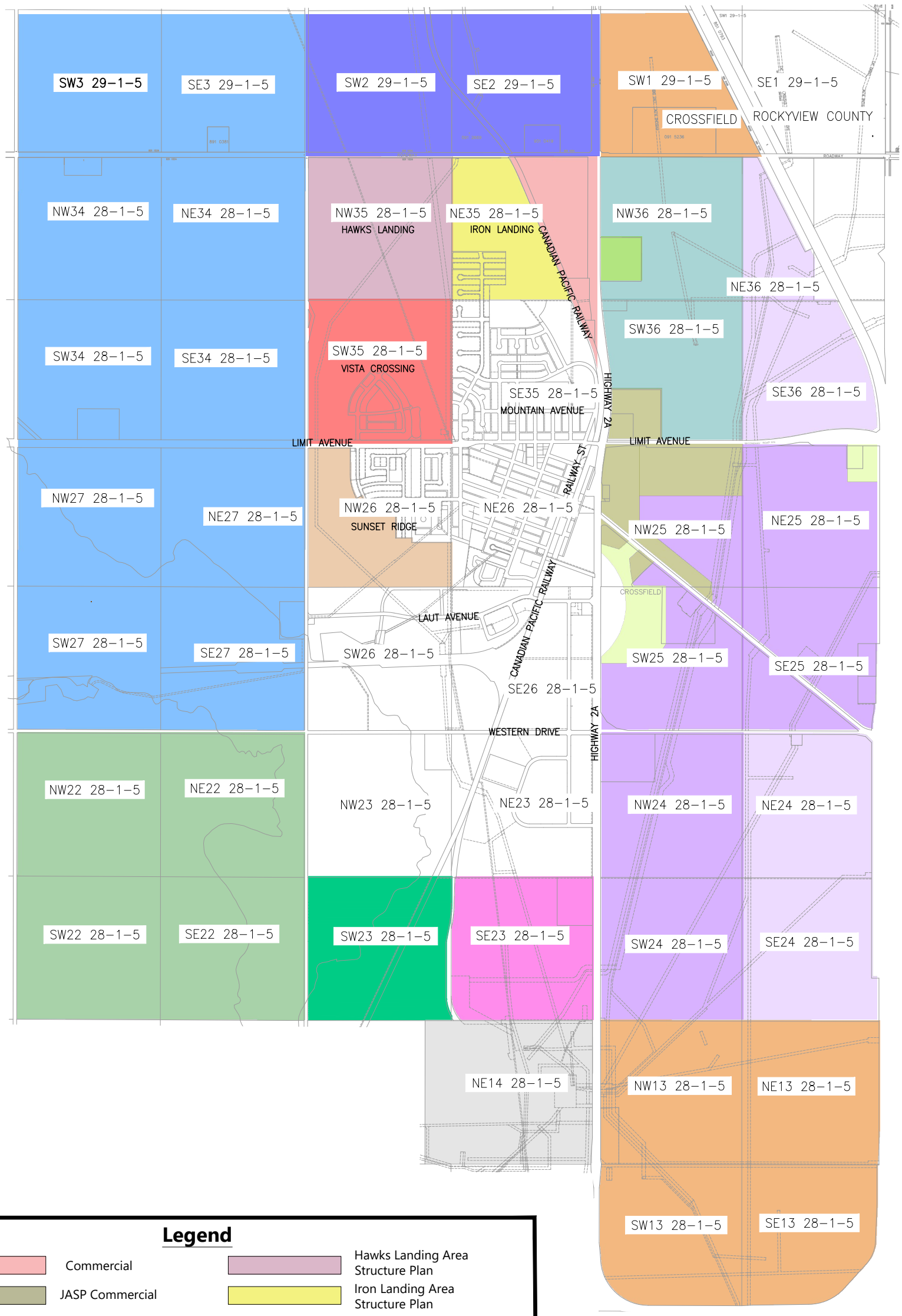
PROJECT: TOWN OF CROSSFIELD

MASTER SANITARY SERVICING STUDY

FIG TITLE: STUDY AREA

FIGURE 2-1

Date: 2021/01/31 | User: Michelle Hover | File: P:\CG\2020\0-99\2000069 - Crossfield 2020 MSSS Update\1000-Drawings\2000069_Figures_REV_change | Layout: Fig 2-2 | Paper Size: 431.8mm x 558.8mm



Legend

- Commercial
- JASP Commercial
- JASP Industrial&Commercial
- JASP Industrial
- JASP Light Industrial
- JASP Green Space
- JASP Wetlands
- Sunset Ridge Area Structure plan
- Vista Crossing Area Structure Plan
- Hawks Landing Area Structure Plan
- Iron Landing Area Structure Plan
- Annex-Existing Development
- Annex-Golf Course
- Annex-Industrial&Commercial
- Annex-Industrial
- Annex-Residential Mix Use
- Annex-Residential Single Detached
- Annex-Urban Reserve
- Municipal and Institutional
- Current Crossfield Town Boundary
- Joint ASP Bounday Rockyview County
- Proposed New Annexation Boundary

CLIENT: THIS is CROSSFIELD EST 1907

CONSULTANT: Allnorth

PROJECT

TOWN OF CROSSFIELD

MASTER SANITARY SERVICING STUDY

FIG TITLE

LAND USE

FIGURE 2-2

2.2 Population

2.2.1 Historical Growth & Growth Projection

Similar to the Water Master Plan (Allnorth, July 2020), the Town of Crossfield's historical population data is presented in **Table 2-1**, based on Statistics Canada census data for 2001-2016, and on internal Crossfield census data for 2017-2018. During this historical period, annual growth was on average approximately 2% until 2017. Recently, growth has been much higher, with growth at 8.3% from 2017 to 2018. This recent increase in growth is likely due to new residential construction in the Iron Landing and Vista Crossing ASPs.

Table 2-1: Historical Population Growth

Year	Population (Census)	Growth (Mean Annual %)
2001	2,399	-
2006	2,643	2.0%
2011	2,853	1.6%
2016	2,983	0.9%
2017	3,055	2.4%
2018	3,308	8.3%

For the purposes of population projection, this study follows the guidance of the 2018 Crossfield MDP, which references the growth study prepared in 2009 for the lands annexed to the Town in 2010. The 2009 growth study projected a residential population of 12,000 to 15,000 by the year 2040, which corresponds to an annual growth of approximately 6%. The actual growth which occurred between the publication of the growth study (2009) and the most recent census (2018) was approximately 2.0%. However, given the high rate of growth from 2017 to 2018, and the upcoming residential ASPs under active construction, 6% is reasonable for planning purposes. A growth rate of 6% as requested by the Town has therefore been assumed for the purposes of this study. Non-residential growth is expected to grow at the same rate, as defined by equivalent population (see **Section 2.3.0**). The projected population at the selected annual growth rate of 6% is summarized in **Table 2-2** and **Figure 2-3**, along with comparison rate of 2%, 4%, and 8%**.**

Table 2-2: Population Projection

Year	Annual Growth				Remark
	2%	4%	6% (selected)	8%	
2018	3,308	3,308	3,308	3,308	2018 municipal census
2023	3,652	4,025	4,427	4,861	
2028	4,032	4,897	5,924	7,142	
2033	4,452	5,958	7,928	10,494	
2038	4,915	7,249	10,609	15,419	
2043	5,427	8,820	14,197	22,656	
2048	5,992	10,731	18,999	33,289	

Year	Annual Growth				Remark
	2%	4%	6% (selected)	8%	
2053	6,616	13,056	25,425	48,912	
2058	7,305	15,885	34,024	71,868	
2063	8,065	19,327	45,532	105,598	

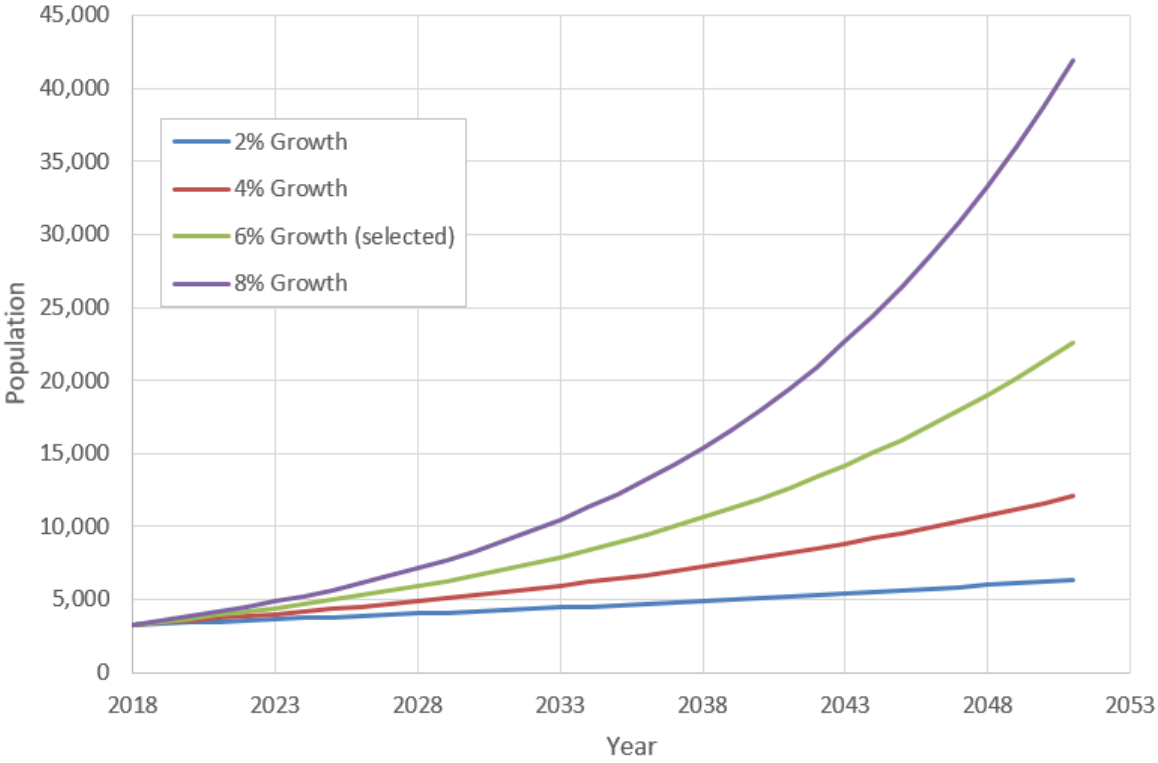


Figure 2-3: Town of Crossfield Population Projections

2.2.2 Existing Town

The population, area, and land use details for the existing town areas are presented in **Table 2-3**.

The information presented is based on the latest Town of Crossfield land use bylaw map (Bylaw No. 2011-05, updated September 2018, see Appendix A).

Equivalent Population

In order to characterize the relative servicing demands of residential and non-residential areas, the concept of equivalent population has been utilized throughout this section similar to Town of Crossfield Master Water Servicing Study 2020 Update (Allnorth, July 2020). The residential equivalent populations are equal to the actual populations.

Non-Residential Existing Areas – Equivalent population density was calculated using the total areas and total metered volumes of residential, commercial, and industrial land uses. For industrial land use zones and commercial land use zones, the relative water use of residential, commercial, and industrial areas was compared for the year from June 2018 to May 2019. Using the demand per capita for the residential areas, equivalent population densities for non residential areas were determined. For commercial areas and industrial areas, the equivalent populations were calculated to be 6.5 and 7.8 persons/ha (c/ha) respectively, for details refer to Town of Crossfield Master Water Servicing Study 2020 Update (Allnorth, July 2020).

Table 2-3: Population and Area by Land Use Code of Existing Town Areas

Land Use Code	Fire Flow Type	Population Type	Gross Area (ha)	Equivalent Population[1]	(Equivalent) Residential Units
MHR	Single Family	Residential	5.6	187	69
RES-R1A	Single Family	Residential	48.3	1432	530
RES-R1B	Single Family	Residential	12.4	466	172
RES-R1C	Single Family	Residential	23.2	752	278
RES-R2	Multi-Family	Residential	20.9	734	270
RES-R3	Multi-Family	Residential	0.1	3	1
RES-R4	High-Density	Residential	1.9	71	26
BUS-C2	Commercial/Institutional	Non-Residential	14.6	94	35
BUS-C3	Commercial/Institutional	Non-Residential	10.4	67	25
BUS-CBD	Commercial/Institutional	Non-Residential	5.1	33	12
BUS-EBD	Commercial/Institutional	Non-Residential	9.0	58	21
BUS-WBD[2]	Multi-Family	Non-Residential	7.4	250	92
IND-I1	Industrial	Non-Residential	10.0	78	29
IND-I2	Industrial	Non-Residential	66.7	522	193
IND-I3	Industrial	Non-Residential	71.6	560	208
MUN (serviced)	Commercial/Institutional	Non-Residential	31.1	201	74
MUN/DC (unserviced)	N/A	N/A	90.3	N/A – Unserviced	
Subtotal – Residential			**112.4**	**3,895**	**1,438**
Subtotal – Non-Residential			**225.90**	**1,613**	**597**
Total (Serviced)			**338.3**	**5,508**	**2,035**

Notes:

1. The land use codes are as per defined in Land Use Districts in Land Use Bylaw (Town of Crossfield, November 2018).
2. "Equivalent Population" means actual residents for residential zones, as well as equivalent population for non-residential zones. It is used to characterize relative water demand, rather than total actual persons present in the town.
3. Although "BUS-WBD" stands for "Business-Western Business District", zones with this code are primarily residential at this time (2018). Since residential areas produce higher flows per unit area, this code has been classed as "Residential" for the purposes of flow demand estimation.

2.2.3 Upcoming Developments

Upcoming developments are summarized below, and include developments approved and in construction, or with construction planned within five years as of 2018.

2.2.4 Vista Crossing ASP (Town of Crossfield Bylaw No. 2015 – 07)

The Vista Crossing development is located at legal location SW1/4 35-28-01-W5M, and covers a gross area of 64.45 ha. For the purpose of water servicing, the land use for this ASP is largely single family residential, with some multi-family (medium density) residential. The population, area, and land use details for the Vista Crossing ASP are presented in **Table 2-4**. The information presented is based on the Vista Crossing ASP Bylaw 2015-07 (B&A et. al., 2015), the Vista Crossing 2017 Servicing Strategy Rev 2 (Exp, 2017), and the Vista Crossing Phase 4 2018 Servicing Strategy Rev 1 (Exp, 2018).

Table 2-4: Vista Crossing ASP Summary

Description	Gross Area (ha)	Status	Equivalent Population[1]	(Equivalent) Residential Units[2]	Remarks
Developable Areas	**60.7**	**-**	**2,925**	**1,106**	
Catchment B Total	**24.61**	**-**	**1,117**	**412**	
Phase 1	10.88	Complete	407	150	Actual units constructed
Phase 3	2.46	Under Construction	141	52	Actual units to be constructed
MF.e	1.15	Future	171	63	Medium density residential - 22 units per acre
Phase 2	5.63	Future	227	84	Low density residential - 6 units per acre
Phase R	4.49	Future	171	63	Low density residential - 6 units per acre
Catchment C Total	**0.84**	**-**	**27**	**10**	
Catchment C	0.84	Future	27	10	Exp estimated maximum units
Catchment A Total	**32.43**	**-**	**1,849**	**684**	
Phase 4	5.01	Under Construction	277	102	Actual units to be constructed
Catchment A excl. Phase 4	27.42	Future	1,572	582	Residential: Medium density @ 22 units/acre (3.81 ha), low density @ 6 units/acre (23.61 ha)
Other	**2.82**	**-**	**-**	**-**	
Stormwater Facilities	2.82	-	-	-	Excluded from servicing area
Non-developable Areas	**3.75**	**-**	**N/A**	**N/A**	
Range Road 12 Area	1.59	-	-	-	Excluded from servicing area
Environmental Reserve / Wetland	2.16	-	-	-	Excluded from servicing area
Vista Crossing ASP Total	**64.45**	**-**	**2,993**	**1,106**	
Under construction / Complete as of 2018	13.3	Under Construction / Complete	548	202	Assumed complete as part of Existing System model
Future as of 2018	44.5	Future	2,445	904	
Stormwater Facilities	2.82	-	-	-	
Non-developable	3.75	-	-	-	

Notes:
1. Based on 2.7 persons per unit (Vista Crossing Servicing Strategy, Exp, 2018)

Description	Gross Area (ha)	Status	Equivalent Population[1]	(Equivalent) Residential Units[2]	Remarks

2. Unit density based on Vista Crossing Servicing Strategy (Exp, 2018). See Remarks for details.
3. For residential the basis was to assign each unit, whether occupied or not, with a demand equal to the assumed residential density (2.7 persons / unit) multiplied by the assumed per capita demand (254 L/c/d and 315 L/c/d for existing and future residential, respectively), see Section 5 and Section 6.2 for demands.

2.2.5 Iron Landing ASP (Town of Crossfield Bylaw No. 2011-11)

The Iron Landing ASP is located at legal location NE1/4 35-28-1 W5M in the northern portion of the current boundaries of the Town of Crossfield and covers an area of approximately 39.91 ha. The land use for this ASP is largely single family residential, with some multi-family (medium density) residential, and a mixed use/commercial zone. The population, area, and land use details for Iron Landing are presented in **Table 2-5.** The information presented is based on the Iron Landing ASP Bylaw 2011-11 (Longview et. al, June 2011), and the Iron Ridge construction drawings (Lee Maher, 2015).

Table 2-5: Iron Landing ASP Summary

Description	Gross Area (ha)	Status	(Equivalent) Population[1]	(Equivalent) Residential Units[2]	Remarks
Developable Areas	**39.9**	**-**	**1618**	**598**	
Iron Landing Phase 1	**7.4**	**-**	**292**	**108**	
Iron Ridge Phase 1	1.8	Complete	68	25	Units constructed (low density residential)
Iron Ridge Phase 2	2.6	Complete	105	39	Units constructed (low density residential)
Iron Ridge Phase 3	3.0	Complete	119	44	Units constructed (low density residential)
Iron Landing Future	**25.6**	**-**	**1326**	**490**	
Low density Residential	21.5	Future	819	303	Based on ASP - Unit density equal to actual density of existing phases
Medium density Residential	3.5	Future	490	181	Based on ASP - Unit density to achieve total 592 residential lots
Commercial/Mixed Node	0.6	Future	17	6	Equivalent population based on 0.10 L/s/ha - see Section 3.0.
Other	**6.9**	**-**	**-**	**-**	
Open/Green Space	4.8	Future	-	-	Excluded from servicing area
Stormwater Facilities	2.1	-	-	-	Excluded from servicing area
Non-developable Areas	**0.0**	**-**	**N/A**	**N/A**	
N/A	0.0	-	-	-	
Iron Landing ASP Total	**39.9**	**-**	**1,618**	**598**	
Under construction / Complete as of 2018	7.4	Under Construction / Complete	292	108	Assumed complete as part of Existing System model
Future as of 2018	25.6	Future	1326	490	
Non-developable/Other	6.9	-	-	-	

Notes:

1. Based on 2.7 persons per unit (National Census, Statistics Canada, 2016), includes equivalent population for non-residential areas.
2. Unit density based on Iron Landing ASP - Bylaw No. 2011-11. See *Remarks* for details.

2.2.6 Hawk's Landing ASP (Town of Crossfield Bylaw No. 2016-12)

The Hawk's Landing ASP is located on legal location NW1/4 35-28-1 W5M, north of Vista Crossing and West of Iron Landing. Water servicing for this development will be via tie-ins to Iron Landing on Harrison Street, and McCaskill Drive. At build-out, Hawk's Landing will cover approximately 64.3 ha, and will contain approximately 962 residential units based on maximum density of 15 units per gross hectare. Estimated residential population for this area is 2,692 people based on the Hawk's Landing ASP. The population, area, and land use details for Hawk's Landing are presented in **Table 2-6**, below. The information presented is based on the Hawk's Landing ASP Bylaw 2016-12 (Creation Communities Inc., 2017).

Table 2-6: Hawk's Landing ASP Summary

Description	Gross Area (ha)	Status	(Equivalent) Population[1]	(Equivalent) Residential Units[2]	Remarks
Developable Areas	**64.3**	**-**	**2,725**	**1,006**	
Residential Areas	**53.4**	**-**	**2,611**	**964**	
Single Detached	39.8	Future	1513	559	Based on ASP estimated units count for Single Detached
Street-Oriented Attached	12.9	Future	873	322	Based on ASP estimated units count for Street-Oriented Attached
Single Site Attached	0.8	Future	225	83	Based on ASP estimated units count for Single Site Attached
Commercial/Municipal Areas	**4.1**	**-**	**114**	**42**	
Commercial Area	0.5	Future	13	5	Equivalent population based on 0.10 L/s/ha - see Section 3.0.
School Reserve	3.7	Future	101	37	Equivalent population based on 0.10 L/s/ha - see Section 3.0.
Other	**6.7**	**-**	**-**	**-**	
Open/Green Space & MR	1.4	-	-	-	Excluded from servicing area
Stormwater Facilities	5.3	-	-	-	Excluded from servicing area
Non-developable Areas	**0.0**	**-**	**N/A**	**N/A**	
N/A	0.0	-	-	-	
Hawk's Landing ASP Total	**64.3**	**-**	**2,725**	**1,006**	
Under construction / Complete as of 2018	0.0	Under Construction / Complete	0	0	
Future as of 2018	57.6	Future	2,725	1,006	
Non-developable/Other	6.7	-	-	-	

Notes:

1. Based on 2.7 persons per unit (National Census, Statistics Canada, 2016), includes equivalent population for non-residential areas.
2. Unit density based on Hawk's Landing ASP - Bylaw No. 2016-12. See *Remarks* for details.

2.2.7 Ultimate Development

The ultimate development extents for this study include the Joint ASP, urban reserve areas within the current Town boundary and future annexation areas as defined in **Figure 2-1**.

2.2.8 Crossfield-Rocky View Joint ASP (Joint ASP)

Based on the Rocky View County / Town of Crossfield Intermunicipal Development Plan (June 2013), MPE completed a Town of Crossfield / Rocky View County Joint Area Structure Plan (Joint ASP) - Water Servicing Study (August 2017). This study covers five quarter-sections within the Town of Crossfield boundary, and an additional six quarter-sections within the Rocky View County. The land use for the Joint ASP is summarized in **Table 2-7**, below**.**

The Joint ASP area is approximately 693 ha, of predominantly agricultural use, which is envisioned to be developed into commercial, industrial, municipal, and institutional land uses. At this time, there is no expected residential development east of Highway 2A, which includes the full Joint ASP area.

Table 2-7: Crossfield / Rocky View Joint ASP – Land Use Summary

Legal Land Description	Gross Area (ha)						(Equivalent) Population[1]
	Residential	Industrial	Light Industrial	Commercial/ Institutional	MR/Green Space	Total	
Residential Areas	**-**	**-**	**-**	**-**	**-**	**-**	**-**
(None)							
Non-Residential Areas	**-**	**358**	**254**	**47**	**23**	**681**	**18,053**
NW 36-28-1-5	-	58.1	-	5.7	-	63.8	1,750
NE 36-28-1-5	-	-	22.5	-	-	22.5	617
SW 36-28-1-5	-	51.1	-	8.1	-	59.2	1,624
SE 36-28-1-5	-	-	50.3	-	-	50.3	1,380
NW 25-28-1-5	-	23.9	-	33.2	3.9	61	1,566
NE 25-28-1-5	-	56.4	-	-	3.4	59.8	1,547
SW 25-28-1-5	-	46.9	-	-	15.4	62.3	1,286
SE 25-28-1-5	-	57.1	-	-	-	57.1	1,566
NW 24-28-1-5	-	64.2	-	-	-	64.2	1,761
NE 24-28-1-5	-	-	58.8	-	-	58.8	1,613
SW 24-28-1-5	-	-	63.2	-	-	63.2	1,733
SE 24-28-1-5	-	-	58.7	-	-	58.7	1,610
Joint ASP Total	**-**	**357.7**	**253.5**	**47.0**	**22.7**	**680.9**	**18,053**

Notes:

1. Equivalent population for non-residential areas is based on 0.1 L/s/ha and future residential design criteria, giving an equivalent population density of 27.4 persons / ha (Allnorth, July 2020).

2.2.9 Remaining 2010 Annexation Build-out

There are several undeveloped areas within the existing town boundary that were annexed in 2010, but which are not part of the Upcoming Developments (see **Section 2.2.3**) or the Joint ASP (see **Section 2.2.8**). These remaining areas for build-out within the 2010 annexation boundary are summarized in **Table 2-8**.

Table 2-8: Remaining 2010 Annexation Build-out – Land Use Summary

Legal Land Description	Gross Area (ha)						(Equivalent) Population[1]
	Residential	Industrial	Light Industrial	Commercial/ Institutional	MR/Green Space	Total	
Residential Areas	**163**	**-**	**-**	**-**	**3**	**166**	**6,602**
Sunset Ridge Future Area (within NE 26-28-1-5)	38.3	-	-	-	-	38.3	1,551
NE 27-28-1-5	62.6	-	-	-	-	62.6	2,535
SE 27-28-1-5	62.1	-	-	-	2.8	64.9	2,515
Non-Residential Areas	**-**	**28.3**	**-**	**-**	**-**	**93.2**	**776**
NE 22-28-1-5	-	-	-	-	64.9	64.9	-
NE 35-28-1-5	-	28.3	-	-	-	28.3	776
2010 Annexation Remaining Development Total[2]	**163.0**	**28.3**	**0.0**	**0.0**	**35.3**	**259.0**	**7,378**

Notes:

1. Residential population based on unit density of 15 units per gross developable hectare, and 2.7 persons per unit (40.5 persons / hectare). Equivalent population for non-residential areas is based on 0.1 L/s/ha and future residential design criteria, giving an equivalent population density of 27.4 persons / ha (Allnorth, July 2020).
2. Excludes Joint ASP lands and Upcoming ASPs

2.2.10 Future Annexation Areas

Proposed future annexation areas, totalling 22 quarter-sections, will roughly double the current town area (see **Table 2-9** and **Figure 2-2** for detailed land descriptions). The future areas land use map includes the assumed land use for all undeveloped areas, both within the existing town boundary, and within the proposed future annexation areas. The assumed land uses and boundaries are based on the Joint ASP, Vista Crossing, Iron Landing, Hawk's Landing, and Sunset Ridge ASP land use maps for their respective areas, and on preliminary land use mapping provided by the Town for the remaining areas. These land use assumptions and boundaries include recent changes when compared to current MDP - Bylaw No. 2018-15 (Town of Crossfield, 2018), primarily due to the proposed new annexation and changes to land use within the Joint ASP, which are not included in the MDP.

These future annexation areas, excluding areas previously covered under the Joint are summarized in **Table 2-9**.

Table 2-9: Future Annexation Areas Land Use Summary

Legal Land Description	Gross Area (ha)						(Equivalent) Population[1]
	Residential	Industrial	Light Industrial	Commercial/ Institutional	Reserve/ Unserviced	Total	
Residential Areas	**637**	**0**	**0**	**0**	**0**	**637**	**25,778**
SW 3-29-1-5	64.1	-	-	-	-	64.1	2,596
SE 3-29-1-5	64.3	-	-	-	-	64.3	2,604
SW 2-29-1-5	64.4	-	-	-	-	64.4	2,608
SE 2-29-1-5	61.1	-	-	-	-	61.1	2,475

Legal Land Description	Gross Area (ha)						(Equivalent) Population[1]
	Residential	Industrial	Light Industrial	Commercial/ Institutional	Reserve/ Unserviced	Total	
NW 34-28-1-5	64.3	-	-	-	-	64.3	2,604
NE 34-28-1-5	64.4	-	-	-	-	64.4	2,608
SW 34-28-1-5	63.1	-	-	-	-	63.1	2,556
SE 34-28-1-5	63.3	-	-	-	-	63.3	2,564
NW 27-28-1-5	62.7	-	-	-	-	62.7	2,539
SW 27-28-1-5	64.8	-	-	-	-	64.8	2,624
Non-Residential Areas	**0.0**	**305.7**	**0.0**	**56.9**	**331.0**	**693.6**	**9,946**
SW 1-29-1-5	-	-	-	54.9	-	54.9	1,506
NW 22-28-1-5 [2]	-	-	-	-	64.8	64.8	-
SW 22-28-1-5 [2]	-	-	-	-	64.8	64.8	-
SE 22-28-1-5 [2]	-	-	-	-	64.8	64.8	-
SW 23-28-1-5	-	-	-	2	61.4	63.4	55
SE 23-28-1-5	-	63.1	-	-	-	63.1	1,731
NW 14-28-1-5 [3]	-	-	-	-	63.5	63.5	-
NE 14-28-1-5 [3]	-	-	-	-	11.7	11.7	-
NW 13-28-1-5	-	64.6	-	-	-	64.6	1,772
NE 13-28-1-5	-	62	-	-	-	62	1,701
SW 13-28-1-5	-	61.1	-	-	-	61.1	1,676
SE 13-28-1-5	-	54.9	-	-	-	54.9	1,506
Future Annexation Remaining Development Total	**636.5**	**305.7**	**0.0**	**56.9**	**331.0**	**1330.1**	**35,724**

Notes:

1. Residential Population based on unit density of 15 units per gross developable hectare and 2.7 persons per unit (40.5 persons / hectare). Equivalent population for non-residential areas is based on 0.1 L/s/ha and future residential design criteria, giving an equivalent population density of 27.4 persons / ha (Allnorth, July 2020).
2. Legal locations NW/NE/SW 22-28-1-5 and SE 22-28-1-5 are expected to be developed beyond the horizon of this study.
3. Legal locations NW & NE 14-28-1-5 are an existing industrial development not serviced via the Town.

2.3 Development Sequencing

The prediction of development sequence, beyond areas already in negotiations with a specific developer, is subject to a great deal of uncertainty. Similar to Town of Crossfield Master Water Servicing Study 2020 Update (Allnorth, July 2020), this study assumed development sequence is based on the Town's best estimate for probable development of specific areas within the next 10 years. For the remainder, we have assumed development will proceed generally outwards, beginning with areas closest to major highways and the existing town. **Table 2-10** summarizes the assumed development sequence from the present to the study horizon.

1. In the near-term, we assume the majority of development will be focused on the upcoming ASPs for the next 10 years, with some development of the Joint ASP.
2. For the range of 10-20 years from present, we assume the upcoming ASPs will be built out, with the remainder of development occurring in the Joint ASP and within the remaining undeveloped 2010 annexation lands.
3. For the range of 20-30 years from present, there is more uncertainty, but we have assumed the lands within the existing (2010 annexation) town boundary will be built out.
4. Finally, within the range of 30 years+, we expect the town to continue expansion in the Joint ASP lands, for the new annexation to be completed, and for expansion to progress throughout the newly annexed lands. The 6% growth estimate may become less appropriate as the town increases in size, due the exponential nature of a constant growth rate assumption. However, if the 6% growth rate is maintained, we expect build-out to the study horizon (all future annexation lands, less four quarter-sections) to occur in approximately 2062.

If higher or lower growth rates occur, the required infrastructure will simply be brought forward or delayed as required by whichever developments proceed at which time. Development sequence is also not strongly related to population totals, much more correlation to actual development locations when dealing with such a large area and potential development in any / or all directions. Therefore, no detailed what-if scenarios are completed as there will very likely to be out of date within a couple of years, and so have been avoided in favour of refining plans at the time of development.

Table 2-10: Assumed Development Sequence

Year Range	Projected Population Growth (Equivalent, All Land Use Types)								Total Equivalent Population	Total Residential Population
	Existing Town excl. Upcoming ASPs	Upcoming Developments			Joint ASP	Balance of 2010 Annexation Lands	Balance of Future Annexation Lands	Total Growth (= 6% P.A.)[1]		
		Vista Crossing	Hawk's Landing	Iron Landing						
Build-out Total	**4,668**	**2,993**	**2,725**	**1,618**	**18,053**	**7,378**	**35,724**	**N/A**	**73,159**	**42,640**
Existing (2018) Total	**4,668**	**548**	**0**	**292**	**0**	**0**	**0**	**N/A**	**5,508**	**3,895**
2019-2023	-	815	500	-	548	-	-	**1,863**	**7,371**	**5,189**
2024-2028	-	815	742	200	736	-	-	**2,493**	**9,864**	**6,912**
2029-2033	-	815	742	563	973	243	-	**3,336**	**13,201**	**9,212**
2034-2038	-	-	741	563	1,896	1,264	-	**4,465**	**17,666**	**11,609**
2039-2043	-	-	-	-	2,987	2,987	-	**5,975**	**23,641**	**14,282**
2044-2048	-	-	-	-	3,998	2,883	1,115	**7,996**	**31,636**	**17,666**
2049-2053	-	-	-	-	4,280	-	6,420	**10,700**	**42,337**	**22,299**
2054-2058	-	-	-	-	2,634	-	11,685	**14,319**	**56,656**	**30,731**
2059-2063	-	-	-	-	-	-	16,503	**16,503**	**73,159**	**42,640**

Notes:
1. P.A means per annum (annual growth rate)

2.4 Existing Sanitary Sewer Infrastructure

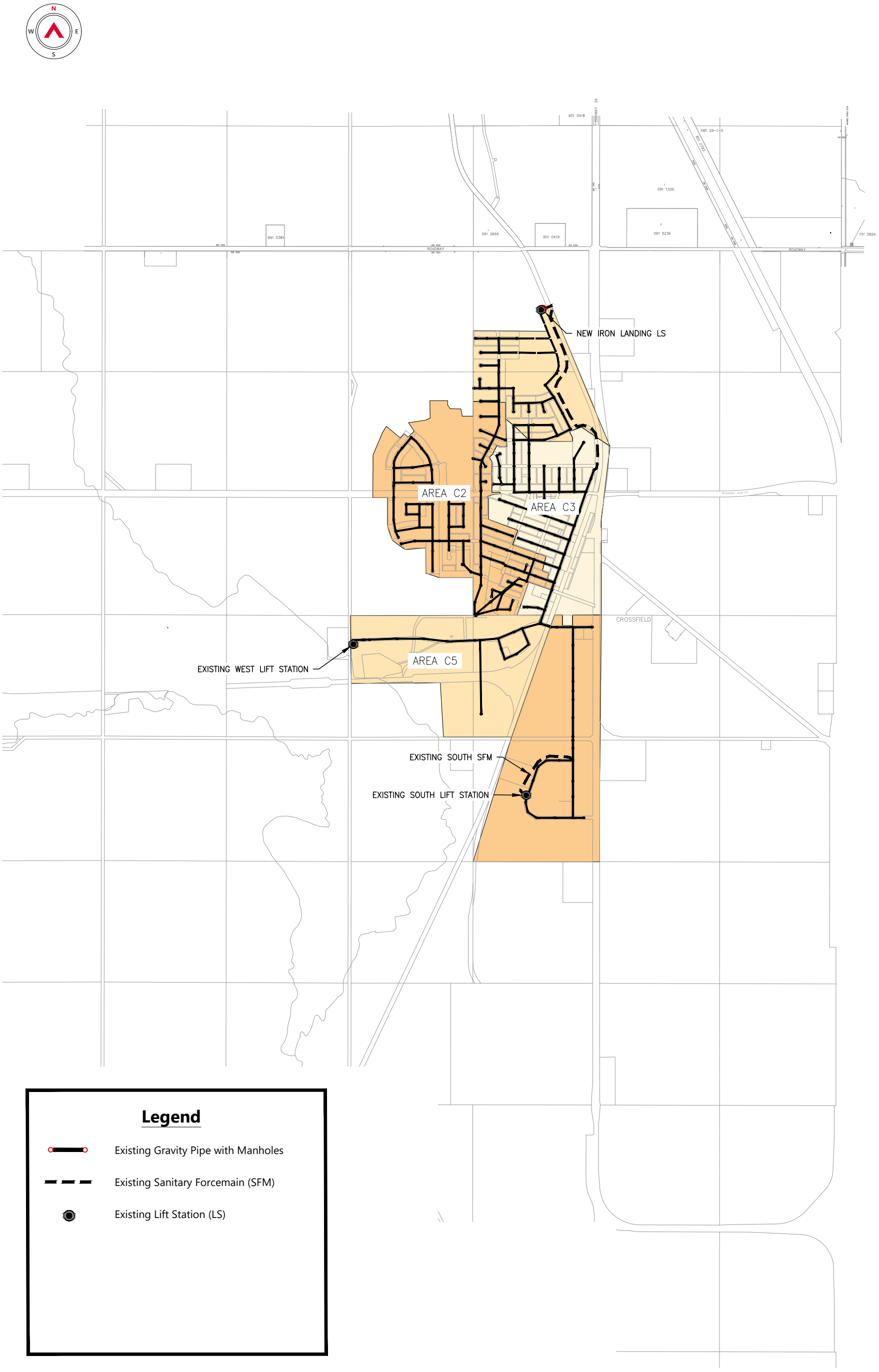
The existing sanitary sewer infrastructure covers the land within the current Town boundary which encompasses eighteen quarter sections of land (1,183 ha).

The Town currently maintains approximately 22.5 km of sanitary sewer gravity plus 1.7 km of forcemain with diameters ranging from 100 mm to 600 mm and three lift stations.

Generally the existing town is split into five main sewershed catchments as described below and shown in **Figure 2-4**:

- Area C1: North encompasses the majority of the Town north of the Community Arena, including Iron Landing. This catchment flows by gravity to Iron Landing Lift station, which pumps the flow south to Railway Avenue to Catchment 3.
- Area C2: West encompasses Vista, Sunset and a portion of the western Town which generally drains to the south by gravity to connect to Laut Avenue trunk just south of Murdoch Park.
- Area C3: East encompasses the remaining residential areas of the existing town, including Railway St. It interconnects to Laut Avenue at the Railway St intersection.
- Area C4: South encompasses the commercial / industrial area south of Laut Ave. The area at the far south flows to the South lift station, which pumps the flow back north where it flows by gravity to connect to Laut Avenue. The south lift station design information used in this study was completed by HMR Engineering Inc. (HMR (b), September 2019).
- Area C5: Centre is the catchment along Laut Ave, which is the convergence of all other catchment areas, plus any loading coming in from the businesses on Laut Ave.

The sewage within the Laut Ave trunk is conveyed to the lift station located on Laut Avenue that is referred to as the West Lift Station. The West Lift Station conveys sewage flow via a forcemain into four anaerobic treatment cells located in the southwest corner of the Town. These anaerobic cells drain into the 60 day treatment cell. The 60 day treatment cell is pumped into the Town's storage lagoon. The storage lagoon is discharged into Nose Creek once per year for a three-week duration.



CLIENT: THIS is CROSSFIELD EST 1907

CONSULTANT: Allnorth

PROJECT

TOWN OF CROSSFIELD

MASTER SANITARY SERVICING STUDY

FIG TITLE

EXISTING TOWN SEWERSHED AREAS

FIGURE 2-4

3 MODEL DEVELOPMENT

This section describes the properties of the sanitary sewer system that were entered into the XPSWMM model to build upon the existing sanitary models for the additional areas.

XPSWMM is a dynamic computer model which computes time-varying flows and levels at each element in the system, solving complex hydraulic equations that account for attenuation of peak flows in the system network, and depending on the complexity of the computational engine, may also account for storage capacity/overflow volumes. These dynamic systems better represent the hydrologic response and hydraulic behaviour of the system under a variety of flow conditions. Detailed volumetric assessment is enabled, which allows assessment of surcharging, storage, pump cycling, and inflow and infiltration (I & I) responses.

The hydraulic model has input parameters to represent the physical model elements and the flows that are to be accommodated by the system. The physical system consists of the sanitary sewer network, the sewersheds and the pump stations.

The sanitary flows were broken down into two categories: dry weather flow and wet weather flow. Dry weather flow includes baseline flow (groundwater infiltration) and sewage generation, and wet weather flow includes the dry weather flow and additional inflow and infiltration associated with a storm event.

3.1 Model Zones

Generally the model was split into two zones which were modelled using different principles due to budget and time constrains and to promote continuity of results from the previous models.

These two zones are as shown in **Figure 3-1**, and described as follows:

1. **Zone 1-Existing Town** completed as of June 2020,
2. **Zone 2-Future Development**, which is everything else inside the study area which is not completely constructed as of June 2020, including:
    a. Known Subdivisions:
        i. Vista Crossing beyond Phases 1
        ii. Iron Landing (beyond Phases 1, 2, and 3)
        iii. Hawk's Landing (full ASP)
        iv. Sunset Ridge (western side, beyond the current developed area as of 2020)
        v. Industrial development on Western Drive
    b. New Annexation Areas:
        i. Joint ASP
        ii. 22 additional quarter sections

Areas excluded from servicing are also indicated in **Figure 3-1**, which includes:

- Two quarter sections containing the existing golf course (Collicutt Siding Golf Club)
    - NW23 28-1-5and SW23 28-1-5
- South part of SW26 28-1-5 which contains the 60 day treatment cell
- One quarter section containing the Effluent Storage Cell / urban reserve area
    - NE22 28-1-5
- Three quarter sections containing the urban reserve area
    - NW22 28-1-5, SW22 28-1-5 and SE22 28-1-5

It is assumed that the excluded areas are not expected to be developed in the near future even up to ultimate development.

3.2 Hydraulic Data

Hydraulic data relates to the hydraulics layer of XPWMM which is used for entering all system physical data, such as pipe locations, lengths, diameters, manhole locations and rims.

The following sections describe the physical system development activities used to build the sanitary sewer system hydraulic model.

3.2.1 Zone 1-Existing Town

Details of the Zone 1-Existing Town sanitary network are shown in **Figure 3-2**.

3.2.1.1 Diameters, Invert Elevations & Manhole Rim Elevations

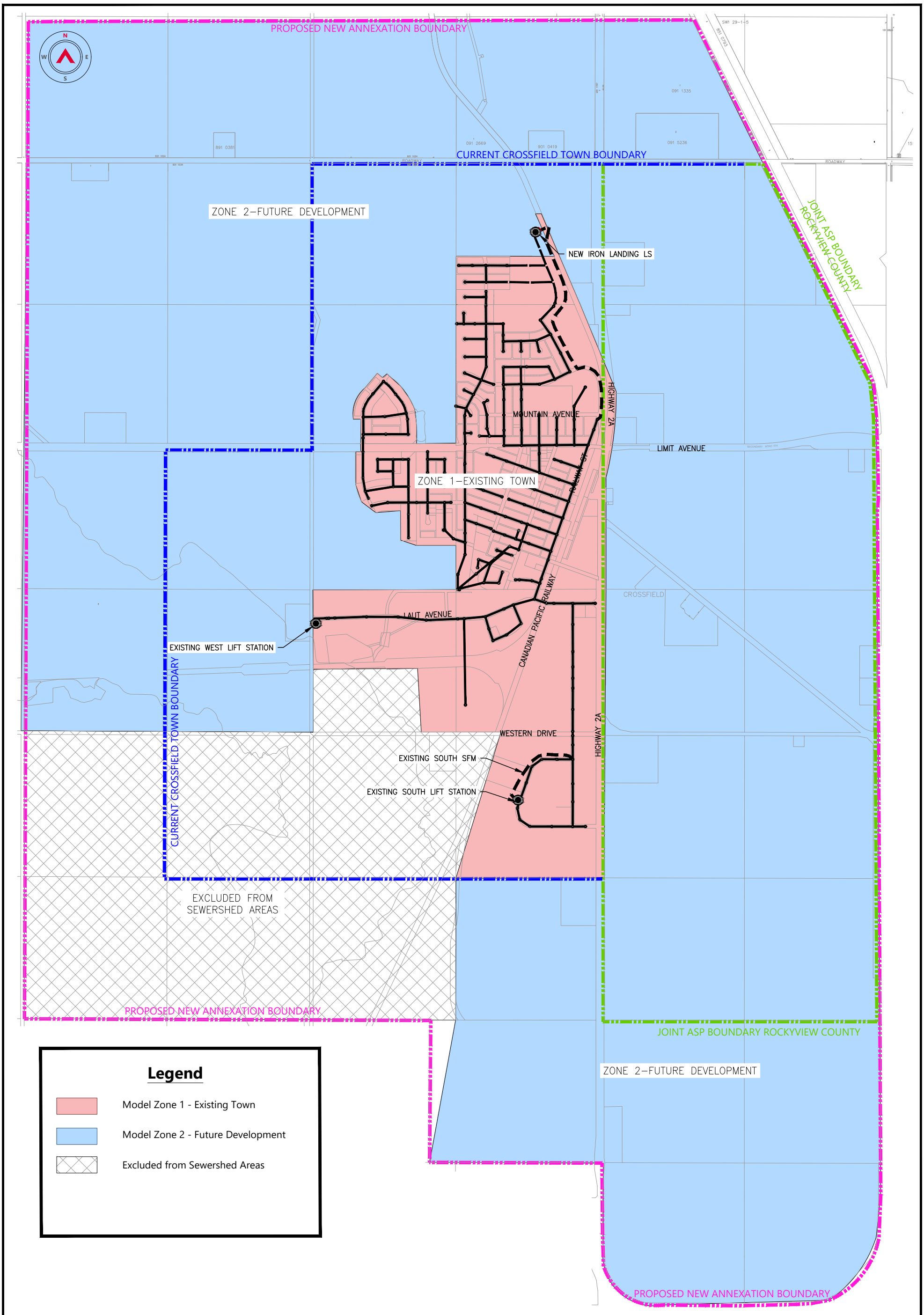
Physical properties of existing sanitary infrastructure was obtained from a combination of record drawings and survey information. The full details of all pipes and manholes was included in the model.

The top elevations of all existing sanitary sewer manholes were surveyed by Allnorth, as well as the horizontal coordinates to allow geo-referencing of the manhole locations. The Town measured the invert elevations of the sanitary sewers by dipping the sewer inverts on the upstream side of the manhole.

To assign pipe invert elevations, the following assumptions were applied using City of Calgary standards:

1. For the sanitary sewers where there is a straight run, the downstream invert elevation of the sewer was computed from the upstream invert elevation by allowing for the recommended design allowance of a 30 mm drop in the invert elevation from the upstream invert elevation to the downstream invert elevation within the manhole.
2. Where there was a 90 degree bend between the upstream sanitary sewer and the downstream sanitary sewer at a manhole the downstream invert elevation of the sewer was computed from the upstream invert elevation by allowing for the recommended design allowance of a 60 mm drop in the invert elevation from the upstream invert elevation to the downstream invert elevation within the manhole.
3. Where there was a change in the sewer diameter at a manhole, the downstream invert elevation within the manhole was computed by matching crown elevations.

Pipe diameters at a manhole were determined from the Town's base map, derived from record drawings. In addition, pipe diameters were determined from drawings of the Iron Landing (record drawings) and Vista Crossing (design drawings) developments that were provided by the Town.



CLIENT: THIS is CROSSFIELD EST 1907

CONSULTANT: Allnorth

PROJECT

TOWN OF CROSSFIELD

MASTER SANITARY SERVICING STUDY

FIG TITLE

ZONE 1 & ZONE 2

MODEL ZONE DELINEATION

FIGURE 3-1

3.2.1.2 Pipe Materials & Manning's Roughness Coefficient

A Manning roughness (n) value of 0.013 was used for all of the sanitary sewer pipes in the sanitary sewer model. The *City of Calgary Design Guidelines for Subdivision Servicing (City of Calgary, August 2015)* recommend a Manning's n value of 0.013 for sanitary PVC pipes. However, the in-situ hydraulic roughness of a sanitary sewer pipe can vary from the values provided in the *City of Calgary Design Guidelines for Subdivision Servicing* based on construction practices such as the pipe joints, and especially with PVC pipe whether there is a uniform slope or the slope is non-uniform because of differential settlement as a result of construction practices. Therefore, a Manning's n value of 0.013 was used for all pipe types.

A Manning n value of 0.011 was used for the two existing forcemains, which is the value recommended by the manufacturer IPEX.

3.2.1.3 Lift Stations

There are three pump stations located within the Town of Crossfield, as described below. Model input parameters for the two pump stations that were included in the hydraulic model included wet well storage, wet well floor elevation, estimated pump curves, pump operating levels, forcemain diameter, and forcemain length. Pump curve information for all lift stations is included in **Appendix B**.

1. **Iron Landing Lift Station** – This lift station is located at the north end of McCaskill Drive, near the Canadian Pacific Railway right-of-way. The pump curves of the Iron Landing Lift Station were provided by the Town as designed by Lee Mahar Engineering Ltd. (Lee Mahar, October 2015) and are included in Appendix B.

2. **South Lift Station** – This lift station is located in an industrial area at the south end of the Town on McCool Crescent, and pumps sewage from a localized low area into the nearby gravity trunk.

   In previously completed MSSS's, there were no design drawings available for the South Lift Station. A number of pump curves were provided for the South Lift Station pumps. The data provided by the Town seemed to indicate that two pumps with 7.5 inch diameter impellers were installed in the South Lift Station. Since there were no design drawings available for the South Lift Station, it was assumed that the wet well was a standard prefabricated station with a diameter of 1.83 m. Consequently, follow-up is recommended to develop as-built drawings for the pump station and to confirm the pump curves.

   The South Lift Station pumps were replaced in 2020 and the revised pump curve and wet well information was received from Beairsto & Associates, and are included in Appendix B. These were updated in the model. The forcemain has not been upgraded so it was modelled as the existing 100 mm forcemain.

3. **West Lift Station (Main)** – This lift station handles all of the Town's sanitary sewage flow, and is located at the west end of Laut Avenue. The West Lift Station was not simulated in the hydraulic model because it is the end point of the sanitary sewer system and it pumps sewage into the four anaerobic treatment cells located in the southwest corner of the Town.

3.2.1.4 Sewershed Boundaries

Sanitary sewershed areas were based on an estimated area of influence associated with the physical sewer network (Allnorth, October 2016). **Figure 3-2** illustrates the delineation of the sanitary sewersheds for the Existing Town.

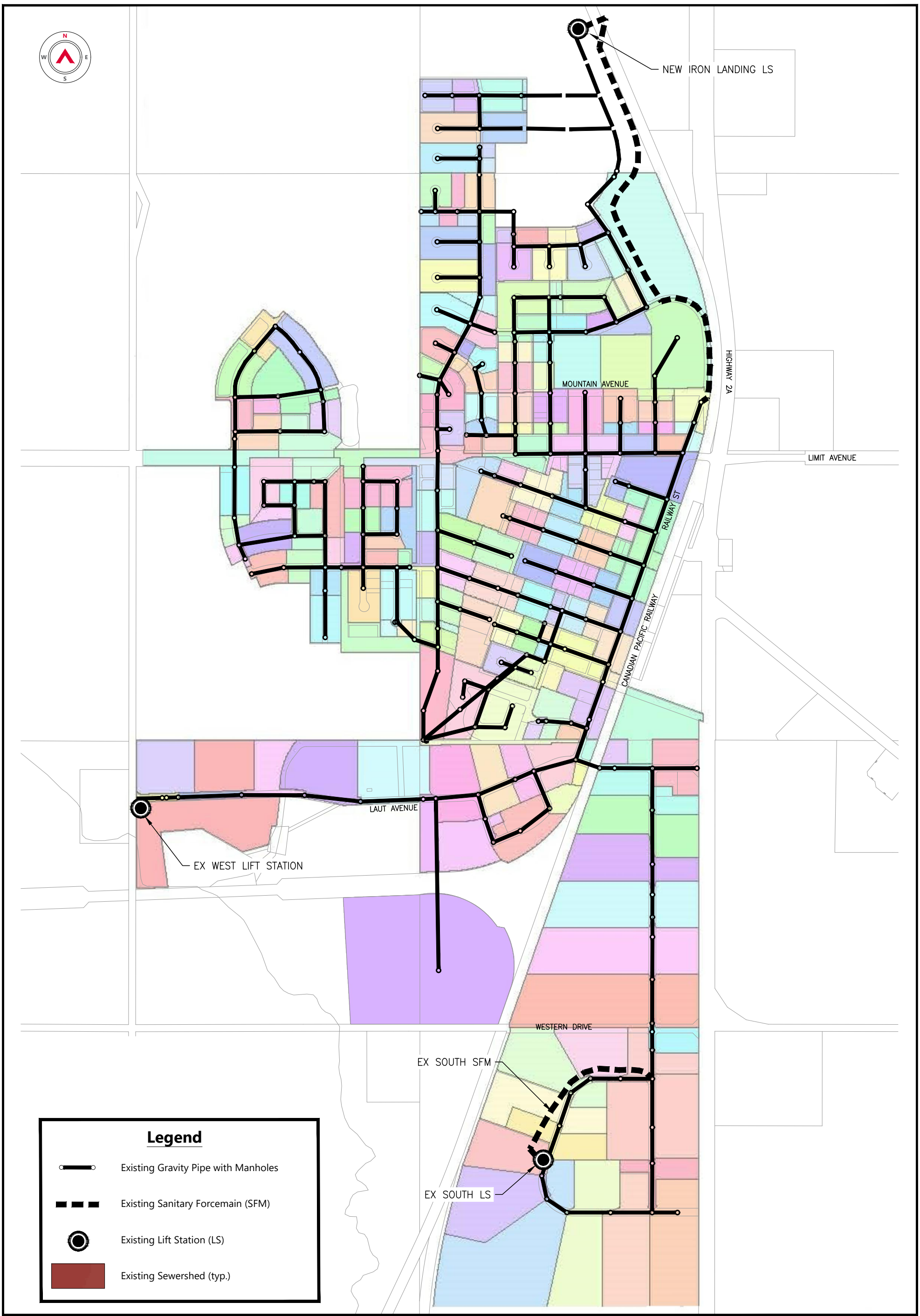
The physical sewersheds form the basis for associating municipal address points to the sewer network, and the sewershed areas also impact the fraction of I & I that enters the system in the hydraulic model.

3.2.1.5 Updated Information

The following new information was received for the Existing Town Zone, and hence it was updated in the model.

- Upgrades to downtown Railway St, including side streets was constructed in 2019 and 2020. The record drawing information was added to the model.
- Upgrades to various streets as designed by Allnorth was constructed in 2018 and 2019. The record drawing information was added to the model.
- TransCanada/TAQA facility at NE28-14-1 W5 is not currently serviced via the Town. This will be assumed not to change for the study horizon.
- MaXfield (existing connection) and Crossfield Baptist Church (future connection) to be modelled as tying into Town system. It is assumed that MaXfield ties into Laut Ave.
- Elevator Road does not have sanitary servicing.
- All manhole sumps were removed from the model.

Date: 2021/01/31 | User: Michelle Hover | File: P:\CG\2020\0-99\2000069 - Crossfield 2020 MSSS Update\1000-Drawings\2000069_Figures_REV_change | Layout: Fig 3-2 | Paper Size: 431.8mm x 558.8mm



CLIENT: THIS is CROSSFIELD EST 1907

CONSULTANT: Allnorth

PROJECT

TOWN OF CROSSFIELD

MASTER SANITARY SERVICING STUDY

FIG TITLE

ZONE 1 - EXISTING TOWN

EXISTING SEWER COLLECTION NETWORK & SEWERSHEDS

FIGURE 3-2

3.2.2 Zone 2-Future Development

Future proposed servicing was included in the model. This was split into two sections which were modelled to different levels of detail based on information available:

- Known Subdivisions, modelled in full detail (i.e. with all pipes) based on received concept designs.
- New Annexation Areas (JASP and 22 New Quarter Sections), were concept designed by Allnorth for trunks only and modelled to a 'skeleton' level of detail (i.e. trunks only). Individual streets have not been designed and hence only the trunks that would collect all of the residential sewer was modelled.

Details of the Zone 2 proposed servicing strategy and existing topography are shown in **Figure 3-3**, along with the proposed sewershed areas in **Figure 3-4**. This sewershed figure also shows the larger sewershed areas for the Existing Town. Four quarter sections are excluded that include NW22 28-1-5, NE22 28-1-5, SW22 28-1-5 and SE22 28-1-5 as explained in **Section 3.1**. These sections containing urban reserve area and Effluent Storage Cell are not expected to be developed in the near future even up to ultimate development.

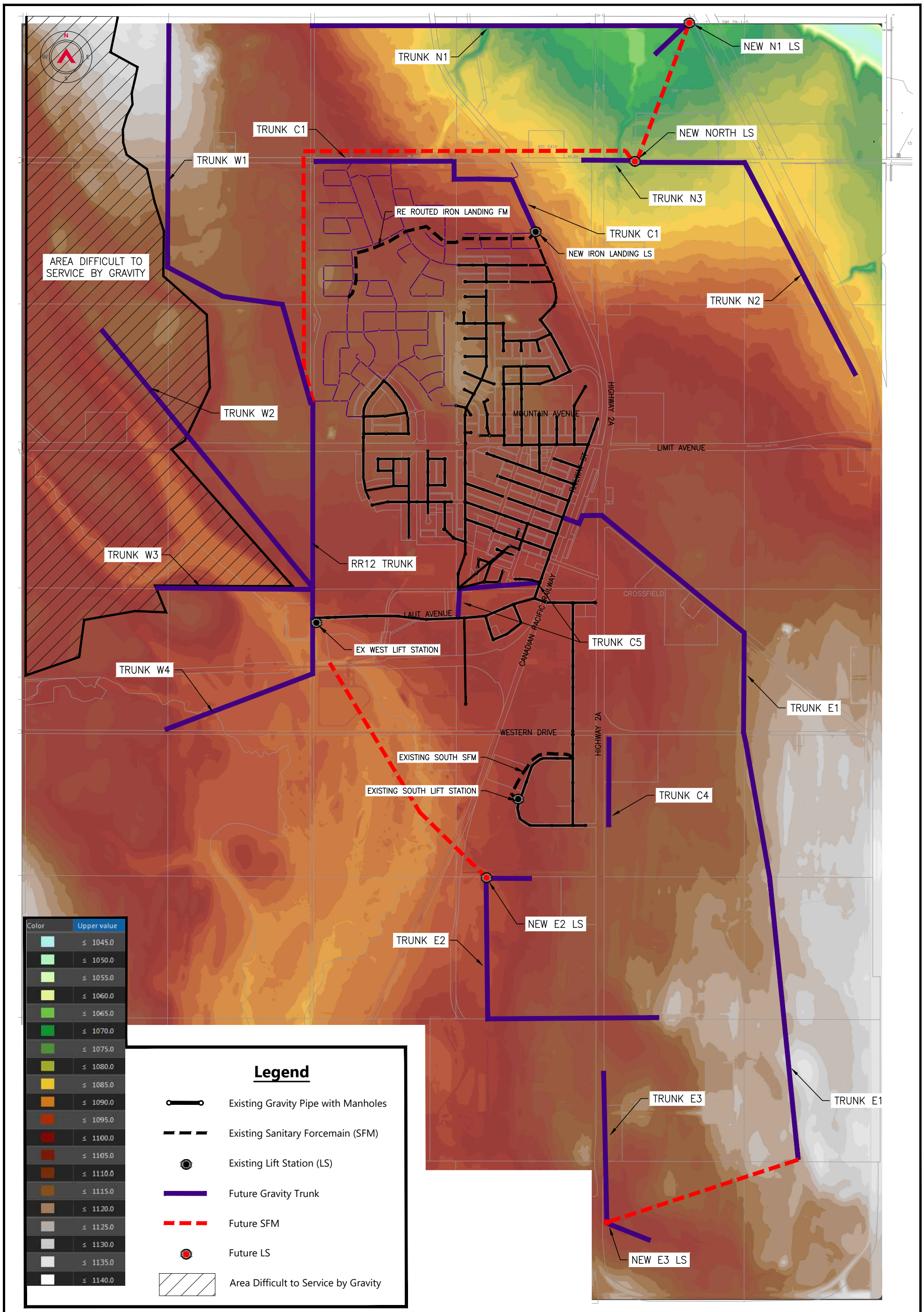
3.2.2.1 Diameters, Invert Elevations & Manhole Rim Elevations

<u>Known Subdivisions</u>

For Hawks Landing, Vista Crossing and Iron Landing, the proposed design was obtained from the relevant engineering firms.

- **Vista Crossing and Range Road 12** proposed development was received from EXP. The design included all physical pipe information, including invert elevations, so these were modelled as suggested in the drawings. The development outfalls to a trunk on Range Road 12. There was a discrepancy between the two files received regarding the proposed pipe size of this outfall trunk and so this was modelled as Ø525, rather than Ø250. Manhole rim elevations were set based on the LIDAR survey. *The results indicate this trunk Range Road 12 should be upsized from 525 mm to 675 mm*.
- **Hawks Landing** proposed development was received from Jubilee Engineering Consultants Ltd, which contained a network layout, flow arrows, pipe lengths and sizes. A preliminary invert design was determined by Allnorth. The north eastern side of site is proposed to interconnect with Iron Landing and outfall to Iron Landing lift station which pumps to Laut Ave. Manhole rim elevations were set based on the LIDAR survey.
- **Iron Landing** proposed development land use was received from Lee Maher Engineering which contained a preliminary pipe layout including invert elevations, which outfalls to the Iron Landing lift station. There is a very small catchment (approximately two blocks of proposed commercial) that will outfall to the north to connect with future development. Manhole rim elevations were set based on the LIDAR survey.

For each of these Subdivisions, the sewersheds were mapped in detail so that flows could be assigned to each sanitary inlet. However, the overall sewershed, based on the trunk outfall location, is shown in **Figure** 3-4.



CLIENT: THIS is CROSSFIELD EST 1907

CONSULTANT: Allnorth

PROJECT

TOWN OF CROSSFIELD

MASTER SANITARY SERVICING STUDY

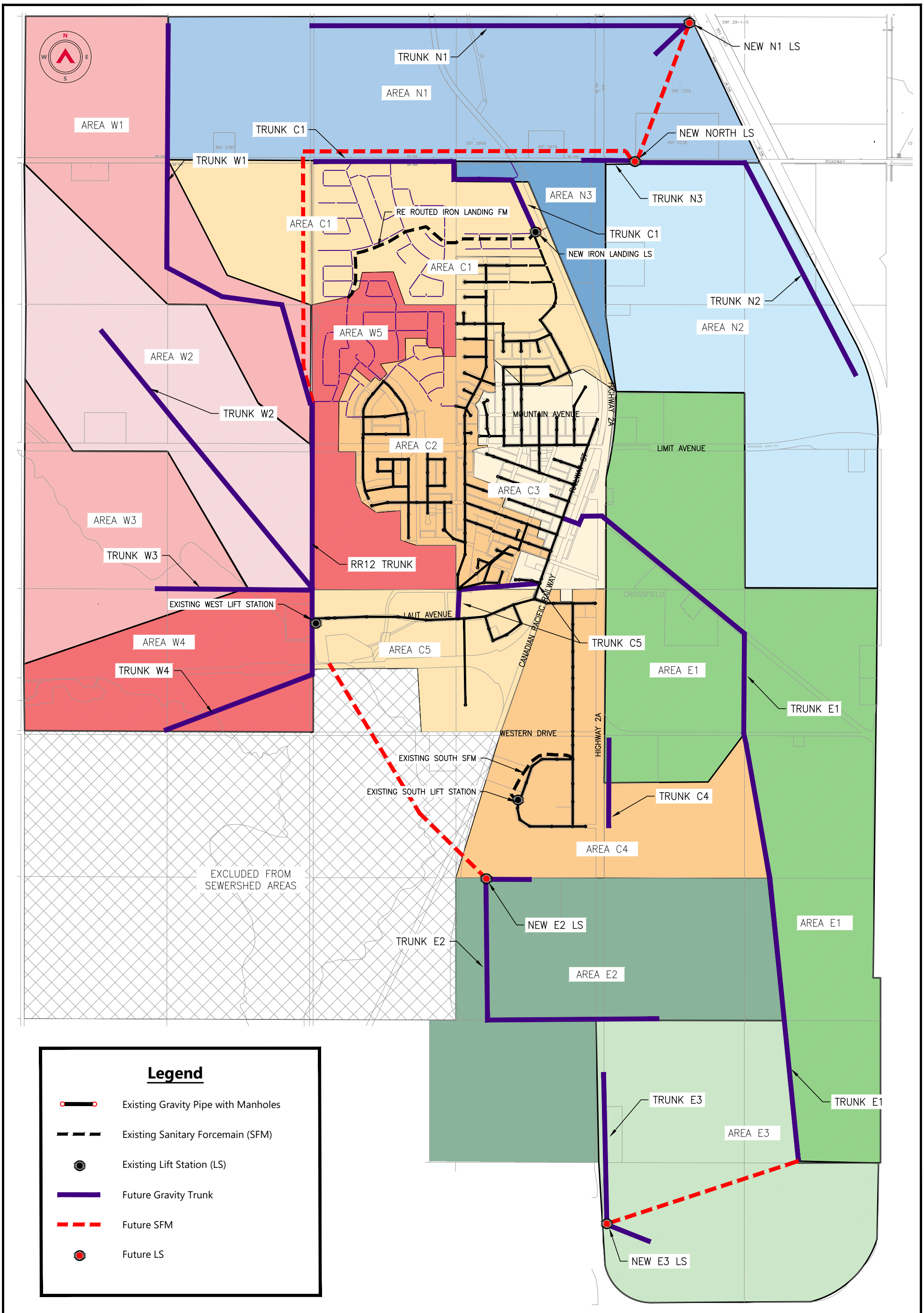
FIG TITLE

ZONE 2 - PROPOSED DEVELOPMENT

PROPOSED SERVICING STRATEGY & TOPOGRAPHY

FIGURE 3-3

Date: 2021/02/02 | User: Michelle Hover | File: P:\CG\2020\0-99\2000069 - Crossfield 2020 MSSS Update\1000-Drawings\2000069_Figures_REV_change | Layout: Fig 3-4 | Paper Size: 431.8mm x 558.8mm



Legend

- Existing Gravity Pipe with Manholes
- Existing Sanitary Forcemain (SFM)
- Existing Lift Station (LS)
- Future Gravity Trunk
- Future SFM
- Future LS

CLIENT: THIS is CROSSFIELD EST 1907

CONSULTANT: Allnorth

PROJECT

TOWN OF CROSSFIELD

MASTER SANITARY SERVICING STUDY

FIG TITLE

FULL BUILD OUT

SEWERSHED AREAS

FIGURE 3-4

New Annexation Areas:

New Annexation Areas (JASP and 22 New Quarter Sections), were concept designed by Allnorth for trunks only and modelled to a 'skeleton' level of detail (i.e. trunks only). Individual streets were not designed and hence only the trunks that would collect all of the residential sewer was modelled.

The concept servicing plan is shown **Figure 3-3**. The full servicing concept including pipe diameters is presented in **Section 4**.

The sewer trunk design was prepared based on the following:

- Existing topography, to determine the feasibility of servicing via gravity flow to minimize lift stations. Sewersheds were mapped out to a high level of detail, typically based on quarter section, so that flow entry into the sanitary network could be spaced out. Sewershed catchment areas are shown in **Figure 3-4**.
- Quarter section boundaries & grid road locations, to determine the likely alignment of sanitary trunks.
- Available trunk sewer capacities within the existing Town sanitary system to determine the most appropriate tie in locations, using the 2017 Crossfield MSSS (Allnorth, 2017) as a guide.
- The previous trunk concept presented in the 2017 MSSS for the JASP area was expanded and modified to better tie in with the new 22 quarter sections, as well as the suit the existing topography.
- Diameters assigned to suit 10 year wet weather flow, based on maximum d/D of 85%. This was undertaken in the XPSWMM model.
- All concept design of sanitary sewer inverts was designed with a minimum cover of 2.6 m in mind, however, this was not achievable in all locations. This cover and trunk locations would need to be optimized during detailed design in conjunction with the earthworks design as no consideration was made for future changes in topography due to cut and fill balances.
- Pump selection and curves input for the XPSWMM model was determined from using the tools on the XYLECT website with basic pump concept information. This selection tool uses Hazen-William factors for different pipe material in calculating pipe head losses.
- Manhole rim elevations were set based on the LIDAR survey.

All concept servicing design is preliminary for concept master plan purpose only, and needs to be further developed during detailed design. It should not be relied upon for construction.

3.2.2.2 Manning's Roughness Coefficient

A Manning roughness (n) value of 0.013 was used for all of the new proposed sanitary sewer pipes in the sanitary sewer model. This is based on *City of Calgary Design Guidelines for Subdivision Servicing (City of Calgary, August 2015)* which recommends a Manning's n value of 0.013 for sanitary PVC pipes.

3.3 Sewage Generation

Sewage generation is dependant on sewershed areas, land usage and rainfall information.

The Town does not currently have any flow monitoring in place within the sanitary system, other than pump logs from lift stations. Hence this could not be directly applied to determine sewage generation information for individual catchments.

3.3.1 General

Sanitary flow generation is separated into two types:

1. **Dry Weather Flow (DWF)** which is the generated sewage that enters via the sanitary collection system, plus a baseline infiltration of outside water (non-sewage) entering via groundwater and other means. A dry weather period is defined by the absence of precipitation, and so the only two components of flow are sewage generation and baseline flow. Base dry weather flow consists of residential, commercial and industrial wastewater flow generated from the Town. The rate of flow depends on land use as each land use has different water usage patterns and quantities.
2. **Wet Weather Flow (WWF)** which is the result of migration of clear water (stormwater / ground water) from the outside. The volume of clear water that enters a sanitary sewer system has an adverse effect on the hydraulic capacity of the sanitary sewer system. Thus, understanding the existing condition of the sanitary sewer system includes an evaluation of the additional clear water component of the wastewater flow that occurs during wet weather conditions. The clear water that enters the sewer system is called infiltration and inflow (I & I).
    a. **Infiltration** is usually present when the groundwater table is high and/or when rain saturates the soil surrounding the sewer pipes, manholes and laterals.
    b. **Inflow** is stormwater that enters the sewer system during rain events. Pick holes in manhole covers, offset manhole rims, cross connections from stormwater catch basins, roof and foundation drains, and illegal sump pump connections are all sources of inflow. Large quantities of I & I in a sanitary sewer system reduces the hydraulic capacity of the sewers and adversely affects the hydraulic capacity of the wastewater treatment plant.

The sewage flow for DWF and WWF is typically calculated as a function of sewershed area. Hence the sewershed areas need to be mapped and calculated with respect to the sanitary sewer system layout, so that flows can be applied correctly to each catchment to imitate the real life expected flows.

3.3.2 Sewersheds

Sewershed areas are shown in **Figure 3-2** for existing Town and **Figure 3-4** for full build out area.

Each sewershed was assigned the following properties:

- Area and width, based on catchment properties
- Slope assigned as 2% for all, which is the ideal earthworks slope for stormwater, for both slope away from buildings and roadway longitudinal slope. This will need to be modified in detailed design.

- Impervious percentage:
    - Residential 65%
    - Commercial / Industrial 95%

For both model zones, the land uses as described in **Section 2.2** and **Figure 2-2** were applied. For Zone 2-Future Development, the full area of all quarter sections have been included in the proposed sewersheds even though some are not easily serviceable by gravity as discussed in **Section 3.2.2.1** and shown in **Figure 3-3**.

3.3.3 Dry Weather Flow (DWF)

A summary of the Dry Weather Flow (DWF) values applied to each Zone is described in **Table 3-1** and detailed in the sections below.

Table 3-1: Sanitary Dry Weather Flow (DWF)

Zone	Density (persons / ha)	Water Average Daily Demand*	% of Water Use Converted to Sanitary Sewer	Sanitary Generation Rate
Residential				
Zone 1-Existing Town		254 l/c/d	85%	217 l/c/d
Zone 2-Future Development	40.5	315 l/c/d	85%	268 l/c/d
Commercial				
Zone 1-Existing Town				0.020 l/s/ha
Zone 2-Future Development	6.5	0.100 l/s/ha	100%	0.100 l/s/ha
Industrial				
Zone 1-Existing Town				0.007 l/s/ha
Zone 2-Future Development	7.8	0.100 l/s/ha	100%	0.100 l/s/ha

*From Master Water Servicing Study, Allnorth 2020.

3.3.3.1 Peak Dry Weather Flow

It is well established that the wastewater flow in a sewer system varies during the course of the day. Consistently, sewer flow rates are greatest in the morning hours when many people are getting ready for work, school, etc. A second smaller peak consistently occurs in the evening when people return home from work. This cycle is commonly referred to as the "diurnal pattern" and is represented by a diurnal curve.

The peaking factor is defined as the ratio of peak daily wastewater flow to average daily wastewater flow. The peaking factor is used to estimate peak daily wastewater flow for the hydraulic capacity analysis. Failure to consider peak flows can lead to underestimation of the required sewer capacity.

The average base dry weather flow is applied to the sanitary sewer hydraulic model as an average flow in liters per second (L/s) which is then multiplied by the 24-hour diurnal pattern. Since no flow monitoring was conducted, a weekday diurnal pattern for Airdrie was used. A typical 24-hour diurnal pattern for a residential area in Airdrie was acquired from the City of Calgary, where sanitary sewer flow monitoring

was conducted for a residential area in Airdrie. It is expected that the Town of Crossfield would have a similar diurnal pattern. The diurnal pattern that was used in the hydraulic model is presented in **Table** 3-2 and **Table 3-5**.

The peaking factor varies with land use, however, since no flow monitoring was conducted during the study, the same diurnal curve for residential land use was used for the industrial and commercial land uses. It is expected that this approach is conservative.

It should be noted that for sizing of the sanitary sewer conveyance system, the peak dry weather flow is calculated by applying a peak factor to the average dry weather sewage generation rate.

For the new development residential areas peaking factor is computed by applying the Harmon equation for residential areas and peaking factor related to average flow rate for commercial and industrial land uses as per Alberta Environment Guidelines (Alberta Government, March 2013), using the equations below.

- $Harmon's\ Peaking\ Factor = 1 + {}^{14}\Big/\left(4 + P^{1}\big/_{2}\right)'$

  Where: P is the design contributing population in thousands

- $Peaking\ factor\ related\ to\ average\ flow\ rate = 6.659 * \left(Q_{avg}^{-0.168}\right)$,

  Where: Q_{avg} is the average dry weather flow rate for commercial and industrial land uses.

- For modelling purposes the generalized diurnal pattern was applied for the residential, commercial and industrial land uses and the determined peaking factors divided by 1.57 as the diurnal curve already has a peaking factor of 1.57. *Therefore, the peaking factors shown in Appendix C DWF Input Data, should be multiplied by 1.57.*

Table 3-2: Generalized Diurnal Pattern for Residential Areas

From (Hours)	To (Hours)	Multiplier	From (Hours)	To (Hours)	Multiplier
0:00	1:00	0.75	12:00	13:00	1.08
1:00	2:00	0.63	13:00	14:00	0.93
2:00	3:00	0.45	14:00	15:00	0.81
3:00	4:00	0.37	15:00	16:00	0.78
4:00	5:00	0.39	16:00	17:00	0.88
5:00	6:00	0.58	17:00	18:00	1.05
6:00	7:00	0.83	18:00	19:00	1.22
7:00	8:00	1.17	19:00	20:00	1.37
8:00	9:00	1.57	20:00	21:00	1.47
9:00	10:00	1.52	21:00	22:00	1.4
10:00	11:00	1.37	22:00	23:00	1.17
11:00	12:00	1.22	23:00	0:00	0.98

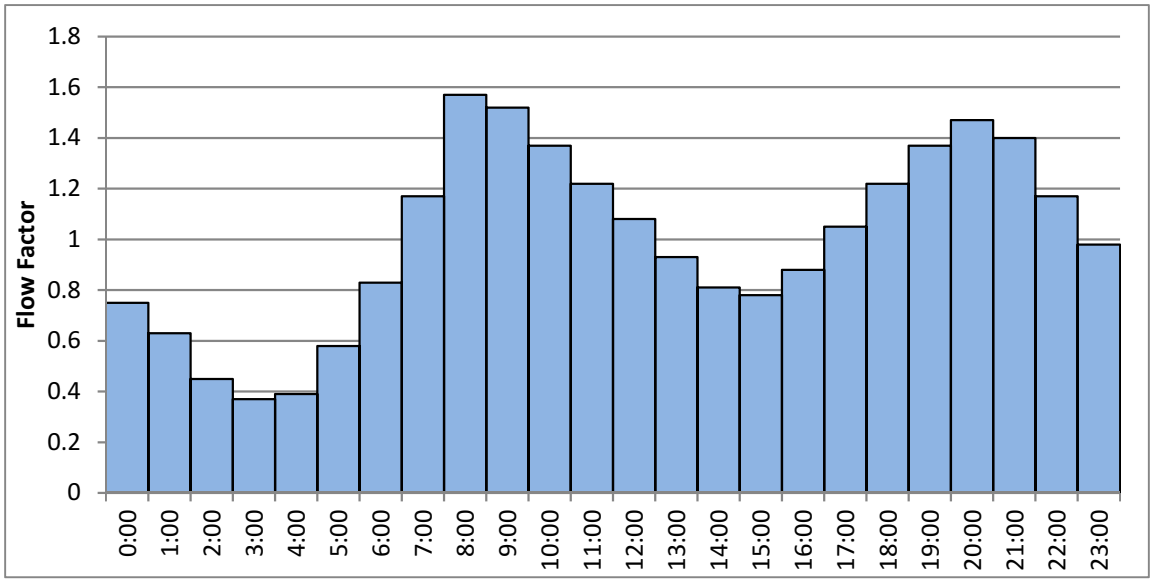


Figure 3-5: Generalized Diurnal Pattern for Residential Areas

3.3.3.2 Zone 1-Existing Town

The methodology used for DWF for the existing town has been retained from the 2016 MSSS. Sanitary flow data was provided by the Town for the West Lift Station, which handles all sanitary sewer flows from Crossfield. This data was in the form of daily pump run hours for November 2012 to April 2016, as well as daily metered flow volumes for the period of October 2015 to April 2016. All data was for winter months, during which there is minimal I&I, A strong correlation was found between pump run hours and metered flow volumes, which allowed conversion of the pump run hours to estimated flow volumes. The metered and estimated flow volumes were combined to provide a continuous dataset for the period of November 2012 to April 2016.

During the coldest winter months, there is minimal infiltration and inflow (I & I) due to the lack of precipitation and frozen ground. The average dry weather sanitary flow was determined by taking the average sanitary flows recorded between December and February. These flows are shown in **Table 3-3** for the years 2014 to 2016.

Table 3-3: Average Winter Sanitary Flows at the West Lift Station, 2014 - 2016

Month	Average Flow (m^3/d)	Average Temperature (°C)
Dec 2014	1,086	0
Jan 2015	1,003	0
Feb 2015	1,078	-1
Dec 2015	1,133	-2
Jan 2016	1,033	-2

Month	Average Flow (m^3/d)	Average Temperature (°C)
Feb 2016	1,022	5

The mean of these average daily winter flows is 1,070 m^3/d. For the purposes of the design basis, this value was rounded up to 1100 m^3/d. In the absence of flow-monitoring data, a method was needed to divide the total sanitary flows by land use category. For this purpose, the Town provided water supply metering data for the years of 2014 and 2015, with land use identified. Bulk water usage was deducted from these figures as bulk water does not typically enter the sanitary system. From this water metering data, the percentage water consumption by residential, commercial and industrial land use was identified.

There were several individual residences and businesses identified to have disproportionately high consumption. To take this into account, the "high-usage" consumers were removed from the totals for each land use category, and set aside to be added as "point loads" during modelling.

To convert the water metering data into sanitary flow data, the following assumptions were made:

- 100% of water used by high usage consumers enters the sanitary system (based on these consumers disposing of the water on their premises)
- 85% of water used by regular and unmetered consumers enters the sanitary system (required to balance water supply and sanitary flow totals, since not all water reaches the sanitary system)
- Ratio of land use for unmetered water consumption is in the same ratio as for regular consumers.
- Unmetered and regular consumers are both included under "regular consumers" for the sanitary flow estimates

The detailed estimated sanitary flows are shown in **Table 3-4**.

Table 3-4: Detailed Average Dry Weather Flow by Land Use Category

Land Use Category	Consumer Type	Water Consumption (m^3/d)	Estimated Sanitary Flow (m^3/d)	Sanitary Unit Flow Rate
Residential	Regular	374	629	217 L/c/d
	High Usage	27	27	-
	Unmetered	407	-	-
	Subtotal	**808** (62%)	**656** (60%)	**-**
Commercial	Regular	63	106	0.020 L/s/ha
	High Usage	48	48	-
	Unmetered	69	-	-
	Subtotal	**180** (14%)	**154** (14%)	**-**
Industrial	Regular	34	58	0.007 L/s/ha
	High Usage	232	232	-
	Unmetered	37	-	-
	Subtotal	**304** (24%)	**290** (26%)	**-**
Total		**1,292**	**1,100**	**-**

The average base dry weather flow for **residential** areas is represented as a unit flow rate of 217 liters per capita per day (L/c/d) for general consumers.

The average base dry weather flows for the **commercial and industrial** areas are represented as unit flow rates on a per hectare basis for general consumers, which was estimated at 0.020 liters per second per hectare (L/s/ha) and the average base dry weather flow for the industrial land use areas within the Town was estimated at 0.007 L/s/ha.

High usage consumer flow rates are included separately as point loads at their actual locations for all land use types.

3.3.3.3 Zone 2-Future Development

For Future Development areas, the land use described in **Section 3.3.2** was converted into sanitary flow rates using the expected water flow rates, as described in the Master Water Servicing Study (Allnorth, 2020), as a base. These flow rates were calculated as summarized below and in **Table 3-1**. The same residential diurnal variation was applied from **Figure 3-5** was applied.

- **Residential**: Average dry weather flow (ADWF) for residential lands is assumed to be 268 L/c/d. This is based upon sanitary flow meter data from the Town's West Lift Station (main lift station and for the winter months, during which there is minimal I & I. Residential density based on 2.7 persons per unit (National Census, Statistics Canada, 2016), and 15 units per hectare (Crossfield MDP, 2018, which results in 40.5 people/ha (people per gross developable hectare).
- **Commercial and Industrial**: Assumed to be 0.10 L/s/ha, based on 100% contribution of the supplied water of 0.10 L/s/ha back into the sanitary system. The same diurnal curve for residential land use was used for the industrial and commercial land uses, however with modified densities of 6.5 and 7.8 people/ha respectively. It is expected that this approach is conservative.

It is assumed that there will be no exceptionally high usage water consumers to generate high point load sewage flows for the future land use areas. Any new consumers expected to generate high volumes of sanitary sewage are assumed to be subject to approval, and would require an individual servicing evaluation before being tied into the sanitary collection system.

3.3.4 Wet Weather Flow (WWF)

The model was run for 4 days to ensure that factors reflecting real life conditions are accounted for in the results. This mitigates the risk of modelling ideal conditions such as completely dry soil for ideal, and unrealistic infiltration rates.

3.3.4.1 Zone 1-Existing Town

The I & I portion of the WWF for each sewershed was added as constant point inflow hydrograph to the model at the tie-in locations described in **Section 3.3.2**.

Rainfall and temperature data was obtained from the McCaskill personal weather station (IALBERTA86) in Crossfield, as well as the Nier AEDM weather station located southwest of Crossfield for the period November 2012 to April 2016.

The rainfall data was analyzed for the period of November 2012 to April 2016, and the most severe storm event was identified by the highest average daily flow rate measured at the West Lift Station, and the highest 24-hour rainfall volume that occurred in the preceding days. The highest 24-hour sewage flow of 4,923 m^3/d was recorded at the West Lift Station on June 22, 2013. On the preceding days of June 20 and June 21, 24-hour rainfall amounts of 47.90 mm and 18.30 mm were recorded respectively at the nearby Nier weather station. **Figure 3-6** shows the sanitary flows and rainfall during this storm event.

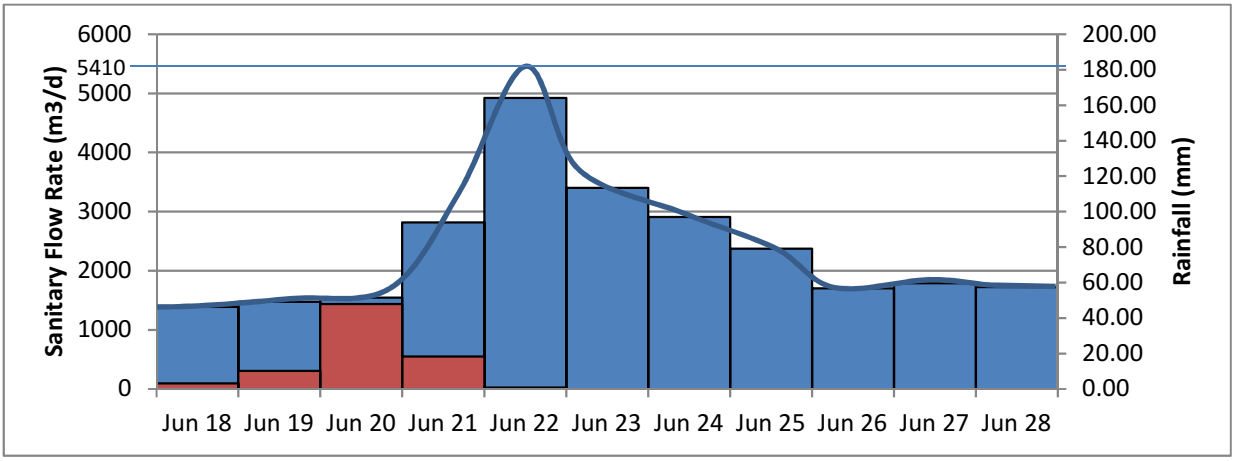


Figure 3-6: June 2013 Storm Event – Sanitary Flows and Rainfall

The peak rainfall volume occurred on June 20 and the peak sanitary flow occurred on June 22. This two day time lag illustrates that unlike stormwater systems, sanitary systems do not receive all of the I & I immediately following rainfall. While there is some direct inflow (e.g. into manholes covered with water at sags), there is also longer-term infiltration as groundwater levels rise more slowly.

The storm event 24-hour average inflow and infiltration (I & I) was estimated at 3,823 m^3/d, by subtracting the average dry weather flow of 1,100 m^3/d from the total sanitary flow of 4,923 m^3/d. A smooth curve was fit to the hydrograph at the lift station using an equal-area method of flow redistribution.

The wet weather flow that was recorded on June 22, 2013 at the West Lift Station is estimated to be approximately a 1-in-5 year return period 24-hour rainfall volume because the 24-hour rainfall amount of 47.90 mm that was recorded at Nier corresponds closely to the City of Calgary 1-in-5 year 24-hour rainfall volume of 51.2 mm. The City of Calgary 1:10 year 24-hour rainfall volume is 60.4 mm, which is approximately 18% greater than the 1:5 year rainfall volume. To approximate a 1-in-10 year wet weather flow, the hydrograph ordinates for the wet weather flow that was recorded on June 22, 2013 at the West Lift Station were increased by 20%.

Peak wet weather flow (WWF) for the existing town was obtained by adding an infiltration and inflow (I & I) of 0.21 L/s/ha for all land uses. This value was determined as per **Table 3-5**.

This value was determined for the 2016 Crossfield MSSS via comparison of rainfall data and sanitary flow data for Crossfield. The value of 0.21 L/s/ha represents the peak of a hydrograph for a 1-in-10 year storm event generated for the 2016 Crossfield MSSS (Allnorth, 2016).

Table 3-5: Storm Event Hydrograph

Hour	I&I Flow (m3/d)	I&I Flow (L/s)	I&I Flow (L/s/ha) (1:5 year storm)	I&I Flow (L/s/ha) (1:10 year storm)
0	2,790	32.3	0.12	0.14
4	3,640	42.1	0.15	0.18
8	4,145	48.0	0.17	0.21
12	4,310	49.9	0.18	0.21
16	4,145	48.0	0.17	0.21
20	3,640	42.1	0.15	0.18
24	2,790	32.3	0.12	0.14

3.3.4.2 Zone 2-Future Development

The WWF in the 2016 and 2017 version of the XPSWMM MSSS models was calculated and applied to the sewersheds manually. To streamline this process for the 2020 MSSS update, the I&I function built into XPSWMM was utilized to model the WWF, which includes entering information for RDII, Rainfall and Infiltration. This is a more realist method, and the original was more conservative on the existing system as it does not consider when the soils are saturated.

Excessive inflow and infiltration (I&I) in the sewer system consumes the sewer capacity and impairs the system infrastructure to handle future growth. This can consequently trigger avoidable sewer capacity upgrades and increased wastewater treatments and possible required upgrades. Different jurisdictions have their own recommendations for I&I rates. The Inflow and Infiltration Allowance Assessment report (Metro Vancouver, 2014) identified I & I rates for different selected municipalities to vary between 0.1 L/s/ha to 0.286 L/s/ha. Alberta Environment recommends a value I & I allowance of 0.28 L/s/ha (Alberta Government, March 2013).

Rainfall was applied as a City of Calgary 1-in-10 year Chicago distribution storm and multiplied by 7.5% as shown in **Figure 3-7**. This 7.5% factor was chosen so that RDII module in XPSWMM was able to generate I & I allowance equivalent to 24,192 L/ha/d (0.28 L/s/ha) based on Alberta Government guidelines (Alberta Government, March 2013).

Rainfall-dependent inflow and infiltration requires calibration to predict the matched recorded wet weather flows, however, for the current model typical unit hydrograph parameters (RTK factors) for the RDII unit hydrograph were used in the RDII module of XPSWMM as summarized in **Table 3-6** to generate approximate 24,192 L/ha/d of maximum infiltration rates.

Table 3-6: RDII Unit Hydrograph Parameters

Parameter Description	Short Term	Medium Term	Long Term
Fraction of Rainfall (R)	0.3	0.2	0.1
Time of Hydrograph to Peak, T (hrs)	12	24	240

Parameter Description	Short Term	Medium Term	Long Term
Ratio of Recession Time to Peak Time (K)	2	4	1
Maximum Initial Abstraction (mm)	35	35	35
Initial Storage	0.0	0.0	0.0
Recovery Rate of Storage	0.0	0.0	0.0

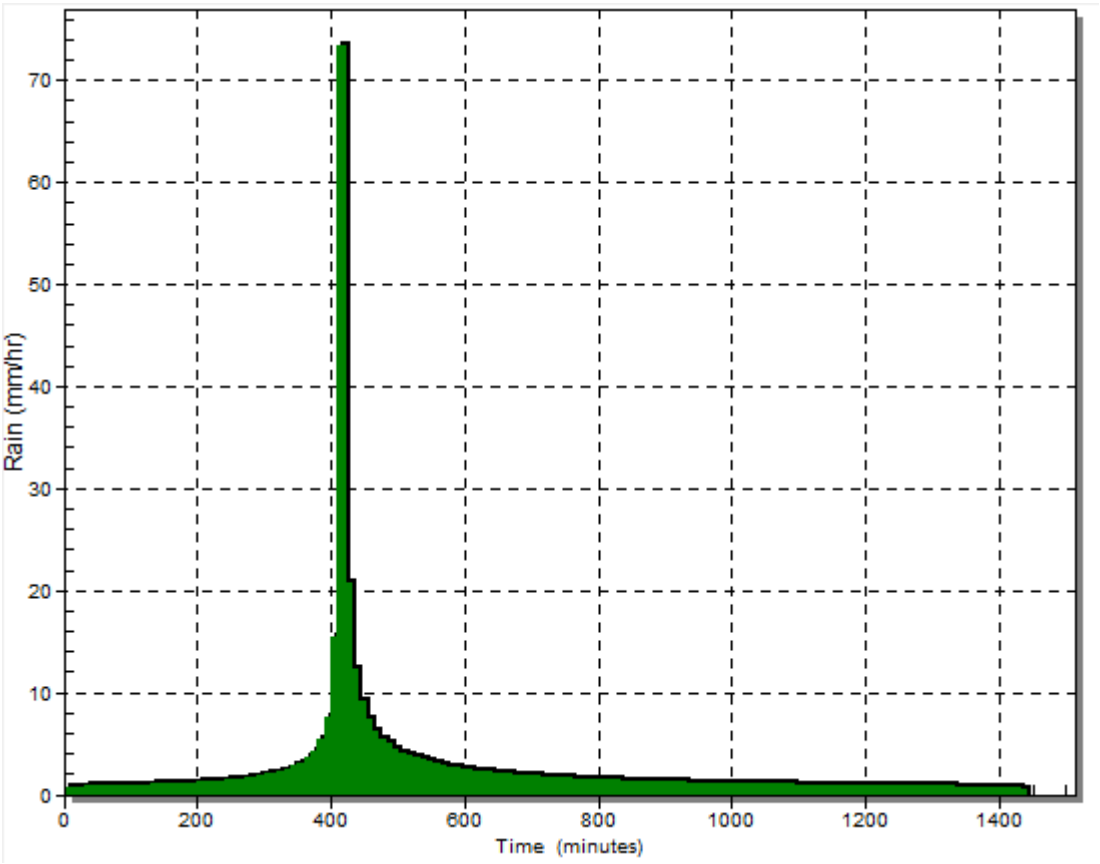


Figure 3-7: City of Calgary 1 in 10 year Chicago Storm Hyetograph

4 SANITARY SEWER SYSTEM ASSESSMENT

This section describes the modeling results for the sanitary sewer assessment model.

4.1 Model Creation and Validation

The existing 2017 Crossfield MSSS hydraulic model in XPSWMM, which contains the existing town as well as the Joint ASP area, was used as a base for the new model. To further develop the model, the following steps were taken:

- The model was split into Zone 1 and Zone 2, as described previously in **Section 3.1**:
    - Zone 1-Existing Town: The part of the model related to Zone 1 was retained exactly as previously modelled in the 2016 model (Allnorth, October 2016).
    - Zone 2-Future Development: DWF and WWF inputs related to the 2017 JASP expansion (Allnorth, October 2017) were removed and re-entered using the same modelling methodology as the 22 New Quarter Sections, as described in in **Section 3.1**. This is because the 2017 JASP flow values had been entered as point loads which were difficult to verify and modify based on the revised sewershed areas. The revised modelling method is based on real world conditions (such as in the impact of already saturated soil), so the results are more realistic.
- The model input parameters of Zone 2 were verified in three ways:
    - A mini test model was created and the results between the two different modelling methods (Zone 1 manually calculated point load vs Zone 2 XPSWMM RDII method) were compared to test the sensitivity of input values (such as DWF and I & I factors) and refine unit hydrograph parameters as presented in **Table 3-6**.
    - The flow rate results were compared between the 2017 model and the revised 2020 model and were seen to be within 10% of the original. For example this was conducted on Railway St with only the JASP catchment areas activated so that the resultant flow could be compared.
    - Sanity check of the generated sewage flow rates to ensure the results make sense, with respect to the results from previous models.

Ideally the rainfall-dependent inflow and infiltration requires calibration to predict the matched recorded wet weather flows, but this was not possible as flow monitoring data was not available.

4.2 Level of Service Criteria

The target level of service for the entire sanitary sewer network was based on the hydraulic capacity of the collection system and the risk of surcharging that would result in basement flooding.

For dry weather flows, based on industry best practices, any sewers with a d/D ratio equal or greater than 0.85 (85%) are identified as having hydraulic capacity constraints.

For wet weather flow events, which were used in the XPSWMM model analysis for this study, surcharging (d/D ratio greater than 1) is considered acceptable provided the water level remains at least 2.0 m below ground elevation. For residential areas, a water level of 2.0 m below ground elevation coincides with the assumed basement elevation for homes with direct or indirect basement connections to the sewer. An increase in water level beyond this would present a risk for basement flooding.

5 PROPOSED FULL BUILD OUT SERVICING CONCEPT

5.1 Concept Description

The full build out scenario is shown in **Figure 5-1**. The routing of the gravity trunks, forcemains, and lift stations within this concept remains unchanged within Town limits, although the sizing has been re-evaluated. Within the New Annexation Areas, the proposed trunks for the Full Buildout Concept have been extended to include servicing areas outside the Town limits, based on topography, boundaries between servicing areas, and available capacity in the existing Crossfield sanitary trunk system for each Joint ASP sewershed tie-in location.

All concept servicing design is preliminary for concept master plan purpose only, and needs to be further developed during detailed design in conjunction with earthworks design and vehicle access routes. It should not be relied upon for construction.

Detailed manhole performance levels for the future full build-out scenario (Zones 1 and Zone 2 combined), with all proposed upgrades included are included in **Appendix C**. It is noted that many nodes indicate a water level that is within 2 m of ground elevation, however, the surrounding sewers are below their maximum hydraulic capacity. This occurs because the sewer depth is shallow (within the 2 m freeboard allowance), thus any water level in the pipe will be within the threshold for surcharging even if the water level in the sanitary sewer pipe is low. In these situations, there is likely no basement connection or local property grading is elevated above the street level, thus there is not a risk of flooding.

5.1.1 West

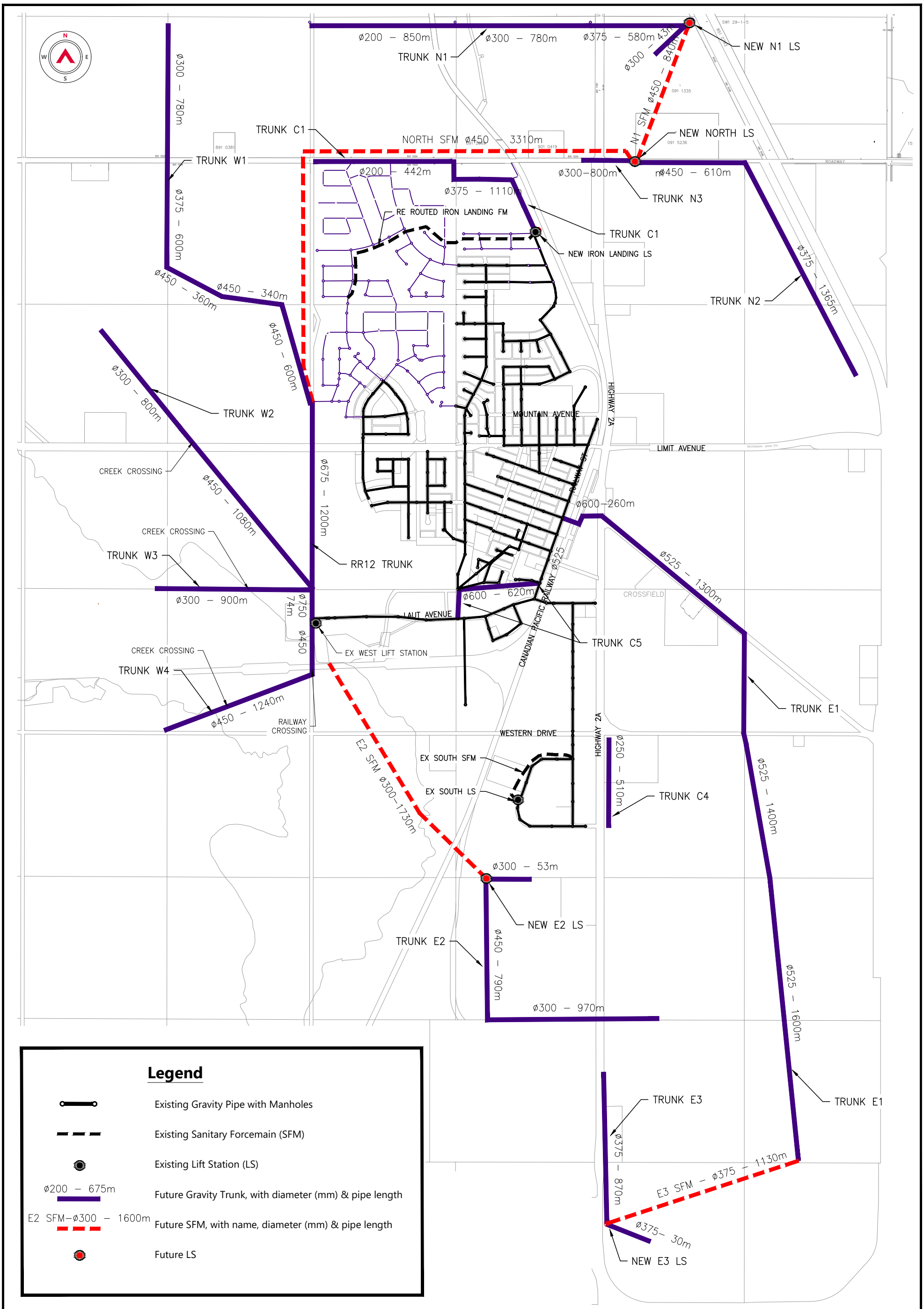
The servicing for the western areas is summarized in **Table 5-1** and in the sections below, including the total sewershed area and maximum flow rate for each trunk.

On the west side of the Town there is an existing creek that flows through the middle of the proposed development area that creates some natural ridges, valleys and islands and therefore cuts off some areas of land for easy servicing by gravity, and also easy access by vehicle directly form the Town. These areas that are not easily serviceable by gravity are highlighted in **Figure 3-3**.

The concept servicing has been prepared trying to minimize creek crossings and lift stations and hence four gravity trunks are required.

5.1.1.1 RR12 Trunk

Range Road 12 (RR12) Trunk has already been detailed designed by EXP Services Inc. to service the Vista Crossing development including rerouting of Iron Landing Forcemain. However, the current modelling indicates that this Trunk need to be upsized to a minimum 675 mm diameter for the first 1152 m and 750 mm for the following 74.3 m up to Laut Avenue. In addition, it is recommended that the future connections of the North SFM and the West proposed trunks to the RR12 Trunk be considered now, to avoid significant rework here in the future, as it may need a larger manhole in 1 or more places to facilitate the proposed connections.



Legend

- Existing Gravity Pipe with Manholes
- Existing Sanitary Forcemain (SFM)
- Existing Lift Station (LS)
- ø200 – 675m — Future Gravity Trunk, with diameter (mm) & pipe length
- E2 SFM–ø300 – 1600m — Future SFM, with name, diameter (mm) & pipe length
- Future LS

CLIENT: THIS is CROSSFIELD EST 1907

CONSULTANT: Allnorth

PROJECT: TOWN OF CROSSFIELD

MASTER SANITARY SERVICING STUDY

FIG TITLE: FULL BUILDOUT

SANITARY COLLECTION NETWORK

FIGURE 5-1

5.1.1.2 Trunk W1

Trunk W1 flows well by gravity along the edge of the creek to connect into the RR12 trunk. Some of the western areas of the quarter sections in the north-west corner of the proposed new Town boundary are not easily serviceable by gravity with respect to the natural topography of the land. However full area of these catchments has been included in the sewershed areas, as described in **Section 3.3.2**, to ensure that there is capacity for any future connections that may feed in from the western New Annexation Areas.

5.1.1.3 Trunk W2

This gravity trunk services an apparent island area formed by the creek splitting around it. The magnitude and importance of the creek path around the north-east of this island is to be investigated during detailed design. From google maps street view (refer **Figure 5-2**) it appears that this creek is not very prominent in this area and hence possibly an infill or embankment crossing in the future will be easy without any stormwater implications.

One creek crossing is required, however, there is an existing grid road here (also shown in **Figure 5-2**) and hence an embankment to facilitate the crossing already exists.

5.1.1.4 Trunk W3

The feasibility of this trunk should be investigated during detailed design as it also services an apparent island area so its function with respect to development earthworks would need to be investigated.

5.1.1.5 Trunk W4

The sizing of this trunk has spare capacity that could also service the two western most quarter sections of the Urban Reserve area, which has a prominent natural topography to the north-east towards this trunk, as shown on **Figure 3-3**.

Figure 5-2: Creek bordering and existing grid road north-east of W2 catchment

Source: Google maps AB-572 (https://www.google.com/maps/@51.4310194,-114.0588447,3a,75y,22.16h,93.6t/data=!3m6!1e1!3m4!1sGy-uNgZ4FetmDh2-lg3U8g!2e0!7i13312!8i6656). Image capture Sept 2014. Accessed June 29, 2020.

Table 5-1: Summary of Western Annexation Area Sanitary Servicing Concept

Trunk Name	Sewer Shed Area (Ha)	Max Flow (L/s)	Pipe Description		Notes	Outfall
			Diameter (mm)	Length (m)		
W1	64.1	37.5	300	780	• Requires highway crossing	Upstream of Range Road 12 (RR12).
	110.62	63.2	375	1295		
	143.47	81.5	450	610		
W2	89.07	44.8	300	801	• Challenging topography and the upstream services an apparent island area, bordered by creeks. Feasibility of servicing this island area to be determined during detailed design. • Perhaps the creek to the north can be infilled and mound shape flattened to further capture some of the hard to service areas in the W1 catchment • One creek crossing & one highway crossing at an existing grid road (Limit Ave)	Range Road 12 (RR12) trunk, just north of the West Lift Station
	125.98	65.2	450	959		
	173.26	91.2	450	120		
W3	85.5	41.6	300	900	• Challenging topography and the upstream services an apparent island area, bordered by creeks. Feasibility of servicing this island area to be determined during detailed design. • Two creek crossings required.	Range Road 12 (RR12) trunk, just north of the West Lift Station
W4	64.80	38.0	450	930	• Requires rail crossing and creek crossing. Need for rail crossing TBC during detailed design • Could also service the two western quarters of the designated Urban Reserve.	Laut Ave / West Lift Station
	129.7	75.2	450	320		
RR12		459.1	675	1,152	• Previously detailed designed by EXP Services Inc. and Dream Developments, however, has to be upsized with shown sizes. • This Trunk accommodates flows from West Trunks (W1, W2, and W3), Vista Crossing development, Iron Landing Forcemain flows and North SFM.	Laut Ave / West Lift Station
		591.9	750	74.3		

5.1.2 North

The servicing for the northern areas is summarized in **Table 5-2** and in the sections below, including the total sewershed area and maximum flow rate for each trunk.

5.1.2.1 Trunks N1, N2, N3, New N1 Lift Station & New North LS

Trunks N1, N2 and N3 drain to a new North LS, located in NW36 28-1-5, just outside the north-east corner of Iron Landing Subdivision. The New North LS would service all of the North catchments N1, N2, N3 (as shown in **Figure 3-4**) and the sanitary force main would tie in with the RR12 trunk.

Trunk N1 also requires a lift station to pump the flow up approximately 10 m to New North LS. The existing topography appears to continue to fall towards the north, to outside of the proposed New

Annexation Area. Hence if the Town expands more north in the future, New N1 LS may be able to be pushed further north so that it services a larger catchment area.

Table 5-2: Summary of Northern Annexation Area Sanitary Servicing Concept

Trunk Name	Sewer Shed Area (Ha)	Max Flow (L/s)	Pipe Description		Notes	Outfall
			Diameter (mm)	Length (m)		
N1	64.40	37.7	200	850	• The topography appears to continue to fall to the north. If the Town expands more north in the future, New N1 LS may be able to be pushed further north so that it services a larger area. • Requires 1x railway crossing and 2x major pipeline crossings.	North LS
	125.50	73.7	300	780		
	180.40	106.5	375	580		
	54.90	41.6	300	43		
N1 SFM		159.7	450	840	• Requires 10 m static head pumping elevation • Requires 2x highway crossings, 1x railway crossing and 2x major pipeline crossings.	
N2	137.85	70.9	375	1365	• Requires 1x highway crossing and approx. 6x major pipeline crossings.	North LS
	237.41	126.8	450	610		
N3	36.1	28.3	300	800	• 1x highway crossing	North LS
North SFM		281.9	300	3,310	• Requires 32 m static head pumping elevation	RR12 Trunk

Note:

- The sanitary forcemain flow rates are higher or lower than the gravity trunks feeding into them due to the dynamic curve of the pump, which should be designed in the detailed design. The pumps will stop and start depending on the water level of the wet well, and hence will pump more volume intermittently.

5.1.3 East

The servicing for the eastern areas is summarized in **Table 5-3** and in the sections below, including the total sewershed area and maximum flow rate for each trunk.

5.1.3.1 Trunks E1, E2 and E3

On the south-east side of the Town, the natural topography grades down to the west towards the existing CP Railway ROW and creek, which are physical barriers for flow and servicing. Hence the concept routing

of Trunks E2 and E3 picks up the sanitary flows at the edges of the western most quarter sections and pumps it back to the east to join the E1 gravity trunk which flows north and connects into the Existing Town system at Railway Ave (MH56).

The reduction of the number of lift stations was investigated, however, the challenging topography in addition to the density of oil & gas pipeline easements from the TAQA Crossfield Gas facility meant that consolidating to one lift station at this level of design was not possible. The feasibility of the E2 and E3 gravity trunks will need to be further investigated during detailed design, with respect to the operating conditions and exact locations of the existing TAQA pipelines that the gravity trunks would need to cross.

Table 5-3: Summary of Eastern Annexation Area Sanitary Servicing Concept

Trunk Name	Sewer Shed Area (Ha)	Max Flow (L/s)	Pipe Description		Notes	Outfall
			Diameter (mm)	Length (m)		
E1		132.6	525	1600	• First segment of E1 receives flows from E3 SFM • 1x highway crossing, 1x railway crossing & approx. 6 x major pipeline crossings required.	Railway Ave to Trunk C5 to Laut Ave
	101.01	181.9	525	1400		
	163.85	221.7	525	1300		
	348.61	316.1	600	260		
E2	79.67	46.8	300	970	• Requires Lift station (E2 LS) • Requires 1x highway crossing • Requires many major pipeline crossings due to proximity to TAQA facility. Gravity trunk installation may be challenging depending on the criticality, depth and operating pressures of the pipelines.	Lagoon
	154.97	94.2	450	790		
	63.10	41.2	300	53		
E2 SFM		156.7	300	1730	• Requires 7 m static head pumping elevation • Requires crossing the Railway line and River	
E3	125.80	66.8	375	870	• Requires Lift station (E3 LS) • Requires many major pipeline crossings due to proximity to TAQA facility. Gravity trunk installation may be challenging depending on the criticality, depth and operating pressures of the pipelines.	Trunk E1
	116.80	64.3	375	30		
E3 SFM		148.5	375	1130	• Requires 14 m static head pumping elevation	

Note:

- The sanitary forcemain flow rates are higher or lower than the gravity trunks feeding into them due to the dynamic curve of the pump, which should be designed in the detailed design. The pumps will stop and start depending on the water level of the wet well, and hence will pump more volume intermittently.

5.1.4 Central

The servicing for the central areas is summarized in **Table 5-4** and in the sections below, including the total sewershed area and maximum flow rate for each trunk.

There are no trunk upgrades proposed for catchments C2 or C3, hence the labels "Trunk C2" and "Trunk C3" have not been utilized in this report.

5.1.4.1 Trunk C1

Trunk C1 picks up flow from approximately three-quarters of the area of one quarter section, as well as most of Hawks Landing and some of Iron Landing subdivisions. It will transport it by gravity to Iron Landing Lift Station, which will then pump the wastewater through the proposed new Lift station and forcemain that is re-routed to the west through Hawks Landing subdivision and discharging to 525 mm pipe that ultimately discharges to Range Road 12 (RR12) Trunk.

This trunk has been designed such that it can connect into Trunk N3 by gravity to flow to the New North LS to relieve flow from Iron Landing LS and the Laut Ave trunk.

5.1.4.2 Trunk C4

This small catchment area has been allowed to be collected by the South Lift station, however, this catchment cannot accept large additional flows, and hence, the majority of flow in the east has been directed via Trunk E1.

5.1.4.3 Trunk C5

Trunk C5 is required to bypass an existing section of 375 mm diameter trunk on Laut Avenue that does not have sufficient capacity to handle any additional flows and is hence a flow bottleneck. Trunk C5 will be a 525 mm diameter connection from Railway Ave across to the existing MH242 in Murdoch Park, behind the Town of Crossfield building through a drainage easement.

This new trunk will serve Areas C1, 2, C3 and Areas E1, E2 and E3 and is one of the most critical upgrades required to support future development in the Town.

Table 5-4: Summary of Central Annexation Area Sanitary Servicing Concept

Trunk Name	Sewer Shed Area (Ha)	Max Flow (L/s)	Pipe Description		Notes	Outfall
			Diameter (mm)	Length (m)		
C1	54.18	25.70	200	442	• New Iron Landing Lift Station and re-routed Iron Landing Forcemain. • Approx. 2x major pipeline crossings • Would require 1x railway crossing if this were to be connected to C1 in the future.	Iron Landing LS
	68.50	44.40	375	1110		
C4	49.9	38.5	250	510	• Directed north along Highway2A to Western Drive, designed by others.	Western Drive

Trunk Name	Sewer Shed Area (Ha)	Max Flow (L/s)	Pipe Description		Notes	Outfall
			Diameter (mm)	Length (m)		
C5	N/A	354.1	600	622	• New bypass trunk and upgrade of an existing line to avoid upgrades on Laut Ave.	Laut Ave

5.2 Phasing and Budgetary Cost Estimate

Suggested phasing has been prepared with regards to the development sequencing presented in **Section 2.3**. Images of the suggested development phasing are available in **Figure 5-3**, **Figure 5-4**, **Figure 5-5** and **Figure 5-6** and summary costs for each project within the Phases 1-4 are presented in Table 5-5 to Table 5-8. An itemised breakdown of each cost estimate is included in **Appendix D**.

The following assumptions were used to prepare the cost estimates.

1. The pricing is based on Allnorth recent tenders in the region, EMCO supplier current 2021 pipe supply quotes and the 2020 City of Calgary Master Development Agreement Unit Rates Schedule (City of Calgary, 2020).
2. Cost estimates include supply, installation, and a 30% allowance for engineering and contingency.
3. All new trunks will not be located underneath existing roads, but rather off to the side in the ditch (particularly Trunks W4, N2, N3, North SFM, and E1). This will save on road surface removal and replacement costs, and traffic management. This is to be confirmed during detailed design.
4. All trunks have been assumed to be installed by standard trench method at 4-4.5m deep, and all trenches are 8m wide at the ground surface.
5. Prices based on standard bedding and typical trench conditions. No allowance for concrete bedding, unsuitable excavation, rock or debris excavation with the trenches has been included.
6. Existing road widths are 15 m and existing stormwater trunks throughout the town are located in road centrelines.
7. Surface restoration for new trunks within current farmland areas is assumed to be part of the future development / subdivision cost.
8. Quantities for hydro vac and existing shallow utility protection have been halved or quartered, depending on the expected level of development in the area and adjacent areas at the time of trunk installation.
9. Lift stations were priced as a flat rate of $10million. This pricing will need to be further developed in the future, considering the Towns wishes for the architecture of the supporting structure.

5.2.1 Phase 1: Near Term to Year 2030

In the next 10 years, it is assumed that the following developments will take place.

- 75% of Vista Crossing ASP
- 50% of Hawks Landing ASP
- 20% of Iron Landing ASP
- 30% Black Bull Industrial Park

Refer to **Figure 5-3** for a map of the recommended projects to support this development, and to **Table 5-5** for the budgetary cost estimate for each project, presented in no particular order.

Table 5-5: Phase 1 Recommended Projects & Budgetary Cost Estimates

Project ID	Project Item	Description	Cost Estimate
1-1	Range Road 12 Trunk	1,200 m of Ø 675 mm and 74.3 m of Ø 750 mm Spanning from Vista crossing along RR12 to West Lift Station	$2,596,214
1-2	Trunk C4	510 m of Ø 250 to Western Drive.	$861,902

5.2.2 Phase 2: Year 2030 to 2040

Table 5-6 indicates the sanitary infrastructure required to support the following assumed developments:

- Remaining % of Vista Crossing ASP
- Remaining % of Hawks Landing ASP
- Remaining % of Iron Landing ASP, except for the northern most commercial lots which will drain north.
- Remaining % of Black Bull Industrial Park (20% of JASP area, approx. 1.7 quarter sections)
- Remaining % of Sunset Vista

Refer to **Figure 5-4** for a map of the recommended projects to support this development, and to Table 5-6 for the budgetary cost estimate for each project, presented in no particular order.

Table 5-6: Phase 2 Recommended Projects & Budgetary Cost Estimates

Project ID	Project Item	Description	Cost Estimate
2-1	Trunk C1	450 m of Ø 200 mm and 1,110 m of Ø 375 mm	$1,151,340
2-2	Trunk C5	620 m of Ø 600 mm	$ 803,340
2-3	Trunk E1 (North)	1,620 m of Ø 525 mm and 260 m of Ø 600 mm	$1,806,290
2-4	Upgrades to Iron Landing LS	Requirement to be confirmed on further investigation. Refer to Section 5.1.4.1.	TBC

5.2.3 Phase 3: Year 2040 to 2050

Table 5-7 indicates the sanitary infrastructure required to support the following assumed developments:

- Residential lands within the existing 2010 annexation town boundary, on the west around the Crossfield Fish Pond.
- 35% of JASP area (4 quarter sections)
- 25% of Future Annexation Area (3.5 quarter sections) of residential lands around Trunk W1

Refer to **Figure 5-5** for a map of the recommended projects to support this development, and to **Table** 5-7 for the budgetary cost estimate for each project, presented in no particular order.

Table 5-7: Phase 3 Recommended Projects & Budgetary Cost Estimates

Project ID	Project Item	Description	Cost Estimate
3-1	Trunk W1	780 m of Ø 300 mm 600 m of Ø 375 mm 1300 m of Ø 450 mm	$ 2,043,860
3-2	Trunk W2 (South)	1,080 m of Ø 450 mm 1,080 m of Ø 450 mm	$ 1,031,830
3-3	Trunk W3	900 m of Ø 300 mm	$ 657,010
3-4	Trunk W4	1,200 m of Ø 450 mm	$ 1,499,640
3-5	New North LS and North SFM	3,310 m of Ø 450 mm Lift Station	$15,597,300
3-6	Trunk N2	1,365 m of Ø 375 mm 612 m of Ø 450 mm	$ 1,703,470
3-7	Trunk N3	300 m of Ø 300	$ 587,420

5.2.4 Phase 4: Beyond year 2050

Table 5-8 indicates the sanitary infrastructure required to support the following assumed developments:

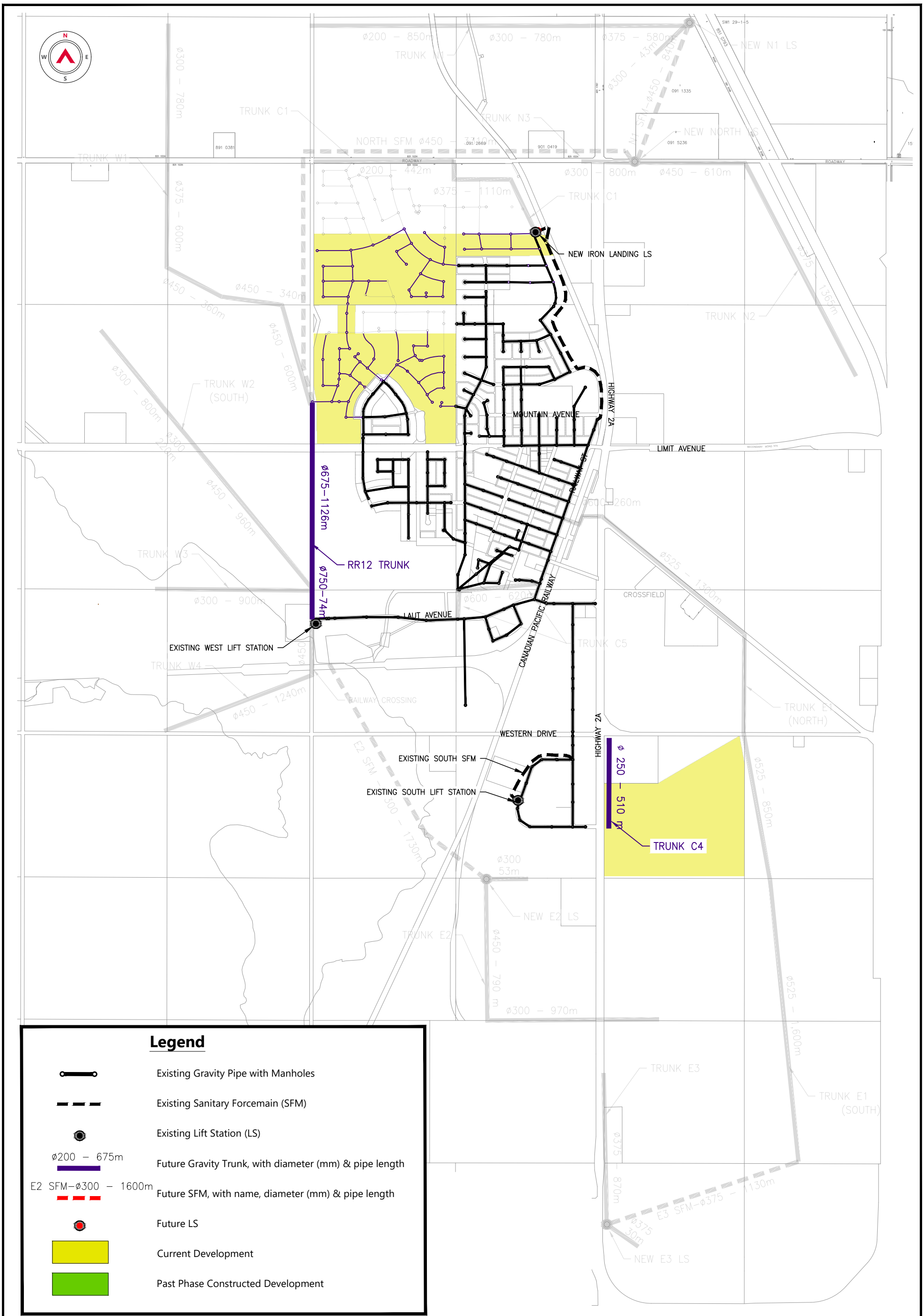
- Remainder of JASP area (4 quarter sections)
- Remainder of Future Annexation Area (12.5 quarter sections)

Refer to **Figure 5-6** for a map of the recommended projects to support this development, and **Table 5-8** for the budgetary cost estimate for each project, presented in no particular order.

Table 5-8: Phase 4 Recommended Projects & Budgetary Cost Estimates

Project ID	Project Item	Description	Cost Estimate
4-1	Trunk N1 New N1 LS N1 SFM	850 m of Ø 200 mm 830 m of Ø 300 580 m of Ø 375 840 m of Ø 450 SFM Lift Station	$14,985,230

4-2	Trunk E1 (South)	2,450 m of Ø 525	$ 2,406,740
4-3	Trunk E2 New E2 LS E2 SFM	1,023 m of Ø 300 mm 790 m of Ø 450 mm 1,731 m of Ø 300 SFM Lift Station	$15,931,760
4-4	Trunk E3 New E3 LS E3 SFM	900 m of Ø 375 1,130 m of Ø 375 SFM Lift Station	$14,371,070



Legend

- Existing Gravity Pipe with Manholes
- Existing Sanitary Forcemain (SFM)
- Existing Lift Station (LS)
- ø200 – 675m — Future Gravity Trunk, with diameter (mm) & pipe length
- E2 SFM–ø300 – 1600m — Future SFM, with name, diameter (mm) & pipe length
- Future LS
- Current Development
- Past Phase Constructed Development

CLIENT: THIS is CROSSFIELD EST 1907

CONSULTANT: Allnorth

PROJECT

TOWN OF CROSSFIELD

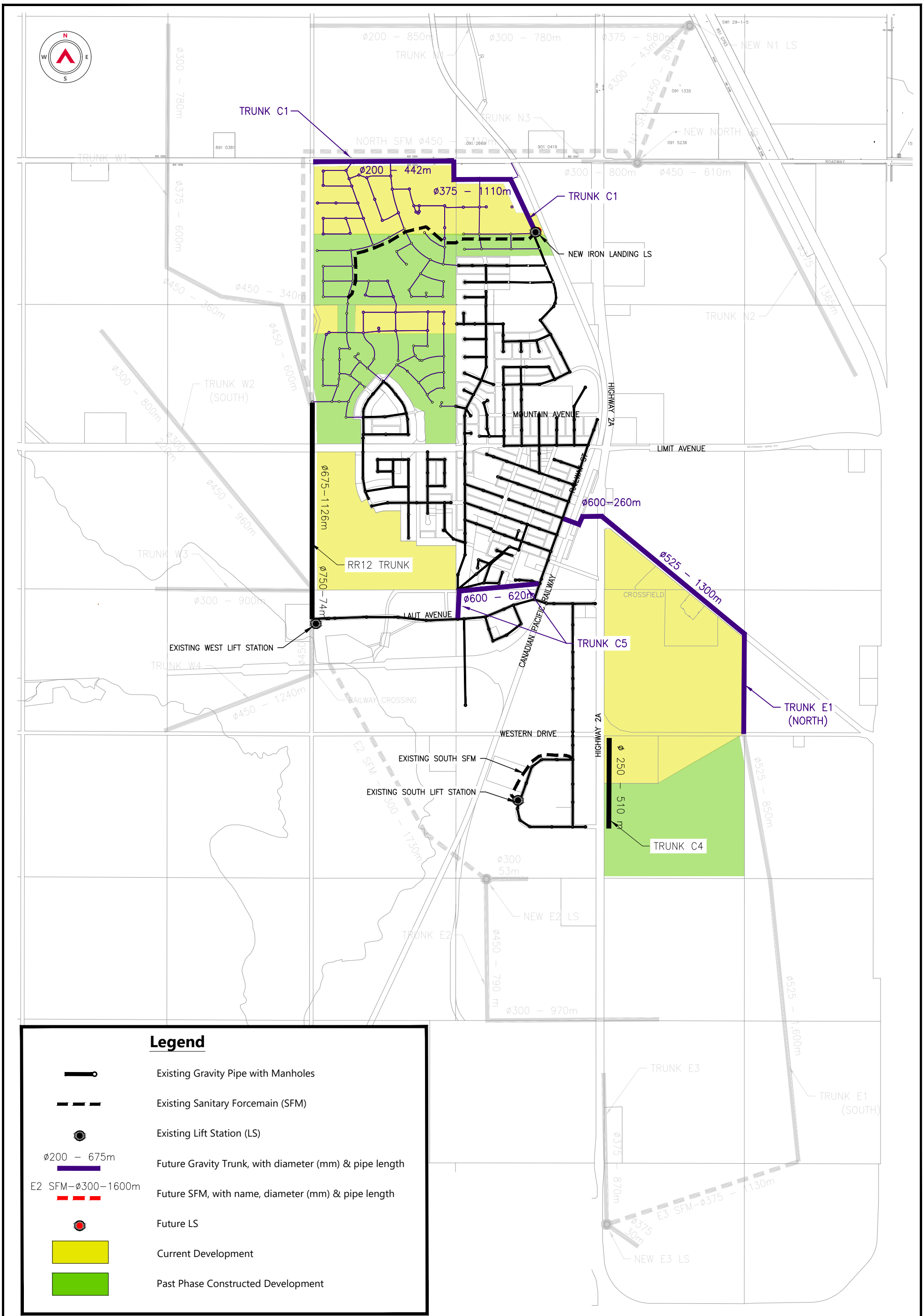
MASTER SANITARY SERVICING STUDY

FIG TITLE

DEVELOPMENT PHASING

PHASE 1:
NEAR TERM TO YEAR 2030

FIGURE 5-3



Legend

- Existing Gravity Pipe with Manholes
- Existing Sanitary Forcemain (SFM)
- Existing Lift Station (LS)
- ø200 – 675m — Future Gravity Trunk, with diameter (mm) & pipe length
- E2 SFM–ø300–1600m — Future SFM, with name, diameter (mm) & pipe length
- Future LS
- Current Development
- Past Phase Constructed Development

CLIENT: THIS is CROSSFIELD EST 1907

CONSULTANT: Allnorth

PROJECT

TOWN OF CROSSFIELD

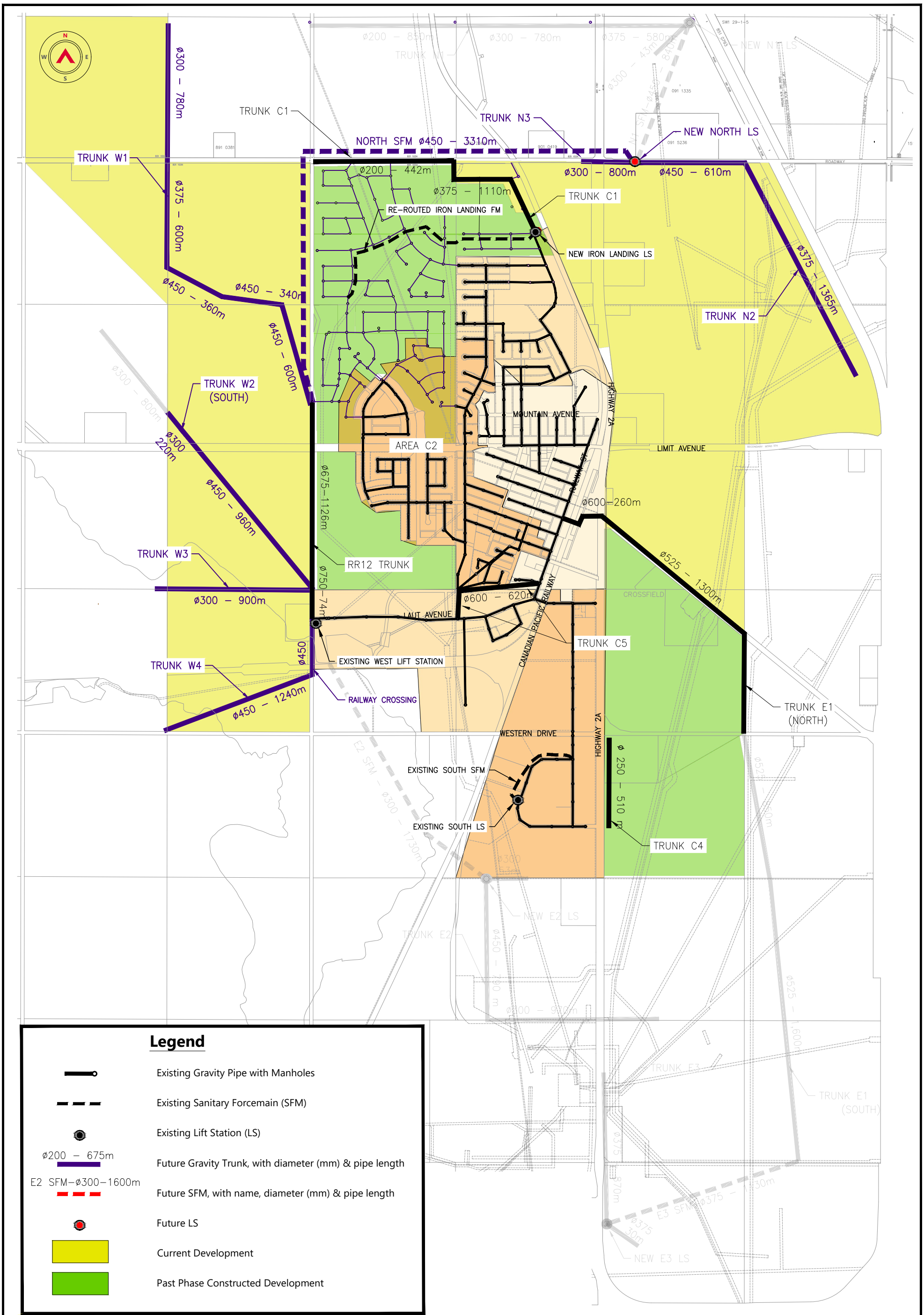
MASTER SANITARY SERVICING STUDY

FIG TITLE

DEVELOPMENT PHASING

PHASE 2:
YEAR 2030 TO 2040

FIGURE 5-4



CLIENT: THIS is CROSSFIELD EST 1907

CONSULTANT: Allnorth

PROJECT

TOWN OF CROSSFIELD

MASTER SANITARY SERVICING STUDY

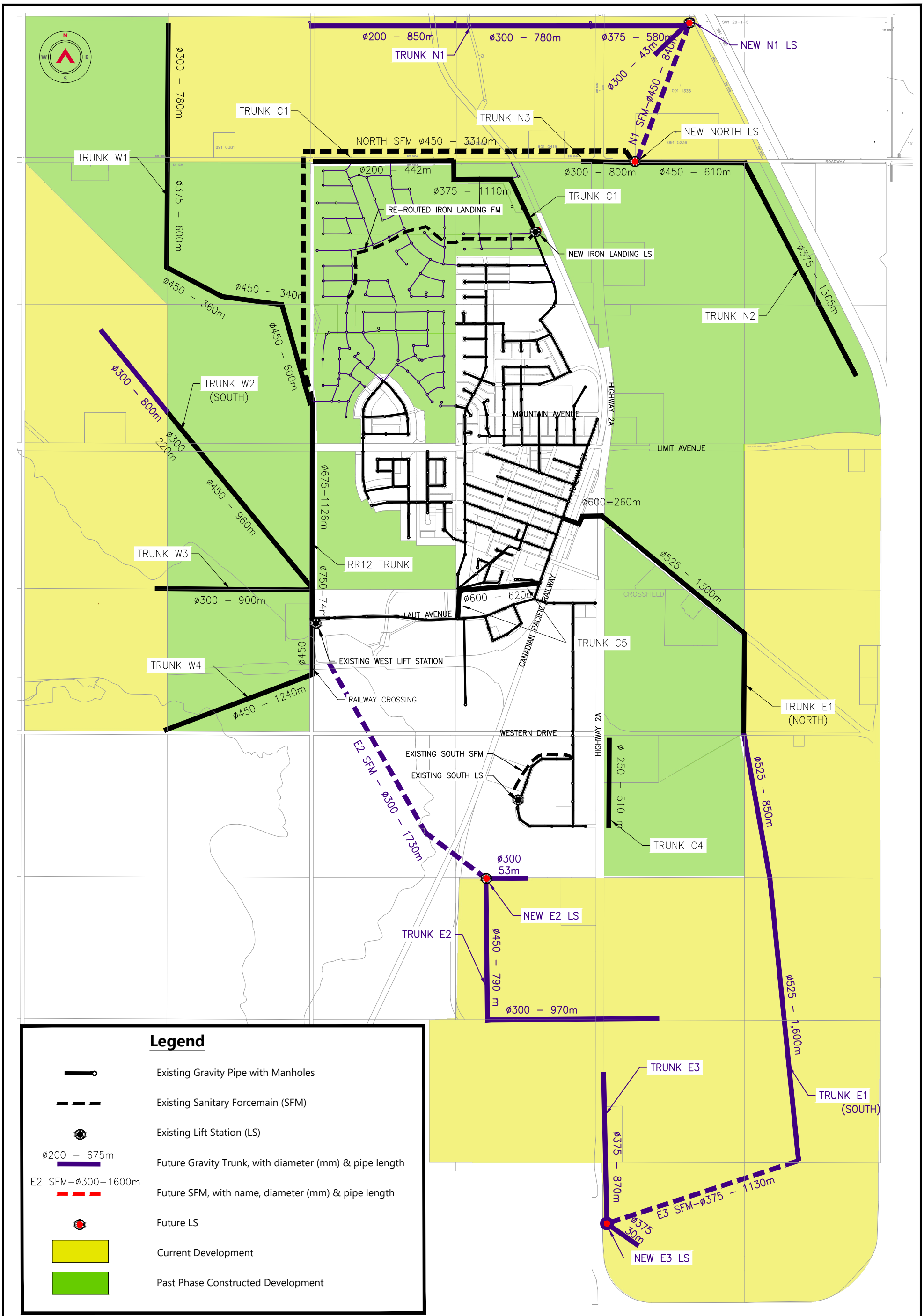
FIG TITLE

DEVELOPMENT PHASING

PHASE 3:
YEAR 2040 TO 2050

FIGURE 5-5

Date: 2021/02/02 | User: Michelle Hover | File: P:\CG\2020\0-99\2000069 - Crossfield 2020 MSSS Update\1000-Drawings\2000069_Figures_REV_change | Layout: Fig 5-6 | Paper Size: 431.8mm x 558.8mm



Legend

- Existing Gravity Pipe with Manholes
- Existing Sanitary Forcemain (SFM)
- Existing Lift Station (LS)
- ø200 – 675m — Future Gravity Trunk, with diameter (mm) & pipe length
- E2 SFM–ø300–1600m — Future SFM, with name, diameter (mm) & pipe length
- Future LS
- Current Development
- Past Phase Constructed Development

CLIENT: THIS is CROSSFIELD EST 1907

CONSULTANT: Allnorth

PROJECT

TOWN OF CROSSFIELD

MASTER SANITARY SERVICING STUDY

FIG TITLE

DEVELOPMENT PHASING

PHASE 4: BEYOND YEAR 2050

FIGURE 5-6

6 WASTEWATER TREATMENT, STORAGE AND DISPOSAL

NOTE: This section has not been updated since the 2016 Crossfield MSSS and therefore any sizing mentioned should not be relied upon to support the New Annexation Areas development. "Additional studies for wastewater treatment, storage and disposal system need to be undertaken to support the New Annexation Areas development".

For this study, the Town of Crossfield's wastewater treatment and storage system was reviewed based on the sewage generation data analysed for the 2016 Crossfield MSSS combined with additional sewage flows from the Joint ASP. The West Lift Station conveys sewage flow via a forcemain to the Town's sewage treatment facility. The Town's treatment and storage system consists of four anaerobic treatment cells located in the southwest corner of Town. These anaerobic cells drain into a 60-day treatment cell. This treatment cell is pumped into the Town's storage lagoon. The Town's Code of Practice allows for discharge of this lagoon into Nose Creek once per year for a three-week duration.

The design requirements for wastewater treatment and disposal are provided in the document entitled "Standards and Guidelines for Municipal Waterworks, Wastewater and Storm Drainage Systems, Part 3, Wastewater Systems Standards for Performance and Design", March 2013, Alberta Government ("the Standards"). The minimum design standards for the wastewater components are based on the average daily design flow. For the current Town of Crossfield, this has been estimated at 1,100 m^3/d waste flow and 250 m^3/d I & I based on the flow measurements at the West Lift Station. The average daily flow for the additional sewage from the Joint ASP is based on the design criteria described in the 2017 MSSS report and is based on land use. These design flows were used to determine the required volume for each wastewater treatment stage in order to evaluate infrastructure capacity requirements and improvements for the existing sanitary treatment, storage and disposal system.

6.1 Analysis of Existing Town of Crossfield Wastewater Treatment System

Information on the wastewater treatment system is based on the 2016 Crossfield MSSS. For the 2016 Crossfield MSSS, there was no as-built or survey data available for the Town's wastewater treatment and storage system; however, some information was provided in the 2009 Master Servicing Study by D.A. Watt ("2009 MSS") and in the existing electronic CAD base ("electronic base"). These sources provided volumes based on actual water depth as recorded at the time of design. In the absence of as-built or survey data, it was assumed that the cells/lagoons were designed to meet the depth limits required by the Standards.

Table 6-1 (sourced from the 2016 Crossfield MSSS) shows the information on the existing waste water treatment facility including the depth limits and assumed design values for the various components of the treatment system.

Table 6-1: Existing wastewater treatment infrastructure capacity

Component	2009 MSS		Electronic Base		Required Depth Limit (m)	Assumed Design Values	
	Depth (m)	Volume (m^3)	Depth (m)	Volume (m^3)		Depth (m)	Volume (m^3)
Anaerobic Cell 1	2.64	2,683	3.05	3,437	3.00 (min)	3.05	3,300
Anaerobic Cell 2	2.58	2,651	3.05	3,437	3.00 (min)	3.05	3,500
Anaerobic Cell 3	2.84	2,403	3.05	3,437	3.00 (min)	3.05	2,800
Anaerobic Cell 4	2.68	2,342	3.05	3,437	3.00 (min)	3.05	2,900
Cells 1-4 Subtotal	-	*10,079*	-	*13,748*	-	-	*12,500*
60-Day Treatment Cell	2.66	119,247	1.54	69,325	1.50 (max)	1.50	69,900
Storage Lagoon	1.62		2.50	385,000	3.00 (max)	3.00	465,000

Table 6-2 (sourced from the 2016 Crossfield MSSS) shows a breakdown of the existing wastewater treatment and storage system capacity, the available surplus capacity, and the estimated time remaining until the surplus is exhausted based on a population growth of 2% per year. Please note that if the growth exceeds an average of 2% per year, expansion to the noted components may be required earlier than estimated.

Table 6-2: Wastewater Treatment Infrastructure Capacity

Component	Design Requirement	Current Volumes (m3)			Estimated Surplus Time Remaining
		Required	Actual	Surplus	
4 Anaerobic Cells	2 Days Holding Capacity	10,800	12,500	1,700	7 years
60-Day Treatment Cell	60 Days Holding Capacity	81,000	69,900	-11,100	Deficit for current conditions
Storage	12 Month Holding Capacity	492,750	Lagoon: 465,000 Irrigation: 135,000 Golf Course: N/A Total: 600,000	107,250	10 years

As per the 2016 Crossfield MSSS, based on 2% annual population growth and a design depth of 3.05 m, the anaerobic cells will need to be expanded in approximately seven years. An expansion to the 60-day Treatment Cell is required in the near future, to restore the cell to its design depth, to ensure that it is functioning correctly, and allow for future population growth. Based on 2% annual growth over the next 10 years, a total of 99,000 m^3 is required. An expansion of 29,000 m^3 would meet this requirement. The combined storage lagoon and irrigation lands volumes provide sufficient surplus for 10 years of population growth at 2% per year. The actual capacity of the expansion for the entire treatment would be determined during detailed design, based on survey data.

From the information in **Table 6-2**, there is no capacity for additional sewage flow from the Joint ASP or for future development of other servicing areas within the Town.

6.2 Requirements for Future Town of Crossfield Sewage Treatment System

For the existing town of Crossfield, the existing system needs an upgrade to increase the volume capacity of the 60-day treatment cell based on **Table 6-2**. An additional storage capacity of approximately 11,000m^3 is required.

Table 6-3 shows the storage volumes that would be required to expand the existing wastewater treatment system in Crossfield to treat sewage flows for both the future build-out areas within the Town limits and the Joint ASP lands. The Town would need to upgrade its sewage treatment capacity to handle approximately 10 times the volume of sanitary average daily sanitary sewage to accommodate this projected growth.

Table 6-3: Future Wastewater Treatment System Volume Requirements

	Wastewater System Volume Capacity Requirements (m^3)					
	Existing Town of Crossfield	Available Existing Treatment Capacity	Future Build-Out Town of Crossfield	Total of Existing and Future Town of Crossfield	Joint ASP	Total Treatment Capacity for Crossfield and JASP
Area (ha)	280		434	714	695	1,409
ADWF (m^3/d)	1,100		4,067	5,167	5,954	11,121
I & I (m^3/d)	250		387	637	621	1,258
AWWF (m^3/d)	1,350		4,455	5,805	6,575	12,379
Anaerobic	10,800	12,500	8,909	11,609	13,149	24,759
60-Day	81,000	69,900	267,279	348,279	394,478	742,757
Storage	492,750	465,000	1,625,949	2,118,699	2,399,741	4,518,440
Total Volume	584,550	547,400	1,902,138	2,478,588	2,807,369	5,285,956

6.3 Options for Future Town of Crossfield Sewage Treatment System

In order to build out the rest of the undeveloped land within the Town limits and the Joint ASP, a treatment facility that can handle a substantially higher volume of sanitary sewage will be required. Additionally, to expand the existing treatment pond system, a significant amount of land would be required.

The Town may opt to convert the existing pond treatment system into mechanical system to handle the larger amount of sewage flows as a mechanical treatment system requires less land. A combination of a mechanical system with storage ponds to control release of the treated sewage into the river may also be considered. An effluent pipeline to an approved treatment system may also be considered.

The costs involved to construct either the pond sewage treatment system or the mechanical system are outlined in the next section of this report.

7 CONCLUSION & RECOMMENDATIONS

7.1 Conclusion

- A conceptual layout of the proposed ultimate sanitary sewer system with lift stations and proposed sanitary sewer trunks was developed, as shown in **Figure 5-1**. The proposed ultimate system consists of 13 sanitary sewer trunks (including some upgrades within the existing town), four new lift stations and associated forcemains.
- Phasing and budgeting of the various projects was provided in **Section 5.1.4**.
- Range Road 12 (RR12) Trunk accommodates flows from West Trunks (W1, W2, and W3), Vista Crossing development, Iron Landing Forcemain flows and North SFM. The trunk sizing completed by EXP () has been revised to 1,200 m of Ø 675 mm and 74.3 m of Ø 750 mm based on the current flows and budgeting cost provided in **Table 5-5**.
- A review of the Town's wastewater treatment and storage system completed as part of the 2017 MSSS was not updated in this study.

7.2 Recommendations

The following is recommended regarding the Master Sanitary Servicing Study:

1. Future connections of the North SFM and the West proposed trunks to the RR12 Trunk should be considered now by EXP Services Inc., so that RR12 Trunk manholes could potentially be resized to larger Type 1S manholes to facilitate the future proposed connections. This will avoid significant rework in the future if larger manhole are needed. The proposed sizing for RR12 Trunk should be considered for construction.
2. This study utilized the recently constructed Iron Landing lift station information (Lee Mahar, October 2015), and the forcemain re-routing to the west through Hawks Landing subdivision utilized design information by Stantec.
3. Investigate the capacities of the sanitary outfall system, treatment system and phasing plan of any required upgrades. The outfall system and treatment system includes the following:
    a. West Lift Station and sewer forcemain
    b. Four anaerobic treatment cells
    c. 60-day treatment cell
    d. Storage lagoon
4. Flow monitoring is recommended in order to calibrate the hydraulic model for dry weather and wet weather flow conditions. The simplest method to achieve this would be to install flow meters at all existing and future lift stations, and set up a rainfall monitoring station in town to record data that is local and in control of the Town. Beyond the test period, the flow monitors may be returned to daily recording. Flow monitoring would also allow the development of diurnal flow patterns for the different land use types.

5. Detailed design of trunk concepts should be undertaken in conjunction with the design of earthworks and development street layouts.
6. Detailed pricing of lift stations to be determined.

REFERENCES

Alberta Government, March 2013, Alberta Environment Standards and Guidelines for Municipal Waterworks, Wastewater and Storm Drainage Systems, Part 4, Wastewater Systems Guidelines for Design, Operating and Monitoring.

Allnorth, October 2016, Crossfield Master Sanitary Servicing Study, prepared for Town of Crossfield, October 7, 2016.

Allnorth, August 2017, Crossfield-Rocky View Joint ASP Master Sanitary Servicing Study, prepared for Town of Crossfield / Rocky View County, August 29, 2017.

Allnorth, June 2018, Sanitary Sewer Condition Assessment, prepared for Town of Crossfield, June 13, 2018.

Allnorth, July 2020, Town of Crossfield Master Water Servicing Study 2020 Update, prepared for Town of Crossfield, July 21, 2020.

B&A et. al., 2015, Vista Crossing ASP Bylaw 2015-07

City of Calgary, August 2015, Design Guidelines for Subdivision Servicing.

City of Calgary, 2020, 2020 Development Agreement Standard Terms and Conditions

Creation Communities Inc., 2017, Hawk's Landing ASP Bylaw 2016-12.

D.A Watt Consulting, 2009, Master Sanitary Servicing Study, prepared for Town of Crossfield.

Exp, 2017, Vista Crossing 2017 Servicing Strategy Rev 2.

Exp, 2018, Vista Crossing Servicing Strategy.

Exp, 2018, Vista Crossing Phase 4 2018 Servicing Strategy Rev 1.

HMR Engineering Inc. (HMR) (a), December 2018, Twon of Crossfield Western Drive Upgrade Drawing # 0303-002-00-07.

HMR Engineering Inc. (HMR) (b), September 2019, South Lift Station Replacement Drawings (# 0303-004-00-02 and 0303-004-00-03), September 5, 2019.

Lee Maher Engineering Associtates Ltd. (Lee Maher), October 2015, Iron Landing Lift Station Design Report.

Liquid Waste Services Department Metro Vancouver (Metro Vancouver), June 2014, Inflow and Infiltration Allowance Assessment, Integrated Liquid Waste and Resource Management, June 19, 2014.

Longview et. al, June 2011, Landing ASP Bylaw 2011-11.

MPE, August 2017, Town of Crossfield / Rocky View County Joint ASP (Joint ASP).

Rocky View and Town of Crossfield, June 2013, Inter-municipal Development Plan.

Town of Crossfield, September 2018, Town of Crossfield Land Use Bylaw Map.

Town of Crossfield, 2018, Master Development Plan (MDP).

Stantec, March 2016, Hawks Landing Crossfield, Prop. Water Distribution, CAD Drawing, showing Alternate Routing of Forcemain from Iron Landing Lift Station.

We trust this report satisfies your requirements at this time and thank you for the opportunity to work with you on the project. If you have questions or concerns do not hesitate to contact our office.

Yours truly,

ALLNORTH CONSULTANTS LIMITED

Prepared By:

Mirren Turnbull,
Project Manager

Reviewed By:

PROFESSIONAL ENGINEER ALBERTA
ALEX GEORGE MUTASINGWA

2021-02-16

Alex Mutasingwa, PhD, P.Eng
Senior Civil Engineer

PERMIT TO PRACTICE
ALLNORTH CONSULTANTS LIMITED
Signature Raul Morales
Date February 17, 2021
PERMIT NUMBER: P 6366
The Association of Professional Engineers, Geologists and Geophysicists of Alberta

Appendix A Town of Crossfield Land Use Bylaw Map (Bylaw No. 2011-05)

Town of Crossfield
Land Use Map

Scale 1:5,000

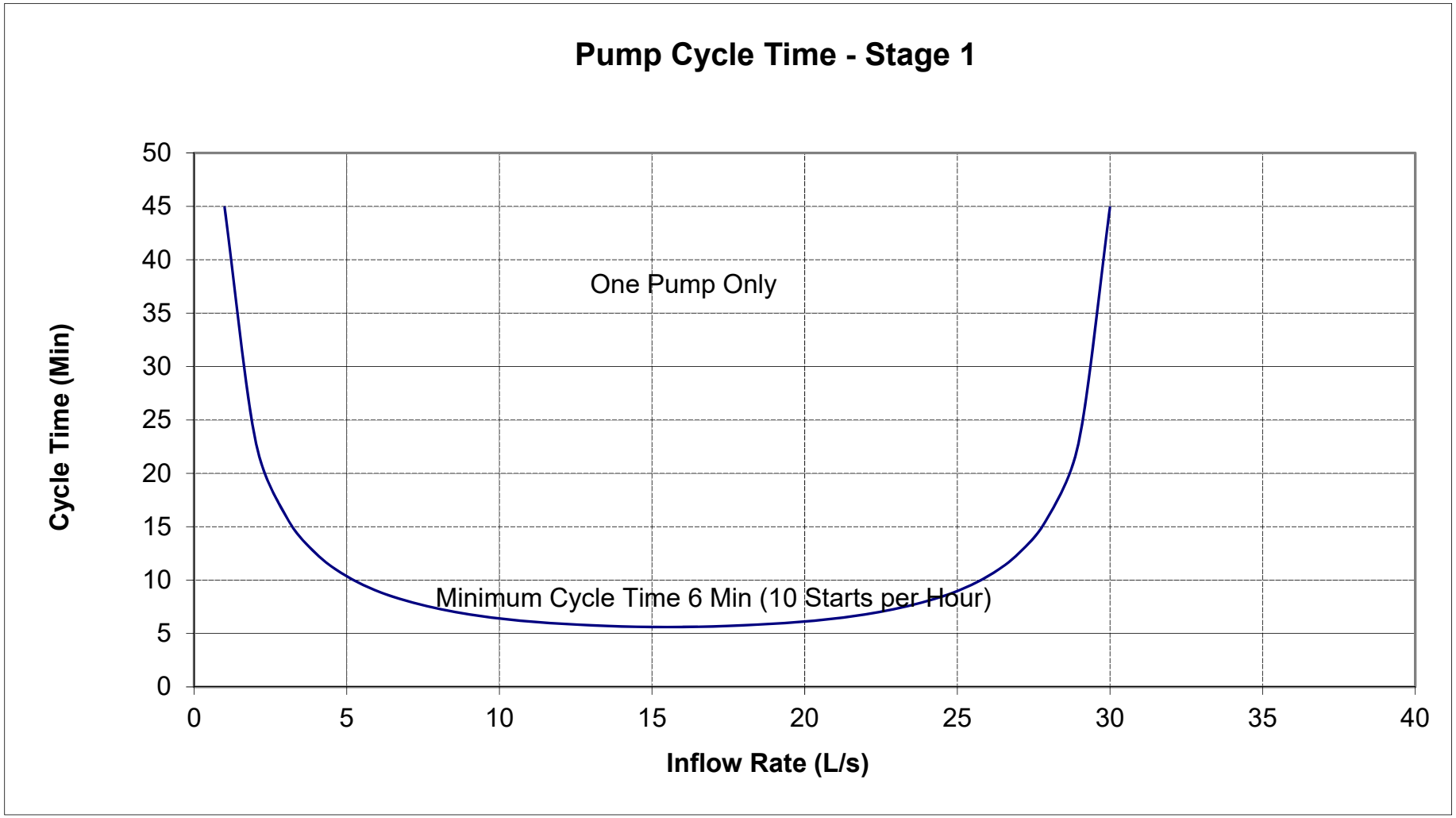
0 100 200 300 400 500m

Date Updated: September 21, 2018

LAND USE DISTRICTS

- Residential - Single Detached District.....R-1
- Residential - Single Detached Large Lot District.....R-1A
- Residential - Single Detached Medium Lot District.....R-1B
- Residential - Single Detached Small Lot District.....R-1C
- Residential - Single Detached Special District.....R1S
- Residential - Single Dwelling Secondary Suite and Carriage House District.....R-1SS
- Residential - Two Dwelling District.....R-2
- Residential - Townhouse District.....R-3
- Residential - Apartment District.....R-4
- Residential - Manufactured Home District.....MHR
- Central Business District.....CBD
- West Downtown Business District.....WBD
- Elevator Road Business District.....EBD
- Neighbourhood Commercial District.....C-1
- Gateway and Entrance Business District.....C-2
- Greenfield Commercial District.....C-3
- Light Industrial and Commercial District.....I-1
- Medium Industrial District.....I-2
- Heavy Industrial District.....I-3
- Municipal and Institutional District.....MUN
- Public Service Right of Way District.....PSR
- Urban Reserve District.....UR
- Direct Control District.....DC
- Direct Control District.....DC-2
- Town Boundary

Appendix B Existing System Pump Data


Pump Cycle Time - Stage 1
Cycle Time (Min)
50
45
40
35
30
25
20
15
10
5
0
One Pump Only
Minimum Cycle Time 6 Min (10 Starts per Hour)
0
5
10
15
20
25
30
35
40
Inflow Rate (L/s)

Pumped fluid		Number of pumps	1
Flow	31 l/s	Nature of system	Single head pump
Static head	13 m	Layout	Wet well installation
Viscosity	1.569 mm²/s	Calculation model	HAZEN WILLIAMS

Friction loss

Individual discharge side pipe

Piping 1 (7)

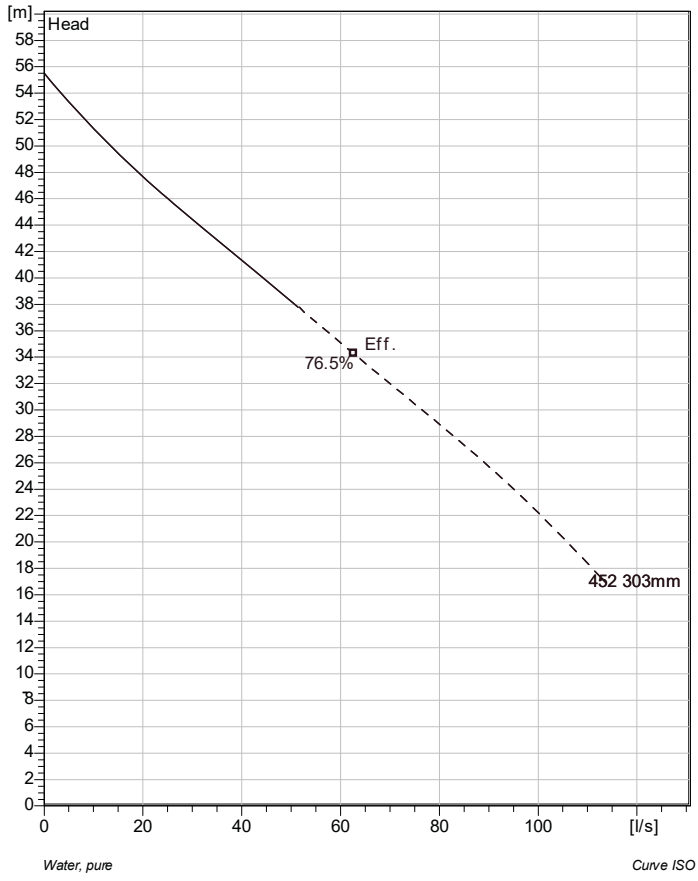
Pipe material	HDPE New _CAN	Inner pipe diameter	154.5 mm
Standard	-	Pipe roughness	0.02 mm
Nominal pipe size	DN 150	Flow velocity	5.423 ft/s
Nominal pressure	DR26		

Type	Zeta - value	Quantity	H [m]
Pipe length; 1550m		1	28.97
Inlet	1	1	0.1683
Discharge Connection	0.3	1	0.05048
Non-return valves	0.9	1	0.1514
VALVE	0.3	1	0.05048
Elbows	0.3	1	0.05048
Outlet	1	1	0.1683
Total friction head			**29.61**

Friction loss head	**29.61 m**
Total friction head	**42.61 m**

NP 3171 HT 3~ 452

Technical specification



Water, pure *Curve ISO*

Note: Picture might not correspond to the current configuration.

General

Patented self cleaning semi-open channel impeller, ideal for pumping in most waste water applications. Possible to be upgraded with Guide-pin® for even better clogging resistance. Modular based design with high adaptation grade.

Impeller

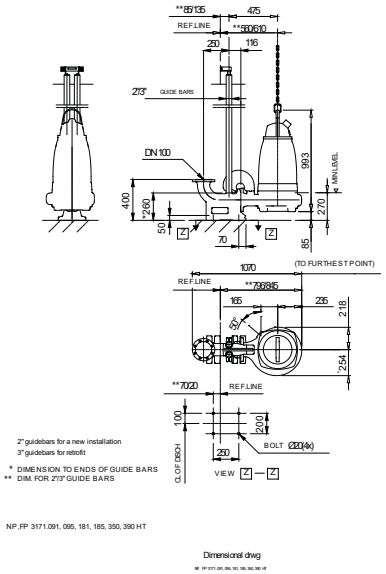
Impeller material	Grey cast iron
Discharge Flange Diameter	100 mm
Inlet diameter	100 mm
Impeller diameter	303 mm
Number of blades	2

Motor

Motor #	N3171.181 25-19-4AA-W 34hp
Stator variant	6
Frequency	60 Hz
Rated voltage	600 V
Number of poles	4
Phases	3~
Rated power	25.4 kW
Rated current	32 A
Starting current	228 A
Rated speed	1765 rpm
Power factor	
1/1 Load	0.86
3/4 Load	0.81
1/2 Load	0.70
Efficiency	
1/1 Load	89.5 %
3/4 Load	90.5 %
1/2 Load	90.0 %

Configuration

Installation: P - Semi permanent, Wet



Dimensional drwg

Project	Project ID	Created by	Created on	Last update
Crossfield Ironridge LS	**13-60-0188**	**Lee Lori**	**2015-05-01**	**2015-05-01**

NP 3171 HT 3~ 452

FLYGT

Performance curve

Pump

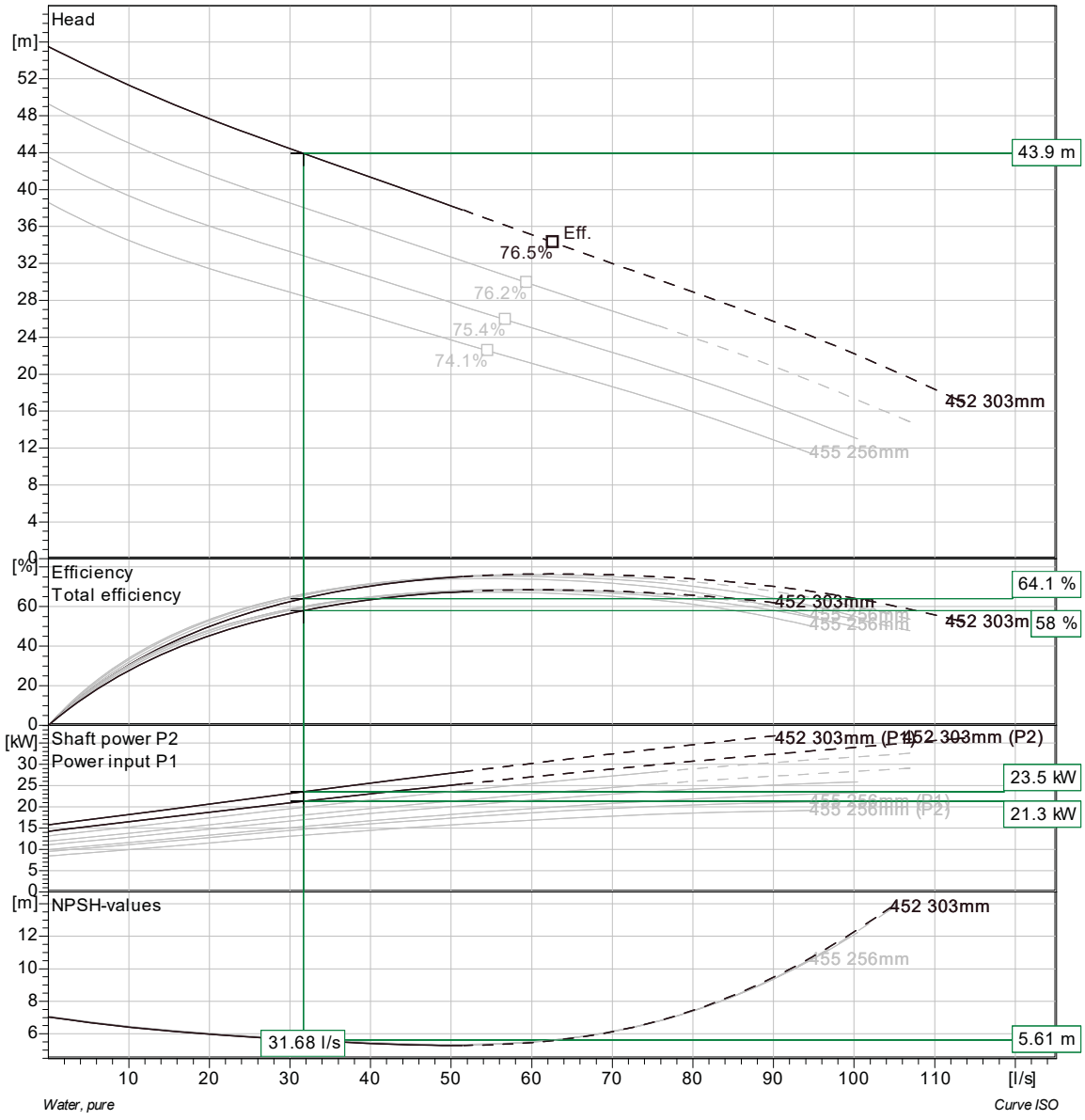
Discharge Flange Diameter	100 mm
Inlet diameter	100 mm
Impeller diameter	303 mm
Number of blades	2

Motor

Motor #	N3171.181 25-19-4AA-W 34hp
Stator variant	6
Frequency	60 Hz
Rated voltage	600 V
Number of poles	4
Phases	3~
Rated power	25.4 kW
Rated current	32 A
Starting current	228 A
Rated speed	1765 rpm

Power factor	
1/1 Load	0.86
3/4 Load	0.81
1/2 Load	0.70

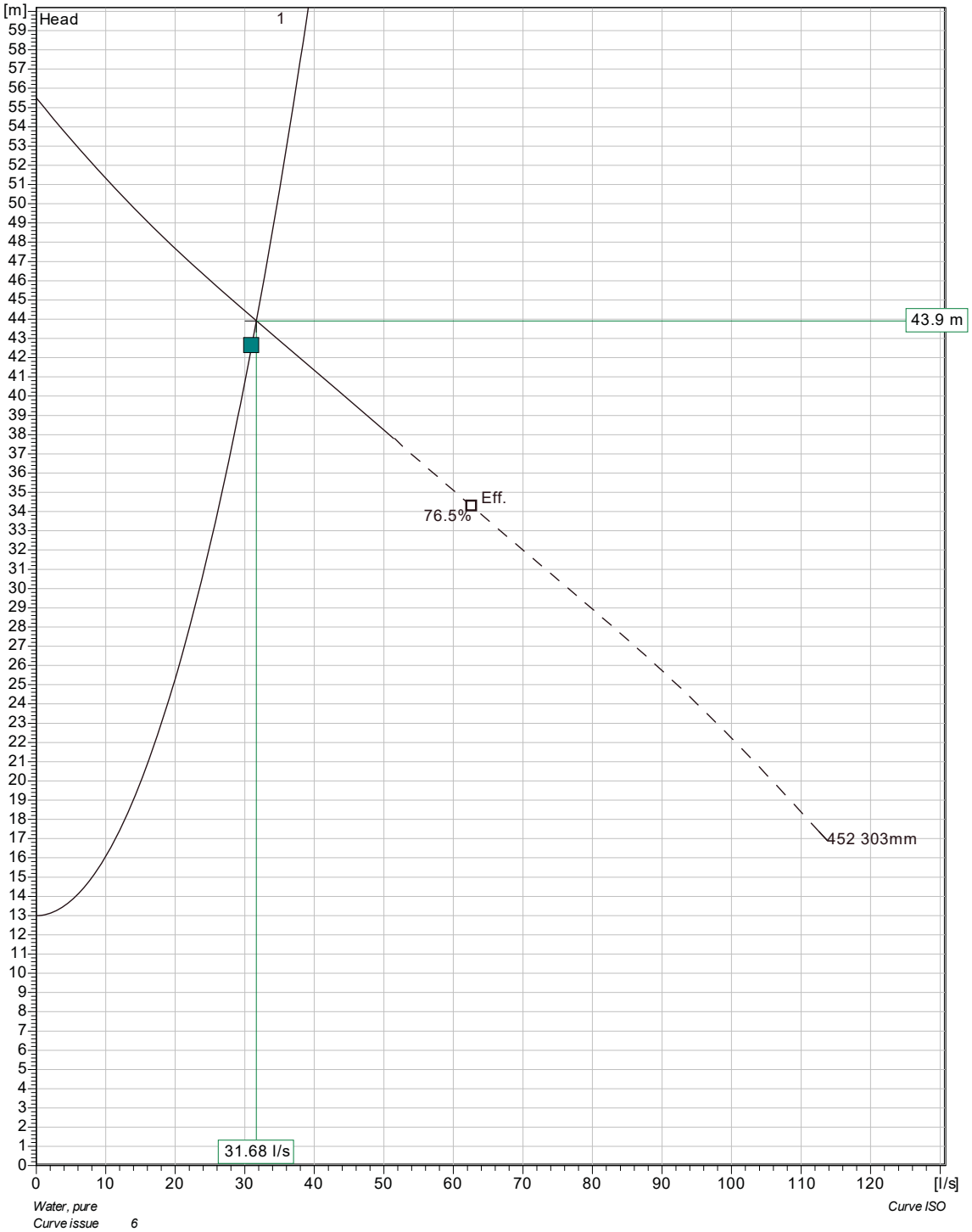
Efficiency	
1/1 Load	89.5 %
3/4 Load	90.5 %
1/2 Load	90.0 %



Project	Project ID	Created by	Created on	Last update
Crossfield Ironridge LS	**13-60-0188**	**Lee Lori**	**2015-05-01**	**2015-05-01**

NP 3171 HT 3~ 452

Duty Analysis

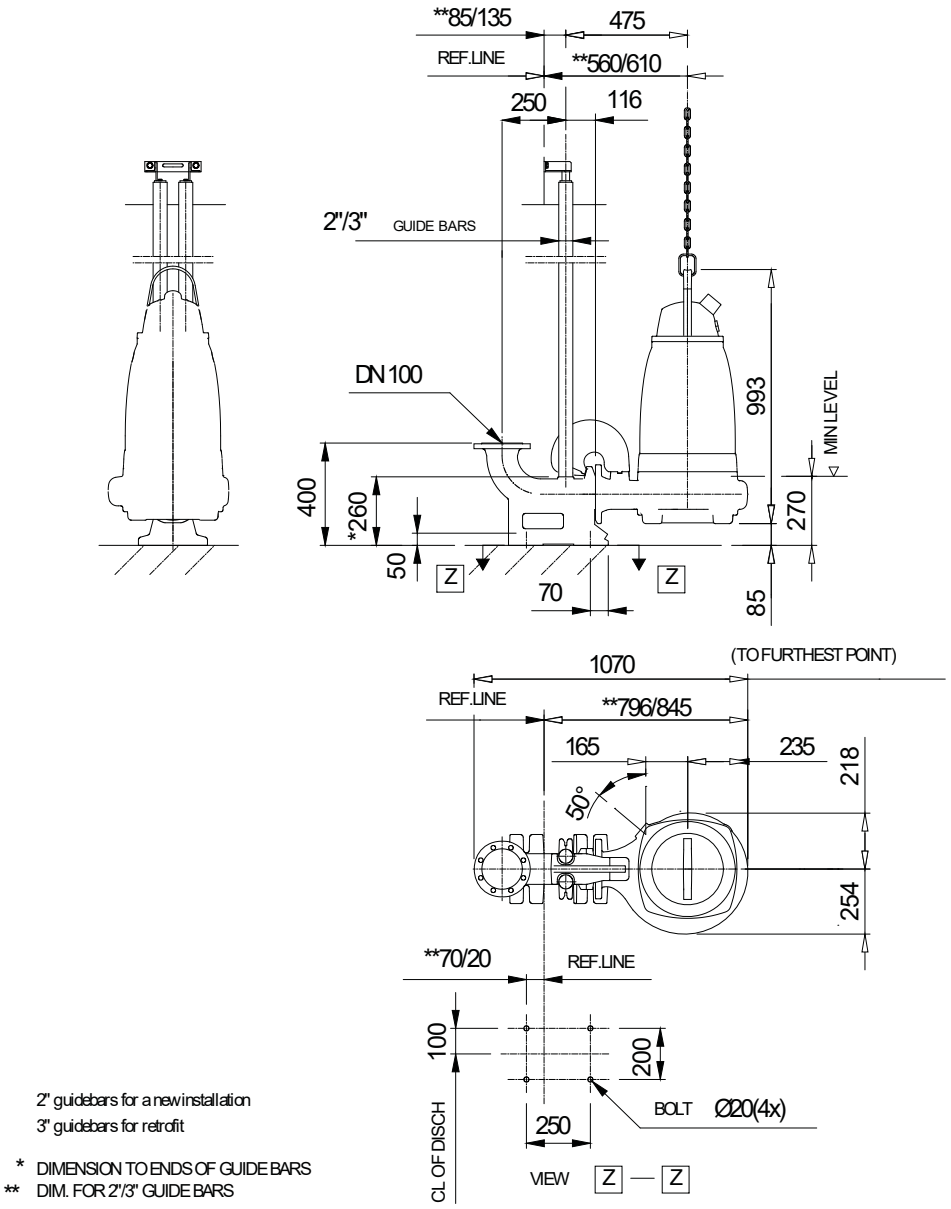


Pumps running /System	Individual pump			Total					
	Flow	Head	Shaft power	Flow	Head	Shaft power	Pump eff.	Specific energy	NPSHre
1	31.7 l/s	43.9 m	21.3 kW	31.7 l/s	43.9 m	21.3 kW	64.1 %	781 kWh/US MG	5.61 m

Project	Project ID	Created by	Created on	Last update
Crossfield Ironridge LS	**13-60-0188**	**Lee Lori**	**2015-05-01**	**2015-05-01**

NP 3171 HT 3~ 452

Dimensional drawing



2" guidebars for a new installation
3" guidebars for retrofit

* DIMENSION TO ENDS OF GUIDE BARS
** DIM. FOR 2"/3" GUIDE BARS

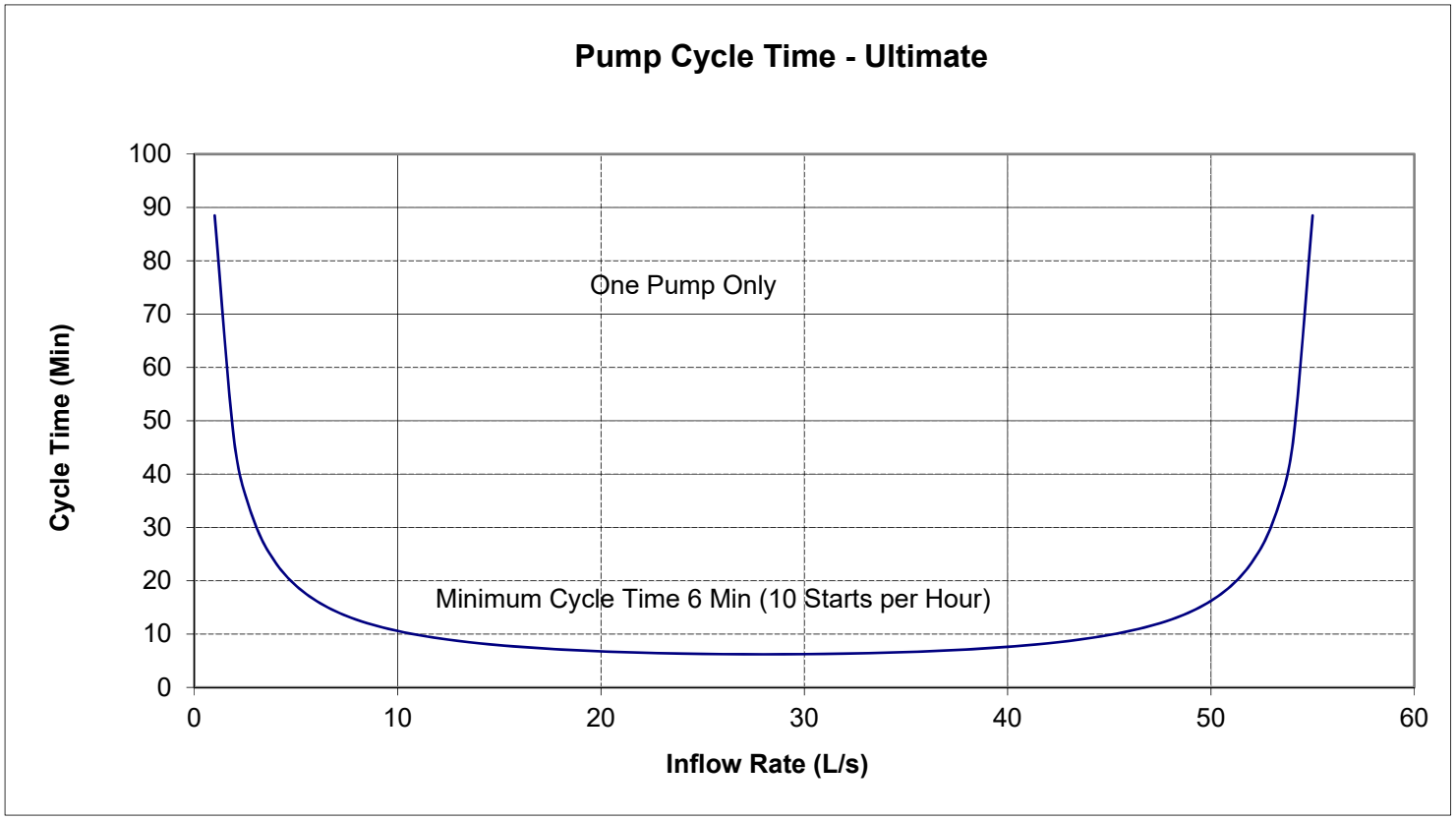
NP,FP 3171.091, 095, 181, 185, 350, 390 HT

Dimensional drwg

NP,FP3171.091,095,181,185,350,390 HT

Project	Project ID	Created by	Created on	Last update
Crossfield Ironridge LS	**13-60-0188**	**Lee Lori**	**2015-05-01**	**2015-05-01**

Iron Landing Lift Station Phase 2 (Ultimate) Pumps - Page 1/6



Pumped fluid		Number of pumps	1
Flow	56.04 l/s	Nature of system	Single head pump
Static head	23 m	Layout	Wet well installation
Viscosity	1.569 mm²/s	Calculation model	HAZEN WILLIAMS

Friction loss

Individual discharge side pipe

Piping 1 (6)

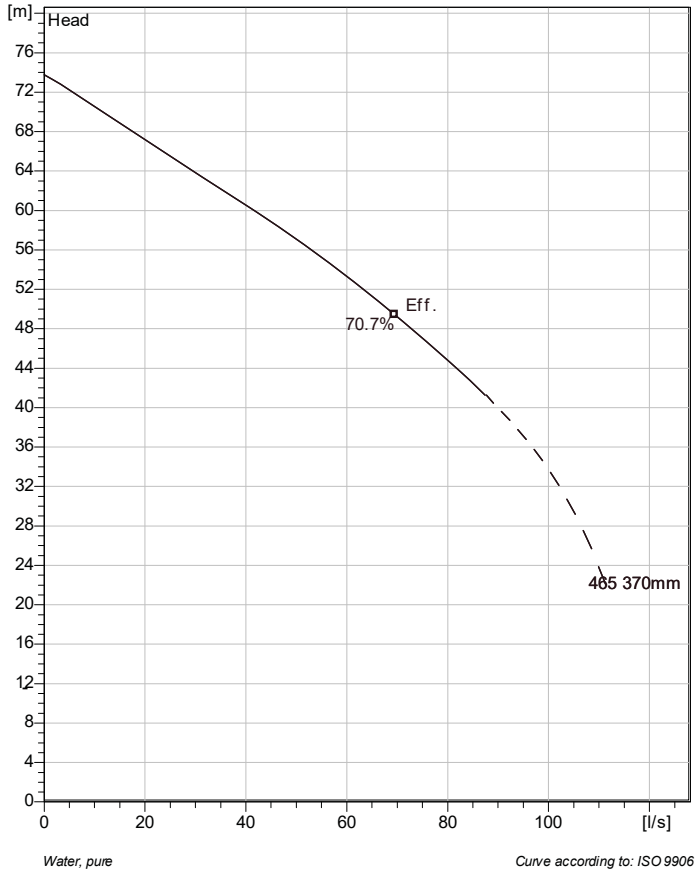
Pipe material	HDPE New _CAN	Inner pipe diameter	245.5 mm
Standard	-	Pipe roughness	0.02 mm
Nominal pipe size	DN 250	Flow velocity	1.184 m/s
Nominal pressure	DR21		

Type	Zeta - value	Quantity	H [m]
Pipe length; 5050m		1	29.68
Inlet	1	1	0.08754
Non-return valves	0.9	1	0.07878
VALVE	0.3	1	0.02626
Elbows	0.3	1	0.02626
Outlet	1	1	0.08754
Total friction head			**29.99**

Friction loss head	**29.99 m**
Total friction head	**52.99 m**

NP 3202 HT 3~ 465

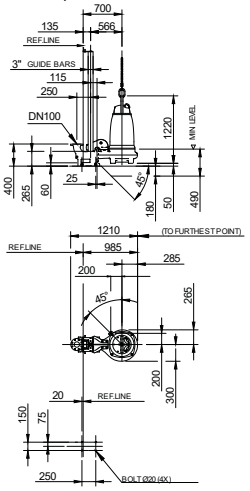
Technical specification



Water, pure *Curve according to: ISO 9906*

Note: Picture might not correspond to the current configuration.

Installation: P - Semi permanent, Wet



* DIMENSION TO ENDS OF GUIDE BARS

FP, NP 3202.090, 095, 180, 185, 350, 390, 660, 670 HT

Dimensional dwg

General

Patented self cleaning semi-open channel impeller, ideal for pumping in most waste water applications. Possible to be upgraded with Guide-pin® for even better clogging resistance. Modular based design with high adaptation grade.

Impeller

Impeller material	Grey cast iron
Discharge Flange Diameter	100 mm
Suction Flange Diameter	100 mm
Impeller diameter	370 mm
Number of blades	2

Motor

Motor #	N3202.180 30-29-4AA-W 70hp
Stator variant	3
Frequency	60 Hz
Rated voltage	600 V
Number of poles	4
Phases	3~
Rated power	52.2 kW
Rated current	61 A
Starting current	445 A
Rated speed	1775 rpm
Power factor	
1/1 Load	0.89
3/4 Load	0.86
1/2 Load	0.78
Efficiency	
1/1 Load	93.0 %
3/4 Load	93.5 %
1/2 Load	93.5 %

Configuration

Project	Project ID	Created by	Created on	Last update
Crossfield Ironridge LS	**13-60-0188**	**Lee Lori**	**2015-05-01**	**2015-05-01**

NP 3202 HT 3~ 465

FLYGT

Performance curve

Pump

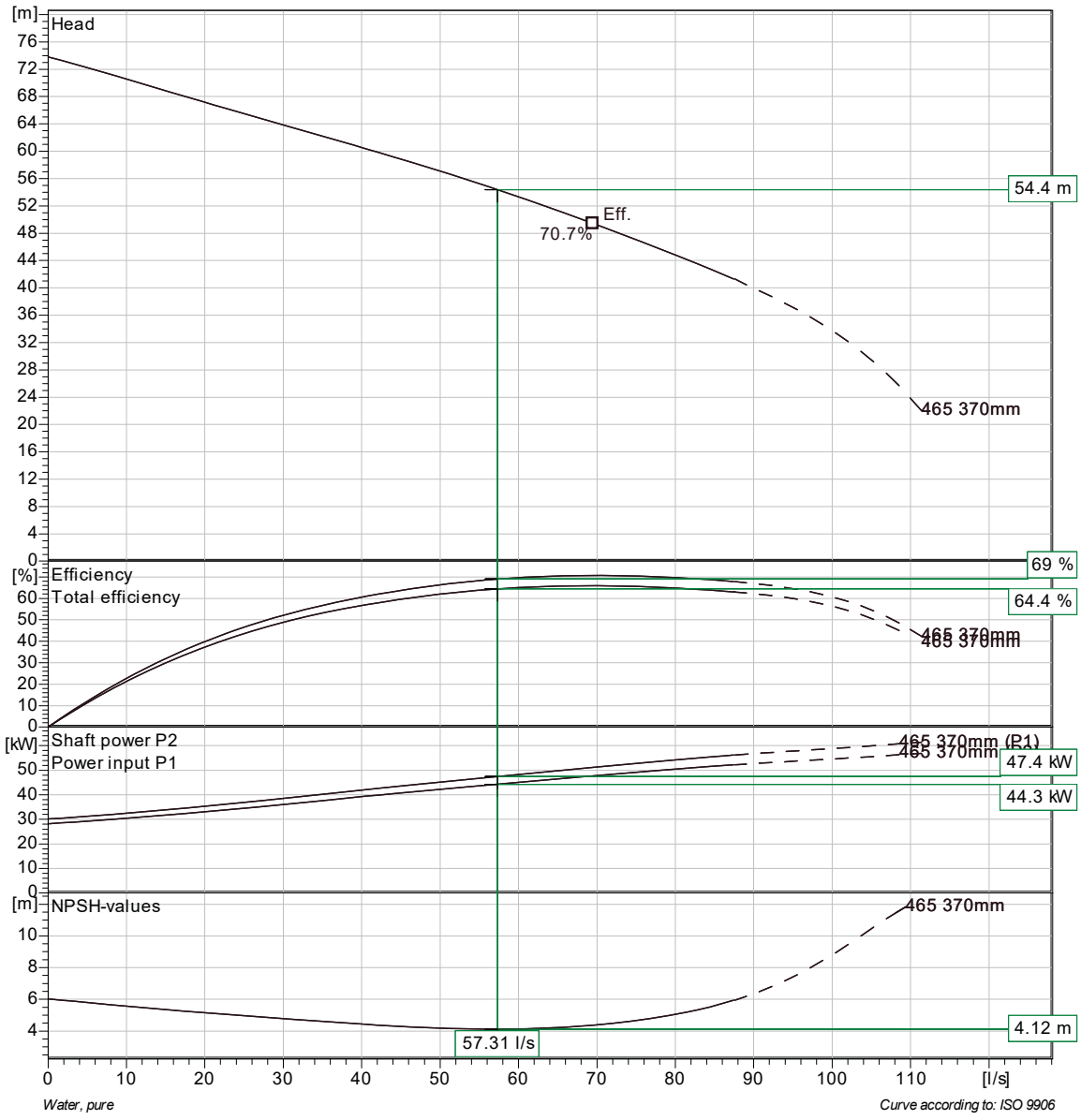
Discharge Flange Diameter	100 mm
Suction Flange Diameter	100 mm
Impeller diameter	370 mm
Number of blades	2

Motor

Motor #	N3202.180 30-29-4AA-W 70hp
Stator variant	3
Frequency	60 Hz
Rated voltage	600 V
Number of poles	4
Phases	3~
Rated power	52.2 kW
Rated current	61 A
Starting current	445 A
Rated speed	1775 rpm

Power factor	
1/1 Load	0.89
3/4 Load	0.86
1/2 Load	0.78

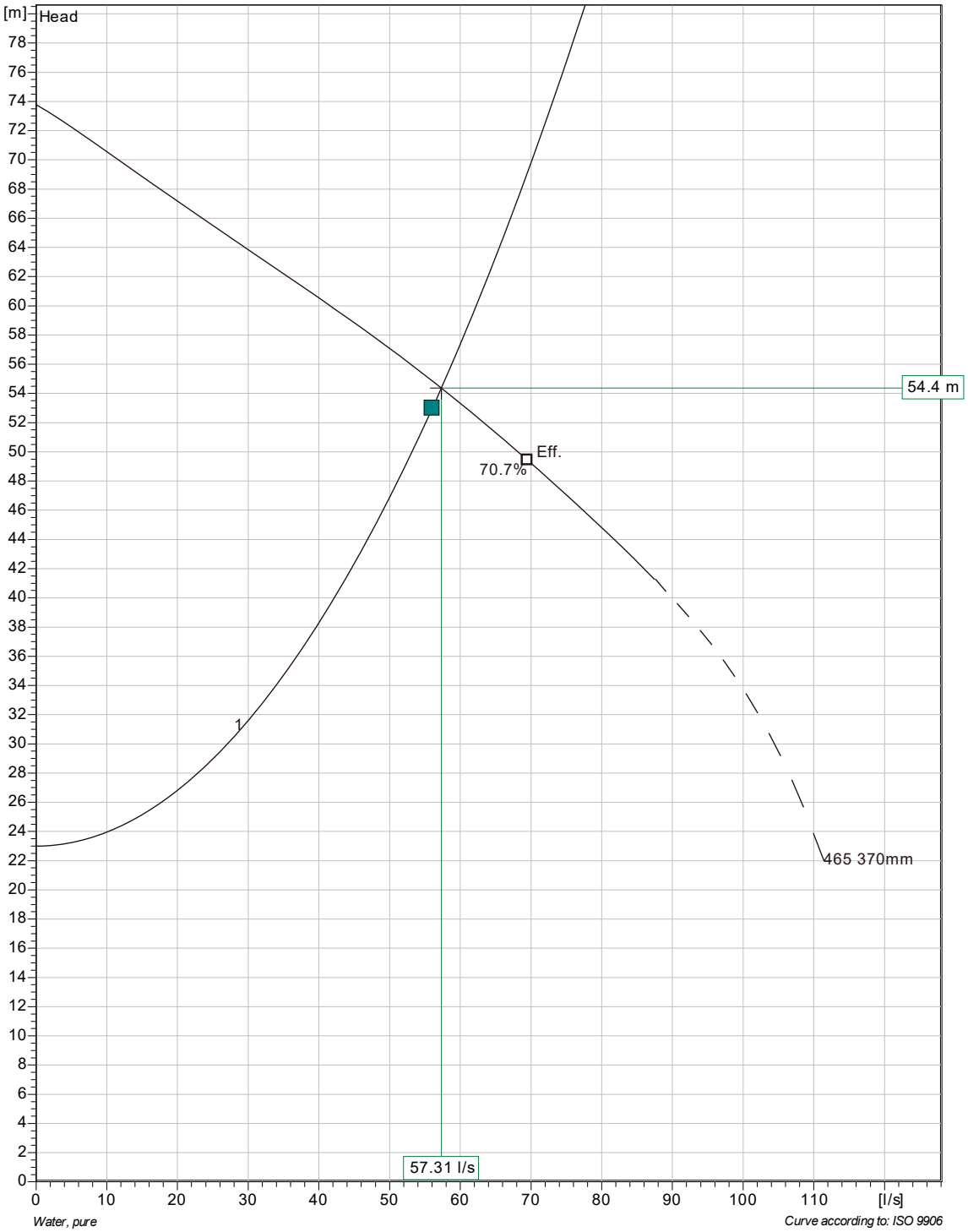
Efficiency	
1/1 Load	93.0 %
3/4 Load	93.5 %
1/2 Load	93.5 %



Project	Project ID	Created by	Created on	Last update
Crossfield Ironridge LS	**13-60-0188**	**Lee Lori**	**2015-05-01**	**2015-05-01**

NP 3202 HT 3~ 465

Duty Analysis

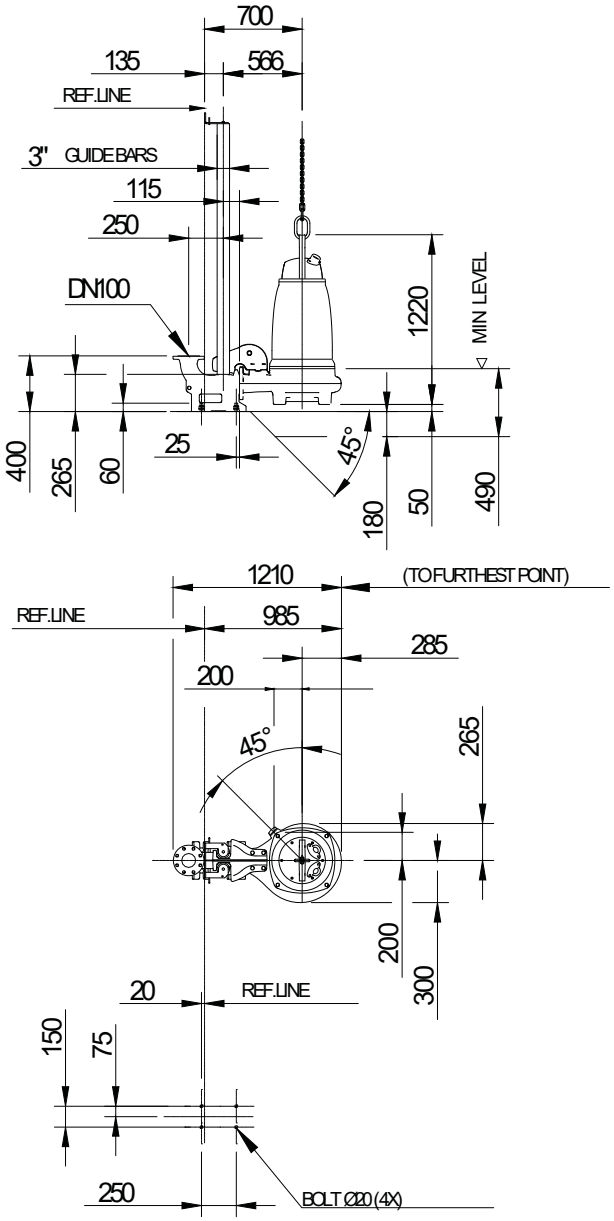


Pumps running /System	Individual pump			Total					
	Flow	Head	Shaft power	Flow	Head	Shaft power	Pump eff.	Specific energy	NPSHre
1	57.3 l/s	54.4 m	44.3 kW	57.3 l/s	54.4 m	44.3 kW	69 %	0.23 kWh/m³	4.12 m

Project	Project ID	Created by	Created on	Last update
Crossfield Ironridge LS	**13-60-0188**	**Lee Lori**	**2015-05-01**	**2015-05-01**

NP 3202 HT 3~ 465

Dimensional drawing



* DIMENSION TO ENDS OF GUIDE BARS

FP, NP 3202.090, 095, 180, 185, 350, 390, 660, 670 HT

Dimensional drwg

FP,NP 3202.090,095,180,185,350,390,660,670 HT

Project	Project ID	Created by	Created on	Last update
Crossfield Ironridge LS	**13-60-0188**	**Lee Lori**	**2015-05-01**	**2015-05-01**

SULZER

Submersible Sewage Pump Type ABS XFP

XFP 100E-CB1 | 4", 4 Pole, 3-Phase, 60 Hz, PE2

Cable Data, PE2 Frame

	Motor	Motor Voltage	Cable Qty	Cable Type [2]	Cable Nominal Outside Diameter +/- .5mm (.02")	
					Power	Ground
Power Cable	PE 45/4	208 volt	1	SOOW 10/7	20.7mm (0.82")	Integrated w/ Power
		230 volt	1	SOOW 10/7	20.7mm (0.82")	Integrated w/ Power
		460 volt	1	SOOW 14/7	17.6mm (0.69")	Integrated w/ Power
		600 volt	1	SOOW 14/7	17.6mm (0.69")	Integrated w/ Power
	PE 56/4	208 volt	1	SOOW 8/4+16/3	24.4mm (0.96")	Integrated w/ Power
		230 volt	1	SOOW 8/4+16/3	24.4mm (0.96")	Integrated w/ Power
		460 volt	1	SOOW 14/7	17.6mm (0.69")	Integrated w/ Power
		600 volt	1	SOOW 14/7	17.6mm (0.69")	Integrated w/ Power
	PE 75/4	208 volt	1	SOOW 8/4+16/3	24.4mm (0.96")	Integrated w/ Power
		230 volt	1	SOOW 8/4+16/3	24.4mm (0.96")	Integrated w/ Power
		460 volt	1	SOOW 12/7	18.8mm (0.74")	Integrated w/ Power
		600 volt	1	SOOW 14/7	17.6mm (0.69")	Integrated w/ Power
	PE 90/4	208 volt	1	SOOW 8/4+16/3	24.4mm (0.96")	Integrated w/ Power
		230 volt	1	SOOW 8/4+16/3	24.4mm (0.96")	Integrated w/ Power
		460 volt	1	SOOW 12/7	18.8mm (0.74")	Integrated w/ Power
		600 volt	1	SOOW 14/7	17.6mm (0.69")	Integrated w/ Power
	PE 105/4	208 volt	1	SOOW 8/4+16/3	24.4mm (0.96")	Integrated w/ Power
		230 volt	1	SOOW 8/4+16/3	24.4mm (0.96")	Integrated w/ Power
		460 volt	1	SOOW 10/7	20.7mm (0.82")	Integrated w/ Power
		600 volt	1	SOOW 12/7	18.8mm (0.74")	Integrated w/ Power
Control Cable	Motor Monitoring Type [3]		Cable Qty	Cable Type	Cable Nominal Outside Diameter +/- .5mm (.02")	
	Std monitoring		N/A	Integrated w/ Power	Integrated w/ Power	
Cable Length	Standard: 15m (49 feet)		Optional: 20m (65 feet), 30m (98 feet); Consult Factory for longer lengths			

[2] Type SOOW power cables have integrated control wires. [3] See motor protection on page 1.

Pump Data

Discharge Size	4" flanged, compatible with 4" class 125 ANSI flanges									
Suction Size (Wet-Pit / Dry-Pit)	4" flanged / 4" flanged, compatible with 4" class 125 ANSI flanges, threaded for 8x5/8-11 UNC screws, 30mm (1.2") deep									
Volute Pressure Rating	16 bar (232 psi)									
Impeller Type	Semi-Open, 1-vane, Contrablock Plus, w/ Seal Protection System									
Impeller Code	.6	.5	.4a	.4	.3	.2	.1			
Impeller Diameter, mm (in.)	185 (7.3)	195 (7.7)	208 (8.2)	217 (8.5)	225 (8.9)	240 (9.4)	250 (9.8)			
Solids Passage Size, mm (in.)	80 (3.15)	80 (3.15)	80 (3.15)	80 (3.15)	80 (3.15)	80 (3.15)	80 (3.15)			
Min. Recommended Flow, GPM [4]	200	250	270	290	300	330	320			

[4] Recommend minimum continuous flow. Consult factory for applications below this flow rate.

Materials of Construction

	Standard	Optional
Power/Control Cable Jacket	Chlorinated Polyethylene (CPE)	
Lifting Hoop	Stainless Steel 1.4401 (AISI 316)	
Cable Connection Chamber	Cast Iron EN-GJL-250 (ASTM A-48, Class 35B)	
Motor Housing	Cast Iron EN-GJL-250 (ASTM A-48, Class 35B)	
Intermediate Housing	Cast Iron EN-GJL-250 (ASTM A-48, Class 35B)	
Seal Plate	Cast Iron EN-GJL-250 (ASTM A-48, Class 35B)	
Pump and Motor Shaft	Stainless Steel 1.4021 (AISI 420)	
Impeller	Cast Iron EN-GJL-250 (ASTM A-48, Class 35B) [5]	Duplex Stainless Steel 1.4470 (ASTM A890, CD3MN Grade 4A)
Wear Parts Bottom/Wear Plate	Cast Iron EN-GJL-250 (ASTM A-48, Class 35B) [5]	Duplex Stainless Steel 1.4470 (ASTM A890, CD3MN Grade 4A)
Volute	Cast Iron EN-GJL-250 (ASTM A-48, Class 35B)	
External Hardware	Stainless Steel 1.4401 (AISI 316)	
O-Rings and Cable Glands	Nitrile (Buna-N)	Viton®
Mechanical Seals Lower	Silicon Carbide / Silicon Carbide, Nitrile, 316 SS	Silicon Carbide / Silicon Carbide, Viton®, 316 SS
Mechanical Seals Upper	Silicon Carbide / Silicon Carbide, Nitrile, 316 SS	
Coating/Protection	Two-part epoxy, blue, 120µm (4.7 mil) DFT	Two-part epoxy, blue, 400µm (15.7 mil); Wet-end liquid ceramic coating, 500µm (19.7 mil); Zinc Anodes

[5] Hardening of bottom edge of impeller vane and wear plate surface available. Consult factory for details.

General Data (Standard Materials of Construction & Cable Length)

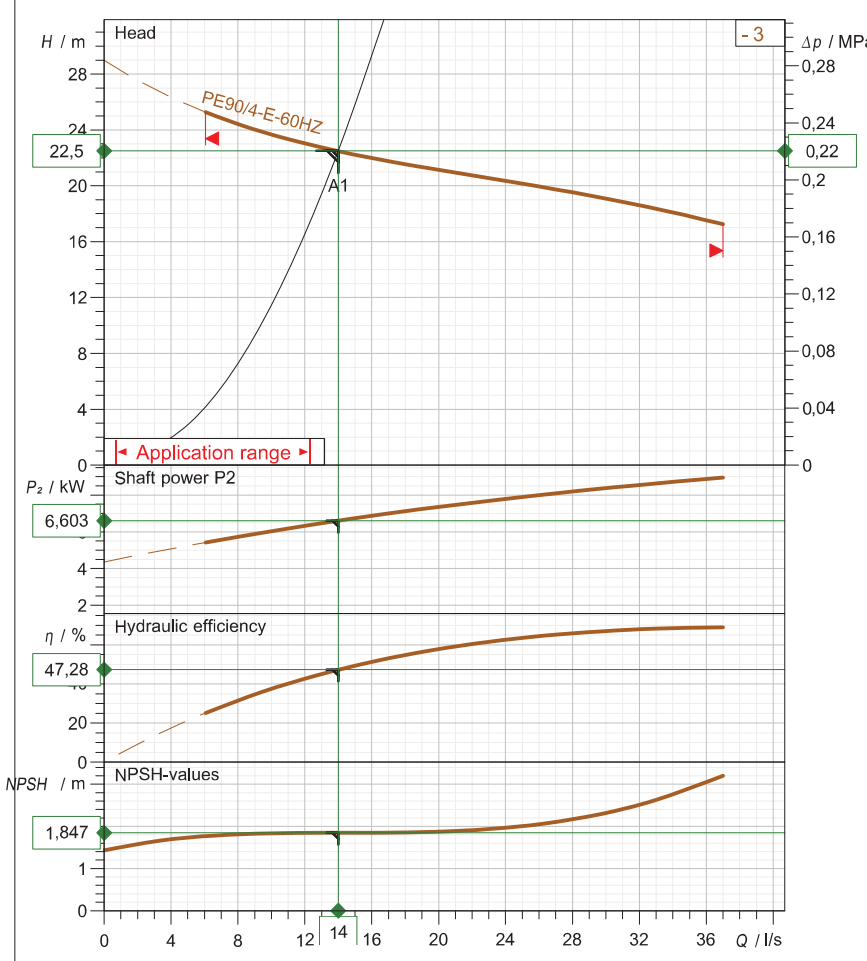
	PE 45/4	PE 56/4	PE 75/4	PE 90/4	PE 105/4
Overall Height	762mm (30.0")	762mm (30.0")	762mm (30.0")	832mm (32.8")	832mm (32.8")
≈ Pump Weight (Non-Cooled)	171 kg (377 lb)	171 kg (377 lb)	181 kg (400 lb)	201 kg (444 lb)	210 kg (462 lb)

DS-E01-024 REV: 8 DATE: 10/16 Specifications Subject to Change Without Notice

FM Approvals CSA IE3 NEMA Premium

SULZER

XFP100E CB1 60HZ (wet pit)



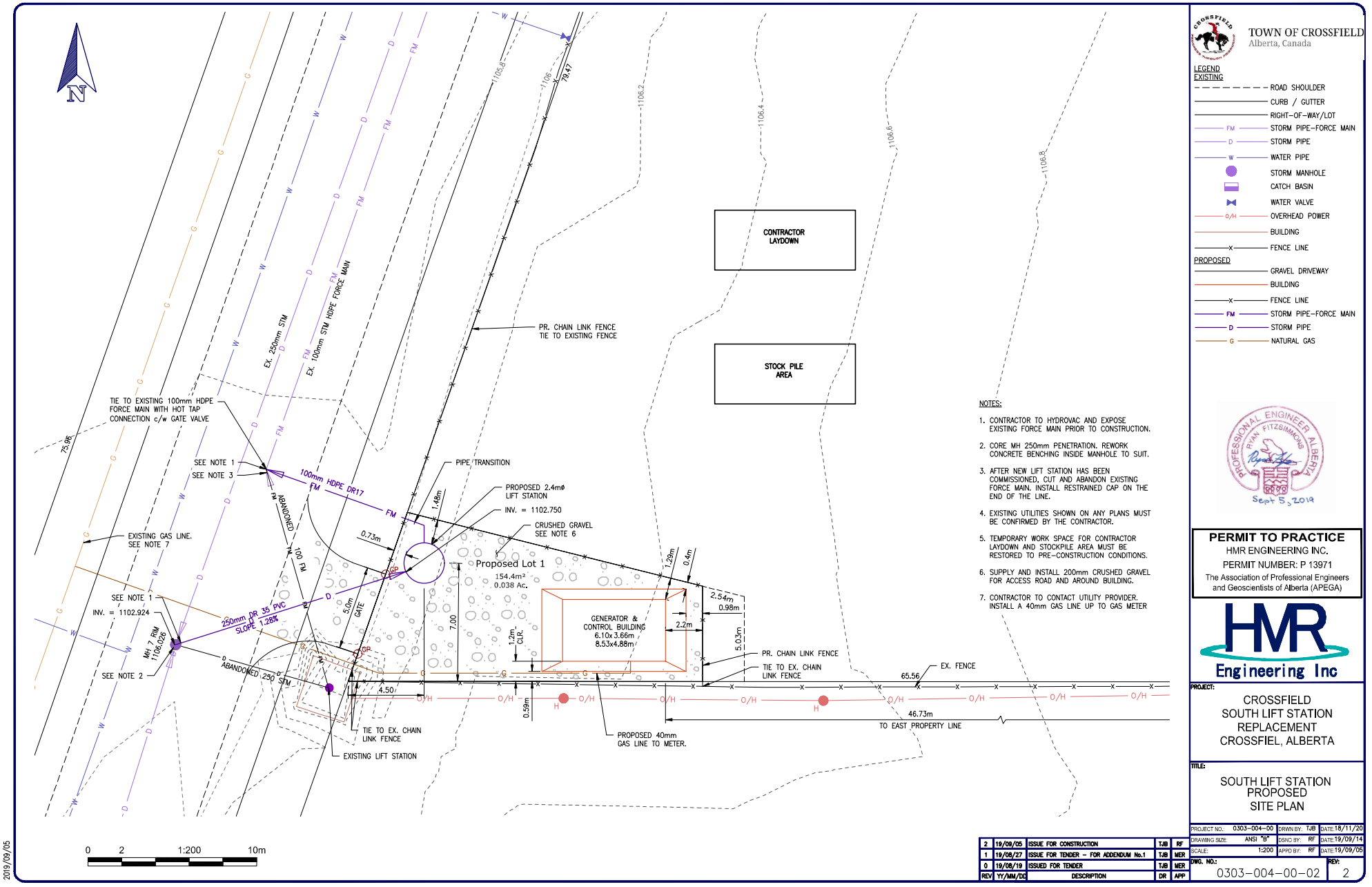
Testnorm
ISO9906:2012,HI 11.6/14.6≤10kW

This pump (non oil-cooled) is suitable for wet pump installation only.
It is NOT suitable for dry pump installation.

2019-09-03

Operating data specification			
Flow	14 l/s	Power input	7,23 kW
Efficiency	47,3 %	Head	22,5 m
NPSH	1,85 m	Rated power	6,6 kW
Temperature	20 °C	Fluid	Water
No. of pumps	1	Nature of system	Single head pump
Pump data			
Type	XFP100E CB1 60HZ (wet pit)	Make	SULZER
Series	XFP PE1-PE3	Impeller	Contrablock Plus impeller, 1 vane
N° of vanes	1	Impeller size	228 mm
Free passage	80 mm	Suction flange	DN100
Discharge flange	DN100	Type of installation	Wet Well installation with pedestal
Moment of inertia	0,0299 kg m²		
Motor data			
Rated voltage	600 V	Frequency	60 Hz
Rated power P2	9 kW	Nominal Speed	1760 1/min
Number of poles	4	Efficiency	91,7 %
Power factor	0,78	Rated current	12,1 A
Starting current	81 A	Rated torque	48,8 Nm
Starting torque	118 Nm	Degree of protection	IP 68
Insulation class	H	No. starts per hour	15

South Lift Station - Page 3/4



NOTES:

1. CONTRACTOR TO HYDROVAC AND EXPOSE EXISTING FORCE MAIN PRIOR TO CONSTRUCTION.
2. CORE MH 250mm PENETRATION. REWORK CONCRETE BENCHING INSIDE MANHOLE TO SUIT.
3. AFTER NEW LIFT STATION HAS BEEN COMMISSIONED, CUT AND ABANDON EXISTING FORCE MAIN. INSTALL RESTRAINED CAP ON THE END OF THE LINE.
4. EXISTING UTILITIES SHOWN ON ANY PLANS MUST BE CONFIRMED BY THE CONTRACTOR.
5. TEMPORARY WORK SPACE FOR CONTRACTOR LAYDOWN AND STOCKPILE AREA MUST BE RESTORED TO PRE-CONSTRUCTION CONDITIONS.
6. SUPPLY AND INSTALL 200mm CRUSHED GRAVEL FOR ACCESS ROAD AND AROUND BUILDING.
7. CONTRACTOR TO CONTACT UTILITY PROVIDER. INSTALL A 40mm GAS LINE UP TO GAS METER

TOWN OF CROSSFIELD
Alberta, Canada

LEGEND

EXISTING
- ROAD SHOULDER
- CURB / GUTTER
- RIGHT-OF-WAY/LOT
- STORM PIPE-FORCE MAIN
- STORM PIPE
- WATER PIPE
- STORM MANHOLE
- CATCH BASIN
- WATER VALVE
- OVERHEAD POWER
- BUILDING
- FENCE LINE

PROPOSED
- GRAVEL DRIVEWAY
- BUILDING
- FENCE LINE
- STORM PIPE-FORCE MAIN
- STORM PIPE
- NATURAL GAS

PROFESSIONAL ENGINEER ALBERTA RYAN FITZSIMMONS Sept 5, 2019

PERMIT TO PRACTICE
HMR ENGINEERING INC.
PERMIT NUMBER: P 13971
The Association of Professional Engineers and Geoscientists of Alberta (APEGA)

HMR Engineering Inc

PROJECT:
CROSSFIELD
SOUTH LIFT STATION
REPLACEMENT
CROSSFIEL, ALBERTA

TITLE:
SOUTH LIFT STATION
PROPOSED
SITE PLAN

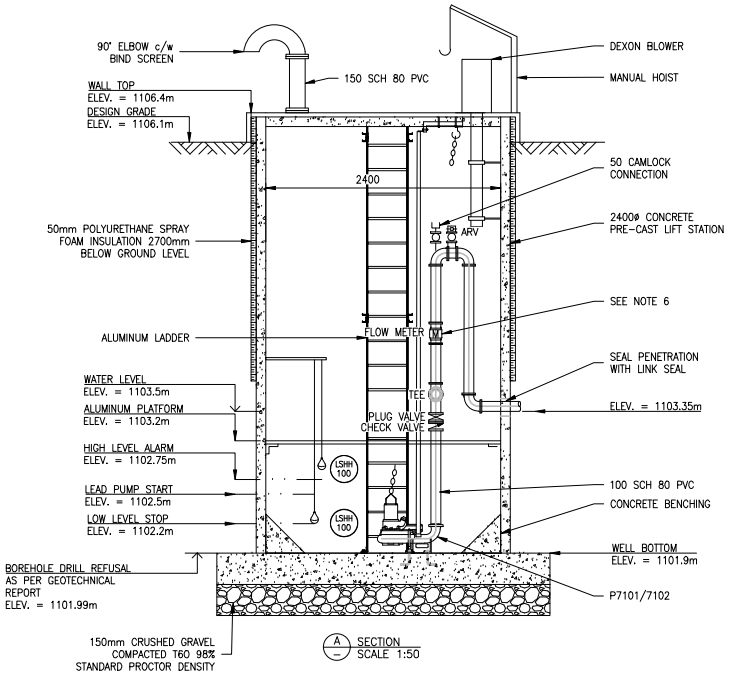
REV	YY/MM/DD	DESCRIPTION	DR	APP
2	19/09/05	ISSUE FOR CONSTRUCTION	TJB	RF
1	19/08/27	ISSUE FOR TENDER - FOR ADDENDUM No.1	TJB	MER
0	19/08/19	ISSUED FOR TENDER	TJB	MER

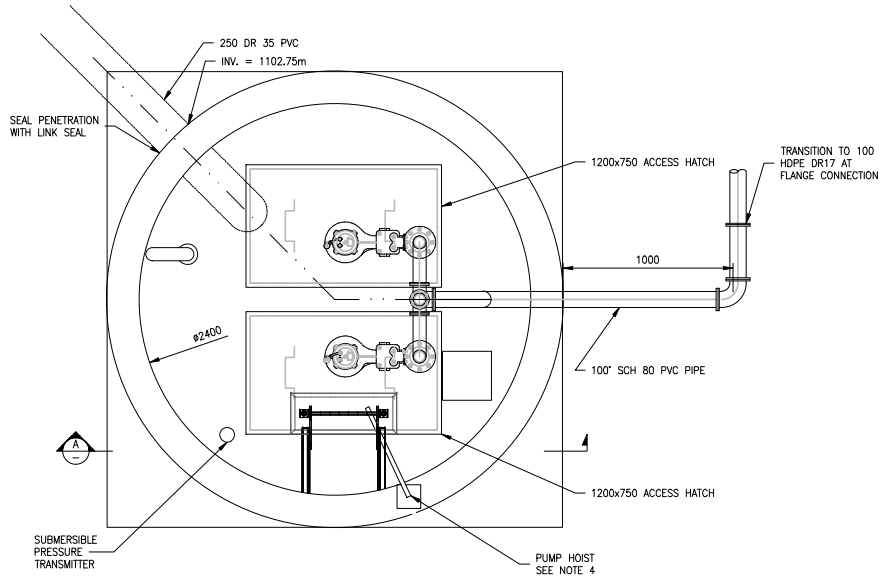
PROJECT NO.:	0303-004-00	DRWN BY: TJB	DATE: 18/11/20
DRAWING SIZE:	ANSI "B"	DSNO BY: RF	DATE: 19/09/14
SCALE:	1:200	APPD BY: RF	DATE: 19/09/05

DWG. NO.: 0303-004-00-02 REV: 2

2019/09/05

South Lift Station - Page 4/4





WET WELL PLAN VIEW
SCALE 1:30

TOWN OF CROSSFIELD
Alberta, Canada

NOTE:

1. ALL DIMENSIONS AND PIPE SIZES ARE IN MILLIMETERS UNLESS OTHERWISE NOTED.
2. ALL PIPING TO BE INSTALLED ON UNDISTURBED GROUND OR NON-SHRINK FILL.
3. THE PRE-CAST CONCRETE VAULT TO BE DESIGNED BY MANUFACTURER. VAULT SHOP DRAWINGS SHALL BE STAMPED BY A PROFESSIONAL ENGINEER LICENSED IN ALBERTA.
4. PROVIDE PUMP HOIST. SEE SPECIFICATIONS FOR DETAILS.
5. PROVIDE HATCHES IN INTERMEDIATE PLATFORM FOR PUMPS.
6. PROVIDE FIVE PIPE DIAMETER LENGTHS UPSTREAM AND THREE PIPE DIAMETER LENGTHS DOWNSTREAM OF FLOW METER.

PROFESSIONAL ENGINEER ALBERTA
RYAN FITZSIMMONS
Sept 5, 2019

PERMIT TO PRACTICE
HMR ENGINEERING INC.
PERMIT NUMBER: P 13971
The Association of Professional Engineers and Geoscientists of Alberta (APEGA)

HMR Engineering Inc

PROJECT:
SOUTH LIFT STATION
REPLACEMENT
CROSSFIELD, ALBERTA

TITLE:
LIFT STATION
PROCESS SECTIONS

REV	YY/MM/DD	DESCRIPTION	DR	APP
2	19/09/05	ISSUE FOR CONSTRUCTION	TJB	RF
1	19/08/27	ISSUE FOR TENDER - FOR ADDENDUM No.1	TJB	MER
0	19/08/19	ISSUED FOR TENDER	TJB	MER

PROJECT NO.:	0303-004-00	DRWN BY:	TJB	DATE:	19/08/06
DRAWING SIZE:	ANSI "B"	DSNO BY:	RF	DATE:	19/08/06
SCALE:	AS NOTED	APPD BY:	RF	DATE:	19/09/05

DWG. NO.: 0303-004-00-03
REV: 2

2019/09/11

Appendix C XPSWMM Model Data

CATCHMENT INPUT DATA

Name	Subcatchment	Node X	Node Y	Rainfall Reference	Infiltration Reference	Width (m)	Area (ha)	Impervious Percentage %	Slope (m/m)	RDII name
EXISTING TOWN										
MH 1		-1831.947	5697327.827	10year-Chicago-7.5%		0	0	0	0	
MH 1A	1	-1606.743	5697338.511	10year-Chicago-7.5%	Horton	563	49.88	95	0.02	RDII-7.5%
MH 1A-1		-1597.266	5697846.444			0	0	0	0	
MH 1A-2		-1714.314	5697848.457			0	0	0	0	
MH 1A-3		-1791.481	5697845.765			0	0	0	0	
MH 2		-1903.922	5697327.903	10year-Chicago-7.5%		0	0	0	0	
MH 3		-2021.995	5697327.894	10year-Chicago-7.5%		0	0	0	0	
MH 4		-2145.749	5697327.935	10year-Chicago-7.5%		0	0	0	0	
MH 5		-2202.803	5697366.35	10year-Chicago-7.5%		0	0	0	0	
MH 6		-2217.026	5697432.311	10year-Chicago-7.5%		0	0	0	0	
MH 7		-2201.881	5697475.121	10year-Chicago-7.5%		0	0	0	0	
MH 8		-2166.724	5697574.239	10year-Chicago-7.5%		0	0	0	0	
MH 9		-2134.68	5697667.742	10year-Chicago-7.5%		0	0	0	0	
MH 10		-2078.389	5697708.388	10year-Chicago-7.5%		0	0	0	0	
MH 11		-1993.504	5697707.893	10year-Chicago-7.5%		0	0	0	0	
MH 12		-1903.268	5697467.686	10year-Chicago-7.5%		0	0	0	0	
MH 13		-1903.416	5697569.547	10year-Chicago-7.5%		0	0	0	0	
MH 14		-1903.32	5697707.46	10year-Chicago-7.5%		0	0	0	0	
MH 15		-1903.465	5697789.043	10year-Chicago-7.5%		0	0	0	0	
MH 16		-1903.737	5697841.025	10year-Chicago-7.5%		0	0	0	0	
MH 17		-1903.667	5697865.291	10year-Chicago-7.5%		0	0	0	0	
MH 18		-1903.425	5697989.625	10year-Chicago-7.5%		0	0	0	0	
MH 19		-1902.843	5698110.038	10year-Chicago-7.5%		0	0	0	0	
MH 20		-1903.114	5698166.301	10year-Chicago-7.5%		0	0	0	0	
MH 21		-1902.958	5698230.241	10year-Chicago-7.5%		0	0	0	0	
MH 22		-1902.982	5698316.502	10year-Chicago-7.5%		0	0	0	0	
MH 23		-1903.522	5698470.132	10year-Chicago-7.5%		0	0	0	0	
MH 24		-1776.601	5698589.225	10year-Chicago-7.5%		0	0	0	0	
MH 25		-1902.997	5698588.8	10year-Chicago-7.5%		0	0	0	0	
MH 26		-2010.302	5698589.291	10year-Chicago-7.5%		0	0	0	0	
MH 27		-2052.864	5698589.919	10year-Chicago-7.5%		0	0	0	0	
MH 28		-2120.362	5698613.393	10year-Chicago-7.5%		0	0	0	0	
MH 29		-2239.356	5698580.954	10year-Chicago-7.5%		0	0	0	0	
MH 30		-2292.636	5698557.65	10year-Chicago-7.5%		0	0	0	0	
MH 31		-2397.545	5698514.096	10year-Chicago-7.5%		0	0	0	0	
MH 32		-2517.623	5698503.179	10year-Chicago-7.5%		0	0	0	0	
MH 33		-2553.57	5698501.429	10year-Chicago-7.5%		0	0	0	0	
MH 34		-2731.329	5698494.586	10year-Chicago-7.5%		0	0	0	0	
MH 35		-2890.323	5698512.379	10year-Chicago-7.5%		0	0	0	0	
MH 36		-3069.329	5698513.253	10year-Chicago-7.5%		0	0	0	0	
MH 37		-3248.726	5698506.74	10year-Chicago-7.5%		0	0	0	0	
MH 38		-3282.271	5698505.608	10year-Chicago-7.5%		0	0	0	0	
MH 39		-3294.46	5698505	10year-Chicago-7.5%		0	0	0	0	
MH 40		-3354.345	5698503.068	10year-Chicago-7.5%		0	0	0	0	
MH 40D	1	-3081.964	5698922.02	10year-Chicago-7.5%	Horton	630	38.51	65	0.02	RDII-7.5%
MH 41		-2377.797	5698445.494	10year-Chicago-7.5%		0	0	0	0	
MH 42		-2354.544	5698378.949	10year-Chicago-7.5%		0	0	0	0	
MH 43		-2277.978	5698411.068	10year-Chicago-7.5%		0	0	0	0	
MH 44		-2194.775	5698475.143	10year-Chicago-7.5%		0	0	0	0	
MH 45		-2133.585	5698717.268	10year-Chicago-7.5%		0	0	0	0	
MH 46		-2204.707	5698722.958	10year-Chicago-7.5%		0	0	0	0	
MH 47		-2226.688	5698722.59	10year-Chicago-7.5%		0	0	0	0	
MH 48		-2331.791	5698889.767	10year-Chicago-7.5%		0	0	0	0	
MH 49		-2292.108	5698876.107	10year-Chicago-7.5%		0	0	0	0	
MH 50		-2247.562	5698860.452	10year-Chicago-7.5%		0	0	0	0	
MH 51		-2089.909	5698702.49	10year-Chicago-7.5%		0	0	0	0	
MH 52		-2082.341	5698727.25	10year-Chicago-7.5%		0	0	0	0	
MH 53		-2043.574	5698834.23	10year-Chicago-7.5%		0	0	0	0	
MH 54		-2027.885	5698883.53	10year-Chicago-7.5%		0	0	0	0	
MH 55		-1993.513	5698977.626	10year-Chicago-7.5%		0	0	0	0	
MH 56		-1960.741	5699070.958	10year-Chicago-7.5%		0	0	0	0	
MH 56A		-1868.437	5699039.97	10year-Chicago-7.5%		0	0	0	0	
MH 57		-1927.634	5699165.086	10year-Chicago-7.5%		0	0	0	0	
MH 58		-1894.562	5699259.095	10year-Chicago-7.5%		0	0	0	0	
MH 59		-1861.572	5699352.784	10year-Chicago-7.5%		0	0	0	0	
MH 60		-1816.909	5699484.6	10year-Chicago-7.5%		0	0	0	0	
MH 61		-1784.756	5699570.717	10year-Chicago-7.5%		0	0	0	0	
MH 62		-1764.732	5699628.225	10year-Chicago-7.5%		0	0	0	0	
MH 63		-2151.719	5698927.515	10year-Chicago-7.5%		0	0	0	0	
MH 64		-2192.043	5698941.573	10year-Chicago-7.5%		0	0	0	0	
MH 65		-2226.015	5698953.274	10year-Chicago-7.5%		0	0	0	0	
MH 66		-2287.831	5698975.406	10year-Chicago-7.5%		0	0	0	0	
MH 67		-2350.874	5698997.475	10year-Chicago-7.5%		0	0	0	0	
MH 68		-2365.616	5699011.573	10year-Chicago-7.5%		0	0	0	0	
MH 69		-2449.074	5699040.424	10year-Chicago-7.5%		0	0	0	0	
MH 70		-2512.071	5698933.051	10year-Chicago-7.5%		0	0	0	0	
MH 71		-2512.364	5698985.988	10year-Chicago-7.5%		0	0	0	0	
MH 72		-2512.434	5699062.217	10year-Chicago-7.5%		0	0	0	0	
MH 73		-2512.728	5699159.487	10year-Chicago-7.5%		0	0	0	0	
MH 74		-2422.159	5699128.021	10year-Chicago-7.5%		0	0	0	0	
MH 75		-2341.686	5699100.233	10year-Chicago-7.5%		0	0	0	0	
MH 76		-2284.781	5699080.396	10year-Chicago-7.5%		0	0	0	0	
MH 77		-2192.335	5699047.474	10year-Chicago-7.5%		0	0	0	0	
MH 78		-2159.229	5699036.322	10year-Chicago-7.5%		0	0	0	0	
MH 79		-2092.171	5699012.008	10year-Chicago-7.5%		0	0	0	0	
MH 80		-2069.437	5699109.185	10year-Chicago-7.5%		0	0	0	0	
MH 81		-2177.245	5699147.289	10year-Chicago-7.5%		0	0	0	0	
MH 82		-2264.44	5699177.807	10year-Chicago-7.5%		0	0	0	0	
MH 83		-2303.403	5699191.502	10year-Chicago-7.5%		0	0	0	0	
MH 84		-2409.218	5699228.963	10year-Chicago-7.5%		0	0	0	0	
MH 85		-2512.654	5699264.647	10year-Chicago-7.5%		0	0	0	0	
MH 86		-2513.702	5699378.089	10year-Chicago-7.5%		0	0	0	0	
MH 87		-2326.815	5699305.489	10year-Chicago-7.5%		0	0	0	0	
MH 88		-2307.524	5699298.437	10year-Chicago-7.5%		0	0	0	0	
MH 89		-2212.978	5699265.746	10year-Chicago-7.5%		0	0	0	0	
MH 90		-2119.478	5699233.012	10year-Chicago-7.5%		0	0	0	0	
MH 91		-2022.492	5699198.375	10year-Chicago-7.5%		0	0	0	0	
MH 92		-1980.737	5699289.004	10year-Chicago-7.5%		0	0	0	0	
MH 93		-2092.438	5699328.232	10year-Chicago-7.5%		0	0	0	0	
MH 94		-2187.524	5699361.825	10year-Chicago-7.5%		0	0	0	0	
MH 95		-2277.441	5699393.488	10year-Chicago-7.5%		0	0	0	0	
MH 96		-2351.326	5699419.294	10year-Chicago-7.5%		0	0	0	0	
MH 97		-2389.308	5699432.342	10year-Chicago-7.5%		0	0	0	0	
MH 98		-2093.036	5699436.369	10year-Chicago-7.5%		0	0	0	0	
MH 99		-2007.954	5699403.184	10year-Chicago-7.5%		0	0	0	0	
MH 100		-1969.772	5699390.305	10year-Chicago-7.5%		0	0	0	0	
MH 101		-2209.099	5699000.489	10year-Chicago-7.5%		0	0	0	0	
MH 102		-2592.554	5699159.717	10year-Chicago-7.5%		0	0	0	0	
MH 103		-2628.049	5699159.298	10year-Chicago-7.5%		0	0	0	0	
MH 104		-2627.849	5699004.468	10year-Chicago-7.5%		0	0	0	0	
MH 105		-2633.669	5699003.74	10year-Chicago-7.5%		0	0	0	0	
MH 106		-2724.103	5699159.638	10year-Chicago-7.5%		0	0	0	0	
MH 107		-2723.669	5699100.222	10year-Chicago-7.5%		0	0	0	0	
MH 108		-2785.917	5699159.122	10year-Chicago-7.5%		0	0	0	0	
MH 109		-2831.642	5699159.48	10year-Chicago-7.5%		0	0	0	0	
MH 110		-2949.522	5699158.921	10year-Chicago-7.5%		0	0	0	0	
MH 111		-3040.391	5699140.628	10year-Chicago-7.5%		0	0	0	0	
MH 112		-3058.86	5699183.412	10year-Chicago-7.5%		0	0	0	0	
MH 113		-3076.469	5699222.838	10year-Chicago-7.5%		0	0	0	0	
MH 114		-3089.594	5699300.143	10year-Chicago-7.5%		0	0	0	0	
MH 115		-3089.057	5699444.126	10year-Chicago-7.5%		0	0	0	0	
MH 116		-2918.326	5699248.499	10year-Chicago-7.5%		0	0	0	0	
MH 117		-2919.285	5699335.572	10year-Chicago-7.5%		0	0	0	0	
MH 118		-3005.65	5699335.546	10year-Chicago-7.5%		0	0	0	0	
MH 119		-3006.071	5699402.782	10year-Chicago-7.5%		0	0	0	0	
MH 120		-2918.68	5699402.771	10year-Chicago-7.5%		0	0	0	0	
MH 121		-2863.906	5699402.951	10year-Chicago-7.5%		0	0	0	0	
MH 122		-2832.273	5699402.737	10year-Chicago-7.5%		0	0	0	0	
MH 123		-2832.085	5699249.292	10year-Chicago-7.5%		0	0	0	0	
MH 124		-2831.977	5699093.094	10year-Chicago-7.5%		0	0	0	0	
MH 125		-2831.713	5698960.496	10year-Chicago-7.5%		0	0	0	0	
MH 126		-2723.956	5699253.14	10year-Chicago-7.5%		0	0	0	0	
MH 127		-2724.12	5699328.592	10year-Chicago-7.5%		0	0	0	0	
MH 128		-2724.082	5699403.733	10year-Chicago-7.5%		0	0	0	0	
MH 129		-2723.995	5699445.688	10year-Chicago-7.5%		0	0	0	0	
MH 130		-2627.717	5699402.923	10year-Chicago-7.5%		0	0	0	0	
MH 131		-2627.83	5699327.137	10year-Chicago-7.5%		0	0	0	0	
MH 132		-2628.267	5699253.839	10year-Chicago-7.5%		0	0	0	0	
MH 133		-2291.837	5699481.247	10year-Chicago-7.5%		0	0	0	0	
MH 134		-2192.47	5699482.037	10year-Chicago-7.5%		0	0	0	0	
MH 135		-2093.17	5699482.973	10year-Chicago-7.5%		0	0	0	0	
MH 136		-1994.635	5699483.61	10year-Chicago-7.5%		0	0	0	0	
MH 137		-1894.806	5699484.491	10year-Chicago-7.5%		0	0	0	0	
MH 138		-1895.452	5699628.556	10year-Chicago-7.5%		0	0	0	0	
MH 139		-1894.852	5699570.901	10year-Chicago-7.5%		0	0	0	0	
MH 140		-1994.124	5699569.756	10year-Chicago-7.5%		0	0	0	0	
MH 141		-1993.596	5699638.666	10year-Chicago-7.5%		0	0	0	0	
MH 142		-2094.236	5699655.686	10year-Chicago-7.5%		0	0	0	0	
MH 143		-2192.731	5699568.432	10year-Chicago-7.5%		0	0	0	0	
MH 144		-2193.304	5699654.594	10year-Chicago-7.5%		0	0	0	0	
MH 145		-2194.049	5699740.893	10year-Chicago-7.5%		0	0	0	0	
MH 146		-2193.903	5699798.505	10year-Chicago-7.5%		0	0	0	0	
MH 147		-2292.047	5699534.393	10year-Chicago-7.5%		0	0	0	0	
MH 148		-2292.348	5699567.595	10year-Chicago-7.5%		0	0	0	0	
MH 149		-2292.983	5699653.625	10year-Chicago-7.5%		0	0	0	0	
MH 150		-2293.223	5699740.275	10year-Chicago-7.5%		0	0	0	0	
MH 151		-2293.34	5699800.078	10year-Chicago-7.5%		0	0	0	0	
MH 152		-2295.997	5699925.135	10year-Chicago-7.5%		0	0	0	0	
MH 153		-2196.543	5699925.985	10year-Chicago-7.5%		0	0	0	0	
MH 154		-2164.247	5699926.356	10year-Chicago-7.5%		0	0	0	0	
MH 155		-2040.067	5699926.445	10year-Chicago-7.5%		0	0	0	0	
MH 156		-2518.774	5699795.733	10year-Chicago-7.5%		0	0	0	0	

XPSWMM LINK INPUT DATA

Name	Upstream (U/S) Node Name	Downstream (D/S) Node Name	U/S-Ground Elevation (Spill Crest) (m)	U/S Node Invert Elevation (m)	D/S-Ground Elevation (Spill Crest) (m)	D/S Node Invert Elevation (m)	Shape	Upstream Invert Elevation (m)	Downstream Invert Elevation (m)	Diameter (Height) (m)	Length (m)	Conduit Slope	Initial Depth (m)	Roughness
EXISTING TOWN														
L 1	MH 1	MH 2	1112.007	1109.162	1110.589	1107.762	Circular	1109.162	1107.932	0.25	71.986	1.709	0	0.013
L 1A	MH 1A	MH 1A-1	1114.237	1110.963	1111.835	1107.372	Circular	1110.963	1107.432	0.25	508.02	0.695	0	0.013
L 1A-1	MH 1A-1	MH 1A-2	1111.835	1107.372	1109.987	1106.877	Circular	1107.372	1106.907	0.25	116.45	0.4	0	0.013
L 1A-2	MH 1A-2	MH 1A-3	1109.987	1106.877	1111.000	1106.397	Circular	1106.877	1106.427	0.25	75	0.6	0	0.013
L 1A-3	MH 1A-3	MH 16	1111.000	1106.397	1110.545	1106.073	Circular	1106.397	1106.073	0.25	120	0.3	0	0.013
L 2	MH 2	MH 3	1110.589	1107.762	1108.952	1105.604	Circular	1107.762	1105.614	0.25	118.093	1.819	0	0.013
L 3	MH 3	MH 4	1108.952	1105.604	1107.000	1104.439	Circular	1105.604	1104.459	0.25	123.759	0.925	0	0.013
L 4	MH 4	MH 5	1107.000	1104.439	1106.288	1103.907	Circular	1104.439	1103.937	0.25	68.783	0.73	0	0.013
L 5	MH 5	MH 6	1106.288	1103.907	1106.134	1103.318	Circular	1103.907	1103.318	0.25	67.48	0.873	0	0.013
L 6	MH 6	MH 7	1106.134	1103.318	1105.999	1101.900	Circular	1103.318	1102.924	0.25	45.412	0.868	0	0.013
South Pump 1	MH 7	MH 7A	1105.999	1101.900	1105.992	1103.026								
South Pump 2	MH 7	MH 7A	1105.999	1101.900	1105.992	1103.026								
South FM	MH 7A	MH 14	1105.992	1103.026	1111.640	1106.476	Circular	1103.026	1106.646	0.1	448.07	-0.808	0	0.011
L 7	MH 8	MH 7	1106.009	1103.355	1105.999	1101.900	Circular	1103.385	1102.931	0.25	105.169	0.432	0	0.013
L 8	MH 9	MH 8	1107.107	1103.732	1106.009	1103.355	Circular	1103.762	1103.399	0.25	99.015	0.367	0	0.013
L 9	MH 10	MH 9	1108.059	1105.141	1107.107	1103.732	Circular	1105.171	1103.848	0.25	68.789	1.923	0	0.013
L 10	MH 11	MH 10	1109.875	1106.816	1108.059	1105.141	Circular	1106.846	1105.191	0.25	84.901	1.949	0	0.013
L 11	MH 12	MH 2	1111.352	1108.356	1110.589	1107.762	Circular	1108.386	1107.772	0.25	139.786	0.439	0	0.013
L 12	MH 13	MH 12	1112.000	1108.952	1111.352	1108.356	Circular	1108.952	1108.416	0.25	101.863	0.526	0	0.013
L 13	MH 13	MH 14	1112.000	1108.952	1111.640	1106.476	Circular	1108.982	1106.506	0.25	137.935	1.795	0	0.013
L 14	MH 14	MH 11	1111.640	1106.476	1109.875	1106.816	Circular	1108.656	1106.846	0.25	90.203	2.007	0	0.013
L 15	MH 14	MH 15	1111.640	1106.476	1110.942	1106.180	Circular	1106.496	1106.240	0.25	81.584	0.314	0	0.013
L 16	MH 15	MH 16	1110.942	1106.180	1110.545	1106.073	Circular	1106.210	1106.073	0.25	51.983	0.264	0	0.013
L 17	MH 16	MH 17	1110.545	1106.073	1110.177	1105.910	Circular	1106.073	1105.970	0.25	24.266	0.424	0	0.013
L 18	MH 17	MH 18	1110.177	1105.910	1108.765	1105.279	Circular	1105.940	1105.339	0.25	124.336	0.483	0	0.013
L 19	MH 18	MH 19	1108.765	1105.279	1106.983	1103.643	Circular	1105.309	1103.693	0.25	120.425	1.342	0	0.013
L 20	MH 19	MH 20	1106.983	1103.643	1106.529	1103.394	Circular	1103.673	1103.394	0.25	56.264	0.496	0	0.013
L 21	MH 20	MH 21	1106.529	1103.394	1106.000	1103.162	Circular	1103.394	1103.222	0.25	63.94	0.269	0	0.013
L 22	MH 21	MH 22	1106.000	1103.162	1105.950	1102.793	Circular	1103.192	1102.793	0.25	86.262	0.463	0	0.013
L 23	MH 22	MH 23	1105.950	1102.793	1105.730	1102.388	Circular	1102.793	1102.448	0.25	153.631	0.225	0	0.013
L 24	MH 23	MH 25	1105.730	1102.388	1105.999	1101.955	Circular	1102.418	1102.030	0.25	118.67	0.327	0	0.013
L 25	MH 24	MH 25	1106.000	1102.621	1105.999	1101.955	Circular	1102.621	1102.055	0.25	126.398	0.448	0	0.013
L 26	MH 25	MH 26	1105.999	1101.955	1105.675	1101.580	Circular	1101.985	1101.650	0.25	107.307	0.312	0	0.013
L 27	MH 26	MH 27	1105.675	1101.580	1105.904	1101.544	Circular	1101.610	1101.594	0.25	42.567	0.038	0	0.013
L 28	MH 27	MH 28	1105.904	1101.544	1105.519	1100.795	Circular	1101.574	1100.815	0.25	71.466	0.861	0	0.013
L 29	MH 28	MH 29	1105.519	1100.795	1104.940	1100.505	Circular	1100.795	1100.595	0.3	123.337	0.295	0	0.013
L 30	MH 29	MH 30	1104.940	1100.505	1105.000	1100.394	Circular	1100.535	1100.394	0.3	58.154	0.242	0	0.013
L 31	MH 30	MH 31	1105.000	1100.394	1104.787	1100.015	Circular	1100.394	1100.065	0.3	113.591	0.29	0	0.013
L 32	MH 31	MH 32	1104.787	1100.015	1104.892	1099.758	Circular	1100.045	1099.798	0.3	120.573	0.205	0	0.013
LK-ID-01	N-ID-01	MH 32	1105.022	1101.859	1104.892	1099.758	Circular	1101.859	1099.908	0.2	487.92	0.4	0	0.013
L 33	MH 32	MH 33	1104.892	1099.758	1104.580	1099.105	Circular	1099.788	1099.617	0.3	35.995	0.475	0	0.013
L 34	MH 33	MH 34	1104.580	1099.105	1105.000	1098.891	Circular	1099.105	1098.891	0.6	177.891	0.12	0	0.013
L 35	MH 34	MH 35	1105.000	1098.891	1105.000	1098.698	Circular	1098.891	1098.698	0.6	159.987	0.121	0	0.013
L 36	MH 35	MH 36	1105.000	1098.698	1105.000	1098.467	Circular	1098.698	1098.483	0.6	179.008	0.12	0	0.013
L 37	MH 36	MH 37	1105.000	1098.467	1102.558	1098.267	Circular	1098.483	1098.267	0.6	179.515	0.12	0	0.013
L 38	MH 37	MH 38	1102.558	1098.267	1101.988	1098.179	Circular	1098.267	1098.227	0.6	33.564	0.119	0	0.013
L 39	MH 38	MH 39	1101.988	1098.179	1101.549	1098.113	Circular	1098.227	1098.213	0.6	12.204	0.115	0	0.013
L 40	MH 39	MH 40	1101.549	1098.113	1099.370	1096.578	Circular	1098.213	1096.678	0.6	59.369	2.586	0	0.013
L 40A	MH 40	MH 40A	1099.370	1096.578	1099.566	1096.455	Circular	1096.578	1096.455	0.6	17.22	0.714	0	0.013
L 40B	MH 40A	MH 40B	1099.566	1096.455	1100.000	1096.439	Circular	1096.455	1096.439	0.6	7.8	0.205	0	0.013
L 41	MH 41	MH 31	1105.006	1100.688	1104.787	1100.015	Circular	1100.688	1100.185	0.15	71.39	0.705	0	0.013
L 42	MH 42	MH 41	1105.849	1101.120	1105.006	1100.688	Circular	1101.120	1100.688	0.25	70.492	0.641	0	0.013
L 43	MH 43	MH 42	1106.000	1101.796	1105.849	1101.120	Circular	1101.796	1101.180	0.25	83.032	0.742	0	0.013
L 44	MH 43	MH 44	1106.000	1101.796	1105.005	1101.319	Circular	1101.796	1101.409	0.25	105.017	0.369	0	0.013
L 45	MH 44	MH 29	1105.005	1101.319	1104.940	1100.505	Circular	1101.349	1100.635	0.25	114.821	0.622	0	0.013
L 46	MH 45	MH 51	1105.207	1100.635	1105.318	1101.560	Circular	1102.342	1102.047	0.25	46.109	0.64	0	0.013
L 47	MH 46	MH 45	1104.698	1102.047	1105.207	1100.635	Circular	1102.470	1102.372	0.25	71.349	0.137	0	0.013
L 48	MH 47	MH 46	1104.651	1102.208	1104.698	1102.047	Circular	1102.541	1102.500	0.25	21.986	0.186	0	0.013
L 49	MH 48	MH 49	1106.000	1104.062	1106.000	1102.714	Circular	1104.062	1102.804	0.2	41.987	2.996	0	0.013
L 50	MH 49	MH 231	1106.000	1102.714	1105.000	1101.786	Circular	1102.744	1101.876	0.2	99.005	0.877	0	0.013
L 51	MH 50	MH 49	1106.000	1103.074	1106.000	1102.714	Circular	1103.074	1102.804	0.2	47.218	0.572	0	0.013
L 52	MH 51	MH 28	1105.318	1101.560	1105.519	1100.795	Circular	1101.560	1100.940	0.525	94.16	0.658	0	0.011
L51A	MH 51	MH 242	1105.318	1101.560	1103.967	1100.278	Circular	1101.560	1100.368	0.6	456.19	0.261	0	0.011
L 53	MH 52	MH 51	1105.268	1101.767	1105.318	1101.560	Circular	1101.767	1101.610	0.525	25.89	0.61	0	0.011
L 54	MH 53	MH 52	1106.000	1102.501	1105.268	1101.767	Circular	1102.501	1101.767	0.525	113.79	0.65	0	0.011
L 55	MH 54	MH 53	1106.390	1102.812	1106.000	1102.501	Circular	1102.812	1102.501	0.525	51.74	0.6	0	0.011
L 56	MH 55	MH 79	1107.687	1103.733	1108.000	1104.662	Circular	1104.788	1104.692	0.3	104.478	0.192	0	0.013
L 56A	MH 56A	MH 56	1106.998	1104.518	1108.468	1103.961	Circular	1104.518	1104.061	0.6	97.37	0.47	0	0.013
L 57	MH 55	MH 54	1107.687	1103.733	1106.390	1102.812	Circular	1103.733	1102.862	0.525	100.18	0.869	0	0.011
L 58	MH 56	MH 55	1108.468	1103.961	1107.687	1103.733	Circular	1103.961	1103.783	0.525	98.92	0.295	0	0.011
L 59	MH 57	MH 56	1108.315	1104.316	1108.468	1103.961	Circular	1104.316	1104.111	0.375	99.781	0.341	0	0.011
L 60	MH 58	MH 57	1108.000	1104.735	1108.315	1104.316	Circular	1104.735	1104.351	0.375	99.657	0.183	0	0.011
L 61	MH 59	MH 58	1108.717	1105.023	1108.000	1104.735	Circular	1105.023	1104.785	0.375	99.328	0.278	0	0.011
L 62	MH 60	MH 59	1109.943	1105.633	1108.717	1105.023	Circular	1105.633	1105.073	0.375	139.18	0.616	0	0.011
L 63	MH 61	MH 60	1109.999	1105.868	1109.943	1105.633	Circular	1105.868	1105.659	0.375	91.924	0.499	0	0.011
L 64	MH 62	MH 61	1109.642	1106.072	1109.999	1105.868	Circular	1106.072	1105.907	0.375	60.9	0.521	0	0.011
L 65	MH 63	MH 64	1107.701	1104.598	1107.705	1104.123	Circular	1104.678	1104.443	0.2	42.705	0.55	0	0.013
L 66	MH 63	MH 54	1107.701	1104.598	1106.390	1102.812	Circular	1104.628	1103.479	0.2	131.421	1.06	0	0.013
L 67	MH 64	MH 239	1107.705	1104.123	1106.984	1104.015	Circular	1104.153	1104.105	0.3	52.388	0.092	0	0.013
L 68	MH 65	MH 64	1107.999	1104.161	1107.705	1104.123	Circular	1104.231	1104.173	0.2	35.931	0.161	0	0.013
L 69	MH 66	MH 65	1108.997	1104.598	1107.999	1104.161	Circular	1104.598	1104.261	0.2	66.158	0.509	0	0.013
L 70	MH 67	MH 66	1108.972	1105.003	1108.997	1104.598	Circular	1105.003	1104.604	0.2	66.296	0.602	0	0.013
L 71	MH 68	MH 69	1108.992	1106.394	1109.004	1105.900	Circular	1106.394	1105.919	0.2	88.305	0.538	0	0.013
L 72	MH 69	MH 72	1109.004	1105.900	1108.953	1105.497	Circular	1105.900	1105.497	0.2	67.004	0.601	0	0.013
L 73	MH 70	MH 245	1106.179	1104.242	1105.033	1103.897	Circular	1104.242	1103.957	0.25	67.917	0.464	0	0.013
L 74	MH 71	MH 70	1107.899	1104.574	1106.179	1104.242	Circular	1104.574	1104.265	0.25	52.939	0.584	0	0.013
L 75	MH 72	MH 71	1108.953	1105.497	1107.899	1104.574	Circular	1105.497	1104.618	0.25	76.236	1.362	0	0.013
L 76	MH 73	MH 72	1110.000	1106.386	1108.953	1105.497	Circular	1106.386	1105.666	0.25	97.273	0.74	0	0.013
L 77	MH 74	MH 73	1110.000	1107.012	1110.000	1106.386	Circular	1107.012	1106.556	0.2	95.88	0.476	0	0.013
L 78	MH 75	MH 74	1110.000	1106.676	1110.000	1107.012	Circular	1107.066	1107.041	0.2	85.136	0.029	0	0.013
L 79	MH 75	MH 76	1110.000	1106.676	1110.000	1106.556	Circular	1106.676	1106.571	0.2	60.264	0.174	0	0.013
L 80	MH 76	MH 77	1110.000	1106.556	1109.000	1104.784	Circular	1106.556	1104.814	0.2	98.149	1.775	0	0.013
L 81	MH 77	MH 78	1109.000	1104.784	1108.917	1104.425	Circular	1104.805	1104.486	0.2	34.935	0.913	0	0.013
L 82	MH 78	MH 64	1108.917	1104.425	1107.705	1104.123	Circular	1104.455	1104.173	0.3	100.271	0.281	0	0.013
L 83	MH 79	MH 78	1108.000	1104.662	1108.917	1104.425	Circular	1104.662	1104.481	0.3	71.33	0.254	0	0.013
L 84	MH 80	MH 56	1109.000	1106.617	1108.468	1103.961	Circular	1106.617	1105.280	0.2	115.23	1.16	0	0.013
L 85	MH 81	MH 80	1109.996	1107.088	1109.000	1106.617	Circular	1107.088	1106.627	0.2	114.345	0.403	0	0.013
L 86	MH 82	MH 81	1110.322	1107.949	1109.996	1107.088	Circular	1107.949	1107.175	0.2	92.385	0.838	0	0.013
L 87	MH 83	MH 84	1110.977	1108.471	1111.000	1107.964	Circular	1108.471	1107.996	0.2	112.251	0.423	0	0.013
L 88	MH 84	MH 85	1111.000	1107.964	1111.000	1107.309	Circular	1107.964	1107.396	0.2	109.42	0.519	0	0.013
L 89	MH 85	MH 73	1111.000	1107.309	1110.000	1106.386	Circular	1107.309	1106.396	0.25	105.164	0.868	0	0.013
L 90	MH 86	MH 85	1111.000	1107.900	1111.000	1107.309	Circular	1107.900	1107.326	0.25	113.448	0.506	0	0.013
L 91	MH 87	MH 88	1112.000	1109.413	1112.000	1109.267	Circular	1109.413	1109.327	0.2	20.54	0.419	0	0.013
L 92	MH 88	MH 89	1112.000	1109.267	1111.000	1109.094	Circular	1109.267	1109.094	0.2	100.18	0.173	0	0.013
L 93	MH 89	MH 90	1111.000	1109.094	1111.000	1108.700	Circular	1109.094	1108.700	0.2	99.069	0.398	0	0.013
L 94	MH 90	MH 91	1111.000	1108.700	1109.080	1106.736	Circular	1108.700	1106.746	0.2	102.894	1.899	0	0.013
L 95	MH 91	MH 57	1109.080	1106.736	1108.315	1104.316	Circular	1106.736	1105.475	0.2	100.536	1.115	0	0.013
L 96	MH 92	MH 58	1109.098	1106.115	1108.000	1104.735	Circular	1106.115	1105.708	0.2	91.218	0.31	0	0.013
L 97	MH 93	MH 92	1111.783	1108.235	1109.098	1106.115	Circular	1108.235	1106.355	0.2	118.404	1.588	0	0.013
L 98	MH 94	MH 93	1112.000	1109.009	1111.783	1108.235	Circular	1109.009	1108.240	0.2	100.849	0.763	0	0.013
L 99	MH 95	MH 94	1112.000	1109.828	1112.000	1109.009	Circular	1109.828	1109.025	0.2	95.332	0.842	0	0.013
L 100	MH 96	MH 95	1112.988	1110.123	1112.000	1109.828	Circular	1110.123	1109.828	0.2	78.263	0.377	0	0.013
L 101	MH 97	MH 96	1112.998	1110.409	1112.988	1110.123	Circular	1110.409	1110.123	0.2	40.162	0.712	0	0.013
L 102	MH 98	MH 93	1112.813	1110.145	1111.783	1108.235	Circular	1110.145	1108.345	0.2	108.154	1.664	0	0.013
L 103	MH 98	MH 135	1112.813	1110.145	1113.000	1108.793	Circular	1110.145	1110.112	0.2	46.604	0.071	0	0.013
L 104	MH 99	MH 100	1110.998	1108.267	1109.974	1107.685	Circular	1108.297	1107.715	0.2	40.3	1.444	0	0.013
L 105	MH 100	MH 59	1109.974	1107.685	1108.717	1105.023	Circular	1107.715	1106.118	0.2	114.532	1.394	0	0.013
L 106	MH 101	MH 65	1108.182	1104.247	1107.999	1104.161	Circular	1104.277	1104.191	0.3	50.154	0.171	0	0.013
L 107	MH 102	MH 103	1110.000	1106.668	1109.704	1105.203	Circular	1106.668	1106.343	0.2	35.499	0.916	0	0.013
L 108	MH 103	MH 104	1109.704	1105.203	1107.992	1104.616	Circular	1105.233	1104.686	0.25	154.831	0.353	0	0.013
L 109	MH 104	MH 246	1107.992	1104.616	1106.241	1104.511	Circular	1104.616	1104.536	0.25	70.346	0.114	0	0.013
L 110	MH 105	MH 104	1107.994	1104.800	1107.992	1104.616	Circular	1104.830	1104.691	0.2	5.867	2.369	0	0.013
L 111	MH 106	MH 103	1109.000	1105.613	1109.704	1105.203	Circular	1105.613	1105.278	0.25	96.055	0.349	0	0.013
L 112	MH 107	MH 106	1109.000	1105.998	1109.000	1105.613	Circular	1106.028	1105.640	0.2	59.419	0.653	0	0.013
L 113	MH 108	MH 106	1109.000	1105.814	1109.000	1105.613	Circular	1105.814	1105.630	0.25	61.816	0.298	0	0.013
L 114	MH 109	MH 108	1109.000	1105.935	1109.000	1105.814	Circular	1105.935	1105.845	0.25	45.726	0.197	0	0.013
L 115	MH 110	MH 109	1109.990	1104.691	1109.000	1105.935	Circular	1106.293	1105.999	0.25	117.882	0.249	0	0.013
L 116	MH 111	MH 110	1110.000	1105.278	1109.990	1104.691	Circular	1107.807	1106.315	0.2	92.704	1.609	0	0.013
L 117	MH 112	MH 113	1111.000	1107.798	1111.000	1107.441	Circular	1107.798	1107.506	0.2	43.181	0.676	0	0.013
L 118	MH 113	MH 116	1111.000	1107.441	1111.000	1106.567	Circular	1107.441	1106.652	0.25	160.214	0.492	0	0.013
L 119	MH 114	MH 113	1111.550	1107.978	1111.000	1107.441	Circular	1107.978	1107.496	0.2	78.413	0.615	0	0.013
L 120	MH 115	MH 114	1113.012	1108.695	1111.550	1107.978	Circular	1108.695	1108.008	0.2	143.986	0.477	0	0.013
L 121	MH 116	MH 123	1111.000	1106.567	1111.000	1106.243	Circular	1106.567	1106.268	0.25	86.245	0.347	0	0.013
L 122	MH 117	MH 116	1112.001	1108.093	1111.000	1106.567	Circular	1108.093	1107.092	0.2	87.084	1.149	0	0.013
L 123	MH 118	MH 117	1113.639	1109.527	1112.001	1108.093	Circular	1109.527	1109.113	0.2	86.366	0.479	0	0.013
L 124	MH 119	MH 118	1113.990	1109.813	1113.639	1109.527	Circular	1109.813	1109.587	0.2	67.238	0.336	0	0.013
L 125	MH 119	MH 120	1113.990	1109.813	1113.000	1109.214	Circular	1109.813	1109.279	0.2	87.392	0.611	0	0.013
L 126	MH 120	MH 117	1113.000	1109.214	1112.001	1108.093	Circular	1109.214	1108.153	0.2	67.21	1.579	0	0.013
L 127	MH 121	MH 120	1113.563	1110.048	1113.000	1109.214	Circular	1110.058	1109.274	0.2	54.78	1.431	0	0.013
L 128	MH 121	MH 122	1113.563	1110.048	1113.717	1109.427	Circular	1110.048	1109.527	0.2	31.638	1.647	0	0.013
L 129	MH 122	MH 123	1113.717	1109.427	1111.000	1106.243	Circular	1109.427	1106.258	0.2	153.482	2.191	0	0.013
L 130	MH 123	MH 109	1111.000	1106.243	1109.000	1105.935	Circular	1106.243	1105.994	0.25	89.813	0.277	0	0.013
L 131	MH 124	MH 109	1109.000	1106.297	1109.000	1105.935	Circular	1106.327	1106.004	0.2	66.388	0.487	0	0.013
L 132	MH 125	MH 124	1110.000	1106.896	1109.000	1106.297	Circular	1106.926	1106.357	0.2	132.599	0.429	0	0.013
L 133	MH 126	MH 106	1109.978	1106.144	1109.000	1105.613	Circular	1106.174	1105.625	0.2	93.504	0.587	0	0.013
L 134	MH 127	MH 126	1110.000	1106.822	1109.978	1106.144	Circular	1106.852	1106.284	0.2	75.454	0.753	0	0.013
L 135	MH 128	MH 127	1110.910	1107.265	1110.000	1106.822	Circular	1107.295	1106.883	0.2	75.142	0.548	0	0.013
L 136	MH 129	MH 128	1111.510	1108.438	1110.910	1107.265	Circular	1108.438	1107.385	0.2	41.968	2.509	0	0.013
L 137	MH 130	MH 128	1111.000	1108.184	1110.910	1107.265	Circular	1108.184	1107.385	0.2	96.372	0.829	0	0.013
L 138	MH 130	MH 131	1111.000	1108.184	1111.000	1107.463	Circular	1108.184	1107.493	0.2	75.789	0.912	0	0.013
L 139	MH 131	MH 132	1111.000	1107.463	1110.203	1106.981	Circular	1107.463	1107.071	0.2	73.3	0.535	0	0.013
L 140	MH 132	MH 126	1110.203	1106.981	1109.978	1106.144	Circular	1106.981	1106.279	0.2	95.694	0.734	0	0.013
L 141	MH 133	MH 134	1112.000	1109.818	1112.315	1109.478	Circular	1109.818	1109.508	0.2	99.371	0.312	0	0.013
L 142	MH 134	MH 135	1112.315	1109.478	1113.000	1108.793	Circular	1109.478	1108.853	0.2	99.307	0.629	0	0.013
L 143	MH 135	MH 136	1113.000	1108.793	1111.191	1108.295	Circular	1108.793	1108.295	0.2	98.538	0.505	0	0.013
L 144	MH 136	MH 137	1111.191	1108.295	1110.479	1107.750	Circular	1108.322	1107.750	0.2	99.835	0.573	0	0.013
L 145	MH 137	MH 60	1110.479	1107.750	1109.943	1105.633	Circular	1107.750	1106.850	0.2	77.901	0.942	0	0.013
L 146	MH 138	MH 139	1110.958	1108.932	1111.000	1108.145	Circular	1108.932	1108.145	0.2	57.663	1.365	0	0.013
L 147	MH 139	MH 137	1111.000	1108.145	1110.479	1107.750	Circular	1108.145	1107.810	0.2	86.411	0.388	0	0.013
L 148	MH 140	MH 136	1112.505	1109.611	1111.191	1108.295	Circular	1109.611	1108.395	0.2	86.156	1.411	0	0.013
L 149	MH 141	MH 140	1113.424	1110.529	1112.505	1109.611	Circular	1110.529	1109.611	0.2	68.918	1.332	0	0.013
L 150	MH 142	MH 135	1115.850	1113.059	1113.000	1108.793	Circular	1113.059	1110.212	0.2	172.74	1.648	0	0.013
L 151	MH 143	MH 134	1113.470	1110.499	1112.315	1109.478	Circular	1110.499	1109.528	0.2	86.401	1.124	0	0.013
L 152	MH 144	MH 143	1114.576	1111.357	1113.470	1110.499	Circular	1111.357	1110.499	0.2	86.168	0.996	0	0.013
L 153	MH 145	MH 144	1115.821	1112.986	1114.576	1111.357	Circular	1112.986	1111.387	0.2	86.317	1.852	0	0.013
L 154	MH 146	MH 145	1116.992	1114.053	1115.821	1112.986	Circular	1114.053	1112.986	0.2	57.622	1.852	0	0.013
L 155	MH 147	MH 133	1112.997	1110.081	1112.000	1109.818	Circular	1110.081	1109.868	0.2	53.147	0.401	0	0.013
L 156	MH 148	MH 147	1113.000	1110.228	1112.997	1110.081	Circular	1110.228	1110.111	0.2	33.204	0.352	0	0.013
L 157	MH 149	MH 148	1113.992	1111.134	1113.000	1110.228	Circular	1111.134	1110.258	0.2	86.037	1.018	0	0.013
L 158	MH 150	MH 149	1115.757	1112.790	1113.992	1111.134	Circular	1112.790	1111.164	0.2	86.666	1.876	0	0.013
L 159	MH 151	MH 150	1116.999	1114.236	1115.757	1112.790	Circular	1114.236	1112.820	0.2	59.82	2.367	0	0.013
L 160	MH 152	MH 153	1118.000	1114.852	1116.998	1114.505	Circular	1114.852	1114.530	0.2	99.671	0.323	0	0.013
L 161	MH 152	MH 165	1118.000	1114.852	1117.574	1114.406	Circular	1114.852	1114.406	0.2	98.838	0.451	0	0.013
L 162	MH 153	MH 164	1116.998	1114.505	1117.454	1114.145	Circular	1114.505	1114.147	0.2	97.796	0.366	0	0.013
L 163	MH 154	MH 153	1116.947	1114.694	1116.998	1114.505	Circular	1114.694	1114.565	0.2	32.302	0.399	0	0.013
L 164	MH 154	MH 155	1116.947	1114.694	1114.000	1111.143	Circular	1114.694	1111.203	0.2	123.996	2.815	0	0.013
L 165	MH 155	MH 162	1114.000	1111.143	1112.548	1109.766	Circular	1111.143	1109.796	0.2	78.651	1.713	0	0.013
L 166	MH 156	MH 185	1119.506	1115.772	1117.986	1111.326	Circular	1115.772	1111.356	0.2	60.243	7.33	0	0.013
L 167	MH 157	MH 159	1117.232	1113.765	1115.095	1111.479	Circular	1113.765	1111.509	0.2	70.884	3.183	0	0.013
L 168	MH 158	MH 157	1117.648	1113.993	1117.232	1113.765	Circular	1113.993	1113.810	0.2	24.942	0.734	0	0.013
L 169	MH 159	MH 160	1115.095	1111.479	1115.011	1110.791	Circular	1111.520	1110.821	0.2	76.457	0.914	0	0.013
L 170	MH 160	MH 227	1115.011	1110.791	1113.475	1110.412	Circular	1110.791	1110.477	0.2	45.428	0.691	0	0.013
L 171	MH 161	MH 167	1109.592	1107.123	1110.738	1106.586	Circular	1107.139	1106.616	0.2	117.84	0.444	0	0.013
L 172	MH 162	MH 161	1112.548	1109.766	1109.592	1107.123	Circular	1109.778	1107.153	0.2	95.411	2.751	0	0.013
L 173	MH 163	MH 162	1115.590	1112.788	1112.548	1109.766	Circular	1112.818	1109.781	0.2	90.906	3.341	0	0.013
L 174	MH 164	MH 146	1117.454	1114.145	1116.992	1114.053	Circular	1114.145	1114.078	0.2	29.319	0.229	0	0.013
L 175	MH 164	MH 163	1117.454	1114.145	1115.590	1112.788	Circular	1114.147	1112.815	0.2	104.205	1.278	0	0.013
L 176	MH 165	MH 151	1117.574	1114.406	1116.999	1114.236	Circular	1114.406	1114.266	0.2	26.316	0.532	0	0.013
L 177	MH 165	MH 164	1117.574	1114.406	1117.454	1114.145	Circular	1114.496	1114.197	0.2	99.748	0.3	0	0.013
L 178	MH 166	MH 186	1117.988	1114.541	1118.957	1113.488	Circular	1114.541	1113.488	0.2	73.551	1.432	0	0.013
L 179	MH 167	MH 168	1110.738	1106.586	1111.486	1105.863	Circular	1106.586	1105.953	0.2	120.085	0.527	0	0.013
L 180	MH 168	MH 177	1111.486	1105.863	1111.116	1105.414	Circular	1105.893	1105.504	0.2	99.185	0.392	0	0.013
L 181	MH 169	MH 168	1112.973	1109.539	1111.486	1105.863	Circular	1109.539	1107.738	0.2	86.443	2.083	0	0.013
L 182	MH 170	MH 169	1114.383	1111.232	1112.973	1109.539	Circular	1111.232	1109.569	0.2	88.023	1.889	0	0.013
L 183	MH 171	MH 172	1114.697	1112.554	1115.000	1112.261	Circular	1112.554	1112.291	0.2	63.704	0.413	0	0.013
L 184	MH 172	MH 173	1115.000	1112.261	1115.343	1111.972	Circular	1112.261	1112.053	0.2	35.138	0.592	0	0.013
L 185	MH 173	MH 170	1115.343	1111.972	1114.383	1111.232	Circular	1111.972	1111.277	0.2	100.044	0.695	0	0.013
L 186	MH 174	MH 173	1116.238	1112.960	1115.343	1111.972	Circular	1112.960	1112.023	0.2	57.65	1.625	0	0.013
L 187	MH 175	MH 170	1115.675	1112.631	1114.383	1111.232	Circular	1112.631	1111.292	0.2	57.961	2.31	0	0.013
L 188	MH 176	MH 169	1113.661	1110.634	1112.973	1109.539	Circular	1110.634	1109.539	0.2	63.25	1.731	0	0.013
L 189	MH 177	MH 216	1111.116	1105.414	1108.840	1103.970	Circular	1105.444	1104.058	0.2	107.667	1.287	0	0.013
L 190	MH 178	MH 86	1111.986	1109.021	1111.000	1107.900	Circular	1109.021	1107.920	0.25	112.356	0.98	0	0.013
L 191	MH 179	MH 178	1112.428	1109.413	1111.986	1109.021	Circular	1109.413	1109.051	0.25	61.4	0.59	0	0.013
L 192	MH 180	MH 179	1112.977	1109.819	1112.428	1109.413	Circular	1109.819	1109.504	0.2	35.052	0.899	0	0.013
L 193	MH 181	MH 179	1114.296	1109.721	1112.428	1109.413	Circular	1109.721	1109.644	0.25	98.062	0.079	0	0.013
L 194	MH 182	MH 183	1114.517	1111.447	1115.807	1110.851	Circular	1111.447	1110.966	0.2	47.696	1.008	0	0.013
L 195	MH 183	MH 181	1115.807	1110.851	1114.296	1109.721	Circular	1110.851	1109.751	0.25	41.714	2.637	0	0.013

Name	Upstream (U/S) Node Name	Downstream (D/S) Node Name	U/S-Ground Elevation (Spill Crest) (m)	U/S Node Invert Elevation (m)	D/S-Ground Elevation (Spill Crest) (m)	D/S Node Invert Elevation (m)	Shape	Upstream Invert Elevation (m)	Downstream Invert Elevation (m)	Diameter (Height) (m)	Length (m)	Conduit Slope	Initial Depth (m)	Roughness
L 196	MH 184	MH 183	1115.435	1112.234	1115.807	1110.851	Circular	1112.234	1110.986	0.2	58.115	2.147	0	0.013
L 197	MH 185	MH 183	1117.986	1111.326	1115.807	1110.851	Circular	1111.326	1110.851	0.25	89.451	0.531	0	0.013
L 198	MH 186	MH 185	1118.957	1113.488	1117.986	1111.326	Circular	1113.488	1111.326	0.25	93.002	2.325	0	0.013
L 199	MH 187	MH 186	1120.000	1116.997	1118.957	1113.488	Circular	1116.997	1115.568	0.2	102.658	1.392	0	0.013
L 200	MH 188	MH 186	1119.000	1113.826	1118.957	1113.488	Circular	1113.826	1113.548	0.2	79.863	0.348	0	0.013
L 201	MH 189	MH 188	1118.424	1114.018	1119.000	1113.826	Circular	1114.018	1113.856	0.2	55.962	0.289	0	0.013
L 202	MH 190	MH 189	1119.991	1116.960	1118.424	1114.018	Circular	1116.990	1114.083	0.2	119.734	2.428	0	0.013
L 203	MH 191	MH 189	1117.555	1114.574	1118.424	1114.018	Circular	1114.574	1114.078	0.2	101.016	0.491	0	0.013
L 204	MH 191	MH 193	1117.555	1114.574	1117.000	1112.980	Circular	1114.670	1113.050	0.2	86.063	1.882	0	0.013
L 205	MH 192	MH 191	1119.735	1116.720	1117.555	1114.574	Circular	1116.720	1114.604	0.2	120.131	1.761	0	0.013
L 206	MH 193	MH 171	1117.000	1112.980	1114.697	1112.554	Circular	1112.980	1112.586	0.2	96.857	0.407	0	0.013
L 207	MH 194	MH 193	1117.000	1113.392	1117.000	1112.980	Circular	1113.392	1113.045	0.2	63.139	0.55	0	0.013
L 208	MH 195	MH 194	1117.976	1114.754	1117.000	1113.392	Circular	1114.754	1113.422	0.2	62.419	2.134	0	0.013
L 209	MH 196	MH 195	1118.910	1115.454	1117.976	1114.754	Circular	1115.454	1114.819	0.2	39.791	1.596	0	0.013
L 210	MH 197	MH 195	1118.414	1115.329	1117.976	1114.754	Circular	1115.329	1114.814	0.2	59.779	0.862	0	0.013
L 211	MH 198	MH 193	1116.999	1113.500	1117.000	1112.980	Circular	1113.500	1113.045	0.2	104.336	0.436	0	0.013
L 212	MH 199	MH 198	1116.947	1113.760	1116.999	1113.500	Circular	1113.760	1113.508	0.2	46.213	0.61	0	0.013
L 213	MH 200	MH 199	1118.000	1114.535	1116.947	1113.760	Circular	1114.535	1113.773	0.2	119.154	0.64	0	0.013
L 214	MH 201	MH 199	1116.874	1113.920	1116.947	1113.760	Circular	1113.920	1113.773	0.2	31.978	0.46	0	0.013
L 215	MH 202	MH 203	1111.990	1108.395	1115.143	1107.773	Circular	1108.425	1107.803	0.2	126.545	0.492	0	0.013
LK-IL-582	MH 202	N-IL-506	1111.990	1108.395	1111.000	1107.750	Circular	1108.395	1107.840	0.2	121.74	0.456	0	0.011
L 216	MH 203	MH 205	1115.143	1107.773	1111.998	1107.369	Circular	1107.840	1107.399	0.2	94.399	0.467	0	0.013
L 217	MH 204	MH 203	1116.000	1112.578	1115.143	1107.773	Circular	1112.608	1111.098	0.2	119.737	1.261	0	0.013
L 218	MH 205	MH 208	1111.998	1107.369	1110.000	1106.524	Circular	1107.369	1106.554	0.2	119.44	0.682	0	0.013
L 219	MH 206	MH 205	1112.000	1107.860	1111.998	1107.369	Circular	1107.890	1107.389	0.2	76.732	0.653	0	0.013
L 220	MH 207	MH 206	1112.544	1108.309	1112.000	1107.860	Circular	1108.339	1107.897	0.2	77.326	0.572	0	0.013
L 221	MH 208	MH 209	1110.000	1106.524	1109.160	1103.133	Circular	1106.570	1103.163	0.2	120.291	2.832	0	0.013
L 222	MH 209	MH 210	1109.160	1103.133	1104.936	1099.233	Circular	1103.180	1099.348	0.2	101.048	3.792	0	0.013
L 223	MH 210	MH 211	1104.936	1099.233	1104.004	1097.979	Circular	1099.263	1097.979	0.25	101.626	1.263	0	0.013
L 224	MH 211	MH 212	1104.004	1097.979	1102.504	1095.600	Circular	1097.979	1095.611	0.25	90.813	2.697	0	0.013
L 225	MH 212	MH 213	1102.504	1095.600	1102.028	1092.870	Circular	1095.600	1095.520	0.525	20.613	0.388	0	0.013
Iron Landing Pump 1	MH 213	MH 213A	1102.028	1092.870	1098.638	1097.320								
Iron Landing Pump 2	MH 213	MH 213A	1102.028	1092.870	1098.638	1097.320								
Iron Landing FM	MH 213A	MH 62	1098.638	1097.320	1109.642	1106.072	Circular	1097.320	1107.715	0.2	1270.78	-0.823	0	0.011
IL_New_FM	MH 213A	N-HWL-303	1098.638	1097.320	1113.456	1110.416	Circular	1097.320	1110.516	0.2	1485.89	-0.888	0	0.013
L 226	MH 214	MH 210	1105.351	1100.460	1104.936	1099.233	Circular	1100.490	1099.343	0.2	101.471	1.13	0	0.013
L 227	MH 215	MH 214	1108.006	1103.451	1105.351	1100.460	Circular	1103.540	1100.520	0.2	121.588	2.484	0	0.013
L 228	MH 216	MH 215	1108.840	1103.970	1108.006	1103.451	Circular	1104.000	1103.481	0.2	18.594	2.791	0	0.013
L 229	MH 217	MH 115	1114.578	1109.240	1113.012	1108.695	Circular	1109.240	1108.725	0.2	80.083	0.681	0	0.013
L 230	MH 218	MH 217	1114.629	1109.360	1114.578	1109.240	Circular	1109.360	1109.270	0.2	20.488	0.439	0	0.013
L 231	MH 219	MH 218	1114.624	1109.828	1114.629	1109.360	Circular	1109.828	1109.392	0.2	97.649	0.447	0	0.013
L 232	MH 220	MH 219	1114.494	1110.744	1114.624	1109.828	Circular	1110.744	1109.883	0.2	142.265	0.605	0	0.013
L 233	MH 221	MH 220	1114.550	1111.172	1114.494	1110.744	Circular	1111.172	1110.804	0.2	91.812	0.401	0	0.013
L 234	MH 222	MH 221	1114.999	1112.000	1114.550	1111.172	Circular	1112.031	1111.175	0.2	100.469	0.852	0	0.013
L 235	MH 222	MH 223	1114.999	1112.000	1113.995	1110.985	Circular	1112.037	1111.330	0.2	122.467	0.577	0	0.013
L 236	MH 223	MH 224	1113.995	1110.985	1113.998	1111.075	Circular	1111.300	1111.105	0.2	33.739	0.578	0	0.013
L 237	MH 223	MH 226	1113.995	1110.985	1114.000	1110.394	Circular	1110.985	1110.417	0.2	122.588	0.463	0	0.013
L 238	MH 224	MH 225	1113.998	1111.075	1114.220	1110.578	Circular	1111.075	1110.614	0.2	85.58	0.539	0	0.013
L 239	MH 225	MH 254	1114.220	1110.578	1115.000	1109.930	Circular	1110.578	1109.975	0.2	125.999	0.479	0	0.013
L 240	MH 226	MH 219	1114.000	1110.394	1114.624	1109.828	Circular	1110.394	1109.863	0.2	121.748	0.436	0	0.013
L 241	MH 227	MH 147	1113.475	1110.412	1112.997	1110.081	Circular	1110.412	1110.136	0.2	82.17	0.336	0	0.013
L 242	MH 228	MH 227	1113.739	1110.670	1113.475	1110.412	Circular	1110.670	1110.442	0.2	57.012	0.4	0	0.013
L 243	MH 229	MH 138	1110.991	1108.934	1110.958	1108.932	Circular	1108.934	1108.932	0.2	74.402	0.003	0	0.013
L 244	MH 230	MH 229	1111.445	1108.965	1110.991	1108.934	Circular	1108.965	1108.934	0.2	125.497	0.025	0	0.013
L 245	MH 231	MH 237	1105.000	1101.786	1105.000	1100.988	Circular	1101.816	1101.018	0.2	113.698	0.702	0	0.013
L 246	MH 232	MH 231	1105.000	1102.305	1105.000	1101.786	Circular	1102.335	1101.876	0.2	70.546	0.651	0	0.013
L 247	MH 233	MH 236	1105.000	1102.280	1105.000	1101.794	Circular	1102.310	1101.824	0.2	64.536	0.753	0	0.013
L 248	MH 234	MH 232	1104.868	1102.675	1105.000	1102.305	Circular	1102.705	1102.395	0.2	45.92	0.675	0	0.013
L 249	MH 235	MH 241	1104.618	1103.358	1105.000	1102.947	Circular	1103.388	1103.057	0.25	135.307	0.245	0	0.013
L 250	MH 236	MH 237	1105.000	1101.794	1105.000	1100.988	Circular	1101.824	1101.023	0.2	84.954	0.943	0	0.013
L 251	MH 237	MH 243	1105.000	1100.988	1104.752	1100.306	Circular	1100.997	1100.336	0.2	142.602	0.464	0	0.013
L 252	MH 238	MH 235	1105.339	1103.701	1104.618	1103.358	Circular	1103.731	1103.398	0.25	137.56	0.242	0	0.013
L 253	MH 239	MH 240	1106.984	1104.015	1107.999	1103.935	Circular	1104.045	1104.025	0.3	53.983	0.037	0	0.013
L 254	MH 240	MH 238	1107.999	1103.935	1105.339	1103.701	Circular	1103.965	1103.741	0.25	106.867	0.21	0	0.013
L 255	MH 241	MH 242	1105.000	1102.947	1103.967	1100.278	Circular	1102.947	1100.358	0.3	9.323	28.092	0	0.013
L 256	MH 242	MH 33	1103.967	1100.278	1104.580	1099.105	Circular	1100.278	1099.436	0.6	165.527	0.509	0	0.013
L 257	MH 243	MH 242	1104.752	1100.306	1103.967	1100.278	Circular	1100.326	1100.318	0.3	5.168	0.155	0	0.013
L 258	MH 244	MH 241	1105.019	1103.556	1105.000	1102.947	Circular	1103.556	1102.967	0.3	82.944	0.71	0	0.013
L 259	MH 245	MH 244	1105.033	1103.897	1105.019	1103.556	Circular	1103.897	1103.616	0.25	119.78	0.235	0	0.013
L 260	MH 246	MH 70	1106.241	1104.511	1106.179	1104.242	Circular	1104.511	1104.285	0.25	69.645	0.325	0	0.013
L 261	MH 254	MH 218	1115.000	1109.930	1114.629	1109.360	Circular	1109.930	1109.392	0.2	127.128	0.423	0	0.013
HAWKS LANDING														
LK-HWL-259	N-HWL-259	N-HWL-260	1109.194	1106.605	1109.117	1106.217	Circular	1106.605	1106.217	0.3	129.65	0.3	0	0.013
LK-HWL-260	N-HWL-260	N-HWL-377	1109.117	1106.217	1107.981	1104.786	Circular	1106.217	1104.786	0.45	59.4	2.41	0	0.013
LK-HWL-261	N-HWL-261	N-HWL-262	1110.733	1107.833	1110.127	1107.227	Circular	1107.833	1107.227	0.3	161.7	0.37	0	0.013
LK-HWL-262	N-HWL-290	N-HWL-262	1110.399	1107.499	1110.127	1107.227	Circular	1107.499	1107.227	0.45	102.17	0.266	0	0.013
LK-HWL-263	N-HWL-263	N-HWL-264	1109.826	1106.926	1108.438	1105.538	Circular	1106.926	1105.538	0.2	59.11	2.35	0	0.013
LK-HWL-264	N-HWL-264	N-HWL-319	1108.438	1105.538	1108.196	1105.296	Circular	1105.538	1105.296	0.2	47.61	0.51	0	0.013
LK-HWL-266	N-HWL-270	N-HWL-266	1107.391	1104.491	1106.009	1103.109	Circular	1104.491	1103.109	0.3	75.08	1.841	0	0.013
LK-HWL-267	N-HWL-268	N-HWL-267	1109.997	1106.248	1109.327	1105.686	Circular	1106.248	1105.686	0.3	126.2	0.445	0	0.013
LK-HWL-268	N-HWL-269	N-HWL-268	1108.829	1105.929	1109.997	1106.248	Circular	1106.700	1106.248	0.3	101.32	0.446	0	0.013
LK-HWL-270	N-HWL-270	N-HWL-271	1107.391	1104.491	1105.997	1103.940	Circular	1104.491	1104.000	0.2	96.64	0.51	0	0.013
LK-HWL-272	N-HWL-272	N-HWL-276	1107.389	1103.440	1106.705	1103.240	Circular	1103.440	1103.300	0.3	30.58	0.46	0	0.013
LK-HWL-273	N-HWL-319	N-HWL-266	1108.196	1105.296	1106.009	1103.109	Circular	1105.296	1103.109	0.3	136.96	1.6	0	0.013
LK-HWL-274	N-HWL-274	N-HWL-275	1108.044	1105.137	1107.643	1104.743	Circular	1105.137	1104.743	0.2	10.97	3.6	0	0.013
LK-HWL-275	N-HWL-275	N-HWL-276	1107.643	1104.743	1106.705	1103.240	Circular	1104.743	1103.300	0.2	32.47	4.444	0	0.013
LK-HWL-276	N-HWL-271	N-HWL-272	1105.997	1103.940	1107.389	1103.440	Circular	1103.940	1103.500	0.2	97.89	0.45	0	0.013
LK-HWL-278	N-HWL-276	N-HWL-320	1106.705	1103.240	1104.994	1102.094	Circular	1103.240	1102.094	0.3	143.92	0.8	0	0.013
LK-HWL-279	N-HWL-278	N-HWL-320	1108.006	1105.106	1104.994	1102.094	Circular	1105.106	1102.154	0.3	123.84	2.384	0	0.013
LK-HWL-280	N-HWL-279	N-HWL-278	1109.097	1106.197	1108.006	1105.106	Circular	1106.197	1105.166	0.3	60.16	1.714	0	0.013
LK-HWL-281	N-HWL-280	N-HWL-279	1110.407	1107.507	1109.097	1106.197	Circular	1107.507	1106.257	0.3	50.24	2.488	0	0.013
LK-HWL-282	N-HWL-281	N-HWL-280	1112.461	1109.561	1110.407	1107.507	Circular	1109.561	1107.567	0.3	96.25	2.072	0	0.013
LK-HWL-283	N-HWL-281	N-HWL-282	1112.461	1109.561	1112.520	1109.620	Circular	1109.561	1109.620	0.2	77.85	-0.08	0	0.013
LK-HWL-284	N-HWL-282	N-HWL-283	1112.520	1109.620	1111.348	1108.448	Circular	1109.620	1108.448	0.2	142.24	0.82	0	0.013
LK-HWL-285	N-HWL-283	N-HWL-286	1111.348	1108.448	1110.031	1107.131	Circular	1108.448	1107.131	0.2	90.89	1.45	0	0.013
LK-HWL-286	N-HWL-285	N-HWL-297	1115.862	1112.512	1113.442	1110.542	Circular	1112.512	1110.602	0.3	191.03	1	0	0.013
LK-HWL-287	N-HWL-312	N-HWL-311	1116.740	1113.575	1115.596	1112.649	Circular	1113.575	1112.679	0.05	94.12	0.952	0	0.013
LK-HWL-288	N-HWL-284	N-HWL-280	1109.372	1107.938	1110.407	1107.507	Circular	1107.938	1107.507	0.2	143.9	0.3	0	0.013
LK-HWL-289	N-HWL-288	N-HWL-289	1111.570	1108.670	1111.107	1108.207	Circular	1108.670	1108.207	0.45	160.35	0.289	0	0.013
LK-HWL-290	N-HWL-289	N-HWL-290	1111.107	1108.207	1110.399	1107.499	Circular	1108.207	1107.499	0.45	91.7	0.772	0	0.013
LK-HWL-291	N-HWL-263	N-HWL-260	1109.826	1106.926	1109.117	1106.217	Circular	1106.926	1106.217	0.45	49.65	1.428	0	0.013
LK-HWL-293	N-HWL-259	N-HWL-261	1109.194	1106.605	1110.733	1107.833	Circular	1106.605	1107.833	0.3	80.87	-1.518	0	0.013
LK-HWL-295	N-HWL-262	N-HWL-263	1110.127	1107.227	1109.826	1106.926	Circular	1107.227	1106.926	0.45	44.2	0.681	0	0.013
LK-HWL-296	N-HWL-292	N-HWL-291	1111.949	1109.432	1112.021	1109.121	Circular	1109.432	1109.121	0.3	103.99	0.3	0	0.013
LK-HWL-297	N-HWL-291	N-HWL-290	1112.021	1109.121	1110.399	1107.499	Circular	1109.121	1107.499	0.3	123.62	1.31	0	0.013
LK-HWL-300	N-HWL-288	N-HWL-287	1111.570	1108.670	1110.555	1107.655	Circular	1108.670	1107.655	0.2	101.13	1	0	0.013
LK-HWL-301	N-HWL-287	N-HWL-286	1110.555	1107.655	1110.031	1107.131	Circular	1107.655	1107.131	0.2	97.42	0.54	0	0.013
LK-HWL-303	N-HWL-293	N-HWL-294	1113.773	1110.873	1112.509	1109.609	Circular	1110.873	1109.609	0.2	127.97	0.99	0	0.013
LK-HWL-304	N-HWL-294	N-HWL-289	1112.509	1109.609	1111.107	1108.207	Circular	1109.609	1108.207	0.2	98.73	1.42	0	0.013
LK-HWL-305	N-HWL-293	N-HWL-295	1113.773	1110.873	1115.002	1112.102	Circular	1110.873	1112.102	0.2	88.29	-1.39	0	0.013
LK-HWL-306	N-HWL-295	N-HWL-296	1115.002	1112.102	1112.955	1110.055	Circular	1112.102	1110.055	0.2	152.27	1.34	0	0.013
LK-HWL-307	N-HWL-296	N-HWL-294	1112.955	1110.055	1112.509	1109.609	Circular	1110.055	1109.609	0.2	88.43	0.5	0	0.013
LK-HWL-308	N-HWL-298	N-HWL-299	1119.000	1116.100	1113.859	1110.959	Circular	1116.100	1110.959	0.2	165.76	3.1	0	0.013
LK-HWL-309	N-HWL-299	N-HWL-297	1113.859	1110.959	1113.442	1110.542	Circular	1110.959	1110.542	0.45	91.38	0.46	0	0.013
LK-HWL-310	N-HWL-297	N-HWL-288	1113.442	1110.542	1111.570	1108.670	Circular	1110.542	1108.670	0.45	128.24	1.46	0	0.013
LK-HWL-311	N-HWL-298	N-HWL-300	1119.000	1116.100	1118.172	1115.272	Circular	1116.100	1115.272	0.2	84.24	0.98	0	0.013
LK-HWL-312	N-HWL-300	N-HWL-301	1118.172	1115.272	1114.058	1111.158	Circular	1115.272	1111.158	0.2	165.59	2.48	0	0.013
LK-HWL-313	N-HWL-305	N-HWL-301	1113.515	1111.579	1114.058	1111.158	Circular	1111.579	1111.158	0.3	94	0.448	0	0.013
LK-HWL-314	N-HWL-305	N-HWL-306	1113.515	1111.579	1112.637	1111.199	Circular	1111.579	1111.259	0.3	106.71	0.3	0	0.013
LK-HWL-315	N-HWL-306	N-HWL-308	1112.637	1111.199	1113.212	1111.046	Circular	1111.199	1111.106	0.3	93.69	0.1	0	0.013
LK-HWL-316	N-HWL-301	N-HWL-299	1114.058	1111.158	1113.859	1110.959	Circular	1111.158	1110.959	0.45	91.72	0.217	0	0.013
LK-HWL-317	N-HWL-301	N-HWL-303	1114.058	1111.158	1113.456	1110.416	Circular	1111.158	1110.556	0.45	92.08	0.65	0	0.013
LK-HWL-318	N-HWL-303	N-HWL-304	1113.456	1110.416	1113.640	1110.268	Circular	1110.416	1110.298	0.525	39.66	0.3	0	0.013
LK-HWL-319	N-HWL-300	N-HWL-302	1118.172	1115.272	1114.670	1111.770	Circular	1115.272	1111.770	0.2	88.18	3.97	0	0.013
LK-HWL-320	N-HWL-302	N-HWL-303	1114.670	1111.770	1113.456	1110.416	Circular	1111.770	1110.556	0.2	140.94	0.86	0	0.013
LK-HWL-321	N-HWL-305	N-HWL-307	1113.515	1111.579	1113.437	1111.365	Circular	1111.579	1111.425	0.3	81.17	0.19	0	0.013
LK-HWL-322	N-HWL-307	N-HWL-308	1113.437	1111.365	1113.212	1111.046	Circular	1111.365	1111.046	0.3	159.63	0.2	0	0.013
LK-HWL-323	N-HWL-269	N-HWL-270	1108.829	1105.929	1107.391	1104.491	Circular	1105.929	1104.491	0.3	138.13	1.04	0	0.013
LK-HWL-324	N-HWL-286	N-HWL-269	1110.031	1107.131	1108.829	1105.929	Circular	1107.131	1106.162	0.3	96.88	1	0	0.013
LK-HWL-325	N-HWL-267	N-HWL-319	1109.327	1105.686	1108.196	1105.296	Circular	1105.686	1105.296	0.3	130.24	0.299	0	0.013
LK-HWL-326	N-HWL-266	N-HWL-378	1106.009	1103.109	1104.826	1098.516	Circular	1103.109	1098.616	0.45	78.69	5.71	0	0.013
LK-HWL-328	N-HWL-316	N-HWL-317	1112.456	1109.529	1111.025	1108.763	Circular	1109.529	1108.793	0.2	92.1	0.8	0	0.013
LK-HWL-329	N-HWL-317	N-HWL-283	1111.025	1108.763	1111.348	1108.448	Circular	1108.763	1108.478	0.2	95.03	0.3	0	0.013
LK-HWL-330	N-HWL-312	N-HWL-314	1116.740	1113.575	1114.743	1111.843	Circular	1113.575	1111.873	0.2	85.14	2	0	0.013
LK-HWL-332	N-HWL-311	N-HWL-309	1115.596	1112.649	1114.158	1112.034	Circular	1112.649	1112.064	0.2	83.5	0.7	0	0.013
LK-HWL-333	N-HWL-309	N-HWL-310	1114.158	1112.034	1113.776	1111.727	Circular	1112.034	1111.757	0.2	39.51	0.7	0	0.013
LK-HWL-334	N-HWL-310	N-HWL-315	1113.776	1111.727	1114.201	1111.301	Circular	1111.727	1111.301	0.2	112.69	0.378	0	0.013
LK-HWL-335	N-HWL-315	N-HWL-282	1114.201	1111.301	1112.520	1109.620	Circular	1111.301	1109.620	0.2	96.91	1.73	0	0.013
LK-HWL-336	N-HWL-314	N-HWL-315	1114.743	1111.843	1114.201	1111.301	Circular	1111.843	1111.301	0.2	138.37	0.39	0	0.013
LK-HWL-337	N-HWL-313	N-HWL-311	1115.641	1112.741	1115.596	1112.649	Circular	1112.741	1112.679	0.2	20.53	0.3	0	0.013
LK-HWL-338	N-HWL-273	N-HWL-272	1108.091	1105.191	1107.389	1103.440	Circular	1105.191	1104.089	0.2	36.73	3	0	0.013
LK-HWL-339	N-HWL-273	N-HWL-274	1108.091	1105.191	1108.044	1105.137	Circular	1105.191	1105.144	0.2	14.15	0.33	0	0.013
LK-HWL-377	N-HWL-377	N-HWL-378	1107.981	1104.786	1104.826	1098.516	Circular	1104.786	1098.576	0.2	215.59	2.88	0	0.013
LK-HWL-378	N-HWL-378	N-HWL-379	1104.826	1098.516	1099.999	1097.917	Circular	1098.516	1097.977	0.375	328.78	0.164	0	0.013
LK-HWL-379.1	N-HWL-379.1	N-ANN-476	1096.525	1093.180	1084.993	1081.670	Circular	1093.180	1081.870	0.15	447.63	2.527	0	0.013
LK-HWL-379.2	N-IL-379	N-HWL-379.1	1098.985	1095.540	1096.525	1093.180	Circular	1095.540	1093.280	0.15	178.04	1.269	0	0.013
VISTA CROSSING														
LK-VST-333	N-VST-333	N-ANN-119	1112.000	1107.599	1114.414	1106.999	Circular	1107.599	1107.059	0.675	178.62	0.336	0	0.013
LK-VST-342	N-HWL-304	N-VST-322	1113.640	1110.268	1113.890	1110.068	Circular	1110.268	1110.128	0.525	54.15	0.259	0	0.013
LK-VST-343	N-VST-322	N-VST-326	1113.890	1110.068	1115.520	1109.639	Circular	1110.068	1109.739	0.525	108.37	0.3	0	0.013
LK-VST-344	N-VST-326	N-VST-327	1115.520	1109.639	1112.000	1109.902	Circular	1109.639	1109.902	0.375	99.88	-0.263	0	0.013
LK-VST-345	N-VST-327	N-VST-328	1112.000	1109.902	1112.000	1110.781	Circular	1110.860	1110.811	0.25	19.18	0.26	0	0.013
LK-VST-346	N-VST-328	N-VST-329	1112.000	1110.781	1112.249	1110.377	Circular	1110.781	1110.407	0.25	144.05	0.26	0	0.013
LK-VST-347	N-VST-329	N-VST-330	1112.249	1110.377	1113.482	1109.673	Circular	1110.377	1109.733	0.25	146.38	0.44	0	0.013
LK-VST-348	N-VST-330	N-VST-331	1113.482	1109.673	1114.000	1108.288	Circular	1109.673	1109.300	0.25	82.9	0.45	0	0.013
LK-VST-349	N-VST-331	N-VST-332	1114.000	1108.288	1115.000	1107.941	Circular	1108.288	1108.007	0.525	95.69	0.294	0	0.013
LK-VST-350	N-VST-332	N-VST-333	1115.000	1107.941	1112.000	1107.599	Circular	1107.941	1107.776	0.525	109.99	0.15	0	0.013
LK-VST-351	N-VST-324	N-VST-323	1114.167	1110.812	1113.953	1110.515	Circular	1111.379	1110.575	0.25	181.96	0.442	0	0.013
LK-VST-352	N-VST-323	N-VST-325	1113.953	1110.515	1114.530	1109.881	Circular	1110.515	1110.006	0.25	115.64	0.44	0	0.013
LK-VST-353	N-VST-325	N-VST-326	1114.530	1109.881	1115.520	1109.639	Circular	1109.881	1109.639	0.375	93.02	0	0	0.013
LK-VST-354	N-VST-324	N-VST-347	1114.167	1110.812	1114.422	1110.478	Circular	1110.812	1110.538	0.375	104.62	0	0	0.013
LK-VST-355	N-VST-347	N-VST-365	1114.422	1110.478	1113.000	1110.174	Circular	1110.478	1110.234	0.375	93.89	0.26	0	0.013
LK-VST-356	N-VST-365	N-VST-325	1113.000	1110.174	1114.530	1109.881	Circular	1110.174	1109.941	0.375	89.8	0.259	0	0.013
LK-VST-357	N-VST-366	N-VST-365	1113.000	1110.489	1113.000	1110.174	Circular	1110.489	1110.349	0.2	16.67	0	0	0.013
LK-VST-358	N-VST-357	N-VST-351	1118.352	1113.332	1118.619	1113.096	Circular	1113.959	1113.156	0.25	183.97	0.436	0	0.013
LK-VST-359	N-VST-351	N-VST-350	1118.619	1113.096	1118.014	1112.007	Circular	1113.096	1112.067	0.25	66.03	1.558	0	0.013
LK-VST-360	N-VST-350	N-VST-349	1118.014	1112.007	1116.313	1111.549	Circular	1112.007	1111.609	0.25	90.05	0.442	0	0.013
LK-VST-361	N-VST-349	N-VST-324	1116.313	1111.549	1114.167	1110.812	Circular	1111.549	1110.887	0.25	183.1	0.436	0	0.013
LK-VST-362	N-VST-349	N-VST-348	1116.313	1111.549	1115.993	1111.010	Circular	1111.549	1111.085	0.25	105.59	0.439	0	0.013
LK-VST-363	N-VST-348	N-VST-352	1115.993	1111.010	1116.453	1113.098	Circular	1111.085	1113.258	0.25	87.57	-2.481	0	0.013
LK-VST-364	N-VST-352	N-VST-353	1116.453	1113.098	1115.394	1112.690	Circular	1113.098	1112.750	0.2	78.75	0.442	0	0.013
LK-VST-365	N-VST-353	N-VST-354	1115.394	1112.690	1114.959	1112.380	Circular	1112.690	1112.440	0.2	57.3	0.436	0	0.013
LK-VST-366	N-VST-354	N-VST-346	1114.959	1112.380	1114.766	1111.827	Circular	1112.380	1111.956	0.2	116.41	0.364	0	0.013
LK-VST-367	N-VST-346	MH 221	1114.766	1111.827	1114.550	1111.172	Circular	1111.827	1111.232	0.2	120.95	0.492	0	0.013
LK-VST-368	N-VST-371	N-VST-325	1114.000	1110.760	1114.530	1109.881	Circular	1110.760	1110.006	0.25	169.86	0.444	0	0.013
LK-VST-369	N-VST-343	N-VST-344	1113.289	1110.291	1113.690	1110.028	Circular	1110.291	1110.088	0.2	25.49	0.796	0	0.013
LK-VST-370	N-VST-344	N-VST-344.1	1113.690	1110.028	1113.820	1109.644	Circular	1110.028	1109.704	0.2	40.49	0.8	0	0.013
LK-VST-370.1	N-VST-345	N-VST-344.1	1114.000	1110.149	1113.820	1109.644	Circular	1110.149	1109.704	0.2	55.562	0.808	0	0.013
LK-VST-372	N-VST-326	N-VST-342	1115.520	1109.639	1113.368	1109.399	Circular	1109.639	1109.399	0.525	93.61	0.256	0	0.013
LK-VST-373	N-VST-342	N-VST-341	1113.368	1109.399	1114.000	1109.105	Circular	1109.399	1109.165	0.525	57.01	0.41	0	0.013
LK-VST-374	N-VST-341	N-VST-340	1114.000	1109.105	1114.000	1108.860	Circular	1109.105	1108.920	0.525	61.06	0.303	0	0.013
LK-VST-375	N-VST-340	N-VST-339	1114.000	1108.860	1114.000	1108.591	Circular	1108.860	1108.621	0.525	80.06	0.299	0	0.013
LK-VST-376	N-VST-339	N-VST-367	1114.000	1108.591	1114.000	1108.497	Circular	1108.591	1108.497	0.525	31.08	0.3	0	0.013
LK-VST-377	N-VST-367	N-VST-331	1114.000	1108.497	1114.000	1108.288	Circular	1108.497	1108.381	0.525	38.35	0.3	0	0.013
LK-VST-379	N-VST-338	N-VST-339	1115.005	1109.164	1114.000	1108.591	Circular	1109.164	1108.886	0.2	62.59	0.444	0	0.013
LK-VST-380	N-VST-338	N-VST-337	1115.005	1109.164	1115.000	1111.266	Circular	1110.669	1111.266	0.2	69.55	-0.858	0	0.013
LK-VST-381	N-VST-336	N-VST-337	1115.000	1111.546	1115.000	1111.266	Circular	1111.546	1111.266	0.2	35.62	0.786	0	0.013
LK-VST-382	N-VST-337	N-VST-334	1115.000	1111.266	1115.000	1111.075	Circular	1111.266	1111.105	0.3	124.23	0.13	0	0.013
LK-VST-383	N-VST-332	N-VST-332.1	1115.000	1107.941	1115.000	1111.338	Circular	1109.000	1111.338	0.2	41.792	-5.594	0	0.013
LK-VST-383.1	N-VST-332.1	N-VST-334	1115.000	1111.338	1115.000	1111.075	Circular	1111.338	1111.105	0.2	51.618	0.45	0	0.013
LK-VST-384	N-VST-334	N-VST-335	1115.000	1111.075	1114.993	1110.775	Circular	1111.075	1110.805	0.2	89.85	0.3	0	0.013
LK-VST-385	N-VST-335	MH 219	1114.993	1110.775	1114.624	1109.828	Circular	1110.775	1109.888	0.2	97.65	0.908	0	0.013
LK-VST-386	N-VST-357	N-VST-358	1118.352	1113.332	1118.039	1113.345	Circular	1114.086	1113.345	0.2	92.16	0.804	0	0.013
LK-VST-387	N-VST-358	N-VST-359	1118.039	1113.345	1115.542	1113.456	Circular	1114.200	1113.516	0.2	87.46	0.782	0	0.013
LK-VST-388	N-VST-359	N-VST-360	1115.542	1113.456	1116.003	1112.934	Circular	1113.456	1113.099	0.2	104.55	0.341	0	0.013
LK-VST-389	N-VST-358	N-VST-361	1118.039	1113.345	1115.421	1112.533	Circular	1113.345	1112.699	0.2	157.33	0.411	0	0.013
LK-VST-390	N-VST-357	N-VST-356	1118.352	1113.332	1115.292	1112.667	Circular	1113.332	1112.779	0.2	126.43	0.437	0	0.013
LK-VST-392	N-VST-356	N-VST-355	1115.292	1112.667	1115.063	1112.585	Circular	1112.667	1112.615	0.2	12.05	0.437	0	0.013
LK-VST-393	N-VST-355	N-VST-354	1115.063	1112.585	1114.959	1112.380	Circular	1112.585	1112.420	0.2	37.87	0.437	0	0.013
LK-VST-394	N-VST-363	N-VST-364	1116.350	1113.576	1115.922	1113.473	Circular	1113.576	1113.533	0.2	21.75	0.2	0	0.013
LK-VST-395	N-VST-364	MH 184	1115.922	1113.473	1115.435	1112.234	Circular	1113.473	1112.294	0.2	86.76	1.359	0	0.013
LK-VST-396	N-VST-362	N-VST-360	1116.591	1113.369	1116.003	1112.934	Circular	1113.369	1112.964	0.2	51.78	0.782	0	0.013
LK-VST-397	N-VST-360	N-VST-361	1116.003	1112.934	1115.421	1112.533	Circular	1112.934	1112.563	0.2	84.5	0.439	0	0.013
LK-VST-398	N-VST-361.1	N-VST-346	1115.001	1112.132	1114.766	1111.827	Circular	1112.132	1111.827	0.2	69.387	0.44	0	0.013
LK-VST-399	N-VST-361	N-VST-361.1	1115.421	1112.533	1115.001	1112.132	Circular	1112.533	1112.132	0.2	91.323	0.439	0	0.013
LK-VST-400	N-HWL-308	N-VST-324	1113.212	1111.046	1114.167	1110.812	Circular	1111.046	1110.862	0.3	92.04	0.2	0	0.013
LK-VST-401	N-HWL-281	MH 207	1112.461	1109.561	1112.544	1108.309	Circular	1109.561	1108.409	0.2	87.57	1.316	0	0.013
LK-VST-402	N-VST-402	N-VST-345	1114.050	1111.546	1114.000	1110.149	Circular	1111.546	1110.669	0.2	104.18	0.842	0	0.013

Name	Upstream (U/S) Node Name	Downstream (D/S) Node Name	U/S-Ground Elevation (Spill Crest) (m)	U/S Node Invert Elevation (m)	D/S-Ground Elevation (Spill Crest) (m)	D/S Node Invert Elevation (m)	Shape	Upstream Invert Elevation (m)	Downstream Invert Elevation (m)	Diameter (Height) (m)	Length (m)	Conduit Slope	Initial Depth (m)	Roughness
LK-VST-403	N-VST-348	N-VST-347	1115.993	1111.010	1114.422	1110.478	Circular	1111.010	1110.538	0.375	180.44	0.262	0	0.013
LK-VST-404	N-VST-404	N-VST-347	1114.766	1110.981	1114.422	1110.478	Circular	1110.981	1110.538	0.375	170.04	0.261	0	0.013
LK-VST-407	N-VST-371	N-VST-345	1114.000	1110.760	1114.000	1110.149	Circular	1110.760	1110.209	0.2	63.37	1.199	0	0.013
LK-VST-409	N-VST-344.1	N-VST-338	1113.820	1109.644	1115.005	1109.164	Circular	1109.644	1109.224	0.2	95.63	0.439	0	0.013
NEW ANNEXATION AREA														
LK-2335-JK	N-2335-JK	N-ANN-476	1089.954	1086.693	1084.993	1081.670	Circular	1086.693	1081.730	0.2	330.89	1.5	0	0.013
LK-ANN-101.1	N-ANN-101.1	N-ANN-101	1070.999	1067.75	1071	1059.979	Circular	1067.75	1066.891	0.3	42.93	2	0	0.013
SW-01-29-1-5-Pump1	N-ANN-101	N-ANN-100	1071.000	1059.979	1071.001	1067.750								
LK-ANN-103	N-ANN-103	N-ANN-102	1083.346	1077.990	1069.154	1065.450	Circular	1077.990	1065.510	0.3	780	1.6	0	0.013
LK-ANN-104	N-ANN-104	N-ANN-103	1105.136	1099.150	1083.346	1077.990	Circular	1099.150	1078.050	0.2	843.66	2.501	0	0.013
LK-ANN-107	N-ANN-107	N-ANN-108	1128.000	1124.975	1122.000	1117.851	Circular	1124.975	1117.980	0.3	777.19	0.9	0	0.013
LK-ANN-108	N-ANN-108	N-ANN-108.1	1122.000	1117.851	1116.974	1114.433	Circular	1117.851	1114.433	0.375	599.65	0.57	0	0.013
LK-ANN-108.1	N-ANN-108.1	N-ANN-109	1116.974	1114.433	1116.760	1113.664	Circular	1114.433	1113.724	0.45	354.54	0.2	0	0.013
LK-ANN-109	N-ANN-109	N-ANN-110	1116.760	1113.664	1112.000	1109.177	Circular	1113.664	1109.237	0.45	340.54	1.3	0	0.013
LK-ANN-110	N-ANN-110	N-VST-333	1112.000	1109.177	1112.000	1107.599	Circular	1109.177	1107.659	0.45	607.26	0.25	0	0.013
LK-ANN-111	N-ANN-111	N-ANN-114.1	1106.331	1102.198	1106.003	1100.420	Circular	1102.198	1101.120	0.45	119.88	0.9	0	0.013
LK-ANN-112	N-ANN-112	N-ANN-113	1101.490	1097.396	1099.020	1096.873	Circular	1097.396	1096.948	0.75	74.28	0.603	0	0.013
LK-ANN-113	N-ANN-113	MH 40	1099.020	1096.873	1099.370	1096.578	Circular	1096.873	1096.681	1.125	22.24	0.863	0	0.013
LK-ANN-114	N-ANN-114	N-ANN-114.1	1108.000	1103.390	1106.003	1100.420	Circular	1103.390	1100.570	0.675	83.83	3.337	0	0.013
LK-ANN-114.1	N-ANN-114.1	N-ANN-112	1106.003	1100.420	1101.490	1097.396	Circular	1100.570	1097.700	0.675	85.31	3.337	0	0.013
LK-ANN-115	N-ANN-115	N-ANN-114	1109.000	1104.734	1108.000	1103.390	Circular	1104.734	1103.446	0.675	127.99	1.006	0	0.013
LK-ANN-116	N-ANN-116	N-ANN-115	1110.006	1105.319	1109.000	1104.734	Circular	1105.319	1104.794	0.675	175.41	0.299	0	0.013
LK-ANN-117	N-ANN-117	N-ANN-116	1112.002	1105.859	1110.006	1105.319	Circular	1105.859	1105.379	0.675	174.72	0.3	0	0.013
LK-ANN-118	N-ANN-118	N-ANN-117	1114.000	1106.489	1112.002	1105.859	Circular	1106.489	1105.964	0.675	175.41	0.299	0	0.013
LK-ANN-119	N-ANN-119	N-ANN-118	1114.414	1106.999	1114.000	1106.489	Circular	1106.999	1106.549	0.675	149.96	0.3	0	0.013
LK-ANN-120	N-ANN-120	N-ANN-120.1	1117.000	1113.726	1106.317	1104.215	Circular	1113.726	1104.275	0.3	800.99	1.18	0	0.013
LK-ANN-120.1	N-ANN-120.1	N-ANN-111	1106.317	1104.215	1106.331	1102.198	Circular	1104.215	1102.298	0.45	958.95	0.2	0	0.013
LK-ANN-121	N-ANN-121	N-HWL-377	1112.000	1108.715	1107.981	1104.786	Circular	1108.715	1104.856	0.2	225.87	1.708	0	0.013
LK-ANN-122	N-ANN-122	N-ANN-123	1109.066	1105.893	1098.014	1097.430	Circular	1105.893	1097.490	0.45	923.51	0.91	0	0.013
LK-ANN-123	N-ANN-123	N-ANN-113	1098.014	1097.430	1099.020	1096.873	Circular	1097.430	1096.963	0.45	311.61	0.15	0	0.013
LK-ANN-127	N-ANN-127	N-ANN-114.1	1109.532	1105.630	1106.003	1100.420	Circular	1105.630	1100.711	0.3	894.31	0.55	0	0.013
LK-ANN-500	N-ANN-100	N-JASP-15	1071.001	1067.750	1079.980	1075.360	Circular	1067.750	1077.160	0.45	840.64	-1.119	0	0.013
LK-ANN-511	N-ANN-476	N-JASP-15	1084.993	1081.670	1079.980	1075.360	Circular	1081.670	1076.860	0.3	262.59	1.832	0	0.013
LK-UR-01	N-UR-01	N-UR-02	1108.265	0.000	1107.251	0.000	Circular	0.050	0.000	0.05	769.49	0	0	0.013
LK-UR-02	N-UR-02	N-ANN-122	1107.251	0.000	1109.066	1105.893	Circular	0.050	0.000	0.05	154.3	0	0	0.013
IRON LANDING														
LK-IL-559	N-IL-489	N-IL-490	1110.874	1107.624	1110.034	1106.784	Circular	1107.624	1106.844	0.2	96.97	0.804	0	0.013
LK-IL-560	N-IL-490	N-IL-491	1110.034	1106.784	1107.962	1104.712	Circular	1106.784	1104.772	0.2	166.72	1.207	0	0.013
LK-IL-561	N-IL-491	MH 211	1107.962	1104.712	1104.004	1097.979	Circular	1104.712	1100.954	0.2	161.24	2.331	0	0.013
LK-IL-562	N-IL-492	N-IL-493	1107.995	1104.745	1107.317	1104.067	Circular	1104.745	1104.167	0.2	87.39	0.661	0	0.013
LK-IL-563	N-IL-493	N-IL-494	1107.317	1104.067	1105.385	1102.135	Circular	1104.067	1102.235	0.2	178.94	1.024	0	0.013
LK-IL-564	N-IL-494	MH 212	1105.385	1102.135	1102.504	1095.600	Circular	1102.135	1099.828	0.2	128.12	1.8	0	0.013
LK-IL-565	N-IL-495	N-IL-496	1104.410	1101.160	1104.003	1100.753	Circular	1101.160	1100.853	0.3	91.55	0.335	0	0.013
LK-IL-566	N-IL-496	N-IL-497	1104.003	1100.753	1101.812	1097.083	Circular	1100.753	1098.662	0.3	156.95	1.332	0	0.013
LK-IL-567	N-IL-498	N-IL-497	1101.355	1097.367	1101.812	1097.083	Circular	1097.367	1097.143	0.375	89.77	0.25	0	0.013
LK-IL-568	N-IL-500	N-IL-499	1099.152	1096.550	1100.039	1096.036	Circular	1096.550	1096.096	0.375	181.82	0.25	0	0.013
LK-IL-569	N-IL-500	N-IL-501	1099.152	1096.550	1097.462	1094.212	Circular	1095.902	1094.312	0.2	47	3.383	0	0.013
LK-IL-570	N-IL-502	N-IL-496	1102.599	1101.108	1104.003	1100.753	Circular	1101.108	1100.953	0.2	38.03	0.408	0	0.013
LK-IL-571	N-IL-493	N-IL-496	1107.317	1104.067	1104.003	1100.753	Circular	1104.067	1100.953	0.2	152.21	2.046	0	0.013
LK-IL-574	N-IL-497	N-IL-500	1101.812	1097.083	1099.152	1096.550	Circular	1097.083	1096.650	0.375	173.59	0.25	0	0.013
LK-IL-576	N-IL-501	N-HWL-379.1	1097.462	1094.212	1096.525	1093.180	Circular	1094.212	1093.575	0.2	93.26	0.683	0	0.013
LK-IL-577	N-IL-490	N-IL-493	1110.034	1106.784	1107.317	1104.067	Circular	1106.784	1104.167	0.2	85.24	3.07	0	0.013
LK-IL-578	N-IL-491	N-IL-494	1107.962	1104.712	1105.385	1102.135	Circular	1104.712	1102.535	0.2	84.09	2.589	0	0.013
LK-IL-579	N-HWL-320	N-IL-495	1104.994	1102.094	1104.410	1101.160	Circular	1102.094	1101.260	0.3	109.64	0.761	0	0.013
LK-IL-581	N-IL-506	MH 214	1111.000	1107.750	1105.351	1100.460	Circular	1107.750	1102.100	0.2	198.55	2.846	0	0.013
LK-IL-588	N-IL-499	MH 212	1100.039	1096.036	1102.504	1095.600	Circular	1096.036	1095.660	0.375	150.79	0.25	0	0.013
LK-IL-589	N-HWL-379	N-IL-509	1099.999	1097.917	1101.001	1097.567	Circular	1097.917	1097.667	0.375	100	0.25	0	0.013
LK-IL-590	N-IL-509	N-IL-498	1101.001	1097.567	1101.355	1097.367	Circular	1097.567	1097.427	0.375	56.05	0.25	0	0.013
LK-IL-591	MH 40D	N-ANN-114	1108.530	1105.197	1108.000	1103.390	Circular	1105.197	1103.486	0.3	342.3	0.5	0	0.013
LK-IL-595	N-ANN-102	N-ANN-101	1069.154	1065.450	1071.000	1059.979	Circular	1065.450	1060.729	0.375	580.67	0.813	0	0.013
JASP AREA														
LK-JASP-1-1	N-JASP-1-1	N-JASP-1	1109.754	1106.149	1109.191	1105.316	Circular	1106.149	1106.066	0.35	27.91	0.3	0	0.013
SW13-28-1-5-Pump1	N-JASP-1	N-JASP-2	1109.191	1105.316	1109.191	1106.066								
LK-JASP-2	N-JASP-2	N-JASP-3	1109.191	1106.066	1122.998	1120.875	Circular	1106.066	1121.100	0.35	1131.48	-1.329	0	0.013
LK-JASP-3	N-JASP-3	N-JASP-9	1122.998	1120.875	1122.254	1117.832	Circular	1120.875	1117.892	0.525	1594.98	0.196	0	0.013
LK-JASP-4	N-JASP-4	N-JASP-1	1114.000	1110.468	1109.191	1105.316	Circular	1110.468	1106.126	0.375	868.41	0.5	0	0.013
LK-JASP-5	N-JASP-5	N-JASP-6	1112.000	1108.750	1104.829	1101.497	Circular	1108.750	1101.557	0.3	970.17	0.741	0	0.013
LK-JASP-6	N-JASP-6	N-JASP-7	1104.829	1101.497	1102.994	1099.178	Circular	1101.497	1099.928	0.45	784.91	0.2	0	0.013
LK-JASP-7-1	N-JASP-7-1	N-JASP-7	1104.105	1100.860	1102.994	1099.178	Circular	1100.860	1100.650	0.3	52.26	0.4	0	0.013
SE23-28-1-5-Pump1	N-JASP-7	N-JASP-8	1102.994	1099.178	1104.234	1100.980								
SE23-28-1-5-Pump2	N-JASP-7	N-JASP-8	1102.994	1099.178	1104.234	1100.980								
LK-JASP-8	N-JASP-8	N-JASP-8.1	1104.234	1100.980	1097.023	1093.770	Circular	1100.980	1093.770	0.3	364.49	1.978	0	0.013
LK-JASP-8-1	N-JASP-8.1	N-JASP-8.2	1097.023	1093.77	1098.017	1094.223	Circular	1093.77	1094.223	0.3	219.65	-0.206	0	0.013
LK-JASP-8-2	N-JASP-8.2	N-JASP-8.3	1098.017	1094.223	1099.34	1096.47	Circular	1094.223	1096.47	0.3	1088.52	-0.206	0	0.013
LK-JASP-8-3	N-JASP-8.3	N-JASP-8.4	1099.34	1096.47	1099.861	1096.439	Circular	1096.47	1096.439	0.6	10.55	0.294	0	0.013
LK-JASP-9	N-JASP-9	N-JASP-10	1122.254	1117.832	1116.001	1110.732	Circular	1117.832	1110.792	0.525	1407.93	0.5	0	0.013
LK-JASP-10	N-JASP-10	N-JASP-11	1116.001	1110.732	1107.006	1105.437	Circular	1110.732	1105.497	0.525	1043.42	0.502	0	0.013
LK-JASP-11	N-JASP-11	N-JASP-12	1107.006	1105.437	1106.991	1104.815	Circular	1105.437	1104.905	0.6	113.36	0.47	0	0.013
LK-JASP-12	N-JASP-12	MH 56A	1106.991	1104.815	1106.998	1104.518	Circular	1104.815	1104.608	0.6	44.07	0.47	0	0.013
LK-JASP-13	N-JASP-13	N-JASP-14	1094.280	1089.515	1087.000	1081.676	Circular	1089.515	1081.736	0.375	1364.82	0.57	0	0.013
LK-JASP-14	N-JASP-14	N-JASP-15	1087.000	1081.676	1079.980	1075.360	Circular	1081.676	1076.920	0.45	792.72	0.6	0	0.013
NW-36-28-1-5-Pump1	N-JASP-15	N-JASP-16	1079.980	1075.360	1079.043	1075.790								
NW-36-28-1-5-Pump2	N-JASP-15	N-JASP-16	1079.980	1075.360	1079.043	1075.790								
NW-36-28-1-5-Pump3	N-JASP-15	N-JASP-16	1079.980	1075.360	1079.043	1075.790								
LK-JASP-16	N-JASP-16	N-VST-333	1079.043	1075.790	1112.000	1107.599	Circular	1075.790	1107.900	0.45	3311.08	-0.97	0	0.013

Name	Node X	Node Y	Predominant Landuse (HDR)	Flow Rate (HDR) (L/s)	Area (HDR) (ha)	Density (HDR) (1/ha)	Peaking Factor (HDR)	Unit Type (HDR)	Dry Weather Flow Generation Method (HDR)	Temporal Variation (HDR) or non
EXISTING TOWN										
MH 1	-1831.947	5697327.827	Industrial	0.035	0	0	1	l/s	Direct Flow	Residential
MH 1A	-1606.743	5697338.511	Industrial	0.1	49.88	0	2.992	l/s	Unit Flow Rate	Industrial
MH 1A-1	-1597.266	5697846.444	Parkland	0	0	0	0	cfs	Direct Flow	0
MH 1A-2	-1714.314	5697848.457	Parkland	0	0	0	0	cfs	Direct Flow	0
MH 1A-3	-1791.481	5697845.765	Parkland	0	0	0	0	cfs	Direct Flow	0
MH 2	-1903.922	5697327.903	Industrial	0.032	0	0	1	l/s	Direct Flow	Residential
MH 3	-2021.995	5697327.894	Industrial	0.038	0	0	1	l/s	Direct Flow	Residential
MH 4	-2145.749	5697327.935	Industrial	0.063	0	0	1	l/s	Direct Flow	Residential
MH 5	-2202.803	5697366.35	Industrial	0.029	0	0	1	l/s	Direct Flow	Residential
MH 6	-2217.026	5697432.311	Industrial	0.018	0	0	1	l/s	Direct Flow	Residential
MH 7	-2201.881	5697475.121	Parkland	0	0	0	0	l/s	Direct Flow	0
MH 8	-2166.724	5697574.239	Industrial	0.014	0	0	1	l/s	Direct Flow	Residential
MH 9	-2134.68	5697667.742	Industrial	0.022	0	0	1	l/s	Direct Flow	Residential
MH 10	-2078.389	5697708.388	Industrial	0.025	0	0	1	l/s	Direct Flow	Residential
MH 11	-1993.504	5697707.893	Industrial	0.017	0	0	1	l/s	Direct Flow	Residential
MH 12	-1903.268	5697467.686	Industrial	0.009	0	0	1	l/s	Direct Flow	Residential
MH 13	-1903.416	5697569.547	Industrial	0.041	0	0	1	l/s	Direct Flow	Residential
MH 14	-1903.32	5697707.46	Industrial	0.012	0	0	1	l/s	Direct Flow	Residential
MH 15	-1903.465	5697789.043	Industrial	0.007	0	0	1	l/s	Direct Flow	Residential
MH 16	-1903.737	5697841.025	Industrial	1.053	0	0	1	l/s	Direct Flow	Residential
MH 17	-1903.667	5697865.291	Industrial	0.052	0	0	1	l/s	Direct Flow	Residential
MH 18	-1903.425	5697989.625	Industrial	1.932	0	0	1	l/s	Direct Flow	Residential
MH 19	-1902.843	5698110.038	Parkland	0	0	0	0	l/s	Direct Flow	0
MH 20	-1903.114	5698166.301	Industrial	0.037	0	0	1	l/s	Direct Flow	Residential
MH 21	-1902.958	5698230.241	Industrial	0.027	0	0	1	l/s	Direct Flow	Residential
MH 22	-1902.982	5698316.502	Industrial	0.025	0	0	1	l/s	Direct Flow	Residential
MH 23	-1903.522	5698470.132	Commercial	0.037	0	0	1	l/s	Direct Flow	Residential
MH 24	-1776.601	5698589.225	Commercial	0.038	0	0	1	l/s	Direct Flow	Residential
MH 25	-1902.997	5698588.8	Commercial	0.062	0	0	1	l/s	Direct Flow	Residential
MH 26	-2010.302	5698589.291	Commercial	0.009	0	0	1	l/s	Direct Flow	Residential
MH 27	-2052.864	5698589.919	Commercial	0.005	0	0	1	l/s	Direct Flow	Residential
MH 28	-2120.362	5698613.393	Commercial	0.03	0	0	1	l/s	Direct Flow	Residential
MH 29	-2239.356	5698580.954	Industrial	0.008	0	0	1	l/s	Direct Flow	Residential
MH 30	-2292.636	5698557.65	Industrial	0.012	0	0	1	l/s	Direct Flow	Residential
MH 31	-2397.545	5698514.096	Industrial	0.019	0	0	1	l/s	Direct Flow	Residential
MH 32	-2517.623	5698503.179	Industrial	0.007	0	0	1	l/s	Direct Flow	Residential
MH 33	-2553.57	5698501.429	Industrial	0.024	0	0	1	l/s	Direct Flow	Residential
MH 34	-2731.329	5698494.586	Industrial	0.023	0	0	1	l/s	Direct Flow	Residential
MH 35	-2890.323	5698512.379	Commercial	0.015	0	0	1	l/s	Direct Flow	Residential
MH 36	-3069.329	5698513.253	Commercial	0.123	0	0	1	l/s	Direct Flow	Residential
MH 37	-3248.726	5698506.74	Commercial	0.007	0	0	1	l/s	Direct Flow	Residential
MH 38	-3282.271	5698505.608	Industrial	0.017	0	0	1	l/s	Direct Flow	Residential
MH 39	-3294.46	5698505	Commercial	0.007	0	0	1	l/s	Direct Flow	Residential
MH 40	-3354.345	5698503.068	Parkland	0	0	0	0	l/s	Direct Flow	0
MH 41	-2377.797	5698445.494	Parkland	0	0	0	0	l/s	Direct Flow	0
MH 42	-2354.544	5698378.949	Industrial	0.015	0	0	1	l/s	Direct Flow	Residential
MH 43	-2277.978	5698411.068	Industrial	0.015	0	0	1	l/s	Direct Flow	Residential
MH 44	-2194.775	5698475.143	Industrial	0.004	0	0	1	l/s	Direct Flow	Residential
MH 45	-2133.585	5698717.268	Commercial	0.007	0	0	1	l/s	Direct Flow	Residential
MH 46	-2204.707	5698722.958	Commercial	0.022	0	0	1	l/s	Direct Flow	Residential
MH 47	-2226.688	5698722.59	Commercial	0.005	0	0	1	l/s	Direct Flow	Residential
MH 48	-2331.791	5698889.767	Residential	0.056	0	0	1	l/s	Direct Flow	Residential
MH 49	-2292.108	5698876.107	Parkland	0	0	0	0	l/s	Direct Flow	0
MH 50	-2247.562	5698860.452	Residential	0.087	0	0	1	l/s	Direct Flow	Residential
MH 51	-2089.909	5698702.49	Commercial	0.006	0	0	1	l/s	Direct Flow	Residential
MH 52	-2082.341	5698727.25	Parkland	0	0	0	0	l/s	Direct Flow	0
MH 53	-2043.574	5698834.23	Commercial	0.034	0	0	1	l/s	Direct Flow	Residential
MH 54	-2027.885	5698883.53	Commercial	0.005	0	0	1	l/s	Direct Flow	Residential
MH 55	-1993.513	5698977.626	Commercial	0.126	0	0	1	l/s	Direct Flow	Residential
MH 56	-1960.741	5699070.958	Commercial	0.018	0	0	1	l/s	Direct Flow	Residential
MH 56A	-1868.437	5699039.97	Parkland	0	0	0	0	cfs	Direct Flow	0
MH 57	-1927.634	5699165.086	Commercial	0.018	0	0	1	l/s	Direct Flow	Residential
MH 58	-1894.562	5699259.095	Commercial	0.015	0	0	1	l/s	Direct Flow	Residential
MH 59	-1861.572	5699352.784	Commercial	0.021	0	0	1	l/s	Direct Flow	Residential
MH 60	-1816.909	5699484.6	Commercial	0.043	0	0	1	l/s	Direct Flow	Residential
MH 61	-1784.756	5699570.717	Commercial	0.009	0	0	1	l/s	Direct Flow	Residential
MH 62	-1764.732	5699628.225	Commercial	0.067	0	0	1	l/s	Direct Flow	Residential
MH 63	-2151.719	5698927.515	Commercial	0.029	0	0	1	l/s	Direct Flow	Residential
MH 64	-2192.043	5698941.573	Residential	0.006	0	0	1	l/s	Direct Flow	Residential
MH 65	-2226.015	5698953.274	Parkland	0	0	0	0	l/s	Direct Flow	0
MH 66	-2287.831	5698975.406	Residential	0.043	0	0	1	l/s	Direct Flow	Residential
MH 67	-2350.874	5698997.475	Residential	0.043	0	0	1	l/s	Direct Flow	Residential
MH 68	-2365.616	5699011.573	Residential	0.068	0	0	1	l/s	Direct Flow	Residential
MH 69	-2449.074	5699040.424	Residential	0.037	0	0	1	l/s	Direct Flow	Residential
MH 70	-2512.071	5698933.051	Commercial	0.042	0	0	1	l/s	Direct Flow	Residential
MH 71	-2512.364	5698985.988	Commercial	0.022	0	0	1	l/s	Direct Flow	Residential
MH 72	-2512.434	5699062.217	Residential	0.031	0	0	1	l/s	Direct Flow	Residential
MH 73	-2512.728	5699159.487	Residential	0.031	0	0	1	l/s	Direct Flow	Residential
MH 74	-2422.159	5699128.021	Residential	0.056	0	0	1	l/s	Direct Flow	Residential
MH 75	-2341.686	5699100.233	Residential	0.093	0	0	1	l/s	Direct Flow	Residential
MH 76	-2284.781	5699080.396	Residential	0.074	0	0	1	l/s	Direct Flow	Residential
MH 77	-2192.335	5699047.474	Residential	0.025	0	0	1	l/s	Direct Flow	Residential
MH 78	-2159.229	5699036.322	Parkland	0	0	0	0	l/s	Direct Flow	0
MH 79	-2092.171	5699012.008	Commercial	0.013	0	0	1	l/s	Direct Flow	Residential
MH 80	-2069.437	5699109.185	Commercial	0.012	0	0	1	l/s	Direct Flow	Residential
MH 81	-2177.245	5699147.289	Commercial	0.049	0	0	1	l/s	Direct Flow	Residential
MH 82	-2264.44	5699177.807	Residential	0.087	0	0	1	l/s	Direct Flow	Residential
MH 83	-2303.403	5699191.502	Residential	0.074	0	0	1	l/s	Direct Flow	Residential
MH 84	-2409.218	5699228.963	Residential	0.074	0	0	1	l/s	Direct Flow	Residential
MH 85	-2512.654	5699264.647	Residential	0.031	0	0	1	l/s	Direct Flow	Residential
MH 86	-2513.702	5699378.089	Residential	0.087	0	0	1	l/s	Direct Flow	Residential
MH 87	-2326.815	5699305.489	Commercial	0.197	0	0	1	l/s	Direct Flow	Residential
MH 88	-2307.524	5699298.437	Residential	0.062	0	0	1	l/s	Direct Flow	Residential
MH 89	-2212.978	5699265.746	Residential	0.087	0	0	1	l/s	Direct Flow	Residential
MH 90	-2119.478	5699233.012	Commercial	0.027	0	0	1	l/s	Direct Flow	Residential
MH 91	-2022.492	5699198.375	Commercial	0.009	0	0	1	l/s	Direct Flow	Residential
MH 92	-1980.737	5699289.004	Commercial	0.009	0	0	1	l/s	Direct Flow	Residential
MH 93	-2092.438	5699328.232	Commercial	0.028	0	0	1	l/s	Direct Flow	Residential
MH 94	-2187.524	5699361.825	Commercial	0.047	0	0	1	l/s	Direct Flow	Residential
MH 95	-2277.441	5699393.488	Commercial	0.042	0	0	1	l/s	Direct Flow	Residential
MH 96	-2351.326	5699419.294	Residential	0.031	0	0	1	l/s	Direct Flow	Residential
MH 97	-2389.308	5699432.342	Commercial	0.148	0	0	1	l/s	Direct Flow	Residential
MH 98	-2093.036	5699436.369	Commercial	0.1	0	0	1	l/s	Direct Flow	Residential
MH 99	-2007.954	5699403.184	Commercial	0.006	0	0	1	l/s	Direct Flow	Residential
MH 100	-1969.772	5699390.305	Commercial	0.006	0	0	1	l/s	Direct Flow	Residential
MH 101	-2209.099	5699000.489	Residential	0.012	0	0	1	l/s	Direct Flow	Residential
MH 102	-2592.554	5699159.717	Residential	0.019	0	0	1	l/s	Direct Flow	Residential
MH 103	-2628.049	5699159.298	Residential	0.297	0	0	1	l/s	Direct Flow	Residential
MH 104	-2627.849	5699004.468	Residential	0.062	0	0	1	l/s	Direct Flow	Residential
MH 105	-2633.669	5699003.74	Residential	0.062	0	0	1	l/s	Direct Flow	Residential
MH 106	-2724.103	5699159.638	Residential	0.031	0	0	1	l/s	Direct Flow	Residential
MH 107	-2723.669	5699100.222	Residential	0.285	0	0	1	l/s	Direct Flow	Residential
MH 108	-2785.917	5699159.122	Parkland	0	0	0	0	l/s	Direct Flow	0
MH 109	-2831.642	5699159.48	Parkland	0	0	0	0	l/s	Direct Flow	0
MH 110	-2949.522	5699158.921	Residential	0.174	0	0	1	l/s	Direct Flow	Residential
MH 111	-3040.391	5699140.628	Residential	0.198	0	0	1	l/s	Direct Flow	Residential
MH 112	-3058.86	5699183.412	Residential	0.019	0	0	1	l/s	Direct Flow	Residential
MH 113	-3076.469	5699222.838	Residential	0.105	0	0	1	l/s	Direct Flow	Residential
MH 114	-3089.594	5699300.143	Residential	0.043	0	0	1	l/s	Direct Flow	Residential
MH 115	-3089.057	5699444.126	Residential	0.112	0	0	1	l/s	Direct Flow	Residential
MH 116	-2918.326	5699248.499	Commercial	0.04	0	0	1	l/s	Direct Flow	Residential
MH 117	-2919.285	5699335.572	Parkland	0	0	0	0	l/s	Direct Flow	0
MH 118	-3005.65	5699335.546	Residential	0.031	0	0	1	l/s	Direct Flow	Residential
MH 119	-3006.071	5699402.782	Residential	0.093	0	0	1	l/s	Direct Flow	Residential
MH 120	-2918.68	5699402.771	Residential	0.043	0	0	1	l/s	Direct Flow	Residential
MH 121	-2863.906	5699402.951	Residential	0.037	0	0	1	l/s	Direct Flow	Residential
MH 122	-2832.273	5699402.737	Residential	0.093	0	0	1	l/s	Direct Flow	Residential
MH 123	-2832.085	5699249.292	Residential	0.031	0	0	1	l/s	Direct Flow	Residential
MH 124	-2831.977	5699093.094	Residential	0.05	0	0	1	l/s	Direct Flow	Residential
MH 125	-2831.713	5698960.496	Residential	0.099	0	0	1	l/s	Direct Flow	Residential
MH 126	-2723.956	5699253.14	Residential	0.037	0	0	1	l/s	Direct Flow	Residential
MH 127	-2724.12	5699328.592	Residential	0.056	0	0	1	l/s	Direct Flow	Residential
MH 128	-2724.082	5699403.733	Residential	0.062	0	0	1	l/s	Direct Flow	Residential
MH 129	-2723.995	5699445.688	Residential	0.019	0	0	1	l/s	Direct Flow	Residential
MH 130	-2627.717	5699402.923	Residential	0.105	0	0	1	l/s	Direct Flow	Residential
MH 131	-2627.83	5699327.137	Residential	0.068	0	0	1	l/s	Direct Flow	Residential
MH 132	-2628.267	5699253.839	Residential	0.037	0	0	1	l/s	Direct Flow	Residential
MH 133	-2291.837	5699481.247	Residential	0.05	0	0	1	l/s	Direct Flow	Residential
MH 134	-2192.47	5699482.037	Commercial	0.068	0	0	1	l/s	Direct Flow	Residential
MH 135	-2093.17	5699482.973	Commercial	0.137	0	0	1	l/s	Direct Flow	Residential
MH 136	-1994.635	5699483.61	Residential	0.062	0	0	1	l/s	Direct Flow	Residential
MH 137	-1894.806	5699484.491	Commercial	0.01	0	0	1	l/s	Direct Flow	Residential
MH 138	-1895.452	5699628.556	Residential	0.074	0	0	1	l/s	Direct Flow	Residential
MH 139	-1894.852	5699570.901	Residential	0.05	0	0	1	l/s	Direct Flow	Residential
MH 140	-1994.124	5699569.756	Residential	0.05	0	0	1	l/s	Direct Flow	Residential
MH 141	-1993.596	5699638.666	Commercial	0.126	0	0	1	l/s	Direct Flow	Residential
MH 142	-2094.236	5699655.686	Commercial	0.175	0	0	1	l/s	Direct Flow	Residential
MH 143	-2192.731	5699568.432	Residential	0.05	0	0	1	l/s	Direct Flow	Residential
MH 144	-2193.304	5699654.594	Commercial	0.137	0	0	1	l/s	Direct Flow	Residential
MH 145	-2194.049	5699740.893	Commercial	0.026	0	0	1	l/s	Direct Flow	Residential
MH 146	-2193.903	5699798.505	Commercial	0.091	0	0	1	l/s	Direct Flow	Residential
MH 147	-2292.047	5699534.393	Parkland	0	0	0	0	l/s	Direct Flow	0
MH 148	-2292.348	5699567.595	Residential	0.025	0	0	1	l/s	Direct Flow	Residential
MH 149	-2292.983	5699653.625	Residential	0.062	0	0	1	l/s	Direct Flow	Residential
MH 150	-2293.223	5699740.275	Residential	0.05	0	0	1	l/s	Direct Flow	Residential

Name	Node X	Node Y	Predominant Landuse (HDR)	Flow Rate (HDR) (L/s)	Area (HDR) (ha)	Density (HDR) (1/ha)	Peaking Factor (HDR)	Unit Type (HDR)	Dry Weather Flow Generation Method (HDR)	Temporal Variation (HDR) or non
MH 151	-2293.34	5699800.078	Residential	0.037	0	0	1	l/s	Direct Flow	Residential
MH 152	-2295.997	5699925.135	Residential	0.112	0	0	1	l/s	Direct Flow	Residential
MH 153	-2196.543	5699925.985	Residential	0.025	0	0	1	l/s	Direct Flow	Residential
MH 154	-2164.247	5699926.356	Residential	0.093	0	0	1	l/s	Direct Flow	Residential
MH 155	-2040.067	5699926.445	Residential	0.031	0	0	1	l/s	Direct Flow	Residential
MH 156	-2518.774	5699795.733	Residential	0.161	0	0	1	l/s	Direct Flow	Residential
MH 157	-2406.186	5699722.549	Residential	0.05	0	0	1	l/s	Direct Flow	Residential
MH 158	-2385.591	5699736.617	Residential	0.037	0	0	1	l/s	Direct Flow	Residential
MH 159	-2388.513	5699653.847	Residential	0.056	0	0	1	l/s	Direct Flow	Residential
MH 160	-2388.4	5699577.395	Residential	0.031	0	0	1	l/s	Direct Flow	Residential
MH 161	-1919.79	5699898.22	Residential	0.037	0	0	1	l/s	Direct Flow	Residential
MH 162	-2005.272	5699855.922	Commercial	0.014	0	0	1	l/s	Direct Flow	Residential
MH 163	-2091.642	5699827.728	Residential	0.025	0	0	1	l/s	Direct Flow	Residential
MH 164	-2195.838	5699827.76	Commercial	0.047	0	0	1	l/s	Direct Flow	Residential
MH 165	-2295.575	5699826.299	Residential	0.043	0	0	1	l/s	Direct Flow	Residential
MH 166	-2350.812	5699826.91	Residential	0.05	0	0	1	l/s	Direct Flow	Residential
MH 167	-1972.092	5700003.816	Commercial	0.186	0	0	1	l/s	Direct Flow	Residential
MH 168	-2028.9	5700109.612	Parkland	0	0	0	0	l/s	Direct Flow	0
MH 169	-2108.209	5700075.271	Residential	0.025	0	0	1	l/s	Direct Flow	Residential
MH 170	-2196.123	5700071.222	Commercial	0.032	0	0	1	l/s	Direct Flow	Residential
MH 171	-2297.016	5700169.078	Parkland	0	0	0	0	l/s	Direct Flow	0
MH 172	-2297.183	5700105.375	Residential	0.012	0	0	1	l/s	Direct Flow	Residential
MH 173	-2296.16	5700070.253	Residential	0.031	0	0	1	l/s	Direct Flow	Residential
MH 174	-2296.394	5700012.611	Residential	0.068	0	0	1	l/s	Direct Flow	Residential
MH 175	-2195.377	5700013.281	Residential	0.062	0	0	1	l/s	Direct Flow	Residential
MH 176	-2093.815	5700013.691	Residential	0.068	0	0	1	l/s	Direct Flow	Residential
MH 177	-2086.691	5700190.221	Parkland	0	0	0	0	l/s	Direct Flow	0
MH 178	-2512.014	5699490.427	Commercial	0.069	0	0	1	l/s	Direct Flow	Residential
MH 179	-2513.909	5699551.797	Residential	0.074	0	0	1	l/s	Direct Flow	Residential
MH 180	-2478.859	5699551.668	Residential	0.124	0	0	1	l/s	Direct Flow	Residential
MH 181	-2514.014	5699649.859	Residential	0.074	0	0	1	l/s	Direct Flow	Residential
MH 182	-2481.305	5699650.816	Residential	0.112	0	0	1	l/s	Direct Flow	Residential
MH 183	-2507.039	5699690.971	Residential	0.037	0	0	1	l/s	Direct Flow	Residential
MH 184	-2563.603	5699704.248	Residential	0.05	0	0	1	l/s	Direct Flow	Residential
MH 185	-2464.616	5699769.721	Residential	0.012	0	0	1	l/s	Direct Flow	Residential
MH 186	-2420.124	5699851.362	Residential	0.012	0	0	1	l/s	Direct Flow	Residential
MH 187	-2514.88	5699890.832	Residential	0.093	0	0	1	l/s	Direct Flow	Residential
MH 188	-2392.834	5699926.417	Residential	0.025	0	0	1	l/s	Direct Flow	Residential
MH 189	-2393.117	5699982.378	Residential	0.056	0	0	1	l/s	Direct Flow	Residential
MH 190	-2512.816	5699982.404	Residential	0.099	0	0	1	l/s	Direct Flow	Residential
MH 191	-2393.655	5700083.391	Residential	0.031	0	0	1	l/s	Direct Flow	Residential
MH 192	-2513.767	5700083.559	Residential	0.099	0	0	1	l/s	Direct Flow	Residential
MH 193	-2393.872	5700169.438	Parkland	0	0	0	0	l/s	Direct Flow	0
MH 194	-2457.01	5700169.286	Residential	0.019	0	0	1	l/s	Direct Flow	Residential
MH 195	-2519.415	5700169.359	Residential	0.025	0	0	1	l/s	Direct Flow	Residential
MH 196	-2559.201	5700169.534	Residential	0.019	0	0	1	l/s	Direct Flow	Residential
MH 197	-2519.758	5700229.135	Residential	0.05	0	0	1	l/s	Direct Flow	Residential
MH 198	-2394.477	5700273.771	Residential	0.019	0	0	1	l/s	Direct Flow	Residential
MH 199	-2393.566	5700319.974	Residential	0.019	0	0	1	l/s	Direct Flow	Residential
MH 200	-2512.717	5700320.196	Residential	0.118	0	0	1	l/s	Direct Flow	Residential
MH 201	-2393.491	5700351.952	Residential	0.019	0	0	1	l/s	Direct Flow	Residential
MH 202	-2266.266	5700405.322	Residential	268	0.886	40.5	1	l/day	Census-Based	Residential
MH 203	-2392.809	5700404.838	Parkland	0	0	0	0	l/s	Direct Flow	0
MH 204	-2512.536	5700405.281	Residential	0.105	0	0	1	l/s	Direct Flow	Residential
MH 205	-2394.366	5700499.223	Residential	0.112	0	0	1	l/s	Direct Flow	Residential
MH 206	-2471.463	5700498.983	Residential	0.062	0	0	1	l/s	Direct Flow	Residential
MH 207	-2548.421	5700499.097	Residential	0.087	0	0	1	l/s	Direct Flow	Residential
MH 208	-2275.296	5700498.602	Residential	0.012	0	0	1	l/s	Direct Flow	Residential
MH 209	-2154.686	5700498.998	Residential	268	1.299	40.5	1	l/day	Census-Based	Residential
MH 210	-2053.711	5700499.052	Residential	268	0.532	40.5	1	l/day	Census-Based	Residential
MH 211	-2090.606	5700593.735	Residential	268	0.48	40.5	1	l/day	Census-Based	Residential
MH 212	-2126.534	5700680.312	Parkland	0	0	0	0	l/s	Direct Flow	0
MH 213	-2106.984	5700689.98	Parkland	0	0	0	0	l/s	Direct Flow	0
MH 214	-2014.051	5700405.66	Residential	268	0.909	40.5	1	l/day	Census-Based	Residential
MH 215	-2003.954	5700284.53	Parkland	0	0	0	0	l/s	Direct Flow	0
MH 216	-2012.04	5700267.794	Parkland	0	0	0	0	l/s	Direct Flow	0
MH 217	-3088.906	5699524.207	Parkland	0	0	0	0	l/s	Direct Flow	0
MH 218	-3087.099	5699544.615	Parkland	0	0	0	0	l/s	Direct Flow	0
MH 219	-3087.496	5699642.262	Residential	0.05	0	0	1	l/s	Direct Flow	Residential
MH 220	-3032.642	5699773.524	Residential	0.167	0	0	1	l/s	Direct Flow	Residential
MH 221	-2973.2	5699843.495	Residential	0.074	0	0	1	l/s	Direct Flow	Residential
MH 222	-2904.146	5699770.524	Residential	0.192	0	0	1	l/s	Direct Flow	Residential
MH 223	-2844.575	5699663.527	Commercial	0.106	0	0	1	l/s	Direct Flow	Residential
MH 224	-2837.579	5699630.522	Residential	0.081	0	0	1	l/s	Direct Flow	Residential
MH 225	-2833.981	5699545.021	Residential	0.124	0	0	1	l/s	Direct Flow	Residential
MH 226	-2965.785	5699645.206	Residential	0.05	0	0	1	l/s	Direct Flow	Residential
MH 227	-2374.216	5699534.239	Residential	0.031	0	0	1	l/s	Direct Flow	Residential
MH 228	-2431.217	5699535.355	Residential	0.019	0	0	1	l/s	Direct Flow	Residential
MH 229	-1896.291	5699702.953	Commercial	0.087	0	0	1	l/s	Direct Flow	Residential
MH 230	-1832.507	5699811.032	Commercial	0.075	0	0	1	l/s	Direct Flow	Residential
MH 231	-2368.724	5698813.407	Parkland	0	0	0	0	l/s	Direct Flow	0
MH 232	-2435.442	5698836.325	Parkland	0	0	0	0	l/s	Direct Flow	0
MH 233	-2300.675	5698765.69	Industrial	0.119	0	0	1	l/s	Direct Flow	Residential
MH 234	-2441.456	5698790.802	Residential	0.2	0	0	1	l/s	Direct Flow	Residential
MH 235	-2448.972	5698755.857	Parkland	0	0	0	0	l/s	Direct Flow	0
MH 236	-2321.553	5698704.626	Parkland	0	0	0	0	l/s	Direct Flow	0
MH 237	-2406.489	5698706.167	Parkland	0	0	0	0	l/s	Direct Flow	0
MH 238	-2342.624	5698843.108	Parkland	0	0	0	0	l/s	Direct Flow	0
MH 239	-2209.526	5698892.188	Commercial	0.008	0	0	1	l/s	Direct Flow	Residential
MH 240	-2260.115	5698911.026	Parkland	0	0	0	0	l/s	Direct Flow	0
MH 241	-2553.179	5698669.551	Parkland	0	0	0	0	l/s	Direct Flow	0
MH 242	-2544.693	5698666.715	Parkland	0	0	0	0	l/s	Direct Flow	0
MH 243	-2544.906	5698671.879	Parkland	0	0	0	0	l/s	Direct Flow	0
MH 244	-2553.009	5698752.493	Parkland	0	0	0	0	l/s	Direct Flow	0
MH 245	-2512.28	5698865.135	Parkland	0	0	0	0	l/s	Direct Flow	0
MH 246	-2578.329	5698954.505	Residential	0.062	0	0	1	l/s	Direct Flow	Residential
MH 254	-2959.977	5699545.69	Residential	0.105	0	0	1	l/s	Direct Flow	Residential
MH 213A	-2035.61	5700719.531	Parkland	0	0	0	0	cfs	Direct Flow	0
MH 7A	-2228.862	5697482.878	Parkland	0	0	0	0	cfs	Direct Flow	0
MH 40A	-3354.21	5698485.847	Parkland	0	0	0	0	cfs	Direct Flow	0
MH 40B	-3353.777	5698477.976	Parkland	0	0	0	0	cfs	Direct Flow	0
MH 40D	-3081.964	5698922.02	Residential	268	38.51	40.5	2.336	l/day	Census-Based	Residential
N-ID-01	-2509.987	5698015.321	Industrial	0.1	15.76	0	3.185	l/s	Unit Flow Rate	Industrial
HAWKS LANDING										
N-HWL-259	-3313.853	5701032.706	Residential	268	1.196	40.5	1	l/day	Census-Based	Residential
N-HWL-260	-3184.633	5701036.498	Residential	268	0	40.5	1	l/day	Census-Based	Residential
N-HWL-261	-3314.195	5700951.839	Residential	268	1.241	40.5	1	l/day	Census-Based	Residential
N-HWL-262	-3152.869	5700948.186	Residential	268	0.624	40.5	1	l/day	Census-Based	Residential
N-HWL-263	-3167.761	5700989.806	Residential	0	0	0	1	l/day	Census-Based	0
N-HWL-264	-3112.421	5701010.588	Residential	268	0.794	40.5	1	l/day	Census-Based	Residential
N-HWL-266	-2932.176	5701005.269	Commercial	0.1	0.406	0	1	l/s	Unit Flow Rate	Commercial
N-HWL-267	-3022.766	5700873.132	Residential	268	0.985	40.5	1	l/day	Census-Based	Residential
N-HWL-268	-2980.119	5700754.361	Residential	268	0.477	40.5	1	l/day	Census-Based	Residential
N-HWL-269	-2889.089	5700797.164	Residential	268	0.482	40.5	1	l/day	Census-Based	Residential
N-HWL-270	-2923.744	5700930.66	Residential	268	0.661	40.5	1	l/day	Census-Based	Residential
N-HWL-271	-2827.106	5700931.377	Residential	268	0.628	40.5	1	l/day	Census-Based	Residential
N-HWL-272	-2801.977	5700836.874	Residential	268	0.995	40.5	1	l/day	Census-Based	Residential
N-HWL-273	-2789.681	5700801.961	Residential	0	0	0	1	l/day	Census-Based	0
N-HWL-274	-2777.172	5700795.122	Residential	0	0	0	1	l/day	Census-Based	0
N-HWL-275	-2771.316	5700804.398	Residential	0	0	0	1	l/day	Census-Based	0
N-HWL-276	-2771.395	5700836.869	Residential	268	0.284	40.5	1	l/day	Census-Based	Residential
N-HWL-278	-2627.338	5700712.999	Residential	268	0.411	40.5	1	l/day	Census-Based	Residential
N-HWL-279	-2627.827	5700652.844	Residential	268	0.306	40.5	1	l/day	Census-Based	Residential
N-HWL-280	-2627.434	5700602.609	Residential	268	0.489	40.5	1	l/day	Census-Based	Residential
N-HWL-281	-2635.645	5700506.842	Residential	268	0.451	40.5	1	l/day	Census-Based	Residential
N-HWL-282	-2708.8	5700532.709	Residential	268	0.843	40.5	1	l/day	Census-Based	Residential
N-HWL-283	-2815.404	5700624.831	Residential	268	0.346	40.5	1	l/day	Census-Based	Residential
N-HWL-284	-2741.387	5700685.568	Residential	268	0.878	40.5	1	l/day	Census-Based	Residential
N-HWL-286	-2856.273	5700706.012	Residential	268	0.271	40.5	1	l/day	Census-Based	Residential
N-HWL-287	-2941.536	5700658.878	Residential	268	0.611	40.5	1	l/day	Census-Based	Residential
N-HWL-288	-3032.535	5700615.039	Residential	0	0	0	1	l/day	Census-Based	0
N-HWL-289	-3087.119	5700765.808	Residential	268	1.16	40.5	1	l/day	Census-Based	Residential
N-HWL-290	-3118.193	5700852.085	Residential	268	0	40.5	0	l/day	Census-Based	Residential
N-HWL-291	-3241.814	5700852.504	Residential	268	0	40.5	0	l/day	Census-Based	Residential
N-HWL-292	-3345.805	5700852.42	Residential	268	1.508	40.5	1	l/day	Census-Based	Residential
N-HWL-293	-3313.813	5700765.888	Residential	268	1.39	40.5	1	l/day	Census-Based	Residential
N-HWL-294	-3185.847	5700765.751	Residential	268	0	40.5	0	l/day	Census-Based	Residential
N-HWL-295	-3313.842	5700677.595	Residential	268	1.704	40.5	1	l/day	Census-Based	Residential
N-HWL-296	-3162.013	5700681.352	Residential	268	0	40.5	0	l/day	Census-Based	Residential
N-HWL-297	-3157.151	5700586.274	Residential	0	0	0	1	l/day	Census-Based	0
N-HWL-298	-3313.968	5700495.14	Residential	268	1.273	40.5	1	l/day	Census-Based	Residential
N-HWL-299	-3148.207	5700495.329	Residential	268	0.235	40.5	1	l/day	Census-Based	Residential
N-HWL-300	-3313.925	5700410.902	Residential	268	0.654	40.5	1	l/day	Census-Based	Residential
N-HWL-301	-3146.819	5700411.711	Residential	268	0.246	40.5	1	l/day	Census-Based	Residential
N-HWL-302	-3313.896	5700322.726	Residential	268	1.111	40.5	1	l/day	Census-Based	Residential
N-HWL-303	-3172.956	5700322.87	Residential	268	0.668	40.5	1	l/day	Census-Based	Residential
N-HWL-304	-3175.115	5700283.269	Parkland	0	0	0	0	cfs	Direct Flow	0
N-HWL-305	-3056.606	5700411.418	Residential	268	0.659	40.5	1	l/day	Census-Based	Residential
N-HWL-306	-2949.897	5700411.616	Residential	268	0.339	40.5	1	l/day	Census-Based	Residential
N-HWL-307	-3075.902	5700332.78	Residential	268	1.407	40.5	1	l/day	Census-Based	Residential
N-HWL-308	-2918.047	5700323.505	Residential	268	0.515	40.5	1	l/day	Census-Based	Residential
N-HWL-309	-2815.453	5700323.769	Residential	268	0.821	40.5	1	l/day	Census-Based	Residential
N-HWL-310	-2828.89	5700360.924	Residential	268	0.261	40.5	1	l/day	Census-Based	Residential
N-HWL-311	-2731.95	5700323.774	Residential	268	0	40.5	1	l/day	Census-Based	Residential
N-HWL-312	-2637.828	5700323.765	Residential	268	0.946	40.5	1	l/day	Census-Based	Residential
N-HWL-313	-2731.991	5700344.304	Residential	268	0.428	40.5	1	l/day	Census-Based	Residential
N-HWL-314	-2633.564	5700408.794	Residential	268	0.932	40.5	1	l/day	Census-Based	Residential
N-HWL-315	-2763.976	5700453.037	Residential	268	0.468	40.5	1	l/day	Census-Based	Residential
N-HWL-316	-2844.032	5700506.533	Residential	268	1.279	40.5	1	l/day	Census-Based	Residential
N-HWL-317	-2898.681	5700579.052	Residential	268	0	40.5	1	l/day	Census-Based	Residential
N-HWL-319	-3067.282	5700995.527	Residential	268	0.739	40.5	1	l/day	Census-Based	Residential
N-HWL-320	-2627.478	5700836.838	Residential	268	1.36	40.5	1	l/day	Census-Based	Residential
N-HWL-285	-3348.028	5700583.476	Residential	268	1.658	40.5	1	l/day	Census-Based	Residential
N-HWL-377	-3149.537	5701084.425	Parkland	0	0	0	0	cfs	Direct Flow	0

Name	Node X	Node Y	Predominant Landuse (HDR)	Flow Rate (HDR) (L/s)	Area (HDR) (ha)	Density (HDR) (1/ha)	Peaking Factor (HDR)	Unit Type (HDR)	Dry Weather Flow Generation Method (HDR)	Temporal Variation (HDR) or non
N-HWL-378	-2933.944	5701083.935	Parkland	0	0	0	0	cfs	Direct Flow	0
N-HWL-379	-2574.044	5701082.104	Parkland	0	0	0	0	cfs	Direct Flow	0
N-HWL-379.1	-2254.099	5701084.411	Parkland	0	0	0	0	cfs	Direct Flow	0
VISTA CROSSING										
N-VST-322	-3181.103	5700229.451	Residential	268	1.464	40.5	1	l/day	Census-Based	Residential
N-VST-323	-3087.061	5700235.112	Residential	268	1.014	40.5	1	l/day	Census-Based	Residential
N-VST-324	-2905.103	5700235.112	Residential	268	0.89	40.5	1	l/day	Census-Based	Residential
N-VST-325	-3087.061	5700119.467	Residential	268	0.531	40.5	1	l/day	Census-Based	Residential
N-VST-326	-3181.103	5700121.085	Residential	268	0.452	40.5	1	l/day	Census-Based	Residential
N-VST-327	-3280.978	5700121.085	Residential	268	0	40.5	0	l/day	Census-Based	Residential
N-VST-328	-3296.748	5700110.167	Residential	268	0.742	40.5	1	l/day	Census-Based	Residential
N-VST-329	-3315.753	5699967.835	Residential	268	1.175	40.5	1	l/day	Census-Based	Residential
N-VST-330	-3314.944	5699821.46	Residential	268	0.742	40.5	1	l/day	Census-Based	Residential
N-VST-331	-3232.052	5699820.247	Residential	268	0.364	40.5	1	l/day	Census-Based	Residential
N-VST-332	-3265.209	5699730.48	Residential	268	0.426	40.5	1	l/day	Census-Based	Residential
N-VST-332.1	-3224.11	5699730.48	Residential	268	0.635	40.5	1	l/day	Census-Based	Residential
N-VST-333	-3373.809	5699729.959	Residential	268	0	40.5	0	l/day	Census-Based	Residential
N-VST-334	-3171.803	5699730.48	Residential	268	0	40.5	0	l/day	Census-Based	Residential
N-VST-335	-3185.147	5699641.927	Residential	268	4.526	40.5	1	l/day	Census-Based	Residential
N-VST-336	-3078.802	5699812.564	Residential	268	0.826	40.5	1	l/day	Census-Based	Residential
N-VST-337	-3106.298	5699835.208	Residential	268	0.397	40.5	1	l/day	Census-Based	Residential
N-VST-338	-3161.694	5699878.437	Residential	268	0.326	40.5	1	l/day	Census-Based	Residential
N-VST-339	-3222.347	5699888.582	Residential	268	0.469	40.5	1	l/day	Census-Based	Residential
N-VST-340	-3221.943	5699968.644	Residential	268	0	40.5	0	l/day	Census-Based	Residential
N-VST-341	-3221.943	5700029.701	Residential	268	0.492	40.5	1	l/day	Census-Based	Residential
N-VST-342	-3164.929	5700029.701	Residential	268	0.255	40.5	1	l/day	Census-Based	Residential
N-VST-343	-3116.003	5700000.588	Residential	268	0.386	40.5	1	l/day	Census-Based	Residential
N-VST-344	-3135.007	5699983.605	Residential	268	0	40.5	0	l/day	Census-Based	Residential
N-VST-344.1	-3105.938	5699955.538	Residential	268	0	40.5	0	l/day	Census-Based	Residential
N-VST-345	-3064.245	5699919.717	Residential	268	0.404	40.5	1	l/day	Census-Based	Residential
N-VST-346	-2898.228	5699938.411	Residential	268	0	40.5	0	l/day	Census-Based	Residential
N-VST-347	-2903.866	5700130.497	Residential	268	0.518	40.5	1	l/day	Census-Based	Residential
N-VST-348	-2724.468	5700131.91	Residential	268	1.017	40.5	1	l/day	Census-Based	Residential
N-VST-349	-2722.015	5700237.489	Residential	268	0.654	40.5	1	l/day	Census-Based	Residential
N-VST-350	-2631.972	5700236.783	Residential	268	1.062	40.5	1	l/day	Census-Based	Residential
N-VST-351	-2632.678	5700170.752	Residential	268	0.901	40.5	1	l/day	Census-Based	Residential
N-VST-352	-2724.468	5700044.339	Residential	268	0.248	40.5	1	l/day	Census-Based	Residential
N-VST-353	-2803.211	5700045.398	Residential	268	0.605	40.5	1	l/day	Census-Based	Residential
N-VST-354	-2794.031	5699990.313	Residential	268	0.411	40.5	1	l/day	Census-Based	Residential
N-VST-355	-2767.901	5699963.83	Residential	268	0	40.5	0	l/day	Census-Based	Residential
N-VST-356	-2755.895	5699962.771	Residential	268	0.654	40.5	1	l/day	Census-Based	Residential
N-VST-357	-2631.972	5699986.782	Residential	268	0	40.5	0	l/day	Census-Based	Residential
N-VST-358	-2632.653	5699895.569	Residential	268	1.536	40.5	1	l/day	Census-Based	Residential
N-VST-359	-2633.013	5699808.109	Residential	268	0.434	40.5	1	l/day	Census-Based	Residential
N-VST-360	-2726.234	5699769.267	Residential	268	0.227	40.5	1	l/day	Census-Based	Residential
N-VST-361	-2774.61	5699838.477	Residential	268	0.951	40.5	1	l/day	Census-Based	Residential
N-VST-361.1	-2838.074	5699902.291	Residential	268	0.452	40.5	1	l/day	Census-Based	Residential
N-VST-362	-2697.468	5699726.87	Residential	268	0	40.5	0	l/day	Census-Based	Residential
N-VST-363	-2644.183	5699725.068	Residential	268	0.398	40.5	1	l/day	Census-Based	Residential
N-VST-364	-2650.361	5699704.217	Residential	268	0	40.5	0	l/day	Census-Based	Residential
N-VST-365	-2998.781	5700128.723	Residential	268	0.481	40.5	1	l/day	Census-Based	Residential
N-VST-366	-3000.439	5700145.306	Residential	268	0.472	40.5	1	l/day	Census-Based	Residential
N-VST-367	-3224.722	5699857.593	Parkland	268	0	40.5	0	l/day	Census-Based	Residential
N-VST-371	-3027.962	5699971.088	Residential	268	1.096	40.5	1	l/day	Census-Based	Residential
N-VST-402	-2984.48	5699852.702	Residential	268	0.273	40.5	1	l/day	Census-Based	Residential
N-VST-404	-2890.546	5699962.257	Residential	268	0.812	40.5	1	l/day	Census-Based	Residential
NEW ANNEXATION AREA										
N-2335-JK	-1897.606	5700987.514	Commercial	0.1	34.919	0	3.177	l/s	Unit Flow Rate	Commercial
N-ANN-100	-1232.242	5701855.211	Parkland	0	0	0	0	cfs	Direct Flow	0
N-ANN-101	-1223.512	5701874.313	Industrial	0	0	0	1	l/s	Unit Flow Rate	0
N-ANN-101.1	-1262.438	5701856.203	Industrial	0.1	54.9	0	2.944	l/s	Unit Flow Rate	Industrial
N-ANN-102	-1803.67	5701873.508	Residential	268	54.9	40.5	1.571	l/day	Census-Based	Residential
N-ANN-103	-2568.534	5701874.056	Residential	268	61.1	40.5	1.571	l/day	Census-Based	Residential
N-ANN-104	-3390.33	5701873.602	Residential	268	64.4	40.5	1.571	l/day	Census-Based	Residential
N-ANN-107	-4189.777	5701872.543	Residential	268	64.1	40.5	1.571	l/day	Census-Based	Residential
N-ANN-108	-4194.778	5701095.368	Residential	268	46.52	40.5	1.571	l/day	Census-Based	Residential
N-ANN-108.1	-4207.509	5700495.856	Parkland	0	0	0	0	cfs	Direct Flow	0
N-ANN-109	-3896.568	5700325.517	Parkland	0	0	0	0	cfs	Direct Flow	0
N-ANN-110	-3559.669	5700275.838	Residential	268	32.85	40.5	1.571	l/day	Census-Based	Residential
N-ANN-111	-3456.657	5698753.189	Residential	268	47.28	40.5	1.571	l/day	Census-Based	Residential
N-ANN-112	-3376.238	5698578.023	Parkland	0	0	0	0	cfs	Direct Flow	0
N-ANN-113	-3376.586	5698502.844	Parkland	0	0	0	0	cfs	Direct Flow	0
N-ANN-114	-3376.238	5698747.161	Parkland	0	0	0	0	cfs	Direct Flow	0
N-ANN-114.1	-3376.238	5698664.283	Parkland	0	0	0	0	cfs	Direct Flow	0
N-ANN-115	-3375.889	5698875.147	Parkland	0	0	0	0	cfs	Direct Flow	0
N-ANN-116	-3375.889	5699050.562	Parkland	0	0	0	0	cfs	Direct Flow	0
N-ANN-117	-3375.891	5699225.279	Parkland	0	0	0	0	cfs	Direct Flow	0
N-ANN-118	-3375.889	5699400.694	Parkland	0	0	0	0	cfs	Direct Flow	0
N-ANN-119	-3375.6	5699550.654	Parkland	0	0	0	0	cfs	Direct Flow	0
N-ANN-120	-4566.926	5700118.667	Residential	268	89.07	40.5	1.571	l/day	Census-Based	Residential
N-ANN-120.1	-4056.508	5699501.366	Residential	268	36.91	40.5	1.571	l/day	Census-Based	Residential
N-ANN-121	-3375.398	5701085.989	Residential	268	46.52	40.5	1	l/day	Census-Based	Residential
N-ANN-122	-4242.444	5697878.621	Residential	268	64.8	40.5	1.571	l/day	Census-Based	Residential
N-ANN-123	-3375.617	5698191.237	Residential	268	64.9	40.5	1.571	l/day	Census-Based	Residential
N-ANN-127	-4270.516	5698672.254	Residential	268	85.49	40.5	1.571	l/day	Census-Based	Residential
N-ANN-476	-1806.482	5701087.47	Parkland	0	0	0	0	cfs	Direct Flow	0
N-UR-01	-4650.236	5697048.798	Parkland	0	0	0	0	cfs	Direct Flow	0
N-UR-02	-4317.258	5697746.434	Parkland	0	0	0	0	cfs	Direct Flow	0
IRON LANDING										
N-IL-379	-2432.133	5701083.235	Residential	268	0.589	40.5	1	l/day	Census-Based	Residential
N-IL-489	-2515.519	5700591.263	Residential	268	0.922	40.5	1	l/day	Census-Based	Residential
N-IL-490	-2418.568	5700593.075	Residential	268	1.009	40.5	1	l/day	Census-Based	Residential
N-IL-491	-2251.849	5700593.075	Residential	268	1.018	40.5	1	l/day	Census-Based	Residential
N-IL-492	-2520.092	5700677.734	Residential	268	0.947	40.5	1	l/day	Census-Based	Residential
N-IL-493	-2432.704	5700677.139	Residential	268	2.401	40.5	1	l/day	Census-Based	Residential
N-IL-494	-2253.765	5700677.139	Residential	268	0.79	40.5	1	l/day	Census-Based	Residential
N-IL-495	-2521.876	5700828.732	Residential	268	0.955	40.5	1	l/day	Census-Based	Residential
N-IL-496	-2430.326	5700829.327	Residential	268	0.484	40.5	1	l/day	Census-Based	Residential
N-IL-497	-2429.137	5700986.27	Residential	268	1.415	40.5	1	l/day	Census-Based	Residential
N-IL-498	-2518.903	5700985.675	Residential	268	0.944	40.5	1	l/day	Census-Based	Residential
N-IL-499	-2186.588	5700818.626	Residential	268	1.256	40.5	1	l/day	Census-Based	Residential
N-IL-500	-2255.548	5700986.865	Residential	268	0.591	40.5	1	l/day	Census-Based	Residential
N-IL-501	-2210.962	5701001.726	Residential	268	0.59	40.5	1	l/day	Census-Based	Residential
N-IL-502	-2392.316	5700830.516	Residential	268	0.36	40.5	1	l/day	Census-Based	Residential
N-IL-506	-2144.546	5700402.881	Residential	268	1.403	40.5	1	l/day	Census-Based	Residential
N-IL-509	-2575.135	5700985.286	Parkland	0	0	0	0	cfs	Direct Flow	0
JASP AREA										
N-JASP-1	-1710.567	5695076.126	Industrial	0	0	0	1	l/s	Census-Based	0
N-JASP-1-1	-1716.05	5695048.756	Industrial	0.1	116.8	0	1.942	l/s	Unit Flow Rate	Industrial
N-JASP-2	-1677.753	5695085.91	Industrial	0	0	0	1.942	l/day	Census-Based	0
N-JASP-3	-628.975	5695436.603	Parkland	0	0	0	0	cfs	Direct Flow	0
N-JASP-4	-1729.229	5695944.333	Industrial	0.1	125.8	0	1.942	l/s	Unit Flow Rate	Industrial
N-JASP-5	-1683.863	5696239	Industrial	0.1	79.67	0	1.942	l/s	Unit Flow Rate	Industrial
N-JASP-6	-2386.233	5696237.728	Industrial	0.1	75.3	0	1.942	l/s	Unit Flow Rate	Industrial
N-JASP-7	-2394.403	5697035.242	Industrial	0	0	0	1.942	l/day	Census-Based	0
N-JASP-7-1	-2276.331	5696916.278	Industrial	0.1	63.1	0	1.942	l/s	Unit Flow Rate	Industrial
N-JASP-8	-2415.455	5697089.425	Parkland	0	0	0	0	cfs	Direct Flow	0
N-JASP-8.1	-2658.443	5697361.107	Industrial	0	0	0	1.942	l/day	Census-Based	0
N-JASP-8.2	-2813.01	5697517.165	Parkland	0	0	0	0	cfs	Direct Flow	0
N-JASP-8.3	-3350.052	5698463.981	Parkland	0	0	0	0	cfs	Direct Flow	0
N-JASP-8.4	-3352.234	5698474.3	Parkland	0	0	0	0	cfs	Direct Flow	0
N-JASP-9	-787.474	5697023.688	Industrial	0.1	101.01	0	1.942	l/s	Unit Flow Rate	Industrial
N-JASP-10	-932.669	5698418.166	Industrial	0.1	62.84	0	1.942	l/s	Unit Flow Rate	Industrial
N-JASP-11	-1737.734	5699081.932	Industrial	0.1	184.76	0	1.942	l/s	Unit Flow Rate	Industrial
N-JASP-12	-1851.084	5699080.478	Parkland	0	0	0	0	cfs	Direct Flow	0
N-JASP-13	-299.027	5699868.745	Commercial	0.1	137.85	0	1.942	l/s	Unit Flow Rate	Commercial
N-JASP-14	-932.248	5701077.777	Industrial	0.1	99.56	0	1.942	l/s	Unit Flow Rate	Industrial
N-JASP-15	-1543.975	5701080.695	Parkland	0	0	0	0	cfs	Direct Flow	0
N-JASP-16	-1573.509	5701101.951	Parkland	0	0	0	0	cfs	Direct Flow	0

NODE / MANHOLE RESULTS

Name	Node X	Node Y	Max Water Elevation (m)	Node Average Inflow Rate (m^3/s)	Node Average Outflow Rate (m^3/s)	Max Water Depth (m)	Freeboard (m)	Surcharge at Max HGL (m)	Duration of Surcharge (minutes)	Flood Loss (m^3)	Duration of Flooding (minutes)	Volume of Inflow from Runoff Layer (m^3)	Volume of Constant Inflow (m^3)	Volume of DWF Inflow (m^3)	Continuity Error Volume (% of Inflow)	Continuity Error Volume (% of Node)
EXISTING TOWN																
MH 1	-1831.947	5697327.827	1109.183	0.001	0.000	0.021	2.820	0.000	0.0	0	0	0	0	9.07	0.00	0.02
MH 1A	-1606.743	5697338.511	1111.767	0.016	0.000	0.804	2.470	0.554	96.3	0	0	357.17	0	3866.71	0.01	0.12
MH 1A-1	-1597.266	5697846.444	1109.776	0.000	0.000	2.404	2.060	2.094	294.7	0	0	0	0	0.00	0.00	-0.01
MH 1A-2	-1714.314	5697848.457	1109.353	0.000	0.000	2.476	0.630	2.196	322.1	0	0	0	0	0.00	0.00	0.00
MH 1A-3	-1791.481	5697845.765	1109.081	0.000	0.000	2.684	1.920	2.404	358.7	0	0	0	0	0.00	0.00	0.00
MH 2	-1903.922	5697327.903	1107.799	0.001	0.000	0.037	2.790	0.000	0.0	0	0	0	0	8.29	0.00	0.00
MH 3	-2021.995	5697327.894	1105.654	0.001	0.000	0.050	3.300	0.000	0.0	0	0	0	0	9.85	0.00	0.01
MH 4	-2145.749	5697327.935	1104.503	0.002	0.000	0.064	2.500	0.000	0.0	0	0	0	0	16.32	0.00	0.00
MH 5	-2202.803	5697366.350	1103.971	0.001	0.000	0.064	2.320	0.000	0.0	0	0	0	0	7.51	0.00	-0.01
MH 6	-2217.026	5697432.311	1103.385	0.000	0.000	0.067	2.750	0.000	0.0	0	0	0	0	4.66	0.00	0.00
MH 7	-2201.881	5697475.121	1103.460	0.000	0.000	1.560	2.540	0.272	0.6	0	0	0	0	0.00	0.01	-0.19
MH 8	-2166.724	5697574.239	1103.437	0.000	0.000	0.082	2.570	0.000	0.0	0	0	0	0	3.63	0.00	0.02
MH 9	-2134.680	5697667.742	1103.813	0.001	0.000	0.081	3.290	0.000	0.0	0	0	0	0	5.70	0.00	0.04
MH 10	-2078.389	5697708.388	1105.199	0.001	0.000	0.058	2.860	0.000	0.0	0	0	0	0	6.48	0.00	0.01
MH 11	-1993.504	5697707.893	1106.869	0.000	0.000	0.053	3.010	0.000	0.0	0	0	0	0	4.40	0.00	0.09
MH 12	-1903.268	5697467.686	1108.422	0.000	0.000	0.066	2.930	0.000	0.0	0	0	0	0	2.33	0.00	0.02
MH 13	-1903.416	5697569.547	1108.983	0.001	0.000	0.031	3.020	0.000	0.0	0	0	0	0	10.62	0.00	-0.01
MH 14	-1903.320	5697707.460	1108.674	0.000	0.000	2.198	2.970	0.000	0.0	0	0	0	0	3.11	0.00	-0.05
MH 15	-1903.465	5697789.043	1108.660	0.000	0.000	2.480	2.280	2.170	356.5	0	0	0	0	1.81	0.00	-0.02
MH 16	-1903.737	5697841.025	1108.651	0.001	0.000	2.578	1.890	2.328	380.0	0	0	0	0	272.82	0.00	-0.01
MH 17	-1903.667	5697865.291	1108.512	0.001	0.000	2.602	1.670	2.292	383.5	0	0	0	0	13.47	0.00	0.03
MH 18	-1903.425	5697989.625	1107.746	0.003	0.000	2.467	1.020	2.157	398.6	0	0	0	0	500.57	0.00	0.00
MH 19	-1902.843	5698110.038	1106.872	0.000	0.000	3.229	0.110	2.929	1132.1	0	0	0	0	0.00	0.00	-0.01
MH 20	-1903.114	5698166.301	1106.476	0.001	0.000	3.082	0.050	2.832	1425.9	0	0	0	0	9.59	0.00	0.01
MH 21	-1902.958	5698230.241	1106.000	0.001	0.000	2.838	0.000	2.528	1368.0	94.021	193.6	0	0	7.00	0.00	-0.01
MH 22	-1902.982	5698316.502	1105.587	0.001	0.000	2.794	0.360	2.544	2243.9	0	0	0	0	6.48	0.00	0.03
N-ID-01	-2509.987	5698015.321	1102.707	0.005	0.000	0.848	2.310	0.648	179.8	0	0	101.65	0	1300.53	0.01	0.31
MH 23	-1903.522	5698470.132	1104.818	0.000	0.000	2.430	0.910	2.120	1319.0	0	0	0	0	9.59	0.00	0.01
MH 24	-1776.601	5698589.225	1104.200	0.000	0.000	1.579	1.800	1.329	351.3	0	0	0	0	9.85	0.00	-0.26
MH 25	-1902.997	5698588.800	1104.200	0.001	0.000	2.245	1.800	1.895	1412.8	0	0	0	0	16.06	0.00	-0.01
MH 26	-2010.302	5698589.291	1103.604	0.000	0.000	2.024	2.070	1.704	2005.9	0	0	0	0	2.33	0.00	0.00
MH 27	-2052.864	5698589.919	1103.364	0.000	0.000	1.820	2.540	1.520	372.0	0	0	0	0	1.30	0.00	0.00
MH 28	-2120.362	5698613.393	1102.959	0.000	0.000	2.164	2.560	1.864	416.0	0	0	0	0	7.77	0.00	0.03
MH 29	-2239.356	5698580.954	1102.690	0.000	0.000	2.185	2.250	1.795	396.6	0	0	0	0	2.07	0.00	-0.02
MH 30	-2292.636	5698557.650	1102.600	0.000	0.000	2.206	2.400	1.906	411.9	0	0	0	0	3.11	0.00	0.01
MH 31	-2397.545	5698514.096	1102.421	0.000	0.000	2.406	2.370	2.056	425.1	0	0	0	0	4.92	0.00	0.00
MH 32	-2517.623	5698503.179	1102.134	0.000	0.000	2.376	2.760	2.026	425.6	0	0	0	0	1.81	0.00	-0.01
MH 33	-2553.570	5698501.429	1102.004	0.001	0.000	2.899	2.580	1.968	417.5	0	0	0	0	6.22	0.01	-0.01
MH 34	-2731.329	5698494.586	1101.224	0.001	0.000	2.333	3.780	1.733	1081.4	0	0	0	0	5.96	0.00	0.00
MH 35	-2890.323	5698512.379	1100.512	0.000	0.000	1.814	4.490	1.214	792.9	0	0	0	0	3.89	0.00	0.00
MH 36	-3069.329	5698513.253	1099.704	0.001	0.000	1.237	5.300	0.621	412.4	0	0	0	0	31.87	0.00	0.00
MH 37	-3248.726	5698506.740	1098.881	0.000	0.000	0.614	3.680	0.014	133.0	0	0	0	0	1.81	0.00	0.00
MH 38	-3282.271	5698505.608	1098.716	0.000	0.000	0.537	3.270	0.000	0.0	0	0	0	0	4.40	0.00	0.00
MH 39	-3294.460	5698505.000	1098.534	0.000	0.000	0.421	3.010	0.000	0.0	0	0	0	0	1.81	0.00	0.00
MH 40	-3354.345	5698503.068	1097.794	0.000	0.000	1.216	1.580	0.000	0.0	0	0	0	0	0.00	0.00	0.00
MH 40A	-3354.210	5698485.847	1097.276	0.000	0.000	0.821	2.290	0.221	1430.8	0	0	0	0	0.00	0.00	0.00
MH 40B	-3353.777	5698477.976	1097.039	0.000	0.546	0.600	2.960	0.000	0.0	0	0	0	0	0.00	0.00	0.00
MH 40D	-3081.964	5698922.020	1105.335	0.012	0.000	0.138	3.200	0.000	0.0	0	0	219.36	0	2928.04	0.01	0.11
MH 41	-2377.797	5698445.494	1102.625	0.000	0.000	1.937	2.380	1.687	346.2	0	0	0	0	0.00	0.00	-0.01
MH 42	-2354.544	5698378.949	1102.640	0.000	0.000	1.520	3.210	1.210	272.0	0	0	0	0	3.89	0.00	-0.01
MH 43	-2277.978	5698411.068	1102.655	0.000	0.000	0.859	3.340	0.609	210.4	0	0	0	0	3.89	0.00	0.03
MH 44	-2194.775	5698475.143	1102.672	0.000	0.000	1.353	2.330	1.013	294.6	0	0	0	0	1.04	0.00	-0.08
MH 45	-2133.585	5698717.268	1103.427	0.000	0.000	2.792	1.780	0.805	185.8	0	0	0	0	1.81	0.00	0.16
MH 46	-2204.707	5698722.958	1103.430	0.000	0.000	1.383	1.270	0.681	164.7	0	0	0	0	5.70	0.00	0.08
MH 47	-2226.688	5698722.590	1103.429	0.000	0.000	1.221	1.220	0.638	160.5	0	0	0	0	1.30	0.00	0.41
MH 48	-2331.791	5698889.767	1104.072	0.000	0.000	0.010	1.930	0.000	0.0	0	0	0	0	14.51	0.00	0.02
MH 49	-2292.108	5698876.107	1102.762	0.000	0.000	0.048	3.240	0.000	0.0	0	0	0	0	0.00	0.00	0.02
MH 50	-2247.562	5698860.452	1103.090	0.000	0.000	0.016	2.910	0.000	0.0	0	0	0	0	22.54	0.00	0.04
MH 51	-2089.909	5698702.490	1103.424	0.000	0.000	1.864	1.890	1.127	220.5	0	0	0	0	1.55	0.03	0.06
MH 52	-2082.341	5698727.250	1103.527	0.000	0.000	1.760	1.740	1.235	227.8	0	0	0	0	0.00	0.00	0.00
MH 53	-2043.574	5698834.230	1103.978	0.000	0.000	1.477	2.020	0.952	193.2	0	0	0	0	8.81	0.00	0.00
MH 54	-2027.885	5698883.530	1104.184	0.000	0.000	1.372	2.210	0.505	146.9	0	0	0	0	1.30	0.00	0.00
MH 55	-1993.513	5698977.626	1104.585	0.000	0.000	0.852	3.100	0.000	0.0	0	0	0	0	32.65	0.00	0.00
MH 56	-1960.741	5699070.958	1104.981	0.000	0.000	1.020	3.490	0.000	0.0	0	0	0	0	4.66	0.00	0.01
MH 56A	-1868.437	5699039.970	1105.219	0.000	0.000	0.701	1.780	0.011	20.2	0	0	0	0	0.00	0.00	0.01
MH 57	-1927.634	5699165.086	1104.986	0.000	0.000	0.670	3.330	0.000	0.0	0	0	0	0	4.66	0.00	0.00
MH 58	-1894.562	5699259.095	1104.989	0.000	0.000	0.254	3.010	0.000	0.0	0	0	0	0	3.89	0.00	0.00
MH 59	-1861.572	5699352.784	1105.105	0.000	0.000	0.082	3.610	0.000	0.0	0	0	0	0	5.44	0.00	0.01
MH 60	-1816.909	5699484.600	1105.701	0.000	0.000	0.068	4.240	0.000	0.0	0	0	0	0	11.14	0.00	0.02
MH 61	-1784.756	5699570.717	1105.885	0.000	0.000	0.017	4.110	0.000	0.0	0	0	0	0	2.33	0.00	0.03
MH 62	-1764.732	5699628.225	1106.088	0.000	0.000	0.016	3.550	0.000	0.0	0	0	0	0	17.36	0.00	0.10
MH 63	-2151.719	5698927.515	1104.643	0.000	0.000	0.045	3.060	0.000	0.0	0	0	0	0	7.51	0.00	0.08
MH 64	-2192.043	5698941.573	1104.202	0.000	0.000	0.079	3.500	0.000	0.0	0	0	0	0	1.55	0.00	0.02
MH 65	-2226.015	5698953.274	1104.257	0.000	0.000	0.096	3.740	0.000	0.0	0	0	0	0	0.00	0.00	0.04
MH 66	-2287.831	5698975.406	1104.617	0.000	0.000	0.019	4.380	0.000	0.0	0	0	0	0	11.14	0.00	0.04
MH 67	-2350.874	5698997.475	1105.016	0.000	0.000	0.013	3.960	0.000	0.0	0	0	0	0	11.14	0.00	0.06
MH 68	-2365.616	5699011.573	1106.414	0.000	0.000	0.020	2.580	0.000	0.0	0	0	0	0	17.62	0.00	0.06
MH 69	-2449.074	5699040.424	1105.922	0.000	0.000	0.022	3.080	0.000	0.0	0	0	0	0	9.59	0.00	-0.04
MH 70	-2512.071	5698933.051	1104.397	0.000	0.000	0.155	1.780	0.000	0.0	0	0	0	0	10.88	0.00	0.00
MH 71	-2512.364	5698985.988	1104.643	0.000	0.000	0.069	3.260	0.000	0.0	0	0	0	0	5.70	0.00	0.00
MH 72	-2512.434	5699062.217	1105.554	0.000	0.000	0.057	3.400	0.000	0.0	0	0	0	0	8.03	0.00	0.00
MH 73	-2512.728	5699159.487	1106.446	0.000	0.000	0.060	3.550	0.000	0.0	0	0	0	0	8.03	0.00	0.01
MH 74	-2422.159	5699128.021	1107.029	0.000	0.000	0.017	2.970	0.000	0.0	0	0	0	0	14.51	0.00	0.09
MH 75	-2341.686	5699100.233	1106.703	0.000	0.000	0.027	3.300	0.000	0.0	0	0	0	0	24.10	0.00	0.06
MH 76	-2284.781	5699080.396	1106.574	0.000	0.000	0.018	3.430	0.000	0.0	0	0	0	0	19.17	0.00	0.02
MH 77	-2192.335	5699047.474	1104.828	0.000	0.000	0.044	4.170	0.000	0.0	0	0	0	0	6.48	0.00	0.00
MH 78	-2159.229	5699036.322	1104.484	0.000	0.000	0.059	4.430	0.000	0.0	0	0	0	0	0.00	0.00	0.06
MH 79	-2092.171	5699012.008	1104.676	0.000	0.000	0.014	3.320	0.000	0.0	0	0	0	0	3.37	0.00	0.16
MH 7A	-2228.862	5697482.878	1113.377	0.000	0.000	10.351	-7.380	10.255	4320.0	0	4320	0	0	0.00	0.29	10.29
MH 80	-2069.437	5699109.185	1106.638	0.000	0.000	0.021	2.360	0.000	0	0	0	0	0	3.11	0.00	0.01
MH 81	-2177.245	5699147.289	1107.114	0.000	0.000	0.027	2.880	0.000	0.0	0	0	0	0	12.70	0.00	0.06
MH 82	-2264.440	5699177.807	1107.965	0.000	0.000	0.016	2.360	0.000	0.0	0	0	0	0	22.54	0.00	0.05
MH 83	-2303.403	5699191.502	1108.491	0.000	0.000	0.020	2.490	0.000	0.0	0	0	0	0	19.17	0.00	0.09
MH 84	-2409.218	5699228.963	1107.989	0.000	0.000	0.025	3.010	0.000	0.0	0	0	0	0	19.17	0.00	0.04
MH 85	-2512.654	5699264.647	1107.365	0.000	0.000	0.056	3.640	0.000	0.0	0	0	0	0	8.03	0.00	0.00
MH 86	-2513.702	5699378.089	1107.960	0.000	0.000	0.060	3.040	0.000	0.0	0	0	0	0	22.54	0.00	0.02
MH 87	-2326.815	5699305.489	1109.438	0.000	0.000	0.025	2.560	0.000	0.0	0	0	0	0	51.04	0.00	0.01
MH 88	-2307.524	5699298.437	1109.302	0.000	0.000	0.035	2.700	0.000	0.0	0	0	0	0	16.06	0.00	0.00
MH 89	-2212.978	5699265.746	1109.131	0.000	0.000	0.037	1.870	0.000	0.0	0	0	0	0	22.54	0.00	-0.01
MH 90	-2119.478	5699233.012	1108.725	0.000	0.000	0.025	2.270	0.000	0.0	0	0	0	0	7.00	0.00	0.01
MH 91	-2022.492	5699198.375	1106.765	0.000	0.000	0.029	2.320	0.000	0.0	0	0	0	0	2.33	0.00	0.01
MH 92	-1980.737	5699289.004	1106.157	0.000	0.000	0.042	2.940	0.000	0.0	0	0	0	0	2.33	0.00	0.02
MH 93	-2092.438	5699328.232	1108.263	0.000	0.000	0.028	3.520	0.000	0.0	0	0	0	0	7.25	0.00	0.01
MH 94	-2187.524	5699361.825	1109.037	0.000	0.000	0.028	2.960	0.000	0.0	0	0	0	0	12.18	0.00	0.02
MH 95	-2277.441	5699393.488	1109.852	0.000	0.000	0.024	2.150	0.000	0.0	0	0	0	0	10.88	0.00	0.02
MH 96	-2351.326	5699419.294	1110.147	0.000	0.000	0.024	2.840	0.000	0.0	0	0	0	0	8.03	0.00	0.00
MH 97	-2389.308	5699432.342	1110.427	0.000	0.000	0.018	2.570	0.000	0.0	0	0	0	0	38.35	0.00	0.00
MH 98	-2093.036	5699436.369	1110.158	0.000	0.000	0.013	2.660	0.000	0.0	0	0	0	0	25.91	0.00	0.07
MH 99	-2007.954	5699403.184	1108.303	0.000	0.000	0.036	2.700	0.000	0.0	0	0	0	0	1.55	0.00	0.04
MH 100	-1969.772	5699390.305	1107.724	0.000	0.000	0.039	2.250	0.000	0.0	0	0	0	0	1.55	0.00	0.10
MH 101	-2209.099	5699000.489	1104.278	0.000	0.000	0.031	3.900	0.000	0.0	0	0	0	0	3.11	0.00	-0.93
MH 102	-2592.554	5699159.717	1106.676	0.000	0.000	0.008	3.320	0.000	0.0	0	0	0	0	4.92	0.00	0.06
MH 103	-2628.049	5699159.298	1105.366	0.001	0.000	0.163	4.340	0.000	0.0	0	0	0	0	76.95	0.00	0.02
MH 104	-2627.849	5699004.468	1104.791	0.000	0.000	0.175	3.200	0.000	0.0	0	0	0	0	16.06	0.00	0.01
MH 105	-2633.669	5699003.740	1104.838	0.000	0.000	0.038	3.160	0.000	0.0	0	0	0	0	16.06	0.00	0.01
MH 106	-2724.103	5699159.638	1105.742	0.000	0.000	0.129	3.260	0.000	0.0	0	0	0	0	8.03	0.00	0.01
MH 107	-2723.669	5699100.222	1106.047	0.001	0.000	0.049	2.950	0.000	0.0	0	0	0	0	73.84	0.00	-0.01
MH 108	-2785.917	5699159.122	1105.930	0.000	0.000	0.116	3.070	0.000	0.0	0	0	0	0	0.00	0.00	0.00
MH 109	-2831.642	5699159.480	1106.067	0.000	0.000	0.132	2.930	0.000	0.0	0	0	0	0	0.00	0.00	0.00
MH 110	-2949.522	5699158.921	1106.321	0.000	0.000	1.630	3.670	0.000	0.0	0	0	0	0	45.08	0.00	0.11
MH 111	-3040.391	5699140.628	1107.823	0.000	0.000	2.545	2.180	0.000	0.0	0	0	0	0	51.30	0.00	0.35
MH 112	-3058.860	5699183.412	1107.806	0.000	0.000	0.008	3.190	0.000	0.0	0	0	0	0	4.92	0.00	0.07
MH 113	-3076.469	5699222.838	1107.529	0.000	0.000	0.088	3.470	0.000	0.0	0	0	0	0	27.20	0.00	0.03
MH 114	-3089.594	5699300.143	1108.066	0.000	0.000	0.088	3.480	0.000	0.0	0	0	0	0	11.14	0.00	-0.01
MH 115	-3089.057	5699444.126	1108.792	0.000	0.000	0.097	4.220	0.000	0.0	0	0	0	0	29.02	0.00	0.02
MH 116	-2918.326	5699248.499	1106.670	0.000	0.000	0.103	4.330	0.000	0.0	0	0	0	0	10.36	0.00	0.00
MH 117	-2919.285	5699335.572	1108.114	0.000	0.000	0.021	3.890	0.000	0.0	0	0	0	0	0.00	0.00	0.01
MH 118	-3005.650	5699335.546	1109.545	0.000	0.000	0.018	4.090	0.000	0.0	0	0	0	0	8.03	0.00	0.06
MH 119	-3006.071	5699402.782	1109.828	0.000	0.000	0.015	4.160	0.000	0.0	0	0	0	0	24.10	0.00	0.07
MH 120	-2918.680	5699402.771	1109.229	0.000	0.000	0.015	3.770	0.000	0.0	0	0	0	0	11.14	0.00	0.01
MH 121	-2863.906	5699402.951	1110.059	0.000	0.000	0.011	3.500	0.000	0.0	0	0	0	0	9.59	0.00	0.02
MH 122	-2832.273	5699402.737	1109.440	0.000	0.000	0.013	4.280	0.000	0.0	0	0	0	0	24.10	0.00	-0.07
MH 123	-2832.085	5699249.292	1106.360	0.000	0.000	0.117	4.640	0.000	0.0	0	0	0	0	8.03	0.00	0.01
MH 124	-2831.977	5699093.094	1106.347	0.000	0.000	0.050	2.650	0.000	0.0	0	0	0	0	12.95	0.00	0.00
MH 125	-2831.713	5698960.496	1106.946	0.000	0.000	0.050	3.050	0.000	0.0	0	0	0	0	25.65	0.00	0.10
MH 126	-2723.956	5699253.140	1106.203	0.000	0.000	0.059	3.780	0.000	0.0	0	0	0	0	9.59	0.00	-0.02
MH 127	-2724.120	5699328.592	1106.877	0.000	0.000	0.055	3.120	0.000	0.0	0	0	0	0	14.51	0.00	0.02
MH 128	-2724.082	5699403.733	1107.319	0.000	0.000	0.054	3.590	0.000	0.0	0	0	0	0	16.06	0.00	0.03
MH 129	-2723.995	5699445.688	1108.448	0.000	0.000	0.010	3.060	0.000	0.0	0	0	0	0	4.92	0.00	0.03
MH 130	-2627.717	5699402.923	1108.196	0.000	0.000	0.012	2.800	0.000	0.0	0	0	0	0	27.20	0.00	0.06
MH 131	-2627.830	5699327.137	1107.485	0.000	0.000	0.022	3.510	0.000	0.0	0	0	0	0	17.62	0.00	0.03
MH 132	-2628.267	5699253.839	1107.003	0.000	0.000	0.022	3.200	0.000	0.0	0	0	0	0	9.59	0.00	0.03
MH 133	-2291.837	5699481.247	1109.873	0.000	0.000	0.055	2.130	0.000	0.0	0	0	0	0	12.95	0.00	0.03
MH 134	-2192.470	5699482.037	1109.534	0.000	0.000	0.056	2.780	0.000	0.0	0	0	0	0	17.62	0.00	0.01
MH 135	-2093.170	5699482.973	1108.856	0.000	0.000	0.063	4.140	0.000	0.0	0	0	0	0	35.50	0.00	-0.02
MH 136	-1994.635	5699483.610	1108.391	0.000	0.000	0.096	2.800	0.000	0.0	0	0	0	0	16.06	0.00	-0.01
MH 137	-1894.806	5699484.491	1107.816	0.000	0.000	0.066	2.660	0.000	0.0	0	0	0	0	2.59	0.00	0.00
MH 138	-1895.452	5699628.556	1108.960	0.000	0.000	0.028	2.000	0.000	0.0	0	0	0	0	19.17	0.00	-0.01
MH 139	-1894.852	5699570.901	1108.190	0.000	0.000	0.045	2.810	0.000	0.0	0	0	0	0	12.95	0.00	0.03
MH 140	-1994.124	5699569.756	1109.628	0.000	0.000	0.017	2.880	0.000	0.0	0	0	0	0	12.95	0.00	0.02
MH 141	-1993.596	5699638.666	1110.543	0.000	0.000	0.014	2.880	0.000	0.0	0	0	0	0	32.65	0.00	0.01
MH 142	-2094.236	5699655.686	1113.075	0.000	0.000	0.016	2.780	0.000	0.0	0	0	0	0	45.34	0.00	0.07
MH 143	-2192.731	5699568.432	1110.528	0.000	0.000	0.029	2.940	0.000	0.0	0	0	0	0	12.95	0.00	0.01
MH 144	-2193.304	5699654.594	1111.385	0.000	0.000	0.028	3.190	0.000	0.0	0	0	0	0	35.50	0.00	-0.01
MH 145	-2194.049	5699740.893	1113.007	0.000	0.000	0.021	2.810	0.000	0.0	0	0	0	0	6.74	0.00	0.02
MH 146	-2193.903	5699798.505	1114.072	0.000	0.000	0.019	2.920	0.000	0.0	0	0	0	0	23.58	0.00	0.00
MH 147	-2292.047	5699534.393	1110.129	0.000	0.000	0.048	2.870	0.000	0.0	0	0	0	0	0.00	0.00	0.01
MH 148	-2292.348	5699567.595	1110.266	0.000	0.000	0.038	2.730	0.000	0.0	0	0	0	0	6.48	0.00	0.00
MH 149	-2292.983	5699653.625	1111.161	0.000	0.000	0.027	2.830	0.000	0.0	0	0	0	0	16.06	0.00	0.02
MH 150	-2293.223	5699740.275	1112.811	0.000	0.000	0.021	2.950	0.000	0.0	0	0	0	0	12.95	0.00	0.02
MH 151	-2293.340	5699800.078	1114.253	0.000	0.000	0.017	2.750	0.000	0.0	0	0	0	0	9.59	0.00	0.01
MH 152	-2295.997	5699925.135	1114.868	0.000	0.000	0.016	3.130	0.000	0.0	0	0	0	0	29.02	0.00	0.05
MH 153	-2196.543	5699925.985	1114.526	0.000	0.000	0.021	2.470	0.000	0.0	0	0	0	0	6.48	0.00	0.02
MH 154	-2164.247	5699926.356	1114.705	0.000	0.000	0.011	2.240	0.000	0.0	0	0	0	0	24.10	0.00	0.06
MH 155	-2040.067	5699926.445	1111.157	0.000	0.000	0.014	2.840	0.000	0.0	0	0	0	0	8.03	0.00	0.02
MH 156	-2518.774	5699795.733	1115.781	0.000	0.000	0.009	3.720	0.000	0.0	0	0	0	0	41.71	0.00	0.02
MH 157	-2406.186	5699722.549	1113.774	0.000	0.000	0.009	3.460	0.000	0.0	0	0	0	0	12.95	0.00	-0.01
MH 158	-2385.591	5699736.617	1114.004	0.000	0.000	0.011	3.640	0.000	0.0	0	0	0	0	9.59	0.00	0.03
MH 159	-2388.513	5699653.847	1111.540	0.000	0.000	0.061	3.560	0.000	0.0	0	0	0	0	14.51	0.00	0.02
MH 160	-2388.400	5699577.395	1110.814	0.000	0.000	0.023	4.200	0.000	0.0	0	0	0	0	8.03	0.00	0.01
MH 161	-1919.790	5699898.220	1107.174	0.000	0.000	0.051	2.420	0.000	0.0	0	0	0	0	9.59	0.00	0.04
MH 162	-2005.272	5699855.922	1109.798	0.000	0.000	0.032	2.750	0.000	0.0	0	0	0	0	3.63	0.00	0.01
MH 163	-2091.642	5699827.728	1112.831	0.000	0.000	0.043	2.760	0.000	0.0	0	0	0	0	6.48	0.00	-0.01
MH 164	-2195.838	5699827.760	1114.162	0.000	0.000	0.017	3.290	0.000	0.0	0	0	0	0	12.18	0.00	0.01
MH 165	-2295.575	5699826.299	1114.428	0.000	0.000	0.022	3.150	0.000	0.0	0	0	0	0	11.14	0.00	-0.01
MH 166	-2350.812	5699826.910	1114.550	0.000	0.000	0.009	3.440	0.000	0.0	0	0	0	0	12.95	0.00	-0.01
MH 167	-1972.092	5700003.816	1106.637	0.001	0.000	0.051	4.100	0.000	0.0	0	0	0	0	48.19	0.00	0.02
MH 168	-2028.900	5700109.612	1105.973	0.000	0.000	0.110	5.510	0.000	0.0	0	0	0	0	0.00	0.00	0.01
MH 169	-2108.209	5700075.271	1109.573	0.000	0.000	0.034	3.400	0.000	0.0	0	0	0	0	6.48	0.00	0.00
MH 170	-2196.123	5700071.222	1111.264	0.000	0.000	0.032	3.120	0.000	0.0	0	0	0	0	8.29	0.00	0.00
MH 171	-2297.016	5700169.078	1112.593	0.000	0.000	0.039	2.100	0.000	0.0	0	0	0	0	0.00	0.00	0.01
MH 172	-2297.183	5700105.375	1112.296	0.000	0.000	0.035	2.700	0.000	0.0	0	0	0	0	3.11	0.00	0.00
MH 173	-2296.160	5700070.253	1112.009	0.000	0.000	0.037	3.330	0.000	0.0	0	0	0	0	8.03	0.00	0.02
MH 174	-2296.394	5700012.611	1112.973	0.000	0.000	0.013	3.270	0.000	0.0	0	0	0	0	17.62	0.00	0.03
MH 175	-2195.377	5700013.281	1112.642	0.000	0.000	0.011	3.030	0.000	0.0	0	0	0	0	16.06	0.00	0.03
MH 176	-2093.815	5700013.691	1110.645	0.000	0.000	0.011	3.020	0.000	0.0	0	0	0	0	17.62	0.00	-0.02
MH 177	-2086.691	5700190.221	1105.500	0.000	0.000	0.086	5.620	0.000	0.0	0	0	0	0	0.00	0.00	0.00
MH 178	-2512.014	5699490.427	1109.069	0.000	0.000	0.048	2.920	0.000	0.0	0	0	0	0	17.88	0.00	0.01
MH 179	-2513.909	5699551.797	1109.466	0.000	0.000	0.053	2.960	0.000	0.0	0	0	0	0	19.17	0.00	-0.01
MH 180	-2478.859	5699551.668	1109.834	0.000	0.000	0.015	3.140	0.000	0.0	0	0	0	0	32.13	0.00	0.02
MH 181	-2514.014	5699649.859	1109.806	0.000	0.000	0.085	4.490	0.000	0.0	0	0	0	0	19.17	0.00	0.06
MH 182	-2481.305	5699650.816	1111.461	0.000	0.000	0.014	3.060	0.000	0.0	0	0	0	0	29.02	0.00	0.03
MH 183	-2507.039	5699690.971	1110.881	0.000	0.000	0.030	4.930	0.000	0.0	0	0	0	0	9.59	0.00	-0.01
MH 184	-2563.603	5699704.248	1112.249	0.000	0.000	0.015	3.190	0.000	0.0	0	0	0	0	12.95	0.00	0.03
MH 185	-2464.616	5699769.721	1111.373	0.000	0.000	0.047	6.610	0.000	0.0	0	0	0	0	3.11	0.00	0.00
MH 186	-2420.124	5699851.362	1113.512	0.000	0.000	0.024	5.440	0.000	0.0	0	0	0	0	3.11	0.00	-0.03
MH 187	-2514.880	5699890.832	1117.012	0.000	0.000	0.015	2.990	0.000	0.0	0	0	0	0	24.10	0.00	0.05
MH 188	-2392.834	5699926.417	1113.866	0.000	0.000	0.040	5.130	0.000	0.0	0	0	0	0	6.48	0.00	0.03
MH 189	-2393.117	5699982.378	1114.058	0.000	0.000	0.040	4.370	0.000	0.0	0	0	0	0	14.51	0.00	0.01
MH 190	-2512.816	5699982.404	1117.004	0.000	0.000	0.044	2.990	0.000	0.0	0	0	0	0	25.65	0.00	0.04
MH 191	-2393.655	5700083.391	1114.598	0.000	0.000	0.024	2.960	0.000	0.0	0	0	0	0	8.03	0.00	0.04
MH 192	-2513.767	5700083.559	1116.735	0.000	0.000	0.015	3.000	0.000	0.0	0	0	0	0	25.65	0.00	0.05
MH 193	-2393.872	5700169.438	1113.019	0.000	0.000	0.039	3.980	0.000	0.0	0	0	0	0	0.00	0.00	0.02
MH 194	-2457.010	5700169.286	1113.415	0.000	0.000	0.023	3.590	0.000	0.0	0	0	0	0	4.92	0.00	0.03
MH 195	-2519.415	5700169.359	1114.769	0.000	0.000	0.015	3.210	0.000	0.0	0	0	0	0	6.48	0.00	0.01
MH 196	-2559.201	5700169.534	1115.461	0.000	0.000	0.007	3.450	0.000	0.0	0	0	0	0	4.92	0.00	0.05
MH 197	-2519.758	5700229.135	1115.342	0.000	0.000	0.013	3.070	0.000	0.0	0	0	0	0	12.95	0.00	0.04
MH 198	-2394.477	5700273.771	1113.530	0.000	0.000	0.030	3.470	0.000	0.0	0	0	0	0	17.62	0.00	0.05
MH 199	-2393.566	5700319.974	1113.782	0.000	0.000	0.022	3.160	0.000	0.0	0	0	0	0	4.92	0.00	0.00
MH 200	-2512.717	5700320.196	1114.554	0.000	0.000	0.019	3.450	0.000	0.0	0	0	0	0	30.57	0.00	0.07
MH 201	-2393.491	5700351.952	1113.928	0.000	0.000	0.008	2.950	0.000	0.0	0	0	0	0	4.92	0.00	0.06
MH 202	-2266.266	5700405.322	1108.417	0.000	0.000	0.022	3.570	0.000	0.0	0	0	5.61	0	28.84	0.00	-0.11
MH 203	-2392.809	5700404.838	1107.861	0.000	0.000	0.088	7.280	0.000	0.0	0	0	0	0	0.00	0.00	-0.02
MH 204	-2512.536	5700405.281	1112.624	0.000	0.000	0.046	3.380	0.000	0.0	0	0	0	0	27.20	0.00	0.06
MH 205	-2394.366	5700499.223	1107.403	0.000	0.000	0.034	4.590	0.000	0.0	0	0	0	0	29.02	0.00	-0.01
MH 206	-2471.463	5700498.983	1107.915	0.000	0.000	0.055	4.080	0.000	0.0	0	0	0	0	16.06	0.00	0.03
MH 207	-2548.421	5700499.097	1108.363	0.000	0.000	0.054	4.180	0.000	0.0	0	0	0	0	22.54	0.00	0.05
MH 208	-2275.296	5700498.602	1106.592	0.000	0.000	0.068	3.410	0.000	0.0	0	0	0	0	3.11	0.00	-0.03
MH 209	-2154.686	5700498.998	1103.207	0.000	0.000	0.074	5.950	0.000	0.0	0	0	7.91	0	42.28	0.00	0.00
MH 210	-2053.711	5700499.052	1099.335	0.000	0.000	0.102	5.600	0.000	0.0	0	0	3.46	0	17.32	0.00	-0.01
MH 211	-2090.606	5700593.735	1098.037	0.000	0.000	0.058	5.970	0.000	0.0	0	0	3.15	0	15.62	0.00	-0.01
MH 212	-2126.534	5700680.312	1095.766	0.000	0.000	0.166	6.740	0.000	0.0	0	0	0	0	0.00	0.00	-0.02
MH 213	-2106.984	5700689.980	1093.832	0.000	0.000	0.962	8.200	0.000	0.0	0	0	0	0	0.00	0.01	-0.10
MH 213A	-2035.610	5700719.531	1126.821	0.000	0.000	29.501	-28.180	29.310	4320.0	0	4320	0	0	0.00	0.10	1.40
MH 214	-2014.051	5700405.660	1100.555	0.000	0.000	0.095	4.800	0.000	0.0	0	0	5.73	0	29.59	0.00	0.00
MH 215	-2003.954	5700284.530	1103.587	0.000	0.000	0.136	4.420	0.000	0.0	0	0	0	0	0.00	0.00	0.01
MH 216	-2012.040	5700267.794	1104.046	0.000	0.000	0.076	4.790	0.000	0.0	0	0	0	0	0.00	0.00	-0.01
MH 217	-3088.906	5699524.207	1109.324	0.000	0.000	0.084	5.250	0.000	0.0	0	0	0	0	0.00	0.00	0.01
MH 218	-3087.099	5699544.615	1109.453	0.000	0.000	0.093	5.180	0.000	0.0	0	0	0	0	0.00	0.00	-0.01

Name	Node X	Node Y	Max Water Elevation (m)	Node Average Inflow Rate (m^3/s)	Node Average Outflow Rate (m^3/s)	Max Water Depth (m)	Freeboard (m)	Surcharge at Max HGL (m)	Duration of Surcharge (minutes)	Flood Loss (m^3)	Duration of Flooding (minutes)	Volume of Inflow from Runoff Layer (m^3)	Volume of Constant Inflow (m^3)	Volume of DWF Inflow (m^3)	Continuity Error Volume (% of Inflow)	Continuity Error Volume (% of Node)
MH 219	-3087.496	5699642.262	1109.915	0.000	0.000	0.087	4.710	0.000	0.0	0	0	0	0	12.95	0.00	0.00
MH 220	-3032.642	5699773.524	1110.805	0.000	0.000	0.061	3.690	0.000	0.0	0	0	0	0	43.27	0.00	0.03
MH 221	-2973.200	5699843.495	1111.239	0.000	0.000	0.067	3.310	0.000	0.0	0	0	0	0	19.17	0.00	0.01
MH 222	-2904.146	5699770.524	1112.047	0.001	0.000	0.047	2.950	0.000	0.0	0	0	0	0	49.75	0.00	0.03
MH 223	-2844.575	5699663.527	1111.010	0.000	0.000	0.025	2.980	0.000	0.0	0	0	0	0	27.46	0.00	0.06
MH 224	-2837.579	5699630.522	1111.091	0.000	0.000	0.016	2.910	0.000	0.0	0	0	0	0	20.99	0.00	0.07
MH 225	-2833.981	5699545.021	1110.605	0.000	0.000	0.027	3.610	0.000	0.0	0	0	0	0	32.13	0.00	0.06
MH 226	-2965.785	5699645.206	1110.421	0.000	0.000	0.027	3.580	0.000	0.0	0	0	0	0	12.95	0.00	0.05
MH 227	-2374.216	5699534.239	1110.445	0.000	0.000	0.033	3.030	0.000	0.0	0	0	0	0	8.03	0.00	0.04
MH 228	-2431.217	5699535.355	1110.680	0.000	0.000	0.010	3.060	0.000	0.0	0	0	0	0	4.92	0.00	0.11
MH 229	-1896.291	5699702.953	1109.006	0.000	0.000	0.072	1.980	0.000	0.0	0	0	0	0	22.54	0.00	0.04
MH 230	-1832.507	5699811.032	1109.027	0.001	0.000	0.062	2.420	0.000	0.0	0	0	0	0	19.43	0.00	0.01
MH 231	-2368.724	5698813.407	1102.541	0.000	0.000	0.755	2.460	0.465	156.1	0	0	0	0	0.00	0.00	0.04
MH 232	-2435.442	5698836.325	1102.542	0.000	0.000	0.237	2.460	0.000	0.0	0	0	0	0	0.00	0.00	0.02
MH 233	-2300.675	5698765.690	1102.541	0.001	0.000	0.261	2.460	0.031	47.6	0	0	0	0	30.83	0.00	0.02
MH 234	-2441.456	5698790.802	1102.728	0.001	0.000	0.053	2.140	0.000	0.0	0	0	0	0	51.82	0.00	0.02
MH 235	-2448.972	5698755.857	1103.432	0.000	0.000	0.074	1.190	0.000	0.0	0	0	0	0	0.00	0.00	0.04
MH 236	-2321.553	5698704.626	1102.540	0.000	0.000	0.746	2.460	0.516	162.7	0	0	0	0	0.00	0.00	0.04
MH 237	-2406.489	5698706.167	1102.540	0.000	0.000	1.552	2.460	1.317	280.9	0	0	0	0	0.00	0.00	-0.11
MH 238	-2342.624	5698843.108	1103.774	0.000	0.000	0.073	1.560	0.000	0.0	0	0	0	0	0.00	0.00	0.05
MH 239	-2209.526	5698892.188	1104.102	0.000	0.000	0.087	2.880	0.000	0.0	0	0	0	0	2.07	0.00	0.04
MH 240	-2260.115	5698911.026	1104.010	0.000	0.000	0.075	3.990	0.000	0.0	0	0	0	0	0.00	0.00	0.05
MH 241	-2553.179	5698669.551	1102.998	0.000	0.000	0.051	2.000	0.000	0.0	0	0	0	0	0.00	0.00	-0.01
MH 242	-2544.693	5698666.715	1102.535	0.000	0.000	2.257	1.430	1.567	313.2	0	0	0	0	0.00	0.01	-0.01
MH 243	-2544.906	5698671.879	1102.535	0.000	0.000	2.229	2.220	1.909	378.9	0	0	0	0	0.00	0.00	-0.07
MH 244	-2553.009	5698752.493	1103.674	0.000	0.000	0.118	1.350	0.000	0.0	0	0	0	0	0.00	0.00	0.00
MH 245	-2512.280	5698865.135	1104.098	0.000	0.000	0.201	0.930	0.000	0.0	0	0	0	0	0.00	0.00	0.02
MH 246	-2578.329	5698954.505	1104.648	0.000	0.000	0.137	1.590	0.000	0.0	0	0	0	0	16.06	0.00	0.01
MH 254	-2959.977	5699545.690	1109.960	0.000	0.000	0.030	5.040	0.000	0.0	0	0	0	0	27.20	0.00	0.04
HAWKS LANDING																
N-HWL-259	-3313.853	5701032.706	1106.637	0.000	0.000	0.032	2.560	0.000	0.0	0	0	7.34	0	38.93	0.00	0.01
N-HWL-260	-3184.633	5701036.498	1106.246	0.000	0.000	0.029	2.870	0.000	0.0	0	0	0	0	0.00	0.00	-0.03
N-HWL-261	-3314.195	5700951.839	1107.843	0.000	0.000	0.010	2.890	0.000	0.0	0	0	7.56	0	40.39	0.00	-0.09
N-HWL-262	-3152.869	5700948.186	1107.277	0.000	0.000	0.050	2.850	0.000	0.0	0	0	4	0	20.31	0.00	-0.03
N-HWL-263	-3167.761	5700989.806	1106.953	0.000	0.000	0.027	2.870	0.000	0.0	0	0	0	0	0.00	0.00	0.00
N-HWL-264	-3112.421	5701010.588	1105.587	0.000	0.000	0.049	2.850	0.000	0.0	0	0	5.02	0	25.84	0.00	0.00
N-HWL-266	-2932.176	5701005.269	1103.141	0.000	0.000	0.032	2.870	0.000	0.0	0	0	2.76	0	10.52	0.00	0.01
N-HWL-267	-3022.766	5700873.132	1105.713	0.000	0.000	0.027	3.610	0.000	0.0	0	0	6.17	0	32.06	0.00	-0.02
N-HWL-268	-2980.119	5700754.361	1106.263	0.000	0.000	0.015	3.730	0.000	0.0	0	0	3.14	0	15.53	0.00	0.18
N-HWL-269	-2889.089	5700797.164	1105.982	0.000	0.000	0.053	2.850	0.000	0.0	0	0	3.14	0	15.69	0.00	0.00
N-HWL-270	-2923.744	5700930.660	1104.531	0.000	0.000	0.040	2.860	0.000	0.0	0	0	4.24	0	21.51	0.00	0.00
N-HWL-271	-2827.106	5700931.377	1103.986	0.000	0.000	0.046	2.010	0.000	0.0	0	0	4.06	0	20.44	0.00	0.03
N-HWL-272	-2801.977	5700836.874	1103.485	0.000	0.000	0.045	3.900	0.000	0.0	0	0	6.23	0	32.39	0.00	0.00
N-HWL-273	-2789.681	5700801.961	1105.191	0.000	0.000	0.000	2.900	0.000	0.0	0	0	0	0	0.00	0.00	0.00
N-HWL-274	-2777.172	5700795.122	1105.137	0.000	0.000	0.000	2.910	0.000	0.0	0	0	0	0	0.00	0.00	0.00
N-HWL-275	-2771.316	5700804.398	1104.743	0.000	0.000	0.000	2.900	0.000	0.0	0	0	0	0	0.00	0.00	0.00
N-HWL-276	-2771.395	5700836.869	1103.278	0.000	0.000	0.038	3.430	0.000	0.0	0	0	1.87	0	9.24	0.00	0.00
N-HWL-278	-2627.338	5700712.999	1105.132	0.000	0.000	0.026	2.870	0.000	0.0	0	0	2.7	0	13.38	0.00	0.05
N-HWL-279	-2627.827	5700652.844	1106.223	0.000	0.000	0.026	2.870	0.000	0.0	0	0	2.37	0	9.96	0.00	0.03
N-HWL-280	-2627.434	5700602.609	1107.529	0.000	0.000	0.022	2.880	0.000	0.0	0	0	3.2	0	15.92	0.00	-0.01
N-HWL-281	-2635.645	5700506.842	1109.576	0.000	0.000	0.015	2.890	0.000	0.0	0	0	2.95	0	14.68	0.00	0.07
N-HWL-282	-2708.800	5700532.709	1109.661	0.000	0.000	0.041	2.860	0.000	0.0	0	0	5.31	0	27.44	0.00	0.00
N-HWL-283	-2815.404	5700624.831	1108.489	0.000	0.000	0.041	2.860	0.000	0.0	0	0	2.32	0	11.26	0.00	-0.03
N-HWL-284	-2741.387	5700685.568	1107.964	0.000	0.000	0.026	1.410	0.000	0.0	0	0	5.54	0	28.58	0.00	0.05
N-HWL-285	-3348.028	5700583.476	1112.533	0.000	0.000	0.021	3.330	0.000	0.0	0	0	9.77	0	53.97	0.00	0.16
N-HWL-286	-2856.273	5700706.012	1107.179	0.000	0.000	0.048	2.850	0.000	0.0	0	0	1.81	0	8.82	0.00	0.01
N-HWL-287	-2941.536	5700658.878	1107.686	0.000	0.000	0.031	2.870	0.000	0.0	0	0	3.94	0	19.89	0.00	-0.02
N-HWL-288	-3032.535	5700615.039	1108.693	0.000	0.000	0.023	2.880	0.000	0.0	0	0	0	0	0.00	0.00	-0.01
N-HWL-289	-3087.119	5700765.808	1108.241	0.000	0.000	0.034	2.870	0.000	0.0	0	0	7.12	0	37.76	0.00	-0.03
N-HWL-290	-3118.193	5700852.085	1107.551	0.000	0.000	0.052	2.850	0.000	0.0	0	0	0	0	0.00	0.00	-0.02
N-HWL-291	-3241.814	5700852.504	1109.135	0.000	0.000	0.014	2.890	0.000	0.0	0	0	0	0	0.00	0.00	-0.08
N-HWL-292	-3345.805	5700852.420	1109.462	0.000	0.000	0.030	2.490	0.000	0.0	0	0	9	0	49.08	0.00	0.06
N-HWL-293	-3313.813	5700765.888	1110.900	0.000	0.000	0.027	2.870	0.000	0.0	0	0	8.36	0	45.24	0.00	0.00
N-HWL-294	-3185.847	5700765.751	1109.637	0.000	0.000	0.028	2.870	0.000	0.0	0	0	0	0	0.00	0.00	-0.03
N-HWL-295	-3313.842	5700677.595	1112.116	0.000	0.000	0.014	2.890	0.000	0.0	0	0	9.97	0	55.46	0.00	0.01
N-HWL-296	-3162.013	5700681.352	1110.073	0.000	0.000	0.018	2.880	0.000	0.0	0	0	0	0	0.00	0.00	-0.04
N-HWL-297	-3157.151	5700586.274	1110.566	0.000	0.000	0.024	2.880	0.000	0.0	0	0	0	0	0.00	0.00	-0.03
N-HWL-298	-3313.968	5700495.140	1116.112	0.000	0.000	0.012	2.890	0.000	0.0	0	0	7.72	0	41.43	0.00	0.02
N-HWL-299	-3148.207	5700495.329	1110.982	0.000	0.000	0.023	2.880	0.000	0.0	0	0	1.61	0	7.65	0.00	-0.03
N-HWL-300	-3313.925	5700410.902	1115.282	0.000	0.000	0.010	2.890	0.000	0.0	0	0	4.18	0	21.29	0.00	-0.01
N-HWL-301	-3146.819	5700411.711	1111.172	0.000	0.000	0.014	2.890	0.000	0.0	0	0	1.68	0	8.01	0.00	0.16
N-HWL-302	-3313.896	5700322.726	1111.796	0.000	0.000	0.026	2.870	0.000	0.0	0	0	6.84	0	36.16	0.00	0.12
N-HWL-303	-3172.956	5700322.870	1110.598	0.000	0.000	0.182	2.860	0.000	0.0	0	0	4.3	0	21.74	0.02	-0.23
N-HWL-304	-3175.115	5700283.269	1110.458	0.000	0.000	0.190	3.180	0.000	0.0	0	0	0	0	0.00	0.00	0.00
N-HWL-305	-3056.606	5700411.418	1111.592	0.000	0.000	0.013	1.920	0.000	0.0	0	0	4.24	0	21.45	0.00	0.22
N-HWL-306	-2949.897	5700411.616	1111.226	0.000	0.000	0.027	1.410	0.000	0.0	0	0	2.26	0	11.03	0.00	0.30
N-HWL-307	-3075.902	5700332.780	1111.393	0.000	0.000	0.028	2.040	0.000	0.0	0	0	8.47	0	45.80	0.00	0.01
N-HWL-308	-2918.047	5700323.505	1111.090	0.000	0.000	0.044	2.120	0.000	0.0	0	0	3.39	0	16.76	0.00	0.03
N-HWL-309	-2815.453	5700323.769	1112.062	0.000	0.000	0.028	2.100	0.000	0.0	0	0	5.19	0	26.72	0.00	0.01
N-HWL-310	-2828.890	5700360.924	1111.763	0.000	0.000	0.036	2.010	0.000	0.0	0	0	1.74	0	8.50	0.00	0.01
N-HWL-311	-2731.950	5700323.774	1112.669	0.000	0.000	0.020	2.930	0.000	0.0	0	0	0	0	0.00	0.00	0.08
N-HWL-312	-2637.828	5700323.765	1113.590	0.000	0.000	0.015	3.150	0.000	0.0	0	0	5.94	0	30.79	0.00	0.07
N-HWL-313	-2731.991	5700344.304	1112.764	0.000	0.000	0.023	2.880	0.000	0.0	0	0	2.83	0	13.93	0.00	0.04
N-HWL-314	-2633.564	5700408.794	1111.874	0.000	0.000	0.031	2.870	0.000	0.0	0	0	5.83	0	30.34	0.00	0.01
N-HWL-315	-2763.976	5700453.037	1111.335	0.000	0.000	0.034	2.870	0.000	0.0	0	0	3.08	0	15.23	0.00	-0.04
N-HWL-316	-2844.032	5700506.533	1109.551	0.000	0.000	0.022	2.900	0.000	0.0	0	0	7.78	0	41.63	0.00	0.07
N-HWL-317	-2898.681	5700579.052	1108.793	0.000	0.000	0.030	2.230	0.000	0.0	0	0	0	0	0.00	0.00	0.07
N-HWL-319	-3067.282	5700995.527	1105.339	0.000	0.000	0.043	2.860	0.000	0.0	0	0	4.89	0	24.05	0.00	-0.01
N-HWL-320	-2627.478	5700836.838	1102.149	0.000	0.000	0.055	2.850	0.000	0.0	0	0	8.2	0	44.27	0.00	0.01
N-HWL-377	-3149.537	5701084.425	1104.877	0.000	0.000	0.091	3.100	0.000	0.0	0	0	0	0	0.00	0.00	0.02
N-HWL-378	-2933.944	5701083.935	1098.715	0.000	0.000	0.199	6.110	0.000	0.0	0	0	0	0	0.00	0.00	0.10
N-HWL-379	-2574.044	5701082.104	1098.086	0.000	0.000	0.169	1.910	0.000	0.0	0	0	0	0	0.00	0.00	-0.03
N-HWL-379.1	-2254.099	5701084.411	1093.199	0.000	0.000	0.019	3.330	0.000	0.0	0	0	0	0	0.00	0.00	0.15
VISTA CROSSING																
N-VST-322	-3181.103	5700229.451	1110.254	0.000	0.000	0.186	3.640	0.000	0.0	0	0	8.73	0	47.65	0.00	0.02
N-VST-323	-3087.061	5700235.112	1110.538	0.000	0.000	0.023	3.410	0.000	0.0	0	0	6.28	0	33.00	0.00	0.14
N-VST-324	-2905.103	5700235.112	1110.863	0.000	0.000	0.051	3.300	0.000	0.0	0	0	5.6	0	28.97	0.00	0.05
N-VST-325	-3087.061	5700119.467	1109.951	0.000	0.000	0.070	4.580	0.000	0.0	0	0	3.45	0	17.28	0.00	-0.08
N-VST-326	-3181.103	5700121.085	1109.843	0.000	0.000	0.204	5.680	0.000	0.0	0	0	2.95	0	14.71	0.00	-0.01
N-VST-327	-3280.978	5700121.085	1109.902	0.000	0.000	0.000	2.100	0.000	0.0	0	0	0	0	0.00	0.00	0.00
N-VST-328	-3296.748	5700110.167	1110.806	0.000	0.000	0.025	1.190	0.000	0.0	0	0	4.72	0	24.15	0.00	0.26
N-VST-329	-3315.753	5699967.835	1110.409	0.000	0.000	0.032	1.840	0.000	0.0	0	0	7.23	0	38.24	0.00	0.10
N-VST-330	-3314.944	5699821.460	1109.710	0.000	0.000	0.037	3.770	0.000	0.0	0	0	4.72	0	24.15	0.00	0.02
N-VST-331	-3232.052	5699820.247	1108.486	0.000	0.000	0.198	5.510	0.000	0.0	0	0	2.38	0	11.85	0.00	0.02
N-VST-332	-3265.209	5699730.480	1108.210	0.000	0.000	0.269	6.790	0.000	0.0	0	0	2.83	0	13.87	0.00	0.02
N-VST-332.1	-3224.110	5699730.480	1111.349	0.000	0.000	0.011	3.650	0.000	0.0	0	0	4.12	0	20.67	0.00	0.06
N-VST-333	-3373.809	5699729.959	1108.119	0.000	0.000	0.520	3.880	0.000	0.0	0	0	0	0	0.00	0.23	-0.24
N-VST-334	-3171.803	5699730.480	1111.096	0.000	0.000	0.021	3.900	0.000	0.0	0	0	0	0	0.00	0.00	0.09
N-VST-335	-3185.147	5699641.927	1110.811	0.001	0.000	0.036	4.180	0.000	0.0	0	0	22.04	0	147.31	0.00	0.03
N-VST-336	-3078.802	5699812.564	1111.567	0.000	0.000	0.021	3.430	0.000	0.0	0	0	5.25	0	26.89	0.00	0.01
N-VST-337	-3106.298	5699835.208	1111.287	0.000	0.000	0.021	3.710	0.000	0.0	0	0	2.64	0	12.92	0.00	0.17
N-VST-338	-3161.694	5699878.437	1109.210	0.000	0.000	0.046	5.790	0.000	0.0	0	0	2.19	0	10.61	0.00	0.01
N-VST-339	-3222.347	5699888.582	1108.785	0.000	0.000	0.194	5.210	0.000	0.0	0	0	3.08	0	15.27	0.00	-0.01
N-VST-340	-3221.943	5699968.644	1109.057	0.000	0.000	0.197	4.940	0.000	0.0	0	0	0	0	0.00	0.00	0.01
N-VST-341	-3221.943	5700029.701	1109.300	0.000	0.000	0.195	4.700	0.000	0.0	0	0	3.2	0	16.01	0.00	0.01
N-VST-342	-3164.929	5700029.701	1109.577	0.000	0.000	0.178	3.790	0.000	0.0	0	0	1.74	0	8.30	0.00	0.00
N-VST-343	-3116.003	5700000.588	1110.308	0.000	0.000	0.017	2.980	0.000	0.0	0	0	2.58	0	12.56	0.00	0.04
N-VST-344	-3135.007	5699983.605	1110.045	0.000	0.000	0.017	3.650	0.000	0.0	0	0	0	0	0.00	0.00	0.05
N-VST-344.1	-3105.938	5699955.538	1109.680	0.000	0.000	0.036	4.140	0.000	0.0	0	0	0	0	0.00	0.00	0.06
N-VST-345	-3064.245	5699919.717	1110.175	0.000	0.000	0.026	3.830	0.000	0.0	0	0	2.64	0	13.15	0.00	0.02
N-VST-346	-2898.228	5699938.411	1111.884	0.000	0.000	0.057	2.880	0.000	0.0	0	0	0	0	0.00	0.00	0.03
N-VST-347	-2903.866	5700130.497	1110.545	0.000	0.000	0.067	3.880	0.000	0.0	0	0	3.39	0	16.86	0.00	0.01
N-VST-348	-2724.468	5700131.910	1111.047	0.000	0.000	0.037	4.950	0.000	0.0	0	0	6.34	0	33.10	0.00	0.21
N-VST-349	-2722.015	5700237.489	1111.577	0.000	0.000	0.028	4.740	0.000	0.0	0	0	4.18	0	21.29	0.00	0.13
N-VST-350	-2631.972	5700236.783	1112.039	0.000	0.000	0.032	5.970	0.000	0.0	0	0	6.56	0	34.57	0.00	0.07
N-VST-351	-2632.678	5700170.752	1113.112	0.000	0.000	0.016	5.510	0.000	0.0	0	0	5.66	0	29.33	0.00	0.06
N-VST-352	-2724.468	5700044.339	1113.115	0.000	0.000	0.017	3.340	0.000	0.0	0	0	1.68	0	8.07	0.00	0.19
N-VST-353	-2803.211	5700045.398	1112.717	0.000	0.000	0.027	2.680	0.000	0.0	0	0	3.94	0	19.69	0.00	0.05
N-VST-354	-2794.031	5699990.313	1112.421	0.000	0.000	0.041	2.540	0.000	0.0	0	0	2.7	0	13.38	0.00	0.08
N-VST-355	-2767.901	5699963.830	1112.608	0.000	0.000	0.023	2.460	0.000	0.0	0	0	0	0	0.00	0.00	0.05
N-VST-356	-2755.895	5699962.771	1112.690	0.000	0.000	0.023	2.600	0.000	0.0	0	0	4.18	0	21.29	0.00	0.02
N-VST-357	-2631.972	5699986.782	1113.332	0.000	0.000	0.000	5.020	0.000	0.0	0	0	0	0	0.00	0.00	0.00
N-VST-358	-2632.653	5699895.569	1113.374	0.000	0.000	0.029	4.660	0.000	0.0	0	0	9.15	0	49.99	0.00	0.24
N-VST-359	-2633.013	5699808.109	1113.477	0.000	0.000	0.021	2.060	0.000	0.0	0	0	2.83	0	14.13	0.00	0.20
N-VST-360	-2726.234	5699769.267	1112.959	0.000	0.000	0.025	3.040	0.000	0.0	0	0	1.78	0	7.39	0.00	0.07
N-VST-361	-2774.610	5699838.477	1112.573	0.000	0.000	0.040	2.850	0.000	0.0	0	0	5.94	0	30.95	0.00	-0.03
N-VST-361.1	-2838.074	5699902.291	1112.175	0.000	0.000	0.043	2.830	0.000	0.0	0	0	2.95	0	14.71	0.00	-0.02
N-VST-362	-2697.468	5699726.870	1113.369	0.000	0.000	0.000	3.220	0.000	0.0	0	0	0	0	0.00	0.00	0.00
N-VST-363	-2644.183	5699725.068	1113.601	0.000	0.000	0.025	2.750	0.000	0.0	0	0	2.64	0	12.95	0.00	0.05
N-VST-364	-2650.361	5699704.217	1113.487	0.000	0.000	0.014	2.430	0.000	0.0	0	0	0	0	0.00	0.00	0.10
N-VST-365	-2998.781	5700128.723	1110.245	0.000	0.000	0.071	2.750	0.000	0.0	0	0	3.14	0	15.66	0.00	0.03
N-VST-366	-3000.439	5700145.306	1110.506	0.000	0.000	0.017	2.490	0.000	0.0	0	0	3.08	0	15.36	0.00	0.02
N-VST-367	-3224.722	5699857.593	1108.693	0.000	0.000	0.196	5.310	0.000	0.0	0	0	0	0	0.00	0.00	0.01
N-VST-371	-3027.962	5699971.088	1110.776	0.000	0.000	0.016	3.220	0.000	0.0	0	0	6.79	0	35.67	0.00	0.18
N-VST-402	-2984.480	5699852.702	1111.560	0.000	0.000	0.014	2.490	0.000	0.0	0	0	1.81	0	8.89	0.00	0.18
N-VST-404	-2890.546	5699962.257	1111.003	0.000	0.000	0.022	3.760	0.000	0.0	0	0	5.13	0	26.43	0.00	0.40
NEW ANNEXATION AREA																
N-ANN-101.1	-1262.438	5701856.203	1067.950	0.017	0.000	0.200	3.050	0.000	0	0	0	306.89	0	4187.59	0.00	-0.02
N-ANN-100	-1232.242	5701855.211	1082.068	0.000	0.000	14.318	-11.070	13.879	4318.0	0	4296.7	0	0	0.00	0.21	-0.97
N-ANN-101	-1223.512	5701874.313	1060.410	0.000	0.000	0.431	10.590	0.000	0.0	0	0	0	0	0.00	0.15	-0.70
N-ANN-102	-1803.670	5701873.508	1065.676	0.012	0.000	0.226	3.480	0.000	0.0	0	0	306.89	0	2807.23	0.00	0.02
N-ANN-103	-2568.534	5701874.056	1078.158	0.013	0.000	0.168	5.190	0.000	0.0	0	0	335.19	0	3124.26	0.00	0.04
N-ANN-104	-3390.330	5701873.602	1099.277	0.014	0.000	0.127	5.860	0.000	0.0	0	0	349.88	0	3293.00	0.00	0.07
N-ANN-107	-4189.777	5701872.543	1125.109	0.014	0.000	0.134	2.890	0.000	0.0	0	0	348.56	0	3277.66	0.01	0.10
N-ANN-108	-4194.778	5701095.368	1118.028	0.010	0.000	0.177	3.970	0.000	0.0	0	0	238.13	0	2378.73	0.01	-0.05
N-ANN-108.1	-4207.509	5700495.856	1114.675	0.000	0.000	0.242	2.300	0.000	0.0	0	0	0	0	0.00	0.00	0.02
N-ANN-109	-3896.568	5700325.517	1113.793	0.000	0.000	0.129	2.970	0.000	0.0	0	0	0	0	0.00	0.00	-0.01
N-ANN-110	-3559.669	5700275.838	1109.421	0.007	0.000	0.244	2.580	0.000	0.0	0	0	174.82	0	1679.74	0.00	0.03
N-ANN-111	-3456.657	5698753.189	1102.378	0.010	0.000	0.180	3.950	0.000	0.0	0	0	246.47	0	2417.60	0.01	-0.08
N-ANN-112	-3376.238	5698578.023	1097.974	0.000	0.000	0.578	3.520	0.000	0.0	0	0	0	0	0.00	0.01	0.00
N-ANN-113	-3376.586	5698502.844	1097.795	0.000	0.000	0.922	1.220	0.000	0.0	0	0	0	0	0.00	0.01	-0.01
N-ANN-114	-3376.238	5698747.161	1103.642	0.000	0.000	0.252	4.360	0.000	0.0	0	0	0	0	0.00	0.01	-0.01
N-ANN-114.1	-3376.238	5698664.283	1100.860	0.000	0.000	0.440	5.140	0.000	0.0	0	0	0	0	0.00	0.01	-0.01
N-ANN-115	-3375.889	5698875.147	1105.076	0.000	0.000	0.342	3.920	0.000	0.0	0	0	0	0	0.00	0.01	-0.01
N-ANN-116	-3375.889	5699050.562	1105.846	0.000	0.000	0.527	4.160	0.000	0.0	0	0	0	0	0.00	0.00	0.00
N-ANN-117	-3375.891	5699225.279	1106.397	0.000	0.000	0.538	5.600	0.000	0.0	0	0	0	0	0.00	0.01	0.01
N-ANN-118	-3375.889	5699400.694	1107.014	0.000	0.000	0.525	6.990	0.000	0.0	0	0	0	0	0.00	0.00	0.00
N-ANN-119	-3375.600	5699550.654	1107.516	0.000	0.000	0.517	6.900	0.000	0.0	0	0	0	0	0.00	0.01	0.01
N-ANN-120	-4566.926	5700118.667	1113.858	0.019	0.000	0.132	3.140	0.000	0.0	0	0	408.09	0	4554.47	0.01	0.16
N-ANN-120.1	-4056.508	5699501.366	1104.467	0.008	0.000	0.252	1.850	0.000	0.0	0	0	202.06	0	1887.34	0.02	0.19
N-ANN-121	-3375.398	5701085.989	1108.817	0.007	0.000	0.102	3.180	0.000	0.0	0	0	254.12	0	1514.15	0.00	0.03
N-ANN-122	-4242.444	5697878.621	1106.007	0.014	0.000	0.114	3.060	0.000	0.0	0	0	351.65	0	3313.46	0.00	0.04
N-ANN-123	-3375.617	5698191.237	1097.997	0.014	0.000	0.567	0.020	0.057	76.3	0	0	352.09	0	3318.57	0.01	0.05
N-ANN-127	-4270.516	5698672.254	1105.798	0.018	0.000	0.168	3.730	0.000	0.0	0	0	381.62	0	4371.41	0.01	0.12
N-ANN-476	-1806.482	5701087.470	1081.765	0.000	0.000	0.095	3.230	0.000	0.0	0	0	0	0	0.00	0.00	0.00
IRON LANDING																
N-IL-379	-2432.133	5701083.235	1095.557	0.000	0.000	0.017	3.430	0.000	0.0	0	0	3.83	0	19.17	0.00	0.14
N-IL-489	-2515.519	5700591.263	1107.644	0.000	0.000	0.020	3.230	0.000	0.0	0	0	5.78	0	30.01	0.00	0.08
N-IL-490	-2418.568	5700593.075	1106.800	0.000	0.000	0.016	3.230	0.000	0.0	0	0	6.3	0	32.84	0.00	0.07
N-IL-491	-2251.849	5700593.075	1104.727	0.000	0.000	0.015	3.240	0.000	0.0	0	0	6.36	0	33.13	0.00	0.06
N-IL-492	-2520.092	5700677.734	1104.767	0.000	0.000	0.022	3.230	0.000	0.0	0	0	5.96	0	30.82	0.00	0.08
N-IL-493	-2432.704	5700677.139	1104.091	0.000	0.000	0.024	3.230	0.000	0.0	0	0	13.42	0	78.15	0.00	0.06
N-IL-494	-2253.765	5700677.139	1102.165	0.000	0.000	0.030	3.220	0.000	0.0	0	0	5.03	0	25.71	0.00	0.01
N-IL-495	-2521.876	5700828.732	1101.234	0.000	0.000	0.074	3.180	0.000	0.0	0	0	6.01	0	31.08	0.00	0.03
N-IL-496	-2430.326	5700829.327	1100.810	0.000	0.000	0.057	3.190	0.000	0.0	0	0	3.15	0	15.75	0.00	0.02
N-IL-497	-2429.137	5700986.270	1097.281	0.000	0.000	0.198	4.530	0.000	0.0	0	0	8.55	0	46.06	0.00	0.03
N-IL-498	-2518.903	5700985.675	1097.536	0.000	0.000	0.169	3.820	0.000	0.0	0	0	5.9	0	30.73	0.00	0.02
N-IL-499	-2186.588	5700818.626	1096.236	0.000	0.000	0.200	3.800	0.000	0.0	0	0	7.69	0	40.88	0.00	0.01
N-IL-500	-2255.548	5700986.865	1096.749	0.000	0.000	0.199	2.400	0.000	0.0	0	0	3.83	0	19.24	0.00	0.02
N-IL-501	-2210.962	5701001.726	1094.231	0.000	0.000	0.019	3.230	0.000	0.0	0	0	3.83	0	19.20	0.00	0.12
N-IL-502	-2392.316	5700830.516	1101.133	0.000	0.000	0.025	1.470	0.000	0.0	0	0	2.45	0	11.72	0.00	0.08
N-IL-506	-2144.546	5700402.881	1107.772	0.000	0.000	0.022	3.230	0.000	0.0	0	0	8.45	0	45.67	0.00	0.06
N-IL-509	-2575.135	5700985.286	1097.733	0.000	0.000	0.166	3.270	0.000	0.0	0	0	0	0	0.00	0.00	0.00
JASP AREA																
N-2335-JK	-1897.606	5700987.514	1086.815	0.012	0.000	0.122	3.140	0.000	0.0	0	0	238.01	0	2874.31	0.00	0.03
N-JASP-1	-1710.567	5695076.126	1105.844	0.000	0.000	0.528	3.350	0.000	0.0	0	0	0	0	0.00	0.14	-0.68
N-JASP-10	-932.669	5698418.166	1111.065	0.014	0.000	0.333	4.940	0.000	0.0	0	0	525.8	0	3161.84	0.02	-0.05
N-JASP-11	-1737.734	5699081.932	1105.829	0.040	0.000	0.392	1.180	0.000	0.0	0	0	1096.89	0	9296.32	0.02	-0.05
N-JASP-1-1	-1716.050	5695048.756	1106.378	0.025	0.000	0.229	3.380	0.000	0.0	0	0	729.23	0	5876.87	0.00	0.00
N-JASP-12	-1851.084	5699080.478	1105.316	0.000	0.000	0.501	1.680	0.000	0.0	0	0	0	0	0.00	0.00	0.00
N-JASP-13	-299.027	5699868.745	1089.711	0.030	0.000	0.196	4.570	0.000	0.0	0	0	809.89	0	6936.01	0.02	0.16
N-JASP-14	-932.248	5701077.777	1081.921	0.022	0.000	0.245	5.080	0.000	0.0	0	0	649.75	0	5009.43	0.00	0.01
N-JASP-15	-1543.975	5701080.695	1075.917	0.000	0.000	0.557	4.060	0.000	0.0	0	0	0	0	0.00	18.41	-29.10
N-JASP-16	-1573.509	5701101.951	1123.301	0.000	0.000	47.511	-44.260	47.069	4310.3	0	4296.9	0	0	0.00	2.98	3.81
N-JASP-2	-1677.753	5695085.910	1128.169	0.000	0.000	22.103	-18.980	21.766	4318.1	0	4303.1	0	0	0.00	0.15	-0.74
N-JASP-3	-628.975	5695436.603	1121.240	0.000	0.000	0.365	1.760	0.000	0.0	0	0	0	0	0.00	0.04	0.17
N-JASP-4	-1729.229	5695944.333	1110.668	0.027	0.000	0.200	3.330	0.000	0.0	0	0	762.57	0	6329.71	0.01	0.11
N-JASP-5	-1683.863	5696239.000	1108.903	0.018	0.000	0.153	3.100	0.000	0.0	0	0	534.29	0	4008.65	0.01	0.13
N-JASP-6	-2386.233	5696237.728	1101.818	0.017	0.000	0.321	3.010	0.000	0.0	0	0	552.49	0	3788.77	0.02	0.12
N-JASP-7	-2394.403	5697035.242	1099.707	0.000	0.000	0.529	3.290	0.000	0.0	0	0	0	0	0.00	3.28	-15.40
N-JASP-7-1	-2276.331	5696916.278	1101.045	0.014	0.000	0.185	3.060	0.000	0.0	0	0	464.66	0	3174.92	0.00	0.01
N-JASP-8	-2415.455	5697089.425	1119.958	0.000	0.000	18.978	-15.720	18.717	2979.2	0	271.9	0	0	0.00	1.86	8.29
N-JASP-8.1	-2658.443	5697361.107	1115.092	0.000	0.000	21.322	-18.070	21.024	4313.8	0	4277.1	0	0	0.00	0.01	-0.05
N-JASP-8.2	-2813.010	5697517.165	1112.400	0.000	0.000	18.177	-14.380	17.877	4305.8	0	4272.2	0	0	0.00	0.04	0.19
N-JASP-8.3	-3350.052	5698463.981	1096.737	0.000	0.000	0.267	2.600	0.000	0.0	0	0	0	0	0.00	0.01	-0.07
N-JASP-8.4	-3352.234	5698474.300	1096.689	0.000	0.053	0.250	3.170	0.000	0.0	0	0	0	0	0.00	0.00	0.00
N-JASP-9	-787.474	5697023.688	1118.126	0.022	0.000	0.294	4.130	0.000	0.0	0	0	584.68	0	5082.39	0.01	0.02
N-UR-01	-4650.236	5697048.798	0.000	0.000	0.000	0.000	0.000	0.000	0.0	0	0	0	0	0.00	0.00	0.00
N-UR-02	-4317.258	5697746.434	0.000	0.000	0.000	0.000	0.000	0.000	0.0	0	0	0	0	0.00	0.00	0.00

LINK RESULTS

Name	Shape	Upstream Node Name	Downstream Node Name	Length (m)	Conduit Slope	Diameter (Height) (m)	Design Full Flow (m^3/s)	Max Flow (m^3/s)	Time to Peak (hr)	Design Velocity (m/s)	Max Velocity (m/s)	Time of Peak Velocity (hr)	U/S Max Water Depth (m)	D/S Max Water Depth (m)	Max Flow/Design Flow (fraction) %	Max d/D (depth/diameter)
EXISTING TOWN																
L 1	Circular	MH 1	MH 2	71.986	1.709	0.250	0.08	0.001	12.01	1.58	0.57	12.01	0.021	0.037	0.02	0.09
L 1A	Circular	MH 1A	MH 1A-1	508.020	0.695	0.250	0.05	0.038	9.02	1.01	1.10	8.42	0.804	2.404	0.78	9.38
L 1A-1	Circular	MH 1A-1	MH 1A-2	116.450	0.400	0.250	0.04	0.038	9.59	0.77	0.87	8.28	2.404	2.476	1.01	9.78
L 1A-2	Circular	MH 1A-2	MH 1A-3	75.000	0.600	0.250	0.05	0.038	9.79	0.94	0.99	8.00	2.476	2.684	0.82	10.62
L 1A-3	Circular	MH 1A-3	MH 16	120.000	0.300	0.250	0.03	0.038	9.83	0.63	0.73	9.83	2.684	2.578	1.23	10.74
L 2	Circular	MH 2	MH 3	118.093	1.819	0.250	0.08	0.004	12.02	1.63	0.84	12.02	0.037	0.050	0.05	0.16
L 3	Circular	MH 3	MH 4	123.759	0.925	0.250	0.06	0.005	12.04	1.17	0.72	12.04	0.050	0.064	0.09	0.20
L 4	Circular	MH 4	MH 5	68.783	0.730	0.250	0.05	0.007	12.03	1.03	0.73	12.04	0.064	0.064	0.14	0.25
L 5	Circular	MH 5	MH 6	67.480	0.873	0.250	0.06	0.008	12.03	1.13	0.81	12.03	0.064	0.067	0.15	0.27
L 6	Circular	MH 6	MH 7	45.412	0.868	0.250	0.06	0.009	12.04	1.13	0.82	12.04	0.067	1.560	0.16	2.12
South Pump 1		MH 7	MH 7A				0.00	0.037	0.01	0.00	0.00	0.00	1.560	10.351	0.00	0.00
South Pump 2		MH 7	MH 7A				0.00	0.037	0.01	0.00	0.00	0.00	1.560	10.351	0.00	0.00
L 7	Circular	MH 8	MH 7	105.169	0.432	0.250	0.04	0.003	10.16	0.80	0.47	10.17	0.082	1.560	0.09	2.08
L 8	Circular	MH 9	MH 8	99.015	0.367	0.250	0.04	0.003	10.10	0.73	0.42	10.11	0.081	0.082	0.08	0.21
L 9	Circular	MH 10	MH 9	68.789	1.923	0.250	0.08	0.002	10.06	1.68	0.72	10.06	0.058	0.081	0.03	0.11
L 10	Circular	MH 11	MH 10	84.901	1.949	0.250	0.08	0.001	10.01	1.69	0.63	10.01	0.053	0.058	0.02	0.09
L 11	Circular	MH 12	MH 2	139.786	0.439	0.250	0.04	0.002	12.07	0.80	0.38	12.07	0.066	0.037	0.04	0.15
L 12	Circular	MH 13	MH 12	101.863	0.526	0.250	0.04	0.001	12.02	0.88	0.38	12.03	0.031	0.066	0.03	0.13
L 13	Circular	MH 13	MH 14	137.935	1.795	0.250	0.08	0.000	6.49	1.62	0.18	6.49	0.031	2.198	0.00	8.67
L 14	Circular	MH 14	MH 11	90.203	2.007	0.250	0.08	0.001	9.92	1.72	0.57	9.92	2.198	0.053	0.01	0.09
L 15	Circular	MH 14	MH 15	81.584	0.314	0.250	0.03	0.012	13.99	0.68	0.58	8.02	2.198	2.480	0.35	9.68
L 16	Circular	MH 15	MH 16	51.983	0.264	0.250	0.03	0.012	14.03	0.62	0.51	5.09	2.480	2.578	0.40	10.31
L 17	Circular	MH 16	MH 17	24.266	0.424	0.250	0.04	0.048	9.67	0.79	0.95	7.92	2.578	2.602	1.24	10.31
L 18	Circular	MH 17	MH 18	124.336	0.483	0.250	0.04	0.049	9.89	0.84	0.96	7.90	2.602	2.467	1.19	10.29
L 19	Circular	MH 18	MH 19	120.425	1.342	0.250	0.07	0.054	9.90	1.40	1.37	7.46	2.467	3.229	0.78	12.72
L 20	Circular	MH 19	MH 20	56.264	0.496	0.250	0.04	0.054	9.91	0.85	1.02	9.91	3.229	3.082	1.28	12.80
L 21	Circular	MH 20	MH 21	63.940	0.269	0.250	0.03	0.055	9.91	0.63	1.04	9.91	3.082	2.838	1.78	12.33
L 22	Circular	MH 21	MH 22	86.262	0.463	0.250	0.04	0.049	9.17	0.82	0.94	9.17	2.838	2.794	1.22	11.23
L 23	Circular	MH 22	MH 23	153.631	0.225	0.250	0.03	0.049	9.17	0.57	0.95	9.17	2.794	2.430	1.75	11.18
L 24	Circular	MH 23	MH 25	118.670	0.327	0.250	0.03	0.049	9.19	0.69	0.96	9.18	2.430	2.245	1.45	9.60
L 25	Circular	MH 24	MH 25	126.398	0.448	0.250	0.04	0.003	14.73	0.81	0.24	0.41	1.579	2.245	0.07	8.58
L 26	Circular	MH 25	MH 26	107.307	0.312	0.250	0.03	0.050	12.65	0.68	0.97	9.20	2.245	2.024	1.49	8.86
L 27	Circular	MH 26	MH 27	42.567	0.038	0.250	0.01	0.050	12.64	0.23	0.98	12.65	2.024	1.820	4.33	7.98
L 28	Circular	MH 27	MH 28	71.466	0.861	0.250	0.06	0.050	12.63	1.25	1.27	7.86	1.820	2.164	0.82	8.58
L 29	Circular	MH 28	MH 29	123.337	0.295	0.300	0.04	0.051	12.62	0.55	0.70	12.62	2.164	2.185	1.31	7.21
L 30	Circular	MH 29	MH 30	58.154	0.242	0.300	0.05	0.051	13.63	0.67	0.78	8.13	2.185	2.206	1.07	7.35
L 31	Circular	MH 30	MH 31	113.591	0.290	0.300	0.05	0.051	13.63	0.74	0.81	8.03	2.206	2.406	0.99	7.85
L 32	Circular	MH 31	MH 32	120.573	0.205	0.300	0.04	0.056	13.21	0.62	0.78	13.23	2.406	2.376	1.28	7.92
LK-ID-01	Circular	N-ID-01	MH 32	487.920	0.400	0.200	0.02	0.013	8.10	0.66	0.69	8.06	0.848	2.376	0.62	11.13
L 33	Circular	MH 32	MH 33	35.995	0.475	0.300	0.07	0.064	12.60	0.94	1.05	7.96	2.376	2.899	0.97	7.96
L 34	Circular	MH 33	MH 34	177.891	0.120	0.600	0.21	0.416	10.49	0.75	1.44	10.49	2.899	2.333	1.95	4.83
L 35	Circular	MH 34	MH 35	159.987	0.121	0.600	0.21	0.416	10.49	0.75	1.45	10.49	2.333	1.814	1.95	3.89
L 36	Circular	MH 35	MH 36	179.008	0.120	0.600	0.21	0.417	10.50	0.75	1.46	10.50	1.814	1.237	1.96	3.02
L 37	Circular	MH 36	MH 37	179.515	0.120	0.600	0.21	0.418	10.50	0.75	1.47	10.50	1.237	0.614	1.97	2.04
L 38	Circular	MH 37	MH 38	33.564	0.119	0.600	0.21	0.419	10.51	0.75	1.48	10.51	0.614	0.537	1.98	1.02
L 39	Circular	MH 38	MH 39	12.204	0.115	0.600	0.21	0.419	10.51	0.74	1.72	10.51	0.537	0.421	2.02	0.82
L 40	Circular	MH 39	MH 40	59.369	2.586	0.600	0.99	0.419	10.51	3.49	2.66	12.92	0.421	1.216	0.43	1.86
L 40A	Circular	MH 40	MH 40A	17.220	0.714	0.600	0.52	1.071	9.62	1.84	3.77	9.62	1.216	0.821	2.06	2.03
L 40B	Circular	MH 40A	MH 40B	7.800	0.205	0.600	0.28	1.071	9.62	0.98	3.78	9.62	0.821	0.600	3.85	1.37
L 41	Circular	MH 41	MH 31	71.390	0.705	0.150	0.01	0.010	12.83	0.72	0.54	12.83	1.937	2.406	0.78	14.91
L 42	Circular	MH 42	MH 41	70.492	0.641	0.250	0.05	0.010	12.84	0.95	0.36	8.37	1.520	1.937	0.21	7.75
L 43	Circular	MH 43	MH 42	83.032	0.742	0.250	0.05	0.009	12.84	1.04	0.50	13.25	0.859	1.520	0.18	5.84
L 44	Circular	MH 43	MH 44	105.017	0.369	0.250	0.04	-0.011	9.16	0.74	-0.23	9.15	0.859	1.353	0.30	5.05
L 45	Circular	MH 44	MH 29	114.821	0.622	0.250	0.05	-0.011	9.16	0.96	0.24	0.59	1.353	2.185	0.24	8.22
L 46	Circular	MH 45	MH 51	46.109	0.640	0.250	0.05	-0.009	9.13	0.97	0.30	8.78	2.792	1.864	0.20	5.51
L 47	Circular	MH 46	MH 45	71.349	0.137	0.250	0.02	-0.007	9.13	0.45	0.20	12.54	1.383	2.792	0.31	4.22
L 48	Circular	MH 47	MH 46	21.986	0.186	0.250	0.03	-0.003	9.24	0.52	0.13	12.41	1.221	1.383	0.11	3.72
L 49	Circular	MH 48	MH 49	41.987	2.996	0.200	0.06	0.000	9.09	1.81	0.44	9.09	0.010	0.048	0.00	0.05
L 50	Circular	MH 49	MH 231	99.005	0.877	0.200	0.03	0.001	9.29	0.98	0.39	9.21	0.048	0.755	0.03	3.33
L 51	Circular	MH 50	MH 49	47.218	0.572	0.200	0.02	0.000	9.14	0.79	0.25	9.14	0.016	0.048	0.01	0.08
L 52	Circular	MH 51	MH 28	94.160	0.658	0.525	0.00	0.000	0.00	0.00	0.00	0.00	1.864	2.164	0.00	0.00
L51A	Circular	MH 51	MH 242	456.190	0.261	0.600	0.37	0.325	10.48	1.31	1.41	8.36	1.864	2.257	0.88	3.61
L 53	Circular	MH 52	MH 51	25.890	0.610	0.525	0.40	0.325	10.46	1.83	1.94	8.47	1.760	1.864	0.82	3.46
L 54	Circular	MH 53	MH 52	113.790	0.650	0.525	0.41	0.324	10.44	1.89	2.01	8.57	1.477	1.760	0.80	3.35
L 55	Circular	MH 54	MH 53	51.740	0.600	0.525	0.39	0.324	10.42	1.82	2.00	8.84	1.372	1.477	0.82	2.81
L 56	Circular	MH 55	MH 79	104.478	0.192	0.300	0.03	0.000	0.00	0.41	0.00	0.00	0.852	0.014	0.00	0.00
L 56A	Circular	MH 56A	MH 56	97.370	0.470	0.600	0.42	0.312	9.59	1.49	1.53	8.58	0.701	1.020	0.74	1.53
L 57	Circular	MH 55	MH 54	100.180	0.869	0.525	0.47	0.324	10.42	2.19	2.33	8.96	0.852	1.372	0.68	2.52
L 58	Circular	MH 56	MH 55	98.920	0.295	0.525	0.22	0.324	9.36	1.00	1.48	10.40	1.020	0.852	1.50	1.94
L 59	Circular	MH 57	MH 56	99.781	0.341	0.375	0.09	0.018	11.53	0.85	0.57	7.13	0.670	1.020	0.19	2.32
L 60	Circular	MH 58	MH 57	99.657	0.183	0.375	0.13	0.014	11.09	1.16	0.70	13.45	0.254	0.670	0.11	1.69
L 61	Circular	MH 59	MH 58	99.328	0.278	0.375	0.10	0.010	9.89	0.92	0.59	9.89	0.082	0.254	0.10	0.54
L 62	Circular	MH 60	MH 59	139.180	0.616	0.375	0.13	0.009	9.59	1.19	0.68	9.59	0.068	0.082	0.07	0.18
L 63	Circular	MH 61	MH 60	91.924	0.499	0.375	0.10	0.000	9.34	0.89	0.19	0.62	0.017	0.068	0.00	0.11
L 64	Circular	MH 62	MH 61	60.900	0.521	0.375	0.11	0.000	9.20	0.98	0.19	9.20	0.016	0.017	0.00	0.04
L 65	Circular	MH 63	MH 64	42.705	0.550	0.200	0.02	0.000	0.00	0.77	0.00	0.00	0.045	0.079	0.00	0.00
L 66	Circular	MH 63	MH 54	131.421	1.060	0.200	0.03	0.001	9.25	0.98	0.37	9.25	0.045	1.372	0.03	3.53
L 67	Circular	MH 64	MH 239	52.388	0.092	0.300	0.03	0.002	9.47	0.41	0.22	9.47	0.079	0.087	0.05	0.17
L 68	Circular	MH 65	MH 64	35.931	0.161	0.200	0.01	0.000	9.40	0.42	0.19	9.37	0.096	0.079	0.04	0.15
L 69	Circular	MH 66	MH 65	66.158	0.509	0.200	0.02	0.000	9.24	0.75	0.27	9.24	0.019	0.096	0.02	0.10
L 70	Circular	MH 67	MH 66	66.296	0.602	0.200	0.03	0.000	9.12	0.81	0.24	9.12	0.013	0.019	0.01	0.07
L 71	Circular	MH 68	MH 69	88.305	0.538	0.200	0.02	0.000	10.01	0.77	0.29	10.01	0.020	0.022	0.02	0.10
L 72	Circular	MH 69	MH 72	67.004	0.601	0.200	0.03	0.001	10.00	0.81	0.31	5.46	0.022	0.057	0.03	0.29
L 73	Circular	MH 70	MH 245	67.917	0.464	0.250	0.04	0.026	9.43	0.78	0.83	9.49	0.155	0.201	0.69	0.62
L 74	Circular	MH 71	MH 70	52.939	0.584	0.250	0.05	0.008	9.50	0.93	0.60	10.10	0.069	0.155	0.17	0.53
L 75	Circular	MH 72	MH 71	76.236	1.362	0.250	0.06	0.007	9.49	1.30	0.86	9.49	0.057	0.069	0.12	0.23
L 76	Circular	MH 73	MH 72	97.273	0.740	0.250	0.05	0.006	9.46	1.04	0.71	9.47	0.060	0.057	0.13	0.24
L 77	Circular	MH 74	MH 73	95.880	0.476	0.200	0.02	0.000	9.30	0.72	0.23	9.30	0.017	0.060	0.01	0.08
L 78	Circular	MH 75	MH 74	85.136	0.029	0.200	0.01	0.000	0.00	0.18	0.00	0.00	0.027	0.017	0.00	0.00
L 79	Circular	MH 75	MH 76	60.264	0.174	0.200	0.01	0.000	9.28	0.44	0.18	9.28	0.027	0.018	0.03	0.14
L 80	Circular	MH 76	MH 77	98.149	1.775	0.200	0.04	0.001	9.28	1.39	0.52	9.29	0.018	0.044	0.02	0.09
L 81	Circular	MH 77	MH 78	34.935	0.913	0.200	0.03	0.001	9.30	1.00	0.44	9.30	0.044	0.059	0.03	0.12
L 82	Circular	MH 78	MH 64	100.271	0.281	0.300	0.05	0.001	9.22	0.73	0.29	9.23	0.059	0.079	0.02	0.10
L 83	Circular	MH 79	MH 78	71.330	0.254	0.300	0.05	0.000	10.07	0.69	0.14	10.08	0.014	0.059	0.00	0.05
L 84	Circular	MH 80	MH 56	115.230	1.160	0.200	0.04	0.001	9.52	1.12	0.46	9.53	0.021	1.020	0.02	0.11
L 85	Circular	MH 81	MH 80	114.345	0.403	0.200	0.02	0.001	9.40	0.66	0.28	9.40	0.027	0.021	0.03	0.13
L 86	Circular	MH 82	MH 81	92.385	0.838	0.200	0.03	0.000	9.21	0.96	0.33	9.21	0.016	0.027	0.01	0.08
L 87	Circular	MH 83	MH 84	112.251	0.423	0.200	0.02	0.000	9.34	0.68	0.24	9.35	0.020	0.025	0.02	0.10
L 88	Circular	MH 84	MH 85	109.420	0.519	0.200	0.02	0.001	9.40	0.75	0.32	9.40	0.025	0.056	0.03	0.13
L 89	Circular	MH 85	MH 73	105.164	0.868	0.250	0.06	0.006	9.43	1.13	0.74	9.43	0.056	0.060	0.11	0.22
L 90	Circular	MH 86	MH 85	113.448	0.506	0.250	0.04	0.005	9.39	0.86	0.57	9.39	0.060	0.056	0.12	0.24
L 91	Circular	MH 87	MH 88	20.540	0.419	0.200	0.02	0.001	9.06	0.68	0.28	9.06	0.025	0.035	0.03	0.13
L 92	Circular	MH 88	MH 89	100.180	0.173	0.200	0.01	0.001	9.17	0.43	0.25	9.16	0.035	0.037	0.07	0.19
L 93	Circular	MH 89	MH 90	99.069	0.398	0.200	0.02	0.001	9.23	0.66	0.33	9.25	0.037	0.025	0.06	0.19
L 94	Circular	MH 90	MH 91	102.894	1.899	0.200	0.05	0.002	9.29	1.44	0.66	9.29	0.025	0.029	0.03	0.13
L 95	Circular	MH 91	MH 57	100.536	1.115	0.200	0.04	0.002	9.35	1.17	0.58	9.35	0.029	0.670	0.04	0.14
L 96	Circular	MH 92	MH 58	91.218	0.310	0.200	0.02	0.002	9.45	0.70	0.41	9.45	0.042	0.254	0.09	0.21
L 97	Circular	MH 93	MH 92	118.404	1.588	0.200	0.04	0.002	9.36	1.32	0.65	9.37	0.028	0.042	0.04	0.14
L 98	Circular	MH 94	MH 93	100.849	0.763	0.200	0.03	0.001	9.31	0.91	0.45	9.31	0.028	0.028	0.04	0.14
L 99	Circular	MH 95	MH 94	95.332	0.842	0.200	0.03	0.001	9.22	0.96	0.43	9.23	0.024	0.028	0.03	0.12
L 100	Circular	MH 96	MH 95	78.263	0.377	0.200	0.02	0.001	9.13	0.64	0.29	9.13	0.024	0.024	0.03	0.12
L 101	Circular	MH 97	MH 96	40.162	0.712	0.200	0.03	0.000	9.05	0.88	0.33	9.05	0.018	0.024	0.02	0.12
L 102	Circular	MH 98	MH 93	108.154	1.664	0.200	0.04	0.000	9.22	1.35	0.39	9.23	0.013	0.028	0.01	0.07
L 103	Circular	MH 98	MH 135	46.604	0.071	0.200	0.01	0.000	9.23	0.28	0.07	9.23	0.013	0.063	0.01	0.07
L 104	Circular	MH 99	MH 100	40.300	1.444	0.200	0.04	0.000	10.06	1.25	0.24	10.06	0.036	0.039	0.00	0.05
L 105	Circular	MH 100	MH 59	114.532	1.394	0.200	0.04	0.000	10.17	1.23	0.29	10.17	0.039	0.082	0.00	0.05
L 106	Circular	MH 101	MH 65	50.154	0.171	0.300	0.04	0.000	9.62	0.57	0.06	0.39	0.031	0.096	0.00	0.22
L 107	Circular	MH 102	MH 103	35.499	0.916	0.200	0.03	0.000	9.17	1.00	0.20	9.17	0.008	0.163	0.00	0.04
L 108	Circular	MH 103	MH 104	154.831	0.353	0.250	0.04	0.018	9.35	0.72	0.68	9.36	0.163	0.175	0.50	0.53
L 109	Circular	MH 104	MH 246	70.346	0.114	0.250	0.02	0.018	9.37	0.41	0.51	9.37	0.175	0.137	0.90	0.70
L 110	Circular	MH 105	MH 104	5.867	2.369	0.200	0.05	0.000	9.04	1.61	0.29	0.73	0.038	0.175	0.00	0.50
L 111	Circular	MH 106	MH 103	96.055	0.349	0.250	0.04	0.017	9.29	0.72	0.68	9.30	0.129	0.163	0.48	0.52
L 112	Circular	MH 107	MH 106	59.419	0.653	0.200	0.03	0.001	9.08	0.84	0.32	0.48	0.049	0.129	0.03	0.51
L 113	Circular	MH 108	MH 106	61.816	0.298	0.250	0.03	0.014	9.24	0.66	0.63	9.27	0.116	0.129	0.43	0.47
L 114	Circular	MH 109	MH 108	45.726	0.197	0.250	0.03	0.014	9.23	0.54	0.55	9.24	0.132	0.116	0.53	0.53
L 115	Circular	MH 110	MH 109	117.882	0.249	0.250	0.03	0.001	9.19	0.61	0.26	21.04	1.630	0.132	0.03	0.27
L 116	Circular	MH 111	MH 110	92.704	1.609	0.200	0.04	0.001	9.12	1.32	0.45	9.12	2.545	1.630	0.01	0.08
L 117	Circular	MH 112	MH 113	43.181	0.676	0.200	0.03	0.000	9.14	0.86	0.19	7.53	0.008	0.088	0.00	0.12
L 118	Circular	MH 113	MH 116	160.214	0.492	0.250	0.04	0.011	9.13	0.85	0.69	9.13	0.088	0.103	0.25	0.35
L 119	Circular	MH 114	MH 113	78.413	0.615	0.200	0.03	0.010	9.07	0.82	0.76	9.08	0.088	0.088	0.39	0.44
L 120	Circular	MH 115	MH 114	143.986	0.477	0.200	0.02	0.010	9.05	0.72	0.67	9.06	0.097	0.088	0.44	0.48
L 121	Circular	MH 116	MH 123	86.245	0.347	0.250	0.04	0.012	9.16	0.71	0.62	9.19	0.103	0.117	0.33	0.41
L 122	Circular	MH 117	MH 116	87.084	1.149	0.200	0.04	0.001	9.40	1.12	0.46	9.40	0.021	0.103	0.02	0.11
L 123	Circular	MH 118	MH 117	86.366	0.479	0.200	0.02	0.000	9.38	0.72	0.24	9.38	0.018	0.021	0.01	0.09
L 124	Circular	MH 119	MH 118	67.238	0.336	0.200	0.02	0.000	9.29	0.61	0.17	9.29	0.015	0.018	0.01	0.08
L 125	Circular	MH 119	MH 120	87.392	0.611	0.200	0.03	0.000	9.29	0.82	0.25	9.29	0.015	0.015	0.01	0.08
L 126	Circular	MH 120	MH 117	67.210	1.579	0.200	0.04	0.000	9.29	1.31	0.43	9.29	0.015	0.021	0.01	0.08
L 127	Circular	MH 121	MH 120	54.780	1.431	0.200	0.04	0.000	9.29	1.25	0.03	9.29	0.011	0.015	0.00	0.00
L 128	Circular	MH 121	MH 122	31.638	1.647	0.200	0.04	0.000	9.29	1.34	0.34	9.29	0.011	0.013	0.01	0.05
L 129	Circular	MH 122	MH 123	153.482	2.191	0.200	0.05	0.001	9.17	1.50	0.47	0.45	0.013	0.117	0.01	0.51
L 130	Circular	MH 123	MH 109	89.813	0.277	0.250	0.03	0.012	9.20	0.64	0.57	9.21	0.117	0.132	0.40	0.47
L 131	Circular	MH 124	MH 109	66.388	0.487	0.200	0.02	0.001	9.30	0.73	0.30	12.02	0.050	0.132	0.03	0.32
L 132	Circular	MH 125	MH 124	132.599	0.429	0.200	0.02	0.000	9.39	0.68	0.25	9.39	0.050	0.050	0.02	0.10
L 133	Circular	MH 126	MH 106	93.504	0.587	0.200	0.03	0.002	9.32	0.80	0.43	10.85	0.059	0.129	0.07	0.58
L 134	Circular	MH 127	MH 126	75.454	0.753	0.200	0.03	0.001	9.31	0.91	0.42	9.31	0.055	0.059	0.03	0.13
L 135	Circular	MH 128	MH 127	75.142	0.548	0.200	0.02	0.001	9.28	0.77	0.33	9.28	0.054	0.055	0.03	0.12
L 136	Circular	MH 129	MH 128	41.968	2.509	0.200	0.05	0.000	10.02	1.65	0.40	10.02	0.010	0.054	0.00	0.05
L 137	Circular	MH 130	MH 128	96.372	0.829	0.200	0.03	0.000	9.22	0.95	0.27	9.22	0.012	0.054	0.01	0.06
L 138	Circular	MH 130	MH 131	75.789	0.912	0.200	0.03	0.000	9.22	1.00	0.28	9.22	0.012	0.022	0.01	0.06
L 139	Circular	MH 131	MH 132	73.300	0.535	0.200	0.02	0.001	9.28	0.76	0.30	9.28	0.022	0.022	0.02	0.11
L 140	Circular	MH 132	MH 126	95.694	0.734	0.200	0.03	0.001	9.34	0.89	0.38	9.35	0.022	0.059	0.03	0.11
L 141	Circular	MH 133	MH 134	99.371	0.312	0.200	0.02	0.003	9.48	0.58	0.39	9.49	0.055	0.056	0.15	0.28
L 142	Circular	MH 134	MH 135	99.307	0.629	0.200	0.03	0.004	9.48	0.83	0.62	9.48	0.056	0.063	0.17	0.28
L 143	Circular	MH 135	MH 136	98.538	0.505	0.200	0.02	0.005	9.46	0.74	0.59	9.47	0.063	0.096	0.24	0.48
L 144	Circular	MH 136	MH 137	99.835	0.573	0.200	0.02	0.006	9.46	0.79	0.65	9.51	0.096	0.066	0.25	0.35
L 145	Circular	MH 137	MH 60	77.901	0.942	0.200	0.04	0.008	9.52	1.12	0.92	9.53	0.066	0.068	0.24	0.33
L 146	Circular	MH 138	MH 139	57.663	1.365	0.200	0.04	0.002	10.02	1.22	0.62	10.02	0.028	0.045	0.05	0.22
L 147	Circular	MH 139	MH 137	86.411	0.388	0.200	0.02	0.002	10.02	0.65	0.39	10.02	0.045	0.066	0.10	0.22
L 148	Circular	MH 140	MH 136	86.156	1.411	0.200	0.04	0.001	9.16	1.24	0.44	9.16	0.017	0.096	0.01	0.08
L 149	Circular	MH 141	MH 140	68.918	1.332	0.200	0.04	0.000	9.07	1.20	0.39	9.07	0.014	0.017	0.01	0.08
L 150	Circular	MH 142	MH 135	172.740	1.648	0.200	0.04	0.001	9.22	1.34	0.46	9.22	0.016	0.063	0.01	0.08
L 151	Circular	MH 143	MH 134	86.401	1.124	0.200	0.03	0.002	9.29	1.11	0.55	9.29	0.029	0.056	0.04	0.14
L 152	Circular	MH 144	MH 143	86.168	0.996	0.200	0.03	0.001	9.28	1.04	0.51	9.28	0.028	0.029	0.04	0.14
L 153	Circular	MH 145	MH 144	86.317	1.852	0.200	0.04	0.001	9.48	1.42	0.57	9.48	0.021	0.028	0.02	0.10
L 154	Circular	MH 146	MH 145	57.622	1.852	0.200	0.04	0.001	9.48	1.42	0.55	9.48	0.019	0.021	0.02	0.10
L 155	Circular	MH 147	MH 133	53.147	0.401	0.200	0.02	0.002	9.39	0.66	0.42	9.39	0.048	0.055	0.11	0.24
L 156	Circular	MH 148	MH 147	33.204	0.352	0.200	0.02	0.001	9.36	0.62	0.34	9.36	0.038	0.048	0.07	0.19
L 157	Circular	MH 149	MH 148	86.037	1.018	0.200	0.03	0.001	9.33	1.05	0.50	9.34	0.027	0.038	0.04	0.13
L 158	Circular	MH 150	MH 149	86.666	1.876	0.200	0.04	0.001	9.30	1.43	0.57	9.30	0.021	0.027	0.02	0.10
L 159	Circular	MH 151	MH 150	59.820	2.367	0.200	0.05	0.001	9.27	1.61	0.57	9.28	0.017	0.021	0.01	0.08
L 160	Circular	MH 152	MH 153	99.671	0.323	0.200	0.02	0.000	9.25	0.59	0.18	9.25	0.016	0.021	0.01	0.08
L 161	Circular	MH 152	MH 165	98.838	0.451	0.200	0.02	0.000	9.25	0.70	0.25	9.25	0.016	0.022	0.01	0.11
L 162	Circular	MH 153	MH 164	97.796	0.366	0.200	0.02	0.000	9.43	0.63	0.23	9.43	0.021	0.017	0.02	0.11
L 163	Circular	MH 154	MH 153	32.302	0.399	0.200	0.02	0.000	9.19	0.66	0.15	9.19	0.011	0.021	0.01	0.05
L 164	Circular	MH 154	MH 155	123.996	2.815	0.200	0.06	0.000	9.19	1.75	0.45	9.19	0.011	0.014	0.01	0.05
L 165	Circular	MH 155	MH 162	78.651	1.713	0.200	0.04	0.000	9.23	1.37	0.43	9.23	0.014	0.032	0.01	0.07
L 166	Circular	MH 156	MH 185	60.243	7.330	0.200	0.09	0.000	9.03	2.83	0.73	9.03	0.009	0.047	0.01	0.09
L 167	Circular	MH 157	MH 159	70.884	3.183	0.200	0.06	0.000	9.10	1.86	0.50	9.09	0.009	0.061	0.01	0.15
L 168	Circular	MH 158	MH 157	24.942	0.734	0.200	0.03	0.000	9.11	0.89	0.23	9.11	0.011	0.009	0.01	0.06
L 169	Circular	MH 159	MH 160	76.457	0.914	0.200	0.03	0.001	9.19	1.00	0.39	9.19	0.061	0.023	0.02	0.10
L 170	Circular	MH 160	MH 227	45.428	0.691	0.200	0.03	0.001	9.22	0.87	0.37	9.22	0.023	0.033	0.03	0.12
L 171	Circular	MH 161	MH 167	117.840	0.444	0.200	0.02	0.001	9.49	0.70	0.37	9.49	0.051	0.051	0.06	0.18
L 172	Circular	MH 162	MH 161	95.411	2.751	0.200	0.05	0.001	9.39	1.73	0.70	9.39	0.032	0.051	0.02	0.11
L 173	Circular	MH 163	MH 162	90.906	3.341	0.200	0.06	0.001	9.43	1.91	0.60	9.44	0.043	0.032	0.01	0.09
L 174	Circular	MH 164	MH 146	29.319	0.229	0.200	0.02	0.000	9.43	0.50	0.16	9.44	0.017	0.019	0.01	0.09
L 175	Circular	MH 164	MH 163	104.205	1.278	0.200	0.04	0.000	9.43	1.18	0.40	9.43	0.017	0.043	0.01	0.08
L 176	Circular	MH 165	MH 151	26.316	0.532	0.200	0.02	0.001	9.26	0.76	0.30	9.26	0.022	0.017	0.02	0.11
L 177	Circular	MH 165	MH 164	99.748	0.300	0.200	0.02	0.000	0.00	0.57	0.00	0.00	0.022	0.017	0.00	0.00
L 178	Circular	MH 166	MH 186	73.551	1.432	0.200	0.04	0.000	9.09	1.25	0.33	9.08	0.009	0.024	0.01	0.12
L 179	Circular	MH 167	MH 168	120.085	0.527	0.200	0.02	0.003	10.01	0.76	0.52	10.02	0.051	0.110	0.14	0.26
L 180	Circular	MH 168	MH 177	99.185	0.392	0.200	0.02	0.006	9.70	0.65	0.55	9.70	0.110	0.086	0.31	0.40
L 181	Circular	MH 169	MH 168	86.443	2.083	0.200	0.05	0.003	9.59	1.51	0.84	9.59	0.034	0.110	0.06	0.17
L 182	Circular	MH 170	MH 169	88.023	1.889	0.200	0.05	0.003	9.58	1.43	0.77	9.58	0.032	0.034	0.06	0.16
L 183	Circular	MH 171	MH 172	63.704	0.413	0.200	0.02	0.002	9.51	0.67	0.37	9.51	0.039	0.035	0.07	0.19
L 184	Circular	MH 172	MH 173	35.138	0.592	0.200	0.03	0.002	9.53	0.80	0.44	9.54	0.035	0.037	0.06	0.17
L 185	Circular	MH 173	MH 170	100.044	0.695	0.200	0.03	0.002	9.57	0.87	0.51	9.57	0.037	0.032	0.08	0.19
L 186	Circular	MH 174	MH 173	57.650	1.625	0.200	0.04	0.000	9.12	1.33	0.38	9.13	0.013	0.037	0.01	0.06
L 187	Circular	MH 175	MH 170	57.961	2.310	0.200	0.05	0.000	9.12	1.59	0.42	9.12	0.011	0.032	0.01	0.06
L 188	Circular	MH 176	MH 169	63.250	1.731	0.200	0.04	0.000	9.08	1.37	0.39	9.05	0.011	0.034	0.01	0.17
L 189	Circular	MH 177	MH 216	107.667	1.287	0.200	0.04	0.006	9.73	1.18	0.88	9.73	0.086	0.076	0.17	0.28
L 190	Circular	MH 178	MH 86	112.356	0.980	0.250	0.06	0.005	9.34	1.20	0.72	9.34	0.048	0.060	0.08	0.19
L 191	Circular	MH 179	MH 178	61.400	0.590	0.250	0.05	0.004	9.30	0.93	0.58	9.30	0.053	0.048	0.10	0.21
L 192	Circular	MH 180	MH 179	35.052	0.899	0.200	0.03	0.000	9.08	0.99	0.33	9.08	0.015	0.053	0.01	0.08
L 193	Circular	MH 181	MH 179	98.062	0.079	0.250	0.02	0.004	9.28	0.34	0.27	9.28	0.085	0.053	0.23	0.34
L 194	Circular	MH 182	MH 183	47.696	1.008	0.200	0.03	0.000	9.10	1.05	0.33	9.10	0.014	0.030	0.01	0.07
L 195	Circular	MH 183	MH 181	41.714	2.637	0.250	0.10	0.004	9.17	1.97	0.92	9.16	0.030	0.085	0.04	0.22
L 196	Circular	MH 184	MH 183	58.115	2.147	0.200	0.05	0.001	7.38	1.53	0.49	7.38	0.015	0.030	0.01	0.07

L 197	Circular	MH 185	MH 183	89.451	0.531	0.250	0.04	0.003	9.38	0.88	0.44	9.29	0.047	0.030	0.06	0.19
L 198	Circular	MH 186	MH 185	93.002	2.325	0.250	0.09	0.002	9.40	1.85	0.76	9.39	0.024	0.047	0.02	0.19
L 199	Circular	MH 187	MH 186	102.658	1.392	0.200	0.04	0.000	9.20	1.23	0.41	9.20	0.015	0.024	0.01	0.08
L 200	Circular	MH 188	MH 186	79.863	0.348	0.200	0.02	0.001	9.42	0.62	0.34	9.42	0.040	0.024	0.08	0.20
L 201	Circular	MH 189	MH 188	55.962	0.289	0.200	0.02	0.001	9.34	0.56	0.31	9.34	0.040	0.040	0.08	0.20
L 202	Circular	MH 190	MH 189	119.734	2.428	0.200	0.05	0.000	9.19	1.63	0.50	9.19	0.044	0.040	0.01	0.07
L 203	Circular	MH 191	MH 189	101.016	0.491	0.200	0.02	0.001	9.35	0.73	0.30	9.36	0.024	0.040	0.03	0.12
L 204	Circular	MH 191	MH 193	86.063	1.882	0.200	0.04	0.000	0.00	1.43	0.00	0.00	0.024	0.039	0.00	0.00
L 205	Circular	MH 192	MH 191	120.131	1.761	0.200	0.04	0.000	9.20	1.39	0.45	9.21	0.015	0.024	0.01	0.07
L 206	Circular	MH 193	MH 171	96.857	0.407	0.200	0.02	0.002	9.45	0.67	0.37	9.45	0.039	0.039	0.07	0.19
L 207	Circular	MH 194	MH 193	63.139	0.550	0.200	0.02	0.001	9.31	0.77	0.31	9.31	0.023	0.039	0.03	0.11
L 208	Circular	MH 195	MH 194	62.419	2.134	0.200	0.05	0.001	9.24	1.53	0.50	9.24	0.015	0.023	0.01	0.07
L 209	Circular	MH 196	MH 195	39.791	1.596	0.200	0.04	0.000	9.20	1.32	0.25	9.20	0.007	0.015	0.00	0.03
L 210	Circular	MH 197	MH 195	59.779	0.862	0.200	0.03	0.000	9.19	0.97	0.29	9.19	0.013	0.015	0.01	0.07
L 211	Circular	MH 198	MH 193	104.336	0.436	0.200	0.02	0.001	9.36	0.69	0.32	9.36	0.030	0.039	0.04	0.15
L 212	Circular	MH 199	MH 198	46.213	0.610	0.200	0.02	0.001	9.23	0.77	0.33	9.34	0.022	0.030	0.03	0.11
L 213	Circular	MH 200	MH 199	119.154	0.640	0.200	0.03	0.000	9.27	0.83	0.31	9.28	0.019	0.022	0.02	0.10
L 214	Circular	MH 201	MH 199	31.978	0.460	0.200	0.02	0.000	9.09	0.71	0.16	9.08	0.008	0.022	0.00	0.05
L 215	Circular	MH 202	MH 203	126.545	0.492	0.200	0.02	0.000	0.00	0.73	0.00	0.00	0.022	0.088	0.00	0.00
L 216	Circular	MH 203	MH 205	94.399	0.467	0.200	0.02	0.000	9.41	0.71	0.27	9.42	0.088	0.034	0.02	0.11
L 217	Circular	MH 204	MH 203	119.737	1.261	0.200	0.04	0.000	9.21	1.17	0.41	9.21	0.046	0.088	0.01	0.08
L 218	Circular	MH 205	MH 208	119.440	0.682	0.200	0.03	0.002	9.10	0.86	0.48	9.10	0.034	0.068	0.07	0.19
L 219	Circular	MH 206	MH 205	76.732	0.653	0.200	0.03	0.001	7.62	0.84	0.38	7.62	0.055	0.034	0.03	0.13
L 220	Circular	MH 207	MH 206	77.326	0.572	0.200	0.02	0.001	7.54	0.79	0.33	7.54	0.054	0.055	0.03	0.12
L 221	Circular	MH 208	MH 209	120.291	2.832	0.200	0.06	0.002	9.13	1.76	0.80	9.13	0.068	0.074	0.03	0.22
L 222	Circular	MH 209	MH 210	101.048	3.792	0.200	0.06	0.003	9.02	2.03	0.98	9.02	0.074	0.102	0.04	0.14
L 223	Circular	MH 210	MH 211	101.626	1.263	0.250	0.07	0.011	9.09	1.36	0.94	9.06	0.102	0.058	0.16	0.29
L 224	Circular	MH 211	MH 212	90.813	2.697	0.250	0.10	0.011	9.04	1.96	1.15	7.34	0.058	0.166	0.12	0.62
L 225	Circular	MH 212	MH 213	20.613	0.388	0.525	0.27	0.058	8.62	1.24	0.99	8.62	0.166	0.962	0.22	0.32
Iron Landing Pump 1		MH 213	MH 213A				0.00	0.087	0.85	0.00	0.00	0.00	0.962	29.501	0.00	0.00
Iron Landing Pump 2		MH 213	MH 213A				0.00	0.000	0.00	0.00	0.00	0.00	0.962	29.501	0.00	0.00
L 226	Circular	MH 214	MH 210	101.471	1.130	0.200	0.03	0.008	9.20	1.11	0.90	9.21	0.095	0.102	0.23	0.32
L 227	Circular	MH 215	MH 214	121.588	2.484	0.200	0.05	0.006	9.76	1.65	1.11	9.76	0.136	0.095	0.12	0.24
L 228	Circular	MH 216	MH 215	18.594	2.791	0.200	0.05	0.006	9.73	1.74	0.96	9.73	0.076	0.136	0.11	0.53
L 229	Circular	MH 217	MH 115	80.083	0.681	0.200	0.03	0.010	8.92	0.84	0.77	8.93	0.084	0.097	0.36	0.42
L 230	Circular	MH 218	MH 217	20.488	0.439	0.200	0.02	0.009	8.89	0.69	0.66	8.89	0.093	0.084	0.42	0.46
L 231	Circular	MH 219	MH 218	97.649	0.447	0.200	0.02	0.008	8.60	0.70	0.62	8.61	0.087	0.093	0.37	0.44
L 232	Circular	MH 220	MH 219	142.265	0.605	0.200	0.03	0.005	7.71	0.81	0.63	7.71	0.061	0.087	0.20	0.31
L 233	Circular	MH 221	MH 220	91.812	0.401	0.200	0.02	0.005	7.61	0.66	0.51	7.62	0.067	0.061	0.22	0.34
L 234	Circular	MH 222	MH 221	100.469	0.852	0.200	0.03	0.001	9.09	0.96	0.37	10.04	0.047	0.067	0.02	0.32
L 235	Circular	MH 222	MH 223	122.467	0.577	0.200	0.02	0.000	20.03	0.79	0.18	20.03	0.047	0.025	0.00	0.05
L 236	Circular	MH 223	MH 224	33.739	0.578	0.200	0.02	0.000	0.00	0.79	0.00	0.00	0.025	0.016	0.00	0.00
L 237	Circular	MH 223	MH 226	122.588	0.463	0.200	0.02	0.001	10.18	0.71	0.30	10.19	0.025	0.027	0.03	0.13
L 238	Circular	MH 224	MH 225	85.580	0.539	0.200	0.02	0.000	9.21	0.77	0.25	9.22	0.016	0.027	0.01	0.08
L 239	Circular	MH 225	MH 254	125.999	0.479	0.200	0.02	0.001	9.32	0.72	0.32	9.32	0.027	0.030	0.04	0.14
L 240	Circular	MH 226	MH 219	121.748	0.436	0.200	0.02	0.001	10.12	0.69	0.33	11.17	0.027	0.087	0.04	0.26
L 241	Circular	MH 227	MH 147	82.170	0.336	0.200	0.02	0.001	9.34	0.61	0.30	9.34	0.033	0.048	0.05	0.17
L 242	Circular	MH 228	MH 227	57.012	0.400	0.200	0.02	0.000	9.26	0.66	0.15	9.26	0.010	0.033	0.00	0.05
L 243	Circular	MH 229	MH 138	74.402	0.003	0.200	0.00	0.002	10.10	0.05	0.17	10.12	0.072	0.028	0.93	0.36
L 244	Circular	MH 230	MH 229	125.497	0.025	0.200	0.01	0.001	10.13	0.16	0.11	12.01	0.062	0.072	0.18	0.36
L 245	Circular	MH 231	MH 237	113.698	0.702	0.200	0.03	-0.003	9.29	0.87	0.45	8.59	0.755	1.552	0.10	7.61
L 246	Circular	MH 232	MH 231	70.546	0.651	0.200	0.03	0.001	11.25	0.84	0.38	9.20	0.237	0.755	0.04	3.33
L 247	Circular	MH 233	MH 236	64.536	0.753	0.200	0.03	0.001	11.41	0.91	0.40	9.08	0.261	0.746	0.04	3.58
L 248	Circular	MH 234	MH 232	45.920	0.675	0.200	0.03	0.001	9.86	0.86	0.38	9.77	0.053	0.237	0.03	0.73
L 249	Circular	MH 235	MH 241	135.307	0.245	0.250	0.03	0.002	9.86	0.60	0.30	9.87	0.074	0.051	0.06	0.18
L 250	Circular	MH 236	MH 237	84.954	0.943	0.200	0.03	-0.002	9.26	1.01	0.44	8.58	0.746	1.552	0.07	7.58
L 251	Circular	MH 237	MH 243	142.602	0.464	0.200	0.02	-0.006	8.60	0.71	0.38	6.36	1.552	2.229	0.25	10.99
L 252	Circular	MH 238	MH 235	137.560	0.242	0.250	0.03	0.002	9.64	0.60	0.30	9.79	0.073	0.074	0.06	0.17
L 253	Circular	MH 239	MH 240	53.983	0.037	0.300	0.02	0.002	9.58	0.26	0.19	9.58	0.087	0.075	0.09	0.19
L 254	Circular	MH 240	MH 238	106.867	0.210	0.250	0.03	0.002	9.63	0.55	0.28	9.56	0.075	0.073	0.06	0.18
L 255	Circular	MH 241	MH 242	9.323	28.092	0.300	0.51	0.028	9.54	7.21	2.85	5.22	0.051	2.257	0.06	7.26
L 256	Circular	MH 242	MH 33	165.527	0.509	0.600	0.44	0.354	10.49	1.55	1.52	7.91	2.257	2.899	0.81	4.28
L 257	Circular	MH 243	MH 242	5.168	0.155	0.300	0.04	-0.007	8.61	0.54	-0.09	8.61	2.229	2.257	0.17	7.39
L 258	Circular	MH 244	MH 241	82.944	0.710	0.300	0.08	0.026	9.53	1.15	1.03	9.53	0.118	0.051	0.32	0.39
L 259	Circular	MH 245	MH 244	119.780	0.235	0.250	0.03	0.026	9.51	0.59	0.65	9.52	0.201	0.118	0.92	0.81
L 260	Circular	MH 246	MH 70	69.645	0.325	0.250	0.03	0.018	9.39	0.69	0.68	9.39	0.137	0.155	0.54	0.55
L 261	Circular	MH 254	MH 218	127.128	0.423	0.200	0.02	0.001	9.31	0.68	0.36	10.07	0.030	0.093	0.06	0.30
Iron Landing FM	Circular	MH 213A	MH 62	1270.780	-0.823	0.200	0.00	0.000	0.00	0.00	0.00	0.00	29.501	0.016	0.00	0.00
IL_New_FM	Circular	MH 213A	N-HWL-303	1485.890	-0.888	0.200	0.03	0.058	9.07	0.98	1.00	9.07	29.501	0.182	1.87	81.52
South FM	Circular	MH 7A	MH 14	448.070	-0.808	0.100	0.01	0.012	8.37	0.77	1.14	16.36	10.351	2.198	1.92	67.30
HAWKS LANDING																
LK-HWL-259	Circular	N-HWL-259	N-HWL-260	129.650	0.300	0.300	0.05	0.001	7.43	0.75	0.29	7.92	0.032	0.029	0.02	0.11
LK-HWL-293	Circular	N-HWL-259	N-HWL-261	80.870	-1.518	0.300	0.12	0.000	7.37	1.69	-0.38	7.36	0.032	0.010	0.00	4.13
LK-HWL-260	Circular	N-HWL-260	N-HWL-377	59.400	2.410	0.450	0.44	0.004	7.98	2.78	0.60	7.57	0.029	0.091	0.01	0.20
LK-HWL-261	Circular	N-HWL-261	N-HWL-262	161.700	0.370	0.300	0.06	0.000	7.88	0.84	0.20	7.87	0.010	0.050	0.01	0.17
LK-HWL-295	Circular	N-HWL-262	N-HWL-263	44.200	0.681	0.450	0.24	0.005	8.01	1.48	0.52	8.01	0.050	0.027	0.02	0.11
LK-HWL-263	Circular	N-HWL-263	N-HWL-264	59.110	2.350	0.200	0.05	0.002	8.01	1.60	0.80	8.01	0.027	0.049	0.05	0.24
LK-HWL-291	Circular	N-HWL-263	N-HWL-260	49.650	1.428	0.450	0.34	0.003	8.02	2.14	0.62	8.02	0.027	0.029	0.01	0.06
LK-HWL-264	Circular	N-HWL-264	N-HWL-319	47.610	0.510	0.200	0.02	0.003	7.88	0.74	0.49	8.02	0.049	0.043	0.12	0.24
LK-HWL-326	Circular	N-HWL-266	N-HWL-378	78.690	5.710	0.450	0.68	0.009	7.55	4.28	1.46	7.50	0.032	0.199	0.01	0.22
LK-HWL-325	Circular	N-HWL-267	N-HWL-319	130.240	0.299	0.300	0.05	0.001	7.52	0.75	0.29	7.51	0.027	0.043	0.02	0.14
LK-HWL-267	Circular	N-HWL-268	N-HWL-267	126.200	0.445	0.300	0.06	0.000	7.47	0.91	0.24	7.47	0.015	0.027	0.01	0.09
LK-HWL-323	Circular	N-HWL-269	N-HWL-270	138.130	1.040	0.300	0.10	0.006	7.54	1.40	0.70	7.58	0.053	0.040	0.06	0.18
LK-HWL-268	Circular	N-HWL-269	N-HWL-268	101.320	0.446	0.300	0.06	0.000	0.00	0.91	0.00	0.00	0.053	0.015	0.00	0.00
LK-HWL-270	Circular	N-HWL-270	N-HWL-271	96.640	0.510	0.200	0.02	0.002	7.63	0.74	0.43	7.64	0.040	0.046	0.08	0.20
LK-HWL-266	Circular	N-HWL-270	N-HWL-266	75.080	1.841	0.300	0.13	0.004	7.54	1.86	0.79	7.44	0.040	0.032	0.03	0.13
LK-HWL-276	Circular	N-HWL-271	N-HWL-272	97.890	0.450	0.200	0.02	0.002	7.69	0.70	0.44	7.70	0.046	0.045	0.11	0.23
LK-HWL-272	Circular	N-HWL-272	N-HWL-276	30.580	0.460	0.300	0.07	0.003	7.70	0.93	0.45	7.70	0.045	0.038	0.05	0.15
LK-HWL-339	Circular	N-HWL-273	N-HWL-274	14.150	0.330	0.200	0.02	0.000	0.00	0.60	0.00	0.00	0.000	0.000	0.00	0.00
LK-HWL-338	Circular	N-HWL-273	N-HWL-272	36.730	3.000	0.200	0.06	0.000	0.00	1.81	0.00	0.00	0.000	0.045	0.00	0.00
LK-HWL-274	Circular	N-HWL-274	N-HWL-275	10.970	3.600	0.200	0.06	0.000	0.00	1.98	0.00	0.00	0.000	0.000	0.00	0.00
LK-HWL-275	Circular	N-HWL-275	N-HWL-276	32.470	4.444	0.200	0.07	0.000	0.00	2.20	0.00	0.00	0.000	0.038	0.00	0.00
LK-HWL-278	Circular	N-HWL-276	N-HWL-320	143.920	0.800	0.300	0.09	0.003	7.73	1.22	0.58	7.73	0.038	0.055	0.04	0.18
LK-HWL-279	Circular	N-HWL-278	N-HWL-320	123.840	2.384	0.300	0.15	0.002	7.42	2.11	0.77	7.43	0.026	0.055	0.02	0.09
LK-HWL-280	Circular	N-HWL-279	N-HWL-278	60.160	1.714	0.300	0.13	0.002	7.40	1.79	0.65	7.40	0.026	0.026	0.02	0.09
LK-HWL-281	Circular	N-HWL-280	N-HWL-279	50.240	2.488	0.300	0.15	0.002	7.40	2.16	0.70	7.40	0.022	0.026	0.01	0.07
LK-HWL-283	Circular	N-HWL-281	N-HWL-282	77.850	-0.080	0.200	0.01	-0.001	7.42	0.29	-0.16	7.43	0.015	0.041	0.08	0.50
LK-VST-401	Circular	N-HWL-281	MH 207	87.570	1.316	0.200	0.04	0.000	7.43	1.20	0.39	7.43	0.015	0.054	0.01	0.08
LK-HWL-282	Circular	N-HWL-281	N-HWL-280	96.250	2.072	0.300	0.14	0.001	7.43	1.97	0.49	7.43	0.015	0.022	0.01	0.05
LK-HWL-284	Circular	N-HWL-282	N-HWL-283	142.240	0.820	0.200	0.03	0.003	7.43	0.95	0.59	7.43	0.041	0.041	0.09	0.21
LK-HWL-285	Circular	N-HWL-283	N-HWL-286	90.890	1.450	0.200	0.04	0.004	7.46	1.26	0.79	7.46	0.041	0.048	0.10	0.24
LK-HWL-288	Circular	N-HWL-284	N-HWL-280	143.900	0.300	0.200	0.02	0.001	7.40	0.57	0.25	7.40	0.026	0.022	0.03	0.13
LK-HWL-324	Circular	N-HWL-286	N-HWL-269	96.880	1.000	0.300	0.10	0.005	7.53	1.37	0.74	7.53	0.048	0.053	0.06	0.16
LK-HWL-301	Circular	N-HWL-287	N-HWL-286	97.420	0.540	0.200	0.02	0.001	7.85	0.77	0.42	7.86	0.031	0.048	0.06	0.24
LK-HWL-300	Circular	N-HWL-288	N-HWL-287	101.130	1.000	0.200	0.03	0.001	7.89	1.05	0.47	7.89	0.023	0.031	0.03	0.16
LK-HWL-289	Circular	N-HWL-288	N-HWL-289	160.350	0.289	0.450	0.15	0.001	7.90	0.96	0.26	7.90	0.023	0.034	0.01	0.08
LK-HWL-290	Circular	N-HWL-289	N-HWL-290	91.700	0.772	0.450	0.25	0.003	7.95	1.58	0.54	7.95	0.034	0.052	0.01	0.12
LK-HWL-262	Circular	N-HWL-290	N-HWL-262	102.170	0.266	0.450	0.15	0.004	8.02	0.92	0.40	8.01	0.052	0.050	0.03	0.12
LK-HWL-297	Circular	N-HWL-291	N-HWL-290	123.620	1.310	0.300	0.11	0.001	8.21	1.57	0.44	8.22	0.014	0.052	0.01	0.17
LK-HWL-296	Circular	N-HWL-292	N-HWL-291	103.990	0.300	0.300	0.05	0.001	8.19	0.75	0.24	8.19	0.030	0.014	0.02	0.10
LK-HWL-303	Circular	N-HWL-293	N-HWL-294	127.970	0.990	0.200	0.03	0.001	8.05	1.04	0.50	8.05	0.027	0.028	0.04	0.14
LK-HWL-305	Circular	N-HWL-293	N-HWL-295	88.290	-1.390	0.200	0.04	0.000	8.21	1.23	-0.42	8.21	0.027	0.014	0.01	6.22
LK-HWL-304	Circular	N-HWL-294	N-HWL-289	98.730	1.420	0.200	0.04	0.002	8.22	1.24	0.62	8.22	0.028	0.034	0.04	0.17
LK-HWL-306	Circular	N-HWL-295	N-HWL-296	152.270	1.340	0.200	0.04	0.000	8.35	1.21	0.40	8.35	0.014	0.018	0.01	0.09
LK-HWL-307	Circular	N-HWL-296	N-HWL-294	88.430	0.500	0.200	0.02	0.000	8.38	0.74	0.28	8.38	0.018	0.028	0.02	0.14
LK-HWL-310	Circular	N-HWL-297	N-HWL-288	128.240	1.460	0.450	0.34	0.002	7.86	2.17	0.57	7.89	0.024	0.023	0.01	0.05
LK-HWL-308	Circular	N-HWL-298	N-HWL-299	165.760	3.100	0.200	0.06	0.001	7.85	1.84	0.57	7.85	0.012	0.023	0.01	0.12
LK-HWL-311	Circular	N-HWL-298	N-HWL-300	84.240	0.980	0.200	0.03	0.000	7.36	1.04	0.27	7.26	0.012	0.010	0.01	0.06
LK-HWL-309	Circular	N-HWL-299	N-HWL-297	91.380	0.460	0.450	0.19	0.001	7.36	1.21	0.32	7.36	0.023	0.024	0.01	0.05
LK-HWL-312	Circular	N-HWL-300	N-HWL-301	165.590	2.480	0.200	0.05	0.000	7.29	1.65	0.43	7.29	0.010	0.014	0.01	0.07
LK-HWL-319	Circular	N-HWL-300	N-HWL-302	88.180	3.970	0.200	0.07	0.000	7.33	2.08	0.59	7.29	0.010	0.026	0.01	0.13
LK-HWL-317	Circular	N-HWL-301	N-HWL-303	92.080	0.650	0.450	0.23	0.000	7.85	1.45	0.27	7.85	0.014	0.182	0.00	0.09
LK-HWL-316	Circular	N-HWL-301	N-HWL-299	91.720	0.217	0.450	0.13	0.000	7.49	0.83	0.16	7.50	0.014	0.023	0.00	0.05
LK-HWL-320	Circular	N-HWL-302	N-HWL-303	140.940	0.860	0.200	0.03	0.001	7.43	0.97	0.46	7.43	0.026	0.182	0.04	0.21
LK-HWL-318	Circular	N-HWL-303	N-HWL-304	39.660	0.300	0.525	0.23	0.059	9.07	1.08	0.90	9.08	0.182	0.190	0.25	0.35
LK-VST-342	Circular	N-HWL-304	N-VST-322	54.150	0.259	0.525	0.22	0.059	9.08	1.01	0.85	9.09	0.190	0.186	0.27	0.36
LK-HWL-314	Circular	N-HWL-305	N-HWL-306	106.710	0.300	0.300	0.05	0.000	7.53	0.75	0.14	7.53	0.013	0.027	0.00	0.04
LK-HWL-321	Circular	N-HWL-305	N-HWL-307	81.170	0.190	0.300	0.04	0.000	7.53	0.60	0.11	7.53	0.013	0.028	0.00	0.04
LK-HWL-313	Circular	N-HWL-305	N-HWL-301	94.000	0.448	0.300	0.06	0.000	7.53	0.92	0.21	7.53	0.013	0.014	0.00	0.05
LK-HWL-315	Circular	N-HWL-306	N-HWL-308	93.690	0.100	0.300	0.03	0.000	7.56	0.43	0.14	7.57	0.027	0.044	0.01	0.09
LK-HWL-322	Circular	N-HWL-307	N-HWL-308	159.630	0.200	0.300	0.04	0.001	7.89	0.61	0.24	8.03	0.028	0.044	0.02	0.15
LK-VST-400	Circular	N-HWL-308	N-VST-324	92.040	0.200	0.300	0.04	0.002	7.74	0.61	0.27	7.74	0.044	0.051	0.04	0.15
LK-HWL-333	Circular	N-HWL-309	N-HWL-310	39.510	0.700	0.200	0.03	0.001	7.36	0.87	0.43	7.36	0.028	0.036	0.04	0.14
LK-HWL-334	Circular	N-HWL-310	N-HWL-315	112.690	0.378	0.200	0.02	0.001	7.38	0.64	0.36	7.39	0.036	0.034	0.07	0.18
LK-HWL-332	Circular	N-HWL-311	N-HWL-309	83.500	0.700	0.200	0.03	0.001	7.36	0.87	0.34	7.36	0.020	0.028	0.02	0.10
LK-HWL-330	Circular	N-HWL-312	N-HWL-314	85.140	2.000	0.200	0.05	0.000	7.36	1.48	0.47	7.36	0.015	0.031	0.01	0.07
LK-HWL-287	Circular	N-HWL-312	N-HWL-311	94.120	0.952	0.050	0.00	0.000	7.36	0.40	0.30	7.36	0.015	0.020	0.18	0.29
LK-HWL-337	Circular	N-HWL-313	N-HWL-311	20.530	0.300	0.200	0.02	0.000	7.23	0.57	0.23	7.23	0.023	0.020	0.02	0.12
LK-HWL-336	Circular	N-HWL-314	N-HWL-315	138.370	0.390	0.200	0.02	0.001	7.41	0.65	0.35	7.43	0.031	0.034	0.05	0.17
LK-HWL-335	Circular	N-HWL-315	N-HWL-282	96.910	1.730	0.200	0.04	0.003	7.39	1.38	0.78	7.39	0.034	0.041	0.07	0.21
LK-HWL-328	Circular	N-HWL-316	N-HWL-317	92.100	0.800	0.200	0.03	0.001	7.86	0.93	0.39	7.87	0.022	0.030	0.03	0.11
LK-HWL-329	Circular	N-HWL-317	N-HWL-283	95.030	0.300	0.200	0.02	0.001	7.95	0.57	0.26	7.95	0.030	0.041	0.04	0.15
LK-HWL-273	Circular	N-HWL-319	N-HWL-266	136.960	1.600	0.300	0.12	0.004	7.68	1.73	0.74	7.43	0.043	0.032	0.04	0.14
LK-HWL-379.1	Circular	N-HWL-379.1	N-ANN-476	447.630	2.527	0.150	0.02	0.001	7.69	1.37	0.64	7.69	0.019	0.095	0.04	0.13
LK-HWL-379.2	Circular	N-IL-379	N-HWL-379.1	178.040	1.269	0.150	0.02	0.000	7.39	0.97	0.42	7.39	0.017	0.019	0.03	0.12
VISTA CROSSING																
LK-VST-343	Circular	N-VST-322	N-VST-326	108.370	0.300	0.525	0.24	0.060	9.10	1.09	0.89	9.10	0.186	0.204	0.25	0.36
LK-VST-352	Circular	N-VST-323	N-VST-325	115.640	0.440	0.250	0.04	0.001	7.54	0.80	0.28	7.54	0.023	0.070	0.02	0.09
LK-VST-351	Circular	N-VST-324	N-VST-323	181.960	0.442	0.250	0.04	0.000	0.00	0.81	0.00	0.00	0.051	0.023	0.00	0.00
LK-VST-354	Circular	N-VST-324	N-VST-347	104.620	0.000	0.375	0.09	0.003	7.79	0.81	0.35	7.80	0.051	0.067	0.03	0.14
LK-VST-353	Circular	N-VST-325	N-VST-326	93.020	0.000	0.375	0.09	0.007	7.93	0.81	0.42	7.72	0.070	0.204	0.08	0.55
LK-VST-344	Circular	N-VST-326	N-VST-327	99.880	-0.263	0.375	0.09	0.000	0.00	0.81	0.00	0.00	0.204	0.000	0.00	0.00
LK-VST-372	Circular	N-VST-326	N-VST-342	93.610	0.256	0.525	0.22	0.067	9.09	1.01	0.87	9.11	0.204	0.178	0.31	0.39
LK-VST-345	Circular	N-VST-327	N-VST-328	19.180	0.260	0.250	0.03	0.000	0.00	0.61	0.00	0.00	0.000	0.025	0.00	0.00
LK-VST-346	Circular	N-VST-328	N-VST-329	144.050	0.260	0.250	0.03	0.001	7.62	0.62	0.21	7.62	0.025	0.032	0.02	0.10
LK-VST-347	Circular	N-VST-329	N-VST-330	146.380	0.440	0.250	0.04	0.001	7.80	0.80	0.34	7.80	0.032	0.037	0.03	0.13
LK-VST-348	Circular	N-VST-330	N-VST-331	82.900	0.450	0.250	0.04	0.002	7.78	0.81	0.39	7.79	0.037	0.198	0.04	0.15
LK-VST-349	Circular	N-VST-331	N-VST-332	95.690	0.294	0.525	0.23	0.071	9.13	1.08	0.94	9.09	0.198	0.269	0.30	0.39
LK-VST-350	Circular	N-VST-332	N-VST-333	109.990	0.150	0.525	0.17	0.071	9.17	0.77	0.65	7.60	0.269	0.520	0.43	0.65
LK-VST-383	Circular	N-VST-332	N-VST-332.1	41.792	-5.594	0.200	0.08	0.000	7.27	2.47	-0.63	7.27	0.269	0.011	0.01	11.74
LK-VST-333	Circular	N-VST-333	N-ANN-119	178.620	0.336	0.675	0.46	0.430	9.20	1.29	1.48	9.21	0.520	0.517	0.93	0.77
LK-VST-384	Circular	N-VST-334	N-VST-335	89.850	0.300	0.200	0.02	0.000	7.57	0.57	0.20	7.57	0.021	0.036	0.02	0.11
LK-VST-385	Circular	N-VST-335	MH 219	97.650	0.908	0.200	0.03	0.002	9.03	1.00	0.57	9.03	0.036	0.087	0.07	0.18
LK-VST-381	Circular	N-VST-336	N-VST-337	35.620	0.786	0.200	0.03	0.001	7.27	0.93	0.37	7.29	0.021	0.021	0.02	0.10
LK-VST-382	Circular	N-VST-337	N-VST-334	124.230	0.130	0.300	0.03	0.000	7.40	0.49	0.13	7.40	0.021	0.021	0.01	0.07
LK-VST-379	Circular	N-VST-338	N-VST-339	62.590	0.444	0.200	0.02	0.002	7.43	0.70	0.43	7.43	0.046	0.194	0.11	0.23
LK-VST-380	Circular	N-VST-338	N-VST-337	69.550	-0.858	0.200	0.03	-0.001	7.40	0.97	-0.39	7.40	0.046	0.021	0.02	3.09
LK-VST-376	Circular	N-VST-339	N-VST-367	31.080	0.300	0.525	0.24	0.069	9.13	1.09	0.94	9.13	0.194	0.196	0.29	0.37
LK-VST-375	Circular	N-VST-340	N-VST-339	80.060	0.299	0.525	0.23	0.067	9.14	1.09	0.92	9.15	0.197	0.194	0.29	0.38
LK-VST-374	Circular	N-VST-341	N-VST-340	61.060	0.303	0.525	0.24	0.067	9.12	1.09	0.93	9.13	0.195	0.197	0.28	0.37
LK-VST-373	Circular	N-VST-342	N-VST-341	57.010	0.410	0.525	0.28	0.067	9.11	1.27	1.04	9.12	0.178	0.195	0.24	0.34
LK-VST-369	Circular	N-VST-343	N-VST-344	25.490	0.796	0.200	0.03	0.000	7.21	0.93	0.33	7.21	0.017	0.017	0.02	0.08
LK-VST-370	Circular	N-VST-344	N-VST-344.1	40.490	0.800	0.200	0.03	0.000	7.27	0.93	0.33	7.27	0.017	0.036	0.01	0.08
LK-VST-370.1	Circular	N-VST-345	N-VST-344.1	55.562	0.808	0.200	0.03	0.001	7.36	0.93	0.44	7.36	0.026	0.036	0.04	0.13
LK-VST-367	Circular	N-VST-346	MH 221	120.950	0.492	0.200	0.02	0.004	7.55	0.73	0.52	7.56	0.057	0.067	0.17	0.29
LK-VST-355	Circular	N-VST-347	N-VST-365	93.890	0.260	0.375	0.09	0.005	7.90	0.81	0.42	7.91	0.067	0.071	0.06	0.18
LK-VST-363	Circular	N-VST-348	N-VST-352	87.570	-2.481	0.250	0.09	0.000	0.00	1.91	0.00	0.00	0.037	0.017	0.00	0.00
LK-VST-403	Circular	N-VST-348	N-VST-347	180.440	0.262	0.375	0.09	0.002	7.94	0.81	0.28	7.94	0.037	0.067	0.02	0.10
LK-VST-361	Circular	N-VST-349	N-VST-324	183.100	0.436	0.250	0.04	0.001	7.68	0.73	0.28	7.68	0.028	0.051	0.02	0.11
LK-VST-362	Circular	N-VST-349	N-VST-348	105.590	0.439	0.250	0.04	0.001	7.68	0.80	0.31	7.68	0.028	0.037	0.02	0.11
LK-VST-360	Circular	N-VST-350	N-VST-349	90.050	0.442	0.250	0.04	0.001	7.43	0.81	0.35	7.43	0.032	0.028	0.03	0.13
LK-VST-359	Circular	N-VST-351	N-VST-350	66.030	1.558	0.250	0.07	0.001	7.36	1.51	0.45	7.36	0.016	0.032	0.01	0.07
LK-VST-364	Circular	N-VST-352	N-VST-353	78.750	0.442	0.200	0.02	0.000	7.29	0.69	0.22	7.29	0.017	0.027	0.01	0.09
LK-VST-365	Circular	N-VST-353	N-VST-354	57.300	0.436	0.200	0.02	0.001	7.34	0.69	0.31	7.35	0.027	0.041	0.04	0.14
LK-VST-366	Circular	N-VST-354	N-VST-346	116.410	0.364	0.200	0.02	0.002	7.43	0.63	0.36	7.43	0.041	0.057	0.08	0.21
LK-VST-393	Circular	N-VST-355	N-VST-354	37.870	0.437	0.200	0.02	0.001	7.34	0.69	0.27	7.36	0.023	0.041	0.03	0.12
LK-VST-392	Circular	N-VST-356	N-VST-355	12.050	0.437	0.200	0.02	0.001	7.23	0.69	0.28	7.23	0.023	0.023	0.03	0.11
LK-VST-358	Circular	N-VST-357	N-VST-351	183.970	0.436	0.250	0.04	0.000	0.00	0.80	0.00	0.00	0.000	0.016	0.00	0.00
LK-VST-386	Circular	N-VST-357	N-VST-358	92.160	0.804	0.200	0.03	0.000	0.00	0.94	0.00	0.00	0.000	0.029	0.00	0.00
LK-VST-390	Circular	N-VST-357	N-VST-356	126.430	0.437	0.200	0.02	0.000	0.00	0.69	0.00	0.00	0.000	0.023	0.00	0.00
LK-VST-389	Circular	N-VST-358	N-VST-361	157.330	0.411	0.200	0.02	0.001	8.36	0.67	0.31	8.37	0.029	0.040	0.04	0.15
LK-VST-387	Circular	N-VST-358	N-VST-359	87.460	0.782	0.200	0.03	0.000	0.00	0.92	0.00	0.00	0.029	0.021	0.00	0.00
LK-VST-388	Circular	N-VST-359	N-VST-360	104.550	0.341	0.200	0.02	0.000	7.38	0.61	0.22	7.36	0.021	0.025	0.02	0.11
LK-VST-397	Circular	N-VST-360	N-VST-361	84.500	0.439	0.200	0.02	0.001	7.39	0.69	0.29	7.39	0.025	0.040	0.03	0.12
LK-VST-399	Circular	N-VST-361	N-VST-361.1	91.323	0.439	0.200	0.02	0.002	7.88	0.69	0.43	7.88	0.040	0.043	0.09	0.21
LK-VST-396	Circular	N-VST-362	N-VST-360	51.780	0.782	0.200	0.03	0.000	0.00	0.92	0.00	0.00	0.000	0.025	0.00	0.00
LK-VST-394	Circular	N-VST-363	N-VST-364	21.750	0.200	0.200	0.01	0.000	7.24	0.46	0.19	7.24	0.025	0.014	0.03	0.13
LK-VST-395	Circular	N-VST-364	MH 184	86.760	1.359	0.200	0.04	0.000	7.34	1.22	0.39	7.34	0.014	0.015	0.01	0.07
LK-VST-356	Circular	N-VST-365	N-VST-325	89.800	0.259	0.375	0.09	0.006	7.93	0.81	0.43	7.94	0.071	0.070	0.07	0.19
LK-VST-357	Circular	N-VST-366	N-VST-365	16.670	0.000	0.200	0.03	0.000	7.21	0.96	0.35	7.21	0.017	0.071	0.02	0.09
LK-VST-377	Circular	N-VST-367	N-VST-331	38.350	0.300	0.525	0.24	0.069	9.14	1.09	0.95	9.15	0.196	0.198	0.29	0.37
LK-VST-398	Circular	N-VST-361.1	N-VST-346	69.387	0.440	0.200	0.02	0.002	7.86	0.69	0.44	7.87	0.043	0.057	0.10	0.29
LK-VST-368	Circular	N-VST-371	N-VST-325	169.860	0.444	0.250	0.04	0.000	7.70	0.81	0.21	7.70	0.016	0.070	0.01	0.06
LK-VST-402	Circular	N-VST-402	N-VST-345	104.180	0.842	0.200	0.03	0.000	7.29	0.96	0.30	7.29	0.014	0.026	0.01	0.07
LK-VST-404	Circular	N-VST-404	N-VST-347	170.040	0.261	0.375	0.09	0.001	7.86	0.81	0.20	7.86	0.022	0.067	0.01	0.06
LK-VST-407	Circular	N-VST-371	N-VST-345	63.370	1.199	0.200	0.03	0.000	7.70	0.97	0.34	7.70	0.016	0.026	0.01	0.08
LK-VST-409	Circular	N-VST-344.1	N-VST-338	95.630	0.439	0.200	0.02	0.001	7.42	0.69	0.37	7.43	0.036	0.046	0.06	0.18
LK-VST-383.1	Circular	N-VST-332.1	N-VST-334	51.618	0.450	0.200	0.02	0.000	7.27	0.70	0.16	7.28	0.011	0.021	0.01	0.05
LK-HWL-286	Circular	N-HWL-285	N-HWL-297	191.030	1.000	0.300	0.10	0.001	8.35	1.37	0.42	8.35	0.021	0.024	0.01	0.07
LK-HWL-377	Circular	N-HWL-377	N-HWL-378	215.590	2.880	0.200	0.06	0.026	9.01	1.77	1.72	9.02	0.091	0.199	0.46	0.70
LK-HWL-378	Circular	N-HWL-378	N-HWL-379	328.780	0.164	0.375	0.07	0.034	8.61	0.64	0.59	8.62	0.199	0.169	0.47	0.53

NEW ANNEXATION AREA																
LK-2335-JK	Circular	N-2335-JK	N-ANN-476	330.890	1.500	0.200	0.04	0.028	9.10	1.28	1.38	9.11	0.122	0.095	0.69	0.61
LK-ANN-101.1	Circular	N-ANN-101.1	N-ANN-101	42.930	2.000	0.300	0.14	0.075	0.01	1.94	1.91	0.01	0.200	0.431	0.55	0.67
SW-01-29-1-5-Pump1		N-ANN-101	N-ANN-100				0.00	0.310	0.02	0.00	0.00	0.00	0.431	14.318	0.00	0.00
LK-ANN-103	Circular	N-ANN-103	N-ANN-102	780.000	1.600	0.300	0.12	0.074	9.10	1.73	1.81	9.11	0.168	0.226	0.60	0.56
LK-ANN-104	Circular	N-ANN-104	N-ANN-103	843.660	2.501	0.200	0.05	0.038	9.07	1.65	1.80	9.07	0.127	0.168	0.73	0.63
LK-ANN-107	Circular	N-ANN-107	N-ANN-108	777.190	0.900	0.300	0.09	0.038	9.09	1.30	1.23	9.10	0.134	0.177	0.41	0.45
LK-ANN-108	Circular	N-ANN-108	N-ANN-108.1	599.650	0.570	0.375	0.13	0.063	9.11	1.20	1.18	9.11	0.177	0.242	0.48	0.65
LK-ANN-108.1	Circular	N-ANN-108.1	N-ANN-109	354.540	0.200	0.450	0.13	0.063	9.24	0.80	0.75	9.25	0.242	0.129	0.49	0.54
LK-ANN-109	Circular	N-ANN-109	N-ANN-110	340.540	1.300	0.450	0.33	0.063	9.26	2.04	1.57	9.27	0.129	0.244	0.19	0.41
LK-ANN-110	Circular	N-ANN-110	N-VST-333	607.260	0.250	0.450	0.14	0.082	9.28	0.90	0.86	9.30	0.244	0.520	0.57	1.02
LK-ANN-111	Circular	N-ANN-111	N-ANN-114.1	119.880	0.900	0.450	0.27	0.091	9.35	1.70	1.53	9.36	0.180	0.440	0.34	0.40
LK-ANN-112	Circular	N-ANN-112	N-ANN-113	74.280	0.603	0.750	0.86	0.591	9.34	1.96	2.02	7.92	0.578	0.922	0.68	1.13
LK-ANN-113	Circular	N-ANN-113	MH 40	22.240	0.863	1.125	3.05	0.665	9.20	3.07	1.67	55.25	0.922	1.216	0.22	0.99
LK-ANN-114	Circular	N-ANN-114	N-ANN-114.1	83.830	3.337	0.675	1.54	0.459	9.30	4.31	3.68	9.30	0.252	0.440	0.30	0.43
LK-ANN-114.1	Circular	N-ANN-114.1	N-ANN-112	85.310	3.337	0.675	1.54	0.592	9.32	4.31	4.02	9.33	0.440	0.578	0.38	0.43
LK-ANN-115	Circular	N-ANN-115	N-ANN-114	127.990	1.006	0.675	0.84	0.430	9.34	2.36	2.37	9.35	0.342	0.252	0.51	0.51
LK-ANN-116	Circular	N-ANN-119	N-ANN-118	149.960	0.300	0.675	0.46	0.430	9.22	1.29	1.48	9.25	0.517	0.525	0.94	0.77
LK-ANN-117	Circular	N-ANN-116	N-ANN-115	175.410	0.299	0.675	0.46	0.430	9.32	1.29	1.47	9.34	0.527	0.342	0.94	0.78
LK-ANN-118	Circular	N-ANN-117	N-ANN-116	174.720	0.300	0.675	0.44	0.430	9.28	1.23	1.43	9.29	0.538	0.527	0.98	0.80
LK-ANN-119	Circular	N-ANN-118	N-ANN-117	175.410	0.299	0.675	0.46	0.430	9.24	1.29	1.47	9.27	0.525	0.538	0.94	0.78
LK-ANN-120	Circular	N-ANN-120	N-ANN-120.1	800.990	1.180	0.300	0.11	0.045	9.11	1.49	1.42	9.10	0.132	0.252	0.43	0.64
LK-ANN-120.1	Circular	N-ANN-120.1	N-ANN-111	958.950	0.200	0.450	0.13	0.065	9.45	0.80	0.74	9.47	0.252	0.180	0.51	0.56
LK-ANN-121	Circular	N-ANN-121	N-HWL-377	225.870	1.708	0.200	0.04	0.022	9.01	1.36	1.38	9.01	0.102	0.091	0.52	0.51
LK-ANN-122	Circular	N-ANN-122	N-ANN-123	923.510	0.910	0.450	0.27	0.038	9.05	1.71	1.02	7.87	0.114	0.567	0.14	1.13
LK-ANN-123	Circular	N-ANN-123	N-ANN-113	311.610	0.150	0.450	0.11	0.075	9.12	0.69	0.73	7.77	0.567	0.922	0.68	1.85
LK-ANN-127	Circular	N-ANN-127	N-ANN-114.1	894.310	0.550	0.300	0.07	0.042	9.39	1.01	1.03	9.40	0.168	0.440	0.58	0.56
LK-ANN-500	Circular	N-ANN-100	N-JASP-15	840.640	-1.119	0.450	0.30	0.160	8.87	1.90	1.42	8.87	14.318	0.557	0.53	21.54
LK-ANN-511	Circular	N-ANN-476	N-JASP-15	262.590	1.832	0.300	0.13	0.028	9.14	1.85	1.48	9.15	0.095	0.557	0.22	0.32
LK-UR-01	Circular	N-UR-01	N-UR-02	769.490	0.000	0.050	0.00	0.000	0.00	0.00	0.00	0.00	0.000	0.000	0.00	0.00
LK-UR-02	Circular	N-UR-02	N-ANN-122	154.300	0.000	0.050	0.00	0.000	0.00	0.00	0.00	0.00	0.000	0.114	0.00	0.00
IRON LANDING																
LK-IL-559	Circular	N-IL-489	N-IL-490	96.970	0.804	0.200	0.03	0.001	7.39	0.94	0.37	7.39	0.020	0.016	0.02	0.10
LK-IL-560	Circular	N-IL-490	N-IL-491	166.720	1.207	0.200	0.04	0.000	7.43	1.15	0.40	7.43	0.016	0.015	0.01	0.08
LK-IL-561	Circular	N-IL-491	MH 211	161.240	2.331	0.200	0.05	0.001	7.51	1.59	0.52	7.51	0.015	0.058	0.01	0.08
LK-IL-562	Circular	N-IL-492	N-IL-493	87.390	0.661	0.200	0.03	0.001	7.39	0.85	0.35	7.39	0.022	0.024	0.02	0.11
LK-IL-563	Circular	N-IL-493	N-IL-494	178.940	1.024	0.200	0.03	0.001	8.08	1.06	0.48	8.08	0.024	0.030	0.03	0.12
LK-IL-564	Circular	N-IL-494	MH 212	128.120	1.800	0.200	0.04	0.002	7.59	1.40	0.72	7.59	0.030	0.166	0.05	0.15
LK-IL-565	Circular	N-IL-495	N-IL-496	91.550	0.335	0.300	0.06	0.007	7.75	0.79	0.51	7.75	0.074	0.057	0.12	0.25
LK-IL-566	Circular	N-IL-496	N-IL-497	156.950	1.332	0.300	0.11	0.009	7.80	1.58	0.94	7.80	0.057	0.198	0.08	0.19
LK-IL-567	Circular	N-IL-498	N-IL-497	89.770	0.250	0.375	0.09	0.034	8.67	0.79	0.73	8.63	0.169	0.198	0.39	0.45
LK-IL-568	Circular	N-IL-500	N-IL-499	181.820	0.250	0.375	0.09	0.044	8.57	0.79	0.75	8.58	0.199	0.200	0.50	0.53
LK-IL-569	Circular	N-IL-500	N-IL-501	47.000	3.383	0.200	0.00	0.000	0.00	0.00	0.00	0.00	0.199	0.019	0.00	0.00
LK-IL-570	Circular	N-IL-502	N-IL-496	38.030	0.408	0.200	0.02	0.001	7.19	0.67	0.28	7.20	0.025	0.057	0.03	0.13
LK-IL-571	Circular	N-IL-493	N-IL-496	152.210	2.046	0.200	0.05	0.001	8.08	1.49	0.67	8.08	0.024	0.057	0.03	0.12
LK-IL-574	Circular	N-IL-497	N-IL-500	173.590	0.250	0.375	0.09	0.043	8.52	0.79	0.75	8.53	0.198	0.199	0.49	0.53
LK-IL-576	Circular	N-IL-501	N-HWL-379.1	93.260	0.683	0.200	0.03	0.000	7.35	0.86	0.32	7.36	0.019	0.019	0.02	0.10
LK-IL-577	Circular	N-IL-490	N-IL-493	85.240	3.070	0.200	0.06	0.001	7.43	1.83	0.64	7.43	0.016	0.024	0.01	0.08
LK-IL-578	Circular	N-IL-491	N-IL-494	84.090	2.589	0.200	0.05	0.001	7.51	1.68	0.55	7.51	0.015	0.030	0.01	0.08
LK-IL-579	Circular	N-HWL-320	N-IL-495	109.640	0.761	0.300	0.08	0.006	7.70	1.19	0.69	7.71	0.055	0.074	0.07	0.18
LK-IL-581	Circular	N-IL-506	MH 214	198.550	2.846	0.200	0.06	0.001	7.69	1.76	0.74	7.69	0.022	0.095	0.03	0.11
LK-IL-582	Circular	MH 202	N-IL-506	121.740	0.456	0.200	0.03	0.001	7.43	0.83	0.33	7.43	0.022	0.022	0.02	0.11
LK-IL-588	Circular	N-IL-499	MH 212	150.790	0.250	0.375	0.09	0.044	8.62	0.79	0.76	8.63	0.200	0.166	0.51	0.53
LK-IL-589	Circular	N-HWL-379	N-IL-509	100.000	0.250	0.375	0.09	0.034	8.65	0.79	0.72	8.66	0.169	0.166	0.38	0.45
LK-IL-590	Circular	N-IL-509	N-IL-498	56.050	0.250	0.375	0.09	0.034	8.67	0.79	0.74	8.68	0.166	0.169	0.38	0.44
LK-IL-591	Circular	MH 40D	N-ANN-114	342.300	0.500	0.300	0.07	0.030	9.03	0.97	0.92	9.02	0.138	0.252	0.43	0.52
LK-IL-595	Circular	N-ANN-102	N-ANN-101	580.670	0.813	0.375	0.16	0.107	9.13	1.43	1.54	9.15	0.226	0.431	0.67	0.60
JASP AREA																
LK-JASP-1-1	Circular	N-JASP-1-1	N-JASP-1	27.910	0.300	0.350	0.08	0.064	9.01	0.83	0.99	9.02	0.229	0.528	0.81	0.65
SW13-28-1-5-Pump1		N-JASP-1	N-JASP-2				0.00	0.222	0.13	0.00	0.00	0.00	0.528	22.103	0.00	0.00
LK-JASP-2	Circular	N-JASP-2	N-JASP-3	1131.480	-1.329	0.350	0.17	0.140	7.68	1.75	1.27	7.67	22.103	0.365	0.83	43.75
LK-JASP-3	Circular	N-JASP-3	N-JASP-9	1594.980	0.196	0.525	0.19	0.131	10.27	0.86	0.85	10.29	0.365	0.294	0.70	0.70
LK-JASP-4	Circular	N-JASP-4	N-JASP-1	868.410	0.500	0.375	0.12	0.067	9.40	1.12	1.12	9.41	0.200	0.528	0.54	0.53
LK-JASP-5	Circular	N-JASP-5	N-JASP-6	970.170	0.741	0.300	0.08	0.047	9.14	1.18	1.20	9.12	0.153	0.321	0.56	0.87
LK-JASP-6	Circular	N-JASP-6	N-JASP-7	784.910	0.200	0.450	0.13	0.094	9.37	0.80	0.81	9.39	0.321	0.529	0.74	0.71
LK-JASP-7-1	Circular	N-JASP-7-1	N-JASP-7	52.260	0.400	0.300	0.06	0.041	9.02	0.87	0.92	9.02	0.185	0.529	0.67	0.62
SE23-28-1-5-Pump1		N-JASP-7	N-JASP-8				0.00	0.183	2.34	0.00	0.00	0.00	0.529	18.978	0.00	0.00
SE23-28-1-5-Pump2		N-JASP-7	N-JASP-8				0.00	0.183	2.34	0.00	0.00	0.00	0.529	18.978	0.00	0.00
LK-JASP-8	Circular	N-JASP-8	N-JASP-8.1	364.490	1.978	0.300	0.14	0.158	8.93	1.92	1.87	0.29	18.978	21.322	1.16	71.08
LK-JASP-8-1	Circular	N-JASP-8.1	N-JASP-8.2	219.650	-0.206	0.300	0.04	0.153	9.27	0.62	1.51	9.26	21.322	18.177	3.49	69.57
LK-JASP-8-2	Circular	N-JASP-8.2	N-JASP-8.3	1088.520	-0.206	0.300	0.04	0.152	9.78	0.62	1.61	9.78	18.177	0.267	3.46	53.10
LK-JASP-8-3	Circular	N-JASP-8.3	N-JASP-8.4	10.550	0.294	0.600	0.33	0.152	9.80	1.18	1.26	9.80	0.267	0.250	0.46	0.45
LK-JASP-9	Circular	N-JASP-9	N-JASP-10	1407.930	0.500	0.525	0.30	0.180	10.22	1.40	1.45	10.24	0.294	0.333	0.59	0.56
LK-JASP-10	Circular	N-JASP-10	N-JASP-11	1043.420	0.502	0.525	0.30	0.221	10.00	1.41	1.53	10.02	0.333	0.392	0.73	0.63
LK-JASP-11	Circular	N-JASP-11	N-JASP-12	113.360	0.470	0.600	0.42	0.315	9.86	1.49	1.63	10.15	0.392	0.501	0.75	0.69
LK-JASP-12	Circular	N-JASP-12	MH 56A	44.070	0.470	0.600	0.42	0.315	9.71	1.49	1.65	9.66	0.501	0.701	0.75	1.02
LK-JASP-13	Circular	N-JASP-13	N-JASP-14	1364.820	0.570	0.375	0.13	0.071	9.59	1.20	1.21	9.60	0.196	0.245	0.54	0.52
LK-JASP-14	Circular	N-JASP-14	N-JASP-15	792.720	0.600	0.450	0.22	0.127	9.54	1.39	1.44	9.55	0.245	0.557	0.57	0.54
NW-36-28-1-5-Pump1		N-JASP-15	N-JASP-16				0.00	0.362	0.80	0.00	0.00	0.00	0.557	47.511	0.00	0.00
NW-36-28-1-5-Pump2		N-JASP-15	N-JASP-16				0.00	0.362	0.80	0.00	0.00	0.00	0.557	47.511	0.00	0.00
NW-36-28-1-5-Pump3		N-JASP-15	N-JASP-16				0.00	0.362	0.52	0.00	0.00	0.00	0.557	47.511	0.00	0.00
LK-JASP-16	Circular	N-JASP-16	N-VST-333	3311.080	-0.970	0.450	0.28	0.282	11.33	1.77	1.29	30.90	47.511	0.520	1.00	72.18

ASSUMED PUMP CURVES

SE23-28-1-5-Pump (1335M-8X.453.S22.230)		
Pump Flow Rate (L/s)	Pump Flow Rate (m^3/s)	Dynamic Head (m)
1.00	0.0010	31
11.88	0.0119	29
26.13	0.0261	27
33.78	0.0338	26
52.00	0.0520	24
73.19	0.0732	22
95.67	0.0957	20
116.56	0.1166	18
135.09	0.1351	16
152.42	0.1524	14
168.48	0.1685	12
183.42	0.1834	10
SW13-28-1-5-Pump1 (NP 3202 MT 3~ 433)		
Pump Flow Rate (L/s)	Pump Flow Rate (m^3/s)	Dynamic Head (m)
1.00	0.0010	36
19.19	0.0192	34
44.49	0.0445	32
69.62	0.0696	30
93.23	0.0932	28
117.29	0.1173	26
142.87	0.1429	24
166.69	0.1667	22
185.95	0.1860	20
203.45	0.20345	18
222.21	0.22221	16
SW01-29-1-5-Pump1 (NP 3315 MT 3~ 635)		
Pump Flow Rate (L/s)	Pump Flow Rate (m^3/s)	Dynamic Head (m)
1.00	0.0010	34.8
24.11	0.0241	34
36.54	0.0365	32
62.32	0.0623	30
92.03	0.0920	28
126.92	0.1269	26
159.78	0.1598	24
189.56	0.1896	22
218.06	0.2181	20
243.25	0.24325	18
266.25	0.26625	16
310.04	0.31004	12
NW-36-28-1-5-Pump-01 (CP 3240/805 3~ 450)		
Pump Flow Rate (L/s)	Pump Flow Rate (m^3/s)	Dynamic Head (m)
13.82	0.01382	79.18
37.23	0.03723	76
66.48	0.06648	72
94.77	0.09477	68
122.18	0.12218	64
153.93	0.15393	60
184.39	0.18439	56
216.69	0.21669	52
247.43	0.24743	48
274.95	0.27495	44
300.00	0.30000	40
322.11	0.32211	36
342.56	0.34256	32
362.15	0.36215	28

PUMP OPERATION

Name	Pump Description	Pump Rating Curve Reference	Pump Rated By	Pump Speed Factor	Pump Starts (m)	Pump Stops (m)
South Pump 1	XFP100E-CB1 designed by HMR Engineering Inc (Dwg 0	XFP100E-CB1.1	Dynamic Head	1	1102.500	1102.200
South Pump 2	XFP100E-CB1 designed by HMR Engineering Inc (Dwg 0	XFP100E-CB1.1	Dynamic Head	1	1102.500	1102.200
Iron Landing Pump 1	New-Pump	NP-3202-HT-3~465-IL	Dynamic Head	1	1093.820	1093.600
Iron Landing Pump 2	New Pump	NP-3202-HT-3~465-IL	Dynamic Head	1	1094.120	1093.600
NW-36-28-1-5-Pump1	CP 3240/805 3~ 450	NW-36-28-1-5-Pump-01	Dynamic Head	1	1075.860	1075.560
NW-36-28-1-5-Pump2	CP 3240/805 3~ 450	NW-36-28-1-5-Pump-01	Dynamic Head	1	1075.860	1075.560
NW-36-28-1-5-Pump3	CP 3240/805 3~ 450	NW-36-28-1-5-Pump-01	Dynamic Head	1	1075.860	1075.560
SW13-28-1-5-Pump1	NP 3202 MT 3~ 433	SW-13-28-1-5-Pump-01	Dynamic Head	1	1105.816	1105.516
SE23-28-1-5-Pump1	1335M-8X.453.S22.230	SE-23-28-1-5-Pump-01	Dynamic Head	1	1099.678	1099.378
SE23-28-1-5-Pump2	1335M-8X.453.S22.230	SE-23-28-1-5-Pump-01	Dynamic Head	1	1099.678	1099.378
SW-01-29-1-5-Pump1	NP 3315 MT 3~ 635	SW-01-29-1-5-Pump-01	Dynamic Head	1	1060.379	1060.179

CATCHMENT INPUT DATA

Name	Subcatchment	Node X	Node Y	Rainfall Reference	Infiltration Reference	Width (m)	Area (ha)	Impervious Percentage %	Slope (m/m)	RDII name
MH 157		-2406.186	5699722.549	10year-Chicago-7.5%		0	0	0	0	
MH 158		-2385.591	5699736.617	10year-Chicago-7.5%		0	0	0	0	
MH 159		-2388.513	5699653.847	10year-Chicago-7.5%		0	0	0	0	
MH 160		-2388.4	5699577.395	10year-Chicago-7.5%		0	0	0	0	
MH 161		-1919.79	5699898.22	10year-Chicago-7.5%		0	0	0	0	
MH 162		-2005.272	5699855.922	10year-Chicago-7.5%		0	0	0	0	
MH 163		-2091.642	5699827.728	10year-Chicago-7.5%		0	0	0	0	
MH 164		-2195.838	5699827.76	10year-Chicago-7.5%		0	0	0	0	
MH 165		-2295.575	5699826.299	10year-Chicago-7.5%		0	0	0	0	
MH 166		-2350.812	5699826.91	10year-Chicago-7.5%		0	0	0	0	
MH 167		-1972.092	5700003.816	10year-Chicago-7.5%		0	0	0	0	
MH 168		-2028.9	5700109.612	10year-Chicago-7.5%		0	0	0	0	
MH 169		-2108.209	5700075.271	10year-Chicago-7.5%		0	0	0	0	
MH 170		-2196.123	5700071.222	10year-Chicago-7.5%		0	0	0	0	
MH 171		-2297.016	5700169.078	10year-Chicago-7.5%		0	0	0	0	
MH 172		-2297.183	5700105.375	10year-Chicago-7.5%		0	0	0	0	
MH 173		-2296.16	5700070.253	10year-Chicago-7.5%		0	0	0	0	
MH 174		-2296.394	5700012.611	10year-Chicago-7.5%		0	0	0	0	
MH 175		-2195.377	5700013.281	10year-Chicago-7.5%		0	0	0	0	
MH 176		-2093.815	5700013.691	10year-Chicago-7.5%		0	0	0	0	
MH 177		-2086.691	5700190.221	10year-Chicago-7.5%		0	0	0	0	
MH 178		-2512.014	5699490.427	10year-Chicago-7.5%		0	0	0	0	
MH 179		-2513.909	5699551.797	10year-Chicago-7.5%		0	0	0	0	
MH 180		-2478.859	5699551.668	10year-Chicago-7.5%		0	0	0	0	
MH 181		-2514.014	5699649.859	10year-Chicago-7.5%		0	0	0	0	
MH 182		-2481.305	5699650.816	10year-Chicago-7.5%		0	0	0	0	
MH 183		-2507.039	5699690.971	10year-Chicago-7.5%		0	0	0	0	
MH 184		-2563.603	5699704.248	10year-Chicago-7.5%		0	0	0	0	
MH 185		-2464.616	5699769.721	10year-Chicago-7.5%		0	0	0	0	
MH 186		-2420.124	5699851.362	10year-Chicago-7.5%		0	0	0	0	
MH 187		-2514.88	5699890.832	10year-Chicago-7.5%		0	0	0	0	
MH 188		-2392.834	5699926.417	10year-Chicago-7.5%		0	0	0	0	
MH 189		-2393.117	5699982.378	10year-Chicago-7.5%		0	0	0	0	
MH 190		-2512.816	5699982.404	10year-Chicago-7.5%		0	0	0	0	
MH 191		-2393.655	5700083.391	10year-Chicago-7.5%		0	0	0	0	
MH 192		-2513.767	5700083.559	10year-Chicago-7.5%		0	0	0	0	
MH 193		-2393.872	5700169.438	10year-Chicago-7.5%		0	0	0	0	
MH 194		-2457.01	5700169.286	10year-Chicago-7.5%		0	0	0	0	
MH 195		-2519.415	5700169.359	10year-Chicago-7.5%		0	0	0	0	
MH 196		-2559.201	5700169.534	10year-Chicago-7.5%		0	0	0	0	
MH 197		-2519.758	5700229.135	10year-Chicago-7.5%		0	0	0	0	
MH 198		-2394.477	5700273.771	10year-Chicago-7.5%		0	0	0	0	
MH 199		-2393.566	5700319.974	10year-Chicago-7.5%		0	0	0	0	
MH 200		-2512.717	5700320.196	10year-Chicago-7.5%		0	0	0	0	
MH 201		-2393.491	5700351.952	10year-Chicago-7.5%		0	0	0	0	
MH 202	1	-2266.266	5700405.322	10year-Chicago-7.5%	Horton	35	0.89	65	0.02	RDII-7.5%
MH 203		-2392.809	5700404.838	10year-Chicago-7.5%		0	0	0	0	
MH 204		-2512.536	5700405.281	10year-Chicago-7.5%		0	0	0	0	
MH 205		-2394.366	5700499.223	10year-Chicago-7.5%		0	0	0	0	
MH 206		-2471.463	5700498.983	10year-Chicago-7.5%		0	0	0	0	
MH 207		-2548.421	5700499.097	10year-Chicago-7.5%		0	0	0	0	
MH 208		-2275.296	5700498.602	10year-Chicago-7.5%		0	0	0	0	
MH 209	1	-2154.686	5700498.998	10year-Chicago-7.5%	Horton	35	1.3	65	0.02	RDII-7.5%
MH 210	1	-2053.711	5700499.052	10year-Chicago-7.5%	Horton	35	0.53	65	0.02	RDII-7.5%
MH 211	1	-2090.606	5700593.735	10year-Chicago-7.5%	Horton	35	0.48	65	0.02	RDII-7.5%
MH 212		-2126.534	5700680.312	10year-Chicago-7.5%		0	0	0	0	
MH 213		-2106.984	5700689.98	10year-Chicago-7.5%		0	0	0	0	
MH 214	1	-2014.051	5700405.66	10year-Chicago-7.5%	Horton	35	0.91	65	0.02	RDII-7.5%
MH 215		-2003.954	5700284.53	10year-Chicago-7.5%		0	0	0	0	
MH 216		-2012.04	5700267.794	10year-Chicago-7.5%		0	0	0	0	
MH 217		-3088.906	5699524.207	10year-Chicago-7.5%		0	0	0	0	
MH 218		-3087.099	5699544.615	10year-Chicago-7.5%		0	0	0	0	
MH 219		-3087.496	5699642.262	10year-Chicago-7.5%		0	0	0	0	
MH 220		-3032.642	5699773.524	10year-Chicago-7.5%		0	0	0	0	
MH 221		-2973.2	5699843.495	10year-Chicago-7.5%		0	0	0	0	
MH 222		-2904.146	5699770.524	10year-Chicago-7.5%		0	0	0	0	
MH 223		-2844.575	5699663.527	10year-Chicago-7.5%		0	0	0	0	
MH 224		-2837.579	5699630.522	10year-Chicago-7.5%		0	0	0	0	
MH 225		-2833.981	5699545.021	10year-Chicago-7.5%		0	0	0	0	
MH 226		-2965.785	5699645.206	10year-Chicago-7.5%		0	0	0	0	
MH 227		-2374.216	5699534.239	10year-Chicago-7.5%		0	0	0	0	
MH 228		-2431.217	5699535.355	10year-Chicago-7.5%		0	0	0	0	
MH 229		-1896.291	5699702.953	10year-Chicago-7.5%		0	0	0	0	
MH 230		-1832.507	5699811.032	10year-Chicago-7.5%		0	0	0	0	
MH 231		-2368.724	5698813.407	10year-Chicago-7.5%		0	0	0	0	
MH 232		-2435.442	5698836.325	10year-Chicago-7.5%		0	0	0	0	
MH 233		-2300.675	5698765.69	10year-Chicago-7.5%		0	0	0	0	
MH 234		-2441.456	5698790.802	10year-Chicago-7.5%		0	0	0	0	
MH 235		-2448.972	5698755.857	10year-Chicago-7.5%		0	0	0	0	
MH 236		-2321.553	5698704.626	10year-Chicago-7.5%		0	0	0	0	
MH 237		-2406.489	5698706.167	10year-Chicago-7.5%		0	0	0	0	
MH 238		-2342.624	5698843.108	10year-Chicago-7.5%		0	0	0	0	
MH 239		-2209.526	5698892.188	10year-Chicago-7.5%		0	0	0	0	
MH 240		-2260.115	5698911.026	10year-Chicago-7.5%		0	0	0	0	
MH 241		-2553.179	5698669.551	10year-Chicago-7.5%		0	0	0	0	
MH 242		-2544.693	5698666.715	10year-Chicago-7.5%		0	0	0	0	
MH 243		-2544.906	5698671.879	10year-Chicago-7.5%		0	0	0	0	
MH 244		-2553.009	5698752.493	10year-Chicago-7.5%		0	0	0	0	
MH 245		-2512.28	5698865.135	10year-Chicago-7.5%		0	0	0	0	
MH 246		-2578.329	5698954.505	10year-Chicago-7.5%		0	0	0	0	
MH 254		-2959.977	5699545.69	10year-Chicago-7.5%		0	0	0	0	
MH 213A		-2035.61	5700719.531	10year-Chicago-7.5%		0	0	0	0	
MH 7A		-2228.862	5697482.878	10year-Chicago-7.5%		0	0	0	0	
MH 40A		-3354.21	5698485.847	10year-Chicago-7.5%		0	0	0	0	
MH 40B		-3353.777	5698477.976	10year-Chicago-7.5%		0	0	0	0	
HAWKS LANDING										
N-HWL-259	1	-3313.853	5701032.706	10year-Chicago-7.5%	Horton	34	1.2	65	0.02	RDII-7.5%
N-HWL-260		-3184.633	5701036.498	10year-Chicago-7.5%		0	0	0	0	
N-HWL-261	1	-3314.195	5700951.839	10year-Chicago-7.5%	Horton	34	1.24	65	0.02	RDII-7.5%
N-HWL-262	1	-3152.869	5700948.186	10year-Chicago-7.5%	Horton	34	0.62	65	0.02	RDII-7.5%
N-HWL-263		-3167.761	5700989.806	10year-Chicago-7.5%		0	0	0	0	
N-HWL-264	1	-3112.421	5701010.588	10year-Chicago-7.5%	Horton	34	0.79	65	0.02	RDII-7.5%
N-HWL-266	1	-2932.176	5701005.269	10year-Chicago-7.5%	Horton	65	0.41	65	0.02	RDII-7.5%
N-HWL-267	1	-3022.766	5700873.132	10year-Chicago-7.5%	Horton	34	0.99	65	0.02	RDII-7.5%
N-HWL-268	1	-2980.119	5700754.361	10year-Chicago-7.5%	Horton	34	0.48	65	0.02	RDII-7.5%
N-HWL-269	1	-2889.089	5700797.164	10year-Chicago-7.5%	Horton	34	0.48	65	0.02	RDII-7.5%
N-HWL-270	1	-2923.744	5700930.66	10year-Chicago-7.5%	Horton	34	0.66	65	0.02	RDII-7.5%
N-HWL-271	1	-2827.106	5700931.377	10year-Chicago-7.5%	Horton	34	0.63	65	0.02	RDII-7.5%
N-HWL-272	1	-2801.977	5700836.874	10year-Chicago-7.5%	Horton	34	1	65	0.02	RDII-7.5%
N-HWL-273		-2789.681	5700801.961	10year-Chicago-7.5%		0	0	0	0	
N-HWL-274		-2777.172	5700795.122	10year-Chicago-7.5%		0	0	0	0	
N-HWL-275		-2771.316	5700804.398	10year-Chicago-7.5%		0	0	0	0	
N-HWL-276	1	-2771.395	5700836.869	10year-Chicago-7.5%	Horton	34	0.28	65	0.02	RDII-7.5%
N-HWL-278	1	-2627.338	5700712.999	10year-Chicago-7.5%	Horton	34	0.41	65	0.02	RDII-7.5%
N-HWL-279	1	-2627.827	5700652.844	10year-Chicago-7.5%	Horton	34	0.31	75	0.02	RDII-7.5%
N-HWL-280	1	-2627.434	5700602.609	10year-Chicago-7.5%	Horton	34	0.49	65	0.02	RDII-7.5%
N-HWL-281	1	-2635.645	5700506.842	10year-Chicago-7.5%	Horton	34	0.45	65	0.02	RDII-7.5%
N-HWL-282	1	-2708.8	5700532.709	10year-Chicago-7.5%	Horton	34	0.84	65	0.02	RDII-7.5%
N-HWL-283	1	-2815.404	5700624.831	10year-Chicago-7.5%	Horton	34	0.35	65	0.02	RDII-7.5%
N-HWL-284	1	-2741.387	5700685.568	10year-Chicago-7.5%	Horton	34	0.88	65	0.02	RDII-7.5%
N-HWL-285	1	-3348.028	5700583.476	10year-Chicago-7.5%	Horton	34	1.66	65	0.02	RDII-7.5%
N-HWL-286	1	-2856.273	5700706.012	10year-Chicago-7.5%	Horton	34	0.27	65	0.02	RDII-7.5%
N-HWL-287	1	-2941.536	5700658.878	10year-Chicago-7.5%	Horton	34	0.61	65	0.02	RDII-7.5%
N-HWL-288		-3032.535	5700615.039	10year-Chicago-7.5%		0	0	0	0	
N-HWL-289	1	-3087.119	5700765.808	10year-Chicago-7.5%	Horton	34	1.16	65	0.02	RDII-7.5%
N-HWL-290		-3118.193	5700852.085	10year-Chicago-7.5%		0	0	0	0	
N-HWL-291		-3241.814	5700852.504	10year-Chicago-7.5%		0	0	0	0	
N-HWL-292	1	-3345.805	5700852.42	10year-Chicago-7.5%	Horton	34	1.51	65	0.02	RDII-7.5%
N-HWL-293	1	-3313.813	5700765.888	10year-Chicago-7.5%	Horton	34	1.39	65	0.02	RDII-7.5%
N-HWL-294		-3185.847	5700765.751	10year-Chicago-7.5%		0	0	0	0	
N-HWL-295	1	-3313.842	5700677.595	10year-Chicago-7.5%	Horton	34	1.7	65	0.02	RDII-7.5%
N-HWL-296		-3162.013	5700681.352	10year-Chicago-7.5%		0	0	0	0	
N-HWL-297		-3157.151	5700586.274	10year-Chicago-7.5%		0	0	0	0	
N-HWL-298	1	-3313.968	5700495.14	10year-Chicago-7.5%	Horton	34	1.27	65	0.02	RDII-7.5%
N-HWL-299	1	-3148.207	5700495.329	10year-Chicago-7.5%	Horton	34	0.24	65	0.02	RDII-7.5%
N-HWL-300	1	-3313.925	5700410.902	10year-Chicago-7.5%	Horton	34	0.65	65	0.02	RDII-7.5%
N-HWL-301	1	-3146.819	5700411.711	10year-Chicago-7.5%	Horton	34	0.25	65	0.02	RDII-7.5%
N-HWL-302	1	-3313.896	5700322.726	10year-Chicago-7.5%	Horton	34	1.11	65	0.02	RDII-7.5%
N-HWL-303	1	-3172.956	5700322.87	10year-Chicago-7.5%	Horton	34	0.67	65	0.02	RDII-7.5%
N-HWL-304		-3175.115	5700283.269	10year-Chicago-7.5%		0	0	0	0	
N-HWL-305	1	-3056.606	5700411.418	10year-Chicago-7.5%	Horton	34	0.66	65	0.02	RDII-7.5%
N-HWL-306	1	-2949.897	5700411.616	10year-Chicago-7.5%	Horton	34	0.34	65	0.02	RDII-7.5%
N-HWL-307	1	-3075.902	5700332.78	10year-Chicago-7.5%	Horton	34	1.41	65	0.02	RDII-7.5%
N-HWL-308	1	-2918.047	5700323.505	10year-Chicago-7.5%	Horton	34	0.52	65	0.02	RDII-7.5%
N-HWL-309	1	-2815.453	5700323.769	10year-Chicago-7.5%	Horton	34	0.82	65	0.02	RDII-7.5%
N-HWL-310	1	-2828.89	5700360.924	10year-Chicago-7.5%	Horton	34	0.26	65	0.02	RDII-7.5%
N-HWL-311		-2731.95	5700323.774	10year-Chicago-7.5%		0	0	0	0	
N-HWL-312	1	-2637.828	5700323.765	10year-Chicago-7.5%	Horton	34	0.95	65	0.02	RDII-7.5%
N-HWL-313	1	-2731.991	5700344.304	10year-Chicago-7.5%	Horton	34	0.43	65	0.02	RDII-7.5%
N-HWL-314	1	-2633.564	5700408.794	10year-Chicago-7.5%	Horton	34	0.93	65	0.02	RDII-7.5%
N-HWL-315	1	-2763.976	5700453.037	10year-Chicago-7.5%	Horton	34	0.47	65	0.02	RDII-7.5%
N-HWL-316	1	-2844.032	5700506.533	10year-Chicago-7.5%	Horton	34	1.28	65	0.02	RDII-7.5%
N-HWL-317		-2898.681	5700579.052	10year-Chicago-7.5%		0	0	0	0	
N-HWL-319	1	-3067.282	5700995.527	10year-Chicago-7.5%	Horton	65	0.74	65	0.02	RDII-7.5%
N-HWL-320	1	-2627.478	5700836.838	10year-Chicago-7.5%	Horton	34	1.36	65	0.02	RDII-7.5%
N-HWL-377		-3149.537	5701084.425	10year-Chicago-7.5%		0	0	0	0	
N-HWL-378		-2933.944	5701083.935	10year-Chicago-7.5%		0	0	0	0	
N-HWL-379		-2574.044	5701082.104	10year-Chicago-7.5%		0	0	0	0	
N-HWL-379.1		-2254.099	5701084.411	10year-Chicago-7.5%		0	0	0	0	

CATCHMENT INPUT DATA

Name	Subcatchment	Node X	Node Y	Rainfall Reference	Infiltration Reference	Width (m)	Area (ha)	Impervious Percentage %	Slope (m/m)	RDII name
VISTA CROSSING										
N-VST-322	1	-3181.103	5700229.451	10year-Chicago-7.5%	Horton	34	1.46	65	0.02	RDII-7.5%
N-VST-323	1	-3087.061	5700235.112	10year-Chicago-7.5%	Horton	34	1.01	65	0.02	RDII-7.5%
N-VST-324	1	-2905.103	5700235.112	10year-Chicago-7.5%	Horton	34	0.89	65	0.02	RDII-7.5%
N-VST-325	1	-3087.061	5700119.467	10year-Chicago-7.5%	Horton	34	0.53	65	0.02	RDII-7.5%
N-VST-326	1	-3181.103	5700121.085	10year-Chicago-7.5%	Horton	34	0.45	65	0.02	RDII-7.5%
N-VST-327		-3280.978	5700121.085	10year-Chicago-7.5%		0	0	0	0	
N-VST-328	1	-3296.748	5700110.167	10year-Chicago-7.5%	Horton	34	0.74	65	0.02	RDII-7.5%
N-VST-329	1	-3315.753	5699967.835	10year-Chicago-7.5%	Horton	34	1.18	65	0.02	RDII-7.5%
N-VST-330	1	-3314.944	5699821.46	10year-Chicago-7.5%	Horton	34	0.74	65	0.02	RDII-7.5%
N-VST-331	1	-3232.052	5699820.247	10year-Chicago-7.5%	Horton	34	0.36	65	0.02	RDII-7.5%
N-VST-332	1	-3265.209	5699730.48	10year-Chicago-7.5%	Horton	34	0.43	65	0.02	RDII-7.5%
N-VST-333		-3373.809	5699729.959	10year-Chicago-7.5%		0	0	0	0	
N-VST-334		-3171.803	5699730.48	10year-Chicago-7.5%		0	0	0	0	
N-VST-335	1	-3185.147	5699641.927	10year-Chicago-7.5%	Horton	34	4.53	65	0.02	RDII-7.5%
N-VST-336	1	-3078.802	5699812.564	10year-Chicago-7.5%	Horton	34	0.83	65	0.02	RDII-7.5%
N-VST-337	1	-3106.298	5699835.208	10year-Chicago-7.5%	Horton	34	0.4	65	0.02	RDII-7.5%
N-VST-338	1	-3161.694	5699878.437	10year-Chicago-7.5%	Horton	34	0.33	65	0.02	RDII-7.5%
N-VST-339	1	-3222.347	5699888.582	10year-Chicago-7.5%	Horton	34	0.47	65	0.02	RDII-7.5%
N-VST-340		-3221.943	5699968.644	10year-Chicago-7.5%		0	0	0	0	
N-VST-341	1	-3221.943	5700029.701	10year-Chicago-7.5%	Horton	34	0.49	65	0.02	RDII-7.5%
N-VST-342	1	-3164.929	5700029.701	10year-Chicago-7.5%	Horton	34	0.26	65	0.02	RDII-7.5%
N-VST-343	1	-3116.003	5700000.588	10year-Chicago-7.5%	Horton	34	0.39	65	0.02	RDII-7.5%
N-VST-344		-3135.007	5699983.605	10year-Chicago-7.5%		0	0	0	0	
N-VST-345	1	-3064.245	5699919.717	10year-Chicago-7.5%	Horton	34	0.4	65	0.02	RDII-7.5%
N-VST-346		-2898.228	5699938.411	10year-Chicago-7.5%		0	0	0	0	
N-VST-347	1	-2903.866	5700130.497	10year-Chicago-7.5%	Horton	34	0.52	65	0.02	RDII-7.5%
N-VST-348	1	-2724.468	5700131.91	10year-Chicago-7.5%	Horton	34	1.02	65	0.02	RDII-7.5%
N-VST-349	1	-2722.015	5700237.489	10year-Chicago-7.5%	Horton	34	0.65	65	0.02	RDII-7.5%
N-VST-350	1	-2631.972	5700236.783	10year-Chicago-7.5%	Horton	34	1.06	65	0.02	RDII-7.5%
N-VST-351	1	-2632.678	5700170.752	10year-Chicago-7.5%	Horton	34	0.9	65	0.02	RDII-7.5%
N-VST-352	1	-2724.468	5700044.339	10year-Chicago-7.5%	Horton	34	0.25	65	0.02	RDII-7.5%
N-VST-353	1	-2803.211	5700045.398	10year-Chicago-7.5%	Horton	34	0.61	65	0.02	RDII-7.5%
N-VST-354	1	-2794.031	5699990.313	10year-Chicago-7.5%	Horton	34	0.41	65	0.02	RDII-7.5%
N-VST-355		-2767.901	5699963.83	10year-Chicago-7.5%		0	0	0	0	
N-VST-356	1	-2755.895	5699962.771	10year-Chicago-7.5%	Horton	34	0.65	65	0.02	RDII-7.5%
N-VST-357		-2631.972	5699986.782	10year-Chicago-7.5%		0	0	0	0	
N-VST-358	1	-2632.653	5699895.569	10year-Chicago-7.5%	Horton	34	1.54	65	0.02	RDII-7.5%
N-VST-359	1	-2633.013	5699808.109	10year-Chicago-7.5%	Horton	34	0.43	65	0.02	RDII-7.5%
N-VST-360	1	-2726.234	5699769.267	10year-Chicago-7.5%	Horton	34	0.23	75	0.02	RDII-7.5%
N-VST-361	1	-2774.61	5699838.477	10year-Chicago-7.5%	Horton	34	0.95	65	0.02	RDII-7.5%
N-VST-362		-2697.468	5699726.87	10year-Chicago-7.5%		0	0	0	0	
N-VST-363	1	-2644.183	5699725.068	10year-Chicago-7.5%	Horton	34	0.4	65	0.02	RDII-7.5%
N-VST-364		-2650.361	5699704.217	10year-Chicago-7.5%		0	0	0	0	
N-VST-365	1	-2998.781	5700128.723	10year-Chicago-7.5%	Horton	34	0.48	65	0.02	RDII-7.5%
N-VST-366	1	-3000.439	5700145.306	10year-Chicago-7.5%	Horton	34	0.47	65	0.02	RDII-7.5%
N-VST-367		-3224.722	5699857.593	10year-Chicago-7.5%		0	0	0	0	
N-VST-361.1	1	-2838.074	5699902.291	10year-Chicago-7.5%	Horton	34	0.45	65	0.02	RDII-7.5%
N-VST-371	1	-3027.962	5699971.088	10year-Chicago-7.5%	Horton	34	1.1	65	0.02	RDII-7.5%
N-VST-344.1		-3105.938	5699955.538	10year-Chicago-7.5%		0	0	0	0	
N-VST-332.1	1	-3224.11	5699730.48	10year-Chicago-7.5%	Horton	34	0.64	65	0.02	RDII-7.5%
N-VST-402	1	-2984.48	5699852.702	10year-Chicago-7.5%	Horton	34	0.27	65	0.02	RDII-7.5%
N-VST-404	1	-2890.546	5699962.257	10year-Chicago-7.5%	Horton	34	0.81	65	0.02	RDII-7.5%
JASP AREA										
N-JASP-1	1	-1710.567	5695076.126	10year-Chicago-7.5%		0	0	0	0	
N-JASP-1-1	1	-1716.05	5695048.756	10year-Chicago-7.5%	Horton	813	116.8	95	0.02	RDII-7.5%
N-JASP-2		-1677.753	5695085.91	10year-Chicago-7.5%		0	0	0	0	
N-JASP-3		-628.975	5695436.603	10year-Chicago-7.5%		0	0	0	0	
N-JASP-4	1	-1729.229	5695944.333	10year-Chicago-7.5%	Horton	800	125.8	95	0.02	RDII-7.5%
N-JASP-5	1	-1683.863	5696239	10year-Chicago-7.5%	Horton	703	79.67	95	0.02	RDII-7.5%
N-JASP-6	1	-2386.233	5696237.728	10year-Chicago-7.5%	Horton	940	75.3	95	0.02	RDII-7.5%
N-JASP-7	1	-2394.403	5697035.242	10year-Chicago-7.5%		0	0	0	0	
N-JASP-7-1	1	-2276.331	5696916.278	10year-Chicago-7.5%	Horton	800	63.1	95	0.02	RDII-7.5%
N-JASP-8		-2415.455	5697089.425	10year-Chicago-7.5%		0	0	0	0	
N-JASP-8.1		-2658.443	5697361.107			0	0	0	0	
N-JASP-8.2		-2813.01	5697517.165			0	0	0	0	
N-JASP-8.3		-3350.052	5698463.981			0	0	0	0	
N-JASP-8.4		-3352.234	5698474.3			0	0	0	0	
N-JASP-9	1	-787.474	5697023.688	10year-Chicago-7.5%	Horton	562	101.01	95	0.02	RDII-7.5%
N-JASP-10	1	-932.669	5698418.166	10year-Chicago-7.5%	Horton	1552	62.84	95	0.02	RDII-7.5%
N-JASP-11	1	-1737.734	5699081.932	10year-Chicago-7.5%	Horton	1105	184.76	95	0.02	RDII-7.5%
N-JASP-12		-1851.084	5699080.478	10year-Chicago-7.5%		0	0	0	0	
N-JASP-13	1	-299.027	5699868.745	10year-Chicago-7.5%	Horton	800	137.85	95	0.02	RDII-7.5%
N-JASP-14	1	-932.248	5701077.777	10year-Chicago-7.5%	Horton	800	99.56	95	0.02	RDII-7.5%
N-JASP-15		-1543.975	5701080.695	10year-Chicago-7.5%		0	0	0	0	
N-JASP-16		-1573.509	5701101.951	10year-Chicago-7.5%		0	0	0	0	
NEW ANNEXATION AREA										
N-2335-JK	1	-1897.606	5700987.514	10year-Chicago-7.5%	Horton	326.5	34.92	95	0.02	RDII-7.5%
N-ANN-100		-1232.242	5701855.211	10year-Chicago-7.5%		0	0	0	0	
N-ANN-101		-1223.512	5701874.313			0	0	0	0	RDII-7.5%
N-ANN-101.1	1	-1262.438	5701856.203	10year-Chicago-7.5%	Horton	800	54.9	65	0.02	RDII-7.5%
N-ANN-102	1	-1803.67	5701873.508	10year-Chicago-7.5%	Horton	800	54.9	65	0.02	RDII-7.5%
N-ANN-103	1	-2568.534	5701874.056	10year-Chicago-7.5%	Horton	800	61.1	65	0.02	RDII-7.5%
N-ANN-104	1	-3390.33	5701873.602	10year-Chicago-7.5%	Horton	800	64.4	65	0.02	RDII-7.5%
N-ANN-107	1	-4189.777	5701872.543	10year-Chicago-7.5%	Horton	800	64.1	65	0.02	RDII-7.5%
N-ANN-108	1	-4194.778	5701095.368	10year-Chicago-7.5%	Horton	432.503	46.52	65	0.02	RDII-7.5%
N-ANN-108.1		-4207.509	5700495.856	10year-Chicago-7.5%		0	0	0	0	
N-ANN-109		-3896.568	5700325.517	10year-Chicago-7.5%		0	0	0	0	
N-ANN-110	1	-3559.669	5700275.838	10year-Chicago-7.5%	Horton	366.851	32.85	65	0.02	RDII-7.5%
N-ANN-111	1	-3456.657	5698753.189	10year-Chicago-7.5%	Horton	477.791	47.28	65	0.02	RDII-7.5%
N-ANN-112		-3376.238	5698578.023	10year-Chicago-7.5%		0	0	0	0	
N-ANN-113		-3376.586	5698502.844	10year-Chicago-7.5%		0	0	0	0	
N-ANN-114		-3376.238	5698747.161	10year-Chicago-7.5%		0	0	0	0	
N-ANN-114.1		-3376.238	5698664.283			0	0	0	0	
N-ANN-115		-3375.889	5698875.147	10year-Chicago-7.5%		0	0	0	0	
N-ANN-116		-3375.889	5699050.562	10year-Chicago-7.5%		0	0	0	0	
N-ANN-117		-3375.891	5699225.279	10year-Chicago-7.5%		0	0	0	0	
N-ANN-118		-3375.889	5699400.694	10year-Chicago-7.5%		0	0	0	0	
N-ANN-119		-3375.6	5699550.654	10year-Chicago-7.5%		0	0	0	0	
N-ANN-120	1	-4566.926	5700118.667	10year-Chicago-7.5%	Horton	534.936	89.07	65	0.02	RDII-7.5%
N-ANN-120.1	1	-4056.508	5699501.366	10year-Chicago-7.5%	Horton	477.657	36.91	65	0.02	RDII-7.5%
N-ANN-121	1	-3375.398	5701085.989	10year-Chicago-7.5%	Horton	595.037	46.52	65	0.02	RDII-7.5%
N-ANN-122	1	-4242.444	5697878.621	10year-Chicago-7.5%	Horton	800	64.8	65	0.02	RDII-7.5%
N-ANN-123	1	-3375.617	5698191.237	10year-Chicago-7.5%	Horton	800	64.9	65	0.02	RDII-7.5%
N-ANN-127	1	-4270.516	5698672.254	10year-Chicago-7.5%	Horton	469.506	85.49	65	0.02	RDII-7.5%
N-ANN-476		-1806.482	5701087.47	10year-Chicago-7.5%		0	0	0	0	
N-UR-01	1	-4650.236	5697048.798	10year-Chicago-7.5%	Horton	800	64.8	65	0.02	RDII-7.5%
N-UR-02	1	-4317.258	5697746.434	10year-Chicago-7.5%	Horton	800	64.8	65	0.02	RDII-7.5%
IRON LANDING										
N-ID-01	1	-2509.987	5698015.321	10year-Chicago-7.5%	Horton	265	15.76	75	0.02	RDII-7.5%
N-IL-379	1	-2432.133	5701083.235	10year-Chicago-7.5%	Horton	35	0.59	65	0.02	RDII-7.5%
N-IL-489	1	-2515.519	5700591.263	10year-Chicago-7.5%	Horton	35	0.92	65	0.02	RDII-7.5%
N-IL-490	1	-2418.568	5700593.075	10year-Chicago-7.5%	Horton	35	1.01	65	0.02	RDII-7.5%
N-IL-491	1	-2251.849	5700593.075	10year-Chicago-7.5%	Horton	35	1.02	65	0.02	RDII-7.5%
N-IL-492	1	-2520.092	5700677.734	10year-Chicago-7.5%	Horton	35	0.95	65	0.02	RDII-7.5%
N-IL-493	1	-2432.704	5700677.139	10year-Chicago-7.5%	Horton	35	2.4	65	0.02	RDII-7.5%
N-IL-494	1	-2253.765	5700677.139	10year-Chicago-7.5%	Horton	35	0.79	65	0.02	RDII-7.5%
N-IL-495	1	-2521.876	5700828.732	10year-Chicago-7.5%	Horton	35	0.96	65	0.02	RDII-7.5%
N-IL-496	1	-2430.326	5700829.327	10year-Chicago-7.5%	Horton	35	0.48	65	0.02	RDII-7.5%
N-IL-497	1	-2429.137	5700986.27	10year-Chicago-7.5%	Horton	35	1.42	65	0.02	RDII-7.5%
N-IL-498	1	-2518.903	5700985.675	10year-Chicago-7.5%	Horton	35	0.94	65	0.02	RDII-7.5%
N-IL-499	1	-2186.588	5700818.626	10year-Chicago-7.5%	Horton	35	1.26	65	0.02	RDII-7.5%
N-IL-500	1	-2255.548	5700986.865	10year-Chicago-7.5%	Horton	35	0.59	65	0.02	RDII-7.5%
N-IL-501	1	-2210.962	5701001.726	10year-Chicago-7.5%	Horton	35	0.59	65	0.02	RDII-7.5%
N-IL-502	1	-2392.316	5700830.516	10year-Chicago-7.5%	Horton	98	0.36	65	0.02	RDII-7.5%
N-IL-506	1	-2144.546	5700402.881	10year-Chicago-7.5%	Horton	35	1.4	65	0.02	RDII-7.5%
N-IL-509		-2575.135	5700985.286			0	0	0	0	

Appendix D Itemized Cost Estimate

Ph 1-2 - Trunk C4 to Western Drive

Description	Unit	Est. Qty	Unit Price	Total Amt
GENERAL				
Mobilization/Demobilization	L.S.	1	$ 24,483.83	$ 24,483.83
Shallow Utility Protection	ea.	15	$ 460.75	$ 6,911.25
Dewatering Allowance	L.S.	1	$ 8,163.90	$ 8,163.90
Tree Protection	L.S.	1	$ 1,599.64	$ 1,599.64
Hydrovac	hr	20	$ 493.11	$ 9,862.20
Traffic accommodation	L.S.	1	$ 11,896.06	$ 11,896.06
Quality control testing	L.S.	1	$ 22,432.55	$ 22,432.55
SITE WORK AND REMOVALS				
Saw cutting	l.m.	1,020	$ 9.26	$ 9,445.20
Road core incl. asphalt removal, base course and surplus material and disposal	m2	4,080	$ 11.84	$ 48,307.20
Breakout and Replace Curb & Gutter low profile	l.m.	0	$ 168.00	$ 0.00
SANITARY SEWER				
SDR 35 PVC Pipe for gravity sewer:				
a) 200 mm PVC DR 35, 4.0-4.5m depth	l.m.	0	$ 224.00	$ 0.00
b) 300 mm PVC DR 35, 4.0-4.5m depth	l.m.	510	$ 298.00	$ 151,980.00
c) 375 mm PVC DR 35, 4.0-4.5m depth	l.m.	0	$ 367.00	$ 0.00
d) 450 mm PVC DR 35, 4.0-4.5m depth	l.m.	0	$ 448.00	$ 0.00
e) 525 mm PVC DR 35, 4.0-4.5m depth	l.m.	0	$ 537.00	$ 0.00
f) 600 mm PVC DR 35, 4.0-4.5m depth	l.m.	0	$ 624.00	$ 0.00
g) 675 mm PVC DR 35, 4.0-4.5m depth	l.m.	0	$ 734.00	$ 0.00
HDPE Pipe for sanitary force main:				
a) 200 mm HDPE DR 17, 4.0-4.5m depth	l.m.	0	$ 250.00	$ 0.00
b) 300 mm HDPE DR 17, 4.0-4.5m depth	l.m.	0	$ 310.00	$ 0.00
c) 375 mm HDPE DR 17, 4.0-4.5m depth	l.m.	0	$ 380.00	$ 0.00
d) 450 mm HDPE DR 17, 4.0-4.5m depth	l.m.	0	$ 420.00	$ 0.00
Manhole Type 5A, 4.0-4.5m depth	ea.	5	$ 6,155.00	$ 31,390.50
Manhole Type 1S, 1800 x 1800, 4.0-4.5m depth	ea.	0	$ 14,103.00	$ 0.00
Tie-in to existing	ea.	1	$ 12,000.00	$ 12,000.00
Crossings				0.00
Creek crossing	ea.	0	$ 20,000.00	$ 0.00
Highway crossing	ea.	0	$ 20,000.00	$ 0.00
Railway crossing (Steel cased - 350 mm SDR 35 PVC)	ea.	0	$ 50,000.00	$ 0.00
Major pipeline crossing	ea.	0	$ 20,000.00	$ 0.00
Lift Station				0.00
New Lift Station	ea.	0	$ 0.00	$ 0.00
Existing Lift Station Upgrades	ea.	0	$ 0.00	$ 0.00
SURFACE IMPROVEMENTS				0.00
Sub-grade preparation (150 mm worked depth)	m^2	4,080	$ 1.98	$ 8,078.40
Granular sub-base - 400 mm compacted depth	m^2	4,080	$ 23.29	$ 95,023.20
Granular base-course - 225 mm compacted depth	m^2	4,080	$ 15.23	$ 62,138.40
Sidewalk and Curb & Gutter Spot Repair	l.m.	0	$ 500.00	$ 0.00
Surface Restoration				0.00
Restoration of Topsoil & Landscaping	m^2	128	$ 24.67	$ 3,157.76
Asphalt pavement: 60 mm depth - Mix 'A'	m^2	4,080	$ 18.27	$ 74,541.60
Asphalt pavement: 40 mm depth - Mix 'B'	m^2	4,080	$ 18.27	$ 74,541.60
Pavement markings	L.S.	1	$ 7,047.87	$ 7,047.87

Project Subtotal:	**$**	**663,001.16**
30% Engineering & Contingency:	$	198,900.35
Project Total:	**$**	**861,901.50**

Range Road 12 Trunk

Description	Unit	Est. Qty	Unit Price	Total Amt
GENERAL				
Mobilization/Demobilization	L.S.	1	$ 57,609.00	$ 57,609.00
Shallow Utility Protection	ea.	36	$ 460.75	$ 16,587.00
Dewatering Allowance	L.S.	1	$ 19,209.18	$ 19,209.18
Tree Protection	L.S.	1	$ 3,763.86	$ 3,763.86
Hydrovac	hr	48	$ 493.11	$ 23,669.28
Traffic accommodation	L.S.	1	$ 24,491.88	$ 24,491.88
Quality control testing	L.S.	1	$ 52,782.48	$ 52,782.48
SITE WORK AND REMOVALS				
Saw cutting	l.m.	2,100	$ 9.26	$ 19,446.00
Road core incl. asphalt removal, base course and surplus material and disposal	m2	8,400	$ 11.84	$ 99,456.00
Breakout and Replace Curb & Gutter low profile	l.m.	0	$ 168.00	$ 0.00
SANITARY SEWER				
SDR 35 PVC Pipe for gravity sewer:				
a) 200 mm PVC DR 35, 4.0-4.5m depth	l.m.	0	$ 224.00	$ 0.00
b) 300 mm PVC DR 35, 4.0-4.5m depth	l.m.	0	$ 298.00	$ 0.00
c) 375 mm PVC DR 35, 4.0-4.5m depth	l.m.	0	$ 367.00	$ 0.00
d) 450 mm PVC DR 35, 4.0-4.5m depth	l.m.	0	$ 448.00	$ 0.00
e) 525 mm PVC DR 35, 4.0-4.5m depth	l.m.	0	$ 537.00	$ 0.00
f) 600 mm PVC DR 35, 4.0-4.5m depth	l.m.	0	$ 624.00	$ 0.00
g) 675 mm PVC DR 35, 4.0-4.5m depth	l.m.	1,126	$ 734.00	$ 826,484.00
g) 750 mm PVC DR 35, 4.0-4.5m depth	l.m.	74	$ 793.00	$ 58,682.00
HDPE Pipe for sanitary force main:				
a) 200 mm HDPE DR 17, 4.0-4.5m depth	l.m.	0	$ 250.00	$ 0.00
b) 300 mm HDPE DR 17, 4.0-4.5m depth	l.m.	0	$ 310.00	$ 0.00
c) 375 mm HDPE DR 17, 4.0-4.5m depth	l.m.	0	$ 380.00	$ 0.00
d) 450 mm HDPE DR 17, 4.0-4.5m depth	l.m.	0	$ 420.00	$ 0.00
Manhole Type 5A, 4.0-4.5m depth	ea.	12	$ 6,155.00	$ 73,860.00
Manhole Type 1S, 1800 x 1800, 4.0-4.5m depth	ea.	0	$ 14,103.00	$ 0.00
Tie-in to existing	ea.	1	$ 12,000.00	$ 12,000.00
Crossings				0.00
Creek crossing	ea.	0	$ 20,000.00	$ 0.00
Highway crossing	ea.	1	$ 20,000.00	$ 20,000.00
Railway crossing (Steel cased - 350 mm SDR 35 PVC)	ea.	0	$ 50,000.00	$ 0.00
Major pipeline crossing	ea.	1	$ 20,000.00	$ 20,000.00
Lift Station				0.00
New Lift Station	ea.	0	$ 0.00	$ 0.00
Existing Lift Station Upgrades	ea.	0	$ 0.00	$ 0.00
SURFACE IMPROVEMENTS				0.00
Sub-grade preparation (150 mm worked depth)	m^2	8,400	$ 1.98	$ 16,632.00
Granular sub-base - 400 mm compacted depth	m^2	8,400	$ 23.29	$ 195,636.00
Granular base-course - 225 mm compacted depth	m^2	8,400	$ 15.23	$ 127,932.00
Sidewalk and Curb & Gutter Spot Repair	l.m.	0	$ 500.00	$ 0.00
Surface Restoration				0.00
Restoration of Topsoil & Landscaping	m^2	300	$ 24.67	$ 7,401.00
Asphalt pavement: 60 mm depth - Mix 'A'	m^2	8,400	$ 18.27	$ 153,468.00
Asphalt pavement: 40 mm depth - Mix 'B'	m^2	8,400	$ 18.27	$ 153,468.00
Pavement markings	L.S.	1	$ 14,510.32	$ 14,510.32
			Project Subtotal:	**$ 1,997,088.00**
			30% Engineering & Contingency:	$ 599,126.40
			Project Total:	**$ 2,596,214.40**

Ph 2-1 Trunk C1

Description	Unit	Est. Qty	Unit Price	Total Amt
GENERAL				
Mobilization/Demobilization	L.S.	1	$ 74,651.66	$ 74,651.66
Shallow Utility Protection	ea.	24	$ 460.75	$ 10,827.63
Dewatering Allowance	L.S.	1	$ 24,891.90	$ 24,891.90
Tree Protection	L.S.	1	$ 4,877.34	$ 4,877.34
Hydrovac	hr	16	$ 493.11	$ 7,643.21
Traffic accommodation	L.S.	1	$ 10,000.00	$ 10,000.00
Quality control testing	L.S.	1	$ 68,397.30	$ 68,397.30
SITE WORK AND REMOVALS				
Saw cutting	l.m.	0	$ 9.26	$ 0.00
Road core incl. asphalt removal, base course and surplus material and disposal	m2	0	$ 11.84	$ 0.00
Breakout and Replace Curb & Gutter low profile	l.m.	0	$ 168.00	$ 0.00
SANITARY SEWER				
SDR 35 PVC Pipe for gravity sewer:				
a) 200 mm PVC DR 35, 4.0-4.5m depth	l.m.	445	$ 224.00	$ 99,680.00
b) 300 mm PVC DR 35, 4.0-4.5m depth	l.m.	0	$ 298.00	$ 0.00
c) 375 mm PVC DR 35, 4.0-4.5m depth	l.m.	1,110	$ 367.00	$ 407,370.00
d) 450 mm PVC DR 35, 4.0-4.5m depth	l.m.	0	$ 448.00	$ 0.00
e) 525 mm PVC DR 35, 4.0-4.5m depth	l.m.	0	$ 537.00	$ 0.00
f) 600 mm PVC DR 35, 4.0-4.5m depth	l.m.	0	$ 624.00	$ 0.00
g) 675 mm PVC DR 35, 4.0-4.5m depth	l.m.	0	$ 734.00	$ 0.00
HDPE Pipe for sanitary force main:				
a) 200 mm HDPE DR 17, 4.0-4.5m depth	l.m.	0	$ 250.00	$ 0.00
b) 300 mm HDPE DR 17, 4.0-4.5m depth	l.m.	0	$ 310.00	$ 0.00
c) 375 mm HDPE DR 17, 4.0-4.5m depth	l.m.	0	$ 380.00	$ 0.00
d) 450 mm HDPE DR 17, 4.0-4.5m depth	l.m.	0	$ 420.00	$ 0.00
Manhole Type 5A, 4.0-4.5m depth	ea.	16	$ 6,155.00	$ 95,710.25
Manhole Type 1S, 1800 x 1800, 4.0-4.5m depth	ea.	0	$ 14,103.00	$ 0.00
Tie-in to existing	ea.	1	$ 12,000.00	$ 12,000.00
Crossings				
Creek crossing	ea.	0	$ 20,000.00	$ 0.00
Highway crossing	ea.	0	$ 20,000.00	$ 0.00
Railway crossing (Steel cased - 350 mm SDR 35 PVC)	ea.	0	$ 50,000.00	$ 0.00
Major pipeline crossing	ea.	3	$ 20,000.00	$ 60,000.00
Lift Station				0.00
New Lift Station	ea.	0	$ 0.00	$ 0.00
Existing Lift Station Upgrades	ea.	0	$ 0.00	$ 0.00
SURFACE IMPROVEMENTS				0.00
Sub-grade preparation (150 mm worked depth)	m^2	0	$ 1.98	$ 0.00
Granular sub-base - 400 mm compacted depth	m^2	0	$ 23.29	$ 0.00
Granular base-course - 225 mm compacted depth	m^2	0	$ 15.23	$ 0.00
Sidewalk and Curb & Gutter Spot Repair	l.m.	0	$ 500.00	$ 0.00
Surface Restoration				0.00
Restoration of Topsoil & Landscaping	m^2	389	$ 24.67	$ 9,596.63
Asphalt pavement: 60 mm depth - Mix 'A'	m^2	0	$ 18.27	$ 0.00
Asphalt pavement: 40 mm depth - Mix 'B'	m^2	0	$ 18.27	$ 0.00
Pavement markings	L.S.	1	$ 0.00	$ 0.00

Project Subtotal:	**$**	**885,645.90**
30% Engineering & Contingency:	$	265,693.77
Project Total:	**$**	**1,151,339.67**

Ph2-2 Trunk C5

Description	Unit	Est. Qty	Unit Price	Total Amt
GENERAL				
Mobilization/Demobilization	L.S.	1	$ 29,764.65	$ 29,764.65
Shallow Utility Protection	ea.	10	$ 460.75	$ 4,377.13
Dewatering Allowance	L.S.	1	$ 9,924.74	$ 9,924.74
Tree Protection	L.S.	1	$ 1,944.66	$ 1,944.66
Hydrovac	hr	25	$ 493.11	$ 12,327.75
Traffic accommodation	L.S.	1	$ 20,000.00	$ 20,000.00
Quality control testing	L.S.	1	$ 27,270.95	$ 27,270.95
SITE WORK AND REMOVALS				
Saw cutting	l.m.	30	$ 9.26	$ 277.80
Road core incl. asphalt removal, base course and surplus material and disposal	m2	120	$ 11.84	$ 1,420.80
Breakout and Replace Curb & Gutter low profile	l.m.	16	$ 168.00	$ 2,688.00
SANITARY SEWER				
SDR 35 PVC Pipe for gravity sewer:				
a) 200 mm PVC DR 35, 4.0-4.5m depth	l.m.	0	$ 224.00	$ 0.00
b) 300 mm PVC DR 35, 4.0-4.5m depth	l.m.	0	$ 298.00	$ 0.00
c) 375 mm PVC DR 35, 4.0-4.5m depth	l.m.	0	$ 367.00	$ 0.00
d) 450 mm PVC DR 35, 4.0-4.5m depth	l.m.	0	$ 448.00	$ 0.00
e) 525 mm PVC DR 35, 4.0-4.5m depth	l.m.	0	$ 537.00	$ 0.00
f) 600 mm PVC DR 35, 4.0-4.5m depth	l.m.	620	$ 624.00	$ 386,880.00
g) 675 mm PVC DR 35, 4.0-4.5m depth	l.m.	0	$ 734.00	$ 0.00
HDPE Pipe for sanitary force main:				
a) 200 mm HDPE DR 17, 4.0-4.5m depth	l.m.	0	$ 250.00	$ 0.00
b) 300 mm HDPE DR 17, 4.0-4.5m depth	l.m.	0	$ 310.00	$ 0.00
c) 375 mm HDPE DR 17, 4.0-4.5m depth	l.m.	0	$ 380.00	$ 0.00
d) 450 mm HDPE DR 17, 4.0-4.5m depth	l.m.	0	$ 420.00	$ 0.00
Manhole Type 5A, 4.0-4.5m depth	ea.	3	$ 6,155.00	$ 19,696.00
Manhole Type 1S, 1800 x 1800, 4.0-4.5m depth	ea.	3	$ 14,103.00	$ 42,309.00
Tie-in to existing	ea.	3	$ 12,000.00	$ 36,000.00
Crossings				0.00
Creek crossing	ea.	0	$ 20,000.00	$ 0.00
Highway crossing	ea.	0	$ 20,000.00	$ 0.00
Railway crossing (Steel cased - 350 mm SDR 35 PVC)	ea.	0	$ 50,000.00	$ 0.00
Major pipeline crossing	ea.	0	$ 20,000.00	$ 0.00
Lift Station				0.00
New Lift Station	ea.	0	$ 0.00	$ 0.00
Existing Lift Station Upgrades	ea.	0	$ 0.00	$ 0.00
SURFACE IMPROVEMENTS				0.00
Sub-grade preparation (150 mm worked depth)	m^2	120	$ 1.98	$ 237.60
Granular sub-base - 400 mm compacted depth	m^2	120	$ 23.29	$ 2,794.80
Granular base-course - 225 mm compacted depth	m^2	120	$ 15.23	$ 1,827.60
Sidewalk and Curb & Gutter Spot Repair	l.m.	16	$ 500.00	$ 8,000.00
Surface Restoration				0.00
Restoration of Topsoil & Landscaping	m^2	155	$ 24.67	$ 3,823.85
Asphalt pavement: 60 mm depth - Mix 'A'	m^2	120	$ 18.27	$ 2,192.40
Asphalt pavement: 40 mm depth - Mix 'B'	m^2	120	$ 18.27	$ 2,192.40
Pavement markings	L.S.	1	$ 2,000.00	$ 2,000.00

Project Subtotal:	**$**	**617,950.13**
30% Engineering & Contingency:	$	185,385.04
Project Total:	**$**	**803,335.17**

Ph2-3 Trunk E1(North)

Description	Unit	Est. Qty	Unit Price	Total Amt
GENERAL				
Mobilization/Demobilization	L.S.	1	$ 74,891.70	$ 74,891.70
Shallow Utility Protection	ea.	24	$ 460.75	$ 10,827.63
Dewatering Allowance	L.S.	1	$ 24,971.93	$ 24,971.93
Tree Protection	L.S.	1	$ 4,893.02	$ 4,893.02
Hydrovac	hr	31	$ 493.11	$ 15,286.41
Traffic accommodation	L.S.	1	$ 15,000.00	$ 15,000.00
Quality control testing	L.S.	1	$ 68,617.22	$ 68,617.22
SITE WORK AND REMOVALS				
Saw cutting	l.m.	100	$ 9.26	$ 926.00
Road core incl. asphalt removal, base course and surplus material and disposal	m2	400	$ 11.84	$ 4,736.00
Breakout and Replace Curb & Gutter low profile	l.m.	8	$ 168.00	$ 1,344.00
SANITARY SEWER				
SDR 35 PVC Pipe for gravity sewer:				
a) 200 mm PVC DR 35, 4.0-4.5m depth	l.m.	0	$ 224.00	$ 0.00
b) 300 mm PVC DR 35, 4.0-4.5m depth	l.m.	0	$ 298.00	$ 0.00
c) 375 mm PVC DR 35, 4.0-4.5m depth	l.m.	0	$ 367.00	$ 0.00
d) 450 mm PVC DR 35, 4.0-4.5m depth	l.m.	0	$ 448.00	$ 0.00
e) 525 mm PVC DR 35, 4.0-4.5m depth	l.m.	1,300	$ 537.00	$ 698,100.00
f) 600 mm PVC DR 35, 4.0-4.5m depth	l.m.	260	$ 624.00	$ 162,240.00
g) 675 mm PVC DR 35, 4.0-4.5m depth	l.m.	0	$ 734.00	$ 0.00
HDPE Pipe for sanitary force main:				
a) 200 mm HDPE DR 17, 4.0-4.5m depth	l.m.	0	$ 250.00	$ 0.00
b) 300 mm HDPE DR 17, 4.0-4.5m depth	l.m.	0	$ 310.00	$ 0.00
c) 375 mm HDPE DR 17, 4.0-4.5m depth	l.m.	0	$ 380.00	$ 0.00
d) 450 mm HDPE DR 17, 4.0-4.5m depth	l.m.	0	$ 420.00	$ 0.00
Manhole Type 5A, 4.0-4.5m depth	ea.	15	$ 6,155.00	$ 89,863.00
Manhole Type 1S, 1800 x 1800, 4.0-4.5m depth	ea.	1	$ 14,103.00	$ 14,103.00
Tie-in to existing	ea.	1	$ 12,000.00	$ 12,000.00
Crossings				
Creek crossing	ea.	0	$ 20,000.00	$ 0.00
Highway crossing	ea.	1	$ 20,000.00	$ 20,000.00
Railway crossing (Steel cased - 600 mm SDR 35 PVC)	ea.	1	$ 66,525.00	$ 66,525.00
Major pipeline crossing	ea.	3	$ 20,000.00	$ 60,000.00
Lift Station				0.00
New Lift Station	ea.	0	$ 0.00	$ 0.00
Existing Lift Station Upgrades	ea.	0	$ 0.00	$ 0.00
SURFACE IMPROVEMENTS				
Sub-grade preparation (150 mm worked depth)	m^2	400	$ 1.98	$ 792.00
Granular sub-base - 400 mm compacted depth	m^2	400	$ 23.29	$ 9,316.00
Granular base-course - 225 mm compacted depth	m^2	400	$ 15.23	$ 6,092.00
Sidewalk and Curb & Gutter Spot Repair	l.m.	8	$ 500.00	$ 4,000.00
Surface Restoration				0.00
Restoration of Topsoil & Landscaping	m^2	390	$ 24.67	$ 9,621.30
Asphalt pavement: 60 mm depth - Mix 'A'	m^2	400	$ 18.27	$ 7,308.00
Asphalt pavement: 40 mm depth - Mix 'B'	m^2	400	$ 18.27	$ 7,308.00
Pavement markings	L.S.	1	$ 690.97	$ 690.97

Project Subtotal:	**$ 1,389,453.18**
30% Engineering & Contingency:	$ 416,835.95
Project Total:	**$ 1,806,289.13**

Ph3-1 Trunk W1

Description	Unit	Est. Qty	Unit Price	Total Amt
GENERAL				
Mobilization/Demobilization	L.S.	1	$ 128,660.10	$ 128,660.10
Shallow Utility Protection	ea.	20	$ 460.75	$ 9,215.00
Dewatering Allowance	L.S.	1	$ 42,900.50	$ 42,900.50
Tree Protection	L.S.	1	$ 8,405.95	$ 8,405.95
Hydrovac	hr	27	$ 493.11	$ 13,190.69
Traffic accommodation	L.S.	1	$ 0.00	$ 0.00
Quality control testing	L.S.	1	$ 117,880.87	$ 117,880.87
SITE WORK AND REMOVALS				
Saw cutting	l.m.	0	$ 9.26	$ 0.00
Road core incl. asphalt removal, base course and surplus material and disposal	m2	0	$ 11.84	$ 0.00
Breakout and Replace Curb & Gutter low profile	l.m.	0	$ 168.00	$ 0.00
SANITARY SEWER				
SDR 35 PVC Pipe for gravity sewer:				
a) 200 mm PVC DR 35, 4.0-4.5m depth	l.m.	0	$ 224.00	$ 0.00
b) 300 mm PVC DR 35, 4.0-4.5m depth	l.m.	780	$ 298.00	$ 232,440.00
c) 375 mm PVC DR 35, 4.0-4.5m depth	l.m.	600	$ 367.00	$ 220,200.00
d) 450 mm PVC DR 35, 4.0-4.5m depth	l.m.	1,300	$ 448.00	$ 582,400.00
e) 525 mm PVC DR 35, 4.0-4.5m depth	l.m.	0	$ 537.00	$ 0.00
f) 600 mm PVC DR 35, 4.0-4.5m depth	l.m.	0	$ 624.00	$ 0.00
g) 675 mm PVC DR 35, 4.0-4.5m depth	l.m.	0	$ 734.00	$ 0.00
HDPE Pipe for sanitary force main:				
a) 200 mm HDPE DR 17, 4.0-4.5m depth	l.m.	0	$ 250.00	$ 0.00
b) 300 mm HDPE DR 17, 4.0-4.5m depth	l.m.	0	$ 310.00	$ 0.00
c) 375 mm HDPE DR 17, 4.0-4.5m depth	l.m.	0	$ 380.00	$ 0.00
d) 450 mm HDPE DR 17, 4.0-4.5m depth	l.m.	0	$ 420.00	$ 0.00
Manhole Type 5A, 4.0-4.5m depth	ea.	26	$ 6,155.00	$ 158,799.00
Manhole Type 1S, 1800 x 1800, 4.0-4.5m depth	ea.	1	$ 14,103.00	$ 14,103.00
Tie-in to existing	ea.	2	$ 12,000.00	$ 24,000.00
Crossings				
Creek crossing	ea.	0	$ 20,000.00	$ 0.00
Highway crossing	ea.	1	$ 20,000.00	$ 20,000.00
Railway crossing (Steel cased - 350 mm SDR 35 PVC)	ea.	0	$ 50,000.00	$ 0.00
Major pipeline crossing	ea.	0	$ 20,000.00	$ 0.00
Lift Station				0.00
New Lift Station	ea.	0	$ 0.00	$ 0.00
Existing Lift Station Upgrades	ea.	0	$ 0.00	$ 0.00
SURFACE IMPROVEMENTS				
Sub-grade preparation (150 mm worked depth)	m^2	0	$ 1.98	$ 0.00
Granular sub-base - 400 mm compacted depth	m^2	0	$ 23.29	$ 0.00
Granular base-course - 225 mm compacted depth	m^2	0	$ 15.23	$ 0.00
Sidewalk and Curb & Gutter Spot Repair	l.m.	0	$ 500.00	$ 0.00
Surface Restoration				0.00
Restoration of Topsoil & Landscaping	m^2	0	$ 24.67	$ 0.00
Asphalt pavement: 60 mm depth - Mix 'A'	m^2	0	$ 18.27	$ 0.00
Asphalt pavement: 40 mm depth - Mix 'B'	m^2	0	$ 18.27	$ 0.00
Pavement markings	L.S.	1	$ 0.00	$ 0.00

Project Subtotal:	**$ 1,572,195.12**
30% Engineering & Contingency:	$ 471,658.54
Project Total:	**$ 2,043,853.66**

Ph3-2 Trunk W2 (South)

Description	Unit	Est. Qty	Unit Price	Total Amt
GENERAL				
Mobilization/Demobilization	L.S.	1	$ 56,648.85	$ 56,648.85
Shallow Utility Protection	ea.	9	$ 460.75	$ 4,031.56
Dewatering Allowance	L.S.	1	$ 18,889.03	$ 18,889.03
Tree Protection	L.S.	1	$ 3,701.13	$ 3,701.13
Hydrovac	hr	12	$ 493.11	$ 5,794.04
Traffic accommodation	L.S.	1	$ 524.83	$ 524.83
Quality control testing	L.S.	1	$ 51,902.77	$ 51,902.77
SITE WORK AND REMOVALS				
Saw cutting	l.m.	45	$ 9.26	$ 416.70
Road core incl. asphalt removal, base course and surplus material and disposal	m2	180	$ 11.84	$ 2,131.20
Breakout and Replace Curb & Gutter low profile	l.m.	0	$ 168.00	$ 0.00
SANITARY SEWER				
SDR 35 PVC Pipe for gravity sewer:				
a) 200 mm PVC DR 35, 4.0-4.5m depth	l.m.	0	$ 224.00	$ 0.00
b) 300 mm PVC DR 35, 4.0-4.5m depth	l.m.	220	$ 298.00	$ 65,560.00
c) 375 mm PVC DR 35, 4.0-4.5m depth	l.m.	0	$ 367.00	$ 0.00
d) 450 mm PVC DR 35, 4.0-4.5m depth	l.m.	960	$ 448.00	$ 430,080.00
e) 525 mm PVC DR 35, 4.0-4.5m depth	l.m.	0	$ 537.00	$ 0.00
f) 600 mm PVC DR 35, 4.0-4.5m depth	l.m.	0	$ 624.00	$ 0.00
g) 675 mm PVC DR 35, 4.0-4.5m depth	l.m.	0	$ 734.00	$ 0.00
HDPE Pipe for sanitary force main:				
a) 200 mm HDPE DR 17, 4.0-4.5m depth	l.m.	0	$ 250.00	$ 0.00
b) 300 mm HDPE DR 17, 4.0-4.5m depth	l.m.	0	$ 310.00	$ 0.00
c) 375 mm HDPE DR 17, 4.0-4.5m depth	l.m.	0	$ 380.00	$ 0.00
d) 450 mm HDPE DR 17, 4.0-4.5m depth	l.m.	0	$ 420.00	$ 0.00
Manhole Type 5A, 4.0-4.5m depth	ea.	11	$ 6,155.00	$ 66,474.00
Manhole Type 1S, 1800 x 1800, 4.0-4.5m depth	ea.	1	$ 14,103.00	$ 14,103.00
Tie-in to existing	ea.	1	$ 12,000.00	$ 12,000.00
Crossings				
Creek crossing	ea.	1	$ 20,000.00	$ 20,000.00
Highway crossing	ea.	1	$ 20,000.00	$ 20,000.00
Railway crossing (Steel cased - 350 mm SDR 35 PVC)	ea.	0	$ 50,000.00	$ 0.00
Major pipeline crossing	ea.	0	$ 20,000.00	$ 0.00
Lift Station				0.00
New Lift Station	ea.	0	$ 0.00	$ 0.00
Existing Lift Station Upgrades	ea.	0	$ 0.00	$ 0.00
SURFACE IMPROVEMENTS				
Sub-grade preparation (150 mm worked depth)	m^2	180	$ 1.98	$ 356.40
Granular sub-base - 400 mm compacted depth	m^2	180	$ 23.29	$ 4,192.20
Granular base-course - 225 mm compacted depth	m^2	180	$ 15.23	$ 2,741.40
Sidewalk and Curb & Gutter Spot Repair	l.m.	0	$ 500.00	$ 0.00
Surface Restoration				0.00
Restoration of Topsoil & Landscaping	m^2	295	$ 24.67	$ 7,277.65
Asphalt pavement: 60 mm depth - Mix 'A'	m^2	180	$ 18.27	$ 3,288.60
Asphalt pavement: 40 mm depth - Mix 'B'	m^2	180	$ 18.27	$ 3,288.60
Pavement markings	L.S.	1	$ 310.94	$ 310.94

Project Subtotal:	**$**	**793,712.89**
30% Engineering & Contingency:	$	238,113.87
Project Total:	**$**	**1,031,826.76**

Ph3-3 Trunk W3

Description	Unit	Est. Qty	Unit Price	Total Amt
GENERAL				
Mobilization/Demobilization	L.S.	1	$ 43,206.75	$ 43,206.75
Shallow Utility Protection	ea.	14	$ 460.75	$ 6,220.13
Dewatering Allowance	L.S.	1	$ 14,406.89	$ 14,406.89
Tree Protection	L.S.	1	$ 2,822.90	$ 2,822.90
Hydrovac	hr	36	$ 493.11	$ 17,751.96
Traffic accommodation	L.S.	1	$ 174.94	$ 174.94
Quality control testing	L.S.	1	$ 39,586.86	$ 39,586.86
SITE WORK AND REMOVALS				
Saw cutting	l.m.	15	$ 9.26	$ 138.90
Road core incl. asphalt removal, base course and surplus material and disposal	m2	60	$ 11.84	$ 710.40
Breakout and Replace Curb & Gutter low profile	l.m.	0	$ 168.00	$ 0.00
SANITARY SEWER				
SDR 35 PVC Pipe for gravity sewer:				
a) 200 mm PVC DR 35, 4.0-4.5m depth	l.m.	0	$ 224.00	$ 0.00
b) 300 mm PVC DR 35, 4.0-4.5m depth	l.m.	900	$ 298.00	$ 268,200.00
c) 375 mm PVC DR 35, 4.0-4.5m depth	l.m.	0	$ 367.00	$ 0.00
d) 450 mm PVC DR 35, 4.0-4.5m depth	l.m.	0	$ 448.00	$ 0.00
e) 525 mm PVC DR 35, 4.0-4.5m depth	l.m.	0	$ 537.00	$ 0.00
f) 600 mm PVC DR 35, 4.0-4.5m depth	l.m.	0	$ 624.00	$ 0.00
g) 675 mm PVC DR 35, 4.0-4.5m depth	l.m.	0	$ 734.00	$ 0.00
HDPE Pipe for sanitary force main:				
a) 200 mm HDPE DR 17, 4.0-4.5m depth	l.m.	0	$ 250.00	$ 0.00
b) 300 mm HDPE DR 17, 4.0-4.5m depth	l.m.	0	$ 310.00	$ 0.00
c) 375 mm HDPE DR 17, 4.0-4.5m depth	l.m.	0	$ 380.00	$ 0.00
d) 450 mm HDPE DR 17, 4.0-4.5m depth	l.m.	0	$ 420.00	$ 0.00
Manhole Type 5A, 4.0-4.5m depth	ea.	9	$ 6,155.00	$ 55,395.00
Manhole Type 1S, 1800 x 1800, 4.0-4.5m depth	ea.	0	$ 14,103.00	$ 0.00
Tie-in to existing	ea.	1	$ 12,000.00	$ 12,000.00
Crossings				
Creek crossing	ea.	2	$ 20,000.00	$ 40,000.00
Highway crossing	ea.	0	$ 20,000.00	$ 0.00
Railway crossing (Steel cased - 350 mm SDR 35 PVC)	ea.	0	$ 50,000.00	$ 0.00
Major pipeline crossing	ea.	0	$ 20,000.00	$ 0.00
Lift Station				0.00
New Lift Station	ea.	0	$ 0.00	$ 0.00
Existing Lift Station Upgrades	ea.	0	$ 0.00	$ 0.00
SURFACE IMPROVEMENTS				
Sub-grade preparation (150 mm worked depth)	m^2	60	$ 1.98	$ 118.80
Granular sub-base - 400 mm compacted depth	m^2	60	$ 23.29	$ 1,397.40
Granular base-course - 225 mm compacted depth	m^2	60	$ 15.23	$ 913.80
Sidewalk and Curb & Gutter Spot Repair	l.m.	0	$ 500.00	$ 0.00
Surface Restoration				0.00
Restoration of Topsoil & Landscaping	m^2	2	$ 24.67	$ 49.34
Asphalt pavement: 60 mm depth - Mix 'A'	m^2	60	$ 18.27	$ 1,096.20
Asphalt pavement: 40 mm depth - Mix 'B'	m^2	60	$ 18.27	$ 1,096.20
Pavement markings	L.S.	1	$ 103.65	$ 103.65

Project Subtotal:	**$**	**505,390.10**
30% Engineering & Contingency:	$	151,617.03
Project Total:	**$**	**657,007.13**

Ph3-4 Trunk W4

Description	Unit	Est. Qty	Unit Price	Total Amt
GENERAL				
Mobilization/Demobilization	L.S.	1	$ 59,529.30	$ 59,529.30
Shallow Utility Protection	ea.	9	$ 460.75	$ 4,261.94
Dewatering Allowance	L.S.	1	$ 19,849.49	$ 19,849.49
Tree Protection	L.S.	1	$ 3,889.32	$ 3,889.32
Hydrovac	hr	13	$ 493.11	$ 6,163.88
Traffic accommodation	L.S.	1	$ 7,464.19	$ 7,464.19
Quality control testing	L.S.	1	$ 54,541.90	$ 54,541.90
SITE WORK AND REMOVALS				
Saw cutting	l.m.	640	$ 9.26	$ 5,926.40
Road core incl. asphalt removal, base course and surplus material and disposal	m2	2,560	$ 11.84	$ 30,310.40
Breakout and Replace Curb & Gutter low profile	l.m.	0	$ 168.00	$ 0.00
SANITARY SEWER				
SDR 35 PVC Pipe for gravity sewer:				
a) 200 mm PVC DR 35, 4.0-4.5m depth	l.m.	0	$ 224.00	$ 0.00
b) 300 mm PVC DR 35, 4.0-4.5m depth	l.m.	0	$ 298.00	$ 0.00
c) 375 mm PVC DR 35, 4.0-4.5m depth	l.m.	0	$ 367.00	$ 0.00
d) 450 mm PVC DR 35, 4.0-4.5m depth	l.m.	1,240	$ 448.00	$ 555,520.00
e) 525 mm PVC DR 35, 4.0-4.5m depth	l.m.	0	$ 537.00	$ 0.00
f) 600 mm PVC DR 35, 4.0-4.5m depth	l.m.	0	$ 624.00	$ 0.00
g) 675 mm PVC DR 35, 4.0-4.5m depth	l.m.	0	$ 734.00	$ 0.00
HDPE Pipe for sanitary force main:				
a) 200 mm HDPE DR 17, 4.0-4.5m depth	l.m.	0	$ 250.00	$ 0.00
b) 300 mm HDPE DR 17, 4.0-4.5m depth	l.m.	0	$ 310.00	$ 0.00
c) 375 mm HDPE DR 17, 4.0-4.5m depth	l.m.	0	$ 380.00	$ 0.00
d) 450 mm HDPE DR 17, 4.0-4.5m depth	l.m.	0	$ 420.00	$ 0.00
Manhole Type 5A, 4.0-4.5m depth	ea.	11	$ 6,155.00	$ 70,167.00
Manhole Type 1S, 1800 x 1800, 4.0-4.5m depth	ea.	1	$ 14,103.00	$ 14,103.00
Tie-in to existing	ea.	3	$ 12,000.00	$ 36,000.00
Crossings				
Creek crossing	ea.	1	$ 20,000.00	$ 20,000.00
Highway crossing	ea.	0	$ 20,000.00	$ 0.00
Railway crossing (Steel cased - 300 mm SDR 35 PVC)	ea.	1	$ 56,550.00	$ 56,550.00
Major pipeline crossing	ea.	0	$ 20,000.00	$ 0.00
Lift Station				0.00
New Lift Station	ea.	0	$ 0.00	$ 0.00
Existing Lift Station Upgrades	ea.	0	$ 0.00	$ 0.00
SURFACE IMPROVEMENTS				
Sub-grade preparation (150 mm worked depth)	m^2	2,560	$ 1.98	$ 5,068.80
Granular sub-base - 400 mm compacted depth	m^2	2,560	$ 23.29	$ 59,622.40
Granular base-course - 225 mm compacted depth	m^2	2,560	$ 15.23	$ 38,988.80
Sidewalk and Curb & Gutter Spot Repair	l.m.	0	$ 500.00	$ 0.00
Surface Restoration				0.00
Restoration of Topsoil & Landscaping	m^2	310	$ 24.67	$ 7,647.70
Asphalt pavement: 60 mm depth - Mix 'A'	m^2	2,560	$ 18.27	$ 46,771.20
Asphalt pavement: 40 mm depth - Mix 'B'	m^2	2,560	$ 18.27	$ 46,771.20
Pavement markings	L.S.	1	$ 4,422.19	$ 4,422.19

Project Subtotal:	**$ 1,153,569.10**
30% Engineering & Contingency:	$ 346,070.73
Project Total:	**$ 1,499,639.83**

Ph 3-5 New North LS & North SFM

Description	Unit	Est. Qty	Unit Price	Total Amt
GENERAL				
Mobilization/Demobilization	L.S.	1	$ 158,904.83	$ 158,904.83
Shallow Utility Protection	ea.	50	$ 460.75	$ 22,807.13
Dewatering Allowance	L.S.	1	$ 52,985.32	$ 52,985.32
Tree Protection	L.S.	1	$ 10,381.98	$ 10,381.98
Hydrovac	hr	66	$ 493.11	$ 32,545.26
Traffic accommodation	L.S.	1	$ 30,000.00	$ 30,000.00
Quality control testing	L.S.	1	$ 145,591.67	$ 145,591.67
SITE WORK AND REMOVALS				
Saw cutting	l.m.	0	$ 9.26	$ 0.00
Road core incl. asphalt removal, base course and surplus material and disposal	m2	0	$ 11.84	$ 0.00
Breakout and Replace Curb & Gutter low profile	l.m.	0	$ 168.00	$ 0.00
SANITARY SEWER				
SDR 35 PVC Pipe for gravity sewer:				
a) 200 mm PVC DR 35, 4.0-4.5m depth	l.m.	0	$ 224.00	$ 0.00
b) 300 mm PVC DR 35, 4.0-4.5m depth	l.m.	0	$ 298.00	$ 0.00
c) 375 mm PVC DR 35, 4.0-4.5m depth	l.m.	0	$ 367.00	$ 0.00
d) 450 mm PVC DR 35, 4.0-4.5m depth	l.m.	0	$ 448.00	$ 0.00
e) 525 mm PVC DR 35, 4.0-4.5m depth	l.m.	0	$ 537.00	$ 0.00
f) 600 mm PVC DR 35, 4.0-4.5m depth	l.m.	0	$ 624.00	$ 0.00
g) 675 mm PVC DR 35, 4.0-4.5m depth	l.m.	0	$ 734.00	$ 0.00
HDPE Pipe for sanitary force main:				
a) 200 mm HDPE DR 17, 4.0-4.5m depth	l.m.	0	$ 250.00	$ 0.00
b) 300 mm HDPE DR 17, 4.0-4.5m depth	l.m.	0	$ 310.00	$ 0.00
c) 375 mm HDPE DR 17, 4.0-4.5m depth	l.m.	0	$ 380.00	$ 0.00
d) 450 mm HDPE DR 17, 4.0-4.5m depth	l.m.	3,310	$ 420.00	$ 1,390,200.00
Manhole Type 5A, 4.0-4.5m depth	ea.	0	$ 6,155.00	$ 0.00
Manhole Type 1S, 1800 x 1800, 4.0-4.5m depth	ea.	0	$ 14,103.00	$ 0.00
Tie-in to existing	ea.	1	$ 12,000.00	$ 12,000.00
Crossings				
Creek crossing	ea.	0	$ 20,000.00	$ 0.00
Highway crossing	ea.	2	$ 20,000.00	$ 40,000.00
Railway crossing (Steel cased - 450 mm SDR 35 PVC)	ea.	1	$ 62,500.00	$ 62,500.00
Major pipeline crossing	ea.	2	$ 20,000.00	$ 40,000.00
Lift Station				0.00
New Lift Station	ea.	1	$ 10,000,000.00	$ 10,000,000.00
Existing Lift Station Upgrades	ea.	0	$ 0.00	$ 0.00
SURFACE IMPROVEMENTS				
Sub-grade preparation (150 mm worked depth)	m^2	0	$ 1.98	$ 0.00
Granular sub-base - 400 mm compacted depth	m^2	0	$ 23.29	$ 0.00
Granular base-course - 225 mm compacted depth	m^2	0	$ 15.23	$ 0.00
Sidewalk and Curb & Gutter Spot Repair	l.m.	0	$ 500.00	$ 0.00
Surface Restoration				0.00
Restoration of Topsoil & Landscaping	m^2	0	$ 24.67	$ 0.00
Asphalt pavement: 60 mm depth - Mix 'A'	m^2	0	$ 18.27	$ 0.00
Asphalt pavement: 40 mm depth - Mix 'B'	m^2	0	$ 18.27	$ 0.00
Pavement markings	L.S.	1	$ 0.00	$ 0.00

Project Subtotal:	**$**	**11,997,916.19**
30% Engineering & Contingency:	$	3,599,374.86
Project Total:	**$**	**15,597,291.04**

Ph3-6 Trunk N2

Description	Unit	Est. Qty	Unit Price	Total Amt
GENERAL				
Mobilization/Demobilization	L.S.	1	$ 94,814.81	$ 94,814.81
Shallow Utility Protection	ea.	30	$ 460.75	$ 13,592.13
Dewatering Allowance	L.S.	1	$ 31,615.11	$ 31,615.11
Tree Protection	L.S.	1	$ 6,194.69	$ 6,194.69
Hydrovac	hr	40	$ 493.11	$ 19,477.85
Traffic accommodation	L.S.	1	$ 10,000.00	$ 10,000.00
Quality control testing	L.S.	1	$ 86,871.17	$ 86,871.17
SITE WORK AND REMOVALS				
Saw cutting	l.m.	0	$ 9.26	$ 0.00
Road core incl. asphalt removal, base course and surplus material and disposal	m2	0	$ 11.84	$ 0.00
Breakout and Replace Curb & Gutter low profile	l.m.	0	$ 168.00	$ 0.00
SANITARY SEWER				
SDR 35 PVC Pipe for gravity sewer:				
a) 200 mm PVC DR 35, 4.0-4.5m depth	l.m.	0	$ 224.00	$ 0.00
b) 300 mm PVC DR 35, 4.0-4.5m depth	l.m.	0	$ 298.00	$ 0.00
c) 375 mm PVC DR 35, 4.0-4.5m depth	l.m.	1,365	$ 367.00	$ 500,955.00
d) 450 mm PVC DR 35, 4.0-4.5m depth	l.m.	610	$ 448.00	$ 273,280.00
e) 525 mm PVC DR 35, 4.0-4.5m depth	l.m.	0	$ 537.00	$ 0.00
f) 600 mm PVC DR 35, 4.0-4.5m depth	l.m.	0	$ 624.00	$ 0.00
g) 675 mm PVC DR 35, 4.0-4.5m depth	l.m.	0	$ 734.00	$ 0.00
HDPE Pipe for sanitary force main:				
a) 200 mm HDPE DR 17, 4.0-4.5m depth	l.m.	0	$ 250.00	$ 0.00
b) 300 mm HDPE DR 17, 4.0-4.5m depth	l.m.	0	$ 310.00	$ 0.00
c) 375 mm HDPE DR 17, 4.0-4.5m depth	l.m.	0	$ 380.00	$ 0.00
d) 450 mm HDPE DR 17, 4.0-4.5m depth	l.m.	0	$ 420.00	$ 0.00
Manhole Type 5A, 4.0-4.5m depth	ea.	20	$ 6,155.00	$ 121,561.25
Manhole Type 1S, 1800 x 1800, 4.0-4.5m depth	ea.	0	$ 14,103.00	$ 0.00
Tie-in to existing	ea.	1	$ 12,000.00	$ 12,000.00
Crossings				
Creek crossing	ea.	0	$ 20,000.00	$ 0.00
Highway crossing	ea.	1	$ 20,000.00	$ 20,000.00
Railway crossing (Steel cased - 350 mm SDR 35 PVC)	ea.	0	$ 50,000.00	$ 0.00
Major pipeline crossing	ea.	6	$ 20,000.00	$ 120,000.00
Lift Station				0.00
New Lift Station	ea.	0	$ 0.00	$ 0.00
Existing Lift Station Upgrades	ea.	0	$ 0.00	$ 0.00
SURFACE IMPROVEMENTS				
Sub-grade preparation (150 mm worked depth)	m^2	0	$ 1.98	$ 0.00
Granular sub-base - 400 mm compacted depth	m^2	0	$ 23.29	$ 0.00
Granular base-course - 225 mm compacted depth	m^2	0	$ 15.23	$ 0.00
Sidewalk and Curb & Gutter Spot Repair	l.m.	0	$ 500.00	$ 0.00
Surface Restoration				0.00
Restoration of Topsoil & Landscaping	m^2	0	$ 24.67	$ 0.00
Asphalt pavement: 60 mm depth - Mix 'A'	m^2	0	$ 18.27	$ 0.00
Asphalt pavement: 40 mm depth - Mix 'B'	m^2	0	$ 18.27	$ 0.00
Pavement markings	L.S.	1	$ 0.00	$ 0.00

Project Subtotal:	**$ 1,310,361.99**
30% Engineering & Contingency:	$ 393,108.60
Project Total:	**$ 1,703,470.59**

Ph3-7 Trunk N3 (east)

Description	Unit	Est. Qty	Unit Price	Total Amt
GENERAL				
Mobilization/Demobilization	L.S.	1	$ 38,406.00	$ 38,406.00
Shallow Utility Protection	ea.	12	$ 460.75	$ 5,529.00
Dewatering Allowance	L.S.	1	$ 12,806.12	$ 12,806.12
Tree Protection	L.S.	1	$ 2,509.24	$ 2,509.24
Hydrovac	hr	32	$ 493.11	$ 15,779.52
Traffic accommodation	L.S.	1	$ 10,000.00	$ 10,000.00
Quality control testing	L.S.	1	$ 35,188.32	$ 35,188.32
SITE WORK AND REMOVALS				
Saw cutting	l.m.	0	$ 9.26	$ 0.00
Road core incl. asphalt removal, base course and surplus material and disposal	m2	0	$ 11.84	$ 0.00
Breakout and Replace Curb & Gutter low profile	l.m.	0	$ 168.00	$ 0.00
SANITARY SEWER				
SDR 35 PVC Pipe for gravity sewer:				
a) 200 mm PVC DR 35, 4.0-4.5m depth	l.m.	0	$ 224.00	$ 0.00
b) 300 mm PVC DR 35, 4.0-4.5m depth	l.m.	800	$ 298.00	$ 238,400.00
c) 375 mm PVC DR 35, 4.0-4.5m depth	l.m.	0	$ 367.00	$ 0.00
d) 450 mm PVC DR 35, 4.0-4.5m depth	l.m.	0	$ 448.00	$ 0.00
e) 525 mm PVC DR 35, 4.0-4.5m depth	l.m.	0	$ 537.00	$ 0.00
f) 600 mm PVC DR 35, 4.0-4.5m depth	l.m.	0	$ 624.00	$ 0.00
g) 675 mm PVC DR 35, 4.0-4.5m depth	l.m.	0	$ 734.00	$ 0.00
HDPE Pipe for sanitary force main:				
a) 200 mm HDPE DR 17, 4.0-4.5m depth	l.m.	0	$ 250.00	$ 0.00
b) 300 mm HDPE DR 17, 4.0-4.5m depth	l.m.	0	$ 310.00	$ 0.00
c) 375 mm HDPE DR 17, 4.0-4.5m depth	l.m.	0	$ 380.00	$ 0.00
d) 450 mm HDPE DR 17, 4.0-4.5m depth	l.m.	0	$ 420.00	$ 0.00
Manhole Type 5A, 4.0-4.5m depth	ea.	8	$ 6,155.00	$ 49,240.00
Manhole Type 1S, 1800 x 1800, 4.0-4.5m depth	ea.	0	$ 14,103.00	$ 0.00
Tie-in to existing	ea.	2	$ 12,000.00	$ 24,000.00
Crossings				
Creek crossing	ea.	0	$ 20,000.00	$ 0.00
Highway crossing	ea.	1	$ 20,000.00	$ 20,000.00
Railway crossing (Steel cased - 350 mm SDR 35 PVC)	ea.	0	$ 50,000.00	$ 0.00
Major pipeline crossing	ea.	0	$ 20,000.00	$ 0.00
Lift Station				0.00
New Lift Station	ea.	0	$ 0.00	$ 0.00
Existing Lift Station Upgrades	ea.	0	$ 0.00	$ 0.00
SURFACE IMPROVEMENTS				
Sub-grade preparation (150 mm worked depth)	m^2	0	$ 1.98	$ 0.00
Granular sub-base - 400 mm compacted depth	m^2	0	$ 23.29	$ 0.00
Granular base-course - 225 mm compacted depth	m^2	0	$ 15.23	$ 0.00
Sidewalk and Curb & Gutter Spot Repair	l.m.	0	$ 500.00	$ 0.00
Surface Restoration				0.00
Restoration of Topsoil & Landscaping	m^2	0	$ 24.67	$ 0.00
Asphalt pavement: 60 mm depth - Mix 'A'	m^2	0	$ 18.27	$ 0.00
Asphalt pavement: 40 mm depth - Mix 'B'	m^2	0	$ 18.27	$ 0.00
Pavement markings	L.S.	1	$ 0.00	$ 0.00

Project Subtotal:	**$**	**451,858.20**
30% Engineering & Contingency:	$	135,557.46
Project Total:	**$**	**587,415.66**

Ph4-1 Trunk N1 + LS + N1 SFM

Description	Unit	Est. Qty	Unit Price	Total Amt
GENERAL				
Mobilization/Demobilization	L.S.	1	$ 108,496.95	$ 108,496.95
Shallow Utility Protection	ea.	17	$ 460.75	$ 7,832.75
Dewatering Allowance	L.S.	1	$ 36,177.29	$ 36,177.29
Tree Protection	L.S.	1	$ 7,088.60	$ 7,088.60
Hydrovac	hr	23	$ 493.11	$ 11,094.98
Traffic accommodation	L.S.	1	$ 0.00	$ 0.00
Quality control testing	L.S.	1	$ 99,407.00	$ 99,407.00
SITE WORK AND REMOVALS				
Saw cutting	l.m.	0	$ 9.26	$ 0.00
Road core incl. asphalt removal, base course and surplus material and disposal	m2	0	$ 11.84	$ 0.00
Breakout and Replace Curb & Gutter low profile	l.m.	0	$ 168.00	$ 0.00
SANITARY SEWER				
SDR 35 PVC Pipe for gravity sewer:				
a) 200 mm PVC DR 35, 4.0-4.5m depth	l.m.	850	$ 224.00	$ 190,400.00
b) 300 mm PVC DR 35, 4.0-4.5m depth	l.m.	830	$ 298.00	$ 247,340.00
c) 375 mm PVC DR 35, 4.0-4.5m depth	l.m.	580	$ 367.00	$ 212,860.00
d) 450 mm PVC DR 35, 4.0-4.5m depth	l.m.	0	$ 448.00	$ 0.00
e) 525 mm PVC DR 35, 4.0-4.5m depth	l.m.	0	$ 537.00	$ 0.00
f) 600 mm PVC DR 35, 4.0-4.5m depth	l.m.	0	$ 624.00	$ 0.00
g) 675 mm PVC DR 35, 4.0-4.5m depth	l.m.	0	$ 734.00	$ 0.00
HDPE Pipe for sanitary force main:				
a) 200 mm HDPE DR 17, 4.0-4.5m depth	l.m.	0	$ 250.00	$ 0.00
b) 300 mm HDPE DR 17, 4.0-4.5m depth	l.m.	0	$ 310.00	$ 0.00
c) 375 mm HDPE DR 17, 4.0-4.5m depth	l.m.	0	$ 380.00	$ 0.00
d) 450 mm HDPE DR 17, 4.0-4.5m depth	l.m.	840	$ 420.00	$ 352,800.00
Manhole Type 5A, 4.0-4.5m depth	ea.	23	$ 6,155.00	$ 139,103.00
Manhole Type 1S, 1800 x 1800, 4.0-4.5m depth	ea.	0	$ 14,103.00	$ 0.00
Tie-in to existing	ea.	1	$ 12,000.00	$ 12,000.00
Crossings				
Creek crossing	ea.	0	$ 20,000.00	$ 0.00
Highway crossing	ea.	0	$ 20,000.00	$ 0.00
Railway crossing (Steel cased - 450 mm SDR 35 PVC)	ea.	1	$ 62,500.00	$ 62,500.00
Major pipeline crossing	ea.	2	$ 20,000.00	$ 40,000.00
Lift Station				0.00
New Lift Station	ea.	1	$ 10,000,000.00	$ 10,000,000.00
Existing Lift Station Upgrades	ea.	0	$ 0.00	$ 0.00
SURFACE IMPROVEMENTS				
Sub-grade preparation (150 mm worked depth)	m^2	0	$ 1.98	$ 0.00
Granular sub-base - 400 mm compacted depth	m^2	0	$ 23.29	$ 0.00
Granular base-course - 225 mm compacted depth	m^2	0	$ 15.23	$ 0.00
Sidewalk and Curb & Gutter Spot Repair	l.m.	0	$ 500.00	$ 0.00
Surface Restoration				0.00
Restoration of Topsoil & Landscaping	m^2	0	$ 24.67	$ 0.00
Asphalt pavement: 60 mm depth - Mix 'A'	m^2	0	$ 18.27	$ 0.00
Asphalt pavement: 40 mm depth - Mix 'B'	m^2	0	$ 18.27	$ 0.00
Pavement markings	L.S.	1	$ 0.00	$ 0.00

Project Subtotal:	**$**	**11,527,100.57**
30% Engineering & Contingency:	$	3,458,130.17
Project Total:	**$**	**14,985,230.74**

Ph 4-2 Trunk E1 (south)

Description	Unit	Est. Qty	Unit Price	Total Amt
GENERAL				
Mobilization/Demobilization	L.S.	1	$ 117,618.38	$ 117,618.38
Shallow Utility Protection	ea.	19	$ 460.75	$ 8,523.88
Dewatering Allowance	L.S.	1	$ 39,218.74	$ 39,218.74
Tree Protection	L.S.	1	$ 7,684.55	$ 7,684.55
Hydrovac	hr	25	$ 493.11	$ 12,081.20
Traffic accommodation	L.S.	1	$ 0.00	$ 0.00
Quality control testing	L.S.	1	$ 107,764.23	$ 107,764.23
SITE WORK AND REMOVALS				
Saw cutting	l.m.	0	$ 9.26	$ 0.00
Road core incl. asphalt removal, base course and surplus material and disposal	m2	0	$ 11.84	$ 0.00
Breakout and Replace Curb & Gutter low profile	l.m.	0	$ 168.00	$ 0.00
SANITARY SEWER				
SDR 35 PVC Pipe for gravity sewer:				
a) 200 mm PVC DR 35, 4.0-4.5m depth	l.m.	0	$ 224.00	$ 0.00
b) 300 mm PVC DR 35, 4.0-4.5m depth	l.m.	0	$ 298.00	$ 0.00
c) 375 mm PVC DR 35, 4.0-4.5m depth	l.m.	0	$ 367.00	$ 0.00
d) 450 mm PVC DR 35, 4.0-4.5m depth	l.m.	0	$ 448.00	$ 0.00
e) 525 mm PVC DR 35, 4.0-4.5m depth	l.m.	2,450	$ 537.00	$ 1,315,650.00
f) 600 mm PVC DR 35, 4.0-4.5m depth	l.m.	0	$ 624.00	$ 0.00
g) 675 mm PVC DR 35, 4.0-4.5m depth	l.m.	0	$ 734.00	$ 0.00
HDPE Pipe for sanitary force main:				
a) 200 mm HDPE DR 17, 4.0-4.5m depth	l.m.	0	$ 250.00	$ 0.00
b) 300 mm HDPE DR 17, 4.0-4.5m depth	l.m.	0	$ 310.00	$ 0.00
c) 375 mm HDPE DR 17, 4.0-4.5m depth	l.m.	0	$ 380.00	$ 0.00
d) 450 mm HDPE DR 17, 4.0-4.5m depth	l.m.	0	$ 420.00	$ 0.00
Manhole Type 5A, 4.0-4.5m depth	ea.	25	$ 6,155.00	$ 150,797.50
Manhole Type 1S, 1800 x 1800, 4.0-4.5m depth	ea.	0	$ 14,103.00	$ 0.00
Tie-in to existing	ea.	1	$ 12,000.00	$ 12,000.00
Crossings				
Creek crossing	ea.	0	$ 20,000.00	$ 0.00
Highway crossing	ea.	0	$ 20,000.00	$ 0.00
Railway crossing (Steel cased - 350 mm SDR 35 PVC)	ea.	0	$ 50,000.00	$ 0.00
Major pipeline crossing	ea.	4	$ 20,000.00	$ 80,000.00
Lift Station				0.00
New Lift Station	ea.	0	$ 0.00	$ 0.00
Existing Lift Station Upgrades	ea.	0	$ 0.00	$ 0.00
SURFACE IMPROVEMENTS				
Sub-grade preparation (150 mm worked depth)	m^2	0	$ 1.98	$ 0.00
Granular sub-base - 400 mm compacted depth	m^2	0	$ 23.29	$ 0.00
Granular base-course - 225 mm compacted depth	m^2	0	$ 15.23	$ 0.00
Sidewalk and Curb & Gutter Spot Repair	l.m.	0	$ 500.00	$ 0.00
Surface Restoration				0.00
Restoration of Topsoil & Landscaping	m^2	0	$ 24.67	$ 0.00
Asphalt pavement: 60 mm depth - Mix 'A'	m^2	0	$ 18.27	$ 0.00
Asphalt pavement: 40 mm depth - Mix 'B'	m^2	0	$ 18.27	$ 0.00
Pavement markings	L.S.	1	$ 0.00	$ 0.00

Project Subtotal:	**$ 1,851,338.47**
30% Engineering & Contingency:	$ 555,401.54
Project Total:	**$ 2,406,740.00**

Ph4-3 Trunk E2 + LS + E2 SFM

Description	Unit	Est. Qty	Unit Price	Total Amt
GENERAL				
Mobilization/Demobilization	L.S.	1	$ 170,426.63	$ 170,426.63
Shallow Utility Protection	ea.	27	$ 460.75	$ 12,325.06
Dewatering Allowance	L.S.	1	$ 56,827.16	$ 56,827.16
Tree Protection	L.S.	1	$ 11,134.75	$ 11,134.75
Hydrovac	hr	36	$ 493.11	$ 17,505.41
Traffic accommodation	L.S.	1	$ 0.00	$ 0.00
Quality control testing	L.S.	1	$ 156,148.17	$ 156,148.17
SITE WORK AND REMOVALS				
Saw cutting	l.m.	0	$ 9.26	$ 0.00
Road core incl. asphalt removal, base course and surplus material and disposal	m2	0	$ 11.84	$ 0.00
Breakout and Replace Curb & Gutter low profile	l.m.	0	$ 168.00	$ 0.00
SANITARY SEWER				
SDR 35 PVC Pipe for gravity sewer:				
a) 200 mm PVC DR 35, 4.0-4.5m depth	l.m.	0	$ 224.00	$ 0.00
b) 300 mm PVC DR 35, 4.0-4.5m depth	l.m.	1,030	$ 298.00	$ 306,940.00
c) 375 mm PVC DR 35, 4.0-4.5m depth	l.m.	0	$ 367.00	$ 0.00
d) 450 mm PVC DR 35, 4.0-4.5m depth	l.m.	790	$ 448.00	$ 353,920.00
e) 525 mm PVC DR 35, 4.0-4.5m depth	l.m.	0	$ 537.00	$ 0.00
f) 600 mm PVC DR 35, 4.0-4.5m depth	l.m.	0	$ 624.00	$ 0.00
g) 675 mm PVC DR 35, 4.0-4.5m depth	l.m.	0	$ 734.00	$ 0.00
HDPE Pipe for sanitary force main:				
a) 200 mm HDPE DR 17, 4.0-4.5m depth	l.m.	0	$ 250.00	$ 0.00
b) 300 mm HDPE DR 17, 4.0-4.5m depth	l.m.	1,730	$ 310.00	$ 536,300.00
c) 375 mm HDPE DR 17, 4.0-4.5m depth	l.m.	0	$ 380.00	$ 0.00
d) 450 mm HDPE DR 17, 4.0-4.5m depth	l.m.	0	$ 420.00	$ 0.00
Manhole Type 5A, 4.0-4.5m depth	ea.	18	$ 6,155.00	$ 112,021.00
Manhole Type 1S, 1800 x 1800, 4.0-4.5m depth	ea.	0	$ 14,103.00	$ 0.00
Tie-in to existing	ea.	1	$ 12,000.00	$ 12,000.00
Crossings				
Creek crossing	ea.	1	$ 20,000.00	$ 20,000.00
Highway crossing	ea.	1	$ 20,000.00	$ 20,000.00
Railway crossing (Steel cased - 350 mm SDR 35 PVC)	ea.	3	$ 56,550.00	$ 169,650.00
Major pipeline crossing	ea.	15	$ 20,000.00	$ 300,000.00
Lift Station				0.00
New Lift Station	ea.	1	$ 10,000,000.00	$ 10,000,000.00
Existing Lift Station Upgrades	ea.	0	$ 0.00	$ 0.00
SURFACE IMPROVEMENTS				
Sub-grade preparation (150 mm worked depth)	m^2	0	$ 1.98	$ 0.00
Granular sub-base - 400 mm compacted depth	m^2	0	$ 23.29	$ 0.00
Granular base-course - 225 mm compacted depth	m^2	0	$ 15.23	$ 0.00
Sidewalk and Curb & Gutter Spot Repair	l.m.	0	$ 500.00	$ 0.00
Surface Restoration				0.00
Restoration of Topsoil & Landscaping	m^2	0	$ 24.67	$ 0.00
Asphalt pavement: 60 mm depth - Mix 'A'	m^2	0	$ 18.27	$ 0.00
Asphalt pavement: 40 mm depth - Mix 'B'	m^2	0	$ 18.27	$ 0.00
Pavement markings	L.S.	1	$ 0.00	$ 0.00

Project Subtotal:	**$**	**12,255,198.17**
30% Engineering & Contingency:	$	3,676,559.45
Project Total:	**$**	**15,931,757.62**

Ph4-4 Trunk E3 + LS + E3 SFM

Description	Unit	Est. Qty	Unit Price	Total Amt
GENERAL				
Mobilization/Demobilization	L.S.	1	$ 43,206.75	$ 43,206.75
Shallow Utility Protection	ea.	7	$ 460.75	$ 3,110.06
Dewatering Allowance	L.S.	1	$ 14,406.89	$ 14,406.89
Tree Protection	L.S.	1	$ 2,822.90	$ 2,822.90
Hydrovac	hr	9	$ 493.11	$ 4,437.99
Traffic accommodation	L.S.	1	$ 0.00	$ 0.00
Quality control testing	L.S.	1	$ 39,586.86	$ 39,586.86
SITE WORK AND REMOVALS				
Saw cutting	l.m.	0	$ 9.26	$ 0.00
Road core incl. asphalt removal, base course and surplus material and disposal	m2	0	$ 11.84	$ 0.00
Breakout and Replace Curb & Gutter low profile	l.m.	0	$ 168.00	$ 0.00
SANITARY SEWER				
SDR 35 PVC Pipe for gravity sewer:				
a) 200 mm PVC DR 35, 4.0-4.5m depth	l.m.	0	$ 224.00	$ 0.00
b) 300 mm PVC DR 35, 4.0-4.5m depth	l.m.	0	$ 298.00	$ 0.00
c) 375 mm PVC DR 35, 4.0-4.5m depth	l.m.	900	$ 367.00	$ 330,300.00
d) 450 mm PVC DR 35, 4.0-4.5m depth	l.m.	0	$ 448.00	$ 0.00
e) 525 mm PVC DR 35, 4.0-4.5m depth	l.m.	0	$ 537.00	$ 0.00
f) 600 mm PVC DR 35, 4.0-4.5m depth	l.m.	0	$ 624.00	$ 0.00
g) 675 mm PVC DR 35, 4.0-4.5m depth	l.m.	0	$ 734.00	$ 0.00
HDPE Pipe for sanitary force main:				
a) 200 mm HDPE DR 17, 4.0-4.5m depth	l.m.	0	$ 250.00	$ 0.00
b) 300 mm HDPE DR 17, 4.0-4.5m depth	l.m.	0	$ 310.00	$ 0.00
c) 375 mm HDPE DR 17, 4.0-4.5m depth	l.m.	1,130	$ 380.00	$ 429,400.00
d) 450 mm HDPE DR 17, 4.0-4.5m depth	l.m.	0	$ 420.00	$ 0.00
Manhole Type 5A, 4.0-4.5m depth	ea.	9	$ 6,155.00	$ 55,395.00
Manhole Type 1S, 1800 x 1800, 4.0-4.5m depth	ea.	0	$ 14,103.00	$ 0.00
Tie-in to existing	ea.	1	$ 12,000.00	$ 12,000.00
Crossings				
Creek crossing	ea.	0	$ 20,000.00	$ 0.00
Highway crossing	ea.	0	$ 20,000.00	$ 0.00
Railway crossing (Steel cased - 350 mm SDR 35 PVC)	ea.	0	$ 50,000.00	$ 0.00
Major pipeline crossing	ea.	6	$ 20,000.00	$ 120,000.00
Lift Station				0.00
New Lift Station	ea.	1	$ 10,000,000.00	$ 10,000,000.00
Existing Lift Station Upgrades	ea.	0	$ 0.00	$ 0.00
SURFACE IMPROVEMENTS				
Sub-grade preparation (150 mm worked depth)	m^2	0	$ 1.98	$ 0.00
Granular sub-base - 400 mm compacted depth	m^2	0	$ 23.29	$ 0.00
Granular base-course - 225 mm compacted depth	m^2	0	$ 15.23	$ 0.00
Sidewalk and Curb & Gutter Spot Repair	l.m.	0	$ 500.00	$ 0.00
Surface Restoration				0.00
Restoration of Topsoil & Landscaping	m^2	0	$ 24.67	$ 0.00
Asphalt pavement: 60 mm depth - Mix 'A'	m^2	0	$ 18.27	$ 0.00
Asphalt pavement: 40 mm depth - Mix 'B'	m^2	0	$ 18.27	$ 0.00
Pavement markings	L.S.	1	$ 0.00	$ 0.00

Project Subtotal:	**$**	**11,054,666.44**
30% Engineering & Contingency:	$	3,316,399.93
Project Total:	**$**	**14,371,066.38**