Rocky View County

Final Report

Bragg Creek Servicing Study

September 2025

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

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4015 7 Street SE, Calgary, AB T2G 2Y9 T: 403.254.0544 F: 403.254.9186

September 30, 2025

Our Reference: 28782

Rocky View County
262075 Rocky View Point
Rocky View County, Alberta
T4A 0X2

Attention: Dalia Wang

Dear Madam:

Reference: Bragg Creek Servicing Study

Enclosed is the final report for the Bragg Creek Servicing Study. We trust that it meets your expectations.

The key objectives of this project are to provide a framework for both existing and future water and wastewater servicing in the Hamlet of Bragg Creek (Bragg Creek). The study will review water supply, fire flow availability, sewage conveyance, and wastewater treatment and disposal. This report supports the investment of infrastructure within the Bragg Creek community, the sustainable and cost-effective growth in the Bragg Creek Hamlet Expansion ASP plan area (expansion area), and the densification and growth objectives within Bragg Creek.

We sincerely appreciate the opportunity to undertake this project on your behalf. Should you have any questions or concerns, please do not hesitate to contact the undersigned at 403-254-0544.

Sincerely,

Geoffrey Schulmeister, P.Eng., SCPM
Director / General Manager, Water and Environment

Corporate Authorization

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

October 3 2025

Jeremy Shinbine, P. Eng. Technical Author	Sarah Barbosa, P.Eng,. ENV SP Technical Review

Executive Summary

Purpose and Scope

The Bragg Creek Servicing Study was commissioned by Rocky View County (RVC) to provide a comprehensive framework for both existing and future water and wastewater servicing in the Hamlet of Bragg Creek and its expansion area. The study's objectives include evaluating current infrastructure, identifying deficiencies, and recommending upgrades to support sustainable growth, fire protection, and regulatory compliance. The study also considers two future growth scenarios, encompassing infill development, Gateway Village, Balsam Avenue, RVC Foundation, and the expansion area (from the Bragg Creek Hamlet Expansion ASP plan area).

Future Growth and Demands

Two growth scenarios were analyzed, projecting a population increase from 777 to approximately 2,577 residents at full build-out. Future development focuses on development at Balsam Avenue, Gateway Village, RVC Foundation, the expansion area to the south, and some infill development which was assumed to be distributed evenly throughout the hamlet. Water and wastewater demands were calculated using conservative design rates to ensure infrastructure resilience and regulatory compliance.

Existing Water Distribution System

- Bragg Creek's potable water is sourced from the Elbow River and treated at the Bragg Creek Water Treatment Plant (WTP), a Level 2 facility with a maximum capacity of 500 m^3/day.
- The distribution network includes the Bragg Creek Reservoir and Pumphouse, Upper and Lower Elkana Reservoirs, and a mix of HDPE, PVC, AC, and PE water mains ranging from 100 – 300 mm in size.
- The existing WTP treatment capacity is sufficient for existing system demands.
- The system currently lacks fire flow protection; only dry hydrants are present, and distribution capacity is insufficient for fire flows as per RVC standards.
- System pressures within Elkana fluctuate significantly due to significant changes in topography.

Existing Wastewater Collection System

- Wastewater is collected via a low-pressure sewer system, primarily using 75 mm HDPE forcemains and Environment One and Liberty grinder pumps. Some of the Liberty pumps have been noted to struggle with maintaining sufficient pumping heads.
- The 100 mm Elbow River syphon conveys sewage under the Elbow River to the WWTP. The existing syphon casing has been noted to have additional space for future twinning.
- The Bragg Creek Wastewater Treatment Plant (WWTP) consists of two treatment trains with capacities of 115 – 185 m^3/d and 180 – 210 m^3/d. Based on historical flow data, no upgrades are anticipated; however, recent studies indicate that there is some infiltration into the upstream system.
- The estimated existing system flows show that some low-pressure mains are below 0.6 m/s which may indicate a risk of sedimentation and odour concerns.
- System heads reach up to 45 m, which is within the operating range of Environment One grinder pumps; however, some Liberty pumps are known to have concerns maintaining adequate pumping head.
- The existing syphon operates at 1.1 m/s indicating sufficient velocity to prevent sedimentation.
- The system is designed to minimize inflow-infiltration (I-I), but recent inspections suggest possible groundwater infiltration at private septic tanks and pumps. Thus, further study may be warranted if the system is experiencing high amounts of I-I.

Water System Recommendations

- Existing system upgrades:
  - Provide a 250 L/s fire pump and increase the discharge header HGL at the Bragg Creek Reservoir to 1,340 m.
  - Construct 2,500 m^3 of additional reservoir storage at the Bragg Creek Reservoir and Pumphouse.
  - Construct 847 m of 300 mm water main from the Bragg Creek Reservoir along Burnside Avenue and connect to the existing 300 mm water main at the intersection of River Drive South and White Avenue.
  - Construct seven (7) fire hydrants along the proposed 300 mm water main near the WTP and where its alignment intersects with Pine Avenue, Spruce Avenue, Balsam Avenue, Cowboy Trail, and at River Drive South.
  - These upgrades are anticipated to cost **$6.96M**.
- Short term upgrades (Gateway Village, Balsam Avenue, and RVC Foundation):
  - Replace the pumps at the Bragg Creek Pumphouse to provide a firm distribution capacity of up to 25 L/s.
  - Construct 610 m^3 of additional reservoir storage at the Bragg Creek Reservoir and Pumphouse.
  - Both short term upgrades are anticipated to cost **$1.43M**.
- Long term upgrades (expansion area):
  - Construct 2,600 m of 125 mm supply main from the Bragg Creek WTP to the proposed expansion area reservoir location.
  - Construct the expansion area reservoir with 1,400 m^3 of storage (includes both MDD and FF storage).
  - Provide 16 L/s of firm distribution pumping capacity (two pumps in lead/standby operation) and one fire pump capable of providing 100 L/s to the expansion area.
  - RVC can consider looping the distribution system in the expansion area back into the existing 200 mm network using PRVs to improve overall distribution system resiliency. Conversely, the valves could be closed and only opened during emergency conditions to provide water to the lower hamlet if the Bragg Creek Reservoir and Pumphouse is out of service.
  - These upgrades are estimated to cost **$4.60M**.
- Upgrading and cost estimates for the WTP are based on conservative consumption rates and further review is recommended closer to the time of development when updated current and anticipated demands are more refined. That being said, the assessment conservatively staged upgrades as follows:
  - Add an additional 500 m^3/d in the short term at an estimated cost of $16.10M.
  - Add an additional 500 m^3/d in the long term at an estimated cost of $16.10M.

Wastewater System Recommendations

The following has been identified for further study regarding the wastewater system:

- ISL recommends that RVC continue their wastewater system inspections to identify the sources of infiltration and continue to communicate to residents the importance of water conservation measures such as reducing laundry cycles, toilet flushing, dishwasher use, length of showers, and to ensure sump pumps do not discharge to the sanitary system.
- If significant I-I sources are identified within the wastewater system that are not accounted for, ISL recommends an I-I Assessment and Wet Weather Flow Management Strategy to remove these sources of I-I from the wastewater system.

ISL recommends the following staging plan for the wastewater system as described in **Figure 9.2** (Servicing Concept #2), subject to the conclusions and recommendations from updated flow monitoring and inspection results.

- Short term upgrades (Gateway Village, Balsam Avenue and RVC Foundation):
  - Design and construct the Gateway Village Lift Station with a design capacity of 26.1 – 26.9 L/s at the southwest corner of the Gateway Village Development.

- Construct the 894 m, 150 mm forcemain from the Gateway Village lift station to the WWTP following River Drive North and the existing Elbow River Syphon alignment (utilizing the existing casing).
- The gravity system will be initially developed in the short term with 249 m of 200 mm gravity sewer along Harwood Street and River Drive South to ensure future development of RVC Foundation can be serviced by gravity.
- If the proposed 70 lots of infill development are realized, the low-pressure sewer system will require the following upgrades:
  - Replace 286 m of existing 75 mm with 125 mm low-pressure main along River Drive North from River Drive South to Balsam Avenue (from Junction #18 to #22).
  - Replace 191 m of existing 75 mm with 125 mm low-pressure main along River Drive North from Balsam Avenue to Spruce Avenue (from Junction #22 to #24).
  - Replace 175 m of existing 75 mm with 150 mm low-pressure main along River Drive North from Spruce Avenue to Pine Avenue (from Junction #24 to #26).
- These upgrades are anticipated to cost **$2.51M** (accounting for 905 m of road restoration costs).

- Long term upgrades (expansion area):
  - The gravity system will be extended with 438 m of 200 mm sewer southwest along White Avenue, and then 400 m south along Park Place to collect sewage from the expansion area.
  - These upgrades are anticipated to cost **$0.59M** (accounting for 666 m of road restoration costs).
- Upgrading and cost estimates for the WWTP are based on conservative generation rates and further review is recommended closer to the time of development when updated current and anticipated demands are more refined. That being said, the assessment conservatively staged upgrades as follows:
  - Add an additional 640 – 980 m^3/d of capacity in the short term at an estimated cost of **$23.50M**.
  - Add an additional 1,107 – 1,241 m^3/d of capacity in the long term at an estimated cost of **$31.10M**.
  - It should be noted that these capacity requirements and cost estimates are based on the conservative flow projections, and further study to refine these projections using monitoring data will likely reduce the upgrading requirements and overall costs.

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APPENDICES

TABLES

FIGURES

LIST OF ACRONYMS

Acronym	Meaning
ADD	Average Daily Demand
AC	Asbestos Cement
ADWF	Average Dry Weather Flow
ASP	Area Structure Plan
BWWTP	Bragg Creek Wastewater Treatment Plant
CT	Contact Time
DWF	Dry-Weather Flow
FF	Fire Flow
GIS	Geographic Information System
HGL	Hydraulic Grade Line
HDPE	High-Density Polyethylene
ICI	Industrial, Commercial, Institutional
I-I	Inflow-Infiltration
IWSMP	Integrated Water Systems Master Plan
MDD	Maximum Daily Demand
MBR	Membrane Bioreactor
NR	Non-Residential
PHD	Peak Hour Demand
PE	Polyethylene
PVC	Polyvinyl Chloride
PDWF	Peak Dry-Weather Flow
PWWF	Peak Wet-Weather Flow
PFD	Process Flow Diagram
PRV	Pressure Reducing Valve
Q_{avg}	Average Flow Rate
Q_d	Design Flow Rate
RVC	Rocky View County
UPA	Units Per Acre
UV	Ultraviolet
WTP	Water Treatment Plant
WWTP	Wastewater Treatment Plant

1.0 Introduction

1.1 Authorization

Rocky View County (RVC) has commissioned ISL Engineering and Land Services Ltd. (ISL) to complete a Servicing Feasibility Study and Servicing Strategy to provide a framework for both existing and future water and wastewater servicing in the Hamlet of Bragg Creek (Bragg Creek). The study will review water supply, fire flow availability, sewage conveyance, and wastewater treatment and disposal. This report supports the investment of infrastructure within the Bragg Creek community, the sustainable and cost-effective growth in the Bragg Creek Hamlet Expansion ASP plan area (expansion area), and the densification and growth objectives within Bragg Creek.

1.2 Purpose of Study

The purpose of this study is outlined below:

- Review available background studies and integrate relevant information and recommendations into this study
- Review available design standards, monitored water consumption data, and monitored wastewater treatment plant (WWTP) inflow data to recommend level of service design criteria for future development within Bragg Creek
- Review and update the existing WaterCAD model based on recent studies
- Assess the existing water treatment plant (WTP), reservoirs, pumping capacity, and distribution network in terms of capacity for existing development
- Develop a spreadsheet model for the existing low-pressure sanitary sewer collection system based on available design standards and best practices
- Assess the existing WWTP, Elbow River syphon, and low-pressure sewer network in terms of capacity for existing development
- Recommend upgrades for the water and wastewater systems to resolve existing system deficiencies and provide cost estimates
- Evaluate future water servicing concepts and provide recommendations for servicing future development including the location, timing and capacity of a future water reservoir
- Evaluate future wastewater servicing concepts and provide recommendations for servicing future development including the location, timing and capacity of future lift stations and forcemains

A key objective of this study is to tie together the proposed growth within Bragg Creek and the expansion area, and develop holistic water and wastewater servicing concepts that not only provide servicing for the expansion area, but consider other growth areas as well, such as infill development, Gateway Village, Balsam Avenue, and RVC Foundation.

1.3 Background Studies

Relevant background documents, design standards and guidelines, and drawings sets are summarized in **Table 1.1** below. These documents provided insight during the analysis and modelling process.

Table 1.1: Background Information

Document	Description
Reports	
Bragg Creek Hamlet Expansion Area Structure Plan Servicing Feasibility Study, ISL (Apr. 2020)	• This study evaluated the existing water system and proposed future water and wastewater servicing concepts with a focus on development of the Area Structure Plan (ASP) expansion area to the south of Bragg Creek
Gateway Village Master Site Development Plan, RVC (May 2021)	• This report is a high-level planning document that discusses the Gateway Village proposed development, architecture and urban design, open space and landscaping consideration, transportation and municipal servicing considerations
Wintergreen Woods Watermain Replacement, ISL (Feb. 2022)	• This memo provides a summary of the requirements needed for abandonment of the Wintergreen Woods WTP and for direct supply of water from the Bragg Creek water distribution system through a 3.1 km long, 100 mm long HDPE water supply main
Gateway Development Servicing, CIMA+ (Apr. 2022)	• This memo investigates water and wastewater servicing for the proposed Gateway development
Preliminary Servicing Options Summary – Revised Memorandum, ISL (Sept. 2022)	• This memo provides a summary of preliminary water and wastewater servicing options to support development of Gateway Village
Bragg Creek Area Structure Plan Hamlet Review, RVC (ongoing)	• This is an ongoing project approved by Council that will continue the work previously started by the Bragg Creek Hamlet Expansion Strategy, but with a broader scope including consideration of growth within Bragg Creek itself • The intent of this study is to provide a holistic growth strategy for the entire Bragg Creek community
Design Standards and Guidelines	
Standards and Guidelines for Municipal Waterworks, Wastewater and Storm Drainage Systems, Government of Alberta (Mar. 2013)	
Rural Servicing Design and Construction Manuals, Section 102 Low-Pressure Sanitary Sewer System, Aquatera Utilities Inc. (2020)	
Design Guidelines for Subdivision Servicing, The City of Calgary (Oct. 2020)	
Low-Pressure Sewer Systems Using Environment One Grinder Pumps Design Manual, E/One (Apr. 2025)	
Rocky View County Servicing Standards, RVC (Feb. 2025)	
Drawing Sets	
Bragg Creek WWTP & Collection System Phase 1, AECOM (Dec. 2012)	
Bragg Creek Potable Water Transmission and Distribution System and Sanitary Collection (Phase 1), MPE Engineering Ltd. (Jul. 2013)	
Bragg Creek Potable Water Transmission and Distribution System and Sanitary Collection (Phase 2), MPE Engineering Ltd. (Dec. 2013)	
Bragg Creek Wastewater Treatment Plant Phase 2, MPE Engineering Ltd. (Mar. 2014)	
Bragg Creek Water Servicing Phase 2, Bragg Creek WTP, Potable Water Storage, MPE Engineering Ltd. (May 2014)	
Wintergreen Woods Watermain Upgrade Issued for Construction, ISL (Jun. 2023)	

2.0 Study Area

2.1 Location

Bragg Creek is located within southwest Rocky View County on the Elbow River and near Highway 22. The expansion area south of Bragg Creek is bounded by Highway 22 (Cowboy Trail) and the Tsuut'ina Nation Reserve #145 to the east, Banded Peak School to the south, and Bragg Creek Provincial Park to the west. Bragg Creek and the expansion area generally drain towards the Elbow River. The study area, expansion area, and Tsuut'ina Nation Reserve #145 are shown in **Figure 2.1**.

2.2 Topography

Topography within the study area is shown in **Figure 2.2**. The area generally drains towards the Elbow River, with a high point of approximately 1,350 m located along the western edge of the expansion area and a low point at the Elbow River of approximately 1,295 m. The expansion area itself consists of significant slopes (≥15%) that make approximately 40 ha undevelopable.

2.3 Existing Land Use

Existing land use within the study area is shown in **Figure 2.3**. Bragg Creek largely consists of urban district residential, with some commercial and public service concentrated along Balsam Avenue and Burnside Drive. The expansion area is currently zoned as rural district residential, agricultural (general and small parcel), and some country residential, although the area is largely undeveloped. Elkana (located north of Bragg Creek and Centre Avenue) consists of country and rural residential.

2.4 Future Growth Plan

Future development within Bragg Creek focuses on development at Balsam Avenue, Gateway Village, RVC Foundation and the expansion area to the south. The information for future growth was provided by RVC and was based on a recent residential feasibility study. There are two growth scenarios that are summarized in **Tables 2.1** and **2.2** and on **Figure 2.4**. Infill development is anticipated as part of both growth scenarios, and the modelling assessments assumed an even distribution throughout the hamlet. Thus, as growth projections are verified in more detail, additional study may be needed if infill development is more heavily concentrated in one area.

Table 2.1: Future Growth Plan Summary – Scenario 1

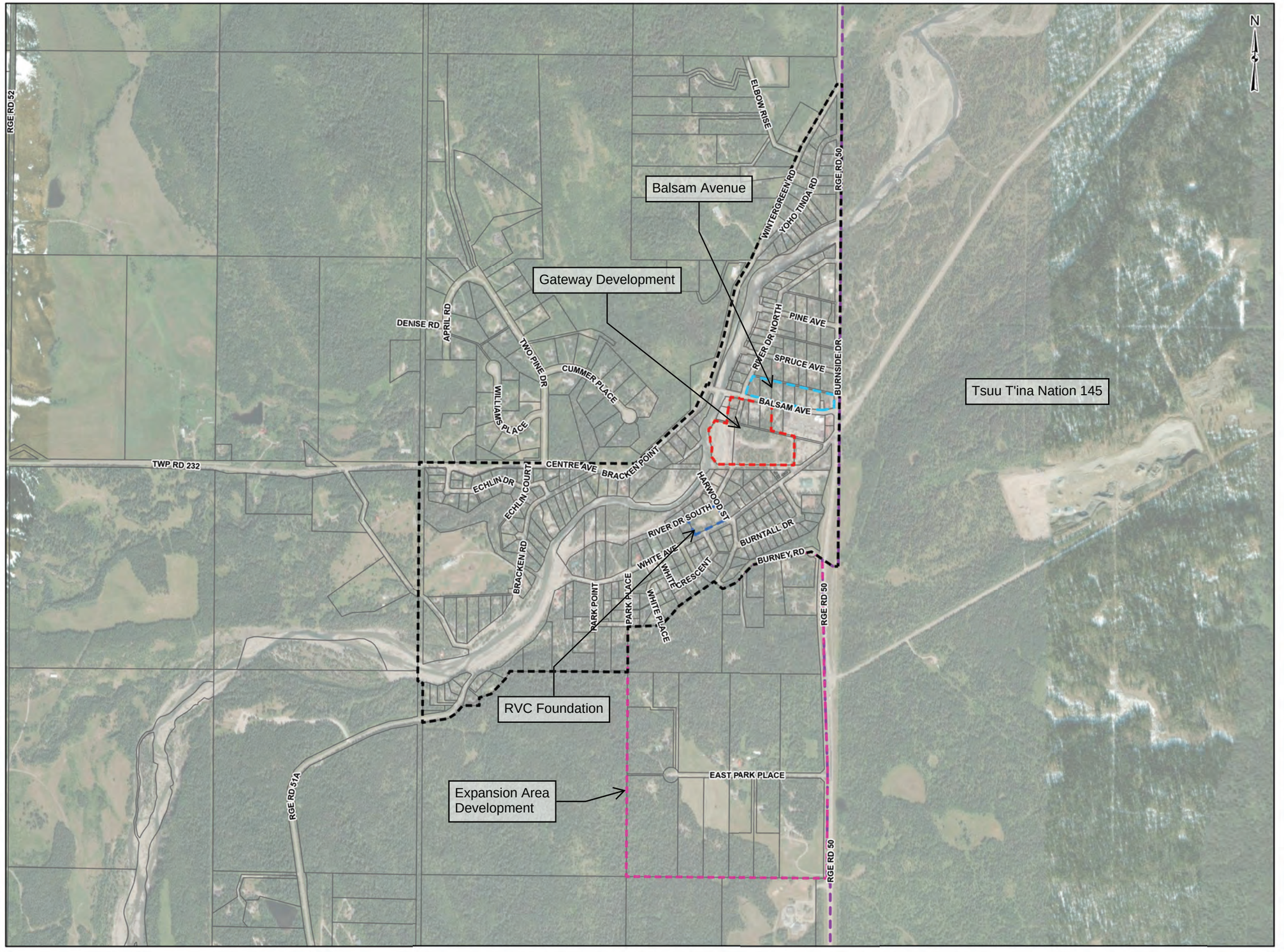
Area	Residential Area	Commercial Area	Institutional Area[1]	Number of Dwellings	Population[2]
	ha	ha	ha	lots	c
Existing					
Bragg Creek	130.1	23.7	6.2	190	570
Elkana	50.2	0.0	0.0	69	207
Existing Total	**180.3**	**23.7**	**6.2**	**259**	**777**
Short Term Development					
Gateway Village	1.3	0.0	0.0	140	420
Balsam Avenue	2.1	0.0	0.0	0	0
RVC Foundation	0.8	0.0	0.0	40	120
Infill	-	0.0	0.0	70	210
Short Term	**4.2**	**0.0**	**0.0**	**250**	**750**
Short Term Total	**184.5**	**23.7**	**6.2**	**509**	**1,527**
Long Term Development					
Expansion Area	9.4[3]	0.0	0.0	350	1,050
Long Term	**9.4**	**0.0**	**0.0**	**350**	**1,050**
Long Term Total	**193.9**	**23.7**	**6.2**	**859**	**2,577**

[1] Institutional is assumed to include Public Use and Direct Control land uses.
[2] Population estimated based on 3 c / lot.
[3] Area of the expansion area is based on 15.1 UPA and 3 c / lot.

Table 2.2: Future Growth Plan Summary – Scenario 2

Area	Residential Area	Commercial Area	Institutional Area[1]	Number of Dwellings	Population[2]
	ha	ha	ha	lots	c
Existing					
Bragg Creek	130.1	23.7	6.2	190	570
Elkana	50.2	0.0	0.0	69	207
Existing Total	**180.3**	**23.7**	**6.2**	**259**	**777**
Short Term Development					
Gateway Village	1.3	0.0	0.0	140	420
Balsam Avenue	2.1	0.0	0.0	40	120
RVC Foundation	0.8	0.0	0.0	40	120
Infill	-	0.0	0.0	70	210
Short Term	**4.2**	**0.0**	**0.0**	**290**	**870**
Short Term Total	**184.5**	**23.7**	**6.2**	**549**	**1,647**
Long Term Development					
Expansion Area	8.3[3]	0.0	0.0	310	930
Long Term	**8.3**	**0.0**	**0.0**	**310**	**930**
Long Term Total	**192.8**	**23.7**	**6.2**	**859**	**2,577**

[1] Institutional is assumed to include Public Use and Direct Control land uses.
[2] Population estimated based on 3 c / lot.
[3] Area of the expansion area is based on 15.1 UPA and 3 c / lot.



LEGEND

- Study Area
- Tsuu T'ina Nation 145
- Gateway Development
- Expansion Area
- Balsam Avenue
- RVC Foundation
- Parcels

TITLE
STUDY AREA

PROJECT
BRAGG CREEK SERVICING STUDY

CLIENT
ROCKY VIEW COUNTY

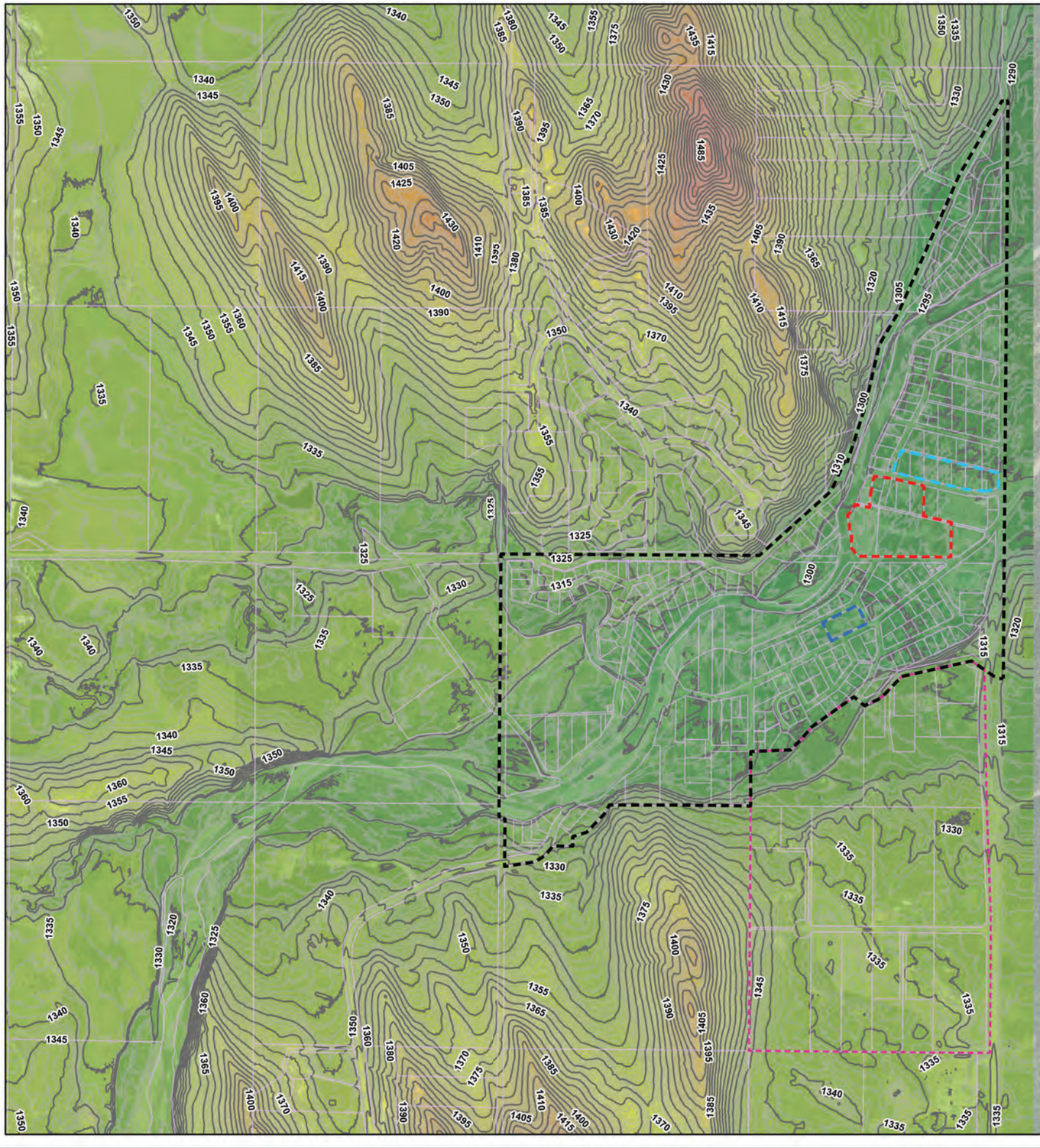
DATA SOURCES:
- Topographic Map:Maxar

PROJECTION
NAD 1983 3TM 114

0 180 360
1:15,000 Meters

FIGURE	2.1
DATE	9/25/2025
PROJECT NO.	28782
AUTHOR	jshinbine

Document: M:\28782_Bragg_Creek\01_GIS\28782_Bragg_Creek_Servicing_Study\28782_Bragg_Creek_Servicing_Study.aprx - Figure 2.1 - Study Area



LEGEND

- Major Contours - 5 m
- Minor Contours - 1 m
- Study Area
- Gateway Development
- Expansion Area
- Balsam Avenue
- RVC Foundation
- Parcels

Ground Elevation (m)

1495.21

1285.8

TITLE

TOPOGRAPHY

PROJECT

BRAGG CREEK SERVICING STUDY

CLIENT

ROCKY VIEW COUNTY

DATA SOURCES

- Topographic Map: Maxar

PROJECTION

NAD 1983 3TM 114

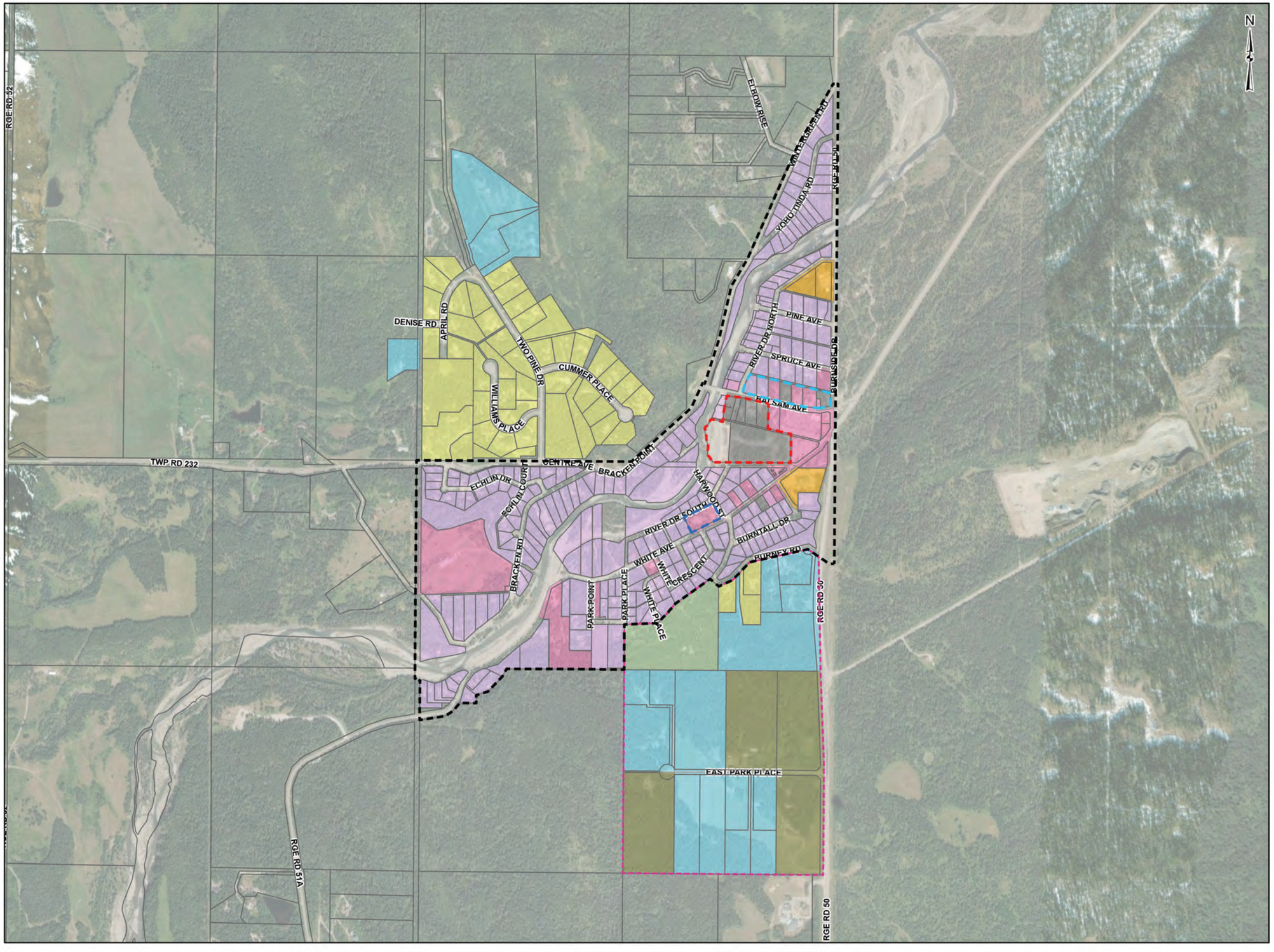
0 180 360

1:15,000 Meters

FIGURE	2.2
DATE	9/25/2025
PROJECT NO.	28782
AUTHOR	jshinbine

ISL

Document: M:\28782_Bragg_Creek\01_GIS\28782_Bragg_Creek_Servicing_Study\28782_Bragg_Creek_Servicing_Study.aprx - Figure 2.2 - Topography



LEGEND

- Study Area
- Gateway Development
- Expansion Area
- Balsam Avenue
- RVC Foundation
- Parcels

Land Use Classification

- Agricultural, General District
- Agricultural, Small Parcel District
- Commercial, Local Urban District
- Direct Control
- Residential, Rural District
- Residential, Urban District
- Special, Public Service District

TITLE
EXISTING LAND USE

PROJECT
BRAGG CREEK SERVICING STUDY

CLIENT
ROCKY VIEW COUNTY

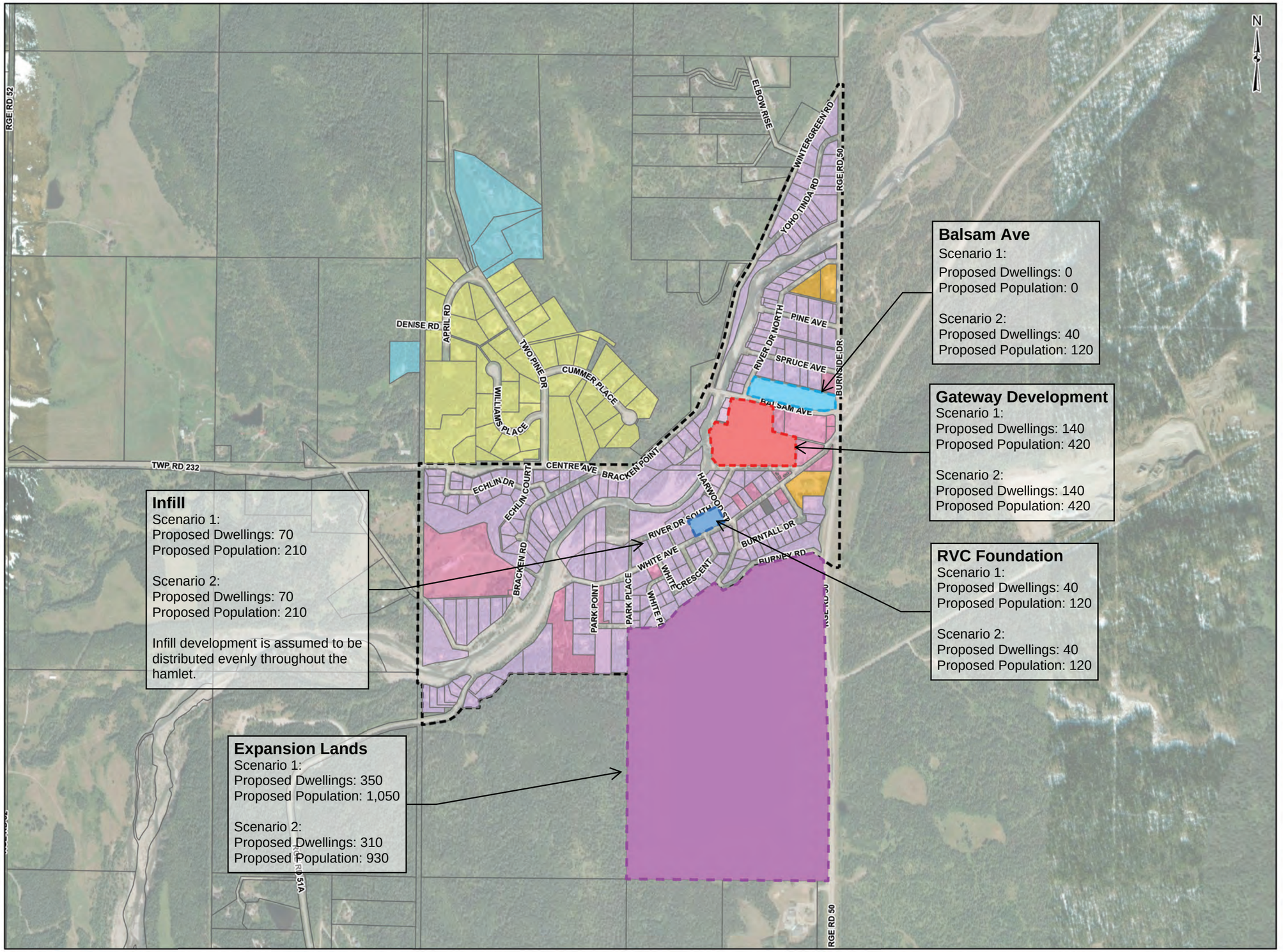
DATA SOURCES
- Topographic Map:Maxar

PROJECTION
NAD 1983 3TM 114

0 180 360
1:15,000 Meters

FIGURE	2.3
DATE	9/25/2025
PROJECT NO.	28782
AUTHOR	jshinbine

Document: M:\28782_Bragg_Creek\01_GIS\28782_Bragg_Creek_Servicing_Study\28782_Bragg_Creek_Servicing_Study.aprx - Figure 2.3 - Existing Land Use



Balsam Ave
Scenario 1:
Proposed Dwellings: 0
Proposed Population: 0

Scenario 2:
Proposed Dwellings: 40
Proposed Population: 120

Gateway Development
Scenario 1:
Proposed Dwellings: 140
Proposed Population: 420

Scenario 2:
Proposed Dwellings: 140
Proposed Population: 420

Infill
Scenario 1:
Proposed Dwellings: 70
Proposed Population: 210

Scenario 2:
Proposed Dwellings: 70
Proposed Population: 210

Infill development is assumed to be distributed evenly throughout the hamlet.

RVC Foundation
Scenario 1:
Proposed Dwellings: 40
Proposed Population: 120

Scenario 2:
Proposed Dwellings: 40
Proposed Population: 120

Expansion Lands
Scenario 1:
Proposed Dwellings: 350
Proposed Population: 1,050

Scenario 2:
Proposed Dwellings: 310
Proposed Population: 930

LEGEND

Study Area
Parcels

Existing Land Use

- Agricultural, General District
- Agricultural, Small Parcel District
- Commercial, Local Urban District
- Direct Control
- Residential, Country Residential District
- Residential, Rural District
- Residential, Urban District
- Special, Public Service District

Proposed Development

- Gateway Development
- Balsam Avenue
- RVC Foundation
- Expansion Area

TITLE
FUTURE DEVELOPMENT SCENARIO

PROJECT
BRAGG CREEK SERVICING STUDY

CLIENT
ROCKY VIEW COUNTY

DATA SOURCES
- Topographic Map:Maxar

PROJECTION
NAD 1983 3TM 114

0 180 360
1:15,000 Meters

FIGURE	2.4
DATE	9/25/2025
PROJECT NO.	28782
AUTHOR	jshinbine

ISL

Document: M:\28782_Bragg_Creek\01_GIS\28782_Bragg_Creek_Servicing_Study\28782_Bragg_Creek_Servicing_Study.aprx - Figure 2.4 - Future Development Scenario

3.0 Existing Water Distribution System

3.1 Existing Water Sources

Raw water is drawn from the Elbow River and treated to supply the Bragg Creek and Elkana distribution systems. A summary of the existing licenses in the area used for municipal purposes is provided in **Table 3.1** as per the 1 Bragg Creek Hamlet Expansion Area Structure Plan Servicing Feasibility Study, ISL (Apr. 2020).

Table 3.1: Municipal Water Diversion License Summary

Approval ID	Priority Number	License Holder	Annual Diversion Volume	Maximum Diversion Rate
			m^3	L/s
33519	1976-07-30-002	Wintergreen Woods Water Utility Ltd.	39,470	16
205141	1998-12-18-001	Wintergreen Woods Water Utility Ltd.	7,400	16
255373	1974-10-24-001	Rocky View County	277,533	9
323153	1969-05-16-001	Rocky View County	5,550	2
331300	1974-08-20-002	Rocky View County	86,343	10
		Total	**416,296**	**53**

3.2 Water Treatment Plant

The Bragg Creek WTP is a Level 2 Facility, which has been in operation since 2013. Raw water from the Elbow River is pumped using two submersible pumps to a series of hydrocyclones for removal of grit, sand and other inorganic particles. Following the hydrocyclones, the water can be directed to a 0.5 mm basket strainer, 2 mm automatic strainer or both. The pre-treated water then flows into two main treatment trains, which each consist of tanks with mixers, where coagulant is added to accomplish enhanced coagulation first. The coagulated stream is directed to membrane filtration units for further treatment. Finally, the filtered water is subjected to ultraviolet (UV) and chlorine disinfection, after which the potable water is sent to a series of reservoirs. Potable water is distributed to the consumers either through the truckfill or through a pair of distribution pumps.

As per the Bragg Creek Potable Water Transmission and Distribution System and Sanitary Collection record drawings (MPE, 2013), the two treatment trains support a maximum potable water production capacity of 500 m^3/d.

Figure 3.1 provides a Process Flow Diagram (PFD) of the existing treatment process.

3.3 Reservoirs and Pumphouses

Treated water from the WTP fills the Bragg Creek Reservoir and is then distributed throughout Bragg Creek. The Upper Elkana Reservoir and Pumphouse, which consists of two concrete reservoir cells and a pumphouse, is supplied by the Bragg Creek Reservoir and is filled during off-peak times, such as overnight. There is an inline booster station (referred to as the Lower Elkana Pumphouse) that pumps water from the Bragg Creek distribution system through a dedicated 100 mm PVC transmission main into the Elkana Reservoir.

It should be noted that the existing reservoirs and pumphouses only have distribution capacity and cannot provide fire flows as per Rocky View County design standards. Assumptions have been made to calculate a “theoretical fire flow availability” in the modelling assessment under the assumption that a fire pump is available.

Table 3.2 summarizes the properties of both reservoirs. As shown, the Elkana Reservoir services two pressure zones and the following notes have been made:

- Elkana 1 is gravity fed and controlled to an average operating pressure of 414 kPa.
- Elkana 2 is serviced by three inline pumps (two online and one standby) whose pumping information is unknown.

Table 3.2: Existing Reservoir Summary

Reservoir	Pressure Zone	Capacity	Slab Elevation	Operating Pressure	Hydraulic Grade Line
		m^3	m	kPa	m
Bragg Creek	Bragg Creek	660	1,293.1	428	1,336.7
Elkana	Elkana 1	276	1,357.0	414	1,399.1
	Elkana 2			276 – 379	1,385.1 – 1,395.7

Table 3.3 summarizes the properties of both pumphouses. The Elkana pumphouse pump capacities are assumed values at this time since available record drawings did not specify pump models or set points.

Table 3.3: Existing Pumphouse Summary

Property	Pump 1	Pump 2	Pump 3
Bragg Creek Pumphouse			
Name	P-701	P-702	Truck Fill Pump
Type	Inline Vertical Centrifugal	Inline Vertical Centrifugal	Inline Vertical Centrifugal
Model	Grundfos CR45-2	Grundfos CR45-2	Grundfos CR64-1-1
Motor	15hp, 600V 3PH	15hp, 600V 3PH	7.5 hp, 600V 3PH
Capacity[2]	10 L/s at 61.0 m TDH	10 L/s at 61.0 m TDH	23 L/s at 16.5 m TDH
Upper Elkana Pumphouse[1]			
Name	P-101	P-102	P-103
Type	-	-	-
Model	-	-	-
Motor	-	-	-
Capacity[2]	*2.2 L/s at 44.0 m TDH*	*2.2 L/s at 44.0 m TDH*	*2.2 L/s at 44.0 m TDH*
Lower Elkana Pumphouse			
Name	P-101	P-102	-
Type	-	-	-
Model	-	-	-
Motor	15hp, 575V	15hp, 575V	-
Capacity	2.2 L/s at 37.7 m	2.2 L/s at 37.7 m	-

[1] The Upper Elkana pumphouse pump capacities are assumed values at this time since available record drawings did not specify pump models or set points.

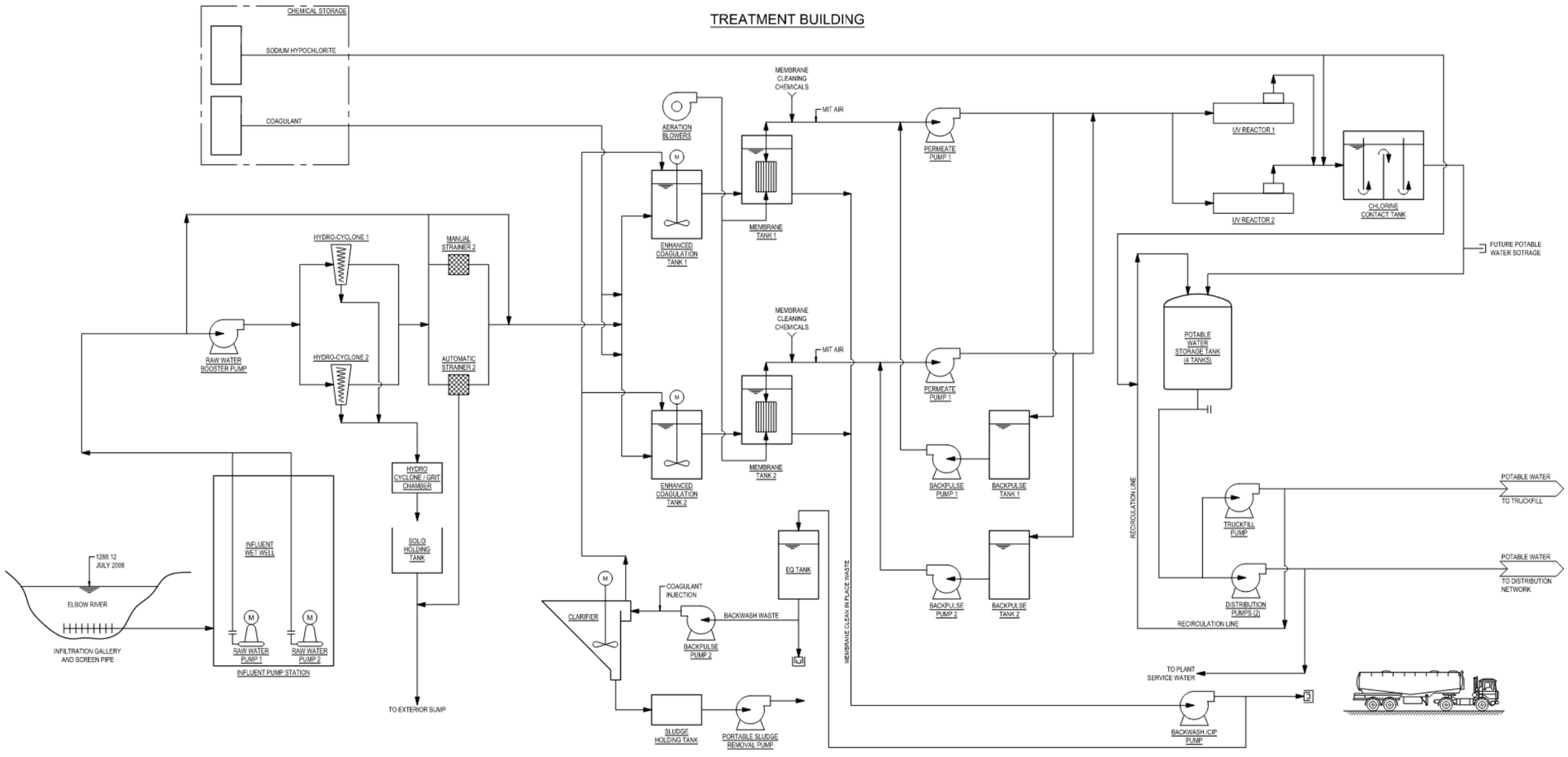
3.4 Water Distribution Network

The existing water distribution system consists of water mains ranging from 100 mm to 300 mm in size. The water main diameters and pressure zones are shown on **Figure 3.2**. Most of the Bragg Creek system consists of high-density polyethylene (HDPE) pipe, whereas the Elkana system consists of primarily polyvinyl chloride (PVC) with some asbestos cement (AC) and polyethylene (PE) pipe. Water main materials are summarized on **Figure 3.3**. A summary of the existing pipe parameters taken from the as-built drawings provided is outlined in **Table 3.4**. As mentioned in **Section 3.3**, there is no fire flow pumping capacity and there are no hydrants within Bragg Creek or Elkana that connect to the distribution system. There are a few dry hydrants that have been noted by the County, but otherwise, there is no existing fire protection.

Table 3.4: Existing Water Distribution System Summary

Water Main Diameter	Length	Water Main Material	Length
	m		m
100 mm	7,849	AC	1,106
150 mm	1,145	HDPE	9,635
200 mm	6,166	PE	1,339
300 mm	322	PVC	3,401
Total	**15,482**	**Total**	**15,481**

[1] Service connections were not included in this summary.



LEGEND

TITLE
EXISTING WATER TREATMENT SYSTEM - PROCESS FLOW DIAGRAM

PROJECT
BRAGG CREEK SERVICING STUDY

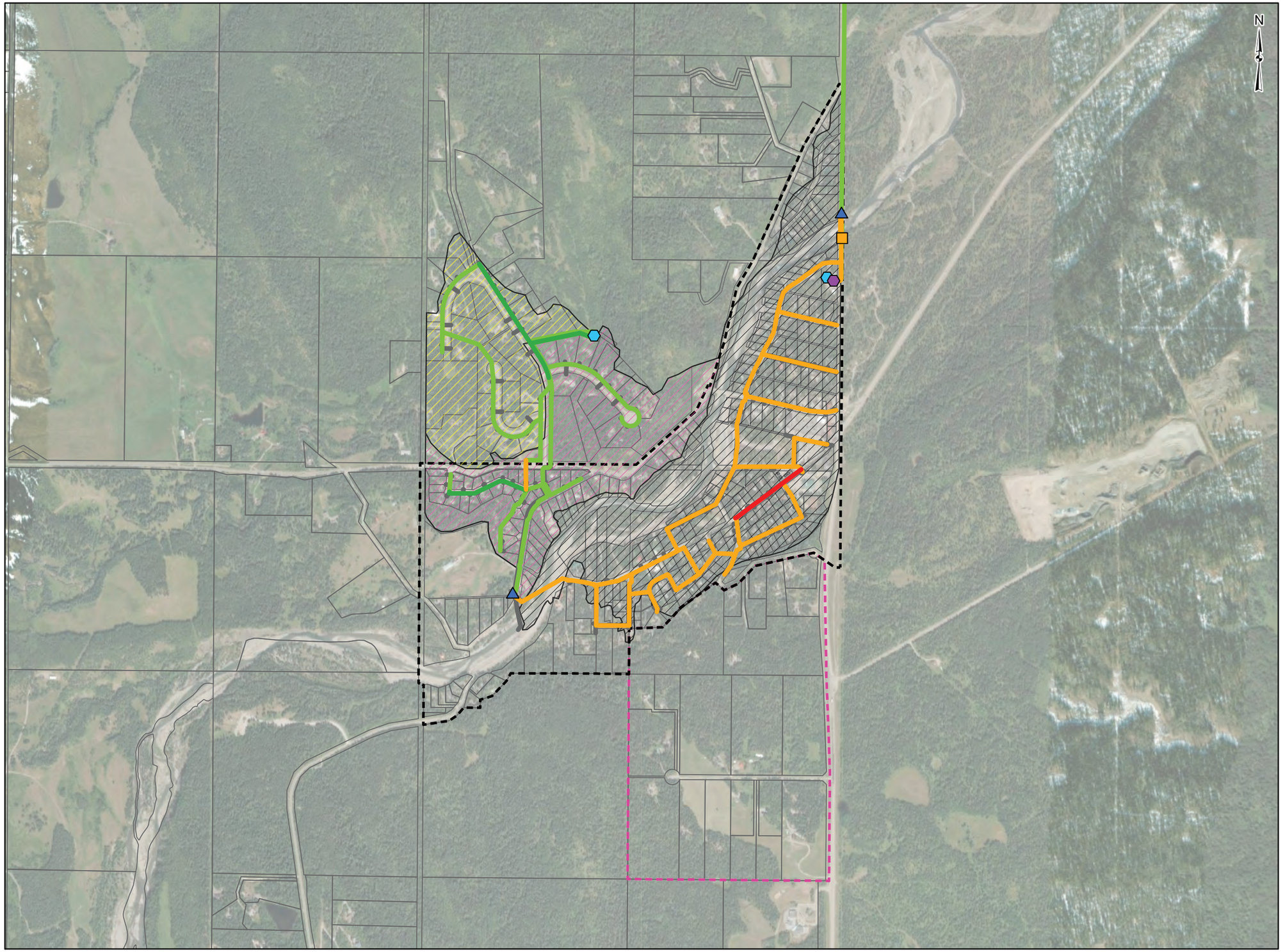
CLIENT
ROCKY VIEW COUNTY

DATA SOURCES
- Topographic Map:

PROJECTION

FIGURE	3.1
DATE	9/25/2025
PROJECT NO.	28782
AUTHOR	jshinbine

Document: M:\28782_Bragg_Creek\01_GIS\28782_Bragg_Creek_Servicing_Study\28782_Bragg_Creek_Servicing_Study.aprx - Figure 3.1 - Ex. Water Treatment - Process Flow Diagram



LEGEND

- Booster Station
- Raw Water Lift Station
- Reservoir
- Treatment Plant
- Study Area
- Expansion Area
- Parcels

Water Main Diameter (mm)

- Unknown
- 100 mm
- 150 mm
- 200 mm
- 300 mm

Pressure Zones

- Bragg Creek
- Elkana 1
- Elkana 2

TITLE

EXISTING WATER SYSTEM PIPE DIAMETER

PROJECT

BRAGG CREEK SERVICING STUDY

CLIENT

ROCKY VIEW COUNTY

DATA SOURCES

- Topographic Map:Maxar

PROJECTION

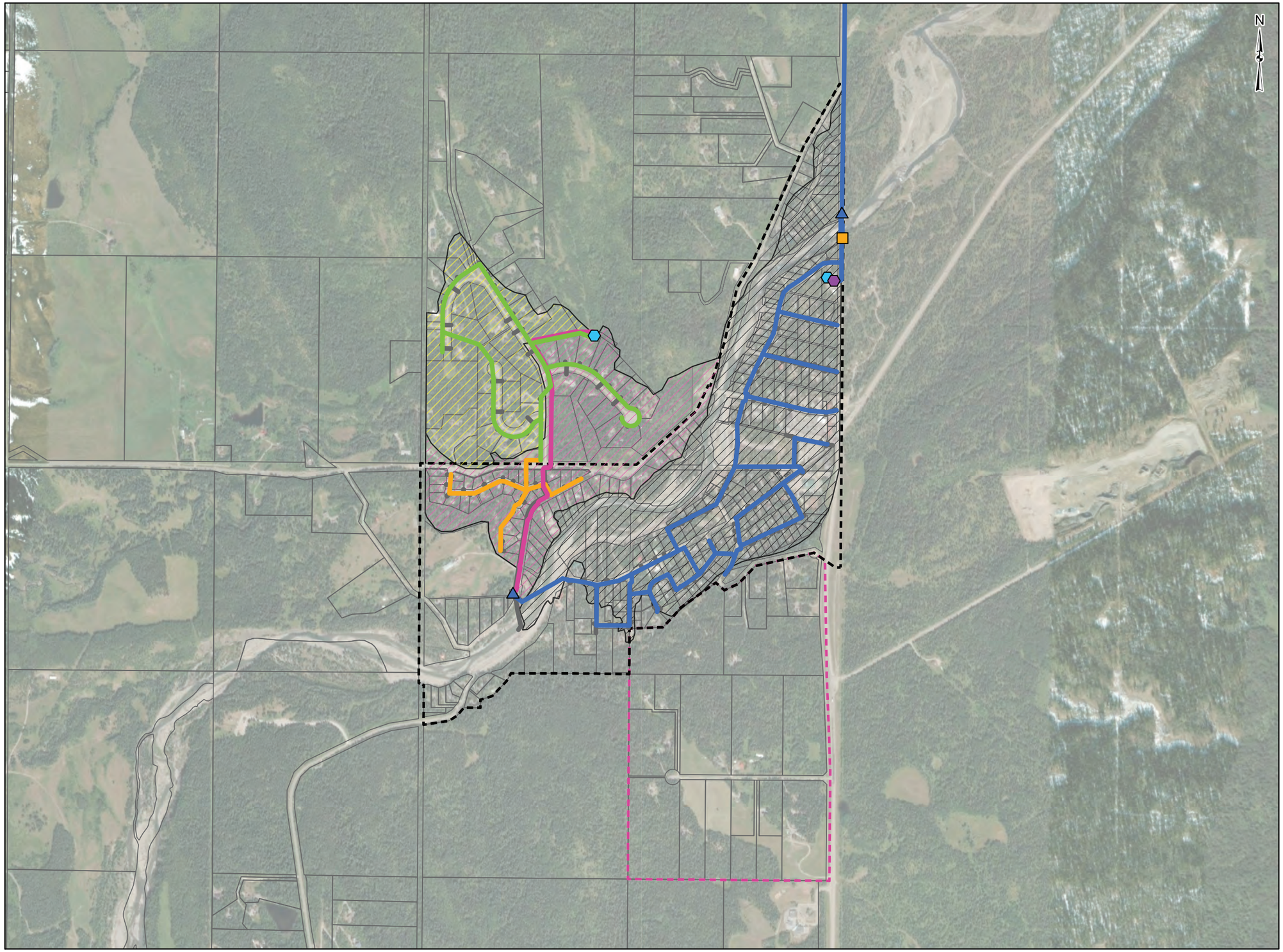
NAD 1983 3TM 114

0 180 360

1:15,000 Meters

FIGURE	3.2
DATE	7/30/2025
PROJECT NO.	28782
AUTHOR	epoon

Document: M:\28782_Bragg_Creek\01_GIS\28782_Bragg_Creek_Servicing_Study\28782_Bragg_Creek_Servicing_Study.aprx - Figure 3.2 - Ex. Water System - Pipe Diameter and Pressure Zones



LEGEND

- Booster Station
- Raw Water Lift Station
- Reservoir
- Treatment Plant
- Study Area
- Expansion Area
- Parcels

Water Main Material

- Unknown
- AC
- HDPE
- PE
- PVC

Pressure Zones

- Bragg Creek
- Elkana 1
- Elkana 2

TITLE

EXISTING WATER SYSTEM PIPE MATERIAL

PROJECT

BRAGG CREEK SERVICING STUDY

CLIENT

ROCKY VIEW COUNTY

DATA SOURCES

- Topographic Map:Maxar

PROJECTION

NAD 1983 3TM 114

0 180 360

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FIGURE	3.3
DATE	7/30/2025
PROJECT NO.	28782
AUTHOR	epoon

Document: M:\28782_Bragg_Creek\01_GIS\28782_Bragg_Creek_Servicing_Study\28782_Bragg_Creek_Servicing_Studyaprx - Figure 3.3 - Ex. Water System - Pipe Material

4.0 Existing Wastewater Collection System

4.1 Wastewater Treatment Plant

Influent from the sanitary collection system is subjected to preliminary treatment via a drum screen. Following removal of unwanted solids, the influent is then sent to either one or both treatment trains, which each begin with equalization tanks and pumps. The equalization pumps then direct the influent to their respective biological treatment trains. Each treatment train consists of anoxic and aeration tanks and alum addition, to achieve organics and nutrient removal. The biologically treated wastewater is filtered via two membrane filtration units in each train, where final solids removal takes place. The final step in the treatment process is UV disinfection, where the wastewater undergoes tertiary treatment, and ultimately is discharged to the Elbow River.

As per the Bragg Creek Hamlet Expansion Area Structure Plan Servicing Feasibility Study, ISL (Apr. 2020), the treatment capacity of Train 1 is 115 m^3/d to 185 m^3/d and 180 m^3/d to 210 m^3/d for Train 2. The existing WWTP does not service the Wintergreen Woods area.

Figure 4.1 provides a PFD of the treatment process.

4.2 Elbow River Syphon

The Elbow River syphon is a 238 m long, 100 mm syphon that conveys sewage from River Drive and Pine Avenue underneath the Elbow River and to the WWTP west of Wintergreen Road. This syphon crosses an elevation difference of 15.7 m as the WWTP is located at a high elevation relative to Bragg Creek. At an assumed velocity of 1.5 m/s, the syphon has a capacity of approximately 11.8 L/s. The existing syphon has a casing installed to allow for future twinning or for another sewer crossing.

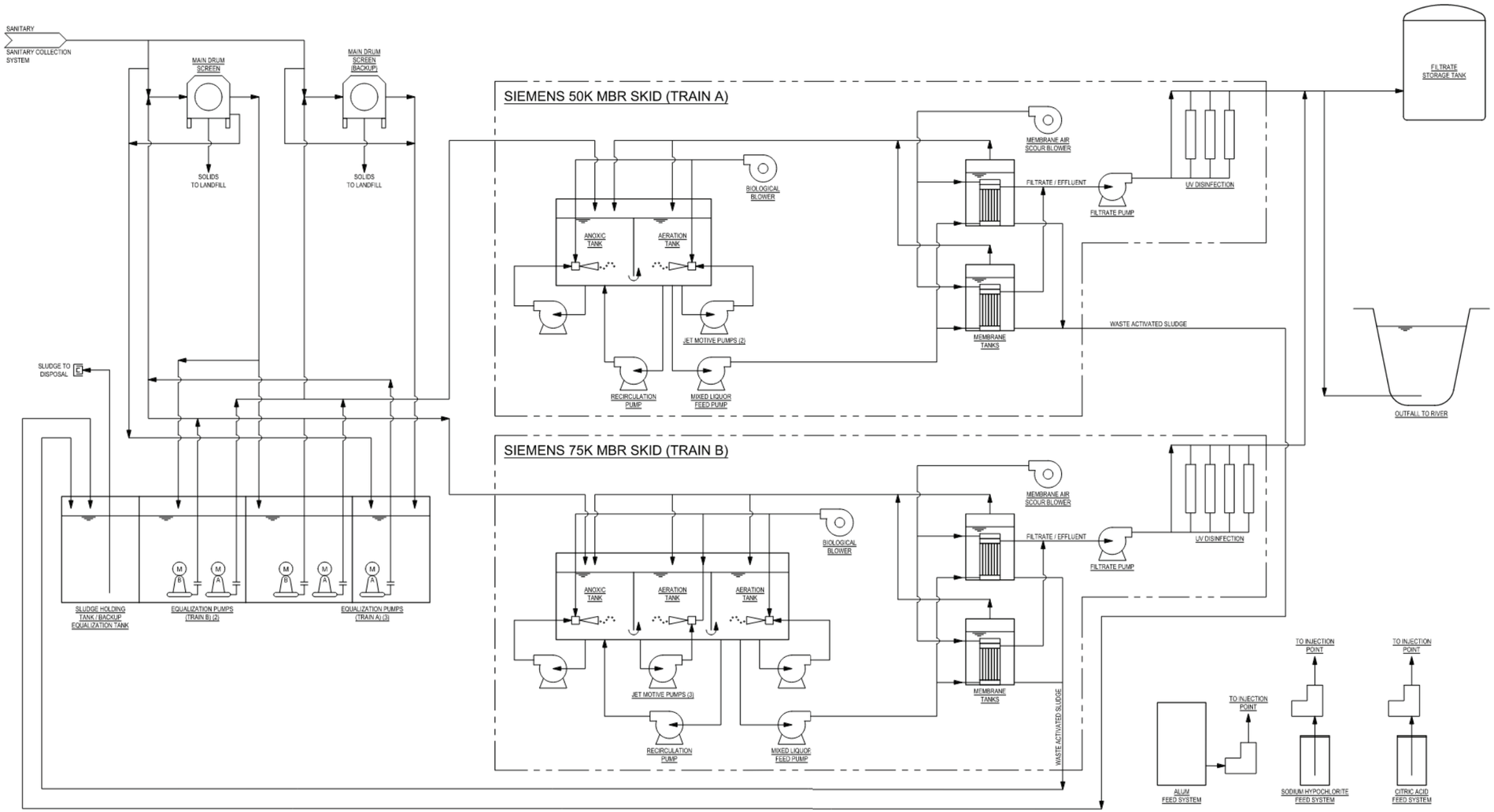
4.3 Low-Pressure Sewer Collection System

The wastewater collection system was constructed in 2013 and consists of high-density polyethylene (HDPE) low-pressure forcemains, primarily 75 mm in diameter. Within each lot in Bragg Creek is a septic tank serviced by a small lift station that pumps wastewater from the tank into the low-pressure mains. Most of the pumps within the system are Environment One grinder pumps with an operating point of up to 80 psi (approximately 56 m of head); however, there are some Liberty Pumps currently installed that have been reported to have concerns maintaining adequate pumping heads. Because the system is pressurized and pipe segments are welded/fused together, there is effectively no inflow-infiltration (I-I) entering the system. The existing wastewater collection system is shown in **Figure 4.2** and is summarized in **Table 4.1**.

Table 4.1: Wastewater Collection System Summary

Forcemain Diameter	Length
mm	m
37	70
75	5,350
100	548
Total	**5,968**

[1] Service connections were not included in this summary.



LEGEND

TITLE
EXISTING WASTEWATER TREATMENT SYSTEM - PROCESS FLOW DIAGRAM

PROJECT
BRAGG CREEK SERVICING STUDY

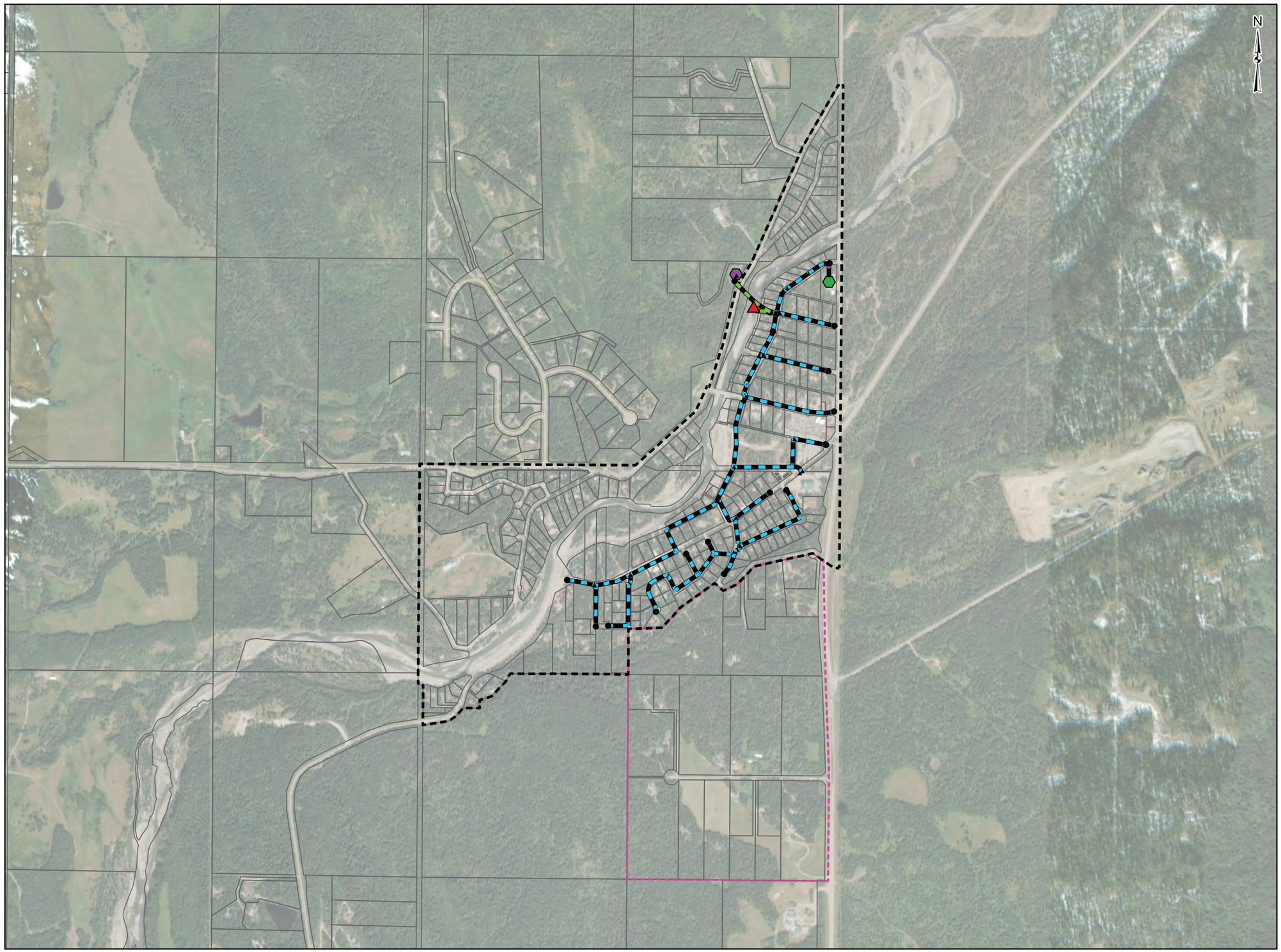
CLIENT
ROCKY VIEW COUNTY

DATA SOURCES
- Topographic Map:

PROJECTION

FIGURE	4.1
DATE	9/25/2025
PROJECT NO.	28782
AUTHOR	jshinbine

Document: M:\28782_Bragg_Creek\01_GIS\28782_Bragg_Creek_Servicing_Study\28782_Bragg_Creek_Servicing_Study.aprx - Figure 4.1 - Ex. Wastewater Treatment - Process Flow Diagram



LEGEND

- Lift Station
- Treatment Plant
- Outfall Structure
- Manhole
- Valve
- Study Area
- Expansion Area
- Parcels

Existing Low-Pressure Main

- 37 mm
- 75 mm
- 100 mm

TITLE

EXISTING WASTEWATER SYSTEM PIPE DIAMETER

PROJECT

BRAGG CREEK SERVICING STUDY

CLIENT

ROCKY VIEW COUNTY

DATA SOURCES

- Topographic Map:Maxar

PROJECTION

NAD 1983 3TM 114

0 180 360

1:15,000 Meters

FIGURE	4.2
DATE	7/30/2025
PROJECT NO.	28782
AUTHOR	epoon

Document: M:\28782_Bragg_Creek\01_GIS\28782_Bragg_Creek_Servicing_Study\28782_Bragg_Creek_Servicing_Study.aprx - Figure 4.2 - Ex. Wastewater System - Pipe Diameter

5.0 Design Criteria

5.1 Water Design Standards

Water servicing design standards are summarized in **Table 5.1** based on Rocky View County Servicing Standards (2025), Standards and Guidelines for Municipal Waterworks, Wastewater and Storm Drainage Systems, Government of Alberta (Mar. 2013), and Design Guidelines for Subdivision Servicing, The City of Calgary (Oct. 2020).

Table 5.1: Bragg Creek Water Servicing Design Standards

Property	Value
Consumption Rates	
Average Daily Demand, ADD (L/c/d)	315
Maximum Daily Demand, MDD (L/c/d)	630 (2.0xADD)
Peak Hour Demand, PHD (L/c/d)	1,260 (4.0xADD)
Non-Residential ADD (L/ha/d)	1,345[2]
Fire Flow Requirements and Storage	
Country Residential	Fire Flow: 50 L/s (1.5 hr) Fire Storage: 270 m^3 + MDD
Single Family Residential	Fire Flow: 100 L/s (2.0 hr) Fire Storage: 720 m^3 + MDD
Multi-Family Residential	Fire Flow: 166 L/s (2.0 hr) Fire Storage: 1,200 m^3 + MDD
High Density Residential (Apartments)	Fire Flow: 250 L/s (3.5 hr) Fire Storage: 2,700 m^3 + MDD[3]
Commercial	Fire Flow: 166 – 250 L/s (2.0 – 3.5 hr) Fire Storage: 1,200 – 2,700 m^3 + MDD[3]
Fire Hydrant Spacing	Placed at street intersections and cul-de-sac entrances
Pressure Requirements[1]	
MDD + Fire Flow, MDD+FF (kPa)	150
Peak Hour Demand, PHD (kPa)	300
Flow Velocity	
Maximum Velocity (m/s)	3.0
Storage Requirements	
Rocky View County	$S = FF \cdot D + MDD$ Where, S = Storage requirement, m^3 FF = Design fire flow, m^3/hr D = Duration of fire flow, hr MDD = Maximum daily demand, m^3
Standards and Guidelines for Municipal Waterworks, Wastewater and Stormwater Drainage Systems	$S = A + B + (the\ greater\ of\ C\ or\ D)$ Where, S = Storage requirement, m^3 A = Fire storage requirement, m^3 B = Equalization storage requirement (25% MDD), m^3 C = Emergency storage requirement (≥15% ADD), m^3 D = Disinfection contact time storage to meet CT requirements, m^3

[1] Pressure reducing valves are to be installed for systems providing delivery pressures above 550 kPa.
[2] Non-residential consumption rates are estimated at 1,345 L/ha/d as per the Preliminary Servicing Options Summary – Revised Memorandum, ISL (Sept. 2022).
[3] ISL notes that at 250 L/s for 3.5 hrs would equate to a volume of 3,150 m^3.

5.2 Monitored Consumption Demands

Monitored consumption rates from 2015 through 2018 are summarized in **Table 5.2**. In addition to this, it is known that Wintergreen Woods has been connected to the Bragg Creek distribution system with an average demand of 95 m^3/d based on data provided by the County.

Table 5.2: Existing Water Treatment Demand Summary

Parameter	Demand			
	2015	2016	2017	2018
	m^3	m^3	m^3	m^3
Minimum Daily	57	61	67	85
Maximum Daily	193	218	224	265
Average Daily	102	121	127	132
Total Annual	37,266	44,386	46,383	48,186

The 2025 Servicing Standards for RVC stipulate a residential water consumption rate of 315 L/c/d. It is noted that water conservation and re-use measures are being adopted to fulfill sustainable growth objections, and the drop in water consumption rates will be observed as conservation policies, bylaws, and public awareness become more prominent.

This residential water consumption rate was already proposed and subsequently adopted by the County for the Glenbow Ranch ASP Servicing Strategy (ISL, 2017). In addition, the review of residential rates adopted for the County's other servicing studies and design briefs indicate that residential rates as low as 175 L/c/d were considered, with an adopted average rate of 225 L/c/d for the Harmony Integrated Water Systems Master Plan (IWSMP) Report (USL, 2011).

A review of residential consumption rates is provided in **Table 5.3**. As shown, the design water consumption rate for Bragg Creek is consistent with rates used for various other servicing studies within RVC and other municipalities.

Table 5.3: Residential Water Consumption Rate Summary

Source	Consumption Rate
	L/c/d
Harmony Development (RVC)	175 – 275 (225)[1]
Watermark Development (RVC)	271[2]
Glenbow Ranch ASP (RVC)	315
Bingham Development (RVC)	340
Balzac West Development (RVC)	340
City of Calgary	300[3]
Airdrie Utility Master Plan	315
Bragg Creek Study Area	**315**

[1] The Harmony Integrated Water Systems Master Plan (USL, 2011) stipulates average day demand rates ranging from 175 L/c/d to 275 L/c/d for low and high demand scenarios, respectively, with the proposed average value of 225 L/c/d as per Table 3.2 of the IWSMP.
[2] Indicates the projected water consumption rate based on the water to wastewater return ratio of 125% and the adopted wastewater generation rate of 217 L/c/d as per the Bearspaw Regional Wastewater Treatment Plant Application Letter (Worley Parsons, May 2011).
[3] The City of Calgary per capita 2034 consumption rate does not separate the ICI water demands from the residential water demands, thus the residential and non-residential rates have been combined.

The consumption rate of 315 L/c/d is considered conservative when compared to actual existing consumption rates; therefore, cost estimates for water infrastructure needed to service future development may be conservatively estimated. A comparison of current water consumption rates is provided in **Table 5.4**.

Table 5.4: Residential Water Consumption Rate Comparison

System	Consumption Rate
	L/c/d
Existing Bragg Creek	225
Existing Elkana	174
Proposed Development	315

5.3 Wastewater Design Standards

Wastewater servicing design standards for Bragg Creek mention that wastewater system designs must conform with Provincial legislation, manufacturer's design guidelines, Alberta Environment and Protected Areas regulations and guidelines as applicable. Thus, design criteria was established based on these available documents along with design criteria from Rural Servicing Design and Construction Manuals, Section 102 Low-Pressure Sanitary Sewer System, Aquatera Utilities Inc. (2020), Design Guidelines for Subdivision Servicing, The City of Calgary (Oct. 2020), and Low-Pressure Sewer Systems Using Environment One Grinder Pumps Design Manual, E/One (Apr. 2025).

Design Criteria for Gravity Sewer Systems

The dry weather flow (DWF) generation rates applied when considering the potential wastewater servicing options were selected based on the City of Calgary's projected sanitary sewer per capita flow rates as shown in **Table 5.5**. The rates range from 315 L/c/d back in 2014 to 255 L/c/d for 2034 and beyond. To follow the County's goal of implementing "Environmentally Preferred" products and services, it is also assumed that its residents will follow a more sustainable lifestyle. Thus, a rate of 255 L/c/d was selected. This rate is also in line with the observed flow rates within the County's other recent developments such as the Watermark Development, as the derived influent rates were determined to be 221 L/c/d and 210 L/c/d for 2014 and 2015, respectively. Additionally, a rate of 255 L/c/d is consistent with a consumption demand of 315 L/c/d since wastewater generation rates are typically on the order of 80% of the water consumption rate.

Table 5.5: City of Calgary Residential Wastewater Flow Rates

Year	Wastewater Flow Rate
	L/c/d
2014	315
2019	290
2024	275
2029	262
2034	255
2039	255
2076	255

To demonstrate the validity of the derived wastewater generation rates, a comparison of typical rates for several communities in Alberta is made in **Table 5.6**. As shown, the recommended rate utilized throughout the study is comparable with the rates used for various servicing studies within the County and in other southern parts of Alberta.

Table 5.6: Residential Wastewater Generation Rates

Source	Generation Rate
	L/c/d
Harmony Development (RVC)	175-275 (225)[1]
Watermark Development (RVC)	217[2]
Glenbow Ranch ASP (RVC)	255
Bingham Development (RVC)	250[3]
Balzac West Development (RVC)	340
City of Calgary - Short Term	315
City of Calgary - Long Term	255
Airdrie Utility Master Plan	255
Bragg Creek Study Area	**255**

[1] The Harmony Integrated Water Systems Master Plan (USL, 2011) stipulates average wastewater generation rates ranging from 175 L/c/d to 275 L/c/d for low and high demand scenarios, respectively, with a proposed average value of 225 L/c/d.
[2] As per the Bearspaw Regional Wastewater Treatment Plant Application Letter (Worley Parsons, May 2011).
[3] As per the Wastewater Pumping, Treatment & Disposal – Predesign Draft Report prepared for Bingham Crossing Properties Inc. (USL, 2013).

The non-residential generation rate for Bragg Creek is noted to be 1,345 L/ha/d as per the Preliminary Servicing Options Summary – Revised Memorandum, ISL (Sept. 2022).

Peaking factors can be calculated using Standards and Guidelines for Municipal Waterworks, Wastewater and Storm Drainage Systems, Government of Alberta (Mar. 2013). The Harmon peaking factor, which is used for residential development is summarized below.

$$P_f = 1 + \frac{14}{4 + P^{\frac{1}{2}}} \geq 2.5$$

Where,
P_f = Harmon peaking factor
P = Design contributing population in thousands

Non-residential land uses have their peaking factors estimated by the equation below.

$$P_f = 6.659 \times Q_{avg}^{-0.168} \leq 5.0$$

Where,
P_f = Peaking factor
Q_{avg} = Average flow rate (L/s)

A constant inflow-infiltration allowance of 0.28 L/s/ha as per the Alberta Environment and Parks' guidelines was adopted. Note that I-I is not observed in low-pressure sewer systems whose pipe segments are welded/fused together and maintain positive pressure to ensure groundwater does not enter the pipe system. I-I may be considered during future growth scenarios for gravity sewer servicing scenarios.

Peak dry-weather flow (PDWF) is calculated by multiplying the average dry-weather flow (ADWF) by the peaking factor. Peak wet-weather flow (PWWF) is then calculated by adding the PDWF to the product of the service area and 0.28 L/s/ha. Finally, the design flow rate (Q_d) is calculated by dividing the PWWF by 0.86 such that the sewer design flows at no more than 80% of the depth. This is because the maximum velocity is achieved when the flow is at about 80% of depth, and as the pipe fills up beyond this point, the additional friction resistance caused by the crown of the sewer has a greater effect than the added cross-sectional area and the flow capacity experiences diminishing returns.

Lift Station and Forcemain Design Criteria

Forcemains are typically designed to operate in a range between 1.1 – 2.0 m/s, with a preferred velocity of 1.5 m/s.

Low-Pressure Sewer Design Criteria

For the assessment of the existing sanitary low-pressure sewer system, the following design standards were used:

- Rural Servicing Design and Construction Manuals, Section 102 Low-Pressure Sanitary Sewer System, Aquatera Utilities Inc. (2020)
- Low-Pressure Sewer Systems Using Environment One Grinder Pumps Design Manual, E/One (Apr. 2025)

From the Aquatera standards, **Figure 5.1** was derived which summarizes the relationship between the number of connections to the low-pressure sewer system and the number of active pumps at any given time and the corresponding design flow. It should be noted that since the low-pressure sewer system joints are sealed and the system maintains positive pressure, there is no I-I within the system and the design flow represents a peak DWF. From **Figure 5.1** the following relationships were derived based on curve fitting the information from Aquatera standards to a power curve function.

The average number of pumps active at any given time, is a function of the total number of connections to the low-pressure sewer system and is shown below.

$$N_a = 0.5484 \times N^{0.5198}$$

Where,
N_a = Number of active pumps
N = Total number of connections

Similarly, the design peak DWF is a function of the total number of connections to the low-pressure sewer system and is shown below.

$$Q = 0.5768 \times N^{0.5198}$$

Where,
Q = Design DWF rate (L/s)
N = Total number of connections

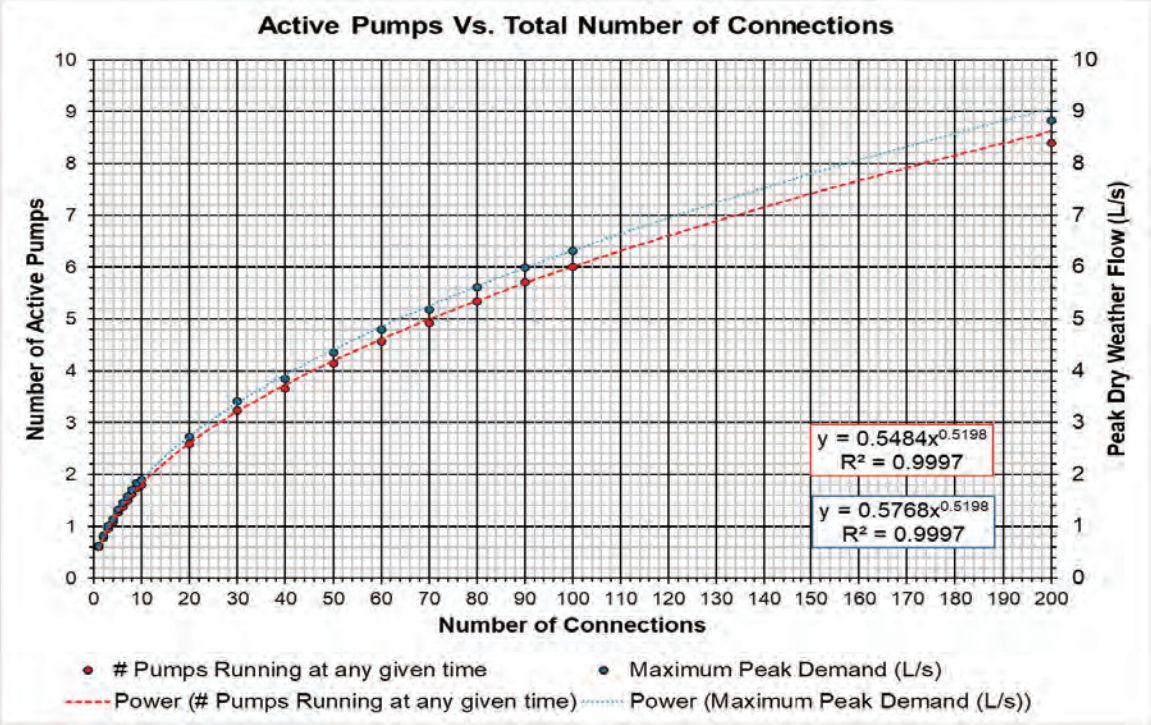


Figure 5.1: Low-Pressure Sewer Design Criteria Relationships

The total head is then calculated throughout the system as the summation of the static head requirements plus the friction head based on the Hazen-Williams equation summarized below:

$$h_f = L\left(\frac{Q}{0.27875 \times C \times D^{2.63}}\right)^{1.852}$$

Where,
hf = head loss (m)
L = pipe length (m)
Q = design flow rate (m^3/s)
D = pipe diameter (m)
C = Hazen-Williams pipe roughness coefficient

Then, the average pipe velocity is calculated as shown below:

$$V = \frac{Q}{A}$$

Where,
V = velocity (m/s)
Q = design flow rate (m^3/s)
A = cross-sectional pipe area (m^2)

The low-pressure sewers should maintain a velocity within the range of 0.6 m/s – 1.5 m/s and a total head that does not exceed the pump head of the private pump systems on each lot. Note that this velocity range is slightly different than that of forcemains which typically operate at higher velocities ranging from 1.1 – 2.0 m/s as discussed above. Previous studies report that most pumps in the low-pressure system are Environment One grinder pumps, which have an operating point up to 56.2 m (80 psi). There are some Liberty pumps currently installed that struggle to keep up with system pressures. Thus, when evaluating the low-pressure system sewer, the following criteria are considered:

1. 0.6 ≤ Velocity ≤ 1.5 m/s to minimize downstream odour concerns and sedimentation within the mains
2. System Head ≤ 56 m to ensure that private pump systems can meet the pumping requirements

Private on-site septic tanks and pumps are the responsibility of the homeowners; thus, upgrades to the low-pressure system will be limited to the publicly owned low-pressure mains and syphon crossing the Elbow River. It is recommended that homeowners replace their pumping systems to ensure adequate pumping capacity where pumping head may be insufficient.

Summary of Wastewater Design Criteria

Wastewater servicing design standards for Bragg Creek are summarized in **Table 5.7**.

Table 5.7: Bragg Creek Wastewater Servicing Design Standards

Property	Value
Gravity Sewer Design Criteria	
Wastewater Generation Rate, G	255 L/c/d (residential) 1,345 L/ha/d (non-residential)
Peaking Factor, P_f	Residential: $P_f = 1 + \frac{14}{4+P_2^{\frac{1}{2}}} \geq 2.5$ Non-Residential: $P_f = 6.659 \times Q_{avg}^{-0.168} \leq 5.0$
Inflow-Infiltration Rate, I-I (L/s/ha)	0.28
Forcemain Design Criteria	
Design Velocity, V (m/s)	1.1 – 2.0 (1.5 preferred)
Low-Pressure Sewer Design Criteria	
Number of Active Pumps	$N_a = 0.5484 \times N^{0.5198}$
Peak DWF Design Rate (L/s)	$Q = 0.5768 \times N^{0.5198}$
Design Head, H (m)	$H = h_s + h_f = h_s + L\left(\frac{Q}{0.27875 \times C \times D^{2.63}}\right)^{1.852} \leq 56\,m$
Design Velocity, V (m/s)	$V = \frac{Q}{A}, 0.6 \leq V \leq 1.5 \frac{m}{s}$

5.4 Monitored Wastewater Treatment Plant Influent Flows

Monitored wastewater inflow to the WWTP is summarized in **Table 5.8** from 2015 through 2018. As shown, the current maximum daily volume is within the treatment capacity of Train 1, and Train 2 does not need to be operated until future development triggers a total demand exceeding 185 m^3/d.

Table 5.8: Existing Water Treatment Demand Summary

Parameter	Demand			
	2015	2016	2017	2018
	m^3	m^3	m^3	m^3
Minimum Daily	22	37	43	34
Maximum Daily	135	113	122	114
Average Daily	48	69	68	63
Total Annual	16,162	25,050	24,903	22,928

A recent news article, Bragg Creek wastewater remains “well above system capacity” as inspections begin, written by Anna Ferensowicz of Discover Airdrie, July 28, 2025, mentions that RVC is conducting lift station assessments to identify if groundwater is entering the wastewater system. Recent reports suggest that the current volumes are well above the system capacity. While low-pressure mains are pressurized and there is little opportunity for I-I in theory, there is potential for groundwater infiltration within the septic tank/pumping systems on each property that could account for some of the increased flows. ISL recommends that RVC continue their inspections to identify the sources of infiltration and continue to communicate to residents the importance of water conservation measures such as reducing laundry cycles, toilet flushing, dishwasher use, length of showers, and to ensure sump pumps do not discharge to the sanitary system.

5.5 Recommended Water and Wastewater Design Criteria

The following recommendations are made regarding water and wastewater design criteria for the Hamlet of Bragg Creek:

- Water design criteria should follow **Table 5.1**, but evaluation of existing systems should use the monitored rates of 225 L/c/d for Bragg Creek and 174 L/c/d for Elkana (as per **Table 5.4**). Future system design should consider the conservative rate of 315 L/c/d for residential development and 1,345 L/ha/d for non-residential development.
- Wastewater design criteria should follow **Table 5.7**. Future design of wastewater systems should consider the modified wastewater generation rate of 255 L/c/d, as per City of Calgary design criteria. It is noted that this value is approximately 80% of the water consumption rate of 315 L/c/d.

6.0 Existing Water System Assessment

6.1 Model Development

The existing WaterCAD model was updated using Bentley OpenFlows WaterCAD 2024. By using this software, the simulation of water demands can estimate the resulting pipe flows, head losses, and pressure throughout the system.

The model was constructed based on available GIS data, as-built information, and zone operating pressure information provided by the County. Pipe locations, materials (and resulting Hazen-Williams C-factors), and diameters were input based on this information. Existing land use data was then used to calculate existing system demands (as discussed in **Section 6.2** in more detail). The service areas for water demand projections are shown on **Figure 6.1**. It should be noted that gross parcel area in some instances can be much larger than net developed area, so the projection of flow demands needs to consider historical records and engineering judgment as well.

The model was evaluated using the following scenarios:

- Existing System ADD
- Existing System MDD
- Existing System PHD
- Existing System MDD+FF

The modelling simulations for the existing system assessment considered the following:

- Elkana Zone 1 was modelled as a gravity system through a pressure reducing valve set at a hydraulic grade line (HGL) such that the pressure zone averaged approximately 414 kPa.
- ADD, MDD and PHD scenarios considered both 276 kPa and 379 kPa operating pressures at the Elkana 2 pressure zone as sub-scenarios.
- To evaluate fire flow conditions, it is assumed that the pressure pump for the Elkana 2 pressure zone is active. Thus, fire flow simulations assume the 379 kPa operating pressure sub-scenario.
- It is known that the Lower Elkana Pumphouse operates during low-flow conditions and that it fills the Upper Elkana reservoir mostly during the night and not during peak demands. Thus, it is assumed that these pumps do not operate during typical or high-demand scenarios.

6.2 Existing Water Demands

Based on the existing level of development and water design criteria described in **Sections 2.3** and **5.0**, respectively, the existing system water demands are summarized in **Table 6.1**. The following is noted:

- A residential water consumption rate of 225 L/c/d for Bragg Creek and 174 L/c/d for Elkana was used. Non-residential land uses used a consumption rate of 1,345 L/ha/d.
- Peaking factors of 2.0 and 4.0 were used for MDD and PHD, respectively. Based on monitored data provided, MDD peaking factors averaged 1.6 and 1.8 for Bragg Creek and Elkana, respectively. Thus, the use of 2.0 is considered conservative.
- The Wintergreen Waterline demand of 1.10 L/s was built into the model at the location of the booster station north of the Elbow River and are subject to the peaking factors of 2.0 and 4.0 for MDD and PHD respectively. Operation of the booster station and the downstream 100 mm HDPE water supply main was not included but it is noted that the booster station was designed to ensure 150 kPa along the entire supply main.
- Fire flows within Bragg Creek assume a conservative requirement of 250 L/s (the maximum required for commercial development). Similarly, Elkana assumes a fire requirement of 50 L/s (based on country residential).
- The Lower Elkana Pumphouse operates only during low-flow conditions to fill the Upper Elkana Reservoir. With a firm capacity of 2.2 L/s, the pump can adequately operate during ADD conditions or during the nighttime. It is assumed that Elkana Reservoir is not being filled during MDD, PHD or fire flow conditions as per its operating philosophy.

Table 6.1: Existing Water Distribution System

Area	ADD	MDD	PHD	FF
	L/s	L/s	L/s	L/s
Bragg Creek				
Distribution	1.48	2.96	5.92	250.00
Wintergreen Woods	1.10	2.20	4.40	-
Bragg Creek Sub-Total	**2.58**	**5.16**	**10.32**	**-**
Elkana				
Elkana 1 (Lower)	0.31	0.62	1.24	50.00
Elkana 2 (Upper)	0.11	0.22	0.44	50.00
Elkana Sub-Total	**0.42**	**0.84**	**1.68**	**-**
Grand Total	**3.00**	**6.00**	**12.00**	**-**

6.3 Water Treatment Plant Capacity Assessment

The modelled flows for the existing scenario, summarized within **Table 6.1**, were utilized to assess the capacity of the existing WTP. The WTP process should be designed for a minimum of MDD plus 10% estimated losses based on Alberta guidelines. The existing WTP has a total potable water production capacity of 500 m^3/d. This means that the actual raw water volume per day that can be treated by the existing WTP is greater than 500 m^3/d. Accounting for a 10% loss through the system, the capacity of the WTP is estimated to be 550 m^3/d. The existing modelled MDD plus 10% losses is less than the total estimated capacity of the WTP. As such, no capacity upgrades are envisioned for the current flows.

6.4 Reservoir and Pumphouse Capacity Assessment

Based on the overall demands in **Section 6.2**, an assessment of the storage and pumping capacity has been completed. **Table 6.2** summarizes the pumping capacity assessment for Bragg Creek and Elkana pumphouses. The pumping capacity for the existing system is considered marginal and the existing PHD appears to exceed the current firm capacity of 10 L/s. Modelling results in **Section 6.5** show that despite this slight overage, the pressures are still acceptable. Thus, any future development will require upgrades to the distribution pumping capacity. Should fire protection be required in the future, a 250 L/s and 50 L/s fire pump would be needed at each of the Bragg Creek and Upper Elkana pumphouses, respectively.

Table 6.2: Existing Pumping Capacity Assessment

Parameter	Bragg Creek Pumphouse	Upper Elkana Pumphouse
Pumping Capacity Assessment		
Firm Capacity (L/s)	10.00	4.40[1]
ADD (L/s)	2.58	0.42
MDD (L/s)	5.16	0.84
PHD (L/s)	10.32	1.68
Pumping Surplus/Deficit (L/s)	-0.32	+2.72
Fire Flow Capacity Assessment		
Fire Flow Requirement	250.00	50.00
MDD+FF	255.16	50.84

[1] Pumping capacity at the Upper Elkana Pumphouse is unknown and was assumed to be similar to the capacity at the Lower Elkana Pumphouse.

Table 6.3 summarizes the storage assessment for the Bragg Creek and Elkana reservoirs. Depending on the standard used to determine the storage requirement, the following conclusions are made:

- The Bragg Creek Reservoir has sufficient storage capacity to support the distribution system while not accounting for fire flow storage.
- If fire protection is desired, then a new reservoir or storage upgrade will be required for the Bragg Creek distribution system.
- It should be noted that upsizing the Bragg Creek Reservoir to provide fire protection may increase water quality concerns due to stagnation.
- The Upper Elkana reservoir has sufficient distribution and fire protection storage capacity based on the provincial requirements but is under capacity based on RVC standards. If fire protection is desired within Elkana, a small reservoir storage improvement will be required.

Table 6.3: Existing Reservoir Storage Capacity Assessment

Property	Bragg Creek	Upper Elkana
Existing Storage (m^3)	660	296
Rocky View County Servicing Standard Storage Requirement		
Fire Flow Storage (m^3)	2,700	270
MDD (m^3)	446	73
Storage Required (m^3)	3,146	343
Surplus/Deficit (m^3)	-2,486	-47
Standards and Guidelines for Municipal Waterworks, Wastewater and Storm Drainage Systems Storage Requirement		
ADD (m^3)	223	36
MDD (m^3)	446	73
A, Fire Flow Storage (m^3)	2,700	270
B, 25% MDD (m^3)	111	18
C, 15% ADD (m^3)	33	5
S = A + B + (greater of C or D) (m^3)	2,844	293
Surplus/Deficit (m^3)	-2,184	+3

6.5 Existing Water Distribution System Assessment

Average Day Demand

The results of the existing ADD assessment are shown in **Figures 6.2** and **6.3** for the 276 kPa and 379 kPa pump pressure scenarios for the Elkana 2 pressure zone, respectively. The following conclusions have been noted:

- The Bragg Creek pressure zone can maintain 300 kPa throughout most of the network. There is one dead end along Burney Road that drops below 300 kPa but remains within 10% of the standard.
- The Elkana 1 pressure zone ranges from 216 to 568 kPa due to significant changes in topography but averages approximately 414 kPa.
- The water main along Cummer Place consistently has low pressures in the range of 216 – 261 kPa.
- The Elkana 2 pressure zone ranges from 278 to 586 kPa during the 276 kPa pressure scenario and from 381 to 689 kPa during the 379 kPa pressure scenario. This high pressure of 689 kPa creates a risk of water mains breaking since this is the traditional pressure limit of standard water mains.
- Water pressures within Elkana vary considerably due to the area's significant elevation differences.
- It was noted by the County that certain service connections have pressure reducing valves in place to protect against high pressures.

Maximum Day Demand

The results of the existing MDD assessment are shown in **Figures 6.4** and **6.5** for the 276 and 379 kPa pump pressure scenarios for the Elkana 2 pressure zone, respectively. The results are very similar to the ADD conditions noted above because the head loss does not change considerably when the demand increases from 3.00 to 6.00 L/s. The water main along Cummer Place consistently has low pressures below the 300 kPa threshold.

Peak Hour Demand

The results of the existing PHD assessment are shown in **Figures 6.6** and **6.7** for the 276 and 379 kPa pump pressure scenarios for the Elkana 2 pressure zone, respectively. The results are similar to the ADD and MDD scenarios. The water main along Cummer Place consistently has low pressures below the 300 kPa threshold.

Maximum Day Demand Plus Fire Flow

The existing Bragg Creek and Elkana developments do not currently provide fire flow protection through traditional hydrants (dry hydrants are present). However, ISL simulated what fire flows could be achieved within the existing system under the assumption that fire pumps are available within Bragg Creek/Elkana and fire hydrants were placed throughout the study area. The results of this theoretical fire flow simulation will provide context to RVC should they pursue installing fire pumps and hydrants within the existing network.

The results of this fire flow assessment are summarized in **Figure 6.8** for the 379 kPa pump pressure scenario for the Elkana 2 pressure zone. It is assumed that this zone will operate at higher pressures in a theoretical fire flow simulation.

The results show that without a pumping capacity restriction:

- Bragg Creek can provide fire flows ranging from approximately 190 L/s near the reservoir, 50 L/s near Gateway Village and just under 50 L/s elsewhere.
- Elkana 1 is limited by a single 100 mm distribution main from the reservoir and cannot provide practical amounts of fire flow without upsizing.
- Elkana 2 is limited by a 150 mm single feed main from the reservoir and can only provide up fire flows in the range of 30 – 60 L/s.
- The results show that significant distribution system upgrades would be needed if fire flows are to be provided.
- To ensure stronger fire flow availability within Bragg Creek, the pressure zone HGL will also need to be increased from 1,336.7 m to 1,340.0 m.

6.6 Water System Upgrading Recommendations

Two upgrading options to provide fire flows to Bragg Creek have been evaluated:

- **Option #1:** Minimum upgrading requirements to provide fire flows to the core development area (Gateway Village, Balsam Avenue, and RVC Foundation) with no fire flows provided in Elkana.
- **Option #2:** Full upgrading requirements to provide fire flows throughout all of Bragg Creek and Elkana.

While Option #2 provides a higher level of service, it may not be possible at this time to provide full fire protection servicing, thus, Option #1 could be pursued in the short term with potential to further upgrade later to achieve the level of service offered by Option #2. **Table 6.4** and **Figures 6.9** (Option #1) and **6.10** (Option #2) summarize the existing system upgrades. Hydrants were assumed to be installed at every major intersection along the 300 mm upgrades.

Table 6.4: Existing Water Distribution System Upgrades

Upgrade ID	Description
Option #1 – Minimum Upgrading Requirements	
1.1	Bragg Creek fire pump (250 L/s) and increase of discharge header HGL to 1,340 m
1.2	Bragg Creek fire storage upgrade of 2,500 m^3
1.3	847 m of 300 mm water main from along Burnside Drive to the intersection of White Avenue and River Drive South
1.4	Installation of hydrants at intersections along Burnside Drive from the Bragg Creek Reservoir to River Drive South
Option #2 – Full Fire Flow Protection	
2.1 (1.1)	Bragg Creek fire pump (250 L/s) and increase of discharge header HGL to 1,340 m
2.2 (1.2)	Bragg Creek fire storage upgrade of 2,500 m^3
2.3 (1.3)	847 m of 300 mm water main from along Burnside Drive to the intersection of White Avenue and River Drive South
2.4 (1.4)	Installation of Hydrants at intersections along Burnside Drive from the Bragg Creek Reservoir to River Drive South
2.5	Upper Elkana Pumphouse fire pump (50 L/s)
2.6	Upper Elkana Reservoir fire storage upgrade of 100 m^3
2.7	Elkana Zone 1: 2,639 m of 200 mm upgrading and looping
2.8	Elkana Zone 2: 2,248 m of 200 mm upgrading and looping
2.9	727 m of 300 mm water main along White Avenue from Harwood Street to west of Park Point
2.10	Installation of Hydrants at intersections and cul-de-sac entrances within Bragg Creek
2.11	Installation of hydrants at intersections and cul-de-sac entrances within Elkana

It should be noted that Elkana can experience very high and low pressures simultaneously due to the steep topography. During the 379 kPa pressure pump scenario, some areas within Elkana 2 experience pressures up to 689 kPa which is the pressure limit of standard water mains implying there is a risk of water mains bursting. Any pumping or HGL improvements within Elkana should investigate impacts to the water mains to ensure risks are mitigated. Additionally, further review of the PRV locations should be confirmed since pressure changes within the system could cause issues at individual homes.

6.7 Cost Estimates

Cost estimates for the potential water system upgrades are summarized in **Table 6.5**. The cost includes 10% for engineering and 30% for contingency. For more details on the cost estimates, see **Appendix A**.

Table 6.5: Existing Water System Upgrade Cost Estimates

ID	Description	Cost ($M)
Upgrade Option #1 – Minimum Upgrading Requirements		
1.1	Bragg Creek fire pump (250 L/s)	0.70
1.2	Bragg Creek fire storage upgrade (2,500 m³)	5.26
1.3	847 m of 300 mm water main along Burnside Ave to White Ave/River Dr S	0.75
1.4	Installation of Hydrants at intersections along Burnside Ave and White Ave	0.25
	Option #1 Total ($M)	**6.96**
Upgrade Option #2 – Full Fire Flow Protection		
2.1 (1.1)	Bragg Creek fire pump (250 L/s)	0.70
2.2 (1.2)	Bragg Creek fire storage upgrade (2,500 m³)	5.26
2.3 (1.3)	847 m of 300 mm water main along Burnside Ave to White Ave/River Dr S	0.75
2.4 (1.4)	Installation of Hydrants at intersections along Burnside Ave and White Ave	0.25
2.5	Elkana fire pump (50 L/s)	0.14
2.6	Elkana reservoir fire storage upgrade (100 m³)	0.22
2.7	Elkana Zone 1: 2,639 m of 200 mm upgrading and looping	1.76
2.8	Elkana Zone 2: 2,248 m of 200 mm upgrading and looping	1.50
2.9	727 m of 300 mm water main along White Ave from Harwood St to Park Pt	0.65
2.10	Installation of hydrants at intersections elsewhere in Bragg Creek	0.50
2.11	Installation of hydrants at cul-de-sac entrances within Elkana	0.28
	Option #2 Total ($M)	**12.01**

6.8 Upgraded Water System Assessment

Average Day Demand

Upgraded ADD results are summarized in **Figures 6.11** and **6.12** for Options #1 and #2, respectively. The results indicate a moderate increase in pressures throughout Bragg Creek due to the proposed increase in discharge header HGL from 1,336.7 m to 1,340 m.

Maximum Day Demand

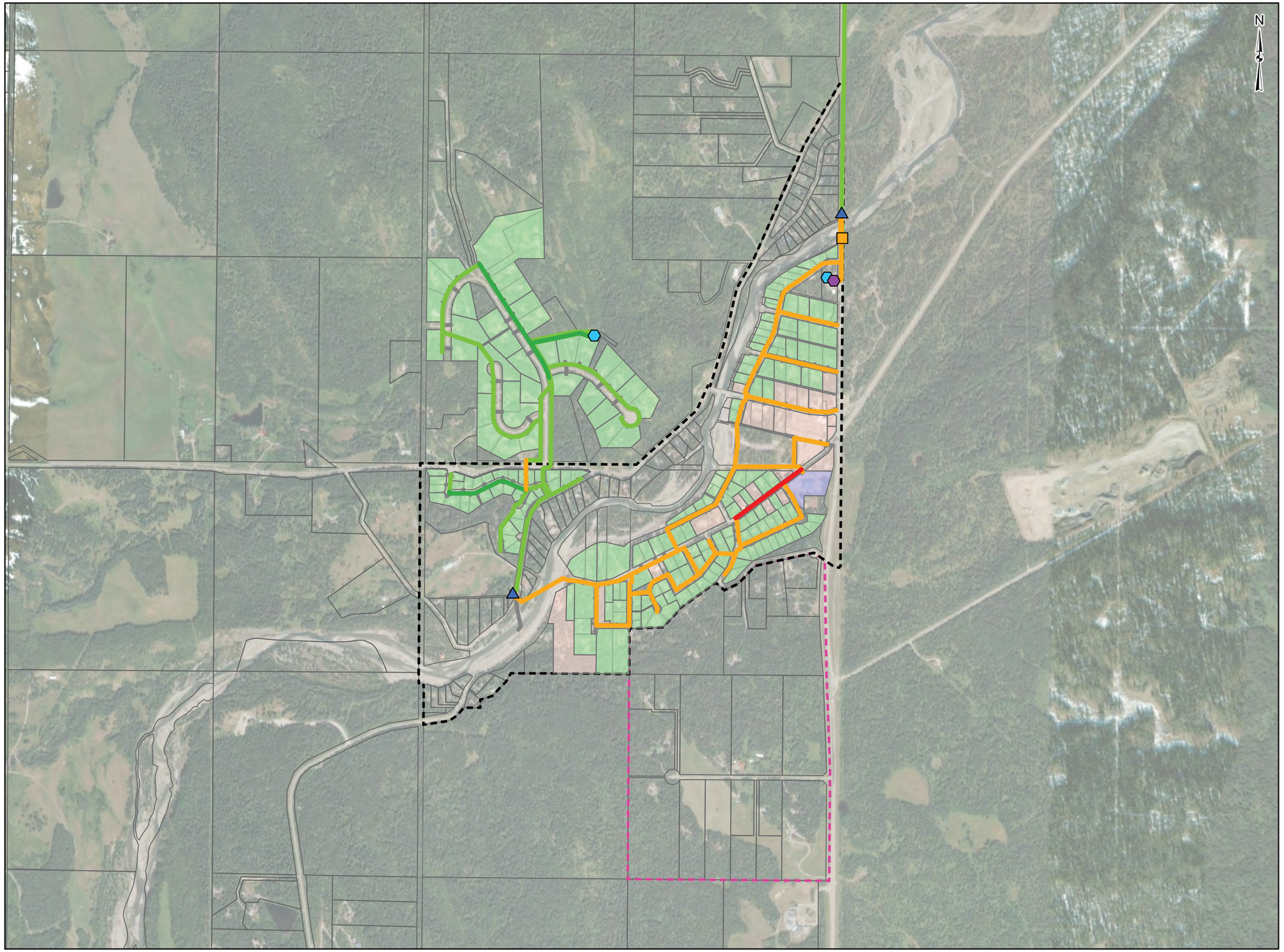
Upgraded MDD results are summarized in **Figures 6.13** and **6.14** for Options #1 and #2, respectively. The results are similar to the ADD results.

Peak Hour Demand

Upgraded PHD results are summarized in **Figures 6.15** and **6.16** for Options #1 and #2, respectively. The results are similar to the ADD results.

Maximum Day Demand Plus Fire Flow

Upgraded MDD+FF results are summarized in **Figures 6.17** and **6.18** for Options #1 and #2, respectively. Option #1 shows that with the minimum upgrades, 250 L/s of fire flow can be achieved at the intersection of White Avenue and River Drive South. Option #2 shows that if the 300 mm is extended along White Avenue to west of Park Point, the Bragg Creek Trading Post can achieve over 180 L/s, which exceeds the minimum requirement of 166 L/s for commercial development. Upgrading the Elkana distribution system to 200 mm with looping from Cummer Place to the intersection of Centre Avenue and Bracken Road will ensure that the 50 L/s fire flow requirement can be met everywhere.



LEGEND

- Booster Station
- Raw Water Lift Station
- Reservoir
- Treatment Plant
- Study Area
- Expansion Area
- Parcels

Water Main Diameter (mm)

- Unknown
- 100 mm
- 150 mm
- 200 mm
- 300 mm

Service Area Land Use

- Commercial
- Institutional
- Residential

TITLE

EXISTING WATER SYSTEM SERVICE AREA

PROJECT

BRAGG CREEK SERVICING STUDY

CLIENT

ROCKY VIEW COUNTY

DATA SOURCES

- Topographic Map:Maxar

PROJECTION

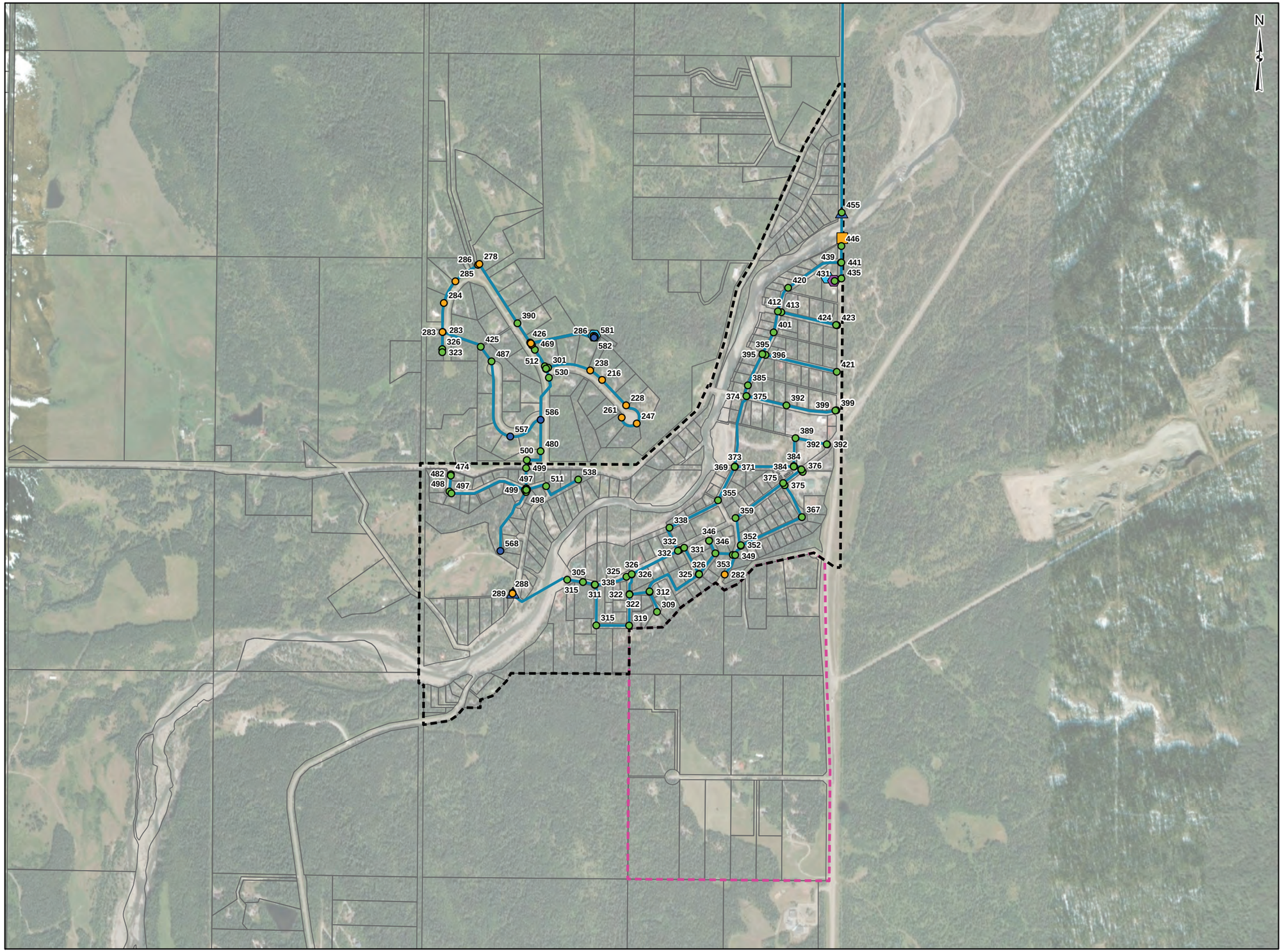
NAD 1983 3TM 114

0 180 360

1:15,000 Meters

FIGURE	6.1
DATE	7/30/2025
PROJECT NO.	28782
AUTHOR	epoon

Document: M:\28782_Bragg_Creek\01_GIS\28782_Bragg_Creek_Servicing_Study\28782_Bragg_Creek_Servicing_Study.aprx - Figure 6.1 - Ex. Water System - Service Area



LEGEND

- Booster Station
- Raw Water Lift Station
- Reservoir
- Treatment Plant
- Water Mains
- Study Area
- Expansion Area
- Parcels

Pressure (kPa)

- Less than 150
- 150 - 300
- 300 - 550
- 550 - 690
- Greater than 690

Note: Labels show modelled pressure in kPa.

TITLE

EXISTING SYSTEM - 276 KPA ADD RESULTS

PROJECT

BRAGG CREEK SERVICING STUDY

CLIENT

ROCKY VIEW COUNTY

DATA SOURCES

- Topographic Map:Maxar

PROJECTION

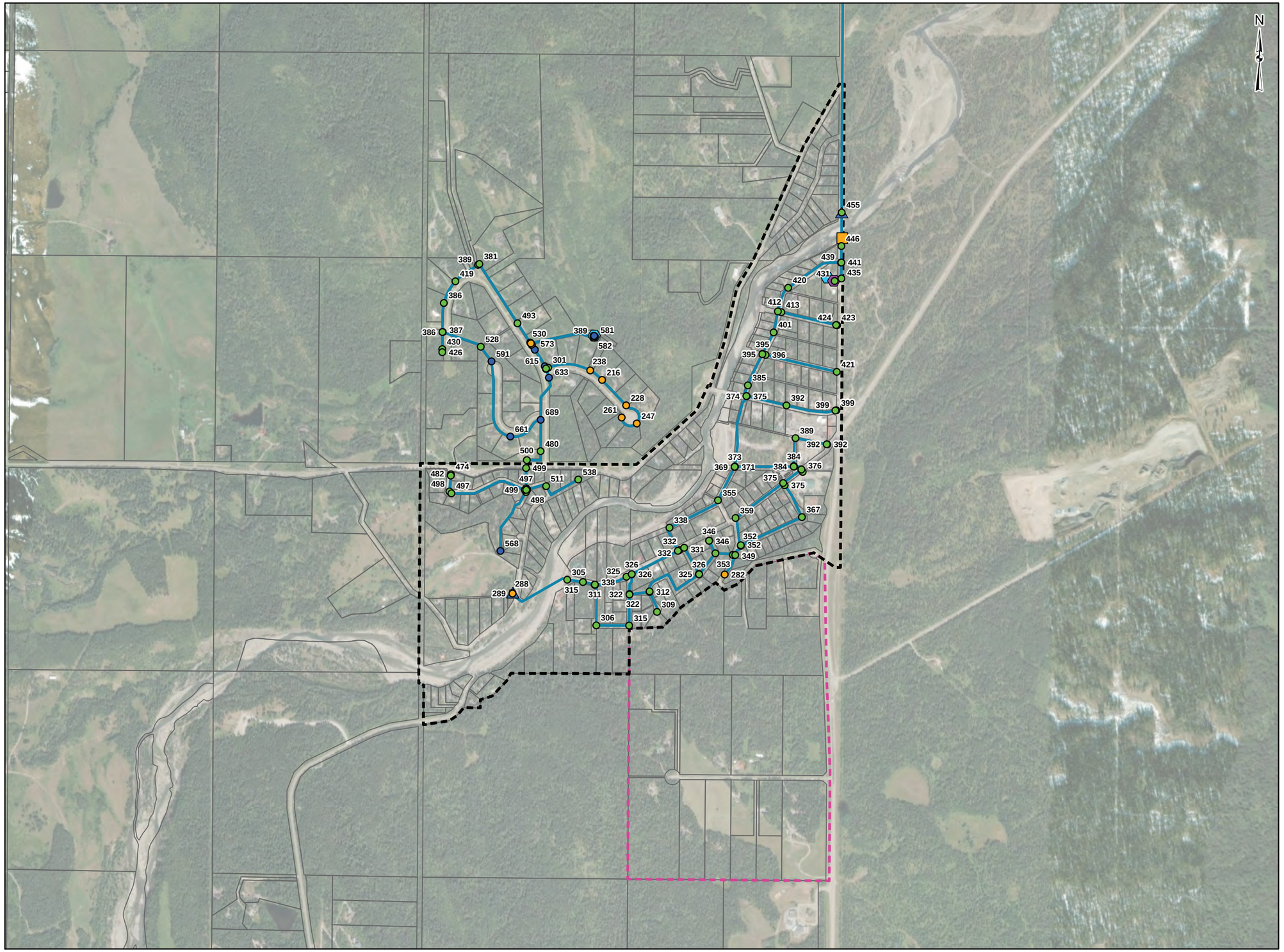
NAD 1983 3TM 114

0 180 360

1:15,000 Meters

FIGURE	6.2
DATE	7/30/2025
PROJECT NO.	28782
AUTHOR	epoon

Document: M:\28782_Bragg_Creek\01_GIS\28782_Bragg_Creek_Servicing_Study\28782_Bragg_Creek_Servicing_Study.aprx - Figure 6.2 - Ex. Water System - ADD - 276kPa - 40 psi



LEGEND

- Booster Station
- Raw Water Lift Station
- Reservoir
- Treatment Plant
- Water Mains
- Study Area
- Expansion Area
- Parcels

Pressure (kPa)

- Less than 150
- 150 - 300
- 300 - 550
- 550 - 690
- Greater than 690

Note: Labels show modelled pressure in kPa.

TITLE

EXISTING SYSTEM - 379 KPA ADD RESULTS

PROJECT

BRAGG CREEK SERVICING STUDY

CLIENT

ROCKY VIEW COUNTY

DATA SOURCES

- Topographic Map:Maxar

PROJECTION

NAD 1983 3TM 114

0 180 360

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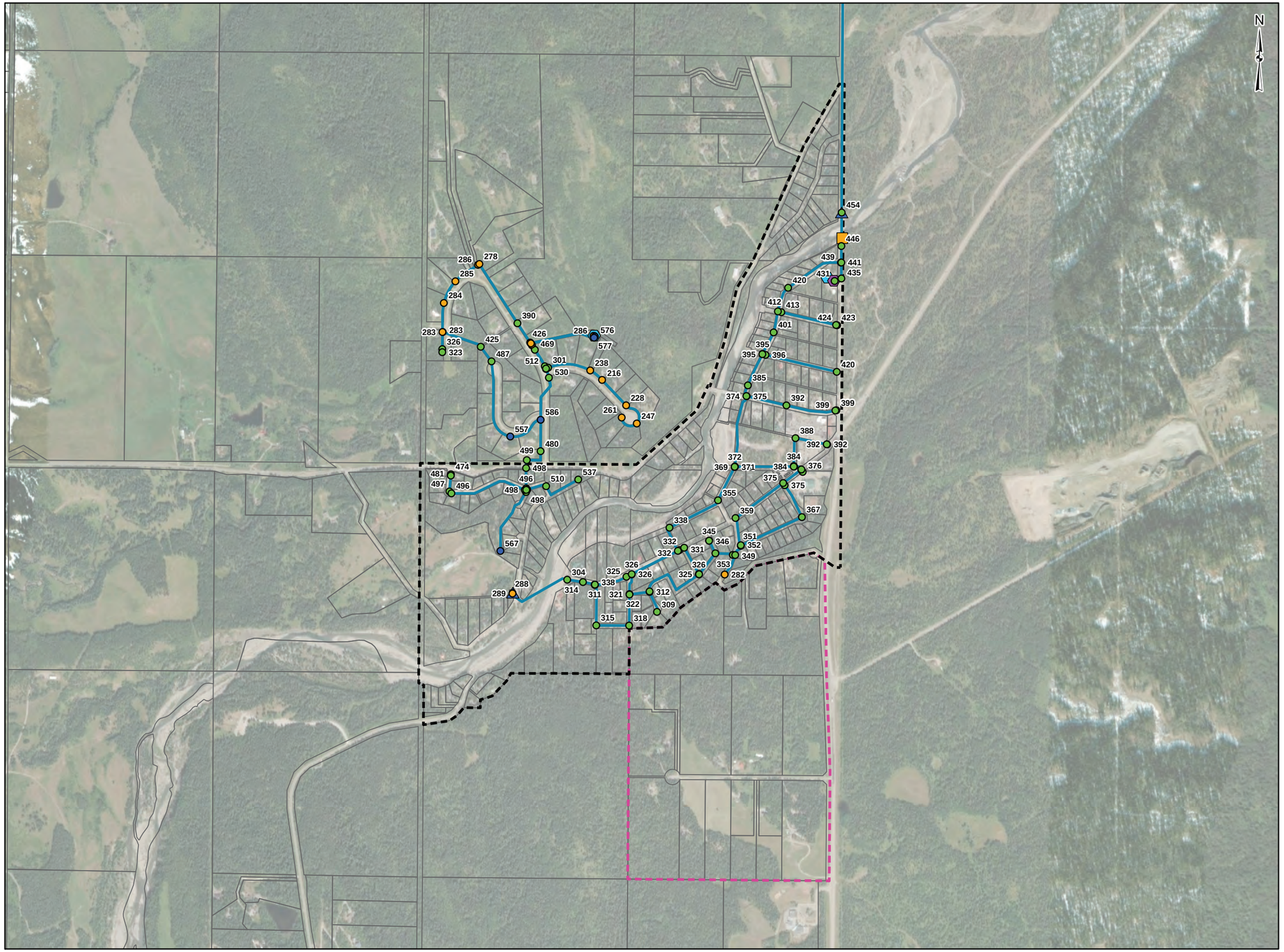
FIGURE	6.3
DATE	7/30/2025
PROJECT NO.	28782
AUTHOR	epoon

Document: M:\28782_Bragg_Creek\01_GIS\28782_Bragg_Creek_Servicing_Study\28782_Bragg_Creek_Servicing_Study.aprx - Figure 6.3 - Ex. Water System - ADD - 379 kPa - 55 psi



LEGEND

- Booster Station
- Raw Water Lift Station
- Reservoir
- Treatment Plant
- Water Mains
- Study Area
- Expansion Area
- Parcels

Pressure (kPa)

- Less than 150
- 150 - 300
- 300 - 550
- 550 - 690
- Greater than 690

Note: Labels show modelled pressure in kPa.

TITLE

EXISTING SYSTEM - 276 KPA MDD RESULTS

PROJECT

BRAGG CREEK SERVICING STUDY

CLIENT

ROCKY VIEW COUNTY

DATA SOURCES

- Topographic Map:Maxar

PROJECTION

NAD 1983 3TM 114

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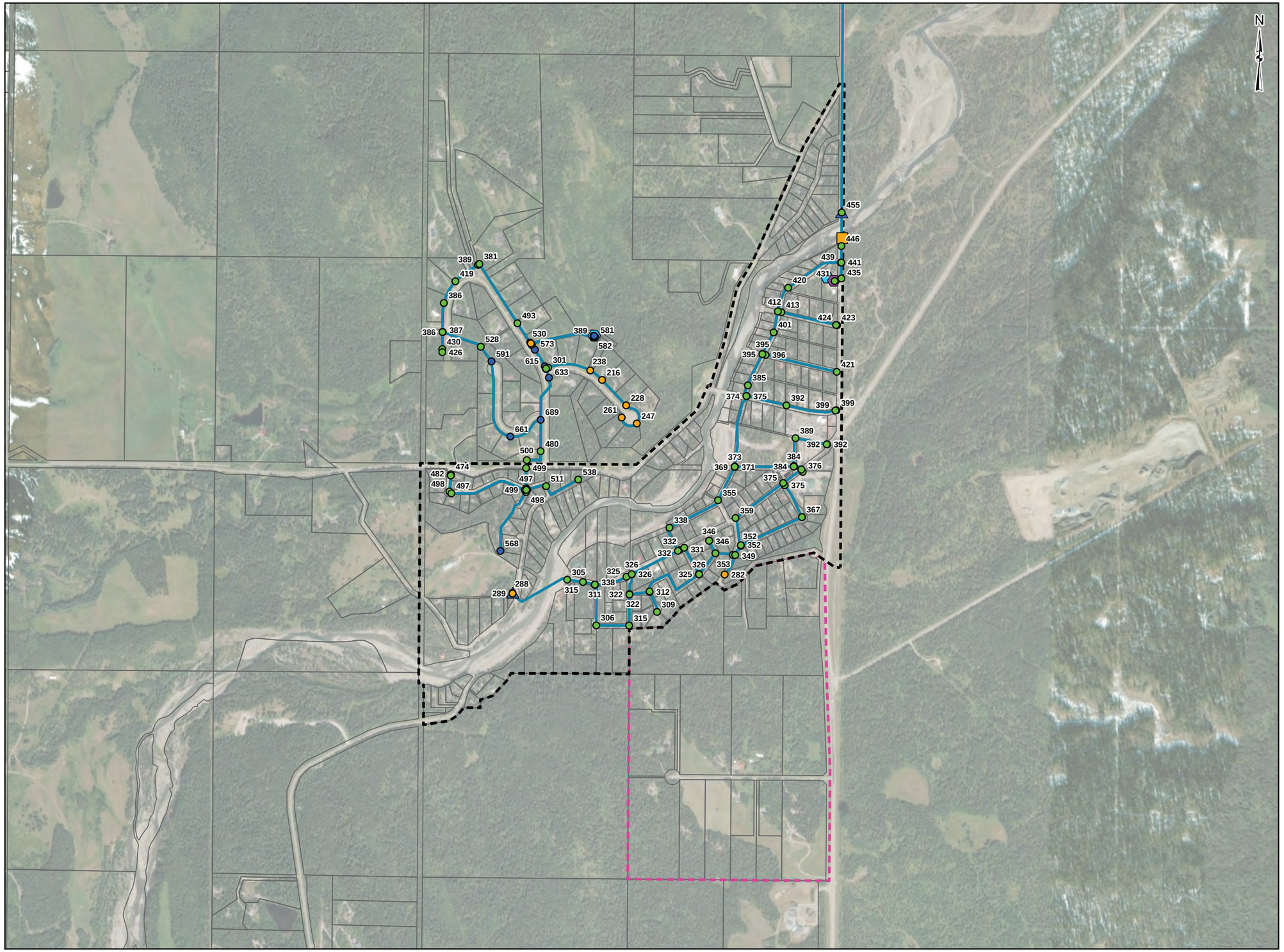
FIGURE	6.4
DATE	7/30/2025
PROJECT NO.	28782
AUTHOR	epoon

Document: M:\28782_Bragg_Creek\01_GIS\28782_Bragg_Creek_Servicing_Study\28782_Bragg_Creek_Servicing_Study.aprx - Figure 6.4 - Ex. Water System - MDD - 276 kPa - 40 psi



LEGEND

- Booster Station
- Raw Water Lift Station
- Reservoir
- Treatment Plant
- Water Mains
- Study Area
- Expansion Area
- Parcels

Pressure (kPa)

- Less than 150
- 150 - 300
- 300 - 550
- 550 - 690
- Greater than 690

Note: Labels show modelled pressure in kPa.

TITLE

EXISTING SYSTEM - 379 KPA MDD RESULTS

PROJECT

BRAGG CREEK SERVICING STUDY

CLIENT

ROCKY VIEW COUNTY

DATA SOURCES

- Topographic Map:Maxar

PROJECTION

NAD 1983 3TM 114

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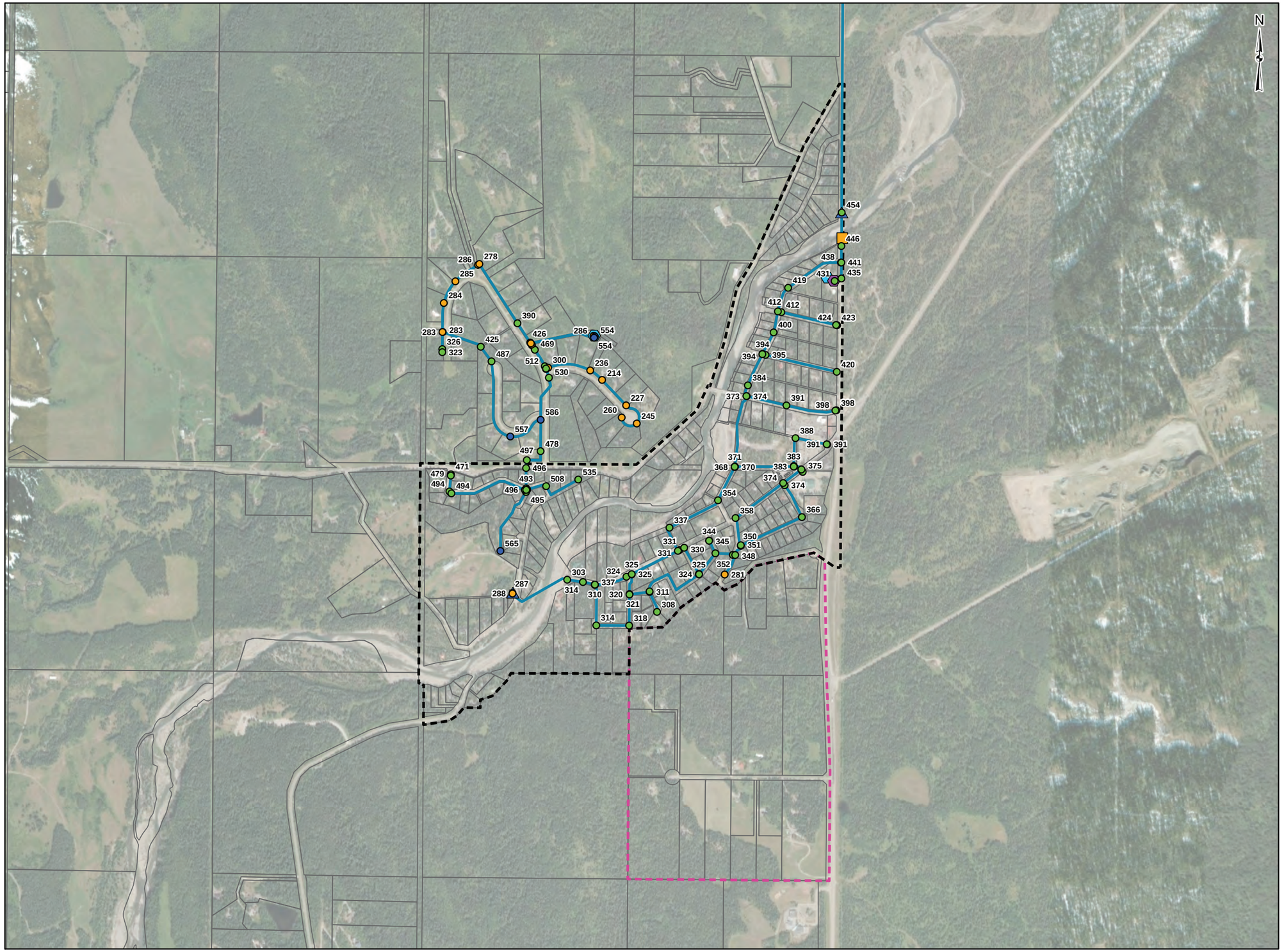
1:15,000 Meters

FIGURE	6.5
DATE	7/30/2025
PROJECT NO.	28782
AUTHOR	epoon

Document: M:\28782_Bragg_Creek\01_GIS\28782_Bragg_Creek_Servicing_Study\28782_Bragg_Creek_Servicing_Study.aprx - Figure 6.5 - Ex. Water System - MDD - 379 kPa - 55 psi



LEGEND

- Booster Station
- Raw Water Lift Station
- Reservoir
- Treatment Plant
- Water Mains
- Study Area
- Expansion Area
- Parcels

Pressure (kPa)

- Less than 150
- 150 - 300
- 300 - 550
- 550 - 690
- Greater than 690

Note: Labels show modelled pressure in kPa.

TITLE

EXISTING SYSTEM - 276 KPA PHD RESULTS

PROJECT

BRAGG CREEK SERVICING STUDY

CLIENT

ROCKY VIEW COUNTY

DATA SOURCES

- Topographic Map:Maxar

PROJECTION

NAD 1983 3TM 114

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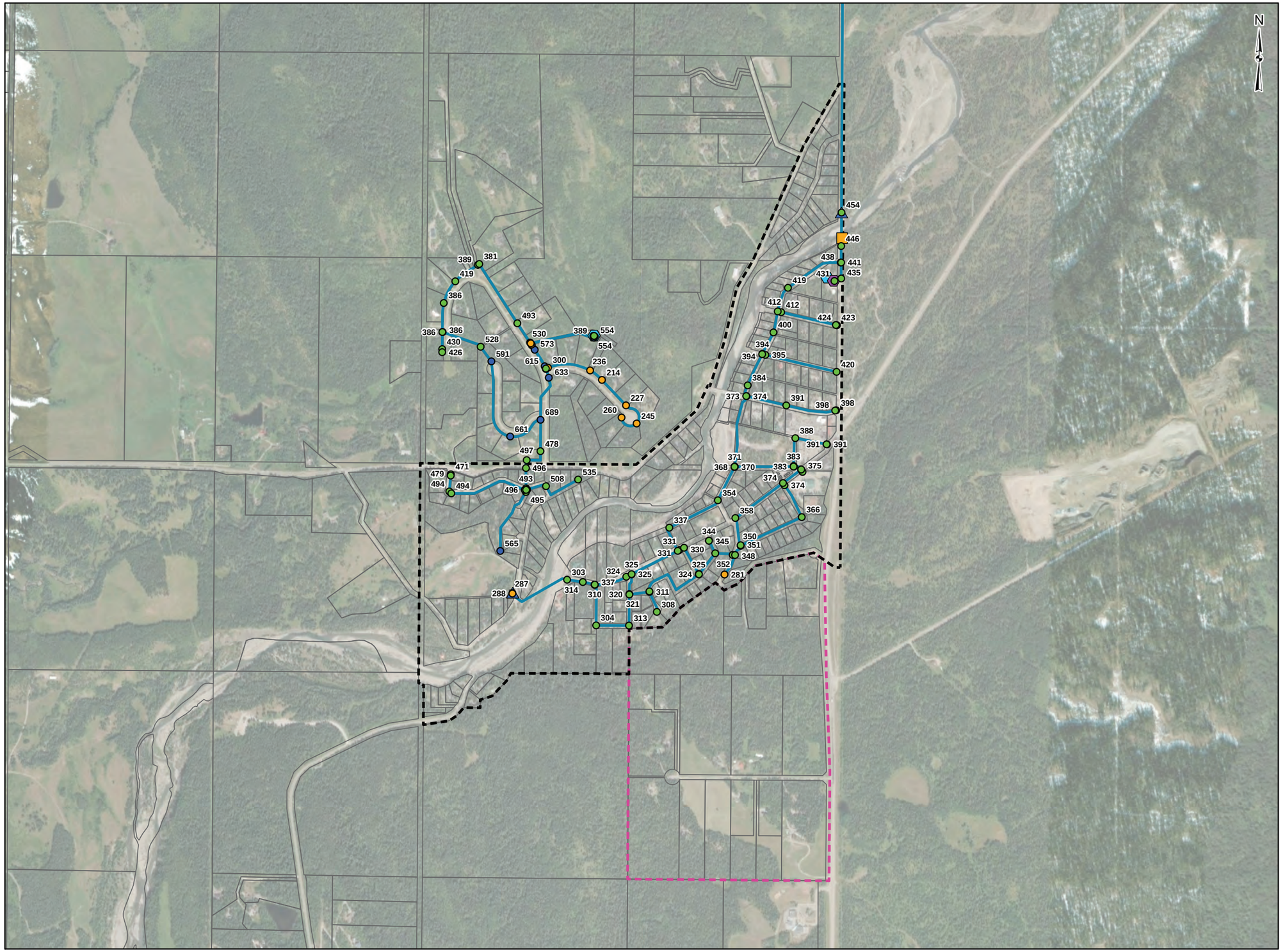
1:15,000 Meters

FIGURE	6.6
DATE	7/30/2025
PROJECT NO.	28782
AUTHOR	epoon

Document: M:\28782_Bragg_Creek\01_GIS\28782_Bragg_Creek_Servicing_Study\28782_Bragg_Creek_Servicing_Study.aprx - Figure 6.6 - Ex. Water System - PHD - 276kPa - 40 psi



LEGEND

- Booster Station
- Raw Water Lift Station
- Reservoir
- Treatment Plant
- Water Mains
- Study Area
- Expansion Area
- Parcels

Pressure (kPa)

- Less than 150
- 150 - 300
- 300 - 550
- 550 - 690
- Greater than 690

Note: Labels show modelled pressure in kPa.

TITLE

EXISTING SYSTEM - 379 KPA PHD RESULTS

PROJECT

BRAGG CREEK SERVICING STUDY

CLIENT

ROCKY VIEW COUNTY

DATA SOURCES

- Topographic Map:Maxar

PROJECTION

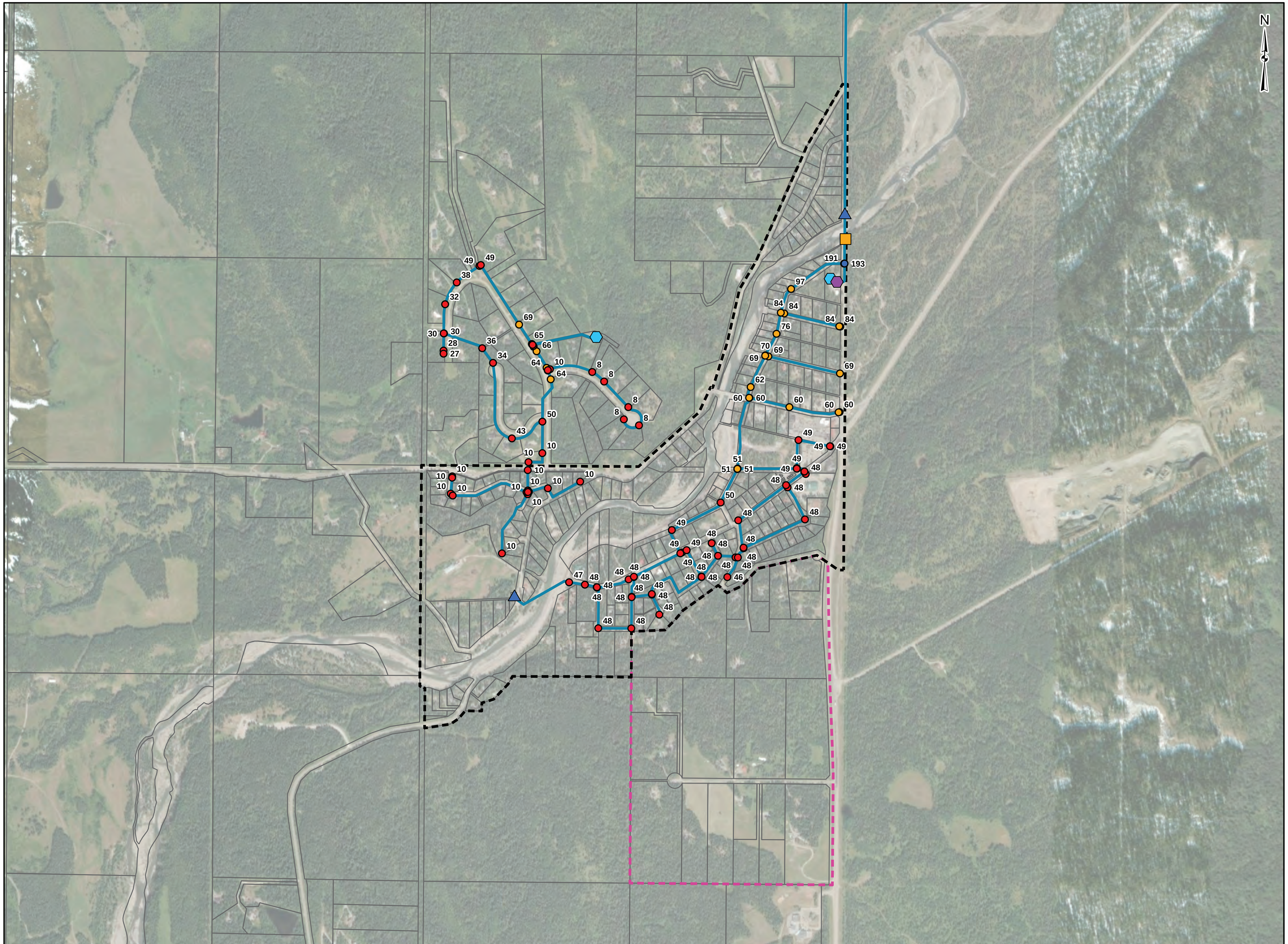
NAD 1983 3TM 114

0 180 360

1:15,000 Meters

FIGURE	6.7
DATE	7/30/2025
PROJECT NO.	28782
AUTHOR	epoon

Document: M:\28782_Bragg_Creek\01_GIS\28782_Bragg_Creek_Servicing_Study\28782_Bragg_Creek_Servicing_Study.aprx - Figure 6.7 - Ex. Water System - PHD - 379kPa - 55 psi



LEGEND

- Booster Station
- Raw Water Lift Station
- Reservoir
- Treatment Plant
- Water Mains
- Study Area
- Expansion Area
- Parcels

Theoretical Available Fire Flow (L/s)

- Less than 50
- 50 - 100
- 100 - 166
- Greater than 166

Note 1: Existing theoretical fire flow results show the available fire flow capacity assuming there is sufficient pumping capacity and fire flows are limited only by the distribution system.

Note 2: Labels show modelled available fire flow in L/s.

TITLE
EXISTING THEORETICAL SYSTEM - 379 KPA MDD + FF RESULTS

PROJECT
BRAGG CREEK SERVICING STUDY

CLIENT
ROCKY VIEW COUNTY

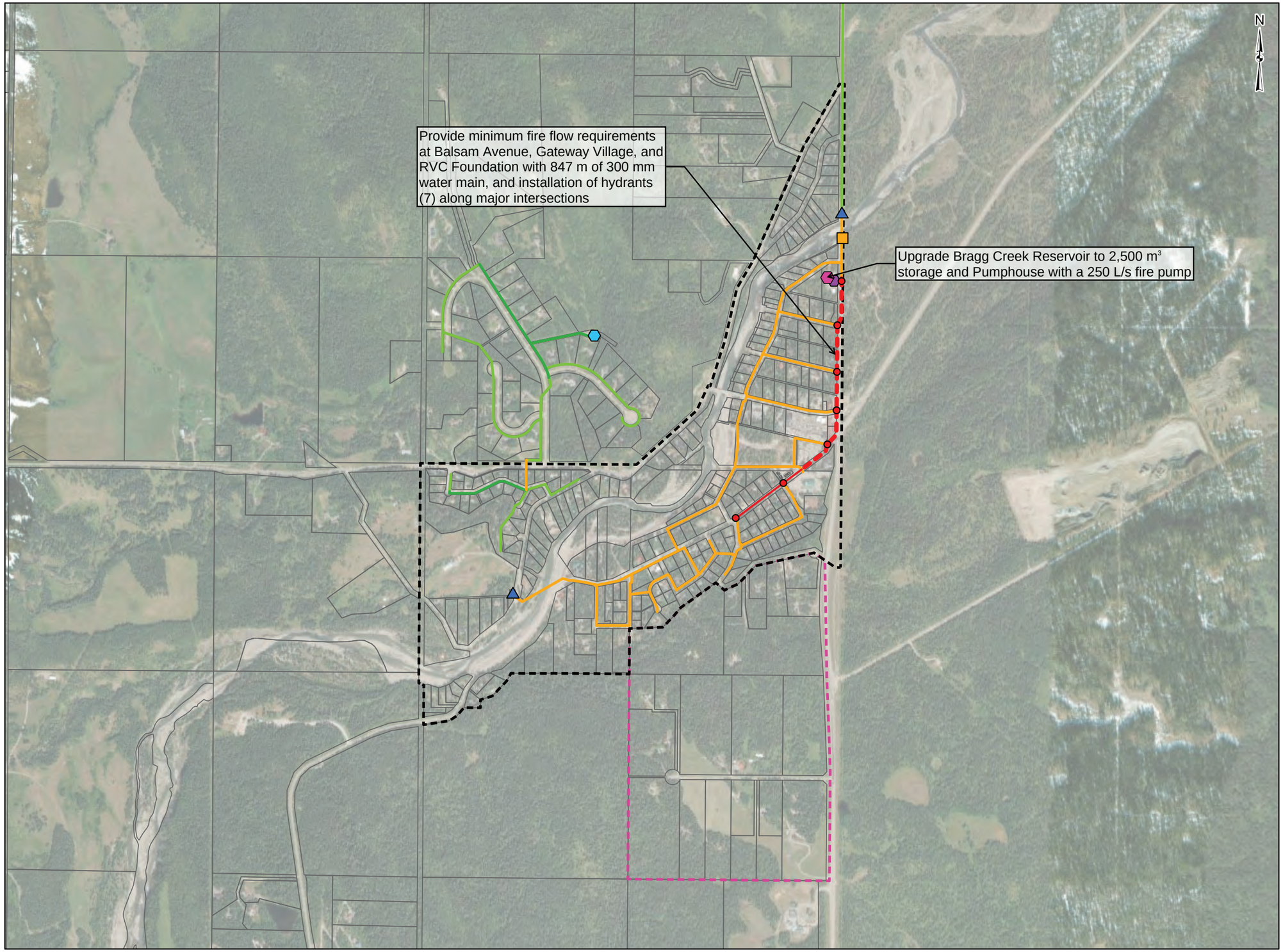
DATA SOURCES
- Topographic Map:Maxar

PROJECTION
NAD 1983 3TM 114

0 180 360
1:15,000 Meters

FIGURE	6.8
DATE	7/31/2025
PROJECT NO.	28782
AUTHOR	epoon

ISL



LEGEND

- Booster Station
- Raw Water Lift Station
- Reservoir
- Treatment Plant
- New/Upgraded Reservoir
- Proposed Hydrants
- Study Area
- Expansion Area
- Parcels

Existing Mains

- 100 mm
- 150 mm
- 200 mm
- 300 mm

Proposed Upgrades

- Proposed 300 mm Main

TITLE

EXISTING WATER SYSTEM UPGRADE
OPTION #1 - MINIMUM REQUIREMENTS

PROJECT

BRAGG CREEK SERVICING STUDY

CLIENT

ROCKY VIEW COUNTY

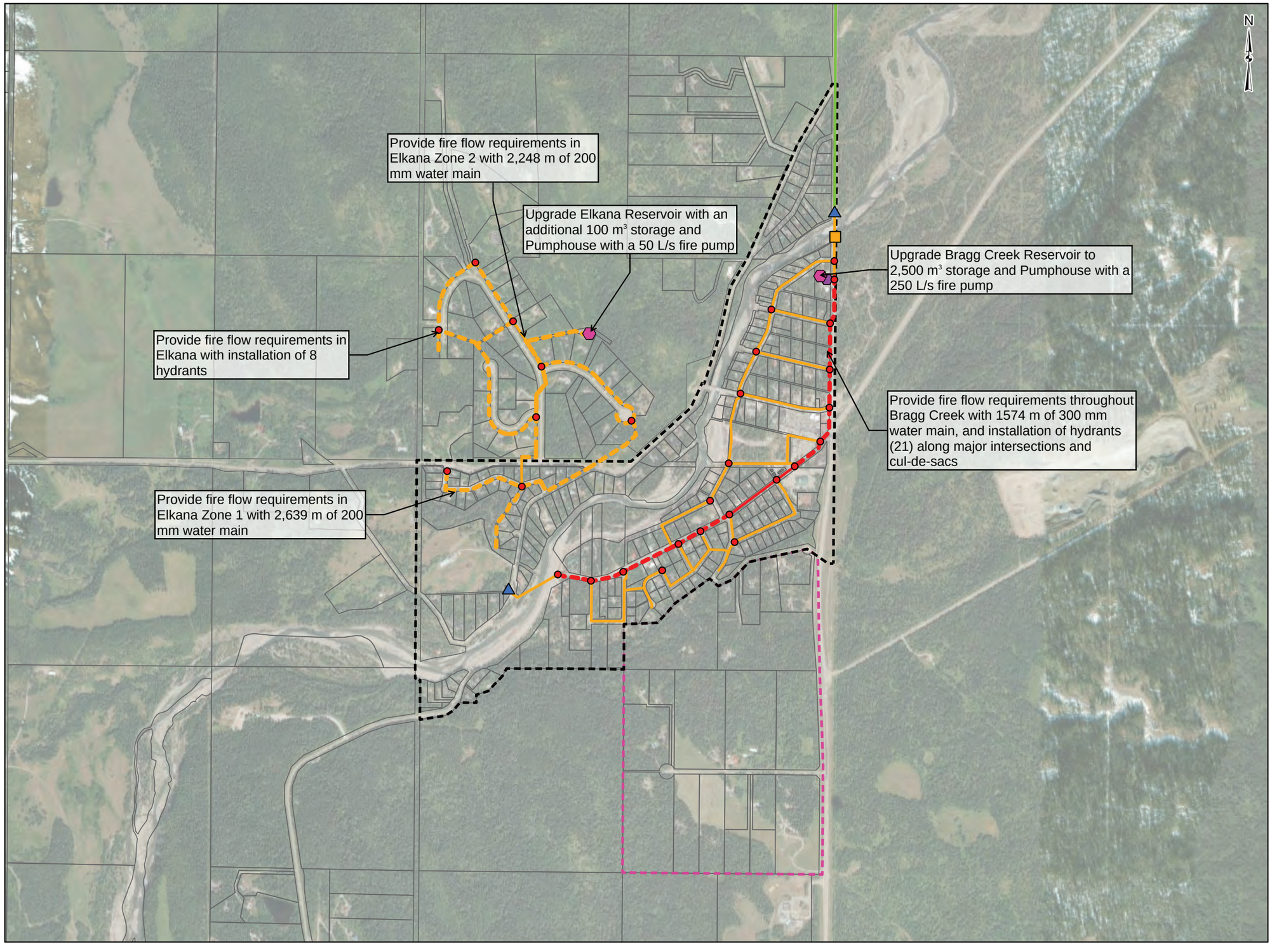
DATA SOURCES
- Topographic Map:Maxar

PROJECTION
NAD 1983 3TM 114

0 180 360
1:15,000 Meters

FIGURE	6.9
DATE	7/30/2025
PROJECT NO.	28782
AUTHOR	epoon

Document: M:\28782_Bragg_Creek\01_GIS\28782_Bragg_Creek_Servicing_Study\28782_Bragg_Creek_Servicing_Study.aprx - Figure 6.9 - Ex. Mn. Upgraded Water System - Option #1



LEGEND

- Booster Station
- Raw Water Lift Station
- Treatment Plant
- New/Upgraded Reservoir
- Proposed Hydrants
- Study Area
- Expansion Area
- Parcels

Existing Mains

- 100 mm
- 200 mm
- 300 mm

Proposed Upgrades

- 200 mm
- 300 mm

TITLE
EXISTING WATER SYSTEM UPGRADE OPTION #2 - FULL FIRE PROTECTION

PROJECT
BRAGG CREEK SERVICING STUDY

CLIENT
ROCKY VIEW COUNTY

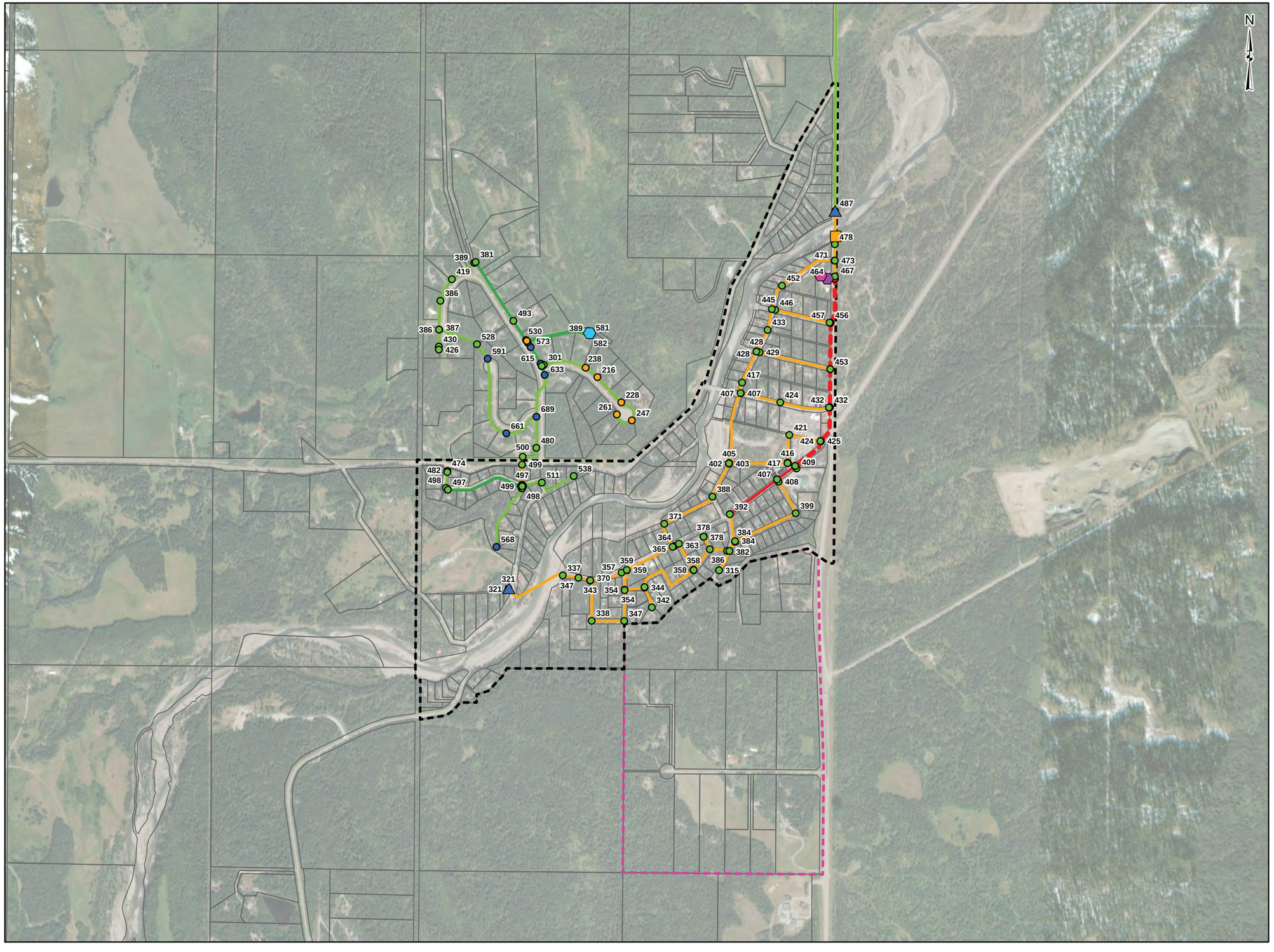
DATA SOURCES
- Topographic Map:Maxar

PROJECTION
NAD 1983 3TM 114

0 180 360
1:15,000 Meters

FIGURE	6.10
DATE	7/30/2025
PROJECT NO.	28782
AUTHOR	epoon

Document: M:\28782_Bragg_Creek\01_GIS\28782_Bragg_Creek_Servicing_Study\28782_Bragg_Creek_Servicing_Study.aprx - Figure 6.10 - Ex. Tot. Upgraded Water System - Option #2



LEGEND

- Booster Station
- Raw Water Lift Station
- Reservoir
- Treatment Plant
- New/Upgraded Reservoir
- Study Area
- Expansion Area
- Parcels

Pressure (kPa)

- Less than 150
- 150 - 300
- 300 - 550
- 550 - 690
- Greater than 690

Existing Mains

- 100 mm
- 150 mm
- 200 mm
- 300 mm

Proposed Upgrades

- 300 mm

Note: Labels show modelled pressures in kPa.

TITLE
EXISTING WATER SYSTEM UPGRADE OPTION #1 - ADD RESULTS

PROJECT
BRAGG CREEK SERVICING STUDY

CLIENT
ROCKY VIEW COUNTY

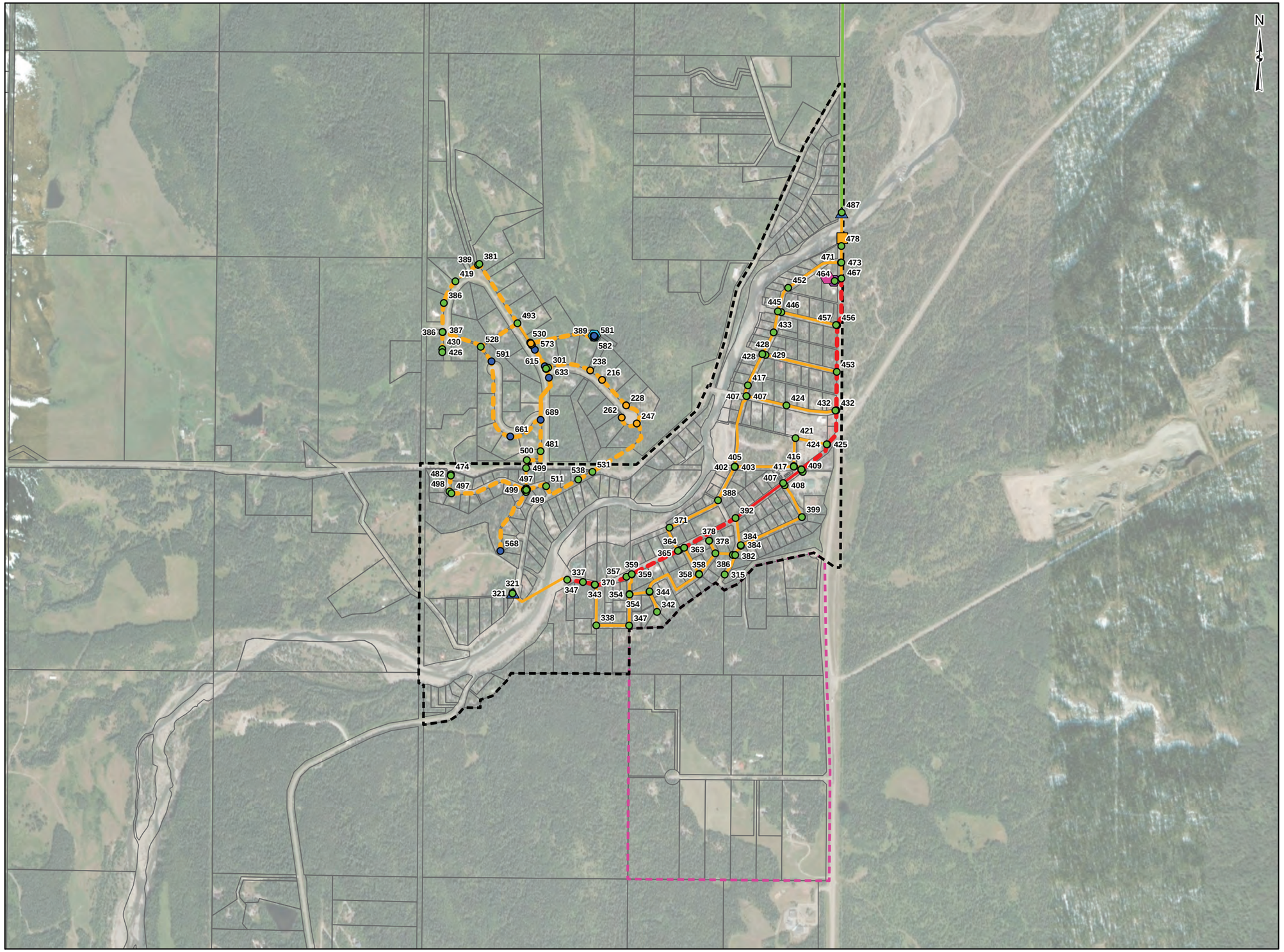
DATA SOURCES
- Topographic Map:Maxar

PROJECTION
NAD 1983 3TM 114

0 180 360
1:15,000 Meters

FIGURE	6.11
DATE	7/31/2025
PROJECT NO.	28782
AUTHOR	epoon

Document: M:\28782_Bragg_Creek\01_GIS\28782_Bragg_Creek_Servicing_Study\28782_Bragg_Creek_Servicing_Study.aprx - Figure 6.11 - Ex. Min. Upgraded Water System - ADD Results



LEGEND

- Booster Station
- Raw Water Lift Station
- Reservoir
- Treatment Plant
- New/Upgraded Reservoir
- Study Area
- Expansion Area
- Parcels

Pressure (kPa)

- Less than 150
- 150 - 300
- 300 - 550
- 550 - 690
- Greater than 690

Existing Mains

- 100 mm
- 200 mm
- 300 mm

Proposed Upgrades

- 200 mm
- 300 mm

Note: Labels show modelled pressures in kPa.

TITLE
EXISTING WATER SYSTEM UPGRADE OPTION #2 - ADD RESULTS

PROJECT
BRAGG CREEK SERVICING STUDY

CLIENT
ROCKY VIEW COUNTY

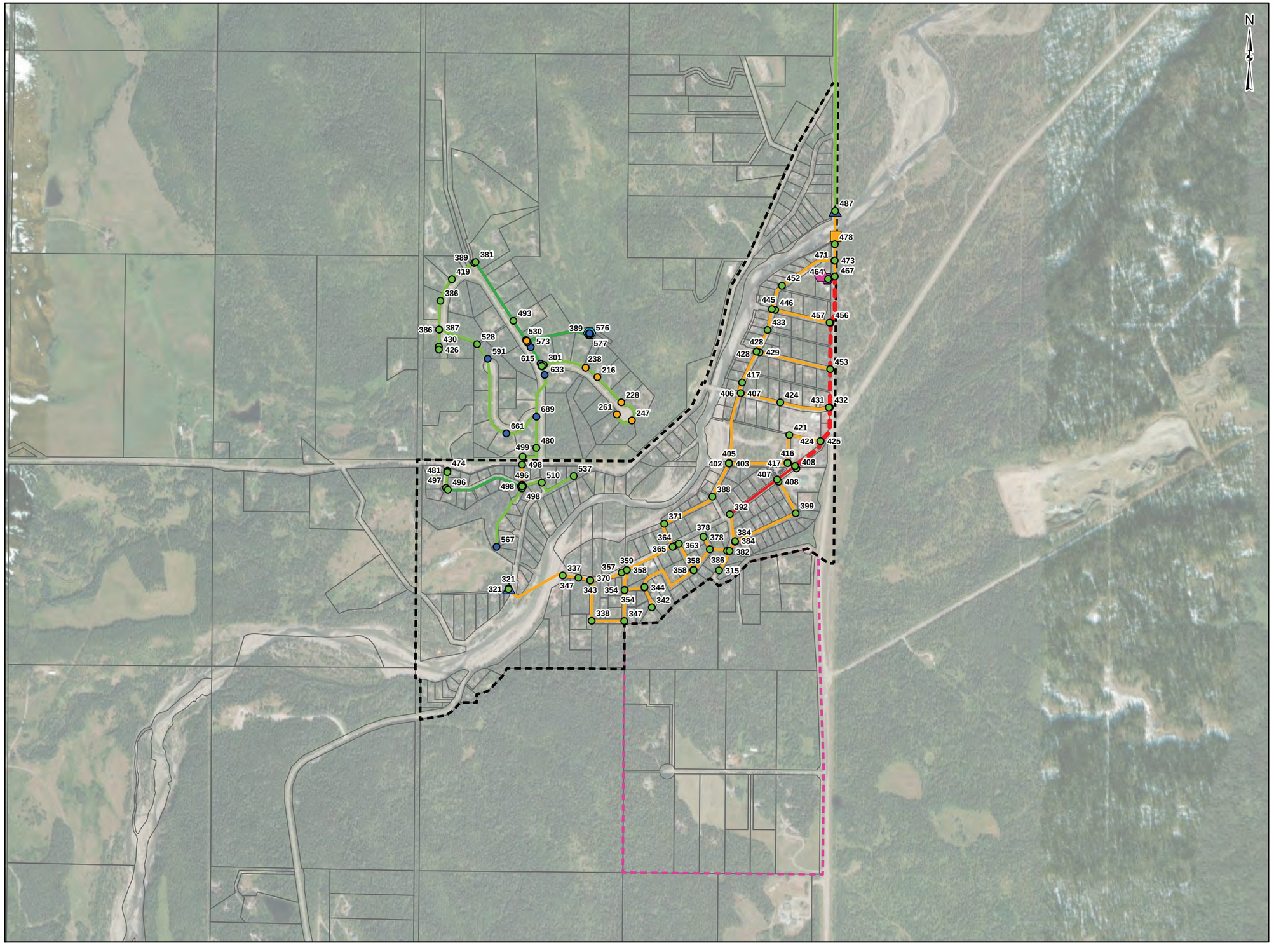
DATA SOURCES
- Topographic Map:Maxar

PROJECTION
NAD 1983 3TM 114

0 180 360
1:15,000 Meters

FIGURE	6.12
DATE	7/30/2025
PROJECT NO.	28782
AUTHOR	epoon

Document: M:\28782_Bragg_Creek\01_GIS\28782_Bragg_Creek_Servicing_Study\28782_Bragg_Creek_Servicing_Study.aprx - Figure 6.12 - Ex. Tot. Upgraded Water System - ADD Results



LEGEND

- Booster Station
- Raw Water Lift Station
- Reservoir
- Treatment Plant
- New/Upgraded Reservoir
- Study Area
- Expansion Area
- Parcels

Pressure (kPa)

- Less than 150
- 150 - 300
- 300 - 550
- 550 - 690
- Greater than 690

Existing Mains

- 100 mm
- 150 mm
- 200 mm
- 300 mm

Proposed Upgrades

- 300 mm

Note: Labels show modelled pressures in kPa.

TITLE
EXISTING WATER SYSTEM UPGRADE OPTION #1 - MDD RESULTS

PROJECT
BRAGG CREEK SERVICING STUDY

CLIENT
ROCKY VIEW COUNTY

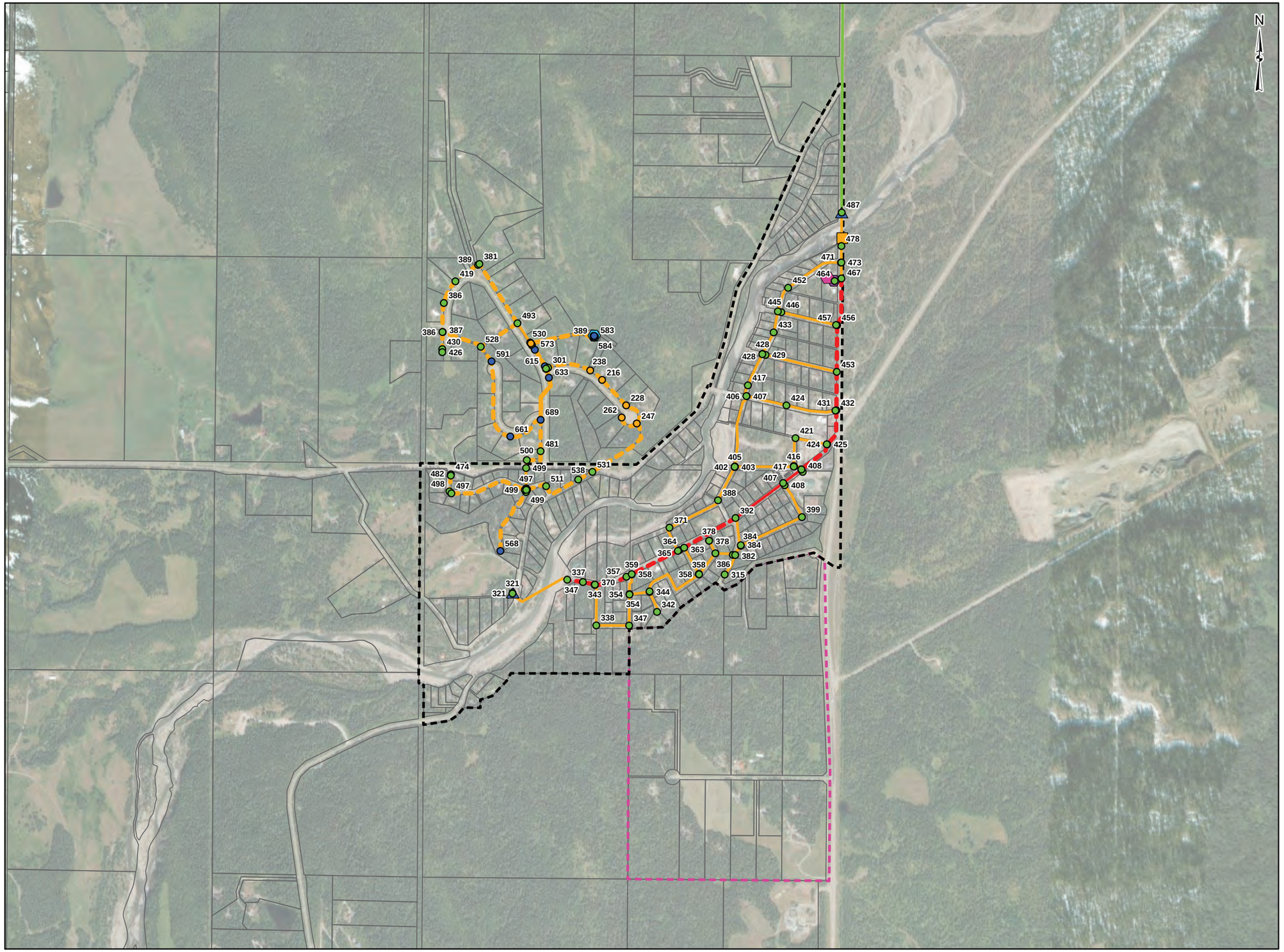
DATA SOURCES
- Topographic Map:Maxar

PROJECTION
NAD 1983 3TM 114

0 180 360
1:15,000 Meters

FIGURE	6.13
DATE	7/30/2025
PROJECT NO.	28782
AUTHOR	epoon

Document: M:\28782_Bragg_Creek\01_GIS\28782_Bragg_Creek_Servicing_Study\28782_Bragg_Creek_Servicing_Study.aprx - Figure 6.13 - Ex. Min. Upgraded Water System - MDD Results



LEGEND

- Booster Station
- Raw Water Lift Station
- Reservoir
- Treatment Plant
- New/Upgraded Reservoir
- Study Area
- Expansion Area
- Parcels

Pressure (kPa)

- Less than 150
- 150 - 300
- 300 - 550
- 550 - 690
- Greater than 690

Existing Mains

- 100 mm
- 200 mm
- 300 mm

Proposed Upgrades

- 200 mm
- 300 mm

Note: Labels show modelled pressures in kPa.

TITLE
EXISTING WATER SYSTEM UPGRADE OPTION #2 - MDD RESULTS

PROJECT
BRAGG CREEK SERVICING STUDY

CLIENT
ROCKY VIEW COUNTY

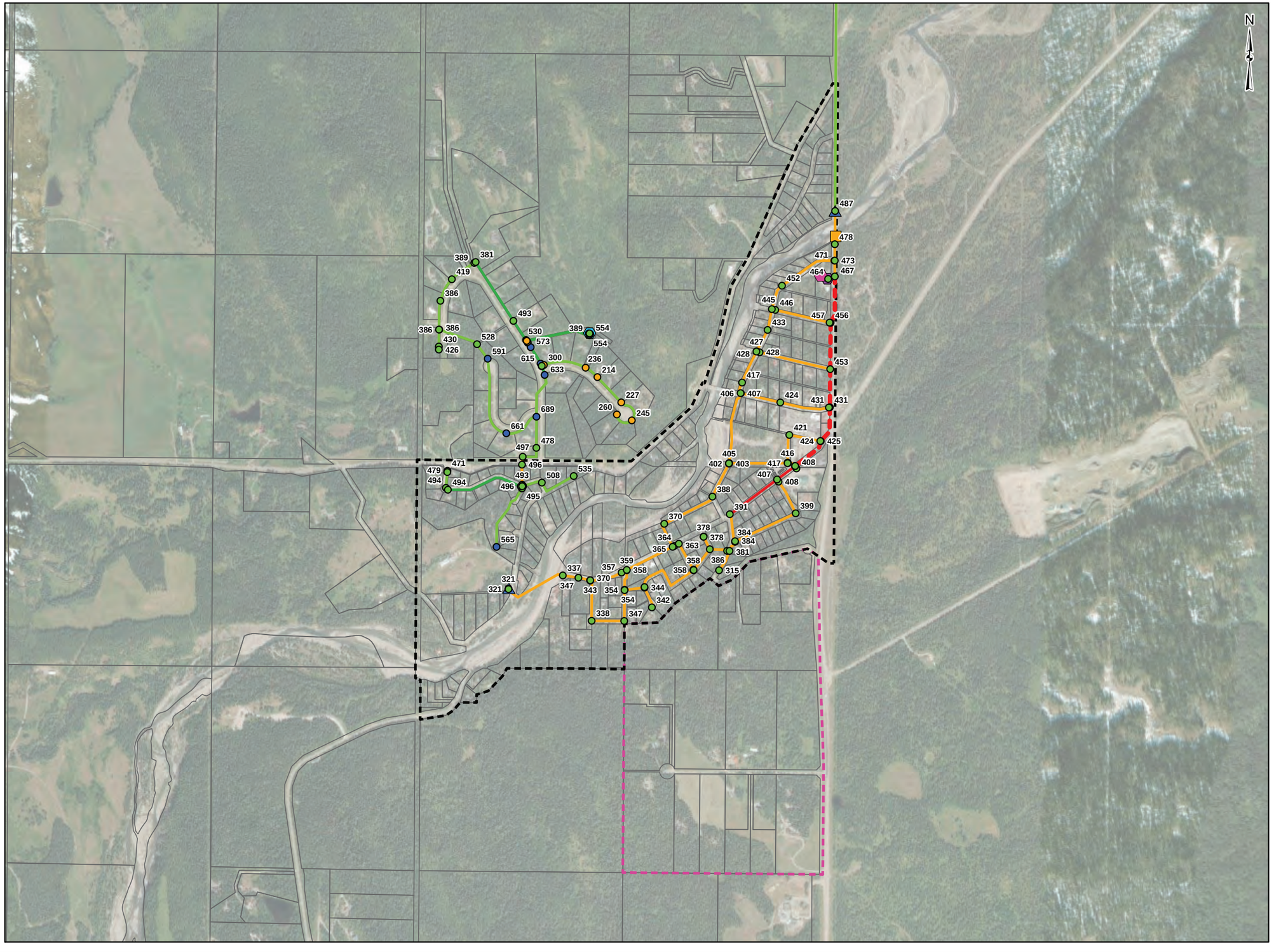
DATA SOURCES
- Topographic Map:Maxar

PROJECTION
NAD 1983 3TM 114

0 180 360
1:15,000 Meters

FIGURE	6.14
DATE	7/30/2025
PROJECT NO.	28782
AUTHOR	epoon

Document: M:\28782_Bragg_Creek\01_GIS\28782_Bragg_Creek_Servicing_Study\28782_Bragg_Creek_Servicing_Study.aprx - Figure 6.14 - Ex. Tot. Upgraded Water System - MDD Results



LEGEND

- Booster Station
- Raw Water Lift Station
- Reservoir
- Treatment Plant
- New/Upgraded Reservoir
- Study Area
- Expansion Area
- Parcels

Pressure (kPa)

- Less than 150
- 150 - 300
- 300 - 550
- 550 - 690
- Greater than 690

Existing Mains

- 100 mm
- 150 mm
- 200 mm
- 300 mm

Proposed Upgrades

- 300 mm

Note: Labels show modelled pressures in kPa.

TITLE
EXISTING WATER SYSTEM UPGRADE OPTION #1 - PHD RESULTS

PROJECT
BRAGG CREEK SERVICING STUDY

CLIENT
ROCKY VIEW COUNTY

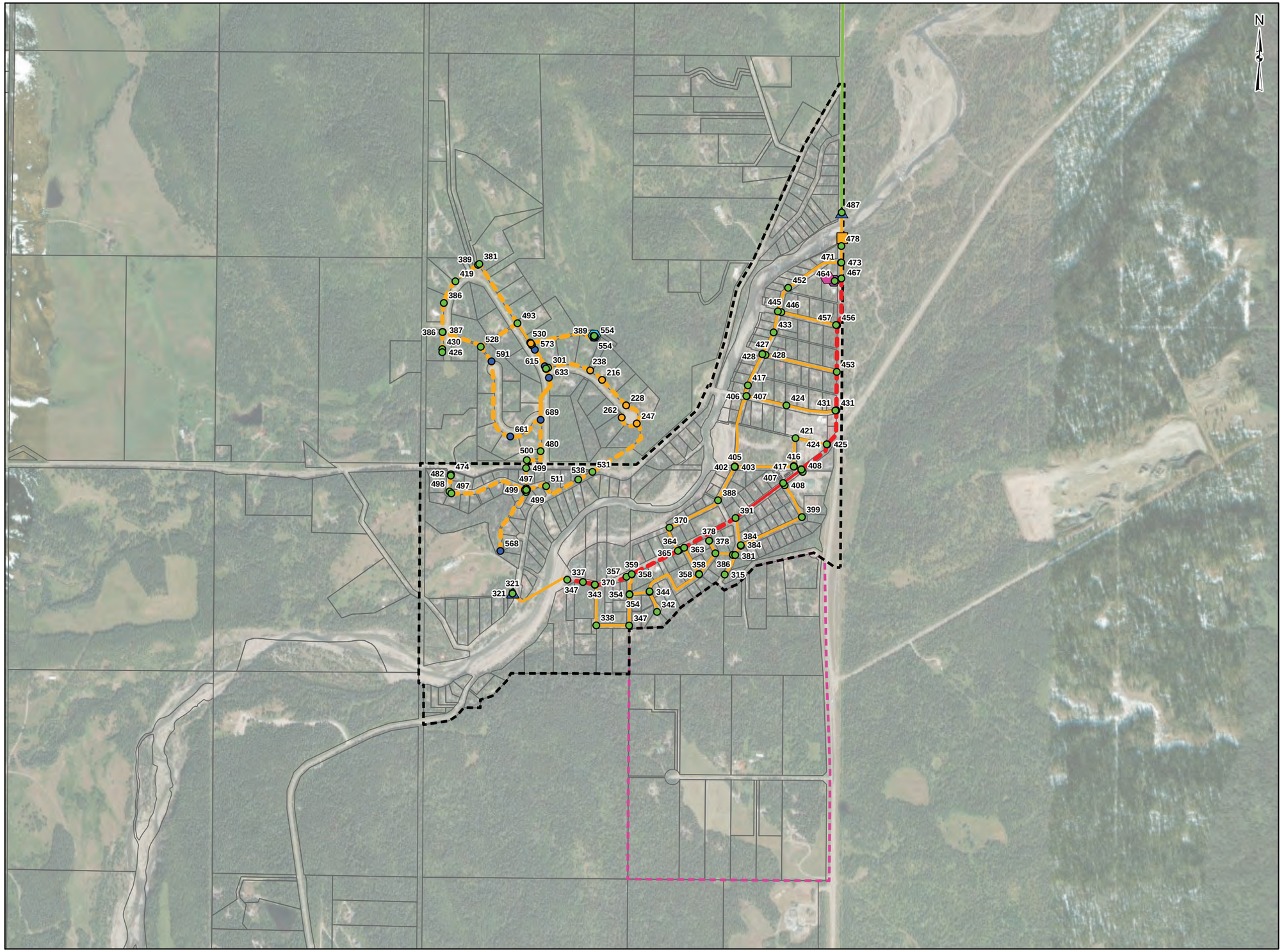
DATA SOURCES
- Topographic Map:Maxar

PROJECTION
NAD 1983 3TM 114

0 180 360
1:15,000 Meters

FIGURE	6.15
DATE	7/30/2025
PROJECT NO.	28782
AUTHOR	epoon

Document: M:\28782_Bragg_Creek\01_GIS\28782_Bragg_Creek_Servicing_Study\28782_Bragg_Creek_Servicing_Study.aprx - Figure 6.15 - Ex. Min. Upgraded Water System - PHD Results



LEGEND

- Booster Station
- Raw Water Lift Station
- Reservoir
- Treatment Plant
- New/Upgraded Reservoir
- Study Area
- Expansion Area
- Parcels

Pressure (kPa)

- Less than 150
- 150 - 300
- 300 - 550
- 550 - 690
- Greater than 690

Existing Mains

- 100 mm
- 200 mm
- 300 mm

Proposed Upgrades

- 200 mm
- 300 mm

Note: Labels show modelled pressures in kPa.

TITLE
EXISTING WATER SYSTEM UPGRADE OPTION #2 - PHD RESULTS

PROJECT
BRAGG CREEK SERVICING STUDY

CLIENT
ROCKY VIEW COUNTY

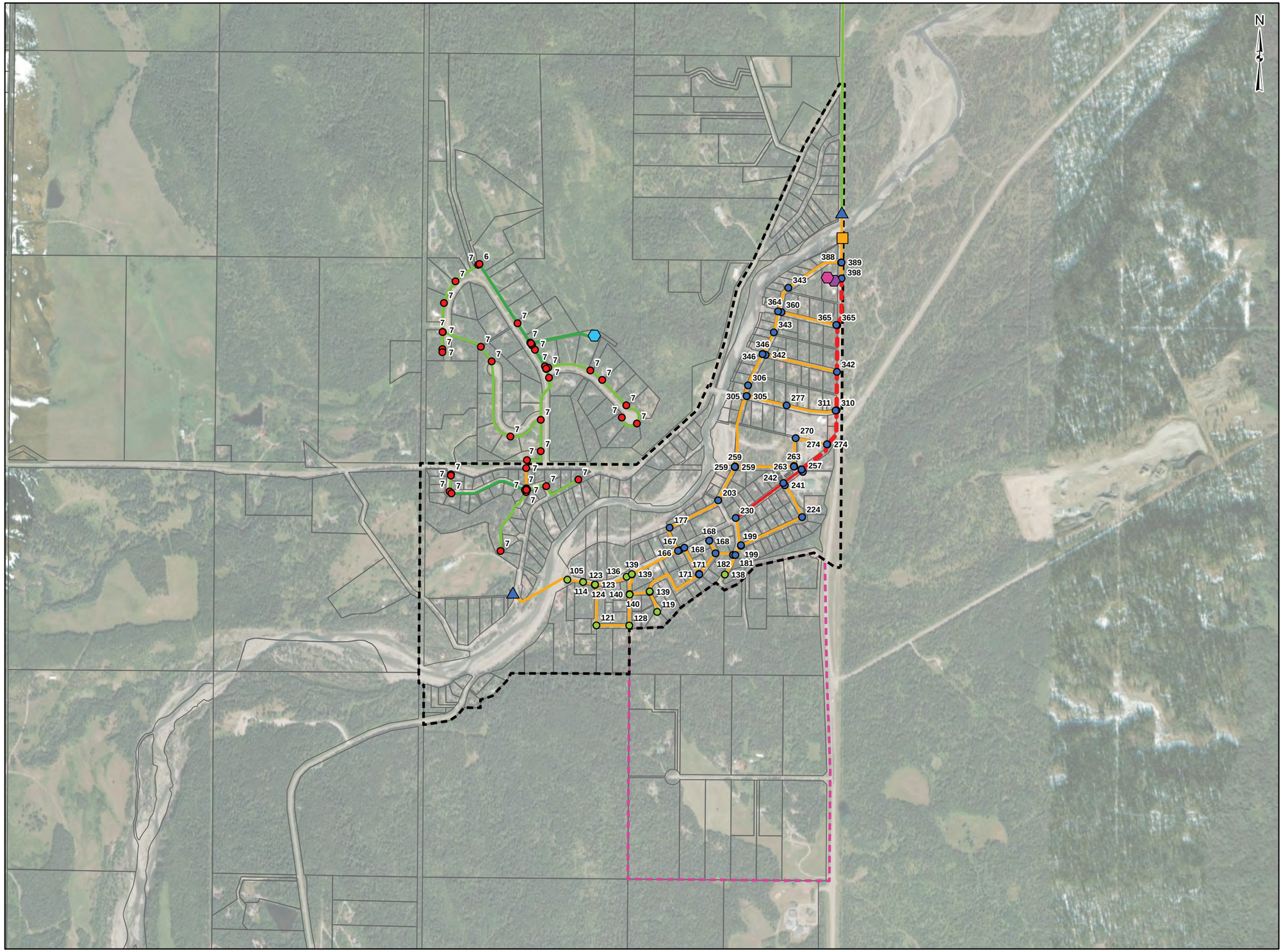
DATA SOURCES
- Topographic Map:Maxar

PROJECTION
NAD 1983 3TM 114

0 180 360
1:15,000 Meters

FIGURE	6.16
DATE	7/30/2025
PROJECT NO.	28782
AUTHOR	epoon

Document: M:\28782_Bragg_Creek\01_GIS\28782_Bragg_Creek_Servicing_Study\28782_Bragg_Creek_Servicing_Study.aprx - Figure 6.16 - Ex. Tot. Upgraded Water System - PHD Results



LEGEND

- Booster Station
- Raw Water Lift Station
- Reservoir
- Treatment Plant
- New/Upgraded Reservoir
- Study Area
- Expansion Area
- Parcels

Available Fire Flow (L/s)

- Less than 50
- 50 - 100
- 100 - 166
- Greater than 166

Existing Mains

- 100 mm
- 150 mm
- 200 mm
- 300 mm

Proposed Upgrades

- 300 mm

Note: Labels show modelled available fire flow in L/s.

TITLE
EXISTING WATER SYSTEM UPGRADE OPTION #1 - MDD+FF RESULTS

PROJECT
BRAGG CREEK SERVICING STUDY

CLIENT
ROCKY VIEW COUNTY

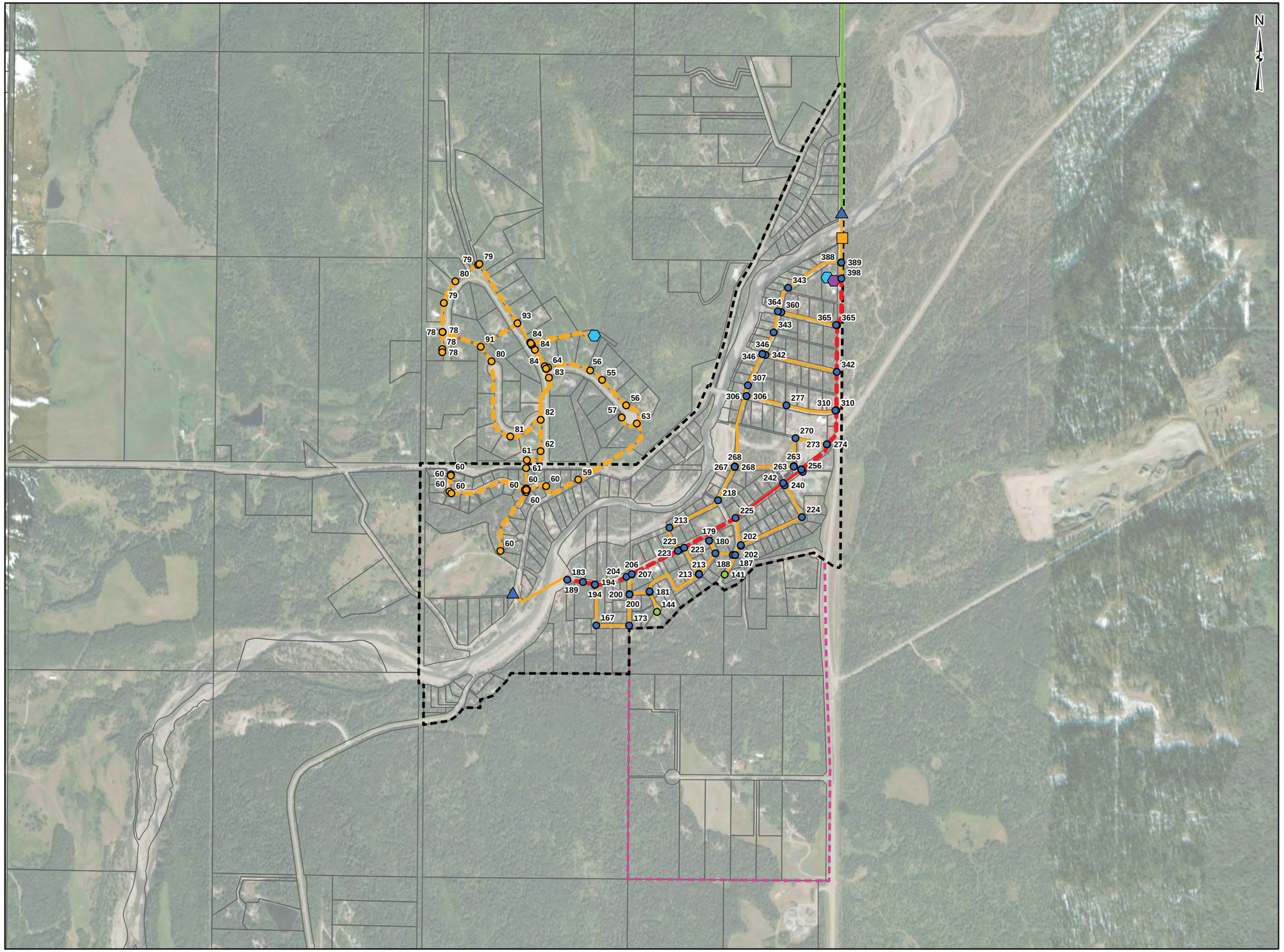
DATA SOURCES
- Topographic Map:Maxar

PROJECTION
NAD 1983 3TM 114

0 180 360
1:15,000 Meters

FIGURE	6.17
DATE	7/31/2025
PROJECT NO.	28782
AUTHOR	epoon

Document: M:\28782_Bragg_Creek\01_GIS\28782_Bragg_Creek_Servicing_Study\28782_Bragg_Creek_Servicing_Study.aprx - Figure 6.17 - Ex. Min. Upgraded Water System - MDD+FF Results



LEGEND

- Booster Station
- Raw Water Lift Station
- Reservoir
- Treatment Plant
- New/Upgraded Reservoir
- Study Area
- Expansion Area
- Parcels

Available Fire Flow (L/s)

- Less than 50
- 50 - 100
- 100 - 166
- Greater than 166

Existing Mains

- 100 mm
- 200 mm
- 300 mm

Proposed Upgrades

- 200 mm
- 300 mm

Note: Labels show modelled available fire flow in L/s.

TITLE
EXISTING WATER SYSTEM UPGRADE OPTION #2 - MDD + FF RESULTS

PROJECT
BRAGG CREEK SERVICING STUDY

CLIENT
ROCKY VIEW COUNTY

DATA SOURCES
- Topographic Map:Maxar

PROJECTION
NAD 1983 3TM 114

0 180 360
1:15,000 Meters

FIGURE	6.18
DATE	7/31/2025
PROJECT NO.	28782
AUTHOR	epoon

Document: M:\28782_Bragg_Creek\01_GIS\28782_Bragg_Creek_Servicing_Study\28782_Bragg_Creek_Servicing_Study.aprx - Figure 6.18 - Ex. Tot. Upgraded Water System - MDD+FF Results

7.0 Existing Wastewater System Assessment

7.1 Model Development

The low-pressure sanitary sewer system was assessed through constructing a spreadsheet model that calculates the equivalent number of active pumps and peak DWF along each low-pressure main based on the number of connections. From the peak DWF calculation for each pressure main, a velocity and friction head can be calculated, and a total friction head can be estimated from the current main all the way downstream to the WWTP. The static head is the maximum elevation that must be cleared by the system and is equal to the elevation of the WWTP (high point) less the pump elevation. Finally, the total head is the sum of the friction and static components.

The system is assessed based on locations that do not meet the velocity and pressure requirements described in **Section 5.3**. The velocities should be within a range of 0.6 m/s to 1.5 m/s, and the pressure should be less than 56 m based on the maximum operating point of Environment One grinder pumps.

The low-pressure sanitary sewer service areas are shown in **Figure 7.1**, and junctions have been labelled to define a naming convention for each row within the spreadsheet model, where each row represents one low-pressure sewer. Pressure main labels have been created as well, and the servicing areas are colour coded based on which pressure main they are serviced by.

7.2 Existing Low-Pressure Sewer Collection System Assessment

The results of the existing low-pressure sewer system assessment are shown in **Table 7.1** and **Figure 7.2**, and the following conclusions have been noted:

- When the system is operating, on average, the peak DWF pump rate that crosses the Elbow River syphon to the WWTP is 8.8 L/s.
- While this wastewater flow rate is higher than the existing system ADD, it should be noted that the water ADD is a constant demand and the sewage flow rate is a temporary pumped rate after storage within septic tanks so some differences should be expected.
- Many of the upstream pressure mains and laterals with fewer connections have velocities below the 0.6 m/s threshold which could contribute to some sedimentation and the generation of anaerobic conditions that may lead to odour concerns at the WWTP.
- The low-pressure main along White Avenue, River Drive South, and River Drive North (between Junctions 4 and 22) has adequate velocities in the preferred range of 0.6 – 1.5 m/s.
- The low-pressure main along River Drive North between Balsam Avenue and Pine Avenue (between Junctions 22 and 26) is slightly above the preferred velocity of 1.5 m/s.
- System heads within the low-pressure sewer system range from 19 m at the upstream end of the Elbow River syphon to 45 m near the upstream end of the system, all of which is within the operating head range of Environment One grinder pumps (≤ 56 m).
- The Elbow River syphon operates at a peak DWF rate of 8.8 L/s and a velocity of 1.12 m/s suggesting sufficient velocity to prevent sedimentation.

As mentioned in **Section 5.4** (Discover Airdrie, 2025), inspections are currently underway to assess whether groundwater is infiltrating into the low-pressure sewer network at the upstream end of the system. If this is found to be true, additional study of the low-pressure sewer network is recommended using additional monitoring data to better assess its current capacity.

7.3 Wastewater Treatment Plant Capacity Assessment

As per the Bragg Creek Hamlet Expansion Area Structure Plan Servicing Feasibility Study, ISL (Apr. 2020), the treatment capacity of Train 1 is 115 m^3/d to 185 m^3/d and 180 m^3/d to 210 m^3/d for Train 2. Mechanical WWTPs should be capable to hydraulically manage the peak flows entering the process based on Standards and Guidelines for Municipal Waterworks, Wastewater and Storm Drainage Systems, Government of Alberta (Mar. 2013). Based upon the flows summarized within **Table 5.8** between 2015 and 2018, the historical maximum flows are under the capacity of Train 1 alone. As such, no capacity upgrades for the WWTP are anticipated.

As previously mentioned, the recent news article (Discover Airdrie, 2025) indicates that the wastewater system is 'well above system capacity'. As the assessment completed within this report was conducted using flows between 2015 and 2018, it is recommended that the assessment is updated using current flows to ascertain if additional capacity is required currently.

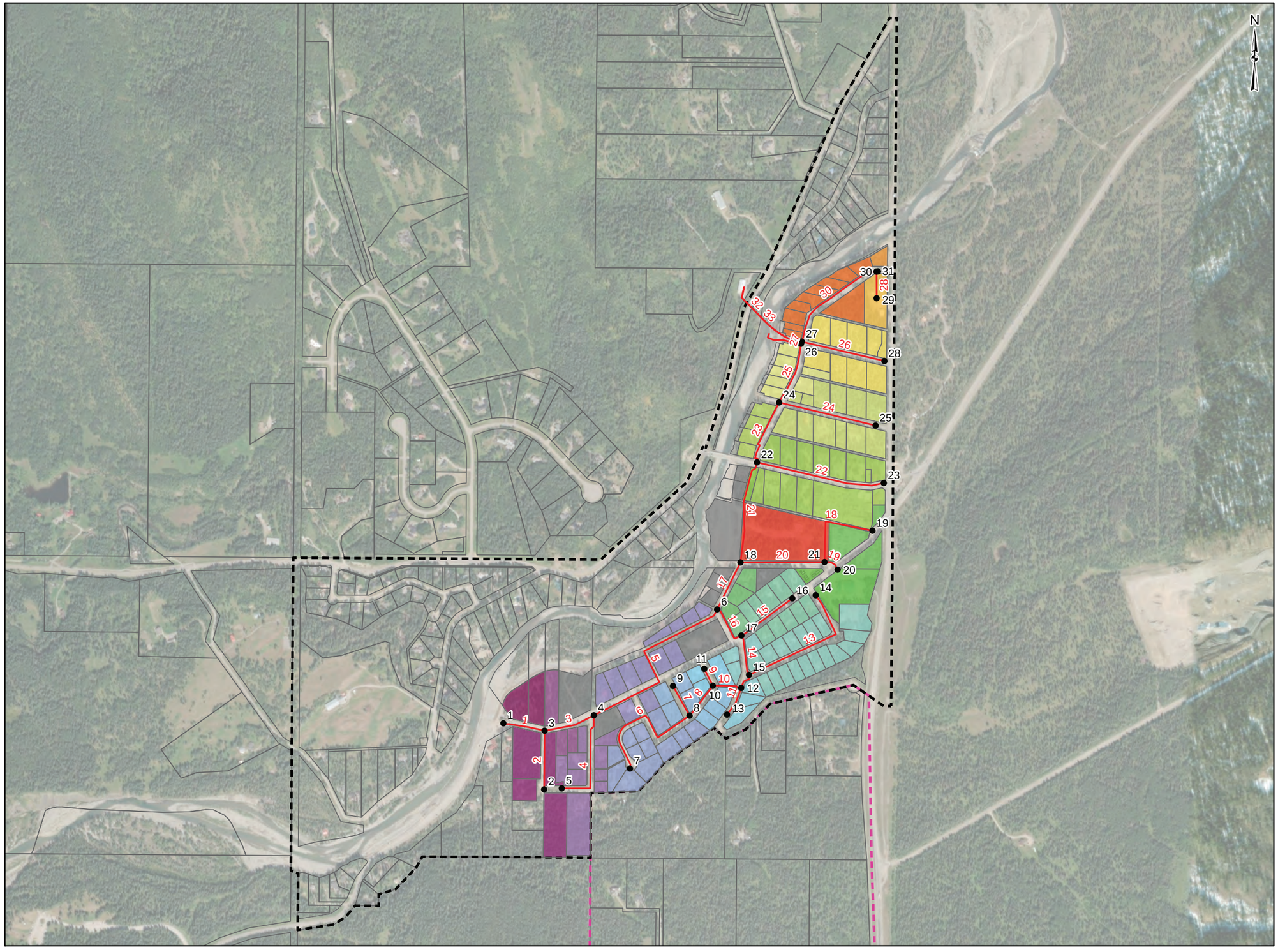
7.4 Wastewater System Upgrading Recommendations

While there are some low-pressure sewers with lower velocities, and RVC has noted that there is some Liberty Pumps installed on private septic tank systems that struggle to keep up with the existing low-pressure system heads, there are no immediate upgrading requirements for the low-pressure sewer system. ISL recommends:

- Ensure routine maintenance and flushing of low-pressure mains to prevent sedimentation.
- Provide guidance to residents who may be upgrading/replacing their septic tanks and pumps in the future to ensure that new pumps can operate within the pressures calculated.

7.5 Cost Estimates

There are no immediate upgrading requirements for the low-pressure sewer system or the WWTP unless newer flow monitoring and inspection results show a significant I-I source within the sanitary system that needs to be addressed.



LEGEND

- Model Nodes
- Model Mains
- Study Area
- Expansion Area
- Parcels

Main Connections

1, 2, 3, 4, 5, 6, 7, 8, 9, 11, 12, 13, 14, 15, 16, 17, 18, 19, 20, 21, 22, 23, 24, 25, 26, 28, 29, 30, Gateway, Undeveloped

Note: Red text shows low-pressure main labels and black text shows low-pressure junctions (used for the spreadsheet assessment).

TITLE

EX. LOW-PRESSURE SYSTEM - LOT SERVICING

PROJECT

BRAGG CREEK SERVICING STUDY

CLIENT

ROCKY VIEW COUNTY

DATA SOURCES

- Topographic Map:Maxar

PROJECTION

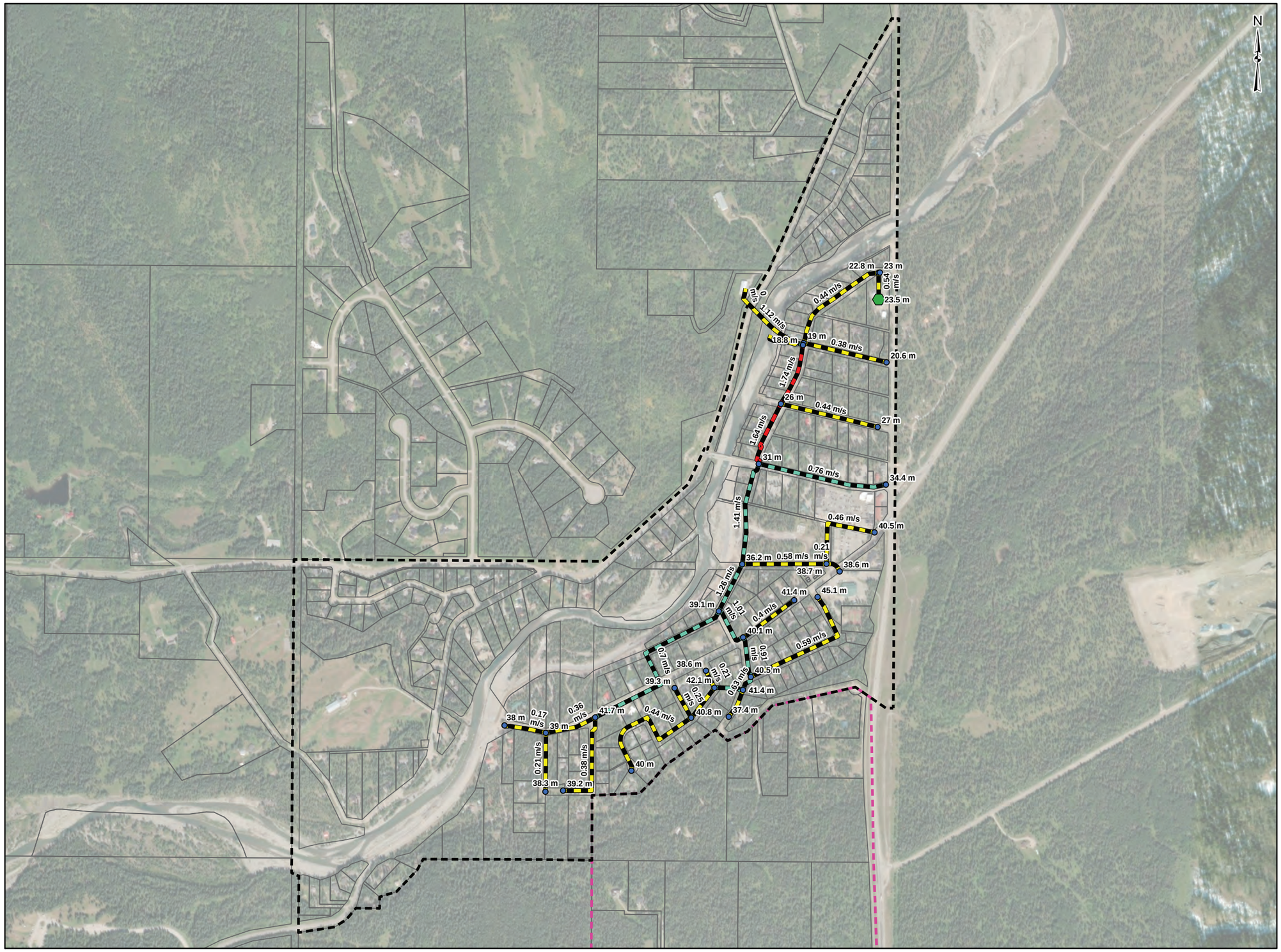
NAD 1983 3TM 114

0 130 260

1:10,500 Meters

FIGURE	7.1
DATE	7/30/2025
PROJECT NO.	28782
AUTHOR	epoon

Document: M:\28782_Bragg_Creek\001_GIS\28782_Bragg_Creek_Servicing_Study\28782_Bragg_Creek_Servicing_Study.aprx - Figure 7.1 - Ex. Low Pressure Sewer System - Lot Servicing



LEGEND

- Lift Station
- Study Area
- Expansion Area
- Parcels

Low-Pressure System Head (m)

- Head < 56 m
- Head >= 56 m

Low-Pressure Main Velocity (m/s)

- V < 0.6 m/s
- 0.6 <= V <= 1.5 m/s
- 1.5 m/s < V

TITLE

EX. LOW PRESSURE SYSTEM - SYSTEM PERFORMANCE

PROJECT

BRAGG CREEK SERVICING STUDY

CLIENT

ROCKY VIEW COUNTY

DATA SOURCES

- Topographic Map:Maxar

PROJECTION

NAD 1983 3TM 114

0 130 260

1:10,500 Meters

FIGURE	7.2
DATE	7/30/2025
PROJECT NO.	28782
AUTHOR	epoon

Document: M:\28782_Bragg_Creek\01_GIS\28782_Bragg_Creek_Servicing_Study\28782_Bragg_Creek_Servicing_Study.aprx - Figure 7.2 - Ex. Low Pressure Sewer System - System Performance

Location			Flow Generation					Estimated Pump Performance							Existing Pipe Performance		
From Node	To Node	Land Use	Added Connections	Total Connections	Equivalent # of Res. Pumps Active	Equivalent Res. PDWF	Friction Head	Total Friction Head	Max. Line Elev.	Critical Elev.	Min. Pump Elev.	Static Head	Total Head	Nominal Diameter	ID	Length	Velocity
			N	N		L/s	m	m	m		m	m	m	mm	mm	m	m/s
1	3	R/NR	2	2	1	0.8	0.1	32.0	1305.4	1310.4	1304.4	6.0	38.0	75	77.8	116.5	0.17
2	3	R/NR	3	3	1	1.0	0.1	32.0	1305.6	1310.4	1304.1	6.3	38.3	75	77.8	162	0.21
3	4	R	3	8	2	1.7	0.3	31.9	1304.0	1310.4	1303.3	7.1	39.0	75	77.8	144	0.36
5	4	R	9	9	2	1.8	0.7	32.3	1305.5	1310.4	1303.5	6.9	39.2	75	77.8	284	0.38
4	6	R/NR	12	29	3	3.3	3.9	31.6	1303.8	1310.4	1300.3	10.1	41.7	75	77.8	535	0.70
7	8	R	12	12	2	2.1	1.2	33.1	1305.0	1310.4	1303.5	6.9	40.0	75	77.8	372	0.44
9	8	R	4	4	1	1.2	0.1	32.1	1303.6	1310.4	1303.2	7.2	39.3	75	77.8	94	0.25
8	10	R	3	19	3	2.7	0.5	32.0	1303.8	1310.4	1301.6	8.8	40.8	75	77.8	105	0.56
11	10	R/NR	3	3	1	1.0	0.0	31.5	1303.6	1310.4	1303.3	7.1	38.6	75	77.8	52	0.21
10	12	-	0	22	3	2.9	0.5	31.5	1301.7	1310.4	1299.8	10.6	42.1	75	77.8	81	0.60
13	12	R	1	1	1	0.6	0.0	31.0	1307.5	1310.4	1301.1	6.4	37.4	75	77.8	84	0.12
12	15	R	1	24	3	3.0	0.3	31.0	1301.0	1310.4	1300.0	10.4	41.4	75	77.8	47	0.63
14	15	R/NR	21	21	3	2.8	2.1	32.8	1300.8	1310.4	1298.1	12.3	45.1	75	77.8	386	0.59
15	17	R	3	48	4	4.3	1.3	30.7	1300.8	1310.4	1300.6	9.8	40.5	75	77.8	113	0.91
16	17	R/NR	10	10	2	1.9	0.5	29.8	1300.7	1310.4	1298.8	11.6	41.4	75	77.8	174	0.40
17	6	R	1	59	5	4.8	1.7	29.4	1301.1	1310.4	1299.7	10.7	40.1	75	77.8	116	1.01
6	18	R	3	91	6	6.0	3.2	27.7	1300.4	1310.4	1299.0	11.4	39.1	75	77.8	145	1.26
19	21	NR	13	13	2	2.2	0.8	26.5	1297.5	1310.4	1296.4	14.0	40.5	75	77.8	241	0.46
20	21	NR	3	3	1	1.0	0.0	25.7	1298.1	1310.4	1297.5	12.9	38.6	75	77.8	47	0.21
21	18	NR	4	20	3	2.7	1.2	25.7	1298.7	1310.4	1297.4	13.0	38.7	75	77.8	232	0.58
18	22	NR	1	112	6	6.7	7.7	24.5	1299.1	1310.4	1298.7	11.7	36.2	75	77.8	286	1.41
23	22	R/NR	34	34	3	3.6	3.0	19.9	1298.4	1310.4	1295.9	14.5	34.4	75	77.8	357	0.76
22	24	R/NR	4	150	7	7.8	6.8	16.9	1298.4	1310.4	1296.3	14.1	31.0	75	77.8	191	1.64
25	24	R	12	12	2	2.1	0.9	11.0	1296.3	1310.4	1294.4	16.0	27.0	75	77.8	274	0.44
24	26	R	7	169	8	8.3	7.0	10.1	1296.4	1310.4	1294.5	15.9	26.0	75	77.8	175	1.74
29	31	R	1	1	1	0.6	0.8	4.9	1292.5	1310.4	1291.8	18.6	23.5	37	37.0	74	0.54
30	31	R	1	1	1	0.6	0.0	4.1	1291.7	1310.4	1291.5	18.9	23.0	75	77.8	4	0.12
31	27	R	10	12	2	2.1	0.9	4.1	1294.7	1310.4	1291.7	18.7	22.8	75	77.8	300	0.44
28	27	R	9	9	2	1.8	0.6	3.7	1297.7	1310.4	1293.5	16.9	20.6	75	77.8	234	0.38
27	26	-	0	21	3	2.8	0.0	3.2	1294.7	1310.4	1294.6	15.8	19.0	75	77.8	6	0.59
26	WWTP	-	0	190	8	8.8	3.1	3.1	-		-	15.7	18.8	100	100.1	238	1.12

Note: Orange cells indicate low velocities and red cells indicate very high velocities.

8.0 Future Water System

8.1 Future Water Demands

Tables 8.1 and **8.2** show future water demands within the study area for Growth Scenarios #1 and #2, respectively.

Table 8.1: Future Water Demands – Growth Scenario #1

Area	Population	ADD	MDD	PHD	FF
	c	L/s	L/s	L/s	L/s
Existing					
Bragg Creek	570	1.48	2.96	5.92	250.00
Elkana	207	0.42	0.84	1.68	50.00
Wintergreen Woods	-	1.10	2.20	4.40	-
Existing Total	**777**	**3.00**	**6.00**	**12.00**	**-**
Short Term Development					
Gateway Village	420	1.53	3.06	6.12	250.00
Balsam Avenue	-	-	-	-	250.00
RVC Foundation	120	0.44	0.88	1.76	250.00
Infill	210	0.77	1.54	3.08	-
Short Term	**750**	**2.74**	**5.48**	**10.96**	**-**
Short Term Total	**1,527**	**5.74**	**11.48**	**22.96**	**-**
Long Term Development					
Expansion Area	1,050	3.83	7.66	15.32	100.00
Long Term	**1,050**	**3.83**	**7.66**	**15.32**	**-**
Long Term Total	**2,577**	**9.57**	**19.14**	**38.28**	**-**

Table 8.2: Future Water Demands – Growth Scenario #2

Area	Population	ADD	MDD	PHD	FF
	c	L/s	L/s	L/s	L/s
Existing					
Bragg Creek	570	1.48	2.96	5.92	250.00
Elkana	207	0.42	0.84	1.68	50.00
Wintergreen Woods	-	1.10	2.20	4.40	-
Existing Total	**777**	**3.00**	**6.00**	**12.00**	**-**
Short Term Development					
Gateway Village	420	1.53	3.06	6.12	250.00
Balsam Avenue	120	0.44	0.88	1.76	250.00
RVC Foundation	120	0.44	0.88	1.76	250.00
Infill	210	0.77	1.54	3.08	-
Short Term	**870**	**3.18**	**6.36**	**12.72**	**-**
Short Term Total	**1,647**	**6.18**	**12.36**	**24.72**	**-**
Long Term Development					
Expansion Area	930	3.39	6.78	13.56	100.00
Long Term	**930**	**3.39**	**6.78**	**13.56**	**-**
Long Term Total	**2,577**	**9.57**	**19.14**	**38.28**	**-**

Based on the design water consumption rate of 315 L/c/d for residential development, it is estimated that the average annual water consumption will reach 296,300 m^3/yr at full build-out of the development areas as shown above. This rate does not exceed the annual amounts allowed as per the water diversion licenses summarized in **Section 3.1**. Water consumption demands are conservative and it is recommended that RVC monitor water demands as the area develops since actual water consumption may be less than projected.

8.2 Future Water Treatment Requirements

The capacity assessment of the WTP has been conducted based upon short term and long term growth scenarios. The timing of these growth scenarios is not known. Depending on the timelines for upgrades, it may be more cost effective for the County to directly implement the long term upgrades to the WTP, rather than completing upgrades at two different timelines. Both growth scenarios are discussed further in **Sections 8.2.1** and **8.2.2**.

Comparing the actual, historical (2015 to 2018) demands summarized within **Table 5.2** and the modelled existing demands summarized within **Tables 8.1** and **8.2** (excluding Wintergreen Woods), it is seen that the average demands for 2018 are only 2% lower than the modelled demands. Similarly, the maximum demands for 2018 is 3% lower than the modelled demands.

8.2.1 Short Term Capacity Assessment

Based upon the total short term MDD demand of 11.48 – 12.36 L/s or 992 – 1,068 m^3/d (slight discrepancies in short term growth of Options #1 and #2), the capacity of the existing WTP will be exceeded. On the basis that the County would like to maintain the current mode of treatment, this would entail additional treatment with a total production capacity of approximately 500 m^3/d based upon 10% losses, to provide treatment at the short term growth scenario. As discussed previously, this assessment is based upon modelled flows and anticipated growth. The need and degree of expansion should be confirmed prior to expansion, with updated current and anticipated demands.

The cost of Veolia's scope of supply in 2009 was approximately $1.0M. Their scope of supply was limited to the strainers, chemical dosing systems, blowers, compressors, coagulation system and the membrane system. It did not include interconnecting pipework, valves, instruments and appurtenances, solids handling system including the clarifier, hydrocyclones, pumps outside their scope of supply, UV reactors, building structure, HVAC systems, power supply, distribution and controls (outside of the membrane system). Accounting for inflation and for all equipment/installation outside of Veolia's scope of supply, a high-level order of magnitude cost for the upgrade is $16.1M. This includes 50% contingency and engineering, combined.

8.2.2 Long Term Capacity Assessment

Based upon the total long term MDD demand of 19.14 L/s or 1,654 m^3/d, the capacity of the existing WTP will be exceeded. On the basis that the County would like to maintain the current mode of treatment, this would entail additional treatment with a total production capacity of approximately 500 m^3/d to provide treatment at the long term growth scenario, in relation to the short term capacity. As stated within **Section 8.2.1**, the need and degree of expansion should be confirmed prior to expansion, with updated current and anticipated demands.

Using the same rationale as in **Section 8.2.1**, a high-level order of magnitude cost for the upgrade is $16.1M.

8.3 Future Reservoir and Pumphouse Requirements

Future reservoir pumping requirements are shown in **Table 8.3**. It is assumed that a 250 L/s fire pump was already installed as per the recommendations in **Section 6.6**. Fire pump/storage recommendations could be delayed until short term development occurs in Gateway Village, Balsam Avenue and RVC Foundation, if RVC is willing to maintain the existing level of service (no fire protection outside of a few dry hydrants) in the meantime. The following is recommended:

- Short term pumping capacity be increased from a firm capacity of 10 L/s to at least 25 L/s (two pumps each with a design flow rate of 25 L/s operating in lead/standby configuration).
- Long term pumping capacity be increased from a firm capacity of 25 L/s to 39 L/s (two pumps each with a design flow rate of 39 L/s operating in lead/standby configuration).

Table 8.3: Future Pumphouse Capacity Assessment

Parameter	Growth Scenario #1		Growth Scenario #2	
	Short Term	Long Term	Short Term	Long Term
Pumping Capacity Assessment				
Existing Firm Capacity (L/s)	10.00		10.00	
ADD (L/s)	5.74	9.57	6.18	9.57
MDD (L/s)	11.48	19.14	12.36	19.14
PHD (L/s)	22.96	38.28	24.72	38.28
Pumping Surplus/Deficit (L/s)	-12.96	-28.28	-14.72	-28.28
Fire Flow Capacity Assessment				
Fire Flow Requirement	250.00		250.00	

Future reservoir storage requirements are shown in **Table 8.4** based on conservative RVC requirements. At this stage, it is assumed that a reservoir expansion of 2,500 m^3 was carried out as per recommendations in **Section 6.6** to provide full fire flow protection to Bragg Creek. This storage expansion could be deferred until the development of Gateway Village, Balsam Avenue, and RVC Foundation, if RVC is willing to maintain the existing level of service (no fire storage) in the meantime. Otherwise, the following is recommended based on Growth Scenario #2 (which is more conservative):

- Provide an additional 610 m^3 of reservoir storage within Bragg Creek prior to the development of Gateway Village, Balsam Avenue, and RVC Foundation.
- Provide an additional 590 m^3 (for a total of 1,200 m^3) of reservoir storage within Bragg Creek prior to the development of the expansion area.

Table 8.4: Future Reservoir Storage Capacity Assessment

Property	Growth Scenario #1		Growth Scenario #2	
	Short Term	Long Term	Short Term	Long Term
Existing Upgraded Storage (m^3)	3,160		3,160	
Rocky View County Servicing Standard Storage Requirement				
Fire Flow Storage (m^3)	2,700	2,700	2,700	2,700
MDD (m^3)	992	1,654	1,068	1,654
Storage Required (m^3)	3,692	4,354	3,768	4,354
Surplus/Deficit (m^3)	-532	-1,194	-608	-1,194

The final pumping and reservoir storage requirements are summarized in **Table 8.5**. It should be noted that there are minimal differences between the two growth scenarios and the overall pumping and storage requirements are similar between both. That being said, the pumping and storage requirements are assuming Growth Scenario #2 which has higher requirements (more conservative) in the short term. The servicing concepts described below go into more detail regarding pumping and storage requirements, thus the values in **Table 8.5** will be revised for each concept.

Table 8.5: Reservoir Pumping and Storage Staging Requirements

Stage	Firm Distribution Capacity	Fire Pump Capacity	Reservoir Storage
	L/s	L/s	m^3
Existing	10	-	660
Existing Upgrades	-	Install a 250 L/s fire pump	Increase reservoir storage by 2,500 m^3 for a total of 3,160 m^3
Short Term	Upgrade pumping capacity to provide a firm distribution capacity of 25 L/s	-	Increase reservoir storage by 610 m^3 for a total of 3,770 m^3
Long Term	Upgrade pumping capacity to provide a firm distribution capacity of 39 L/s	-	Increase reservoir storage by 590 m^3 for a total of 4,360 m^3

8.4 Future Water Concepts

Based on the pumping and reservoir staging requirements shown in **Table 8.5**, it may be more feasible to consider construction of a new reservoir and pumphouse instead of pursuing upgrades to the existing Bragg Creek Reservoir and Pumphouse. This is especially true given the high elevations within the expansion area and the need to provide 300 kPa system wide. Thus, three future servicing concepts have been developed and evaluated at a high-level:

- Servicing Concept #1: Provide all future pumping and storage from the existing Bragg Creek Reservoir and Pumphouse.
- Servicing Concept #2: Provide future distribution/fire pumping and storage capacity from a new reservoir located adjacent to the Gateway Village development.
- Servicing Concept #3: Provide future distribution/fire pumping and storage capacity from a new reservoir located at a high point adjacent to the expansion area development.

Another option that ISL did not consider would be to provide water servicing without fire flow protection. This concept would appear similar to Servicing Concept #3 below but would have lower costs due to no longer needing a 300 mm main servicing the core development area and reduced reservoir storage requirements at Bragg Creek and the future expansion area reservoir. ISL does not recommend this option since it results in a lower level of service.

It should be noted that all three future water servicing scenarios consider existing water upgrade option #1 as a base (minimum requirements for fire flows). Additionally, the three water concepts can service both growth scenarios since they are very similar and have the same total number of proposed dwellings.

Servicing Concept #1 – Bragg Creek Reservoir and Pumphouse

Servicing Concept #1 is shown in **Figure 8.1** and is summarized below:

- The existing Bragg Creek Reservoir and Pumphouse is at a slab elevation of 1,293.1 m and can effectively service the developments in Gateway Village, Balsam Avenue, and RVC Foundation as well as infill development.
- The expansion area is at an elevation of 1,335 m which would require the installation of a separate pressure zone serviced through a dedicated supply main.
- The expansion area could be serviced through new pumps at the Bragg Creek pumphouse or a separate booster station to the south along Range Road 50 (**Figure 8.1** assumes the pumping is provided at the pumphouse).
- Since fire protection would be provided from Bragg Creek, the 2,300 m long supply main would need to be at least 300 mm in size to ensure a fire flow of 100 L/s, a velocity below 3.0 m/s, and reasonable head losses.
- Pumping capacity for the expansion area would need to provide a total maximum flow capacity of 106.36 – 107.66 L/s (MDD+FF) with a total dynamic head of up to 71.0 m (friction losses based on C = 140). This flow capacity is representative of the total long-term maximum requirement.
- A 300 mm supply main servicing the expansion area would result in low ADD and MDD velocities (< 0.1 m/s) which would cause water quality and stagnation concerns for the expansion area.

Servicing Concept #2 – Gateway Village Reservoir and Pumphouse

Servicing Concept #2 is shown in **Figure 8.2** and is summarized below:

- A new reservoir and pumphouse located near Gateway Village would be at similar elevations to the existing Bragg Creek Reservoir and Pumphouse (~1,295 m).
- Existing fire protection upgrades (250 L/s fire pump and a storage upgrade of 2,500 m^3) could be delayed until the construction of this reservoir.
- A new reservoir and pumphouse at Gateway Village could be serviced through an 1,100 m long, 100 mm dedicated supply main directly from the WTP or filled through the distribution system during off-peak demands.
- In addition to the fire protection upgrades, distribution pumping capacity at Gateway Village would be approximately 13 – 15 L/s (depending on the growth scenario) at a design head similar to the Bragg Creek Pumphouse to ensure PHD demands could be provided in the short term.
- The Gateway Village Reservoir and Pumphouse would be designed with additional space such that future pumps would be able to provide a firm distribution pumping capacity of 29 L/s (PHD) and a fire flow capacity of 100 L/s (similarly with a total dynamic head up to 71.0 m) for the expansion area.
- The pumping requirements at the Gateway Reservoir assume that the Bragg Creek pumphouse maintains a distribution pumping capacity of 10 L/s.
- To achieve the required fire flow within the expansion area, a 2,200 m long, 300 mm water main would be required, which would create water quality/stagnation concerns when demands are at ADD or MDD rates.

Servicing Concept #3 – Expansion Area Reservoir and Pumphouse

Servicing Concept #3 is shown in **Figure 8.3** and is summarized below:

- Existing system improvements will be made to the Bragg Creek Reservoir such that the existing system can provide 250 L/s fire flow and the required 2,500 m^3 of storage.
- Short term infill and development at Balsam Avenue, Gateway Village and RVC Foundation would require distribution pumping upgrades at the Bragg Creek Pumphouse (total firm capacity requirement of 25 L/s).
- Prior to development of the expansion area, a new reservoir and pumphouse would be constructed with 1,400 m^3 of storage, a distribution pumping capacity of 16 L/s, and a fire flow pumping capacity of 100 L/s. This new expansion area reservoir and pumphouse would provide independent fire flow protection (storage and pumping capacity) which would provide stronger redundancy in the system. This redundancy is recommended since the expansion area will be within its own pressure zone.
- This new reservoir would be serviced by a 2,600 m long, 125 mm supply main from the WTP. A pump with up to 8 L/s capacity and a design head of approximately 65 m can ensure that the expansion area reservoir can fill at MDD rates while maintaining a minimum of 150 kPa along the fill line.
- Additionally, connections from this new reservoir could be made to the north (such as at Park Place and/or Burney Road) with pressure reducing valves (PRV) to provide even stronger system resiliency.
- With the expansion area being serviced directly from the nearby reservoir, the water quality risks associated with Concepts #1 and #2 are no longer an issue.

8.5 Future Water Concept Cost Estimates

Cost estimates have been prepared for each of the three concept options in **Table 8.6** which includes 30% contingency and 10% for engineering costs. For more information regarding the cost estimates, see **Appendix B**. The costs show that the three options are comparable in price, and since Option #3 provides the best resiliency with no water quality concerns, it is recommended as the preferred servicing option. Note that these costs are cumulative and account for the recommended upgrades for option #1 from **Section 6.6**.

Table 8.6: Future Water Concept Cost Estimates

ID	Description	Cost ($M)
Servicing Concept #1 – Upgrading Bragg Creek Reservoir and Pumphouse		
1.1	Bragg Creek fire pump (250 L/s)	0.70
1.2	Bragg Creek fire storage upgrade (2,500 m³)	5.26
1.3	847 m of 300 mm main along Burnside Ave to White Ave/River Dr S	0.75
1.4	Installation of hydrants at intersections	0.25
1.5	Short term Bragg Creek distribution pumping capacity upgrade (25 L/s)	0.14
1.6	Short term Bragg Creek storage upgrade (610 m³)	1.29
1.7	2,300 m of 300 mm water main to expansion area	2.06
1.8	Long term Bragg Creek distribution pumping capacity upgrade (39 L/s) assuming pump replacement	0.22
1.9	Long term Bragg Creek storage upgrade (590 m³)	1.25
	Servicing Concept #1 Total ($M)	**11.92**
Servicing Concept #2 – New Gateway Village Reservoir and Pumphouse		
2.1	Gateway Village fire pump (250 L/s)	0.70
2.2	Gateway Village fire storage (2,500 m³)	5.26
2.3	600 m of 300 mm water main near Gateway Village	0.53
2.4	Installation of hydrants at intersections	0.18
2.5	Short term Gateway distribution pumping capacity (13 – 15 L/s)	0.09
2.6	Short term Gateway storage upgrade (610 m³)	1.29
2.7	2,200 m of 300 mm water main to expansion area	1.96
2.8	Long term Gateway distribution pumping capacity upgrade (29 L/s)	0.14
2.9	Long term Gateway storage upgrade (590 m³)	1.25
2.10	1,100 m of 100 mm supply main for Gateway reservoir	0.47
	Servicing Concept #2 Total ($M)	**11.87**
Servicing Concept #3 – New Expansion Area Reservoir and Pumphouse		
3.1	Bragg Creek fire pump (250 L/s)	0.70
3.2	Bragg Creek fire storage upgrade (2,500 m³)	5.26
3.3	847 m of 300 mm main along Burnside Ave to White Ave/River Dr S	0.75
3.4	Installation of hydrants at intersections	0.25
3.5	Short term Bragg Creek distribution pumping capacity upgrade (25 L/s)	0.14
3.6	Short term Bragg Creek storage upgrade (610 m³)	1.29
3.7	Long term expansion area distribution pumping capacity (16 L/s)	0.09
3.8	Long term expansion area fire pump (100 L/s)	0.28
3.9	Long term expansion area distribution/fire storage capacity (1,400 m³)	2.94
3.10	2,600 m of 125 mm supply main for expansion area reservoir	1.29
	Servicing Concept #3 Total ($M)	**12.99**

8.6 Future Water Concept Assessment

This section summarizes the modelling results for Servicing Concept #3, which is considered the preferred servicing option as per the discussion in **Sections 8.4** and **8.5**. As mentioned previously, these scenarios assume that the minimum upgrading recommendations (Option #1) from **Section 6.0** were implemented. For the analysis of the expansion area, a schematic 250 mm looped system was assumed since a looped 250 mm system will be able to provide the fire flow requirements to the area while maintaining reasonable velocities during ADD/MDD conditions. The distribution network within the expansion area is assumed to avoid areas of steep slopes, thus is schematically shown to service the flatter areas around an elevation of 1,330 – 1,335 m.

Average Day Demand

ADD results for Servicing Concept #3 are summarized in **Figures 8.4** and **8.5** for Growth Scenarios #1 and #2, respectively. Results show that Gateway Village, Balsam Avenue, and RVC Foundation are all within acceptable pressure ranges. The expansion area supply main can maintain greater than 150 kPa during fill conditions (assumed to fill at a steady rate equal to MDD). The expansion area network shown is schematic, but the pumping configuration shows that pressures are within acceptable ranges, although the network to the northwest starts to increase in pressure due to topography starting to drop.

Maximum Day Demand

MDD results for Servicing Concept #3 are summarized in **Figures 8.6** and **8.7** for Growth Scenarios #1 and #2, respectively. The results are similar to ADD conditions and the system can maintain acceptable pressures at the development areas.

Peak Hour Demand

PHD results for Servicing Concept #3 are summarized in **Figures 8.8** and **8.9** for Growth Scenarios #1 and #2, respectively. The results are similar to ADD conditions and the system can maintain acceptable pressures at the development areas.

Maximum Day Demand Plus Fire Flow

MDD+FF results for Servicing Concept #3 are summarized in **Figures 8.10** and **8.11** for Growth Scenarios #1 and #2, respectively. With Option #1 recommendations implemented for the existing system, and implementing future Servicing Concept #3, the development areas can achieve acceptable fire flows (250+ L/s at Gateway Village/Balsam Avenue, 166+ L/s at RVC Foundation, and 100+ L/s within the expansion area).

8.7 Recommended Future Water Concept and Timing

Servicing Concept #3 is recommended for future water servicing within Bragg Creek as shown in **Figure 8.3**. This option provides the best pumping and storage resiliency and does not have a water quality risk due to low velocities in a 300 mm supply main. The recommended timing of upgrades is summarized below.

Minimum recommended existing system upgrades:

- Provide a 250 L/s fire pump and increase the discharge header HGL at the Bragg Creek Reservoir to 1,340 m.
- Construct 2,500 m^3 of additional reservoir storage at the Bragg Creek Reservoir and Pumphouse.
- Construct 847 m of 300 mm water main from the Bragg Creek Reservoir along Burnside Avenue and connect to the existing 300 mm water main at the intersection of River Drive South and White Avenue.
- Construct seven (7) fire hydrants along the proposed 300 mm water main near the WTP and where its alignment intersects with Pine Avenue, Spruce Avenue, Balsam Avenue, Cowboy Trail, and at River Drive South.

If full fire protection is required, then the follow upgrades are also required:

- Construct (and replace existing 200 mm) 727 m of 300 mm water main along White Avenue from Harwood Street to west of Park Point such that the Bragg Creek Trading Post can achieve the minimum required commercial fire flow requirement of 166 L/s.
- Construct fourteen (14) additional fire hydrants throughout Bragg Creek as shown in **Figure 6.10** at intersections and entrances to cul-de-sacs.
- Provide a 50 L/s fire pump at the Upper Elkana Pumphouse.
- Construct 100 m^3 of additional reservoir storage at the Upper Elkana Reservoir.
- Replace the existing Elkana Zone 1 system with 2,639 m of 200 mm water mains to ensure 50 L/s of fire flow can be achieved throughout the pressure zone.
- Replace the existing Elkana Zone 2 system with 2,248 m of 200 mm water mains to ensure 50 L/s of fire flow can be achieved throughout the pressure zone.
- Construct eight (8) fire hydrants throughout Elkana at the locations indicated on **Figure 6.10**.

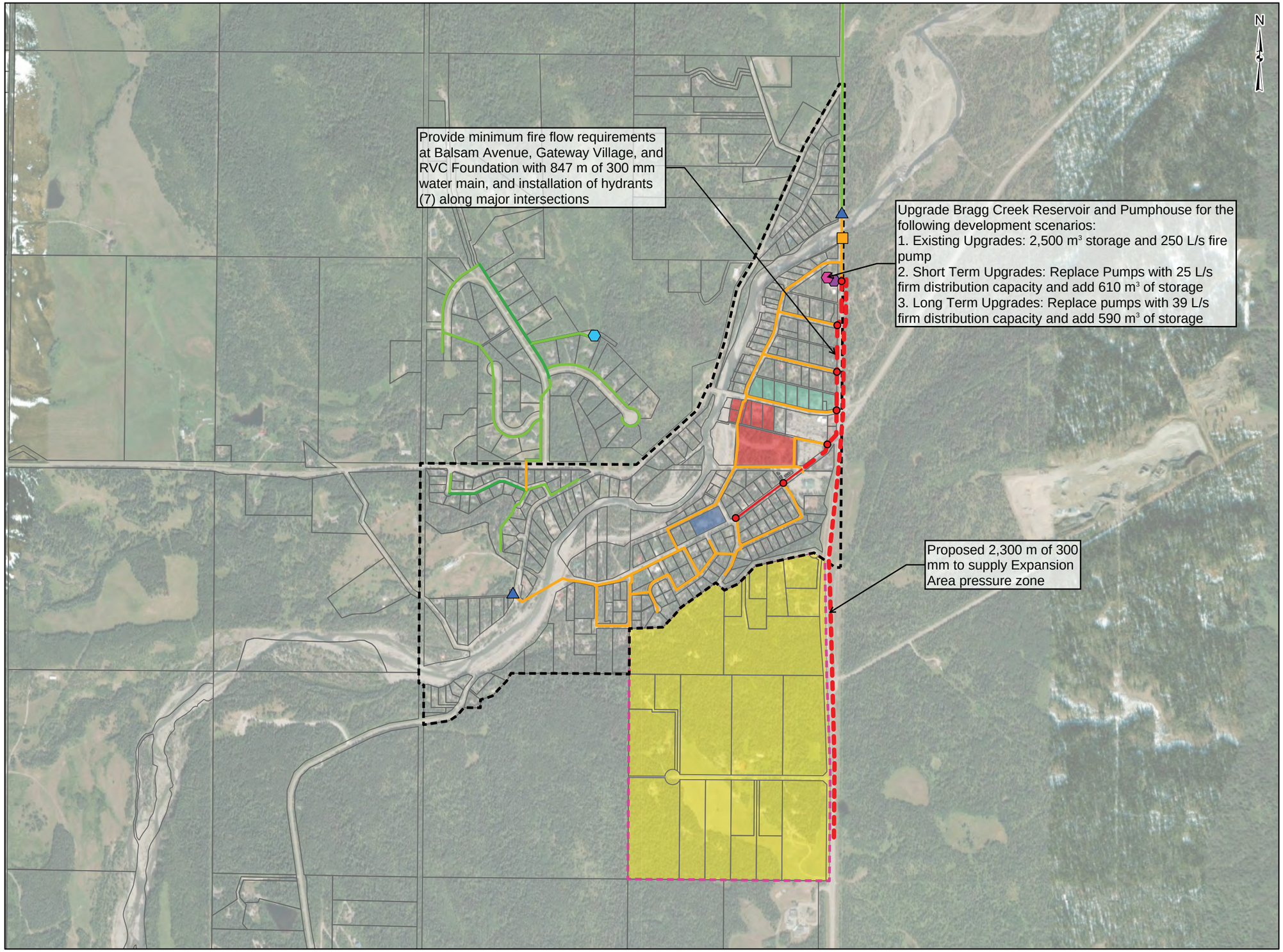
Short term upgrades (Gateway Village, Balsam Avenue, and RVC Foundation):

- Replace the pumps at the Bragg Creek Pumphouse to provide a firm distribution capacity of up to 25 L/s.
- Construct 610 m^3 of additional reservoir storage at the Bragg Creek Reservoir and Pumphouse.

Long term upgrades (expansion area):

- Construct 2,600 m of 125 mm supply main from the Bragg Creek WTP to the proposed expansion area reservoir location.
- Construct the expansion area reservoir with 1,400 m^3 of storage (includes both MDD and FF storage).
- Provide 16 L/s of distribution pumping capacity (two pumps in lead/standby operation) and one fire pump capable of providing 100 L/s to the expansion area.
- RVC can consider looping the distribution system in the expansion area back into the existing 200 mm network using PRVs to improve overall distribution system resiliency. Conversely, the valves could be closed and only opened during emergency conditions to provide water to the lower hamlet if the Bragg Creek Reservoir and Pumphouse is out of service.

With regards to the WTP, an expansion is anticipated in the short term scenario to provide an additional production capacity of 500 m^3/d. An expansion is also expected in the long term scenario to provide an additional production capacity of 500 m^3/d, in addition to the short term upgrades). The need and degree for upgrades required at both the short and long term scenarios should be re-assessed with updated current and anticipated demands, prior to expansion.



LEGEND

- Booster Station
- Raw Water Lift Station
- Reservoir
- Treatment Plant
- New/Upgraded Reservoir
- Proposed Hydrants
- Study Area
- Expansion Area
- Parcels

Growth Area

- Balsam Avenue
- Gateway Village
- RVC Foundation
- Expansion Area

Existing Mains

- 100 mm
- 150 mm
- 200 mm
- 300 mm

Proposed Mains

- Proposed 300 mm Water Main

TITLE

FUTURE WATER SERVICING CONCEPT #1

PROJECT

BRAGG CREEK SERVICING STUDY

CLIENT

ROCKY VIEW COUNTY

DATA SOURCES

- Topographic Map:Maxar

PROJECTION

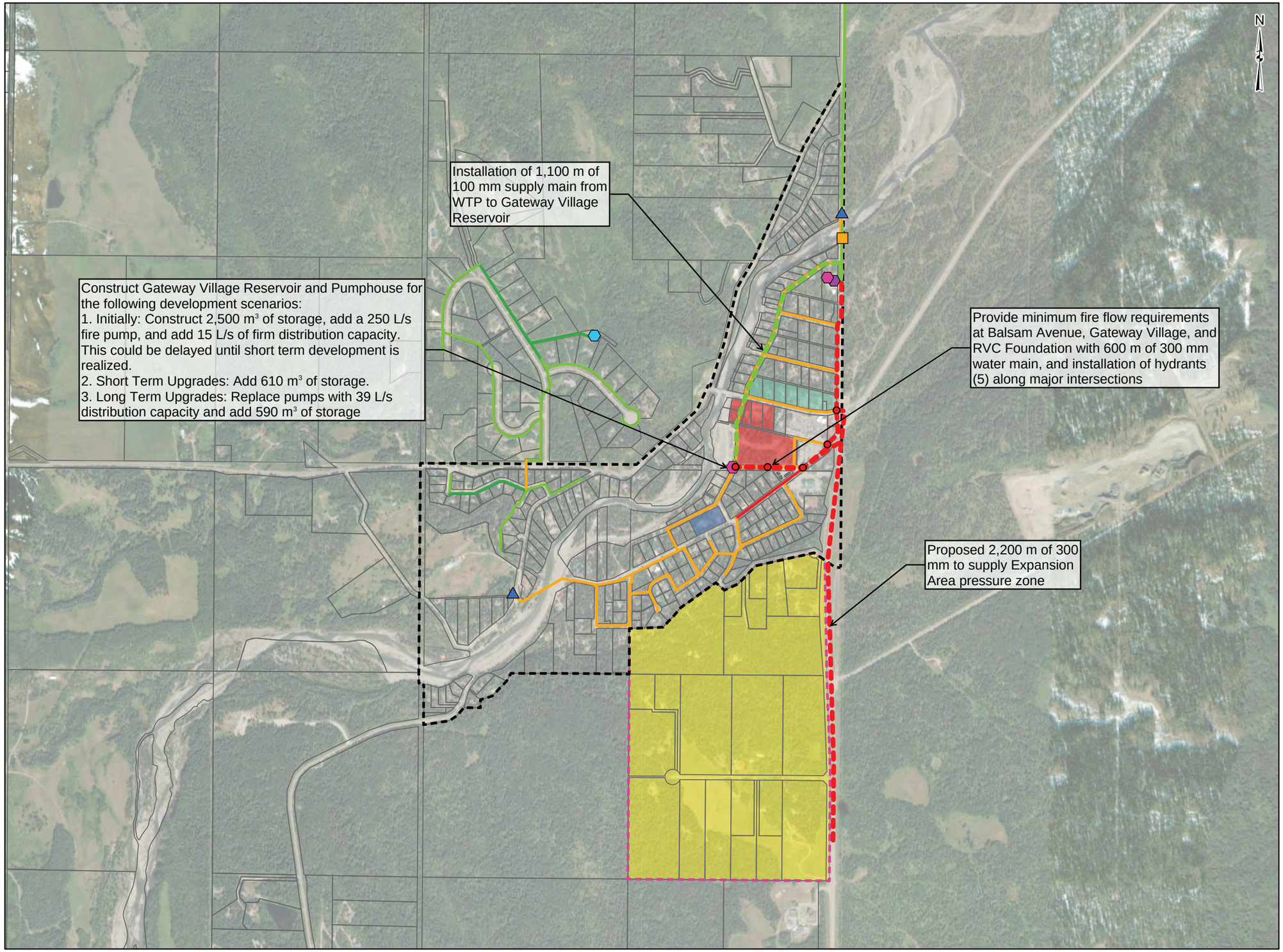
NAD 1983 3TM 114

0 180 360

1:15,000 Meters

FIGURE	8.1
DATE	9/25/2025
PROJECT NO.	28782
AUTHOR	jshinbine

Document: M:\28782_Bragg_Creek\01_GIS\28782_Bragg_Creek_Servicing_Study\28782_Bragg_Creek_Servicing_Study.aprx - Figure 8.1 - Future Water Servicing Concept #1



LEGEND

- Booster Station
- Raw Water Lift Station
- Reservoir
- Treatment Plant
- New/Upgraded Reservoir
- Proposed Hydrants
- Study Area
- Expansion Area
- Parcels

Growth Area

- Balsam Avenue
- Gateway Village
- RVC Foundation
- Expansion Area

Existing Mains

- 100 mm
- 150 mm
- 200 mm
- 300 mm

Proposed Mains

- Proposed 100mm Supply Main
- Proposed 300mm Water Main

TITLE
FUTURE WATER SERVICING CONCEPT #2

PROJECT
BRAGG CREEK SERVICING STUDY

CLIENT
ROCKY VIEW COUNTY

DATA SOURCES
- Topographic Map:Maxar

PROJECTION
NAD 1983 3TM 114

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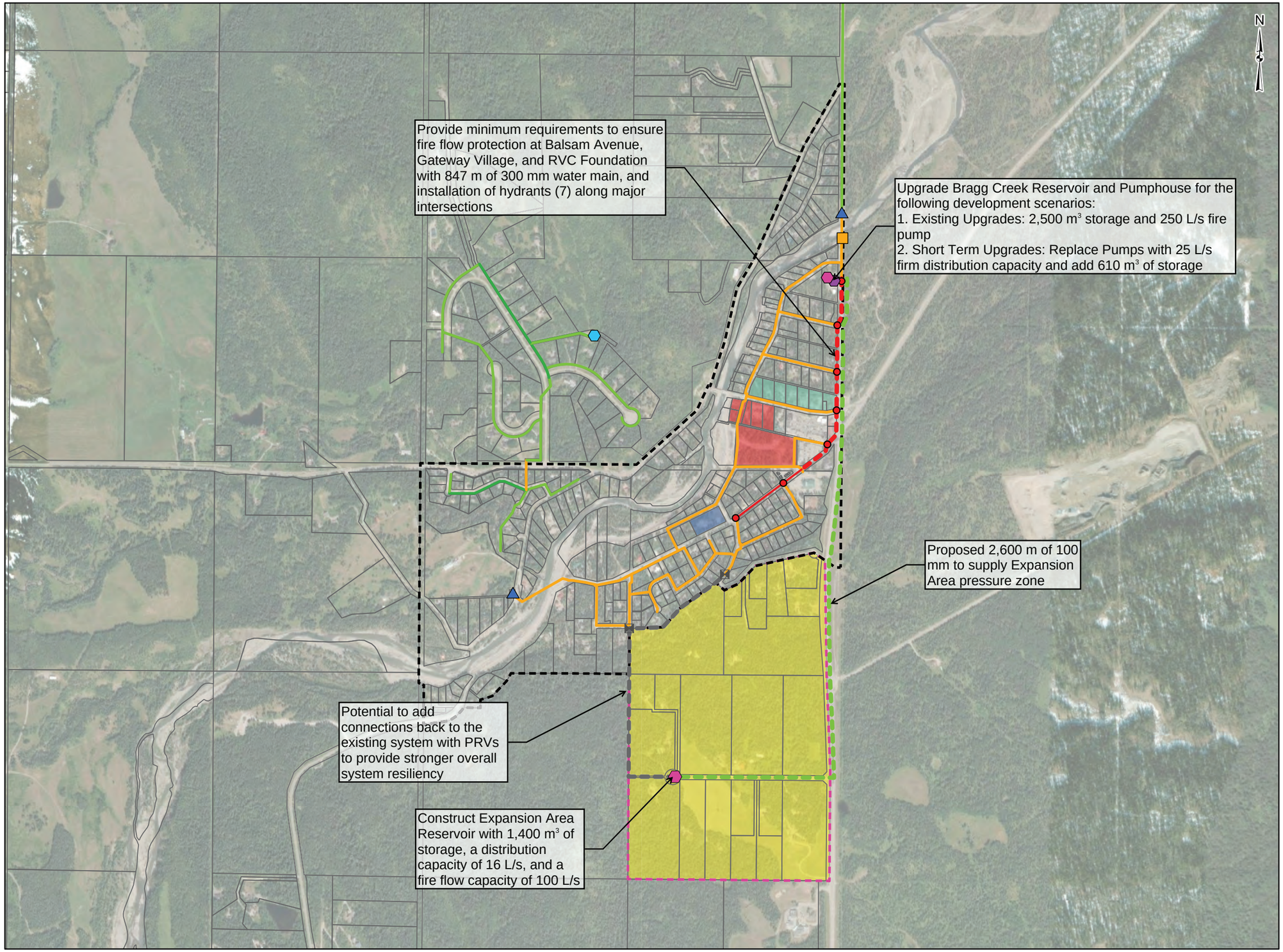
1:15,000 Meters

FIGURE	8.2
DATE	9/25/2025
PROJECT NO.	28782
AUTHOR	jshinbine

Document: M:\28782_Bragg_Creek\01_GIS\28782_Bragg_Creek_Servicing_Study\28782_Bragg_Creek_Servicing_Studyaprx - Figure 8.2 - Future Water Servicing Concept #2



LEGEND

- Booster Station
- Raw Water Lift Station
- Reservoir
- Treatment Plant
- New/Upgraded Reservoir
- Proposed Hydrants
- Study Area
- Expansion Area
- Parcels

Growth Area

- Balsam Avenue
- Gateway Village
- RVC Foundation
- Expansion Area

Existing Mains

- 100 mm
- 150 mm
- 200 mm
- 300 mm

Proposed Mains

- Proposed 100mm Supply Main
- Proposed 300mm Water Main

TITLE
FUTURE WATER SERVICING CONCEPT #3

PROJECT
BRAGG CREEK SERVICING STUDY

CLIENT
ROCKY VIEW COUNTY

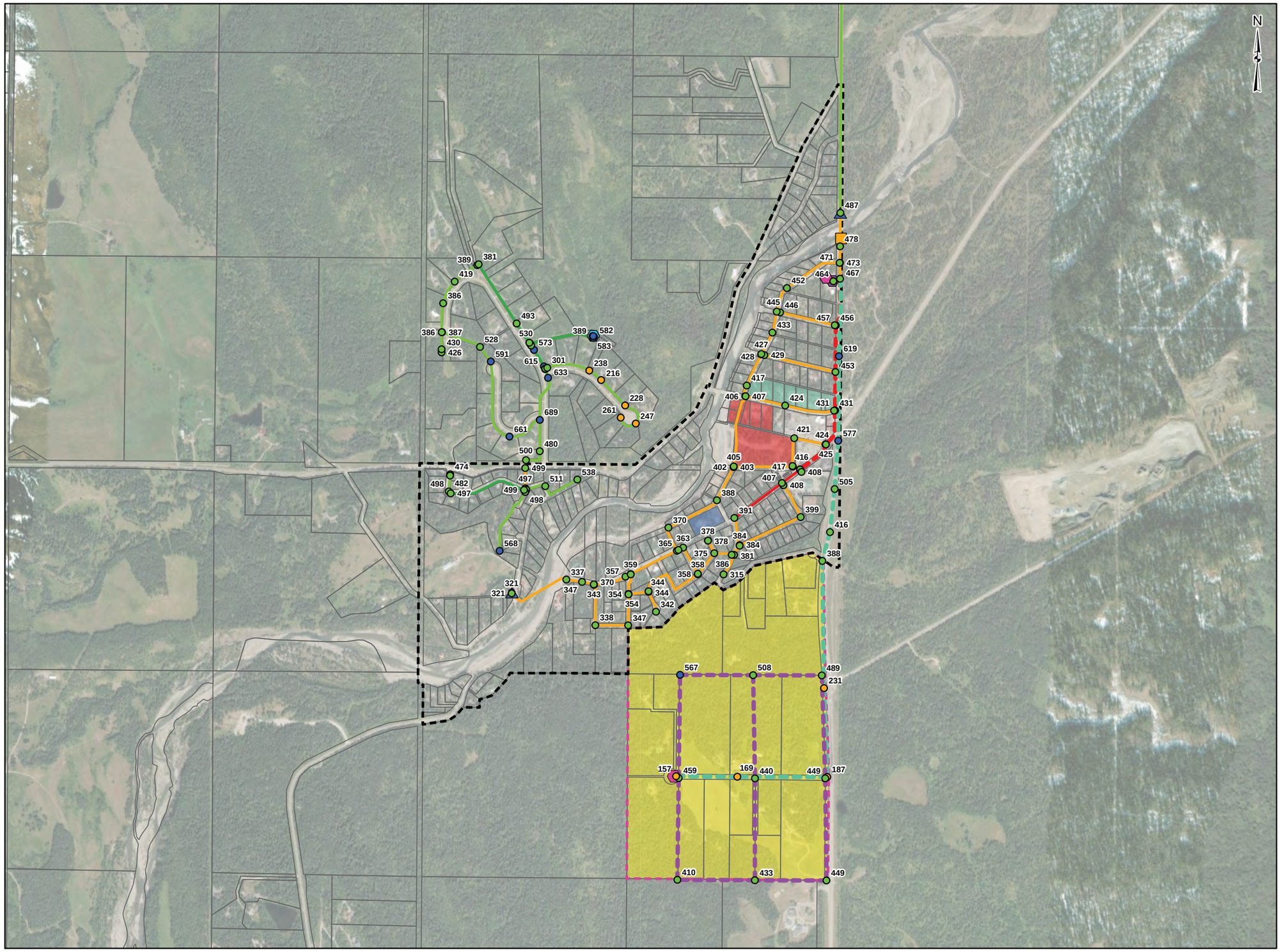
DATA SOURCES
- Topographic Map:Maxar

PROJECTION
NAD 1983 3TM 114

0 180 360
1:15,000 Meters

FIGURE	8.3
DATE	9/25/2025
PROJECT NO.	28782
AUTHOR	jshinbine

Document: M:\28782_Bragg_Creek\01_GIS\28782_Bragg_Creek_Servicing_Study\28782_Bragg_Creek_Servicing_Studyaprx - Figure 8.3 - Future Water Servicing Concept #3



LEGEND

- Booster Station
- Raw Water Lift Station
- Reservoir
- Treatment Plant
- New/Upgraded Reservoir
- Study Area
- Expansion Area
- Parcels

Growth Area

- Balsam Avenue
- Gateway Village
- RVC Foundation
- Expansion Area

Pressure (kPa)

- Less than 150
- 150 - 300
- 300 - 550
- 550 - 690
- Greater than 690

Existing Mains

- 100 mm
- 150 mm
- 200 mm
- 300 mm

Proposed Upgrades

- 300 mm

Servicing Concept #3

- Proposed 125 mm Supply Line
- Proposed 250 mm Watermain

Note: Labels show pressure in kPa.

TITLE
FUTURE WATER CONCEPT #3 - GROWTH SCENARIO #1 ADD PERFORMANCE

PROJECT
BRAGG CREEK SERVICING STUDY

CLIENT
ROCKY VIEW COUNTY

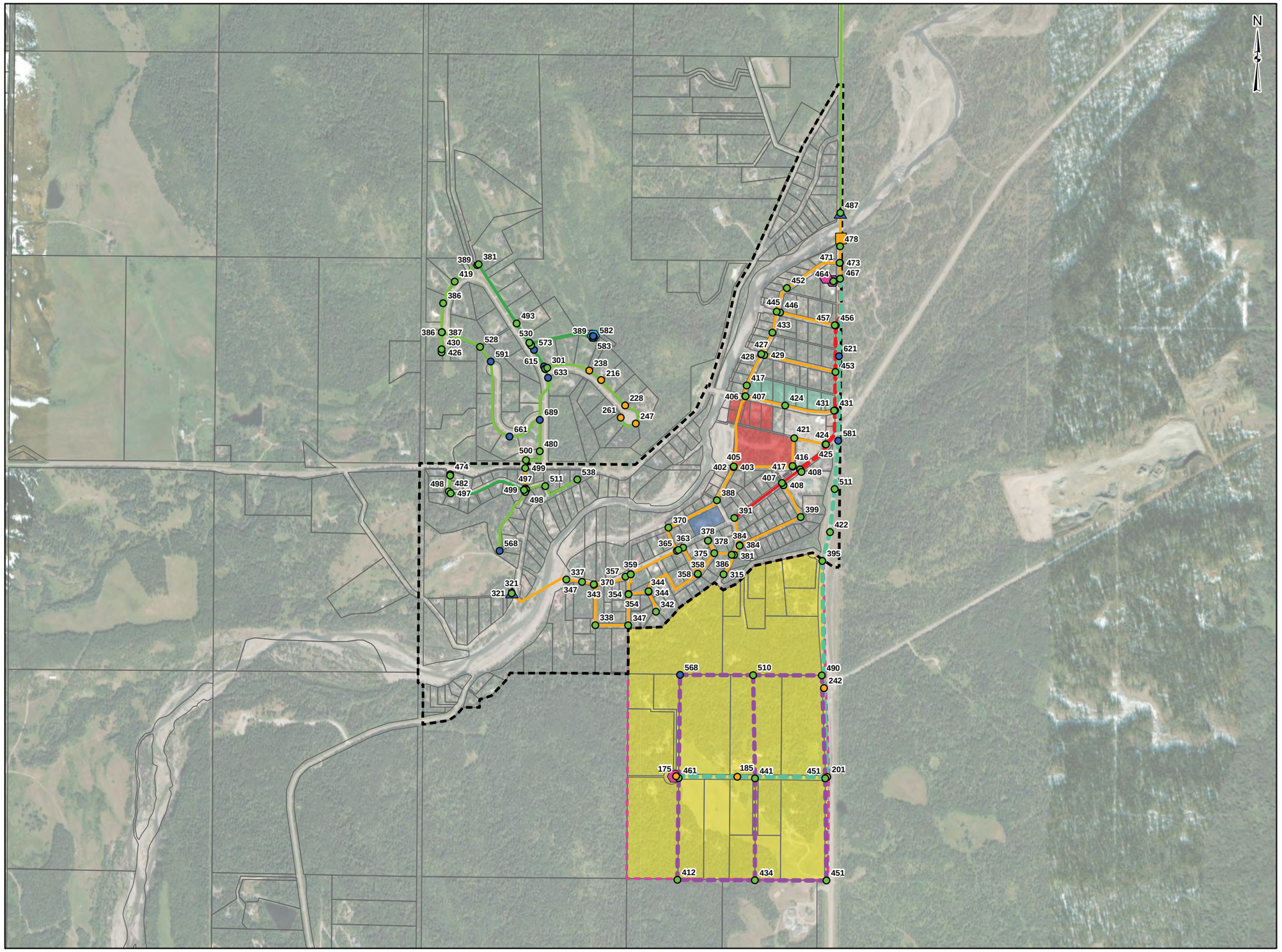
DATA SOURCES
- Topographic Map:Maxar

PROJECTION
NAD 1983 3TM 114

0 180 360
1:15,000 Meters

FIGURE	8.4
DATE	9/30/2025
PROJECT NO.	28782
AUTHOR	jshinbine

Document: M:\28782_Bragg_Creek\01_GIS\28782_Bragg_Creek_Servicing_Study\28782_Bragg_Creek_Servicing_Study.aprx - Figure 8.4 - Future Water Concept #3 - Growth Scenario #1 ADD Results



LEGEND

- Booster Station
- Raw Water Lift Station
- Reservoir
- Treatment Plant
- New/Upgraded Reservoir
- Study Area
- Expansion Area
- Parcels

Growth Area

- Balsam Avenue
- Gateway Village
- RVC Foundation
- Expansion Area

Pressure (kPa)

- Less than 150
- 150 - 300
- 300 - 550
- 550 - 690
- Greater than 690

Existing Mains

- 100 mm
- 150 mm
- 200 mm
- 300 mm

Proposed Upgrades

- 300 mm

Servicing Concept #3

- Proposed 125 mm Supply Line
- Proposed 250 mm Watermain

Note: Labels show pressure in kPa.

TITLE
FUTURE WATER CONCEPT #3 - GROWTH SCENARIO #2 ADD PERFORMANCE

PROJECT
BRAGG CREEK SERVICING STUDY

CLIENT
ROCKY VIEW COUNTY

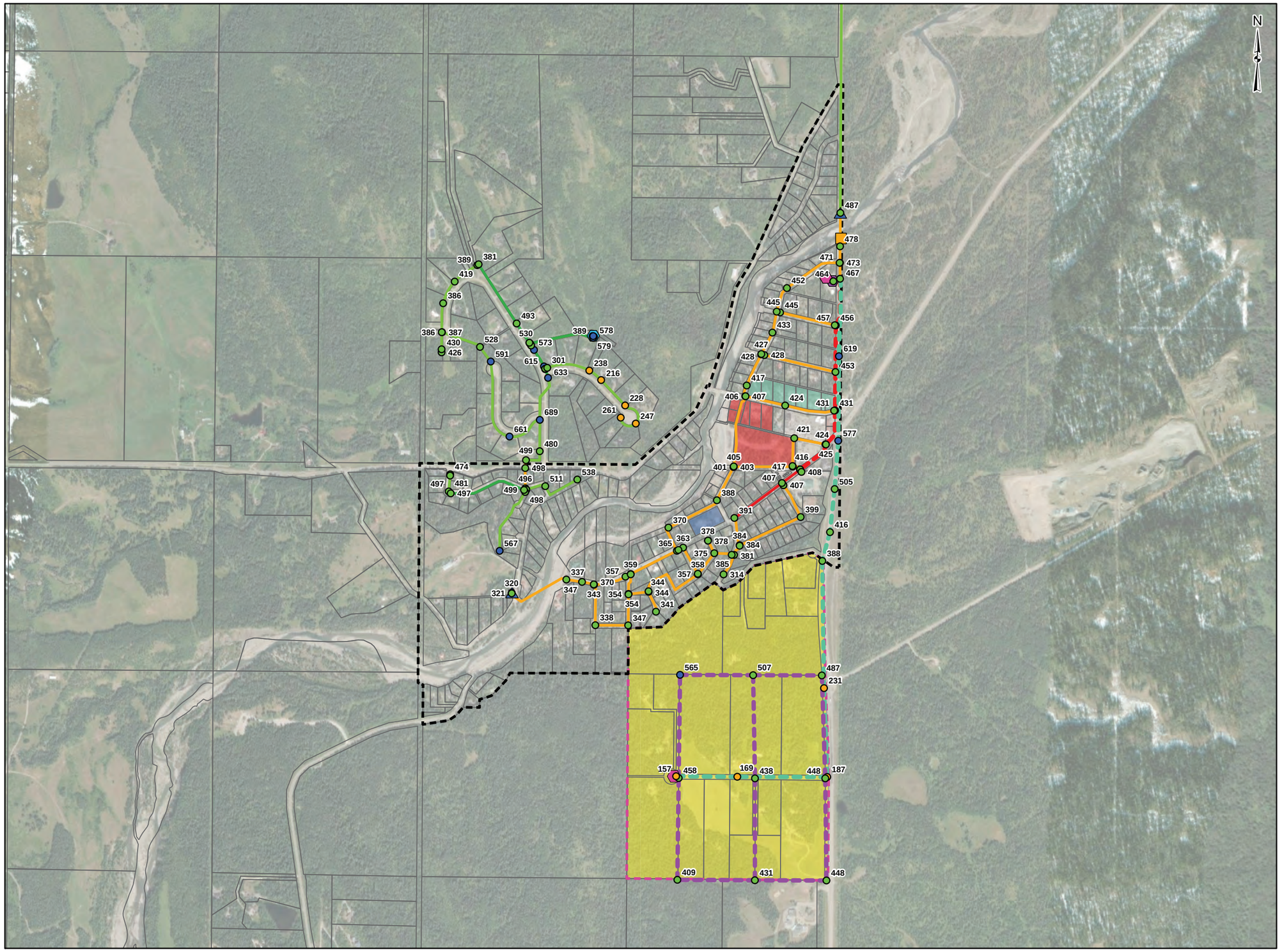
DATA SOURCES
- Topographic Map:Maxar

PROJECTION
NAD 1983 3TM 114

0 180 360
1:15,000 Meters

FIGURE	8.5
DATE	9/30/2025
PROJECT NO.	28782
AUTHOR	jshinbine

Document: M:\28782_Bragg_Creek\01_GIS\28782_Bragg_Creek_Servicing_Study\28782_Bragg_Creek_Servicing_Study.aprx - Figure 8.5 - Future Water Concept #3 - Growth Scenario #2 ADD Results



LEGEND

- Booster Station
- Raw Water Lift Station
- Reservoir
- Treatment Plant
- New/Upgraded Reservoir
- Study Area
- Expansion Area
- Parcels

Growth Area

- Balsam Avenue
- Gateway Village
- RVC Foundation
- Expansion Area

Pressure (kPa)

- Less than 150
- 150 - 300
- 300 - 550
- 550 - 690
- Greater than 690

Existing Mains

- 100 mm
- 150 mm
- 200 mm
- 300 mm

Proposed Upgrades

- 300 mm

Servicing Concept #3

- Proposed 125 mm Supply Line
- Proposed 250 mm Watermain

Note: Labels show pressure in kPa.

TITLE
FUTURE WATER CONCEPT #3 - GROWTH SCENARIO #1 MDD PERFORMANCE

PROJECT
BRAGG CREEK SERVICING STUDY

CLIENT
ROCKY VIEW COUNTY

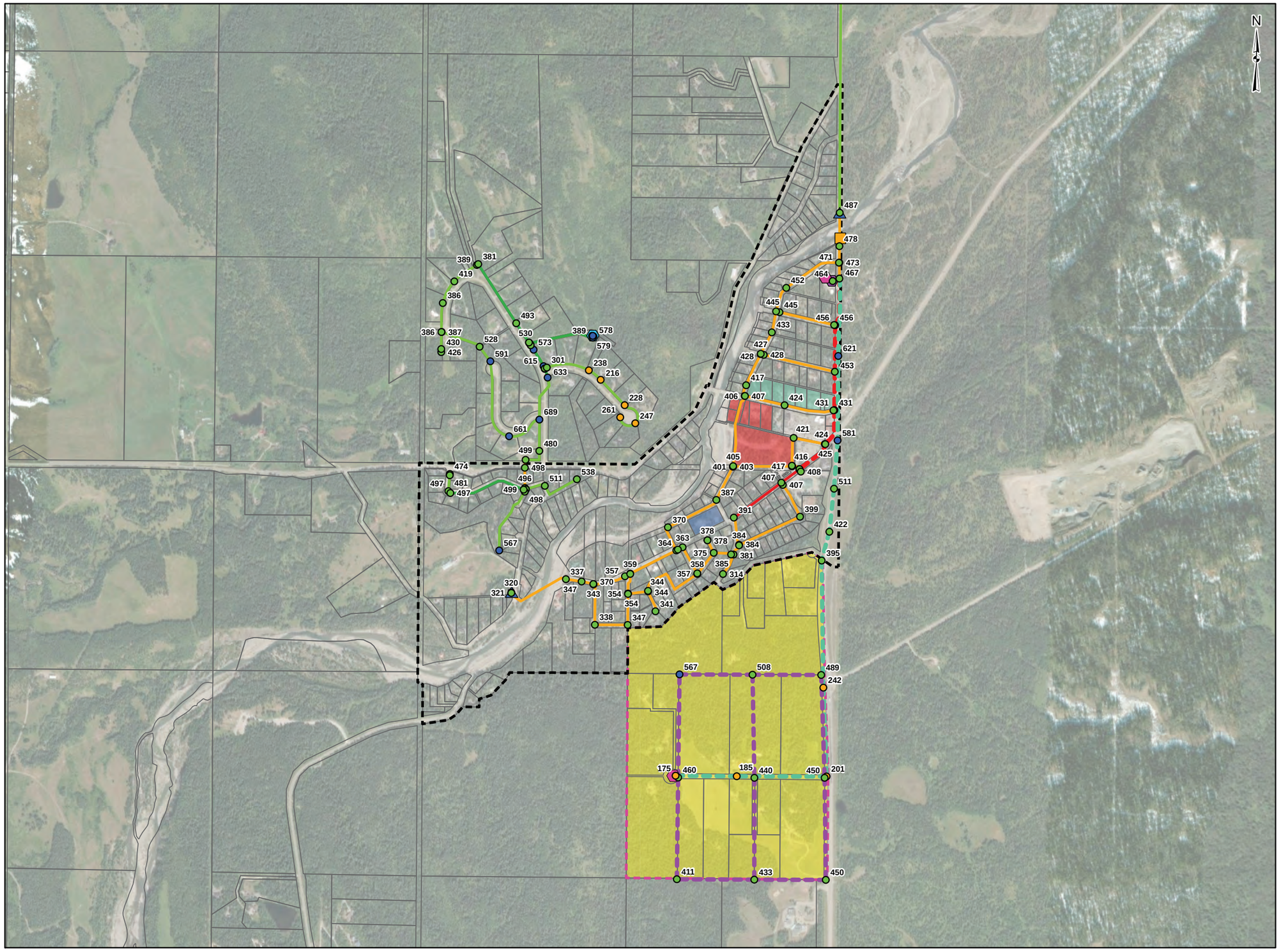
DATA SOURCES
- Topographic Map:Maxar

PROJECTION
NAD 1983 3TM 114

0 180 360
1:15,000 Meters

FIGURE	8.6
DATE	9/30/2025
PROJECT NO.	28782
AUTHOR	jshinbine

Document: M:\28782_Bragg_Creek\01_GIS\28782_Bragg_Creek_Servicing_Study\28782_Bragg_Creek_Servicing_Study.aprx - Figure 8.6 - Future Water Concept #3 - Growth Scenario #1 MDD Results



LEGEND

- Booster Station
- Raw Water Lift Station
- Reservoir
- Treatment Plant
- New/Upgraded Reservoir
- Study Area
- Expansion Area
- Parcels

Growth Area

- Balsam Avenue
- Gateway Village
- RVC Foundation
- Expansion Area

Pressure (kPa)

- Less than 150
- 150 - 300
- 300 - 550
- 550 - 690
- Greater than 690

Existing Mains

- 100 mm
- 150 mm
- 200 mm
- 300 mm

Proposed Upgrades

- 300 mm

Servicing Concept #3

- Proposed 125 mm Supply Line
- Proposed 250 mm Watermain

Note: Labels show pressure in kPa.

TITLE

FUTURE WATER CONCEPT #3 - GROWTH SCENARIO #2 MDD PERFORMANCE

PROJECT

BRAGG CREEK SERVICING STUDY

CLIENT

ROCKY VIEW COUNTY

DATA SOURCES

- Topographic Map:Maxar

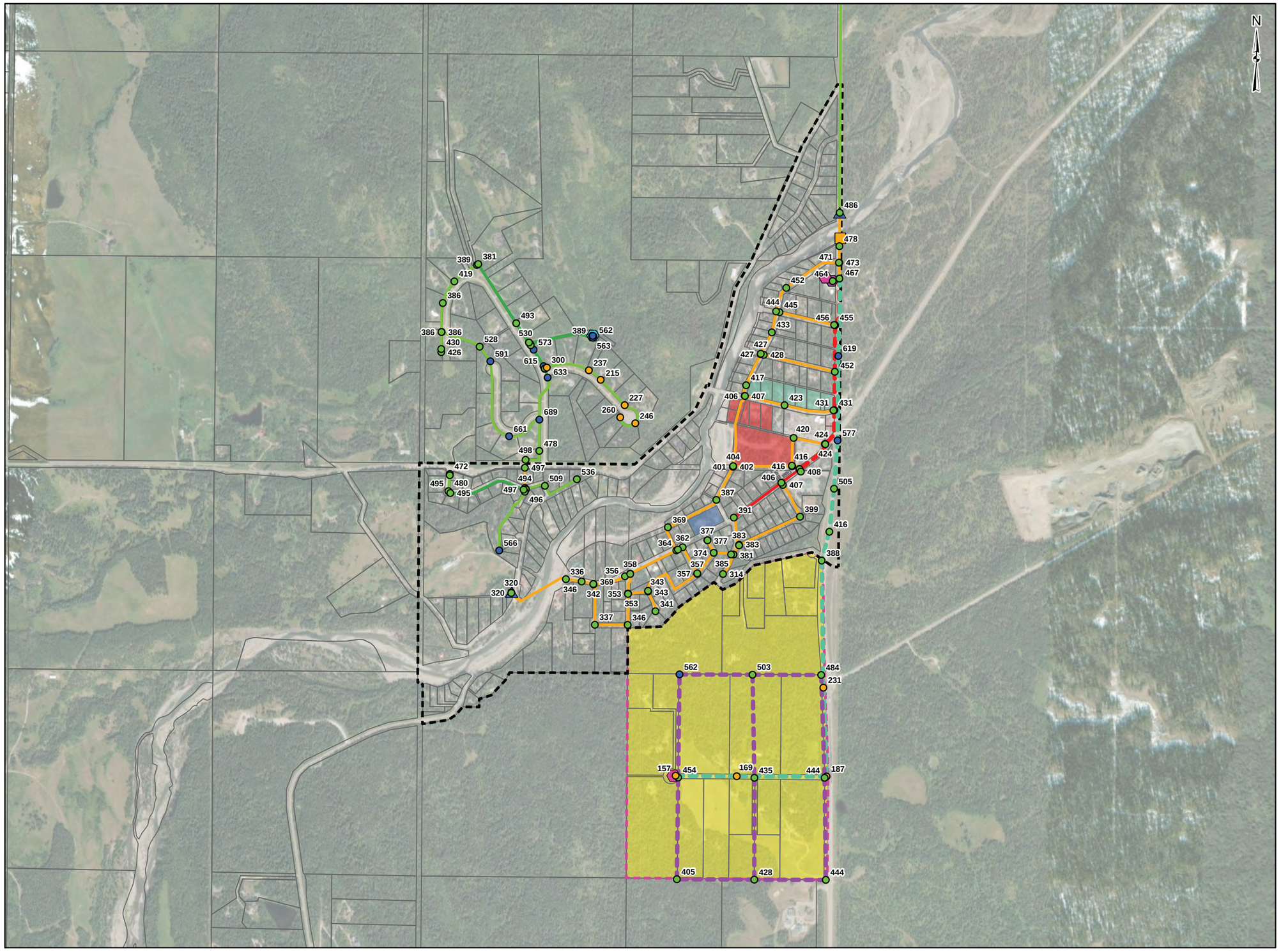
PROJECTION

NAD 1983 3TM 114

0 180 360

1:15,000 Meters

FIGURE	8.7
DATE	9/30/2025
PROJECT NO.	28782
AUTHOR	jshinbine



LEGEND

- Booster Station
- Raw Water Lift Station
- Reservoir
- Treatment Plant
- New/Upgraded Reservoir
- Study Area
- Expansion Area
- Parcels

Growth Area

- Balsam Avenue
- Gateway Village
- RVC Foundation
- Expansion Area

Pressure (kPa)

- Less than 150
- 150 - 300
- 300 - 550
- 550 - 690
- Greater than 690

Existing Mains

- 100 mm
- 150 mm
- 200 mm
- 300 mm

Proposed Upgrades

- 300 mm

Servicing Concept #3

- Proposed 125 mm Supply Line
- Proposed 250 mm Watermain

Note: Labels show pressure in kPa.

TITLE
FUTURE WATER CONCEPT #3 - GROWTH SCENARIO #1 PHD PERFORMANCE

PROJECT
BRAGG CREEK SERVICING STUDY

CLIENT
ROCKY VIEW COUNTY

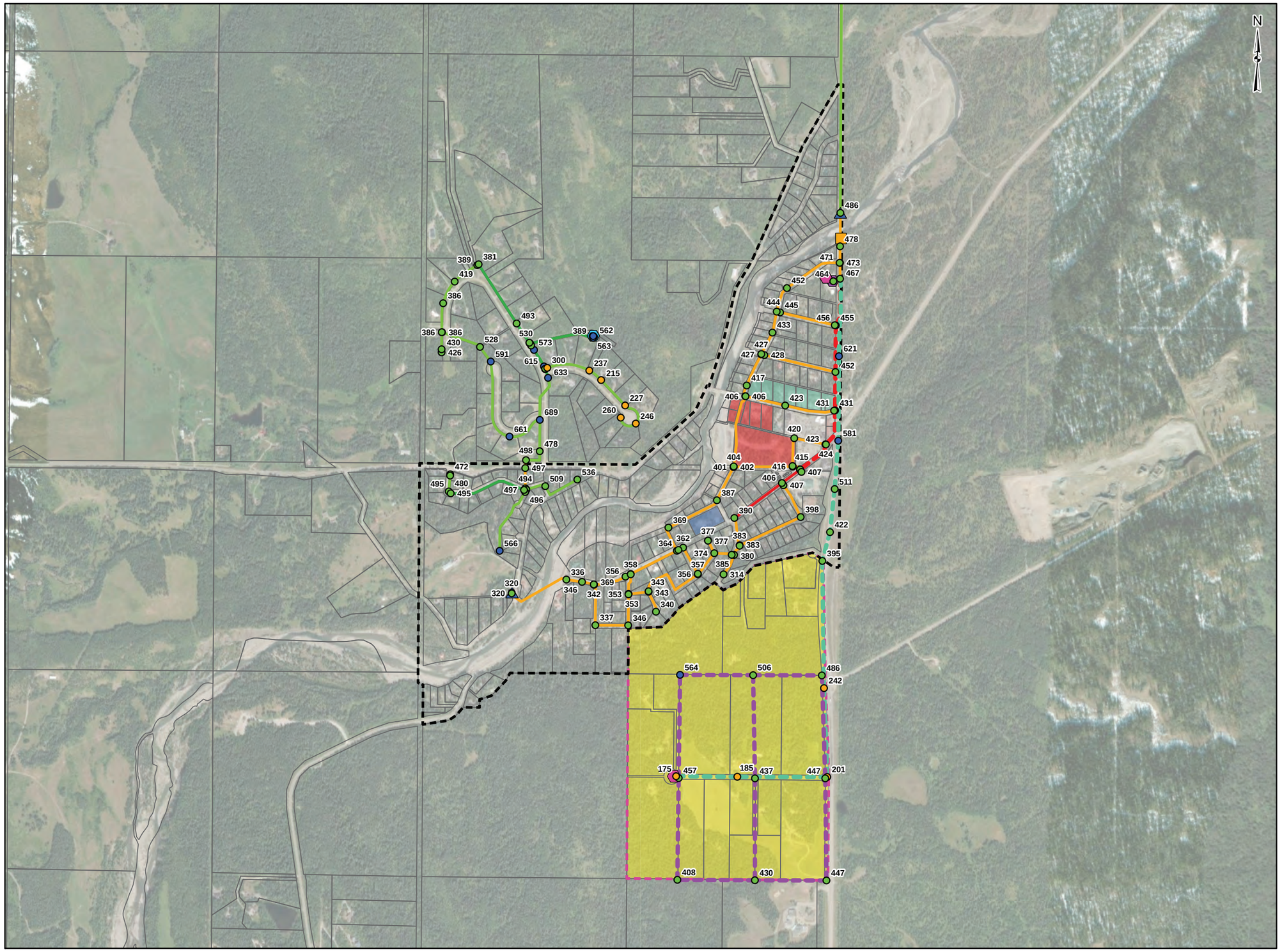
DATA SOURCES
- Topographic Map:Maxar

PROJECTION
NAD 1983 3TM 114

0 180 360
1:15,000 Meters

FIGURE	8.8
DATE	9/30/2025
PROJECT NO.	28782
AUTHOR	jshinbine

Document: M:\28782_Bragg_Creek\01_GIS\28782_Bragg_Creek_Servicing_Study\28782_Bragg_Creek_Servicing_Study.aprx - Figure 8.8 - Future Water Concept #3 - Growth Scenario #1 PHD Results



LEGEND

- Booster Station
- Raw Water Lift Station
- Reservoir
- Treatment Plant
- New/Upgraded Reservoir
- Study Area
- Expansion Area
- Parcels

Growth Area

- Balsam Avenue
- Gateway Village
- RVC Foundation
- Expansion Area

Pressure (kPa)

- Less than 150
- 150 - 300
- 300 - 550
- 550 - 690
- Greater than 690

Existing Mains

- 100 mm
- 150 mm
- 200 mm
- 300 mm

Proposed Upgrades

- 300 mm

Servicing Concept #3

- Proposed 125 mm Supply Line
- Proposed 250 mm Watermain

Note: Labels show pressure in kPa.

TITLE
FUTURE WATER CONCEPT #3 - GROWTH SCENARIO #2 PHD PERFORMANCE

PROJECT
BRAGG CREEK SERVICING STUDY

CLIENT
ROCKY VIEW COUNTY

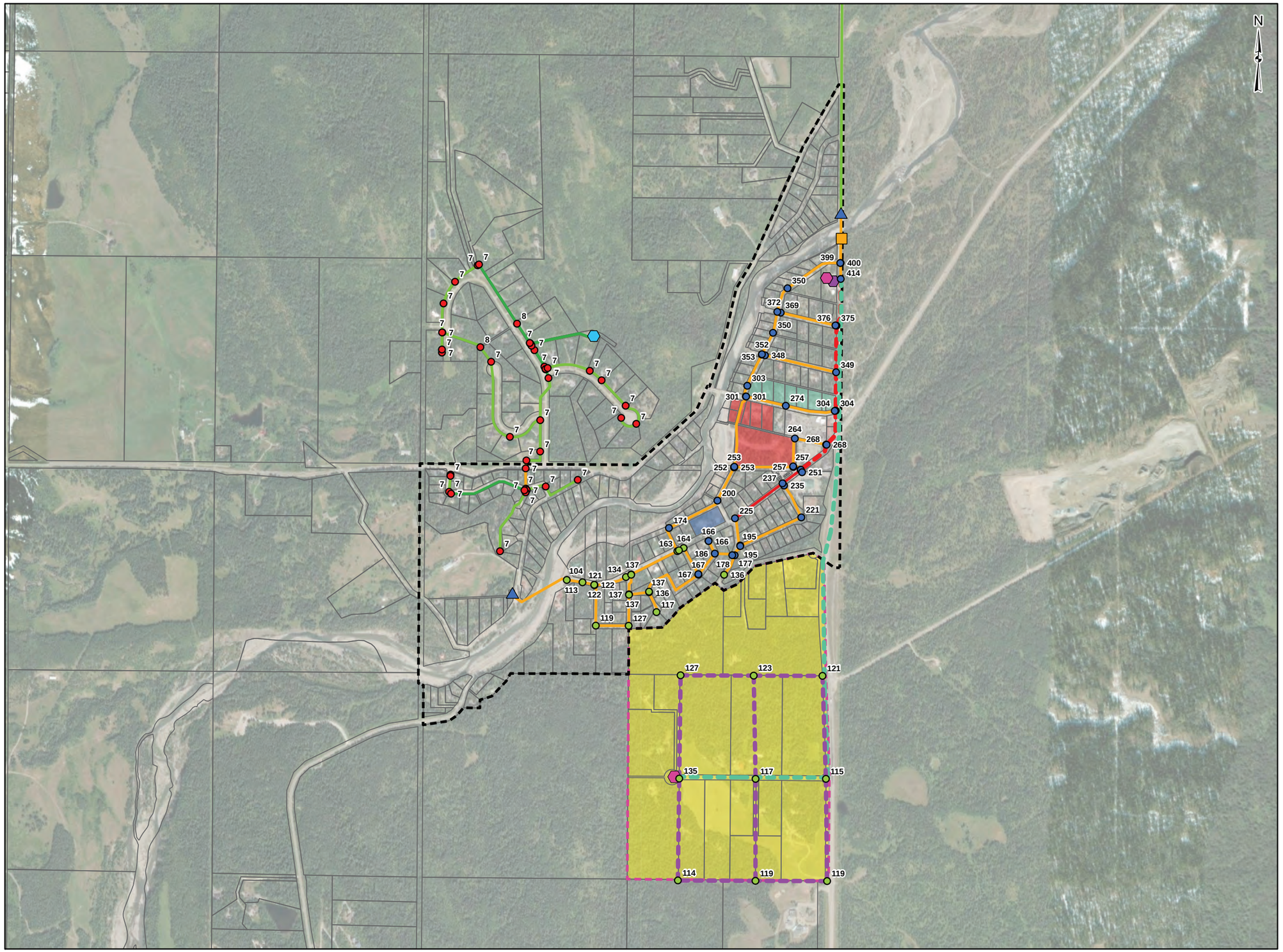
DATA SOURCES
- Topographic Map:Maxar

PROJECTION
NAD 1983 3TM 114

0 180 360
1:15,000 Meters

FIGURE	8.9
DATE	9/30/2025
PROJECT NO.	28782
AUTHOR	jshinbine

Document: M:\28782_Bragg_Creek\01_GIS\28782_Bragg_Creek_Servicing_Study\28782_Bragg_Creek_Servicing_Study.aprx - Figure 8.9 - Future Water Concept #3 - Growth Scenario #2 PHD Results



LEGEND

- Booster Station
- Raw Water Lift Station
- Reservoir
- Treatment Plant
- New/Upgraded Reservoir
- Study Area
- Expansion Area
- Parcels

Growth Area

- Balsam Avenue
- Gateway Village
- RVC Foundation
- Expansion Area

Available Fire Flow (L/s)

- Less than 50
- 50 - 100
- 100 - 166
- Greater than 166

Existing Mains

- 100 mm
- 150 mm
- 200 mm
- 300 mm

Proposed Upgrades

- 300 mm

Servicing Concept #3

- Proposed 125 mm Supply Line
- Proposed 250 mm Watermain

Note: Labels show available fire flow in L/s.

TITLE
FUTURE WATER CONCEPT #3 - GROWTH SCENARIO #1 MDD+FF PERFORMANCE

PROJECT
BRAGG CREEK SERVICING STUDY

CLIENT
ROCKY VIEW COUNTY

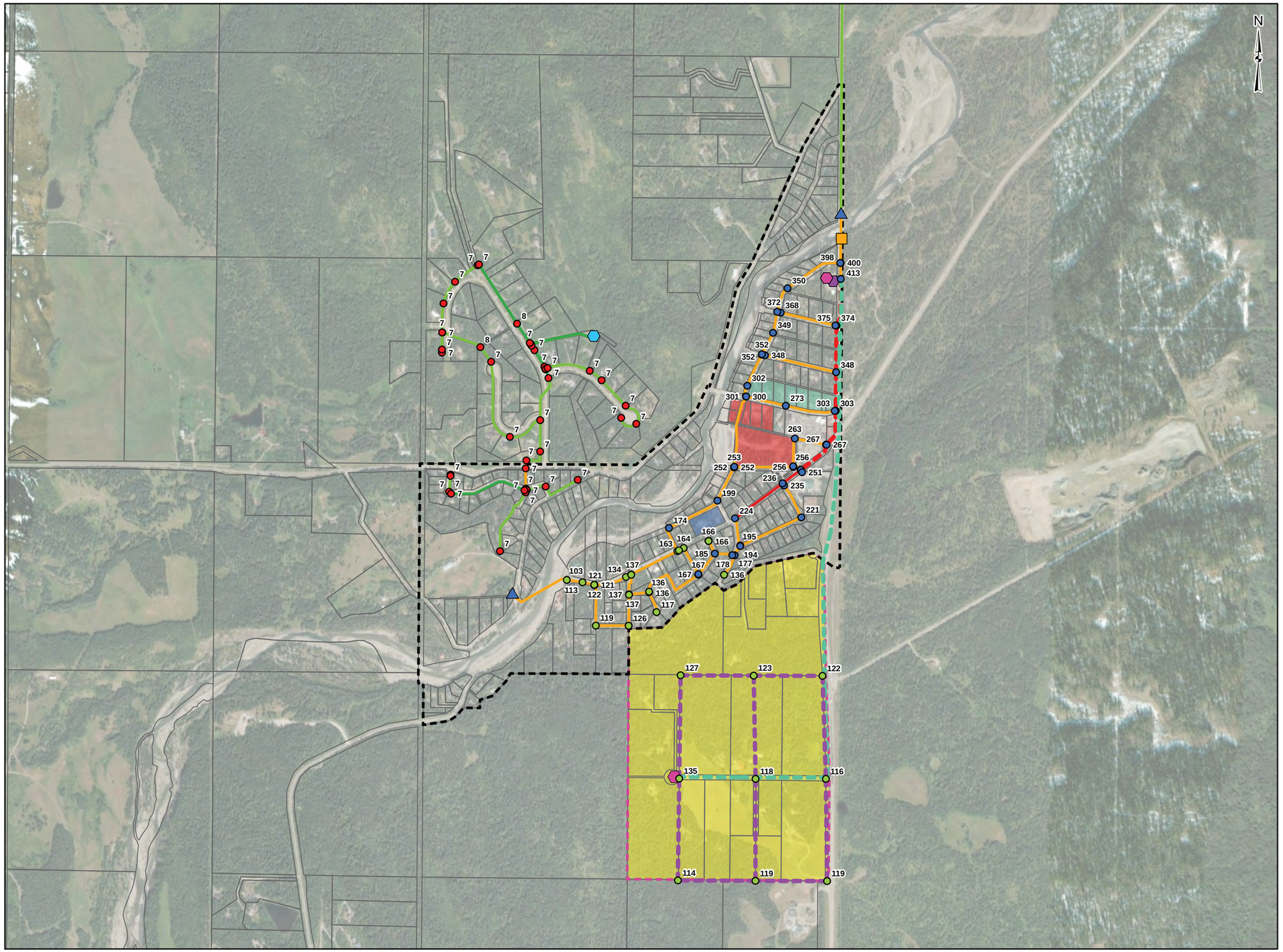
DATA SOURCES
- Topographic Map:Maxar

PROJECTION
NAD 1983 3TM 114

0 180 360
1:15,000 Meters

FIGURE	8.10
DATE	9/30/2025
PROJECT NO.	28782
AUTHOR	jshinbine

Document: M:\28782_Bragg_Creek\01_GIS\28782_Bragg_Creek_Servicing_Study\28782_Bragg_Creek_Servicing_Study.aprx - Figure 8.10 - Future Water Concept #3 - Growth Scenario #1 MDD+FF Results



LEGEND

- Booster Station
- Raw Water Lift Station
- Reservoir
- Treatment Plant
- New/Upgraded Reservoir
- Study Area
- Expansion Area
- Parcels

Growth Area

- Balsam Avenue
- Gateway Village
- RVC Foundation
- Expansion Area

Available Fire Flow (L/s)

- Less than 50
- 50 - 100
- 100 - 166
- Greater than 166

Existing Mains

- 100 mm
- 150 mm
- 200 mm
- 300 mm

Proposed Upgrades

- 300 mm

Servicing Concept #3

- Proposed 125 mm Supply Line
- Proposed 250 mm Watermain

Note: Labels show available fire flow in L/s.

TITLE
FUTURE WATER CONCEPT #3 - GROWTH SCENARIO #2 MDD+FF PERFORMANCE

PROJECT
BRAGG CREEK SERVICING STUDY

CLIENT
ROCKY VIEW COUNTY

DATA SOURCES
- Topographic Map:Maxar

PROJECTION
NAD 1983 3TM 114

0 180 360
1:15,000 Meters

FIGURE	8.11
DATE	9/30/2025
PROJECT NO.	28782
AUTHOR	jshinbine

Document: M:\28782_Bragg_Creek\01_GIS\28782_Bragg_Creek_Servicing_Study\28782_Bragg_Creek_Servicing_Study.aprx - Figure 8.11 - Future Water Concept #3 - Growth Scenario #2 MDD+FF Results

9.0 Future Wastewater System

9.1 Future Wastewater Generation

The future wastewater generation is summarized in **Tables 9.1** and **9.2** for Growth Scenarios #1 and #2, respectively, based on the design standards from **Table 5.7**. The following is noted regarding both tables:

- ADWF for the existing Bragg Creek system is estimated based on 570 c at 255 L/c/d. This estimate is conservative compared to historical inflows to the WWTP which average approximately 0.8 L/s.
- Note that Elkana sewage generation is excluded from these projections as are not serviced by the low-pressure sewer system within Bragg Creek. Because of this reason, the design populations are slightly different compared to **Tables 8.1** and **8.2**.
- PDWF is estimated based on the low-pressure sewer calculations from **Section 7.2**. The PDWF is considered the design flow since there is no I-I anticipated within low-pressure sewers. However, the recent reports (Discover Airdrie, 2025) mention that septic tank/pump systems on properties may be the source of groundwater infiltration that is increasing the flows experienced in the system. Thus, the design flow should be reviewed in the future if I-I sources are detected.
- Cumulative peak totals are not shown due to the differences in flow projections for PDWF, PWWF and design flows. Peak flows within the low-pressure sewers will be different than those calculated by traditional gravity sewer flow calculations. ADWF are shown for information purposes only.
- The developable area for the expansion area is based on 15.1 UPA and an assumed 3 c / lot.

Table 9.1: Future Wastewater Generation – Growth Scenario #1

Area	Population	Area	ADWF	Pf	PDWF	PWWF	Q_d
	c	ha	L/s	-	L/s	L/s	L/s
Existing							
Bragg Creek	570	-	1.68	-	8.82	8.82	8.82
Existing Total	**570**	**-**	**1.68**	**-**	**8.82**	**-**	**-**
Short Term Development							
Gateway Village	420	4.93	1.24	4.01	4.97	6.35	7.39
Balsam Avenue	-	-	-	-	-	-	-
RVC Foundation	120	0.86	0.35	4.22	1.49	1.74	2.02
Infill	210	-	0.62	4.14	2.57	2.57	2.57
Short Term	**750**	**5.79**	**2.21**	**-**	**9.03**	**10.66**	**11.97**
Short Term Total	**1,320**	**-**	**3.90**	**-**	**-**	**-**	**-**
Long Term Development							
Expansion Area	1,050	9.38	3.10	3.79	11.73	14.36	16.70
Long Term	**1,050**	**9.38**	**3.10**	**-**	**11.73**	**14.36**	**16.70**
Long Term Total	**2,370**	**-**	**6.99**	**-**	**-**	**-**	**-**

Table 9.2: Future Wastewater Generation – Growth Scenario #2

Area	Population	Area	ADWF	Pf	PDWF	PWWF	Q_d
	c	ha	L/s	-	L/s	L/s	L/s
Existing							
Bragg Creek	570	-	1.68	-	8.82	8.82	8.82
Existing Total	**570**	**-**	**1.68**	**-**	**8.82**	**-**	**-**
Short Term Development							
Gateway Village	420	4.93	1.24	4.01	4.97	6.35	7.39
Balsam Avenue	120	2.53	0.35	4.22	1.49	2.20	2.56
RVC Foundation	120	0.86	0.35	4.22	1.49	1.74	2.02
Infill	210	-	0.62	4.14	2.57	2.57	2.57
Short Term	**870**	**8.32**	**2.57**	**-**	**10.53**	**12.86**	**14.53**
Short Term Total	**1,440**	**-**	**4.25**	**-**	**-**	**-**	**-**
Long Term Development							
Expansion Area	930	8.31	2.74	3.82	10.49	12.81	14.90
Long Term	**930**	**8.31**	**2.74**	**-**	**10.49**	**12.81**	**14.90**
Long Term Total	**2,370**	**-**	**6.99**	**-**	**-**	**-**	**-**

9.2 Future Wastewater Treatment Requirements

Similar to the WTP, the capacity assessment of the WWTP has been conducted based upon two growth scenarios – short term and long term.

As indicated in **Section 8.2**, the timing of these growth scenarios is not known. Depending on the timelines for upgrades, it may be more cost effective for the County to directly implement the long term upgrades to the WWTP, rather than completing upgrades at two different timelines. Both growth scenarios are discussed further in **Sections 9.2.1** and **9.2.2**.

9.2.1 Short Term Capacity Assessment

Based upon the total short term PWWF of 10.66 – 12.86 L/s or 921 – 1,255 m^3/d, the capacity of the existing WWTP will be exceeded. On the basis that the County would like to maintain the current mode of treatment, this would entail a total additional treatment with a capacity of approximately 640 – 980 m^3/d, to provide treatment at the short term growth scenario (calculation estimated based on the short term projections plus the monitored maximum day demands of approximately 114 m^3/d less the maximum existing treatment capacity of 395 m^3/d).

The projections provided within **Tables 9.1** and **9.2** are conservative. If the existing estimations summarized in **Tables 9.1** and **9.2** were to be compared with the actual historical flows summarized within **Table 5.8** (2015 to 2018), it is seen that the estimated ADWF of 1.68 L/s or 145 m^3/d is approximately 2.3 times the actual average flow of 62 m^3/d (average between 2015 to 2018). Furthermore, the maximum daily to average daily peaking factor from historical data is approximately 2.0. Adjusting the short term projected average flows using a factor of 2.3 results in a revised short term average flow of 83 - 97 m^3/d. Applying a maximum to average daily peaking factor of 2.0 results in a total combined maximum daily flow of 290 – 318 m^3/d for the short term scenario, including the existing scenario, which is below the total capacity of Train A and B.

While the 2015 to 2018 data indicates that the current treatment capacity is sufficient, the news article published by Discover Airdrie in July 2025 suggests that the current wastewater system is undersized. Additionally, wastewater is generally estimated to be 80% of the water demands, which may entail inaccurate wastewater flow data. As such, a capacity assessment using more recent/current flow data is recommended to be conducted prior to expansion to confirm the need and degree for expansion.

For the sake of alignment/consistency with the WTP upgrades and in considering the recent Discover Airdrie news article, ISL have provided a high-level order of magnitude estimate based upon the conservative flows. The cost of membrane manufacturer's scope of supply in 2010 was approximately $0.65M. The extent of their scope of supply is not known; however applying the same rationale as the WTP, the order of magnitude estimate is provided on the basis that the membrane manufacturer's scope of supply was limited to the chemical dosing systems, biological (anoxic/aerobic) system, blowers, diffusers, compressors and the MBR system. It did not include interconnecting pipework, valves, instruments and appurtenances, solids handling system, drum screens, pumps outside their scope of supply, UV reactors, building structure, concrete tanks, HVAC systems, power supply, distribution and controls (outside of the MBR system). Accounting for inflation, scaling and for all equipment/installation outside of membrane manufacturer's scope of supply, a high-level order of magnitude cost for the upgrade is $23.5M. This includes 50% contingency and engineering, combined.

Thus, in conclusion:

- If the flow estimates are adjusted to maintain consistency with 2015 – 2018 flow monitoring data, no upgrades are anticipated at the WWTP in the short term.
- If the conservative flow estimates are assumed, a high-level order of magnitude cost estimate for WWTP upgrades would be on the order of $23.5M (assuming 50% contingency and engineering, combined).

9.2.2 Long Term Capacity Assessment

Based upon the total long term PWWF of 12.81 – 14.36 L/s or 1,107 – 1,241 m^3/d, the capacity of the existing WWTP will be exceeded. On the basis that the County would like to maintain the current mode of treatment, this would entail additional treatment with a capacity of approximately 1,241 m^3/d, to provide treatment at the short term growth scenario, in relation to the short term capacity.

That said, however, applying the same rationale/factor as applied within **Section 9.2.1**, the resulting total maximum daily flow is estimated as 524 m^3/d. As the existing capacity of the WWTP is 395 m^3/d, an additional capacity of 129 m^3/d is anticipated at the long term scenario, which is equivalent to the current capacity of Train A.

As described within **Section 9.2.1**, the need and degree of expansion should be confirmed prior to expansion with the most recent flow data.

For the sake of alignment/consistency with the WTP upgrades and in considering the recent Discover Airdrie news article, ISL have provided a high-level order of magnitude estimate based upon the conservative flows for the long term scenario. Using the same rationale as in **Section 9.2.1**, a high-level order of magnitude cost for the upgrade is $31.1M.

Thus, in conclusion:

- If the flow estimates are adjusted to maintain consistency with 2015 – 2018 flow monitoring data, an additional treatment train is required at the WWTP in the long term (equivalent in capacity to the current capacity of Train A).
- If the conservative flow estimates are assumed, a high-level order of magnitude cost estimate for WWTP upgrades would be on the order of $31.1M (assuming 50% contingency and engineering, combined).

9.3 Future Wastewater Concepts

Three wastewater servicing concepts were developed for infill development within the hamlet, and new development within Gateway Village, Balsam Avenue, RVC Foundation, and the expansion area.

- Servicing Concept #1: Servicing all future growth through upgrades to the existing low-pressure sewer network with additional service connections.
- Servicing Concept #2: Gravity sewer servicing for Balsam Avenue, Gateway Village, RVC Foundation and the expansion area with a proposed lift station located near the Gateway Village development to pump wastewater to the WWTP along the same alignment as the existing syphon. Infill development within Bragg Creek will require some upgrades to the low-pressure sewer system to ensure acceptable velocities between 0.6 – 1.5 m/s and required pumping heads maintained to reasonable levels.
- Servicing Concept #3: Gravity sewer servicing for all development within the expansion area that flows to a lift station located at Park Place. This lift station would then pump wastewater along White Avenue to another proposed lift station at Gateway Village which would collect gravity flows from Gateway Village, Balsam Avenue and RVC Foundation, and then pump the flows to the WWTP along the same alignment as the existing syphon. Infill development within Bragg Creek will require some upgrades to the low-pressure sewer system to ensure acceptable velocities between 0.6 – 1.5 m/s and required pumping heads maintained to reasonable levels.

Some notes regarding the servicing options:

- The existing syphon's casing was designed with additional space to provide room for future twinning. It is assumed that future low-pressure mains or forcemains will make use of this to prevent the need for an additional casing if crossing the Elbow River elsewhere.
- The potential lift station at Gateway Village is assumed to remain independent of the existing low-pressure sewer network. Because of the low velocities observed in the existing low-pressure sewer network analysis, discharge at a proposed Gateway Village Lift Station may create odour concerns in the area.

Servicing Concept #1 – Utilization of the Existing Low-Pressure Network

Servicing Concept #1 has been conceptually designed to convey future wastewater flows for both Growth Scenarios #1 and #2. This concept is shown in **Figure 9.1** and is summarized below:

- Growth Scenario #1 is described below:
  - The Gateway Village development is assumed to connect to low-pressure main #21 and includes the addition of 140 dwellings.
  - The RVC Foundation development is assumed to connect to low-pressure main #16 and includes the addition of 40 dwellings.
  - There is an assumed 70 lots of infill development which has been distributed evenly throughout the low-pressure network.
  - The expansion area development is assumed to connect to low-pressure main #4 and includes the addition of 350 dwellings.
- Growth Scenario #2 is described below:
  - The Gateway Village development is assumed to connect to low-pressure main #21 and includes the addition of 140 dwellings.
  - The Balsam Avenue development is assumed to connect to low-pressure main #22 and includes the addition of 40 dwellings.
  - The RVC Foundation development is assumed to connect to low-pressure main #16 and includes the addition of 40 dwellings.
  - There is an assumed 70 lots of infill development which has been distributed evenly throughout the low-pressure network.
  - The expansion area development is assumed to connect to low-pressure main #4 and includes the addition of 310 dwellings.

- Without any upgrades to the existing low-pressure main system, the total system head requirement increases to above 200 m for each growth scenario, which neither Environment One or Liberty Pumps can meet. Thus, substantial system upgrades would be required.
- The upgrading concept for the low-pressure system can ensure future velocities remain less than 1.5 m/s and that pumping heads do not exceed the 56 m threshold for both growth scenarios.
- Upgrades required only for the 70 lots of projected infill include:
  - Replace 286 m of existing 75 mm with 125 mm low-pressure main along River Drive North from River Drive South to Balsam Avenue (from Junction #18 to #22).
  - Replace 191 m of existing 75 mm with 125 mm low-pressure main along River Drive North from Balsam Avenue to Spruce Avenue (from Junction #22 to #24).
  - Replace 175 m of existing 75 mm with 150 mm low-pressure main along River Drive North from Spruce Avenue to Pine Avenue (from Junction #24 to #26).
- Short term low-pressure main upgrades include:
  - Replace 145 m of existing 75 mm with 125 mm low-pressure main along River Drive South from Harwood Street to where River Drive South turns east (from Node #6 to #18).
- Long term low-pressure main upgrades include:
  - Replace 284 m of existing 75 mm with 125 mm low-pressure main along Park Place to White Avenue (from Junction #5 to #4).
  - Replace 535 m of existing 75 mm with 125 mm low-pressure main along White Avenue from Park Place to River Drive South, and along River Drive South from White Avenue to Harwood Street (from Junction #4 to #6).
  - Twin the existing 100 mm Elbow River Syphon with 238 m of 125 mm low-pressure main (or replace with 150 mm for similar hydraulic performance).
- With the upgrades listed above, the low-pressure sewer network can maintain acceptable velocities and slightly reduced pumping heads throughout the entire system.
- The number of upgrades needed to the low-pressure sewer network is substantial and may warrant more detailed hydraulic analysis to ensure no hydraulic impacts to existing service connections.
- If future development is not fully realized, upsizing existing low-pressure mains may worsen existing low velocities meaning the system may not be able to effectively self-clean which may lead to solids buildup, sedimentation, blockages, odour generation, hazardous gas buildup (H_2S), and corrosion concerns.
- Due to the recent reporting (Discover Airdrie, 2025), this conceptual design option is not recommended since the actual flows may be much higher than standard low-pressure sewer calculations suggest.

Detailed calculations for the future low-pressure assessments are included in **Appendix C**.

Servicing Concept #2 – Centralized Gateway Village Lift Station with Upstream Gravity Servicing

Servicing Concept #2 has been conceptually designed to convey future wastewater flows for both Growth Scenarios #1 and #2. This concept is shown in plan view in **Figure 9.2** and is summarized below:

- The expansion area, Gateway Village, Balsam Avenue and RVC Foundation will be serviced by a lift station located adjacent to the site of development sized to accommodate the following design requirements:
  - Design Flow: 26.1 – 26.9 L/s
  - Static Head: 15.2 m (1,310.4 m – 1,296.2 m + 1.0 m free discharge)
  - Friction Head: 12.3 – 13.0 m (based on Hazen-Williams with C = 140, d = 150 mm, and a length of 894 m)
  - Total Dynamic Head: 27.5 – 28.2 m
  - Forcemain Velocity: 1.5 m/s
- The 150 mm forcemain will be 894 m long and follow the alignment of River Drive North from River Drive South to Pine Avenue where it will turn northwest and cross the Elbow River along the same alignment as the existing syphon (assuming use of the existing casing).

- The gravity system will be initially developed in the short term with 249 m of 200 mm gravity sewer along Harwood Street and River Drive South to ensure future development of RVC Foundation can be serviced by gravity.
- In the long term, the gravity system will be extended with 438 m of 200 mm sewer southwest along White Avenue, and then 400 m south along Park Place to collect sewage from the expansion area.
- The gravity system which has a total length of 1,087 m, has sufficient grade along its entire alignment to maintain sufficient slope at a depth of approximately 3.0 m.
- A high-level constructability review was undertaken and the gravity alignment shown is considered preferable, with other alignments requiring significantly more tree removal or coordination with Alberta Transportation along the longer alignment of Highway 22 to the east.
- The analysis of the gravity sewer was conducted using the design flows from **Section 9.1** as constant inflows (conservative estimate) using a simplified PCSWMM model with a lift station at the downstream end.
- It is assumed that infill development within Bragg Creek will be serviced by the existing low-pressure sewer system and the upgrades required for the 70 projected lots include:
  - Replace 286 m of existing 75 mm with 125 mm low-pressure main along River Drive North from River Drive South to Balsam Avenue (from Junction #18 to #22).
  - Replace 191 m of existing 75 mm with 125 mm low-pressure main along River Drive North from Balsam Avenue to Spruce Avenue (from Junction #22 to #24).
  - Replace 175 m of existing 75 mm with 150 mm low-pressure main along River Drive North from Spruce Avenue to Pine Avenue (from Junction #24 to #26).

Figure 9.3 shows the HGL profile of the gravity sewer alignment with street labels for Growth Scenario #1. As shown, the 200 mm gravity sewer network can maintain shallow depths due to the topography, velocities within 0.6 – 3.0 m/s, and capacity utilizations less than 86%. The HGL profile is shown for Growth Scenario #1, which is the more conservative scenario. While the system was designed to accommodate both growth scenarios, Option #1 assumes higher flow projections from the expansion area.

Servicing Concept #3 – Expansion Area and Gateway Village Lift Stations

Servicing Concept #3 has been conceptually designed to convey future wastewater flows for both Growth Scenarios #1 and #2. This concept is shown in plan view in **Figure 9.4** and is summarized below:

- The expansion area, Gateway Village, Balsam Avenue and RVC Foundation will be serviced by a lift station located adjacent to the site of development sized to accommodate the following design requirements:
  - Design Flow: 26.1 – 26.9 L/s
  - Static Head: 15.2 m (1,310.4 m – 1,296.2 m + 1.0 m free discharge)
  - Friction Head: 12.3 – 13.0 m (based on Hazen-Williams with C = 140, d = 150 mm, and a total length of 894 m)
  - Total Dynamic Head: 27.5 – 28.2 m
  - Forcemain Velocity: 1.5 m/s
- The 150 mm forcemain will be 894 m long and follow the alignment of River Drive North from River Drive South to Pine Avenue where it will turn northwest and cross the Elbow River along the same alignment as the existing syphon (assuming use of the existing casing).
- The expansion area will be serviced by a lift station located just south of Park Place with a forcemain along a similar alignment as the gravity option and will discharge into the Gateway Village lift station.
- The expansion area lift station will be sized to accommodate the following design requirements:
  - Design Flow: 14.9 – 16.7 L/s
  - Static Head: 1.0 m free discharge (no elevation gain required)
  - Friction Head: 10.6 – 13.1 m (based on Hazen-Williams with C = 140, d = 125 mm, and a total length of 899 m)
  - Total Dynamic Head: 11.6 – 14.1 m
  - Forcemain Velocity: 1.2 – 1.4 m/s

- It is assumed that infill development within Bragg Creek will be serviced by the existing low-pressure sewer system and the upgrades required for the 70 projected lots include:
  - Replace 286 m of existing 75 mm with 125 mm low-pressure main along River Drive North from River Drive South to Balsam Avenue (from Junction #18 to #22).
  - Replace 191 m of existing 75 mm with 125 mm low-pressure main along River Drive North from Balsam Avenue to Spruce Avenue (from Junction #22 to #24).
  - Replace 175 m of existing 75 mm with 150 mm low-pressure main along River Drive North from Spruce Avenue to Pine Avenue (from Junction #24 to #26).

9.4 Future Wastewater Concept Cost Estimates

Cost estimates have been prepared for each of the three concept options in **Table 9.3** and more detail is provided in **Appendix D**. The costs assume the following:

- Low-pressure sewer main replacement assumes open cut since trenchless construction would require excavation at each home's service connection.
- Twinning of the syphon has a lower unit rate which reflects the existing steel casing under the Elbow River having sufficient space, thus a new bore is not needed.
- Low-pressure sewer main replacement is assumed to be more expensive than similarly sized forcemains due to the service connections and the need to replace existing 75 mm low-pressure mains.

The cost estimates show that upgrading the low-pressure system may be the most cost-effective; however, due to recent reporting (Discover Airdrie, 2025) suggesting groundwater infiltration within the septic tank/pump systems on individual properties may be causing capacity constraints downstream, ISL recommends that Servicing Concept #2 be pursued.

Table 9.3: Future Wastewater Concept Cost Estimates

ID	Description	Cost ($M)
Servicing Concept #1 – Low-Pressure Sewer System Improvements		
1.1	125 mm low-pressure sewer	0.92
1.2	150 mm low-pressure sewer	0.13
1.3	Twin existing Elbow River syphon with 125 mm	0.27
1.4	Roadway restoration	0.45
	Servicing Concept #1 Total ($M)	**1.77**
Servicing Concept #2 – Gateway Village Lift Station with Upstream Gravity Servicing		
2.1	Gateway Village lift station (PWWF = 26.1 – 26.9 L/s)	1.13
2.2	656 m of 150 mm forcemain from Gateway Village to WWTP	0.32
2.3	238 m of 150 mm forcemain crossing Elbow River (at syphon casing)	0.27
2.4	1,087 m of 200 mm gravity sewer	0.53
2.5	125 mm low-pressure sewer	0.29
2.6	150 mm low-pressure sewer	0.13
2.7	Roadway restoration	0.43
	Servicing Concept #2 Total ($M)	**3.10**
Servicing Concept #3		
3.1	Gateway Village lift station (PWWF = 26.1 – 26.9 L/s)	1.13
3.2	656 m of 150 mm forcemain from Gateway Village to WWTP	0.32
3.3	238 m of 150 mm forcemain crossing Elbow River (at syphon casing)	0.27
3.4	Expansion area lift station (PWWF = 14.9 – 16.7 L/s)	0.70
3.5	899 m of 125 mm expansion area forcemain	0.41
3.6	172 m of 200 mm gravity sewer within expansion area	0.09
3.7	125 mm low-pressure sewer	0.29
3.8	150 mm low-pressure sewer	0.13
3.9	Roadway restoration	0.43
	Servicing Concept #3 Total ($M)	**3.77**

9.5 Recommended Future Wastewater Concept and Timing

Servicing Concept #2 is recommended for future wastewater servicing within Bragg Creek as shown in **Figure 9.2**. This option is generally cost-effective and maximizes the use of gravity sewer servicing, which requires the lowest amount of maintenance. Additionally, there are risks associated with upgrading the low-pressure sewer system, such as low velocities due to larger mains prior to development. This could mean that the system may not be able to effectively self-clean which may lead to solids buildup, sedimentation, blockages, odour generation, hazardous gas buildup (H_2S), and corrosion concerns. The recommended timing of upgrades is summarized below.

Short term upgrades (Gateway Village, Balsam Avenue, and RVC Foundation):

- Design and construct the Gateway Village Lift Station with a design capacity of 26.1 – 26.9 L/s at the southwest corner of the Gateway Village Development.
- Construct the 894 m, 150 mm forcemain from the Gateway Village lift station to the WWTP following River Drive North and the existing Elbow River Syphon alignment (utilizing the existing casing).

- The gravity system will be initially developed in the short term with 249 m of 200 mm gravity sewer along Harwood Street and River Drive South to ensure future development of RVC Foundation can be serviced by gravity.
- If the proposed 70 lots of infill development are realized, the low-pressure sewer system will require the following upgrades:
  - Replace 286 m of existing 75 mm with 125 mm low-pressure main along River Drive North from River Drive South to Balsam Avenue (from Junction #18 to #22).
  - Replace 191 m of existing 75 mm with 125 mm low-pressure main along River Drive North from Balsam Avenue to Spruce Avenue (from Junction #22 to #24).
  - Replace 175 m of existing 75 mm with 150 mm low-pressure main along River Drive North from Spruce Avenue to Pine Avenue (from Junction #24 to #26).
  - Additional study is recommended based on the 2025 Discover Airdrie news article to verify current low-pressure flows through downstream monitoring data.
- No expansion to the WWTP is envisioned under the short term scenario based upon the assessment completed based upon the historical data (2015 to 2018) and the modelled flow data. A more detailed assessment using recent and current flows should be conducted, prior to any upgrades to confirm the need and degree of upgrades.

Long term upgrades (expansion area):

- The gravity system will be extended with 438 m of 200 mm sewer southwest along White Avenue, and then 400 m south along Park Place to collect sewage from the expansion area.
- An expansion of the WWTP equivalent to the current Train A capacity is envisioned based upon the assessment completed based upon the historical data (2015 to 2018) and the modelled flow data. A more detailed assessment using recent and current flows should be conducted, prior to any upgrades to confirm the need and degree of upgrades due to the information provided within the 2025 Discover Airdrie news article and the significant difference between the water and wastewater projections.

Required upgrades for the **expansion area** include 819 m of 125 mm from Junction #5 to #6, twinning of the existing 100 mm syphon with a 125 mm syphon (using the existing casing) plus the upgrades for infill development, Gateway Village, RVC Foundation and Balsam Avenue.

Required upgrades for **infill development** includes 477 m of 125 mm from Junction #18 to #24 and 175 m of 150 mm from Junction #24 to #26

Required upgrades for **Gateway Village**, **RVC Foundation** and **Balsam Avenue** include 145 m of 125 mm from Junction #6 to #18 plus the upgrades for infill development.

N

LEGEND

- Lift Station
- Treatment Plant
- Outfall Structure
- Manhole
- Valve
- Study Area
- Expansion Area
- Parcels

Growth Area

- Balsam Avenue
- Gateway Village
- RVC Foundation
- Expansion Area

Existing Low-Pressure Mains

- 37 mm
- 75 mm
- 100 mm

Servicing Concept #1

- 125 mm Upgrade
- 150 mm Upgrade

TITLE
FUTURE WASTEWATER SERVICING CONCEPT #1

PROJECT
BRAGG CREEK SERVICING STUDY

CLIENT
ROCKY VIEW COUNTY

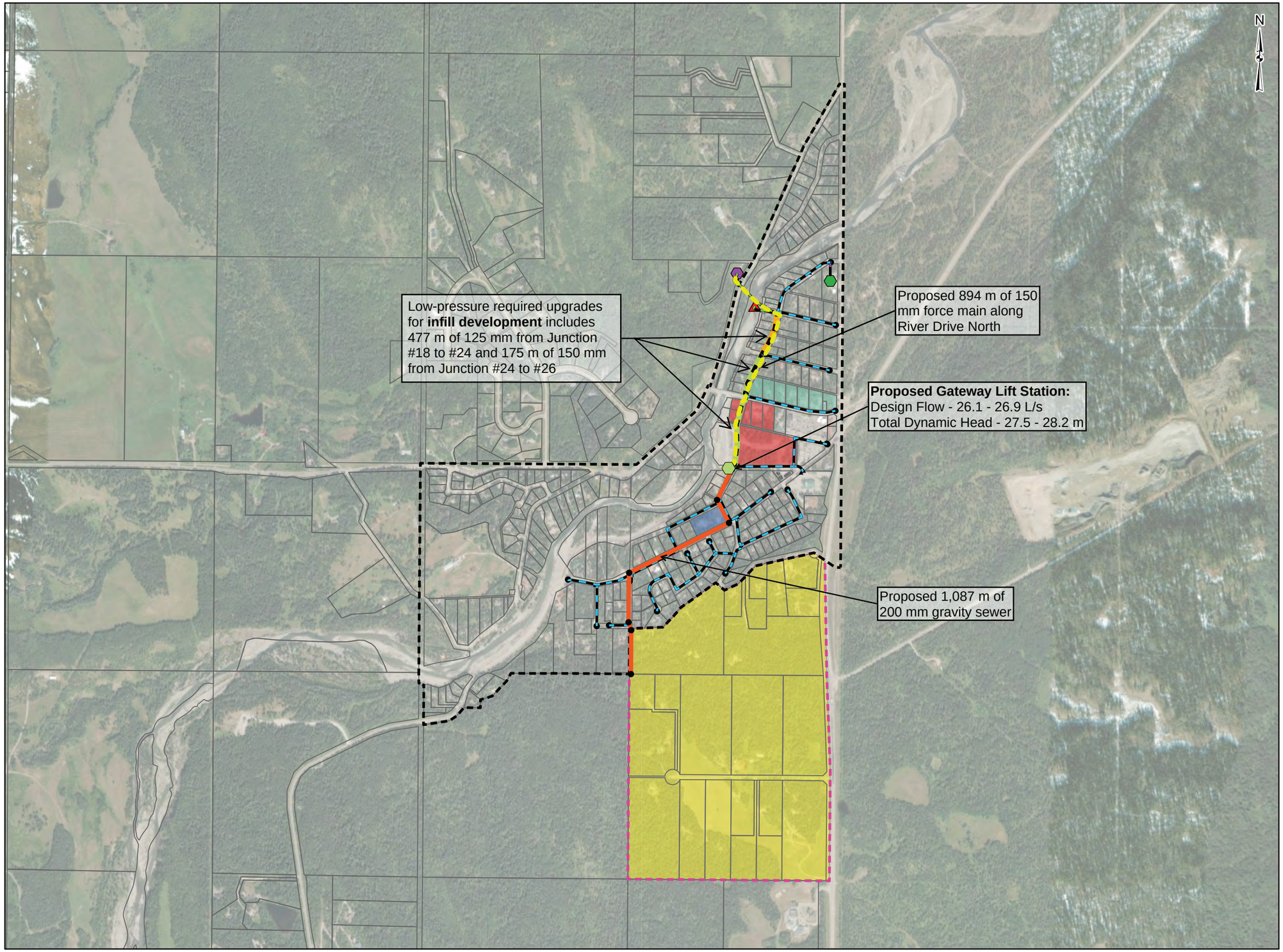
DATA SOURCES
- Topographic Map:Maxar

PROJECTION
NAD 1983 3TM 114

0 180 360
1:15,000 Meters

FIGURE	9.1
DATE	9/30/2025
PROJECT NO.	28782
AUTHOR	jshinbine

Document: M:\28782_Bragg_Creek\01_GIS\28782_Bragg_Creek_Servicing_Study\28782_Bragg_Creek_Servicing_Study.aprx - Figure 9.1 - Future Wastewater Servicing Concept #1



LEGEND

- Proposed Lift Station
- Lift Station
- Treatment Plant
- Outfall Structure
- Manhole
- Valve
- Study Area
- Expansion Area
- Parcels

Growth Area

- Balsam Avenue
- Gateway Village
- RVC Foundation
- Expansion Area

Existing Low-Pressure Mains

- 37 mm
- 75 mm
- 100 mm

Infill Development Upgrades

- 125 mm Upgrade
- 150 mm Upgrade

Servicing Concept #2

- Proposed 150 mm Forcemain
- Proposed 200 mm Gravity main

TITLE
FUTURE WASTEWATER SERVICING CONCEPT #2

PROJECT
BRAGG CREEK SERVICING STUDY

CLIENT
ROCKY VIEW COUNTY

DATA SOURCES
- Topographic Map:Maxar

PROJECTION
NAD 1983 3TM 114

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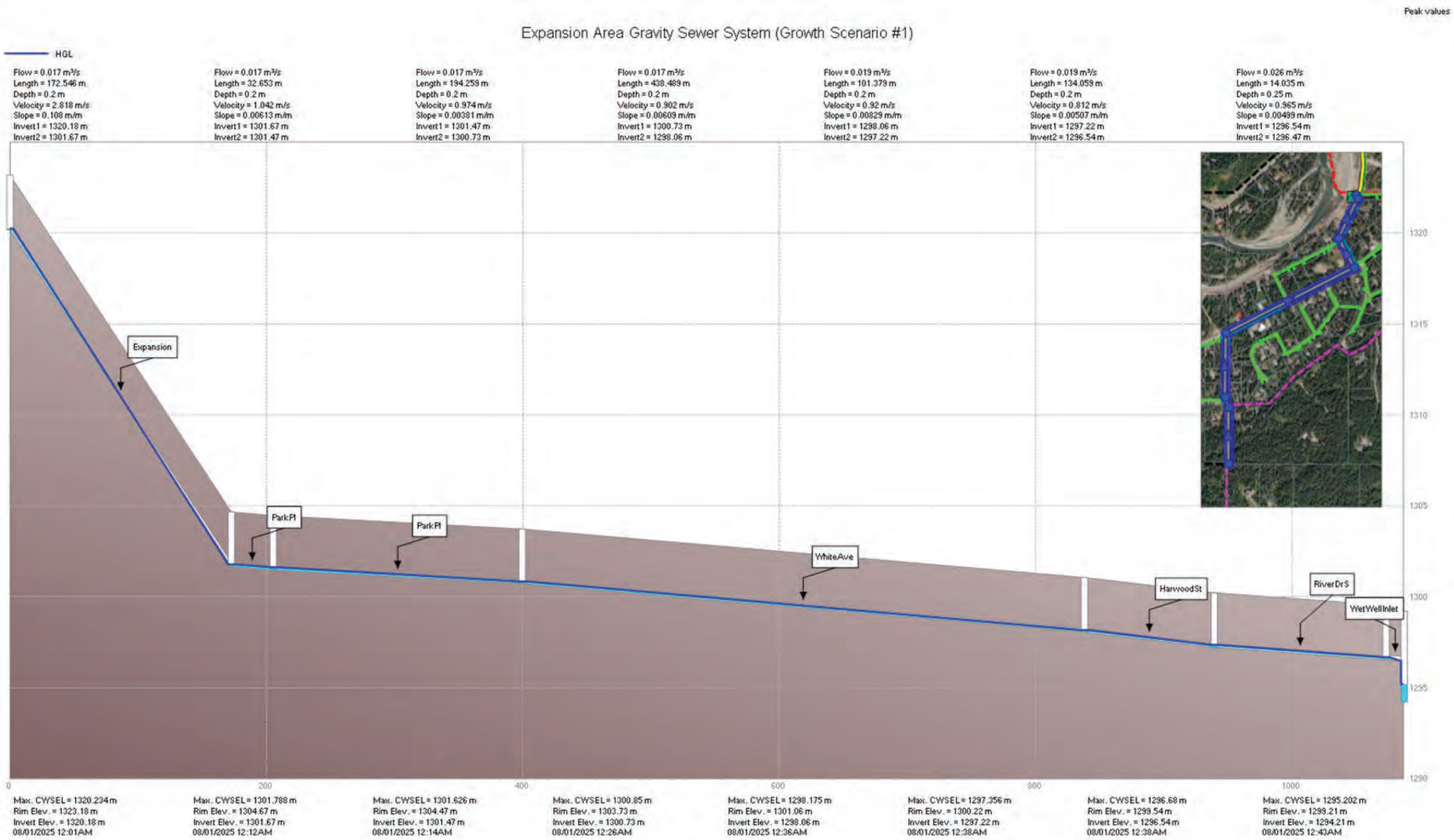
1:15,000 Meters

FIGURE	9.2
DATE	9/30/2025
PROJECT NO.	28782
AUTHOR	jshinbine

Document: M:\28782_Bragg_Creek\001_GIS\28782_Bragg_Creek_Servicing_Study\28782_Bragg_Creek_Servicing_Study.aprx - Figure 9.2 - Future Wastewater Servicing Concept #2



LEGEND

Hydraulic Grade Line (HGL)

Note: The HGL profile is shown for Growth Option #1, which is the more conservative scenario. While the system was designed to accommodate both growth options, Option #1 assumes higher flow projections from the expansion area.

TITLE

FUTURE WASTEWATER SYSTEM #2 - GRAVITY HGL PROFILE (GROWTH #1)

PROJECT

BRAGG CREEK SERVICING STUDY

CLIENT

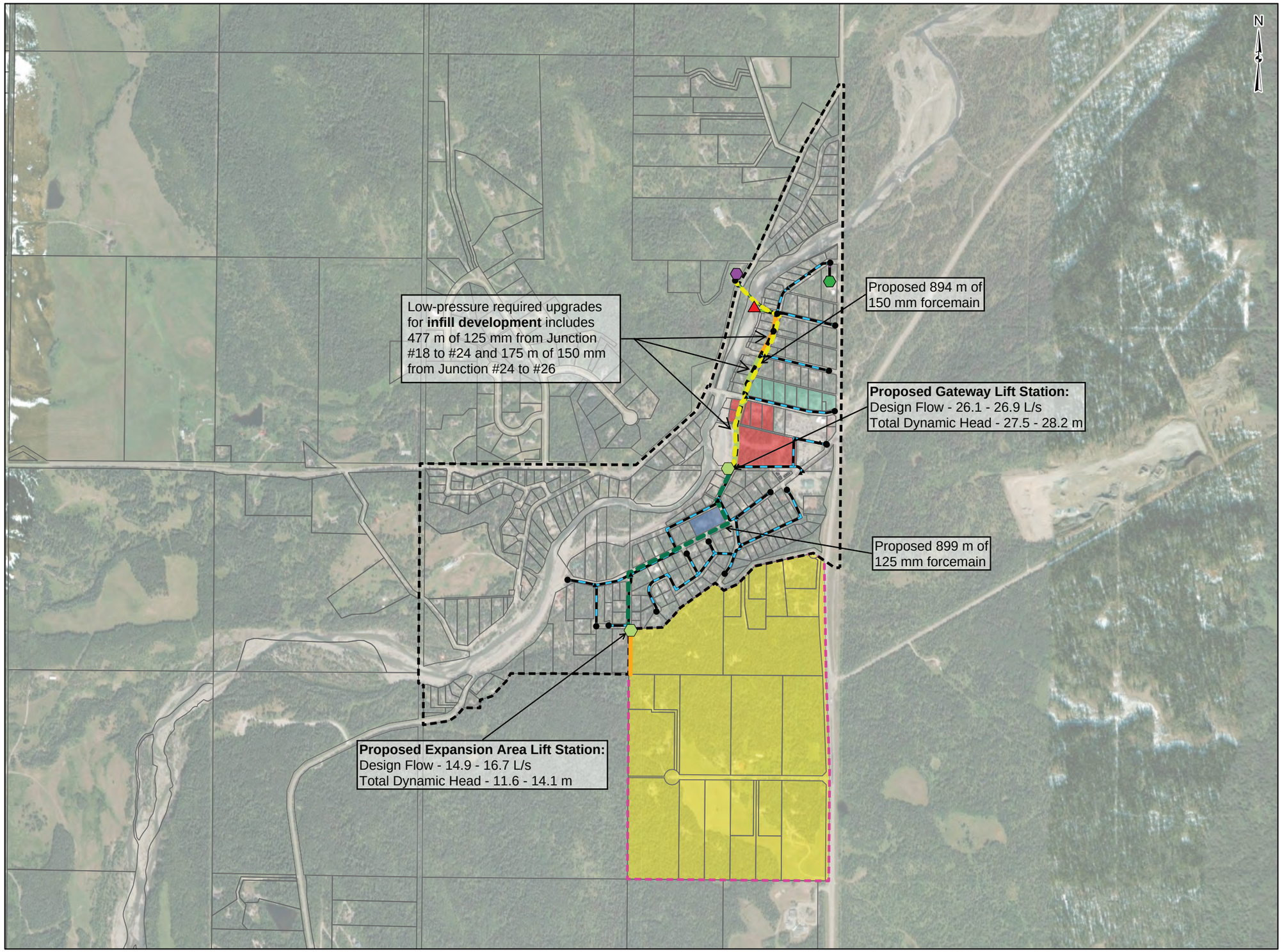
ROCKY VIEW COUNTY

DATA SOURCES

- Topographic Map:

PROJECTION

FIGURE	9.3
DATE	9/30/2025
PROJECT NO.	28782
AUTHOR	jshinbine



LEGEND

- Proposed Lift Station
- Lift Station
- Treatment Plant
- Outfall Structure
- Manhole
- Valve
- Study Area
- Expansion Area
- Parcels

Growth Area

- Balsam Avenue
- Gateway Village
- RVC Foundation
- Expansion Area

Existing Low-Pressure Mains

- 37 mm
- 75 mm
- 100 mm

Infill Development Upgrades

- 125 mm Upgrade
- 150 mm Upgrade

Service Concept #3

- Proposed 125 mm Forcemain
- Proposed 150 mm Forcemain
- Proposed 200 mm Gravity Main

TITLE
FUTURE WASTEWATER SERVICING CONCEPT #3

PROJECT
BRAGG CREEK SERVICING STUDY

CLIENT
ROCKY VIEW COUNTY

DATA SOURCES
- Topographic Map:Maxar

PROJECTION
NAD 1983 3TM 114

0 180 360
1:15,000 Meters

FIGURE	9.4
DATE	9/30/2025
PROJECT NO.	28782
AUTHOR	jshinbine

Document: M:\28782_Bragg_Creek\01_GIS\28782_Bragg_Creek_Servicing_Study\28782_Bragg_Creek_Servicing_Study.aprx - Figure 9.4 - Future Wastewater Servicing Concept #3

10.0 Conclusions and Recommendations

10.1 Conclusions

- The Bragg Creek Servicing Study provides a framework for both existing and future water and wastewater servicing in the Hamlet of Bragg Creek (Bragg Creek) and included a review of water supply, fire flow availability, sewage conveyance, and wastewater treatment and disposal.
- Bragg Creek consists of urban residential development with some commercial and public service land uses and Elkana is entirely country/rural residential development. The total estimated population is 777.
- Future development within Bragg Creek has been analyzed based on two growth scenarios summarized in **Tables 2.1** and **2.2**. Future development consists of infill development throughout the hamlet, and proposed growth at Gateway Village, Balsam Avenue, RVC Foundation, and within the expansion area to the south of Bragg Creek. There is some possibility for mixed use and commercial development as well.
- The WTP has a capacity of 500 m^3/d. The Bragg Creek Reservoir and Pumphouse which distributes potable water throughout the hamlet, to the Lower Elkana Pumphouse, and to Wintergreen Woods. The Upper Elkana Reservoir and Pumphouse services Elkana through two pressure zones. Some homes are equipped with PRVs to control high pressures.
- The WWTP has two treatment trains with a capacity of 115 – 185 m^3/d and 180 – 210 m^3/d. The existing low-pressure sewer system is largely 75 mm in size and some of the pumps cannot maintain adequate pumping heads. The Elbow River syphon is 100 mm in size with additional space within its casing to allow for twinning.
- Assessment of the existing water distribution shows that Bragg Creek can maintain acceptable pressures, Cummer Place is consistently below 300 kPa, and some of the lower elevation areas within Elkana 1 can reach as high as 689 kPa which creates a risk of bursting water mains. The existing water system does not have fire pumps but there are a few dry hydrants within the system.
- Assessment of the existing low-pressure sewer system revealed that existing capacities are sufficient based on standard low-pressure sewer calculations. These assessments should be reviewed in the future once further investigation and flow monitoring is available to evaluate the impact (if any) of groundwater infiltration into the low-pressure pumping systems.
- Future water servicing concepts were evaluated and are summarized below. Of these options, Servicing Concept #3 is preferred because it provided fire storage redundancy and had none of the potential water quality concerns noted with Concepts #1 and #2.
  - Servicing Concept #1: Provide future pumping and storage from the existing Bragg Creek Reservoir and Pumphouse.
  - Servicing Concept #2: Provide future distribution/fire pumping and storage capacity from a new reservoir located adjacent to the Gateway Village development.
  - Servicing Concept #3: Provide future distribution/fire pumping and storage capacity from a new reservoir located at a high point adjacent to the expansion area development.
- Future wastewater servicing concepts were evaluated and are summarized below. Of these options, Servicing Concept #2 is preferred because it is more cost-effective than Concept #3 and there are ongoing concerns regarding capacity within the low-pressure sewer system due to unaccounted for groundwater infiltration (Concept #1). Servicing Concepts #2 and #3 both assume some low-pressure upgrades in the event of infill development.
  - Servicing Concept #1: Servicing all future growth through upgrades to the existing low-pressure sewer network with additional service connections.
  - Servicing Concept #2: Gravity sewer servicing for future growth with a new lift station located near Gateway Village to pump wastewater to the WWTP along the same alignment as the existing syphon.
  - Servicing Concept #3: Gravity sewer servicing for the expansion area connecting to a lift station located at Park Place that pumps to the proposed Gateway Village lift station. This station would then collect flows from Gateway Village, Balsam Avenue, and RVC Foundation and pump all flows to the WWTP along the same alignment as the existing syphon.

10.2 Recommendations

Water System Recommendations

ISL recommends the following staging plan for the water distribution system as described on **Figures 6.9** and **8.3**:

- Existing system upgrades:
  - Provide a 250 L/s fire pump and increase the discharge header HGL at the Bragg Creek Reservoir to 1,340 m.
  - Construct 2,500 m^3 of additional reservoir storage at the Bragg Creek Reservoir and Pumphouse.
  - Construct 847 m of 300 mm water main from the Bragg Creek Reservoir along Burnside Avenue and connect to the existing 300 mm water main at the intersection of River Drive South and White Avenue.
  - Construct seven (7) fire hydrants along the proposed 300 mm water main near the WTP and where its alignment intersects with Pine Avenue, Spruce Avenue, Balsam Avenue, Cowboy Trail, and at River Drive South.
  - These upgrades are anticipated to cost **$6.96M**.
- Short term upgrades (Gateway Village, Balsam Avenue, and RVC Foundation):
  - Replace the pumps at the Bragg Creek Pumphouse to provide a firm distribution capacity of up to 25 L/s.
  - Construct 610 m^3 of additional reservoir storage at the Bragg Creek Reservoir and Pumphouse.
  - Both short term upgrades are anticipated to cost **$1.43M**.
- Long term upgrades (expansion area):
  - Construct 2,600 m of 125 mm supply main from the Bragg Creek WTP to the proposed expansion area reservoir location.
  - Construct the expansion area reservoir with 1,400 m^3 of storage (includes both MDD and FF storage).
  - Provide 16 L/s of firm distribution pumping capacity (two pumps in lead/standby operation) and one fire pump capable of providing 100 L/s to the expansion area.
  - RVC can consider looping the distribution system in the expansion area back into the existing 200 mm network using PRVs to improve overall distribution system resiliency. Conversely, the valves could be closed and only opened during emergency conditions to provide water to the lower hamlet if the Bragg Creek Reservoir and Pumphouse is out of service.
  - These upgrades are estimated to cost **$4.60M**.
- Upgrading and cost estimates for the WTP are based on conservative consumption rates and further review is recommended closer to the time of development when updated current and anticipated demands are more refined. That being said, the assessment conservatively staged upgrades as follows:
  - Add an additional 500 m^3/d in the short term at an estimated cost of **$16.10M**.
  - Add an additional 500 m^3/d in the long term at an estimated cost of **$16.10M**.

Wastewater System Recommendations

The following has been identified for further study regarding the wastewater system:

- ISL recommends that RVC continue their wastewater system inspections to identify the sources of infiltration and continue to communicate to residents the importance of water conservation measures such as reducing laundry cycles, toilet flushing, dishwasher use, length of showers, and to ensure sump pumps do not discharge to the sanitary system.
- If significant I-I sources are identified within the wastewater system that are not accounted for, ISL recommends an I-I Assessment and Wet Weather Flow Management Strategy to remove these sources of I-I from the wastewater system.

ISL recommends the following staging plan for the wastewater system as described in **Figure 9.2** (Servicing Concept #2), subject to the conclusions and recommendations from updated flow monitoring and inspection results.

- Short term upgrades (Gateway Village, Balsam Avenue and RVC Foundation):
  - Design and construct the Gateway Village Lift Station with a design capacity of 26.1 – 26.9 L/s at the southwest corner of the Gateway Village Development.
  - Construct the 894 m, 150 mm forcemain from the Gateway Village lift station to the WWTP following River Drive North and the existing Elbow River Syphon alignment (utilizing the existing casing).
  - The gravity system will be initially developed in the short term with 249 m of 200 mm gravity sewer along Harwood Street and River Drive South to ensure future development of RVC Foundation can be serviced by gravity.
  - If the proposed 70 lots of infill development are realized, the low-pressure sewer system will require the following upgrades:
    - Replace 286 m of existing 75 mm with 125 mm low-pressure main along River Drive North from River Drive South to Balsam Avenue (from Junction #18 to #22).
    - Replace 191 m of existing 75 mm with 125 mm low-pressure main along River Drive North from Balsam Avenue to Spruce Avenue (from Junction #22 to #24).
    - Replace 175 m of existing 75 mm with 150 mm low-pressure main along River Drive North from Spruce Avenue to Pine Avenue (from Junction #24 to #26).
  - These upgrades are anticipated to cost **$2.51M** (accounting for 905 m of road restoration costs).
- Long term upgrades (expansion area):
  - The gravity system will be extended with 438 m of 200 mm sewer southwest along White Avenue, and then 400 m south along Park Place to collect sewage from the expansion area.
  - These upgrades are anticipated to cost **$0.59M** (accounting for 666 m of road restoration costs).
- Upgrading and cost estimates for the WWTP are based on conservative generation rates and further review is recommended closer to the time of development when updated current and anticipated demands are more refined. That being said, the assessment conservatively staged upgrades as follows:
  - Add an additional 640 – 980 m^3/d of capacity in the short term at an estimated cost of **$23.50M**.
  - Add an additional 1,107 – 1,241 m^3/d of capacity in the long term at an estimated cost of **$31.10M**.
  - It should be noted that these capacity requirements and cost estimates are based on the conservative flow projections, and further study to refine these projections using monitoring data will likely reduce the upgrading requirements and overall costs.

11.0 References

1. Bragg Creek Hamlet Expansion Area Structure Plan Servicing Feasibility Study, ISL (Apr. 2020)
2. Gateway Village Master Site Development Plan, RVC (May 2021)
3. Wintergreen Woods Watermain Replacement, ISL (Feb. 2022)
4. Gateway Development Servicing, CIMA+ (Apr. 2022)
5. Preliminary Servicing Options Summary – Revised Memorandum, ISL (Sept. 2022)
6. Bragg Creek Area Structure Plan Hamlet Review, RVC (ongoing)
7. Standards and Guidelines for Municipal Waterworks, Wastewater and Storm Drainage Systems, Government of Alberta (Mar. 2013)
8. Rural Servicing Design and Construction Manuals, Section 102 Low-Pressure Sanitary Sewer System, Aquatera Utilities Inc. (2020)
9. Design Guidelines for Subdivision Servicing, The City of Calgary (Oct. 2020)
10. Low-Pressure Sewer Systems Using Environment One Grinder Pumps Design Manual, E/One (Apr. 2025)
11. Rocky View County Servicing Standards, RVC (Feb. 2025)
12. Bragg Creek WWTP & Collection System Phase 1, AECOM (Dec. 2012)
13. Bragg Creek Potable Water Transmission and Distribution System and Sanitary Collection (Phase 1), MPE Engineering Ltd. (Jul. 2013)
14. Bragg Creek Potable Water Transmission and Distribution System and Sanitary Collection (Phase 2), MPE Engineering Ltd. (Dec. 2013)
15. Bragg Creek Wastewater Treatment Plant Phase 2, MPE Engineering Ltd. (Mar. 2014)
16. Bragg Creek Water Servicing Phase 2, Bragg Creek WTP, Potable Water Storage, MPE Engineering Ltd. (May 2014)
17. Wintergreen Woods Watermain Upgrade Issued for Construction, ISL (Jun. 2023)
18. The Harmony Integrated Water Systems Master Plan, Urban Systems Limited (2011)
19. Bearspaw Regional Wastewater Treatment Plant Application Letter, Worley Parsons (May 2011)
20. Bragg Creek wastewater remains “well above system capacity” as inspections begin, Discover Airdrie (July 28, 2025)

APPENDIX A
Existing Water System Upgrade Cost Estimates

Item	Description	Unit Rate ($/unit)	Unit	Quantity (unit)	Cost ($)	Engineering ($)	Contingency ($)	Total ($)
Upgrade Option #1 - Minimum Upgrading Requirements								
1.1	Bragg Creek fire pump (250 L/s)	500,000	ea	1	$ 500,000	$ 50,000	$ 150,000	$ 700,000
1.2	Bragg Creek fire storage upgrade (2,500 m³)	1,500	m³	2,500	$ 3,750,000	$ 380,000	$ 1,130,000	$ 5,260,000
1.3	847 m of 300 mm water main along Burnside Avenue to the intersection of White Avenue and River Drive South	638	m	847	$ 540,000	$ 50,000	$ 160,000	$ 750,000
1.4	Installation of Hydrants at intersections along Burnside Drive from Reservoir to River Drive South	25,000	ea	7	$ 180,000	$ 20,000	$ 50,000	$ 250,000
				Option #1 Total	**$ 4,970,000**	**$ 500,000**	**$ 1,490,000**	**$ 6,960,000**
Upgrade Option #2 - Full Fire Flow Protection								
2.1	Bragg Creek fire pump (250 L/s)	500,000	ea	1	$ 500,000	$ 50,000	$ 150,000	$ 700,000
2.2	Bragg Creek fire storage upgrade (2,500 m³)	1,500	m³	2,500	$ 3,750,000	$ 380,000	$ 1,130,000	$ 5,260,000
2.3	847 m of 300 mm water main along Burnside Avenue to the intersection of White Avenue and River Drive South	638	m	847	$ 540,000	$ 50,000	$ 160,000	$ 750,000
2.4	Installation of Hydrants at intersections along Burnside Drive from Reservoir to River Drive South	25,000	ea	7	$ 180,000	$ 20,000	$ 50,000	$ 250,000
2.5	Elkana fire pump (50 L/s)	100,000	ea	1	$ 100,000	$ 10,000	$ 30,000	$ 140,000
2.6	Elkana reservoir fire storage upgrade (100 m³)	1,500	m³	100	$ 150,000	$ 20,000	$ 50,000	$ 220,000
2.7	Elkana Zone 1: 2,639 m of 200 mm upgrading and looping	475	m	2,639	$ 1,250,000	$ 130,000	$ 380,000	$ 1,760,000
2.8	Elkana Zone 2: 2,248 m of 200 mm upgrading and looping	475	m	2,248	$ 1,070,000	$ 110,000	$ 320,000	$ 1,500,000
2.9	727 m of 300 mm water main along White Avenue from Harwood Street to west of Park Point	638	m	727	$ 460,000	$ 50,000	$ 140,000	$ 650,000
2.10	Installation of Hydrants at intersections along White Avenue from Harwood Street to west of Park Point	25,000	ea	14	$ 350,000	$ 40,000	$ 110,000	$ 500,000
2.11	Installation of Hydrants throughout Elkana	25,000	ea	8	$ 200,000	$ 20,000	$ 60,000	$ 280,000
				Option #2 Total	**$ 8,550,000**	**$ 880,000**	**$ 2,580,000**	**$ 12,010,000**

TABLE A.1: Existing Water System Upgrade Cost Estimates
Bragg Creek Servicing Study
Rocky View County

APPENDIX B
Future Water Servicing Concept Cost Estimates

Item	Description	Unit Rate ($/unit)	Unit	Quantity (unit)	Cost ($)	Engineering ($)	Contingency ($)	Total ($)
Servicing Concept #1 - Upgrading Bragg Creek Reservoir and Pumphouse								
1.1	Bragg Creek fire pump (250 L/s)	500,000	ea	1	$ 500,000	$ 50,000	$ 150,000	$ 700,000
1.2	Bragg Creek fire storage upgrade (2,500 m³)	1,500	m³	2,500	$ 3,750,000	$ 380,000	$ 1,130,000	$ 5,260,000
1.3	847 m of 300 mm main along Burnside Ave to White Ave/River Dr S	638	m	847	$ 540,000	$ 50,000	$ 160,000	$ 750,000
1.4	Installation of Hydrants at intersections	25,000	ea	7	$ 180,000	$ 20,000	$ 50,000	$ 250,000
1.5	Short term Bragg Creek distribution pumping capacity upgrade (25 L/s)	50,000	ea	2	$ 100,000	$ 10,000	$ 30,000	$ 140,000
1.6	Short term Bragg Creek storage upgrade (610 m³)	1,500	m³	700	$ 920,000	$ 90,000	$ 280,000	$ 1,290,000
1.7	2,300 m of 300 mm water main to Expansion Area	638	m	2,300	$ 1,470,000	$ 150,000	$ 440,000	$ 2,060,000
1.8	Long term Bragg Creek distribution pumping capacity upgrade (39 L/s)	75,000	ea	2	$ 150,000	$ 20,000	$ 50,000	$ 220,000
1.9	Long term Bragg Creek storage upgrade (590 m³)	1,500	m³	590	$ 890,000	$ 90,000	$ 270,000	$ 1,250,000
				Servicing Option #1 Total	**$ 8,500,000**	**$ 860,000**	**$ 2,560,000**	**$ 11,920,000**
Servicing Concept #2 - New Gateway Village Reservoir and Pumphouse								
2.1	Gateway Village fire pump (250 L/s)	500,000	ea	1	$ 500,000	$ 50,000	$ 150,000	$ 700,000
2.2	Gateway Village fire storage (2,500 m³)	1,500	m³	2,500	$ 3,750,000	$ 380,000	$ 1,130,000	$ 5,260,000
2.3	600 m of 300 mm water main near Gateway Village	638	m	600	$ 380,000	$ 40,000	$ 110,000	$ 530,000
2.4	Installation of Hydrants at intersections	25,000	ea	5	$ 130,000	$ 10,000	$ 40,000	$ 180,000
2.5	Short Term Gateway distribution pumping capacity (13 – 15 L/s)	30,000	ea	2	$ 60,000	$ 10,000	$ 20,000	$ 90,000
2.6	Short term Gateway storage upgrade (610 m³)	1,500	m³	610	$ 920,000	$ 90,000	$ 280,000	$ 1,290,000
2.7	2,200 m of 300 mm water main to Expansion Area	638	m	2,200	$ 1,400,000	$ 140,000	$ 420,000	$ 1,960,000
2.8	Long term Gateway distribution pumping capacity upgrade (29 L/s)	50,000	ea	2	$ 100,000	$ 10,000	$ 30,000	$ 140,000
2.9	Long term Gateway storage upgrade (590 m³)	1,500	m³	590	$ 890,000	$ 90,000	$ 270,000	$ 1,250,000
2.10	1,100 m of 100 mm supply main for Gateway Reservoir	312	m	1,100	$ 340,000	$ 30,000	$ 100,000	$ 470,000
				Servicing Option #2 Total	**$ 8,470,000**	**$ 850,000**	**$ 2,550,000**	**$ 11,870,000**
Servicing Concept #3 - New Expansion Area Reservoir and Pumphouse								
3.1	Bragg Creek fire pump (250 L/s)	500,000	ea	1	$ 500,000	$ 50,000	$ 150,000	$ 700,000
3.2	Bragg Creek fire storage upgrade (2,500 m³)	1,500	m³	2,500	$ 3,750,000	$ 380,000	$ 1,130,000	$ 5,260,000
3.3	847 m of 300 mm water main along Burnside Avenue to the intersection of White Avenue and River Drive South	638	m	847	$ 540,000	$ 50,000	$ 160,000	$ 750,000
3.4	Installation of Hydrants at intersections along Burnside Drive from Reservoir to River Drive South	25,000	ea	7	$ 180,000	$ 20,000	$ 50,000	$ 250,000
3.5	Upgrade Bragg Creek distribution pumping capacity (25 L/s) - Short Term	50,000	ea	2	$ 100,000	$ 10,000	$ 30,000	$ 140,000
3.6	Upgrade Bragg Creek distribution storage (610 m³) - Short Term	1,500	m³	610	$ 920,000	$ 90,000	$ 280,000	$ 1,290,000
3.7	Install Expansion Area distribution pumping capacity (16 L/s) - Long Term	30,000	ea	2	$ 60,000	$ 10,000	$ 20,000	$ 90,000
3.8	Install Expansion Area fire pump (100 L/s)	200,000	ea	1	$ 200,000	$ 20,000	$ 60,000	$ 280,000
3.9	Construct Expansion Area distribution and fire storage capacity (1,400 m³) - Long Term	1,500	m³	1,400	$ 2,100,000	$ 210,000	$ 630,000	$ 2,940,000
3.10	2,600 m of 125 mm supply main for Expansion Area Reservoir	353	m	2,600	$ 920,000	$ 90,000	$ 280,000	$ 1,290,000
				Servicing Option #3 Total	**$ 9,270,000**	**$ 930,000**	**$ 2,790,000**	**$ 12,990,000**

TABLE B.1: Future Water Servicing Concept Cost Estimates
Bragg Creek Servicing Study
Rocky View County

APPENDIX C
Future Low-Pressure Sewer System Assessments