TECHNICAL MEMORANDUM

To: Jamie Clark, PE

From: Trevor Datwyler, PE
Boone Maruska, PE

Re: **Craftsman Village Phase 8 Development Analysis**
City of Helena, MT

Date: July 18, 2022

INTRODUCTION

The purpose of this memo is to summarize the impacts of the proposed Craftsman Village Phase 8 Development on the City's water distribution system. Craftsman Village Phase 8 is proposed to have 230 residences, with the Development being divided into three phases. The following sections describe the demands, analysis, and results pertaining to the connection of this new residential development.

DEMANDS

For planning purposes, domestic and irrigation demands for the Development have been estimated. According to the City of Helena Water Facilities Plan, domestic water usage is based on 1.6 times the wastewater flow of 112 gallons per day per capita with an average of 2.39 people per residence. The estimated domestic water usage utilized in the model for the new Craftsman Village Phase 8 development are summarized in Table 1.

Table 1 – Craftsman Village Phase 8 Domestic Demand Estimate

No. of Units	Per Capita Use (gpdc)	Residents per Unit	Average Day (gpd)	Average Day Demand (gpm)
230	181	2.39	99,360	69

The estimated irrigation water usage for the development was based on 1 inch of irrigation per week, which equates to 0.01 feet per day. It is assumed that the average lot size in the development will be 5,100 square feet with a maximum lot coverage of 60%, resulting in a total irrigable area per lot of 2,040 square feet. The estimated irrigation water usage utilized in the

model for the development are summarized in Table 2 – Craftsman Village Phase 8 Irrigation Demand Estimate.

Table 2 – Craftsman Village Phase 8 Irrigation Demand Estimate

Irrigation Rate (ft/day)	Irrigable Area per Lot (ft^2)	Number of Lots	Usage (ft^3/day)	Usage (gal/day)	Usage (gpm)
0.01	2,040	230	4,692	35,100	25

According to the City of Helena Water Facilities Plan, the Maximum Day and Peak Hour peaking factors are 2.4 and 3.5, respectively. The total estimated water usage for the development are summarized in Table 3 – Craftsman Village Phase 8 Combined Water Demand Estimate.

Table 3 – Craftsman Village Phase 8 Combined Water Demand Estimate

Average Day Demand (gpm)	Max Day Demand (gpm)	Peak Hour Demand (gpm)
94	226	329

The demands were allocated evenly across the following junctions, as shown in Figure 1. The demands were allocated so that when the peak hour demand multiplier (shown in Figure 2) reaches 1.48, the total peak hour demand for the Development would be equal to 329 gpm. In addition to the demands summarized above, there is anticipated to be an additional 500 gpm of demand north of each of the two north intersections. These demands have also been included in the model.

Figure 1 Maximum Day Demands Allocated in the Model

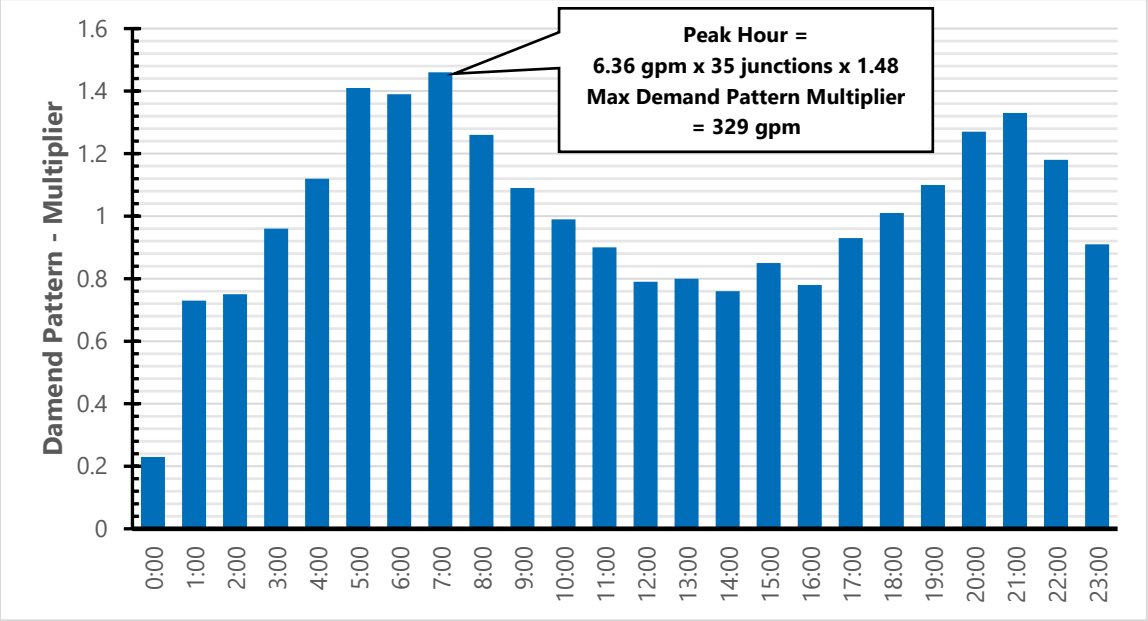

Figure 2 Model Maximum Day Demand Pattern

The pipeline along Alpine View Drive from Jean Baucus Street to Vista View Avenue is proposed to be either 8-inch diameter or 12-inch diameter. Both scenarios were evaluated as part of this tech memo. Figure 3 shows the peak hour minimum pressure, and Figure 4 provides a map of the available fire flow at 20 psi with an 8-inch pipeline along Alpine View Drive. Figure 5 – Peak Hour Minimum Pressures (12-inch Pipeline Along Alpine View) shows the peak hour minimum pressure, and Figure 6 – Available Fire Flow @ 20 psi (12-inch Pipeline Along Alpine View) provides a map of the available fire flow at 20 psi with a 12-inch pipeline along Alpine View Drive.

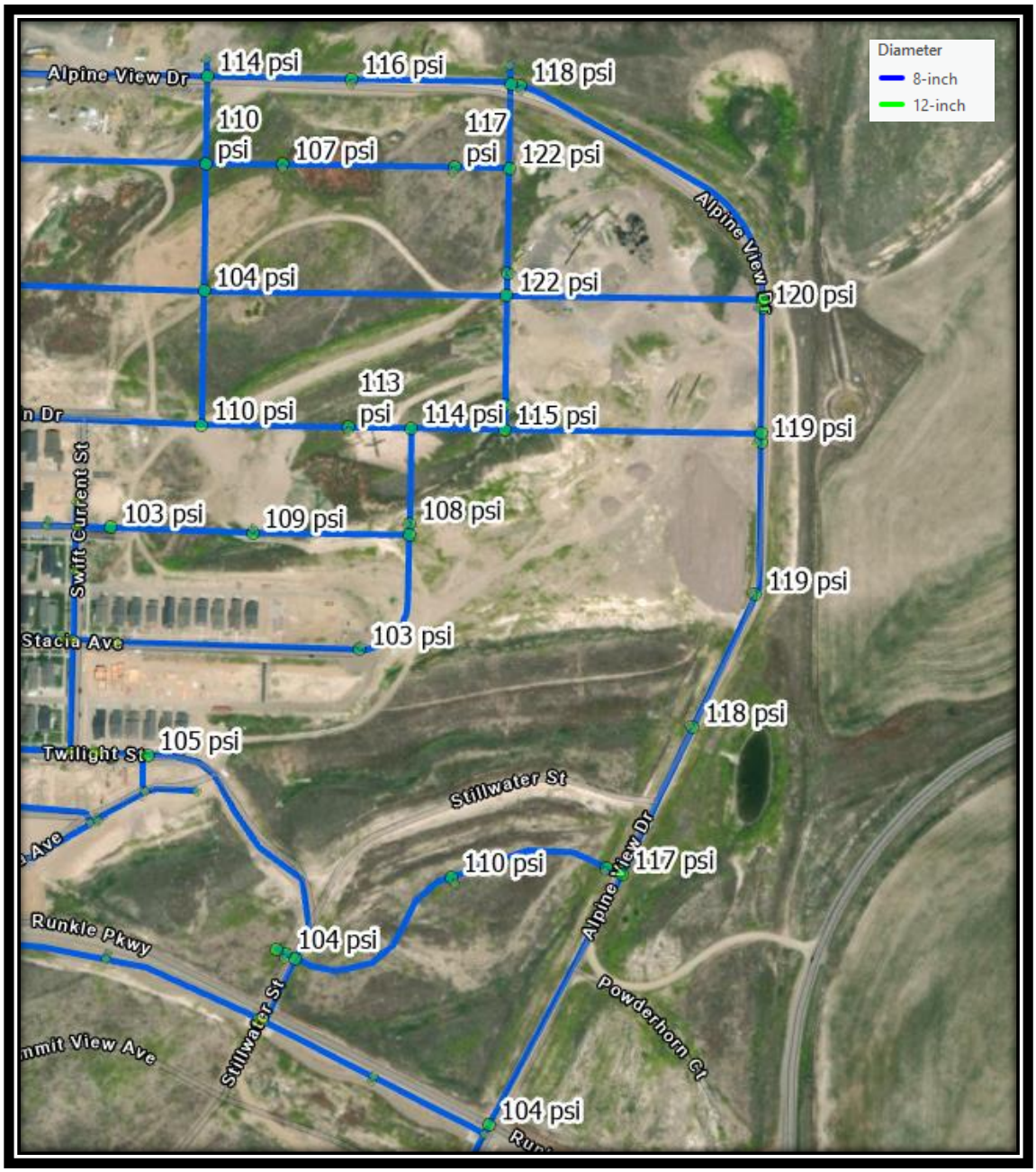

Figure 3 – Peak Hour Minimum Pressures (8-inch Pipeline Along Alpine View)

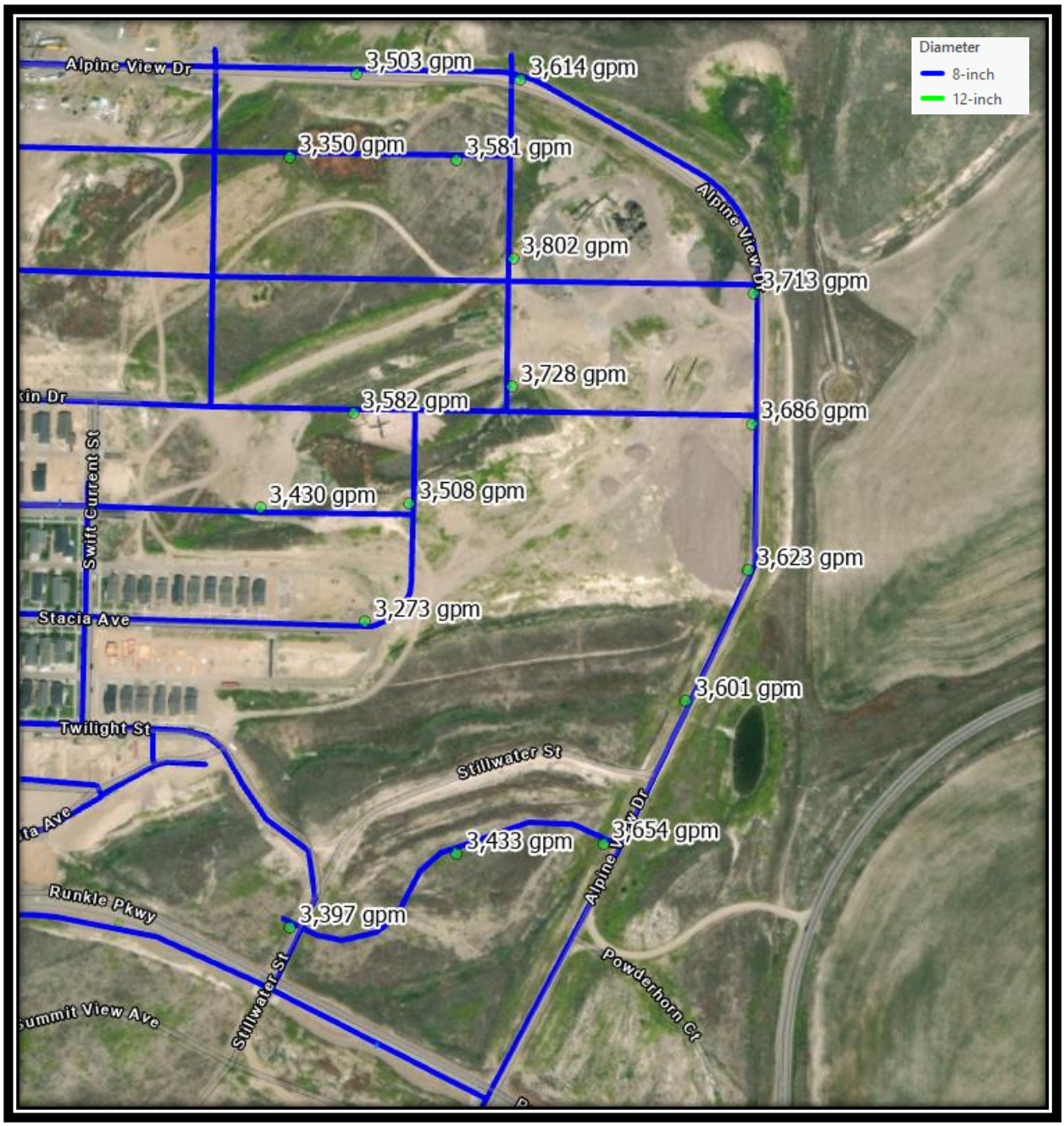

Figure 4 – Available Fire Flow @ 20 psi (8-inch Pipeline Along Alpine View)

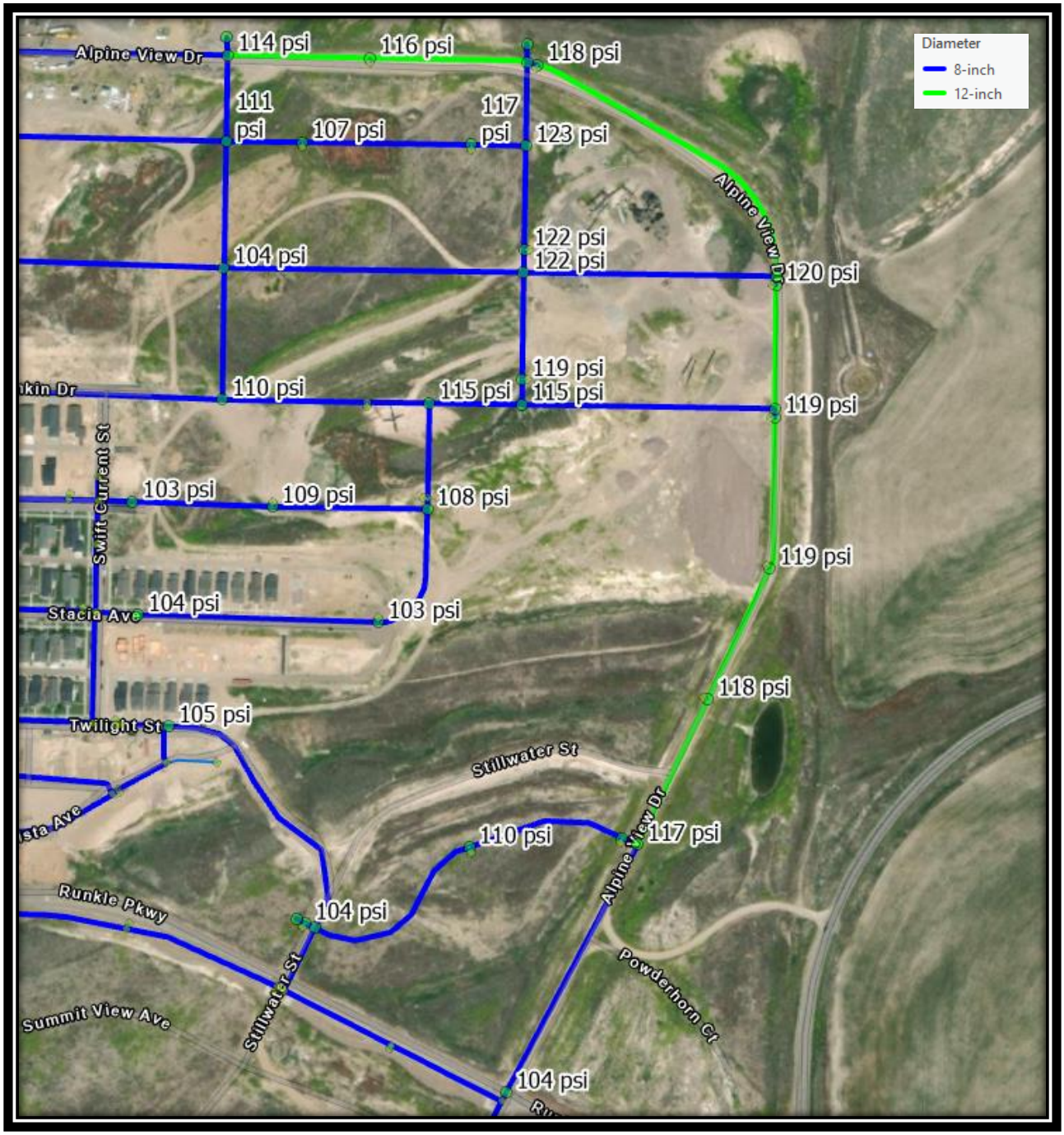

Figure 5 – Peak Hour Minimum Pressures (12-inch Pipeline Along Alpine View)

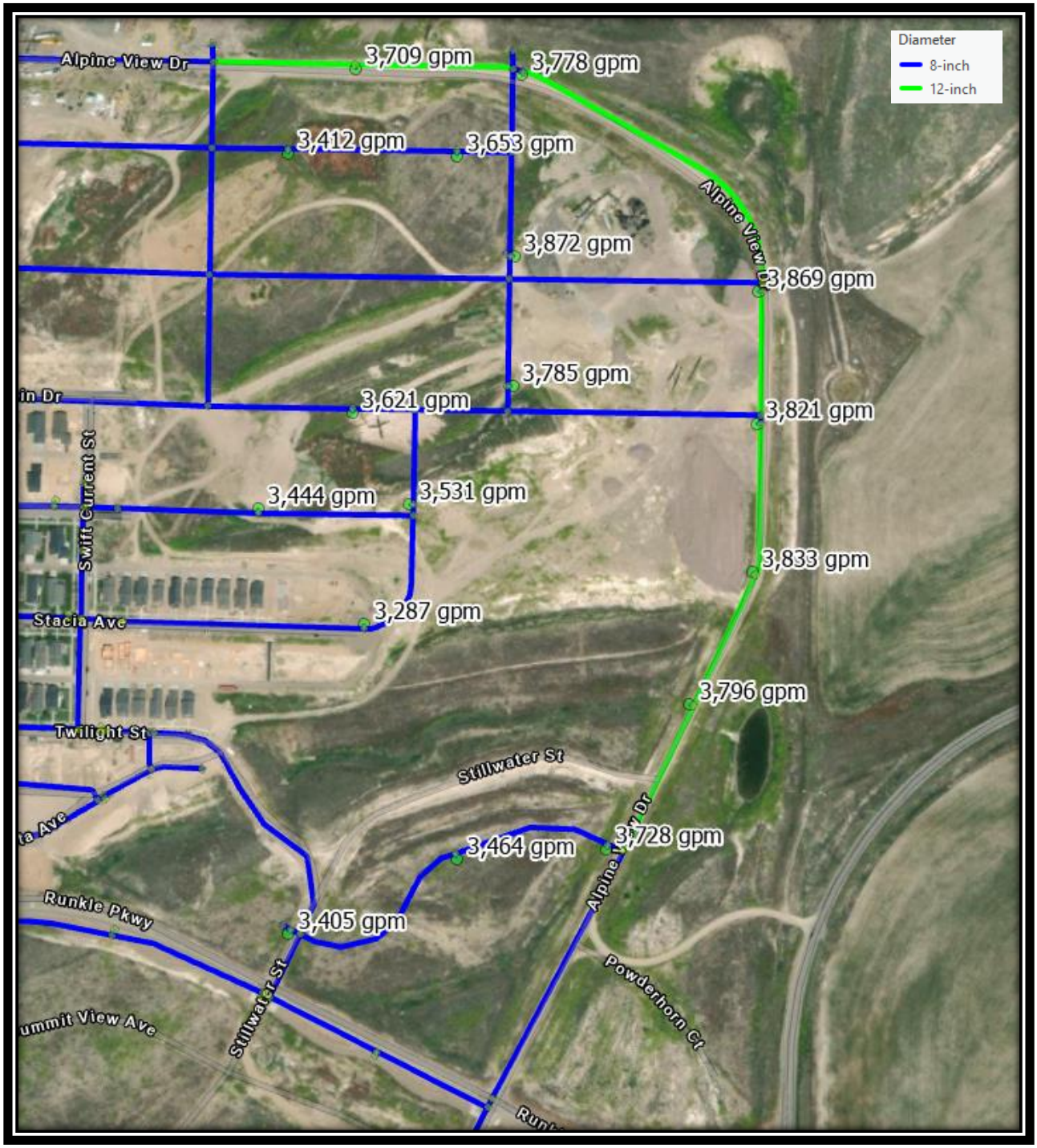

Figure 6 – Available Fire Flow @ 20 psi (12-inch Pipeline Along Alpine View)

As previously mentioned, the Development is proposed to be constructed in three phases. These three phases may be constructed in any order. As a result, it is important to verify that each of the three phases is capable of meeting the demand requirements if constructed on their own. The hydraulic model was used to analyze minimum pressures and available fire flows for each phase of the Development. Results of these analyses are provided in Figures 7 through 12.

Figure 7 – Peak Hour Minimum Pressures – Phase 1 of Development

Figure 8 – Available Fire Flow @ 20 psi – Phase 1 of Development

Figure 9 – Peak Hour Minimum Pressures – Phase 2 of Development

Figure 10 – Available Fire Flow @ 20 psi – Phase 2 of Development

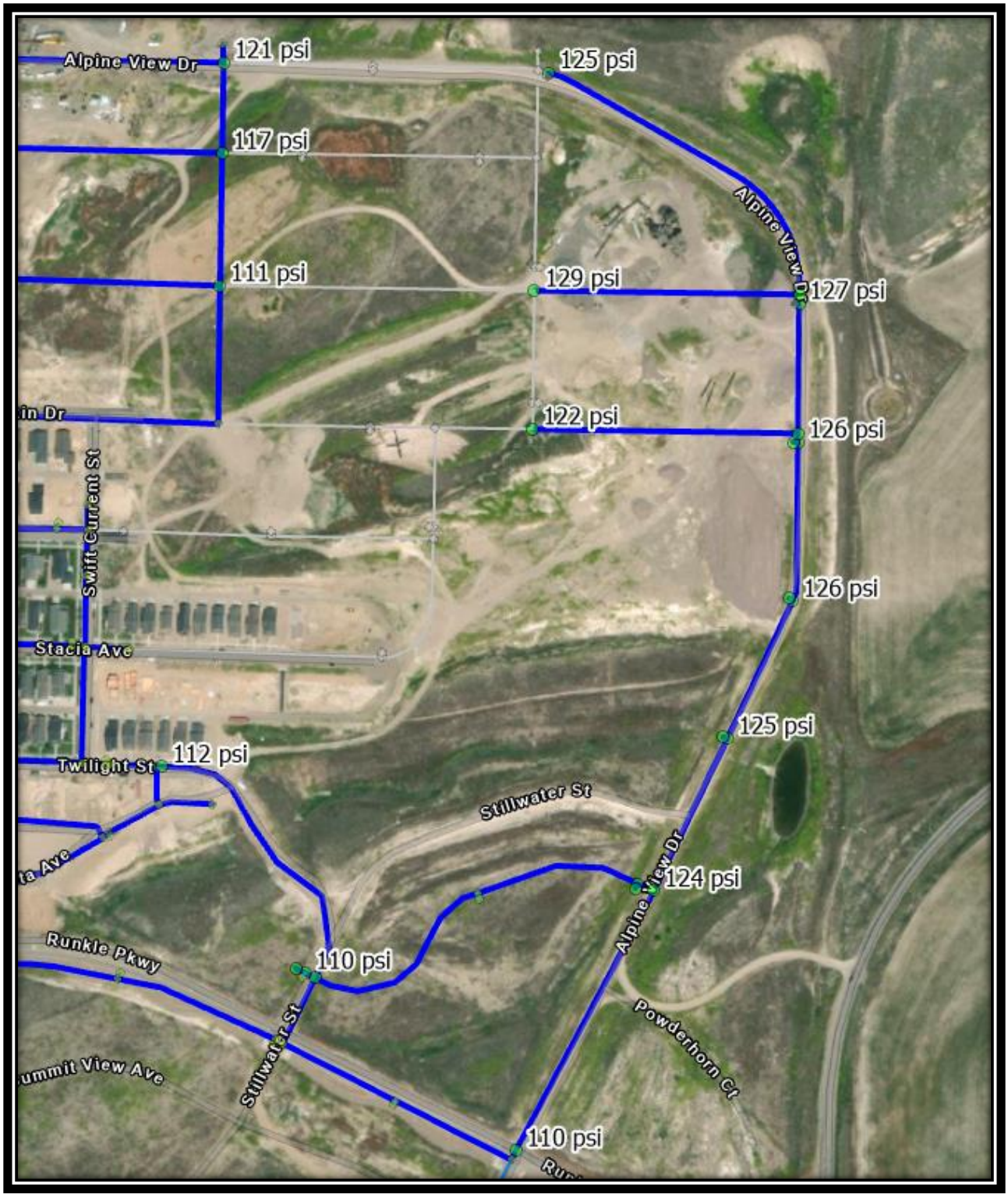

Figure 11 – Peak Hour Minimum Pressures – Phase 3 of Development

Figure 12 – Available Fire Flow @ 20 psi – Phase 3 of Development

Since the model was run on the maximum day, the Missouri River Water Treatment Plant (MRWTP) and the Tenmile Water Treatment Plant (TMWTP) were both running. A constant 5,500 gpm comes from the TMWTP, while the rest of the water comes from the MRWTP. The total system demand for the maximum day demand was 15.2 MGD, not including the demand from the Craftsman Village Phase 8 development.

ADDITIONAL INFORMATION

This section provides details of the demand junctions, labeled in Figure 13 and detailed in Table 4.

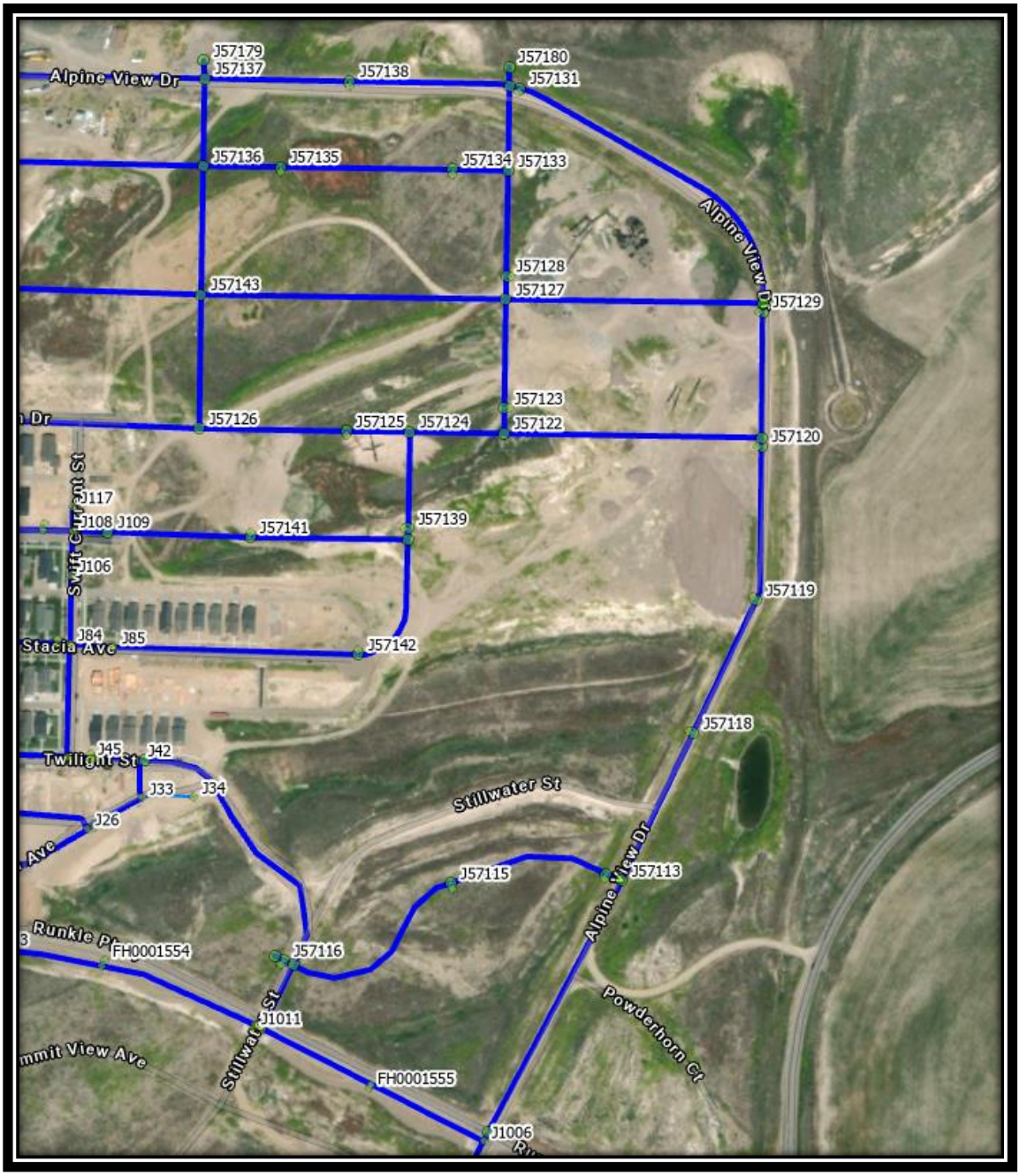

Figure 13 –Junction IDs

Table 4 – Demand Junction – Elevation, Demand and Minimum Pressures

Junction ID	Elevation (ft)	Demand (gpm)	Minimum Pressure (psi)[a]
J1007	4,032	6.46	104
J109	4,033	6.46	103
J43	4,029	6.46	105
J57113	4,002	6.46	117
J57114	4,003	6.46	116
J57115	4,018	6.46	110
J57116	4,032	6.46	104
J57117	4,033	6.46	103
J57118	3,998	6.46	118
J57119	3,997	6.46	119
J57120	3,996	6.46	119
J57121	3,996	6.46	119
J57122	4,004	6.46	115
J57123	3,996	6.46	119
J57124	4,006	6.46	114
J57125	4,009	6.46	113
J57126	4,017	6.46	110
J57127	3,988	6.46	122
J57128	3,988	6.46	122
J57129	3,993	6.46	120
J57130	3,993	6.46	120
J57131	3,998	6.46	118
J57132	3,998	6.46	118
J57133	3,987	6.46	122
J57134	4,001	6.46	117
J57135	4,022	6.46	107
J57136	4,015	6.46	110
J57137	4,006	6.46	114
J57138	4,003	6.46	116
J57139	4,021	6.46	108
J57140	4,022	6.46	108
J57141	4,020	6.46	109
J57142	4,034	6.46	103
J57143	4,031	6.46	104
J57174	4,032	6.46	104
J57179	4,009	500	113
J57180	3,996	500	118

[a]Minimum pressure during maximum day demand (MDD).