CLEAR SOLUTIONS
ENGINEERING

TECHNICAL MEMORANDUM

DATE: October 6, 2022

TO: River Lane, LLC

FROM: Grae Harper, P.E., Eric Landsberg, P.E. – Clear Solutions

RE: River Lane Apartments

Hydraulic Modeling Results and Analysis

1.0 INTRODUCTION AND BACKGROUND

River Lane, LLC is planning to construct a 51-unit apartment complex project in Hailey, Idaho (City). The project is located on River St. between Spruce St. and Silver St., as shown in Figure 1. The project will connect to the City's water system upper pressure zone for domestic water supply. This technical memorandum presents the results of hydraulic modeling that was completed to evaluate the potential impact of the project on the water system.

Figure 1
Project Location and Vicinity

2.0 WATER DEMAND PROJECTIONS

The apartment complex will include residential units, a coffee shop, and an irrigation system. Water demand projections have been prepared based on the type of development proposed, maximum occupancy at full project buildout, estimated water usage by type, and information provided by the design team regarding irrigation demands. Demand calculations are based on an Average Day Demand (ADD) of 50 gallons per capita per day (gpcd) for residents and 800 gallons per day (gpd) for coffee shops. These typical values are recommended by the American Water Works Association (AWWA 1999) and the Specialty Coffee Association of America's Green Guide Module (SCAA 2013) for planning purposes. Maximum Day Demand (MDD) for residents is estimated to be 125 gpcd and Peak Hour Demand (PHD) is estimated to be 183 gpcd. MDD for the coffee shop is estimated to be 2,000 gpd and PHD is estimated to be 2,920 gpd. Peaking factors are based on historical water production/consumption and were published in the City's 2015 Water System Master Plan. Unit demands and peak factors are shown in Table 1.

Table 1
Water Demand Values

PARAMETER	RESIDENTS[1]	COFFEE SHOP[2]
Average Day Demand (ADD)	50 gpcd	800 gpd
Maximum Day Demand (MDD)	125 gpcd	2,000 gpd
Peak Hour Demand (PHD)	183 gpcd	2,920 gpd
MDD Peaking Factor (MDD/ADD) [3]	2.5	
PHD Peaking Factor (PHD/ADD) [3]	3.65	

Notes:
1. Average Day Demand based on *Design and Construction of Small Water System: A Guide for Managers, AWWA* for apartments complexes.
2. Average Day Demand based on *SCAA Green Guide Module 2: Water* for coffee shops.
3. Peaking factors are based on the City of Hailey's 2015 Water System Master Plan.

The complex will include 51 apartments including 43 one-bedroom units, and 8 two-bedroom units. A conservative estimate of two people per bedroom was used to estimate the residential demand of the complex. A maximum irrigation demand of 10 gpm was provided by the design team and added to the other demands. The project includes a fire sprinkler system, which reduces the recommended available fire flow for the complex below the City's minimum fire flow requirement of 1,500 gpm. The more stringent standard of 1,500 gpm was used for this analysis. Table 2 presents the projected total average day demand, maximum day demand, peak hour demand, and required fire flow for full buildout of the project.

Table 2
Water Demand Projections

PARAMETER	TOTAL OCCUPANCY	RESIDENTIAL DEMAND GPD (GPM)	COFFEE SHOP DEMAND GPD (GPM)	IRRIGATION DEMAND GPM	TOTAL DEMAND GPM
Average Day Demand (ADD)	118	5,900 (4.1)	800 (0.6)	10	14.7
Maximum Day Demand (MDD)	118	14,750 (10.2)	2,000 (1.4)	10	21.6
Peak Hour Demand (PHD)	118	21,590 (15.0)	2,920 (2.0)	10	27.0
Required Fire Flow [(1)]					1,500

Notes:
1. Minimum fire flow requirement per City of Hailey's 2015 Water System Master Plan.

3.0 HYDRAULIC MODELING RESULTS

The City of Hailey maintains a hydraulic model of their water system, which was created using Bentley WaterCAD software. The model was last calibrated in 2020 and is regularly used to evaluate the potential impacts proposed projects will have on water system performance. Three criteria were used to evaluate the River Lane project:

- Changes in available fire flow at maximum day demand. The State of Idaho requires public water system to provide sufficient fire flow during maximum day demands with any pump out of service while maintaining a 20 psi residual pressure in the distribution system (IDAPA 58.01.08.552.01.b.i & IDAPA 58.01.08.501.18.a). A minimum fire flow requirement of 1,500 gpm was established in the City's 2015 Water Master Plan and approved by the City.

- Changes in system pressures at peak hour demand. The State of Idaho requires public water systems to maintain a minimum pressure of 40 psi throughout the distribution system during peak hour demands (IDAPA 58.01.08.552.01.b.v).

- Changes in pipe velocities at peak hour demand. Although the State does not regulate pipe velocities in water distribution systems, pipe velocities that exceed 6-8 feet per second (fps) result in greater headlosses (decreased system performance) and may result in excessive water hammer. For planning purposes, maintaining pipe velocities below 6 fps is recommended.

The demands presented in Table 2 were added to the City hydraulic model at the node nearest where the project is expected to connect. Modeling results were compared to existing conditions for each of the criteria established above.

3.1 AVAILABLE FIRE FLOW AT MAXIMUM DAY DEMANDS

Existing available fire flow at maximum day demands in the project area was established by running the hydraulic model with the Quigley and Turbine tanks at their lowest operating levels and the largest pump out of service, the River Street pump. Existing available fire flow at the project location is 3,000 gpm and is shown in Figure 2 in red. After demands were added to the model for the project, available fire flow remained at 3,000 gpm and is shown in Figure 3 in red. It should be noted that actual available fire flow is higher than 3,000 gpm but modeling results have a user defined upper limit of 3,000 gpm to reduce processing time of modeling scenarios. Available fire flow in the project area is not expected to be affected substantially by the added demands of the project and simulated modeling results show available fire flow remains above the 1,500 gpm minimum requirement in the project area.

Figure 2

Available Fire Flow at Maximum Day Demands (Existing Conditions)

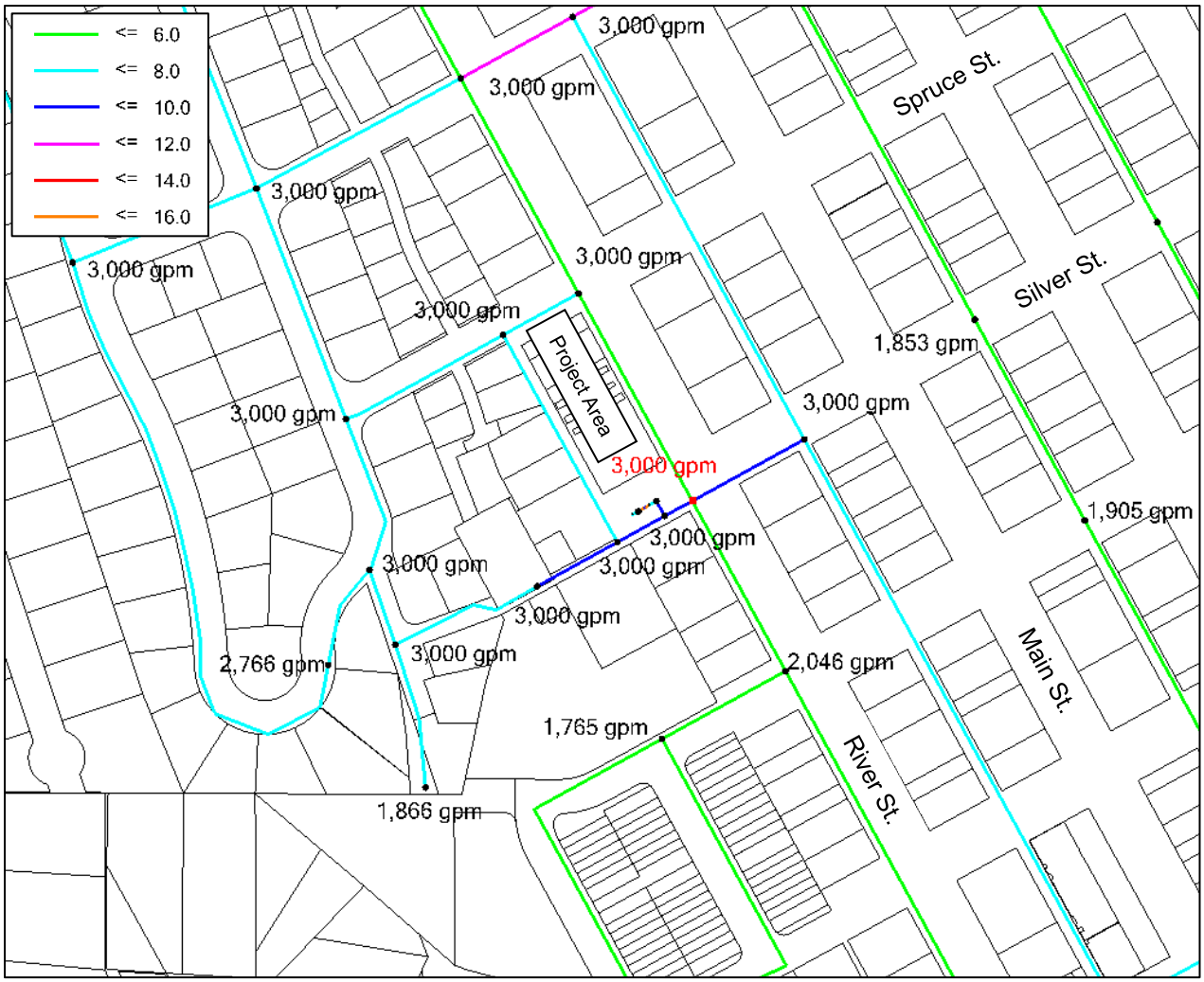
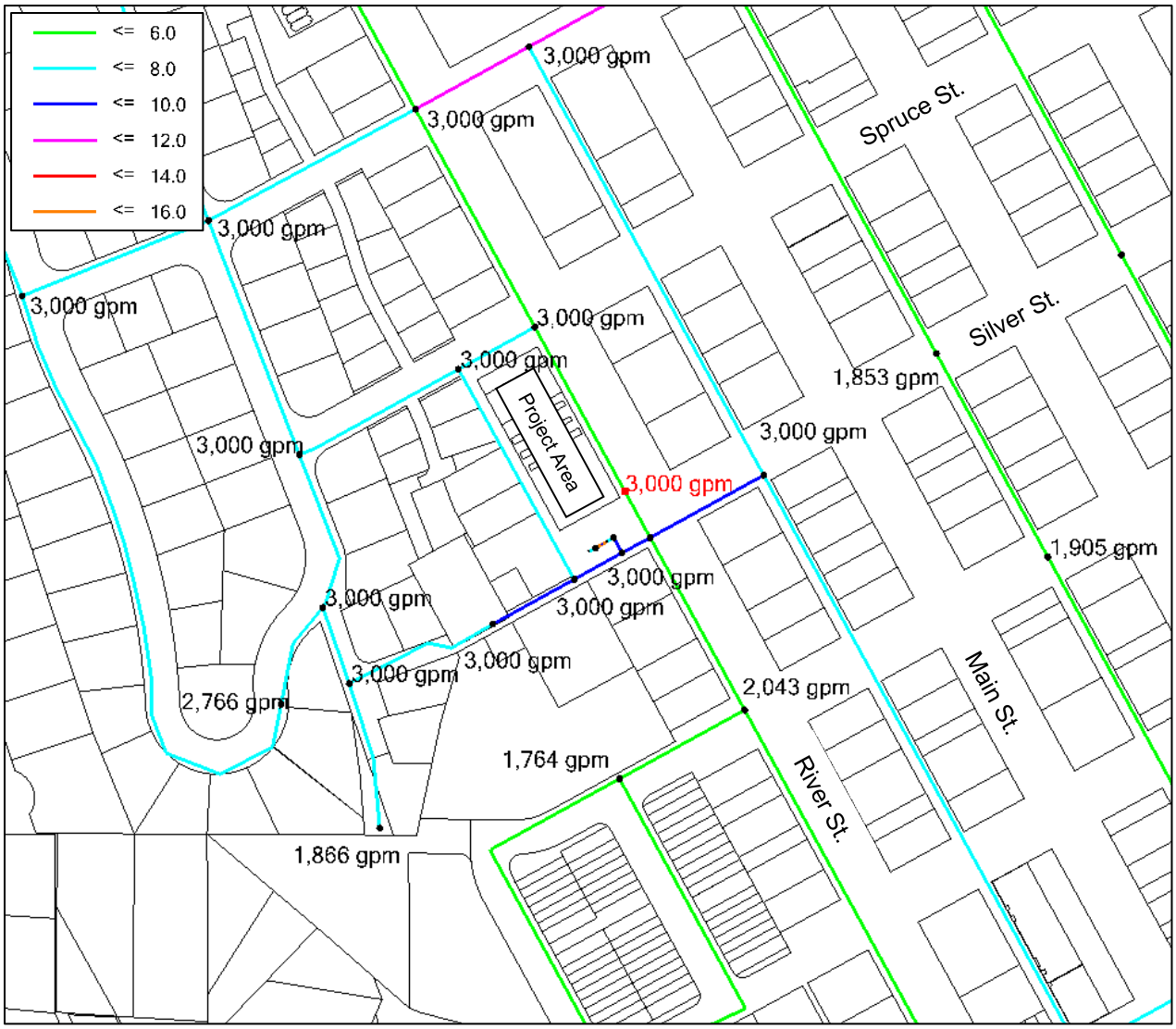


Figure 3
Available Fire Flow and Maximum Day Demands (Simulated Conditions)



3.2 SYSTEM PRESSURES AT PEAK HOUR DEMANDS

Existing system pressures at peak hour demands in the project area were established by running the hydraulic model with the Quigley and Turbine tanks at their maximum operating levels and the largest pump out of service, the River Street pump. Existing system pressure at the project location is 72 psi and is shown in Figure 4 in red. After demands were added to the model for the project, system pressure remained the same and is shown in Figure 5 in red. System pressure in the project area is not expected to be affected noticeably by the added demands of the project and simulated modeling results show system pressures remain above the 40 psi minimum requirement in the project area.

Figure 4
System Pressures At Peak Hour Demands (Existing Conditions)

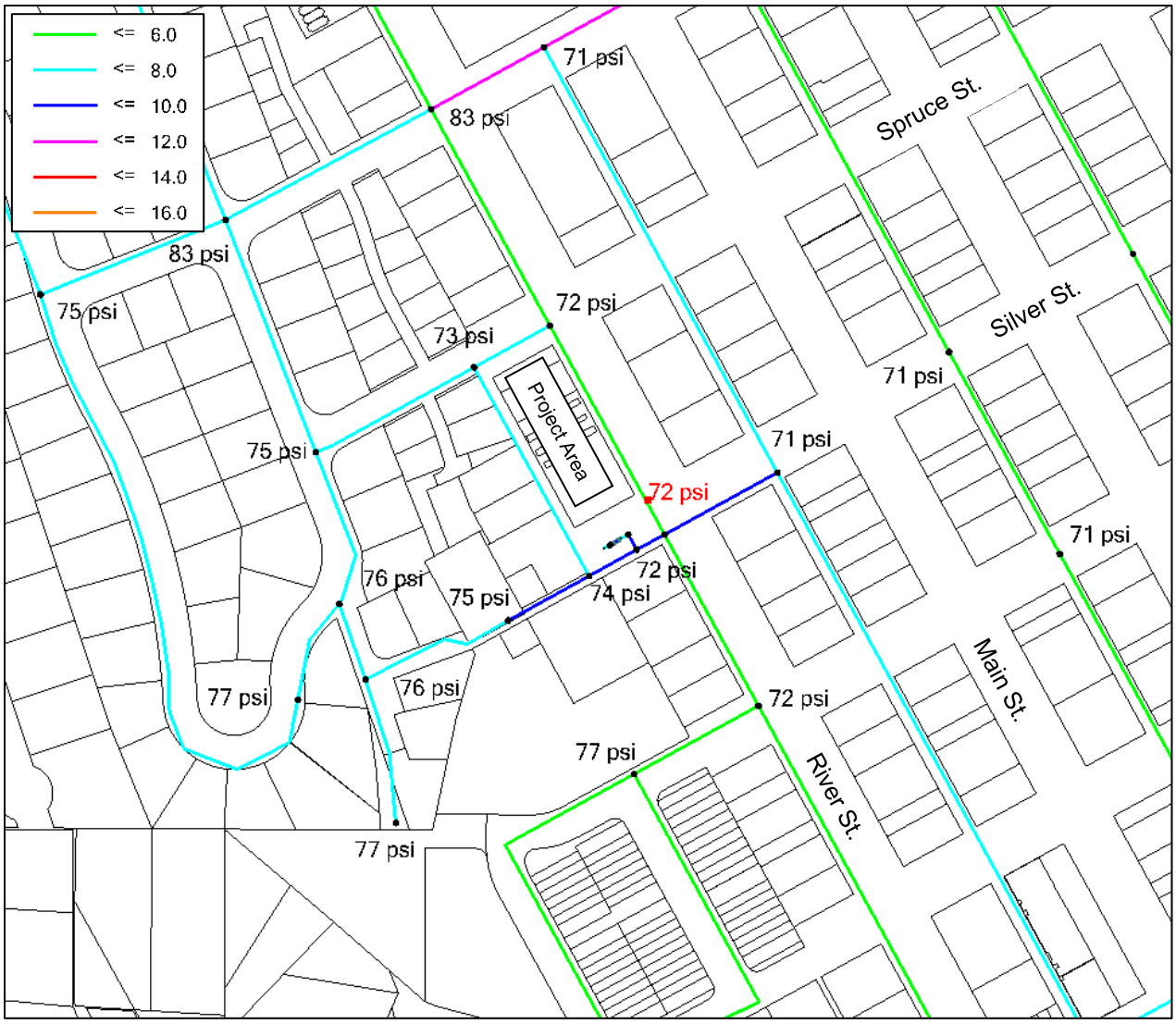
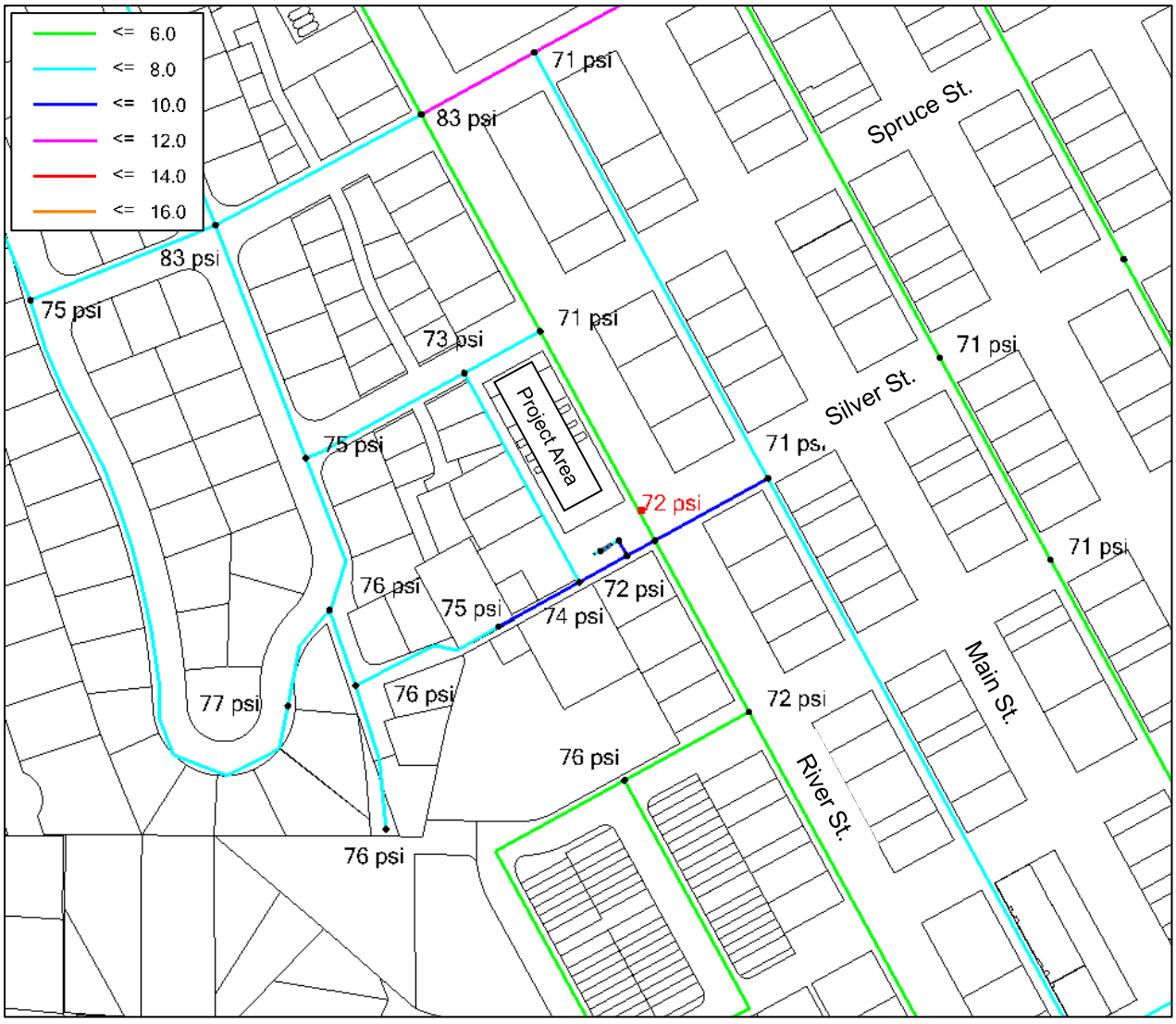


Figure 5
System Pressures at Peak Hour Demands (Simulated Conditions)



3.3 WATER VELOCITIES AT PEAK HOUR DEMANDS

Existing water velocities at peak hour demands in the project area were established by running the hydraulic model with the Quigley and Turbine tanks at their maximum operating levels and all pumps operating. Existing water velocity at the project location is 0.87 fps and is shown in Figure 6 in red. After demands were added to the model for the project, water velocity increased to 0.90 fps and is shown in Figure 7 in red. Water velocity in the project area is not expected to be affected substantially by the added demands of the project and simulated modeling results show water velocities remain below the recommended 6 fps in the project area.

Figure 6

Water Velocities at Peak Hour Demands (Existing Conditions)

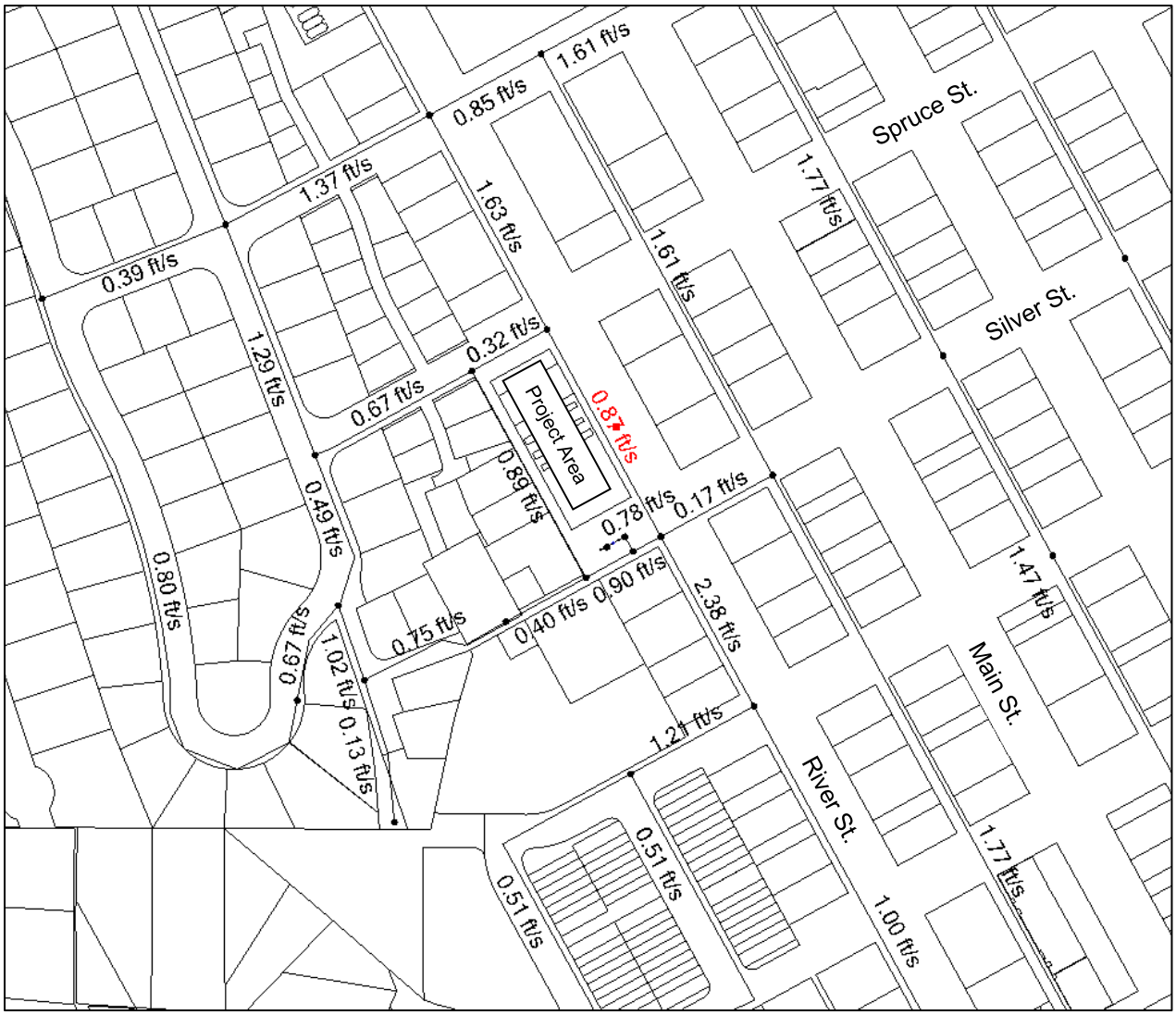
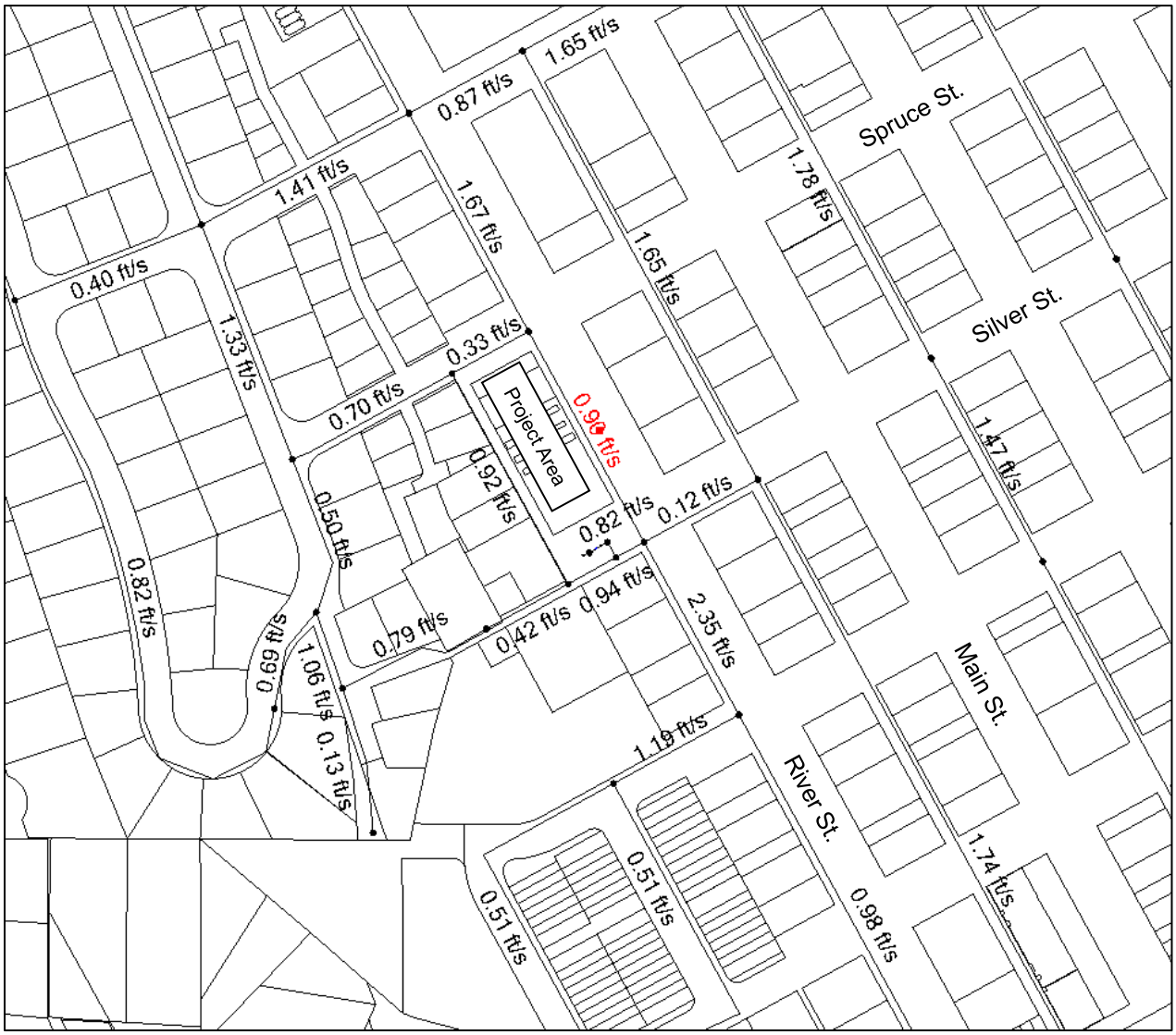


Figure 7

Water Velocities at Peak Hour Demands (Simulated Conditions)



4.0 SUMMARY

Hydraulic modeling results indicate the proposed River Lane project is expected to have a negligible impact on the available fire flow, system pressure, and water velocity in the project area, see Table 3.

Table 3
Summary of Hydraulic Modeling Results

PARAMETER	CURRENT CONDITIONS	AFTER PROJECT	STANDARD
Fire Flow Availability	3,000 gpm	3,000 gpm	1,500 gpm minimum
Pressure at Peak Hour Demand	72 psi	72 psi	40 psi minimum
Water Velocity at Peak Hour Demand	0.87 fps	0.90 fps	<6 fps for planning

For each of the criteria established in Section 3, the system exceeds state regulatory requirements as well as recommended engineering standards for water system performance.

5.0 REFERENCES

Design and Construction of Small Water Systems: An AWWA Small Systems Resource Book. American Water Works Association, 1999.

IDAPA 58 – Idaho Rules for Public Drinking Water Systems. Department of Environmental Quality, https://adminrules.idaho.gov/rules/current/58/580108.pdf.

SCAA Green Guide Module 2: Water, Specialty Coffee Association of America, 2013

Water System Master Plan, City of Hailey. SPF, 2015.