Attachment B

Harper Houf Peterson Righellis Inc.

ENGINEERS ◆ PLANNERS
LANDSCAPE ARCHITECTS ◆ SURVEYORS

February 6, 2020
Job No.: KSP-001

MEMORANDUM

TO: Erik Huffman, PE, PLS, CWRE, LEED AP
BECON, Engineer of Record, City of Sisters

FROM: Nicolas Speros, P.E., HHPR

CC: Kevin Spencer, Three Sisters Holdings, LLC, et al

SUBJECT: USFS Parcel 3 – Barclay Drive
Sanitary Sewer and Water Infrastructure Re-Zone Impact Summary

REGISTERED PROFESSIONAL ENGINEER 94,828 OREGON MAY 15, 2019 NICOLAS G. SPEROS
EXPIRES: 06/30/20

INTRODUCTION AND PURPOSE

The subject USFS Parcel 3 property is currently zoned Urban Area Reserve (UAR). The property has a gross area of 15.58 acres. The property is bounded by Barclay Drive to the south, Pine Street to the east, United States Forest Service property to the north, and the Best Western Ponderosa Lodge to the west. The property is proposed to be rezoned to Light Industrial (LI). Per the City of Sisters Development Code, Section 4.7.300 B.3, for a Land Use District Map change, the applicant shall demonstrate that the property and affected area shall be served with adequate public facilities.

This memo addresses the City of Sister's sanitary sewer and water infrastructure and any associated impacts of the proposed land use change.

SANITARY SEWER ANALYSIS

The City's Sanitary Sewer infrastructure is outlined in the Wastewater System Capital Facilities Plan Update (WSCFPU), current version dated February 2016. In this document, design flows for the City's collection system are calculated on an Equivalent Dwelling Unit (EDU) basis. The report is prepared with a 20-year outlook and identifies the City's anticipated infrastructure needs in the year 2035. In order to determine the design flows in the system, a specific amount of square footage was designated per EDU for each land use zone to determine the total design flow from each tributary area by land use. The specifics of the design flow determinations is discussed in Section 6.2 of the WSCFPU and this method is noted to be conservative for planning purposes.

As noted previously, the property is currently zoned UAR with a proposed change to LI. As the UAR land use zone is a "holding zone" until the land is re-zoned for development, a square footage per EDU was not identified for the UAR land use zone. However, the UAR zone was conservatively assumed to be a Commercial/Multi-Family land use for design flow planning purposes which has an EDU rate of one per 5,000 SF of zone area. Light Industrial has an EDU rate of one per 20,000 SF of zone area. EDU square foot designations are per Table 6.1 of the WSCFPU.

Table 6.1 - EDU Designation

Description	*FT.^{2}/EDU*
Commercial	5,000
Multi-Family Res.	5,000
Industrial	20,000
Residential	10,000
Open Space	20,000
City Parks	30,000
Schools	10,000
Public Facilities	10,000

The EDU count for the subject property assumed in the WSCFPU is calculated as follows:

17.11 acres x (43,560 SF / acre) x (1 EDU / 5,000 SF Commercial/M-F) = 149 EDU's.

After the recent Property Line Adjustment with the Best Western Ponderosa Lodge, the resultant project area is 15.58 gross acres. The updated EDU count with a Light Industrial land use is calculated as follows:

15.58 acres x (43,560 SF / acre) x (1 EDU / 20,000 SF Light Industrial) = 34 EDU's.

Therefore, the proposed land use change results in a significant decrease in the assumed design flow and EDU count, and no mitigation measures are required.

In addition, before accounting for any potential flow reduction associated with the land use change, all existing sewer system elements downstream of the project are at or within capacity per WSCFPU, Table 6.2 – System Flow Capacities. The WSCFPU notes the potential for the 10-inch gravity main to be at or very near capacity within the planning period if the density of development increases, however this project is reducing the expected flow in the system with the proposed land use change. System elements that the project is tributary to are marked with an asterisk.

	Description	*2035 Flow (gpm)*	*Capacity (gpm)*
*	P.S. No. 1	850	850
	Force Main No. 1	850	1670
*	P.S. No. 2	85	153
*	Force Main No. 2	85	235
	P.S. No. 3	95	260
	Force Main No. 3	140	529
	P.S. No. 4	150	270
	Force Main No. 4	176	529
	8" Grav. Main	38	170
*	10" Grav. Main	138	260
	12" Grav. Main	332	375
	15" Grav. Main	362	667
*	18" Grav. Main	865	970
	24" Grav. Main	1004	3813

Table 6.2 - System Flow Capacities

* Project is tributary to these facilities

WATER ANALYSIS

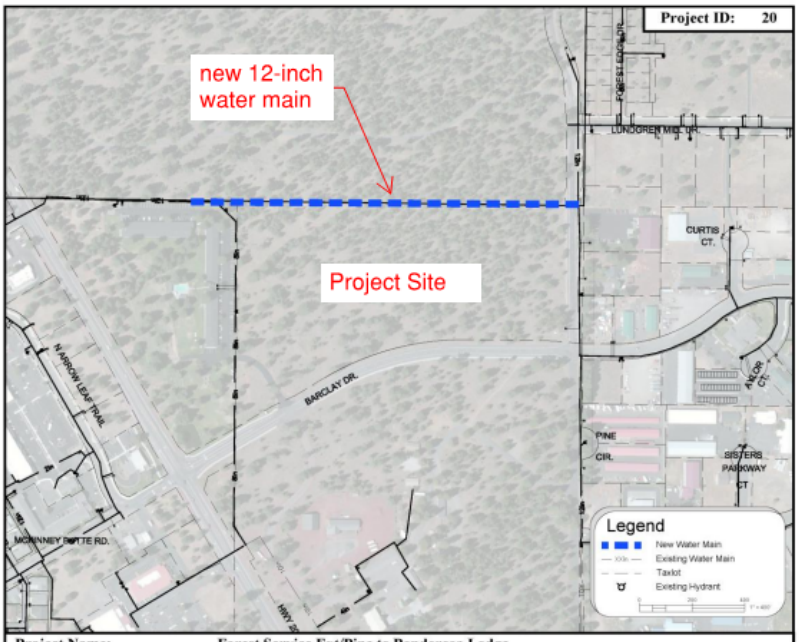
The City's Water infrastructure is outlined in the 2017 Water Capital Facilities Plan Update (WCFPU), current version dated April 2017. As reflected in the WCFPU, Section 10.6 and Table 10.1, the subject is property is already anticipated for development and will be required to connect the existing 12-inch water main on the Ponderosa Lodge property to the existing 12-inch water main in North Pine Street, which will improve system fire flow capacity.

10.6 TOTAL CAPITAL INPROVEMENTS

A summary of capital improvements to the City of Sisters Water System appears in Table 10.1, which includes prioritization (timing), and project cost.

Table 10.1: Timing and Cost Summary

ID	Project Description	Timing	Project Cost
20	Forest Service Ext/Pine to Ponderosa Lodge	TBD by Development	$168,000



Project Name:	**Forest Service Ext/Pine to Ponderosa Lodge**
Location:	Ponderosa Lodge to Pine St.
Project Category:	Hydraulic Capacity
Implementation Timeframe:	TBD by Development
Objective:	To improve the existing water system and thereby increase fire flow and water quality.
Description:	A new 12-inch main will be constructed from Ponderosa lodge to the existing 12-inch main at Pine St, approximately 1475-feet in length.
Total Project Estimate	*$168,000.00*

City of Sisters ◦ Exhibit Drawing

2017 Water Capital Facilities Plan Update

SCALE: 1" = 400'
DRAWN BY: EJH/JLB
APPROVED BY: PB
REVISION DATE: 03/13/2017

BECON Civil Engineering & Land Surveying

This memo addresses two water service issues. Available Fire Flow and Water Rights.

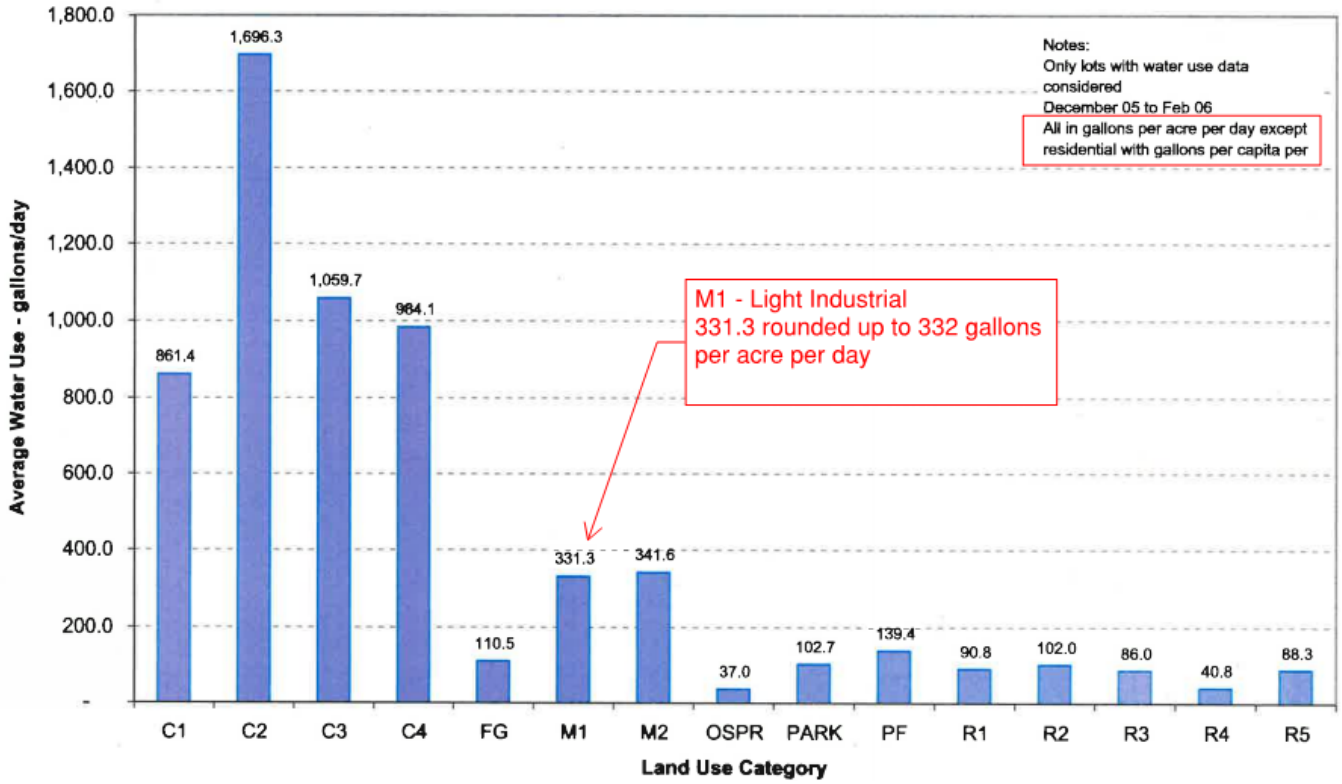
Fire Flow - As shown on Attachments 1 and 2, Conceptual FH Layout and Fire Flow Calculation Worksheets, although a 12-inch water main will need to be constructed to meet the City's water system needs, a minimum sized 8-inch water main is adequate to serve the property and meet required fire flows of 2,500 gpm (or 1,500 gpm if the facilities are sprinklered). In conjunction with a future Preliminary Plat package submittal, the water system layout will be finalized, fire flow calculations re-verified, and any potential reimbursements identified.

Water Rights – As requested, a water volume analysis based on land use was performed to determine the acreage of water mitigation rights necessary to be purchased by the City and the corresponding fee required to be paid at building permit issuance to offset this City cost. Water volumes are typically calculated on a per capita basis, but this approach is not applicable to non-residential uses and the WCFPU does identify any water usage rates associated with non-residential uses. However, the City of Redmond Water System Master Plan (WSMP), current version dated December 2007 does identify non-residential water usage rates. As shown on Figure 4: Average Water Use by Land Use Category, non-residential land use rates are measured in gallons per acre per day. Land Use category M-1 (Light Industrial) is comparable to the proposed Light Industrial zoning for the subject property and has a water usage rate of 331.3 gallons per acre per day (gpad).

Crawford Engineering Associates
AveWtrUsebyLU_Fig_SwrBasin_wateruse.xls

City of Redmond
5/22/2007

Figure 4: Average Water Use by Land Use Category
City of Redmond



With this water usage rate, rounded up to 332 gpad, the acres of water rights to be purchased and the associated fee is calculated as follows:

15.58 acres x (332 gallons / acre / day) = 1,887,984 gallons / year = 5.79 acre-ft / year

Reduce by 180 days per year (use 0.5) and 40% consumption factor ➔

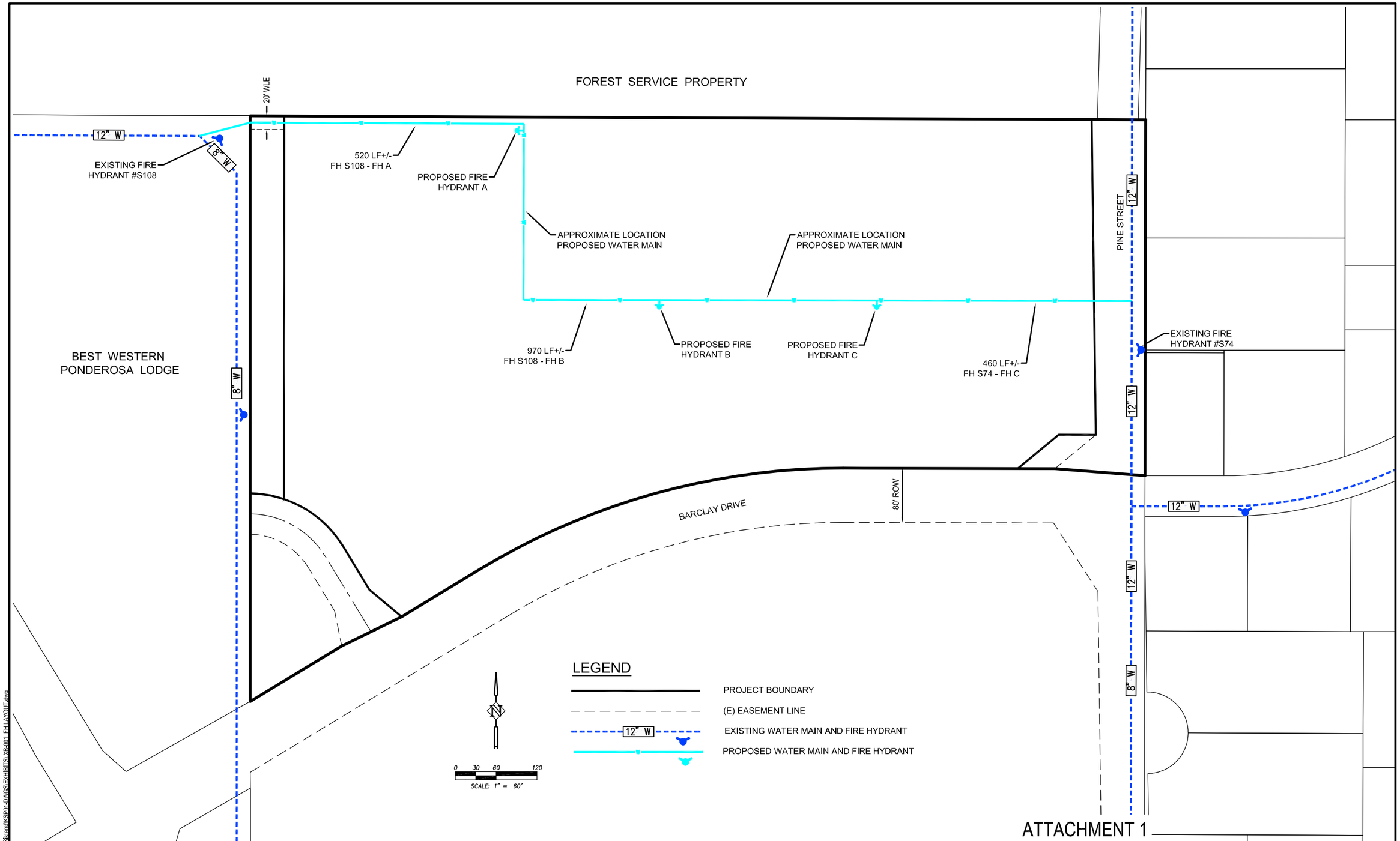
(5.79 acre-ft / year) x 0.5 x 0.40 = 1.16 acre-ft / year

One acre purchased of water rights provides 1.8 acre-ft / acre / year at a cost of $6,800 / acre.

Acres needed to be purchased ➔ (1.16 acre-ft) / (1.8 acre-ft / acre) = 0.64 acres

Fee Calculation ➔ 0.64 acres x ($6,800 / acre) = $4,352 total due at building permit issuance.

The fee total is for the entire project and will be divided on a per lot basis.



ATTACHMENT 1

DATE	NO.	DESCRIPTION

R E V I S I O N S

DESIGNED:
DRAWN:
CHECKED:
DATE: FEBRUARY 6, 2020

REGISTERED PROFESSIONAL ENGINEER 94,828 OREGON MAY 15, 2019 NICOLAS G. SPEROS EXPIRES: 06/30/20

HHPR Harper Houf Peterson Righellis Inc.
ENGINEERS • PLANNERS
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CONCEPTUAL FIRE HYDRANT LAYOUT PLAN

USFS PARCEL 3 PROPERTY

SISTERS, OREGON

SHEET NO. 1 OF 1

P:\KSP (Kevin Spencer)\KSP-01 (Sisters)\KSP01-DWG\SE\EXHIBITS\XB-001_FH LAYOUT.dwg

ATTACHMENT 2 - FIRE FLOW WORKSHEET

USFS PARCEL 3

KSP-01 - February 4, 2020
Fire Flow Calculations
Prepared by: Jennifer VanCamp, P.E.

Proposed Hydrant #A **Residual Pressure @ 2500 gpm**

Existing Fire Hydrant #S108

Static pressure	90	psi	
Residual pressure	67	psi	
Flow (Q)	1058	gpm	
Elevation	3186	surface elevation	
Hydrant Elevation	3187.5	hydrant	1.5 feet above surface elevation

$K = Q/(p_{static} - p_{residual})^{0.54}$ 195

$Q_{20} = K(p_{static} - p_{20})^{0.54}$ 1930 gpm

Proposed FH

Flow Rate	**2500**	**gpm**	
Surface Elev	3184	surface elevation	
Hydrant Elev	3185.5	hydrant	1.5 feet above surface elevation

Proposed Pipe Segment 1 (Main to FH Tee):

Diameter	8	inches
Length	520	LF
Hazen C-value	120	ductile iron

Minor Losses:		Equiv. Length	Total
0	8" Tee Thru	14	*0*
2	8" Tee Branch	40.0	*80*
1	8" Bend Other	10.0	*10*
4	8" GV	4.5	*18*
		Total Equiv L:	*108*

$$h_f = \frac{(10.44)(L)(Q_{gpm})^{1.85}}{(C)^{1.85}(d_{inches})^{4.8655}}$$

Q (gpm)	d (in)	L (ft)	head loss (ft)
2500	8	628	**73**

Proposed Pipe Segment 2 (FH Tee to FH):

Diameter	6	inches
Length	10	LF
Hazen C-value	120	ductile iron
Riser Pipe	5	LF

Minor Losses:		Equiv. Length	Total
1	6" Tee Branch	30.0	*30*
1	6" GV	3.5	*3.5*
1	6" 90-deg	16.0	*16*
		Total Equiv L:	*33.5*

Q (gpm)	d (in)	L (ft)	head loss (ft)
2500	6	48.5	**23**

Static pressure	90	psi
Elev Losses	-2.0	ft
Pipe Losses	96	ft
Total Losses (ft)	94	ft
Total Losses (psi)	41	psi
Resulting Pressure at Proposed Hydrant	**49**	**psi**

Flow Rate	**3350**	**gpm**	**Available Flow @ 20 psi**
Elev Losses	-2.0	ft	
Pipe Losses	164	ft	
Total Losses (ft)	162	ft	
Total Losses (psi)	70	psi	
Resulting Pressure at Proposed Hydrant	**20**	**psi**	

USFS PARCEL 3

KSP-01 - February 4, 2020
Fire Flow Calculations
Prepared by: Jennifer VanCamp, P.E.

Proposed Hydrant #B **Residual Pressure @ 2500 gpm**

Existing Fire Hydrant #S108

Static pressure	90	psi		
Residual pressure	67	psi		
Flow (Q)	1058	gpm		
Elevation	3186	surface elevation		
Hydrant Elevation	3187.5	hydrant	1.5	feet above surface elevation

$K = Q/(p_{static} - p_{residual})^{0.54}$ 195

$Q_{20} = K(p_{static} - p_{20})^{0.54}$ 1930 gpm

Proposed FH

Flow Rate	**2500**	**gpm**		
Surface Elev	3183	surface elevation		
Hydrant Elev	3184.5	hydrant	1.5	feet above surface elevation

Proposed Pipe Segment 1 (Main to FH Tee):

Diameter	8	inches
Length	970	LF
Hazen C-value	120	ductile iron

Minor Losses:		Equiv. Length	Total
0	8" Tee Thru	14	*0*
3	8" Tee Branch	40.0	*120*
1	8" Bend Other	10.0	*10*
6	8" GV	4.5	*27*
		Total Equiv L:	*157*

$$h_f = \frac{(10.44)(L)(Q_{gpm})^{1.85}}{(C)^{1.85}(d_{inches})^{4.8655}}$$

Q (gpm)	d (in)	L (ft)	head loss (ft)
2500	8	1127	**131**

Proposed Pipe Segment 2 (FH Tee to FH):

Diameter	6	inches
Length	10	LF
Hazen C-value	120	ductile iron
Riser Pipe	5	LF

Minor Losses:		Equiv. Length	Total
1	6" Tee Branch	30.0	*30*
1	6" GV	3.5	*3.5*
1	6" 90-deg	16.0	*16*
		Total Equiv L:	*33.5*

Q (gpm)	d (in)	L (ft)	head loss (ft)
2500	6	48.5	**23**

Static pressure	90	psi
Elev Losses	-3.0	ft
Pipe Losses	154	ft
Total Losses (ft)	151	ft
Total Losses (psi)	65	psi
Resulting Pressure at Proposed Hydrant	**25**	**psi**

Flow Rate	**2600**	**gpm**	**Available Flow @ 20 psi**
Elev Losses	-3.0	ft	
Pipe Losses	165	ft	
Total Losses (ft)	162	ft	
Total Losses (psi)	70	psi	
Resulting Pressure at Proposed Hydrant	**20**	**psi**	

USFS PARCEL 3

KSP-01 - February 4, 2020
Fire Flow Calculations
Prepared by: Jennifer VanCamp, P.E.

Proposed Hydrant #C **Residual Pressure @ 2500 gpm**

Existing Fire Hydrant #S74

Static pressure	96	psi	
Residual pressure	53	psi	
Flow (Q)	1843	gpm	
Elevation	3178	surface elevation	
Hydrant Elevation	3179.5	hydrant	1.5 feet above surface elevation

$K = Q/(p_{static} - p_{residual})^{0.54}$ 242

$Q_{20} = K(p_{static} - p_{20})^{0.54}$ 2507 gpm

Proposed FH

Flow Rate	**2500**	**gpm**	
Surface Elev	3180	surface elevation	
Hydrant Elev	3181.5	hydrant	1.5 feet above surface elevation

Proposed Pipe Segment 1 (Main to FH Tee):

Diameter	8	inches
Length	460	LF
Hazen C-value	120	ductile iron

Minor Losses:		Equiv. Length	Total
0	8" Tee Thru	14	*0*
1	8" Tee Branch	40.0	*40*
0	8" Bend Other	10.0	*0*
2	8" GV	4.5	*9*
		Total Equiv L:	*49*

$$h_f = \frac{(10.44)(L)(Q_{gpm})^{1.85}}{(C)^{1.85}(d_{inches})^{4.8655}}$$

Q (gpm)	d (in)	L (ft)	head loss (ft)
2500	8	509	**59**

Proposed Pipe Segment 2 (FH Tee to FH):

Diameter	6	inches
Length	10	LF
Hazen C-value	120	ductile iron
Riser Pipe	5	LF

Minor Losses:		Equiv. Length	Total
1	6" Tee Branch	30.0	*30*
1	6" GV	3.5	*3.5*
1	6" 90-deg	16.0	*16*
		Total Equiv L:	*33.5*

Q (gpm)	d (in)	L (ft)	head loss (ft)
2500	6	48.5	**23**

Static pressure	96	psi
Elev Losses	2.0	ft
Pipe Losses	82	ft
Total Losses (ft)	84	ft
Total Losses (psi)	36	psi
Resulting Pressure at Proposed Hydrant	**60**	**psi**

Flow Rate	**3750**	**gpm**	**Available Flow @ 20 psi**
Elev Losses	2.0	ft	
Pipe Losses	173	ft	
Total Losses (ft)	175	ft	
Total Losses (psi)	76	psi	
Resulting Pressure at Proposed Hydrant	**20**	**psi**	