Vaquero Village Cluster Subdivision

Hydraulic Analysis

Reeve & Associates, Inc.
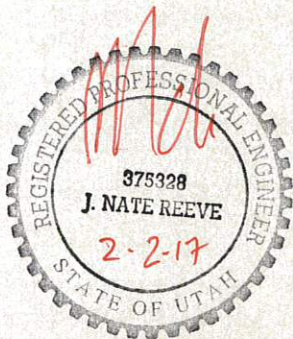
Solutions You Can Build On

for

Vaquero Village
7100 W 900 S
Weber County, UT

submitted to

Department of Environmental Quality
Division of Drinking Water
195 North 1950 West
Salt Lake City, Utah 84114
PH: (801) 536-0087

Reeve & Associates, Inc.

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Ref: 6352-01

REGISTERED PROFESSIONAL ENGINEER
375328
J. NATE REEVE
2·2·17
STATE OF UTAH

February 2, 2017

Reeve & Associates, Inc.

February 2, 2017

Camron Harry
Division of Drinking Water
Department of Environmental Quality
195 North 1950 West
Salt Lake City, Utah 84114
(801) 536-0087

Re: Vaquero Village Subdivision water line – File # 10648

As per your request, we are submitting to you this water main analysis for the proposed subdivision development located at the intersection of 7100 west and 900 south. This report complies with the Utah Administrative Code R309-511-5 & -6.

This land is currently undeveloped and is bordered to the north, east and west by agricultural property, and to the south by private residences. The area of the site is 12.42 acres.

The proposed subdivision includes 13 residential lots. See attached for water demand calculations, water model and outputs. The 8-inch water line will connect to the existing water main in 900 south. Secondary water is provided in a separate system for outdoor water use.

Calculations and analysis were performed to assure that the water facilities are adequate for the proposed site and that the minimum pressures as required by R309-500-5(1) can be maintained with the additional water demand.

To perform this analysis, we modeled the proposed system demands given the pressure of the existing main line using data provided by West Warren Water District. The software used for the analysis was WaterCAD V8i. With this information we were able to analyze the proposed changes in pressure to the water system to ensure it will not overtax the system. Therefore, it is our professional opinion that after the proposed design has been completed; this project will maintain pressures above the required minimum pressures, and should be permitted per the analysis contained within this letter.

Attached is the proposed model with data output. The first model was analyzed at peak day demand using the supplied demands in Table 510-1 of R309-510-7. The second model was analyzed at peak instantaneous demand per the equation in R309-510-9(2)(b). The third model was analyzed at peak day demand plus fire flow. The requirement for fire flow is based on the International Fire Code 2009 edition as per Weber County/Utah Administrative Code requirement of 1000 gallons per minute. Table 1 below summarizes this information.

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Table 1 – Model Demand and Pressure Requirements

System Model	Demand (gpm)	Minimum Modeled Pressure (psi)	Minimum Acceptable Pressure (psi)
Peak Day	14	60	40
Peak Instantaeous	43	60	30
Peak Day + Fire Flow	1043	52	20

See attached layout and model outputs. As output demonstrates, pressures are within acceptable ranges in all demand scenarios.

If you have any questions, or we can be of further assistance, please let us know.

Sincerely,

Nate Reeve, P.E.
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Kenneth Hunter, E.I.T.
Project Engineer
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Scenario: Base

W Pipe Calcs.wtg
2/1/2017

Bentley Systems, Inc. Haestad Methods Solution Center
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Watertown, CT 06795 USA +1-203-755-1666

Bentley WaterCAD V8i (SELECTseries 6)
[08.11.06.113]
Page 1 of 1
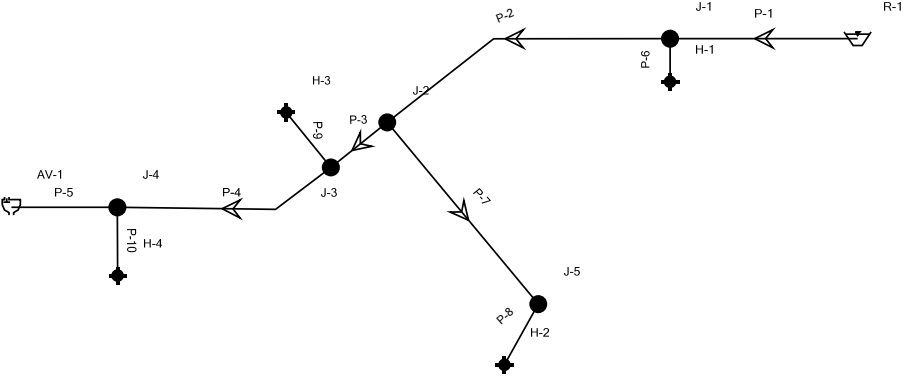
Water Demand Calculations
Vaquero Village Subdivision
7100 W 900 S

2/1/2017 KHH

	Peak Day Demand (gpd/conn)	Average Day Demand (gpd/conn)	# of Connections	Peak Day Demand (gpd)	Average Day Demand (gpd)	Peak Day Demand (gpm)	Peak Instantaneous Demand (gpm)	Fire Flow Demand (gpm)
Residential	800	400	13	10400	5200	14.4	43.1	1000

instantaneous demand
$Q = 10.8 \times N^{0.64}$
N=ERC/residential lots
Q=total flow

fire flow
1,000 gallons per minute for 60 minutes

Peaking Factor
Peak Day   2

Peak Day Demand	14.4 gpm
Peak Instantaneous Demand	43.1 gpm
Peak Day Demand + Fire Flow	1043.1 gpm

Design Constraints:
1. 40 psi during peak day demand
2. 30 psi during peak instantaneous demand
3. 20 psi during conditions of fire flow and fire demand experienced during peak day demand

Water Model Output
Peak Day Demand
Vaquero Village Subdivision
7100 W 900 S

2/1/2017 KHH

Table 1.A-Pipe Data

Label	Length	Start Node	Stop Node	Diameter (in)	Hazen-Williams C	Flow (gpm)	Velocity (ft/s)	Headloss Gradient (ft/ft)
P-1	317	R-1	J-1	8	150	14	0.09	0.000
P-2	421	J-1	J-2	8	150	12	0.08	0.000
P-3	84	J-2	J-3	8	150	8	0.05	0.000
P-4	520	J-3	J-4	8	150	4	0.03	0.000
P-5	88	J-4	AV-1	8	150	0	0.00	0.000
P-6	16	J-1	H-1	8	150	0	0.00	0.000
P-7	193	J-2	J-5	8	150	2	0.01	0.000
P-8	14	H-2	J-5	8	150	0	0.00	0.000
P-9	36	H-3	J-3	8	150	0	0.00	0.000
P-10	16	H-4	J-4	8	150	0	0.00	0.000

Table 1.B-Junction Data

Label	Elevation (ft)	Demand (gpm)	Hydraulic Grade (ft)	Pressure (psi)
J-1	4,217	2	4358.32	61.00
J-2	4,217	2	4358.32	61.00
J-3	4,217	3	4358.32	61.00
J-4	4,218	4	4358.32	61.00
J-5	4,219	2	4358.32	60.00

Table 1.C-Reservoir Data

Label	Elevation (ft)	Flow (Out net) (gpm)	Hydraulic Grade (ft)
R1	4,358	14.0	4,358

Water Model Output
Peak Instantaneous Demand
Vaquero Village Subdivision
7100 W 900 S

2/1/2017 KHH

Table 1.A-Pipe Data

Label	Length	Start Node	Stop Node	Diameter (in)	Hazen-Williams C	Flow (gpm)	Velocity (ft/s)	Headloss Gradient (ft/ft)
P-1	317	R-1	J-1	8	150	43	0.28	0.000
P-2	421	J-1	J-2	8	150	37	0.23	0.000
P-3	84	J-2	J-3	8	150	23	0.15	0.000
P-4	520	J-3	J-4	8	150	13	0.08	0.000
P-5	88	J-4	AV-1	8	150	0	0.00	0.000
P-6	16	J-1	H-1	8	150	0	0.00	0.000
P-7	193	J-2	J-5	8	150	7	0.04	0.000
P-8	14	H-2	J-5	8	150	0	0.00	0.000
P-9	36	H-3	J-3	8	150	0	0.00	0.000
P-10	16	H-4	J-4	8	150	0	0.00	0.000

Table 1.B-Junction Data

Label	Elevation (ft)	Demand (gpm)	Hydraulic Grade (ft)	Pressure (psi)
J-1	4,217	7	4358.31	61.00
J-2	4,217	7	4358.29	61.00
J-3	4,217	10	4358.29	61.00
J-4	4,218	13	4358.29	61.00
J-5	4,219	7	4358.29	60.00

Table 1.C-Reservoir Data

Label	Elevation (ft)	Flow (Out net) (gpm)	Hydraulic Grade (ft)
R1	4,358	43.0	4,358

Water Model Output
Peak Day Demand + Fire Flow
Vaquero Village Subdivision
7100 W 900 S

2/1/2017 KHH

Table 1.A-Pipe Data

Label	Length	Start Node	Stop Node	Diameter (in)	Hazen-Williams C	Flow (gpm)	Velocity (ft/s)	Headloss Gradient (ft/ft)
P-1	317	R-1	J-1	8	150	1,043	6.66	0.015
P-2	421	J-1	J-2	8	150	1,037	6.62	0.015
P-3	84	J-2	J-3	8	150	1,023	6.53	0.015
P-4	520	J-3	J-4	8	150	1,013	6.47	0.014
P-5	88	J-4	AV-1	8	150	0	0.00	0.000
P-6	16	J-1	H-1	8	150	0	0.00	0.000
P-7	193	J-2	J-5	8	150	7	0.04	0.000
P-8	14	H-2	J-5	8	150	0	0.00	0.000
P-9	36	H-3	J-3	8	150	0	0.00	0.000
P-10	16	H-4	J-4	8	150	-1,000	6.38	0.014

Table 1.B-Junction Data

Label	Elevation (ft)	Demand (gpm)	Hydraulic Grade (ft)	Pressure (psi)
J-1	4,217	7	4353.52	59.00
J-2	4,217	7	4347.21	56.00
J-3	4,217	10	4345.98	56.00
J-4	4,218	13	4338.52	52.00
J-5	4,219	7	4347.21	56.00

Table 1.C-Reservoir Data

Label	Elevation (ft)	Flow (Out net) (gpm)	Hydraulic Grade (ft)
R1	4,358	1,043.0	4,358