WHITCHURCH ENGINEERING

610 9th Street, Fortuna, CA 95540
716 Harris Street, Eureka, CA 95503

5/5/2023

ATTN: Mark Roberts
City of Clearlake - Community Development Department
14050 Olympic Drive
Clearlake, CA 95422

RE: Water Model Result Summary
Burns Valley Subdivision
2890 Old Hwy 53, Clearlake, Ca, 95422
APN: 010-048-08

JN: DAN2201

Dear Mark Roberts,

Whitchurch Engineering has analyzed the anticipated domestic water and fire water service demand generated by the proposed Burns Valley Subdivision located at 2890 Old Hwy 53 in Clearlake to determine the feasibility of providing adequate fire flow at the subdivision by connecting to the City of Clearlake water distribution system located at 3009 Old Hwy 35. This letter includes the anticipated water demand, existing water supply, analysis procedure through EPANET, and performance of the model.

The Burns Valley Subdivision involves subdividing a 30-acre lot into 22 one- and two-family residential parcels, ranging in size from 1.25 acres to 2.7 acres. Access will be by two cul-de-sacs. The water distribution system will include 5 new fire hydrants in the interior of the development. All structures served by these hydrants are assumed to be sprinkled one- and two-family residences.

Combined domestic water demand is estimated as 137 gallons per capita per day with a peak demand multiplier of 1.8. The fire flow demands for sprinklered one- or two-family residences are anticipated as 500 gpm with a minimum residual pressure of 20 psi for a one-hour time duration, per the National Fire Protection Association Fire Code and confirmed by the Lake County Fire Protection District Fire Marshall.

Existing water supply assumptions are based on a Fire Hydrant Flow Test performed by Highlands Water Company on April 13th, 2023. This shows that at 3009 Old Hwy 35 the existing water distribution network provides a static pressure of 59 psi with a residual pressure of 40 psi under 900 gpm flow conditions.

The proposed water addition to the water distribution network consists of 6" diameter C900 pipe along Old Hwy 53 with branches up each new cul-d-sac. Pressure loss is modeled using the Hazen-Williams Equations through the EPANET 2.0 software provided by the US EPA.

The model results show that there is sufficient supply from the existing water distribution network with the proposed addition to meet the fire flow and domestic water demands throughout the proposed subdivision. Detailed results can be found in the attached calculation packet.

Sincerely,

Jeffrey Laikam
Engineering Manager
RCE# 68586

WHITCHURCH ENGINEERING

610 9th Street, Fortuna, CA 95540

716 Harris Street, Eureka, CA 95503

Water Model for Burns Valley Subdivision

For: Mark Roberts
City of Clearlake – Community Development Office
14050 Olympic Drive
Clearlake, Ca 95422

JN: DAN2201
Rev: 0

Re: Burns Valley Subdivision
2890 Old Hwy 53, Clearlake, Ca 95422
APN: 010-048-008

Date: May 5th, 2023

Scope: This model examines a proposed water distribution for a 22-lot subdivision at the above-mentioned location. The purpose of this model is to verify that the proposed system is able to supply domestic and fire water demands as specified by the California Fire Code, National Fire Protection Association, and the Lake County Fire Marshall.

Includes:

Prepared by: Daniel Gent — Name — Signature/ Date 5/5/23

Checked by: Eric Allen — Name — Signature/ Date 5/5/23

Approved by: Jeffrey Laikam — Name — Signature/ Date 5-5-2023

Project Description

The Burns Valley Subdivision involves subdividing a 30-acre lot into 22 one- and two-family residential parcels, ranging in size from 1.25 acres to 2.7 acres. Access will be by two cul-de-sacs. The water distribution system will include 5 new fire hydrants in the interior of the development. All structures served by these hydrants are assumed to be sprinkled one- and two-family residences.

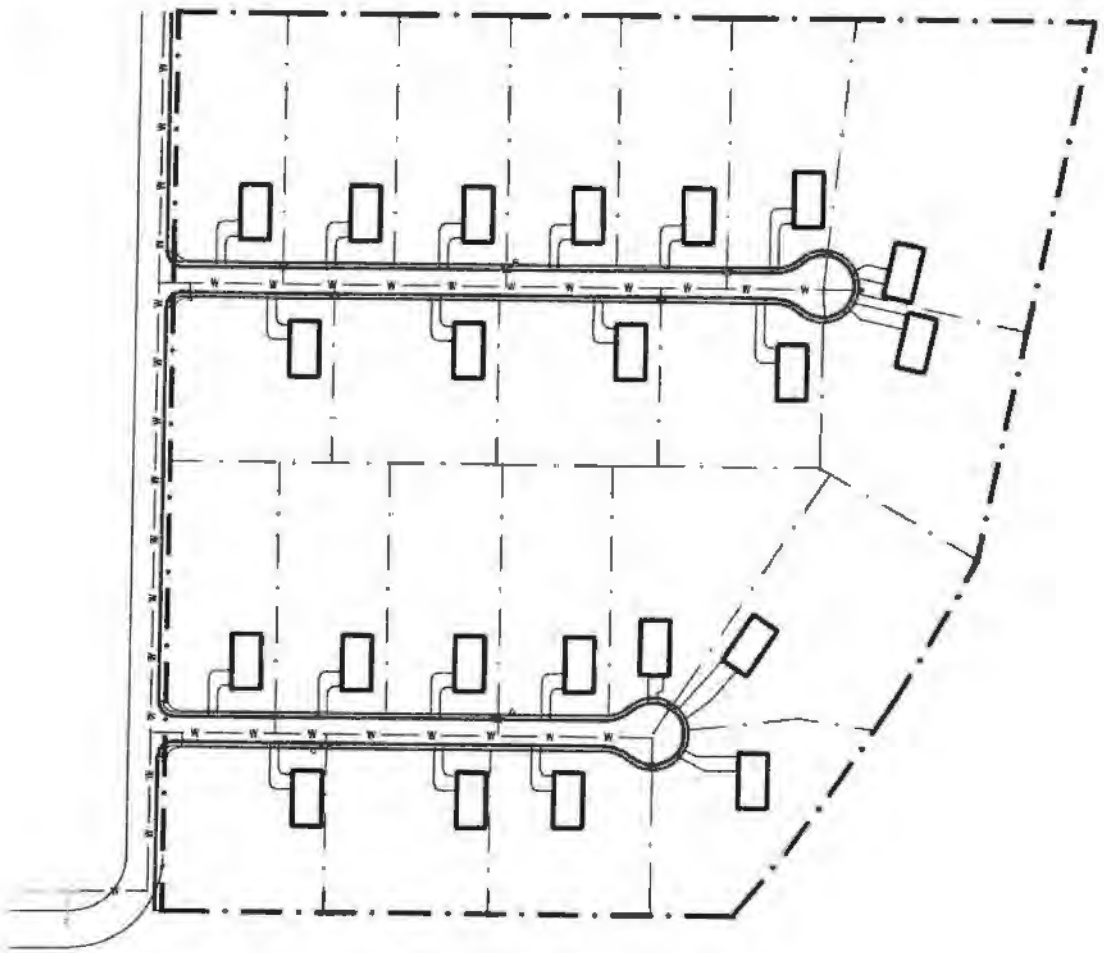

Figure 1: Project Layout

Acronyms

- GPCA – Gallons Per Capita Per Day
- gpm – Gallons per minute
- HP – Horse Power
- NFPA – National Fire Protection Association
- psi – Pounds per square inch
- PVC – Polyvinyl Chloride

Assumptions

- Water model was created in EPANET 2.2.
- Water is sourced from an existing water main with the following data:
    - Connection location at approximately 38°58'08.98"N 122°37'02.59W (WGS84 Datum) at the south east corner of lot 309 Old Hwy 53, APN: 039-354-23.
    - Static Pressure = 59 psi and Residual pressure = 40 psi at 900 gpm per Highlands Water Company Fire Hydrant Flow Data Sheet, dated 04/13/23, see Appendix A.
    - This situation is modeled by a reservoir with 136.25' of head with water delivered through a 2915' pipe with 8" diameter.
- C900 PVC pipe has a Hazen-Williams roughness coefficient of 130.
  Source: Civil Engineering Reference Manual, 8th Ed. A-25
- Combined domestic demands are based on the following:
    - 4 members per household
    - 137 GPCD (2013 Average for North Coast Hydrologic Region)
      Source: Pacific Institute: California Urban Water Use Map
    - Domestic peak demand multiplier = 1.8
      Source: Water Demands | Estimating and Variations; by R Sonowal
- Fire flow demands are based on the following:
    - All new construction to have approved sprinkler systems with a maximum sprinkled area of 2,500 sqft per building with Ordinary 1 hazard classification.
      Sprinkler demand = 0.13 gpm/sqft for a total of 325 gpm
      Source: NFPA 13 figure 11.2.3.1.1.
    - All new construction, to have approved sprinkler systems sprinkled, require a fire flow of 500 gpm at 20psi for a 1-hour duration at the hydrant.
      Source: NFPA 1 Fire Code 2021 Edition. Section 18.4.5.1 and Lake County Fire Marshall approval, see Appendix B
    - The largest of these values, 500 gpm at 20psi for a 1-hour duration, shall be the required fire flow.
      Source: NFPA 1 Fire Code 2021 Edition. Section 18.4.5.3.5

Model Development

The model consists of the additional water lines from the existing fire hydrant, labelled FH-1, located at 3009 Old Hwy 53, to 6 new hydrants, labelled FH-2 through FH-6, in the proposed Burns Valley Subdivision. All new water lines are modeled as 6" diameter C900 pipe. The input data for each node is included below in table 1 and a schematic diagram is included below figure 2.

Table 1: Input data

Node	Elevation	Number New Parcels Served	Combined Domestic Demand (GPM)
FH-1	1400	0	0.0
FH-2	1402	4	6.5
FH-3	1417	6	9.8
FH-4	1305	3	4.9
FH-5	1400	5	8.1
FH-6	1403	4	6.5

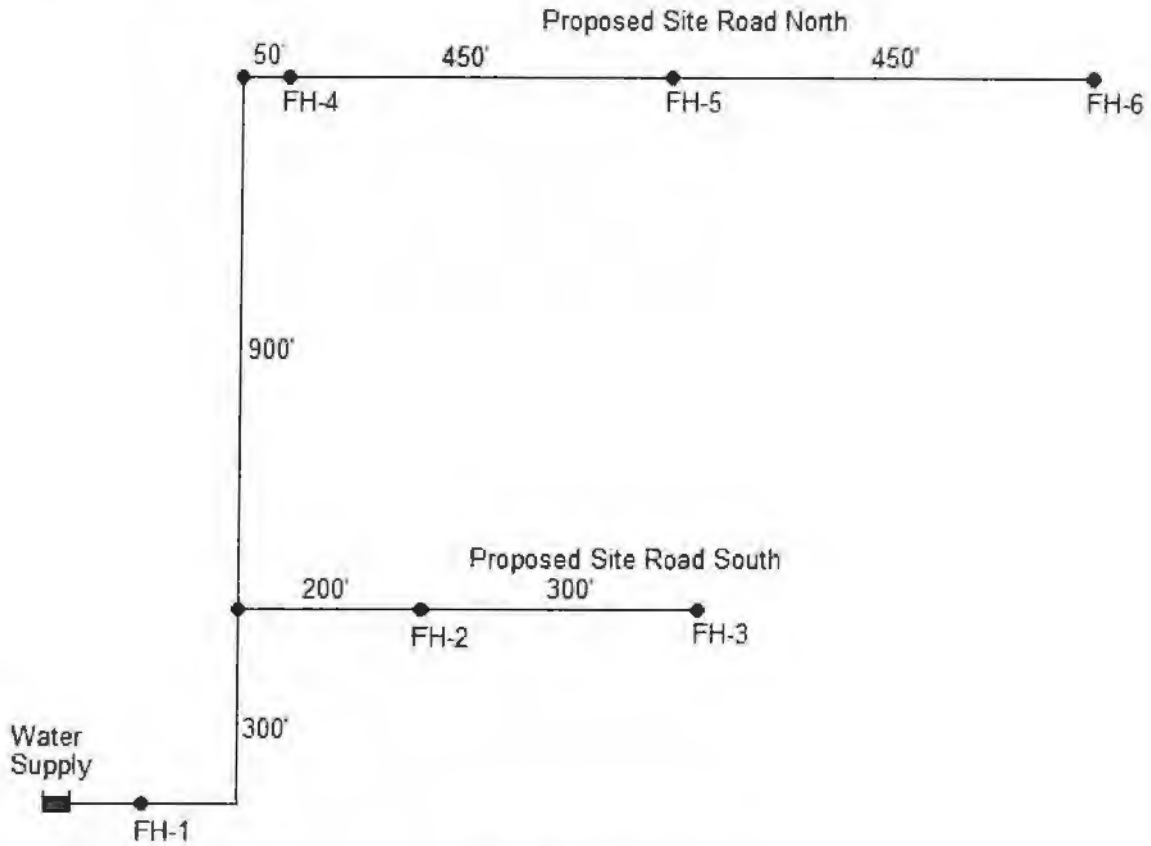

Fig 1: Project Area Layout

The worst-case pressures during fire flow situations will take place at FH-4 and FH-6 respectively. The results at these two nodes are presented below.

Results

During design fire flow events, 500gpm, the residual pressure at FH-3 was modelled as 29 psi. The residual pressure at FH-3 remains acceptable, above 20 psi, for flow rate up to approximately 750 gpm. FH-6 showed a residual pressure of 35 psi at the design fire flow rate of 500 gpm, and maintained an acceptable residual pressure up to a flow rate of approximately 580 gpm. The pressure flow curves for FH-3 and FH-6 are presented below in figure 3.

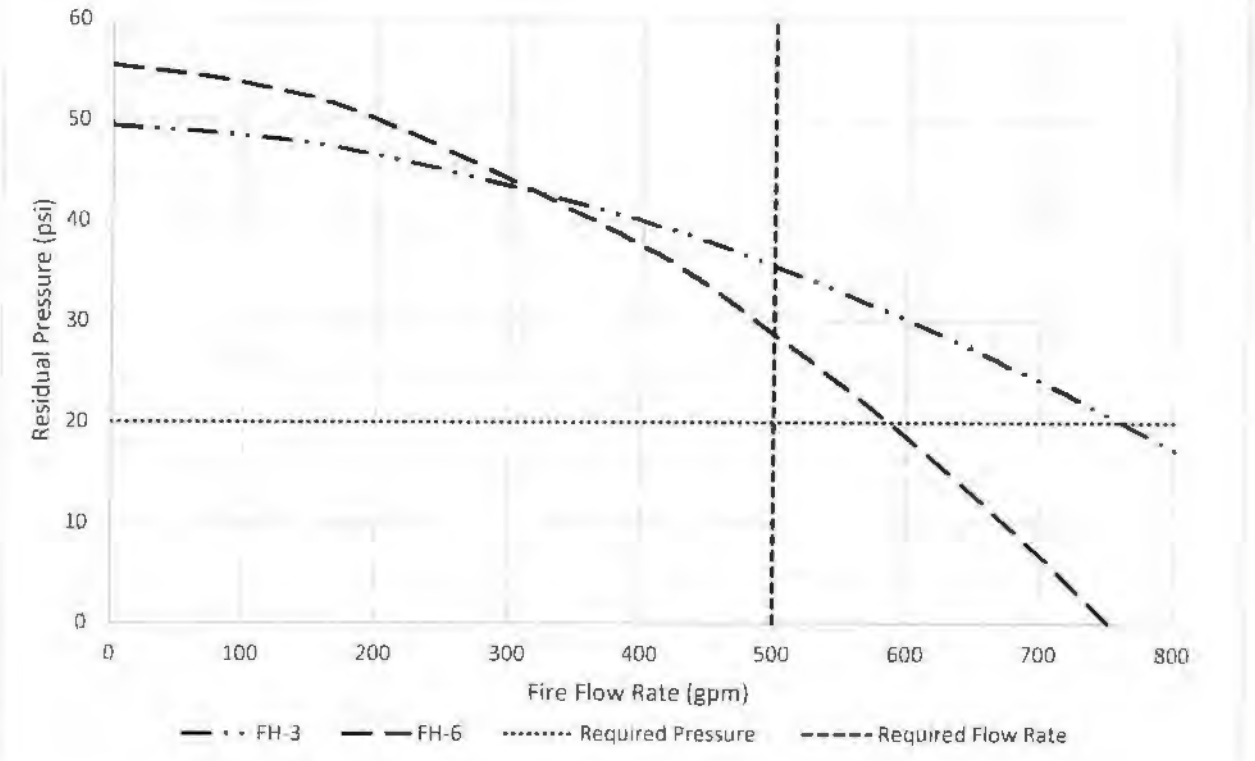

Figure 3: Residual pressures at FH-4 and FH-7 over various flow rates.

Conclusion

The proposed 6" diameter C-900 water distribution lines will be sufficient to meet the fire flow rates and pressures prescribed by the NFPA and California Fire Code.

APPENDIX A – HIGHLANDS WATER COMPANY DATA SHEET

HIGHLANDS WATER COMPANY
Mutual Water Utility
14580 Lakeshore Drive
Clearlake, California 95422
Plant Facility (707) 994-8676

Fire Hydrant Flow Data Record Sheet

Nearest HYDRANT LOCATIONS: *3009 Old Hwy 53*
3127 Old Hwy 53

Test Date: *4/13/2023*
Time: *11:10 AM*
Test Result:
Determined GPM: *900*
Static Pressure psi: *59*
Residual Pressure psi: *40*
Test Performed by: *Lowell Estep*

Associated Project Information Recv'd from Daniel /Whitchurch
Project Name: *Burns Valley Subdivision*
Address: *2890 Old Hwy 53*
Parcel # : *010-048-08*

Please Note: Information provided is indicative of the water supply characteristics in a particular area on the date and time as noted. Highlands Water Company does not guarantee that this data will be representative of the water supply characteristics any time in the future.

APPENDIX B – LAKE COUNTY FIRE PROTECTION DISTRICT FIRE MARSHALL COMMUNICATION

RE: Local Fire Code Amendments

Autumn Lancaster <ALancaster@lakecountyfire.com>

Thu 5/4/2023 10:49 AM

To: Daniel Gent <dpg@whitchurchengineering.com>

Cc: Jeff Laikam <jtl@whitchurchengineering.com>

Good Morning,

First and foremost thank you for reaching out about the [illegible] fire flow and getting [illegible] prior to the start of the project. [illegible]

[illegible] acceptable fire flow for the project, I would like to note spacing of the hydrants [illegible] with 5 hydrants in two cul-de-sacs this will be met.

If you have any more questions before plan submittals please do not hesitate to ask.

- Autumn Lancaster LCFPD Fire Marshal

From: Daniel Gent [illegible]

Sent: Wednesday, May [illegible] 2023 [illegible] PM

To: Autumn Lancaster [illegible]

Cc: Jeff Laikam [illegible]

Subject: Re: Local Fire Code Amendments

Hello Autumn Lancaster,

The purpose of this email is to request your feedback on design fire flows for the proposed the Burns Valley Subdivision on Old Hwy 53.

Background:

The proposed subdivision is located at 2890 Old Hwy 53, APN: 010-048-008. The proposal involves subdividing the 30 acre lot into 22 one- and two-family residential parcels, ranging in size from 1.25 acres to 2.7 acres. Access will be by two cul-de-sacs. The water distribution system will include 5 new fire hydrants in the interior of the development. All structures served by these hydrants are assumed to be sprinckled one- and two-family residences (The site currently has no structures and all new construction will be permitted according to the Ca Fire Code).

Codes & Standards:

The following requirements come from the NFPA 1 (2021 Ed)

18.4.5.1.1 The minimum fire flow and flow duration requirements for one- and two-family dwellings having a fire flow area that does not exceed 5000 ft2 (464.5 m2) shall be 1000 gpm (3785 L/min) for 1 hour.

18.4.5.1.2 A reduction in required fire flow of 75 percent shall be permitted where the one- and two-family dwelling is provided with an approved automatic sprinkler system.

18.4.5.1.5* The reductions in 18.4.5.1.2, 18.4.5.1.3, and 18.4.5.1.4 shall not reduce the required fire flow to less than 500 gpm (1900 L/min).

18.4.5.3.5 Required Fire Flow and Automatic Sprinkler System Demand. For a building with an approved fire sprinkler system, the fire flow demand and the fire sprinkler demand shall not be required to be added together. The water supply shall be capable of delivering the larger of the individual demands.

Feedback Request:

As I understand the NFPA Requirements listed above the water distribution system needs to be sized such that each project hydrant can deliver 500 gpm of fire flow with a residual pressure not less than 20 psi, and that this

requirement is subject to the approval of the authority having jurisdiction. Is the above mentioned fire flow with residual pressure requirement acceptable for this project?

Thanks for your time,

Daniel Gent E.I.T.

Engineer in Training

Whitchurch Engineering, Inc.

dpg@whitchurchengineering.com

WHITCHURCH ENGINEERING

www.whitchurchengineering.com

Fortuna Office:	*Eureka Office:*
610 9th Street	716 Harris Street
Fortuna, CA 95540	Eureka, CA 95503
(707) 725-6926	(707) 444-1420