Lakeside at Sutter Pointe

Domestic Water Study

Sutter County, California

Prepared For:

Lennar Homes-Winn Communities
And Golden State Water Company

March 13, 2020

Prepared By:

WOOD RODGERS
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1.0 Introduction

1.1 Purpose

This water study identifies the domestic water needs for the Lakeside at Sutter Pointe (Project). The Project will be constructed in phases, with Phase 1 modeled as an interim condition to the ultimate build out which will include Phases 2 and 3. This study demonstrates that the proposed domestic water system layout is in technical compliance with the water purveyor's requirements for domestic water conveyance. The Project's water purveyor is the Golden State Water Company (GSWC). This study forms the basis for improvement plan design and processing through Sutter County (County) and GSWC and affected agencies; the study must be approved by the GSWC before improvement plans are signed.

1.2 Project Description and Study Methodology

The Project area encompasses 873.5 acres within the Sutter County. It is part of the Sutter Pointe Specific Plan, completed in August 2014. Lakeside at Sutter Pointe is divided into three phases; 1, 2 and 3. Phase 1 has a small lot tentative map completed. Phase 2 and 3 are designed to a large lot tentative map level of detail only.

To the south of Phase 1 lies Riego Road, which is also subject to improvements per the Specific Plan. To the east is Natomas Road and to the North, Sankey Road; neither of which are a part of this Project. The Project will be a mix of land uses, including Low Density Residential (LDR), Medium Density Residential (MDR), High Density Residential (HDR), Park, Employment Centers, Schools, Open Space/Detention Basins and Major Right of Ways.

The project falls within the jurisdiction of Sutter County, with water purveyed by GSWC. The water distribution system was therefore designed to be consistent with the Sutter Pointe Specific Plan and the standards set by the *Sutter County Improvement Standards* (Standards) and the *Golden State Water Company Master Planning Criteria and Standards* (Criteria).

The methodology used in this study is consistent with the existing studies. Total water demand was calculated for the proposed project based on the known land use per Sutter County design standards and checked against the availability of water described in known studies. A hydraulic model of the proposed infrastructure was designed to confirm that the water conveyance requirements of GSWC can be met. The transmission mains were sized with future developments in mind, accounting for projected demands outlined in the Specific Plan. The site will be served by groundwater sources in the form of two groundwater wells and an equalization tank.

Figure 1: Vicinity Map

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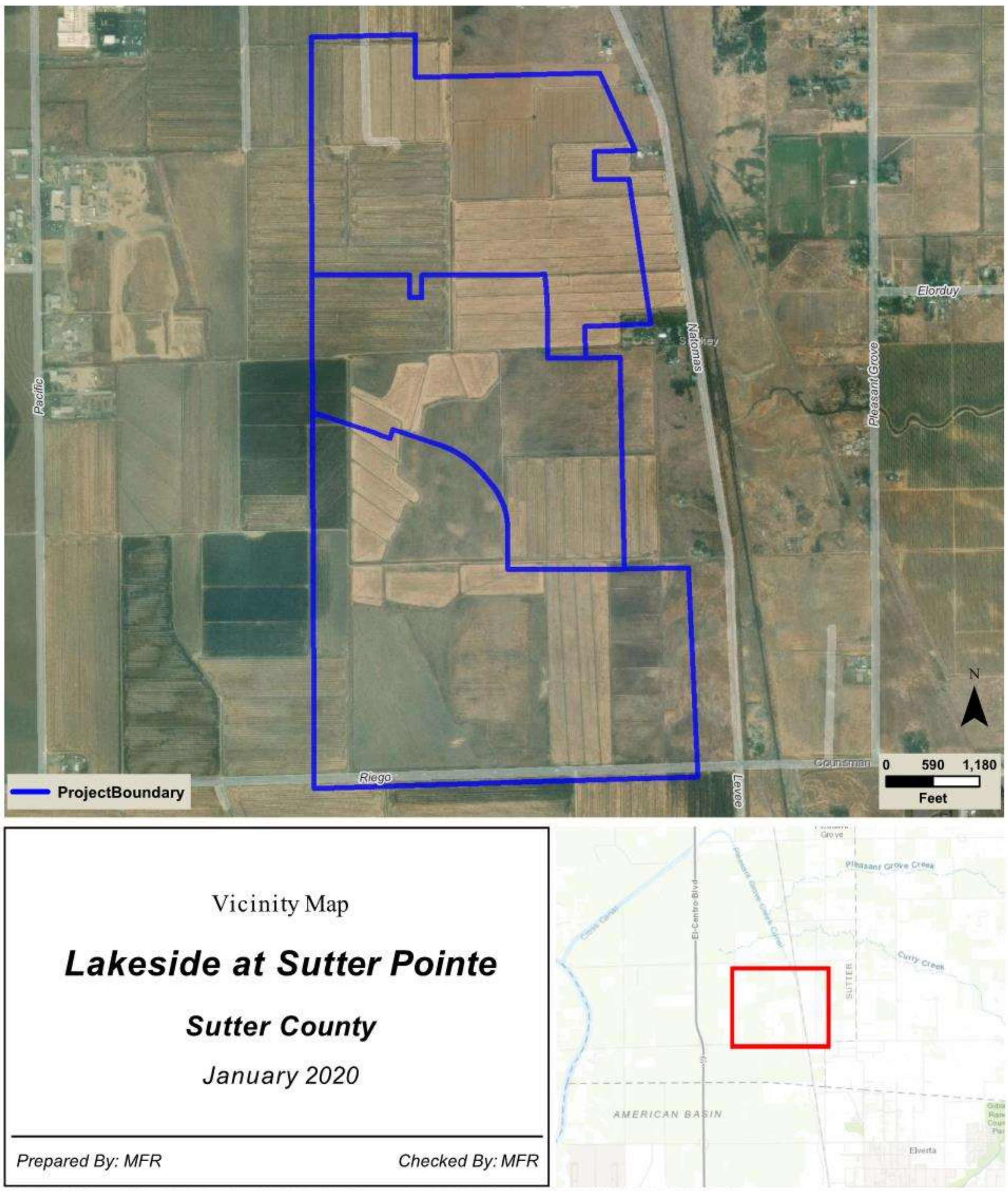
BUILDING RELATIONSHIPS ONE PROJECT AT A TIME



2.0 Background

2.1 Location

The Project is located within the Sutter County limits, immediately west of Natomas Road, south of Sankey Road, and north of Riego Road. It is situated within and on the east side of the City's Sutter Pointe Planning Area. Refer to **Figure 1** for the project location and vicinity map. The general layout and uses for the land are shown in detail on the **Tentative Subdivision Map** provided as **Appendix A**.

2.2 Topography

The existing site topography is previously farmed land and has mild to moderate slopes ranging from 1% to 5%. The land slopes generally southwest. Elevation ranges between 25' and 40'. Existing Site topography is included with the **Water System Layout** in **Appendix B**.

2.3 Water Supply

The Project Area is currently unserved with the exception of irrigation water drawn from groundwater wells. Per the Specific Plan, the Service Area will be supplied exclusively with groundwater drawn from wells on site. The production capacity of the two proposed groundwater wells will be determined in a future document. This study will proceed with an assumed production capacity based upon similar wells in the area.

Two test wells will be drilled on site within the proposed vicinity well locations. These wells will be used to determine the production level of the proposed groundwater wells onsite. The test wells will be discussed in a separate report to be submitted at a later date. Additionally, a water tank and pump station will be provided to meet fire water and peak hour demands and storage requirement.

The Project water system is intended to stand on its own but future connections to Riego Road are anticipated. Land Use and Demand Projections can be seen in Section 3.0.

2.4 Land Use and Zoning

The existing land is primarily farm land. The proposed land use will include a mix of low, mid, and high density residential neighborhoods with commercial space, parks, and open spaces. The Project has been approved as a residential community of approximately 873.5 acres, land uses shown in **Table 1** below. The Project is generally consistent with the current Sutter Pointe Specific Plan.

A land use summary for the Project is shown in **Table 1**. Within Phase 1 there will be 1391 low, medium and high density lots on residential roads with lots mixed between 40'x105', 45'x105' and 55'x105' footprints. **Table 2** includes an acreage breakdown specific to Phase 1. Phase 2 and 3 are not designed to a small lot tentative map scale yet and do not have unit counts; acreage is shown in **Table 1** for Lakeside at Sutter Pointe as a whole. The lots are more fully described with the approved Tentative Subdivision Map provided in **Appendix A**.

Table 1: Lakeside at Sutter Pointe Approved Land Use

Land Use	Acreage
Low Density Residential	240.9
Medium Density Residential	361.7
High Density Residential	21.4
Park	61.3
Detention Basins	39.3
Schools	16.0
Commercial//Office	71.1
Open Space	15.6
Right-of-Way	45.7
Total	**873.5**

Acreage excludes Riego Road.

Table 2: Lakeside at Sutter Pointe Phase 1 Approved Land Use

Land Use	Acreage	Units
Low Density Residential	102.1	440
Medium Density Residential	129.0	745
High Density Residential	10.3	206
Park	36.8	
Detention Basins	31.1	
Commercial//Office	37.0	
Open Space	9.2	
Right-of-Way	30.2	
Pump Station	0.5	
Total	**386.2**	**1391**

3.0 Project Water Demands and Storage

3.1 Water Use Demands

Project water demands – average-day, maximum day, and peak hour – were determined using unit water demand factors (annual), which are defined in the previously approved Water Supply Assessment from the Sutter Pointe Specific Plan prepared by Tully and Young. The demand factors (acre-ft/ac/yr), the area of each land use type (acres), and the resulting projected average daily demand (gpm) are presented in **Table 3** below.

Table 3. Domestic and Irrigation Water Demand for Lakeside at Sutter Pointe

Land Use	Unit Demand Factor (acre-ft/ac/yr)[1]	Area – Phase 1 Only (acre)	Phase 1 ADD (gpm)	Overall ADD (gpm)
Low Density Residential	3.67	102.1	249.2	589.2
Medium Density Residential	4.17	129	358.5	1005.1
High Density Residential	4.67	10.3	32.1	66.6
Commercial/ Office	3.00	37.0	72.0	92.2
Community Park	4.08	36.8	100.1	166.7
Schools	3.67	0	0.0	39.1
Detention Basin	0.60	31.1	12.4	0.0
Pump Station	4.08	0.5	3.0	1.0
Open Space	0.60	9.2	3.7	22.0
Right-of-Way	0.20	30.2	4.0	6.1
Total		**386.2**	**835.5**	**2037.9**

[1] Demand factors from Tully and Young Water Supply Assessment

Once the Average Day Demand (ADD) was calculated, the maximum day demand (MDD) was calculated to be 1.85 times the ADD, and the peak hour demand (PHD) was calculated as 1.9 times the MDD, as outlined in Section 8-7 of Sutter County standards. The Project water demands are summarized in **Table 4** in gallons per minute. Demands are modeled at specific nodes located in each lot, with each large lot designated a demand. Demands are split into Phase 1 and Ultimate conditions.

Table 4: Sutter Pointe Project Water Demands

Phase	Average Day Demand	Maximum Day Demand	Peak Hour Demand
Phase 1	835.48 gpm	1549.34 gpm	2943.75 gpm
Ultimate (Phase 1, 2 and 3)	2037.91 gpm	3770.13 gpm	7163.25 gpm

3.2 Water Storage

Storage required for the Project is determined from the Golden State Water Company criteria. Per the "Water Supply and Storage" section of the GSWC Criteria, stored water must be allocated into one of three categories and cannot be used interchangeably, meaning the total storage volume must be additive. The three categories are discussed below.

1) Operational Storage:
   Operational storage is the storage required to meet short periods of high demand, specifically the PHD. The PHD for the ultimate condition (7,163.25 gpm) exceeds the 4,000 gpm available from the combined capacity of the two wells. Per the GSWC

Criteria, there should be enough storage to cover 4 hours of the difference between the PHD and available supply. This difference, approximately 3,163 gpm, will be provided by water storage and will be delivered with the storage system pump. The required Operational Storage volume is 759,180 gallons.

2) Fire Storage:
Fire Storage is the storage required to meet the maximum fire demand set by the County. Section 8-7 of the Sutter County Standards specifies 3,000 gpm fire flow for 3 hours totaling in 540,000 gallons for commercial and school land uses. This Project will include commercial and school lots, therefor the fire supply flow storage is 540,000 gallons.

3) Emergency Storage:
Emergency storage is reserved for unplanned losses of a major supply source per the GSWC standards. Section 5 *Supply and Storage Capacity Evaluation* provided by GSWC and included in **Appendix D** specifies an added emergency storage requirement of 12 hours of ADD. This is approximately 1,470,000 gallons of storage.

The cumulative storage requirement for the ultimate condition will be 2.8 million gallons to account for operational, fire, and emergency storage.

4.0 Water System

4.1 Water Distribution System

The Project water pipes will be installed in a typical looped layout, following the street layout on the approved Tentative Subdivision Map. The system is supplied water through two groundwater wells. One is proposed at the northwest corner of Phase 1 within lot P-11A, the other is proposed at the south-central portion of Phase 1 within lot E1-4. The groundwater wells are assumed to provide 2,000 gpm each, totaling in 4,000 gpm of production. The proposed tank and pump station will provide system reliability at operational level.

The tank discussed in the previous storage section will be connected to the system via a pump. The pump will deliver the approximate difference between the PHD and available supply, approximately 3,100 gpm, at 130 ft of head to the system to match the head delivered by the well.

The Project area's existing topography ranges in elevation from 25 ft to 40 ft. There are no special geographical conditions requiring special design considerations. Preliminary grading and centerline elevations have been incorporated into the water pipe layout as shown in **Appendix B**. The model node elevations are modeled at elevation 30 as this is the approximate average of the expected centerline grades. Minor adjustments in the depth of the line will occur during the final design with the establishment of the final street grades for the Project.

4.2 System Design Criteria

Sutter County requires that water distribution systems follow a set of operational criteria, outlined for transmission mains and for distribution mains of the County water study guidelines. The system has been designed to meet or exceed these goals. See **Table 5: Golden State Water Conditions** below for a summary of the operating goals. A maximum of 6 ft of head loss per 1000ft of water line is allowed for all conditions.

Table 5: Golden State Water Operating Conditions

Condition	Velocity Max. (fps)	Pressure Min.(psi)	Pressure Max. (psi)
ADD	5 fps	40 psi	150 psi
MDD	5 fps	40 psi	150 psi
MDD + Fire	10 fps	20 psi	150 psi
PHD	10 fps	40 psi	150 psi

GSWC Criteria for Fire Flow Requirements specify that the county/local agency sets fire flow requirements based on land use type. See **Table 6: Sutter County Minimum Fire Flow Requirements** below for these requirements.

Table 6: Sutter County Minimum Fire Flow Requirements

Land Use	Duration (hour)	Fire Flow (gpm)
Low Density Residential	2	1,500
Medium Density Residential	2	1,500
High Density Residential	3	2,500
Commercial/Office	3	3,000
School	3	3,000

For Lakeside at Sutter Pointe, the fire flow was modeled as 3,000 gpm to account for schools and commercial lots. The MDD + Fire Flow scenario was modeled by applying a 3,000 gpm fire flow demand at the most hydraulically remote node on top of the MDD fire demands. For the buildout condition, the system must be able to provide 3,000 gpm for 3 hours to the commercial/office lot.

5.0 Phasing/Interim Conditions

5.1 Project Phasing

The Project is anticipated to be constructed in two phases, as shown in **Appendix B**. Phase 1 will be developed first along with the groundwater wells. Phase 2 and Phase 3 will be developed after Phase 1. Therefore, we modeled Phase 1 separately and then Lakeside at Sutter Pointe as a whole.

Eight total scenarios were modeled and analyzed, as show in **Table 7** below. Scenarios 1 through 4 model the water infrastructure for Phase 1, scenarios 5 through 8 model the ultimate buildout.

Table 7: List of Model Scenarios

Scenario #	Infrastructure	Water Demand
1	Phase 1 Only	Average Day Demand
2	Phase 1 Only	Maximum Day Demand
3	Phase 1 Only	Peak Hour Demand
4	Phase 1 Only	Maximum Day + FF Demand
5	Ultimate Buildout	Average Day Demand
6	Ultimate Buildout	Maximum Day Demand
7	Ultimate Buildout	Peak Hour Demand
8	Ultimate Buildout	Maximum Day + FF Demand

6.0 Hydraulic Model Results and Conclusions

6.1 Hydraulic Model Assumptions

The modeling software used for this analysis is H2ONet version 14.0 by Innovyze. In H2ONet, the water system is represented by pipe elements, nodes (pipe junctions), and boundary conditions. Nodes are identified with the prefix "J" if it is a junction or "FH" if it is a fire hydrant. Pipes are identified with the prefix "P". Pumps are identified with the prefix "PU" and the reservoirs from which the pumps pull are identified with "W" to represent the well. Tanks are identified with the prefix "T". Valves have the prefix "V". Water demands coinciding with land use to model represent each flow scenario.

The wells are the boundary conditions for this project and will be modeled as reservoirs with a fixed head and a pump delivering the water into the system. Each well will have an assumed production of 2,000 gpm.

The following assumptions were used in the hydraulic model:

- Boundary condition: fixed head reservoirs at both well locations with a pump consistent with the forthcoming groundwater well design. An equalization tank is modeled to meet the Peak Hour Demand.
  - Groundwater wells were designed to provide 2,000 gpm @ 130 feet of head. Each well is modeled as a reservoir connected to a pump connected to the system.
  - The equalization tank was modeled as two 1,500,000-gallon tanks. On the same location. One built with Phase 1, the other with Phase 2. The tanks are connected to a pump that provides 130 feet of head to match the groundwater pump and delivers 3,100 gpm for four hours of operation per Golden State

Water Standards. The tanks will only be modeled as open for the ultimate condition and are not necessary for Phase 1 as the demands can be met with the two groundwater wells.

- Pipe losses are reflected with a Hazen-William "C" value of 130 to represent all pipe material, including ductile iron, welded steel, concrete cylinder, and polyvinyl chloride (PVC) mains. Pipe material will likely be PVC.

6.2 Hydraulic Model Results and Conclusion

The results of the model are summarized in this section. See **Table 8** below for a summary of the results from all model scenarios. For both Phase 1 and the ultimate buildout condition, the proposed infrastructure meets the minimum pressure and maximum velocity criteria for all domestic demand and fire flow cases as required by the County. Pipes used to model the interconnections between the pump and the water system will always exceed the maximum velocity and will not be included in the table below.

Table 8: H2ONet Model Results Summary

Scenario	Min. Pressure (psi)	@ Node	Max. Velocity (fps)	@ Pipe
Phase 1 Average Day Demand	73.8	J265	0.86	P250
Phase 1 Maximum Day Demand	70.8	J265	1.58	P250
Phase 1 Peak Hour Demand	59.9	J265	2.89	P20
Phase 1 MDD + 3,000 gpm Fire Flow @ FH50	40.0	J115	5.69	P105
Ultimate Average Day Demand	68.5	J265	1.54	P20
Ultimate Maximum Day Demand	53.0	J265	2.83	P20
Ultimate Peak Hour Demand	54.2	J265	8.03	P20
Ultimate MDD + 3,000 gpm Fire Flow @ FH130	28.0	FH130	8.79	P785

The model results show that the proposed pipe layout and sizes are adequate to distribute water throughout the site. The Project water follows a looped layout, and the system met minimum pressure and maximum velocity requirements. Emergency interties with adjacent water districts are not planned at this time.

Detailed results tables can be viewed for each model scenario in **Appendix C**.

6.3 Conclusion

This Water Study has been prepared in accordance with the Sutter County 2016 Improvement Standards requirements and the Golden State Water Company's Criteria. Based on the proposed land use, boundary conditions, and generally accepted water modeling techniques, the system as proposed will meet and/or exceed operational requirements of the County at project build-out. This project does rely on the production of the groundwater supply wells and the use of an equalization tank. The finalized production rates for the wells are pending the forthcoming study.

APPENDIX A

TENTATIVE SUBDIVISION MAP

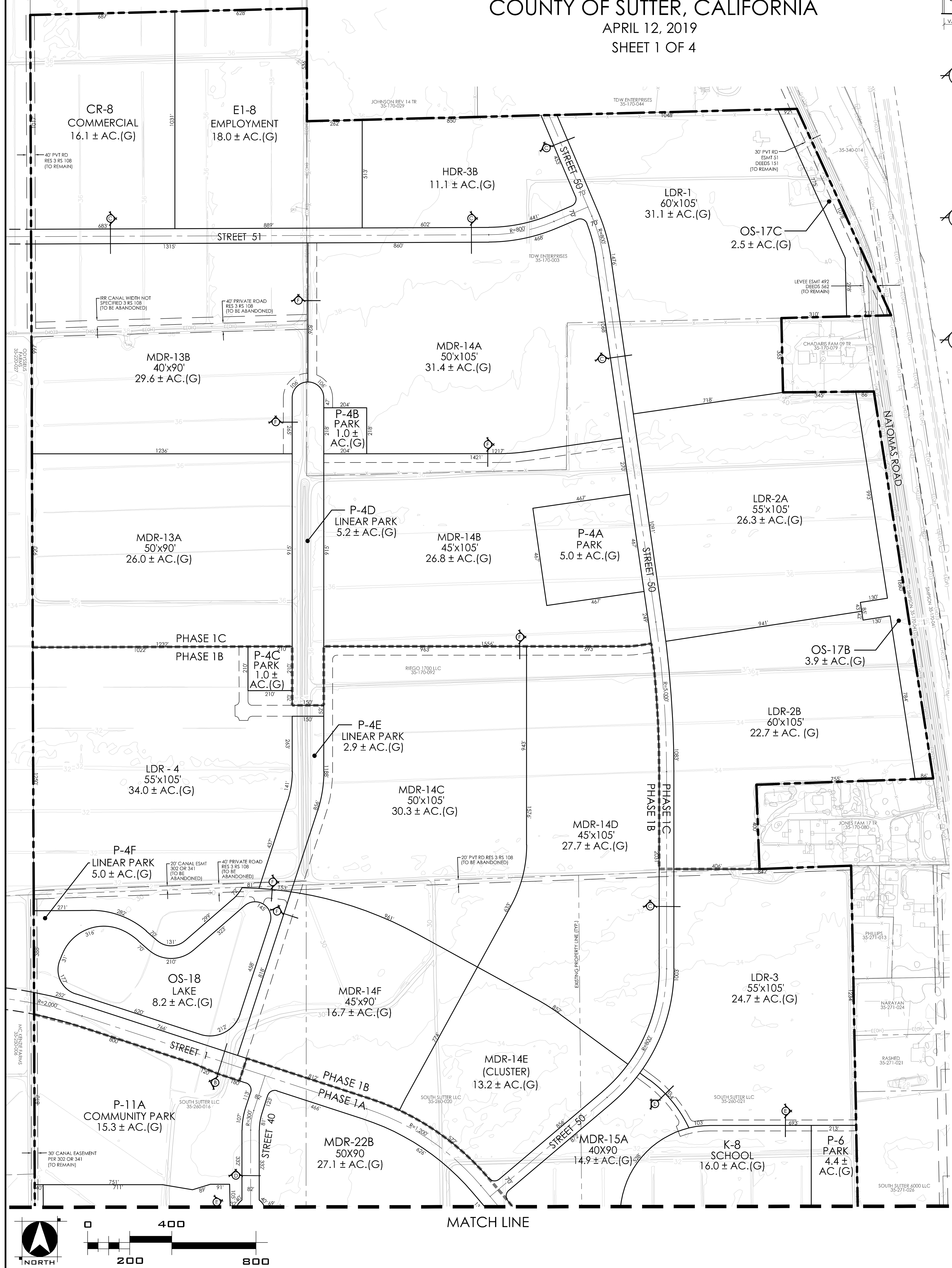
LARGE LOT TENTATIVE MAP

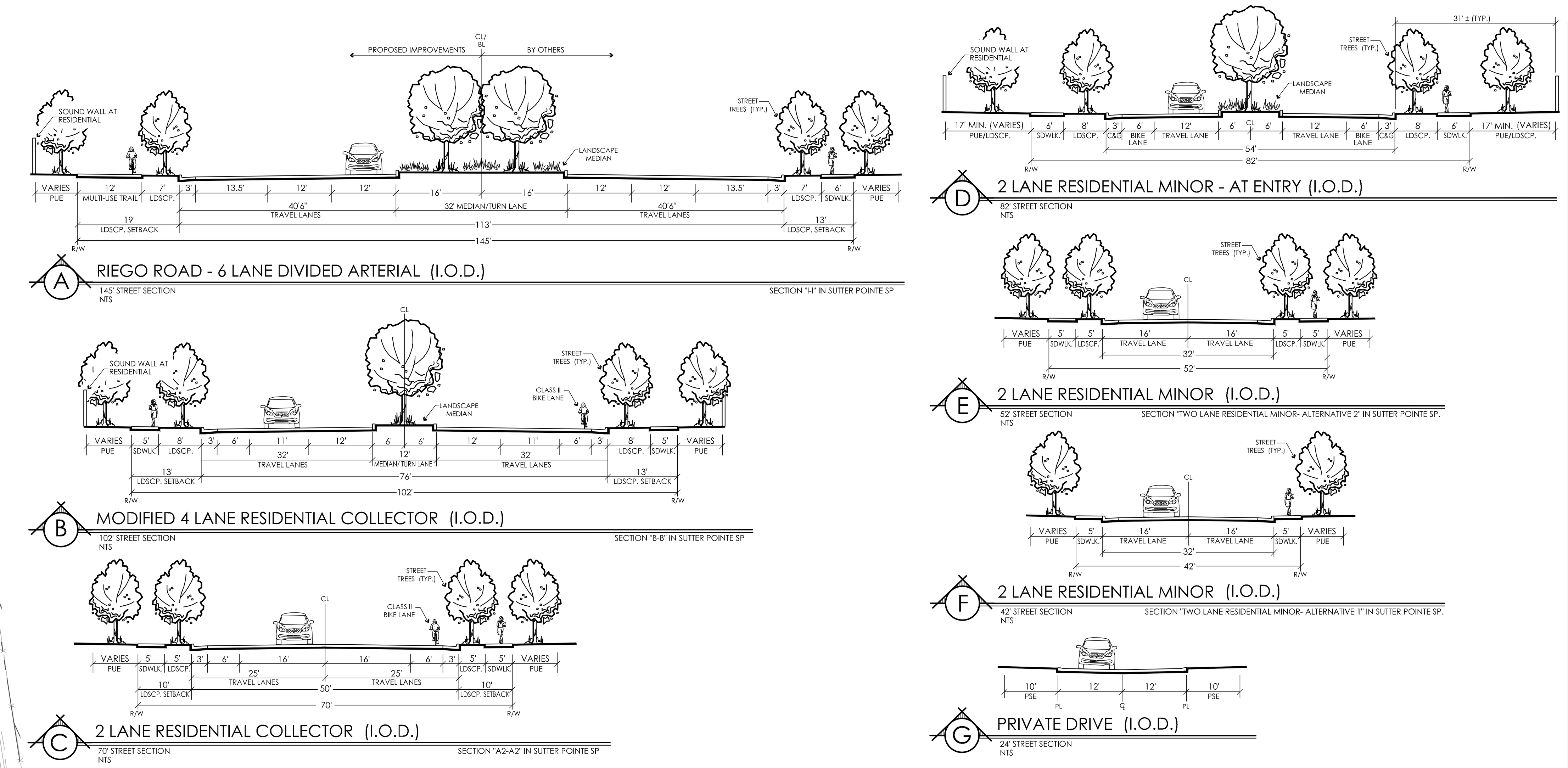
SUTTER POINTE PHASE 1

COUNTY OF SUTTER, CALIFORNIA

APRIL 12, 2019

SHEET 1 OF 4





PROJECT NOTES

OWNERS
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JEFF CARPENTER, PE 55380
PHONE: (916) 341-7760

ASSESSOR'S PARCEL NUMBERS
35-260-002, -016, -020, -021
35-170-003, -092

AREA
873.5 ± ACRES GROSS

NUMBER OF PARCELS
53 PARCELS

EXISTING USE
AGRICULTURE

PROPOSED USE
SEE LAND USE SUMMARY

EXISTING/ PROPOSED GENERAL PLAN
SUTTER POINTE SPECIFIC PLAN

EXISTING ZONING
LDR, MDR, HDR, E1, NC, OS, P & AG

PROPOSED ZONING
LDR, MDR, HDR, E1, NC, P/QP, OS, & P

PARK DISTRICT
SUTTER COUNTY GENERAL SERVICES DEPARTMENT

FIRE PROTECTION
PLEASANT GROVE FIRE DEPARTMENT (CSA-D)

SCHOOL DISTRICT
PLEASANT GROVE JOINT UNION SCHOOL DISTRICT

SEWER
SACRAMENTO REGIONAL COUNTY SANITATION DISTRICT

STORM DRAIN
SUTTER COUNTY

WATER
GOLDEN STATE WATER

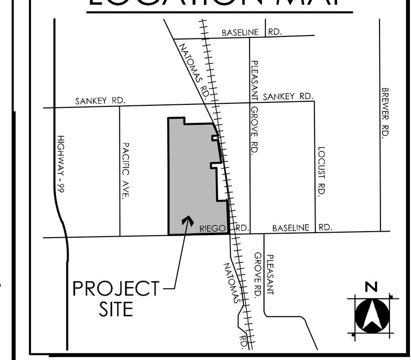
ELECTRICITY
PG&E

GAS
PG&E

NOTE:

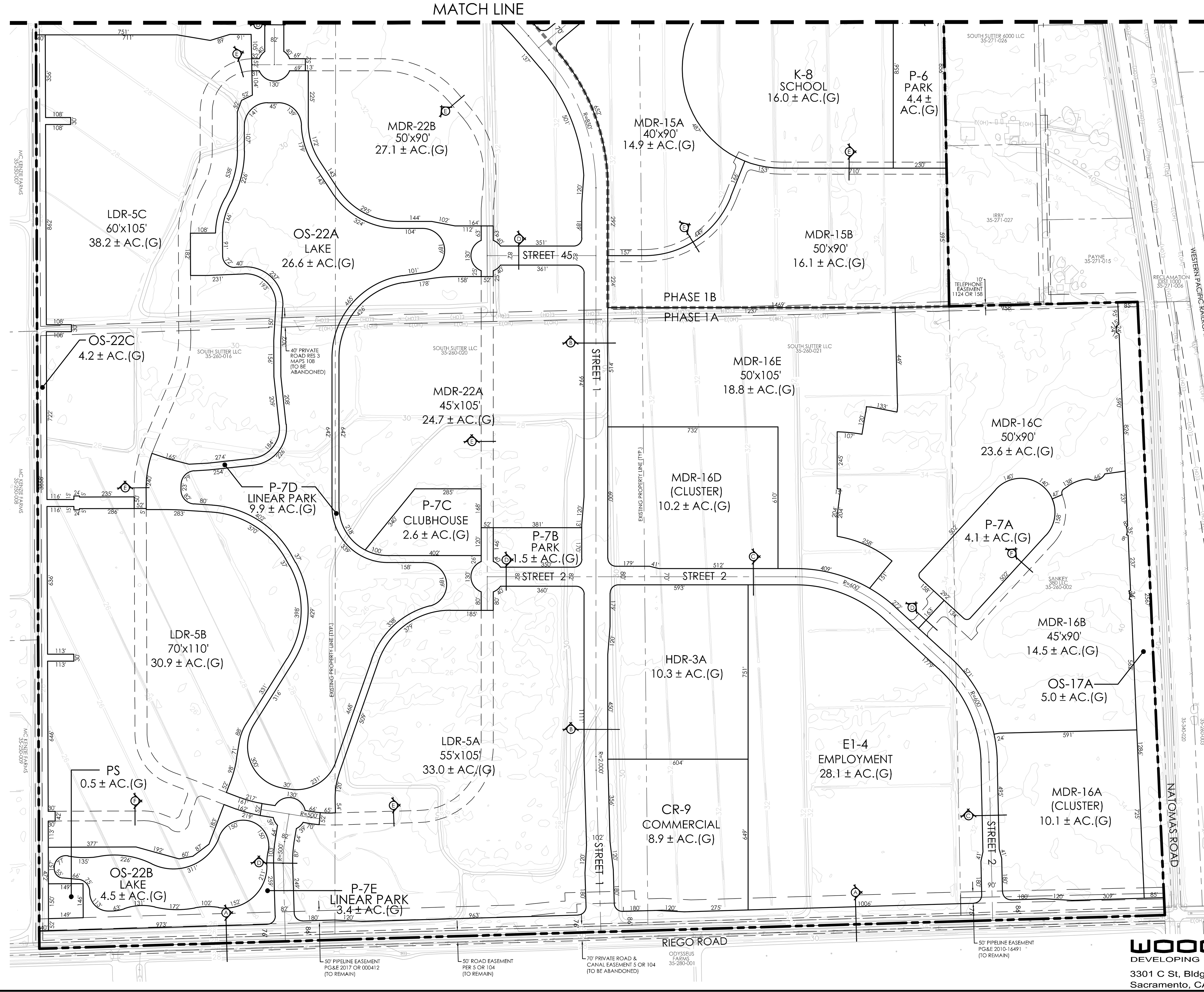
1) *SUBDIVIDER(S) RESERVES THE RIGHT TO FILE MULTIPLE FINAL MAPS PURSUANT TO SECTION 66456.1 OF THE SUBDIVISION MAP ACT.*
2) *EXISTING TOPOGRAPHY PROVIDED BY WOOD RODGERS, INC. AND WAS FLOWN IN JANUARY, 2019.*
3) *EXISTING WELLS TO BE REMOVED OR TO REMAIN AS NOTED.*
4) *THIS EXHIBIT IS FOR TENTATIVE MAP PURPOSES ONLY. ALL SITE CHARACTERISTICS ARE TO BE VERIFIED PRIOR TO FINAL MAP.*
5) *PARCEL OS-B (LAKE) ACCESS TO BE PROVIDED BY ACCESS EASEMENT ON PARCEL P-22B.*
6) *THIS IS AN APPLICATION FOR A DEVELOPMENT PERMIT.*

LOCATION MAP

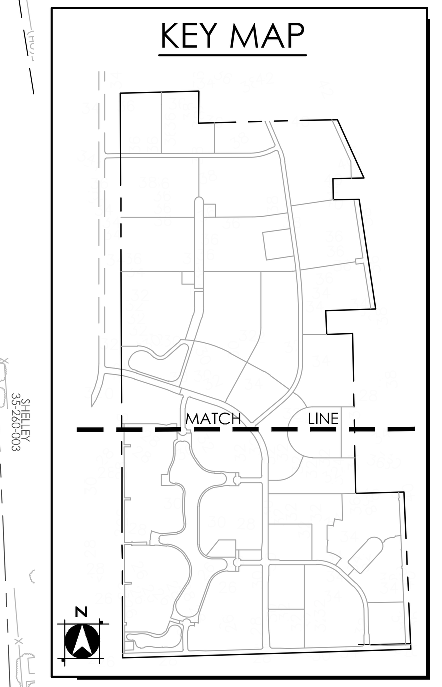


LAND USE SUMMARY

PARCEL	LAND USE	LOT SIZE	AC ±
LOW DENSITY RESIDENTIAL (SF)			
1	LDR	60'x105'	31.1
2A	LDR	55'x105'	26.3
2B	LDR	60'x105'	22.7
3	LDR	55'x105'	24.7
4	LDR	55'x105'	34.0
5A	LDR	55'x105'	33.0
5B	LDR	70'x110'	30.9
5C	LDR	60'x105'	38.2
SUBTOTAL			**240.9**
MEDIUM DENSITY RESIDENTIAL (SF)			
13A	MDR	50'x90'	26.0
13B	MDR	40'x90'	29.6
14A	MDR	50'x105'	31.4
14B	MDR	45'x105'	26.8
14C	MDR	50'x105'	30.3
14D	MDR	45'x105'	27.7
14E	MDR	CLUSTER	13.2
14F	MDR	45'x90'	16.7
15A	MDR	40'x90'	14.9
15B	MDR	50'x90'	16.1
16A	MDR	CLUSTER	10.1
16B	MDR	45'x90'	14.5
16C	MDR	50'x90'	23.6
16D	MDR	CLUSTER	10.2
16E	MDR	50'x105	18.8
22A	MDR	45'x105'	24.7
22B	MDR	50'x90'	27.1
SUBTOTAL			**361.7**
MULTI-FAMILY RESIDENTIAL (HDR)			
3A		-	10.3
3B		-	11.1
SUBTOTAL			**21.4**
TOTAL RESIDENTIAL			**624.0**
COMMERCIAL			
CR-9		-	8.9
CR-8		-	16.1
SUBTOTAL			**25.0**
EMPLOYMENT			
E1-4			28.1
E1-8			18.0
SUBTOTAL			**46.1**
P/QP			
PS			0.5
SUBTOTAL			**0.5**
SCHOOLS			
K-8			16.0
SUBTOTAL			**16.0**
OPEN SPACE			
OS-17A			5.0
OS-17B			3.9
OS-17C			2.5
OS-22D			4.2
OS LAKE A			8.2
OS LAKE B			26.6
OS LAKE C			4.5
SUBTOTAL			**54.9**
PARKS			
P-4A			5.0
P-4B			1.0
P-4C			1.0
P-4D			5.2
P-4E			2.9
P-4F			5.0
P-6			4.4
P-7A			4.1
P-7C			1.5
P-7C			2.6
P-7D			9.9
P-7E			3.4
P-11A			15.3
SUBTOTAL			**61.3**
RIGHT-OF-WAY			
MAJOR ROADS			45.7
SUBTOTAL			**45.7**
TOTAL			**873.5**



KEY MAP



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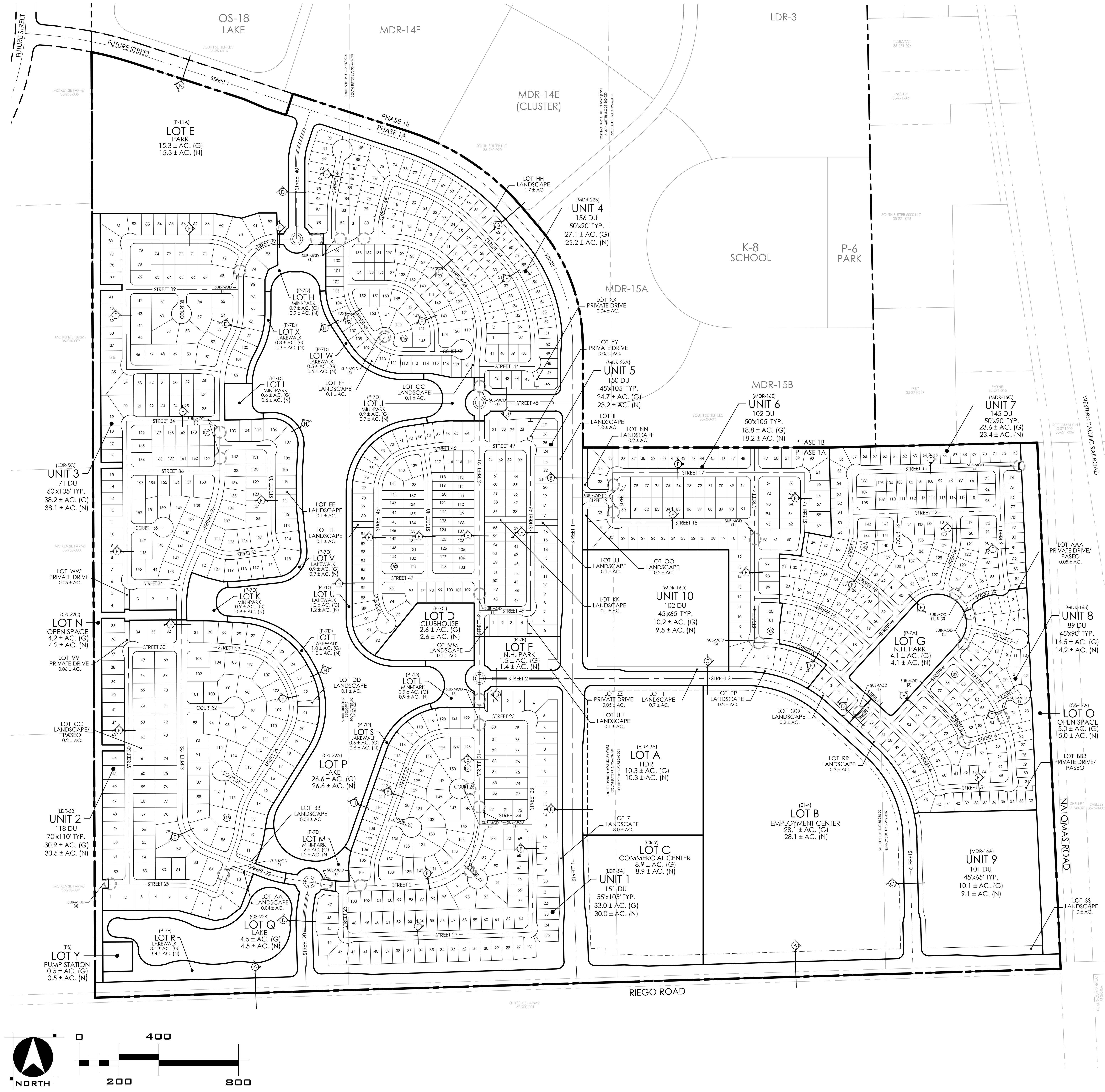
SMALL LOT TENTATIVE MAP

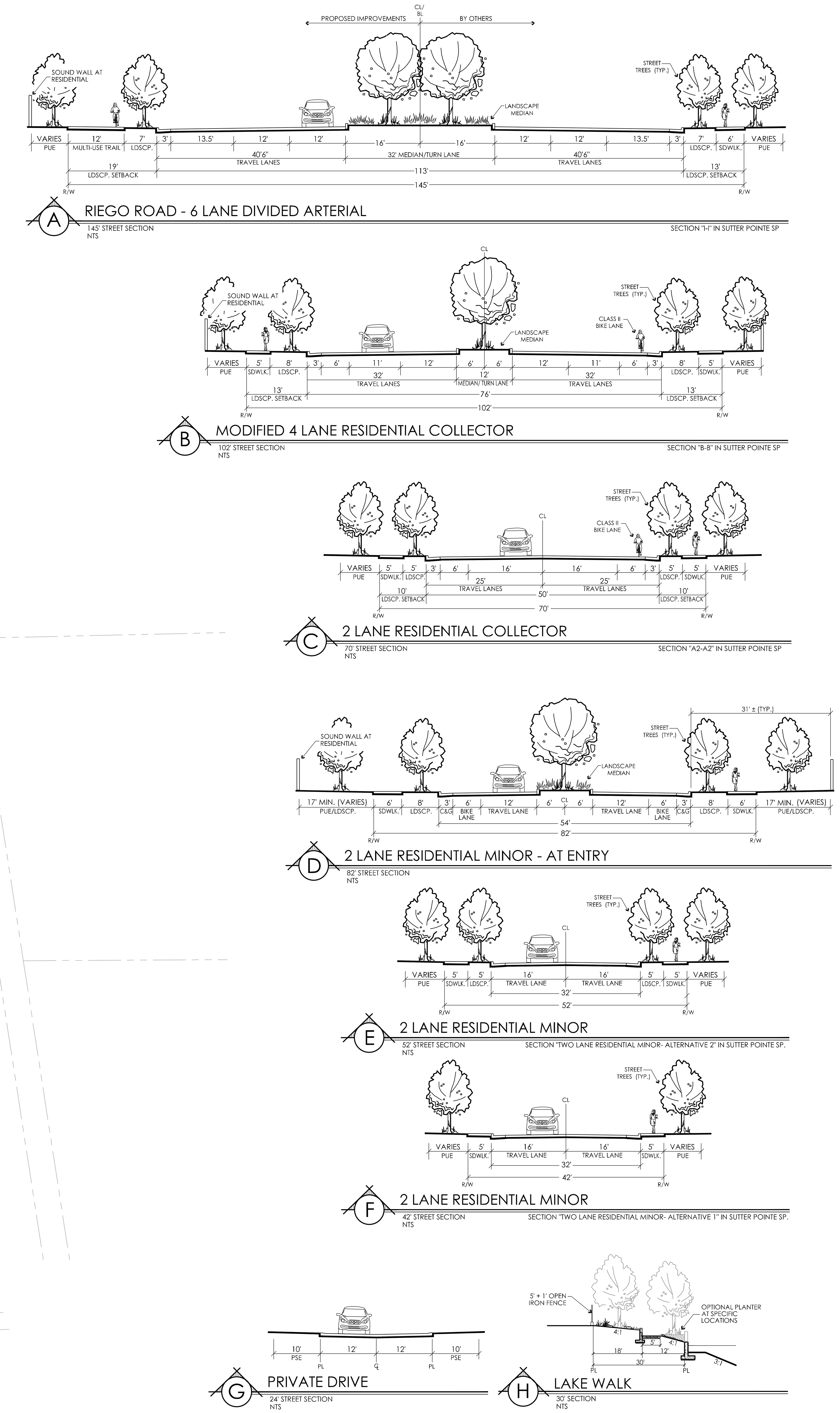
SUTTER POINTE - PHASE 1A

COUNTY OF SUTTER, CALIFORNIA

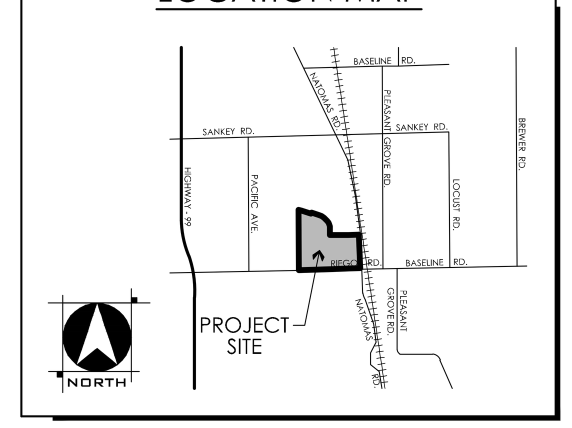
APRIL 12, 2019

SHEET 2 OF 4





LOCATION MAP



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ASSESSOR'S PARCEL NUMBERS
35-260-002, -016, -020, -021
35-170-003, -092

AREA
386.2 ± ACRES GROSS

NUMBER OF PARCELS
1,082 SINGLE FAMILY LOTS
2 CLUSTER RESIDENTIAL LOTS
1 HIGH-DENSITY RES. LOT
1 EMPLOYMENT CENTER LOT
1 COMMERCIAL CTR. LOT
1 CLUBHOUSE CTR. LOT
1 PARK LOT
2 NEIGHBORHOOD PARK LOTS
6 MINI-PARK LOTS
2 OPEN SPACE LOTS
2 LAKE LOTS
7 LAKEWALK LOTS
1 PUMP STATION LOT
22 LANDSCAPE LOTS
7 PRIVATE DRIVES
1,138 TOTAL LOTS

EXISTING USE
AGRICULTURE

PROPOSED USE
SEE LAND USE SUMMARY

EXISTING/ PROPOSED GENERAL PLAN
SUTTER POINTE SPECIFIC PLAN

EXISTING ZONING
LDR, MDR, HDR, E1, NC, OS, P & AG

PROPOSED ZONING
LDR, MDR, HDR, E1, NC, OS, & P

PARK DISTRICT
SUTTER COUNTY GENERAL SERVICES DEPARTMENT

FIRE PROTECTION
PLEASANT GROVE FIRE DEPARTMENT (CSA-D)

SCHOOL DISTRICT
PLEASANT GROVE JOINT UNION SCHOOL DISTRICT

SEWER
SACRAMENTO REGIONAL COUNTY SANITATION DISTRICT

STORM DRAIN
SUTTER COUNTY

WATER
GOLDEN STATE WATER

ELECTRICITY
PG&E

GAS
PG&E

NOTE:

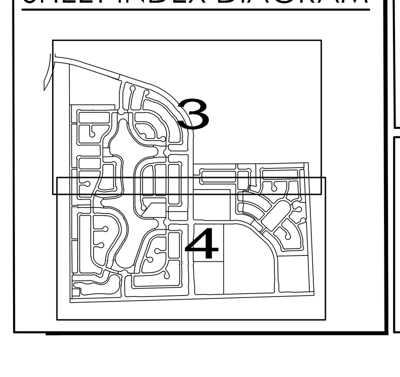
1) *SUBDIVIDER(S) RESERVES THE RIGHT TO FILE MULTIPLE FINAL MAPS PURSUANT TO SECTION 66456.1 OF THE SUBDIVISION MAP ACT.*
2) *EXISTING TOPOGRAPHY PROVIDED BY WOOD RODGERS, INC. AND WAS FLOWN IN JANUARY, 2019.*
3) *UNLESS OTHERWISE SHOWN ON MAP, ALL UTILITIES WILL BE INSTALLED WITHIN THE PUBLIC ROAD RIGHT-OF-WAY OR WITHIN A PUBLIC UTILITY EASEMENT.*
4) *OWNER WILL DEDICATE ALL EASEMENTS AND RIGHTS-OF-WAY NECESSARY TO PROVIDE ALL UTILITIES.*
5) *ALL INTERNAL STREETS WILL HAVE A DEDICATED PUBLIC SERVICE EASEMENT MEASURED FROM THE RIGHT-OF-WAY AS SHOWN BY THE STREET SECTIONS.*
6) *THIS IS AN APPLICATION FOR A DEVELOPMENT PERMIT.*
7) *PHASING IS NOT SHOWN ON THESE EXHIBITS.*
8) *EXISTING WELLS TO BE REMOVED OR TO REMAIN AS NOTED.*
9) *THIS EXHIBIT IS FOR TENTATIVE MAP PURPOSES ONLY. ALL SITE CHARACTERISTICS ARE TO BE VERIFIED PRIOR TO FINAL MAP.*
10) *FINAL SUBDIVISION MAPPING SHALL BE PREPARED TO IDENTIFY ALL R/W AND/OR IOD'S NEEDED TO ACCOMMODATE THE CONSTRUCTION PHASING OF THE UNITS SHOWN ON THIS TENTATIVE SUBDIVISION MAP.*

LAND USE SUMMARY - PHASE 1A

UNIT NO.	LAND USE	LOT SIZE	GROSS ACRES ±	NET ACRES ±	DWELLING UNITS ±	GROSS DENSITY	NET DENSITY
1	LOW DENSITY RES.	55'x105'	33.0	30.00	151	4.6	5.0
2	LOW DENSITY RES.	70'x110'	30.9	30.46	118	3.8	3.9
3	LOW DENSITY RES.	60'x105'	38.2	38.05	171	4.5	4.5
4	MED. DENSITY RES.	50'x90'	27.1	25.16	156	5.8	6.2
5	MED. DENSITY RES.	45'x105'	24.7	23.20	150	6.1	6.5
6	MED. DENSITY RES.	50'x105'	18.8	18.20	102	5.4	5.6
7	MED. DENSITY RES.	50'x90'	23.6	23.35	145	6.1	6.2
8	MED. DENSITY RES.	45'x90'	14.5	14.15	89	6.1	6.3
SUBTOTAL			**210.8**	**202.6**	**1,082**		
9	MED. DENSITY RES. CLUSTER	45'x65'	10.1	9.1	101	10.0	11.1
10	MED. DENSITY RES. CLUSTER	45'x65'	10.2	9.5	102	10.0	10.7
SUBTOTAL			**20.3**	**18.6**	**203**		
A	HIGH DENSITY RES.		10.3	10.3	206	20.0	20.0
SUBTOTAL			**10.3**	**10.3**	**206**		
B	EMPLOYMENT CENTER	-	28.1	28.1			
C	COMMERCIAL CENTER	-	8.9	8.9			
D	CLUBHOUSE CENTER	-	2.6	2.6			
E	PARK	-	15.3	15.3			
F	N.H. PARK	-	1.5	1.4			
G	N.H. PARK	-	4.1	4.1			
H-M	MINI-PARK	-	5.4	5.4			
N	OPEN SPACE		4.2	4.2			
O	OPEN SPACE	-	5.0	5.0			
P	LAKE	-	26.6	26.6			
Q	LAKE		4.5	4.5			
R	LAKEWALK		3.4	3.4			
S-X	LAKEWALK		4.5	4.5			
Y	PUMP STATION		0.5	0.5			
	MAJOR RIGHT-OF-WAY	-	30.2	30.2			
SUBTOTAL			**144.8**	**144.7**			
Z-UU	LANDSCAPE LOTS			9.68			
VV-BBB	PRIVATE DRIVES			0.35			
SUBTOTAL				**10.0**			
TOTAL			**386.2**	**386.2**	**1,491**	**Units**	

NOTE: NET ACREAGES EXCLUDE LANDSCAPE LOTS AND PRIVATE DRIVES

SHEET INDEX DIAGRAM



SHEET INDEX

NO.	TITLE	SCALE
1	LARGE LOT TENTATIVE SUBDIVISION MAP	1"=200'
2	SMALL LOT TENTATIVE SUBDIVISION MAP COVER	1"=200'
3	TENTATIVE SUBDIVISION MAP	1"=100'
4	TENTATIVE SUBDIVISION MAP	1"=100'

SUBDIVISION MODIFICATION

PROPOSED SUBDIVISION MODIFICATION:

1. OFFSET INTERSECTION < 200' (21)
2. CENTERLINE RADIUS < 200' (1)
3. ELBOW TANGENT < 50' (2)
4. DEAD-END STUB (2)
5. NON-STANDARD CUL-DE-SAC (3)

WOOD RODGERS
DEVELOPING INNOVATIVE DESIGN SOLUTIONS
3301 C St, Bldg. 100-B
Sacramento, CA 95816
Tel 916.341.7760
Fax 916.341.7767

APPENDIX B

WATER LAYOUT

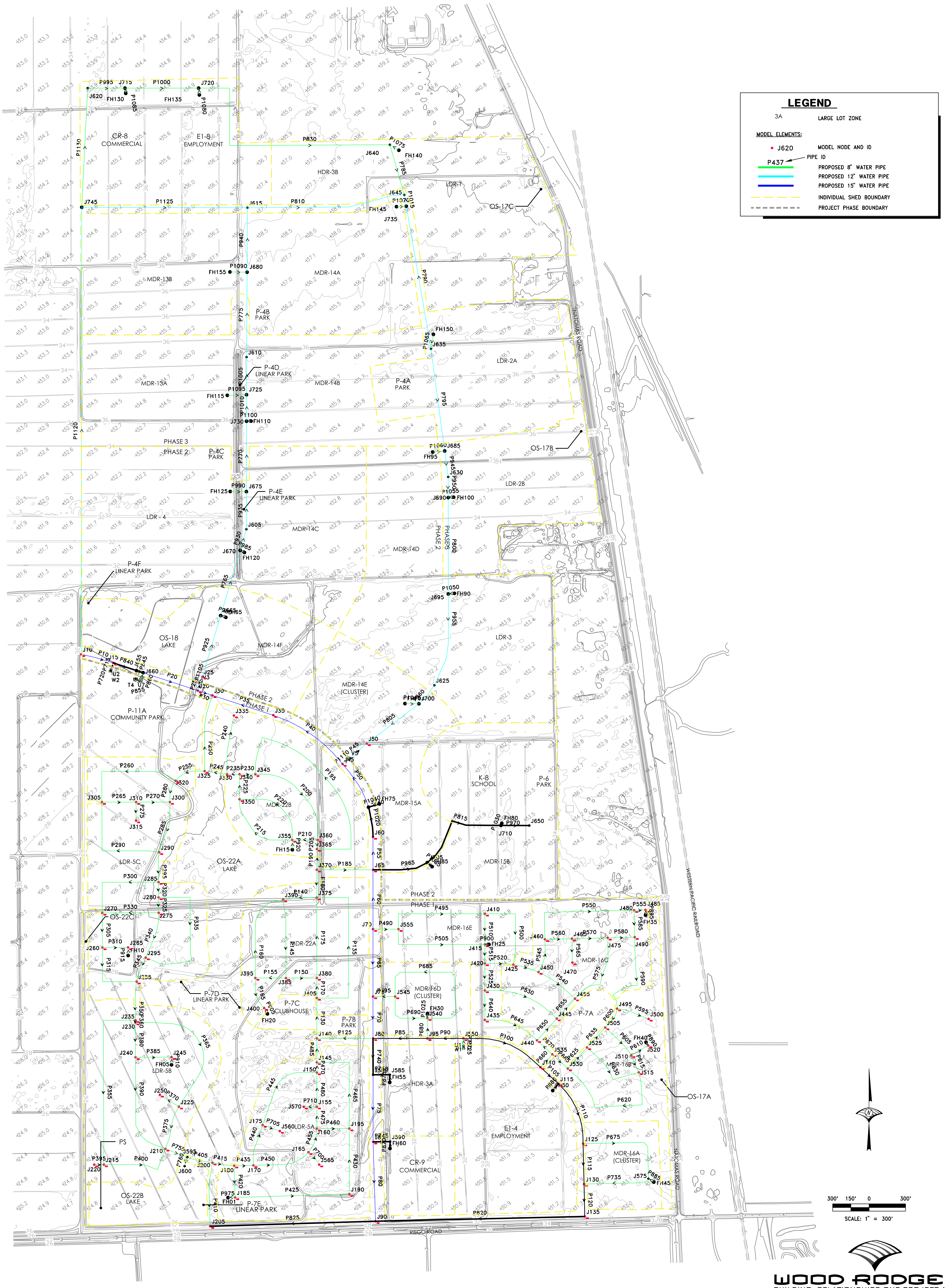
WATER MODEL

LAKESIDE AT SUTTER POINTE

LENNAR WINN

SUTTER COUNTY CALIFORNIA

FEBRUARY 2020



WOOD RODGERS

BUILDING RELATIONSHIPS ONE PROJECT AT A TIME

3301 C St, Bldg. 100-B Tel 916.341.7760
Sacramento, CA 95816 Fax 916.341.7767

APPENDIX C

WATER STUDY MODEL RESULTS

SUTTER POINTE SUBDIVISION WATER STUDY
AVERAGE DAY DEMAND MODEL RESULTS ULTIMATE

Junction Report					Pipe Report									
ID	Demand (gpm)	Elevation (ft)	Head (ft)	Pressure (psi)	ID	From Node	To Node	Length (ft)	Diameter (in)	Roughness	Flow (gpm)	Velocity (ft/s)	Headloss (ft)	HL/1000 (ft/k-ft)
FH01	0.0	30.0	188.3	81.6	P10	J10	J15	273	15	130	-291.6	0.53	0.02	0.1
FH05	0.0	30.0	188.2	81.5	P100	J550	J110	704	12	130	371.0	1.05	0.28	0.4
FH10	0.0	30.0	188.1	81.5	P1000	J715	J720	606	8	130	24.1	0.15	0.01	0.0
FH100	0.0	30.0	187.9	81.4	P1005	J725	J610	310	12	130	178.8	0.51	0.03	0.1
FH110	0.0	30.0	187.9	81.4	P1010	J730	J725	217	12	130	178.8	0.51	0.02	0.1
FH115	0.0	30.0	187.9	81.4	P1015	J735	J645	94	12	130	42.6	0.12	0.00	0.0
FH120	0.0	30.0	188.1	81.5	P1020	J60	J740	249	15	130	115.6	0.21	0.00	0.0
FH125	0.0	30.0	188.0	81.4	P1025	FH30	J540	38	8	130	0.0	0.00	0.00	0.0
FH130	0.0	30.0	187.8	81.4	P1030	FH80	J710	19	8	130	0.0	0.00	0.00	0.0
FH135	0.0	30.0	187.8	81.4	P1035	FH85	J705	52	8	130	0.0	0.00	0.00	0.0
FH140	0.0	30.0	187.7	81.3	P1040	FH75	J740	93	8	130	0.0	0.00	0.00	0.0
FH145	0.0	30.0	187.8	81.4	P1045	FH70	J700	115	8	130	0.0	0.00	0.00	0.0
FH15	0.0	30.0	188.3	81.6	P105	J110	J115	202	12	130	192.1	0.55	0.02	0.1
FH150	0.0	30.0	187.8	81.4	P1050	FH90	J695	51	8	130	0.0	0.00	0.00	0.0
FH155	0.0	30.0	187.8	81.4	P1055	FH100	J690	45	8	130	0.0	0.00	0.00	0.0
FH20	0.0	30.0	188.2	81.6	P1060	FH95	J685	99	8	130	0.0	0.00	0.00	0.0
FH25	0.0	30.0	188.5	81.7	P1065	FH150	J635	120	8	130	0.0	0.00	0.00	0.0
FH30	0.0	30.0	188.6	81.7	P1070	FH145	J735	81	8	130	0.0	0.00	0.00	0.0
FH35	0.0	30.0	188.5	81.7	P1075	FH140	J640	86	8	130	0.0	0.00	0.00	0.0
FH40	0.0	30.0	188.5	81.7	P1080	FH135	J720	56	8	130	0.0	0.00	0.00	0.0
FH45	0.0	30.0	188.6	81.7	P1085	FH130	J715	43	8	130	0.0	0.00	0.00	0.0
FH50	0.0	30.0	188.6	81.7	P1090	FH155	J680	141	8	130	0.0	0.00	0.00	0.0
FH55	0.0	30.0	188.5	81.7	P1095	FH115	J725	158	8	130	0.0	0.00	0.00	0.0
FH60	0.0	30.0	188.5	81.7	P110	J115	J125	549	12	130	192.1	0.55	0.07	0.1
FH65	0.0	30.0	188.3	81.6	P1100	FH110	J730	37	8	130	0.0	0.00	0.00	0.0
FH70	0.0	30.0	188.1	81.5	P1105	V3	J25	50	12	130	420.0	1.19	0.03	0.5
FH75	0.0	30.0	188.4	81.6	P1110	J45	V5	69	12	130	393.0	1.11	0.03	0.5
FH80	0.0	30.0	188.1	81.5	P1120	J10	J745	3678	12	130	291.6	0.83	0.95	0.3
FH85	0.0	30.0	188.3	81.6	P1125	J745	J615	1363	12	130	199.4	0.57	0.17	0.1
FH90	0.0	30.0	188.0	81.5	P1130	J745	J620	981	8	130	92.2	0.59	0.22	0.2
FH95	0.0	30.0	187.9	81.4	P115	J125	J130	332	12	130	111.9	0.32	0.01	0.0
J10	0.0	30.0	189.0	68.9	P120	J130	J135	266	12	130	107.9	0.31	0.01	0.0
J110	0.0	30.0	188.7	68.8	P125	J80	J140	463	8	130	128.2	0.82	0.19	0.4
J115	0.0	30.0	188.6	68.7	P130	J140	J405	332	8	130	51.8	0.33	0.03	0.1
J125	56.2	30.0	188.6	68.7	P135	J405	J375	1346	8	130	12.7	0.08	0.01	0.0
J130	0.0	30.0	188.6	68.7	P140	J375	J390	278	8	130	32.1	0.20	0.01	0.0
J135	0.0	30.0	188.5	68.7	P145	J390	J385	646	8	130	7.2	0.05	0.00	0.0
J140	11.2	30.0	188.3	68.6	P150	J385	J380	254	8	130	-36.6	0.23	0.01	0.0
J145	0.0	30.0	188.3	68.6	P155	J385	J395	252	8	130	43.7	0.28	0.01	0.1
J15	0.0	30.0	189.0	68.9	P160	J395	J390	778	8	130	-24.9	0.16	0.02	0.0
J150	0.0	30.0	188.3	68.6	P165	J395	J400	267	8	130	68.6	0.44	0.03	0.1
J155	0.0	30.0	188.3	68.6	P170	J405	J380	164	8	130	39.1	0.25	0.01	0.1
J160	0.0	30.0	188.3	68.6	P175	J380	J375	662	8	130	2.5	0.02	0.00	0.0
J165	0.0	30.0	188.3	68.6	P180	J370	J375	229	8	130	16.8	0.11	0.00	0.0
J170	0.0	30.0	188.3	68.6	P185	J370	J65	463	8	130	-95.3	0.61	0.11	0.2
J175	0.0	30.0	188.3	68.6	P190	J370	J365	170	8	130	40.9	0.26	0.01	0.1
J180	0.0	30.0	188.3	68.6	P195	J365	J345	1866	8	130	13.1	0.08	0.01	0.0
J185	0.0	30.0	188.3	68.6	P20	J660	J20	474	15	130	849.1	1.54	0.30	0.6
J190	80.7	30.0	188.3	68.6	P200	J345	J360	852	8	130	-18.1	0.12	0.01	0.0
J195	0.0	30.0	188.3	68.6	P205	J360	J365	75	8	130	-27.8	0.18	0.00	0.0
J20	41.6	30.0	188.5	68.7	P210	J360	J355	208	8	130	9.7	0.06	0.00	0.0
J200	0.0	30.0	188.3	68.6	P215	J355	J350	633	8	130	4.8	0.03	0.00	0.0
J205	0.0	30.0	188.5	68.7	P220	J350	J355	654	8	130	-4.9	0.03	0.00	0.0
J210	0.0	30.0	188.2	68.5	P225	J350	J340	206	8	130	9.7	0.06	0.00	0.0

Wood Rodgers, Inc.
M. Ronco
02/24/2020

SUTTER POINTE SUBDIVISION WATER STUDY
AVERAGE DAY DEMAND MODEL RESULTS ULTIMATE

		Junction Report								Pipe Report				
ID	Demand (gpm)	Elevation (ft)	Head (ft)	Pressure (psi)	ID	From Node	To Node	Length (ft)	Diameter (in)	Roughness	Flow (gpm)	Velocity (ft/s)	Headloss (ft)	HL/1000 (ft/k-ft)
J215	0.0	30.0	188.1	68.5	P230	J340	J345	130	8	130	44.1	0.28	0.01	0.1
J220	77.3	30.0	188.1	68.5	P235	J340	J330	103	8	130	-34.4	0.22	0.00	0.0
J225	0.0	30.0	188.2	68.5	P240	J330	J335	488	8	130	0.0	0.00	0.00	0.0
J230	0.0	30.0	188.2	68.5	P245	J330	J325	186	8	130	-34.4	0.22	0.01	0.0
J235	0.0	30.0	188.2	68.5	P25	J20	V3	69	12	130	420.0	1.19	0.04	0.5
J240	0.0	30.0	188.2	68.5	P250	J325	J30	632	8	130	-110.1	0.70	0.19	0.3
J245	0.0	30.0	188.2	68.5	P255	J325	J320	264	8	130	75.7	0.48	0.04	0.2
J25	63.3	30.0	188.5	68.7	P260	J320	J305	878	8	130	23.4	0.15	0.02	0.0
J250	0.0	30.0	188.2	68.5	P265	J305	J310	281	8	130	-6.9	0.04	0.00	0.0
J255	0.0	30.0	188.2	68.5	P270	J310	J300	278	8	130	-6.9	0.04	0.00	0.0
J260	0.0	30.0	188.1	68.5	P275	J310	J315	152	8	130	0.0	0.00	0.00	0.0
J265	93.4	30.0	188.1	68.5	P280	J320	J300	186	8	130	52.3	0.33	0.01	0.1
J270	0.0	30.0	188.2	68.5	P285	J300	J290	429	8	130	45.4	0.29	0.03	0.1
J275	0.0	30.0	188.2	68.5	P290	J290	J305	873	8	130	-30.3	0.19	0.02	0.0
J280	0.0	30.0	188.2	68.5	P295	J290	J285	246	8	130	75.7	0.48	0.04	0.2
J285	0.0	30.0	188.2	68.5	P30	J20	J30	126	15	130	387.5	0.70	0.02	0.2
J290	0.0	30.0	188.2	68.6	P300	J285	J270	716	8	130	30.2	0.19	0.02	0.0
J295	0.0	30.0	188.2	68.5	P305	J270	J260	284	8	130	53.6	0.34	0.02	0.1
J30	0.0	30.0	188.5	68.7	P310	J260	J265	211	8	130	93.4	0.60	0.05	0.2
J300	0.0	30.0	188.3	68.6	P315	J260	J255	562	8	130	-39.9	0.25	0.03	0.1
J305	0.0	30.0	188.3	68.6	P320	J285	J280	126	8	130	45.5	0.29	0.01	0.1
J310	0.0	30.0	188.3	68.6	P325	J280	J275	126	8	130	33.7	0.22	0.00	0.0
J315	0.0	30.0	188.3	68.6	P330	J275	J270	464	8	130	23.4	0.15	0.01	0.0
J320	0.0	30.0	188.3	68.6	P335	J280	J295	1175	8	130	11.8	0.08	0.01	0.0
J325	0.0	30.0	188.3	68.6	P340	J275	J295	388	8	130	10.3	0.07	0.00	0.0
J330	0.0	30.0	188.3	68.6	P345	J295	J255	212	8	130	22.1	0.14	0.00	0.0
J335	0.0	30.0	188.3	68.6	P35	J35	J30	527	15	130	-277.4	0.50	0.04	0.1
J340	0.0	30.0	188.3	68.6	P350	J255	J235	318	8	130	-17.8	0.11	0.00	0.0
J345	75.3	30.0	188.3	68.6	P355	J235	J215	1451	8	130	24.9	0.16	0.03	0.0
J35	0.0	30.0	188.5	68.7	P360	J235	J230	20	8	130	-42.6	0.27	0.00	0.1
J350	0.0	30.0	188.3	68.6	P365	J230	J225	1191	8	130	-19.7	0.13	0.02	0.0
J355	0.0	30.0	188.3	68.6	P370	J225	J250	185	8	130	0.0	0.00	0.00	0.0
J360	0.0	30.0	188.3	68.6	P375	J225	J210	366	8	130	-19.7	0.13	0.00	0.0
J365	0.0	30.0	188.3	68.6	P380	J230	J240	285	8	130	-22.9	0.15	0.00	0.0
J370	37.6	30.0	188.3	68.6	P385	J240	J245	296	8	130	0.0	0.00	0.00	0.0
J375	0.0	30.0	188.3	68.6	P390	J240	J210	887	8	130	-22.9	0.15	0.01	0.0
J380	0.0	30.0	188.3	68.6	P395	J220	J215	79	8	130	-77.3	0.49	0.01	0.2
J385	0.0	30.0	188.3	68.6	P40	J45	J35	707	15	130	-277.4	0.50	0.06	0.1
J390	0.0	30.0	188.3	68.6	P400	J215	J210	632	8	130	-52.4	0.33	0.05	0.1
J395	0.0	30.0	188.3	68.6	P405	J595	J200	213	8	130	-107.4	0.69	0.06	0.3
J400	68.6	30.0	188.2	68.6	P410	J200	J205	524	8	130	-122.9	0.78	0.20	0.4
J405	0.0	30.0	188.3	68.6	P415	J200	J180	180	8	130	15.5	0.10	0.00	0.0
J410	52.2	30.0	188.5	68.7	P420	J180	J185	261	8	130	32.5	0.21	0.01	0.0
J415	0.0	30.0	188.5	68.7	P425	J185	J190	940	8	130	32.5	0.21	0.03	0.0
J420	0.0	30.0	188.5	68.7	P430	J190	J195	540	8	130	-48.2	0.31	0.04	0.1
J425	0.0	30.0	188.5	68.7	P435	J180	J170	158	8	130	-17.1	0.11	0.00	0.0
J430	0.0	30.0	188.5	68.7	P440	J170	J175	344	8	130	-15.5	0.10	0.00	0.0
J435	0.0	30.0	188.5	68.7	P445	J175	J150	713	8	130	-15.5	0.10	0.01	0.0
J440	0.0	30.0	188.5	68.7	P45	V5	J50	192	12	130	393.0	1.11	0.09	0.5
J445	0.0	30.0	188.5	68.7	P450	J170	J165	483	8	130	-1.6	0.01	0.00	0.0
J45	0.0	30.0	188.4	68.6	P455	J165	J160	211	8	130	-1.6	0.01	0.00	0.0
J450	0.0	30.0	188.5	68.7	P460	J160	J195	267	8	130	22.6	0.14	0.00	0.0
J455	0.0	30.0	188.5	68.7	P465	J195	J145	811	8	130	-25.6	0.16	0.02	0.0
J460	0.0	30.0	188.5	68.7	P470	J150	J145	84	8	130	-39.6	0.25	0.00	0.1

Wood Rodgers, Inc.
M. Ronco
02/24/2020

SUTTER POINTE SUBDIVISION WATER STUDY
AVERAGE DAY DEMAND MODEL RESULTS ULTIMATE

		Junction Report								Pipe Report				
ID	Demand (gpm)	Elevation (ft)	Head (ft)	Pressure (psi)	ID	From Node	To Node	Length (ft)	Diameter (in	Roughness	Flow (gpm)	Velocity (ft/s)	Headloss (ft)	HL/1000 (ft/k-ft)
J465	0.0	30.0	188.5	68.7	P475	J160	J155	179	8	130	-24.1	0.15	0.00	0.0
J470	0.0	30.0	188.5	68.7	P480	J155	J150	281	8	130	-24.1	0.15	0.01	0.0
J475	0.0	30.0	188.5	68.7	P485	J145	J140	197	8	130	-65.2	0.42	0.02	0.1
J480	0.0	30.0	188.5	68.7	P490	J70	J555	209	8	130	-7.6	0.05	0.00	0.0
J485	65.6	30.0	188.5	68.7	P495	J555	J410	837	8	130	4.7	0.03	0.00	0.0
J490	0.0	30.0	188.5	68.7	P50	J740	J45	418	15	130	115.6	0.21	0.01	0.0
J495	0.0	30.0	188.5	68.7	P500	J410	J425	671	8	130	-22.2	0.14	0.01	0.0
J50	78.1	30.0	188.3	68.6	P505	J555	J415	837	8	130	-12.2	0.08	0.00	0.0
J500	0.0	30.0	188.5	68.7	P510	J410	J415	252	8	130	-25.4	0.16	0.01	0.0
J505	0.0	30.0	188.5	68.7	P515	J415	J420	157	8	130	-37.6	0.24	0.01	0.0
J510	0.0	30.0	188.5	68.7	P520	J420	J425	235	8	130	11.3	0.07	0.00	0.0
J515	0.0	30.0	188.5	68.7	P525	J420	J430	222	8	130	-48.9	0.31	0.02	0.1
J520	42.3	30.0	188.5	68.7	P530	J430	J445	658	8	130	-13.7	0.09	0.00	0.0
J525	0.0	30.0	188.5	68.7	P535	J425	J450	217	8	130	-10.9	0.07	0.00	0.0
J530	0.0	30.0	188.5	68.7	P540	J450	J455	374	8	130	-24.5	0.16	0.01	0.0
J535	11.2	30.0	188.6	68.7	P545	J450	J460	280	8	130	13.6	0.09	0.00	0.0
J540	28.4	30.0	188.6	68.7	P55	J65	J60	269	15	130	115.6	0.21	0.00	0.0
J545	0.0	30.0	188.6	68.7	P550	J460	J480	961	8	130	20.6	0.13	0.01	0.0
J550	0.0	30.0	188.9	68.9	P555	J480	J485	94	8	130	65.6	0.42	0.01	0.1
J555	0.0	30.0	188.5	68.7	P560	J460	J465	222	8	130	-7.0	0.04	0.00	0.0
J560	0.0	30.0	188.3	68.6	P565	J465	J470	197	8	130	0.0	0.00	0.00	0.0
J565	0.0	30.0	188.3	68.6	P570	J465	J475	295	8	130	-7.0	0.04	0.00	0.0
J570	0.0	30.0	188.3	68.6	P575	J475	J455	646	8	130	-19.4	0.12	0.01	0.0
J575	28.1	30.0	188.6	81.7	P580	J475	J490	222	8	130	12.4	0.08	0.00	0.0
J580	0.0	30.0	188.5	81.7	P585	J480	J490	222	8	130	-45.0	0.29	0.01	0.1
J585	32.1	30.0	188.5	81.7	P590	J490	J495	737	8	130	-32.6	0.21	0.02	0.0
J590	17.8	30.0	188.5	81.7	P595	J495	J500	274	8	130	0.0	0.00	0.00	0.0
J595	0.0	30.0	188.2	81.6	P60	J70	J65	489	15	130	306.7	0.56	0.05	0.1
J60	0.0	30.0	188.4	68.6	P600	J495	J505	187	8	130	-32.6	0.21	0.01	0.0
J600	12.4	30.0	188.2	81.6	P605	J505	J510	314	8	130	5.0	0.03	0.00	0.0
J605	178.0	30.0	188.0	81.5	P610	J510	J520	161	8	130	42.3	0.27	0.01	0.1
J610	163.6	30.0	187.8	81.4	P615	J510	J515	154	8	130	-37.3	0.24	0.01	0.0
J615	169.5	30.0	187.8	81.4	P620	J515	J530	1062	8	130	-24.5	0.16	0.02	0.0
J620	68.2	30.0	187.8	81.4	P625	J530	J525	234	8	130	50.4	0.32	0.02	0.1
J625	137.4	30.0	188.1	81.5	P630	J525	J515	565	8	130	12.8	0.08	0.00	0.0
J630	57.1	30.0	187.9	81.4	P635	J525	J505	222	8	130	37.6	0.24	0.01	0.0
J635	77.9	30.0	187.8	81.4	P640	J430	J435	242	8	130	-35.2	0.22	0.01	0.0
J640	111.6	30.0	187.7	81.3	P645	J435	J440	476	8	130	-35.2	0.22	0.02	0.0
J645	0.0	30.0	187.8	81.4	P65	J70	J75	554	15	130	-299.1	0.54	0.05	0.1
J65	0.0	30.0	188.4	68.6	P650	J440	J445	242	8	130	57.6	0.37	0.02	0.1
J650	95.8	30.0	188.1	81.5	P655	J445	J455	222	8	130	43.9	0.28	0.01	0.1
J655	0.0	30.0	188.9	81.8	P660	J110	J535	144	8	130	178.8	1.14	0.11	0.8
J660	0.0	30.0	188.8	81.8	P665	J535	J530	173	8	130	74.9	0.48	0.03	0.2
J665	0.0	30.0	188.3	81.6	P670	J535	J440	171	8	130	92.8	0.59	0.04	0.2
J670	0.0	30.0	188.1	81.5	P675	J125	J575	813	8	130	24.1	0.15	0.01	0.0
J675	0.0	30.0	188.0	81.4	P680	J95	J540	167	8	130	143.1	0.91	0.08	0.5
J680	0.0	30.0	187.8	81.4	P685	J540	J545	1245	8	130	41.1	0.26	0.06	0.1
J685	0.0	30.0	187.9	81.4	P690	J545	J540	424	8	130	-73.6	0.47	0.06	0.2
J690	0.0	30.0	187.9	81.4	P695	J545	J75	182	8	130	114.7	0.73	0.06	0.3
J695	0.0	30.0	188.0	81.5	P70	J75	J80	344	15	130	-184.4	0.33	0.01	0.0
J70	0.0	30.0	188.5	68.7	P700	J165	J565	136	8	130	0.0	0.00	0.00	0.0
J700	0.0	30.0	188.1	81.5	P705	J175	J560	149	8	130	0.0	0.00	0.00	0.0
J705	0.0	30.0	188.3	81.6	P710	J155	J570	108	8	130	0.0	0.00	0.00	0.0
J710	0.0	30.0	188.1	81.5	P715	W2	J15	56	12	130	1140.7	3.24	0.18	3.2

Wood Rodgers, Inc.
M. Ronco
02/24/2020

SUTTER POINTE SUBDIVISION WATER STUDY
AVERAGE DAY DEMAND MODEL RESULTS ULTIMATE

Junction Report					Pipe Report									
ID	Demand (gpm)	Elevation (ft)	Head (ft)	Pressure (psi)	ID	From Node	To Node	Length (ft)	Diameter (in	Roughness	Flow (gpm)	Velocity (ft/s)	Headloss (ft)	HL/1000 (ft/k-ft)
J715	0.0	30.0	187.8	81.4	P720	RES2	W2	24	12	130	1140.7	3.24	0.08	3.2
J720	0.0	30.0	187.8	81.4	P725	RES1	W1	30	6	130	897.6	10.19	1.85	60.7
J725	0.0	30.0	187.9	81.4	P730	W1	J550	63	6	130	897.6	10.19	3.81	60.7
J730	0.0	30.0	187.9	81.4	P735	J575	J130	544	8	130	-4.0	0.03	0.00	0.0
J735	0.0	30.0	187.8	81.4	P740	J80	J580	300	15	130	64.9	0.12	0.00	0.0
J740	0.0	30.0	188.4	81.6	P745	J85	J590	140	6	130	17.8	0.20	0.01	0.0

SUTTER POINTE SUBDIVISION WATER STUDY
AVERAGE DAY DEMAND MODEL RESULTS PHASE 1

Junction Report					Pipe Report									
ID	Demand (gpm)	Elevation (ft)	Head (ft)	Pressure (psi)	ID	From Node	To Node	Length (ft)	Diameter (in)	Roughness	Flow (gpm)	Velocity (ft/s)	Headloss (ft)	HL/1000 (ft/k-ft)
J265	93.4	30.0	200.3	73.8	P725	RES1	W1	30	6	130	370.4	4.20	0.36	11.8
J220	77.3	30.0	200.4	73.8	P730	W1	J550	63	6	130	370.4	4.20	0.74	11.8
J215	0.0	30.0	200.4	73.8	P715	W2	J15	56	12	130	461.3	1.31	0.03	0.6
J260	0.0	30.0	200.4	73.8	P720	RES2	W2	24	12	130	461.3	1.31	0.01	0.6
J230	0.0	30.0	200.4	73.8	P250	J325	J30	632	8	130	-134.4	0.86	0.28	0.4
J235	0.0	30.0	200.4	73.8	P185	J370	J65	463	8	130	-113.6	0.72	0.15	0.3
J255	0.0	30.0	200.4	73.8	P20	J660	J20	474	15	130	384.6	0.70	0.07	0.2
J270	0.0	30.0	200.4	73.8	P840	J15	J655	202	15	130	384.6	0.70	0.03	0.2
J210	0.0	30.0	200.4	73.8	P845	J655	J660	58	15	130	384.6	0.70	0.01	0.2
J225	0.0	30.0	200.4	73.8	P125	J80	J140	463	8	130	106.4	0.68	0.13	0.3
J240	0.0	30.0	200.4	73.8	P30	J20	J30	126	15	130	358.0	0.65	0.02	0.1
J245	0.0	30.0	200.4	73.8	P410	J200	J205	524	8	130	-102.1	0.65	0.14	0.3
J250	0.0	30.0	200.4	73.8	P405	J595	J200	213	8	130	-96.4	0.62	0.05	0.2
J275	0.0	30.0	200.4	73.8	P660	J110	J535	144	8	130	97.2	0.62	0.04	0.2
J280	0.0	30.0	200.4	73.8	P310	J260	J265	211	8	130	93.4	0.60	0.05	0.2
J295	0.0	30.0	200.4	73.8	P255	J325	J320	264	8	130	86.7	0.55	0.05	0.2
J285	0.0	30.0	200.4	73.9	P295	J290	J285	246	8	130	86.7	0.55	0.05	0.2
J190	80.7	30.0	200.5	73.9	P90	J550	J95	296	12	130	192.7	0.55	0.04	0.1
J185	0.0	30.0	200.5	73.9	P755	J210	J595	193	8	130	-84.0	0.54	0.04	0.2
J290	0.0	30.0	200.5	73.9	P1020	J60	J740	249	15	130	-285.3	0.52	0.02	0.1
J400	68.6	30.0	200.5	73.9	P50	J740	J45	418	15	130	-285.3	0.52	0.04	0.1
J150	0.0	30.0	200.5	73.9	P55	J65	J60	269	15	130	-285.3	0.52	0.02	0.1
J155	0.0	30.0	200.5	73.9	P100	J550	J110	704	12	130	177.8	0.50	0.07	0.1
J160	0.0	30.0	200.5	73.9	P395	J220	J215	79	8	130	-77.3	0.49	0.01	0.2
J165	0.0	30.0	200.5	73.9	P485	J145	J140	197	8	130	-75.0	0.48	0.03	0.2
J170	0.0	30.0	200.5	73.9	P490	J70	J555	209	8	130	74.1	0.47	0.03	0.2
J175	0.0	30.0	200.5	73.9	P165	J395	J400	267	8	130	68.6	0.44	0.03	0.1
J180	0.0	30.0	200.5	73.9	P555	J480	J485	94	8	130	65.6	0.42	0.01	0.1
J195	0.0	30.0	200.5	73.9	P35	J35	J30	527	15	130	-223.6	0.41	0.03	0.1
J200	0.0	30.0	200.5	73.9	P40	J45	J35	707	15	130	-223.6	0.41	0.04	0.1
J300	0.0	30.0	200.5	73.9	P85	J95	J80	447	12	130	137.5	0.39	0.03	0.1
J305	0.0	30.0	200.5	73.9	P280	J320	J300	186	8	130	59.9	0.38	0.02	0.1
J310	0.0	30.0	200.5	73.9	P305	J270	J260	284	8	130	56.0	0.36	0.02	0.1
J315	0.0	30.0	200.5	73.9	P750	J580	J585	138	6	130	32.1	0.36	0.02	0.1
J560	0.0	30.0	200.5	73.9	P680	J95	J540	167	8	130	55.2	0.35	0.01	0.1
J565	0.0	30.0	200.5	73.9	P320	J285	J280	126	8	130	53.7	0.34	0.01	0.1
J570	0.0	30.0	200.5	73.9	P665	J535	J530	173	8	130	53.6	0.34	0.01	0.1
J145	0.0	30.0	200.5	73.9	P285	J300	J290	429	8	130	52.0	0.33	0.03	0.1
J320	0.0	30.0	200.5	73.9	P400	J215	J210	632	8	130	-50.5	0.32	0.05	0.1
J385	0.0	30.0	200.5	73.9	P180	J370	J375	229	8	130	48.4	0.31	0.02	0.1
J390	0.0	30.0	200.5	73.9	P430	J190	J195	540	8	130	-49.2	0.31	0.04	0.1
J395	0.0	30.0	200.5	73.9	P60	J70	J65	489	15	130	-171.8	0.31	0.02	0.0
J140	11.2	30.0	200.6	73.9	P230	J340	J345	130	8	130	46.8	0.30	0.01	0.1
J340	0.0	30.0	200.6	73.9	P235	J340	J330	103	8	130	-47.7	0.30	0.01	0.1
J345	75.3	30.0	200.6	73.9	P245	J330	J325	186	8	130	-47.7	0.30	0.01	0.1
J350	0.0	30.0	200.6	73.9	P470	J150	J145	84	8	130	-46.7	0.30	0.01	0.1
J355	0.0	30.0	200.6	73.9	P155	J385	J395	252	8	130	43.3	0.28	0.01	0.1
J360	0.0	30.0	200.6	73.9	P740	J80	J580	300	15	130	155.7	0.28	0.01	0.0
J365	0.0	30.0	200.6	73.9	P610	J510	J520	161	8	130	42.3	0.27	0.01	0.1
J370	37.6	30.0	200.6	73.9	P585	J480	J490	222	8	130	-41.1	0.26	0.01	0.1
J375	0.0	30.0	200.6	73.9	P325	J280	J275	126	8	130	38.8	0.25	0.01	0.0
J380	0.0	30.0	200.5	73.9	P315	J260	J255	562	8	130	-37.4	0.24	0.02	0.0
J405	0.0	30.0	200.6	73.9	P495	J555	J410	837	8	130	38.0	0.24	0.04	0.0
J325	0.0	30.0	200.6	73.9	P105	J110	J115	202	12	130	80.6	0.23	0.00	0.0

Wood Rodgers, Inc.
M. Ronco
02/24/2020

SUTTER POINTE SUBDIVISION WATER STUDY
AVERAGE DAY DEMAND MODEL RESULTS PHASE 1

Junction Report					Pipe Report									
ID	Demand (gpm)	Elevation (ft)	Head (ft)	Pressure (psi)	ID	From Node	To Node	Length (ft)	Diameter (in	Roughness	Flow (gpm)	Velocity (ft/s)	Headloss (ft)	HL/1000 (ft/k-ft)
J330	0.0	30.0	200.6	73.9	P110	J115	J125	549	12	130	80.6	0.23	0.01	0.0
J335	0.0	30.0	200.6	73.9	P505	J555	J415	837	8	130	36.1	0.23	0.03	0.0
J480	0.0	30.0	200.6	73.9	P625	J530	J525	234	8	130	35.7	0.23	0.01	0.0
J485	65.6	30.0	200.6	73.9	P70	J75	J80	344	15	130	124.6	0.23	0.01	0.0
J490	0.0	30.0	200.6	73.9	P1120	J10	J745	3678	12	130	76.8	0.22	0.08	0.0
J520	42.3	30.0	200.6	73.9	P140	J375	J390	278	8	130	34.5	0.22	0.01	0.0
J410	52.2	30.0	200.6	73.9	P150	J385	J380	254	8	130	-34.1	0.22	0.01	0.0
J420	0.0	30.0	200.6	73.9	P290	J290	J305	873	8	130	-34.7	0.22	0.03	0.0
J425	0.0	30.0	200.6	73.9	P75	J580	J85	551	15	130	123.6	0.22	0.01	0.0
J445	0.0	30.0	200.6	73.9	P300	J285	J270	716	8	130	33.0	0.21	0.02	0.0
J450	0.0	30.0	200.6	73.9	P360	J235	J230	20	8	130	-33.5	0.21	0.00	0.0
J455	0.0	30.0	200.6	73.9	P670	J535	J440	171	8	130	32.5	0.21	0.01	0.0
J460	0.0	30.0	200.6	73.9	P345	J295	J255	212	8	130	30.7	0.20	0.01	0.0
J465	0.0	30.0	200.6	73.9	P420	J180	J185	261	8	130	31.5	0.20	0.01	0.0
J470	0.0	30.0	200.6	73.9	P425	J185	J190	940	8	130	31.5	0.20	0.03	0.0
J475	0.0	30.0	200.6	73.9	P545	J450	J460	280	8	130	31.9	0.20	0.01	0.0
J495	0.0	30.0	200.6	73.9	P745	J85	J590	140	6	130	17.8	0.20	0.01	0.0
J500	0.0	30.0	200.6	73.9	P580	J475	J490	222	8	130	29.8	0.19	0.01	0.0
J505	0.0	30.0	200.6	73.9	P80	J85	J90	654	15	130	105.8	0.19	0.01	0.0
J510	0.0	30.0	200.6	73.9	P825	J90	J205	1361	15	130	102.1	0.19	0.02	0.0
J515	0.0	30.0	200.6	73.9	P1015	J735	J645	94	12	130	-61.7	0.18	0.00	0.0
J525	0.0	30.0	200.6	73.9	P1110	J45	V5	69	12	130	-61.7	0.18	0.00	0.0
J530	0.0	30.0	200.6	73.9	P1125	J745	J615	1363	12	130	62.2	0.18	0.02	0.0
J205	0.0	30.0	200.6	73.9	P190	J370	J365	170	8	130	27.6	0.18	0.00	0.0
J415	0.0	30.0	200.6	73.9	P45	V5	J50	192	12	130	-61.7	0.18	0.00	0.0
J430	0.0	30.0	200.6	73.9	P465	J195	J145	811	8	130	-28.3	0.18	0.02	0.0
J435	0.0	30.0	200.6	73.9	P475	J160	J155	179	8	130	-27.8	0.18	0.00	0.0
J440	0.0	30.0	200.6	73.9	P480	J155	J150	281	8	130	-27.8	0.18	0.01	0.0
J535	11.2	30.0	200.6	73.9	P615	J510	J515	154	8	130	-28.8	0.18	0.00	0.0
J110	0.0	30.0	200.7	74.0	P65	J70	J75	554	15	130	97.7	0.18	0.01	0.0
J115	0.0	30.0	200.7	74.0	P655	J445	J455	222	8	130	28.9	0.18	0.01	0.0
J125	56.2	30.0	200.7	74.0	P790	J635	J735	1191	12	130	-61.7	0.18	0.02	0.0
J130	0.0	30.0	200.7	74.0	P795	J635	J685	848	12	130	61.7	0.18	0.01	0.0
J135	0.0	30.0	200.7	74.0	P800	J690	J695	793	12	130	61.7	0.18	0.01	0.0
J555	0.0	30.0	200.7	74.0	P805	J700	J50	539	12	130	61.7	0.18	0.01	0.0
J85	0.0	30.0	200.7	74.0	P945	J685	J630	215	12	130	61.7	0.18	0.00	0.0
J90	0.0	30.0	200.7	74.0	P950	J630	J690	170	12	130	61.7	0.18	0.00	0.0
J540	28.4	30.0	200.7	74.0	P955	J695	J625	773	12	130	61.7	0.18	0.01	0.0
J545	0.0	30.0	200.7	74.0	P960	J625	J700	199	12	130	61.7	0.18	0.00	0.0
J70	0.0	30.0	200.7	74.0	P260	J320	J305	878	8	130	26.8	0.17	0.02	0.0
J75	0.0	30.0	200.7	74.0	P355	J235	J215	1451	8	130	26.8	0.17	0.03	0.0
J80	0.0	30.0	200.7	74.0	P695	J545	J75	182	8	130	26.9	0.17	0.00	0.0
J65	0.0	30.0	200.7	74.0	P160	J395	J390	778	8	130	-25.3	0.16	0.02	0.0
J95	0.0	30.0	200.7	74.0	P435	J180	J170	158	8	130	-25.8	0.16	0.00	0.0
J60	0.0	30.0	200.7	74.0	P535	J425	J450	217	8	130	25.4	0.16	0.00	0.0
J550	0.0	30.0	200.8	74.0	P550	J460	J480	961	8	130	24.4	0.16	0.02	0.0
J45	0.0	30.0	200.8	74.0	P635	J525	J505	222	8	130	24.8	0.16	0.00	0.0
J50	0.0	30.0	200.8	74.0	P330	J275	J270	464	8	130	23.0	0.15	0.01	0.0
J35	0.0	30.0	200.8	74.0	P10	J10	J15	273	15	130	-76.8	0.14	0.00	0.0
J30	0.0	30.0	200.9	74.0	P170	J405	J380	164	8	130	22.7	0.14	0.00	0.0
J20	41.6	30.0	200.9	74.0	P575	J475	J455	646	8	130	-22.4	0.14	0.01	0.0
J25	0.0	30.0	200.9	74.0	P650	J440	J445	242	8	130	22.2	0.14	0.00	0.0
J10	0.0	30.0	201.0	74.1	P130	J140	J405	332	8	130	20.2	0.13	0.00	0.0
J15	0.0	30.0	201.0	74.1	P460	J160	J195	267	8	130	20.9	0.13	0.00	0.0

Wood Rodgers, Inc.
M. Ronco
02/24/2020

SUTTER POINTE SUBDIVISION WATER STUDY
AVERAGE DAY DEMAND MODEL RESULTS PHASE 1

		Junction Report								Pipe Report				
ID	Demand (gpm)	Elevation (ft)	Head (ft)	Pressure (psi)	ID	From Node	To Node	Length (ft)	iameter (ir	Roughness	Flow (gpm)	Velocity (ft/s)	Headloss (ft)	HL/1000 (ft/k-ft)
FH10	0.0	30.0	200.3	86.8	P510	J410	J415	252	8	130	-20.2	0.13	0.00	0.0
FH05	0.0	30.0	200.4	86.8	P810	J615	J645	1304	12	130	47.2	0.13	0.01	0.0
J595	0.0	30.0	200.5	86.9	P380	J230	J240	285	8	130	-18.0	0.12	0.00	0.0
J600	12.4	30.0	200.5	86.9	P390	J240	J210	887	8	130	-18.0	0.12	0.01	0.0
FH01	0.0	30.0	200.5	86.9	P440	J170	J175	344	8	130	-18.9	0.12	0.00	0.0
FH20	0.0	30.0	200.5	86.9	P445	J175	J150	713	8	130	-18.9	0.12	0.01	0.0
FH15	0.0	30.0	200.6	86.9	P520	J420	J425	235	8	130	19.5	0.12	0.00	0.0
FH35	0.0	30.0	200.6	86.9	P200	J345	J360	852	8	130	-16.9	0.11	0.01	0.0
FH40	0.0	30.0	200.6	86.9	P620	J515	J530	1062	8	130	-17.9	0.11	0.01	0.0
FH25	0.0	30.0	200.6	86.9	P690	J545	J540	424	8	130	-17.2	0.11	0.00	0.0
FH45	0.0	30.0	200.7	86.9	P205	J360	J365	75	8	130	-16.0	0.10	0.00	0.0
J575	28.1	30.0	200.7	86.9	P340	J275	J295	388	8	130	15.8	0.10	0.00	0.0
FH50	0.0	30.0	200.7	87.0	P365	J230	J225	1191	8	130	-15.5	0.10	0.01	0.0
FH55	0.0	30.0	200.7	87.0	P375	J225	J210	366	8	130	-15.5	0.10	0.00	0.0
FH60	0.0	30.0	200.7	87.0	P515	J415	J420	157	8	130	15.9	0.10	0.00	0.0
J580	0.0	30.0	200.7	87.0	P735	J575	J130	544	8	130	-15.4	0.10	0.00	0.0
J585	32.1	30.0	200.7	87.0	P1000	J715	J720	606	8	130	14.6	0.09	0.00	0.0
J590	17.8	30.0	200.7	87.0	P1130	J745	J620	981	8	130	14.6	0.09	0.01	0.0
FH30	0.0	30.0	200.7	87.0	P335	J280	J295	1175	8	130	14.9	0.09	0.01	0.0
FH80	0.0	30.0	200.7	87.0	P605	J505	J510	314	8	130	13.5	0.09	0.00	0.0
FH85	0.0	30.0	200.7	87.0	P785	J640	J645	429	8	130	14.6	0.09	0.00	0.0
J650	0.0	30.0	200.7	87.0	P830	J720	J640	2046	8	130	14.6	0.09	0.01	0.0
J705	0.0	30.0	200.7	87.0	P995	J620	J715	307	8	130	14.6	0.09	0.00	0.0
J710	0.0	30.0	200.7	87.0	P675	J125	J575	813	8	130	12.7	0.08	0.00	0.0
FH75	0.0	30.0	200.8	87.0	P760	J595	J600	77	8	130	12.4	0.08	0.00	0.0
J740	0.0	30.0	200.8	87.0	P175	J380	J375	662	8	130	-11.4	0.07	0.00	0.0
FH70	0.0	30.0	200.8	87.0	P195	J365	J345	1866	8	130	11.6	0.07	0.01	0.0
FH90	0.0	30.0	200.8	87.0	P590	J490	J495	737	8	130	-11.3	0.07	0.00	0.0
J625	0.0	30.0	200.8	87.0	P600	J495	J505	187	8	130	-11.3	0.07	0.00	0.0
J695	0.0	30.0	200.8	87.0	P630	J525	J515	565	8	130	10.9	0.07	0.00	0.0
J700	0.0	30.0	200.8	87.0	P640	J430	J435	242	8	130	-10.3	0.07	0.00	0.0
FH100	0.0	30.0	200.8	87.0	P645	J435	J440	476	8	130	-10.3	0.07	0.00	0.0
FH95	0.0	30.0	200.8	87.0	P145	J390	J385	646	8	130	9.2	0.06	0.00	0.0
J630	0.0	30.0	200.8	87.0	P685	J540	J545	1245	8	130	9.6	0.06	0.00	0.0
J685	0.0	30.0	200.8	87.0	P265	J305	J310	281	8	130	-7.9	0.05	0.00	0.0
J690	0.0	30.0	200.8	87.0	P270	J310	J300	278	8	130	-7.9	0.05	0.00	0.0
FH145	0.0	30.0	200.9	87.0	P560	J460	J465	222	8	130	7.5	0.05	0.00	0.0
FH150	0.0	30.0	200.9	87.0	P570	J465	J475	295	8	130	7.5	0.05	0.00	0.0
J635	0.0	30.0	200.9	87.0	P1005	J725	J610	310	12	130	-15.0	0.04	0.00	0.0
J735	0.0	30.0	200.9	87.0	P1010	J730	J725	217	12	130	-15.0	0.04	0.00	0.0
FH110	0.0	30.0	200.9	87.0	P1105	V3	J25	50	12	130	-15.0	0.04	0.00	0.0
FH115	0.0	30.0	200.9	87.0	P25	J20	V3	69	12	130	-15.0	0.04	0.00	0.0
FH120	0.0	30.0	200.9	87.0	P350	J255	J235	318	8	130	-6.8	0.04	0.00	0.0
FH125	0.0	30.0	200.9	87.0	P415	J200	J180	180	8	130	5.7	0.04	0.00	0.0
FH130	0.0	30.0	200.9	87.0	P450	J170	J165	483	8	130	-7.0	0.04	0.00	0.0
FH135	0.0	30.0	200.9	87.0	P455	J165	J160	211	8	130	-7.0	0.04	0.00	0.0
FH140	0.0	30.0	200.9	87.0	P500	J410	J425	671	8	130	5.9	0.04	0.00	0.0
FH155	0.0	30.0	200.9	87.0	P530	J430	J445	658	8	130	6.7	0.04	0.00	0.0
FH65	0.0	30.0	200.9	87.0	P540	J450	J455	374	8	130	-6.5	0.04	0.00	0.0
J605	0.0	30.0	200.9	87.0	P765	J665	J670	559	12	130	-15.0	0.04	0.00	0.0
J610	0.0	30.0	200.9	87.0	P770	J675	J730	580	12	130	-15.0	0.04	0.00	0.0
J615	0.0	30.0	200.9	87.0	P775	J610	J680	699	12	130	-15.0	0.04	0.00	0.0
J640	0.0	30.0	200.9	87.0	P925	J25	J665	526	12	130	-15.0	0.04	0.00	0.0
J645	0.0	30.0	200.9	87.0	P930	J670	J605	182	12	130	-15.0	0.04	0.00	0.0

SUTTER POINTE SUBDIVISION WATER STUDY
AVERAGE DAY DEMAND MODEL RESULTS PHASE 1

Junction Report					Pipe Report									
ID	Demand (gpm)	Elevation (ft)	Head (ft)	Pressure (psi)	ID	From Node	To Node	Length (ft)	Diameter (in)	Roughness	Flow (gpm)	Velocity (ft/s)	Headloss (ft)	HL/1000 (ft/k-ft)
J665	0.0	30.0	200.9	87.0	P935	J605	J675	309	12	130	-15.0	0.04	0.00	0.0
J670	0.0	30.0	200.9	87.0	P940	J680	J615	530	12	130	-15.0	0.04	0.00	0.0
J675	0.0	30.0	200.9	87.0	P115	J125	J130	332	12	130	11.7	0.03	0.00	0.0
J680	0.0	30.0	200.9	87.0	P135	J405	J375	1346	8	130	-2.5	0.02	0.00	0.0
J715	0.0	30.0	200.9	87.0	P525	J420	J430	222	8	130	-3.6	0.02	0.00	0.0
J720	0.0	30.0	200.9	87.0	P120	J130	J135	266	12	130	-3.7	0.01	0.00	0.0
J725	0.0	30.0	200.9	87.0	P210	J360	J355	208	8	130	-0.9	0.01	0.00	0.0

SUTTER POINTE SUBDIVISION WATER STUDY
MAX DAY DEMAND MODEL RESULTS ULTIMATE

		Junction Report								Pipe Report				
ID	Demand (gpm)	Elevation (ft)	Head (ft)	Pressure (psi)	ID	From Node	To Node	Length (ft)	iameter (ir	Roughness	Flow (gpm)	Velocity (ft/s)	Headloss (ft)	HL/1000 (ft/k-ft)
J265	172.8	30.0	152.3	53.0	P725	RES1	W1	30	6	130	1675.1	19.01	5.88	192.8
J220	142.9	30.0	152.4	53.0	P730	W1	J550	63	6	130	1675.1	19.01	12.10	192.8
J260	0.0	30.0	152.4	53.0	P715	W2	J15	56	12	130	2095.0	5.94	0.56	10.0
J215	0.0	30.0	152.4	53.1	P720	RES2	W2	24	12	130	2095.0	5.94	0.24	10.0
J270	0.0	30.0	152.5	53.1	P20	J660	J20	474	15	130	1557.4	2.83	0.92	1.9
J235	0.0	30.0	152.5	53.1	P840	J15	J655	202	15	130	1557.4	2.83	0.39	1.9
J255	0.0	30.0	152.5	53.1	P845	J655	J660	58	15	130	1557.4	2.83	0.11	1.9
J295	0.0	30.0	152.5	53.1	P90	J550	J95	296	12	130	983.1	2.79	0.73	2.5
J230	0.0	30.0	152.5	53.1	P1105	V3	J25	50	12	130	777.1	2.20	0.08	1.6
J240	0.0	30.0	152.5	53.1	P25	J20	V3	69	12	130	777.1	2.20	0.11	1.6
J245	0.0	30.0	152.5	53.1	P660	J110	J535	144	8	130	333.8	2.13	0.35	2.4
J275	0.0	30.0	152.5	53.1	P1110	J45	V5	69	12	130	728.7	2.07	0.10	1.4
J280	0.0	30.0	152.5	53.1	P45	V5	J50	192	12	130	728.7	2.07	0.27	1.4
J285	0.0	30.0	152.6	53.1	P85	J95	J80	447	12	130	716.1	2.03	0.61	1.4
J210	0.0	30.0	152.6	53.1	P100	J550	J110	704	12	130	692.1	1.96	0.90	1.3
J225	0.0	30.0	152.6	53.1	P765	J665	J670	559	12	130	660.0	1.87	0.66	1.2
J250	0.0	30.0	152.6	53.1	P925	J25	J665	526	12	130	660.0	1.87	0.62	1.2
J290	0.0	30.0	152.7	53.2	P930	J670	J605	182	12	130	660.0	1.87	0.21	1.2
J305	0.0	30.0	152.7	53.2	P680	J95	J540	167	8	130	267.0	1.70	0.26	1.6
J310	0.0	30.0	152.7	53.2	P805	J700	J50	539	12	130	-584.3	1.66	0.51	0.9
J315	0.0	30.0	152.7	53.2	P960	J625	J700	199	12	130	-584.3	1.66	0.19	0.9
J400	127.0	30.0	152.7	53.2	P1120	J10	J745	3678	12	130	537.6	1.53	2.95	0.8
J300	0.0	30.0	152.8	53.2	P125	J80	J140	463	8	130	238.6	1.52	0.59	1.3
J190	149.3	30.0	152.8	53.2	P410	J200	J205	524	8	130	-228.3	1.46	0.62	1.2
J320	0.0	30.0	152.8	53.2	P695	J545	J75	182	8	130	214.6	1.37	0.19	1.1
J395	0.0	30.0	152.8	53.2	P250	J325	J30	632	8	130	-201.0	1.28	0.59	0.9
J50	144.5	30.0	152.8	53.2	P30	J20	J30	126	15	130	703.3	1.28	0.06	0.5
J345	139.3	30.0	152.9	53.2	P405	J595	J200	213	8	130	-199.0	1.27	0.20	0.9
J185	0.0	30.0	152.9	53.3	P755	J210	J595	193	8	130	-176.8	1.13	0.14	0.7
J195	0.0	30.0	152.9	53.3	P815	J705	J710	815	8	130	177.3	1.13	0.60	0.7
J330	0.0	30.0	152.9	53.3	P965	J65	J705	459	8	130	177.3	1.13	0.34	0.7
J335	0.0	30.0	152.9	53.3	P970	J710	J650	233	8	130	177.3	1.13	0.17	0.7
J340	0.0	30.0	152.9	53.3	P185	J370	J65	463	8	130	-175.9	1.12	0.34	0.7
J350	0.0	30.0	152.9	53.3	P670	J535	J440	171	8	130	173.7	1.11	0.12	0.7
J355	0.0	30.0	152.9	53.3	P310	J260	J265	211	8	130	172.8	1.10	0.15	0.7
J360	0.0	30.0	152.9	53.3	P1130	J745	J620	981	8	130	170.3	1.09	0.68	0.7
J365	0.0	30.0	152.9	53.3	P60	J70	J65	489	15	130	579.7	1.05	0.15	0.3
J385	0.0	30.0	152.9	53.3	P1125	J745	J615	1363	12	130	367.3	1.04	0.54	0.4
J390	0.0	30.0	152.9	53.3	P785	J640	J645	429	8	130	-162.3	1.04	0.27	0.6
J155	0.0	30.0	152.9	53.3	P105	J110	J115	202	12	130	358.2	1.02	0.08	0.4
J160	0.0	30.0	152.9	53.3	P110	J115	J125	549	12	130	358.2	1.02	0.21	0.4
J165	0.0	30.0	152.9	53.3	P65	J70	J75	554	15	130	-562.7	1.02	0.16	0.3
J170	0.0	30.0	152.9	53.3	P10	J10	J15	273	15	130	-537.6	0.98	0.07	0.3
J175	0.0	30.0	152.9	53.3	P1005	J725	J610	310	12	130	330.8	0.94	0.10	0.3
J180	0.0	30.0	152.9	53.3	P1010	J730	J725	217	12	130	330.8	0.94	0.07	0.3
J200	0.0	30.0	152.9	53.3	P770	J675	J730	580	12	130	330.8	0.94	0.19	0.3
J325	0.0	30.0	152.9	53.3	P800	J690	J695	793	12	130	-330.1	0.94	0.26	0.3
J370	69.5	30.0	152.9	53.3	P935	J605	J675	309	12	130	330.8	0.94	0.10	0.3
J375	0.0	30.0	152.9	53.3	P950	J630	J690	170	12	130	-330.1	0.94	0.06	0.3
J380	0.0	30.0	152.9	53.3	P955	J695	J625	773	12	130	-330.1	0.94	0.25	0.3
J560	0.0	30.0	152.9	53.3	P35	J35	J30	527	15	130	-502.3	0.91	0.13	0.2
J565	0.0	30.0	152.9	53.3	P395	J220	J215	79	8	130	-142.9	0.91	0.04	0.5
J570	0.0	30.0	152.9	53.3	P40	J45	J35	707	15	130	-502.3	0.91	0.17	0.2
J150	0.0	30.0	152.9	53.3	P255	J325	J320	264	8	130	139.0	0.89	0.12	0.5

Wood Rodgers, Inc.
M. Ronco
02/24/2020

SUTTER POINTE SUBDIVISION WATER STUDY
MAX DAY DEMAND MODEL RESULTS ULTIMATE

		Junction Report								Pipe Report				
ID	Demand (gpm)	Elevation (ft)	Head (ft)	Pressure (psi)	ID	From Node	To Node	Length (ft)	Diameter (in	Roughness	Flow (gpm)	Velocity (ft/s)	Headloss (ft)	HL/1000 (ft/k-ft)
J405	0.0	30.0	152.9	53.3	P295	J290	J285	246	8	130	139.0	0.89	0.12	0.5
J145	0.0	30.0	153.0	53.3	P665	J535	J530	173	8	130	139.5	0.89	0.08	0.5
J140	20.6	30.0	153.0	53.3	P690	J545	J540	424	8	130	-137.7	0.88	0.20	0.5
J45	0.0	30.0	153.2	53.4	P165	J395	J400	267	8	130	127.0	0.81	0.11	0.4
J60	0.0	30.0	153.3	53.4	P485	J145	J140	197	8	130	-120.1	0.77	0.07	0.4
J65	0.0	30.0	153.3	53.4	P555	J480	J485	94	8	130	121.3	0.77	0.03	0.4
J25	117.1	30.0	153.4	53.5	P650	J440	J445	242	8	130	107.8	0.69	0.07	0.3
J35	0.0	30.0	153.4	53.5	P750	J580	J585	138	6	130	59.3	0.67	0.05	0.4
J485	121.3	30.0	153.4	53.5	P795	J635	J685	848	12	130	-224.5	0.64	0.14	0.2
J480	0.0	30.0	153.4	53.5	P945	J685	J630	215	12	130	-224.5	0.64	0.03	0.2
J410	96.7	30.0	153.4	53.5	P305	J270	J260	284	8	130	98.9	0.63	0.07	0.3
J415	0.0	30.0	153.4	53.5	P70	J75	J80	344	15	130	-348.1	0.63	0.04	0.1
J555	0.0	30.0	153.4	53.5	P130	J140	J405	332	8	130	97.9	0.62	0.08	0.3
J70	0.0	30.0	153.4	53.5	P400	J215	J210	632	8	130	-97.1	0.62	0.15	0.2
J420	0.0	30.0	153.5	53.5	P280	J320	J300	186	8	130	96.0	0.61	0.04	0.2
J425	0.0	30.0	153.5	53.5	P625	J530	J525	234	8	130	93.9	0.60	0.05	0.2
J450	0.0	30.0	153.5	53.5	P115	J125	J130	332	12	130	209.3	0.59	0.05	0.1
J460	0.0	30.0	153.5	53.5	P525	J420	J430	222	8	130	-91.8	0.59	0.05	0.2
J465	0.0	30.0	153.5	53.5	P120	J130	J135	266	12	130	202.4	0.57	0.04	0.1
J470	0.0	30.0	153.5	53.5	P430	J190	J195	540	8	130	-89.1	0.57	0.11	0.2
J475	0.0	30.0	153.5	53.5	P285	J300	J290	429	8	130	83.4	0.53	0.08	0.2
J490	0.0	30.0	153.5	53.5	P320	J285	J280	126	8	130	83.5	0.53	0.02	0.2
J455	0.0	30.0	153.5	53.5	P585	J480	J490	222	8	130	-83.4	0.53	0.04	0.2
J30	0.0	30.0	153.5	53.5	P155	J385	J395	252	8	130	80.9	0.52	0.04	0.2
J430	0.0	30.0	153.5	53.5	P230	J340	J345	130	8	130	81.1	0.52	0.02	0.2
J445	0.0	30.0	153.5	53.5	P655	J445	J455	222	8	130	81.9	0.52	0.04	0.2
J495	0.0	30.0	153.5	53.5	P360	J235	J230	20	8	130	-79.6	0.51	0.00	0.2
J500	0.0	30.0	153.5	53.5	P610	J510	J520	161	8	130	78.2	0.50	0.03	0.2
J520	78.2	30.0	153.5	53.5	P190	J370	J365	170	8	130	77.3	0.49	0.03	0.2
J205	0.0	30.0	153.5	53.5	P685	J540	J545	1245	8	130	76.9	0.49	0.20	0.2
J435	0.0	30.0	153.5	53.5	P170	J405	J380	164	8	130	73.7	0.47	0.02	0.2
J505	0.0	30.0	153.5	53.5	P315	J260	J255	562	8	130	-73.9	0.47	0.08	0.2
J510	0.0	30.0	153.5	53.5	P470	J150	J145	84	8	130	-72.9	0.47	0.01	0.1
J20	77.0	30.0	153.6	53.5	P515	J415	J420	157	8	130	-71.5	0.46	0.02	0.1
J515	0.0	30.0	153.6	53.5	P635	J525	J505	222	8	130	70.0	0.45	0.03	0.1
J525	0.0	30.0	153.6	53.5	P615	J510	J515	154	8	130	-69.5	0.44	0.02	0.1
J440	0.0	30.0	153.6	53.6	P150	J385	J380	254	8	130	-67.8	0.43	0.03	0.1
J75	0.0	30.0	153.6	53.6	P640	J430	J435	242	8	130	-65.9	0.42	0.03	0.1
J80	11.3	30.0	153.6	53.6	P645	J435	J440	476	8	130	-65.9	0.42	0.06	0.1
J85	0.0	30.0	153.6	53.6	P1020	J60	J740	249	15	130	226.4	0.41	0.01	0.1
J90	0.0	30.0	153.6	53.6	P50	J740	J45	418	15	130	226.4	0.41	0.02	0.1
J530	0.0	30.0	153.6	53.6	P55	J65	J60	269	15	130	226.4	0.41	0.01	0.1
J135	0.0	30.0	153.7	53.6	P825	J90	J205	1361	15	130	228.3	0.41	0.08	0.1
J535	20.6	30.0	153.7	53.6	P235	J340	J330	103	8	130	-62.0	0.40	0.01	0.1
J130	0.0	30.0	153.7	53.6	P245	J330	J325	186	8	130	-62.0	0.40	0.02	0.1
J125	103.9	30.0	153.8	53.6	P325	J280	J275	126	8	130	61.9	0.39	0.01	0.1
J545	0.0	30.0	153.8	53.6	P590	J490	J495	737	8	130	-61.2	0.39	0.08	0.1
J540	52.4	30.0	154.0	53.7	P600	J495	J505	187	8	130	-61.2	0.39	0.02	0.1
J115	0.0	30.0	154.0	53.7	P140	J375	J390	278	8	130	59.2	0.38	0.03	0.1
J110	0.0	30.0	154.1	53.8	P420	J180	J185	261	8	130	60.2	0.38	0.03	0.1
J95	0.0	30.0	154.2	53.8	P425	J185	J190	940	8	130	60.2	0.38	0.09	0.1
J10	0.0	30.0	154.9	54.1	P745	J85	J590	140	6	130	32.9	0.37	0.02	0.1
J550	0.0	30.0	155.0	54.1	P820	J135	J90	1723	15	130	202.4	0.37	0.08	0.0
J15	0.0	30.0	155.0	54.2	P290	J290	J305	873	8	130	-55.6	0.35	0.08	0.1

SUTTER POINTE SUBDIVISION WATER STUDY
MAX DAY DEMAND MODEL RESULTS ULTIMATE

		Junction Report								Pipe Report				
ID	Demand (gpm)	Elevation (ft)	Head (ft)	Pressure (psi)	ID	From Node	To Node	Length (ft)	Diameter (in	Roughness	Flow (gpm)	Velocity (ft/s)	Headloss (ft)	HL/1000 (ft/k-ft)
FH140	0.0	30.0	151.1	65.5	P300	J285	J270	716	8	130	55.5	0.35	0.06	0.1
J640	206.5	30.0	151.1	65.5	P205	J360	J365	75	8	130	-52.9	0.34	0.01	0.1
FH135	0.0	30.0	151.2	65.5	P465	J195	J145	811	8	130	-47.2	0.30	0.05	0.1
J720	0.0	30.0	151.2	65.5	P510	J410	J415	252	8	130	-47.7	0.30	0.02	0.1
FH130	0.0	30.0	151.3	65.5	P160	J395	J390	778	8	130	-46.1	0.29	0.05	0.1
J715	0.0	30.0	151.3	65.5	P355	J235	J215	1451	8	130	45.8	0.29	0.09	0.1
J620	126.1	30.0	151.3	65.6	P540	J450	J455	374	8	130	-46.1	0.29	0.02	0.1
FH145	0.0	30.0	151.4	65.6	P620	J515	J530	1062	8	130	-45.6	0.29	0.06	0.1
J645	0.0	30.0	151.4	65.6	P675	J125	J575	813	8	130	45.0	0.29	0.05	0.1
J735	0.0	30.0	151.4	65.6	P1000	J715	J720	606	8	130	44.2	0.28	0.03	0.1
FH150	0.0	30.0	151.4	65.6	P330	J275	J270	464	8	130	43.4	0.28	0.03	0.1
FH155	0.0	30.0	151.4	65.6	P475	J160	J155	179	8	130	-44.4	0.28	0.01	0.1
J610	302.6	30.0	151.4	65.6	P480	J155	J150	281	8	130	-44.4	0.28	0.02	0.1
J615	313.6	30.0	151.4	65.6	P830	J720	J640	2046	8	130	44.2	0.28	0.12	0.1
J635	144.2	30.0	151.4	65.6	P995	J620	J715	307	8	130	44.2	0.28	0.02	0.1
J680	0.0	30.0	151.4	65.6	P260	J320	J305	878	8	130	43.0	0.27	0.05	0.1
FH115	0.0	30.0	151.5	65.7	P380	J230	J240	285	8	130	-42.9	0.27	0.02	0.1
J725	0.0	30.0	151.5	65.7	P390	J240	J210	887	8	130	-42.9	0.27	0.05	0.1
FH95	0.0	30.0	151.6	65.7	P460	J160	J195	267	8	130	41.8	0.27	0.01	0.1
J685	0.0	30.0	151.6	65.7	P500	J410	J425	671	8	130	-42.2	0.27	0.03	0.1
J630	105.6	30.0	151.6	65.7	P345	J295	J255	212	8	130	40.1	0.26	0.01	0.1
FH110	0.0	30.0	151.6	65.7	P550	J460	J480	961	8	130	37.9	0.24	0.04	0.0
J730	0.0	30.0	151.6	65.7	P1015	J735	J645	94	12	130	80.4	0.23	0.00	0.0
FH100	0.0	30.0	151.6	65.7	P365	J230	J225	1191	8	130	-36.8	0.23	0.05	0.0
J690	0.0	30.0	151.6	65.7	P375	J225	J210	366	8	130	-36.8	0.23	0.01	0.0
FH125	0.0	30.0	151.8	65.8	P575	J475	J455	646	8	130	-35.8	0.23	0.02	0.0
J675	0.0	30.0	151.8	65.8	P790	J635	J735	1191	12	130	80.4	0.23	0.03	0.0
J605	329.2	30.0	151.9	65.8	P810	J615	J645	1304	12	130	81.9	0.23	0.03	0.0
FH90	0.0	30.0	151.9	65.8	P200	J345	J360	852	8	130	-33.8	0.22	0.03	0.0
J695	0.0	30.0	151.9	65.8	P350	J255	J235	318	8	130	-33.8	0.22	0.01	0.0
J745	0.0	30.0	152.0	65.8	P740	J80	J580	300	15	130	118.1	0.21	0.00	0.0
FH120	0.0	30.0	152.1	65.9	P435	J180	J170	158	8	130	-31.0	0.20	0.00	0.0
J670	0.0	30.0	152.1	65.9	P180	J370	J375	229	8	130	29.1	0.19	0.01	0.0
J650	177.3	30.0	152.1	65.9	P415	J200	J180	180	8	130	29.2	0.19	0.00	0.0
J625	254.2	30.0	152.2	65.9	P440	J170	J175	344	8	130	-28.5	0.18	0.01	0.0
FH10	0.0	30.0	152.3	66.0	P445	J175	J150	713	8	130	-28.5	0.18	0.02	0.0
FH80	0.0	30.0	152.3	66.0	P530	J430	J445	658	8	130	-25.9	0.17	0.01	0.0
J710	0.0	30.0	152.3	66.0	P195	J365	J345	1866	8	130	24.4	0.16	0.04	0.0
FH70	0.0	30.0	152.3	66.0	P135	J405	J375	1346	8	130	24.2	0.15	0.02	0.0
J700	0.0	30.0	152.3	66.0	P505	J555	J415	837	8	130	-23.7	0.15	0.01	0.0
FH05	0.0	30.0	152.5	66.1	P545	J450	J460	280	8	130	24.3	0.15	0.01	0.0
J595	0.0	30.0	152.7	66.2	P630	J525	J515	565	8	130	23.9	0.15	0.01	0.0
J600	22.3	30.0	152.7	66.2	P335	J280	J295	1175	8	130	21.6	0.14	0.02	0.0
FH20	0.0	30.0	152.7	66.2	P535	J425	J450	217	8	130	-21.8	0.14	0.00	0.0
FH65	0.0	30.0	152.8	66.2	P580	J475	J490	222	8	130	22.2	0.14	0.00	0.0
J665	0.0	30.0	152.8	66.2	P760	J595	J600	77	8	130	22.3	0.14	0.00	0.0
FH01	0.0	30.0	152.9	66.2	P520	J420	J425	235	8	130	20.3	0.13	0.00	0.0
FH15	0.0	30.0	152.9	66.3	P210	J360	J355	208	8	130	19.1	0.12	0.00	0.0
FH85	0.0	30.0	152.9	66.3	P225	J350	J340	206	8	130	19.1	0.12	0.00	0.0
J705	0.0	30.0	152.9	66.3	P340	J275	J295	388	8	130	18.5	0.12	0.00	0.0
FH75	0.0	30.0	153.2	66.4	P490	J70	J555	209	8	130	-17.0	0.11	0.00	0.0
J740	0.0	30.0	153.2	66.4	P75	J580	J85	551	15	130	58.8	0.11	0.00	0.0
FH35	0.0	30.0	153.4	66.5	P560	J460	J465	222	8	130	-13.6	0.09	0.00	0.0
FH25	0.0	30.0	153.4	66.5	P570	J465	J475	295	8	130	-13.6	0.09	0.00	0.0

Wood Rodgers, Inc.
M. Ronco
02/24/2020

SUTTER POINTE SUBDIVISION WATER STUDY
MAX DAY DEMAND MODEL RESULTS ULTIMATE

Junction Report					Pipe Report									
ID	Demand (gpm)	Elevation (ft)	Head (ft)	Pressure (psi)	ID	From Node	To Node	Length (ft)	iameter (ir	Roughness	Flow (gpm)	Velocity (ft/s)	Headloss (ft)	HL/1000 (ft/k-ft)
FH40	0.0	30.0	153.5	66.5	P145	J390	J385	646	8	130	13.1	0.08	0.00	0.0
FH55	0.0	30.0	153.6	66.5	P265	J305	J310	281	8	130	-12.6	0.08	0.00	0.0
J585	59.3	30.0	153.6	66.5	P270	J310	J300	278	8	130	-12.6	0.08	0.00	0.0
FH60	0.0	30.0	153.6	66.6	P775	J610	J680	699	12	130	28.2	0.08	0.00	0.0
J590	32.9	30.0	153.6	66.6	P940	J680	J615	530	12	130	28.2	0.08	0.00	0.0
J580	0.0	30.0	153.6	66.6	P215	J355	J350	633	8	130	9.4	0.06	0.00	0.0
FH45	0.0	30.0	153.7	66.6	P220	J350	J355	654	8	130	-9.7	0.06	0.00	0.0

Wood Rodgers, Inc.
M. Ronco
02/24/2020

SUTTER POINTE SUBDIVISION WATER STUDY
MAX DAY DEMAND MODEL RESULTS PHASE 1

Junction Report					Pipe Report									
ID	Demand (gpm)	Elevation (ft)	Head (ft)	Pressure (psi)	ID	From Node	To Node	Length (ft)	Diameter (in	Roughness	Flow (gpm)	Velocity (ft/s)	Headloss (ft)	HL/1000 (ft/k-ft)
J265	172.8	30.0	193.4	70.8	P725	RES1	W1	30	6	130	690.2	7.83	1.14	37.3
J220	142.9	30.0	193.5	70.8	P730	W1	J550	63	6	130	690.2	7.83	2.34	37.3
J215	0.0	30.0	193.5	70.8	P715	W2	J15	56	12	130	847.8	2.41	0.11	1.9
J260	0.0	30.0	193.5	70.9	P720	RES2	W2	24	12	130	847.8	2.41	0.04	1.9
J230	0.0	30.0	193.6	70.9	P250	J325	J30	632	8	130	-247.6	1.58	0.87	1.4
J235	0.0	30.0	193.6	70.9	P185	J370	J65	463	8	130	-210.1	1.34	0.47	1.0
J240	0.0	30.0	193.6	70.9	P20	J660	J20	474	15	130	706.8	1.28	0.21	0.5
J245	0.0	30.0	193.6	70.9	P840	J15	J655	202	15	130	706.8	1.28	0.09	0.5
J255	0.0	30.0	193.6	70.9	P845	J655	J660	58	15	130	706.8	1.28	0.03	0.5
J270	0.0	30.0	193.6	70.9	P125	J80	J140	463	8	130	197.0	1.26	0.42	0.9
J225	0.0	30.0	193.6	70.9	P410	J200	J205	524	8	130	-189.0	1.21	0.44	0.8
J250	0.0	30.0	193.6	70.9	P30	J20	J30	126	15	130	657.6	1.19	0.05	0.4
J275	0.0	30.0	193.6	70.9	P660	J110	J535	144	8	130	180.4	1.15	0.11	0.8
J295	0.0	30.0	193.6	70.9	P405	J595	J200	213	8	130	-178.1	1.14	0.16	0.8
J210	0.0	30.0	193.6	70.9	P310	J260	J265	211	8	130	172.8	1.10	0.15	0.7
J280	0.0	30.0	193.6	70.9	P255	J325	J320	264	8	130	159.9	1.02	0.16	0.6
J285	0.0	30.0	193.7	70.9	P295	J290	J285	246	8	130	159.9	1.02	0.15	0.6
J190	149.3	30.0	193.8	71.0	P90	J550	J95	296	12	130	359.8	1.02	0.11	0.4
J290	0.0	30.0	193.8	71.0	P755	J210	J595	193	8	130	-155.8	0.99	0.11	0.6
J400	127.0	30.0	193.9	71.0	P1020	J60	J740	249	15	130	-523.3	0.95	0.06	0.3
J185	0.0	30.0	193.9	71.0	P50	J740	J45	418	15	130	-523.3	0.95	0.11	0.3
J180	0.0	30.0	193.9	71.0	P55	J65	J60	269	15	130	-523.3	0.95	0.07	0.3
J195	0.0	30.0	193.9	71.0	P100	J550	J110	704	12	130	330.5	0.94	0.23	0.3
J200	0.0	30.0	193.9	71.0	P395	J220	J215	79	8	130	-142.9	0.91	0.04	0.5
J160	0.0	30.0	193.9	71.0	P485	J145	J140	197	8	130	-138.4	0.88	0.09	0.5
J165	0.0	30.0	193.9	71.0	P490	J70	J555	209	8	130	136.5	0.87	0.10	0.5
J170	0.0	30.0	193.9	71.0	P165	J395	J400	267	8	130	127.0	0.81	0.11	0.4
J175	0.0	30.0	193.9	71.0	P555	J480	J485	94	8	130	121.3	0.77	0.03	0.4
J300	0.0	30.0	193.9	71.0	P35	J35	J30	527	15	130	-410.0	0.74	0.09	0.2
J305	0.0	30.0	193.9	71.0	P40	J45	J35	707	15	130	-410.0	0.74	0.12	0.2
J310	0.0	30.0	193.9	71.0	P85	J95	J80	447	12	130	256.6	0.73	0.09	0.2
J315	0.0	30.0	193.9	71.0	P280	J320	J300	186	8	130	110.5	0.71	0.06	0.3
J560	0.0	30.0	193.9	71.0	P750	J580	J585	138	6	130	59.3	0.67	0.05	0.4
J565	0.0	30.0	193.9	71.0	P305	J270	J260	284	8	130	103.5	0.66	0.08	0.3
J150	0.0	30.0	194.0	71.0	P680	J95	J540	167	8	130	103.2	0.66	0.05	0.3
J155	0.0	30.0	193.9	71.0	P320	J285	J280	126	8	130	99.0	0.63	0.03	0.3
J570	0.0	30.0	193.9	71.0	P665	J535	J530	173	8	130	99.2	0.63	0.04	0.3
J145	0.0	30.0	194.0	71.1	P285	J300	J290	429	8	130	96.0	0.61	0.10	0.2
J395	0.0	30.0	194.0	71.1	P400	J215	J210	632	8	130	-93.5	0.60	0.14	0.2
J320	0.0	30.0	194.0	71.1	P430	J190	J195	540	8	130	-90.9	0.58	0.12	0.2
J385	0.0	30.0	194.0	71.1	P180	J370	J375	229	8	130	89.0	0.57	0.05	0.2
J390	0.0	30.0	194.0	71.1	P60	J70	J65	489	15	130	-313.2	0.57	0.05	0.1
J380	0.0	30.0	194.1	71.1	P235	J340	J330	103	8	130	-87.7	0.56	0.02	0.2
J140	20.6	30.0	194.1	71.1	P245	J330	J325	186	8	130	-87.7	0.56	0.04	0.2
J345	139.3	30.0	194.1	71.1	P230	J340	J345	130	8	130	86.6	0.55	0.03	0.2
J375	0.0	30.0	194.1	71.1	P470	J150	J145	84	8	130	-86.1	0.55	0.02	0.2
J405	0.0	30.0	194.1	71.1	P740	J80	J580	300	15	130	287.0	0.52	0.03	0.1
J340	0.0	30.0	194.1	71.1	P155	J385	J395	252	8	130	80.1	0.51	0.04	0.2
J350	0.0	30.0	194.1	71.1	P610	J510	J520	161	8	130	78.2	0.50	0.03	0.2
J355	0.0	30.0	194.1	71.1	P585	J480	J490	222	8	130	-76.1	0.49	0.03	0.2
J360	0.0	30.0	194.1	71.1	P325	J280	J275	126	8	130	71.5	0.46	0.02	0.1
J365	0.0	30.0	194.1	71.1	P495	J555	J410	837	8	130	70.1	0.45	0.11	0.1
J330	0.0	30.0	194.1	71.1	P315	J260	J255	562	8	130	-69.4	0.44	0.07	0.1
J335	0.0	30.0	194.1	71.1	P105	J110	J115	202	12	130	150.1	0.43	0.02	0.1

Wood Rodgers, Inc.
M. Ronco
02/24/2020

SUTTER POINTE SUBDIVISION WATER STUDY
MAX DAY DEMAND MODEL RESULTS PHASE 1

		Junction Report						Pipe Report						
ID	Demand (gpm)	Elevation (ft)	Head (ft)	Pressure (psi)	ID	From Node	To Node	Length (ft)	Diameter (in	Roughness	Flow (gpm)	Velocity (ft/s)	Headloss (ft)	HL/1000 (ft/k-ft)
J370	69.5	30.0	194.1	71.1	P110	J115	J125	549	12	130	150.1	0.43	0.04	0.1
J325	0.0	30.0	194.2	71.1	P505	J555	J415	837	8	130	66.4	0.42	0.10	0.1
J485	121.3	30.0	194.2	71.1	P625	J530	J525	234	8	130	66.1	0.42	0.03	0.1
J480	0.0	30.0	194.2	71.2	P140	J375	J390	278	8	130	63.8	0.41	0.03	0.1
J520	78.2	30.0	194.2	71.2	P290	J290	J305	873	8	130	-64.0	0.41	0.10	0.1
J490	0.0	30.0	194.3	71.2	P70	J75	J80	344	15	130	227.5	0.41	0.02	0.1
J510	0.0	30.0	194.3	71.2	P75	J580	J85	551	15	130	227.7	0.41	0.03	0.1
J460	0.0	30.0	194.3	71.2	P1120	J10	J745	3678	12	130	141.1	0.40	0.25	0.1
J465	0.0	30.0	194.3	71.2	P150	J385	J380	254	8	130	-63.2	0.40	0.03	0.1
J470	0.0	30.0	194.3	71.2	P360	J235	J230	20	8	130	-62.4	0.40	0.00	0.1
J475	0.0	30.0	194.3	71.2	P300	J285	J270	716	8	130	61.0	0.39	0.07	0.1
J495	0.0	30.0	194.3	71.2	P670	J535	J440	171	8	130	60.5	0.39	0.02	0.1
J500	0.0	30.0	194.3	71.2	P545	J450	J460	280	8	130	59.0	0.38	0.03	0.1
J505	0.0	30.0	194.3	71.2	P420	J180	J185	261	8	130	58.4	0.37	0.02	0.1
J515	0.0	30.0	194.3	71.2	P425	J185	J190	940	8	130	58.4	0.37	0.09	0.1
J525	0.0	30.0	194.3	71.2	P745	J85	J590	140	6	130	32.9	0.37	0.02	0.1
J450	0.0	30.0	194.3	71.2	P345	J295	J255	212	8	130	56.5	0.36	0.02	0.1
J455	0.0	30.0	194.3	71.2	P580	J475	J490	222	8	130	55.1	0.35	0.02	0.1
J530	0.0	30.0	194.3	71.2	P80	J85	J90	654	15	130	194.8	0.35	0.03	0.0
J410	96.7	30.0	194.3	71.2	P615	J510	J515	154	8	130	-53.3	0.34	0.01	0.1
J415	0.0	30.0	194.3	71.2	P655	J445	J455	222	8	130	53.5	0.34	0.02	0.1
J420	0.0	30.0	194.3	71.2	P825	J90	J205	1361	15	130	189.0	0.34	0.05	0.0
J425	0.0	30.0	194.3	71.2	P190	J370	J365	170	8	130	51.6	0.33	0.01	0.1
J430	0.0	30.0	194.3	71.2	P465	J195	J145	811	8	130	-52.2	0.33	0.06	0.1
J435	0.0	30.0	194.3	71.2	P475	J160	J155	179	8	130	-51.4	0.33	0.01	0.1
J445	0.0	30.0	194.3	71.2	P480	J155	J150	281	8	130	-51.4	0.33	0.02	0.1
J205	0.0	30.0	194.4	71.2	P1015	J735	J645	94	12	130	-113.3	0.32	0.00	0.0
J440	0.0	30.0	194.3	71.2	P1110	J45	V5	69	12	130	-113.3	0.32	0.00	0.0
J535	20.6	30.0	194.4	71.2	P1125	J745	J615	1363	12	130	114.3	0.32	0.06	0.1
J125	103.9	30.0	194.4	71.2	P260	J320	J305	878	8	130	49.5	0.32	0.06	0.1
J130	0.0	30.0	194.4	71.2	P355	J235	J215	1451	8	130	49.5	0.32	0.10	0.1
J135	0.0	30.0	194.4	71.2	P45	V5	J50	192	12	130	-113.3	0.32	0.01	0.0
J90	0.0	30.0	194.4	71.2	P65	J70	J75	554	15	130	176.7	0.32	0.02	0.0
J115	0.0	30.0	194.5	71.3	P695	J545	J75	182	8	130	50.8	0.32	0.01	0.1
J555	0.0	30.0	194.4	71.3	P790	J635	J735	1191	12	130	-113.3	0.32	0.05	0.0
J85	0.0	30.0	194.4	71.3	P795	J635	J685	848	12	130	113.3	0.32	0.04	0.0
J110	0.0	30.0	194.5	71.3	P800	J690	J695	793	12	130	113.3	0.32	0.04	0.0
J80	0.0	30.0	194.5	71.3	P805	J700	J50	539	12	130	113.3	0.32	0.02	0.0
J75	0.0	30.0	194.5	71.3	P945	J685	J630	215	12	130	113.3	0.32	0.01	0.0
J540	52.4	30.0	194.5	71.3	P950	J630	J690	170	12	130	113.3	0.32	0.01	0.0
J545	0.0	30.0	194.5	71.3	P955	J695	J625	773	12	130	113.3	0.32	0.03	0.0
J70	0.0	30.0	194.5	71.3	P960	J625	J700	199	12	130	113.3	0.32	0.01	0.0
J65	0.0	30.0	194.6	71.3	P160	J395	J390	778	8	130	-46.9	0.30	0.05	0.1
J95	0.0	30.0	194.6	71.3	P435	J180	J170	158	8	130	-47.5	0.30	0.01	0.1
J60	0.0	30.0	194.6	71.3	P535	J425	J450	217	8	130	46.9	0.30	0.01	0.1
J550	0.0	30.0	194.7	71.4	P550	J460	J480	961	8	130	45.2	0.29	0.06	0.1
J45	0.0	30.0	194.8	71.4	P635	J525	J505	222	8	130	46.0	0.29	0.01	0.1
J50	0.0	30.0	194.8	71.4	P170	J405	J380	164	8	130	42.2	0.27	0.01	0.1
J35	0.0	30.0	194.9	71.5	P330	J275	J270	464	8	130	42.5	0.27	0.02	0.1
J30	0.0	30.0	195.0	71.5	P10	J10	J15	273	15	130	-141.1	0.26	0.01	0.0
J20	77.0	30.0	195.1	71.5	P575	J475	J455	646	8	130	-41.4	0.26	0.03	0.1
J25	0.0	30.0	195.1	71.5	P650	J440	J445	242	8	130	41.3	0.26	0.01	0.1
J10	0.0	30.0	195.4	71.7	P460	J160	J195	267	8	130	38.7	0.25	0.01	0.0
J15	0.0	30.0	195.4	71.7	P810	J615	J645	1304	12	130	86.5	0.25	0.04	0.0

Wood Rodgers, Inc.
M. Ronco
02/24/2020

SUTTER POINTE SUBDIVISION WATER STUDY
MAX DAY DEMAND MODEL RESULTS PHASE 1

Junction Report					Pipe Report									
ID	Demand (gpm)	Elevation (ft)	Head (ft)	Pressure (psi)	ID	From Node	To Node	Length (ft)	Diameter (in)	Roughness	Flow (gpm)	Velocity (ft/s)	Headloss (ft)	HL/1000 (ft/k-ft)
FH10	0.0	30.0	193.4	83.8	P130	J140	J405	332	8	130	38.0	0.24	0.01	0.0
FH05	0.0	30.0	193.6	83.9	P510	J410	J415	252	8	130	-37.4	0.24	0.01	0.0
J595	0.0	30.0	193.8	84.0	P520	J420	J425	235	8	130	36.1	0.23	0.01	0.0
J600	22.3	30.0	193.8	84.0	P440	J170	J175	344	8	130	-34.8	0.22	0.01	0.0
FH20	0.0	30.0	193.9	84.0	P445	J175	J150	713	8	130	-34.8	0.22	0.03	0.0
FH01	0.0	30.0	193.9	84.0	P380	J230	J240	285	8	130	-33.6	0.21	0.01	0.0
FH15	0.0	30.0	194.1	84.1	P390	J240	J210	887	8	130	-33.6	0.21	0.03	0.0
FH35	0.0	30.0	194.2	84.1	P620	J515	J530	1062	8	130	-33.2	0.21	0.04	0.0
FH40	0.0	30.0	194.2	84.2	P690	J545	J540	424	8	130	-32.6	0.21	0.01	0.0
FH25	0.0	30.0	194.3	84.2	P200	J345	J360	852	8	130	-31.3	0.20	0.03	0.0
FH45	0.0	30.0	194.4	84.2	P205	J360	J365	75	8	130	-30.2	0.19	0.00	0.0
J575	51.9	30.0	194.4	84.2	P340	J275	J295	388	8	130	29.0	0.19	0.01	0.0
FH55	0.0	30.0	194.4	84.2	P515	J415	J420	157	8	130	29.1	0.19	0.00	0.0
FH60	0.0	30.0	194.4	84.2	P335	J280	J295	1175	8	130	27.4	0.18	0.03	0.0
J585	59.3	30.0	194.4	84.2	P365	J230	J225	1191	8	130	-28.8	0.18	0.03	0.0
J590	32.9	30.0	194.4	84.2	P375	J225	J210	366	8	130	-28.8	0.18	0.01	0.0
FH50	0.0	30.0	194.5	84.3	P735	J575	J130	544	8	130	-28.4	0.18	0.01	0.0
J580	0.0	30.0	194.5	84.3	P1000	J715	J720	606	8	130	26.8	0.17	0.01	0.0
FH30	0.0	30.0	194.5	84.3	P1130	J745	J620	981	8	130	26.8	0.17	0.02	0.0
FH80	0.0	30.0	194.6	84.3	P785	J640	J645	429	8	130	26.8	0.17	0.01	0.0
FH85	0.0	30.0	194.6	84.3	P830	J720	J640	2046	8	130	26.8	0.17	0.05	0.0
J650	0.0	30.0	194.6	84.3	P995	J620	J715	307	8	130	26.8	0.17	0.01	0.0
J705	0.0	30.0	194.6	84.3	P605	J505	J510	314	8	130	25.0	0.16	0.01	0.0
J710	0.0	30.0	194.6	84.3	P675	J125	J575	813	8	130	23.5	0.15	0.01	0.0
FH75	0.0	30.0	194.7	84.4	P195	J365	J345	1866	8	130	21.4	0.14	0.03	0.0
J740	0.0	30.0	194.7	84.4	P760	J595	J600	77	8	130	22.3	0.14	0.00	0.0
FH70	0.0	30.0	194.9	84.4	P175	J380	J375	662	8	130	-21.0	0.13	0.01	0.0
J625	0.0	30.0	194.9	84.4	P590	J490	J495	737	8	130	-21.0	0.13	0.01	0.0
J700	0.0	30.0	194.9	84.4	P600	J495	J505	187	8	130	-21.0	0.13	0.00	0.0
FH90	0.0	30.0	194.9	84.5	P630	J525	J515	565	8	130	20.1	0.13	0.01	0.0
J695	0.0	30.0	194.9	84.5	P640	J430	J435	242	8	130	-19.2	0.12	0.00	0.0
FH100	0.0	30.0	194.9	84.5	P645	J435	J440	476	8	130	-19.2	0.12	0.01	0.0
J690	0.0	30.0	194.9	84.5	P685	J540	J545	1245	8	130	18.2	0.12	0.01	0.0
FH95	0.0	30.0	195.0	84.5	P145	J390	J385	646	8	130	16.9	0.11	0.01	0.0
J630	0.0	30.0	194.9	84.5	P265	J305	J310	281	8	130	-14.5	0.09	0.00	0.0
J685	0.0	30.0	195.0	84.5	P270	J310	J300	278	8	130	-14.5	0.09	0.00	0.0
FH150	0.0	30.0	195.0	84.5	P560	J460	J465	222	8	130	13.8	0.09	0.00	0.0
J635	0.0	30.0	195.0	84.5	P570	J465	J475	295	8	130	13.8	0.09	0.00	0.0
FH145	0.0	30.0	195.0	84.5	P1005	J725	J610	310	12	130	-27.8	0.08	0.00	0.0
J645	0.0	30.0	195.1	84.5	P1010	J730	J725	217	12	130	-27.8	0.08	0.00	0.0
J735	0.0	30.0	195.0	84.5	P1105	V3	J25	50	12	130	-27.8	0.08	0.00	0.0
FH120	0.0	30.0	195.1	84.5	P25	J20	V3	69	12	130	-27.8	0.08	0.00	0.0
FH140	0.0	30.0	195.1	84.5	P350	J255	J235	318	8	130	-12.9	0.08	0.00	0.0
FH65	0.0	30.0	195.1	84.5	P450	J170	J165	483	8	130	-12.7	0.08	0.00	0.0
J605	0.0	30.0	195.1	84.5	P455	J165	J160	211	8	130	-12.7	0.08	0.00	0.0
J640	0.0	30.0	195.1	84.5	P530	J430	J445	658	8	130	12.2	0.08	0.00	0.0
J665	0.0	30.0	195.1	84.5	P540	J450	J455	374	8	130	-12.1	0.08	0.00	0.0
J670	0.0	30.0	195.1	84.5	P765	J665	J670	559	12	130	-27.8	0.08	0.00	0.0
FH110	0.0	30.0	195.1	84.5	P770	J675	J730	580	12	130	-27.8	0.08	0.00	0.0
FH115	0.0	30.0	195.1	84.5	P775	J610	J680	699	12	130	-27.8	0.08	0.00	0.0
FH125	0.0	30.0	195.1	84.5	P925	J25	J665	526	12	130	-27.8	0.08	0.00	0.0
FH155	0.0	30.0	195.1	84.5	P930	J670	J605	182	12	130	-27.8	0.08	0.00	0.0
J610	0.0	30.0	195.1	84.5	P935	J605	J675	309	12	130	-27.8	0.08	0.00	0.0
J615	0.0	30.0	195.1	84.5	P940	J680	J615	530	12	130	-27.8	0.08	0.00	0.0

SUTTER POINTE SUBDIVISION WATER STUDY
MAX DAY DEMAND MODEL RESULTS PHASE 1

Junction Report					Pipe Report									
ID	Demand (gpm)	Elevation (ft)	Head (ft)	Pressure (psi)	ID	From Node	To Node	Length (ft)	Diameter (in	Roughness	Flow (gpm)	Velocity (ft/s)	Headloss (ft)	HL/1000 (ft/k-ft)
J675	0.0	30.0	195.1	84.5	P415	J200	J180	180	8	130	10.9	0.07	0.00	0.0
J680	0.0	30.0	195.1	84.5	P500	J410	J425	671	8	130	10.8	0.07	0.00	0.0
J725	0.0	30.0	195.1	84.5	P115	J125	J130	332	12	130	22.6	0.06	0.00	0.0
J730	0.0	30.0	195.1	84.5	P525	J420	J430	222	8	130	-7.0	0.04	0.00	0.0
FH130	0.0	30.0	195.1	84.5	P135	J405	J375	1346	8	130	-4.1	0.03	0.00	0.0
FH135	0.0	30.0	195.1	84.5	P120	J130	J135	266	12	130	-5.8	0.02	0.00	0.0
J715	0.0	30.0	195.1	84.5	P210	J360	J355	208	8	130	-1.1	0.01	0.00	0.0

SUTTER POINTE SUBDIVISION WATER STUDY
MAX DAY DEMAND WITH FIRE FLOW AT NODE FH130 ULTIMATE

		Junction Report								Pipe Report				
ID	Demand (gpm)	Elevation (ft)	Head (ft)	Pressure (psi)	ID	From Node	To Node	Length (ft)	)iameter (ir	Roughness	Flow (gpm)	Velocity (ft/s)	Headloss (ft)	HL/1000 (ft/k-ft)
FH130	3000.0	30.0	64.6	28.0	P1085	FH130	J715	43	8	130	-3000.0	19.15	6.05	139.7
J715	0.0	30.0	70.6	30.6	P725	RES1	W1	30	6	130	1421.0	16.12	4.34	142.2
FH135	0.0	30.0	85.4	37.0	P730	W1	J550	63	6	130	1421.0	16.12	8.92	142.2
J720	0.0	30.0	85.4	37.0	P1130	J745	J620	981	8	130	1956.2	12.49	62.08	63.3
J620	126.1	30.0	87.8	38.0	P995	J620	J715	307.09	8	130	1,830.03	11.68	17.18	55.94
FH140	0.0	30.0	135.4	58.7	P855	T4	U7	41.26	12	130	3,717.07	10.54	1.19	28.83
J640	206.5	30.0	135.4	58.7	P860	U7	J660	64.72	12	130	3,717.07	10.54	1.87	28.83
J50	144.5	30.0	165.4	58.7	P785	J640	J645	429.15	8	130	-1,376.44	8.79	14.17	33.01
J265	172.8	30.0	166.3	59.1	P1000	J715	J720	606	8	130	-1170.0	7.47	14.80	24.4
J220	142.9	30.0	166.4	59.1	P830	J720	J640	2,045.78	8	130	-1,169.97	7.47	49.98	24.43
J215	0.0	30.0	166.4	59.1	P20	J660	J20	474	15	130	3701.0	6.72	4.57	9.7
J260	0.0	30.0	166.5	59.1	P1105	V3	J25	50	12	130	1804.6	5.12	0.38	7.6
J230	0.0	30.0	166.5	59.2	P25	J20	V3	69	12	130	1804.6	5.12	0.52	7.6
J235	0.0	30.0	166.5	59.2	P765	J665	J670	559.02	12	130	1,687.51	4.79	3.73	6.68
J240	0.0	30.0	166.5	59.2	P925	J25	J665	526.34	12	130	1,687.51	4.79	3.52	6.68
J245	0.0	30.0	166.5	59.2	P930	J670	J605	181.95	12	130	1,687.51	4.79	1.22	6.68
J255	0.0	30.0	166.5	59.2	P1120	J10	J745	3678	12	130	1648.1	4.68	23.51	6.4
J210	0.0	30.0	166.5	59.2	P715	W2	J15	56	12	130	1632.0	4.63	0.35	6.3
J225	0.0	30.0	166.5	59.2	P720	RES2	W2	24	12	130	1632.0	4.63	0.15	6.3
J250	0.0	30.0	166.5	59.2	P1110	J45	V5	69	12	130	1590.9	4.51	0.41	6.0
J270	0.0	30.0	166.5	59.2	P45	V5	J50	192	12	130	1590.9	4.51	1.15	6.0
J295	0.0	30.0	166.5	59.2	P805	J700	J50	539.23	12	130	-1,446.39	4.1	2.71	5.02
J275	0.0	30.0	166.6	59.2	P960	J625	J700	199.06	12	130	-1,446.39	4.1	1	5.02
J280	0.0	30.0	166.6	59.2	P1005	J725	J610	310	12	130	1358.3	3.85	1.39	4.5
J190	149.3	30.0	166.6	59.2	P1010	J730	J725	217	12	130	1358.3	3.85	0.97	4.5
J285	0.0	30.0	166.6	59.2	P770	J675	J730	579.55	12	130	1,358.28	3.85	2.59	4.47
J400	127.0	30.0	166.7	59.2	P935	J605	J675	309.28	12	130	1,358.28	3.85	1.38	4.47
J185	0.0	30.0	166.7	59.2	P800	J690	J695	792.92	12	130	-1,192.22	3.38	2.78	3.51
J160	0.0	30.0	166.8	59.3	P950	J630	J690	170.22	12	130	-1,192.22	3.38	0.6	3.51
J165	0.0	30.0	166.8	59.3	P955	J695	J625	772.89	12	130	-1,192.22	3.38	2.71	3.51
J170	0.0	30.0	166.8	59.3	P30	J20	J30	126	15	130	1819.5	3.30	0.33	2.6
J180	0.0	30.0	166.7	59.3	P795	J635	J685	848.29	12	130	-1,086.63	3.08	2.51	2.96
J195	0.0	30.0	166.7	59.3	P945	J685	J630	214.95	12	130	-1,086.63	3.08	0.64	2.96
J200	0.0	30.0	166.8	59.3	P10	J10	J15	273	15	130	-1648.1	2.99	0.59	2.2
J565	0.0	30.0	166.8	59.3	P775	J610	J680	698.81	12	130	1,055.65	2.99	1.96	2.8
J150	0.0	30.0	166.8	59.3	P940	J680	J615	530.09	12	130	1,055.65	2.99	1.49	2.8
J155	0.0	30.0	166.8	59.3	P1015	J735	J645	94	12	130	942.5	2.67	0.21	2.3
J175	0.0	30.0	166.8	59.3	P790	J635	J735	1,190.78	12	130	942.48	2.67	2.7	2.27
J395	0.0	30.0	166.8	59.3	P35	J35	J30	527	15	130	-1446.1	2.63	0.89	1.7
J560	0.0	30.0	166.8	59.3	P40	J45	J35	707	15	130	-1446.1	2.63	1.20	1.7
J570	0.0	30.0	166.8	59.3	P250	J325	J30	632	8	130	-373.4	2.38	1.86	3.0
J145	0.0	30.0	166.8	59.3	P90	J550	J95	295.87	12	130	828.89	2.35	0.53	1.79
J290	0.0	30.0	166.8	59.3	P660	J110	J535	144	8	130	287.1	1.83	0.26	1.8
J385	0.0	30.0	166.8	59.3	P85	J95	J80	447.26	12	130	600.26	1.7	0.44	0.98
J390	0.0	30.0	166.8	59.3	P100	J550	J110	704	12	130	592.2	1.68	0.68	1.0
J375	0.0	30.0	166.8	59.3	P680	J95	J540	167	8	130	228.6	1.46	0.20	1.2
J380	0.0	30.0	166.8	59.3	P235	J340	J330	103	8	130	-192.7	1.23	0.09	0.9
J405	0.0	30.0	166.8	59.3	P245	J330	J325	186	8	130	-192.7	1.23	0.16	0.9
J140	20.6	30.0	166.9	59.3	P810	J615	J645	1,303.67	12	130	433.96	1.23	0.7	0.54
J370	69.5	30.0	166.9	59.3	P125	J80	J140	463	8	130	184.3	1.18	0.37	0.8
J345	139.3	30.0	166.9	59.3	P410	J200	J205	524	8	130	-185.0	1.18	0.42	0.8
J360	0.0	30.0	166.9	59.3	P255	J325	J320	264	8	130	180.7	1.15	0.20	0.8
J365	0.0	30.0	166.9	59.3	P295	J290	J285	246	8	130	180.7	1.15	0.19	0.8
J305	0.0	30.0	166.9	59.3	P815	J705	J710	815.07	8	130	177.3	1.13	0.6	0.74
J310	0.0	30.0	166.9	59.3	P965	J65	J705	458.75	8	130	177.3	1.13	0.34	0.74
J315	0.0	30.0	166.9	59.3	P970	J710	J650	232.76	8	130	177.3	1.13	0.17	0.74

Wood Rodgers, Inc.
M. Ronco
02/24/2020

SUTTER POINTE SUBDIVISION WATER STUDY
MAX DAY DEMAND WITH FIRE FLOW AT NODE FH130 ULTIMATE

		Junction Report								Pipe Report				
ID	Demand (gpm)	Elevation (ft)	Head (ft)	Pressure (psi)	ID	From Node	To Node	Length (ft)	Diameter (in	Roughness	Flow (gpm)	Velocity (ft/s)	Headloss (ft)	HL/1000 (ft/k-ft)
J355	0.0	30.0	166.9	59.3	P695	J545	J75	182	8	130	176.2	1.12	0.13	0.7
J300	0.0	30.0	166.9	59.3	P310	J260	J265	211	8	130	172.8	1.10	0.15	0.7
J350	0.0	30.0	166.9	59.3	P405	J595	J200	213	8	130	-157.4	1.00	0.13	0.6
J340	0.0	30.0	167.0	59.4	P395	J220	J215	79	8	130	-142.9	0.91	0.04	0.5
J45	0.0	30.0	167.0	59.4	P670	J535	J440	171	8	130	140.9	0.90	0.08	0.5
J485	121.3	30.0	167.0	59.4	P105	J110	J115	202	12	130	305.0	0.87	0.06	0.3
J60	0.0	30.0	167.0	59.4	P110	J115	J125	549	12	130	305.0	0.87	0.15	0.3
J320	0.0	30.0	167.0	59.4	P1125	J745	J615	1363	12	130	-308.1	0.87	0.39	0.3
J480	0.0	30.0	167.0	59.4	P755	J210	J595	192.61	8	130	-135.08	0.86	0.09	0.45
J65	0.0	30.0	167.0	59.4	P230	J340	J345	130	8	130	133.8	0.85	0.06	0.4
J330	0.0	30.0	167.1	59.4	P65	J70	J75	554	15	130	-452.8	0.82	0.11	0.2
J335	0.0	30.0	167.1	59.4	P165	J395	J400	267	8	130	127.0	0.81	0.11	0.4
J410	96.7	30.0	167.1	59.4	P280	J320	J300	186	8	130	124.8	0.80	0.07	0.4
J460	0.0	30.0	167.1	59.4	P665	J535	J530	173	8	130	125.6	0.80	0.07	0.4
J465	0.0	30.0	167.1	59.4	P485	J145	J140	197	8	130	-121.6	0.78	0.07	0.4
J470	0.0	30.0	167.1	59.4	P555	J480	J485	94	8	130	121.3	0.77	0.03	0.4
J475	0.0	30.0	167.1	59.4	P60	J70	J65	489	15	130	423.1	0.77	0.08	0.2
J490	0.0	30.0	167.1	59.4	P320	J285	J280	126	8	130	113.9	0.73	0.04	0.3
J415	0.0	30.0	167.1	59.4	P690	J545	J540	424	8	130	-113.0	0.72	0.14	0.3
J420	0.0	30.0	167.1	59.4	P305	J270	J260	284	8	130	108.9	0.70	0.09	0.3
J425	0.0	30.0	167.1	59.4	P285	J300	J290	429	8	130	108.4	0.69	0.13	0.3
J450	0.0	30.0	167.1	59.4	P750	J580	J585	138.33	6	130	59.3	0.67	0.05	0.4
J520	78.2	30.0	167.1	59.4	P185	J370	J65	463	8	130	-101.0	0.64	0.12	0.3
J555	0.0	30.0	167.1	59.4	P400	J215	J210	632	8	130	-90.6	0.58	0.13	0.2
J70	0.0	30.0	167.1	59.4	P430	J190	J195	540	8	130	-89.2	0.57	0.11	0.2
J455	0.0	30.0	167.1	59.4	P650	J440	J445	242	8	130	88.3	0.56	0.05	0.2
J495	0.0	30.0	167.1	59.4	P180	J370	J375	229	8	130	84.9	0.54	0.04	0.2
J500	0.0	30.0	167.1	59.4	P625	J530	J525	234	8	130	84.3	0.54	0.04	0.2
J430	0.0	30.0	167.1	59.4	P325	J280	J275	126	8	130	80.8	0.52	0.02	0.2
J435	0.0	30.0	167.1	59.4	P585	J480	J490	222	8	130	-81.0	0.52	0.04	0.2
J445	0.0	30.0	167.1	59.4	P155	J385	J395	252	8	130	80.2	0.51	0.04	0.2
J505	0.0	30.0	167.1	59.4	P610	J510	J520	161	8	130	78.2	0.50	0.03	0.2
J510	0.0	30.0	167.1	59.4	P70	J75	J80	344	15	130	-276.6	0.50	0.03	0.1
J515	0.0	30.0	167.1	59.4	P470	J150	J145	84	8	130	-74.0	0.47	0.01	0.2
J205	0.0	30.0	167.2	59.4	P115	J125	J130	332	12	130	163.8	0.46	0.03	0.1
J525	0.0	30.0	167.2	59.4	P290	J290	J305	873	8	130	-72.3	0.46	0.12	0.1
J440	0.0	30.0	167.2	59.4	P345	J295	J255	212	8	130	71.8	0.46	0.03	0.1
J325	0.0	30.0	167.2	59.5	P525	J420	J430	222	8	130	-70.3	0.45	0.03	0.1
J530	0.0	30.0	167.2	59.5	P655	J445	J455	222	8	130	70.6	0.45	0.03	0.1
J75	0.0	30.0	167.2	59.5	P300	J285	J270	716	8	130	66.8	0.43	0.09	0.1
J80	11.3	30.0	167.2	59.5	P120	J130	J135	266	12	130	149.2	0.42	0.02	0.1
J85	0.0	30.0	167.2	59.5	P140	J375	J390	278	8	130	63.6	0.41	0.03	0.1
J90	0.0	30.0	167.2	59.5	P315	J260	J255	562	8	130	-63.9	0.41	0.06	0.1
J130	0.0	30.0	167.3	59.5	P615	J510	J515	154	8	130	-63.5	0.41	0.02	0.1
J135	0.0	30.0	167.3	59.5	P150	J385	J380	254	8	130	-63.4	0.40	0.03	0.1
J535	20.6	30.0	167.3	59.5	P635	J525	J505	222	8	130	62.1	0.40	0.02	0.1
J125	103.9	30.0	167.3	59.5	P685	J540	J545	1245	8	130	63.2	0.40	0.14	0.1
J545	0.0	30.0	167.3	59.5	P210	J360	J355	208	8	130	-58.9	0.38	0.02	0.1
J115	0.0	30.0	167.5	59.6	P225	J350	J340	206	8	130	-58.9	0.38	0.02	0.1
J540	52.4	30.0	167.5	59.6	P420	J180	J185	261	8	130	60.1	0.38	0.03	0.1
J110	0.0	30.0	167.5	59.6	P425	J185	J190	940	8	130	60.1	0.38	0.09	0.1
J95	0.0	30.0	167.7	59.7	P745	J85	J590	140	6	130	32.9	0.37	0.02	0.1
J35	0.0	30.0	168.2	59.9	P260	J320	J305	878	8	130	55.9	0.36	0.08	0.1
J550	0.0	30.0	168.2	59.9	P190	J370	J365	170	8	130	-53.4	0.34	0.01	0.1
J25	117.1	30.0	168.5	60.0	P640	J430	J435	242	8	130	-52.6	0.34	0.02	0.1
J30	0.0	30.0	169.1	60.3	P645	J435	J440	476	8	130	-52.6	0.34	0.04	0.1

SUTTER POINTE SUBDIVISION WATER STUDY
MAX DAY DEMAND WITH FIRE FLOW AT NODE FH130 ULTIMATE

Junction Report					Pipe Report									
ID	Demand (gpm)	Elevation (ft)	Head (ft)	Pressure (psi)	ID	From Node	To Node	Length (ft)	Diameter (in	Roughness	Flow (gpm)	Velocity (ft/s)	Headloss (ft)	HL/1000 (ft/k-ft)
J20	77.0	30.0	169.4	60.4	P825	J90	J205	1,361.18	15	130	185.03	0.34	0.05	0.04
J10	0.0	30.0	173.4	62.1	P355	J235	J215	1451	8	130	52.4	0.33	0.11	0.1
J15	0.0	30.0	174.0	62.4	P205	J360	J365	75	8	130	48.9	0.31	0.00	0.1
J645	0.0	30.0	149.6	64.8	P160	J395	J390	778	8	130	-46.8	0.30	0.05	0.1
FH145	0.0	30.0	149.8	64.9	P465	J195	J145	811	8	130	-47.7	0.30	0.05	0.1
J735	0.0	30.0	149.8	64.9	P590	J490	J495	737	8	130	-47.3	0.30	0.05	0.1
J745	0.0	30.0	149.9	64.9	P600	J495	J505	187	8	130	-47.3	0.30	0.01	0.1
J615	313.6	30.0	150.3	65.1	P475	J160	J155	179	8	130	-45.0	0.29	0.01	0.1
FH155	0.0	30.0	151.8	65.8	P480	J155	J150	281	8	130	-45.0	0.29	0.02	0.1
J680	0.0	30.0	151.8	65.8	P510	J410	J415	252	8	130	-45.1	0.29	0.01	0.1
FH150	0.0	30.0	152.5	66.1	P360	J235	J230	20	8	130	-44.5	0.28	0.00	0.1
J635	144.2	30.0	152.5	66.1	P130	J140	J405	332	8	130	42.1	0.27	0.02	0.1
J610	302.6	30.0	153.7	66.6	P170	J405	J380	164	8	130	43.0	0.27	0.01	0.1
FH95	0.0	30.0	155.0	67.2	P330	J275	J270	464	8	130	42.1	0.27	0.02	0.1
J685	0.0	30.0	155.0	67.2	P460	J160	J195	267	8	130	41.5	0.27	0.01	0.1
FH115	0.0	30.0	155.1	67.2	P820	J135	J90	1,722.88	15	130	149.16	0.27	0.04	0.03
J725	0.0	30.0	155.1	67.2	P1020	J60	J740	249	15	130	144.8	0.26	0.01	0.0
J630	105.6	30.0	155.6	67.4	P50	J740	J45	418	15	130	144.8	0.26	0.01	0.0
FH110	0.0	30.0	156.1	67.6	P55	J65	J60	269	15	130	144.8	0.26	0.01	0.0
J730	0.0	30.0	156.1	67.6	P550	J460	J480	961	8	130	40.4	0.26	0.05	0.1
FH100	0.0	30.0	156.2	67.7	P620	J515	J530	1062	8	130	-41.3	0.26	0.05	0.1
J690	0.0	30.0	156.2	67.7	P340	J275	J295	388	8	130	38.7	0.25	0.02	0.0
FH125	0.0	30.0	158.7	68.7	P515	J415	J420	157	8	130	-39.8	0.25	0.01	0.1
J675	0.0	30.0	158.7	68.7	P545	J450	J460	280	8	130	37.9	0.24	0.01	0.0
FH90	0.0	30.0	159.0	68.9	P675	J125	J575	813	8	130	37.3	0.24	0.03	0.0
J695	0.0	30.0	159.0	68.9	P575	J475	J455	646	8	130	-36.1	0.23	0.03	0.0
J605	329.2	30.0	160.0	69.3	P740	J80	J580	300	15	130	128.1	0.23	0.01	0.0
FH120	0.0	30.0	161.3	69.9	P540	J450	J455	374	8	130	-34.5	0.22	0.01	0.0
J670	0.0	30.0	161.3	69.9	P335	J280	J295	1175	8	130	33.1	0.21	0.04	0.0
J625	254.2	30.0	161.7	70.1	P435	J180	J170	158	8	130	-32.5	0.21	0.01	0.0
FH70	0.0	30.0	162.7	70.5	P580	J475	J490	222	8	130	33.6	0.21	0.01	0.0
J700	0.0	30.0	162.7	70.5	P215	J355	J350	633	8	130	-29.7	0.19	0.02	0.0
FH65	0.0	30.0	165.0	71.5	P220	J350	J355	654	8	130	29.2	0.19	0.02	0.0
J665	0.0	30.0	165.0	71.5	P490	J70	J555	209	8	130	29.7	0.19	0.01	0.0
J650	177.3	30.0	165.9	71.9	P520	J420	J425	235	8	130	30.5	0.19	0.01	0.0
FH80	0.0	30.0	166.1	72.0	P415	J200	J180	180	8	130	27.7	0.18	0.00	0.0
J710	0.0	30.0	166.1	72.0	P440	J170	J175	344	8	130	-29.0	0.18	0.01	0.0
FH10	0.0	30.0	166.3	72.1	P445	J175	J150	713	8	130	-29.0	0.18	0.02	0.0
FH05	0.0	30.0	166.5	72.2	P500	J410	J425	671	8	130	-27.2	0.17	0.02	0.0
J595	0.0	30.0	166.6	72.2	P495	J555	J410	837	8	130	24.4	0.16	0.02	0.0
J600	22.3	30.0	166.6	72.2	P380	J230	J240	285	8	130	-24.0	0.15	0.01	0.0
FH20	0.0	30.0	166.7	72.2	P390	J240	J210	887	8	130	-24.0	0.15	0.02	0.0
FH85	0.0	30.0	166.7	72.2	P630	J525	J515	565	8	130	22.2	0.14	0.01	0.0
J705	0.0	30.0	166.7	72.2	P760	J595	J600	76.98	8	130	22.28	0.14	0	0.02
FH01	0.0	30.0	166.7	72.2	P175	J380	J375	662	8	130	-20.4	0.13	0.01	0.0
FH15	0.0	30.0	166.9	72.3	P365	J230	J225	1191	8	130	-20.6	0.13	0.02	0.0
FH35	0.0	30.0	167.0	72.4	P375	J225	J210	366	8	130	-20.6	0.13	0.01	0.0
FH75	0.0	30.0	167.0	72.4	P75	J580	J85	551.34	15	130	68.79	0.12	0	0.01
J740	0.0	30.0	167.0	72.4	P145	J390	J385	646	8	130	16.8	0.11	0.01	0.0
FH25	0.0	30.0	167.1	72.4	P530	J430	J445	658	8	130	-17.7	0.11	0.01	0.0
FH40	0.0	30.0	167.1	72.4	P265	J305	J310	281	8	130	-16.4	0.10	0.00	0.0
FH55	0.0	30.0	167.2	72.4	P270	J310	J300	278	8	130	-16.4	0.10	0.00	0.0
J585	59.3	30.0	167.2	72.4	P605	J505	J510	314	8	130	14.8	0.09	0.00	0.0
FH60	0.0	30.0	167.2	72.5	P735	J575	J130	544	8	130	-14.7	0.09	0.00	0.0
J590	32.9	30.0	167.2	72.5	P80	J85	J90	653.67	15	130	35.88	0.07	0	0
J580	0.0	30.0	167.2	72.5	P200	J345	J360	852	8	130	-10.0	0.06	0.00	0.0

SUTTER POINTE SUBDIVISION WATER STUDY
MAX DAY DEMAND WITH FIRE FLOW AT NODE FH130 ULTIMATE

Junction Report					Pipe Report									
ID	Demand (gpm)	Elevation (ft)	Head (ft)	Pressure (psi)	ID	From Node	To Node	Length (ft)	Diameter (in	Roughness	Flow (gpm)	Velocity (ft/s)	Headloss (ft)	HL/1000 (ft/k-ft)
FH45	0.0	30.0	167.3	72.5	P350	J255	J235	318	8	130	7.8	0.05	0.00	0.0

SUTTER POINTE SUBDIVISION WATER STUDY
MAX DAY DEMAND WITH FIRE FLOW AT NODE FH50 PHASE 1

		Junction Report								Pipe Report				
ID	Demand (gpm)	Elevation (ft)	Head (ft)	Pressure (psi)	ID	From Node	To Node	Length (ft)	Diameter (in)	Roughness	Flow (gpm)	Velocity (ft/s)	Headloss (ft)	HL/1000 (ft/k-ft)
FH50	3000.0	30.0	112.1	48.6	P730	W1	J550	63	6	130	2088.5	23.70	18.20	290.1
J265	172.8	30.0	127.8	42.4	P725	RES1	W1	30	6	130	2088.5	23.70	8.85	290.1
J190	149.3	30.0	127.7	42.3	P880	FH50	J115	73.34	8	130	-3,000.00	19.15	10.25	139.73
J220	142.9	30.0	127.5	42.2	P715	W2	J15	56	12	130	2449.6	6.95	0.75	13.3
J345	139.3	30.0	129.6	43.2	P720	RES2	W2	24	12	130	2449.6	6.95	0.32	13.3
J400	127.0	30.0	128.7	42.8	P105	J110	J115	202	12	130	2006.9	5.69	1.86	9.2
J485	121.3	30.0	124.8	41.1	P100	J550	J110	704	12	130	1702.1	4.83	4.78	6.8
J125	103.9	30.0	123.8	40.6	P490	J70	J555	209	8	130	621.6	3.97	1.58	7.6
J410	96.7	30.0	126.0	41.6	P250	J325	J30	632	8	130	-593.3	3.79	4.39	7.0
J520	78.2	30.0	124.5	41.0	P20	J660	J20	474	15	130	2036.0	3.70	1.51	3.2
J20	77.0	30.0	134.9	45.5	P840	J15	J655	201.63	15	130	2,035.95	3.7	0.64	3.19
J370	69.5	30.0	129.5	43.1	P845	J655	J660	57.59	15	130	2,035.95	3.7	0.18	3.19
J585	59.3	30.0	128.4	55.6	P30	J20	J30	126	15	130	2001.3	3.63	0.39	3.1
J540	52.4	30.0	128.9	42.9	P120	J130	J135	266	12	130	-1149.0	3.26	0.87	3.3
J575	51.9	30.0	124.1	53.8	P50	J740	J45	418	15	130	-1779.4	3.23	1.04	2.5
J590	32.9	30.0	127.9	55.4	P55	J65	J60	269	15	130	-1779.4	3.23	0.67	2.5
J600	22.3	30.0	127.6	55.3	P1020	J60	J740	249	15	130	-1779.4	3.23	0.62	2.5
J535	20.6	30.0	124.5	41.0	P110	J115	J125	549	12	130	-993.1	2.82	1.37	2.5
J140	20.6	30.0	128.5	42.7	P60	J70	J65	489	15	130	-1517.7	2.76	0.90	1.9
J115	0.0	30.0	122.4	40.0	P115	J125	J130	332	12	130	-964.4	2.74	0.79	2.4
J110	0.0	30.0	124.3	40.8	P40	J45	J35	707	15	130	-1408.0	2.56	1.14	1.6
J130	0.0	30.0	124.6	41.0	P35	J35	J30	527	15	130	-1408.0	2.56	0.85	1.6
J510	0.0	30.0	124.5	41.0	P515	J415	J420	157	8	130	351.4	2.24	0.41	2.6
J515	0.0	30.0	124.6	41.0	P255	J325	J320	264	8	130	331.5	2.12	0.62	2.4
J525	0.0	30.0	124.6	41.0	P295	J290	J285	246	8	130	331.5	2.12	0.58	2.4
J530	0.0	30.0	124.6	41.0	P820	J135	J90	1,722.88	15	130	-1,148.99	2.09	1.9	1.11
J505	0.0	30.0	124.6	41.0	P180	J370	J375	229	8	130	314.6	2.01	0.49	2.1
J495	0.0	30.0	124.6	41.0	P740	J80	J580	300	15	130	1099.4	2.00	0.31	1.0
J500	0.0	30.0	124.6	41.0	P505	J555	J415	837	8	130	311.3	1.99	1.76	2.1
J480	0.0	30.0	124.8	41.1	P495	J555	J410	837	8	130	310.2	1.98	1.75	2.1
J490	0.0	30.0	124.8	41.1	P660	J110	J535	144	8	130	-304.7	1.94	0.29	2.0
J440	0.0	30.0	124.9	41.1	P670	J535	J440	171	8	130	-299.0	1.91	0.33	2.0
J475	0.0	30.0	124.9	41.1	P485	J145	J140	197	8	130	-297.6	1.90	0.38	1.9
J465	0.0	30.0	125.0	41.2	P75	J580	J85	551.34	15	130	1,040.11	1.89	0.51	0.92
J470	0.0	30.0	125.0	41.2	P80	J85	J90	653.67	15	130	1,007.19	1.83	0.57	0.87
J460	0.0	30.0	125.0	41.2	P535	J425	J450	217	8	130	268.5	1.71	0.35	1.6
J445	0.0	30.0	125.0	41.2	P185	J370	J65	463	8	130	-261.6	1.67	0.71	1.5
J455	0.0	30.0	125.0	41.2	P245	J330	J325	186	8	130	-261.7	1.67	0.28	1.5
J435	0.0	30.0	125.1	41.2	P235	J340	J330	103	8	130	-261.7	1.67	0.16	1.5
J450	0.0	30.0	125.2	41.2	P525	J420	J430	222	8	130	256.4	1.64	0.33	1.5
J430	0.0	30.0	125.2	41.3	P65	J70	J75	554	15	130	896.2	1.63	0.39	0.7
J135	0.0	30.0	125.4	41.4	P70	J75	J80	344	15	130	847.3	1.54	0.22	0.6
J425	0.0	30.0	125.5	41.4	P280	J320	J300	186	8	130	229.0	1.46	0.22	1.2
J420	0.0	30.0	125.6	41.4	P320	J285	J280	126	8	130	216.7	1.38	0.14	1.1
J415	0.0	30.0	126.0	41.6	P285	J300	J290	429	8	130	198.9	1.27	0.39	0.9
J90	0.0	30.0	127.3	42.2	P470	J150	J145	84	8	130	-197.0	1.26	0.08	0.9
J205	0.0	30.0	127.4	42.2	P130	J140	J405	332	8	130	-187.6	1.20	0.27	0.8
J215	0.0	30.0	127.5	42.3	P735	J575	J130	544	8	130	-184.7	1.18	0.43	0.8
J200	0.0	30.0	127.6	42.3	P1120	J10	J745	3678	12	130	413.6	1.17	1.82	0.5
J210	0.0	30.0	127.6	42.3	P230	J340	J345	130	8	130	179.0	1.14	0.10	0.8
J225	0.0	30.0	127.6	42.3	P500	J410	J425	671	8	130	173.6	1.11	0.48	0.7
J250	0.0	30.0	127.6	42.3	P310	J260	J265	211	8	130	172.8	1.10	0.15	0.7
J230	0.0	30.0	127.7	42.3	P90	J550	J95	295.87	12	130	386.34	1.1	0.13	0.44
J240	0.0	30.0	127.7	42.3	P85	J95	J80	447.26	12	130	382.8	1.09	0.19	0.43

SUTTER POINTE SUBDIVISION WATER STUDY
MAX DAY DEMAND WITH FIRE FLOW AT NODE FH50 PHASE 1

		Junction Report								Pipe Report				
ID	Demand (gpm)	Elevation (ft)	Head (ft)	Pressure (psi)	ID	From Node	To Node	Length (ft)	Diameter (in)	Roughness	Flow (gpm)	Velocity (ft/s)	Headloss (ft)	HL/1000 (ft/k-ft)
J245	0.0	30.0	127.7	42.3	P435	J180	J170	158	8	130	-168.4	1.08	0.11	0.7
J180	0.0	30.0	127.7	42.3	P305	J270	J260	284	8	130	167.5	1.07	0.19	0.7
J185	0.0	30.0	127.7	42.3	P790	J635	J735	1,190.78	12	130	-371.33	1.05	0.48	0.4
J235	0.0	30.0	127.7	42.3	P795	J635	J685	848.29	12	130	371.33	1.05	0.34	0.4
J555	0.0	30.0	127.7	42.4	P800	J690	J695	792.92	12	130	371.33	1.05	0.32	0.4
J170	0.0	30.0	127.8	42.4	P955	J695	J625	772.89	12	130	371.33	1.05	0.31	0.4
J165	0.0	30.0	127.9	42.4	P805	J700	J50	539.23	12	130	371.33	1.05	0.22	0.4
J175	0.0	30.0	127.9	42.4	P345	J295	J255	212	8	130	164.1	1.05	0.14	0.6
J255	0.0	30.0	127.9	42.4	P945	J685	J630	214.95	12	130	371.33	1.05	0.09	0.4
J260	0.0	30.0	127.9	42.4	P45	V5	J50	192	12	130	-371.3	1.05	0.08	0.4
J560	0.0	30.0	127.9	42.4	P960	J625	J700	199.06	12	130	371.33	1.05	0.08	0.4
J565	0.0	30.0	127.9	42.4	P950	J630	J690	170.22	12	130	371.33	1.05	0.07	0.4
J85	0.0	30.0	127.9	42.4	P1015	J735	J645	94	12	130	-371.3	1.05	0.04	0.4
J160	0.0	30.0	127.9	42.4	P1110	J45	V5	69	12	130	-371.3	1.05	0.03	0.4
J195	0.0	30.0	127.9	42.4	P350	J255	J235	318	8	130	158.7	1.01	0.19	0.6
J155	0.0	30.0	128.0	42.5	P650	J440	J445	242	8	130	-156.3	1.00	0.14	0.6
J570	0.0	30.0	128.0	42.5	P545	J450	J460	280	8	130	152.3	0.97	0.16	0.6
J295	0.0	30.0	128.0	42.5	P415	J200	J180	180	8	130	-148.3	0.95	0.10	0.5
J150	0.0	30.0	128.1	42.5	P1125	J745	J615	1363	12	130	331.5	0.94	0.45	0.3
J270	0.0	30.0	128.1	42.5	P325	J280	J275	126	8	130	146.8	0.94	0.07	0.5
J145	0.0	30.0	128.1	42.5	P410	J200	J205	524	8	130	141.8	0.91	0.26	0.5
J275	0.0	30.0	128.1	42.5	P645	J435	J440	476	8	130	142.7	0.91	0.24	0.5
J280	0.0	30.0	128.2	42.6	P640	J430	J435	242	8	130	142.7	0.91	0.12	0.5
J285	0.0	30.0	128.3	42.6	P395	J220	J215	79	8	130	-142.9	0.91	0.04	0.5
J80	0.0	30.0	128.7	42.8	P580	J475	J490	222	8	130	141.3	0.90	0.11	0.5
J405	0.0	30.0	128.8	42.8	P290	J290	J305	873	8	130	-132.6	0.85	0.38	0.4
J395	0.0	30.0	128.8	42.8	P675	J125	J575	813	8	130	-132.7	0.85	0.35	0.4
J380	0.0	30.0	128.8	42.8	P125	J80	J140	463	8	130	130.7	0.83	0.20	0.4
J385	0.0	30.0	128.8	42.8	P140	J375	J390	278	8	130	129.3	0.83	0.11	0.4
J95	0.0	30.0	128.9	42.9	P810	J615	J645	1,303.67	12	130	289.2	0.82	0.33	0.25
J290	0.0	30.0	128.9	42.9	P430	J190	J195	540	8	130	-129.2	0.82	0.22	0.4
J390	0.0	30.0	128.9	42.9	P165	J395	J400	267	8	130	127.0	0.81	0.11	0.4
J545	0.0	30.0	128.9	42.9	P190	J370	J365	170	8	130	-122.4	0.78	0.06	0.4
J75	0.0	30.0	128.9	42.9	P555	J480	J485	94	8	130	121.3	0.77	0.03	0.4
J375	0.0	30.0	129.0	42.9	P10	J10	J15	273	15	130	-413.6	0.75	0.05	0.2
J550	0.0	30.0	129.0	42.9	P540	J450	J455	374	8	130	116.3	0.74	0.13	0.3
J305	0.0	30.0	129.3	43.0	P300	J285	J270	716	8	130	114.9	0.73	0.24	0.3
J310	0.0	30.0	129.3	43.0	P530	J430	J445	658	8	130	113.7	0.73	0.21	0.3
J315	0.0	30.0	129.3	43.0	P170	J405	J380	164	8	130	-106.9	0.68	0.05	0.3
J300	0.0	30.0	129.3	43.0	P590	J490	J495	737	8	130	104.6	0.67	0.21	0.3
J70	0.0	30.0	129.3	43.0	P175	J380	J375	662	8	130	-104.6	0.67	0.18	0.3
J320	0.0	30.0	129.5	43.1	P480	J155	J150	281	8	130	-104.5	0.67	0.08	0.3
J365	0.0	30.0	129.6	43.2	P475	J160	J155	179	8	130	-104.5	0.67	0.05	0.3
J360	0.0	30.0	129.6	43.2	P600	J495	J505	187	8	130	104.6	0.67	0.05	0.3
J355	0.0	30.0	129.6	43.2	P750	J580	J585	138.33	6	130	59.3	0.67	0.05	0.4
J350	0.0	30.0	129.7	43.2	P260	J320	J305	878	8	130	102.6	0.65	0.24	0.3
J340	0.0	30.0	129.7	43.2	P465	J195	J145	811	8	130	-100.6	0.64	0.21	0.3
J330	0.0	30.0	129.9	43.3	P205	J360	J365	75	8	130	100.6	0.64	0.02	0.3
J335	0.0	30.0	129.9	43.3	P520	J420	J425	235	8	130	95.0	0.61	0.05	0.2
J325	0.0	30.0	130.1	43.4	P340	J275	J295	388	8	130	94.2	0.60	0.09	0.2
J65	0.0	30.0	130.2	43.4	P445	J175	J150	713	8	130	-92.6	0.59	0.16	0.2
J60	0.0	30.0	130.9	43.7	P440	J170	J175	344	8	130	-92.6	0.59	0.08	0.2
J45	0.0	30.0	132.6	44.4	P360	J235	J230	20	8	130	91.1	0.58	0.00	0.2
J50	0.0	30.0	132.7	44.5	P550	J460	J480	961	8	130	84.7	0.54	0.18	0.2

SUTTER POINTE SUBDIVISION WATER STUDY
MAX DAY DEMAND WITH FIRE FLOW AT NODE FH50 PHASE 1

		Junction Report							Pipe Report					
ID	Demand (gpm)	Elevation (ft)	Head (ft)	Pressure (psi)	ID	From Node	To Node	Length (ft)	Diameter (in	Roughness	Flow (gpm)	Velocity (ft/s)	Headloss (ft)	HL/1000 (ft/k-ft)
J35	0.0	30.0	133.7	44.9	P210	J360	J355	208	8	130	-82.7	0.53	0.04	0.2
J30	0.0	30.0	134.5	45.3	P225	J350	J340	206	8	130	-82.7	0.53	0.04	0.2
J25	0.0	30.0	134.9	45.5	P830	J720	J640	2,045.78	8	130	82.12	0.52	0.36	0.18
J10	0.0	30.0	137.2	46.5	P1130	J745	J620	981	8	130	82.1	0.52	0.17	0.2
J15	0.0	30.0	137.3	46.5	P1000	J715	J720	606	8	130	82.1	0.52	0.11	0.2
FH45	0.0	30.0	124.1	53.8	P785	J640	J645	429.15	8	130	82.12	0.52	0.08	0.18
FH40	0.0	30.0	124.5	54.0	P995	J620	J715	307.09	8	130	82.12	0.52	0.05	0.18
FH35	0.0	30.0	124.8	54.1	P135	J405	J375	1346	8	130	-80.7	0.51	0.23	0.2
FH25	0.0	30.0	126.0	54.6	P610	J510	J520	161	8	130	78.2	0.50	0.03	0.2
J595	0.0	30.0	127.6	55.3	P400	J215	J210	632	8	130	-75.3	0.48	0.10	0.2
FH05	0.0	30.0	127.7	55.3	P450	J170	J165	483	8	130	-75.9	0.48	0.07	0.2
FH01	0.0	30.0	127.7	55.3	P455	J165	J160	211	8	130	-75.9	0.48	0.03	0.2
FH10	0.0	30.0	127.8	55.4	P575	J475	J455	646	8	130	-73.7	0.47	0.09	0.2
FH60	0.0	30.0	127.9	55.4	P335	J280	J295	1175	8	130	69.8	0.45	0.16	0.1
FH55	0.0	30.0	128.4	55.6	P355	J235	J215	1451	8	130	67.6	0.43	0.18	0.1
J580	0.0	30.0	128.4	55.6	P160	J395	J390	778	8	130	-66.8	0.43	0.09	0.1
FH20	0.0	30.0	128.7	55.8	P570	J465	J475	295	8	130	67.6	0.43	0.04	0.1
FH30	0.0	30.0	128.9	55.9	P560	J460	J465	222	8	130	67.6	0.43	0.03	0.1
FH15	0.0	30.0	129.6	56.2	P145	J390	J385	646	8	130	62.5	0.40	0.07	0.1
FH80	0.0	30.0	130.2	56.4	P155	J385	J395	252	8	130	60.2	0.38	0.03	0.1
FH85	0.0	30.0	130.2	56.4	P745	J85	J590	140	6	130	32.9	0.37	0.02	0.1
J650	0.0	30.0	130.2	56.4	P605	J505	J510	314	8	130	54.1	0.35	0.03	0.1
J705	0.0	30.0	130.2	56.4	P330	J275	J270	464	8	130	52.6	0.34	0.04	0.1
J710	0.0	30.0	130.2	56.4	P635	J525	J505	222	8	130	-50.5	0.32	0.02	0.1
FH75	0.0	30.0	131.5	57.0	P390	J240	J210	887	8	130	49.0	0.31	0.06	0.1
J740	0.0	30.0	131.5	57.0	P380	J230	J240	285	8	130	49.0	0.31	0.02	0.1
FH70	0.0	30.0	132.9	57.6	P695	J545	J75	182	8	130	-48.9	0.31	0.01	0.1
J700	0.0	30.0	132.9	57.6	P365	J230	J225	1191	8	130	42.1	0.27	0.06	0.1
J625	0.0	30.0	133.0	57.6	P215	J355	J350	633	8	130	-41.7	0.27	0.03	0.1
FH90	0.0	30.0	133.3	57.8	P375	J225	J210	366	8	130	42.1	0.27	0.02	0.1
J695	0.0	30.0	133.3	57.8	P655	J445	J455	222	8	130	-42.6	0.27	0.01	0.1
FH100	0.0	30.0	133.6	57.9	P220	J350	J355	654	8	130	41.0	0.26	0.03	0.1
J690	0.0	30.0	133.6	57.9	P825	J90	J205	1,361.18	15	130	-141.8	0.26	0.03	0.02
J630	0.0	30.0	133.7	57.9	P510	J410	J415	252	8	130	40.0	0.26	0.01	0.1
FH95	0.0	30.0	133.8	58.0	P585	J480	J490	222	8	130	-36.7	0.23	0.01	0.0
J685	0.0	30.0	133.8	58.0	P625	J530	J525	234	8	130	-31.0	0.20	0.01	0.0
FH150	0.0	30.0	134.1	58.1	P690	J545	J540	424	8	130	31.3	0.20	0.01	0.0
J635	0.0	30.0	134.1	58.1	P265	J305	J310	281	8	130	-30.1	0.19	0.01	0.0
FH145	0.0	30.0	134.6	58.3	P270	J310	J300	278	8	130	-30.1	0.19	0.01	0.0
J735	0.0	30.0	134.6	58.3	P460	J160	J195	267	8	130	28.6	0.18	0.01	0.0
J645	0.0	30.0	134.6	58.3	P665	J535	J530	173	8	130	-26.4	0.17	0.00	0.0
FH140	0.0	30.0	134.7	58.4	P615	J510	J515	154	8	130	-24.2	0.15	0.00	0.0
J640	0.0	30.0	134.7	58.4	P195	J365	J345	1866	8	130	-21.8	0.14	0.03	0.0
FH65	0.0	30.0	134.9	58.5	P760	J595	J600	76.98	8	130	22.28	0.14	0	0.02
J665	0.0	30.0	134.9	58.5	P425	J185	J190	940	8	130	20.1	0.13	0.01	0.0
FH110	0.0	30.0	134.9	58.5	P420	J180	J185	261	8	130	20.1	0.13	0.00	0.0
FH115	0.0	30.0	134.9	58.5	P630	J525	J515	565	8	130	19.6	0.12	0.01	0.0
FH120	0.0	30.0	134.9	58.5	P775	J610	J680	698.81	12	130	-42.3	0.12	0.01	0.01
FH125	0.0	30.0	134.9	58.5	P1005	J725	J610	310	12	130	-42.3	0.12	0.00	0.0
FH155	0.0	30.0	135.0	58.5	P1010	J730	J725	217	12	130	-42.3	0.12	0.00	0.0
J605	0.0	30.0	134.9	58.5	P1105	V3	J25	50	12	130	-42.3	0.12	0.00	0.0
J610	0.0	30.0	134.9	58.5	P25	J20	V3	69	12	130	-42.3	0.12	0.00	0.0
J615	0.0	30.0	135.0	58.5	P765	J665	J670	559.02	12	130	-42.3	0.12	0	0.01
J670	0.0	30.0	134.9	58.5	P770	J675	J730	579.55	12	130	-42.3	0.12	0	0.01

SUTTER POINTE SUBDIVISION WATER STUDY
MAX DAY DEMAND WITH FIRE FLOW AT NODE FH50 PHASE 1

Junction Report					Pipe Report										
ID	Demand (gpm)	Elevation (ft)	Head (ft)	Pressure (psi)	ID	From Node	To Node	Length (ft)	Diameter (in	Roughness	Flow (gpm)	Velocity (ft/s)	Headloss (ft)	HL/1000 (ft/k-ft)
J675	0.0	30.0	134.9	58.5	P925	J25	J665	526.34	12	130	-42.3	0.12	0	0.01
J680	0.0	30.0	135.0	58.5	P930	J670	J605	181.95	12	130	-42.3	0.12	0	0.01
J725	0.0	30.0	134.9	58.5	P935	J605	J675	309.28	12	130	-42.3	0.12	0	0.01
J730	0.0	30.0	134.9	58.5	P940	J680	J615	530.09	12	130	-42.3	0.12	0	0.01
FH135	0.0	30.0	135.1	58.5	P200	J345	J360	852	8	130	17.9	0.11	0.01	0.0
J720	0.0	30.0	135.1	58.5	P685	J540	J545	1245	8	130	-17.6	0.11	0.01	0.0
FH130	0.0	30.0	135.2	58.6	P755	J210	J595	192.61	8	130	15.78	0.1	0	0.01

SUTTER POINTE SUBDIVISION WATER STUDY
PEAK HOUR DEMAND MODEL RESULTS ULTIMATE

Junction Report					Pipe Report										
ID	Demand (gpm)	Elevation (ft)	Head (ft)	Pressure (psi)	ID	From Node	To Node	Length (ft)	Diameter (in)	Roughness	Flow (gpm)	Velocity (ft/s)	Headloss (ft)	HL/1000 (ft/k-ft)
J265	328.4	30.0	155.0	54.2	P725	RES1	W1	30	6	130.00	1598.2	18.13	5.39	176.7
J220	271.5	30.0	155.2	54.3	P730	W1	J550	63	6	130.00	1598.2	18.13	11.09	176.7
J215	0.0	30.0	155.4	54.3	P855	T4	U7	41.26	12	130	3,828.48	10.86	1.26	30.46
J260	0.0	30.0	155.5	54.4	P860	U7	J660	64.72	12	130	3,828.48	10.86	1.97	30.46
J230	0.0	30.0	155.7	54.5	P20	J660	J20	474	15	130	4422.8	8.03	6.36	13.4
J235	0.0	30.0	155.7	54.5	P30	J20	J30	126	15	130	2727.3	4.95	0.69	5.5
J255	0.0	30.0	155.7	54.5	P715	W2	J15	56	12	130	1736.6	4.93	0.40	7.0
J240	0.0	30.0	155.8	54.5	P720	RES2	W2	24	12	130	1736.6	4.93	0.17	7.0
J245	0.0	30.0	155.8	54.5	P1105	V3	J25	50	12	130	1549.3	4.39	0.29	5.7
J210	0.0	30.0	155.8	54.5	P25	J20	V3	69	12	130	1549.3	4.39	0.39	5.7
J225	0.0	30.0	155.8	54.5	P250	J325	J30	632	8	130	-637.2	4.07	5.01	7.9
J250	0.0	30.0	155.8	54.5	P35	J35	J30	527	15	130	-2090.1	3.79	1.76	3.4
J270	0.0	30.0	155.8	54.5	P40	J45	J35	707	15	130	-2090.1	3.79	2.37	3.4
J295	0.0	30.0	155.8	54.5	P765	J665	J670	559.02	12	130	1,326.84	3.76	2.39	4.28
J275	0.0	30.0	155.9	54.5	P925	J25	J665	526.34	12	130	1,326.84	3.76	2.25	4.28
J280	0.0	30.0	155.9	54.6	P930	J670	J605	181.95	12	130	1,326.84	3.76	0.78	4.28
J285	0.0	30.0	156.1	54.6	P1110	J45	V5	69	12	130	1191.1	3.38	0.24	3.5
J190	283.7	30.0	156.2	54.7	P45	V5	J50	192	12	130	1191.1	3.38	0.67	3.5
J400	241.3	30.0	156.4	54.8	P1120	J10	J745	3678	12	130	1142.3	3.24	11.93	3.2
J185	0.0	30.0	156.5	54.8	P805	J700	J50	539.23	12	130	-916.64	2.6	1.16	2.16
J180	0.0	30.0	156.5	54.8	P960	J625	J700	199.06	12	130	-916.64	2.6	0.43	2.16
J195	0.0	30.0	156.5	54.8	P90	J550	J95	295.87	12	130	879.31	2.49	0.59	2
J200	0.0	30.0	156.5	54.8	P660	J110	J535	144	8	130	377.0	2.41	0.43	3.0
J160	0.0	30.0	156.6	54.8	P1125	J745	J615	1363	12	130	794.0	2.25	2.25	1.7
J165	0.0	30.0	156.6	54.8	P1130	J745	J620	981	8	130	348.2	2.22	2.54	2.6
J170	0.0	30.0	156.6	54.8	P255	J325	J320	264	8	130	337.3	2.15	0.64	2.4
J565	0.0	30.0	156.6	54.8	P295	J290	J285	246	8	130	337.3	2.15	0.60	2.4
J155	0.0	30.0	156.6	54.9	P815	J705	J710	815.07	8	130	336.86	2.15	1.98	2.43
J175	0.0	30.0	156.6	54.9	P965	J65	J705	458.75	8	130	336.86	2.15	1.12	2.43
J560	0.0	30.0	156.6	54.9	P970	J710	J650	232.76	8	130	336.86	2.15	0.57	2.43
J570	0.0	30.0	156.6	54.9	P125	J80	J140	463	8	130	332.6	2.12	1.10	2.4
J150	0.0	30.0	156.7	54.9	P410	J200	J205	524	8	130	-332.6	2.12	1.25	2.4
J290	0.0	30.0	156.7	54.9	P310	J260	J265	211	8	130	328.4	2.10	0.49	2.3
J145	0.0	30.0	156.7	54.9	P10	J10	J15	273	15	130	-1142.3	2.07	0.30	1.1
J395	0.0	30.0	156.8	54.9	P100	J550	J110	704	12	130	718.9	2.04	0.97	1.4
J385	0.0	30.0	156.9	55.0	P1005	J725	J610	310	12	130	701.3	1.99	0.41	1.3
J390	0.0	30.0	156.9	55.0	P1010	J730	J725	217	12	130	701.3	1.99	0.29	1.3
J380	0.0	30.0	157.0	55.0	P770	J675	J730	579.55	12	130	701.31	1.99	0.76	1.31
J405	0.0	30.0	157.0	55.0	P935	J605	J675	309.28	12	130	701.31	1.99	0.41	1.31
J140	39.2	30.0	157.0	55.0	P405	J595	J200	213	8	130	-305.0	1.95	0.43	2.0
J375	0.0	30.0	157.0	55.0	P185	J370	J65	463	8	130	-300.7	1.92	0.91	2.0
J300	0.0	30.0	157.1	55.1	P235	J340	J330	103	8	130	-300.0	1.91	0.20	2.0
J305	0.0	30.0	157.1	55.1	P245	J330	J325	186	8	130	-300.0	1.91	0.37	2.0
J310	0.0	30.0	157.1	55.1	P785	J640	J645	429.15	8	130	-283.7	1.81	0.76	1.77
J315	0.0	30.0	157.1	55.1	P85	J95	J80	447.26	12	130	623.63	1.77	0.47	1.06
J485	230.5	30.0	157.2	55.1	P395	J220	J215	79	8	130	-271.5	1.73	0.13	1.6
J345	264.7	30.0	157.2	55.1	P755	J210	J595	192.61	8	130	-262.67	1.68	0.3	1.54
J365	0.0	30.0	157.3	55.1	P1020	J60	J740	249	15	130	-899.0	1.63	0.17	0.7
J370	132.0	30.0	157.3	55.1	P485	J145	J140	197	8	130	-256.1	1.63	0.29	1.5
J360	0.0	30.0	157.3	55.2	P50	J740	J45	418	15	130	-899.0	1.63	0.29	0.7
J320	0.0	30.0	157.3	55.2	P55	J65	J60	269	15	130	-899.0	1.63	0.19	0.7
J355	0.0	30.0	157.3	55.2	P680	J95	J540	167	8	130	255.7	1.63	0.24	1.5
J480	0.0	30.0	157.3	55.2	P165	J395	J400	267	8	130	241.3	1.54	0.35	1.3
J350	0.0	30.0	157.3	55.2	P280	J320	J300	186	8	130	232.9	1.49	0.23	1.2

SUTTER POINTE SUBDIVISION WATER STUDY
PEAK HOUR DEMAND MODEL RESULTS ULTIMATE

Junction Report					Pipe Report										
ID	Demand (gpm)	Elevation (ft)	Head (ft)	Pressure (psi)	ID	From Node	To Node	Length (ft)	Diameter (in)	Roughness	Flow (gpm)	Velocity (ft/s)	Headloss (ft)	HL/1000 (ft/k-ft)
J340	0.0	30.0	157.4	55.2	P555	J480	J485	94	8	130	230.5	1.47	0.11	1.2
J520	148.7	30.0	157.4	55.2	P490	J70	J555	209	8	130	225.0	1.44	0.24	1.2
J490	0.0	30.0	157.4	55.2	P230	J340	J345	130	8	130	215.2	1.37	0.14	1.1
J495	0.0	30.0	157.5	55.2	P320	J285	J280	126	8	130	212.1	1.35	0.13	1.0
J500	0.0	30.0	157.5	55.2	P305	J270	J260	284	8	130	205.3	1.31	0.28	1.0
J510	0.0	30.0	157.5	55.2	P180	J370	J375	229	8	130	203.9	1.30	0.22	1.0
J460	0.0	30.0	157.5	55.2	P285	J300	J290	429	8	130.00	202.4	1.29	0.41	1.0
J465	0.0	30.0	157.5	55.2	P750	J580	J585	138.33	6	130	112.67	1.28	0.18	1.3
J470	0.0	30.0	157.5	55.2	P665	J535	J530	173	8	130	195.4	1.25	0.15	0.9
J475	0.0	30.0	157.5	55.2	P800	J690	J695	792.92	12	130	-433.73	1.23	0.43	0.54
J505	0.0	30.0	157.5	55.2	P950	J630	J690	170.22	12	130	-433.73	1.23	0.09	0.54
J515	0.0	30.0	157.5	55.3	P955	J695	J625	772.89	12	130	-433.73	1.23	0.42	0.54
J525	0.0	30.0	157.5	55.3	P400	J215	J210	632	8	130	-172.8	1.10	0.45	0.7
J330	0.0	30.0	157.6	55.3	P430	J190	J195	540	8	130	-171.9	1.10	0.38	0.7
J335	0.0	30.0	157.6	55.3	P840	J15	J655	201.63	15	130	594.36	1.08	0.07	0.33
J450	0.0	30.0	157.6	55.3	P845	J655	J660	57.59	15	130	594.36	1.08	0.02	0.33
J455	0.0	30.0	157.6	55.3	P470	J150	J145	84	8	130	-158.7	1.01	0.05	0.6
J410	183.6	30.0	157.6	55.3	P695	J545	J75	182	8	130	156.0	1.00	0.11	0.6
J425	0.0	30.0	157.6	55.3	P105	J110	J115	202	12	130	341.8	0.97	0.07	0.4
J530	0.0	30.0	157.6	55.3	P110	J115	J125	549	12	130	341.8	0.97	0.19	0.4
J415	0.0	30.0	157.7	55.3	P155	J385	J395	252	8	130	151.3	0.97	0.14	0.6
J420	0.0	30.0	157.6	55.3	P325	J280	J275	126	8	130	150.9	0.96	0.07	0.6
J430	0.0	30.0	157.7	55.3	P610	J510	J520	161	8	130	148.7	0.95	0.09	0.5
J445	0.0	30.0	157.6	55.3	P585	J480	J490	222	8	130	-146.1	0.93	0.12	0.5
J435	0.0	30.0	157.7	55.3	P810	J615	J645	1,303.67	12	130	324.48	0.92	0.41	0.32
J440	0.0	30.0	157.7	55.3	P670	J535	J440	171	8	130.00	142.5	0.91	0.08	0.5
J205	0.0	30.0	157.8	55.4	P290	J290	J305	873	8	130	-134.9	0.86	0.39	0.5
J535	39.2	30.0	157.8	55.4	P345	J295	J255	212	8	130	132.0	0.84	0.09	0.4
J50	274.5	30.0	157.9	55.4	P740	J80	J580	300	15	130	462.2	0.84	0.06	0.2
J555	0.0	30.0	157.9	55.4	P625	J530	J525	234	8	130	130.3	0.83	0.10	0.4
J90	0.0	30.0	157.9	55.4	P140	J375	J390	278	8	130	125.8	0.80	0.11	0.4
J125	197.5	30.0	158.0	55.4	P300	J285	J270	716	8	130	125.2	0.80	0.28	0.4
J130	0.0	30.0	157.9	55.4	P315	J260	J255	562	8	130	-123.1	0.79	0.21	0.4
J135	0.0	30.0	157.9	55.4	P150	J385	J380	254	8	130	-115.4	0.74	0.09	0.3
J325	0.0	30.0	158.0	55.4	P495	J555	J410	837	8	130	116.7	0.74	0.29	0.3
J85	0.0	30.0	158.0	55.5	P420	J180	J185	261	8	130	111.8	0.71	0.08	0.3
J80	21.4	30.0	158.1	55.5	P425	J185	J190	940	8	130	111.8	0.71	0.30	0.3
J70	0.0	30.0	158.1	55.5	P745	J85	J590	140	6	130	62.5	0.71	0.06	0.4
J75	0.0	30.0	158.1	55.5	P1000	J715	J720	606	8	130	108.6	0.69	0.18	0.3
J115	0.0	30.0	158.2	55.5	P505	J555	J415	837	8	130	108.3	0.69	0.25	0.3
J65	0.0	30.0	158.2	55.5	P545	J450	J460	280	8	130	107.4	0.69	0.08	0.3
J110	0.0	30.0	158.2	55.6	P830	J720	J640	2,045.78	8	130	108.6	0.69	0.61	0.3
J545	0.0	30.0	158.2	55.6	P995	J620	J715	307.09	8	130	108.6	0.69	0.09	0.3
J540	99.6	30.0	158.4	55.6	P260	J320	J305	878	8	130	104.4	0.67	0.24	0.3
J60	0.0	30.0	158.4	55.6	P655	J445	J455	222	8	130	105.6	0.67	0.06	0.3
J95	0.0	30.0	158.6	55.7	P615	J510	J515	154	8	130	-103.6	0.66	0.04	0.3
J45	0.0	30.0	158.8	55.8	P795	J635	J685	848.29	12	130	-233.1	0.66	0.14	0.17
J550	0.0	30.0	159.2	56.0	P945	J685	J630	214.95	12	130	-233.1	0.66	0.04	0.17
J35	0.0	30.0	161.2	56.9	P690	J545	J540	424	8	130	-100.1	0.64	0.11	0.3
J30	0.0	30.0	163.0	57.6	P355	J235	J215	1451	8	130	98.8	0.63	0.36	0.3
J25	222.4	30.0	163.0	57.6	P580	J475	J490	222	8	130	99.4	0.63	0.06	0.3
J20	146.2	30.0	163.7	57.9	P75	J580	J85	551	15	130	349.5	0.63	0.07	0.1
J10	0.0	30.0	169.8	60.6	P465	J195	J145	811	8	130	-97.4	0.62	0.20	0.2
J15	0.0	30.0	170.1	60.7	P475	J160	J155	179	8	130	-95.1	0.61	0.04	0.2

Wood Rodgers, Inc.
M. Ronco
08/23/2019

SUTTER POINTE SUBDIVISION WATER STUDY
PEAK HOUR DEMAND MODEL RESULTS ULTIMATE

Junction Report					Pipe Report										
ID	Demand (gpm)	Elevation (ft)	Head (ft)	Pressure (psi)	ID	From Node	To Node	Length (ft)	Diameter (in)	Roughness	Flow (gpm)	Velocity (ft/s)	Headloss (ft)	HL/1000 (ft/k-ft)
FH140	0.0	30.0	154.5	66.9	P480	J155	J150	281	8	130	-95.1	0.61	0.07	0.2
J640	392.3	30.0	154.5	66.9	P825	J90	J205	1,361.18	15	130	332.64	0.6	0.15	0.11
J650	336.9	30.0	154.5	67.0	P635	J525	J505	222	8	130	91.7	0.59	0.05	0.2
FH10	0.0	30.0	155.0	67.2	P650	J440	J445	242	8	130	92.8	0.59	0.05	0.2
FH135	0.0	30.0	155.1	67.2	P160	J395	J390	778	8	130	-90.0	0.57	0.16	0.2
FH80	0.0	30.0	155.1	67.2	P360	J235	J230	20	8	130	-89.9	0.57	0.00	0.2
J710	0.0	30.0	155.1	67.2	P210	J360	J355	208	8	130	-84.8	0.54	0.04	0.2
J720	0.0	30.0	155.1	67.2	P225	J350	J340	206	8	130	-84.8	0.54	0.04	0.2
FH145	0.0	30.0	155.2	67.3	P435	J180	J170	158	8	130	-84.1	0.54	0.03	0.2
FH150	0.0	30.0	155.2	67.3	P550	J460	J480	961	8	130	84.4	0.54	0.18	0.2
J635	273.9	30.0	155.2	67.3	P80	J85	J90	653.67	15	130	286.95	0.52	0.06	0.08
J645	0.0	30.0	155.2	67.3	P330	J275	J270	464	8	130	80.1	0.51	0.08	0.2
J735	0.0	30.0	155.2	67.3	P535	J425	J450	217	8	130	78.2	0.50	0.04	0.2
FH130	0.0	30.0	155.2	67.3	P575	J475	J455	646	8	130	-76.4	0.49	0.10	0.2
J715	0.0	30.0	155.2	67.3	P460	J160	J195	267	8	130	74.6	0.48	0.04	0.2
FH95	0.0	30.0	155.4	67.3	P510	J410	J415	252	8	130	-73.7	0.47	0.04	0.2
J620	239.6	30.0	155.3	67.3	P60	J70	J65	489	15	130	-261.4	0.47	0.03	0.1
J685	0.0	30.0	155.4	67.3	P520	J420	J425	235	8	130	71.4	0.46	0.03	0.1
J630	200.6	30.0	155.4	67.3	P340	J275	J295	388	8	130	70.7	0.45	0.05	0.1
FH100	0.0	30.0	155.5	67.4	P620	J515	J530	1062	8	130	-65.1	0.42	0.12	0.1
J690	0.0	30.0	155.5	67.4	P170	J405	J380	164	8	130	64.3	0.41	0.02	0.1
J615	595.9	30.0	155.6	67.4	P440	J170	J175	344	8	130	-63.6	0.41	0.04	0.1
FH155	0.0	30.0	155.7	67.4	P445	J175	J150	713	8	130	-63.6	0.41	0.08	0.1
J680	0.0	30.0	155.7	67.4	P335	J280	J295	1175	8	130	61.3	0.39	0.12	0.1
J610	575.0	30.0	155.7	67.5	P685	J540	J545	1245	8	130	55.9	0.36	0.11	0.1
FH05	0.0	30.0	155.8	67.5	P775	J610	J680	698.81	12	130	126.3	0.36	0.04	0.05
FH90	0.0	30.0	155.9	67.6	P940	J680	J615	530.09	12	130	126.3	0.36	0.03	0.05
J695	0.0	30.0	155.9	67.6	P70	J75	J80	344	15	130	192.5	0.35	0.01	0.0
FH115	0.0	30.0	156.1	67.6	P205	J360	J365	75	8	130	53.2	0.34	0.01	0.1
J595	0.0	30.0	156.1	67.6	P175	J380	J375	662	8	130	-51.2	0.33	0.05	0.1
J600	42.3	30.0	156.1	67.6	P735	J575	J130	544	8	130	-51.4	0.33	0.04	0.1
J725	0.0	30.0	156.1	67.6	P640	J430	J435	242	8	130	-49.6	0.32	0.02	0.1
J625	482.9	30.0	156.3	67.7	P645	J435	J440	476	8	130	-49.6	0.32	0.03	0.1
FH110	0.0	30.0	156.4	67.8	P380	J230	J240	285	8	130	-48.4	0.31	0.02	0.1
J730	0.0	30.0	156.4	67.8	P390	J240	J210	887	8	130	-48.4	0.31	0.06	0.1
FH20	0.0	30.0	156.4	67.8	P590	J490	J495	737	8	130	-46.7	0.30	0.05	0.1
FH01	0.0	30.0	156.5	67.8	P600	J495	J505	187	8	130	-46.7	0.30	0.01	0.1
FH70	0.0	30.0	156.8	67.9	P675	J125	J575	813	8	130	47.2	0.30	0.05	0.1
J700	0.0	30.0	156.8	67.9	P605	J505	J510	314	8	130	45.0	0.29	0.02	0.1
FH85	0.0	30.0	157.1	68.1	P115	J125	J130	332	12	130	97.1	0.28	0.01	0.0
J705	0.0	30.0	157.1	68.1	P215	J355	J350	633	8	130	-42.8	0.27	0.03	0.1
FH125	0.0	30.0	157.1	68.1	P220	J350	J355	654	8	130	42.0	0.27	0.03	0.1
J675	0.0	30.0	157.1	68.1	P760	J595	J600	76.98	8	130	42.33	0.27	0	0.05
FH35	0.0	30.0	157.2	68.1	P365	J230	J225	1191	8	130	-41.5	0.26	0.06	0.1
FH15	0.0	30.0	157.3	68.2	P375	J225	J210	366	8	130	-41.5	0.26	0.02	0.1
FH40	0.0	30.0	157.4	68.2	P630	J525	J515	565	8	130	38.6	0.25	0.02	0.0
J605	625.5	30.0	157.6	68.3	P130	J140	J405	332	8	130	37.3	0.24	0.01	0.0
FH25	0.0	30.0	157.7	68.3	P525	J420	J430	222	8	130	-36.9	0.24	0.01	0.0
FH55	0.0	30.0	157.9	68.4	P145	J390	J385	646	8	130	35.9	0.23	0.02	0.0
J585	112.7	30.0	157.9	68.4	P190	J370	J365	170	8	130	-35.3	0.23	0.01	0.0
J745	0.0	30.0	157.9	68.4	P515	J415	J420	157	8	130	34.6	0.22	0.01	0.0
FH45	0.0	30.0	157.9	68.4	P200	J345	J360	852	8	130	-31.6	0.20	0.03	0.0
J575	98.7	30.0	157.9	68.4	P265	J305	J310	281	8	130	-30.6	0.20	0.01	0.0
FH60	0.0	30.0	157.9	68.4	P270	J310	J300	278	8	130	-30.6	0.20	0.01	0.0

Wood Rodgers, Inc.
M. Ronco
08/23/2019

SUTTER POINTE SUBDIVISION WATER STUDY
PEAK HOUR DEMAND MODEL RESULTS ULTIMATE

Junction Report					Pipe Report									
ID	Demand (gpm)	Elevation (ft)	Head (ft)	Pressure (psi)	ID	From Node	To Node	Length (ft)	iameter (ir	Roughness	Flow (gpm)	Velocity (ft/s)	Headloss (ft)	HL/1000 (ft/k-ft)
J590	62.5	30.0	157.9	68.4	P540	J450	J455	374	8	130	-29.2	0.19	0.01	0.0
J580	0.0	30.0	158.1	68.5	P415	J200	J180	180	8	130	27.6	0.18	0.00	0.0
FH50	0.0	30.0	158.2	68.5	P135	J405	J375	1346	8	130	-27.0	0.17	0.03	0.0
FH120	0.0	30.0	158.3	68.6	P560	J460	J465	222	8	130	23.0	0.15	0.00	0.0
J670	0.0	30.0	158.3	68.6	P570	J465	J475	295	8	130	23.0	0.15	0.00	0.0
FH30	0.0	30.0	158.4	68.6	P120	J130	J135	266	12	130.00	45.7	0.13	0.00	0.0
FH75	0.0	30.0	158.5	68.7	P450	J170	J165	483	8	130	-20.5	0.13	0.01	0.0

Wood Rodgers, Inc.
M. Ronco
02/24/2020

SUTTER POINTE SUBDIVISION WATER STUDY
PEAK HOUR DEMAND MODEL RESULTS PHASE 1

Junction Report					Pipe Report									
ID	Demand (gpm)	Elevation (ft)	Head (ft)	Pressure (psi)	ID	From Node	To Node	Length (ft)	Diameter (in	Roughness	Flow (gpm)	Velocity (ft/s)	Headloss (ft)	HL/1000 (ft/k-ft)
J265	328.4	30.0	168.1	59.9	P725	RES1	W1	30	6	130	1330.5	15.10	3.84	125.9
J220	271.5	30.0	168.4	60.0	P730	W1	J550	63	6	130	1330.5	15.10	7.90	125.9
J215	0.0	30.0	168.5	60.0	P715	W2	J15	56	12	130	1591.8	4.52	0.34	6.0
J260	0.0	30.0	168.6	60.1	P720	RES2	W2	24	12	130	1591.8	4.52	0.14	6.0
J255	0.0	30.0	168.9	60.2	P250	J325	J30	632	8	130	-485.0	3.10	3.02	4.8
J230	0.0	30.0	168.9	60.2	P20	J660	J20	474	15	130	1591.8	2.89	0.96	2.0
J235	0.0	30.0	168.9	60.2	P840	J15	J655	201.63	15	130	1,591.81	2.89	0.41	2.02
J270	0.0	30.0	168.9	60.2	P845	J655	J660	57.59	15	130	1,591.81	2.89	0.12	2.02
J240	0.0	30.0	168.9	60.2	P30	J20	J30	126	15	130	1445.6	2.62	0.21	1.7
J245	0.0	30.0	168.9	60.2	P185	J370	J65	463	8	130	-390.6	2.49	1.48	3.2
J295	0.0	30.0	168.9	60.2	P125	J80	J140	463	8	130	370.7	2.37	1.35	2.9
J225	0.0	30.0	169.0	60.2	P410	J200	J205	524	8	130	-356.8	2.28	1.42	2.7
J250	0.0	30.0	169.0	60.2	P660	J110	J535	144	8	130	345.4	2.20	0.37	2.6
J275	0.0	30.0	169.0	60.2	P405	J595	J200	213	8	130	-335.8	2.14	0.52	2.4
J210	0.0	30.0	169.0	60.2	P310	J260	J265	211	8	130	328.4	2.10	0.49	2.3
J280	0.0	30.0	169.0	60.2	P90	J550	J95	295.87	12	130	696.9	1.98	0.38	1.3
J285	0.0	30.0	169.1	60.3	P255	J325	J320	264	8	130	306.5	1.96	0.54	2.0
J190	283.7	30.0	169.5	60.4	P295	J290	J285	246	8	130	306.5	1.96	0.50	2.0
J290	0.0	30.0	169.6	60.5	P755	J210	J595	192.61	8	130	-293.44	1.87	0.36	1.89
J400	241.3	30.0	169.7	60.5	P100	J550	J110	704	12	130	633.6	1.80	0.77	1.1
J185	0.0	30.0	169.8	60.6	P1020	J60	J740	249	15	130	-960.6	1.74	0.20	0.8
J180	0.0	30.0	169.9	60.6	P35	J35	J30	527	15	130	-960.6	1.74	0.42	0.8
J200	0.0	30.0	169.9	60.6	P40	J45	J35	707	15	130	-960.6	1.74	0.56	0.8
J195	0.0	30.0	169.9	60.6	P50	J740	J45	418	15	130	-960.6	1.74	0.33	0.8
J160	0.0	30.0	169.9	60.6	P55	J65	J60	269	15	130	-960.6	1.74	0.21	0.8
J165	0.0	30.0	169.9	60.6	P395	J220	J215	79	8	130	-271.5	1.73	0.13	1.6
J170	0.0	30.0	169.9	60.6	P485	J145	J140	197	8	130	-262.7	1.68	0.30	1.5
J565	0.0	30.0	169.9	60.6	P490	J70	J555	209	8	130	256.6	1.64	0.31	1.5
J155	0.0	30.0	170.0	60.6	P165	J395	J400	267	8	130	241.3	1.54	0.35	1.3
J175	0.0	30.0	169.9	60.6	P555	J480	J485	94	8	130	230.5	1.47	0.11	1.2
J300	0.0	30.0	170.0	60.6	P85	J95	J80	447.26	12	130	496.15	1.41	0.31	0.69
J305	0.0	30.0	169.9	60.6	P280	J320	J300	186	8	130	211.7	1.35	0.19	1.0
J310	0.0	30.0	170.0	60.6	P680	J95	J540	167	8	130	200.7	1.28	0.16	0.9
J315	0.0	30.0	170.0	60.6	P750	J580	J585	138.33	6	130	112.67	1.28	0.18	1.3
J560	0.0	30.0	169.9	60.6	P305	J270	J260	284	8	130	197.3	1.26	0.26	0.9
J570	0.0	30.0	170.0	60.6	P320	J285	J280	126	8	130	189.9	1.21	0.11	0.8
J150	0.0	30.0	170.0	60.7	P665	J535	J530	173	8	130	189.1	1.21	0.14	0.8
J145	0.0	30.0	170.1	60.7	P285	J300	J290	429	8	130	183.9	1.17	0.34	0.8
J395	0.0	30.0	170.1	60.7	P235	J340	J330	103	8	130	-178.5	1.14	0.08	0.8
J320	0.0	30.0	170.2	60.7	P245	J330	J325	186	8	130	-178.5	1.14	0.14	0.8
J385	0.0	30.0	170.2	60.8	P400	J215	J210	632	8	130	-177.2	1.13	0.47	0.7
J390	0.0	30.0	170.2	60.8	P180	J370	J375	229	8	130	172.4	1.10	0.16	0.7
J380	0.0	30.0	170.3	60.8	P430	J190	J195	540	8	130	-172.7	1.10	0.38	0.7
J375	0.0	30.0	170.3	60.8	P230	J340	J345	130	8	130	165.8	1.06	0.09	0.7
J405	0.0	30.0	170.3	60.8	P470	J150	J145	84	8	130	-163.5	1.04	0.05	0.6
J140	39.2	30.0	170.4	60.8	P60	J70	J65	489	15	130	-570.0	1.03	0.15	0.3
J345	264.7	30.0	170.4	60.8	P740	J80	J580	300	15	130	539.9	0.98	0.08	0.3
J340	0.0	30.0	170.5	60.9	P155	J385	J395	252	8	130	152.2	0.97	0.14	0.6
J350	0.0	30.0	170.5	60.9	P610	J510	J520	161	8	130	148.7	0.95	0.09	0.5
J355	0.0	30.0	170.5	60.9	P585	J480	J490	222	8	130	-144.8	0.92	0.11	0.5
J360	0.0	30.0	170.5	60.9	P325	J280	J275	126	8	130	137.1	0.88	0.06	0.5
J365	0.0	30.0	170.5	60.9	P315	J260	J255	562	8	130	-131.1	0.84	0.24	0.4
J370	132.0	30.0	170.5	60.9	P495	J555	J410	837	8	130	131.8	0.84	0.36	0.4
J330	0.0	30.0	170.6	60.9	P105	J110	J115	202	12	130	288.2	0.82	0.05	0.3

SUTTER POINTE SUBDIVISION WATER STUDY
PEAK HOUR DEMAND MODEL RESULTS PHASE 1

Junction Report					Pipe Report										
ID	Demand (gpm)	Elevation (ft)	Head (ft)	Pressure (psi)	ID	From Node	To Node	Length (ft)	Diameter (in)	Roughness	Flow (gpm)	Velocity (ft/s)	Headloss (ft)	HL/1000 (ft/k-ft)
J335	0.0	30.0	170.6	60.9	P110	J115	J125	549	12	130	288.2	0.82	0.14	0.3
J325	0.0	30.0	170.7	61.0	P505	J555	J415	837	8	130	124.8	0.80	0.32	0.4
J485	230.5	30.0	170.7	61.0	P625	J530	J525	234	8	130	125.9	0.80	0.09	0.4
J480	0.0	30.0	170.9	61.0	P140	J375	J390	278	8	130	121.6	0.78	0.10	0.4
J520	148.7	30.0	170.9	61.1	P290	J290	J305	873	8	130	-122.6	0.78	0.33	0.4
J490	0.0	30.0	171.0	61.1	P75	J580	J85	551.34	15	130	427.26	0.78	0.1	0.18
J495	0.0	30.0	171.0	61.1	P150	J385	J380	254	8	130	-119.7	0.76	0.09	0.4
J500	0.0	30.0	171.0	61.1	P670	J535	J440	171	8	130	117.2	0.75	0.06	0.3
J510	0.0	30.0	171.0	61.1	P70	J75	J80	344	15	130	414.5	0.75	0.06	0.2
J475	0.0	30.0	171.0	61.1	P300	J285	J270	716	8	130	116.6	0.74	0.24	0.3
J505	0.0	30.0	171.0	61.1	P360	J235	J230	20	8	130	-116.3	0.74	0.01	0.3
J460	0.0	30.0	171.0	61.1	P420	J180	J185	261	8	130	111.0	0.71	0.08	0.3
J465	0.0	30.0	171.0	61.1	P425	J185	J190	940	8	130	111.0	0.71	0.29	0.3
J470	0.0	30.0	171.0	61.1	P545	J450	J460	280	8	130	111.7	0.71	0.09	0.3
J515	0.0	30.0	171.0	61.1	P745	J85	J590	140	6	130	62.5	0.71	0.06	0.4
J525	0.0	30.0	171.1	61.1	P345	J295	J255	212	8	130	109.2	0.70	0.06	0.3
J450	0.0	30.0	171.1	61.2	P580	J475	J490	222	8	130	104.4	0.67	0.06	0.3
J455	0.0	30.0	171.1	61.2	P80	J85	J90	653.67	15	130	364.72	0.66	0.09	0.13
J530	0.0	30.0	171.1	61.2	P615	J510	J515	154	8	130	-101.4	0.65	0.04	0.3
J410	183.6	30.0	171.2	61.2	P655	J445	J455	222	8	130.00	101.9	0.65	0.06	0.3
J425	0.0	30.0	171.2	61.2	P695	J545	J75	182	8	130	101.1	0.65	0.05	0.3
J415	0.0	30.0	171.2	61.2	P825	J90	J205	1,361.18	15	130	356.82	0.65	0.17	0.13
J420	0.0	30.0	171.2	61.2	P465	J195	J145	811	8	130	-99.2	0.63	0.21	0.3
J430	0.0	30.0	171.2	61.2	P475	J160	J155	179	8	130	-97.5	0.62	0.04	0.3
J435	0.0	30.0	171.2	61.2	P480	J155	J150	281	8	130	-97.5	0.62	0.07	0.3
J445	0.0	30.0	171.2	61.2	P260	J320	J305	878	8	130	94.8	0.61	0.20	0.2
J440	0.0	30.0	171.2	61.2	P355	J235	J215	1451	8	130	94.4	0.60	0.33	0.2
J205	0.0	30.0	171.3	61.2	P160	J395	J390	778	8	130	-89.1	0.57	0.16	0.2
J535	39.2	30.0	171.3	61.2	P435	J180	J170	158	8	130	-89.9	0.57	0.03	0.2
J130	0.0	30.0	171.5	61.3	P65	J70	J75	554	15	130.00	313.4	0.57	0.06	0.1
J135	0.0	30.0	171.5	61.3	P535	J425	J450	217	8	130	88.2	0.56	0.04	0.2
J90	0.0	30.0	171.5	61.3	P635	J525	J505	222	8	130	87.7	0.56	0.04	0.2
J125	197.5	30.0	171.5	61.3	P190	J370	J365	170	8	130	86.2	0.55	0.03	0.2
J555	0.0	30.0	171.5	61.3	P550	J460	J480	961	8	130	85.8	0.55	0.19	0.2
J85	0.0	30.0	171.6	61.3	P330	J275	J270	464	8	130	80.7	0.51	0.08	0.2
J115	0.0	30.0	171.6	61.4	P650	J440	J445	242	8	130	79.6	0.51	0.04	0.2
J110	0.0	30.0	171.7	61.4	P170	J405	J380	164	8	130	79.0	0.50	0.03	0.2
J80	0.0	30.0	171.7	61.4	P575	J475	J455	646	8	130	-78.4	0.50	0.11	0.2
J75	0.0	30.0	171.8	61.4	P460	J160	J195	267	8	130	73.5	0.47	0.04	0.2
J545	0.0	30.0	171.8	61.5	P510	J410	J415	252	8	130	-71.3	0.45	0.03	0.1
J70	0.0	30.0	171.8	61.5	P130	J140	J405	332	8	130	68.9	0.44	0.04	0.1
J540	99.6	30.0	171.9	61.5	P520	J420	J425	235	8	130	68.8	0.44	0.03	0.1
J65	0.0	30.0	172.0	61.5	P440	J170	J175	344	8	130	-66.0	0.42	0.04	0.1
J95	0.0	30.0	172.0	61.5	P445	J175	J150	713	8	130	-66.0	0.42	0.08	0.1
J60	0.0	30.0	172.2	61.6	P690	J545	J540	424	8	130	-64.9	0.41	0.05	0.1
J550	0.0	30.0	172.4	61.7	P380	J230	J240	285	8	130	-62.6	0.40	0.03	0.1
J45	0.0	30.0	172.7	61.8	P390	J240	J210	887	8	130	-62.6	0.40	0.10	0.1
J35	0.0	30.0	173.3	62.1	P620	J515	J530	1062	8	130	-63.2	0.40	0.12	0.1
J30	0.0	30.0	173.7	62.3	P200	J345	J360	852	8	130	-59.0	0.38	0.08	0.1
J20	146.2	30.0	173.9	62.4	P340	J275	J295	388	8	130	56.4	0.36	0.03	0.1
J10	0.0	30.0	175.4	63.0	P335	J280	J295	1175	8	130	52.8	0.34	0.09	0.1
J15	0.0	30.0	175.4	63.0	P365	J230	J225	1191	8	130	-53.7	0.34	0.10	0.1
J25	0.0	30.0	175.4	63.0	P375	J225	J210	366	8	130	-53.7	0.34	0.03	0.1
J50	0.0	30.0	175.4	63.0	P515	J415	J420	157	8	130	53.5	0.34	0.01	0.1

Wood Rodgers, Inc.
M. Ronco
02/24/2020

SUTTER POINTE SUBDIVISION WATER STUDY
PEAK HOUR DEMAND MODEL RESULTS PHASE 1

Junction Report					Pipe Report										
ID	Demand (gpm)	Elevation (ft)	Head (ft)	Pressure (psi)	ID	From Node	To Node	Length (ft)	Diameter (in	Roughness	Flow (gpm)	Velocity (ft/s)	Headloss (ft)	HL/1000 (ft/k-ft)
FH10	0.0	30.0	168.1	72.9	P735	J575	J130	544	8	130	-53.9	0.34	0.04	0.1
FH05	0.0	30.0	168.9	73.2	P205	J360	J365	75	8	130	-46.4	0.30	0.00	0.1
J595	0.0	30.0	169.4	73.4	P605	J505	J510	314	8	130.00	47.3	0.30	0.02	0.1
J600	42.3	30.0	169.4	73.4	P675	J125	J575	813	8	130.00	44.8	0.29	0.05	0.1
FH20	0.0	30.0	169.7	73.5	P760	J595	J600	76.98	8	130	42.33	0.27	0	0.05
FH01	0.0	30.0	169.8	73.6	P175	J380	J375	662	8	130	-40.7	0.26	0.03	0.1
FH15	0.0	30.0	170.5	73.9	P590	J490	J495	737	8	130	-40.4	0.26	0.04	0.1
FH35	0.0	30.0	170.7	74.0	P600	J495	J505	187	8	130	-40.4	0.26	0.01	0.1
FH40	0.0	30.0	170.9	74.1	P195	J365	J345	1866	8	130	39.8	0.25	0.09	0.1
FH25	0.0	30.0	171.2	74.2	P630	J525	J515	565	8	130	38.2	0.24	0.02	0.0
FH45	0.0	30.0	171.4	74.3	P640	J430	J435	242	8	130	-37.6	0.24	0.01	0.0
J575	98.7	30.0	171.4	74.3	P645	J435	J440	476	8	130	-37.6	0.24	0.02	0.0
FH55	0.0	30.0	171.5	74.3	P685	J540	J545	1245	8	130	36.2	0.23	0.05	0.0
FH60	0.0	30.0	171.5	74.3	P145	J390	J385	646	8	130	32.4	0.21	0.02	0.0
J585	112.7	30.0	171.5	74.3	P265	J305	J310	281	8	130	-27.8	0.18	0.01	0.0
J590	62.5	30.0	171.5	74.3	P270	J310	J300	278	8	130	-27.8	0.18	0.01	0.0
FH50	0.0	30.0	171.6	74.4	P560	J460	J465	222	8	130	25.9	0.17	0.00	0.0
J580	0.0	30.0	171.6	74.4	P570	J465	J475	295	8	130	25.9	0.17	0.01	0.0
FH30	0.0	30.0	171.9	74.5	P450	J170	J165	483	8	130	-24.0	0.15	0.01	0.0
FH80	0.0	30.0	172.0	74.5	P455	J165	J160	211	8	130	-24.0	0.15	0.00	0.0
FH85	0.0	30.0	172.0	74.5	P540	J450	J455	374	8	130	-23.5	0.15	0.01	0.0
J650	0.0	30.0	172.0	74.5	P350	J255	J235	318	8	130	-21.9	0.14	0.00	0.0
J705	0.0	30.0	172.0	74.5	P530	J430	J445	658	8	130	22.3	0.14	0.01	0.0
J710	0.0	30.0	172.0	74.5	P115	J125	J130	332	12	130	45.9	0.13	0.00	0.0
FH75	0.0	30.0	172.4	74.7	P415	J200	J180	180	8	130	21.0	0.13	0.00	0.0
J740	0.0	30.0	172.4	74.7	P500	J410	J425	671	8	130	19.4	0.12	0.01	0.0
J660	0.0	30.0	174.9	75.8	P525	J420	J430	222	8	130	-15.3	0.10	0.00	0.0
J655	0.0	30.0	175.0	75.8	P210	J360	J355	208	8	130	-12.7	0.08	0.00	0.0
FH145	0.0	30.0	175.4	76.0	P225	J350	J340	206	8	130	-12.7	0.08	0.00	0.0
FH100	0.0	30.0	175.4	76.0	P135	J405	J375	1346	8	130	-10.1	0.06	0.00	0.0
FH110	0.0	30.0	175.4	76.0	P215	J355	J350	633	8	130	-6.0	0.04	0.00	0.0
FH115	0.0	30.0	175.4	76.0	P220	J350	J355	654	8	130	6.7	0.04	0.00	0.0
FH120	0.0	30.0	175.4	76.0	P120	J130	J135	266	12	130	-7.9	0.02	0.00	0.0
FH125	0.0	30.0	175.4	76.0	P1000	J715	J720	606	8	130	1.7	0.01	0.00	0.0
FH130	0.0	30.0	175.4	76.0	P1130	J745	J620	981	8	130	1.7	0.01	0.00	0.0
FH135	0.0	30.0	175.4	76.0	P785	J640	J645	429.15	8	130	1.71	0.01	0	0
FH140	0.0	30.0	175.4	76.0	P820	J135	J90	1,722.88	15	130	-7.9	0.01	0	0
FH150	0.0	30.0	175.4	76.0	P830	J720	J640	2,045.78	8	130	1.71	0.01	0	0
FH155	0.0	30.0	175.4	76.0	P995	J620	J715	307.09	8	130	1.71	0.01	0	0
FH65	0.0	30.0	175.4	76.0	P10	J10	J15	273	15	130	0.0	0.00	0.00	0.0
FH70	0.0	30.0	175.4	76.0	P1005	J725	J610	310	12	130	0.0	0.00	0.00	0.0
FH90	0.0	30.0	175.4	76.0	P1010	J730	J725	217	12	130.00	0.0	0.00	0.00	0.0
FH95	0.0	30.0	175.4	76.0	P1015	J735	J645	94	12	130.00	0.0	0.00	0.00	0.0
J605	0.0	30.0	175.4	76.0	P1025	FH30	J540	38	8	130	0.0	0.00	0.00	0.0
J610	0.0	30.0	175.4	76.0	P1030	FH80	J710	19	8	130	0.0	0.00	0.00	0.0
J615	0.0	30.0	175.4	76.0	P1035	FH85	J705	52	8	130	0.0	0.00	0.00	0.0
J620	0.0	30.0	175.4	76.0	P1040	FH75	J740	93	8	130	0.0	0.00	0.00	0.0
J625	0.0	30.0	175.4	76.0	P1045	FH70	J700	115	8	130	0.0	0.00	0.00	0.0
J630	0.0	30.0	175.4	76.0	P1050	FH90	J695	51	8	130	0.0	0.00	0.00	0.0
J635	0.0	30.0	175.4	76.0	P1055	FH100	J690	45	8	130	0.0	0.00	0.00	0.0
J640	0.0	30.0	175.4	76.0	P1060	FH95	J685	99	8	130	0.0	0.00	0.00	0.0
J645	0.0	30.0	175.4	76.0	P1065	FH150	J635	120	8	130	0.0	0.00	0.00	0.0
J665	0.0	30.0	175.4	76.0	P1070	FH145	J735	81	8	130.00	0.0	0.00	0.00	0.0
J670	0.0	30.0	175.4	76.0	P1075	FH140	J640	86	8	130	0.0	0.00	0.00	0.0

SUTTER POINTE SUBDIVISION WATER STUDY
PEAK HOUR DEMAND MODEL RESULTS PHASE 1

Junction Report					Pipe Report									
ID	Demand (gpm)	Elevation (ft)	Head (ft)	Pressure (psi)	ID	From Node	To Node	Length (ft)	Diameter (ir	Roughness	Flow (gpm)	Velocity (ft/s)	Headloss (ft)	HL/1000 (ft/k-ft)
J675	0.0	30.0	175.4	76.0	P1080	FH135	J720	56	8	130	0.0	0.00	0.00	0.0
J680	0.0	30.0	175.4	76.0	P1085	FH130	J715	43	8	130	0.0	0.00	0.00	0.0
J685	0.0	30.0	175.4	76.0	P1090	FH155	J680	141	8	130	0.0	0.00	0.00	0.0
J690	0.0	30.0	175.4	76.0	P1095	FH115	J725	158	8	130.00	0.0	0.00	0.00	0.0
J695	0.0	30.0	175.4	76.0	P1100	FH110	J730	37	8	130	0.0	0.00	0.00	0.0
J700	0.0	30.0	175.4	76.0	P1105	V3	J25	50	12	130	0.0	0.00	0.00	0.0
J715	0.0	30.0	175.4	76.0	P1110	J45	V5	69	12	130	0.0	0.00	0.00	0.0

APPENDIX D

GOLDEN STATE WATER COMPANY MASTER PLANNING CRITERIA AND STANDARDS

Golden State Water Company
Master Planning Criteria and Standards

Purpose

This technical memorandum contains a compilation of hydraulic design criteria and water quality standards that will be used to evaluate the Golden State Water Company (GSWC) water distribution systems. The criteria contained in this report were compiled using applicable regulatory standards, design standards, and design guidelines that are widely recognized in the water industry.

Sources of Hydraulic Design Criteria and Water Quality Standards

Technical manuals and water industry standards were consulted to obtain criteria that will be used in the water system evaluation. Water industry standards that were consulted to develop the criteria include the following:

- Recommended Standards for Water Works, 2007 Edition ("Ten States Standards")
- American Water Works Association (AWWA), 2005 Edition Manual of Water Supply Practices M32-Second Edition (AWWA M32)
- Rules Governing Water Service Including Minimum Standards For Design and Construction, General Order 103-A, Public Utilities Commission of the State of California, 2009 ("General Order 103-A")
- The Administrative Code of the Metropolitan Water District of Southern California (Metropolitan), updated January, 11, 2011.
- Drinking water standards and associated rules from the Environmental Protection Agency's Office of Ground Water and Drinking Water and California-specific drinking water standards from the California Department of Public Health (CDPH) office of Prevention Services
- Recommendations based on industry standard practice

Hydraulic Planning and Design Criteria

Table 1 contains a summary of the hydraulic design criteria that will be used in the evaluation of GSWC water systems.

TABLE 1
Water System Evaluation Criteria

System Parameter	Evaluation Criterion	Value	Design Standard/Guideline
Water Supply & Storage	Firm Capacity[1]	MDD[2]	GSWC Policy adapted from General Order 103-A to provide reliable supplies

TABLE 1
Water System Evaluation Criteria

System Parameter	Evaluation Criterion	Value	Design Standard/Guideline
	Firm Capacity[1]	PHD[3]	GSWC Policy adapted from General Order 103-A to provide reliable supplies
	Total Capacity	MDD + Fire Flow	Local fire protection agency or other prevailing local governmental agency, whichever is greater
	Minimum Capacity[4]	7 Days of ADD[5]	Admin Code of Metropolitan-Division 4 Section 4503(b)
	Unplanned Loss of Metropolitan Supplies	1 day of MDD + 6 days of ADD	GSWC Policy adapted from General Order 103-A to provide dependable supplies
System Pressure	Normal Pressure	40-125 psi	General Order 103-A
	Minimum, during ADD, MDD or PHD	40 psi	GSWC Policy[6]
	Minimum, during MDD + Fire Flow	20 psi	General Order 103-A
	Maximum	150 psi	General Order 103-A
Metropolitan Supply Requirements	Limits to Rate of Change in Flow	+/- 10% previous 24-hour average rate of flow	Metropolitan Admin. Code - Division 4 Section 4504(a)
	Range of Flow	Maximum: full design capacity of connection	
		Minimum: 10% of design capacity of connection	Metropolitan Admin. Code - Division 4 Section 4504(b)
Pressure Reducing Valves	Minimum Number of Stations[7]	2[8]	Industry Standard Practice
Piping Hydraulics	Maximum Velocity during MDD	5 ft/s[9]	AWWA M32 (p. 68)
	Velocity during PHD or MDD+FF	Not to Exceed 10 ft/s	AWWA M32 (p. 69)
	Maximum Headloss	6 ft per 1000 ft[9]	AWWA M32 (p. 68)
	Minimum Pipe Diameter (New Mains)	Larger of 8-inch or size needed for current fire flow requirements. 6-inch is allowable for dead-ends mains extended beyond the last fire hydrant.	GSWC Policy
Booster Stations	Minimum Number of Pumps	2	Ten States Standards

TABLE 1
Water System Evaluation Criteria

System Parameter	Evaluation Criterion	Value	Design Standard/Guideline
Fire Flow Requirement	Fire Flow Requirements	-	Local fire protection agency or other prevailing local governmental agency, whichever is greater

Notes:

[1] Firm capacity was defined for this master plan as the total production capacity with the single largest capacity pumping facility (well or booster pump) out of service.

[2] MDD: Maximum day demand was defined for this master plan as the maximum volume (or flow rate) of water delivered to the system during any single day of the year. The MDD should be calculated using a reasonable amount of historical data (10 years is usually adequate). The specific method used to calculate MDD will be developed on a system specific basis.

[3] PHD: Peak hour demand, defined as the maximum volume (or flow rate) of water delivered to the system during any single hour of the MDD.

[4] Minimum capacity was defined as a combination of local reservoir storage, groundwater production, non-Metropolitan system interconnections or alternate supply sources. This requirement assumes the most critical Metropolitan facility is out of service for 7 days of ADD for scheduled maintenance.

[5] ADD: Average day demand, defined as the average volume (or flow rate) of water delivered to the system during a single day. The Administration Code of Metropolitan defines ADD as annual average demands.

[6] While the General Order 103-A allows service pressures under PHD to fall to 30 psi, GSWC policy mandates minimum pressures of 40 psi.

[7] This only applies to pressure zones supplied exclusively by pressure reducing valves.

[8] Each station requires the installation of a main and bypass pressure reducing valve.

[9] Value shown is recommended for the design of new facilities. Existing facilities may have a higher value.

Water Supply and Storage

Through reference to California Waterworks Standards, CCR Title 22, Section 64554, General Order 103-A states that "At all times, a public water system's water source(s) shall have the capacity to meet the system's maximum day demand (MDD)." While General Order 103-A does not specifically mandate redundancy, it does specify that the supply be "reliable". To provide a reliable supply while meeting the demands of maximum day, the system must be capable of producing MDD with the largest capacity pumping unit out of service. Firm capacity takes into account the fact that a single pumping unit can be out of service at any time. The ability to dependably meet supplies for PHD and MDD plus Fire Flow must also be met using only firm capacity.

Additionally, General Order 103-A requires water systems to meet fire flow requirements set by local fire agencies. For many of GSWC's systems, the local fire agencies require fire flows to be met during MDD. This standard was therefore adopted company-wide by GSWC.

The water supply requirements for firm capacity apply to the entire water system and to each pressure zone. It is important to note that water systems with multiple pressure zones require that each pressure zone be equipped with a sufficient number of supply pumps to meet the firm capacity requirements within the pressure zone.

Stored water can be used in place of water supplies to help meet relatively short demand periods such as PHD, fire flows, and for short term emergencies. Stored water should not be relied on for ADD or MDD. Stored water should be allocated into one of the following three categories: Operational, Fire, or Emergency. Once storage has been allocated into one of these categories, it should only be used for this purpose. Operational storage, for example, should only be used to help supplement short demand periods that exceed supply production, such as PHD. Emergency storage should not be confused with fire storage. Fires can occur somewhat frequently, especially in larger systems. Emergency storage should be reserved for the infrequent times when the system experiences the unplanned loss of a major supply source (such as a Metropolitan connection).

To adequately size the volume of water needed in storage, calculations should be performed to determine the supply shortage for each demand scenario. These calculations should consider each pressure zone as well as the system overall. Fire storage needs should be calculated as the MDD+FF demand minus the firm capacity available for the duration of the fire flow (typically 2 to 5 hours). When calculating fire flow for the overall system, only the largest fire flow in any pressure zone should be used. This assumes that the water system will recover before a second fire occurs. For operational storage, a computer model running an extended period simulation (EPS) may be considered the best approach to identify the storage requirements. However, where an EPS model has not been performed, then the minimum volume required should not be less than 4 hours of PHD minus the firm supply production capacity available for the same duration. Emergency storage should be identified to account for supply shortages during unplanned outages of major supply sources.

Metropolitan Supply Requirements

Scheduled and Unplanned Service Interruptions

Minimum storage capacity requirements based on the Administration Code of the Metropolitan state that each member agency shall have sufficient resources such as local reservoir storage, groundwater production capacity, system interconnections or alternate supply sources to sustain a seven-day interruption in Metropolitan deliveries based on annual average demands (Metropolitan Admin code, 4503(b)). To comply with this requirement, GSWC assumes that the most critical (largest capacity) Metropolitan facility is out of service for seven days. The first day of an unplanned outage may be during MDD conditions with little opportunity to reduce demands; however, public notification and other reduction programs are likely to significantly decrease demands. For this master plan, it was assumed that aggressive reductions during an unplanned outage could reduce demands to ADD levels for the remaining six days of outage. Thus, for this scenario, it was assumed that supplies would still be available from a combination of other supply sources and storage capacity. Other supply sources include wells, Metropolitan connections not effected by the shutdown, and reliable connections with other agencies. If there are no other supply sources, then emergency storage should total one day of MDD plus six days of ADD. In some cases Metropolitan service outages may involve conveyance facilities which can affect more than one delivery connection to GSWC’s system.

Flow Rate Adjustments

Rate of flow change at any Metropolitan connection is limited to a maximum of ten percent of the previous 24-hour average rate of flow. The only exception to this limitation can be made when a specific request has been made to Metropolitan and the Chief Executive Officer approves of this change. The Metropolitan Chief Executive Officer is responsible for assessing if this change adversely affects Metropolitan's ability to apportion available water equitably.

Acceptable flow rates to the system from Metropolitan ranges from a minimum rate equal to ten percent of the capacity of the interconnection to a maximum rate equal to the full design capacity of the interconnection.

Booster Pumping Stations

According to "Ten States Standards" (2007), booster pumping stations should be equipped with a minimum of two pumping units. With any booster pump out of service, the remaining pump or pumps should be capable of providing the maximum pumping demand required at the pump station.

System Pressure

It is required that normal operating pressures will not be less than 40 psi or more than 125 psi at a service connection. While General Order 103-A requires that the pressures at service connections at PHD be no less than 30 psi, GSWC policy requires a higher standard of 40 psi. In accordance with General Order 103-A, GSWC requires the minimum pressures at service connections during MDD plus Fire Flow conditions to be no less than 20 psi and during periods of hourly minimum demand no more than 150 psi. Most customer services would be adversely affected by pressures above 100 psi, and pressure reducing valves are likely necessary in areas of the distribution system that experience such high sustained pressures.

Pressure Reducing Valves

To maintain adequate pressures in the system, Industry Standard Practice requires that any pressure zone supplied exclusively with pressure reducing valves (PRV) be equipped with a minimum of two PRV stations. Each station should have a main and bypass PRV. With any PRV station out of service, the remaining valve or valves should be capable of maintaining adequate pressures in the system.

Piping Hydraulics

According to AWWA Manual M32—Distribution Network Analysis for Water Utilities, piping segments are considered as potentially deficient in terms of hydraulic capacity if a hydraulic analysis reveals either of the following characteristics:

1) Flow velocities greater than 5 feet per second (ft/s) during MDD conditions
2) Energy (head) losses greater than 6 feet per 1000 feet of pipe

It is important to point out that these hydraulic characteristics are recommended design guidelines rather than hard-and-fast design criteria. AWWA Manual M32 states that velocities in pipe segments may be acceptable up to 10 ft/s. However, as water velocities increase, pipe head losses rise exponentially, along with the potential for water hammer. Generally, as velocities approach 5 ft/s, pipes become limiting factors in delivering water at acceptable pressures to the extremities of the system. When head losses in a pipe segment approach 6 ft per 1000 ft of pipe, a substantial loss of pressure occurs in that length of pipe. Thus, pipes with head losses exceeding 6 ft per 1000 ft are generally a contributing factor to inadequate system pressures.

These hydraulic guidelines will be used to evaluate the hydraulic capacity of future pipelines in the water distribution systems. Existing pipelines may, however, somewhat exceed these criteria. For evaluations involving either PHD or fire flow conditions, maximum flow velocity should not exceed 10 ft/s.

As a matter of policy, GSWC requires that all newly constructed mains are a minimum of eight inches in diameter. However, where a larger diameter is required to meet current fire flow standards, then the larger diameter pipe should be used. Existing six-inch mains may be considered acceptable if they meet the fire flow and pressure criteria.

Fire Flow Requirements

Generally, the hydraulic modeling effort will use fire flow requirements based on the local fire protection agency or other prevailing local governmental agency to evaluate the GSWC's distribution systems. Table 2 shows fire flow requirements by seven land-use categories. Local standards, however, if more stringent, supersede these requirements; for many of GSWC's systems, the local fire authorities have more stringent requirements.

Special Situations

Due to unforeseen situations that may arise in any water system, the planning and design criteria specified herein may be modified based on engineering judgment and at the discretion of the Planning Department.

Water Quality Standards

The Environmental Protection Agency (EPA) and the California Department of Public Health (CDPH) have established, or will develop, key water quality regulations under the Safe Drinking Water Act (SDWA). California is a primacy state, and as such CDPH has the authority to impose drinking water quality regulations that are more stringent than those promulgated by the EPA. Those regulations apply to community and non-community water systems, which includes those of the GSWC and may affect the GSWC water treatment facilities, treatment processes used, and monitoring requirements.

In addition to the list of primary and secondary drinking water standards, the following rules are included in this discussion: Total Coliform Rule, Surface Water Treatment Rules, Disinfectant/Disinfection By-Product Rules, Volatile Organic, Synthetic Organic, and Inorganic Chemical Rules, Groundwater Rule, Filter Backwash Rule, Lead and Copper Rule, Arsenic Rule, Radionuclide Rule, Radon Rule, Drinking Water Candidate Contaminant List, Secondary Water Standards, Perchlorate Rule, and Public Notification Rule.

The EPA and CDPH have regulatory authority over the GSWC water distribution systems. The current and future regulations will very likely impact GSWC water treatment facilities, treatment processes, and monitoring requirements. Moreover, because the GSWC has systems that include both surface and groundwater sources, it is impacted by essentially all of the pending SDWA revisions, as well as California's own drinking water regulations which are, in some cases, more stringent than the EPA's. Equally important, the current regulations and the proposed changes to the SDWA will likely have meaningful impacts to the future operation of GSWC's systems.

It is important to note that the regulatory environment is dynamic. Of immediate importance to the GSWC master planning efforts is how the current regulations and the proposed changes to the SDWA may affect the operation and utilization of the GSWC resources and delivered water quality. Specific changes are envisioned for several elements of the SDWA, including revisions to the Total Coliform Rule, revisions to the Lead and Copper Rule, Unregulated Contaminant Monitoring Rule 3, methyl tertiary butyl ether (MtBE) considerations, and perchlorate considerations. The existing regulations and potential changes and future regulations are discussed briefly in the sections below.

Safe Drinking Water Act (SDWA)

The SDWA is comprised of two parts: primary and secondary drinking water standards. Compliance with primary drinking water standards is required by the EPA. The EPA list of drinking water contaminants and their corresponding Maximum Contaminant Limits (MCLs) can be found at the following EPA website: http://water.epa.gov/drink/contaminants/index.cfm. Compliance with both primary and secondary standards is required by CDPH. The CDPH list of drinking water contaminants and their corresponding MCLs and Secondary Maximum Contaminant Limits (SMCLs) can be found at the following CDPH website: http://www.cdph.ca.gov/certlic/drinkingwater/Pages/Chemicalcontaminants.aspx. Additionally, this website has a table that compares the EPA and CDPH standards.

In addition to primary and secondary drinking water standards, a brief discussion of numerous rules is presented here. Generally, the intent of these rules is to better enable water utilities to meet drinking water standards.

Total Coliform Rule (TCR)

Total coliform testing is commonly used in drinking water treatment to determine the adequacy of water treatment and the integrity of the distribution system. Total coliforms are regulated based on presence/absence. For systems that collect 40 or more samples per month (more than 33,000 population or 11,800 service connections) to be in compliance, no more than 5 percent of the samples taken for coliforms in a month can be coliform positive. For systems that collect fewer than 40 samples per month, no more than one sample may be coliform positive. All distribution system zones must be included in the routine sampling program, and some of the sample locations may be rotated throughout the year if the required number of sites needed to represent all pressure zones is greater than the number of sites required based on the population or number of service connections.

Surface Water Treatment Rules

A series of rules has been, or is, currently being developed to provide control of microbial contaminants from surface water or groundwater that is under the direct influence of surface water. These rules include the original Surface Water Treatment Rule, the Interim Enhanced Surface Water Treatment Rule, and the Long Term 1 and Long Term 2 Enhanced Surface Water Treatment Rules. The details on each of these rules are provided in the USEPA website at http://water.epa.gov/lawsregs/rulesregs/sdwa/mdbp/index.cfm

Disinfectant/Disinfection By-Product Rules

Stage 1 Disinfectant/Disinfection By-Product Rule (Stage 1 DBPR)

The Stage 1 DBPR was enacted to reduce the health risk due to disinfection practice. To accomplish this, the Rule reduced the MCL for total trihalomethanes (TTHM), enacted MCLs for haloacetic acids (HAA5), bromate (an ozone by-product), and chlorite (a chlorine dioxide by-product), enacted maximum residual disinfectant levels (MRDLs) for chlorine, chloramines, and chlorine dioxide, and enacted a treatment technique called "enhanced coagulation" (EC) to limit the amount of unknown by-products that may be formed during chlorination. Compliance with each MCL (TTHM and HAA5) and MRDL will be determined based upon a system wide Running Annual Average (RAA).

Stage 2 Disinfectant/Disinfection By-Product Rule (Stage 2 DBPR)

The Stage 2 DBPR is designed to reduce disinfection by-products (DBP) occurrence peaks in the distribution system. Compliance monitoring will be preceded by an initial distribution system evaluation (IDSE) to select optimal sampling points for capturing peaks. Very small systems (VSS), which are those serving less than 500 persons, and systems with less than 40 ppb TTHM and less than 30 ppb HAA5 in all their sample results during a two-year period (40/30) may qualify for a waiver from the IDSE requirement. The IDSE requires monitoring in accordance with an approved Standard Monitoring Plan (SMP) or System Specific Study (SSS). Standard Monitoring must have been completed by September 1, 2008 and the IDSE report submitted by January 1, 2009 for Schedule 1 systems. Compliance with each MCL (TTHM and HAA5) will be determined based upon a Locational Running Annual Average (LRAA, a running annual average calculated at each sample location).

Systems fall into 1 of 4 schedules based on the population of the largest consecutive system. Schedule 1 systems are those with a consecutive system with over 100,000 population. However, the number and frequency of sampling is still based on each system's population. Schedule 1 systems must comply with the Stage 2 DBPR by April 1, 2012 with an additional 2-year extension available for systems requiring capital improvements. The current MCLs of 80 ppb TTHM and 60 ppb HAA5 will be based on the new sample sites identified in the IDSE.

Schedule 2 systems (50,000 to 99,999 population) must begin compliance by October 1, 2012. Schedule 3 (10,000 to 49,999) and Schedule 4 (<10,000) must begin compliance by October 1, 2013. Schedule 4 systems that must also conduct Cryptosporidium monitoring (LT2SWTR) must begin compliance by October 1, 2014. The bromate MCL will remain at 0.010 mg/L. Additional information can be found on the EPA website: http://water.epa.gov/lawsregs/rulesregs/sdwa/stage2/compliance.cfm

Volatile Organic, Synthetic Organic and Inorganic Chemical Rules

CDPH has established Public Health Goals (PHGs) and MCLs for 27 Volatile Organic Chemicals (VOCs), 33 Synthetic Organic Chemicals (SOCs), and 16 Inorganic Chemicals (IOCs). Requirements include sampling at each source or at each entry point to the distribution system. Repeat monitoring is based on the vulnerability of the source as determined in the CDPH Vulnerability Assessment. If a VOC or SOC is detected, quarterly samples must be analyzed. Quarterly monitoring of an IOC, except nitrate and nitrite, is required only if there is a continuous or persistent trend toward higher levels. Quarterly monitoring for nitrate and nitrite is required if levels equal or exceed half the MCL. Compliance requires that levels be lower than the MCLs, based on the annual average of quarterly samples. However, compliance with the nitrate and nitrite MCLs is based on the average of the initial and confirmation samples.

Groundwater Rule

The EPA promulgated the Groundwater Rule (GWR), formerly known as the Groundwater Disinfection Rule, on November 8, 2006. The rule name was changed to reflect a more holistic regulatory approach to addressing groundwater issues. The rule applies to public groundwater systems and to systems that mix surface water and groundwater if the ground water is added directly to the distribution system and provided to consumers without treatment. This includes untreated stand-alone groundwater wells and untreated groundwater plants that have their own entry points to the distribution system as well as untreated groundwater blended with treated surface water prior to the entry point to the distribution system. Treatment in this case is defined as a 4-log inactivation or removal of viruses.

The GWR compliance date was December 1, 2009 and has the following requirements:

1. Periodic sanitary surveys by CDPH, with the initial survey of Community Water Systems (CWS) to be completed by December 31, 2012 and repeated every 3 years. For Non-Community Water Systems (NCWS) and CWS with "outstanding" performance, the initial survey must be completed December 31, 2014 and repeated every 5 years.

2. Source water monitoring for public water systems (PWS) without 4-log virus treatment that is triggered by a distribution system total coliform positive sample.
3. Assessment source water monitoring if directed by CDPH
4. Corrective action (treatment technique) for systems with significant deficiencies or source water fecal contamination
5. Continuous disinfectant residual monitoring for systems providing 4-log treatment of viruses

Filter Backwash Recycling Rule

The Filter Backwash Recycling Rule is a regulation for filtered surface water supplies that recycle some or all of their filter backwash into the plant and is part of the CDPH proposed Interim Enhanced Surface Water Treatment Rule (IESWTR). The rule contains the following key provisions: (1) Return of all recycled flows prior to the point of the primary coagulant addition, (2) Direct filtration plants to provide information to the state on their current recycle practice, and (3) retain information on operations for CDPH review and evaluation.

Lead and Copper Rule

The Lead and Copper Rule applies to all community and non-transient non-community water systems. The rule developed maximum contaminant level goals (MCLGs) and action levels (ALs) for both lead and copper in drinking water. The major difference between this regulation and most others is that the water is to be monitored at the customer's tap (in highest risk locations), not the treatment plant discharge point. The highest risk locations are defined as: (1) piping with lead solder installed after 1982, (2) lead water service lines, and (3) lead interior piping.

For compliance, the samples at the customer's tap must not exceed the following action levels:

- Lead concentration of 0.015 mg/L detected in the 90^{th} percentile of all samples.
- Copper concentration of 1.3 mg/L detected in the 90^{th} percentile of all samples.

All water systems that exceed the lead or copper action levels are also required to conduct a corrosion control study. After a corrosion control study is completed, a water system must develop a corrosion control program and submit it for approval to the primacy agency. Once approval of the plans is received, water systems have 24 months to install and implement the treatment methods for corrosion control and 12 additional months to collect follow-up samples. After this time, the water system must comply with the action levels for both lead and copper.

The Final Lead and Copper Rule (LCR) Short-Term Revisions and Clarifications was promulgated on October 10, 2007. The revisions to the LCR enhanced the implementation of the LCR in the areas of monitoring, treatment, customer awareness, lead service line replacement; and improved compliance with the public education requirements of the LCR to ensure drinking water consumers receive meaningful, timely, and useful information needed to help them limit their exposure to lead in drinking water.

Arsenic Rule

On January 22, 2001 EPA adopted a new standard for arsenic in drinking water at 10 parts per billion (ppb), replacing the old standard of 50 ppb. The rule became effective on February 22, 2002. The date by which systems had to comply with the new 10 ppb standard was January 23, 2006. Compliance is based on a running annual average of quarterly samples.

Radionuclide Rule

A summary of the Radionuclides Rule is provided below.

- Affected Systems: CWS and Non-Transient Non-Community Water Systems (NTNCWS)
- MCLGs for radionuclides: MCLGs of zero; includes combined radium-226/228; gross alpha, beta particle and photon radioactivity, and uranium
- California PHGs for radionuclides: Tritium = 400 pCi/L; Uranium = 0.5 ppb (0.43 pCi/L); Strontium-90 = 0.35 pCi/L; Gross Alpha/Beta = N/A; Radium-226 = 0.5 pCi/L; and Radium-228 = 0.019 pCi/L.
- Radium MCL: Combined Ra-226 and Ra-228 MCL of 5 pCi/L; based on new risk levels.
- Beta/Photon Radioactivity MCL:
  - ≤ 4 mrem/yr to the total body or any given internal organ except for H-3 and Sr-90
  - H-3 = 20,000 pCi/L (equal to 4 mrem/year for the total body)
  - Sr-90 = 8 pCi/L (equal to 4 mrem/year to the bone marrow)
- Gross alpha MCL: 15 pCi/L excluding uranium and radon.
- Uranium MCL: 30 µg/L (equivalent to 20 pCi/L in California).
- The monitoring cycle changed from 4 years to 3 years as for other Title 22 constituents. Tritium and Strontium-90 monitoring is only for vulnerable systems.

Radon Rule

The proposed Radon Rule applies to all community water systems that use groundwater or mixed groundwater and surface water supply sources.

The Radon Rule includes a two-option approach that allows states and water suppliers to reduce radon risks in indoor air while protecting public health from the highest levels of radon in drinking water. The proposed rule includes the following provisions:

- MCLG zero
- MCL 300 pCi/L
- Alternative MCL (AMCL) 4,000 pCi/L

The AMCL provision of the rule applies to water systems that adopt and comply with a multimedia mitigation (MMM) program aimed at reducing household indoor/air health risks from the soil as well as the tap water. The AMCL of 4,000 pCi/L is based on the National Research Council recommended estimate of 10,000 to 1 as the transfer factor from water to air and the national average outdoor radon concentration of 0.4 pCi/L in air. Thus, an estimate of 0.4 pCi/L in air would be equivalent to 4,000 pCi/L in water.

Drinking Water Contaminant Candidate List

The SWDA requires the EPA to establish a Contaminant Candidate List (CCL) that is a list of contaminants that are known or anticipated to occur in public water systems and may require regulation under the SWDA.

Contaminants included in the CCL are studied to develop analytical methods for detecting the contaminants, determine whether they occur in drinking water, and evaluate treatment technologies to remove them from drinking water. In addition, the health effects of the contaminants are studied to help determine if actions such as drinking water guidance, health advisories, or regulation need to be developed. The CCL alone does not impose any requirements on public water system.

Secondary Water Standards

The Secondary Water Standards clarify and specify the procedure to determine compliance with Secondary Maximum Contaminant Levels (SMCL), which is now similar to that for Primary MCLs. It also incorporates the application requirements for SMCL waivers and includes requirements for short-term used of sources exceeding the SMCL, similar to those for sources classified as "Standby" sources. The revision to the SMCL regulation took effect on September 27, 2006, it clarifies that compliance with the SMCL is based on a running annual average of quarterly samples.

Public Notification Rule

The Public Notification Rule clarifies the notification requirements by organizing the notices into three tiers. Tier 1 requires public and CDPH notification of acute violations (e.g. TCR and nitrate MCLs) within 24 hours. Tier 2 requires public notification of non-acute MCL and monitoring violations within 30 days. Tier 3 requires public notification of all other violations determined by CDPH to be neither Tier 1 nor Tier 2 within 1 year. In addition, new customers must be provided with all notices for outstanding violations.

Future Regulatory Issues

Revisions to the Total Coliform Rule (TCR)

As of June 2010, the Environmental Protection Agency (EPA) has proposed revisions to the 1989 Total Coliform Rule (TCR), a national primary drinking water regulation (NPDWR). The purpose of the TCR is to protect public health by ensuring the integrity of the drinking water distribution system and monitoring for the presence of microbial contamination. EPA anticipates greater public health protection under the proposed revised requirements, which are based on recommendations by a federal advisory committee. The proposed revisions to the TCR will require public water systems that are vulnerable to microbial contamination to identify and fix problems, and establish criteria for systems to qualify for and stay on reduced monitoring, thereby providing incentives for improved water system operation.

Revisions to the Lead and Copper Rule (LCR)

The LCR came into existence in 1992. The thrust of the LCR has been to require specific corrosion control treatment techniques to reduce metal leaching from household plumbing systems. GSWC has few problems meeting the current LCR criteria relative to groundwater sources; the service areas with blended ground and surface waters may be more problematic.

The goal for the LCR Long-Term Revisions is to improve public health protection provided by the LCR by making substantive changes based on topics that were identified in the 2004 National Review, and to streamline the rule requirements. Example categories of potential changes to the rule include sample site collection criteria and sampling procedures for lead and copper tap monitoring; lead service line replacement requirements; and sampling of schools and day care facilities.

Unregulated Contaminant Monitoring

EPA uses the Unregulated Contaminant Monitoring (UCM) program to collect data for contaminants suspected to be present in drinking water, but that do not have health-based standards set under the Safe Drinking Water Act (SDWA). Every five years EPA reviews the list of contaminants, largely based on the CCL. The SDWA Amendments of 1996 provide for monitoring no more than 30 contaminants per 5-year cycle, and monitoring only a representative sample of public water systems serving less than 10,000 people. Other than continued sampling and reporting expense, the direct impact of the latest round of sampling, UCMR3, is not yet clear. The history of the UCM program includes:

- UCMR 1 (2001-2005)
- UCMR 2 (2007-2010)
- UCMR 3 (2013-2015)

Further information can be found at the EPAs UCM web site, http://water.epa.gov/lawsregs/rulesregs/sdwa/ucmr/ .

Methyl Tertiary Butyl Ether (MTBE)

MTBE is a component of oxygenated petroleum fuels. Because of its density, high solubility, and large quantities it has become a recognized threat to groundwater supplies nationwide. The monitoring requirements are the same as those for other VOCs. Future regulatory action on the part of the EPA is unclear. However, the State of California has acted independently of the EPA and has established a MTBE Secondary MCL of 5 ppb and Primary MCL of 13 ppb.

Perchlorate

Perchlorate is both a naturally occurring and man-made chemical that is used to produce rocket fuel, fireworks, flares and explosives. Perchlorate can also be present in bleach and in some fertilizers. EPA has decided to regulate perchlorate under the SDWA, and intends to publish a proposed regulation and analyses required by SDWA for public review and comment by 02/11/2013. The State of California has already enacted an MCL for perchlortae of 6 ug/L, and in January 2011, OEHHA released a draft technical support document for a 1-µg/L PHG for perchlorate, which could result in a lowering of that MCL. Reduction in the MCL could result in significant increased sampling and treatment costs for GSWC.

Waterworks Standards

The Waterworks Standards can be found in Chapter 16 of Title 22 (California Waterworks Standards) and include Domestic Public Water System Permit requirements and a list of systems modifications requiring a Permit Amendment. Other requirements are the use of NSF 61 certified products in water applications and submittal to CDPH of a Water System Operations and Maintenance Plan and a Source Capacity Planning Study if directed by CDPH.

Cross Connection Control

The draft Cross Connection Control regulations moves Cross Connection Control from Title 17 to Title 22. Major additions include the definition of a Cross Connection Control Specialist and the requirement that the Hazard Assessment is performed by a Specialist. The draft regulations also specify an initial Hazard Assessment within its service area, including all new water users. Other changes include the reorganization of and additions to the Table of Hazard Criteria and Appropriate Types of Backflow Protection, recordkeeping requirements for Hazard Assessments, and CDPH notification of known backflow incidents into the public water system.

Fluoridation

The CDPH has adopted regulations that establish standards for the addition of fluoride to drinking water. These are in Title 22 of the California Code of Regulations (22 CCR), Section 64433, *et. seq*. According to these standards, any public water system that fluoridates its water supply must maintain fluoride levels within the control range that has been established for its climate. The established fluoride control ranges vary according to average air temperatures. More information can be found under http://www.cdph.ca.gov/certlic/drinkingwater/Pages/Fluoridation.aspx

The CDPH will provide a list of funding priority for water systems based upon the fluoridation cost estimates that were submitted by public water systems in 2006 to CDPH.

The CPDH has also set an MCL for fluoride in drinking water of 2.0 mg/L, while the EPA maintains an MCL of 4.0 mg/L. The EPA is in the process of reevaluating the current science on fluoride, and will rely on these new assessments to review the existing MCL of fluoride allowed in drinking water and determine whether its drinking water regulations for fluoride should be revised. EPA will review the drinking water standard to make sure that it continues to protect against unwanted effects of excessive exposure. EPA's examination of the fluoride drinking water public health goal and enforceable standard will be based on this new science, along with other information such as analytical methods and treatment feasibility. If the MCL were to be reduced below California's current level of 2.0 mg/L, it could result in significant increased sampling and treatment costs for GSWC.

Chromium (VI)

Total chromium is currently regulated with an MCL of 50 ug/L, but chromium (VI) does not currently have an MCL. OEHHA has proposed a PHG of 0.020 ug/L; CDPH will determine an MCL after the PHG has been finalized. EPA began a rigorous and comprehensive review of chromium-6 health effects following the release of the toxicity studies by the National Toxicology Program in 2008. In September, 2010, EPA released a draft of the scientific assessment (Toxicological Review of Hexavalent Chromium) for public comment and external peer review. When this human health assessment is finalized in 2011, EPA will carefully review the conclusions and consider all relevant information to determine if a new standard needs to be set. Depending upon the final MCL set for chromium (VI), expensive ion exchange or other treatment may have to be installed.

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SECTION 5

Supply and Storage Capacity Evaluation

This section documents the evaluation of the water supply and storage capacity for the Cordova System. The evaluation results accomplished the following:

- Established storage needs for each pressure zone and the entire distribution system
- Identified supply and/or storage deficiencies in the existing and future systems
- Proposed improvements that mitigate the deficiencies identified

In each subsection, the supply and storage capacity of the existing and future water systems were measured against the objectives identified in the technical memorandum titled *Master Planning Criteria and Standards* (see Appendices). When the analysis indicated that the system did not meet these criteria, a deficiency was identified and facilities were proposed to mitigate the deficiency.

5.1 Overview

To provide a reliable water supply, a water system must be able to meet the system demands under a variety of conditions. The water supplied may be provided by a combination of supply sources, or stored water, or both. The specific demand period being analyzed may limit the source of water for the scenario. For example, stored water should not be used to meet ADD or MDD but could be used for PHD or MDD+FF. Therefore, each demand period may require a different ratio of water supplies and storage. This analysis examines various demand periods to determine if the system has the ability to reliably meet the system demands under typical demand scenarios using a combination of water supply sources and storage.

5.2 Evaluation Approach

This supply and storage capacity analysis examined the Cordova System under two planning periods:

- **Existing (2019) system.** The demands for the existing water system were determined by multiplying the 10 year historical average demand per connection and the most recent number of connections (year 2018) to obtain the total system demand. The analyses assumed all facilities that were operational in 2019.

- **2040 system.** The long-term planning horizon (2040) water system analysis assumed 2040 demands (assumed buildout) and facilities included in the existing system analysis plus facilities needed to correct deficiencies in 2040.

5.2.1 Analysis Criteria

The Cordova System must be capable of providing sufficient water supply and storage capacity to meet the minimum criteria summarized in TABLE 5-1. These criteria were extracted from the technical memorandum titled *Master Planning Criteria and Standards*.

The criteria apply to the system as a whole and to each pressure zone in the system. For planning purposes, this Master Plan utilizes the Planning Scenario 'MDD + Fire Flow' to analyze the system performance under a worst-case planning scenario. The worst-case planning scenario is represented by applying the single most stringent fire flow requirement established (based on land use plans or as designated by the local fire jurisdiction) for a structure within a hydraulic zone or planning area as the baseline fire flow requirement for the entire hydraulic zone or planning area. For the purposes of the planning analysis, this is considered a goal rather than a requirement. If the result of the worst case planning scenario indicates a deficiency in MDD + Fire Flow, it should be noted that there may not be a deficiency in the actual fire flow requirement for a particular structure, but rather that GSWC is not meeting the planning goal for the overall hydraulic zone or planning area.

TABLE 5-1 Supply and Storage Capacity Analysis Criteria

Planning Scenario	Demand and Duration	Evaluation Criterion	Storage Usage	Facilities Assumed to be Out of Service
Average day	ADD for 24 hours	Total capacity	No storage drawdown	-
Maximum day	MDD for 24 hours	Firm capacity	No storage drawdown	Largest pumping unit in system
Peak hour	PHD for 4 hours[1]	Firm capacity	Operational storage	Largest pumping unit in system
MDD + fire flow	MDD plus fire flow, duration varies[2]	Total capacity	Fire storage	-

[1] Operational storage required to meet peak demands during MDD was defined as the supply needs during 4 hours of PHD.
[2] Fire flow scenarios are based on fire agency maximum flow requirements for a single structure within a planning area and are applied throughout the planning area as part of the planning analysis. Actual fire flows may be less than the maximum fire flow used for planning analysis.

It is worth noting that the California Public Utilities Commission (CPUC) and State Water Resources Control Board, Division of Drinking Water (DDW) currently provide no specific requirements for storage volume. Therefore, recommended standards published by the American Water Works Association (AWWA) were considered in the development of the storage criteria used in this master plan.

5.2.2 Storage

In addition to providing adequate water supplies for the water consumers, water distribution systems often rely on stored water within the distribution system to provide the following operational benefits:

- Help equalize fluctuations between supply and demand.
- Supply sufficient water for firefighting.
- Meet demands during an emergency or unplanned outage of a major supply source.

AWWA defines three types of storage: operational, fire, and emergency. The amount of storage required for each of these types varies by system. Nevertheless, all three types of storage must be considered. In some cases, water stored in the groundwater basin can provide some of this storage. However, when the stored water does not flow by gravity and requires pumping, sufficient pumping redundancy and stand-by power generators must be provided if the storage source is to be considered reliable.

This analysis evaluates the ability of the system's storage facilities to meet the water system's storage requirements. The resulting volume must be allocated to the pressure zones where the demands exist, or to a neighboring zone (if there are pressure-regulating stations or check valves available that allow the water to flow into the neighboring zone). The water system must also be evaluated to determine if existing booster stations provide sufficient water to be pumped into the higher-pressure zones.

TABLE 5-2 presents the recommended operational, fire, and emergency storage criteria as defined by GSWC for the Cordova System.

TABLE 5-2 Criteria for Calculating Storage

Storage Category	GSWC Criteria
Operational	Storage volume to meet PHD in addition to MDD supply
Fire	Maximum recommended fire storage volume in the system
Emergency	ADD for 12 hours

Operational Storage

The required volume of water for operational storage is determined by the volume needed for regulating the difference between the rate of supply and the daily variations (peaks) in water usage. This difference results in the lowest and highest operating levels in the reservoirs under normal conditions. The resulting volume must be allocated to either the pressure zone (where the demands exist) or to a higher-pressure zone (for use by the lower-pressure zone).

Fire Storage

The volume of water required for firefighting is a function of the instantaneous flow rate required to fight the fire over the duration of the fire flow event as determined by the local fire jurisdiction. Consideration is also made to evaluate the number of fire flow events that may occur before the volume can be replenished. Further, the volume of water necessary to fight a fire can be provided from water supply, water storage, or a combination thereof. For planning purposes, it is desirable and conservative to design the water system to have capacity within water tanks for the volume of water needed for firefighting; however, the fire storage in the tanks plus available supply in excess of MDD can be utilized to meet firefighting requirements. The fire-flow requirements listed in TABLE 5-3 were used to establish the flow rate and duration for each pressure zone; these criteria were used to identify the largest volume of water required for firefighting within each pressure zone (based on the land use in that zone and the flow rates and durations from TABLE 5-3). The resulting fire-flow volumes are shown in TABLE 5-3.

TABLE 5-3 Fire Storage Volumes

Land Use Category	Minimum Fire Flow Required (gpm)	Duration (hr)	Recommended Fire Storage Volume (MG)
Commercial or business	4,000	3	0.72
Public facilities or high school	3,500	3	0.63
Intermediate/elementary school	2,500	2	0.30
Multifamily residential	2,500	2	0.30
Single-family residential	1,500	2	0.18

MG: million gallons

For the Cordova System, it was assumed that only one fire event within the system would occur before storage tanks could recover. The lowest fire-flow volume (0.18 MG) is the result of a 1,500-gpm fire for duration of 2 hours (single-family residential land use). The largest fire-flow volume (0.72 MG) is the result of a 4,000-gpm fire for a duration of 3 hours (commercial or business use).

Emergency Storage

Emergency storage is a dedicated source of water that can be used as a backup supply in the event a major supply source is interrupted. This can be provided by water from a second independent source, by water stored in reservoirs, or a combination of both. *Ten States Standards* recommends that emergency storage total between 12 and 24 hours of ADD volume. Because the Cordova System contains multiple supply sources and a storage reservoir, 12 hours of ADD volume for this system is appropriate.

5.3 Existing System Evaluation

Evaluation of the existing system's supply and storage capacity involved analysis of key system facilities to identify supply or storage capacity deficiencies. This approach involved analyzing multiple proposed improvement alternatives to address these deficiencies. These proposed improvements were then evaluated to determine the most cost-effective alternatives, which would then be identified as the recommended improvements and incorporated into the CIP. The following subsections describe the existing system evaluation:

- Water demands for each demand period
- Supply facilities
- Storage facilities
- Capacity analysis
- Proposed improvements to address deficiencies in the existing system

5.3.1 Existing System Water Demands for Each Demand Period

TABLE 5-4 defines the existing demands by pressure zone for each demand period. The demand in the East Zone is assumed to be 34 percent of the total demand, and the demand in the West Zone is assumed to be 66 percent of the total demands, which are based on spatial demand allocation data from the Cordova GIS.