APPENDIX W -
WATER STUDY

Water Study

Approved - Camrosa WD
10/14/19
TC

FOR

TTM-6016
Camarillo Springs Golf Course Community

City of Camarillo, California

October 3, 2019

PREPARED FOR

New Urban West Inc.
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TABLE OF CONTENTS

SECTION 1 INTRODUCTION

This report details the water system related to the development of the Camarillo Springs Golf Course Community. The complete site includes 182 acres, however, this report will only highlight the developed portion which is roughly 32 acres. This developed portion includes 248 total detached single family dwelling units and some parks/green belt areas.

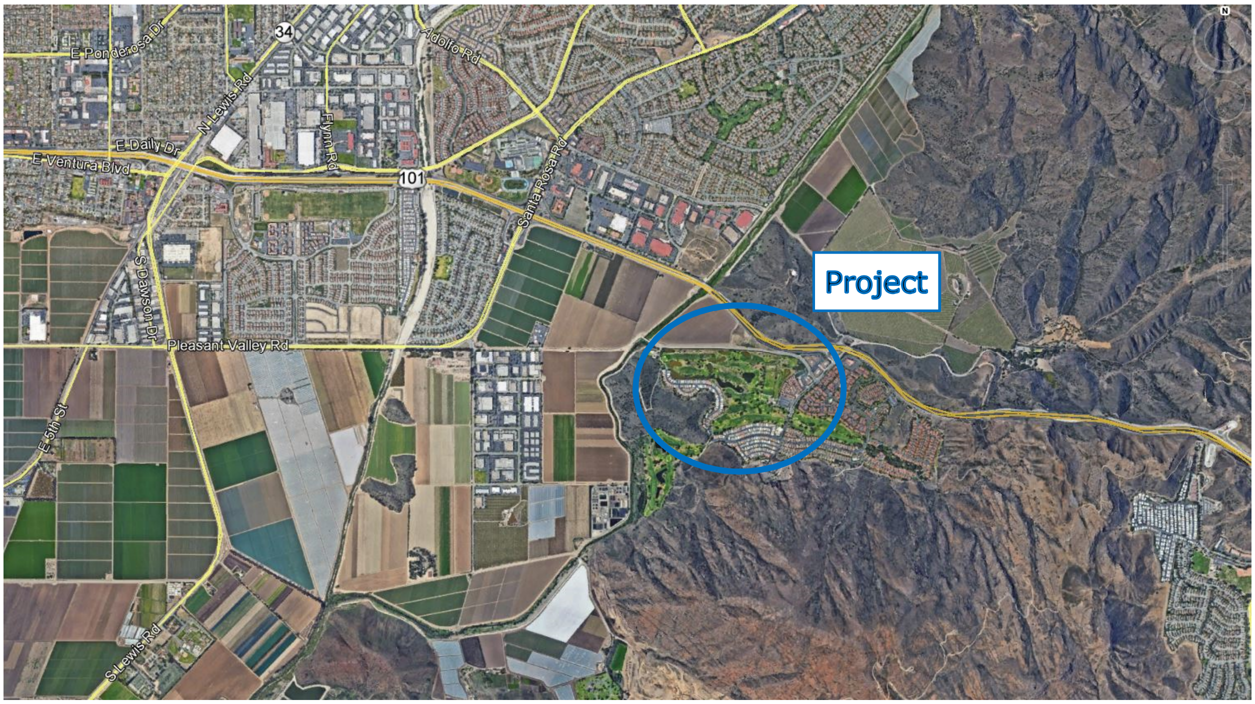

Figure 1: Project Location Map

SECTION 2 EXISTING WATER SYSTEM

The proposed project is within the service area of the Camrosa Water District (Camrosa) and is in Camrosa's Pressure Zone 1. It is located south of US Route 101 and is bounded by Ridge View Street on the North, an existing driving range on the east and Margarita Avenue on the south and west (see the Water Layout Exhibit attached). The existing 3 million gallon (MG) tank that feeds this location is directly north of the 101 freeway from the project with a bottom elevation of 410' and an approximate minimum water level elevation of 430'.

SECTION 3 PROPOSED WATER SYSTEM

The project currently proposes to connect to the existing water system in 3 locations: at the end of Margarita Avenue, in Ridge View Street and at the project entrance near the existing golf course parking lot (see the Water Layout Exhibit attached).

3.1 DEMAND

The Camarillo Springs Golf Course Community is currently comprised of 248 detached single family dwelling units and some parks and green belt areas. Per the Camrosa Design Standards 2.2 A. Quantity of Flow, a typical single family detached unit would have 3.38 persons/unit. This project is expected to generate 2 persons/unit since it is a senior housing development. The 2.1 persons/unit for multifamily developments was used to determine demand and is considered conservative. The following tables estimate the demand that the proposed project will generate.

Table 1: Estimated Indoor Water Demand

Type of Units	Number of Units	Persons per Unit*	Usage per Person (gpcd)	Indoor Demand (gpd)	Indoor Demand (afy)
Single Family Detached	248	2.1*	220	114,576	128.3

gpcd = gallons per capita per day; gpd = gallons per day; afy = acre feet per year
** Project is expected to generate 2 residents per unit since it is a senior housing development. Using 2.1 is conservative.*
Source: Camrosa Water District, Water Design and Construction Standards, Section 2: Design Criteria

Table 2: Estimated Outdoor Water Demand

Land Use	Area (acres)	Usage (gal/acre/day)	Outdoor Demand (gpd)	Outdoor Demand (afy)
Parks/Green Belt	3.1	1,500	4,650	5.2

gpd = gallons per day; afy = acre feet per year
Source: Camrosa Water District, Water Design and Construction Standards, Section 2: Design Criteria

Table 3: Estimated Total Water Demand and Camrosa Supply

Total Project Demand (gpd)	Total Project Demand (afy)	Camrosa Projected 2020 Water Demand (afy)*	Camrosa Projected 2020 Water Supply (afy)*	Camrosa Projected 2020 Water Surplus (afy)*
119,226	133.6	15,941	24,450	8,509

gpd = gallons per day; afy = acre feet per year
**Source: Camrosa Water District, Urban Water Management Plan, 2015 tables 4-3, 6-9 & 7-3*

The proposed project estimated total water demand including residential and open space uses will increase total demand by less than 1 percent from the projected 2020 demand. Also, the project will consume only 1.3 percent of the projected water surplus. Based on this information, the projected Camrosa Water District water supply is more than adequate to meet the project demand.

3.2 STORAGE

In addition to the proposed water demand, the project will also need to store water in the event of an emergency. The project water demand is considered to be an average water demand. The storage requirements are based on the maximum day demand which is calculated by multiplying the average demand by a peaking factor of 2.15. The following table summarizes the required storage.

Table 4: Estimated Project Storage Required

Total Project Demand (gpd)	Peaking Factor	Maximum Day Demand (gallons)	Fire Flow Requirements (gallons)	Storage Demand (gallons)
119,226	2.15	256,336	180,000	436,336

gpd = gallons per day
Source: Camrosa Water District, Water Design and Construction Standards, Section 2: Design Criteria

3.3 DOMESTIC WATER

Per Camrosa Water District standards, the proposed domestic water system will be designed to provide service pressures between 45 psi and 80 psi. The approximate existing tank water level elevation is at 430’ with the highest proposed lot at around 128’ and the lowest pad at around 120’. The following table illustrates the project pressure analysis.

Table 5: Proposed Pressures at Highest and Lowest Pad

Pad	Elevation (feet)	Conversion Factor (feet/psi)	Pressure (psi)
Highest Pad	128	2.31	130.7
Lowest Pad	120	2.31	134.2

psi = pounds per square inch

Given the estimated pressures above, each house in the proposed project will need an individual pressure reducing valve to reduce the pressures to within the acceptable range.

3.4 FIRE WATER

It is anticipated that the required fire flow for this project will be 1,500 gallons per minute (gpm) at 20 pounds per square inch (psi) residual pressure. A hydraulic analysis was performed on the proposed system by creating a hydraulic model using Bentley WaterCAD. The fire flow analysis was run assigning a minimum 1,500 gallons per minute (gpm) demand at each hydrant individually. In addition to the fire flow demand, the maximum day domestic demand of 178 GPM (256,336 GPD) from section 3.2 above was added to the hydraulic model. The fire hydrant spacing was assumed to be 250 feet or less. As a result of the analysis, the worst-case hydrant from both a residual pressure and pipe velocity perspective was determined to be fire hydrant 8 (H-8). See the table below for fire hydrant 8 results. See Attachment 2 for the hydraulic model layout and Attachment 3 for worst-case hydrant analysis results. Based on the results of the fire flow analysis, it can be concluded that the system can supply a minimum of 1,500 gpm at 20 psi residual pressure to each fire hydrant.

Table 6: Worst-Case Hydrant (H-8) Results

Hydrant	Lowest Residual Pressure (psi)	Lowest Residual Pressure Location	Highest Pipe Velocity (ft/s)	Highest Pipe Velocity Location
H-8	111.07	J-8	9.61	P-77

psi = pounds per square inch

SECTION 4 CONCLUSIONS AND RECOMMENDATIONS

Analysis of the proposed Camarillo Springs Golf Course Community water system indicates that the project will increase total demand by less than 1 percent from the projected 2020 demand and will consume only 1.3 percent of the projected water surplus. Based on this information, the projected Camrosa Water District water supply is more than adequate to meet the project demand.

The proposed pressures for the project will be between 130.7 psi (highest pad) and 134.2 psi (lowest pad). Therefore, the proposed project will need to construct an individual pressure reducing valve at each house.

Based on the fire flow analysis, in can be concluded that the proposed system can supply a minimum 1,500 gpm at 20 psi residual pressure to each fire hydrant.

If you have any questions or concerns regarding the water analysis summarized herein, please do not hesitate to contact me via email at Glen.Pace@ECGcivil.com, or via phone at 805-416-8701.

Sincerely,

Glen H. Pace, P.E.

Principal Engineer

Attachment 1 – Water Layout Exhibit

Attachment 2 – Hydraulic Model Exhibit

Attachment 3 – Hydraulic Model Results

Attachment 4 – Fire Flow Test Results

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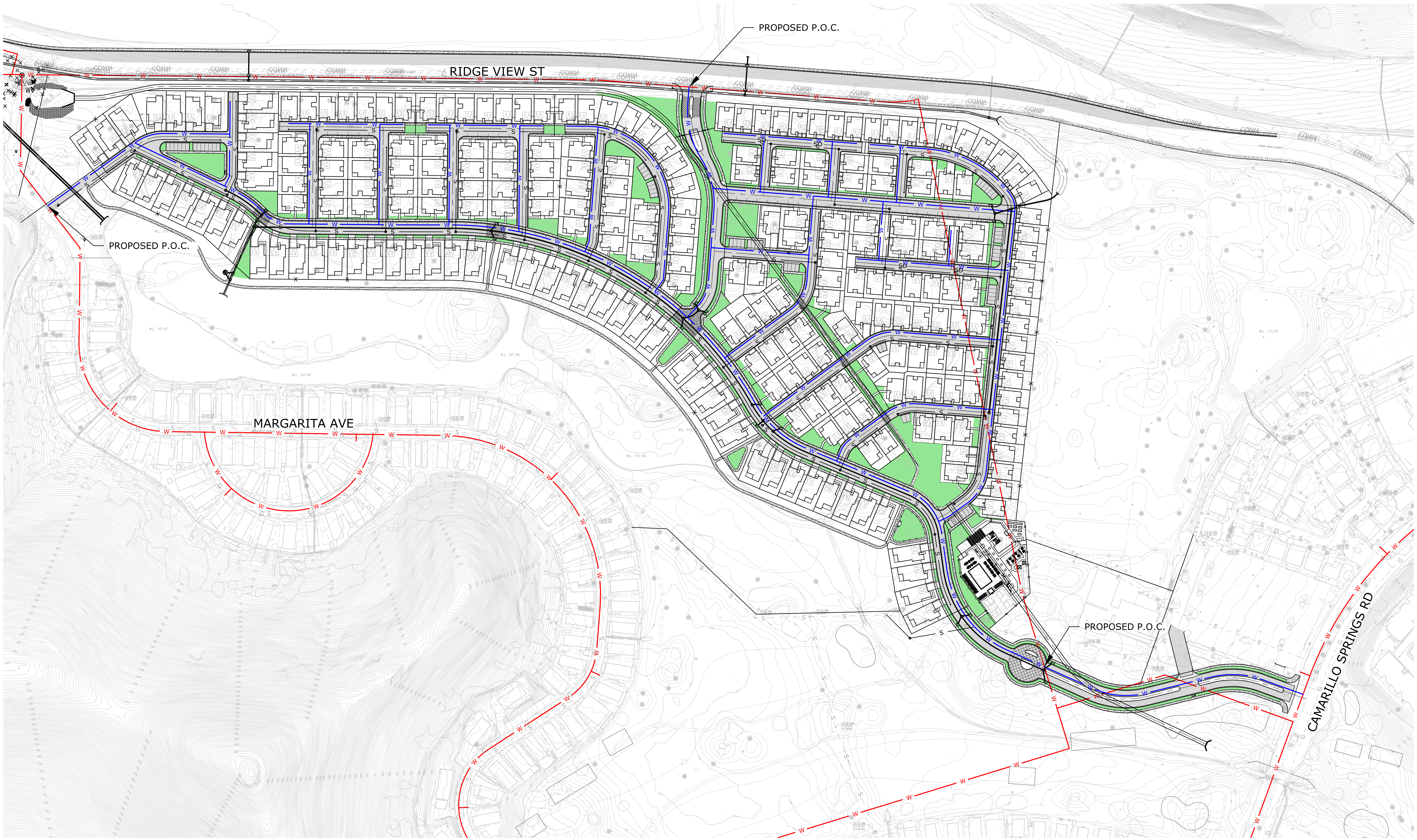
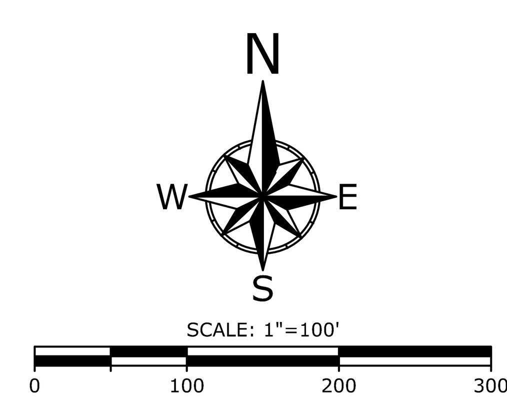
ATTACHMENT 1 – WATER LAYOUT EXHIBIT



LEGEND

- PROPOSED WATER LINE
- EXISTING WATER LINE
- APPROXIMATE PARK/GREEN BELT AREA



REVISIONS

MARK	DATE	DESCRIPTION	BY

REVIEWED BY:

DATE

DATE

Encompass Consultant Group
333 N. LANTANA ST, SUITE 287, CAMARILLO, CA 93010
PHONE: 805.322.4443 WEBSITE: WWW.ECGCIVIL.COM

PROJECT ENGINEER
R.C.E.

DATE: 8/14/2019

TTM-6016
CAMARILLO SPRINGS GOLF COURSE COMMUNITY
WATER LAYOUT EXHIBIT

CAMARILLO, CA

SCALE: HORIZ. 1"=100' VERT. N/A

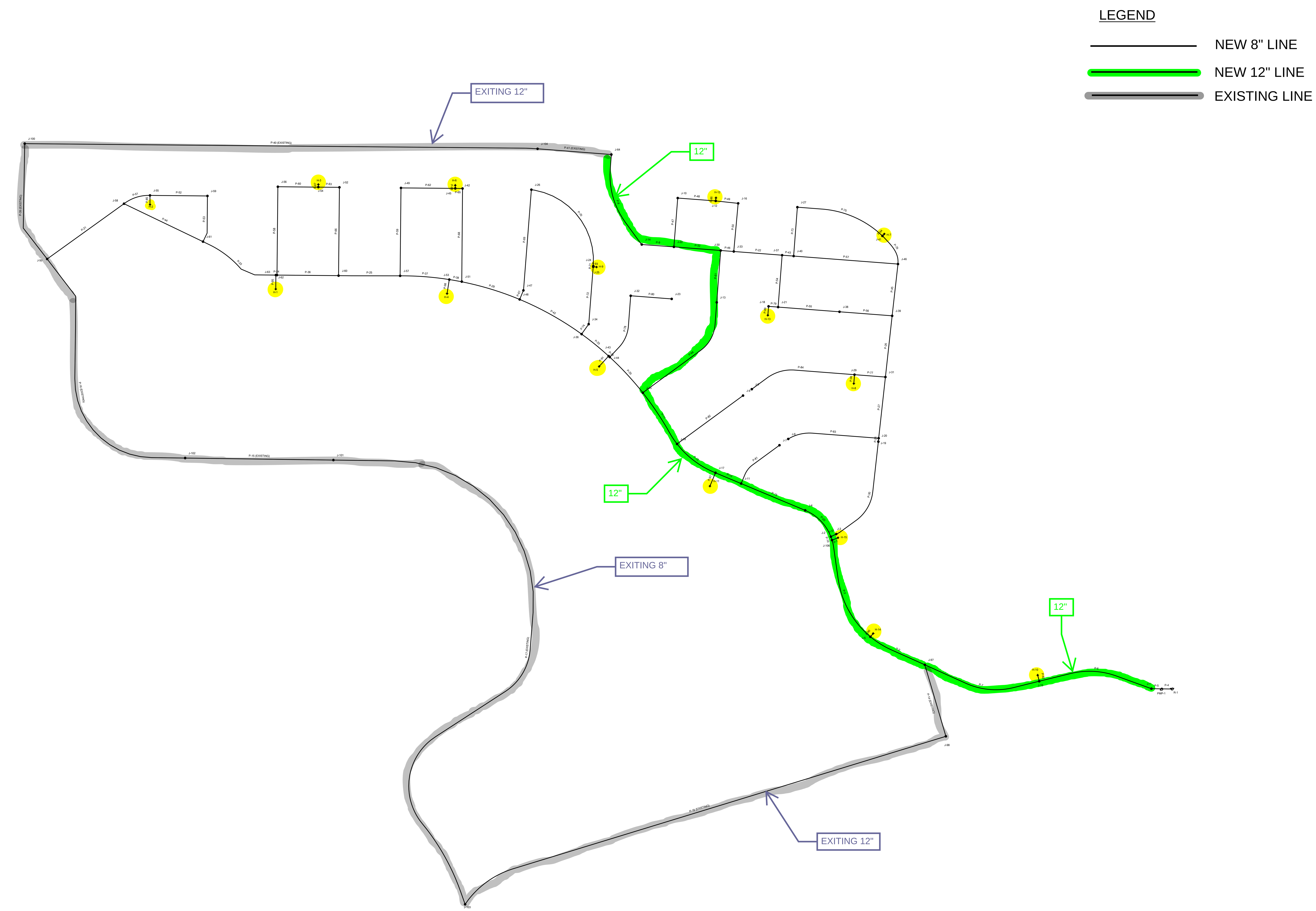
WORK ORDER
DRAWN BY: JDJ
CHECKED BY: GHP

SHEET NO. 1 OF 1

DRAWING: n:\projects\0381\engineering\acad\exhibits\0381_water exhibit.dwg

ATTACHMENT 2 – HYDRAULIC MODEL EXHIBIT

Scenario: Fire Flow Analysis



ATTACHMENT 3 – HYDRAULIC MODEL RESULTS

H-8 SCENARIO - HYDRANT TABLE

Label	Elevation (ft)	Demand (gpm)	Hydraulic Grade (ft)	Pressure (psi)	Pressure Head (ft)	Fire Flow (Available) (gpm)
H-8	125.53	1500	374.63	107.77	249.1	2102.08
H-13	126.43	0	389.46	113.8	263.03	2533.36
H-4	122.27	0	391.78	116.6	269.51	2600.42
H-6	123.92	0	391.78	115.89	267.86	2605.38
H-3	121.96	0	391.78	116.74	269.82	2608.06
H-1	119.89	0	391.78	117.63	271.89	2611.17
H-9	125.73	0	391.78	115.11	266.05	2634.96
H-7	124.06	0	389.37	114.79	265.31	2651.16
H-5	123.84	0	391.79	115.93	267.95	2676.09
H-2	120.99	0	391.78	117.16	270.79	2691.31
H-12	126.42	0	391.14	114.53	264.72	2714.98
H-11	126.11	0	392.09	115.08	265.98	2755.34
H-14	127	0	393.8	115.43	266.8	2966.98
H-15	127.59	0	392.61	114.66	265.02	2999.75
H-10	125.88	0	396.25	116.98	270.37	3117.8

H-8 SCENARIO - NODE TABLE

Label	Elevation (ft)	Demand (gpm)	Hydraulic Grade (ft)	Pressure (psi)
J-103	151.3	0	394.33	105.15
J-8	126.5	2.78	383.22	111.07
J-29	124.65	2.78	383.22	111.87
J-6	126.7	2.78	389.05	113.51
J-31	124.55	2.78	387.49	113.76
J-20	125.36	2.78	389.05	114.09
J-19	125.36	2.78	389.13	114.12
J-18	125.45	2.78	389.46	114.22
J-21	125.32	2.78	389.46	114.28
J-3	127.49	2.78	391.83	114.37
J-27	124.78	2.78	389.53	114.54
J-10	126.36	2.78	391.25	114.6
J-2	127.55	2.78	392.47	114.62
J-106	127.53	0	392.61	114.69
J-39	123.74	2.78	388.88	114.72
J-4	127.09	2.78	392.36	114.77
J-12	125.86	2.78	391.14	114.77
J-38	123.74	2.78	389.19	114.85
J-7	126.66	2.78	392.18	114.88
J-16	125.57	2.78	391.09	114.88
J-9	126.42	2.78	391.96	114.88
J-14	125.72	2.78	391.39	114.94
J-13	125.79	2.78	391.49	114.95
J-41	123.51	2.78	389.37	115.03
J-37	123.83	2.78	389.77	115.06
J-40	123.68	2.78	389.64	115.07
J-22	125.26	2.78	391.38	115.14
J-11	126	2.78	392.18	115.16
J-46	123.06	2.78	389.31	115.2
J-33	124.47	2.78	390.96	115.3
J-17	125.56	2.78	392.09	115.31
J-23	125.18	2.78	391.79	115.35
J-24	125.15	2.78	391.78	115.36
J-25	125.08	2.78	391.78	115.39
J-30	124.64	2.78	391.38	115.41
J-26	124.88	2.78	391.78	115.48
J-5	126.83	2.78	393.8	115.51
J-28	124.74	2.78	391.96	115.61
J-32	124.53	2.78	391.79	115.63
J-34	124.36	2.78	391.78	115.7
J-35	124.01	2.78	391.79	115.86
J-36	123.84	2.78	391.78	115.93
J-42	123.45	2.78	391.78	116.09
J-43	123.4	2.78	391.79	116.12
J-44	123.38	2.78	391.79	116.13
J-45	123.37	2.78	391.78	116.13
J-47	123.01	2.78	391.78	116.29

J-48	122.9	2.78	391.78	116.33
J-49	122.72	2.78	391.78	116.41
J-50	122.6	2.78	391.79	116.47
J-51	121.94	2.78	391.78	116.75
J-52	121.83	2.78	391.78	116.8
J-1	127.92	2.78	397.92	116.81
J-53	121.76	2.78	391.78	116.83
J-54	121.55	2.78	391.78	116.92
J-55	121.34	2.78	391.78	117.01
J-15	125.65	2.78	396.25	117.08
J-56	121.1	2.78	391.78	117.11
J-57	121.06	2.78	391.78	117.13
J-58	120.93	2.78	391.78	117.19
J-59	120.48	2.78	391.78	117.38
J-60	120.25	2.78	391.78	117.48
J-61	119.45	2.78	391.78	117.83
J-62	119.43	2.78	391.78	117.83
J-63	119.42	2.78	391.78	117.84
J-100	116.47	0	391.55	119.01
J-102	115.61	0	392.46	119.78
J-101	115.25	0	392.81	120.09
J-97	116.94	0	394.53	120.1
J-104	113.14	0	391.43	120.4
J-64	112.3	2.78	391.41	120.76
J-98	115.3	0	394.5	120.8

H-8 SCENARIO - PIPE TABLE

Label	Length (Scaled) (ft)	Diameter (in)	Material	Hazen-Williams C	Minor Loss Coefficient (Local)	Flow (gpm)	Velocity (ft/s)	Headloss Gradient (ft/ft)
P-96	23.5	6	PVC	150	1.28	-1500	17.02	0.366
P-77	81.57	8	PVC	150	1.28	-1505.56	9.61	0.052
P-31	15.7	8	PVC	150	1.28	788.1	5.03	0.041
P-30	286.14	8	PVC	150	0.35	785.32	5.01	0.009
P-28	8.9	8	PVC	150	0	782.54	4.99	0.009
P-27	162.09	8	PVC	150	0.35	776.98	4.96	0.01
P-22	127.53	8	PVC	150	0.35	756.38	4.83	0.009
P-4	27.63	12	PVC	150	0	1677.92	4.76	0.005
P-5	26.81	12	PVC	150	0	1677.92	4.76	0.005
P-6	305.48	12	PVC	150	0.35	-1675.14	4.75	0.005
P-7	316.36	12	PVC	150	0.35	-1672.36	4.74	0.005
P-26	162.09	8	PVC	150	0.35	-731.36	4.67	0.009
P-2	161.62	12	PVC	150	0.35	-1463.18	4.15	0.005
P-10	9.78	12	PVC	150	0.35	-1460.4	4.14	0.013
P-3	281.72	12	PVC	150	0.35	-1460.4	4.14	0.004
P-46	34.47	8	PVC	150	1.28	559.47	3.57	0.012
P-43	30.47	8	PVC	150	0.35	433.13	2.76	0.004
P-45	137.15	8	PVC	150	0.35	-422.01	2.69	0.003
P-54	137	8	PVC	150	1.28	-320.48	2.05	0.002
P-55	162	8	PVC	150	0	314.92	2.01	0.002
P-56	138.93	8	PVC	150	1.28	312.14	1.99	0.002
P-20	99.22	12	PVC	150	0.35	-669.52	1.9	0.001
P-19	182.74	12	PVC	150	0.35	-666.74	1.89	0.001
P-13	73.19	12	PVC	150	0.35	-661.18	1.88	0.001
P-12	127.92	12	PVC	150	0.35	-658.4	1.87	0.001
P-11	162.31	12	PVC	150	0.35	-652.84	1.85	0.001
P-64	327.54	12	PVC	150	1.28	603.19	1.71	0.001
P-61	137	12	PVC	150	0	600.41	1.7	0.001
P-57	275.32	8	PVC	150	1.28	242.48	1.55	0.001
P-15 (EXISTING)	390.15	8	Asbestos Cement	140	0.35	209.18	1.34	0.001
P-16 (EXISTING)	750.37	8	Asbestos Cement	140	0.35	209.18	1.34	0.001
P-17 (EXISTING)	1718.92	8	Asbestos Cement	140	0.35	209.18	1.34	0.001
P-47	128.89	8	PVC	150	1.28	208.03	1.33	0.001
P-48	100.29	8	PVC	150	1.28	205.25	1.31	0.001
P-49	59.37	8	PVC	150	0.35	202.47	1.29	0.001
P-50	127.17	8	PVC	150	1.28	-199.69	1.27	0.001
P-73	129	8	PVC	150	1.28	187.87	1.2	0.001
P-75	242.38	8	PVC	150	0.35	185.09	1.18	0.001
P-76	88.07	8	PVC	150	0.35	182.31	1.16	0.001
P-39 (EXISTING)	325.08	8	Asbestos Cement	140	1.28	178.21	1.14	0.001
P-14 (EXISTING)	196.2	12	Steel	140	1.28	209.18	0.59	0
P-18 (EXISTING)	1351.11	12	Steel	140	1.28	209.18	0.59	0
P-40 (EXISTING)	1349.65	12	Steel	140	0	178.21	0.51	0
P-41 (EXISTING)	194.78	12	Steel	140	0.5	178.21	0.51	0
P-8	260.05	12	PVC	150	0	175.43	0.5	0
P-9	84.82	12	PVC	150	0.35	172.65	0.49	0
P-35	128.09	8	PVC	150	0.35	-46.87	0.3	0
P-34	4.06	8	PVC	150	0.35	-38.53	0.25	0
P-33	91.66	8	PVC	150	0.35	-35.75	0.23	0
P-21	249.12	8	PVC	150	1.28	28.19	0.18	0
P-42	187.25	8	PVC	150	0.35	-17.85	0.11	0

P-23	219.27	8	PVC	150	0.35	17.07	0.11	0
P-32	123.53	12	PVC	150	1.28	-38.16	0.11	0
P-29	160.36	8	PVC	150	0.35	-16.29	0.1	0
P-74	32.16	8	PVC	150	1.28	15.11	0.1	0
P-24	2.99	8	PVC	150	0.35	14.29	0.09	0
P-51	73.19	8	PVC	150	0.35	13.03	0.08	0
P-44	230.6	8	PVC	150	1.28	12.38	0.08	0
P-72	151.51	8	PVC	150	0.35	12.33	0.08	0
P-52	151.18	8	PVC	150	0.35	10.25	0.07	0
P-71	1.86	8	PVC	150	0	9.55	0.06	0
P-38	33.56	8	PVC	150	0.35	-7.99	0.05	0
P-53	122.7	8	PVC	150	1.28	-7.47	0.05	0
P-70	285.1	8	PVC	150	1.28	-6.77	0.04	0
P-36	162	8	PVC	150	0.35	6.1	0.04	0
P-78	177.66	8	PVC	150	1.28	5.56	0.04	0
P-68	245.01	8	PVC	150	1.28	5.52	0.04	0
P-58	232.53	8	PVC	150	1.28	5.41	0.03	0
P-37	129.86	8	PVC	150	0.35	-5.21	0.03	0
P-69	266.09	8	PVC	150	0.05	-3.99	0.03	0
P-66	232.48	8	PVC	150	1.28	2.93	0.02	0
P-59	231.35	8	PVC	150	1.28	2.82	0.02	0
P-79	25.27	8	PVC	150	1.28	-2.78	0.02	0
P-80	108.13	8	PVC	150	0.8	2.78	0.02	0
P-81	146.19	8	PVC	150	1.28	2.78	0.02	0
P-82	215.32	8	PVC	150	1.28	2.78	0.02	0
P-83	241.22	8	PVC	150	1.28	-2.78	0.02	0
P-84	284.94	8	PVC	150	0.35	-2.78	0.02	0
P-65	19.09	8	PVC	150	0.35	-2.74	0.02	0
P-60	106.48	8	PVC	150	1.28	2.63	0.02	0
P-67	25.8	8	PVC	150	1.28	-1.21	0.01	0
P-25	162	8	PVC	150	0.35	0.39	0	0
P-63	55.52	8	PVC	150	0.35	-0.15	0	0
P-62	142.91	8	PVC	150	1.28	0.04	0	0
P-88	8.18	6	PVC	150	1.28	0	0	0
P-87	7.09	6	PVC	150	1.28	0	0	0
P-90	11.27	6	PVC	150	1.28	0	0	0
P-1	16.83	6	PVC	150	0	0	0	0
P-86	8.18	6	PVC	150	1.28	0	0	0
P-93	8.76	6	PVC	150	1.28	0	0	0
P-89	23.42	6	PVC	150	1.28	0	0	0
P-91	37.21	6	PVC	150	1.28	0	0	0
P-97	37.97	6	PVC	150	1.28	0	0	0
P-95	36.9	6	PVC	150	1.28	0	0	0
P-98	37.42	6	PVC	150	1.28	0	0	0
P-94	7.26	6	PVC	150	1.28	0	0	0
P-85	24.07	6	PVC	150	0.75	0	0	0
P-92	16.5	6	PVC	150	1.28	0	0	0

ATTACHMENT 4 – FIRE FLOW TEST RESULTS

WREA

WATER RESOURCE ENGINEERING ASSOCIATES

CONSULTING CIVIL AND ENVIRONMENTAL ENGINEERS IN WATER AND WASTEWATER

COLLECTION, CONSERVATION, DISTRIBUTION AND TREATMENT

2300 ALESSANDRO DR, SUITE 215, VENTURA, CA. 93001 (805) 653-7900 1-800-25-WATER FAX: (805) 653-0610

FIREFLOW TEST DATA

PROJECT:	Camarillo Springs Golf Course	ASSESSORS PARCEL NO.:	234-0-045-95
PROJECT NO.:	3341	FOR:	Encompass Consultant Group
FIRE DEPT:	VCFD	OBSERVERS:	Steve Cattanach, Will Trax
WATER PURV:	Camrosa	FIRM:	Water Resource Engineering Associates (WREA)

		Time				*Pressure (PSI)*			*Flow Rates (GPM)*		
Test No.	***Location***	***Date***	***Time***	***c***	***d (in)***	P_S	p	P_R	Q_O	***M***	***Q 20***
1	**791 Camarillo Springs Rd**	**9/26/19**	**8:30am**	***0.90***	***2.50***	**130**	**100**	**124**	**1678**	**4.81**	**8071**
See Note B				***0.90***	***2.50***	***130***	***100***	***117***	***1678***	***3.17***	***5319***

c = *Nozzle Coefficient of Discharge*

d = *Diameter of Outlet in Inches*

P_S = *Static Pressure*

P_R = *Residual Pressure (min 10 psi or 10% drop)*

p = *Pitot Gage Pressure in PSI*

Q_O = *Observed Flow*

Q_{20} = *Extrapolated Flow at 20 PSI*

M = *Multiplier for Extrapolated Flow*

Formula for Multiplier:

$$M = \frac{(P_S - 20)^{0.54}}{(P_S - P_R)^{0.54}}$$

Formula for Extrapolated Flow at 20 PSI Residual:

$$Q_{20} = Q_O \times M$$

Formula for Observed

$$Q_O = 29.83cd^2 \sqrt{p}$$

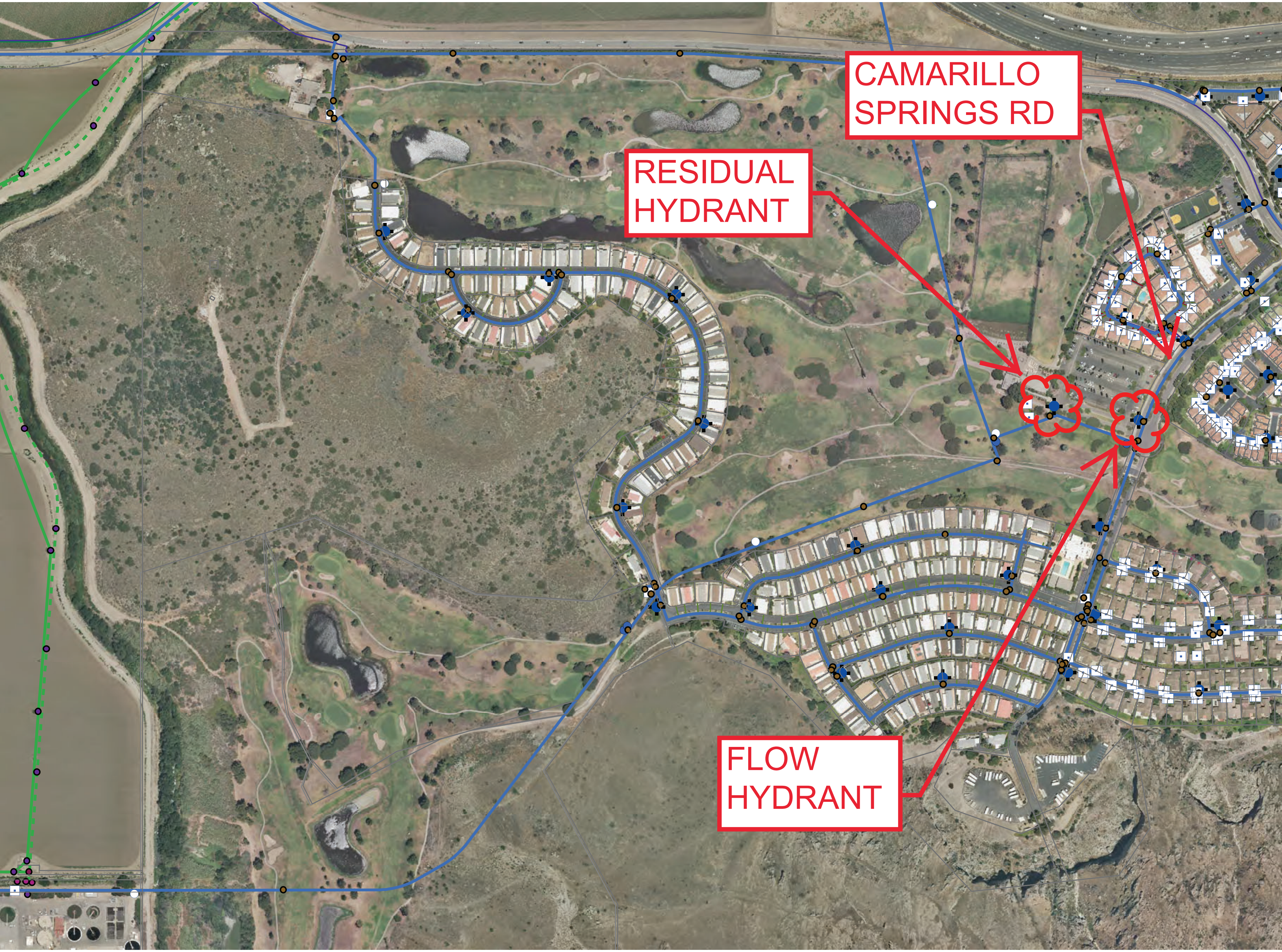
Note: A: This fire flow test data is provided for information only. Use of the results is solely at the user's risk. The Engineer makes no guarantee that the results of this test can be repeated, except to state that at the time and date indicated, the test yielded the results indicated. Calculated Q20 flows reflect hydraulic conditions that may not actually be attainable in field.

B: Theoretical extrapolated flow rate at 20 psi calculated for adjusted residual pressure drop of 10% P_S. Actual residual pressure drop measured during testing less than 10 psi or 10%.

REGISTERED PROFESSIONAL ENGINEER
BENJAMIN T. FISCHETTI
NO 69360
CIVIL
STATE OF CALIFORNIA

Testing & Calculations Checked and Certified

9/26/2019
Date


CAMARILLO SPRINGS RD
RESIDUAL HYDRANT
FLOW HYDRANT