Final

Valiano
Water and Recycled Water Study

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Contents

1. Introduction 1
2. Potable Water Source 1
3. Historical Baseline Water Use for the Property 2
4. Project Land Use and Water Demands 6
5. Potable Water System 8
   - 5.1 Water System Design Criteria 8
   - 5.2 Storage Requirements 9
6. Proposed Water System 15
7. Conceptual Recycled Water System 17

Appendices

A Hydraulic System Analysis Model Simulations

Tables

Table 1 Valiano's Historic Annual Fiscal Year Water Use (2006-2015) (x 1,000 gallons) 3
Table 2 Year 2013 Valiano Property Baseline Water Use (Metered Usage) 5
Table 3 Project Land Uses 6
Table 4 Potable Water Demands 7
Table 5 Reduced Potable Water Demand (With Increased Conservation) 8
Table 6 Existing Storage Analysis 10
Table 7 Future (2035) Storage Analysis 11
Table 1 Hydraulic Analysis Results Summary 3

Figures

Figure 1 Conceptual On-Site Water System 19
Figure 2 Proposed Water System Phasing 20
Figure 3 Reclaimed Water Exhibit 21

Valiano Water and Recycled Water Study

October 2015

1. Introduction

The proposed Valiano development (project) is located on approximately 239 acres within an area called Eden Valley, which is an unincorporated area of northern San Diego County. The property is located approximately one mile south of State Route 78 (SR-78) and the Nordahl Road exit along Country Club and Hill Valley Drives. When fully developed, the project will develop 326 residential units on varying lot sizes within five neighborhoods. In addition, the project includes a neighborhood park, equestrian staging area, and recreational center. The project is being processed as a General Plan Amendment and Specific Plan with the County of San Diego (County).

The purpose of this Water and Recycled Water Study (Study) is to layout and analyze potable and recycled water systems to serve the proposed project within the Rincon del Diablo Municipal Water District (District) in support of the processing of a Tentative Map and Project Environmental Impact Report (EIR) within the County. A previous water and recycled study was submitted in April 2015. This updated study incorporates the District's comments and includes a detailed hydraulic analysis to document facility sizes and phasing of the water system in accordance with District design criteria. In addition, this study documents historical water use on the site to demonstrate there is no net increase in water supply.

2. Potable Water Source

The project is located in the District's Improvement District 1 South (ID-1) water system which serves existing development within the City of Escondido and the County of San Diego, generally south of SR-78 and west of Interstate 15 (I-15). The District maintains north and south water systems within ID-1 that operate at slightly varying pressures. The ID-1 North water system is supplied by two reservoirs (R-3A and R-3B) which operate at high water levels of 1,000 feet and are supplied by one San Diego County Water Authority (SDCWA) connection. The ID-1 South system includes a total of four reservoirs with slightly varying high water levels with the highest being the R-1A and R-1B reservoirs at 959 feet.

The project is just northwest of the R-1A and R-1B reservoirs and can be immediately served by the 959 Pressure Zone in this area, similar to the adjacent Harmony Grove development under construction. Potable water service for the project will be primarily provided by a connection to an existing 14-inch transmission water main from the R-1B Reservoir, along the southern boundary,

near Country Club Lane. Secondary sources of water supply are necessary for reliability and to meet design criteria. These include:

- new connections along Country Club Lane, including the new Harmony Grove 16-inch waterline to provide looping for the southerly neighborhood;
- a new connection to the Harmony Grove water system along the south-central boundary to provide additional looping and hydraulic support;
- a new 12-inch main is recommended to connect to Eden Valley Lane to provide reliability for the south half of the project to support initial development phasing; and
- a new 16-inch main to the north at Hill Valley Drive to provide system redundancy from north to south and to provide a supply pipeline to the proposed R7 Reservoir.

The project site includes existing waterlines that will be abandoned and removed or replaced during various construction phases. It may be necessary to maintain water service to existing customers along the southerly boundary during construction.

Based on a proposed graded pad elevation range of 880 feet in the southwest portion to 630 feet in the southeast, static pressures for the proposed water system will range between 34 psi to 142 psi based on the high water level of 959 feet at the R-1B Reservoir. Because of the low static water pressures along the western boundary, a small boosted pressure zone will be required to serve all lots above approximately 800 feet in elevation. A new 1030 Pressure Zone, established by the construction of a new water booster pump station, can serve proposed pads between an elevation of 800 and 870 feet and provide static pressure between 100 psi and 65 psi, respectively.

3. Historical Baseline Water Use for the Property

Development of the Valiano property during these unprecedented times of mandatory water use restrictions and water supply cutbacks is possible because the property can establish a reasonable baseline of historical water use since the land was an active irrigated agriculture area. Water use records were reviewed for the past ten years, when the land was primarily used for commercial avocado production. It was assumed that 80-90 percent of the total land was irrigated. There were three major properties that were irrigated and were served imported water by District water meters ranging in size from 5/8 inch to 3 inch. There were private water wells also supplementing irrigation water demands. **Table 1** summarizes the annual water between fiscal year (FY) 2006 and 2015.

Table 1 Valiano's Historic Annual Fiscal Year Water Use (2006-2015)
(x 1,000 gallons)

Property Name	APNs	Rincon #	2005/06	2006/07	2007/08	2008/09	2009/10	2010/11	2011/12	2012/13	2013/14	2014/15
Hu Property	232-313-13	94-1050-1	39,834	43,465	2,497	29,837	25,320	25,288	28,318	30,410	25,249	1,145
Henry Avocadoes	232-013-01	94-1300-0	45,363	47,707	37,197	33,144	28,329	27,224	27,050	19,375	508	73
Fahr	232-013-02,03 & 232-020-55	94-1400-2 & 94-1600-2	31,654	28,140	23,429	15,312	11,088	7,577	14,345	30,821	21,918	338
Hakimian	232-492-01	25-3110-0	732	345	610	352						
Fines	232-500-18 to 23, 235-031-41	25-5700-4	59	67	72	16	131	36	33	146	33	9
	238 acres		117,642	119,724	93,805	78,761	64,868	60,125	69,746	80,752	47,708	1,565

Source: Integral Communities water record research provided by the District.

Over the past ten years, total annual water use ranged from a high of 119,724,000 gallons per year to a low of 1,565,000 gallons per year. The last year represents the land no longer being used for agriculture. In order to estimate the average day demands over the course of one year the total gallons in a year is divided by 365 days. In FY 06, the highest recorded water year, the average daily water use was 322,000 gallons per day (gpd). Over a period of five fiscal years (between FY 2009-13) the average annual water use was 194,000 gpd or 70,810,000 gallons a year.

Assuming approximately 200 acres of irrigated land, this equates to an average irrigation rate between 970 and 1,600 gpd/acre (1.1 to 1.8 acre-feet per acre per year). These irrigation application rates appear reasonable, since supplemental water was being provided by well water for the agricultural operation.

Based on the analysis above, it appears reasonable to utilize either a five year rolling average for historical baseline water use or conservatively assume one recent year. Although the data was reported by fiscal year, it was determined to use actual calendar year 2013 as the baseline year for the following reasons:

- Year 2013 represents the “baseline” for issuance of the Project’s Notice of Preparation for the Environmental Impact Report.
- The annual water use appears to represent a reasonable average use during a normal climatic year and was after the economic downturn where water use may have been curtailed.
- The District’s Water Master Plan (June 2014) based its “existing water demands” on water use records from 2013 and therefore future water supply and storage requirements use 2013 as a baseline year.
- A 2013 baseline year provides a conservative historical water usage for the District to document water supply recognizing that higher demands were experienced in the past.

Table 2 below summarizes the calendar year 2013 water consumption and baseline average.

Table 2 Year 2013 Valiano Property Baseline Water Use (Metered Usage)

Month	Gallons (1,000)
January	2,859
February	5,339
March	2,900
April	4,962
May	5,959
June	4,824
July	6,086
August	5,413
September	5,794
October	5,595
November	5,524
December	3,854
Total Annual Usage	**59,109,000 gallons**

Notes:
1. Water use based on calendar Year 2013 and four properties with existing water meters
2. Property Names: Hu, Henry Avocadoes, Fahr, and Fines
3. Rincon Account #'s: 94-1050-1, 94-1300-0, 94-1400-2 & 94-1600-2, and 25-5700-4

Year 2013 Baseline Average Day Demand: 59,109,000 ÷ 365 days = 161,900 gallons per day (gpd)

Based on the above calculations and assumptions it is reasonable to assume that the Valiano property conservatively has a historical water use of approximately 162,000 gpd (0.16 mgd) for an assumed baseline year of 2013. Based on the five year rolling average, the baseline average annual water use increases to approximately 194,000 gpd. Since the District estimates a typical single-family residential unit at 510 gpd per unit, which may be lower today with water conservation, the baseline average use would compare to between 320 and 380 equivalent single-family units.

Historical levels of use may serve as a project EIR baseline condition for development of the property which had a different land use and is being replaced with development. This issue on using historical levels to gauge environmental impacts was re-affirmed in a recent legal decision, *North County Advocates v. City of Carlsbad, Fourth District, First Division, October 9, 2015.* The Valiano project therefore utilizes this baseline condition in its analysis of future water supply and storage needs further presented in this report.

The Valiano property has a reasonable and defendable historical baseline water demand between 162,000 and 194,000 gpd. As a result, the proposed development will not require an increase in new water supplies to serve the property.

4. Project Land Use and Water Demands

This section of the report presents information regarding the District's land use and potable water planning criteria and projected water demands for the project.

The project has a gross acreage of 239 acres and will develop 326 residential units, with lot sizes ranging from 6,000 square feet (sf) to 40,000 sf, including up to 51 secondary units. Potable water will also be provided to the recreation center, neighborhood park restroom facilities, and an equestrian staging area. Landscape irrigation will be provided by a separate recycled water system. A summary of the proposed land uses are presented in **Table 3**.

Table 3 Project Land Uses

Site	Gross Acreage	Dwelling Units
Single Family Residential[1]		273
Condominium Residential (detached)		53
Open Space[2]	35.6	0
Parks[2]	6.46	0
Landscape Irrigation[2]	28	0
Neighborhood Park[3]	2.7	-
Recreation Facility	2.3	-
Agriculture Preserve Easement[4]	35.4	-
Total		**326**

[1] The 273 dwellings included an option to add up to 51 secondary units.
[2] Assumed served by recycled water system.
[3] Potable water supplied for restrooms and recycled water supplied for irrigation purposes.
[4] The project will provide an agricultural easement for possible agriculture use in the northwest portion. Irrigation will be by well water or if available recycled water.

The District's 2011 Harmony Grove Potable Water Study presented unit demand criteria for residential and non-residential land uses based on a gross acreage basis and residential density ranges.

The primary project components include 273 single-family residential units and 53 condominium-mapped detached units encompassing approximately 239 acres located in the unincorporated area known as Eden Valley, just west of the City of Escondido. The single-family units could include up to a total of 51 secondary units.

Based on a gross application of the design criteria this equates to an average water duty factor of 510 gallons per day per dwelling unit (gpd/DU) for single-family residential and 400 gpd/DU for condominium-mapped residential units. The optional 51 secondary units are assumed to be

included within the 510 gpd/DU single-family water use based on a review of lot sizes and estimated average density of 2.9 people per dwelling unit.

Projected water demands for the project are shown in **Table 4**. The total average day demand for the project is 164,590 gpd (0.16 mgd). Based on District design criteria, the peaking factors are 2.7 for max day and 3.9 for peak hour. These equate to a maximum day demand of approximately 444,400 gpd (309 gpm) and a peak hour demand of 445 gpm for the potable water system.

Table 4 Potable Water Demands

Site	Units/ Acres	Unit Demand (gpd/unit)	Average Demand		Max Day Demand		Peak Hour Demand
			gpd	gpm	gpd	gpm	gpm
Condominium Residential (detached)	53	400	21,200	15	57,240	40	57
Single Family Residential	273[1]	510	139,740	97	377,300	262	378
Neighborhood Park	2.7	500	1,350[2]	0.94	3,645	3	4
Recreation Center	2.3	1,000	2,300	1.6	6,210	4	6
Total			**164,590**	**115**	**444,400**	**309**	**445**

[1] Includes up to 51 secondary units in the water demand estimate.

[2] Includes potential equestrian staging area.

Water Conservation and Future Residential Water Use

In light of the recent water use restrictions and drought, it is anticipated that future water use could be 20-25 percent lower per single-family unit, based on a review of new residential developments through-out San Diego County. Water saving devices such as low flow fixtures, including requiring high efficiency wash machines, are common practice today for single-family residences. Outdoor water use restrictions have further curtailed average single-family usage. **Table 5** presents a potential reduced potable water demand due to these conservation measures that may be realized by the project due to the drought conditions and permanent water conservation. The water demands for condominiums and single-family residential were reduced to 300 gpd/unit and 400 gpd/unit, respectively.

Table 5 Reduced Potable Water Demand (With Increased Conservation)

Site	Units/ Acres	Unit Demand (gpd/unit)	Average Demand		Max Day Demand		Peak Hour Demand
			gpd	gpm	gpd	gpm	gpm
Condominium Residential (detached)	53	300	15,900	11	42,930	30	43
Single Family Residential	273[1]	400	109,200	76	294,840	205	296
Neighborhood Park	2.7	500	1,350[2]	1	3,645	3	4
Recreation Facility	2.3	1,000	2,300	2	6,210	4	6
Total			**128,750**	**90**	**347,630**	**242**	**349**

[1] Includes up to 51 secondary units in water use estimate.

[2] Includes potential equestrian staging area.

The reduced water demand analysis was not used in the hydraulic capacity analysis but presents the lower range of water use that may be ultimately required of the project given recent water use trends in San Diego County. Under this scenario, water demands would be 20 percent lower compared to using current District criteria.

5. Potable Water System

This section of the report presents the on-site potable water system based on a review of District facility criteria and the Harmony Grove Village Study.

5.1 Water System Design Criteria

The following is the District's criteria for minimum residual pressures and pipeline fluid velocities:

- Maximum day demand plus single fire flow condition: 20 psi within the water mains in the vicinity of the fire flow demand. At the flowing hydrant, the 20 psi is measured at the lateral connection to the water main.
- Simultaneous fire flow event: 20 psi within the public water facilities in the vicinity of the fire flow demand and, if applicable, positive pressures within private water mains feeding the fire flow. The second fire shall be placed within the same pressure zone on the nearest transmission main feeding the project (12-inch diameter or greater), within one radial mile of the first fire. The amount of the second fire flow shall be based on the fire severity zone of the locations selected (1,500 gpm residential with "moderate" severity, 2,500 gpm residential with "high" and "very high" severity, etc.).
- Maximum fluid velocity: 15 feet per second (fps) during fire flow on existing pipe, 10 fps on new pipe.

- Per the San Marcos Fire Protection District Fire Marshal, a total fire flow demand of 1,500 gpm is required for the project based on its location within a “moderate” severity zone. Fire sprinkler demands specific to this project have not been analyzed as part of this study.

5.2 Storage Requirements

In-District water storage is needed to provide operational, fire, and local emergency water distribution system needs for the existing and proposed expansion of the water system. The District’s 2014 Water Master Plan recommended a new 3.0 mg reservoir, referred to as the “R7 Reservoir” in the ID-1 South service area. The District owns a future reservoir site, within the northern portion of the proposed project. The R7 Reservoir would provide multiple benefits for the service area including:

- Replace the District’s R1-A Reservoir existing storage capacity in the ID-1 South service area, which is being converted from potable water to recycled water.
- Provide fire storage to meet the new dual fire flow standards by providing a new water source and increased water pressures.
- Provide operational storage and fire flow capacity needs for planned development in the ID-1 South service area.

The District’s 2014 Water Master Plan developed a baseline year of 2013 for analyzing existing water storage needs and a 2035 growth forecast to estimate future storage needs. Based on the discussions presented in Section 3 regarding historical baseline water use for Valiano in 2013, it is reasonable to conclude that Valiano’s new water demand is accounted for in the District’s “existing” water demand. Accordingly, the primary need for R7 Reservoir for the project becomes twofold:

1. Provide fire storage and pressure for Valiano
2. Alleviate ID-1 South existing system storage deficiencies

In accordance with District criteria, new development water storage is roughly estimated based on a criteria of approximately 3.33 times the new or increase in water demand. In the case of Valiano, the historical baseline water usage is approximately 0.16 mgd (as discussed in Section 3) and the projected water use for Valiano (see **Table 4**) is also 0.16 mgd. In summary, there is no increase in water demand for the project compared to historical use. It is therefore assumed that the Valiano project is included in the 2013 existing water demand and storage calculations in the 2014 Water Master Plan.

Table 6 presents the District existing storage analysis for the 2013 “existing” water demand within Improvement District 1, including ID-1 South where the Valiano property is located and prior to the conversion of the R1-A Reservoir.

Referring to **Table 6**, a summary of ID-1 South storage findings and observations include:

- Prior to the conversion of the R1-A Reservoir, the ID-1 South had a storage surplus of 1.2 mg.
- Nearly 90 percent of a tank is used for emergency purposes compared to daily operational use.
- Upon conversion of the R1-A Reservoir, the ID-1 South system will be deficit by 1.9 mg.
- The District may want to consider including up to 1.9 mg in the new R7 Reservoir to correct existing deficiencies.
- Water quality concerns should be considered in the final storage analysis and design of for the R7 Reservoir.

Table 6 Existing Storage Analysis

Reservoir	Average Annual Demand (gpm)	Average Annual Demand (mgd)	Operational (33-40% of AAD)	Fire (2 hours, dual fire)	Emergency (3x AAD)	Total Storage Required (mg)	Existing Storage (mg)	Surplus/ (Deficit) (mg)
ID-1 North								
R-3A R-3B	911	1.3	0.4	0.6	3.9	5.0	3.1 2.8 *5.9*	0.9
Rockhoff								
R-4	72	0.1	0.0	0.6	0.3	0.9	0.6	-0.3
ID-1 South								
R-1A R-1B R-5 R-6	2,722	3.9	1.3	0.6	11.8	13.7	3.1 3.7 3.0 5.1 *14.9*	1.2
ID-A								
R-2A R-2B R-2C	636	0.9	0.4	0.6	2.7	3.7	0.4 1.1 3.1 *4.6*	0.9
Total		**6.2**	**2.1**	**2.4**	**18.7**	**23.3**	**26.0**	**2.7**

Source: Rincon del Diablo Municipal Water District Water Master Plan Update, June 2014.

Table 7 presents the District future storage analysis for the 2035 water demands within Improvement District 1, including ID-1 South and the conversion of the R1-A Reservoir. The R7 Reservoir is assumed at 3.0 mg in the analysis and although a small ID-1 South storage deficiency exists, it was noted to be mitigated by other District emergency storage in the ID-1 North water system which is interconnected with ID-1 South. Note the 2035 analysis assumes new units for Harmony Grove, Valiano, and Harmony Meadow. Since Valiano retains a historical baseline existing use, the District's total required future storage would likely be reduced.

Table 7 Future (2035) Storage Analysis

Reservoir	Average Annual Demand (gpm)	Average Annual Demand (mgd)	Operational (33-40% of AAD)	Fire (2 hours, dual fire)	Emergency (3x AAD)	Total Storage Required (mg)	Total Storage (mg)	Surplus/ (Deficit) (mg)
ID-1 North								
R-3A R-3B	970	1.4	0.5	0.6	4.2	5.3	3.1 2.8 *5.9*	0.6
Rockhoff								
R-4	77	0.1	0.0	0.6	0.3	1.0	0.6	-0.3
ID-1 South[1,4]								
R-1A[2] R-1B R-5 R-6 R-7[3]	3,110	4.5	1.5	0.6	13.4	15.5	0.0 3.7 3.0 5.1 3.0 *14.8*	-0.7
ID-A								
R-2A R-2B R-2C	677	1.0	0.4	0.6	2.9	3.9	0.4 1.1 3.1 *4.6*	0.7
Total		**7.0**	**2.4**	**2.4**	**20.8**	**25.7**	**25.9**	**0.3**

gpm = gallons per minute; AAD = Average Annual Demand; mg = million gallons

1 Future residential growth of 1,800 EDUs assumed to develop in ID-1 South.

2 R-1A converted to a recycled water tank in the 2035 analysis.

3 2035 analysis assumes new 3.0 mg R-7 Reservoir.

4 Surplus 2035 storage in ID-1 North can be used to help offset the 0.7 mgd storage deficit in ID-1 South.

Source: Rincon del Diablo Municipal Water District Water Master Plan Update, June 2014.

R7 Reservoir Sizing and Valiano Fair Share Analysis

A number of factors should be taken into consideration in the recommended final sizing and timing for the R7 Reservoir as well as providing a technical basis for Valiano's fair share percentage of the new tank. These include but are not limited to:

- Meet the objectives and goals of the District's 2014 Water Master Plan
- Provide a conservative size and height for analysis in the project EIR
- Incorporate Valiano's historical baseline water use into the analysis
- Evaluate the benefit of the new tank to meet the District's new fire flow criteria
- Review of site constraints, pad elevation on cut, and access issues
- Water quality management and ability to integrate tank into ID-1 South water system

As part of the sizing analysis two reservoir size options were considered.

R7 Reservoir (Option 1 – Master Plan Size)

Based on a review of the 2014 Master Plan and the Valiano baseline water use established for 2013, the District could justify the proposed 3 mg reservoir to meet all the storage requirements in the ID-1 South system. This could include contribution by the District of at least 1.9 mg for the loss of the R1-A Reservoir and emergency storage it provided. The new R7 Reservoir will also provide fire storage and water supply to meet existing and future fire flow needs.

R7 Reservoir–3.0 mg

Detailed hydraulic analyses were performed on the proposed water system to evaluate the tank sizing and timing. The analyses is included in Appendix A. Because of the proximity of the Valiano project to the existing R1-B Reservoir a majority of Valiano can be served by the existing tank under maximum day plus fire flow demands, due to the lower requirement of a 1,500 gpm fire, compared to 2,500 gpm used in Harmony Grove. The primary benefit of the R7 Reservoir is to provide fire flow by "gravity flow" to the highest pad elevations within Valiano, which are above 800 feet and avoid the construction of an expensive, large water booster pump station with fire pumps. Under this scenario, Valiano can meet the dual 1,500 gpm fire flow requirement for two hours, which requires 0.36 mg of fire storage.

Therefore, a reasonable fair share contribution to the R7 Reservoir could be based on the fire storage portion of the total tank, since Valiano maintains a historical baseline water use and does not necessarily add more operational and emergency storage. This analysis would equate to about 12 percent of the R7 Reservoir. The District, as part of its capital improvement program could include the 1.9 mg storage deficiency; and future growth in the District, with no baseline usage, would contribute to the remaining volume of 0.74 mg. A preliminary fair share summary would be as follows:

Option 1 – R7 Reservoir (3.0 mg)

	Capacity	Share
District	1.90 mg	63%
Valiano	0.36 mg	12%
Future	0.74 mg	25%
	3.00 mg	100%

R7 Reservoir (Option 2 – Reduced Size)

Based on a review of the 2014 Master Plan, the Valiano baseline water use established for 2013, and potential water quality and tank turnover issues with large tanks, the District could consider a smaller 2 mg reservoir to meet the majority of storage requirements in the ID-1 South system. This would include a contribution by the District for a portion of the loss of the R1-A Reservoir since a large portion was emergency storage. A smaller R7 Reservoir will still provide fire storage and supply to meet existing and future fire flow needs.

R7 Reservoir–2.0 mg

The primary benefit of a smaller R7 Reservoir would be to provide more optimum operating levels of the tank when integrated into the ID-1 South system. In addition the tank would be easier to site and construct as a smaller capacity. The tank would still provide fire flow by "gravity flow" to the highest pad elevations and as such Valiano benefits from being able to be meet dual 1,500 fire flows. Under this scenario, a reasonable fair share contribution to the R7 Reservoir could be based on a proportion of the fire storage and a proportion of the District making up the loss of R1-A storage, since a smaller tank would be constructed. Under Option 2 a preliminary fair share summary would be as follows, with the following notes:

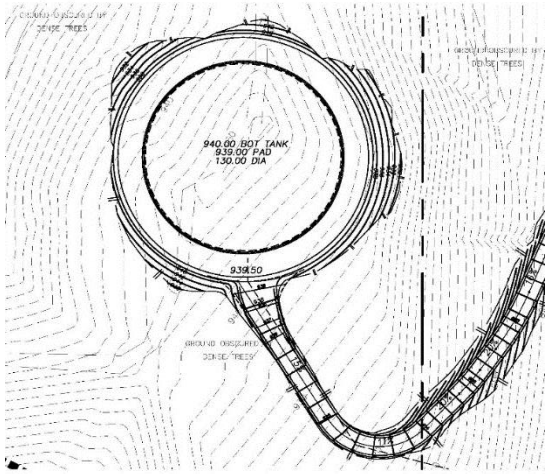
Option 2 – R7 Reservoir (2.0 mg)

	Capacity	Share	Notes
District	1.08 mg	54%	Assume roughly 50% capacity for the loss of R1-A
Valiano	0.18 mg	9%	Assumes 50% contribution toward fire storage
Future	0.74 mg	37%	Maintain future contribution at 0.74 mg
R7 Reservoir	2.00 mg	100%	

For the purposes of the Project Environmental Impact Report a 3 mg R7 Reservoir is analyzed from a visual and site constraint standpoint. It is recommended that during the design phase, a pre-design report be prepared for the District to determine the optimum size, anticipated to between 2 and 3 mg.

R7 Reservoir Design Criteria

Shown below is a similar District steel tank that mirrors a reservoir that could be constructed on the R7 Reservoir site. A typical 3 mg steel reservoir would have a footprint diameter of 130 feet with a height of 32 feet. A typical site plan of the R7 site and cross sections are shown below. A paved 15 foot road would provide access to the site. In addition, the District will require a minimum of a 20 foot permanent easement for the pipeline and access easement for the access road. The grade for the access road would be limited to a maximum of 20-25 percent. A 16-inch PVC or steel water pipeline would be required from the R7 Reservoir. A 2 mg reservoir project could be constructed on the same pad with a slightly lower tank height of 24 feet, also shown in cross section. Parameters of the site and reservoir would be determined during the pre-design phase.



R7 Reservoir Site Plan

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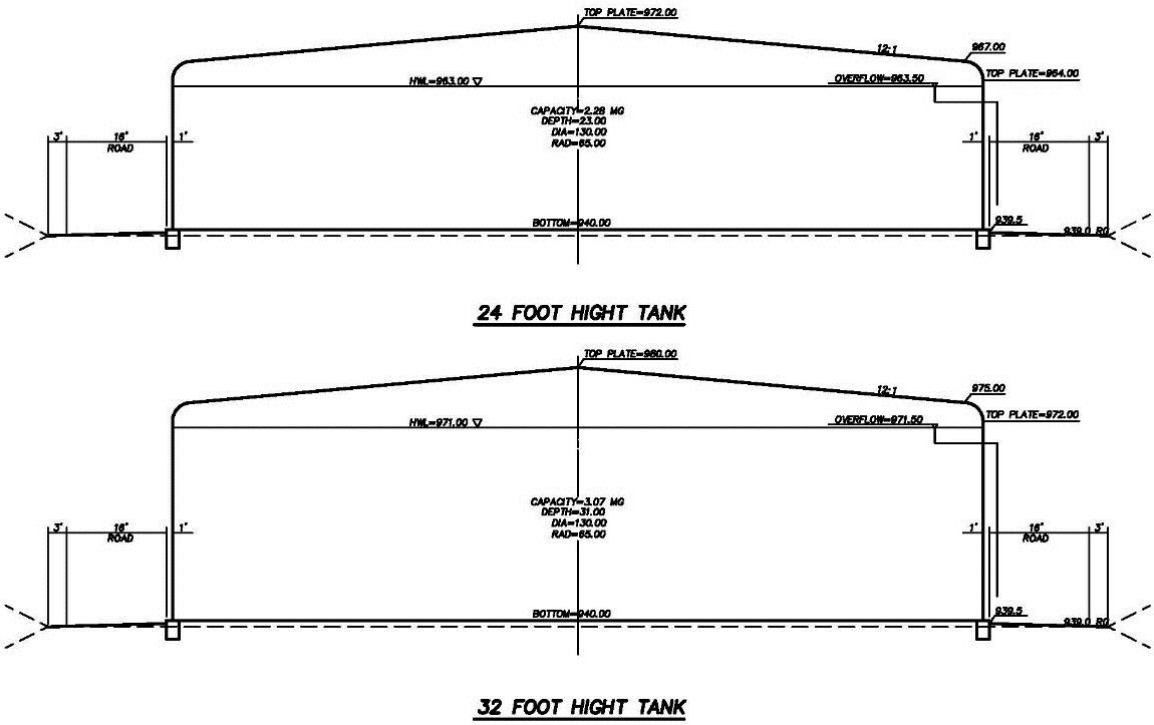


R7 Reservoir Cross Sections

6. Proposed Water System

A detailed water system analysis was performed using a hydraulic computer model to determine the sizing of the water distribution system in accordance with District design criteria presented in Section 5.1. Specifically, the proposed water system was primarily evaluated for maximum day plus fire flow and peak hour demand conditions. In addition, the project was evaluated under assumed phasing scenarios to determine the need and timing of the proposed R7 Reservoir and other key backbone facilities. Appendix A includes the detailed hydraulic analysis. This section provides a summary of the findings and recommendations.

Figure 1 shows the proposed on-site water distribution system for the project. A 16-inch 959 Pressure Zone water main loops the core development area to provide:

- The new dual fire flow requirements for the project and adjacent existing areas
- Minimize pressure losses in providing fire flow to the highest elevations of the project
- Support operations of the R7 Reservoir
- Facilitate phasing of the water system

Figure 2 shows a proposed concept for water system phasing evaluated in the analysis. Generally, the project will be constructed from south to north. Therefore, initially the primary water supply will be from the south and from the infrastructure that is currently being constructed by Harmony Grove Villages. Three phases of development could serve the five neighborhoods shown on **Figure 2**, and discussed further below:

Phase 1

Neighborhood 5 in the southeast can be served with the three proposed connections in Country Club Lane and construction of the backbone looped system. Fire flow and peak hour requirements can be met by the District's R1-B Reservoir. In addition, Neighborhood 1 can be served with extension of the 16-inch backbone waterline and a connection to the Harmony Grove water system, along the southerly boundary. Phase 1 does not require the R7 Reservoir.

Phase 2

Neighborhood 3 in the central area of the project can be served with a new connection to Eden Valley Lane and completion of a looped system. In addition Neighborhood 4 can be served with extension of the 16-inch backbone waterline and a connection to Hill Valley Drive in the north. Fire flow and peak hour requirements can be met by the District's R1-B Reservoir. Phase 2 also does not require the R7 Reservoir.

Phase 3

Neighborhood 2 along the western project boundary and serving elevations above 800 feet will require the construction of a small water booster pump station to meet peak hour pressure criteria.

The requirements for the water booster pump station are presented in the following section. In order to supply dual 1,500 gpm fires by gravity in Neighborhood 2, the R7 Reservoir would need to be in service. An alternative to deferring the R7 Reservoir to later in the project would be to construct an expanded water pump station with dedicated fire pumps and stand-by back-up power.

1030 Water Booster Pump Station

The project will be required to construct a water booster pump station to serve the Neighborhood 2 lots above elevation 800 feet. It is estimated that approximately 80 lots along the western boundary would need to be pumped. **Figure 1** illustrates a new 1030 Pressure Zone that would be supplied by the pump station and includes a backbone 12-inch system and 8-inch distribution pipelines.

The proposed booster pump station would be owned and operated by the District and would be sized only for domestic demands and would not include fire flows. The fire flows would be supplied by the R7 Reservoir by gravity and meet the minimum 20 psi criteria. Therefore, the new pump station would not need dedicated fire pumps and larger generator for stand-by power. Shown to the right is a typical District booster pump station that accomplishes these goals. A prefabricated pumping system, housed in a small building with electrical system controls would be required.

District Water Booster Pump Station (Typical)

A preliminary design report would need to be prepared as part of the final design to determine the final pump sizes, system controls, and building requirements. Based on preliminary review key elements of the station would include:

- Prefabricated Grunflo pumping system
- Design flow range up to approximately 200 gpm
- Instrumentation and controls
- Small stand-by generator
- System check valve to allow fire flow to bypass pump station
- Sump block building on dedicated site to District

During the preliminary design phase, should Neighborhood 2 be developed in an earlier phase, an alternative could be studied to include an option to add two dedicated fire flow pumps at 1,500 gpm capacity to the booster pump station design. This would increase the building size, change the system controls and also increase the generator size.

7. Conceptual Recycled Water System

The primary source of recycled water for the project will be the on-site wastewater treatment and water reclamation facility (WTWRF) (assumed County owned and operated) located at the southeast corner of the development. The WTWRF will produce Title 22 water and provide a recycled water supply for on-site irrigation demands. At build-out, the WTWRF is estimated to produce 71,500 gpd or 50 gpm of average daily recycled water supply.

The District currently purchases recycled water from the City of Escondido. The City of Escondido's Hale Avenue Resource Recovery Facility (HARRF) is an 18-million gallons per day (MGD) activated sludge, secondary treatment facility and has been expanded to provide full Title 22 recycled water capacity. The permitted tertiary treatment capacity is 9.0 mgd and peak day summer demands have approached 7 to 8 mgd in the City's system. The District will soon purchase all the recycled water supplied by the proposed Harmony Grove WRP currently under construction (180,000 gpd or 125 gpm). The County (Valiano) WTWRF recycled water supply will be integrated into the District's recycled water system.

The proposed Valiano project will develop sufficient on-site landscape irrigation demand to beneficially reuse all the effluent from the WTWRF on an average annual demand basis. This will be accomplished through development of significant common area landscape irrigation for streetscapes, manufactured slopes, and public and private parks. In total, it is estimated that approximately 36.5 acres of permanent landscape area will be irrigated. Except for the parks, the slopes and streetscapes will be a Mediterranean-type landscape requiring between 2.2 and 2.5 acre-feet per year (afy) per acre of irrigation. In comparison, the Harmony Grove Villages landscape irrigation was based on average of approximately 3.0 afy per acre for similar effluent disposal requirements from their on-site water reclamation plant. In summary, with a WTWRF disposal requirement of approximately 71,500 gpd, an average irrigation rate of 1,950 gpd/acre (2.2 afy per acre is required) is well within the proposed landscaping irrigation rate. During final design of the recycled water system and the WTWRF a detailed water balance and irrigation master plan will be developed to confirm the effluent disposal requirements are satisfied.

The proposed recycled water system (see **Figure 3**) will originate at the new WTWRF, which will require a dedicated recycled water pump station to serve the distribution system and also supply the wet weather storage site, via the recycled distribution system, when needed, during the winter months. Given the small booster pump station capacity, no operational storage is recommended on-site at the WTWRF, since operational storage will exist in the District's system. A converted existing potable reservoir R-1A (3.1 mg) to recycled water is being required by the Harmony Grove Village development and will serve as the hydraulic control for the recycled water pump station. The recycled water pump station would be sized for the maximum day irrigation demands, and similar to Harmony Grove WRP, operated by the County as part of the wastewater plant operations. The estimated capacity for the recycled water pump station at the WTWRF is about 150 gpm.

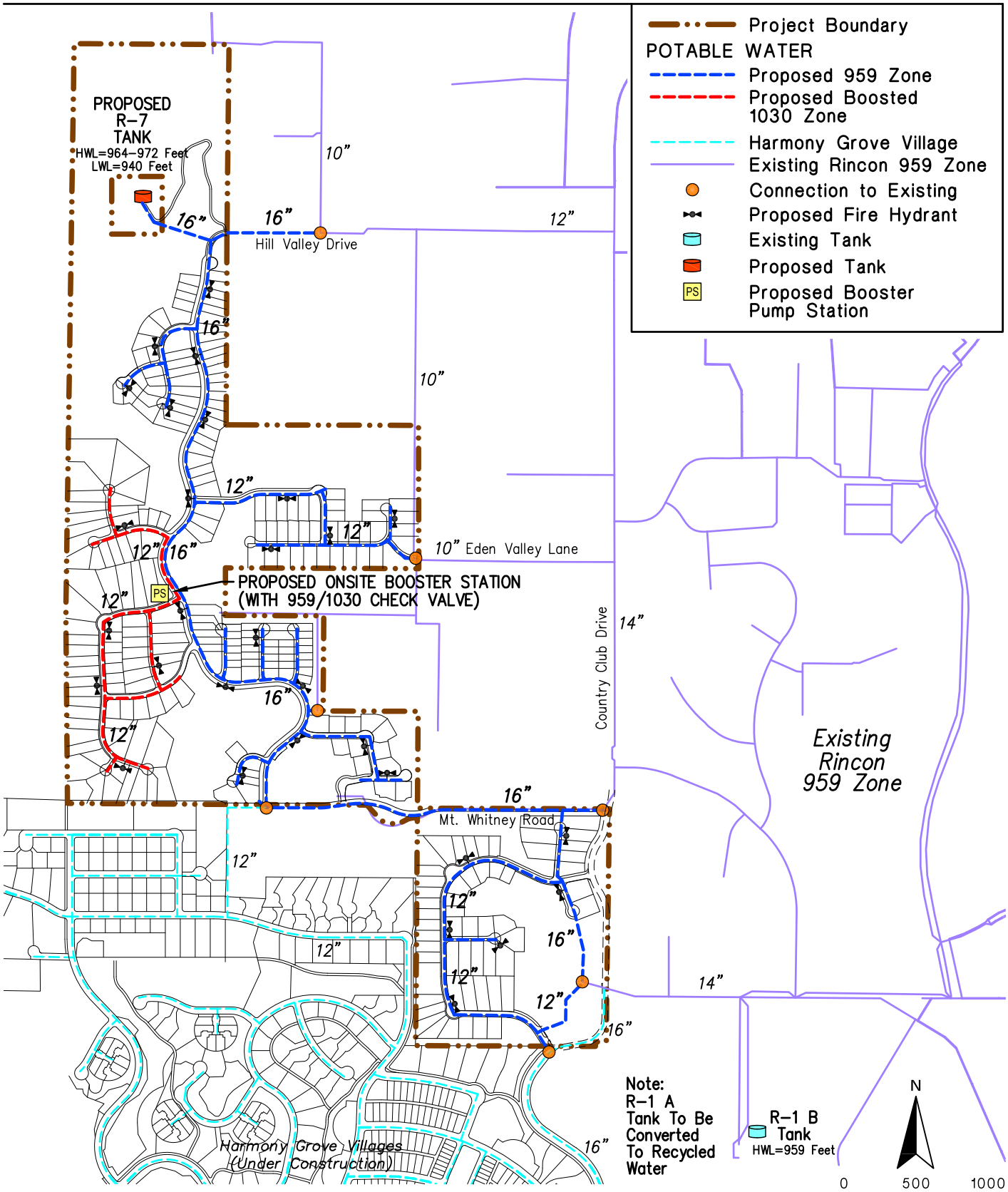
A preliminary backbone recycled water system was developed for the project to serve the 36.5 acres of irrigated area. An 8-inch PVC pipeline would extend from the recycled pump station at the WTWRF through the project to Hill Valley Drive. A connection would be made to the south to the Harmony Grove recycled water system. The District would be able to expand the recycled water system in Hill Valley Drive and Country Club Lane to serve future recycled water customers, consistent with the 2014 Water Master Plan. Smaller 4-inch PVC recycled pipelines as shown on **Figure 3** would be extended to serve major slope irrigation areas.

The recycled water system will be served by a 959 Pressure Zone, similar to the water system. It is recommended that irrigation meters serving elevations above 800 feet be equipped with private irrigation booster pumps to meet required irrigation system pressures. **Figure 3** also includes possible irrigation services and meter locations to optimize distribution of recycled water to the irrigation areas. The final irrigation design would refine these locations and determine actual meter sizes.

The Valiano project proposes to manage and maintain approximately 35 acres of a proposed easement for potential agriculture use in the northwest hillside, near the R7 Reservoir site. This on-site agriculture is currently proposed to be irrigated with groundwater from an existing well, which was also used to irrigate previous avocado orchards. However, subject to availability from the District and the City of Escondido, recycled water may be used to supplement or replace the groundwater for agriculture purposes. It is estimated the agriculture easement could potentially require approximately 30 to 40 afy depending on the specific agriculture use proposed. A service connection, meter, and private irrigation booster pump would be required at the north end of Hill Valley Drive.

The project will require approximately 6 mg of wet weather storage, as part of the design of the Valiano WTWRF, to satisfy the permit requirements (minimum 84 days of storage) of the San Diego Water Quality Control Board. This study assumes this storage is dedicated to the WTWRF operations during wet weather events. Surplus recycled water generated by the WTWRF during winter months would be stored in the wet weather storage facility for future use by the project. This study recommends that the District coordinate this operation as part of its agreement with the County. Recycled water storage in the wet weather storage site will need to be retreated with a small on-site cartridge type filter system, then pumped back into the recycled water system.

Figure 3 includes the recommended recycled water system to serve the proposed irrigated areas and to achieve the minimum 36.5 acres of irrigated area.



Note: All Pipeline 8-Inch Unless Otherwise Noted

Proposed Onsite Water System

Figure 1

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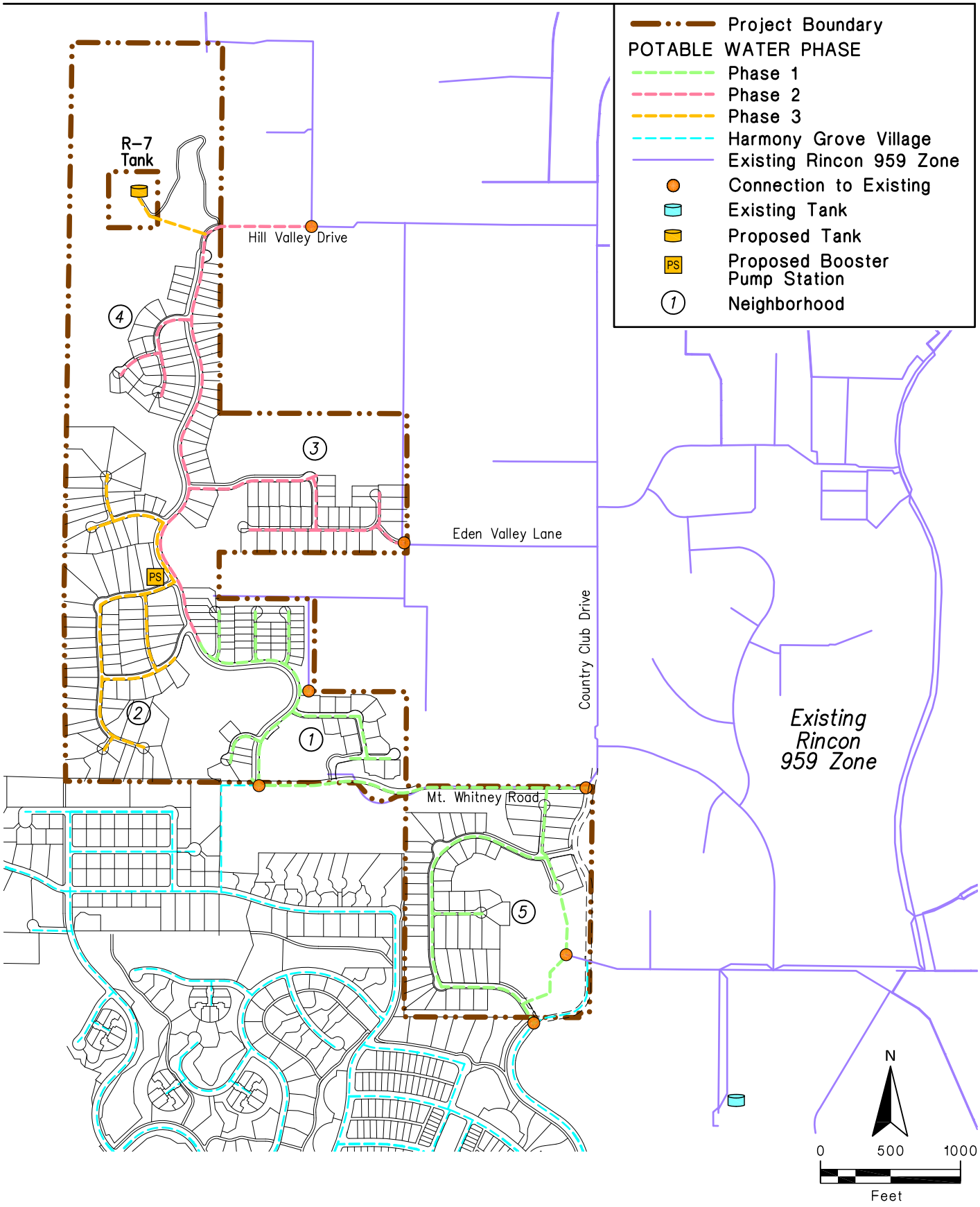
Valiano Water Study
December 2015



Proposed Water Phasing System

Figure 2

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FUSCOE ENGINEERING
full circle thinking

LEGEND

SEWER TREATEMENT PLANT

WET WEATHER STORAGE

SLOPES/COMMON AREAS TO BE IRRIGATED WITH RECLAIMED WATER AREA= 36.41 ACRES

PROPOSED RINCON RECLAIMED WATERLINE

PRELIMINARY IRRIGATION/METER

SCALE: 1" = 500'

AGRICULTURAL EASEMENT

HILL VALLEY ROAD

EDEN VALLEY LANE

COUNTRY CLUB DRIVE

MT. WHITNEY ROAD

4"

8"

WET WEATHER STORAGE

SEWER TREATMENT PLANT AND PUMPS

NOTE: RECLAIMED WATER DISTRIBUTION SYSTEM WILL BE LOCATED WITHIN PROPOSED PROJECT ROADS AND EASEMENTS, AND WILL NOT BE LOCATED IN UNDEVELOPED AREAS. IRRIGATION BOOSTER PUMPS MAY BE REQUIRED AT INDIVIDUAL METER LOCATIONS TO BE DETERMINED DURING FINAL DESIGN.

VALIANO RECLAIMED WATER SYSTEM

Figure 3

December 2015

0 250' 500'

APPENDIX A
HYDRAULIC SYSTEM ANALYSIS MODEL SIMULATIONS

Appendix A
Hydraulic System Analysis Model Simulations
December 2015

Model Scenarios

Four hydraulic scenarios were modeled: peak hour, maximum day plus fire, peak hour with aqueduct supply, and a fire pump analysis. The first scenario represented the proposed water systems under a peak hour demand (PHD) condition for the three proposed development phases for the Valiano subdivision. The existing District reservoirs that supply the water distribution system were assumed to have a storage capacity of 50% under PHD conditions. The peak hour scenarios conservatively assumed no supply from the North and South Aqueduct connections. The PHD factor applied to the steady state model was 3.9.

The second scenario analyzed the system under maximum daily demand (MDD) plus a 1,500 gpm fire flow in all development phases. Because the District requires "dual" fire flows to be analyzed, a second fire flow was modeled within a mile and was off a 12-inch and larger pipeline. The MDD factor applied to the steady state model was 2.6. The third scenario analyzed the system, with Phases 1 through 3 of the Valiano subdivision constructed, under PHD conditions including the North and South San Diego County Water Authority connections contributing 1,000 gpm and 2,000 gpm, respectively.

A fourth scenario was simulated to include Phase 1 and a portion of Phase 3 to include the highest point in the Valiano subdivision during MDD plus fire flow. Under this scenario it was necessary to operate a fire pump at the proposed booster pump station to deliver the required flow and pressure. Fire pumps could be added to the booster pumps station to serve above 800 feet, without the R7 Reservoir. Hydraulic analysis of these scenarios served to evaluate the existing distribution system capacity and sizing for the proposed Valiano water system.

Analysis Results

Simulations were performed to verify the hydraulic performance of the existing regional facilities and proposed on-site distribution system. Fire flow criteria were presented in previous sections. Table 1 presents a summary of the simulation results. The hydraulic simulation output reports have been included and Exhibit A illustrates the model pipes and nodes.

Summarized in Table 1 are the results of the model scenarios to evaluate the proposed on-site distribution system for the project under ultimate and phased conditions. The scenarios include a Peak Hour and a Maximum Day plus simulated 1,500 gpm fires for the two phases at the most critical locations of the development.

The proposed Valiano subdivision distribution system operates within the District criteria and no off-site improvements are required.

It is recommended that as part of the design of the R7 Reservoir that tank fill simulations be performed under various District scenarios to confirm the optimum operation levels of the tank.

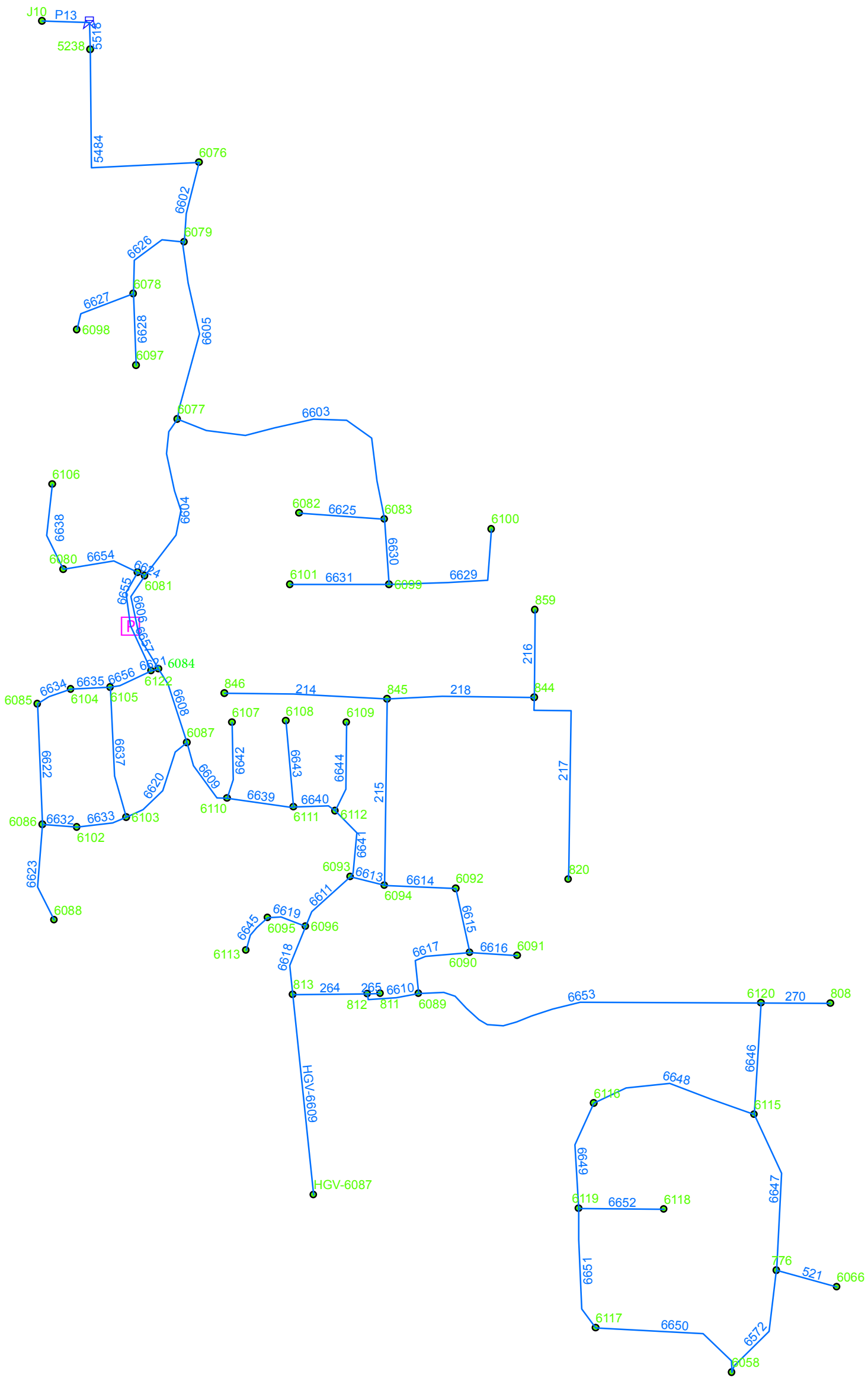
Table 1 Hydraulic Analysis Results Summary

Run No.	Base Case Scenario Description	R-7 Tank Status	Minimum Pressure (psi)		Maximum Velocity (fps)
			1030 PZ	959 PZ	
1	Peak Hour Demand – Phase 1	OFF	-	44.7 (Node 6084)	3.1 (Pipe 270)
2	Peak Hour Demand – Phase 2	OFF	-	43.8 (Node 6084)	2.7 (Pipe 6646)
3	Peak Hour Demand - Phase 3	OFF	76.7 (Node 6088)	52.3 (Node 6084)	4.4 (Pipe 6602)
4	Phase 1 MDD plus 1,500 gpm fire at node 6107	OFF	-	42.2 (Node 6084)	4.3 (Pipe 6642)
4A	Phase 1 MDD plus Dual 1,500 gpm fire at nodes 6107 and 6119	OFF	-	38.7 (Node 6084)	4.3 (Pipe 6642)
5	Phase 2 MDD plus 1,500 gpm fire at node 6097	OFF	-	42.7 (Node 6084)	4.3 (Pipe 6626)
5A	Phase 2 MDD plus Dual 1,500 gpm fire at nodes 6089 and 6097	OFF	-	36.9 (Node 6084)	4.3 (Pipe 6626)
6	Phase 3 MDD plus 1,500 gpm fire at node 6088	ON	24.0 (Node 6088)	50.5 (Node 6084)	4.8 (Pipe 6602)
6A	Phase 3 MDD plus Dual 1,500 gpm fire at nodes 6088 and 6121	ON	21.3 (Node 6088)	46.9 (Node 6103)	5.9 (Pipe 6602)
7	Phase 3 MDD plus 1,500 gpm fire at node w/ aqueduct flow (1,000 gpm North Aqueduct; 2,000 gpm South Aqueduct)	ON	25.00 (Node 6088)	51.5 (Node 6084)	4.5 (Pipe 6602)
8	Peak Hour Demand - Phase 3 w/ Aqueduct flow (1,000 gpm North Aqueduct; 2,000 gpm South Aqueduct)	ON	71.2 (Node 6088)	46.8 (Node 6084)	2.0 (Pipe 6646)
9	Phase 1A and High Point MDD plus 1,500 gpm fire at node 6088; Harmony Grove Connection OFF + Fire Pump	OFF	65.1 (Node 6088)	40.9 (Node 6084)	4.4 (Pipe 6656)

gpm = gallons per minute; psi = pounds per square inch; fps = feet per second
Run Nos. 1-6 assumed the aqueduct connections are off.

U:\WO\Projects\Rincon\Model\2015 Model 10-15-2015.mxd

Date: 10/15/2015



Legend

- Pipes
- Junctions

N

Valiano Pipe and Node Map

0 600 1,200 Feet

1 inch = 500 feet

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Run No. 5A Node Dual FF

ID	Demand (gpm)	Elevation (ft)	Head (ft)	Pressure (psi)
6084	0	818	903.2	36.9
6098	10.8	803.7	899.5	41.5
6078	10.8	793.1	899.5	46.1
6097	1,510.80	786.4	897.8	48.3
6087	0	791.5	903.3	48.4
6081	0	786	903	50.7
6107	0	776	903.4	55.2
846	0	777	905.2	55.6
6110	0	771.3	903.4	57.2
HGV-6087	0	774	906.9	57.6
6079	10.8	762	901.7	60.6
6108	0	758	903.5	63
6076	10.8	754	902.4	64.3
6111	0	753.1	903.5	65.2
6109	0	750	903.6	66.5
6077	0	746	902.8	67.9
6112	0	742	903.6	70
6113	0	742	903.8	70.1
845	0	739	905.2	72
6095	0	730	903.8	75.3
813	0	724	904	78
6093	0	722	903.7	78.7
6096	0	721.9	903.8	78.8
6101	5.4	720	902.8	79.2
844	0	722	905.7	79.6
6094	16.2	716	903.7	81.3
6082	8.1	712.4	902.8	82.5
6091	37.8	710	903.4	83.8
6099	5.4	708	902.8	84.4
812	0	708	903.4	84.7
6092	16.2	708	903.5	84.7
859	0	709	905.9	85.3
811	0	706	903.4	85.5
6090	13.5	705.3	903.4	85.8
6083	8.1	702	902.8	87
6100	8.1	691	902.8	91.8
820	0	690	905.7	93.4
6089	1,500.00	684	903.2	95
6119	10.8	694	913.6	95.1
6118	10.8	684	913.6	99.5
808	0	660	909.9	108.3
6116	10.8	661.9	913.3	108.9
6117	10.8	653.6	913.9	112.8
6120	0	648	910.5	113.8
6115	8.1	640	913	118.3
6066	0	630	915.4	123.6
6058	0	626.7	914.3	124.6
776	0	622	914.9	126.9

Run No. 5A Pipe Dual FF

ID	From Node	To Node	Length (ft)	Diameter (in)	Roughness	Flow (gpm)	Velocity (ft/s)	Headloss (ft)	HL/1000 (ft/k-ft)
6626	6079	6078	397.1	12	130	1,532.40	4.3	2.2	5.6
6628	6078	6097	314.1	12	130	1,510.80	4.3	1.7	5.4
6646	6115	6120	491	12	130	1,432.60	4.1	2.4	4.9
6653	6120	6089	1,573.20	10	130	858.1	3.5	7.3	4.6
HGV-6609	HGV-6087	813	884.5	12	130	1,152.80	3.3	2.9	3.3
6647	6115	776	712.4	12	130	-1,029.20	2.9	1.9	2.7
521	776	6066	274.7	14	130	-1,250.40	2.6	0.5	1.8
6602	6076	6079	357.4	12	130	854.9	2.4	0.7	1.9
270	808	6120	304.7	10	130	-574.5	2.3	0.7	2.2
6605	6079	6077	799.7	12	130	-688.3	2	1	1.3
215	845	6094	819	8	130	296.2	1.9	1.6	1.9
264	812	813	328	8	130	-287.4	1.8	0.6	1.8
6572	6058	776	515.5	8	130	-221.2	1.4	0.6	1.1
6618	6096	813	314.2	16	130	-865.4	1.4	0.2	0.5
6611	6093	6096	299.8	16	130	-865.4	1.4	0.1	0.5
6650	6117	6058	694.3	12	130	-454.8	1.3	0.4	0.6
6651	6119	6117	546.1	12	130	-444	1.3	0.3	0.6
216	844	859	384.2	10	130	-296.2	1.2	0.2	0.6
218	845	844	646.6	10	130	-296.2	1.2	0.4	0.6
6649	6116	6119	481	12	130	-422.4	1.2	0.2	0.5
6614	6094	6092	312.8	12	130	422	1.2	0.2	0.5
6610	6089	812	247.5	10	130	-287.4	1.2	0.2	0.6
6648	6115	6116	744.9	12	130	-411.6	1.2	0.4	0.5
6641	6112	6093	333.5	16	130	-723.4	1.2	0.1	0.3
6640	6111	6112	190.4	16	130	-723.4	1.2	0.1	0.3
6606	6081	6084	456.3	16	130	-723.4	1.2	0.2	0.3
6609	6087	6110	325.7	16	130	-723.4	1.2	0.1	0.3
6608	6084	6087	348	16	130	-723.4	1.2	0.1	0.3
6604	6077	6081	756.4	16	130	-723.4	1.2	0.3	0.3
6639	6110	6111	295	16	130	-723.4	1.2	0.1	0.3
6615	6092	6090	288.1	12	130	405.8	1.2	0.1	0.5
6617	6090	6089	390.1	12	130	354.5	1	0.1	0.4
6613	6093	6094	161	12	130	142	0.4	0	0.1
6616	6090	6091	208.8	12	130	37.8	0.1	0	0
6603	6077	6083	1,259.40	12	130	35.1	0.1	0	0
6630	6083	6099	286.4	12	130	18.9	0.1	0	0
6627	6078	6098	320	12	130	10.8	0	0	0
6652	6119	6118	375	12	130	10.8	0	0	0
6625	6083	6082	376	12	130	8.1	0	0	0
6629	6099	6100	660.8	12	130	8.1	0	0	0
6631	6099	6101	434	12	130	5.4	0	0	0
6619	6096	6095	174.6	12	130	0	0	0	0
6643	6111	6108	379.2	12	130	0	0	0	0
6642	6110	6107	338	12	130	0	0	0	0
6644	6112	6109	400	12	130	0	0	0	0
265	812	811	55.4	8	130	0	0	0	0
217	820	844	960.6	6	130	0	0	0	0
6645	6095	6113	177.6	12	130	0	0	0	0
214	846	845	716.4	8	130	0	0	0	0

Run No. 4A Node Dual FF

ID	Demand (gpm)	Elevation (ft)	Head (ft)	Pressure (psi)
6084	0	818	907.3	38.7
6087	0	791.5	907.3	50.2
6107	1,500.00	776	905.5	56.1
846	0	777	909.8	57.5
6110	0	771.3	907.3	58.9
HGV-6087	0	774	910.3	59
6108	0	758	907.7	64.8
6111	0	753.1	907.7	67
6109	0	750	907.9	68.4
6112	0	742	907.9	71.9
6113	0	742	908.5	72.2
845	0	739	909.8	74
6095	0	730	908.5	77.4
813	0	724	908.7	80
6093	0	722	908.4	80.7
6096	0	721.9	908.5	80.9
844	0	722	910.2	81.5
6094	16.2	716	908.5	83.4
6091	37.8	710	908.7	86.1
6092	16.2	708	908.6	86.9
812	0	708	908.8	87
859	0	709	910.4	87.3
811	0	706	908.8	87.9
6090	13.5	705.3	908.7	88.1
6119	1,510.80	694	910.6	93.9
820	0	690	910.2	95.4
6089	0	684	908.8	97.4
6118	10.8	684	910.6	98.2
6116	10.8	661.9	911.1	108
808	0	660	911.4	108.9
6117	10.8	653.6	911.8	111.9
6120	0	648	911.4	114.1
6115	8.1	640	911.8	117.8
6066	0	630	914.9	123.5
6058	0	626.7	913.4	124.2
776	0	622	914.3	126.6

Run No. 4A Pipe Dual FF

ID	From Node	To Node	Length (ft)	Diameter (in)	Roughness	Flow (gpm)	Velocity (ft/s)	Headloss (ft)	HL/1000 (ft/k-ft)
6642	6110	6107	338	12	130	1,500.00	4.3	1.8	5.4
6647	6115	776	712.4	12	130	-1,179.90	3.3	2.5	3.4
521	776	6066	274.7	14	130	-1,454.50	3	0.7	2.4
6650	6117	6058	694.3	12	130	-942	2.7	1.6	2.3
6651	6119	6117	546.1	12	130	-931.2	2.6	1.2	2.2
6641	6112	6093	333.5	16	130	-1,500.00	2.4	0.4	1.3
6640	6111	6112	190.4	16	130	-1,500.00	2.4	0.3	1.3
6639	6110	6111	295	16	130	-1,500.00	2.4	0.4	1.3
HGV-6609	HGV-6087	813	884.5	12	130	826.9	2.3	1.6	1.8
6653	6120	6089	1,573.20	10	130	486.9	2	2.6	1.6
6572	6058	776	515.5	8	130	-274.6	1.8	0.9	1.7
215	845	6094	819	8	130	269.8	1.7	1.3	1.6
6648	6115	6116	744.9	12	130	601.2	1.7	0.7	1
6649	6116	6119	481	12	130	590.4	1.7	0.5	1
6646	6115	6120	491	12	130	570.6	1.6	0.4	0.9
6613	6093	6094	161	12	130	-559.4	1.6	0.1	0.9
6618	6096	813	314.2	16	130	-940.6	1.5	0.2	0.6
6611	6093	6096	299.8	16	130	-940.6	1.5	0.2	0.6
216	844	859	384.2	10	130	-269.8	1.1	0.2	0.5
218	845	844	646.6	10	130	-269.8	1.1	0.4	0.5
6617	6090	6089	390.1	12	130	-373.2	1.1	0.2	0.4
6615	6092	6090	288.1	12	130	-321.9	0.9	0.1	0.3
6614	6094	6092	312.8	12	130	-305.7	0.9	0.1	0.3
264	812	813	328	8	130	113.7	0.7	0.1	0.3
6610	6089	812	247.5	10	130	113.7	0.5	0	0.1
270	808	6120	304.7	10	130	-83.7	0.3	0	0.1
6616	6090	6091	208.8	12	130	37.8	0.1	0	0
6652	6119	6118	375	12	130	10.8	0	0	0
6645	6095	6113	177.6	12	130	0	0	0	0
6643	6111	6108	379.2	12	130	0	0	0	0
6619	6096	6095	174.6	12	130	0	0	0	0
6609	6087	6110	325.7	16	130	0	0	0	0
6608	6084	6087	348	16	130	0	0	0	0
265	812	811	55.4	8	130	0	0	0	0
217	820	844	960.6	6	130	0	0	0	0
6644	6112	6109	400	12	130	0	0	0	0
214	846	845	716.4	8	130	0	0	0	0

Run No. S6A Node Dual FF

ID	Demand (gpm)	Elevation (ft)	Head (ft)	Pressure (psi)
6,088.00	1,508.10	874	923.3	21.3
6085	8.1	870.5	926.5	24.3
6086	8.1	866	925.6	25.8
6104	8.1	857	926.8	30.2
6102	8.1	851.1	925.9	32.4
6105	8.1	836.7	927	39.1
6106	10.8	836	928.2	40
6103	8.1	818	926.2	46.9
6080	8.1	818.6	928.2	47.5
6084	0	818	928.4	47.8
6122	0	805	928.2	53.4
6098	10.8	803.7	937.9	58.1
6087	0	791.5	928.7	59.4
6121	1,500.00	786	928.2	61.6
6081	0	786	928.5	61.7
6078	10.8	793.1	937.9	62.7
6097	10.8	786.4	937.9	65.6
6107	0	776	928.9	66.2
846	0	777	931.5	66.9
HGV-6087	0	774	930	67.6
6110	0	771.3	928.9	68.3
6108	0	758	929.1	74.1
6079	10.8	762	937.9	76.2
6111	0	753.1	929.1	76.3
6109	0	750	929.2	77.7
6077	0	746	930.2	79.8
6112	0	742	929.2	81.1
6076	10.8	754	941.4	81.2
6113	0	742	929.5	81.2
845	0	739	931.5	83.4
6095	0	730	929.5	86.4
813	0	724	929.6	89.1
6093	0	722	929.5	89.9
6096	0	721.9	929.5	90
844	0	722	932	91
6101	5.4	720	930.2	91.1
6094	16.2	716	929.6	92.5
6082	8.1	712.4	930.2	94.4
6091	37.8	710	929.7	95.2
6092	16.2	708	929.6	96
812	0	708	929.7	96.1
6099	5.4	708	930.2	96.3
859	0	709	932.3	96.7
811	0	706	929.7	96.9
6090	13.5	705.3	929.7	97.2
6083	8.1	702	930.2	98.9
6119	10.8	694	931.9	103.1
6100	8.1	691	930.2	103.7
820	0	690	932	104.8
6089	0	684	929.8	106.5
6118	10.8	684	931.9	107.4
6116	10.8	661.9	931.9	117
808	0	660	931.9	117.8
6117	10.8	653.6	931.9	120.6
6120	0	648	931.8	123
6115	8.1	640	931.9	126.5
6066	0	630	932.2	130.9
6058	0	626.7	931.9	132.2
776	0	622	932.1	134.4

Run No. 6A Pipe

ID	From Node	To Node	Length (ft)	Diameter (in)	Roughness	Flow (gpm)	Velocity (ft/s)	Headloss (ft)	HL/1000 (ft/k-ft)	Status	Flow Reversal Count
6602	6076	6079	357.4	12	130	2,096.50	5.9	3.6	10	Open	0
6605	6079	6077	799.7	12	130	2,053.30	5.8	7.7	9.6	Open	0
6656	6122	6105	195.4	12	130	1,556.70	4.4	1.1	5.8	Open	0
6623	6086	6088	438.1	12	130	1,508.10	4.3	2.4	5.4	Open	0
6604	6077	6081	756.4	16	130	2,018.20	3.2	1.7	2.3	Open	0
6635	6105	6104	173.8	12	130	798	2.3	0.3	1.7	Open	0
6634	6104	6085	160.6	12	130	789.9	2.2	0.3	1.6	Open	0
6622	6085	6086	531.7	12	130	781.8	2.2	0.9	1.6	Open	0
6637	6105	6103	580.6	12	130	750.6	2.1	0.9	1.5	Open	0
6633	6103	6102	223.1	12	130	742.5	2.1	0.3	1.5	Open	0
6632	6102	6086	151.5	12	130	734.4	2.1	0.2	1.4	Open	0
215	845	6094	819	8	130	326.2	2.1	1.9	2.3	Open	0
6653	6120	6089	1,573.20	10	130	428.6	1.8	2	1.3	Open	0
6641	6112	6093	333.5	16	130	-1,057.40	1.7	0.2	0.7	Open	0
6640	6111	6112	190.4	16	130	-1,057.40	1.7	0.1	0.7	Open	0
6639	6110	6111	295	16	130	-1,057.40	1.7	0.2	0.7	Open	0
6609	6087	6110	325.7	16	130	-1,057.40	1.7	0.2	0.7	Open	0
6608	6084	6087	348	16	130	-1,057.40	1.7	0.2	0.7	Open	0
6613	6093	6094	161	12	130	-528.9	1.5	0.1	0.8	Open	0
216	844	859	384.2	10	130	-326.2	1.3	0.3	0.8	Open	0
218	845	844	646.6	10	130	-326.2	1.3	0.5	0.8	Open	0
HGV-6609	HGV-6087	813	884.5	12	130	386.3	1.1	0.4	0.4	Open	0
521	776	6066	274.7	14	130	-447.3	0.9	0.1	0.3	Open	0
264	812	813	328	8	130	142.2	0.9	0.2	0.5	Open	0
6647	6115	776	712.4	12	130	-316.3	0.9	0.2	0.3	Open	0
6618	6096	813	314.2	16	130	-528.5	0.8	0.1	0.2	Open	0
6611	6093	6096	299.8	16	130	-528.5	0.8	0.1	0.2	Open	0
6572	6058	776	515.5	8	130	-131	0.8	0.2	0.4	Open	0
6617	6090	6089	390.1	12	130	-286.4	0.8	0.1	0.3	Open	0
6646	6115	6120	491	12	130	274.8	0.8	0.1	0.2	Open	0
6615	6092	6090	288.1	12	130	-235.1	0.7	0	0.2	Open	0
270	808	6120	304.7	10	130	153.8	0.6	0.1	0.2	Open	0
6614	6094	6092	312.8	12	130	-218.9	0.6	0	0.2	Open	0
6610	6089	812	247.5	10	130	142.2	0.6	0	0.2	Open	0
6606	6081	6084	456.3	16	130	343.5	0.5	0	0.1	Open	0
6657	6122	6121	465.1	12	100	-155.8	0.4	0.1	0.1	Open	0
6616	6090	6091	208.8	12	130	37.8	0.1	0	0	Open	0
6603	6077	6083	1,259.40	12	130	35.1	0.1	0	0	Open	0
6648	6115	6116	744.9	12	130	33.4	0.1	0	0	Open	0
6626	6079	6078	397.1	12	130	32.4	0.1	0	0	Open	0
6649	6116	6119	481	12	130	22.6	0.1	0	0	Open	0
6630	6083	6099	286.4	12	130	18.9	0.1	0	0	Open	0
6654	6121	6080	340.3	12	130	18.9	0.1	0	0	Open	0
6628	6078	6097	314.1	12	130	10.8	0	0	0	Open	0
6627	6078	6098	320	12	130	10.8	0	0	0	Open	0
6652	6119	6118	375	12	130	10.8	0	0	0	Open	0
6638	6080	6106	393.2	12	130	10.8	0	0	0	Open	0
6650	6117	6058	694.3	12	130	-9.8	0	0	0	Open	0
6629	6099	6100	660.8	12	130	8.1	0	0	0	Open	0
6625	6083	6082	376	12	130	8.1	0	0	0	Open	0
6631	6099	6101	434	12	130	5.4	0	0	0	Open	0
6651	6119	6117	546.1	12	130	1	0	0	0	Open	0
6643	6111	6108	379.2	12	130	0	0	0	0	Open	0
6642	6110	6107	338	12	130	0	0	0	0	Open	0
6645	6095	6113	177.6	12	130	0	0	0	0	Open	0
6619	6096	6095	174.6	12	130	0	0	0	0	Open	0
265	812	811	55.4	8	130	0	0	0	0	Open	0
217	820	844	960.6	6	130	0	0	0	0	Open	0
214	846	845	716.4	8	130	0	0	0	0	Open	0
6644	6112	6109	400	12	130	0	0	0	0	Open	0

Run No. S1 Node PH3 PHD

ID	Demand (gpm)	Elevation (ft)	Head (ft)	Pressure (psi)
6084	0	818.00	921.20	44.7
6087	0	791.5	921.2	56.2
846	0	777	919.6	61.8
6107	0	776	921.2	62.9
HGV-6087	0	774	921.5	63.9
6110	0	771.3	921.2	65
6108	0	758	921.2	70.7
6111	0	753.1	921.2	72.9
6109	0	750	921.2	74.2
6112	0	742	921.2	77.7
6113	0	742	921.2	77.7
845	0	739	919.6	78.3
6095	0	730	921.2	82.9
844	0	722	919.2	85.5
813	0	724	921.3	85.5
6093	0	722	921.2	86.3
6096	0	721.9	921.2	86.4
6094	23.4	716	921.2	88.9
859	0	709	919	91
6091	54.6	710	921.2	91.5
6092	23.4	708	921.2	92.4
812	0	708	921.2	92.4
811	0	706	921.2	93.3
6090	19.5	705.3	921.2	93.5
6119	15.6	694	922.7	99.1
6089	0	684	921.2	102.8
6118	15.6	684	922.7	103.4
808	0	660	920.4	112.8
6116	15.6	661.9	922.6	113
6117	15.6	653.6	922.8	116.6
6120	0	648	921.5	118.5
6115	11.7	640	922.5	122.4
6066	0	630	923.6	127.2
6058	0	626.7	923	128.4
776	0	622	923.4	130.6
820	0	690	932	104.8

Run No. S1 Pipe PH3 PHD

ID	From Node	To Node	Length (ft)	Diameter (in)	Roughness	Flow (gpm)	Velocity (ft/s)	Headloss (ft)	HL/1000 (ft/k-ft)
270	808	6120	304.7	10	130	-756.30	3.1	1.1	3.7
6646	6115	6120	491	12	130	890.30	2.5	1	2
6647	6115	776	712.4	12	130	-675.50	1.9	0.9	1.2
215	845	6094	819	8	130	-294.90	1.9	1.6	1.9
521	776	6066	274.7	14	130	-847.80	1.8	0.2	0.9
218	845	844	646.6	10	130	294.90	1.2	0.4	0.6
216	844	859	384.2	10	130	294.90	1.2	0.2	0.6
6572	6058	776	515.5	8	130	-172.30	1.1	0.4	0.7
6650	6117	6058	694.3	12	130	-288.9	0.8	0.2	0.3
HGV-6609	HGV-6087	813	884.5	12	130	281.80	0.8	0.2	0.2
6651	6119	6117	546.1	12	130	-273.30	0.8	0.1	0.2
6613	6093	6094	161	12	130	250.90	0.7	0	0.2
6649	6116	6119	481	12	130	-242.1	0.7	0.1	0.2
6648	6115	6116	744.9	12	130	-226.50	0.6	0.1	0.2
6653	6120	6089	1,573.20	10	130	134	0.5	0.2	0.1
6617	6090	6089	390.1	12	130	-164.90	0.5	0	0.1
6618	6096	813	314.2	16	130	-250.90	0.4	0	0
6611	6093	6096	299.8	16	130	-250.90	0.4	0	0
6615	6092	6090	288.1	12	130	-90.80	0.3	0	0
264	812	813	328	8	130	-30.90	0.2	0	0
6614	6094	6092	312.8	12	130	-67.4	0.2	0	0
6616	6090	6091	208.8	12	130	54.60	0.2	0	0
6610	6089	812	247.5	10	130	-30.90	0.1	0	0
6652	6119	6118	375.00	12	130	15.60	0	0	0
6642	6110	6107	338.00	12	130	0.00	0	0	0
6640	6111	6112	190.4	16	130	0	0	0	0
6644	6112	6109	400	12	130	0	0	0	0
6645	6095	6113	177.6	12	130	0.00	0	0	0
6619	6096	6095	174.60	12	130	0.00	0	0	0
6643	6111	6108	379.2	12	130	0	0	0	0
6641	6112	6093	333.50	16	130	0.00	0	0	0
6609	6087	6110	325.7	16	130	0.00	0	0	0
6608	6084	6087	348	16	130	0.00	0	0	0
265	812	811	55.4	8	130	0.00	0	0	0
217	820	844	960.6	6	130	0.00	0	0	0
6639	6110	6111	295	16	130	0	0	0	0
214	846	845	716.4	8	130	0	0	0	0

Run No. S2 Node PH2 PHD

ID	Demand (gpm)	Elevation (ft)	Head (ft)	Pressure (psi)
6084	0	818	919	43.8
6098	15.6	803.7	918.3	49.6
6078	15.6	793.10	918.30	54.2
6087	0	791.5	919.1	55.3
6097	15.6	786.4	918.3	57.1
6081	0	786	918.9	57.6
846	0	777	918.9	61.5
6107	0	776	919.1	62
HGV-6087	0	774	920	63.3
6110	0	771.3	919.1	64.1
6079	15.6	762	918.3	67.7
6108	0	758	919.2	69.9
6076	15.6	754	918.1	71.1
6111	0	753.1	919.2	72
6109	0	750	919.2	73.3
6077	0	746	918.8	74.9
6112	0	742	919.2	76.8
6113	0	742	919.4	76.9
845	0	739	918.9	77.9
6095	0	730	919.4	82.1
813	0	724	919.4	84.7
844	0	722	918.8	85.3
6093	0	722	919.3	85.5
6096	0	721.9	919.4	85.6
6101	7.8	720	918.8	86.1
6094	23.4	716	919.3	88.1
6082	11.7	712.4	918.8	89.4
6091	54.6	710	919.4	90.7
859	0	709	918.7	90.9
6099	7.8	708	918.8	91.3
6092	23.4	708	919.3	91.6
812	0	708	919.4	91.6
811	0	706	919.4	92.5
6090	19.5	705.3	919.4	92.7
6083	11.7	702	918.8	93.9
6100	11.7	691	918.8	98.7
6119	15.6	694	921.9	98.7
6089	0	684	919.5	102
6118	15.6	684	921.9	103.1
808	0	660	919.8	112.6
6116	15.6	661.9	921.8	112.6
6117	15.6	653.6	922	116.3
6120	0	648	920.6	118.1
6115	11.7	640	921.7	122
6066	0	630	922.9	126.9
6058	0	626.7	922.2	128
776	0	622	922.6	130.3

Run No. S2 Pipe PH2 PHD

ID	From Node	To Node	Length (ft)	Diameter (in)	Roughness	Flow (gpm)	Velocity (ft/s)	Headloss (ft)	HL/1000 (ft/k-ft)
6646	6115	6120	491	12	130	935.80	2.7	1.1	2.2
270	808	6120	304.7	10	130	-626.10	2.6	0.8	2.6
6647	6115	776	712.4	12	130	-708.40	2	1	1.3
521	776	6066	274.7	14	130	-889.2	1.9	0.3	1
HGV-6609	HGV-6087	813	884.5	12	130	487.40	1.4	0.6	0.7
6605	6079	6077	799.7	12	130	-478.90	1.4	0.5	0.6
6653	6120	6089	1,573.20	10	130	309.70	1.3	1.1	0.7
6602	6076	6079	357.4	12	130	-416.5	1.2	0.2	0.5
6572	6058	776	515.5	8	130	-180.80	1.2	0.4	0.8
215	845	6094	819	8	130	-146.60	0.9	0.4	0.5
6650	6117	6058	694.3	12	130	-301.40	0.9	0.2	0.3
6618	6096	813	314.2	16	130	-533.8	0.9	0.1	0.2
6611	6093	6096	299.8	16	130	-533.80	0.9	0.1	0.2
6641	6112	6093	333.5	16	130	-529.60	0.8	0.1	0.2
6640	6111	6112	190.4	16	130	-529.60	0.8	0	0.2
6639	6110	6111	295	16	130	-529.60	0.8	0.1	0.2
6609	6087	6110	325.7	16	130	-529.6	0.8	0.1	0.2
6604	6077	6081	756.4	16	130	-529.60	0.8	0.1	0.2
6608	6084	6087	348	16	130	-529.60	0.8	0.1	0.2
6606	6081	6084	456.3	16	130	-529.60	0.8	0.1	0.2
6651	6119	6117	546.1	12	130	-285.8	0.8	0.1	0.2
6617	6090	6089	390.1	12	130	-263.30	0.7	0.1	0.2
6649	6116	6119	481	12	130	-254.60	0.7	0.1	0.2
6648	6115	6116	744.9	12	130	-239	0.7	0.1	0.2
218	845	844	646.6	10	130	146.60	0.6	0.1	0.2
216	844	859	384.20	10	130	146.60	0.6	0.1	0.2
6615	6092	6090	288.1	12	130	-189.2	0.5	0	0.1
6614	6094	6092	312.8	12	130	-165.80	0.5	0	0.1
264	812	813	328	8	130	46.4	0.3	0	0.1
6610	6089	812	247.5	10	130	46.40	0.2	0	0
6616	6090	6091	208.80	12	130	54.60	0.2	0	0
6603	6077	6083	1,259.40	12	130	50.70	0.1	0	0
6626	6079	6078	397.1	12	130	46.80	0.1	0	0
6630	6083	6099	286.4	12	130	27.30	0.1	0	0
6652	6119	6118	375	12	130	15.6	0	0	0
6627	6078	6098	320.00	12	130	15.60	0	0	0
6628	6078	6097	314.10	12	130	15.60	0	0	0
6629	6099	6100	660.80	12	130	11.7	0	0	0
6625	6083	6082	376.00	12	130	11.70	0	0	0
6631	6099	6101	434	12	130	7.8	0	0	0
6613	6093	6094	161	12	130	4.3	0	0	0
6643	6111	6108	379.2	12	130	0	0	0	0
6619	6096	6095	174.6	12	130	0	0	0	0
6644	6112	6109	400	12	130	0	0	0	0
265	812	811	55.4	8	130	0	0	0	0
217	820	844	960.6	6	130	0	0	0	0
6642	6110	6107	338	12	130	0	0	0	0
6645	6095	6113	177.60	12	130	0	0	0	0
214	846	845	716.4	8	130	0.00	0	0	0

Run No. S3 Node PH1 PHD

ID	Demand (gpm)	Elevation (ft)	Head (ft)	Pressure (psi)
6084	0	818	938.8	52.3
6098	15.6	803.7	944.4	61
6087	0	791.5	938.5	63.7
6078	15.6	793.1	944.4	65.6
6081	0	786	939.4	66.5
6097	15.6	786.4	944.4	68.5
846	0	777	937.1	69.4
HGV-6087	0	774	935.8	70.1
6107	0	776	938.1	70.2
6110	0	771.3	938.1	72.3
6088	11.7	874	1,051.10	76.7
6108	0	758	937.8	77.9
6085	11.7	870.5	1,051.10	78.3
6079	15.6	762	944.4	79
6111	0	753.1	937.8	80.1
6086	11.7	866	1,051.10	80.2
6109	0	750	937.6	81.3
6076	15.6	754	946.40	83.4
6104	11.7	857	1,051.10	84.1
6077	0	746	940.3	84.2
6113	0	742	937.1	84.6
6112	0	742	937.6	84.8
845	0	739	937.1	85.8
6102	11.7	851.1	1,051.10	86.7
6095	0	730	937.1	89.8
813	0	724	937	92.3
6105	11.7	836.7	1,051.10	92.9
844	0	722	937	93.2
6106	15.6	836	1,051.10	93.2
6096	0	721.9	937.10	93.3
6093	0	722	937.3	93.3
6101	7.8	720	940.3	95.4
6094	23.4	716	937.20	95.8
6091	54.6	710	936.90	98.3
6082	11.7	712.4	940.30	98.7
859	0	709	937	98.8
812	0	708.00	936.90	99.2
6092	23.4	708	937	99.2
811	0	706	936.9	100
6090	19.5	705.3	936.90	100.3
6099	7.8	708	940.3	100.6
6080	11.7	818.6	1,051.10	100.7
6103	11.7	818	1,051.10	101
6083	11.7	702	940.3	103.2
6119	15.6	694	934.7	104.3
6100	11.7	691	940.3	108
6118	15.6	684	934.7	108.6
6089	0	684	936.8	109.5
6116	15.6	661.9	934.7	118.2
808	0	660	934.8	119.1
6117	15.6	653.6	934.70	121.8
6120	0	648	934.9	124.3
6115	11.7	640	934.8	127.7
6066	0	630	934.8	132.1
6058	0	626.7	934.7	133.4
776	0	622	934.8	135.5
820	0	690	932	104.8
6121	0	786	928.20	61.6
6122	0	805	928.20	53.4

Run No. S3 Pipe PH1 PHD

ID	From Node	To Node	Length (ft)	Diameter (in)	Roughness	Flow (gpm)	Velocity (ft/s)	Headloss (ft)	HL/1000 (ft/k-ft)
6602	6076	6079	357.4	12	130	1,535.30	4.4	2	5.6
6605	6079	6077	799.7	12	130	1,472.90	4.2	4.2	5.2
6606	6081	6084	456.3	16	130	1,422.20	2.3	0.5	1.2
6604	6077	6081	756.4	16	130	1,422.20	2.3	0.9	1.2
6608	6084	6087	348	16	130	1,313.00	2.1	0.4	1
6609	6087	6110	325.70	16	130	1,313.00	2.1	0.3	1
6639	6110	6111	295	16	130	1,313.00	2.1	0.3	1
6640	6111	6112	190.4	16	130	1,313.00	2.1	0.2	1
6641	6112	6093	333.5	16	130	1,313.00	2.1	0.3	1
HGV-6609	HGV-6087	813	884.5	12	130	-699.80	2	1.2	1.3
6653	6120	6089	1,573.20	10	130	-420.00	1.7	1.9	1.2
6613	6093	6094	161	12	130	480.9	1.4	0.1	0.7
6611	6093	6096	299.8	16	130	832.10	1.3	0.1	0.4
6618	6096	813	314.2	16	130	832.10	1.3	0.1	0.4
6614	6094	6092	312.8	12	130	385.20	1.1	0.1	0.4
6615	6092	6090	288.1	12	130	361.80	1	0.1	0.4
264	812	813	328	8	130	-132.3	0.8	0.1	0.4
270	808	6120	304.7	10	130	-203.20	0.8	0.1	0.3
6617	6090	6089	390.1	12	130	287.70	0.8	0.1	0.3
6646	6115	6120	491	12	130	-216.80	0.6	0.1	0.1
6572	6058	776	515.5	8	130	-90.4	0.6	0.1	0.2
6610	6089	812	247.5	10	130	-132.30	0.5	0	0.1
215	845	6094	819	8	130	-72.30	0.5	0.1	0.1
6648	6115	6116	744.9	12	130	146.40	0.4	0.1	0.1
6649	6116	6119	481	12	130	130.80	0.4	0	0.1
6621	7004	6122	17.90	12	130	109.20	0.3	0	0
6658	6084	7004	14.4	12	130	109.2	0.3	0	0
218	845	844	646.6	10	130	72.30	0.3	0	0
216	844	859	384.2	10	130	72.30	0.3	0	0
6651	6119	6117	546.1	12	130	99.60	0.3	0	0
6650	6117	6058	694.30	12	130	84.00	0.2	0	0
6656	6122	6105	195.4	12	130	81.90	0.2	0	0
6647	6115	776	712.40	12	130	58.60	0.2	0	0
6616	6090	6091	208.8	12	130	54.60	0.2	0	0
6603	6077	6083	1,259.40	12	130	50.70	0.1	0	0
6626	6079	6078	397.10	12	130	46.80	0.1	0	0
6635	6105	6104	173.80	12	130	40.80	0.1	0	0
6637	6105	6103	580.6	12	130	29.4	0.1	0	0
6634	6104	6085	160.60	12	130	29.10	0.1	0	0
6657	6122	6121	465.10	12	100	27.30	0.1	0	0
6654	6121	6080	340.3	12	130	27.3	0.1	0	0
6630	6083	6099	286.4	12	130	27.3	0.1	0	0
521	776	6066	274.7	14	130	-31.8	0.1	0	0
6633	6103	6102	223.1	12	130	17.7	0.1	0	0
6622	6085	6086	531.7	12	130	17.4	0	0	0
6627	6078	6098	320	12	130	15.60	0	0	0

Run No. S3 Pipe PH1 PHD

ID	From Node	To Node	Length (ft)	Diameter (in)	Roughness	Flow (gpm)	Velocity (ft/s)	Headloss (ft)	HL/1000 (ft/k-ft)
6652	6119	6118	375	12	130	15.60	0	0	0
6628	6078	6097	314.10	12	130	15.6	0	0	0
6638	6080	6106	393.2	12	130	15.60	0	0	0
6625	6083	6082	376.00	12	130	11.70	0	0	0
6629	6099	6100	660.8	12	130	11.7	0	0	0
6623	6086	6088	438.1	12	130	11.7	0	0	0
6631	6099	6101	434.00	12	130	7.8	0	0	0
6632	6102	6086	151.50	12	130	6	0	0	0
6644	6112	6109	400	12	130	0	0	0	0
6643	6111	6108	379.2	12	130	0	0	0	0
6642	6110	6107	338	12	130	0.00	0	0	0
6645	6095	6113	177.6	12	130	0.00	0	0	0
6624	6081	6121	35.3	12	130	0	0	0	0
6619	6096	6095	174.6	12	130	0.00	0	0	0
265	812	811	55.4	8	130	0.00	0	0	0
217	820	844	960.6	6	130	0.00	0	0	0
214	846	845	716.4	8	130	0	0	0	0

Run No. S4 Node PH2 FF

ID	Demand (gpm)	Elevation (ft)	Head (ft)	Pressure (psi)
6084	0	818	915.3	42.2
6087	0.00	791.5	915.3	53.6
6107	1,500.00	776.00	913.50	59.6
846	0	777	917.8	61
6110	0	771.3	915.3	62.4
HGV-6087	0	774	918	62.4
6108	0	758	915.7	68.3
6111	0	753.1	915.7	70.5
6109	0	750	915.9	71.9
6112	0	742	915.9	75.4
6113	0	742	916.5	75.6
845	0	739	917.8	77.5
6095	0	730	916.5	80.8
813	0	724	916.7	83.5
6093	0	722	916.4	84.2
6096	0	721.9	916.5	84.3
844	0	722	918.1	85
6094	16.2	716	916.5	86.9
6091	37.8	710	916.7	89.6
6092	16.2	708	916.6	90.4
812	0	708	916.9	90.5
859	0	709	918.3	90.7
811	0	706	916.9	91.4
6090	13.5	705.3	916.7	91.6
6119	10.8	694	921.8	98.7
820	0	690	918.1	98.9
6089	0	684	916.9	100.9
6118	10.8	684	921.8	103
6116	10.8	661.9	921.7	112.6
808	0	660	919.9	112.6
6117	10.8	653.6	922	116.3
6120	0	648	920.3	118
6115	8.1	640	921.6	122
6066	0	630	922.9	126.9
6058	0	626.7	922.2	128
776	0	622	922.6	130.2

Run No. S4 Pipe PH2 FF

ID	From Node	To Node	Length (ft)	Diameter (in)	Roughness	Flow (gpm)	Velocity (ft/s)	Headloss (ft)	HL/1000 (ft/k-ft)
6642	6110	6107	338	12	130	1,500.00	4.3	1.8	5.4
6646	6115	6120	491	12	130	996.50	2.8	1.2	2.5
6641	6112	6093	333.5	16	130	-1,500.00	2.4	0.4	1.3
6640	6111	6112	190.4	16	130	-1,500.00	2.4	0.3	1.3
6639	6110	6111	295	16	130	-1,500.00	2.4	0.4	1.3
6653	6120	6089	1,573.20	10	130	566.20	2.3	3.4	2.1
HGV-6609	HGV-6087	813	884.5	12	130	753.1	2.1	1.3	1.5
6647	6115	776	712.4	12	130	-743.10	2.1	1	1.5
521	776	6066	274.7	14	130	-933.60	1.9	0.3	1.1
270	808	6120	304.7	10	130	-430.30	1.8	0.4	1.3
215	845	6094	819.00	8	130	264.4	1.7	1.3	1.6
6613	6093	6094	161	12	130	-590.80	1.7	0.2	1
6618	6096	813	314.2	16	130	-909.20	1.5	0.2	0.5
6611	6093	6096	299.8	16	130	-909.20	1.5	0.2	0.5
6572	6058	776	515.5	8	130	-190.50	1.2	0.4	0.8
6617	6090	6089	390.1	12	130	-410.20	1.2	0.2	0.5
216	844	859	384.2	10	130	-264.40	1.1	0.2	0.5
218	845	844	646.6	10	130	-264.4	1.1	0.3	0.5
6615	6092	6090	288.1	12	130	-358.90	1	0.1	0.4
264	812	813	328	8	130	156	1	0.2	0.6
6614	6094	6092	312.8	12	130	-342.70	1	0.1	0.3
6650	6117	6058	694.3	12	130	-304.70	0.9	0.2	0.3
6651	6119	6117	546.1	12	130	-293.90	0.8	0.1	0.3
6649	6116	6119	481	12	130	-272.30	0.8	0.1	0.2
6648	6115	6116	744.9	12	130	-261.50	0.7	0.2	0.2
6610	6089	812	247.50	10	130	156.00	0.6	0	0.2
6616	6090	6091	208.8	12	130	37.8	0.1	0	0
6652	6119	6118	375	12	130	10.8	0	0	0
6645	6095	6113	177.6	12	130	0.00	0	0	0
6643	6111	6108	379.2	12	130	0	0	0	0
6619	6096	6095	174.6	12	130	0	0	0	0
6609	6087	6110	325.7	16	130	0.00	0	0	0
6608	6084	6087	348	16	130	0.00	0	0	0
265	812	811	55.4	8	130	0.00	0	0	0
217	820	844	960.6	6	130	0	0	0	0
6644	6112	6109	400.00	12	130	0	0	0	0
214	846	845	716.4	8	130	0	0	0	0

Run No. S5 Node PH2 FF

ID	Demand (gpm)	Elevation (ft)	Head (ft)	Pressure (psi)
6084	0	818	916.5	42.7
6098	10.8	803.7	911.7	46.8
6078	10.8	793.10	911.70	51.4
6097	1,510.80	786.4	910	53.5
6087	0	791.5	916.7	54.2
6081	0	786	916.2	56.4
846	0	777	917.4	60.8
6107	0	776	916.9	61
HGV-6087	0	774	918.5	62.6
6110	0	771.3	916.9	63.1
6079	10.8	762	913.9	65.8
6108	0	758	917.1	68.9
6076	10.8	754	914.3	69.4
6111	0	753.1	917.1	71.1
6109	0	750	917.2	72.4
6077	0	746	915.7	73.6
6112	0	742	917.2	75.9
6113	0	742	917.5	76
845	0	739	917.4	77.3
6095	0	730	917.5	81.2
813	0	724	917.6	83.9
6093	0	722	917.4	84.7
844	0	722	917.4	84.7
6096	0	721.9	917.5	84.7
6101	5.4	720	915.7	84.8
6094	16.2	716	917.4	87.3
6082	8.1	712.4	915.7	88.1
6091	37.8	710	917.6	89.9
6099	5.4	708	915.7	90
859	0	709	917.4	90.3
6092	16.2	708	917.5	90.8
812	0	708	917.7	90.9
811	0	706	917.7	91.7
6090	13.5	705.3	917.6	92
6083	8.1	702	915.7	92.6
6100	8.1	691	915.7	97.4
6119	10.8	694	921.5	98.6
6089	0	684	917.7	101.3
6118	10.8	684	921.5	102.9
808	0	660	919.3	112.4
6116	10.8	661.9	921.4	112.4
6117	10.8	653.6	921.7	116.1
6120	0	648	920	117.8
6115	8.1	640	921.2	121.9
6066	0	630	922.6	126.8
6058	0	626.7	921.9	127.9
776	0	622	922.3	130.1
820	0	690	932	104.8

Run No. S5 Pipe PH2 FF

ID	From Node	To Node	Length (ft)	Diameter (in)	Roughness	Flow (gpm)	Velocity (ft/s)	Headloss (ft)	HL/1000 (ft/k-ft)
6626	6079	6078	397.1	12	130	1,532.40	4.3	2.2	5.6
6628	6078	6097	314.1	12	130	1,510.80	4.3	1.7	5.4
6646	6115	6120	491	12	130	1,018.60	2.9	1.3	2.6
6605	6079	6077	799.7	12	130	-945.80	2.7	1.8	2.3
270	808	6120	304.7	10	130	-564.40	2.3	0.7	2.1
6647	6115	776	712.4	12	130	-755.4	2.1	1.1	1.5
521	776	6066	274.7	14	130	-944.30	2	0.3	1.1
6653	6120	6089	1,573.20	10	130	454.20	1.9	2.2	1.4
HGV-6609	HGV-6087	813	884.5	12	130	622.70	1.8	0.9	1.1
6602	6076	6079	357.4	12	130	597.4	1.7	0.3	1
6641	6112	6093	333.5	16	130	-980.90	1.6	0.2	0.6
6640	6111	6112	190.4	16	130	-980.90	1.6	0.1	0.6
6639	6110	6111	295	16	130	-980.90	1.6	0.2	0.6
6604	6077	6081	756.4	16	130	-980.90	1.6	0.5	0.6
6608	6084	6087	348	16	130	-980.90	1.6	0.2	0.6
6606	6081	6084	456.3	16	130	-980.90	1.6	0.3	0.6
6609	6087	6110	325.7	16	130	-980.90	1.6	0.2	0.6
6572	6058	776	515.5	8	130	-188.8	1.2	0.4	0.8
6618	6096	813	314.2	16	130	-727.20	1.2	0.1	0.3
6611	6093	6096	299.8	16	130	-727.20	1.2	0.1	0.3
6617	6090	6089	390.1	12	130	-349.70	1	0.1	0.4
6650	6117	6058	694.3	12	130	-314.50	0.9	0.2	0.3
6651	6119	6117	546.1	12	130	-303.70	0.9	0.2	0.3
6615	6092	6090	288.10	12	130	-298.40	0.8	0.1	0.3
6614	6094	6092	312.8	12	130	-282.2	0.8	0.1	0.2
6649	6116	6119	481	12	130	-282.10	0.8	0.1	0.2
6648	6115	6116	744.9	12	130	-271.3	0.8	0.2	0.2
6613	6093	6094	161	12	130	-253.7	0.7	0	0.2
264	812	813	328	8	130	104.50	0.7	0.1	0.3
6610	6089	812	247.5	10	130	104.50	0.4	0	0.1
6616	6090	6091	208.8	12	130	37.8	0.1	0	0
6603	6077	6083	1,259.40	12	130	35.10	0.1	0	0
215	845	6094	819	8	130	-12.30	0.1	0	0
6630	6083	6099	286.40	12	130	18.9	0.1	0	0
218	845	844	646.6	10	130	12.30	0.1	0	0
216	844	859	384.2	10	130	12.3	0.1	0	0
6627	6078	6098	320	12	130	10.8	0	0	0
6652	6119	6118	375	12	130	10.80	0	0	0
6625	6083	6082	376	12	130	8.10	0	0	0
6629	6099	6100	660.8	12	130	8.10	0	0	0
6631	6099	6101	434	12	130	5.4	0	0	0
6644	6112	6109	400	12	130	0	0	0	0
265	812	811	55.4	8	130	0	0	0	0
6643	6111	6108	379.2	12	130	0	0	0	0
6642	6110	6107	338.00	12	130	0	0	0	0
6619	6096	6095	174.6	12	130	0	0	0	0
217	820	844	960.6	6	130	0	0	0	0
214	846	845	716.4	8	130	0	0	0	0
6645	6095	6113	177.60	12	130	0.00	0	0	0

Run No. S6 Node PH3 FF

ID	Demand (gpm)	Elevation (ft)	Head (ft)	Pressure (psi)
6088	1,508.10	874	929.5	24
6085	8.1	870.5	932.7	27
6086	8.1	866	931.9	28.5
6104	8.1	857.00	933.00	32.9
6102	8.1	851.1	932.1	35.1
6105	8.1	836.7	933.3	41.8
6106	10.8	836	934.9	42.8
6103	8.1	818	932.4	49.6
6080	8.1	818.6	934.9	50.4
6084	0	818	934.6	50.5
6098	10.8	803.7	941.2	59.5
6087	0	791.5	934.6	62
6078	10.80	793.1	941.2	64.1
6081	0	786	934.9	64.5
6097	10.8	786.4	941.2	67
846	0	777	935.2	68.6
6107	0	776	934.6	68.7
HGV-6087	0	774	934.4	69.5
6110	0	771.3	934.6	70.7
6108	0	758	934.6	76.5
6079	10.8	762	941.2	77.6
6111	0	753.1	934.6	78.6
6109	0	750	934.6	80
6076	10.8	754	943.5	82.1
6077	0	746	936	82.3
6113	0	742	934.5	83.4
6112	0	742	934.6	83.4
845	0	739	935.2	85
6095	0	730	934.5	88.6
813	0	724	934.5	91.2
6093	0	722	934.5	92.1
6096	0	721.9	934.5	92.1
844	0	722	935.4	92.5
6101	5.4	720	936	93.6
6094	16.2	716	934.6	94.7
6082	8.1	712.4	936	96.9
6091	37.8	710	934.6	97.3
859	0	709	935.5	98.1
812	0	708	934.6	98.2
6092	16.2	708	934.6	98.2
6099	5.4	708	936	98.8
811	0	706	934.6	99
6090	13.5	705.3	934.6	99.3
6083	8.1	702	936	101.4
6119	10.8	694	934.7	104.3

Run No. S6 Node PH3 FF

ID	Demand (gpm)	Elevation (ft)	Head (ft)	Pressure (psi)
6100	8.1	691	936	106.2
6089	0	684	934.6	108.6
6118	10.8	684	934.7	108.6
820	0	680	935.4	110.7
6116	10.8	661.9	934.7	118.2
808	0	660	934.7	119
6117	10.8	653.6	934.7	121.8
6120	0	648	934.7	124.2
6115	8.1	640	934.7	127.7
6066	0	630	934.8	132.1
6058	0	626.7	934.7	133.5
776	0	622	934.8	135.5
6122	0	805	928.2	53.4
6121	0	786	928.2	61.6

Run No. S6 Pipe PH3 FF

ID	From Node	To Node	Length (ft)	Diameter (in)	Roughness	Flow (gpm)	Velocity (ft/s)	Headloss (ft)	HL/1000 (ft/k-ft)
6602	6076	6079	357.4	12	130	1,690.40	4.8	2.4	6.7
6605	6079	6077	799.7	12	130	1,647.20	4.7	5.1	6.4
6656	6122	6105	195.4	12	130	1,556.70	4.4	1.1	5.8
6623	6086	6088	438.10	12	130	1,508.10	4.3	2.4	5.4
6604	6077	6081	756.4	16	130	1,612.10	2.6	1.1	1.5
6635	6105	6104	173.8	12	130	798.00	2.3	0.3	1.7
6634	6104	6085	160.6	12	130	789.90	2.2	0.3	1.6
6622	6085	6086	531.7	12	130	781.8	2.2	0.9	1.6
6637	6105	6103	580.6	12	130	750.60	2.1	0.9	1.5
6633	6103	6102	223.1	12	130	742.50	2.1	0.3	1.5
6632	6102	6086	151.5	12	130	734.40	2.1	0.2	1.4
6606	6081	6084	456.3	16	130	1,117.90	1.8	0.4	0.8
6657	6122	6121	465.1	12	100	-475.30	1.3	0.5	1
215	845	6094	819	8	130	182.9	1.2	0.6	0.8
216	844	859	384.2	10	130	-182.9	0.7	0.1	0.3
218	845	844	646.6	10	130	-182.9	0.7	0.2	0.3
HGV-6609	HGV-6087	813	884.5	12	130	-246.6	0.7	0.2	0.2
6572	6058	776	515.5	8	130	-85.40	0.5	0.1	0.2
521	776	6066	274.7	14	130	-256.7	0.5	0	0.1
6647	6115	776	712.4	12	130	-171.3	0.5	0.1	0.1
6653	6120	6089	1,573.20	10	130	111.00	0.5	0.2	0.1
6613	6093	6094	161	12	130	-154.8	0.4	0	0.1
264	812	813	328	8	130	55.3	0.4	0	0.1
6611	6093	6096	299.8	16	130	191.3	0.3	0	0
6618	6096	813	314.2	16	130	191.3	0.3	0	0
6646	6115	6120	491	12	130	88.40	0.3	0	0
6610	6089	812	247.5	10	130	55.3	0.2	0	0
6648	6115	6116	744.9	12	130	74.8	0.2	0	0
6649	6116	6119	481	12	130	64.00	0.2	0	0
6617	6090	6089	390.1	12	130	-55.6	0.2	0	0
6651	6119	6117	546.1	12	130	42.40	0.1	0	0
6616	6090	6091	208.8	12	130	37.80	0.1	0	0
6603	6077	6083	1,259.40	12	130	35.1	0.1	0	0
270	808	6120	304.7	10	130	22.6	0.1	0	0
6626	6079	6078	397.1	12	130	32.4	0.1	0	0
6650	6117	6058	694.3	12	130	31.60	0.1	0	0
6608	6084	6087	348	16	130	36.50	0.1	0	0
6609	6087	6110	325.7	16	130	36.50	0.1	0	0
6639	6110	6111	295	16	130	36.5	0.1	0	0
6640	6111	6112	190.4	16	130	36.50	0.1	0	0
6641	6112	6093	333.5	16	130	36.5	0.1	0	0
6654	6121	6080	340.3	12	130	18.90	0.1	0	0
6630	6083	6099	286.40	12	130	18.9	0.1	0	0
6614	6094	6092	312.8	12	130	11.90	0	0	0
6652	6119	6118	375	12	130	10.80	0	0	0
6627	6078	6098	320	12	130	10.8	0	0	0

Run No. S6 Pipe PH3 FF

ID	From Node	To Node	Length (ft)	Diameter (in)	Roughness	Flow (gpm)	Velocity (ft/s)	Headloss (ft)	HL/1000 (ft/k-ft)
6628	6078	6097	314.1	12	130	10.80	0	0	0
6638	6080	6106	393.2	12	130	10.80	0	0	0
6629	6099	6100	660.8	12	130	8.1	0	0	0
6625	6083	6082	376	12	130	8.10	0	0	0
6631	6099	6101	434	12	130	5.4	0	0	0
6615	6092	6090	288.1	12	130	-4.30	0	0	0
6643	6111	6108	379.2	12	130	0.00	0	0	0
265	812	811	55.4	8	130	0.00	0	0	0
6642	6110	6107	338	12	130	0.00	0	0	0
6644	6112	6109	400.00	12	130	0	0	0	0
6645	6095	6113	177.6	12	130	0.00	0	0	0
6619	6096	6095	174.6	12	130	0	0	0	0
217	820	844	960.6	6	130	0	0	0	0
214	846	845	716.40	8	130	0	0	0	0

Run No. S7 Node PH3 FF-Aqueduct

ID	Demand (gpm)	Elevation (ft)	Head (ft)	Pressure (psi)
6088	1,508.10	874	931.7	25
6085	8.1	870.5	934.9	27.9
6086	8.1	866	934.1	29.5
6104	8.1	857	935.2	33.9
6102	8.1	851.1	934.3	36
6105	8.1	836.7	935.5	42.8
6106	10.8	836	937	43.8
6103	8.1	818	934.6	50.5
6080	8.1	818.6	937	51.3
6084	0	818	936.8	51.5
6122	0	805	936.6	57
6098	10.8	803.7	942.6	60.2
6087	0	791.5	936.8	62.9
6078	10.8	793.1	942.6	64.8
6121	0.00	786	937	65.4
6081	0	786	937.1	65.5
6097	10.8	786.4	942.6	67.7
846	0	777	937.6	69.6
6107	0	776	936.8	69.7
HGV-6087	0	774	936.6	70.5
6110	0	771.3	936.8	71.7
6108	0	758	936.8	77.5
6079	10.8	762	942.6	78.3
6111	0	753.1	936.8	79.6
6109	0	750	936.8	80.9
6076	10.8	754	944.8	82.7
6077	0	746	938.1	83.2
6113	0	742	936.7	84.4
6112	0	742	936.8	84.4
845	0	739	937.6	86.1
6095	0	730	936.7	89.6
813	0	724	936.7	92.2
6093	0	722	936.8	93.1
6096	0	721.9	936.7	93.1
844	0	722	937.9	93.5
6101	5.4	720	938.1	94.5
6094	16.2	716	936.8	95.7
6082	8.1	712.4	938.1	97.8
6091	37.8	710	936.8	98.3
6092	16.2	708	936.8	99.1
812	0	708	936.8	99.1
859	0	709	938	99.2
6099	5.4	708	938.1	99.7
811	0	706	936.8	100
6090	13.5	705.3	936.8	100.3

Run No. S7 Node PH3 FF-Aqueduct

ID	Demand (gpm)	Elevation (ft)	Head (ft)	Pressure (psi)
6083	8.1	702	938.1	102.3
6119	10.8	694	937	105.3
6100	8.1	691	938.1	107.1
6089	0	684	936.8	109.5
6118	10.8	684	937	109.6
820	0	680	937.9	111.7
6116	10.8	661.9	937	119.2
808	0	660	937.2	120.1
6117	10.8	653.6	936.9	122.8
6120	0	648	937	125.2
6115	8.1	640	937	128.7
6066	0	630	937	133
6058	0	626.7	936.9	134.4
776	0	622	937	136.5

Run No. S7 Pipe PH3 FF-Aqueduct

ID	From Node	To Node	Length (ft)	Diameter (in)	Roughness	Flow (gpm)	Velocity (ft/s)	Headloss (ft)	HL/1000 (ft/k-ft)
6602	6076	6079	357.4	12	130	1,592.70	4.5	2.1	6
6656	6122	6105	195.4	12	130	1,556.70	4.4	1.1	5.8
6605	6079	6077	799.7	12	130	1,549.50	4.4	4.6	5.7
6623	6086	6088	438.1	12	130	1,508.10	4.3	2.4	5.4
6604	6077	6081	756.4	16	130	1,514.40	2.4	1	1.3
6635	6105	6104	173.8	12	130	798.00	2.3	0.3	1.7
6634	6104	6085	160.6	12	130	789.9	2.2	0.3	1.6
6622	6085	6086	531.7	12	130	781.80	2.2	0.9	1.6
6637	6105	6103	580.60	12	130	750.6	2.1	0.9	1.5
6633	6103	6102	223.1	12	130	742.5	2.1	0.3	1.5
6632	6102	6086	151.5	12	130	734.4	2.1	0.2	1.4
6606	6081	6084	456.3	16	130	1,040.00	1.7	0.3	0.7
215	845	6094	819	8	130	213.90	1.4	0.9	1
6657	6122	6121	465.1	12	100	-455.50	1.3	0.4	1
270	808	6120	304.7	10	130	286.7	1.2	0.2	0.6
216	844	859	384.20	10	130	-213.9	0.9	0.1	0.4
218	845	844	646.6	10	130	-213.9	0.9	0.2	0.4
HGV-6609	HGV-6087	813	884.5	12	130	-208.60	0.6	0.1	0.1
6613	6093	6094	161	12	130	-208.10	0.6	0	0.1
6653	6120	6089	1,573.20	10	130	139.60	0.6	0.3	0.2
6572	6058	776	515.5	8	130	-70.6	0.5	0.1	0.1
6646	6115	6120	491	12	130	-147.10	0.4	0	0.1
264	812	813	328	8	130	61.6	0.4	0	0.1
6648	6115	6116	744.9	12	130	109.8	0.3	0	0
6649	6116	6119	481	12	130	99	0.3	0	0
6610	6089	812	247.5	10	130	61.60	0.3	0	0
6611	6093	6096	299.8	16	130	147.00	0.2	0	0
6618	6096	813	314.2	16	130	147.00	0.2	0	0
6617	6090	6089	390.1	12	130	-78.00	0.2	0	0
6651	6119	6117	546.1	12	130	77.4	0.2	0	0
6650	6117	6058	694.3	12	130	66.60	0.2	0	0
6616	6090	6091	208.8	12	130	37.8	0.1	0	0
6603	6077	6083	1,259.40	12	130	35.1	0.1	0	0
6641	6112	6093	333.5	16	130	-61.2	0.1	0	0
6640	6111	6112	190.4	16	130	-61.2	0.1	0	0
6639	6110	6111	295	16	130	-61.2	0.1	0	0
6608	6084	6087	348	16	130	-61.2	0.1	0	0
6609	6087	6110	325.7	16	130	-61.20	0.1	0	0
6626	6079	6078	397.1	12	130	32.40	0.1	0	0
521	776	6066	274.7	14	130	-41.40	0.1	0	0
6647	6115	776	712.4	12	130	29.2	0.1	0	0
6615	6092	6090	288.1	12	130	-26.70	0.1	0	0
6630	6083	6099	286.4	12	130	18.90	0.1	0	0
6654	6121	6080	340.30	12	130	18.9	0.1	0	0
6638	6080	6106	393.2	12	130	10.8	0	0	0

Run No. S7 Pipe PH3 FF-Aqueduct

ID	From Node	To Node	Length (ft)	Diameter (in)	Roughness	Flow (gpm)	Velocity (ft/s)	Headloss (ft)	HL/1000 (ft/k-ft)
6628	6078	6097	314.1	12	130	10.80	0	0	0
6627	6078	6098	320	12	130	10.80	0	0	0
6652	6119	6118	375.00	12	130	10.80	0	0	0
6614	6094	6092	312.8	12	130	-10.50	0	0	0
6625	6083	6082	376	12	130	8.10	0	0	0
6629	6099	6100	660.8	12	130	8.1	0	0	0
6631	6099	6101	434	12	130	5.4	0	0	0
6642	6110	6107	338	12	130	0	0	0	0
6643	6111	6108	379.2	12	130	0	0	0	0
265	812	811	55.4	8	130	0.00	0	0	0
6644	6112	6109	400	12	130	0.00	0	0	0
6645	6095	6113	177.6	12	130	0.00	0	0	0
217	820	844	960.6	6	130	0	0	0	0
214	846	845	716.4	8	130	0.00	0	0	0
6619	6096	6095	174.60	12	130	0	0	0	0

Run No. S8 Pipe PH3 -Aqueduct

ID	From Node	To Node	Length (ft)	Diameter (in)	Roughness	Flow (gpm)	Velocity (ft/s)	Headloss (ft)	HL/1000 (ft/k-ft)
6646	6115	6120	491	12	130	721.10	2	0.7	1.4
270	808	6120	304.7	10	130	-446.80	1.8	0.4	1.4
6647	6115	776	712.4	12	130	-554.90	1.6	0.6	0.9
521	776	6066	274.70	14	130	-698.30	1.5	0.2	0.6
HGV-6609	HGV-6087	813	884.5	12	130	410.20	1.2	0.4	0.5
6653	6120	6089	1,573.20	10	130	274.30	1.1	0.9	0.6
6605	6079	6077	799.7	12	130	-344.90	1	0.3	0.4
6572	6058	776	515.5	8	130	-143.50	0.9	0.3	0.5
6641	6112	6093	333.5	16	130	-504.8	0.8	0.1	0.2
6640	6111	6112	190.4	16	130	-504.80	0.8	0	0.2
6639	6110	6111	295	16	130	-504.80	0.8	0.1	0.2
6609	6087	6110	325.7	16	130	-504.80	0.8	0.1	0.2
6608	6084	6087	348	16	130	-504.80	0.8	0.1	0.2
6602	6076	6079	357.4	12	130	-282.5	0.8	0.1	0.2
6618	6096	813	314.2	16	130	-453.00	0.7	0	0.1
6611	6093	6096	299.8	16	130	-453	0.7	0	0.1
6650	6117	6058	694.3	12	130	-240.4	0.7	0.1	0.2
6617	6090	6089	390.1	12	130	-231.50	0.7	0.1	0.2
6651	6119	6117	546.1	12	130	-224.80	0.6	0.1	0.2
6604	6077	6081	756.4	16	130	-395.6	0.6	0.1	0.1
6606	6081	6084	456.3	16	130	-395.6	0.6	0.1	0.1
6649	6116	6119	481	12	130	-193.6	0.5	0.1	0.1
6648	6115	6116	744.9	12	130	-178	0.5	0.1	0.1
6615	6092	6090	288.1	12	130	-157.40	0.4	0	0.1
6614	6094	6092	312.8	12	130	-134	0.4	0	0.1
215	845	6094	819	8	130	-58.7	0.4	0.1	0.1
264	812	813	328	8	130	42.8	0.3	0	0.1
218	845	844	646.6	10	130	58.7	0.2	0	0
216	844	859	384.2	10	130	58.7	0.2	0	0
6656	6122	6105	195.4	12	130	81.90	0.2	0	0
6610	6089	812	247.5	10	130	42.8	0.2	0	0
6616	6090	6091	208.8	12	130	54.6	0.2	0	0
6613	6093	6094	161	12	130	-51.80	0.1	0	0
6603	6077	6083	1,259.40	12	130	50.70	0.1	0	0
6626	6079	6078	397.1	12	130	46.80	0.1	0	0
6635	6105	6104	173.8	12	130	40.8	0.1	0	0
6637	6105	6103	580.6	12	130	29.4	0.1	0	0
6634	6104	6085	160.6	12	130	29.10	0.1	0	0
6630	6083	6099	286.4	12	130	27.30	0.1	0	0
6654	6121	6080	340.3	12	130	27.3	0.1	0	0
6657	6122	6121	465.10	12	100	27.3	0.1	0	0
6633	6103	6102	223.1	12	130	17.70	0.1	0	0
6622	6085	6086	531.7	12	130	17.4	0	0	0
6628	6078	6097	314.1	12	130	15.60	0	0	0
6627	6078	6098	320	12	130	15.60	0	0	0
6638	6080	6106	393.2	12	130	15.6	0	0	0

Run No. S8 Pipe PH3 -Aqueduct

ID	From Node	To Node	Length (ft)	Diameter (in)	Roughness	Flow (gpm)	Velocity (ft/s)	Headloss (ft)	HL/1000 (ft/k-ft)
6652	6119	6118	375	12	130	15.60	0	0	0
6629	6099	6100	660.80	12	130	11.7	0	0	0
6623	6086	6088	438.1	12	130	11.7	0	0	0
6625	6083	6082	376	12	130	11.70	0	0	0
6631	6099	6101	434	12	130	7.80	0	0	0
6632	6102	6086	151.5	12	130	6.00	0	0	0
6644	6112	6109	400	12	130	0.00	0	0	0
6643	6111	6108	379.2	12	130	0.00	0	0	0
6642	6110	6107	338	12	130	0.00	0	0	0
6619	6096	6095	174.60	12	130	0.00	0	0	0
6645	6095	6113	177.6	12	130	0.00	0	0	0
265	812	811	55.4	8	130	0	0	0	0
217	820	844	960.6	6	130	0	0	0	0
214	846	845	716.4	8	130	0	0	0	0

Run No. S8 Node PH3 PHD-Aqueduct

ID	Demand (gpm)	Elevation (ft)	Head (ft)	Pressure (psi)
6084	0.00	818	926.1	46.8
6098	15.6	803.7	925.7	52.8
6078	15.6	793.10	925.70	57.4
6087	0	791.5	926.2	58.3
6097	15.6	786.4	925.7	60.3
6081	0	786	926.1	60.7
846	0	777	926.3	64.7
6107	0	776	926.2	65.1
HGV-6087	0	774	926.9	66.3
6110	0	771.3	926.2	67.1
6079	15.6	762	925.7	70.9
6088	11.7	874	1,038.40	71.2
6085	11.7	870.5	1,038.40	72.8
6108	0	758	926.3	72.9
6076	15.6	754	925.6	74.4
6086	11.7	866	1,038.40	74.7
6111	0	753.1	926.3	75.1
6109	0	750	926.3	76.4
6077	0	746	926	78
6104	11.7	857	1,038.40	78.6
6112	0	742	926.3	79.9
6113	0	742	926.4	79.9
6102	11.7	851.1	1,038.40	81.2
845	0	739	926.3	81.2
6095	0	730	926.4	85.1
6105	11.7	836.7	1,038.40	87.4
6106	15.6	836	1,038.40	87.7
813	0	724	926.5	87.7
844	0	722	926.3	88.5
6093	0	722	926.4	88.6
6096	0	721.9	926.4	88.6
6101	7.8	720	926	89.2
6094	23.4	716	926.4	91.2
6082	11.7	712.4	926	92.5
6091	54.6	710	926.4	93.8
859	0	709	926.3	94.1
6099	7.8	708	926	94.4
6092	23.4	708	926.4	94.6
812	0	708	926.5	94.7
6080	11.7	818.6	1,038.40	95.2
6103	11.7	818	1,038.40	95.5
811	0	706	926.5	95.5
6090	19.5	705.3	926.4	95.8
6083	11.7	702	926	97
6122	0	805	1,038.40	101.1

Run No. S8 Node PH3 PHD-Aqueduct

ID	Demand (gpm)	Elevation (ft)	Head (ft)	Pressure (psi)
6119	15.6	694	928.2	101.5
6100	11.7	691	926	101.8
6089	0	684	926.5	105.1
6118	15.6	684	928.2	105.8
820	0	680	926.3	106.7
6121	0	786	1,038.40	109.4
6116	15.6	661.9	928.1	115.4
808	0	660	926.9	115.7
6117	15.6	653.6	928.3	119
6120	0	648	927.4	121.1
6115	11.7	640	928.1	124.8
6066	0	630	928.8	129.5
6058	0	626.7	928.4	130.7
776	0	622	928.7	132.9

Run No. S9 Pipe

ID	From Node	To Node	Length (ft)	Diameter (in)	Roughness	Flow (gpm)	Velocity (ft/s)	Headloss (ft)	HL/1000 (ft/k-ft)
6656	6122	6105	195.4	12	130	1,556.70	4.4	1.1	5.8
6623	6086	6088	438.1	12	130	1,508.10	4.3	2.4	5.4
6653	6120	6089	1,573.20	10	130	1,021.10	4.2	10.1	6.4
215	845	6094	819	8	130	619.40	4	6.2	7.5
6646	6115	6120	491	12	130	1,218.70	3.5	1.8	3.7
6613	6093	6094	161	12	130	-1,154.90	3.3	0.5	3.3
264	812	813	328	8	130	401.8	2.6	1.1	3.4
216	844	859	384.2	10	130	-619.4	2.5	1	2.5
218	845	844	646.6	10	130	-619.4	2.5	1.6	2.5
6641	6112	6093	333.5	16	130	-1,556.70	2.5	0.5	1.4
6640	6111	6112	190.4	16	130	-1,556.70	2.5	0.3	1.4
6609	6087	6110	325.7	16	130	-1,556.70	2.5	0.5	1.4
6608	6084	6087	348	16	130	-1,556.70	2.5	0.5	1.4
6639	6110	6111	295	16	130	-1,556.70	2.5	0.4	1.4
6647	6115	776	712.4	12	130	-842.10	2.4	1.3	1.8
6635	6105	6104	173.8	12	130	798.00	2.3	0.3	1.7
6634	6104	6085	160.6	12	130	789.9	2.2	0.3	1.6
6622	6085	6086	531.7	12	130	781.8	2.2	0.9	1.6
6637	6105	6103	580.6	12	130	750.6	2.1	0.9	1.5
6633	6103	6102	223.1	12	130	742.5	2.1	0.3	1.5
6632	6102	6086	151.5	12	130	734.4	2.1	0.2	1.4
521	776	6066	274.7	14	130	-942.3	2	0.3	1.1
6617	6090	6089	390.1	12	130	-619.3	1.8	0.4	1
6610	6089	812	247.5	10	130	401.8	1.6	0.3	1.1
6615	6092	6090	288.1	12	130	-568	1.6	0.3	0.9
6614	6094	6092	312.8	12	130	-551.8	1.6	0.3	0.8
6650	6117	6058	694.3	12	130	-428	1.2	0.4	0.5
6651	6119	6117	546.1	12	130	-417.2	1.2	0.3	0.5
6649	6116	6119	481	12	130	-395.6	1.1	0.2	0.5
6648	6115	6116	744.9	12	130	-384.8	1.1	0.3	0.4
270	808	6120	304.7	10	130	-197.7	0.8	0.1	0.3
6618	6096	813	314.2	16	130	-401.8	0.6	0	0.1
6611	6093	6096	299.8	16	130	-401.8	0.6	0	0.1
6572	6058	776	515.5	8	130	-100.2	0.6	0.1	0.3
6616	6090	6091	208.8	12	130	37.8	0.1	0	0
6652	6119	6118	375	12	130	10.8	0	0	0
265	812	811	55.4	8	130	0	0	0	0
6643	6111	6108	379.2	12	130	0	0	0	0
6642	6110	6107	338	12	130	0	0	0	0
HGV-6609	HGV-6087	813	884.5	12	130	0	0	0	0
6619	6096	6095	174.6	12	130	0	0	0	0
6644	6112	6109	400	12	130	0	0	0	0
6645	6095	6113	177.6	12	130	0	0	0	0
217	820	844	960.6	6	130	0	0	0	0
214	846	845	716.4	8	130	0	0	0	0

Run No. S9 Node

ID	Demand (gpm)	Elevation (ft)	Head (ft)	Pressure (psi)
6084	0	818	912.3	40.9
6087	0	791.5	912.8	52.6
6107	0	776	913.3	59.5
6110	0	771.3	913.3	61.5
846	0	777	921.1	62.4
6088	1,508.10	874	1,024.10	65.1
HGV-6087	0	774	928.8	67.1
6108	0	758	913.7	67.5
6085	8.1	870.5	1,027.40	68
6086	8.1	866	1,026.50	69.6
6111	0	753.1	913.7	69.6
6109	0	750	914	71
6104	8.1	857	1,027.60	73.9
6112	0	742	914	74.5
6113	0	742	914.5	74.7
6102	8.1	851.1	1,026.70	76.1
845	0	739	921.1	78.9
6095	0	730	914.5	79.9
813	0	724	914.5	82.5
6105	8.1	836.7	1,027.90	82.9
6093	0	722	914.4	83.4
6096	0	721.9	914.5	83.4
6094	16.2	716	915	86.2
844	0	722	922.8	87
6091	37.8	710	915.5	89
6092	16.2	708	915.2	89.8
812	0	708	915.6	90
6103	8.1	818	1,027.10	90.6
811	0	706	915.6	90.8
6090	13.5	705.3	915.5	91.1
859	0	709	923.7	93
6122	0	805	1,029.00	97.1
6089	0	684	915.9	100.5
6119	10.8	694	928.3	101.5
820	0	680	922.8	105.2
6118	10.8	684	928.3	105.9
808	0	660	925.9	115.2
6116	10.8	661.9	928.1	115.3
6117	10.8	653.6	928.6	119.1
6120	0	648	926	120.4
6115	8.1	640	927.8	124.7
6066	0	630	929.4	129.7
6058	0	626.7	928.9	131
776	0	622	929.1	133.1