

FINAL

TWIN OAKS SUB-BASIN SEWER EVALUATION

Vallecitos Water District

B&V PROJECT NO. 414649

PREPARED FOR:

Vallecitos Water District

7 NOVEMBER 2023

Table of Contents

1.0	Introduction	1
2.0	Updated Sanitary Loading	2
2.1	Updated Sewer Studies.....	2
2.2	Accessory Dwelling Units.....	4
2.3	Updated General Plan.....	4
3.0	Hydraulic Modeling Results	6
4.0	Recommendations	6

LIST OF TABLES

Table 1	Projected Development Loading.....	2
Table 2	Recommendation for Updated Pipe Diameters.....	6

LIST OF FIGURES

Figure 1	– Proposed Development Locations	3
Figure 2	– Potential ADUs within Twin Oaks Sub-basin.....	5
Figure 3	– Recommended Pipe Improvements.....	1
Figure 4	– Segment 1, Peak Flow Depth with 12-inch Diameter Replacement Pipe	1
Figure 5	– Segment 2, Peak Flow Depth with 15-inch Diameter Replacement Pipe	1
Figure 6	– Segment 2 (continued), Peak Flow Depth with 15-inch Diameter Replacement Pipe	2
Figure 7	– Segment 2 (continued), Peak Flow Depth with 15-inch Diameter Replacement Pipe	2
Figure 8	– Segment 2 (continued), Peak Flow Depth with 15-inch Diameter Replacement Pipe	3
Figure 9	– Segment 3, Peak Flow Depth with 18-inch Diameter Replacement Pipe	3
Figure 10	– Additional Wastewater Flow from Development of ADUs.....	4
Figure 11	– Profile of 8-inch Sewer main West of Cox Rd	5
Figure 12	– Profile of 8- and 10-inch Sewer main West of Cox Rd	5

1.0 Introduction

The objective of this sewer study is to evaluate the capacity of the existing Twin Oaks Valley Trunk Sewer and make recommendations for sewer improvements needed to convey additional wastewater flows from future developments within the sewer basin in accordance with the Vallecitos Water District's (District) Master Plan. The evaluation was performed using the District's existing calibrated sewer hydraulic model, which was developed in the OpenFlows SewerGems modeling platform (Bentley Systems) as part of the District's 2018 Wastewater Master Plan. The model was reviewed and updated to reflect the current sewer system configuration, planned and forecasted development within the sewer basin, and the updated City of San Marcos General Plan Alternatives. Based on updated model simulations, improvements to the existing Twin Oaks Valley Trunk Sewer, located in North Twin Oaks Valley Road are needed to convey additional wastewater flows from planned or forecasted development and are presented in Section 4.

There are four major planned developments within the Twin Oaks Valley sewer sub-basin that have updated sewer studies since the 2018 Master Plan was published. These four developments are:

- TERI Campus of Life
- Mulberry 9-lot Residential Subdivision
- Kiddie Academy
- Twin Oaks Fuel Station and Car Wash

Additionally, the District requested the hydraulic capacity evaluation consider the impact of connecting future accessory dwelling units (ADUs) from single-family residential lots with an area of 5,500 square feet or larger to the Twin Oaks Valley trunk sewer. Since the 2018 Master Plan, California passed Assembly Bill (AB) 68 and subsequent legislation which make it easier to build ADUs on existing residential lots, potentially resulting in a significant increase in density within residentially zoned communities, including the Twin Oaks Valley sewer sub-basin. ADU development may increase sewer flows beyond the sewer system's originally planned capacity.

The 2018 Master Plan recommended a capital improvement project (CIP) for the Twin Oaks Valley Trunk Sewer to replace and upsize the existing 16,700 feet of 8-inch vitrified clay sewer with an 18-inch PVC sewer (SP-31). The analysis performed under this study evaluated the previously proposed CIP pipe and the existing parallel 12" sewer main sizing and configuration considering the updated development plans, updated general plan, and additional ADU flows, and revised the recommended pipe size for the Twin Oaks Valley Trunk Sewer CIP. Additionally, this study included analysis of other sewer improvements in the Twin Oaks Valley Trunk Sewer sub-basin associated with the Mulberry development project.

2.0 Updated Sanitary Loading

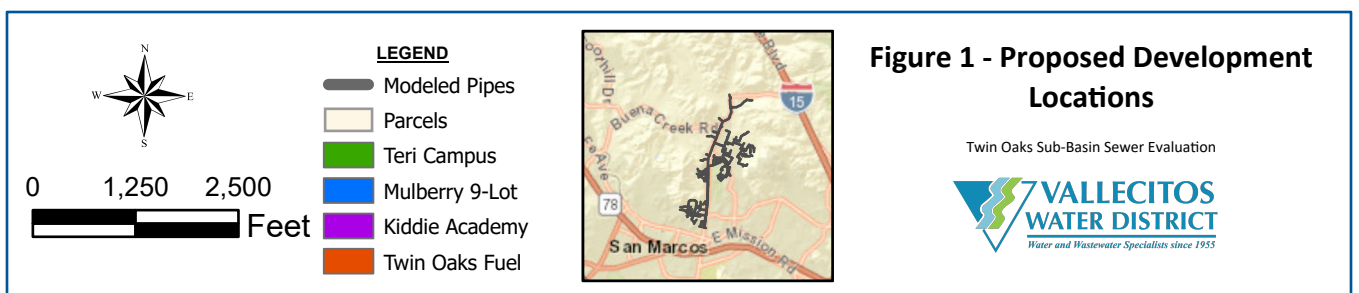
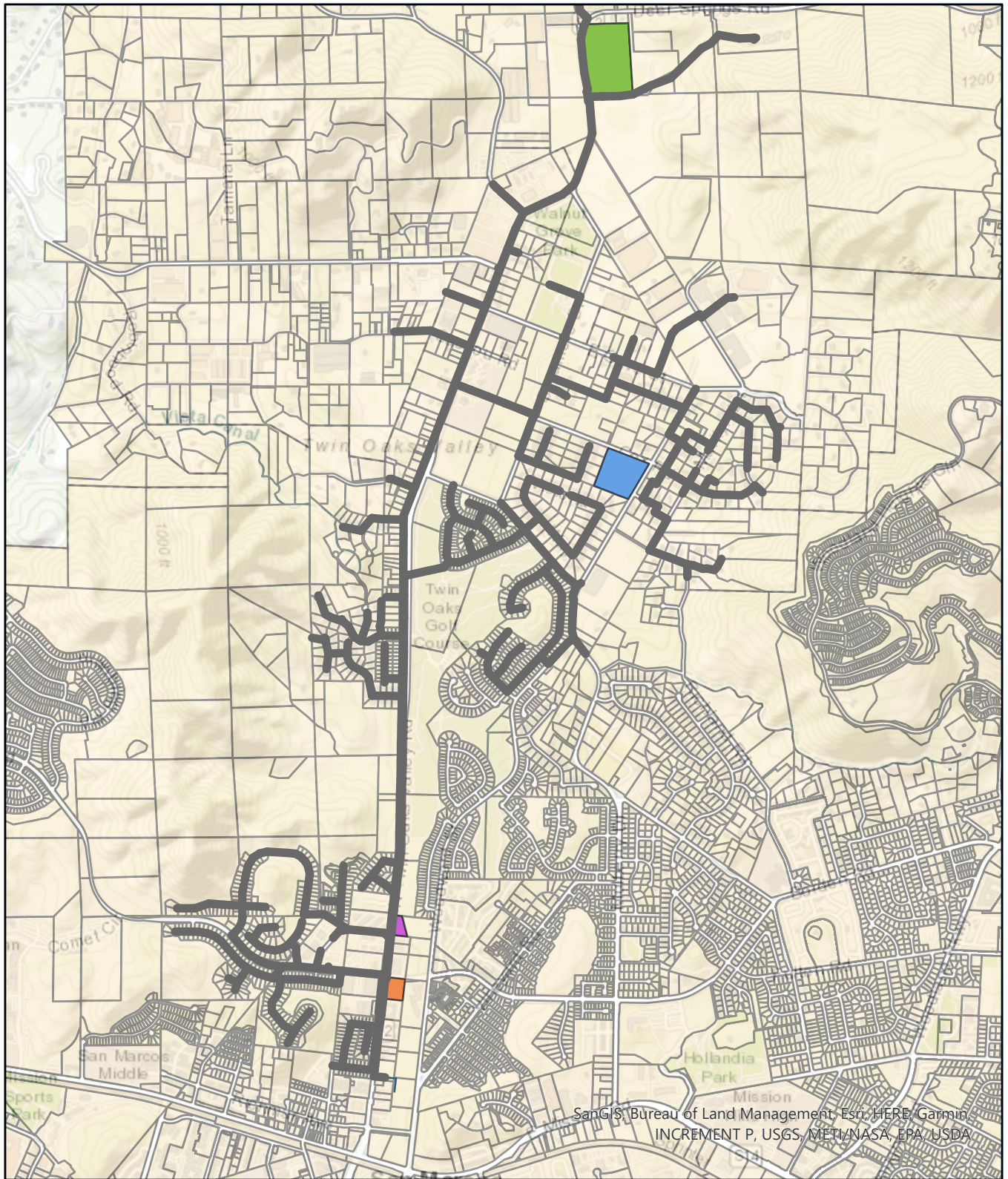
2.1 Updated Sewer Studies

The District received updated water and sewer studies for four proposed developments within the Twin Oaks Valley sewer sub-basin. Three of the studies were submitted in 2022, while the TERI Campus of Life study was submitted in 2020, all four being prepared after the release of the 2018 Master Plan. The sewer studies describe the project location, estimated wastewater generation, and impacts to the existing sewer. For this evaluation, the projected wastewater flows and locations of proposed connection points to the existing sewer system were added to the hydraulic sewer model. The locations of the four proposed developments are shown in Figure 1. Table 1 summarizes the revised sewer rates and the corresponding loading manholes used to update the model’s flow projections based on increased flow above the Master Plan.

Table 1 Projected Development Loading

Development	Area (acreage)	Proposed Land Use	Projected Flow Rate from Sewer Study (gpm)	Projected Flow Rate Increase (gpm)	Manhole Loading ID
Teri Campus of Life	19.83	School	2.05	0	MH24
Mulberry 9-Lot	10.06	Residential	1.05	0.49	MH5232
Kiddie Academy	1.61	School	1.57	0.23	MH3381
Twin Oaks Fuel Station and Car Wash	2.47	Commercial	2.06*	0	MH2983

*The sewer study for the Twin Oaks Fuel Station and Carwash (Table 3 – Project Estimated Wastewater Flows for Twin Oaks Fuel Station & Car Wash) incorrectly identifies a total wastewater flow from the project of 9,048 gpd; based on a parcel size of 2.47 acres and proposed commercial land use with a duty factor of 1,200 gpd/ac, the correct flow rate is 2,964 gpd or 2.06 gpm.

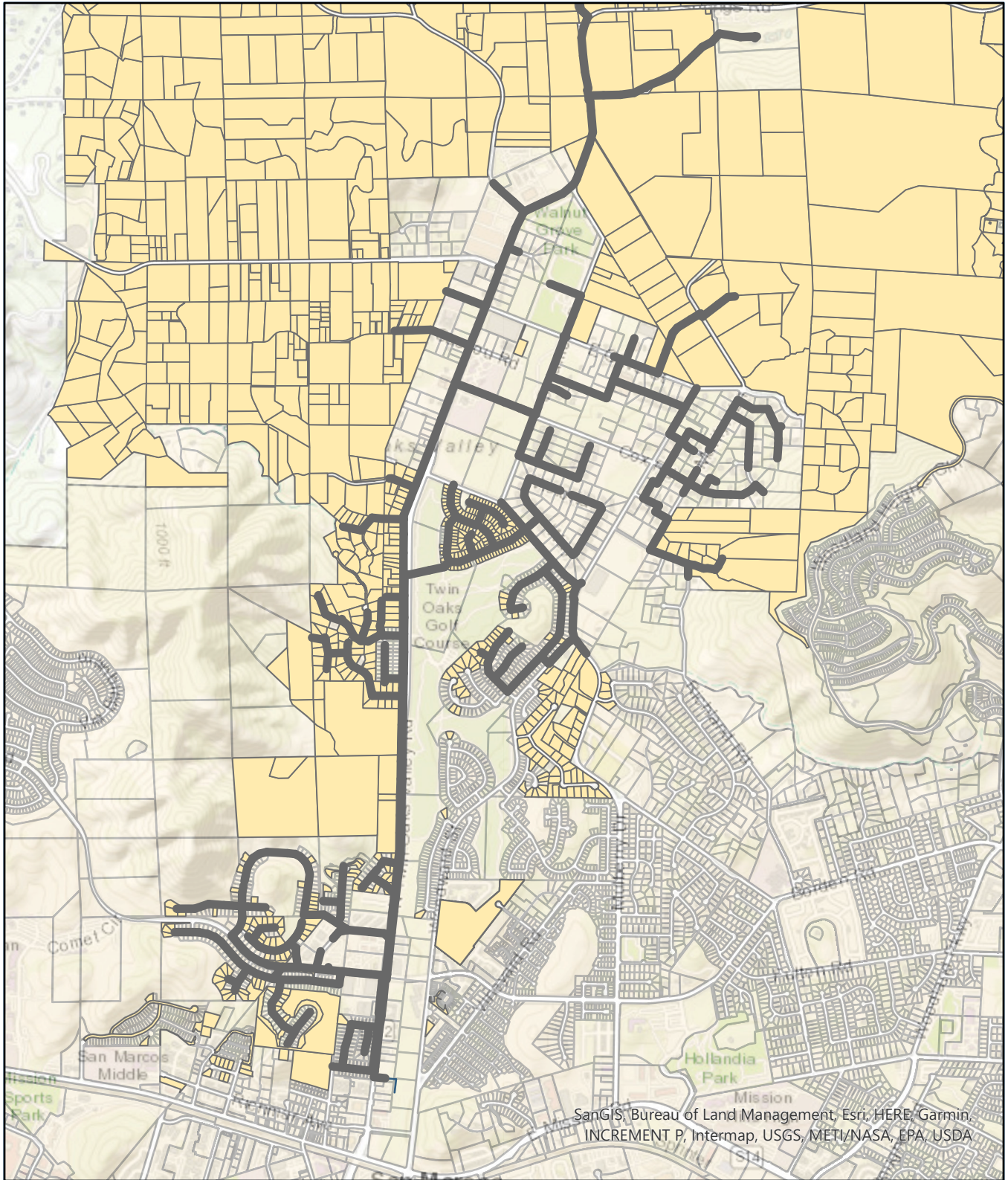


2.2 Accessory Dwelling Units

As part of the analysis of the Twin Oaks Valley Trunk Sewer, potential impacts from future construction of ADUs on residentially zoned parcels as now allowed by the passage of AB 68 and subsequent legislation were evaluated. Potential widespread development of ADUs may significantly increase sanitary sewer flows from residential areas beyond what was projected in the 2018 Master Plan. Based on input from the District for this evaluation, parcels identified as single-family zoned with a lot size of 5,500 square feet or larger were assumed as potential ADU sites. Out of the 1,564 single-family parcels within the Twin Oaks Valley sewer sub-basin, 1,407 are larger than 5,500 square-feet. Additional wastewater loading was added to each parcel in the model based on the projected average estimated indoor water use for an ADU. Water use was assumed to comply with the state mandated (SB 1157) indoor usage cap of 42 gallons per capita per day. An average occupancy of three persons per ADU was assumed given the maximum size of 1,200 square feet (SF) per ADU. Therefore, an average additional loading of 123 gallons per ADU per day was applied to each of the 1,407 single-family parcels. The locations of these ADU parcels are presented in Figure 2. This adds up to an additional 123 gpm of wastewater flows into the system.

2.3 Updated General Plan

The City of San Marcos General Plan Advisory Committee has proposed updates and two land use alternatives to the General Plan (discussed at July 21, 2022 Advisory Committee meeting). The changes in the Twin Oaks Valley sewer sub-basin are the same in both alternatives. The major change is the recategorization of 13 parcels from residential to agricultural land use and one parcel from industrial to light industrial land use types. These parcel types were analyzed to determine if the changes would affect future sanitary sewer loadings and recommended pipe diameters for the trunk sewer improvements. Sanitary loading generation factors for various land uses are specified in the Master Plan and were utilized to calculate the projected sewer loadings from the parcels with changed land use designations. The General Plan changes result in an overall reduction of approximately 8.5 gpm from the projected loading rate in the Master Plan. The hydraulic model was updated by reducing the loading from the affected parcels. Note that some of the parcels currently lie outside of the District's service area, however, the Master Plan assumed that all 14 parcels would be served by the District sewer system at basin build-out and therefore were accounted for in the Ultimate Peak Wet Weather scenario of the Master Plan.



SanGIS, Bureau of Land Management, Esri, HERE, Garmin, INCREMENT P, Intermap, USGS, METI/NASA, EPA, USDA

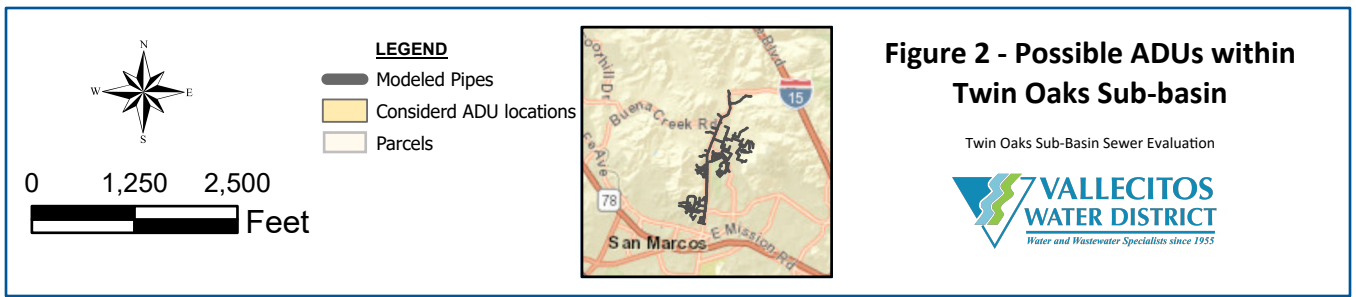


Figure 2 - Possible ADUs within Twin Oaks Sub-basin

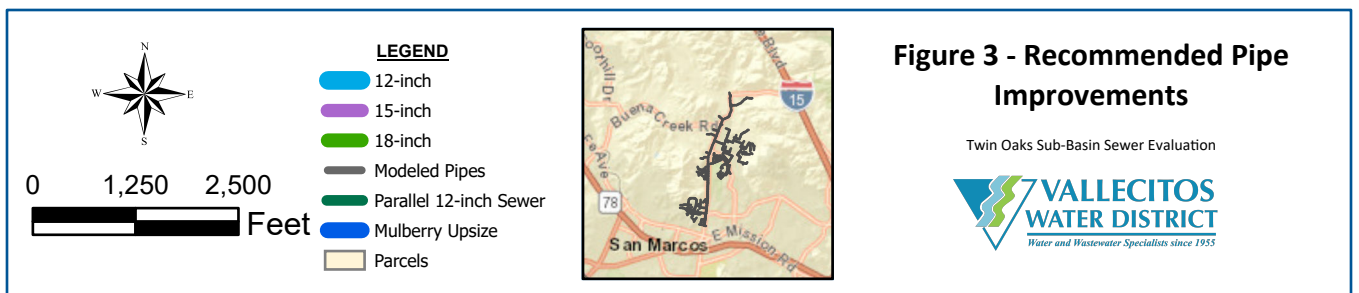
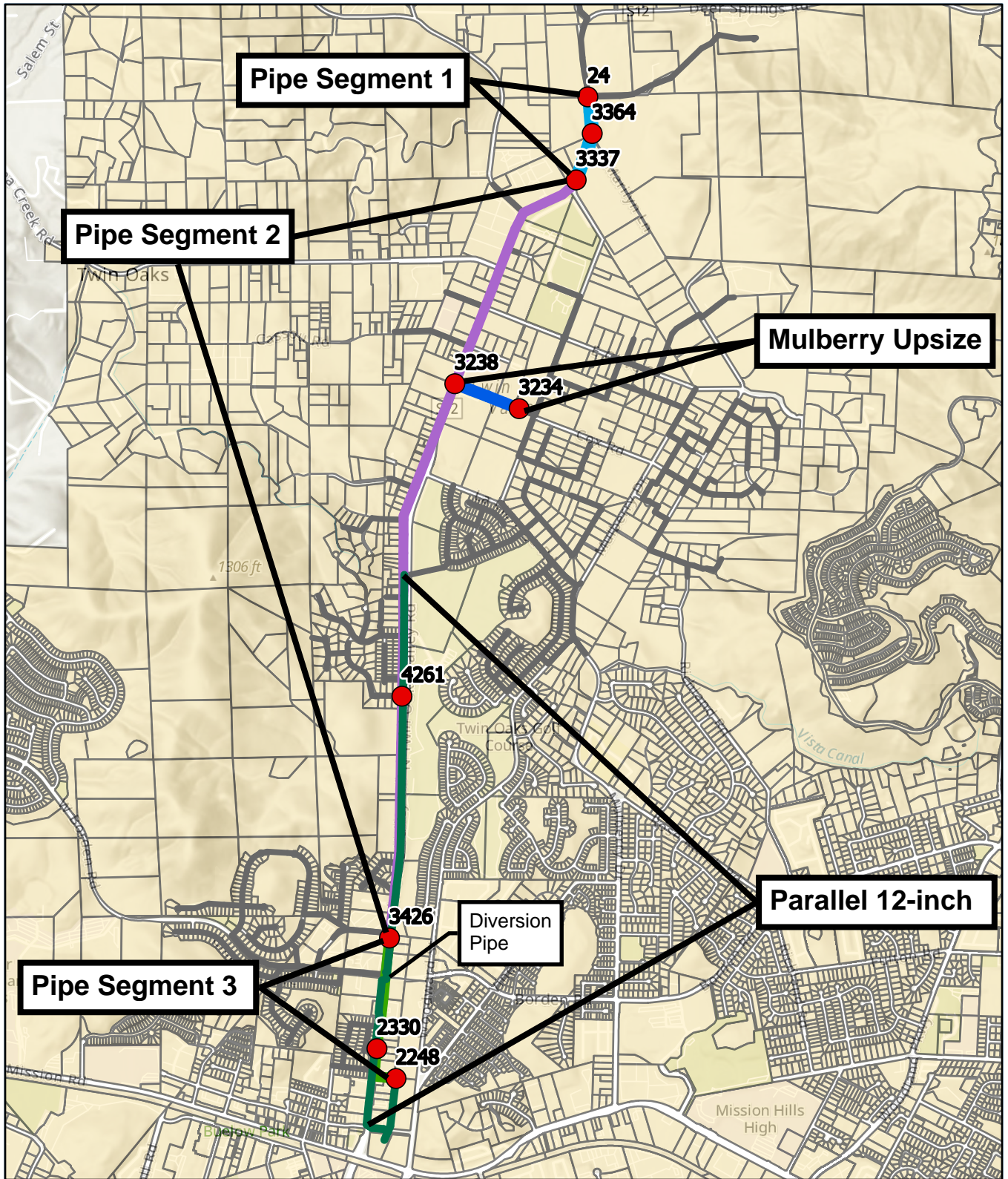
Twin Oaks Sub-Basin Sewer Evaluation



3.0 Hydraulic Modeling Results

Hydraulic modeling was conducted using the 2018 Master Plan hydraulic sewer model and updated with loading described in Section 2.0. With the addition of the proposed developments and ADUs, modeled simulations of the sewer system at future buildout of the sewer basin and under peak wet weather conditions indicate that the existing 8-inch trunk sewer will need to be upsized to convey projected future peak flows through the system without surcharging. Iterations on pipe size were done to identify the optimal size pipeline for each length of pipe in order to satisfy the District's design criteria for the maximum flow depth allowed under peak flow conditions, expressed as the ratio of peak flow depth (d) to pipe diameter (D). For pipe sizes 12-inch in diameter and smaller the criterion is a maximum d/D ratio of 0.5, and for pipes greater than 12-inch in diameter a maximum d/D ratio of 0.75. This assessment did not make modifications to the sewer slope or material parameters in the 2018 Master Plan model and base assumptions from the 2018 Master Plan were used. The pipes were sized according to these assumptions.

To meet d/D criteria in the trunk sewer at basin development buildout and under peak wet weather conditions, the analysis indicated that the Twin Oaks Valley Trunk Sewer from the intersection of Deer Springs Rd and Deer Creek Road, south to the intersection of North Twin Oaks Valley Road and Woodward Street will require upsizing from 8-inch to 12, 15, or 18-inch diameter. The recommended upsizing consists of three segments, shown in Figure 3. The first segment extends from the intersection of Deer Springs Road and Deer Creek Road (Manhole 24) south to the intersection of Deer Springs Road and Sycamore Drive (Manhole 3337). The recommended replacement pipe size is 12-inch diameter. As shown in Figure 4, the maximum simulated peak flow depth through this segment with a 12-inch diameter sewer pipe is 44.7% ($d/D = 0.45$), meeting the design criteria of less than 50% ($d/D = 0.5$).



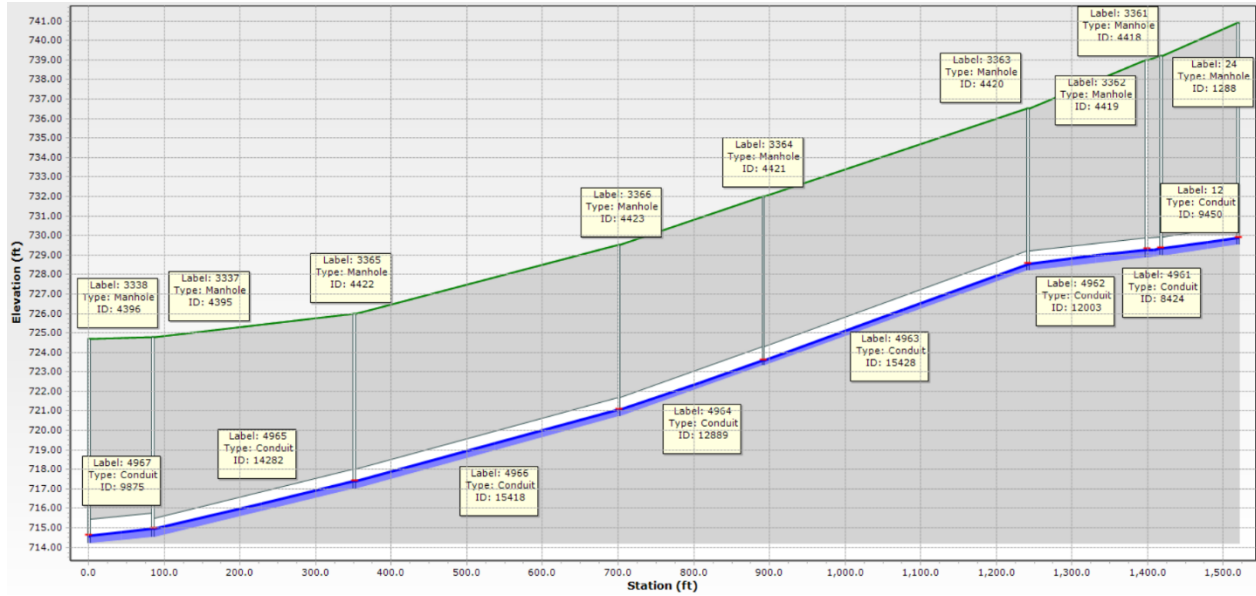


Figure 4 – Segment 1, Peak Flow Depth with 12-inch Diameter Replacement Pipe

Segment 2 extends from the intersection of Deer Springs Road and Sycamore Drive (Manhole 3337) south to the intersection of North Twin Oaks Valley Road and Windy Way (Manhole 3426). The recommended sewer replacement size in this segment is 15-inch diameter. As shown in Figure 5 through Figure 8, the maximum simulated peak flow depth through this segment with a 15-inch diameter sewer pipe is 72% ($d/D = 0.74$), meeting the design criteria of less than 75% ($d/D = 0.75$).

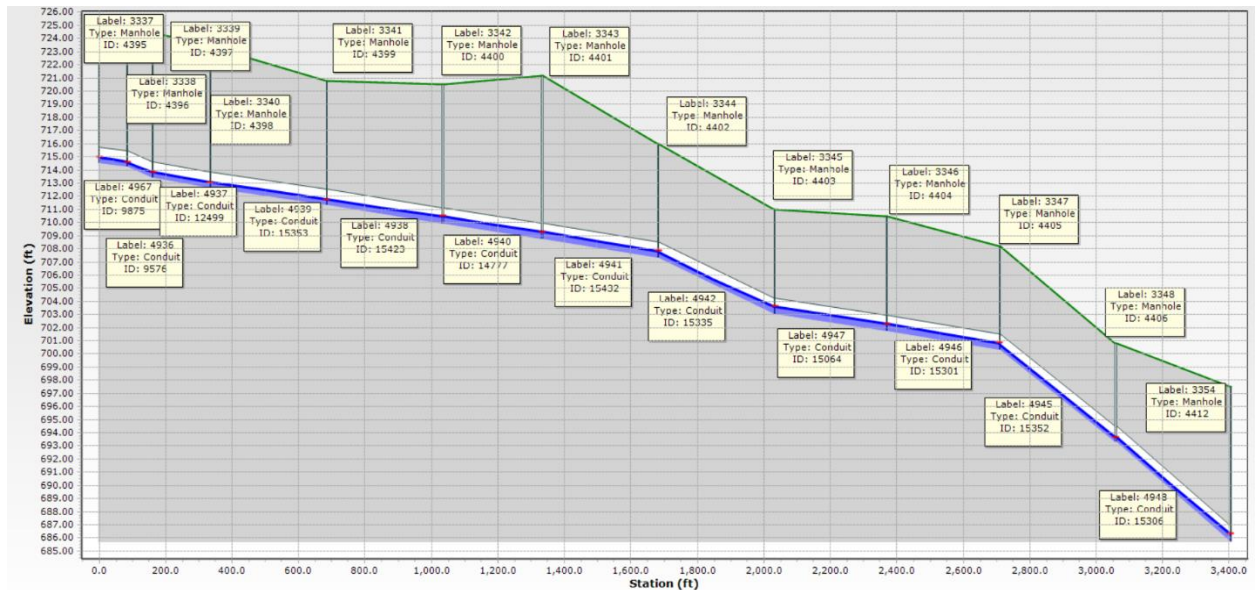


Figure 5 – Segment 2, Peak Flow Depth with 15-inch Diameter Replacement Pipe

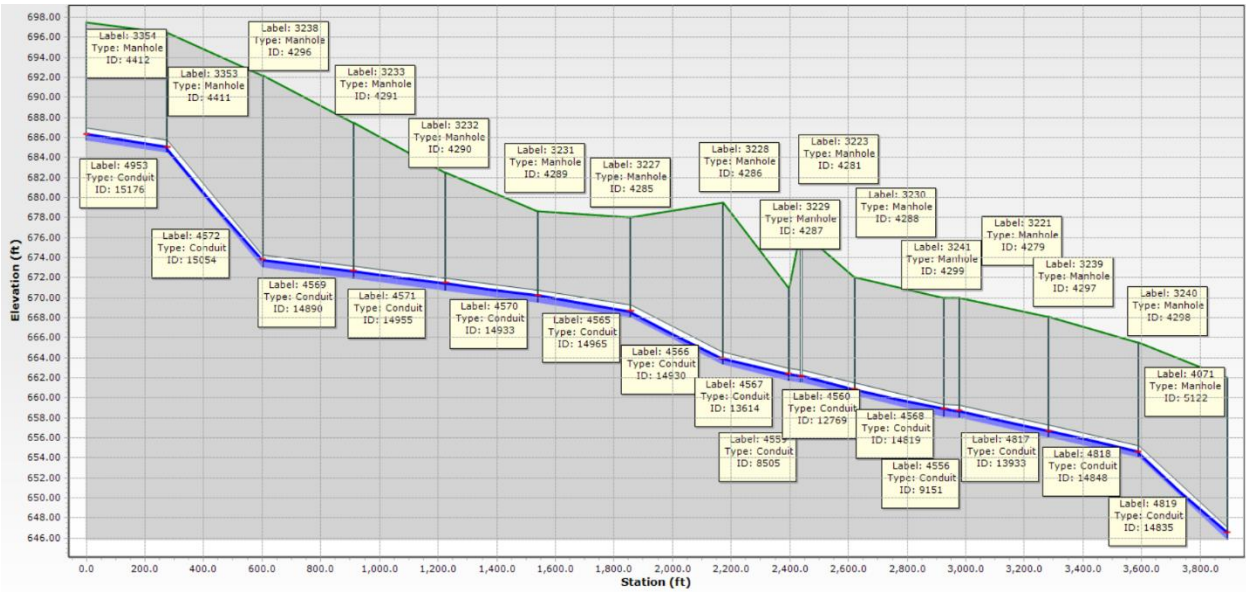


Figure 6 – Segment 2 (continued), Peak Flow Depth with 15-inch Diameter Replacement Pipe

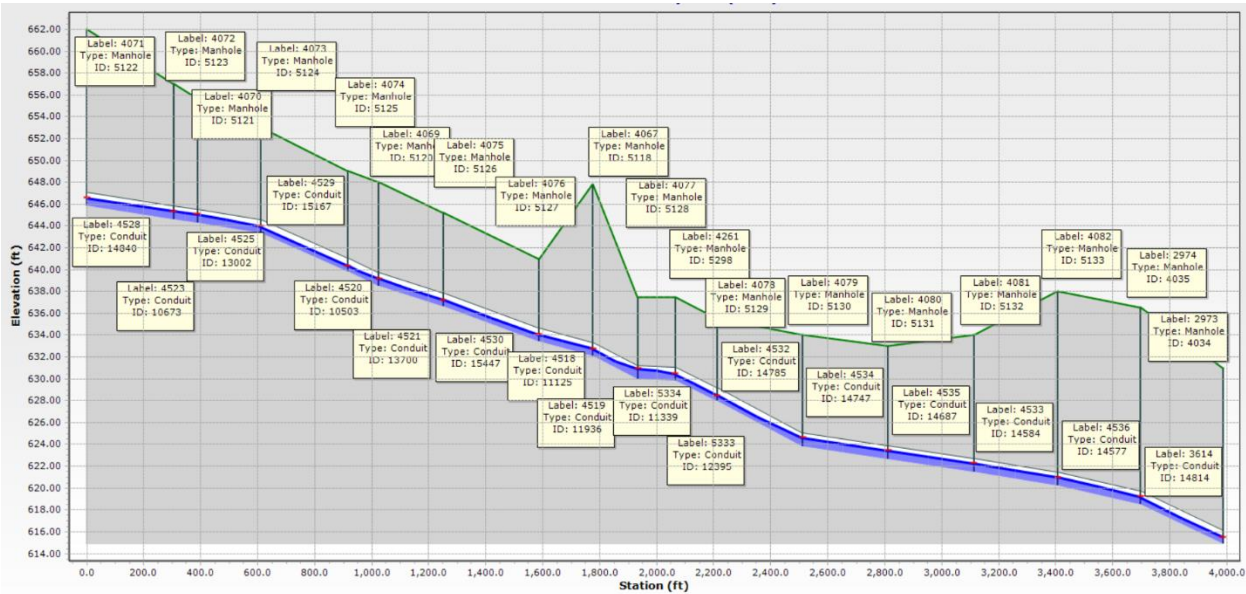


Figure 7 – Segment 2 (continued), Peak Flow Depth with 15-inch Diameter Replacement Pipe

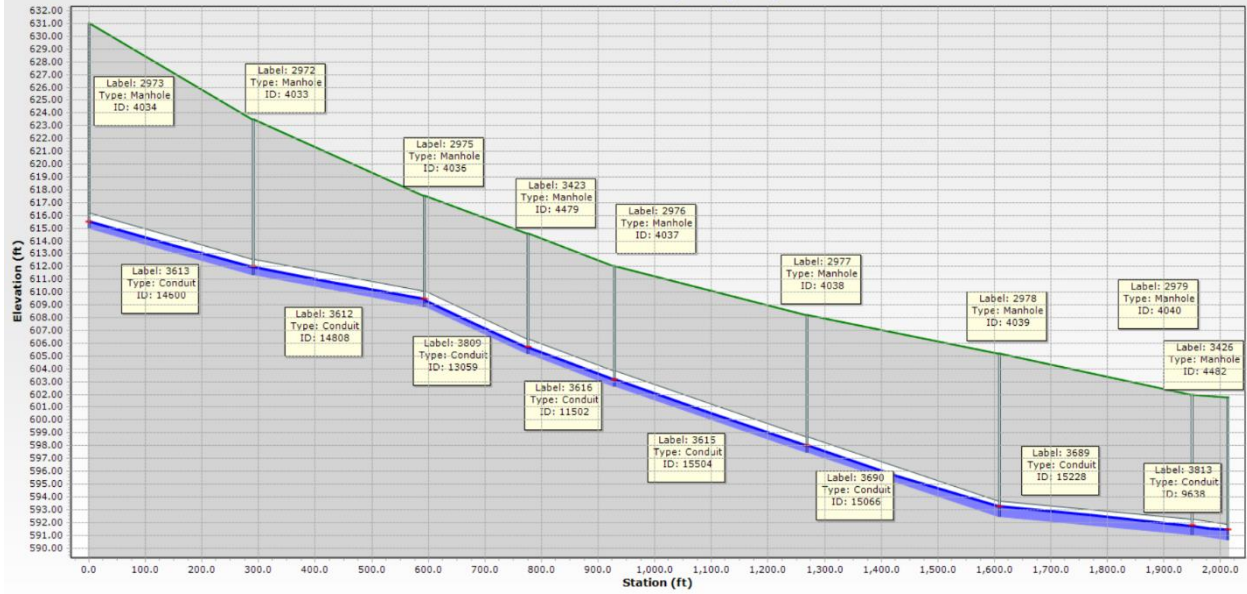


Figure 8 – Segment 2 (continued), Peak Flow Depth with 15-inch Diameter Replacement Pipe

Segment 3 extends from the intersection of North Twin Oaks Valley Road (Manhole 3426) and Windy Way south to the intersection of North Twin Oaks Valley Road and Woodward Street (Manhole 2248). The recommended sewer replacement size in this segment is 18-inch diameter. As shown in Figure 9, the maximum simulated peak flow depth through this segment with an 18-inch diameter sewer pipe is 64% ($d/D = 0.67$), meeting the design criteria of less than 75% ($d/D = 0.75$).

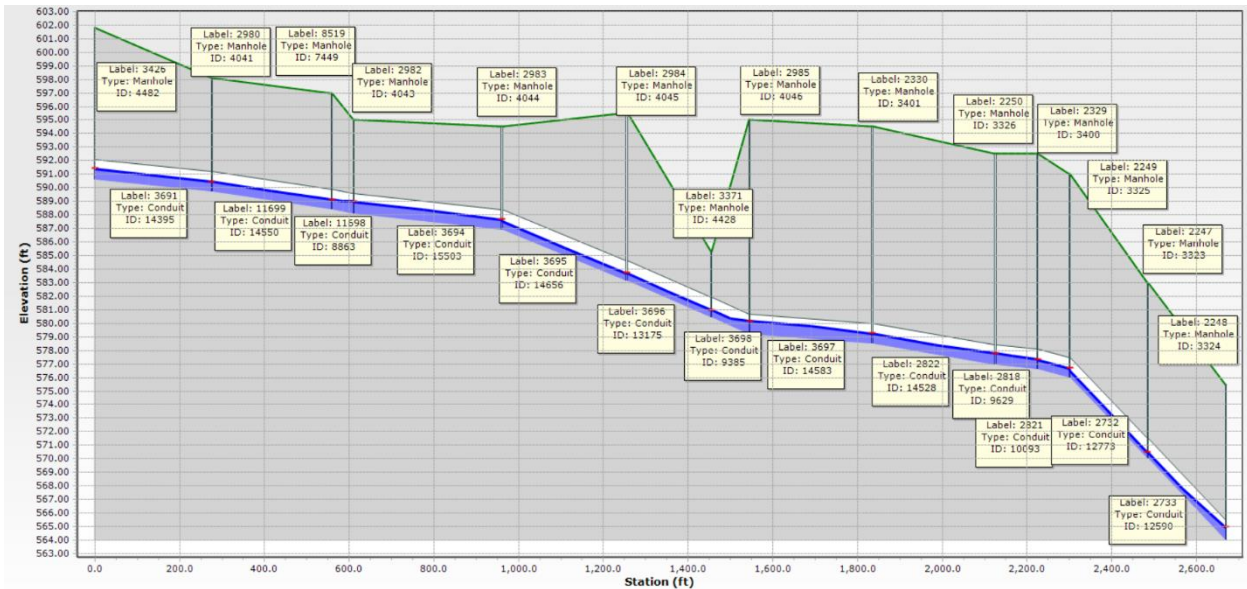


Figure 9 – Segment 3, Peak Flow Depth with 18-inch Diameter Replacement Pipe

The graph below, Figure 10, displays the projected maximum daily flow at basin development buildout through the most downstream pipe along the trunk sewer with (blue line) and without (red line) additional wastewater generation from potential development of ADUs on residential lots within the sewer basin. The difference in the projected peak flow rates with and without ADU development is approximately 200 gallons per minute.

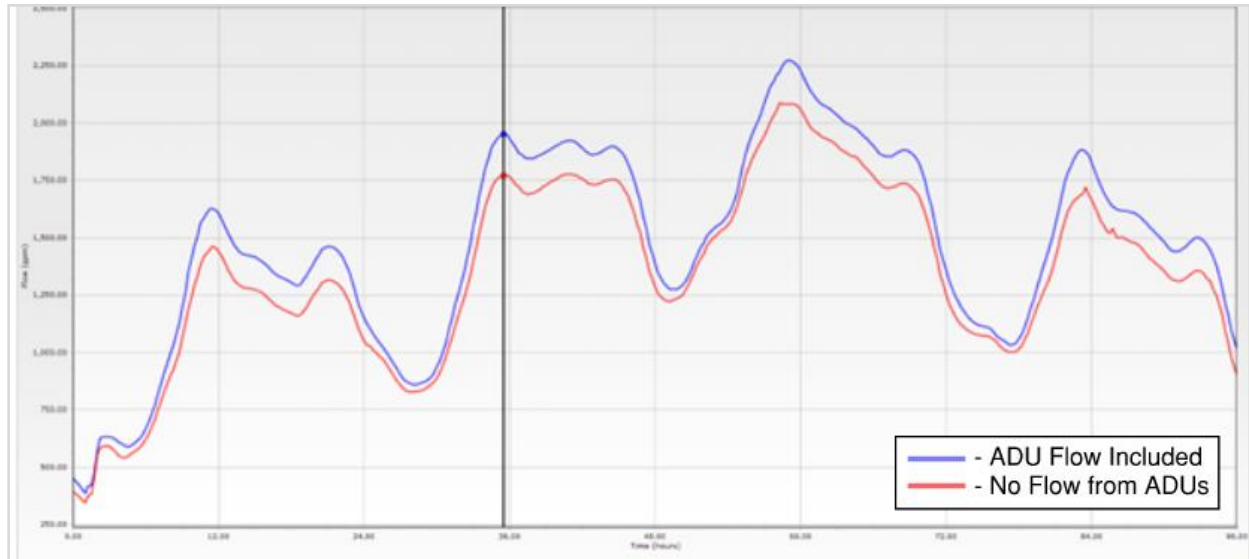


Figure 10 – Additional Wastewater Flow from Development of ADUs

Although not a part of the Twin Oaks Valley Trunk Sewer, the hydraulic analysis indicates that 1,120 feet of existing 8-inch diameter sewer south of Olive Street is capacity constrained during peak wet weather flows under basin development buildout conditions. The constraint results from additional loading due to future development of the Mulberry subdivision project and upstream ADUs. To alleviate this constraint, and consistent with findings of the 2022 Mulberry Residential Subdivision Water and Sewer Study, upsizing of the sewer from 8 to 10-inch diameter is recommended. Figure 11 shows the peak hydraulic profile of the 8-inch pipe downstream of the proposed Mulberry development from Manhole 3234 at the intersection of Sycamore Drive and Cox Road to the connection to the Twin Oaks Valley Trunk Sewer at Manhole 3238. Figure 12 is the peak hydraulic profile of the recommended upsized sewer. Figure 3 shows the plan view of this pipeline.

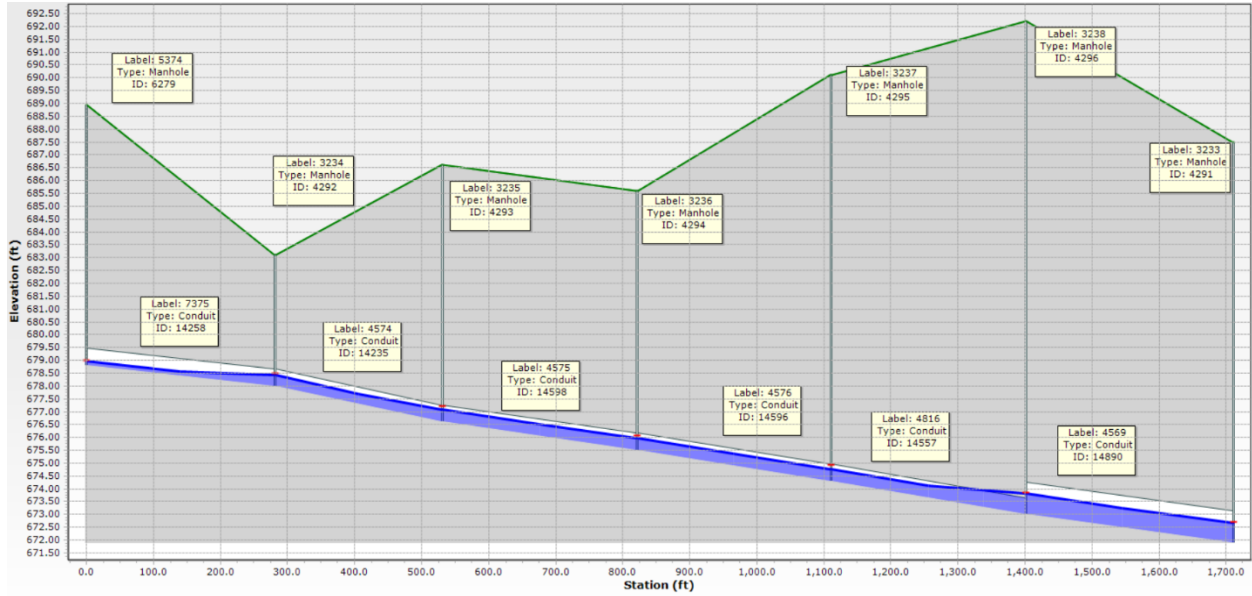


Figure 11 – Profile of 8-inch Sewer main West of Cox Rd

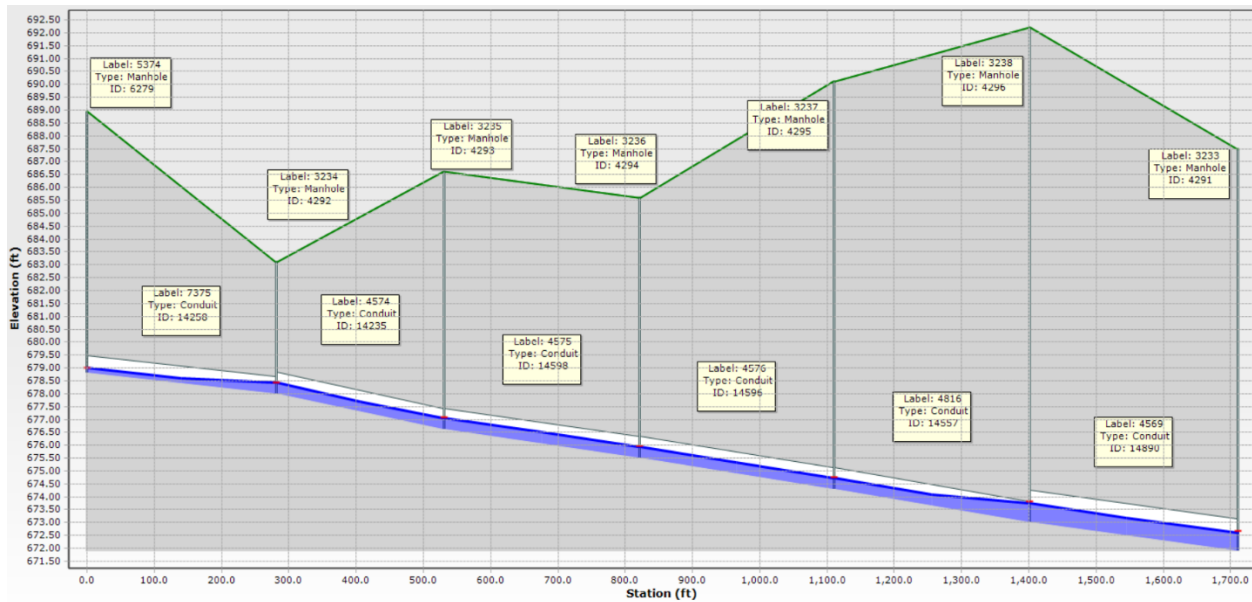


Figure 12 – Profile of 8- and 10-inch Sewer main West of Cox Rd

4.0 Recommendations

To optimize capacity of the Twin Oak Valley Trunk Sewer, the District installed a 10-inch diversion structure between the existing 8-inch diameter trunk sewer and parallel 12-inch diameter sewer in North Twin Oaks Valley Road from just north of W Borden road (MH8519 – MH8520). The parallel 12-inch sewer runs from just south of Via las Brisas and reconnects to the trunk sewer at Richmar avenue. The diversion routes some of the flow from the 8-inch trunk sewer to the parallel sewer, effectively providing additional capacity in the trunk sewer downstream of the diversion. The parallel sewer, which acts a relief for the trunk sewer during periods of high flow, connects back to a downstream 24-inch reach of the trunk sewer.

Model simulations indicate that either closing the diversion structure or raising it more than one foot at MH8519 would allow the 12-inch parallel sewer to remain under 50% full at ultimate conditions. This would make the diversion a strictly overflow pipe to allow for additional relief at the planned 18-inch trunk sewer. The District should determine during the full engineering analysis of the proposed 18-inch trunk sewer that if the diversion structure will be required or if it should be capped and filled.

Based on updated hydraulic model simulations of peak wet weather flows at basin development buildout (consistent with the Master Plan *Ultimate Buildout* scenario), which includes the four major planned developments (listed in Table 1), development of ADUs on single-family residential parcels within the sewer basin, and recent changes to the General Plan, the following improvements to the Twin Oaks Valley Trunk Sewer, as shown in Table 2, are recommended as part of the District’s CIP. A plan view of the planned pipe diameters is shown in Figure 3.

Table 2 Twin Oaks Valley Trunk Sewer Recommended Improvements

Sewer Segment	Length (feet)	From Manhole	To Manhole	Existing Pipe Diameter (inches)	Recommended Replacement Pipe Diameter (inches)
1	1,435	MH24	MH3337	8	12
2	13,298	MH3337	MH3426	8	15
3	2,669	MH3426	MH2248	8	18
Mulberry	1,120	MH3234	MH3238	8	10