Section 6
Capacity Analysis

SECTION 6 – CAPACITY ANALYSIS

Previous sections of this SMP described the existing facilities assessment, flow monitoring data collection and flow assignment methodology required to construct and calibrate the VVWRA Interceptor Model. This section uses the calibrated Model to determine Interceptor capacity under existing conditions and under several scenarios for future capital improvement projects.

Future capital improvement projects were derived from the VVWRA Capital Improvements Plan and include the construction of new regional water reclamation plants and bypass sewers. These improvements could eliminate the need for Interceptor improvements via diversion of wastewater flow.

Scenarios were developed under which to determine Interceptor capacity. The scenarios start with assessment of the capacity of the existing system without improvements. From there, Interceptor capacity is assessed after key capital improvement projects are brought on line:

1. The current capacity of the existing Interceptor in each of its principal sections:
    - In Hesperia from Hercules to Bear Valley Road.
    - From Bear Valley Road to the Spring Valley Lake/CSA-64 connection.
    - From the Spring Valley Lake connection to the Upper Narrows.
    - The South Apple Valley Interceptor.
    - The North Apple Valley Interceptor.
    - From the Upper Narrows to the Lower Narrows.
    - The Lower Narrows to the double barrel section (Victorville Schedules 3 through 6).
    - The double barrel (Victorville Schedules 1 and 2 and Relief Sewer) section to the RWWRF.
2. Capacity in the Hercules to Bear Valley Road Section after construction of the Santa Fe Bypass

3. Principal sections capacity after construction of the Hesperia North Relief Interceptor (Bear Valley Road to Spring Valley Lake)
4. Principal sections capacity after construction of the SVL/CSA-64 Relief Interceptor
5. Principal sections capacity after construction of the Hesperia WRP-1
6. Principal sections capacity after construction of the Apple Valley WRP
7. Principal sections capacity after construction of the Eastside WRP

Figure 6-1 depicts the principal sections of the Interceptors analyzed in this section and shows the capital improvements described in the VVWRA Capital Improvements Plan.

6.1 VVWRA INTERCEPTOR CAPACITY CRITERIA

VVWRA has established dry weather capacity criteria for its Interceptor sewers. The criteria distinguish between pipe larger and smaller than 12 inches diameter. No criteria have been established for wet weather flow.

6.1.1 Dry Weather Flow Capacity Criteria

The VVWRA dry weather flow criteria apply to the peak hour of dry weather flow. Table 6-1 summarizes the capacity criteria.

Table 6-1
Capacity Criteria

Pipe Size	Condition	Maximum d/D
12 inch and smaller	New Pipe	0.50
15 inch and larger	New Pipe	0.75
12 inch and smaller	Existing Pipe	0.75
15 inch and larger	Existing Pipe	0.89

VVWRA
RWWRF

SCLA

AIR EXPRESSWAY

NEW
EASTSIDE
REGIONAL
WRP

Town of
Apple Valley

DALE EVANS PKWY

NAVAJO RD

NEW APPLE
VALLEY WRP

CORWIN RD

City of
Victorville

ZUNI RD

APPLE VALLEY RD

THUNDER BIRD RD

MOJAVE DR

New SVL/CSA-64
Parallel Interceptor

BNSF Rail

SENECA RD

New Hesperia
Parallel Interceptor

PALMDALE RD

Spring
Valley
Lake

YUCCA LOMA RD

New Hesperia
Parallel Interceptor

APPLE VALLEY RD

NAVAJO RD

BEAR VALLEY RD

Mojave
River

MAPLE ST

SANTA FE AVE

HESPERIA RD

NEW
HESPERIA
WRP

City of
Hesperia

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Interceptor Capacity Analysis
Fig 6-1

- Victorville Double Barrel
- Hesperia North Interceptor
- Hesperia South Interceptor
- Lower Narrows to Double Barrel Interceptor
- Upper Narrows to Lower Narrows Interceptor
- North Apple Valley Interceptor
- South Apple Valley Interceptor
- SVL / CSA-64 Interceptor
- N/A
- New Hesperia Parallel Interceptor
- New SVL/CSA 64 Parallel Interceptor
- New Santa Fe Bypass Relief Sewer
- City Boundaries

RBF CONSULTING GIS

N

0 0.5 1
Miles

6.1.2 Wet Weather Flow Capacity Criteria

No wet weather flow criteria have been established by VVWRA. For this analysis, it was assumed that flow under storm conditions could backup to approximately half way up manholes and no higher than within five feet of finished grade.

6.2 FLOW LOADING ASSIGNMENT

The Year 2008 was used to calibrate the Interceptor Model, as described in Section 4 of this SMP. For the capacity analysis, the Existing Capacity Scenario (Item 1 above) uses current dry weather flow to date in 2009 as the baseline. Weekend flow patterns were used to test against the VVWRA capacity criteria, as they are slightly higher than weekday patterns.

For the remainder of scenarios described above, overall VVWRA Service Area Flow was increased per the estimate in the most recent VVWRA Service Area Flow Projection. The allocation of the future flow to Model loading manholes was estimated using the projections in member agency master plans, as described below.

6.2.1 Existing Average Dry Weather Flow Assignment

Existing Interceptor flows were estimated as follows:

1. The flow assignment methodology described in Section 4 was used for percent allocation to each loading manhole.
2. Average dry weather flow to date in 2009 was used as the overall Service Area baseline.
3. The average flow to date in 2009 was augmented to reflect weekend flow patterns.

Table 6-2 shows the resultant existing average dry weather flow estimate for each member agency that discharges to the Interceptor.

Table 6-2
Existing (2009) Average Dry Weather Flows

Interceptor ID	Flow, mgd
Apple Valley	*1.81*
Hesperia	*1.78*
Victorville	*7.87*
Spring Valley Lake/CSA-64	*0.82*
SCLA 2	0.001
SCLA 1	0.17
Oro Grande	0.09
Total Service Area Flow, mgd	**12.55**

The estimate of existing dry weather flow from each member agency was proportioned to the loading manholes in the Model as shown in Table 6-3. The proportioning is based on the 2008 flow data, as described in Section 4.

Table 6-3
Existing ADWF Proportioning

Apple Valley Flow	Current ADWF Split
South Apple Valley Interceptor	99.8%
A-MH4	*6.9%*
A-MH9	*8.5%*
A-MH11	*21.3%*
A-MH24	*9.6%*
A-MH45	*14.9%*
A-MH63	*24.5%*
A-MH70	*14.4%*

Table 6-3 (continued)
Existing ADWF Proportioning

Apple Valley Flow	Current ADWF Split
North Apple Valley Interceptor	0.2%
Victorville	**Current ADWF Split**
VSD 1	6.7%
VSD 2	26.2%
VSD 3	37.8%
VSD 4	16.1%
VSD 5	0.6%
NAV	0.0%
VSD 6	10.3%
SCLA	**Current ADWF Split**
SCLA 1	99.4%
SCLA 2	0.6%
Hesperia	**Current ADWF Split**
Hercules	18.7%
Lemon	60.3%
Bear Valley Road	21.1%

6.2.2 Future Average Dry Weather Flow Assignment

An estimate was made of future dry weather flow in the Service Area. Future dry weather flow was proportioned to each of the Model loading manholes. Six sources were used to both estimate and proportion future dry weather flow in the VVWRA Service Area:

1. VVWRA has commissioned periodic updates of future flow projections in its Service Area. The most recent update was completed in April 2009. Table 6-4 shows the flow projections to the Year 2021, proportioned yearly to each Member Agency. Figure 6-2 shows the future ADWF estimate graphically.

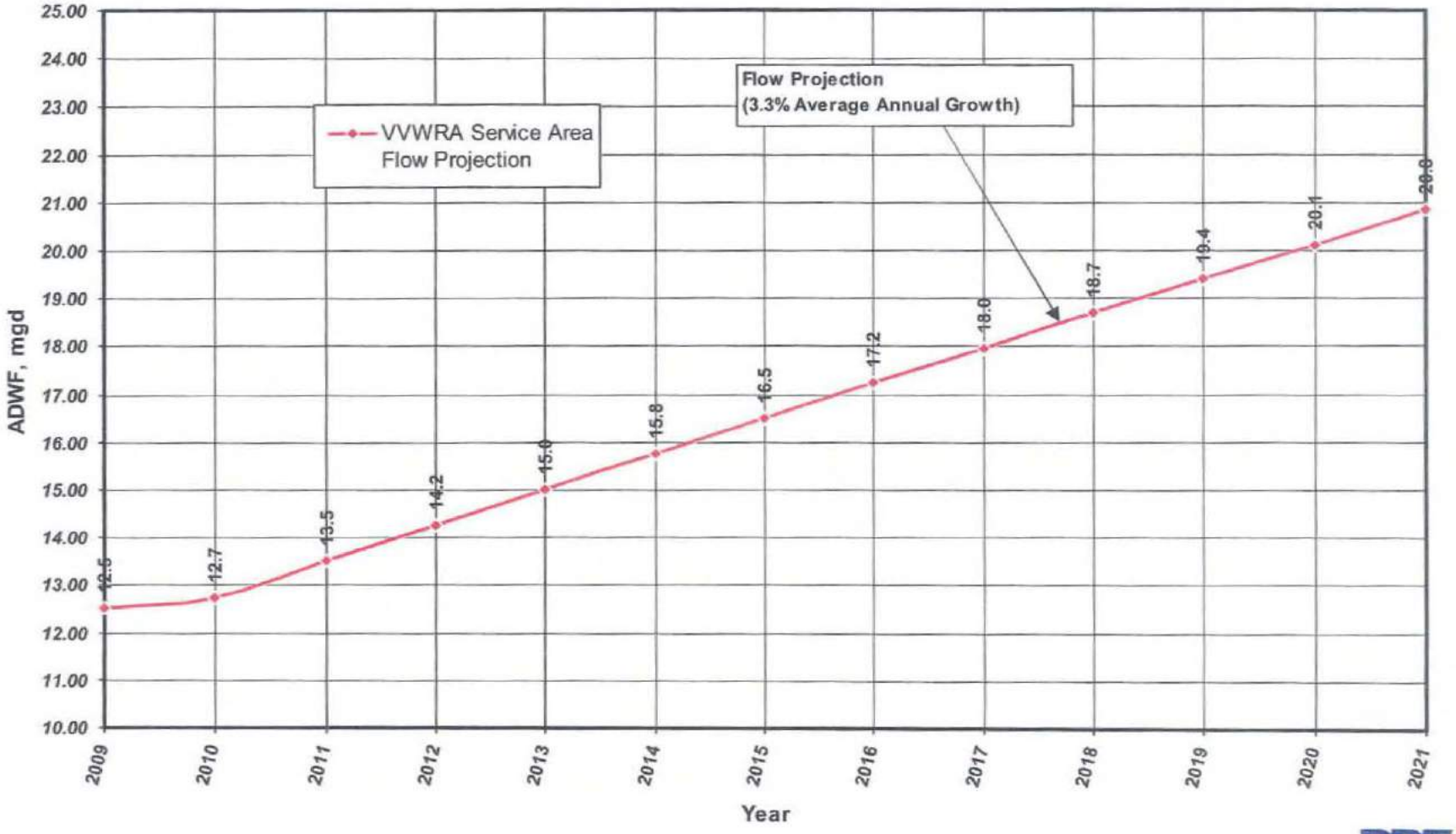
   The April 2009 flow projection study incorporated the following elements to provide an estimate of future sewage flow growth:

Table 6-4 - VVWRA Flow Projection All units in mgd

Year	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021
Total Service Area Flow, ADWF	**12.5**	**12.7**	**13.5**	**14.2**	**15.0**	**15.8**	**16.5**	**17.2**	**18.0**	**18.7**	**19.4**	**20.1**	**20.8**
Hesperia Flow, mgd	1.78	1.87	2.07	2.28	2.48	2.68	2.88	3.08	3.28	3.48	3.68	3.88	4.08
Apple Valley, mgd	1.81	1.84	1.92	1.99	2.07	2.14	2.22	2.30	2.37	2.45	2.52	2.60	2.68
Victorville, mgd	7.87	7.91	8.33	8.75	9.18	9.60	10.02	10.43	10.85	11.27	11.69	12.11	12.52
SCLA 2, mgd	0.001	0.003	0.004	0.006	0.008	0.009	0.011	0.012	0.013	0.015	0.016	0.017	0.019
SCLA 1, mgd	0.17	0.22	0.25	0.28	0.31	0.34	0.37	0.39	0.42	0.44	0.47	0.49	0.52
Oro Grande, mgd	0.06	0.06	0.06	0.06	0.06	0.06	0.06	0.06	0.06	0.06	0.06	0.06	0.06
Spring Valley Lake/CSA-64, mgd	0.82	0.84	0.86	0.88	0.90	0.92	0.94	0.96	0.96	0.96	0.96	0.96	0.96

ADWF = Average Dry Weather Flow

FIGURE 6-2
VVWRA - Service Area Flow Projection



a. Current economic activity in the Service Area to provide insight into potential short term growth patterns. This included analysis of building permits, new sewer connections and housing data.

b. Review of historical influent flow meter records compared to US census bureau population statistics for refinement of generation factors.

c. Historical growth rates (20+ years) for other similar high growth Southern California communities for comparison purposes.

d. Current development planning activity for each Member Agency for planned Single Family Residential, Multi-Family Residential and Commercial/Industrial projects for longer term growth projections.

2. The City of Hesperia adopted a Sewer Master Plan in 2007. The Hesperia Sewer Master Plan provided a thorough examination of future development within the City that will drain to the existing sewers. This data was used to proportion future flow increases over the three Hesperia loading points as growth occurs in the City:

   a. Hercules St @ I Ave -15%
   b. Lemon St @ I Ave - 29%
   c. Bear Valley Rd - 56%

3. The City of Victorville adopted a Sewer Master Plan in 2008. The master plan proportioned future flow to the VVWRA load points as shown below:

   a. VSD-1 – 4.3%
   b. VSD-2 – 4.0%
   c. VSD-3 – 14.8%
   d. VSD-4 - 29.8%
   e. VSD-5 – 6.4%

f. North Apple Valley Sewer – 34.1%

g. VSD-6 – 6.7%

The allocation of flow to the VVWRA Interceptor, from Victorville, would be impacted by the City's proposed Wastewater Treatment Facility at SCLA. The SCLA treatment plant would divert up to 2 mgd (ADWF) flow from the VVWRA Interceptor at Loading Manholes VSD-3 and VSD-4. VVWRA Interceptor capacity impacts from the proposed flow diversion will be discussed later in this Section.

4. The Town of Apple Valley adopted a sewer master plan in 1993. This master plan estimated ultimate future flows within the Town by local assessment districts. Using this information a flow split was derived to proportion future flow to the South Apple Valley and North Apple Valley Interceptors: 68% to the North Apple Valley Trunk; and 32% to the South Apple Valley Trunk. For flow influent to the South Apple Valley Trunk, the following assignment to Model load manholes was assumed based on current flow conditions gathered during the March 2008 flow monitoring for this Sewer Master Plan.

   a. SAV Manhole 4 – 6.9%
   b. SAV Manhole 9 – 8.5%
   c. SAV Manhole 11 – 21.3%
   d. SAV Manhole 24 – 9.6%
   e. SAV Manhole 45 – 14.9%
   f. SAV Manhole 63 – 24.5%
   g. SAV Manhole 70 – 14.4%

5. Spring Valley Lake has a limited number of lots remaining for development. A review of San Bernardino County records showed that approximately 460 lots are available. Build out on the remaining lots was assumed at 80 per year, near

the average from 2000 through 2007; yielding an estimated flow growth of 20,000 gpd/year.

6. SCLA, located in the City of Victorville, developed a master utilities plan. The plan estimated future flows from the industrial development over the life of the project and allotted flows as tributary to either the SCLA 1 or SCLA 2 connections to the VVWRA Interceptor. These flow estimates were used to supplement the flow projection study estimates for loading the SCLA manholes in the Model for future growth.

6.2.3 Wet Weather Flow Assignment

Two data sources were used to estimate wet weather flow contributions to the Interceptor:

1. The RWWRF has an influent emergency storage system that is used during major rain storms and an influent flow meter. The data from these sources were analyzed to approximate total inflow and infiltration into the Interceptor.
2. Flow meters were placed for a storm in 2008 in the City of Hesperia and Town of Apple Valley.

A major storm in on November 30 through December 1, 2007 dropped approximately 2 inches of rain over 12 hours. Based on the *San Bernardino County Hydrology Manual* the return frequency for this size of storm is approximately 10 years. The additional flow recorded into the RWWRF influent flow meter along with the volume of flow into the emergency storage system during this storm was reviewed against normal dry weather flow. The additional flow was calculated at 4.5 million gallons due to inflow and infiltration (I&I) in the system. The data was compared to the flow monitored storm in 2008 for comparison. The analyses of these two sources yielded the assignment of wet weather flow for each section of the Interceptor as shown in Table 6-5.

Table 6-5
Inflow and Infiltration Calculation by Interceptor Reach

Member Agency	ADWF, mgd (2009)	% of Total Plant Flow	January 08 Storm I&I Estimate (gpd)	I&I / ADWF	Assumed % for Nov. 2007 Storm	Estimated I &I Contribution, mgd	Estimated I &I Contribution, cfs
Hesperia	1.78	14.4%	283,000	15.9%	17.0%	0.76	1.17
South Apple Valley	1.81	14.6%	200,000	11.0%	10.0%	0.45	0.69
North Apple Valley	0.004	0.0%	NA	NA	3.0%	0.13	0.21
Spring Valley Lake	0.82	6.6%	NA	NA	20.0%	0.89	1.38
Victorville	8.04	64.8%	NA	NA	50.0%	2.23	3.46
					Totals	4.46	6.91

6.3 EXISTING INTERCEPTOR CAPACITY SCENARIO

The existing VVWRA Interceptor was analyzed using the calibrated Interceptor Model and the VVWRA Interceptor capacity criteria described above to estimate its dry weather flow capacity. The Interceptor was broken down into the following principal segments:

1. Hesperia South Interceptor from Hercules to Bear Valley Road.
2. Hesperia North Interceptor from Bear Valley Road to the Spring Valley Lake/CSA-64 connection.
3. From the Spring Valley Lake/CSA-64 connection to the Upper Narrows.
4. The South Apple Valley Interceptor.
5. The North Apple Valley Interceptor.
6. Victorville Interceptor from the Upper Narrows to the Lower Narrows.
7. The Lower Narrows to the Double Barrel section.
8. The double barrel section to the RWWRF.

Flow was assigned to each principal segment's loading manholes as described above. If the segment showed adequate capacity at existing flow, then the flow was incrementally increased until the VVWRA capacity criteria were exceeded. The limiting dry weather capacity was defined as the average flow out of the downstream end of the principal segment.

Once the limiting dry weather flow was determined, the scenario was tested with the estimated wet weather contribution. If the resultant hydraulic grade line (HGL) in the peak hour exceeded the wet weather capacity criterion, then the dry weather base was reduced until the wet weather violation was eliminated, and the segment became wet weather limited, but reported in dry weather terms. Table 6-6 gives a summary of the results of this analysis, followed by a detailed description of each Interceptor segment analyzed. Figure 6-3 shows these results graphically.

VVWRA
RWWRF

SCLA

17

10

6.3

9.0

9.0

1.8

5.2

2.2

1.6

HIST 66

15

18

AIR EXPRESSWAY

City of
Victorville

Town of
Apple Valley

City of
Hesperia

CORWIN RD

DALE EVANS PKWY

NAVAJO RD

ZUNI RD

THUNDER BIRD RD

APPLE VALLEY RD

MOJAVE DR

BNSF Rail

SENECA RD

PALMDALE RD

Spring
Valley
Lake

YUCCA LOMA RD

HESPERIA RD

BEAR VALLEY RD

SANTA FE AVE

Mojave
River

DEEP CREEK RD

Average Dry Weather Flow Projection

14.3 MGD - 2012

16.5 MGD - 2015

20.8 MGD - 2021

Existing System Capacity Fig 6-3

Model Indicates Pipes Over Capacity:

- Within 3 Years (2012 - 14.3 MGD)
- Within 3 to 6 Years (2015 - 16.5 MGD)
- Within 6 to 12 Years (2021 - 20.8 MGD)
- Greater Than 12 Years (2021+ - 20.8 MGD)

City Boundaries

N

0 1 2

Miles

1.0 Existing Flow Capacity, MGD

Table 6-6
Existing Interceptor Capacity Results

Interceptor Reach	From Manhole	To Manhole	Existing ADWF, mgd	Max ADWF Capacity, mgd	Projected Flow Year for Max Capacity	Wet or Dry Weather Limited[2]
Hesperia South (Hercules to BVR)	H-87	H-43	1.35	1.65	2012	Dry
Hesperia North (BVR to SVL/CSA-64)	H-43	H-1	1.78	2.20	2012	Wet
SVL/CSA-64[1]	SVL-26	SVL-3	4.79	5.20	2012	Wet
South Apple Valley[3]	SAV-70	SAV-2	1.81	1.81	2009	Dry
North Apple Valley	NAV-99	NAV-1	0.004	6.25	> 2021	Dry
Victorville, Upper Narrows to Lower Narrows	VV 5-8	VV 3-17	8.02	8.80	2012	Dry
Victorville, Lower Narrows to Double Barrel	VV 3-17	VV-2-26/ RS-45	8.02	10.00	2015	Dry
Victorville, Double Barrel to RWWRF	VV 2-26/ RS-45	RWWRF	12.54	17.00	2016	Dry

[1] Includes Hesperia, SVL and VSD-2 flows
[2] Dry weather capacity criteria listed in Table 4-1, wet weather criteria described in Section 4.2.2
[3] South Apple Valley exhibits two pipes influenced by the Riverside 2 PS causing the over capacity condition

6.3.1 Hesperia South Interceptor – From Hercules St (Hesperia Manhole #87) to Bear Valley Rd (Hesperia Manhole #43)

This segment has two loading points along the Interceptor:

1. Hercules St at I Ave
2. Lemon St at I Ave

This portion of the Interceptor was tested under current conditions, at an ADWF of approximately 1.40 mgd (South Hesperia flow only), and did not violate the adopted design criteria. Flow was increased proportionally, as previously described, until pipes

were over capacity. The capacity of this line was determined to be a maximum of 1.65 mgd.

When average dry weather flow exceeded 1.65 mgd, several pipes in this reach exceeded VVWRA capacity criteria. One particular area that exceeded capacity criteria is near the overflow that occurred in 2007 at manholes 67 and 68. Figure 6-4 shows the flow depth profile in this area of the Interceptor.

Other areas in this segment that exceeded VVWRA capacity criteria were at Manholes H-45 and H-46 near Bear Valley Rd at 1.65 mgd. Flow in this portion of the Hesperia system is anticipated to reach 1.65 mgd by 2013. Tabulated results for the Model runs are included in Appendix C.

VVWRA had an overflow at Manholes #67 during a significant rainstorm in November/December 2007. The calibrated model, ran under wet weather conditions, did not overflow along this section under both current flow and the increased ADWF of 1.65 mgd. During the condition assessment and survey conducted in late December 2007 and early January 2008, Manhole #54, located downstream of the overflow manhole, was discovered to have significant blockage due to what appeared to be storm water infiltration debris. This is the likely source of the upstream overflow as a blockage at this point would cause a backup in the upstream pipes, and would first overflow at Manholes #67, which has the lowest rim elevation in this section. The calibrated model was run simulating a significant constriction at MH #54. The profile of this simulation is shown in Figure 6-5.

FIGURE 6-4
HESPERIA SOUTH INTERCEPTOR
2012 DRY WEATHER FLOW – CAPACITY ANALYSIS
OVER CAPACITY PIPES BETWEEN MANHOLES 68 TO 73

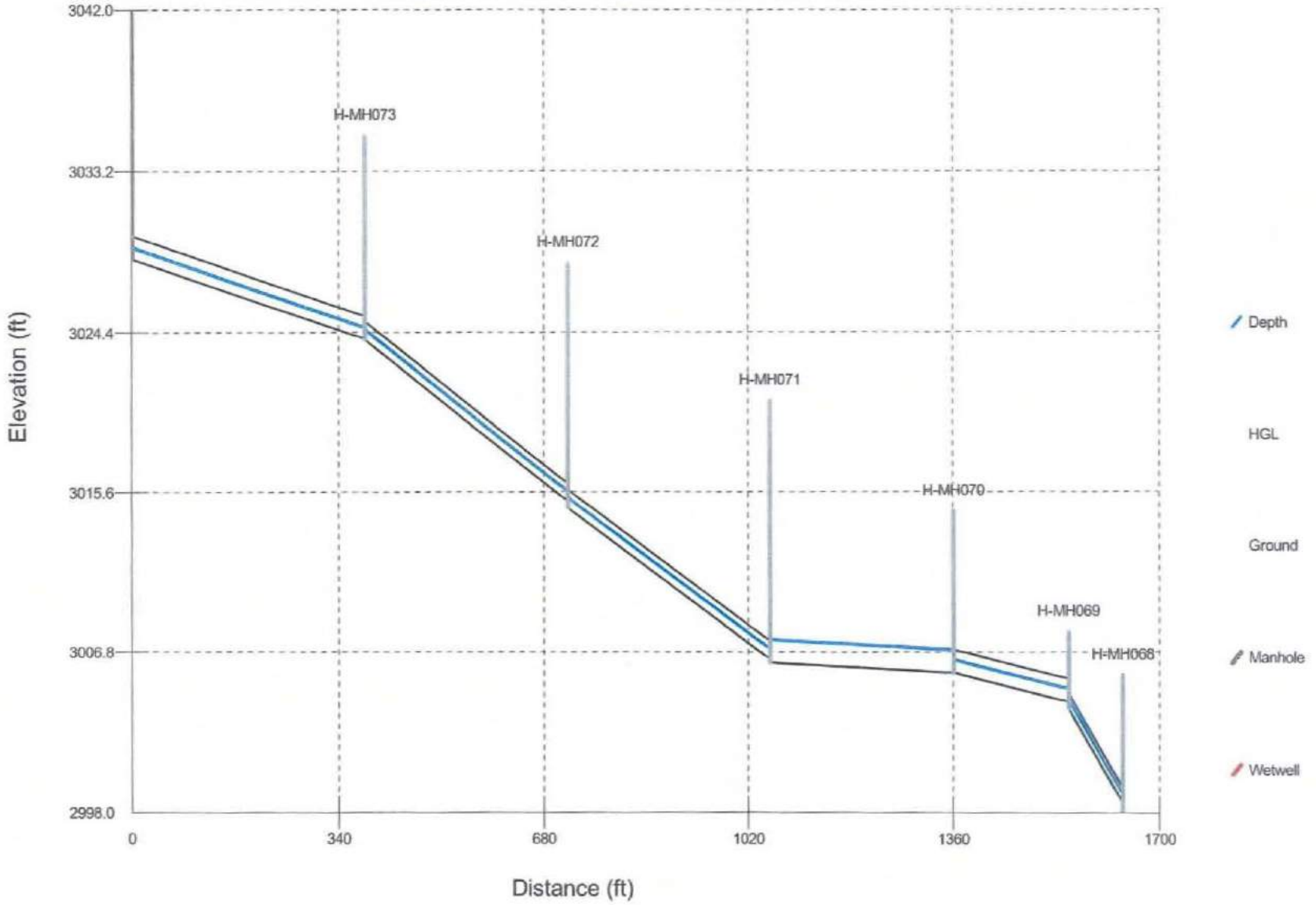
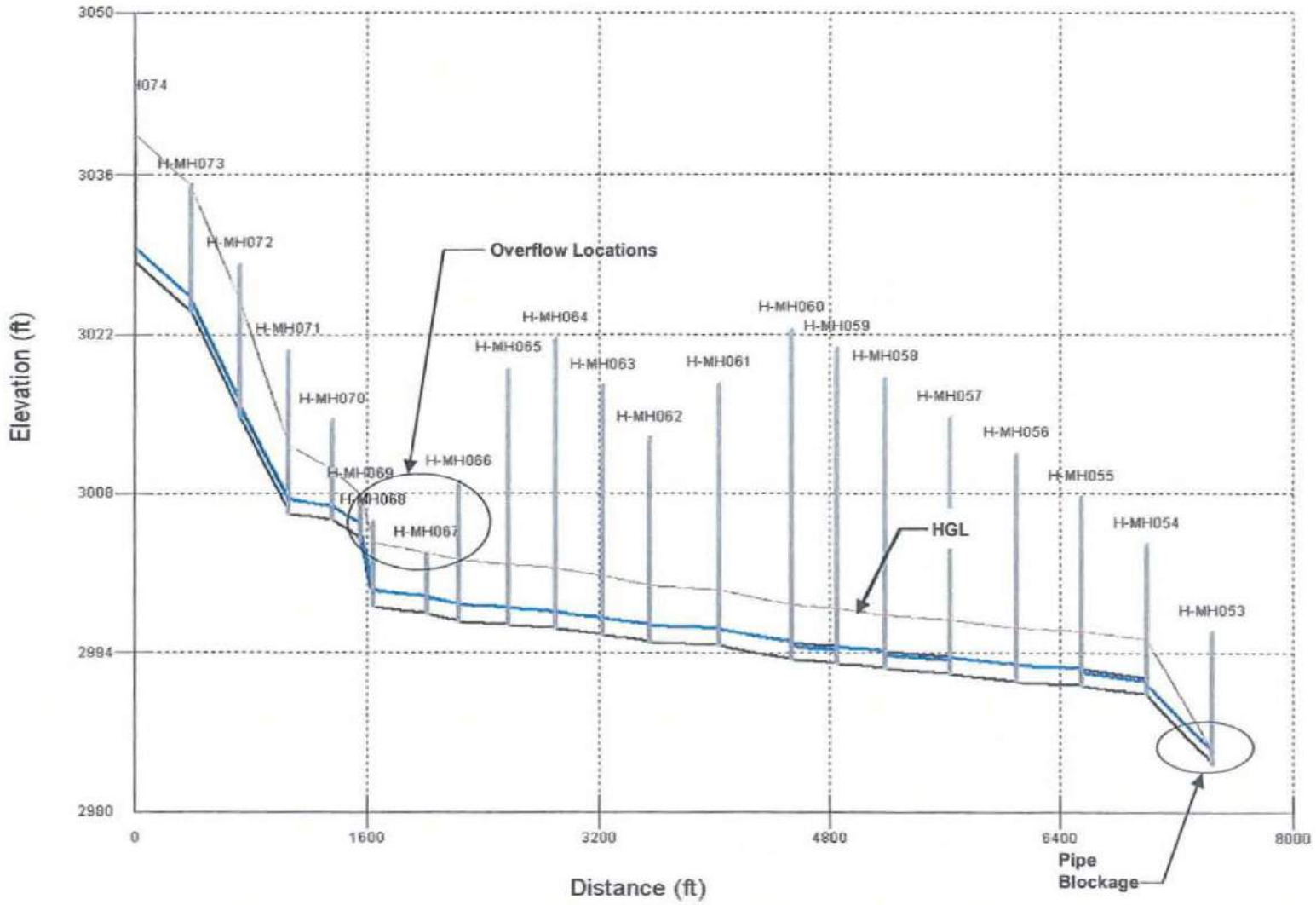


Figure 6-5

Model Simulated Blockage at Hesperia Manhole #54



6.3.2 Hesperia North - Bear Valley Road (Hesperia Manhole #43) to Spring Valley Lake Connection (Hesperia Manhole #1)

This segment has one loading point in addition to the flow from the South Hesperia segment: Bear Valley Road.

This portion of the Hesperia Interceptor was tested under current flows, an ADWF of 1.78 mgd, and did not violate the capacity criteria. Flow was increased proportionally under dry and wet weather conditions, as previously described, until flow depths exceeded capacity criteria. The system was determined to be over capacity at the section of the Interceptor nearest the SVL/CSA-64 connection (Hesperia Manholes #1 to #3) under wet weather conditions. The wet weather capacity criterion was violated with an ADWF of 2.28 mgd in Hesperia, corresponding to the year 2012 in the flow projection. Figure 6-6 depicts the flow depth profile estimated in the Model in this area under wet weather flow loadings. Tabulated results for the Model runs are included in Appendix C.

During the field condition assessment and survey two locations, Manholes #10 and #13, were found to have flow surcharged up in the manholes. This was likely caused by pipe diameter reductions and increases at various locations along the entire reach of the Hesperia Interceptor. Figure 6-7 shows the Interceptor, color coded by pipe diameter.

Pipe Diameter Reduction Diagram

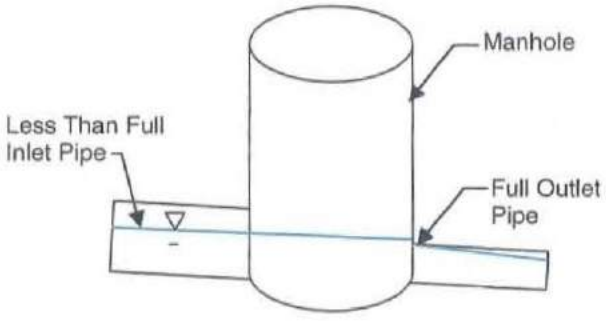


FIGURE 6-6
HESPERIA NORTH
2012 WET WEATHER FLOW – CAPACITY ANALYSIS
OVER CAPACITY PIPES BETWEEN MH #01 TO MH#04

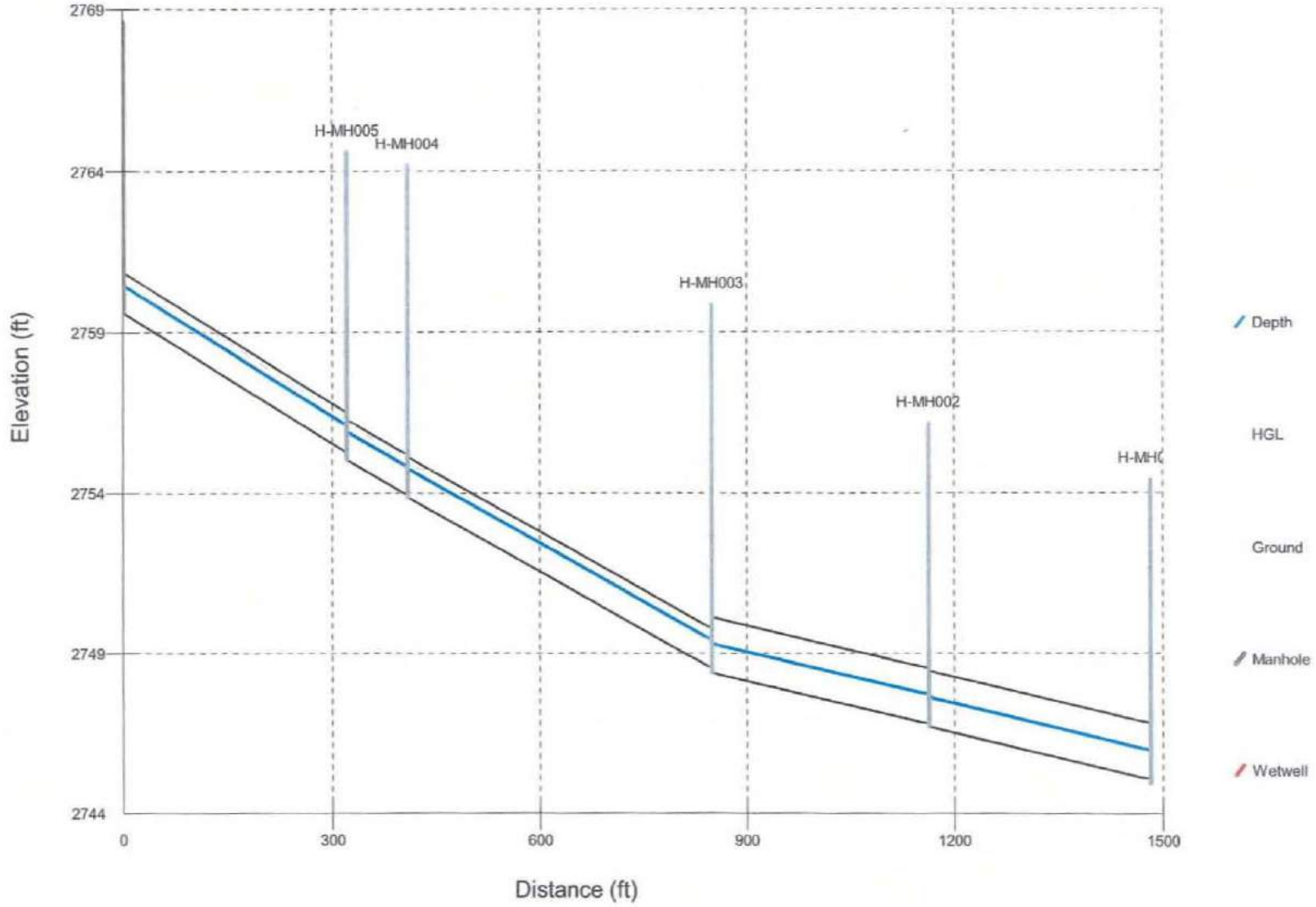


Figure 6-7 HESPERIA INTERCEPTOR PIPE DIAMETER TRANSITIONS

LEGEND

- MANHOLE
- MODEL LOADING MANHOLE
- CITY BOUNDARIES
- MAJOR ROADS
- HESPERIA SEWER

INTERCEPTOR PIPELINE DIAMETER

- 10"
- 12"
- 15"
- 18"
- 21"
- 24"
- 27"
- 36"

Miles

SOURCE: EAGLE AERIAL IMAGERY 2007, COUNTY OF SAN BERNARDINO, CARRILLO ENGINEERS

This design approach is intended to take advantage of additional flow capacity provided by a steeper slope by reducing the pipe diameter and therefore reducing construction costs. However, Pipe decreases create an undesirable flow condition at the transition manhole. If the designer wishes to match inverts of the upstream and downstream pipes, as is the case in Hesperia and is shown below, the larger pipeline can be flowing less than full, but will overload the smaller diameter line causing back up in the manhole and increasing the chances for debris to collect and clog the line.

6.3.3 Spring Valley Lake/CSA-64 to Upper Narrows Segment

This segment has two loading points:

1. Spring Valley Lake
2. VSD-2

Flow monitoring showed the existing dry weather flow of 0.90 mgd at Spring Valley Lake manhole 26, the discharge from the Spring Valley Lake community. The current VSD-2 flow, which discharges into the SVL/CSA 64 Interceptor, was estimated at 2.11 mgd, ADWF. Future flow growth was based on a 20,000 gpd increase per year estimated from the Spring Valley Lake community. VSD-2 future flow was proportioned as discussed earlier in this section for the City of Victorville, based on the City's 2008 Sewer Master Plan.

The wet weather flow analysis estimated the contribution of the SVL/CSA-64 pipeline at 20% of total infiltration and inflow in the system. A larger portion of the wet weather contribution was allotted to Spring Valley Lake due to field conditions observed during the condition assessment and survey. Along stretches of this line nearest to the Spring Valley Lake community root intrusion in the manholes and pipelines was discovered indicating potential access for infiltration. Along the entire stretch of this line several of the manhole rims are below grade in areas that are routinely flood irrigated and subject to ponding during storms. This condition serves as an opportunity for inflow into the system. Recommendations to alleviate these conditions are included in the recommendations in Section 5 of this report.

The SVL/CSA-64 Interceptor was tested under current flow conditions and was found not to be overloaded, however, a moderate increases in ADWF, from 4.72 mgd (2009) to 5.30 mgd under both dry and wet weather conditions violated the capacity criteria in the Interceptor at 4 locations. The ADWF capacity was determined to be 5.2 mgd. Flows are estimated to approach this rate in 2012. A profile of the impacted pipe reach, from manholes #21 to 24 under wet weather 2012 flow loadings is shown in Figure 6-8. Tabulated results for the Model runs are included in Appendix C.

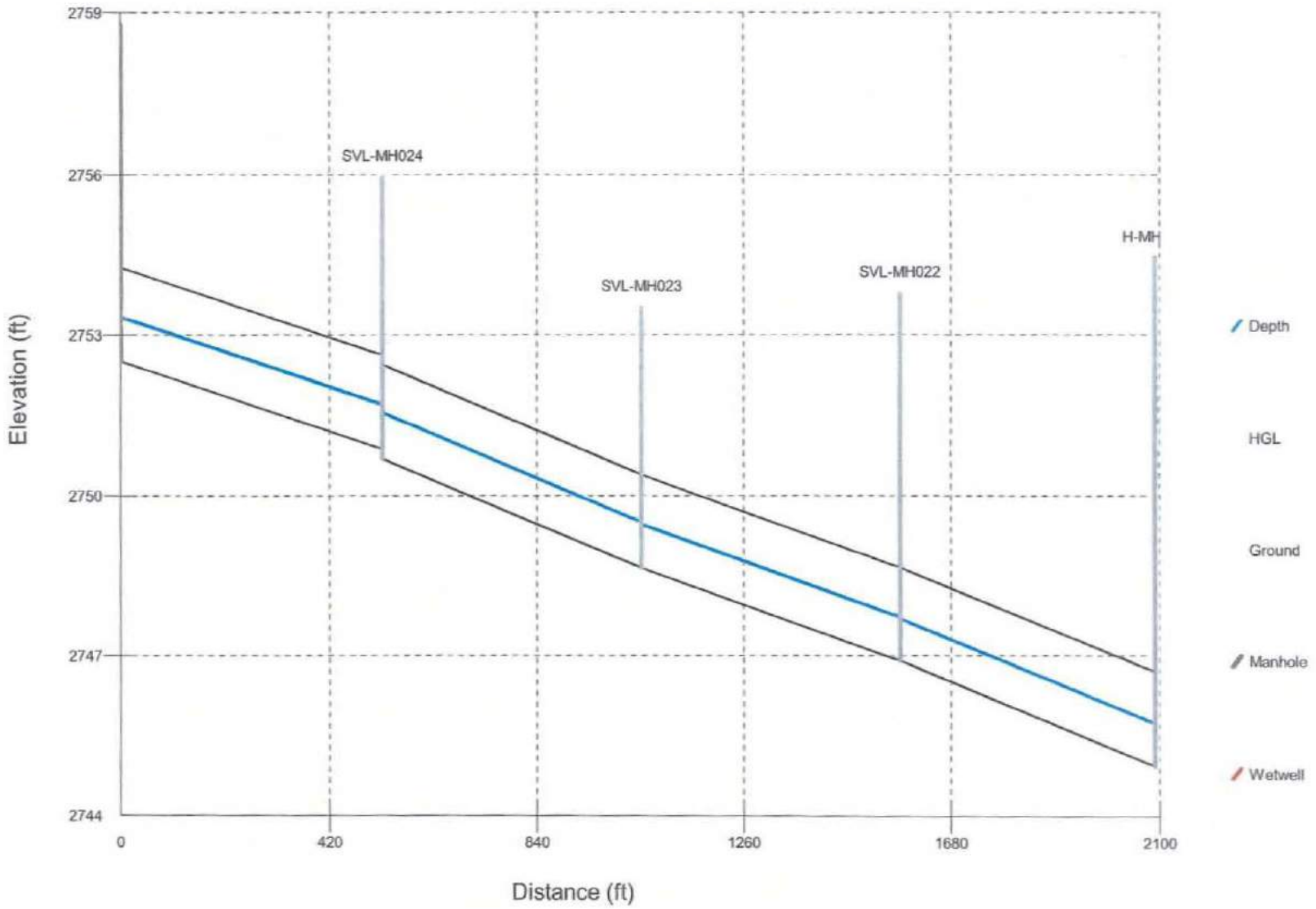
6.3.4 South Apple Valley (SAV) Interceptor

The South Apple Valley Interceptor was loaded at seven points:

1. SAV MH #70, the furthest upstream end of the SAV pipeline
2. SAV MH #63
3. SAV MH #45
4. SAV MH #24
5. SAV MH #11
6. SAV MH #9
7. SAV MH #4

From the investigation of the Riverside Pump Station flows, described in Section 4, an additional 3 ft^3/s constant rate load was placed at SAV MH #4 for model simulation.

FIGURE 6-8
SVL/CSA-64
2012 WET WEATHER FLOW – CAPACITY ANALYSIS
OVER CAPACITY PIPES BETWEEN MH #21 TO MH#24

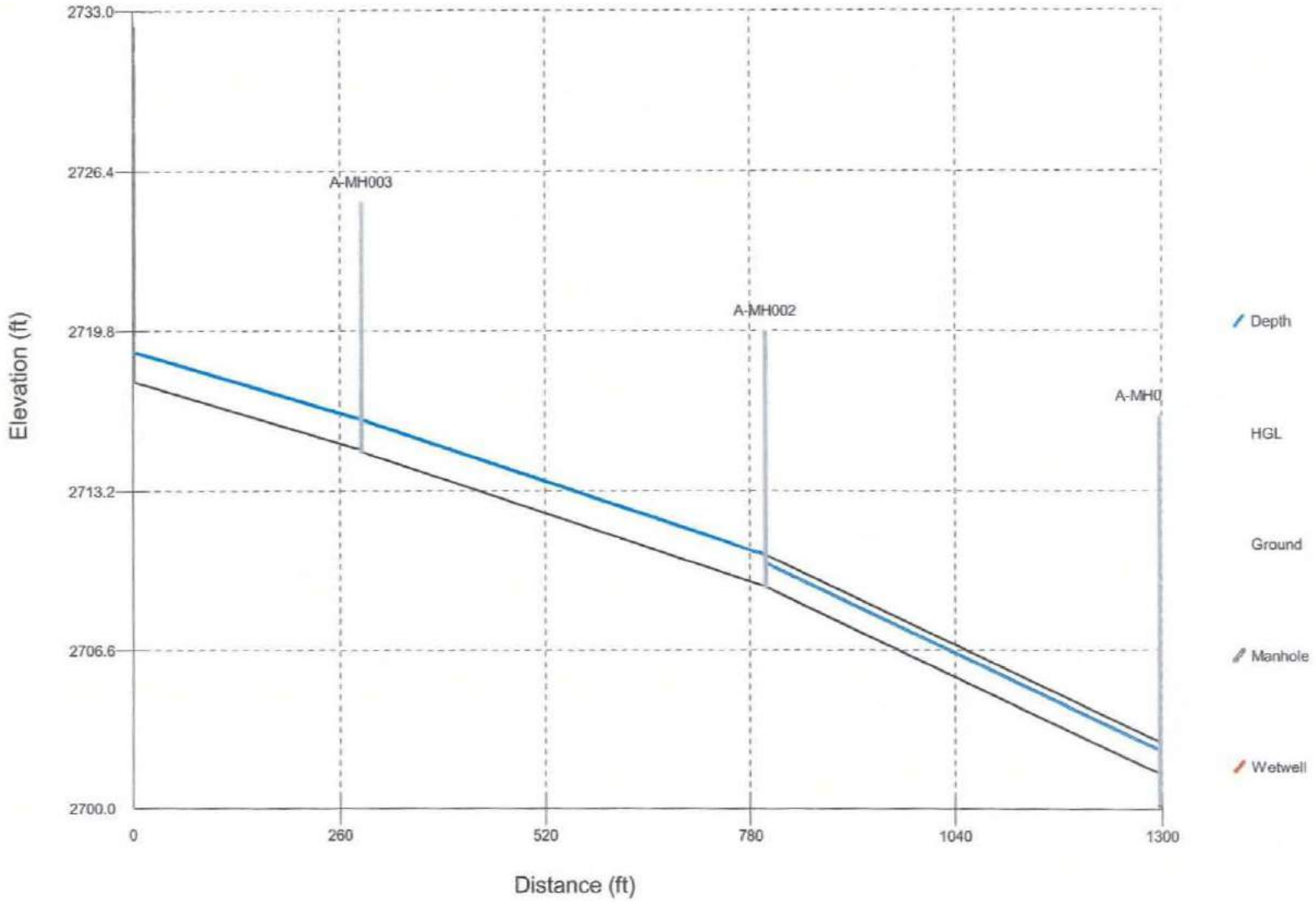


The model results indicate that under current ADWF conditions two (2) pipelines, between Manoles #2 and #4 are overloaded beyond VVWRA dry weather capacity criteria. A profile of the Model simulation is shown in Figure 6-9. The two overloaded pipes are immediately downstream of the Riverside Pump Station connection. This overloaded model simulation was corroborated during the flow monitoring efforts in January, 2008 as a surcharge event in SAV MH #3 was witnessed in the early afternoon on a weekday by the field crew. The flow rose in the manhole approximately 3 feet above top of pipe, and then subsided within a few minutes. This event prompted the analysis of the Riverside Pump Station as the characteristics of the surcharge point to the turning on and off of an additional pump(s) as the likely cause. Current ADWF capacity in the South Apple Valley Interceptor was determined to be 1.81 mgd because of this condition. Retrofit of this pump station to create a more steady flow discharge to the Interceptor could increase the ADWF capacity in the SAV line. A brief study should be conducted to evaluate potential upgrades to the pump station to accomplish that may include:

- Replacement of existing fixed speed drives (on-off) to variable frequency drives for the pumps to stabilize flow discharge
- Evaluation and upgrades to pump operation control strategy

The model was run for South Apple Valley assuming the flow from the Riverside Pump Stations #1 and #2 were upgraded to reduce the peak flows delivered to Manhole #4 to 1.5 ft^3/s. The model results indicated that 2 pipelines upstream of the connection (Pipe #8 and Pipe #9) are over capacity under 2012 ADWF with the upgrades. The revised capacity for the South Apple Valley Interceptor based on the Pump Station upgrades peak flow reduction assumptions described above is 2.2 mgd. Tabulated results for all model runs are included in Appendix C.

FIGURE 6-9
SOUTH APPLE VALLEY
2012 DRY WEATHER FLOW – CAPACITY ANALYSIS
OVER CAPACITY PIPES BETWEEN MH #2 AND #3



6.3.5 North Apple Valley (NAV) Interceptor

The North Apple Valley Interceptor was loaded at two points:

1. MH #99, at the furthest upstream end of the pipeline and
2. MH #51, located at the intersection of Stoddard Wells Rd at NAV MH #51

These two loading points were chosen as the logical locations for assessing the Interceptor capacity. The initial load was placed at the end of the line, to assess the entire pipeline, in particular the reach from MH #99 to MH #51, consisting of 15-inch and 18-inch diameter pipes. Downstream of MH #51 the pipe transitions from 18-Inch to 21-Inch and increases further to 24-inch at the downstream end. NAV MH #51 has two large connections making it a likely point for significant future flow growth.

The model indicated a flow capacity of 2.5 mgd ADWF in the upstream section and an additional 3.75 mgd capacity in the downstream section for a total ADWF capacity of 6.25 mgd. Flows beyond 6.25 mgd overloaded the pipeline under dry weather conditions. Wet weather was tested and did not exceed the capacity criteria.

6.3.6 Upper Narrows Segment to Lower Narrows

In addition to the Hesperia, SVL/CSA-64, South Apple Valley and North Apple Valley Interceptors, which are tributary to this Victorville Interceptor section, the Upper Narrows to Lower Narrows segment has three (3) connection points:

a. VSD-1
b. VSD-5
c. VSD-6

The model was loaded under the current service area ADWF of 12.5 mgd and the corresponding 7.9 mgd ADWF in this section, to assess capacity. The model indicated no pipes exceeding dry weather capacity criteria; however several pipes near the lower narrows were nearly 80% full during peak flows. This correlates well to what was field

measured during recent flow monitoring activities and the condition assessment. Flows were increased and the maximum capacity was determined to be 9.0 mgd, corresponding to the year 2012. Figure 6-10 shows the overloaded section of Interceptor between manhole 4-09 and 4-14. Additional pipes overloaded are near the Lower Narrows at manhole 3-17 and 3-18, shown in Figure 6-11. Tabulated results for all model runs are included in Appendix C.

6.3.7 Lower Narrows to Double Barrel Section

The Lower Narrows to The Double Barrel segment of the interceptor extends from VVWRA's Victorville Manhole 3-17 to Manhole 2-26. The reach includes the steel section through the Lower Narrows. This Interceptor was tested in the calibrated model under current ADWF conditions and did not violate dry or wet weather criteria.

Flows were increased with pipes exceeding capacity criteria under dry weather conditions at an ADWF in this pipeline of 10 mgd, a service area ADWF of 16.5 mgd. This corresponds to the projected flow in the year 2015. Figure 6-12 depicts the over capacity area near Manhole #3-03. Tabulated results for all model runs are included in Appendix C.

FIGURE 6-10
UPPER NARROWS TO LOWER NARROWS
2012 DRY WEATHER FLOW – CAPACITY ANALYSIS
OVER CAPACITY PIPES BETWEEN MH #4-09 AND #4-14

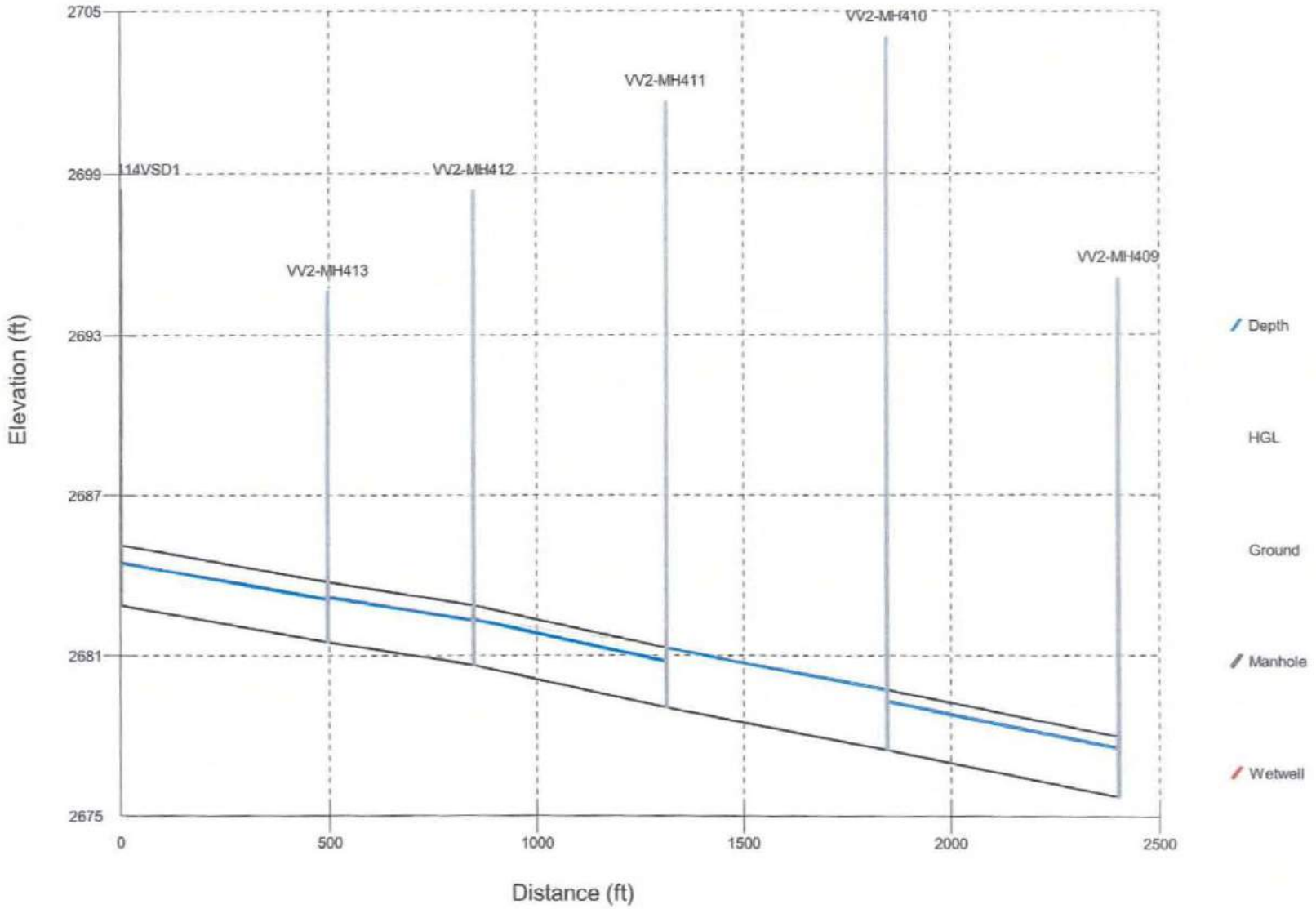


FIGURE 6-11
UPPER NARROWS TO LOWER NARROWS
2012 DRY WEATHER FLOW – CAPACITY ANALYSIS
OVER CAPACITY PIPES BETWEEN MH #3-17 AND #4-04

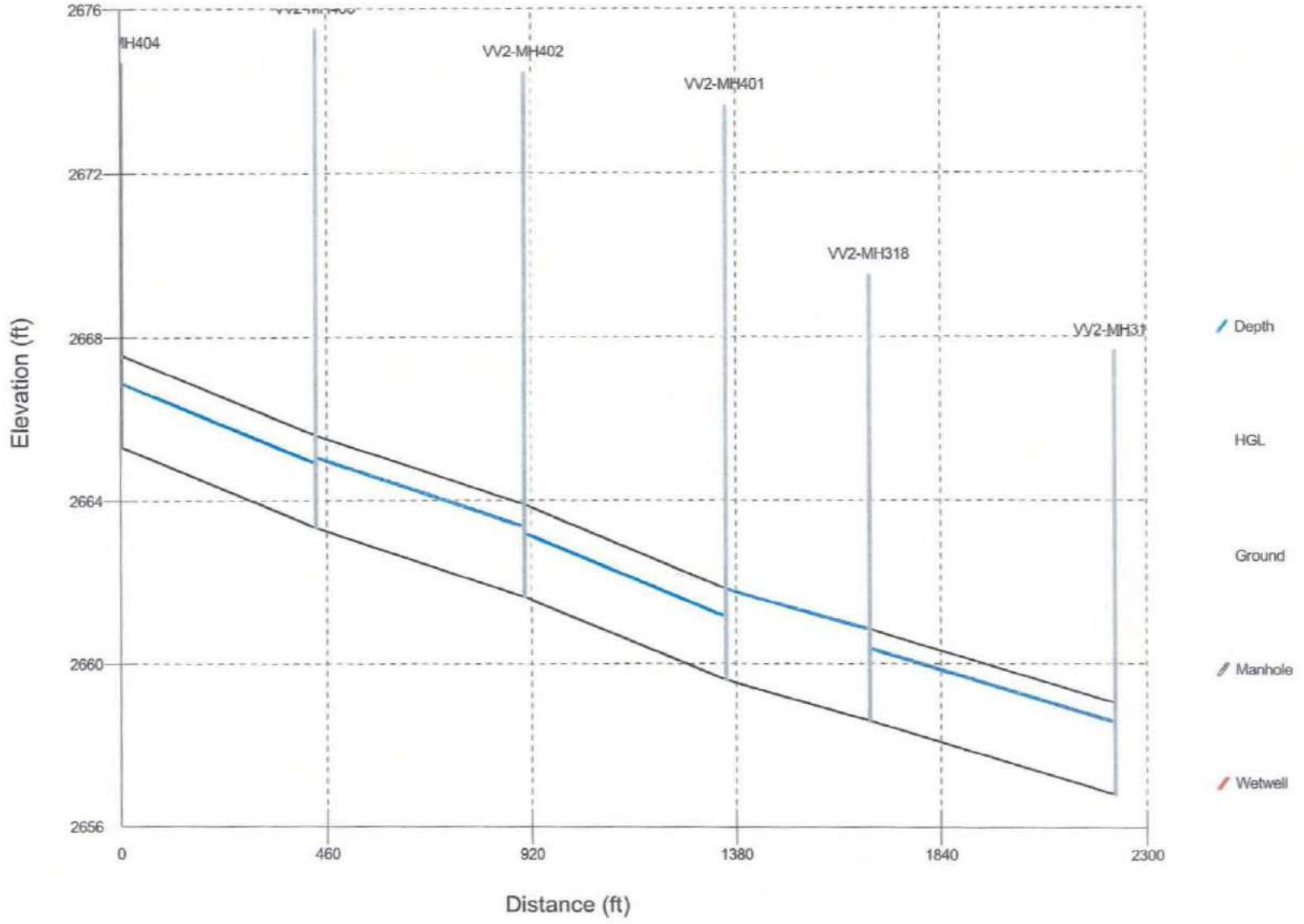
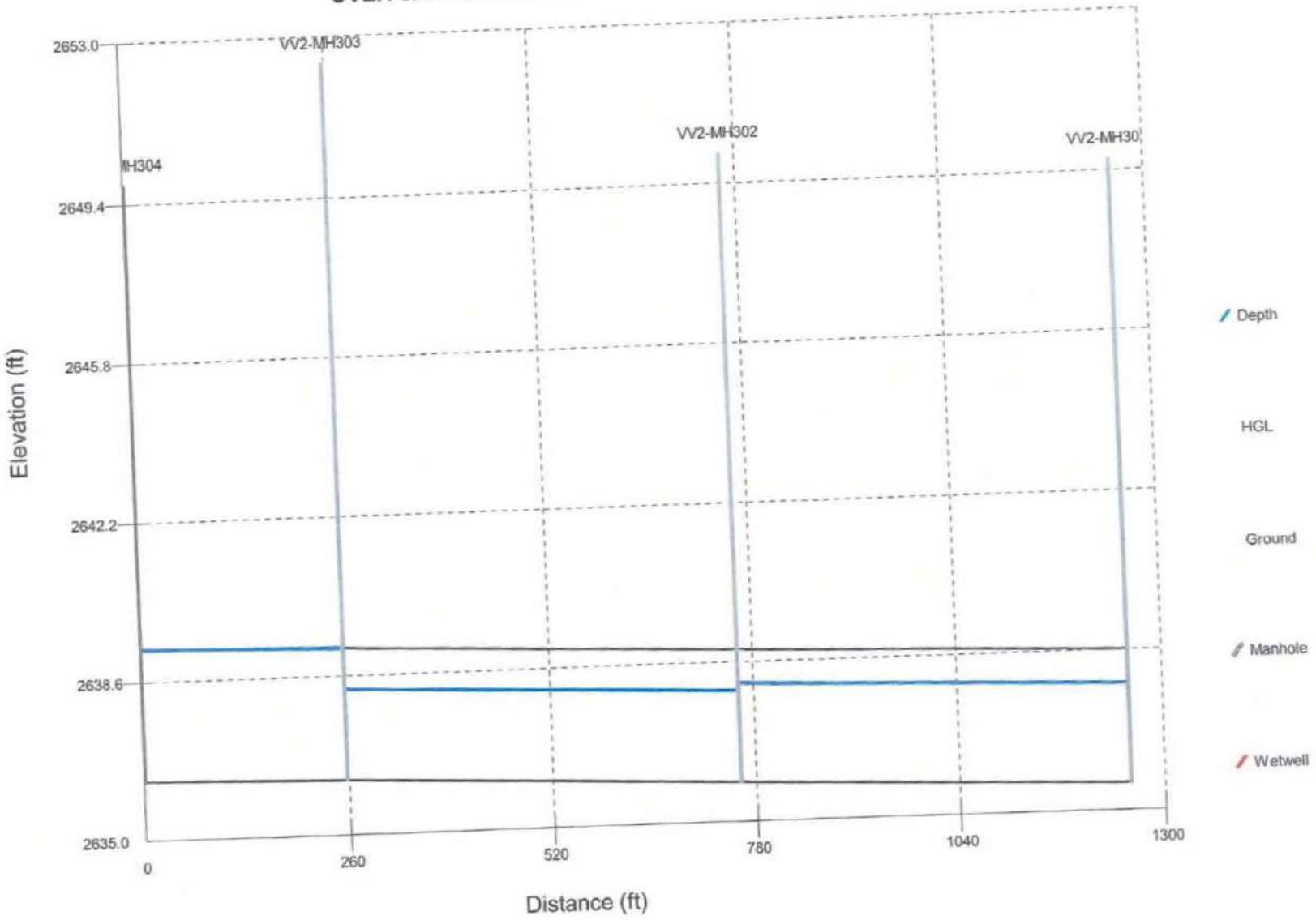


FIGURE 6-12
LOWER NARROWS TO DOUBLE BARREL
2015 DRY WEATHER FLOW – CAPACITY ANALYSIS
OVER CAPACITY PIPES BETWEEN MH #301 TO MH#304



6.3.8 Double Barrel to the RWWRF

In addition to the flows from all the main Interceptor lines in the VVWRA system, the Double Barrel Line has four connection points along its reach:

1. VSD-3
2. VSD-4
3. SCLA-1
4. SCLA-2

The double barrel line, which includes the original Victorville Schedules 1 and 2 Interceptors and the Victorville Schedules 1 and 2 Relief Sewers were tested extensively for available capacity in the 2007 *VVWRA Interceptor Facilities Plan Amendment*. The model loadings for the Facilities Plan Update were predicated on the fact that the planned subregional wastewater treatment facilities would divert nearly all the flow upstream of the Upper Narrows and from the NAV Interceptor away from the VVWRA Victorville Interceptors. It assumed that the majority of future flow would enter the VVWRA interceptor at VSD-4. The analysis as a part of this Sewer Master Plan took a broader look at the Interceptor system and, for this existing capacity analysis, assumed flows are distributed per the member agency master plan documents. Due to this, the model indicates slightly different results in the Double Barrel sections upstream of VSD-4 as more flow is tributary to upstream sections under these assumptions.

The model indicates, under current conditions, no overloaded pipes in the system. The flow was increased, as previously described, and concluded an ADWF capacity of 17 mgd in this Section, projected to occur in the year 2016. Flows above this exceeded dry weather capacity criteria. Figure 6-13 depicts the over capacity pipes in the Main Sewer (36") from Manholes 2-05 to 2-11. Figure 6-14 depicts the over capacity pipes in the Relief Sewer (42") from Manholes RS-23 to RS-28. Tabulated results for all model runs are included in Appendix C.

FIGURE 6-13
DOUBLE BARREL MAIN SEWER (36")
2018 DRY WEATHER FLOW – CAPACITY ANALYSIS
OVER CAPACITY PIPES BETWEEN MH #2-05 TO RS#2-11

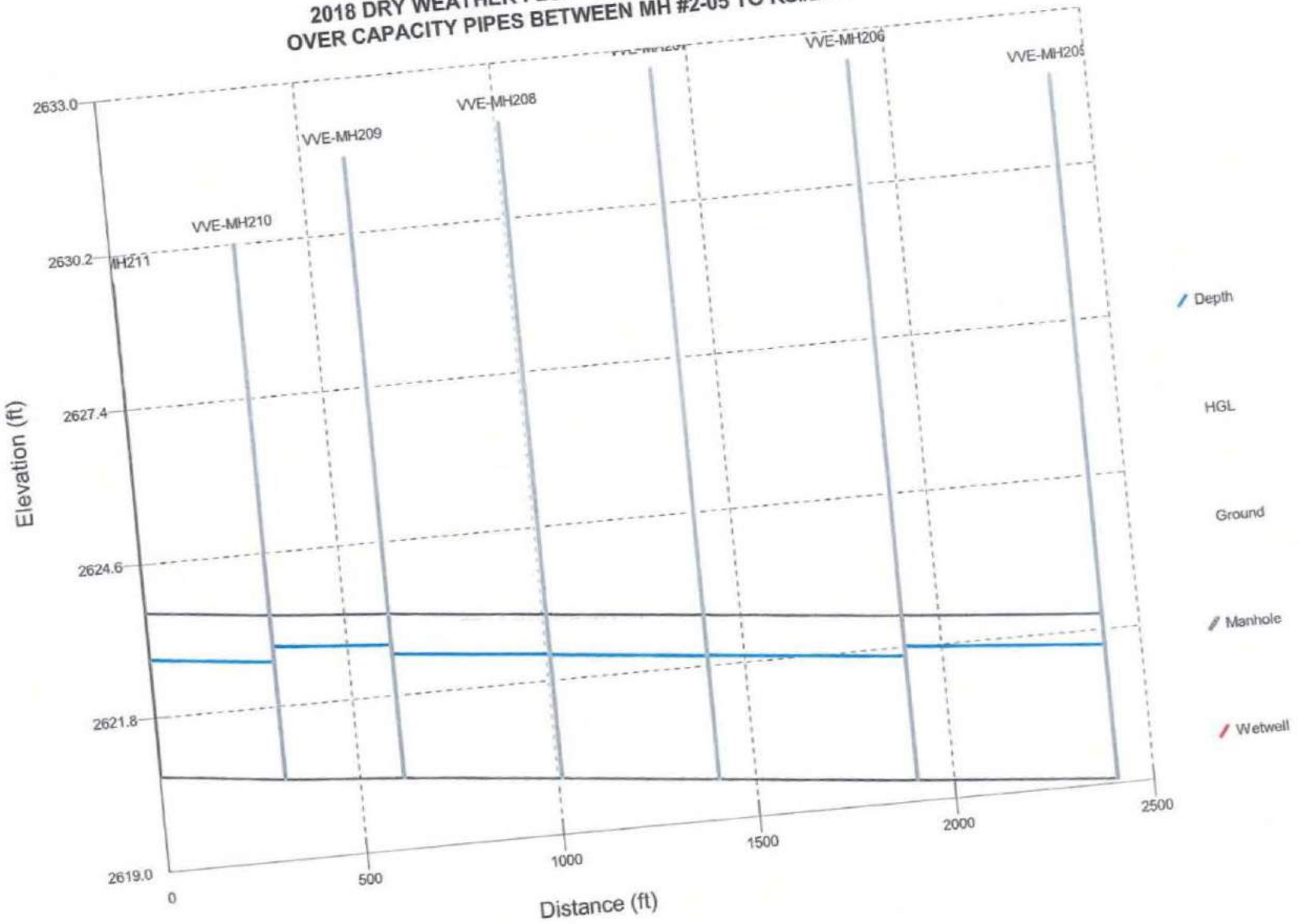
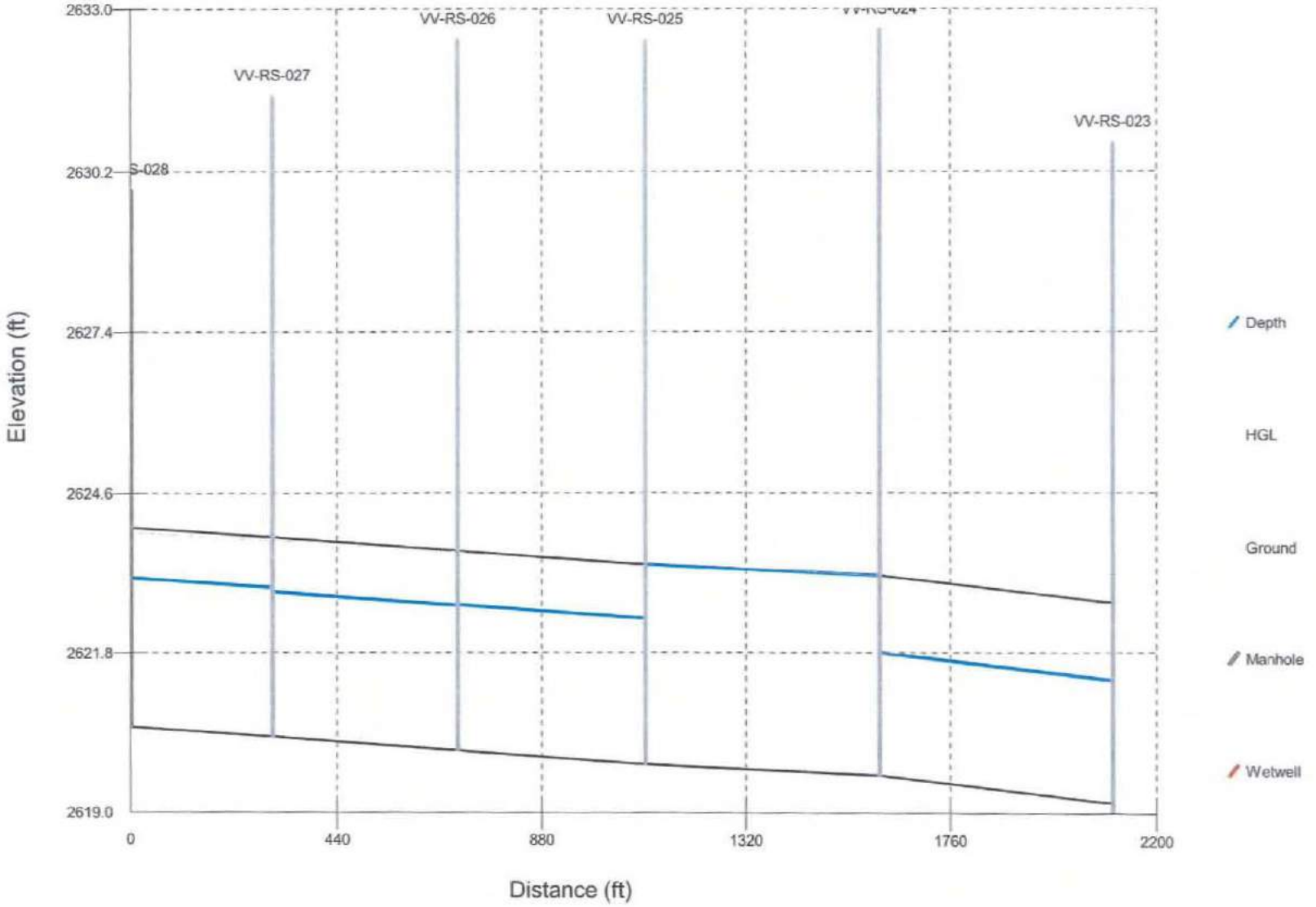


FIGURE 6-14
DOUBLE BARREL RELIEF SEWER (42")
2016 DRY WEATHER FLOW – CAPACITY ANALYSIS
OVER CAPACITY PIPES BETWEEN MH #RS-23 TO RS#28



From the *2007 VVWRA Facilities Plan Amendment*, analyzing the VVWRA Victorville Interceptors, it was indicated that the limiting section of pipe in the Double Barrel is the 42-inch immediately downstream from VSD-4 (i.e., the smallest slope area). This condition is exacerbated by the fact the VSD-4 connects to the 42-inch, only, and recombination of flow is not achieved until mixing occurs at the downstream junction structure. In addition, the 36-inch sewer is one to 1-1/2 feet above the 42-inch sewer and, therefore, does not adequately function as relief. Two improvements were made, in the Interceptor Model, to the Double Barrel system to increase capacity by better utilization of the 36-inch sewer. A gate was simulated at the first junction structure (MH 227) to force more flow through the 36-inch and a junction was simulated to the 36-inch at VSD-4. This resulted in a much better flow balance and an increase of 1 mgd capacity in the entire line to 18 mgd ADWF.

The double barrel Interceptor will be impacted if flow from VSD-3/VSD-4 is diverted to the City of Victorville's planned 2.0 mgd wastewater treatment facility at SCLA. Diversion of this flow would increase capacity life in the Double Barrel to flows 20.0 mgd service area flow (w/junction structure upgrades described above) projected to occur in the year 2020.

6.4 SANTA FE BYPASS SCENARIO

The 2007 Hesperia Master Plan indicated the South Hesperia (I Avenue) Interceptor as overloaded. The recommended project to alleviate this section was construction of a Bypass pipeline along Santa Fe Avenue to divert flow away from the Lemon St at I Street connection to the Bear Valley Road connection.

Based on flow monitoring along the Lemon Street sewer lateral, conducted by Downstream Inc. as part of the Hesperia Master Plan, approximately 0.80 mgd of existing flow can be diverted initially and 2.0 mgd in the future.

The Santa Fe Bypass Pipeline project does not increase capacity in the existing Interceptor downstream from Bear Valley Road. It does relieve overloading in the Hesperia segment between Lemon and Bear Valley Road. Section 2 described the

unusual construction of this line and its propensity for causing overflow. Construction of the Santa Fe Bypass mitigates this potential problem.

The Santa Fe Bypass will accommodate a dry weather flow of 2.0 mgd within the VVWRA criteria. This flow capacity will be suitable beyond the year 2021.

6.5 NORTH HESPERIA RELIEF SEWER SCENARIO

The North Hesperia Interceptor (NHI), from Bear Valley Road to Spring Valley Lake, was determined to exceed capacity criteria at a flow of 2.2 mgd, projected to occur within 3 years. The NHI was constructed with multiple pipeline diameter changes, as described in Section 2 of this SMP. The frequent diameter change can lead to clogging with subsequent overflow.

VVWRA anticipates that regional water reclamation plants may not be ready in time to alleviate capacity problems in the NHI. Any overflow in the NHI would result in costly fines. VVWRA has therefore incorporated a relief sewer into its Capital Improvement Plan.

A focused study was conducted to determine the size and general design features of the relief sewer. The calibrated Interceptor Model was used to assess design recommendations.

The analysis yielded the following result: The Hesperia line, North of Bear Valley Road to the connection along the SVL/CSA-64 Interceptor, will be paralleled by a 24-Inch sewer with an ADWF capacity of 4.0 mgd. Based on the flow projections from Table 4-2, this will provide adequate capacity in this reach, to the year 2021. The existing Interceptor will be utilized as an emergency bypass/overflow to the new sewer with its existing 2.2 mgd of ADWF capacity.

Construction of the NHRI will increase the capacity of this line, however flow from the new Interceptor will still connect to Interceptors downstream that have not been

upgraded and therefore will have no positive impact on downstream segments of the VVWRA Interceptor.

6.6 SPRING VALLEY LAKE INTERCEPTOR RELIEF SCENARIO

The model showed the Spring Valley Lake Interceptor (SVLI) to exceed capacity criteria within 3 years. The SVLI is suspected to be a major contributor to inflow and infiltration because of the age of the pipeline, high groundwater due to the proximity of the pipeline to the Mojave River and below grade elevation of several manhole rims. VVWRA has added a relief sewer to this segment of the Interceptor in their Capital Improvement Plan.

A focused study was conducted to establish design criteria for the relief sewer. The focus study concluded that the relief sewer should be routed from the Hesperia connection to the Upper Narrows. The relief sewer should be sized at 30 inches diameter upstream from VSD-2 and 36 inches diameter downstream from VSD-2 to the Upper Narrows.

The Model estimated a dry weather capacity of 7.5 mgd for the relief sewer. Based on the projections provided (See Table 4-3), this relief sewer will provide flow capacity in the SVL/CSA-64 Interceptors beyond the year 2021. The existing Interceptor is proposed to be slip-lined for I&I reduction and utilized as an emergency bypass/overflow with an existing ADWF capacity of 5.2 mgd.

Construction of the new SVL-CSA-64 parallel Interceptor will increase the capacity of this Interceptor reach; however flow from the new Interceptor will still connect to Interceptors downstream that have not been paralleled and therefore will have no positive impact on downstream segments of the VVWRA Interceptor.

6.7 HESPERIA SUBREGIONAL WATER RECLAMATION PLANT SCENARIO

Hesperia's Sewer Master Plan identified the first of three water reclamation plants within City limits on the east side of the 15 Freeway near Main Street and Mauna Loa Ave. VVWRA initiated a preliminary design contract for this facility that is currently underway. The WRP is envisioned to be built for 2.0 mgd treatment capacity with 1.0 mgd of equipment installed initially. For this analysis we assumed a 1.0 mgd plant would come on-line in the next 3-5 years, after the construction of both the Santa Fe Bypass and Hesperia North Relief Sewer.

The Hesperia WRP-1 and associated lift station are key elements of VVWRA's strategic plan. The regional plant will provide recycled water in the City of Hesperia, offsetting potable water use, and provide additional capacity in the VWWRA Hesperia Interceptor system beyond the flow projections through 2021 (with the Interceptor upgrades). The Hesperia WRP-1 also provides relief to downstream Interceptors in Spring Valley Lake and Victorville.

Table 6-7 summarizes the impacts of the Hesperia Water Reclamation Plant 1. It was assumed that 5% of the skimmed flow would be returned from the Hesperia Water Reclamation Plant 1 to the Interceptor for waste sludge.

Table 6-7
Interceptor Capacity with 1.0 mgd Hesperia WRP-1

Improvement ID	Description	Interceptor Reach	Projected Year to Reach Max Capacity w/o Improvement	Projected Year to Reach Max Capacity w/ 1.0 mgd WRP
Hesperia WRP-1	Construct 1.0 mgd WRP on East side of the 15 Freeway near Main Street and Mauna Loa Ave	Hesperia South	2012	>2021
		Hesperia North	2012	2016
		SVL/CSA-64	2012	2016
		South Apple Valley	2009	No Impact
		North Apple Valley	>2021	No Impact
		Victorville Upper Narrows to Lower Narrows	2012	2014
		Victorville Lower Narrows to Double Barrel	2015	2017
		Victorville Double Barrel	2016	2017

6.8 APPLE VALLEY WATER RECLAMATION PLANT SCENARIO

The Town of Apple Valley's Sewer Master Plan identified a reclamation plant located at Brewster Park. VVWRA initiated a preliminary design contract for this facility that is currently in progress. The plant is envisioned to be built for 2 mgd treatment capacity with 1.0 mgd of equipment installed initially. For this analysis we assumed a 1.0 mgd plant would come on-line in 2012.

The WRP is a key element of the VVWRA's strategic plan. The regional plant will provide recycled water to the Town of Apple Valley and provide additional capacity in the South Apple Valley Interceptor system beyond the flow projections through 2021.

Removal of 1.0 mgd from South Apple Valley Interceptor will also benefit the sections in Victorville, downstream from it. Table 6-8 summarizes the impacts of the Apple Valley Water Reclamation Plant. It was assumed that 5% of the skimmed flow would be returned from the Apple Water Reclamation Plant to the Interceptor for waste sludge.

Table 6-8
Interceptor Capacity with 1.0 mgd Apple Valley WRP

Improvement ID	Description	Interceptor Reach	Projected Year to Reach Max Capacity w/o Improvement	Projected Year to Reach Max Capacity w/ Improvement
Apple Valley WRP	Construct 1.0 mgd WRP at Brewster Park in the Town of Apple Valley	Hesperia South	2012	No Impact
		Hesperia North	2012	No Impact
		SVL/CSA-64	2012	No Impact
		South Apple Valley	2009	2021[1]
		North Apple Valley	>2021	No Impact
		Victorville Upper Narrows to Lower Narrows	2012	2014
		Victorville Lower Narrows to Double Barrel	2015	2017
		Victorville Double Barrel	2016	2017

[1] Includes improvement to Riverside pump stations to alleviate peak flows at downstream end of SAVI

6.9 EASTSIDE WATER RECLAMATION PLANT SCENARIO

The Eastside Water Reclamation Plant and Interceptor is listed in the VVWRA CIP, but with no firm timeline. The Eastside plant will be situated on the east side of the Mojave River near the outlet of the North Apple Valley Interceptor into the Victorville Interceptor. The area tributary to this location is anticipated to be a major growth center for both the City of Victorville and the Town of Apple Valley. This is confirmed in their respective sewer master plans. The plant will be delivered flow through a new Interceptor that begins near the South Apple Valley outlet to the Victorville Interceptor and flows via gravity through the Upper Narrows via a horizontally directional drilled (HDD) pipeline to the plant. The Eastside WRP is tentatively planned for 4 MGD ADWF capacity, expandable to 8 mgd and will provide reclaimed water to the City of Victorville and the Town of Apple Valley.

The Eastside Plant was input into the model to skim off an average flow of 4 mgd. This diverted flow will relieve capacity constraints in all portions of the Interceptor downstream from the South Apple Valley connection. It was assumed that 5% of the skimmed flow would be returned from the Eastside Water Reclamation Plant to the Interceptor for waste sludge. Table 6-9 summarizes the impacts of the Eastside Water Reclamation Plant.

Table 6-9
Interceptor Capacity with 4.0 mgd Eastside WRP

Improvement ID	Description	Interceptor Reach	Projected Year to Reach Max Capacity w/o Improvement	Projected Year to Reach Max Capacity w/ Improvement
Eastside WRP	Construct an Interceptor from the Upper Narrows to a 4.0 mgd capacity WRP near the outlet of the North Apple Valley Interceptor and Stoddard Wells Rd.	Hesperia South	2012	No Impact
		Hesperia North	2012	No Impact
		SVL/CSA-64	2012	No Impact
		South Apple Valley	2009	No Impact
		North Apple Valley	>2021	No Impact
		Victorville Upper Narrows to Lower Narrows	2012	>2021
		Victorville Lower Narrows to Double Barrel	2015	>2021
		Victorville Double Barrel	2016	2021

6.10 IMPROVEMENTS COMPOSITE

The improvements analyzed above were combined to produce a composite picture of Interceptor capacity. The improvements incorporated into the composite are:

1. Santa Fe Bypass.
2. North Hesperia Relief Sewer.
3. Spring Valley Lake Relief Sewer.
4. Hesperia Water Reclamation Plant 1.
5. Apple Valley Water Reclamation Plant.
6. Eastside Water Reclamation Plant.

Capacity impacts with the composite improvements complete are shown graphically on Figure 6-15.

VVWRA
RWWRF

SCLA

18

10

6.3

9.0

NEW
EASTSIDE
REGIONAL
WRP

Town of
Apple Valley

NEW APPLE
VALLEY WRP

9.0

1.8

City of
Victorville

New SVL/CSA-64
Parallel Interceptor

7.5

5.2

New Hesperia
Parallel Interceptor

4.0

2.2

New Hesperia
Parallel Interceptor

2.0

1.6

NEW
HESPERIA
WRP

City of
Hesperia

AIR EXPRESSWAY
MOJAVE DR
PALMDALE RD
MAPLE ST
HESPERIA RD
SANTA FE AVE
BNSF Rail
CORWIN RD
APPLE VALLEY RD
ZUNI RD
THUNDER BIRD RD
SENECA RD
YUCCA LOMA RD
BEAR VALLEY RD
DALE EVANS PKWY
NAVAJO RD
Spring
Valley
Lake
Mojave
River

Average Dry Weather Flow

14.3 MGD - 2012
16.5 MGD - 2015
20.8 MGD - 2021

System Capacity With Strategic Plan Improvements Fig 6-15

Model Indicates Pipes Over Capacity:

- Within 3 Years (2012 - 14.3 MGD)
- Within 3 to 6 Years (2015 - 16.5 MGD)
- Within 6 to 12 Years (2021 - 20.8 MGD)
- Greater Than 12 Years (2021+ - 20.8 MGD)

New Hesperia Parallel Interceptor
New SVL/CEA 64 Parallel Interceptor
New Santa Fe Bypass Relief Sewer
City Boundaries

1.0 Flow Capacity, MGD

1.0 Emergency Capacity in Existing Interceptors

RBF CONSULTING GIS

N

0 0.5 1
Miles

M:\wdata\10\10996\GIS\System Capacity Strategic Improvements 11X17.mxd 11/16/09 EJ

COMMENTS ON THE VVWRA SEWER MASTER PLAN MODELING AND CONDITION ASSESSMENT, DRAFT FINAL

By A. Jakher and S. McGlade, 12/7/09

Below are comments resulting from a cursory review of the Master Plan. The amount of time given to provide an in-depth review and assessment of the document is insufficient, due to the magnitude and nature of the preliminary comments. There were no workshops in Victorville, to our knowledge, to help explain the basic goal of this effort. It is therefore recommended that further meetings take place to address Victorville questions and concerns as well as those of any other member entity and no action be taken at the December meeting on the Master Plan.

Page ES-3 Why is there conservatism of 5-10%?

The methodology for building and calibrating the model relies on field flow metering data that can be plus or minus 10% accurate. VVWRA criteria for existing sewers allows them to be 89% full for dry weather flow. This leaves very little room for storm events. We thought it prudent, therefore to build in a level of conservatism in the calibration process.

Exhibit ES-1 Neglects to show the VVWRA Nanticoke Lift Station and Force Main

Will add to Exhibit ES-1

Fig. ES-2 This disagrees with April 2009 Growth Study by RBF

The following will be clarified in the Sewer Master Plan for the Final Document:

The April 2009 Flow Projection was updated with the most recent VVWRA flow information both from Agency Flow Monitoring and Plant Flow Data from 2009. In particular the existing flows from SCLA and Oro Grande were updated which resulted in slightly higher future flow projections from the County of San Bernardino and City of Victorville. Also, the updated flow projection in this SMP reflected the time that has passed since the flow projection study was conducted. This resulted in a shortening of the "slow growth period" that was assumed in the Flow Projection Study for 2009/2010 as normal growth was assumed to resume after 2010. This resulted in a slightly higher average annual growth rate as depicted in the flow projection figure.

ES-8 Option #2 includes "delivery of recycled water to customers in the close proximity to the treatment plants". While this is not in and of itself an issue, the proposed location of the subregional raises questions.

Siting of WRP's was not a part of the scope of this document.

1-8 1.2.5 contains inaccurate information. The City of Victorville built approximately 18,000 LF of 16" diameter purple pipe from VVWRA pumps to Westwinds pond. Victorville owns and maintains 14,500 LF and VVWRA owns and maintains 3,500 LF.

This will be corrected in the Final Document.

1-10 #1 is incorrect. The HDPP requires 3.6 mgd for cooling, while the future Victorville 2 project will require 2.9 mgd.

These volumes were provided to RBF by VVWRA. VVWRA will double check them and corrections will be included in the final document.

#3 and #4 both imply that VVWRA will be including "a new distribution system" in this Master Plan to distribute recycled water to Apple Valley and Hesperia customers. Each member entity should be responsible for the cost of distribution of any recycled water resulting from subregional treatment.

Will clarify in final SMP document.

CIP 5C Sheet 2 has costs for the AV and Hesperia subregionals and the Hesperia lift station and force main, which disagree substantially with the cost estimates used in the RBF Technical Memo justifying the Option 2.

Updated costs for the WRP's were provided verbally by VVWRA.

3-28 We believe the flow from the Juvenile Detention Center to be in excess of 40,000 gpd, not 2,540!

We will use this revised flow in the final document, although we suspect no impacts or recommendations made.

5-4 Should the slope for Hesperia Pipe 55 in Table 5-2 not be 0.005 instead of 0.0005?

Yes, will correct in Final Document.

5-5 Should the "n" value for Slope Range <0.001 in Table 5-3 not be 0.0065 instead of 0.065?

Yes, will correct in Final Document.

6-7 Table 6-4 does not reflect the reduction in Victorville flow of 1.5 mgd in 2010 and onwards.

6-10 Victorville intends to direct 1.5 mgd to its new IWWTP, not 2.0 mgd.

6-11 Table 6-11 shows costs for Apple Valley and Hesperia Subregionals as $55.3 million. The CIP version 5C estimates the cost to be $92.1 million and an additional cost of $44.77 million for reclaimed water projects. In addition the interceptor upgrades costs of $2,787,000 in this table do not match the interceptor cost shown in table 7-2 in recommendation section.

Interceptor cost of 2,787,000 under option 2 in the Recycled Water tech memo is for interceptor upgrades along the Victorville section only to convey system wide flows of 18 mgd to the plant. Santa Fe Bypass, N Hesp/SVL parallel lines are common to both options 1 and 2 in Recycled Water tech memo and were not included.

6-44 Again, the subregionals seem to include facilities to convey the recycled to the Hesperia and AV customers. This cost should be borne by the respective member entity in the same manner as Victorville currently purchases the recycled water from the Regional Wastewater Treatment Facility. A VVWRA subregional facility should be located on its interceptor pipeline to minimize pumping and the resulting recycled water should be made available to the member entity. But, any costs associated with conveying to storage and distributing to a user, should be borne by the member entity.

Cost for Recycled Water distribution facilities from the proposed WRP's to recycled water customers in the City of Hesperia and Apple Valley are not included in this document. This will be clarified in the Final SMP Document.

6-45 The statement that table 6-11 includes interceptor improvements required to convey 18 mgd to RWWRF is incorrect.

The tech memo assumed the North Hesperia and Spring Valley Lake Relief Interceptors to be common to both alternatives; therefore there costs were not included. The interceptor cost for both alternatives addresses portions in Victorville, between the Upper Narrows and RWWRF, that must be upgraded to convey flow to the regional plant.

Appendix D The recommendations appear to result from an analysis that is predicated upon the responsibility of VVWRA to furnish recycled water to the member entity. This would depart from the precedent set with the current situation of delivery of recycled water to Victorville. Any analysis based upon the costs of conveying recycled water to Apple Valley and Hesperia (Option 1) are therefore flawed. In addition, the cost estimates for Option 2 are substantially different from the costs in the adopted CIP. This Technical Memorandum is entitled "Recycled Water Options". The evaluation of the two options is not "apples to apples" as it includes the delivery of recycled water. A more "apples to apples" comparison should be prepared to look at just the costs associated with the treatment of wastewater. This would align with the current Service Agreement with Victorville.

The technical memo looked at the point of delivery of treated water for recycling. Costs did not include recycled water transmission facilities such as pipelines and reservoirs. We felt it appropriate, however, to include the cost of transmitting recycled water from the RWWRF to Hesperia and Apple Valley for that option.

Page 3, Section 1 under upgrade existing interceptors states that Santa Fe Bypass Sewer is under construction while figure ES-4 indicates that construction is slated for 2nd quarter of 2010.

This will be corrected in the final document.

FURTHER COMMENTS ON THE VVWRA SEWER MASTER PLAN MODELING AND CONDITION ASSESSMENT, DRAFT FINAL

By S. McGlade, 12/14/09

These additional comments are still incomplete, given the vast amount of information in the Master Plan. In order to facilitate the adoption, the comments are being submitted as they are compiled.

The concept of providing recycled water to the upstream member entities should be analyzed on a stand-alone basis, just as the case with the current system supplying the City of Victorville. A 16" delivery pipeline was paid for and constructed by the City of Victorville from the VVWRA Regional Facility pumps to the Westwind's storage pond. VVWRA charges the City $35 per acre-foot, plus pumping costs and an unknown additional charge that has yet to be explained.

In the same manner, any facilities to convey water to a member entity should be modeled similarly. The proposed Master Plan includes two fundamental elements, which conflict with the previously stated Victorville situation.

1. The comparison of the Recycled Water Options contained in Section 6.11, VVWRA Recycled Water Options and Appendix D, RBF Consulting Technical Memorandum, is based upon the premise of delivering reclaimed water to Apple Valley and Hesperia (Option 2). The analysis should be based upon the cost of treating sewage only. The ability to sell reclaimed water for recycling should be an independent assessment, which should analyze the cost of conveying reclaimed water to a user and the resulting revenue collected for the delivery. Option 1 should be analyzed to include only the upsizing of the interceptors beyond that already contemplated (Santa Fe, Hesperia Parallel and SVL/CSA 64 interceptors) for the existing deficiencies, to provide necessary capacity without subregional facilities.
2. Any subregional facility should be located at or near the interceptor from which it is skimming. It is inefficient to pump the sewage containing solids any further than necessary. In the case of the proposed Hesperia subregional, a pump station is being considered to pump two miles to its location. This increases pumping costs, which would be borne unfairly by all of the users in the JPA. The proposed Apple Valley facility requires an additional trunk line, where again, the construction cost is to borne by all of the users in the JPA.

We believe the cost for treating water at the RWWRF and delivering it to Apple Valley and Hesperia is the appropriate way to evaluate the two options since it puts the treated water source at the same locations (ie at the proposed sites for the Hesperia and Apple Valley WRP's). We acknowledge that the recycled water systems from these treated water locations would be provided by the member agencies and are not a part of the costs in the tech memo

We agree that the ability to sell recycled water is an independent analysis and was not part of the SMP.

Page 7-3, Section1: The proposed Santa Fe Interceptor is already identified in the City of Hesperia's Master Plan. Why is VVWRA including it in its Master Plan?

Page 7-4, Section 4: The Master Plan proposes that VVWRA construct recycled water distribution systems from the subregional plants to identified customers. Why is this not the responsibility of the pertinent member entity?

Clarification will be made in the final document that VVWRA is not constructing Recycled Water distribution to the potential RW customers in Apple Valley and Hesperia. Cost for these facilities are not included in this document.

Page 7-4, Table 7-2: The estimate for the Interceptor Upgrades totals $8.6m, while the estimate in Table 6-11 on Page 6-45 is only $2.8m.

Interceptor cost of 2,787,000 under Option 2 in the Recycled Water tech memo is for interceptor upgrades along the Victorville section only to convey system wide flows of 18 mgd to the plant. Santa Fe Bypass, N.Hesp/SVL parallel lines are common to both options 1 and 2 in Recycled Water tech memo and were not included.

There is no breakdown of any of the cost estimates included. There is a huge disparity between cost estimates appearing in the Capital Improvement Program and the various tables within the Master Plan. They need to explained or corrected. The 10% design reports for the subregionals could have provided valuable information, but are being withheld by VVWRA.

Costs were provided verbally by VVWRA for the WRP's. Cost for the SF Bypass was provided by others through VVWRA. We have included the later CIP in the document. Please be more specific about the disparities.

6.11 VVWRA RECYCLED WATER OPTIONS

In November 2009, RBF prepared an independent technical memorandum for VVWRA that compared the capital cost and annual electricity costs for two general options for reclaimed water in the VVWRA Service Area. The complete technical memorandum is included in this SMP in Appendix D. The two options analyzed are:

1. Treat all wastewater at the Regional Wastewater Reclamation Facility (RWWRF) and deliver recycled water to customers in Hesperia and Apple Valley.
2. Construct subregional reclamation plants in Hesperia and Apple Valley for delivery of recycled water to customers in the close proximity to the treatment plants.

The three main components evaluated for each option included:

1. Treatment including any new sewers, lift stations and force mains to route flow to the subregional plants
2. Upgrade of existing VVWRA Interceptor Sewers
3. Recycled water pumping and transmission facilities to the proposed subregional sites

Option 1 included the required upgrades for a 22 mgd VVWRA Service area flow including conveyance through an upgraded Interceptor system, expansion of the RWWRF to 22 mgd tertiary treated capacity and conveyance of reclaim water to from the RWWRF to Hesperia and Apple Valley. An estimate of capital cost for Option 1 is shown in Table 6-10.

Table 6-10
Recycled Water Option 1 Capital Cost Estimate

Cost Item	Estimated Capital Cost
RWWRF Improvements	$133,400,000
Recycled Water Transmission	$22,612,000
Interceptor Upgrades	$36,569,000
Option 1 Total	**$192,581,000**

Option 2 also included the required upgrades to accommodate a service area flow of 22 mgd by constructing 2.0 mgd capacity each at subregional treatment facilties in Apple Valley and Hesperia, upgrades to the RWWRF for 18 mgd tertiary treated capacity and Interceptor upgrades required to convey 18 mgd to the RWWRF. Table 6-11 summarizes the estimate of capital cost for Option 2.

Table 6-11
Recycled Water Option 2 Capital Cost Estimate

Cost Item	Estimated Capital Cost
RWWRF Improvements	$95,000,000
Subregional Treatment Faciliites	$55,300,000
Interceptor Upgrades	$2,787,000
Option 1 Total	**$153,087,000**

Operation and maintenance costs were evaluated for the two options. Treatment costs were predicted to be similar for both options, with the major distinction coming in the form of electricity cost from pumping. Option 1 required recycled water to be pumped to both Apple Valley and Hesperia while Option 2 required a sewage lift station at the Hesperia subregional plant. Annual costs were estimated based on $0.12/kWH. O&M costs are in Table 6-12 below.

Table 6-12
Recycled Water Options Annual Pumping Costs

	Estimated Annual Cost
Option 1 Pumping Cost	$563,911
Option 2 Pumping Cost	$31,158