ATTACHMENTS

ATTACHMENT #1

Draft Technical Memorandum

Trunk Sewer Model for Placer Vineyards Wastewater Shed A

Subject:	**Trunk Sizing Technical Memorandum**
Prepared For:	Mike Smith, MacKay and Somps
Prepared by:	Chris van Lienden, RMC
Reviewed by:	Dave Richardson, RMC
Date:	November 18, 2013
Reference:	0201-005

1 Introduction

The purpose of this technical memorandum (TM) is to describe the sanitary sewer hydraulic modeling conducted for Wastewater Shed A of the Placer Vineyards urban growth area (UGA) near the City of Roseville in Placer County. This TM was prepared for MacKay and Somps Civil Engineers, Inc (MacKay and Somps).

The Placer Vineyards UGA is within the ultimate service area of the South Placer Wastewater Authority (SPWA). As such, MacKay and Somps was asked by SPWA to add portions of the planned Placer Vineyards sanitary sewer system to an existing hydraulic model of the SPWA trunk sewer system. Prior to the preparation of this TM, a Sewer Master Plan had been prepared by MacKay and Somps for the Placer Vineyards UGA. The Sewer Master Plan provides the basis for the modeling described in this TM.

As part of the South Placer Regional Wastewater and Recycled Water Systems Evaluation (Systems Evaluation), a TM titled *Unit Flow Factor Sets and Sewer Design Criteria* (TM 3a) was prepared by SPWA to provide criteria for the sizing of sewers for new developments. TM 3a states that for the sizing of future infrastructure facilities, the hydraulic model of the trunk sewer system should be used for pipes 15 to 18 inches in diameter and larger. TM 3a is attached to this TM (Attachment A).

A previous TM evaluating Placer Vineyards sewer flows was developed in 2006 titled Placer Vineyards Pump Station and Forcemain Analysis Technical Memorandum; the 2006 TM estimated peak flows for the pump station and force main system for Placer Vineyards. The current TM will update the flows in the Wastewater Shed A based on the most recent land use information provided by Mackay and Somps.

1.1 Information Source

The alignments, diameters, inverts, and slopes of modeled sewers, as well as the locations, rim elevations, tributary areas and wastewater flow information associated with the manholes for the proposed infrastructure were provided by MacKay and Somps. Pipeline geometry information is shown on Sheets 1 of 3 and 2 of 3 of Exhibit SS-2 (Preliminary Sewer Manhole Data Wastewater Shed A) of the Placer Vineyards Sanitary Sewer Master Plan. Wastewater flow information is based on information shown in Tables 9A (Wastewater Flows By Node – Shed A) and 9B (Wastewater Base Sanitary Flows By Node – Shed A) of the Placer Vineyards Sanitary Sewer Master Plan.

2 Hydraulic Model

Pipes 18 inches in diameter and larger in Wastewater Shed A of the Placer Vineyards UGA sanitary sewer system were added to an existing SPWA trunk sewer model. The SPWA trunk sewer model was designed to function as an extended period simulation, and features land use-specific diurnal curves, a design storm, and unit hydrographs for the purpose of simulating time-varying wastewater flows in the trunk sewer system during a design storm event. These same features were applied to the modeled Placer

Vineyards trunk sewers. For more information on the development of the SPWA trunk sewer model, refer to the SPWA TM titled *Trunk Sewer Hydraulic Analysis* (TM 3b). This analysis uses the Buildout PWWF model described in TM 3b. The RDI/I rate parameters used were the same as surrounding UGAs, and the GWI rate assumption was the same as used throughout the Dry Creek basin (GWI: 200 gallons per acre per day). Consistent with the modeling assumptions described in TM 3b, a Manning's n value of 0.013 was assumed for all pipelines. No force mains were evaluated.

The modeled pipelines are shown in Figure 1.

2.1 Model Software

The software used to model the Placer Vineyards trunk sewers was InfoSewer GIS Professional Suite 7.6 (InfoSewer), a product of Innovyze. The original model of the SPWA system was constructed using H2Omap Sewer, which uses the same underlying hydraulic modeling engine, but uses a stand-alone GIS interface, rather than the ArcGIS platform used by InfoSewer. The model was converted to InfoSewer to facilitate model development and evaluation; no change in modeling results occurred due to the conversion. Infosewer and H20map Sewer software are both widely used for hydraulic analysis of collection systems.

2.2 Model Results

The modeled Placer Vineyards trunk sewers were evaluated using the same criteria used by SPWA (and presented in TM 3b) to evaluate other existing and planned trunk sewers in the SPWA service area. The surcharge criterion used for this analysis requires that under design flow conditions, trunk sewers shall not be allowed to surcharge.

According to the hydraulic model results, all of the Placer Vineyard trunk sewers sized 18 inches in diameter and larger have ample capacity to convey the modeled peak wet weather flows (PWWF). As such, the sizes of the 18-inch and larger pipes were adjusted, as appropriate, to achieve the minimum size necessary to convey the PWWF without surcharging. Table 6 below summarizes the modeled pipes and PWWF. Hydraulic profiles are shown in Figure 2, Figure 3, Figure 4, and Figure 5. Profiles represent the hydraulic grade line at 9:00 am; which is the highest flow for most pipes during the simulation period.

2.2.1 Comparison to 2006 Technical Memorandum

The modeled Peak Wet Weather Flow of 5.02 mgd to the Pump Station is different than the flows calculated in the 2006 Pump Station and Force Main Analysis TM. The 2006 TM estimated peak wet weather flows for Shed A to be 7.33 mgd. The primary reason for the decrease is that the 2006 evaluation assumed that the entire 4,200 acres in Placer Vineyards Shed A would contribute to rainfall dependent infiltration. The current analysis assumes that only parcels contributing to base flow (i.e. excluding open space), would contribute to rainfall dependent infiltration; based on this approach, the contributing acreage for Placer Vineyards Shed A is 3,340 acres. This assumption is consistent with the approach used in TM 3b.

Figure 1: Placer Vineyards Modeled Pipelines

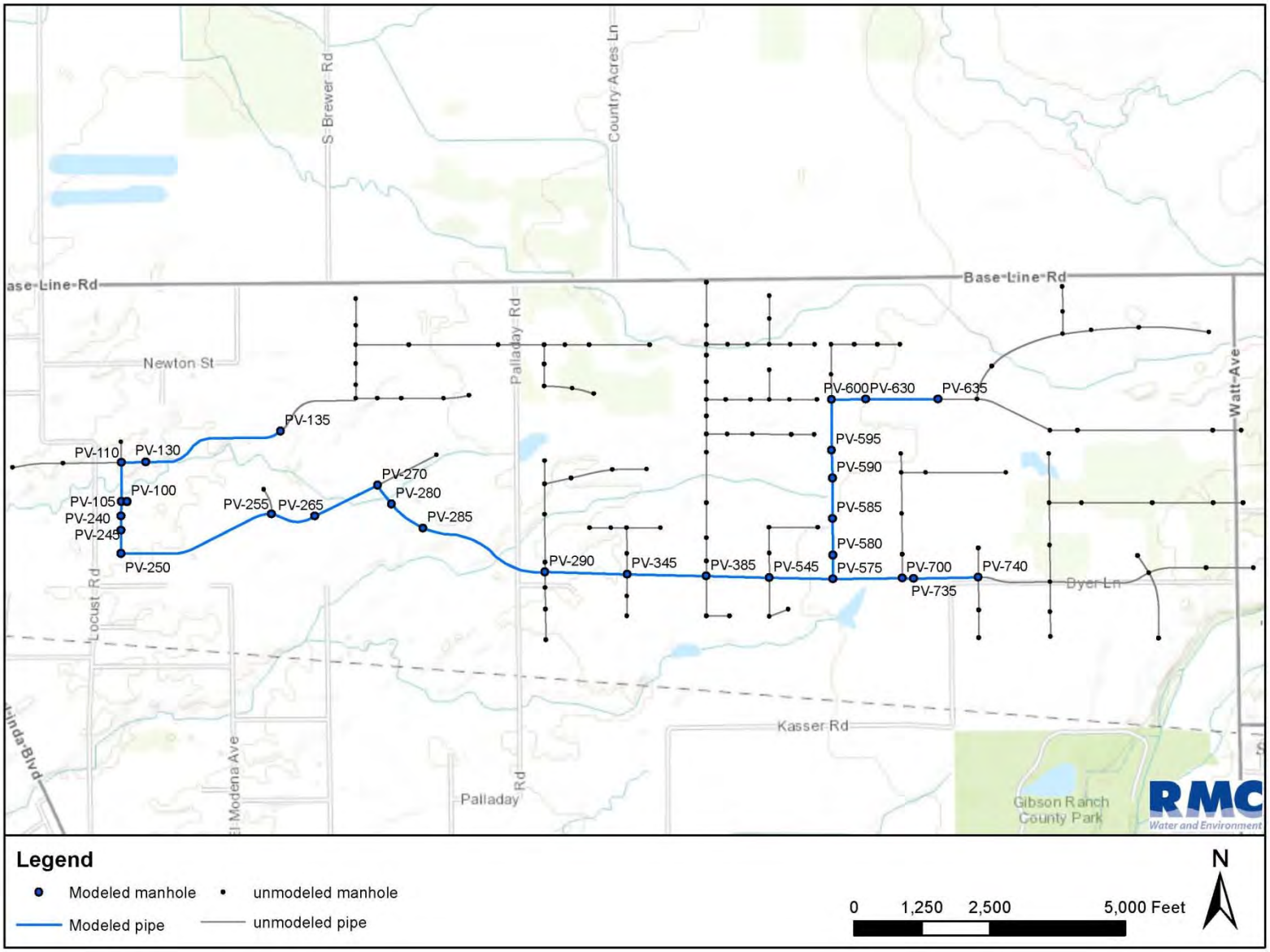


Figure 2: PWWF Profile PV-135 – PV-100

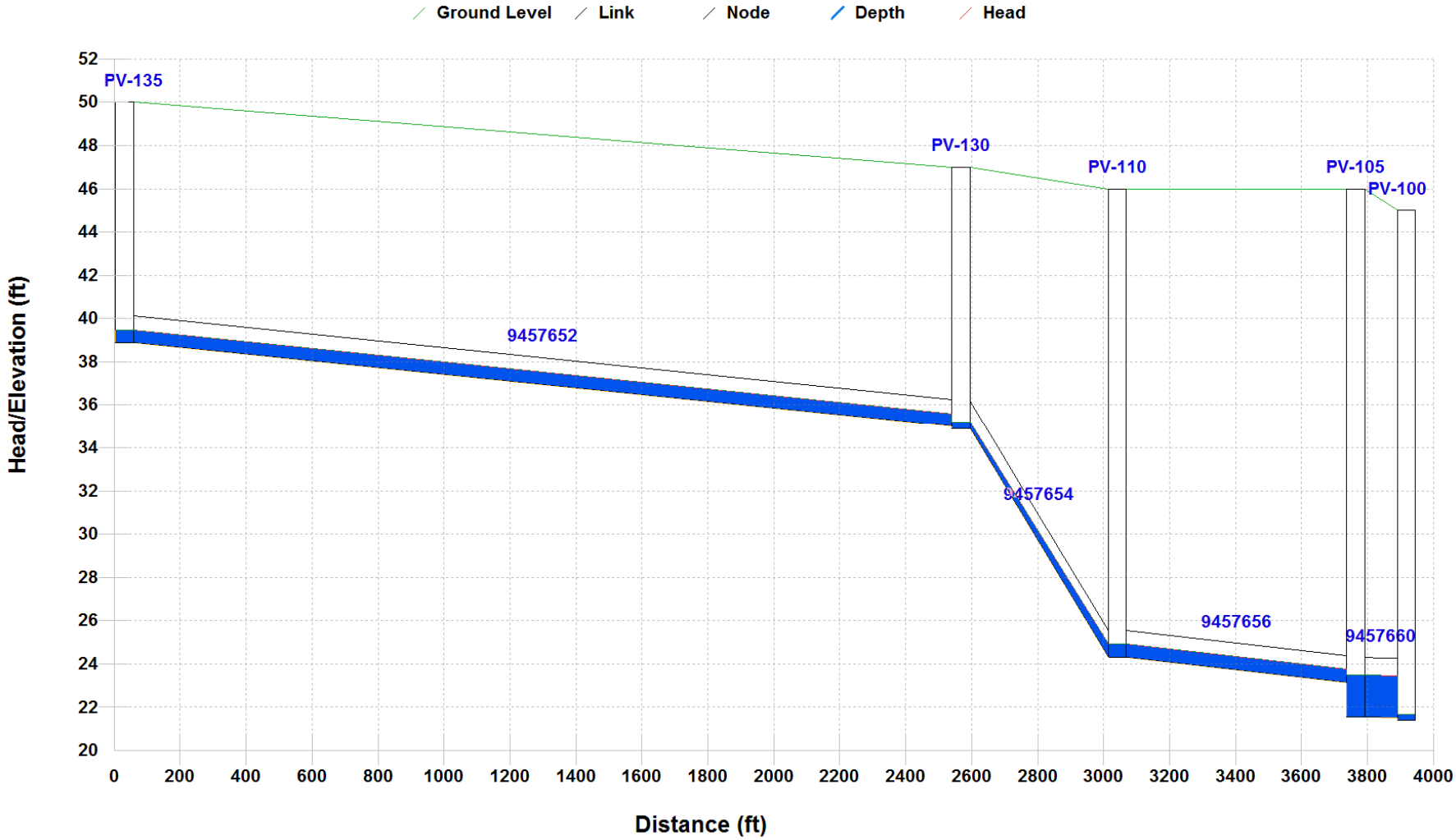


Figure 3: PWWF Profile PV-635 – PV-575

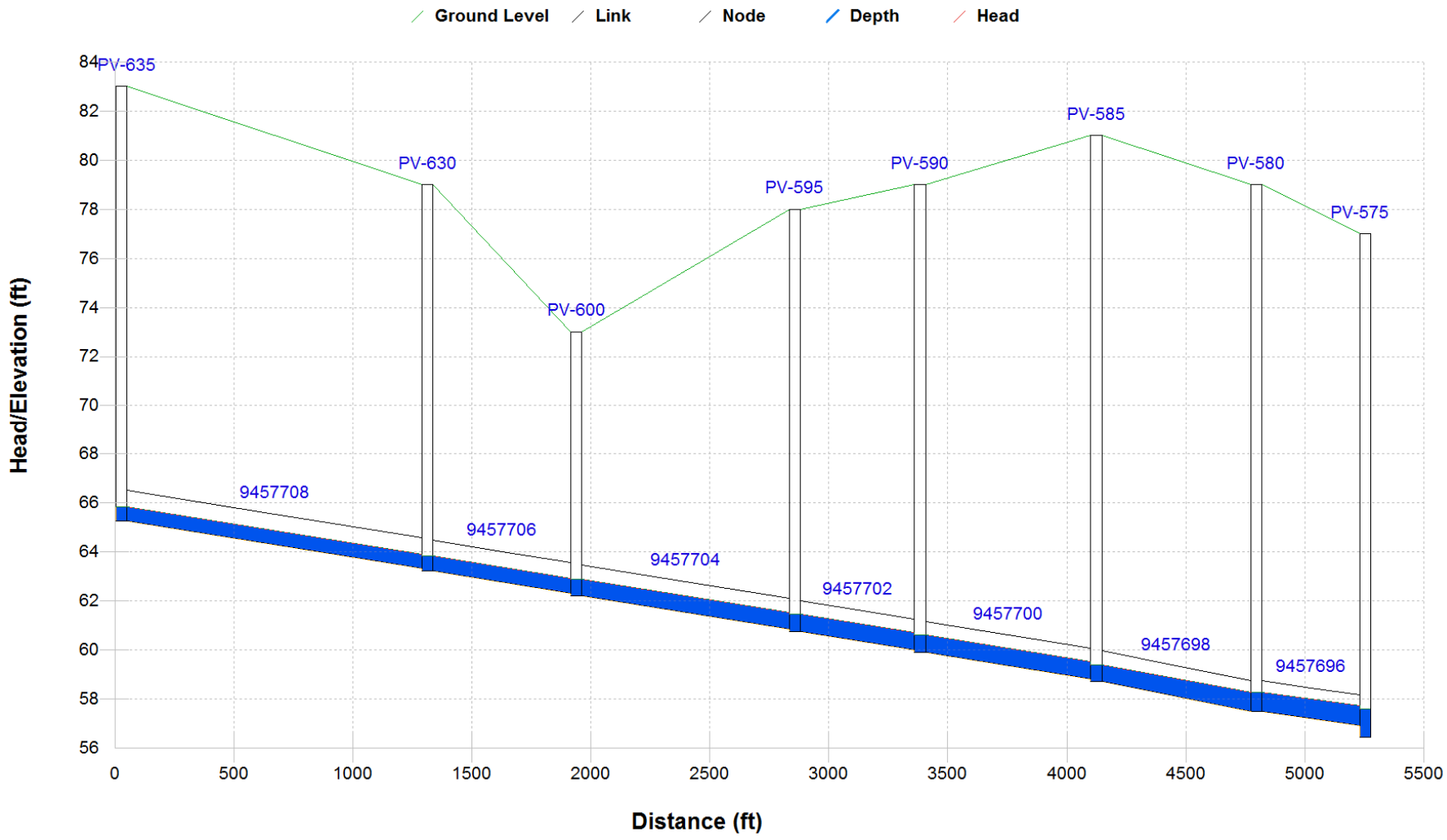


Figure 4: PWWF Profile PV-740 – PV-575

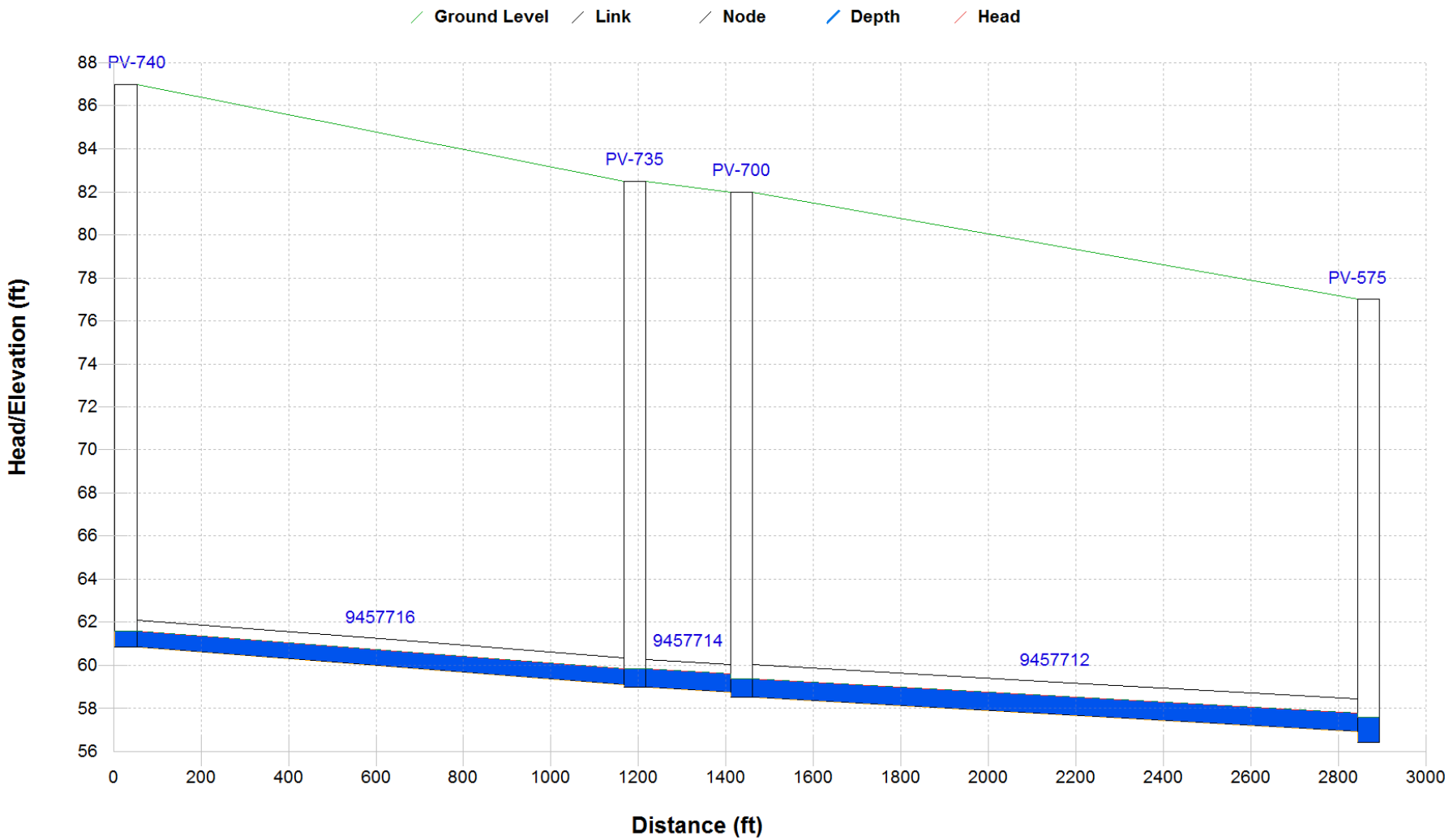


Figure 5: PWWF Profile PV-575 – PV-100

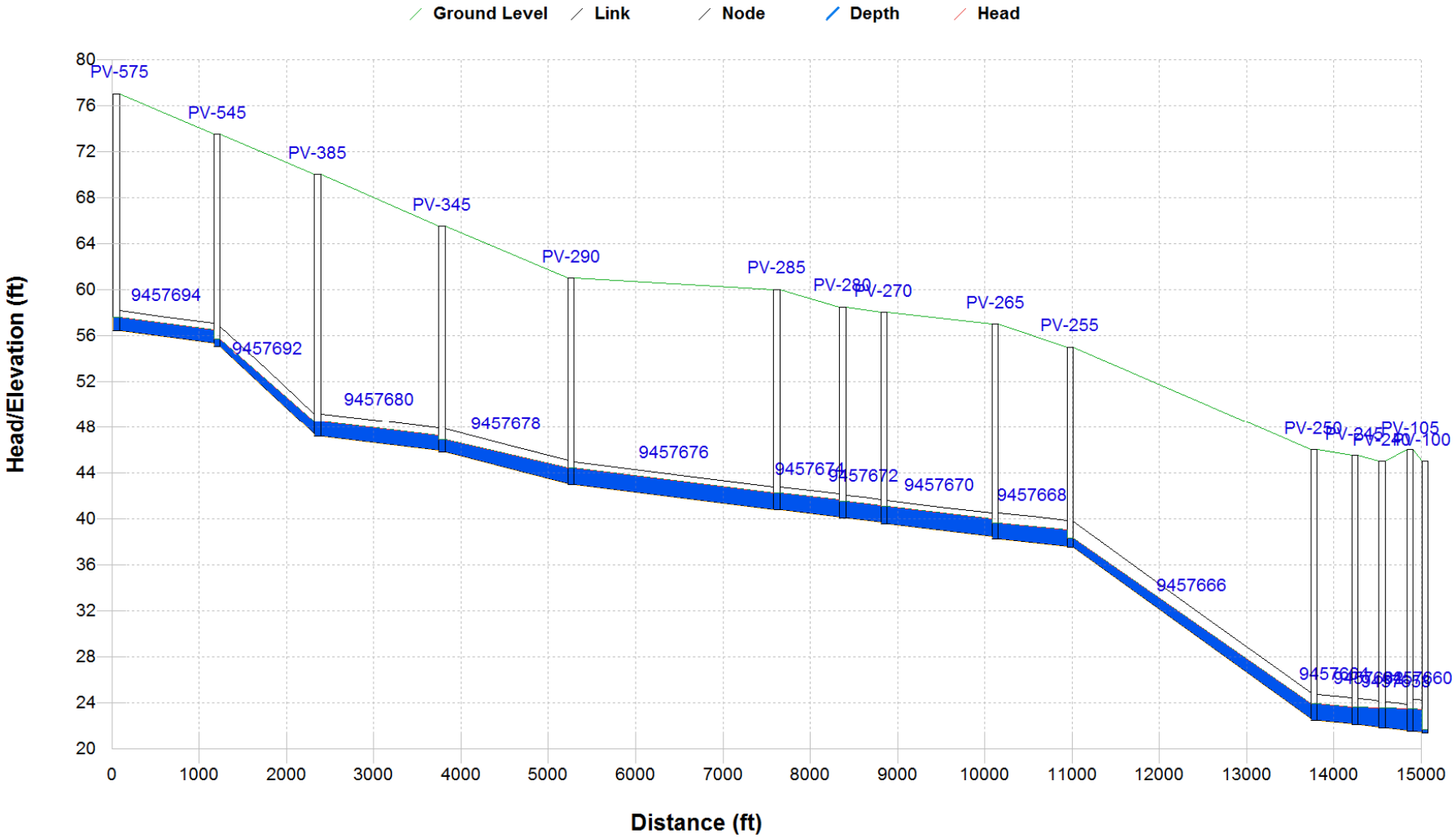


Table 6: Modeled Pipe Summary

Modeling Inputs							Modeling Results					
U/S Manhole ID	D/S Manhole ID	U/S invert	D/S Invert	Length (ft)	Slope (ft/ft)	BSF[a] (mgd)	PWWF (mgd)	Diameter (in)	Velocity at PWWF (ft/s)	d/D at PWWF	q/Q at PWWF	Headloss (ft/1000ft)
PV-135	PV-130	39.04	34.36	2,670	0.0018	0.31	0.62	15[b]	2.1	0.46	0.43	N/A
PV-130	PV-110	34.26	24.52	451	0.0216	0.32	0.64	15[b]	5.3	0.24	0.12	N/A
PV-110	PV-105	24.42	23.16	719	0.0018	0.42	0.94	15[b]	2.3	0.58	0.64	N/A
PV-635	PV-630	65.41	63.08	1,334	0.0017	0.32	0.61	15[b]	2.1	0.45	0.42	N/A
PV-630	PV-600	62.98	61.88	624	0.0018	0.34	0.65	15[b]	2.2	0.47	0.44	N/A
PV-600	PV-595	61.78	60.13	937	0.0018	0.42	0.80	15[b]	2.3	0.53	0.55	N/A
PV-595	PV-590	60.03	59.12	518	0.0018	0.44	0.83	15[b]	2.3	0.54	0.57	N/A
PV-590	PV-585	59.02	57.72	747	0.0017	0.45	0.87	15[b]	2.3	0.56	0.60	N/A
PV-585	PV-580	57.62	56.44	673	0.0018	0.46	0.88	15[b]	2.3	0.56	0.60	N/A
PV-580	PV-575	56.34	55.55	446	0.0018	0.48	0.93	15[b]	2.4	0.58	0.63	N/A
PV-740	PV-735	61.00	58.90	1,198	0.0018	0.39	0.90	15[b]	2.3	0.57	0.61	N/A
PV-735	PV-700	58.80	58.49	208	0.0015	0.41	0.93	15[b]	2.2	0.61	0.70	N/A
PV-700	PV-575	58.24	55.30	1,487	0.0020	0.50	1.15	18	2.6	0.47	0.46	N/A
PV-575	PV-545	55.05	53.58	1,170	0.0013	0.99	2.06	21	2.5	0.61	0.68	N/A
PV-545	PV-385	53.48	48.18	1,162	0.0046	1.04	2.19	21	4.2	0.43	0.38	N/A
PV-385	PV-345	47.93	46.39	1,458	0.0011	1.34	2.84	24	2.6	0.63	0.72	N/A
PV-345	PV-290	46.29	43.82	1,514	0.0016	1.44	3.05	24	3.1	0.57	0.62	N/A
PV-290	PV-285	43.72	41.14	2,461	0.0010	1.56	3.32	24	2.6	0.70	0.84	N/A
PV-285	PV-280	41.04	40.26	740	0.0011	1.58	3.36	24	2.6	0.71	0.85	N/A
PV-280	PV-270	40.16	39.71	432	0.0010	1.59	3.39	24	2.6	0.71	0.86	N/A
PV-270	PV-265	39.61	38.25	1,295	0.0011	1.61	3.42	24	2.6	0.72	0.86	N/A
PV-265	PV-255	38.00	37.19	848	0.0010	1.67	3.53	27	2.6	0.61	0.68	N/A
PV-255	PV-250	37.09	23.37	2,932	0.0047	1.68	3.56	27	4.7	0.38	0.31	N/A
PV-250	PV-245	23.27	22.85	428	0.0010	1.73	3.68	27	2.6	0.62	0.70	N/A
PV-245	PV-240	22.75	22.50	260	0.0010	1.74	3.69	27	2.6	0.62	0.71	N/A
PV-240	PV-105	22.40	22.16	274	0.0009	1.77	3.75	27	2.5	0.65	0.76	N/A
PV-105	PV-100	21.66	21.60	106	0.0006	2.19	5.03	33	2.3	0.64	0.74	N/A
PV-100[c]	N/A			N/A	N/A	N/A	5.03	16	5.6	N/A	N/A	7.5[d]

Footnotes:

a. Base Sanitary Flow
b. Several pipe segments were originally estimated to be 18-inches based on developer peaking factor calculations. As a result of this modeling effort, some of these segments were reduced in size to 15-inches.
c. Force main.
d. Assumes Hazen-Williams coefficient of 120.

Attachment A

Technical Memorandum

South Placer Regional Wastewater & Recycled Water Systems Evaluation Project

Subject: Unit Flow Factor Sets and Sewer Design Criteria –TM No. 3a (FINAL)

Prepared For: Art O'Brien – City of Roseville

Prepared By: Mai-Tram Le - RMC; revised by Gisa Ju - RMC

Reviewed By: Dave Richardson - RMC
Pete Bellows – BC

Date: May 25, 2005; Final revision October 3, 2006

Reference: 0091-4.02

This technical memorandum (TM) provides a definition of the unit flow factors that have been developed and used in analyses of treatment and trunk sewer facilities as part of the South Placer Regional Wastewater and Recycled Water Systems Evaluation Project (Project). The TM also proposes criteria to be used by developers for design of new sewer facilities.

The various analyses and their associated application are as follows:

1. **Treatment Plant Analyses** – A set of average dry weather unit flow factors has been developed for the entire South Placer Wastewater Authority (SPWA) service area. These factors include the average flow coming from various areas based on specific land use designations, along with a base dry weather groundwater infiltration (GWI) component across the service area. The average unit flow factors were developed using water use and flow monitoring data, as presented in TM 2a, "Dry Weather Flow Projection for 2005 Service Area." For example, the unit flow factor for single-family residential dwelling units, regardless of density, is 190 gpd, of which 10 gpd represents the dry weather GWI component. The unit flow factors used for treatment plant analyses are presented in **Table 1**.

2. **Hydraulic Model Calibration and Trunk Sewer Analyses** – The dry weather flows used for model calibration and analyses of trunk sewers consists of base sanitary flows (BSF) which have been developed using the same unit flow factor concept as for the treatment plant analyses discussed above. However, the dry weather GWI component of the unit flow factors has been included on an areal basis based on actual measured flows, rather than having been considered as a uniform base dry weather GWI load across the service area.

   Trunk Sewer analyses also include additional components of wet weather GWI and rainfall-dependent infiltration and inflow (RDI/I) that vary across the SPWA service area to reflect actual conditions as verified by the wet weather flow monitoring data. The wet weather GWI factors are specific to each wastewater treatment plant (WWTP) service area and were determined from analysis of WWTP flows to be 200 gpd/acre in the Dry Creek WWTP basin and 100 gpd/acre in the Pleasant Grove WWTP basin. The GWI rates and RDI/I parameters used in the trunk sewer model are documented in TM 2c, "Wet Weather Flow Projection for the Ultimate SPWA Service Area."

Table 1 – Average Dry Weather Unit Flow Factors Used for Treatment Plant Analyses

Land Use Designation	Units	Flow Factor (gpd/unit)[1]
Commercial	gpd per acre	850
Heavy Industrial	gpd per acre	850
Light Industrial	gpd per acre	850
Mixed Use	gpd per acre	2,300
Public/Quasi-Public	gpd per acre	660
Schools	gpd per acre	170
Residential 1 DU	gpd per DU	190
Residential 2 DU	gpd per DU	190
Residential 3 DU	gpd per DU	190
Residential Multiple DU[2]	gpd per acre or gpd per DU	2,040 or 130
Open Space	gpd per acre	0
Parks > 10 Acres	gpd per acre	10
Vacant	gpd per acre	0

[1] Includes allowance for dry season GWI.
[2] Future development projects should use the factor that results in the highest flow .

3. **Design Flow Standards (Criteria) for Sizing Infrastructure** – For sizing future infrastructure facilities, the hydraulic model of the trunk sewer system should be used for pipes 18 inches in diameter and larger. For smaller facilities, the average dry weather unit flow factors for the treatment plant analyses can be used along with a safety factor of 2.0 and appropriate peaking factors. The safety factor of 2.0 will be used to factor the average dry weather unit flow factor in order to:
    1. Account for changes that may occur over time in the behavior of residential and nonresidential contributors to the sewer systems, such as increased indoor water use;
    2. Account for changes in environmental conditions (higher groundwater table and consequent higher GWI) and changes in infrastructure (aging pipes, etc.);
    3. Provide for safety to adequately size the infrastructure to avoid any sanitary sewer overflows due to under-sizing;
    4. Account for the increasing friction losses (increase in the roughness coefficient) due to pipe aging; and,
    5. Account for nominal pipe diameter decreases due to accumulation of material adhering to the walls of the sewer piping and restricting capacity.

    Peak wet weather flows will be accounted for using a system-wide peaking factor. A peaking factor curve was developed based on the following assumptions:
    - Single family residential development at 4 DU/acre
    - Design average dry weather flow (ADWF) based on a unit flow rate of 190 gpd/DU times a safety factor of 2.0

- Diurnal peaking factor ranging from 1.8 to 3.0 depending on area size (reflects the attenuation of peak flows through the sewer system as the tributary area increases – refer to Footnote 4 in Table 2))
- GWI at 150 gpd/acre
- RDI/I at 700 gpd/acre, estimated based on model parameters used for new development UGAs (Note: New development RDI/I parameters were assumed to be similar to those determined by flow monitoring and model calibration for relatively new areas of the system; see TM 2c for discussion.)
- Peak diurnal flow concurrent with peak RDI/I flow

The resultant peaking factor curve is presented in **Figure 1**. **Table 2** below shows the derivation of the peaking factor curve for areas ranging from 10 to 750 acres. (NOTE: the values in Table 2 are meant to support the derivation of the peaking factor curve, rather than to be published as design standards).

Table 2 - Derivation of Proposed Roseville/SPWA Design Peaking Factor Curve[1]

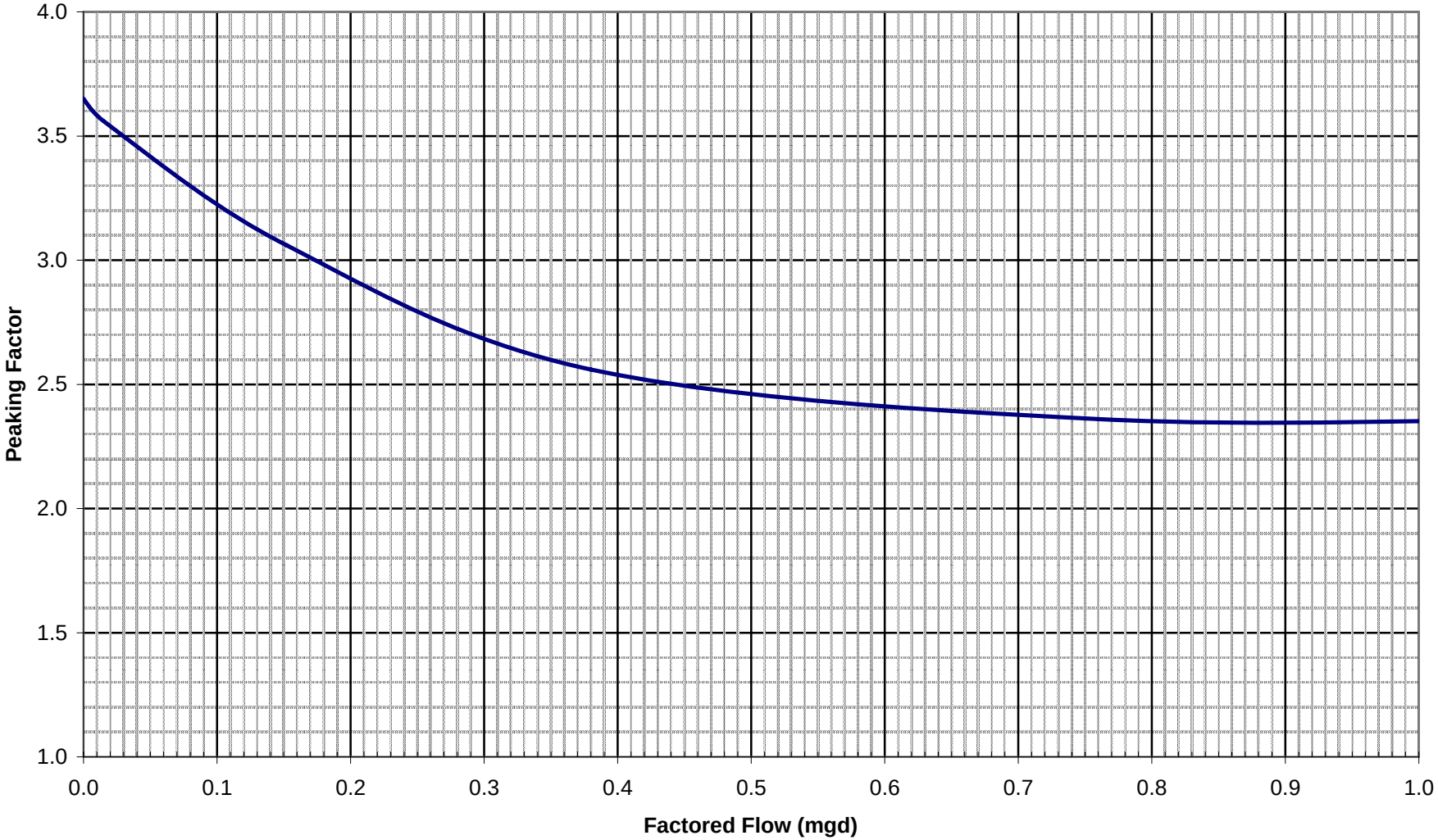
Area (acres)	No. of DUs[1]	ADWF (mgd)[2]	Factored Flow (mgd)[3]	Diurnal PF[4]	Wet GWI (mgd)[5]	Peak RDI/I (mgd)[6]	PWWF (mgd)[7]	Peaking Factor	PF Curve
0			0						3.65
10	40	0.0076	0.0152	3.0	0.0015	0.0070	0.054	3.56	3.56
100	400	0.076	0.152	2.5	0.015	0.070	0.47	3.06	3.06
250	1,000	0.19	0.38	2.0	0.038	0.175	0.97	2.56	2.56
500	2,000	0.38	0.76	1.8	0.075	0.350	1.79	2.36	2.36
750	3,000	0.57	1.14	1.8	0.11	0.53	2.69	2.36	2.36

[1] Based on single-family residential development at 4 DUs/acre. 4 DUs/acre is considered to be a typical density for single family residences, and is not intended to be used as a design criterion.
[2] Based on 190 gpd/DU
[3] Based on safety factor of 2.0
[4] The diurnal PF values in this analysis are based on the peaking factor used for residential flows (PF = 1.8) in the hydraulic model, which was derived from dry weather flow monitoring data. Since that derivation was based on a large area, the PF value is increased progressively as the area decreases in order to account for decreased attenuation of peak flows. Selection of the upper limit of that range is based on engineering judgment and experience with similar analyses.
[5] Based on 150 gpd/acre
[6] Based on 700 gpd/acre
[7] Assumes peak RDI/I coincides with peak diurnal

Attachment A includes an example calculation illustrating the application of the peaking factor curve.

At the direction of SPWA member agencies, several planning-level criteria were developed to aid developers in the sizing and configuration of pump station and force main facilities. These criteria are presented in **Attachment B**.

Figure 1
SPWA Design Peaking Factor Curve



ATTACHMENT A:
Example Design Flow Analysis for Sewers Smaller than 18-inches

Example calculation for application of peaking factor curve for 400-unit single family subdivision:

ADWF [a]:

(400 DUs)*(190 gpd/DU) = **76,000 gpd = ADWF**

Factored Flow:

(ADWF)*(2.0) = (76,000 gpd)*(2.0) = **152,000 gpd = Factored Flow**

PWWF:

(Factored flow)*(3.05 [b]) = (152,000)*(3.05) = **464,000 gpd = PWWF**

Per City of Roseville Improvement Standards, page SS-5, a 10-inch sewer at minimum slope is adequate for this PWWF.

[a] Based on ADWF unit flow factors (as opposed to base sanitary flow unit flow factors, which do not allow for dry season GWI)

[b] From Figure 1: SPWA Design Peaking Factor Curve

ATTACHMENT B:
Recommended Planning Level Criteria for Pump Stations and Force Mains

Table B-1 presents planning-level criteria for the design of pump stations and force mains within the SPWA service area; these criteria should be confirmed during design.

Table B-1: Recommended Planning Level Criteria for Pump Stations and Force Mains

Pump Stations	
Capacity	PWWF (hydraulic modeling required for pipes 18 inches and larger)
Storage	24 hours, or 8 hours with an emergency generator
Operation	Lead/lag for duty pump(s), plus 1 standby pump
Maximum Pump Cycles	6 cycles/hour
Force Mains	
Headloss	Hazen-Williams roughness coefficient (C-factor) of 120
Maximum Velocity	7-10 feet per second
Minimum Velocity	3.0 feet per second

NOTE: Hydraulic transient, surge, and odor control analyses will need to be performed during final design.

ATTACHMENT #2

Appendix K Placer Vineyards TM

Technical Memorandum

Subject:	**Placer Vineyards Pump Station and Forcemain Capacity Analysis -- Final**
Prepared For:	Kent MacDiarmid, The MacDiarmid Company; Mike Smith, MacKay and Somps
Prepared by:	Chris Peters/Pete Bellows – Brown and Caldwell
Reviewed by:	Dave Richardson/Austin Peterson – RMC
Date:	May 31, 2006
Reference:	0163-001.00

1 Introduction

This technical memorandum (TM) summarizes the results of a hydraulic assessment for the proposed pump station and force main system that will serve the Placer Vineyards Urban Growth Area (UGA). This TM will identify pump station and force main sizes for the two development scenarios in the Placer Vineyards UGA: Base Plan and Blueprint Plan. Land use data for the development of flow projections was provided by MacKay and Somps.

Wastewater flow from Placer Vineyards Shed A and Shed B is tributary to two proposed pump stations upstream of the Dry Creek Wastewater Treatment Plan (DCWWTP). Each pump station will have its own force main system. The Placer Vineyards pump station, serving Shed A, will pump directly to the DCWWTP. Shed B will be served by Dry Creek Pump Station No. 2, which also serves a small area of unincorporated development in Placer County directly south of Shed B. The force main for Dry Creek Pump Station No. 2 will connect to the existing 16-inch force main serving Dry Creek Pump Station No. 1. A map of the proposed Placer Vineyards pump station and force main system is shown in Figure 1.

2 Flow Projections

Flow projections for base sanitary and wet weather flows were developed with the land use information provided by MacKay and Somps and unit wastewater flow generation criteria established as part of the South Placer Wastewater Authority (SPWA) trunk sewer evaluation (Trunk Sewer Hydraulic Analysis TM No. 3b). The Average Base Sanitary Unit Flow Factors used for the trunk sewer evaluation are presented in Table 1. A summary of the average base sanitary flow (BSF) projections for each development scenario is provided in Table 2 through Table 5.

To develop the peak wet weather flow (PWWF) projection, wet weather flow (groundwater infiltration (GWI) and inflow) was applied to each developed parcel on an acreage basis. A wet season GWI rate of 200 gpd/acre was applied to developed parcels in the DCWWTP service area. Wet season GWI was not applied to parks or open space. Inflow is based on a 10-year 24-hour synthetic rainfall pattern that occurs across the entire service area. Inflow is dependent on several factors including rainfall amount. For the SPWA project, a 10-year, 24-hour design storm was chosen to project peak wet weather flows in the model. Further discussion on design flows is presented in the SPWA Wet Weather Flow Projection TM No. 2c. The 10-year PWWF, including base sanitary flow, for each development scenario is provided in Table 6.

Table 1 – Average Base Sanitary Unit Flow Factors

Land Use Designation	Units	Trunk Sewer Analyses Unit Flow Factor[1]
Commercial	gpd per acre	800
Heavy Industrial	gpd per acre	800
Light Industrial	gpd per acre	800
Mixed Use	gpd per acre	2,160
Public/Quasi-Public	gpd per acre	620
Schools	gpd per acre	160
Residential 1 DU	gpd per DU	180
Residential 2 DU	gpd per DU	180
Residential 3 DU	gpd per DU	180
Residential Multiple DU[2]	gpd per acre	1,920
Open Space	gpd per acre	0
Parks > 10 Acres	gpd per acre	10
Vacant	gpd per acre	0

[1] Does not include an allowance for dry season GWI. Dry and wet season GWI are applied on an area-specific basis.
[2] The proposed Residential Multiple DU unit flow factor can also be represented as 130 gpd per DU.

Table 2 – Average Base Sanitary Flow Projection – Shed A Base Plan

Land use	Area (ac)	Dwelling Units (du)	Unit Flow Factor	Total Flow (mgd)
Single Family Residential	2,598	7,983	180 gpd/du	1.44
Multi-Family Residential	171	2,551	130 gpd/du	0.33
Mixed Use	67	844	2,160 gpd/ac	0.14
Commercial	176		800 gpd/ac	0.14
School	140		160 gpd/ac	0.02
Public/Quasi-Public	179	218	620 gpd/ac	0.11
Total	3,331	11,596		2.18

Table 3 – Average Base Sanitary Flow Projection – Shed B Base Plan

Land use	Area (ac)	Dwelling Units (du)	Unit Flow Factor	Total Flow (mgd)
Single Family Residential	568	2,149	180 gpd/du	0.39
Multi-Family Residential	20	293	130 gpd/du	0.04
Commercial	25		800 gpd/ac	0.02
Public/Quasi-Public	27	94	620 gpd/ac	0.02
Total	640	2,536		0.47

Table 4 – Average Base Sanitary Flow Projection – Shed A Blueprint Plan

Land use	Area (ac)	Dwelling Units (du)	Unit Flow Factor	Total Flow (mgd)
Single Family Residential	2,388	10,536	180 gpd/du	1.90
Multi-Family Residential	271	4,872	130 gpd/du	0.63
Mixed Use	90	1,378	2,160 gpd/ac	0.19
Commercial	222		800 gpd/ac	0.18
School	190		160 gpd/ac	0.03
Public/Quasi-Public	137	621	620 gpd/ac	0.09
Total	3,298	17,407		3.02

Table 5 – Average Base Sanitary Flow Projection – Shed B Blueprint Plan

Land use	Area (ac)	Dwelling Units (du)	Unit Flow Factor	Total Flow (mgd)
Single Family Residential	470	2,769	180 gpd/du	0.50
Multi-Family Residential	49	870	130 gpd/du	0.11
Mixed Use	23	354	2,160 gpd/ac	0.05
Commercial	25		800 gpd/ac	0.02
School	30		160 gpd/ac	0.01
Public/Quasi-Public	30	231	620 gpd/ac	0.02
Total	627	4,224		0.71

Table 6 – Shed A and Shed B Peak Wet Weather Flow Projection

Scenario	Base Sanitary Flow (mgd)	Peak Wet Weather Flow (mgd)	Resultant Peaking Factor[1]
Shed A – Base Plan	2.18	7.33	3.36
Shed B – Base Plan	0.47	1.62	3.45
Shed A – Blueprint Plan	3.02	8.93	2.96
Shed B – Blueprint Plan	0.71	2.08	2.93

[1] Resultant Peaking Factor is a function of land use category, applicable BSF diurnal pattern and developed area for GWI and Inflow flow components (excludes open space and parks). GWI and Inflow are approximately constant for each plan scenario. Resultant peaking factor is lower for the Blueprint Plan due to a higher base sanitary flow.

3 Criteria for Sizing Pump Stations and Force Mains

Pump stations are sized so that the rated capacities that match or exceed the PWWF. For the force mains, the maximum velocity criterion is 7 feet per second (fps) with a Hazen-Williams C factor of 120. Also, the maximum allowable system head (static head, velocity head and minor head losses) is limited to 200 feet.

4 Hydraulic Model

The hydraulic modeling program used for this analysis is H_2OMAP Sewer Pro, a product of MWH Soft, Inc. This model is currently being used by SPWA to perform an evaluation of the regional trunk sewer system. To perform the hydraulic analysis for this study, the 10-year PWWF from Shed A and Shed B was allocated in the hydraulic model to a "dummy" trunk sewer pipe upstream of each respective pump station. These flow input nodes are shown on Figure 1, Figure 2 and Figure 3.

5 Hydraulic Model Results

After the flows were loaded into the hydraulic model, the model was run for each scenario. Flows were identified in the model pipes and were used to size each pump station and associated force main. The results of this analysis are presented below. The pump station and force main sizing is also indicated on Figure 2 and Figure 3.

5.1 Placer Vineyards Pump Station and Force Main

The model results indicate that a 7.33 mgd pump station is needed to transport the PWWF for the Base Plan scenario. The associated force main for this scenario must also be able to handle this flow and should be sized as a single 24-inch force main (velocity of 3.6 fps) or a dual 18-inch force main (velocity of 3.2 fps). For the Blueprint Plan scenario, a 8.93 mgd pump station is needed to transport the PWWF. The associated force main should be sized as a single 26-inch force main (velocity of 3.8 fps) or a dual 20-inch force main (velocity of 3.2 fps). Smaller force main sizes were tested in the model but were not feasible due to the high head losses associated with the long force main length. Using smaller force main diameters is only feasible if a second pump station is operated.

There are a number of advantages associated with operating a dual force main system with the Placer Vineyard pump station. These advantages include:

- Increased reliability and redundancy in the case of force main failure.
- Ability to handle a wider range of flows (one force main handles peak BSF; both force mains handle PWWF).
- Ability to sequence the force main construction over time as development occurs.
- Ability to shut down a force main for maintenance.
- Possibly less sulfide generation than in a single force main.

There are also some disadvantages associated with operating a dual force main system with the Placer Vineyard pump station. These disadvantages include:

- Increased cost to install additional force main.
- Additional land needed to install additional force main.
- More maintenance on a dual force main (twice as much pipe to maintain).

A cost-benefit analysis should be performed to fully understand the value of each advantage and disadvantage of the dual force main system. It is possible that the higher initial costs of a dual force main system may be outweighed by the long-term risk and maintenance savings.

5.2 Dry Creek No. 2 Pump Station and Force Main

Dry Creek No. 2 pump station is sized to receive flow from Placer Vineyards Shed B and some unincorporated areas of Placer County (directly south of Shed B). The contribution from Placer Vineyards Shed B is shown in Table 6. The model results indicate that a 2.30 mgd pump station (1.62 mgd from Shed B) is needed to transport the PWWF for the Base Plan scenario. The associated force main for this scenario must also be able to handle this flow and should be sized as a single 12-inch force main (velocity of 4.5 fps). For the Blueprint Plan scenario, a 2.77 mgd pump station (2.08 mgd from Shed B) is needed to transport the PWWF. The associated force main should also be sized as a single 12-inch force main (velocity of 5.5 fps).

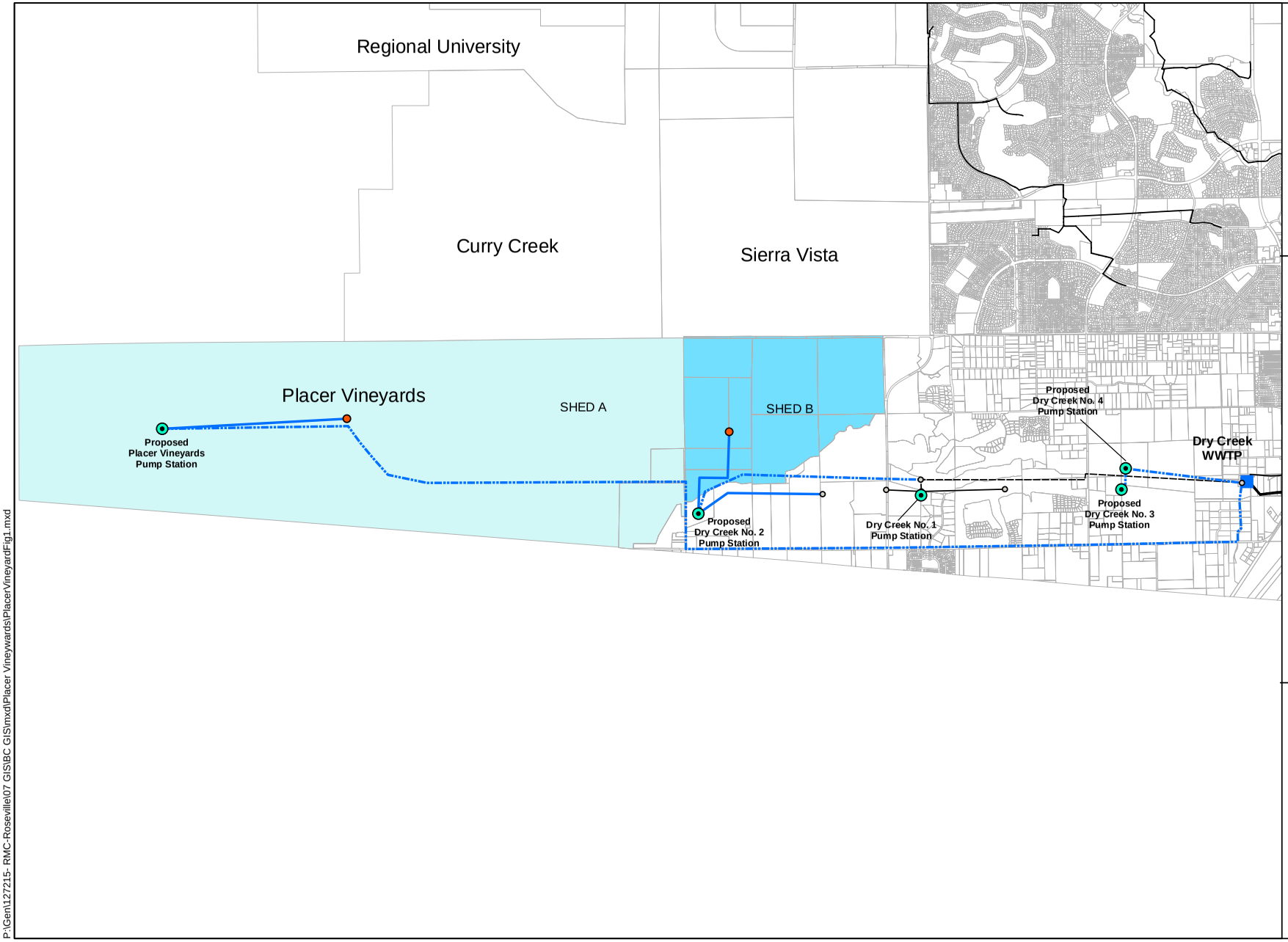


FIGURE 1

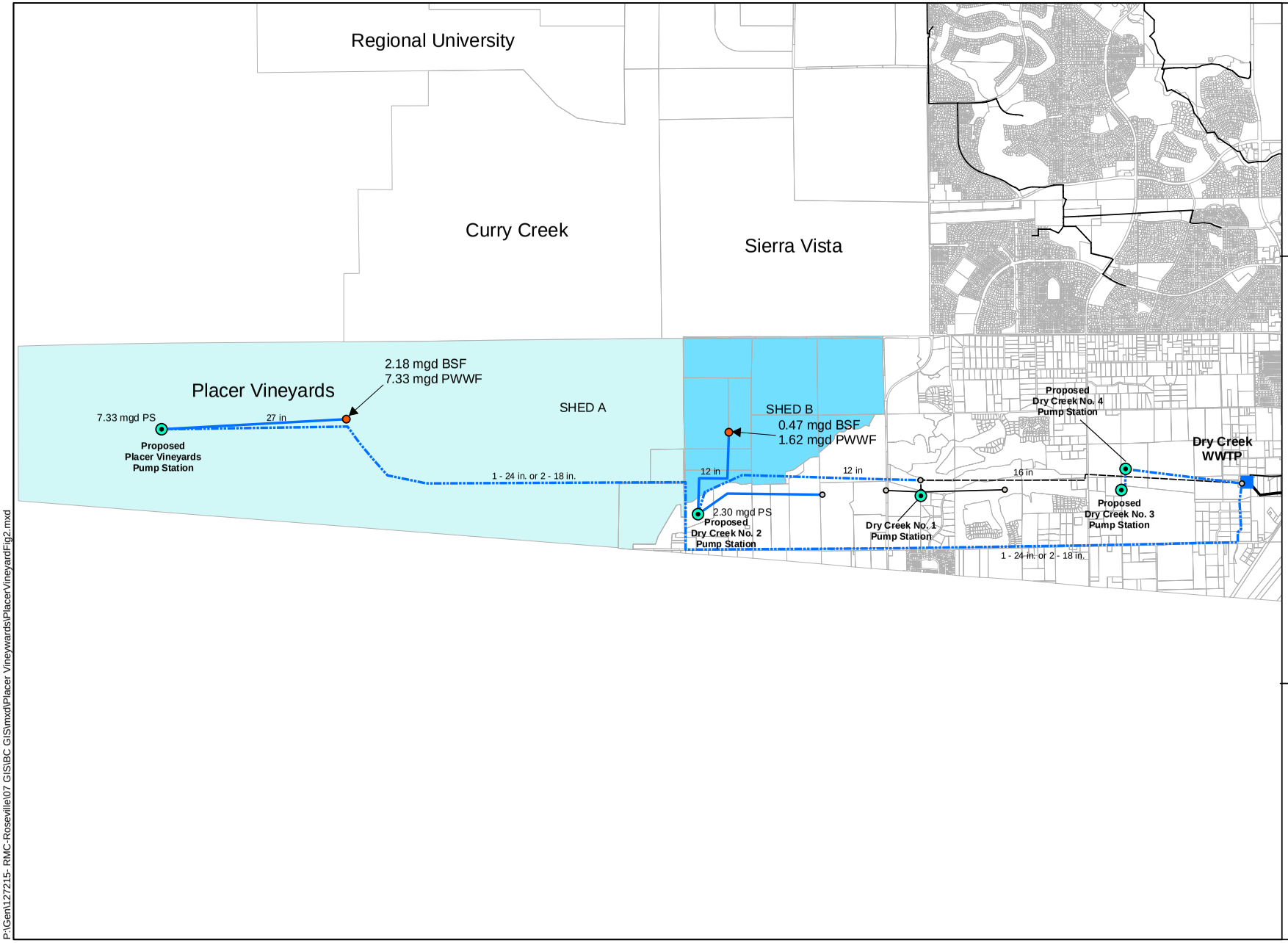
Placer Vineyards Model Network

May 2006

PLACER VINEYARDS

Pump Station and Force Main Capacity Analysis

P:\Gen\127215- RMC-Roseville\07 GIS\BC GIS\mxd\Placer Vineywards\PlacerVineyardFig1.mxd



Legend

- Pump Station
- WWTP
- Modeled Manhole
- Flow Input Node
- Existing Gravity Main
- Existing Force Main
- Proposed Force Main
- Proposed Gravity Pipe
- Watershed A
- Watershed B
- Parcel Boundary

FIGURE 2

Base Plan Pump Station and Force Main Sizing

May 2006

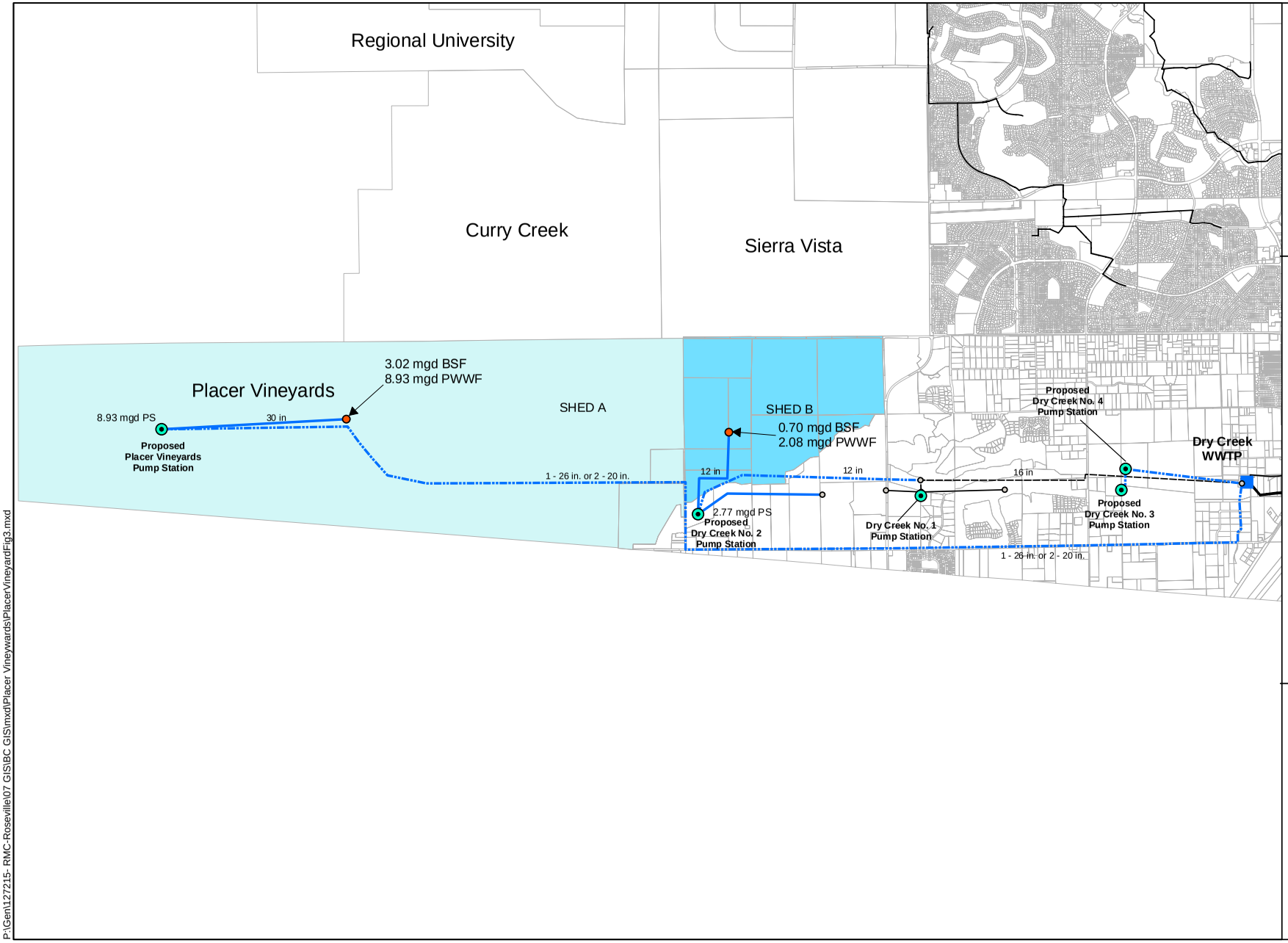
PLACER VINEYARDS

Pump Station and Force Main Capacity Analysis

N
W E
S

3,000 1,500 0 3,000
Feet

P:\Gen\127215- RMC-Roseville\07 GIS\BC GIS\mxd\Placer Vineywards\PlacerVineyardFig2.mxd



Legend

- Pump Station
- WWTP
- Modeled Manhole
- Flow Input Node
- Existing Gravity Main
- Existing Force Main
- Proposed Force Main
- Proposed Gravity Pipe
- Watershed A
- Watershed B
- Parcel Boundary

FIGURE 3

Blueprint Plan Pump Station and Force Main Sizing

May 2006

PLACER VINEYARDS

Pump Station and Force Main Capacity Analysis

N
W E
S

3,000 1,500 0 3,000
Feet

P:\Gen\127215- RMC-Roseville\07 GIS\BC GIS\mxd\Placer Vineywards\PlacerVineyardFig3.mxd

ATTACHMENT #3

Appendix M Riolo Vineyards TM

Memorandum

Subject:	**Dry Creek No. 1 Pump Station Flows – Memo 1.1**
Prepared For:	Mike Smith, MacKay and Somps
Prepared by:	Andy Smith, RMC
Reviewed by:	Dave Richardson, RMC
Date:	May 17, 2007
Reference:	0201-002

1 Background

RMC was asked by MacKay and Somps to prepare several figures that identify projected wastewater flows to, and in the vicinity of, the Dry Creek West Placer Community Facilities District # 1 and 2, Sewer Lift Station 1 (Dry Creek No. 1 Pump Station and Dry Creek No. 2 Pump Station, respectively). Refer to Dry Creek No. 1 Pump Station Flows Memorandums 1, 2, and 3, dated October 18, 2006, November 11, 2006, and March 7, 2007, respectively, for summaries of previous investigations in and around this area. The purpose of this memorandum is to update the flows presented in the memo dated October 18, 2006 (Memo 1), and to investigate the impacts of the updated flows on the sewers in vicinity of Dry Creek Nos. 1 and 2 Pump Stations.

2 Hydraulic Model Modifications

The projected base sanitary flow (BSF) for one of two areas tributary to the Dry Creek No. 2 Pump Station, which includes the Riolo Vineyards development, was increased from 0.185 mgd to 0.218 mgd, in order to include "offsite" flows, as well as flows from a school and church whose modeled flows had previously been tributary to Dry Creek No. 1 Pump Station. The subbasin acreage associated with the area tributary to Dry Creek No. 2 Pump Station was also adjusted to include the area associated with the offsite flows and school and church flows.

3 Flow Projections

Two figures are presented in the following pages: Riolo Vineyards/Placer Vineyards Model Network – Base Plan (**Figure 1**), and Riolo Vineyards/Placer Vineyards Model Network – Blueprint Plan (**Figure 2**). Both figures focus on the area surrounding the proposed Riolo Vineyards development in southern Placer County[1]. The base sanitary flow (BSF) and peak wet weather flow (PWWF) projections shown in the figures are based on hydraulic modeling results. The hydraulic model used to generate the results was developed using 1) land use information from the Placer Vineyards Specific Plan Sewer Master Plan (Base Plan) and the Placer Vineyards Specific Plan Sewer Master Plan – Blueprint Alternative (Blueprint), 2) information from the land use GIS database developed for the South Placer Wastewater Authority (SPWA) South Placer Regional Wastewater and Recycled Water Systems Evaluation (Systems Evaluation), and 3) BSF unit flow factors developed for the SPWA Systems Evaluation.

[1] The gravity sewer and force main alignments shown in Figures 1 and 2 are for preliminary planning purposes only, and do not necessarily reflect the plans most recently discussed by the City of Roseville, SPWA, etc.

The results indicate that approximately 1.92 million gallons per day (mgd) of wastewater will enter the Dry Creek No. 1 pump station during PWWF conditions, independent of Placer Vineyards projected flows. Under the Base Plan scenario, approximately 2.37 mgd of wastewater from the proposed Dry Creek No. 2 pump station will join the flows from the Dry Creek No. 1 pump station in a common force main, totaling approximately 4.29 mgd under PWWF conditions. Under the Blueprint scenario, approximately 2.85 mgd of wastewater from the Dry Creek No. 2 pump station will join the flows from the Dry Creek No. 1 pump station, totaling approximately 4.77 mgd under PWWF conditions. As stated above, the flows entering the Dry Creek No. 1 pump station are independent of the Placer Vineyards Specific Plan scenario.

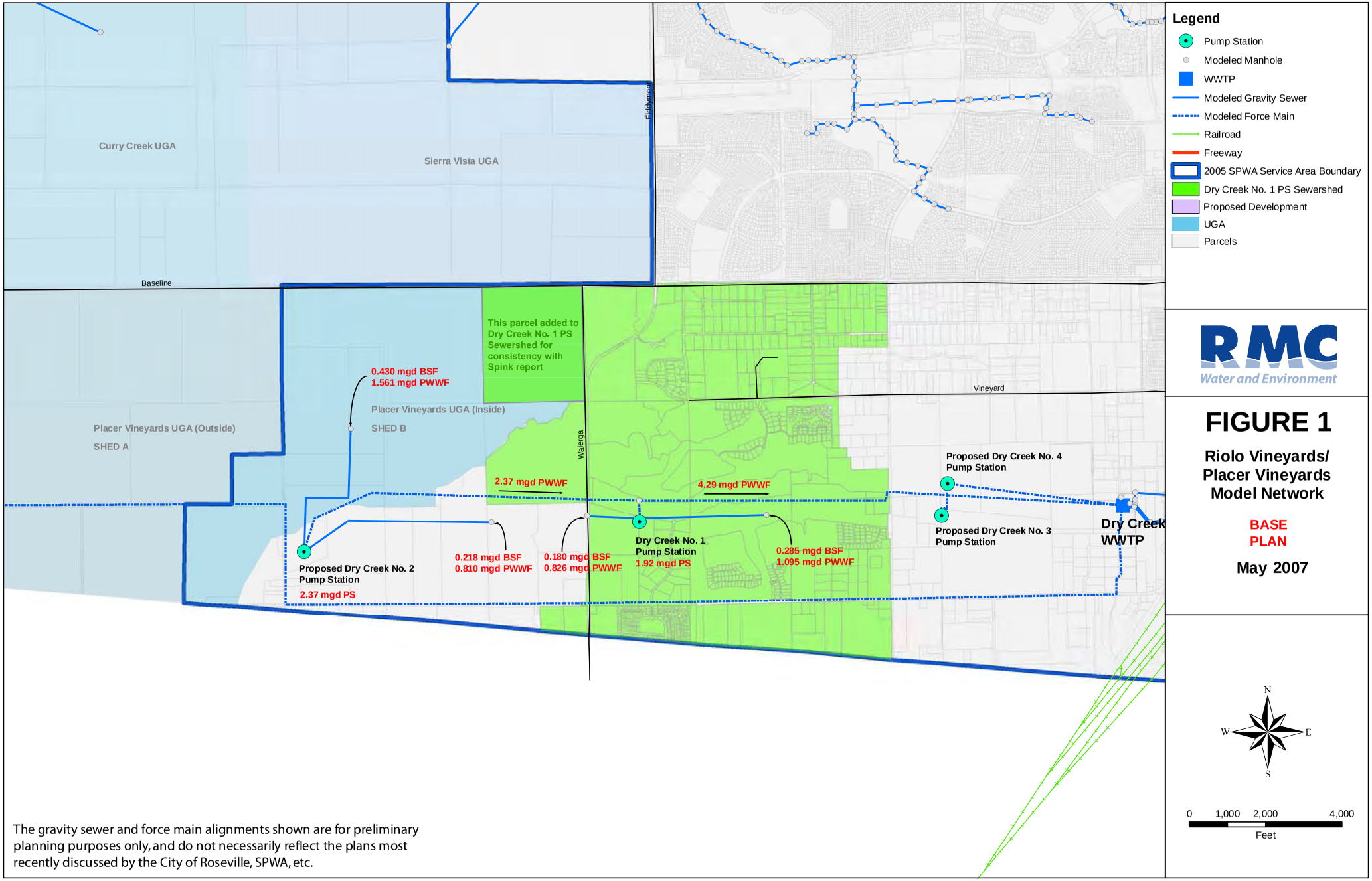


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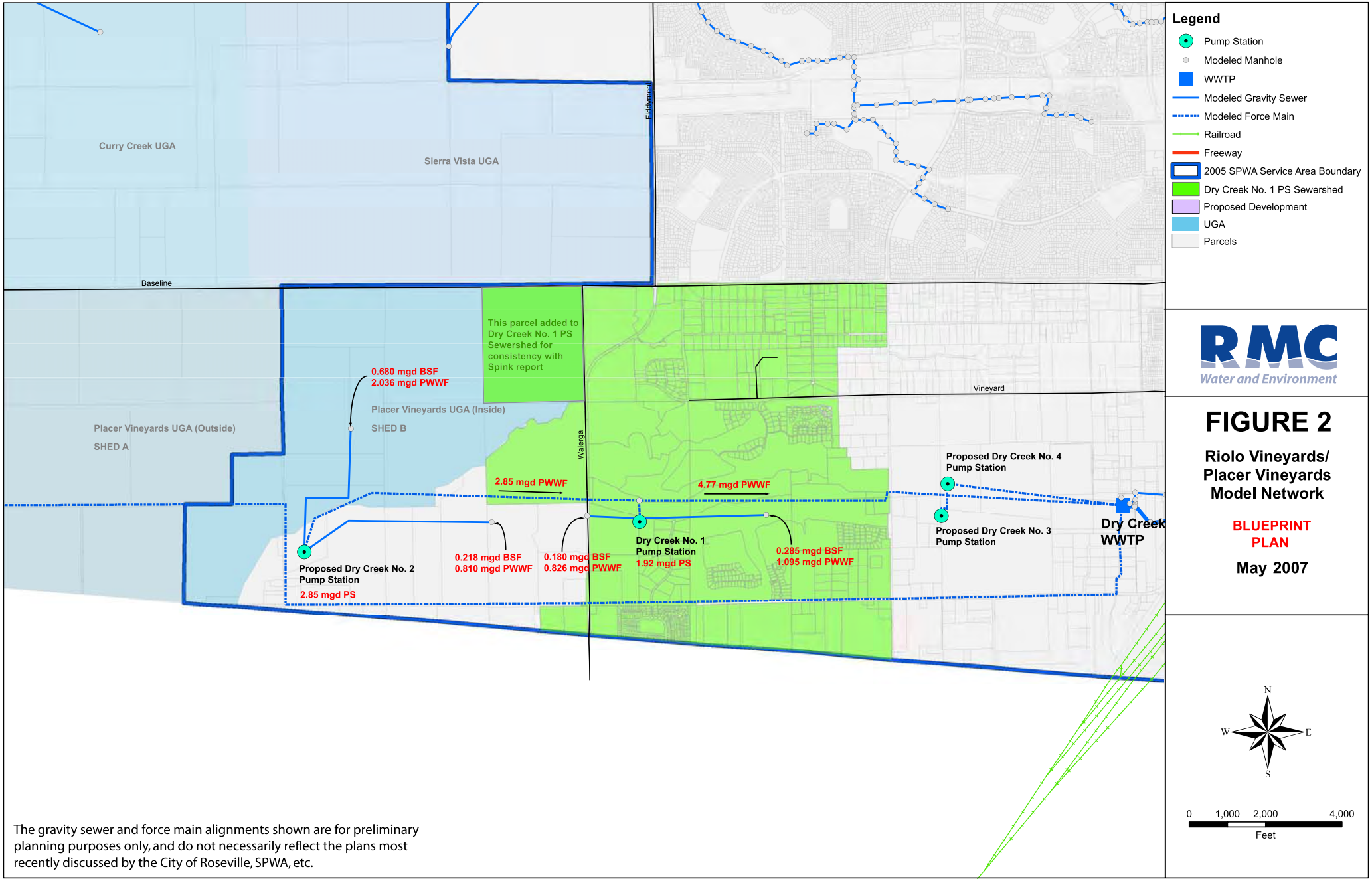
FIGURE 1

Riolo Vineyards/ Placer Vineyards Model Network

BASE PLAN

May 2007

The gravity sewer and force main alignments shown are for preliminary planning purposes only, and do not necessarily reflect the plans most recently discussed by the City of Roseville, SPWA, etc.



RMC Water and Environment

FIGURE 2

Riolo Vineyards/ Placer Vineyards Model Network

BLUEPRINT PLAN

May 2007

The gravity sewer and force main alignments shown are for preliminary planning purposes only, and do not necessarily reflect the plans most recently discussed by the City of Roseville, SPWA, etc.

Memorandum

Subject:	**Dry Creek No. 1 Pump Station Flows – Memo 2.1**
Prepared For:	Mike Smith, MacKay and Somps
Prepared by:	Andy Smith, RMC
Reviewed by:	Dave Richardson, RMC
Date:	May 16, 2007
Reference:	0201-001

1 Background

RMC was asked by MacKay and Somps to analyze the impacts of including a proposed development (including a school and church located directly to the south of the development) in the vicinity of the Dry Creek West Placer Community Facilities District # 1, Sewer Lift Station 1 (Dry Creek No. 1 Pump Station). Refer to Dry Creek No. 1 Pump Station Flows Memorandums 1, 2, and 3, dated October 18, 2006, November 11, 2006, and March 7, 2007, respectively, for summaries of previous investigations in and around this area. The purpose of this memorandum is to investigate the impacts of including flows from the proposed development (and the school and church to the south) to a proposed 8-inch diameter gravity sewer.

2 Hydraulic Model Modifications

Based on the information provided by MacKay and Somps, a new manhole (i.e., node) and 8-inch diameter gravity sewer were added to the hydraulic model to convey the wastewater flows from the proposed development to the Dry Creek No. 1 Pump Station. The flows from the parcels occupied by the proposed development and the school and church to the south were subtracted from nodes tributary to the proposed Dry Creek Nos. 2 and 1 Pump Stations, respectively, and reapplied to the new manhole. The subbasin acreages associated with the proposed development (and the school and church to the south) were similarly subtracted and reapplied.

3 Modeled Flow Projections

Two figures are presented in the following pages: Riolo Vineyards/Placer Vineyards Model Network – Base Plan (**Figure 1**), and Riolo Vineyards/Placer Vineyards Model Network – Blueprint Plan (**Figure 2**). Both figures focus on the area surrounding the proposed Riolo Vineyards development in southern Placer County[1]. The BSF and peak wet weather flow (PWWF) projections shown in the figures are based on hydraulic modeling results, which are presented below. The hydraulic model used to generate the results was developed using 1) land use information from the Placer Vineyards Specific Plan Sewer Master Plan (Base Plan) and the Placer Vineyards Specific Plan Sewer Master Plan – Blueprint Alternative (Blueprint), 2) information from the hydraulic model and land use GIS database developed for the South Placer Wastewater Authority (SPWA) South Placer Regional Wastewater and Recycled Water Systems Evaluation (Systems Evaluation), 3) BSF unit flow factors developed for the SPWA Systems Evaluation, and 4) information provided by MacKay and Somps.

[1] The gravity sewer and force main alignments shown in Figures 1 and 2 are for preliminary planning purposes only, and do not necessarily reflect the plans most recently discussed by the City of Roseville, SPWA, etc.

Model Results

The hydraulic model results indicate that approximately 0.826 million gallons per day (mgd) of wastewater would be conveyed through the existing 12-inch gravity sewer during PWWF conditions, independent of Placer Vineyards projected flows, and that approximately 0.182 mgd of wastewater would be conveyed through the proposed 8-inch gravity sewer during PWWF conditions, also independent of Placer Vineyards projected flows. The 0.182 mgd includes approximately 240 dwelling units associated with the development introduced in Section 1, as well as a school and church located directly south of this development. Approximately 2.10 mgd of wastewater would enter the Dry Creek No. 1 pump station during PWWF conditions, also independent of Placer Vineyards projected flows. Under the Base Plan scenario, approximately 2.18 mgd of wastewater from the proposed Dry Creek No. 2 pump station would join the flows from the Dry Creek No. 1 pump station in a common force main, totaling approximately 4.28 mgd under PWWF conditions. Under the Blueprint scenario, approximately 2.65 mgd of wastewater from the Dry Creek No. 2 pump station would join the flows from the Dry Creek No. 1 pump station, totaling approximately 4.75 mgd under PWWF conditions. As stated above, the flows entering the Dry Creek No. 1 pump station are independent of the potential flows from the Placer Vineyards Specific Plan scenario.

4 Analysis and Conclusions

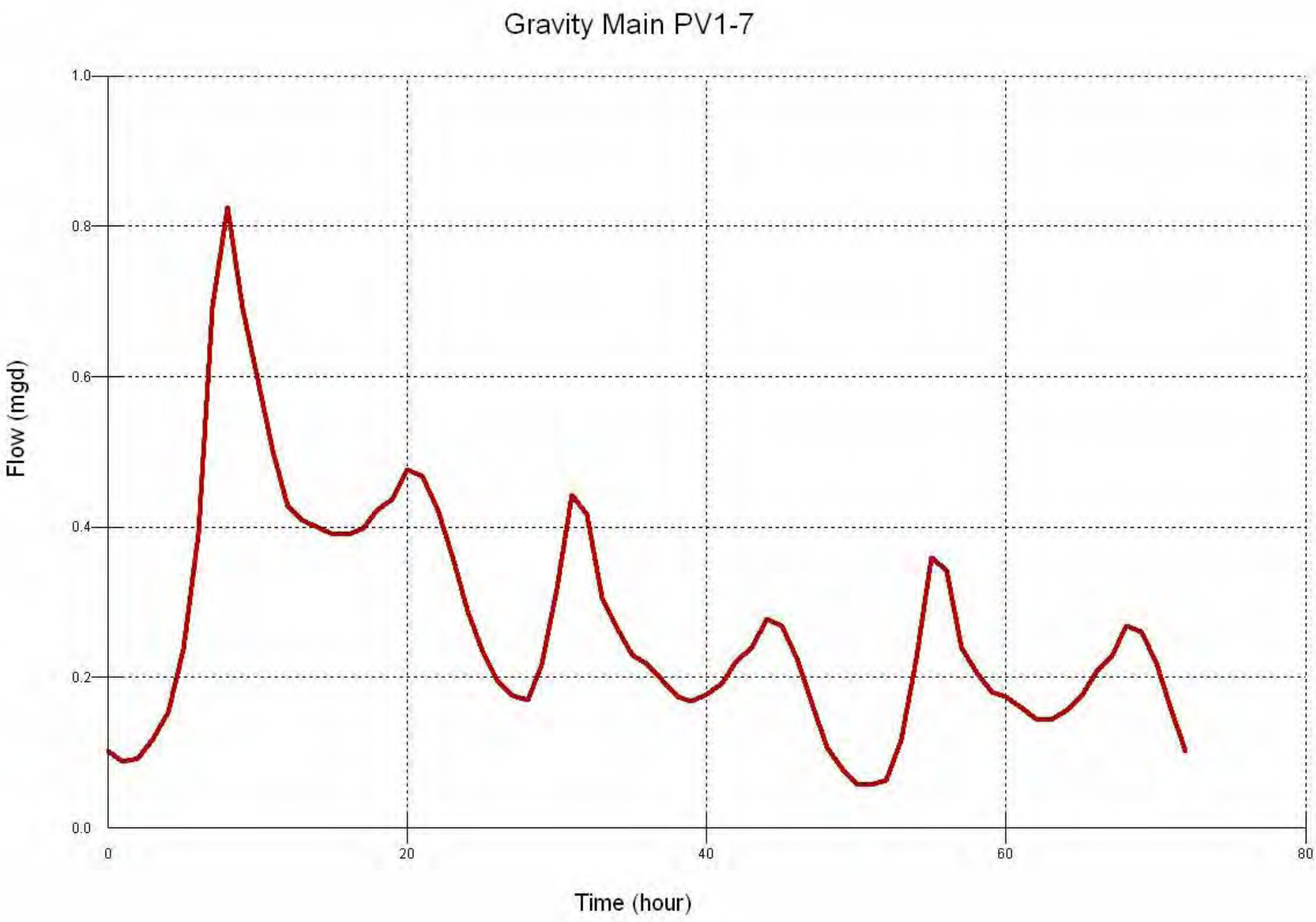
Flowing full at a slope of 0.002[2], the hydraulic capacity of the existing 12-inch diameter gravity sewer is 1.03 mgd. Based on the hydraulic model results, and if the proposed 8-inch sewer were to tie into the existing 12-inch sewer upstream of the pump station, 1.01 mgd would be conveyed through the downstream end of the existing 12-inch diameter gravity sewer during PWWF conditions. The hydraulic capacity of the sewer is greater than the 1.01 mgd PWWF indicated by the hydraulic modeling analysis performed for this memorandum. As such, it appears that there would be adequate capacity in the existing 12-inch diameter gravity sewer (to handle peak wastewater flows directed to it under the conditions described in this memorandum) if the hydraulic model methodology were used. **Attachment A** presents the model results for time-varying flow (not including the 0.182 mgd from the proposed 8-inch sewer) in the existing 12-inch diameter gravity sewer.

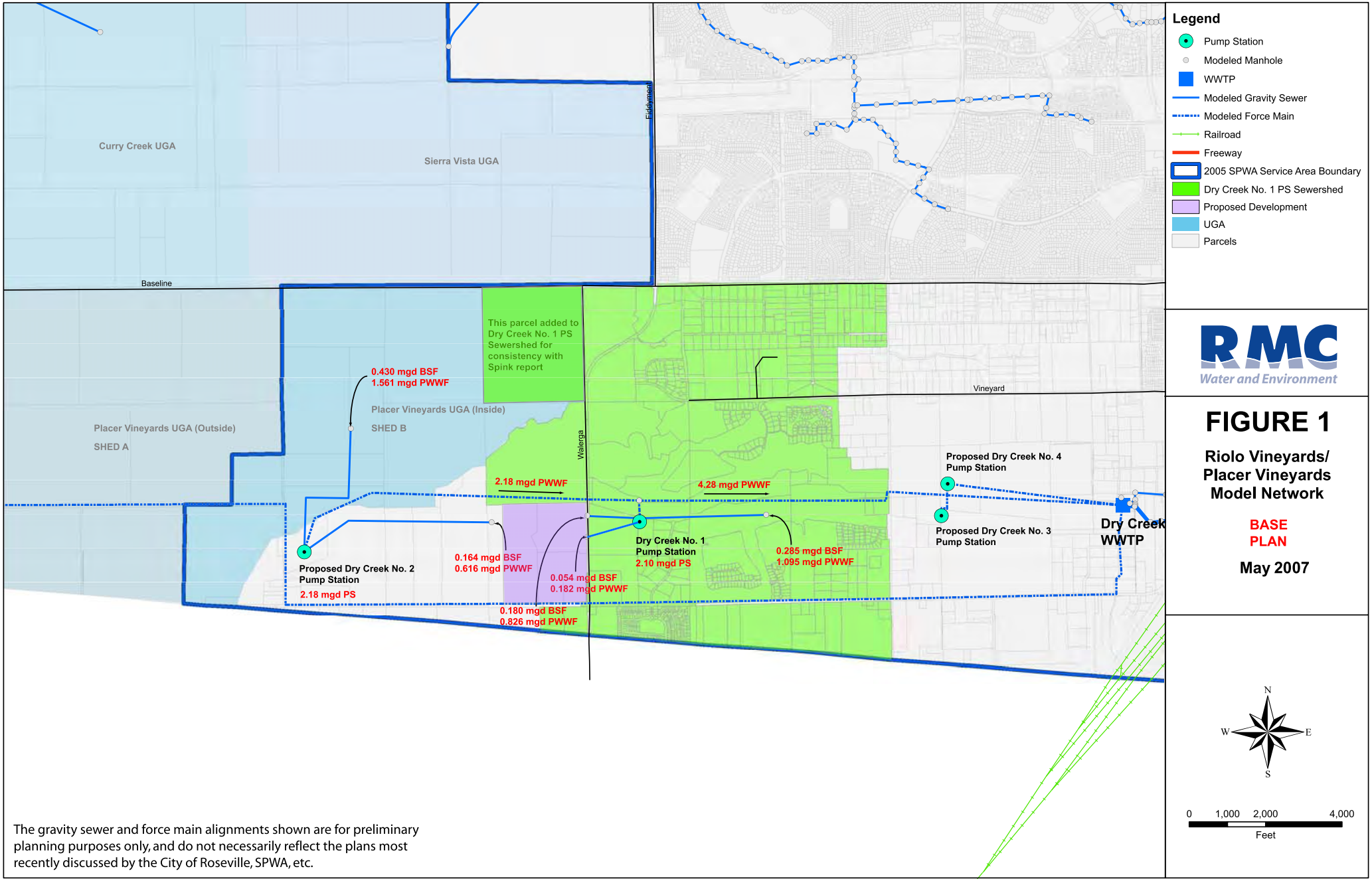
Flows to Dry Creek No. 1 pump station were previously estimated and presented in the Dry Creek West Placer Community Facilities District (CFD) # 1 Sewer Lift Station 1 and Pressure Sewers Preliminary Facilities Plan, prepared by the Spink Corporation in 1999. The Spink report presented a peak flow criteria of 2.314 mgd to the Dry Creek No. 1 pump station, which is greater than the 2.10 mgd PWWF indicated by the hydraulic modeling analysis performed for this memorandum. As such, it appears that there is adequate capacity at the Dry Creek No. 1 pump station to handle peak wastewater flows from the sewershed defined in **Figures 1 and 2**, including the proposed development described in Section 1.

[2] Per the Dry Creek West Placer Gravity Sewer "B" plans, dated February 14, 2001, the existing 12-inch gravity sewer has a slope of 0.002 feet/feet.

Attachment A

Modeling Results for Existing
12-inch Diameter Gravity Sewer


Gravity Main PV1-7
Flow (mgd)
1.0
0.8
0.6
0.4
0.2
0.0
0
20
40
60
80
Time (hour)



RMC
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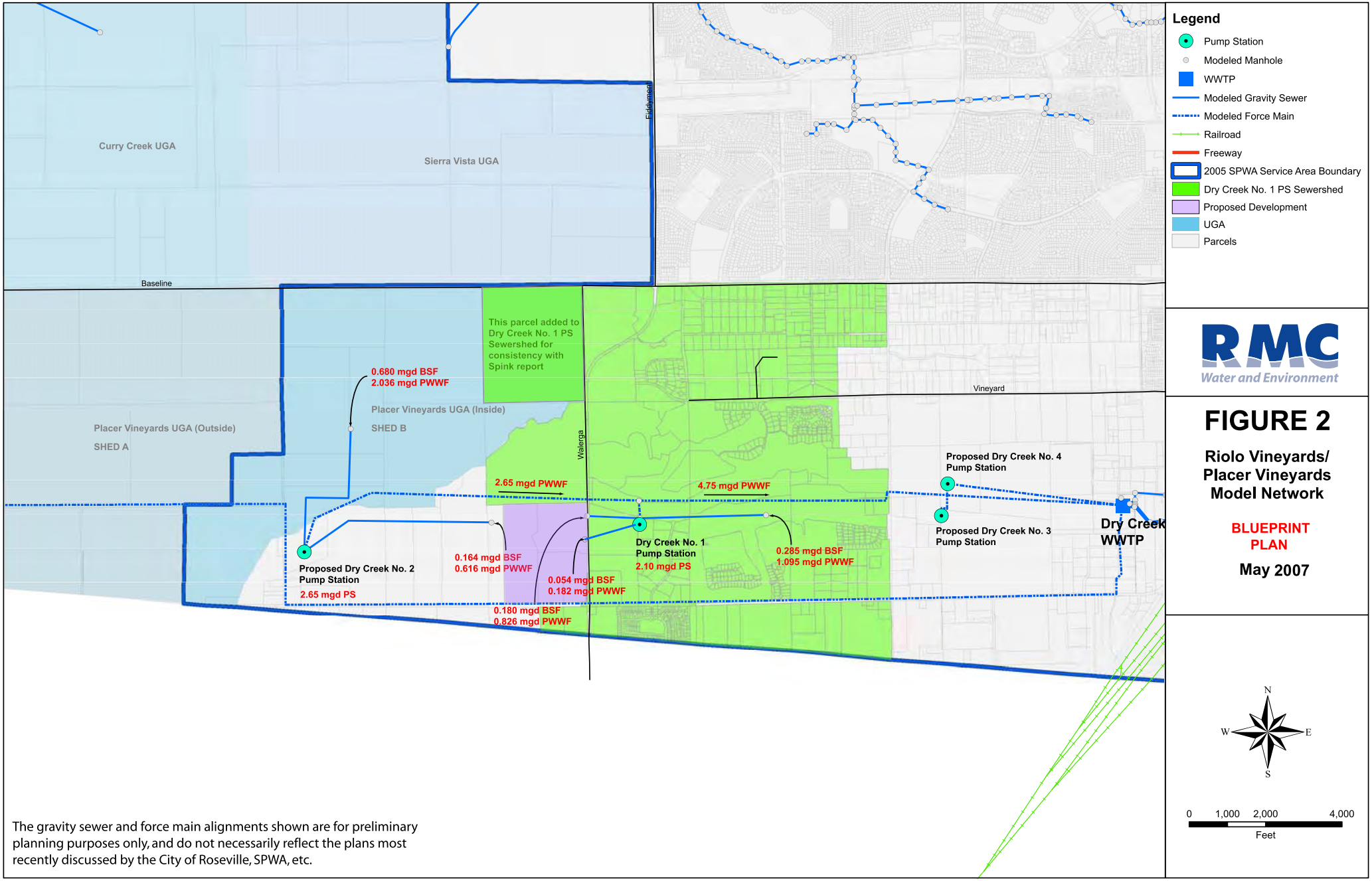
FIGURE 1

Riolo Vineyards/ Placer Vineyards Model Network

BASE PLAN

May 2007

The gravity sewer and force main alignments shown are for preliminary planning purposes only, and do not necessarily reflect the plans most recently discussed by the City of Roseville, SPWA, etc.



RMC Water and Environment

FIGURE 2

Riolo Vineyards/ Placer Vineyards Model Network

BLUEPRINT PLAN

May 2007

The gravity sewer and force main alignments shown are for preliminary planning purposes only, and do not necessarily reflect the plans most recently discussed by the City of Roseville, SPWA, etc.

Memorandum

Subject:	**Dry Creek No. 1 Pump Station Flows – Memo 3.1**
Prepared For:	Tim Stevens, MacKay and Somps
Prepared by:	Andy Smith, RMC
Reviewed by:	Dave Richardson, RMC
Date:	March 7, 2007
Reference:	0201-002

1 Background

RMC was asked by MacKay and Somps to analyze the impacts of including a proposed development in the vicinity of the Dry Creek West Placer Community Facilities District # 1, Sewer Lift Station 1 (Dry Creek No. 1 Pump Station). Refer to Dry Creek No. 1 Pump Station Flows Memorandums 1, 2, and 3, dated October 18, 2006, November 11, 2006, and March 7, 2007, respectively, for summaries of previous investigations in and around this area. The purpose of this memorandum is to investigate the impacts of including flows from the proposed development (and a school and church located directly to the south) in the existing 12-inch diameter gravity sewer to Dry Creek No. 1 Pump Station.

2 Hydraulic Model Modifications

The projected base sanitary flow (BSF) for the proposed development was applied to the node at the upstream end of the existing 12-inch gravity sewer. The subbasin acreage associated with the proposed development (and the school and the church to the south) was similarly applied. A manhole (i.e., node) and 8-inch diameter gravity sewer, which had been added during previous investigations by RMC to convey flows from the proposed development, were deleted from the hydraulic model.

3 Modeled Flow Projections

Two figures are presented in the following pages: Riolo Vineyards/Placer Vineyards Model Network – Base Plan (**Figure 1**), and Riolo Vineyards/Placer Vineyards Model Network – Blueprint Plan (**Figure 2**). Both figures focus on the area surrounding the proposed Riolo Vineyards development in southern Placer County[1]. The BSF and peak wet weather flow (PWWF) projections shown in the figures are based on hydraulic modeling results, which are presented below. The hydraulic model used to generate the results was developed using 1) land use information from the Placer Vineyards Specific Plan Sewer Master Plan (Base Plan) and the Placer Vineyards Specific Plan Sewer Master Plan – Blueprint Alternative (Blueprint), 2) information from the hydraulic model and land use GIS database developed for the South Placer Wastewater Authority (SPWA) South Placer Regional Wastewater and Recycled Water Systems Evaluation (Systems Evaluation), 3) BSF unit flow factors developed for the SPWA Systems Evaluation, and 4) information provided by MacKay and Somps.

Model Results

The hydraulic model results indicate that approximately 0.997 million gallons per day (mgd) of wastewater would be conveyed through the existing 12-inch gravity sewer during PWWF conditions,

[1] The gravity sewer and force main alignments shown in Figures 1 and 2 are for preliminary planning purposes only, and do not necessarily reflect the plans most recently discussed by the City of Roseville, SPWA, etc.

independent of Placer Vineyards projected flows. This flow includes approximately 240 dwelling units associated with the development introduced in Section 1. Approximately 2.09 mgd of wastewater would enter the Dry Creek No. 1 pump station during PWWF conditions, also independent of Placer Vineyards projected flows. Under the Base Plan scenario, approximately 2.18 mgd of wastewater from the proposed Dry Creek No. 2 pump station would join the flows from the Dry Creek No. 1 pump station in a common force main, totaling approximately 4.27 mgd under PWWF conditions. Under the Blueprint scenario, approximately 2.65 mgd of wastewater from the Dry Creek No. 2 pump station would join the flows from the Dry Creek No. 1 pump station, totaling approximately 4.74 mgd under PWWF conditions. As stated above, the flows entering the Dry Creek No. 1 pump station are independent of the potential flows from the Placer Vineyards Specific Plan scenario.

4 Analysis and Conclusions

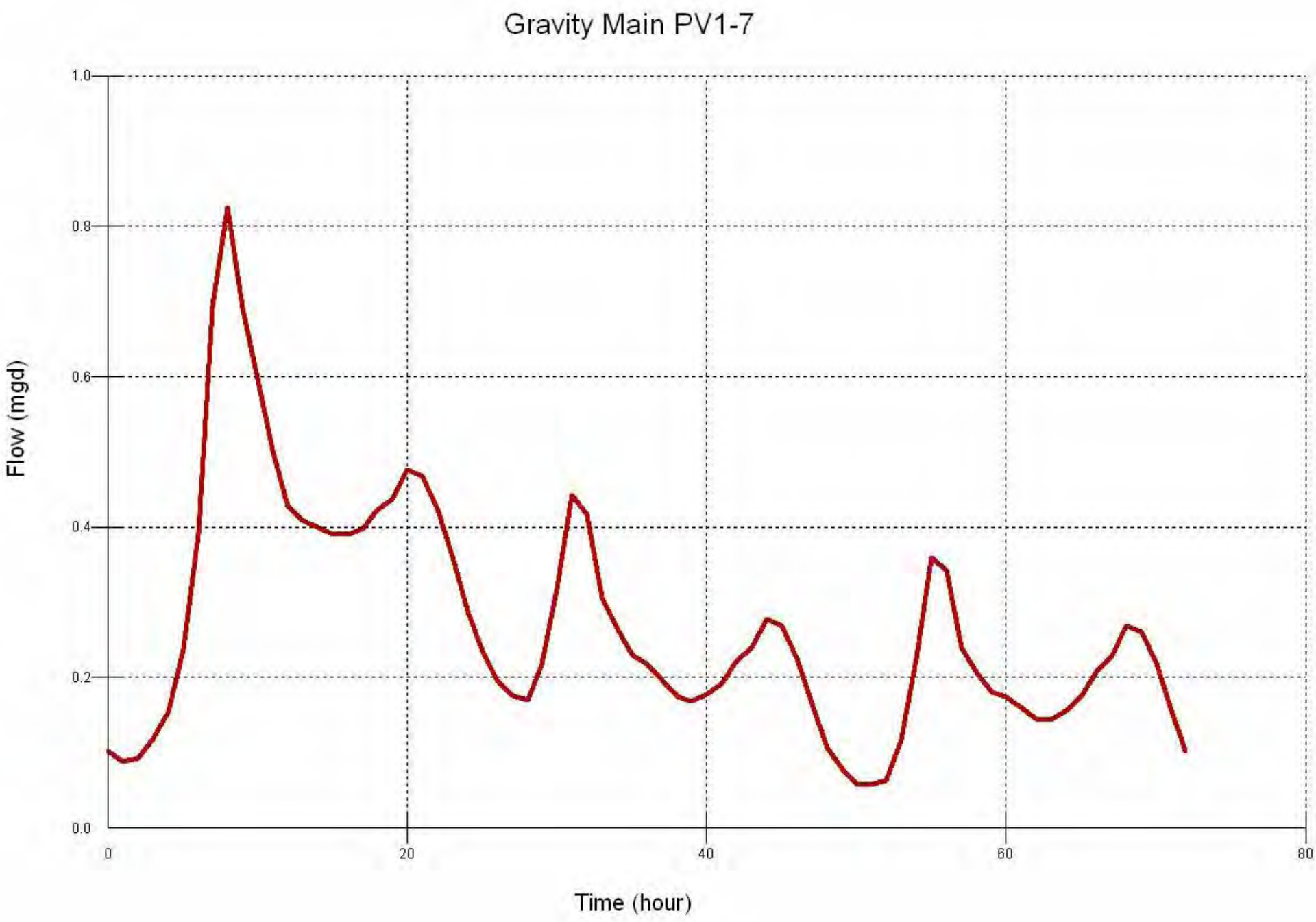
Flowing full at a slope of 0.002[2], the hydraulic capacity of the existing 12-inch diameter gravity sewer is 1.03 mgd. Based on the hydraulic model results, 0.997 mgd would be conveyed through the existing 12-inch diameter gravity sewer during PWWF conditions. The hydraulic capacity of the sewer is greater than the 0.997 mgd PWWF indicated by the hydraulic modeling analysis performed for this memorandum. As such, it appears that there would be adequate capacity in the existing 12-inch diameter gravity sewer (to handle peak wastewater flows from the proposed development described in Section 1) if the hydraulic model methodology were used. **Attachment A** presents the model results for time-varying flow in the existing 12-inch diameter gravity sewer.

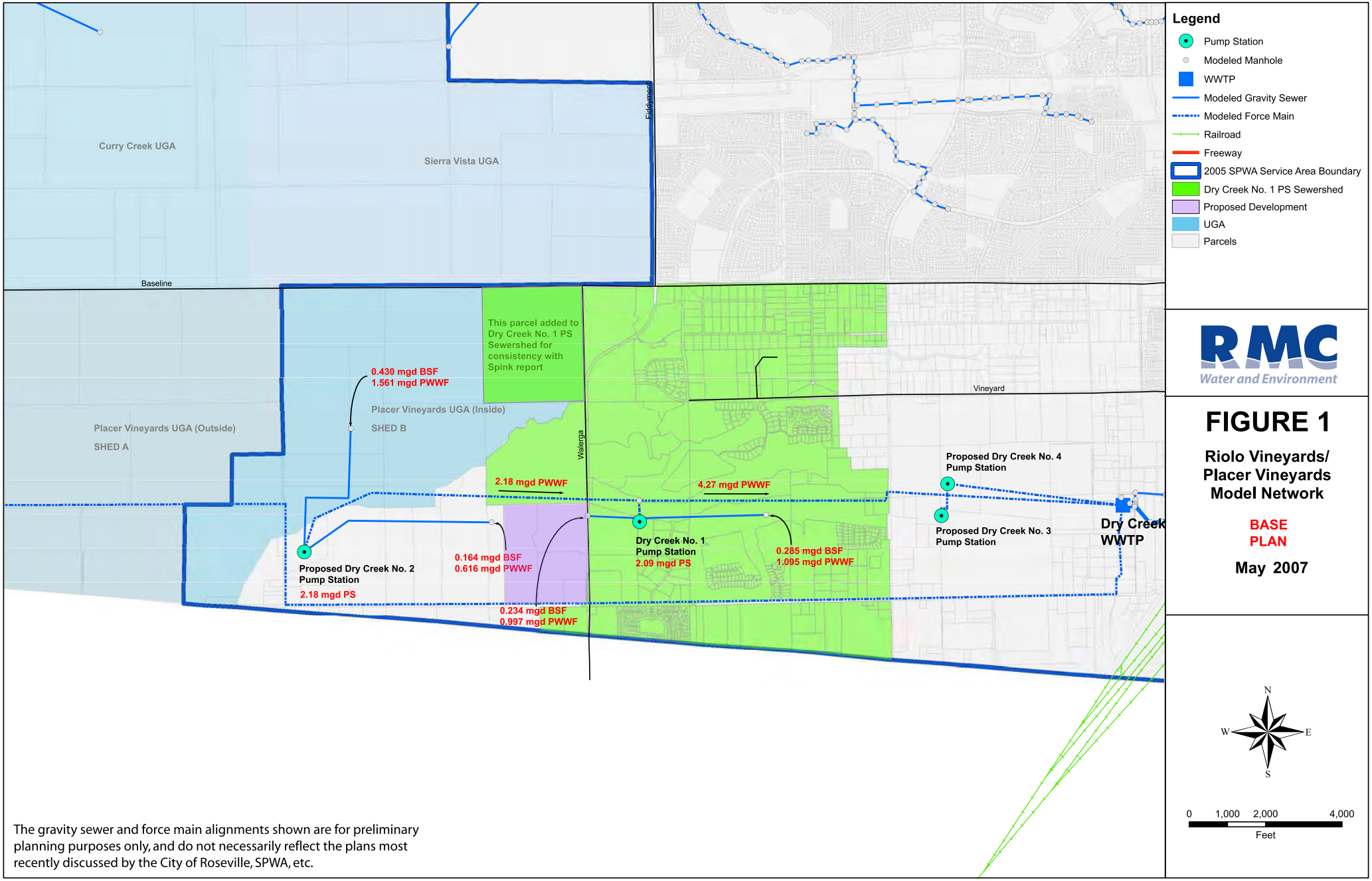
Flows to Dry Creek No. 1 pump station were previously estimated and presented in the Dry Creek West Placer Community Facilities District (CFD) # 1 Sewer Lift Station 1 and Pressure Sewers Preliminary Facilities Plan, prepared by the Spink Corporation in 1999. The Spink report presented a peak flow criteria of 2.314 mgd to the Dry Creek No. 1 pump station, which is greater than the 2.09 mgd PWWF indicated by the hydraulic modeling analysis performed for this memorandum. As such, it appears that there is adequate capacity at the Dry Creek No. 1 pump station to handle peak wastewater flows from the sewershed defined in **Figures 1 and 2**, including the proposed development described in Section 1.

[2] Per the Dry Creek West Placer Gravity Sewer "B" plans, dated February 14, 2001, the existing 12-inch gravity sewer has a slope of 0.002 feet/feet.

Attachment A

Modeling Results for Existing
12-inch Diameter Gravity Sewer


Gravity Main PV1-7
Flow (mgd)
1.0
0.8
0.6
0.4
0.2
0.0
0
20
40
60
80
Time (hour)



RMC Water and Environment

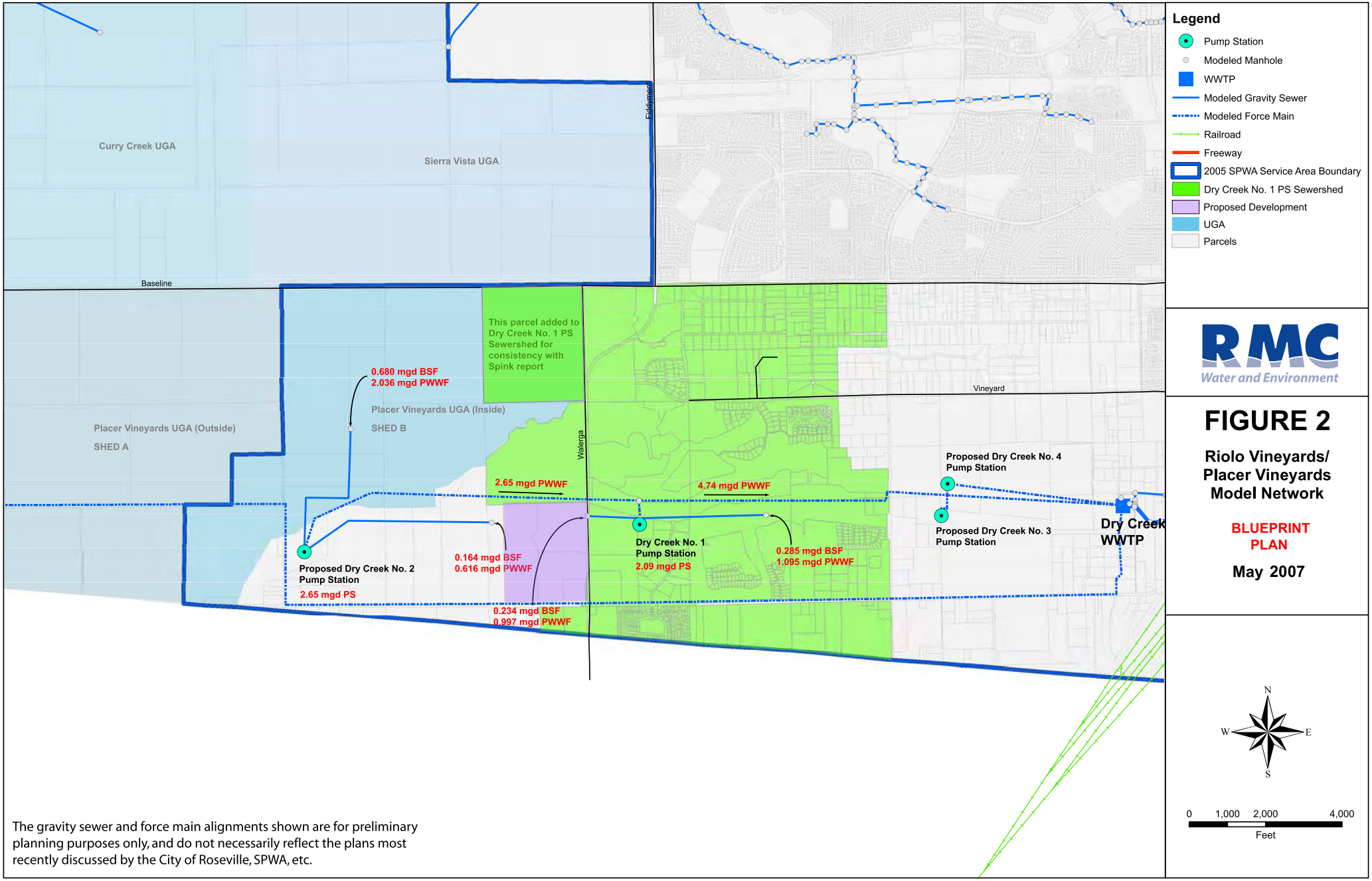
FIGURE 1

Riolo Vineyards/ Placer Vineyards Model Network

BASE PLAN

May 2007

The gravity sewer and force main alignments shown are for preliminary planning purposes only, and do not necessarily reflect the plans most recently discussed by the City of Roseville, SPWA, etc.



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Water and Environment

FIGURE 2

Riolo Vineyards/ Placer Vineyards Model Network

BLUEPRINT PLAN

May 2007

The gravity sewer and force main alignments shown are for preliminary planning purposes only, and do not necessarily reflect the plans most recently discussed by the City of Roseville, SPWA, etc.

ATTACHMENT #4

Appendix D TM 2b – Dry Weather Flow Projections for Ultimate Service Area (w/ UGAs)

Technical Memorandum

South Placer Regional Wastewater and Recycled Water Systems Evaluation

Subject:	**Average Dry Weather Flow Projection for the Ultimate SPWA Service Area (Including Urban Growth Areas) -- (TM No. 2b)**
Prepared For:	Art O'Brien – City of Roseville
Prepared by:	Pete Bellows/Chris Peters – Brown and Caldwell Andy Smith – RMC
Reviewed by:	Dave Richardson/Gisa Ju – RMC
Date:	November 4, 2005; updated October 31, 2006, January 24, 2008 & September 3, 2009
Reference:	0091-004 Task 2

0 Previous TM Publication and Updates

Since the initial publication of technical memorandum (TM) 2b on November 4, 2005, changes in information available for the South Placer Wastewater and Recycled Water Systems Evaluation (Systems Evaluation), as well as changes in the data, have resulted in the need to identify and update out-of-date information. As part of the June 2007 publication of the Systems Evaluation, an Update Sheet was prepared for this TM, and is included in **Attachment B**. Subsequent changes have resulted in the need for further updates of the TM. The newest version of the TM is consistent with the updates summarized in the 2009 Update Sheet which is included in **Attachment C**.

1 Introduction

This TM summarizes the average dry weather wastewater flow (ADWF) projections for buildout conditions within the Ultimate SPWA service area. This includes flows generated within the 2005 Regional Service Area boundary and flows generated within the Urban Growth Areas (UGAs) located outside the 2005 Regional Service Area boundary. ADWF projections are used to project flows for the analysis of the SPWA wastewater treatment plants.

This TM is a supplement to the *Dry Weather Flow Projection for the 2005 Regional Service Area TM* (TM No. 2a) which summarized flow projections within the 2005 Regional Service Area. Further discussion of wastewater flow components, flow monitoring, development of the base sanitary flow (BSF) unit factors, and groundwater infiltration (GWI) is presented in TM No. 2a.

2 Buildout Land Use

Development of the buildout land use map (including UGAs), land use code designations, and connected land use is documented in the *June 2004 and Buildout Land Use TM* (TM No. 1b). Buildout land use is based on buildout within the Ultimate Service Area as shown in **Figure 1**. For the buildout condition, all parcels are considered to be connected to the wastewater collection system even though some land uses in the "Open Space" category do not generate wastewater. Buildout land use acreages for connected parcels within the Ultimate Service Area are summarized in **Table 1** and **Table 2**. Detailed land use summaries for each UGA are provided in **Attachment A** and TM No. 1b.

The total buildout acreage within the SPWA Ultimate Service Area is 74,522 acres. This includes 30,637 acres in the Pleasant Grove watershed and 43,253 acres in the Dry Creek watershed.

Table 1: Buildout Land Use Summary within the 2005 Regional Service Area

Land Use Designation	Buildout Connected Area (Acres)		Total Buildout Connected Area (Acres[1,2])
	Pleasant Grove Watershed[1]	Dry Creek Watershed[2]	
Commercial	2,151	2,915	5,066
Heavy Industrial	1,715	263	1,979
Light Industrial	1,599	637	2,236
Mixed Use	13	12	25
Open Space	7,318	3,502	10,820
Parks > 10 Acres	303	361	664
Public/Quasi-Public	327	878	1,206
Residential 1 DU	7,629	18,859	26,488
Residential 2 DU	0	839	839
Residential 3 DU	9	366	375
Residential Multiple DU	789	635	1,424
Schools	377	540	917
Total Acreage	**22,231**	**29,808**	**52,039**

[1] Includes portion of Placer Ranch UGA within the 2005 Regional Service Area.
[2] Includes portion of Placer Vineyards UGA within the 2005 Regional Service Area.

Table 2: Buildout Land Use Summary within Urban Growth Areas

Urban Growth Area (UGA)	Buildout Connected Area (Acres)		Total Buildout Connected Area (Acres)
	Pleasant Grove Watershed	Dry Creek Watershed	
Curry Creek UGA	3,212	--	3,212
Regional University UGA	1,140	--	1,140
Inviro Tech UGA	5	--	5
Placer UGA	--	630	630
Orchard Creek	25	--	25
Placer Ranch [1]	807	--	807
Placer Vineyards [1]	--	4,806	4,806
SMD-3	--	2,231	2,231
SPMUD UGA	--	6,410	6,410
Creekview UGA [2]	749		749
Sierra Vista UGA	1,785		1,785
Brookfield UGA	683		683
Total Acreage	**8,406**	**14,077**	**22,483**

[1] Does not include portions of Placer Ranch or Placer Vineyards UGAs within the 2005 Regional Service Area.
[2] "Panhandle" refers to a 238-acre portion of the Reason Farms planning area that is adjacent to the western boundary of the 511-acre Creekview UGA. Though not considered a UGA, the panhandle area is assumed to contribute wastewater flow to the Creekview UGA.

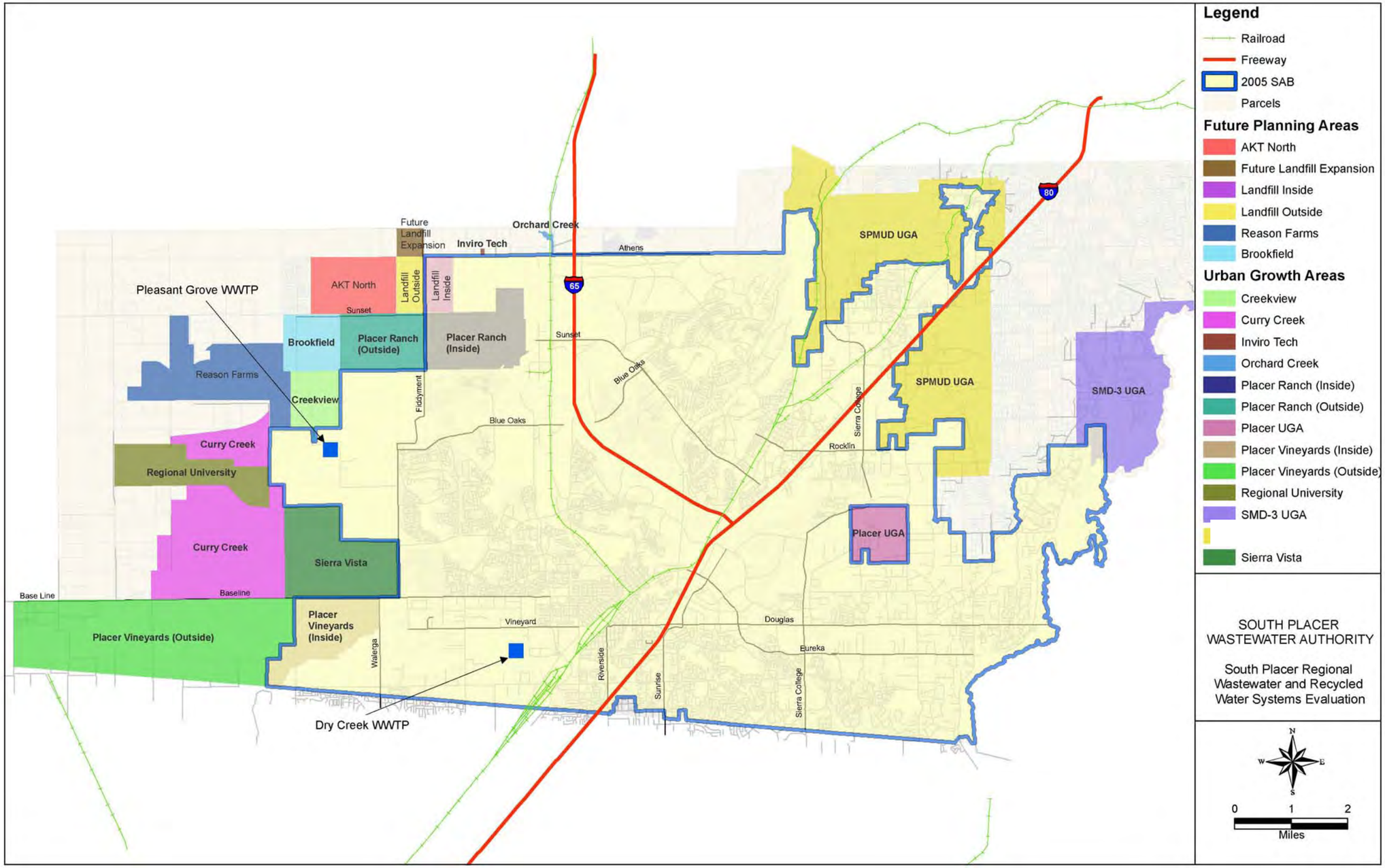


Figure 1 – Buildout Land Use Map Including UGAs

3 Point Sources

Seven existing point sources were identified within the 2005 Regional Service Area based on discussions with SPWA member agencies. Information about point sources is summarized in **Table 3**. There are also three point sources located within UGAs. These point source flows are included with the UGA flow projections presented later in this TM and the UGA flow projection worksheets provided in **Attachment A**. Existing point sources in the 2005 Regional Service Area were identified from flow monitoring and water billing information. The Placer County Landfill was also identified as a point source because it generates very little wastewater flow in comparison to its land area. Buildout flow projections from NEC and HP were provided by the City of Roseville and are based on buildout conditions for each development.

Table 3: June 2004 and Buildout ADWF from Point Sources in the June 2004 Service Area

Point Source	Location	Current Flow Data Source	Current ADWF (gpd)	Projected Buildout ADWF (gpd)
Union Pacific Railroad	Roseville	City of Roseville	85,000	85,000
Landfill	Placer County	City of Roseville	5,000	5,000
NEC	Roseville	Flow Monitor Data	700,000	2,000,000
HP	Roseville	City of Roseville	150,000	484,000
Kaiser Hospital	Roseville	Water Use Data	50,000	50,000
Formica	Placer County	Placer County	60,000	60,000
Rio Bravo Power Plant	Placer County	Placer County	15,000	15,000

Notes: Flow projections are based upon existing land use and existing land use designations current as of June 2004, and will provide the estimated flows for baseline modeling scenario for SPWA. Rezoning of HP and Kaiser Hospital properties are now better known than in June 2004, and are documented in TM No. 9b, and are included in a "Land Use intensification Scenario".

4 Unit Flow Factors

Information about the development of unit flow factors used for the WWTP expansion analysis is discussed in the Dry Weather Flow Projection for the 2005 Regional Service Area TM (TM No. 2a). The 2005 unit flow factors for the buildout scenario are presented in **Table 4**. Unit flow factors for single family residential are applied on a per dwelling unit (du) basis while unit flow factors for other land uses are applied on an acreage basis.

Table 4: 2005 Average Dry Weather Flow (ADWF) Factors

Land Use Designation	Units	2005 Unit Flow Factors WWTP Analysis[1]	1996 Master Plan Unit Flow Factor
Commercial	gpd per acre	850	1,040
Heavy Industrial	gpd per acre	850	1,560
Light Industrial	gpd per acre	850	1,040
Mixed Use	gpd per acre	2,300	N/A
Public/Quasi-Public	gpd per acre	660	1,040
Schools	gpd per acre	170	N/A
Residential 1 DU	gpd per du	190	260
Residential 2 DU	gpd per du	190	260
Residential 3 DU	gpd per du	190	260
Residential Mult. DU	gpd per acre	2,040[2]	4,160
Open Space	gpd per acre	0	0
Parks > 10 Acres	gpd per acre	10	N/A
Vacant	gpd per acre	0	0

[1] Includes allowance for dry season GWI.
[2] The 2005 Residential Multiple DU unit flow factor can also be represented as 130 gpd per du

5 Buildout Flow Projections

Buildout ADWF projections within the Ultimate SPWA Service Area are based on the unit ADWF factors developed for the WWTP analysis above (includes dry season GWI). These flow projections include the results of proposed redevelopment/intensification within Roseville and Rocklin, which were analyzed as a separate scenario and are presented in detail in the *Intensification Land Use TM* (TM No. 9c). Buildout ADWF projections within the 2005 Regional Service Area are presented in **Table 5**. Buildout average dry weather flow projections within the Ultimate SPWA Service Area (including UGAs) are presented in **Table 6**. Detailed flow projections for each UGA are presented in **Attachment A** at the end of this TM.

Table 5: Buildout ADWF Projections within 2005 Regional Service Area

Land Use	Unit Flow Factor	PG WWTP[3] Buildout Units (ac or du)	PG WWTP[3] Buildout ADWF (mgd)	DC WWTP[4] Buildout Units (ac or du)	DC WWTP[4] Buildout ADWF (mgd)	2005 Regional Service Area Buildout Units (ac or du)	2005 Regional Service Area Buildout ADWF (mgd)
Commercial	850 gpd/ac	1,728	1.47	2,890	2.46	4,618	3.92
Heavy Industrial[1]	850 gpd/ac	1,680	1.43	263	0.22	1,943	1.65
Light Industrial[1]	850 gpd/ac	1,221	1.04	637	0.54	1,858	1.58
Mixed Use	2,300 gpd/ac	-	-	7	0.02	7	0.02
Public/Quasi-Public[1]	660 gpd/ac	282	0.19	851	0.56	1,133	0.75
Schools	170 gpd/ac	258	0.04	540	0.09	798	0.14
Residential 1 DU	190 gpd/du	26,893	5.11	42,866	8.14	69,759	13.25
Residential 2 DU	190 gpd/du	2	0.0004	2,122	0.40	2,124	0.40
Residential 3 DU	190 gpd/du	12	0.002	720	0.14	732	0.14
Residential Multiple DU	2,040 gpd/ac	594	1.21	606	1.24	1,200	2.45
Open Space	0 gpd/ac	6,034	-	3,171	-	9,205	-
Parks > 10 Acres	10 gpd/ac	270	0.003	361	0.004	631	0.01
Point Sources	Varies gpd/ac	1,043	2.56	91	0.14	1,134	2.70
Placer Ranch[2]	Varies gpd/ac	1,027	0.90	-	-	1,027	0.90
West Roseville[2]	Varies gpd/ac	3,162	2.07	-	-	3,162	1.70
Placer Vineyards[2]	Varies gpd/ac	-	-	1,062	0.58	1,062	0.58
Rezones	Varies gpd/ac	-	0.50	-	0.17	-	0.67
Intensification	Varies gpd/ac	-	-	-	1.64	-	1.64
	Total (mgd)		**16.52**		**16.34**		**32.86**

[1] Land use category does not include area of parcels associated with point sources identified in **Table 3**.
[2] Includes portion of development located within the 2005 Regional Service Area.
[3] Pleasant Grove WWTP Service Area
[4] Dry Creek WWTP Service Area
[5] Includes all of WRSP, located entirely inside of the 2005 Regional Service Area boundary

Table 6: Buildout ADWF Projections within Ultimate SPWA Service Area

Description of Area	Buildout ADWF (mgd)		Total Buildout ADWF (mgd)
	PGWWTP[3]	DCWWTP[4]	
2005 Regional Service Area	16.52	16.34	32.86
Curry Creek UGA	2.72	-	2.72
Regional University UGA	1.17	-	1.17
Inviro Tech UGA	0.08	-	0.08
Placer UGA	-	0.01	0.01
Orchard Creek UGA	0.02	-	0.02
Placer Ranch UGA	1.27	-	1.27
Placer Vineyards UGA	-	2.23	2.23
SMD-3 UGA	-	0.29	0.29
SPMUD UGA	-	1.11	1.11
Creekview UGA and Panhandle[5]	1.06	-	1.06
Sierra Vista UGA	2.10	-	2.10
Brookfield UGA	0.73	-	0.73
Total ADWF (mgd)	**25.67**	**19.99**	**45.64**

[1] Includes portion of Placer Ranch UGA within the 2005 Regional Service Area.
[2] Includes portion of Placer Vineyards UGA within the 2005 Regional Service Area.
[3] Pleasant Grove WWTP Service Area
[4] Dry Creek WWTP Service Area
[5] "Panhandle" refers to a 238-acre portion of the Reason Farms planning area that is adjacent to the western boundary of the 511-acre Creekview UGA. The panhandle area is assumed to contribute wastewater flow to the Creekview UGA.

Attachment A

Urban Growth Area Flow Projections

CURRY CREEK UGA

PLEASANT GROVE WATERSHED

Connected Land Use Description	Units	DU or Area (acres)	Unit Flow Factor (gpd)	(gpd)
OPEN SPACE	Acres	931	-	-
COMMERCIAL	Acres	161	850	136,850
HEAVY INDUSTRIAL	Acres	64	850	54,400
LIGHT INDUSTRIAL	Acres	161	850	136,850
MIXED USE	Acres	64	2,300	147,200
PUBLIC/QUASI-PUBLIC	Acres	161	660	106,260
SCHOOLS	Acres	96	170	16,320
RESIDENTIAL 1 DU	DU	8,988	190	1,707,720
RESIDENTIAL 2 DU	DU	-	190	-
RESIDENTIAL 3 DU	DU	-	190	-
RESIDENTIAL MULTIPLE DU	DU	3,210	130	417,300
Total				2,722,900
Total (mgd)				**2.72**

REGIONAL UNIVERSITY UGA

PLEASANT GROVE WATERSHED

Connected Land Use Description	Units	DU or Area (acres)	Unit Flow Factor (gpd)	(gpd)
OPEN SPACE	Acres	149	-	-
COMMERCIAL	Acres	22	850	18,870
HEAVY INDUSTRIAL	Acres	-	850	-
LIGHT INDUSTRIAL	Acres	-	850	-
MIXED USE	Acres	-	2,300	-
PUBLIC/QUASI-PUBLIC	Acres	10	660	6,864
SCHOOLS	Acres	31	170	5,270
RESIDENTIAL 1 DU	DU	2,226	190	422,940
RESIDENTIAL 2 DU	DU	-	190	-
RESIDENTIAL 3 DU	DU	-	190	-
RESIDENTIAL MULTIPLE DU	DU	1,006	130	130,780
Point Sources				
UNIVERSITY				582,600
Total				1,167,324
Total (mgd)				**1.17**

INVIRO TECH UGA

PLEASANT GROVE WATERSHED

Connected Land Use Description	Units	DU or Area (acres)	Unit Flow Factor (gpd)	(gpd)
OPEN SPACE	Acres	0	0	0
COMMERCIAL	Acres	0	850	0
HEAVY INDUSTRIAL	Acres	0	850	0
LIGHT INDUSTRIAL	Acres	0	850	0
MIXED USE	Acres	0	2,300	0
PUBLIC/QUASI-PUBLIC	Acres	0	660	0
SCHOOLS	Acres	0	170	0
RESIDENTIAL 1 DU	DU	0	190	0
RESIDENTIAL 2 DU	DU	0	190	0
RESIDENTIAL 3 DU	DU	0	190	0
RESIDENTIAL MULTIPLE DU	DU	0	130	0
Point Sources				
INVIRO TECH				80,000
Total				80,000
Total (mgd)				**0.08**

PLACER RANCH UGA (OUTSIDE 2005 REGIONAL SERVICE AREA)

PLEASANT GROVE WATERSHED

Connected Land Use Description	Units	DU or Area (acres)	Unit Flow Factor (gpd)	(gpd)
OPEN SPACE	Acres	74	-	-
COMMERCIAL	Acres	67	850	56,610
HEAVY INDUSTRIAL	Acres	-	850	-
LIGHT INDUSTRIAL	Acres	29	850	24,650
MIXED USE	Acres	20	2,300	46,460
PUBLIC/QUASI-PUBLIC	Acres	21	660	14,058
SCHOOLS	Acres	30	170	5,100
RESIDENTIAL 1 DU	DU	2,046	190	388,683
RESIDENTIAL 2 DU	DU	-	190	-
RESIDENTIAL 3 DU	DU	-	190	-
RESIDENTIAL MULTIPLE DU	DU	2,281	130	296,582
Point Sources				
UNIVERSITY [a]				440,000
Total				1,272,143
Total [b] (mgd)				**1.27**

Footnotes:
(a) Does not include faculty housing, which is included in the Residential categories above.
(b) 1.27 mgd does not include flows from "offsite" areas.

CREEKVIEW UGA & PANHANDLE [a]

PLEASANT GROVE WATERSHED

Connected Land Use Description	Units	DU or Area (acres)	Unit Flow Factor (gpd)	(gpd)
OPEN SPACE	Acres	248	-	-
COMMERCIAL	Acres	11	850	9,435
HEAVY INDUSTRIAL	Acres	-	850	-
LIGHT INDUSTRIAL	Acres	9	850	7,225
MIXED USE	Acres	12	2,300	27,600
PUBLIC/QUASI-PUBLIC	Acres	3	660	2,046
SCHOOLS	Acres	11	170	1,785
RESIDENTIAL 1 DU	DU	1,593	190	302,670
RESIDENTIAL 2 DU	DU		190	-
RESIDENTIAL 3 DU	DU		190	-
RESIDENTIAL MULTIPLE DU	DU	1,170	130	152,100
Total				502,861
Point Sources *(From Panhandle Area)*				
From North Panhandle Area [a,b]				
MDH (Faculty Housing)	DU	96	190	18,240
Commercial (Hotel)	DU	150	190	28,500
Commercial (Athletic Club)	acres	1	850	850
From South Panhandle Area [c]				
University [d]	acres	221	2,304	509,184
Total (mgd)				**1.06**

Footnotes:

(a) "North Panhandle" refers to the portion of the Reason Farms panhandle that is north of Pleasant Grove Creek; this area is adjacent to the western boundary of the Creekview UGA. This area is assumed to contribute wastewater flow to the Creekview UGA.

(b) As of July 2007, several development scenarios were under consideration for the North Panhandle area. The scenarios associated with the highest flow estimates are included here.

(c) The entire "Panhandle" area comprises approximately 238 acres. Subtracting 17 acres (Wood Rodgers) for the North Panhandle area yields 221 acres remaining for a proposed private university in the "South Panhandle" area.

(d) The unit flow factor for the university was derived by dividing the total flow projection for the university in the Placer Ranch UGA (0.68 mgd) by its corresponding acreage (295 acres), yielding 2,304 gpad.

SIERRA VISTA UGA

PLEASANT GROVE WATERSHED

Connected Land Use Description	Units	DU or Area (acres)	Unit Flow Factor (gpd)	(gpd)
OPEN SPACE [a]	Acres	412	-	-
COMMERCIAL	Acres	220	850	187,000
HEAVY INDUSTRIAL	Acres	-	850	-
LIGHT INDUSTRIAL	Acres	-	850	-
MIXED USE [b]	Acres	43	2,300	98,900
PUBLIC/QUASI-PUBLIC	Acres	10	660	6,600
SCHOOLS	Acres	68	170	11,492
RESIDENTIAL 1 DU	DU	7,799	190	1,481,810
RESIDENTIAL 2 DU	DU	-	190	-
RESIDENTIAL 3 DU	DU	-	190	-
RESIDENTIAL MULTIPLE DU	DU	2,399	130	311,870
Total				2,097,672
Total (mgd)				**2.10**

Footnotes:
(a) Estimated area. At zero gpd/acre, however, this estimate does not impact flow projections

(b) Differs from 78,900 gpd calculated in the Sierra Vista Sanitary Sewer Master Plan (MSCE, July 2007).

BROOKFIELD UGA

PLEASANT GROVE WATERSHED

Connected Land Use Description	Units	DU or Area (acres)	Unit Flow Factor (gpd)	(gpd)
OPEN SPACE	Acres	208	-	-
COMMERCIAL	Acres	14	850	11,560
HEAVY INDUSTRIAL	Acres	-	850	-
LIGHT INDUSTRIAL	Acres	-	850	-
MIXED USE	Acres	-	2,300	-
PUBLIC/QUASI-PUBLIC	Acres	2	660	1,320
SCHOOLS	Acres	22	170	3,740
RESIDENTIAL 1 DU	DU	835	190	158,650
RESIDENTIAL 2 DU	DU	2,087	190	396,530
RESIDENTIAL 3 DU	DU	-	190	-
RESIDENTIAL MULTIPLE DU	DU	1,252	130	162,760
Total				734,560
Total[1] (mgd)				**0.73**

Footnotes:
[1]Brookfield developers supplied several sets of preliminary land use data during this project, resulting in a range of projected ADWF from 0.69 (the most recent) to 0.73 mgd. The largest of these projections, 0.73 mgd, was used for this analysis.

PLACER UGA

DRY CREEK WATERSHED

Connected Land Use Description	Units	DU or Area (acres)	Unit Flow Factor (gpd)	(gpd)
OPEN SPACE	Acres	-	-	-
COMMERCIAL	Acres	-	850	-
HEAVY INDUSTRIAL	Acres	-	850	-
LIGHT INDUSTRIAL	Acres	-	850	-
MIXED USE	Acres	-	2,300	-
PUBLIC/QUASI-PUBLIC	Acres	-	660	-
SCHOOLS	Acres	-	170	-
RESIDENTIAL 1 DU	DU	27	190	5,130
RESIDENTIAL 2 DU	DU	-	190	-
RESIDENTIAL 3 DU	DU	-	190	-
RESIDENTIAL MULTIPLE DU	DU	-	130	-
Total				5,130
Total (mgd)				**0.01**

PLACER VINEYARDS UGA (OUTSIDE 2005 REGIONAL SERVICE AREA [a,b])

DRY CREEK WATERSHED

Connected Land Use Description	Units	DU or Area (acres)	Unit Flow Factor (gpd)	(gpd)
OPEN SPACE [c]	Acres	729	-	-
COMMERCIAL	Acres	236	850	200,600
HEAVY INDUSTRIAL	Acres	-	850	-
LIGHT INDUSTRIAL	Acres	-	850	-
MIXED USE	Acres	63	2,300	143,750
PUBLIC/QUASI-PUBLIC	Acres	119	660	78,540
SCHOOLS	Acres	140	170	23,800
RESIDENTIAL 1 DU	DU	7,649	190	1,453,310
RESIDENTIAL 2 DU	DU	-	190	-
RESIDENTIAL 3 DU	DU	-	190	-
RESIDENTIAL MULTIPLE DU	DU	2,542	130	330,460
Total				2,230,460
Total (mgd)				**2.23**

Footnotes:
(a) There is an area of approximately 150 acres inside Placer Vineyards Shed A, but within the 2005 Regional Service Area Boundary. Mike Smith of MSCE provided land use information for this area in September 2007. Flow projections for this area were therefore subtracted from Shed A and added to the Shed B flows to represent the total flow from within the 2005 Regional Service Area Boundary.

(b) For convenience, the boundary for Shed A is henceforth assumed to be contiguous with the 2005 SAB and the area represented by the ADWF presented above.
(c) Estimated area. At zero gpd/acre, however, this estimate does not impact flow projections

SMD-3 UGA

DRY CREEK WATERSHED

Connected Land Use Description	Units	DU or Area (acres)	Unit Flow Factor (gpd)	(gpd)
OPEN SPACE	Acres	-	-	-
COMMERCIAL	Acres	3	850	2,550
HEAVY INDUSTRIAL	Acres	-	850	-
LIGHT INDUSTRIAL	Acres	-	850	-
MIXED USE	Acres	-	2,300	-
PUBLIC/QUASI-PUBLIC	Acres	11	660	7,260
SCHOOLS	Acres	-	170	-
RESIDENTIAL 1 DU	DU	1,268	190	240,920
RESIDENTIAL 2 DU	DU	14	190	2,660
RESIDENTIAL 3 DU	DU	-	190	-
RESIDENTIAL MULTIPLE DU	DU	250	130	32,500
Total				285,890
Total (mgd)				**0.29**

SPMUD UGA

DRY CREEK WATERSHED

Connected Land Use Description	Units	DU or Area (acres)	Unit Flow Factor (gpd)	(gpd)
OPEN SPACE	Acres	97	-	-
COMMERCIAL	Acres	99	850	84,150
HEAVY INDUSTRIAL	Acres	-	850	-
LIGHT INDUSTRIAL	Acres	-	850	-
MIXED USE	Acres	-	2,300	-
PUBLIC/QUASI-PUBLIC	Acres	-	660	-
SCHOOLS	Acres	-	170	-
RESIDENTIAL 1 DU - by 2050 [a]	DU	1,200	190	228,000
RESIDENTIAL 1 DU - after 2050 [a]	DU	4,180	190	794,200
RESIDENTIAL 2 DU	DU	-	190	-
RESIDENTIAL 3 DU	DU	-	190	-
RESIDENTIAL MULTIPLE DU	DU	-	130	-
Total				1,106,350
Total - by 2050 [a] (mgd)				**0.23**
Total - after 2050 [a] (mgd)				**1.11**

Footnotes:
a) Based on information provided by SPMUD, a total of 5,380 DUs are expected in the SPMUD UGA at ultimate buildout. However, SPMUD projects that only 1,200 of these DUs will be built within the planning horizon (2050) of this study, leaving 4,180 DUs for later buildout.

Attachment B

June 2007 TM Update Sheet

Update Sheet

South Placer Regional Wastewater and Recycled Water Systems Evaluation

Subject: **Update for TM 2b**

Prepared For: Art O'Brien, City of Roseville

Prepared by: Andy Smith, RMC

Reviewed by: Dave Richardson, RMC

Date: October 31, 2006

Reference: 0091-04

1 Summary of Update for TM 2b

Since the completion of TM 2b on November 4, 2005, changes in the scope of the South Placer Wastewater and Recycled Water Systems Evaluation, as well as changes in the data available, have resulted in the need to identify out-of-date information, to summarize the updated information, and provide justification as to the need for the update. **Table 1** presents a summary of the updates for TM 2b.

Table 1: Summary of Update for TM 2b

Page	Location	Summary of Outdated Information	Summary of Updated Information	Reason for Update
1	Paragraph 4	Total Ultimate Service Area acreage = 29,724 (PG); 36,070 (DC); 65,794 (Total)	Total Ultimate Service Area acreage = 30,407 (PG); 40,161 (DC); 70,568 (Total)	Expanded SPMUD boundary and Brookfield
2	Table 2	SPMUD UGA = 2,319 acres	SPMUD UGA = 6,410	SPMUD provided an expanded UGA boundary
2	Table 2	Brookfield not included	Brookfield: Pleasant Grove Watershed, 683 acres	Brookfield added as a UGA
2	Table 2	Total UGA acreage = 7,549 (PG); 6,242 (DC); 13,791 (Total)	Total UGA acreage = 8,232 (PG); 10,333 (DC); 18,565 (Total)	Expanded SPMUD boundary and Brookfield
3	Figure 1	SPMUD UGA included, but does not reflect expanded boundary	Expanded boundary shown in Figure 2-5 of Systems Evaluation report	SPMUD provided an expanded UGA boundary
3	Figure 1	Brookfield included, but not shown as a UGA	Brookfield is considered as a UGA	Brookfield added as a UGA
7	Table 6	Brookfield not included	Brookfield: 0.73 mgd (PG)	Brookfield added as a UGA
n/a	Attachment A	Brookfield not included	Refer to TM 11a for land use summary	Brookfield added as a UGA

Attachment C

2009 Update Sheet

Update Sheet

South Placer Regional Wastewater and Recycled Water Systems Evaluation

Subject:	**2009 Update Sheet for TM 2b**
Prepared For:	Art O'Brien, City of Roseville
Prepared by:	Chris van Lienden, RMC
Reviewed by:	Dave Richardson, RMC
Date:	September 3, 2009
Reference:	0091-04

The TM has been modified since it was originally developed in 2005 based on the following updates.

1 2006 Updates

The TM was updated in 2006 to reflect changes in the SPMUD UGA boundary and land use, and to add Brookfield as an additional UGA.

2 2008 Updates

The TM was further updated in 2008 to reflect changes in the land uses and flow projections of the UGAs.

3 2009 Updates

An additional update was prepared in 2009 to reflect the following changes.

3.1 Updates to the H2Omap Sewer Model

Since the 2008 update, the H2Omap Sewer software has been updated which resulted changes to the build-out flow estimates. The flow estimates in the TM has been updated to reflect the most recent model results.

3.2 Changes to the Development Timeline

Flow projections have been updated to reflect reduced rates of residential development due to the economic slowdown beginning in 2008.

3.3 West Roseville Specific Plan Rezone

Buildout flow estimates have been updated to reflect additional inflow from a proposed rezone in the West Roseville Specific Plan (May, 2009). The new land uses and associated average dry weather flow (ADWF) are summarized in Table 1.

Table 1 – West Roseville Specific Plan Rezone Comparison

Connected Land Use Description	Original Developer Agreements		2009 Proposed Update	
	DU or Area (DU or ac)	Flow (mgd)	DU or Area (DU or ac)	Flow (mgd)
1 Residential				
1.1 Low Density Residential	4842 DU	0.92	5963 DU	1.13
1.2 LDR (age restricted)	710 DU	0.13	0 DU	0.00
1.3 Medium Density Residential	1064 DU	0.20	1746 DU	0.33
1.4 High Density Residential	1774 DU	0.23	3229 DU	0.42
2 Open Space	670 ac		696 ac	0.00
2.1 Paseo	15 ac		0 ac	0.00
2.2 Park	251 ac		284 ac	0.00
2.3 Pocket Parks	19 ac		0 ac	0.00
3. Public/Quasi-Public				
3.1 Schools	108 ac	0.02	109 ac	0.02
3.2 Public/Quasi-Public	41 ac	0.02	15 ac	0.01
4 Community Commercial				
4.1 Commercial	34 ac	0.03	56 ac	0.05
4.2 Mixed Use	14 ac	0.03	0 ac	0.00
4.3 Church	0 ac	0.01	0 ac	0.00
5. Business Professional				
5.1 Commercial	20 ac	0.02	18 ac	0.02
6. Light Industrial	74 ac	0.06	75 ac	0.06
7. Industrial	34 ac	0.03	35 ac	0.03
Total		**1.71**		**2.07**

ATTACHMENT #5

Technical Memorandum

South Placer Regional Wastewater & Recycled Water Systems Evaluation Project

Subject: Unit Flow Factor Sets and Sewer Design Criteria –TM No. 3a (FINAL)

Prepared For: Art O'Brien – City of Roseville

Prepared By: Mai-Tram Le - RMC; revised by Gisa Ju - RMC

Reviewed By: Dave Richardson - RMC
Pete Bellows – BC

Date: May 25, 2005; Final revision October 3, 2006

Reference: 0091-4.02

This technical memorandum (TM) provides a definition of the unit flow factors that have been developed and used in analyses of treatment and trunk sewer facilities as part of the South Placer Regional Wastewater and Recycled Water Systems Evaluation Project (Project). The TM also proposes criteria to be used by developers for design of new sewer facilities.

The various analyses and their associated application are as follows:

1. **Treatment Plant Analyses** – A set of average dry weather unit flow factors has been developed for the entire South Placer Wastewater Authority (SPWA) service area. These factors include the average flow coming from various areas based on specific land use designations, along with a base dry weather groundwater infiltration (GWI) component across the service area. The average unit flow factors were developed using water use and flow monitoring data, as presented in TM 2a, "Dry Weather Flow Projection for 2005 Service Area." For example, the unit flow factor for single-family residential dwelling units, regardless of density, is 190 gpd, of which 10 gpd represents the dry weather GWI component. The unit flow factors used for treatment plant analyses are presented in **Table 1**.

2. **Hydraulic Model Calibration and Trunk Sewer Analyses** – The dry weather flows used for model calibration and analyses of trunk sewers consists of base sanitary flows (BSF) which have been developed using the same unit flow factor concept as for the treatment plant analyses discussed above. However, the dry weather GWI component of the unit flow factors has been included on an areal basis based on actual measured flows, rather than having been considered as a uniform base dry weather GWI load across the service area.

   Trunk Sewer analyses also include additional components of wet weather GWI and rainfall-dependent infiltration and inflow (RDI/I) that vary across the SPWA service area to reflect actual conditions as verified by the wet weather flow monitoring data. The wet weather GWI factors are specific to each wastewater treatment plant (WWTP) service area and were determined from analysis of WWTP flows to be 200 gpd/acre in the Dry Creek WWTP basin and 100 gpd/acre in the Pleasant Grove WWTP basin. The GWI rates and RDI/I parameters used in the trunk sewer model are documented in TM 2c, "Wet Weather Flow Projection for the Ultimate SPWA Service Area."

Table 1 – Average Dry Weather Unit Flow Factors Used for Treatment Plant Analyses

Land Use Designation	Units	Flow Factor (gpd/unit)[1]
Commercial	gpd per acre	850
Heavy Industrial	gpd per acre	850
Light Industrial	gpd per acre	850
Mixed Use	gpd per acre	2,300
Public/Quasi-Public	gpd per acre	660
Schools	gpd per acre	170
Residential 1 DU	gpd per DU	190
Residential 2 DU	gpd per DU	190
Residential 3 DU	gpd per DU	190
Residential Multiple DU[2]	gpd per acre or gpd per DU	2,040 or 130
Open Space	gpd per acre	0
Parks > 10 Acres	gpd per acre	10
Vacant	gpd per acre	0

[1] Includes allowance for dry season GWI.
[2] Future development projects should use the factor that results in the highest flow .

3. **Design Flow Standards (Criteria) for Sizing Infrastructure** – For sizing future infrastructure facilities, the hydraulic model of the trunk sewer system should be used for pipes 18 inches in diameter and larger. For smaller facilities, the average dry weather unit flow factors for the treatment plant analyses can be used along with a safety factor of 2.0 and appropriate peaking factors. The safety factor of 2.0 will be used to factor the average dry weather unit flow factor in order to:
    1. Account for changes that may occur over time in the behavior of residential and nonresidential contributors to the sewer systems, such as increased indoor water use;
    2. Account for changes in environmental conditions (higher groundwater table and consequent higher GWI) and changes in infrastructure (aging pipes, etc.);
    3. Provide for safety to adequately size the infrastructure to avoid any sanitary sewer overflows due to under-sizing;
    4. Account for the increasing friction losses (increase in the roughness coefficient) due to pipe aging; and,
    5. Account for nominal pipe diameter decreases due to accumulation of material adhering to the walls of the sewer piping and restricting capacity.

    Peak wet weather flows will be accounted for using a system-wide peaking factor. A peaking factor curve was developed based on the following assumptions:
    - Single family residential development at 4 DU/acre
    - Design average dry weather flow (ADWF) based on a unit flow rate of 190 gpd/DU times a safety factor of 2.0

- Diurnal peaking factor ranging from 1.8 to 3.0 depending on area size (reflects the attenuation of peak flows through the sewer system as the tributary area increases – refer to Footnote 4 in Table 2))
- GWI at 150 gpd/acre
- RDI/I at 700 gpd/acre, estimated based on model parameters used for new development UGAs (Note: New development RDI/I parameters were assumed to be similar to those determined by flow monitoring and model calibration for relatively new areas of the system; see TM 2c for discussion.)
- Peak diurnal flow concurrent with peak RDI/I flow

The resultant peaking factor curve is presented in **Figure 1**. **Table 2** below shows the derivation of the peaking factor curve for areas ranging from 10 to 750 acres. (NOTE: the values in Table 2 are meant to support the derivation of the peaking factor curve, rather than to be published as design standards).

Table 2 - Derivation of Proposed Roseville/SPWA Design Peaking Factor Curve[1]

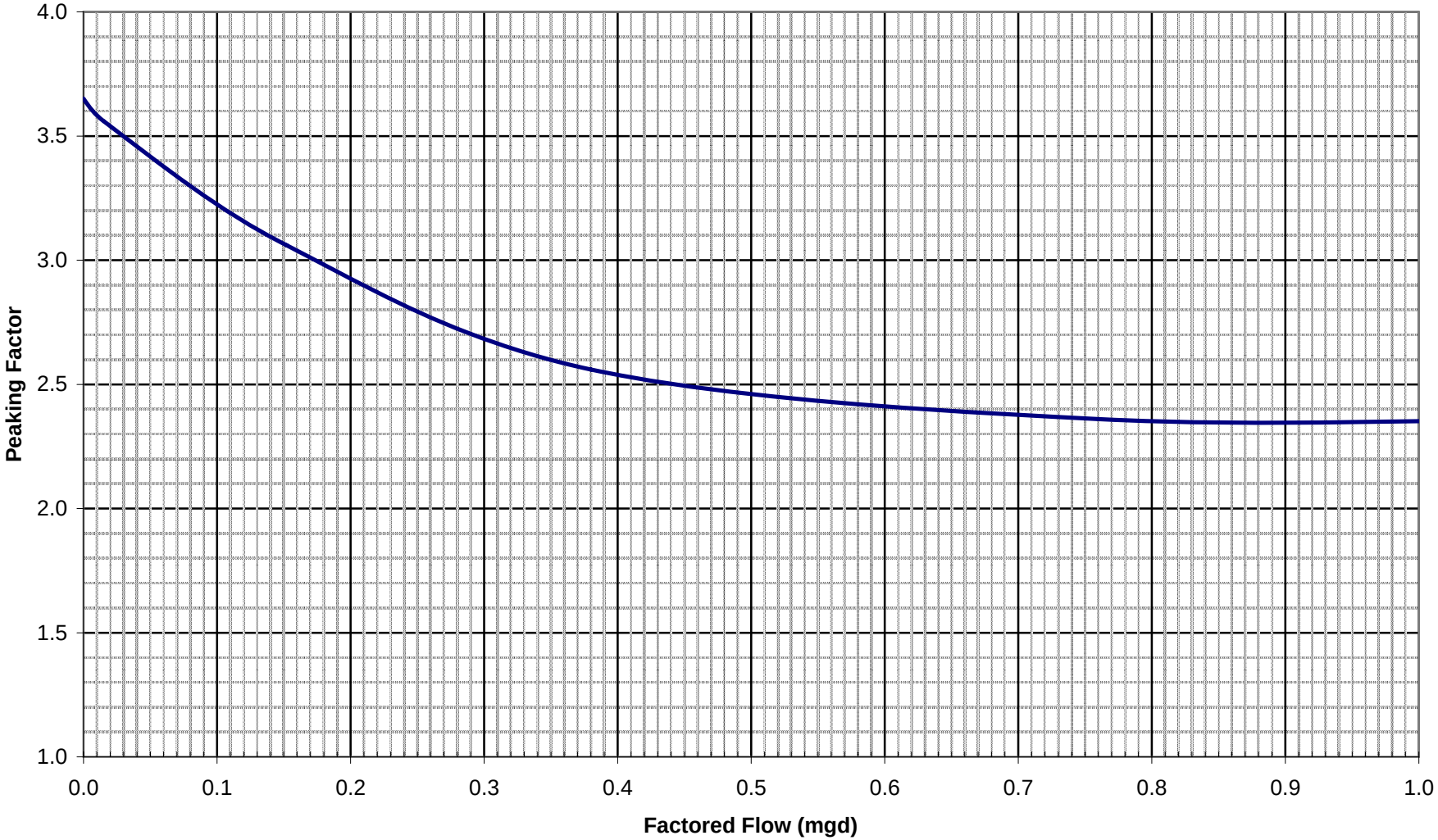
Area (acres)	No. of DUs[1]	ADWF (mgd)[2]	Factored Flow (mgd)[3]	Diurnal PF[4]	Wet GWI (mgd)[5]	Peak RDI/I (mgd)[6]	PWWF (mgd)[7]	Peaking Factor	PF Curve
0			0						3.65
10	40	0.0076	0.0152	3.0	0.0015	0.0070	0.054	3.56	3.56
100	400	0.076	0.152	2.5	0.015	0.070	0.47	3.06	3.06
250	1,000	0.19	0.38	2.0	0.038	0.175	0.97	2.56	2.56
500	2,000	0.38	0.76	1.8	0.075	0.350	1.79	2.36	2.36
750	3,000	0.57	1.14	1.8	0.11	0.53	2.69	2.36	2.36

[1] Based on single-family residential development at 4 DUs/acre. 4 DUs/acre is considered to be a typical density for single family residences, and is not intended to be used as a design criterion.
[2] Based on 190 gpd/DU
[3] Based on safety factor of 2.0
[4] The diurnal PF values in this analysis are based on the peaking factor used for residential flows (PF = 1.8) in the hydraulic model, which was derived from dry weather flow monitoring data. Since that derivation was based on a large area, the PF value is increased progressively as the area decreases in order to account for decreased attenuation of peak flows. Selection of the upper limit of that range is based on engineering judgment and experience with similar analyses.
[5] Based on 150 gpd/acre
[6] Based on 700 gpd/acre
[7] Assumes peak RDI/I coincides with peak diurnal

Attachment A includes an example calculation illustrating the application of the peaking factor curve.

At the direction of SPWA member agencies, several planning-level criteria were developed to aid developers in the sizing and configuration of pump station and force main facilities. These criteria are presented in **Attachment B**.

Figure 1
SPWA Design Peaking Factor Curve



ATTACHMENT A:
Example Design Flow Analysis for Sewers Smaller than 18-inches

Example calculation for application of peaking factor curve for 400-unit single family subdivision:

ADWF [a]:

(400 DUs)*(190 gpd/DU) = **76,000 gpd = ADWF**

Factored Flow:

(ADWF)*(2.0) = (76,000 gpd)*(2.0) = **152,000 gpd = Factored Flow**

PWWF:

(Factored flow)*(3.05 [b]) = (152,000)*(3.05) = **464,000 gpd = PWWF**

Per City of Roseville Improvement Standards, page SS-5, a 10-inch sewer at minimum slope is adequate for this PWWF.

[a] Based on ADWF unit flow factors (as opposed to base sanitary flow unit flow factors, which do not allow for dry season GWI)

[b] From Figure 1: SPWA Design Peaking Factor Curve

ATTACHMENT B:
Recommended Planning Level Criteria for Pump Stations and Force Mains

Table B-1 presents planning-level criteria for the design of pump stations and force mains within the SPWA service area; these criteria should be confirmed during design.

Table B-1: Recommended Planning Level Criteria for Pump Stations and Force Mains

Pump Stations	
Capacity	PWWF (hydraulic modeling required for pipes 18 inches and larger)
Storage	24 hours, or 8 hours with an emergency generator
Operation	Lead/lag for duty pump(s), plus 1 standby pump
Maximum Pump Cycles	6 cycles/hour
Force Mains	
Headloss	Hazen-Williams roughness coefficient (C-factor) of 120
Maximum Velocity	7-10 feet per second
Minimum Velocity	3.0 feet per second

NOTE: Hydraulic transient, surge, and odor control analyses will need to be performed during final design.

ATTACHMENT #6

Appendix H TM 3b – Trunk Sewer Hydraulic Analysis

Technical Memorandum

South Placer Regional Wastewater and Recycled Water Systems Evaluation

Subject:	**Trunk Sewer Hydraulic Analysis (TM No. 3b)**
Prepared For:	Art O'Brien – City of Roseville
Prepared by:	Pete Bellows/Chris Peters – Brown and Caldwell Andy Smith – RMC
Reviewed by:	Dave Richardson/Gisa Ju – RMC
Date:	April 14, 2006; updated January 24, 2008 & September 3, 2009
Reference:	0091-004 Task 3

0 Previous TM Publication and Updates

Since the initial publication of technical memorandum (TM) 3b on April 14, 2006, changes in information available for the South Placer Wastewater and Recycled Water Systems Evaluation (Systems Evaluation), as well as changes in the data, have resulted in the need to identify and update out-of-date information. As part of the June 2007 publication of the Systems Evaluation, an Update Sheet was prepared for this TM, and is included in **Attachment E**. Subsequent changes have resulted in the need for further updates of the TM. The newest version of the TM is consistent with the updates summarized in the 2009 Update Sheet which is included in Attachment F.

1 Introduction

This TM summarizes the results of the hydraulic assessment of the SPWA collection system and the necessary hydraulic improvements, using a set of assumptions and criteria for identifying constraints in the system under conservative design conditions. The hydraulic assessment and development of hydraulic improvements is based on the hydraulic model of trunk sewers in the SPWA collection system. The results of the hydraulic assessment were used to develop potential capital improvement projects. Although the potential projects provide SPWA with a starting point for evaluating the magnitude of regional trunk sewer system improvements, they should be refined with site specific field and engineering evaluations.

The hydraulic assessment is based on the flow projections for the ultimate service area presented in TM 2b (Dry Weather Flow Projection) and TM 2c (Wet Weather Flow Projection).

2 Hydraulic Model Development

The development of the hydraulic model network included the development of pipeline network information, development of pump station and force main information, selection of input nodes and delineation of input node tributary areas.

2.1 Collection System Model

The hydraulic modeling program used for this project is H_2OMAP Sewer Pro, a product of MWH Soft, Inc. This software is widely used for hydraulic analysis of collection systems. It is also being used by the City of Roseville to model its collection system. Using the same software for this project allows the information developed for the City's model to be directly utilized for this model.

2.2 Model Network Development

The June 2004 network of sewer pipes for the hydraulic model includes all trunk sewers in the SPWA member agencies service areas that are greater than or equal to 15 inches in diameter. They are included in the hydraulic model to provide a complete analysis of the regional collection system. The June 2004 model network is shown on Figure 1.

Approximately 83 miles of gravity trunk sewers, 3 pump stations and 4 miles of force main are included in the June 2004 model network. The buildout network includes approximately 100 miles of trunk sewer pipe, 10 pump stations and 19 miles of force main. Alignments of buildout pipes included in the model network were based upon USGS topographic contour data and available data from the West Roseville Specific Plan, and planning documents supporting development within Urban Growth Areas (UGAs) such as Placer Vineyards, Regional University and Placer Ranch. The buildout model network is shown on Figure 2. The amount of pipeline included in the model network is summarized by diameter in Table 1 (gravity pipe) and Table 3 (force main pipe).

Table 1 – Model Network Gravity Pipe Summary

	Length (ft)	
Diameter (in)	June 2004	Buildout
6	462	462
8	8,026	8,026
10	8,264	8,264
12	11,405	21,726
15	93,622	102,540
16	8,599	8,539
18	93,644	93,573
20	4,080	4,080
21	33,527	62,190
24	32,801	41,097
27	9,608	23,655
30	26,311	33,570
33	21,508	25,242
36	16,631	19,618
42	30,417	33,494
48	403	4,860
63	8,629	8,629
66	11,286	11,286
72	10,867	10,867
78	5,862	5,862
90	1,082	1,082
Total	**437,035**	**528,663**

Information on the existing (June 2004) trunk sewers was obtained from several sources. Information on the trunk sewers in Roseville was obtained from the City's hydraulic model of its collection system. The City's hydraulic model network was based on the City's GIS of the collection system, as-built drawings, survey data, and discussions with City staff. Trunk sewer information for the Granite Bay (SMD-2) area

was obtained from Placer County's sewer GIS. Record drawings were reviewed to develop the model network in SPMUD. Manhole numbers used in the model were provided by each respective SPWA member agency. In some instances there were duplicate manhole numbers along the borders between Roseville and Placer County. In this case, Roseville's manhole numbers were used. For reference, duplicate Placer County manhole numbers are shown on the project summary tables in Attachment C.

Survey information was obtained for some missing invert and rim elevation data. The survey information included the rim elevation and invert elevation of each connecting trunk sewer. Survey information was also obtained at several locations to verify elevation information from other sources. In some areas, pipe invert elevations were estimated using features within H_2OMAP Sewer Pro. Based on given slopes, H_2OMAP Sewer Pro can interpolate invert elevations based on elevations upstream and downstream of the pipe reaches that are missing invert data. This is a very useful modeling feature, but does not always yield accurate elevations in the model. This is the type of data that needs to be field verified by SPWA members as the members proceed forward to identify precise capital projects.

The June 2004 network was extended to include the proposed gravity trunk sewers and force mains serving the buildout development areas in Roseville and Placer County on the west side of the 2005 Service Area boundary. UGAs located to the west of the 2005 Service Area will require pump stations and force mains to convey their wastewater to the SPWA treatment plants. The proposed sewers and force mains are based on preliminary sewer alignments provided in specific plans and USGS topographic contour information. Most UGAs and buildout development areas were connected (loaded) to trunk sewers existing as of June 2004. There are no specific planned developments identified within the SPMUD service area at this time, and future sewer extensions were not included in the SPMUD collection system at SPMUD's request. The model network for the buildout scenario is shown on Figure 2.

The industry standard Manning's friction factor of 0.013 was assigned to each modeled pipe reach. Manning's friction factor is used by H_2OMAP Sewer Pro to determine pipe hydraulic capacities.

Figure 1 – June 2004 Model Network

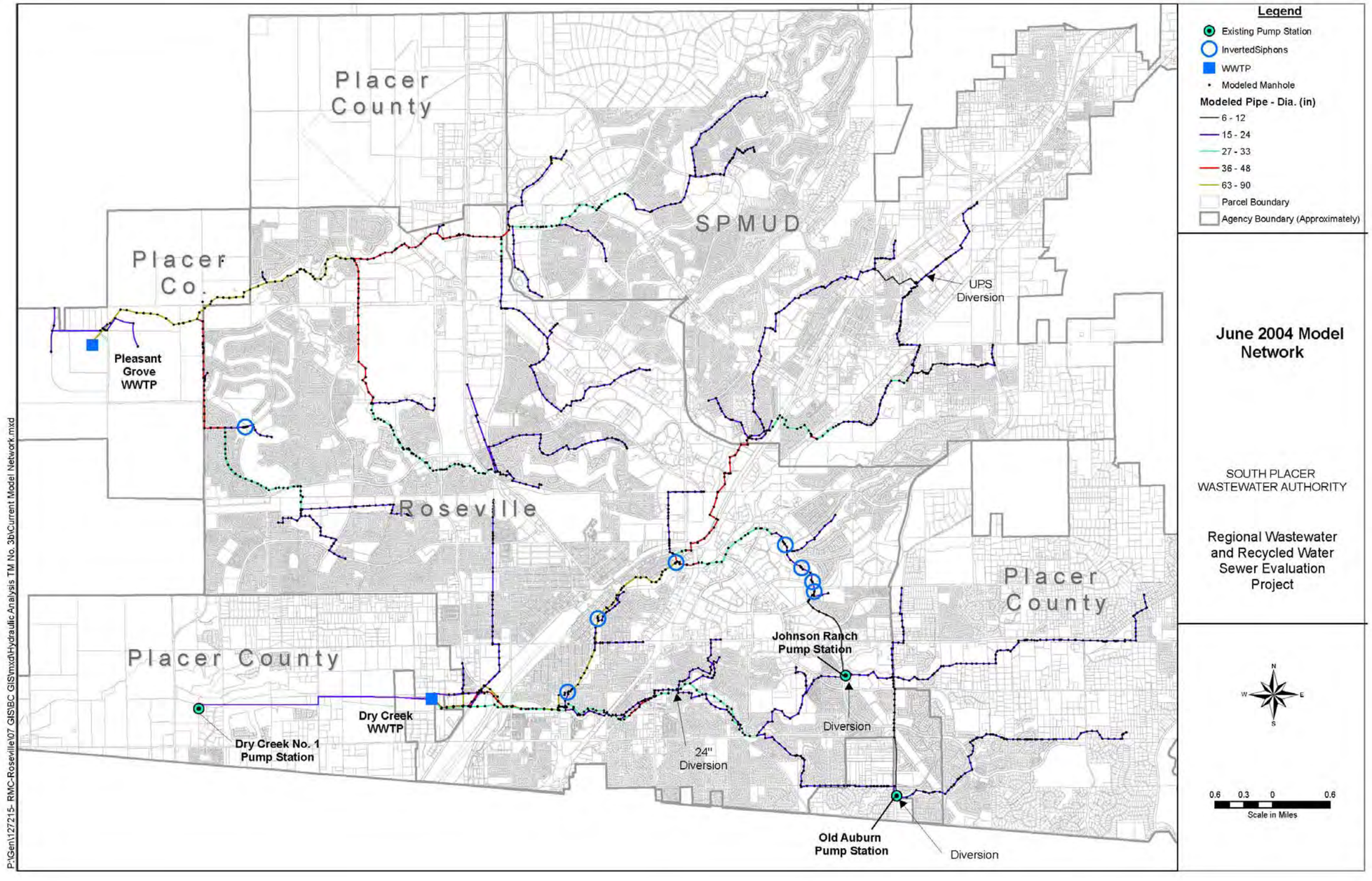
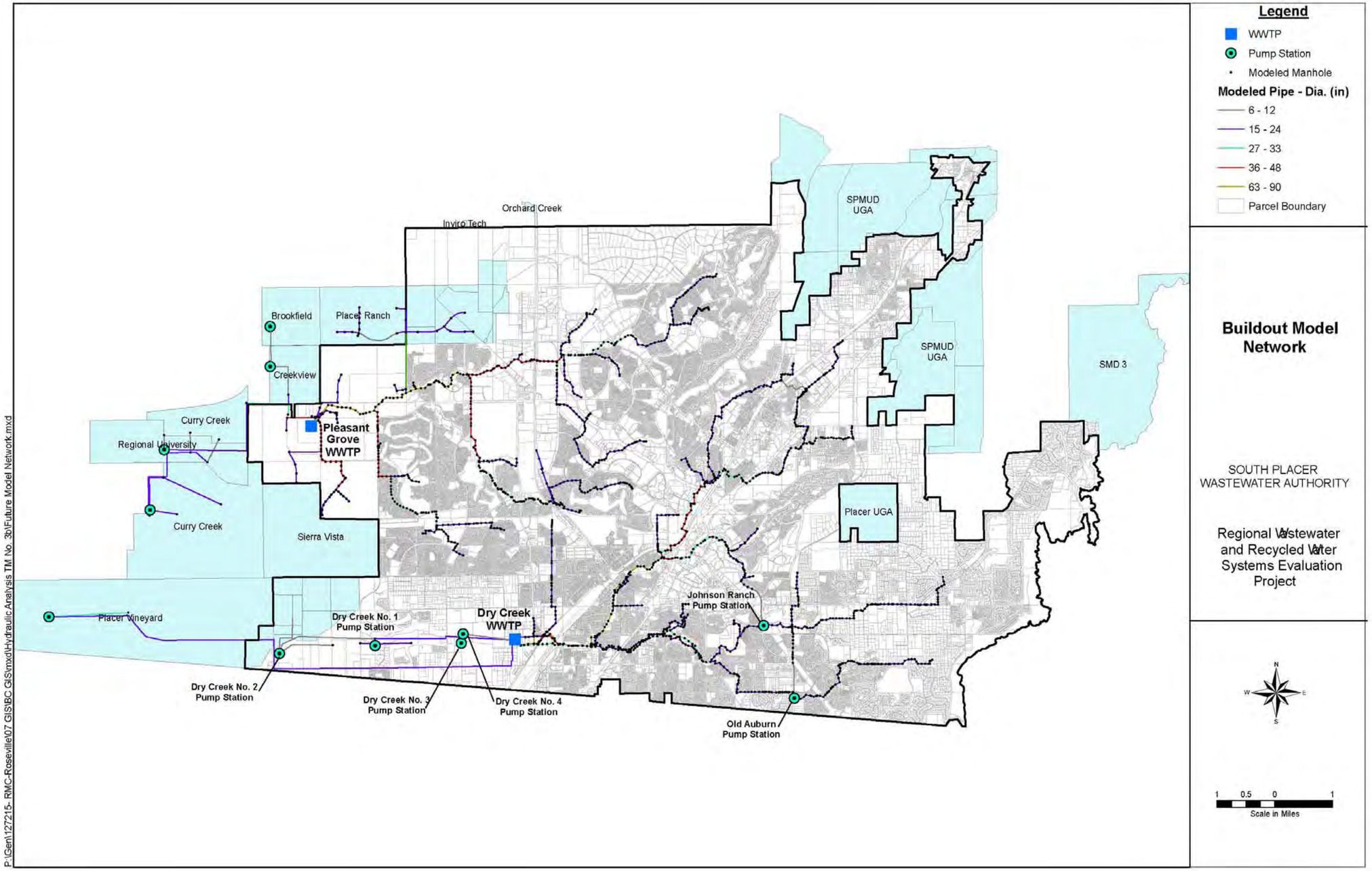


Figure 2 – Buildout Model Network



2.3 Flow Diversions

The model network includes four flow diversions which are shown on Figure 1. Three of the diversions are located in Roseville and one diversion is located in SPMUD. H_2OMAP Sewer Pro has several options for designating the operation of flow diversions. The UPS diversion in SPMUD has movable boards that direct all flow one direction or the other. In the hydraulic model, this diversion was simulated by putting all flow into the 10-inch diversion pipeline (west) or into the trunk sewer downstream (south) of the diversion. The UPS diversion only affects flow in the SPMUD system. The two diversions upstream of the pump stations in Roseville (Old Auburn and Johnson Ranch) were simulated in the model by allowing an amount of flow equal to the pump station capacity (with all pumps operating) to divert from the trunk sewer to the pump station. The final diversion, at manhole B06-169 in Roseville, diverts flow from the local 15-inch sewer through the 24-inch diversion pipe, to the 33-inch trunk sewer. This diversion is controlled with a weir structure at the manhole. According to City of Roseville field crews that investigated the diversion, approximately 70 percent of the flow is diverted to the 33-inch trunk sewer and 30 percent remains in the local sewer. This diversion was simulated in the model in the same manner. The diversion structure at manhole B06-169 is illustrated in Figure 3.

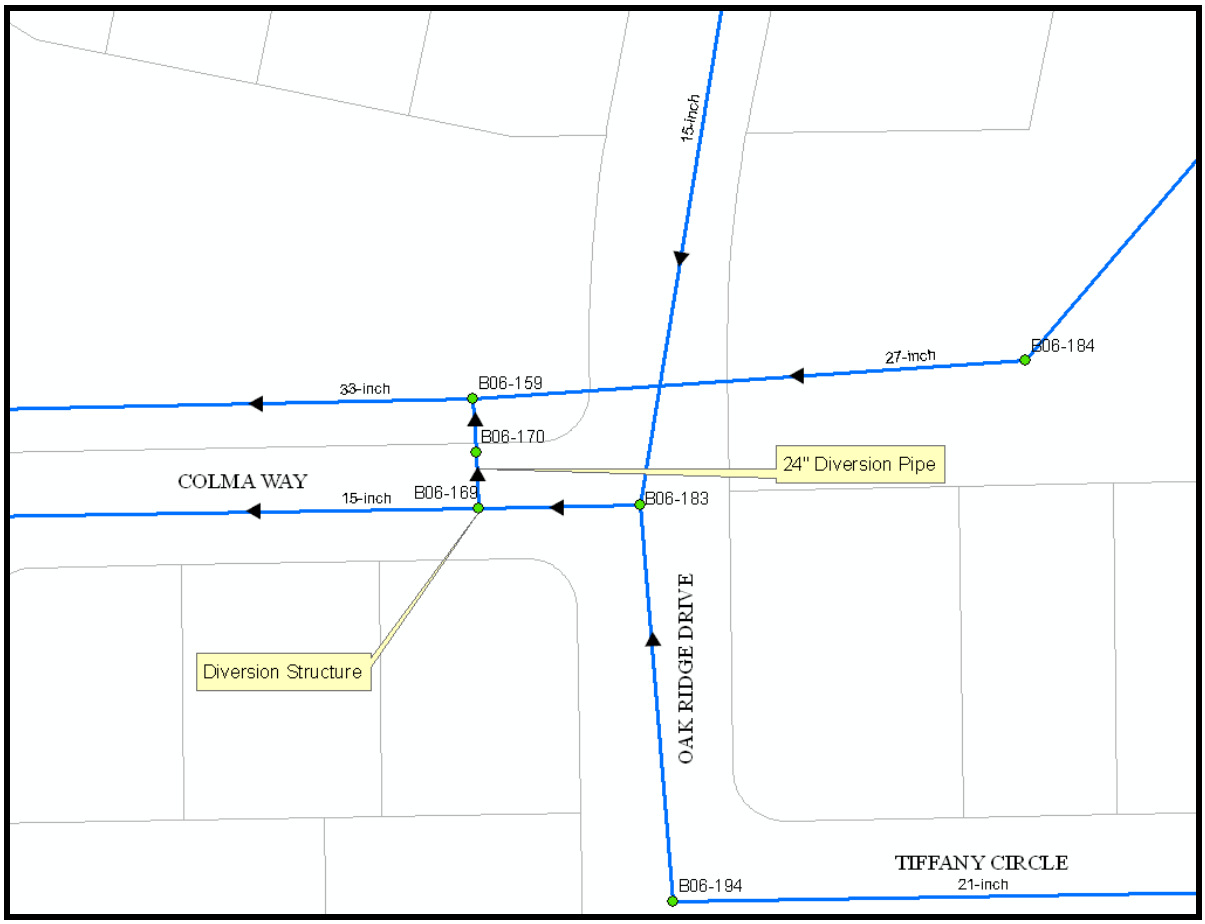


Figure 3 – Roseville Trunk Sewer Diversion at Manhole B06-169

2.4 Inverted Siphons

The model network has 8 inverted siphons which are shown on Figure 1. All inverted siphons have multiple barrels. Information on the individual barrels for each siphon was obtained the City of Roseville GIS. Flow was allocated to each barrel within H_2OMAP Sewer Pro based on the cross-sectional area of each barrel.

2.5 Pump Stations

The model of the June 2004 trunk sewers includes three pump stations which are shown on Figure 1. Other pump stations within the City of Roseville and Placer County that are not included in the model are not located on trunk sewers that are 15 inches in diameter or larger. Information on the pump stations are presented in Table 2.

Johnson Ranch and Old Auburn pump stations are located in the City of Roseville. These two pump stations were designed to operate during peak wet weather flow events to transfer flow between trunk sewers and alleviate downstream capacity issues. These pump stations each have two pumps and, as of June 2004, operate in duty/standby mode with the standby pump operating only if the duty unit fails. It is feasible for these two pump stations to operate with both pumps running, providing additional peak wet weather pumping capacity. The City of Roseville staff has identified that these two pump stations can operate in a lead/lag mode because the pump stations are intended to reduce the peak wet weather flow events, and the pump stations are not needed to convey average dry weather flows. If a pump within the pump station were to fail, it could be replaced immediately after the peak wet weather flow event, when the pump station was shut down under normal operation. Table 2 presents the capacity of these two pump stations with either one or both pumps operating.

Dry Creek No. 1 pump station is located in Placer County, west of the Dry Creek WWTP. This pump station operates during dry and wet weather with three pumps in duty/standby mode. Table 2 presents the capacity of this pump station with two pumps operating.

Table 2 – Pump Stations and Capacity Designations

Facility No.	Facility Name	Pumps	Duty/Standby Capacity[1] (mgd)	Lead/Lag Capacity[2] (mgd)
25	Johnson Ranch	2@1400 gpm	2.02	3.20
26	Old Auburn	2@300 gpm	0.43	0.68
NA	Dry Creek No. 1	3@1580 gpm	2.52[3]	NA

[1] Pump station capacity with one pump out of service
[2] Pump station capacity with both pumps operating
[3] Proposed pump station capacity at buildout with three 60 hp pumps (one standby) each rated at 1580 gpm. As of June 2004, pump station has a capacity of 1.73 mgd with two 20-hp duty pumps and one standby 60-hp pump.

2.6 Force Mains

Each pump station has an associated force main. Force main information is summarized in Table 3. The force mains are identified by their associated pump stations. The capacity of the force mains is based on a maximum flow velocity of 7 fps. The force main analysis does not include evaluation of hydraulic transients.

Table 3 – Force Mains

Facility No.	Facility Name	Diameter (in)	Length (ft)	Capacity (mgd)
25	Johnson Ranch	12	3,886	3.55
26	Old Auburn	8	3,358	1.58
NA	Dry Creek No. 1	16	14,100	6.31

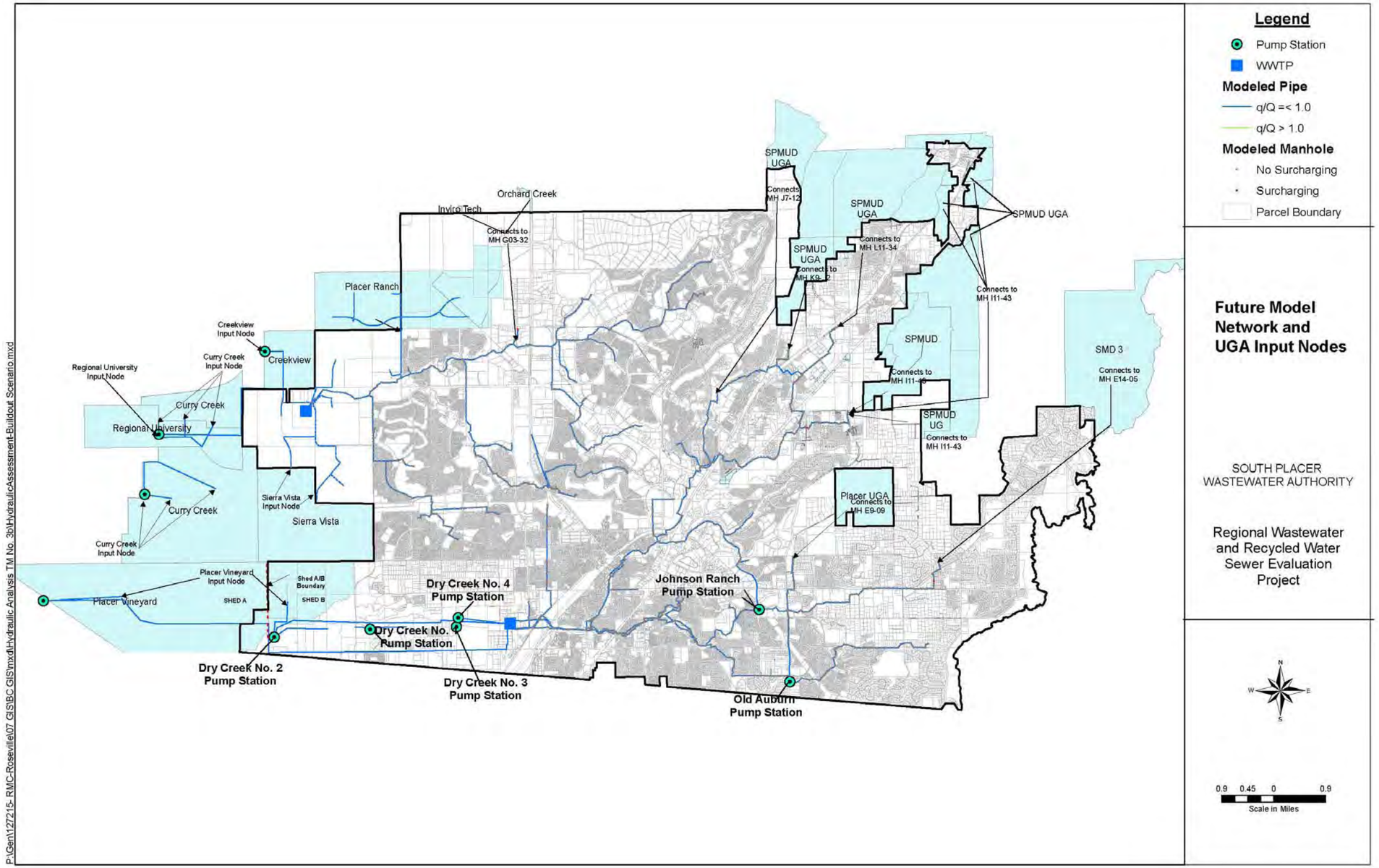
2.7 Input Nodes

The model network contains input nodes at locations where flow is added to the model. Input nodes were located at each manhole in the model network. The amount of flow at the input nodes is based on the number of surrounding parcels and their land use designation. Parcels were generally assigned to the nearest pipe network input node using the Load Allocator feature within H_2OMAP Sewer Pro. The assignments were modified to account for the network of smaller diameter sewers that are not included in the model network. Each parcel in the model database has a corresponding input node associated with it.

Input nodes were also selected for future development areas, large point sources and UGAs that will contribute wastewater to the regional system. Most new developments, large point sources and UGAs in the eastern portion of regional service area were connected to the June 2004 model network. New developments to the west of the 2005 Service Area boundary were connected to the proposed trunk sewers indicated in the buildout trunk sewer network. The input nodes that receive wastewater flow from these UGAs are indicated on Figure 4.

The HP and NEC point sources were loaded as indicated on Figure 4. For the buildout scenario at NEC, 1.0 mgd must be diverted from the NEC site south to the 30-inch trunk sewer along Foothills Road, south of Pleasant Grove Blvd. This will eliminate the potential for overloading the existing NEC sewer connection.

Figure 4 – Buildout Model Network and Input Nodes



3 Evaluation Criteria

This section summarizes the criteria for evaluating the capacity of the June 2004 sewer system and for sizing relief sewer facilities, as potential capital projects. The criteria were used to evaluate results of the hydraulic model.

3.1 Flows

The hydraulic assessment was performed using June 2004 and buildout peak wet weather flows. Peak wet weather flows include base sanitary flow (BSF), dry season and wet season groundwater infiltration (GWI) and rainfall dependent infiltration and inflow (RDI/I). A diurnal curve was applied to BSF to simulate the changes in BSF throughout a day. Base sanitary flows, defined in the Dry Weather Flow Projection TM (No. 2a), were applied in the model based on land use and the unit flow factors presented in Table 4.

Table 4 – Base Sanitary Flow Unit Flow Factors

Land Use Designation	Units	BSF Unit Flow Factor[1]
Commercial	gpd per acre	800
Heavy Industrial	gpd per acre	800
Light Industrial	gpd per acre	800
Mixed Use	gpd per acre	2,160
Public/Quasi-Public	gpd per acre	620
Schools	gpd per acre	160
Residential 1 DU	gpd per DU	180
Residential 2 DU	gpd per DU	180
Residential 3 DU	gpd per DU	180
Residential Multiple DU[2]	gpd per acre	1,920
Open Space	gpd per acre	0
Parks > 10 Acres	gpd per acre	10
Vacant	gpd per acre	0

[1] Does not include an allowance for dry season GWI. Dry and wet season GWI are applied on an area-specific basis.
[2] The proposed Residential Multiple DU unit flow factor can also be represented as 130 gpd per DU.

Dry season GWI, defined in the Dry Weather Flow Projection TM (No. 2a), was applied spatially in the model to areas upstream of the permanent flow monitor sites as shown in Table 5. Dry season GWI was not applied to parks, open space, or Union Pacific Railroad property.

Table 5 – Dry Season GWI Rates

Basin	Tributary Area	Agency	GWI Rate
Pleasant Grove	Pleasant Grove WWTP Flow Monitor	Roseville	0 gpd/acre
Pleasant Grove	North Roseville Flow Monitor	SPMUD	0 gpd/acre
Pleasant Grove	Sunset Industrial Park	Placer County	0 gpd/acre
Dry Creek	Dry Creek WWTP Flow Monitor	Roseville	20 gpd/acre
Dry Creek	Springview Flow Monitor	SPMUD	210 gpd/acre
Dry Creek	Highlands Flow Monitor	SPMUD	0 gpd/acre
Dry Creek	Strap Ravine Flow Monitor	Placer County	120 gpd/acre
Dry Creek	Old Auburn Flow Monitor	Placer County	350 gpd/acre

Wet season GWI, defined in the Wet Weather Flow Projection TM (No. 2c), occurs in addition to the dry season GWI. Based on the results of this analysis, a wet season GWI rate of 200 gpd/acre was applied to developed parcels in the Dry Creek watershed. A wet season GWI rate of 100 gpd/acre was applied to developed parcels in the Pleasant Grove watershed. Wet season GWI was not applied to parks, open space, or Union Pacific Railroad property.

Design RDI/I is based on a 10-year 24-hour synthetic rainfall pattern that occurs across the entire service area. RDI/I flows are dependent on several factors including rainfall amount. RDI/I flows are typically projected using a design storm event. For this project, a 10-year, 24-hour design storm was chosen to project peak wet weather flows in the model. *Note: This is the design condition adopted by Sacramento County and recently required by the Central Valley Regional Water Quality Control Board in an order (official document adopted by the Board) to the City of Folsom.* The design storm hyetograph was developed utilizing Table 5-A-1 (elevation (h) = 150 feet) from the Placer County Flood Control and Water Conservation District Stormwater Management Manual (September 1, 1990). The peak rainfall hour was set at 6 a.m. so that the peak RDI/I response (which would normally occur about 1-2 hours after the rainfall for a typical basin) roughly coincides with the peak hour of the dry weather profiles to give a conservative flow response in the collection system. Further discussion on design flows is presented in the Wet Weather Flow Projection TM (No. 2c).

3.2 Pipe Network

June 2004 gravity sewers were evaluated primarily by the amount of surcharge that occurs within them under peak wet weather conditions. Hydraulic capacity, defined as the ratio of the peak flow in the pipe divided by capacity of the pipe, is used as a secondary evaluation criterion to develop relief sewer improvement projects. Additional pipe network evaluation criteria are provided below.

3.2.1 Surcharge

Gravity sewers were evaluated to identify areas with surcharge. Surcharge occurs when the hydraulic gradeline is above the crown of the pipe, indicating that the pipe would be flowing under pressure during

surcharge conditions. The study area is anticipating significant growth in the future, so a conservative evaluation criterion of "no surcharging" was selected. Relief sewers were considered as potential capital projects to eliminate surcharging under peak wet weather flow conditions.

The exception to this criterion is surcharging that is the result of "backwatering" from larger diameter pipes into smaller diameter pipes. Typically, at junctions between larger diameter and smaller diameter pipes, the crowns of the pipes are matched to avoid "backwatering". However, some pipe invert information that was used to develop the hydraulic model indicates that the crowns may not be matched at all junctions. In these cases, constructing relief sewers would not alleviate the "backwatering caused" surcharging.

3.2.2 Capacity

June 2004 sewers were also evaluated to identify hydraulic bottlenecks. Bottlenecks occur when the peak flow exceeds the calculated hydraulic capacity of an individual pipe reach. The modeling software program H_2OMAP Sewer Pro was used to determine the capacity of the June 2004 and buildout gravity sewer lines. H_2OMAP Sewer Pro compares the calculated capacity of each pipeline to the peak flow and flags sewer reaches which have capacities that are less than the peak flows.

3.3 Pump Stations

Typically, pump stations need rated capacities that match or exceed the peak hourly wet weather flow (PWWF) for current and future conditions. As of June 2004, the Old Auburn and Johnson Ranch pump stations divert some of the peak flow from the sewers where they are located. After discussions with the City, it was decided to allow these pump stations to be modeled to operate as peak wet weather pump stations with two pumps operating in a lead/lag mode (no standby pump). This criterion, rather than rating their capacity with one pump operating, was used to evaluate June 2004 and buildout PWWF projections. In contrast, the Dry Creek No. 1 pump station operates at all times and was evaluated with the first and/or second pump operating and the third pump considered a standby pump that only operates if one of the duty pumps fails.

Additional detailed hydraulic assessments including surge analysis and field testing of actual pump capacities was beyond the scope of this Systems Evaluation.

3.4 Force Mains

The maximum velocity criterion for force mains is 7 feet per second (fps). Additional assessment of force mains, including surge analysis, was beyond the scope of this System Evaluation. The maximum velocity criterion was considered as an approximate indicator of the need to perform further assessment of a force main (if the criterion were exceeded under design conditions, for example).

4 Hydraulic Model Results

This section presents the results of the hydraulic modeling. The hydraulic evaluation of gravity sewers utilized the model network and the June 2004 and buildout PWWF projections developed for this study.

4.1 June 2004 Gravity Sewer Evaluation

The results of the gravity sewer hydraulic analysis under June 2004 PWWF conditions are presented on Figure 5. The June 2004 land use scenario is defined in the June 2004 and Buildout Land Use TM (No. 1b) and consists of the parcels connected to the system as of June 2004. This figure identifies manholes in the trunk sewer network with surcharging and where the peak wet weather flows exceed the calculated

capacities of the pipelines using Manning's equation in the model. Sewer profiles illustrating the hydraulic grade line at the time of PWWF are included in Attachment A.

Both hydraulic capacity deficiencies and backwater surcharging occurred under June 2004 PWWF conditions in a limited number of locations. Under June 2004 PWWF conditions, notable hydraulic capacity surcharging occurred in three general areas. Each of these areas is shown in Figures 5. Additional discussion on each of these pipe reaches is presented in the following sections.

The figures also show other surcharging and capacity issues that arise under June 2004 peak flow conditions but which are not included in the areas of concern discussed above. The surcharging is caused by backwatering and the capacity issues are localized and minimal. A number of these areas are immediately upstream of the inverted siphons. Gravity sewer improvements (or other substantial capital projects) are not needed to address these issues.

4.1.1 Area A – Placer County SMD-2

Area A is located upstream of the Old Auburn permanent flow monitoring site in Placer County. This 15-inch trunk sewer serves the southern portion of Granite Bay. Four of these pipe reaches surcharge for a period of approximately 1 hour during the June 2004 PWWF scenario.

4.1.2 Area E – Roseville

Area E is located in the Pleasant Grove WWTP basin in Roseville, along McAnally Road. This 15 and 18-inch trunk sewer serves a portion of western Roseville. Thirteen of these pipe reaches surcharge for a period of approximately 1 hour during the June 2004 PWWF scenario. Flow monitoring data indicated that this area had one of the highest rates of RDI/I in the SPWA service area. Modeling results indicated that this surcharging is solely attributable to the high I/I levels. The surcharging was eliminated when model run scenarios were completed with more typical I/I rates for this area. Roseville sewer operations staff indicated that a manhole may have been missing its cover in this area during the flow monitoring period and that the RDI/I rates may be inflated. City staff also commented that this area has not had historical hydraulic capacity issues. The City should perform an additional investigation in this area prior to considering the construction of relief sewers.

4.1.3 Area K – Roseville

Area K is located in the Dry Creek WWTP basin in Roseville. Area K has several inverted siphons and flat reaches of pipe that cause minor surcharging during June 2004 PWWF conditions. No improvement project is needed.

4.2 Buildout Gravity Sewer Evaluation

The results of the gravity sewer hydraulic analysis under buildout PWWF conditions are presented on Figure 6. The buildout land use scenario is defined in the June 2004 and Buildout Land Use TM (No. 1b). This figure identifies manholes in the trunk sewer network with surcharging and where the peak wet weather flows exceed the calculated capacities of the pipelines using Manning's equation in the model. Sewer profiles illustrating the hydraulic grade line at the time of PWWF are included in Attachment B.

Both hydraulic capacity deficiencies and backwater surcharging occurred under buildout PWWF conditions in a limited number of locations. Under buildout PWWF conditions, pipe reaches in 13 areas are projected to surcharge. Each of these areas is shown in Figure 6. Additional discussion on each of these pipe reaches is presented in the following sections.

The figures also show other surcharging and capacity issues that arise under June 2004 and buildout peak flow conditions but which are not included in the areas of concern discussed above. The surcharging is caused by backwatering and the capacity issues are localized and minimal. A number of these areas are

immediately upstream of the inverted siphons. Gravity sewer improvements (or other substantial capital projects) are not needed to address these issues.

4.2.1 Area A – Placer County SMD-2 and Roseville

Area A is located upstream of the Old Auburn permanent flow monitoring site in Placer County. This 15-inch trunk sewer serves the southern portion of Granite Bay and the extreme southeast corner of Roseville. Thirteen pipe reaches in this area experience surcharging up to 3 feet for approximately 18 hours due to hydraulic capacity deficiencies for the buildout PWWF scenario.

4.2.2 Area B1 – Placer County SMD-2

Area B1 is located upstream of the Johnson Ranch pump station in Placer County. This 15 and 18-inch trunk sewer serves the northern portion of Granite Bay. A hydraulic analysis was performed in this area both with and without the SMD-3 UGA.

When a PWWF input of 1.85 mgd from the SMD-3 UGA is introduced into the model on this trunk sewer, fifty pipe reaches experience surcharging up to 4 feet for approximately 19 hours due to hydraulic capacity deficiencies. There are no hydraulic capacity deficiencies in this area if the SMD-3 UGA were not connected to the SPWA system for the buildout scenario. In a separate study, Placer County evaluated whether holding peak wet weather flows at the existing (as of June 2004) SMD-3 WWTP would affect the SMD-2 trunk sewer. This study showed that a controlled release of 0.5 mgd from SMD-3 into SMD-2 would not adversely affect the trunk sewers in Area B1.

4.2.3 Area B2 – Roseville

Area B2 is located in Roseville upstream of the Johnson Ranch pump station and downstream of Area B1 and Area C. This 15 and 21-inch trunk sewer serves the northern portion of Granite Bay and a small area of Roseville. Nine pipe reaches in this area experience surcharging up to 11 feet for approximately 17 hours due to hydraulic capacity deficiencies for the buildout PWWF scenario. The surcharging in area B2 is caused by the proposed SMD-3 UGA and approximately 2,700 acres of future development in Placer County and SPMUD that is loaded into the trunk sewer model upstream of Area C, which is tributary to Area B2. SPMUD has commented that some of this future development area may ultimately remain on septic tank service. For the buildout growth scenario (including SMD-3 UGA and approximately 2700 acres of future development in Placer County and SPMUD) a 24-inch replacement sewer is needed to resolve hydraulic capacity deficiencies. Without SMD-3, nine pipe reaches in this area experience surcharging up to 7 feet due to the future development in Placer County and SPMUD upstream of Area C and hydraulic relief is still needed. Without SMD-3 and the 2,700 acres of future development in Placer County and SPMUD, the two 15-inch pipe reaches (bottleneck downstream of the 18-inch and upstream of the 21-inch) surcharge less than two feet in pipes over 23 feet deep. These 15-inch pipe diameters are suspicious and should be investigated. However, no improvement project is needed for this deficiency.

4.2.4 Area C – Placer County SMD-2

Area C is tributary to Area B2 and is located along the Roseville City boundary. As of June 2004, this 15-inch trunk sewer serves the northern portion of Granite Bay and a small area of Roseville (several parcels). Future development tributary to Area C includes the Placer UGA (very low density development) and approximately 2,700 acres of additional development within the 2005 Service Area in Placer County and SPMUD. As of June 2004, this trunk sewer serves approximately 600 acres. SPMUD commented that some of this area may ultimately remain on septic tank service. Sixteen pipe reaches in this area experience surcharging up to 4 feet for approximately 18 hours due to hydraulic capacity deficiencies for the buildout PWWF scenario as a result of connections in Placer County and SPMUD. If these 2,700 acres of additional development are not loaded to the trunk sewer in Area C there is only

minor surcharging (0.60 ft) for one flat pipe segment that is approximately 22 feet deep. No improvement project is needed for this deficiency.

4.2.5 Area E – Roseville

Area E is located in the Pleasant Grove WWTP basin in Roseville, along McAnally Road. This 15 and 18-inch trunk sewer serves a portion of western Roseville. Fourteen pipe reaches in this area experience surcharging up to 6 feet for approximately 2 hours due to hydraulic capacity deficiencies for the buildout PWWF scenario. Flow monitoring data indicated that this area had one of the highest rates of RDI/I in the SPWA service area. Modeling results indicated that this surcharging is solely attributable to the high I/I levels. The surcharging was eliminated when model runs were completed with more typical I/I rates for this part of Roseville. Also, Roseville sewer operations staff indicated that a manhole may have been missing its cover in this area during the flow monitoring period and that the RDI/I rates may be inflated. City staff also commented that this area has not had historical hydraulic capacity issues. The City should perform an additional investigation in this area prior to considering the construction of relief sewers.

4.2.6 Area F – Roseville

Area F is located in the Dry Creek WWTP basin in Roseville. This 15-inch trunk sewer serves a portion of Roseville and SPMUD. Five pipe reaches in this area experience minor surcharging during the buildout PWWF scenario with the hydraulic grade line less than two feet above the crown of the pipe (but 16 feet below grade). The hydraulic deficiencies are attributed four sections of flat pipe. The pipe is approximately 18 feet deep in the area of surcharge and there is no risk of overflow for the design PWWF. No improvement project is needed.

4.2.7 Area H1, H2, H3 and H4 – SPMUD

A significant number of pipe reaches in Areas H1, H2, H3 and H4 of SPMUD experience surcharging due to inadequate hydraulic capacity for the buildout PWWF scenario. Area H1 is an existing 15-inch trunk sewer that experiences up to six feet of surcharge for a period of 9 hours for the buildout PWWF. Area H2 is an existing 12 and 15-inch trunk sewer that experiences up to 13 feet of surcharge for a period of 20 hours for the buildout PWWF. Area H3 is an existing 24, 27 and 30-inch trunk sewer that experiences up to 3 feet of surcharge for a period of 13 hours for the buildout PWWF. Area H4 is an existing 18-inch trunk sewer that experiences up to 2 feet of surcharge for a period of 8 hours for the buildout PWWF.

According to SPMUD, these deficiencies are consistent with the results of their current (as of June 2004) wastewater collection system master plan. SPMUD will be identifying appropriate projects to relieve these sewer deficiencies separately.

4.2.8 Area I – Roseville

Area I is located in the Dry Creek WWTP basin in Roseville. Area I has very minor surcharging with the hydraulic gradeline at, or just above, the crown of the pipe. No improvement project is needed.

4.2.9 Area J – Placer County SMD-2

Area J is located in the Dry Creek WWTP basin in Placer County. Area J has very minor surcharging with the hydraulic gradeline at, or just above, the crown of the pipe. No improvement project is needed.

4.2.10 Area K – Roseville

Area K is located in the Dry Creek WWTP basin in Roseville. Area K has several inverted siphons and flat reaches of pipe that cause minor surcharging. No improvement project is needed.

4.2.11 Area L – Roseville

Area L is located in West Roseville. The proposed 18-inch and 24-inch pipe reaches from the intersection of Phillip Road and Westside Drive to the existing 36-inch stub at the PGWWTP influent junction structure are undersized for PWWF. The hydraulic deficiencies are attributed to the additional flow input into the West Roseville collection system from Creekview, Regional University, and Curry Creek UGAs. To carry the projected PWWF, these pipe reaches should be increased in size from 18-inches to 30-inches and 24-inches to 36-inches. The existing 36-inch stub out of the PGWWTP influent junction structure has is sufficiently sized to convey flow from the West Roseville Specific plan and Creekview, Regional University and Curry Creek UGAs.

Figure 5 –Hydraulic Assessment – June 2004 Scenario

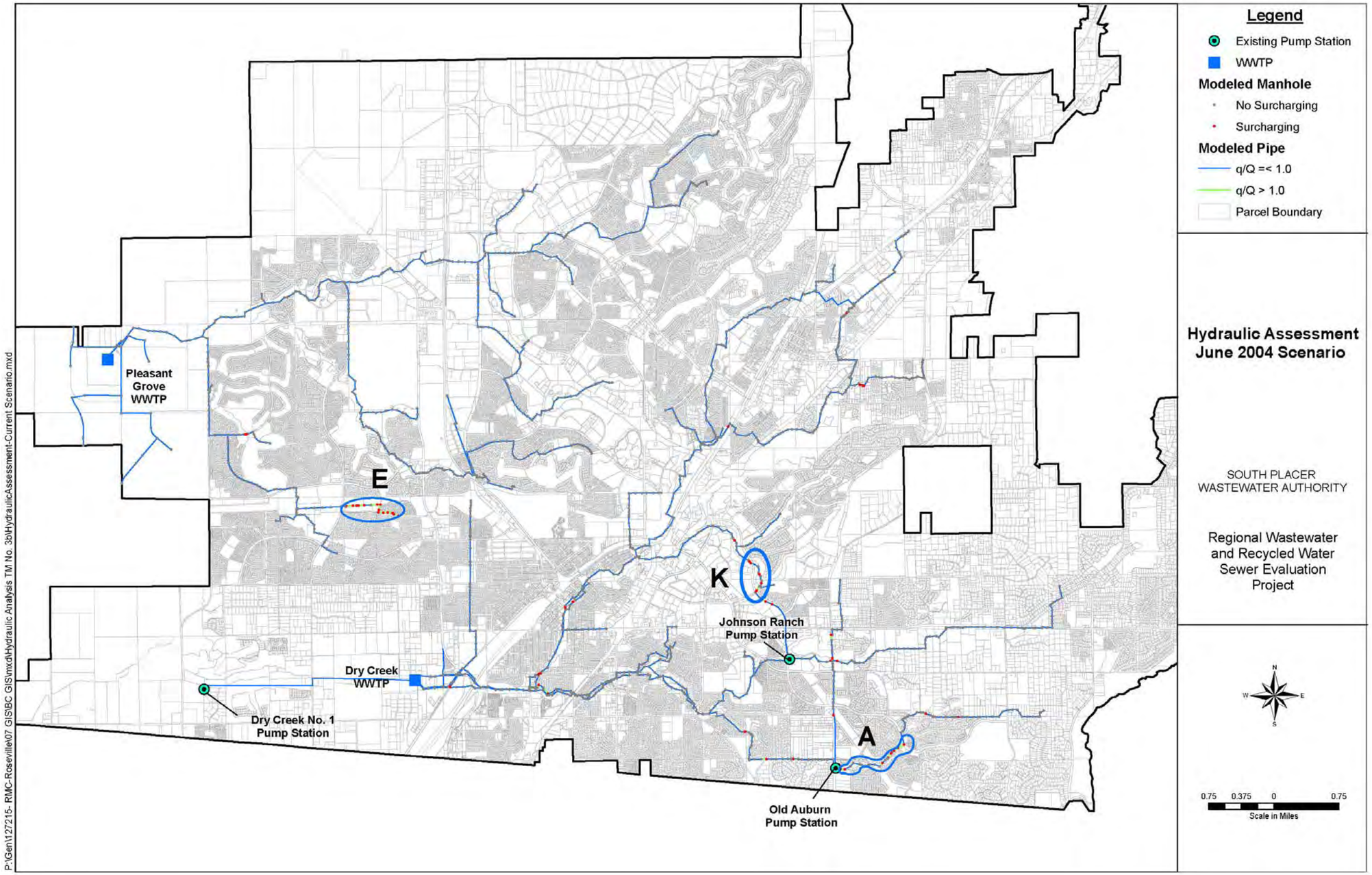
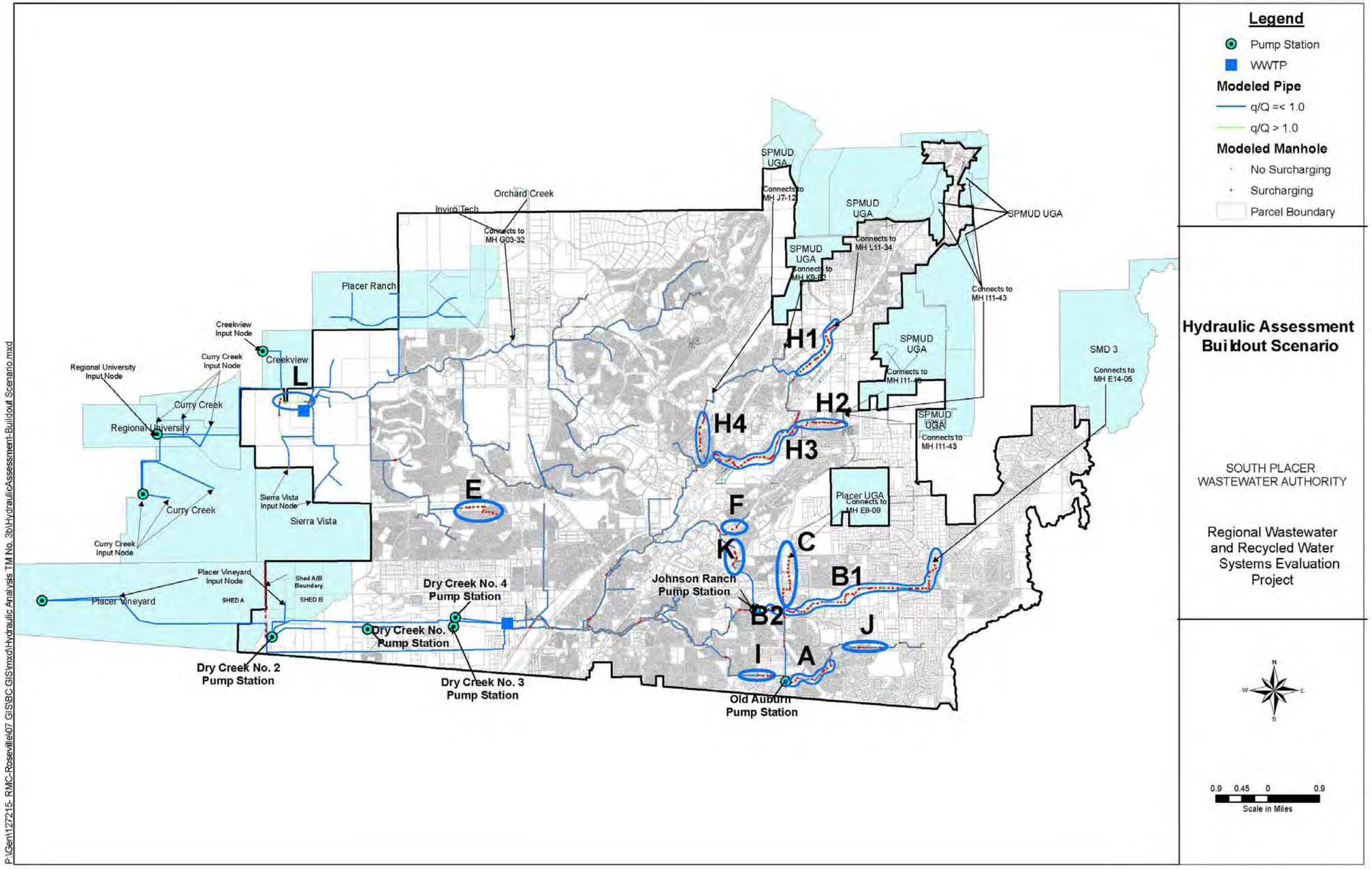


Figure 6 –Hydraulic Assessment – Buildout Scenario



4.3 Pump Station and Force Main Evaluation

The results of the pump station and force main hydraulic analysis under June 2004 and buildout PWWF conditions are presented in Table 6 and Table 7. Capacity issues with pump stations are determined by comparing the pump station capacities with the June 2004 and buildout PWWF. The capacities of the pump stations and force mains are based on information summarized in Table 2 and Table 3. All three pump stations and their associated force mains have capacity to meet the buildout PWWF. Buildout PWWF at Dry Creek No. 1 pump station is approximately 24 percent lower than values published in the Dry Creek West Placer Facilities Plan prepared by The Spink Corporation in November 1999. This difference is likely attributed to the new flow projection criteria utilized for this evaluation.

Table 6 – Pump Station Hydraulic Assessment

Facility No.	Facility Name	Duty/Standby (one pump) Capacity[1] (mgd)	Lead/Lag (two pump) Capacity[2] (mgd)	June 2004 PWWF (mgd)	Buildout PWWF (mgd)
25	Johnson Ranch	2.02	3.20	0.00[4]	2.50[5]
26	Old Auburn	0.43	0.68	0.00[4]	0.68[5]
NA	Dry Creek No. 1	2.52[3]	NA	0.14[6]	1.92[7]

[1] Pump station capacity with one pump not operating
[2] Pump station capacity with both pumps operating
[3] Proposed pump station capacity at buildout with three 60 hp pumps (one standby) each rated at 1580 gpm. As of June 2004, pump station has a capacity of 1.73 mgd with two 20-hp duty pumps and one standby 60-hp pump.
[4] Downstream trunk sewer can adequately convey June 2004 PWWF
[5] Buildout PWWF determined by identifying the amount of PWWF above the capacity of the downstream trunk sewers
[6] This is based on connected parcels in June 2004. Actual flow metering in October 2005 suggests Average Day Weather Flow may be as high as 0.13 mgd, which would translate to an estimated Peak Wet Weather flow of 0.3 mgd.
[7] Per *Dry Creek No. 1 PS Flows – Memo 1.1* (RMC, May 17, 2007)

Table 7 – Force Main Hydraulic Assessment

Facility No.	Facility Name	Design Capacity (mgd)	June 2004 PWWF (mgd)	Buildout PWWF (mgd)
25	Johnson Ranch	3.55	3.20	3.20
26	Old Auburn	1.58	0.68	0.68
NA	Dry Creek No. 1	6.31	1.73	4.29[1,2]

[1] Includes PWWF from the proposed Dry Creek Pump Station No. 2 which will share the common force main. Dry Creek Pump Station No. 2 service area includes Shed B of the Placer Vineyards Specific Plan service area. See Section 5.4 for further discussion.
[7] Per Dry Creek No. 1 PS Flows – Memo 1.1 (May 17, 2007)

4.3.1 June 2004 PWWF Conditions

For June 2004 PWWF, the Old Auburn and Johnson Ranch pump stations have adequate capacity because the downstream trunk sewer systems have adequate capacity and flow is not diverted to the pump stations. As of June 2004, the Dry Creek pump station has a capacity of 1.73 mgd because it has not been expanded to serve buildout conditions. This is adequate to meet the June 2004 PWWF of 0.14 mgd. The force mains for all three pump stations have adequate capacity for June 2004 PWWF scenarios.

4.3.2 Buildout PWWF Conditions

For buildout PWWF (including the SMD-3 UGA), the Old Auburn and Johnson Ranch pump station capacities with one pump operating are inadequate. However, the pump stations have adequate capacity if operated with two pumps in lead/lag mode. The force mains also have adequate capacity for the June 2004 and buildout PWWF scenarios. Without the SMD-3 UGA, the Johnson Ranch pump station can operate with one pump and still meet the PWWF conditions.

The Dry Creek No. 1 pump station also has adequate capacity to meet the buildout PWWF scenario. However, this pump station may need to be upgraded as outlined in the Dry Creek facility plan to meet flow projections for the buildout condition. It is possible that these pumps may not need to be as large as originally planned. The buildout PWWF for the Dry Creek No. 1 pump station is 1.92 mgd versus the design capacity of 2.52 mgd. The force mains for all three pump stations (Old Auburn, Johnson Ranch and Dry Creek No. 1) have adequate capacity for the buildout PWWF scenarios. It appears that the existing 16-inch force main serving Dry Creek No. 1 pump station may have enough capacity (without exceeding the 7 fps maximum velocity criteria) to serve all four pump stations that will eventually serve the West Dry Creek service area. However, due to the complex hydraulics associated with four pump stations sharing a common force main, a detailed hydraulic analysis should be performed prior to selecting this alternative.

5 Improvement Projects

This section describes the criteria used for developing and pricing hydraulic capacity improvement projects in the regional and regional partners' collection system. Thirteen projects have been identified to (1) address hydraulic deficiencies by potential improvements to existing facilities or by diverting flow, and (2) to extend service to new development.

5.1 Criteria

Criteria were identified for developing potential improvements to the collection system to accommodate June 2004 and buildout flows.

5.1.1 New Replacement Sewers

New replacement sewers are provided to increase hydraulic capacity and to eliminate capacity-related surcharging. New sewers are sized to replace the sewer existing as of June 2004 with a larger diameter sewer.

5.1.2 Minimum size

New replacement sewers will be sized so that the peak hourly flow rate in the replacement sewer will not exceed the full pipe capacity.

5.1.3 Slope

New replacement sewers are developed using the slope of the existing (June 2004) sewer or associated sewers. The slopes of the new sewers are constrained by the upstream and downstream invert elevations of the sewers existing of June 2004. The flow velocities in the new sewers may be less than typical design standards due to the constraint of the June 2004 invert elevations.

5.1.4 Pump Stations

New pump stations have been sized with one or more duty pumps and one pump operating in a standby mode (as opposed to the wet weather peaking pump stations). Duty/standby pump station operations are

typical for wastewater pumping stations to prevent a sewer overflow in the event that the duty pump fails. The determination of the number of duty pumps will be made during the project design phase (subsequent to this Systems Evaluation).

As of June 2004, the Old Auburn and Johnson Ranch pump stations only operate during peak flow events and only to divert some of the peak flow from where they are located. After discussions with the City staff, it was decided to identify the operating criteria for these pump stations so that they operate as peak wet weather pump stations with capacity defined as "both pumps in a lead/lag mode (no standby pump)". These criteria were used to determine if capacity improvements are required.

5.2 Capital and Construction Costs

Capital and construction costs presented in this TM represent preliminary cost estimates of the costs to plan and engineer projects, and the materials, labor and services necessary to build the proposed projects. The cost estimates are indicative of the cost of construction in the study area. In considering cost estimates, it is important to realize that changes during final design, as well as future changes in the cost of material, labor and equipment, will cause comparable changes in the estimated costs. Construction cost data given in this report are not intended to represent the lowest prices that can be achieved, but rather to represent planning-level estimates for budgeting purposes.

The unit capital costs for gravity sewer and force main pipeline construction were developed based on the sewer pipeline replacement costs shown in Tables 2-3 and 2-6 of the City of Roseville Infrastructure Rehabilitation Plan (April 2003). These costs were developed from recent projects in the City of Roseville and include allowances for engineering and administration (including construction management). The unit capital costs have been adjusted by approximately 8 percent for increasing construction cost considerations since April 2003. Costs for construction of new large diameter sewers would significantly increase if extensive utility relocation and traffic control were required. Pipeline unit capital costs are presented in Table 8.

Pump station capital and construction costs are based on cost curves from Pumping Station Design, Second Edition by Robert L. Sanks. This reference book is an industry standard for pump station design. There is no capital cost associated with changing operating modes/capacity definitions of the Old Auburn and Johnson Ranch pump stations.

Capital costs were increased by 30 percent to account for contingencies. A contingency allowance is appropriate given the planning level of the capital cost estimates and provides a conservative cost estimate that is suitable for budgeting purposes.

Table 8 –Pipe Unit Capital Costs (ENR CCI Value = 8435)

Pipe Diameter (in)	Conveyance	Pipe Material[1]	Replacement Cost[1]	
			$/ft	$/dia-inch
8	Gravity	VCP	164	21
8	Force Main	PVC	120	15
10	Gravity	VCP	205	21
10	Force Main	PVC	150	15
12	Gravity	VCP	246	21
12	Force Main	PVC	174	15
15	Gravity	VCP	292	19
16	Force Main	PVC	224	14
18	Gravity	VCP	330	18
18	Force Main	PVC	250	14
20	Force Main	PVC	260	13
21	Gravity	VCP	363	17
24	Gravity	VCP	415	17
24	Force Main	PVC	312	13
27	Gravity	VCP	437	16
30	Gravity	VCP	454	15
30	Force Main	PVC	360	12
33	Gravity	VCP	463	14
36	Gravity	VCP	505	14
42	Gravity	VCP	544	13
48	Gravity	RCP	622	13
60	Gravity	RCP	713	12
66	Gravity	RCP	713	11
72	Gravity	RCP	778	11

[1] Includes allowance for engineering and administration (including construction management)

5.3 Projects for June 2004 Facilities (Part 1)

The proposed improvements to the June 2004 collection system are shown on Figure 7. Improvements were developed to address the hydraulic deficiencies discussed above and to prevent capacity-related surcharging in the improved collection system. *This Section (Part 1) does not include projects that are attributed to the SMD-3 UGA and approximately 2,700 acres of future development in Placer County and SPMUD within the 2005 Service Area that is tributary to Area C.*

The improvement projects and their estimated CIP Budgetary Cost estimates (with a 30 percent contingency included) are summarized in Table 9 and Attachment C. Prior to constructing these projects, flow monitoring and other site specific investigations should be conducted on the critical line segments to validate and refine the model results. *The entity with Primary Responsibility for the specific improvement project is indicated in Table 9 and the project headings listed below.* "Placer County" refers to development within Placer County SMD-2.

5.3.1 Improvement Project 1 – Area A (Primary Responsibility: Placer County)

An 18-inch replacement sewer is needed to improve the hydraulic deficiencies identified in Area A through the hydraulic modeling process. Redirecting flow to another trunk sewer is not feasible. This project extends 5,000 feet from manhole B11-16 to A08-156. This project is located in an existing sewer easement between Roseville Parkway and Sierra College Boulevard and a new alignment may be necessary. To conservatively estimate the cost of this new alignment without undertaking site specific investigations, the length of this project was increased by 50 percent over the June 2004 deficient length to develop a higher cost estimating allowance. The determination of the new alignment will be made during design.

5.3.2 Improvement Project 6 – Area E (Primary Responsibility: Roseville)

An additional investigation is needed in Area E prior to the construction of any replacement sewer. This project extends 4,000 feet from manhole D03-100 to D02-353. This project is located in the McAnally Road street right-of way and a sewer easement south of Pleasant Grove Road. Additional investigation is needed due to the uncertainty in the flow monitoring data at this site. This was previously discussed in the June 2004 and buildout gravity sewer evaluation (Section 4). The additional investigation should include the following items:

- Flow monitoring during the wet season at Basin 7 as identified in the Wet Weather Flow Projection TM (No. 3b).
- Elevation survey of approximately 18 manhole inverts between manholes D03-100 to D02-353 to confirm pipe slopes.
- Visual surcharge checks of the pipes in question during heavy rainfall.

RDI/I reduction to levels seen in adjacent sewer basins would also eliminate the need for this improvement project. As a last resort, if the additional investigations did not eliminate the basis of the hydraulic deficiencies identified by the modeling, a 21-inch replacement sewer would be needed to improve the hydraulic deficiencies identified in Area E. For contingency planning purposes, the cost for this project is included in Table 8. Since the initial analysis performed by RMC, the City has performed further investigations in this area and determined new, reduced I/I parameters that would be appropriate for the area. Using these new parameters, City staff determined that no improvements for Area E are required at this time. The analysis performed by the City has been included as **Attachment D**.

5.3.3 Improvement Project 7 – Area L (Primary Responsibility: Regional University UGA and Curry Creek UGA)

This project extends from the intersection of Phillip Road and Westside Drive to the existing 36-inch pipe stub that connects with the influent junction structure at Pleasant Grove WWTP. The deficient sewers in Area L have been designed and will be constructed in early 2006. The deficiencies identified in the model can be corrected if 30-inch and 36-inch pipe is constructed in lieu of the planned 18-inch and 24-inch trunk sewer. Another option is to route the Regional University force main directly to the 36-inch pipe that connects with the influent junction structure. This 36-inch stub is sufficiently sized to convey PWWF from the West Roseville Specific Plan area and Creekview, Regional University and Curry Creek UGAs.

5.3.4 Improvement Project 8 – Area H1, H2, H3 and H4 (Primary Responsibility: SPMUD)

Improvement projects in SPMUD have not been developed at the request of SPMUD and a cost is not provided in Table 8. SPMUD will be identifying appropriate projects to relieve these sewer deficiencies separately.

Table 9 – June 2004 Facility Project Summary (Part 1)[4]

Project No.	Primary Responsibility	Item	Quantity	Unit Cost ($)	Estimated Capital Cost ($)	Proposed CIP Budget Cost[1] ($)
1-Area A	Placer County	18-inch Gravity	7,500[2] lf	330	2,475,000	3,218,000
Project 1 Subtotal					**2,475,000**	**3,218,000**
6- Area E[3]	Roseville	21-inch Gravity	4,000 lf	363	1,452,000	1,888,000
Project 6 Subtotal					**1,452,000**	**1,888,000**
7- Area L	Regional Univ. UGA Curry Creek UGA	30-inch Gravity	1,500 lf	454	681,000	885,000
		36-inch Gravity	3,000 lf	505	1,515,000	1,970,000
Project 7 Subtotal					**2,196,000**	**2,855,000**
Total Cost					**6,123,000**	**7,961,000**

[1] Includes 30 percent contingency
[2] Includes 50 percent allowance for alternative alignment
[3] This project needed only if additional investigation identifies it as a necessary project
[3] This Table does not include Projects 2, 3 and 4 which are solely attr buted to the SMD-3 UGA and approximately 2,700 acres of future development in Placer County and SPMUD within the 2005 Service Area. These projects are included in Section 5.4.

5.4 Projects for June 2004 Facilities (Part 2)

The proposed improvements to the June 2004 collection system are shown on Figure 7. Improvements were developed to address the hydraulic deficiencies discussed above and to prevent capacity-related surcharging in the improved collection system. *This Section (Part 2) only includes projects that are attributed to the SMD-3 UGA and approximately 2,700 acres of future development in Placer County and SPMUD within the 2005 Service Area that is tributary to Area C.*

The improvement projects and their estimated CIP Budgetary Cost estimates (with a 30 percent contingency included) are summarized in Table 10 and Attachment C. Prior to constructing these projects, flow monitoring and other site specific investigations should be conducted on the critical line segments to validate and refine the model results. *The entity with Primary Responsibility for the specific improvement project is indicated in Table 10 and the project headings listed below.* "Placer County" refers to development within Placer County SMD-2.

5.4.1 Improvement Project 2 – Area B1 (Primary Responsibility: SMD-3 UGA)

Based on the model results discussed in Section 4, a 21-inch replacement sewer is needed to improve the hydraulic deficiencies identified in Area B1. Redirecting flow to another trunk sewer is not feasible. These deficiencies are solely attributed to the SMD-3 UGA and this project is not needed if the flow from SMD-3 was limited to 0.5 mgd (storage scenario).

Area B1 extends 18,000 feet from manhole E14-05 to B08-042. This project is located upstream of the Johnson Ranch Pump Station in an existing sewer easement and in the Douglas Boulevard street right-of way; a new alignment may be necessary. To estimate the cost of this new alignment, the length of this project was increased by 50 percent over the June 2004 deficient length to develop a higher cost estimating allowance. The determination of the new alignment will be made during design.

5.4.2 Improvement Project 3 – Area B2 (Primary Responsibility: Placer County, SMD-3 UGA and SPMUD)

A 24-inch replacement sewer is needed to improve the hydraulic deficiencies identified in Area B2. Redirecting flow to another trunk sewer is not feasible. These deficiencies are attributed to the SMD-3 UGA and approximately 2,700 acres of future development in Placer County and SPMUD within the 2005 Service Area. This project is not needed if flows from SMD-3 and the future growth areas within Placer County and SPMUD (upstream of Area C) were directed elsewhere.

Area B2 extends 3,000 feet from manhole B08-042 to B07-405. This project is located upstream of the Johnson Ranch Pump Station in an existing sewer easement and a new alignment may be necessary. To estimate the cost of this new alignment, the length of this project was increased by 50 percent over the June 2004 deficient length to develop a higher cost estimating allowance. The determination of the new alignment will be made during design.

5.4.3 Improvement Project 4 – Area C (Primary Responsibility: Placer County and SPMUD)

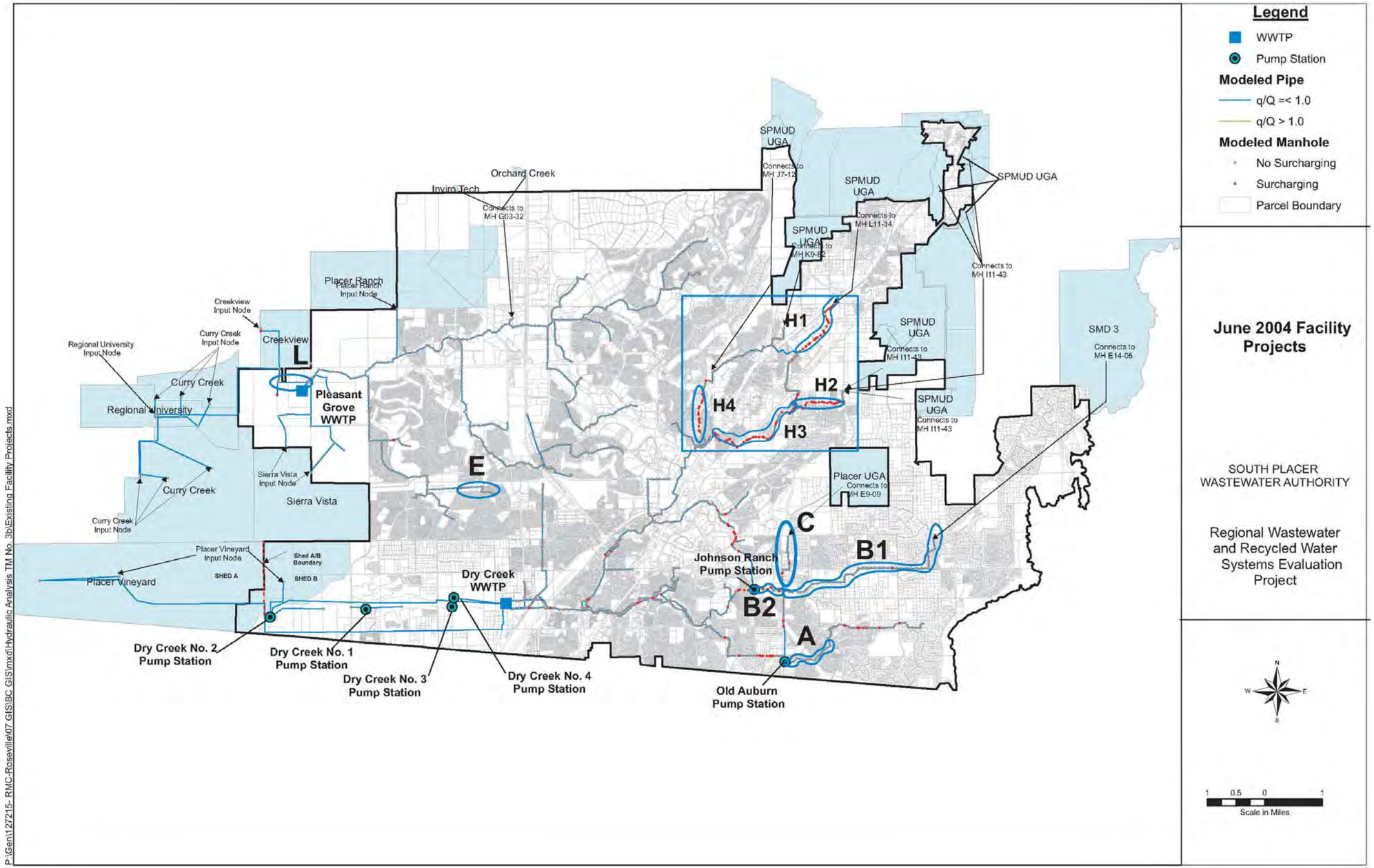
A 21-inch replacement sewer is needed to improve the hydraulic deficiencies identified in Area C. Redirecting flow to another trunk sewer is not feasible. These deficiencies are attributed to 2,700 acres of future development in Placer County and SPMUD within the 2005 Service Area. This project is not needed if flow from the 2,700 acres of future development in Placer County and SPMUD within the 2005 Service Area was directed elsewhere. This project extends 6,000 feet from manhole E9-09 to B08-042. This project is primarily located in the Sierra College Boulevard and Cavitt Stallman Road street right-of way. It extends from the Strap Ravine trunk sewer north to Olive Ranch Road.

Table 10 – June 2004 Facility Project Summary (Part 2)

Project No.	Primary Responsibility	Item	Quantity	Unit Cost ($)	Estimated Capital Cost ($)	Proposed CIP Budget Cost[1] ($)
2- Area B1	SMD-3 UGA	21-inch Gravity	27,000[2] lf	363	9,801,000	12,741,000
Project 2 Subtotal					**9,801,000**	**12,741,000**
3- Area B2	Placer County SMD-3 UGA SPMUD	24-inch Gravity	4,500[2] lf	415	1,868,000	2,428,000
Project 3 Subtotal					**1,868,000**	**2,428,000**
4- Area C	Placer County SPMUD	21-inch Gravity	6,000 lf	363	2,178,000	2,831,000
Project 4 Subtotal					**2,178,000**	**2,831,000**
Total Cost					**13,847,000**	**18,000,000**

[1] Includes 30 percent contingency
[2] Includes 50 percent allowance for alternative alignment

Figure 7 – June 2004 Facility Projects



5.5 Projects to Extend Service

The proposed improvements needed to extend service to the proposed UGAs west of Roseville are shown on Figure 8. Service extension projects are identified by the UGA they serve in Table 11. Project information is based on information provided by UGA applicants at the time of this evaluation and changes may evolve over time. The proposed Total Project Costs identified in Table 10 are for informational purposes only. These costs have been developed utilizing a unit cost table representative of municipal sewer projects in the SPWA area. Actual sewer infrastructure costs for each extension project will be the responsibility of the developer.

NOTE: Proposed sewer infrastructure for the Placer Ranch and Sierra Vista UGAs were provided by developers after the original publication date (April 2006) of this TM. Although the sizes and alignments of the subsequently proposed trunk sewers are included Figure 8, Table 11 contains the estimates from the original publication of this TM.

5.5.1 Extension Project 1 – Placer Ranch

The proposed improvements to extend service into Placer Ranch were identified in the Placer Ranch Specific Plan and were included in the trunk sewer model. Flow from Placer Ranch and some areas of Placer County north of Placer Ranch are introduced into the existing trunk sewer that is tributary to the Pleasant Grove WWTP. Proposed pipe diameters are included in Figure 8 and Table 11.

5.5.2 Extension Project 2 – Placer Vineyards and West Dry Creek

The proposed improvements to extend service into Placer Vineyards and West Dry Creek were identified in the Placer Vineyards Specific Plan and the West Dry Creek Facilities Plan and were included in the trunk sewer model. The West Dry Creek service area is located between the Dry Creek WWTP and the Placer Vineyards UGA. The Placer Vineyards UGA includes one pump station. This pump station will roughly serve the area of Placer Vineyards outside the 2005 Service Area (Shed A). This pump station will pump directly to the Dry Creek WWTP. The area of Placer Vineyards roughly within the 2005 Service Area (Shed B) will be served by the proposed Dry Creek Pump Station No. 2. Dry Creek Pump Station No. 2 will pump into a common force main already serving the existing Dry Creek Pump Station No. 1 which flows directly to the Dry Creek WWTP. Two additional pump stations (No. 3 and No. 4) to serve the eastern portion of West Dry Creek are also proposed and will share a common force main to the Dry Creek WWTP. Proposed pipe diameters and pump station capacities for the Placer Vineyards UGA and West Dry Creek are included in Table 11 and Figure 8.

5.5.3 Extension Project 3 – Regional University

The proposed improvements to extend service into the Regional University UGA were identified in the Regional University Specific Plan and were included in the trunk sewer model. The Regional University UGA includes one pump station and is able to collect flow from Curry Creek North and South. Flow from the Regional University pump station is pumped (along with flow from Curry Creek South) east through Regional University and north along Watt Avenue to a gravity sewer main on Phillip Road. This gravity main flows east to the West Roseville collection system, tying into the proposed 18-inch gravity sewer at Westside Drive and Phillip Road transitioning to a 24-inch as the proposed gravity sewer heads east to join the existing Philip Road. Note that for this gravity sewer option to provide service to Regional University and Curry Creek, the gravity sewers planned for West Roseville (the 18-inch/24-inch) would have to be upsized to 42-inch and 48-inch, respectively. An alternate alignment is to pump directly from Regional University to the 36-inch gravity sewer that ties into the influent junction structure at Pleasant Grove WWTP. The proposed pipe diameters and pump station capacities are included in Figure 8 and Table 11.

5.5.4 Extension Project 4 – Curry Creek

The proposed improvements to extend service into Curry Creek were identified in the Regional University Master Sewer Study. Pipes in Curry Creek North will flow by gravity into Regional University. Flow from Curry Creek South will be pumped north where the Curry Creek South force main will tee into the proposed Regional University force main. An alternate alignment for the Curry Creek South force main is to go east across Curry Creek and then north at Watt Avenue to a junction point on the Regional University force main. The proposed pipe diameters and lift station capacity are included in Figure 8 and Table 11.

5.5.5 Extension Project 5 – Creekview

The proposed improvements to extend service into Creekview were not previously identified. USGS topographic contour information indicates that a pump station will be necessary to transport flow into the West Roseville collection system. The proposed pipe diameters and pump station capacity are included in Figure 8 and Table 11.

5.5.6 Extension Project 6 – Sierra Vista

The proposed improvements to extend service into Sierra Vista were not previously identified. Flows from Sierra Vista will tie into two existing sewer stubs along the border of Sierra Vista and West Roseville. Approximately 1/3 of Sierra Vista is projected in our modeling to be served to the 18-inch trunk sewer in West Roseville and 2/3 of the area is projected to be served to the 24-inch trunk sewer in West Roseville. A trunk sewer network and corresponding sewer extension project had not been established for the Sierra Vista service area at the original publication date of this TM.

5.5.7 Extension Project 7 – Brookfield

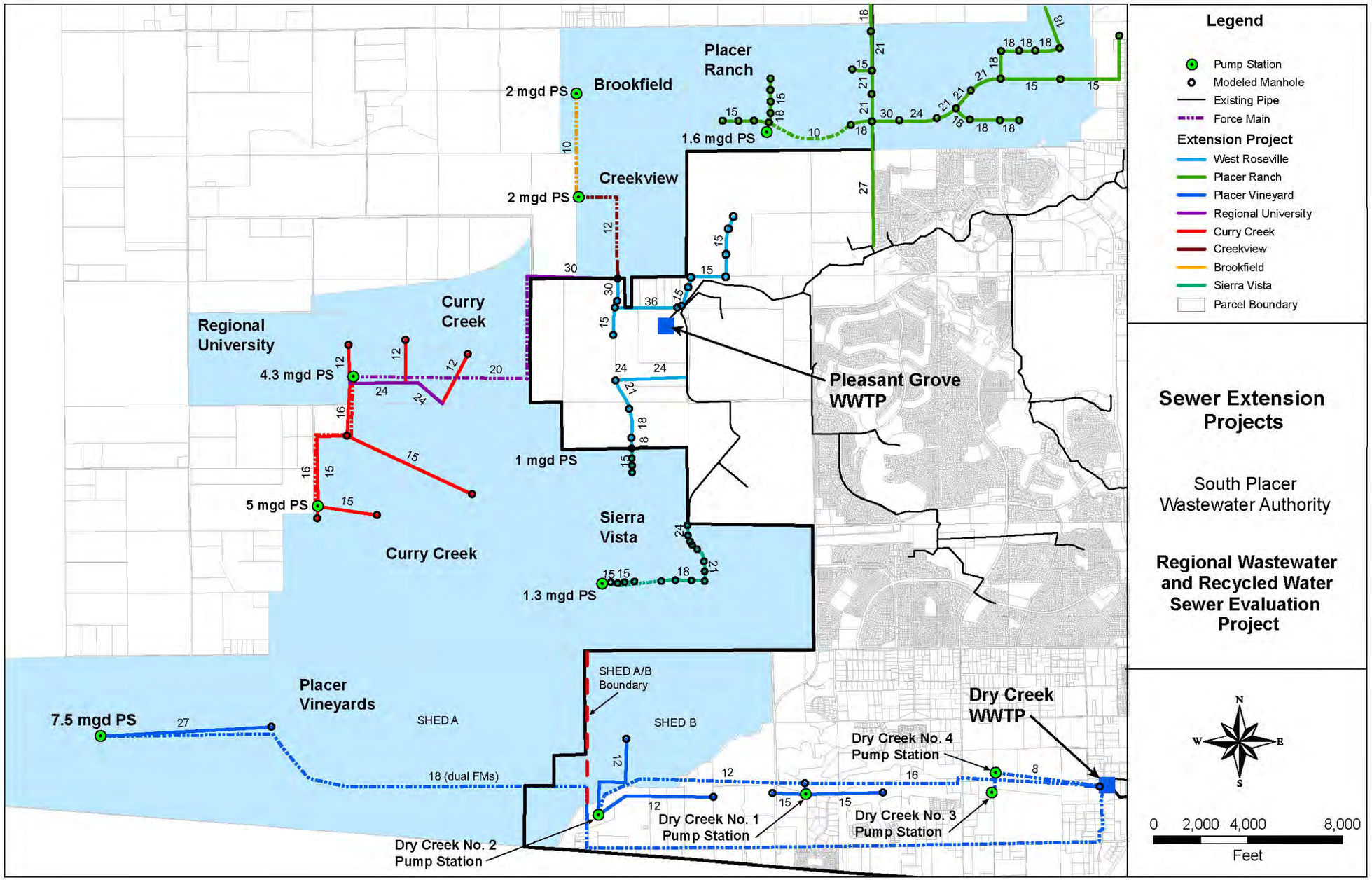
The proposed improvements to extend service into Brookfield were not previously identified. USGS topographic contour information indicates that a pump station will be necessary to transport flow from a low spot in Brookfield towards Creekview, where flows will be combined and pumped into a common Brookfield-Creekview force main and into the West Roseville collection system. The proposed pipe diameters and pump station capacity are included in Figure 8 and Table 11.

Table 11 – Sewer Extension Project Summary[1]

Project No.	Item	Quantity	Unit Cost ($/unit)	Estimated Capital Cost ($)	Proposed Total Project Cost[2] ($)
1-Placer Ranch	48-inch gravity	6,000 lf	622	3,732,000	4,852,000
	15-inch gravity	5,700 lf	292	1,664,000	2,164,000
Project 1 Subtotal				**5,396,000**	**7,016,000**
2-Placer Vineyards/ West Dry Creek	12-inch gravity - PV	4,400 lf	246	1,082,000	1,407,000
	27-inch gravity - PV	7,300 lf	437	3,190,000	4,147,000
	18-inch (dual) force mains - PV	48,000 lf	400[3]	19,200,000	24,960,000
	7.5 mgd pump station - PV	1 ea	2,750,000	2,750,000	3,575,000
	12-inch gravity - DC	5,100 lf	246	1,255,000	1,631,000
	15-inch gravity - DC	4,700 lf	292	1,372,000	1,784,000
	12-inch force main – DC No. 2	9,500 lf	174	1,653,000	2,149,000
	2.5 mgd pump station – DC No. 2	1 ea	900,000	900,000	1,170,000
	0.6 mgd pump station – DC No. 3	1 ea	400,000	400,000	520,000
	1.2 mgd pump station – DC No. 4	1 ea	600,000	600,000	780,000
	8-inch force main – DC No. 3 and 4	5,600 lf	120	672,000	874,000
Project 2 Subtotal				**33,075,000**	**42,997,000**
3-Regional University	24-inch gravity	5,000 lf	415	2,075,000	2,698,000
	30-inch gravity	2,900 lf	454	1,317,000	1,712,000
	20-inch force main	12,000 lf	260	3,120,000	4,056,000
	4.4 mgd pump station	1 ea	2,000,000	2,000,000	2,600,000
Project 3 Subtotal				**8,512,000**	**11,066,000**
4-Curry Creek	12-inch gravity	6,000 lf	246	1,476,000	1,919,000
	15-inch gravity	13,000 lf	292	3,796,000	4,935,000
	16-inch force main	7,000 lf	224	1,568,000	2,038,000
	5 mgd lift station	1 ea	2,000,000	2,000,000	2,600,000
Project 4 Subtotal				**8,840,000**	**11,492,000**
5-Creekview	12-inch force main	4,100 lf	174	713,000	927,000
	2 mgd pump station	1 ea	1,500,000	1,500,000	1,950,000
Project 5 Subtotal				**2,213,000**	**2,877,000**
7-Brookfield	10-inch force main	4,450 lf	150	668,000	868,000
	2 mgd pump station	1 ea	1,500,000	1,500,000	1,950,000
Project 7 Subtotal				**2,168,000**	**2,818,000**
Total Cost				**60,204,000**	**78,266,000**

[1] Proposed Sewer Extension Project Cost Table is for informational purposes only. These costs have been developed utilizing a unit cost table representative of municipal sewer projects in the SPWA area. Actual sewer infrastructure costs for each extension project will be the responsibility of the developer.
[2] Includes 30 percent contingency
[3] Unit cost for dual 18-inch force mains assumes 60 percent increase in unit cost for a single 18-inch force main ($250/LF x 1.60 = $400/LF)

Figure 8 – Trunk Sewer Extension Projects

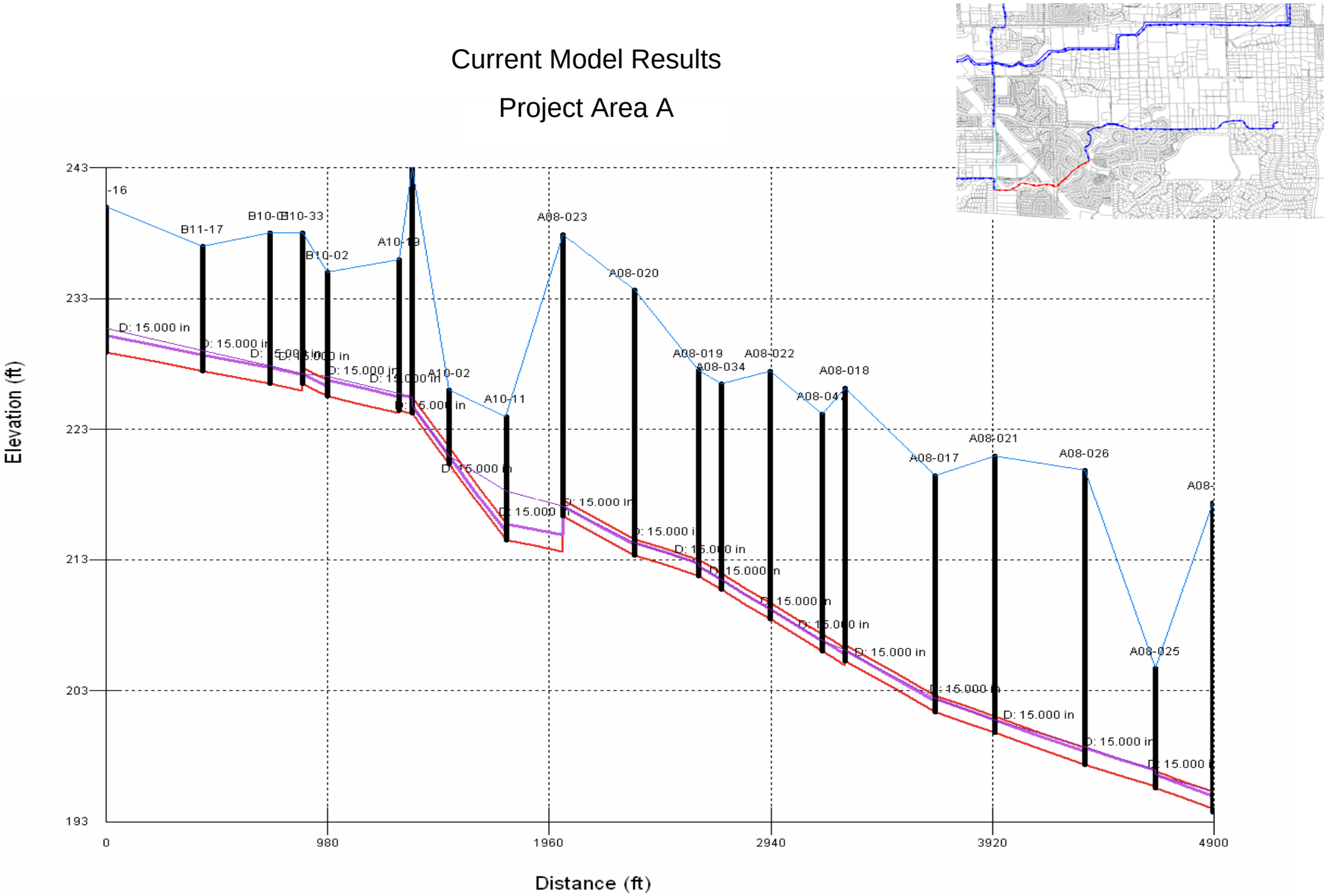


Attachment A

Sewer Profiles – June 2004 Scenario

Current Model Results

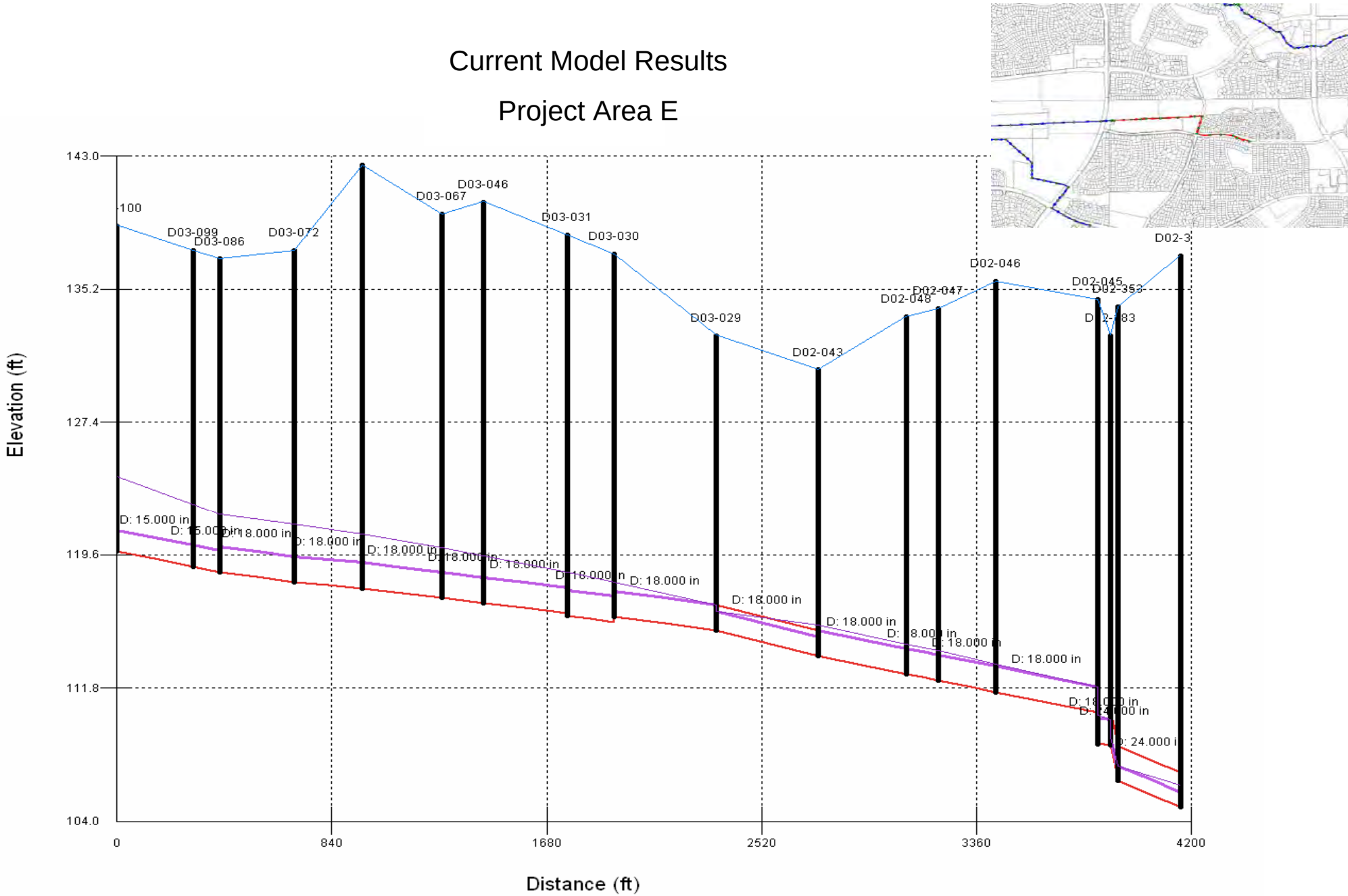
Project Area A



Note: Pipe shown in red, HGL shown in purple and ground elevation shown in blue

Current Model Results

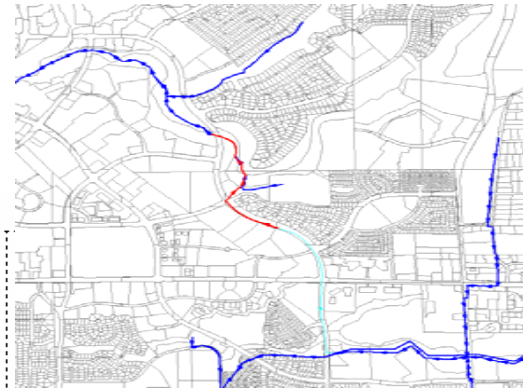
Project Area E

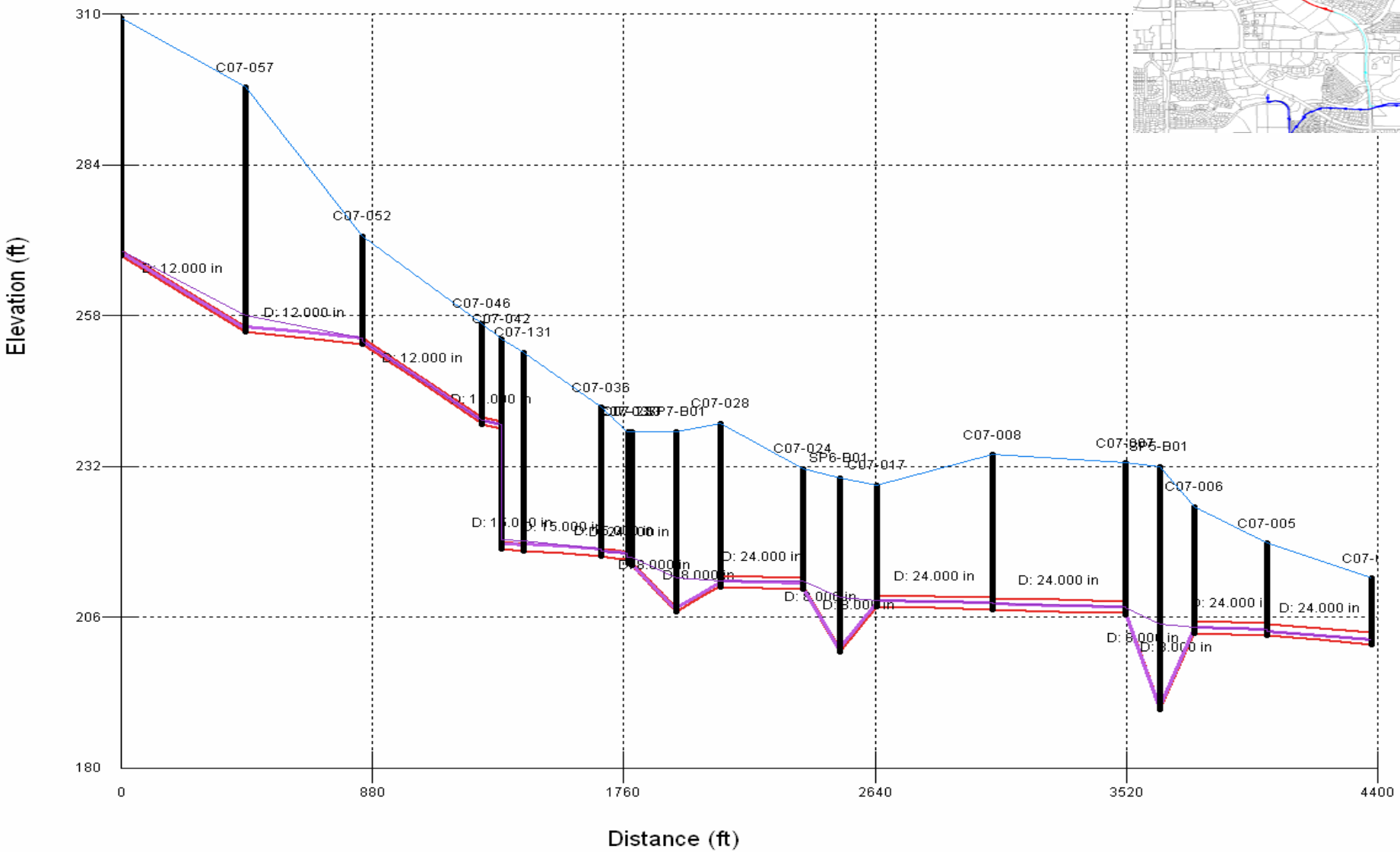


Note: Pipe shown in red, HGL shown in purple and ground elevation shown in blue

Current Model Results

Project Area K





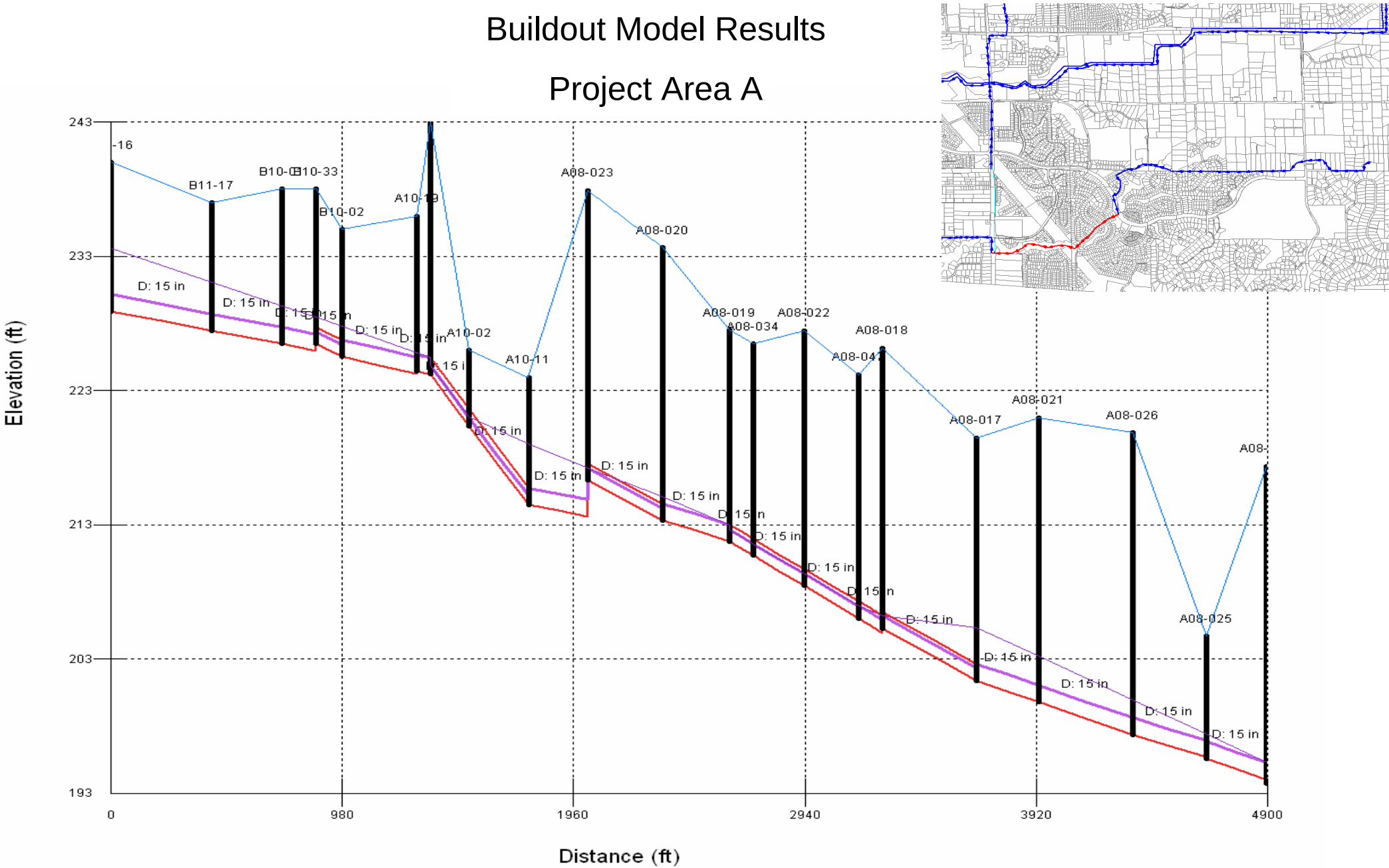
Note: Pipe shown in red, HGL shown in purple and ground elevation shown in blue

Attachment B

Sewer Profiles – Buildout Scenario

Buildout Model Results

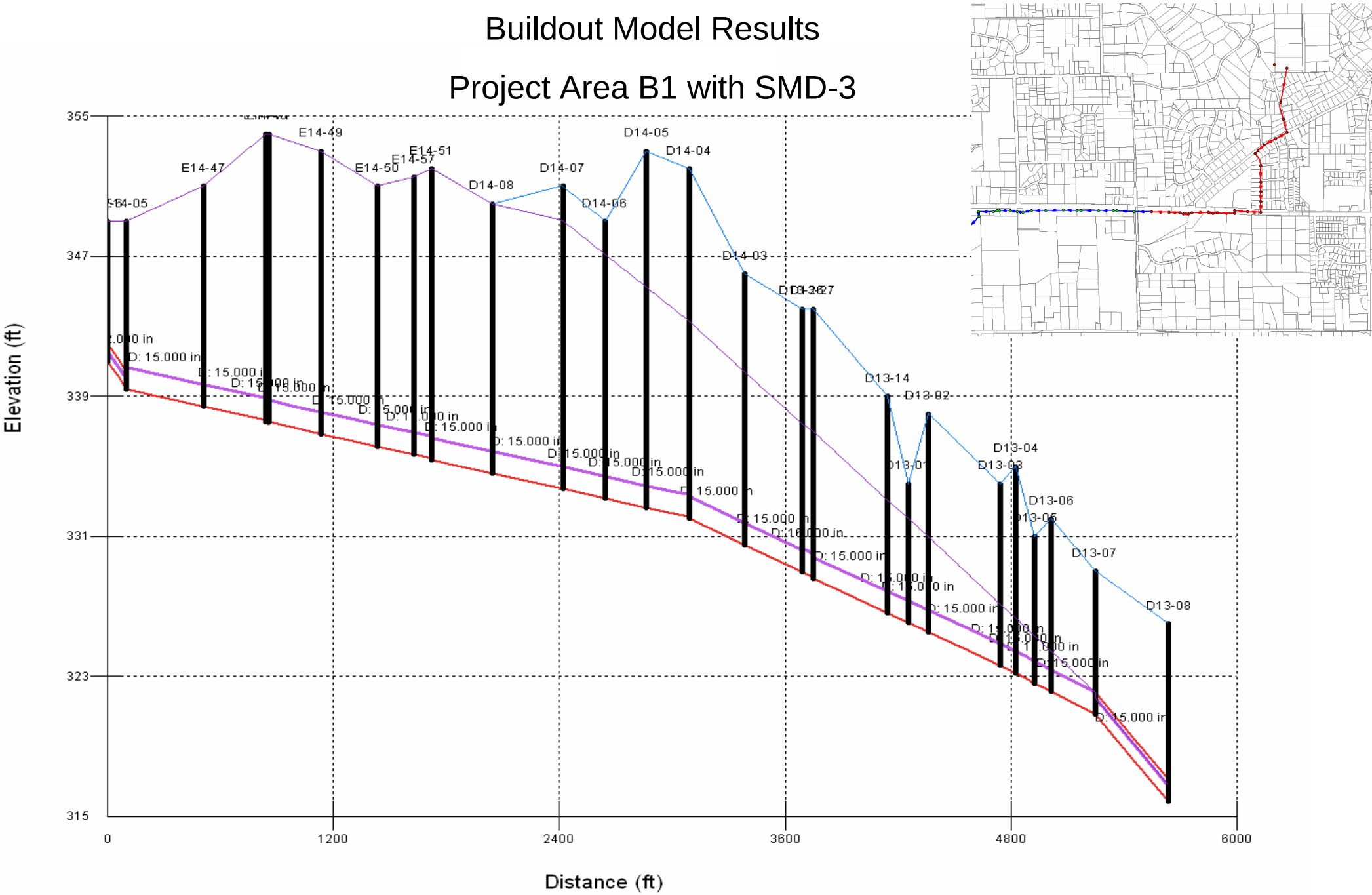
Project Area A



Note: Pipe shown in red, HGL shown in purple and ground elevation shown in blue

Buildout Model Results

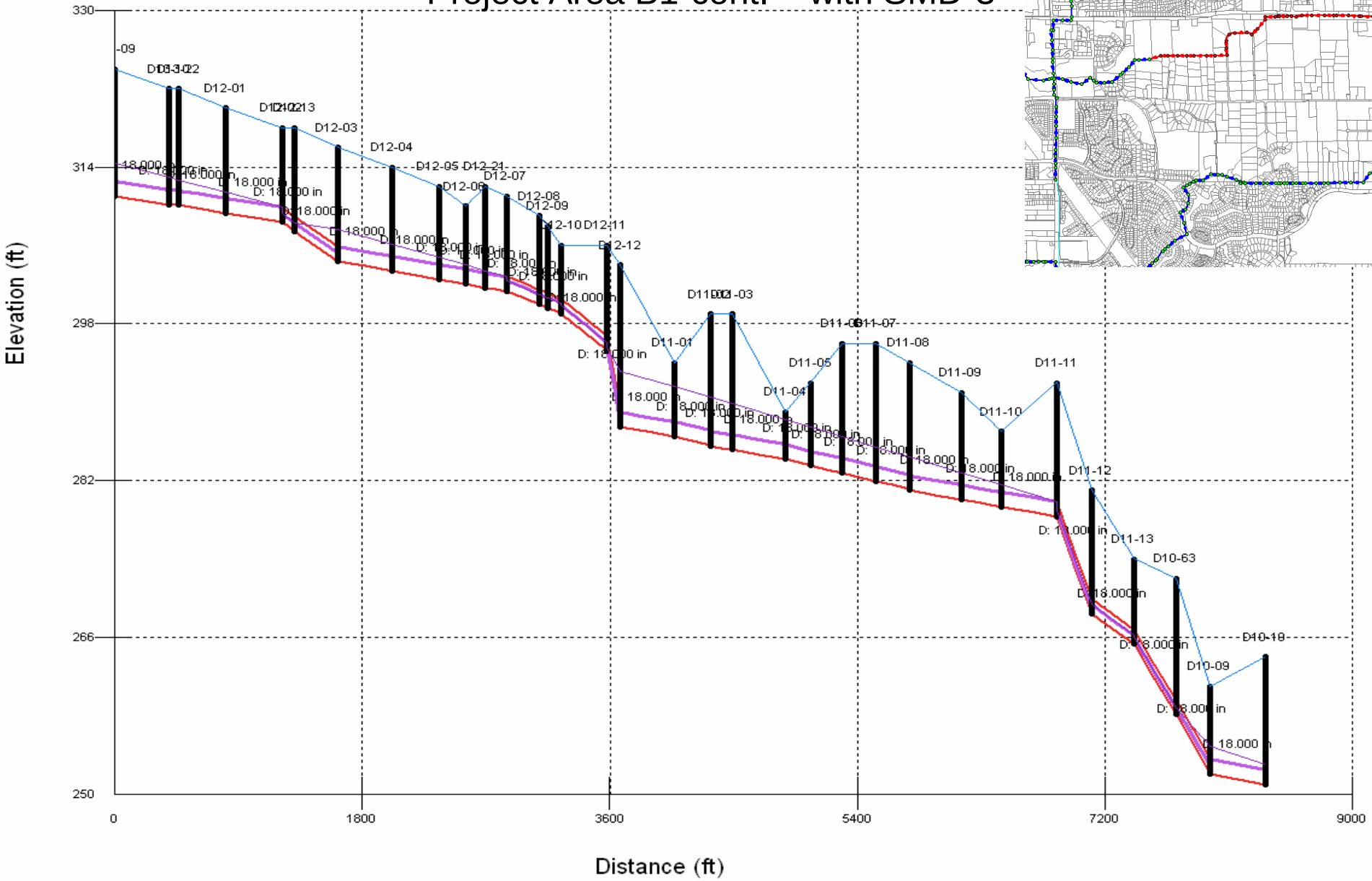
Project Area B1 with SMD-3

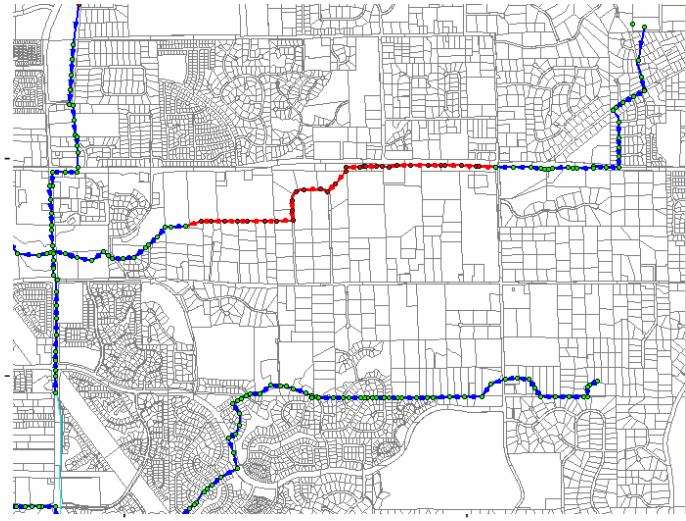


Note: Pipe shown in red, HGL shown in purple and ground elevation shown in blue

Buildout Model Results

Project Area B1-cont. – with SMD-3

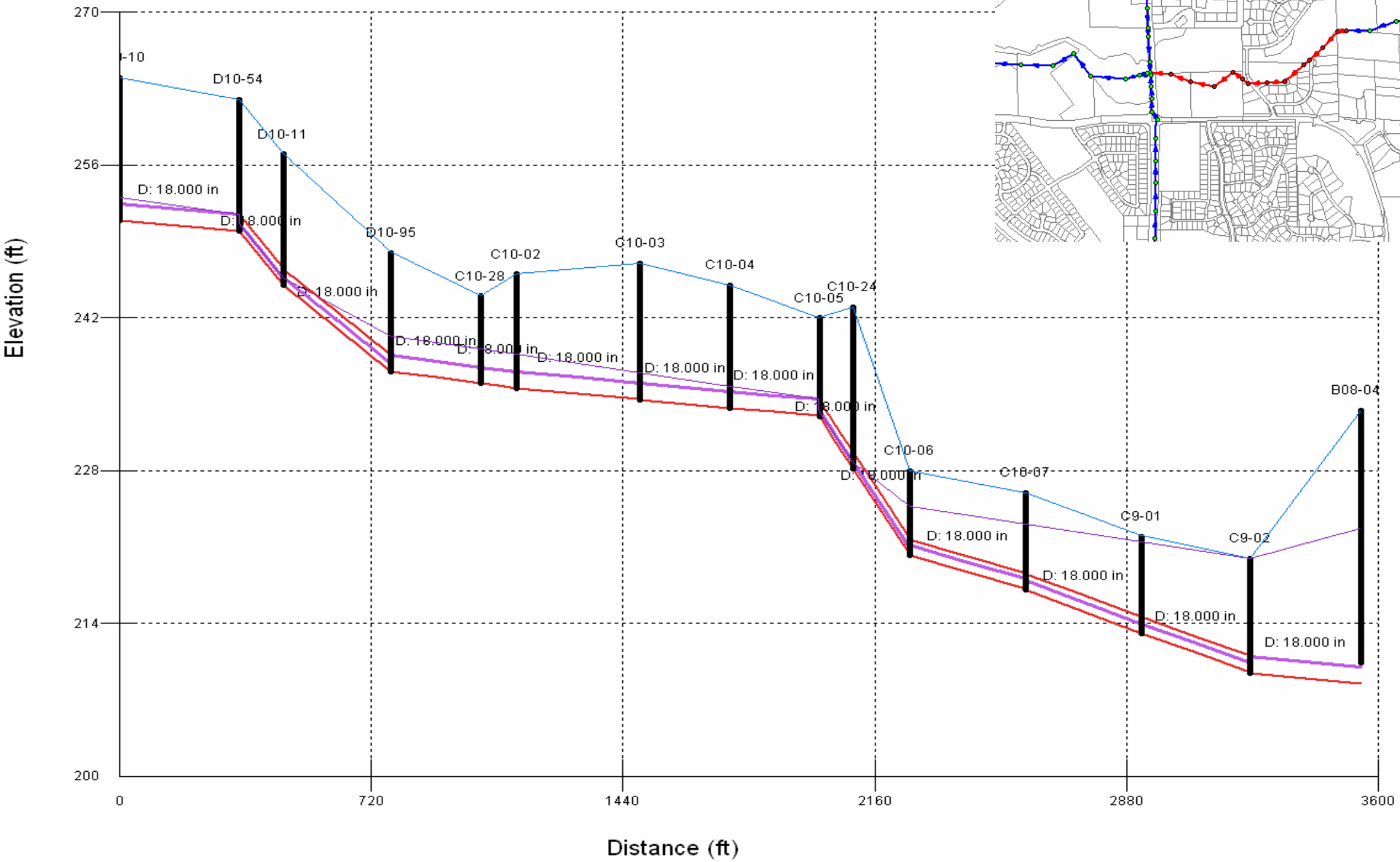


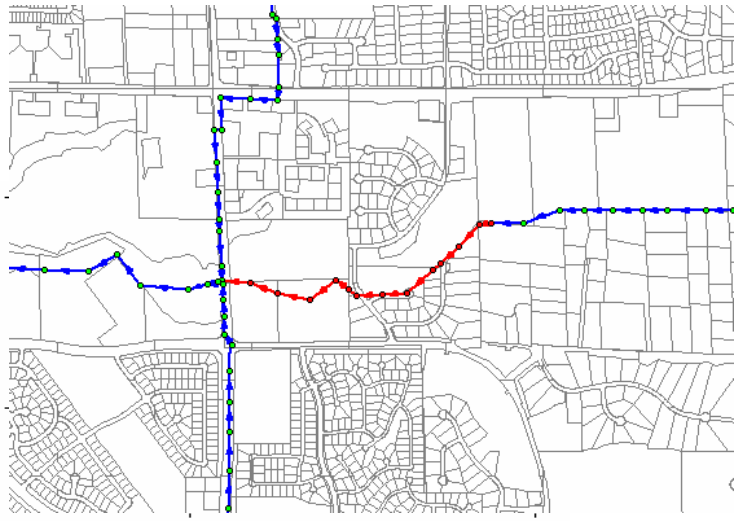


Note: Pipe shown in red, HGL shown in purple and ground elevation shown in blue

Buildout Model Results

Project Area B1-cont. – with SMD-3

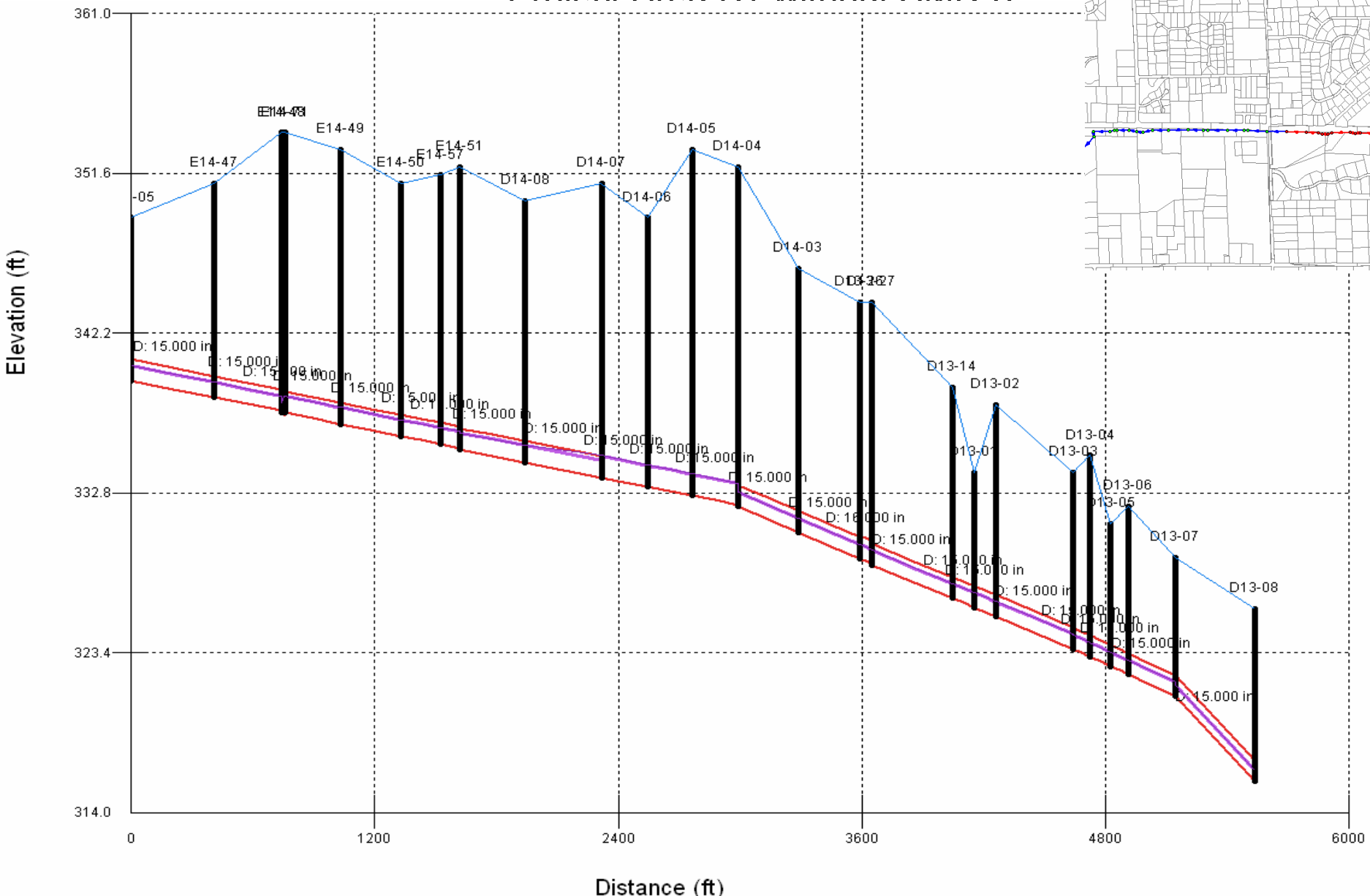


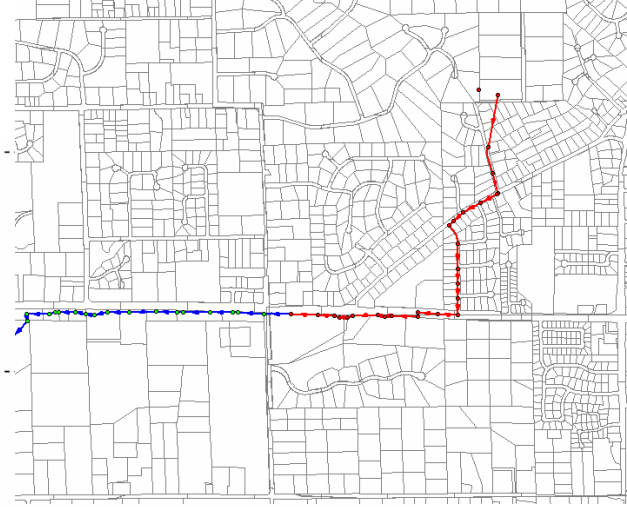


Note: Pipe shown in red, HGL shown in purple and ground elevation shown in blue

Buildout Model Results

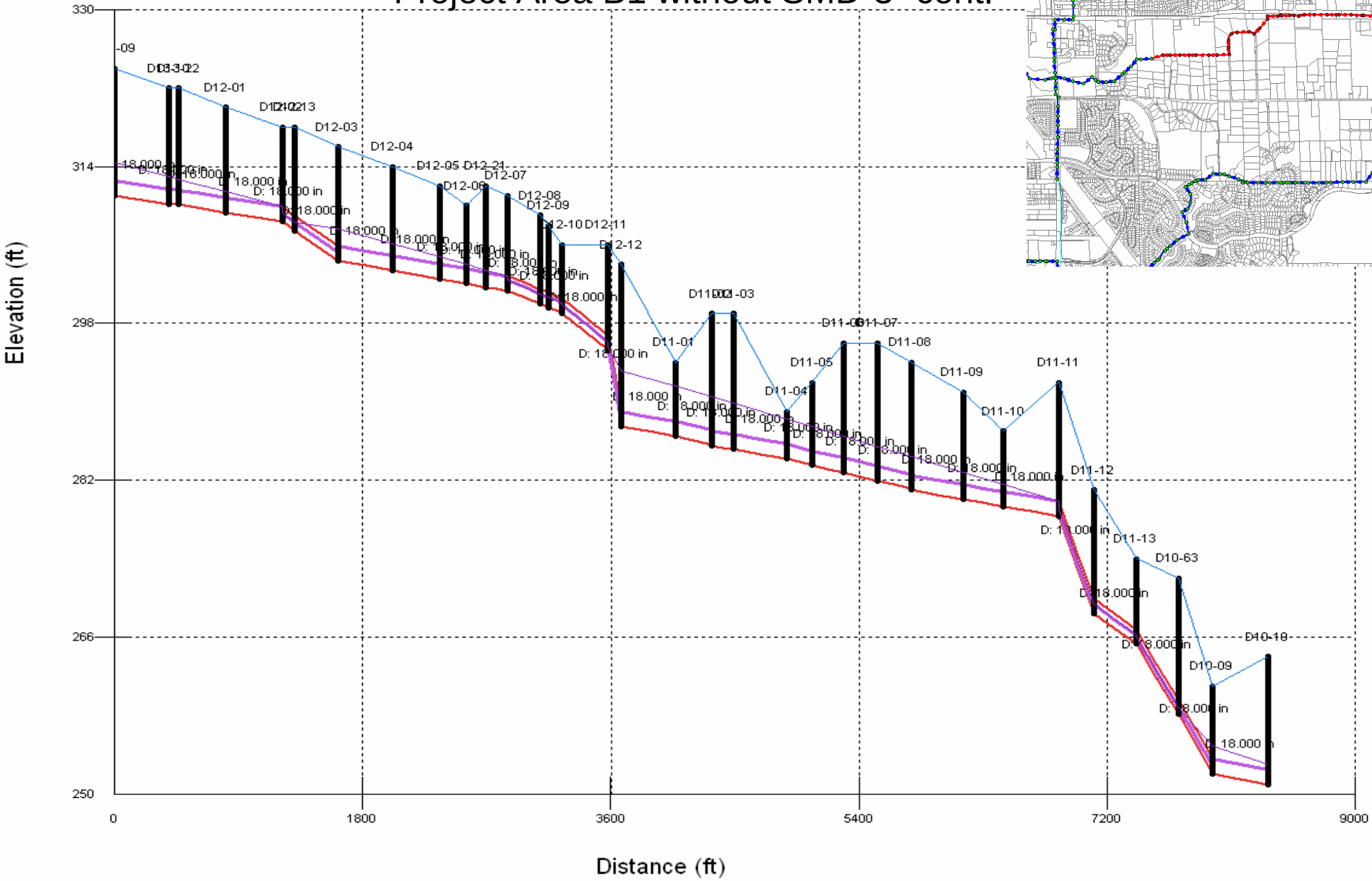
Project Area B1 without SMD-3





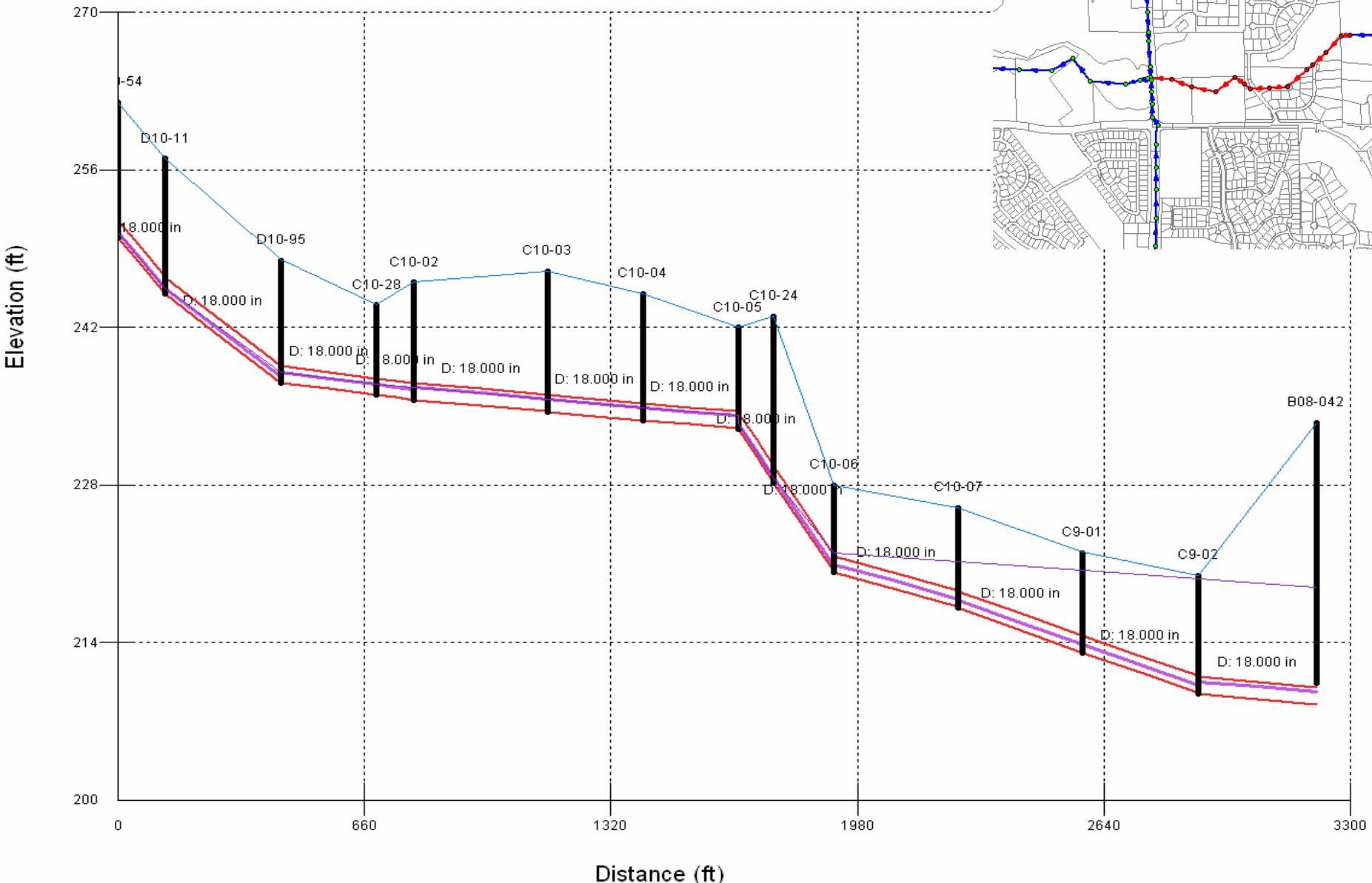
Buildout Model Results

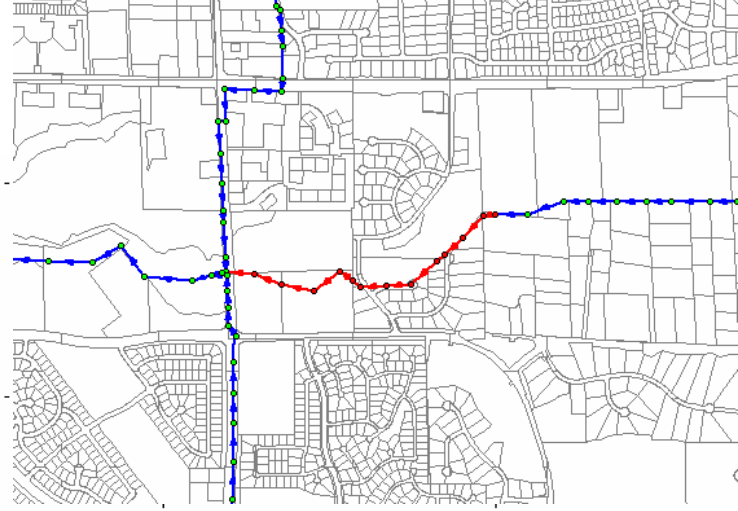
Project Area B1 without SMD-3 -cont.



Buildout Model Results

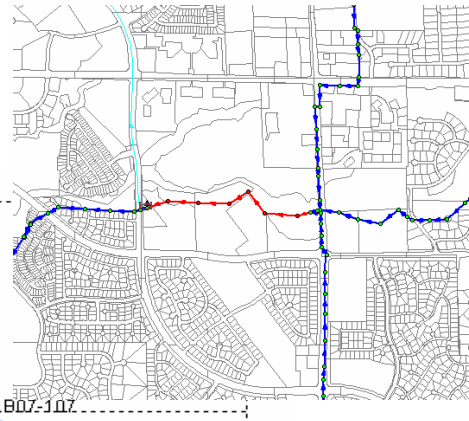
Project Area B1 without SMD-3 –cont.

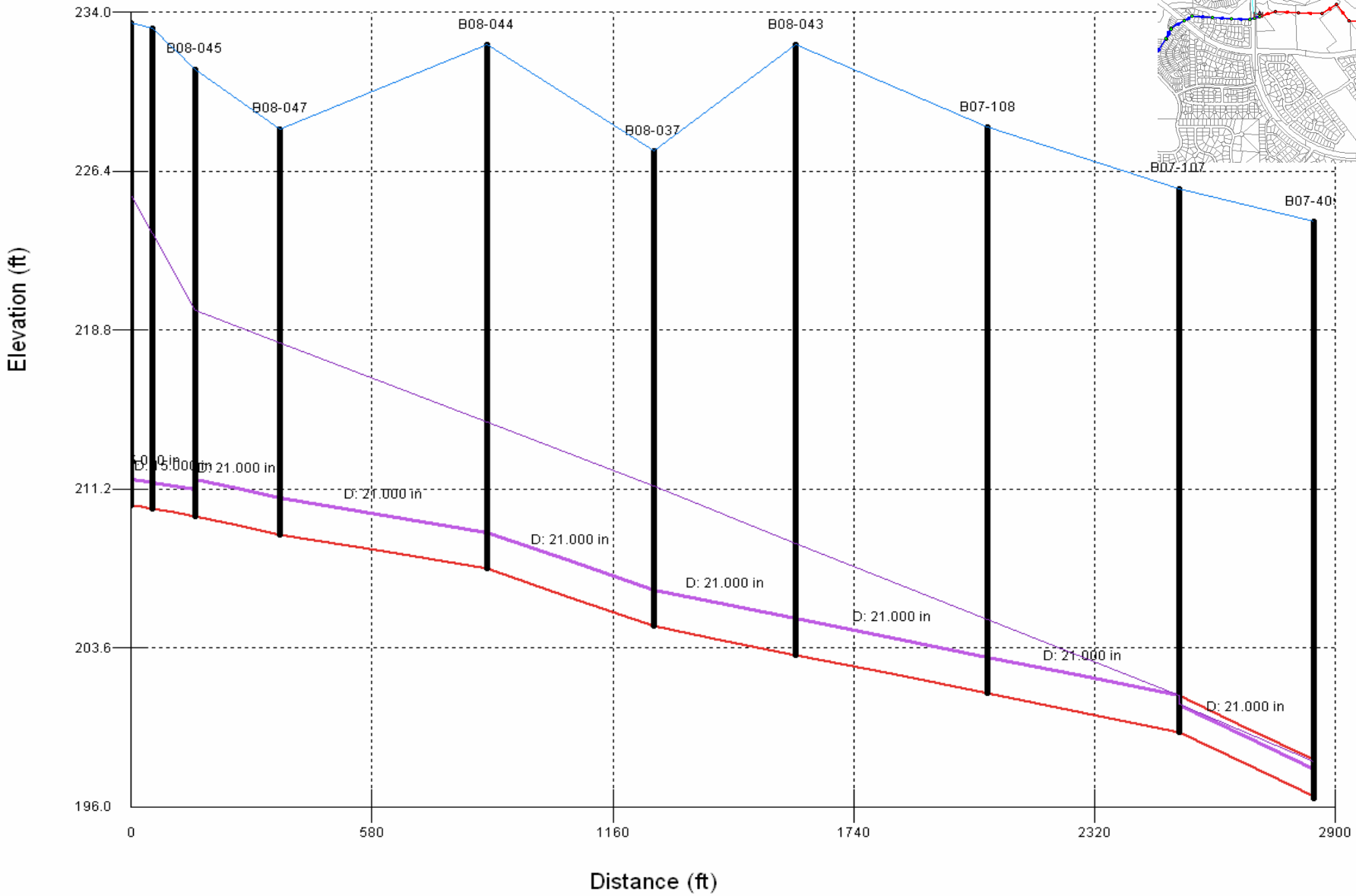




Buildout Model Results

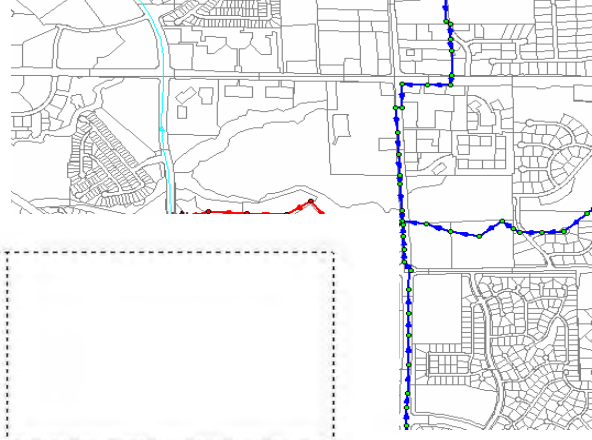
Project Area B2 – with SMD-3

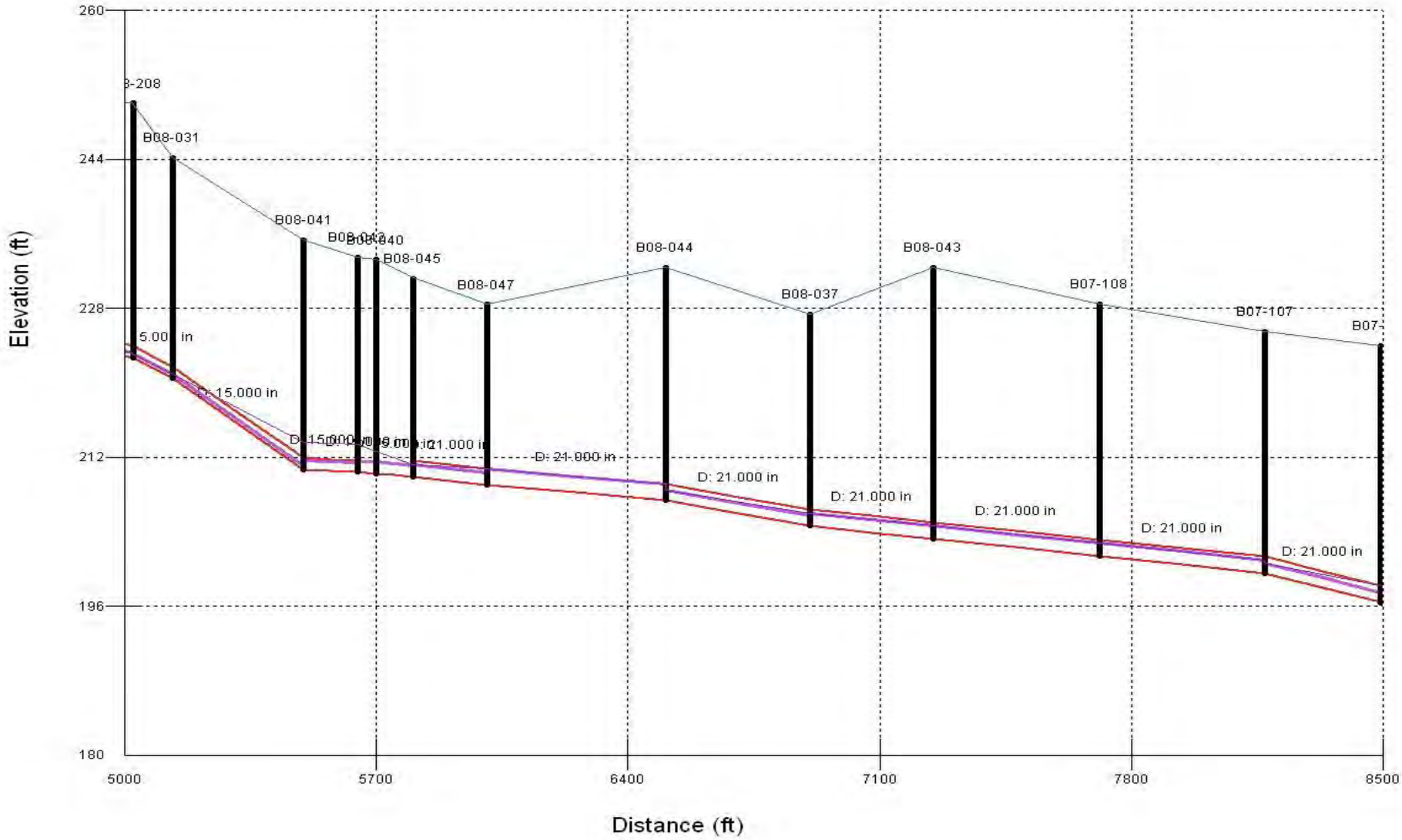




Note: Pipe shown in red, HGL shown in purple and ground elevation shown in blue

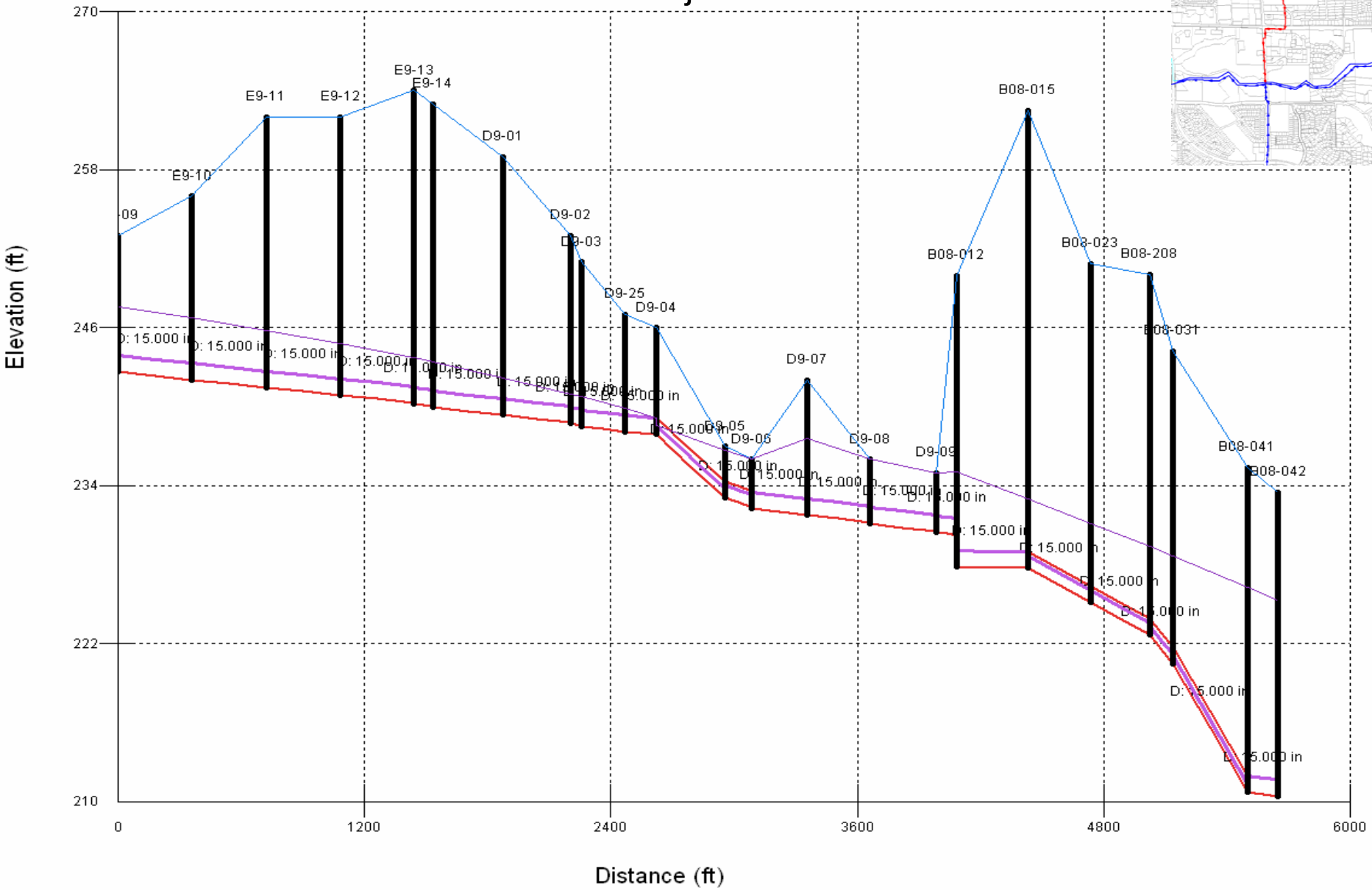
Buildout Model Results
Project Area B2 (not including SMD-3 and development outside of SMD-2 Service Area)

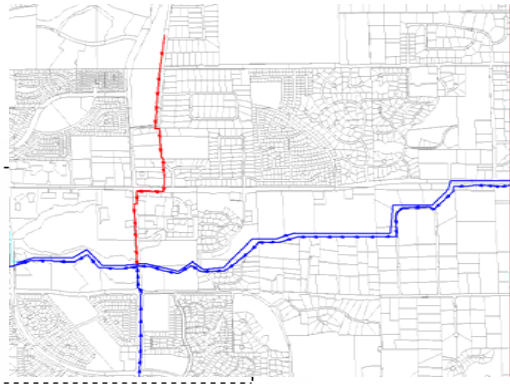




Buildout Model Results

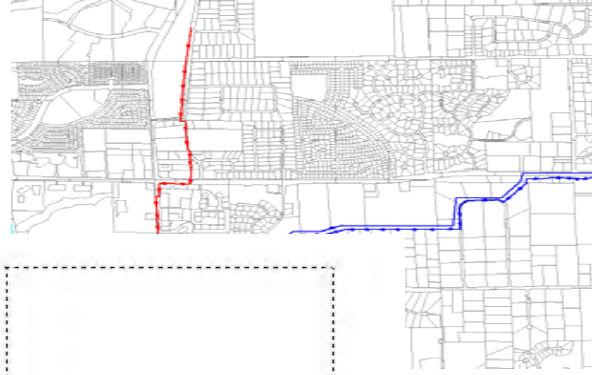
Project Area C

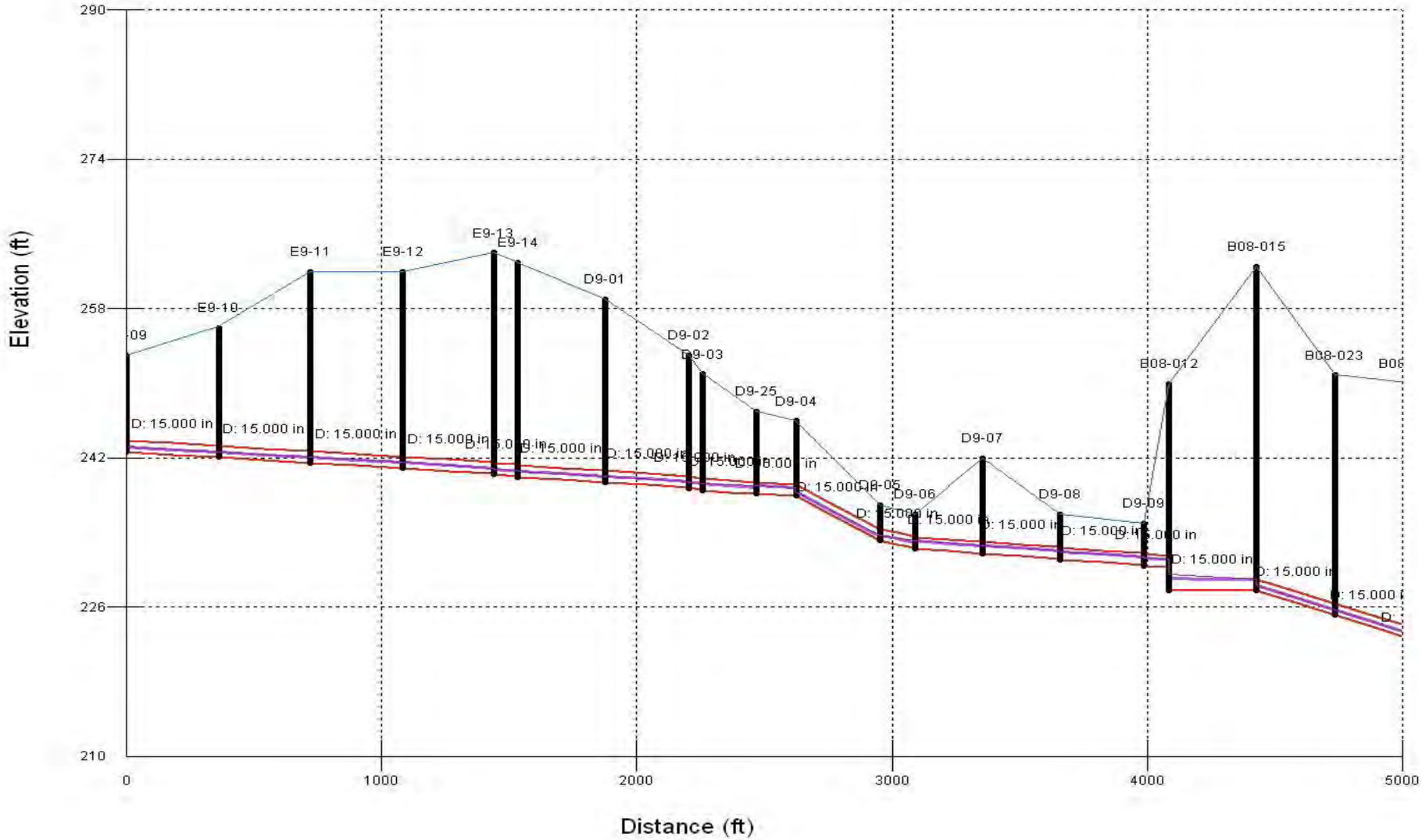




Note: Pipe shown in red, HGL shown in purple and ground elevation shown in blue

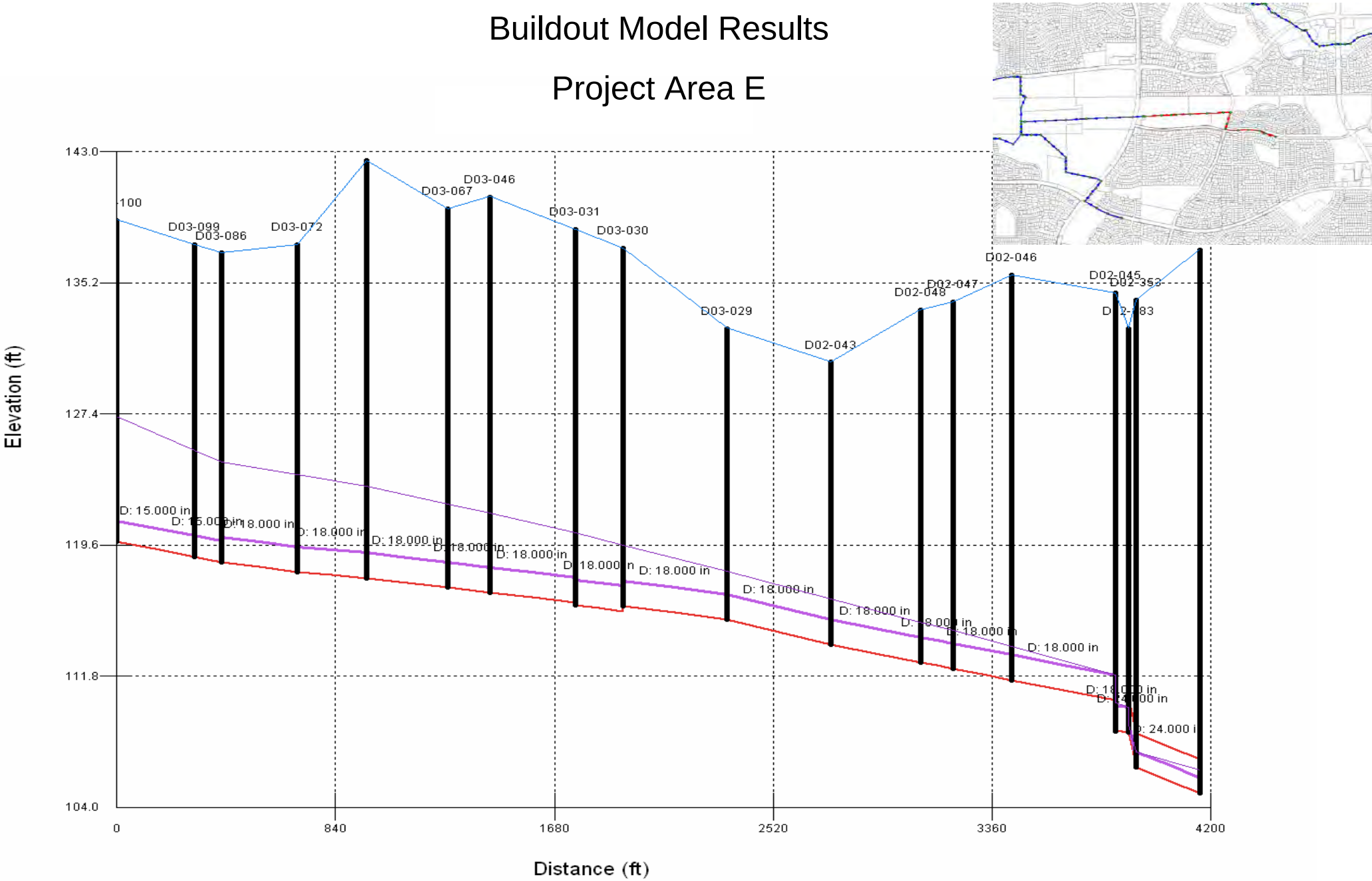
Buildout Model Results
Project Area C (not including development outside of SMD-2 Service Area)





Buildout Model Results

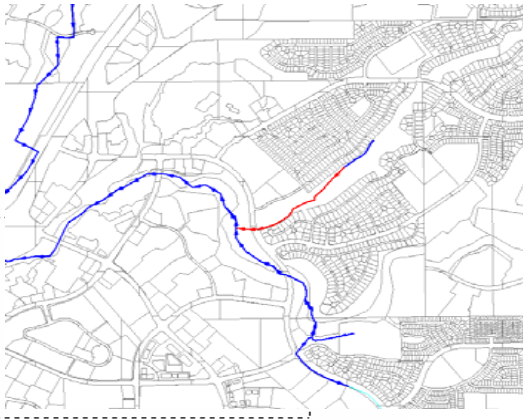
Project Area E

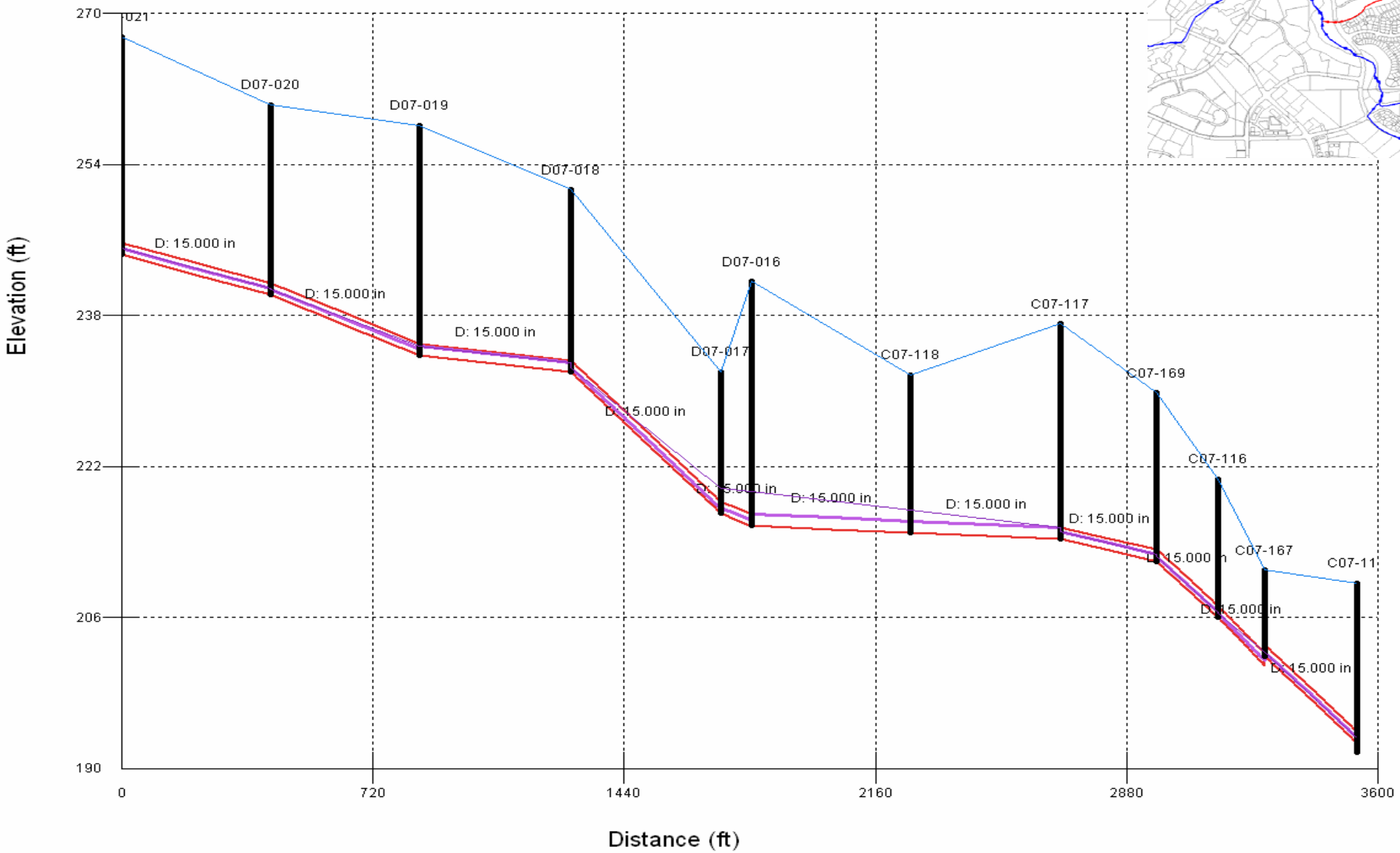


Note: Pipe shown in red, HGL shown in purple and ground elevation shown in blue

Buildout Model Results

Project Area F

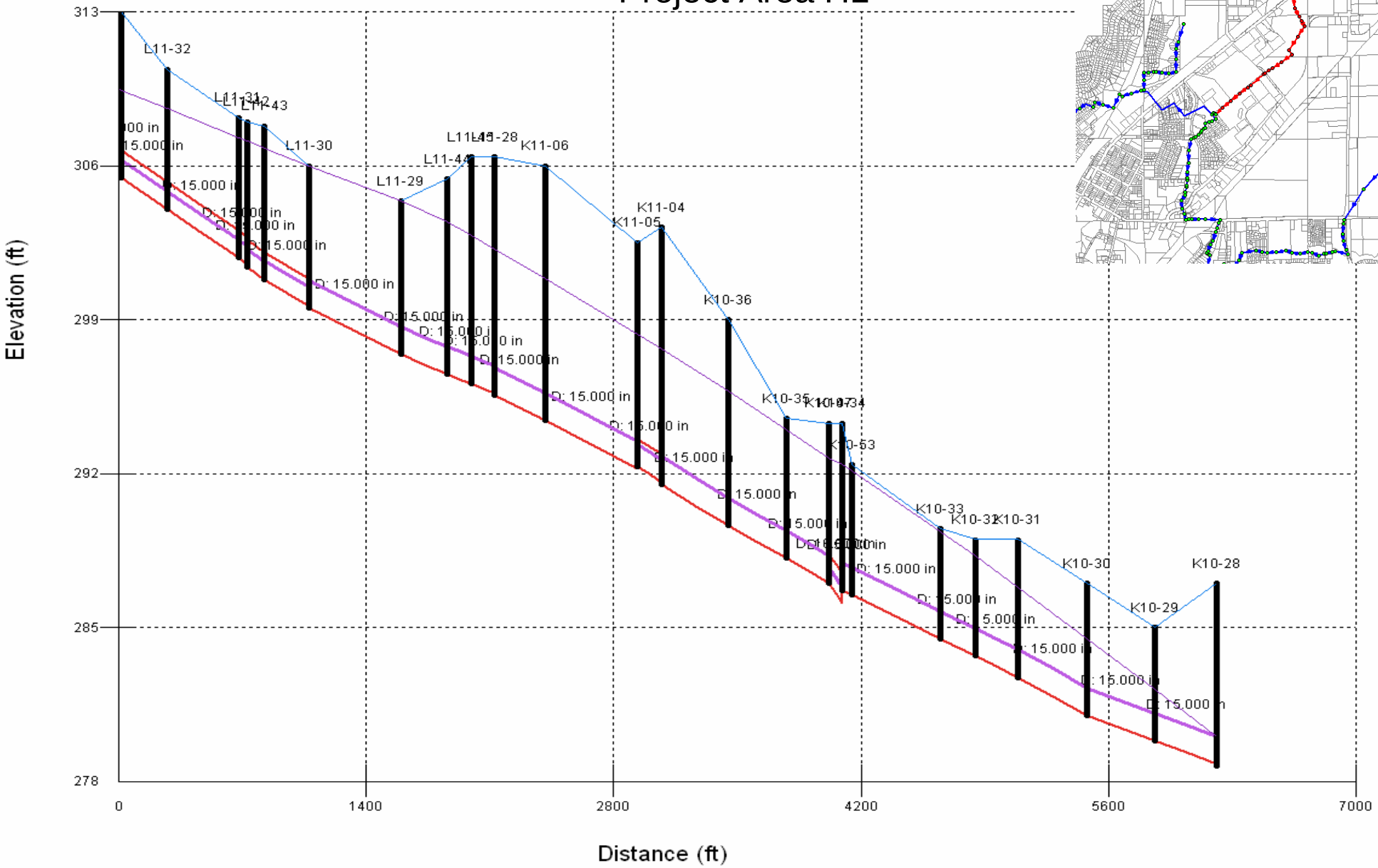


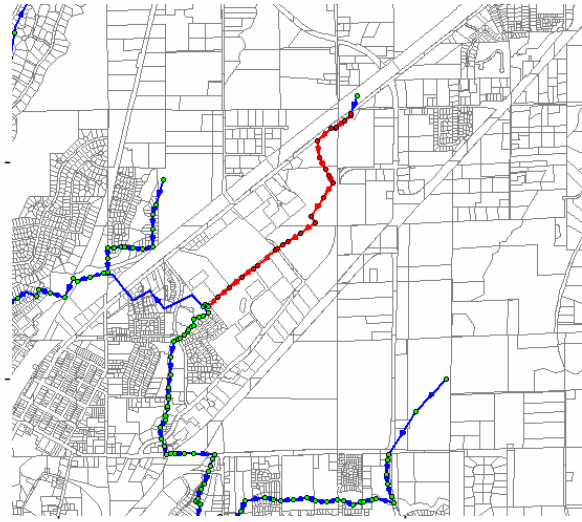


Note: Pipe shown in red, HGL shown in purple and ground elevation shown in blue

Buildout Model Results

Project Area H1

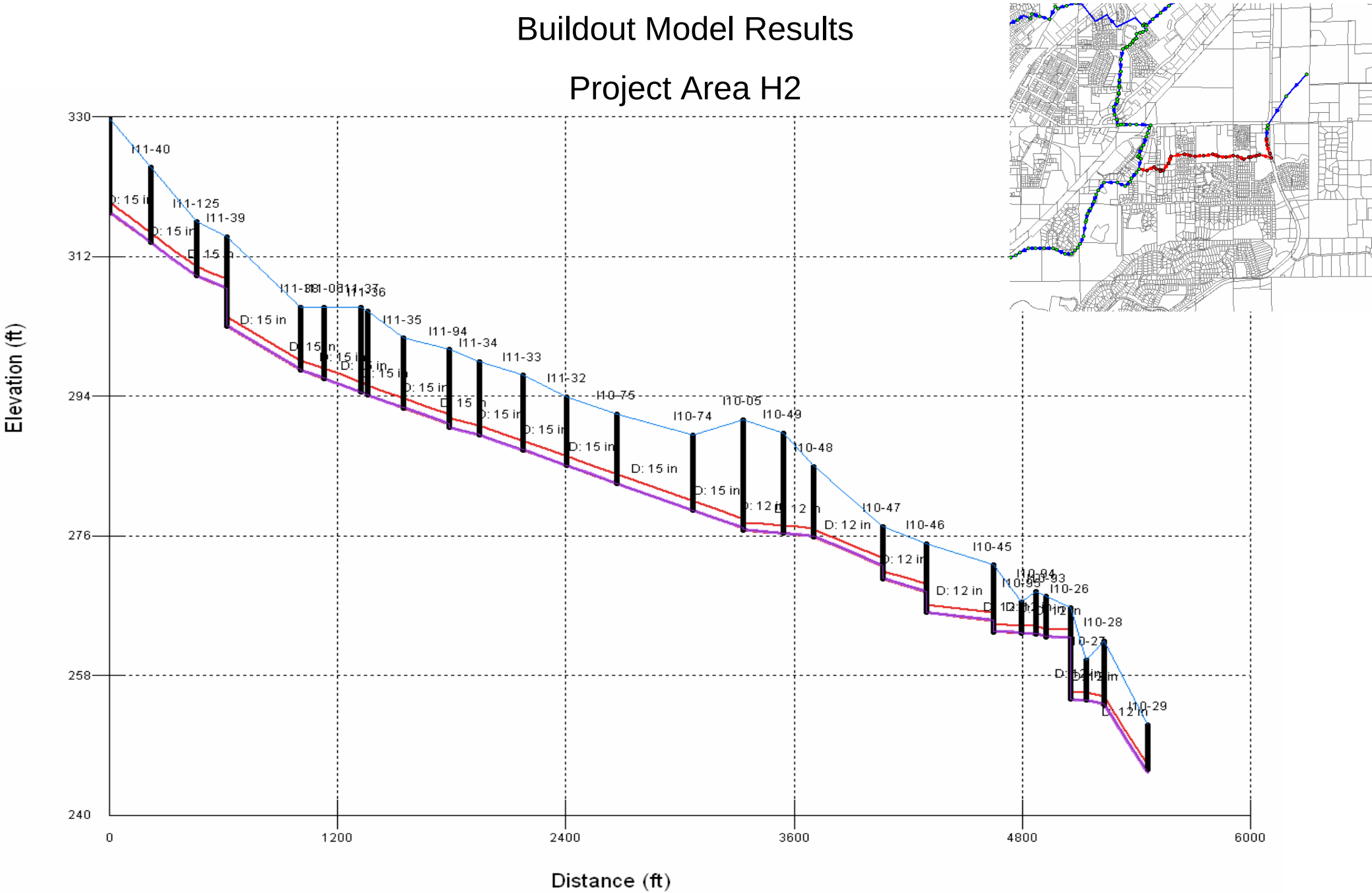




Note: Pipe shown in red, HGL shown in purple and ground elevation shown in blue

Buildout Model Results

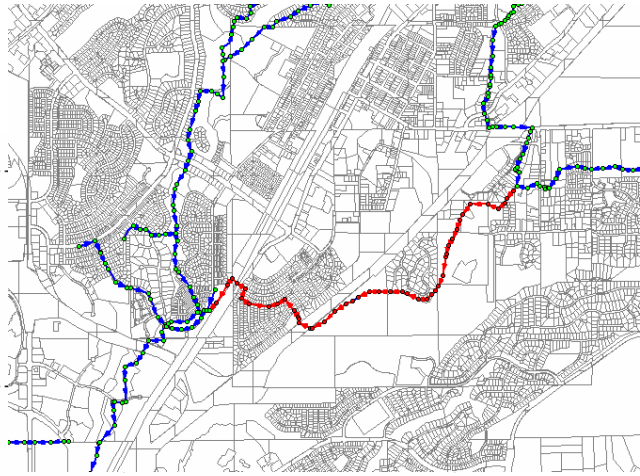
Project Area H2

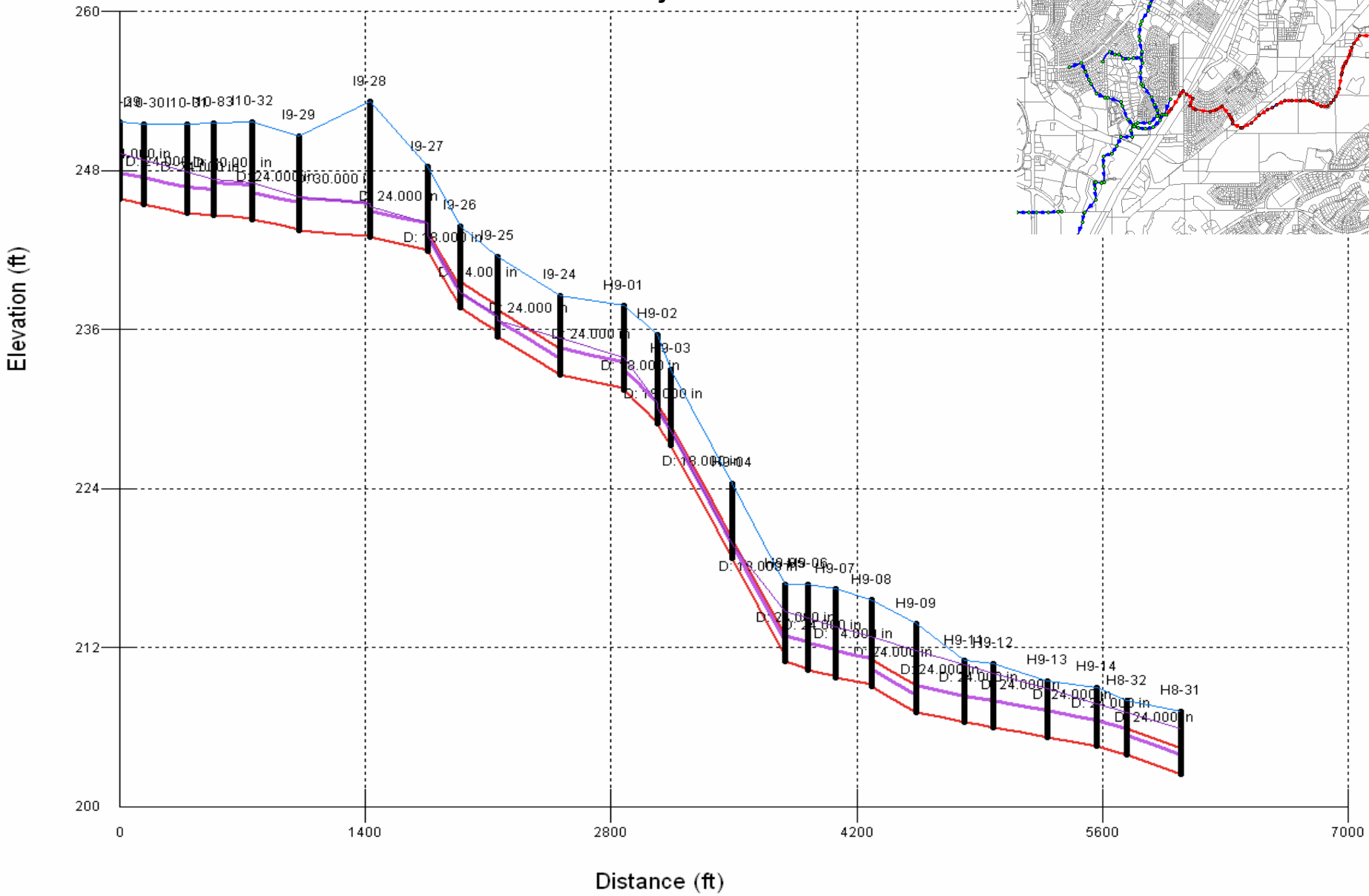


Note: Pipe shown in red, HGL shown in purple and ground elevation shown in blue

Buildout Model Results

Project Area H3

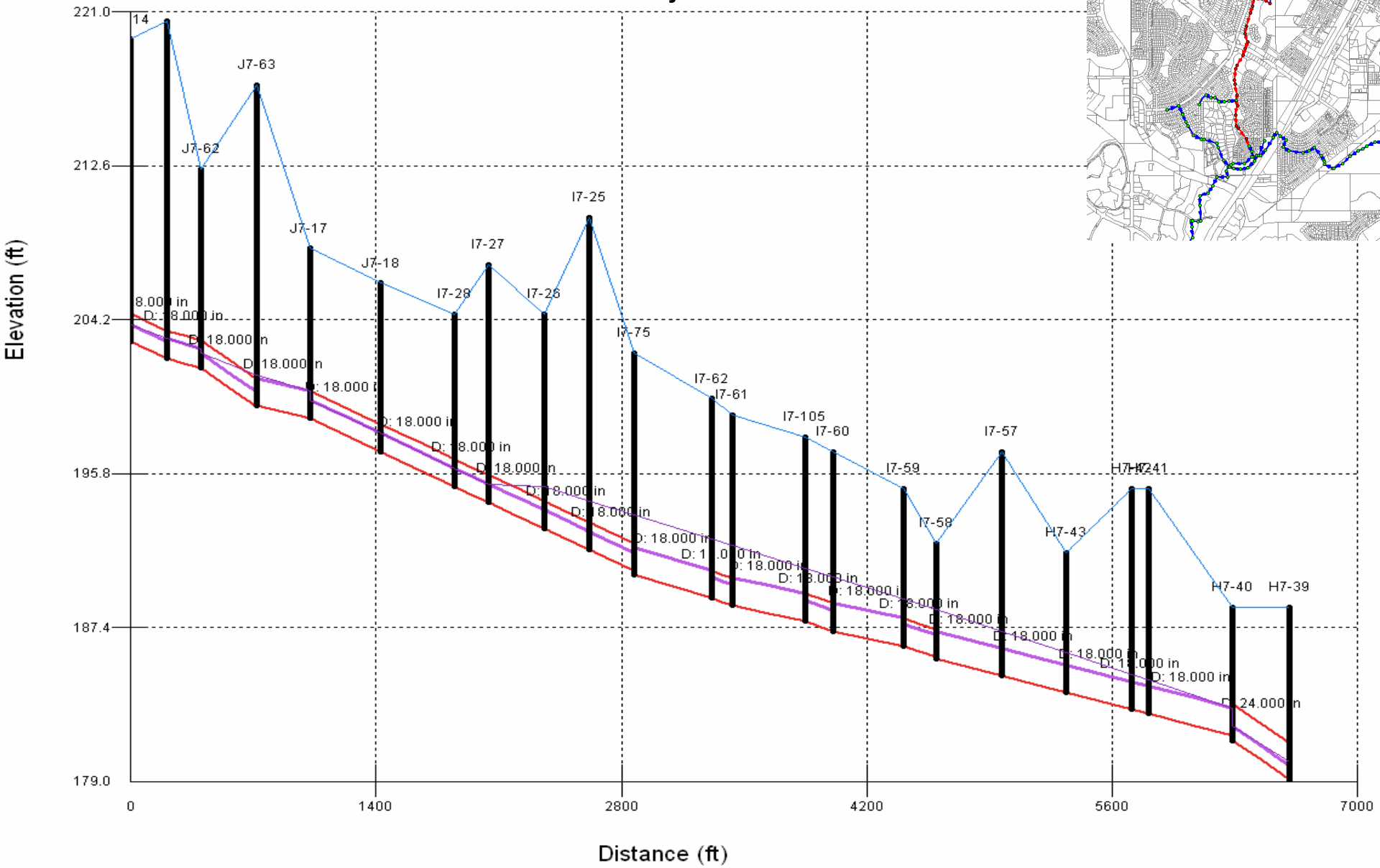


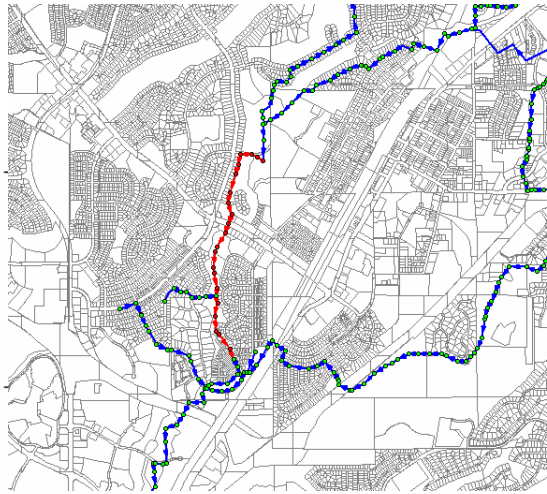


Note: Pipe shown in red, HGL shown in purple and ground elevation shown in blue

Buildout Model Results

Project Area H4

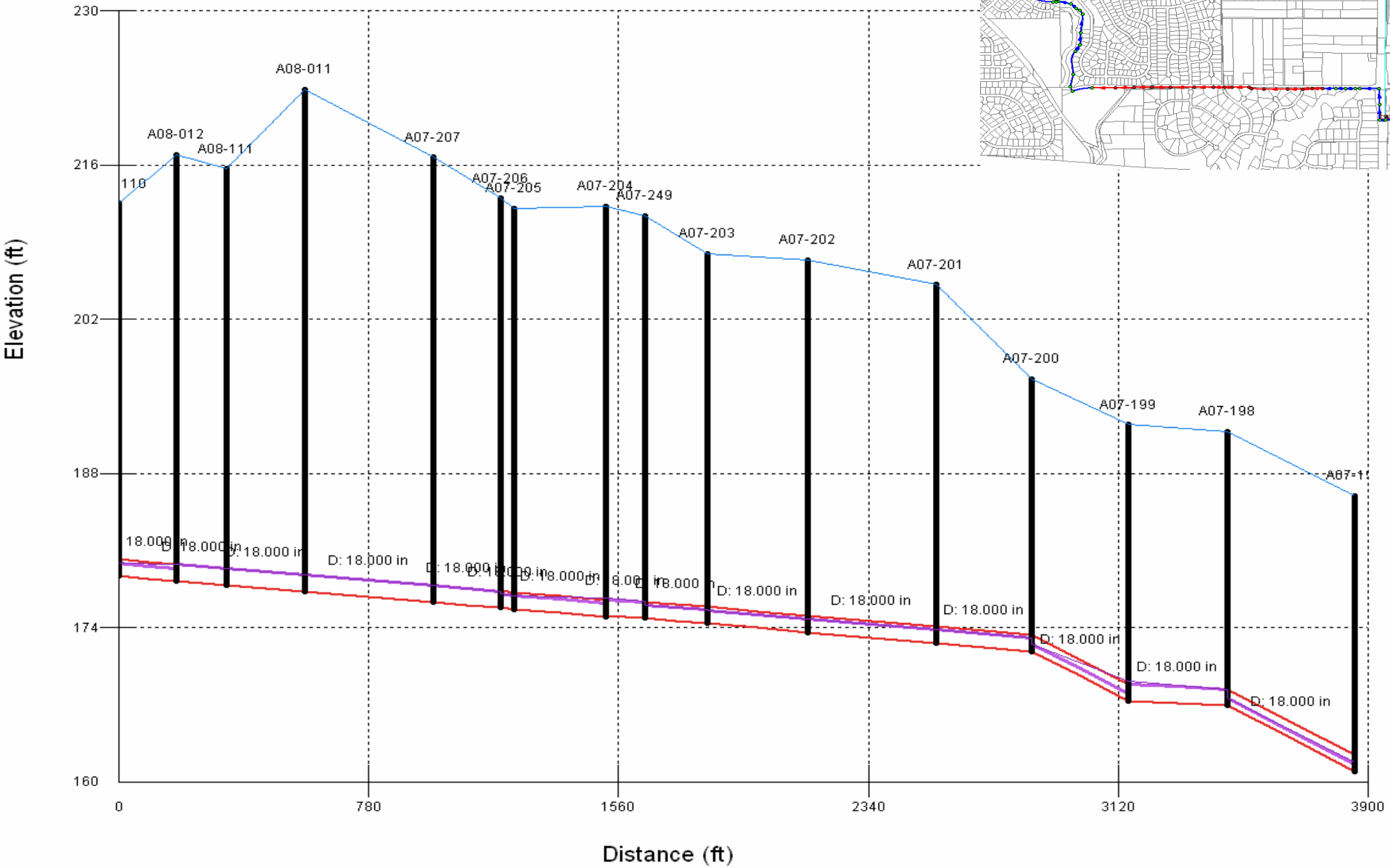




Note: Pipe shown in red, HGL shown in purple and ground elevation shown in blue

Buildout Model Results

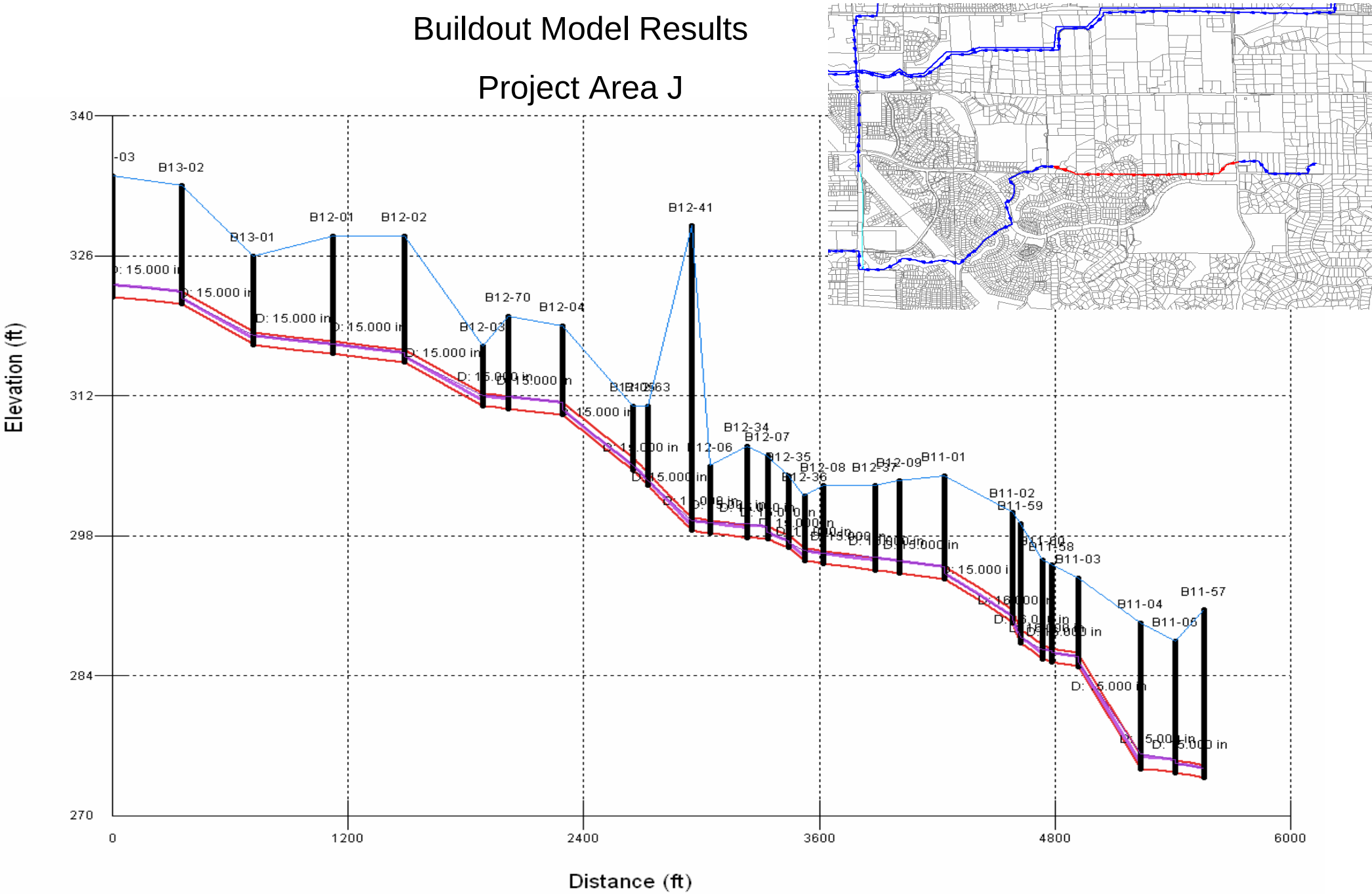
Project Area I



Note: Pipe shown in red, HGL shown in purple and ground elevation shown in blue

Buildout Model Results

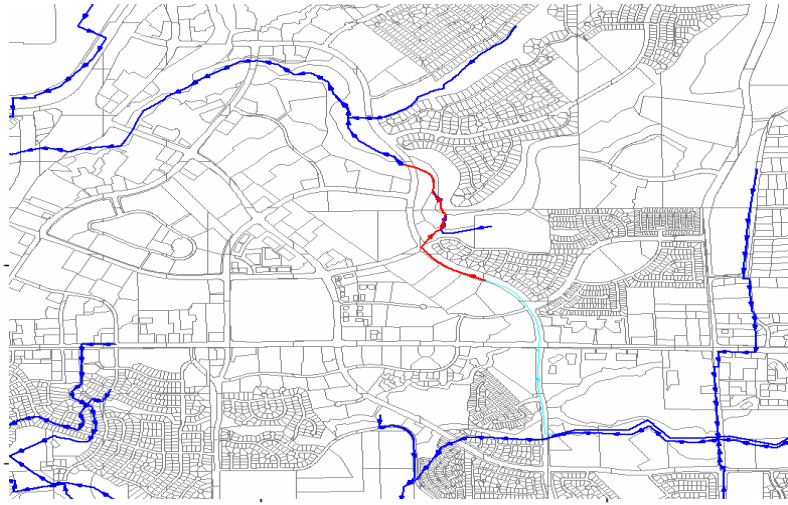
Project Area J

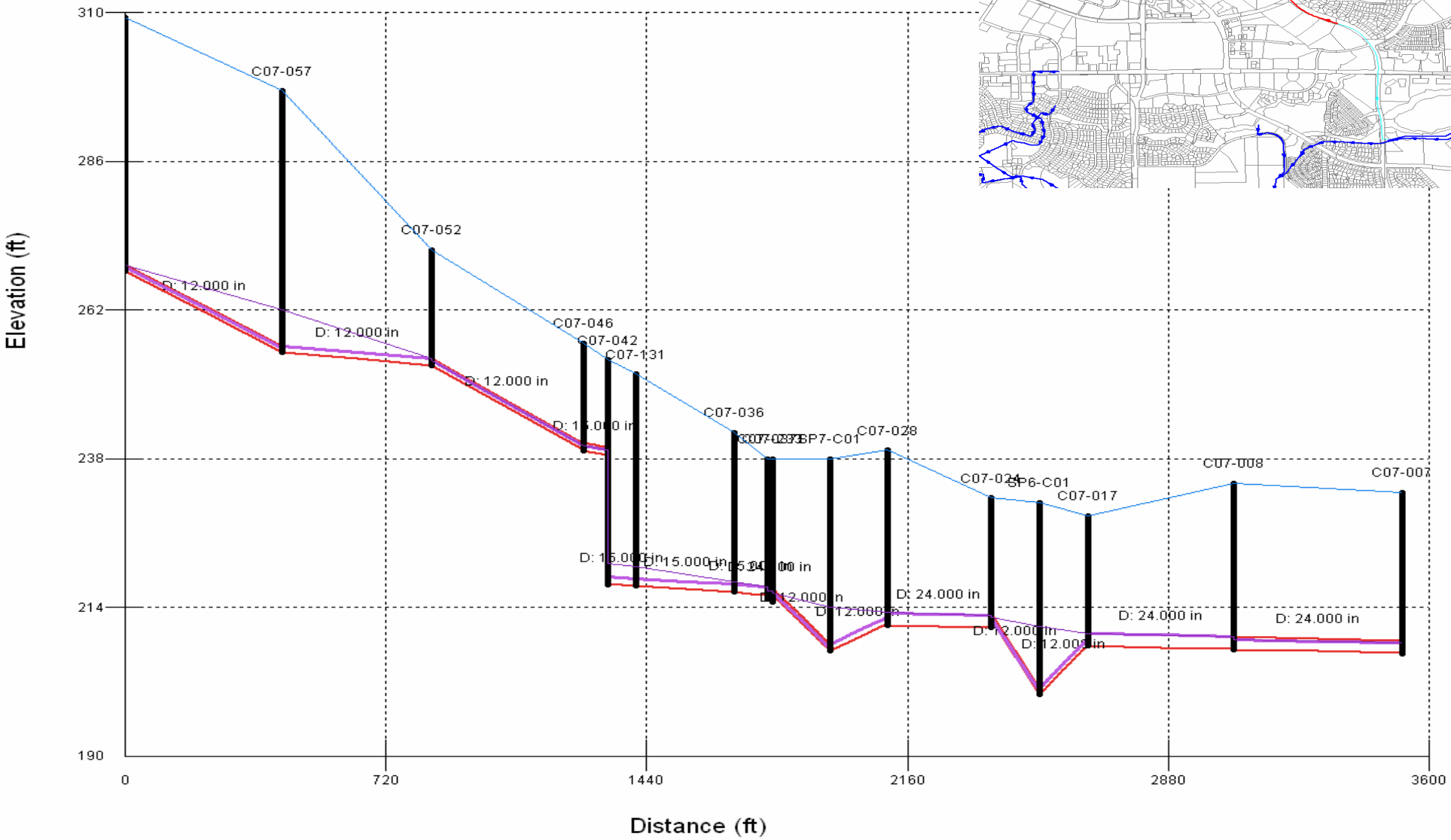


Note: Pipe shown in red, HGL shown in purple and ground elevation shown in blue

Buildout Model Results

Project Area K





Note: Pipe shown in red, HGL shown in purple and ground elevation shown in blue

Attachment C

June 2004 Facility Project Summary Tables

SPWA Sewer Evaluation

Pipe Capacity Analysis

Project A

Pipe ID	Upstream Manhole	Placer County Upstream Manhole[1]	Downstream Manhole	Placer County Downstream Manhole[1]	Upstream Invert	Downstream Invert	Upstream Manhole Rim Elevation	Upstream Manhole Depth (ft)	Existing Diameter (inches)	Length (feet)	Slope	Existing PWWF (MGD)	Existing PWWF q/Q	Future PWWF (MGD)	Future PWWF q/Q	Manhole HGL Elevation (ft)	Crown Elevation (ft)	Surcharging in Manhole (ft)	Improved Diameter (inches)
B11-16	B11-16	B11-16	B11-17	B11-17	228.92	227.44	240.00	11.08	15	429	0.003	2.63	1.07	3.20	1 30	233.60	230.17	3.43	18
B11-17	B11-17	B11-17	B10-01	B10-01	227.44	226.49	237.00	9.56	15	294	0.003	2.65	1.12	3.22	1 35	231.08	228 69	2.39	18
B10-01	B10-01	B10-01	B10-33	B10-33	226.49	225.93	238.00	11.51	15	146	0.004	2.67	1.03	3.24	1 25	229.33	227.74	1.59	18
B10-33	B10-33	B10-33	B10-02	B10-02	226.49	225.55	238.00	11.51	15	108	0.009	2.69	0.69	3.25	0 83	228.45	227.74	0.71	18
B10-02	B10-02	B10-02	A10-19	A10-19	225.55	224.24	235.00	9.45	15	319	0.004	2.71	1 01	3.28	1 22	227.79	226 80	0.99	18
A10-19	A10-19	A10-19	A10-01	A10-01	224.43	224.23	236.00	11.57	15	56	0.004	2.72	1.09	3.29	1 32	225.83	225 68	0.15	18
A10-01	A10-01	A10-01	A10-02	A10-02	224.24	220.37	243.00	18.76	15	165	0.023	2.72	0.42	3.30	0 51	224.88	225.49	0.00	18
A10-02	A10-02	A10-02	A10-11	A10-11	220.37	214.50	226.00	5.63	15	250	0.023	2.73	0.43	3.31	0 52	221.01	221 62	0.00	18
A10-11	A10-11	A10-11	A08-023	A10-03	214.50	213.62	224.00	9.50	15	250	0.004	2.92	1.18	3.58	1.44	219.07	215.75	0.00	18
11686	A08-023	A10-03	A08-020	A10-04	216.32	213.33	237.90	21.58	15	318	0.009	2.92	0.72	3.58	0 88	217.23	217 57	0.00	18
11688	A08-020	A10-04	A08-019	A10-05	213.33	211.76	233.64	20.31	15	285	0.005	2.92	0.94	3.58	1.15	215.10	214 58	0.00	18
113542	A08-019	A10-05	A08-034	-	211.76	210.70	227.50	15.74	15	101	0 01	2.91	0 68	3.57	0 83	212.63	213 01	0.00	18
113543	A08-034	-	A08-022	A10-06	210.70	208.47	226.48	15.78	15	213	0.011	2.91	0.68	3.57	0 83	211.57	211 95	0.00	18
74279	A08-022	A10-06	A08-047	-	208.47	206.05	227.48	19.02	15	230	0 01	2.91	0.68	3.57	0 83	209.34	209.72	0.00	18
113544	A08-047	-	A08-018	A10-07	206.05	204.96	224.18	18.13	15	104	0.011	3.09	0.72	3.75	0 87	206.95	207 30	0.00	18
11694	A08-018	A10-07	A08-017	A10-08	205.28	201.39	226.16	20.89	15	399	0 01	3.08	0.75	3.75	0 91	206.21	206 53	0.00	18
11696	A08-017	A10-08	A08-021	A10-09	201.39	199.80	219.46	18.08	15	261	0.006	3.13	0.96	3.78	1.16	205.36	202 64	2.72	18
11698	A08-021	A10-09	A08-026	A9-51	199.80	197.37	220.99	21.20	15	398	0.006	3.13	0.96	3.77	1.15	203.22	201 05	2.18	18
11700	A08-026	A9-51	A08-025	A9-01	197.37	195.70	219.85	22.48	15	311	0.005	3.12	1.02	3.77	1 23	199.97	198 62	1.35	18
11702	A08-025	A9-01	A08-156	-	195.60	194.03	204.70	9.10	15	255	0.006	3.11	0.95	3.82	1.16	197.44	196 85	0.59	18
									Total Length	**4,893**									

1. Placer County Manhole IDs are based on County GIS. Corresponding Placer County manhole IDs are estimated and field verification may be required.

SPWA Sewer Evaluation

Pipe Capacity Analysis

Project B1

Pipe ID	Upstream Manhole	Downstream Manhole	Upstream Invert	Downstream Invert	Upstream Manhole Rim Elevation	Upstream Manhole Depth (ft)	Existing Diameter (inches)	Length (feet)	Slope	Existing PWWF (MGD)	Existing PWWF q/Q	Future PWWF (MGD)	Future PWWF q/Q	Manhole HGL Elevation (ft)	Crown Elevation (ft)	Surcharging in Manhole (ft)	Improved Diameter (inches)
E14-05	E14-05	E14-47	339.40	338.42	349.00	9.60	15	412	0.002	1.17	0.58	3.60	1.76	349.00	340.65	8.35	21
E14-47	E14-47	E14-48	338.42	337.64	351.00	12.58	15	329	0.002	1.19	0.58	3.60	1.77	351.00	339.67	11.33	21
E14-48	E14-48	E14-71	337.54	337.35	354.00	16.46	15	16	0.012	1.38	0.30	3.80	0.83	354.00	338.79	15.21	21
E14-71	E14-71	E14-49	337.52	336.85	354.00	16.48	15	276	0.002	1.38	0.67	3.81	1.85	354.00	338.77	15.23	21
E14-49	E14-49	E14-50	336.85	336.14	353.00	16.15	15	298	0.002	1.38	0.68	3.80	1.86	353.00	338.10	14.90	21
E14-50	E14-50	E14-57	336.14	335.68	351.00	14.86	15	194	0.002	1.39	0.68	3.79	1.86	351.00	337.39	13.61	21
E14-57	E14-57	E14-51	335.68	335.45	351.50	15.82	15	96	0.002	1.39	0.68	3.78	1.85	351.50	336.93	14.57	21
E14-51	E14-51	D14-08	335.35	334.59	352.00	16.65	15	322	0.002	1.44	0.71	3.83	1.88	352.00	336.60	15.40	21
D14-08	D14-08	D14-07	334.59	333.70	350.00	15.41	15	374	0.002	1.44	0.71	3.82	1.87	350.00	335.84	14.16	21
D14-07	D14-07	D14-06	333.70	333.17	351.00	17.30	15	225	0.002	1.51	0.74	3.87	1.90	349.04	334.95	14.09	21
D14-06	D14-06	D14-05	333.17	332.65	349.00	15.83	15	220	0.002	1.51	0.74	3.86	1.90	347.11	334.42	12.69	21
D14-05	D14-05	D14-04	332.65	332.11	353.00	20.35	15	227	0.002	1.54	0.76	3.88	1.90	345.23	333.90	11.33	21
D14-04	D14-04	D14-03	332.01	330.50	352.00	19.99	15	296	0.005	1.70	0.57	4.13	1.38	343.26	333.26	10.00	21
D14-03	D14-03	D13-26	330.50	328.96	346.00	15.50	15	302	0.005	1.70	0.57	4.12	1.38	340.37	331.75	8.62	21
D13-26	D13-26	D13-27	328.96	328.66	344.00	15.04	16	60	0.005	1.71	0.49	4.13	1.17	337.42	330.29	7.13	21
D13-27	D13-27	D13-14	328.56	326.60	344.00	15.44	15	395	0.005	1.72	0.59	4.16	1.41	337.01	329.81	7.20	21
D13-14	D13-14	D13-01	326.60	326.07	339.00	12.40	15	107	0.005	1.73	0.59	4.15	1.41	333.08	327.85	5.23	21
D13-01	D13-01	D13-02	326.07	325.54	334.00	7.93	15	107	0.005	1.73	0.59	4.16	1.41	332.02	327.32	4.70	21
D13-02	D13-02	D13-03	325.54	323.62	338.00	12.46	15	384	0.005	1.74	0.59	4.17	1.41	330.96	326.79	4.17	21
D13-03	D13-03	D13-04	323.62	323.17	334.00	10.38	15	81	0.006	1.74	0.56	4.16	1.34	327.13	324.87	2.26	21
D13-04	D13-04	D13-05	323.17	322.60	335.00	11.83	15	102	0.006	1.75	0.56	4.18	1.34	326.32	324.42	1.90	21
D13-05	D13-05	D13-06	322.60	322.12	331.00	8.40	15	86	0.006	1.75	0.56	4.19	1.34	325.30	323.85	1.44	21
D13-06	D13-06	D13-07	322.12	320.83	332.00	9.88	15	232	0.006	1.76	0.56	4.20	1.35	324.43	323.37	1.06	21
D13-07	D13-07	D13-08	320.83	315.84	329.00	8.17	15	392	0.013	1.77	0.38	4.22	0.89	321.75	322.08	0.00	21
D13-08	D13-08	D13-09	315.84	311.29	326.00	10.16	15	390	0.012	1.78	0.39	4.27	0.94	316.81	317.09	0.00	21
D13-09	D13-09	D13-10	311.04	310.18	324.00	12.96	18	399	0.002	1.79	0.57	4.28	1.35	314.85	312.54	2.31	21
D13-10	D13-10	D13-22	310.18	310.10	322.00	11.82	18	67	0.001	1.79	0.76	4.32	1.84	313.26	311.68	1.58	21
D13-22	D13-22	D12-01	310.10	309.30	322.00	11.90	18	344	0.002	1.80	0.55	4.34	1.32	312.99	311.60	1.39	21
D12-01	D12-01	D12-02	309.30	308.42	320.00	10.70	18	406	0.002	1.80	0.57	4.35	1.37	311.59	310.80	0.79	21
D12-02	D12-02	D12-13	308.42	307.42	318.00	9.58	18	95	0.011	1.81	0.26	4.35	0.62	309.28	309.92	0.00	21
D12-13	D12-13	D12-03	307.42	304.38	318.00	10.58	18	309	0.01	1.82	0.27	4.38	0.65	308.30	308.92	0.00	21
D12-03	D12-03	D12-04	304.38	303.38	316.00	11.62	18	402	0.002	1.81	0.53	4.40	1.30	308.00	305.88	2.12	21
D12-04	D12-04	D12-05	303.38	302.54	314.00	10.62	18	336	0.002	1.82	0.54	4.41	1.30	306.31	304.88	1.43	21
D12-05	D12-05	D12-06	302.54	302.05	312.00	9.46	18	190	0.003	1.83	0.53	4.43	1.28	304.89	304.04	0.85	21
D12-06	D12-06	D12-21	302.05	301.69	310.00	7.95	18	145	0.002	1.83	0.54	4.44	1.31	304.08	303.55	0.53	21
D12-07	D12-07	D12-08	301.30	299.97	311.00	9.70	18	243	0.005	1.83	0.36	4.44	0.88	302.39	302.80	0.00	21
D12-08	D12-08	D12-09	299.97	299.60	309.00	9.03	18	60	0.006	1.83	0.34	4.44	0.83	301.01	301.47	0.00	21
D12-09	D12-09	D12-10	299.60	299.06	308.00	8.40	18	96	0.006	1.83	0.36	4.45	0.87	300.68	301.10	0.00	21
D12-10	D12-10	D12-11	299.06	295.27	306.00	6.94	18	330	0.011	1.83	0.25	4.45	0.61	299.91	300.56	0.00	21
D12-11	D12-11	D12-12	295.17	287.58	306.00	10.83	18	102	0.075	1.83	0.10	4.47	0.24	295.67	296.67	0.00	21
D12-12	D12-12	D11-01	287.48	286.50	304.00	16.52	18	386	0.003	1.83	0.53	4.47	1.30	293.56	288.98	4.58	21
D12-21	D12-21	D12-07	301.69	301.30	312.00	10.31	18	155	0.003	1.83	0.54	4.43	1.30	303.46	303.19	0.27	21
D11-01	D11-01	D11-02	286.50	285.62	294.00	7.50	18	265	0.003	1.83	0.47	4.47	1.14	291.91	288.00	3.91	21
D11-02	D11-02	D11-03	285.52	285.15	299.00	13.48	18	162	0.002	1.83	0.56	4.48	1.38	290.79	287.02	3.77	21
D11-03	D11-03	D11-04	285.15	284.18	299.00	13.85	18	385	0.003	1.83	0.54	4.48	1.31	290.09	286.65	3.44	21
D11-04	D11-04	D11-05	284.18	283.49	289.00	4.82	18	184	0.004	1.83	0.44	4.47	1.07	288.44	285.68	2.76	21
D11-05	D11-05	D11-06	283.49	282.78	292.00	8.51	18	230	0.003	1.83	0.48	4.47	1.18	287.65	284.99	2.65	21
D11-06	D11-06	D11-07	282.78	281.94	296.00	13.22	18	243	0.003	1.82	0.46	4.47	1.12	286.65	284.28	2.37	21
D11-07	D11-07	D11-08	281.94	281.10	296.00	14.06	18	242	0.003	1.82	0.45	4.47	1.12	285.60	283.44	2.16	21
D11-08	D11-08	D11-09	281.00	280.05	294.00	13.00	18	376	0.003	1.81	0.53	4.49	1.31	284.55	282.50	2.05	21
D11-09	D11-09	D11-10	280.05	279.32	291.00	10.95	18	293	0.002	1.81	0.53	4.51	1.33	282.90	281.55	1.35	21
D11-10	D11-10	D11-11	279.32	278.32	287.00	7.68	18	404	0.002	1.82	0.54	4.52	1.33	281.61	280.82	0.79	21
D11-11	D11-11	D11-12	278.32	268.45	292.00	13.68	18	251	0.039	1.82	0.14	4.55	0.34	278.92	279.82	0.00	21
D11-12	D11-12	D11-13	268.45	265.31	281.00	12.55	18	309	0.01	1.83	0.27	4.56	0.66	269.34	269.95	0.00	21
D11-13	D11-13	D10-63	265.31	258.11	274.00	8.69	18	304	0.024	1.86	0.18	4.61	0.44	266.01	266.81	0.00	21
D10-63	D10-63	D10-09	258.11	252.18	272.00	13.89	18	250	0.024	1.86	0.18	4.62	0.44	258.81	259.61	0.00	21
D10-09	D10-09	D10-10	252.08	251.00	261.00	8.92	18	404	0.003	1.86	0.53	4.63	1.32	254.97	253.58	1.39	21
D10-10	D10-10	D10-54	250.90	249.99	264.00	13.10	18	340	0.003	1.86	0.53	4.65	1.32	253.09	252.40	0.69	21
D10-54	D10-54	D10-11	249.99	245.00	262.00	12.01	18	128	0.039	1.86	0.14	4.66	0.35	250.60	251.49	0.00	21
D10-11	D10-11	D10-95	244.95	237.09	257.00	12.05	18	309	0.025	1.87	0.17	4.68	0.43	245.64	246.45	0.00	21
D10-95	D10-95	C10-28	237.09	235.99	248.00	10.91	18	256	0.004	1.87	0.42	4.70	1.05	240.48	238.59	1.89	21
C10-28	C10-28	C10-02	235.99	235.56	244.00	8.01	18	101	0.004	1.87	0.42	4.70	1.06	239.26	237.49	1.77	21

SPWA Sewer Evaluation

Pipe Capacity Analysis

Project B1 - Cont.

Pipe ID	Upstream Manhole	Downstream Manhole	Upstream Invert	Downstream Invert	Upstream Manhole Rim Elevation	Upstream Manhole Depth (ft)	Existing Diameter (inches)	Length (feet)	Slope	Existing PWWF (MGD)	Existing PWWF q/Q	Future PWWF (MGD)	Future PWWF q/Q	Manhole HGL Elevation (ft)	Crown Elevation (ft)	Surcharging in Manhole (ft)	Improved Diameter (inches)
C10-02	C10-02	C10-03	235.56	234.56	246.00	10.44	18	356	0.003	1.88	0.52	4.72	1.31	238.77	237.06	1.71	21
C10-03	C10-03	C10-04	234.46	233.75	247.00	12.54	18	256	0.003	1.92	0.53	4.76	1.33	237.05	235.96	1.09	21
C10-04	C10-04	C10-05	233.75	233.03	245.00	11.25	18	256	0.003	1.92	0.53	4.77	1.32	235.79	235.25	0.54	21
C10-05	C10-05	C10-24	232.93	228.15	242.00	9.07	18	95	0.05	1.91	0.13	4.77	0.31	233.51	234.43	0.00	21
C10-24	C10-24	C10-06	228.15	220.31	243.00	14.85	18	162	0.048	1.91	0.13	4.77	0.32	228.73	229.65	0.00	21
C10-06	C10-06	C10-07	220.21	217.14	228.00	7.79	18	333	0.009	1.92	0.29	4.78	0.73	224.85	221.71	3.14	21
C10-07	C10-07	C9-01	217.04	213.10	226.00	8.96	18	333	0.012	1.92	0.26	4.79	0.65	223.20	218.54	4.66	21
C9-01	C9-01	C9-02	213.10	209.52	222.00	8.90	18	307	0.012	1.92	0.26	4.81	0.65	221.54	214.60	6.94	21
C9-02	C9-02	B08-042	209.42	208.50	220.00	10.58	18	317	0.003	1.92	0.52	4.82	1.31	220.00	210.92	9.08	24

Total Length **17,839**

SPWA Sewer Evaluation
Pipe Capacity Analysis
Project B2

Pipe ID	Upstream Manhole	Placer County Upstream Manhole[1]	Downstream Manhole	Placer County Downstream Manhole[1]	Upstream Invert	Downstream Invert	Upstream Manhole Rim Elevation	Upstream Manhole Depth (ft)	Existing Diameter (inches)	Length (feet)	Slope	Existing PWWF (MGD)	Existing PWWF q/Q	Future PWWF (MGD)	Future PWWF q/Q	Manhole HGL Elevation (ft)	Crown Elevation (ft)	Surcharging in Manhole (ft)	Improved Diameter (inches)
11825	B08-042	C9-03	B08-040	C9-M5	210.41	210.26	233.52	23.12	15	52	0.003	3.03	1.37	8 07	3.65	226.03	211.66	14.37	24
11826	B08-040	C9-M5	B08-045	-	210.26	209.91	233.23	22 97	15	102	0.003	3.03	1.24	8 07	3.30	224.08	211.51	12.57	24
11827	B08-045	-	B08-047	-	209.91	209.03	231.26	21 35	21	205	0.004	3.73	0.55	9 05	1.34	220.27	211.66	8.60	24
11828	B08-047	-	B08-044	-	209.03	207.38	228.43	19.40	21	498	0.003	3.72	0 63	9 04	1.53	218.67	210.78	7.88	24
11829	B08-044	-	B08-037	-	207.38	204.63	232.44	25 05	21	402	0.007	3.71	0.44	9 06	1.07	214.78	209.13	5.64	24
11830	B08-037	-	B08-043	-	204.63	203.26	227.37	22.74	21	342	0.004	3.84	0.59	9 26	1.42	211.63	206.38	5.25	24
11831	B08-043	-	B07-108	-	203.26	201.42	232.44	29.17	21	461	0.004	3.83	0.59	9 24	1.43	208.83	205.01	3.82	24
12891	B07-108	-	B07-107	-	201.42	199.59	228.49	27 06	21	461	0.004	3.82	0.59	9 21	1.42	205.07	203.17	1.90	24
12892	B07-107	-	B07-405	-	199.59	196.50	225.56	25 98	21	324	0.01	3.81	0.38	9.19	0.92	200.90	201.34	0.00	24
									Total Length	**2,846**									

1. Placer County Manhole Ds are based on County GIS. Corresponding Placer County manhole IDs are estimated and field verification may be required.

SPWA Sewer Evaluation

Pipe Capacity Analysis

Project C

Pipe ID	Upstream Manhole	Placer County Upstream Manhole[1]	Downstream Manhole	Placer County Downstream Manhole[1]	Upstream Invert	Downstream Invert	Upstream Manhole Rim Elevation	Upstream Manhole Depth (ft)	Existing Diameter (inches)	Length (feet)	Slope	Existing PWWF (MGD)	Existing PWWF q/Q	Future PWWF (MGD)	Future PWWF q/Q	Manhole HGL Elevation (ft)	Crown Elevation (ft)	Surcharging in Manhole (ft)	Improved Diameter (inches)
E9-09	E9-09	E9-09	E9-10	E9-10	242.62	242.04	253.00	10 38	15	360	0.002	0.59	0.35	3 58	2.13	253.00	243.87	9.13	21
E9-10	E9-10	E9-10	E9-11	E9-11	242.04	241.46	256.00	13 96	15	360	0.002	0.67	0.40	3 58	2.13	255.64	243.29	12.35	21
E9-11	E9-11	E9-11	E9-12	E9-12	241.46	240.88	262.00	20 54	15	363	0.002	0.68	0.41	3 52	2.10	253.00	242.71	10.29	21
E9-12	E9-12	E9-12	E9-13	E9-13	240.88	240.30	262.00	21.12	15	356	0.002	0.68	0.40	3.47	2.06	250.42	242.13	8.29	21
E9-13	E9-13	E9-13	E9-14	E9-14	240.20	240.02	264.00	23 80	15	93	0.002	0.67	0 36	3.40	1.85	247.95	241.45	6.50	21
E9-14	E9-14	E9-14	D9-01	D9-01	239.92	239.36	263.00	23 08	15	345	0.002	0.79	0.47	3 60	2.13	247.34	241.17	6.17	21
D9-01	D9-01	D9-01	D9-02	D9-02	239.36	238.80	259.00	19 64	15	324	0.002	0.80	0.46	3 54	2.03	244.78	240.61	4.16	21
D9-02	D9-02	D9-02	D9-03	D9-03	238.70	238.59	253.00	14 30	15	55	0.002	0.80	0.43	3.49	1.87	242.45	239.95	2.50	21
D9-03	D9-03	D9-03	D9-25	D9-25	238.49	238.10	251.00	12 51	15	211	0.002	0.95	0.53	3.72	2.07	242.06	239.74	2.32	21
D9-25	D9-25	D9-25	D9-04	D9-04	238.10	237.90	247.00	8.90	15	154	0.001	1.00	0.66	3.74	2.48	240.39	239.35	1.04	21
D9-04	D9-04	D9-04	D9-05	D9-05	237.89	233.08	246.00	8.11	15	331	0.015	1.06	0.21	3.78	0.75	238.70	239.14	0.00	21
D9-05	D9-05	D9-05	D9-06	D9-06	233.08	232.35	237.00	3.92	15	134	0.005	1.10	0.36	3 80	1.23	237.00	234.33	2.67	21
D9-06	D9-06	D9-06	D9-07	D9-07	232.25	231.76	236.00	3.75	15	266	0.002	1.12	0.62	3 84	2.14	236.00	233.50	2.50	21
D9-07	D9-07	D9-07	D9-08	D9-08	231.76	231.21	242.00	10 24	15	304	0.002	1.12	0.63	3.79	2.13	237.74	233.01	4.73	21
D9-08	D9-08	D9-08	D9-09	D9-09	231.11	230.53	236.00	4.89	15	329	0.002	1.11	0.63	3.75	2.13	236.00	232.36	3.64	21
D9-09	D9-09	D9-09	B08-012	B08-012	230.43	230.25	235.00	4.57	15	97	0.002	1.12	0.62	3.72	2.06	235.00	231.68	3.32	21
11819	B08-012	D9-10	B08-015	D9-11	227.80	227.74	249.99	22.19	15	345	0.0002	1.16	2.12	3.77	6.92	236.01	229.05	6.97	21
11821	B08-015	D9-11	B08-023	D9-12	227.74	225.14	262.50	34.76	15	306	0.008	1.09	0.28	3 53	0.91	233.94	228.99	4.95	21
11822	B08-023	D9-12	B08-208	D9-43	225.14	222.68	250.89	25.75	15	289	0.009	1.08	0.28	3 50	0.91	232.02	226.39	5.63	21
9353385	B08-208	D9-43	B08-031	D9-13	222.68	220.50	250.03	27 35	15	111	0.02	1.15	0.20	3 55	0.61	230.19	223.93	6.26	21
11823	B08-031	D9-13	B08-041	C9-04	220.50	210.68	244.21	23.71	15	364	0.027	1.14	0.17	3 54	0.52	229.45	221.75	7.70	21
11824	B08-041	C9-04	B08-042	C9-03	210.68	210.41	235.39	24.71	15	150	0.002	1.14	0.64	3 53	1.99	227.03	211.93	15.10	21
									Total Length	**5,647**									

1. Placer County Manhole Ds are based on County GIS. Corresponding Placer County manhole IDs are estimated and field verification may be required.

SPWA Sewer Evaluation
Pipe Capacity Analysis
Project E

Pipe ID	Upstream Manhole	Downstream Manhole	Upstream Invert	Downstream Invert	Upstream Manhole Rim Elevation	Upstream Manhole Depth (ft)	Existing Diameter (inches)	Length (feet)	Slope	Existing PWWF (MGD)	Existing PWWF q/Q	Future PWWF (MGD)	Future PWWF q/Q	Manhole HGL Elevation (ft)	Crown Elevation (ft)	Surcharging in Manhole (ft)	Improved Diameter (inches)
16608	D03-100	D03-099	119.80	118.90	138.94	19.15	15	298	0.003	3.11	1.36	3.43	1.50	127.26	121.05	6.21	21
16607	D03-099	D03-086	118.90	118.59	137.50	18.60	15	104	0.003	3.11	1.36	3.43	1.50	125.25	120.15	5.10	21
16604	D03-086	D03-072	118.59	118.00	136.97	18.38	18	294	0.002	3.11	1.02	3.49	1.15	124.55	120.09	4.46	21
16599	D03-072	D03-069	118.00	117.64	137.50	19.50	18	263	0.001	3.11	1.22	3.48	1.37	123.77	119.50	4.27	21
2957	D03-069	D03-067	117.64	117.07	142.50	24.86	18	315	0.002	3.52	1.22	3.89	1.35	123.08	119.14	3.94	21
2844	D03-067	D03-046	117.07	116.78	139.62	22.55	18	159	0.002	3.67	1.27	4.05	1.40	122.05	118.57	3.48	21
2845	D03-046	D03-031	116.78	116.19	140.32	23.54	18	330	0.002	3.67	1.27	4.04	1.40	121.48	118.28	3.20	21
2902	D03-031	D03-030	116.03	115.67	138.41	22.38	18	180	0.002	3.87	1.27	4.25	1.40	120.31	117.53	2.78	21
2903	D03-030	D03-029	115.97	115.17	137.27	21.30	18	400	0.002	3.87	1.27	4.24	1.39	119.60	117.47	2.13	21
2229	D03-029	D02-043	115.17	113.65	132.50	17.33	18	400	0.004	3.85	0.92	4.33	1.03	118.04	116.67	1.37	21
2232	D02-043	D02-048	113.65	112.63	130.48	16.83	18	341	0.003	3.84	1.03	4.32	1.16	116.41	115.15	1.26	21
2234	D02-048	D02-047	112.63	112.25	133.61	20.99	18	125	0.003	3.83	1.03	4.30	1.15	115.03	114.13	0.90	21
2200	D02-047	D02-046	112.25	111.58	134.09	21.84	18	225	0.003	3.95	1.06	4.42	1.19	114.52	113.75	0.77	21
2202	D02-046	D02-045	111.58	110.38	135.67	24.09	18	400	0.003	3.94	1.06	4.41	1.18	113.57	113.08	0.49	21
17110	D02-045	D02-183	108.53	108.47	134.62	26.09	18	50	0.001	4.59	1.94	5.01	2.12	110.24	110.03	0.21	21
							Total Length	**3,883**									

Attachment D

City of Roseville Area E Sewer Capacity Evaluation

Environmental Utilities Department
Engineering Division
2005 Hilltop Circle
Roseville, California 95747

City of Roseville Wastewater Collection System Study

TASK 3. RMC SYSTEMS EVALUATION REPORT/TM 3b – AREA E EVALUATION

TITLE: AREA E SEWER CAPACITY EVALUATION

EXECUTIVE SUMMARY

The purpose of this technical memorandum (TM) is to implement recommendations provided by RMC regarding Area E, located within Basin 7 in the City of Roseville service area. Per the South Placer Wastewater Authority (SPWA) Wastewater and Recycled Water Systems Evaluation Project (TM No. 3b), RMC identified potential sewer capacity constraints in Area E and recommended the City conduct further infiltration and inflow (I/I) studies to evaluate this area prior to considering the relief sewer improvement project with a proposed budget cost of $1,888,000. This TM presents the results of the I/I evaluation.

RMC performed a capacity analysis of the collection system using a computerized hydraulic model to simulate flow conditions in the system. The model was used to determine peak hydraulic flows in each pipeline segment and compare them to the available capacity. Capacity shortcomings were identified by RMC but further investigation of the area was recommended prior to any potential improvements.

Approach and Analysis - The model determines peak flows using a combination of unit wastewater flow criteria and peak rainfall dependent infiltration and inflow (I/I) criteria. The analysis presented herein was conducted by evaluating the sensitivity of the model to varying R values and to determine if a reduced R value would result in lesser surcharging or lesser required improvements to the system. Further, the system in Basin 7 was evaluated to determine if a reduced R value is justified.

Determination of R Value - To assess the validity of the model analysis, the magnitude of pipe flow was measured in the field during a rainfall event. The rainfall event was simulated in the model and the resultant depth ratio measured in the field was compared to the modeled depth ratio to gain a correlation. I/I data included in the model was adjusted slightly to determine the differences in pipe flow depth. The sensitivity of these adjustments to variations in depth was determined. Visual field inspections of actual pipe flow were conducted during storm events between February and May 2007. The winter of 2007 did not yield significant storm intensities or rainfall volumes so the storms observed were not comparable with the storms RMC utilized (March 2005 storms) for calibration of the model during the RMC study. The measured storm (winter 2007) intensity was approximately 4 times less than the March 2005 storms. Regardless, the data obtained from the storm (observed between February and May 2007) with the highest peak intensity was used to calculate pipeline hydraulic values [referred to as the depth-to-diameter (d/D) ratio]. These values were compared to capacity values obtained from hydraulic model simulations. Multiple model simulations were performed with varying R values (ranging from 0.5 to 3) to calibrate the R value for the storm event measured to that used with the model. Five pipe segments from Area E were selected for the study. The hydraulically modeled d/D was found to be larger than the d/D from the visual field inspections (approximately in the range of 122-200% greater) when an R value of 3 was used. This difference progressively reduced as smaller R values were used. For the final simulation with an R value of 0.5, the hydraulically modeled d/D was still larger than the field obtained d/D data by approximately 13 to 55 percent. The trend of a reduced d/D differential correlating to a reduced R value indicates that a very small R value is likely reflective of the system in Area E.

This difference is likely a reflection of an overestimated R value as determined by RMC in their study.

Sensitivity of R Value to Surcharging - A sensitivity analysis was conducted using the City's buildout model for peak wet weather flow. This analysis was conducted to determine whether the R value was appropriately responding to the hydraulic activity in the collection system and subsequently to correlate the R value with the potential to surcharge the system. The R factor for Basin 7 was varied, and the corresponding d/D obtained was observed and noted. Values of R ranging from 0.5 to 3.0 were used. These maximum and minimum values were used since 3.0 was the value utilized for Basin 7 when the model was calibrated in the RMC study and 0.5 was the lowest value utilized for the City's basins per the RMC study. The model results indicate that all five segments selected for the evaluation would surcharge at an R value of 3 and d/D values would decrease with a corresponding decrease in the R value. Below an R value of 2.5, none of the segments surcharged.

Correlation to Age of Infrastructure - The approximate age of infrastructure in the various basins was identified and compared with the R values utilized in the RMC study for the respective basins. Based upon a qualitative inspection, the following general trends were noted.

- Infrastructure installed prior to the 1960s had an R value of 3 or greater
- Infrastructure installed from the 1960s to 1980s had values in the range of 0.75 to 1
- Infrastructure installed from the 1990s to 2000s had the lowest R values ranging between 0.5 and 1.

Area E infrastructure was constructed within the 1980s to 1990s and would be expected to produce an R value between 0.5 and 1 as RMC modeled throughout the system. However, RMC modeled an R value of 3 in Area E which is significantly higher than the remainder of the system. This indicates that the surcharging in Area E, described in the RMC study, is likely based on unreasonably high I/I.

Interviews were conducted with the City's wastewater collection system staff to obtain an event history for Area E. Staff indicated that there had not been any history of surcharging in Area E.

Conclusions & Recommendations - The following conclusions were derived from this analysis:

- Peak flows and related surcharging are directly related to the R value as used in the model. Model sensitivity analysis showed that below an R value of 2.5, none of the segments in Basin 7 surcharged.

- The significant difference between visually obtained d/D values in comparison with d/D values hydraulically modeled is likely due to an overestimated R value utilized for Basin 7. In this study, the R value was reduced to 0.5 to bring the modeled and visually obtained values within a 55 percent difference. The R value of 3 utilized by RMC for Basin 7 can likely be reduced.

- Qualitative observations of the correlation between infrastructure age and R values for the entire City showed that the utilization of an R value of 0.5 to 1 for Basin 7, based on the infrastructure installation time frame, would provide much more consistency with the R values utilized for the City's basins per the RMC study.

- Interviews conducted with wastewater collection system staff indicated that there had not been any known surcharging events in Area E during the winter of 2005, when the RMC study was conducted.

- Even though a specific R value could not be selected for Basin 7, based on the above observations combined with engineering judgment, the R value is more likely in the range of 0.5 to 1.0 and quite possibly less than 0.5.

- Area E is not likely to surcharge from a design storm event provided the R value for the area is 2.5 or less. Since the analysis indicates the R value for Area E to range from 0.5 to 1.0, and quite possibly less than 0.5, it is not likely that surcharging will occur from a design storm event.

- With the absence of any potential surcharge conditions under a design storm event, no improvements are required at this time.

- No conclusion has been drawn for why RMC needed to simulate an R value of 3.0 in Area E. RMC concluded in TM 3B that extraneous inflow may have occurred through an open manhole causing a higher calibrated flow from the storm. Such a condition was not evident during our field walks.

- Staff should accelerate the condition assessment of pipe segments in Area E by performing video inspection and defect coding to investigate any potential for increased I/I not observed by this evaluation.

BACKGROUND

This TM is to implement recommendations provided by RMC regarding Area E, in a report titled TM3B. Area E is located in the Pleasant Grove Wastewater Treatment Plant basin in the City of Roseville along McAnally Drive. The entire City of Roseville service area is subdivided into drainage basins. The study area for this analysis (Area E) falls within Basin 7. This study area was selected as the domain for the analysis. Figure 1 shows a map of the study area.

Per the South Placer Wastewater Authority (SPWA) Wastewater and Recycled Water Systems Evaluation Project (TM No. 3b), RMC identified potential sewer capacity constraints in Area E and recommended that the City conduct further I/I studies to evaluate this area prior to considering an improvement project in Area E, to extend over a 4,000 foot segment from MH D03-100 to D02-353. The proposed budget cost for this improvement project was $1,888,000.

This TM is presented in four parts.

The first part includes verifying model calibration: this involves analyzing data obtained from visual field inspections and comparing this data with hydraulically modeled data to determine the accuracy of I&I assumptions used in the hydraulic model.

The second part is a model sensitivity analysis, which was conducted to determine the models sensitivity to d/D values for varying R values in Basin 7.

The third part involves conducting a qualitative inspection of the correlation between infrastructure age and R values (defined in the following paragraphs). This inspection is to determine whether the R value utilized by RMC for Basin 7 is consistent with R values used for other similar basins in the City.

The final part of this TM includes conducting interviews with the City's wastewater collection system staff to obtain an event history for Area E.

Legend

- Manholes
- Mains

Study Area Location Map – Pipe Segment from MH D03-100 to D02-356

Figure 1

N W E S

1 inch equals 300 feet

The magnitude of the resulting rainfall dependent infiltration and inflow (RDII) response is typically described by the percentage of the rainfall volume (called the R value or R factor). The R value can vary from storm to storm, depending on such factors as the degree of soil saturation (due to antecedent rainfall) prior to the storm event. R values also vary by area depending on the age and condition of the sewer system, depth of pipes, pipe materials, and hydrogeologic and topographic characteristics. The H2OMap Sewer Professional software uses the R value in simulating the effect on flow due to wet weather events.

The amount of infiltration and inflow produced during a storm consumes pipeline capacity and reduces the ability of the pipeline to convey municipal wastewater. The collection systems capacity for different segments is measured as the depth of water in the pipe (referred to as the d/D ratio). For the City, the d/D criterion for design is a 0.7. Once the design criterion is exceeded, a replacement of the segment is considered. The replacement criteria d/D for the City is 1.0. Pipe capacity d/D values have a maximum value of 1.0. The pipe is considered as being surcharged at a d/D of 1.0.

Since the R factor utilized in the hydraulic modeling impacts the collection systems capacity, this factor was analyzed.

PART 1: MODEL CALIBRATION VERIFICATION - FIELD INVESTIGATION & ASSOCIATED MODELING

Visual field inspections were conducted during storm events that occurred between February and May 2007 to measure flow depths in pipe segments in the project area. The purpose of obtaining this data was to confirm the R value used in the model.

A total of three storms (occurring between February and May 2007) were observed for the study. Data was collected during the storms by dipping a rod into various manholes and measuring the depth of flow in the pipes.

Table 1 shows the data collection dates for this study and the data used for the RMC study.

Table 1. Rainfall Data

Date	Duration Recorded (hours)	Total Rainfall (inches)	Peak Hr Intensity (in/hr)
Feb 9th 2007	8	0.12	0.04
Feb 22nd 2007	9	0.44	0.08
May 2nd 2007	9	0.28	0.04
Calibration Storm*	9	1.0	0.3**

*Storm utilized by RMC in their study for calibration of RDII factors. This was the storm event of March 1-2, 2005.
** The peak hour intensity of the RMC calibration storm is approximately four times that of the most intense storm observed between February and May 2007.

Although the three storms measured yielded relatively short durations, low rainfall and low peak intensity, the February 22, 2007 storm was selected for this study because it provided the greatest peak hour intensity. Five of the segments which provided the greatest pipe capacity (d/D) values in the RMC study under design storm conditions, were selected for the study. Pipe capacity values, were also computed for these segments with data obtained from the field. Table 2 shows this field data.

Table 2. Pipe capacity data for the storm event of February 22 2007

Pipe Segment	Diameter (inches)	Slope	d/D from Visual Inspection of Flow Depth	Estimated Flow (MGD)*
D03-100 to D03-099	15	0.0029	0.43	2.2
D03-099 to D03-086	15	0.0030	0.40	2.3
D03-031 to D03-030	18	0.0020	0.33	3.0
D03-030 to D03-029	18	0.0020	0.33	3.0
D03-069 to D03-072	18	0.0014	0.35	2.5

*Flow calculated based on pipe slope, pipe diameter and Manning's of 0.013

The d/D values based on the visual field observations were compared with the d/D values obtained from the hydraulic simulation of the current scenario model described below.

Comparison of Model Output (Current Scenario) and Field Data - The rainfall event with the highest intensity during the February to May 2007 field investigation (the February 22, 2007 storm) was selected and modeled for the current scenario.

A hyetograph was developed based on this rainfall data for a 2.5 hr duration. Rainfall data, in the form of storm intensity (in inches per hour) over specific time duration, was obtained from a permanent rain gauge station (Fire Station No. 2) located in the Basin 7 area and maintained by the City. This data was loaded into the hydraulic model, then applied to manholes in the selected domain in Basin 7 and modeled. Using the hydraulic model, peak wet weather flows for this scenario were simulated using an R value of 3 (the value utilized for Basin 7 per the RMC report). Additional iterations were performed as necessary, with varying R values, and are discussed below. The five study segments were selected, and analyzed.

As shown in Table 3a, the d/D obtained for the current scenario model run (with R=3) was compared with the d/D values obtained from the visual inspection

- The hydraulically modeled d/D was found to be larger than the d/D calculated from the visual field inspections approximately 122-200% greater.

Table 3a. Comparison between field obtained and hydraulically modeled pipe capacity values using an R=3.0

Pipe Segment	d/D from Visual Inspection	d/D from Modeling, R=3.0	Approximate Percent Differential (%)
D03-100 to D03-099*	0.45	1.00	+122
D03-099 to D03-086	0.40	1.00	+150
D03-031 to D03-030	0.33	1.00	+200
D03-030 to D03-029	0.33	1.00	+200
D03-069 to D03-072	0.35	0.82	+135

Since the difference in the modeled data and field data was very large, a second iteration was performed with a lower R value. The reason for lowering the R value was an attempt to simulate reduced d/D results for the hydraulically modeled data to obtain a closer comparison to the visually observed data. An R value of 2.5 was selected and modeled.

- As shown in Table 3b, the hydraulically modeled d/D was still found to be much larger than the d/D calculated from the visual field inspections (approximately in the range of 80-130% greater).

Table 3b. Comparison between field obtained and hydraulically modeled pipe capacity values using an R=2.5

Pipe Segment	d/D from Visual Inspection	d/D from Modeling, R=2.5	Approximate Percent Differential (%)
D03-100 to D03-099*	0.45	0.81	+80
D03-099 to D03-086	0.40	0.80	+100
D03-031 to D03-030	0.33	0.76	+130
D03-030 to D03-029	0.33	0.76	+130
D03-069 to D03-072	0.35	0.72	+105

With the difference between the hydraulically modeled the field data still being very large, a third iteration was performed, and again, the R value was lowered for this run. An R value of 1.0 was selected and modeled.

- As shown in Table 3c, the hydraulically modeled d/D was found to be still larger than the d/D calculated from the visual field inspections (approximately in the range of 20-57% greater).

Table 3c. Comparison between field obtained and hydraulically modeled pipe capacity values using an R=1.0

Pipe Segment	d/D from Visual Inspection	d/D from Modeling, R=1.0	Approximate Percent Differrential (%)
D03-100 to D03-099*	0.45	0.54	+20
D03-099 to D03-086	0.40	0.54	+35
D03-031 to D03-030	0.33	0.52	+57
D03-030 to D03-029	0.33	0.52	+57
D03-069 to D03-072	0.35	0.50	+43

Since there was a significant difference between the modeled data and field data, a fourth and final iteration was run with an R value of 0.5. A minimum value of 0.5 was selected because from the RMC study of all the City's basins, the lowest R value was a 0.5.

- As shown in Table 3d, the hydraulically modeled d/D was found to be larger than the d/D calculated from the visual field inspections for four out of the five segments (approximately in the range of 13-55% greater). For one segment however, D03-100 to D03-099, field data and hydraulically modeled data were the same.

Table 3d. Comparison between field obtained and hydraulically modeled pipe capacity values using an R=0.5

Pipe Segment	d/D from Visual Inspection	d/D from Modeling, R=0.5	Approximate Percent Differential (%)
D03-100 to D03-099*	0.45	0.45	0
D03-099 to D03-086	0.40	0.45	+13
D03-031 to D03-030	0.33	0.43	+30
D03-030 to D03-029	0.33	0.51	+55
D03-069 to D03-072	0.35	0.43	+23

The difference in d/D values between modeled and field data progressively decreased with decreasing R values. However, with an R value of 0.5 the difference in d/D values was still

significant (up to 55%), over some segments in the domain. To further investigate the correlation of R and d/D will asymptotically approach a value of R not much lower that 0.5. This suggests it is sufficient to cease further analysis and conclude that R is significantly lower than a value of 3 as assumed in the model by RMC and is likely at a value significantly less than 1 and likely less than 0.5.

PART 2: MODEL SENSITIVITY ANALYSIS

The model sensitivity analysis was conducted to determine how the R value affected the potential to surcharge the system during a design storm event. The R factor for Basin 7 was varied, and the corresponding d/D was observed and noted. The R value at which a surcharge condition is indicated was then determined. The existing buildout model developed by RMC for the City of Roseville Sanitary Sewer Model Development Project (Sewer Project) was used for this analysis.

Sensitivity Test - Buildout Scenario - Peak wet weather flow scenarios (for buildout) were modeled. Values of R ranging from 0.5 to 3.0 were used. The five study segments, selected in the Visual Field Investigation section, were analyzed and results plotted. A plot showing the pipe capacity (represented as d/D) with varying R's for the study segments is shown in Figure 2. A legend of plotted segments is presented in Table 4.

Figure 2. Sensitivity Analyses for R factor

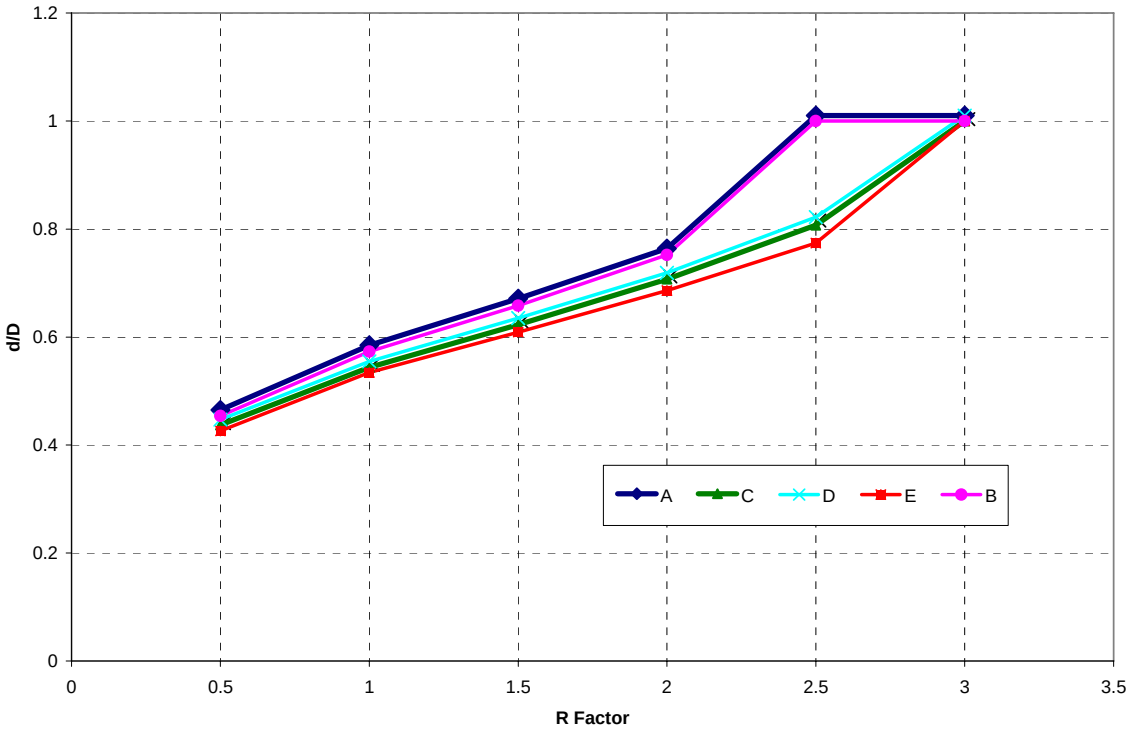


Table 4 presents a legend for this chart.

Table 4. Legend for Plotted Segments

Plotted Curve	A	B	C	D	E
Pipe Segment	D03-100 to D03-099	D03-099 to D03-086	D03-030 to D03-029	D03-031 to D03-030	D03-069 to D03-072

From the data (see Figure 2), the following observations were made

- All five segments selected showed a decrease in d/D values with a corresponding decrease in the R value

    - All five segments surcharged at an R value of 3.
    - Three out of the five segments, curves C, D & E, showed a steady decrease in the d/D value with a corresponding decrease in the R value.
    - The other two segments (curves A & B), surcharged for R values between the range of 2.5 to 3.0. For R values below 2.5, there was a steady decrease in the d/D values with a corresponding decrease in the R value.

PART 3: INFRASTRUCTURE AGE AND R VALUE INSPECTION

As previously mentioned, the entire City of Roseville service area is subdivided into twenty-three drainage basins. The approximate age of infrastructure in the various basins was found and compared with the R values utilized (in the RMC study) for the respective basins. The data is shown in Table 5.

Table 5. Infrastructure Age and R factors for City of Roseville

Basin	R value	Approximate Installation Dates
1	0.5	1990s to 2000s
2	0.5	1990s
3	1	2000s
4	1	1970s to 1980s
5	3.5	1950s to 1960s
6	0.5	1990s to 2000s
7	3	1980s to 1990s
8	1	1970s to 2000s
9	0.75	1990s
10	0.75	Late 1980s
12	3	1980s to 1990s
14	1.5	1950s to 1960s
15N	3	1910s to 1920s
15S	1	1960s to 1990s
17	1	1960s to 1980s
18	1	1980s to 2000s
19	1	2000s
20	1	1990s to 2000s
21	0.5	1990s
22	0.5	1990s to 2000s
23	0.5	1990s
24	0.75	Late 1980s to 2000s
25	0.5	1990s to 2000s

A qualitative inspection was conducted and a correlation between R value and installation date of infrastructure was observed.

The data showed the following general trends[1]:

- Infrastructure installed prior to the 1960s had an R value of 3 or greater.
- Infrastructure installed from the 1960s to 1980s had values in the range of 0.75 to 1.
- Infrastructure installed from the 1990s to 2000s had the lowest R values ranging between 0.5 and 1.

The R value utilized for the Area E study area was compared with these general trends and an inconsistency was observed. The infrastructure in the study area was constructed within the 1980s to 1990s time frame. Infrastructure installed in this time frame was shown to typically have a maximum R value of 1. However, the RMC report utilized an R value of 3, which seemed high from these initial observations.

PART 4: STAFF INTERVIEWS

Interviews were conducted with the City's wastewater collection system staff to obtain a history of any probable surcharging events that may have occurred in the past, and specifically during the winter of 2005, the period over which the RMC study was conducted. Staff indicated that there had not been any known incidence of surcharging in Area E since the sewer infrastructure in that area was installed.

Conclusion & Recommendations - The following conclusions and recommendations were derived from this analysis:

- Peak flows and related surcharging are directly related to the R value as used in the model. Model sensitivity analysis showed that below an R value of 2.5, none of the segments in Basin 7 surcharged.

- The significant difference between visually obtained d/D values in comparison with d/D values hydraulically modeled is likely due to an overestimated R value utilized for Basin 7. In this study, the R value was reduced to a 0.5 to bring the modeled and visually obtained values within a 55% difference. The R value of 3 utilized by RMC for Basin 7 can likely be reduced.

- Qualitative observations of the correlation between infrastructure age and R values for the entire City showed that the utilization of an R value of 0.5 to 1 for Basin 7, based on the infrastructure installation time frame, would provide much more consistency with the R values utilized for the City's basins per the RMC study.

- Interviews conducted with wastewater collection system staff indicated that there had not been any known surcharging events in Area E during the winter of 2005, when the RMC study was conducted.

- Even though a specific R value could not be selected for Basin 7, based on the above observations combined with engineering judgment, the R value is more likely in the range of 0.5 to 1.0 and quite possibly less than 0.5.

- Area E is not likely to surcharge from a design storm event provided the R value for the area is 2.5 or less. Since the analysis indicates the R value for Area E to range from 0.5 to 1.0, and quite possibly less than 0.5, it is not likely that surcharging will occur from a design storm event.

[1] Only one basin, basin 12, did not follow these general trends. The R value for this basin could be overstated in the RMC study.

- With the absence of any potential surcharge conditions under a design storm event, no improvements are required at this time.

- No conclusion has been drawn for why RMC needed to simulate an R value of 3.0 in Area E. RMC concluded in TM 3B that extraneous inflow may have occurred through an open manhole causing a higher calibrated flow from the storm. Such a condition was not evident during our field walks.

- Staff should accelerate the condition assessment of pipe segments in Area E by performing video inspection and defect coding to investigate the potential for increased I/I not observed by this evaluation.

Attachment E

June 2007 TM Update Sheet

Update Sheet

South Placer Regional Wastewater and Recycled Water Systems Evaluation

Subject: **Update for TM 3b**

Prepared For: Art O'Brien, City of Roseville

Prepared by: Andy Smith, RMC

Reviewed by: Dave Richardson, RMC

Date: October 31, 2006

Reference: 0091-04

1 Summary of Update for TM 3b

Since the completion of TM 3b on April 14, 2006, changes in the scope of the South Placer Wastewater and Recycled Water Systems Evaluation, as well as changes in the data available, have resulted in the need to identify out-of-date information, to summarize the updated information, and provide justification as to the need for the update. **Table 1** presents a summary of the updates for TM 3b.

Table 1: Summary of Update for TM 3b

Page	Location	Summary of Outdated Information	Summary of Updated Information	Reason for Update
1	Paragraph 6	Future model network includes 10 pump stations	Future model network includes 11 pump stations	One pump station for the Brookfield UGA was added
5	Figure 2	Does not include Brookfield; un-expanded SPMUD UGA included	Brookfield is considered as a UGA, and a pump station and force main have been modeled in the UGA. The SPMUD UGA boundary has been expanded. Refer to Figure ES-7 in the Systems Evaluation report for an updated version of this figure.	Expanded SPMUD boundary and Brookfield
9	Figure 4	Does not include Brookfield; un-expanded SPMUD UGA included	Refer to TM 11a for Brookfield configuration. Refer to Figure ES-7 for expanded SPMUD UGA boundary.	Expanded SPMUD boundary and Brookfield
13	Paragraph 4	Deficiency for Area D	Discussion of Area D no longer necessary	Deficiencies have been addressed by City of Roseville; Area D no longer a problem
15	Paragraph 2	Deficiency for Area D	Discussion of Area D no longer necessary	Deficiencies have been addressed by City of Roseville; Area D no longer a problem
17	Figure 5	Deficiency shown for Area D	Identification of Area D no longer necessary	Deficiencies have been addressed by City of Roseville; Area D no longer a problem

(continued on next page)

Table 1 (cont'd)

Page	Location	Summary of Outdated Information	Summary of Updated Information	Reason for Update
18	Figure 6	Deficiency shown for Area D	Identification of Area D no longer necessary	Deficiencies have been addressed by City of Roseville; Area D no longer a problem
23	Paragraph 4	Improvement project for Area D	Improvements for Area D no longer necessary	Deficiencies have been addressed by City of Roseville; Area D no longer a problem
24	Table 9	Costs included for Area D improvement project; total cost = $8,000,000	Improvements (and costs) for Area D no longer necessary; total cost = $7,961,000	Deficiencies have been addressed by City of Roseville; Area D no longer a problem
27	Figure 7	Improvement project shown for Area D	Improvements for Area D no longer necessary	Deficiencies have been addressed by City of Roseville; Area D no longer a problem
29	n/a	Extension project for Brookfield not included	Refer to TM 11a for trunk sewer information for Brookfield	Brookfield added as a UGA
30	Table 11	Costs for extension to Brookfield not included	Refer to TM 11a for trunk sewer cost information for Brookfield	Brookfield added as a UGA
31	Figure 8	Extension project for Brookfield not shown	Refer to TM 11a for trunk sewer information for Brookfield	Brookfield added as a UGA
n/a	Attachment A	Sewer profile(s) for Area D	Sewer profile(s) for Area D no longer necessary	Deficiencies have been addressed by City of Roseville; Area D no longer a problem

Attachment F

2009 Update Sheet

Update Sheet

South Placer Regional Wastewater and Recycled Water Systems Evaluation

Subject:	**2009 Update Sheet for TM 3b**
Prepared For:	Art O'Brien, City of Roseville
Prepared by:	Chris van Lienden, RMC
Reviewed by:	Dave Richardson, RMC
Date:	September 3, 2009
Reference:	0091-04

The TM has been modified since it was originally developed in 2005 based on the following updates.

1 2006 Updates

The TM was updated in 2006 to reflect changes in the SPMUD UGA boundary and land use, and to add Brookfield as an additional UGA.

2 2008 Updates

The TM was further updated in 2008 to reflect changes in the land uses and flow projections of the UGAs.

3 2009 Updates

An additional update was prepared in 2009 to reflect the following changes.

3.1 Updates to the H2Omap Sewer Model

Since the 2008 update, the H2Omap Sewer software has been updated which resulted changes to the build-out flow estimates. The flow estimates in the TM has been updated to reflect the most recent model results.

3.2 Changes to the Development Timeline

Flow projections have been updated to reflect reduced rates of residential development due to the economic slowdown beginning in 2008.

3.3 West Roseville Specific Plan Rezone

Buildout flow estimates have been updated to reflect additional inflow from a proposed rezone in the West Roseville Specific Plan (May, 2009). The new land uses and associated average dry weather flow (ADWF) are summarized in Table 1.

Table 1 – West Roseville Specific Plan Rezone Comparison

Connected Land Use Description	Original Developer Agreements		2009 Proposed Update	
	DU or Area (DU or ac)	Flow (mgd)	DU or Area (DU or ac)	Flow (mgd)
1 Residential				
1.1 Low Density Residential	4842 DU	0.92	5963 DU	1.13
1.2 LDR (age restricted)	710 DU	0.13	0 DU	0.00
1.3 Medium Density Residential	1064 DU	0.20	1746 DU	0.33
1.4 High Density Residential	1774 DU	0.23	3229 DU	0.42
2 Open Space	670 ac		696 ac	0.00
2.1 Paseo	15 ac		0 ac	0.00
2.2 Park	251 ac		284 ac	0.00
2.3 Pocket Parks	19 ac		0 ac	0.00
3. Public/Quasi-Public				
3.1 Schools	108 ac	0.02	109 ac	0.02
3.2 Public/Quasi-Public	41 ac	0.02	15 ac	0.01
4 Community Commercial				
4.1 Commercial	34 ac	0.03	56 ac	0.05
4.2 Mixed Use	14 ac	0.03	0 ac	0.00
4.3 Church	0 ac	0.01	0 ac	0.00
5. Business Professional				
5.1 Commercial	20 ac	0.02	18 ac	0.02
6. Light Industrial	74 ac	0.06	75 ac	0.06
7. Industrial	34 ac	0.03	35 ac	0.03
Total		**1.71**		**2.07**

ATTACHMENT #7

PLACER VINEYARDS

Placer Vineyards Specific Plan
Placer County, California

CHAPTER III: LAND USE

RESIDENTIAL USES:

Low Density Residential (2 to 6 du/ac)

The Low Density Residential (LDR) areas are intended for single-family detached homes on lots greater than 4,000 square feet and similar and compatible uses. Refer also to the housing type examples in Appendix A under the LDR land use designation. Special housing types for elderly, active-adult, and community living are also allowed. The LDR neighborhoods also permit public and quasi-public uses such as schools, parks, and recreation facilities with appropriate buffers and access to major local roadways and collector streets. Agricultural use of the land may continue as an interim use until development occurs, pursuant to this Specific Plan.

The Land Use Diagram designates 1,001 acres of LDR uses. This designation allows a density range of 2 to 6 dwelling units per acre (du/ac). Refer to Table 3-3 for the distribution of total units to individual properties of record and to Appendix A for Residential Development Standards.

Medium Density Residential (4 to 8 du/ac)

The Medium Density Residential (MDR) areas are intended for a range of housing types, such as standard-lot and small-lot single family detached homes and similar, compatible uses. Refer also to the housing type examples in Appendix A under the MDR land use designation.

The Land Use Diagram provides 1,176 acres of MDR uses. This designation allows a density range of 4 to 8 du/ac. Refer to Table 3-3 for the distribution of total units to individual properties of record and to Appendix A for Residential Development Standards.

High Density Residential (7 to 21 du/ac)

The High Density Residential (HDR) land use designation allows for a range of housing types, including small-lot single family detached homes, duplex, cluster housing or motor courts, attached and detached townhouses, condominiums, apartments, and similar, compatible uses. Refer to housing type examples in Appendix A under the HDR land use designation.

The Land Use Diagram indicates 205 acres of High Density Residential uses. This designation allows a density range of 7 to 21 du/ac. A Use Permit is not required for units in this category if the development is consistent with the requirements of this Specific Plan. However, Design/Site Review is required to determine design consistency. Refer to Table 3-3 for the distribution of total units to individual properties of record and to Appendix A for residential development standards.

Alternative housing designs are encouraged in all residential categories. The use of innovative subdivision designs, such as zero-lot-line patio homes, cluster home designs, garage units, and auto court arrangements or the use of duplex units that provide two single-family homes attached along a common wall, is encouraged. The number of units in the MDR and HDR categories should be maximized to the extent feasible to achieve a more transit-oriented development pattern.

COMMERCIAL USES:

Commercial (FAR Range: 0.20 to 0.30)

The Commercial (COM) land use designation allows for a variety of retail uses and services. These include small convenience stores and centers, neighborhood-serving shopping centers, and community-scale retail centers. Typical COM land uses include neighborhood grocery stores, drugstores, and retail stores providing household goods and services for the surrounding residential neighborhoods. The COM designation would also allow for banks and financial institution offices, realty and insurance offices, medical offices and professional offices, and gas stations and auto repair uses (limited in extent and located where compatible with adjoining land uses and subject to approval of a Minor Use Permit). The COM designation also allows for public and quasi-public uses, parks, libraries and museums, public utility and safety facilities, and other similar, compatible uses. Refer to Appendix A for the complete list of permitted uses in the COM land use designation.

The range of floor area ratio (FAR) applicable to the COM designation is between 0.20 to 0.30. The intensity utilized for the purpose of distributing Commercial intensity to individual properties of record is 0.25. Refer to Appendix A for the applicable Commercial Development Standards.

Town Center

The purpose of the town center is to create a pedestrian-oriented, easily accessible, mixed-use retail core in the heart of the Placer Vineyards community. The town center is intended to be a highly visible, higher intensity, active, social, and cultural gathering place. The town center supports a mix of uses with office or residential uses located above ground-floor retail shops. Ground-floor retail uses with mid-rise buildings, placed at the back of sidewalks, open onto wide pedestrian sidewalks, allowing for outdoor dining and retail displays.

Town Center Commercial (FAR Range: 0.35 to 2.0)

Uses encouraged in the Town Center Commercial (TCC) designation include all types of office uses (e.g., banks and medical offices), a variety of retail stores and services (e.g., furniture stores, clothing and household goods, music stores and video outlets, hotels, motels, restaurants, and bars), a variety of entertainment uses (e.g., movie theaters and nightclubs), and public and quasi-public uses (e.g., community recreation center, library, fire station, sheriff's substation, and religious facility); along with public parks, an outdoor performance stage, and plazas. The TCC use may also include locally-serving retail uses (grocery store <25,000 square feet, drugstore, and other local services). Refer to Appendix A for a more specific list of permitted uses in the TCC land use designation. The town center shall be designed to encourage outdoor eating and dining along its sidewalks.

The TCC designation is assumed to provide 80 percent retail uses and 20 percent office uses. The development of residential uses within the TCC designation, however, is also encouraged.

The FAR applicable to the TCC designation ranges from 0.35 to 2.0. For the purposes of distributing development intensities, the Land Use Diagram assumes that approximately 80 percent of this area will be developed with retail uses at an FAR of 0.45. The remaining 20 percent is anticipated to develop with office uses with the same FAR of 0.45. Refer to the Development Standards in Appendix A for allowed Town Center Commercial uses and applicable Development Standards.

Policy 3.17 Specialty Grocery Stores.
It is the intent of the Specific Plan to have the first specialty grocery store located in the town center, if feasible. The purpose of having the first specialty grocery store in the town center is to provide a catalyst that would assist in generating an intensity of commercial and pedestrian use in the heart of the Placer Vineyards community. To that end, the town center will have the exclusive rights for specialty grocery stores less than 25,000 square feet in size. Examples of specialty grocery stores are Trader Joe's, Whole Foods Market, or other similar type store concepts with a store size of less than 25,000 square feet.

Policy 3.18 Grocery Stores.
Similar to the intent expressed in the preceding policy, the Specific Plan encourages the siting of the first traditional grocery store in the town center. However, this policy also recognizes that if plans for other projects in the vicinity of Placer Vineyards include lands designated for a grocery store, market pressures may make it necessary to override this policy. As a result, the town center will have the exclusive right within the Plan Area to open a traditional grocery store, such as a Safeway, Albertson's, Raley's, or similar type stores for a period of 12 months following the issuance of a certificate of occupancy on the 250th residential unit within the Specific Plan. Notwithstanding the foregoing, if the City of Roseville approves a specific plan for a project adjacent to the Plan Area that is immediately north of Base Line Road, and the project includes a traditional grocery store component, then the right of exclusivity for traditional grocery stores in the town center shall become null and void, and any commercial owner in the Plan Area with properties zoned as PC, BP/PC and COM will be allowed to open a traditional grocery store without the restrictions described above. This right of exclusivity shall not apply to non-traditional grocery stores, such as a Wal-Mart, Food 4 Less, or similar type store.

Policy 3.19 Movie Theater and Other Entertainment Uses.
To encourage pedestrian activity and provide attractions that support local shops and restaurants in the town center, the town center shall have exclusive right to all movie theater uses within the Plan Area. Other entertainment uses including dance clubs, live music, theaters, and art galleries shall also be located primarily in the town center.

Commercial/Mixed-Use (14 to 22 du/ac) (FAR Range: 0.35 to 2.0)

The Commercial/Mixed-Use (C/MU) designation is intended to encourage a variety of projects with a mix of uses, including high density residential, retail, and office uses within one development. The C/MU designation allows for mixed-use neighborhood nodes of office and commercial uses on smaller sites integrated into the surrounding residential neighborhoods. Mixed-use developments may include both vertical mixed-use–ground floor commercial uses with residences or offices above, or horizontal mixed-use–commercial and residential development located on the same site with shared open space and direct pedestrian connections.

Typically found on the corners of collector and arterial streets, the C/MU designation allows flexibility for future market conditions and provides for local neighborhood services. The C/MU district also envisions uses such as live-work residential loft spaces with living units integrated into office spaces, commercial store fronts, and artist studios. C/MU areas will also allow religious facilities.

The C/MU designation allows for a residential density range of 14 to 22 du/ac. For the purposes of distributing development intensities, the land use plan assumes that approximately 70 percent of the development area will be developed with residential uses, as assigned in Table 3-3. The FAR applicable to the C/MU land use designation ranges from 0.35 to 2.0. The remaining 30 percent of the development area is assumed to develop with commercial uses evenly split between retail and office uses at a FAR of 0.45. Refer to Appendix A for allowed Commercial/Mixed-Use permitted uses and applicable Development Standards.

Policy 3.20 Parking in Commercial/Mixed-use Sites.

For mixed-use projects, including the town center and village centers, parking may be shared between uses. To facilitate shared parking, a parking analysis shall be prepared during the Design/Site Review process that lists the project-specific assumptions for the mix of uses, outlines peak parking periods for each use type, and demonstrates that adequate parking will be provided. To relax the individual parking requirements, the County Planning Director shall determine that, based on the findings in the shared parking analysis, the entire project will not result in a parking shortfall.

Office (FAR Range: 0.25 to 0.45)

The Office (O) land use category is intended for professional and administrative office uses (e.g., finance, insurance, and banking offices), office parks for research and development, medical and dental facilities, and related incidental office-supporting commercial uses (e.g., copy centers, cafes, communication retail sales and services, and office supplies). Refer to Appendix A for the complete list of permitted uses in the Office land use designation.

The FAR applicable to the O land use designation ranges from 0.25 to 0.45. The intensity utilized for the purpose of distributing Office intensity to individual parcels of record is 0.30. Refer to the Development Standards in Appendix A for the applicable Development Standards.

Business Park (FAR Range: 0.20 to 0.45)

The purpose of the Business Park (BP) land use designation is to provide a wide-range of large-scale office, commercial, and light industrial land uses on large parcels. BP land uses will provide employment, commercial, and regional uses that will help foster a balance of jobs and housing and meet the economic goals of the Placer County General Plan. The BP land use designation also allows for flexibility to meet changing market conditions over time. The BP designation allows for a mix of office park uses (e.g., light industrial, "high-tech" manufacturing and assembly, distribution, warehousing, research and development, and medical and dental facilities) and supporting retail commercial uses (e.g., business services and office support services). The BP designation also allows for public and quasi-public uses such as commercial recreation uses, religious facilities, and private school and university facilities.

The BP designation allows for office and retail development within a FAR range of 0.20 to 0.45. For the purposes of distributing development intensities, the land use plan assumes that the BP development area will develop with 10 percent retail uses and 90 percent office uses at a FAR of 0.25. Refer to the Development Standards in Appendix A for the allowed Business Park uses and applicable Development Standards.

Power Center (FAR Range: 0.20 to 0.35)

The Power Center (PC) land use is envisioned for large-scale retail stores providing goods and services for the regional market. Stores include, but are not limited to, home improvement and large-scale gardening centers, large-scale discount centers, furniture, computers, household goods and groceries, auto sales and services, auto service stations, tire stores, large-scale clothing outlets, and other uses typically found in power centers. PC uses may also include restaurants and drinking establishments, and fast-food outlets (including drive-thru facilities). The PC designation will also allow for the location of public and quasi-public uses such as commercial recreation uses, religious facilities, and private schools and university facilities.

The FAR applicable to the PC land use designation ranges from 0.20 to 0.35. For the purposes of distributing development intensities, the land use plan assumes that the PC development area will be 100 percent retail uses at a FAR of 0.25. Refer to the Development Standards in Appendix A for the allowed Power Center uses and applicable Development Standards.

Business Park/Power Center

31 acres are designated with a Business Park/Power Center (BP/PC) land use in the Plan Area. The BP/PC designation allows uses from both the BP land use and the PC land use categories, defined above. The FAR applicable to the BP/PC land use designation ranges from 0.25 to 0.45 for Business Park uses and 0.20 to 0.35 for Power Center uses. For the purposes of distributing development intensities, the land use plan assumes that the BP/PC development area will develop as a Power Center with 80 percent retail uses and 20 percent office uses at a FAR of 0.25. Refer to Appendix A, Section 3.7, "Business Park" or Section 3.8, "Power Center" for BP/PC development standards and to Table A-14 for permitted Business Park and Power Center uses.

PARKS, RECREATION, AND OPEN SPACE USES:

The parks, recreation, and open space system proposed for Placer Vineyards incorporates 920 acres of parks and open space to be used for active and passive recreation. 2 large community-sized parks are distributed in the Plan Area, as well as 2 large open space oak preserve areas. 8 joint-use park/school sites, over 50 neighborhood and mini parks, and several smaller image parks, are dispersed throughout the Plan Area. A dog park shall also be provided. Development of other mini parks or pocket parks large enough for tot lots and other recreation facilities, but not indicated in the Land Use Diagram, are also encouraged. In addition, a series of trails linked to several east-west and north-south open space corridors provide neighborhood connections throughout the Plan Area. Information on trails is provided in Chapter V, "Transportation and Circulation." Additional details on the parks and open space system are described in Chapter VII, "Parks and Open Space."

Open Space

The Open Space (OS) land use designation is intended to protect the natural areas, creeks, wetlands, and specified tree groves within the Plan Area. Open space will include flood control and drainage channels, properties within power line easements, and special setback areas, such as along the Placer/Sacramento County line. Open Space areas may have compatible uses, including trails and other active and passive recreational uses, including their associated parking lots.

A total of 709 acres (approximately 14 percent of the Plan Area) is designated Open Space. This category includes only natural and/or passive open space and does not include parks.

Oak Grove Open Spaces

Concentrations of significant oak trees on the site are preserved in 2 large oak grove open space areas. These oak grove areas provide open space amenities to the community and provide passive recreational opportunities, such as picnic areas, quiet seating areas, and trail loops.

Park

A variety of park types and sizes are planned for Placer Vineyards under the Park (P) designation. Each park is planned and designed with a range of park facilities, depending on the character of the park. The park types and characteristics are described below.

Mini Parks (Pocket Parks)

Mini parks can be as small as 1/4 to 1/2 acre in size, but are more typically 1 to 2 acre sites that provide green space and passive recreation opportunities for a specific neighborhood. Uses and activities may include tot lots/playgrounds, half-court basketball, open turf areas, picnic areas with barbecues and a minimum of 2 tables, a shade structure or adequate shading provided by trees, and security lighting. Not all of the mini parks are shown in the Land Use Diagram, but providing mini parks in large residential developments is encouraged.

Town Center Green

A 3.5-acre town center green is centrally located in the town center. The town center green is intended to serve as a civic, cultural, and community focal point, designed to complement the design themes within the town center. The town center green will include play areas, picnic areas, an outdoor space configured for performances, open areas for farmers' markets or other informal uses, and a water feature or other landmark feature as a focal point.

Neighborhood Parks

Neighborhood parks range from 2 to 15 acres in size. Eight joint-use school/park sites are also included in this category. Facilities planned for joint-use school/park sites should take into consideration proposed school facilities to maximize the recreation facilities of both. These parks should also be designed to operate independently of the school facilities, if necessary.

Community Parks

2 large community parks are located in the Plan Area. The East Community Park is located at the southeast corner of Watt Avenue and Dyer Lane, adjacent to the Dry Creek Parkway. The West Community Park is bounded to the east by West Dyer Lane, just northwest of the power line easement corridor. Community parks will include active recreation uses such as ball fields, passive recreation uses such as trails and picnic areas, and other support facilities such as restrooms, concession stands, and parking and staging areas for bicyclists and runners. Each community park will also contain a small shop and yard for park maintenance. Additionally, these parks may be used for meetings, neighborhood activities, special-interest groups, and youth and adult sports leagues.

Private Parks

Private parks and a recreation center are provided within the active adult community in the eastern portions of the Plan Area, identified in Figure 7.1, "Parks and Open Space Plan Diagram." Private parks shall count toward satisfying the park dedication requirements for the project, subject to the conditions for private parks found in Section 16.08.100-I, "Private Facilities Credit" in the *Placer County Code*.

Recreation Center (Only in Town Center)

The Placer Vineyards Specific Plan envisions the development of a large community-wide recreation facility, designated RC on the Land Use Diagram, to add to the vitality and community life of the town center. The Recreation Center is planned as a large indoor and outdoor recreation facility with indoor meeting rooms, fitness rooms and equipment, and associated offices. Outdoor facilities may include tennis courts or basketball courts, plazas, and picnic or gathering areas.

Landscaped Rights-of-Way and Entries

Landscape corridors and landscaped areas are provided along public street rights-of-way as networks of green spaces designed to enhance the visual and environmental quality of the Plan Area for pedestrians and other visitors. Landscape entry features and gateways are also provided in the community to help define different parts of the community. These are landscaped, themed features at the entrances to major intersections of the community or smaller signature features in residential neighborhoods. Landscaped rights-of-way and entries are not counted within the park or open space requirements for this project. Landscape rights-of-way shall be developed and dedicated to the County at the same time that the public street rights-of-way are developed and dedicated to the County. See Chapter VI, "Community Design," for additional streetscape and community gateway design guidelines.

PUBLIC AND QUASI-PUBLIC USES:

The Placer Vineyards Specific Plan provides for a broad range of cultural, public/quasi-public, and religious uses, strategically located throughout the Plan Area. Nestled within the Placer Vineyards neighborhoods and village centers and connected with local trails and bicycle paths, these areas provide for cultural activities that enrich the character and quality of the community in proximity to where people live. These uses are listed below.

Cemetery

Cemetery (C) designates property subdivided into cemetery lots and offering burial plots or air space for sale.

Corporation Yard

A shared corporation yard (CY) is provided to accommodate the following facility needs of the County:

- Sheriff's Department vehicle and equipment storage area,
- Fire Department training and storage facility,
- Special District's office and shop area,
- Facilities Services Department maintenance yard,
- Fleet/Transit maintenance building space, yard, and fueling facility,
- Shared office space for transit, fleet services and roads, and
- Roads Division storage and employee areas

Fire

2 fire stations (F) and an administrative center are provided in the Plan Area. One fire station serves the eastern side of the Plan Area and is located on Town Center Drive near Watt Avenue. The other fire station is located on the west side of the Plan Area, at the intersection of Palladay Road and A Street. A fire administrative center will be collocated with other County administrative offices in the Town Center.

Government/Sheriff

A government (Gov) office facility will be located in the town center, housing administrative offices. A small Sheriff's Substation will be collocated with the government office in the town center to provide policing and local public safety services.

Library

A library (L) facility is centrally located in the town center to provide literary, educational, and informational resources to the community.

Religious Site

The Religious Site (REL) designation is reserved for religious organization facilities operated for worship or promotion of religious activities, such as churches, synagogues, and temples. Religious sites also include religious accessory uses on the same site, including living quarters for staff, child day care facilities, and other uses normally associated with a religious facilities (e.g., schools and recreation facilities), as approved by the Planning Director.

Sites made available for religious uses other than the religious sites designated in Figure 3.1, "Land Use Diagram," may be approved through a Minor Use Permit and shall be identified on tentative maps.

Transit Station

A multi-modal transit station or terminal (T) is provided in the Plan Area within the east village center with access provided from Watt Avenue. The station/terminal will serve to distribute information on local transit options and serve as a passenger terminal and transfer station for public mass-transit systems including a future, potential bus rapid transit line along Watt Avenue.

Utility Substation

The utility substation (SS) designation allows for electrical substations, pumping stations, pressure regulation stations, or similar facility required to serve the Plan Area.

SCHOOLS:

6 elementary schools, 2 middle schools, and 1 high school are designated by the ES, MS, and HS symbols on the Land Use Diagram. The Land Use Diagram designates 167 acres for schools. School sites are situated adjacent to park sites and open space to allow for joint use of facilities, trail access, and efficient use of the land. Joint school/park sites are centrally placed within each neighborhood to provide a focus for neighborhood interaction and to allow children to walk to school. School sites have been located based on the estimated number of students in each surrounding neighborhood and may need to be revised slightly based on actual build-out densities; one of the middle school sites may also be relocated in accordance with Section 9.2.6-C, consitent with these location parameters. Schools are sized for "stand alone" facilities, which may develop independently of parks.

Policy 3.21 Land Use for Unused School Sites.

If the responsible School District decides that a school site shown in the Land Use Diagram is not needed, residential development will be permitted at the residential density of the predominant land use adjacent to the designated school site. The total number of residential units allocated to the underlying parcel of record as of the date of the adoption of this Specific Plan (seeTable 3-3) will not be increased by the readjustment of the land use. The neighborhood park site located adjacent to the excess school site shall remain as indicated on the Land Use Diagram, providing a central focus for the neighborhood.

If subsequent to the development of the property adjacent to a school site, the School District decides it no longer has a need for the property, it will be necessary to amend the Specific Plan to define the appropriate use of the property.

Elementary Schools

Elementary schools (ES) serve kindergarten through grades 5 or 6 (depending on the school district). Elementary school sites are 12 acres in size with an adjacent neighborhood park. They are located within residential neighborhoods, within easy walking distance (1/2 mile radius), and provide easy auto access from local residential and collector streets.

Middle Schools

Middle school (MS) sites are planned for 22.5 acres in size and will serve grades 6 through 7 or 8 (depending on the school district). 2 middle schools are provided. These are located within residential neighborhoods on major collector streets.

High School

The High School (HS) site, located on Palladay Road between A Street and Base Line Road, is 50 acres. It is planned to serve grades 9 through 12 and is sited on collector streets, in proximity to the surrounding residential community, local commercial services, and adjacent to park facilities located in the community park.

SPECIAL PLANNING AREA:

The Special Planning Area (SPA) designation is located on approximately 979 acres at the western portion of the Plan Area and includes the existing Riego area. There are approximately 150 existing homes within the SPA. Approximately 200 (or 87 percent) of the 230± existing parcels within the SPA are 5 acres or less in size, with the majority being less than 2 acres and located primarily in the Riego township area. The remaining approximately 30 parcels range in size from 5 to 96 acres and are generally located in the vicinity of Newton Street, south of Browning and Colburn Streets. Refer to Figure 3.2 for a map of the SPA.

Of the 14,132 units within the Plan Area, a total of 411 total units are reserved in the SPA for the eventual build-out of this area. These 411 units include the 150 existing homes, leaving an additional 261 new homes allowed for development in the SPA. The 261 additional units reserved for the potential build-out of parcels within the SPA area include: 63 new units allowed to develop consistent with their current zoning and 198 units allowed to develop under the Placer Vineyards Specific Plan and the Specific Plan EIR on a first come, first serve basis. Property owners who choose to subdivide their properties beyond that allowed under current zoning in the SPA will be required to amend this plan (refer to Section 9.2.6).

The main trunk lines of the Placer Vineyards infrastructure system (water, wastewater, and drainage systems) will be sized to serve the anticipated build-out of up to 411 total units reserved within the SPA. Property owners of the SPA may connect to infrastructure systems in the Plan Area but shall be responsible for the costs incurred from the extension of services to their property, including any hook up fees, Plan Area, or Special District fees.

Policy 3.22 Special Planning Area.
This Specific Plan does not revise or designate zoning for the SPA properties. The corresponding existing zoning for these SPA properties and existing County administrative processes shall govern. Refer to Chapter IX, Section 9.6-D, "Entitlements in the Special Planning Area" for the procedures for requesting entitlements in the SPA.

3.4 LAND OWNERSHIP AND LAND USE ALLOCATION

Figure 3.3 and Table 3-3 summarize the development program for each property owner in the Plan Area. Within the development program, the following standards shall apply.

1. No property may exceed the permitted density range for the land use designation or the allowable number of residential units and commercial intensities assigned to the property in Table 3-3 without a rezoning, Specific Plan amendment, and additional environmental review. However, to provide development flexibility, development transfers between land use parcels is permitted, provided that they meet the criteria set forth in "Density Transfers," described in Chapter IX, "Implementation."

2. When constructed at the same time as the primary residential unit is being constructed on a lot, a secondary dwelling shall be counted as a residential unit for the purposes of calculating the total number of units allowed for a property under Table 3-3. Each such secondary dwelling shall be subject to payment of all fees payable by the primary unit, including those required under the applicable provisions of the development agreement. Lots where secondary dwellings are proposed to be constructed shall be identified as part of any application for the tentative subdivision map for the property.

ATTACHMENT #8

PLACER VINEYARDS SPECIFIC PLAN
SPECIAL PLANNING AREA - WASTEWATER SUBSHED ALLOCATION

Wastewater Subshed SPA-A Tributary to Node 340 (Qp=0.110MGD)				
APN	**GIS Acres**	**Land Use Designation**	**Buildout EDU**	**SPA Buildout EDU**
023-010-007-000	95.7	Agriculture-Residential Development Reserve 4.6 - 20 Ac. Min.	20	20.0
Subtotal	95.7		20.0	20

PLACER VINEYARDS SPECIFIC PLAN
SPECIAL PLANNING AREA - WASTEWATER SUBSHED ALLOCATION

Wastewater Subshed SPA-B Tributary to Node 252 (Qp=0.087MGD)				
APN	**GIS Acres**	**Land Use Designation**	**Buildout EDU**	**SPA Buildout EDU**
023-190-019-000	5.0	Rural Residential 2.3 - 10 Ac. Min.	2	1.8
023-190-030-000	3.8	Rural Residential 2.3 - 10 Ac. Min.	1	0.9
023-170-020-000	7.2	Rural Residential 2.3 - 10 Ac. Min.	3	2.6
023-170-022-000	3.3	Rural Residential 2.3 - 10 Ac. Min.	1	0.9
023-190-029-000	4.9	Rural Residential 2.3 - 10 Ac. Min.	2	1.8
023-190-007-000	10.6	Rural Residential 2.3 - 10 Ac. Min.	4	3.5
023-190-028-000	4.9	Rural Residential 2.3 - 10 Ac. Min.	2	1.8
023-190-005-000	9.9	Rural Residential 2.3 - 10 Ac. Min.	4	3.5
023-190-010-000	5.4	Rural Residential 2.3 - 10 Ac. Min.	2	1.8
023-190-025-000	5.2	Rural Residential 2.3 - 10 Ac. Min.	2	1.8
023-190-014-000	7.1	Rural Residential 2.3 - 10 Ac. Min.	3	2.6
023-170-026-000	0.0	Rural Residential 2.3 - 10 Ac. Min.	1	0.9
023-190-018-000	5.3	Rural Residential 2.3 - 10 Ac. Min.	2	1.8
023-190-024-000	7.6	Rural Residential 2.3 - 10 Ac. Min.	3	2.6
023-190-003-000	10.2	Rural Residential 2.3 - 10 Ac. Min.	4	3.5
023-190-004-000	10.2	Rural Residential 2.3 - 10 Ac. Min.	4	3.5
023-170-009-000	6.9	Rural Residential 2.3 - 10 Ac. Min.	3	2.6
023-190-022-000	1.0	Rural Residential 2.3 - 10 Ac. Min.	1	0.9
023-190-023-000	2.7	Rural Residential 2.3 - 10 Ac. Min.	1	0.9
023-190-012-000	8.6	Rural Residential 2.3 - 10 Ac. Min.	3	2.6
023-190-020-000	5.0	Rural Residential 2.3 - 10 Ac. Min.	2	1.8
023-190-026-000	4.8	Rural Residential 2.3 - 10 Ac. Min.	2	1.8
023-170-024-000	5.0	Rural Residential 2.3 - 10 Ac. Min.	2	1.8
023-170-023-000	4.7	Rural Residential 2.3 - 10 Ac. Min.	2	1.8
023-190-021-000	9.8	Rural Residential 2.3 - 10 Ac. Min.	4	3.5
023-190-027-000	5.0	Rural Residential 2.3 - 10 Ac. Min.	2	1.8
023-170-025-000	6.3	Rural Residential 2.3 - 10 Ac. Min.	2	1.8
023-190-017-000	9.1	Rural Residential 2.3 - 10 Ac. Min.	3	2.6
023-170-021-000	17.3	Rural Residential 2.3 - 10 Ac. Min.	7	6.1
Subtotal	186.7		74.0	65.0

PLACER VINEYARDS SPECIFIC PLAN
SPECIAL PLANNING AREA - WASTEWATER SUBSHED ALLOCATION

Wastewater Subshed SPA-C Tributary to Node 125 (Qp=0.408MGD)				
APN	**GIS Acres**	**Land Use Designation**	**Buildout EDU**	**SPA Buildout EDU**
023-170-006-000	2.7	Rural Residential 2.3 - 10 Ac. Min.	1	0.9
023-093-001-000	1.8	Rural Residential 2.3 - 10 Ac. Min.	1	0.9
023-050-033-000	0.9	Rural Residential 2.3 - 10 Ac. Min.	1	0.9
023-121-002-000	2.6	Rural Residential 2.3 - 10 Ac. Min.	1	0.9
023-070-006-510	0.0	Rural Residential 2.3 - 10 Ac. Min.	1	0.9
023-050-023-000	2.5	Rural Residential 2.3 - 10 Ac. Min.	1	0.9
023-040-017-000	2.4	Rural Residential 2.3 - 10 Ac. Min.	1	0.9
023-111-007-000	1.1	Rural Residential 2.3 - 10 Ac. Min.	1	0.9
023-030-022-000	2.3	Rural Residential 2.3 - 10 Ac. Min.	1	0.9
023-060-001-000	2.4	Rural Residential 2.3 - 10 Ac. Min.	1	0.9
023-050-017-000	1.8	Rural Residential 2.3 - 10 Ac. Min.	1	0.9
023-071-003-000	0.5	Rural Residential 2.3 - 10 Ac. Min.	1	0.9
023-030-024-000	0.5	Rural Residential 2.3 - 10 Ac. Min.	1	0.9
023-072-010-000	3.0	Rural Residential 2.3 - 10 Ac. Min.	1	0.9
023-040-038-000	2.3	Rural Residential 2.3 - 10 Ac. Min.	1	0.9
023-170-005-000	2.2	Rural Residential 2.3 - 10 Ac. Min.	1	0.9
023-113-002-000	1.2	Rural Residential 2.3 - 10 Ac. Min.	1	0.9
023-101-005-000	1.2	Rural Residential 2.3 - 10 Ac. Min.	1	0.9
023-030-004-000	2.4	Rural Residential 2.3 - 10 Ac. Min.	1	0.9
023-050-021-000	0.9	Rural Residential 2.3 - 10 Ac. Min.	1	0.9
023-132-003-000	1.7	Rural Residential 2.3 - 10 Ac. Min.	1	0.9
023-111-006-510	1.9	Rural Residential 2.3 - 10 Ac. Min.	1	0.9
023-133-004-000	0.5	Rural Residential 2.3 - 10 Ac. Min.	1	0.9
023-040-041-000	2.4	Rural Residential 2.3 - 10 Ac. Min.	1	0.9
023-091-013-000	0.2	Rural Residential 2.3 - 10 Ac. Min.	1	0.9
023-050-019-000	0.9	Rural Residential 2.3 - 10 Ac. Min.	1	0.9
023-160-009-000	72.0	Agriculture-Residential Development Reserve 4.6 - 20 Ac. Min.	15	13.1
023-050-013-000	1.7	Rural Residential 2.3 - 10 Ac. Min.	1	0.9
023-050-025-000	1.0	Rural Residential 2.3 - 10 Ac. Min.	1	0.9
023-071-001-000	0.9	Rural Residential 2.3 - 10 Ac. Min.	1	0.9
023-072-005-000	0.2	Rural Residential 2.3 - 10 Ac. Min.	1	0.9
023-081-014-000	0.7	Rural Residential 2.3 - 10 Ac. Min.	1	0.9
023-030-013-000	1.4	Rural Residential 2.3 - 10 Ac. Min.	1	0.9
023-030-009-000	2.3	Rural Residential 2.3 - 10 Ac. Min.	1	0.9
023-030-002-000	2.3	Rural Residential 2.3 - 10 Ac. Min.	1	0.9
023-040-037-000	2.3	Rural Residential 2.3 - 10 Ac. Min.	1	0.9
023-160-010-000	22.7	Agriculture-Residential Development Reserve 4.6 - 20 Ac. Min.	4	3.5
023-050-007-000	1.9	Rural Residential 2.3 - 10 Ac. Min.	1	0.9
023-050-029-000	4.7	Rural Residential 2.3 - 10 Ac. Min.	2	1.8
023-133-003-000	0.5	Rural Residential 2.3 - 10 Ac. Min.	1	0.9
023-141-004-000	1.3	Rural Residential 2.3 - 10 Ac. Min.	1	0.9
023-141-003-000	1.3	Rural Residential 2.3 - 10 Ac. Min.	1	0.9
023-030-025-000	2.4	Rural Residential 2.3 - 10 Ac. Min.	1	0.9
023-030-015-000	0.5	Rural Residential 2.3 - 10 Ac. Min.	1	0.9
023-070-001-000	0.1	Commercial	1	0.5
023-072-011-000	0.2	Rural Residential 2.3 - 10 Ac. Min.	1	0.9
023-040-022-000	3.3	Rural Residential 2.3 - 10 Ac. Min.	1	0.9
023-170-013-000	21.2	Industrial Development Reserve	95	83.0
023-030-017-000	0.5	Rural Residential 2.3 - 10 Ac. Min.	1	0.9
023-093-003-000	0.5	Rural Residential 2.3 - 10 Ac. Min.	1	0.9

PLACER VINEYARDS SPECIFIC PLAN
SPECIAL PLANNING AREA - WASTEWATER SUBSHED ALLOCATION

Wastewater Subshed SPA-C Tributary to Node 125 (Qp=0.408MGD)				
APN	**GIS Acres**	**Land Use Designation**	**Buildout EDU**	**SPA Buildout EDU**
023-030-023-000	2.5	Rural Residential 2.3 - 10 Ac. Min.	1	0.9
023-050-012-000	1.9	Rural Residential 2.3 - 10 Ac. Min.	1	0.9
023-050-038-000	4.8	Rural Residential 2.3 - 10 Ac. Min.	2	1.8
023-060-024-000	4.7	Rural Residential 2.3 - 10 Ac. Min.	2	1.8
023-131-007-000	0.5	Rural Residential 2.3 - 10 Ac. Min.	1	0.9
023-121-001-000	2.6	Rural Residential 2.3 - 10 Ac. Min.	1	0.9
023-030-026-000	2.4	Rural Residential 2.3 - 10 Ac. Min.	1	0.9
023-040-040-000	2.4	Rural Residential 2.3 - 10 Ac. Min.	1	0.9
023-060-011-000	1.3	Rural Residential 2.3 - 10 Ac. Min.	1	0.9
023-091-010-000	0.5	Rural Residential 2.3 - 10 Ac. Min.	1	0.9
023-050-018-000	0.9	Rural Residential 2.3 - 10 Ac. Min.	1	0.9
023-131-006-000	2.4	Rural Residential 2.3 - 10 Ac. Min.	1	0.9
023-091-015-000	0.5	Rural Residential 2.3 - 10 Ac. Min.	1	0.9
023-170-012-000	1.5	Rural Residential 2.3 - 10 Ac. Min.	1	0.9
023-170-004-000	2.8	Rural Residential 2.3 - 10 Ac. Min.	1	0.9
023-050-034-000	0.9	Rural Residential 2.3 - 10 Ac. Min.	1	0.9
023-112-006-000	0.5	Rural Residential 2.3 - 10 Ac. Min.	1	0.9
023-101-006-000	1.2	Rural Residential 2.3 - 10 Ac. Min.	1	0.9
023-030-006-000	2.4	Rural Residential 2.3 - 10 Ac. Min.	1	0.9
023-060-015-000	4.7	Rural Residential 2.3 - 10 Ac. Min.	2	1.8
023-160-007-000	20.7	Agriculture-Residential Development Reserve 4.6 - 20 Ac. Min.	4	3.5
023-134-001-000	0.6	Rural Residential 2.3 - 10 Ac. Min.	1	0.9
023-141-005-000	1.3	Rural Residential 2.3 - 10 Ac. Min.	1	0.9
023-050-031-000	2.4	Rural Residential 2.3 - 10 Ac. Min.	1	0.9
023-050-026-000	3.8	Rural Residential 2.3 - 10 Ac. Min.	1	0.9
023-050-036-000	2.4	Rural Residential 2.3 - 10 Ac. Min.	1	0.9
023-060-010-000	1.1	Rural Residential 2.3 - 10 Ac. Min.	1	0.9
023-060-005-000	4.8	Rural Residential 2.3 - 10 Ac. Min.	2	1.8
023-081-007-000	2.3	Rural Residential 2.3 - 10 Ac. Min.	1	0.9
023-070-007-510	0.5	Rural Residential 2.3 - 10 Ac. Min.	1	0.9
023-081-013-000	0.7	Rural Residential 2.3 - 10 Ac. Min.	1	0.9
023-081-015-000	0.9	Rural Residential 2.3 - 10 Ac. Min.	1	0.9
023-170-003-000	16.7	Rural Residential 2.3 - 10 Ac. Min.	7	6.1
023-093-002-000	0.2	Rural Residential 2.3 - 10 Ac. Min.	1	0.9
023-040-042-000	2.3	Rural Residential 2.3 - 10 Ac. Min.	1	0.9
023-040-019-000	2.4	Rural Residential 2.3 - 10 Ac. Min.	1	0.9
023-040-013-000	0.2	Rural Residential 2.3 - 10 Ac. Min.	1	0.9
023-112-003-000	0.5	Rural Residential 2.3 - 10 Ac. Min.	1	0.9
023-131-003-000	0.3	Rural Residential 2.3 - 10 Ac. Min.	1	0.9
023-131-005-000	0.1	Rural Residential 2.3 - 10 Ac. Min.	1	0.9
023-040-039-000	2.4	Rural Residential 2.3 - 10 Ac. Min.	1	0.9
023-050-015-000	0.3	Rural Residential 2.3 - 10 Ac. Min.	1	0.9
023-092-003-000	0.5	Rural Residential 2.3 - 10 Ac. Min.	1	0.9
023-133-001-000	1.1	Rural Residential 2.3 - 10 Ac. Min.	1	0.9
023-141-006-000	1.3	Rural Residential 2.3 - 10 Ac. Min.	1	0.9
023-101-007-000	1.2	Rural Residential 2.3 - 10 Ac. Min.	1	0.9
023-091-014-000	0.4	Rural Residential 2.3 - 10 Ac. Min.	1	0.9
023-072-013-000	0.2	Rural Residential 2.3 - 10 Ac. Min.	1	0.9
023-072-014-000	0.2	Rural Residential 2.3 - 10 Ac. Min.	1	0.9
023-072-012-000	0.5	Rural Residential 2.3 - 10 Ac. Min.	1	0.9

PLACER VINEYARDS SPECIFIC PLAN
SPECIAL PLANNING AREA - WASTEWATER SUBSHED ALLOCATION

Wastewater Subshed SPA-C Tributary to Node 125 (Qp=0.408MGD)				
APN	**GIS Acres**	**Land Use Designation**	**Buildout EDU**	**SPA Buildout EDU**
023-111-008-000	1.1	Rural Residential 2.3 - 10 Ac. Min.	1	0.9
023-030-016-000	0.4	Rural Residential 2.3 - 10 Ac. Min.	1	0.9
023-040-030-000	1.2	Rural Residential 2.3 - 10 Ac. Min.	1	0.9
023-050-008-000	4.5	Rural Residential 2.3 - 10 Ac. Min.	1	0.9
023-050-030-000	4.7	Rural Residential 2.3 - 10 Ac. Min.	2	1.8
023-060-025-000	4.7	Rural Residential 2.3 - 10 Ac. Min.	2	1.8
023-111-002-000	1.1	Rural Residential 2.3 - 10 Ac. Min.	1	0.9
023-091-006-000	0.2	Rural Residential 2.3 - 10 Ac. Min.	1	0.9
023-091-007-000	0.2	Rural Residential 2.3 - 10 Ac. Min.	1	0.9
023-050-020-000	0.7	Rural Residential 2.3 - 10 Ac. Min.	1	0.9
023-093-004-000	2.0	Rural Residential 2.3 - 10 Ac. Min.	1	0.9
023-050-032-000	2.4	Rural Residential 2.3 - 10 Ac. Min.	1	0.9
023-071-002-000	0.5	Rural Residential 2.3 - 10 Ac. Min.	1	0.9
023-072-001-000	0.5	Rural Residential 2.3 - 10 Ac. Min.	1	0.9
023-170-002-000	0.2	Rural Residential 2.3 - 10 Ac. Min.	1	0.9
023-092-001-000	0.9	Rural Residential 2.3 - 10 Ac. Min.	1	0.9
023-090-003-510	1.7	Rural Residential 2.3 - 10 Ac. Min.	1	0.9
023-050-004-000	3.6	Rural Residential 2.3 - 10 Ac. Min.	1	0.9
023-040-014-000	3.5	Rural Residential 2.3 - 10 Ac. Min.	1	0.9
023-050-039-000	4.8	Rural Residential 2.3 - 10 Ac. Min.	2	1.8
023-050-037-000	4.8	Rural Residential 2.3 - 10 Ac. Min.	2	1.8
023-112-004-000	0.5	Rural Residential 2.3 - 10 Ac. Min.	1	0.9
023-113-001-000	1.7	Rural Residential 2.3 - 10 Ac. Min.	1	0.9
023-091-012-000	0.7	Rural Residential 2.3 - 10 Ac. Min.	1	0.9
023-092-002-000	0.5	Rural Residential 2.3 - 10 Ac. Min.	1	0.9
023-132-002-000	1.6	Rural Residential 2.3 - 10 Ac. Min.	1	0.9
023-130-001-510	1.9	Rural Residential 2.3 - 10 Ac. Min.	1	0.9
023-101-008-000	1.2	Rural Residential 2.3 - 10 Ac. Min.	1	0.9
023-050-035-000	2.4	Rural Residential 2.3 - 10 Ac. Min.	1	0.9
023-030-010-000	1.4	Rural Residential 2.3 - 10 Ac. Min.	1	0.9
023-112-005-000	0.5	Rural Residential 2.3 - 10 Ac. Min.	1	0.9
023-070-005-000	0.7	Rural Residential 2.3 - 10 Ac. Min.	1	0.9
023-072-016-000	0.6	Rural Residential 2.3 - 10 Ac. Min.	1	0.9
023-072-017-000	0.9	Rural Residential 2.3 - 10 Ac. Min.	1	0.9
023-040-029-000	1.1	Rural Residential 2.3 - 10 Ac. Min.	1	0.9
Subtotal	361.3		263.3	231

PLACER VINEYARDS SPECIFIC PLAN
SPECIAL PLANNING AREA - WASTEWATER SUBSHED ALLOCATION

Wastewater Subshed SPA-D Tributary to Node 115 (Qp=0.163MGD)				
APN	**GIS Acres**	**Land Use Designation**	**Buildout EDU**	**SPA Buildout EDU**
023-150-034-000	5.0	Rural Residential 2.3 - 10 Ac. Min.	2	1.8
023-060-021-000	9.4	Rural Residential 2.3 - 10 Ac. Min.	4	3.5
023-150-021-000	9.6	Rural Residential 2.3 - 10 Ac. Min.	4	3.5
023-040-026-000	2.2	Rural Residential 2.3 - 10 Ac. Min.	1	0.9
023-020-010-000	5.7	Rural Residential 2.3 - 10 Ac. Min.	2	1.8
023-040-034-000	1.0	Rural Residential 2.3 - 10 Ac. Min.	1	0.9
023-060-013-000	2.2	Rural Residential 2.3 - 10 Ac. Min.	1	0.9
023-060-018-000	1.2	Rural Residential 2.3 - 10 Ac. Min.	1	0.9
023-020-019-000	5.0	Rural Residential 2.3 - 10 Ac. Min.	2	1.8
023-150-022-000	4.8	Rural Residential 2.3 - 10 Ac. Min.	2	1.8
023-150-013-000	2.2	Rural Residential 2.3 - 10 Ac. Min.	1	0.9
023-020-013-000	5.5	Rural Residential 2.3 - 10 Ac. Min.	2	1.8
023-040-032-000	2.2	Rural Residential 2.3 - 10 Ac. Min.	1	0.9
023-020-015-000	5.2	Rural Residential 2.3 - 10 Ac. Min.	2	1.8
023-150-011-000	3.8	Rural Residential 2.3 - 10 Ac. Min.	1	0.9
023-020-007-000	5.3	Rural Residential 2.3 - 10 Ac. Min.	2	1.8
023-150-005-000	35.7	Rural Residential 2.3 - 10 Ac. Min.	15	13.1
023-150-023-000	4.8	Rural Residential 2.3 - 10 Ac. Min.	2	1.8
023-150-020-000	5.6	Rural Residential 2.3 - 10 Ac. Min.	2	1.8
023-150-012-000	1.8	Rural Residential 2.3 - 10 Ac. Min.	1	0.9
023-020-003-000	3.1	Rural Residential 2.3 - 10 Ac. Min.	1	0.9
023-040-033-000	1.2	Rural Residential 2.3 - 10 Ac. Min.	1	0.9
023-150-028-000	5.6	Rural Residential 2.3 - 10 Ac. Min.	2	1.8
023-150-015-000	3.8	Rural Residential 2.3 - 10 Ac. Min.	1	0.9
023-020-014-000	4.9	Rural Residential 2.3 - 10 Ac. Min.	2	1.8
023-040-035-000	4.7	Rural Residential 2.3 - 10 Ac. Min.	2	1.8
023-020-017-000	5.0	Rural Residential 2.3 - 10 Ac. Min.	2	1.8
023-020-011-000	4.7	Rural Residential 2.3 - 10 Ac. Min.	2	1.8
023-150-035-000	5.0	Rural Residential 2.3 - 10 Ac. Min.	2	1.8
023-060-022-000	2.1	Rural Residential 2.3 - 10 Ac. Min.	1	0.9
023-150-033-000	4.5	Rural Residential 2.3 - 10 Ac. Min.	1	0.9
023-150-025-000	4.8	Rural Residential 2.3 - 10 Ac. Min.	2	1.8
023-150-030-000	4.7	Rural Residential 2.3 - 10 Ac. Min.	2	1.8
023-150-014-000	11.6	Rural Residential 2.3 - 10 Ac. Min.	5	4.4
023-040-028-000	2.4	Rural Residential 2.3 - 10 Ac. Min.	1	0.9
023-020-009-000	5.4	Rural Residential 2.3 - 10 Ac. Min.	2	1.8
023-150-007-000	19.6	Rural Residential 2.3 - 10 Ac. Min.	8	7.0
023-150-032-000	4.5	Rural Residential 2.3 - 10 Ac. Min.	1	0.9
023-150-024-000	4.8	Rural Residential 2.3 - 10 Ac. Min.	2	1.8
023-020-002-000	19.9	Rural Residential 2.3 - 10 Ac. Min.	8	7.0
023-020-018-000	8.7	Rural Residential 2.3 - 10 Ac. Min.	3	2.6
023-150-031-000	4.4	Rural Residential 2.3 - 10 Ac. Min.	1	0.9
023-040-021-000	2.4	Rural Residential 2.3 - 10 Ac. Min.	1	0.9
023-060-017-000	1.2	Rural Residential 2.3 - 10 Ac. Min.	1	0.9
023-060-023-000	2.2	Rural Residential 2.3 - 10 Ac. Min.	1	0.9
023-060-014-000	2.4	Rural Residential 2.3 - 10 Ac. Min.	1	0.9
023-020-012-000	4.7	Rural Residential 2.3 - 10 Ac. Min.	2	1.8
023-040-008-000	2.4	Rural Residential 2.3 - 10 Ac. Min.	1	0.9
023-040-036-000	2.4	Rural Residential 2.3 - 10 Ac. Min.	1	0.9
Subtotal	271.3		109.0	95

PLACER VINEYARDS SPECIFIC PLAN
SPECIAL PLANNING AREA - WASTEWATER SUBSHED ALLOCATION

SPA-TOTALS	
Buildout EDU	**SPA Buildout EDU**
466.3	411