APPENDIX BB

Sewer Alignment and Capacity Analysis

Technical Memorandum

HydroScience Engineers, Inc.

To: Chad Broussard, Analytical Environmental Services

From: Lydia Porras

Reviewed By: Curtis Lam, P.E.

Subject: North Fork Rancheria Project
Sewer Alignment and Capacity Analysis

Date: October 8, 2008

Authorization

Analytical Environmental Services retained HydroScience Engineers (HSe) to provide engineering services to assess the wastewater impacts from the North Fork Rancheria Project (Project) in Madera, California on the existing City of Madera (City) collection system, and recommend a wastewater transmission pipeline alignment.

Objectives

The objectives of this study are as follows:

- Estimate the average daily flow and peaking factors for the City of Madera based on monitored flow information, zoning and land use, and the City's *Sewer System Master Plan* (SSMP) (Montgomery Watson, February 1997);
- Evaluate field flow monitoring data to determine collection system conveyance capacity;
- Determine the available capacity of the City's existing sanitary sewer collection system for each alignment alternative, develop a hydraulic model of each alignment option using the derived flow data for the City's collection system;
- Evaluate infrastructure requirements for each alignment option;
- Prepare a cost estimate for each alignment option; and
- Recommend a wastewater transmission pipeline alignment from the Project in Madera, California (Madera site) to the City's existing collection system.

Madera Site Description

The 305-acre Madera site is adjacent to State Route 99 (SR 99), north of the incorporated City of Madera. The site is bounded on the north by Avenue 18, Road 23 to the west, Golden State Boulevard to the east, and agricultural land to the south. **Figure 1** identifies the location of the Madera site. The Madera site is currently zoned for agricultural or farm uses and a single family dwelling unit. The Madera site currently has a single residence with associated outbuildings near the southeastern corner.

The Project includes three alternatives at the Madera site and one alternative at the North Fork site. This analysis only addresses the Madera site alternatives. Alternatives A, B, and C are described in the *North Fork Water and Wastewater Feasibility Study* (HSe, 2006) and summarized below.

- Alternative A – The development of a 493,010 square-foot casino and hotel resort. In addition to the main gaming facilities the development will include food, beverage, and retail establishments; and conference areas.
- Alternative B – The development of a 198,990 square-foot casino. In addition to the main gaming facilities the development will include food and beverage establishments and conference areas.
- Alternative C – The development of a 237,000 square-foot shopping center. In addition to the shopping center the development will include food and beverage establishments.

The Project's Madera site sanitary sewer system shall connect into the City's existing collection system.

Existing System Description

The City is located in Madera County, approximately 18 miles north of Fresno, along SR 99. The City's current population is approximately 56,710 (City of Madera, 2008) and includes residential; commercial; industrial; public; and agricultural zones. **Figure 2** shows the existing zoning map for the City.

The City's sanitary sewer collection system is comprised of approximately 140 miles of 6- to 48-inch sanitary sewer mains and includes five sanitary sewer lift stations. **Figure 3** shows the existing main pipelines and lift stations, as well as force main alignments. The lift stations collect flows from outlying areas and discharge to branches of the main gravity pipeline. The collection system generally drains to the south and west. The wastewater flows are collected in a 48-inch main trunk line, which traverses west along Avenue 13, and are delivered to the City's wastewater treatment plant (WWTP).

The City's WWTP is located on Road 21½ at Avenue 13, approximately five miles from the Madera site. The WWTP collects wastewater from over 10,000 residential, commercial, public, and industrial sources. The WWTP has a current capacity of 10.1 million gallons per day (MGD) with an average daily flow of 5.8 MGD (Wayne Clay, City of Madera, 2008). The City currently operates an activated sludge WWTP. Effluent from the WWTP is discharged to fourteen 20-acre percolation ponds. In the past, a nearby 40-acre farm has also used effluent from the WWTP for agricultural irrigation.

Connection Options

This Technical Memorandum analyzes the three wastewater transmission alignments presented in the *Feasibility Study* (HSe, 2006) for the connection and conveyance of wastewater from the Madera site to the City's WWTP, and provides a recommendation for a preferred alignment.

The sanitary sewer connection and alignment options have been identified and are shown in **Figure 4**. Each option is summarized below.

Option 1 – Airport Drive Option. The first option would convey the Project's wastewater flows via a new 1.2-mile gravity sewer main from the Madera site and would connect to the City's existing 10-inch gravity sewer line at Airport Drive and Avenue 17. The Project flows would then drain southwest along Aviation Drive to the existing sewer lift station and then pumped to the 30-inch Westberry Boulevard gravity main line.

Option 2 – State Route 99 Option. The second option would connect to the sewer line west of SR 99. This 24-inch pipeline crosses beneath SR 99 from the northeast, traverses west along Avenue 16, and then flows into the Westberry Boulevard gravity main. This option would include a new 2.6-mile gravity sewer main from the Madera site that would connect to the 24-inch sewer line west of SR 99.

Option 3 – Road 23 Option. The third option would be to construct a new sewer line from the Madera site west to Road 23, then south along Road 23 where it would connect to the 48-inch main trunk line along Avenue 13. The new sewer line would require a Fresno River crossing at the existing Road 23 bridge as well as a new lift station. The new sewer line would be a 5-mile sewer force main.

Wastewater Flows

This section provides a discussion of the wastewater flow estimates for the Project's Madera site alternatives as well as the City's existing and projected flows based on the planned zoning and land uses identified in the *Comprehensive General Plan & Environmental Impact Report* (Grunwald and Associates, 1992).

Madera Site Flow Estimates

The Project's wastewater flow estimates were developed in the *Feasibility Study* (HSe, 2006). The wastewater production for the Project was based on typical water usage in similar California projects.

Casinos differ from other business establishments in the hours that they operate, the type of services they provide, and the type and duration of occupancy. The peak flow times of the day vary depending on local patronage rates, but there are typical patterns to the rate of occupancy for casinos. The occupancy or use of the casino generally varies depending on whether it is a weekday or a weekend. Occupancy and flows are usually the lowest during weekdays and normal two-day weekends usually have the highest flows of the week. Based on observed flows at other similar casinos, there are times of the day when the casino has a lower or higher occupancy rate and these times are different, depending on whether it is during a weekday or a weekend. A casino is open 24 hours a day and the number of guests varies throughout the day.

Additionally, flows vary diurnally. For example, during a typical weekday morning and early afternoon the casino has an occupancy rate of roughly 30 to 40 percent but starting in the late afternoon, and extending into the night, the casino occupancy rate may average between 60 to 70 percent.

Tables 1 and 2 contain the estimated wastewater flows for Alternatives A and B, respectively.

Table 1: Estimated Wastewater Flows for Alternative A[1]

Project Component	Wastewater Flows (gpd)		
	Typical Weekday[2]	**Typical Weekend[2]**	**Average Day[3]**
Casino	87,200	128,900	99,100
Back of House	27,400	41,400	31,400
Retail[4]	0	0	0
Food and Beverage	50,700	89,500	61,800
Entertainment/Lounge	1,500	2,400	1,800
Hotel	16,100	31,600	20,500
Pool and Spa	1,800	3,700	2,400
Central Plant/Cooling Towers	49,500	49,500	49,500
Total[5]	**230,000**	**350,000**	**270,000**

Notes:
1. Data provided in *North Fork Water and Wastewater Feasibility Study* (HSe, 2006)
2. Used for calculation purposes only.
3. Average Day Flow = 5/7 Weekday + 2/7 Weekend
4. Retail flow is estimated to be less than 20 gpd and is not a significant contributor to the overall flows.
5. Total wastewater flows rounded to nearest 10,000 gpd.

Table 2: Estimated Wastewater Flows for Alternative B[1]

Project Component	Wastewater Flows (gpd)		
	Typical Weekday[1]	**Typical Weekend[1]**	**Average Day[2]**
Casino	52,800	78,100	60,000
Back of House	21,000	31,600	24,000
Retail[3]	0	0	0
Food and Beverage	37,900	66,800	46,100
Entertainment/Lounge	1,500	2,400	1,800
Hotel	--	--	--
Pool and Spa	--	--	--
Central Plant/Cooling Towers	30,000	30,000	30,000
Total[4]	**140,000**	**210,000**	**160,000**

Notes:
1. Data provided in *North Fork Water and Wastewater Feasibility Study* (HSe, 2006)
2. Used for calculation purposes only.
3. Average Day Flow = 5/7 Weekday + 2/7 Weekend
4. Retail flow is estimated to be less than 20 gpd and is not a significant contributor to the overall flows.
5. Total wastewater flows rounded to nearest 10,000 gpd.

Retail centers such as those proposed for Alternative C are more typical business establishments in the hours that they operate, the type of services they provide, and the type and duration of occupancy. Similar to casinos, the time of days with the peak flow vary slightly depending on the surrounding community but there is a fairly typical pattern to the rate of occupancy for retail centers in general. The occupancy or use of the retail center typically varies depending on whether it is a weekday or a weekend. Occupancy and flows are usually the lowest during the weekdays (Monday through Friday). Normal two-day weekends (Saturday and Sunday) usually have the highest flows on a weekly basis.

A retail center is typically open 12 hours a day and the number of guests varies throughout the day. Based on flows at other retail centers, there are times of the day when the shops have a lower or higher occupancy rate and these times are different depending on whether it is during a weekday or a weekend. For example, during a typical weekday in the morning and early afternoon the retail center has an occupancy rate of roughly 30 to 40 percent but starting the late afternoon, and extending into the evening, the retail center may have a 60 to 70 percent occupancy rate (HSe, 2006).

Table 3 contains the estimated wastewater flows for Alternative C.

Table 3: Estimated Wastewater Flows for Alternative C[1]

Project Component	Wastewater Flows (gpd)		
	Typical Weekday[2]	Typical Weekend[2]	Average Day[3]
Retail	11,100	17,300	12,900
Food and Beverage	3,600	6,400	4,400
Total[4]	**15,000**	**24,000**	**17,000**

Notes:
1. Data provided in *North Fork Water and Wastewater Feasibility Study* (HSe, 2006)
2. Used for calculation purposes only.
3. Average Day Flow = 5/7 Weekday + 2/7 Weekend
4. Total wastewater flows rounded to nearest 1,000 gpd.

For all three alternatives, the average daily wastewater flow is calculated using the time-weighted average of the weekday and weekend flows. The average is weighted based on five days of weekday flows plus two days of weekend flows. The average wastewater flow is useful in determining the design average day water demand and design wastewater disposal flow (HSe, 2006).

City of Madera Wastewater Flow Estimates

Wastewater flow estimates were developed for the *City of Madera Wastewater Treatment Plant Expansion Predesign Report* (Boyle Engineering, July 2004) as part of the analysis to size the expansion of the WWTP. The flow rate per capita was based on historical WWTP flow data over a five year period (1998 to 2003) and corresponding population data. An average flowrate of 119 gallons per day per capita (gpcd) was calculated and applied to the anticipated population increases for five year increments to 2020 and to 2023 to establish future flow projections. The projected population for the year 2020 is 76,897 (Boyle, 2004). The flow projections are provided in **Table 4**, below.

Table 4: Estimated Average Daily Flows for the City (Boyle, 2004)

Parameter	2005	2010	2015	2020	2023
Flow (MGD)	5.70	6.67	7.81	9.15	10.10

Notes:
1. Data obtained from *City of Madera Wastewater Treatment Plant Expansion Predesign Report* (Boyle Engineering, July 2004)

The City's SSMP (Montgomery Watson, 1997) establishes a range of recommended unit flow factors for sanitary sewer system design. For the purposes of this analysis the existing sanitary sewer unit flow factors were based on the average capita per dwelling unit per zone (Grunwald and Associates, 1992) and the SSMP per capita flow of 100 gallons per day (gpd). To account for increasing population density and the effects of the City's population growth on the existing sanitary sewer system, future flow factors were based on a higher capita per dwelling unit. This assumption resulted in an increased flow factor in the residential zones, which is within the higher end of the recommended range established in the SSMP. The flow factors shown in **Table 5** were used to estimate the City's existing and future flows.

Table 5: Sanitary Sewer Unit Flow Factors

Land Use	Abbreviation	Existing Flow Factor	Future Flow Factor	Unit
Very Low Density Residential	VLDR	330	330	gpd/unit
Low Density Residential	LDR	330	380	gpd/unit
Medium Density Residential	MDR	250	300	gpd/unit
High Density Residential	HDR	200	250	gpd/unit
Commercial/Industrial	COM/IND	1,000	1,000	gpd/unit gpd/acre
Heavy Commercial	H. COM	2,500	2,500	gpd/unit
School	SCH	15	15	gpd/student

In order to calibrate the flows estimates, HSe contracted with SFE Global NW (SFE) to conduct sewer flow monitoring at two locations within the sewer collection system. Flow monitoring equipment was installed in the manhole at the intersection of Avenue 13 and Road 23 in the 48-inch main trunk line and in the manhole at the intersection of Westberry Boulevard and Cleveland Avenue in a 30-inch pipeline. These monitoring locations are shown in **Figure 4**.

Monitoring was conducted between February 1, 2008 and April 7, 2008. The locations were selected to collect data for the collection pipelines that would be impacted by the Project's Madera site connection. The intent was to capture both dry weather and wet weather flow data. Four small rain events occurred during the monitored month of February. Rain gauge data was obtained from a local rain monitoring station (CIMIS, 2008). The records indicate that the combined precipitation of the four rain events was 1.52 inches. The estimated inflow was calculated for each of these events. During the largest storm event the inflow rate into the existing collection system was calculated to be approximately 22 gpd/acre. However, the lack of sufficient wet weather flow data did not allow for a detailed analysis of the inflow and infiltration (I/I) into the collection system. The City's SSMP notes that the estimated I/I was not considered particularly high (Montgomery Watson, 1997) for the existing system especially in newly developed areas. As a conservative estimate of the I/I flowrates for the system, a flow factor of 200 gpd/acre was used and applied at the respective tributary area's downstream manhole. This value was used to estimate peak flows.

The field flow monitoring study was also used to calibrate wastewater flow assumptions, and to validate the peaking factor identified in the SSMP for use in the system's hydraulic model. A copy of the flow monitoring report prepared by SFE is included as **Attachment A**.

Existing City Wastewater Flows

Average daily flows were estimated by using a combination of SSMP identified point sources, land use maps, and unit flow factors identified in **Table 5**. These flows were calibrated against the flow monitoring data. The existing system's diurnal curve was developed from the flow monitoring data by selecting a two week time period in which no rainfall was recorded. The diurnal curve was estimated by averaging monitored flow data over a 24-hour period. The diurnal curve is provided as **Figure 5**. Peak flows generally occur during the mornings and evenings, with the lowest flows occurring during the midday, as well as late evening into early morning.

Figure 6 shows the estimated tributary areas for the sanitary sewer flow analysis. **Table 6** provides a breakdown of land usage per tributary area and the estimated average daily flows associated with each. The estimations are based on land uses and their associated flow factors, as well as SSMP specified point sources.

Table 6: Existing Estimated Average Daily Flows for the City

MH No.	VLDR (DU)	LDR (DU)	MDR (DU)	HDR (DU)	COM/IND (Unit, Acre)	H COM (Unit)	SCH (Students)	Average Flow (gpd)
A	4	7,159	2,536	992	967	392	12,100	5,073,570
B	0	0	2	0	0	0	0	34,000
C	0	1,280	0	0	0	5	900	440,900
D	0	426	0	0	0	0	0	140,600
E	0	0	0	0	8	562	0	67,900
F	0	0	0	0	1	7	0	8,000
Total	**4**	**8,865**	**2,538**	**992**	**976**	**966**	**13,000**	**5,765,000**

Notes:
1. MH = manhole
2. DU = Dwelling Unit

Table 6 shows that the estimated average daily flow was approximately 5.77 MGD. The peak hour peaking factor (PF) for the City's existing system was derived from flow monitoring data collected by SFE and the City's SSMP design criteria. The PF was based on the diurnal curve and the average daily flowrate. The collection system should be designed to handle peak hour flowrates. The PF is based on the flow data represented by the maximum flowrate identified in the diurnal curve and the average daily flowrate. The result is based on the following calculation:

PF = (maximum flowrate / average flowrate)

A summary of the estimated flows based on unit flow factors and tributary areas as well as the monitored flows are included below in **Table 7**.

Table 7: Summary of Monitored and Estimated Flows

Source	ADWF (MGD)	Peaking Factor	Peak Hour Flow (MGD)
Westberry Blvd and Avenue 15 1/2			
Monitoring Data	0.023	3.6	0.082
Flow Estimate	0.067	1.6	0.107
Discrepancy	**0.044**	**2.0**	**0.025**
Road 23 and Avenue 13			
Monitoring Data	5.28	1.6	8.45
Flow Estimate	5.77	1.6	8.65
Discrepancy	**0.49**	**0**	**0.20**

Notes:
1. ADWF = Average Dry Weather Flow

The ADWF estimate in the Westberry Boulevard pipeline is substantially higher than the monitored flow, and the peak flow is within 23% discrepancy. It is expected that the discrepancy is due to a combination of low flows and the lift station operation. Surging in the pipeline would occur when the lift station is operating, accounting for the high PF. This modeled flow is based on the more conservative flow estimate developed in the analysis. The estimated total flows in the Avenue 13 main line closely correlate to the flow monitoring data and provide confidence in the unit flow factors utilized. These flowrates were applied to the gravity sewer model and used to estimate future sanitary sewer system capacities for the City in the sections of pipeline that would be affected by the Project.

Future City Wastewater Flows

Future expansion of the City's wastewater collection system is expected to occur within the City's sphere of influence, as shown in **Figure 6**. Expansion is projected through the 2020 planning horizon (Montgomery Watson, 1997). Future development in the City includes low and high density residential, commercial, and industrial around the proposed sewer lines. Projected future wastewater flows from each tributary area were determined based on the type of zoning identified on the zoning map and the unit flow factors from **Table 5**.

Flows from the developments were included in the nearest tributary areas and modeled based on the assumption that these flows would be tied into the nearest downstream manhole. The model results were used to evaluate the effects of these additional flows on the capacity of the affected section of the collection system. These projected flows are listed in **Table 8**. The estimations are based on land uses and estimated flow factors for each type of land use.

Table 8: Future 2020 Estimated Average Daily Flows for the City

MH No.	VLDR (DU)	LDR (DU)	MDR (DU)	HDR (DU)	COM (Unit)	H COM/IND (Unit, Acre)	School (Students)	Average Flow (gpd)
A	0	7,417	3,357	988	1,293	472	12,100	6,600,000
B	0	309	103	0	2	1	0	137,100
C	0	1,280	0	0	0	5	900	512,400
D	0	426	0	0	0	0	0	162,900
E	0	0	0	0	19	729	0	1,420,700
F	19	262	215	0	60	7	0	224,000
G	0	0	0	0	8	17	0	53,300
H	17	4	0	0	6	0	0	12,500
Total	**36**	**9,698**	**3,675**	**988**	**1,388**	**1,231**	**13,000**	**9,123,000**

Notes:
1. MH = manhole
2. DU = Dwelling Unit

The flowrates shown in **Table 8** were used to estimate future sanitary sewer system capacity requirements for the applicable portions of the sewer collection system. The PF identified in **Table 7** was globally applied to the estimated daily ADWF values for each tributary area to estimate a peak hour flow rate for future flows. The future peak hour flow estimates are identified in **Table 9**.

Table 9: Future City Peak Hour Flows

ADWF (MGD)	Peaking Factor	Peak Hour Flow (MGD)
9.12	1.6	14.6

Notes:
1. ADWF = Average Dry Weather Flow

Table 10 contains a summary of the combined future City and Project wastewater flows for each Madera site alternative. These flows were used for modeling purposes.

Table 10: Summary of Future Wastewater Flows

Alternative	ADWF[1] (mgd)	PHF[1] (mgd)
Alternative A	9.40	14.95
Alternative B	9.28	14.81
Alternative C	9.14	14.62

Notes:
1. Future Flows = Alternative Flows + Future City Flows. For Alternative Flows see Tables 1, 2, 3.
2. These flows represent peak hour flows which are used to determine the impact to the collection system only and not the WWTP.

Sanitary Sewer Modeling

An analysis of the existing collection system was conducted to determine whether the City's collection system has sufficient capacity to convey wastewater from the Project to the WWTP. SewerCAD version 5.6 was the sanitary sewer modeling software used to model the City's collection system. SewerCAD calculations, for this model, were based on the Manning's formula for gravity friction and the Hazen-Williams formula for pressure friction. The design capacity of the pipelines was assumed to be 75% of the total pipe capacity, as an added factor of safety.

The base model traced the existing main lines that feed directly into the 48-inch main trunk line that feeds the WWTP influent pipeline. Manhole invert and rim elevations were obtained from data provided by City staff and from the SSMP. For the purposes of this study, the City was divided into eight tributary areas contributing to eight manholes. The wastewater generated by each tributary was assumed to enter the modeled pipelines at the downstream manhole.

A baseline model run was performed on the existing collection system using calculated peak flows to determine the baseline condition and identify any serious problem areas prior to Project connection. The existing condition was compared to the Project condition to determine the net change in capacity, flow, and velocity in the pipeline due to the proposed Project at the Madera site. The results are provided in **Attachment B**. Flows from the Madera site were modeled based on the assumption that these flows would connect into the existing collection via the previously identified options. The model results were used to evaluate the effects of these additional flows on the capacity of the existing collection system. The results are summarized below.

Baseline Model: The results of the baseline model indicated that the existing condition of the system is within the current available capacity prior to the addition of the Madera site flows. Pipeline capacities were based on design criteria identified in the SSMP as well as data provided by the City for the existing collection system. The model was then used as the basis for developing scenarios to evaluate the Madera site alternatives, alignment options, and future conditions.

Three alignment options were investigated for connection to the City's existing collection system and modeled as described below. Model outputs for the sanitary sewer capacities are provided as **Attachment B**. Below is a discussion of each alignment and connection option.

Option 1 – Airport Drive. For this option, flows from the Project development were modeled based on the assumption that the Madera site flows would tie into the existing system at the Airport Drive and Avenue 17 manhole.

The existing triplex lift station on Aviation Drive has an 11-foot diameter and 20-foot deep wet well. The current capacity of each of the three existing Allis Chalmers pumps (two active, one standby) is 410 gpm (City of Madera, 2008). Based on information from City staff, it is understood that the lift station on Aviation Drive does not frequently start. It is estimated that with the addition of flows from the Madera site the existing lift station will fill at a rate of 250 gpm and drain approximately once an hour. The City's SSMP outlines a future sewer connection of the housing developments to the north of Avenue 17. It is proposed that this developments' flows would also be routed to the Aviation Drive lift station. The existing lift station has adequate capacity to accept the Project's wastewater flows with existing flows, prior to this housing development connection. However, the housing developments' connection may require lift station upgrades to accommodate the additional flows.

The model showed that the Westberry main line and downstream pipelines have sufficient capacity to support anticipated future flows for the City plus flows from any of the Project alternatives. Detailed model results are provided in **Attachment B**.

Option 2 – SR 99. Flows from the Madera site were modeled based on the assumption that the wastewater flows would tie into the new 24-inch gravity line west of SR 99. Currently there are no connections to this new line. However, the model showed that this sewer line, as well as the downstream Westberry sewer main, had sufficient remaining capacity to support anticipated future flows for the City plus flows from any of the Project alternatives. Detailed model results are provided in **Attachment B**.

Option 3 – Road 23. Wastewater flows from the Madera site would be pumped via a 5-mile, force main to the Avenue 13 sewer main line. The model was used to evaluate the effects of these additional flows on the capacity of the existing 48-inch trunk line.

The new lift station would need to be designed to convey a minimum flow of 250 gpm, with a minimum total dynamic head of 100 feet. This lift station would likely be a triplex system to provide redundancy and flexibility. The force main is sized such that velocities remain below five feet per second for each alternative. Subsequent planning and design efforts should provide detailed specifications for the Madera site wastewater flow conveyance, and modify the recommendations herein as appropriate.

The model showed that the main sewer line along Avenue 13 had sufficient capacity to support each of the anticipated future flows for the City plus flows from any of the Project alternatives. Detailed model results are provided in **Attachment B**.

Summary: Based on the results of each modeled connection option, all three Options for connection to the City's collection system have the capacity to convey wastewater flows from the Project. The model results show that none of the Project alternatives for any of the alignment options cause any pipelines to exceed the 75% design capacity. **Table 11** provides a summary of the required pipe sizes for each option and alternative.

Table 11: Summary of Pipeline Sizes

Alternative	Option 1 (Gravity)	Option 2 (Gravity)	Option 3 (Force main)
Alternative A	10-inch	10-inch	6-inch
Alternative B	8-inch	8-inch	4-inch
Alternative C	8-inch	8-inch	4-inch

Cost Estimate

The preliminary capital costs for the wastewater pipeline facilities for Alternative A and the three connection options are summarized in **Table 12**. Alternative A provides the most conservative estimate as it is the highest flow alternative. Alternatives B and C have smaller flows than Alternative A resulting in smaller pipe size requirements, therefore the associated option costs will be slightly less. The ratio of costs for each option is the same for each alternative. A detailed cost analysis for all alignment options and Project alternatives is provided as **Attachment C**.

Table 12: Preliminary Capital Cost Estimate Summary

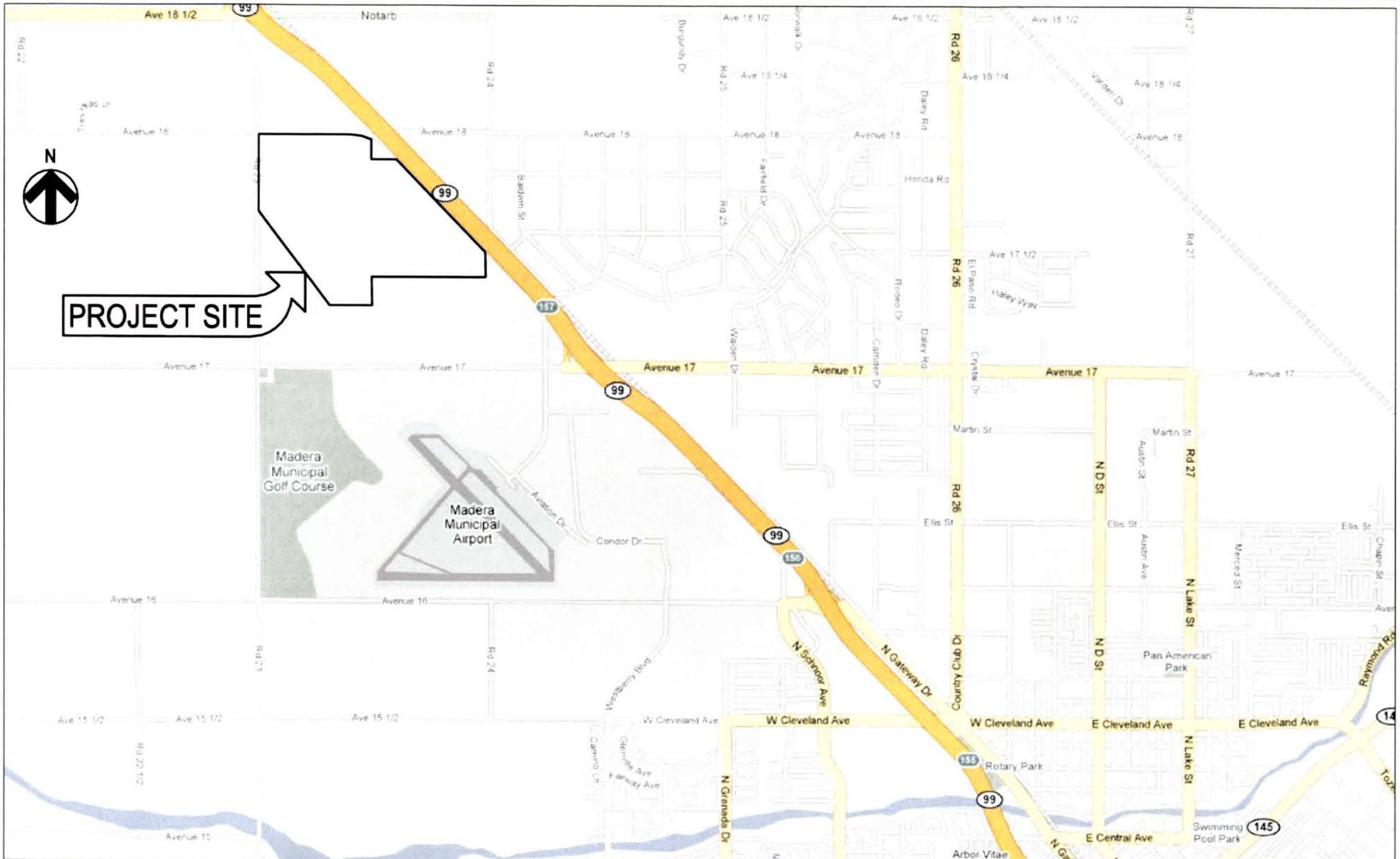
Pipeline Alignment	Option 1	Option 2	Option 3
10-inch Gravity Sewer	$880,000	$1,606,000	-
Manholes	$60,000	$100,000	-
6-inch Force Main	-	-	$1,848,000
Creek Crossing (Bore and Jack)	-	-	$200,000
Lift Station	-	-	$80,000
Sewer Facilities Subtotal	**$940,000**	**$1,706,000**	**$2,128,000**
Design, Construction Management, and Permitting (30%)	$282,000	$514,000	$639,000
Contingency (30%)	$367,000	$666,000	$831,000
Total Capital Costs	**$1,590,000**	**$2,886,000**	**$3,598,000**

Notes:
1. All values rounded to the nearest thousand.

Recommendations

Based on the modeling output data and associated cost estimates for each connection and alignment option, the preferred alignment would be Option 1 – Airport Drive. This option requires a shorter length of pipe to the point of connection and utilizes the existing Airport Drive lift station to convey the Madera site wastewater to the City's existing sewer main. Therefore the associated costs are substantially less than the other two options. Option 2 would require additional piping and associated manholes and Option 3 would require a creek crossing as well as additional costs associated with a new lift station.

The recommended option requires construction of 8,000-linear feet of gravity pipe from the Madera site to the point of connection. The pipeline construction should include approximately 30 manholes. The pipeline diameter will be 10 inches for Alternative A and 8 inches for Alternatives B and C.



SOURCE: GOOGLE MAPS

HydroScience Engineers, Inc.

FIGURE 1
NORTH FORK RANCHERIA PROJECT
SEWER CAPACITY ANALYSIS
LOCATION MAP

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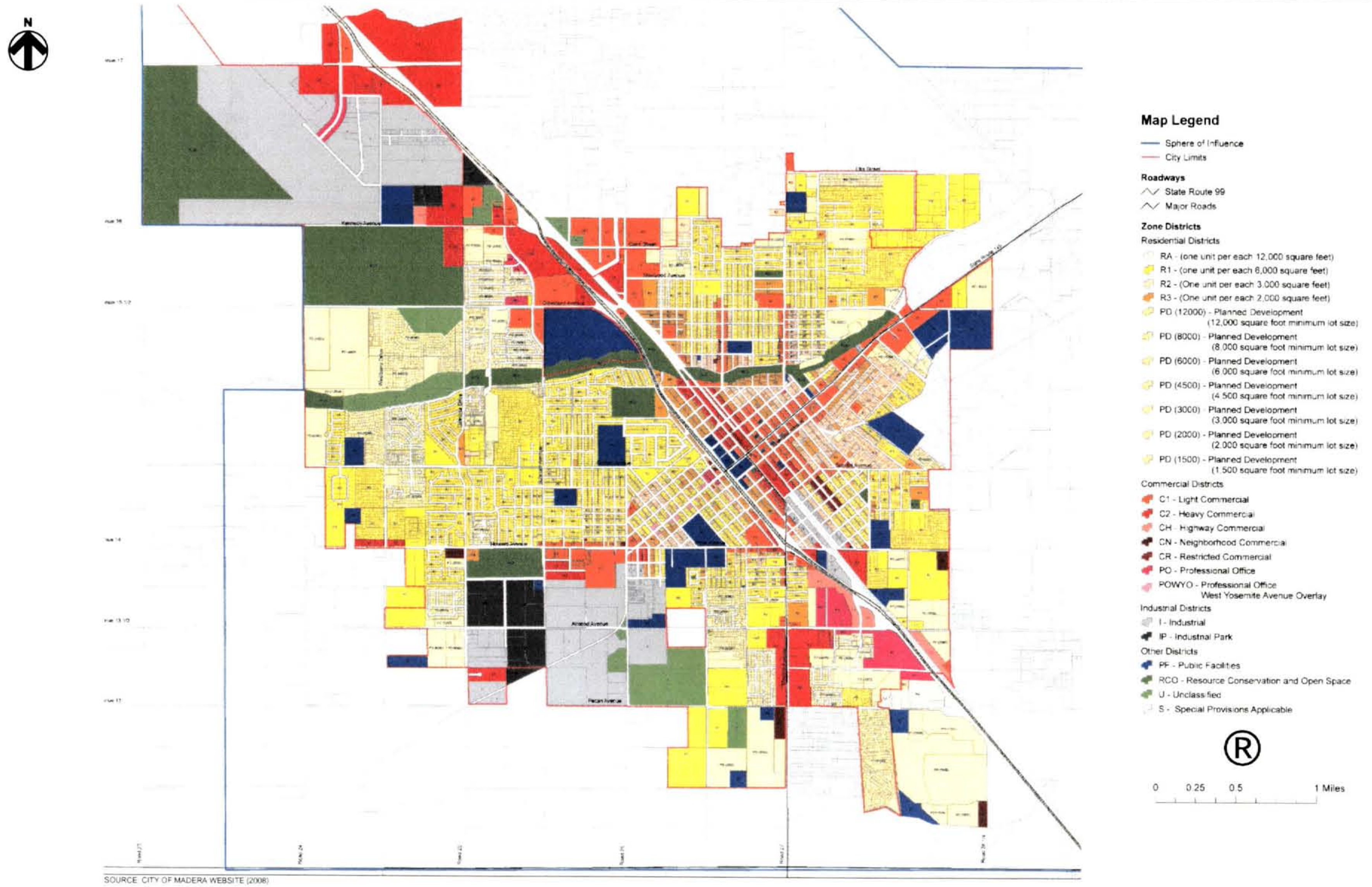

FIGURE 2
NORTH FORK RANCHERIA PROJECT
SEWER CAPACITY ANALYSIS
ZONING MAP

HydroScience Engineers, Inc.

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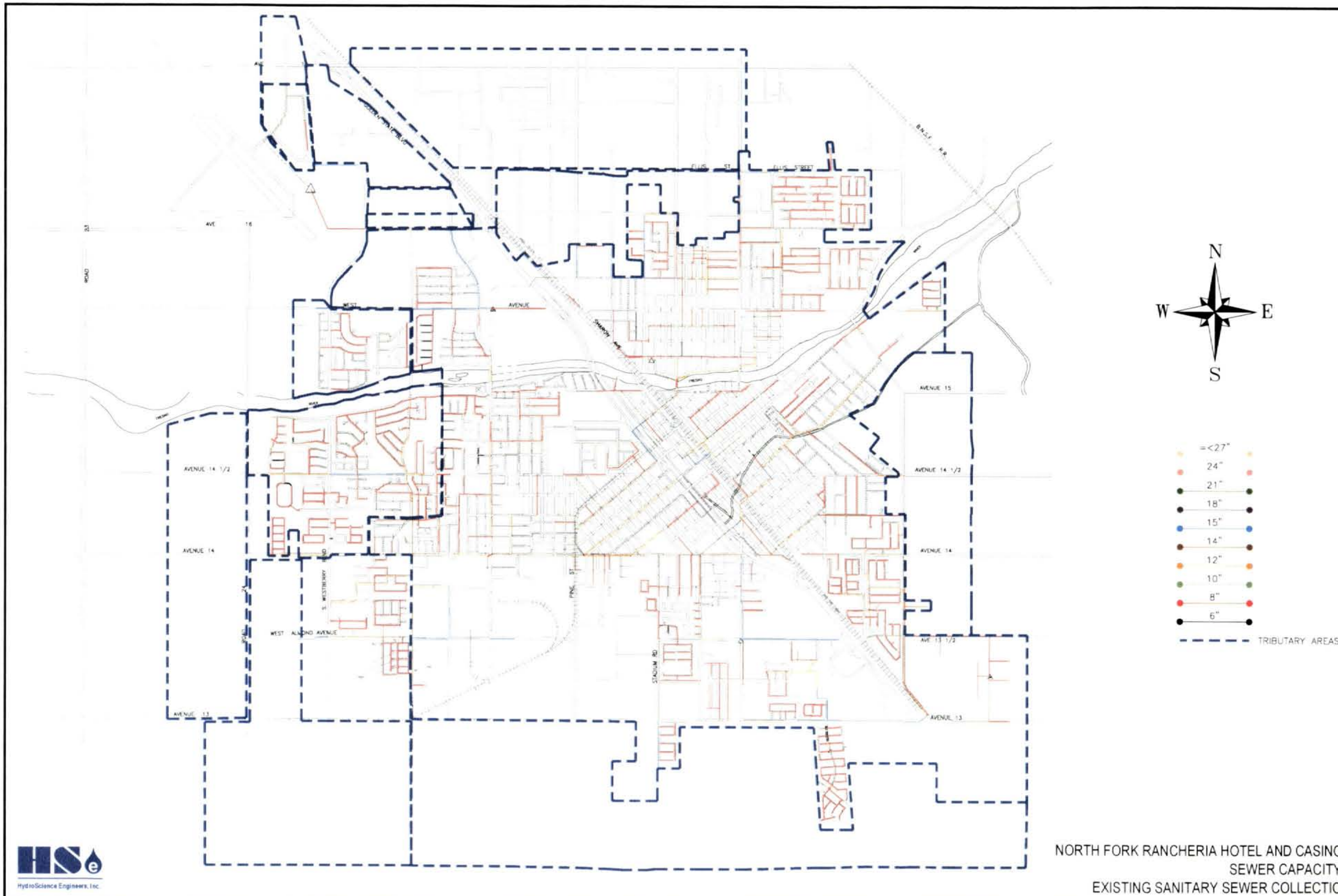


FIGURE 3
NORTH FORK RANCHERIA HOTEL AND CASINO PROJECT
SEWER CAPACITY ANALYSIS
EXISTING SANITARY SEWER COLLECTION SYSTEM

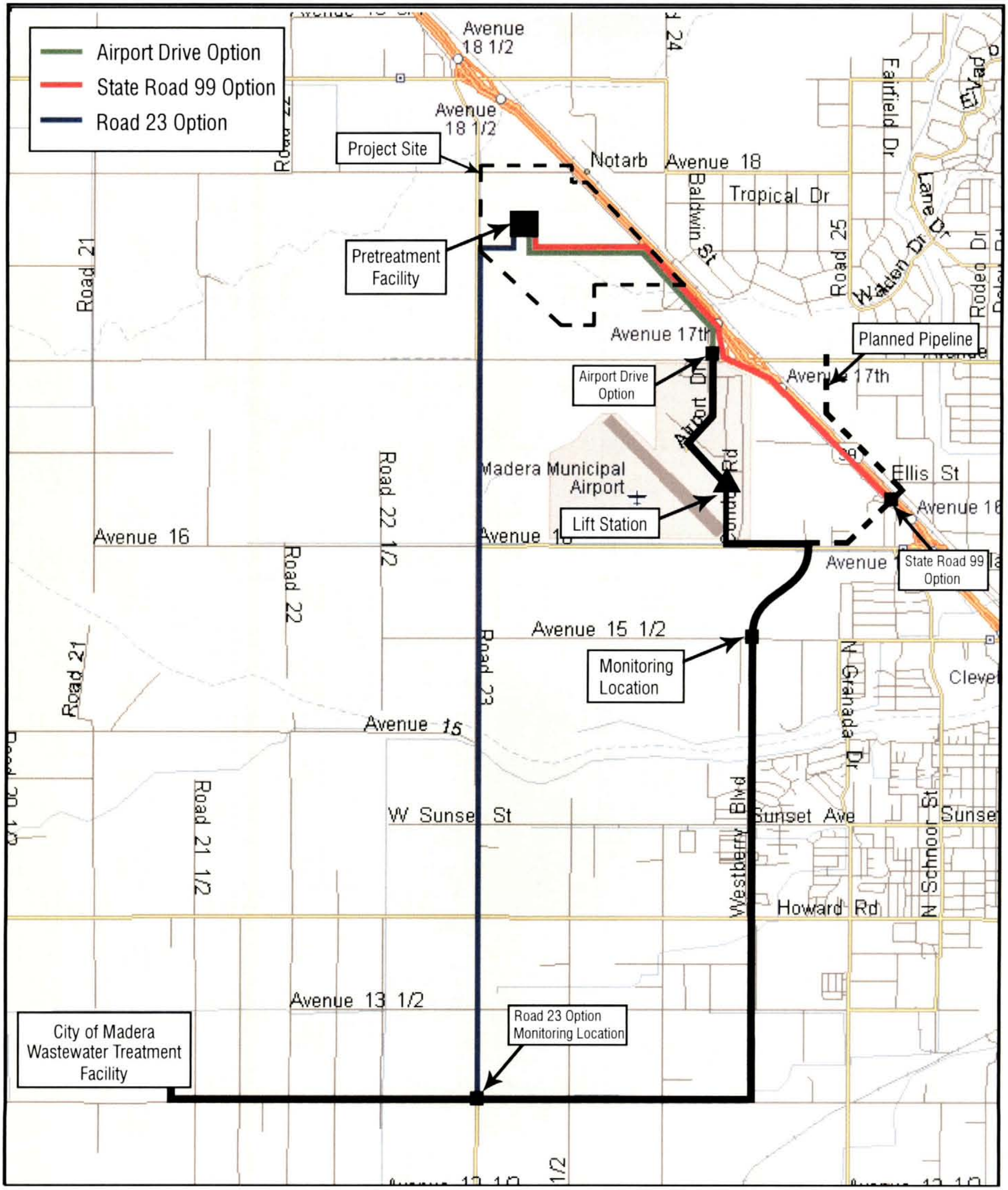
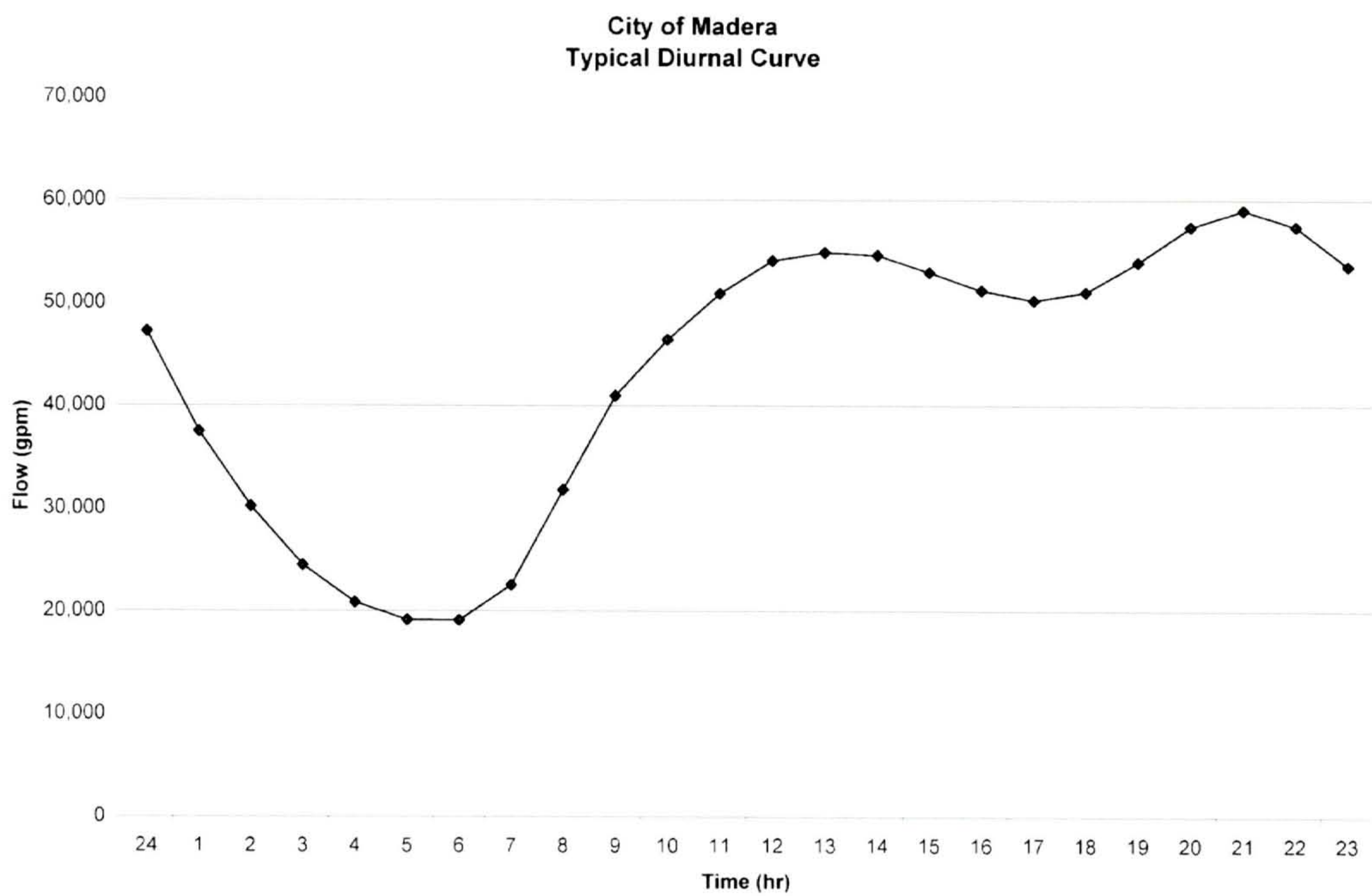


FIGURE 4

NORTH FORK RANCHERIA PROJECT
SEWER CAPACITY ANALYSIS
PIPELINE ALIGNMENT OPTIONS

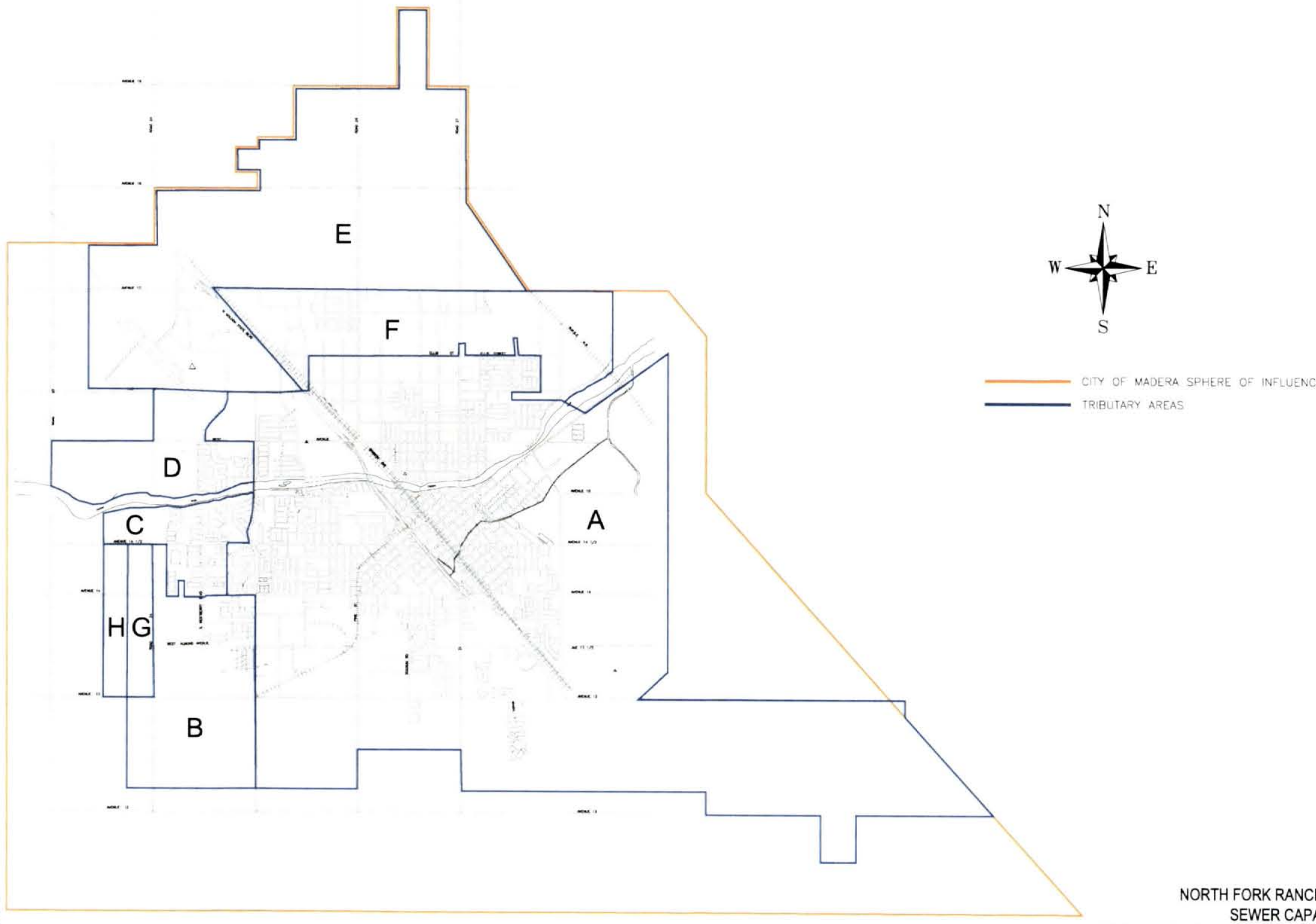
HydroScience Engineers, Inc.



HydroScience Engineers, Inc.

FIGURE 5
NORTH FORK RANCHERIA PROJECT
SEWER CAPACITY ANALYSIS
DIURNAL CURVE

S:\Common\Projects\129_054_North Fork\Drawings\Fig 5.dwg DATE:5/23/08



HydroScience Engineers, Inc.

FIGURE 6
NORTH FORK RANCHERIA PROJECT
SEWER CAPACITY ANALYSIS
SPHERE OF INFLUENCE AND TRIBUTARY AREAS

City of Madera – Collection System
Flow Monitoring 2008
SFE File #C51-04

Final Report

Submitted To:

Hydroscience Engineers Inc.
Attention: Mr. Curtis Lam, Project Manager
221 Gateway Road West, Suite 403
Napa, CA 94558

Submitted By:

SFE Global NW
4141 Northgate Blvd., Suite 3
Sacramento, California 95834
(866) 332-9876

1.0 INTRODUCTION

This report provides details of the sanitary sewer flow monitoring project conducted within the City of Madera, by SFE Global for Hydroscience Engineers Inc. under the direction of Mr. Curtis Lam, Project Manager. Enclosed are the results of flow monitoring performed on two sanitary sewer sites. These sites were installed and commenced logging February 1st, 2008. These sites collected flow data for two month duration until they were removed on April 7th, 2008.

Site #	Location	Meter Used
C51-04-01	Avenue 13 @ Road 23	ISCO 2150 Area Velocity Meter
C51-04-02	Westberry Blvd, N. of Cleveland Ave	350mm Weir c/w ISCO 2150 Area Velocity Meter

Mr. Paul Loving, as Project Manager represented SFE Global during this project.

2.0 MONITORING PROGRAM

Prior to installing these flow monitoring stations, SFE performed detailed site assessments of each potential site to determine the most appropriate flow monitoring device in achieving optimal results. Factors such as pipe size, channel condition, site location, and site hydraulics were all considered and documented while performing site assessments. See Appendix #2 of this report for site assessment details.

SFE installed each of the flow monitoring stations in accordance with the approved site assessment documentation. The meter had been calibrated and set to log data at a 5-minute interval. To ensure proper operation of the station, a regular maintenance schedule was adhered to for the duration of the project. During each site maintenance inspection conducted by SFE, corresponding meter and field readings were obtained and recorded on the field maintenance sheet. These readings provided an indication of the accuracy and operation of the meter. See Appendix #2 of this report for the field report sheets detailing site inspection information, calibrations, and depth verifications.

Confined space entry procedures and general site/traffic safety was adhered to during site installation and site maintenance. SFE utilizes the "DBI SALA" rescue system, a 2800 CFM air induction device and TMX 412 air quality monitors. All of our staff members are thoroughly trained and certified in confined space entry procedures. Certificates are available upon request.

A thorough traffic control plan was established and used by SFE Global crews where required.

2.1 SANITARY SEWER FLOW MONITORING LOCATIONS

Site C51-04-01 – Avenue 13 @ Road 23: SFE installed an ISCO 2150 Area Velocity Meter within the manhole to monitor flow from the 48 inch diameter pipe. Flow was calculated using the continuity equation Q=VA by the flow meter's internal computer. Flow monitoring results were obtained for the complete monitoring period. Monitoring duration was from January 31st to April 7th, 2008. All equipment was removed from the site.

Site C51-04-02 – Westberry Blvd, N. of Cleveland Ave: SFE installed a 350mm Custom Compound Weir and an ISCO 2150 Meter within the manhole to monitor flow from the 30 inch diameter pipe. Flow was calculated using a site-specific depth vs. flow lookup table. Flow monitoring results were able to obtain for the complete monitoring period. Monitoring duration was from February 1st to April 7th, 2008. All equipment was removed from the site.

Report End
April 2008

Appendix 1

Technical Information

SFE's Custom Compound Weir Technology was first developed in 1983. This system consists of the following two components:

- A customized primary device (Custom Compound Weir or CCW), which provides a predictable relationship of "head" versus "flow".
- A water level sensor and data logger

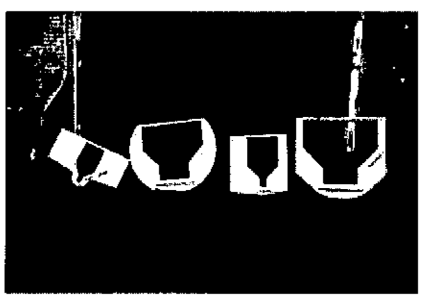
Testing & Awards

The relationship between "head" and "flow" for the primary device was initially established in a hydraulics lab in conjunction with the Canadian Centre for Inland Waterways (CCIW) and published in a report prepared for a local utility. In subsequent years the monitoring techniques were further refined and additional laboratory work was carried out for the primary device. In 1988 the Association of Consulting Engineers in their annual national engineering awards program recognized the work with an Award of Merit.

Any level sensing device may be used reliably measure flows including ultrasonic level indicators, pressure transducers and floats. The system was designed to make it economically feasible for even small utilities to be able to operate a network of stations for a long duration - the low operating costs & high accuracy/reliability prevailing over other measurement systems.

Self-Cleaning

The primary device has a rectangular notch, which then flares out into a "V" section and then a rectangular upper portion. The notch and "V" section have chamfered 38 mm thick "lips" which make them self-cleaning and result in a very high weir flow coefficient.



The self-cleaning properties of these weirs have been amply field proven over the past 18 years at approximately 2200 such stations. Each of our Custom Compound Weirs is custom designed by an open channel hydraulics specialist for the manhole, chamber or channel configuration it is to be used in.

Low Flow Accuracy

For sewers up to 534 mm diameter the notch is typically 100 mm wide and 140 mm deep. This results in a flow rate of roughly 1.0 l/s for a head of 25 mm. Since a 2.5 psi pressure transducer or narrow beam ultrasonic indicator is usually capable of measuring water levels within +/- ¼", flow rates down to 1.0 l/s can readily be measured (a special unit has previously been designed to measure pre-treated wastewater flow rates down to 0.001 l/s).

No Sewer Backups

The lower notch magnifies the variation of the water level with small changes in flow rate (e.g. for the base flow regime). The overall primary device or "weir" normally has an opening greater than the pipe cross sectional area and capacities greater than that of the sewer in which they are placed.

Any Size, Any Shape

SFE has installed custom compound weirs in sewers from 0.15 m to 3.6 m as well as in varying sizes of pond outlets, creeks, WWTP's, etc. Custom designing the primary device for the manhole or channel in which it will be placed means that you have considerable control over the final flow regime. This has allowed many difficult hydraulic situations to be handled including bends, junctions, slopes over 10%, drop connections, and drops in the main pipe invert.

Velocity Measurements Not Required

One of the major advantages of SFE's Custom Compound Weir is that it only requires a depth sensor and logger; a velocity sensor is not used. Many of the problems associated with sewer flow monitoring are related to the velocity sensor and the need to measure average velocity. Velocity sensors are prone to fouling with subsequent "drifting" of the signal whereas pressure sensors will still accurately register variations in water level even if they have debris on them.

No "In the flow" Probes

The use of SFE's Custom Compound Weir further improves the performance of pressure sensors since they no longer represent an effective obstruction in the flow (they are installed behind the weir). They will always have a reasonable "head" on them as the weir lip elevation maintains a minimum depth of 100 mm behind the weir. As pressure transducers are much less accurate when depths approach zero; this situation becomes a problem for Area-Velocity (AV)) type meters in small pipes where base flow rates are low.

Less Expensive

"Level only" monitors such as those used with our Custom Compound Weir are less expensive than AV meters and need less power to operate. Flow profiling is needed for conventional AV meters to ensure that the velocity sensed at a point or across a band of flow is properly transformed into average velocity across the pipe section. Since the Custom Compound Weir does not use velocity, profiling becomes redundant.

High Accuracy

Dye dilution and full-scale lab comparisons have been conducted and the results have been excellent. In most cases +/- 5% is readily achievable without special attention.

Temporary or Permanent

The Custom Compound Weir's are normally located in the manhole chamber about 300 mm from the downstream end.

Material	Life Expectancy	Uses
Lumber/Lexan	1 week to several years	Short Term (E.g. I/I Study)
Plywood	Up to 2 years	Temporary
Pressure Treated Lumber	5 to 8 years	Semi-Permanent
Lexan and 3/16 Stainless	50 Years	Permanent

No Surcharges

Is there a possibility of sewer surcharges causing basement flooding because of the use of such primary devices or weirs? The question has been raised many times over the past 18 years and was addressed on a project when the Custom Compound Weir was first designed in 1984. The purpose of that first project was to determine the cause of persistent sewer related basement flooding. The client was very concerned that the study procedures did not create more flooding since two Custom Compound Weir stations were just downstream of the area receiving the flooding. The design and placement of the Custom Compound Weirs addressed this as follows:

- Each CCW was located in a manhole and not in the pipe, approximately 300 mm from the downstream end so that if the weir were to ever get blocked it could simply overflow safely. (This event has never occurred).
- For manholes with a chamber larger than the pipe (i.e. 450 mm pipe in standard 1065 mm manhole), the weir opening is greater than the pipe area. The flow over the weir is also at critical depth and therefore at a higher velocity than normally occurs in the pipe itself. As a result, the weir capacity is much greater than the pipe capacity in most installations.

- A rating curve was provided for a demo weir that has the standard opening used in pipes up to 450 mm. Table 1 below shows the flow capacity of this weir configuration at selected heads versus the full flow capacity of selected pipe sizes up to 450 mm at a 0.25 % grade. The comparison illustrates that the CCW capacity can be much greater than the pipe capacity.

Flow Capacity of Standard Small Pipe Configuration at Selected Heads		Full Flow Capacity of Selected Pipes @ 0.25 % Grade	
Head (mm.)	**Flow (l/s)**	**Pipe Diameter (mm.)**	**Capacity (l/s)**
25	1	200	16
140	12	250	30
200	22	300	48
318	63	380	88
508	145	450	143
610	230		

Laboratory Tested

Hydraulic model testing conducted at the Canada Centre for Inland Waters, provided the opportunity of observing the pipe / weir / manhole performance as the flow rates in the system were increased to the point that it surcharged. As the system started to surcharge, the "control" shifted from the weir to the downstream pipe and there was essentially no drop in the water surface across the weir (i.e. under surcharge, the weir was not influencing the water levels upstream).

Custom Designs

Every Custom Compound Weir is custom designed with a rectangular low flow notch and chamfered lips to give it a high weir flow coefficient. This means that it passes a greater flow for a given head than normal sharp crested weirs. Custom designed means specific concerns are addressed at specific sites.

Appendix 2

Site Information
Including Photos & Field Reports

Site Assessment

CLIENT FLOW MONITORING #:		**1**	**SFE PROJECT #:**	**C51-04**	
NAME:	**Hydroscience**	**City of Madera**	**SFE SITE #:**	**C51-04-01**	
Date / Time:	**01/31/08**	**1:42 PM**			

Project Specific Information

Client Name:	Hydroscience	
End User Name:	City of Madera	
Project Name:	CoMadera Collection System FM	
Client Contact:	Angela Singer	707-254-1900
Field Contact:	Al Ua	559-232-8767
SFE PM Contact:	Paul Loving	604-992-6792

Site Equipment

Install / Remove Date:	01/31/08	04/07/08
Meter Make & Model:	ISCO 2150	
Level Type:	Pressure	
Velocity Type:	Average	
Primary Device:	Pipe	
Wireless:	No	
Redundancy:	No	
Logging Rate:	5 Min	

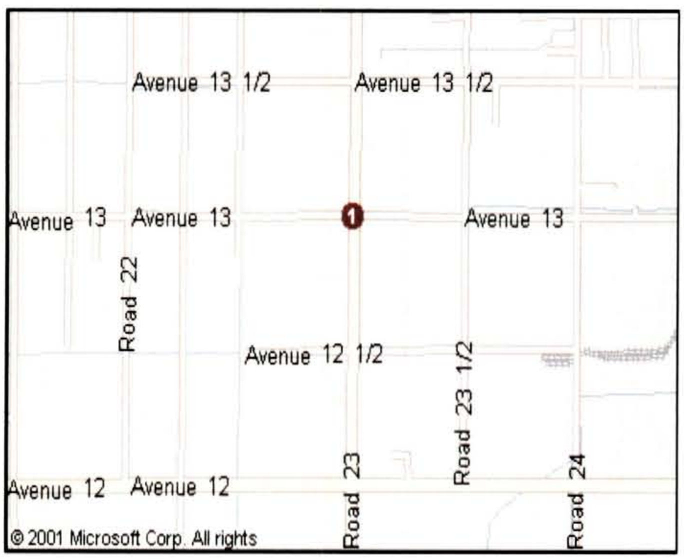
Site Location Information

Client Manhole #:				
Address (Location):	Avenue 13 @ Road 23			
City, State:	Madera, CA			
GPS (North - West):	N	36°56.299	W	120°07.716
Landmarks:				
Additional Information:				

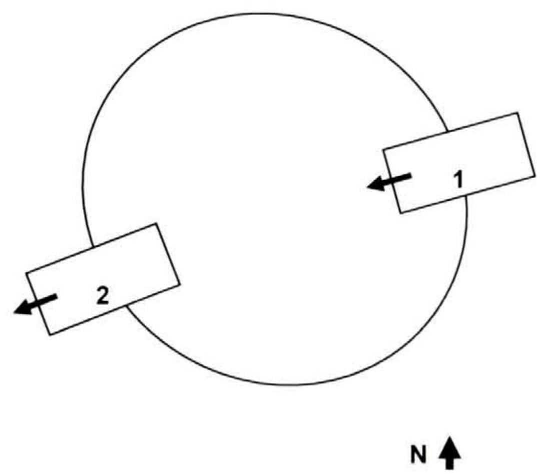
Site Profile

Pipe #1 Size:	48	Inches
Pipe #2 Size:	48	Inches
Pipe #3 Size:	N/A	Inches
Pipe #4 Size:	N/A	Inches
Manhole Depth:	224.125	Inches
Laterals / Rungs:	No	No
Additional Information:		

Map of Area



Manhole Layout



Traffic Control Requirements

Provider:	SFE
Condition	Local
Frequency:	Install / Maintenance / Removal
Speed Limit:	45 MPH
# of Lanes Effected:	1
Lane Configuration:	Intersection
Additional Information:	

Notes

1
2

Site Hydraulics

Date & Time:	01/31/08	1:42 PM
Depth:	15	Inches
Velocity:	2	FPS
Turbulent:	No	
Surcharge:	No	
Silting:	No	
Solids:	No	

Notes

3
4

Site Pictures

CLIENT FLOW MONITORING #:	1	SFE PROJECT #:	C51-04
NAME: Hydroscience	City of Madera	SFE SITE #:	C51-04-01
Date / Time: 01/31/08	1:42 PM		

Picture 1

Picture 2

Picture 3

Picture 4

Notes

1
2
3

SFE

Area Velocity Site Installation Form

CLIENT FLOW MONITORING #: 1

NAME: Hydroscience City of Madera

Date / Time: 01/31/08 4:09 PM

SFE PROJECT #: C51-04

SFE SITE #: C51-04-01

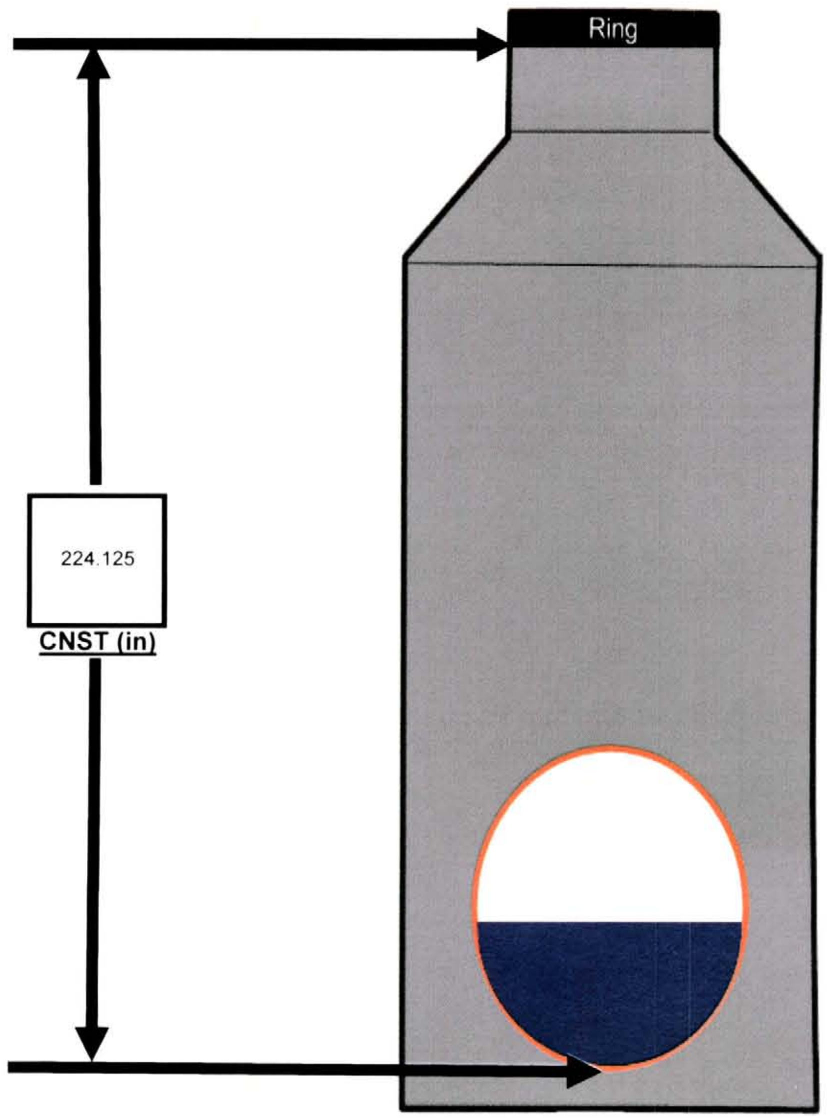
Technician 1: James Scott

Technician 2: Josh Perez

Meter Depth vs.. Field Depth Calibration / Verification

Reading Number	Date	Time	Field Meas (in.)	Meter Depth (in)	Comments (Zero Meter Level before Installation)
Initial	1/31/2008	16:39	13.625	7.140	Pre Adjust
1	1/31/2008	16:41	13.625	13.710	
2	1/31/2008	16:49	13.625	13.710	
3	1/31/2008	16:56	13.875	13.680	
Average			13.708	13.700	

* Three Continuous Measurements Within 0.5 Inches
* Average Meter vs (WL1 and WL2) Within 5%

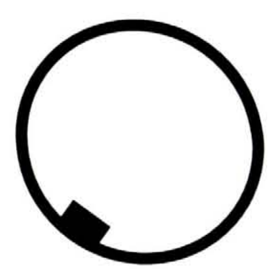


Manhole Depth (in) = CNST

224.125

Pipe Diameters (in)

Pipe 1	48
Pipe 2	48
Pipe 3	N/A
Pipe 4	N/A



Sensor Location

CLIENT FLOW MONITORING #:	1	SFE PROJECT #:	C51-04
NAME: Hydroscience	City of Madera	SFE SITE #:	C51-04-01
Date / Time:			

Pipe Diameter (in):	48	PV Meter	Marsh McBirney
Weather	Overcast	AV Meter:	ISCO 2150

2-D Method

Depth from Invert (in)	Left Corner	Left	Center	Right	Right Corner
	1.4	2.16	3.4	3.37	1.8
		3.4	3.75	3.24	
		3.55	3.7	3.5	
		3.52	3.55	3.8	
		2.85	3.25	3.1	
Average all readings		3.13			

0.9 Vmax Method

If depth is less than 4", use Max measured velocity x 0.9
Use above 2-D method as preferred method when possible

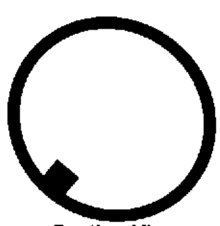
Max	N/A	Max * 0.9	N/A	

Velocity Profile Summary

Profile Average fps	Meter Reading fps	Meter Coeff.	Depth of Flow (in.)	Time	
3.07	3.28	N/A	13.71	16:27	

Meter Location and Orientation

Sensor Location



Section View

Comments:

Sensor in Pipe #1

MAINTENANCE SHEET

CLIENT FLOW MONITORING #: 1
NAME: Hydroscience City of Madera

SFE PROJECT #: C51-04
SFE SITE #: C51-04-01

FIELD MAINTENANCE RECORD

LEGEND

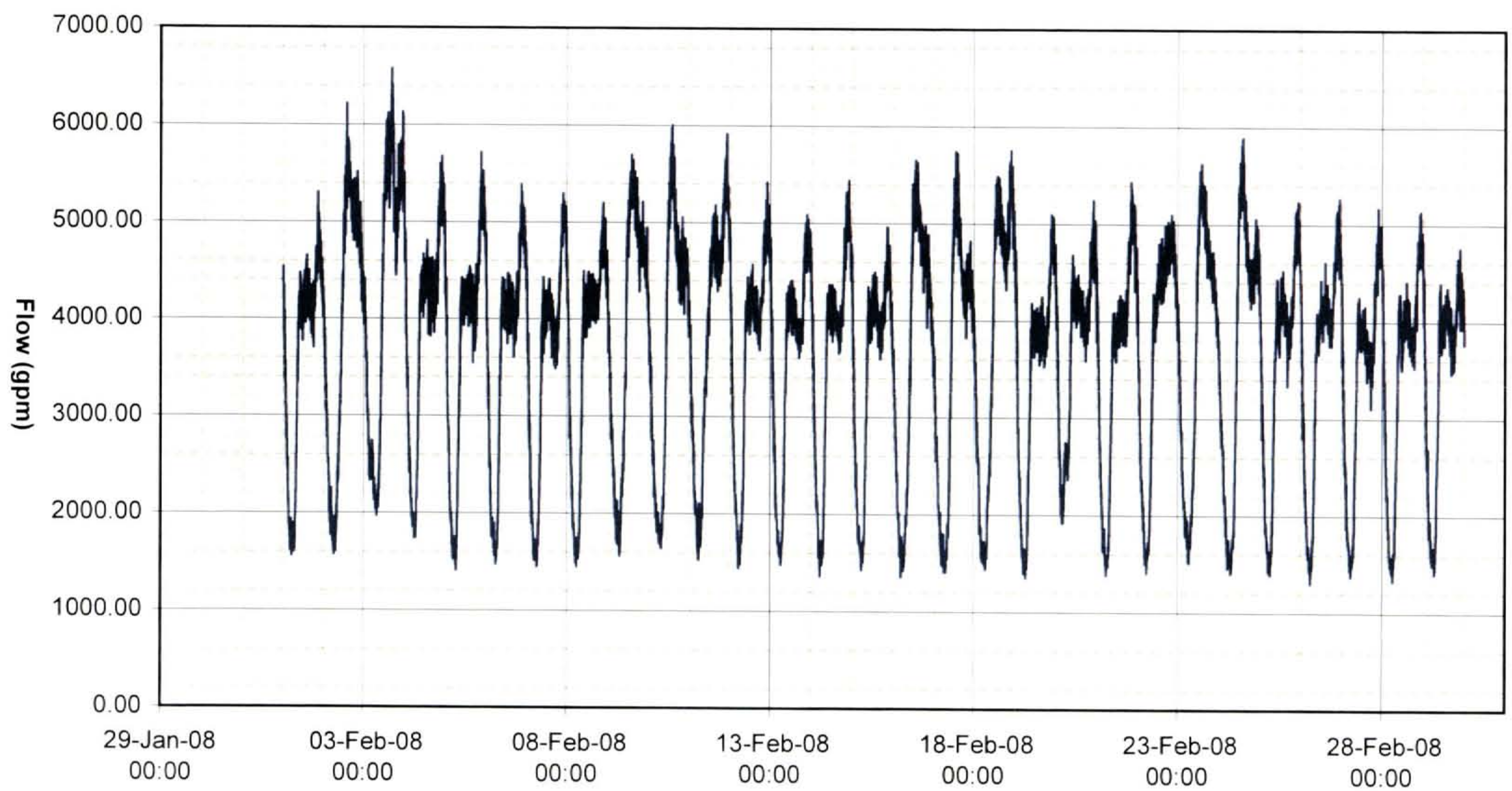
DL - DOWNLOAD — PC - PROGRAM COMPLETE
CB - CHG BATTERY — PM - PROG. METER
V - VERIFY — ML - Meter Level
LA - LEVEL ADJUST — VP - VELOCITY PROFILE

SITE#:	C51-04-01	CONSTANT	225.125
LOCATION:	Avenue 13 @ Road 23		
STUDY:	Sanitary		
DEVICE:	AV	METER #	SFE 66

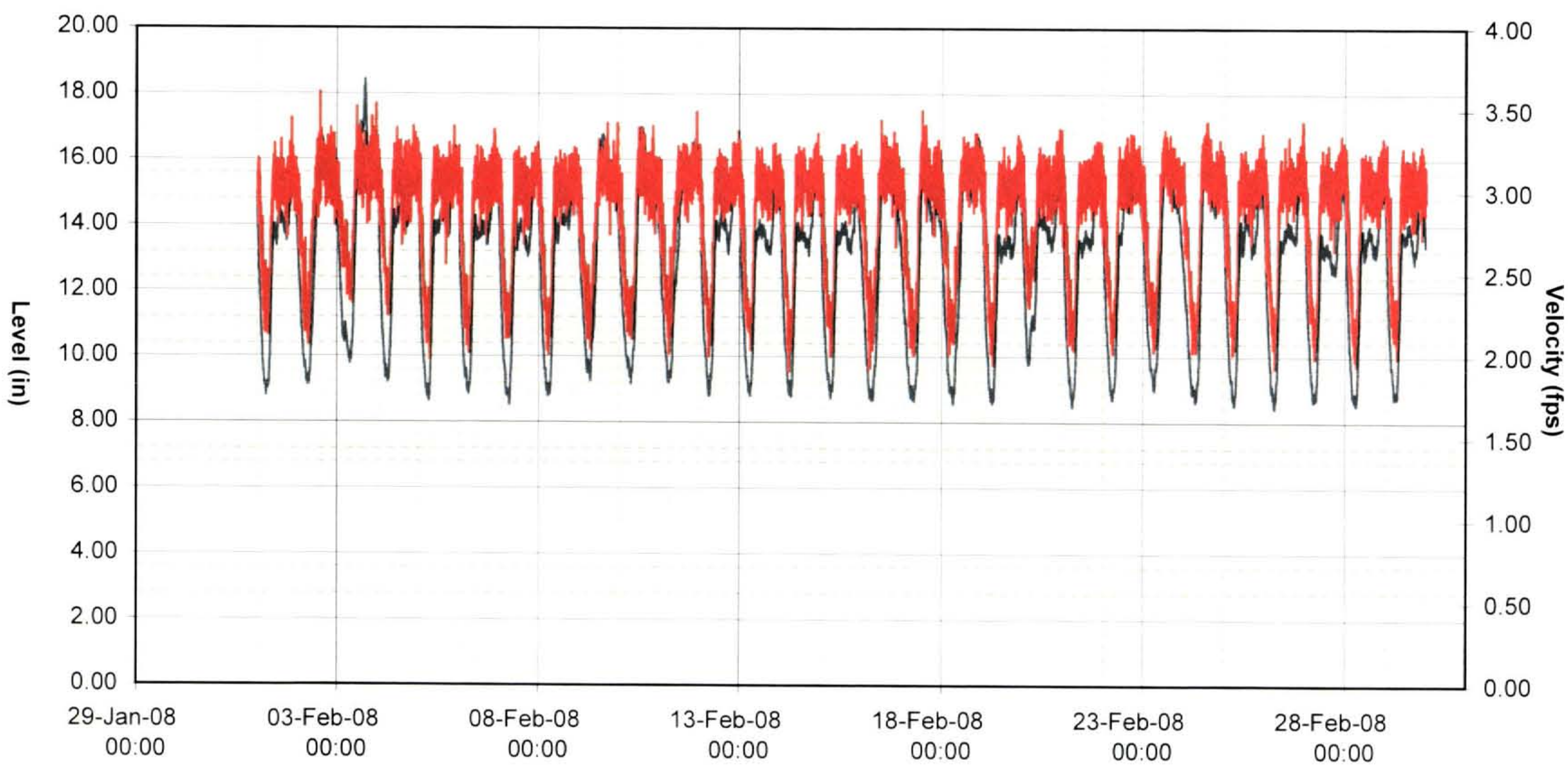
DATE	TIME	METER TIME	METER DEPTH	FIELD MEAS	METER VEL	FIELD VEL-VIS	FLOW	BATT OLD	BATT NEW	SILT	MTR RUN	MTC BY	COMMENTS
M/D/YY	HH:MM	HH:MM	in.	in.	fps	fps	gpm	V	V	in.	Y/N	(INIT.)	
1/31/2008	16:58	16:58	13.71	13.625	3.09	*	4138	N/A	12.1	0	Y	JS	New Install
2/5/2008	13:40	13:40	14.29	13.875	3.26	*	4519	11.8	N/A	0	Y	JG	
2/14/2007	12:06	12:06	13.84	13.625	3.15	*	4273	11.3	N/A	0	Y	MS	
2/21/2008	12:07	12:07	13.31	11.625	3.18	*	4176	11.3	N/A	0	Y	JR	ML=1.685 HIGH
2/27/2008	11:50	11:50	13.3	11.125	3.05	*	3918	10.3	N/A	0	Y	MS	ML=2.175
3/7/2008	12:28	12:28	14.91	14.63	3.22	*	4841	10.6	N/A	0	Y	JR	
3/12/2008	11:34	10:33	13	13.86	3.07	*	4073	10.7	N/A	0	Y	JS	
3/21/2008	10:48	9:47	13.19	13.25	3.04	*	3823	10.7	N/A	0	Y	JG	
3/26/2008	11:47	10:47	14.43	14.25	2.78	*	4522	10.7	N/A	0	Y	MS	
4/4/2008	12:18	11:17	15.91	15.5	2.66	*	4501	10.2	N/A	0	Y	JR	
4/7/2008	12:13	11:13	15.42	16.125	2.72	*	4461	10	N/A	0	Y	JR	PRE ENTRY
4/7/2008	12:42	11:42	14.7	14.625	2.69	*	4209	10.4	N/A	0	Y	JR	
4/7/2008	13:25	12:25	14.52	15.25	2.99	*	4267	10.2	N/A	0	Y	JR	PRE REMOVAL

NOTES:

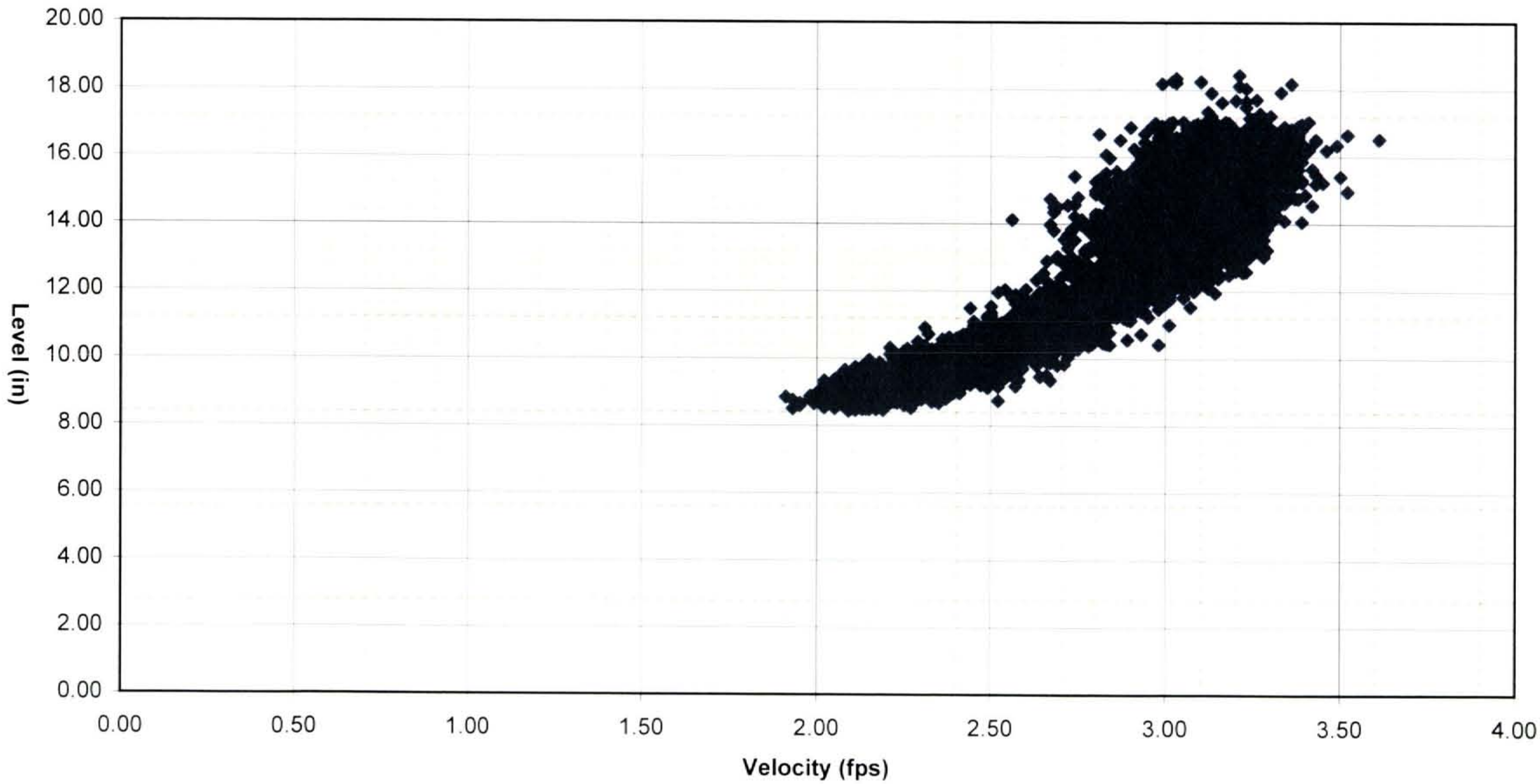
City of Madera, CA
C51-04-01
ISCO AV Meter
Avenue 13 @ Road 23
February 1 to February 29, 2008



City of Madera, CA
C51-04-01
ISCO AV Meter
Avenue 13 @ Road 23
February 1 to February 29, 2008



City of Madera, CA
C51-04-01
ISCO AV Meter
Avenue 13 @ Road 23
February 1 to February 29, 2008



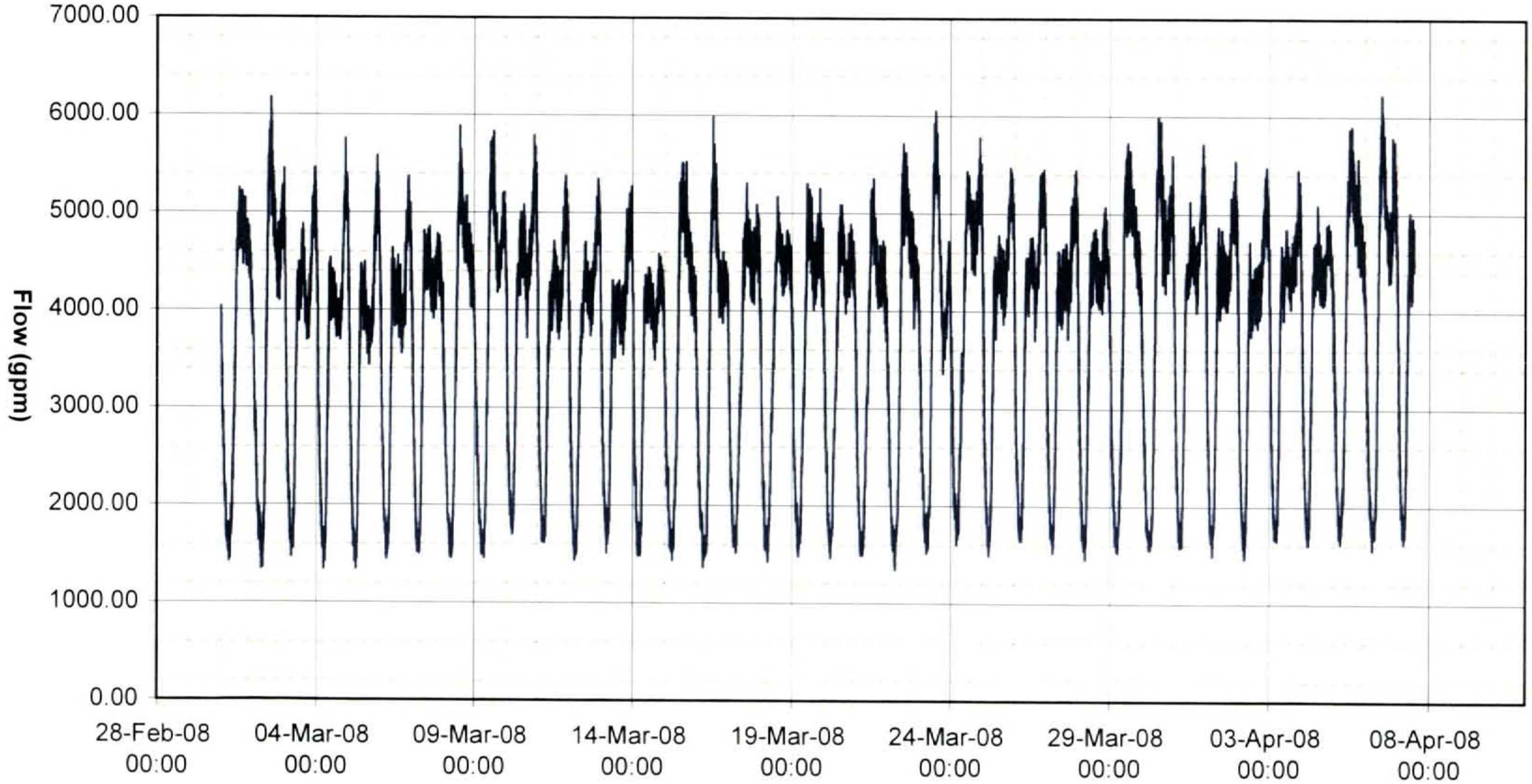
City of Madera, CA
C51-04-01
ISCO AV Meter
Avenue 13 @ Road 23
February 1 to February 29, 2008

Date	Avg Flow (gpm)	Min Flow (gpm)	Max Flow (gpm)	Total Flow (mgd)
01-Feb-08	3618.51	1560.72	5305.32	5.211
02-Feb-08	3901.68	1572.45	6219.66	5.618
03-Feb-08	4251.24	1969.66	6577.96	6.122
04-Feb-08	3887.36	1740.66	5680.00	5.598
05-Feb-08	3715.09	1414.94	5718.02	5.350
06-Feb-08	3655.70	1474.11	5385.31	5.264
07-Feb-08	3567.90	1448.44	5298.92	5.138
08-Feb-08	3616.72	1449.31	5198.41	5.208
09-Feb-08	3845.97	1560.85	5682.76	5.538
10-Feb-08	3772.24	1644.97	6005.07	5.432
11-Feb-08	3811.90	1528.47	5912.70	5.489
12-Feb-08	3646.15	1441.42	5415.13	5.250
13-Feb-08	3553.84	1476.40	5081.83	5.118
14-Feb-08	3618.07	1361.70	5438.92	5.210
15-Feb-08	3479.61	1427.14	4962.07	5.011
16-Feb-08	3652.55	1358.23	5637.33	5.260
17-Feb-08	3549.40	1411.05	5740.92	5.111
18-Feb-08	3785.12	1439.00	5756.43	5.451
19-Feb-08	3458.55	1353.89	5098.49	4.980
20-Feb-08	3733.61	1918.87	5244.75	5.376
21-Feb-08	3560.41	1382.97	5426.08	5.127
22-Feb-08	3675.96	1406.53	5100.14	5.293
23-Feb-08	3687.15	1514.82	5621.15	5.310
24-Feb-08	3677.33	1404.29	5888.49	5.295
25-Feb-08	3535.84	1391.26	5236.03	5.092
26-Feb-08	3537.02	1301.11	5263.85	5.093
27-Feb-08	3395.98	1373.42	5169.37	4.890
28-Feb-08	3451.57	1332.92	5134.56	4.970
29-Feb-08	3411.93	1404.50	4753.34	4.913

Statistics

Total Flow (mg)	Min Flow (gpm)	Max Flow (gpm)
152.718	1301.110	6577.960

City of Madera
C51-04-01
ISCO AV Meter
Avenue 13 @ Road 23
March 1 to April 7, 2008



City of Madera
C51-04-01
ISCO AV Meter
Avenue 13 @ Road 23
March 1 to April 7, 2008

Date	Avg Flow (gpm)	Min Flow (gpm)	Max Flow (gpm)	Total Flow (mgd)
01-Mar-08	3586.20	1419.35	5242.83	5.164
02-Mar-08	3808.63	1343.92	6159.65	5.484
03-Mar-08	3678.62	1466.25	5457.14	5.297
04-Mar-08	3616.88	1340.01	5748.34	5.208
05-Mar-08	3590.76	1342.84	5579.55	5.171
06-Mar-08	3636.08	1444.49	5366.94	5.236
07-Mar-08	3671.51	1503.24	4858.72	5.287
08-Mar-08	3712.05	1460.33	5885.10	5.345
09-Mar-08	3763.25	1461.10	5804.67	5.419
10-Mar-08	3929.31	1701.31	5786.79	5.658
11-Mar-08	3681.51	1615.05	5364.23	5.301
12-Mar-08	3618.84	1433.88	5345.00	5.211
13-Mar-08	3587.14	1510.71	5270.26	5.165
14-Mar-08	3454.35	1481.50	4575.38	4.974
15-Mar-08	3610.52	1442.22	5520.83	5.199
16-Mar-08	3578.31	1364.16	5984.37	5.153
17-Mar-08	3615.78	1516.11	5304.83	5.207
18-Mar-08	3594.45	1427.81	5165.55	5.176
19-Mar-08	3672.07	1478.36	5303.88	5.288
20-Mar-08	3639.12	1465.10	5076.48	5.240
21-Mar-08	3570.21	1491.43	5353.83	5.141
22-Mar-08	3712.27	1345.61	5714.15	5.346
23-Mar-08	3686.93	1515.70	6050.09	5.309
24-Mar-08	3950.20	1605.93	5774.71	5.688
25-Mar-08	3819.81	1490.94	5461.19	5.501
26-Mar-08	3867.57	1642.05	5436.84	5.569
27-Mar-08	3768.70	1521.37	5442.15	5.427
28-Mar-08	3712.87	1457.24	5070.13	5.347
29-Mar-08	3841.69	1527.92	5725.17	5.532
30-Mar-08	3872.26	1551.59	5993.90	5.576
31-Mar-08	3871.69	1575.82	5713.13	5.575
01-Apr-08	3832.70	1494.65	5539.06	5.519
02-Apr-08	3742.89	1470.11	5474.27	5.390
03-Apr-08	3832.54	1650.53	5441.91	5.519
04-Apr-08	3810.12	1604.35	5089.30	5.487
05-Apr-08	3975.38	1617.81	5892.07	5.725
06-Apr-08	4008.35	1553.42	6210.31	5.772
07-Apr-08	3232.15	1623.69	5019.69	4.654

Statistics

Total Flow (mg)	Min Flow (gpm)	Max Flow (gpm)
203.261	1340.010	6210.310

Site Assessment

CLIENT FLOW MONITORING #: 2
NAME: Hydroscience City of Madera
Date / Time: 02/01/08 9:30 AM

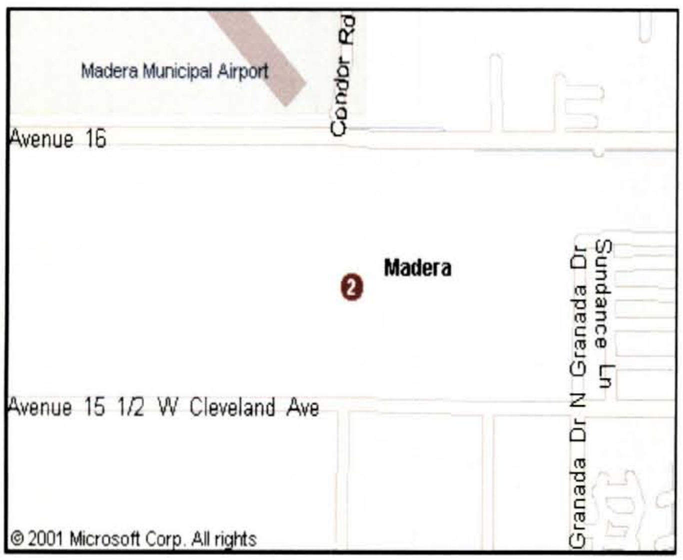
Project Specific Information

Client Name:	Hydroscience
End User Name:	City of Madera
Project Name:	CoMadera Collection System FM
Client Contact:	Angela Singer 707-254-1900
Field Contact:	Al Ua 559-232-8767
SFE PM Contact:	Paul Loving 604-992-6792

Site Location Information

Client Manhole #:	
Address (Location):	Westerberry Rd
City, State:	Madera, CA
GPS (North - West):	N 36°58.569 W 120°06.060
Landmarks:	Just N. of Cleavland Ave
Additional Information:	

Map of Area



Traffic Control Requirements

Provider:	SFE
Condition	None
Frequency:	Install / Maintenance / Removal
Speed Limit:	45 MPH
# of Lanes Effected:	None
Lane Configuration:	Road
Additional Information:	On Shoulder

Notes
1
2

SFE PROJECT #: C51-04
SFE SITE #: C51-04-02

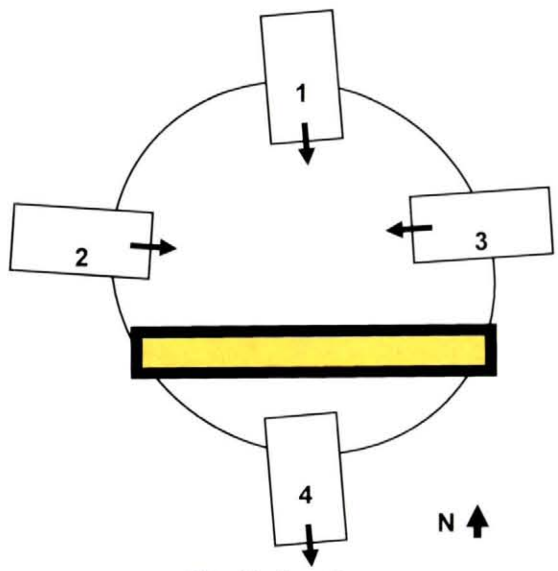
Site Equipment

Install / Remove Date:	02/01/08	04/07/08
Meter Make & Model:	ISCO 2150	
Level Type:	Pressure	
Velocity Type:	Average	
Primary Device:	Weir	
Wireless:	No	
Redundancy:	No	
Logging Rate:	5 Min	

Site Profile

Pipe #1 Size:	30	Inches
Pipe #2 Size:	30	Inches
Pipe #3 Size:	N/A	Inches
Pipe #4 Size:	N/A	Inches
Manhole Depth:	143.875	Inches
Laterals / Rungs:	No	No
Additional Information:		

Manhole Layout



Site Hydraulics

Date & Time:	02/01/08	9:30 AM
Depth:	4	Inches
Velocity:	0.5	FPS
Turbulent:	No	
Surcharge:	No	
Silting:	No	
Solids:	No	

Notes
3
4

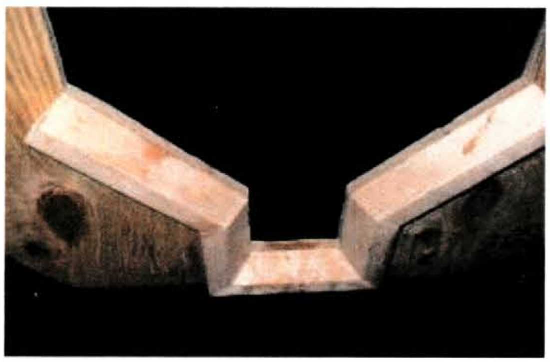
Site Pictures

CLIENT FLOW MONITORING #:	2	SFE PROJECT #:	C51-04
NAME: Hydroscience	City of Madera	SFE SITE #:	C51-04-02
Date / Time: 02/01/08	9:30 AM		

Picture 1

Picture 2

Picture 3



Picture 4

Picture 5

Picture 6

Notes

1
2
3

CCW Installation Form

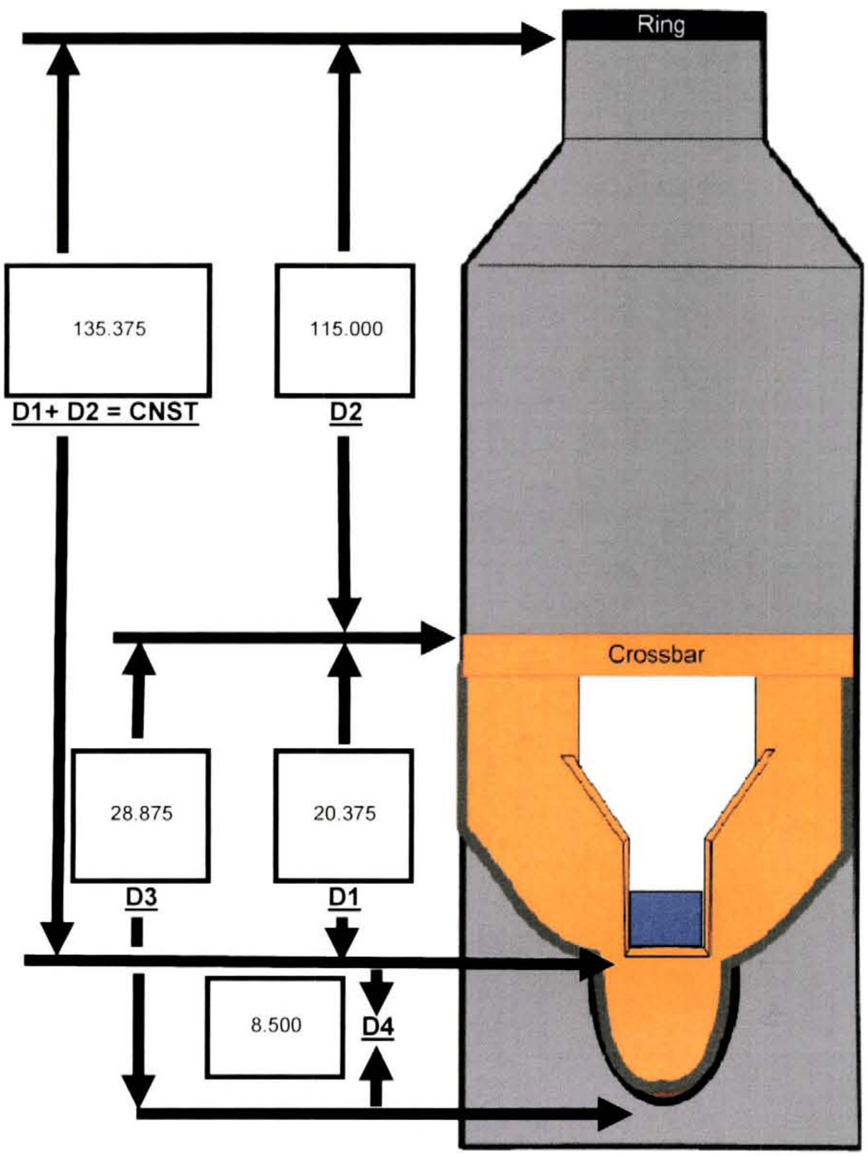
CLIENT FLOW MONITORING #: 2
NAME: Hydroscience City of Madera
Date / Time: 02/01/08 12:48 PM

SFE PROJECT #: C51-04
SFE SITE #: C51-04-02
Technician 1: Jason Scott (916) 837-8009
Technician 2: James Scott

Meter Depth vs.. Field Depth Calibration / Verification

Reading Number	Date	Time	Field Meas (in.)	Meter Depth (in)	Comments (Zero Meter Level before Installation)
Initial	2/1/2008	12:49	-2.875	2.240	Pre Adjust
1	2/1/2008	12:50	-2.875	-2.870	
2	2/1/2008	12:55	-2.625	-2.640	
3	2/1/2008	13:00	-2.625	-2.580	
Average			-2.708	-2.697	

* Three Continuous Measurements Within 0.5 Inches
* Average Meter vs (WL1 and WL2) Within 5%



Manhole Depth (in) (D2+D3)
143.875

Pipe Diameters (in)

Pipe 1	30
Pipe 2	30
Pipe 3	N/A
Pipe 4	N/A

Weir Size
350mm

D4=Invert to Weir Lip (D3-D1)
8.5

Obvert to Weir Lip
20.5

MAINTENANCE SHEET

CLIENT FLOW MONITORING #: 2
NAME: Hydroscience — City of Madera

SFE PROJECT #: C51-04
SFE SITE #: C51-04-02

FIELD MAINTENANCE RECORD

SITE#:	C51-04-02	CONSTANT	135.375
LOCATION:	Westerberry Blvd		
STUDY:	Sanitary		
DEVICE:	WEIR	METER #	SFE 61

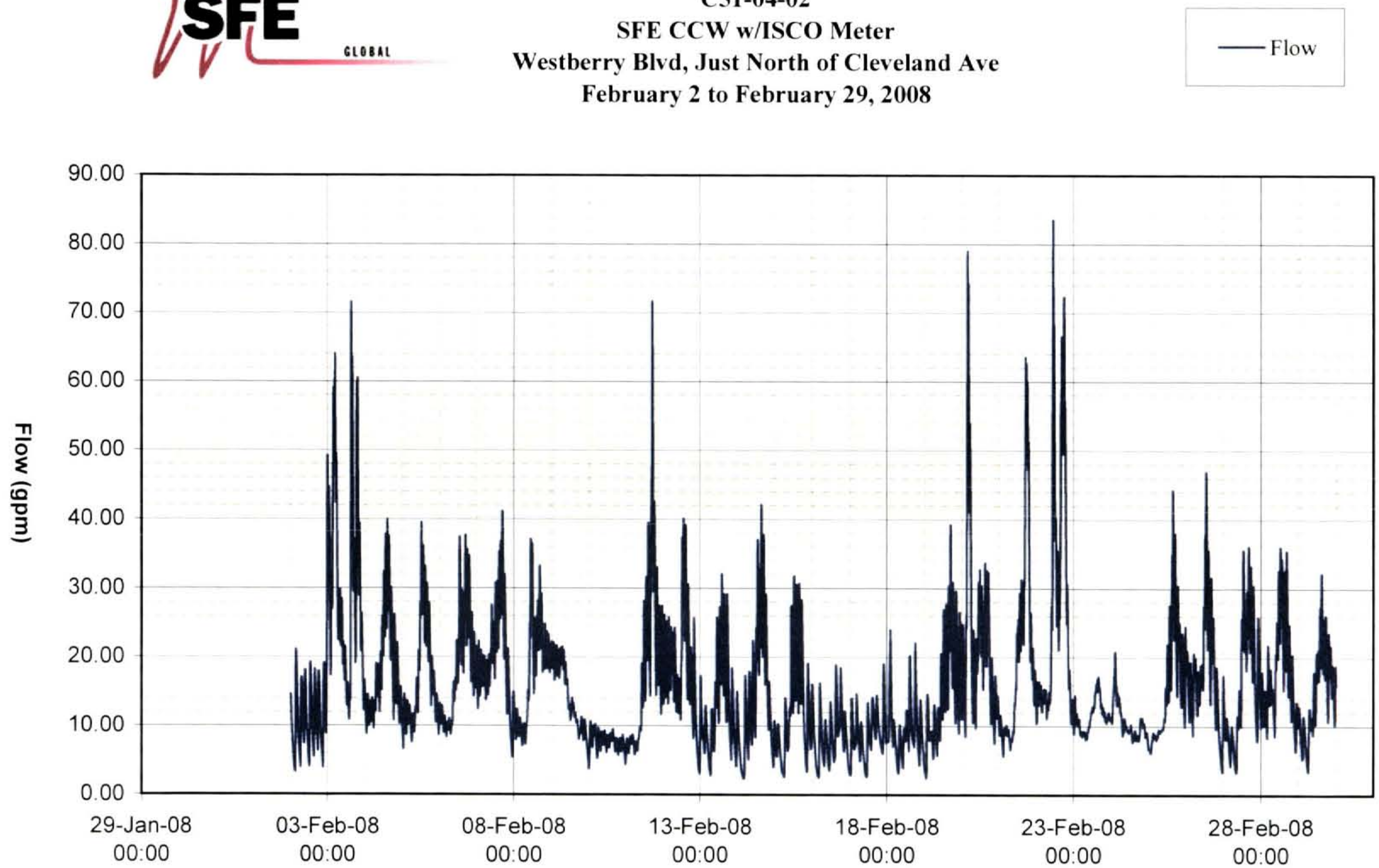
LEGEND

DL - DOWNLOAD — PC - PROGRAM COMPLETE
CB - CHG BATTERY — PM - PROG. METER
V - VERIFY — ML - Meter Level
LA - LEVEL ADJUST — VP - VELOCITY PROFILE

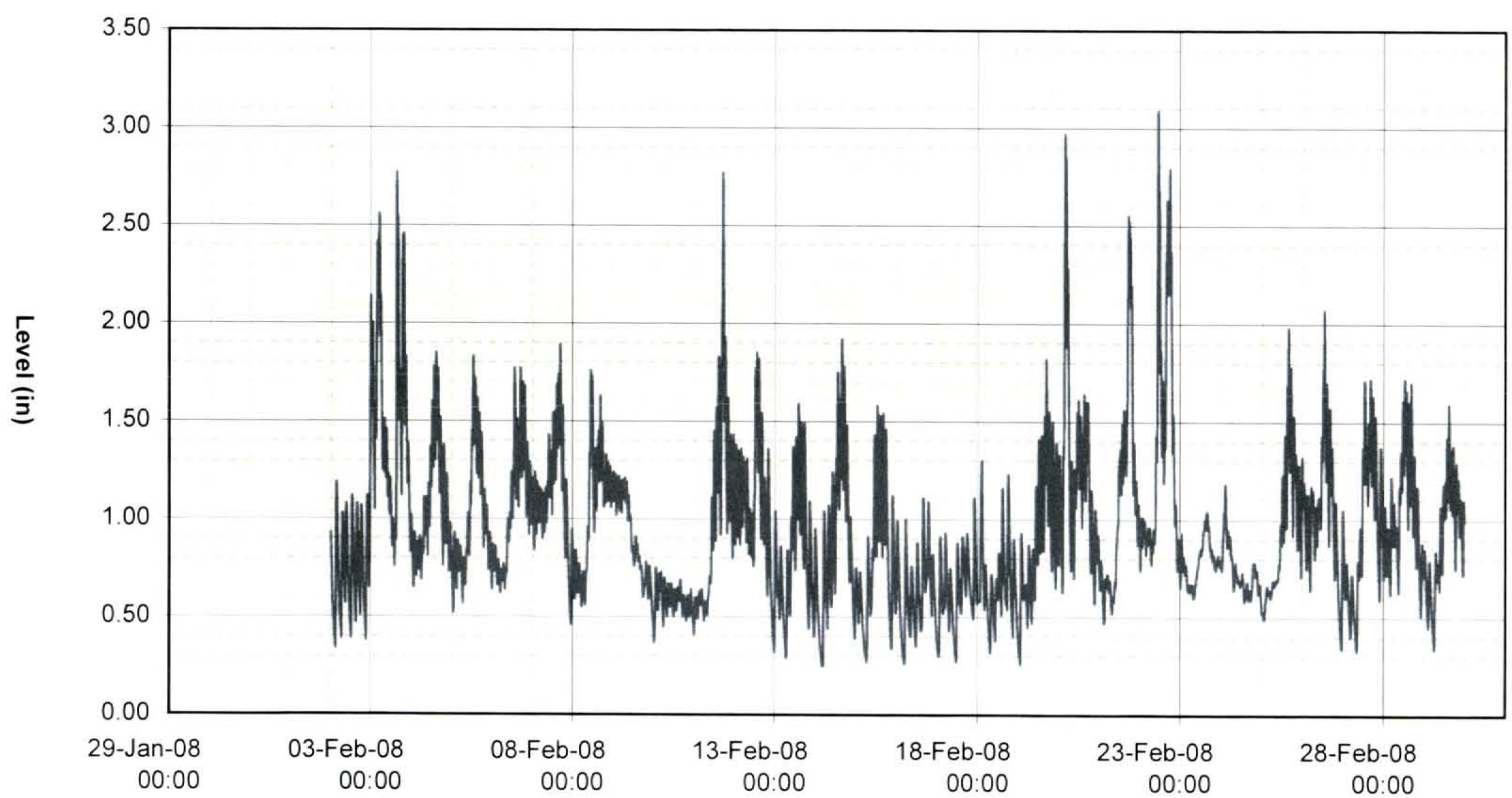
DATE	TIME	METER TIME	METER DEPTH	FIELD MEAS	METER VEL	FIELD VEL-VIS	FLOW	BATT OLD	BATT NEW	SILT	MTR RUN	MTC BY	COMMENTS
M/D/YY	HH:MM	HH:MM	in.	in.	fps	fps	gpm	V	V	in.	Y/N	(INIT.)	
2/1/2008	13:00	13:00	-2.58	-2.708	*	*	0	10.6	N/A	0	Y	JFS	New Install
2/5/2008	14:00	14:00	1.5	1.125	*	*	30	12.1	N/A	0	Y	JG	
2/14/2008	11:50	11:50	1.13	1	*	*	20	11.6	N/A	0	Y	JG	
2/21/2008	11:53	11:53	1.26	1.125	*	*	24	11	N/A	0	Y	JR	
2/28/2008	11:39	11:39	1.21	1	*	*	21	11	N/A	0	Y	MS	
3/7/2008	12:12	12:12	1.61	1.375	*	*	33	10.7	N/A	0	Y	JR	
3/12/2008	11:18	10:18	0.93	1.125	9.65	*	14	10.6	N/A	0	Y	JS	
3/21/2008	11:30	10:30	0.87	0.75	0	*	13	10.6	N/A	0	Y	MS	
3/26/2008	12:04	11:04	1.39	1.25	0	*	27	10.6	N/A	0	Y	MS	CLEANED SITE
4/4/2008	12:04	11:04	1.26	1.125	0	*	24	10.7	N/A	0	Y	JR	CLEANED SITE
4/7/2008	13:51	12:52	1.39	1.5	0	*	25	10.7	N/A	0	Y	JR	PRE REMOVAL

NOTES:

City of Madera
C51-04-02
SFE CCW w/ISCO Meter
Westberry Blvd, Just North of Cleveland Ave
February 2 to February 29, 2008



City of Madera
C51-04-02
SFE CCW w/ISCO Meter
Westberry Blvd, Just North of Cleveland Ave
February 2 to February 29, 2008



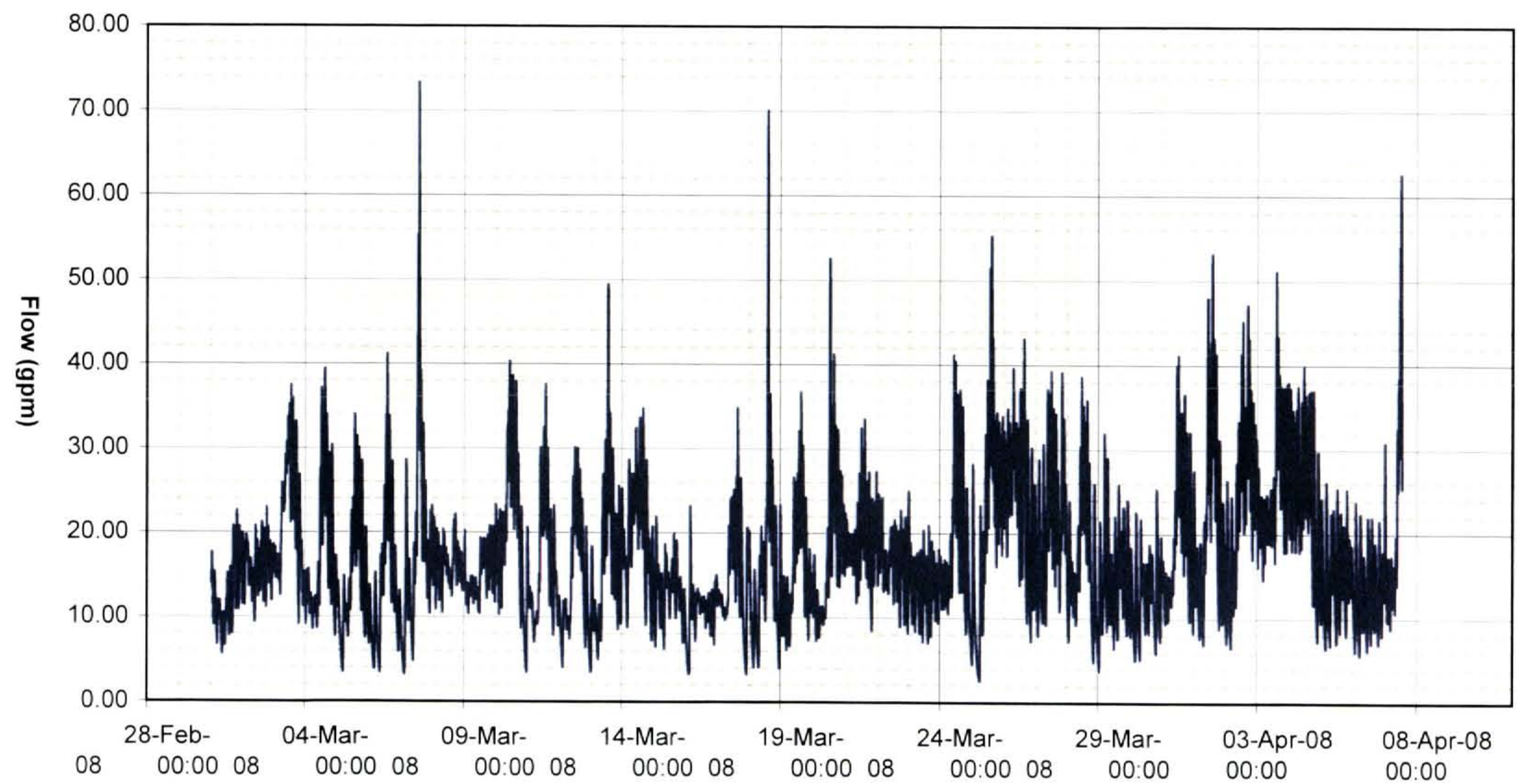
City of Madera
C51-04-02
SFE CCW w/ISCO Meter
Westberry Blvd, Just North of Cleveland Ave
February 2 to February 29, 2008

Date	Avg Flow	Min Flow	Max Flow	Total Flow
	(gpm)	(gpm)	(gpm)	(mgd)
02-Feb-08	11.88	3.32	49.23	0.017
03-Feb-08	31.67	10.89	71.50	0.046
04-Feb-08	18.74	8.82	39.95	0.027
05-Feb-08	16.78	6.64	39.52	0.024
06-Feb-08	18.74	8.38	37.64	0.027
07-Feb-08	20.39	5.44	41.14	0.029
08-Feb-08	18.34	7.09	37.10	0.026
09-Feb-08	14.30	4.75	22.21	0.021
10-Feb-08	7.77	3.76	10.68	0.011
11-Feb-08	18.76	4.70	71.66	0.027
12-Feb-08	18.55	3.09	40.06	0.027
13-Feb-08	13.29	2.76	32.05	0.019
14-Feb-08	15.14	2.35	42.09	0.022
15-Feb-08	12.72	2.58	31.74	0.018
16-Feb-08	8.72	2.49	18.88	0.013
17-Feb-08	8.95	2.61	19.00	0.013
18-Feb-08	9.77	3.15	23.93	0.014
19-Feb-08	15.58	2.48	39.22	0.022
20-Feb-08	23.61	7.50	78.98	0.034
21-Feb-08	20.15	5.62	63.55	0.029
22-Feb-08	27.73	9.54	83.53	0.040
23-Feb-08	11.59	8.07	17.22	0.017
24-Feb-08	10.71	7.07	20.84	0.015
25-Feb-08	16.13	6.11	44.25	0.023
26-Feb-08	18.27	3.38	46.92	0.026
27-Feb-08	16.06	3.29	36.13	0.023
28-Feb-08	17.94	6.37	36.04	0.026
29-Feb-08	14.88	3.42	32.15	0.021

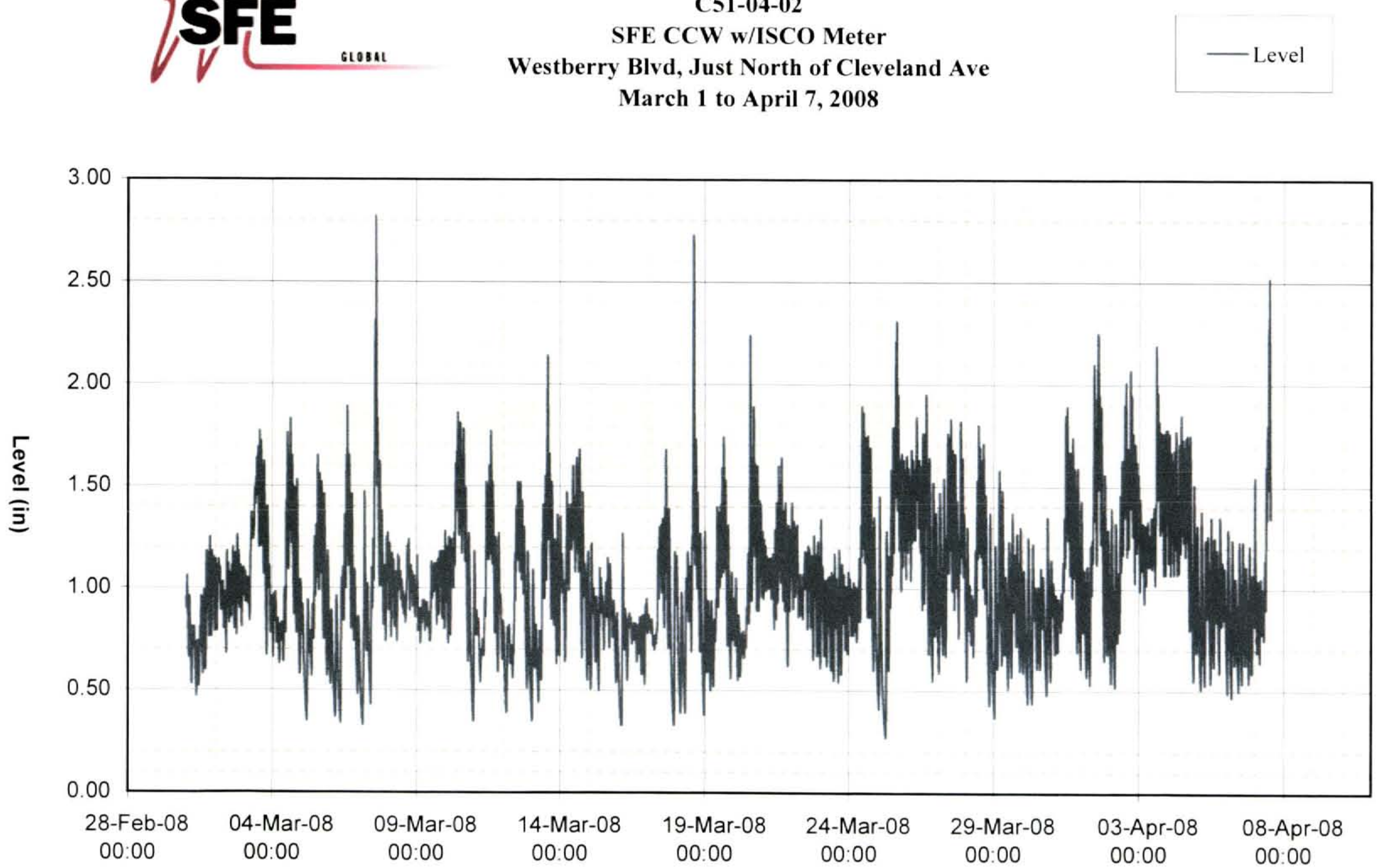
Statistics

Total Flow	Min Flow	Max Flow
(mg)	(gpm)	(gpm)
0.658	2.350	83.530

City of Madera
C51-04-02
SFE CCW w/ISCO Meter
Westberry Blvd, Just North of Cleveland Ave
March 1 to April 7, 2008



City of Madera
C51-04-02
SFE CCW w/ISCO Meter
Westberry Blvd, Just North of Cleveland Ave
March 1 to April 7, 2008



City of Madera
C51-04-02
SFE CCW w/ISCO Meter
Westberry Blvd, Just North of Cleveland Ave
March 1 to April 7, 2008

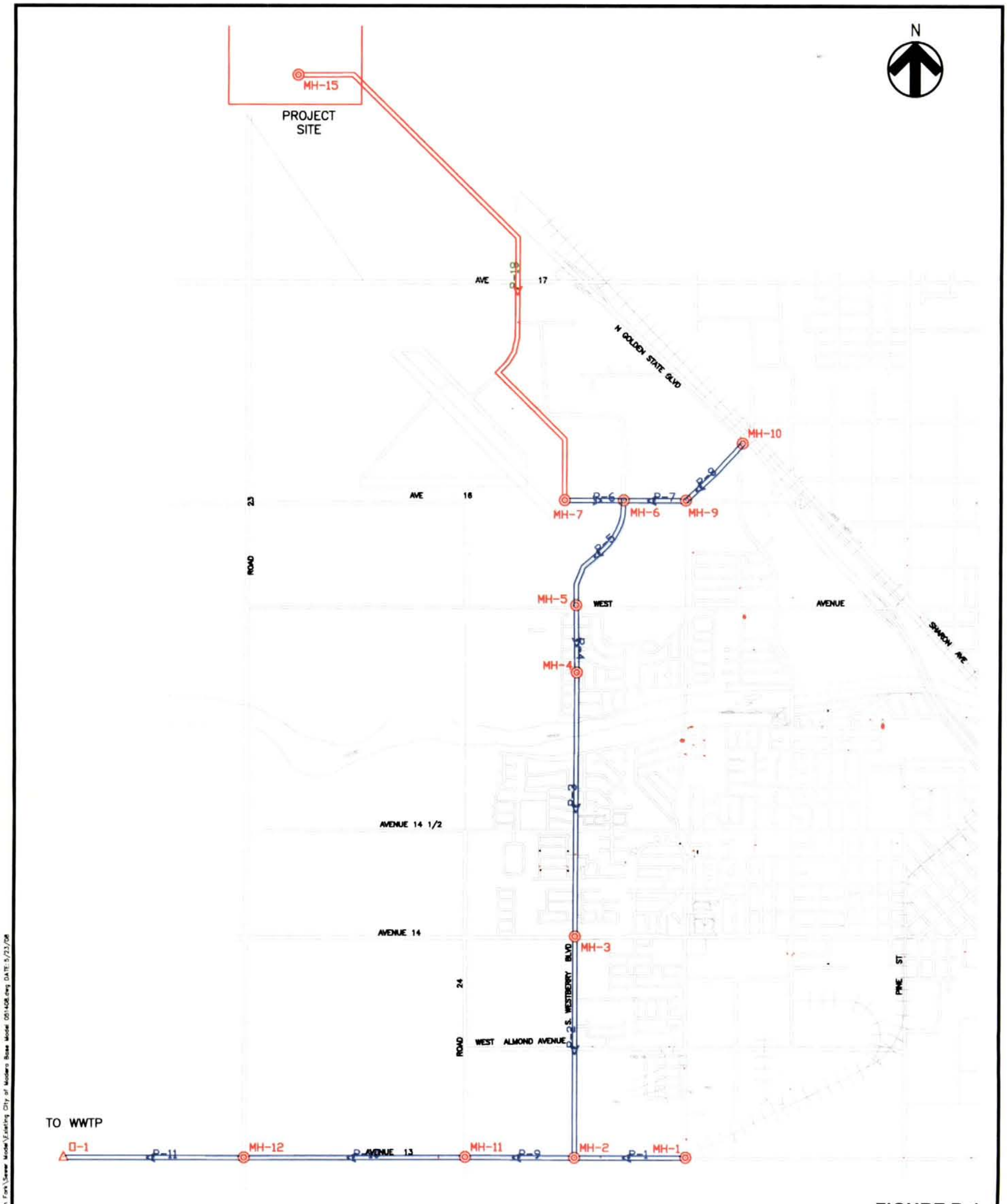
Date	Avg Flow (gpm)	Min Flow (gpm)	Max Flow (gpm)	Total Flow (mgd)
01-Mar-08	12.72	5.60	22.61	0.018
02-Mar-08	16.24	9.40	22.99	0.023
03-Mar-08	21.76	9.15	37.50	0.031
04-Mar-08	17.71	7.68	39.45	0.026
05-Mar-08	14.89	3.47	33.99	0.021
06-Mar-08	14.74	3.43	41.16	0.021
07-Mar-08	19.35	3.21	72.98	0.028
08-Mar-08	16.44	10.46	22.20	0.024
09-Mar-08	15.23	10.36	23.32	0.022
10-Mar-08	20.96	3.47	40.33	0.030
11-Mar-08	16.53	7.02	37.59	0.024
12-Mar-08	14.45	3.66	30.14	0.021
13-Mar-08	17.66	3.49	49.47	0.025
14-Mar-08	20.21	7.23	34.73	0.029
15-Mar-08	12.98	6.23	21.91	0.019
16-Mar-08	10.80	3.24	23.18	0.016
17-Mar-08	15.20	3.25	34.82	0.022
18-Mar-08	16.55	3.97	70.06	0.024
19-Mar-08	16.18	6.13	36.70	0.023
20-Mar-08	18.41	7.23	52.57	0.027
21-Mar-08	19.52	8.38	33.54	0.028
22-Mar-08	16.80	8.18	24.64	0.024
23-Mar-08	13.75	6.98	24.99	0.020
24-Mar-08	18.50	4.99	41.15	0.027
25-Mar-08	22.31	2.54	55.26	0.032
26-Mar-08	24.84	7.25	43.10	0.036
27-Mar-08	21.76	7.87	39.24	0.031
28-Mar-08	17.42	4.27	38.55	0.025
29-Mar-08	14.88	3.73	31.89	0.021
30-Mar-08	12.78	5.02	25.29	0.018
31-Mar-08	19.85	8.29	41.18	0.029
01-Apr-08	21.77	6.87	53.17	0.031
02-Apr-08	24.74	6.52	47.13	0.036
03-Apr-08	26.06	14.56	51.06	0.038
04-Apr-08	24.76	7.26	39.97	0.036
05-Apr-08	15.16	6.43	26.15	0.022
06-Apr-08	13.30	5.65	30.67	0.019
07-Apr-08	21.87	8.77	62.61	0.031

Statistics

Total Flow (mg)	Min Flow (gpm)	Max Flow (gpm)
0.978	2.540	72.980

ATTACHMENT B

SewerCAD Modeling Output Data



HydroScience Engineers, Inc.

FIGURE B-1
NORTH FORK RANCHERIA PROJECT
SEWER CAPACITY ANALYSIS
MODEL OPTION 1 (AIRPORT DRIVE)

S:\Common\Projects\128_054_North Fork\Sewer Model\Existing City of Madera Base Model 051408.dwg DATE: 5/23/08

Gravity Node Report
Model Option 1 (Airport Drive)
Alternative A

Label	Rim Elevation (ft)	Sump Elevation (ft)	Hydraulic Grade Line In (ft)	Hydraulic Grade Line Out (ft)	Velocity In (ft/s)	Velocity Out (ft/s)	Sanitary Base Load (gpd)	Inflow Pattern Load Base Flow (gpd)	Total Flow (gpd)
MH-1	248	234.2	235.8	235.8	4.11	4.11	10,560,000	1,877,900	12,437,900
MH-2	248	229.9	231.73	231.73	4.77	4.77	219,360	34,400	17,217,860
MH-3	248	232.6	234.05	234.05	2.08	2.08	819,840	124,900	4,526,200
MH-4	253	239.7	240.69	240.69	2.72	2.72	260,640	46,800	3,581,460
MH-5	254	241.2	242.25	242.25	2.44	2.44	0	0	3,274,020
MH-6	258	242.5	243.87	243.87	1.84	1.84	2,273,120	30,500	3,274,020
MH-7	257	244	244.35	244.35	1.44	1.44	0	40,000	391,000
MH-9	259	246.5	246.94	246.94	1.77	1.77	358,400	18,100	579,400
MH-10	266	249.3	249.63	249.63	1.39	1.39	0	202,900	202,900
MH-11	246	224.9	227.27	227.27	3.49	3.49	85,280	185,100	17,488,240
MH-12	234	220.5	222.2	222.2	5.37	5.37	20,000	115,400	17,623,640
MH-15	270	265	265.49	265.49	1.65	1.65	351,000	0	351,000
O-1	235	200	200	200	0	0			17,623,640

Gravity Pipe Report
Model Option 1 (Airport Drive)
Alternative A

Label	Upstream Node	Upstream Invert Elevation (ft)	Downstream Node	Downstream Invert Elevation (ft)	Constructed Slope (ft/ft)	Section Size	Length (ft)	Velocity In (ft/s)	Velocity Out (ft/s)	Total Flow (gpd)	Design Capacity (gpd)	Excess Design Capacity (gpd)
P-1	MH-1	234.2	MH-2	229.9	0.001593	48 inch	2,700	4.11	3.45	12,437,900	33,782,834	21,344,934
P-2	MH-3	232.6	MH-2	229.9	0.0005	36 inch	5,400	2.08	1.56	4,526,200	8,789,391	4,263,191
P-3	MH-4	239.7	MH-3	232.6	0.001246	36 inch	5,700	2.72	1.64	3,581,460	13,872,844	10,291,384
P-4	MH-5	241.2	MH-4	239.7	0.000968	33 inch	1,550	2.44	2.63	3,274,020	9,695,809	6,421,789
P-5	MH-6	242.5	MH-5	241.2	0.000448	30 inch	2,900	1.84	2.6	3,274,020	5,117,955	1,843,935
P-6	MH-7	244	MH-6	242.5	0.001202	30 inch	1,248	1.44	0.22	391,000	8,380,349	7,989,349
P-7	MH-9	246.5	MH-6	242.5	0.001435	24 inch	2,788	1.77	0.39	579,400	5,049,876	4,470,476
P-8	MH-10	249.3	MH-9	246.5	0.0014	12 inch	2,000	1.39	0.95	202,900	785,623	582,723
P-9	MH-2	229.9	MH-11	224.9	0.001887	48 inch	2,650	4.77	3.43	17,217,860	36,771,030	19,553,170
P-10	MH-11	224.9	MH-12	220.5	0.000815	48 inch	5,400	3.49	5.33	17,488,240	24,164,243	6,676,003
P-11	MH-12	220.5	O-1	200	0.002563	48 inch	8,000	5.37	6.08	17,623,640	42,852,451	25,228,811
P-18	MH-15	265	MH-7	244	0.001489	10 inch	14,100	1.65	2.48	351,000	498,311	147,311

Gravity Node Report
Model Option 1 (Airport Drive)
Alternative B

Label	Rim Elevation (ft)	Sump Elevation (ft)	Hydraulic Grade Line In (ft)	Hydraulic Grade Line Out (ft)	Velocity In (ft/s)	Velocity Out (ft/s)	Sanitary Base Load (gpd)	Inflow Pattern Load Base Flow (gpd)	Total Flow (gpd)
MH-1	248	234.2	235.8	235.8	4.11	4.11	10,560,000	1,877,900	12,437,900
MH-2	248	229.9	231.72	231.72	4.76	4.76	219,360	34,400	17,074,860
MH-3	248	232.6	234.02	234.02	2.06	2.06	819,840	124,900	4,383,200
MH-4	253	239.7	240.67	240.67	2.69	2.69	260,640	46,800	3,438,460
MH-5	254	241.2	242.22	242.22	2.41	2.41	0	0	3,131,020
MH-6	258	242.5	243.83	243.83	1.82	1.82	2,273,120	30,500	3,131,020
MH-7	257	244	244.28	244.28	1.26	1.26	0	40,000	248,000
MH-9	259	246.5	246.94	246.94	1.77	1.77	358,400	18,100	579,400
MH-10	266	249.3	249.63	249.63	1.39	1.39	0	202,900	202,900
MH-11	246	224.9	227.26	227.26	3.48	3.48	85,280	185,100	17,345,240
MH-12	234	220.5	222.19	222.19	5.36	5.36	20,000	115,400	17,480,640
MH-15	270	265	265.33	265.33	1.43	1.43	208,000	0	208,000
O-1	235	200	200	200	0	0			17,480,640

Gravity Pipe Report
Model Option 1 (Airport Drive)
Alternative B

Label	Upstream Node	Upstream Invert Elevation (ft)	Downstream Node	Downstream Invert Elevation (ft)	Constructed Slope (ft/ft)	Section Size	Length (ft)	Velocity In (ft/s)	Velocity Out (ft/s)	Total Flow (gpd)	Design Capacity (gpd)	Excess Design Capacity (gpd)
P-1	MH-1	234.2	MH-2	229.9	0.001593	48 inch	2,700	4.11	3.47	12,437,900	33,782,834	21,344,934
P-2	MH-3	232.6	MH-2	229.9	0.0005	36 inch	5,400	2.06	1.51	4,383,200	8,789,391	4,406,191
P-3	MH-4	239.7	MH-3	232.6	0.001246	36 inch	5,700	2.69	1.62	3,438,460	13,872,844	10,434,384
P-4	MH-5	241.2	MH-4	239.7	0.000968	33 inch	1,550	2.41	2.59	3,131,020	9,695,809	6,564,789
P-5	MH-6	242.5	MH-5	241.2	0.000448	30 inch	2,900	1.82	2.56	3,131,020	5,117,955	1,986,935
P-6	MH-7	244	MH-6	242.5	0.001202	30 inch	1,248	1.26	0.14	248,000	8,380,349	8,132,349
P-7	MH-9	246.5	MH-6	242.5	0.001435	24 inch	2,788	1.77	0.4	579,400	5,049,876	4,470,476
P-8	MH-10	249.3	MH-9	246.5	0.0014	12 inch	2,000	1.39	0.95	202,900	785,623	582,723
P-9	MH-2	229.9	MH-11	224.9	0.001887	48 inch	2,650	4.76	3.42	17,074,860	36,771,030	19,696,170
P-10	MH-11	224.9	MH-12	220.5	0.000815	48 inch	5,400	3.48	5.32	17,345,240	24,164,243	6,819,003
P-11	MH-12	220.5	O-1	200	0.002563	48 inch	8,000	5.36	6.07	17,480,640	42,852,451	25,371,811
P-18	MH-15	265	MH-7	244	0.001489	8 inch	14,100	1.44	2.29	208,000	274,836	66,836

Gravity Node Report
Model Option 1 (Airport Drive)
Alternative C

Label	Rim Elevation (ft)	Sump Elevation (ft)	Hydraulic Grade Line In (ft)	Hydraulic Grade Line Out (ft)	Velocity In (ft/s)	Velocity Out (ft/s)	Sanitary Base Load (gpd)	Inflow Pattern Load Base Flow (gpd)	Total Flow (gpd)
MH-1	248	234.2	235.8	235.8	4.11	4.11	10,560,000	1,877,900	12,437,900
MH-2	248	229.9	231.71	231.71	4.75	4.75	219,360	34,400	16,888,960
MH-3	248	232.6	233.98	233.98	2.04	2.04	819,840	124,900	4,197,300
MH-4	253	239.7	240.64	240.64	2.65	2.65	260,640	46,800	3,252,560
MH-5	254	241.2	242.19	242.19	2.37	2.37	0	0	2,945,120
MH-6	258	242.5	243.79	243.79	1.79	1.79	2,273,120	30,500	2,945,120
MH-7	257	244	244.15	244.15	0.83	0.83	0	40,000	62,100
MH-9	259	246.5	246.94	246.94	1.77	1.77	358,400	18,100	579,400
MH-10	266	249.3	249.63	249.63	1.39	1.39	0	202,900	202,900
MH-11	246	224.9	227.24	227.24	3.47	3.47	85,280	185,100	17,159,340
MH-12	234	220.5	222.18	222.18	5.34	5.34	20,000	115,400	17,294,740
MH-15	270	265	265.12	265.12	0.78	0.78	22,100	0	22,100
O-1	235	200	200	200	0	0			17,294,740

Gravity Pipe Report
Model Option 1 (Airport Drive)
Alternative C

Label	Upstream Node	Upstream Invert Elevation (ft)	Downstream Node	Downstream Invert Elevation (ft)	Constructed Slope (ft/ft)	Section Size	Length (ft)	Velocity In (ft/s)	Velocity Out (ft/s)	Total Flow (gpd)	Design Capacity (gpd)	Excess Design Capacity (gpd)
P-1	MH-1	234.2	MH-2	229.9	0.001593	48 inch	2,700	4.11	3.49	12,437,900	33,782,834	21,344,934
P-2	MH-3	232.6	MH-2	229.9	0.0005	36 inch	5,400	2.04	1.46	4,197,300	8,789,391	4,592,091
P-3	MH-4	239.7	MH-3	232.6	0.001246	36 inch	5,700	2.65	1.58	3,252,560	13,872,844	10,620,284
P-4	MH-5	241.2	MH-4	239.7	0.000968	33 inch	1,550	2.37	2.53	2,945,120	9,695,809	6,750,689
P-5	MH-6	242.5	MH-5	241.2	0.000448	30 inch	2,900	1.79	2.52	2,945,120	5,117,955	2,172,835
P-6	MH-7	244	MH-6	242.5	0.001202	30 inch	1,248	0.83	0.04	62,100	8,380,349	8,318,249
P-7	MH-9	246.5	MH-6	242.5	0.001435	24 inch	2,788	1.77	0.42	579,400	5,049,876	4,470,476
P-8	MH-10	249.3	MH-9	246.5	0.0014	12 inch	2,000	1.39	0.95	202,900	785,623	582,723
P-9	MH-2	229.9	MH-11	224.9	0.001887	48 inch	2,650	4.75	3.42	16,888,960	36,771,030	19,882,070
P-10	MH-11	224.9	MH-12	220.5	0.000815	48 inch	5,400	3.47	5.3	17,159,340	24,164,243	7,004,903
P-11	MH-12	220.5	O-1	200	0.002563	48 inch	8,000	5.34	6.05	17,294,740	42,852,451	25,557,711
P-18	MH-15	265	MH-7	244	0.001489	8 inch	14,100	0.78	0.6	22,100	274,836	252,736

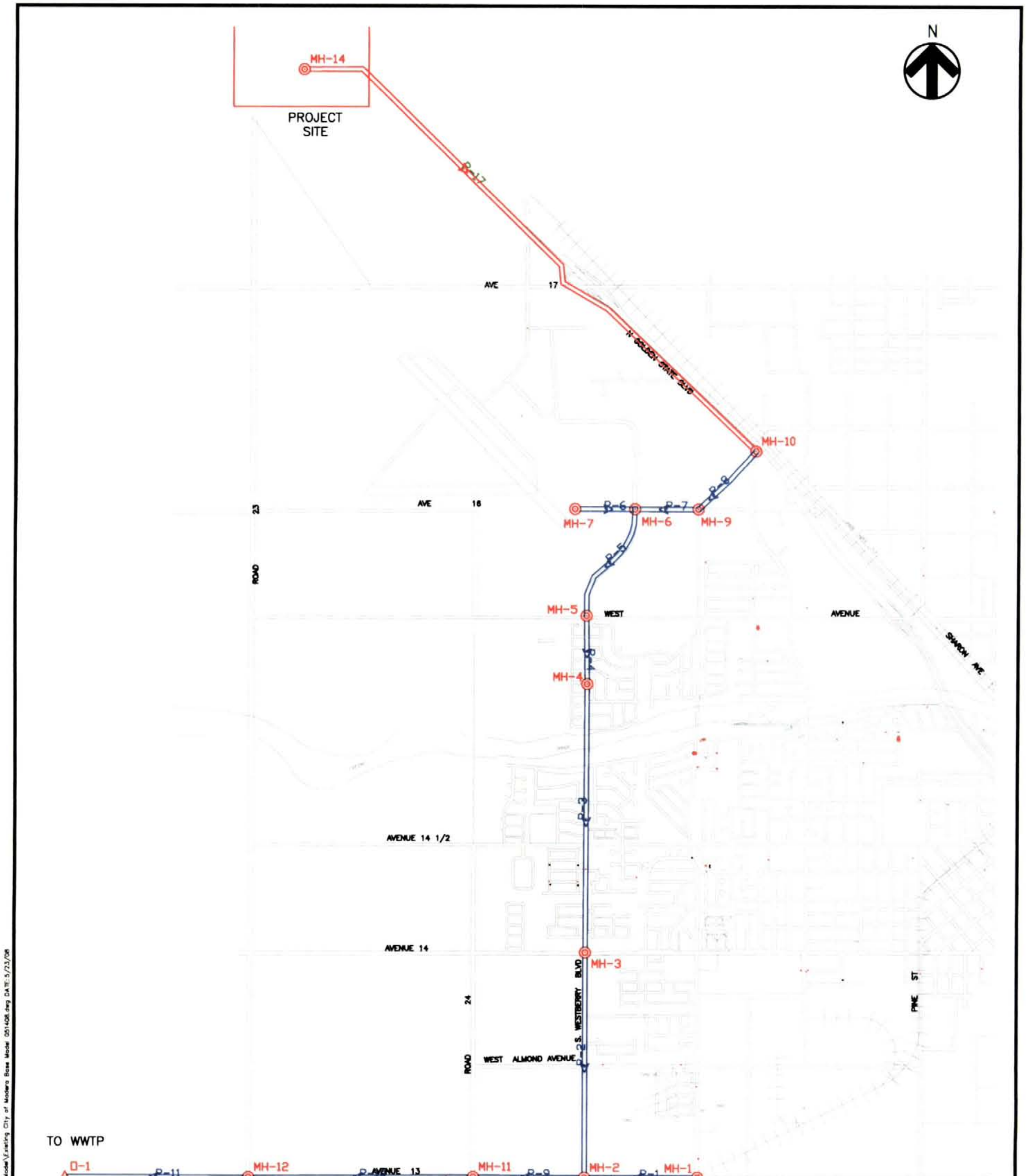


FIGURE B-2

NORTH FORK RANCHERIA PROJECT
SEWER CAPACITY ANALYSIS
MODEL OPTION 2 (STATE ROUTE 99)

HydroScience Engineers, Inc.

Gravity Node Report
Model Option 2 (SR-99)
Alternative A

Label	Rim Elevation (ft)	Sump Elevation (ft)	Hydraulic Grade Line In (ft)	Hydraulic Grade Line Out (ft)	Velocity In (ft/s)	Velocity Out (ft/s)	Sanitary Base Load (gpd)	Inflow Pattern Load Base Flow (gpd)	Total Flow (gpd)
MH-1	248	234.2	235.8	235.8	4.11	4.11	10,560,000	1,877,900	12,437,900
MH-2	248	229.9	231.73	231.73	4.77	4.77	219,360	34,400	17,217,860
MH-3	248	232.6	234.05	234.05	2.08	2.08	819,840	124,900	4,526,200
MH-4	253	239.7	240.69	240.69	2.72	2.72	260,640	46,800	3,581,460
MH-5	254	241.2	242.25	242.25	2.44	2.44	0	0	3,274,020
MH-6	258	242.5	243.87	243.87	1.84	1.84	2,273,120	30,500	3,274,020
MH-7	257	244	244.12	244.12	0.72	0.72	0	40,000	40,000
MH-9	259	246.5	247.05	247.05	2.03	2.03	358,400	18,100	930,400
MH-10	266	249.3	249.88	249.88	1.8	1.8	0	202,900	553,900
MH-11	246	224.9	227.27	227.27	3.49	3.49	85,280	185,100	17,488,240
MH-12	234	220.5	222.2	222.2	5.37	5.37	20,000	115,400	17,623,640
MH-14	270	266	266.53	266.53	1.48	1.48	351,000	0	351,000
O-1	235	200	200	200	0	0			17,623,640

Gravity Pipe Report
Model Option 2 (SR-99)
Alternative A

Label	Upstream Node	Upstream Invert Elevation (ft)	Downstream Node	Downstream Invert Elevation (ft)	Constructed Slope (ft/ft)	Section Size	Length (ft)	Velocity In (ft/s)	Velocity Out (ft/s)	Total Flow (gpd)	Design Capacity (gpd)	Excess Design Capacity (gpd)
P-1	MH-1	234.2	MH-2	229.9	0.001593	48 inch	2,700	4.11	3.45	12,437,900	33,782,834	21,344,934
P-2	MH-3	232.6	MH-2	229.9	0.0005	36 inch	5,400	2.08	1.56	4,526,200	8,789,391	4,263,191
P-3	MH-4	239.7	MH-3	232.6	0.001246	36 inch	5,700	2.72	1.64	3,581,460	13,872,844	10,291,384
P-4	MH-5	241.2	MH-4	239.7	0.000968	33 inch	1,550	2.44	2.63	3,274,020	9,695,809	6,421,789
P-5	MH-6	242.5	MH-5	241.2	0.000448	30 inch	2,900	1.84	2.6	3,274,020	5,117,955	1,843,935
P-6	MH-7	244	MH-6	242.5	0.001202	30 inch	1,248	0.72	0.02	40,000	8,380,349	8,340,349
P-7	MH-9	246.5	MH-6	242.5	0.001435	24 inch	2,788	2.03	0.63	930,400	5,049,876	4,119,476
P-8	MH-10	249.3	MH-9	246.5	0.0014	12 inch	2,000	1.8	1.92	553,900	785,623	231,723
P-9	MH-2	229.9	MH-11	224.9	0.001887	48 inch	2,650	4.77	3.43	17,217,860	36,771,030	19,553,170
P-10	MH-11	224.9	MH-12	220.5	0.000815	48 inch	5,400	3.49	5.33	17,488,240	24,164,243	6,676,003
P-11	MH-12	220.5	O-1	200	0.002563	48 inch	8,000	5.37	6.08	17,623,640	42,852,451	25,228,811
P-17	MH-14	266	MH-10	249.3	0.001144	10 inch	14,600	1.48	1.33	351,000	436,699	85,699

Gravity Node Report
Model Option 2 (SR-99)
Alternative B

Label	Rim Elevation (ft)	Sump Elevation (ft)	Hydraulic Grade Line In (ft)	Hydraulic Grade Line Out (ft)	Velocity In (ft/s)	Velocity Out (ft/s)	Sanitary Base Load (gpd)	Inflow Pattern Load Base Flow (gpd)	Total Flow (gpd)
MH-1	248	234.2	235.8	235.8	4.11	4.11	10,560,000	1,877,900	12,437,900
MH-2	248	229.9	231.72	231.72	4.76	4.76	219,360	34,400	17,074,860
MH-3	248	232.6	234.02	234.02	2.06	2.06	819,840	124,900	4,383,200
MH-4	253	239.7	240.67	240.67	2.69	2.69	260,640	46,800	3,438,460
MH-5	254	241.2	242.22	242.22	2.41	2.41	0	0	3,131,020
MH-6	258	242.5	243.83	243.83	1.82	1.82	2,273,120	30,500	3,131,020
MH-7	257	244	244.12	244.12	0.72	0.72	0	40,000	40,000
MH-9	259	246.5	247.01	247.01	1.93	1.93	358,400	18,100	787,400
MH-10	266	249.3	249.79	249.79	1.68	1.68	0	202,900	410,900
MH-11	246	224.9	227.26	227.26	3.48	3.48	85,280	185,100	17,345,240
MH-12	234	220.5	222.19	222.19	5.36	5.36	20,000	115,400	17,480,640
MH-14	270	266	266.45	266.45	1.3	1.3	208,000	0	208,000
O-1	235	200	200	200	0	0			17,480,640

Gravity Pipe Report
Model Option 2 (SR-99)
Alternative B

Label	Upstream Node	Upstream Invert Elevation (ft)	Downstream Node	Downstream Invert Elevation (ft)	Constructed Slope (ft/ft)	Section Size	Length (ft)	Velocity In (ft/s)	Velocity Out (ft/s)	Total Flow (gpd)	Design Capacity (gpd)	Excess Design Capacity (gpd)
P-1	MH-1	234.2	MH-2	229.9	0.001593	48 inch	2,700	4.11	3.47	12,437,900	33,782,834	21,344,934
P-2	MH-3	232.6	MH-2	229.9	0.0005	36 inch	5,400	2.06	1.51	4,383,200	8,789,391	4,406,191
P-3	MH-4	239.7	MH-3	232.6	0.001246	36 inch	5,700	2.69	1.62	3,438,460	13,872,844	10,434,384
P-4	MH-5	241.2	MH-4	239.7	0.000968	33 inch	1,550	2.41	2.59	3,131,020	9,695,809	6,564,789
P-5	MH-6	242.5	MH-5	241.2	0.000448	30 inch	2,900	1.82	2.56	3,131,020	5,117,955	1,986,935
P-6	MH-7	244	MH-6	242.5	0.001202	30 inch	1,248	0.72	0.02	40,000	8,380,349	8,340,349
P-7	MH-9	246.5	MH-6	242.5	0.001435	24 inch	2,788	1.93	0.55	787,400	5,049,876	4,262,476
P-8	MH-10	249.3	MH-9	246.5	0.0014	12 inch	2,000	1.68	1.58	410,900	785,623	374,723
P-9	MH-2	229.9	MH-11	224.9	0.001887	48 inch	2,650	4.76	3.42	17,074,860	36,771,030	19,696,170
P-10	MH-11	224.9	MH-12	220.5	0.000815	48 inch	5,400	3.48	5.32	17,345,240	24,164,243	6,819,003
P-11	MH-12	220.5	O-1	200	0.002563	48 inch	8,000	5.36	6.07	17,480,640	42,852,451	25,371,811
P-17	MH-14	266	MH-10	249.3	0.001144	8 inch	14,600	1.3	1.18	208,000	240,855	32,855

Gravity Node Report
Model Option 2 (SR-99)
Alternative C

Label	Rim Elevation (ft)	Sump Elevation (ft)	Hydraulic Grade Line In (ft)	Hydraulic Grade Line Out (ft)	Velocity In (ft/s)	Velocity Out (ft/s)	Sanitary Base Load (gpd)	Inflow Pattern Load Base Flow (gpd)	Total Flow (gpd)
MH-1	248	234.2	235.8	235.8	4.11	4.11	10,560,000	1,877,900	12,437,900
MH-2	248	229.9	231.71	231.71	4.75	4.75	219,360	34,400	16,888,960
MH-3	248	232.6	233.98	233.98	2.04	2.04	819,840	124,900	4,197,300
MH-4	253	239.7	240.64	240.64	2.65	2.65	260,640	46,800	3,252,560
MH-5	254	241.2	242.19	242.19	2.37	2.37	0	0	2,945,120
MH-6	258	242.5	243.79	243.79	1.79	1.79	2,273,120	30,500	2,945,120
MH-7	257	244	244.12	244.12	0.72	0.72	0	40,000	40,000
MH-9	259	246.5	246.95	246.95	1.79	1.79	358,400	18,100	601,500
MH-10	266	249.3	249.65	249.65	1.43	1.43	0	202,900	225,000
MH-11	246	224.9	227.24	227.24	3.47	3.47	85,280	185,100	17,159,340
MH-12	234	220.5	222.18	222.18	5.34	5.34	20,000	115,400	17,294,740
MH-14	270	266	266.13	266.13	0.71	0.71	22,100	0	22,100
O-1	235	200	200	200	0	0			17,294,740

Gravity Pipe Report
Model Option 2 (SR-99)
Alternative C

Label	Upstream Node	Upstream Invert Elevation (ft)	Downstream Node	Downstream Invert Elevation (ft)	Constructed Slope (ft/ft)	Section Size	Length (ft)	Velocity In (ft/s)	Velocity Out (ft/s)	Total Flow (gpd)	Design Capacity (gpd)	Excess Design Capacity (gpd)
P-1	MH-1	234.2	MH-2	229.9	0.001593	48 inch	2,700	4.11	3.49	12,437,900	33,782,834	21,344,934
P-2	MH-3	232.6	MH-2	229.9	0.0005	36 inch	5,400	2.04	1.46	4,197,300	8,789,391	4,592,091
P-3	MH-4	239.7	MH-3	232.6	0.001246	36 inch	5,700	2.65	1.58	3,252,560	13,872,844	10,620,284
P-4	MH-5	241.2	MH-4	239.7	0.000968	33 inch	1,550	2.37	2.53	2,945,120	9,695,809	6,750,689
P-5	MH-6	242.5	MH-5	241.2	0.000448	30 inch	2,900	1.79	2.52	2,945,120	5,117,955	2,172,835
P-6	MH-7	244	MH-6	242.5	0.001202	30 inch	1,248	0.72	0.02	40,000	8,380,349	8,340,349
P-7	MH-9	246.5	MH-6	242.5	0.001435	24 inch	2,788	1.79	0.44	601,500	5,049,876	4,448,376
P-8	MH-10	249.3	MH-9	246.5	0.0014	12 inch	2,000	1.43	1.03	225,000	785,623	560,623
P-9	MH-2	229.9	MH-11	224.9	0.001887	48 inch	2,650	4.75	3.42	16,888,960	36,771,030	19,882,070
P-10	MH-11	224.9	MH-12	220.5	0.000815	48 inch	5,400	3.47	5.3	17,159,340	24,164,243	7,004,903
P-11	MH-12	220.5	O-1	200	0.002563	48 inch	8,000	5.34	6.05	17,294,740	42,852,451	25,557,711
P-17	MH-14	266	MH-10	249.3	0.001144	8 inch	14,600	0.71	0.19	22,100	240,855	218,755

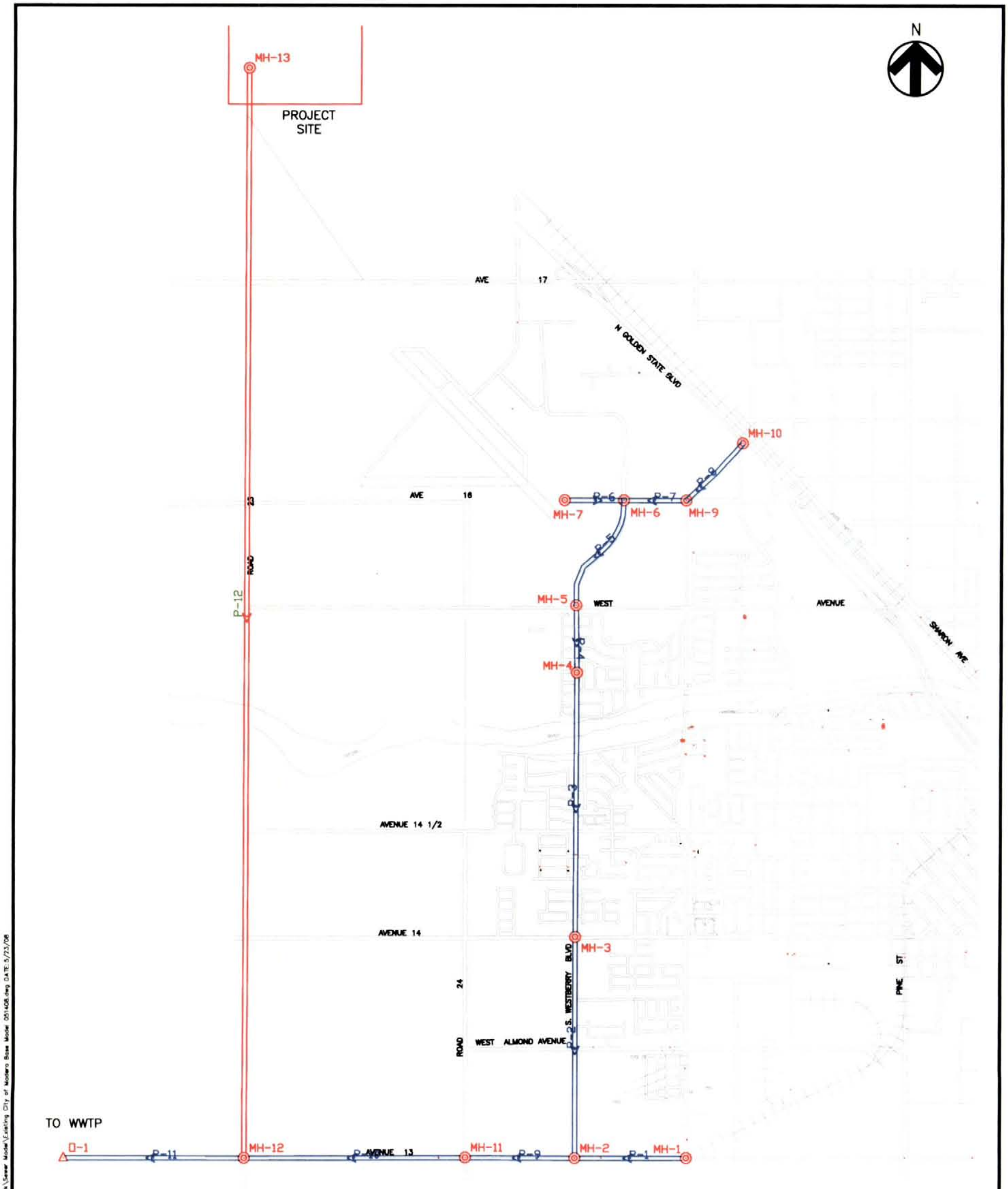


FIGURE B-3
NORTH FORK RANCHERIA PROJECT
SEWER CAPACITY ANALYSIS
MODEL OPTION 3 (ROAD 23)

HydroScience Engineers, Inc.

Gravity Node Report
Model Option 3 (Road 23)
Alternative A

Label	Rim Elevation (ft)	Sump Elevation (ft)	Hydraulic Grade Line In (ft)	Hydraulic Grade Line Out (ft)	Velocity In (ft/s)	Velocity Out (ft/s)	Sanitary Base Load (gpd)	Inflow Pattern Load Base Flow (gpd)	Total Flow (gpd)
MH-1	248	234.2	235.8	235.8	4.11	4.11	10,560,000	1,877,900	12,437,900
MH-2	248	229.9	231.7	231.7	4.74	4.74	219,360	34,400	16,866,860
MH-3	248	232.6	233.98	233.98	2.03	2.03	819,840	124,900	4,175,200
MH-4	253	239.7	240.64	240.64	2.64	2.64	260,640	46,800	3,230,460
MH-5	254	241.2	242.19	242.19	2.36	2.36	0	0	2,923,020
MH-6	258	242.5	243.78	243.78	1.79	1.79	2,273,120	30,500	2,923,020
MH-7	257	244	244.12	244.12	0.72	0.72	0	40,000	40,000
MH-9	259	246.5	246.94	246.94	1.77	1.77	358,400	18,100	579,400
MH-10	266	249.3	249.63	249.63	1.39	1.39	0	202,900	202,900
MH-11	246	224.9	227.24	227.24	3.47	3.47	85,280	185,100	17,137,240
MH-12	234	220.5	222.2	222.2	5.37	5.37	20,000	115,400	17,623,640
MH-13	260	237	237.55	237.55	1.23	1.23	351,000	0	351,000
O-1	235	200	200	200	0	0			17,623,640

Gravity Pipe Report
Model Option 3 (Road 23)
Alternative A

Label	Upstream Node	Upstream Invert Elevation (ft)	Downstream Node	Downstream Invert Elevation (ft)	Constructed Slope (ft/ft)	Section Size	Length (ft)	Velocity In (ft/s)	Velocity Out (ft/s)	Total Flow (gpd)	Design Capacity (gpd)	Excess Design Capacity (gpd)
P-1	MH-1	234.2	MH-2	229.9	0.001593	48 inch	2,700	4.11	3.5	12,437,900.00	33,782,833.70	21,344,933.70
P-2	MH-3	232.6	MH-2	229.9	0.0005	36 inch	5,400	2.03	1.45	4,175,200.00	8,789,390.65	4,614,190.65
P-3	MH-4	239.7	MH-3	232.6	0.001246	36 inch	5,700	2.64	1.57	3,230,460.00	13,872,844.29	10,642,384.29
P-4	MH-5	241.2	MH-4	239.7	0.000968	33 inch	1,550	2.36	2.53	2,923,020.00	9,695,808.96	6,772,788.96
P-5	MH-6	242.5	MH-5	241.2	0.000448	30 inch	2,900	1.79	2.52	2,923,020.00	5,117,954.88	2,194,934.88
P-6	MH-7	244	MH-6	242.5	0.001202	30 inch	1,248	0.72	0.02	40,000.00	8,380,349.14	8,340,349.14
P-7	MH-9	246.5	MH-6	242.5	0.001435	24 inch	2,788	1.77	0.42	579,400.00	5,049,875.67	4,470,475.67
P-8	MH-10	249.3	MH-9	246.5	0.0014	12 inch	2,000	1.39	0.95	202,900.00	785,623.45	582,723.45
P-9	MH-2	229.9	MH-11	224.9	0.001887	48 inch	2,650	4.74	3.41	16,866,860.00	36,771,029.97	19,904,169.97
P-10	MH-11	224.9	MH-12	220.5	0.000815	48 inch	5,400	3.47	5.22	17,137,240.00	24,164,242.64	7,027,002.64
P-11	MH-12	220.5	O-1	200	0.002563	48 inch	8,000	5.37	6.08	17,623,640.00	42,852,450.97	25,228,810.97

Gravity Node Report
Model Option 3 (Road 23)
Alternative B

Label	Rim Elevation (ft)	Sump Elevation (ft)	Hydraulic Grade Line In (ft)	Hydraulic Grade Line Out (ft)	Velocity In (ft/s)	Velocity Out (ft/s)	Sanitary Base Load (gpd)	Inflow Pattern Load Base Flow (gpd)	Total Flow (gpd)
MH-1	248	234.2	235.8	235.8	4.11	4.11	10,560,000	1,877,900	12,437,900
MH-2	248	229.9	231.7	231.7	4.74	4.74	219,360	34,400	16,866,860
MH-3	248	232.6	233.98	233.98	2.03	2.03	819,840	124,900	4,175,200
MH-4	253	239.7	240.64	240.64	2.64	2.64	260,640	46,800	3,230,460
MH-5	254	241.2	242.19	242.19	2.36	2.36	0	0	2,923,020
MH-6	258	242.5	243.78	243.78	1.79	1.79	2,273,120	30,500	2,923,020
MH-7	257	244	244.12	244.12	0.72	0.72	0	40,000	40,000
MH-9	259	246.5	246.94	246.94	1.77	1.77	358,400	18,100	579,400
MH-10	266	249.3	249.63	249.63	1.39	1.39	0	202,900	202,900
MH-11	246	224.9	227.24	227.24	3.47	3.47	85,280	185,100	17,137,240
MH-12	234	220.5	222.19	222.19	5.36	5.36	20,000	115,400	17,480,640
MH-13	260	237	237.45	237.45	1.08	1.08	208,000	0	208,000
O-1	235	200	200	200	0	0			17,480,640

Gravity Pipe Report
Model Option 3 (Road 23)
Alternative B

Label	Upstream Node	Upstream Invert Elevation (ft)	Downstream Node	Downstream Invert Elevation (ft)	Constructed Slope (ft/ft)	Section Size	Length (ft)	Velocity In (ft/s)	Velocity Out (ft/s)	Total Flow (gpd)	Design Capacity (gpd)	Excess Design Capacity (gpd)
P-1	MH-1	234.2	MH-2	229.9	0.001593	48 inch	2,700	4.11	3.5	12,437,900	33,782,834	21,344,934
P-2	MH-3	232.6	MH-2	229.9	0.0005	36 inch	5,400	2.03	1.45	4,175,200	8,789,391	4,614,191
P-3	MH-4	239.7	MH-3	232.6	0.001246	36 inch	5,700	2.64	1.57	3,230,460	13,872,844	10,642,384
P-4	MH-5	241.2	MH-4	239.7	0.000968	33 inch	1,550	2.36	2.53	2,923,020	9,695,809	6,772,789
P-5	MH-6	242.5	MH-5	241.2	0.000448	30 inch	2,900	1.79	2.52	2,923,020	5,117,955	2,194,935
P-6	MH-7	244	MH-6	242.5	0.001202	30 inch	1,248	0.72	0.02	40,000	8,380,349	8,340,349
P-7	MH-9	246.5	MH-6	242.5	0.001435	24 inch	2,788	1.77	0.42	579,400	5,049,876	4,470,476
P-8	MH-10	249.3	MH-9	246.5	0.0014	12 inch	2,000	1.39	0.95	202,900	785,623	582,723
P-9	MH-2	229.9	MH-11	224.9	0.001887	48 inch	2,650	4.74	3.41	16,866,860	36,771,030	19,904,170
P-10	MH-11	224.9	MH-12	220.5	0.000815	48 inch	5,400	3.47	5.25	17,137,240	24,164,243	7,027,003
P-11	MH-12	220.5	O-1	200	0.002563	48 inch	8,000	5.36	6.07	17,480,640	42,852,451	25,371,811

Gravity Node Report
Model Option 3 (Road 23)
Alternative C

Label	Rim Elevation (ft)	Sump Elevation (ft)	Hydraulic Grade Line In (ft)	Hydraulic Grade Line Out (ft)	Velocity In (ft/s)	Velocity Out (ft/s)	Sanitary Base Load (gpd)	Inflow Pattern Load Base Flow (gpd)	Total Flow (gpd)
MH-1	248	234.2	235.8	235.8	4.11	4.11	10,560,000	1,877,900	12,437,900
MH-2	248	229.9	231.7	231.7	4.74	4.74	219,360	34,400	16,866,860
MH-3	248	232.6	233.98	233.98	2.03	2.03	819,840	124,900	4,175,200
MH-4	253	239.7	240.64	240.64	2.64	2.64	260,640	46,800	3,230,460
MH-5	254	241.2	242.19	242.19	2.36	2.36	0	0	2,923,020
MH-6	258	242.5	243.78	243.78	1.79	1.79	2,273,120	30,500	2,923,020
MH-7	257	244	244.12	244.12	0.72	0.72	0	40,000	40,000
MH-9	259	246.5	246.94	246.94	1.77	1.77	358,400	18,100	579,400
MH-10	266	249.3	249.63	249.63	1.39	1.39	0	202,900	202,900
MH-11	246	224.9	227.24	227.24	3.47	3.47	85,280	185,100	17,137,240
MH-12	234	220.5	222.18	222.18	5.34	5.34	20,000	115,400	17,294,740
MH-13	260	237	237.15	237.15	0.59	0.59	22,100	0	22,100
O-1	235	200	200	200	0	0			17,294,740

Gravity Pipe Report
Model Option 3 (Road 23)
Alternative C

Label	Upstream Node	Upstream Invert Elevation (ft)	Downstream Node	Downstream Invert Elevation (ft)	Constructed Slope (ft/ft)	Section Size	Length (ft)	Velocity In (ft/s)	Velocity Out (ft/s)	Total Flow (gpd)	Design Capacity (gpd)	Excess Design Capacity (gpd)
P-1	MH-1	234.2	MH-2	229.9	0.001593	48 inch	2,700	4.11	3.5	12,437,900	33,782,834	21,344,934
P-2	MH-3	232.6	MH-2	229.9	0.0005	36 inch	5,400	2.03	1.45	4,175,200	8,789,391	4,614,191
P-3	MH-4	239.7	MH-3	232.6	0.001246	36 inch	5,700	2.64	1.57	3,230,460	13,872,844	10,642,384
P-4	MH-5	241.2	MH-4	239.7	0.000968	33 inch	1,550	2.36	2.53	2,923,020	9,695,809	6,772,789
P-5	MH-6	242.5	MH-5	241.2	0.000448	30 inch	2,900	1.79	2.52	2,923,020	5,117,955	2,194,935
P-6	MH-7	244	MH-6	242.5	0.001202	30 inch	1,248	0.72	0.02	40,000	8,380,349	8,340,349
P-7	MH-9	246.5	MH-6	242.5	0.001435	24 inch	2,788	1.77	0.42	579,400	5,049,876	4,470,476
P-8	MH-10	249.3	MH-9	246.5	0.0014	12 inch	2,000	1.68	0.95	202,900	785,623	582,723
P-9	MH-2	229.9	MH-11	224.9	0.001887	48 inch	2,650	4.74	3.41	16,866,860	36,771,030	19,904,170
P-10	MH-11	224.9	MH-12	220.5	0.000815	48 inch	5,400	3.47	5.3	17,137,240	24,164,243	7,027,003
P-11	MH-12	220.5	O-1	200	0.002563	48 inch	8,000	5.34	6.05	17,294,740	42,852,451	25,557,711

ATTACHMENT C

Preliminary Cost Estimate

North Fork Rancheria Sewer Alignment and Capacity Analysis
Preliminary Capital Cost Estimate - October 2008
Option 1 - Airport Drive, Alternative A

Item #	Item	Qty.	Unit	Unit Cost	Total
	Collection System Construction Cost Estimate				
1	10-inch gravity sewer	8,000	LF	$ 110	$ 880,000
2	Manholes	30	EA	$ 2,000	$ 60,000
	Sewer Facilities Subtotal				**$ 940,000**
	Overall Project Cost Estimate				
	Construction				$ 940,000
	Design (10%)				$ 94,000
	Permitting (3%)				$ 29,000
	CM (10%)				$ 94,000
	Legal and Administrative (7%)				$ 65,800
	Contingency (30%)				$ 367,000
	Total Capital Cost				**$ 1,590,000**

North Fork Rancheria Sewer Alignment and Capacity Analysis
Preliminary Capital Cost Estimate - October 2008
Option 1 - Airport Drive, Alternative B

Item #	Item	Qty.	Unit	Unit Cost	Total
	Collection System Construction Cost Estimate				
1	8-inch gravity sewer	8,000	LF	$ 90	$ 720,000
2	Manholes	30	EA	$ 2,000	$ 60,000
	Sewer Facilities Subtotal				**$ 780,000**
	Overall Project Cost Estimate				
	Construction				$ 780,000
	Design (10%)				$ 78,000
	Permitting (3%)				$ 24,000
	CM (10%)				$ 78,000
	Legal and Administrative (7%)				$ 55,000
	Contingency (30%)				$ 305,000
	Total Capital Cost				**$ 1,320,000**

North Fork Rancheria Sewer Alignment and Capacity Analysis
Preliminary Capital Cost Estimate - October 2008
Option 1 - Airport Drive, Alternative C

Item #	Item	Qty.	Unit	Unit Cost	Total
	Collection System Construction Cost Estimate				
1	8-inch gravity sewer	8,000	LF	$ 90	$ 720,000
2	Manholes	30	EA	$ 2,000	$ 60,000
	Sewer Facilities Subtotal				**$ 780,000**
	Overall Project Cost Estimate				
	Construction				$ 780,000
	Design (10%)				$ 78,000
	Permitting (3%)				$ 24,000
	CM (10%)				$ 78,000
	Legal and Administrative (7%)				$ 55,000
	Contingency (30%)				$ 305,000
	Total Capital Cost				**$ 1,320,000**

North Fork Rancheria Sewer Alignment and Capacity Analysis
Preliminary Capital Cost Estimate - October 2008
Option 2 - SR 99, Alternative A

Item #	Item	Qty.	Unit	Unit Cost	Total
	Collection System Construction Cost Estimate				
1	10-inch gravity sewer	14,600	LF	$ 110	$ 1,606,000
2	Manholes	50	EA	$ 2,000	$ 100,000
	Sewer Facilities Subtotal				**$ 1,706,000**
	Overall Project Cost Estimate				
	Construction				$ 1,706,000
	Design (10%)				$ 171,000
	Permitting (3%)				$ 52,000
	CM (10%)				$ 171,000
	Legal and Administrative (7%)				$ 120,000
	Contingency (30%)				$ 666,000
	Total Capital Cost				**$ 2,886,000**

North Fork Rancheria Sewer Alignment and Capacity Analysis
Preliminary Capital Cost Estimate - October 2008
Option 2 - SR 99, Alternative B

Item #	Item	Qty.	Unit	Unit Cost	Total
	Collection System Construction Cost Estimate				
1	8-inch gravity sewer	14,600	LF	$ 90	$ 1,314,000
2	Manholes	50	EA	$ 2,000	$ 100,000
	Sewer Facilities Subtotal				**$ 1,414,000**
	Overall Project Cost Estimate				
	Construction				$ 1,414,000
	Design (10%)				$ 142,000
	Permitting (3%)				$ 43,000
	CM (10%)				$ 142,000
	Legal and Administrative (7%)				$ 99,000
	Contingency (30%)				$ 552,000
	Total Capital Cost				**$ 2,392,000**

North Fork Rancheria Sewer Alignment and Capacity Analysis
Preliminary Capital Cost Estimate - October 2008
Option 2 - SR 99, Alternative C

Item #	Item	Qty.	Unit	Unit Cost	Total
	Collection System Construction Cost Estimate				
1	8-inch gravity sewer	14,600	LF	$ 90	$ 1,314,000
2	Manholes	50	EA	$ 2,000	$ 100,000
	Sewer Facilities Subtotal				**$ 1,414,000**
	Overall Project Cost Estimate				
	Construction				$ 1,414,000
	Design (10%)				$ 142,000
	Permitting (3%)				$ 43,000
	CM (10%)				$ 142,000
	Legal and Administrative (7%)				$ 99,000
	Contingency (30%)				$ 552,000
	Total Capital Cost				**$ 2,392,000**

North Fork Rancheria Sewer Alignment and Capacity Analysis
Preliminary Capital Cost Estimate - October 2008
Option 3 - Road 23, Alternative A

Item #	Item	Qty.	Unit	Unit Cost	Total
	Collection System Construction Cost Estimate				
1	Creek crossing (bore and jack)	1,000	LF	$ 200	$ 200,000
2	Lift Stations	1	LS	$ 80,000	$ 80,000
3	6-inch force main	26,400	LF	$ 70	$ 1,848,000
	Sewer Facilities Subtotal				**$ 2,128,000**
	Overall Project Cost Estimate				
	Construction				$ 2,128,000
	Design (10%)				$ 213,000
	Permitting (3%)				$ 64,000
	CM (10%)				$ 213,000
	Legal and Administrative (7%)				$ 149,000
	Contingency (30%)				$ 831,000
	Total Capital Cost				**$ 3,598,000**

North Fork Rancheria Sewer Alignment and Capacity Analysis
Preliminary Capital Cost Estimate - October 2008
Option 3 - Road 23, Alternative B

Item #	Item	Qty.	Unit	Unit Cost	Total
	Collection System Construction Cost Estimate				
1	Creek crossing (bore and jack)	1,000	LF	$ 200	$ 200,000
2	Lift Stations	1	LS	$ 80,000	$ 80,000
3	4-inch force main	26,400	LF	$ 55	$ 1,452,000
	Sewer Facilities Subtotal				**$ 1,732,000**
	Overall Project Cost Estimate				
	Construction				$ 1,732,000
	Design (10%)				$ 174,000
	Permitting (3%)				$ 52,000
	CM (10%)				$ 174,000
	Legal and Administrative (7%)				$ 122,000
	Contingency (30%)				$ 677,000
	Total Capital Cost				**$ 2,931,000**

North Fork Rancheria Sewer Alignment and Capacity Analysis
Preliminary Capital Cost Estimate - October 2008
Option 3 - Road 23, Alternative C

Item #	Item	Qty.	Unit	Unit Cost	Total
	Collection System Construction Cost Estimate				
1	Creek crossing (bore and jack)	1,000	LF	$ 200	$ 200,000
2	Lift Stations	1	LS	$ 80,000	$ 80,000
3	4-inch force main	26,400	LF	$ 55	$ 1,452,000
	Sewer Facilities Subtotal				**$ 1,732,000**
	Overall Project Cost Estimate				
	Construction				$ 1,732,000
	Design (10%)				$ 174,000
	Permitting (3%)				$ 52,000
	CM (10%)				$ 174,000
	Legal and Administrative (7%)				$ 122,000
	Contingency (30%)				$ 677,000
	Total Capital Cost				**$ 2,931,000**