PRELIMINARY SEWER STUDY
FOR
TTM 34760

IN THE

CITY OF CORONA, CALIFORNIA

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Planning-Infrastructure-Site Development-Water Resources

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TABLE OF CONTENTS

SECTION I

A. INTRODUCTION.

This sewer study has been prepared to examine the design characteristics of the proposed sanitary sewer system servicing Tentative Tract 34760.
This study will analyze the pipe slopes, flow velocities and depths of flow to ensure that the proposed sanitary sewer system meets or exceeds the City of Corona's design criteria.

B. PROPOSED DEVELOPMENT

This project is located in South Corona, adjacent to Cleveland National Forest south of Shepard Crest Drive. The project proposes to subdivide 65.4 acres into 34 single family residential lots and several open space lots. 24.4 acres of the project are currently outside of the City of Corona and are being annexed into the City as part of the project. The highest point in the proposed 8" sewer system is in the cul-de-sac at the terminus of "C" Circle (See Appendix "A"). The sewer flows westerly in "C" Circle and then northerly in "B" Circle before joining the sewer in "A" Circle at Node 13. The proposed 8" sewer runs westerly in "A" Circle and joins the sewer in "D" Circle at Node 20. The proposed 8" sewer will continue northeasterly in "D" Circle and northerly in Malaga Street, where it will connect to the existing 8" sewer stub at the current terminus of Malaga Street. The existing sewer was constructed by Tr. No. 28153 per Dwg. No. 97-51S, Sh. 13 and has an invert elevation of 1264.05.

The sewer system was modeled with nodes at each proposed sewer manhole. The manholes will be 5 feet in diameter with 3-foot frames and covers per City Standards. There are various high and low points along the proposed streets that affect the proposed sewer minimum and maximum cover depths. The proposed sewer systems depth ranges from a minimum cover of 7.0' (6.0' at terminal manholes) to a maximum cover of 19.77'. Ductile Iron pipe (sewer safe) will be used for sewer system reaches that exceed a cover depth of 15.0'. PVC SDR 35 pipe will be used for sewer reaches that have less than 15.0' cover depth.

C. DESIGN CRITERIA

All sanitary sewers within this project shall be designed for gravity flow. All sewer mains shall be public and maintained by the City of Corona. The sanitary sewer system for the project was designed based on the following criteria:

1. The Manning equation with a Manning's "n" of 0.013 was used to size the sewer pipe per City of Corona sewer design standards.

2. Gravity lines are sized with 8-inch PVC SDR 35 lines flowing a maximum of half-full @ peak dry weather flow when a pipe depth cover is less than 15.0-feet and Ductile Iron 8-inch sewer pipe for pipe depth covers that exceed 15.0 feet cover per the City of Corona sewer design standards.

3. The average daily sewer contribution from the proposed subdivision can be calculated either with a unit flow factor of 500 gallons per day (Option 1) or with a unit flow factor of 300 gallons per day per dwelling unit (Option 2). These flow factors are used for an "Estate" development per the City of Corona's Sewer Master Plan. Both flow factors are being considered for this study with the governing option being the one producing the highest peak flow. Section II has calculations for both options with "Option II" governing. The peak flow was obtained from the equation:

   $Q_{peak} = 1.95 (Q_{adf})^{0.92}$

   Per City of Corona Sewer Master Plan.

4. The velocity in the sewer line is limited as follows:
   Minimum velocity = 2.0 feet per second
   Maximum velocity = 6.0 feet per second at design flow.

Where the minimum velocity cannot be maintained, the pipe slope must be a minimum of 0.01 ft/ft (1%).

D. SUMMARY

The minimum amount of dwelling units tributary to one reach of pipe is 2DU. The maximum amount of units tributary to one reach of pipe is 34 dwelling units. There are some reaches in the system generating pipe flow velocities less than the minimum 2 fps required by the City of Corona. These reaches were designed with a minimum slope of 1-percent. The minimum sewer slope for an 8-inch pipe is 0.4-percent. The minimum and maximum slopes used for the system are 1-percent and 15-percent, respectively. The minimum and maximum depth of flow within the system is 0.02' and 0.08' respectively, both depths flowing below half full at peak dry weather flow conditions. The maximum pipe flow velocity generated by a given reach in the system is 4.51 fps, which does not exceed the City of Corona's maximum allowable flow velocity of 6 fps.

The City's Sewer Master Plan has identified the proposed connection point to the existing 8" pipe in Malaga St. as Pipe Model ID 5864 (16-28010 to 16-28790). The Mater Plan accounted for a Peak Flow of 0.1016 cfs at this location (See Appendix "C"). The Master Plan utilized the existing City land use designations to determine future sewer generation rates for this undeveloped property. The existing land use Estate Residential (ER) allowed for 58 dwelling units on the 39.9 acres within the existing City boundary. The overall project including the annexed property proposes only 34 dwelling units which is considerably less than accounted for in the Sewer Master Plan. The project Peak Flow is 0.0533 cfs, which is approximately 48 percent less than anticipated by the Master Plan.

At the request of the City of Corona we have reviewed the Sewer Master Plan to identify any downstream deficiencies in the City of Corona's publicly maintained sewer system. The project is tributary to the existing Master Plan sewer in Buena Vista Av. which conveys flows to Wastewater Treatment Plant No. 2. The Master Plan identifies two deficient segments (16-29430 to 16-29470 and 16-29470 to 16-29520) located in Buena Vista Av. Approximately 350 feet north of Highgrove St. This particular sewer line is also identified in the South Corona Community Facility Plan (SCCFP) as Section No. 0137-0004-00. This facility was identified as a SCCFP Master Plan facility within sewer tributary area "D5" and also a component of the South Corona Sewer Fee structure. In the attached Appendix "C" we have provided the existing and ultimate Master Plan data at the deficient location and have also provided adjusted data representing the reduced flow from the proposed project .

The Master Plan indicates that the existing system at this location is deficient. The d/D is .70 and .60 respectively. The proposed project will increase the existing data to a d/D of .73 and .61. In the ultimate condition, or calculated buildout the proposed development, by underbuilding 48 percent, will reduce the impacts on the downstream facilities. Since the sewer flows generated by the proposed development have already been accounted for in the City's Sewer Master Plan and the proposed project will generate less than anticipated flows the existing deficiencies will be reduced by this development.

The preceding calculations indicate that the proposed sewer system for the project meets the design requirements provided by the City of Corona.

SECTION II

SEWER CALCULATION TABLE

Sewer Calculations

Option 1 -

Calculations via Site acreage

REACH	INVERT EL. (FT) UPSTREAM	DOWNSTREAM	LENGTH (FT.)	DIA. (IN.)	SLOPE FT./FT.	TRIB. SIZE (AC)	FLOW FACTOR	TRIB. Qadf[1] (GPD)	TRIB. Qadf[2] (CFS)	TRIB. Qpeak[3] (CFS)	Tot. Qpeak (CFS)	VELOCITY (FPS)	d/D
MH 1 - MH 2	1384.17	1382.76	140.53	8	0.0100	2.1	500.0	1050.00	0.0016	0.0053	0.0053	0.86	0.075
MH 2 - MH 3	1382.66	1381.18	147.57	8	0.0100	1.5	500.0	750.00	0.0012	0.0039	0.0092	1.02	0.090
MH 3 - MH 4	1381.08	1379.11	197.25	8	0.0100	1.0	500.0	500.00	0.0008	0.0027	0.0119	1.11	0.090
MH 4 - MH 5	1379.01	1376.87	213.61	8	0.0100	1.0	500.0	500.00	0.0008	0.0027	0.0145	1.18	0.104
MH 5 - MH 6	1376.77	1371.09	213.61	8	0.0266	0.5	500.0	230.00	0.0004	0.0013	0.0158	1.70	0.075
MH 6 - MH 7	1370.89	1363.95	173.41	8	0.0400	1.1	500.0	535.00	0.0008	0.0028	0.0187	2.06	0.090
MH 7 - MH 13	1363.85	1345.63	162.48	8	0.1121	0.6	500.0	280.00	0.0004	0.0016	0.0203	3.03	0.075
							500.0		0.0000	0.0000			
MH 8 - MH 9	1356.91	1355.06	184.62	8	0.0100	1.0	500.0	475.00	0.0007	0.0026	0.0026	0.69	0.045
MH 9 - MH 10	1354.96	1352.28	268.07	8	0.0100	1.0	500.0	500.00	0.0008	0.0027	0.0052	0.86	0.060
MH 10 - MH 11	1352.18	1349.74	243.57	8	0.0100	1.0	500.0	500.00	0.0008	0.0027	0.0079	0.98	0.075
MH 11 - MH 12	1349.64	1347.05	259.15	8	0.0100	1.0	500.0	500.00	0.0008	0.0027	0.0106	1.07	0.090
MH 12 - MH 13	1346.95	1345.63	132.17	8	0.0100	1.0	500.0	475.00	0.0007	0.0026	0.0131	1.14	0.104
MH 13						0.0	500.0	0.00	0.0000	0.0000	0.0334		
MH 13 - MH 14	1345.43	1342.73	130.07	8	0.0208	0.0	500.0	0.00	0.0000	0.0000	0.0334	1.95	0.119
MH 14 - MH 20	1342.63	1339.80	128.49	8	0.0220	0.0	500.0	0.00	0.0000	0.0000	0.0334	1.99	0.119
							500.0		0.0000	0.0000			
MH 15 - MH 16	1360.13	1352.93	180.07	8	0.0400	1.5	500.0	740.00	0.0011	0.0038	0.0038	1.54	0.045
MH 16 - MH 17	1352.83	1346.00	227.73	8	0.0300	1.0	500.0	485.00	0.0008	0.0026	0.0064	1.64	0.060
MH 17 - MH 18	1345.80	1343.50	230.22	8	0.0100	0.9	500.0	460.00	0.0007	0.0025	0.0089	1.23	0.090
MH 18 - MH 19	1343.40	1342.05	135.18	8	0.0100	0.9	500.0	450.00	0.0007	0.0024	0.0113	1.32	0.090
MH 19 - MH 20	1341.95	1339.80	98.96	8	0.0217	0.0	500.0	0.00	0.0000	0.0000	0.0113	1.74	0.075
MH 20						0.0	500.0	0.00	0.0000	0.0000	0.0447		
MH 20 - MH 21	1339.60	1337.93	83.70	8	0.0200	0.0	500.0	0.00	0.0000	0.0000	0.0447	2.53	0.149
MH 21 - MH 22	1337.83	1333.32	150.37	8	0.0300	0.0	500.0	0.00	0.0000	0.0000	0.0447	2.91	0.134
MH 22 - MH 23	1333.22	1306.18	270.43	8	0.1000	0.0	500.0	0.00	0.0000	0.0000	0.0447	4.44	0.104
MH 23 - MH 24	1306.08	1300.16	73.97	8	0.0800	0.0	500.0	0.00	0.0000	0.0000	0.0447	4.11	0.104
MH 24 - MH 25	1300.06	1297.34	135.90	8	0.0200	0.0	500.0	0.00	0.0000	0.0000	0.0447	2.53	0.149
MH 25 - MH 26	1297.24	1284.09	164.33	8	0.0800	0.0	500.0	0.00	0.0000	0.0000	0.0447	4.11	0.104
MH 26 - MH 27	1283.89	1281.13	69.06	8	0.0400	0.0	500.0	0.00	0.0000	0.0000	0.0447	3.22	0.119
MH 27 - (MH 28)	**1281.03**	**1264.05**	**110.67**	**8**	**0.1534**	**0.0**	**500.0**	**0.00**	**0.0000**	**0.0000**	**0.0447**	**4.45**	**0.075**

See sewer map in Appendix “A” for location of reaches

(1) Trib Qadf = (Trib size (acres)) x (Flow Factror)

(2) Qadf (CFS) = Qadf/(24 hr/day x 1day/3,600 sec x 7.48 gpd/cfs)

(3) Qpeak = 1.95Qadf0.92

Sewer Calculations

Option 2 -

Calculations via Dwelling Units

REACH	INVERT EL. (FT) UPSTREAM	DOWNSTREAM	LENGTH (FT.)	DIA. (IN.)	SLOPE FT./FT.	Dwelling Unit (DU)	FLOW FACTOR	TRIB. Qadf[1] (GPD)	TRIB. Qadf[2] (CFS)	TRIB. Qpeak[3] (CFS)	Tot. Qpeak (CFS)	VELOCITY (FPS)	d/D
MH 1 - MH 2	1384.17	1382.76	140.53	8	0.0100	4.0	300.0	1200.00	0.0019	0.0060	0.0060	0.90	0.060
MH 2 - MH 3	1382.66	1381.18	147.57	8	0.0100	3.0	300.0	900.00	0.0014	0.0046	0.0106	1.07	0.060
MH 3 - MH 4	1381.08	1379.11	197.25	8	0.0100	2.0	300.0	600.00	0.0009	0.0032	0.0137	1.16	0.075
MH 4 - MH 5	1379.01	1376.87	213.61	8	0.0100	2.0	300.0	600.00	0.0009	0.0032	0.0169	1.23	0.075
MH 5 - MH 6	1376.77	1371.09	213.61	8	0.0266	1.0	300.0	300.00	0.0005	0.0017	0.0186	2.05	0.060
MH 6 - MH 7	1370.89	1363.95	173.41	8	0.0400	2.0	300.0	600.00	0.0009	0.0032	0.0218	2.15	0.060
MH 7 - MH 13	1363.85	1345.63	162.48	8	0.1121	1.0	300.0	300.00	0.0005	0.0017	0.0234	3.16	0.060
							300.0		0.0000	0.0000			
MH 8 - MH 9	1356.91	1355.06	184.62	8	0.0100	2.0	300.0	600.00	0.0009	0.0032	0.0032	0.74	0.030
MH 9 - MH 10	1354.96	1352.28	268.07	8	0.0100	2.0	300.0	600.00	0.0009	0.0032	0.0063	0.91	0.045
MH 10 - MH 11	1352.18	1349.74	243.57	8	0.0100	2.0	300.0	600.00	0.0009	0.0032	0.0095	1.03	0.060
MH 11 - MH 12	1349.64	1347.05	259.15	8	0.0100	2.0	300.0	600.00	0.0009	0.0032	0.0127	1.13	0.075
MH 12 - MH 13	1346.95	1345.63	132.17	8	0.0100	2.0	300.0	600.00	0.0009	0.0032	0.0158	1.21	0.075
MH 13						0.0	300.0	0.00	0.0000	0.0000	0.0392		
MH 13 - MH 14	1345.43	1342.73	130.07	8	0.0208	0.0	300.0	0.00	0.0000	0.0000	0.0392	2.05	0.104
MH 14 - MH 20	1342.63	1339.80	128.49	8	0.0220	0.0	300.0	0.00	0.0000	0.0000	0.0392	2.09	0.104
							300.0		0.0000	0.0000			
MH 15 - MH 16	1360.13	1352.93	180.07	8	0.0400	3.0	300.0	900.00	0.0014	0.0046	0.0046	1.34	0.030
MH 16 - MH 17	1352.83	1346.00	227.73	8	0.0300	2.0	300.0	600.00	0.0009	0.0032	0.0078	1.43	0.045
MH 17 - MH 18	1345.80	1343.50	230.22	8	0.0100	2.0	300.0	600.00	0.0009	0.0032	0.0109	1.08	0.060
MH 18 - MH 19	1343.40	1342.05	135.18	8	0.0100	2.0	300.0	600.00	0.0009	0.0032	0.0141	1.17	0.075
MH 19 - MH 20	1341.95	1339.80	98.96	8	0.0217	0.0	300.0	0.00	0.0000	0.0000	0.0141	1.53	0.060
MH 20						0.0	300.0	0.00	0.0000	0.0000	0.0533		
MH 20 - MH 21	1339.60	1337.93	83.70	8	0.0200	0.0	300.0	0.00	0.0000	0.0000	0.0533	2.22	0.119
MH 21 - MH 22	1337.83	1333.32	150.37	8	0.0300	0.0	300.0	0.00	0.0000	0.0000	0.0533	2.55	0.104
MH 22 - MH 23	1333.22	1306.18	270.43	8	0.1000	0.0	300.0	0.00	0.0000	0.0000	0.0533	3.89	0.089
MH 23 - MH 24	1306.08	1300.16	73.97	8	0.0800	0.0	300.0	0.00	0.0000	0.0000	0.0533	3.60	0.089
MH 24 - MH 25	1300.06	1297.34	135.90	8	0.0200	0.0	300.0	0.00	0.0000	0.0000	0.0533	2.22	0.119
MH 25 - MH 26	1297.24	1284.09	164.33	8	0.0800	0.0	300.0	0.00	0.0000	0.0000	0.0533	3.60	0.089
MH 26 - MH 27	1283.89	1281.13	69.06	8	0.0400	0.0	300.0	0.00	0.0000	0.0000	0.0533	2.82	0.104
MH 27 - (MH 28)	**1281.03**	**1264.05**	**110.67**	**8**	**0.1534**	**0.0**	**300.0**	**0.00**	**0.0000**	**0.0000**	**0.0533**	**4.51**	**0.075**

See sewer map in Appendix "A" for location of reaches

[1] Trib Q_{adf} = (DU) x (Flow Factror)

[2] Q_{adf} (CFS) = Q_{adf}/(24 hr/day x 1day/3,600 sec x 7.48 gpd/cfs)

[3] $Q_{peak} = 1.95 Q_{adf}^{0.92}$

Appendix “A”

MH 1 TO MH 2
Worksheet for Circular Channel

Project Description	
Worksheet	MH1 - MH2
Flow Element	Circular Channel
Method	Manning's Formula
Solve For	Channel Depth

Input Data		
Mannings Coefficient	0.013	
Slope	0.010000	ft/ft
Diameter	8	in
Discharge	0.0060	cfs

Results		
Depth	0.03	ft
Flow Area	6.7e-3	ft²
Wetted Perimeter	0.30	ft
Top Width	0.29	ft
Critical Depth	0.03	ft
Percent Full	5.1	%
Critical Slope	0.009094	ft/ft
Velocity	0.90	ft/s
Velocity Head	0.01	ft
Specific Energy	0.05	ft
Froude Number	1.05	
Maximum Discharge	1.2996	cfs
Discharge Full	1.2081	cfs
Slope Full	2.46643e-7	ft/ft
Flow Type	Supercritical	

MH 2 TO MH 3
Worksheet for Circular Channel

Project Description	
Worksheet	MH2 - MH3
Flow Element	Circular Channel
Method	Manning's Formula
Solve For	Channel Depth

Input Data		
Mannings Coefficient	0.013	
Slope	0.010000	ft/ft
Diameter	8	in
Discharge	0.0106	cfs

Results		
Depth	0.04	ft
Flow Area	9.9e-3	ft²
Wetted Perimeter	0.35	ft
Top Width	0.33	ft
Critical Depth	0.05	ft
Percent Full	6.6	%
Critical Slope	0.008645	ft/ft
Velocity	1.07	ft/s
Velocity Head	0.02	ft
Specific Energy	0.06	ft
Froude Number	1.09	
Maximum Discharge	1.2998	cfs
Discharge Full	1.2083	cfs
Slope Full	0.000001	ft/ft
Flow Type	Supercritical	

MH 3 TO MH 4
Worksheet for Circular Channel

Project Description	
Worksheet	MH3 - MH4
Flow Element	Circular Channel
Method	Manning's Formula
Solve For	Channel Depth

Input Data		
Mannings Coefficient	0.013	
Slope	0.010000	ft/ft
Diameter	8	in
Discharge	0.0137	cfs

Results		
Depth	0.05	ft
Flow Area	1.2e-2	ft²
Wetted Perimeter	0.37	ft
Top Width	0.35	ft
Critical Depth	0.05	ft
Percent Full	7.5	%
Critical Slope	0.008018	ft/ft
Velocity	1.16	ft/s
Velocity Head	0.02	ft
Specific Energy	0.07	ft
Froude Number	1.11	
Maximum Discharge	1.2998	cfs
Discharge Full	1.2083	cfs
Slope Full	0.000001	ft/ft
Flow Type	Supercritical	

MH 4 TO MH 5
Worksheet for Circular Channel

Project Description	
Worksheet	MH4 - MH5
Flow Element	Circular Channel
Method	Manning's Formula
Solve For	Channel Depth

Input Data		
Mannings Coefficient	0.013	
Slope	0.010000	ft/ft
Diameter	8	in
Discharge	0.0169	cfs

Results		
Depth	0.06	ft
Flow Area	1.4e-2	ft²
Wetted Perimeter	0.39	ft
Top Width	0.37	ft
Critical Depth	0.06	ft
Percent Full	8.3	%
Critical Slope	0.007818	ft/ft
Velocity	1.23	ft/s
Velocity Head	0.02	ft
Specific Energy	0.08	ft
Froude Number	1.12	
Maximum Discharge	1.2998	cfs
Discharge Full	1.2083	cfs
Slope Full	0.000002	ft/ft
Flow Type	Supercritical	

MH 5 TO MH 6
Worksheet for Circular Channel

Project Description	
Worksheet	MH5 - MH6
Flow Element	Circular Channel
Method	Manning's Formula
Solve For	Channel Depth

Input Data		
Mannings Coefficient	0.013	
Slope	0.040000	ft/ft
Diameter	8	in
Discharge	0.0186	cfs

Results		
Depth	0.04	ft
Flow Area	9.1e-3	ft²
Wetted Perimeter	0.34	ft
Top Width	0.32	ft
Critical Depth	0.06	ft
Percent Full	6.2	%
Critical Slope	0.007709	ft/ft
Velocity	2.05	ft/s
Velocity Head	0.07	ft
Specific Energy	0.11	ft
Froude Number	2.16	
Maximum Discharge	2.5997	cfs
Discharge Full	2.4167	cfs
Slope Full	0.000002	ft/ft
Flow Type	Supercritical	

MH 6 TO MH 7
Worksheet for Circular Channel

Project Description	
Worksheet	MH6 - MH7
Flow Element	Circular Channel
Method	Manning's Formula
Solve For	Channel Depth

Input Data		
Mannings Coefficient	0.013	
Slope	0.040000	ft/ft
Diameter	8	in
Discharge	0.0218	cfs

Results		
Depth	0.04	ft
Flow Area	1.0e-2	ft²
Wetted Perimeter	0.35	ft
Top Width	0.33	ft
Critical Depth	0.07	ft
Percent Full	6.7	%
Critical Slope	0.007595	ft/ft
Velocity	2.15	ft/s
Velocity Head	0.07	ft
Specific Energy	0.12	ft
Froude Number	2.18	
Maximum Discharge	2.5997	cfs
Discharge Full	2.4167	cfs
Slope Full	0.000003	ft/ft
Flow Type	Supercritical	

MH 7 TO MH 13
Worksheet for Circular Channel

Project Description	
Worksheet	MH7 - MH13
Flow Element	Circular Channel
Method	Manning's Formula
Solve For	Channel Depth

Input Data		
Mannings Coefficient	0.013	
Slope	0.112100	ft/ft
Diameter	8	in
Discharge	0.0234	cfs

Results		
Depth	0.04	ft
Flow Area	7.4e-3	ft²
Wetted Perimeter	0.31	ft
Top Width	0.30	ft
Critical Depth	0.07	ft
Percent Full	5.5	%
Critical Slope	0.007560	ft/ft
Velocity	3.16	ft/s
Velocity Head	0.15	ft
Specific Energy	0.19	ft
Froude Number	3.55	
Maximum Discharge	4.3520	cfs
Discharge Full	4.0457	cfs
Slope Full	0.000004	ft/ft
Flow Type	Supercritical	

MH 8 TO MH 9
Worksheet for Circular Channel

Project Description	
Worksheet	MH8 - MH9
Flow Element	Circular Channel
Method	Manning's Formula
Solve For	Channel Depth

Input Data		
Mannings Coefficient	0.013	
Slope	0.010000	ft/ft
Diameter	8	in
Discharge	0.0032	cfs

Results		
Depth	0.03	ft
Flow Area	4.3e-3	ft²
Wetted Perimeter	0.26	ft
Top Width	0.25	ft
Critical Depth	0.03	ft
Percent Full	3.8	%
Critical Slope	0.010133	ft/ft
Velocity	0.74	ft/s
Velocity Head	0.01	ft
Specific Energy	0.03	ft
Froude Number	1.00	
Maximum Discharge	1.2998	cfs
Discharge Full	1.2083	cfs
Slope Full	7.013207e-8	ft/ft
Flow Type	Supercritical	

MH 9 TO MH 10
Worksheet for Circular Channel

Project Description	
Worksheet	MH9 - MH10
Flow Element	Circular Channel
Method	Manning's Formula
Solve For	Channel Depth

Input Data		
Mannings Coefficient	0.013	
Slope	0.010000	ft/ft
Diameter	8	in
Discharge	0.0063	cfs

Results		
Depth	0.03	ft
Flow Area	6.9e-3	ft²
Wetted Perimeter	0.31	ft
Top Width	0.30	ft
Critical Depth	0.04	ft
Percent Full	5.2	%
Critical Slope	0.008863	ft/ft
Velocity	0.91	ft/s
Velocity Head	0.01	ft
Specific Energy	0.05	ft
Froude Number	1.06	
Maximum Discharge	1.2998	cfs
Discharge Full	1.2083	cfs
Slope Full	2.718303e-7	ft/ft
Flow Type	Supercritical	

MH 10 TO MH 11
Worksheet for Circular Channel

Project Description	
Worksheet	MH10 - MH11
Flow Element	Circular Channel
Method	Manning's Formula
Solve For	Channel Depth

Input Data		
Mannings Coefficient	0.013	
Slope	0.010000	ft/ft
Diameter	8	in
Discharge	0.0095	cfs

Results		
Depth	0.04	ft
Flow Area	9.2e-3	ft²
Wetted Perimeter	0.34	ft
Top Width	0.32	ft
Critical Depth	0.04	ft
Percent Full	6.3	%
Critical Slope	0.008417	ft/ft
Velocity	1.03	ft/s
Velocity Head	0.02	ft
Specific Energy	0.06	ft
Froude Number	1.08	
Maximum Discharge	1.2998	cfs
Discharge Full	1.2083	cfs
Slope Full	0.000001	ft/ft
Flow Type	Supercritical	

MH 11 TO MH 12
Worksheet for Circular Channel

Project Description	
Worksheet	MH11 - MH12
Flow Element	Circular Channel
Method	Manning's Formula
Solve For	Channel Depth

Input Data		
Mannings Coefficient	0.013	
Slope	0.010000	ft/ft
Diameter	8	in
Discharge	0.0127	cfs

Results		
Depth	0.05	ft
Flow Area	1.1e-2	ft²
Wetted Perimeter	0.36	ft
Top Width	0.35	ft
Critical Depth	0.05	ft
Percent Full	7.2	%
Critical Slope	0.008154	ft/ft
Velocity	1.13	ft/s
Velocity Head	0.02	ft
Specific Energy	0.07	ft
Froude Number	1.10	
Maximum Discharge	1.2998	cfs
Discharge Full	1.2083	cfs
Slope Full	0.000001	ft/ft
Flow Type	Supercritical	

MH 12 TO MH 13
Worksheet for Circular Channel

Project Description	
Worksheet	MH12 - MH13
Flow Element	Circular Channel
Method	Manning's Formula
Solve For	Channel Depth

Input Data		
Mannings Coefficient	0.013	
Slope	0.010000	ft/ft
Diameter	8	in
Discharge	0.0158	cfs

Results		
Depth	0.05	ft
Flow Area	1.3e-2	ft²
Wetted Perimeter	0.38	ft
Top Width	0.36	ft
Critical Depth	0.06	ft
Percent Full	8.0	%
Critical Slope	0.007802	ft/ft
Velocity	1.21	ft/s
Velocity Head	0.02	ft
Specific Energy	0.08	ft
Froude Number	1.12	
Maximum Discharge	1.2998	cfs
Discharge Full	1.2083	cfs
Slope Full	0.000002	ft/ft
Flow Type	Supercritical	

MH 13 TO MH 14
Worksheet for Circular Channel

Project Description	
Worksheet	MH13 - MH14
Flow Element	Circular Channel
Method	Manning's Formula
Solve For	Channel Depth

Input Data		
Mannings Coefficient	0.013	
Slope	0.020800	ft/ft
Diameter	8	in
Discharge	0.0392	cfs

Results		
Depth	0.07	ft
Flow Area	1.9e-2	ft²
Wetted Perimeter	0.44	ft
Top Width	0.41	ft
Critical Depth	0.09	ft
Percent Full	10.4	%
Critical Slope	0.007021	ft/ft
Velocity	2.05	ft/s
Velocity Head	0.07	ft
Specific Energy	0.13	ft
Froude Number	1.66	
Maximum Discharge	1.8746	cfs
Discharge Full	1.7427	cfs
Slope Full	0.000011	ft/ft
Flow Type	Supercritical	

MH 14 TO MH 20
Worksheet for Circular Channel

Project Description	
Worksheet	MH14 - MH20
Flow Element	Circular Channel
Method	Manning's Formula
Solve For	Channel Depth

Input Data		
Mannings Coefficient	0.013	
Slope	0.022000	ft/ft
Diameter	8	in
Discharge	0.0392	cfs

Results		
Depth	0.07	ft
Flow Area	1.9e-2	ft²
Wetted Perimeter	0.43	ft
Top Width	0.40	ft
Critical Depth	0.09	ft
Percent Full	10.2	%
Critical Slope	0.007021	ft/ft
Velocity	2.09	ft/s
Velocity Head	0.07	ft
Specific Energy	0.14	ft
Froude Number	1.71	
Maximum Discharge	1.9280	cfs
Discharge Full	1.7923	cfs
Slope Full	0.000011	ft/ft
Flow Type	Supercritical	

MH 15 TO MH 16
Worksheet for Circular Channel

Project Description		
Worksheet	MH15 - MH16	
Flow Element	Circular Channel	
Method	Manning's Formula	
Solve For	Channel Depth	

Input Data		
Mannings Coefficient	0.013	
Slope	0.040000	ft/ft
Diameter	8	in
Discharge	0.0046	cfs

Results		
Depth	0.02	ft
Flow Area	3.4e-3	ft²
Wetted Perimeter	0.24	ft
Top Width	0.24	ft
Critical Depth	0.03	ft
Percent Full	3.3	%
Critical Slope	0.009588	ft/ft
Velocity	1.34	ft/s
Velocity Head	0.03	ft
Specific Energy	0.05	ft
Froude Number	1.95	
Maximum Discharge	2.5997	cfs
Discharge Full	2.4167	cfs
Slope Full	1.449214e-7	ft/ft
Flow Type	Supercritical	

MH 16 TO MH 17
Worksheet for Circular Channel

Project Description	
Worksheet	MH16 - MH17
Flow Element	Circular Channel
Method	Manning's Formula
Solve For	Channel Depth

Input Data		
Mannings Coefficient	0.013	
Slope	0.030000	ft/ft
Diameter	8	in
Discharge	0.0078	cfs

Results		
Depth	0.03	ft
Flow Area	5.5e-3	ft²
Wetted Perimeter	0.28	ft
Top Width	0.27	ft
Critical Depth	0.04	ft
Percent Full	4.4	%
Critical Slope	0.008578	ft/ft
Velocity	1.43	ft/s
Velocity Head	0.03	ft
Specific Energy	0.06	ft
Froude Number	1.78	
Maximum Discharge	2.2514	cfs
Discharge Full	2.0929	cfs
Slope Full	4.166831e-7	ft/ft
Flow Type	Supercritical	

MH 17 TO MH 18
Worksheet for Circular Channel

Project Description	
Worksheet	MH17 - MH18
Flow Element	Circular Channel
Method	Manning's Formula
Solve For	Channel Depth

Input Data		
Mannings Coefficient	0.013	
Slope	0.010000	ft/ft
Diameter	8	in
Discharge	0.0109	cfs

Results		
Depth	0.04	ft
Flow Area	1.0e-2	ft²
Wetted Perimeter	0.35	ft
Top Width	0.33	ft
Critical Depth	0.05	ft
Percent Full	6.7	%
Critical Slope	0.008360	ft/ft
Velocity	1.08	ft/s
Velocity Head	0.02	ft
Specific Energy	0.06	ft
Froude Number	1.09	
Maximum Discharge	1.2998	cfs
Discharge Full	1.2083	cfs
Slope Full	0.000001	ft/ft
Flow Type	Supercritical	

MH 18 TO MH 19
Worksheet for Circular Channel

Project Description	
Worksheet	MH18 - MH19
Flow Element	Circular Channel
Method	Manning's Formula
Solve For	Channel Depth

Input Data		
Mannings Coefficient	0.013	
Slope	0.010000	ft/ft
Diameter	8	in
Discharge	0.0141	cfs

Results		
Depth	0.05	ft
Flow Area	1.2e-2	ft²
Wetted Perimeter	0.37	ft
Top Width	0.35	ft
Critical Depth	0.05	ft
Percent Full	7.6	%
Critical Slope	0.007859	ft/ft
Velocity	1.17	ft/s
Velocity Head	0.02	ft
Specific Energy	0.07	ft
Froude Number	1.11	
Maximum Discharge	1.2998	cfs
Discharge Full	1.2083	cfs
Slope Full	0.000001	ft/ft
Flow Type	Supercritical	

MH 19 TO MH 20
Worksheet for Circular Channel

Project Description		
Worksheet	MH19 - MH20	
Flow Element	Circular Channel	
Method	Manning's Formula	
Solve For	Channel Depth	

Input Data		
Mannings Coefficient	0.013	
Slope	0.021700	ft/ft
Diameter	8	in
Discharge	0.0141	cfs

Results		
Depth	0.04	ft
Flow Area	9.2e-3	ft²
Wetted Perimeter	0.34	ft
Top Width	0.32	ft
Critical Depth	0.05	ft
Percent Full	6.3	%
Critical Slope	0.007859	ft/ft
Velocity	1.53	ft/s
Velocity Head	0.04	ft
Specific Energy	0.08	ft
Froude Number	1.59	
Maximum Discharge	1.9148	cfs
Discharge Full	1.7800	cfs
Slope Full	0.000001	ft/ft
Flow Type	Supercritical	

MH 20 TO MH 21
Worksheet for Circular Channel

Project Description	
Worksheet	MH20 - MH21
Flow Element	Circular Channel
Method	Manning's Formula
Solve For	Channel Depth

Input Data		
Mannings Coefficient	0.013	
Slope	0.020000	ft/ft
Diameter	8	in
Discharge	0.0533	cfs

Results		
Depth	0.08	ft
Flow Area	2.4e-2	ft²
Wetted Perimeter	0.47	ft
Top Width	0.44	ft
Critical Depth	0.10	ft
Percent Full	12.1	%
Critical Slope	0.006852	ft/ft
Velocity	2.22	ft/s
Velocity Head	0.08	ft
Specific Energy	0.16	ft
Froude Number	1.66	
Maximum Discharge	1.8382	cfs
Discharge Full	1.7089	cfs
Slope Full	0.000019	ft/ft
Flow Type	Supercritical	

MH 21 TO MH 22
Worksheet for Circular Channel

Project Description	
Worksheet	MH21 - MH22
Flow Element	Circular Channel
Method	Manning's Formula
Solve For	Channel Depth

Input Data		
Mannings Coefficient	0.013	
Slope	0.030000	ft/ft
Diameter	8	in
Discharge	0.0533	cfs

Results		
Depth	0.07	ft
Flow Area	2.1e-2	ft²
Wetted Perimeter	0.45	ft
Top Width	0.42	ft
Critical Depth	0.10	ft
Percent Full	11.0	%
Critical Slope	0.006852	ft/ft
Velocity	2.55	ft/s
Velocity Head	0.10	ft
Specific Energy	0.17	ft
Froude Number	2.01	
Maximum Discharge	2.2514	cfs
Discharge Full	2.0929	cfs
Slope Full	0.000019	ft/ft
Flow Type	Supercritical	

MH 22 TO MH 23
Worksheet for Circular Channel

Project Description		
Worksheet	MH22 - MH23	
Flow Element	Circular Channel	
Method	Manning's Formula	
Solve For	Channel Depth	

Input Data		
Mannings Coefficient	0.013	
Slope	0.100000	ft/ft
Diameter	8	in
Discharge	0.0533	cfs

Results		
Depth	0.06	ft
Flow Area	1.4e-2	ft²
Wetted Perimeter	0.39	ft
Top Width	0.37	ft
Critical Depth	0.10	ft
Percent Full	8.3	%
Critical Slope	0.006852	ft/ft
Velocity	3.89	ft/s
Velocity Head	0.24	ft
Specific Energy	0.29	ft
Froude Number	3.55	
Maximum Discharge	4.1104	cfs
Discharge Full	3.8211	cfs
Slope Full	0.000019	ft/ft
Flow Type	Supercritical	

MH 23 TO MH 24
Worksheet for Circular Channel

Project Description	
Worksheet	MH23 - MH24
Flow Element	Circular Channel
Method	Manning's Formula
Solve For	Channel Depth

Input Data		
Mannings Coefficient	0.013	
Slope	0.080000	ft/ft
Diameter	8	in
Discharge	0.0533	cfs

Results		
Depth	0.06	ft
Flow Area	1.5e-2	ft²
Wetted Perimeter	0.40	ft
Top Width	0.38	ft
Critical Depth	0.10	ft
Percent Full	8.7	%
Critical Slope	0.006852	ft/ft
Velocity	3.60	ft/s
Velocity Head	0.20	ft
Specific Energy	0.26	ft
Froude Number	3.19	
Maximum Discharge	3.6765	cfs
Discharge Full	3.4177	cfs
Slope Full	0.000019	ft/ft
Flow Type	Supercritical	

MH 24 TO MH 25
Worksheet for Circular Channel

Project Description	
Worksheet	MH24 - MH25
Flow Element	Circular Channel
Method	Manning's Formula
Solve For	Channel Depth

Input Data		
Mannings Coefficient	0.013	
Slope	0.020000	ft/ft
Diameter	8	in
Discharge	0.0533	cfs

Results		
Depth	0.08	ft
Flow Area	2.4e-2	ft²
Wetted Perimeter	0.47	ft
Top Width	0.44	ft
Critical Depth	0.10	ft
Percent Full	12.1	%
Critical Slope	0.006852	ft/ft
Velocity	2.22	ft/s
Velocity Head	0.08	ft
Specific Energy	0.16	ft
Froude Number	1.66	
Maximum Discharge	1.8382	cfs
Discharge Full	1.7089	cfs
Slope Full	0.000019	ft/ft
Flow Type	Supercritical	

MH 25 TO MH 26
Worksheet for Circular Channel

Project Description	
Worksheet	MH25 - MH26
Flow Element	Circular Channel
Method	Manning's Formula
Solve For	Channel Depth

Input Data		
Mannings Coefficient	0.013	
Slope	0.080000	ft/ft
Diameter	8	in
Discharge	0.0533	cfs

Results		
Depth	0.06	ft
Flow Area	1.5e-2	ft²
Wetted Perimeter	0.40	ft
Top Width	0.38	ft
Critical Depth	0.10	ft
Percent Full	8.7	%
Critical Slope	0.006852	ft/ft
Velocity	3.60	ft/s
Velocity Head	0.20	ft
Specific Energy	0.26	ft
Froude Number	3.19	
Maximum Discharge	3.6765	cfs
Discharge Full	3.4177	cfs
Slope Full	0.000019	ft/ft
Flow Type	Supercritical	

MH 26 TO MH 27
Worksheet for Circular Channel

Project Description	
Worksheet	MH26 - MH27
Flow Element	Circular Channel
Method	Manning's Formula
Solve For	Channel Depth

Input Data		
Mannings Coefficient	0.013	
Slope	0.040000	ft/ft
Diameter	8	in
Discharge	0.0533	cfs

Results		
Depth	0.07	ft
Flow Area	1.9e-2	ft²
Wetted Perimeter	0.43	ft
Top Width	0.40	ft
Critical Depth	0.10	ft
Percent Full	10.3	%
Critical Slope	0.006852	ft/ft
Velocity	2.82	ft/s
Velocity Head	0.12	ft
Specific Energy	0.19	ft
Froude Number	2.30	
Maximum Discharge	2.5997	cfs
Discharge Full	2.4167	cfs
Slope Full	0.000019	ft/ft
Flow Type	Supercritical	

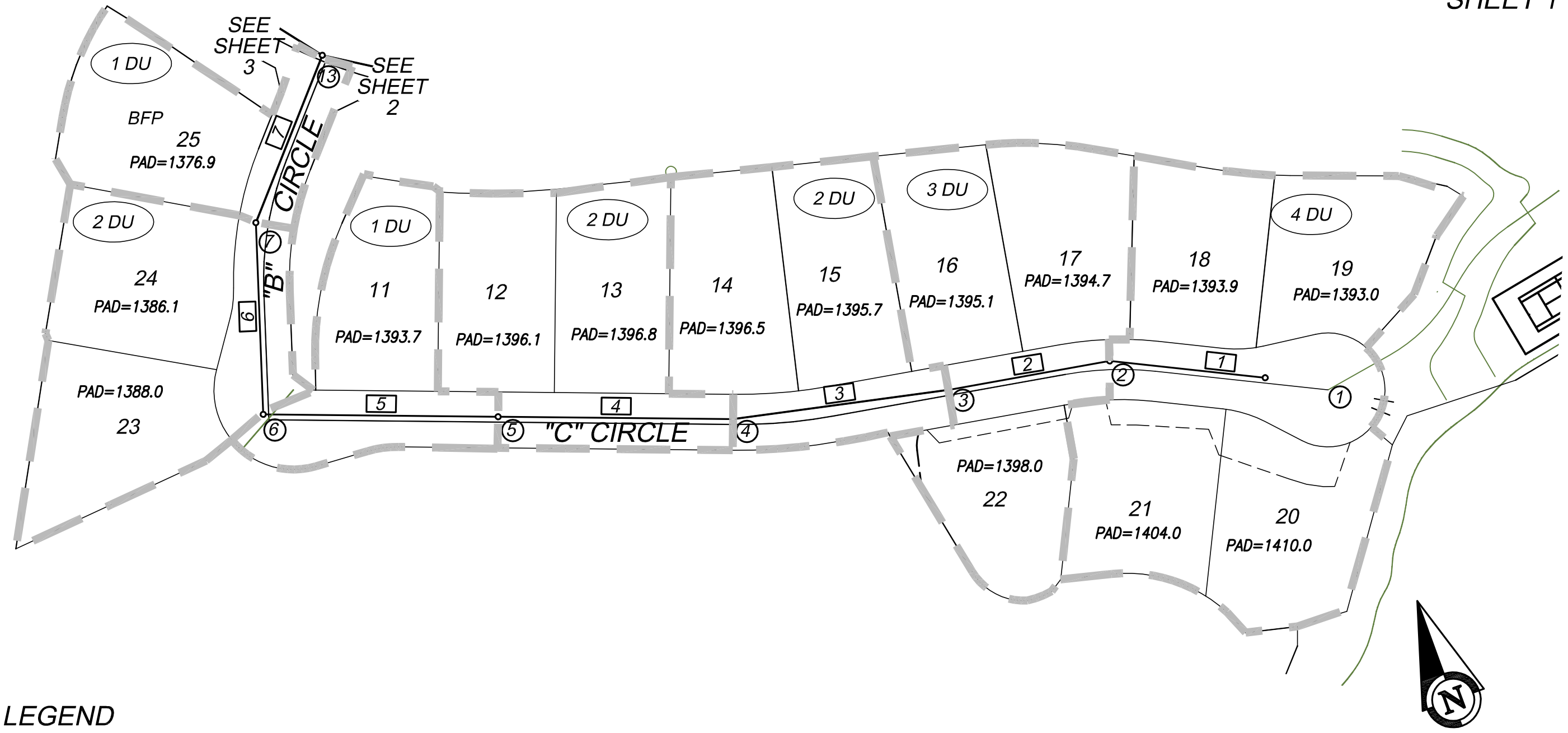
MH 27 TO MH (28)
Worksheet for Circular Channel

Project Description	
Worksheet	MH27 - (MH28)
Flow Element	Circular Channel
Method	Manning's Formula
Solve For	Channel Depth

Input Data		
Mannings Coefficient	0.013	
Slope	0.153400	ft/ft
Diameter	8	in
Discharge	0.0533	cfs

Results		
Depth	0.05	ft
Flow Area	1.2e-2	ft²
Wetted Perimeter	0.37	ft
Top Width	0.35	ft
Critical Depth	0.10	ft
Percent Full	7.5	%
Critical Slope	0.006852	ft/ft
Velocity	4.51	ft/s
Velocity Head	0.32	ft
Specific Energy	0.37	ft
Froude Number	4.33	
Maximum Discharge	5.0909	cfs
Discharge Full	4.7326	cfs
Slope Full	0.000019	ft/ft
Flow Type	Supercritical	

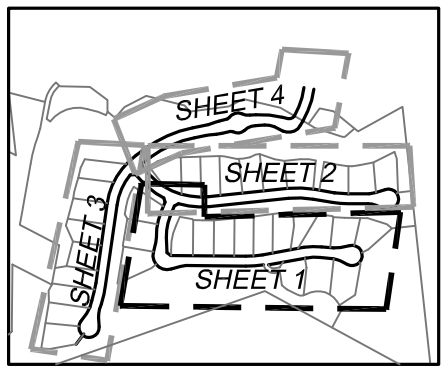
Appendix “B”



LEGEND

[X]	PIPE NUMBER
(X)	NODE NUMBER
X DU	MAXIMUM DWELLING UNITS PER SEWER REACH
— —	SERVICE AREA
BFP	SEWAGE BACKFLOW PREVENTOR

NODE	RIM ELEV. (ft)	U.S. INV. ELEV. (ft)	D.S. INV. ELEV. (ft)
(1)	1390.93	–	1384.17
(2)	1391.79	1382.76	1382.66
(3)	1392.71	1381.18	1381.08
(4)	1394.13	1379.11	1379.01
(5)	1393.82	1376.87	1376.77
(6)	1386.64	1371.09	1370.89
(7)	1376.62	1363.95	1363.85
(13)	1366.16	1345.63	1345.43



KEY MAP

SCALE 1" = 100 '

SEWER STUDY
FOR
TRACT 34760

PREPARED BY:
ARMSTRONG & BROOKS CONSULTING ENGINEERS
PLANNING - INFRASTRUCTURE - SITE DEVELOPMENT - WATER RESOURCES
1580 CONSUMER CIRCLE, SUITE B - CORONA, CA 92880
P: 951 - 872 - 8400 F: 951 - 872 - 8490

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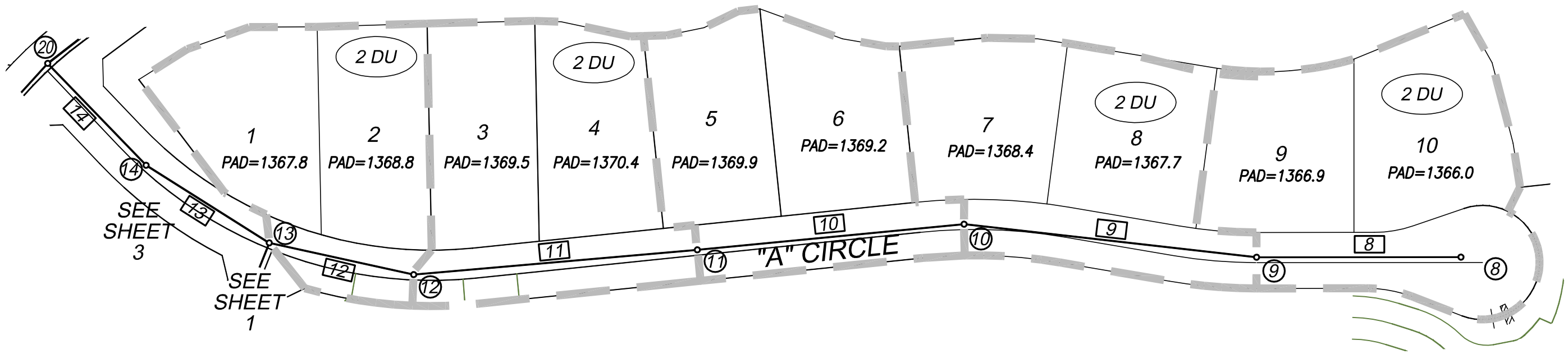
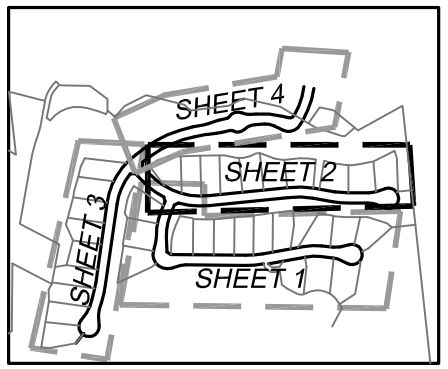


SCALE 1" = 100 '

LEGEND

[X]	PIPE NUMBER
(X)	NODE NUMBER
X DU	MAXIMUM DWELLING UNITS PER SEWER REACH
	SERVICE AREA
BFP	SEWAGE BACKFLOW PREVENTOR

NODE	RIM ELEV. (ft)	U.S. INV. ELEV. (ft)	D.S. INV. ELEV. (ft)
(8)	1363.67	–	1356.91
(9)	1364.32	1355.06	1354.96
(10)	1365.96	1352.28	1352.18
(11)	1367.45	1349.74	1349.64
(12)	1367.24	1347.05	1346.95
(13)	1366.16	1345.63	1345.43
(14)	1360.08	1342.73	1342.63
(20)	1356.01	1339.80	1339.60



KEY MAP

SEWER STUDY
FOR
TRACT 34760

PREPARED BY:
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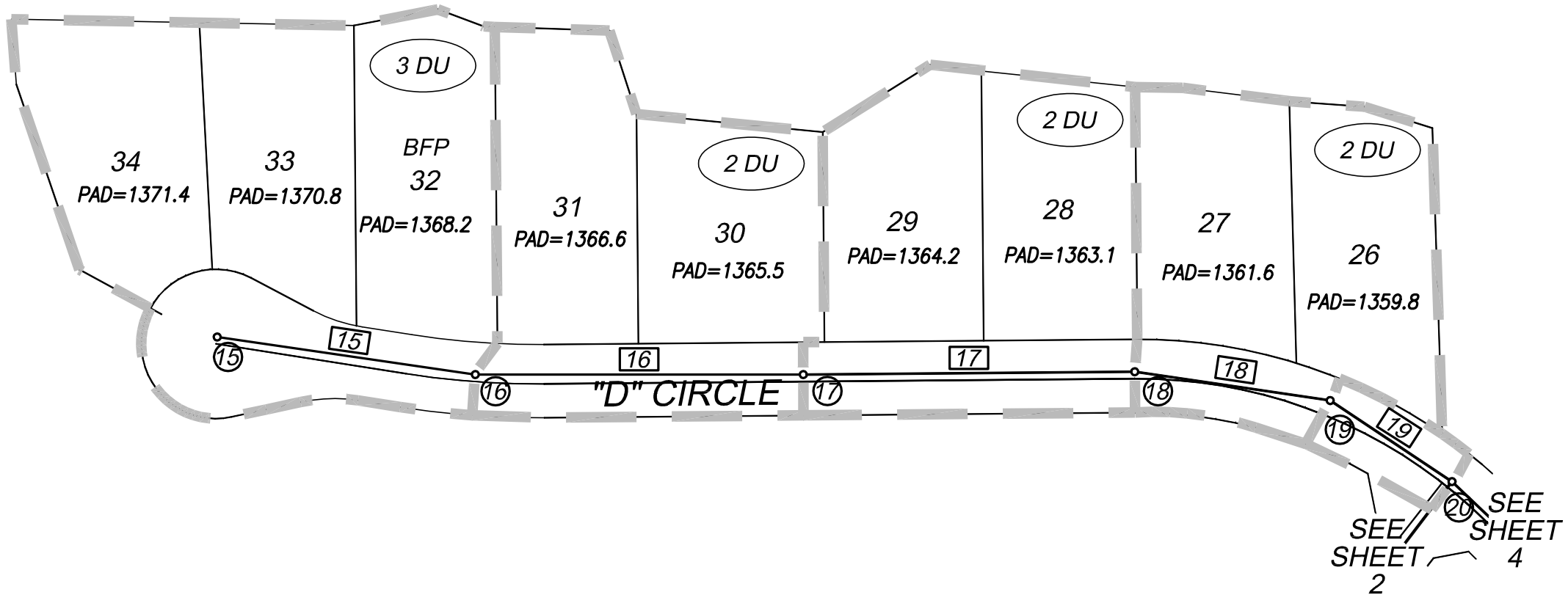
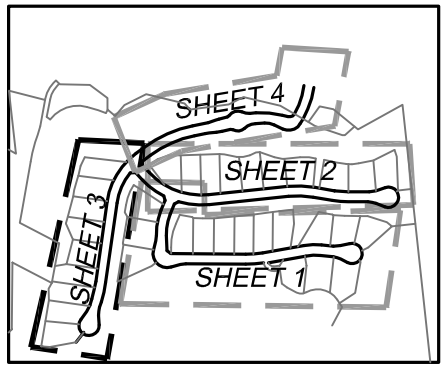
PLANNING - INFRASTRUCTURE - SITE DEVELOPMENT - WATER RESOURCES
1580 CONSUMER CIRCLE, SUITE B - CORONA, CA 92880
P: 951 - 872 - 8400 F: 951 - 872 - 8490



LEGEND

[X]	PIPE NUMBER
(X)	NODE NUMBER
X DU	MAXIMUM DWELLING UNITS PER SEWER REACH
	SERVICE AREA
BFP	SEWAGE BACKFLOW PREVENTOR

NODE	RIM ELEV. (ft)	U.S. INV. ELEV. (ft)	D.S. INV. ELEV. (ft)
15	1369.13	–	1360.13
16	1365.19	1352.93	1352.83
17	1362.57	1346.00	1345.80
18	1359.62	1343.50	1343.40
19	1357.56	1342.05	1341.95
20	1356.01	1339.80	1339.60



KEY MAP

N

SCALE 1" = 100 '

SEWER STUDY
FOR
TRACT 34760

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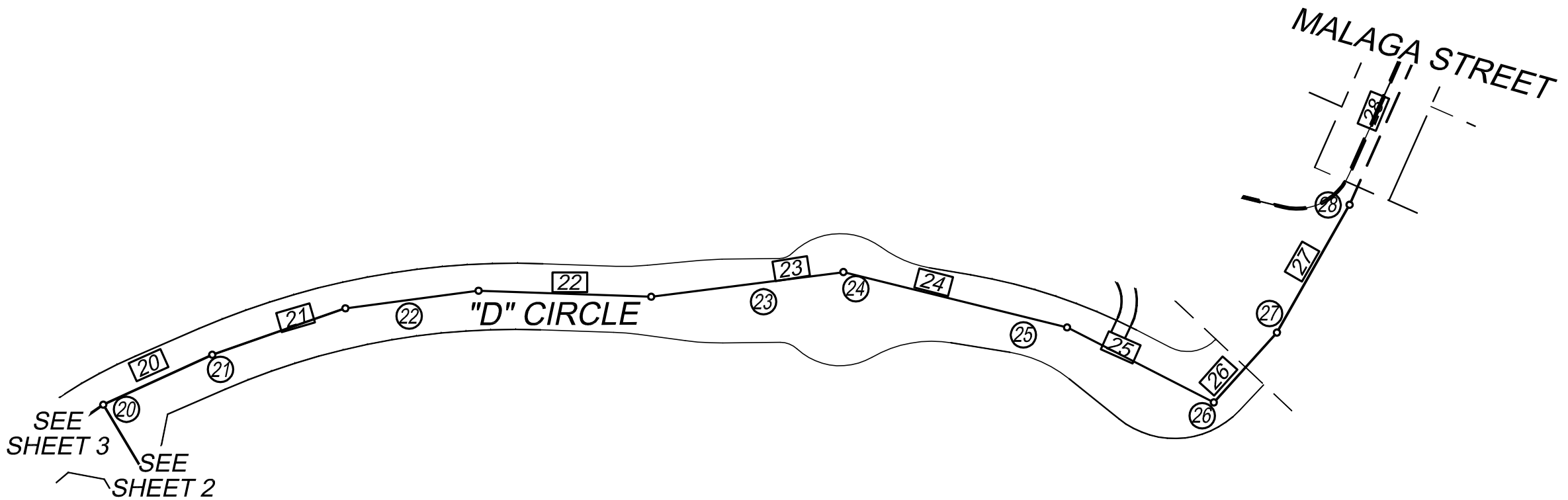
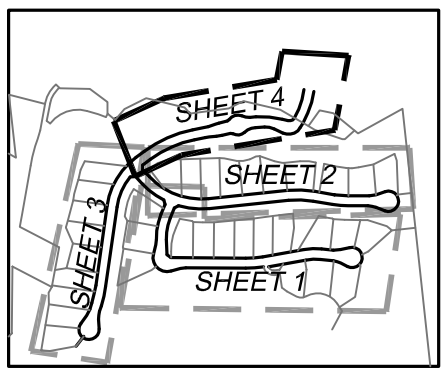


LEGEND

[X]	PIPE NUMBER
(X)	NODE NUMBER
X DU	MAXIMUM DWELLING UNITS PER SEWER REACH
	SERVICE AREA
BFP	SEWAGE BACKFLOW PREVENTOR

NODE	RIM ELEV. (ft)	U.S. INV. ELEV. (ft)	D.S. INV. ELEV. (ft)
(20)	1356.01	1339.80	1339.60
(21)	1353.92	1337.93	1337.83
(22)	1344.00	1333.32	1333.22
(23)	1318.00	1306.18	1306.08
(24)	1315.58	1300.16	1300.06
(25)	1308.92	1297.34	1297.24
(26)	1295.64	1284.09	1283.89
(27)	1289.81	1281.13	1281.03
(28)	1276.35	1263.85	1264.05



KEY MAP

N

SCALE 1" = 100 '

SEWER STUDY
FOR
TRACT 34760

PREPARED BY:
ARMSTRONG & BROOKS CONSULTING ENGINEERS
PLANNING - INFRASTRUCTURE - SITE DEVELOPMENT - WATER RESOURCES
1580 CONSUMER CIRCLE, SUITE B - CORONA, CA 92880
P: 951 - 872 - 8400 F: 951 - 872 - 8490

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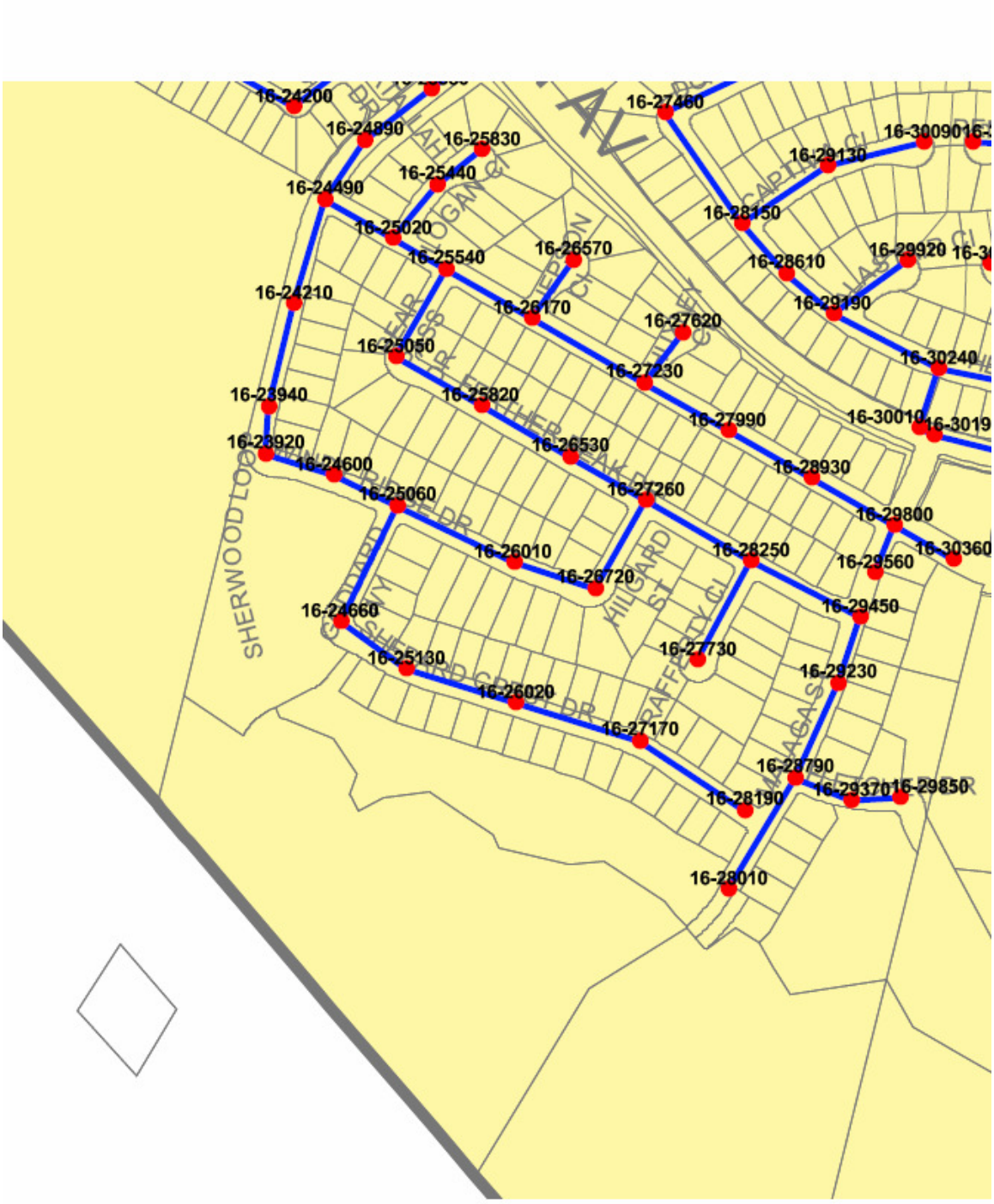
Appendix “C”

2005 SEWER MASTER PLAN PIPE NETWORK - MALAGA ST..



2005 SEWER MASTER PLAN PIPE NETWORK - BUENA VISTA AVE.

Appendix 3
Existing Hydraulic Model Results (Sewer Master Plan - 9/05)

Pipe Model ID	U/S MH Model ID	D/S MH Model ID	Pipe Dia (in)	Length (ft)	Slope	Average Flow (cfs)	Pumped Flow (cfs)	Total Peak Dry Weather Flow (cfs)	Peak Dry Weather Velocity (ft/s)	Peak Dry Weather d/D	Full Flow (cfs)
6061	16-29240	16-29430	8	342	0.0645	0.2512	0.0000	0.5471	6.66	0.29	3.0761
6060	16-29430	16-29470	8	101	0.0038	0.2905	0.0000	0.6254	2.38	0.70	0.7432
6059	16-29470	16-29520	8	154	0.0071	0.3170	0.0000	0.6777	3.13	0.60	1.0193
6073	16-29520	16-29710	10	340	0.0400	0.3209	0.0000	0.6853	5.86	0.27	4.3936

Notes: Depth of flow in Pipe Model ID No.s 6060 & 6059 exceeds City design criteria
Slope of PM ID No. 6060 does not meet City design criteria for 8" pipe

Appendix 3
Adjusted - Existing Hydraulic Model Results

Pipe Model ID	U/S MH Model ID	D/S MH Model ID	Pipe Dia (in)	Length (ft)	Slope	Average Flow (cfs)	Pumped Flow (cfs)	Total Peak Dry Weather Flow (cfs)	Peak Dry Weather Velocity (ft/s)	Peak Dry Weather d/D	Full Flow (cfs)
6060	16-29430	16-29470	8	101	0.0038	0.2905	0.0000	0.6787	2.43	0.73	0.7432
6059	16-29470	16-29520	8	154	0.0071	0.3170	0.0000	0.7310	3.18	0.61	1.0193

Notes: Data for Pipe Model ID No.s 6060 & 6059 has been adjusted to reflect proposed project flows.

Worksheet
Worksheet for Circular Channel

Project Description	
Worksheet	MH16-29430 - MH16-29470 (EXISTING)
Flow Element	Circular Channel
Method	Manning's Formula
Solve For	Channel Depth

Input Data		
Mannings Coefficient	0.013	
Slope	0.003800	ft/ft
Diameter	8	in
Discharge	0.6787	cfs

Results		
Depth	0.49	ft
Flow Area	0.3	ft²
Wetted Perimeter	1.38	ft
Top Width	0.60	ft
Critical Depth	0.39	ft
Percent Full	73.0	%
Critical Slope	0.007538	ft/ft
Velocity	2.43	ft/s
Velocity Head	0.09	ft
Specific Energy	0.58	ft
Froude Number	0.63	
Maximum Discharge	0.8267	cfs
Discharge Full	0.7686	cfs
Slope Full	0.002963	ft/ft
Flow Type	Subcritical	

Worksheet
Worksheet for Circular Channel

Project Description	
Worksheet	MH16-29470 - MH16-26520 (EXISTING)
Flow Element	Circular Channel
Method	Manning's Formula
Solve For	Channel Depth

Input Data		
Mannings Coefficient	0.013	
Slope	0.007100	ft/ft
Diameter	8	in
Discharge	0.7310	cfs

Results		
Depth	0.41	ft
Flow Area	0.2	ft^2
Wetted Perimeter	1.21	ft
Top Width	0.66	ft
Critical Depth	0.40	ft
Percent Full	61.4	%
Critical Slope	0.007750	ft/ft
Velocity	3.18	ft/s
Velocity Head	0.16	ft
Specific Energy	0.57	ft
Froude Number	0.95	
Maximum Discharge	1.1301	cfs
Discharge Full	1.0505	cfs
Slope Full	0.003438	ft/ft
Flow Type	Subcritical	

Appendix 3
Ultimate Hydraulic Model Results (Sewer Master Plan - 9/05)

Pipe Model ID	U/S MH Model ID	D/S MH Model ID	Pipe Dia (in)	Length (ft)	Slope	Average Flow (cfs)	Pumped Flow (cfs)	Total Peak Dry Weather Flow (cfs)	Peak Dry Weather Velocity (ft/s)	Peak Dry Weather d/D	Full Flow (cfs)
6061	16-29240	16-29430	8	342	0.0645	0.3979	0.0000	0.8353	7.50	0.36	3.0761
6060	16-29430	16-29470	8	101	0.0038	0.4471	0.0000	0.9299	2.66	1.00	0.7432
6059	16-29470	16-29520	8	154	0.0071	0.4726	0.0000	0.9785	3.33	0.79	1.0193
6073	16-29520	16-29710	10	340	0.0400	0.4755	0.0000	0.9841	6.49	0.32	4.3936

Notes: Depth of flow in Pipe Model ID No.s 6060 & 6059 exceeds City design criteria
Slope of PM ID No. 6060 does not meet City design criteria for 8" pipe

Appendix 3
Adjusted - Ultimate Hydraulic Model Results

Pipe Model ID	U/S MH Model ID	D/S MH Model ID	Pipe Dia (in)	Length (ft)	Slope	Average Flow (cfs)	Pumped Flow (cfs)	Total Peak Dry Weather Flow (cfs)	Peak Dry Weather Velocity (ft/s)	Peak Dry Weather d/D	Full Flow (cfs)
6060	16-29430	16-29470	8	101	0.0038	0.4471	0.0000	0.8816	2.15	1.00	0.7432
6059	16-29470	16-29520	8	154	0.0071	0.4726	0.0000	0.9302	3.32	0.73	1.0193

Notes: Data for Pipe Model ID No.s 6060 & 6059 has been adjusted to reflect underbuilding by proposed project.

Worksheet
Worksheet for Circular Channel

Project Description	
Worksheet	MH16-29430 - MH16-29470
Flow Element	Circular Channel
Method	Manning's Formula
Solve For	Full Flow Capacity

Input Data		
Mannings Coefficient	0.013	
Slope	0.003800	ft/ft
Diameter	8	in

Results		
Depth	0.67	ft
Discharge	0.7686	cfs
Flow Area	0.4	ft^2
Wetted Perimeter	2.12	ft
Top Width	0.00	ft
Critical Depth	0.41	ft
Percent Full	100.0	%
Critical Slope	0.007902	ft/ft
Velocity	2.15	ft/s
Velocity Head	0.07	ft
Specific Energy	0.75	ft
Froude Number	0.00	
Maximum Discharge	0.8267	cfs
Discharge Full	0.7686	cfs
Slope Full	0.003800	ft/ft
Flow Type	N/A	

Worksheet
Worksheet for Circular Channel

Project Description	
Worksheet	MH16-29470 - MH16-26520
Flow Element	Circular Channel
Method	Manning's Formula
Solve For	Channel Depth

Input Data		
Mannings Coefficient	0.013	
Slope	0.007100	ft/ft
Diameter	8	in
Discharge	0.9302	cfs

Results		
Depth	0.49	ft
Flow Area	0.3	ft²
Wetted Perimeter	1.38	ft
Top Width	0.60	ft
Critical Depth	0.46	ft
Percent Full	73.2	%
Critical Slope	0.008722	ft/ft
Velocity	3.32	ft/s
Velocity Head	0.17	ft
Specific Energy	0.66	ft
Froude Number	0.85	
Maximum Discharge	1.1301	cfs
Discharge Full	1.0505	cfs
Slope Full	0.005566	ft/ft
Flow Type	Subcritical	

Appendix 1
Sewer Database

U/S MH City Atlas ID	Pipe Model ID	U/S MH Model ID	D/S MH Model ID	U/S Model Invert (ft)	D/S Model Invert (ft)	Length (ft)	Diameter (in)	Pipe Material	Street Location
8029	5863	16-29230	16-29450	1227.69	1219.56	183	8	TRUSS	MALAGA ST
3678	6061	16-29240	16-29430	980.05	957.99	342	8	VCP	BUENA VISTA AV
3616	4257	16-29250	16-29390	918.03	910.10	210	8	VCP	SENA ST
3612	4166	16-29260	16-29310	907.73	907.58	19	8	VCP	MONTOYA DR
5976	7520	16-29270	16-29120	1138.06	1135.20	169	8	DIP	
3611	4193	16-29290	16-29260	909.24	907.93	135	8	VCP	
3610	4172	16-29310	16-30260	907.38	904.87	255	8	VCP	MONTOYA DR
3391	2523	16-29330	16-30230	722.70	721.84	245	8	VCP	
3472	3120	16-29340	16-30400	785.07	783.88	328	8	VCP	CRESTVIEW ST
5922	6901	16-29350	16-29170	991.55	990.82	63	8	VCP	BRIARHAVEN LN
8031	5865	16-29370	16-28790	1246.69	1240.20	158	8	TRUSS	FLETCHER DR
3617	4207	16-29390	16-29290	909.90	909.34	70	8	VCP	SENA ST
8264	6788	16-29400	16-30100	1128.23	1126.25	198	8	TRUSS	SAINT JAMES DR
7768	5432	16-29410	16-29150	1058.60	1042.72	306	8	TRUSS	SUNDOWN LN
3237	1774	16-29420	16-29690	647.40	646.00	99	12	VCP	
3679	6060	16-29430	16-29470	957.89	957.51	101	8	VCP	BUENA VISTA AV
3374	2729	16-29440	16-30520	750.96	750.06	340	8	VCP	OLIVE ST
8028	5861	16-29450	16-28250	1219.36	1208.32	327	8	TRUSS	PEATHER PEAK DR
5930	6911	16-29460	16-30390	1019.20	1016.89	231	8	VCP	CRESTMONT CI
3680	6059	16-29470	16-29520	957.41	956.32	154	8	VCP	BUENA VISTA AV
7757	6485	16-29480	16-28770	1083.53	1063.58	346	8	TRUSS	ROWENA DR
3219	1515	16-29490	16-29570	621.51	619.16	280	8	VCP	LINCOLN AVE
3568	3880	16-29500	16-28220	866.02	864.84	300	8	TRUSS	
3332	2180	16-29510	16-30830	688.20	683.62	404	8	VCP	
3681	6073	16-29520	16-29710	956.22	942.62	340	10	VCP	BUENA VISTA AV
3321	2044	16-29530	16-30580	675.75	670.65	330	8	VCP	SIXTH ST
8019	5851	16-29560	16-29800	1223.96	1222.60	130	8	TRUSS	MALAGA ST
3218	1451	16-29570	16-29790	619.04	613.10	300	8	VCP	LINCOLN AVE

Appendix 3
Ultimate Hydraulic Model Results

Pipe Model ID	U/S MH Model ID	D/S MH Model ID	Pipe Dia (in)	Length (ft)	Slope	Average Flow (cfs)	Pumped Flow (cfs)	Total Peak Dry Weather Flow (cfs)	Peak Dry Weather Velocity (ft/s)	Peak Dry Weather d/D	Full Flow (cfs)
5781	16-27820	16-27950	8	300	0.0284	0.1415	0.0000	0.3227	4.27	0.27	2.0418
6892	16-27830	16-26910	8	246	0.0100	0.0038	0.0000	0.0117	1.10	0.07	1.2116
4219	16-27850	16-28490	8	174	0.0122	0.0052	0.0000	0.0154	1.28	0.08	1.3359
2252	16-27860	16-28870	8	240	0.0078	0.0013	0.0000	0.0042	0.74	0.05	1.0723
4454	16-27870	16-27270	8	200	0.0272	0.0028	0.0000	0.0086	1.43	0.05	1.9982
6092	16-27870	16-27770	8	298	0.0425	0.0000	0.0000	0.0000	0.00	0.00	2.4973
4043	16-27880	16-28880	8	242	0.0076	0.0025	0.0000	0.0078	0.88	0.06	1.0565
6082	16-27900	16-28100	8	38	0.0026	0.0166	0.0000	0.0450	1.04	0.18	0.6224
6894	16-27910	16-27090	8	246	0.0100	0.0039	0.0000	0.0118	1.10	0.07	1.2116
6490	16-27920	16-27790	8	45	0.0101	0.3146	0.0000	0.6730	3.57	0.53	1.2171
1147	16-27930	16-27560	8	300	0.0100	0.0068	0.0000	0.0196	1.29	0.09	1.2116
5778	16-27950	16-28030	10	63	0.0540	0.2259	0.0000	0.4962	5.93	0.21	5.1033
2079	16-27970	16-29720	8	438	0.0128	0.0015	0.0000	0.0048	0.92	0.04	1.3700
5883	16-27990	16-27230	8	257	0.0576	0.0091	0.0000	0.0258	2.58	0.07	2.9078
989	16-28000	16-25610	42	770	0.0010	6.8034	3.9684	15.3484	3.33	0.48	32.5166
5864	16-28010	16-28790	8	349	0.0683	0.0403	0.0000	0.1016	4.14	0.12	3.1662
2989	16-28020	16-28090	8	144	0.0216	0.0013	0.0000	0.0043	1.06	0.04	1.7793
2013	16-28030	16-28210	10	351	0.0207	0.2425	0.0000	0.5297	4.30	0.28	3.1580
6898	16-28050	16-26810	8	346	0.0100	0.0087	0.0000	0.0247	1.38	0.10	1.2116
2631	16-28060	16-26830	8	340	0.0039	0.0061	0.0000	0.0178	0.91	0.11	0.7606
7284	16-28070	16-28600	8	279	0.0756	0.0032	0.0000	0.0098	2.11	0.04	3.3322
4399	16-28080	16-28340	8	57	0.0092	0.0435	0.0000	0.1090	2.09	0.21	1.1644
5171	16-28090	16-28320	8	300	0.0215	0.0031	0.0000	0.0097	1.36	0.05	1.7765
2718	16-28100	16-29440	8	340	0.0027	0.0184	0.0000	0.0494	1.08	0.19	0.6302
8085	16-28120	16-28280	10	52	0.0962	0.0059	0.0000	0.0172	2.64	0.04	6.8119
7749	16-28140	16-28160	10	89	0.0028	0.0000	0.0000	0.0000	0.00	0.00	1.1661
6272	16-28150	16-27460	8	364	0.0395	0.0553	0.0000	0.1358	3.73	0.16	2.4083
3893	16-28160	16-28220	10	106	0.0366	0.0008	0.0000	0.0027	1.06	0.02	4.2030
6786	16-28170	16-28970	8	201	0.0045	0.1778	0.0000	0.3981	2.32	0.49	0.8145

Appendix 1
Sewer Database

U/S MH City Atlas ID	Pipe Model ID	U/S MH Model ID	D/S MH Model ID	U/S Model Invert (ft)	D/S Model Invert (ft)	Length (ft)	Diameter (in)	Pipe Material	Street Location
3329	2079	16-27970	16-29720	686.86	681.26	438	8	VCP	
8017	5883	16-27990	16-27230	1197.57	1182.78	257	8	TRUSS	ORANGE HEIGHTS LN
3196	989	16-28000	16-25610	564.39	563.59	770	42	VCP	
8033	5864	16-28010	16-28790	1263.95	1240.10	349	8	TRUSS	MALAGA ST
9253	2989	16-28020	16-28090	779.48	776.38	144	8	VCP	
3277	2013	16-28030	16-28210	675.20	667.94	351	10	VCP	LINCOLN AVE
5900	6898	16-28050	16-26810	951.92	948.46	346	8	TRUSS	HARBOR ST
3385	2631	16-28060	16-26830	735.82	734.48	340	8	VCP	ALTA LOMA DR
8255	7284	16-28070	16-28600	1130.02	1108.91	279	8	TRUSS	ATLANTIC CI
3697	4399	16-28080	16-28340	961.43	960.90	57	8	TRUSS	
3501	5171	16-28090	16-28320	776.26	769.81	300	8	VCP	
3370	2718	16-28100	16-29440	752.00	751.08	340	8	VCP	OLIVE ST
3513	8085	16-28120	16-28280	868.90	863.90	52	10	DIP	ONTARIO AV
8827	7749	16-28140	16-28160	869.08	868.83	89	10	VCP	CONEJO ST
5971	6272	16-28150	16-27460	1159.90	1145.51	364	8	TRUSS	HEARST WY
3567	3893	16-28160	16-28220	868.73	864.84	106	10	VCP	CONEJO ST
8251	6786	16-28170	16-28970	1121.38	1120.47	201	8	DIP	SAINT JAMES DR
3326	1994	16-28180	16-30050	678.14	673.57	488	8	VCP	
8034	5870	16-28190	16-27170	1249.52	1225.10	338	8	TRUSS	SHEPARD CREST DR
3489	3185	16-28200	16-26960	793.32	792.00	345	8	VCP	LORNA ST
3278	5055	16-28210	16-28390	666.74	662.27	295	10	VCP	LINCOLN AVE
3514	3863	16-28220	16-28350	864.74	857.18	173	10	VCP	CONEJO ST
3322	2032	16-28240	16-29530	681.47	675.87	330	8	VCP	SIXTH ST
8026	5860	16-28250	16-27260	1208.22	1192.01	324	8	TRUSS	PEATHER PEAK DR
3613	4299	16-28260	16-29100	924.49	922.53	201	8	VCP	SOLANO ST
3390	2513	16-28270	16-29330	723.72	722.82	255	8	VCP	
3571	3936	16-28280	16-29640	859.82	859.19	350	15	DIP	ONTARIO AVE
3622	4291	16-28290	16-28470	927.69	914.78	315	8	VCP	WATER WY
3223	1412	16-28300	16-28500	612.64	608.68	345	8	VCP	OTT ST
3627	4124	16-28310	16-29590	897.44	893.98	350	8	VCP	HORATIO AVE
3369	2897	16-28320	16-27690	769.69	768.11	170	8	VCP	
7756	6483	16-28330	16-27920	1052.07	1039.62	304	8	TRUSS	ROWENA DR
3698	4404	16-28340	16-29430	960.80	958.09	276	8	DIP	
3515	3825	16-28350	16-28400	857.08	856.37	145	10	VCP	CONEJO ST
3718	6066	16-28360	16-28460	1023.33	1022.39	200	10	VCP	BUENA VISTA AV