CASTLEROCK PROJECT
CITY OF SAN DIEGO
SEWER SERVICE STUDY

March 8, 2012

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Job No. 648-010

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March 8, 2012

648-010

Pardee Homes
6025 Edgewood Bend Court
San Diego, CA 92130

Attention: Allen Kashani, P.E., Land Development Manager

Subject: Sewer Service Alternatives for the Castlerock Project in the City of San Diego

Introduction

The Castlerock development is located within the Elliott Community Planning area in the City of San Diego. The planning area originally encompassed approximately 10,120 acres from Murphy Canyon on the west; Friar's Road, San Diego River and Sycamore Canyon on the south and east; and the former Camp Elliott military reserve on the north. Over the years, some of this area was removed from the Elliott Community Plan and incorporated into the new Tierrasanta Community, Mission Trails Regional Park Plans, landfill expansion and designated open space under the Multiple Species Conservation Program. The remaining portion of the Elliott Community, known as East Elliott (Castlerock), is largely undeveloped.

The Castlerock development is located at the City of San Diego's eastern boundary adjacent to the City of Santee and is planned for residential development. The area encompasses 117 acres, with 422 dwelling units currently planned based on the No Annexation scenario. The project consists of 282 single family detached units and 140 multi-family dwelling units. There is a 4 acre public park as well as several pocket parks totaling 0.64 acre.

This study provides an overview of alternative means of providing sewer service to the proposed Castlerock development project from the City of San Diego. A description of the proposed alternatives for sewer service to the development and a discussion of technical issues associated with these facilities are provided.

Project Background: Padre Dam Municipal Water District Service Alternative

The Castlerock project is processing its land development plan which includes an option of de-annexing from the City of San Diego and annexing to the City of Santee. Under this scenario, sewer service to the project would be provided by Padre Dam Municipal Water District. The Castlerock project proposed tentative tract map incorporates an Alternative A scenario which reflects annexation to the City of Santee and sewer service from Padre Dam Municipal Water District. The tentative map also addresses an Alternative B scenario which considers the project to remain within the City of San Diego; under this alternative, sewer service to the project would be provided by the City of San Diego.

Under the Alternative A scenario, Padre Dam Municipal Water District would provide sewer service to the project. Padre Dam Municipal Water District has existing sewer facilities located in the streets adjacent to the Castlerock development. Short connections from the Castlerock project to these offsite facilities would be necessary to provide sewer service to the project by Padre Dam Municipal Water District.

City of San Diego Sewer Service

The proposed Castlerock development project is within the city limits of the City of San Diego. The City currently does not operate sewer collection facilities in the near vicinity of the project. The closest City of San Diego sewer collection system is located in the Tierrasanta area to the west of Mission Trails Regional Park and south of State Route 52, or in the Navajo area south of Mission Trails Regional Park along Mission Gorge Road. The City of San Diego operates the Mission Gorge Trunk Sewer which is located along the south side of the San Diego River. This 42-inch trunk sewer carries sewage to the City of San Diego Metro Wastewater sewer system to the west of the Castlerock project area.

Sewer service to the Castlerock development consists of a private onsite sewer collection system and private onsite sewer lift station coupled with a public offsite gravity sewer line to convey sewage to the Mission Gorge Trunk Sewer. A description of this sewer service scenario is provided below and illustrated in Figure 1.

Castlerock Project Sewage Generation

The sewage generation estimates for the Castlerock development were developed in accordance with the City of San Diego Sewer Design Guide. Single family residential sewage generation is estimated based on 3.5 persons per dwelling unit and a wastewater generation factor of 80 gpd/person which results in a sewage generation factor of 280 gpd per single family dwelling unit. For multi-family residential, the sewage generation is based on 3.0 persons per dwelling unit which results in a sewage generation factor of 240 gpd/dwelling unit.

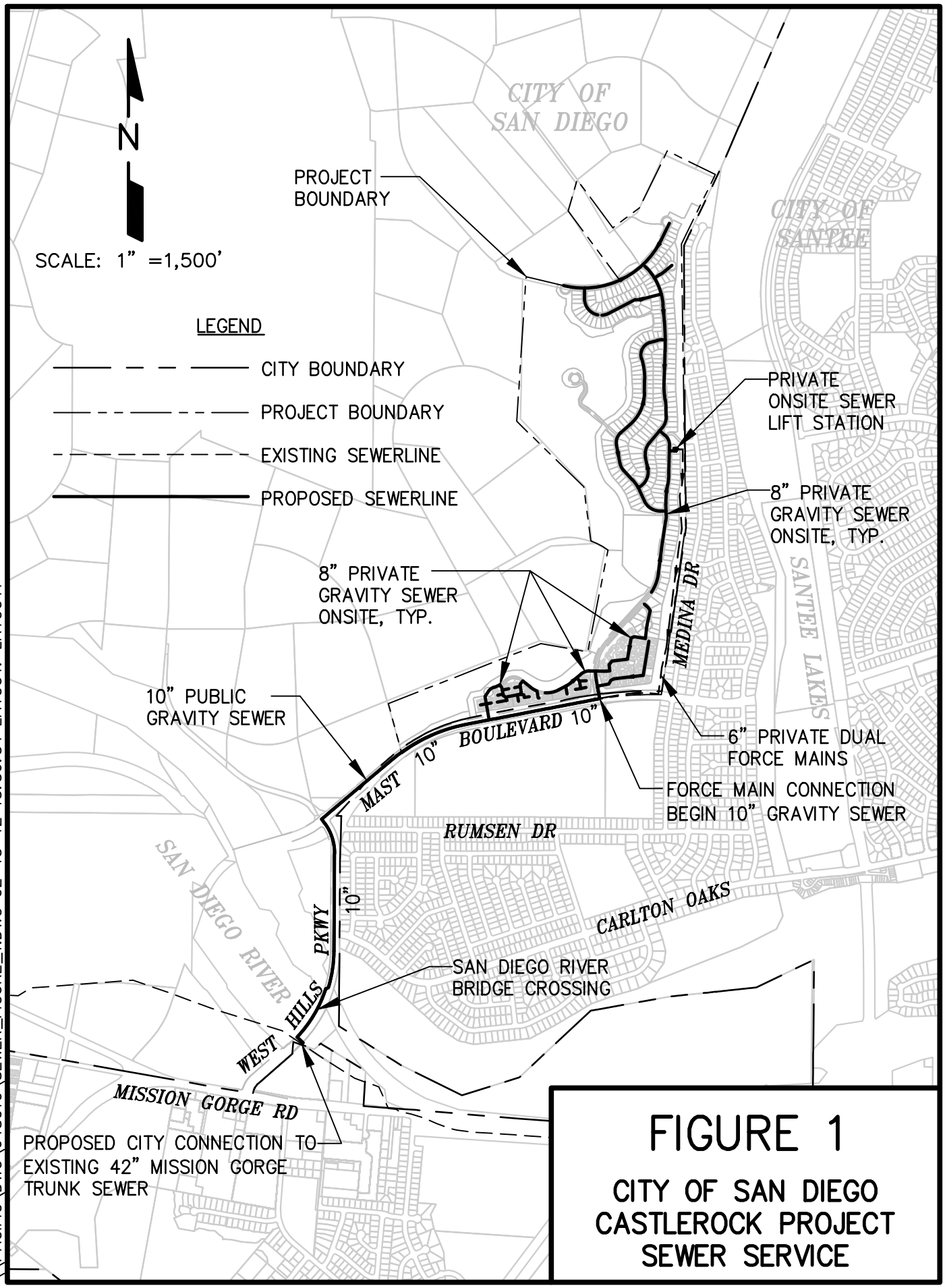
The average sewage flow for the project is:

280 gpd/SF DU x 282 SF DUs = 78,960 gpd
240 gpd/ MF DU x 140 MF DUs = 33,600 gpd
Total Average Sewage Generation = 112,560 gpd

Sewage peaking factors are based on population served and are in accordance with the City of San Diego Sewer Design Guide, Figure 1-1. The estimate population of the Castlerock project can be calculated as:

282 SF DUs x 3.5 persons/DU = 987 people
140 MF DUs x 3.0 persons/DU = 420 people
Total 1,407 people

For a population of 1,407 people, the peaking factor is 2.4. Thus, the peak sewage flow generated by the Castlerock project will be: 112,560 gpd x 2.4 = 270,144 gpd = 188 gpm.



\\PACIFIC\DWG\648010\SEWER_FIGURE_1.DWG 02-15-12 15:56:34 LAYOUT: LAYOUT1

FIGURE 1

CITY OF SAN DIEGO CASTLEROCK PROJECT SEWER SERVICE

Castlerock Project Sewer Service

The topography of the Castlerock development project site prevents gravity service directly to the City's Metro Wastewater interceptor. Therefore, a combination of onsite private gravity sewers, an onsite private sewer lift station and dual force mains, and an offsite public gravity sewer would be required to deliver the wastewater to the 42-inch Mission Gorge Trunk Sewer. The onsite private gravity sewer piping is sized adequately at 8-inch diameter and all reaches flow below half full in conformance with the City of San Diego Sewer Design Guide (see discussion of sewer system calculations in the next section of this report).

The onsite private sewer lift station is located in the central portion of the project. It will provide service to 270 single family lots. Estimated lift station pumping capacity is:

270 SF DU x 280 gpd/DU = 75,600 gpd average
Population equivalent is: 270 SF DU x 3.5 persons/DU = 945 persons
For 945 people, the City of San Diego Sewer Peaking Factor is: 2.56
Peak Sewage Flow is: 75,600 gpd x 2.56 = 193,536 gpd = 135 gpm
Pumping Capacity: Peak Sewage Flow x 1.3 Reserve Capacity Factor = 180 gpm.

Dual private 6-inch force mains are anticipated; these will be located in the trail system along the eastern boundary of the Castlerock subdivision. The force mains will extend south to Mast Boulevard then turn west and connect to the gravity sewer main at the intersection of Street 'A' and Mast Boulevard. Force main velocity at the design pumping capacity will be 2.0 feet per second. The length of the force main is approximately 3,600 feet. The force main alignment will follow an open space trail along the east and south sides of the project; the force main discharge point will be into the 10" gravity sewer in Mast Boulevard.

The offsite public gravity sewer would extend from the south entry of the project off of Mast Boulevard west in Mast Boulevard to West Hills Parkway, across the existing bridge over the San Diego River, and then to the 42-inch Mission Gorge Trunk Sewer. The offsite segment of the public gravity sewer conveyance system must be increased in size to 10-inch diameter in order to maintain flow depth below half full in conformance with the City of San Diego Sewer Design Guide.

This alternative includes 7,200 feet of public offsite 10-inch gravity sewer in Mast Boulevard and West Hills Parkway, and a connection to the 42-inch Metro Wastewater interceptor just north of Mission Gorge Road. The public gravity main would need to be designed to cross the existing West Hills Parkway Bridge over the San Diego River. Connection to the Metro Wastewater interceptor near Mission Gorge Road is expected to include an odorless manhole connection in accordance with the City of San Diego Sewer Design Guide.

Sewer System Calculations

Appendix A of this report presents the reach-by-reach calculations for the private onsite and public offsite gravity sewer lines proposed for the sewer collection and conveyance system for the Castlerock development project. These calculations are done in spreadsheet form consistent with City of San Diego preferences. Also included in Appendix A is a listing of manhole numbers along with rim and invert elevations. All the sewer system data such as manhole numbering and rim and invert elevations is based on the proposed tentative map for the Castlerock project. Exhibit A at the back of this report provides a graphic showing the pertinent sewer system data used in the calculations.

The sewer system calculations show that private onsite gravity sewer lines are adequate at 8-inch diameter. For the public offsite sewer portion of the sewer system in Mast Boulevard and West Hills Parkway, the gravity line is increased to 10-inch diameter in order to keep the depth of flow below half full. During final design adjustments may be able to be made to the public offsite sewer slopes that will permit using 8-inch sewer lines all the way to the Metro Wastewater trunk sewer connection. Calculations substantiating such a change would be provided at the time of final design.

Sewer System Technical Challenges

There are two primary challenges associated with the proposed sewer service for the Castlerock development. Neither of these challenges is insurmountable. The first challenge is related to the special design considerations that will be needed for the private

onsite sewer lift station. Odor control and noise attenuation will be the main issues related to the design of this facility. Both of these challenges can be addressed with current proven technologies that are in use at other City of San Diego sewer lift stations. Secondary concerns for the private lift station will be facility aesthetics which can be mitigated through architectural features and appropriate landscaping.

A second challenge is constructing a public gravity main through the existing West Hills Parkway Bridge. The bridge has provisions for future utilities. In addition, it is constructed with a slope pitched south in favor of the flow direction of the proposed gravity sewer main. However, there may be as little as 3 feet of cover above the pipe as it enters and exits the bridge in order for the sewer to use the existing openings and fit into the bridge cell. This concern can be addressed by designing the gravity sewer pipeline at both ends of the bridge to withstand the higher loadings imposed by the shallow cover.

Conclusion

Thank you for the opportunity to provide you and the Castlerock development project with our engineering services in the preparation of this report. Please contact us if you have any questions or need additional information.

Dexter Wilson Engineering, Inc.

Andrew Oven, P.E.

AO:ps

APPENDIX A

SEWER LINE CALCULATIONS
AND
MANHOLE DATA

SEWER STUDY SUMMARY

DATE: 3/7/2012 FOR: Castlerock Tentative Map - City of San Diego SHT 1 OF 3

JOB NUMBER: 648-010 BY: Dexter Wilson Engineering, Inc. REFER TO PLAN SHEET:

LINE	FROM	TO	POP. PER D.U.	IN-LINE EDUs	POPULATION SERVED		SEWAGE PER CAPITA/DAY (gpd)	AVG. DRY WEATHER FLOW (gpd)	DRY WEATHER PEAKING FACTOR	PEAK DRY WEATHER FLOW (gpd)	WET WEATHER PEAKING FACTOR	PEAK WET WEATHER FLOW (DESIGN FLOW)		LINE SIZE, D (inches)	DESIGN SLOPE (%)	DEPTH K' [1]	d_n (feet)	d_n/D [2]	C_a for Velocity [3]	VELOCITY (f.p.s.)	Remarks
					IN-LINE	TOTAL						M.G.D.	C.F.S.								
P01	A4	A5	3.5	17.0	59.5	59.5	80	4,760	4.00	19,040	1.00	0.02	0.03	8	2.0	0.0080	0.0600	0.09	0.0350	1.89	
P02	A5	A7	3.5	5.0	17.5	77.0	80	6,160	4.00	24,640	1.00	0.02	0.04	8	3.1	0.0083	0.0600	0.09	0.0350	2.45	
P03	A7	G1	3.5	0.0	0.0	77.0	80	6,160	4.00	24,640	1.00	0.02	0.04	8	10.2	0.0046	0.0467	0.07	0.0242	3.54	
P05	A3	B1	3.5	15.0	52.5	52.5	80	4,200	4.00	16,800	1.00	0.02	0.03	8	1.5	0.0082	0.0667	0.10	0.0409	1.43	
P08	B1	B2	3.5	4.0	14.0	66.5	80	5,320	4.00	21,280	1.00	0.02	0.03	8	3.8	0.0064	0.0600	0.09	0.0350	2.12	
P09	B2	C2	3.5	8.0	28.0	94.5	80	7,560	4.00	30,240	1.00	0.03	0.05	8	1.0	0.0179	0.0933	0.14	0.0668	1.58	
P10	C1	C2	3.5	11.0	38.5	38.5	80	3,080	4.00	12,320	1.00	0.01	0.02	8	4.2	0.0036	0.0467	0.07	0.0242	1.77	
P11	C2	F1	3.5	2.0	7.0	140.0	80	11,200	4.00	44,800	1.00	0.04	0.07	8	1.0	0.0262	0.1133	0.17	0.0885	1.76	Added Pop. from Line P09 and P10
P12	E1	F1	3.5	11.0	38.5	38.5	80	3,080	4.00	12,320	1.00	0.01	0.02	8	2.4	0.0047	0.0533	0.08	0.0294	1.46	
P13	F1	G1	3.5	5.0	17.5	196.0	80	15,680	4.00	62,720	1.00	0.06	0.10	8	1.0	0.0364	0.1267	0.19	0.1039	2.10	Added Pop. from Line P11 and P12
P14	G1	G2	3.5	3.0	10.5	283.5	80	22,680	3.75	85,050	1.00	0.09	0.13	8	0.96	0.0514	0.1533	0.23	0.1365	2.17	Added Pop. from Line P04 and P13
P15	G2	H1	3.5	13.0	45.5	329.0	80	26,320	3.58	94,226	1.00	0.09	0.15	8	0.76	0.0641	0.1667	0.25	0.1535	2.14	
P16	D1	D2	3.5	13.0	45.5	45.5	80	3,640	4.00	14,560	1.00	0.01	0.02	8	6.1	0.0035	0.0467	0.07	0.0242	2.09	
P17	D2	D3	3.5	8.0	28.0	73.5	80	5,880	4.00	23,520	1.00	0.02	0.04	8	3.2	0.0078	0.0667	0.10	0.0409	2.00	
P18	D3	D5	3.5	19.0	66.5	140.0	80	11,200	4.00	44,800	1.00	0.04	0.07	8	1.1	0.0254	0.1067	0.16	0.0811	1.92	
P19	D5	H1	3.5	11.0	38.5	178.5	80	14,280	4.00	57,120	1.00	0.06	0.09	8	4.0	0.0170	0.0933	0.14	0.0668	2.98	
P21	H1	I1	3.5	10.0	35.0	542.5	80	43,400	2.98	129,332	1.00	0.13	0.20	8	0.55	0.1031	0.2133	0.32	0.2167	2.08	Added Pop. from Line P15 and P19
P22	I1	I2	3.5	11.0	38.5	581.0	80	46,480	2.94	136,651	1.00	0.14	0.21	8	0.68	0.0981	0.2067	0.31	0.2074	2.29	
P23	I2	K1	3.5	12.0	42.0	623.0	80	49,840	2.90	144,536	1.00	0.14	0.22	8	0.58	0.1130	0.2267	0.34	0.2355	2.14	
P24	J1	J2	3.5	12.0	42.0	42.0	80	3,360	4.00	13,440	1.00	0.01	0.02	8	3.1	0.0046	0.0533	0.08	0.0294	1.59	
P25	J2	K1	3.5	10.0	35.0	77.0	80	6,160	4.00	24,640	1.00	0.02	0.04	8	6.9	0.0056	0.0533	0.08	0.0294	2.92	
P26	K1	O2	3.5	3.0	10.5	710.5	80	56,840	2.83	160,857	1.00	0.16	0.25	8	0.40	0.1508	0.2600	0.39	0.2836	1.97	Added Pop. from Line P23 and P25
P37	O2	O1	3.5	0.0	0.0	710.5	80	56,840	2.83	160,857	1.00	0.16	0.25	8	0.56	0.1280	0.2400	0.36	0.2546	2.20	

[1] K' based on n = 0.013
[2] dn/D using K' in Brater King Table 7-14
[3] From Brater King Table 7-4 based on dn/D
[4] Includes Pumped Flow

SEWER STUDY SUMMARY

DATE: 3/7/2012 FOR: Castlerock Tentative Map - City of San Diego SHT 2 OF 3

JOB NUMBER: 648-010 BY: Dexter Wilson Engineering, Inc. REFER TO PLAN SHEET:

LINE	FROM	TO	POP. PER D.U.	IN-LINE EDUs	POPULATION SERVED		SEWAGE PER CAPITA/DAY (gpd)	AVG. DRY WEATHER FLOW (gpd)	DRY WEATHER PEAKING FACTOR	PEAK DRY WEATHER FLOW (gpd)	WET WEATHER PEAKING FACTOR	PEAK WET WEATHER FLOW (DESIGN FLOW)		LINE SIZE, D (inches)	DESIGN SLOPE (%)	DEPTH K' [1]	d_n (feet)	d_n/D [2]	C_a for Velocity [3]	VELOCITY (f.p.s.)	Remarks
					IN-LINE	TOTAL						M.G.D.	C.F.S.								
P31	M1	M2	3.5	4.0	14.0	14.0	80	1,120	4.00	4,480	1.00	0.00	0.01	8	7.7	0.0010	0.0267	0.04	0.0105	1.49	
P32	M2	M3	3.5	5.0	17.5	31.5	80	2,520	4.00	10,080	1.00	0.01	0.02	8	3.7	0.0031	0.0400	0.06	0.0192	1.83	
P33	M3	N1	3.5	7.0	24.5	56.0	80	4,480	4.00	17,920	1.00	0.02	0.03	8	1.0	0.0105	0.0733	0.11	0.0470	1.33	
P27	L1	L2	3.5	15.0	52.5	52.5	80	4,200	4.00	16,800	1.00	0.02	0.03	8	2.0	0.0071	0.0600	0.09	0.035	1.67	
P28	L2	L3	3.5	7.0	24.5	77.0	80	6,160	4.00	24,640	1.00	0.02	0.04	8	5.0	0.0065	0.0600	0.09	0.035	2.45	
P29	L3	L4	3.5	6.0	21.0	98.0	80	7,840	4.00	31,360	1.00	0.03	0.05	8	5.0	0.0083	0.0667	0.10	0.041	2.67	
P30	L4	N1	3.5	0.0	0.0	98.0	80	7,840	4.00	31,360	1.00	0.03	0.05	8	4.5	0.0088	0.0667	0.10	0.041	2.67	
P34	N1	N2	3.5	12.0	42.0	196.0	80	15,680	4.00	62,720	1.00	0.06	0.10	8	1.0	0.0370	0.1133	0.17	0.0885	2.47	Added Pop. from Line P30 and P33
P35	N2	O1	3.5	11.0	38.5	234.5	80	18,760	3.92	73,539	1.00	0.07	0.11	8	3.5	0.0235	0.1000	0.15	0.0739	3.46	
P36	O1	LS	3.5	0.0	0.0	945.0	80	75,600	2.56	193,536	1.00	0.19	0.30	8	0.6	0.1526	0.2600	0.39	0.2836	2.38	Added Pop. from Line P26 and P37
P38	Q1	R1	3.5	2.0	7.0	7.0	80	560	4.00	2,240	1.00	0.00	0.00	8	1.2	0.0012	0.0267	0.04	0.0105	0.74	
P39	R1	R3	3.5	10.0	35.0	42.0	80	3,360	4.00	13,440	1.00	0.01	0.02	8	1.7	0.0061	0.0533	0.08	0.0294	1.59	
P40	R3	R4	3.0	0.0	0.0	42.0	80	3,360	4.00	13,440	1.00	0.01	0.02	8	1.1	0.0077	0.0600	0.09	0.0350	1.34	
P41	R4	R5	3.0	4.0	12.0	54.0	80	4,320	4.00	17,280	1.00	0.02	0.03	8	1.0	0.0100	0.0733	0.11	0.0470	1.28	
P42	R5	R6	3.0	13.0	39.0	93.0	80	7,440	4.00	29,760	1.00	0.03	0.05	8	2.5	0.0112	0.0733	0.11	0.0470	2.20	
P57	R6	R9	3.0	0.0	0.0	93.0	80	7,440	4.00	29,760	1.00	0.03	0.05	8	1.0	0.0176	0.0867	0.13	0.0600	1.73	
P43	R9	R7	3.0	16.0	48.0	141.0	80	11,280	4.00	45,120	1.00	0.05	0.07	8	1.1	0.0260	0.1067	0.16	0.0811	1.94	
P44	R7	R8	3.0	0.0	0.0	141.0	80	11,280	4.00	45,120	1.00	0.05	0.07	8	0.6	0.0353	0.1067	0.16	0.0811	1.94	
P45	R8	T1	3.0	3.0	9.0	150.0	80	12,000	4.00	48,000	1.00	0.05	0.07	8	1.4	0.0239	0.1000	0.15	0.0739	2.26	
P51	T1	V1	3.0	0.0	0.0	150.0	80	12,000	4.00	48,000	1.00	0.05	0.07	8	1.0	0.0281	0.1067	0.16	0.0811	2.06	
P54	X15	X16	3.0	6.0	18.0	18.0	80	1,440	4.00	5,760	1.00	0.01	0.01	8	1.3	0.0030	0.0400	0.06	0.0192	1.04	
P55	X16	X17	3.0	6.0	18.0	36.0	80	2,880	4.00	11,520	1.00	0.01	0.02	8	1.6	0.0054	0.0533	0.08	0.0294	1.36	
P56	X17	V1	3.0	6.0	18.0	54.0	80	4,320	4.00	17,280	1.00	0.02	0.03	8	4.0	0.0051	0.0533	0.08	0.0294	2.05	
P52	V1	V3	3.0	0.0	0.0	204.0	80	16,320	4.00	65,280	1.00	0.07	0.10	8	3.7	0.0201	0.0933	0.14	0.0668	3.40	Add P51 and P56
P46	S1	S2	3.0	22.0	66.0	66.0	80	5,280	4.00	21,120	1.00	0.02	0.03	8	3.0	0.0073	0.1267	0.19	0.1039	0.71	
P58	S2	S6	3.0	0.0	0.0	66.0	80	5,280	4.00	21,120	1.00	0.02	0.03	8	1.3	0.0108	0.0733	0.11	0.0470	1.56	
P47	S6	S3	3.0	20.0	60.0	126.0	80	10,080	4.00	40,320	1.00	0.04	0.06	8	0.9	0.0251	0.1067	0.16	0.0811	1.73	
P48	S3	S4	3.0	4.0	12.0	138.0	80	11,040	4.00	44,160	1.00	0.04	0.07	8	1.0	0.0260	0.1067	0.16	0.0811	1.90	
P49	S4	S5	3.0	3.0	9.0	147.0	80	11,760	4.00	47,040	1.00	0.05	0.07	8	1.0	0.0272	0.1133	0.17	0.0885	1.85	
P50	S5	V3	3.0	0.0	0.0	147.0	80	11,760	4.00	47,040	1.00	0.05	0.07	8	1.0	0.0276	0.1133	0.17	0.0885	1.85	

[1] K' based on n = 0.013
[2] dn/D using K' in Brater King Table 7-14
[3] From Brater King Table 7-4 based on dn/D
[4] Includes Pumped Flow

SEWER STUDY SUMMARY

DATE: 3/7/2012 FOR: Castlerock Tentative Map - City of San Diego SHT 3 OF 3

JOB NUMBER: 648-010 BY: Dexter Wilson Engineering, Inc. REFER TO PLAN SHEET:

LINE	FROM	TO	POP. PER D.U.	IN-LINE EDUs	POPULATION SERVED		SEWAGE PER CAPITA/DAY (gpd)	AVG. DRY WEATHER FLOW (gpd)	DRY WEATHER PEAKING FACTOR	PEAK DRY WEATHER FLOW (gpd)	WET WEATHER PEAKING FACTOR	PEAK WET WEATHER FLOW (DESIGN FLOW)		LINE SIZE, D (inches)	DESIGN SLOPE (%)	DEPTH K' [1]	d_n (feet)	d_n/D [2]	C_a for Velocity [3]	VELOCITY (f.p.s.)	Remarks
					IN-LINE	TOTAL						M.G.D.	C.F.S.								
P53	V3	OS1		0.0	0.0	351.0	80	28,080	3.50	98,280	1.00	0.10	0.15	8	0.3	0.0997	0.2133	0.32	0.2167	1.58	Added Pop. from Line P50 and P52
P59	OS1	OS2		0.0	0.0	351.0	80	28,080	3.50	349,877	1.00	0.35	0.54	10	0.5	0.1579	0.3333	0.40	0.2934	2.66	Note [4] Force Main Connects Here
P60	OS2	OS3		0.0	0.0	351.0	80	28,080	3.50	349,877	1.00	0.35	0.54	10	1.3	0.1004	0.2667	0.32	0.2167	3.60	Note [4]
P61	OS3	OS4		0.0	0.0	351.0	80	28,080	3.50	349,877	1.00	0.35	0.54	10	1.6	0.0919	0.2500	0.30	0.1982	3.93	Note [4]
P62	OS4	OS20		0.0	0.0	351.0	80	28,080	3.50	349,877	1.00	0.35	0.54	10	1.0	0.1173	0.2833	0.34	0.2355	3.31	Note [4]
P63	X14	X13	3.0	3.0	9.0	9.0	80	720	4.00	2,880	1.00	0.00	0.00	8	1.4	0.0015	0.0267	0.04	0.0105	0.95	
P64	X13	X12	3.0	1.0	3.0	12.0	80	960	4.00	3,840	1.00	0.00	0.01	8	1.0	0.0023	0.0333	0.05	0.0147	0.91	
P65	X12	X11	3.0	4.0	12.0	24.0	80	1,920	4.00	7,680	1.00	0.01	0.01	8	1.1	0.0044	0.0467	0.07	0.0242	1.10	
P66	X11	X10	3.0	4.0	12.0	36.0	80	2,880	4.00	11,520	1.00	0.01	0.02	8	1.7	0.0053	0.0533	0.08	0.0294	1.36	
P67	X10	X9	3.0	4.0	12.0	48.0	80	3,840	4.00	15,360	1.00	0.02	0.02	8	0.9	0.0095	0.0667	0.10	0.0409	1.31	
P68	X9	X8	3.0	5.0	15.0	63.0	80	5,040	4.00	20,160	1.00	0.02	0.03	8	0.5	0.0169	0.0867	0.13	0.0600	1.17	
P69	X8	X7	3.0	4.0	12.0	75.0	80	6,000	4.00	24,000	1.00	0.02	0.04	8	1.0	0.0142	0.0800	0.12	0.0534	1.56	
P70	X7	X6	3.0	4.0	12.0	87.0	80	6,960	4.00	27,840	1.00	0.03	0.04	8	1.0	0.0165	0.0867	0.13	0.0600	1.62	
P71	X6	X5	3.0	0.0	0.0	87.0	80	6,960	4.00	27,840	1.00	0.03	0.04	8	1.1	0.0154	0.0800	0.12	0.0534	1.82	
P72	X5	X4	3.0	0.0	0.0	87.0	80	6,960	4.00	27,840	1.00	0.03	0.04	8	0.9	0.0172	0.0867	0.13	0.0600	1.62	
P73	X4	X3	3.0	0.0	0.0	87.0	80	6,960	4.00	27,840	1.00	0.03	0.04	8	0.9	0.0178	0.0867	0.13	0.0600	1.62	
P74	X3	X2	3.0	0.0	0.0	87.0	80	6,960	4.00	27,840	1.00	0.03	0.04	8	1.1	0.0157	0.0800	0.12	0.0534	1.82	
P75	X2	X1	3.0	8.0	24.0	111.0	80	8,880	4.00	35,520	1.00	0.04	0.05	8	1.0	0.0211	0.0933	0.14	0.0668	1.85	
P76	X1	OS20	3.0	0.0	0.0	111.0	80	8,880	4.00	35,520	1.00	0.04	0.05	8	20.0	0.0047	0.0467	0.07	0.0242	5.11	
P77	OS20	OS5		0.0	0.0	462.0	80	36,960	3.08	365,434	1.00	0.37	0.57	10	1.0	0.1195	0.2917	0.35	0.2450	3.32	Note [4] Add Flow from P62 and P76
P78	OS5	OS6		0.0	0.0	462.0	80	36,960	3.08	365,434	1.00	0.37	0.57	10	0.7	0.1483	0.3250	0.39	0.2836	2.87	Note [4]
P79	OS6	OS7		0.0	0.0	462.0	80	36,960	3.08	365,434	1.00	0.37	0.57	10	0.5	0.1670	0.3500	0.42	0.3130	2.60	Note [4]
P80	OS7	OS8		0.0	0.0	462.0	80	36,960	3.08	365,434	1.00	0.37	0.57	10	0.5	0.1675	0.3500	0.42	0.3130	2.60	Note [4]
P81	OS8	OS9		0.0	0.0	462.0	80	36,960	3.08	365,434	1.00	0.37	0.57	10	3.8	0.0616	0.2083	0.25	0.1535	5.30	Note [4]
P82	OS9	OS10		0.0	0.0	462.0	80	36,960	3.08	365,434	1.00	0.37	0.57	10	4.8	0.0546	0.1917	0.23	0.1365	5.97	Note [4]
P83	OS10	OS11		0.0	0.0	462.0	80	36,960	3.08	365,434	1.00	0.37	0.57	10	1.0	0.1195	0.2917	0.35	0.2450	3.32	Note [4]
P84	OS11	OS12		0.0	0.0	462.0	80	36,960	3.08	365,434	1.00	0.37	0.57	10	3.2	0.0671	0.2167	0.26	0.1623	5.02	Note [4]
P85	OS12	OS13		0.0	0.0	462.0	80	36,960	3.08	365,434	1.00	0.37	0.57	10	5.1	0.0530	0.1917	0.23	0.1365	5.97	Note [4]
P86	OS13	OS14		0.0	0.0	462.0	80	36,960	3.08	365,434	1.00	0.37	0.57	10	3.6	0.0630	0.2083	0.25	0.1535	5.30	Note [4]
P87	OS14	OS15		0.0	0.0	462.0	80	36,960	3.08	365,434	1.00	0.37	0.57	10	1.2	0.1098	0.2750	0.33	0.2260	3.60	Note [4]
P88	OS15	OS16		0.0	0.0	462.0	80	36,960	3.08	365,434	1.00	0.37	0.57	10	2.1	0.0830	0.2417	0.29	0.1890	4.31	Note [4]
P89	OS16	OS17		0.0	0.0	462.0	80	36,960	3.08	365,434	1.00	0.37	0.57	10	1.5	0.0967	0.2583	0.31	0.2074	3.93	Note [4]
P90	OS17	OS18		0.0	0.0	462.0	80	36,960	3.08	365,434	1.00	0.37	0.57	10	1.0	0.1195	0.2917	0.35	0.2450	3.32	Note [4]
P91	OS18	OS19		0.0	0.0	462.0	80	36,960	3.08	365,434	1.00	0.37	0.57	10	14.0	0.0319	0.1500	0.18	0.0961	8.47	Note [4]

[1] K' based on n = 0.013
[2] dn/D using K' in Brater King Table 7-14
[3] From Brater King Table 7-4 based on dn/D
[4] Includes Pumped Flow

MANHOLE ELEVATIONS				
Manhole ID	Rim Elevation (Feet)	Invert Elevation (Feet)	Depth of Cover (Feet)	Notes
A4	444.0	439.0	5.0	
A5	435.8	430.5	5.3	
A6	432.0	426.5	5.5	
A7	434.5	425.2	9.3	
A3	443.7	438.7	5.0	
B1	443.7	438.7	5.0	
B2	424.0	419.0	5.0	
C1	444.0	439.0	5.0	
C2	422.0	415.1	6.9	
E1	424.0	419.0	5.0	
F1	418.0	413.0	5.0	
G1	419.7	410.9	8.8	
G2	421.4	409.7	11.7	
D1	457.5	452.5	5.0	
D2	436.8	431.8	5.0	
D3	429.7	424.7	5.0	
D5	425.5	419.3	6.2	
H1	424.1	406.6	17.5	
I1	420.7	404.8	15.9	
I2	416.3	402.4	13.9	
J1	439.4	434.4	5.0	
J2	430.4	425.4	5.0	
K1	411.7	400.1	11.6	
L1	461.7	456.5	5.0	
L2	453.8	448.8	5.0	
L3	439.0	434.0	5.0	
L4	428.5	423.5	5.0	
M1	449.6	444.6	5.0	
M2	433.4	428.4	5.0	
M3	422.6	417.6	5.0	
N1	418.9	413.9	5.0	
N2	418.7	410.2	8.5	
O1	410.6	398.7	11.9	
PS	414.0	398.4	15.6	Pump Station
Q1	462.0	456.9	4.9	
R1	460.8	455.3	5.5	
R3	454.8	449.8	5.0	
R4	454.7	448.4	6.3	
R5	454.3	448.0	6.3	
R6	447.0	442.0	5.0	
R7	448.8	439.8	9.0	
R8	448.9	439.5	9.4	
S1	452.9	447.9	5.0	
S2	440.0	436.0	4.0	
S3	445.0	432.6	12.4	
S4	443.9	432.2	11.7	
S5	443.9	431.7	12.2	
T1	447.5	438.5	9.0	
V1	445.9	436.8	9.1	

MANHOLE ELEVATIONS				
Manhole ID	Rim Elevation (Feet)	Invert Elevation (Feet)	Depth of Cover (Feet)	Notes
V3	437.8	430.3	7.5	
OS1	435.2	429.8	5.4	Offsite Manhole
OS2	435.7	427.7	8.0	Offsite Manhole
OS3	427.5	422.5	5.0	Offsite Manhole
OS4	421.3	416.3	5.0	Offsite Manhole
OS5	416.3	412.3	4.0	Offsite Manhole
OS6	413.7	409.7	4.0	Offsite Manhole
OS7	420.9	407.7	13.2	Offsite Manhole
OS8	415.8	405.7	10.1	Offsite Manhole
OS9	395.8	390.8	5.0	Offsite Manhole
OS10	376.7	371.7	5.0	Offsite Manhole
OS11	377.4	371.0	6.4	Offsite Manhole
OS12	363.3	358.3	5.0	Offsite Manhole
OS13	344.0	339.0	5.0	Offsite Manhole
OS14	330.3	325.3	5.0	Offsite Manhole
OS15	325.8	320.8	5.0	Offsite Manhole
OS16	317.5	312.5	5.0	Offsite Manhole
OS17	316.2	311.2	5.0	Offsite Manhole
OS18	313.0	304.6	8.4	Offsite Manhole
OS19	313.0	299.0	14.0	Offsite Manhole
OS20	420.0	415.3	4.7	Offsite Manhole
OSN1	388.0	380.8	7.2	Offsite Manhole
S6	440.0	435.6	4.4	Offsite Manhole
R9	447.5	441.7	5.8	Offsite Manhole
X0	420.8	415.3	5.5	Offsite Manhole
X1	454.0	440.3	13.7	Offsite Manhole
X2	455.0	441.0	14.0	Offsite Manhole
X3	456.5	442.0	13.0	Offsite Manhole
X4	456.1	442.6	13.5	Offsite Manhole
X5	455.1	443.4	6.4	Offsite Manhole
X6	454.2	444.2	10.0	Offsite Manhole
X7	454.9	444.9	10.0	Offsite Manhole
X8	455.3	445.4	9.9	Offsite Manhole
X9	455.8	445.7	10.1	Offsite Manhole
X10	456.1	447.0	9.1	Offsite Manhole
X11	455.3	448.0	7.3	Offsite Manhole
X12	455.5	448.6	6.4	Offsite Manhole
X13	454.5	449.5	5.0	Offsite Manhole
X14	457.4	452.4	5.0	Offsite Manhole
X15	458.5	453.5	5.0	Offsite Manhole
X16	454.8	449.8	5.0	Offsite Manhole
X17	452.2	447.2	5.0	Offsite Manhole

SEE CONTINUATION AT RIGHT

MH OS8 (10.1')
IE=405.7
RIM=415.8

MH OS7 (13.2')
IE=407.7
RIM=420.9

MAST BOULEVARD

MH OS6 (4.0')
IE=409.7
RIM=413.7

MH OS5 (4.0')
IE=412.3
RIM=416.3

MH X1 (13.7')
IE=440.3
RIM=454.0

MH OS20 (4.7')
IE=415.3
RIM=420.0

MH OS4 (5.0')
IE=416.3
RIM=421.3

MH X8 (9.9')
IE=445.4
RIM=455.3

MH X9 (10.1')
IE=445.7
RIM=455.8

MH X10 (9.1')
IE=447.0
RIM=456.1

MH X11 (7.3')
IE=448.0
RIM=455.3

MH OS3 (5.0')
IE=422.5
RIM=427.5

MH OS2 (8.0')
IE=427.7
RIM=435.7

MH X2 (14.0')
IE=441.0
RIM=455.0

MH X3 (13.0')
IE=442.0
RIM=456.5

MH X4 (13.5')
IE=442.6
RIM=456.1

MH X5 (6.4')
IE=443.4
RIM=455.1

MH X7 (10.0')
IE=444.9
RIM=454.9

MH X6 (10.0')
IE=444.2
RIM=454.2

MH X12 (6.4')
IE=448.6
RIM=455.5

MH X13 (5.0')
IE=449.5
RIM=454.5

MH X14 (5.0')
IE=452.4
RIM=457.4

MH X15 (5.0')
IE=453.5
RIM=458.5

MH X16 (5.0')
IE=449.8
RIM=454.8

MH X17 (5.0')
IE=447.2
RIM=452.2

MH T1 (9.0')
IE=438.5
RIM=447.5

MH V1 (9.1')
IE=436.8
RIM=445.9

MH R8 (9.4')
IE=439.5
RIM=448.9

MH R7 (9.0')
IE=439.8
RIM=448.9

MH OS1 (5.4')
IE=429.8
RIM=435.2

MH V3 (7.5')
IE=430.3
RIM=437.8

MH R9 (5.8')
IE=441.7
RIM=447.5

MH R6 (5.0')
IE=442.0
RIM=447.0

MH S5 (12.2')
IE=431.7
RIM=443.9

MH S4 (11.7')
IE=432.2
RIM=443.9

MH R5 (6.3')
IE=448.0
RIM=454.3

MH S3 (12.4')
IE=432.6
RIM=445.0

MH S6 (4.4')
IE=435.6
RIM=440.0

MH R4 (6.3')
IE=448.4
RIM=454.7

MH S2 (4.0')
IE=436.0
RIM=440.0

MH S1 (5.0')
IE=447.9
RIM=452.9

MH R3 (5.0')
IE=449.8
RIM=454.8

MH Q1 (4.9')
IE=456.9
RIM=462.0

MH R1 (5.5')
IE=455.3
RIM=460.8

MH M1 (5.0')
IE=444.6
RIM=449.6

MH M2 (5.0')
IE=428.4
RIM=433.4

MH M3 (5.0')
IE=417.6
RIM=422.6

MH N1 (5.0')
IE=413.9
RIM=418.9

MH L4 (5.0')
IE=423.5
RIM=428.5

MH N2 (8.5')
IE=410.2
RIM=418.7

MH O2 (10.4')
IE=399.7
RIM=410.1

MH O1 (11.9')
IE=398.7
RIM=410.6

MH OSN1 (7.2')
IE=380.8
RIM=388.0

MH L3 (5.0')
IE=434.0
RIM=439.0

MH J1 (5.0')
IE=434.4
RIM=439.4

MH J2 (5.0')
IE=425.4
RIM=430.4

MH L2 (5.0')
IE=448.8
RIM=453.8

MH L1 (5.0')
IE=456.5
RIM=461.5

MH D1 (5.0')
IE=452.5
RIM=457.5

MH D2 (5.0')
IE=431.8
RIM=436.8

MH D3 (5.0')
IE=424.7
RIM=429.7

MH D5 (6.2')
IE=419.3
RIM=425.5

MH K1 (11.6')
IE=400.1
RIM=411.7

MH I1 (15.9')
IE=404.8
RIM=420.7

MH I2 (13.9')
IE=402.4
RIM=416.3

MH H1 (17.5')
IE=406.6
RIM=424.1

MH G2 (11.7')
IE=409.7
RIM=421.4

MH G1 (8.8')
IE=410.9
RIM=419.7

MH OS18 (8.4')
IE=304.6
RIM=313.0

MH OS19 (14.0')
IE=299.0
RIM=313.0

MH OS17 (5.0')
IE=311.2
RIM=316.2

MH OS16 (5.0')
IE=312.5
RIM=317.5

MH OS15 (5.0')
IE=320.8
RIM=325.8

MH OS14 (5.0')
IE=325.3
RIM=330.3

MH OS13 (5.0')
IE=339.0
RIM=344.0

MH OS12 (5.0')
IE=358.3
RIM=363.3

MH OS11 (6.4')
IE=371.0
RIM=377.4

WEST HILLS PARKWAY

MH OS10 (5.0')
IE=371.7
RIM=376.7

MAST BOULEVARD

MH OS9 (5.0')
IE=390.8
RIM=395.8

MH OS8 (10.1')
IE=405.7
RIM=415.8

SEE CONTINUATION AT LEFT

MH A3 (5.0')
IE=438.7
RIM=443.7

MH A4 (5.0')
IE=439.0
RIM=444.0

MH A5 (5.3')
IE=430.5
RIM=435.8

MH A7 (9.3')
IE=425.2
RIM=434.5

MH B1 (5.0')
IE=433.0
RIM=448.0

MH B2 (5.0')
IE=419.0
RIM=424.0

MH C2 (6.9')
IE=415.1
RIM=422.0

MH C1 (5.0')
IE=439.0
RIM=444.0

MH F1 (5.0')
IE=413.0
RIM=418.0

MH E1 (5.0')
IE=419.0
RIM=424.0

SCALE: 1" = 200'

DEXTER WILSON ENGINEERING, INC.
CONSULTING ENGINEERS
2234 FARADAY AVENUE
CARLSBAD, CA 92008 (760) 438-4422

EXHIBIT A

PROPOSED SEWER SYSTEM LAYOUT
CITY OF SAN DIEGO
CASTLEROCK PROJECT SEWER SERVICE

\\PACIFIC\DWG\648010\SEWER_EXHIBIT_A.DWG 02-13-12 13:40:52 LAYOUT: 24X36