

Appendix C
Alternatives Screening – Supporting Materials

Olivenhain Trunk Sewer Improvements Project Technical Memorandum: Potential to Remove Existing Manholes

This memorandum evaluates the feasibility of removing existing sewer manholes along the Olivenhain Trunk Sewer between El Camino del Norte and the Olivenhain Pump Station, as part of the City of Encinitas' planned Olivenhain Trunk Sewer Improvements Project (Project). One manhole has been proposed for removal since Project inception: MH1286, which is immediately adjacent to an existing siphon that is also slated for removal; MH1286 would no longer be needed when the siphon is removed and a new straight section of sewer constructed to replace it. The analysis presented in this memorandum was prepared in response to the San Elijo Lagoon Conservancy and resource agencies' request that the City assess whether additional manholes can be removed while still meeting Project objectives; the assumption is that removing additional manholes would reduce the City's overall access needs and thereby decrease Project impacts on jurisdictional habitat.

This memorandum contains the following information.

- Background information on the Project, including Project drivers and objectives and a brief overview of the City's approach to Project planning
- An overview of the methods used to evaluate additional manholes for removal
- Information on manhole abandonment methods, including an approach to reduce impacts
- Results of the manhole removal analysis and conclusions for Project design

Background

Project Need and Objectives

The Olivenhain Trunk Sewer (hereafter, OTS) conveys wastewater from the City of Encinitas and adjacent communities about 4 miles along Escondido Creek and San Elijo Lagoon to the Olivenhain Pump Station at Manchester Avenue and I-5. Constructed in 1972, the OTS has many deteriorated manholes, experiences significant inflow and infiltration (I&I), and lacks reliable access for cleaning and maintenance. There is a very real potential for failure, and such an event would interrupt sanitary sewer service to thousands of residences and businesses, as well as impacting water quality in some of San Diego County's most valuable tidal and riparian habitat.

The Project is proposed to address existing maintenance issues, reduce I&I, improve system reliability, and provide better protection for water quality and habitat values in Escondido Creek and San Elijo Lagoon. Specific objectives as identified to date include

- Rehabilitating 54 existing sewer manholes to reduce I&I
- Relocating approximately 2,800 linear feet of the upper OTS out of the Escondido Creek floodplain and increasing its capacity to meet currently projected system needs
- Providing environmentally appropriate access for maintenance vehicles along the remainder of the OTS

Because the OTS is a 15-inch trunk sewer line, access will need to accommodate the City's Vac-Con or similar large sewer cleaning truck; smaller equipment is inadequate to serve this large-diameter line.

Project Development Approach

Recognizing the Project’s sensitive location, the Project team has been collaborating closely with the San Elijo Lagoon Conservancy and resource agencies (USFWS, USACE, DFG, RWQCB, and California Coastal Commission) through an ongoing Regulatory Working Group convened for the Project. The Project approach reflects guidance from extensive discussions with the Regulatory Working Group. At this time, rather than the traditional layout with a continuous hardscape roadway along the length of the OTS, the solution is tentatively envisioned as incorporating a number of shorter access spurs from adjacent roadways. Spurs would be configured to reach one or more manholes while reducing or avoiding impacts on the most sensitive habitat areas and maximizing the preservation of habitat connectivity; and would be constructed using a range of permeable, plantable surfaces, with the level of engineering treatment kept to the minimum needed to provide maintenance vehicles with reliable passage while preventing damage to the substrate. To support a sustainable outcome, Project planning is also considering the long-term target condition desired under the upcoming San Elijo Lagoon restoration effort, and will take into account the effects of anticipated sea level rise.

Methods

This analysis was designed to identify manholes that could be recommended for removal while still meeting Project objectives. Each manhole was evaluated through a series of screening questions focusing on

- requirements of good design practice, and
- factors that control the ability to provide adequate maintenance

The screening questions are summarized in the matrix below, which also presents the rationale behind each question, and summarizes the way responses were applied. Evaluation was based on City sewer infrastructure mapping in ArcGIS.

Rationale	Screening Question	Application
Because of the line’s diameter, adequate cleaning requires access by the City’s Vac-Con truck or other equipment of similar size and capability. In a large-diameter main, trucks of this type can typically clean no more than 500 linear feet (lf) of sewer line upstream of any given location	Would removing this manhole create a sewer reach with a length of more than 500 lf between manholes?	If YES , manhole must remain in service. If NO , manhole may be removed if it passes Questions 2 and 3
To facilitate proper maintenance and cleaning and serve as a physical junction between the two mains, a manhole must be located at any junction where a tributary line meets a trunk sewer	Is this manhole located at the junction with an incoming tributary line?	If YES , manhole must remain in service. If NO , manhole may be removed if it also passes Question 3
To facilitate proper maintenance and cleaning, a manhole must be located at any substantial* change in the horizontal direction or invert gradient of a trunk sewer line	Is this manhole located at a change in direction or invert gradient?	If YES , manhole must remain in service. If NO , manhole may be removed, assuming it also passed Questions 1 and 2

* For this evaluation, a *substantial change in direction* was considered to be any angle point greater than 3 degrees’ deflection, as cleaning equipment typically cannot navigate a change in direction greater than this.

Manhole Abandonment Methods

Traditional manhole abandonment involves bypassing the sewer flow from the manhole upstream to the manhole downstream of the manhole to be abandoned; excavating to remove the manhole, typically resulting in an excavation with a footprint of about 10 feet by 10 feet; installing a new PVC sewer pipe to connect the existing main through the area where the manhole was removed; and backfilling and compacting. In undeveloped areas, this method can result in a substantial disturbance of habitat due to the footprint necessary to stage bypass operations and mobilize/demobilize the heavy equipment used for excavation.

IEC has researched alternative manhole abandonment methods in order to reduce the impact associated with manhole abandonment. One method that has been successfully implemented in sensitive habitat in the County of San Diego and City of Vista involves installing a stainless steel half-pipe over the manhole channel; sealing the half-pipe edges with an epoxy grout to prevent infiltration; filling the manhole with an expanding foam product; and removing the top manhole rings. Manhole abandonments of this nature have been performed in environmentally sensitive areas utilizing only foot access and without the need for bypass pumping. Additional protection may be provided by installing a cured-in-place-pipe patch over the length of the manhole abandonment from an upstream or downstream manhole.

Results and Conclusions

Results are itemized on a manhole-by-manhole basis in Table 1. As Table 1 shows, a total of five manholes (in addition to MH1286, already slated for removal along with the adjacent siphon) could be removed without compromising the City's ability to provide adequate maintenance:

- MH1299 or MH1304
- MH1303
- MH1283
- MH1281

MH1299 and MH1304 are adjacent, and one must remain in service; removing both would create a reach (between MH1500 and MH1425) more than 500 lf long. As Figure 1 shows, under Alternative 2, which reflects the tentatively preferred approach for this portion of the OTS, MH1304 would be accessed via MH1299. The majority of the access spur from MH1299 to MH1304 would run within a developed area, but removing MH1304 would very slightly reduce incursions into areas of southwestern willow scrub and alkali marsh habitat. Under Alternative 1, MH1304 would be accessed from the north via MH1425; removing MH1304 would shorten the access route in this area and would reduce Project-related losses of alkali marsh. Removing MH1299 would not provide a direct benefit to habitat loss under Alternative 1, since the access from MH1500 to MH1299 would be within developed lands.

MH1283 is at the terminus of an access spur. Under both alternatives, removing this manhole would shorten the spur and slightly reduce impacts on alkali marsh, coastal brackish marsh, and southwestern willow scrub.

Under both Alternative 1 and Alternative 2, MH1303 would be accessed from the south via MH1425. In order to reach MH1303, access would pass through the location of MH1425. MH 1281 is also located between two other manholes. As a result, removing MH1303 and/or MH1281 would not materially alter the Project's impacts on jurisdictional habitat. Removing any of these manholes would also reduce infrastructure redundancy, potentially reducing the City's flexibility of operation in maintaining the OTS.

In summary,

- Based on this analysis, removal of the following manholes would offer a benefit in terms of reducing

Project impacts on habitat, without materially compromising the City's ability to maintain critical infrastructure: MH1304, MH1283. *This is a beneficial trade-off, and removal of these manholes could/should be included in the Project. To reduce impacts on sensitive habitat, we further recommend considering an environmentally sensitive alternative to traditional manhole abandonment techniques*

- This analysis also shows that removal of the following manholes would not reduce Project impacts, but could somewhat limit the City's ability to maintain critical infrastructure: MH1303, MH1281, MH1299. *This is a detrimental trade-off, and removal of these manholes should not be included in the Project*

Table 1. Olivenhain Trunk Sewer Improvements Project – Manhole Removal Analysis

MH #	Length of Reach			Incoming Tributary?	Change in Direction?		Candidate for Removal?	Reasons
	Distance to Upstream MH	Distance to Downstream MH	Length of Reach if Removed		More than 500'?	Direction Change?		
1493	335	13	348	—	Yes	64	No	Change in direction requires MH
1319	92	335	427	—	Yes	18	No	Change in direction requires MH
1501	297	92	389	Yes	—	3	No	Junction with tributary requires MH
1318	542	297	839	—	—	3	No	Removal would create reach >500 feet long
1309	603	542	1145	—	—	2	No	Removal would create reach >500 feet long
1310	607	603	1210	—	Yes	5	No	Removal would create reach >500 feet long; also, change in direction requires MH
1315	324	607	931	—	Yes	31	No	Removal would create reach >500 feet long; also, change in direction requires MH
1314	32	324	356	—	Yes	48	No	Change in direction requires MH
1305	494	32	526	—	Yes	57	No	Removal would create reach >500 feet long; also, change in direction requires MH
1312	248	494	742	Yes	Yes	42	No	Removal would create reach >500 feet long; also, junction with incoming tributary and change in direction both require MH
1297	414	248	662	—	Yes	49	No	Removal would create reach >500 feet long; also, change in direction requires MH
1296	536	414	950	—	—	0	No	Removal would create reach >500 feet long
1345	61	536	597	Yes	—	2	No	Removal would create reach >500 feet long; also, junction with tributary requires MH
1295	594	61	655	—	—	1	No	Removal would create reach >500 feet long

MH #	Length of Reach			Incoming Tributary?	Change in Direction?		Candidate for Removal?	Reasons
	Distance to Upstream MH	Distance to Downstream MH	Length of Reach if Removed		More than 500'?	Direction Change?		
1294	603	594	1197	Yes	—	0	No	Removal would create reach >500 feet long
1298	419	603	1022	Yes	—	0	No	Removal would create reach >500 feet long
1500	180	419	599	Yes	—	0	No	Removal would create reach >500 feet long; also, junction with tributary requires MH
1299	216	180	396	—	—	1	YES	MH1299 and MH1304 are adjacent. One must remain; removing both would create reach >500 long. Under Alternative 2 (currently preferred), MH1304 is accessed via MH1299; removing MH1304 would very slightly reduce incursions into SWS and AM. Under Alternative 1, MH1304 is accessed from north via MH1425; removing MH1304 would also slightly reduce incursion into AM; removing MH1299 would not benefit habitat loss because access to MH1299 from MH1500 (next closest to south) is via developed area
1304	125	216	341	—	—	1	YES	
1425	242	125	367	Yes	—	2	No	Junction with tributary requires MH
1303	114	242	356	—	—	2	YES	Under both alternatives, MH1303 is accessed from the south via MH1425; removing MH1303 would not materially alter impacts on jurisdictional habitat
1652	464	114	578	Yes	—	3	No	Removal would create reach >500 feet long; also, junction with tributary requires MH
1291	593	464	1057	Yes	Yes	6	No	Removal would create reach >500 feet long; also, direction change requires MH
1302	289	593	882	—	Yes	4	No	Removal would create reach >500 feet long; also, change in direction requires MH
1321	399	289	688	—	Yes	14	No	Removal would create reach >500 feet long

MH #	Length of Reach			Incoming Tributary?	Change in Direction?		Candidate for Removal?	Reasons
	Distance to Upstream MH	Distance to Downstream MH	Length of Reach if Removed		More than 500'?	Direction Change?		
1287	25	399	760	Yes	—	10	No	long; also, change in direction requires MH
1286	336	25	361	n/a	n/a	11	YES	MH1286 is located immediately adjacent to the siphon and is proposed for removal along with the siphon. MH1287 is needed to avoid creating a reach >500 feet long as a result of removing the siphon and MH1286
1284	503	336	839	Yes	Yes	4	No	Removal would create reach >500 feet long; also, change in direction requires MH
1285	149	503	652	Yes	—	3	No	Removal would create reach >500 feet long
1283	342	149	491	—	—	0	YES	MH1283 is at the terminus of an "axial" (along-alignment) access reach; removing this MH would slightly reduce incursions into SWS, AM, and CBM
1282	352	342	694	Yes	Yes	7	No	Removal would create reach >500 feet long; also, change in direction requires MH
1281	64	352	416	—	—	1	YES	MH1281 is located between two other MHs; removing MH1281 would not materially alter impacts on jurisdictional habitat
1329	532	64	596	Yes	Yes	9	No	Removal would create reach >500 feet long; also, junction with incoming tributary and change in direction both require MH
3575	566	532	1098	Yes	Yes	15	No	Removal would create reach >500 feet long; also, junction with incoming tributary and change in direction both require MH
1279	393	566	959	—	Yes	19	No	Removal would create reach >500 feet long
1278	204	393	597	—	—	0	No	Removal would create reach >500 feet

MH #	Length of Reach			Incoming Tributary?	Change in Direction?		Candidate for Removal?	Reasons
	Distance to Upstream MH	Distance to Downstream MH	Length of Reach if Removed		More than 500'?	Direction Change?		
3786	112	204	316	—	—	6	No	long Junction with tributary requires MH
1260	19	112	131	—	Yes	32	No	Change in direction requires MH
3788	146	19	165	Yes	Yes	27	No	Junction with tributary and change in direction both require MH
1301	365	146	511	—	—	0	No	Removal would create reach >500 feet long
1277	395	365	760	—	Yes	11	No	Removal would create reach >500 feet long; also, change in direction requires MH
1327	208	395	603	—	—	0	No	Removal would create reach >500 feet long
1300	591	208	799	—	—	0	No	Removal would create reach >500 feet long
1276	88	591	679	—	Yes	6	No	Removal would create reach >500 feet long; also, change in direction requires MH
3826	56	88	144	Yes	Yes	11	No	Junction with tributary and change in direction both require MH
1275	436	56	492	Yes	Yes	8	No	Junction with tributary and change in direction both require MH
1272	602	436	1038	—	—	0	No	Removal would create reach >500 feet long
1271	601	602	1203	—	—	0	No	Removal would create reach >500 feet long
1269	101	601	702	Yes	Yes	10	No	Removal would create reach >500 feet long; also, junction with incoming tributary and change in direction both require MH
266	294	101	395	Yes	—	0	No	Junction with tributary requires MH
1270	396	294	690	—	—	1	No	Removal would create reach >500 feet long

MH #	Length of Reach			Incoming Tributary?	Change in Direction?		Candidate for Removal?	Reasons
	Distance to Upstream MH	Distance to Downstream MH	Length of Reach if Removed		Direction Change?	If Yes, Horizontal Angle		
169	409	396	805	Yes	Yes	9	No	Removal would create reach >500 feet long; also, junction with incoming tributary and change in direction both require MH
1268	407	409	816	—	—	0	No	Removal would create reach >500 feet long
1263	406	407	813	—	Yes	7	No	Removal would create reach >500 feet long; also, change in direction requires MH
1264	406	406	812	—	—	1	No	Removal would create reach >500 feet long
1142	54	406	460	Yes	Yes	8	No	Junction with tributary and change in direction both require MH

Legend

Encinitas Sewer Infrastructure

- Sewer Manhole, from City GIS
- Sewer Manhole, Approximately Located
- Tributary Sewers

Draft Preferred Alternative (Surface Improvement Level)

Alternative in Existing Easement

- 0
- 1
- 2
- 3
- 4
- 5

Alternative in New Easement

- 0
- 1
- 2
- 3
- 4
- 5

Vegetation Mapping (IEC/Rocks 2012-2013)

- Vegetation Mapping (IEC/Rocks 2012-2013)

SEL PPM Potential Habitat USFWS Confirmed

San Elijo Lagoon Conservancy Conservation Easements

Sensitive Species

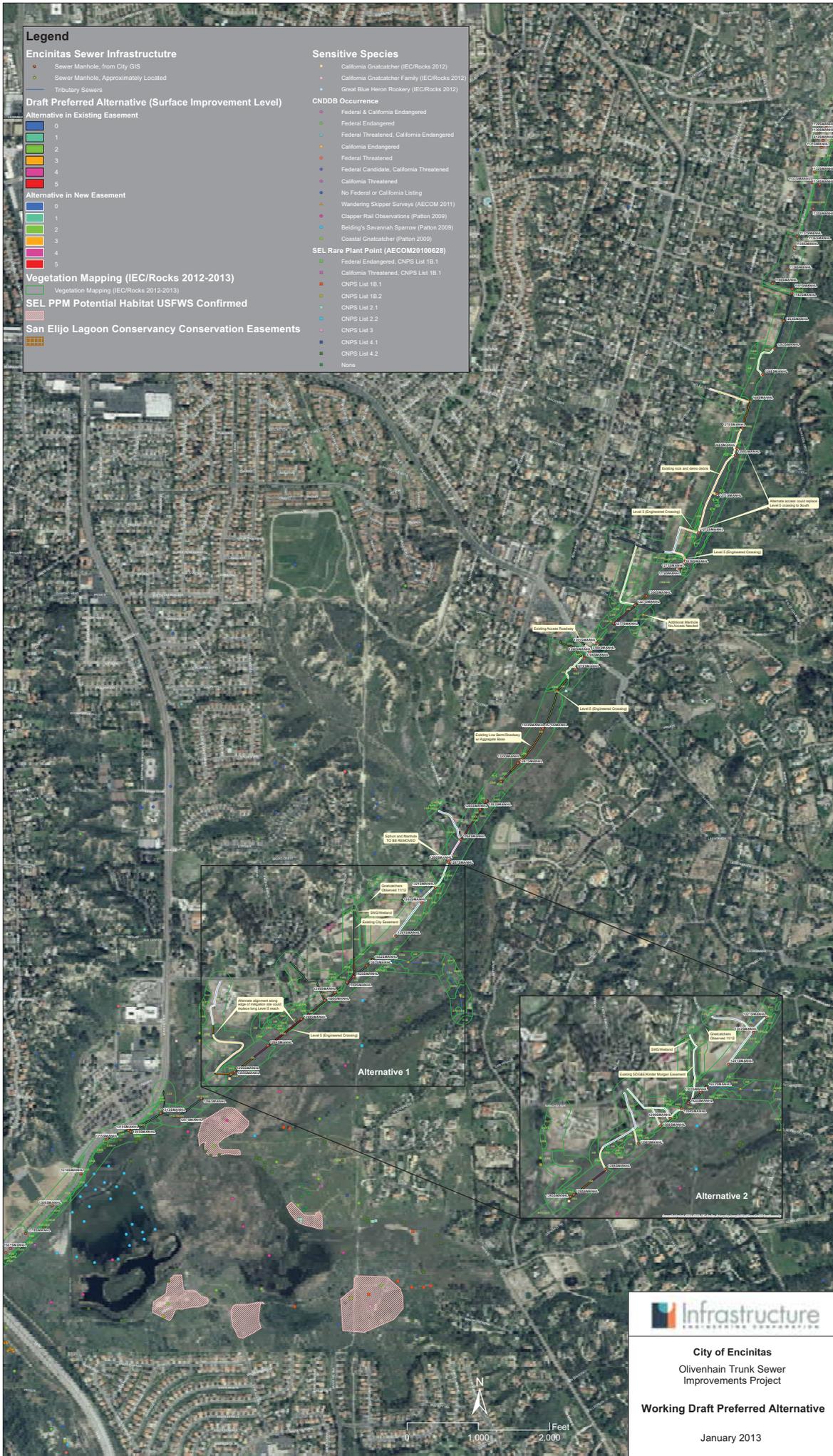
- California Gnatcatcher (IEC/Rocks 2012)
- California Gnatcatcher Family (IEC/Rocks 2012)
- Great Blue Heron Rookery (IEC/Rocks 2012)

CNDDDB Occurrence

- Federal & California Endangered
- Federal Endangered
- Federal Threatened, California Endangered
- California Endangered
- Federal Threatened
- Federal Candidate, California Threatened
- California Threatened
- No Federal or California Listing
- Wandering Skipper Surveys (AECOM 2011)
- Clapper Rail Observations (Patton 2009)
- Belding's Savannah Sparrow (Patton 2009)
- Coastal Gnatcatcher (Patton 2009)

SEL Rare Plant Point (AECOM20100628)

- Federal Endangered, CNPS List 1B.1
- California Threatened, CNPS List 1B.1
- CNPS List 1B.1
- CNPS List 1B.2
- CNPS List 2.1
- CNPS List 2.2
- CNPS List 3
- CNPS List 4.1
- CNPS List 4.2
- None



City of Encinitas
 Olivenhain Trunk Sewer
 Improvements Project

Working Draft Preferred Alternative

January 2013

**CITY OF ENCINITAS
 OLIVENHAIN TRUNK SEWER IMPROVEMENTS
 Engineer's Opinion of Probable Construction Cost
 Proposal
 July 2011**

TRUNK SEWER ALTERNATIVE ALIGNMENT PROFILE 1:					
Item	Quantity	Unit	Article	Unit Price	Extension
1	2	EA	Pump Station	\$4,000,000	\$8,000,000
2	3,200	LF	Sewer Force Main 1	\$300	\$960,000
3	1,500	LF	Sewer Force Main 2	\$300	\$450,000
4	9,350	LF	Sewer Gravity Main	\$260	\$2,431,000
5	7,150	LF	Sewer Gravity Main (Deep)	\$400	\$2,860,000
6	8	EA	Satellite Pump Station	\$1,500,000	\$12,000,000
7	9,400	LF	Satellite Force Main	\$180	\$1,692,000

Subtotal:	\$28,393,000
Contingency (40%):	\$11,357,200
Subtotal:	\$39,750,200
Design & CM (30%):	\$11,925,060
Total:	\$51,675,260

