

7.0 Implementation Plan

7.1 Introduction

This section presents the Implementation Plan, which includes recommendations for an adequately sized sanitary sewer system in the FSD study area. The Implementation Plan was prepared using information from flow monitoring, sewer system inventory, growth and development projections, and computer modeling described in this report. The Implementation Plan for the FSD sanitary sewer system includes the following components:

- ?? Constructing relief sewers
- ?? Constructing extension sewers to serve new development
- ?? Upgrading the Little Ranches pumping station and force main
- ?? Constructing a new pumping station and force main to serve part of the Valley Ranch subdivision that is within the study area
- ?? Addressing SSO Rule and CMOM program requirements
- ?? Addressing wastewater treatment capacity requirements through build-out of the study area

The capital improvements recommended in the Implementation Plan are based on providing sewer capacity and flow containment for a 5-year storm event.

The recommended improvements are grouped into two priorities. Priority 1 improvements are needed to address immediate or near term needs and are based on the projected year 2010 flows and extending service to currently planned new subdivisions. Priority 2 improvements are based on projected flows and requirements at build-out of the service area. Extension sewers should be reviewed prior to implementation, based on the actual growth that occurs.

Recommended improvements included in the Implementation Plan are shown on Figure 7-1.

Figure 7-1 Recommended Improvements

7.2 Relief Sewers

For existing conditions, a total of approximately 8,800 feet of sewer lines are indicated to be overloaded by a 5-year storm event. Additional sewers will become overloaded as the sewer system is expanded to meet development. Recommended relief sewers, shown on Figure 7-1 and listed in Table 7-1, were identified based on projected year 2010 flows and sized to handle flows at build-out of the study area. Priority 1 relief sewers are required by year 2010, and priority 2 relief sewers are required to convey projected build-out flows. All capital improvement projects are identified by a project name that includes the trunk sewer designation plus a number. The projected cost of relief sewers required to alleviate present hydraulic deficiencies is \$3.34 million, as shown in Table 7-1. The projected cost of relief sewers required through build-out of the study area is an additional \$4.76 million, also as shown in Table 7-1.

For planning purposes, relief sewers are sized to parallel and follow average slopes of existing sewers. The preliminary alignments and pipe diameters indicated in this report should be used as a guide in planning. More precise alignments and sizes should be determined during design.

Table 7-1							
Recommended Relief Sewers							
CIP Name ⁽¹⁾	Upstream Node	Downstream Node	Existing Size (in.)	Relief Size (in.)	CIP Length (ft)	Construction Cost (\$)	Capital Cost (\$)
Priority 1 Relief Sewers – 2010 Analyses							
CS1	CS-016	CS-003	8, 10, 12	15	850	488,600	684,600
	CS-003	JC-008		18	<u>3,952</u> 4,802		
FM1	FM-017	FM-001	8	12	1,277	120,800	169,100
JC1	JC-008	LR-PS	10, 12, 24	33	2,205	417,500	584,500
JC3	JC-030	JC-016	15	33	5,101	917,700	1,284,800
JC4	JC-041	JC-036	8, 12, 15	24	1,045	441,200	617,600
	JC-036	JC-030		27	<u>2,055</u> 3,100		
Total Priority 1					16,485	2,385,800	3,340,600
Priority 2 Relief Sewers – Build-out Analyses							
BO1	BO-013	B0-010	12	15	1,188	112,500	157,500
CS2	LR-001	CS-019	8	8	478	115,200	161,300
	CS-019	CS-016		8	<u>1,027</u> 1,505		
CS7	CS-027	CS-003	12	18	1,697	115,400	245,500
JC2	JC-016	JC-008	15	33	2,649	476,600	667,200
JC5	JC-059B	JC-058	18	18	736	693,600	971,000
	JC-058	JC-056		21	665		
	JC-056	JC-041		24	<u>4,375</u> 5,796		
SF2	MISC-01	MISC-08	24	54	1,335	473,600	663,000
SF3	SF-008	MISC-01	18,24	30	1,736	291,400	407,900
SF4	SF-019	SF-018	8	18	85	531,300	473,800
	SF-018	SF-011		24	2,130		
	SF-011	SF-008		27	<u>1,499</u> 3,714		
SF5	SF-040	SF-019	12, 15, 18	18	7,013	723,100	1,012,300
Total Priority 2					26,633	3,532,700	4,759,500
Total					43,188	5,918,500	8,100,100
⁽¹⁾ There is no priority associated with the CIP numbering system. FSD will evaluate each individual project and prioritize prior to implementation.							

7.3 Extension Sewers

New trunk sewer construction will be required to extend service to new developments, as they require service. Recommended extension sewers, shown on Figure 7-1 and listed in Table 7-2, were identified based on the future land use map and sized to handle projected build-out flows. The projected cost of extension sewers required to extend service to currently known subdivisions is \$6.13 million, as shown in Table 7-2. The projected cost of additional extension sewers required to complete build-out of the study area is \$4.10 million, also as shown in Table 7-2.

Table 7-2 Recommended Sewer Extensions						
CIP Name ⁽¹⁾	Upstream Node	Downstream Node	CIP Size (in.)	CIP Length (ft)	Construction Cost (\$)	Capital Cost (\$)
Priority 1 Extension Sewers – 2010 Analyses						
CS3	CS-F002	CS-027	18	1,213	125,500	175,700
CS5	CS-F004	CS-F002	15	2,106	201,862	282,600
FM2	FM-F004	FM-F003	15	2,883	693,700	971,200
	FM-F003	FM-001	18	<u>4,412</u> 6,995		
JC6	JC-F037	JC-F036	8	1,772	310,200	434,300
	JC-F036	JC-064	10	<u>2,399</u> 4,171		
JC7	JC-F031	JC-F030	10	982	688,700	964,100
	JC-F030	JC-F029	12	1,090		
	JC-F029	JC-064	15	<u>5,582</u> 7,624		
JC8	JC-F033	JC-F032	8	1,110	150,400	210,600
	JC-F032	JC-F025	10	<u>997</u> 2,102		
JC10	JC-F002	JC-030	24	2,011	257,500	360,500
JC11	JC-F004	JC-F003	15	1,479	265,600	371,900
	JC-F003	JC-F002	21	<u>876</u> 2,355		
JC14	JC-F014	JC-F011	18	3,430	951,800	1,332,500
	JC-F011	JC-F002	21	<u>3,287</u> 6,717		
JC15	JC-F022	JC-F014	15	5,836	735,838	1,030,200
Total Priority 1				41,330	4,383,100	6,133,600
Priority 2 Extension Sewers – Build-out Analyses						
BO2	BO-F004	B0-057	8	2,880	274,900	384,900

Table 7-2 Recommended Sewer Extensions						
CIP Name ⁽¹⁾	Upstream Node	Downstream Node	CIP Size (in.)	CIP Length (ft)	Construction Cost (\$)	Capital Cost (\$)
CS6	CS-F008	CS-F006	10	3,014	721,800	1,010,500
	CS-F006	CS-F004	12	<u>3,040</u> 6,054		
FM3	FM-F006	FM-F005	8	1,556	227,100	317,900
	FM-F005	FM-F004	10	<u>1,361</u> 2,917		
JC9	JC-F034	JC-F033	8	2,116	162,100	226,900
JC12	JC-F008	JC-F006	10	2,838	551,300	771,900
	JC-F006	JC-F004	15	<u>2,611</u> 5,499		
JC13	JC-F009	JC-F004	8	2,110	186,700	261,400
JC16	JC-F023	JC-F022	15	1,880	264,100	369,800
JC17	JC-F018	JC-F016	8	2,508	540,500	756,800
	JC-F016	JC-F015	10	1,490		
	JC-F015	JC-F014	12	<u>1,499</u> 5,497		
Total Priority 2				28,953	2,928,500	4,100,100
Total				70,283	7,311,600	10,233,700

⁽¹⁾ There is no priority associated with the CIP numbering system. FSD will evaluate each individual project and prioritize prior to implementation.

For planning purposes, sewer extensions are located and sized to extend service into the various drainage areas and to follow the average slopes of the existing ground. Actual alignments and available sewer slopes would be determined during design. The preliminary alignments and pipe diameters indicated in this report should be used as a guide in planning.

7.4 Pumping Stations and Force Mains

Lift station capacities were evaluated based on existing and projected peak flow conditions and the existing firm pumping capacity. Recommendations for expansion or replacement of a lift station are based on whether the flow/capacity ratio of the station equals or exceeds 2.0. Expansion is suggested when flow/capacity ratio equals 2.0. Replacement is recommended when flow/capacity ratio is higher than 2.0. Proposed force mains are assumed to be replaced; however, whether the force mains are paralleled or replaced will be determined during detailed design. It should be noted that this study

includes no consideration of the present physical configuration or the condition of the station; therefore, detailed review of whether to expand or replace each pumping station should be carried out as part of detailed design.

The Little Ranches pump station will require expansion to its planned ultimate capacity of 5.0 mgd to satisfy projected year 2010 flows. This expansion is CIP project JCP1A. Along with the station expansion, the existing 10-inch force main will be pulled from the 12-inch pipe that it was installed inside of to accommodate the increased pumping station capacity.

The Little Ranches pump station will require replacement to allow a total PWWF of 22 mgd to satisfy flows through build-out of the study area, as CIP project JCP1. The existing force main would require replacement with a 30-inch diameter main in order to convey the peak flows at build-out within the design limit for velocity. The force main is CIP project JCF1. In the event that FSD selects a regional wastewater management alternative, the Little Ranches station would be replaced with a new facility designed to convey Jimmy Camp Creek basin flows to the regional plant.

The portion of the Valley Ranch subdivision within the study area is one quarter-section of land located south of C&S Road and east of Lords Hill Drive. To provide sewer service to this area, a pumping station would be located on low ground at the southwest of the area. A force main would be required to convey flows to a proposed trunk sewer manhole No. CS-F002 on Wilson Road. The pumping station and force main are CIP projects CSP1 and CSF1, respectively.

The planned land use area at the southwest-most part of the study area is currently used for mineral extraction, but could be redeveloped in the future. Service to most of this area would require wastewater collection to a pumping station near the southern boundary, and a force main to convey flows to existing sewers. The pumping station and force main are shown as CIP projects BOP1 and BOF1, respectively.

Pump station and force main improvements are listed in Table 7-3 and 7-4, respectively.

CIP Name ⁽¹⁾	Design Year	Type	Recommended Firm capacity (mgd)	Probable Construction Cost (\$)	Probable Capital Cost (\$)
JCP1A	2010	Expansion	5	537,600	752,600
JCP1	Build-out	Replacement	22	4,786,900	6,701,600
CSP1	2010	New Facility	0.5	306,900	537,600
BOP1	Build-out	New Facility	0.5	306,900	537,600
Total				5,938,300	8,312,200

CIP Name ⁽¹⁾	Design Year	Design Diameter (in.)	Length (ft)	Probable Construction Cost (\$)	Probable Capital Cost (\$)
JCF1	Build-out	30	2,635	395,300	553,400
CSF1	Build-out	4	2,630	52,600	73,600
BOF1	Build-out	6	6,390	191,700	268,400
Total			10,337	639,600	897,400

7.5 SSO Rule and CMOM Program Requirements

The proposed SSO Rule consists of regulations that will amend NPDES permit requirements to improve the operation of collection systems, reduce the frequency and severity of sewer overflows, and provide more effective public notification when overflows do occur. Review of the FSD’s current operation and the proposed rule indicates that FSD will be required to accomplish the following:

- ?? Prepare a “CMOM Program Plan” for submittal to ODEQ when the first NPDES Permit is renewed subsequent to implementation of the regulations
- ?? Identify and address any legal issues that limit FSD’s ability to effectively address overflows in satellite systems
- ?? FSD should prepare a detailed review, beyond the scope of this report, of the adequacy of current operations and maintenance activities with regard to upcoming regulations.

Review of FSD's overall program indicates several potential weaknesses that should be addressed in planning for the proposed SSO rule:

- ?? Lack of a formal and written Overflow Emergency Response Plan (OERP)
- ?? Lack of an automated Maintenance Management Information System (MMIS) which would greatly facilitate the process of record keeping and reporting required by CMOM
- ?? Lack of a formal process for identification and prioritization of structural deficiencies
- ?? Lack of a formal short-term and long-term rehabilitation plan to address deficiencies
- ?? Legal issues related to satellite systems
- ?? Need to adopt procedures for formal review and evaluation of odor complaints
- ?? Need for review and assessment of whether FSD has adequate authority over private sector infiltration/inflow, and a program to provide construction inspection of private service connections
- ?? Need for enhancement of existing Floatable Oil and Grease (FOG) ordinance and activities to reduce the amounts of FOG received by the system

7.6 Wastewater Treatment Plant Hydraulic Capacity

FSD's existing wastewater treatment facility provides a current design average daily flow of 1.30 mgd and design peak flow of 2.73 mgd. Hydraulic components are designed with a hydraulic capacity of 5.0 mgd to permit the plant to be approximately doubled in the future. Treatment process facilities were designed based on a maximum month average daily flow of 1.56 mgd and an organic loading capacity of 2,928 pounds of 5-day biochemical oxygen demand.

The State of Colorado requires wastewater utilities to have new treatment facilities in a design stage by the time flows reach 80 percent of their existing treatment capacity, and have new facilities under construction by the time that the flows reach 90 percent of existing capacity. Current ADF flows are approximately 80 percent of 1.30 mgd, or 1.04 mgd. Current maximum month average daily flows are slightly less than 80 percent of the 1.56 mgd process capacity, or 1.25 mgd. Therefore, FSD should be planning for additional treatment capacity at this time.

Projected ADF flows are 2.91 mgd for year 2010, and 8.9 mgd by build-out of the study area. The projected year 2010 ADF flow for the study area exceeds the planned ultimate capacity of the existing treatment facility. The projected flows for the Fountain Creek portion of the study area are within the planned ultimate treatment capacity beyond year 2010.

7.7 Summary of Costs

The total projected capital cost of the Implementation Plan is \$10.8 million through year 2010, and an additional \$16.9 million through build-out. These costs are limited to the collection system improvements and do not include wastewater management or treatment costs. The recommended facilities are summarized in Table 7-5 and indicated on Figure 7-1. The projected capital costs listed in Table 7-5 for capital projects include construction cost plus allowances of 20 percent for contingencies and 20 percent for engineering, legal, and administrative costs. Costs for land, rights-of-way, or rock excavation are not included.

Table 7-5 Summary of Probable Capital Costs	
Cost Item	Total Capital Cost (\$)
Priority 1 – Year 2010	
Relief Sewers	3,340,600
Extension Sewers	6,133,600
Little Ranches Pump Station Expansion (JCP1A)	752,600
Valley Ranch Pump Station and Force Main (CSP1, CSF1)	611,200
SSO Rule / CMOM Program	N.A.
Wastewater Treatment Requirements	N.A.
Total Priority 1 Probable Cost	10,838,000
Priority 2 – Build-out Conditions	
Relief Sewers	4,759,500
Extension Sewers	4,100,100
Little Ranches Pump Station and Force Main Replacement (JCP1, JCF1)	7,255,000
Southeast Area Pump Station and Force Main (BOP1, BOF1)	806,000
Wastewater Treatment Requirements	N.A.
Total Priority 2 Probable Cost	16,920,600
Total Probable Cost	27,758,600
⁽¹⁾ N.A. – Cost to be determined by FSD.	