SECTION VIII—CAPACITY MANAGEMENT

Requirement*

Each Enrollee shall prepare and implement a capital improvement plan (CIP) that provides hydraulic capacity of key sanitary sewer system elements for dry weather peak flow conditions and the appropriate design storm or wet weather event. The CIP shall include the following elements:

a. Evaluation of those sections of the collection system that experience or contribute to SSO discharge caused by hydraulic deficiency

b. Establish design criteria if it does not exist or if deficient

c. Establish short- and long-term capacity enhancement measures to include in the CIP including an implementation schedule and funding sources

d. Develop a completion schedule for the CIP developed, which is reviewed and updated in accordance with Section D.14 of the Order

Supporting Documents

A summary of the capacity management work related to this section and the supporting official documents are shown in Table VIII.1.

A copy of each document (or excerpts thereof) follows the table. The relevant section from the Benicia Business Park Sewer Collection System Analysis regarding the existing collection system and related hydraulic analysis for the industrial park is attached.

The City's wastewater system master plan was updated in July 2011. This document includes data collected in 2007/2008 on inflow and infiltration, operational experience with the Relief Sewer Pipeline, hydraulic modeling, capital improvements, and funding and implementation schedules.

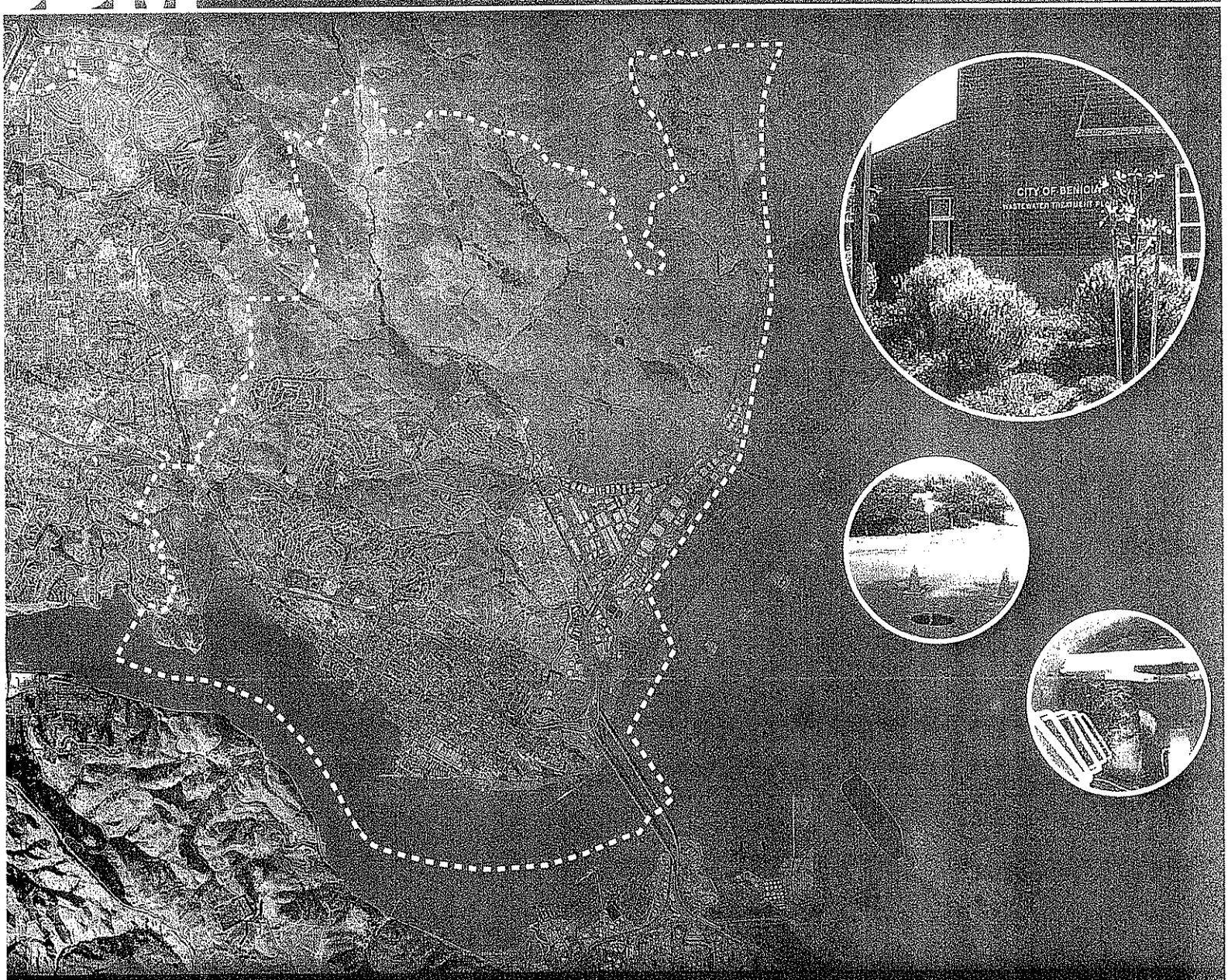
* SWRCB Order No. 2006-0003-DWQ § B.13 (viii)

TABLE VIII.1—SUMMARY OF CAPACITY MANAGEMENT

Item Required	Supporting Documents
a. Evaluate collection system for hydraulic deficiencies	Wastewater Master Plan. July 2011. CDM. Infiltration/Inflow (I/I) Improvements Project Master Plan – Executive Summary. September 2000. City of Benicia.
b. Establish design criteria	Wastewater Master Plan. July 2011. CDM. Infiltration/Inflow (I/I) Improvements Project Master Plan – Executive Summary. September 2000. CDM.
c. Establish short- and long-term capacity enhancement measures	Wastewater Master Plan. July 2011. CDM. Infiltration/Inflow (I/I) Improvements Project Master Plan – Executive Summary. September 2000. CDM. Capital Improvement Program FY 2011–2016. October 26, 2011. City of Benicia. (See Section IV)
d. Develop a completion schedule	Capacity Management CIP Memo. December 2011. City of Benicia City Engineer. Wastewater Master Plan. July 2011. CDM. Capital Improvement Program FY 2011–2016. October 26, 2011. City of Benicia. (See Section IV)

Excerpt from City of Benicia Wastewater Master Plan

CDM



City of Benicia

Wastewater System Master Plan

Final Report – July 2011

THE CITY OF BENICIA CALIFORNIA

Executive Summary

Purpose of the Master Plan

The City of Benicia (City) provides the full range of wastewater services for its customers involving the operation, maintenance, repair, and capital improvements of a city-wide sewer collection system and a Wastewater Treatment Plant (WWTP). This master plan update provides a foundation on which the City can base future decisions regarding the construction, operation, and maintenance of the collection and treatment facilities through the planning horizon of 2035 (buildout).

Section 2 describes the study area and land uses.

The master plan is formulated to be consistent with the goals, policies and programs of the City's General Plan. The master plan reflects current conditions and anticipated future growth, and incorporates information from recent relevant City studies. It includes development of a city-wide sanitary sewer collection system model (pipelines of 10-inch and greater diameter); use of the model to identify and analyze required capacity improvements for these major sewers; and development of capital improvement program recommendations based on the analysis results.

Existing Wastewater System

Section 3 describes the existing wastewater system and the hydraulic model.

The City owns and operates all aspects of the wastewater collection and treatment facilities serving the master plan study area. The wastewater system includes a WWTP and sanitary sewer collection system. The City's collection system conveys all wastewater flows to the wastewater treatment plant located in the southeastern part of the City. The collection system consists of about 150 miles of pipeline, a 3-mile wet weather relief (interceptor) pipeline, and 24 lift stations.

Flow Projections

Section 4 provides information on wastewater flow projections, which were used for the collection system analysis.

Existing and future flow projections were developed using a land use based approach, using unit flow factors developed from City flow meter data. For the master plan analysis of collection system, peak wet weather flows were the critical flow condition for the evaluation of capacity needs. The increase in projected flows between existing and buildout is not large; due to the limited future growth in sewered land uses anticipated in the City. Peak wet weather flows (10-year storm) are projected to increase from 18 million gallons per day (mgd) under existing conditions to 21.8 mgd at buildout, about a 20 percent increase.

Regulation Review

The master plan included review of upcoming regulations potentially affecting the City's wastewater system. The regulation review addressed wastewater treatment and discharge issues including: effluent limits and total maximum daily loads; treatment plant operations; recycled water; biosolids; and the collection system; as well as potential air quality issues. Overall, the City's wastewater system is in a good position with respect to regulatory compliance. There are no new significant regulatory issues that the City is not already aware of and addressing.

Section 5 summarizes the findings of the regulation review.

Collection System Analysis

The hydraulic model and wastewater flow projections were used to analyze existing and buildout conditions, to determine where the existing collection system does not have adequate capacity to convey peak flows. The collection system capacity analysis included the modeled gravity sewers, lift stations and force mains.

Section 6 summarizes the evaluation criteria for the collection system analysis, and the collection system analysis results.

The model results for the existing and buildout peak dry and peak wet weather simulations were compared to the evaluation criteria. Locations that did meet the criteria were identified as deficient capacity locations. The deficient locations were then subject to a detailed analysis to determine the need for improvements. As the City is close to buildout, the hydraulic analysis results for existing and buildout conditions are similar for most of the City, with the exception of the Benicia Business Park, which is the largest future anticipated development.

Sustainability Approaches

This master plan is formulated to be consistent with the objectives, strategies, and implementation actions of the City's Climate Action Plan (CAP).

Section 7 summarizes sustainability approaches for the wastewater system.

The City's Wastewater Division has made great strides in terms of sustainable operations. Most of the measures identified in the Climate Action Plan focusing on the control and minimization of energy demands from their operations are in place or currently being implemented. Energy usage for wastewater operations has been significantly lowered in recent years by installing high efficiency aeration blowers at the treatment plant, utilizing high efficiency pumps and motors, minimizing pumping operations, utilizing high efficiency lights, minimizing idle equipment/processes, and utilizing digester gas to heat the digesters at the plant. In addition, the City, in partnership with Valero Refinery, has been developing a project to supply recycled

water to the refinery for industrial uses, which will move forward when economically feasible. The City should continue to monitor the potential impact of sea level rise on high tides with respect to potential vulnerability of the treatment plant which is located near the shoreline. Current information suggests that the mean sea level may rise from 16 to 20 inches by 2050. Adaptive strategies to reduce the potential risk of flooding should be designed into future rehabilitation or upgrades based on detailed site analyses and continued monitoring of information on sea level information.

Sludge Disposal Alternatives and Treatment Options

With respect to the wastewater treatment plant, the master plan included evaluation of potential sludge (biosolids) disposal alternatives, as well as options for solids treatment upgrades that could reduce solids disposal volume and/or produce higher quality biosolids. Reducing disposal volume decreases hauling and landfill costs and operational greenhouse gas (GHG) emissions. Producing higher quality biosolids can provide additional long-term flexibility for disposal.

Section 8 describes sludge disposal alternatives and solids treatment options for the wastewater treatment plant.

The City has a relatively small biosolids production. For the near-term timeframe, the current disposal method of landfilling is the most feasible and cost effective disposal option. There are some relatively minor and low cost modifications of the current solids treatment processes, such as co-thickening, which could help meet the City's CAP goals for reducing GHG emissions. For the long-term, more capital intensive improvements, such as sludge drying, could provide increased disposal flexibility with higher quality biosolids.

Recommended Capital Improvements

Table ES-1 summarizes the major categories of recommended sewer collection system capacity improvements for the City's Capital Improvement Program.

Section 9 presents the recommended sewer system capacity improvements, estimated costs, and implementation considerations.

Table ES-1
Recommended Sewer Collection System Capacity Improvements

Type	*Total Quantity*	*Unit*	*Capital Cost (2010 $ Million)*
Gravity Sewers	19,700	Feet	$10.0
Force Mains	14,200	Feet	$5.1
Lift Station Upgrades	165	Horsepower	$1.4
		Total	$16.5

Table 9-1 (in Section 9) provides a detailed description of the recommended improvements to provide the required sewer collection system capacity to convey buildout flows. Figure 9-1 (in Section 9) shows the conceptual locations of the recommended capacity improvements. All collection system improvements are sized to convey buildout peak flows.

The sewer collection system capacity improvements for the master plan address the larger diameter sewers (generally 10-inch and greater). The City also has an ongoing program to identify sewer rehabilitation/replacement projects for all sewers, including smaller sewers of less than 10-inch diameter, that address poor condition, infiltration/inflow reductions, improved performance, or other needs.

As discussed in Section 8, landfilling continues to be the most feasible and cost-effective disposal option for the City. Therefore, no significant capital improvements are needed for the solids handling facilities at the wastewater treatment plant. To provide some reduction in biosolids volume and help meet GHG emission reduction goals, two modifications of existing solid treatment facilities/practices are recommended for further analysis of feasibility for near-term implementation. These modifications, which have minimal capital costs and could be implemented simultaneously, are:

- Co-thickening of primary sludge and scum with waste activated sludge, which involves adding a 6-inch actuated plug valve to the existing treatment process.
- Series digestion, which involves heating an additional existing digester to increase operational temperatures, and operation of additional existing recirculation pumps.

As part of the City's rehabilitation/replacement program, an additional option could be considered to retrofit the existing belt filter press from 8 rollers to 12 rollers if major rehabilitation becomes necessary, or to replace it with a 12-roller press at the end of its useful life. This option would require detailed investigation to determine its feasibility and potential cost.

A potential long-term upgrade would add an on-site sludge drying unit. However, this improvement would be very costly and is not recommended at this time given the City's available landfill disposal options. In future master plan updates, it could be re-evaluated depending on future disposal needs.

Section 9
Recommended Capital Improvements

This section presents the recommended wastewater system improvements based on the analysis findings presented in the previous sections.

9.1 Recommended Collection System Capacity Improvements

Table 9-1 shows the recommended CIP projects to provide the required wastewater collection system capacity to convey buildout flows. Figure 9-1 shows the conceptual locations of the capacity projects. At this conceptual master planning level, the conceptual locations are assumed to be in the same alignments as the existing facilities.

The projects identified in Table 9-1 are based on the capacity evaluations discussed in Section 6. All recommended improvements are sized to convey the build-out peak wet weather flows for the 10-year design storm.

For conservative budgeting purposes, CIP costs shown in Table 9-1 are based on replacement rather than parallel sewers, to provide more flexibility for the City in implementing projects. Pump station capacity expansion costs assume the existing station will be completely replaced when upgraded. Costs for conditional lift station improvements to replace pumps due only to changes in the future hydraulic gradeline, assume replacement of pumps/motors and electrical upgrades. Section 9.3 provides the basis for the capital cost estimates.

The timeframe for improvements in Table 9-1 is shown as either existing or future, depending on the initial timeframe when additional capacity is needed. All projects, whether identified for the existing or future timeframes, are sized for buildout flows. Within each category, projects are prioritized for implementation considering: severity of deficiency and threat of overflow; higher priority for deficiencies under peak dry weather as well as wet weather flow; and impact on other improvements, e.g., downstream improvements that may impact upstream improvements and should be constructed first.

The prioritization of projects in Table 9-1 is intended to serve as a guideline for City staff in its CIP planning. City staff will review individual projects for implementation as part of the development of the City's 5-year CIPs. The specific priority for implementation of individual projects will depend on the City's needs and availability of funding, as determined over time.

Table 9-1
Summary of Recommended Sewer Collection System Capacity Improvements

Gravity Sewer Capacity Projects	Replacement Diameter (in)	Parallel Diameter (in)	Length (ft)	Capital Cost ($) [1]	Time Frame [2]	Cost Allocations [3]	
						Existing Users (%)	Future Users (%)
West Fork (Profile P-2): replace existing 8-inch pipe with 18-inch pipe from West Channel Road to Park Road. [4]	18	15	4,300	$2,279,000	Existing (initial deficiency); Future (capacity for Benicia Business Park)	40%	60%
East Channel Road (Profile P-4): replace existing 12-inch pipe with 15-inch pipe from E 2nd Street to extension of Industrial Court; and 18-inch pipe from that point to Industrial Way. As discussed in Section 6.4.2, prior to implementing, conduct field survey to confirm invert data and hydraulic analysis results. [4]	18	15	2,900	$2,493,000	Existing	100%	0%
	15	10	2,100				
I-780 Crossing at West 7th Street (P-5): Either bolt down manhole cover if no adverse impacts to nearby services or replace/parallel existing 12-inch pipe at the crossing. For budgeting purposes, CIP assumes replacement.	12	6	400	$152,000	Existing	100%	0%
West 7th Street (Profile P-6): replace existing 8- and 10-inch pipes with 12-inch pipe from south of Cherl Drive to K Street at the existing diversion structure at the Relief Interceptor.	12	8	1,700	$646,000	Existing	100%	0%
I-780 at Rose Drive (Profile P-8): replace existing 12-inch pipe that runs parallel to I-780 from approximately London Circle to E. Rose Drive in the Southampton area. As discussed in Section 6.4.2, prior to implementing, conduct field survey to confirm invert data and hydraulic analysis results.	18	12	8,300	$4,399,000	Existing	100%	0%
Subtotal Gravity Sewer Capacity Projects			**19,700**	**$9,969,000**		**86%**	**14%**
Force Main Capacity Projects	**Existing Diameter (in)**	**New Diameter (in)**	**Length (ft)**	**Capital Cost ($)**	**Time Frame [2]**	**Cost Allocations [3]**	
						Existing Users (%)	**Future Users (%)**
Replace existing 8-inch force main with 16-inch from the 24-inch gravity sewer to just upstream of Benicia Industries LS (segment where new line is parallel to existing 14-inch).	8	16	3,900	$1,365,000	Future (capacity for Benicia Business Park)	0%	100%
Replace existing 8-inch force main with 18-inch from just upstream of Benicia Industries LS to Tire Shop LS (segment where parallel to existing 12-inch main).	8	18	6,700	$2,479,000		0%	100%
New parallel 18-inch force main between Tire Shop LS and Park Industrial LS. [5]	NA	18	3,600	$1,332,000		0%	100%
Subtotal Force Main Capacity Projects			**14,200**	**$5,176,000**		**0%**	**100%**

Table 9-1
Summary of Recommended Sewer Collection System Capacity Improvements

Lift Station Capacity Projects	Existing Firm Capacity (gpm)	Required Firm Capacity (gpm)	Total Station HP	Capital Cost ($)	Time Frame [2]	Cost Allocations [3]	
						Existing Users (%)	Future Users (%)
Replace Park Industrial LS to provide 4,490 gpm firm pumping capacity. Cost based on replacing entire station. Total station HP estimated to range from 80 HP (3 pumps) to 100 HP (2 pumps) at the existing TDH. Cost based on high end of range for budgeting purposes. As discussed in Section 6.5.3, prior to implementing, conduct field investigations and predesign studies to confirm existing hydraulic characteristics and capacity, as well as the most effective future configuration.	1200	4490	100	$830,000	Existing (initial deficiency); Future (capacity for Benicia Business Park)	70%	30%
Conditional LS Projects (if needed). The following conditional projects would only be needed if the future hydraulic gradeline of Bayshore force mains increases significantly due to future Park Industrial LS upgrades). These conditional projects are included to provide flexibility for future implementation of the Park Industrial LS improvements. [6]							
Conditional Project for Tire Shop LS Pump Replacements (2 pumps)	350	350	30	$240,000	Future (conditional, if needed due to improvements for Benicia Business Park)	0%	100%
Conditional Project for Benicia Industries LS Pump Replacements (2 pumps)	350	350	30	$240,000		0%	100%
Conditional Project for Wharf LS Pump Replacement (only 1 pump at station due to limited use for dock bathrooms, so firm capacity equal to total capacity)	340	340	5	$50,000		0%	100%
Subtotal Lift Station Capacity Projects			165	**$1,360,000**		**43%**	**57%**
GRAND TOTAL FOR ALL CAPACITY PROJECTS				**$16,505,000**		**56%**	**44%**

[1] Capital costs include construction costs plus a design and construction contingency of 35% to determine total construction, and a project implementation allowance of 40% of the total construction cost for environmental, engineering, construction services, legal and administration. The total compounded markup including the design and construction contingency and the project implementation allowance is 1.89. Unit costs are in 2010 dollars for San Francisco ENR CCI of 8700. Unit capital costs are shown in Table 9-2.

[2] Timeframe shown is when the initial deficiency occurs; and indicates if additional capacity is needed for future development, e.g., Benicia Business Park. All improvements are sized for buildout flows.

[3] Cost allocations between existing and future users for projects that initially become deficient in the existing timeframe are based on the ratio of existing flow to buildout flows. For projected identified for the future timeframe, all costs are allocated to future users, i.e., not needed to correct any existing deficiencies.

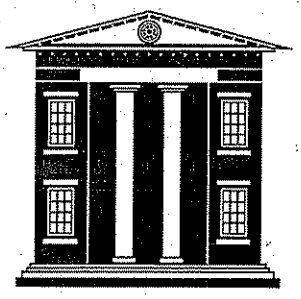
[4] Section 6 discusses a potential alternative to combine the improvements for both West Fork and East Channel Road at the East Channel Road location. This alternative could be further investigated during predesign. With the alternative, flows would be diverted from West Fork to East Channel Road to consolidate all improvements along East Channel Road and eliminating improvements along the West Fork alignment. If detailed investigations determine the diversions are feasible, this alternative would require the following improvements in East Channel Road instead of those shown in the table above: 2900 LF of 18-inch replacement pipe (or 15-inch parallel pipe); and 2100 LF of 24-inch replacement pipe (or 21-inch parallel pipe); plus the cost of the diversion pipes at two locations between West Fork and East Channel Road.

[5] Field information recently obtained by City Operations staff indicate the existing force main diameter between Tire Shop LS and Park Industrial LS may vary from 14-inch to 12-inch diameter in some segments. For CIP planning, the improvement is conceptually sized assuming an existing 12-inch diameter. During predesign/design of improvements, the actual diameter of all segments should be field verified.

[6] Costs for conditional LS projects assume pump/motor replacement and electrical upgrades. For conceptual budgeting purposes, station HP provides flexibility assuming that TDH may increase up to double in the future due to higher pressures in the force mains. Cost estimated at 50% of cost of total station replacement, per footnote in Table 9-3.

Infiltration/Inflow (I/I) Improvements Project Master Plan – Executive Summary

CDM Camp Dresser & McKee



City of Benicia

Infiltration/Inflow (I/I) Improvements Project Master Plan

EXECUTIVE SUMMARY

September 2000

Prepared by:

Camp Dresser & McKee Inc.
100 Pringle Avenue, Suite 300
Walnut Creek, California 94596

CDM Camp Dresser & McKee Inc.

consulting engineering construction operations

One Walnut Creek Center
100 Pringle Avenue, Suite 300
Walnut Creek, California 94596
Tel: 925 933-2900 Fax: 925 933-4174

September 29, 2000

Mr. Virgil A. Mustain, P.E.
Director of Public Works
City of Benicia
250 East L Street
Benicia, CA 94510

Subject: *Benicia I/I Improvements Master Plan*

Dear Mr. Mustain:

We are delighted to submit this Master Plan Report on the I/I control program we have developed jointly with your staff over the past two years.

I wish to express appreciation for the creativity and hard work contributed to this effort by the Public Works engineering and maintenance staff and your other consultants, throughout the investigation and analysis.

It has been a pleasure to work with an organization so committed to teamwork, and so effective in developing an action-focused program to address sewer overflows in the community.

Very truly yours,

CAMP DRESSER & McKEE INC.

John A. Burgh
Project Manager

City of Benicia

Infiltration/Inflow (I/I) Improvements Project Master Plan

EXECUTIVE SUMMARY

September 2000

Prepared by:

Camp Dresser & McKee Inc.
100 Pringle Avenue, Suite 300
Walnut Creek, California 94596

Executive Summary

During stormy weather with heavy rainfall, excessive rainwater enters the City of Benicia wastewater collection system, also known as the sanitary sewer system. The illicit entrance of the additional rainfall causes the hydraulic capacity of the sewers and pumping stations to be exceeded, which in turn causes an overflow of diluted, untreated sewage from the sanitary sewer. This condition is known as a sanitary sewer overflow (SSO). These SSOs are unacceptable since they create a public health hazard and an environmental problem.

The sanitary sewers in the City of Benicia have adequate capacity to convey the wastewater collected from existing customers discharging to the system and for the rainfall dependent infiltration and inflow (RDI/I) during light rainfall events. However, the sanitary sewer system does not have capacity to carry the peak RDI/I flow rates from large storm events. The total overflow volume expected for each of the recurrence intervals is listed in Table ES-1.

Table ES-1
Anticipated Overflow Volume During Wet Weather Events

Recurrence Interval	*Overflow Volume (Million Gallons)*
5 years	2.5
10 years	5.3
20 years	10

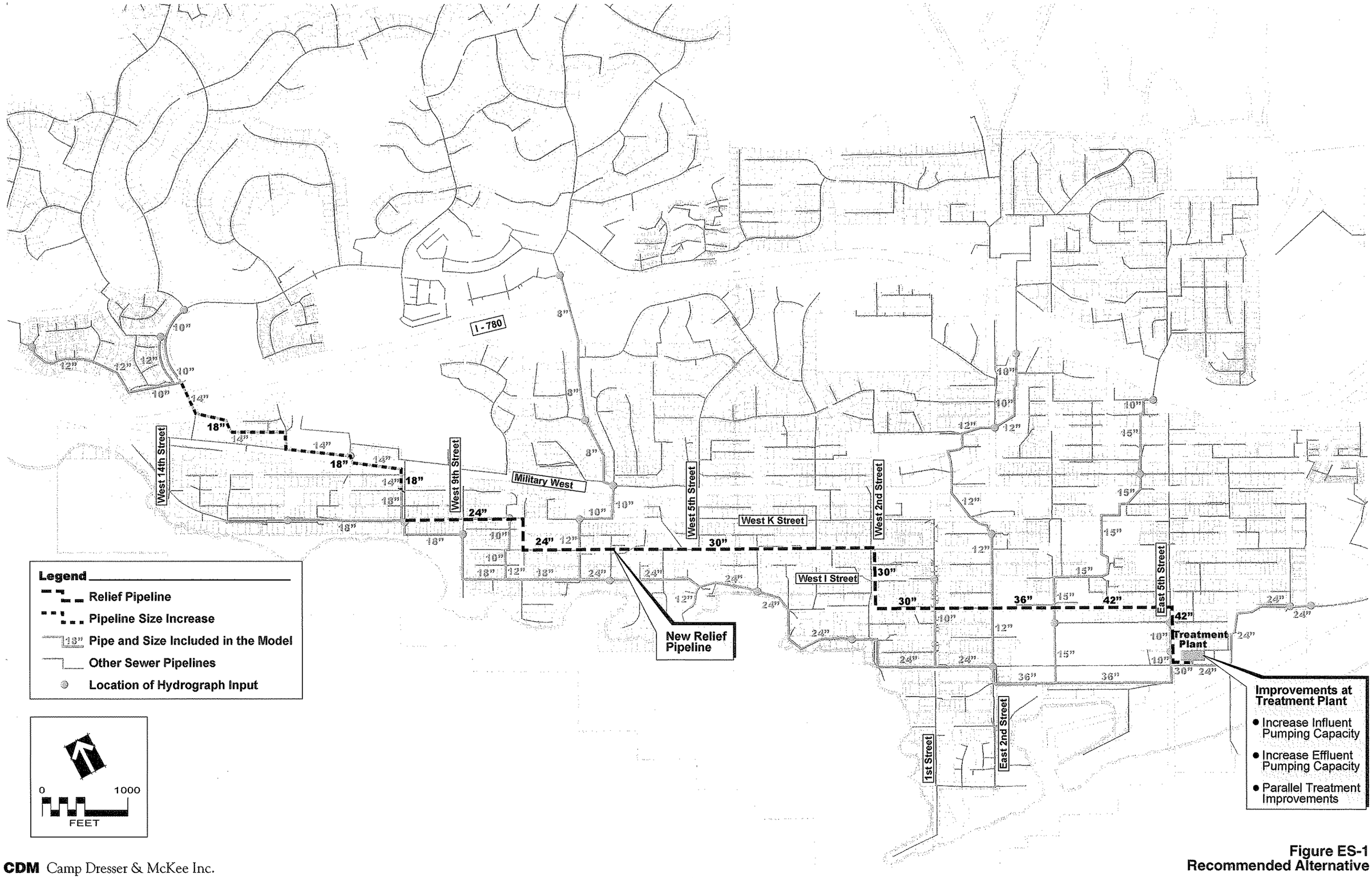
In August 1997 the City initiated a phased I/I correction program to optimize cost-effectiveness in preventing these SSOs. The four completed phases include:

Phase 1 – Investigation and Predesign of Immediate Projects to Prevent Overflows. This phase focused on the immediate investigation and remediation of known key SSOs in the City and led to construction of two new lift stations on West I Street in 1998.

Phase 2 – Analysis of Collection System Flow Conditions. This phase included flow monitoring of existing sewers, development of design flow rates, modeling of flows to identify overflow locations, and identification of the potential improvements to prevent overflows in each recurrence interval.

Phase 3 – Evaluation of Sanitary Sewer Structural Conditions. This phase was a sewer system evaluation survey (SSES) to assess the structural integrity of sewers in areas that were identified as having potential for high flows. It was found that approximately two-thirds of the system is in good condition. This phase also included the calculation of costs, development of a recommended alternative, and phasing of improvements over a 10-year period.

In March 1999, the California Regional Water Quality Control Board – San Francisco Bay Region (RWQCB) asked the City to conduct a study to compare the costs of preventing system overflows during storms of varying recurrence intervals to their respective impacts on receiving water beneficial uses. The RWQCB does not endorse any specific control measures for overflows. However, the San Francisco Bay Basin Water Quality Control Plan (Basin Plan) provides a conceptual framework that can be used as guidance in adopting specific control measures that



CDM Camp Dresser & McKee Inc.

Figure ES-1
Recommended Alternative

allow for an evaluation of costs and benefits. This framework from the Basin Plan identifies appropriate levels of treatment for areas with different needs for water quality protection. Table ES-2 includes a listing of the required levels of treatment for water quality protection as listed in the Basin Plan Table 4-8. The allowable recurrence interval for an overflow becomes greater as the level of water quality protection becomes higher.

Table ES-2
Wet Weather Overflow Water Quality Protection Levels

Levels of Water Quality Protection	Appropriate Level of Treatment
Complete protection for areas where the aquatic environment should be free of any identifiable risk from the discharge of untreated waste (i.e., shellfish beds for year-round harvesting).	Secondary treatment up to 20-year recurrence interval; above 20-year overflow allowed.
Areas that do not need complete year-round protection, such as shellfish beds for dry-weather harvesting, public beaches, and other water contact areas.	Secondary treatment for all flows up to 2-year recurrence interval; primary treatment up to 20-year recurrence interval; above 20-year overflow allowed.
Areas where water quality or aquatic productivity may be limited due to the pollution effects of a dense human population or other urban activities that are largely uncontrollable. Such areas may include some shipyards and harbors. .	Secondary treatment to half-year recurrence interval; primary treatment to 5-year recurrence interval; above 5-year overflows allowed.

The prevention of overflows can involve collection system improvements, treatment plant pumping improvements, or both. Collection system improvements may include:

- an increase in conveyance capacity to transport the peak wet weather flows
- a reduction in RDI/I to preclude or minimize any necessary conveyance improvements

The collection system improvements to convey the peak wet weather flows without overflow were identified by modeling. Collection system improvements with I/I reductions of up to 70 percent were also calculated for the 10-year and 20-year recurrence intervals.

The treatment plant flow rate will determine the amount of storage needed at the treatment plant. By increasing the flow rate through the plant, the total storage volume and overall cost is reduced, since more flow can pass through the plant rather than being retained in storage. Three plant flow options examined in this master plan include:

- Plant flow rate set at 12 mgd secondary treatment capacity, with excess volume to storage for treatment after the storm.
- Plant flow rate set at 18 mgd maximum hydraulic capacity, with excess volume to storage for treatment after the storm.

CDM Camp Dresser & McKee Inc.

Figure ES-2
Recommended
Sewer Replacements

- Plant flow rate set at 18 mgd maximum hydraulic capacity, with excess volume treated by a parallel process that occurs when passing through wet-weather-only sedimentation/storage basins.

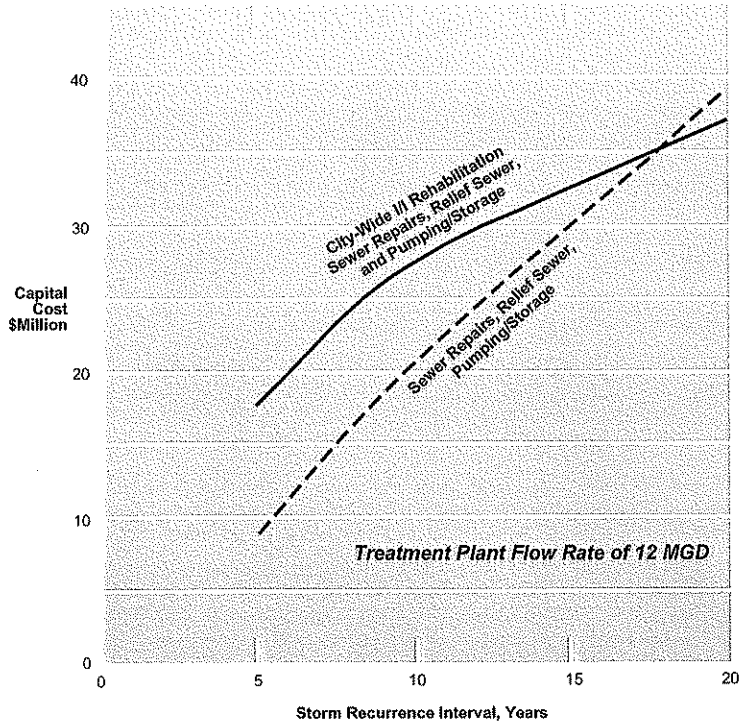
Thirteen separate alternatives were developed for prevention of SSOs. Relief pipeline and pipeline improvement costs generally range from $5 to $6 million. Pumping improvements vary from $2.3 to $3.4 million. The two costliest components are generally the storage and I/I rehabilitation work. Storage costs can be as high as $32 million due to the large amount of additional storage required with a maximum plant flow of 12 mgd. The I/I rehabilitation alternatives require replacement of significant portions of the sanitary sewer collection system at a cost of $18 million. This aggressive rehabilitation approach requires complete replacement of all sewers in selected areas. The minimum costs generally occur with parallel treatment of peak wet weather flows.

The costs to prevent overflows in a 20-year recurrence interval are between $35 and $40 million, both with and without aggressive I/I rehabilitation. For the 5-year and 10-year recurrence intervals, the costs with no aggressive RDI/I rehabilitation are significantly less. By increasing the plant flows above 12 mgd, the costs are greatly reduced. The total range in cost at a plant flow of 18 mgd is $8.0 to $16.0 million with no aggressive RDI/I rehabilitation. The maximum cost is reduced to about $9.0 million if parallel treatment is used during peak wet weather events.

It was noted that the cost to handle a 20-year event was only about seven percent more than designing for a 10-year storm. Recognizing the much larger benefit the community and environment will receive for this very small incremental cost, the City has opted for providing protection in a 20-year event. Therefore, the estimated minimum capital cost of about $9.0 million was selected from costs with a 20-year recurrence interval for SSOs.

When the cost of sewer replacements and master plan updates are included, the total costs of the program will reach about $12.8 million.

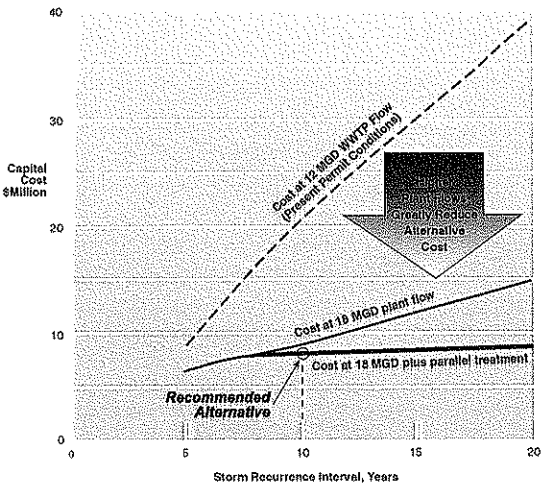
The recommended alternative is to provide overflow protection for a recurrence interval of 20 years. The recommended plant flow option is to operate at a maximum influent flow rate of 31 mgd, with the peak flows in excess of storage receiving parallel treatment by passing through the existing storage basin. Effluent pumping will be increased to 24 mgd during this brief peak flow.



Because the proposed relief sewer is so efficient, aggressive I/I rehabilitation in Benicia is generally not cost-effective.

The City also is planning to perform about $2.2 million to repair sections of sewer which are deficient structurally. Since structurally deficient sewers typically allow greater RDI/I, their replacement will further reduce the likelihood of overflows from the system.

The cost breakdown for the recommended alternative is listed on Table ES-3. The locations and sizes of the relief pipeline, the undersized sewers to be replaced, and facilities at the treatment plant are shown on Figure ES-1. The sewers in poor and fair condition to be replaced to further reduce the likelihood of sewer overflows are shown on Figure ES-2.



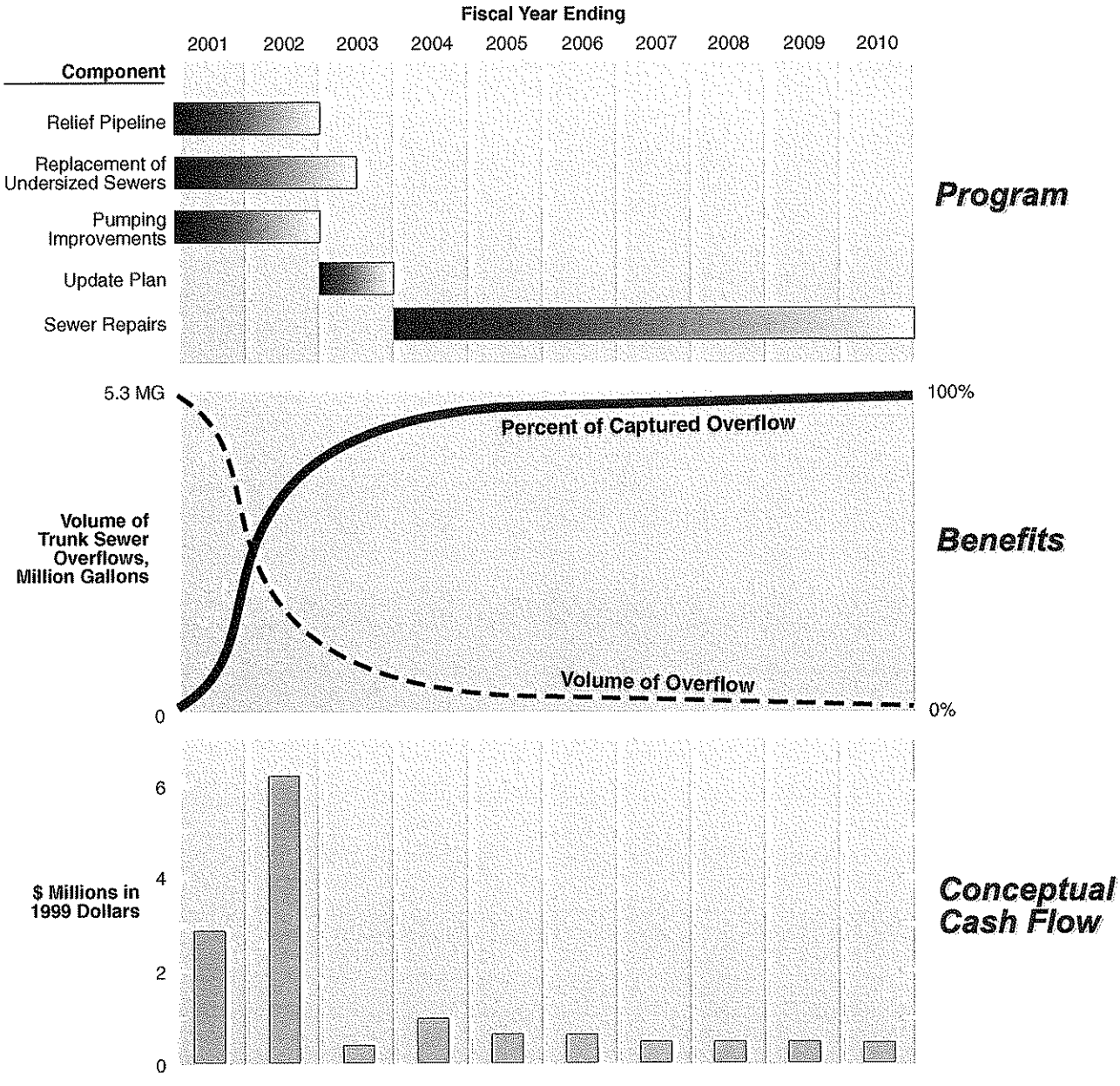
The program is even more cost-effective if higher flows are pumped through the WWTP during rare, brief storm periods.

Table ES-3
Recommended Improvements

Individual Projects	***Description***	***Cost Million***
Relief Pipeline	New 24 to 42 inch diameter pipeline from West 10th Street to the treatment plant site at East 5th Street to provide additional conveyance capacity.	$4.2
Replacement of Undersized Sewers	Replacement and/or paralleling of existing collector sewer parallel to Military West between W 10th St and W 14th Street.	$0.9
Wet Weather Pumping Improvements	Pumping capacity increases at the treatment plant influent and effluent pumping stations as well as modifications to the storage basin for parallel treatment of flows in excess of 18 mgd. A new influent bar screen and standby generator are also necessary.	$3.9
Total Recommended Alternative Cost		**$9.0**
Repair of Deteriorating Sewers	Replacement of sewers identified in poor or fair structural condition.	$2.2
Replacement of Undersized Sewers	Replacement and/or paralleling existing sewers on East 2nd Street and W. 7th Street	$0.9
Master Plan Updates	Flow monitoring studies, I/I rehabilitation studies, modeling and video inspection of sewers to identify any other necessary I/I improvements.	$0.7
Total Capital Improvement Program Cost		**$12.8**

A summary of the construction components and their impact to overflow reduction is shown on Figure ES-3. The relief pipeline replacement of one section of undersized sewer, and pumping improvements will be completed within the first two years, dramatically decreasing the current overflow risk. Overflow risk will be further reduced by replacement of older, undersized, and failing sewers over the next ten years. The improvements are shown on Figure ES-2. After these facilities enter service, it is planned to devote the next rainy season to an evaluation of how well these initial improvements perform. This may enable the balance of the program to be refined, with individual projects deferred, changed or even eliminated, if engineering verifies that overflows in those areas are successfully being resolved by the initial project.

Large reduction in overflow frequency will be achieved in the first 2 years of the 10-year, $12.8M program.



A substantial annual sewer repair project is essential to reduce overflow occurrence and replace old, failing sewers in time.

Figure ES-3
Capital Improvements Program

This master plan should be updated every five years to incorporate the successively better data and results of the continued annual sewer repair work, which may reduce future costs. The complete Capital Improvements Program is listed in Table ES-4. The schedule for implementing the initial project and then updating the remainder of the 10-year program is shown on Figure ES-4.

Table ES-3 Identified Capital Improvements and Costs
Wastewater Collection System
Proposed 10-Year Capital Improvement Program

Projects	Length (feet)	Diameter (inches)	Fiscal Year: Initial 2-Year Program 2000-2001	2001-2002	Re-evaluation 2002-2003	Exact project timing and nature to be optimized after studies on results of initial program 2003-2004	2004-2005	2005-2006	2006-2007	2007-2008	2008-2009	2009-2010	10-Year Totals
Relief Pipeline													
East 2nd Street to Treatment Plant	3100	36/42	1,400,000										1,400,000
West 7th Street to East 2nd St	5300	30		2,000,000									2,000,000
West 10th Street to West 7th St	2400	24		800,000									800,000
Replacement of Undersized Sewers													
Along E 2nd St, H St to K St	1000	15/18					200,000						200,000
Along W 7th St, I St to I-780	3500	12/15				700,000							700,000
Parallel to Military, West of W 10th St	3600	18		900,000									900,000
Wet Weather Pumping Improvements													
Influent and Effluent Pump Stations			1,600,000										1,600,000
Storage Modifications for Treatment				1,100,000									1,100,000
Bar Screen, piping, generator,other				1,200,000									1,200,000
Repair of Deteriorating Sewers													
E 2nd St, J St to N St	750	6/12				130,000							130,000
West of W 7th St, North of K St	800	6/8				140,000							140,000
J St and West 8th St area	1400	6/8/12					210,000						210,000
T St and Vista Grande area	1600	6/8				250,000							250,000
S St and La Cruz area, W of E 3rd St	1600	6/8/10/12					250,000						250,000
El Bonita Way area	1700	6						240,000					240,000
E 3rd St and O St, Bayview Circle area	1600	6/8/10							250,000				250,000
E 2nd St and N St area	1500	6/8/12								270,000			270,000
Buena Vista and Alta Loma area	1550	6/8									280,000		280,000
I St and W 8th St area	1050	6/8/12										160,000	160,000
Subtotal financed by SRF loan =			3,000,000	6,000,000	0	1,220,000	660,000	240,000	250,000	270,000	280,000	160,000	$12,080,000
Master Plan Updates													
Flow monitoring					50,000		50,000	50,000	50,000	50,000	50,000	50,000	350,000
I/I Rehabilitation Study					50,000			50,000	40,000			50,000	190,000
Modeling of Additional Subbasins					40,000			50,000	40,000			50,000	180,000
Video Inspection of Additional Subbasins					10,000			10,000	10,000				30,000
Subtotal from annual O&M budget =			0	0	150,000	0	50,000	160,000	140,000	50,000	50,000	150,000	$750,000
Annual Totals =			$3,000,000	$6,000,000	$150,000	$1,220,000	$710,000	$400,000	$390,000	$320,000	$330,000	$310,000	$12,830,000
Cumulative Totals =			3,000,000	9,000,000	9,150,000	10,370,000	11,080,000	11,480,000	11,870,000	12,190,000	12,520,000	12,830,000	

ID	Task Name
	PROGRAM MANAGEMENT ACTITIVIES BY CITY STAFF
	Workshops with Council committee and Council
3	Community outreach and public education, Year 2000
	Community outreach and public education, Year 2001
5	Workshops with neighborhood groups and/or others, Yr 2000
	Workshops with neighborhood groups and/or others, Yr 2001
7	CEQA documentation (S-1 and T-1)
	Coordination with street resurfacing program
	Finalize NPDES negotiations, receive Permit Renewal
10	Finalize SRF Loan documentation
	Finalize Financing Plan
12	Conduct sewer flow sampling and testing, send data to RWQCB
	Conduct 2000-01 sewer flow monitoring
14	Conduct 2001-02 sewer flow monitoring
	ENGINEERING AND CONSTRUCTION (PHASE 1)
	Surveying and mapping (S-1 and T-1)
17	Geotechnical (S-1 and T-1)
	Predesign Report
19	Predesign Review Workshop
	Contract S-1, 14,400 ft: Trunk sewer WWTP to W.
21	**10th, new sewer parallel to Military west of W. 10th St.**
	50 percent design
	City review
24	90 percent design
	City review and SRF approval
26	Final contract documents
	Bid and award (S-1)
28	Construction and startup (S-1)
	Contract T-1: WWTP bar screen, influent and
	effluent pumping, generator, and storage improvements
31	50 percent design
	City review
33	SCADA/controls configuration
	90 percent design
35	City review and SRF approval
	Final contract documents
	Bid and award (T-1)
38	Construction and startup (T-1)
	I/I PROGRAM MASTER PLAN UPDATE (PHASE 2)
40	Flow monitoring, sampling, TV inspection, updating project priorities
42	

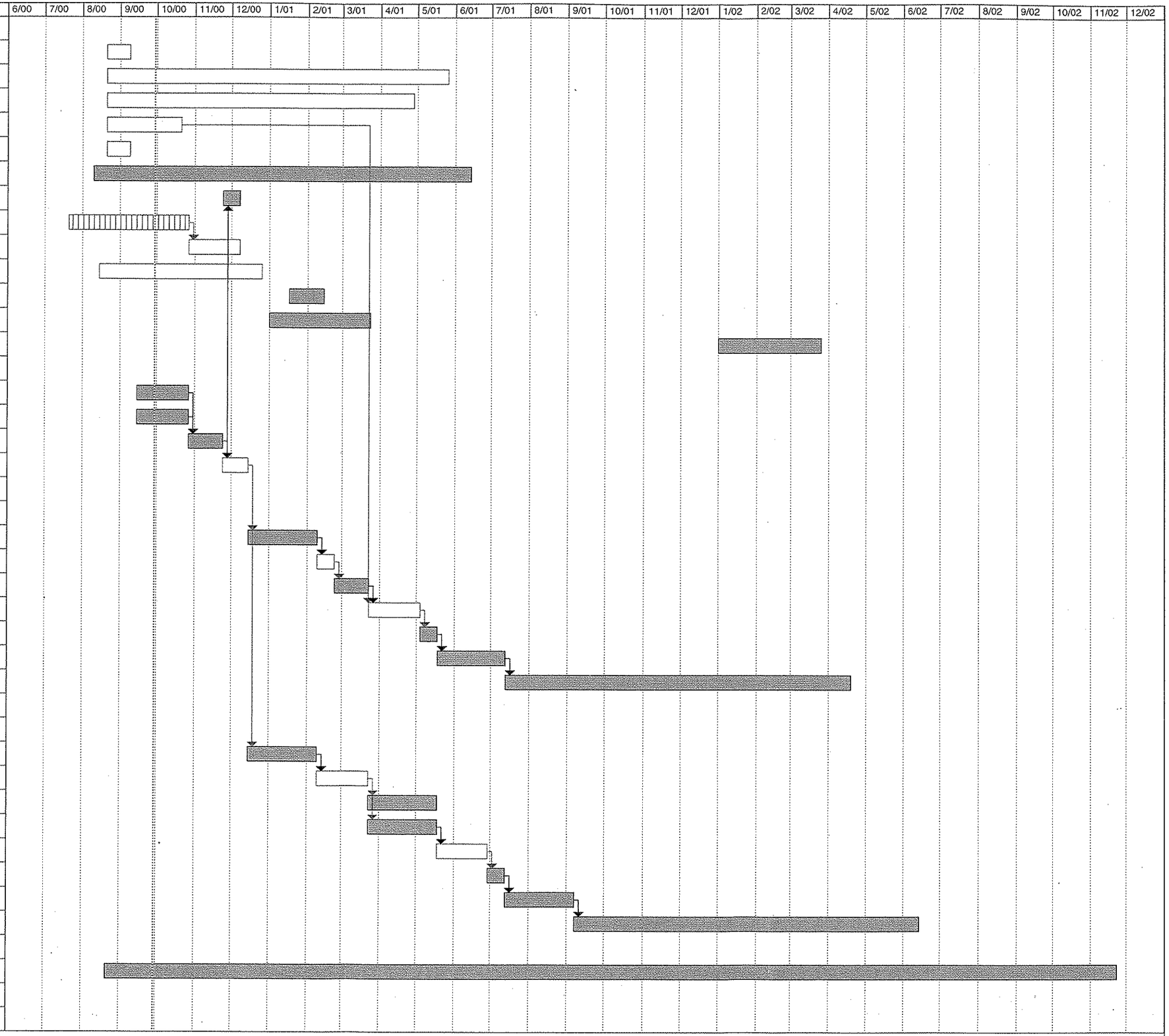


Figure ES-4 Schedule for Years 2000-2003

Public Works & Community
Development Department
MEMORANDUM

Date: December 2, 2011

To: File

From: Melissa Morton, City Engineer

Subject: SSMP Section 8 – Capacity Management

The Statewide Permit requires a schedule for implementation of Capital Improvement Projects (CIP) identified by a hydraulic analysis be included in the City's Sewer System Management Plan (SSMP). The City has a 5-year CIP (FY 2011/12 through FY 2015/16), which also includes a long-range plan for 6 to 20 years out (FY 2016-31). A 2011 CIP excerpt can be found in SSMP Section 4. The City updates the CIP every two years.

The CIP for FY 2013/14 and FY 2014/15 includes the Bayshore Road Gravity Main Rehabilitation project. This project will replace/refurbish a sanitary sewer main and manhole structures starting at 921 Bayshore Road to the IM building located at the Wastewater Treatment Plant. This project is estimated at $1.464 million and will take place over a two-year period.

The East 7th Street Sewerline Replacement is in the CIP for FY 2015/16 and FY 2016-31. This is a two-phase project. The first phase involves replacement of a 6-inch sanitary sewer main from manhole 003 located at 616 East K Street to East 7th lift station, plus manholes 005 and 006. The second phase includes replacement of a 6-inch main located at East 7th Street and Valero pipeline (alley S/O L Street) to East 7th Street lift station, plus manholes 118, 508, 408, 308 and 208. This project is estimated at $387,000. The first phase is scheduled to occur in FY 2015/16. The second phase will occur sometime in FY 2016-2031 based on priority.

The City updated its Wastewater System Master Plan (WWMP) in 2011. This plan identified twelve sewer collection system capacity improvements, which can be found in Table 9-1 (see WWMP excerpt in SSMP Section 8, preceding this memo.) Table 9-1 provides a detailed description of the recommended improvements to provide the required sewer collection system capacity to convey buildout flows. The sewer collection system capacity improvements address the larger diameter sewers (generally 10-inch and greater). These twelve CIPs identified in the WWMP are included in the CIP under the long-range plan for 6 to 20 years out. These CIPs will be moved from the long-range plan into the 5-year CIP based on priority and available funding.