CHAPTER 7

RECOMMENDED WET WEATHER MANAGEMENT PLAN

INTRODUCTION

This chapter addresses the refinements to the City's December 1998 Wet Weather Overflow Management Plan as required in Schedule D, Special Conditions (3) of the it's NPDES permit with the goal of reducing overflow frequency to the one-in-five year, 24-hour duration storm standard by January 2010.

The chapter also discusses the elements of the revised plan, consistency with historical efforts to manage peak flows, the implementation schedule and related information.

A number of alternatives were identified and a series of cost curves were developed to show the relationship between alternative solutions including rain dependent infiltration and inflow reduction, conveyance improvements, treatment capacity increases, and storage of peak flows. Each option is presented in detail in Chapter 6 of the draft Conveyance System Master Plan.

PLAN OBJECTIVE

The recommended plan was developed to meet the goals of controlling (managing) sanitary sewer overflows to waters of the State for conditions up to and including the one-in-five year 24-hour duration rainfall event.

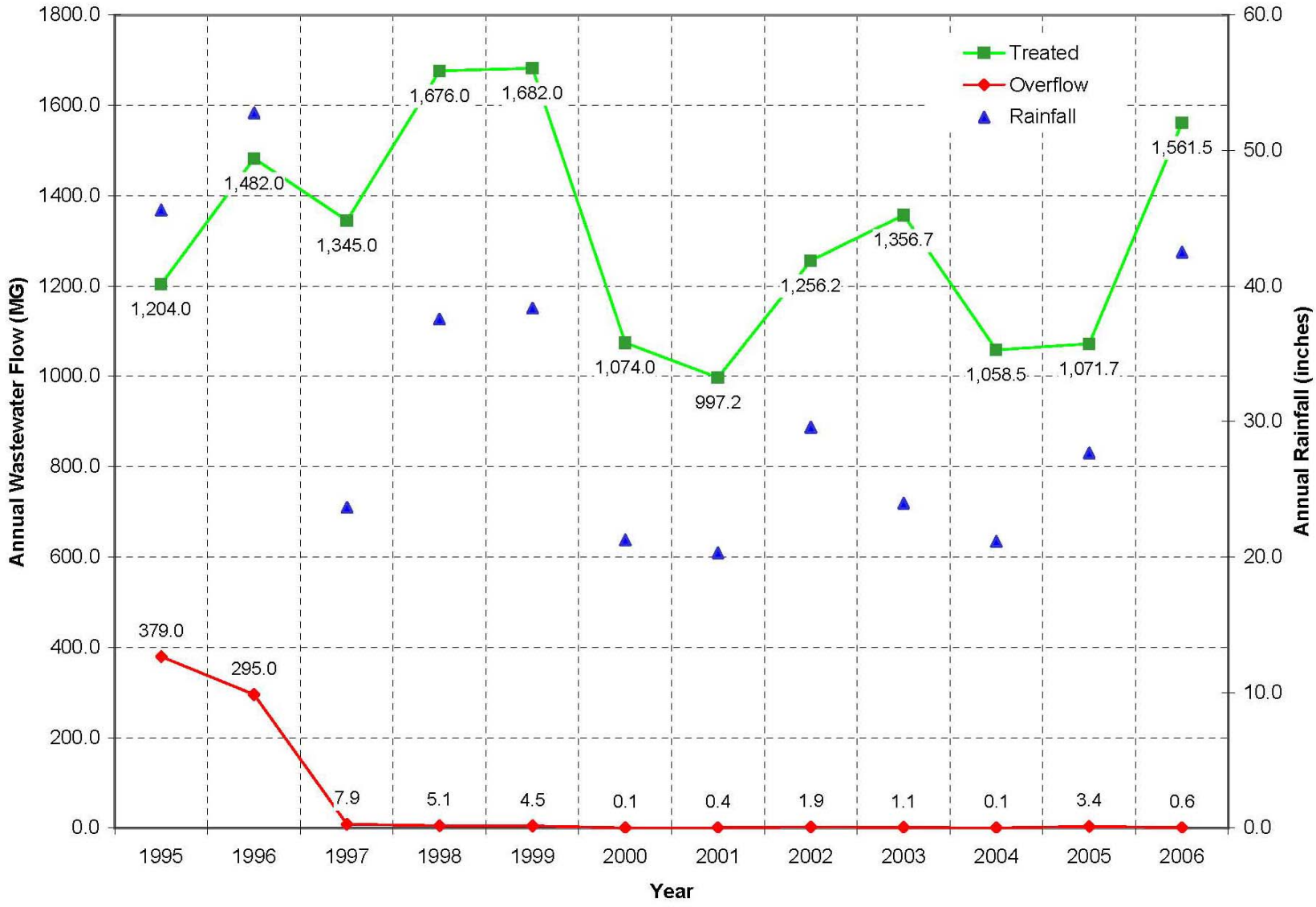
SUMMARY OF COMPLETED OVERFLOW MANAGEMENT PROJECTS

The City of McMinnville has been investigating and implementing projects to address wet weather overflows since the early 1990's. These projects have significantly reduced both the frequency and total volume of wastewater overflows. This section summarizes the progress with collection system repairs that have resulted in overflow reduction.

The Water Reclamation Facility (WRF) has been fully operational for over 12 years. It is important to recognize that the current and future treatment capacity of the WRF is, and will remain, a significant part of the overflow control program. The construction of the WRF, the raw sewage pump station, the associated modifications to the Lafayette Overflow, and the Cozine Trunkline projects have dramatically reduced the total volume of overflows since 1996.

Figure 7-1 provides a summary of the winter month overflows and wastewater treatment volumes from 1995 through 2007. The figure shows a dramatic reduction in overflows due to the implementation of multiple wet weather flow management improvements, despite population growth and service area expansion.

Figure 7-1: Volume of Wastewater Treated Versus Overflows at Water Reclamation Facility



Wet-weather overflow management projects implemented since 1995 have had significant impacts by targeting overflow control and/or reduction by replacing portions of the collection system that were either deteriorated or undersized. The projects targeted the source of the overflow problem—rainfall-dependent infiltration and inflow (RDII).Thousands of feet of sewer main or trunk line pipe ranging in size from 8 to 54 inches in diameter have been replaced. In addition, 4- and 6-inch-diameter service lateral pipes within the public right-of-way and on private properties have been replaced along with over 100 manholes. The City also abandoned two old pump stations, replaced two others, and eliminated three temporary overflows to Cozine Creek.

The estimated reduction in I/I volume for two of the rehabilitation projects (Alpine Avenue and Morgan Lane) was 40 to 50 percent based on post-project flow monitoring. Completed projects and accomplishments:

- Water Reclamation Facility construction and operations.
- Modifications to the Lafayette Overflow structure
- Cozine trunk line and pump station project
- Alpine Avenue pipeline project
- Morgan Lane pipeline and pump station project
- High School basin sewer reconstruction (11^{th} and Galloway).
- Yamhill trunk line project.
- Johnson Street and Irvine Street sewer replacement
- Evans Street sanitary sewer project
- 2001 Sewer Rehabilitation Project (elimination of First Street overflow)
- 3 Mile Trunk Sewer Replacement and Pump Station Consolidation
- TV inspection of over 90 percent of wastewater collection system pipelines to identify structural deficiencies and repair/rehabilitation/replacement projects
- Development and successful implementation of a private sewer lateral ordinance targeted at replacing defective, I/I contributing, pipe on private property.
- Continued refinement of the information management and Geographic Information System (GIS).
- Continued routine operations and maintenance of, and repairs to, the collection system.
- Current (2008) refinement of the wet weather management plan.

RECOMMENDED PLAN

A discussion of the relative risk of overflow from the 5-year, 24- and 72-hour design storms is provided in Chapter 6. The decision regarding the design storm event was based on a risk management evaluation that included, but was not limited to, the information provided in this

Master Plan Update. There is a low likelihood of the 72-hour design storm considered. No occurrences of the combination of rainfall and plant flow rate associated with the 72-hour storm have occurred during the last 12 years. Therefore, a decision to use the 24-hour duration storm was made with confidence that the 72-hour event and the resulting flows are unlikely and the associated risk can be managed. Other factors not directly addressed include the financial impact to the City given other infrastructure and publicly funded needs.

The major features of the recommended plan consist of targeted I/I reduction to limit flows at the Raw Sewage Pump Station (RSPS) to 32 mgd and capacity improvements in the Michelbook Basin. A complete description of the recommended plan is as follows:

- *Pipeline Capacity Improvements. Construction of the 10th Street pipeline diversion and Michelbook trunk line pipeline improvements.* This project eliminates a system capacity constraint. In addition to improvements to the pipe capacity of the existing trunk line this project diverts excess flows from the east Michelbook trunk line at 9th Street to the Cozine Creek trunk line, which has capacity to convey the additional flows. Figure 7-2 shows the pipeline improvements for the recommended plan.
- *Treatment Capacity Improvements. Limited upgrades to the WRF to provide peak treatment capacity of 32 million gallons per day (mgd*). Improvements include; grit system expansion and hydraulic improvements to the orbal aeration basins.
- *RDI/I Reduction. Near term RDI/I reduction of 31 percent, and ultimate reduction of 45 percent from 2006 levels in targeted basins with high levels of I/I.* The recommended I/I reduction also eliminates the need for capacity upgrades at the Cozine and Raw Sewage pump stations. Table 7-1 summarizes peak flows for the major sewer basins with and without the recommended RDI/I reduction. It should be noted that the buildout I/I reduction percentage is the sum of RDII reduction required for existing land use plus reduction required for future land use for a total of 45%. For basins not targeted for I/I reduction the peak flow values do not change. Table 7-2 compares peak flow from the 5-year, 24-hour storm and firm capacity at each of the modeled pump stations.

Capital Cost Estimates

All cost estimates are order-of-magnitude estimates as defined by the American Association of Cost Engineers (AACE). An order of magnitude estimate is one that is made without detailed engineering data and uses techniques such as cost curves and scaling factors applied to estimates developed for similar projects. The overall expected level of accuracy of the cost estimates presented is -30 percent to +50 percent. This means that bids can be expected to fall within a range of 30 percent under to 50 percent over the estimate for each project. This is consistent with the guidelines established by the AACE for planning level studies.

The economic evaluation was based on capital cost estimates. The capital cost estimates were prepared using the current 20-Cities Engineering News Record (ENR) Construction Cost Index average of 8089. The estimates reflect a professional opinion of costs at this time and are subject to change as the design of each project component develops.

Table 7-1. Comparison of Peak Flow by Basin For Existing and Future Conditions, 5-year, 24-hour Storm Event, With and Without Recommended Rehabilitation

Manhole ID	Basin	Existing Peak Flow, No RDII Reduction (mgd)	Buildout Peak Flow, No RDII Reduction (mgd)	Existing Peak Flow, 31% RDII Reduction (mgd)	Buildout Peak Flow, 45% RDII Reduction[1] (mgd)
J-7-20	Fairgrounds	2.85	4.49	2.85	4.49
J-7-48	Yamhill	0.28	0.33	0.28	0.33
J-7-44	Downtown, Cozine, Michelbook	9.36	9.49	7.96	8.09
J-7-90	Downtown, Airport, Cozine, Michelbook	8.85	10.33	7.45	8.93
J-7-68	High School	7.28	7.33	5.18	5.23
J-7-8	High School	0.66	0.67	0.49	0.50
I-7-3	High School	5.32	5.34	3.76	3.78
H-8-102	Cozine	2.21	2.93	1.94	2.54
H-8-107	Cozine	0.79	0.81	0.56	0.58
H-8-93	Michelbook	1.59	3.30	1.59	3.30
H-8-112	Michelbook	2.98	3.04	2.22	2.26

Table 7-2. Pump Station Capacity Versus Modeled 5-year, 24-hour Storm Flow

Pump Station	Firm Capacity (mgd)		Existing Flow (mgd)		Buildout Flow (mgd)	
	mgd	gpm	mgd	gpm	mgd	gpm
Cozine	11.5	7,986	10.5	7,292	10.8	7,500
Raw Sewage PS	38	26,389	32	22,222	32	22,222
Cozine Woods	0.3	208	0.1	69	0.4	278
Morgan Lane	1.2	833	0.7	486	0.9	625
3-Mile Lane #1	3.6	2,500	1.2	833	2.2	1,528
3-Mile Lane #3	1.4	972	0.5	347	0.8	556
Northeast	1.0	694	0.5	347	0.7	486
Kathleen Manor	0.5	347	0.1	69	Decom-missioned	

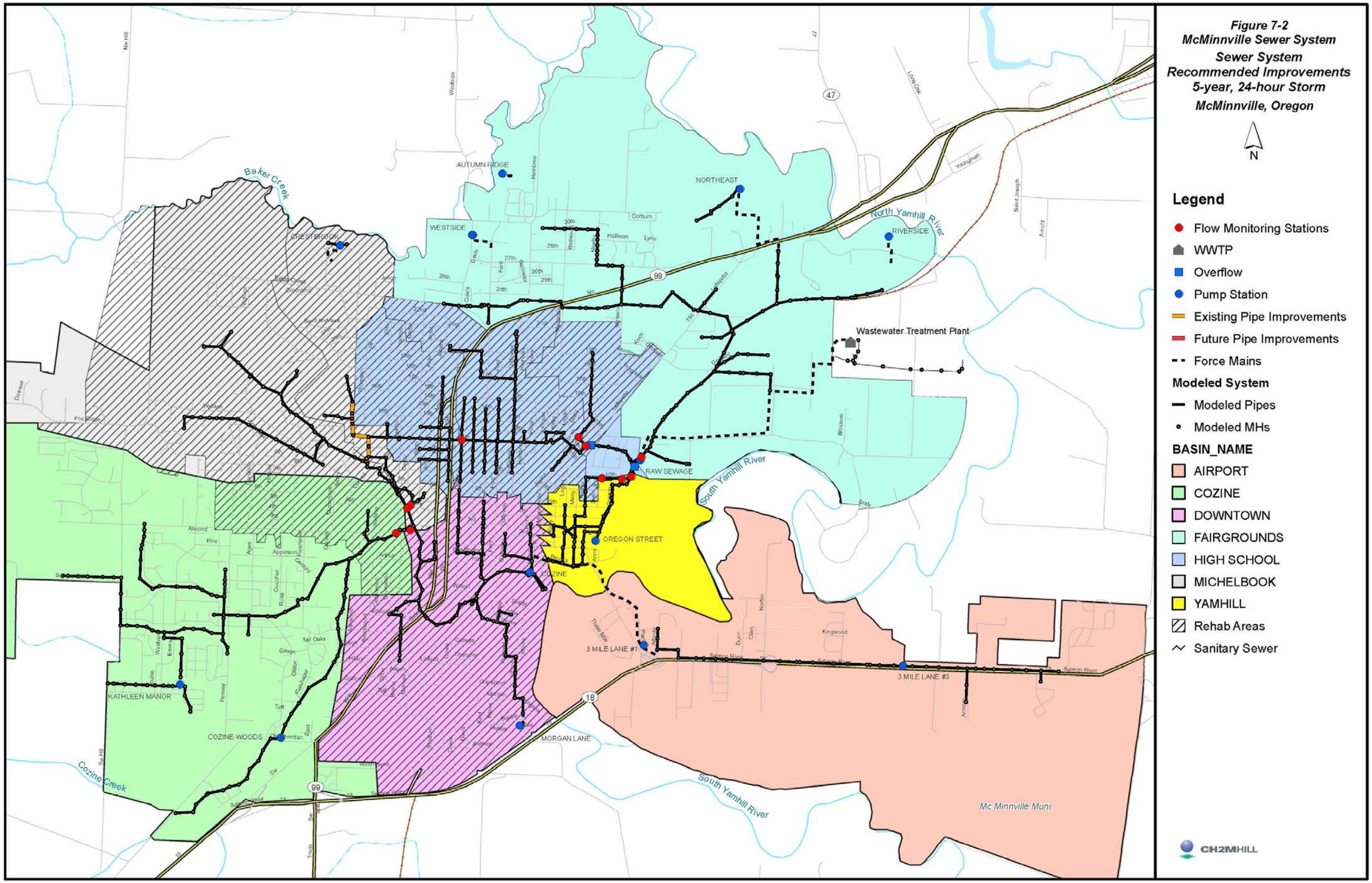


Figure 7-2
McMinnville Sewer System
Sewer System
Recommended Improvements
5-year, 24-hour Storm
McMinnville, Oregon
N
Legend
Flow Monitoring Stations
WWTP
Overflow
Pump Station
Existing Pipe Improvements
Future Pipe Improvements
Force Mains
Modeled System
Modeled Pipes
Modeled MHs
BASIN_NAME
AIRPORT
COZINE
DOWNTOWN
FAIRGROUNDS
HIGH SCHOOL
MICHELBOOK
YAMHILL
Rehab Areas
Sanitary Sewer
CH2MHILL
Baker Creek
North Yamhill River
South Yamhill River
Cozine Creek
AUTUMN RIDGE
NORTHEAST
WESTSIDE
RIVERSIDE
CREST BROOK
Wastewater Treatment Plant
RAW SEWAGE
OREGON STREET
COZINE
3 MILE LANE #1
3 MILE LANE #3
KATHLEEN MANOR
COZINE WOODS
MORGAN LANE
Mc Minnville Muni
99
18
47

Based on these results, a phased approach to wet weather flow management is recommended. The improvements associated with the 24-hour storm event shall be programmed into the CIP with consideration for expanding on that solution if observed system performance results in unacceptable overflows or reducing the amount of system rehabilitation if effectiveness estimates are exceeded. Improvements focus on collection system rehabilitation as opposed to conveyance and treatment improvements, given that rehabilitation provides multiple benefits including asset replacement as well as I/I reduction. Table 7-3 summarizes the recommended pipeline improvements and their cost. These improvements along with the basins targeted for rehabilitation are shown in Figure 7-2.

Table 7-3. Required Collection System Improvements For Existing and Future Conditions, 5-year, 24-hour Storm Event With Recommended Rehabilitation

Pipe ID	Existing Diameter (inches)	Required Diameter (inches)	Length (feet)	Cost
C_H-6-7	10	12	301	$109,000
C_H-6-8	10	12	128	$ 46,000
C_H-7-4	10	12	131	$ 47,000
C_H-7-5	10	12	291	$105,000
C_H-7-6	10	12	393	$142,000
C_H-7-7	10	12	237	$ 86,000
C_H-7-8	10	12	17	$ 6,000
C_H-7-9	10	12	253	$ 92,000
C_H-7-10d1	--	10	43	$ 20,000[1]
C_H-7-10d2	--	10	123	$ 55,000[1]
Total				$708,000

[1]Values from City's current CIP

Figure 7-3 provides peak flow values at key locations in the system generally associated with the City's major basins and the 2006 flow monitoring locations.

Future Development

In addition to required conveyance capacity improvements, areas that will develop in the future will require service extensions to connect them to the existing collection system. Figure 7-4 shows the areas where future development is anticipated. Preliminary locations of pump stations and pipelines needed to serve these areas are also shown.

Tables 7-4 and 7-5 summarize the infrastructure requirements as well as the estimated costs to serve future development.

Figure 7-3
McMinnville Sewer System
Peak Flow Values at Key Locations

McMinnville, Oregon

N

Legend

- Flow Monitoring Stations
- WWTP
- Overflow
- Pump Station
- Modeled MHs
- Force Mains

Modeled System

- Modeled Pipes
- Sanitary Sewer

BASIN NAME

- AIRPORT
- COZINE
- DOWNTOWN
- FAIRGROUNDS
- HIGH SCHOOL
- MICHELBOOK
- YAMHILL

existing flow (mgd)	future flow (mgd)

Locations

I-7-3: 3.76 / 3.78

J-7-8: 0.49 / 0.50

J-7-68: 5.18 / 5.23

J-7-20: 2.85 / 4.49

32.0 / 32.0

7.45 / 8.93

J-7-90

J-7-44

J-7-48: 7.96 / 8.09

0.28 / 0.33

RAW SEWAGE

H-8-112: 2.22 / 2.26

H-8-93: 1.59 / 3.30

H-8-107: 0.56 / 0.58

H-8-102: 1.94 / 2.54

OREGON STREET

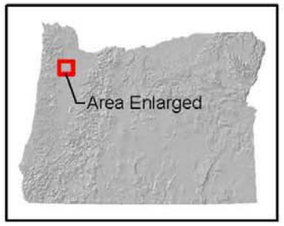
COZINE

3 MILE LANE #1: 1.9 / 3.4

CH2MHILL

Figure 7-4

City Of McMinnville Service Extensions To Future Developed Areas



LEGEND

- WWTP
- Future Pump Station
- Future Force Main
- Pipe Extensions
- Overflow
- Pump Station
- Modeled Pump Station
- Force Main
- Modeled Pipes
- Proposed Urban Growth Boundary
- New Expansion Areas

Basins

- AIRPORT
- COZINE
- DOWNTOWN
- FAIRGROUNDS
- HIGH SCHOOL
- MICHELBOOK
- YAMHILL

N

0 1,550 3,100

Feet

CH2MHILL

PDX: \\ROSA\PROJ\WESTYOSTASSOCIATES\340411MCMINNVILLE\GIS\MXDS\FIGURE7-4_SERVICEEXTENSIONS_PG.MXD 9/24/2008 14:50:06

Table 7-4. Pipeline Extensions Required to Serve Future Development

Location	Peak Flow (mgd)	Diameter (inches)	Connection Manhole to Modeled System
Southwest, Kathleen Manor	0.43	10	G-11-14
Redmond Hill Road and West Hills South	0.17	10	E-9-1
Fox Ridge Road	0.74	10	F-7-9
Northwest	0.31	10	F-7-9
Grandhaven	0.31	10	J-4-35
Riverside South	0.27	10	J-7-67
Norton Lane West	0.05	10	J-7-40
Norton Lane East	0.1	10	J-10-3
Three Mile Lane/ Lawson Lane	0.37	10	K-10-14, J-10-1
Crestbrook PS Area	* The peak rated capacity of the PS is 160 gpm, the 2007 peak flow is estimate as 164 gpm and the buildout flow is 526 gpm. It is unlikely that the existing station can be improved to increase capacity given its location and lack of area for improvement. As a result this service area requires more detailed study to finalize a service plan.		

Table 7-5. New Pump Stations Required to Serve Future Development

Location	Peak Flow (gpm)
West Hills South	230
Norton Lane West	35
Riverside South	190
Three Mile Lane, Lawson Lane	260
Grandhaven[1]	275

[1] Includes future development area south of Grandhaven that cannot flow by gravity to the existing system.

Plan Summary

Table 7-6 summarizes the phasing and estimated annual cost of collection system improvement projects through buildout conditions in fiscal year 2020-21. Improvement implementation should also include the means to define system performance for multiple rainfall events and to assess I/I reduction levels resulting from rehabilitation efforts. To achieve this result, permanent flow monitors should be placed in the system and the resulting data combined with monitored flows at the RSPS and Cozine PS. This will provide value in determining SSO control compliance and assessing accuracy of hydraulic model predictions, and subsequent refinements.

Table 7-6. Wet Weather Overflow Management Project List and Implementation Schedule

	2008-09	2009-10	2010-11	2011-12	2012-13	2013-14	2014-15	2015-16	2016-17	2017-18	2018-19	19-20	20-21	21-22	22-23	Total
Item	ADWF Flow, mgd															
	3.3	3.5	3.7	3.9	4.1	4.3	4.5	4.7	4.9	5.1	5.3	5.5	5.7	5.9	6.1	
	Annual Average BOD Load, ppd															
	6,100	6,486	6,871	7,257	7,643	8,029	8,414	8,800	9,186	9,571	9,957	10,343	10,729	11,114	11,500	
Collection System																
Michelbook Basin Pipelines		$634,000														$634,000
10th Street Pipeline/Diversion	$75,000															$75,000
Existing Rehabilitation	$1,000,000	$2,000,000	$2,500,000	$2,500,000												$8,000,000
Buildout Rehabilitation					$790,000	$790,000	$790,000	$790,000	$790,000	$790,000	$790,000	$790,000	$790,000	$790,000	$790,000	$8,700,000
WRF - Liquids																
Headworks - Screen modifications							$30,000	$60,000	$60,000							$150,000
Headworks - Grit system expansion							$400,000	$800,000	$800,000							$2,000,000
Secondary Treatment - Orbal No. 3				$1,400,000	$2,800,000	$2,800,000										$7,000,000
Secondary Treatment - Orbal Nos. 1 and 2 CS Mods							$366,000									$366,000
Secondary Treatment - Clarifier No. 3 + RAS pumping expansion												$1,320,000	$2,640,000	$2,640,000		$6,600,000
Tertiary Treatment - Filtration system expansion			$400,000	$900,000	$900,000											$2,200,000
Administration Building										$1,250,000	$1,250,000					$2,500,000
WRF - Solids																
New 1 MG Storage Tank and Mixer		$900,000	$1,700,000	$1,700,000												$4,300,000
Dewatering Process (Equipment and Building)						$1,100,000	$2,300,000	$2,300,000								$5,700,000
Dryer													$1,800,000	$3,800,000	$3,800,000	$9,400,000
Dry Biosolids Storage						$100,000	$300,000	$300,000								$700,000
Odor Contol						$50,000	$100,000	$100,000								$250,000
Investigation and Consultant Services																
Flow monitoring																
Model updates																
Total	$1,075,000	$3,534,000	$4,600,000	$6,500,000	$4,490,000	$4,840,000	$4,286,000	$4,350,000	$1,650,000	$2,040,000	$2,040,000	$2,110,000	$5,230,000	$7,230,000	$4,590,000	$58,600,000

The City should reevaluate this approach in 2012-13 and then in conjunction with discharge permit renewals, determine if any refinements are warranted. This re-evaluation should include:

- Update the model based on collection system flow monitoring data
- Assess the effectiveness of rehabilitation efforts based on the monitoring and the updated model.
- Update the cost-effectiveness determination (rehabilitation/conveyance/treatment) based on the latest available information
- Review compliance history and actual consequences of overflows.
- Adjust design storm selection and peak flow management approach as appropriate.

PROGRAM FINANCING

Over the past 16 years, the City of McMinnville has been in the process of implementing an aggressive financial strategy designed to generate adequate revenues to meet both existing wet weather flow-related capital improvement requirements and future system capacity needs. The initial financing strategy was adopted in 1991 following completion of the McMinnville Collection System Facilities Plan. The initial strategy consisted of a series of five consecutive annual system rate increases, significant increases in SDCs, and the use of long-term debt.

The average residential monthly sewer bill increased from about $7.00 in 1989 to about $53.00 currently. The annual rate increases adopted by the City since 1989 have ranged from 2.75 percent to 41 percent. System development charges have increased from $150 in 1989 to $2,400 per equivalent dwelling unit (EDU) currently. In 1994, the City issued $28.56 million in revenue bonds to finance a large portion of the City's water reclamation and conveyance facility, collection system improvements, and some I/I reduction work. The City also received a $10.20 million loan from the Oregon Economic Development Department (OEDD) to help fund the treatment and collection system improvements.

The wet weather flow management strategy presented here will continue to place a large demand on the City's financial resources. The City will need to look for additional resources such as increasing sewer rates and charges, and continued use of long-term debt will be required to meet the projected capital and O&M requirements of the system over the next 10 to 15 years. The City has adopted a strategy for phasing-in the additional rate and SDC increases so that the financial burden may be spread among existing and future customers.

As the identification and implementation of projects to manage wet weather flows progresses, the complexity of the solutions and the associated costs increase. The improvements performed to date have been successful in accomplishing reductions in the volume of rainfall entering the system. An example of this reduction is in the High School Basin where the 1998 Wet Weather Overflow Management Plan targeted rehabilitation for I/I reduction. Based on the 2006 monitoring data and model refinement in the 2008 Master Plan Update, a 25% reduction in the response to a selected 5-year design storm is estimated. These flow reductions are complemented by conveyance and flow management improvements resulting in reduction in overflows. The projects have typically served the multiple purposes of reducing overflows, replacing aging

system components, and providing for growth in the community. Progressing into the future, the identified projects to complete the stated objectives defined in this document have increasingly fewer multiple benefits. This results in a plan that meets the overflow reduction objectives, but includes projects that will be subject to increasing competition for the limited funding capacity of the City.

STAFFING

As shown in Table 7-7, there are a total of 6 City staff with responsibilities for collection system operation and maintenance. Future staff requirements will based on anticipated system expansion and the desired service levels for future O&M. Staffing levels may also be influenced once the City has performed the "Recommended Departmental Action Items" identified in the CMOM assessment performed as a part of this project.

Table 7-7. Current City of McMinnville Collection System Staff Requirements

Conveyance System	
Position	No. of Employees
Conveyance System Supervisor	1
Utility Worker II	5
Total	6

PLAN IMPLEMENTATION VARIABLES

The recommended wet weather management plan and the related implementation schedule are all integrally linked to deliver a comprehensive solution to manage wet weather overflow in McMinnville and comply with DEQ regulations. All of these elements were developed based on some important actions that are essential to fully implement the plan within the planned schedule. These underlying important actions are as follows:

- *Community Growth.* A critical element of the financial plan to deliver the recommended wet weather management improvements is growth in the community and a resulting increase in revenue. This planned increase in revenue, within the time frame forecasted, is required to fund increased investments for the projects. If community growth and the resulting revenue are less than planned, the plan may take longer to implement. Conversely, if community growth is faster than planned, major additional investments for treatment plant expansion will need to be accelerated.

- *Rate Increases.* Another critical element of the financial plan to deliver the plan is approval by the City Council and acceptance by the community of some relatively large rate increases. There is no certainty that future City Councils will approve rate increases. Without increased rates to pay for increased debt, implementation of the wet weather management plan would be delayed.

- *Other Community Investments.* Like most small and growing communities, McMinnville has many community needs ranging from transportation, parks, education and other public facilities. An integral part of the City Council's and the community's support of additional investments for wet-weather overflow management will be the continued ability to adequately fund these other needs. Inability to meet these other community needs could negatively affect support for future rate increases needed for plan investments and possibly delay completion.

- *Regulatory Changes.* The recommended WWOMP is developed to achieve compliance with the current bacteria standard. If new standards or regulations evolve that change the compliance requirements, then the completion time for the recommended plan could also change.

- *Cost Estimates and Escalation.* The underlying foundation of the plan implementation schedule and financial plan is the definition of key projects and estimating the cost of these projects. Best engineering information and judgment has been applied to estimate the cost of the projects identified in the recommended plan. However, since these projects will be completed over the next 15 years, a variety of factors such as the economic climate and the available workforce could affect the actual cost of each project. If, because of these factors, the actual costs of the identified plan projects are higher than currently estimated, then financial limitations could require delays in the program as planned.

5-YEAR CAPITAL IMPROVEMENT PROGRAM

The 5-year wastewater capital improvement program is defined as the first 5 years of the project implementation schedule shown in Table 7-6. Table 7-6 lists the projects identified for the 5-year period beginning with the 2008-09 budget year.

LONG-TERM MANAGEMENT ACTIVITIES

The recommended plan requires the City to continue their pro-active maintenance of the collection system. This approach is essential for the following reasons:

- Growth includes a future I/I allowance, but no increase in existing RDI/I is assumed.
- Existing I/I must be managed to maintain the selected solution.

To avoid the potential cost consequences of allowing I/I to increase, a meaningful and adequately funded system maintenance program employing I/I Best Management Practices must be an integral part of the recommended plan for wet-weather overflow management.

I/I Best Management Practices

The City will continue and enhance I/I Best Management Practices to meet permit requirements and achieve the desired wet-weather overflow control frequency. These practices are summarized as follows:

- Repair known structural problems

- Perform source identification activities
- TV inspection
- Smoke testing
- Incorporate field investigation results in capital improvement program projects
- Perform flow monitoring
- Replace/line pipe in selected areas
- Continue system data management