EXECUTIVE SUMMARY

Clean Water Services provides wastewater collection and treatment, as well as stormwater conveyance and environmental enhancement, to a population of about 500,000 people over a 122 square mile area in the Tualatin River watershed. The District operates four wastewater treatment plants and 39 pump stations, working with 12 member cities to build and maintain the public sanitary sewer and surface water management system. Part of the District's responsibilities includes wastewater collection system master planning to identify facility improvements needed to provide adequate conveyance capacity to the current and anticipated future service area. Figure ES-1 shows the current District boundary and the current Urban Growth Boundary (UGB). Figure ES-1 also depicts the study area boundary for this analysis.

This Sanitary Sewer Master Plan Update (Master Plan) provides a prediction of current and future wastewater flows, and identifies the pipeline and pump station improvements needed to serve the project study area. The major topics covered in this Executive Summary include:

- Regulatory Setting
- Overview of Update Process
- Sanitary Flows
- Conclusions and Recommendations
- Next Steps

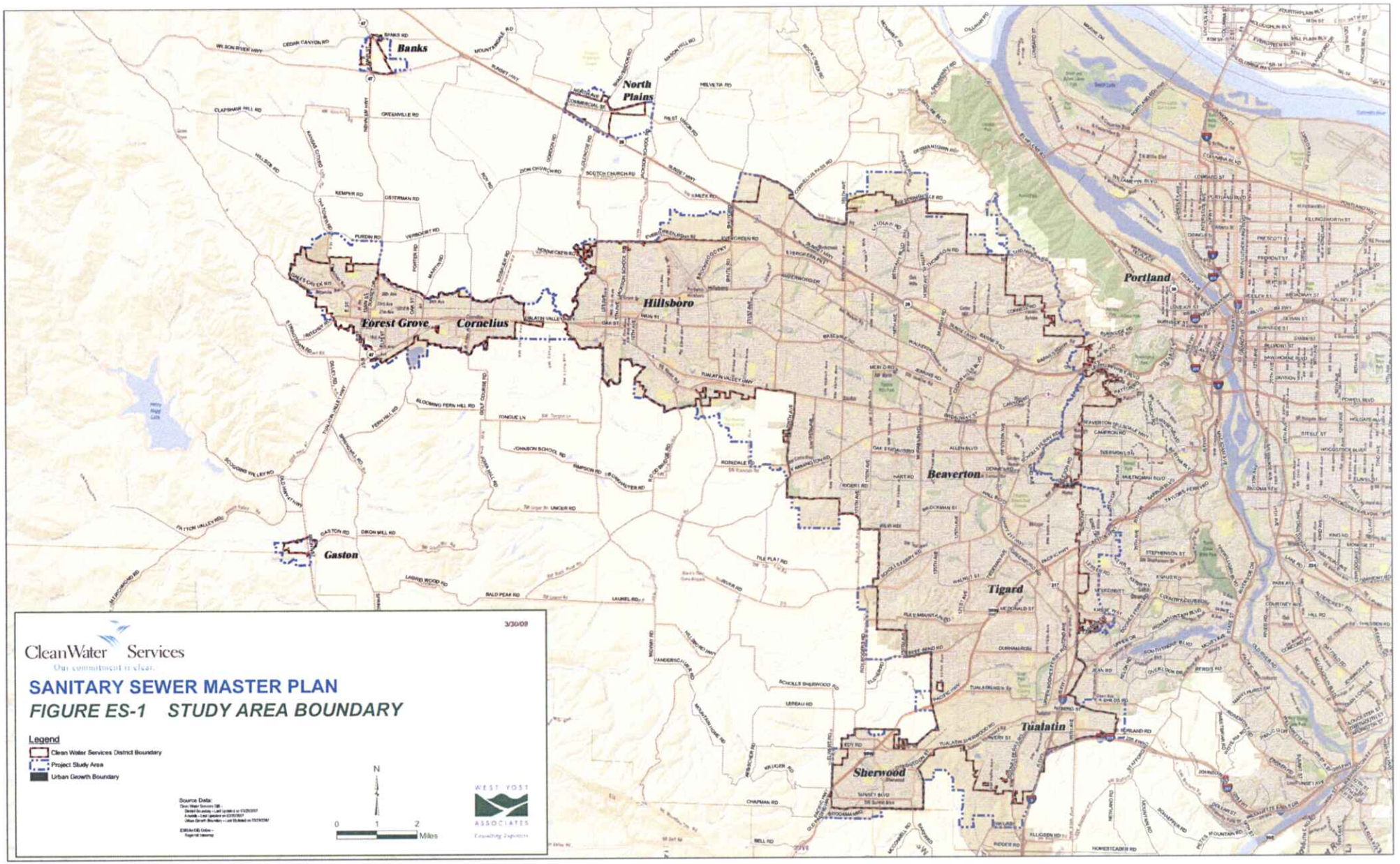
REGULATORY SETTING

Oregon Water Quality Standards set forth two conditions restricting sanitary sewer overflows based on bacterial standards for waters of the State. The standards generally prohibit raw sewage discharges to waters of the State, except during a storm event greater than the one-in-five-year, 24-hour duration storm during the period of November 1 through May 21, and during a storm event greater than the one-in-ten-year, 24-hour duration storm during the period of May 22 through October 31. The regulations do not prescribe a required methodology for planning collection system capacity improvements. This Master Plan follows previous planning practices employed by the District, and includes recommendations for additional efforts to further evaluate the anticipated actions needed to ensure conformance to the Water Quality Standards.

OVERVIEW OF UPDATE PROCESS

The first step in the Master Plan update process was to establish a study area that encompasses areas of anticipated growth that will need to be accommodated within the foreseeable future by District facilities. The District's computer model of the sanitary sewer system was then updated first by adding 10-inch diameter and larger sewers constructed subsequent to the last update, and then by adding conceptual future trunk sewers extending into the growth areas. Previously un-modeled pump stations were also incorporated into the model, representing a substantial refinement that resulted in a more comprehensive assessment of pump station flows and capacity needs.

The basis of sanitary flows simulated in the model was updated to reflect current land use information on a parcel by parcel basis. The land use update was based on information provided by member agencies, or by Metro where city-specific land use information was not available. Sanitary flows (including process flows) from significant industrial discharges were updated using current flow records and permit flow limits. Sanitary flows from all other areas were obtained by application of sanitary flow factors on a parcel-by-parcel basis based on the land-use category assigned to the parcel. This work resulted in updated sanitary flow estimates and projections. Finally, wet weather infiltration and inflow (I&I) estimates were updated for areas where I&I abatement projects have been completed subsequent to the previous master plan.


Banks
North Plains
Hillsboro
Forest Grove
Cornelius
Gaston
Portland
Beaverton
Tigard
Tualatin
Sherwood
3/30/09
Clean Water Services
Our commitment is clear.
SANITARY SEWER MASTER PLAN
FIGURE ES-1 STUDY AREA BOUNDARY
Legend
Clean Water Services District Boundary
Project Study Area
Urban Growth Boundary
N
0 1 2 Miles
WEST YOST ASSOCIATES

Following completion of these updates, the computer model was used to simulate existing and future flow conditions within the sanitary sewer system, and to identify those locations where the existing pipe or pump station capacity may not be adequate. For each identified location, a ranking system was used to determine where improvements are warranted. The necessary improvements, along with future extensions of the collection system, were then described and documented to serve as a guide for annual capital improvement planning and extension of service to growth areas.

SANITARY FLOWS

The land-use based flow predictions of the computer model do not explicitly use population as a basis. However, the population implicit in the modeled wastewater flows may be estimated from the modeled average dry weather flow (ADWF). Specifically, by assuming a fixed flow per person value (67 gallons per person per day, in the case of this Master Plan), the portion of the modeled ADWF attributed to residential uses can be translated into an approximate population. Tables ES-1 and ES-2 summarize for 2006 conditions and buildout of the study area, respectively, the total acreage and flow, the residential portion of flow, and an estimated population value based on the residential portion of flow.

Table ES-1. Implied Population for Treatment Plant Service Areas (2006 Model)

Treatment Plant Basin	Modeled Service Area Acreage	Total ADWF (modeled – 2006), mgd	Modeled Residential Portion[(a)] of ADWF, mgd	Approximate Population[(b)] Based on Residential ADWF
Forest Grove	2,162	2.53	0.820	12,380
Hillsboro	4,987	4.31	1.76	34,550
Rock Creek	24,805	24.2	12.0	234,070
Durham	21,911	19.0	10.4	181,580
All Basins	53,865	50.0	25.0	462,580

(a) Includes all residential land use categories and mixed use commercial categories.

(b) Estimated based on a wastewater generation rate of 67 gallons per capita per day.

Table ES-2. Implicit Population for Treatment Plant Service Areas (Service Area Buildout Conditions)

Treatment Plant	Modeled Service Area Acreage	Total Modeled ADWF, mgd	Modeled Residential Portion[a] of ADWF, mgd	Approximate Population[b] Based on Residential ADWF
Forest Grove	2,941	5.43	2.12	31,600
Hillsboro	7,526	14.1	8.13	121,300
Rock Creek	32,974	57.2	34.5	515,100
Durham	27,325	38.7	22.2	331,100
All Basins	70,766	115.4	67.0	999,100

(a) Includes all residential land use categories and mixed use commercial categories.
(b) Estimated based on a wastewater generation rate of 67 gallons per capita per day.

CONCLUSIONS AND RECOMMENDATIONS

The findings of this Master Plan are presented in Chapters 4, 5, and 6 of this report, and summarized in Chapter 7. The contents of these four chapters are summarized as follows:

Chapter 4. Collection System Evaluation

Chapter 4 presents the modeling results and recommended improvements for existing gravity sewer facilities. A ranking condition based on modeled flow versus capacity for each modeled pipe is illustrated on large format maps (Plates 4 through 12). Each improvement is described and depicted on a Project Data Sheet. The various Project Data Sheets are provided in Appendix O, which is bound separately in 11 x 17 inch format. An example is provided in the Sample Project Data Sheet included in this Executive Summary.

Chapter 5. Pump Station and Force Main Capacity Assessment

Chapter 5 presents findings and recommended capacity improvements for existing pump stations and force mains. A detailed Pump Station Data Sheet provides key information about each existing pump station, including the modeled flows, remaining capacity, estimated service area population, and a map of the area tributary to the pump station. The pump station data sheets are provided in Appendix P, which is bound separately in 11 x 17 inch format. An example is provided in the Sample Pump Station Data Sheet included in this Executive Summary.

SAMPLE PROJECT DATA SHEET

PROJECT - Beef Bend Road Trunk

Project ID: D-245

Base Construction Cost	1,159,000
Contingency (30%)	348,000
Construction Budget Amount	1,510,000
Engineering & Administration (25%)	377,500

NOTES: Project would be triggered by growth in the Beef Bend area, as well as abandonment of Pleasant View Pump Station and redirection of the flow through the Beef Bend growth area.

Capital Improvement Cost Total[1]: 1,888,000

(1) Cost rounded. ENR CCI = 8602 average of 20 Cities, November 2008

Model G_ID	Manhole IDs USMH_DSMH	Condition Rating (yr)			Existing Diameter, inches	Existing Slope	Full-pipe Capacity, mgd	Peak Flows, mgd			HGL Rank			Buildout Peaking Ratio, PH/ADWF	Upsize Diameter, inches	Depth, ft	Length, ft	Unit Cost, $	Unit	Base Construction Cost (w/o Contingency), $
								Existing (2006)	2015	Buildout	Existing	2015	Buildout							
8474	15074_15073				8	0.0040	0.49	0.27	2.41	4.05	OK	LS	LS	2.6	18	29.6	153	795	ft	122,000
8493	15073_15072				8	0.0040	0.49	0.27	2.41	4.05	OK	LS	LS	2.6	18	35.7	400	933	ft	373,000
8489	15072_15071				8	0.0040	0.49	0.27	2.40	4.04	OK	LS	LS	2.6	18	39.8	400	1026	ft	410,000
8494	15071_15250				8	0.0040	0.49	0.27	2.39	4.03	OK	LS	LS	2.6	18	28.5	228	771	ft	176,000
8484	15250_15070				8	0.0040	0.50	0.27	2.38	4.03	OK	HS	LS	2.6	18	19.1	84	252	ft	21,000
8495	15070_15069				8	0.0039	0.49	0.27	2.38	4.02	OK	IS	LS	2.6	18	16.9	66	236	ft	16,000
8482	15069_15068				8	0.0040	0.49	0.27	2.38	4.02	OK	IS	HS	2.6	18	22.2	65	628	ft	41,000

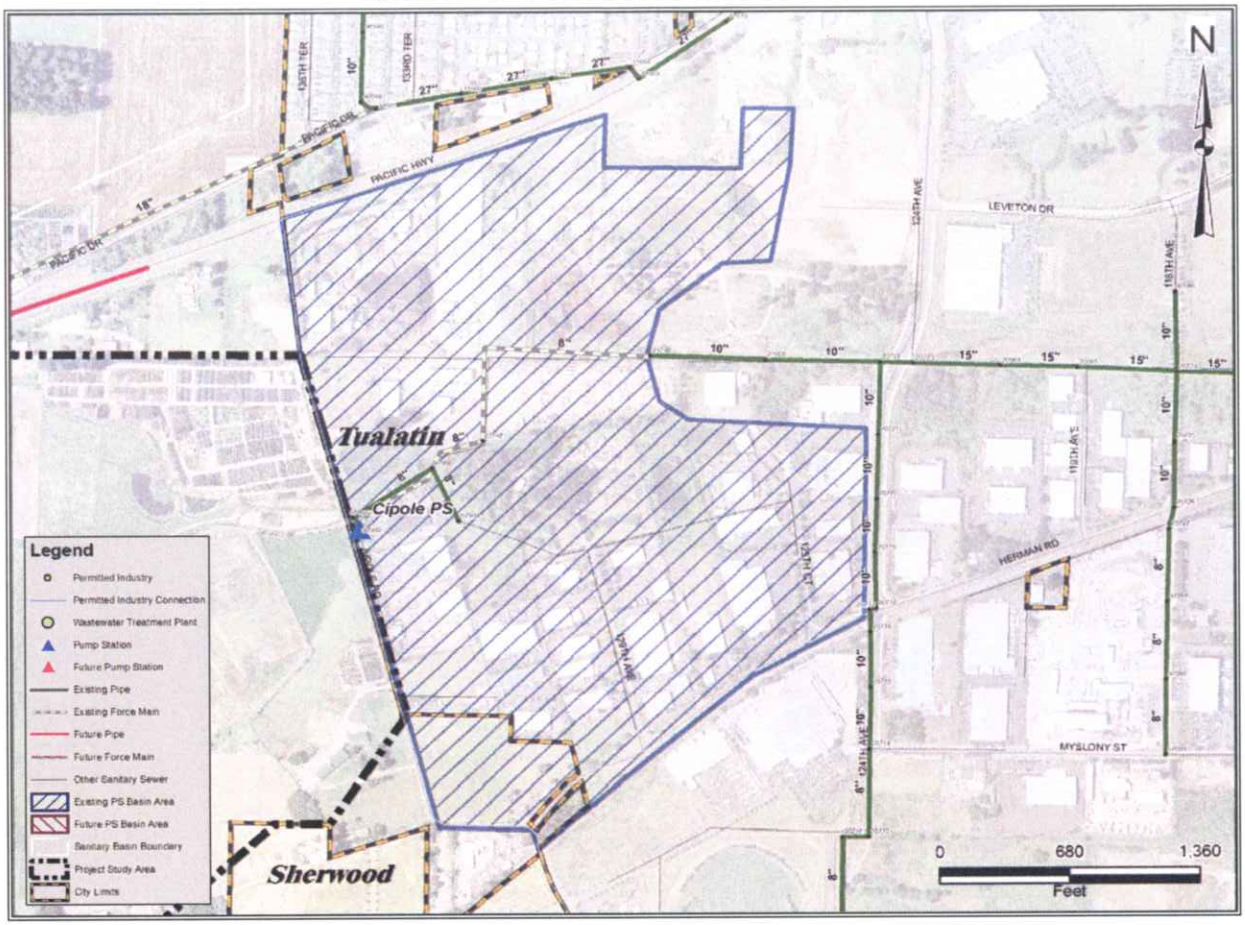
Location:	Near South Bull Mountain Pump Station
Treatment Plant Basin:	LS
Jurisdiction:	-
Local/Regional:	-
Brief Description:	Upsize ~1,400 ft of 8-inch diameter sanitary sewer to 18-inch diameter sanitary sewer.

Special Considerations: NA
(Included in Unit Costs)

Project Driver

- ☐ Residential development [in area _____]
- ☐ Industrial development
- ☐ High I/I
- ☐ Pump station upgrade

SAMPLE PUMP STATION DATA SHEET



Cipole PS

Scenario	Developed PS Basin Size, acres	PS Basin Composite Density, EDU[1]/acre	Total ADWF[2], mgd	PS Basin Composite I/I[3], gpd/acre	Modeled PWWF[4], mgd	Modeled Force Main Velocity[5], fps	Remaining Firm Capacity, mgd	PS Basin EDUs[6]	Approx. Residential DUs[7]	Approx. Residential Population @ 2.4 pers/DU	Remaining EDUs[8]	Improvement Required?, Y/N
Existing Conditions	157	1.36	0.03	90	0.41	1.81	0.15	213	0	0	287	N
2015 Conditions[9]	167	1.49	0.04	90	0.46	2.03	0.10	249	0	0	190	N
Buildout Conditions[9]	198	1.97	0.06	90	0.66	2.91	-0.10	389	0	0	-189	Y
Buildout Plus Conditions	N/A	N/A	N/A	N/A	0.66	2.91	-0.10	389	N/A	N/A	N/A	N/A
Firm Capacity					0.56							

Footnotes:
1. Equivalent Dwelling Units
2. Average Dry Weather Flow
3. Inflow and Infiltration
4. Peak Wet Weather Flow
5. Based on existing force main diameter and modeled PWWF. Actual velocity will be determined by pumping rate.
6. Based on total ADWF and 161 gpd/EDU
7. Based on residential ADWF and 161 gpd/DU. Assumes flows from growth areas with a non-specific land use (RRFU or FF) is 72% residential.
8. Assumes 8 EDU/acre for the purpose of converting remaining PWWF capacity to an equivalent ADWF
9. Includes RRFU and FF land use areas listed as occupied

Master Planning Notes: Cipole

Pump station and force main are adequately sized for flows anticipated through 2015. A pump station upgrade will be needed to accommodate the modeled buildout flows.

The basin is occupied by industrial and commercial uses, which tend to have wide ranging flow generation characteristics. Actual flows may be signficantly different than modeled flows. For planning purposes, it is assumed that replacement of pumping equipment and controls will be adequate to provide the necessary buildout capacity.

WYA - March 2009
517-03-06-14

West Yost Associates
517-03-06-14

Clean Water Services
Sanitary Sewer Master Plan Update
March 30, 2009

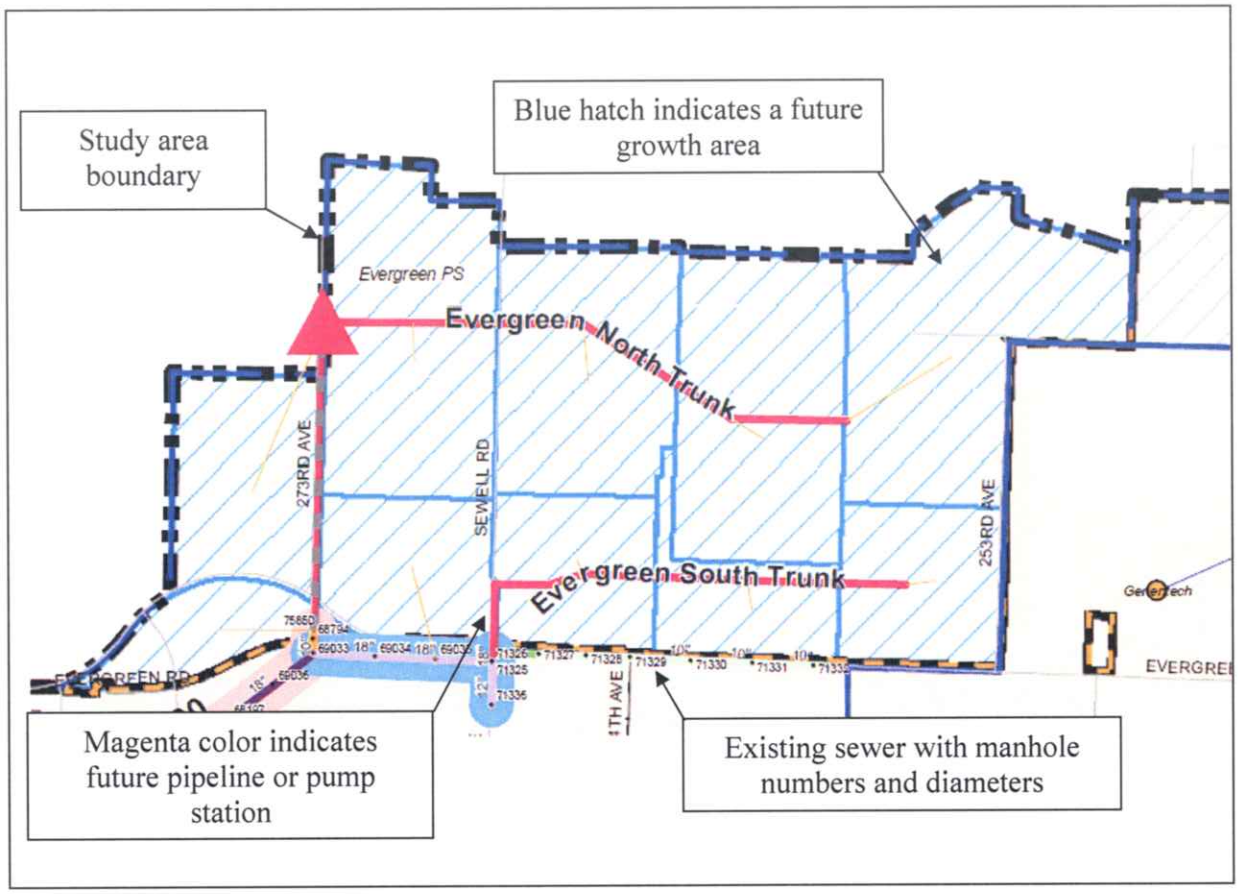
Cipole PS

Firm Capacity: 0.56 mgd
No. Pumps: 2
Basin: Durham
FM Diameter: 8 in
FM Length: 1,100 ft

Chapter 6. Service to Growth Areas

Chapter 6 describes the conceptual trunk sewer extensions, pump stations, and force mains that will be needed to extend service into areas of anticipated growth. The conceptual future pipeline alignments and pump station locations are depicted on the large format maps, Plates 4 through 6. The plates also depict the area that is expected to be tributary to each extension. Detailed information defining the basis of sizing and cost for the facilities is provided. Figure ES-2 is an excerpt from Plate 4, showing the future sewers that would extend service to the South Hillsboro area.

Figure ES-2. Plate 4, Excerpt Showing Conceptual Future Sewer Alignment



Chapter 7. Capital Improvement Cost Summary

Chapter 7 provides a series of tables summarizing the recommended improvements and presenting estimated costs. A preliminary allocation of costs to be funded by system development charges is also included for improvements to existing gravity sewers and pump stations.

Table ES-3 presents a summary of costs for the planned projects by basin. The costs account for new backbone facilities that will be needed to extend service into future development areas, as well as upsizing in existing gravity sewers and pumping facilities needed to accommodate anticipated growth. In some instances, a new pumping facility is planned in lieu of upsizing an existing gravity sewer (e.g., Council Creek Pump Station and Dawson Creek Pump Station). In addition to the backbone facilities included in the Master Plan, future growth areas will need the smaller diameter sewers typical of any new development.

Project cost estimates exclude land acquisition, financing, and inflation. The costs include a 30 percent contingency based on the level of planning, as well as a 25 percent allowance for engineering and administration. Costs are presented in current dollars for late 2008 / early 2009, but do not likely fully capture the effects of unusual economic conditions and bidding climates that can dramatically affect construction costs.

The conceptual alignments and preliminary sizing presented herein for extension of service, and for upsizing existing facilities, will be refined through the normal planning and design processes. However, in general, the master-planned points of connection for growth areas should be used unless additional evaluation of downstream impacts in the existing collection system indicates that alternate connection points can be accommodated.

Member cities periodically conduct sanitary sewer system master planning for the facilities specific to their particular area of local responsibility. Furthermore, it is understood that the member city master plans identify collection system improvements based on a variety of factors, and that sanitary sewer improvements different from, or additional to, those presented in this report may be identified. Differences could arise from more detailed alignment studies, additional flow analysis and calibration, or identified non-capacity-related deficiencies.

Projects identified in member city sanitary sewer master plans that differ from projects described in this Master Plan will be considered through the work of the recently established CIP Prioritization Committee. Differing master planning conclusions regarding the need for, priority of, or description of a project will be resolved through review of prior analyses and documentation of actual flows.

Table ES-3. Summary of Costs for Planned Projects

Basin and Improvement Category	Length of Sewers (ft) or Number Pump Stations	Total Project Cost, $
Durham		
Upgrades to Existing Gravity Sewers	88,865	65,420,000
Upgrades to Existing Pump Stations and Force Mains	9	22,846,000
New Gravity Sewer Extensions	65,111	36,268,000
New Pump Stations and Force Mains	4	28,913,000
Subtotal, Durham Basin		*153,447,000*
Forest Grove		
Upgrades to Existing Gravity Sewers	5,297	1,290,000
Upgrades to Existing Pump Stations and Force Mains	3	5,503,000
New Gravity Sewer Extensions	7,126	2,038,000
New Pump Stations and Force Mains	1	2,250,000
Subtotal, Forest Grove Basin		*11,081,000*
Hillsboro		
Upgrades to Existing Gravity Sewers	15,876	9,220,000
Upgrades to Existing Pump Stations and Force Mains	2	15,604,000
New Gravity Sewer Extensions	43,752	13,740,000
New Pump Stations and Force Mains	4	22,330,000
Subtotal, Hillsboro Basin		*60,894,000*
Rock Creek		
Upgrades to Existing Gravity Sewers	26,962	9,390,000
Upgrades to Existing Pump Stations and Force Mains	2	2,933,000
New Gravity Sewer Extensions	72,690	60,663,000
New Pump Stations and Force Mains	4	59,159,000
Subtotal, Rock Creek Basin		*132,145,000*
Total Project Costs, All Basins		715,134,000

NEXT STEPS

Many of the District's ongoing sanitary sewer system management and planning activities will build on the analysis and conclusions of this Master Plan. These activities may include the following:

1. Evaluation of Wet Weather Conditions: It is recommended that additional wet weather conditions be evaluated, and that additional I&I calibration be performed if necessary to determine whether or not additional improvements are needed to comply with state water quality standards. Consideration of system performance with various wet antecedent conditions will be important.
2. Prioritization of Collection System Improvements: The District has established a priority ranking system for collection system improvements. This Master Plan focuses on capacity relative to existing and anticipated flows, which is an important consideration in the project ranking process. The ranking will also take into account other factors, such as opportunities to combine sewer improvements with other infrastructure replacements or redevelopment, maintenance needs, structural repair needs, and basin infiltration and inflow rehabilitation. Prioritization is dynamic. This Master Plan will be used as a tool during the periodic project prioritization procedures. Over the course of time, projects identified herein may be modified or eliminated, and additional projects may be added.
3. Periodic Master Plan Updates: Periodic updates to the Master Plan are anticipated, with the next update anticipated in 2015. Such updates will be necessary to refine sizing and conceptual alignments for long-term projects, and to reflect evolving planning for development in outlying areas. Significant land use changes or additional calibration work could trigger the need for special studies or accelerate the need for a full update.
4. Collection System Model Refinement: Model refinement in response to facility construction and development, or to take advantage of evolving modeling technologies and data improvements may be warranted. This Master Plan update, like the previous update, relied heavily on collection system configuration data compiled in the 1990s, supplemented by data from recent projects. Improved and updated data for older portions of the collection system are identified on a regular basis. A number of recommended model refinement activities are identified at the end of Chapter 3.