Table 5-1. Cost Estimates for Recommended Projects

	Description	Pipe diameter (in)	Channel: Flow depth (ft)	Channel: Width (ft)	Channel: Side slope V/H	Cost: Amount	Cost: Unit	Cost: Unit cost ($)	Cost: Capital cost ($)	Cost: Total cost[2,3] ($)
NW Region										
A	**Jetty Road and Rhododendron Drive Improvements[1]**									
	Box culvert under drive		1	4	vert.	61	CY	600	36,307	50,800
	8 ft-wide pavement patch					480	SF	4	1,920	2,700
	Ditch		2	2.5	0.5	677	CY	20	13,533	18,900
	Pipe	30				392	LF	150	58,800	82,300
	Slope drain	30				129	LF	300	38,700	54,200
	Flow dissipator (riprap)					5	CY	50	250	400
	TOTAL								**149,510**	**209,300**
NE Region										
A	**Wetland along Munsel Creek Road and drainage south to Munsel Creek**									
	Swale or wetland excavation		1	10	0.5	1,892	CY	20	37,831	53,000
	Plant native vegetation					17,024	SF	1	17,024	23,800
	Geotextile lining					17,598	SF	1	17,598	24,600
	Culvert under Munsel Ck Rd	36				113	LF	180	20,340	28,500
	5 ft-wide pavement patch					200	SF	4	800	1,100
	Ditch south of Munsel Ck Rd		1	5	0.5	296	CY	20	5,920	8,300
	Pipe to Munsel Ck	30				522	LF	150	78,300	109,600
	Flow dissipator (riprap)					3	CY	50	150	200
	TOTAL								**177,963**	**249,100**
B	**Upsize culverts along Spruce Street south of Florentine Estates**									
	Upsize MUN410L	42				324	LF	210	68,040	95,300
	Upsize MUN420L	42				682	LF	210	143,220	200,500
	TOTAL								**211,260**	**295,800**
C	**Extend drainage to undeveloped area north of Munsel Lake Road**									
	Swale or wetland		2	6	0.5	4,175	CY	20	83,502	116,900
	Plant native vegetation					18,788	SF	1	18,788	26,300
	Geotextile lining					20,055	SF	1	20,055	28,100
	TOTAL								**122,345**	**171,300**

[1] Costs are not shown for pump station improvements required at Gullsettle Court.
[2] Total cost includes capital costs and provisions for engineering, administration, and contingency that represent a 1.4 multiplier on the capital cost.
[3] Costs do not include land acquisition or easement costs.

Table 5-1. Cost Estimates for Recommended Projects (continued)

	Description	Pipe diameter (in)	Channel Flow depth (ft)	Channel Width (ft)	Channel Side slope V/H	Cost Amount	Cost Unit	Cost Unit cost ($)	Cost Capital cost ($)	Cost Total cost[2,3] ($)
D	**Drainage along U.S. Highway 101 Munsel Lake Road to 42nd St.**									
	Pipe along west side and under Hwy 101	24				3,160	LF	120	379,200	530,900
	Pipe along east side of Hwy 101	24				2,521	LF	120	302,520	423,500
	Pipe from Hwy 101 to Spruce	30				526	LF	150	78,900	110,500
	5 ft-wide pavement patch (10% of pipe length)					1,193	SF	4	4,770	6,700
	TOTAL								**765,390**	**1,071,600**
E	**Drainage along U.S. Highway 101 north of Munsel Lake Road**									
	Pipe draining north portion of Hwy 101	30				2,385	LF	150	357,750	500,900
	5 ft-wide pavement patch (10% of pipe length)					1,193	SF	4	4,770	6,700
	TOTAL								**362,520**	**507,600**
CEN region										
A	**Rhododendron Diversion**									
	Plug existing culvert					1	EA	50	50	100
	Culvert under drive	36				179	LF	180	32,220	45,100
	Excavate ditch along drive		1.5	2	0.5	2,109	CY	20	42,187	59,100
	Line ditch w/4 in. of concrete					505	CY	320	161,643	226,300
	TOTAL								**236,100**	**330,600**
B	**Ditch from Mariner's Village**									
	Excavate ditch from Mariner's Village		1	1.5	0.5	907	CY	20	18,138	25,400
	Line ditch w/4 in. of concrete					325	CY	320	103,988	145,600
	TOTAL								**122,126**	**171,000**
C	**Golf Course Flow Bypass**									
	Excavate ditch from Golf Course		1	2	0.5	611	CY	20	12,227	17,100
	Line ditch w/4 in. of concrete					218	CY	320	69,637	97,500
	TOTAL								**81,863**	**114,600**

[1] Costs are not shown for pump station improvements required at Gullsettle Court.

[2] Total cost includes capital costs and provisions for engineering, administration, and contingency that represent a 1.4 multiplier on the capital cost.

[3] Costs do not include land acquisition or easement costs.

Table 5-1. Cost Estimates for Recommended Projects (continued)

	Description	Pipe diameter (in)	Channel: Flow depth (ft)	Channel: Width (ft)	Channel: Side slope V/H	Cost: Amount	Cost: Unit	Cost: Unit cost ($)	Cost: Capital cost ($)	Cost: Total cost[2,3] ($)
SW Region										
A	**Greentrees**									
	Ditch		2	5	0.5	1,309	CY	20	26,173	36,600
	TOTAL								**26,173**	**36,600**
B	**Upsize Pipes East of Airport**									
	Upsize CEN270L	30				179	LF	150	26,850	37,600
	Upsize CEN260L	30				411	LF	150	61,650	86,300
	Upsize CEN250L	48				828	LF	240	198,720	278,200
	Upsize CEN230L	36				180	LF	180	32,400	45,400
	TOTAL								**319,620**	**447,500**
C	**Upsize Pipes in Downtown Area**									
	Upsize 8-inch pipe in 9th St. (library)	12				360	LF	60	21,600	30,200
	Upsize 8-inch pipe in 8th St.	12				318	LF	60	19,080	26,700
	Upsize 8-inch pipe in Maple St.	12				1,014	LF	60	60,840	85,200
	Upsize DTN100L	21				320	LF	105	33,600	47,000
	Upsize DTN090L	24				390	LF	120	46,800	65,500
	Upsize DTN070L	27				346	LF	135	46,710	65,400
	Upsize DTN060L	27				357	LF	135	48,195	67,500
	Upsize DTN050L	27				282	LF	135	38,070	53,300
	Upsize DTN040L	30				304	LF	150	45,600	63,800
	Upsize DTN030L	30				355	LF	150	53,250	74,600
	Upsize DTN020L	30				365	LF	150	54,750	76,700
	5-ft pavement patch for above work					22,055	SF	4	88,220	123,500
	TOTAL								**556,715**	**779,400**
SE Region										
A	**Pine Court Pump Station**									
	PS (413 gpm @ 50 ft)					1	EA	100,000	100,000	140,000
	Force main	4				412	LF	20	8,240	11,500
	Pine Ct. pavement patch (3 ft. x 300 ft)					900	SF	4	3,600	5,000
	Flow dissipator (riprap)					3	CY	50	150	200
	TOTAL								**111,990**	**156,700**
GRAND TOTAL (ALL AREAS)										

[1] Costs are not shown for pump station improvements required at Gullsettle Court.
[2] Total cost includes capital costs and provisions for engineering, administration, and contingency that represent a 1.4 multiplier on the capital cost.
[3] Costs do not include land acquisition or easement costs.

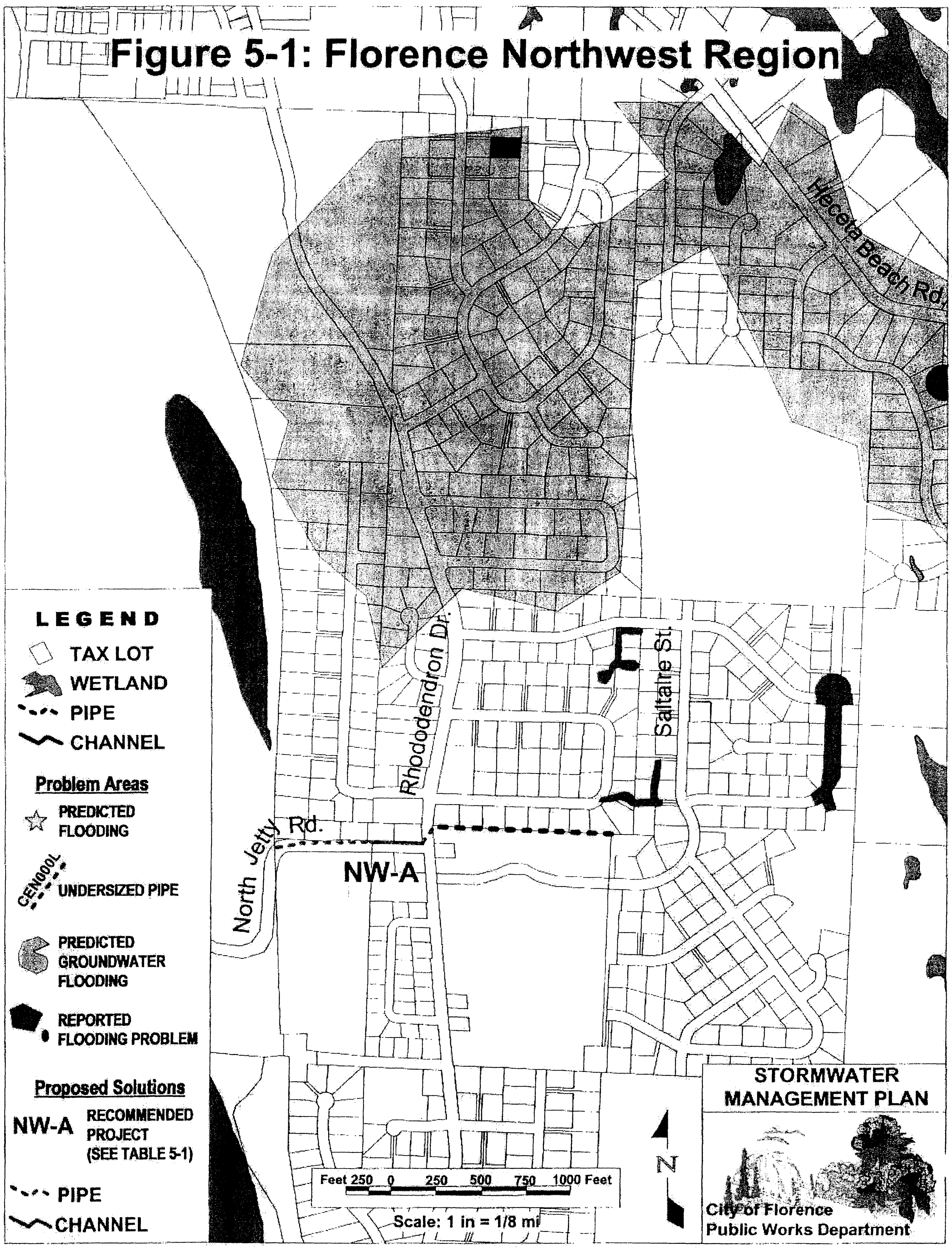


Figure 5-1: Florence Northwest Region
Heceta Beach Rd.
Rhododendron Dr.
Saltaire St.
North Jetty Rd.
NW-A
LEGEND
TAX LOT
WETLAND
PIPE
CHANNEL
Problem Areas
PREDICTED FLOODING
CEN000L
UNDERSIZED PIPE
PREDICTED GROUNDWATER FLOODING
REPORTED FLOODING PROBLEM
Proposed Solutions
NW-A RECOMMENDED PROJECT (SEE TABLE 5-1)
PIPE
CHANNEL
Feet 250 0 250 500 750 1000 Feet
Scale: 1 in = 1/8 mi
N
STORMWATER MANAGEMENT PLAN
City of Florence
Public Works Department

Figure 5-2: Florence Northeast Region

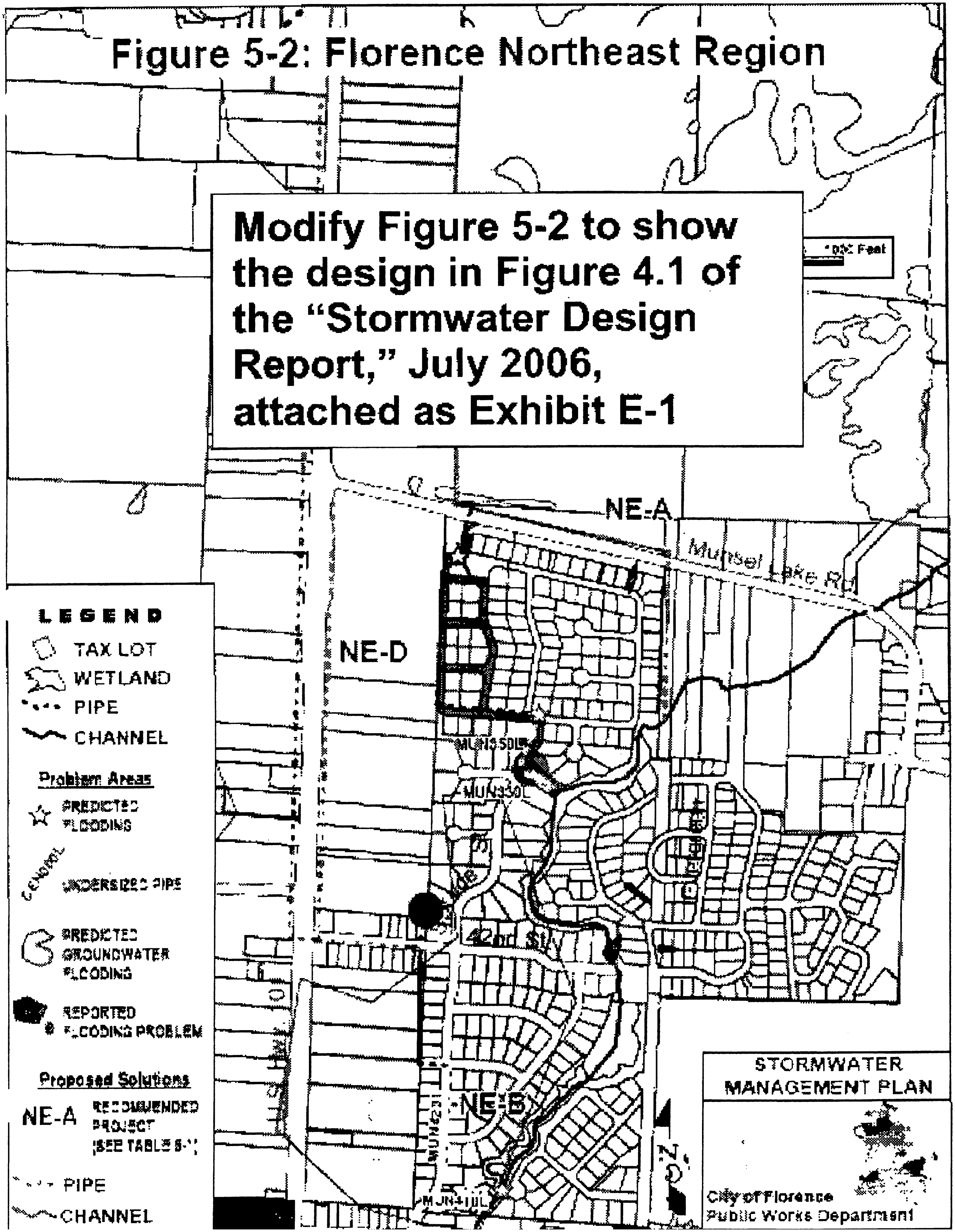
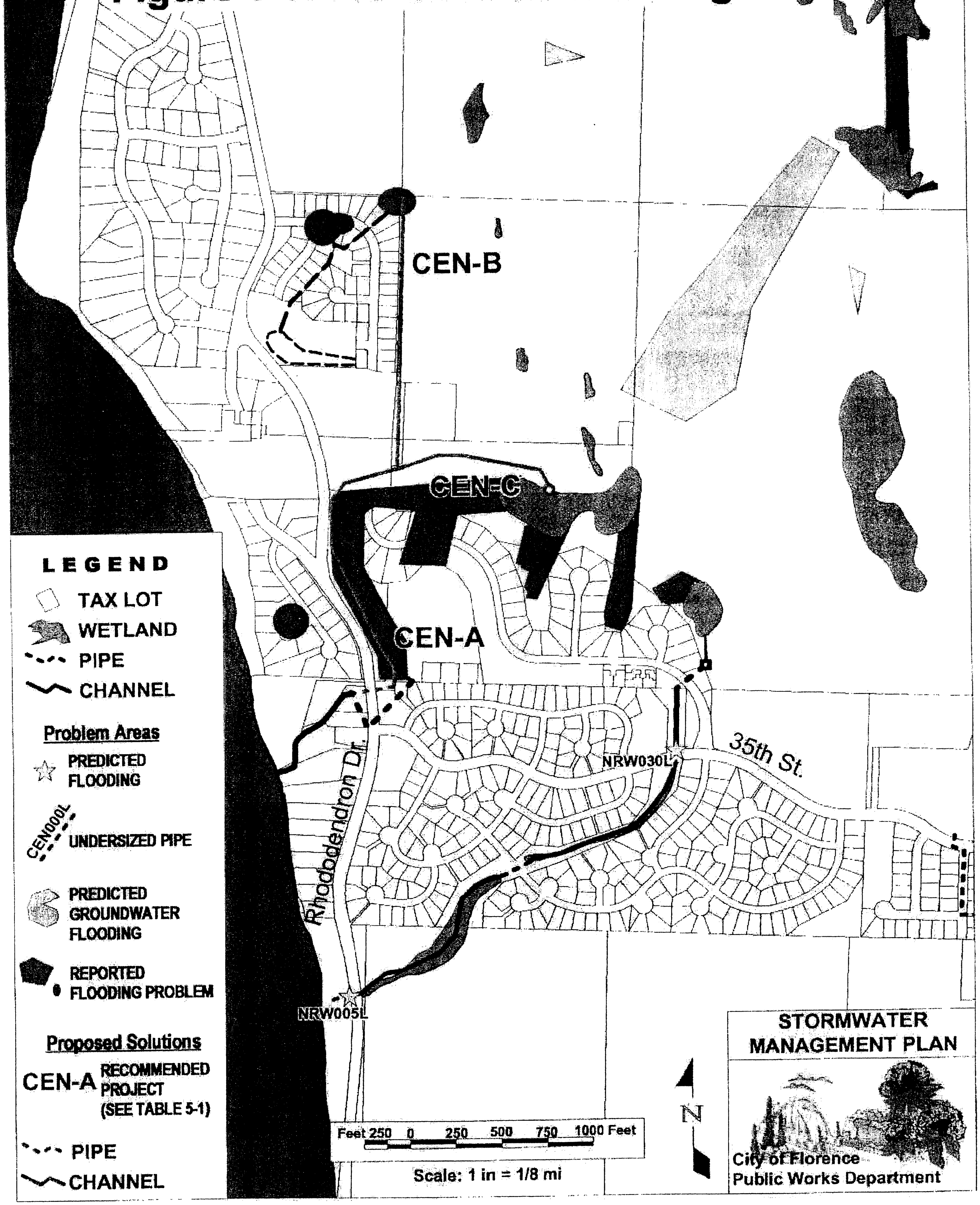


Figure 5-3: Florence Central Region



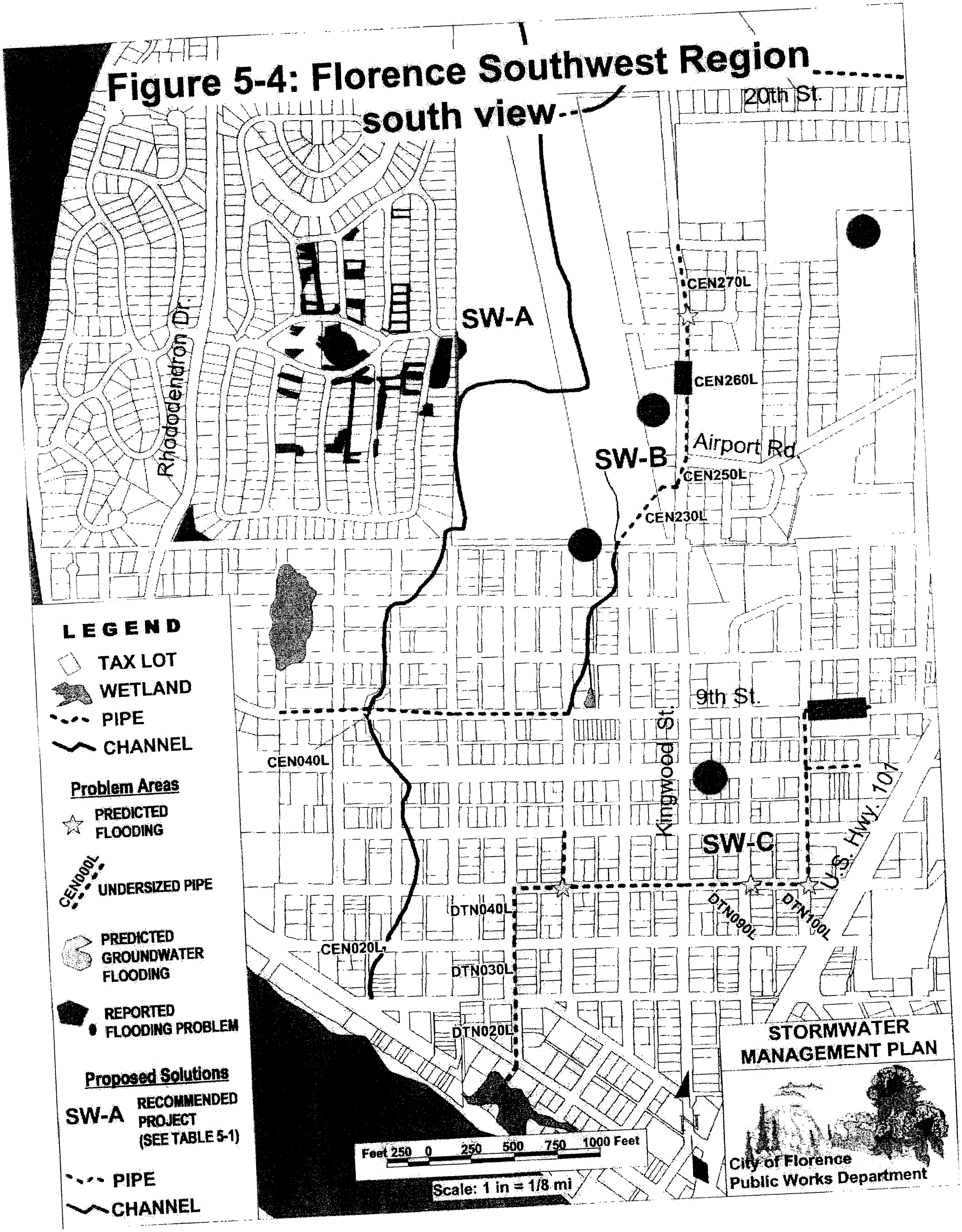


Figure 5-4: Florence Southwest Region
south view
20th St.
Rhododendron Dr.
SW-A
CEN270L
CEN260L
Airport Rd
SW-B
CEN250L
CEN230L
9th St.
Kingwood St.
CEN040L
SW-C
U.S. Hwy. 101
DTN040L
DTN090L
DTN100L
CEN020L
DTN030L
DTN020L
LEGEND
TAX LOT
WETLAND
PIPE
CHANNEL
Problem Areas
PREDICTED FLOODING
CEN000L
UNDERSIZED PIPE
PREDICTED GROUNDWATER FLOODING
REPORTED FLOODING PROBLEM
Proposed Solutions
SW-A RECOMMENDED PROJECT (SEE TABLE 5-1)
PIPE
CHANNEL
Feet 250 0 250 500 750 1000 Feet
Scale: 1 in = 1/8 mi
STORMWATER MANAGEMENT PLAN
City of Florence
Public Works Department

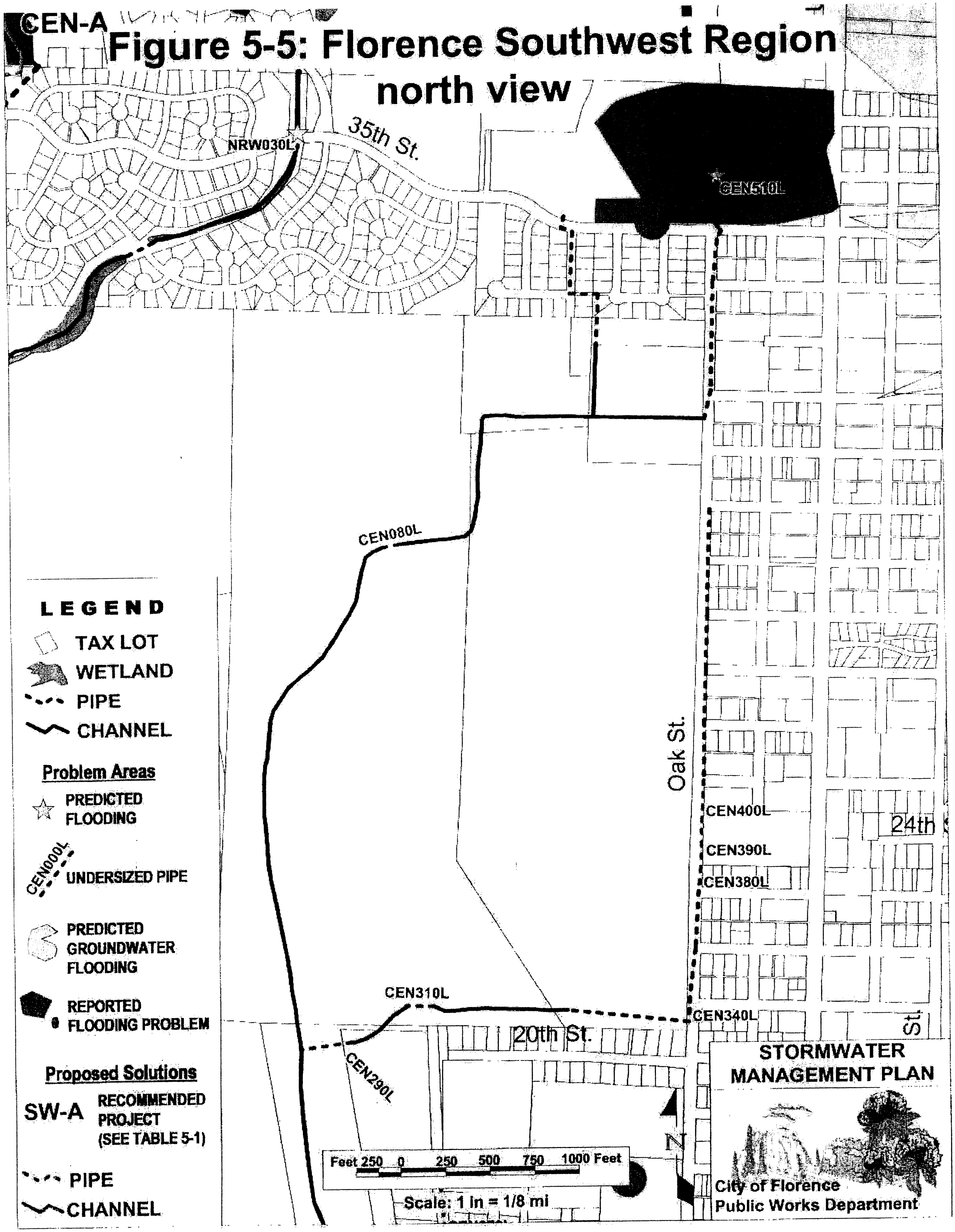
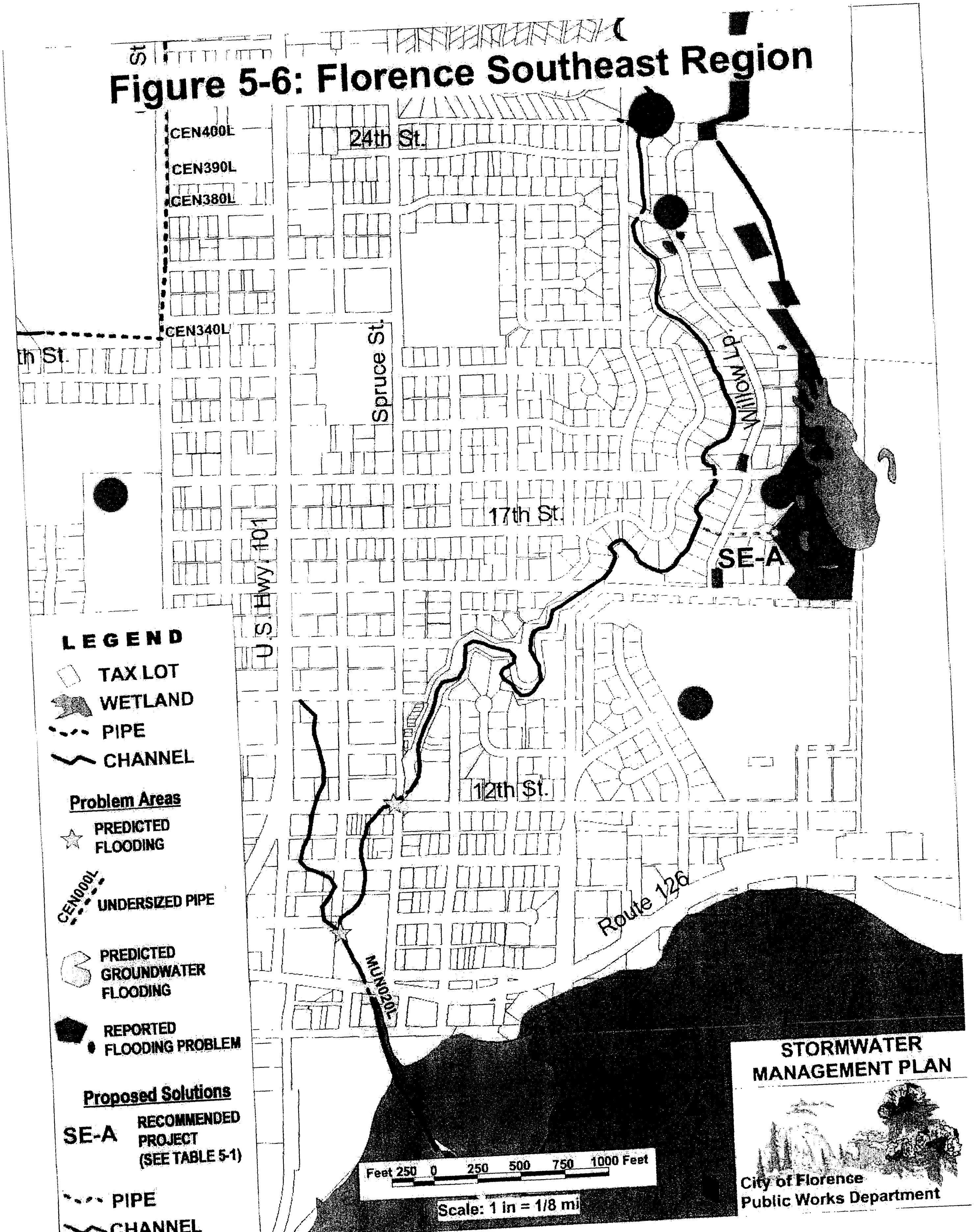

CEN-A
Figure 5-5: Florence Southwest Region
north view
35th St.
NRW030L
CEN510L
CEN080L
LEGEND
TAX LOT
WETLAND
PIPE
CHANNEL
Problem Areas
PREDICTED FLOODING
CEN000L
UNDERSIZED PIPE
PREDICTED GROUNDWATER FLOODING
REPORTED FLOODING PROBLEM
Proposed Solutions
SW-A
RECOMMENDED PROJECT (SEE TABLE 5-1)
PIPE
CHANNEL
Oak St.
CEN400L
CEN390L
CEN380L
24th
CEN310L
CEN340L
20th St.
CEN290L
Feet 250 0 250 500 750 1000 Feet
Scale: 1 in = 1/8 mi
N
STORMWATER MANAGEMENT PLAN
City of Florence
Public Works Department

Figure 5-6: Florence Southeast Region



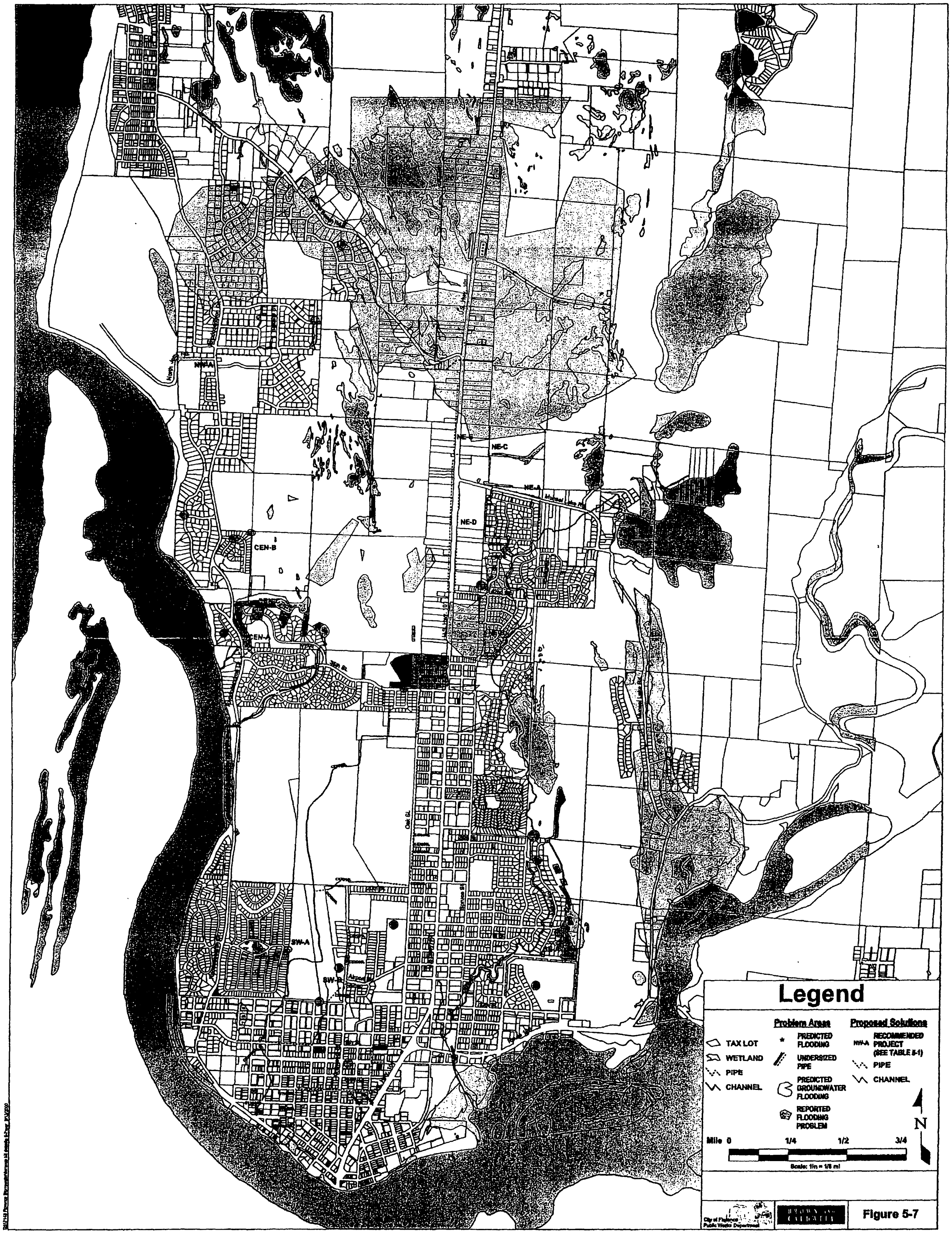

NE-C
NE-A
NE-D
CEN-B
SW-A
Legend
Problem Areas
Proposed Solutions
TAX LOT
WETLAND
PIPE
CHANNEL
PREDICTED FLOODING
UNDERSIZED PIPE
PREDICTED GROUNDWATER FLOODING
REPORTED FLOODING PROBLEM
RECOMMENDED PROJECT (SEE TABLE 5-1)
PIPE
CHANNEL
N
Mile 0 1/4 1/2 3/4
City of Florence Public Works Department

Figure 5-7

CHAPTER 6

IMPLEMENTATION PLAN

Over $4.5 million in capital improvement projects is recommended by this Storm Water Management Plan (SWMP). Implementation of the projects is subject to funding limitations, and is influenced by future development and current and future state and federal regulations. This chapter describes how the projects were prioritized for implementation, presents the results of the prioritization process, and recommends additional activities required for successful storm water and surface water management in Florence.

PROJECT PRIORITIZATION

Brown and Caldwell in conjunction with the City of Florence (City) and the Stakeholder Advisory Committee (SAC), developed projects to protect property, maintain public access to essential facilities, protect the quantity and quality of the aquifer, limit impacts to the community, and satisfy federal and state regulations. Thirteen projects were defined to address deficiencies identified by the modeling and public involvement process. They consist of groups of recommendations required to address each specific deficiency. A priority ranking of the projects is required, since funding and other resource limitations prohibit implementation of all projects at one time, though the City intends to ultimately implement all of the projects. The 13 projects defined in Chapter 5 were evaluated by the SAC to determine a priority ranking for implementation.

Project Ranking Process

Prior to the SAC evaluation, Brown and Caldwell provided descriptions of each of the proposed projects. The descriptions along with oral and visual presentations made at SAC meetings and the December 9, 1999 Public Workshop, explained the need for the projects and presented the options available for addressing the problems. To develop a further understanding of the projects, members of the SAC visited each of the project sites.

The SAC evaluated the projects with respect to each project's ability to meet both technical and value-based criteria established by the consultant team and the SAC. The criteria are summarized below.

- Provides flood protection
- Maintains public access to critical facilities
- Protects aquifer (quantity and quality)
- Limits impacts to community
- Satisfies regulatory requirements
- Provides water quality benefits
- Enhances or protects natural habitat
- Responds to maintenance and public complaints

For each criterion, weights and point scales were determined which are described in detail in Appendix B.

Projects Not Ranked

Not all of the projects were prioritized for implementation. Issues such as available funding, the timing of new development proposals, available land or easements, and government regulations (i.e., permitting and prohibitions) have a major impact on the order in which projects are implemented. As a result, the SAC and the City decided that too many variables were involved to prioritize all of the projects at this time. Instead, the top five most critical projects identified by the SAC and consultant team were included in the initial priority ranking process. As the ranked projects are constructed, it is expected that the current unranked projects will be prioritized and their implementation scheduled.

The priority ranking of projects is subject to change due to the factors identified above. The City reserves the right to modify the order of implementation based on these and any other factors that may arise.

Project Ranking Results

All members of the SAC participated in the evaluation during a special meeting. The numerical results of the evaluation process are presented in Appendix B. The recommended priority of the top five projects is listed in Table 6-1, along with the associated capital costs. Unranked projects are also listed in the table.

Table 6-1. Priority Ranking of Projects

Priority ranking	Project description/Identifier	Study region	Estimated capital cost ($)
1	Rhododendron channel/CEN-A	Central	331,000
2	Munsel Lake Rd. drainage and diversion/NE-A	Northeast	249,000
3	Pine Court Pump station/SE-A	Southeast	157,000
4	Greentrees ditch/SW-A	Southwest	37,000
5	Rhododendron Dr. and North Jetty Rd. Improvements/ NW-A	Northwest	209,000
Subtotal			983,000
Unranked projects	Spruce Street/NE-B	Northeast	296,000
	Undeveloped area north of Munsel Lake Road/NE-C	Northeast	171,000
	Highway 101 drainage south of Munsel Lake Road/NE-D	Northeast	1,072,000
	Highway 101 drainage north of Munsel Lake Road/NE-E	Northeast	508,000
	Mariner's Village drainage/CEN-B	Central	171,000
	Golf Course bypass/CEN-C	Central	115,000
	Drainage east of airport/SW-B	Southwest	448,000
	Downtown area/SW-C	Southwest	779,000
Subtotal			3,560,000
Total all projects			4,543,000

Some of the projects provide benefits to a very specific area, rather than providing general benefit to the overall community. In these areas, the City will explore with the impacted community the idea of forming a Local Improvement District (LID). The LID would provide a mechanism for sharing the costs of capital and operational improvements with the citizens receiving the benefit.

PROJECT IMPLEMENTATION

The recommended capital improvement actions identified by the SWMP consist of structural improvements that will improve storm water runoff and surface water flooding conditions throughout the City. Several projects can be designed to provide additional benefits, such as water quality and riparian fish/wildlife habitat improvements. Where possible, additional benefits should be designed into the projects. This approach will help the City comply with federal and state regulations, i.e., Endangered Species Act (ESA), the National Pollution Discharge Elimination System (NPDES) Phase II storm water permitting program, and Total Maximum Daily Loads (TMDL)

Though a comprehensive hydrologic and hydraulic assessment of the area was conducted, it does not preclude the need for additional technical analysis and potential re-evaluation of project recommendations and prioritization in the future. New regulations, changes in development plans, and updated information on the science of storm water management should be factored into the decisions about the priority or appropriateness of a given project prior to implementation.

Predesign

The recommended projects are based on limited data or assumed field conditions. For this reason, more detailed data collection and pre-design on project elements that involve structural improvements should be conducted prior to implementation. Predesign assessment activities may include the following, as appropriate:

- Wetland determination
- ESA survey
- In-stream and riparian habitat assessment
- Geomorphic assessment
- Stream and culvert survey
- Photo points and water quality monitoring

Following site assessment, detailed design criteria should be developed to guide design activities. The design criteria will dictate project design needs and provide a benchmark of design/ construction success. Design activities for a structural project may include the following, as appropriate:

- Wetland delineation and tree survey
- Hydraulic analysis
- Geomorphic/sediment transport analysis
- Vegetative replacement determination
- Habitat replacement determination
- Plan and specification development

Physical, chemical and/or photo monitoring should also be conducted upstream and downstream of all major projects before the project is constructed, and over the life of the project, if possible. Monitoring, along with the design criteria, will allow for an evaluation of the effectiveness of the project over time and estimate the benefits to the watershed. The costs for monitoring are not included in the estimated costs.

Property Acquisitions/Easements

The SWMP identifies projects that will benefit developed and undeveloped areas in need of flood protection, protect the aquifer, and improve water quality and riparian fish/wildlife habitat. In order to implement many of these projects, the City will need to acquire properties or easements on which the proposed projects are located.

The cost of purchasing property or acquiring easements is not included in the estimate shown in this chapter. Land costs can be quite variable and are dependent upon a number of factors. Land acquisition costs must be estimated and included in a rate or funding analysis study.

There are no proposed buy-outs of existing homes that are prone to flooding. However, owners of homes that flood should be advised to floodproof their homes. The Federal Emergency Management Agency can provide guidance information on how to floodproof homes.

Costs

Project costs vary depending on the specific conditions of the project site. Therefore, the accuracy of the cost estimate is dependent on the amount of site information available.

Type of Estimate. Generally, a cost estimate is prepared for each phase of public works planning and design projects. As a project moves through the different phases—planning to predesign; predesign to design—the level of confidence in the specifics of the design increases, as does the certainty in the cost estimate. A description of the three major cost estimate categories is provided as follows:

Order-of-Magnitude Estimate. This type of estimate is approximate, and is made without detailed engineering data. Techniques such as cost-capacity curves, scale-up or scale-down factors, and ratios are used in developing such an estimate. Typically an order-of-magnitude estimate is considered accurate within a range of +50 percent or -30 percent. That is, the final cost may be as much as 50 percent more or 30 percent less than the estimated amount.

Budget Estimate. In this case, budget applies to the owner's budget and not to the budget as a project control document. This estimate is prepared based on field observations, or using process flow sheets, layouts, and equipment details. A budget estimate is normally accurate within +30 percent or -15 percent.

Definitive Estimate. As the name implies, this is an estimate prepared from well-defined engineering data, such as construction plans and specifications. At a minimum, the data must include fairly comprehensive plot plans and elevations, piping and instrument diagrams, one-line electrical diagrams, equipment data sheets and quotations, structural drawings, soil data and drawings, and a complete set of specifications. The most accurate estimate would be made from approved for construction drawings and specifications. The accuracy of a definitive estimate would fall within +15 percent or -5 percent.

The cost estimates developed for the SWMP are planning level estimates or order-of-magnitude estimates, not budget estimates or definitive estimates. Watershed planning is not an exact science and cost realities typically force planners to make subjective decisions based on limited data and assumed knowledge. Many assumptions were used to prepare the planning-level cost estimates for the SWMP. The cost assumptions were consistent with planning studies completed for Unified Sewerage Agency of Washington County for the Beaverton Creek Watershed Study (USA, 1999), the City of Portland for the Fanno Creek watershed (BES, 1997), and actual construction costs from projects in the Willamette Valley. The costs do not reflect internal staff time or monitoring (construction management) necessary to implement the capital projects. The costs for acquisition of land or easements were not included for any of the proposed projects.

During the predesign effort, detailed survey data on pipe and channel slopes, channel cross-sections, and topography at the project location will be developed. Also, a definitive decision on the design details will be made. At that time, a budget or definitive cost estimate will be developed.

Provisions for Engineering, Administration, and Contingencies. Other project costs have been assumed to be equal to 40 percent of the construction costs of the project. This includes 15 percent for engineering, 5 percent for administration, and 20 percent for contingency.

Cost Index. All costs were developed in June 2000, therefore, the future updating of these costs should be based on an Engineering News Record (ENR) Construction Cost Index of 6300.

Maintenance Costs. For maintenance activities, a 1 to 5 percent markup on the estimated construction costs were applied, as listed in Table 6-2.

Table 6-2. Annual Maintenance Costs by Facility

Type of facility	Annual maintenance as percent of construction cost
Pipe systems	0.5
Detention/water quality ponds	1
Constructed wetlands	3-6
Vegetated swales/manmade channels	5-7
Infiltration facilities	5-20
Sand filter	11-13

Table adapted from EPA, 1999.

Based on the assumptions shown above, the estimated annual maintenance costs for the projects recommended by this SWMP are listed in Table 6-3.

Table 6-3. Estimated Annual Maintenance Costs

Project Description/Identifier	Study region	Estimated annual maintenance cost ($)
Rhododendron channel/CEN-A	Central	9,900
Munsel Lake road drainage and diversion/NE-A	Northeast	12,500
Pine Court pump station/SE-A	Southeast	4,000
Greentrees ditch/SW-A	Southwest	1,800
Rhododendron Dr. and North Jetty Rd. improvements/NW-A	Northwest	10,500
Spruce St./NE-B	Northeast	800
Undeveloped area north of Munsel Lake Rd./NE-C	Northeast	8,600
Highway 101 drainage south of Munsel Lake Rd./NE-D	Northeast	5,400
Highway 101 drainage north of Munsel Lake Rd./NE-E	Northeast	2,500
Mariner's Village drainage/CEN-B	Central	5,100
Golf course bypass/CEN-C	Central	3,400
Drainage east of airport/SW-B	Southwest	2,200
Downtown area/SW-C	Southwest	3,900
Total all projects		70,600

In areas where the proposed project benefits only a very localized area, the idea of forming a Local Improvement District will be considered as a mechanism for sharing the costs of the activity with those receiving the benefit.

Operations and maintenance costs used in a rate study should include consideration of the above noted costs and the planned implementation of the projects. Existing maintenance program costs will also be required in such a study.

COUNTY INVOLVEMENT

Several of the capital projects identified by the SWMP are located outside of the city limits, but within the Urban Growth Boundary (UGB). Lane County (County) is the responsible government entity for managing development and other land use activities in this area. Primarily, the County's focus for managing storm water and surface water is to provide adequate drainage for the county road system. The recommended improvements located outside of city limits will have to be coordinated and permitted by the County.

The City and County should develop a working agreement for approving new development and redevelopment within the unincorporated area inside the UGB. Since this area may eventually be brought into the city, the City and County should cooperate to ensure that the areas are developed in accordance with design and engineering standards acceptable to the City.

FUNDING

Historically, the City has funded storm water management through its Street Department. The revenue demands of the capital, operation, and maintenance recommendations made by the SWMP go well beyond what can be funded by the Street Department. In addition, the use of street funds for storm water management activities is not an equitable utilization of that revenue, since only a portion of all storm water runoff originates from city streets. A separate funding source dedicated to storm water management is required to ensure that other City services are not negatively impacted, to provide equitable utilization of the funding, and to develop adequate revenue sources providing for the timely implementation of the storm water recommendations. This section describes the next steps required for successful implementation of this SWMP. A summary of funding options available to the City is provided in Appendix F.

Storm Water Utility

The concept of a storm water utility was started in the early 1970s as an alternative for funding storm water related services. At that time, most municipal storm water programs were funded through general funds or taxation. Historically, these revenue sources have not provided adequate or reliable funding. Today, storm water utilities have gained acceptance throughout the country as a stable and equitable way of funding municipal storm water programs.

Storm water utilities are more than just a mechanism for funding storm water related services. A utility is an organizational structure, created by the City, with the sole purpose and function of implementing storm water management activities. This focus raises the importance of storm water management within the city and the community, thus helping to provide financial and political support for the planned improvements. In addition, a utility can be established as its own legal entity with the authority to manage and operate the storm water collection system and to assess fees to support the program financially.

A storm water utility would provide the City with stable and equitable funding sources to meet the capital, operation, and maintenance needs of the program. The funding mechanisms used by utilities are based on the "user pays" principle. User fees that relate directly to services provide a funding mechanism that is often more acceptable to the public than systems based on general taxes.

There are several funding options available to utilities, including user fees, system development charges (SDCs), and special improvement districts. Revenue from storm water user fees is flexible in that it can be used to pay for both the capital, and operation and maintenance needs of the system. It also allows the City to secure debt funding (through bonds and loans) of major capital projects, because there is a dedicated source for repayment. SDCs are used to fund growth related projects and are paid for by the properties being developed. Special improvement districts or LIDs used to levy assessments to a community for which a special benefit has been provided. Other funding options are available, including different types of grants offered by federal and state governments that could be applied to elements of the storm water program.

The City should create a storm water utility to manage, operate, and fund the storm water management program.

Rate Study

The City should proceed with a rate study to determine the initial user fees to be charged by the utility and to determine what costs can be funded by other revenue sources. The rate study should include a determination of System Development Charges for funding the growth related storm water improvements. Where applicable, community participation in LIDs should be examined with the cost sharing responsibilities defined for the participating residents. In addition, the rate study should explore the range of alternative funding possibilities, including, federal and state grant programs. For example, the Oregon Watershed Enhancement Board provides grants for public and private watershed enhancement projects through the use of state lottery funds. Projects that enhance watershed function and quality may be eligible to participate in the program.

OTHER RECOMMENDATIONS

Over the last four years, the citizens of Florence and the surrounding area have experienced a number of problems associated with high water levels found throughout the city. Adoption of the SWMP and the creation of a storm water utility will initiate activities that will address the causes of many of the flooding problems. Other activities required for successful implementation of the storm water program include the adoption of storm water ordinances and the establishment of a program to address the City's responsibility under the ESA.

Ordinance Adoption

The City should immediately adopt the storm water ordinances developed for the SWMP. The recommended ordinances shown in Appendix D will address many of the water quantity and water quality issues associated with new development. The new ordinances will help prevent many of the problems associated with past development from occurring again with new development. In addition, the new ordinances were developed with an understanding of the federal and state regulations facing the City at this time: ESA, NPDES Phase II, and TMDL. While the new ordinances alone will not address all of the regulatory requirements, they were developed to help meet the intent of the regulations.

Future Regulations

The ESA will have the most immediate and far-reaching impact on the City and its citizens in the future. The City should develop a formal response to ESA requirements by implementing a program to bring it into complete compliance. The first activity implemented under the program should be a risk evaluation. A risk evaluation would determine the City's exposure to ESA enforcement for each activity. Then, an ESA response should be developed in areas where the City is deemed to be at risk. Such a program would be consistent with programs implemented in other Oregon cities for ESA compliance, and it would help the City determine modifications to its current activities that could help save a species.

The City should proceed with developing a wellhead protection plan to ensure that the local aquifer remains a source of high quality water. The SWMP and the supporting ordinance recommendations support the use of infiltration as a means of recharging the aquifer and managing storm water. The use of infiltration facilities is broadly supported throughout the Pacific Northwest as one way of maintaining historic base flows in streams, which is a requirement of ESA. However, infiltration facilities must be used with consideration of the risks. They should not be used where there is a potential for groundwater contamination. In addition, the Oregon Department of Environmental Quality now requires permits for most types of infiltration facilities under the federal Safe Drinking Water Act of 1984.

STORMWATER DESIGN REPORT

FOR

SPRUCE STREET LID

FLORENCE, OR

July, 2006

REGISTERED PROFESSIONAL ENGINEER
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EXPIRES 12-31-06

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EXECUTIVE SUMMARY

The stormwater system outlined in this report will serve not just the Spruce Street LID but also the entire northwest Munsel Creek drainage area. This became necessary after a number of concerns were raised during an initial attempt to follow the recommended improvements described in Florence's Stormwater Master Plan (SWMP). The suggested project outlined in the SWMP for the Spruce Street LID area was deemed inferior to the alternative developed in this study. This alternative combines two separate drainage projects into one larger project aimed to serve the remaining undeveloped areas in the upper Munsel Creek basin within Florence's Urban Growth Boundary.

Both of the original drainage schemes described in the SWMP discharged into Munsel Creek. The SWMP indicated that Munsel Creek had sufficient capacity to assimilate the increased flows without problems. However, numerous residents disputed that conclusion. Residents along the upper reaches of the stream provided photographs that documented flooding along the stream inconsistent with the SWMP findings. The proposed alternative system bypasses this problem area by combining it with another SWMP recommended drainage system along Highway 101. In addition to reducing the risk of flooding, the combination will result in sizeable cost savings over constructing two separate systems.

To ensure that the new plan would not threaten properties along Munsel Creek, the original SWMM computer model from the SWMP was re-created. The model was updated and adjusted to better reflect the hydraulic conditions within Munsel Creek. Drainage characteristics of the upper basin were updated with more accurate and precise parameters. The remainder of the model was left intact except for some slight changes to channel cross-sections, Mannings "n" values, and other stream parameters if research indicated changes were desirable. The model was run under existing conditions and provided reasonable results, so it was determined that it could be used as a tool to size pipes and determine the relative effects the new pipe system would have on the waterway. The model indicated that in some areas available capacity was more limited than reported in the Stormwater Master Plan.

It was assumed that as properties developed they would follow the City's stormwater ordinance and continue to discharge at predevelopment rates through the 25 year storm. The model was run under future conditions for the 25 and 100 yr storm. A slight increase in flows and velocity were shown with the new system but will not substantially increase the risk of flooding or erosion for downstream properties. Properties upstream of the proposed outfall will actually experience a decrease in flow, velocity, and water depth. Modeling for the 100 year storm assumes detention facilities only detain water up to the 25 year peak flow rate with the rest traveling overland towards Munsel Creek. To ensure that developed runoff rates do not exceed predeveloped rates, hydrologic analyses for developing properties should be consistent with the analyses documented in this plan. This is necessary to ensure that sufficient capacity will remain for full buildout of the subject area.

1. Introduction

For over two years, the city of Florence has been working to provide municipal services to the northernmost extent of the city in the vicinity of Highway 101 and Munsel Lake Road. A high demand for serviced residential land has spurred the development of the Spruce Street Local Improvement District (LID). The original design report, "Highway 101 – North Vicinity Local Improvements District for Streets, Storm Drains, Sewers and Water Lines," was published May 3, 2004. The scope and extent of the project have evolved from the projects onset. This report summarizes relevant analyses, conclusions, and basis of design for the stormwater system.

While developing a stormwater system for the LID, it was determined that limited drainage capacity was available for the subject region. Munsel Creek serves as the primary drainage way for northeast Florence. This waterway was determined to have limited capacity for stormwater runoff. Therefore, in developing the stormwater system for the LID, a drainage strategy for the entire sub-basin was developed. The analyses, methodologies, and conclusions are included in this report to serve as a reference to planners, designers, and city officials as this area develops.

1.1. LID AREA

The Spruce Street LID is east of Highway 101 and will extend Spruce Street approximately 1150 feet north of Munsel Lake Road. The district includes seven parcels of land under five ownerships, and contains approximately 158-acres. A vicinity map of the proposed LID area is shown in Figure 1.1.

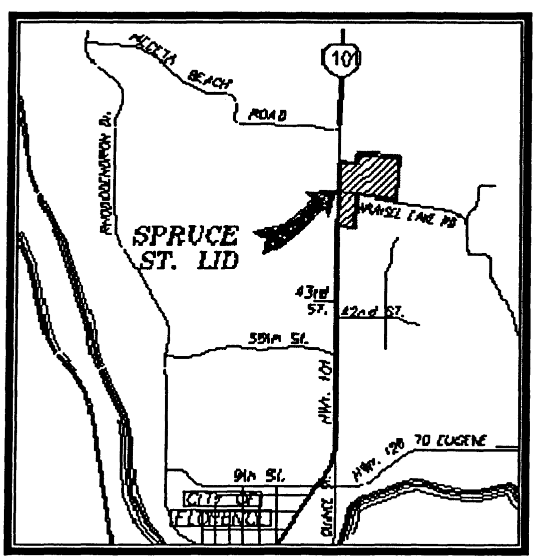


Figure 1.1: Vicinity Map of Spruce Street LID

1.2. LID PHASING AND FUTURE DEVELOPMENT

Future phases of the improvements would extend Spruce Street to the north along with a connector to Highway 101 at or beyond the Heceta Beach Road intersection. However, phase 1 is the only phase currently being pursued. The boundaries of phase 1 are shown in Figure 1.1. In addition, development is anticpated along the west side of 101 along a future Oak Street extension.

1.3. DESIGN PURPOSE AND INTENT

The stormwater system summarized and explained in this report strives to balance the many interests of this unique and dynamic area. The 3 primary objectives are listed below beginning with the highest priority:

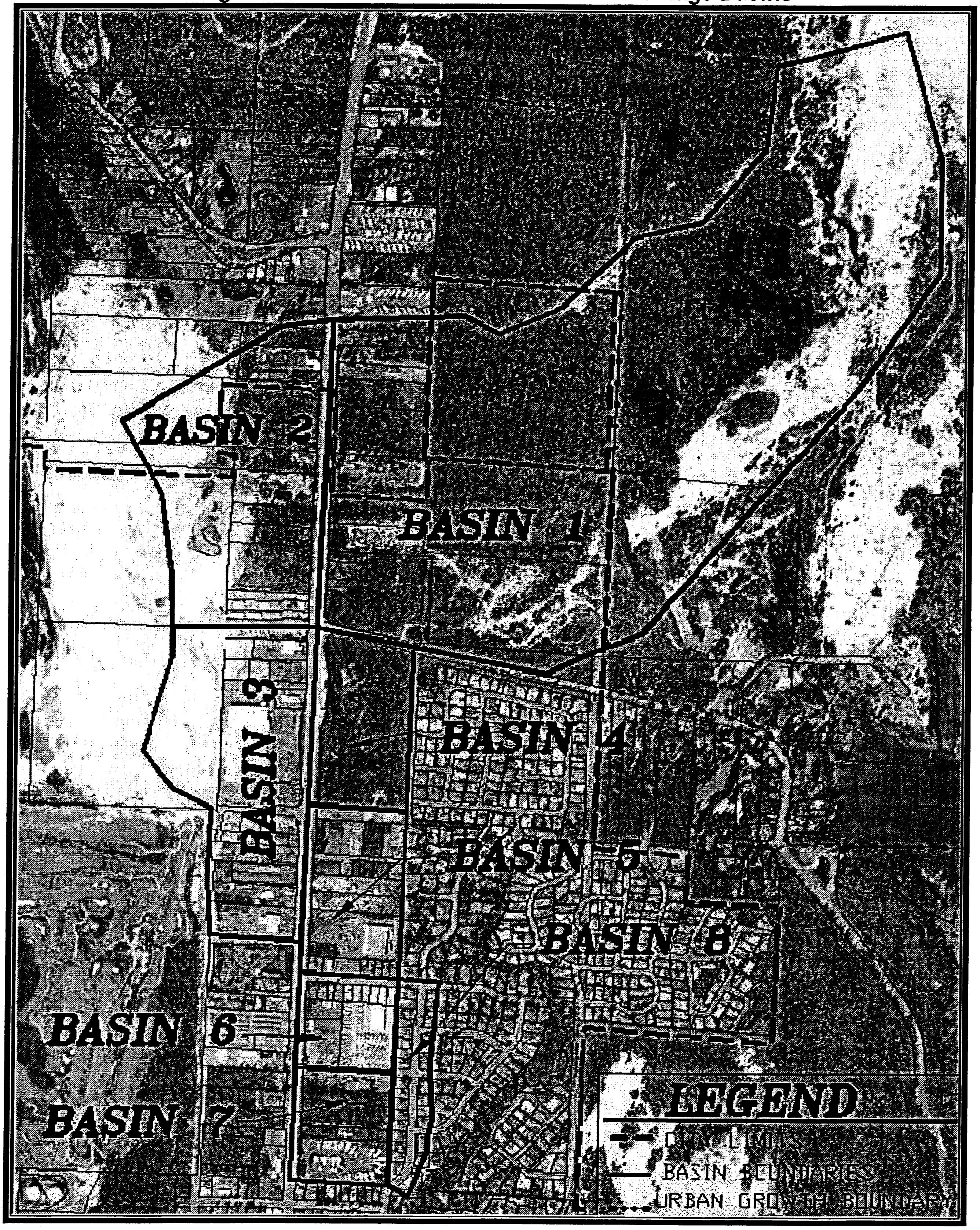
1) Safety and security
2) Minimizing risk to existing property
3) Providing stormwater service to areas identified for development in the city of Florence Comprehensive Plan.

This design is intended to provide adequate conveyance for a 25 year design storm event that statistically has a one in twenty-five or four percent chance of exceedance in any given year. The City's new stormwater ordinance requires that all new development maintain runoff to predevelopment levels. This plan is consistent with this policy.

1.4. STORMWATER SERVICE AREA

The stormwater system is designed to serve all undeveloped properties that lie both within the city of Florence's Urban Growth Boundary (UGB) and the upper Munsel Creek drainage basin. Drainage basins are based on areas delineated in the City's Stormwater Master Plan. However, some boundaries have been adjusted to better reflect the true drainage areas. The basins include the LID area, developed areas, and undeveloped areas. Figure 1.2 shows the boundaries of the drainage basins for this project.

Figure 1.2: Location and Boundaries of Drainage Basins



1.5. CONGRUITY WITH STORMWATER MASTER PLAN

In designing the proposed stormwater system, an effort was made to ensure that the data, parameters, and assumptions made were consistent with information published in Florence's Stormwater Master Plan. Basin boundaries, modeling parameters, and assumptions about physical properties of the watershed were retained. Deviations were only made when errors were discovered or more precise information was acquired.

The original strategy outlined in the SWMP to serve the area included a plan to bypass water that currently floods Florentine Estates. Stormwater that currently overtops Munsel Lake Road was planned to be routed east along Munsel Lake road and then be piped south to Munsel Creek upstream of the existing Florentine Estates outfall. While attempting to implement this plan local residents raised concerns about flooding and lack of capacity in the downstream sections of Munsel Creek. In addition, the area along Highway 101 to the west was planned to be served by another set of storm drain pipes, also draining into Munsel Creek in the vicinity of Spruce Street and 37^{th} street.

In order to alleviate concerns of flooding in the original plan, the present design was proposed as an alternative. It combines the two recommended stormwater systems proposed in the Master Plan. Not only does this reduce the possibility of flooding upstream of 37^{th} Street, but it also provides substantial cost savings over constructing two separate systems.

1.6. PROJECT FUNDING

The total Phase 1 Spruce Street LID improvement costs are estimated to be $3,325,000.00. The project is proposed to be primarily funded through assessments levied to the benefited properties within the district. The costs associated with over sizing and off-site facilities is proposed to be funded with a combination of City System Development Charges (SDC) funds and stormwater utility user fees.

1.7 CONSTRUCTION SCHEDULE

Phase I of the Spruce Street LID is expected to be constructed within a year. No timetable has been set for additional development. However, it is expected that development will be rapid once city services are available to neighboring properties.

1.8 LARGE FORMAT FIGURES

Figures showing drainage basin boundaries and drainage category delineations are available in 18" x 24" format. They are included separate from the main report.

2. Drainage Basin Characteristics

2.1 TOPOGRAPHY

The Munsel Creek drainage area can be roughly described as the area from the Siuslaw River to Munsel Lake, constrained on the east and west by large sand dunes. Elevations vary from over 100 ft to sea level. USGS topographic maps show the general location of the surrounding dunes and waterways. Lane County topographic maps are also available showing 1 foot contours for much of the area. However, the accuracy of both maps is limited due to the thick vegetation and limited relief in low lying areas. In the vicinity of the Spruce Street LID, the general topography is flat with a large sand dune rising sharply to the east.

2.2 SOILS

The predominant soils in the northern Munsel Creek Drainage were obtained from the Lane County Soil Survey (NRCS, 1987). Site soils consist primarily of Yaquina Loamy Fine Sand and Waldport Fine Sand. In addition, some active dune land exists at the western and eastern extents of the drainage area. Below is a summary of the soil characteristics.

<u>Yaquina Loamy Fine Sand (140)</u>

- Deep, excessively drained soil located on stabilized sand dunes
- Moderately rapid permeability
- High groundwater table, 2 feet above or below ground surface.
- Corrosive to steel and concrete

<u>Waldport Fine Sand (131)</u>

- Deep, somewhat poorly drained soil located in low interdune areas
- Very rapid permeability
- Very susceptible to wind erosion if vegetation is removed.

2.3 VEGETATION

Undeveloped areas of this region consist of stabilized dunes and low interdune areas. Dense Dunal Climax Forest covers the majority of the area. Dominant tree species include Shore pine, Douglas fir, and Sitka spruce. Understory primarily consists of Pacific rhododendron, salal, and Evergreen huckleberry. Wetland areas have a Red alder overstory and a variety of grasses and shrubs, most notably Bog blueberry.

2.4 GROUNDWATER/ SURFACE RUNOFF RELATIONSHIP

This area of Florence has unique hydrologic characteristics. Groundwater and surface runoff are inextricably related. Groundwater in the area fluctuates seasonally and also annually. Nearly all precipitation on pervious surfaces infiltrates the soil and contributes to the groundwater. During above average rainfall years, high groundwater levels are experienced. Seasonally, extended wet periods can cause elevated groundwater levels that increase the rates of surface runoff.

Low areas without constructed or natural drainage facilities are often inundated with water much of the year. These areas expose the high groundwater table and create seasonal wetlands. Historically, drainage channels were dug to attempt to drain some of these areas.

3. Existing Conditions

In determining a stormwater solution for this area, thorough and extensive research was completed to understand existing conditions. A compilation of city records, as-built construction drawings, topographic maps, and anecdotal evidence provided a reasonably accurate idea of current drainage characteristics. Field research confirmed the accuracy of critical elements of the drainage system.

3.1 PRE-DEVELOPMENT RUNOFF

The natural drainage of this area is predominated by infiltration of rainwater into the subsurface. The groundwater then flows south and west, eventually discharging in the Siuslaw River or the Pacific Ocean. Munsel Creek also intercepts groundwater flow and limited surface runoff and directs it towards the Siuslaw River. Before Anglo-American settlement the area would have experienced little runoff in low rainfall years but would have been very wet with ponded water and some surface runoff during wet years with high groundwater levels.

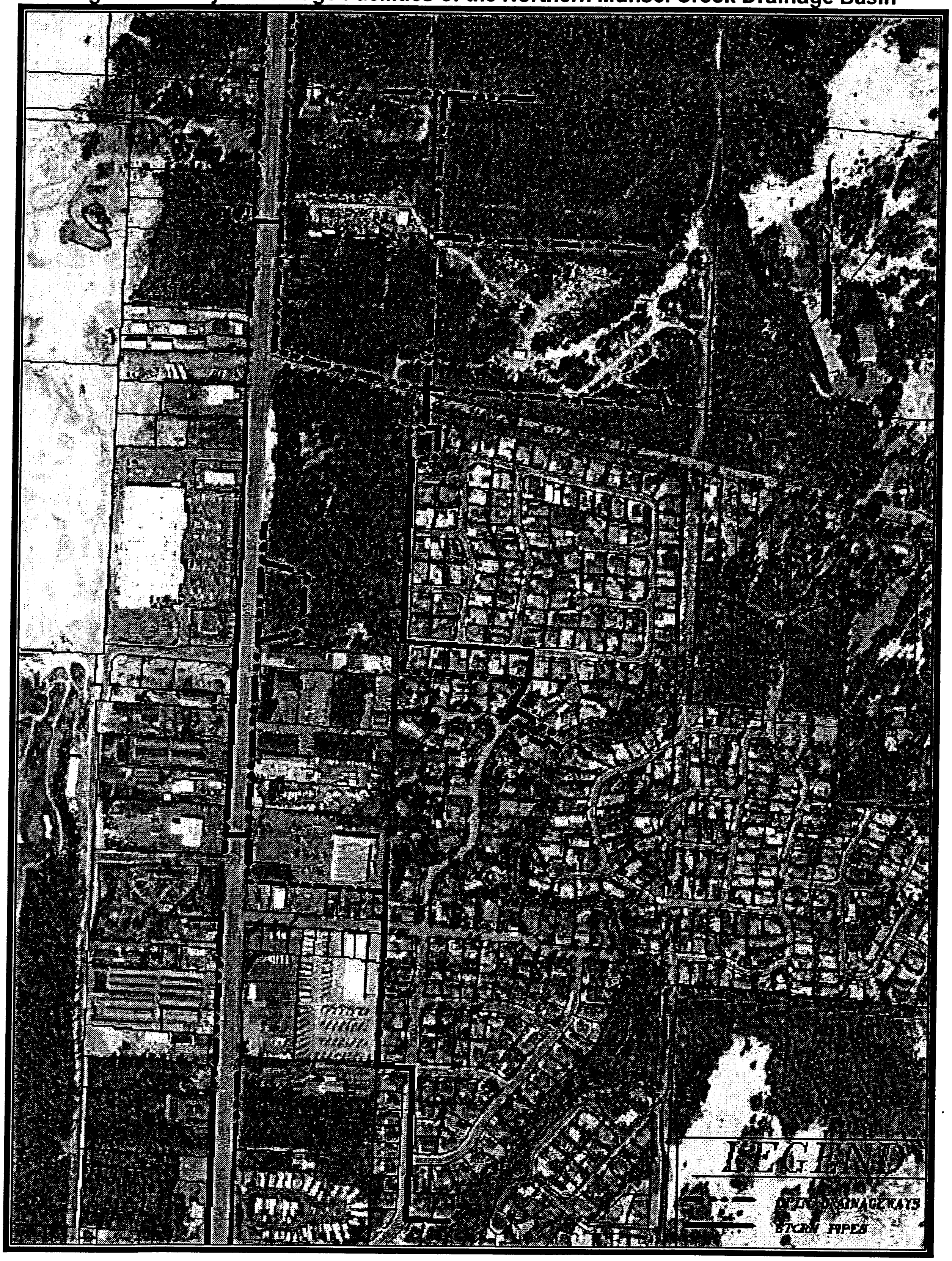
3.2 EXISTING DRAINAGE FACILITIES

In the mid 20th century, a number of drainage channels were dug to convey groundwater and/or ponded surface water toward Munsel Creek. These drainage ditches still constitute the primary drainage facilities for this area. In addition, when Hwy 101 was constructed, large drainage ditches were dug on both sides of the road that eventually convey water to Munsel Creek. Most development along the highway utilizes these ditches and/or infiltrates stormwater on site.

One of these ditches previously passed through the western section of what is now Florentine Estates. This ditch was filled in and replaced with twin 18" storm pipes. Often these storm pipes are over-capacity and flooding is experienced in vicinity streets. Another ditch was also partially replaced with a 36" pipe during construction of the Surf Village Subdivision, which the SWMP identifies as undersized for future conditions.

The primary drainage facilities for the northern Munsel Creek Drainage are shown in Figure 3.1 below.

Figure 3.1: Major Drainage Facilities of the Northern Munsel Creek Drainage Basin



3.3 EXISTING PEAK RUNOFF RATES

Runoff rates were determined by inputting more accurate basin characteristics and conveyance properties into the SWMM model for the study area. Based on field research, anecdotal evidence, and other information sources the original Stormwater Master Plan parameters were improved and additional detail added in the subject area. It was determined that the modeling results from the Storm Water Master Plan underestimated existing peak runoff rates in some areas.

Table 3.1: Existing 25 Year Peak Runoff Rates

Drainage Basin(s)[1]/Discharge Point	25 year Peak Runoff Rate (cfs)
Basin 1[a]/ NW Corner of Florentine Estates	51
Basin 2/ NW Corner of Florentine Estates	5.0
Basins 3,4,5/ 18" pipe into channel at 42nd street	17
Basin 6/ channel between 40th and 42nd	3.7
Basin 7/ 40th street drain, private drains, flooding	3.3
Basin 8/ 36" Spruce Street Storm Pipe	1.8
TOTAL	81.8

1. *Drainage basins are shown in Figure 1.2*
a. *Also Includes Highway 101 Drainage*

3.4 MUNSEL CREEK

Munsel Creek begins at the outlet of Munsel Lake. The outflow is controlled by a partially collapsed culvert. Neighbors report somewhat stable outflow save for occasional problems with the outlet becoming plugged by debris and beaver dams. Downstream, no other streams enter Munsel Creek but a number of pipes and channels drain into the creek. The stream channel in the upper reaches is fairly shallow compared to surrounding land but becomes heavily incised as it nears the Siuslaw River.

Munsel Creek has hydrology characteristics unique to Oregon coastal dune areas. The stream's discharge is highly dependent on groundwater levels. Large rainfall events can cause varying peak stream flows depending on the groundwater level. Compared to streams in other areas of Oregon, Munsel Creek flow rates are more stable. Maximum discharge occurs during large rain events when groundwater levels are also high.

In the past, residents who live near Munsel Creek have expressed concern regarding erosion and flooding. The Stormwater Master Plan does not identify a likelihood of flooding but has identified a number of areas where stream bank erosion is possible.

4. PROPOSED STORMWATER SYSTEM

4.1 SUMMARY OF DESIGN

The new storm system will start at the northern extent of the Spruce Street LID as a constructed drainage swale and will eventually outfall along Spruce Street between Munsel Creek Drive and 37th street. It will employ a combination of open drainage channels and enclosed pipe systems to effectively convey future flows. The general path of the new stormwater system is shown in Figure 4.1 below. The preliminary construction drawings for the proposed stormwater system are included in Appendix A.

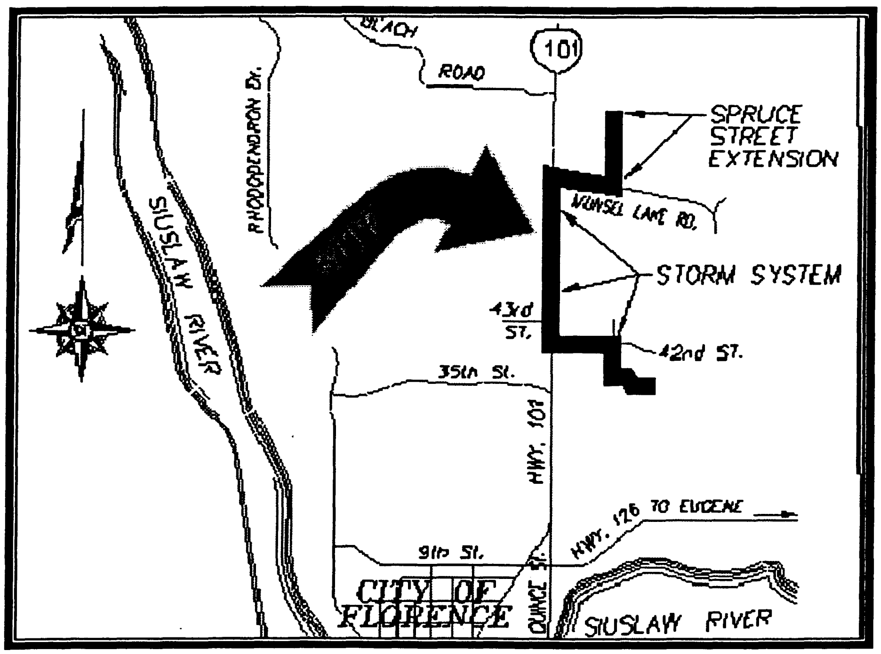


Figure 4.1: Overview of Path of New Stormwater System.

The storm system will begin as a large drainage swale that will run along the east side of Spruce Street south towards Munsel Lake Road where it will enter a flow splitter device. To sustain the health of adjacent wetland areas, 13 cfs will be allowed to continue into the Florentine Estates system. The rest will be diverted west to Highway 101. It will then be piped south along the east side of Highway 101 to 42nd street. The pipe will then head east and empty into an existing open channel.

At the end of this channel, at 40th street, a flow splitter manhole will be placed where approximately 20 cfs will be directed down the existing 36" pipe system. The remaining flow will be continued south through a new pipe system, cross through an existing easement to and across Spruce Street, and discharge parallel to the existing pipe outfall.

4.2 42nd STREET OPEN CHANNEL

The existing open channel between 42nd and 40th street is overgrown with vegetation and other material. This channel will be cleaned out and re-graded to accommodate projected flows. The other existing channels will not be altered.

4.3 ACCOMODATION OF EXISTING FLOWS

The new piping system was designed to accommodate existing flows into the Spruce Street storm system and flows being rerouted around Florentine Estates. However, it is not intended for existing development to increase current runoff rates. The new pipe will be buried in the ditch alongside Highway 101 but will not directly drain it. This drainage will still follow its current route and enter the system at 42nd street. By retaining the existing drainage the peak flowrate entering the new system will not be increased over current levels.

4.4 OUTFALL TO MUNSEL CREEK

The outfall is located between Munsel Creek Drive and 37th street off of Spruce Street. An existing 36" concrete pipe discharges here and a utility easement already exists. This was the recommended location determined in the Stormwater Master Plan for the piping and drainage upgrades to conclude.

5. Modeling and Analysis

The entire Munsel Creek drainage basin was modeled using the Environmental Protection Agency's (EPA) Storm Water Management Model (SWMM). An extensive modeling effort re-created the original SWMM model used by Brown and Caldwell in their October 2000 Stormwater Management Plan. The model was then altered based on field research and anecdotal evidence so that output better matched reported conditions. This model was then used to assure that the new pipe system wouldn't have adverse effects on Munsel Creek and also to determine the capacity of the existing pipe network.

5.1 PRECIPITATION DATA

The design storm from the Stormwater Master Plan was used for modeling purposes. The storm is based on records from a large storm system with an approximate 50 year recurrence interval that occurred in November 1996. Multipliers listed in Table 5.1 were used to manipulate the data for each recurrence interval. All four storms were used when calibrating the model but all calculations for the new pipe system are based solely on the 25 yr storm.

Table 5.1: Design Storm Recurrence Interval, Depth, and Multiplier.

Return Frequency (years)	24 hour Rainfall Depth	11/96 (5.4 inch) Storm Multiplier
2	3.46	0.64
10	4.48	0.83
25	5.06	0.94
100	5.95	1.1

5.2 MODEL RE-CREATION AND CALIBRATION

A copy of the original XP SWMM model was obtained in electronic format. Due to trouble in running the model in its original format and to ensure its future usefulness, the model inputs were manually re-entered into SWMM5. The most recent version, v 5.0.008, released in July 2006, was utilized. The model was run unaltered to confirm that the outputs were similar to the values published in the Stormwater Master Plan. The new model outputs were generally within 5% of the previously reported values so it was accepted as an updated replica of the original model.

5.3 ALTERATIONS AND UPDATES TO MODEL

Multiple field trips, conversations with local residents, and researched information indicated some inaccuracies in the model that needed to be rectified. In particular, the Stormwater Master Plan's conclusion that Munsel Creek has significant additional capacity is contradictory to what has been experienced by neighbors of the stream. It was determined that many of the Manning's "n" values used in the original model were too low for real stream conditions. These values were increased to more appropriate levels and correspondingly reduced the projected capacity of many stretches of Munsel Creek. Many of the original stream cross sections were rough approximations from topographic maps and most sections were altered slightly based on site visits and photographs to more accurately reflect the shape of the stream channel.

Additionally, a base flow of 5 cfs was used in the original model, measured at a fish structure in early August. However, since the large rainfall events occur during the rainy winter season, it was determined that this base flow was insufficient. A field visit during November led to the conclusion that winter base flow was most likely closer to 10 cfs at the fish structure. The model was adjusted to reflect this increased flow.

The extensive research for the northern reach of the Munsel Creek drainage led to increased detail over the original model. Areas that were previously summarized by a set of general characteristics were split into many smaller areas with more accurate physical characteristics. Additional survey information was gathered as part of the project that included more accurate elevations of pipes and ground elevations. These values were updated in the model.

Flooding in Florentine Estates was reported in the SWMP. However, the modeling results published match poorly to actual conditions that would cause the flooding reported. The original model anticipated a 25 yr peak flow rate entering the Florentine Estates of 6.2 cfs, insufficient to cause the flooding reported. Basin characteristics were altered so that 25 year peak flow rates entering Florentine Estates is approximately 56 cfs which would more closely mimic the type of flooding that has been reported in the past including water overtopping Munsel Lake Road.

5.4 EXISTING CONVEYANCE SYSTEM CAPACITY

The existing pipe systems were modeled with varying flowrates under future conditions to iteratively determine the maximum capacity of each pipe system. The pipes were allowed to surcharge but not cause surface flooding. The available capacity for the Florentine Estates system is 13 cfs and 20 cfs for the Spruce Street pipe network during the 25 year storm.

5.5 FUTURE PIPE SYSTEM

The pipe system was created based on two criteria: accommodating existing inflows to the system and rerouting stormwater that floods Florentine Estates. It results in approximately 43 cfs of capacity to reroute flows.

Existing developed basins were expected to continue producing storm runoff at current rates. Undeveloped regions were given new parameters based on expected development density based on land uses shown in Florence's Comprehensive Plan. All runoff greater than predevelopment flows was modeled to be detained and released at predevelopment rates. This model was run to double check the performance of the future pipe system.

The new drainage system was entered into SWMM. Table 5.2 below summarizes the major pipes and channels that were added to the SWMM model and their properties. Design flows are simply the cumulative runoff rates from each drainage basin. However, because each basin has a different time of concentration, peak flows do not all reach the outfall at the same time resulting in lower actual flows then design flows. More details of this drainage system are shown on the construction drawings in Appendix A.

Table 5.2: Description and Design Capacity of Major Links (Pipes and Channels) Added to SWMM Model

Links	Link Size	Pipe Type	Slope (%)	"n" value	Description	Design Flow (cfs)
MUN41A	42"	Arch SRP	0.28	.011	Munsel Creek outfall to Spruce Street	48
MUN411	30"	Twin Arch SRP	2.39	.011	Under Spruce Street	48
MUN412	42"	Arch SRP	0.35	.011	Spruce Street to 90 degree turn	48
MUN413	42"	Arch SRP	0.35	.011	90 degree turn to 40th Street	48
MUN46A	18"	HDPE	1.0c	.012	Existing pipe from start of 42nd Street to open channel south of Bimart	n/a
MUN46B	n/a	Trapezoidal Channel	0.32c	.08	Existing open channel along Bimart's south property line	n/a
MUN46	n/a	Trapezoidal Channel	0.55	.03	Open channel between 42nd and ending at 40th street	65

MUN461	48"	Arch CMP	.24	.02	Beginning of open channel at 42nd Street to Hwy 101	44.5
MUN462	42"	HDPE	.22	.012	Along Hwy 101: 42nd St. halfway to Munsel Lake Rd	44.5
MUN463	36"	HDPE	.40	.012	Along Hwy 101: Halfway Point to Munsel Lake Rd	43
MUN464	30"	HDPE	.36	.02	Highway 101 to Spruce Street Extension along Munsel Lake Rd.	38

a. Discharge that links are sized to accommodate.
c. No data exists. Estimate only.

5.6 MUNSEL CREEK CAPACITY

The primary reason for the re-creation of the Munsel Creek model was to confirm that the proposed stormwater system would not substantially increase flooding risk. The Stormwater Master Plan assumed that new development would not increase stream peak flow rates over pre-developed conditions. However, in rectifying existing drainage problems peak flows could potentially increase in Munsel Creek.

Under the Stormwater Master Plan's recommended future drainage projects, a 20 cfs increase in peak stream discharge was anticipated during the 25 year storm at the location of the proposed Spruce Street and 37th street outfall. The SWMP recommended project to create a bypass of Florentine Estates was apparently not included in the published values of future flows since flows downstream of the suggested outfall are not shown to increase. However, the existing Florentine outfall is shown to experience a 5 cfs increase during the 25 year storm under future conditions.

The updated model indicates that the capacity of Munsel Creek is limited only in the vicinity immediately downstream of the proposed outfall for the proposed stormwater system. The SWMP indicated that the downstream capacity at this point was 130 cfs. However, after modifications to the model the new capacity was determined to be 105 cfs. Munsel Creek is predicted to have a flow of 51 cfs immediately upstream of the outfall during the 25 year storm.

Under the new piping system a 25 year peak discharge at the Spruce Street outfall of approximately 69 cfs is predicted. Since this would exceed the downstream capacity, some temporary localized ponding at the outfall has been accounted for. The ponded water is predicted to remain more than 2.5 ft below the floor elevations of the houses adjacent to the outfall. However, the capacity of the floodplain was omitted to be conservative and water depth will likely be lower than predicted. No flooding is predicted further downstream, however water does back up behind the three 30 inch culverts under Highway 126. Table 5.3 below shows the existing and future discharges to Munsel Creek at the two affected outfall locations.

Table 5.3: Summary of Discharges to Munsel Creek during 25 Year Storm for affected outfalls

	Discharge Node	Description	Discharge
Existing	**JUNCT19**	Spruce Street Outfall	26
	JUNCT22	Florentine Estates Outfall	49
Future[1]	**JUNCT19**	Spruce Street Outfall	69
	JUNCT22	Florentine Estates Outfall	18

The community has expressed significant concern regarding the effects the new system will have on Munsel Creek, particularly during storm events larger than the 25 year design storm. All pipes have been sized to accommodate existing flows during the 25 year storm only and will not be able to convey flows from storms significantly larger. As a result, flows exceeding the 25 year flows will either be detained on site as localized flooding or travel overland towards Munsel Creek. The effects during the 100 year storm were modeled under a worse case scenario that, where possible, flows over the 25 year discharge rate flow overland into Munsel Creek. Tables 5.4 and 5.5 show the discharge, velocity, and change in water surface elevation for the entire length of the stream for the 25 and 100 year storms respectively. The percentage change is also shown for comparative purposes.

Table 5.4: Projected Impacts on Munsel Creek Discharge, Velocity, and Water Depth during 25 Year Storm

Link	Description	25 yr Peak Flow Rates (CFS)				25 yr Peak Velocities (FPS)				Increase in Water Depth (in)	Free-board (feet)
		2000 SWMP	2006 Revision	Projected Build-out	% Increase	2000 SWMP	2006 Revision	Projected Build-out	% Increase		
MUN01	*Hwy 126 to Siuslaw River*	*115*	**172.3**	**174.9**	1.5%	*-2.07*	**3.91**	**3.93**	0.5%	**0.0**	**11.9**
MUN03	*10th Street to Hwy 126*	*101*	**172.9**	**175.4**	1.5%	*1.85*	**2.51**	**2.42**	-3.6%	**1.8**	**4.3**
MUN04	*Spruce Street to 10th*	*98.9*	**142.6**	**145.6**	2.1%	*3.53*	**2.28**	**2.36**	3.5%	**3.2**	**6.6**
MUN06	*15th Pl to Spruce Street*	*90.9*	**146.3**	**149.5**	2.2%	*4.37*	**4.06**	**3.92**	-3.4%	**2.6**	**7.7**
MUN09	*18th Street to 15th Pl.*	*91.8*	**117.8**	**120.6**	2.4%	*3.61*	**3.78**	**3.69**	-2.4%	**1.7**	**11.1**
MUN11	*E of Park Dr to 18th St.*	*85.4*	**118.6**	**121.3**	2.3%	*4.13*	**4.26**	**4.29**	0.7%	**0.0**	**7.1**
MUN12	*23rd Street to E of Park Dr*	*85.7*	**111.9**	**114.4**	2.3%	*3.19*	**2.99**	**3.02**	1.0%	**0.0**	**9.7**
MUN14	*Outer Dr to 23rd St*	*85.9*	**112.2**	**114.7**	2.3%	*2.92*	**3.10**	**3.11**	0.3%	**0.0**	**1.8**
MUN15	*Munsel Creek Greenway Park*	*82*	**104.5**	**106.7**	2.2%	*-1.94*	**2.75**	**2.77**	0.7%	**0.0**	**1.7**
MUN17	*Munsel Crk Lp To Munsel Crk Greenway Park*	*59*	**105.6**	**107.7**	2.0%	*1.11*	**2.05**	**2.06**	0.5%	**0.8**	**3.1**
MUN19	*Munsel Creek Lp*	*60.9*	**79.1**	**81.0**	2.5%	*4.16*	**4.10**	**4.22**	2.9%	**0.0**	**0.8**
MUN20	*Munsel Creek E of Munsel Crk Dr.*	*52.4*	**81.0**	**50.5**	-37.6%	*1.89*	**3.06**	**2.20**	-28.1%	**-4.1**	**0.8**
MUN22	*Florentine Estates to 42nd*	*27.9*	**70.7**	**40.1**	-43.3%	*1.76*	**2.25**	**1.95**	-13.3%	**-8.6**	**2.8**
MUN23	*Munsel Ck SE of Sherwood Lp*	*15.2*	**20.3**	**20.3**	0.0%	*2.53*	**2.06**	**1.55**	-24.8%	**-3.8**	**3.5**
MUN25	*Florentine Estates*	*15.2*	**20.3**	**20.3**	0.0%	*2.39*	**2.31**	**2.31**	0.0%	**0.0**	**5.8**
MUN27	*Munsel Lk Rd to Florentine Estates Rd.*	*15.3*	**20.3**	**20.3**	0.0%	*1.3*	**2.31**	**2.31**	0.0%	**0.0**	**2.0**
MUN29	*Nordahl Rd to Munsel Lk Rd*	*15.3*	**20.3**	**20.3**	0.0%	*1.71*	**1.76**	**1.76**	0.0%	**0.0**	**2.0**

Table 5.5: Projected Impacts on Munsel Creek Discharge, Velocity, and Water Depth during 100 Year Storm

Link	Description	100 yr Peak Flow Rates (CFS) 2000 SWMP	2006 Revision	Projected Build-out	% Increase in Flow	100 yr Peak Velocities (FPS) 2006 Revision	Projected Build-out	% Increase in Velocity	Increase in Water Depth (in)	Free-board (feet)
MUN01	*Hwy 126 to Siuslaw River*	*131*	**188.41**	**191.1**	1.4%	**4.06**	**4.08**	0.5%	**0.0**	**11.7**
MUN03	*10th Street to Hwy 126*	*112*	**188.9**	**191.63**	1.4%	**2.54**	**2.43**	-4.3%	**3.7**	**2.6**
MUN04	*Spruce Street to 10th*	*108*	**159.61**	**162.61**	1.9%	**2.3**	**2.45**	6.5%	**3.2**	**5.1**
MUN06	*15th Pl to Spruce Street*	*108*	**164.33**	**168.78**	2.7%	**4.12**	**4.13**	0.2%	**1.3**	**7.3**
MUN09	*18th Street to 15th Pl.*	*109*	**130.71**	**135.28**	3.5%	**3.92**	**3.96**	1.0%	**0.0**	**11.1**
MUN11	*E of Park Dr to 18th St.*	*102*	**131.54**	**136.23**	3.6%	**4.37**	**4.44**	1.6%	**0.0**	**6.9**
MUN12	*23rd Street to E of Park Dr*	*102*	**123.4**	**128.02**	3.7%	**3.06**	**3.13**	2.3%	**1.7**	**9.4**
MUN14	*Outer Dr to 23rd St*	*102*	**123.79**	**128.39**	3.7%	**3.15**	**3.16**	0.3%	**1.3**	**1.6**
MUN15	*Munsel Creek Greenway Park*	*97.6*	**114.39**	**119.13**	4.1%	**2.82**	**2.85**	1.1%	**0.6**	**1.5**
MUN17	*Munsel Crk Lp To Munsel Crk Greenway Park*	*69.9*	**115.6**	**120.35**	4.1%	**2.14**	**2.18**	1.9%	**0.0**	**3.0**
MUN19	*Munsel Creek Lp*	*72*	**84.14**	**91.04**	8.2%	**4.27**	**4.59**	7.5%	**0.4**	**0.7**
MUN20	*Munsel Creek E of Munsel Crk Dr.*	*61.5*	**87.43**	**76.09**	-13.0%	**3.22**	**2.93**	-9.0%	**-0.9**	**0.5**
MUN22	*Florentine Estates to 42nd*	*32.6*	**75.58**	**67.32**	-10.9%	**2.26**	**2.23**	-1.3%	**-2.4**	**2.2**
MUN23	*Munsel Ck SE of Sherwood Lp*	*17.8*	**22.87**	**22.87**	0.0%	**2.06**	**1.44**	-30.1%	**-1.3**	**3.2**
MUN25	*Florentine Estates*	*17.8*	**22.88**	**22.88**	0.0%	**2.42**	**2.42**	0.0%	**0.0**	**5.7**
MUN27	*Munsel Lk Rd to Florentine Estates Rd.*	*17.9*	**22.88**	**22.88**	0.0%	**2.42**	**2.42**	0.0%	**0.0**	**1.9**
MUN29	*Nordahl Rd to Munsel Lk Rd*	*17.9*	**22.88**	**22.88**	0.0%	**1.85**	**1.85**	0.0%	**0.0**	**1.9**

5.7 GENERAL NOTES ABOUT MODELING

A few general notes about modeling:

- ✓ The model is a simplification of constructed drainage systems and a complex natural waterway. It provides a reasonable approximation of conditions and relative impacts but can not perfectly mimic actual responses to a storm event.
- ✓ The shape of channel cross sections were made more accurate but generally overall widths and depths of the channels were left unchanged
- ✓ All node elevations are the same as the original model except for where more accurate measurements were obtained
- ✓ All nodes, links, areas etc. retain original names from SWMP model except the extra 0 was dropped (i.e. MUN220 became MUN22)
- ✓ Parameters were coarsely estimated if results were not sensitive to the parameters accuracy (i.e. basin slope)
- ✓ Groundwater parameters in original model had little effect on peak runoff and were not included in revised basins.
- ✓ The SWMP indicates link MUN330 has a very shallow slope and a capacity of only 4 CFS however the link is shown graphically to be in the location of an existing pond and is only described as "Florentine Estates". This link was omitted and a pond added in its place to the model and the capacity is based on the remaining pipe network which is approximately 17 cfs. If flooding continues or this pipe is confirmed to exist it should be upsized to have sufficient capacity.

6. Capacity Allocation and Recommended Policy

6.1 OVERVIEW OF PROPOSED POLICY

The city's existing stormwater policy is largely sufficient in regulating flows into the system. Recently adopted stormwater rules require post development flows to match pre-development flows. However, due to Munsel Creek concerns and need to ensure that capacity remains in the system, calculation of predevelopment flows needs to be carefully determined. Hydrologic/hydraulic analyses must be made using consistent assumptions as used in this report and as outlined in the following section.

Developed properties will be allowed their current runoff rates to existing surface and piped conveyance systems. As these properties redevelop, efforts should be made to understand how much runoff enters the existing drainage system and how much is retained onsite. This will ensure that post development runoff does not exceed what is currently being discharged. In addition, stormwater retention should be used whenever practicable to match pre-developed conditions. The Fred Meyer infiltration gallery is reported to be functioning properly and it has been assumed that it will not require access to the system in the future.

The policy outlined below should serve as a guide to development or redevelopment of all the areas shown to be within the overall drainage area. This should provide developers, designers, and city officials a reference for effectively and fairly utilizing this stormwater system.

6.2 CLASSIFICATION OF DRAINAGE AREAS

Based on aerial photos, mapping, and field research, land within each drainage basin is classified as one of four types. Table 6.1 shows each drainage basin previously outlined and the composition of land use within the basin. This is also shown graphically in Figure 6.1. Below is a description of the four land use classifications:

TYPE 1: Outside of Urban Growth Boundary

- Land outside of the city of Florence's current UGB
- Is comprised solely of the eastern part of Basin 1
- This area unavoidably contributes surface runoff to downstream basins that must be accounted for.

TYPE 2: Undeveloped Properties Currently Draining Directly to Munsel Creek

- Identified areas within Basins 1,2,3,4,and 7
- Generally drainage ditches were dug in the vicinity of these properties that allowed them to drain towards Munsel Creek
- High groundwater and surface runoff currently discharge into Munsel Creek

TYPE 3: Developed Properties Draining to Munsel Creek

- Includes lower basins that primarily drain into existing drainage system.
- Includes areas along Highway 101, properties adjacent to the 42nd street open channel, and residential development that directly drains into the existing pipe system

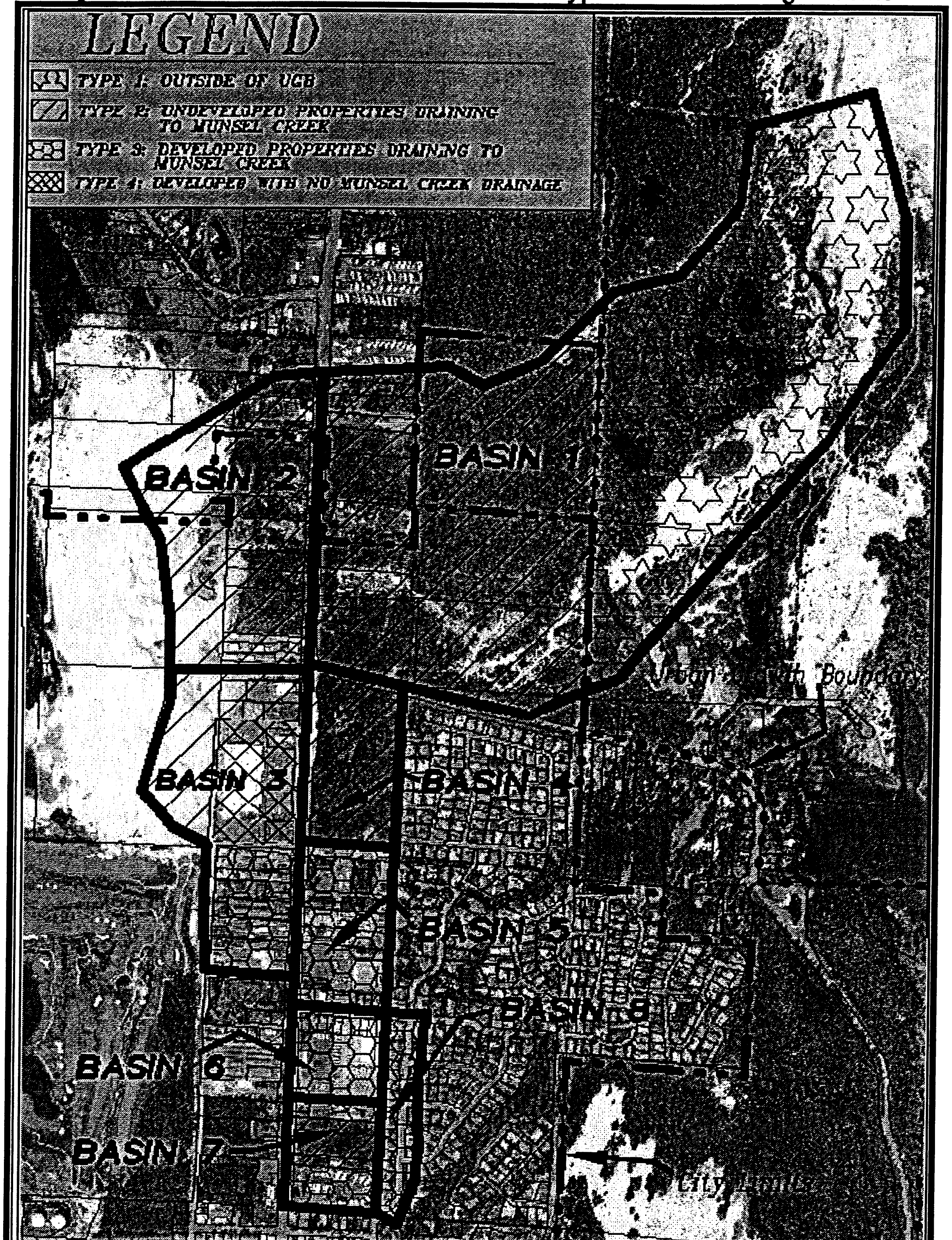
TYPE 4: Developed Properties with No Munsel Creek Drainage

- Includes properties that are developed but have independent drainage facilities.
- Fred Meyer property largest known qualifying area

Table 6.1: Summary of Drainage Basin Composition by Area Classification

	Total Area (acres)	TYPE 1	TYPE 2	TYPE 3	TYPE 4
Basin 1	242	60%	40%	0%	0%
Basin 2	52	0%	100%	0%	0%
Basin 3	46	0%	41%	32%	27%
Basin 4	18	0%	100%	0%	0%
Basin 5	19	0%	0%	100%	0%
Basin 6	10	0%	0%	100%	0%
Basin 7	13	0%	40%	60%	0%
Basin 8	9	0%	0%	100%	0%

Figure 6.1: Overview of Delineation of Area Types within Drainage Basins



6.3 REQUIRED HYDROLOGIC ANALYSIS AND PARAMETERS

Computer modeling or the Santa Barbara Unit Hydrograph (SBUH) method should be required for all new development in Type 2 areas. This includes properties in Basins 1,2,3,4, and 7. Larger redevelopment projects in Type 3 areas should also be required to perform this analysis, at the city's discretion. This prevents the use of hand calculations that could potentially overestimate predevelopment runoff and cause capacity to be prematurely used up. Calculations utilizing the Rational Method are typically conservative and overestimate runoff. If all the properties overestimated runoff, combined discharges would exceed those predicted in this report and insufficient capacity would be available downstream. Therefore, if all properties generally use the same assumptions as used for the entire drainage basin, cumulative runoff should not differ drastically from the analysis performed for this report.

When determining an allowable discharge rate using the NRCS Type 1a synthetic design storm, an average runoff over the peak hour should be used to determine predevelopment runoff rates. Storms in Florence are not shaped exactly like the Type 1a storm; rather, storms have long periods of steady rainfall and a less sharply defined peak. By using the average over the peak hour, calculated pre-development runoff rates will better match runoff rates assumed for the design of this stormwater system.

All modeling for the report utilized the EPA's Stormwater Management Model (SWMM). This model is free and available for download at: www.epa.gov/ednnrmrl/models/swmm/ if the designer wishes to use this model. This or other computer models could be used using consistent parameters as outlined in this report. A CD at the end of this document includes all models used in this work, rainfall files, and a sample SWMM file with most of the parameters already entered so that it can be used to model individual sites. Table 6.2 summarizes the most important parameters used in SWMM modeling and all pre-development runoff calculations should use parameters consistent with these values.

Table 6.2: Summary of Important Parameters Used in SWMM Modeling for Determining Predevelopment Flow Rates

Parameter	Value (units)
RAINFALL	
Design Storm	Multiplier of NOV. 1996 Storm
HORTON INFILTRATION	
Maximum Infiltration Rate	5 (in/hr)
Minimum Infiltration Rate	1.18 (in/hr)
Decay Constant	2
SURFACE RUNOFF PARAMETERS	
Percent Impervious	AREA OF WETLANDS, CHANNELS, SATURATED SOIL
Impervious "n" Value	0.011
Pervious "n" Value	0.8
Width	TOTAL SITE AREA/ LONGEST FLOW LENGTH
Slope	AVERAGE SITE SLOPE
Depression Storage	0 (IN)

Hydrologic modeling and parameters were extended from the SWMP model but altered slightly to more accurately reflect true conditions. Infiltration parameters were taken from the SWMM user manual's recommendations for sandy soil. Though it has a reduced hydraulic conductivity over the original SWMP model's values it essentially remains that all rainfall that falls on pervious surfaces are modeled to infiltrate the soil. As a result, all existing runoff is assumed to originate on wetlands or areas that would be saturated during the peak of the design storm. For the model, this saturated area was approximated from wetland maps, aerial photos, and visual observations.

The appropriate way that the designer would conduct a hydrologic analysis would be to survey or visit the site, preferably in the winter, and note the areas with ponded water or evidence of ponded water. This area would be the equivalent to the impervious surface that would be input into a computer model or SBUH to determine existing runoff. The length of the flow path would be the longest distance from a point on the site to the discharge point.

Since the runoff from many properties travels a convoluted route before discharging into a major pipe or channel, the effect of these restrictions should be included in determining the pre-developed peak runoff rate. This is particularly true of properties in Basin 2 where current flow travels through numerous small, possibly damaged culverts and ditches before reaching the Florentine Estates discharge point. These effects should be accounted for in calculating the pre-development runoff rate.

This method is not an exact replication of the true hydrology but should provide a reasonable approximation, in most cases, of the existing site runoff. If this method significantly underestimates runoff from a given site, the designer can provide detailed analyses and evidence to support using a different method to calculate pre-development peak runoff.

6.4 RECOMMENDED POLICY BY DRAINAGE AREA TYPE

TYPE 1: Outside of Urban Growth Boundary

- All new development needs to accommodate flows that originate from this area, approximate 25 yr flow of 25 cfs
- If developed in the future, predevelopment flows will be maintained requiring no new capacity.

TYPE 2: Undeveloped Properties Currently Draining to Munsel Cr

- Must discharge to the system at no more than existing pre-developed flow rates for the 2 through 25 year storms.
- Pre-development flow rates must be determined using Computer modeling or the Santa Barbara Unit Hydrograph method
- Parameters and methodologies used in analysis must be consistent with those outlined in this report.
- Rainfall data shall be based on 11/1996 data from Stormwater Master Plan or an average of the peak hour of runoff using the NRCS Type 1A synthetic storm.
- Existing downstream restrictions that increase travel time to discharge point listed in Table 3.1 and reduce peak runoff rates must be accounted for in pre-developed runoff rate calculations.

TYPE 3: Developed Areas Using Existing Drainage

- No improvements shall be made that would increase peak runoff rates to the storm drainage system over existing levels.
- Where feasible, properties should further reduce flows to match native, predevelopment runoff rates to the maximum amount practicable.

TYPE 4: Developed Areas with no Munsel Creek Drainage

- Maintain zero discharge to city system.

Table 6.2 summarizes the allotted 25 year flows to developable areas within each drainage basin. As these areas develop, the cumulative runoff rates should be less than or equal to the values shown below for the pipe system to have adequate capacity.

Table 6.3: Allocated Discharge for New Development by Drainage Basin

BASIN	Existing Peak Discharge Rates For Undeveloped Areas[1] (CFS)
Basin 1	23
Basin 2	4.5
Basin 3	0.5
Basin 4	1.4
Basin 7	0.9

1. Undeveloped properties classified as Area 2 on Figure 6. Does not include highway drainage.

APPENDIX

A

Preliminary Construction Plans

APPENDIX

B

S W M M Modeling Results

APPENDIX

C

RESPONSE TO PUBLIC COMMENTS

FINDINGS OF FACT
CITY OF FLORENCE AMENDMENTS TO THE: COMPREHENSIVE PLAN, COMPREHENSIVE PLAN MAP, TRANSPORTATION SYSTEM PLAN, STORMWATER MANAGEMENT PLAN, WASTEWATER FACILITIES PLAN, AND WATER FACILITIES PLAN FOR COMPLETION OF PERIODIC REVIEW WORK TASKS 2, 3, 4, 5, 7, and 8; AND UPDATED COMPREHENSIVE PLAN MAP AND COMPREHENSIVE PLAN TEXT AND TRANSPORTATION SYSTEM PLAN HOUSEKEEPING AMENDMENTS.

1. The City of Florence requests Lane County co-adoption of the Comprehensive Plan Amendments and refinement plans adopted by the Florence City Council through the Ordinances listed in the table below.

Ordinance Number	Dates of Adoption By the City of Florence	City of Florence Ordinance Title and Summary
No. 1 Series 2002	1/14/02	*An Ordinance Amending The City Of Florence 1988 Comprehensive Plan By Changing The Title To The Florence Comprehensive Plan – Realization 2000/2020, And Adopting Sections Titled Introduction, The Community, Plan Adoption, Amendments Review And Implementation, Comprehensive Plan Effectiveness And Organization, Coordination With Agencies, Population, Definitions.* Plan updated and new Plan sections adopted to comply with 1995 Periodic Review.
No. 2 Series 2002	1/14/02	*An Ordinance Amending The City Of Florence 1988 Comprehensive Plan By Adopting Chapter 1 – Citizen Involvement.* Plan updated and new Plan sections adopted to comply with 1995 Periodic Review.
No. 3 Series 2002	1/14/02	*An Ordinance Amending The City Of Florence 1988 Comprehensive Plan By Adopting Chapter 2 – Land Use.* Plan updated and new Plan sections adopted to comply with 1995 Periodic Review.
No. 4 Series 2002	1/14/02	*An Ordinance Amending The City Of Florence 1988 Comprehensive Plan By Adopting Chapter 5 – Open Space, Scenic, historic and Natural Resources.* Plan updated and new Plan sections adopted to comply with 1995 Periodic Review.
No. 5 Series 2002	1/14/02	*An Ordinance Amending The City Of Florence 1988 Comprehensive Plan By Adopting Chapter 9 – Economic Development.* Plan updated and new Plan sections adopted to comply with 1995 Periodic Review.

Ordinance Number	Dates of Adoption By the City of Florence	City of Florence Ordinance Title and Summary
No. 6 Series 2002	1/14/02	*An Ordinance Amending The City Of Florence 1988 Comprehensive Plan By Adopting Chapter 11 – Utilities and Facilities.* Plan updated and new Plan sections adopted to comply with 1995 Periodic Review.
No. 7 Series 2002	1/14/02	*An Ordinance Amending The City Of Florence 1988 Comprehensive Plan By Adopting Chapter 12 – Transportation Systems Plan.* Plan updated and new Plan sections adopted to comply with 1995 Periodic Review.
No. 8 Series 2002	1/14/02	*An Ordinance Amending The City Of Florence 1988 Comprehensive Plan By Adopting Chapter 14 – Urbanization.* Plan updated and new Plan sections adopted to comply with 1995 Periodic Review.
No. 9 Series 2002	1/14/02	*An Ordinance Amending The City Of Florence 1988 Comprehensive Plan By Adopting Chapters 6 – Air, Water and Land Quality, Chapter 7 – Development Hazards and Constraints, Chapter 10 – Housing Opportunities, Chapter 13 – Energy Facilities and Conservation, Chapter 16 – Estuarine Resources, Siuslaw Estuary and Shorelands, Chapter 17 – Coastal Shorelands, Ocean and Lake Shorelands, and Chapter 18 – Beaches and Dunes.* Plan updated and new Plan sections adopted to comply with 1995 Periodic Review.
No. 14 Series 2003	8/4/03	*An Ordinance Amending Chapter 12- Transportation Systems Plan and Appendix 12 of the Florence 2000/2020 Comprehensive Plan.* Comprehensive Plan was updated to comply with 1995 Periodic Review. Amendments include incorporation of the Access Management Plan for Highway 101 between the Siuslaw River Bridge and the Highway 101/126 Intersection; incorporation of the LCOG traffic study related to density of development in the North Commercial Node and inclusion of that study in Appendix 12; and those amendments include deletion of all references and maps related to the extension of 18th Street east of its current terminus; and additional amendments in Exhibit A.
No. 1 Series 2006	2/07/06	*An Ordinance Amending The 2000/2020 Comprehensive Plan, Adding Definitions for "Private Open Space" and "Public" Plan Map Designations.* Plan updated and new Plan definitions adopted to comply with 1995 Periodic Review.

Ordinance Number	Dates of Adoption By the City of Florence	City of Florence Ordinance Title and Summary
No. 6 Series 2008	3/24/08	*An Ordinance For The Adoption Of Housekeeping Amendments To The Florence Realization 2020 Comprehensive Plan Text; Comprehensive Plan Map; Appendix 11, Utilities And Facilities; And Appendix 12, Transportation System Plan; Amendments To Florence City Code Title 1 Chapter 10: Comprehensive Plans; And Declaring An Emergency.* Post acknowledgement Plan housekeeping amendments to Comprehensive Plan text and map and TSP to correct scrivener errors, achieve internal consistency, and improve clarity and function; and to adopt an updated Comprehensive Plan Map.

2. **Periodic Review Amendments:** All of the above ordinances, except Ordinance No.6, Series 2008, were adopted by the City in order to comply with the City's 1995 Periodic Review Order. These ordinances adopted amendments to the City's comprehensive plan and refinement plans that completed Periodic Review work tasks #2, 3, 4, 5, 7, and 8.

   In addition, the City adopted ordinances in compliance with Periodic Review Work Task #1: Urban Growth Boundary, and these amendments have already been co-adopted by Lane County; and the City adopted a new Comprehensive Plan Map through Ordinance No. 10, Series 2002. The 2002 version of the Map is not submitted for co-adoption at this time because the Comprehensive Plan Map was updated in 2008 through Ordinance No. 6, Series 2008, as referenced in Finding #3, below; and the revised, 2008 Comprehensive Plan Map replaced the version of the Map adopted by the City in 2002.

3. **Updated Comprehensive Plan Map and Housekeeping Amendments**: On March 24, 2008, the Florence City Council adopted, through Ordinance No. 6, Series 2008, an Updated Comprehensive Plan Map and "housekeeping" amendments to the Florence Realization 2020 Comprehensive Plan and Transportation System Plan in order to achieve the following objectives: to make the text internally consistent; to improve readability, clarity, and function of the Plan; and to remove references that are outdated or will be outdated, e.g., "by 2001."

   Findings of Fact adopted by the Florence City Council in support of the Updated Comprehensive Plan Map and Housekeeping Amendments ("Exhibit A to City of Florence Ordinance No. 6, Series 2008") **are attached to and incorporated into these findings.**

4. The City initiated the Periodic Review amendments in accordance with Florence City Code (FCC) Title 10, Chapter 1, Section 3-C:

> *"A legislative change in zoning district boundaries, in the text of this Title, Title 11 or in the Comprehensive Plan may be initiated by resolution of the Planning Commission or by a request of the Council to the Planning Commission that proposes changes be considered by the Commission and its recommendation returned to the Council."*

5. Notice of the Comprehensive Plan Amendments was sent to DLCD in accordance with the Periodic Review requirements of state law. The hearings were noticed in the Siuslaw News as required by state law and the Florence Development Code.

6. Owners of property affected by Comprehensive Plan Map Changes received notification of the hearing in accordance with state law.

7. Referrals were sent to the Oregon Department of Transportation, Florence Police Department, Central Lincoln Public Utility District, Qwest, Charter Communications, Florence Public Works Department, Heceta Water District, Florence U.S. Postal Service, the Siuslaw Valley Fire and Rescue District, the Confederated Tribes of Coos, Lower Umpqua and Siuslaw Indians, and Lane County.

8. **Applicable Criteria:** The amendments are consistent with the following applicable criteria:

   a. **Florence City Code (FCC) Title 10: Zoning Regulations**
   Chapter 1: Zoning Administration, Sections: 10-1-1-5 Land Use Hearings; Section 10-1-2-2, Change of Boundaries on Zoning Map; 10-1-3 Amendments and Changes.

   b. **Oregon Revised Statutes and Administrative Rules:** ORS 197.628 through ORS 197.644; and OAR Chapter 660, Division 25: Periodic Review.

   c. **Statewide Land Use Planning Goals:** Goal 1 – Citizen Involvement; Goal 2 – Land Use Planning; Goal 5 – Natural Resources, Scenic and Historic Areas, and Open Spaces; Goal 6 – Air, Water, and Land Resources; Goal 8 – Recreational Needs; Goal 9 – Economic Development; Goal 11 – Public Facilities and Services; Goal 12 – Transportation.

9. **Findings of Consistency with Applicable Criteria**

   Applicable criteria are shown in bold and findings are in plain text below.

   a. **FLORENCE CITY CODE (FCC) TITLE 10: ZONING REGULATIONS**