City of Eugene

Stormwater Basin Master Plan

Laurel Hill Basin

Volume IV of VII

CITY OF EUGENE
STORMWATER
MANAGEMENT PROGRAM

August 2002
Prepared by:
City of Eugene
URS Corporation
Lane Council of Governments

Local Stormwater Planning Can Make a World of Difference

Stormwater Basin Master Plan

Volume IV of VII

Laurel Hill Basin

December 2002

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ACKNOWLEDGEMENTS

The Stormwater Basin Master Plan represents the culmination of a long term planning effort by a multi-agency team consisting of representatives from the City of Eugene, Lane Council of Governments (LCOG), and URS Corporation.

The project team would like to gratefully acknowledge the efforts of the many present and former city and consultant staff who provided input for and review of this document. The following acknowledgements include a representative from each of the divisions, departments and agencies involved over the years. The project team would like to especially acknowledge the leadership, guidance, commitment and contribution to this effort by Christine Andersen, former Public Works Director and the late Les Lyle, City Engineer (1983-2001) for Eugene.

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The information published in this report is subject to revision. Please contact the City of Eugene's Engineering Division for potential changes before proceeding with any engineering design that uses the information published herein.

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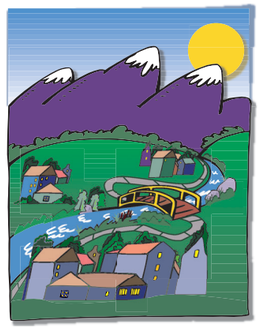
City of Eugene



Vision for a Green Infrastructure

Laurel Hill Basin

Stormwater Management Strategy

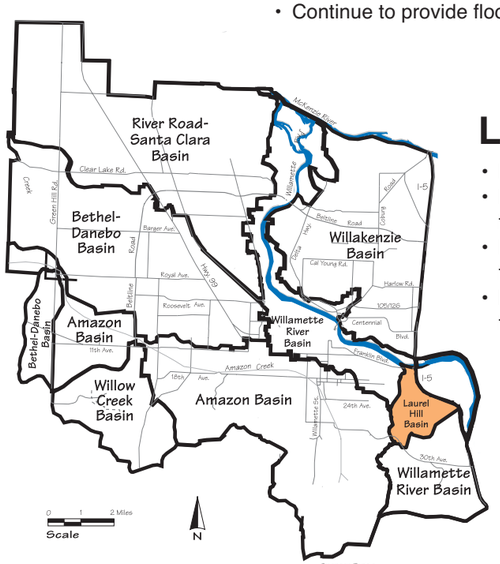
Laurel Hill is the smallest of Eugene's seven drainage basins and is a tribuary to the Willamette River. Laurel Hill Creek is the predominant drainage feature in the basin and collects upstream runoff near Floral Hill Drive and Augusta Street where it flows northerly and enters the Willamette River near the Interstate 5 bridge. While 45 percent of the basin is developed, it is still rural in character. Future development will occur primarily in the steeper hillside areas to the south and east and will primarily be low-density residential. The stormwater assessment process for this basin revealed:

- Flooding problems occur under existing conditions and will be exacerbated as new development occurs,
- Nonpoint source pollution is relatively low under current conditions but will significantly increase with new development, and
- Existing waterways and riparian zones will be impacted by increased runoff volumes and pollutant loads.

Strategy

The recommended strategy for this basin is:

- Reduce existing pollutants to the extent feasible through construction of a neighborhood water quality facility.
- Minimize future pollutants through on-site development standards and flow controls for headwater areas.
- Protect waterways through a combination of development standards and other techniques including acquisition.
- Address existing stream bank stabilization problems through capital projects.
- Restore waterways through federal-local partnerships.
- Continue to provide flood protection services basin wide.



Basin Context Map

Laurel Hill Basin Facts

- Ranks last among all the basins in total size (829 acres).
- Ranks last in the amount of area designated as 100-year floodplain (7 acres).
- Ranks last in total length of local open waterways (4 miles) but fourth in proportion of waterways to basin size.
- Impervious surface area in the UGB is projected to increase from 20% to 43% at buildout.

August 2002

Comprehensive Plan

Cleaner, Safer, Healthier Environment

Adoption of the **Comprehensive Stormwater Management Plan** (CSWMP) in November 1993 ushered in a new vision for managing the City of Eugene's stormwater program. In addition to protecting the community from flooding problems, CSWMP expanded the program to include protection of stormwater quality and related natural resources.

Basin Planning

Bringing CSWMP into Focus

Basin Planning is one of many action items for implementing CSWMP. The basin planning process includes assessing existing conditions, identifying stormwater system problems and opportunities, and recommending management strategies for implementing several CSWMP policies. Each of the City's seven drainage basins offers unique conditions and opportunities for implementing capital projects and development standards. Basin planning, therefore, is a refinement of CSWMP's broader policy direction and represents what is feasible and practical to implement at the stormwater system level.

Other Activities

In addition to Basin Planning, many other city activities are conducted to enhance water quality, protect stormwater-related natural resources, and prevent flooding. A few examples include:

- Erosion control for construction activities
- Education and outreach
- Monitor stormwater discharges of certain industrial uses
- Street sweeping
- Volunteer programs
- Vegetation management

Green Infrastructure

Green Infrastructure uses the beneficial flood control and water quality treatment characteristics of the natural landscapes to help meet stormwater management objectives. When linked with the constructed system, the two work together to form a coordinated drainage system of streams, ponds, streets, and pipes.

Why This Strategy?

Flood Control

- Capital projects are the most cost-effective solutions for correcting existing problems and will be designed to address the incremental effects of new development.

Water Quality

- *Existing Pollution Problem:* Capital projects are the most cost-effective solution for addressing existing conditions, along with other ongoing program activities.
- *Pollution Associated with New Development:* Development standards are most effective for addressing pollutants at their source and minimizing water quality impacts of new development in headwater areas.

Stormwater-Related Natural Resources

- Capital projects are the most viable method for addressing negative effects of high runoff volumes in open waterways for existing developed areas.
- Stream corridor acquisition can be used to protect a limited number of high-priority waterways.
- Development standards are effective at preventing encroachment into waterways and preserving water quality functions.

More Information

- Visit the City's website at www.ci.eugene.or.us/pw/storm
- Contact Therese Walch at (541) 682-6839

The Management Strategy

Flood Control

Issue: **A large portion of the drainage system floods under existing conditions.**

Desired Outcome: Flooding problems are eliminated.

Actions: **Capital Projects - see map**

- LH06C – Construct high flow bypass and improve Riverview/ Augusta drainage system.
- LH07 – Improve the minor drainage system between Riverview and Augusta.
- LH08 – Develop a minor drainage system plan for Riverview/ Augusta.

Related Natural Resources

Issue: **Laurel Hill Creek has limited capacity under existing conditions, and experiences erosion and downcutting problems. Future development will exacerbate these problems.**

Desired Outcome: Eliminate negative effects of high flows and enhance waterway.

Actions: **Capital Projects - see map**

- LH06C – Construct high flow bypass and improve Riverview/ Augusta drainage system.
- Yearly budget item: Address hydrologic (volume) impacts to open waterways.
- Ongoing: Restore waterways through federal-local partnerships (to be identified).

Issue: **Open waterways and their beneficial stormwater functions are susceptible to impact due to lack of an overall management and implementation strategy.**

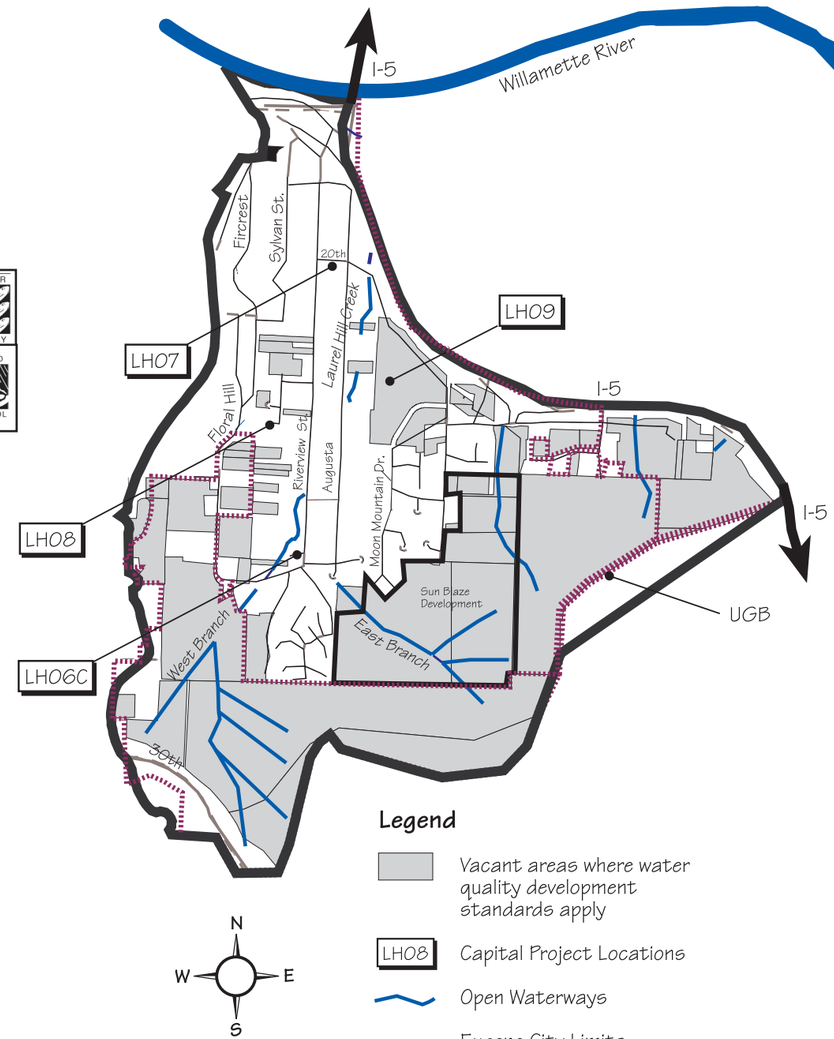
Desired Outcome: Maintain and improve the extent and quality of existing waterways and stormwater-related natural resources.

Actions: **Development Standards – see map**

- Prohibit filling/piping of important storm waterways.
- Require streamside setbacks.

Acquisition

- Acquire stream corridors according to the *City's Stream Corridor Acquisition Study.*



Water Quality

Issue: **Runoff from existing development is a major source of pollutants.**

Desired Outcome: Pollutants from existing land uses are reduced.

Actions: **Capital Projects- see map**

- LH09 – Construct neighborhood water quality facility at I-5 and Augusta.
- Yearly Budget Category: Outfall stabilization.
- Yearly Budget Category: Water quality facilities in high source areas.

Issue: **Runoff from future development will increase pollutant discharges.**

Desired Outcomes: Reduce stormwater pollution from new development.

Actions: **Development Standards – see map**

- New and significant redevelopment projects are required to treat all runoff from City's water quality design standard
- Incentives – provide incentives for existing development to reduce effective impervious surface areas and treat stormwater runoff.
- Control rate of runoff into headwater streams for water quality benefits.

Other Elements of the Strategy

- General stormwater rehabilitation projects.
- Channel easement acquisition.

CITY OF EUGENE
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SECTION 1 Introduction

Adoption of the City of Eugene's *Comprehensive Stormwater Management Plan* (CSWMP) in November 1993 marked a significant shift in the City's approach to stormwater management. In addition to drainage and flood control services, the stormwater program was expanded to include the protection and enhancement of stormwater quality and related natural resources. Since the previous *Storm Drainage Master Plan* (OTAK, 1990) was developed solely for the purpose of addressing drainage and flood control issues, an update of that Plan was necessary to bring it into compliance with current City policy. As a result, the City initiated a project to develop multiple-objective Stormwater Basin Master Plans.

In addition to CSWMP, other locally adopted policy documents were reviewed for applicability to the Basin Master Planning effort. The following were identified for containing policies related to and supportive of protection of water quality and related natural resources:

1) Eugene/Springfield Metro Area General Plan (1987 Update) in general and, specifically, the following refinement plans:

   - Bethel-Danebo, 1982
   - Eugene Downtown Plan, 1984
   - Eugene Parks and Recreation Plan, 1989
   - Jefferson/Far West, 1983
   - Public Facilities and Services Plan, December 2001
   - Laurel Hill, 1982
   - Riverfront Park Study, 1985
   - River Road-Santa Clara Urban Facilities Plan, 1985
   - South Hills Study, 1974
   - Willakenzie Neighborhood, 1991
   - Willow Creek, 1982

2) Eugene Growth Management Study, 1998

The overall goal of the Stormwater Basin Master Plans was to provide a stormwater management strategy for each basin that proactively addresses the multiple objectives of CSWMP. In addition to flood control, these multiple objectives include:

- Protect and improve water quality.
- Protect natural resources that provide beneficial stormwater functions.
- Use best management practices that promote a green infrastructure.
- Address the unique qualities of each drainage basin.
- Meet federal, state, and local laws and policies (including CSWMP, the Clean Water Act, the Endangered Species Act, and State Underground Injection Control Rules – for these broader topics and other issues, please refer to Volume I).
- Complement other existing BMPs that are part of the City's stormwater program.
- Balance responsibilities community-wide.
- Provide a dynamic and flexible program that can be refined based on a changing regulatory climate.

SECTION 1 Introduction

This report presents the integrated stormwater management strategy (integrated strategy) for the Laurel Hill basin. It represents Volume IV of a seven volume report generated to summarize and document the city-wide Stormwater Basin Master Plans. Volume I provides an overview of the project, describes the process for developing integrated strategies, and summarizes the information that is presented in detail in the six companion volumes, each of which covers one of the following City's six drainage basins: *Volume II - Amazon Creek, Volume III - Bethel-Danebo, Volume IV – Laurel Hill, Volume V - Willakenzie, Volume VI - Willamette River, Volume VII - Willow Creek.* Volumes II through VII provide more detailed information regarding development of stormwater management strategies for each of the six basins including: characteristics unique to the basin; results of the basin evaluation for flood control, water quality and natural resources; and resulting integrated stormwater management strategies. A basin specific plan was not produced for River Road Santa Clara, pending resolution of inter-jurisdictional issues as well as additional information gathering and analysis.

NOTE: It should be noted that the term basin is typically used to refer to a defined surface area that drains to a common discharge point. However, for the purposes of this study, the term basin is used to refer to a specific planning or study area. While the planning or study areas were developed based on topography and drainage patterns, they may include several discharge points, or they may exclude specific tributary areas based on convenience for planning purposes. In some cases, portions of the basin were not included in the planning area as they are managed by other jurisdictions. The basin areas as defined in this plan are also further divided into major subbasins and subbasins as described in Section 3.0.

The process conducted to develop integrated strategies for each of the six basins included the following thirteen steps. The details regarding each of these steps are provided in Volume I.

Step 1) Compile information regarding the unique characteristics of each basin that are related to the stormwater drainage system.
Step 2) Identify problems and opportunities associated with the stormwater drainage system with respect to flood control, water quality, natural resources, and maintenance.
Step 3) Develop potential solutions in the form of capital projects and development standards for addressing identified problems.
Step 4) Evaluate and compare potential solutions in terms of feasibility, costs, and effectiveness.
Step 5) Evaluate capital projects to address problems expected under existing conditions.
Step 6) Evaluate capital projects and development standards to address problems expected as a result of future build-out.
Step 7) Select an integrated stormwater management strategy based on the evaluations conducted in steps 5 and 6.
Step 8) Develop a maintenance strategy for the proposed solutions.
Step 9) Obtain feedback regarding integrated stormwater management strategies and the maintenance strategy from the public and refine the strategies as appropriate.
Step 10) Prioritize selected capital projects for implementation and conduct a financial analysis.

Step 11) Develop stormwater basin master plans to summarize the integrated stormwater management strategies including proposed capital projects and development standards.
Step 12) Develop an ordinance to implement the proposed development standards.
Step 13) Develop a best management practices manual to help guide developers in meeting the requirements of the development standards.

The process for conducting these steps is outlined in Figure 1-1. As a result of this process, a mix of capital projects and development standards was proposed for each of the basins. A total of 44 multiple-objective capital projects were selected for the integrated stormwater management strategies city-wide (not including the Santa Clara/River Road basin). Four of these are located in the Laurel Hill basin. In addition, development standards were selected for treating the quality of runoff from new development and for protecting open waterways. These standards were proposed city-wide and therefore would apply to the Laurel Hill basin when enacted. A development standard was adopted in April 2000 (Open Waterways Ordinance) that prohibited waterways from being filled and/or piped. The ordinance was subsequently appealed and remanded back to the City by the Oregon Court of Appeals (July 2001) and is no longer in effect. Additional methods and options for protecting open waterways are under review. In the meantime, waterway protection efforts will include stream corridor acquisitions and land use approval criteria where applicable.

Information updates related to this plan are provided at the end of this section. The integrated basin strategy specific to the Laurel Hill basin is described in the following sections. Section 2.0 provides a summary of the specific characteristics in the Laurel Hill basin. Sections 3.0, 4.0, and 5.0 provide summaries of the flood control, water quality, and natural resources evaluations respectively. Section 6.0 describes the resulting integrated basin strategy and provides information regarding the implementation of the strategy including scheduling and financing.

Information Updates

The information contained in this document represents a "snapshot-in-time." The Study Area Characteristics data (Section 2) are current through 1998, and the evaluation data (Sections 3, 4, 5, 6) are current through June, 2001. As conditions in this basin change, the information in this document will need to be updated to reflect those conditions.

The following recent or imminent changes to conditions, information, or the integrated basin strategy are not reflected in this document, but will be addressed in the next update:

- The jurisdictional transfer of Glenwood to the City of Springfield happened mid-way through the basin planning project. This report is focused on the Eugene jurisdictional area, although the stormwater model developed as a part of this project included sub-basins from the Glenwood area. For more detailed explanation of what is and is not included in the Eugene stormwater model and output tables, see Section 3 of this report.
- Capital project LH06C (Riverview/Augusta Piped Bypass and System Improvements) was considered a high priority project and has been constructed. Capital project LH09 (I-5 and Augusta Water Quality Facility) has been eliminated from the proposed strategy as the area

thought to be available for acquisition and construction of a water quality facility is not available to be purchased.

- Eugene is participating in a Metropolitan Waterways Restoration project with the Army Corps of Engineers and other metro partners under authority of the Water Resources Development Act. This Study will further define and prioritize needs for waterway restoration throughout the metro area including waterways in the Laurel Hill basin, and will allow the City to partner with, and cost share with, the Corps and other agencies to optimize the use of local funds for stream restoration. The first phase of this study, the Reconnaissance Phase, was initiated in February 2002. The second phase, Feasibility, is expected to begin in spring 2003. Implementation of on-the-ground projects is anticipated by 2007.
- The narrative description of existing and future parks and schools in subsections 2.10.1 and 2.10.2 has been updated to the time of printing of this document. Map 12 (Section 2), Parks, Recreation, and Educational Facilities, has not been updated to match. Map 12 changes will be included in the next document update.
- Relationship to and compliance with the State of Oregon's Underground Injection Well requirements.
- Relationship to Eugene's ESA/Salmon response strategy.
- Updates to rare plant and animal species inventories through the Oregon Natural Heritage Program data base.

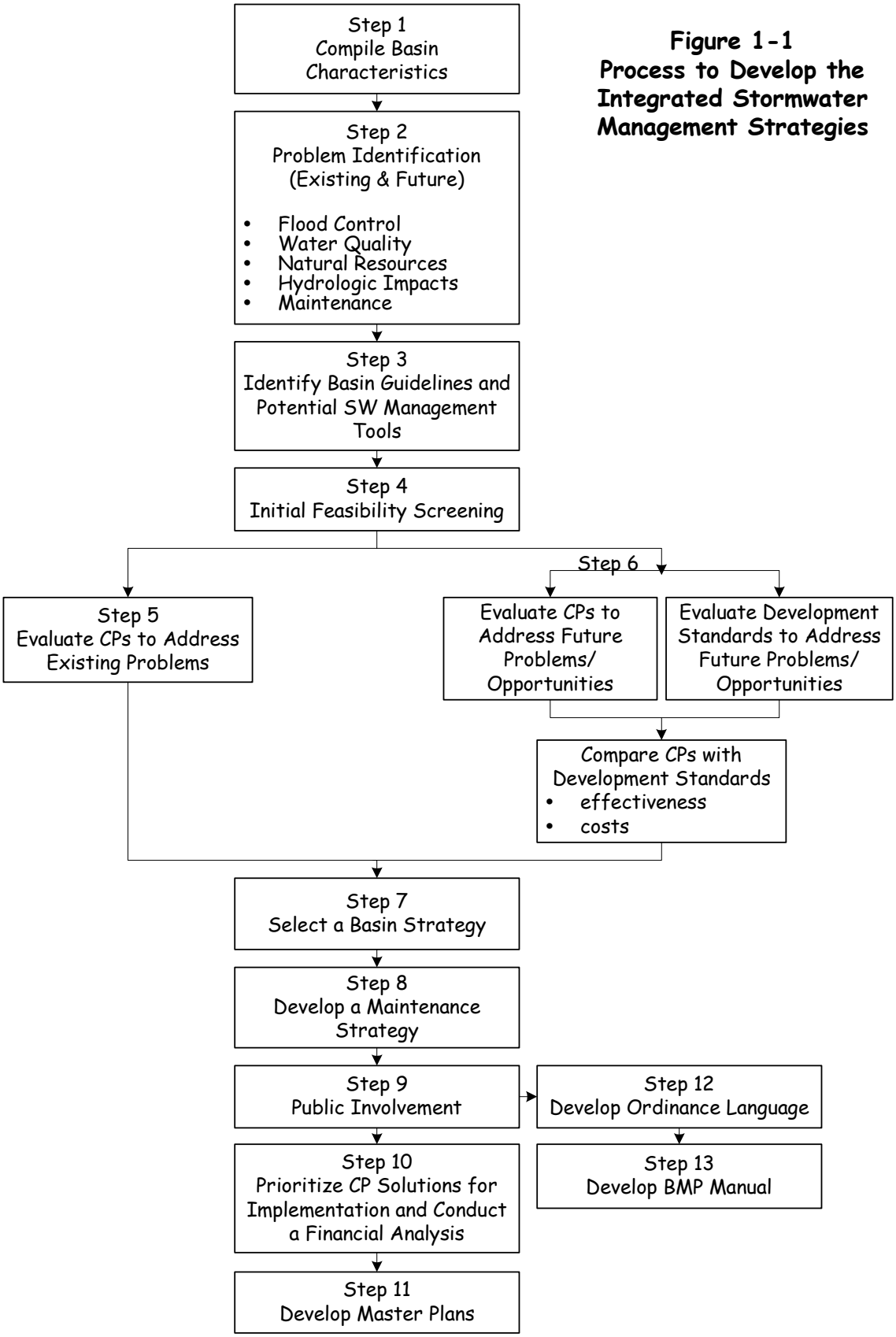


Figure 1-1
Process to Develop the Integrated Stormwater Management Strategies

SECTION 2 Study Area Characteristics

This section provides background information regarding the existing physical characteristics of the Laurel Hill basin. This information was used to assess opportunities and constraints for meeting the multiple-objective goals of the Stormwater Basin Master Plans. Specifically this section includes the following information: location and area; climate; land use and surface cover; land form; topography and slopes; surface water features and drainage system; water quality; rare, threatened and endangered plants, animals and communities; soils; groundwater; and recreational and educational facilities.

2.1 Location and Area

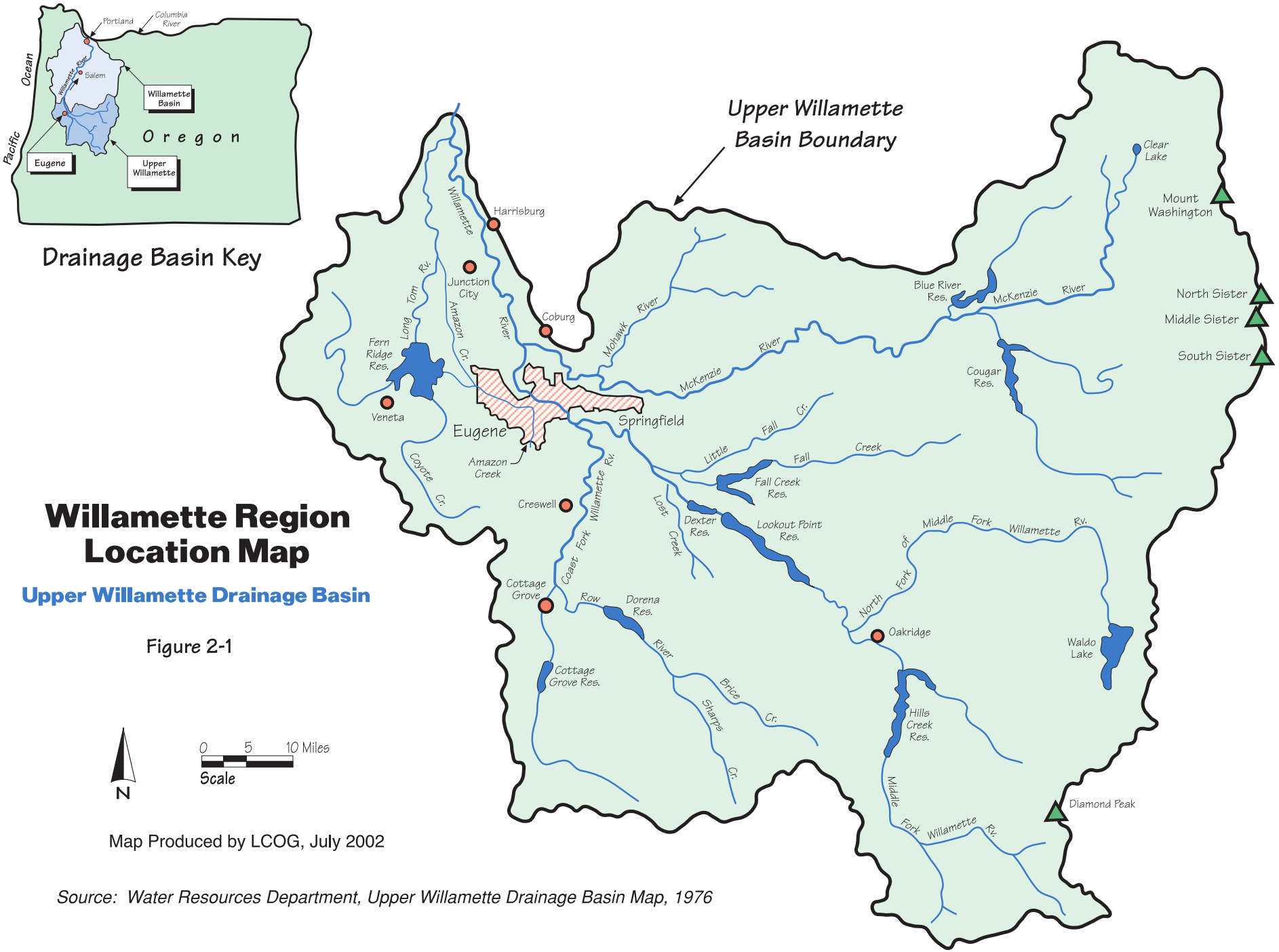
2.1.1 Regional Drainage Context

Eugene is located in the western third of the Upper Willamette Drainage Basin as shown on Figure 2-1. Drainage in the southern Willamette Valley is a combination of natural and built systems that have evolved over time. The natural system is composed of rivers, waterways, and a series of interconnected ponds and wetlands. Historically, the natural system had an extensive floodplain that typically experienced over-bank flooding every 1-2 years. The built drainage system includes a series of dams, pipes, and waterways that were built to contain over-bank flooding, and to retain water for recreational and irrigation purposes. The primary drainage features of the Upper Willamette Drainage Basin are: Main Stem of the Willamette River, Middle Fork of the Willamette River, Coast Fork of the Willamette River, McKenzie River, Amazon Creek, Coyote Creek, and the Long Tom River. From 1940 to 1960, the U.S. Army Corps of Engineers built nine dams on this system.

The cities of Cottage Grove, Creswell, and Springfield are all upstream from the City of Eugene and contribute urban runoff to the regional drainage system. Runoff from Cottage Grove, Creswell, and South Springfield flows through Eugene via the Willamette River. Approximately 4,800 acres of west Springfield's drainage area, as shown on Figure 2-2, discharges urban runoff into the Q-Street Floodway, which is within Eugene's public drainage system. Eugene public drainage system refers to the system of stormwater facilities (i.e., pipes, ditches, open waterways) that Eugene is responsible for operating and maintaining.

2.1.2 City of Eugene

The City of Eugene is currently responsible for managing the stormwater quantity, quality, and related natural resources for the drainage area within its city limits. The area outside of the City limits but within the urban growth boundary (UGB) is expected to be annexed into the city as urban development occurs. Therefore, this Stormwater Basin Master Plan includes both the current city limits and the area within the UGB. The *Eugene-Springfield Metro Area General Plan (Metro Plan)* boundary covers the city limits, the UGB and, in some cases, areas beyond the UGB. For the purposes of characterizing the study area in this chapter, the area covered includes the *Metro Plan* boundary.



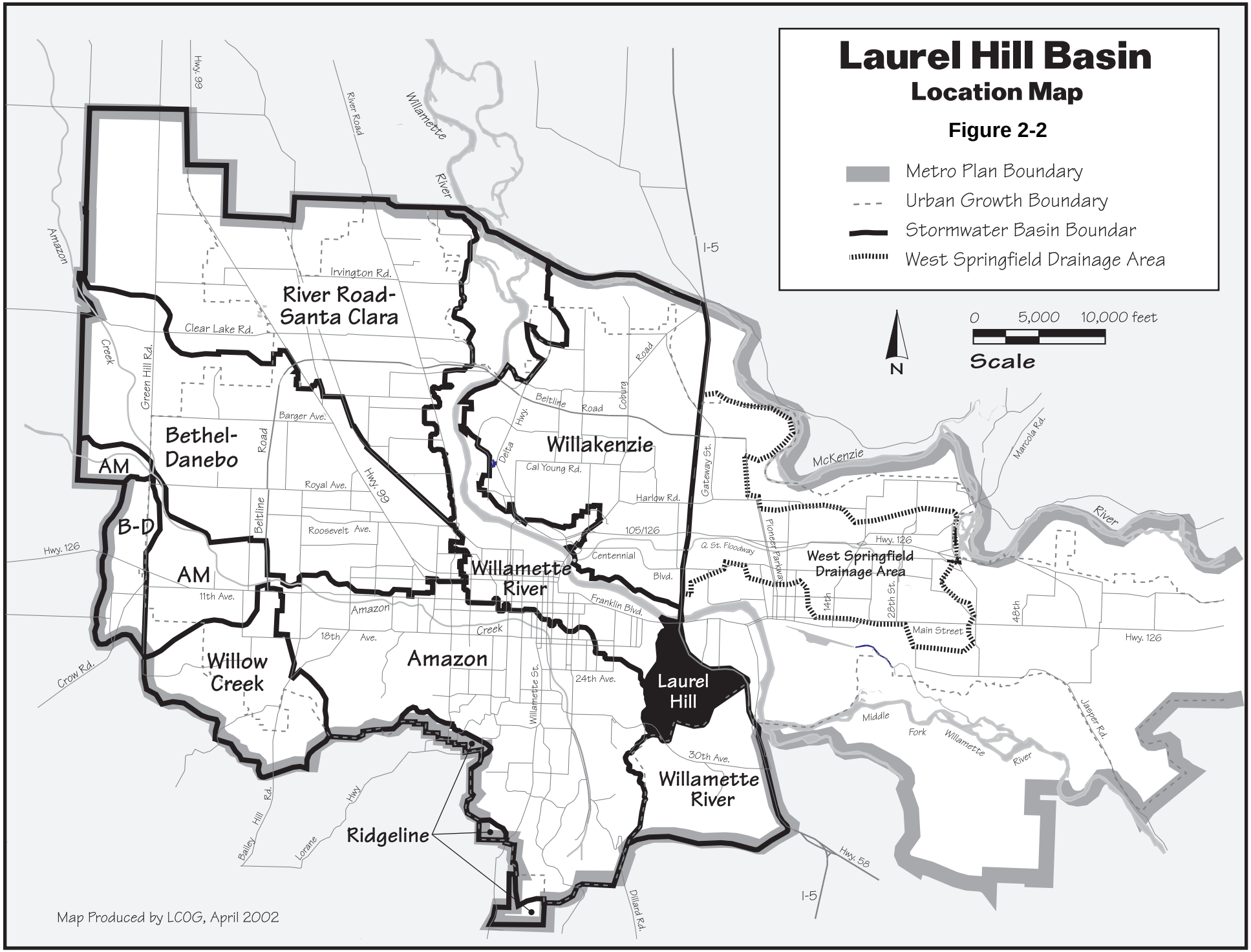
Willamette Region Location Map

Upper Willamette Drainage Basin

Figure 2-1

Map Produced by LCOG, July 2002

Source: Water Resources Department, Upper Willamette Drainage Basin Map, 1976


Laurel Hill Basin
Location Map
Figure 2-2
Metro Plan Boundary
Urban Growth Boundary
Stormwater Basin Boundar
West Springfield Drainage Area
N
0 5,000 10,000 feet
Scale
River Road-
Santa Clara
Bethel-
Danebo
AM
B-D
AM
Willow
Creek
Willakenzie
Willamette
River
Amazon
Laurel
Hill
Willamette
River
Ridgeline
West Springfield
Drainage Area
Hwy. 99
River Road
Willamette
River
I-5
Irvington Rd.
Clear Lake Rd.
Green Hill Rd.
Barger Ave.
Royal Ave.
Roosevelt Ave.
11th Ave.
18th Ave.
Amazon
Creek
Crow Rd.
Hwy. 126
Beltline
Road
Hwy. 99
Beltline Road
Coburg
Road
Delta
Hwy.
Cal Young Rd.
Harlow Rd.
105/126
Centennial
Blvd.
Franklin Blvd.
24th Ave.
Willamette St.
Gateway St.
McKenzie
River
Marcola Rd.
Pioneer Parkway
Q. St. Floodway
Hwy. 126
14th
28th St.
48th
Main Street
Hwy. 126
Middle
Fork
Willamette
River
Jasper Rd.
30th Ave.
Hwy. 58
I-5
Dillard Rd.
Bailey Hill Rd.
Hwy
Lorane
Map Produced by LCOG, April 2002

2.1.3 Laurel Hill Basin

The Laurel Hill basin is located in the southeastern portion of the study area as shown on Figure 2-2. It is bounded by Interstate 5 on the east and north and 30th Avenue on the south. With only 829 total acres, Laurel Hill is the smallest of the city's seven major drainage basins. Steep hillside topography is the predominant landform where 57 percent of the basin contains slopes greater than 10 percent grade. Laurel Hill Creek is the principal waterway for the basin with two significant headwater tributaries, west and east forks. The tributaries originate in the hills to the south and flow northward where they converge and discharge into the Willamette River near Interstate 5. Over 55 percent of the basin is vacant or in an open space use. The undeveloped areas are located in the steep, hillsides to the east and south. Most of these areas are designated for future low-density residential use.

2.2 Climate

The climate in the study area is primarily affected by humid air masses from the west and south, and infrequent influxes of cold, continental air masses from the east. As a result, the year-round climate in Eugene is moderate with relatively cool, wet winters, and warm, dry summers. Average minimum winter temperatures are in the mid-30s with extremes seldom dropping below 10 degrees Fahrenheit (-12.2 Celsius). Average maximum summer temperatures are in the low 80's (26.7 to 28.9 Celsius) with extremes seldom exceeding 100 degrees Fahrenheit (37.8 Celsius). Snowfall constitutes only 2 percent of the annual precipitation in Eugene. Winter snow does not accumulate; however, quick snow melt can contribute to flooding problems throughout the Eugene area.

The National Weather Service records rainfall information at the Mahlon Sweet Airport in Eugene. Average annual precipitation is approximately 46 inches with 86 percent occurring from October to May. Figure 2-3 presents the average monthly rainfall distribution based on the airport's 48-year rainfall record from 1949-1987.

Figure 2-3
Average Monthly Rainfall

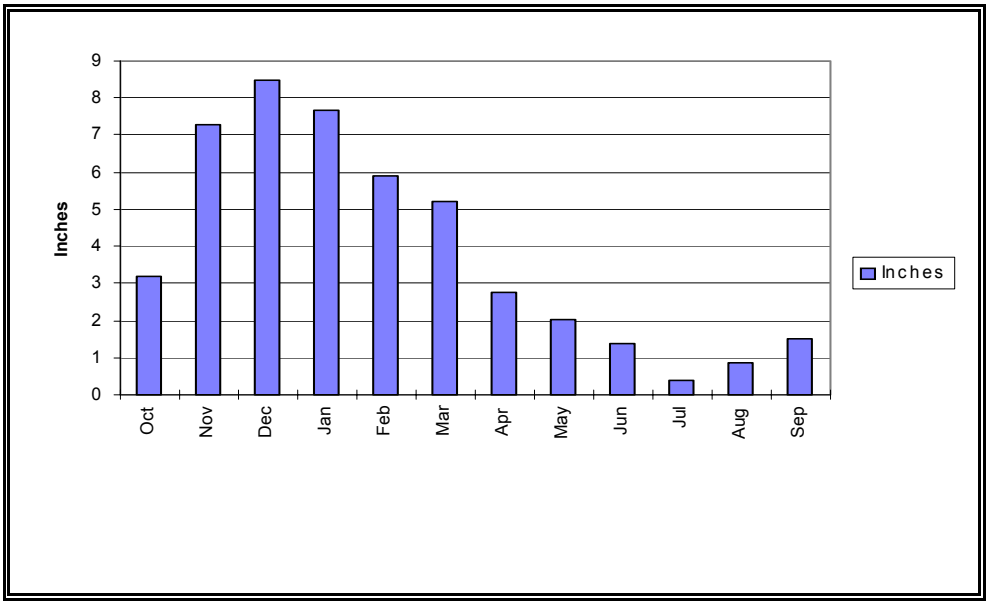


Table 2-1 characterizes a typical storm event for the Eugene area based on the historic 48-year precipitation record measured at the Eugene Airport:

Table 2-1
Average Storm Event

Storm Event Parameter	Average
Volume	0.67 inches
Duration	16.9 hours
Intensity	0.042 inches per hour

Since 1992, rainfall information has been recorded at six rain-gage stations within the Eugene city limits. Comparison of those data with the National Weather Service's Eugene Airport data indicates a significant difference between the two, with the airport data approximately 30 percent higher. For additional information regarding this issue, see Appendix A of Volume I.

Historically, performance of the City's drainage system has been very good. For example, the City's system handled the February 1996 storm event with very few problems even though this event caused widespread flooding in the Willamette River Valley.

2.3 Land Use and Surface Cover

The conversion from undisturbed to developed land uses can significantly affect the quantity and quality of stormwater runoff. Runoff volumes and velocities increase as impervious

surface areas increase. Likewise, stormwater quality decreases due to nonpoint source pollution from highways and urban land uses such as commercial, industrial, and residential. The purpose of this section is to describe existing land use and impervious surface conditions within the basin and to forecast changes in these conditions due to buildout of remaining vacant lands according to *Metro Plan* designations. Existing land use data presented in Map 1 are current to November 1998. Buildout data presented in Map 2 are based on current *Metro Plan* designations. See maps at the end of Section 2.

2.3.1 Existing Land Use

As shown in Table 2-2, the current predominant urban land use in the basin is low-density residential (177 acres), which comprises approximately 21 percent of the basin area. Fifty-eight percent (483 acres) is undeveloped with the majority located in the hillsides to the east and south.

Fourteen percent of the basin is street and right-of-way use, and 3% is parks, recreation, open space use.

Table 2-2
Existing Land Use – Laurel Hill Basin

Land Use Categories	Acres	Percent of Area
Inside UGB		
Low-Medium-Density Residential	177	22.0%
Medium-High-Density Residential	4	0.5%
Commercial	3	0.4%
Communication and Utilities	2	0.2%
Parks, Open Space, and Recreation	25	3.1%
Schools, Churches, and Cemeteries	13	1.6%
Other Government	5	0.6%
Other Undeveloped Land	458	57.0%
Streets (R.O.W.)	117	14.6%
Subtotal	**804**	**97%**
Outside UGB		
Other Undeveloped Land	25	3%
Subtotal	**25**	**3%**
Grand Total	**829**	**100%**

Source: LCOG GIS Parcel File 1998

2.3.2 Buildout Land Use

The *Metro Plan* (1987) and the *Laurel Hill Plan* (1982) are the primary governing land use policy documents for the Laurel Hill basin. All but 25 acres of the basin's total area is within the UGB. Lane County zoning applies to areas outside the UGB and City Codes apply within the UGB. Table 2-3 summarizes the buildout land use for the Laurel Hill basin.

2.3.2.1 Buildout Land Use Within the UGB

This area includes both the current city limits and the unincorporated UGB. For the purposes of this report, the term "vacant acres" refers to lands that are within the UGB and expected to develop to urban uses. As shown in Table 2-3, the most significant category of new development will be low-density residential (390 acres), followed by parks and open space (46 acres), commercial (15 acres) and medium-density residential (7 acres).

2.3.2.2 Buildout Land Use Outside the UGB

Three percent (25 acres) of the Laurel Hill basin lies outside the UGB. This portion of the basin will remain in a forest use as areas outside the UGB are not permitted to develop to urban uses.

Table 2-3
Buildout Land Use

Generalized Plan Designation	Designated Acres	
	Total	Vacant* (1998) for future Urban Development
Inside UGB		
Low-Density Residential	532	390
Medium-Density Residential	7	7
Commercial and Commercial-Residential Mixed	18	15
Parks and Open Space	67	46
Streets (R.O.W.)**	182	-
Subtotal	**804**	**458**
Outside UGB		
Forest	25	**0**
Subtotal	**25**	**0**
Grand Total	**829**	**458**

Source: LCOG and City of Eugene Geographic Information System, 1998

***For purposes of this report, vacant acres apply to lands within the urban growth boundary.**

***Notes: Streets (Right of Way). The Metro Plan does not have a "Streets" Plan designation. This amount was estimated based on the difference between total designated area and total basin size. In undeveloped areas, 15 percent of the land area was put into the Streets (Right of Way) category to account for streets that will serve future designated development.*

2.3.3 Surface Cover

Other than precipitation, surface cover is perhaps the single most influential factor that affects the volume, quality, and velocity of stormwater runoff and the ability to treat runoff through filtration and other natural processes. Pervious surfaces are undisturbed natural areas that retain native prairie or forest vegetation or lands in developed areas that are typically covered with lawn, agricultural fields, or pasture. In both cases, water is free to infiltrate into the ground. Undisturbed natural areas provide significant beneficial stormwater functions. They help reduce the volume and velocity of runoff by facilitating infiltration of precipitation into the ground. Stormwater quality is best in undisturbed natural areas. The vegetative cover associated with

undisturbed natural areas is also important for stabilizing steep slopes and streambanks. Pervious surfaces in developed areas also provide stormwater benefits, although to a lesser degree than undisturbed natural areas. The infiltration capacity may be reduced during conversion to urban lawns and agricultural crops. Stormwater quality may also be impacted by lawn care and agricultural practices.

In contrast, impervious surfaces are lands covered by hard surfaces such as rooftops, roads, and parking lots and allow little or no infiltration of water. Impervious surfaces are unable to absorb and infiltrate precipitation, which results in greater runoff volumes, higher but shorter duration peak flows, and higher concentrations of pollutants. The transition from undisturbed to developed land uses and densities involves a significant change from pervious to impervious surfaces. As a consequence, adequate facilities must be planned, constructed, and maintained to minimize drainage and flood problems and impacts to water quality and natural resources.

The purpose of this section is to describe surface cover conditions as they existed in 1998 and as they are projected to exist at buildout of the Laurel Hill basin's urban growth boundary (UGB).

2.3.3.1 Impervious Surfaces

Total impervious surface area for the study area was calculated using a set of impervious surface area factors (ISAF) that were applied to the existing and buildout land use data. To calculate total impervious surface area, the ISAF percentages were multiplied by the total land area in each of the land use categories.

The ISAFs used are provided in Volume I. These factors were derived through a process that used existing developed properties in Eugene to generate typical impervious percentages. Impervious surface area for residential, commercial, and industrial land uses had previously been digitized as the basis for calculating stormwater user fees. By using this data source, the resulting ISAFs have been calibrated specific to the City of Eugene and in some cases specific to the basin. The ISAFs for land use categories that were not previously digitized were derived through review of national standards and by calculating the impervious surface area on sample sites.

The amount of existing impervious surface area in the UGB portion of the Laurel Hill basin is estimated to be 163 acres or 20 percent of the basin's UGB area. [Note: calculations for these data are available from the City of Eugene.] The majority of this impervious surface is found in the flatter, valley portion the basin where most of the development has occurred. Map 3 depicts the existing generalized impervious surface area in pink. Due to the map scale and data restrictions, developed lots are shown entirely in pink. These pink areas are a mix of impervious surface and pervious surfaces associated with the land use such as lawns, streetscapes, parking lot planting, and other landscaped areas.

Assuming that future growth in the basin will follow conventional stormwater drainage practices and will develop according to the land use categories depicted on the Eugene-Springfield Metro Plan designations (see Map 2), the amount of impervious acres in the UGB portion of the basin is

projected to increase to 348 acres, or 43 percent of the basin's UGB area at buildout. [Note: calculations for these data are available from the City of Eugene.]

2.3.3.2 Pervious Surfaces

Large blocks of remaining pervious surface area in the Laurel Hill basin are located in the steep, hillside areas. The majority of this area is forested.

Overall, pervious area cover is expected to decrease from the current 80 percent of the UGB portion of the basin (641 acres) to 57 percent at UGB buildout. For the purposes of this report, pervious surface areas were identified and grouped into *Forest Cover*, *Landscaping*, and *Other Vegetated Areas* (refer to Figure 2-4) for the following reasons:

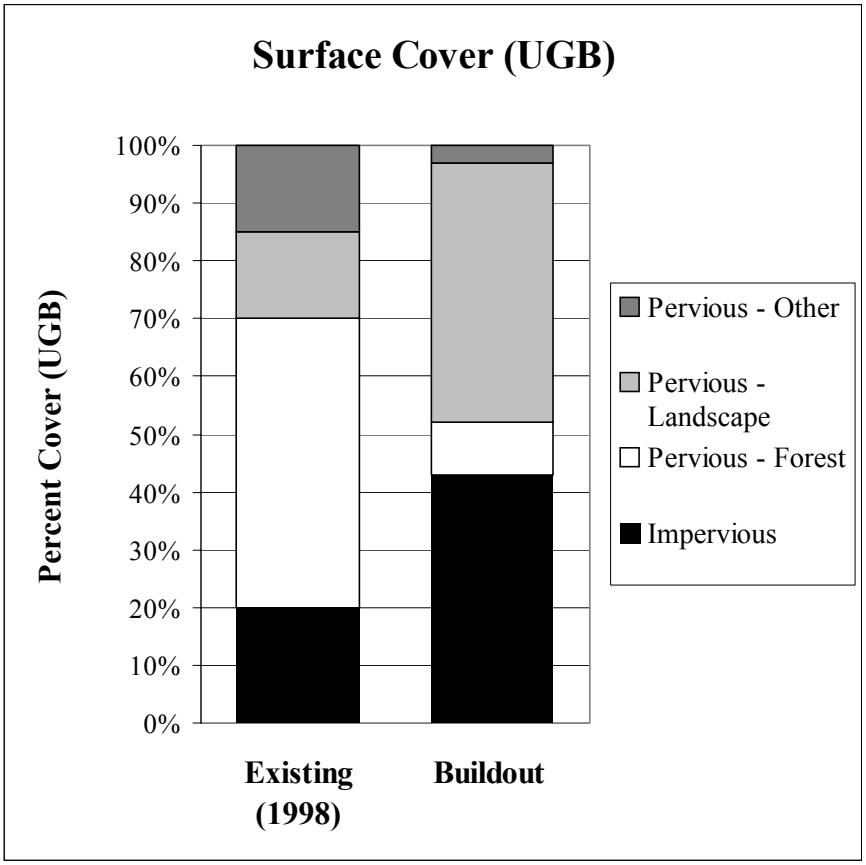
- Forest Cover is highly effective in reducing runoff volumes, and in preventing erosion (e.g., reduces soil impact by slowing down the velocity of precipitation and by intercepting up to 35 percent of it before hitting the ground) and stabilizing steep slopes (established root zones). Areas were included in this category if the forested area exceeded one acre in size. Approximately 50 percent of the Laurel Hill basin is currently in forest cover. At UGB buildout, forest cover percentage is projected to decrease to 9 percent.

- Landscaping areas, including lawns, streetscape and parking lot landscaping are associated with site improvements due to urban development. This category was distinguished to highlight both its positive and potential negative impacts on stormwater resources and is included in the area shaded pink on Map 3. Positive impacts include protection of surface soils, filtration of sediments, and some infiltration (although this is reduced from pre-development conditions). The use of chemical fertilizers, pesticides, and herbicides can cause negative impacts to water quality. The amount of landscaped area in the UGB is projected to increase from the existing 15 percent to 45 percent at buildout.

- Other Vegetated Areas are those not in *forest cover* or *landscaping* use, such as agricultural fields, pasture, vacant lots, prairie wetlands, and small clusters of trees (less than one acre). Similar to the landscaping category, these areas have both positive and negative impacts on stormwater resources. Agriculture and pasture uses can be significant contributors of pollutants in this category due to the use of chemical fertilizers, pesticides, herbicides, and fecal coliform due to grazing. This category is expected to decrease from 14 percent of the UGB to 3 percent at buildout.

Figure 2-4 compares the existing and projected surface cover for the UGB portion of the Laurel Hill basin.

Figure 2-4
Surface Cover in the Laurel Hill Basin (UGB)



2.4 Landform, Topography, Slopes

The South Hills are the prominent landform of the Laurel Hill basin forming a horseshoe-shaped backdrop to the central and northern lowlands below. Elevations range from approximately 500 feet above mean sea level in the floodplain adjacent to the Willamette River to over 900 feet along portions of the South Hills ridgeline.

Topography in the Laurel Hill basin is varied. It is nearly level in the central lowlands and changes from rolling hills to steep slopes in the southern portion of the basin. The basin can be broadly characterized by two topographic regions the relatively flat central low lands and the southern highlands.

Approximately 23 percent of the Laurel Hill basin has slopes of less than 10 percent. The central lowlands, the area in the valley bottom, generally have slopes less than 5 percent. The majority of the basin, approximately 77 percent, is affected by slopes exceeding 10 percent. Most of these occur in the southern and western uplands. Slopes of 10 to 25 percent generally occur along the lower hill slopes adjacent to open waterways and up the hillslopes toward the ridge crest. Twenty-two percent of the basin is affected by slopes exceeding 25 percent. These very steep

slopes are found throughout the ridge area that forms the perimeter of the basin. More specifically, these very steep slopes are found on the east facing slopes of Hendricks Hill and the northwest facing slopes of Moon Mountain.

The following table is keyed to Map 4, Slope and Topography, and indicates the percentage of the basin affected by varying categories of slope steepness:

Table 2-4
Laurel Hill Basin Slope Distribution

Location	Slope Distribution (percent)				
	Slopes 0-5%	Slopes 6-10%	Slopes 11-15%	Slopes 16-25%	Slopes >25%
Within UGB	9%	15%	19%	36%	21%
Outside UGB	1%	4%	11%	40%	44%
Total Basin	9%	14%	19%	36%	22%

2.5 Surface Water Features and Drainage System

This section describes the existing drainage features of the basin including the City's stormwater facilities, open waterways, and wetlands. Refer to Map 5.

2.5.1 Waterways

Pre-settlement (prior to 1855) morphological conditions in the Willamette Valley reflected a network of shallow, broad swales that would often flood during storm events creating ponded conditions. Today, most of the drainages have been altered into narrow, deep, and well-defined channels where the management objectives of preventing flooding conditions has been accomplished for the most frequent storm events. To accomplish this in the Laurel Hill basin, most of the low-land drainage system has been modified.

Laurel Hill Creek is an intermittent, natural open waterway that drains the area known as Laurel Hill Valley. Originating in the southwest section of the basin, the waterway is fed by tributaries from the hills to the east and west (east and west forks) as it travels in a northern direction. The waterway follows approximately the same alignment as Riverview and Augusta Streets until being piped under Interstate 5 and Franklin Boulevard to its confluence with the Willamette River. The main stem of Laurel Hill Creek (i.e., the segment located on the valley floor and not in the hillsides) is listed in the Metropolitan Natural Resources Study inventory (NR Study) as a riparian resource (refer to E78: August Creek/Laurel Valley Creek) and the West Branch (i.e., the tributaries located in steep, hillside areas south of Floral Hill Drive) is listed as an upland resource (refer to E38: Laurel Hill).

2.5.2 Wetlands

A comprehensive local inventory and evaluation of wetlands has not been conducted for the Laurel Hill basin. Wetland features described in this section are based on the National Wetlands Inventory (NWI) and the *Metropolitan Natural Resources Study (NR Study)*. The NWI provides

basic data about general characteristics and the extent of wetlands and identifies general wetland boundaries. Only Laurel Hill Creek is identified on the NWI and the NR Study.

2.5.3 Piped System

The extent of stormwater pipe system in this basin is small given the relative undeveloped conditions of the basin. Currently there are only 3.2 miles of stormwater pipe in the basin. The piped system primarily serves the function of transferring stormwater away from development and into the natural open waterways nearby. Existing stormwater pipes contain portions of tributaries, and they direct runoff from development to both of the main collectors on either side of the basin. They also serve to contain the collectors for short distances and direct flow under right-of-ways.

2.5.4 Maintaining the Drainage System

Maintenance activities in the Laurel Hill basin include occasional cleaning of open waterways and periodic checking and cleaning of catch basins. In several areas, debris accumulates at the open waterway - pipe interface interrupting flow. Waterway maintenance activities are performed to clear debris in order to ensure hydraulic capacity to prevent flooding problems.

2.5.5 Floodplain

A flood insurance study for the Federal Emergency Management Agency (FEMA) covers only a small portion of the Laurel Hill basin along the Willamette River. As part of this study, areas subject to flooding by the 100-year storm event have been identified. As shown on Map 5, the flood hazard area is directly associated with contours of the Willamette River. Only a small portion of the basin, about 3.7 acres, is within the floodplain.

2.6 Water Quality

This section provides a description of water quality conditions in the Laurel Hill basin. Water quality conditions can vary depending on time of day, weather conditions, land use activities conducted in the watershed, and location in the water body. Therefore, without significant amounts of data, it is often difficult to adequately evaluate water quality conditions. It is even more difficult to evaluate the water quality impacts of stormwater runoff on receiving waters. Therefore, a variety of available sources of water quality-related information were reviewed in an attempt to provide a general picture of water quality conditions in the basin. The following sources of information were reviewed and are described below:

- Documented water quality problems based on existing chemical data, biological data, and field observations.
- Oregon Department of Environmental Quality's (DEQ's) designations of water quality limited water bodies.
- Natural and built environmental conditions that influence water quality.

2.6.1 Documented Water Quality Problems

The following subsections describe the water quality problems that have been documented for the Laurel Hill basin in terms of chemical stormwater monitoring data, macroinvertebrate sampling, and field observations.

2.6.1.1 Chemical Stormwater Monitoring Data

The City collected and analyzed samples of stormwater runoff from 1992 to 1997 at 6 sampling stations in Eugene (see Figure 2-5). The 6 sampling stations were selected to represent runoff from various land uses. In 1998, the storm event monitoring at the 6 sampling stations was discontinued and a pilot project on the A3 Channel using a basin approach to water quality monitoring was implemented. The revised monitoring plan consisted of collecting monthly composite samples at the original industrial land use station on the A3 Channel (station I1) and collecting samples at selected high source areas in the piped system on the A3 Channel.

The following table provides a summary of the results collected during 1992 to 1997 from the 6 sampling stations. Table 2-5 includes a description of the problem pollutants, typical sources of the pollutants, specific results from Eugene, and potential problems associated with the pollutants. Although none of these data were collected from within the Laurel Hill basin, they provide general information regarding stormwater quality in Eugene and were used in identifying a stormwater management strategy for this basin.

Table 2-5
Summary of Stormwater Quality Monitoring in Eugene

Pollutant	Description	Sources	Eugene's Results	Potential Problems
Bacteria	- Enterococcus, - Fecal coliform, and - Fecal streptococcus	- Animal Wastes (droppings from wild/domestic animals), - Human Wastes (leaking sanitary sewer pipes, and seepage from septic tanks).	**Results from almost all of the samples significantly exceeded the DEQ standard for water quality**.	These are commonly used indicators of human pathogens. Water contact may cause eye and skin irritations and gastro-intestinal diseases if swallowed.
Heavy Metals	Antimony Arsenic Beryllium Cadmium Chromium Copper Lead Mercury Nickel Selenium Silver Thallium Zinc	- Vehicles (combustion of fossil fuels, improper disposal of car batteries, wear/tear of tires and brake pads), - Metal Corrosion, - Pigments for Paints, - Solder, - Fungicides, - Pesticides, - Wood Preservatives	Cadmium, chromium, copper, lead, nickel, and zinc were typically present in samples. **Copper, lead, and zinc in stormwater samples frequently exceeded DEQ standards for the protection of aquatic life.**	Heavy metals are toxic to freshwater aquatic ecosystems. These metals are considered to be the most significant toxic substances which are commonly found in urban stormwater runoff.
Oil & Grease	A broad group of pollutants including: - Animal fats, and - Petroleum products.	- Food Wastes (animal and vegetable fats from garbage), - Petroleum Products (gas, engine oil, lubricants, etc.).	**Two of fifty-three samples had concentrations which exceeded discharge limitations specified for industrial stormwater discharges (i.e., > 10 mg/L).**	These compounds can coat the surface of the water limiting oxygen exchange, clog fish gills, and cling to waterfowl feathers. When ingested these compounds can be toxic to birds, animals and other aquatic life.

Table 2-5 (continued)

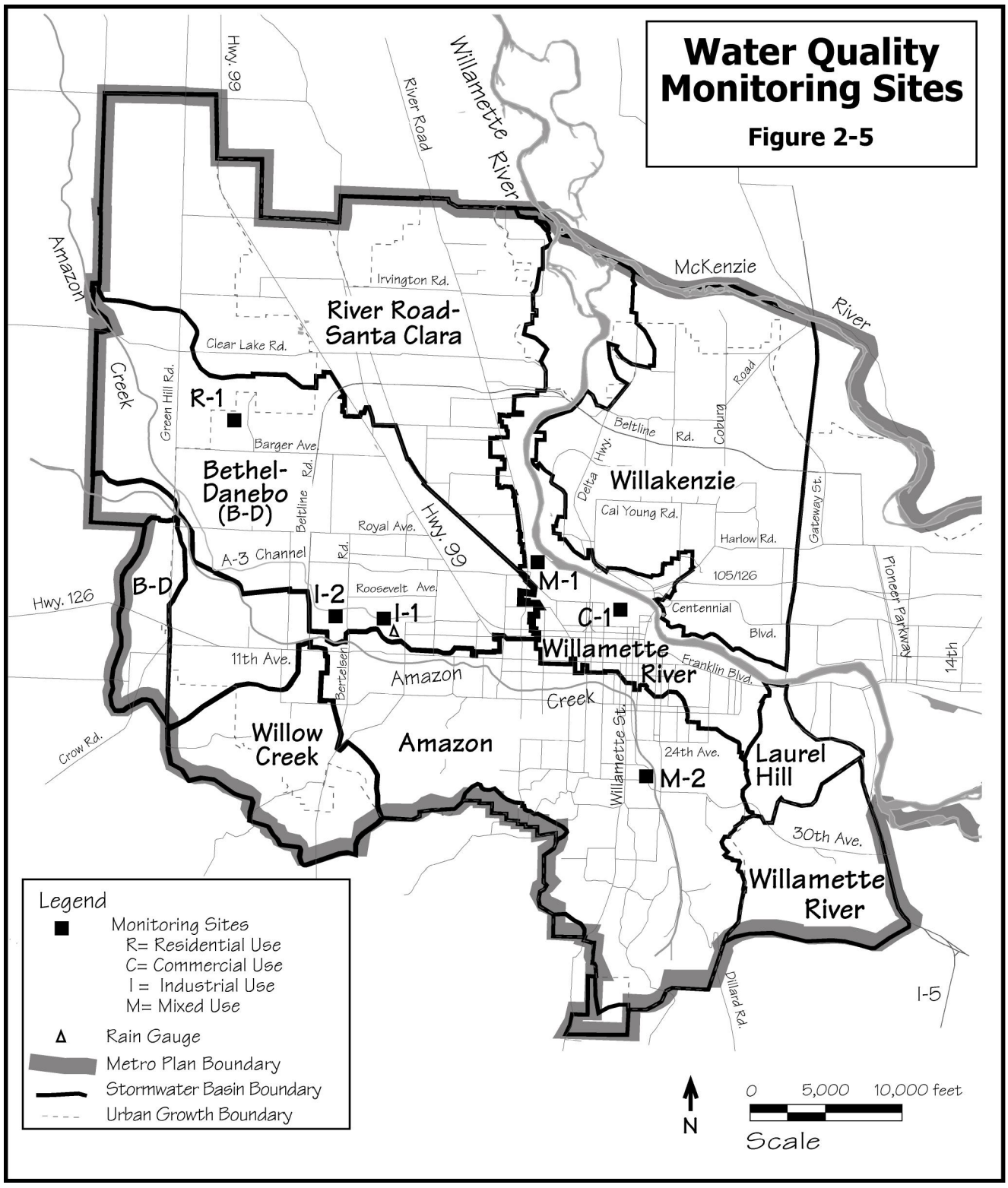
Pollutant	Description	Sources	Eugene's Results	Potential Problems
Sediments	Sediments in the water are considered pollutants when they exceed natural concentrations and negatively affect water quality and/or beneficial uses of the water.	- Erosion from increased stream flows, - Construction site runoff, - Landscaping activities, - Agricultural activities, - Logging, - All other activities where the ground surface is disturbed.	**Excess levels were measured at all stations. Results from the urban sampling stations in Eugene were all 40% to 70% higher than results from an open space (i.e., undeveloped) sampling.**	Sediments cause increased turbidity, reduced prey capture for sight feeding predators, clogging of gills/filters of fish and aquatic insects, and blocked light which limits food production available for fish. Sediments also accumulate in stream bottoms which reduces the capacity of the stream (and hence increases the potential for flooding) and covers stream bottom habitats. Sediment also acts as a carrier of toxic pollutants such as metals and organics.
Nutrients	- Nitrate - Ammonia - Kjeldahl Nitrogen - Phosphorus - Orthophosphate	- Landscaping activities, - Yard debris, - Human wastes (leaks from septic tanks and sanitary sewers), - Animal wastes, - Vehicle exhausts, - Agricultural activities, - Detergents (car washing), - Food Processing	**The DEQ guidance value of 0.1 mg/L for total phosphorus was exceeded in 100% of the samples collected.**	Excess levels of nutrients can lead to eutrophication in downstream receiving waters. Problems include surface algal scums, odors, reduced oxygen levels, and dense mats of algae. In addition to water quality problems, these effects have a negative impact to the aesthetic quality of water bodies.
Organics	There are many organic compounds, however, the synthetic organics are of most concern and include: - Fuels - Solvents - Pesticides - Herbicides.	- Illegal dumping, - Illicit connections, - Spills, - Leaks from drums and storage tanks, - Landscaping activities - Agricultural activities.	Although sampling for these compounds was limited, **nine volatile organic compounds were detected (including one pesticide).**	Most synthetic organics are highly toxic to aquatic life at very low concentrations, and many are carcinogenic (cancer causing) or suspected carcinogens. Diazinon has been identified in many recent studies as one of the causes of toxicity in stormwater.
Litter and other Floatable Debris	- Plastics, - Paper products, - Yard debris, - Tires, - Metal, - Glass.	- Littering, - Dumping, - Spills.	Sampling for litter and floatables was not conducted, however, **specific problem dumping areas have been identified in Eugene** (see notes below).	These pollutants degrade the aesthetic quality of water bodies. In addition, they contribute pollutants as they decompose, and they can reduce the capacity of the water body. Excess yard debris contributes to high levels of nutrients and it reduces oxygen levels as it decomposes.

Based on results from the above monitoring program and the results from state-wide monitoring efforts (ACWA, 1997), industrial and commercial land uses have been identified as significant sources of stormwater pollutants (i.e., high source areas). Concentrated areas of industrial/commercial land uses do not exist in the Laurel Hill basin.

2.6.1.2 Findings from Macroinvertebrate Sampling

Aquatic macroinvertebrate sampling is useful in evaluating water quality and ecological integrity. Pronounced changes in biological communities indicate a disruption of healthy environmental conditions and can be useful in identifying cumulative effects of pollutants, habitat alterations, effects from bioaccumulative chemicals, and other impacts that chemical monitoring may not reveal.

No macroinvertebrate sampling has occurred in the Laurel Hill basin.


Water Quality Monitoring Sites
Figure 2-5
Hwy. 99
River Road
Willamette River
McKenzie River
Amazon Creek
Irvington Rd.
River Road-Santa Clara
Clear Lake Rd.
Green Hill Rd.
R-1
Barger Ave.
Bethel-Danebo (B-D)
Beltline Rd.
Royal Ave.
Hwy. 99
A-3 Channel
B-D
Hwy. 126
I-2
Roosevelt Ave.
I-1
11th Ave.
Bertelsen Rd.
Crow Rd.
Willow Creek
Amazon
Amazon Creek
Willamette St.
24th Ave.
M-2
Laurel Hill
30th Ave.
Willamette River
Dillard Rd.
I-5
Delta Hwy.
Beltline Rd.
Coburg Road
Willakenzie
Cal Young Rd.
Harlow Rd.
Gateway St.
105/126
Centennial Blvd.
M-1
C-1
Willamette River
Franklin Blvd.
Pioneer Parkway
14th
Legend
Monitoring Sites
R= Residential Use
C= Commercial Use
I = Industrial Use
M= Mixed Use
Rain Gauge
Metro Plan Boundary
Stormwater Basin Boundary
Urban Growth Boundary
N
0 5,000 10,000 feet
Scale

2.6.1.3 Field Observations of Water Quality Problems

In addition to the information obtained from the stormwater monitoring data described above, specific water quality related problems/issues have been observed in this basin as follows:

- *Erosion and Downcutting:* Erosion and downcutting have been observed in the open waterways and appear to be due to encroachment from development and increased runoff volumes from development activities.

- *Erodible Soils:* Most of the remaining vacant lands in this basin are in the steep hillsides containing highly erodible soils.

2.6.2 Oregon Department of Environmental Quality Water Quality Limited Designations [303(d) List]

The federal Clean Water Act requires states to maintain a list of water bodies that do not meet water quality standards. These standards are established to protect beneficial uses such as drinking water, fisheries, industrial water supply, recreational, and agricultural uses. This list is called the 303(d) List based on the section of the Clean Water Act that mandates this requirement. The list is meant only as a means of identifying water quality problems and not the causes.

States must monitor water quality and review available data and information to determine if the standards are being met. In Oregon, this responsibility is carried out by the Department of Environmental Quality (DEQ). If available data indicate a water body is not meeting water quality standards, and the data meet listing guidelines, DEQ must assume that the water body is water quality limited. Water bodies with no information, or information incompatible with the EPA guidelines, are not included on the 303(d) list. The 303(d) list is updated and revised every two years. Once a water body is included on the 303(d) list, DEQ is required to develop a total maximum daily load (TMDL) requirement for both point and non-point sources of the pollutants of concern. It is anticipated that DEQ will develop TMDL requirements for all designated water quality limited water bodies in the State of Oregon sometime within the next ten years.

As water quality data have not been collected in this basin, no water bodies in the Laurel Hill basin currently appear on the 303(d) list.

2.6.3 Natural and Built Conditions

Evaluating the natural and built conditions that influence water quality can be useful in indirectly assessing water quality conditions in the basin. As urbanization occurs, negative impacts to the health of receiving waters result from changes in the quality of stormwater runoff. Natural features such as riparian areas, wetlands, and open drainage systems have the ability to treat stormwater pollutants, prevent waterway scour by slowing down runoff rates, settle out sediments, and protect stream banks from erosion. However, with research showing that water quality degradation occurs at relatively low levels of imperviousness (10-20 percent), the

implications of development on water quality is significant.[1] Figures 2-6, 2-7, and 2-8 examine natural and built conditions relative to the other Eugene drainage basins.

Figure 2-6
Extent of Open Drainage System in the Laurel Hill Basin (UGB)

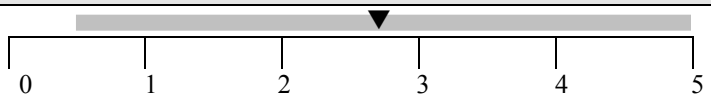
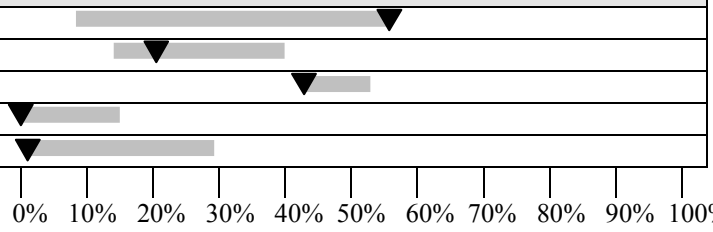
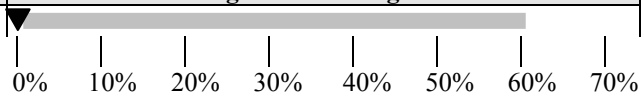
Miles per Square Mile Of Open Drainage System in the Laurel Hill Basin	Laurel Hill Basin [▼] Relative to the Range in Other Eugene Basins (miles/sq mile)
2.8	

Figure 2-7
Extent of Area as a Percentage of the Laurel Hill Basin (UGB)

Factors	Percent in Laurel Hill Basin	Laurel Hill Basin [▼] Relative to the Range in other Eugene Basins
Remaining Vacant Lands*	**57%**	
Existing Impervious Surface Area	**20%**	
Projected Impervious Surface Area	**43%**	
Wetlands	**0%**	
100-Year Floodplain	**0.4%**	

**Vacant land* includes tax-lotted areas currently in vacant, agricultural, and timber uses.

Figure 2-8
Extent of 100-Year Floodway Fringe that is Vacant in the Laurel Hill Basin

Percent of 100-Yr. Floodway Fringe Vacant* in the Laurel Hill Basin	The Range in other Eugene Basins
0%	

**Vacant land* includes tax-lotted areas currently in vacant, agricultural, and timber uses.

2.6.4 Conclusions

A summary of the above findings suggest that degraded water quality conditions exist in the Laurel Hill basin as follows:

[1] Tom Schueler, et al. *Site Planning for Urban Stream Protection: The Importance of Imperviousness*, 1995.

- Based on the analysis of stormwater runoff samples collected from Eugene and other urban areas in Oregon, the pollutants of concern that were identified are as follows:
  - Total Suspended Solids (TSS)
  - Nutrients
  - Heavy Metals
  - Bacteria
  - Oil and Grease
- The extent of the open drainage system in the basin on a miles per square mile basis is in the middle range when compared with other Eugene drainage basins.
- At 20 percent, the basin currently has levels of imperviousness that are beginning to degrade water quality. Projections indicate that the impervious surface area will increase to 43 percent.
- Erosion and downcutting have been observed in headwater tributaries.

2.7 Rare, Threatened, and Endangered Plants, Animals, and Communities

Stormwater management decisions and practices can affect rare, threatened, and endangered plant and animal species. Local populations can be reduced or even eliminated as a result of decisions to pipe a waterway, install upstream detention, or to allow significant increases in runoff due to new development. The purpose of this section is to describe the known rare species and communities located in the Laurel Hill basin so that the details of these resources can be consulted prior to any stormwater management decisions.

Review of the Oregon Natural Heritage Program (ONHP) database reveals no records of rare plant and animal observations in this basin. Given this condition is a snapshot in time, the ONHP data base should be consulted for updated information for future project design issues and or policy application.

In March 1999, the National Marine Fisheries Service (NMFS) listed spring-run Chinook salmon as a threatened species under the Endangered Species Act (ESA). It includes all naturally spawned populations of Spring Chinook in the Clackamas River and in the Willamette River and its tributaries above Willamette Falls, Oregon. Because runoff from Eugene discharges either directly or indirectly to the Willamette River, this listing affects the city's stormwater management program and practices.

A species that is listed as *threatened* means it is *likely to become endangered within the foreseeable future throughout all or a significant portion of its range.* Protective regulations, known as 4(d) rules have been developed that are *deemed necessary and advisable to provide for the conservation of the species*. These rules spell-out the *take* prohibitions that pertain to Spring Chinook and focus on the type of activities that are likely to lead to a *take*. The City is in the process of reviewing its own processes, procedures, and development standards for identifying and adjusting those that may not be compatible with the 4(d) rules.

2.8 Soils

Soil characteristics are important factors in predicting the amount, rate, and quality of stormwater runoff and for selecting management measures for addressing the effects of runoff. This section describes the key soil parameters relative to stormwater issues and the distribution of those parameters in the Laurel Hill basin. All soils data were obtained from the *USDA Soil Survey of Lane County*. Refer to Tables 2-6 to 2-8 and Maps 6 to 10 for a description of the soil mapping units and relevant stormwater related data found in the Laurel Hill basin.

2.8.1 Permeability

Soil permeability measures the rate of water movement through the soil horizon. This factor is important in managing stormwater quantity and quality. Soils with slow permeability rates are more likely to result in higher stormwater runoff volumes than soils of high permeability. Under these conditions, larger and more extensive stormwater facilities are needed to accommodate new development where space permits. In more densely developed areas, slow permeable soils may be better suited to stormwater conveyance and storage facilities than infiltration facilities. Storage facilities could include detention ponds and treatment ponds where time is desired for settling and filtering purposes.

Soil permeability measures the rate of water movement through the soil horizon. Permeability rates are assigned based on the dominant soil horizon (15-40 inches). This factor is important in managing stormwater quantity and quality. Soils with slow permeability rates are more likely to result in higher stormwater runoff volumes than soils of high permeability. As shown on Map 6, permeability rates in the Laurel Hill basin vary from moderately slow to very slow with 83 percent of the soils in the slow to very slow category. The following table displays the distribution of soil permeability rates for the basin.

Table 2-6
Soil Permeability in the Laurel Hill Basin

Location	Permeability						
	Very Rapid	Moderately Rapid	Moderate	Moderately Slow	Slow	Very Slow	Total
Within UGB	0%	0%	0%	17%	63%	20%	100%
Outside UGB/UR	0%	0%	0%	0%	71%	29%	100%%
Total Basin	0%	0%	0%	17%	63%	20%	100%

Source: USDA Soil Survey of Lane County Area, Oregon, 1987.

2.8.2 Runoff Potential

Soil groups have been rated according to their runoff potential under nonvegetated and saturated conditions without consideration of topographic conditions. Runoff potential measures a soil's capacity to permit infiltration and, therefore, can be used to describe the degree of runoff expected during storm events. For example, soils rated as having “low runoff potential” are most

likely to have high infiltration rates and, conversely, soils with a "high runoff potential" are most likely to have low infiltration rates. Hydrologic stormwater models often use this parameter in conjunction with slope and surface cover factors for estimating surface flows under undeveloped conditions.

As shown on Map 7, soils in the Laurel Hill basin range from moderately high to high runoff potential. The following table displays the distribution of soils by rate of runoff for the basin:

Table 2-7
Runoff Potential in the Laurel Hill Basin

Location	Runoff Potential (percent)				
	High	Moderately High	Moderately Low	Low	Total
Within UGB	58%	42%	0%	0%	100%
Outside UGB	76%	24%	0%	0%	100%
Total Basin	58%	42%	0%	0%	100%

Source: USDA Soil Survey of Lane County Area, Oregon, 1987.

2.8.3 Erodible Soils

Highly erodible soils have significant stormwater management implications. If not properly protected during construction and land clearing activities, erosion and sedimentation from these soils can have the following negative effects:

- Reduction in the conveyance capacity of downstream stormwater facilities resulting in potential drainage and flooding problems.
- Reduction or elimination of aquatic habitat and covering or destroying of spawning beds.
- Water quality impacts due to pollutants that are attached to sediments.

As shown on Map 8, 82 percent of the soils in the basin are classified as highly erodible. Generally these soils are located throughout the basin except within the stream corridors where soils are moderately erodible.

The City's erosion prevention program has designated highly erodible soils as one of the criteria for sensitive area designation. Construction sites containing these soils are required to obtain an erosion prevention permit so that appropriate management measures can be designed and implemented to prevent and/or minimize erosion impacts.

2.8.4 Unstable Slopes

Approximately 36 percent of the basin is affected by soils that are subject to slumping (see Map 10 Soil Types). Soils prone to slumping generally occur in the basin's gently sloping hills and central lowlands. Slumping soils can present structural problems especially where extensive grading is needed for roads and building foundations. Properly designed drainage systems can help mitigate slump potential. Soil types subject to slumping include:

- 43C, 43E Dixonville-Philomath-Hazelair complex, 3 to 12 percent slopes.
- 52D Hazelair silty clay loam, 7 to 20 percent slopes.
- 102C Panther silty clay loam, 2 to 12 percent slopes.
- 103C Panther-Urban land complex, 2 to 12 percent slopes.
- 113G Ritner cobbly silty clay loam, 30 to 60 percent slopes.
- 127C Urban land-Hazelair-Dixonville complex, 3 to 12 percent slopes.
- 135F Willakenzie clay loam, 30 to 50 percent slopes.

2.8.5 Hydric Soils

Hydric soil is one of three criteria for determining the presence of wetlands; the other two being inundated or saturated soil conditions and the presence of hydrophytic vegetation. Federal and state regulations limit activities that can occur in wetlands, including the direct discharge of untreated stormwater runoff. The Oregon DEQ has not yet established such standards for discharging into wetlands.

Map 9 displays the basin's hydric soils (about 13 percent of the basin) and National Wetland Inventory (NWI) wetlands in the basin. Hydric soils are primarily located in the drainage ways and lowlands in the central portion of the basin. No NWI wetlands are indicated within the basin although wetland areas may exist in association with drainage ways. Although field checking is needed to confirm the presence of wetlands in these areas, wetlands should be suspected to exist for planning purposes. Siting of future stormwater facilities and stormwater management actions should be chosen carefully so as to not alter the hydrologic regime of wetlands by either adding or taking away water. The following table displays the percentage of hydric soils found in the basin:

Table 2-8
Hydric Soils in the Laurel Hill Basin

Location	Hydric Soils (percent)	
	No	Yes
Total Basin	87%	13%

Source: USDA Soil Survey of Lane County Area, Oregon, 1987.

2.9 Groundwater

Two aspects related to groundwater need to be given special consideration when planning for stormwater management. The first relates to the regional aquifer that underlies much of the lower Willamette Valley basin. This aquifer is the source of drinking water for rural residents and several nearby communities (i.e., Springfield, Coburg, Junction City) and has also been investigated as a potential future source of water for Eugene. For this reason, consideration needs to be given to the effects that stormwater management can have on groundwater quality and quantity.

Two recent studies help to characterize the groundwater resource in the Laurel Hill basin. A study contracted by the Eugene Water & Electric Board in 1993 to assess the feasibility of

developing groundwater for municipal and agricultural purposes in the Eugene-Springfield metropolitan area has identified the Confluence Area, a large area near the confluence of the McKenzie and Willamette Rivers that includes the northeastern half of the Laurel Hill basin, as the most promising area for future large-scale groundwater development (GEM, 1993). The study also acknowledges that this shallow, unconfined aquifer is susceptible to contamination resulting from land use activities, surface spills, and other potential sources of contaminants.

A second study of groundwater in this area was completed in 1995 by the Springfield Utility Board (SUB) and Rainbow Water District (RWD). SUB and RWD contracted with Golder Associates to map and model the groundwater resources that supply their wells. These wells provide the water supply for Springfield and adjacent portions of unincorporated Lane County. This effort also led to the delineation of wellhead protection areas (WHPAs) for each of SUB's and RWD's supply wells. A portion of the WHPA for SUB's Interstate 5 wells extends into the Laurel Hill basin (see Map 11 High Water Table map). Stormwater management decisions affecting land lying within this WHPA should be made with consideration given the potential risk of degrading groundwater quality.

The other groundwater issue relates to the depth of the seasonal high water table. Map 11 shows the depth of the high water table during the wet season. This information is linked to soil type and comes from the *USDA Soil Survey of Lane County* (1987). A high water table (less than three feet below the ground's surface) will play a significant role in determining both how stormwater disperses and what types of stormwater facilities might work well in a given area. In general, a high water table will contribute to high runoff levels and can limit the effectiveness of infiltration facilities.

The high water table for most of Laurel Hill basin is greater than six feet deep which is a positive indicator for infiltration suitability. Only along stream corridors is the water table shallow, less than two feet from the surface.

2.10 Recreational and Educational Facilities

The CSWMP multiple-objectives approach to stormwater management includes recreational and educational facilities. Recreational facilities, such as trails and parks, are compatible with and are often located within areas that are prone to flooding. Drainage can provide corridors for hiking and biking trails as well as for conveying stormwater runoff. Areas within parks can be used as storm event overflow areas with minimal property repair cost. Drainage and wetlands provide opportunities for classroom study and open space recreation and, therefore, their proximity to schools have educational benefits. The following section describes existing and future parks, trails, recreational, and educational facilities within proximity to the Laurel Hill basin. Refer to Map 12.

2.10.1 Existing and Planned Educational Facilities

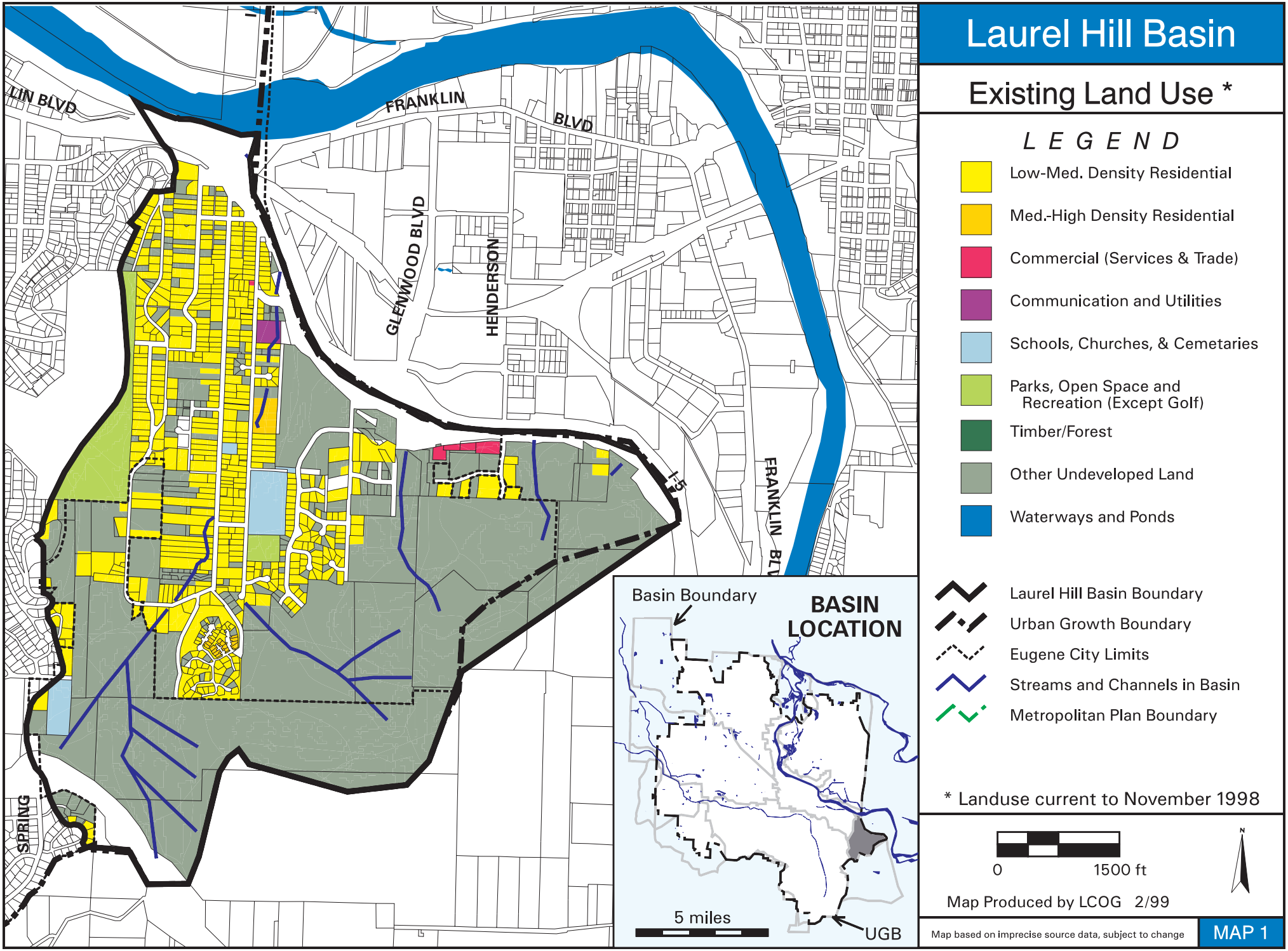
Laurel Hill Elementary School on Augusta Street is currently being used by Northwest Youth Corp (NYC), a non-profit job training, education and youth development program. NYC offers

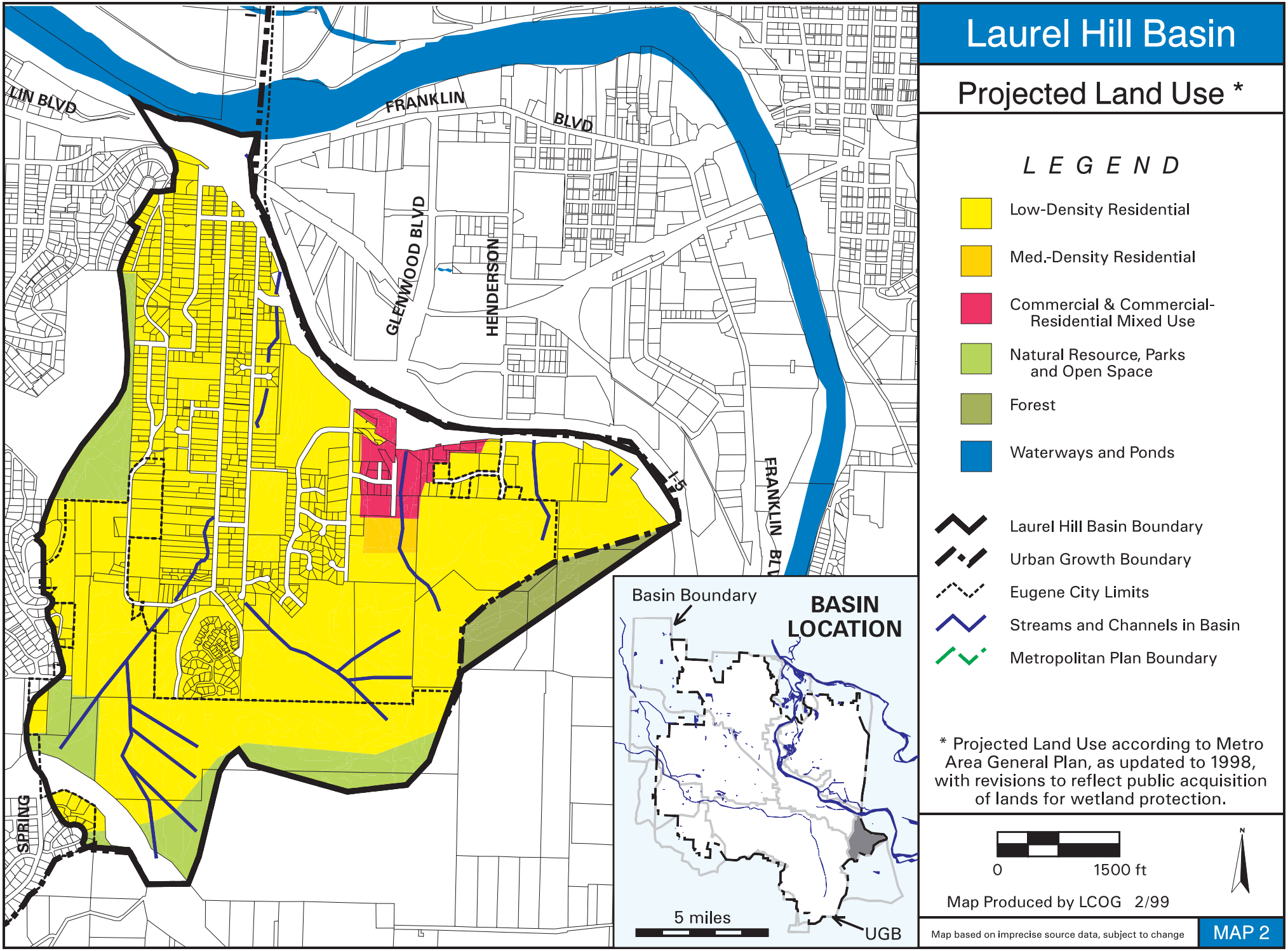
six different programs, including an AmeriCorp program and an alternative high school focusing on environmental education.

2.10.2 Existing and Planned Park and Recreational Facilities

The Laurel Hill basin contains approximately 60 acres of park land including Laurel Hill Neighborhood Park, the eastern portion of Hendricks Park, and Moon Mountain Park. The *Parks, Open Spaces and Natural Areas Study-Phase II* (1996) targets acquisition of one neighborhood park and much of the land along the upper (southern) portion of the basin including portions of Moon Mountain. Much of this land would eventually form an extension of the ridgeline trail system that could also connect to Hendricks Park.

In November, 1998, voters in Eugene passed a $25.3 million general obligation bond measure for purposes of purchasing new parkland and building parks, and youth sports fields. In the Laurel Hill basin, a 45 acre Ridgeline corridor between 30th Avenue and Moon Mountain is proposed for acquisition.


LIN BLVD
FRANKLIN
BLVD
GLENWOOD BLVD
HENDERSON
I-5
FRANKLIN BLV
SPRING
Basin Boundary
BASIN LOCATION
5 miles
UGB
Laurel Hill Basin
Existing Land Use *
L E G E N D
Low-Med. Density Residential
Med.-High Density Residential
Commercial (Services & Trade)
Communication and Utilities
Schools, Churches, & Cemetaries
Parks, Open Space and Recreation (Except Golf)
Timber/Forest
Other Undeveloped Land
Waterways and Ponds
Laurel Hill Basin Boundary
Urban Growth Boundary
Eugene City Limits
Streams and Channels in Basin
Metropolitan Plan Boundary
* Landuse current to November 1998
0
1500 ft
N
Map Produced by LCOG 2/99
Map based on imprecise source data, subject to change
MAP 1



Laurel Hill Basin

Projected Land Use *

L E G E N D

- Low-Density Residential
- Med.-Density Residential
- Commercial & Commercial-Residential Mixed Use
- Natural Resource, Parks and Open Space
- Forest
- Waterways and Ponds
- Laurel Hill Basin Boundary
- Urban Growth Boundary
- Eugene City Limits
- Streams and Channels in Basin
- Metropolitan Plan Boundary

* Projected Land Use according to Metro Area General Plan, as updated to 1998, with revisions to reflect public acquisition of lands for wetland protection.

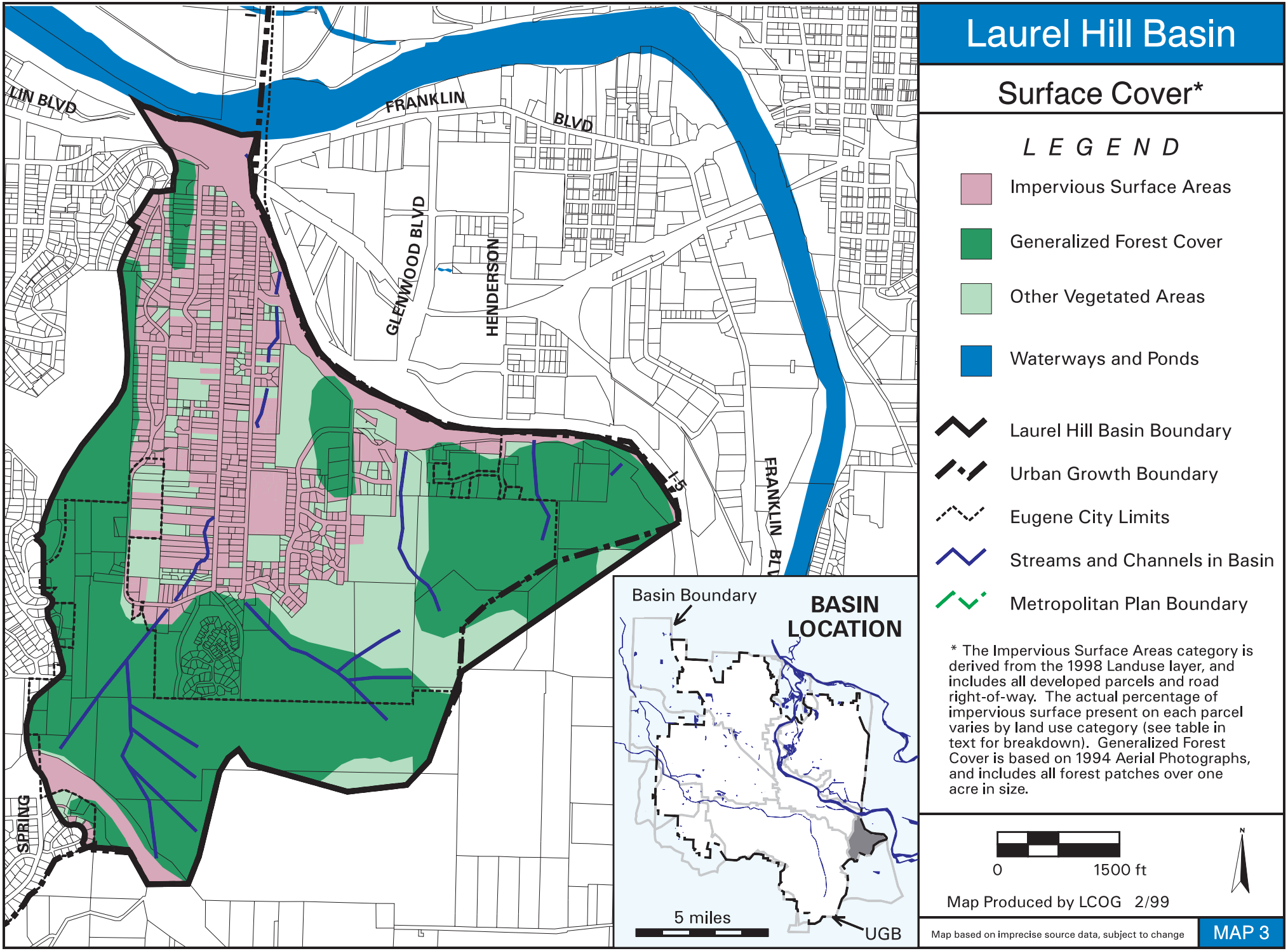
0 1500 ft

N

Map Produced by LCOG 2/99

Map based on imprecise source data, subject to change

MAP 2



Laurel Hill Basin

Surface Cover*

L E G E N D

- Impervious Surface Areas
- Generalized Forest Cover
- Other Vegetated Areas
- Waterways and Ponds
- Laurel Hill Basin Boundary
- Urban Growth Boundary
- Eugene City Limits
- Streams and Channels in Basin
- Metropolitan Plan Boundary

* The Impervious Surface Areas category is derived from the 1998 Landuse layer, and includes all developed parcels and road right-of-way. The actual percentage of impervious surface present on each parcel varies by land use category (see table in text for breakdown). Generalized Forest Cover is based on 1994 Aerial Photographs, and includes all forest patches over one acre in size.

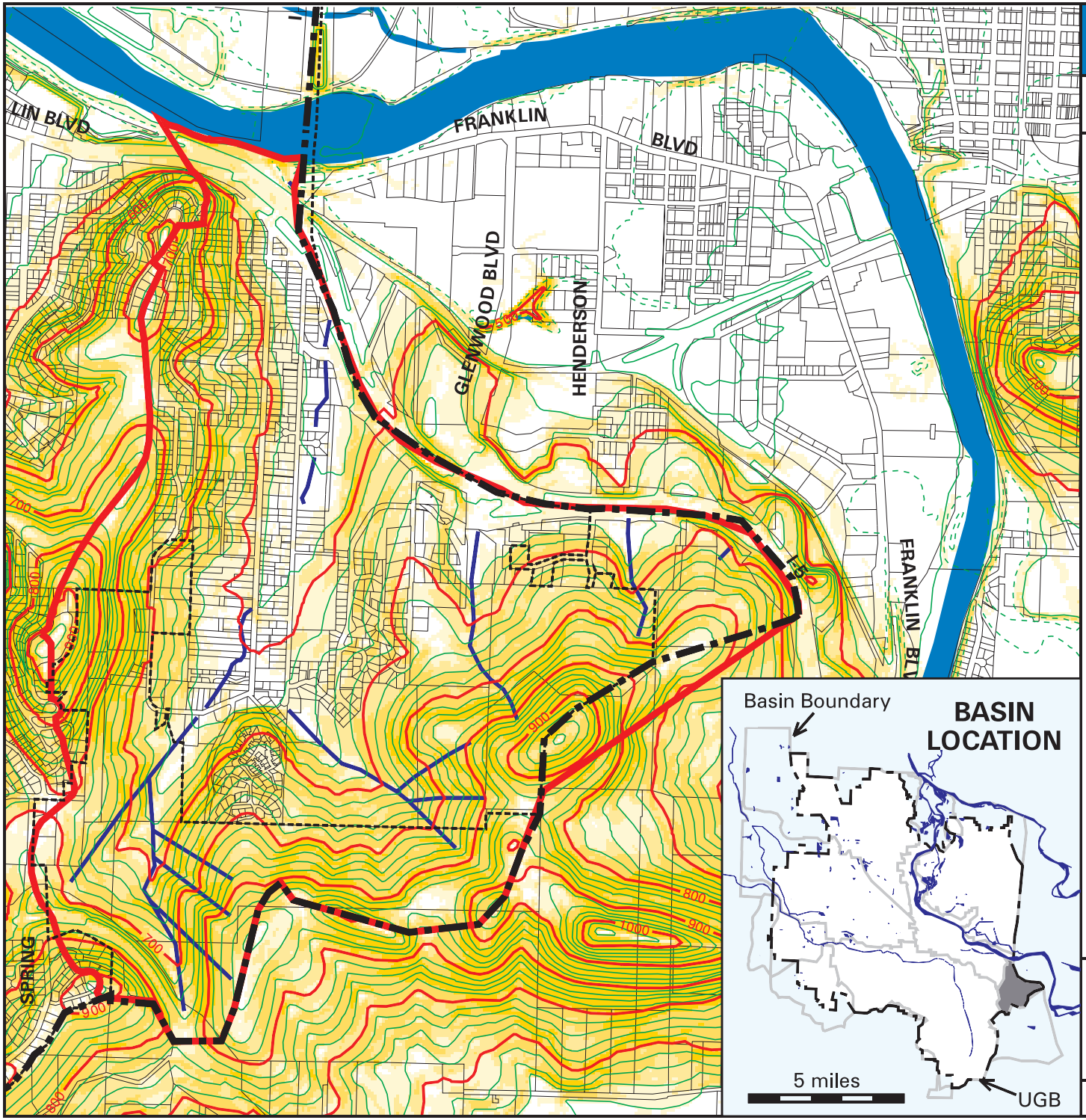
0 1500 ft

N

Map Produced by LCOG 2/99

Map based on imprecise source data, subject to change

MAP 3



Laurel Hill Basin

Slope and Topography *

L E G E N D

- 0 - 5% Slopes
- 5 - 10% Slopes
- 10 - 15% Slopes
- 15 - 25% Slopes
- > 25% Slopes
- Waterways and Ponds
- 100-foot contours
- 20-foot contours
- Intermediate contours
- Laurel Hill Basin Boundary
- Urban Growth Boundary
- Eugene City Limits
- Streams and Channels
- Metropolitan Plan Boundary

* Slopes and Contours derived from enhanced 10-meter USGS Digital Elevation Models (DEMs)

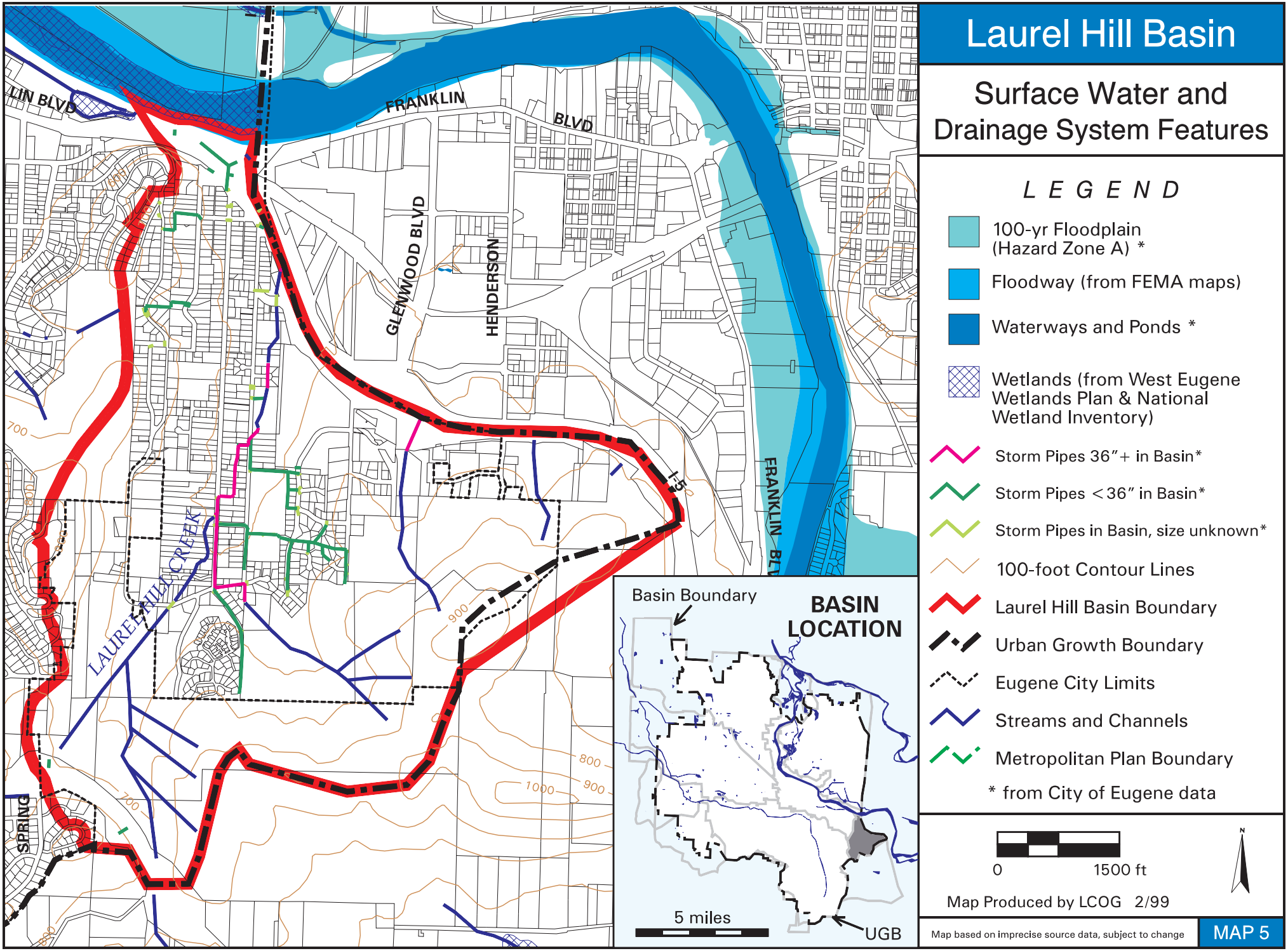
0 1500 ft

N

Map Produced by LCOG 2/99

Map based on imprecise source data, subject to change

MAP 4



Laurel Hill Basin

Surface Water and Drainage System Features

L E G E N D

- 100-yr Floodplain (Hazard Zone A) *
- Floodway (from FEMA maps)
- Waterways and Ponds *
- Wetlands (from West Eugene Wetlands Plan & National Wetland Inventory)
- Storm Pipes 36"+ in Basin*
- Storm Pipes <36" in Basin*
- Storm Pipes in Basin, size unknown*
- 100-foot Contour Lines
- Laurel Hill Basin Boundary
- Urban Growth Boundary
- Eugene City Limits
- Streams and Channels
- Metropolitan Plan Boundary

* from City of Eugene data

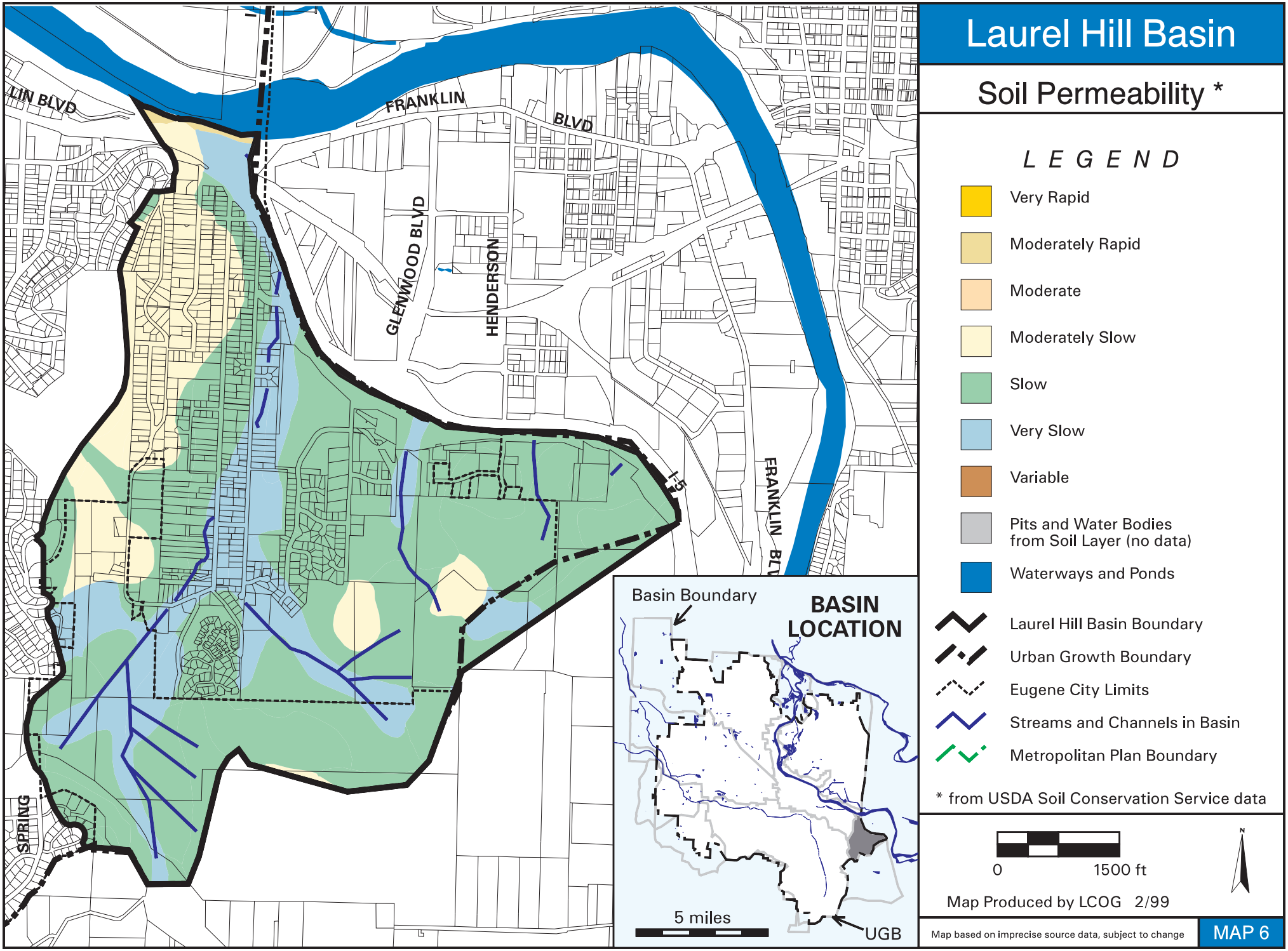
0 1500 ft

N

Map Produced by LCOG 2/99

Map based on imprecise source data, subject to change

MAP 5



Laurel Hill Basin

Soil Permeability *

L E G E N D

- Very Rapid
- Moderately Rapid
- Moderate
- Moderately Slow
- Slow
- Very Slow
- Variable
- Pits and Water Bodies from Soil Layer (no data)
- Waterways and Ponds
- Laurel Hill Basin Boundary
- Urban Growth Boundary
- Eugene City Limits
- Streams and Channels in Basin
- Metropolitan Plan Boundary

* from USDA Soil Conservation Service data

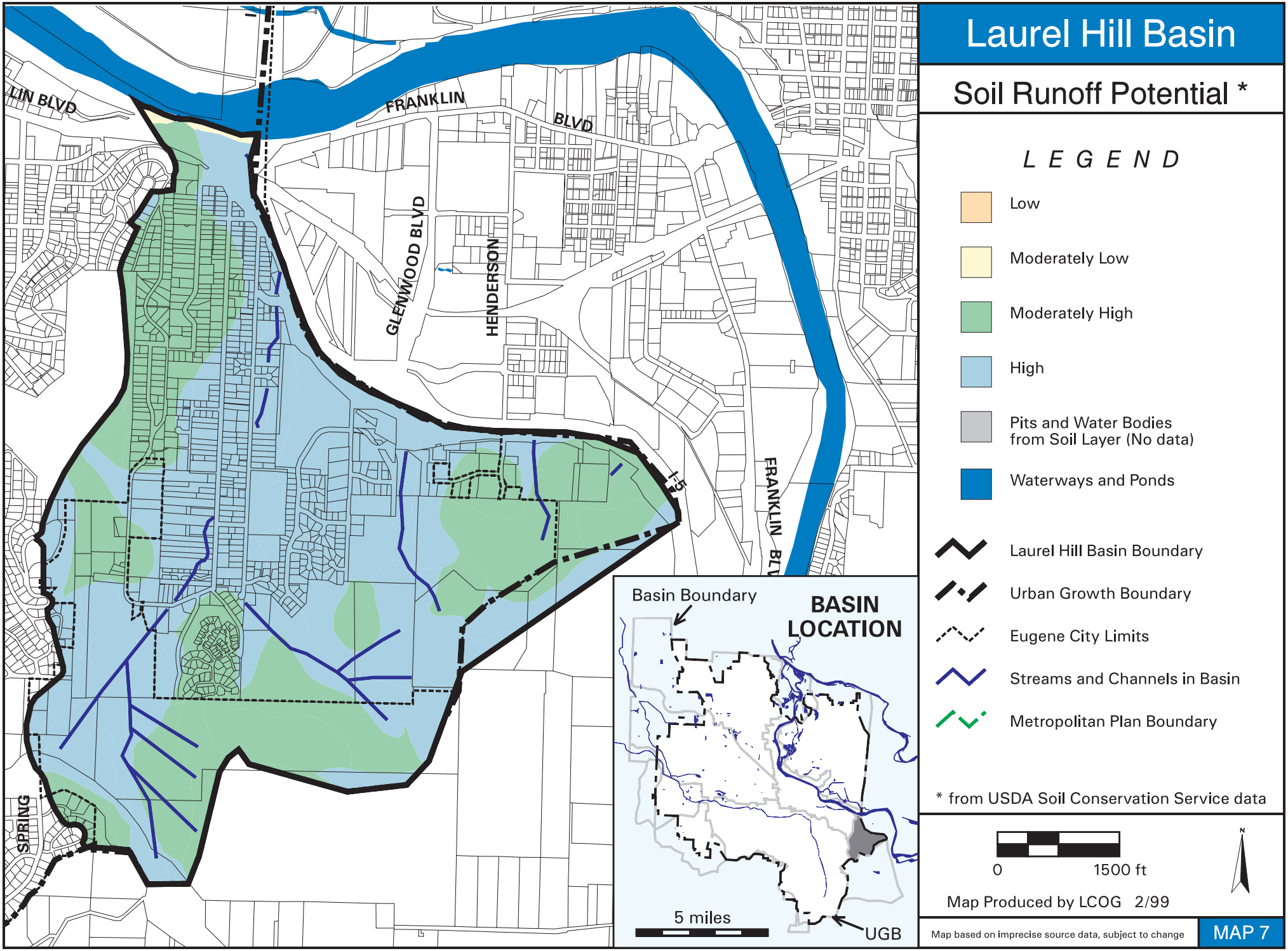
0 1500 ft

N

Map Produced by LCOG 2/99

Map based on imprecise source data, subject to change

MAP 6



Laurel Hill Basin

Soil Runoff Potential *

L E G E N D

- Low
- Moderately Low
- Moderately High
- High
- Pits and Water Bodies from Soil Layer (No data)
- Waterways and Ponds
- Laurel Hill Basin Boundary
- Urban Growth Boundary
- Eugene City Limits
- Streams and Channels in Basin
- Metropolitan Plan Boundary

* from USDA Soil Conservation Service data

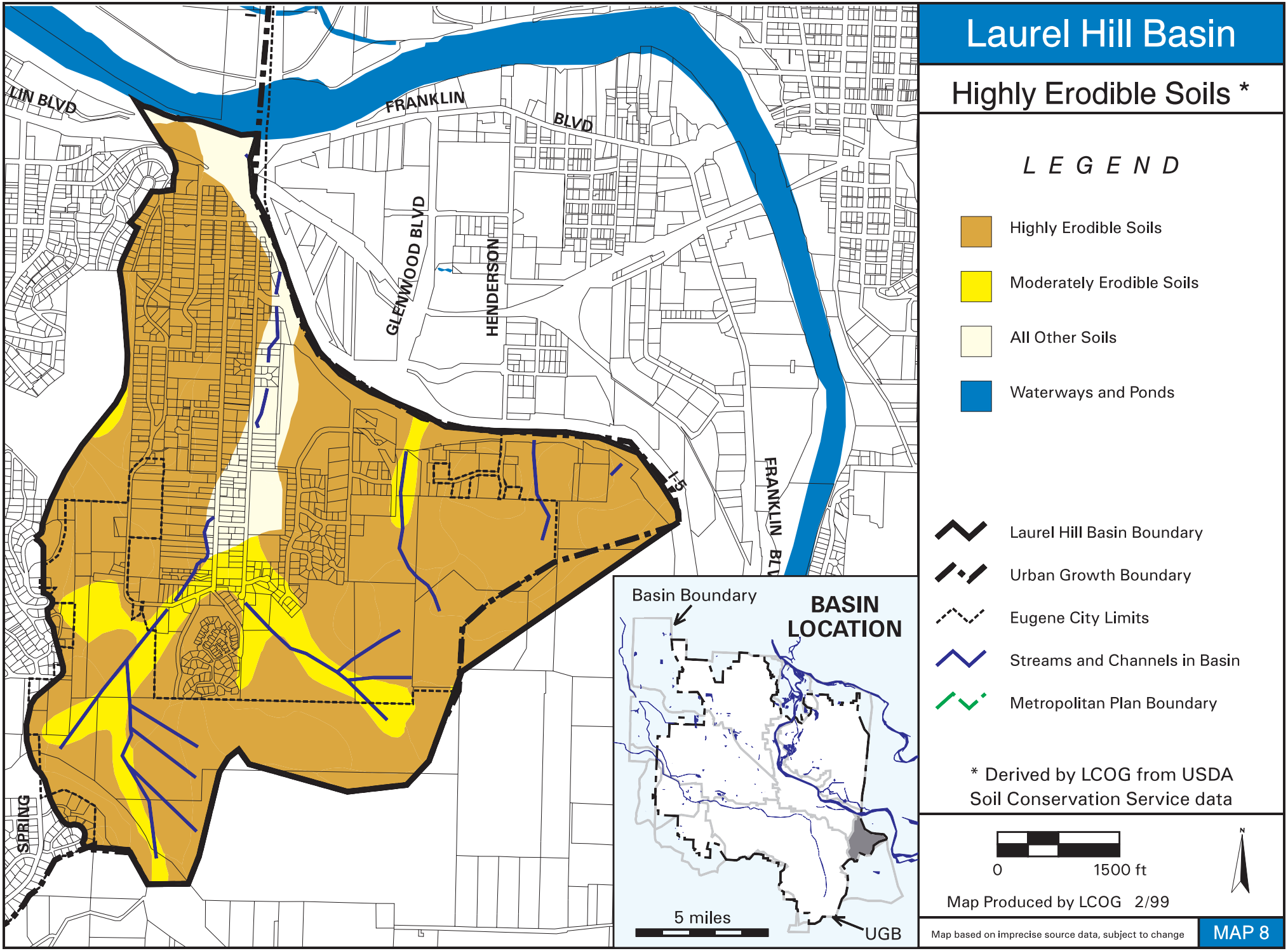
0 1500 ft

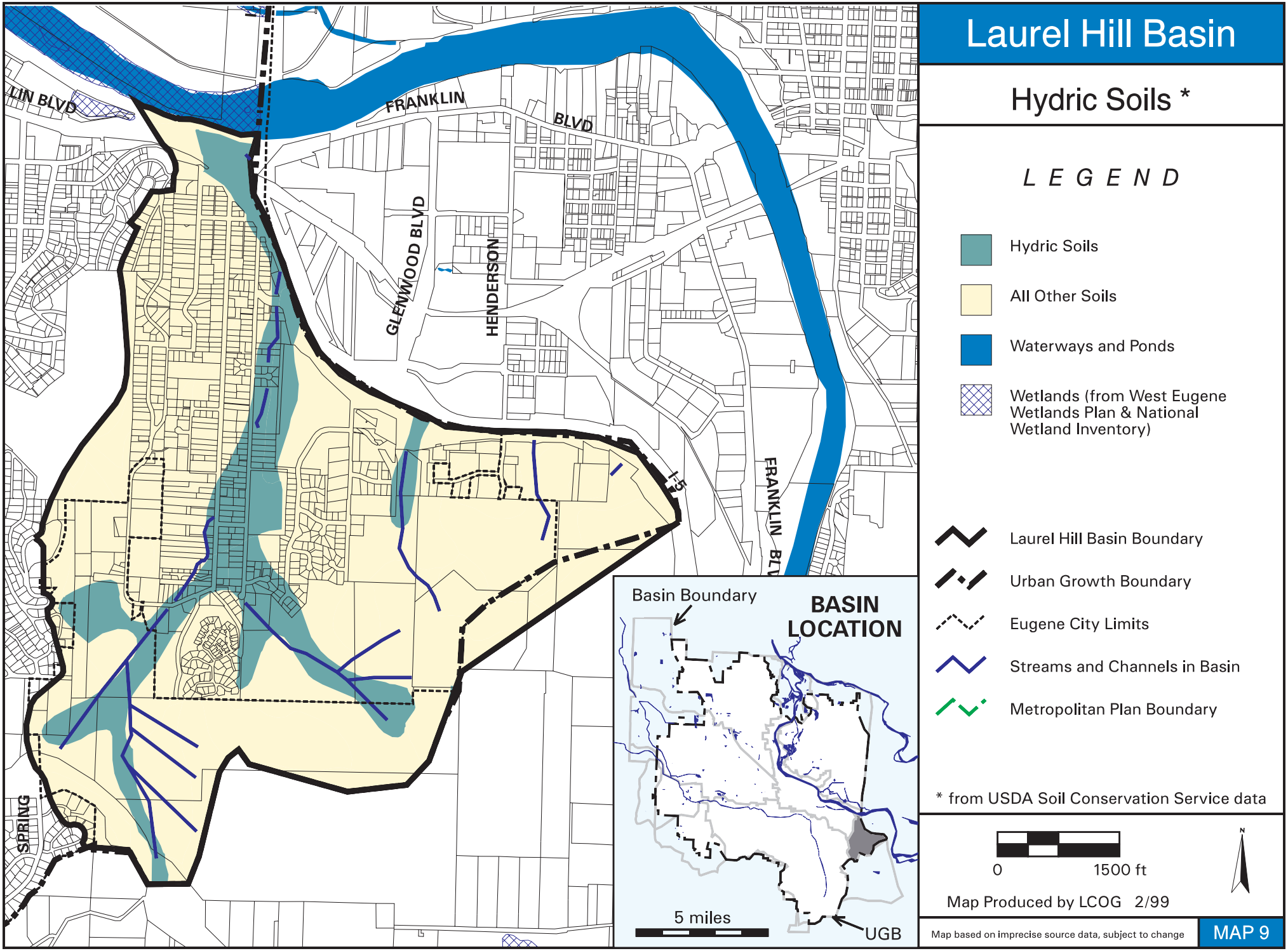
N

Map Produced by LCOG 2/99

Map based on imprecise source data, subject to change

MAP 7


Laurel Hill Basin
Highly Erodible Soils *
LEGEND
Highly Erodible Soils
Moderately Erodible Soils
All Other Soils
Waterways and Ponds
Laurel Hill Basin Boundary
Urban Growth Boundary
Eugene City Limits
Streams and Channels in Basin
Metropolitan Plan Boundary
* Derived by LCOG from USDA Soil Conservation Service data
0
1500 ft
N
Map Produced by LCOG 2/99
Map based on imprecise source data, subject to change
MAP 8
BASIN LOCATION
Basin Boundary
5 miles
UGB
FRANKLIN BLVD
GLENWOOD BLVD
HENDERSON
I-5
SPRING



Laurel Hill Basin

Hydric Soils *

L E G E N D

- Hydric Soils
- All Other Soils
- Waterways and Ponds
- Wetlands (from West Eugene Wetlands Plan & National Wetland Inventory)
- Laurel Hill Basin Boundary
- Urban Growth Boundary
- Eugene City Limits
- Streams and Channels in Basin
- Metropolitan Plan Boundary

* from USDA Soil Conservation Service data

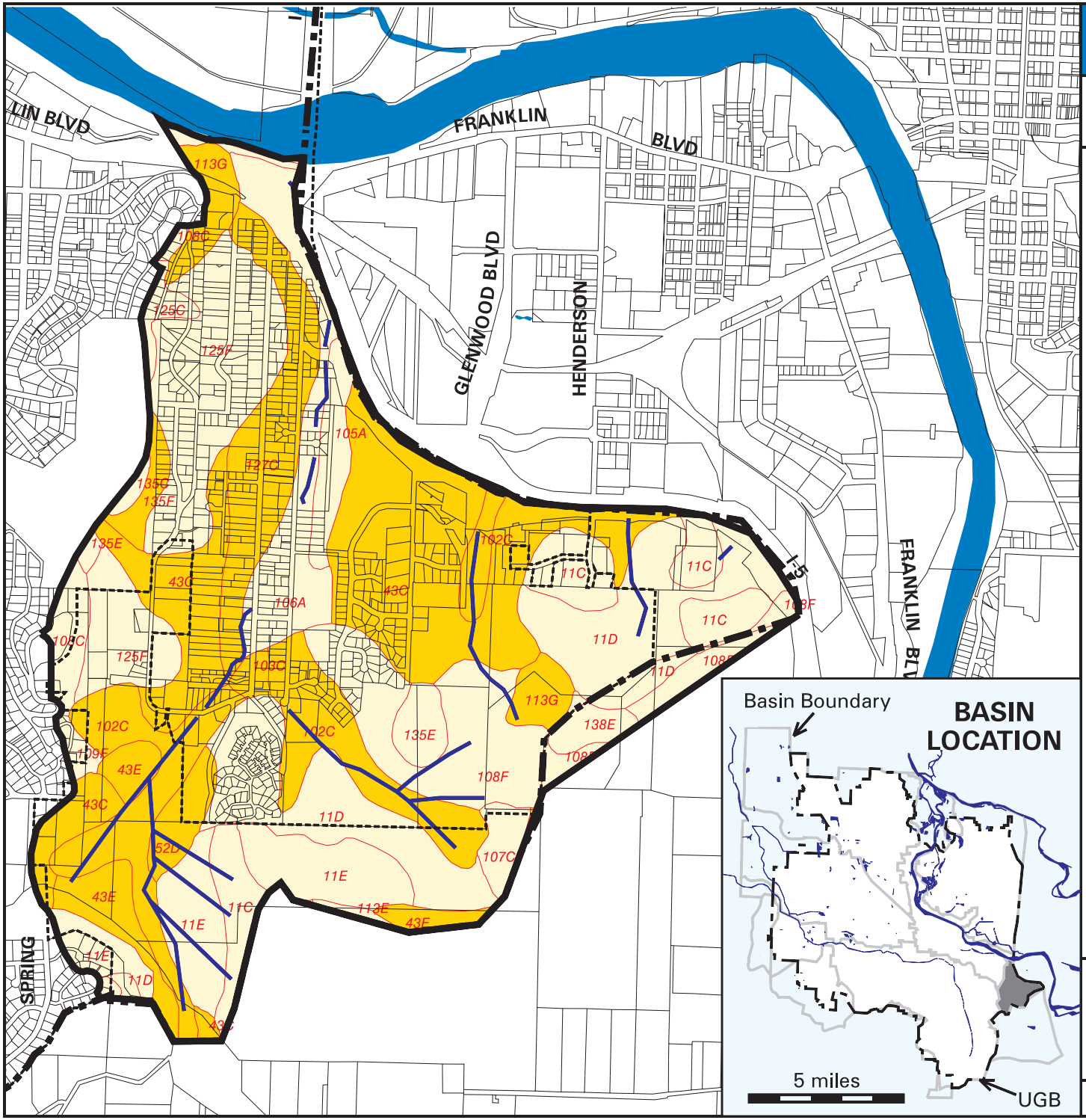
0 1500 ft

N

Map Produced by LCOG 2/99

Map based on imprecise source data, subject to change

MAP 9



Laurel Hill Basin

Soil Types *

L E G E N D

Soils subject to slumping

All other soil types

11C,BELLPINE SILTY CLAY LOAM,3 TO 12% SLOPES
11D,BELLPINE SILTY CLAY LOAM,12 TO 20% SLOPES
11E,BELLPINE SILTY CLAY LOAM,20 TO 30% SLOPES
22,CAMAS GRAVELLY SANDY LOAM,OCCASIONALLY FLOODED
23,CAMAS-URBAN LAND COMPLEX
26,CHEHALIS SILTY CLAY LOAM,OCCASIONALLY FLOODED
27,CHEHALIS-URBAN LAND COMPLEX
30,CLOQUATO-URBAN LAND COMPLEX
43C,DIXONVILLE-PHILOMATH-HAZELAIR COMPLEX,3 TO 12% SLP
43E,DIXONVILLE-PHILOMATH-HAZELAIR COMPLEX,12 TO 35% SLP
52D,HAZELAIR SILTY CLAY LOAM,7 TO 20% SLOPES
95,NEWBERG FINE SANDY LOAM
97,NEWBERG-URBAN LAND COMPLEX
102C,PANTHER SILTY CLAY LOAM,2 TO 12% SLOPES
103C,PANTHER-URBAN LAND COMPLEX,2 TO 12% SLOPES
105A,PENGRA SILT LOAM,1 TO 4% SLOPES
106A,PENGRA-URBAN LAND COMPLEX,1 TO 4% SLOPES
107C,PHILOMATH SILTY CLAY,3 TO 12% SLOPES
108C,PHILOMATH COBBLY SILTY CLAY,3 TO 12% SLOPES
108F,PHILOMATH COBBLY SILTY CLAY,12 TO 45% SLOPES
109F,PHILOMATH-URBAN LAND COMPLEX,12 TO 45% SLOPES
113E,RITNER COBBLY SILTY CLAY LOAM,12 TO 30% SLOPES
113G,RITNER COBBLY SILTY CLAY LOAM,30 TO 60% SLOPES
125C,STEIWER LOAM,3 TO 12% SLOPES
125F,STEIWER LOAM,20 TO 50% SLOPES
127C,URBAN LAND-HAZELAIR-DIXONVILLE COMPLEX,3 TO 12% SLP
135C,WILLAKENZIE CLAY LOAM,2 TO 12% SLOPES
135E,WILLAKENZIE CLAY LOAM,20 TO 30% SLOPES
135F,WILLAKENZIE CLAY LOAM,30 TO 50% SLOPES
138E,WITZEL VERY COBBLY LOAM,3 TO 30% SLOPES
W,WATER

Waterways and Ponds

Laurel Hill Basin Boundary

Urban Growth Boundary

Eugene City Limits

Streams and Channels in Basin

Metropolitan Plan Boundary

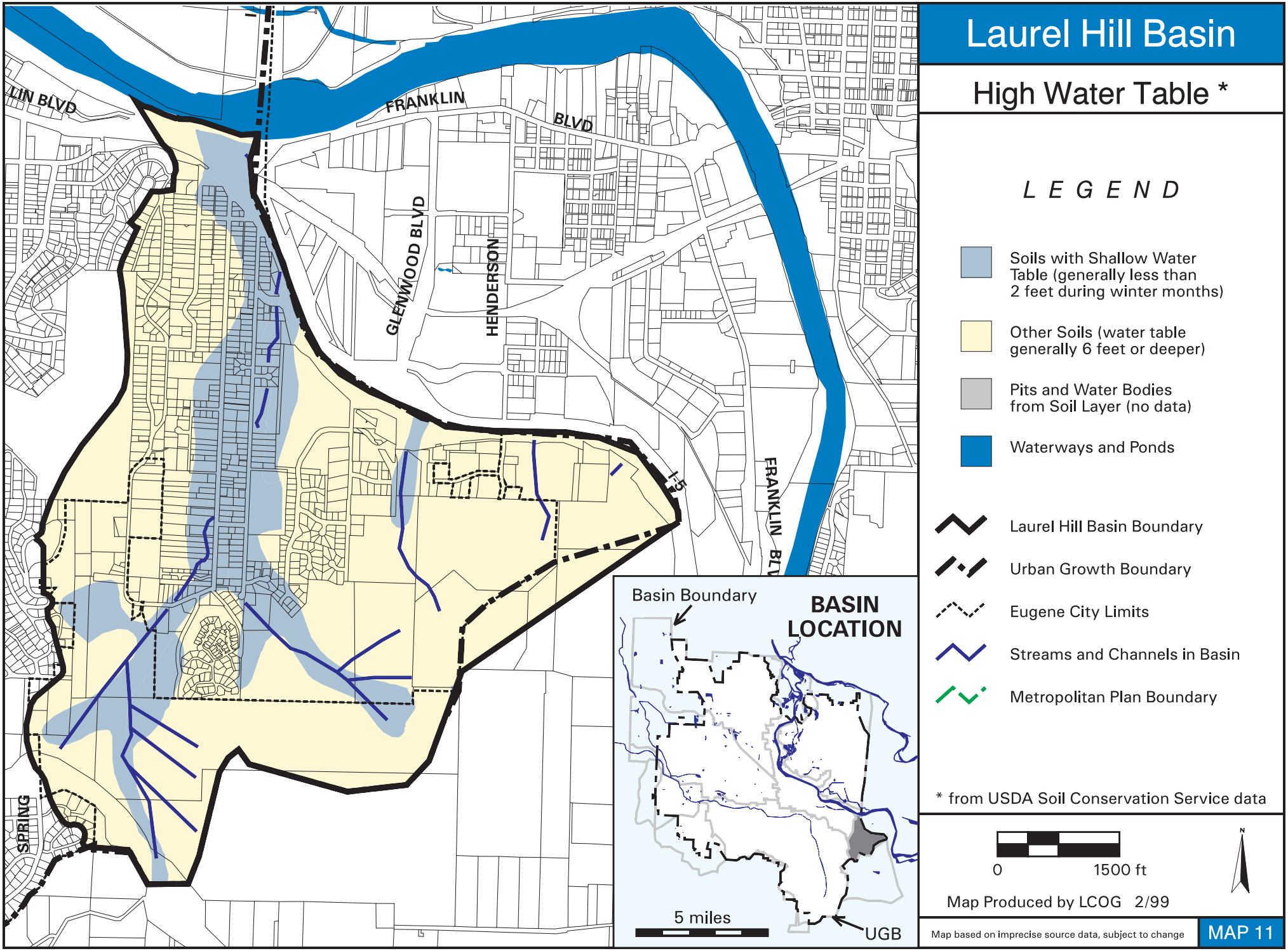
* from USDA Soil Conservation Service data

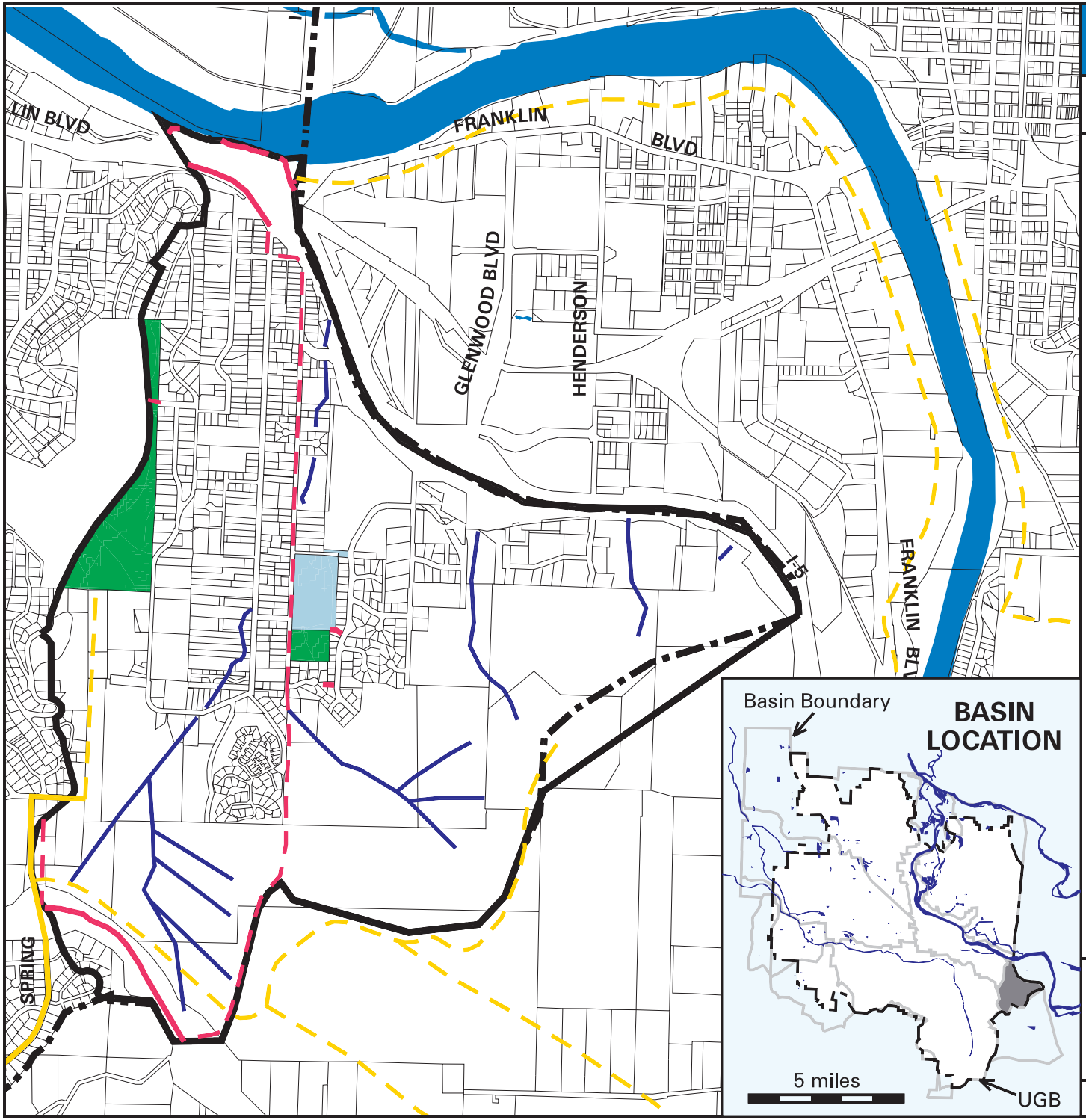
0 1500 ft

Map Produced by LCOG 2/99

Map based on imprecise source data, subject to change

MAP 10


LIN BLVD
FRANKLIN
BLVD
GLENWOOD BLVD
HENDERSON
I-5
FRANKLIN BLV
SPRING
Basin Boundary
BASIN LOCATION
5 miles
UGB
Laurel Hill Basin
High Water Table *
L E G E N D
Soils with Shallow Water Table (generally less than 2 feet during winter months)
Other Soils (water table generally 6 feet or deeper)
Pits and Water Bodies from Soil Layer (no data)
Waterways and Ponds
Laurel Hill Basin Boundary
Urban Growth Boundary
Eugene City Limits
Streams and Channels in Basin
Metropolitan Plan Boundary
* from USDA Soil Conservation Service data
0
1500 ft
N
Map Produced by LCOG 2/99
Map based on imprecise source data, subject to change
MAP 11



Laurel Hill Basin

Parks, Rec. & Ed. Facilities

L E G E N D

EXISTING

- Parks
- Schools (Pub. & Pvt.)
- Golf Courses
- Bikeways in Basin
- Trails

FUTURE

- Parks in Basin *
- Bikeways in Basin **
- Trails *
- Waterways and Ponds
- Laurel Hill Basin Boundary
- Urban Growth Boundary
- Streams and Channels in Basin

* Eugene Parks & Recreation Plan, 1989; Parks, Open Spaces, and Natural Areas Study, 1996.

** Draft TransPlan Update, 1996.

0 1500 ft

N

Map Produced by LCOG 2/99

Map based on imprecise source data, subject to change

MAP 12

To identify flooding problems and opportunities, a flood control evaluation was completed for the drainage system in the Laurel Hill basin that is described in Section 2.5 and illustrated on Map 5. Section 3.1 describes the extents of the drainage system evaluated, the process used to identify flooding problems and a general description of each problem. Section 3.2 describes the capital project alternatives and development standard alternatives that were proposed to address the flooding problems. Section 3.3 describes the selected flood control alternatives.

3.1 Evaluation of Flood Control Under Existing and Expected Future Conditions

To develop a flood control strategy for the Laurel Hill basin, a computer model was used to evaluate hydrologic/hydraulic conditions of the public storm drainage system. The storm system was evaluated under both existing and buildout land use conditions using XP-SWMM model software. The computer model for the Laurel Hill basin includes the major drainage channel (i.e., Laurel Hill Creek) that runs parallel to Riverview Street and Augusta Street from Floral Hill Drive to its confluence with the Willamette River near the I-5 Bridge. The major hydraulic elements from the area east of I-5, located in the City of Springfield between I-5 and the Willamette River are also included in the model as this portion of the drainage system was under the jurisdiction of the City of Eugene when this project was initiated. This eastern stream joins the main channel downstream of the I-5 crossing before it discharges to the Willamette River. As jurisdiction for the eastern system was transferred to the City of Springfield midway through the development of this plan, this document includes results from the Laurel Hill Creek section of the model only (i.e., the portion of the model that is within the City of Eugene limits). Model input data for the eastern system (Glenwood area) are provided for informational purposes only.

In addition to the major drainage channels, the model evaluation concentrated on the significant components of the public drainage system; typically all storm sewer pipes with a diameter of 36" or greater, and major roadway crossings and open waterways. The storm system was evaluated under both existing and buildout land use conditions. The Laurel Hill basin drainage system is shown on Figures 3-2 through 3-3. Figure 3-1 is an index map that illustrates the relative locations of Figures 3-2 through 3-3. Modeled drainage segments and locations of the proposed capital projects are also illustrated on Figures 3-2 through 3-3.

The City-wide summary in Volume I contains detailed information regarding the process and sources of information that were used for identifying flooding problems and opportunities. Chapter 3 of Volume I specifically includes detailed information regarding the following:

- Model selection process.
- Sources of model input data.
- Model calibration.
- Design storm selection process.

This section of the Laurel Hill report provides a summary of the basin specific hydrologic and hydraulic data used in the models and a summary of the basin specific model results with respect to flood control.

3.1.1 Hydrologic Data

The Laurel Hill basin (including the eastern system in Springfield) was subdivided into 2 major subbasins, the Riverview-Augusta major subbasin and the Glenwood major subbasin. The major basin boundaries are presented on Figure 3-1. The 2 major subbasins were further divided into 22 subbasins, with 12 subbasins in the Riverview-Augusta major subbasin and 10 subbasins in the Glenwood major subbasin. Again, most of the subbasins in the Glenwood major subbasin are now located in the City of Springfield. The subbasin boundaries presented on Figures 3-2 through 3-3 were delineated based on both topography and the storm drainage system layout. The subbasin boundaries were digitized into the City's GIS so that hydrologic data could be generated for each subbasin.

Seven-character names were assigned to each subbasin. The first two characters represent a two-letter abbreviation for the major basin; in this case LH for Laurel Hill. The second two characters represent a two-letter abbreviation for the major subbasin. The names for the 2 major subbasins in the Laurel Hill basin are defined as follows:

GL = Glenwood Major Subbasin
RA = Riverview-Augusta Major Subbasin

The last three characters of the subbasin name consist of numbers, starting with 010 and increasing in increments of 10 for each additional subbasin. For example, the first two subbasins in the Riverview-Augusta subbasin of the Laurel Hill basin are LHRA10 and LHRA020. In addition, each subbasin has an associated inlet node number. The hydrologic component (i.e., RUNOFF block) of XP-SWMM was used to generate a stormwater runoff hydrograph for each subbasin. This hydrograph was routed by the hydraulic component (i.e., the EXTRAN block) of XP-SWMM to model the storm drainage system. The subbasin inlet node is the point where the subbasin hydrograph enters the storm drainage system for routing.

The following parameters were required for each subbasin in the hydrology component of XP-SWMM.

1. Subbasin name or number.
2. Channel or pipe inlet node number into the storm drainage system.
3. Subbasin area (acres).
4. Hydraulically connected impervious percentage for both existing and future land use scenarios (percent).
5. Average ground slope (dimensionless, ft/ft).
6. Subbasin width (feet).
7. Manning's roughness coefficient for impervious areas.
8. Manning's roughness coefficient for pervious areas.
9. Depression storage for impervious areas (inches of water over subbasin).
10. Depression storage for pervious areas (inches of water over subbasin).
11. Green-Ampt soil infiltration parameters: average capillary suction (inches) saturated hydraulic conductivity (inches/hour), and initial moisture deficit (volume air/volume voids).

Table 3-2 (provided at the back of this section) provides the major hydrologic information for each of the Laurel Hill subbasins. Specifically, the table provides the information for parameters 1 – 5 listed above in addition to the expected increase in impervious surface under future conditions. More detailed hydrologic information, including information described for parameters 1 – 11, can be found in Appendix E of Volume I. Table 3-2 also provides peak runoff discharge information for each modeled subbasin.

3.1.2 Laurel Hill Basin Hydraulic Data

The primary purpose of the modeling was to evaluate the capacity of the storm drainage system. The evaluation of the storm drainage system included a hydraulic analysis of the major storm pipes, culverts, and open channels which convey stormwater discharges. Information for the piped system was obtained from the City's GIS. Information for the culverts and open channel segments was mainly based on field survey information. In order to analyze the hydraulic capacity of the storm drainage system, the hydraulic component of XP-SWMM required the following parameters for each pipe, culvert or open channel section:

1. Conduit name.
2. Upstream node number.
3. Downstream node number.
4. Conduit size (diameter for pipes and culverts; and cross-section dimensions for open channels).
5. Conduit length.
6. Conduit material for pipes and culverts.
7. Upstream and downstream invert elevations.
8. Upstream and downstream ground surface elevations.
9. Channel roughness coefficients (for open channels).

For the Laurel Hill basin, the model was used to evaluate the capacity of approximately 76 open waterway and pipe segments under existing and future land use conditions. Table 3-3 (provided at the back of this section) provides the major hydraulic information for each of the modeled conduits located within the City of Eugene limits. Specifically, the table provides the information for parameters 1 – 6 listed above in addition to the drainage area for each conduit, the relevant design storm, and the model results for the relevant design storm. Model results are presented in terms of peak flows and maximum water surface elevations. The results for all storm events that were routed through the models (i.e., 10-year, 25-year, 50-year and 100-year storms) can be found in an appendix to Volume I.

3.1.3 Flooding Problems Identified by the Model

This section provides a general description of model-identified flooding problems. The model results are summarized in Table 3-3 which includes peak flows and water surface elevations for the relevant design storm under both existing and buildout conditions. The last column in the table indicates which conduits are expected to be deficient and when (i.e., under existing and/or future land use conditions). For pipe segments and roadway crossings, surcharging was considered to be acceptable and flooding problems were only identified if the models showed

water getting out of the system and into the streets. For open waterways, deficiencies were identified when the depth of the design flow exceeded the tops of the channel banks.

In general, very few flooding problems on the major system were identified in the Laurel Hill basin. Specifically, no flooding problems are expected to occur in the drainage system upstream of the confluence with the major system in the Glenwood major subbasin downstream of the I-5 crossing. Six out of seven segments downstream of the confluence were identified as deficient under the 25-year design storm. Five of these six segments are expected to be deficient under existing land use conditions. The flooding problems are caused by backup conditions from high water levels in the Willamette River. These problems are described in more detail in Section 3.2 in association with the proposed capital project to address the problem.

NOTE: Initial model results from this basin predicted flooding problems to occur in upstream areas of the Laurel Hill Creek. Specifically 10 segments were expected to be deficient under existing conditions and 4 additional segments were expected to be deficient under future conditions. A preliminary capital project was proposed to address these problems. As the problems were considered to be high priority, the capital project has already been designed and constructed as of the date of this basin plan. The capital project consists of a piped bypass system that runs parallel to Riverview and Augusta Streets and is described in Section 3.2 (capital project LH06C). The flooding problems identified above are based on the Laurel Hill basin model that incorporates the newly constructed Riverview-Augusta piped bypass system. The implementation of this capital project eliminates the previously identified flooding problems in the Laurel Hill Creek upstream of the I-5 crossing.

3.1.4 Other Identified Flooding Related Problems

In addition to flooding problems identified as a result of system modeling, other flooding-related problems have been identified through field observations of maintenance staff. In general, these problems include the build-up of vegetation, sediment and/or debris in culverts and adjacent open waterways in various locations of the basin. This has caused or is expected to cause localized flooding problems. One specific capacity deficiency has been observed in a drainage system that is located between Riverview and Augusta just north of 19th Ave. Also lack of a defined/planned storm drainage system has caused localized flooding problems in some residential areas in the vicinity of Riverview Street and Augusta Street. The pipe and open drainage system in this area has been constructed on a piece-meal basis leading to an inefficient and problematic drainage system. Each of these problems is described in more detail in Section 3.2 in association with the proposed capital project to address the problem.

3.2 Development of the Flood Control Strategy

As shown in the Stormwater Basin Planning Project process flow chart in Figure 1-1, Step 1 included a compilation of basin characteristics. These basin characteristics are summarized in Section 2.0 of this document. Step 2 in the process included problem identification under both existing and buildout land use conditions. The evaluation was focused on the major components of the public drainage system and the expectation was that the system would convey the design storm associated with drainage area. The results of this step for flood control are provided in

Section 3.1 above. The next step included the development of potential stormwater management tools (i.e., capital projects or development standards) to address the identified problems. These stormwater management tools were developed as a result of an all-day basin assessment meeting. The meeting was attended by a large multi-disciplinary group of people including staff with experience in water quality, engineering, maintenance, natural resources, planning, and groundwater resources. Preliminary ideas were developed based on the goals and objectives of the project. This section describes the capital projects and flood control development standards that were proposed to address the identified flooding problems.

3.2.1 Capital Project Alternatives

All existing and future flooding problems identified through modeling and proposed capital projects to address these problems are presented in Table 3-1. The locations of these proposed capital projects are illustrated on Figures 3-2 through 3-3. As shown in Table 3-1, capital project LH06C was selected to address previously identified flooding problems in the Laurel Hill basin. Table 3-1 also lists when the flooding problem is expected to occur (i.e., under existing or future conditions). Note that the flooding problems listed in Table 3-1 are associated with segment names. To locate a segment, one should first look up the upstream node and downstream node associated with the segment in Table 3-3, then pinpoint the segment on Figures 3-2 through 3-3. Since this capital project has been constructed and incorporated into the basin model, previously identified flooding problems in the drainage system between Riverview and Augusta are no longer expected to present flooding problems.

Table 3-1
Capacity Deficiencies Identified Through Modeling and Proposed Capital Projects to Address Them

Expected Flooding Problems		Selected Flood Control Capital Project
Segment Name	**When Deficient**	
LHLH010A LHLH010C LHLH010D1 LHLH010D2 LHLH010E LHLH010F LHLH020A	25-yr existing 25-yr existing 25-yr existing 25-yr existing 25-yr existing 25-yr future 25-yr existing	**None –** These segments are flooded due to high water levels in the Willamette River, not as a result of insufficient capacity for runoff from upstream drainage areas. The City of Eugene does not have the ability to control high water levels in the Willamette River. In addition, flooding of these segments is not expected to result in property damage. For these reasons, a capital project was not proposed to address these problems.
A series of 14 previously model-identified flooding problems in Laurel Hill Creek upstream of the I-5 crossing.		**LH06C**- This capital project included the construction of a piped flow bypass system to route flows from the existing Floral Hill drainage system to Riverview Street and to modify the existing drainage system at Riverview/Augusta in its current alignment. This capital project was considered to be high priority and has been constructed as of the date of this plan. The location of the capital project is illustrated on Figures 3-2 and 3-3.

In addition to the flooding problems identified as a result of basin modeling, the following capital projects were proposed to address other observed flooding-related problems.

LH07- Minor System between Riverview and Augusta – A flooding problem was observed in the drainage area between Riverview and Augusta, north of 19th Avenue. The observed flooding problem at this location is due to lack of capacity in the existing pipes. In order to eliminate this problem, construction of a 450 foot 24" pipe segment that runs north under the west shoulder of Riverview Street to the west side of Augusta Road is proposed.

LH08 – Riverview/Augusta Minor Storm Drainage System Plan – Localized flooding problems have been observed in residential areas located between the western basin boundary and Riverview Street. These observed flooding problems are due to lack of a storm drainage system plan for this area. Pipes and open drainages have been constructed on a piece-meal basis leading to an inefficient and problematic system. This capital project includes developing a comprehensive storm drainage system plan for this area.

3.2.2 Development Standard Alternatives

In addition to capital project alternatives, development standard alternatives were evaluated for addressing those problems that are expected to occur as a result of future buildout conditions. The two flood control development standards that were evaluated for the Laurel Hill basin were as follows:

- *Require post-development peak flows to equal pre-development peak flows* – This standard would require developers to ensure that post-development peak flow rates would not exceed pre-development peak flow rates from their sites for the flood control design storm of concern. This requirement could be met through the use of reduced effective impervious areas, infiltration, or detention.

- *Require post-development peak flows to equal available capacity* – This standard would require developers to ensure that post-development peak flow rates would not exceed the design capacity of the existing public stormwater conveyance system that would be accepting these flows. This standard would allow developers to take advantage of available surplus capacity where it exists in the public system. This standard would require that the City conduct hydraulic analyses in order to provide information to developers regarding available capacity. This requirement could also be met through the use of reduced effective impervious areas, infiltration, or detention. This standard is currently required where there are no model results and capital projects are not proposed.

3.3 Selected Alternatives

Capital projects were selected to address all of the flooding problems expected to occur under existing conditions. When several capital project options were proposed for addressing the same flooding problem, one capital project option was chosen as a result of a capital project selection and prioritization process that was implemented for this project (see Section 4.0 and Appendix J of Volume I).

For addressing flooding problems expected to occur under future buildout conditions, the capital project and development standards alternatives were compared in terms of both costs and

effectiveness. For the Laurel Hill basin, the capital project alternatives were estimated to be more cost effective than the development standard alternatives for the following reasons:

- The majority of the flooding problems identified upstream of the east tributary in this basin were expected to occur under existing land use conditions as well as future land use conditions. Therefore, development standards alone would not be expected to resolve this problem and a capital project was required at this location regardless of which approach was taken.
- The flooding problems downstream of the east tributary are expected as a result of high water levels in the Willamette River. Development standards would not be expected to resolve these problems.
- An issue associated with new development is adverse impacts to waterways from the increase in volume of stormwater discharged to them. Increased flow volumes can result in erosion, downcutting and riparian habitat degradation. Detention systems designed solely for flood control would not address this issue of hydrologic (volume) impacts due to new development. Standards to control flows from new development in headwater area are being proposed as a part of the Water Quality Strategy. See Section 4.2.2 for more information about headwater flow controls.

In summary, the selected flood control alternatives to address the expected flooding problems under both existing and future conditions for this basin include each of the capital projects listed below. For more detail regarding each of these projects, capital project fact sheets are provided in the Appendix. The full range of flood control, water quality and natural resource capital projects are listed in Section 6.3 and shown on Figures 3-2 through 3-3.

- **Capital Project LH06C – Riverview/Augusta Piped Bypass and System Improvements:** This capital project has been constructed and includes the following components:
  - A piped bypass to route excess flows from the existing Floral Hill drainage system to Riverview Street.
  - An approximately 1,800 foot long 36" diameter parallel pipe system along Augusta Street from the south end of Augusta to the point where the existing system crosses Augusta Street.
  - An approximately 1,800 foot long 36" diameter parallel pipe system along Augusta Street from the point where the existing system crosses Augusta Street to the upstream end of the culvert crossing at Laurel Hill Drive.

- **Capital Project LH07 – Minor Drainage System Between Riverview and Augusta:** This capital projects consists of constructing an approximately 450 foot 24" pipe segment that runs north under the west shoulder of Riverview Street to the west side of Augusta Street.

- **Capital Project LH08 – Riverview/Augusta Drainage System Plan:** This capital project involves developing a detailed storm drainage system plan for the residential areas in the Laurel Hill basin between the western basin boundary and Riverview Street, including subbasins LHRA010, LHRA030, LHRA050 and LHRA060.

- **Multiple Objective Stormwater Capital Improvement Program:** In general, all stormwater capital projects, including water quality and natural resources projects, will consider flood control objectives when feasible and appropriate.

TABLE 3-2
MAJOR HYDROLOGIC INPUT/OUTPUT DATA FOR THE LAUREL HILL STORM DRAINAGE SYSTEM

Subbasin Name	Inlet Node	Subbasin Area (acres)	Impervious Area (%)					Average Subbasin Slope (ft/ft)	Subbasin Peak Flow (cfs) Existing Land Use Conditions				Subbasin Peak Flow (cfs) Future Land Use Conditions			
			Existing Land Use		Future Land Use		Increase [1] (%)		10-Year	25-Year-W[2]	25-Year-S[3]	50-Year	10-Year	25-Year-W[2]	25-Year-S[3]	50-Year
			Mapped	Effective	Mapped	Effective										
Laurel Hill - Glenwood																
LHGL-010	72143	20.7	71.1	60.4	71.1	60.4	0.0	0.300	8	9	12	24	8	9	12	24
LHGL-020[4]	72596	60.5	28.2	24.0	58.0	49.3	25.3	0.220	10	10	13	30	20	21	27	58
LHGL-030[4]	56387	35.9	36.5	31.0	62.9	53.5	22.5	0.160	7	8	10	21	13	13	18	36
LHGL-040[4]	72587	76.2	43.5	37.0	55.1	46.8	9.8	0.110	19	20	26	54	24	25	33	67
LHGL-050[4]	56390	69.4	49.4	42.0	64.0	54.4	12.4	0.250	39	38	34	91	41	41	42	103
LHGL-070[4]	72591	44.7	43.5	37.0	61.1	51.9	14.9	0.010	11	12	15	28	15	16	21	37
LHGL-080[4]	72589	101.7	27.1	23.0	54.0	45.9	22.9	0.230	16	16	22	44	31	33	43	87
LHGL-090	53485	89.4	8.2	7.0	48.9	41.6	34.6	0.220	34	29	11	47	45	45	39	99
LHGL-060[4] & LHGL-100[5]	72585	91.8	21.2	18.0	53.1	45.1	27.1	0.170	33	26	17	52	45	41	40	95
Laurel Hill - Riverview/Augusta																
LHRA-010	72139	39.5	37.6	32.0	45.1	38.3	6.3	0.230	8	10	12	28	10	12	14	32
LHRA-020[4]	56522	40.3	43.5	37.0	62.0	52.7	15.7	0.120	10	11	14	30	14	15	20	42
LHRA-030	53635	39.6	36.5	31.0	41.1	34.9	3.9	0.180	8	10	11	26	9	11	13	29
LHRA-040	75473	56.2	28.2	24.0	49.1	41.7	17.7	0.120	9	9	12	28	16	16	22	47
LHRA-050	53752	32.4	30.6	26.0	43.1	36.6	10.6	0.160	6	6	8	18	8	8	11	24
LHRA-051	75484	26.6	30.6	26.0	43.5	37.0	11.0	0.160	5	5	6	15	7	7	9	21
LHRA-060	53777	53.0	18.8	16.0	32.0	27.2	11.2	0.270	13	12	8	25	17	16	13	36
LHRA-070	53783	23.9	24.7	21.0	42.0	35.7	14.7	0.140	9	9	5	19	11	11	9	25
LHRA-071	75486	39.7	24.7	21.0	42.4	36.0	15.0	0.140	15	14	8	28	17	17	14	39
LHRA-080	51387	106.6	0.0	0.0	32.0	27.2	27.2	0.230	39	37	12	52	50	51	38	100
LHRA-090	53704	38.4	22.4	19.0	36.9	31.4	12.4	0.190	16	15	9	28	18	18	14	36
LHRA-100	99796	158.6	16.5	14.0	38.0	32.3	18.3	0.260	64	63	35	108	75	77	61	156

Note.
1. Increase in effective impervious percentage from existing land use conditions to future land use conditions.
2. W = Winter
3. S = Summer
4. The drainage system originally modeled for this basin included Laurel Hill (south of I-5) and Glenwood (north of I-5). The Glenwood area has since been transferred to the City of Springfield. Users of this Plan should contact the City of Springfield for drainage information in the Glenwood area. The information provided here is for context purposes only.
5. Subbasins LHGL-060 and LHGL-100 were combined in the model. Subbasin LHGL-060is under City of Springfield jurisdiction and subbasin LHGL-100 is under City of Eugene jurisdiction.

TABLE 3-3
HYDRAULIC PERFORMANCE OF THE LAUREL HILL STORM DRAINAGE SYSTEM

Segment ID	Node ID		Segment Size/Type	Segment Length (ft)	Design Storm	Peak Flow (cfs) For Design Storm		Water Surface Elevation For Design Storm (ft)				When Deficient
								Existing Land Use		Future Land Use		
	US	DS				Existing	Future	US	DS	US	DS	
Laurel Hill - Glenwood												
LHGL010A	72145	72146	Natural	150	25	119	134	425.1	425.0	425.2	425.0	25-yr Existing
LHGL010B	72144	72145	46" CSP culvert	120	25	119	134	427.8	425.1	428.7	425.2	
LHGL010BRD	72144	72145	Roadway	120		0	0	425.1	425.1	425.1	425.1	
LHGL010C	72143	72144	Natural	90	25	119	135	427.9	427.8	428.8	428.7	25-yr Existing
LHGL010D1	72142	72143	30" CMP culvert	70	25	34	34	429.3	427.9	429.5	428.8	25-yr Existing
LHGL010D2	72142	72143	30" CMP culvert	70	25	33	34	429.3	427.9	429.5	428.8	25-yr Existing
LHGL010DRD	72142	72143	Roadway	70		209	308	429.2	428.8	429.4	429.0	
LHGL010E	72597	72598	Natural	150	25	171	273	426.8	425.0	427.3	425.0	25-yr Existing
LHGL010F	72143	72597	Natural	340	25	171	273	427.9	426.8	428.8	427.3	25-yr Future
LHGL020A	72596	72142	Natural	110	25	285	402	429.8	429.3	430.2	429.5	25-yr Existing
LHGL020B	56526	72596	Natural	70	25	182	229	430.5	429.8	430.9	430.2	
LHGL020C	56525	56526	60" CMP culvert	79	25	182	229	433.5	430.7	435.2	431.1	
LHGL020CRD	56525	56526	Roadway	79		0	0	430.4	430.4	430.7	430.7	
Laurel Hill - Riverview/Augusta												
LHRA020A	72139	56525	Natural	350	25	182	230	434.9	433.5	435.6	435.2	
LHRA020B	72138	72139	6'x6' CSP culvert	68	25	174	221	436.1	434.9	436.9	435.6	
LHRA020BRD	72138	72139	Roadway	68		0	0	434.7	434.7	435.0	435.0	
LHRA020C	56522	72138	Natural	500	10	154	187	438.9	435.7	439.1	436.3	
LHRA020D	66993	56522	6'x6' CSP culvert	285	25	167	209	441.1	439.0	441.8	439.3	
LHRA020DRD	66993	56522	Roadway	285		0	0	438.9	438.9	439.1	439.1	
LHRA030A	53635	66993	Natural	230	10	147	176	444.4	440.8	444.8	441.3	
LHRA030B1	75474	53635	7'x4' CSP culverts	75	10	74	89	445.2	444.4	445.4	444.8	
LHRA030B2	75474	53635	7'x4' CSP culverts	75	10	66	80	445.2	444.4	445.4	444.8	
LHRA030BRD	75474	53635	Roadway	75		0	0	444.4	444.4	444.8	444.8	

TABLE 3-3 (continued)
HYDRAULIC PERFORMANCE OF THE LAUREL HILL STORM DRAINAGE SYSTEM

Segment ID	Node ID		Segment Size/Type	Segment Length (ft)	Design Storm	Peak Flow (cfs) For Design Storm		Water Surface Elevation For Design Storm (ft)				When Deficient
								Existing Land Use		Future Land Use		
	US	DS				Existing	Future	US	DS	US	DS	
LHRA040A	75473	75474	Natural	400	10	96	123	450.3	445.2	450.7	445.4	
LHRA040B	53662	75473	Natural	250	10	90	111	451.2	450.3	451.5	450.7	
LHRA040C	53649	53662	66" CSP culvert	350	10	90	112	454.9	451.2	455.1	451.5	
LHRA040CRD	53649	53662	Roadway	350		0	0	451.2	451.2	451.5	451.5	
LHRA040D	72125	53649	Natural	105	10	90	112	456.4	454.9	456.7	455.1	
LHRA040E	72124	72125	72" CMP culvert	40	10	90	112	457.2	456.4	457.7	456.7	
LHRA040ERD	72124	72125	Roadway	40		0	0	456.4	456.4	456.7	456.7	
LHRA040F	72123	72124	Natural	310	10	90	112	460.2	457.3	460.5	457.7	
LHRA040G	72122	72123	60" CMP culvert	30	10	90	111	461.2	460.2	461.7	460.5	
LHRA040GRD	72122	72123	Roadway	30		0	0	460.2	460.2	460.5	460.5	
LHRA040H	53655	72122	Natural	110	10	90	111	461.5	461.2	461.9	461.7	
LHRA040I	53755	53655	72" CMP	140	10	91	112	462.2	461.5	462.5	461.9	
LHRA040J1	75482	53755	36" CSP	95	10	36	48	463.3	462.2	463.6	462.5	
LHRA040J2	75482	53755	36" CSP	95	10	55	64	463.3	462.2	463.6	462.5	
LHRA040K	75475	75474	36" CSP	86	10	45	46	449.3	448.2	449.4	448.2	
LHRA040L	75476	75475	36" CSP	212	10	45	46	453.5	449.3	453.5	449.4	
LHRA040M	75477	75476	36" CSP	429	10	45	46	457.5	454.5	457.6	454.5	
LHRA040N	75478	75477	36" CSP	413	10	46	47	460.0	457.5	460.3	457.6	
LHRA040O	75479	75478	36" CSP	120	10	46	47	460.7	460.0	461.0	460.3	
LHRA040P	75480	75479	36" CSP	347	10	46	46	462.5	460.7	463.0	461.0	
LHRA040Q	75481	75480	36" CSP	150	10	46	47	463.3	462.5	463.6	463.0	
LHRA040R	53754	75481	36" CSP	43	10	46	47	463.7	463.4	463.9	463.6	
LHRA040S	53754	75482	65" CSP	189	10	37	48	463.7	463.3	463.9	463.6	
LHRA050A1	53753	53754	36" CSP	45	10	42	47	464.0	463.7	464.3	463.9	
LHRA050A2	53753	53754	36" CSP	45	10	42	47	464.0	463.7	464.3	463.9	
LHRA050ARD	53753	53754	Roadway	45		0	0	463.7	463.7	463.9	463.9	
LHRA050B	53752	53753	65" CMP	189	10	83	95	465.4	464.0	465.7	464.3	
LHRA050C	66483	53752	48" CSP	667	10	78	90	470.0	465.4	470.2	465.7	
LHRA050CRD	66483	53752	Roadway	667		0	0	465.4	465.4	465.7	465.7	
LHRA050D	53777	66483	42" CSP	193	10	79	91	474.0	470.0	474.2	470.2	

TABLE 3-3 (continued)
HYDRAULIC PERFORMANCE OF THE LAUREL HILL STORM DRAINAGE SYSTEM

Segment ID	Node ID		Segment Size/Type	Segment Length (ft)	Design Storm	Peak Flow (cfs) For Design Storm		Water Surface Elevation For Design Storm (ft)				When Deficient
								Existing Land Use		Future Land Use		
	US	DS				Existing	Future	US	DS	US	DS	
LHRA050DRD	53777	66483	Roadway	193		0	0	470.0	470.0	470.2	470.2	
LHRA050E	75483	75482	36" CSP	388	10	55	67	468.8	463.3	469.2	463.6	
LHRA050F	75484	75483	36" CSP	210	10	55	67	471.7	469.0	472.1	469.3	
LHRA050G	75485	75484	36" CSP	250	10	52	61	479.1	471.7	479.2	472.1	
LHRA060A	68603	53777	42" CSP	140	10	69	80	477.0	475.1	477.2	475.3	
LHRA060ARD	68603	53777	Roadway	140		0	0	474.0	474.0	474.2	474.2	
LHRA070A	53783	68603	42" CSP	160	10	54	58	478.5	477.0	478.6	477.2	
LHRA070ARD	53783	68603	Roadway	160		0	0	477.0	477.0	477.2	477.2	
LHRA070B	53704	53783	42" CSP	732	10	46	49	490.7	478.5	490.7	478.6	
LHRA070BRD	53704	53783	Roadway	732		0	0	478.5	478.5	478.6	478.6	
LHRA070C	53646	68603	42" CSP culvert	50	10	24	28	478.7	477.0	478.8	477.2	
LHRA070CRD	53646	68603	Roadway	50		0	0	477.0	477.0	477.2	477.2	
LHRA070D	72119	53646	Natural	160	10	24	28	483.7	478.7	483.8	478.8	
LHRA070E	72118	72119	36" CSP culvert	15	10	24	28	485.0	484.3	485.2	484.4	
LHRA070ERD	72118	72119	Roadway	15		0	0	483.7	483.7	483.8	483.8	
LHRA070F	72117	72118	Natural	52	10	24	28	485.6	485.0	485.7	485.2	
LHRA070G	72116	72117	Bridge	9	10	24	28	485.8	485.6	485.9	485.7	
LHRA070GRD	72116	72117	Roadway	9		0	0	485.6	485.6	485.7	485.7	
LHRA070H	72115	72116	Natural	150	10	24	28	486.8	485.8	486.9	485.9	
LHRA070I	72114	72115	Bridge	12	10	24	28	486.9	486.8	487.0	486.9	
LHRA070IRD	72114	72115	Roadway	12		0	0	486.8	486.8	486.9	486.9	
LHRA070J	72113	72114	Natural	65	10	24	28	487.9	486.9	488.0	487.0	
LHRA070K	72112	72113	42" CSP culvert	17	10	24	28	488.2	487.9	488.4	488.0	
LHRA070KRD	72112	72113	Roadway	17		0	0	487.9	487.9	488.0	488.0	
LHRA070L	72111	72112	Natural	60	10	24	28	489.6	488.2	489.8	488.4	
LHRA070M	72110	72111	5'x3.5' CSP culvert	20	10	24	29	489.7	489.6	489.9	489.8	
LHRA070MRD	72110	72111	Roadway	20		0	0	489.6	489.6	489.8	489.8	
LHRA070N	72109	72110	Natural	177	10	26	31	490.6	489.7	490.7	489.9	

TABLE 3-3 (continued)
HYDRAULIC PERFORMANCE OF THE LAUREL HILL STORM DRAINAGE SYSTEM

Segment ID	Node ID		Segment Size/Type	Segment Length (ft)	Design Storm	Peak Flow (cfs) For Design Storm		Water Surface Elevation For Design Storm (ft)				When Deficient
								Existing Land Use		Future Land Use		
	US	DS				Existing	Future	US	DS	US	DS	
LHRA070O	72108	72109	3'x2.7' CSP culvert	20	10	26	31	491.4	490.6	491.6	490.7	
LHRA070ORD	72108	72109	Roadway	20		0	0	490.6	490.6	490.7	490.7	
LHRA070P	72107	72108	Natural	66	10	26	31	492.4	491.4	492.5	491.6	
LHRA070Q	72106	72107	36" CSP	32	10	26	31	493.7	492.4	493.9	492.5	
LHRA070QRD	72106	72107	Roadway	32		0	0	492.4	492.4	492.5	492.5	
LHRA070R	75486	75485	36" CSP	253	10	52	61	486.4	479.2	486.5	479.3	
LHRA070S	75487	75486	36" CSP	284	10	39	46	493.6	486.4	493.7	486.5	
LHRA070T	75488	75487	36" CSP	363	10	39	46	498.7	493.6	498.9	493.7	
LHRA070U	53703	75488	36" CSP	92	10	39	46	500.4	498.7	500.6	498.9	
LHRA090A	75489	53704	30" CSP	38	10	35	37	494.0	492.2	494.0	492.2	
LHRA090B	75490	75489	30" CSP	292	10	35	36	498.7	494.0	498.8	494.0	
LHRA090C1	76212	75490	18" CSP	18	10	20	21	501.0	498.7	501.1	498.8	
LHRA090C2	76212	75490	18" CSP	18	10	16	16	501.0	498.7	501.1	498.8	
LHRA090D	51387	53703	42" CSP	158	10	39	46	502.1	501.1	502.3	501.3	
LHRA100A	72105	72106	Natural	100	10	27	31	494.4	493.7	494.4	493.9	
LHRA100B	72104	72105	36" CSP	118	10	27	31	498.3	495.2	498.4	495.3	
LHRA100BRD	72104	72105	Roadway	118		0	0	494.4	494.4	494.4	494.4	
LHRA100C	51409	72104	Natural	56	10	28	32	500.3	498.3	500.4	498.4	
LHRA100D	99796	51409	30" CSP culvert	31	10	29	32	501.0	500.3	501.1	500.4	
LHRA100DRD	99796	51409	Roadway	31		0	0	500.3	500.3	500.4	500.4	

Laurel Hill Basin Drainage System

INDEX MAP

This index map shows the layout of the Laurel Hill basin into two geographic areas depicted on Figures 3-2 through 3-3. These figures contain detailed drainage system information for areas within the city limits and urban growth boundary (UGB).

L E G E N D

Eugene City Limits
Urban Growth Boundary
Eugene Plan Boundary

Basin Map Coverage
(Alternating color borders to distinquish overlapping areas.)

Laurel Hill Basin Major Subbasins
GL = Glenwood
RA = Riverview-Augusta

N
W E
S

1 inch equals 0.30 miles

0.3 0 0.3 Miles

Produced by LCOG - August 2002
g:\projects\basins\drainage_maps\LaurelHill\LH_index

Figure 3-1

Willamette River Basin

Amazon Basin

No Map

No Map

No Map

GL

RA

GL

Figure 3-2

Figure 3-3

Willamette River

Interstate 5

South Pacific Railroad

Laurel Hill Basin Drainage System

Legend

- Drainpipe - Modeled
- Drainpipe - Not Modeled
- Waterway - modeled
- Waterway - not modeled

Major Subbasins on this map

- GL = Glenwood (Eugene)
- RA = Riverview-Augusta (Eugene)
- GL = Glenwood (Springfield)
- RA = Riverview-Augusta (Springfield)
- Overlapping subbasins (Eugene-Springfield)
- AB-123 Subbasin ID's within Major Subbasins

- Modeled Point
- *12345* Modeled Reference Numbers

Capital Projects

- LHxx Water Quality
- LHxx Natural Resources
- LHxx Flood Control

- Other Water Features
- Acquisition Corridor
- Urban Growth Boundary
- Eugene City Limits

Due to the scale of these maps, the display of some modeled pipe segments may either hide other nearby pipes, or appear connected when they are not.
To verify actual connections please refer to Table 3-3.

N W E S

1 inch equals 750 feet

390 0 390 780 Feet

Produced by LCOG - August 2002
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Willamette River Basin

Amazon Basin

No Map

Willamette River

Interstate 5

Southern Pacific Railroad

GL-010 GL-020 GL-030 GL-040 GL-050 GL-060 GL-070 GL-080 GL-090 GL-100

RA-010 RA-020 RA-030 RA-040 RA-050 RA-051 RA-060 RA-070 RA-071 RA-100

LH07 LH08 LH09 LH06C LH06C LH06C

72146 72598 72145 72597 72144 72143 72142 56526 72596 56525 72139 72138 56387 56522 66993 72595 72594 72599 53635 53622 75476 75475 75473 56390 72588 72587 72591 72593 72592 72586 72585 72590 53482 53481 75477 53662 75478 53649 75479 72125 72124 72123 72122 53655 53755 75480 53752 75482 75481 53754 53753 53485 72589 75483 75484 53777 66483 53646 68603 72119 72118 72117 72116 72115 72114 72113 72112 72111 53783 75485 75486 75487 72110 72109 72108 72107 72106 72105 72104 53704 75489 75488 53703 51409 75490 51387

FRANKLIN BLVD · 14TH · 15TH · 16TH · 17TH · 18TH · 19TH AVE · 21ST AVE · 22ND AVE · 23RD · 25TH · 25TH AVE · GLENWOOD · GLENWOOD DR · MAIN ST · S A ST · E 20TH AVE · 16TH AVE · ISLAND PARK · JAMES PARK · ASTER · BIRCH · ROSE · SUNSET · SUMMIT · HUBBARD · HENDRICKS PARK · VERDE HILL · LAUREL · N CONCORD · N BROOKLYN · OLDHAM · MISSISSIPPI · LEXINGTON · HENDERSON · MORTON · SENECA · NUGGET · MONROE · CHANDLER · AUGUSTA · RIVERVIEW · FLORAL · HILL · BRISTOL · MOUNTAIN · WILLAMETTE ST · FRANKLIN BLVD

Figure 3-3

The drainage system originally modeled for this basin included Laurel Hill (south of I-5) and Glenwood (north of I-5). For jurisdictional planning purposes, the Glenwood area has since been transferred to the City of Springfield. Users of this Plan should contact the City of Springfield for specific drainage information for the Glenwood area. The drainage information shown on this figure for Glenwood is for context purposes only.

Figure 3-2

Laurel Hill Basin Drainage System

Figure 3-2

RA-040
RA-050
RA-060
RA-070
RA-071
RA-080
RA-090
RA-100
RA-051
GL-050
GL-060
GL-080
GL-090
GL-100
LH06C
LH06C

75478 53649 75479 72125 72124 72123 72122 53655 53755 75480 75482 53752 75481 53754 53753 75483 75484 66483 53777 75485 53646 72119 72118 72117 72116 72115 72114 72113 72112 72111 68603 53783 75486 75487 72110 72109 72108 72107 72106 72105 72104 53704 75489 75488 53703 51409 99796 75490 76212 51387 53481 53485 72589

The drainage system originally modeled for this basin included Laurel Hill (south of I-5) and Glenwood (north of I-5). For jurisdictional planning purposes, the Glenwood area has since been transferred to the City of Springfield. Users of this Plan should contact the City of Springfield for specific drainage information for the Glenwood area. The drainage information shown on this figure for Glenwood is for context purposes only.

Amazon Basin

No Map

No Map

HENDRICKS PARK
FAIRMONT HEIGHTS
VERDE HILL
HIGHLAND
WOODLAWN
CAPITAL
SPRING
FLORAL
ALTA VISTA
HENDRICKS HILL
EVERGLADE
29TH AVE
KIMBERLY
MOUNTAIN VIEW
RIVERVIEW
AUGUSTA
CHANDLER
25TH AVE
GLENWOOD DR
HENDERSON
SENECA
MORTON
23RD
25TH
MERIDIAN
FRANKLIN BLVD
Interstate 5
I-5
Southern Pacific Railroad
Willamette River
HARBOR
BLOOMBERG
TIMBER LN
FIR GROVE
FIRLAND BLVD
CENTRAL
MOAT

Legend

- Drainpipe - Modeled
- Drainpipe - Not Modeled
- Waterway - modeled
- Waterway - not modeled

Major Subbasins on this map

- GL = Glenwood (Eugene)
- RA = Riverview-Augusta (Eugene)
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- LHxx Flood Control

- Other Water Features
- Acquisition Corridor
- Urban Growth Boundary
- Eugene City Limits

Due to the scale of these maps, the display of some modeled pipe segments may either hide other nearby pipes, or appear connected when they are not.
To verify actual connections please refer to Table 3-3.

N W E S

EUGENE

1 inch equals 750 feet

390 0 390 780 Feet

Produced by LCOG - August 2002
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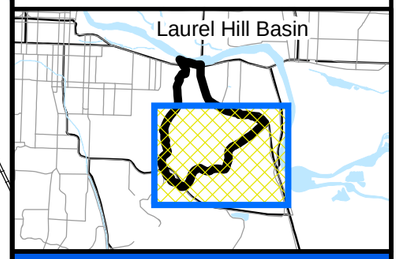


Figure 3-3

A general characterization of water quality in the Laurel Hill basin is described in Section 2.6. This section describes the processes that were used to further evaluate the existing water quality data (Section 4.1). Then, it describes the capital project alternatives and development standard alternatives (Section 4.2) that were proposed to address the water quality problems. Section 4.3 describes the selected water quality alternatives.

4.1 Evaluation of Water Quality Under Existing and Expected Future Conditions

To supplement the water quality information provided in Section 2.6, pollutant loads for Total Suspended Solids were calculated for the basin. Although TSS has not been shown to be directly related to all other pollutants, it was used as a general indicator of other pollutants for the purposes of making relative comparisons. The relative values and not the absolute values of the pollutant loads were used to assign priorities and to target those drainage subbasins or land uses that appear to contribute the largest pollutant loads to receiving waters. The values were also used to evaluate the relative contribution of pollutant loads expected as a result of future development. The methods used to estimate pollutant loads are described in Volume I, Section 3.2. The results for the Laurel Hill basin are provided in Figures 4-1 through 4-3 below. As mentioned in Section 2.6, these results are based on stormwater quality monitoring conducted in the City of Eugene. Although none of the stormwater monitoring stations was located in the Laurel Hill basin, all of the City-wide data were used to provide general information regarding stormwater quality in Eugene and to identify a stormwater management strategy for this basin. In general, the Laurel Hill basin pollutant load is 117,000 pounds per year under existing condition and pollutant load is expected to increase by 88% as a result of future development (based on results from the TSS pollutant loads estimations).

Figure 4-1
Estimated Total Suspended Solids Loads Per Year in the Laurel Hill Basin (UGB)

Estimated TSS Pounds Per Year in the Laurel Hill basin	1,000 Pounds	Laurel Hill basin Relative to the Range of TSS Pounds Per Year in Other Eugene Basins
From Existing Development	117	
From Development of Vacant Land	103	
Total Buildout	220	

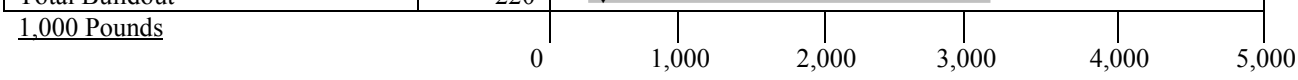


Figure 4-2
Estimated Increases in Total Suspended Solids Loads Associated with Future Buildout in the Laurel Hill Basin (UGB)

Estimated Increase in TSS Loads	Percent	Laurel Hill basin Relative to the Range of Increase in TSS Loading in Other Eugene Basins
From Future Development	88	

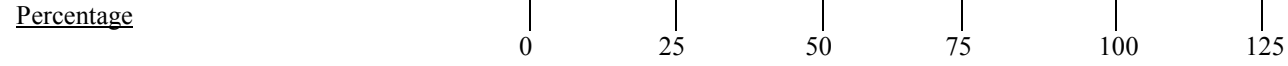
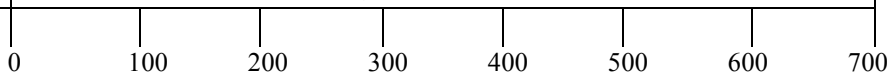


Figure 4-3
Estimated Total Suspended Solids Loads Per Acre - Per Year
in the Laurel Hill Basin(UGB)

Estimated TSS Pounds Per Acre Per Year in the Laurel Hill basin	Pounds per Acre per Year	Laurel Hill basin Relative to the Range of TSS Pounds Per Acre Per Year in Other Eugene Basins
Existing Development	145	
Development of Vacant Land	128	
Total Buildout	273	



The above information, along with the information provided in Section 2.6, was used to develop capital project and development standard alternatives for addressing water quality. The capital project alternatives and the development standard alternatives are described in Section 4.2 and the selected alternatives for the water quality portion of the basin strategy are described in Section 4.4.

4.2 Development of Water Quality Strategy

As shown in the stormwater basin planning process flow chart in Figure 1-1, Step 1 included a compilation of basin characteristics. These basin characteristics are summarized in Section 2.0 of this document. Step 2 in the process included problem identification under both existing and future land use conditions. The results of this step for water quality are provided in Section 4.1 above. The next step included the development of potential stormwater management tools (i.e., capital projects or development standards) to address the identified problems. These stormwater management tools were developed as a result of an all-day basin assessment meeting. The meeting was attended by a large multi-disciplinary group of people including staff with experience in water quality, engineering, maintenance, natural resources, planning, and groundwater resources. Preliminary ideas were developed based on the goals and objectives of the project. This section describes the capital projects and development standards that were proposed to address the identified water quality problems.

4.2.1 Capital Project Alternatives

Identifying potential capital projects to address water quality concerns is very different from identifying capital projects to address flooding issues. With respect to flooding, specific capacity deficiencies are identified through modeling and capital projects are proposed to address those deficiencies. With respect to water quality, pollutant discharges associated with urban runoff are ubiquitous. Therefore, with the exception of the specifically observed water quality problems, the focus of developing capital project alternatives for water quality was on identifying opportunity areas for the siting of surface water capital projects. This included looking for areas with the following characteristics: 1) sufficient space was available for a surface water quality facility, 2) space was available that was publicly owned or vacant and potentially available for purchase, 3) the location drained a large and densely developed high source area, and 4) the

location could be used to construct a capital project that addresses multiple objectives in addition to water quality control (i.e., flood control, natural resources enhancement, recreation, education).

For the Laurel Hill basin, capital project options were evaluated and considered for addressing pollutant discharges in runoff from both existing and future development and for addressing existing erosion, bank stability and downcutting problems that have been observed or that are expected to occur as a result of future buildout. These capital projects are listed below:

Citywide Annual Budget Line Item – Stream Bank Stabilization – This proposed project alternative includes the use of bioengineering techniques to stabilize creek banks at locations where problems have been observed or are expected to occur as a result of future development.

LH09- I-5 and Augusta Water Quality Facility – The undeveloped property adjacent to the Riverview/Augusta drainage system east of Augusta Street from 22nd Avenue to 19th Avenue provides an opportunity for treating runoff from upstream residential areas. This capital project involves constructing a water quality facility on this property.

4.2.2 Development Standard Alternatives

Potential development standards were considered for addressing the identified water quality problems in the Laurel Hill basin. The standards that were considered include:

- *Require Best Management Practices (BMPs) to reduce pollutants associated with stormwater runoff from new development for a design storm representing a specified amount of rainfall* – This standard would require developers to construct stormwater quality BMPs to reduce pollutants in stormwater runoff associated with a specific design event. Based on an analysis of rainfall data from Eugene, the design event was selected to represent 80% of the average total annual rainfall. An evaluation of the design storms representing 70%, 80%, and 90% of the average total annual rainfall was conducted. The design storm representing 80% was found to be the most cost effective. Significant cost increases were estimated using the 90% event with not much additional treatment. And, the cost difference between the 70% and 80% events was insignificant. Therefore, the 80% event was selected. As a result, the water quality design storm volume for detention type facilities is 1.4 inches over a 24 hour period; and the water quality design storm intensity for flow through type facilities is 0.22 inches/hour for on-line facilities and 0.13 inches/hour for off-line facilities. For more details on the analysis conducted to develop the water quality design storm parameters, see Appendix K of Volume I.

- *Require additional BMPs for specific land uses* – This standard would be implemented in addition to the standard listed above. The standard listed above would result in a base set of water quality BMPs required for all land uses. This development standard would require additional water quality BMPs for specific land uses. Specifically, it would require oil control for high traffic areas, and structural source controls for industrial/commercial activities that are exposed to stormwater.

- *Require flow controls for headwater areas* – This standard would require developers to control and minimize increased flows from new development into headwater tributaries. The objective is to prevent downcutting and erosion of waterways due to the increased flows, thereby protecting water quality and the structural integrity of the waterway.

- *Require developers to construct stormwater quality BMPs that remove a specified percentage of pollutants (e.g., 80% removal of TSS)* - This development standard was not considered viable, however, due to its many disadvantages including: 1) this approach is very difficult for the development community to address because there are many unknowns about how to meet such a performance standard; 2) it is difficult to enforce compliance with this approach without conducting very expensive chemical monitoring of the influent and effluent; and 3) this approach does not address the fact that some constituents may be of concern in one receiving water but not another.

- *Prohibit filling and/or piping of key waterways* – This standard would prohibit filling and piping of "key" waterways that provide important stormwater functions including water quality protection and treatment. Criteria would be established for identifying "key" waterways for protection. This standard is covered in Section 5.2.2 of this plan.

4.3 Selected Alternatives

The water quality management alternatives selected address pollutant discharges from both existing and new development. A significant portion of the Laurel Hill basin remains to be developed (i.e., 57%). This will result in incremental increases in the discharge of pollutant loads to the creek. Therefore, for future development, a development standard is recommended for all land uses and additional BMPs are recommended for high source areas as they would effectively reduce these incremental increases in pollutant discharges. The development standard also applies to significant re-development as it will reduce additional pollutant discharges resulting from the re-development and will aid in addressing the existing water quality condition. The resulting water quality management strategy for the Laurel Hill basin consists of the following elements. For more detail regarding each of the capital projects, capital project fact sheets are provided in the Appendix.

- **Water Quality Development Standards:**

  - Require treatment BMPs that are designed according to the BMP Manual and the City's water quality design storms.

  - Require additional BMPs for specific land use activities of concern (i.e., oil control for high traffic areas, and structural source controls for commercial/industrial activities that are exposed to stormwater).

  - Require flow controls for headwater areas to protect water quality.

  - Prohibit filling and/or piping of key waterways (covered in Section 5.2.2).

- **Incentives for Existing Development** – Financial incentives will be incorporated into the stormwater user fee structure to encourage existing development not subject to the new water quality development standards to construct (retrofit) new stormwater quality BMPs.

- **Capital Project Citywide Annual Budget Line Item – Stream Bank Stabilization:** Use bioengineering techniques to stabilize the creek bank at locations where problems have been observed or are expected to occur as a result of future development.

- **Capital Project LH09- I-5 and Augusta Water Quality Facility -** Construct a water quality facility on the undeveloped property that is adjacent to the Riverview/Augusta drainage system east of Augusta Street.

- **Multiple Objective Stormwater Capital Improvement Program -** In general, all stormwater capital projects, including flood control and natural resources projects, will consider water quality objectives when feasible and appropriate.

Note: It should be noted that this basin stormwater management strategy was intended to focus on water quality management tools in the form of development standards and capital projects. To comply with the National Pollutant Discharge Elimination System (NPDES) permit for stormwater discharges, the City is or has been also implementing a significant number of other stormwater quality management practices that will supplement this strategy and help to reduce the discharge of pollutants in stormwater. These include the following:

Inspection, Enforcement, and Monitoring

- Strengthen Enforcement to Prevent and Eliminate Illicit Connections
- Field Screening to Detect and Eliminate Illicit Connections
- Monitor Stormwater Discharges from Industrial Facilities

Operations and Maintenance

- Revise Comprehensive Operation and Maintenance Plans
- On-going Evaluation of City Vegetation Management Practices to Protect Stormwater Quality
- On-going Evaluation of Ice and Snow Road Traction Practices to Protect Stormwater Quality
- Evaluate and Improve DOT Practices to Improve Stormwater Quality
- Improve Clean-up After Accidents and Fires
- Evaluate and Improve Existing Street Sweeping Program
- Evaluate and Improve Effectiveness of Storm System Cleaning
- Storm System Mapping and Data Management
- Improve Litter Pickup Programs in Public Areas and Major Events
- Prevent Leaks and Spills from Municipal Trucks
- Maintain and Equip a Trained Environmental Spill Response Team

Planning and Administration

- Review Street Design Standards with Respect to Water Quality (this has been completed)
- Erosion Prevention and Construction Site Management Program (a new ordinance was developed in 1999)
- Illegal Dumping Program
- Improve Solid Waste Management Program to Address Stormwater Quality
- Inventory and Maintain Wetland Mitigation Sites to Ensure Benefits are Maintained in Perpetuity

Public Education

- Stormwater Information and Education Activities
- Storm Drain Stenciling
- Support government and community Tree Planting Programs
- Eugene Stream Team Volunteer Activities
- Educate Commercial/Industrial Business About Good Housekeeping Practices
- Improve Reporting of Illegal Dumping
- Education for Stormwater-Friendly Design Practices
- Expand Household Hazardous Waste Disposal Program

SECTION 5 Stormwater Related Natural Resources

For purposes of the basin planning process, the term "natural resources" pertains specifically to the City's open waterways drainage system and the characteristics of it that provide or assist in providing beneficial stormwater functions such as: storm conveyance, flood storage, water quality preservation or treatment, aquatic and riparian habitat, and water temperature controls. These natural resources include the primary waterway corridors of Eugene and adjoining riparian and wetland areas, and headwater streams and wetlands. These characteristics are described in Section 2.0 of this report.

Section 5.1 describes the evaluation process used and the basin-specific problems and opportunities identified under existing and expected future conditions. A description of existing waterway protection measures, other related efforts underway, and gaps in stormwater related natural resources data is also included. Section 5.2 describes the alternatives considered for addressing these problems and opportunities, and Section 5.3 describes the selected alternatives.

5.1 Evaluation of Natural Resources Under Existing and Expected Future Conditions

The following provides the objectives, methods, and results of the stormwater related natural resources evaluation for the Laurel Hill basin.

Objectives of the evaluation

- Determine the extent of the open waterway drainage system that should be protected for beneficial stormwater functions.
- Determine where existing protection policies apply and where gaps exist.
- Determine where restoration efforts should be targeted to improve stormwater functions.
- Determine where intervention efforts are needed to correct streambank stability problems.
- Determine what other efforts are underway which may ultimately provide protection consistent with stormwater program objectives.

Methods used to conduct the evaluation

Several methods were used to conduct the natural resources evaluation including the following:

- The following information was compiled and reviewed to assess the location, condition, and function of the Laurel Hill basin waterway system. Most of the data were contained in the City's geographic information system (GIS):
  - Open waterway drainage system.
  - Draft inventory of the Eugene-Springfield Metropolitan Plan Natural Resources Study.
  - FEMA floodway and floodplain areas.
  - National wetland inventory.
  - Soil Survey of Lane County Area, Oregon (1987), Natural Resources Conservation Service.
  - Historic photos, hydric soils – to help reconstruct the historic drainage system (i.e. pre-settlement).
  - Areas with stormwater pipe system.

  - 1999 aerial photography of the Laurel Hill basin.
- Site visits to collect and verify GIS information about select portions of the waterway system including location, size, condition, and function. For the site visits that were conducted, functions were evaluated using a modified version of the Oregon Freshwater Assessment Methodology (OFWAM). This method was modified to focus on the stormwater related benefits of natural resources.
- Eugene Public Works Department engineering and maintenance staff were interviewed as to their knowledge of the system.
- Property owners provided site specific information at public workshops and through other contacts.
- Policy plans were reviewed to determine where and how waterways were protected in the Laurel Hill basin.
- Other City of Eugene and Metro area staff were consulted to identify other on-going efforts which may ultimately provide protection for waterways consistent with stormwater program objectives.

Results of the evaluation

The results are provided below in terms of both existing conditions and expected future conditions.

Existing Waterway System Conditions:
- There are about 3.5 miles of remaining open waterways in the basin.
- Most of the remaining waterways are headwater tributaries.
- Significant waterways include: Laurel Hill Creek Mainstem and the east and west forks of Laurel Hill Creek.
- None of these waterways are currently protected through local policies.
- In the urbanized area, significant impacts are occurring to open waterways in the form of piping, downcutting, erosion, encroachment by structures, and removal of streambank vegetation.

Expected Future Waterway System Conditions:
- Future conditions for "private" waterways are expected to deteriorate due to lack of specific waterway protection policies and measures in this basin.
- Future conditions of "publicly owned and/or maintained" waterways are expected to remain the same or improve over existing conditions due to the City's commitment to environmentally friendly maintenance practices and increasing level of responsibility for managing the open waterway system.

The remainder of this section provides additional context for the stormwater related natural resources evaluation:

Existing Protection Measures

- The Natural Resource Zone (EC 9.2500) is intended to protect outstanding natural resource areas in adopted plans (EC 9.2500). It currently does not apply to any specific property but could be used in the future as a waterway protection tool.
- The Planned Unit Development (EC 9.8300) provisions contain specific approval criteria for protecting significant natural resources. These criteria are to be balanced with other policy needs and standards and, therefore, offer some but no consistent protection standards for waterways.
- Site Review (EC 9.8425) provisions contain approval criteria that could be used for waterways protection if specifically identified for protection.

Other Related On-going Efforts

- Endangered Species/Salmon program is expected to develop strategies for responding to the *January 2001* listing of spring Chinook salmon. Strategies are likely to include incentives and regulatory measures for protection and restoration of salmon habitat in Eugene. The timeline for developing strategy options for Council consideration is fall 2002.
- The Metro Natural Resources Study (NR Study) is expected to provide increased protection of waterways with riparian habitat functions. The timeline for implementation of protection measures is 2005.

Data Gaps

- There are little or no available data as to existing aquatic habitat and species conditions in the Laurel Hill basin waterways. These data would not only help further inform the condition of the waterways, but would also allow for better evaluation of the effects of proposed capital improvements to these waterways.

5.2 Development of the Natural Resources Strategy

As shown in the stormwater basin master planning process flow chart in Figure 1-1, Step 1 included a compilation of basin characteristics. These basin characteristics are summarized in Section 2.0 of this document. Step 2 in the process included problem identification under both existing and future land use conditions. The results of this step for natural resources are provided in Section 5.1 above. The next step included the development of potential stormwater management tools (i.e., capital projects or development standards) to address the identified problems and opportunities. These stormwater management tools were developed as a result of an all-day basin assessment meeting. The meeting was attended by a large multi-disciplinary group of people including staff with experience in water quality, engineering, maintenance, natural resources, planning, and groundwater resources. Preliminary ideas were developed based on the goals and objectives of the project. This section describes the capital projects and development standards that were proposed to address the identified stormwater-related natural resource problems and opportunities.

5.2.1 Capital Project Alternatives

The following capital projects were considered that would address stormwater related natural resources problems and opportunities:

Stream Corridor Acquisition - Stream corridors and specific sites with relatively high stormwater values which are also at risk of future development would be identified for acquisition. Those corridors on undeveloped parcels that had already been processed through development review were not considered for potential acquisition. The following corridor (shown on Figures 3-2 through 3-3) was identified for potential acquisition in the Laurel Hill basin:

- West Fork of Laurel Hill Creek

Citywide Annual Budget Line Item – Streambank Stabilization – This would be an annual budget line item for identifying and implementing streambank stabilization projects to help streams adjust to increased runoff volumes while limiting negative impacts associated with downcutting, sedimentation, and erosion. Where appropriate, bioengineering techniques would be used.

Citywide Annual Budget Line Item - Outfall Stabilization – This would be an annual budget line item for identifying and retrofitting storm drainage system outfalls which are creating localized erosion and bank stability problems.

5.2.2 Development Standard Alternatives

Potential development standards were considered for addressing identified stormwater related natural resources problems and opportunities in the Laurel Hill basin.

- *Prohibit filling and/or piping of key waterways* – Using this approach, criteria would be established for identifying "key" waterways to be protected. A map of the key waterways and requirements would be adopted that would prohibit filling and/or piping of the waterways unless exemptions could be obtained. The key waterways approach would recognize that certain waterways possess characteristics that provide important stormwater functions and should be protected, while other smaller, isolated, segmented waterways provide little or no stormwater function and protection would not be warranted. This code would only apply within the Eugene city limits.

- *Pursue setback protection requirements for key waterways through other appropriate processes* – There is a significant overlap between the stormwater program, NR Study, and ESA/Salmon program. This approach would rely on these other processes for providing some or all natural resources protection policies.

- *Require flow controls for headwaters areas* – This standard would require developers to control and minimize increased flows from new development into headwater tributaries. The objective is to prevent downcutting and erosion of waterways due to the increased flows,

thereby protecting water quality and the structural integrity of the waterway. This standard is covered in Section 4.2.2.

- *Require BMPs to reduce pollutants associated with stormwater runoff from new development* – This standard would require new development to control the quality of stormwater runoff by selecting, designing, constructing, and maintaining a water quality facility. This standard is covered in Section 4.2.2 of this plan.

5.3 Selected Alternatives

The selected natural resources management strategy included a combination of capital projects, development standards, and other items, as follows:

- **Support Existing Waterway Protection Standards:** (i.e., Waterside Protection Overlay Zone, "Needed Housing", Natural Resource Zone, Planned Unit Development provisions, Site Review provisions as applicable).

- **Prohibit Filling and/or Piping of Key Waterways:**

  Note: This standard was selected and an ordinance was processed through the Eugene Planning Commission and City Council. Ultimately, this standard was replaced by an approach that would apply no-fill/no-pipe prohibitions to all waterways until the NR Study was completed. When processed for adoption, this standard was referred to as the Open Waterways ordinance. The Open Waterways ordinance was challenged and subsequently remanded back to the City by the Land Use Board of Appeals for further processing. This ordinance is no longer in effect. The strategy for protecting stormwater significant waterways from being piped and filled is currently under development.

- **Water Quality Development Standards:** These standards are selected to prevent pollutants from entering the waterways. They include: treatment BMPs for stormwater runoff from new development, additional BMPs for specific land use activities of concern, and flow controls for headwater areas to protect water quality, and are covered in Section 4.2.2 of this plan.

- **Pursue Waterway Setback Protection Measures in Coordination with Natural Resources Study and ESA/Salmon Program (described in Section 5.1):** Coordination will continue to ensure consistency with stormwater program objectives for long term stream corridor protection and to identify and fill gaps in protection measures for waterways.

- **Stream Corridor Acquisitions:** Acquire the west fork of Laurel Hill Creek.

- ***Citywide Annual Budget Line Item - Streambank Stabilization:** Projects to be determined on an annual basis.

- **Citywide Annual Budget Line Item - Outfall Stabilization:** Projects to be determined on an annual basis.

- **Multiple objective stormwater Capital Improvement Program:** In general, all stormwater capital projects, including flood control and water quality projects, will consider stormwater related natural resources protection and enhancement as project objectives when feasible.

- **Aquatic Habitat and Species Data Collection:** Opportunities to fill-in data gaps will be explored via local studies and/or as part of partnership arrangements with federal and state agencies.

*Also listed under the flood control strategy and/or the water quality strategy in Sections 3.0 and 4.0.

6.1 Integrated Stormwater Management Strategy

The stormwater management strategy for the Laurel Hill basin represents the City's recommended combined approach of capital projects and development standards to address the flood control, water quality, stormwater related natural resources and maintenance problems and opportunities associated with stormwater discharges. The purpose of this section is to summarize the flood control, water quality, and stormwater related natural resource elements of the strategy as they were presented in Sections 3.0, 4.0, and 5.0 respectively. In addition, this section discusses the costs and priorities associated with implementing the strategy. The elements of the stormwater management strategy are presented below:

Flood Control Strategy

The following capital projects are proposed:

- **Capital Project LH06C – Riverview/Augusta Piped Bypass and System Improvements:** This capital project has been constructed and includes the following components:
  - A piped bypass to route excess flows from the existing Floral Hill drainage system to Riverview Street.
  - An approximately 1,800 foot long 36" diameter parallel pipe system along Augusta Street from the south end of Augusta to the point where the existing system crosses Augusta Street.
  - An approximately 1,800 foot long 36" diameter parallel pipe system along Augusta Street from the point where the existing system crosses Augusta Street to the upstream end of the culvert crossing at Laurel Hill Drive.

- **Capital Project LH07 – Minor Drainage System Between Riverview and Augusta:** Construct a 450 foot 24" pipe segment that runs north under the west shoulder of Riverview Street to the west side of Augusta Street.

- **Capital Project LH08 – Riverview/Augusta Drainage System Plan:** Develop a detailed storm drainage system plan for the residential areas in the Laurel Hill basin between the western basin boundary and Riverview Street, including subbasins LHRA010, LHRA030, LHRA050 and LHRA060.

Water Quality Strategy

In order to reduce the pollutant load, the City proposes to implement an on-site water quality development standard for all new development and significant redevelopment throughout the basin. This development standard requires treatment BMPs that are designed according to the BMP Manual. The standard also requires additional BMPs for specific land use activities of concern (i.e., oil control for high traffic areas, and structural source controls for commercial/industrial activities that are exposed to stormwater). Flow control standards will be implemented for the headwater tributaries. The purpose of this standard will be to minimize downcutting and erosion in these streams.

Financial incentives will be incorporated into the stormwater user fee structure to encourage existing development not subject to the new water quality development standards to construct (retrofit) new stormwater quality BMPs.

In addition, the following capital projects are proposed:

- **Capital Project Citywide Annual Budget Line Item – Stream Bank Stabilization:** Use bioengineering techniques to stabilize the creek bank at locations where problems have been observed or are expected to occur as a result of future development.
- **Capital Project LH09- I-5 and Augusta Water Quality Facility:** Construct a water quality facility on the undeveloped property that is adjacent to the Riverview/Augusta drainage system east of Augusta Street.

Natural Resources Management Strategy

The natural resources strategy is focused on the protection and enhancement of open waterways for their stormwater functions and benefits. Part of the strategy will include support for existing waterway protection standards (i.e., Waterside Protection Overlay Zone, Natural Resource Zone, Planned Unit Developments provisions, Site Review provisions as applicable). Another part of the strategy involves coordinating with other related on-going efforts (NR Study, ESA) to ensure that, ultimately, the stormwater functions and benefits of stream corridors are protected and enhanced.

In addition, the following capital projects are proposed to improve open waterways in the basin:

- **Stream Corridor Acquisitions:** Acquire the west fork of Laurel Hill Creek.
- ***Citywide Annual Budget Line Item – Streambank Stabilization:** Projects to be determined on an annual basis.
- **Citywide Annual Budget Line Item – Outfall Stabilization:** Projects to be determined on an annual basis.

* Also listed under the water quality strategy.

Multiple Objective Stormwater Capital Improvement Program

It should be noted that, in general, all stormwater capital projects, will consider flood control, water quality and natural resources protection and enhancement as project objectives when feasible and appropriate. All stormwater capital projects will conform to adopted code requirements for private development, including stormwater quality standards. Opportunities to fill in aquatic habitat and species data gaps will be explored via local studies and/or as part of partnership arrangements with federal and state agencies.

6.2 Summary of Strategy Benefits

When implemented, the integrated strategy is expected to provide the following benefits:

1. Provide the required level of flood protection basin-wide through capital projects.
2. Reduce existing pollutant loads through capital projects and financial incentives to retrofit existing developments.
3. Reduce pollutant loads associated with new developments through development standards.
4. Identify, protect and manage significant open waterways for their beneficial stormwater functions.

6.3 Summary of Strategy Implementation and Costs

For a description of implementation of water quality and stormwater related natural resources standards, refer to Volume I – Citywide Basin Master Plan Report.

This section describes the approach for capital project implementation in the Laurel Hill basin. It also provides estimated costs and expected funding sources for each of the capital projects.

Four specific projects were selected and prioritized for implementation over a 35-year time period (2001-2035). Six generic capital project categories pertain to the Laurel Hill basin and were also identified for construction city-wide, annually, over the same 35-year period. In addition, 1.0 mile of stream corridors representing 19.0 acres are targeted for acquisition over a five-to-seven year period. Together these three categories of capital projects constitute the City's capital programming for the Laurel Hill basin. Refer to Figures 3-2 through 3-3 for a generalized location of these projects.

For a general description of the capital prioritization methodology and financing approach, refer to Volume I – Citywide Basin Master Plan Report. Table 6-1 shows the priority schedule, cost, and funding allocations for the four specific capital projects and the yearly line item projects.

A separate prioritization scheme was developed for prioritizing open waterway sites for acquisition. There is one stream corridor identified for acquisition in the Laurel Hill basin: west fork of Laurel Hill Creek. Within this corridor, two sites have been prioritized for immediate acquisition. The remaining portions of the corridor have yet to be evaluated and prioritized for acquisition. Table 6-2 indicates the acquisition corridor and estimated cost. For more detailed background information see *City of Eugene Stream Corridor Acquisition Study (May 2001)*.

Table 6-1*
Implementation Schedule Years 2001 – 2035

Capital Project Identification	Priority	Total Estimated Cost	Estimated Funding Source and Allocation		
			SDCs	User Fees	Federal Priority Funds
LH 06C – Riverview/Augusta Piped Bypass and System Improvements	2001 - 2005	$541,600	$444,112 [82%]	$97,488 [18%]	$0
LH 07 – Minor system between Riverview and Augusta	2001 - 2005	$59,400	$0	$59,400 [100%]	$0
LH 08 – Riverview/Augusta Minor Storm Drainage System Plan	2001 - 2005	$48,000	$0	$48,000 [100%]	$0
LH 09 – Water Quality Facility at I-5 and Augusta	2001 - 2005	$1,245,600	$0	$1,245,600 [100%]	$0
Subtotal:		**$1,894,600**	**$444,112**	**$1,450,488**	**$0**
Yearly Capital Program Line Items Citywide: • Stormwater Outfall Stabilization • Streambank Stabilization • General Rehabilitation • Stream Corridor Acquisition • Services for New Development • Wetland Mitigation Bank		These costs have not been calculated on a basin specific basis. See Volume I Citywide for overall cost estimates.			

* See Introduction section for information updates related to capital projects LH06C and LH09.

Table 6-2
Stream Corridor Acquisition Schedule Years 2001 – 2007

Priority Stream Corridor	Area Miles/Acres	Estimated Cost
Laurel Hill Creek – West Fork	1.0 miles / 19.0 acres	$380,000

APPENDIX

CAPITAL PROJECT FACT SHEETS

Project Identifier	**LH01 - Citywide Annual Budget Line Item**
Project Title	**Streambank Stabilization**

Project Location

Open Waterways throughout the Laurel Hill Basin.

Subbasin	**NA**	
GIS U/S Node Location	**NA**	
GIS D/S Node Location	**NA**	
Drainage Area Served by Capital Project	**NA**	Acres
% Impervious (1994 Existing Land Use)	**NA**	
% Impervious (Future)	**NA**	
Design Flow (Future Conditions	**NA**	cfs

Project Description

Implement streambank stabilization projects to help streams adjust to increased runoff volumes while limiting negative impacts associated with downcutting , sedimentation, and erosion. Where appropriate, use bioengineering techniques to stabilize streambanks.

Project Elements

0 SY – Streambank Stabilization

Problems and/or Opportunities Addressed by the Capital Projects

Problems

Downcutting, sedimentation, and erosion problems have been observed in open waterways that are receiving increased runoff volumes associated with urbanization.

Opportunities

Streambank stabilization provides the opportunity to improve or restore riparian vegetation and aquatic habitat conditions.

Maintenance Requirements

Facility Type	*Annual Maintenance Activities*
Streambank Stabilization	Inspect vegetation and banks for erosion.

CSWMP Objectives and Policies Addressed by the Capital Project

Flood Control

N/A

Water Quality

This CP eliminates localized erosion of streambeds and streambanks.

Natural Resources

This CP can restore native riparian vegetation and improve aquatic habitat conditions.

Other City Objectives Addressed by the Capital Project

To be completed by the City

Costs

Construction Costs:

Site Acquisition: $0

Engineering / Administration:

Capital Project Implementation Costs

There will be a $150,000 annual line item in the capital project budget to address streambank stabilization projects on a city-wide basis.

Annual Maintenance Costs **$0**

Project Identifier	**LH03 - Citywide Annual Budget Line Item**
Project Title	**Outfall stabilization**

Project Location

All storm drainage system outfalls draining directly to the Laurel Hill Creek within the City of Eugene that are causing erosion and bank stabilization problems.

Subbasin	**N/A**	
GIS U/S Node Location	**N/A**	
GIS D/S Node Location	**N/A**	
Drainage Area Served by Capital Project	**N/A**	Acres
% Impervious (1994 Existing Land Use)	**N/A**	
% Impervious (Future)	**N/A**	
Design Flow (Future Conditions	**N/A**	cfs

Project Description

Identify and retrofit storm drainage system outfalls creating bank stability problems along the Laurel Hill Creek within the City of Eugene.

Project Elements

1 Ea – Outfall Protection

Problems and/or Opportunities Addressed by the Capital Projects

Problems

Erosion and bank stabilization problems, and in some cases maintenance access problems, exist at storm drainage system outfalls draining into the Laurel Hill Creek.

Opportunities

Opportunity to retrofit storm drainage system outfalls to provide maintenance access, energy dissipation, and bank stabilization.

Maintenance Requirements

Facility Type	*Annual Maintenance Activities*
Outfall Protection	Inspect and clean outlet, inspect vegetation and slope protection.

CSWMP Objectives and Policies Addressed by the Capital Project

Flood Control

N/A

Water Quality

This CP provides bank stabilization that will reduce sedimentation from erosion caused by storm drainage system outfalls draining into the Laurel Hill Creek.

Natural Resources

This CP will reduce impacts on streambank vegetation and aquatic habitat.

Other City Objectives Addressed by the Capital Project

To be completed by the City

Costs

Construction Costs:	
Site Acquisition:	$0
Engineering / Administration:	
Capital Project Implementation Costs	

There will be a $125,000 annual line item in the capital project budget to address outfall stabilization projects on a city-wide basis.

Annual Maintenance Costs	**$0**

Capital Project Fact Sheet

Basin Name: Laurel Hill Basin

Project Identifier	**LH06C**
Project Title	**Riverview/Augusta Bypass and System Improvements**

Project Location

This capital project encompasses the open waterways, culverts, bridges, and storm drainage pipes that make up the Riverview/Augusta drainage system from Floral Hill Dr. to I-5. The drainage system is shown on pages 80, 91, and 92 of the stormwater system index map.

Subbasin	**GLRA**	
GIS U/S Node Location	**99796 and 53187**	
GIS D/S Node Location	**53622**	
Drainage Area Served by Capital Project	**479**	Acres
% Impervious (1994 Existing Land Use)	**16**	
% Impervious (Future)	**37**	
Design Flow (Future Conditions	**N/A**	cfs

Project Description

Construct a highflow bypass to route high flows from the existing drainage system from Floral Hill to Riverview Rd. (node 53704). From this point downstream to I-5, improve the existing drainage system in its current alignment. This capital project includes the following improvements to the existing drainage system: GLRA050B (667 ft 48" replaced by 54" CSP), GLRA050C (193 ft 42" replaced by 54" CSP), GLRA060A (140 ft 42" replaced by 54" CSP), and channel modifications for segments GLRA040A and GLRA040G.

Project Elements

620 Ft – 36" CSP (2-5 ft. cover)

1000 Ft – 54" CSP (2-5 ft. cover)

1 EA – LH06C Open Waterway Improvement

Problems and/or Opportunities Addressed by the Capital Projects

Problems

The capacities of segments GLRA100B through GLRA100D, GLRA070D, GLRA070F through GLRA070H, GLRA070L, GLRA70N, GLRA070P, GLRA040A are expected to be deficient for a 10-yr storm under existing land use conditions. The capacities of segments GLRA070A, GLRA060A, GLRA050C, and GLRA040G are expected to be deficient for a 10-yr storm under future land use conditions. Problems associated with accumulation of vegetation/debris have also been noted in several of these segments.

Opportunities

N/A

Maintenance Requirements

Facility Type	*Annual Maintenance Activities*
36" CSP (2-5 ft. cover)	N/A
54" CSP (2-5 ft. cover)	N/A
LH06C Open Waterway Improvement	Inspect vegetation and banks for erosion.

CSWMP Objectives and Policies Addressed by the Capital Project

Flood Control

The high flow bypass, pipe size increases, and channel modifications is expected to eliminate all of the predicted flooding problems for the 10-year design storm under existing and future conditions in the Riverview-Augusta drainage system.

Water Quality

N/A

Natural Resources

N/A

Other City Objectives Addressed by the Capital Project

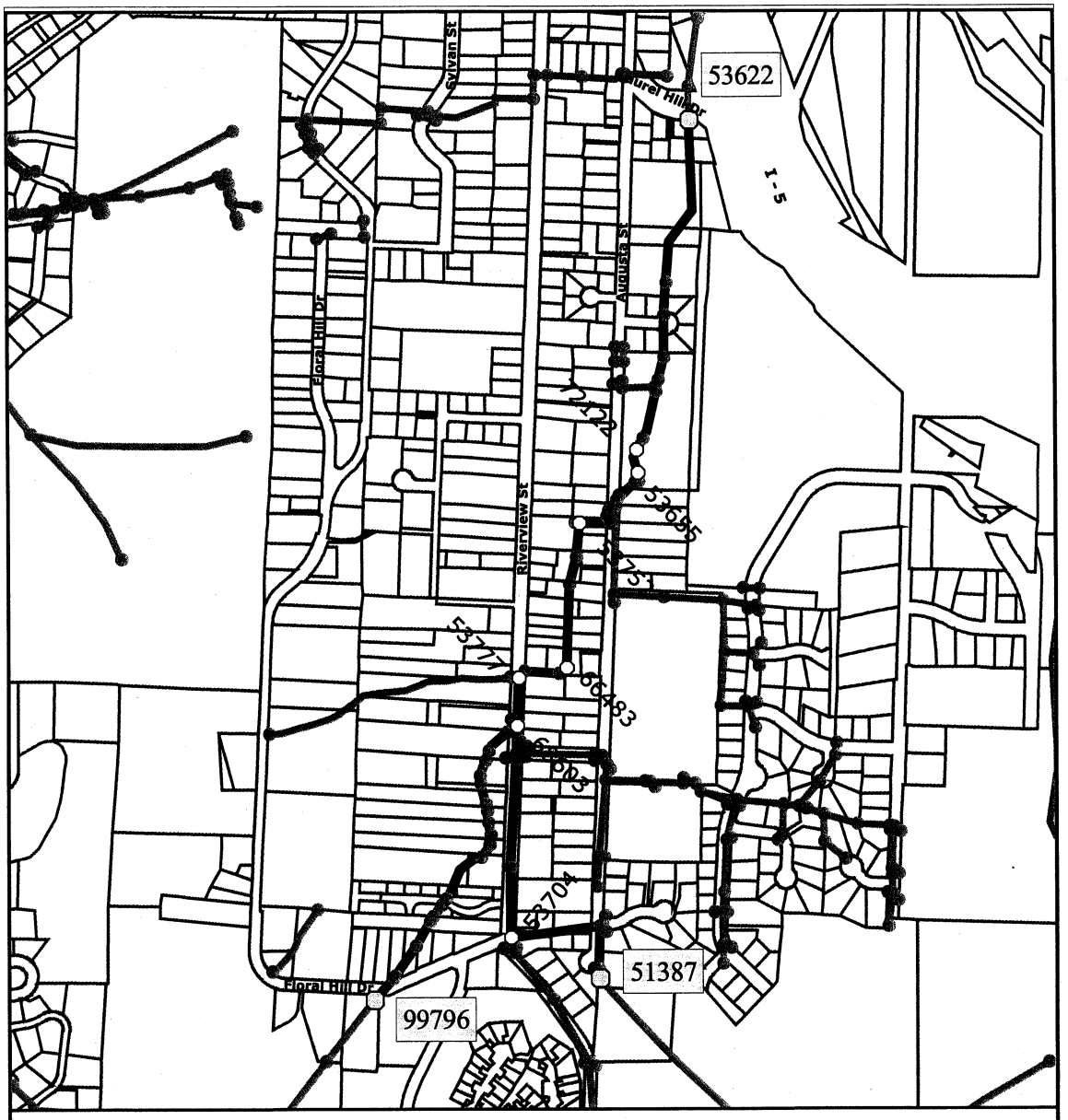
To be completed by the City

Costs

Construction Costs:	$451,400
Site Acquisition:	$0
Engineering / Administration:	$90,200

Capital Project Implementation Costs **$541,600**

Annual Maintenance Costs



Site Map for CIP # LH06C

Riverview/Augusta Piped Bypass and - System Improvements
Laurel Hill Basin
City of Eugene
Capital Project

March 2001
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LH06C

URS

Design Assumptions

The depth of segment GLRA070N was increased from 1.8 ft to 2.7 ft. This segment falls between two culverts with the smallest depth being 2.7 ft, therefore it is unlikely that the open waterway connecting them is less deep than 2.7 ft.

Project Identifier	LH07	
Project Title	**Riverview and Augusta Pipe Improvements**	
Project Location		
The minor drainage system is located between Riverview and Augusta, north of 19th Avenue (sewer map index page 79 and 80).		
Subbasin	LHRA	
GIS U/S Node Location	N/A	
GIS D/S Node Location	68819	
Drainage Area Served by Capital Project	40	Acres
% Impervious (1994 Existing Land Use)	37	
% Impervious (Future)	41	
Design Flow (Future Conditions	9	cfs

Project Description

Construct a 450 ft 24" CSP that runs north under the west shoulder of Riverview Rd. from the southeast corner of the property at 1878 Riverview to the front of 1860 Riverview; it then turns east and crosses under Riverview until connecting with structure 68819 on the west side of Augusta Rd.

Project Elements

450 Ft – 24" CSP (2-5 ft. cover)

Problems and/or Opportunities Addressed by the Capital Projects

Problems

Observed flooding problems at this location reported by city maintenance personnel due to lack of capacity of the existing pipes.

Opportunities

N/A

Maintenance Requirements

Facility Type	*Annual Maintenance Activities*
24" CSP (2-5 ft. cover)	N/A

CSWMP Objectives and Policies Addressed by the Capital Project

Flood Control

Eliminates observed flooding problems identified in this area.

Water Quality

N/A

Natural Resources

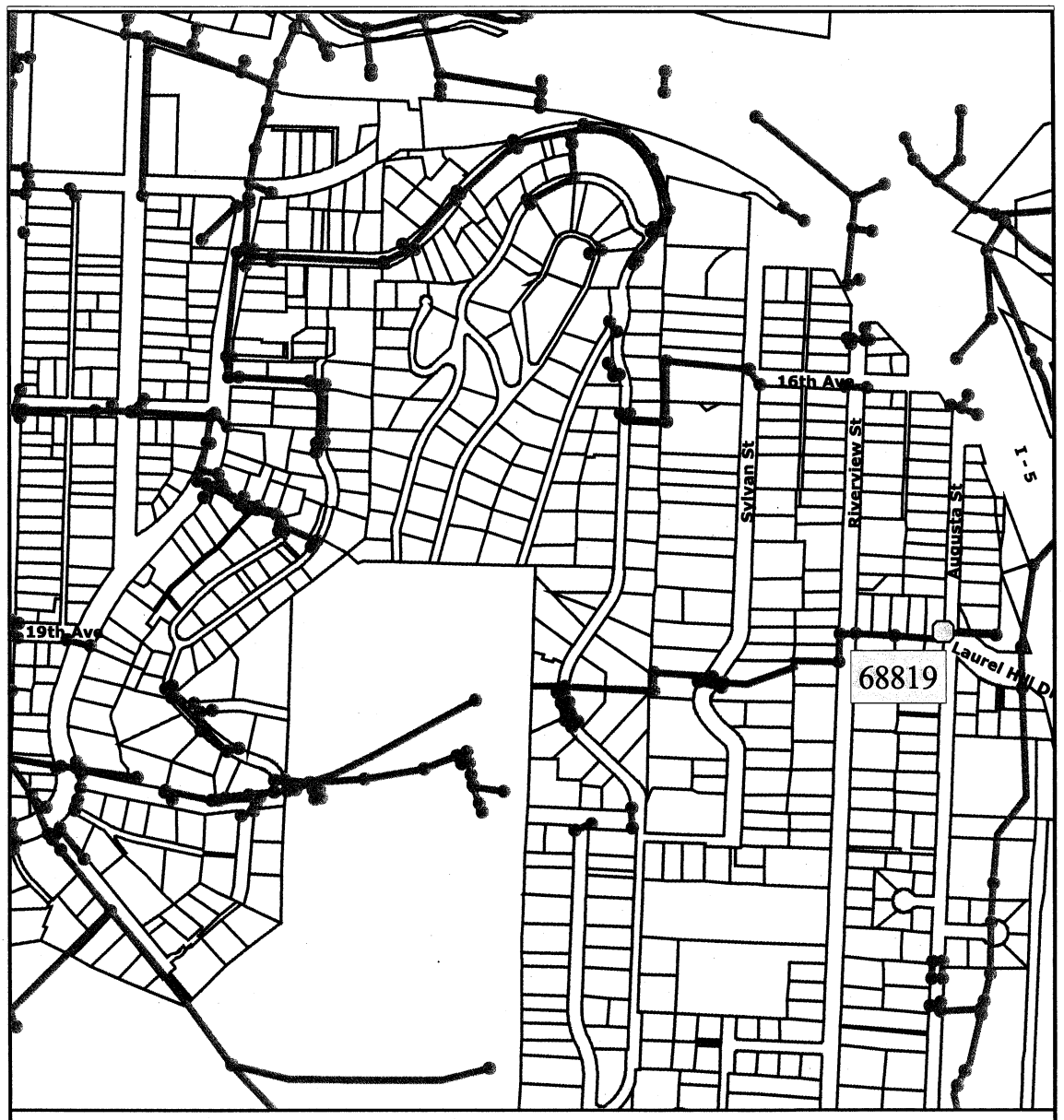
N/A

Other City Objectives Addressed by the Capital Project

To be completed by the City

Costs

Construction Costs:	$49,500
Site Acquisition:	$0
Engineering / Administration:	$9,900
Capital Project Implementation Costs	**$59,400**
Annual Maintenance Costs	**$0**



Property Parcel Boundary
Capital Project Location
Storm Drainage System (Pipe or Open Channel)
Capital Improvement Project Element
Upstream/Downstream Node
Upstream/Downstream Subnode
Manholes or Catch Basins

N

200 0 200 400 Feet

Site Map for CIP # LH07

Minor System Between Riverview/Augusta
Laurel Hill Basin
City of Eugene
Capital Project

March 2001
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URS

LH07

Design Assumptions

Assume an average slope of 1% for the 450 ft long 24" pipe.

Project Identifier	LH08	
Project Title	**Pre-design Riverview/Augusta Minor Storm Drainage System**	
Project Location		
Residential areas in the Laurel Hill Basin between the western basin boundary and Riverview Street, including subbasins LHRA010, LHRA030, LHRA050, and LHRA060 (sewer index map pages 79 and 80).		
Subbasin	LHRA	
GIS U/S Node Location	N/A	
GIS D/S Node Location	N/A	
Drainage Area Served by Capital Project	161	Acres
% Impervious (1994 Existing Land Use)	37	
% Impervious (Future)	43	
Design Flow (Future Conditions	N/A	cfs

Project Description

Develop a pre-design of a storm drainage system for this area of the Laurel Hill Basin.

Project Elements

1 EA – Pre-design of a storm drainage system

Problems and/or Opportunities Addressed by the Capital Projects

Problems

Lack of a minor storm drainage system for this area has resulted in observed localized flooding problems.

Opportunities

Opportunity to reduce localized flooding problems.

Maintenance Requirements

Facility Type	*Annual Maintenance Activities*
Pre-design of a storm drainage system	N/A

CSWMP Objectives and Policies Addressed by the Capital Project

Flood Control

This CP would provide a pre-design to eliminate localized flooding problems.

Water Quality

This CP could potentially include water quality benefits by incorporating stormwater quality facilities into the storm drainage system plan.

Natural Resources

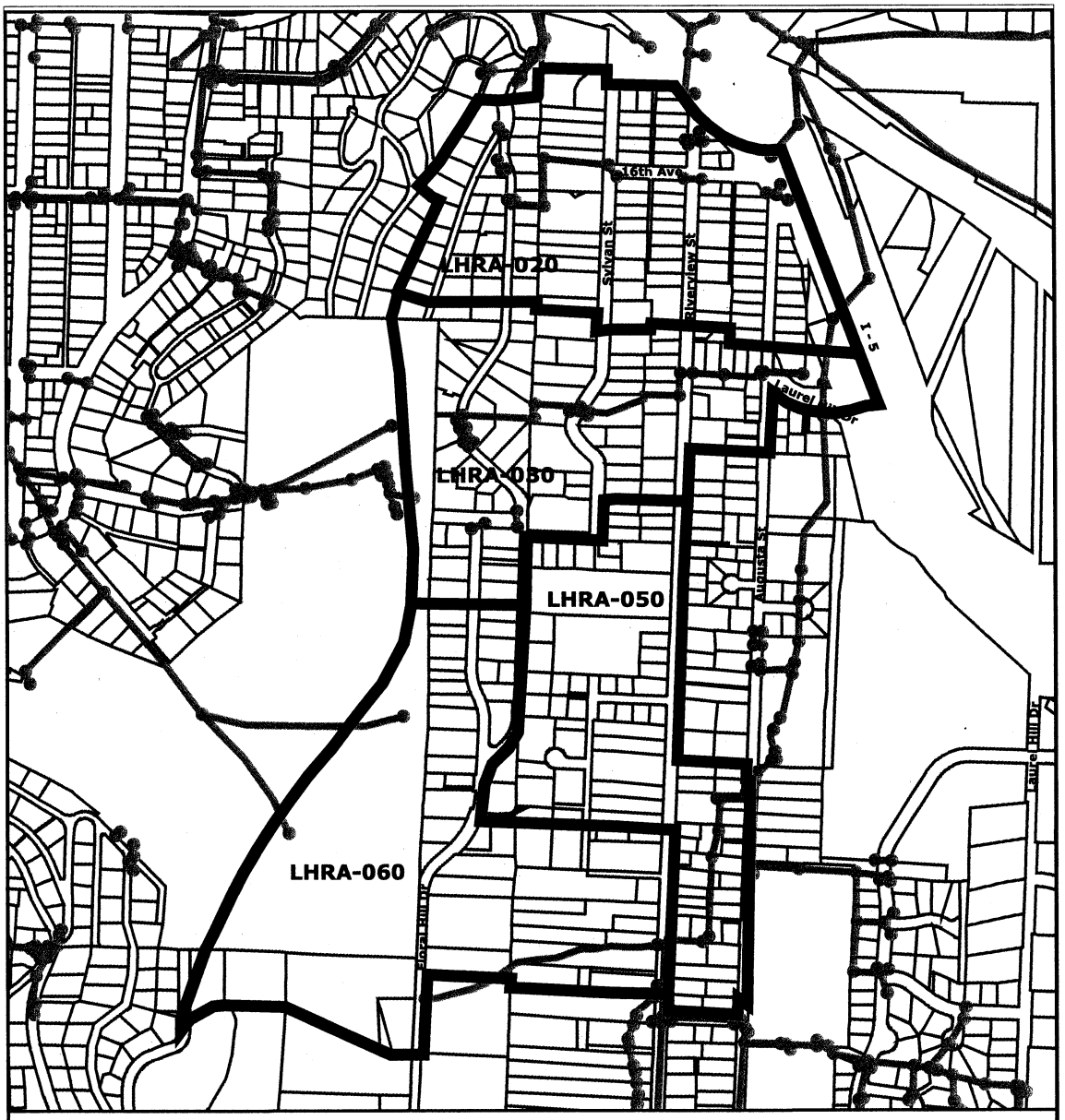
This CP could potentially include natural resources benefits by incorporating open waterway enhancements into the storm drainage system plan.

Other City Objectives Addressed by the Capital Project

To be completed by the City

Costs

Construction Costs:	$40,000
Site Acquisition:	$0
Engineering / Administration:	$8,000
Capital Project Implementation Costs	**$48,000**
Annual Maintenance Costs	**$0**



Property Parcel Boundary

Capital Project Location

Storm Drainage System (Pipe or Open Channel)

Subbasin Boundary

Upstream/Downstream Node

Upstream/Downstream Subnode

Manholes or Catch Basins

200 0 200 400 600 Feet

N

Site Map for CIP # LH08

Riverview/Augusta
Minor Storm Drainage System
Laurel Hill Basin
City of Eugene
Capital Project

April 2001
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LH08

URS

Design Assumptions

Cost estimate is based on 8 person-week at $75/hour and 4 person-week at $95/hour

Project Identifier	**LH09**
Project Title	**I-5 & Augusta Water Quality Facility**

Project Location

This capital project is located on undeveloped property adjacent to the Riverview/Augusta drainage system east of Augusta St. from 22nd Avenue to 19th Avenue. The project area is shown on pages 91 and 92 of the sewer index map.

Subbasin	**LHRA**	
GIS U/S Node Location	**53662**	
GIS D/S Node Location	**53622**	
Drainage Area Served by Capital Project	**535**	Acres
% Impervious (1994 Existing Land Use)	**19**	
% Impervious (Future)	**38**	
Design Flow (Future Conditions	**N/A**	cfs

Project Description

Construct a 20 ac-ft regional water quality facility adjacent to open waterway segment LHRA040B. This CP also requires acquisition of 5 acres of residential property.

Project Elements

20 Ac-Ft – Water Quality Pond

5 Ac – Residential Property Acquisition

Problems and/or Opportunities Addressed by the Capital Projects

Problems

Stormwater runoff carries problem pollutants such as sediments, metals, nutrients, bacteria, and oils and greases to open waterways in Eugene.

Opportunities

Existing vacant land adjacent to this open waterway provides opportunities to construct a regional water quality facility.

Maintenance Requirements

Facility Type	*Annual Maintenance Activities*
Water Quality Pond	Inspect and clean inlet and outlet, maintain vegetation, inspect sediment loading, remove sediment, remove debris, inspect and repair separation berm.
Residential Property Acquisition	N/A

CSWMP Objectives and Policies Addressed by the Capital Project

Flood Control

N/A

Water Quality

This regional water quality facility will provide treatment of the stormwater runoff from a 535-acre drainage area with an estimated annual discharge of 119,000 lbs of TSS under future land use conditions (70% low-density residential, 1% commercial, 29% parks and open space). This CP is expected to remove 57,000 of the 119,000 lbs/yr of TSS.

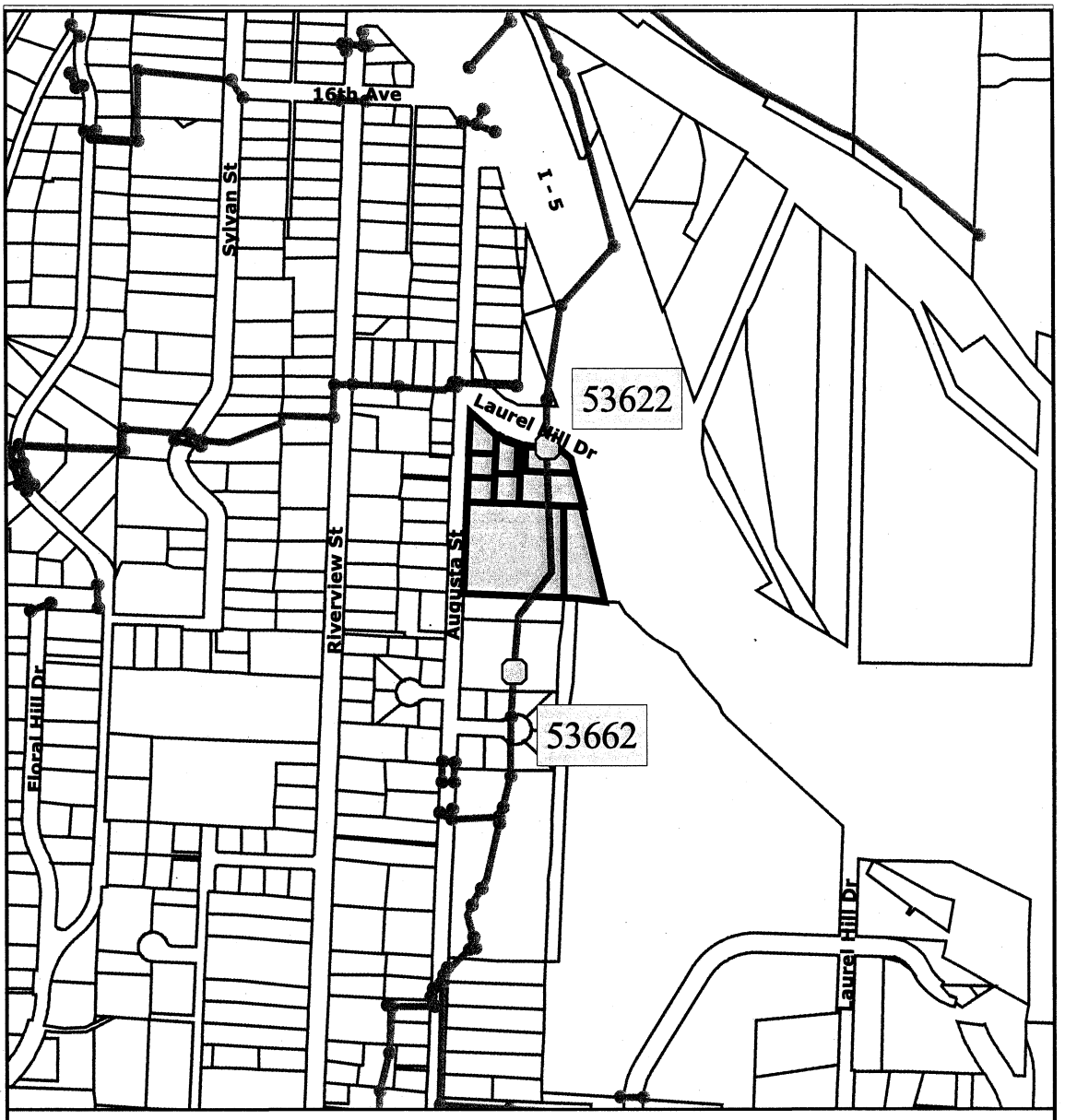
Natural Resources

The water quality facility will provide natural resources enhancement of approximately 5 acres.

Other City Objectives Addressed by the Capital Project

Costs

Construction Costs:	$1,038,000
Site Acquisition:	$0
Engineering / Administration:	$207,600
Capital Project Implementation Costs	**$1,245,600**
Annual Maintenance Costs	**$20,900**



Site Map for CIP # LH09

I-5 & Augusta Water Quality Facility
Laurel Hill Basin
City of Eugene
Capital Project

April 2001
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URS

LH09

Design Assumptions

The water quality pond will receive runoff from sub-basins LHRA040, LHRA050, LHRA060, LHRA070, LHRA080, LHRA090 and LHRA100. It has been sized to accommodate the water quality design storm under future land use conditions.
This CP would treat subbasins LHRA040-100 for water quality.
The TSS removal was estimated by multiplying the total TSS load by 0.8 (since the facility will treat 80% of the runoff) and then again by 0.6 (since the BMP used to provide treatment is expected to be approximately 60% effective.)