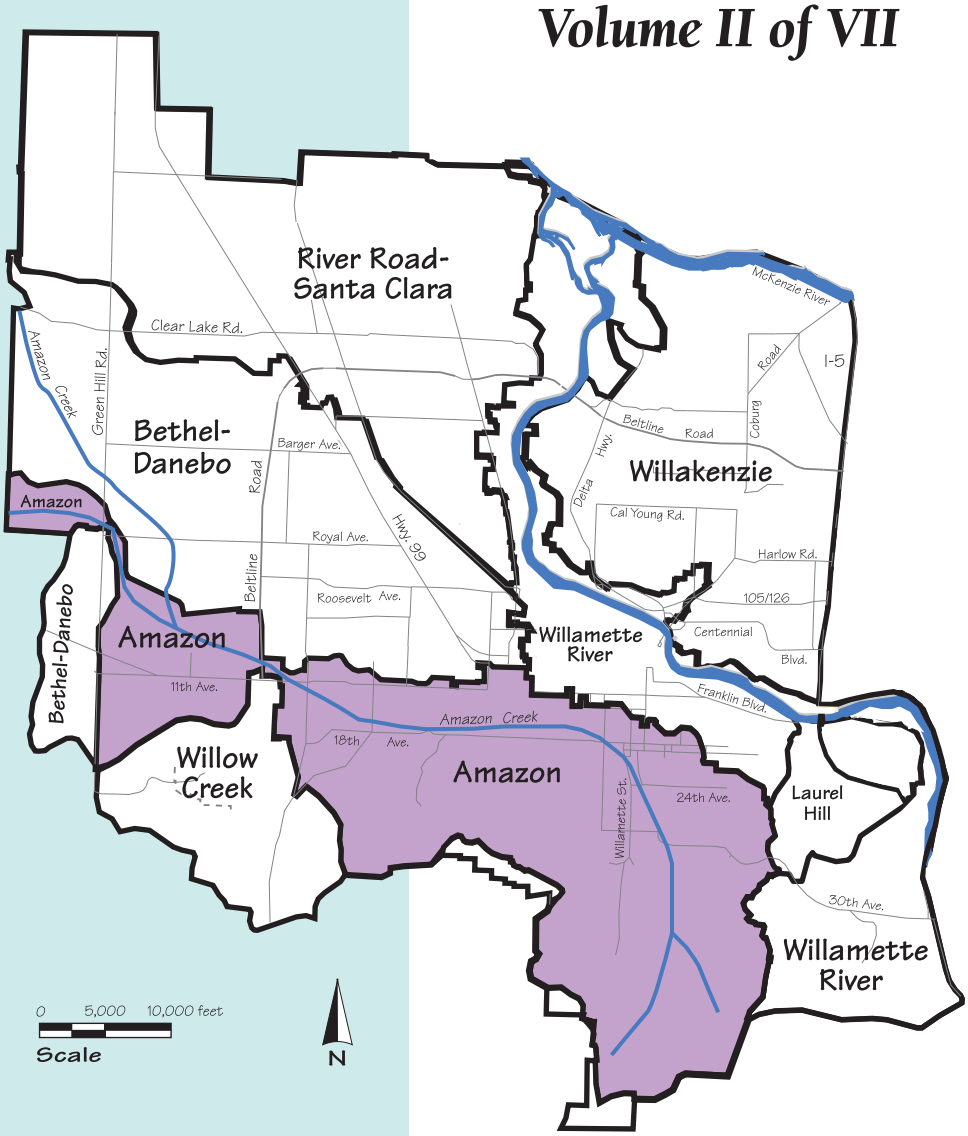
City of Eugene

Stormwater Basin Master Plan

Amazon Basin

Volume II 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 II of VII

Amazon Basin

December 2002

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City of Eugene
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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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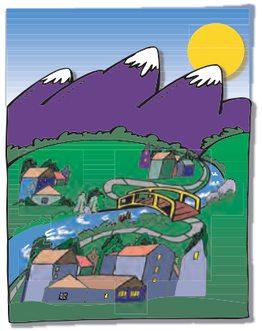
Executive Summary

City of Eugene



Vision for a Green Infrastructure

Amazon Basin

Stormwater Management Strategy

The Context

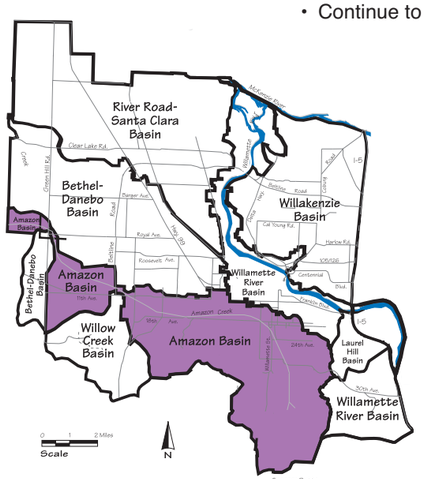
Amazon is the largest of Eugene's drainage basins and the most diverse in terms of land uses, landform, and natural resources. The lay of the land varies from steep hillsides to flat, low-lying valleys. Significant patches of natural resources are located in the upper elevations of the south hills in the form of headwater tributaries, coniferous forests and oak savannas, and in the flatlands of west Eugene in the form of remnant Willamette Valley wet prairie wetlands. Located between these rich natural resource areas are highly urbanized land uses ranging from low-density residential to strip commercial and heavy industrial. Most of the remaining vacant acres are located in the steep hillside areas. Results of the stormwater assessment for this basin revealed:

- Drainage problems occur under existing conditions and will be exacerbated as the basin reaches build-out conditions.
- Untreated stormwater runoff from existing land uses is the primary water quality issue.
- The Amazon Diversion Channel is designated as "water quality limited" for bacteria and temperature and will be subject to future restrictions by the Department of Environmental Quality.
- Channel and bank stability problems exist along most of the headwater tributaries.
- Existing waterways, wetlands, and riparian areas will be impacted by increased runoff volumes, rates, and pollutants.
- Waterway restoration potential exists along most of the waterways.

Strategy

The recommended strategy for this basin is:

- Reduce existing pollutants to the extent feasible through system retrofits, especially in high source areas.
- 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

Amazon Basin Facts

- Ranks first among all the basins in total size (11,442 acres).
- Ranks fifth in the amount of area designated as 100-year floodplain (845 acres).
- Ranks third in total length of local open waterways (38 miles) but sixth in proportion of waterways to basin size.
- Impervious surface area in the UGB is projected to increase from 33% to 44% at buildout.
- Is home to twelve plant and animal species listed or being considered for listing as threatened or endangered.
- Amazon Diversion Channel is listed by the Oregon Department of Environmental Quality as water quality limited.

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 water 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

EUGENE

The Management Strategy

Flood Control

Issue: **Over 23% of the major drainage facilities exceed design capacity under existing conditions.**

Desired Outcome: Flooding problems are eliminated or mitigated.

Actions: **Capital Projects – see map**
- Pipe improvements: AM08B, AM11, AM13, AM14, AM15B, AM17, AM27B
- Flood control facilities: AM15B

Stormwater-Related Natural Resources

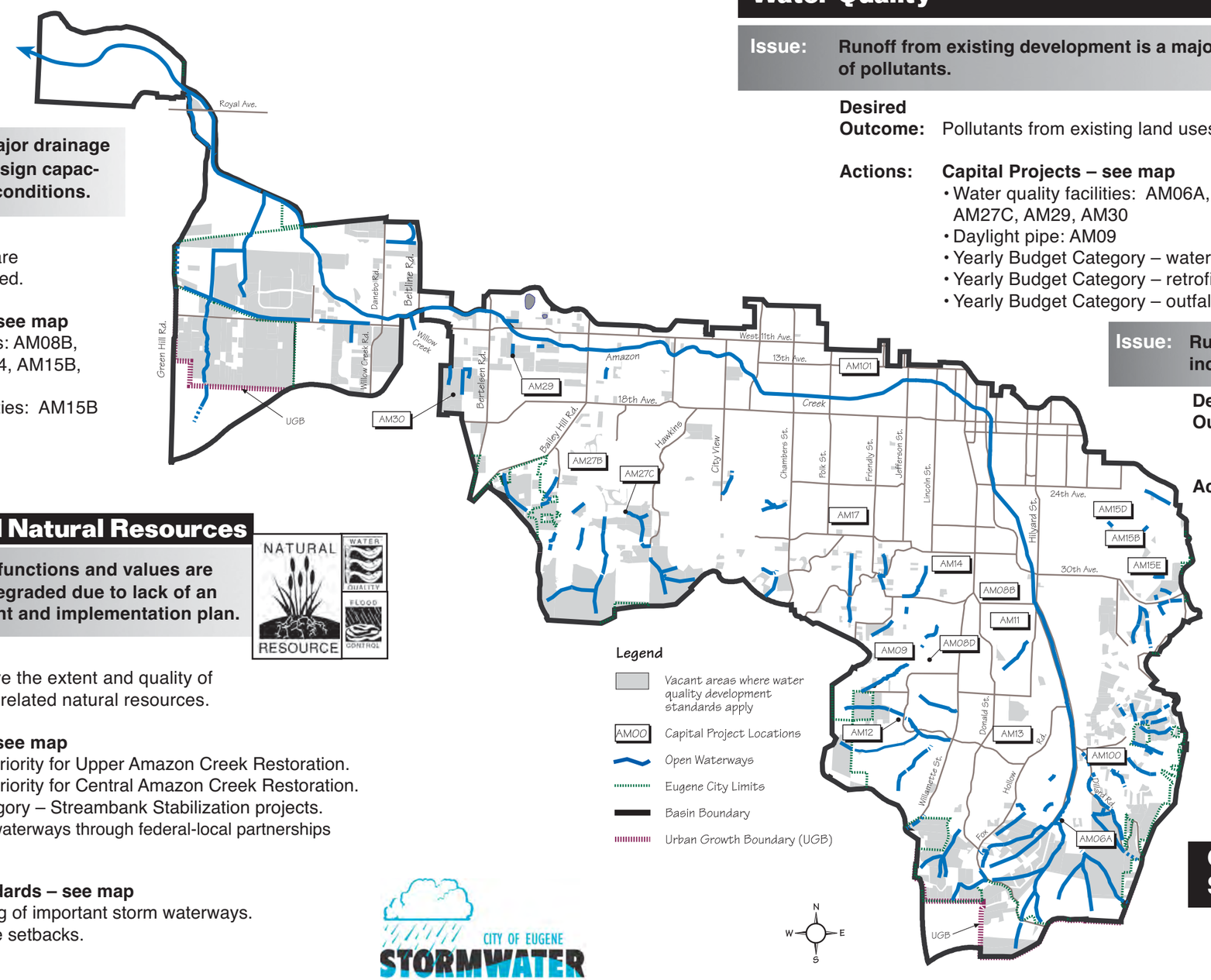
Issue: **Natural resources functions and values are being lost or are degraded due to lack of an overall management and implementation plan.**

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

Actions: **Capital Projects – see map**
- AM100 – Federal priority for Upper Amazon Creek Restoration.
- AM101 – Federal priority for Central Amazon Creek Restoration.
- Yearly budget category – Streambank Stabilization projects.
- Ongoing: Restore waterways through federal-local partnerships (to be identified).

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**
- Water quality facilities: AM06A, AM08D, AM12, AM15D, AM15E, AM27C, AM29, AM30
- Daylight pipe: AM09
- Yearly Budget Category – water quality facilities in high-source areas.
- Yearly Budget Category – retrofit tip-ups.
- Yearly Budget Category – outfall stabilization.

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 STORMWATER MANAGEMENT PROGRAM

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.

This report presents the integrated stormwater management strategy (integrated strategy) for the Amazon Creek basin. It represents Volume II 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). Eighteen of these are located in the Amazon Creek 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 Amazon 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 Amazon Creek basin is described in the following sections. Section 2.0 provides a summary of the specific characteristics in the Amazon Creek 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

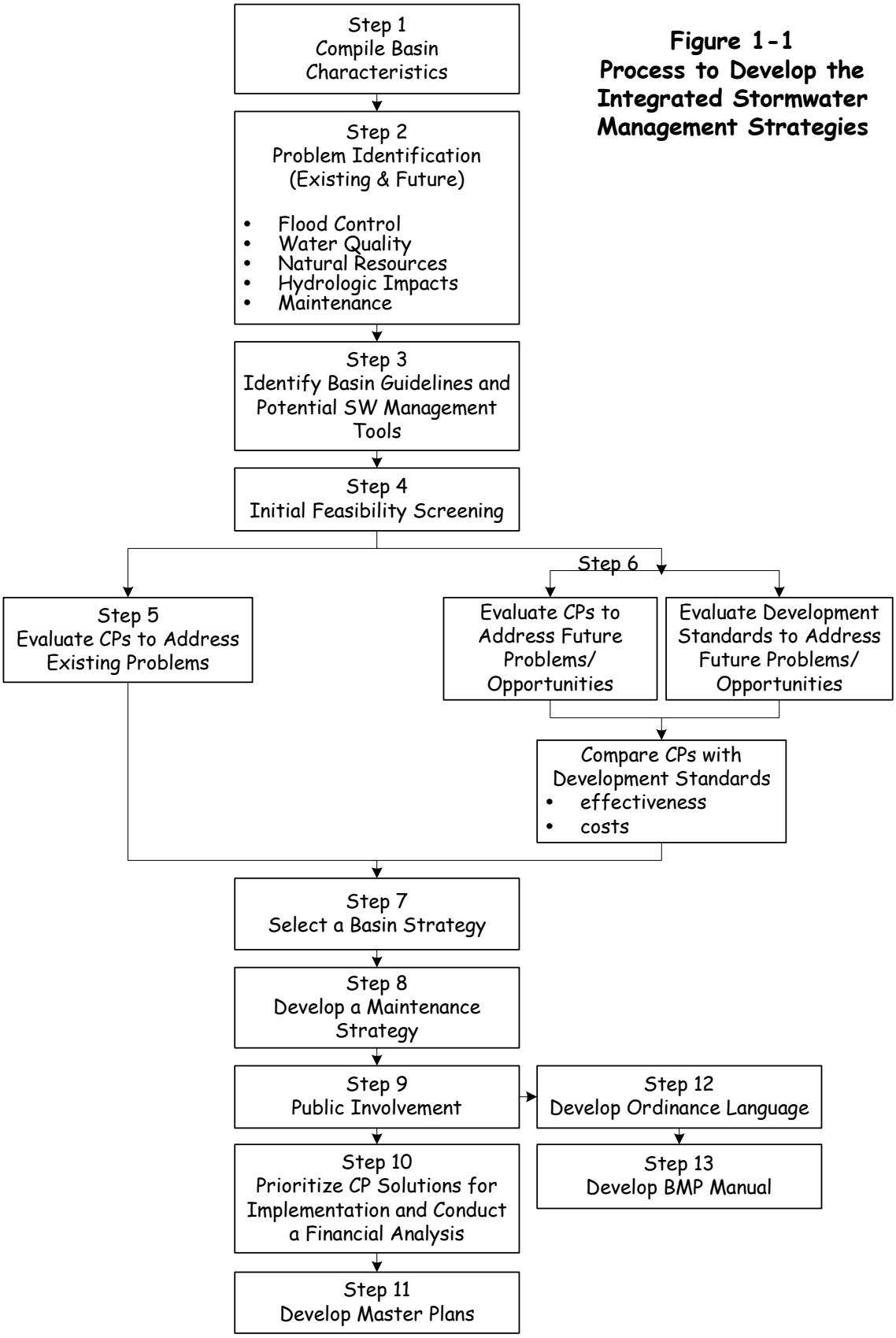
The information contained in this document represents a “snapshot-in-time.” The Study Area Characteristics data (Section 2) are current through 1998, and the evaluation data (Sections 3, 4, 5, 6) are current through June, 2001. As conditions in this basin change, the information in this document will 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 subbasin boundaries and storm drainage system in the westerly Upper Amazon subbasin have changed since the time the models were completed. Tables 3-2 and 3-3 reflect the old subbasin delineations. The map (Figure 3-8) reflects the updated subbasin delineations where subbasins AMUP-190 and AMUP-200 have been further delineated into subbasins AMUP-192, AMUP-194, AMUP-196, AMUP-198, AMUP-202, AMUP-204, AMUP-206, and AMUP-208. As model updates are made, these changes will be reflected in Tables 3-2 and 3-3.

- Capital projects AM100 and AM101 have been incorporated into the Corps of Engineers Metropolitan Waterways Restoration project, currently underway in partnership with other metro agencies. This study, authorized by the Water Resources Development Act, will further define and prioritize needs for waterway restoration throughout the metro area including waterways in the Amazon 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.
- Results of the floodplain analysis for Amazon Creek from the Southern Pacific Railroad crossing to Greenhill Road.
- 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



This section provides background information regarding the existing physical characteristics of the Amazon 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 for the Amazon Basin: location and area; climate; land use and surface cover; landform, 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

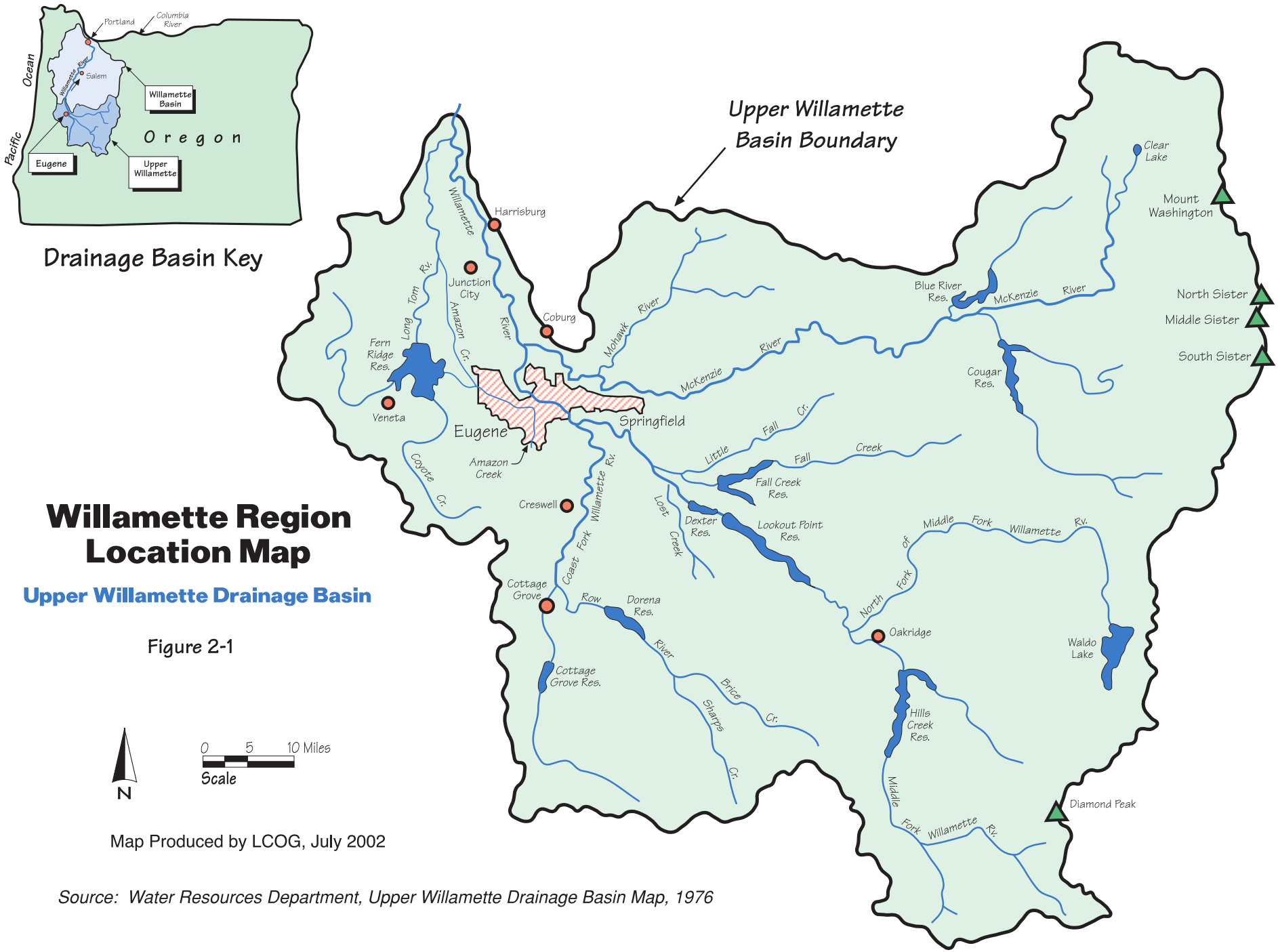
2.1.1 Regional Drainage Context

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.



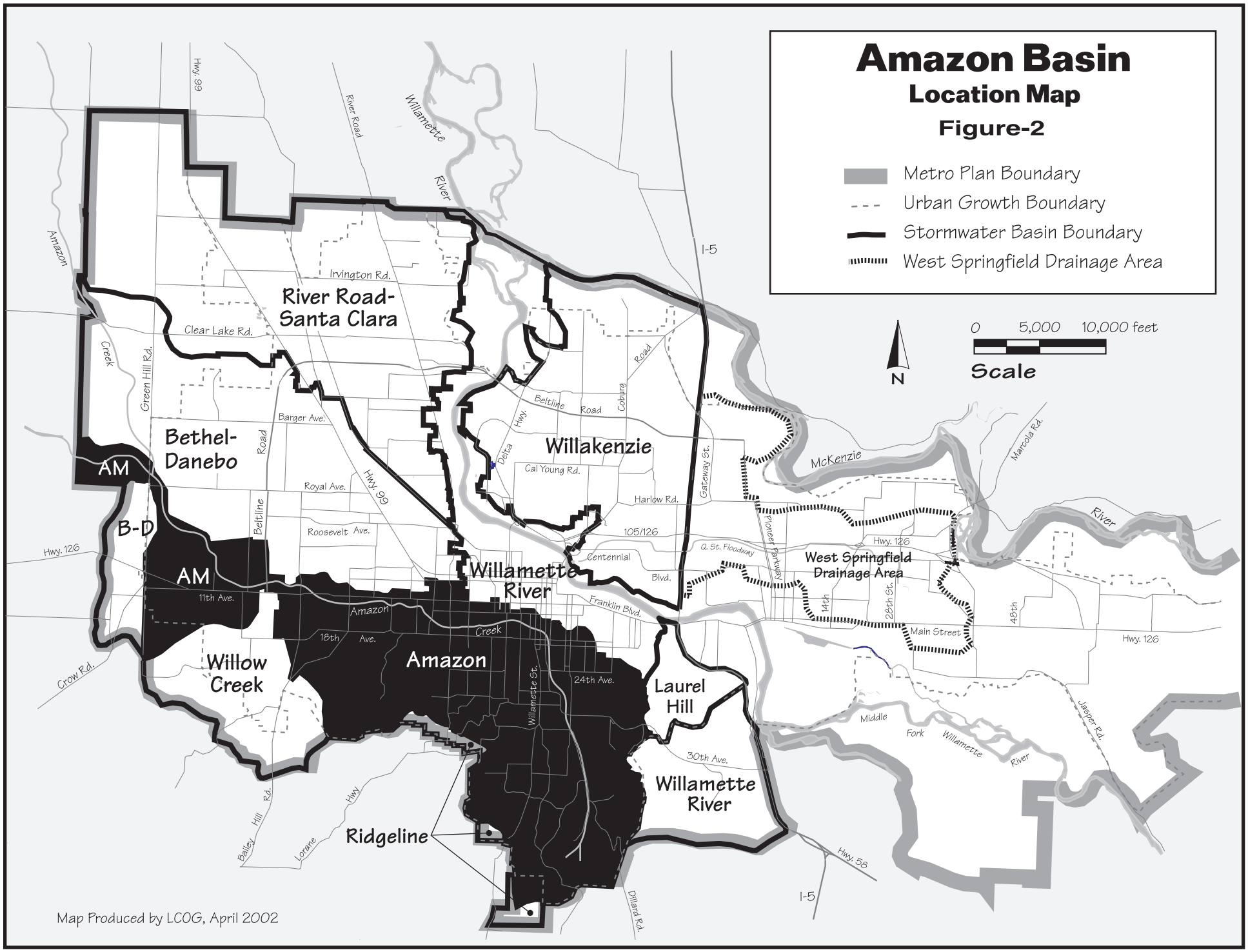
Willamette Region Location Map

Upper Willamette Drainage Basin

Figure 2-1

Map Produced by LCOG, July 2002

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



Map Produced by LCOG, April 2002

2.1.3 Amazon Basin

The Amazon Creek drainage basin forms part of the southern edge of the Eugene-Springfield metropolitan area as shown on Figure 2-2. It is generally bounded by the Bethel-Danebo Basin (northwest), Willamette River Basin (northeast), Laurel Hill Basin (east), the *Metropolitan Plan* boundary (south), and the Willow Creek Basin (southwest). With a total area of approximately 11,442 acres, 93 percent of the basin (10,656 acres) is within the Urban Growth Boundary (UGB). The remaining 7 percent of the basin (786 acres) is outside the UGB and approximately 173 acres of this area is designated Urban Reserve on the *Metropolitan Plan* diagram. The area outside the UGB is designated for agriculture, forest, parks and open space, and rural residential uses.

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

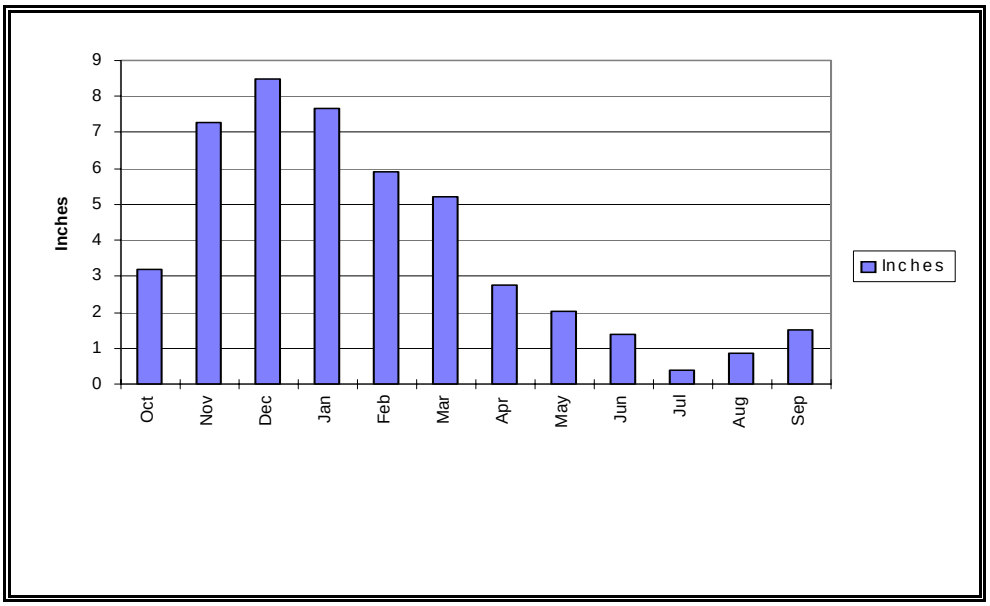


Table 2-1 characterizes a typical storm event for the Eugene area based on the historic 48-year precipitation record measured at the Eugene Airport:

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 H 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 predominant current land use in the Amazon Basin is low-density residential, which covers approximately 33 percent (3,720 acres) of the total basin area. Approximately 25 percent (2,852 acres) is currently vacant or in forest or agriculture use. The majority of this undeveloped land is found in the south hills area.

Significant quantities of high-density residential, commercial, and school uses are also found throughout the basin. Less than one percent of the basin is industrial use. Streets and associated right-of-way currently cover an additional 16 percent (1,790 acres) of the basin.

Parks, open space, and recreational uses including Spencer Butte Park, Amazon Park, Tugman Park, Ridgeline Park, Westmoreland Park, and West Eugene Wetlands system, and several neighborhood parks cover almost 12 percent of the basin (1,388 acres). In addition, the Laurelwood Golf Course encompasses 92 acres.

Table 2-2
Existing Land Use – Amazon Basin

Land Use Categories	Acres	Percent of Area
Inside UGB		
Low-Medium Density Residential	3,695	32.3%
Medium-High Density Residential	414	3.6%
Commercial	339	3.0%
Industrial	127	1.1%
Communication and Utilities	41	0.4%
Parks, Open Space, and Recreation	1,127	9.8%
Golf Courses	101	0.9%
Schools, Churches, Cemeteries	604	5.3%
Other Government	47	0.4%
Agriculture*	304	2.7%
Timber*	63	.6%
Other Undeveloped Land*	2,048	17.9%
Streets (R.O.W.)	1,746	15.3%
Subtotal	10,656	93.1%
Outside UGB (In Urban Reserve)		
Low-Medium Density Residential	3	0.2%
Medium-High Density Residential	13	0.1%
Agriculture	11	0.1%
Timber/Forest	128	1.1%
Other Undeveloped Land	14	0.1%
Streets (R.O.W.)	4	0.0%
Subtotal	173	1.6%
Outside UGB and Outside Urban Reserve		
Low-Med. Density Residential	22	0.2%
Commercial	1	0.0%
Industrial	3	0.0%
Parks, Open Space, and Recreation	261	2.3%
Other Government	3	0.0%
Agriculture	225	2.0%
Timber/Forest	1	0.0%
Other Undeveloped Land	58	0.5%
Streets (R.O.W.)	40	0.3%
Subtotal	613	5.3%
Grand Total	11,442	100%

*****_These categories are used to determine the amount of vacant land for future urban development._
Source: LCOG 1998 Parcel File

2.3.2 Buildout Land Use

The primary land use policies covering Amazon Basin are contained in the following locally adopted policy documents:

- *Eugene-Springfield Metro Area General Plan (1987).*
- *Jefferson/Far West Refinement Plan (1983).*
- *South Hill Study (1974).*
- *West Eugene Wetlands Plan (2000 as amended).*

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 Amazon Basin.

2.3.2.1 Buildout Land Use Within the UGB

This area includes both the current city limits and the unincorporated UGB. Approximately 93 percent of the land in the basin is currently contained within the UGB (10,656). Of this, 2,415 acres are considered vacant (1998 data). 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 (1,438 acres), followed by industrial (491 acres), and medium-density residential (284 acres).

2.3.2.2 Buildout Land Use Outside the UGB

Approximately 7 percent (787 acres) of the Amazon Creek basin is outside the UGB. This area will remain almost entirely in agriculture, forest, rural residential, and park and open space uses based on current plan designations. Areas outside the UGB are not permitted to develop to urban uses and, therefore, “vacant” acres do not apply here.

Table 2-3
Buildout Land Use

Generalized Plan Designation	Designated Acres	
	Total	Vacant* (1998) Future Urban Development
Inside UGB		
Low-Density Residential	5,588	1,438
Medium-Density Residential	536	284
High-Density Residential and Mixed	103	29
Commercial and Commercial-Residential Mixed	207	26
Industrial and Commercial-Industrial Mixed	670	491
Natural Resources, Parks, Open Space	1,336	109
Government and Education	204	-
Forest	1	1
Streets (R.O.W.)**	2,012	-
Subtotal	10,656	2,415
Outside UGB (In Urban Reserve)		
Forest	167	0
Rural Residential	2	0
Streets (R.O.W)**	4	0
Subtotal	173	0
Outside UGB (Outside Urban Reserve)		
Rural Residential	53	0
Natural Resource, Parks, Open Space	291	0
Agriculture and Agriculture/Airport Reserve	252	0
Streets (R.O.W) **	17	0
Subtotal	613	**0**
Grand Total	**11,442**	**2,415**

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

*For purposes of this report, vacant acres for future urban development apply to lands only 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, 15.3 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

groundwater. 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 within the Amazon 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 Amazon Basin is estimated to be 3,566 acres or 33 percent of the basin's UGB area. [Note: calculations for this data are available from the City of Eugene.] The majority of the impervious surface area is found east of Bailey Hill Road. 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 follows 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 is projected to increase at buildout to

4,655 acres, or 44 percent of the basin's UGB area. [Note: calculations for this data are available from the City of Eugene.]

2.3.3.2 Pervious Surfaces

Currently, the majority of the remaining large blocks of pervious surface area within the Amazon Basin are located in the South Hills and in the relatively undeveloped area west of Bailey Hill Road. The South Hills area is predominantly forested while the lower lying areas are predominantly agricultural fields or wetlands. The remaining pervious surfaces are in the form of lawns and other ornamental landscaping associated with urban development.

Overall, pervious area cover is expected to decrease from the current 67 percent of the UGB portion of the basin (7,090 acres) to 54 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:

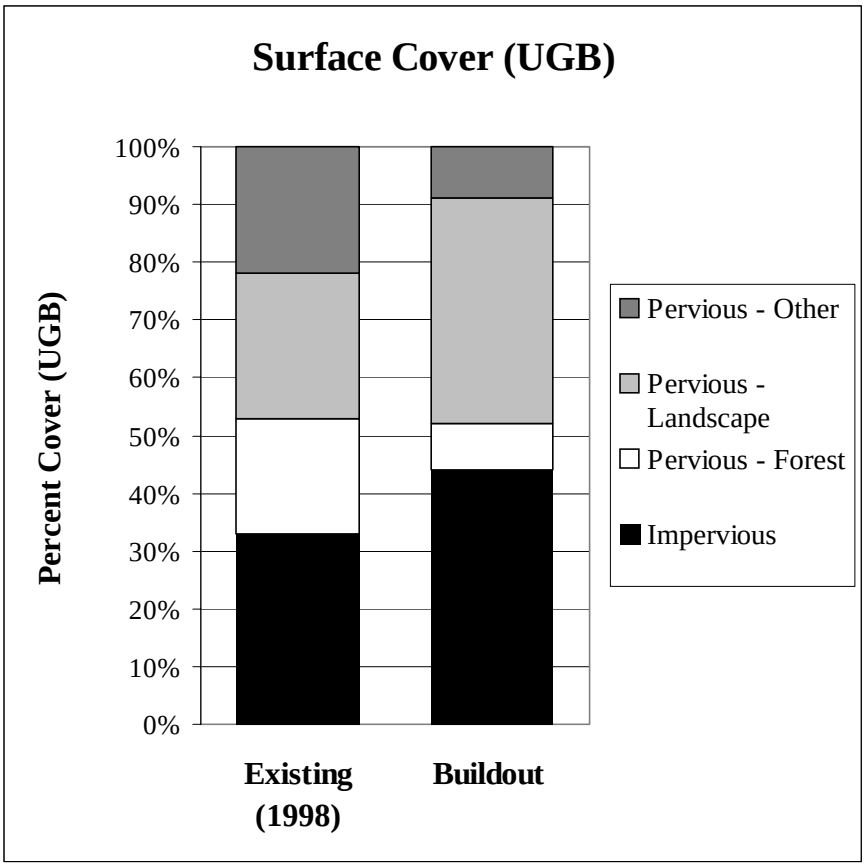
Forest Cover is highly effective in reducing runoff volumes, and in preventing erosion (e.g., reduces soil impact by slowing down the velocity of precipitation and by intercepting up to 35 percent of it before hitting the ground) and stabilizing steep slopes (established root zones). Areas were included in this category if the forested area exceeded one acre in size. Approximately 20 percent of the UGB area within Amazon Basin is in forest cover (1998), and at UGB buildout, the forest cover is projected to decrease to 8 percent of the UGB.

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 area is projected to increase from 25 percent (1998) to 39 percent at UGB 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 22 percent (1998) of the UGB area to 9 percent at UGB buildout.

Figure 2-4 compares the percentage of existing and projected surface cover for the UGB portion of Amazon Basin.

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



2.4 Landform, Topography, Slopes

Amazon basin drains the entirety of south Eugene. Amazon Creek has its headwaters in the South Eugene Hills and flows north and then west through the densely developed core of central Eugene. The creek then passes through the wetland-rich West 11th Avenue industrial/commercial corridor, finally flowing northwest to Fern Ridge Reservoir. With the exception of the Willow Creek basin and the western-most portion of Amazon basin, the southern ridgeline is roughly synonymous with the basin boundary, the UGB and city limits. Two constrictions in the basin boundary, at Beltline and Green Hill Roads, are the result of previously constructed stormwater and flood control projects. Those projects artificially cut out sections of what was historically the natural drainage basin.

The Ridgeline basin is included on maps of the Amazon basin. The three section areas actually lie outside the Amazon Basin and drain into either Spencer Creek or Russell Creek. Due to their relatively small combined size (336 acres), they were included in the Amazon Basin for purposes of this report. Characteristics of the Ridgeline Basin will be reflected in tables and maps but will not be distinguished in the narrative.

Steep hills flank the southern and western borders of the Amazon basin, reaching high points of greater than 1000 feet along the ridgeline. Another significant feature in the basin is College Hill, which reaches 600 feet in elevation. The distinct separation between the south hills and the flatlands of the Amazon basin is shown on Map 4. Table 2-4 displays the slope distribution of the basin. Of significance is that approximately 30 percent of the basin is affected by slopes ranging from 11 percent to 25 percent, and 9 percent of the basin is affected by slopes greater than 25 percent. Approximately half of these steep hillside lands are undeveloped.

Table 2-4
Amazon Basin Slope Distribution

Location	Slope Distribution (percent)				
	Slopes 0-5%	Slopes 6-10%	Slopes 11-15%	Slopes 16-25%	Slopes >25%
Within UGB	46%	14%	14%	17%	9%
Outside UBG	51%	6%	9%	17%	16%
Total Basin	47%	14%	13%	17%	9%

Slope steepness and length are important factors of stormwater management. Generally, steeper and longer slopes result in greater runoff volumes and velocities, especially where impervious surfaces exist. These conditions require special engineering designs to accommodate the hydraulic conditions that occur at the interface of waterways and the piped system. Depending on soil and surface cover type, slope steepness can also increase risks to water quality impacts - due to erosion and sedimentation - and to public safety due to earth slides and slumping.

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

The Amazon basin drainage system contains about 38 miles of open waterways and 123 miles of pipe. Amazon Creek is the main open waterway feature in the basin with headwater tributaries originating along the south hills ridgeline. Amazon Creek originates in the hills to the north of Spencer Butte, where several intermittent streams come together. It generally flows north towards downtown Eugene and then bends to the west near 18th Avenue and Pearl Street. The creek then flows west between 11th and 18th Avenues. After crossing 11th Avenue, it continues in a more northwesterly route past Green Hill Road where it continues meandering west to Fern Ridge Reservoir.

Historically, Amazon Creek meandered through the bottomlands of south Eugene and into west Eugene where it spread out over a vast area feeding several large wetland areas before finally flowing into the Long Tom River. Starting with the first recorded channelization in 1902, Amazon Creek has been systematically altered for flood control purposes. Much of the main stem of Amazon Creek has been straightened, dredged, or placed into concrete channels. Many of the headwater tributaries are in relatively stable condition and part of the lower main stem

(Bailey Hill to the Southern Pacific railway) has been widened to provide greater conveyance capacity and water quality treatment function. Amazon Creek is referred to as E30/31 in the *Metropolitan Natural Resources Special Study* (NR Study).

2.5.1.1 Headwaters of Amazon Creek

Headwater tributaries of Amazon Creek originate along the south hills ridgeline near the southern and eastern edges of the basin. As shown on Map 5, most of these natural tributaries do not flow directly into Amazon Creek but are intercepted by a piped system. Key headwater clusters include: East Fork near Dillard Road, East 46th Avenue, and East 43 Avenue; Middle Fork near Martin Street, Amazon Drive, Fox Hollow Road; West Fork near Donald Road; Braeburn Creek near Brookside Drive; Videra Creek near Hawkins Lane; Timberline Creek near Timberline Drive, and Bailey Hill Oak Woodland near Bailey Hill Road.

2.5.1.2 Upper Amazon Creek (Martin Street to Lane County Fairgrounds)

Intermittent headwater tributaries converge near Martin Street and West Amazon Drive to form the upper mainstem of Amazon Creek. At this point, the creek becomes a perennial waterway that was channelized in the 1950s. From Martin Street to Frank Kinney Park, channelization of the creek is less pronounced than downstream reaches and mostly contains native vegetation**,** including Oregon Ash and black cottonwood. From Snell Street north, exotic plant species such as English ivy and blackberry, have choked out some of the native understory species. This portion of the creek has also been used as a dumping area for yard debris by homeowners in the nearby area. Where Amazon Creek enters Amazon Park near 30th Avenue, the creek is highly channelized and in some places concrete lined. As the creek moves through Amazon Park between 30th Avenue and 24th Street, riparian vegetation is more abundant and pronounced than in previous years due to changes in management practices to allow for healthier habitat function while also maintaining necessary stormwater conveyance function. North of 24th Street, the waterway is concrete lined until it reaches the Lane County Fairgrounds near 14th Avenue and Madison Street.

2.5.1.3 Middle Amazon Creek (Lane County Fairgrounds to Bailey Hill Road)

The middle section of the mainstem of Amazon Creek has been channelized along its length from the fairgrounds to Bailey Hill Road. The creek follows a straightened pathway from the fairgrounds as it flows westward until just before Garfield Street where the creek begins a slight meandering. Riparian vegetation along this section is generally healthy but limited due to the steepened gradient of the channel banks. Trees along the waterway are sparse as maintenance practices limit the ability for an overstory to develop. A creek-side pedestrian and bicycle path exists along most of this segment.

2.5.1.4 Lower Amazon Creek (Bailey Hill Road to Royal Avenue)

This segment is similar in geometric design and size as the upstream reaches; however, it is distinguished by both the character of existing land uses transitioning from extensive urban uses to undeveloped wet prairies and the lack of a creek-side bike path. Through the Intermodal

Surface Transportation Efficiency Act (ISTEA), federal funds were secured to enhance the segment from Bailey Hill Road to the Southern Pacific Railroad tracks. Improvements include creek widening and planting with native plants for water quality treatment functions and the extension of the Fern Ridge Bike Path. The segment from the Southern Pacific Railroad tracks to Royal Avenue also received federal funding (Section 1135, Water Resources Development Act) for restoring lost environmental values due to the channelization work by the Army Corps of Engineers. A joint project of the Army Corps of Engineers and the City of Eugene, the 400-acre restoration project includes the redesign of Amazon Creek to reconnect it with the adjacent floodplain. Improvements include the elimination of levees, replanting of adjoining wetlands with native wet prairie species, and construction of the Fern Ridge Bike Path. Overall construction was completed in 2001 with bike path improvements scheduled for 2002.

2.5.1.5 Amazon Creek drainage outside the Urban Growth Boundary

South of Royal Avenue and west of Green Hill Road a diversion canal branches from Amazon Creek. The Amazon Diversion Canal exits the UGB near Green Hill Road. This waterway is channelized and surrounded by agricultural and residential lands.

2.5.1.6 Maintaining the Drainage System

In order to lessen flooding in the downtown area, as early as 1913, the City began cleaning and deepening Amazon Creek up-stream of Jefferson Street (CSWMP Draft Technical Report, 1993). In 1958, the Amazon flood control project was completed resulting in a symmetrical, trapezoidal-shaped flood control channel. The City is under agreement with the Army Corps of Engineers to maintain Amazon Creek as a flood conveyance channel. The Army Corps of Engineers has jurisdictional responsibility and inspects the system to ensure that it meets federal standards. Historically, as part of this agreement, the City periodically (every 7 - 10 years) removes vegetation and areas of sediment buildup from the waterway. Lately, the extent of vegetation and sediment removal is limited to situations where the waterway has become choked with vegetation or filled with sediment and will not accept and convey water. Maintenance is performed only when it is deemed absolutely necessary for safety reasons or there is a problem with the conveyance integrity of the system.

2.5.2 Wetlands

A comprehensive wetlands inventory has not been conducted for the entire Amazon basin although the *West Eugene Wetlands Plan* (WEWP) study area includes much of the western portion of the basin. Wetland features for this section are based on a combination of the *National Wetlands Inventory* (NWI) and the WEWP. The NWI provides basic data about general characteristics and the extent of wetlands. The NWI identifies general wetland boundaries, however, in many instances actual wetland boundaries and features are more extensive than what is identified through this mapping. The WEWP provides a more detailed and extensive inventory of existing wetlands than the NWI.

Most of the wetlands in the Amazon basin identified by the NWI and/or WEWP are located in the western portion of the basin and are primarily wet prairie wetland types. Linear wetland

features follow most of the drainages such as Amazon Creek and its main tributaries. There are about 1,574 acres of wetlands in the basin, including two wetland mitigation sites that were recently constructed in Amazon Park.. Of this amount, about 95 percent (1,491 acres) are within the WEWP area and are contained within the UGB. Less than one percent (55 acres) of the basin total, are outside of the UGB.

As part of the WEWP, assessments have been made as to wetland values and a determination regarding the need for either protection, restoration, or future fill. Table 2-5 shows the amount and management status of these wetlands:

Table 2-5
Wetlands – Amazon Basin by WEWP Management Categories

Management Category (acres)			Total Acres
Protect	Restore	Future Fill	
720	445	326	1,491

Source: West Eugene Wetlands Plan, 2000

2.5.3 Public Piped System

There are about 123 miles of stormwater pipe mostly located in the central portions of the basin. The piped system primarily serves the function of carrying stormwater away from development and conveying it to Amazon Creek at various discharge points along the channel. As can be seen on Map 5, nearly all of the tributaries of Amazon Creek have been filled and replaced with pipes, intercepting stormwater a short distance from the headwater area and carrying it to Amazon Creek.

2.5.4 Floodplain

A flood insurance study for the Federal Emergency Management Agency (FEMA) has been conducted within the Amazon basin. As part of this study, areas subject to flooding out to the 100-year flood event have been identified. Amazon basin includes about 845 acres of floodplain most of which is inside the UGB (624 acres). Most of the 100-year flood hazard area is associated with Amazon Creek. This flood hazard area follows a ribbon-like band along Amazon Creek where its headwaters converge near the southern portion of the basin to the area near the Lane County Fairgrounds. Near the fairgrounds, the extent of the flood hazard area begins to spread out until about Arthur Street. Westward from Arthur Street, the flood hazard area once again follows the waterway channel in a narrow band until the creek reaches the vicinity of 11th Avenue. At this point, the floodplain begins to fan out in places primarily associated with the extensive wetland system in the area. Outside of the UGB the 100-year floodplain includes about 222 acres, which generally spreads out in the area adjacent to the Amazon Diversion Channel.

2.6 Water Quality

This section provides a description of water quality conditions in the Amazon Basin. Water quality conditions 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, physical, and biological data.
- 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 Amazon 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 2-6 includes a description of the problem pollutants, typical sources of the pollutants, specific results from Eugene, and potential problems associated with the pollutants. Although one of the stormwater monitoring stations was located in the Amazon Creek, all of the City-wide data were also used to provide general information regarding stormwater quality in Eugene and to identify a stormwater management strategy for this basin.

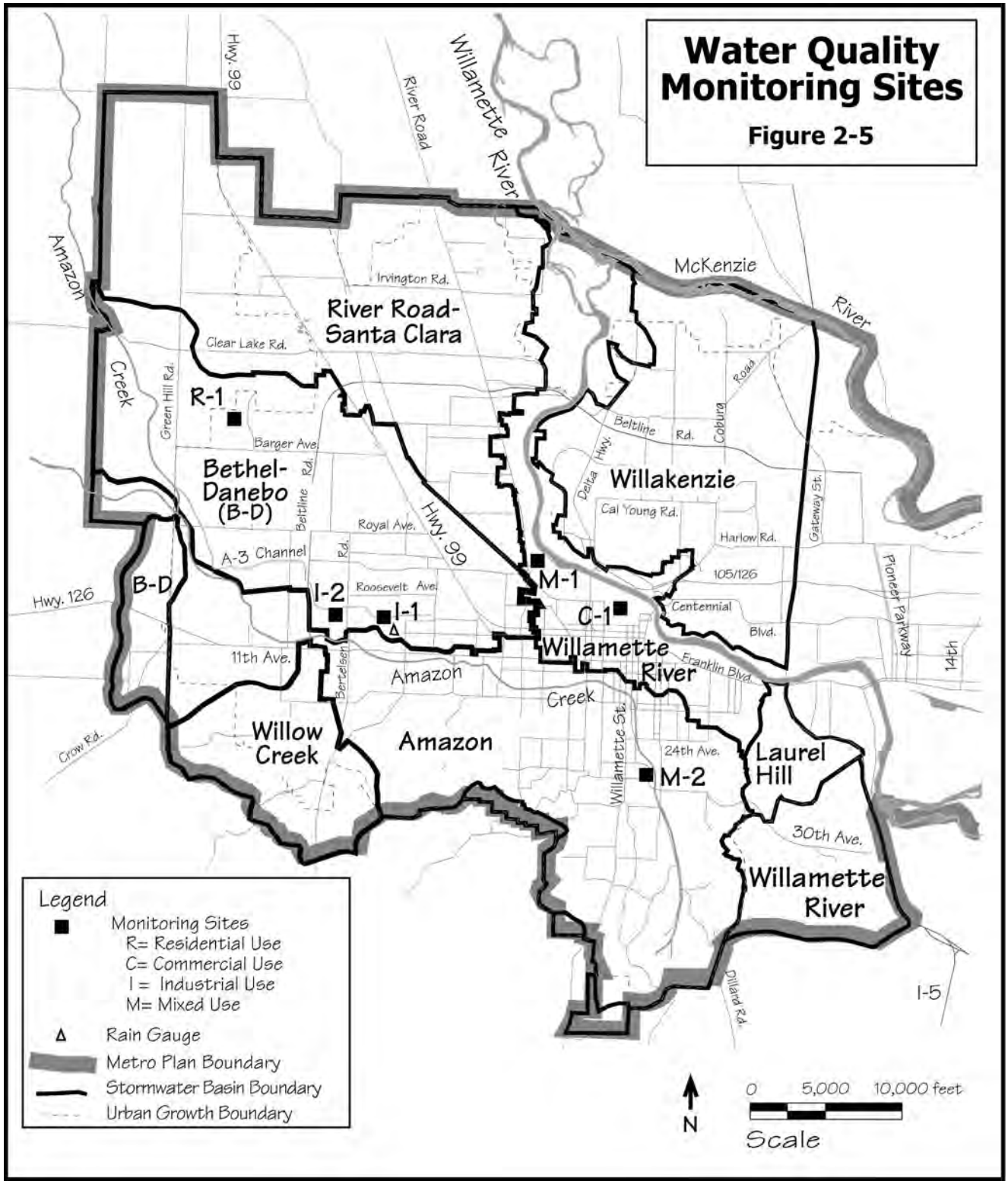

Water Quality Monitoring Sites
Figure 2-5
Hwy. 99
River Road
Willamette River
McKenzie River
Amazon Creek
Irvington Rd.
River Road-Santa Clara
Clear Lake Rd.
Green Hill Rd.
R-1
Barger Ave.
Bethel-Danebo (B-D)
Beltline Rd.
Royal Ave.
A-3 Channel
Hwy. 99
Delta Hwy.
Beltline Rd.
Coburg Road
Willakenzie
Cal Young Rd.
Harlow Rd.
Gateway St.
105/126
Centennial Blvd.
Pioneer Parkway
14th
M-1
C-1
B-D
Hwy. 126
I-2
Roosevelt Ave.
I-1
11th Ave.
Bertelsen
Amazon Creek
Willamette River
Franklin Blvd.
Willamette St.
24th Ave.
M-2
Laurel Hill
30th Ave.
Willamette River
Crow Rd.
Willow Creek
Amazon
Dillard Rd.
I-5
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

Table 2-6
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.
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.

Table 2-6 (continued)

Pollutant	Description	Sources	Eugene's Results	Potential Problems
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). In the Amazon Basin, the commercial and industrial areas are mostly concentrated in the following locations:

- Along West 11th Avenue between Chambers and Terry Streets.
- In the core downtown area between 19th and the Fairgrounds.

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.

Four 50-meter waterway reaches on Amazon Creek were evaluated for habitat structure and macroinvertebrate composition in December 1996 and April 1997[1]. Two of the reaches were upstream of the concrete-lined portion of Amazon Creek that runs through downtown Eugene. These reaches were located in Amazon Park and in a residential area upstream of the park. The two remaining reaches were downstream of the concrete-lined section of the creek in the Lane County Fairgrounds and in a commercial district farther downstream.

Habitat complexity was highest at the reach located in Amazon Park and lowest at the reach adjacent to the Lane County Fairgrounds. Measurable algae growth was virtually absent in December, but was extensive during the April sampling event, particularly for the two downstream reaches. Even accounting for poor habitat conditions, findings from the macroinvertebrate sampling suggest poor water quality conditions exist, particularly in the two reaches downstream of the concrete-lined portion of the creek.

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:

[1] Anderson, Tinniswood, and Jepson. *Life in an Urban Stream: Habitat Structure and Macroinvertebrate Composition of Amazon Creek*, 1997.

- *Tip-ups:* Sediment and debris that has been observed to accumulate in tip-ups is likely getting flushed into downstream open waterways during larger storm events.
- *Nuisance Algal Growths:* Large algae mats are observed in Amazon Creek during the summer from the concrete channel downstream to the urban growth boundary, but are most apparent from the concrete channel downstream to Beltline Rd.
- *Erosion and Downcutting:* Erosion and downcutting have been observed in some of the headwater tributaries and appear to be due to increased runoff volumes from new development activities.
- *Unstable Banks:* Erosion and bank stabilization problems have been noted at various locations along Amazon Creek, including some outfall discharge points to Amazon Creek.

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.

With respect to the Amazon Basin, waterways on the 303(d) list include:

- Amazon Diversion Channel – from the diversion structure of Amazon Creek to its discharge into Fern Ridge Reservoir - for bacteria and dissolved oxygen.
- Fern Ridge Reservoir for turbidity and bacteria.

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

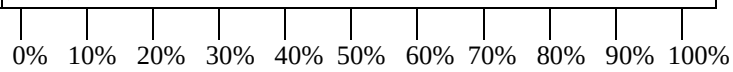
implications of development on water quality are significant.[2] Figures 2-6, 2-7, and 2-8 examine natural and built conditions in the Amazon Basin relative to the other Eugene drainage basins.

Figure 2-6
Extent of Open Drainage System in the Amazon Basin's UGB

Miles per Square Mile Of Open Drainage System in the Amazon Basin's UGB	Amazon Basin [▼] Relative to The Range in Other Eugene Basins (miles/sq mile)
2.1	

Figure 2-7
Extent of Area as a Percentage of Amazon Basin's UGB

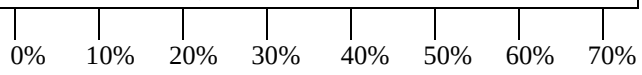
Factors	Percent in Amazon Basin	Amazon Basin [▼] Relative to the Range in other Eugene Basins
Remaining Vacant Lands[*]	**23%**	
Existing Impervious Surface Area	**33%**	
Projected Impervious Surface Area	**44%**	
Wetlands	**14%**	
100-Year Floodplain	**7%**	



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

Figure 2-8
Extent of 100-Year Floodway Fringe Vacant in the Amazon Basin's UGB

Percent of 100-Yr. Floodway Fringe Vacant* in the Amazon Basin	Amazon Basin [▼] Relative to The Range in other Eugene Basins
21%	



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

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

2.6.4 Conclusions

A summary of the above findings suggest that degraded water quality conditions exist in the Amazon Basin as follows:

- 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
- Commercial and industrial areas have shown to be the most significant contributors of specific stormwater pollutants.
- The extent of the open drainage system in the basin on a miles per square mile basis is in the middle to lower range when compared with other Eugene drainage basins.
- At 33 percent, the basin currently has levels of imperviousness that are expected to degrade water quality. Projections indicate that the impervious surface area will increase to 44 percent.
- Only 21 percent of the basin's tax-lotted 100-year floodway fringe is currently vacant.
- The Amazon Diversion Channel is designated as *water quality limited* for bacteria and dissolved oxygen.
- Amazon Creek, which eventually drains into the Long Tom River, is designated as *water quality limited* for temperature and bacteria.
- Fern Ridge Reservoir which is the receiving water for the Amazon Diversion Channel is designated as *water quality limited* for turbidity and bacteria.
- Large algae mats form in some reaches of Amazon Creek during the summer resulting in oxygen depletion.
- Macroinvertebrate sampling suggests poor water quality conditions exist in some reaches of Amazon Creek.
- Sediment and debris that has been observed to accumulate in tip-ups is likely getting flushed into downstream open waterways during larger storm events.
- Erosion and downcutting have been observed in some of the headwater tributaries.
- Erosion and bank stabilization problems have been noted at some of the outfall discharge points to Amazon Creek and at other locations along the creek.

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 study area so that the details of these resources can be consulted prior to any final decisions.

Table 2-7 indicates rare plant and animal species that have been observed in the Amazon Basin and that appear on the Oregon Natural Heritage Program's data base. Specific locations of these species are available through the Oregon Natural Heritage Database Program. Due to the WEWP and The Nature Conservancy's interest in the Willamette Valley Wet Prairies, the most extensive surveys for rare plant and animal species have occurred in Willow Creek, Amazon Creek, and Bethel-Danebo basins. As a consequence, more species information is known about these areas than in the other basins; however, given the relatively high level of urban development in the remaining basins, the occurrence of rare species is likely to be low when compared with basins within the WEWP Boundary.

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, the listing will affect 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.

Table 2-7 displays the inventoried rare plants and animal species within the Amazon Basin.

Table 2-7
Rare Plants and Animals in Amazon Basin

Species/Communities	Federal		State		TNC Rank		Associated	ONHP
	Listed	Candidate	Listed	Candidate	Global	State	Habitat	List
White-topped aster (*Aster curtus)*		SOC	T		G3	S2	Prairie	1
Wayside aster (*Aster vialis)*		SOC	T		G2	S2	Coniferous Forest	1
Tall bugbane *(Cimicifuga elata)*		SOC		C	G2	S2	Coniferous Forest	1
Timwort (*Cicendia quadrangularis)*					G4	S2	Wet Prairie	2
Western meadowlark (*Sturnella neglecta*)		SOC			G5	S5	Prairie	4
Willamette valley daisy (*Erigeron decumbens* var. *decumbens)*	E		E		G4T1	S1	Prairie	1
Shaggy horkelia (*Horkelia congesta ssp. Congesta)*		SOC		C	G4T1	S2	Prairie	1
Bradshaw's lomatium (*Lomatium bradshawii)*	E		E		G2	S2	Wet Prairie	1
Kincaid's lupine (*Lupinus sulphureus ssp. Kincaidii*)	T		T		G5T2	S2	Upland Prairie	1

Table 2-7 (continued)

Species/Communities	Federal		State		TNC Rank		Associated	ONHP
	Listed	Candidate	Listed	Candidate	Global	State	Habitat	List
Fenders Blue Butterfly (*Icaricia icarioides fenderi*)	E				G5	S1	Upland Prairie	1
Thompson's romanzoffia (*Romanzoffia thompsonii*)					G3	S3	Coniferous Forest	1
Western pond turtle (*Clemmys marmorata marmorata*)		SOC		SC	G3	S2	Riparian/Wetlands	2

KEY: *Federal and State (E=Endangered, T=Threatened, C=Candidate throughout its range, SOC=Species of Concern, SC=Sensitive/Critical, SV=Sensitive/Vulnerable, *=Under Consideration for Protective Status).* ***TNC Rank*** *(State Rank: 1=critically imperiled, 2=imperilled, 3=rare, uncommon or threatened but not immediately imperiled, 4=not rare and apparently secure, and 5=demonstrably secure, widespread. Global Rank: The number is prefixed by a "G" and for the state an "S". A "T" ranks subspecific species on a global scale (but not on state scale).* ***ONHP List*** *(List 1= threatened or endangered throughout their range, List 2= threatened or endangered in Oregon but more stable elsewhere, List 3 = need more information, List 4=species of concern but are not currently threatened or endangered.*

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 chapter describes the key soil parameters relative to stormwater issues and the distribution of those parameters in the Amazon basin. All soil data were obtained from the *Soil Survey of Lane County*. Refer to Tables 2-8 to 2-11 and Maps 6 to 10 for a description of the soil mapping units and relevant stormwater related data found in the Amazon 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 permeability soils may be better suited to stormwater conveyance and storage facilities than infiltration facilities. Storage facilities could include detention ponds and treatment ponds where long residence times are desired for settling and filtering purposes.

Permeability rates are assigned based on the dominant soil horizon (15-40 inches). In the Amazon Basin, permeability rates vary from moderately slow to very slow. About 95 percent of the soils in this basin are rated either very slow or slow. Generally, soils in the slow permeability category are located in the foothills and steep slope areas, while the very slow soils are located in the drainage courses and flat, low lying valleys. Most of the remaining vacant lands lie in the very slow category. These characteristics are depicted on Map 6.

Table 2-8
Permeability Rates – Amazon Basin

Location	Moderately Rapid	Moderate	Moderately Slow	Slow	Very Slow	Total
Within UGB	0%	0%	10%	50%	40%	100%
Outside UGB – In Urban Reserve	0%	0%	0%	100%	0%	100%
Outside UGB – Not in Urban Reserve	0%	0%	57%	9%	34%	100%
Total Basin	0%	0%	13%	48%	39%	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. Hydrologic stormwater models often use this parameter in conjunction with slope and surface cover factors for estimating surface flows under undeveloped conditions. Runoff potential measures a soil's capacity to permit infiltration and, therefore, can be used as to describe the degree of runoff expected during storm events. For example, soils with a "low runoff potential" are most likely to have high infiltration rates and, conversely, soils with a "high runoff potential" are most likely to have a very slow infiltration rate.

As shown on Map 7, soils in the Amazon basin have moderately high and high runoff potential. Most of the remaining vacant lands in the basin are in the high runoff category. This characteristic, compounded by the slow permeability rates of the basin's soils and the steep slopes in the southern portions of the basin, could result in significant stormwater runoff during heavier storms. When considered with the slow permeability rates and steep slopes of this basin, it is clear that under most conditions, stormwater runoff volumes and velocities are expected to be high. The following table displays the distribution of soil runoff potential for the Amazon basin:

Table 2-9
Runoff Potential – Amazon Basin

Location	Runoff Potential (percent)				
	High	Moderately High	Moderately Low	Low	Total
Within UGB	73%	27%	0%	0%	100%
Outside UGB – In Urban Reserve	2%	98%	0%	0%	100%
Outside UGB – Not in Urban Reserve	46%	54%	0%	0%	100%
Total Basin	71%	29%	0%	0%	100%

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

2.8.3 Erodible Soils

For erodibility purposes, the U.S. Department of Agriculture classifies soils as either, highly, moderate or other. The other category indicates soils that do not meet the criteria for high and moderate and, therefore, are either less erodible or require more research.

Erodible soils have significant stormwater management implications. If not properly protected during construction and logging 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 by covering or destroying spawning beds.
- Water quality impacts due to pollutants that are attached to sediments.

As shown on Map 8, almost 60 percent of the soils in this basin are in the highly erodible category. With the exception of a few areas, in the level lowlands, almost all of the highly erodible soils coincide with the steeply sloped south hills. The remaining vacant lands in the basin are almost all located in the highly erodible category. The drainage courses and lowland areas are predominantly classified as other.

Erodible soils present a challenge for erosion control during development activities. The City's erosion prevention program has designated highly erodible soils as one of the criteria for sensitive area designation.

Table 2-10
Soil Erodibility – Amazon Basin

Location	Erodible Soils (percent)			
	High	Moderate	Low	Total
Within UGB	59%	9%	32%	100%
Outside UGB – In Urban Reserve	100%	0%	0%	100%
Outside UGB – Not in Urban Reserve	49%	14%	37%	100%
Total Basin	58%	9%	33%	100%

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

2.8.4 Unstable Slopes

Unstable slopes can present structural problems especially where extensive grading is needed for siting roads and building foundations. Roads requiring significant cuts should not be located on these soils. Unstable slopes combined with saturated soil conditions create high potential for mass movement. Properly designed drainage systems can help mitigate slump potential.

As shown on Map 10, many of the soils subject to slumping are located on the steeper slopes in the south hills. This is also the location of much of the undeveloped land in the basin.

2.8.5 Hydric Soils

Hydric soil is one of the 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 into wetlands, although the Oregon Department of Environmental Quality has not yet established standards for discharging into wetlands.

Map 9 displays the basin's hydric soils (36.5 percent of the basin) and the National Wetlands Inventory wetlands in the basin. Most of the area west of Garfield Street has been investigated for the presence of wetlands under the *West Eugene Wetlands Plan*. Field inventory work is needed to confirm the presence of wetlands in other areas. The hydric soils and wetlands generally follow the natural waterways, spreading out broadly in the level low-lying areas of the basin. These hydric soils likely represent the historic floodplain of Amazon Creek. This area was densely developed following the channelization of Amazon Creek for flood control. Other areas with hydric soil and wetlands are found in the headwater streams of the south hills. Many of these areas are currently undeveloped and will need to be inventoried for wetlands prior to construction. Siting future stormwater facilities and stormwater management actions should be chosen carefully so as to not alter the hydrologic regime of wetlands by either adding to or taking away water.

Table 2-11
Hydric Soils – Amazon Basin

Location	Hydric Soils (percent)
Within UGB	38%
Outside UGB – In Urban Reserve	31%
Outside UGB – Not in Urban Reserve	5%
Total	36%

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

2.9 Groundwater

Groundwater resources need to be considered when developing a stormwater management plan for two key reasons. The first relates to human consumption and the need for protection for drinking water purposes. The second is the potential role it may play in determining the feasibility for stormwater infiltration facilities.

A regional aquifer underlies most of the southern Willamette Valley basin. It serves as a drinking water source for rural residents and several nearby communities, such as Springfield, Coburg, and Junction City. For this reason, potential negative water quality effects need to be evaluated prior to any final decisions on certain stormwater management measures, such as infiltration facilities. There is very little use of groundwater for drinking water purposes in the Amazon basin. Water service is supplied to all new development within the city limits, which includes the vast majority of the Amazon basin. Areas of the Amazon basin that lie outside the UGB rely on groundwater for domestic use. The aquifer in these areas is generally poorly permeable, water yield to wells can be slow, or may contain brackish water (*Assessment of*

Groundwater Resources in the Eugene-Springfield Area [GEM Consulting, Inc., 1993]). Because the underlying aquifer of the Amazon basin generally flows to the northwest toward Veneta and Junction City, there are potential negative effects to the quantity and quality of groundwater due to infiltration practices. These negative effects and their potential health risks should be evaluated prior to final decisions as to their use in the Amazon Basin.

Health risks notwithstanding, the second issue relates to the functional feasibility of an area for infiltration facilities. Feasibility is determined by a number of factors including soil permeability and depth to the groundwater table during the wet season. Generally, the deeper the groundwater table, the more suitable the site is for infiltration practices. Map 11 shows the depth to high water table during the wet season. As shown the deeper groundwater areas are generally located in the steep, hillside terrain and the shallower depths located along waterways and in the flat lowlands. This information is linked to soil type and comes from the *USDA Soil Survey of Lane County*. A high water table (less than three feet below the ground's surface) determines how stormwater disperses and what types of stormwater facilities might work well in a given area. In general, a high water table contributes to high runoff levels and can limit the effectiveness of infiltration facilities. Most of the other remaining vacant land is located in the steeper, hillside areas where groundwater depth is greater than six feet. High water table should be considered with other parameters such as unstable and steep slopes. Sites should be evaluated on a case-by-case basis.

High water tables may also be linked to wetland ecology. This link is implied by the close connection between wetlands, hydric soils and a high water table (see Maps 9 and 11). If stormwater management practices alter the depth of the water table, wetland systems may be impacted. This needs to be considered when development occurs in portions of the Amazon Basin, including areas in the south hills and in west Eugene, that are within or adjacent to areas that support high water tables and/or wetlands.

2.10 Existing and Planned Education Facilities

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

The Amazon basin contains a total of 23 public or private schools, including two public high schools and three public middle schools, covering approximately 400 acres. All of the schools in the basin are located to the east of Bertelsen Road. No additional schools are currently planned in the basin.

There are extensive opportunities for utilization of the stormwater drainage system and related facilities for educational purposes in conjunction with school curriculum. Of the 23 schools in

the basin, four are immediately adjacent to Amazon Creek, the basin's major drainage feature, and 19 are within a short distance of the creek. In addition, Amazon Creek bisects the Lane County Fairgrounds property and would be an ideal location for stormwater related education, especially if proposed waterway enhancements are made.

2.11 Existing and Planned Park and Recreation Facilities

There is currently an extensive system of public parks in the Amazon basin, with the highest concentration of parks currently found in the upper (eastern) half. Some of the larger parks in this system include: the northern half of Spencer Butte Park, the Ridgeline Park system, the unnamed linear park along Amazon Creek running from Frank Kinney Park to Hilyard Street, Tugman Park (17 acres), Amazon Park (79 acres), Laurelwood Golf Course (92 acres), and Westmoreland Park (47 acres). In addition, numerous neighborhood parks are found throughout the basin, with the highest concentration again occurring in the upper half.

In addition to developed neighborhood and community parks, nearly 300 acres of land in the western portion of the basin have been designated for wetland protection under the *West Eugene Wetlands Plan* (1992) and will likely remain as open space in the future. Much of this land is either currently in public ownership or is in the process of being acquired by the City of Eugene or the Bureau of Land Management for long term protection and enhancement.

Public parks and lands in public ownership for wetland protection total approximately 1,388 acres (12 percent of the total basin area).

The ridgeline trail system currently extends from Dillard-Skyline Park westward to Blanton Road, with a spur trail connecting with the summit trail to Spencer Butte. The *Eugene Parks and Recreation Master Plan* (1989) proposes extending the ridgeline trail from Dillard-Skyline Park northeast towards the Willamette River and from Blanton Road westward towards Fern Ridge Reservoir following the crest of the ridge. In addition, a spur trail connecting Frank Kinney Park to the Ridgeline trail is proposed for construction in 2002. Significant park land acquisition would likely occur as this trail system is extended.

In November, 1998, voters in Eugene passed a $25.3 million general obligation bond measure for the purposes of purchasing new parkland and building parks, and youth sports fields.

In the Amazon Basin, seven new parks are slated for development or upgrade, three of which are completed. Approximately 90 acres within the ridgeline park corridor were identified for acquisition and have purchased with the bond funds. These plans are consistent with the Parks, Open Spaces and Natural Areas Study (1996).

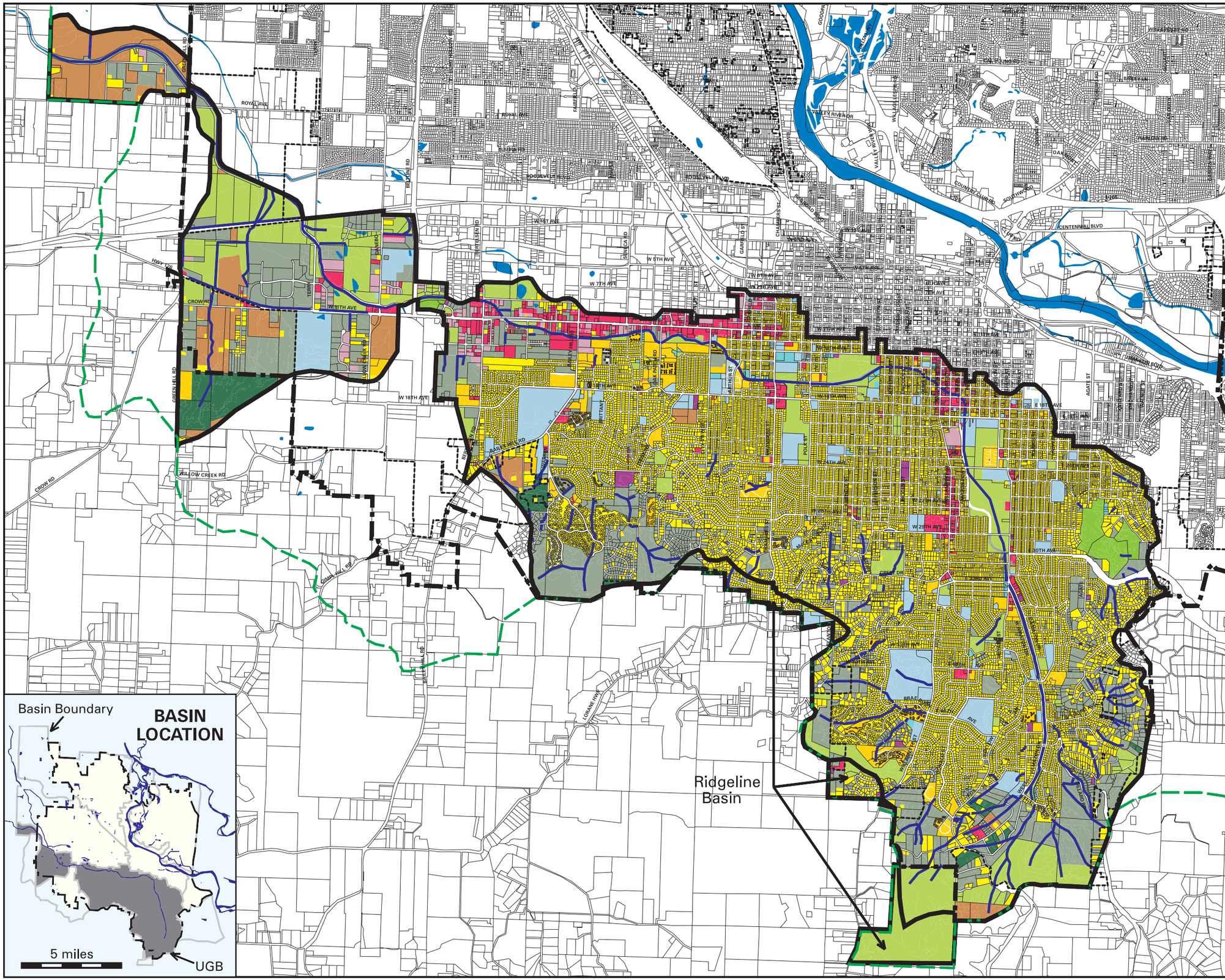
Planned for, but not yet funded or constructed, is a recreation and open space corridor in the Middle section of Amazon Creek Corridor, including community and neighborhood-scale park improvements.

Much of the basin is currently served with on-street bicycle lanes and routes. A bicycle path runs along Amazon Creek in Amazon Park and from the Lane County Fairgrounds to Terry

Street. Extension of this path is planned from Terry Street to Green Hill Road and has been proposed from Green Hill Road to Fern Ridge Reservoir. This bicycle corridor will receive heavy use and has great potential for stormwater education.

Amazon and Ridgeline Basins

Existing Land Use *



LEGEND

- Low-Med. Density Residential
- Med.-High Density Residential
- Commercial (Services & Trade)
- Industrial
- Railroads
- Communication and Utilities
- Parks, Open Space, and Recreation (Except Golf)
- Golf Courses and Driving Ranges
- Schools, Churches, & Cemetaries
- Other Government
- Agriculture
- Timber/Forest
- Other Undeveloped Land
- Waterways and Ponds
- Amazon/Ridgeline Basin Boundaries
- Urban Growth Boundary
- Eugene City Limits
- Streams and Channels in Basin
- Metropolitan Plan Boundary

* Landuse Data current to Nov. 1998

0 3700 ft

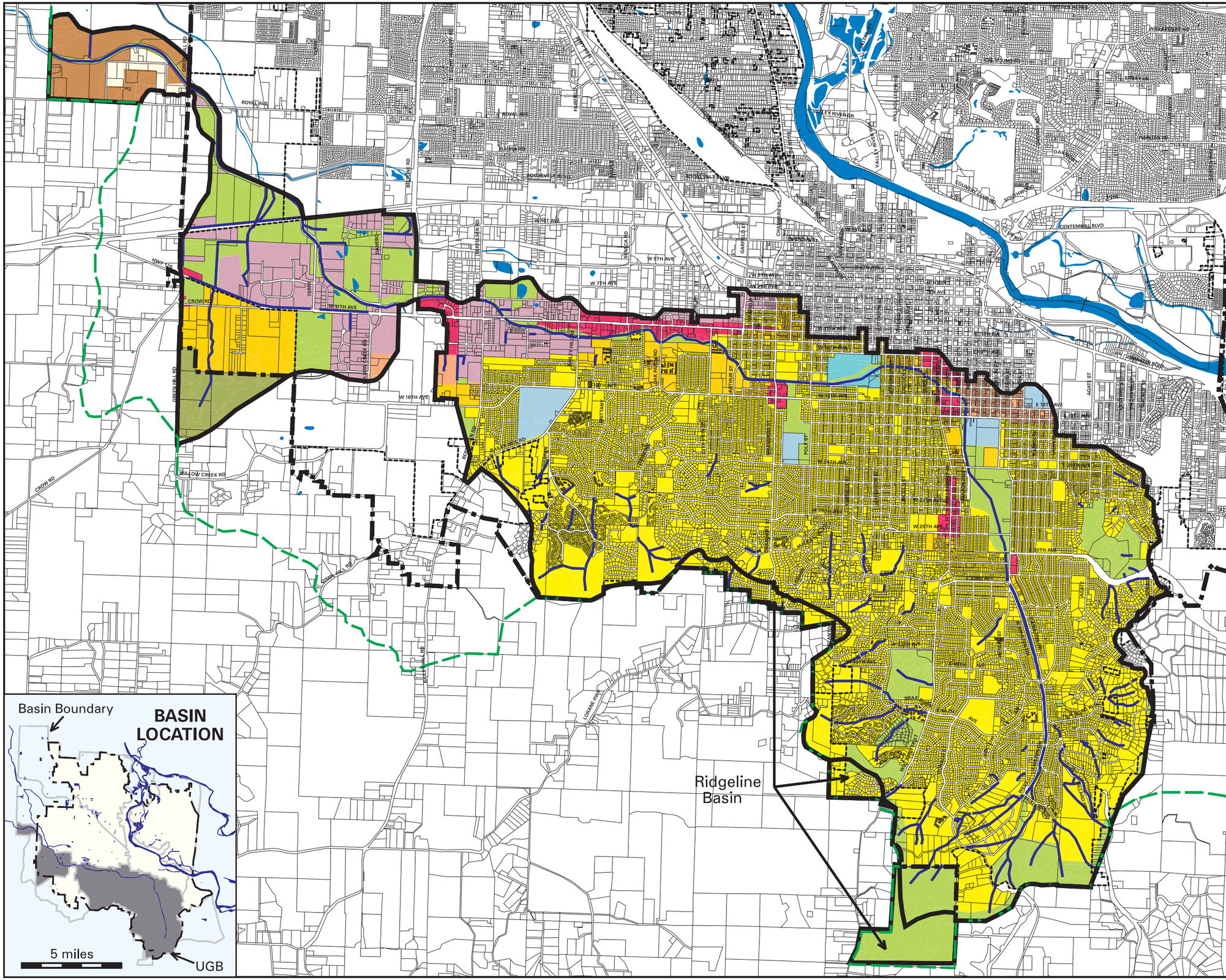
Map Produced by LCOG 2/99

Based on imprecise source data, subject to change

MAP 1

Amazon and Ridgeline Basins

Projected Land Use *



LEGEND

- Rural Residential
- Low-Density Residential
- Med.-Density Residential and MDR Mixed Use
- High-Density Residential and HDR Mixed Use
- Commercial & Commercial-Residential Mixed Use
- Industrial & Commercial-Industrial Mixed Use
- Natural Resource, Parks and Open Space
- Education and University Research
- Government
- Agriculture and Ag/Airport Reserve
- Forest
- Waterways and Ponds
- Amazon/Ridgeline Basin Boundaries
- 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 3700 ft

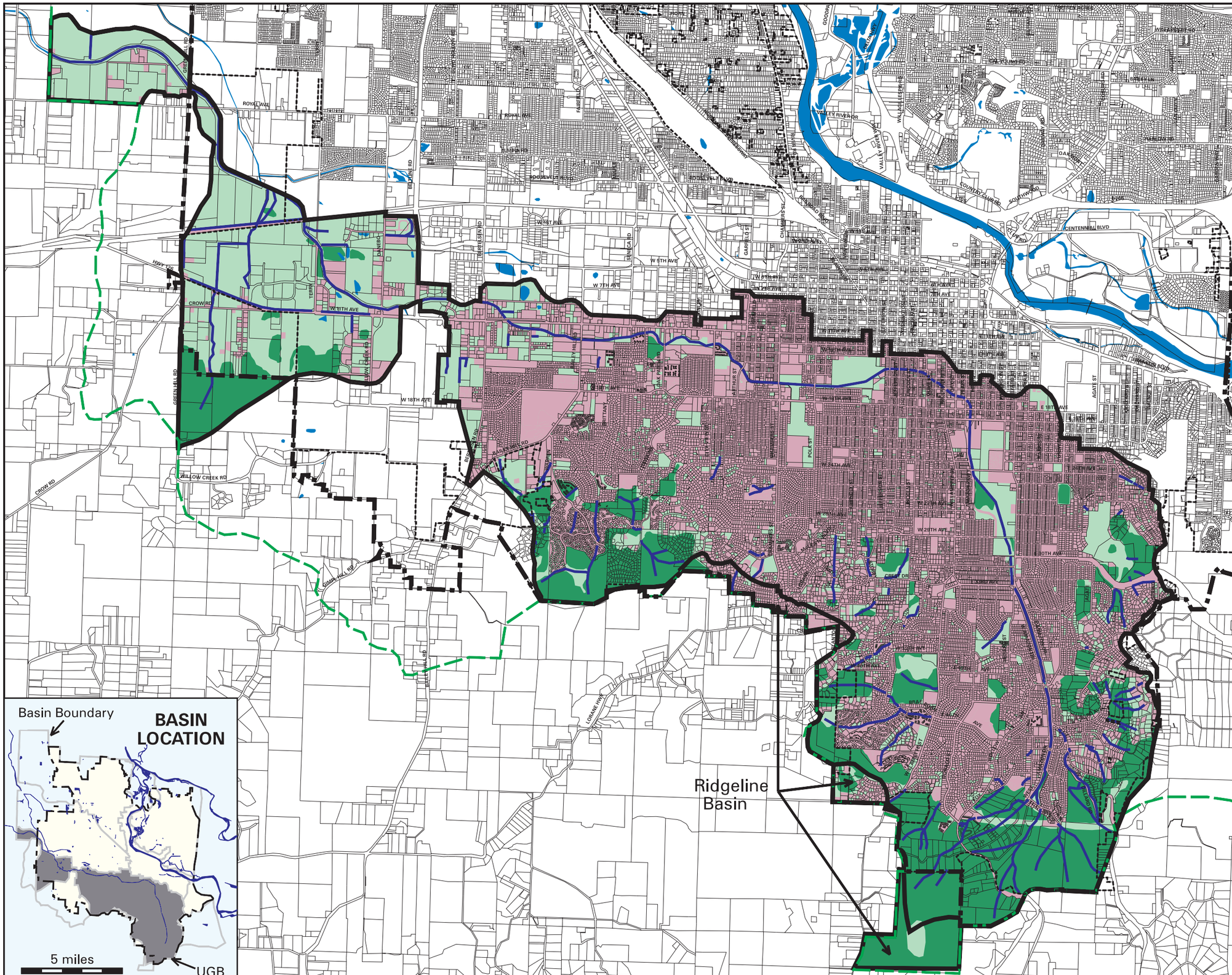
Map Produced by LCOG 2/99

Based on imprecise source data, subject to change

MAP 2

Amazon and Ridgeline Basins

Surface Cover*



LEGEND

- Impervious Surface Areas
- Generalized Forest Cover
- Other Vegetated Areas
- Waterways and Ponds
- Amazon/Ridgeline Basin Boundaries
- 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 3700 ft

N

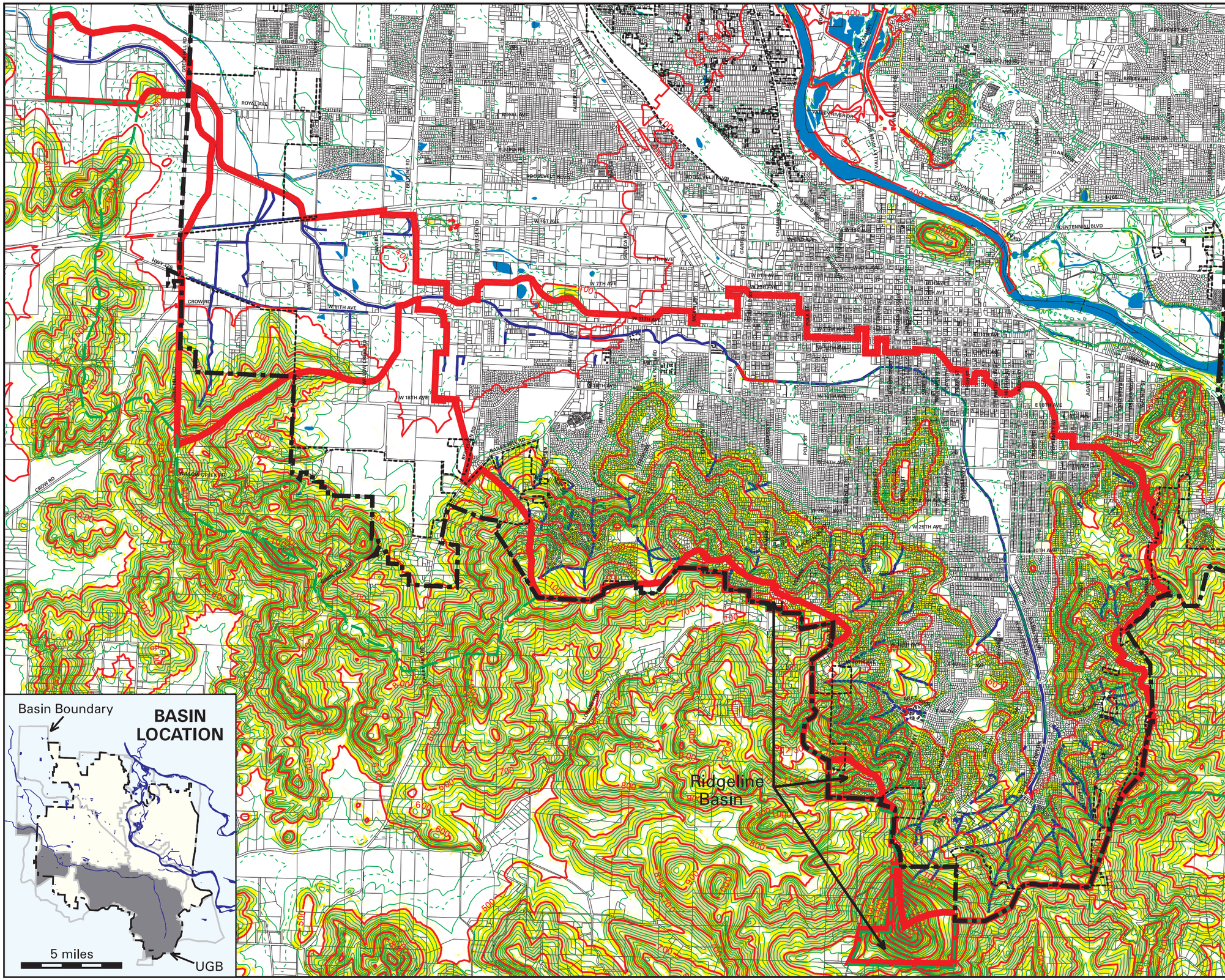
Map Produced by LCOG 2/99

Based on imprecise source data, subject to change

MAP 3

Amazon and Ridgeline Basins

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
- Amazon/Ridgeline Basin Boundaries
- 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 3700 ft

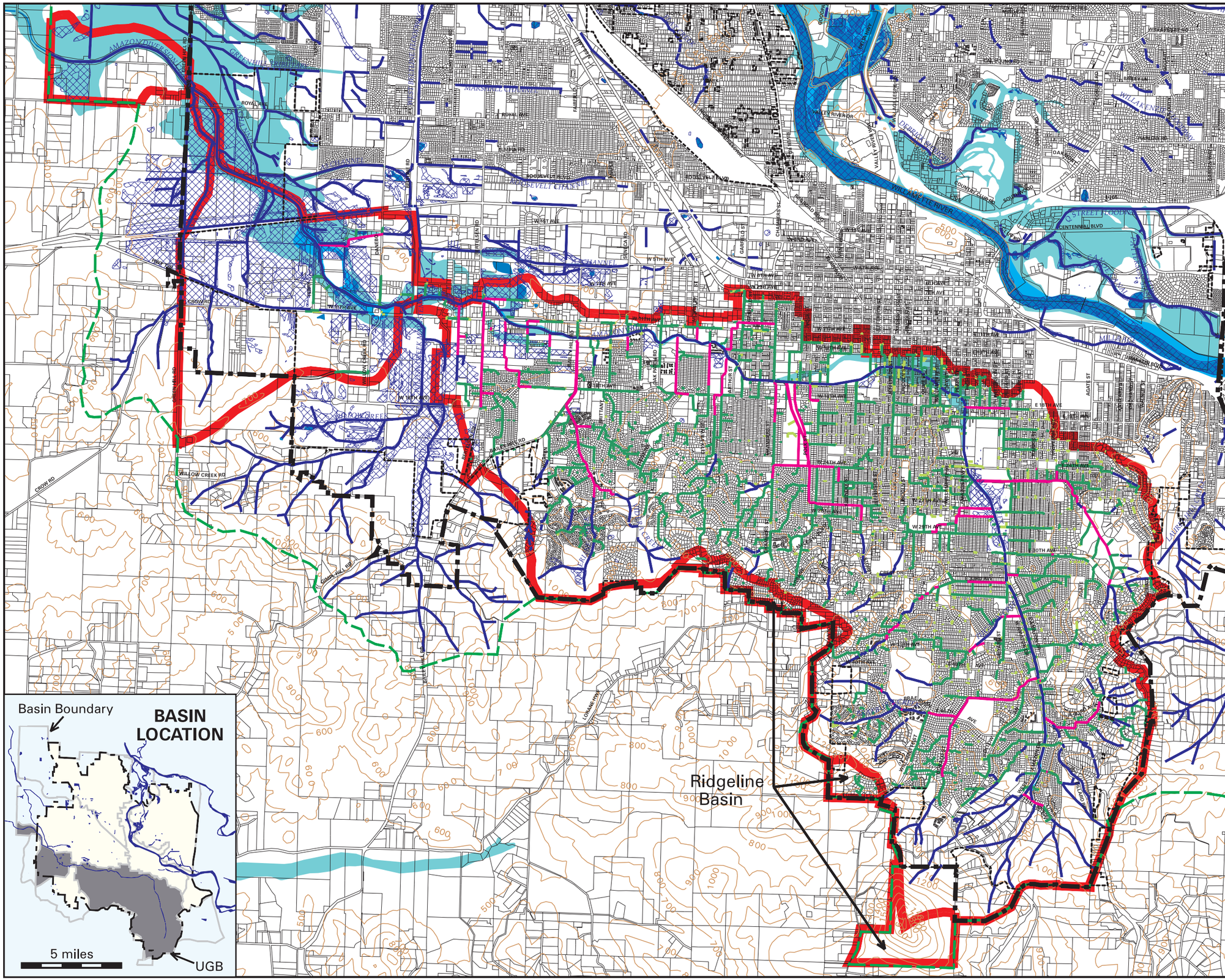
Map Produced by LCOG 2/99

Based on imprecise source data, subject to change

MAP 4

Amazon and Ridgeline Basins

Surface Water and Drainage System Features



LEGEND

- 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
- Amazon/Ridgeline Basin Boundaries
- Urban Growth Boundary
- Eugene City Limits
- Streams and Channels
- Metropolitan Plan Boundary

* from City of Eugene data

0 3700 ft

N

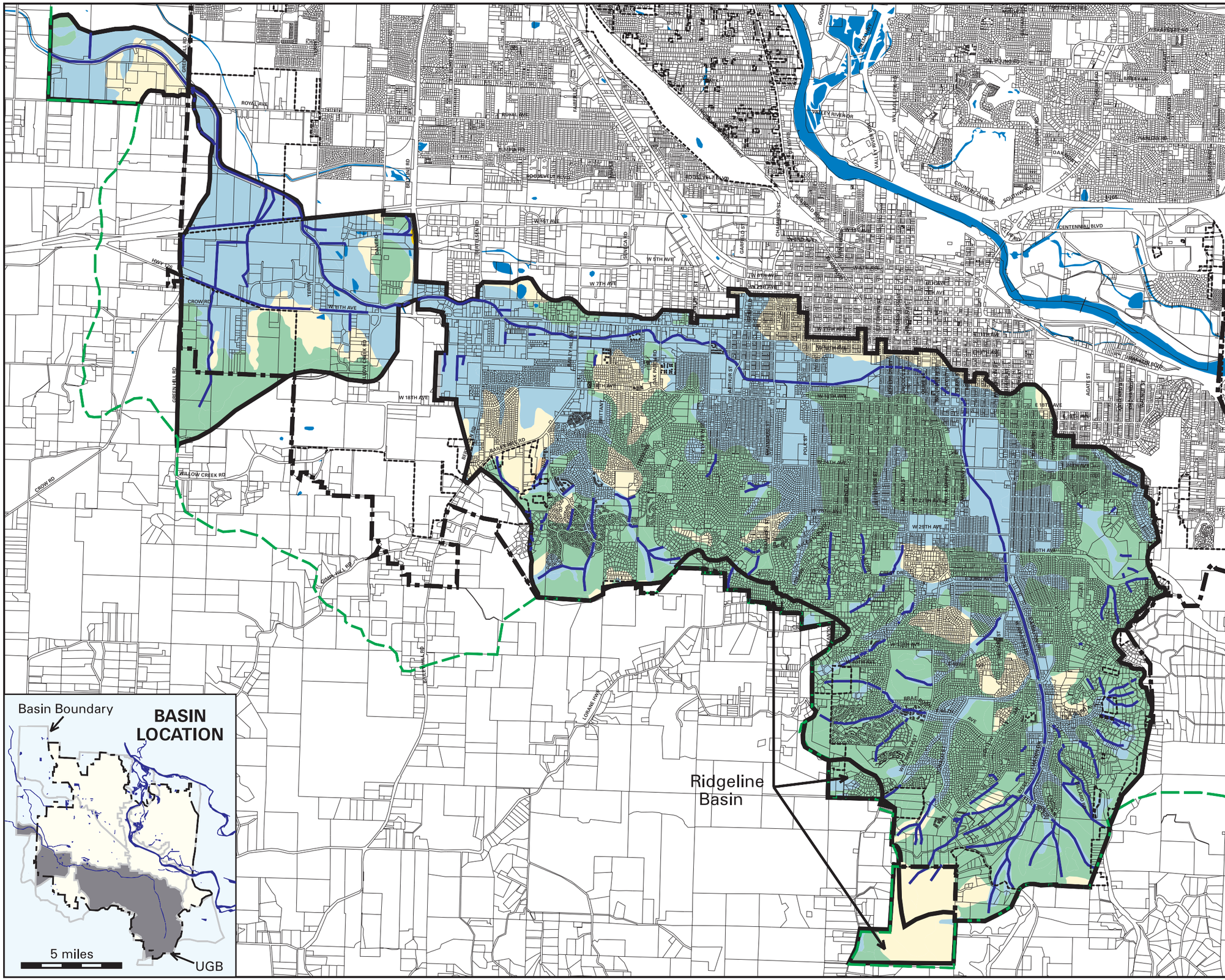
Map Produced by LCOG 2/99

Based on imprecise source data, subject to change

MAP 5

Amazon and Ridgeline Basins

Soil Permeability *



LEGEND

- Very Rapid
- Moderately Rapid
- Moderate
- Moderately Slow
- Slow
- Very Slow
- Variable
- Pits and Water Bodies from Soil Layer (no data)
- Waterways and Ponds

- Amazon/Ridgeline Basin Boundaries
- Urban Growth Boundary
- Eugene City Limits
- Streams and Channels in Basin
- Metropolitan Plan Boundary

* from USDA Soil Conservation Service data

0 3700 ft

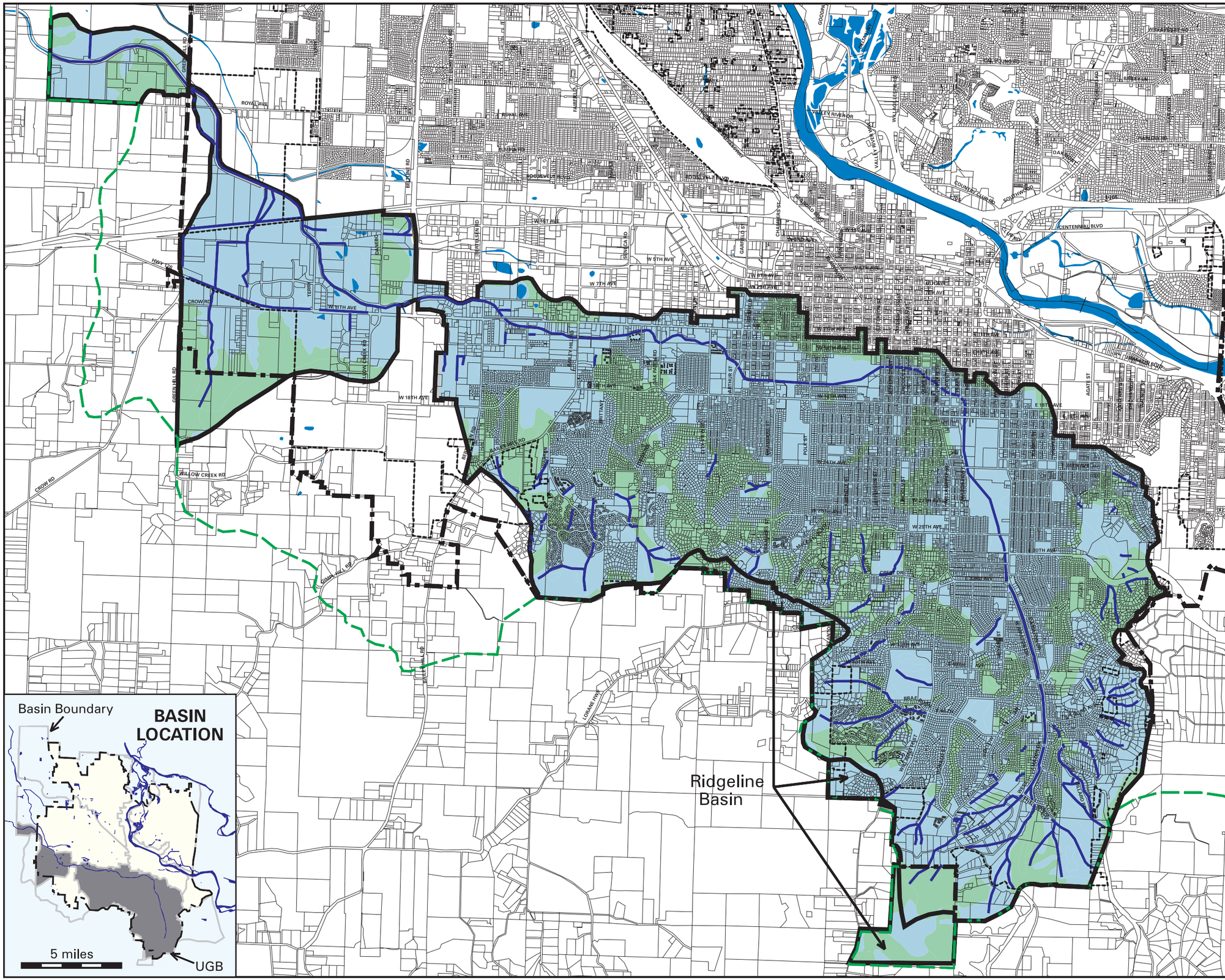
Map Produced by LCOG 2/99

Based on imprecise source data, subject to change

MAP 6

Amazon and Ridgeline Basins

Soil Runoff Potential *



LEGEND

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

* from USDA Soil Conservation Service data

0 3700 ft

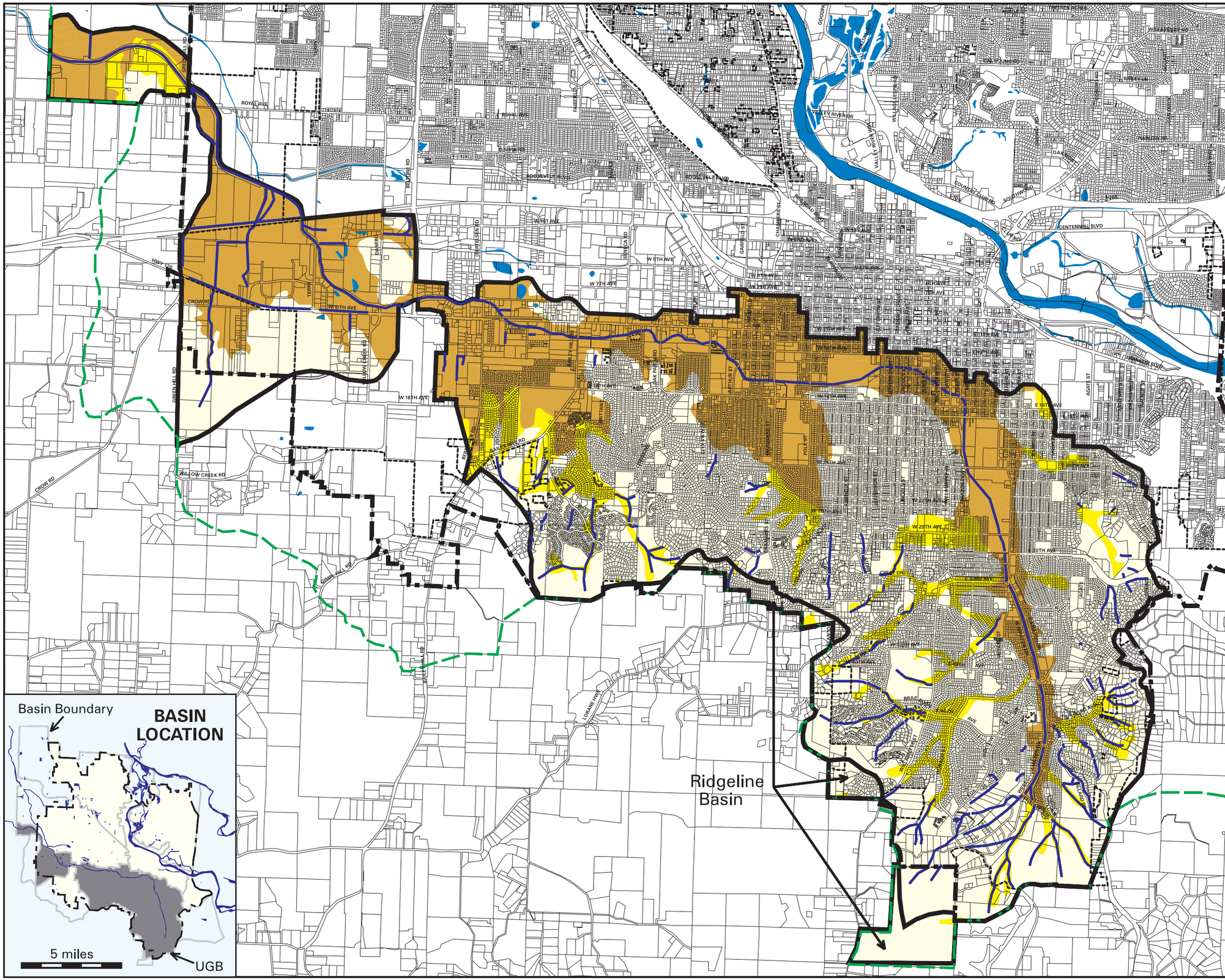
Map Produced by LCOG 2/99

Based on imprecise source data, subject to change

MAP 7

Amazon and Ridgeline Basins

Highly Erodible Soils *



LEGEND

- Highly Erodible Soils
- Moderately Erodible Soils
- All Other Soils
- Waterways and Ponds
- Amazon/Ridgeline Basin Boundaries
- Urban Growth Boundary
- Eugene City Limits
- Streams and Channels in Basin
- Metropolitan Plan Boundary

* Derived by LCOG from UDSA Soil Conservation Service data

0 3700 ft

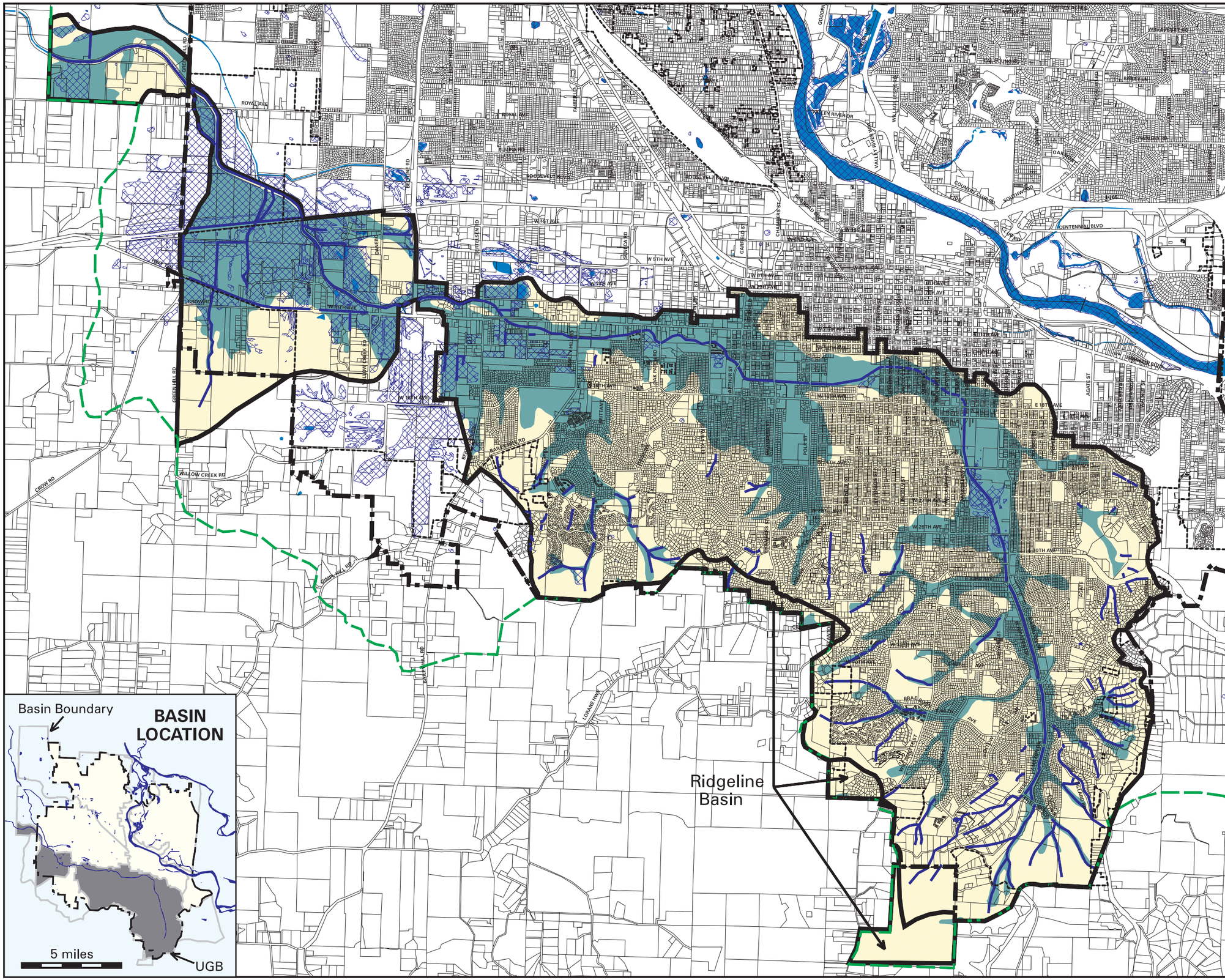
Map Produced by LCOG 2/99

Based on imprecise source data, subject to change

MAP 8

Amazon and Ridgeline Basins

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)
- Amazon/Ridgeline Basin Boundaries
- Urban Growth Boundary
- Eugene City Limits
- Streams and Channels in Basin
- Metropolitan Plan Boundary

* from USDA Soil Conservation Service data

0 3700 ft

Map Produced by LCOG 2/99

Based on imprecise source data, subject to change

MAP 9

Amazon and Ridgeline Basins

Soil Types *

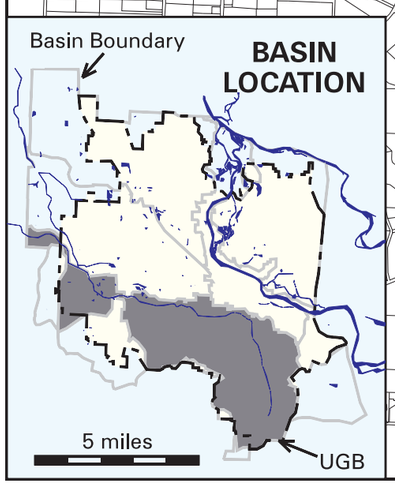
LEGEND

- Soils subject to slumping
- All other soil types

5, AWBRIG SILTY CLAY LOAM
8, BASHAW CLAY
9, BASHAW-URBAN LAND COMPLEX
11C, BELLPINE SILTY CLAY LOAM, 3-12% SLOPES
11D, BELLPINE SILTY CLAY LOAM, 12-20% SLOPES
11E, BELLPINE SILTY CLAY LOAM, 20-30% SLOPES
11F, BELLPINE SILTY CLAY LOAM, 30-50% SLOPES
28C, CHEHULPUM SILT LOAM, 3-12% SLOPES
31, COBURG SILTY CLAY LOAM
32, COBURG-URBAN LAND COMPLEX
33, CONSER SILTY CLAY LOAM
38, DAYTON SILT LOAM, CLAY SUBSTRATUM
41C, DIXONVILLE SILTY CLAY LOAM, 3-12% SLOPES
41E, DIXONVILLE SILTY CLAY LOAM, 12-30% SLOPES
41F, DIXONVILLE SILTY CLAY LOAM, 30-50% SLOPES
42E, DIXONVILLE-HAZELAIR-URBAN LAND COMPLEX, 12-35% SL
43C, DIXONVILLE-PHILOMATH-HAZELAIR COMPLEX, 3-12% SL
43E, DIXONVILLE-PHILOMATH-HAZELAIR COMPLEX, 12-35% SL
45C, DUPEE SILT LOAM, 3-20% SLOPES
52B, HAZELAIR SILTY CLAY LOAM, 2-7% SLOPES
52D, HAZELAIR SILTY CLAY LOAM, 7-20% SLOPES
56, HOLCOMB SILTY CLAY LOAM
63C, JORY SILTY CLAY LOAM, 2-12% SLOPES
73, LINSLAW LOAM
76, MALABON-URBAN LAND COMPLEX
85, NATROY SILTY CLAY LOAM
87, NATROY-URBAN LAND COMPLEX
89C, NEKIA SILTY CLAY LOAM, 2-12% SLOPES
89D, NEKIA SILTY CLAY LOAM, 12-20% SLOPES
89E, NEKIA SILTY CLAY LOAM, 20-30% SLOPES
102C, PANTHER SILTY CLAY LOAM, 2-12% SLOPES
103C, PANTHER-URBAN LAND COMPLEX, 2-12% SLOPES
105A, PENGRA SILT LOAM, 1-4% SLOPES
106A, PENGRA-URBAN LAND COMPLEX, 1-4% SLOPES
107C, PHILOMATH SILTY CLAY, 3-12% SLOPES
108C, PHILOMATH COBBLY SILTY CLAY, 3-12% SLOPES
108F, PHILOMATH COBBLY SILTY CLAY, 12-45% SLOPES
109F, PHILOMATH-URBAN LAND COMPLEX, 12-45% SLOPES
113C, RITNER COBBLY SILTY CLAY LOAM, 2-12% SLOPES
113E, RITNER COBBLY SILTY CLAY LOAM, 12-30% SLOPES
113G, RITNER COBBLY SILTY CLAY LOAM, 30-60% SLOPES
116G, ROCK OUTCROP-WITZEL COMPLEX, 10-70% SLOPES
119, SALEM-URBAN LAND COMPLEX
120B, SALKUM SILT LOAM, 2-6% SLOPES
121B, SALKUM SILTY CLAY LOAM, 2-8% SLOPES
125C, STEIWER LOAM, 3-12% SLOPES
127C, URBAN LAND-HAZELAIR-DIXONVILLE COMPLEX, 3-12% SL
135C, WILLAKENZIE CLAY LOAM, 2-12% SLOPES
135D, WILLAKENZIE CLAY LOAM, 12-20% SLOPES
135E, WILLAKENZIE CLAY LOAM, 20-30% SLOPES
135F, WILLAKENZIE CLAY LOAM, 30-50% SLOPES
138G, WITZEL VERY COBBLY LOAM, 30-75% SLOPES
138E, WITZEL VERY COBBLY , LOAM, 3-30% SLOPES
W, WATER

- Waterways and Ponds
- Amazon/Ridgeline Basin Boundaries
- Urban Growth Boundary
- Eugene City Limits
- Streams and Channels in Basin
- Metropolitan Plan Boundary

* from USDA Soil Conservation Service data



Ridgeline Basin

0 3700 ft

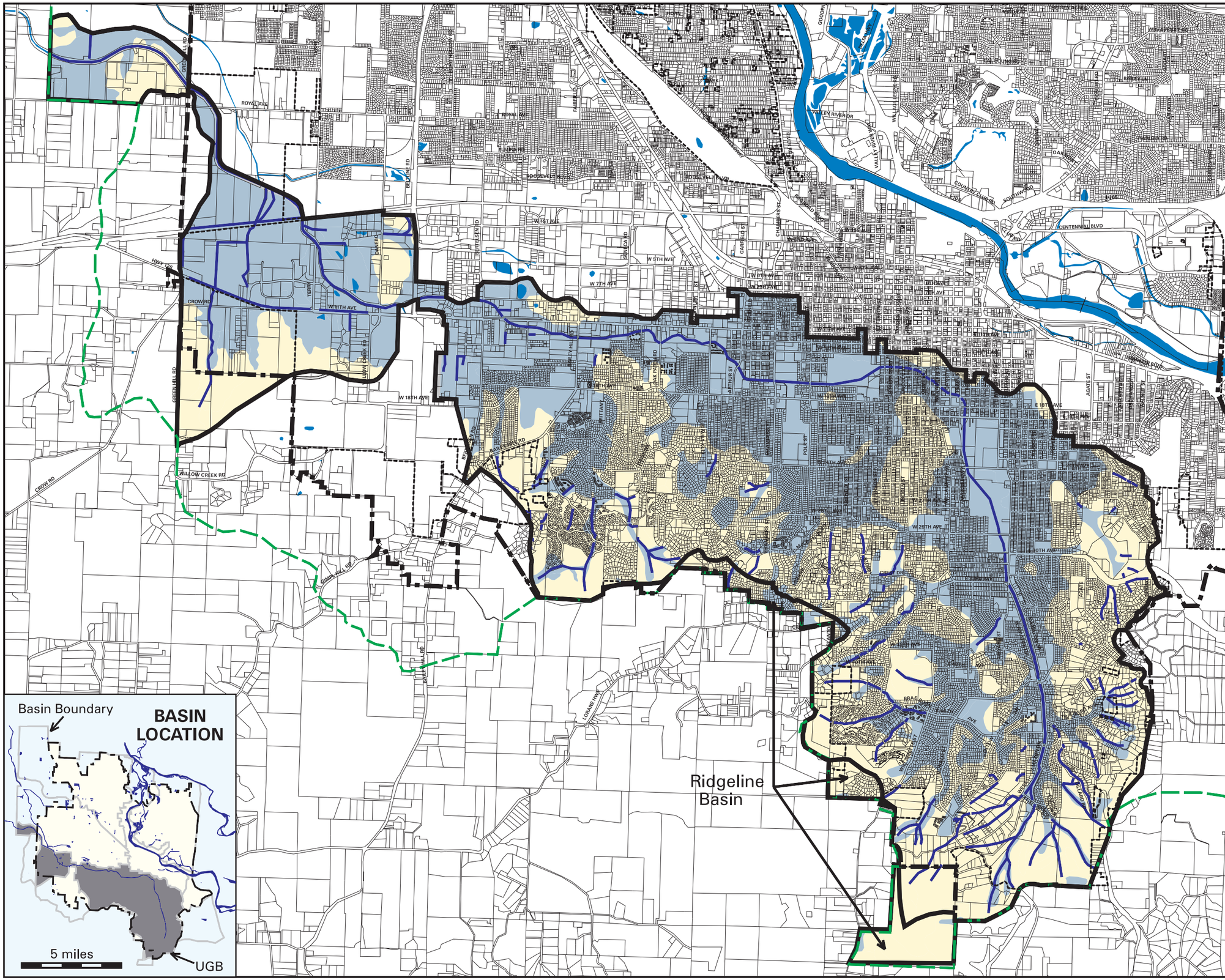
Map Produced by LCOG 2/99

Based on imprecise source data, subject to change

MAP 10

Amazon and Ridgeline Basins

High Water Table *



LEGEND

- 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
- Amazon/Ridgeline Basin Boundaries
- Urban Growth Boundary
- Eugene City Limits
- Streams and Channels in Basin
- Metropolitan Plan Boundary

* from USDA Soil Conservation Service data

0 3700 ft

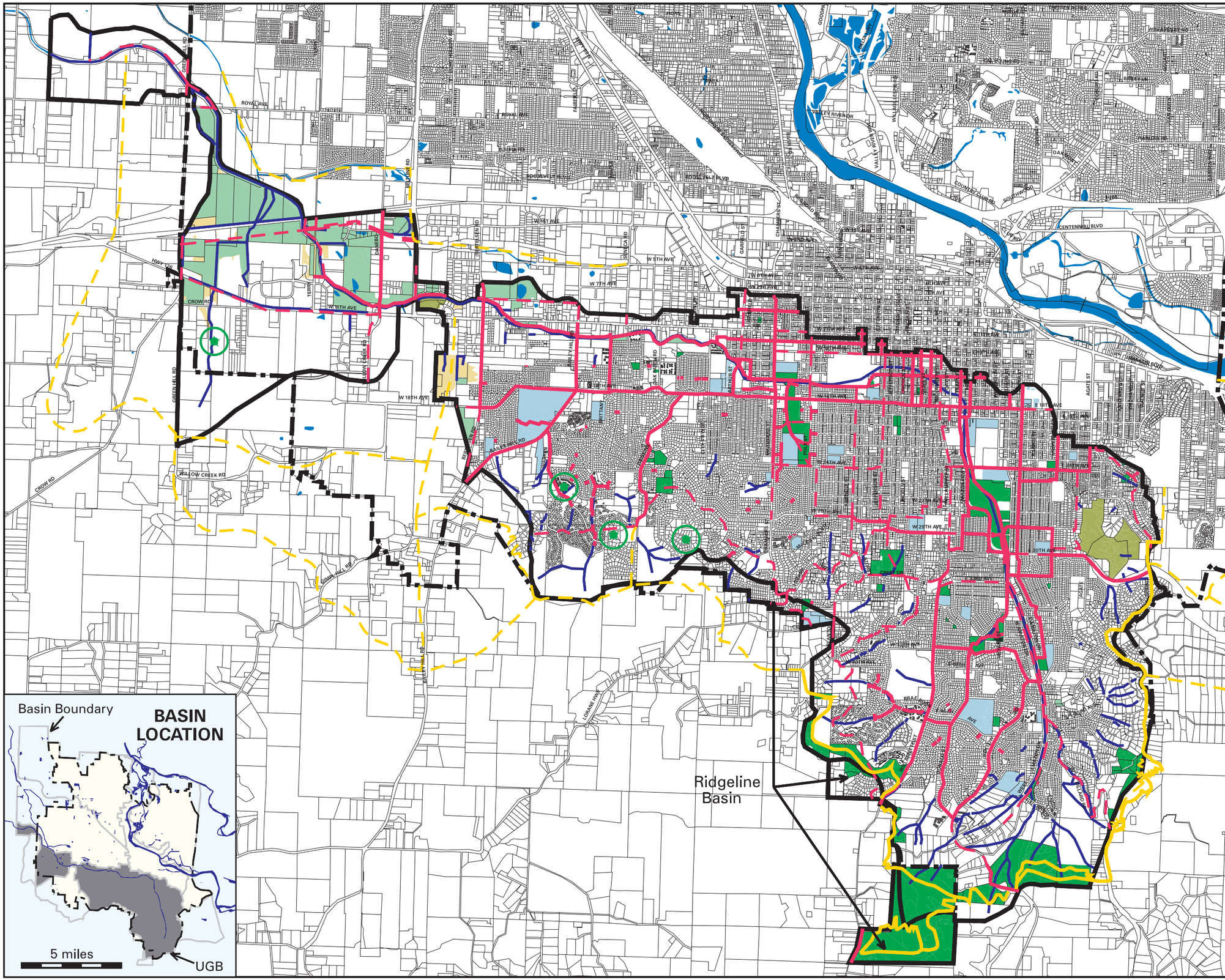
Map Produced by LCOG 2/99

Based on imprecise source data, subject to change

MAP 11

Amazon and Ridgeline Basins

Park, Recreation & Education Facilities



LEGEND

EXISTING

- Parks
- Schools (Pub. & Pvt.)
- Golf Courses
- Public Ownership for Wetland Protection *
- Protected Wetlands in Private Ownership *
- Bikeways in Basin
- Trails

FUTURE

- Parks in Basin **
- Bikeways in Basin ***
- Trails **
- Waterways and Ponds
- Amazon/Ridgeline Basin Boundaries
- Urban Growth Boundary
- Streams and Channels in Basin

* WEWP, 1992; Ownership data, 1998.

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

*** Draft TransPlan Update, Nov. 1997.

0 3700 ft

Map Produced by LCOG 2/99

Based on imprecise source data, subject to change

MAP 12

To identify flooding problems and opportunities for improvement, a flood control evaluation was completed for the drainage system in the Amazon Creek basin that is described in Section 2.5 and illustrated on Map 5. Section 3.1 describes 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 Amazon Creek 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 extent of the Amazon Creek that is covered by the hydrologic/hydraulic model includes:

- The Amazon Creek main stem and tributaries from Martin Drive to the diversion point of A Channel and the Diversion Channel.
- The A Channel from the diversion to approximately 500 feet downstream of Greenhill Road.
- The Diversion Channel from the diversion to approximately 3 mile downstream of Greenhill Road.

Although the Amazon basin model covers a significant portion of the lower Amazon Creek area, the evaluation of the conveyance system deficiencies and the design of capital improvements were focused on the Amazon Creek main stem and tributaries upstream of the Southern Pacific Railroad (SPRR) crossing, which coincides with the City limits. In general, the evaluation also 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 lower portion of the Amazon Creek (i.e., downstream of SPRR) was included in the basin model mainly for the purpose of generating downstream boundary conditions for the evaluation of the A-3 Channel and the Greenhill Tributary.

The Willow Creek basin is also included in the Amazon Creek basin model as it is a significant tributary to the Amazon Creek. However, information for the Willow Creek basin including the modeling results, are provided in Volume VII (i.e., Willow Creek basin report).

The Amazon Creek basin drainage system, is shown on Figures 3-2 through 3-11. Figure 3-1 is an index map that illustrates the relative locations of Figures 3-2 through 3-11. Modeled drainage segments and locations of the proposed capital projects are also illustrated on Figures 3-2 through 3-11.

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. Section 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 Amazon Creek basin 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 Amazon Creek basin was subdivided into 8 major subbasins. The major basin boundaries are presented on Figure 3-1. The 8 major subbasins were further divided into 100 subbasins. One subbasin was not included in the model. Subbasin AMLW000 was not included in the model since it is located outside the City limit. The subbasin boundaries presented on Figures 3-2 through 3-11 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 compiled 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 AM for Amazon. The second two characters represent a two-letter abbreviation for the major subbasin. The 8 major subbasins in the Amazon Creek basin are as follows:

BH = Bailey Hill Major Subbasin
BT = Bertelsen Major Subbasin
CV = City View Major Subbasin
HW = Headwaters Major Subbasin
LW = Lower Amazon Major Subbasin
MD = Middle Amazon Major Subbasin
PK = Polk Street Major Subbasin
UP = Upper Amazon 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 City View major subbasin of the Amazon Creek basin are AMCV010 and AMCV020. 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 three Ridgeline subbasins shown on Figure 3-1 were not included in the Amazon basin model as they drain to the south, not to the Amazon Creek. They are illustrated to show where this area adjacent to the Amazon Creek basin, inside UGB, drains.

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 subbasins included in the Amazon Creek basin model. Specifically, the table provides the information for parameters 1 – 5 listed above and 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 Amazon Creek 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 compiled from previous flood control and natural resource studies and supplemented with field surveys where deemed necessary. 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 Amazon Creek basin, the model was used to evaluate the capacity of approximately 78 open waterway segments, 40 bridge and culvert crossings, and 175 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 in the Amazon Creek basin. 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.
The model-identified flooding problems are summarized separately below for the main channel and tributary pipe systems.

<u>Amazon Creek Main Stem</u>

The main stem of Amazon Creek was evaluated using a 25-year recurrence interval design storm under existing and buildout land use conditions. Based on the modeling results, twenty-four of sixty-nine open channel segments modeled were identified to have overbank flooding problems under existing land use conditions. Most of the overbank flooding problems are expected to occur in the concrete lined portion of the main stem between Jefferson Street and 24th Avenue. Nine of thirty-three roadway crossings were identified as deficient under existing land use conditions. These bridge crossings are located at:

- Garfield Street
- Washington Street
- Lincoln Street
- Olive Street
- 16th Avenue
- Oak Street
- Pearl Street
- 18th Avenue
- 19th Avenue

It should be noted that the existing conditions for a 25-year design storm in the Amazon basin were based on model results using a storm event that occurred in February of 1996. Based on actual field observations during this event, there were some minor flooding problems that occurred during this event, however, none of the problems resulted in property damage. The problems that were observed included the following: flows overtopping Martin Drive, pipe surcharging just upstream of the concrete channel at 18th Avenue and 19th Avenue, and flow in

the bike path at Chambers Street. Only minimal flooding problems occurred in the Amazon main stem and flows in the concrete lined portion of the channel were observed to be within one foot of the top of the channel in some location. . Therefore, the modeling results for the Amazon main stem are likely to be somewhat conservative.

In addition to the deficiencies predicted under existing land use conditions, two bridge crossings (i.e., City View Street and Lawrence Street) and two culvert crossings (i.e., Fox Hollow Street and Snell Street), were predicted to be deficient under buildout land use conditions. Two additional open channel segments were also identified to have overbank flooding under buildout land use conditions.

Amazon Tributaries

In general, 51 model-identified flooding problems are expected in the Amazon tributaries. The flooding problems are expected to occur most frequently in the Middle Amazon major subbasin, followed by the Upper Amazon and Bailey Hill major subbasins. Three flooding problems were identified in the Headwaters, Polk Street and Lower Amazon major subbasins, with one in each major subbasin. No flooding problems are expected in the Bertelsen and City View major subbasins.

Thirty-three pipe segments were identified as deficient for their respective design storms in the Middle Amazon subbasins, representing approximately 65% of all pipe segments modeled in this major subbasin. Among the pipe segments identified as deficient, thirty-one segments are expected to be deficient under existing land use conditions. Only two pipe segments were predicted to be deficient under buildout land use conditions.

Thirteen out of forty-four modeled segments in the Upper Amazon major subbasin were identified to be deficient, of which ten segments are expected to be deficient under existing land use conditions.

For the two flooding problems identified in Bailey Hill subbasins, one deficiency is expected under existing land use conditions and the other under buildout conditions. Three flooding problems identified in Headwaters, Polk Street and Lower Amazon major subbasins are all expected to occur under buildout conditions.

Each of these problems is described in more detail in Section 3.2 in association with the proposed capital project to address the problem.

3.1.4 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 in the Amazon Creek basin included flooding associated with tip-ups. A tip-up is a negatively sloped pipe segment that conveys stormwater discharges from a deeper pipe system to an open waterway with a higher elevation. In many cases, the negative slope of the tip-up causes sediment and debris buildup resulting in localized flooding problems. Typically, the existing tip-

ups do not have adequate access for maintenance. These problems are 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 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 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 observations, and the 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 3-11. As shown in Table 3-1, twenty-eight capital projects were proposed to address the expected flooding problems identified based on modeling results in the Amazon Creek 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 3-11.

In addition to the proposed capital projects listed in Table 3-1, a federal priority project is described below, following the table, as it will also provide some flood control benefits to the Amazon Creek.

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

Expected Flooding Problems		Capital Project Alternatives Considered for Addressing Capacity Deficiencies	Selected Flood Control Capital Projects
Segment Name	**When Deficient**		
Amazon Tributaries			
AMBH015A	10-yr existing	Citywide Annual Budget Line Item - Retrofit of Tip-ups. This capital project will apply to all tip-ups in the basin.	**Citywide Annual Budget Line Item –** The tip-up retrofits that are proposed include manhole or vault like structures that would allow for the capture and removal of sediments/debris and would also allow for maintenance access.
AMHW010B	10-yr future	AM06A - Kinney Park Neighborhood Facility; AM06B - Kinney Park Flow Diversion	**AM06A** – This capital project includes restoring flow to the historical channel through a newly constructed culvert and constructing a neighborhood water quality facility in Kinney Park. The location of the capital project is illustrated on Figure 3-11.
AMUP180A AMUP180B AMUP180C	10-yr existing 10-yr existing 10-yr future	AM08A - Mt. Cavalry Flood Control Facility; AM08B - Mt. Cavalry Pipe Improvements; AM08C – Mt. Cavalry Flood Control Facility and Pipe Improvements	**AM08B** - This capital project includes the following pipe replacements: AMUP180A (1314 ft 36" along 33rd from High St. to Amazon Creek replaced by 48" CSP); AMUP180B (215 ft 36" replaced by 48" CSP); AMUP180C (1254 ft 30" along 33rd from Willamette to east of High St replaced by 36"). The location of the capital project is illustrated on Figures 3-8 and 3-9.
AMUP190A AMUP190B	10-yr existing 10-yr existing	AM09 – Frederick Court Pipe Daylight	**AM09** – This capital project includes: replacing 135 lineal feet of 24” CSP with 36” CSP along Delwood Drive; improving open waterways between West 37th Avenue and Frederick Court (includes daylighting approximately 235 linear feet of existing pipe system); and a culvert replacement at Frederick Court (24” CSP replaced by 36” CSP). The location of the capital project is illustrated on Figure 3-8.
AMUP140C AMUP140D AMUP140E AMUP140F	10-yr existing 10-yr existing 10-yr existing 10-yr future	AM11 – Hilyard Street Pipe Improvements	**AM11**- This capital project includes the following pipe improvements: Segments AMUP140C, 140D and 140E which run parallel to 36th Ave just west of Hilyard are replaced by 42" CSPs; tip-up AMUP140A and pipe segments 140B which run from Hilyard St. to Amazon Creek are re-graded and replaced by 54" CSPs. The location of the capital project is illustrated on Figure 3-9.

Table 3-1 (continued)

Expected Flooding Problems		Capital Project Alternatives Considered for Addressing Capacity Deficiencies	Selected Flood Control Capital Projects
Segment Name	**When Deficient**		
AMUP060A AMUP060C AMUP130A Willamette	10-yr existing 10-yr existing 10-yr existing 10-yr future	AM13- 43rd Avenue Pipe Improvements	**AM13** –This capital project includes the following pipe replacements: AMUP060A (64 ft 60" outfall to Amazon Creek) replaced by 72" CSP; AMUP060B (623 ft 54" from Fox Hollow Rd. to Amazon Dr. W) replaced by 72" CSP; AMUP060C (2580 ft 54" along 43rd Ave. from Donald St. to Fox Hollow Rd.) replaced by 66" CSP; AMUP130A (882 ft 54" CSP along Donald St. from 46th Ave. to 43rd Ave.) replaced by 66" CSP; and the culvert at Willamette St (128 ft 42" CSP) replaced by 48" CSP. The location of the capital project is illustrated on Figure 3-9.
AMMD110A AMMD110B AMMD080B to AMMD080E AMMD080G to AMMD080L	10yr existing	AM14- Morse Ranch Park Pipe Improvements	**AM14-** This capital project includes the following pipe replacements: AMMD080A to AMMD080H (18" to 36" CSPs along 29th Ave. from Charnelton St. to Oak); AMMD070B (27" along 29th Ave. from Oak to Amazon Creek). All of these pipe segments are replaced by 42" CSPs. AMMD070A (30" along 29th Ave. from Oak to Amazon Creek) is replaced by a 48" CSP. The location of the capital project is illustrated on Figure 3-8.
AMMD040A AMMD040B AMMD040C AMMD040K AMMD040G	10-yr existing 10-yr existing 10-yr future 10-yr future 10-yr existing	AM15A – Laurelwood Golf Course Neighborhood Facilities; AM15B – Laurelwood Flood Control Facility and Pipe Improvements; AM15C – Laurelwood Golf Course Pipe Improvements	**AM15B-** This capital project includes constructing a flood control facility at node 54260 (northwest end of the Golf Course) and the following pipe replacements: AMMD040A (961 ft long parallel 60" CSPs) and AMMD040B (486 ft long 42" and 72" elliptical) replaced by 2894 ft long parallel 72" CSPs. The location of the capital project is illustrated on Figure 3-7.
AMPK170R	10-yr future	AM17 – Jackson Street Pipe Improvement	**AM17 –** This capital project includes removing the 24" CSP along Jackson St. from 28th Ave. to 27th Ave. and replacing it with a 30" CSP. The location of the capital project is illustrated on Figure 3-8.
AMBH070B	10-yr future	AM27A- Hawkins Lane Flood Control Facility; AM27B – Windsor Circle Pipe Improvements	**AM27B –** This capital project includes the following pipe replacements: Segment AMBH070A (515 ft 66" CSP) replaced by 72" CSP; and segment AMBH070B (1272 ft 54" CSP) replaced by 66" CSP. The location of the capital project is illustrated on Figure 3-5.
AMLW030G	10-yr future	AM32A – Atlantic Avenue Pipe Daylight; AM32B – Atlantic Avenue Pipe Improvements	**None –** Proposed capital projects may have potential impacts to wetlands and the Amazon Parkway alignment.

Table 3-1 (continued)

Expected Flooding Problems		Capital Project Alternatives Considered for Addressing Capacity Deficiencies	Selected Flood Control Capital Projects
Segment Name	**When Deficient**		
AMMD140A AMMD140B AMMD145A	10-yr existing 10-yr existing 10-yr existing	AM16A – 18th Avenue Flood Storage	**None** – Flooding is due to backwater from the Amazon Creek. Implementing proposed capital projects was estimated to be infeasible due to high costs and a significant need for space.
AMMD165A AMMD165B	10-yr existing 10-yr existing	AM16B – West 19th Avenue Flood Storage	
AMMD135A AMMD135B AMMD135C	10-yr existing	AM16C – East 19th Avenue Flood Storage	
Amazon Creek Main Stem			
MainUP050 MainMD100A 19th Fox Hollow Snell	25-yr existing 25-yr existing 25-yr existing 25-yr future 25-yr future	AM33A – Snell Street Culvert Improvement; AM33B – Fox Hollow Culvert Improvement	**None** – The predicted flooding problems on the Upper Amazon Creek would be addressed as part of a federal priority project titled "Upper Amazon Creek Enhancement Project".
The concrete lined portion of the Amazon Creek between 24th Avenue and Jefferson Street	25-yr existing except for the bridge crossing at Lawrence Street, which is expected to be deficient under 25-yr future	AM36B – Construct a low flow pipe system under the concrete lines portion; AM36C - Cap the creek in the concrete lines portion of the channel; AM41 – 24th to Fairgrounds Channel Modifications	**None** – The modeling results for the Amazon Creek main stem are believed to be conservative when compared to observations from the February 1996 flood. The majority of the Amazon Creek main stem appears to have the capacity for at least a 25-year event. Also, potential capital projects proposed for the concrete lined channel are very costly to implement and significant property acquisition would be needed.
All flooding problems on main stem downstream of Jefferson Street bridge	25-yr existing and 25-yr future	AM38 – Fairgrounds to Bailey Hill Channel Enhancement; AM39 – Grant Street to Arthur Street Channel Enhancement; AM42 – Fairgrounds to Bailey Hill Channel Modification;	**None**- these projects were not selected due to the following reasons: • Very costly. • May have significant negative impacts to existing natural resources. • May have significant impacts to property in highly developed areas. • May not be physically feasible at certain locations.

In addition to the above proposed capital projects, the following related federal priority capital project is currently planned or underway for the main stem of Amazon Creek. This project is described here as it will also provide some flood control benefits to Amazon Creek.

<u>AM100 - Upper Amazon Creek Enhancement Project –</u> This federal priority project involves the Amazon Creek main stem from Martin Drive downstream to 19th Ave. Enhancements will likely include a low flow channel, an area for overbank flows, replanting with native vegetation, and potentially some settling basins for treating the discharges from outfalls. Flood control, water quality, and natural resource benefits will be provided.

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 Amazon Creek 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

With the exception of the Amazon main stem, and the 18th and 19th Ave. flooding problems, capital projects were selected to address all of the flooding problems expected to occur under existing conditions. Capital projects were not selected for the Amazon main stem due to an upcoming federal project that is proposed (upper Amazon Creek enhancement, referred to as capital project AM100), due to expected conservatism in the model results, and due to the significant costs associated with the types of projects that would be needed. Capital projects were not selected for the 18th and 19th Ave. flooding problems due to cost and feasibility issues.

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 Amazon Creek 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 are expected to occur under existing land use conditions. Therefore, capital projects would be required at these locations regardless of which approach is taken. Implementing flood control development standards throughout the Amazon Creek basin would only result in eliminating the need for two of twelve flood

control capital projects (AM17 – Jackson Street pipe improvements and AM27B – Windsor Circle pipe improvements).

- 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 twelve 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 3-11.

- **Citywide Annual Budget Line Item – Tip-Ups:** Retrofit the existing tip-ups located throughout the basin with a sedimentation manhole that provides maintenance access.

- **Capital Project AM06A – Kinney Park Neighborhood Facility:** Divert some of the flow from the pipe system under Martin Drive and route it through the historical channel in Kinney Park.

- **Capital Project AM08B – Mt. Cavalry Pipe Improvements:** Construct pipe improvements to address flooding problems that are expected to occur in pipe segments downstream of Mt. Cavalry Cemetery.

- **Capital Project AM09 – Frederick Court Pipe Daylight:** Replace the undersized pipe segments along Delwood Drive, modify the open waterway and daylight a pipe segments between West 37th and Frederick Court, and replace the undersized culvert at Frederick Court to eliminate the expected flooding problems.

- **Capital Project AM11 – Hilyard Street Pipe Improvements:** Replace pipe segments which run parallel to 36th Avenue just west of Hilyard and regrade/replace pipe segments which run from Hilyard Street to Amazon Creek to eliminate the expected flooding problems.

- **Capital Project AM13 – 43rd Avenue Pipe Improvements:** Replace the undersized pipe segments along Donald Street, 43rd Street, and Fox Hollow Road and replace the culvert crossing at Willamette Street to eliminate the expected flooding problems.

- **Capital Project AM14 – Morse Ranch Park Pipe Improvements:** Replace pipe segments along 29th Avenue from Charnelton Street to Amazon Creek to eliminate expected flooding problems.

- **Capital Project AM15B – Laurelwood Flood Control Facility and Pipe Improvements:** Construct pipe improvements and detention facilities to eliminate

expected flooding problems in pipe segments downstream of the Laurelwood Golf Course.

- **Capital Project AM17 – Jackson Street Pipe Improvements:** Replace the pipe segment along Jackson Street with a larger stormwater pipe to eliminate the expected flooding problems.

- **Capital Project AM27B – Windsor Circle Pipe Improvements:** Replace the undersized pipes with larger pipes to eliminate the expected flooding problems.

- **Capital Project AM100 – Upper Amazon Creek Enhancement:** This federal priority project involves the Amazon Creek main stem from Martin Street downstream to 19th Ave. Enhancements will likely include a low flow channel, an area for overbank flows, replanting with native vegetation, and potentially some settling basins for treating the discharges from outfalls.

- **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 AMAZON CREEK 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] (%)											
			Mapped	Effective	Mapped	Effective			10-Year	25-Year-W[2]	25-Year-S[3]	50-Year	100-Year	10-Year	25-Year-W[2]	25-Year-S[3]	50-Year	100-Year
Amazon - Bailey Hill																		
AMBH-010	54741	128.8	53.0	45.1	58.0	49.3	4.3	0.014	51	52	68	124	147	55	55	74	134	158
AMBH-015	54854	68.6	36.0	30.6	48.0	40.8	10.2	0.047	14	18	24	44	55	19	22	32	57	69
AMBH-020 & AMBH-030	71086	36.2	45.8	38.9	56.0	47.6	8.7	0.003	9	9	16	26	30	11	11	20	31	35
AMBH-040	54772	97.5	42.0	35.7	46.0	39.1	3.4	0.115	23	23	40	65	76	25	25	44	71	83
AMBH-050	54815	31.8	38.0	32.3	48.9	41.6	9.3	0.016	7	7	12	19	21	9	9	15	24	27
AMBH-060	54773	61.9	36.0	30.6	47.1	40.0	9.4	0.137	20	21	24	44	54	24	24	31	54	65
AMBH-070	52255	95.5	40.0	34.0	44.0	37.4	3.4	0.083	29	31	38	71	85	31	33	41	76	92
AMBH-080	66465	90.9	32.0	27.2	42.0	35.7	8.5	0.138	49	50	65	124	147	51	51	71	132	155
AMBH-090	52167	213.9	8.0	6.8	42.0	35.7	28.9	0.203	72	80	53	106	134	101	101	121	209	247
AMBH-100	52214	230.0	14.0	11.9	41.1	34.9	23.0	0.189	82	89	66	128	160	107	107	125	217	256
AMBH-110	52145	61.0	20.0	17.0	44.0	37.4	20.4	0.250	25	24	22	43	54	30	30	36	64	76
AMBH-120	67805	96.6	27.0	23.0	42.9	36.5	13.6	0.205	43	43	47	82	99	48	48	61	103	121
Amazon - Bertelsen Sub-Basin																		
AMBT-010	63173	79.8	19.0	16.2	33.1	28.1	12.0	0.031	23	27	18	36	44	28	31	29	52	63
AMBT-020	54522	73.9	37.0	31.5	67.1	57.0	25.6	0.005	31	31	32	59	71	39	38	53	89	104
AMBT-030	63127	75.6	46.0	39.1	57.1	48.5	9.4	0.004	20	20	34	56	65	24	24	42	68	79
AMBT-040	54747	39.1	30.0	25.5	57.1	48.5	23.0	0.004	16	16	15	29	36	20	20	25	44	52
AMBT-050	71091	102.2	33.0	28.1	58.9	50.1	22.1	0.034	42	42	41	77	93	52	51	66	114	134
AMBT-060	54909	48.3	44.0	37.4	47.1	40.0	2.6	0.004	15	17	21	33	38	16	18	22	34	40
AMBT-070	54898	77.4	45.0	38.3	46.0	39.1	0.9	0.078	20	20	34	55	63	20	20	35	56	64
AMBT-080	51995	50.0	9.0	7.7	41.1	34.9	27.3	0.149	18	18	13	29	38	23	24	28	52	62
AMBT-090	68843	106.5	43.0	36.6	46.0	39.1	2.6	0.038	41	41	49	91	109	42	43	52	96	114
AMBT-100	66971	91.1	12.0	10.2	52.0	44.2	34.0	0.005	10	12	11	20	25	30	31	46	65	75
Amazon - City View Sub-Basin																		
AMCV-010	71084	26.4	55.0	46.8	67.1	57.0	10.3	0.003	11	12	15	22	26	13	13	18	26	30
AMCV-020	55283	41.0	61.0	51.9	65.1	55.3	3.5	0.000	16	17	23	29	34	17	18	24	30	35
AMCV-030	55272	68.9	53.0	45.1	56.0	47.6	2.6	0.020	32	32	40	71	84	33	33	42	74	87
AMCV-040	71004	80.1	44.0	37.4	47.1	40.0	2.6	0.080	20	20	34	55	62	21	21	37	58	66
AMCV-050	55274	90.2	43.0	36.6	48.0	40.8	4.3	0.056	22	22	38	62	72	24	24	42	68	80
AMCV-060	71081	55.2	40.0	34.0	45.1	38.3	4.3	0.084	12	13	21	35	41	14	15	24	39	46
AMCV-070	55294	95.0	41.0	34.9	46.0	39.1	4.3	0.032	22	22	38	61	71	25	25	42	68	80
AMCV-080	55365	108.8	39.0	33.2	46.0	39.1	6.0	0.132	42	44	44	87	105	45	46	52	98	117
AMCV-090	52730	39.8	40.0	34.0	46.0	39.1	5.1	0.155	19	19	22	40	48	20	20	24	43	52
AMCV-100	52573	123.4	32.0	27.2	42.9	36.5	9.3	0.182	50	51	48	91	111	56	55	61	111	133
Amazon - Headwaters Sub-Basin																		
AMHW-010	67175	249.6	14.0	11.9	32.0	27.2	15.3	0.311	77	86	52	111	142	97	102	95	178	216
AMHW-020	65344	214.1	14.0	11.9	35.1	29.8	17.9	0.270	82	83	64	131	163	99	96	106	195	233
AMHW-030	65392	157.7	9.0	7.7	32.0	27.2	19.6	0.277	63	60	45	95	121	74	73	79	146	176
Amazon - Lower Sub-Basin																		
AMLW-010	71114	565.6	5.0	4.3	33.1	28.1	23.9	0.157	16	23	27	52	70	105	112	181	282	331
AMLW-020	71113	189.3	2.0	1.7	9.1	7.7	6.0	0.016	22	34	6	23	34	29	40	19	44	57

TABLE 3-2 (continued)
MAJOR HYDROLOGIC INPUT/OUTPUT DATA FOR THE AMAZON CREEK 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] (%)											
			Mapped	Effective	Mapped	Effective			10-Year	25-Year-W[2]	25-Year-S[3]	50-Year	100-Year	10-Year	25-Year-W[2]	25-Year-S[3]	50-Year	100-Year
AMLW-030	63178	251.4	14.0	11.9	28.0	23.8	11.9	0.017	59	75	42	87	108	77	90	77	137	165
AMLW-040	71110	137.0	10.0	8.5	36.9	31.4	22.9	0.115	41	45	23	52	69	57	58	59	108	131
AMLW-050	71105	224.5	12.0	10.2	48.0	40.8	30.6	0.077	58	67	35	77	97	94	99	114	192	228
AMLW-060	71122	68.5	18.0	15.3	31.1	26.4	11.1	0.014	23	25	17	36	45	27	28	26	49	59
Amazon - Middle Sub-Basin																		
AMMD-010	51437	121.7	32.0	27.2	42.0	35.7	8.5	0.225	55	52	54	103	127	59	57	65	121	146
AMMD-020	54260	196.9	26.0	22.1	32.0	27.2	5.1	0.196	90	90	90	172	209	94	94	101	188	226
AMMD-030	54295	97.6	43.0	36.6	46.0	39.1	2.6	0.249	46	45	51	93	111	47	46	54	97	115
AMMD-040	54330	165.1	41.0	34.9	44.0	37.4	2.6	0.108	87	88	104	189	226	89	89	109	195	233
AMMD-050	54174	119.9	39.0	33.2	41.1	34.9	1.8	0.070	52	54	58	102	122	53	54	60	106	126
AMMD-060	51751	130.9	44.0	37.4	46.0	39.1	1.7	0.082	59	59	66	120	143	61	60	69	124	147
AMMD-070	71052	33.4	42.0	35.7	42.9	36.5	0.8	0.014	17	17	21	37	43	17	17	21	37	44
AMMD-080	51303	85.0	51.0	43.4	52.9	45.0	1.7	0.120	44	44	54	98	117	44	44	56	100	119
AMMD-090	51344	165.5	33.0	28.1	42.0	35.7	7.7	0.146	69	69	69	129	156	75	74	83	150	180
AMMD-100	71053	135.1	44.0	37.4	47.1	40.0	2.6	0.084	62	61	69	124	148	63	63	73	130	154
AMMD-110	66967	28.0	54.0	45.9	57.1	48.5	2.6	0.043	15	15	20	34	40	15	16	21	36	41
AMMD-120	54175	15.3	39.0	33.2	44.0	37.4	4.3	0.011	9	9	13	20	23	9	9	13	21	24
AMMD-130	57163	55.3	31.0	26.4	45.1	38.3	12.0	0.011	23	25	25	44	52	26	27	32	54	63
AMMD-135	57428	122.7	51.0	43.4	54.0	45.9	2.6	0.034	54	57	67	112	132	56	58	70	117	138
AMMD-140	57400	30.0	54.0	45.9	62.0	52.7	6.8	0.003	12	13	16	25	29	13	14	19	27	32
AMMD-145	57427	46.5	47.0	40.0	55.1	46.8	6.8	0.035	20	21	24	41	49	22	22	28	46	55
AMMD-150	71059	56.2	61.0	51.9	68.0	57.8	6.0	0.017	27	28	36	62	73	29	29	40	68	79
AMMD-160	71063	52.0	56.0	47.6	58.9	50.1	2.5	0.058	16	18	28	47	55	17	19	30	49	58
AMMD-165	56284	44.8	50.0	42.5	54.0	45.9	3.4	0.108	19	19	23	42	50	19	20	24	44	53
AMMD-170	71075	171.0	47.0	40.0	50.0	42.5	2.6	0.077	64	66	80	145	173	66	68	85	153	182
Amazon - Polk Street Sub-Basin																		
AMPK-010	55432	71.6	55.0	46.8	61.1	51.9	5.2	0.001	27	30	38	50	59	29	31	42	54	63
AMPK-020	66991	87.3	57.0	48.5	61.1	51.9	3.5	0.013	37	40	51	80	94	39	41	54	84	99
AMPK-030	71080	81.6	45.0	38.3	51.1	43.4	5.2	0.013	29	32	37	60	70	31	35	42	66	77
AMPK-040	56048	68.1	45.0	38.3	48.9	41.6	3.4	0.026	25	28	31	54	64	27	29	34	58	69
AMPK-050	71079	66.9	46.0	39.1	47.1	40.0	0.9	0.026	24	27	31	52	61	24	27	31	52	62
AMPK-060	52687	78.1	35.0	29.8	36.9	31.4	1.7	0.011	15	15	27	44	52	16	16	28	47	55
AMPK-070	55256	36.7	33.0	28.1	36.0	30.6	2.6	0.006	7	7	12	19	22	7	7	13	21	24
AMPK-080	71003	110.5	50.0	42.5	52.0	44.2	1.7	0.058	31	31	54	88	101	32	32	56	91	105
AMPK-090	52685	33.7	46.0	39.1	47.1	40.0	0.9	0.115	9	9	15	25	30	9	9	15	25	31
AMPK-100	52707	142.1	40.0	34.0	45.1	38.3	4.3	0.184	64	63	69	127	153	67	65	76	137	164
AMPK-110	53441	121.0	38.0	32.3	44.0	37.4	5.1	0.171	43	46	47	89	108	46	49	54	100	120
AMPK-120	53422	118.0	40.0	34.0	44.0	37.4	3.4	0.166	54	52	57	106	128	55	54	62	112	135
AMPK-130	53408	106.0	32.0	27.2	42.0	35.7	8.5	0.181	45	44	43	82	100	49	47	53	97	117
AMPK-140	53390	103.4	38.0	32.3	45.1	38.3	6.0	0.153	45	44	46	86	104	48	47	53	97	116
AMPK-150	53358	47.6	46.0	39.1	47.1	40.0	0.9	0.126	23	22	26	46	55	23	22	26	47	56
AMPK-160	53448	71.1	44.0	37.4	45.1	38.3	0.9	0.072	32	32	36	65	77	32	32	36	66	79
AMPK-170	68813	70.3	45.0	38.3	46.0	39.1	0.9	0.032	18	21	31	60	77	18	22	31	61	79

TABLE 3-2 (continued)
MAJOR HYDROLOGIC INPUT/OUTPUT DATA FOR THE AMAZON CREEK 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] (%)											
			Mapped	Effective	Mapped	Effective			10-Year	25-Year-W[2]	25-Year-S[3]	50-Year	100-Year	10-Year	25-Year-W[2]	25-Year-S[3]	50-Year	100-Year
Amazon - Upper Sub-Basin																		
AMUP-010	65582	172.4	20.0	17.0	40.0	34.0	17.0	0.242	73	70	62	123	154	84	83	94	173	206
AMUP-020	65398	197.3	38.0	32.3	45.1	38.3	6.0	0.136	79	83	84	152	182	85	88	97	171	204
AMUP-030	65396	182.7	25.0	21.3	42.9	36.5	15.3	0.258	79	76	71	139	171	89	88	102	186	222
AMUP-040	65370	218.9	19.0	16.2	38.9	33.1	17.0	0.274	98	100	103	189	228	110	114	141	244	286
AMUP-050	67978	76.4	34.0	28.9	44.0	37.4	8.5	0.260	38	38	42	79	96	40	41	49	89	107
AMUP-060	50653	97.0	41.0	34.9	45.1	38.3	3.5	0.159	50	50	58	107	130	51	51	61	112	135
AMUP-070	50200	126.1	43.0	36.6	45.1	38.3	1.8	0.192	64	65	77	141	168	65	66	79	144	172
AMUP-080	50090	114.8	33.0	28.1	40.0	34.0	6.0	0.295	50	50	53	104	129	52	53	60	115	141
AMUP-090	50739	122.6	20.0	17.0	42.9	36.5	19.5	0.224	52	49	44	88	111	60	60	70	128	153
AMUP-100	50109	151.9	27.0	23.0	40.0	34.0	11.1	0.302	62	61	55	108	134	69	67	74	137	165
AMUP-110	99479	93.1	19.0	16.2	42.0	35.7	19.6	0.237	38	36	29	61	78	45	44	50	92	111
AMUP-120	50660	181.3	33.0	28.1	42.9	36.5	8.5	0.100	69	74	70	128	155	77	80	87	154	184
AMUP-130	50671	42.6	43.0	36.6	45.1	38.3	1.8	0.071	21	21	24	45	55	21	21	25	47	56
AMUP-140	51763	101.6	34.0	28.9	42.9	36.5	7.6	0.120	47	46	49	92	111	50	49	58	105	125
AMUP-150	50544	179.9	35.0	29.8	42.9	36.5	6.8	0.264	88	89	103	181	217	92	94	116	200	236
AMUP-160	51757	150.7	39.0	33.2	46.0	39.1	6.0	0.238	72	69	77	143	172	75	73	86	158	188
AMUP-170	51729	64.1	47.0	40.0	48.0	40.8	0.8	0.090	28	29	33	57	68	28	29	34	58	69
AMUP-180	51841	93.7	42.0	35.7	45.1	38.3	2.6	0.150	51	51	63	115	138	52	52	65	118	141
AMUP-190[4]	51239	49.4	32.0	27.2	42.0	35.7	8.5	0.214	27	27	34	61	72	28	28	37	66	78
AMUP-200[4]	50163	92.9	23.0	19.6	42.9	36.5	17.0	0.203	42	42	46	80	96	48	48	63	104	121

Note.
1. Increase in effective impervious percentage from existing land use conditions to future land use conditions
2. W = Winter
3. S = Summer
4. Modeling data for these subbasins have recently been updated and are available by contacting the City of Eugene Public Works Department, Engineering Division.

TABLE 3-3
HYDRAULIC PERFORMANCE OF THE AMAZON CREEK 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	
Amazon Main channel												
SPRR-B	71110	71111	bridge	95	25	3297	3484	382.9	382.7	383.0	382.8	
SPRR-rd	71110	71111	Roadway	95		0	0	382.3	382.3	382.4	382.4	
MainLW020E	71123	71110	Natural	978	25	3284	3469	384.2	382.9	384.4	383.0	25-yr Existing
MainLW020F	63032	71123	Natural	300	25	3286	3471	384.4	384.2	384.6	384.4	
MainLW030A	71107	63032	Natural	1252	25	3253	3424	385.8	384.4	385.9	384.6	
SPB	71106	71107	bridge	118	25	3253	3426	386.0	385.8	386.1	385.9	
SPBrd	71106	71107	Roadway	118		0	0	384.8	384.8	385.1	385.1	
MainLW030B	71105	71106	Natural	935	25	3253	3427	387.2	386.0	387.4	386.1	25-yr Future
MainLW030C	71104	71105	Natural	1300	25	3227	3405	388.2	387.2	388.4	387.4	25-yr Existing
MainLW030D	71103	71104	Natural	240	25	3229	3409	388.3	388.2	388.5	388.4	
Danebo	71122	71103	bridge	75	25	3229	3410	388.5	388.3	388.7	388.5	
Danebord	71122	71103	Roadway	75		0	0	387.1	387.1	387.7	387.7	
MainLW050A	71120	71122	Natural	1079	25	3221	3401	389.8	388.5	390.0	388.7	25-yr Existing
MainLW060A	71100	71120	Natural	297	25	2455	2578	389.9	389.8	390.1	390.0	25-yr Existing
Beltline	71099	71100	bridge	97	50	2359	2482	389.1	389.1	389.7	389.7	
Beltlinerd	71099	71100	Roadway	96		0	0	388.5	388.5	389.0	389.0	
MainLW060B	71098	71099	Natural	205	25	2468	2590	390.0	390.0	390.2	390.1	
MainLW060C	63126	71098	Natural	1620	25	2522	2622	390.6	390.0	390.8	390.2	25-yr Existing
MainBT020C	71097	63126	Natural	245	25	2516	2610	390.9	390.6	391.1	390.8	
MainBT020D	71096	71097	Natural	255	25	2518	2614	391.2	390.9	391.5	391.1	
MainBT030A	71095	71096	Natural	490	25	2521	2618	392.0	391.2	392.2	391.5	
Bertlesn	63127	71095	bridge	90	25	2374	2471	392.1	392.0	392.3	392.2	
Bertlesnrd	63127	71095	Roadway	90		108	157	391.2	391.1	391.5	391.4	
MainBT010B	71094	63127	Natural	970	25	2466	2542	393.4	392.1	393.6	392.3	
W11th	54748	71094	bridge	162	50	2315	2423	393.3	393.0	393.5	393.3	
W11thrd	54748	71094	Roadway	162		0	0	392.8	392.8	393.0	393.0	
MainBT050A	71093	54748	Natural	284	25	2448	2513	393.9	393.6	394.1	393.8	
MainBT050B	71092	71093	Natural	500	25	2449	2516	393.9	393.9	394.2	394.1	
MainBT050C	71091	71092	Natural	100	25	2450	2520	394.0	393.9	394.2	394.2	
MainBT050D	71090	71091	Natural	115	25	2429	2487	394.1	394.0	394.4	394.2	
MainBT050E	71089	71090	Natural	685	25	2429	2488	394.8	394.1	395.0	394.4	
MainBT050F	71088	71089	Natural	705	25	2430	2492	395.3	394.8	395.5	395.0	

TABLE 3-3 (continued)
HYDRAULIC PERFORMANCE OF THE AMAZON CREEK 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	
MainBH030A	71087	71088	Natural	400	25	2432	2496	396.2	395.3	396.4	395.5	
MainBH030B	71086	71087	Natural	218	25	2433	2497	396.5	396.2	396.6	396.4	
BaileyHl	71085	71086	bridge	64	25	2238	2281	396.5	396.5	396.7	396.6	
BaileyHlrd	71085	71086	Roadway	64		0	0	395.5	395.5	395.8	395.8	
MainBH010A	54741	71085	Natural	1275	25	2235	2250	397.9	396.5	397.9	396.7	25-yr Existing
MainBH010B	54745	54741	Natural	725	25	2216	2228	398.2	397.9	398.2	397.9	25-yr Existing
MainBH015A	71006	54745	Natural	550	25	2206	2213	398.8	398.2	398.8	398.2	
AcornPk	71007	71006	bridge	25	25	2206	2213	399.0	398.8	399.0	398.8	
MainBH010C	71124	71007	Natural	498	25	2207	2213	399.7	399.0	399.7	399.0	
MainBH010D	71084	71124	Natural	486	25	2207	2213	400.6	399.7	400.6	399.7	
OakPatch	71083	71084	bridge	52	25	2199	2204	400.8	400.6	400.8	400.6	
MainCV010	55294	71083	Natural	800	25	2200	2204	402.3	400.8	402.3	400.8	
MainCV070	55283	55294	Natural	800	25	2159	2173	403.5	402.3	403.5	402.3	
MainCV020	71082	55283	Natural	600	25	2153	2165	404.5	403.5	405.0	403.5	25-yr Future
CityView	71081	71082	bridge	58	25	2150	2229	404.6	404.5	405.5	405.0	25-yr Future
MainCV060	55272	71081	Natural	680	25	2152	2216	405.3	404.6	406.1	405.5	25-yr Existing
MainCV050A	55274	55272	Natural	400	25	2145	2209	406.2	405.3	406.6	406.1	25-yr Existing
MainCV050B	71005	55274	Natural	500	25	2091	2156	406.7	406.2	407.0	406.6	25-yr Existing
Garfield	71004	71005	bridge	59	25	2093	2158	406.8	406.7	407.1	407.0	25-yr Existing
MainCV040	71003	71004	Natural	1600	25	2090	2164	407.7	406.8	407.8	407.1	25-yr Existing
Chambers#1	71002	71003	10'x9' CSP culvert	45	25	707	735	408.3	407.7	408.5	407.8	
Chambers#2	71002	71003	10'x9' CSP culvert	45	25	707	735	408.3	407.7	408.5	407.8	
Chamb-bike	71002	71003	13.3'x8' CSP culvert	45	25	661	682	408.3	407.7	408.5	407.8	
MainPK080	55256	71002	Natural	500	25	2076	2151	408.8	408.3	409.0	408.5	
MainPK060	71080	55256	Natural	1000	25	1835	1905	410.2	408.8	410.6	409.0	
Polk	71079	71080	bridge	70	25	1812	1883	410.8	410.2	411.1	410.6	
Polkrd	71079	71080	Roadway	33		0	0	409.6	409.6	410.2	410.2	
MainPK050	66991	71079	Natural	700	25	1793	1865	411.8	410.8	412.1	411.1	
MainPK020B	71128	66991	Natural	500	25	1767	1839	412.4	411.8	412.7	412.1	
MainPK020A	56048	71128	Natural	800	25	1767	1840	413.5	412.4	413.7	412.7	

TABLE 3-3 (continued)
HYDRAULIC PERFORMANCE OF THE AMAZON CREEK 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	
MainPK040C	71127	56048	Natural	120	25	1748	1821	413.8	413.5	414.0	413.7	
MainPK040B	71125	71127	Natural	680	25	1748	1821	415.3	413.8	415.5	414.0	
MainPK040A	71078	71125	Natural	500	25	1748	1821	415.3	415.3	415.5	415.5	
Jefrsn#1	71077	71078	10.67' x 9.83' CSP culvert	46	25	874	911	416.1	415.3	416.4	415.5	
Jefrsn#2	71077	71078	10.67' x 9.83' CSP culvert	46	25	874	911	416.1	415.3	416.4	415.5	
Jefrsnrd	71077	71078	Roadway	46		0	0	414.9	414.9	415.4	415.4	
MainMD170A	71076	71077	Natural	327	25	1749	1822	416.9	416.1	417.0	416.4	25-yr Existing
Wash#1	71075	71076	7.9'x 10.67' CSP culvert	40	25	774	791	417.6	416.9	417.7	417.0	25-yr Existing
Wash#2	71075	71076	7.9'x 10.67' CSP culvert	40	25	774	791	417.6	416.9	417.7	417.0	25-yr Existing
Washngtnrd	71075	71076	Roadway	40		147	219	417.4	417.1	417.6	417.5	
MainMD170B	71074	71075	Natural	332	25	1707	1778	417.8	417.6	417.9	417.7	25-yr Existing
Lawren#1	71073	71074	9.7'x10.67' CSP culvert	46	25	854	889	418.3	417.8	418.5	417.9	25-yr Future
Lawren#2	71073	71074	9.7'x10.67' CSP culvert	46	25	854	889	418.3	417.8	418.5	417.9	25-yr Future
Lawrencerd	71073	71074	Roadway	46		0	0	417.6	417.6	417.8	417.8	
MainMD170C	71072	71073	Natural	337	25	1708	1779	418.6	418.3	418.8	418.5	25-yr Existing
Lincoln#1	71071	71072	9.4'x 10.67' CSP culvert	47	25	843	862	419.1	418.6	419.3	418.8	25-yr Existing
Lincoln#2	71071	71072	9.4'x 10.67' CSP culvert	47	25	843	862	419.1	418.6	419.3	418.8	25-yr Existing
Lincolnrd	71071	71072	Roadway	47		0	34	418.3	418.3	419.2	419.0	
MainMD150A	71070	71071	Natural	363	25	1709	1779	419.6	419.1	419.9	419.3	25-yr Existing
Charn#1	71069	71070	10.8'x 10.67' CSP culvert	60	25	855	890	420.1	419.6	420.4	419.9	
Charn#2	71069	71070	10.8'x 10.67' CSP culvert	60	25	855	890	420.1	419.6	420.4	419.9	
Charnltnrd	71069	71070	Roadway	60		0	0	419.2	419.2	419.8	419.8	
MainMD150B	71068	71069	Natural	126	25	1711	1781	420.1	420.1	420.4	420.4	25-yr Existing

TABLE 3-3 (continued)
HYDRAULIC PERFORMANCE OF THE AMAZON CREEK 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	
15th	71067	71068	9.8'x22' CSP culvert	87	25	1712	1781	420.2	420.1	420.5	420.4	
15thrd	71067	71068	Roadway	87		0	0	419.6	419.6	420.2	420.2	
MainMD150C	71066	71067	Natural	145	25	1713	1782	420.2	420.2	420.5	420.5	25-yr Existing
Olive#1	71065	71066	10'x 10.67' CSP culvert	50	25	824	832	420.7	420.2	420.9	420.5	25-yr Existing
Olive#2	71065	71066	10'x 10.67' CSP culvert	50		798	848	420.1	419.7	420.8	420.3	25-yr Existing
Oliverd	71065	71066	Roadway	50		3	106	420.1	420.1	420.8	420.6	
MainMD150D	71064	71065	Natural	376	25	1716	1784	421.2	420.7	421.3	420.9	25-yr Existing
16th#1	71063	71064	10'x 10.67' CSP culvert	120	25	765	783	421.6	421.2	421.7	421.3	25-yr Existing
16th#2	71063	71064	10'x 10.67' CSP culvert	120	25	765	783	421.6	421.2	421.7	421.3	25-yr Existing
16thrd	71063	71064	Roadway	120		131	229	421.4	421.0	421.7	421.4	
MainMD150E	71062	71063	Natural	423	25	1708	1776	421.8	421.6	421.9	421.7	25-yr Existing
Oak#1	71061	71062	9.6'x 10.67' CSP culvert	54	25	668	693	422.0	421.8	422.2	421.9	25-yr Existing
Oak#2	71061	71062	9.6'x 10.67' CSP culvert	54	25	668	693	422.0	421.8	422.2	421.9	25-yr Existing
Oakrd	71061	71062	Roadway	54		496	714	421.8	421.6	422.1	421.8	
MainMD150F	71060	71061	Natural	350	25	1710	1777	422.2	422.0	422.3	422.2	25-yr Existing
Pearl#1	71059	71060	8.4'x 10.67' CSP culvert	80	25	648	666	422.3	422.2	422.4	422.3	25-yr Existing
Pearl#2	71059	71060	8.4'x 10.67' CSP culvert	80	25	648	666	422.3	422.2	422.4	422.3	25-yr Existing
Pearlrd	71059	71060	Roadway	80		896	1114	422.2	422.0	422.4	422.2	
MainMD150G	66998	71059	Natural	510	25	1694	1760	422.5	422.3	422.6	422.4	25-yr Existing
18th#1	71057	66998	10.8'x 10.67' CSP culvert	50	25	798	833	423.0	422.5	423.2	422.6	25-yr Existing
18th#2	71057	66998	10.8'x 10.67' CSP culvert	50	25	798	833	423.0	422.5	423.2	422.6	25-yr Existing
18thrd	71057	66998	Roadway	50		116	190	422.8	422.6	423.1	422.9	

TABLE 3-3 (continued)
HYDRAULIC PERFORMANCE OF THE AMAZON CREEK 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	
MainMD030	57188	71057	Natural	350	25	1681	1745	423.2	423.0	423.4	423.2	25-yr Existing
19th	57163	57188	10.5'x22' CSP culvert	53	25	1668	1763	423.3	423.2	423.4	423.4	25-yr Existing
19thrd	57163	57188	Roadway	53		68	108	423.2	423.1	423.4	423.3	
MainMD100A	71054	57163	Natural	1975	25	1621	1795	424.9	423.3	425.3	423.4	25-yr Existing
24th#1	71053	71054	7'x9.68' CSP culverts	46	25	814	901	425.9	424.9	426.3	425.3	
24th#2	71053	71054	7'x9.68' CSP culvert	46	25	814	901	425.9	424.9	426.3	425.3	
24thrd	71053	71054	Roadway	46		0	0	424.7	424.7	425.4	425.4	
MainMD100B	54172	71053	Natural	650	25	1578	1787	427.5	425.9	427.9	425.9	
MainMD040	66967	54172	Natural	1300	25	1365	1567	428.2	427.5	428.7	427.9	
MainMD110	54174	66967	Natural	150	25	1287	1497	428.3	428.2	428.7	428.7	
MainUP050	65370	67978	Natural	1400	25	491	626	461.5	454.8	462.1	456.2	25-yr Existing
MainMD120	71052	54175	Natural	700	25	1227	1460	429.1	428.4	429.5	428.8	
29th	71051	71052	7.5'x15' CMP M baskhnd culvert	80	25	1206	1443	432.4	430.9	433.3	431.6	
29thrd	71051	71052	Roadway	80		0	0	429.1	429.1	429.5	429.5	
MainMD060A	71001	71051	Natural	725	25	1206	1446	433.9	432.4	434.7	433.3	
30th	71000	71001	bridge	79	25	1207	1451	434.3	433.9	435.0	434.7	
MainMD060B	51750	71000	Natural	335	25	1207	1455	434.9	434.3	435.6	435.0	
31st	51751	51750	7.5'x15' CMP M baskhnd culvert	84	25	1207	1458	435.8	434.9	436.7	435.6	
31strd	51751	51750	Roadway	84		0	0	435.0	435.0	435.3	435.3	
MainUP160A	51757	51751	Natural	415	25	1158	1405	436.3	435.8	437.2	436.7	
MainUP160B	51730	51757	Natural	268	25	1102	1350	436.8	436.3	437.6	437.2	
33rd	51729	51730	8'x15' CMP M baskhnd culvert	220	25	1010	1219	437.9	436.8	438.9	437.6	

TABLE 3-3 (continued)
HYDRAULIC PERFORMANCE OF THE AMAZON CREEK 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	
33rdrd	51729	51730	8'x15' CMP M baskhnd culvert	220	25	0	0	436.8	436.8	437.6	437.6	
MainUP170	66944	51729	Natural	1390	25	987	1194	442.4	437.9	443.0	438.9	
MainUP150A	50544	66944	Natural	1240	25	890	1071	447.4	442.4	447.9	443.0	
MainUP150B	50517	50544	Natural	1340	25	823	993	452.8	447.4	453.4	447.9	
FoxHolw#1	67978	50517	72" CSP culverts	225	25	257	300	454.8	452.8	456.2	453.4	25-yr Future
FoxHolw#2	67978	50517	72" CSP culvert	225	25	258	300	454.8	452.8	456.2	453.4	25-yr Future
FoxHolwrd	67978	50517	Roadway	225		0	0	452.9	452.9	453.1	453.1	
MainMD050	54175	54174	Natural	175	25	1243	1474	428.4	428.3	428.8	428.7	
MainUP020	65398	65370	Natural	1050	25	362	435	471.1	461.5	471.6	462.1	
Snell	65396	65398	72" CSP culvert	37	25	292	345	473.3	471.1	474.2	471.6	25-yr Future
Snellrd	65396	65398	Roadway	37		0	0	471.1	471.1	471.3	471.3	
MainUP030	65379	65396	Natural	2100	25	225	270	506.4	473.3	506.7	474.2	
Amazon - Lower Sub-Basin												
AMLW030E	63042	63032	66" CSP	425	10	50	62	383.8	383.7	384.0	383.9	
AMLW030Erd	63042	63032	Roadway	425		0	0	383.7	383.7	383.9	383.9	
AMLW030F	69111	63042	60" CSP	1038	10	50	62	384.1	383.8	384.5	384.0	
AMLW030Frd	69111	63042	Roadway	1038		0	0	383.8	383.8	384.0	384.0	
AMLW030G	63178	69111	54" CSP	1351	10	50	62	385.2	384.1	385.6	384.5	10-yr Future
AMLW030Grd	63178	69111	Roadway	1351		0	7	384.1	384.1	385.6	384.5	
Amazon - Bertelsen Sub-Basin												
AMBT020A	54522	63126	48" CSP	1239	10	34	63	389.8	389.5	391.0	389.8	
AMBT020Ard	63126	54522	Roadway	1239		0	0	389.8	389.8	391.0	391.0	
AMBT020B	66971	54522	42" CSP	761	10	8	27	389.8	389.8	391.5	391.0	
AMBT020Brd	66971	54522	Roadway	761		0	0	389.8	389.8	391.0	391.0	
AMBT010A	63173	63127	36" CSP	77	10	20	24	391.3	391.2	391.7	391.5	
AMBT030A	54486	63127	66" CSP	2250	10	50	55	391.4	391.2	391.9	391.5	
AMBT030B	54488	54486	60" CSP	2208	10	51	57	392.6	391.4	392.9	391.9	
AMBT030Brd	54488	54486	Roadway	2208		0	0	391.4	391.4	391.9	391.9	

TABLE 3-3 (continued)
HYDRAULIC PERFORMANCE OF THE AMAZON CREEK 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	
AMBT030C	54489	54488	54" CSP	358	10	52	58	393.4	392.6	393.5	392.9	
AMBT030Crd	54489	54488	Roadway	358		0	0	392.6	392.6	392.9	392.9	
AMBT030D	68843	54489	42" CSP	508	10	52	58	396.4	393.4	396.8	393.5	
AMBT030Drd	68843	54489	Roadway	508		0	0	393.4	393.4	393.5	393.5	
AMBT090A	54809	68843	30" CSP	1144	10	17	22	407.2	396.4	407.4	396.8	
AMBT090Ard	54809	68843	Roadway	1144		0	0	396.4	396.4	396.8	396.8	
AMBT090B	51993	54809	27" CSP	978	10	17	22	421.2	407.4	421.4	407.6	
AMBT090Brd	51993	54809	Roadway	978		0	0	407.2	407.2	407.4	407.4	
AMBT090C	51995	51993	24" CSP	690	10	17	22	445.4	421.5	445.6	421.7	
AMBT090Crd	51995	51993	Roadway	690		0	0	421.2	421.2	421.4	421.4	
AMBT040A	54747	54748	54" CSP	445	10	43	47	393.1	393.0	393.4	393.2	
AMBT040Ard	54748	54747	Roadway	445		0	0	393.1	393.1	393.4	393.4	
AMBT040B	66976	54747	Natural	500	10	33	33	393.1	393.1	393.4	393.4	
AMBT040C	54813	66976	54" CSP	13	10	33	33	393.1	393.1	393.5	393.4	
AMBT040Crd	54813	66976	Roadway	13		0	0	393.1	393.1	393.4	393.4	
AMBT040D	54811	54813	54" CSP	596	10	33	33	393.2	393.1	393.5	393.5	
AMBT040Drd	54811	54813	Roadway	596		0	0	393.1	393.1	393.5	393.5	
AMBT040E	54909	54811	48" CSP	980	10	33	33	393.5	393.2	393.8	393.5	
AMBT040Erd	54909	54811	Roadway	980		0	0	393.2	393.2	393.5	393.5	
AMBT060A	54898	54909	48" CSP	604	10	20	20	393.6	393.5	393.9	393.8	
Amazon Bailey Hill												
AMBH020A	54773	71086	72" CSP	2886	25	166	222	401.2	396.5	402.5	394.4	
AMBH020Ard	54773	71086	Roadway	2886		0	0	395.5	395.5	395.8	395.8	
AMBH020B	54772	71086	72" CSP	2884	25	158	216	400.9	396.5	402.2	394.4	
AMBH020Brd	54772	71086	Roadway	2884		0	0	395.5	395.5	395.8	395.8	
AMBH050A	54815	54773	66" CSP	320	25	153	193	402.0	401.2	404.0	402.5	
AMBH050Ard	54815	54773	Roadway	320		0	0	399.8	399.8	401.8	401.8	
AMBH020C	54815	54772	66" CSP	312	25	139	180	402.0	400.9	404.0	402.2	
AMBH020Crd	54815	54772	Roadway	312		0	0	399.5	399.5	401.4	401.4	
AMBH050B	68846	54815	84" CSP	132	25	279	366	402.5	402.0	404.8	404.0	
AMBH050Brd	68846	54815	Roadway	132		0	0	400.6	400.6	402.8	402.8	
AMBH050C	52255	68846	72" CSP	528	25	279	366	405.1	402.5	409.1	404.8	
AMBH050Crd	52255	68846	Roadway	528		0	0	401.0	401.0	403.5	403.5	

TABLE 3-3 (continued)
HYDRAULIC PERFORMANCE OF THE AMAZON CREEK 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	
AMBH070C	52243	52255	36" CSP	595	10	49	51	414.0	407.5	414.0	407.6	
AMBH070Crd	52243	52255	Roadway	595		0	0	403.4	403.4	406.9	406.9	
AMBH070D	52248	52243	33" CSP	515	10	49	51	423.7	415.4	423.7	415.4	
AMBH070Drd	52248	52243	Roadway	515		0	0	414.0	414.0	414.0	414.0	
AMBH070E	52240	52248	30" CSP	442	10	49	51	435.0	425.7	435.4	425.8	
AMBH070Erd	52240	52248	Roadway	442		0	0	423.7	423.7	423.7	423.7	
AMBH070F	66465	52240	27" CSP	290	10	49	51	447.8	435.8	448.7	435.8	
AMBH070Frd	66465	52240	Roadway	290		0	0	435.0	435.0	435.4	435.4	
AMBH070A	52163	52255	66" CSP	515	10	212	254	405.8	403.4	410.5	406.9	
AMBH070Ard	52163	52255	Roadway	515		0	0	405.8	405.8	410.5	410.5	
AMBH070B	67805	52163	54" CSP	1272	10	207	230	421.9	405.8	427.2	410.5	10-yr Future
AMBH070Brd	67805	52163	Roadway	1272		0	47	405.8	405.8	427.2	410.6	
AMBH120A	52213	67805	54" CSP	311	10	170	210	426.1	421.9	432.6	427.2	
AMBH120Ard	52213	67805	Roadway	311		0	0	421.9	421.9	427.2	427.2	
AMBH120E	52216	52213	36" CSP	170	10	24	28	429.8	426.1	433.0	432.6	
AMBH120Erd	52216	52213	Roadway	170		0	0	426.1	426.1	432.6	432.6	
AMBH120F	52217	52216	30" CSP	230	10	24	28	434.3	429.8	434.5	433.0	
AMBH120Frd	52217	52216	Roadway	230		0	0	429.8	429.8	433.0	433.0	
AMBH120G	52145	52217	27" CSP	372	10	24	28	459.9	434.9	460.0	435.0	
AMBH120Grd	52145	52217	Roadway	372		0	0	434.3	434.3	434.5	434.5	
AMBH120B	68649	52213	48" CSP	430	10	147	183	438.5	426.5	440.6	432.6	
AMBH120Brd	68649	52213	Roadway	430		0	0	426.1	426.1	432.6	432.6	
AMBH120C	52167	68649	36" CSP	1057	10	70	92	481.3	439.7	481.7	440.6	
AMBH120Crd	52167	68649	Roadway	1057		0	0	438.5	438.5	440.6	440.6	
AMBH120D	52214	68649	36" CSP	321	10	77	94	466.7	439.5	466.9	440.6	
AMBH120Drd	52214	68649	Roadway	321		0	0	438.5	438.5	440.6	440.6	
AMBH015A	54776	54745	36" CSP	13	10	14	19	398.1	398.1	398.1	398.1	10-yr Existing
AMBH015Ard	54776	54745	Roadway	13		3	4	398.1	398.1	398.1	398.1	
AMBH015B	54867	54776	36" CSP	384	10	14	19	398.2	398.1	398.3	398.1	
AMBH015Brd	54867	54776	Roadway	384		0	0	398.1	398.1	398.1	398.1	
AMBH015C	54854	54867	30" CSP	278	10	14	19	398.3	398.2	398.7	398.3	
AMBH015Crd	54854	54867	Roadway	278		0	0	398.2	398.2	398.3	398.3	
Amazon - City View Sub-Basin												

TABLE 3-3 (continued)
HYDRAULIC PERFORMANCE OF THE AMAZON CREEK 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	
AMCV070A	68093	55294	48" CSP	766	10	41	42	402.5	401.7	402.7	402.0	
AMCV070Ard	68093	55294	Roadway	766		0	0	401.7	401.7	402.0	402.0	
AMCV070B	55344	68093	42" CSP	420	10	40	42	403.4	402.5	403.6	402.7	
AMCV070Brd	55344	68093	Roadway	420		0	0	402.5	402.5	402.7	402.7	
AMCV070C	55365	55344	36" CSP	1238	10	41	42	415.0	403.4	415.1	403.6	
AMCV070Crd	55365	55344	Roadway	1238		0	0	403.4	403.4	403.6	403.6	
AMCV030A	55432	55272	42" CSP	1773	10	19	21	405.0	404.5	405.3	404.9	
AMCV030Ard	55432	55272	Roadway	1773		0	0	404.5	404.5	404.9	404.9	
AMCV030B	55446	55272	30" CSP	440	10	5	5	404.5	404.5	404.9	404.9	
AMCV030Brd	55446	55272	Roadway	440		0	0	404.5	404.5	404.9	404.9	
AMCV030C	55432	55446	24" CSP	1540	10	5	5	405.0	404.5	405.3	404.9	
AMCV030Crd	55432	55446	Roadway	1540		0	0	404.5	404.5	404.9	404.9	
AMCV050A	55395	55274	48" CSP	650	10	62	66	406.3	405.0	406.7	405.8	
AMCV050Ard	55395	55274	Roadway	650		0	0	405.0	405.0	405.8	405.8	
AMCV050B	55396	55395	42" CSP	256	10	62	66	407.5	406.3	408.1	406.7	
AMCV050Brd	55396	55395	Roadway	256		0	0	406.3	406.3	406.7	406.7	
AMCV050C	55369	55396	36" CSP	11	10	25	27	407.6	407.5	408.3	408.1	
AMCV050Crd	55369	55396	Roadway	11		0	0	407.5	407.5	408.1	408.1	
AMCV050D	55382	55369	30" CSP	621	10	25	27	411.2	407.6	411.3	408.3	
AMCV050Drd	55382	55369	Roadway	621		0	0	407.6	407.6	408.3	408.3	
AMCV050H	55382	55396	42" CSP	613	10	37	41	411.2	407.5	411.3	408.1	
AMCV050Hrd	55382	55396	Roadway	613		0	0	407.5	407.5	408.1	408.1	
AMCV050I	68794	55382	36" CSP	1203	10	45	48	422.2	411.6	422.4	411.7	
AMCV050Ird	68794	55382	Roadway	1203		0	0	411.2	411.2	411.3	411.3	
AMCV050J	52716	68794	30" CSP	884	10	45	49	434.1	422.2	436.3	422.4	
AMCV050Jrd	52716	68794	Roadway	884		0	0	422.2	422.2	422.4	422.4	
AMCV050K	52713	52716	27" CSP	872	10	46	49	463.3	434.1	463.6	436.3	
AMCV050Krd	52713	52716	Roadway	872		0	0	434.1	434.1	436.3	436.3	
AMCV050L	52573	52713	30" CSP	115	10	45	49	471.3	464.2	471.4	464.3	
AMCV050Lrd	52573	52713	Roadway	115		0	0	463.3	463.3	463.6	463.6	
AMCV050E	52736	55382	30" CSP	1053	10	18	19	420.5	411.2	420.5	411.3	
AMCV050Erd	52736	55382	Roadway	1053		0	0	411.2	411.2	411.3	411.3	
AMCV050F	52733	52736	24" CSP	940	10	18	19	437.7	424.1	437.8	424.1	

TABLE 3-3 (continued)
HYDRAULIC PERFORMANCE OF THE AMAZON CREEK 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	
AMCV050Frd	52733	52736	Roadway	940		0	0	420.5	420.5	420.5	420.5	
AMCV050G	52730	52733	18" CSP	617	10	18	19	463.7	437.7	463.8	437.8	
AMCV050Grd	52730	52733	Roadway	617		0	0	437.7	437.7	437.8	437.8	
Amazon - Polk Street Sub-Basin												
AMPK070A	55289	55256	66" CSP	1262	10	131	134	410.1	408.2	410.4	408.7	
AMPK070Ard	55289	55256	Roadway	1262		0	0	408.2	408.2	408.7	408.7	
AMPK070B	52686	55289	60" CSP	905	10	131	137	413.0	410.1	413.2	410.4	
AMPK070Brd	52686	55289	Roadway	905		0	0	410.1	410.1	410.4	410.4	
AMPK070C	52685	52686	66" CSP	1555	10	131	138	417.2	413.0	417.3	413.2	
AMPK070Crd	52685	52686	Roadway	1555		0	0	413.0	413.0	413.2	413.2	
AMPK090A	52707	52685	36" CSP	1550	10	57	60	445.2	417.2	445.3	417.3	
AMPK090Ard	52707	52685	Roadway	1550		0	0	417.2	417.2	417.3	417.3	
AMPK060A	55290	55256	66" CSP	1263	10	79	84	408.8	408.2	409.2	408.7	
AMPK060Ard	55256	55290	Roadway	1263		0	0	408.8	408.8	409.2	409.2	
AMPK060B	52689	55290	60" CSP	1354	10	79	87	414.0	408.8	414.1	409.2	
AMPK060C#1	66476	52689	48" CSP	1092	10	64	67	417.7	414.0	417.8	414.1	
AMPK060C#2	66476	52689	60" CSP	855	10	92	97	417.7	414.0	417.8	414.1	
AMPK060Crd	66476	52689	Roadway	1092		0	0	414.0	414.0	414.1	414.1	
AMPK060D	52687	55256	54" CSP	1589	25	115	117	412.4	407.3	413.0	407.7	
AMPK060Drd	52687	55256	Roadway	1589		0	0	408.2	408.2	408.7	408.7	
AMPK060E	52689	52687	48" CSP	573	10	79	81	414.0	411.6	414.1	411.7	
AMPK060Erd	52689	52687	Roadway	573		0	0	411.6	411.6	411.7	411.7	
AMPK170A	53474	66476	60" CSP	256	10	94	98	418.6	417.7	418.7	417.8	
AMPK090B	53474	52685	48" CSP	391	10	68	70	418.6	417.2	418.7	417.3	
AMPK170B	53457	53474	48" CSP	28	10	162	168	421.5	419.8	421.7	419.8	
AMPK170Brd	53457	53474	Roadway	28		0	0	418.6	418.6	418.7	418.7	
AMPK170C	53441	53457	54" CSP	766	10	137	143	426.6	421.5	427.3	421.7	
AMPK170Crd	53441	53457	Roadway	766		0	0	421.5	421.5	421.7	421.7	
AMPK170D	53415	53441	54" CSP	1374	10	101	105	433.6	426.6	433.6	427.3	
AMPK170Drd	53415	53441	Roadway	1374		0	0	426.6	426.6	427.3	427.3	
AMPK170E	53405	53415	54" CSP	659	10	78	82	437.8	433.6	437.8	433.6	
AMPK170Erd	53415	53405	Roadway	659		0	0	437.8	437.8	437.8	437.8	
AMPK170F	53388	53405	54" CSP	779	10	40	42	440.6	437.8	440.6	437.8	

TABLE 3-3 (continued)
HYDRAULIC PERFORMANCE OF THE AMAZON CREEK 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	
AMPK170Frd	53388	53405	Roadway	779		0	0	437.8	437.8	437.8	437.8	
AMPK170G	53390	53388	48" CSP	361	10	40	42	442.9	441.1	443.0	441.1	
AMPK170Grd	53390	53388	Roadway	361		0	0	440.6	440.6	440.6	440.6	
AMPK170H	53416	53415	54" CSP	26	10	23	24	433.6	433.6	433.7	433.6	
AMPK170I	53422	53416	24" CSP	459	10	23	24	453.5	439.8	453.5	439.8	
AMPK170Ird	53422	53416	Roadway	459		0	0	433.6	433.6	433.7	433.7	
AMPK170J	68811	53457	36" CSP	358	10	25	26	422.1	421.5	422.3	421.7	
AMPK170Jrd	53457	68811	Roadway	358		0	0	422.1	422.1	422.3	422.3	
AMPK170K	53426	68811	27" CSP	1528	10	25	26	440.0	422.1	440.1	422.3	
AMPK170Krd	53426	68811	Roadway	1528		0	0	422.1	422.1	422.3	422.3	
AMPK170L	53422	53426	24" CSP	422	10	25	26	453.5	440.1	453.5	440.1	
AMPK170Lrd	53422	53426	Roadway	422		0	0	440.0	440.0	440.1	440.1	
AMPK170M	68813	66476	48" CSP	452	10	64	66	418.7	417.7	418.9	417.8	
AMPK170N	53447	68813	42" CSP	1262	10	49	50	422.4	418.7	422.5	418.9	
AMPK170Nrd	53447	68813	Roadway	1262		0	0	422.4	422.4	422.5	422.5	
AMPK170O	53400	53447	30" CSP	290	10	8	9	422.5	422.4	422.7	422.5	
AMPK170Ord	53400	53447	Roadway	290		0	0	422.4	422.4	422.5	422.5	
AMPK170P	53401	53400	24" CSP	311	10	8	9	424.5	422.5	424.5	422.7	
AMPK170Prd	53401	53400	Roadway	311		0	0	422.5	422.5	422.7	422.7	
AMPK170Q	53405	53401	24" CSP	888	10	2	3	437.8	424.5	437.8	424.5	
AMPK170Qrd	53405	53401	Roadway	888		0	0	424.5	424.5	424.5	424.5	
AMPK170R	53408	53405	24" CSP	430	10	40	41	456.6	439.2	458.3	439.4	10-yr Future
AMPK170Rrd	53408	53405	Roadway	430		0	2	437.8	437.8	458.3	443.0	
AMPK170S	53448	53447	30" CSP	180	10	41	42	424.6	422.4	424.6	422.5	
AMPK170Srd	53448	53447	Roadway	180		0	0	422.4	422.4	422.5	422.5	
AMPK170U	53358	53448	36" CSP	580	10	14	14	425.2	424.6	425.3	424.6	
AMPK170Urd	53358	53448	Roadway	580		0	0	424.6	424.6	424.6	424.6	
AMPK170T	53358	53401	21" CSP	197	10	6	7	425.2	424.5	425.3	424.5	
AMPK170Trd	53401	53358	Roadway	197		0	0	425.2	425.2	425.3	425.3	
Amazon - Middle Sub-Basin												
AMMD140A	57400	66998	48" CSP	575	10	59	60	422.3	422.3	422.6	422.5	10-yr Existing
AMMD140Ard	66998	57400	Roadway	575		53	62	422.3	422.3	422.5	422.6	
AMMD140B	57422	57400	42" CSP	608	10	57	58	422.3	422.3	422.6	422.6	10-yr Existing

TABLE 3-3 (continued)
HYDRAULIC PERFORMANCE OF THE AMAZON CREEK 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	
AMMD140Brd	57400	57422	Roadway	608		-41	-51	422.3	422.3	422.6	422.6	
AMMD145A	57427	57422	36" CSP	767	10	21	21	422.3	422.3	422.6	422.6	10-yr Existing
AMMD145Ard	57427	57422	Roadway	767		15	19	422.3	422.3	422.6	422.6	
AMMD165A	57436	57188	27" CSP	216	10	31	32	423.1	423.1	423.3	423.3	10-yr Existing
AMMD165Ard	57188	57436	Roadway	216		107	120	423.1	423.1	423.3	423.3	
AMMD165B	56284	57436	24" CSP	294	10	15	15	423.1	423.1	423.3	423.3	10-yr Existing
AMMD165Brd	57436	56284	Roadway	294		38	40	423.1	423.1	423.3	423.3	
AMMD135A	57433	57163	30" CSP	72	10	35	33	423.2	423.2	423.4	423.4	10-yr Existing
AMMD135Ard	57163	57433	Roadway	72		164	207	423.2	423.2	423.4	423.4	
AMMD135B	57431	57433	30" CSP	704	10	29	27	423.2	423.2	423.4	423.4	10-yr Existing
AMMD135Brd	57433	57431	Roadway	704		111	146	423.2	423.2	423.4	423.4	
AMMD135C	57428	57431	30" CSP	808	10	25	24	423.2	423.2	423.4	423.4	10-yr Existing
AMMD135Crd	57428	57431	Roadway	808		42	45	423.2	423.2	423.4	423.4	
AMMD040A#1	54353	54172	60" CSP	961	10	110	108	429.6	427.6	429.8	427.9	10-yr Existing
AMMD040A#2	54353	54172	60" CSP	961	10	110	108	429.6	427.6	429.8	427.9	10-yr Existing
AMMD040Ard	54353	54172	Roadway	961		24	43	429.6	429.0	429.8	429.1	
AMMD040B#1	54330	54353	83.04" elliptical CSP	486	10	161	158	430.5	429.6	430.6	429.8	10-yr Existing
AMMD040B#2	54330	54353	42" CSP	451	10	63	61	430.5	429.6	430.6	429.8	10-yr Existing
AMMD040Brd	54330	54353	Roadway	486		86	106	430.5	429.6	430.6	429.8	
AMMD040C	54335	54330	83.04" CSP	646	10	131	131	431.1	430.5	431.2	430.6	10-yr Future
AMMD040Crd	54335	54330	Roadway	646		24	30	431.1	430.5	431.2	430.6	
AMMD040D	66486	54335	54" CSP	1157	10	141	145	439.1	431.1	439.3	431.2	
AMMD040Drd	66486	54335	Roadway	1157		0	0	431.1	431.1	431.2	431.2	
AMMD040L	54315	54330	42" CSP	612	10	31	32	431.4	430.5	431.5	430.6	
AMMD040Lrd	54315	54330	Roadway	612		0	0	430.5	430.5	430.6	430.6	
AMMD040M	66485	54315	36" CSP	836	10	31	32	433.8	431.4	434.0	431.5	
AMMD040Mrd	66485	54315	Roadway	836		0	0	431.4	431.4	431.5	431.5	
AMMD040N	54295	66485	30" CSP	777	10	31	32	440.0	433.8	440.2	434.0	
AMMD040Nrd	54295	66485	Roadway	777		0	0	433.8	433.8	434.0	434.0	
AMMD040H	54295	66486	42" CSP	384	10	40	42	440.0	439.1	440.2	439.3	
AMMD040Hrd	66486	54295	Roadway	384		0	0	440.0	440.0	440.2	440.2	

TABLE 3-3 (continued)
HYDRAULIC PERFORMANCE OF THE AMAZON CREEK 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	
AMMD040I	54267	54295	30" CSP	1499	10	29	30	451.1	440.0	451.2	440.2	
AMMD040Ird	54267	54295	Roadway	1499		0	0	440.0	440.0	440.2	440.2	
AMMD040J	54271	54267	24" CSP	482	10	29	30	460.9	451.8	461.5	451.9	
AMMD040Jrd	54271	54267	Roadway	482		0	0	451.1	451.1	451.2	451.2	
AMMD040E	54325	66486	48" CSP	481	10	103	106	446.5	439.1	446.5	439.3	
AMMD040Erd	54325	66486	Roadway	481		0	0	439.1	439.1	439.3	439.3	
AMMD040F	54271	54325	42" CSP	712	10	103	106	460.9	446.5	461.5	446.5	
AMMD040Frd	54271	54325	Roadway	712		0	0	446.5	446.5	446.5	446.5	
AMMD040G#1	54254	54271	42" CSP	232	10	101	101	465.3	460.9	465.4	461.5	10-yr Existing
AMMD040G#2	54254	54271	24" CSP	166	10	31	31	465.3	460.9	465.4	461.5	10-yr Existing
AMMD040Grd	54254	54271	Roadway	232		2	14	465.3	462.6	465.4	462.7	
AMMD040K	54260	54254	42" CSP	639	10	133	136	482.1	465.3	482.8	465.4	10-yr Future
AMMD040Krd	54260	54254	Roadway	639		0	3	465.3	465.3	482.8	465.4	
AMMD020A	66702	54260	42" CSP	475	10	51	54	485.3	482.1	485.5	482.8	
AMMD020Ard	66702	54260	Roadway	475		0	0	482.1	482.1	482.8	482.8	
AMMD020B	51411	66702	36" CSP	1442	10	50	55	531.4	485.3	531.5	485.5	
AMMD020Brd	51411	66702	Roadway	1442		0	0	485.3	485.3	485.5	485.5	
AMMD020C	51437	51411	30" CSP	526	10	50	55	552.9	531.4	553.1	531.5	
AMMD020Crd	51437	51411	Roadway	526		0	0	531.4	531.4	531.5	531.5	
AMMD110A	54362	66967	42" CSP	1291	10	63	63	433.7	428.3	433.8	428.7	10-yr Existing
AMMD110Ard	54362	66967	Roadway	1291		12	18	433.7	433.3	433.8	433.4	
AMMD110B	66460	54362	36" CSP	772	10	49	48	435.4	433.7	435.5	433.8	10-yr Existing
AMMD110Brd	66460	54362	Roadway	772		48	53	435.4	433.7	435.5	433.8	
AMMD080L	51307	66460	30" CSP	164	10	48	46	437.2	435.4	437.2	435.5	10-yr Existing
AMMD080Lrd	51307	66460	Roadway	164		40	46	437.2	435.4	437.2	435.5	
AMMD080K#1	51306	51307	2-24" CSP	278	10	23	23	440.2	437.2	440.2	437.2	10-yr Existing
AMMD080K#2	51306	51307	24" CSP	235	10	25	25	440.2	437.2	440.2	437.2	10-yr Existing
AMMD080Krd	51306	51307	Roadway	278		31	36	440.2	437.2	440.2	437.2	
AMMD080J#1	51305	51306	36" CSP	251	10	34	34	440.9	440.2	441.0	440.2	10-yr Existing
AMMD080J#2	51305	51306	27" CSP	250	10	16	16	440.9	440.2	441.0	440.2	10-yr Existing
AMMD080Jrd	51305	51306	Roadway	251		28	33	440.9	440.3	441.0	440.3	
AMMD080I	51303	51305	48" CSP	473	10	61	63	442.2	440.9	442.2	441.0	10-yr Existing
AMMD080Ird	51303	51305	Roadway	473		14	19	442.2	440.9	442.2	441.0	

TABLE 3-3 (continued)
HYDRAULIC PERFORMANCE OF THE AMAZON CREEK 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	
AMMD080H	51344	51302	30" CSP	710	10	47	47	455.1	445.1	455.2	445.1	10-yr Existing
AMMD080Hrd	51344	51302	Roadway	710		18	22	455.1	445.1	455.2	445.2	
AMMD080G	51302	51303	36" CSP	288	10	57	57	445.1	442.2	445.1	442.2	10-yr Existing
AMMD080Grd	51302	51303	Roadway	288		5	9	445.1	443.1	445.1	443.1	
AMMD080F	51303	51309	36" CSP	32	10	24	27	442.2	442.1	442.2	442.1	
AMMD080Frd	51303	51309	Roadway	32		0	0	442.1	442.1	442.1	442.1	
AMMD080E	51309	51311	18" CSP	106	10	13	14	442.1	440.2	442.1	440.2	10-yr Existing
AMMD080Erd	51309	51311	Roadway	106		12	14	442.1	440.2	442.1	440.2	
AMMD080D#1	51311	51313	18" CSP	489	10	6	6	440.2	439.7	440.2	439.7	10-yr Existing
AMMD080D#2	51311	51313	18" CSP	339	10	7	7	440.2	439.7	440.2	439.7	10-yr Existing
AMMD080Drd	51311	51313	Roadway	489		17	19	440.2	439.7	440.2	439.7	
AMMD080C#1	51313	51314	18" CSP	31	10	10	10	439.7	439.5	439.7	439.6	10-yr Existing
AMMD080C#2	51313	51314	18" CSP	35	10	10	10	439.7	439.5	439.7	439.6	10-yr Existing
AMMD080Crd	51313	51314	Roadway	31		14	17	439.7	439.7	439.7	439.7	
AMMD080B#1	51314	68667	18" CSP	182	10	11	11	439.5	437.2	439.6	437.3	10-yr Existing
AMMD080B#2	51314	68667	18" CSP	182	10	11	11	439.5	437.2	439.6	437.3	10-yr Existing
AMMD080Brd	51314	68667	Roadway	182		2	5	439.5	437.8	439.6	437.9	
AMMD080A	68667	51963	27" CSP	150	10	24	25	437.2	434.3	437.3	434.3	
AMMD080Ard	68667	51963	Roadway	150		0	0	434.3	434.3	434.3	434.3	
AMMD080M	51963	51961	30" CSP	388	10	14	15	434.3	429.5	434.3	429.8	
AMMD080Mrd	51963	51961	Roadway	388		0	0	429.5	429.5	429.8	429.8	
AMMD120A	51961	54175	42" CSP	2445	10	13	15	429.5	428.5	429.8	428.8	
AMMD120Ard	51961	54175	Roadway	2445		0	0	428.5	428.5	428.8	428.8	
AMMD070B	51963	51964	27" CSP	731	10	10	11	434.3	430.2	434.3	430.4	
AMMD070Brd	51963	51964	Roadway	731		0	0	430.2	430.2	430.4	430.4	
AMMD070A	51964	71052	30" CSP	1051	10	10	11	430.2	429.1	430.4	429.5	
AMMD070Ard	71052	51964	Roadway	1051		0	0	430.2	430.2	430.4	430.4	
Amazon - Upper Sub-Basin												
AMUP180A	51841	51730	36" CSP	1314	10	65	65	450.1	436.9	450.1	437.2	10-yr Existing
AMUP180Ard	51841	51730	Roadway	1314		45	54	450.1	440.8	450.1	440.8	
AMUP180B	68653	51841	36" CSP	214	10	58	58	452.0	450.1	452.1	450.1	10-yr Existing
AMUP180Brd	68653	51841	Roadway	214		2	10	452.0	450.1	452.1	450.1	
AMUP180C	51296	68653	30" CSP	1254	10	61	62	483.3	452.0	486.1	452.1	10-yr Future

TABLE 3-3 (continued)
HYDRAULIC PERFORMANCE OF THE AMAZON CREEK 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	
AMUP180Crd	51296	68653	Roadway	1254		0	8	452.0	452.0	486.1	452.1	
AMUP180D	66447	51296	36" CSP	146	10	61	71	486.9	483.7	488.1	486.1	
AMUP180Drd	66447	51296	Roadway	146		0	0	483.3	483.3	486.1	486.1	
AMUP180E	51285	66447	30" CSP	321	10	61	71	500.8	487.1	500.9	488.1	
AMUP180Erd	51285	66447	Roadway	321		0	0	486.9	486.9	488.1	488.1	
AMUP180F	68670	51285	36" CSP	185	10	61	71	509.9	501.4	510.2	501.5	
AMUP180Frd	68670	51285	Roadway	185		0	0	500.8	500.8	500.9	500.9	
AMUP180G	68668	68670	30" CSP	41	10	61	71	512.1	509.9	512.6	510.2	
AMUP180Grd	68668	68670	Roadway	41		0	0	512.1	512.1	512.6	512.6	
AMUP180H	51271	68668	27" CSP	102	10	61	71	517.1	512.1	519.7	512.6	
AMUP180Hrd	51271	68668	Roadway	102		0	0	512.1	512.1	512.6	512.6	
AMUP180I	51284	51271	36" CSP	283	10	61	73	525.8	519.0	526.1	519.7	
AMUP180Ird	51284	51271	Roadway	283		0	0	517.1	517.1	519.7	519.7	
AMUP180J	51256	51284	33" CSP	178	10	61	71	532.8	525.8	533.1	526.1	
AMUP180Jrd	51256	51284	Roadway	178		0	0	525.8	525.8	526.1	526.1	
AMUP180K	51239	51256	30" CSP	92	10	61	71	544.8	533.1	545.1	533.2	
AMUP180Krd	51239	51256	Roadway	92		0	0	532.8	532.8	533.1	533.1	
AMUP190A	51204	51239	Natural	675	10	39	44	588.1	544.8	588.1	545.1	
AMUP190B	50107	51204	24" CSP culvert	320	10	37	38	606.0	588.1	606.0	588.1	10-yr Existing
AMUP190Brd	50107	51204	Roadway	320		3	6	606.0	589.9	606.0	589.9	
AMUP190C	50115	50107	Natural	75	10	39	45	606.2	606.0	606.3	606.0	10-yr Existing
AMUP190D	50163	50115	36" CSP culvert	655	10	39	51	622.5	606.2	622.5	606.3	
AMUP190Drd	50163	50115	Roadway	655		0	0	606.2	606.2	606.3	606.3	
AMUP140A	51469	66944	54" CSP	61	10	102	109	442.9	442.5	443.2	442.7	
AMUP140Ard	51469	66944	Roadway	61		0	0	442.5	442.5	443.2	443.1	
AMUP140B	51850	51469	54" CSP	582	10	102	109	444.8	442.9	445.4	443.2	
AMUP140Brd	51850	51469	Roadway	582		0	0	442.9	442.9	443.2	443.2	
AMUP140C	66678	51850	30" CSP	80	10	79	79	448.2	444.8	448.2	445.4	10-yr Existing
AMUP140Crd	66678	51850	Roadway	80		36	49	448.2	446.7	448.2	446.7	
AMUP140D	51853	66678	36" CSP	125	10	72	73	448.6	448.2	448.7	448.2	10-yr Existing
AMUP140Drd	51853	66678	Roadway	125		67	74	448.6	448.3	448.7	448.4	

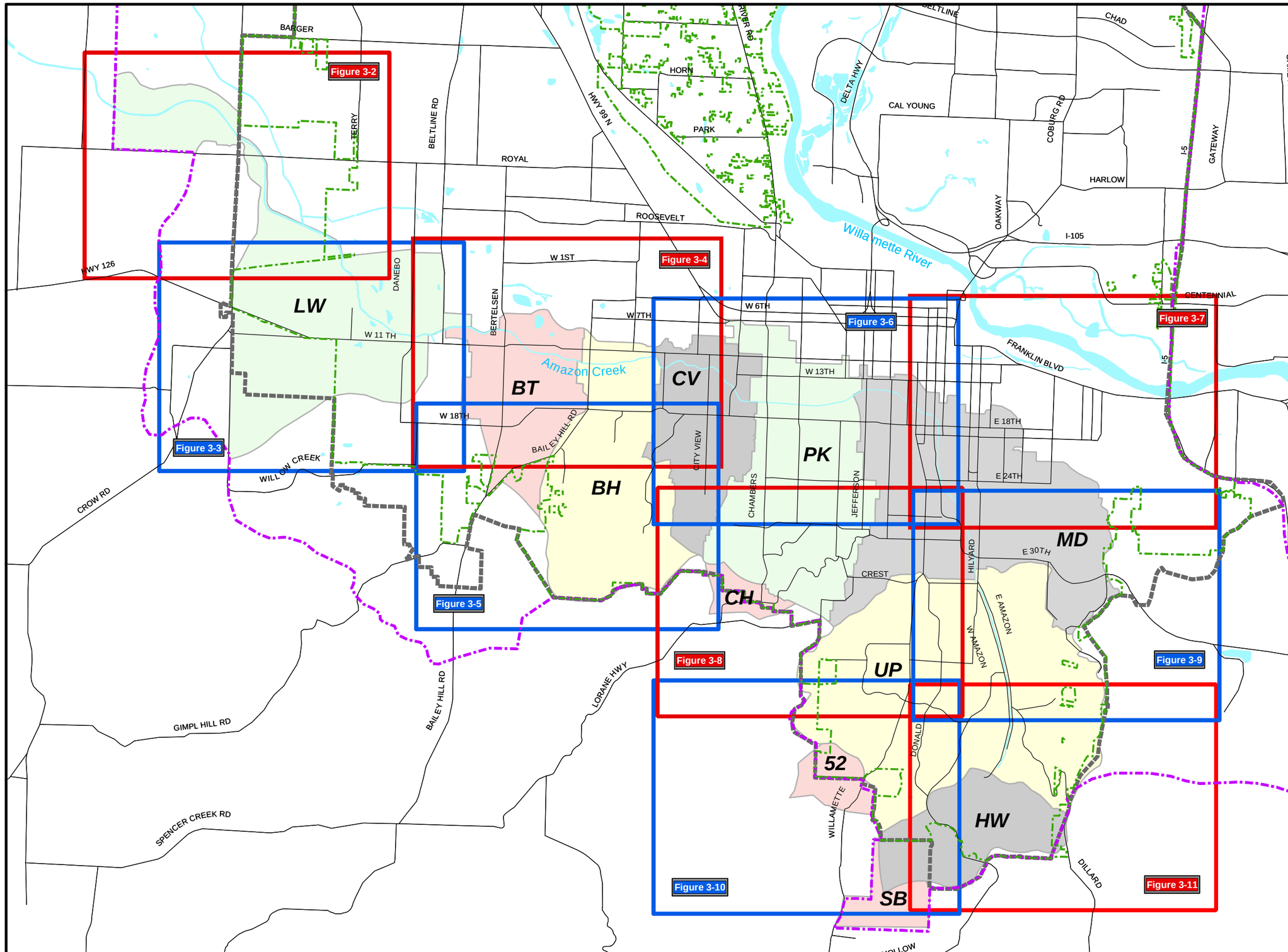
TABLE 3-3 (continued)
HYDRAULIC PERFORMANCE OF THE AMAZON CREEK STORM DRAINAGE SYSTEM

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	
AMUP140E	51763	51853	36" CSP	11	10	84	84	450.1	448.6	450.1	448.7	10-yr Existing
AMUP140Erd	51763	51853	Roadway	11		19	26	450.1	448.6	450.1	448.7	
AMUP140F	50531	51763	Natural	1550	10	60	66	485.9	450.1	486.0	450.1	10-yr Future
AMUP120A	50660	50531	36" CSP	314	10	61	67	495.5	485.9	495.6	486.0	
AMUP120Ard	50660	50531	Roadway	314		0	0	485.9	485.9	486.0	486.0	
AMUP060A	50629	50517	60" CSP	64	10	305	304	455.3	452.9	455.4	453.1	10-yr Existing
AMUP060Ard	50629	50517	Roadway	64		21	45	455.3	455.1	455.4	455.2	
AMUP060B	50653	50629	54" CSP	623	10	322	341	476.9	455.3	480.5	455.4	
AMUP060Brd	50653	50629	Roadway	623		0	0	455.3	455.3	455.4	455.4	
AMUP060C	50671	50653	54" CSP	2580	10	257	260	530.9	476.9	531.0	480.5	10-yr Existing
AMUP060Crd	50671	50653	Roadway	2580		22	51	530.9	487.6	531.0	487.7	
AMUP130A	50200	50671	54" CSP	882	10	215	216	542.3	530.9	542.4	531.0	10-yr Existing
AMUP130Ard	50200	50671	Roadway	882		69	88	542.3	531.1	542.4	531.2	
AMUP070A	65601	50200	42" CSP	547	10	68	77	547.2	542.3	547.5	542.4	
AMUP070Ard	65601	50200	Roadway	547		0	0	542.3	542.3	542.4	542.4	
AMUP070B	65582	65601	36" CSP	2041	10	68	77	625.0	547.2	625.1	547.5	
AMUP070Brd	65582	65601	Roadway	2041		0	0	547.2	547.2	547.5	547.5	
AMUP070C	50238	50200	48" CSP	1133	10	139	150	555.5	542.3	558.5	542.4	
AMUP070Crd	50238	50200	Roadway	1133		0	0	542.3	542.3	542.4	542.4	
Willamte	50090	50238	42" CSP	128	10	140	144	561.6	555.5	564.2	558.5	10-yr Future
Willamterd	50090	50238	Roadway	128		0	18	555.5	555.5	564.2	563.7	
AMUP080A	50110	50090	Natural	950	10	98	116	594.6	561.6	594.7	564.2	
Brooksd#1	50109	50110	48" CSP culverts	114	10	48	53	595.3	594.6	595.4	594.7	
Brooksd#2	50109	50110	48" CSP culvert	114	10	48	53	595.3	594.6	595.4	594.7	
AMUP100A	66910	50109	Natural	350	10	39	45	618.7	595.3	618.8	595.4	
BraeBurn	50108	66910	36" CSP culvert	59	10	39	45	621.1	619.5	621.3	619.6	
BraeBurnrd	50108	66910	Roadway	59		0	0	618.7	618.7	618.8	618.8	
AMUP100C	71047	50108	Natural	460	10	39	46	651.8	621.1	651.9	621.3	
AMUP100D	50130	71047	Natural	140	10	39	46	662.3	651.8	662.4	651.9	

TABLE 3-3 (continued)
HYDRAULIC PERFORMANCE OF THE AMAZON CREEK 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	
AMUP100E	50129	50130	36" CSP culvert	148	10	39	46	669.1	662.3	669.2	662.4	
AMUP100Erd	50129	50130	Roadway	148		0	0	662.3	662.3	662.4	662.4	
AMUP110A	99479	50129	Natural	600	10	35	42	707.0	669.1	707.2	669.2	
AMUP040A#1	65533	65370	48" CSP	401	10	47	54	463.3	461.5	463.4	461.8	
AMUP040A#2	65533	65370	36" CSP	382	10	1	3	463.3	461.5	463.4	461.8	
AMUP040Ard	65533	65370	Roadway	401		0	0	461.5	461.5	461.8	461.8	
AMUP040B	65310	65533	48" CSP	19	10	48	57	463.7	463.3	463.9	463.4	
AMUP040C	50602	65310	48" CSP	1966	10	48	57	511.3	463.7	511.4	463.9	
AMUP040D	50739	50602	36" CSP	845	10	49	58	543.8	511.3	544.0	511.4	
AMUP040Drd	50739	50602	Roadway	845		0	0	511.3	511.3	511.4	511.4	
Amazon - Headwaters Sub-Basin												
Martin	66656	65379	48" CSP	45	10	222	252	511.9	506.3	513.6	506.6	
Martinrd	66656	65379	Roadway	45		0	0	506.3	506.3	506.6	506.6	
AMHW010A	67175	66656	36" CSP	79	10	75	90	513.8	511.9	516.2	513.6	
AMHW010Ard	67175	66656	Roadway	79		0	0	511.9	511.9	513.6	513.6	
AMHW010B	65344	66656	48" CSP	352	10	147	153	517.2	511.9	518.5	513.6	10-yr Future
AMHW010Brd	65344	66656	Roadway	352		0	21	511.9	511.9	518.5	518.0	
AMHW020A	66776	65344	48" CSP	174	10	65	72	517.1	517.2	519.1	518.5	
AMHW020Ard	66776	65344	Roadway	174		0	0	517.2	517.2	518.5	518.5	
AMHW020B	65295	66776	36" CSP	353	10	65	72	528.0	517.8	528.0	519.1	
AMHW020Brd	65295	66776	Roadway	353		0	0	517.1	517.1	519.1	519.1	
AMHW020C	65392	65295	30" CSP	593	10	65	72	558.1	528.0	558.3	528.0	
AMHW020Crd	65392	65295	Roadway	593		0	0	528.0	528.0	528.0	528.0	

Amazon Basin Drainage System



INDEX MAP

This index map shows the layout of the Amazon basin into ten geographic areas depicted on Figures 3-2 through 3-11. 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.)

Amazon Basin Major Subbasins

- BH = Bailey Hill
- BT = Bertelsen
- CV = City View
- HW = Headwaters
- LW = Lower Amazon
- MD = Middle Amazon
- PK = Polk Street
- UP = Upper Amazon
- 52 = 52nd Avenue*
- CH = Chambers*
- SB = Spencer Butte*

*Ridgeline Major subbasins not modeled as they drain away from Amazon Basin and into Spencer Creek drainage system to the south.

N W E S

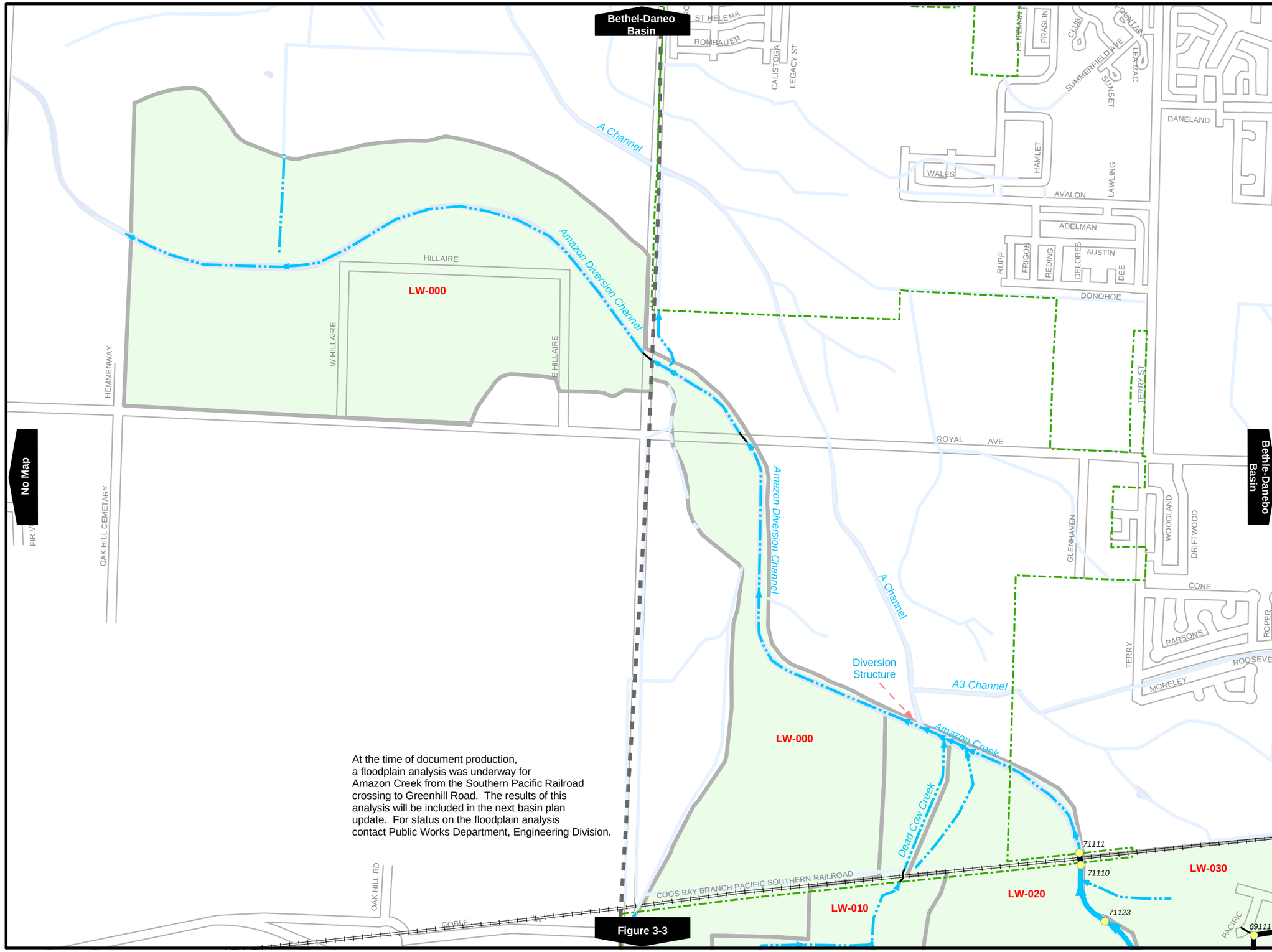
EUGENE

1 inch equals 0.80 miles

0.4 0 0.4 0.8 Miles

Produced by LCOG - August 2002
g:/projects/basin/drainage_maps/amazon/subarea_index.mxd

Figure 3-1



At the time of document production, a floodplain analysis was underway for Amazon Creek from the Southern Pacific Railroad crossing to Greenhill Road. The results of this analysis will be included in the next basin plan update. For status on the floodplain analysis contact Public Works Department, Engineering Division.

Amazon Basin Drainage System

Legend

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

Major Subbasins on this map

- LW = Lower Amazon

AB-123 Subbasin ID's within Major Subbasins

- Modeled Point
- 12345 Modeled Reference Numbers

Capital Projects

- AMxx Water Quality
- AMxx Natural Resources
- AMxx 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

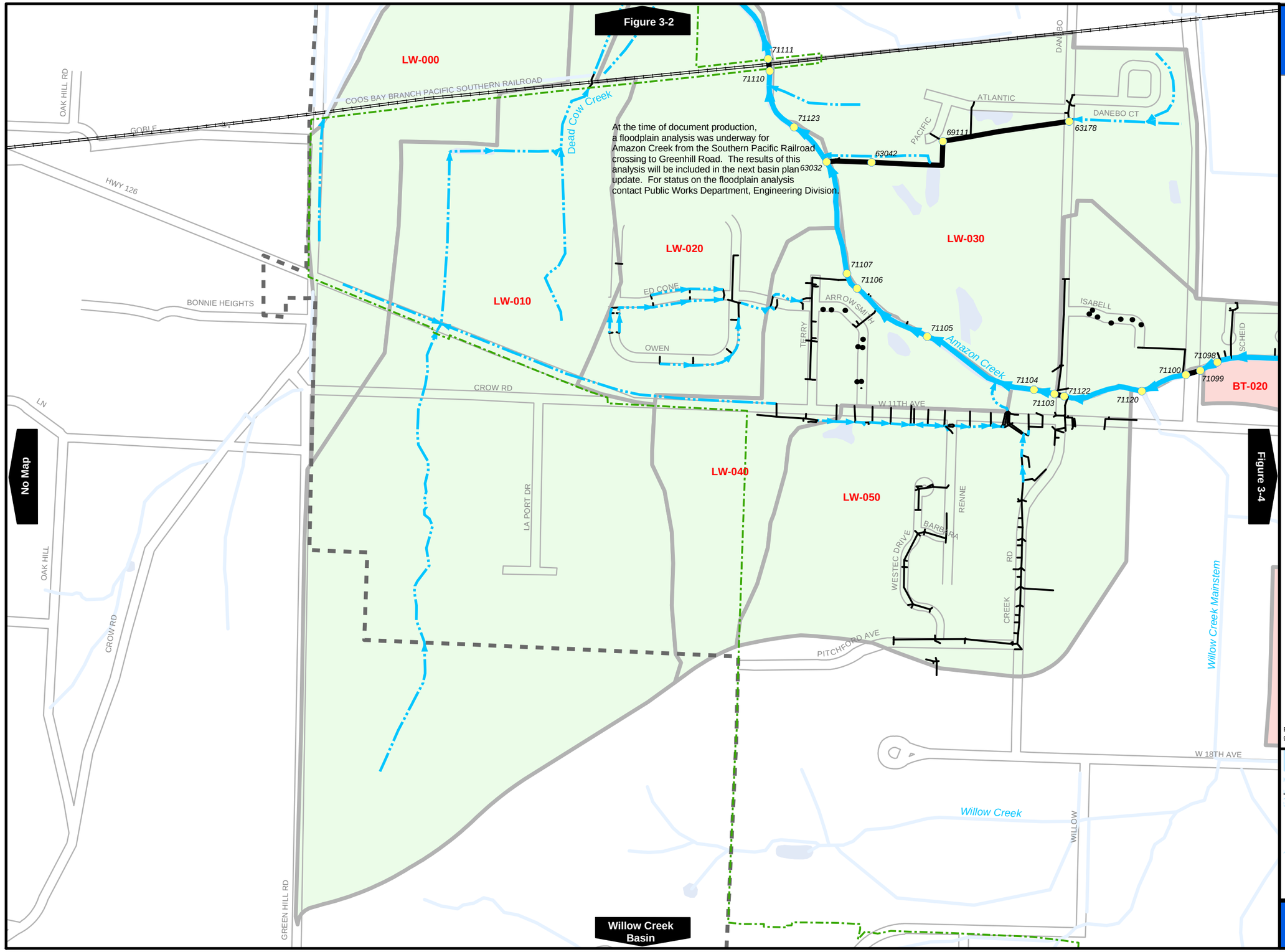
EUGENE

1 inch equals 1,000 feet

500 0 500 1,000 Feet

Produced by LCOG - July 2002
g:\projects\basins\drainage_maps\Amazon\AM_subarea01.mxd

Figure 3-2



Amazon Basin Drainage System

Legend

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

Major Subbasins on this map

- LW = Lower Amazon
- BT = Bertelsen

AB-123 Subbasin ID's within Major Subbasins

- Modeled Point
- 12345 Modeled Reference Numbers

Capital Projects

- AMxx Water Quality
- AMxx Natural Resources
- AMxx 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

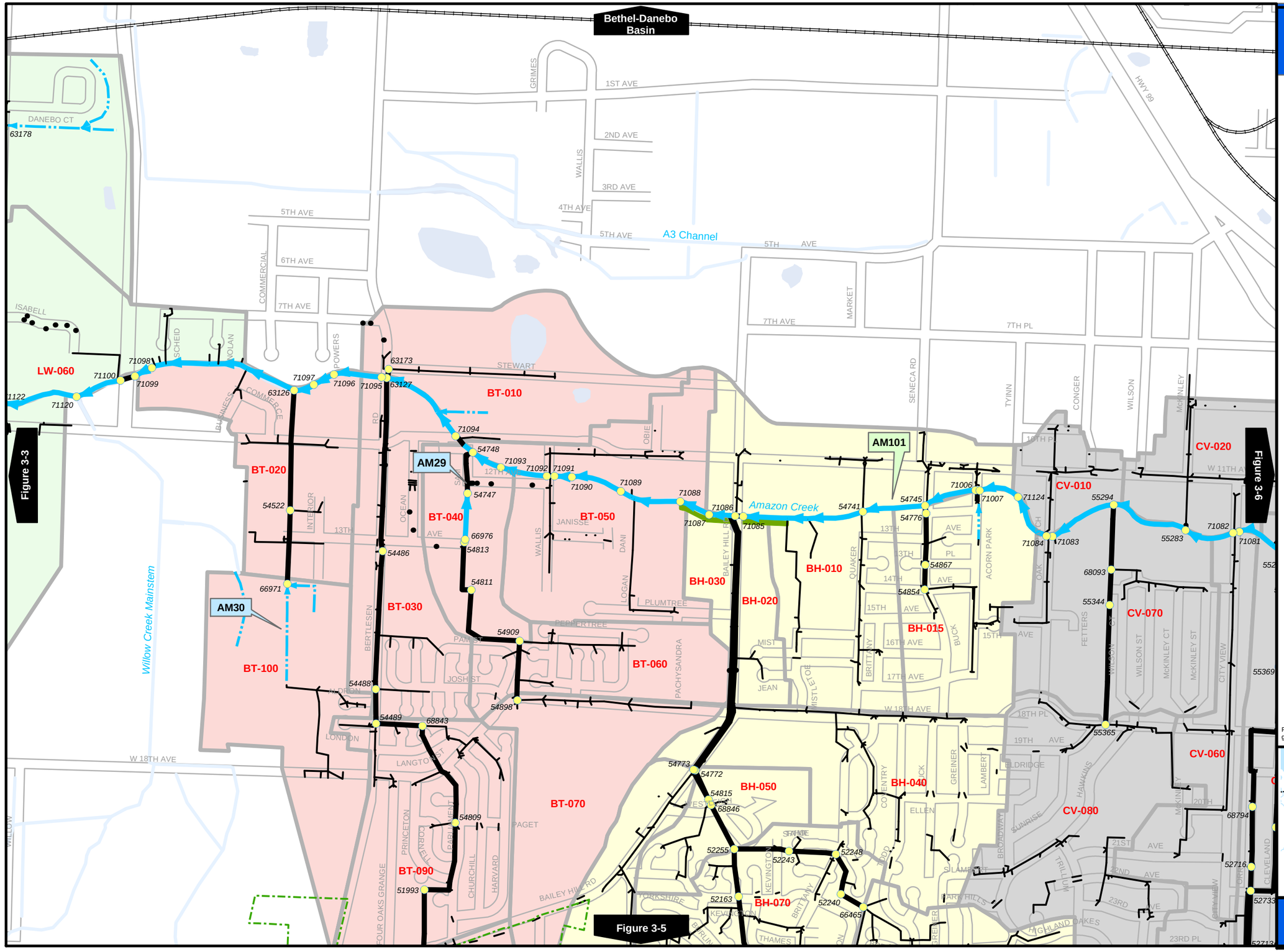
1 inch equals 1,000 feet

500 0 500 1,000 Feet

Produced by LCOG - July 2002
g:\projects\basins\drainage_maps\Amazon\AM_subarea02.mxd

Figure 3-3

Amazon Basin Drainage System



Legend

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

Major Subbasins on this map

- LW = Lower Amazon
- BT = Bertelsen
- BH = Bailey Hill
- CV = City View

AB-123 Subbasin ID's within Major Subbasins

- Modeled Point
- 12345 Modeled Reference Numbers

Capital Projects

- AMxx Water Quality
- AMxx Natural Resources
- AMxx 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.

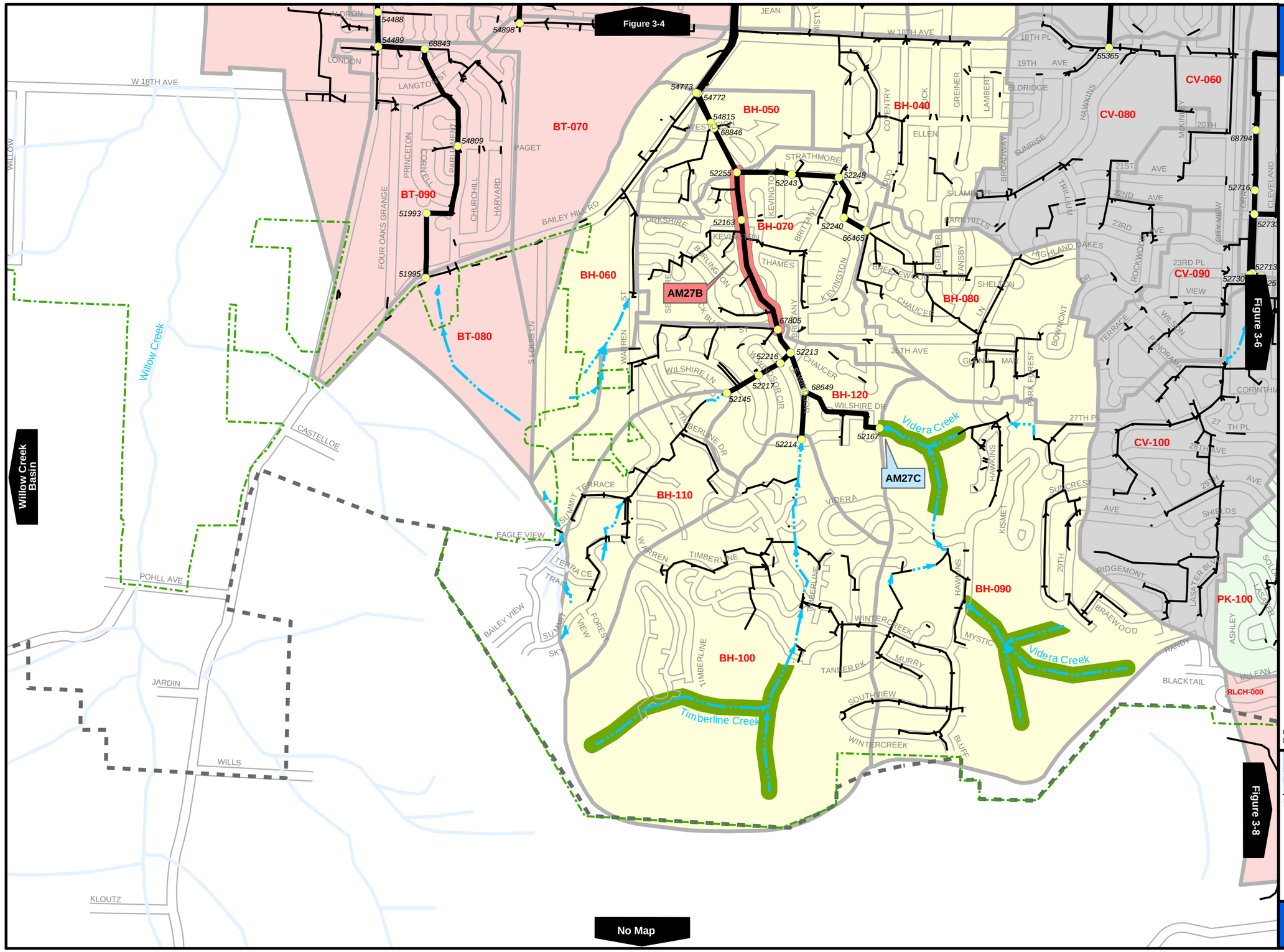
N W E S

1 inch equals 1,000 feet

Feet: 500 0 500 1,000

Produced by LCOG - July 2002
g:\projects\basins\drainage_maps\Amazon\AM_subarea03.mxd

Figure 3-4



Amazon Basin Drainage System

Legend

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

Major Subbasins on this map

- BT = Bertelsen
- BH = Bailey Hill
- CV = City View
- PK = Polk Street
- RLCH = Ridge Line - Chambers

AB-123 Subbasin ID's within Major Subbasins

Modeled Point

12345 Modeled Reference Numbers

Capital Projects

- AMxx Water Quality
- AMxx Natural Resources
- AMxx 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.

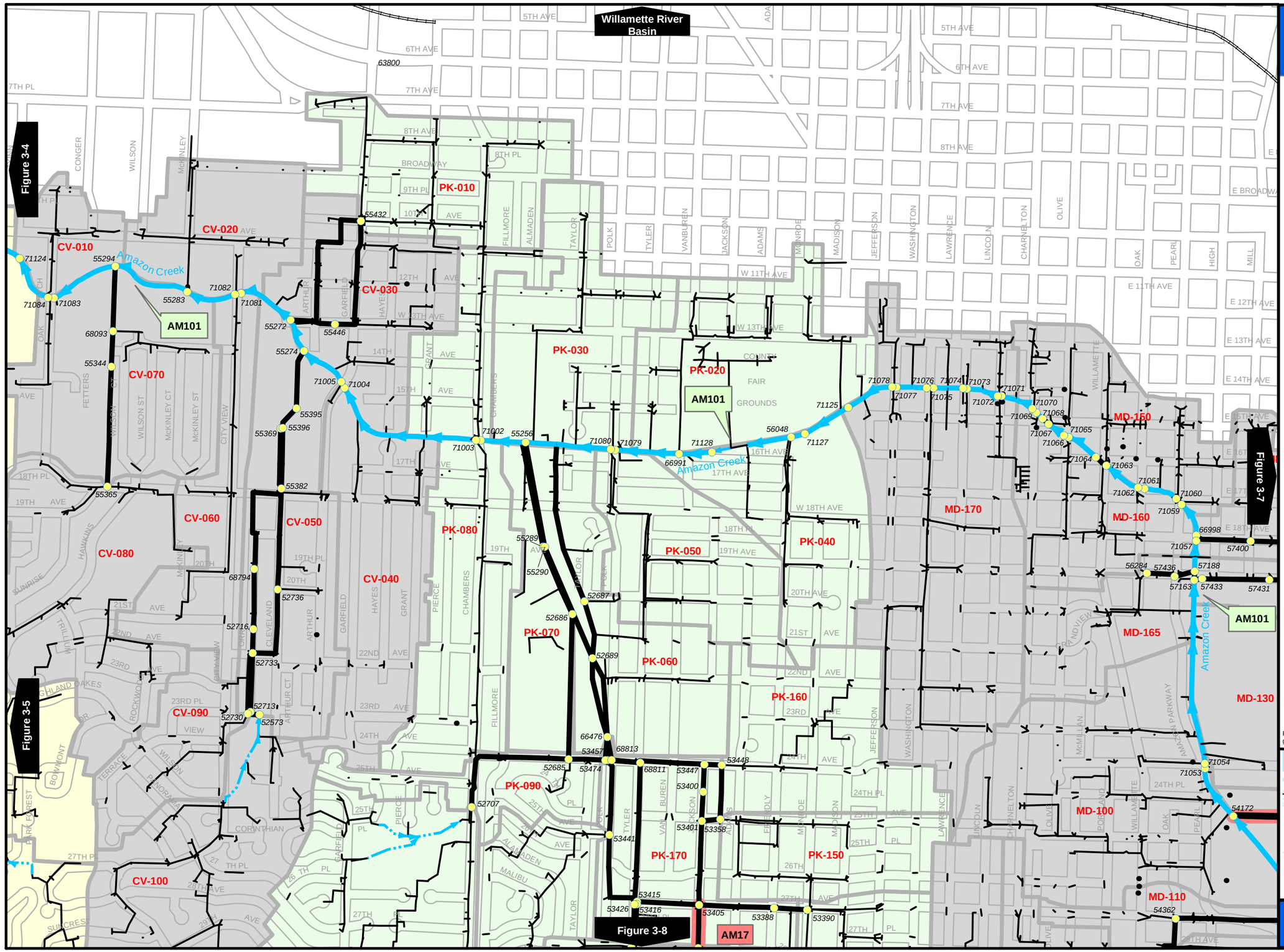
N W E S

1 inch equals 1,000 feet

500 0 500 1,000 Feet

Produced by LCOG - July 2002
g:\projects\basins\drainage_maps\Amazon\AM_subarea04.mxd

Figure 3-5



Amazon Basin Drainage System

Legend

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

Major Subbasins on this map

- BH = Bailey Hill
- CV = City View
- PK = Polk Street
- MD = Middle Amazon

AB-123 Subbasin ID's within Major Subbasins

- Modeled Point
- 12345 Modeled Reference Numbers

Capital Projects

- AMxx Water Quality
- AMxx Natural Resources
- AMxx 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

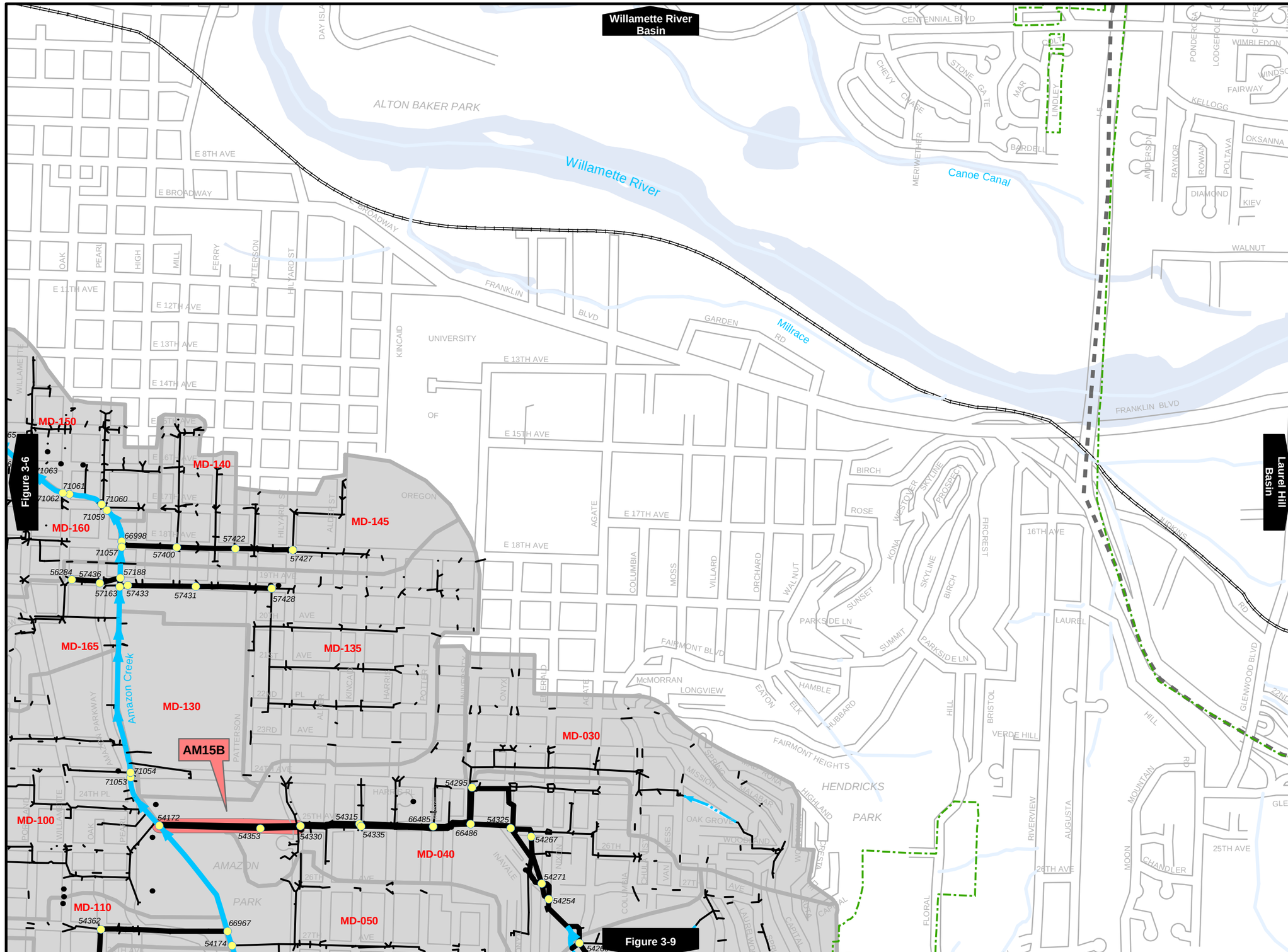
EUGENE

1 inch equals 1,000 feet

500 0 500 1,000 Feet

Produced by LCOG - July 2002
g:\projects\basins\drainage_maps\Amazon\AM_subarea05.mxd

Figure 3-6



Amazon Basin Drainage System

Legend

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

Major Subbasins on this map

- MD = Middle Amazon

AB-123 Subbasin ID's within Major Subbasins

- Modeled Point
- *12345* Modeled Reference Numbers

Capital Projects

- AMxx Water Quality
- AMxx Natural Resources
- AMxx 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 1,000 feet

500 0 500 1,000 Feet

Produced by LCOG - July 2002
g:\projects\basins\drainage_maps\Amazon\AM_subarea06.mxd

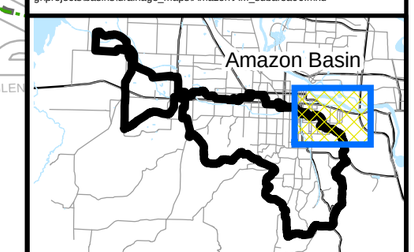
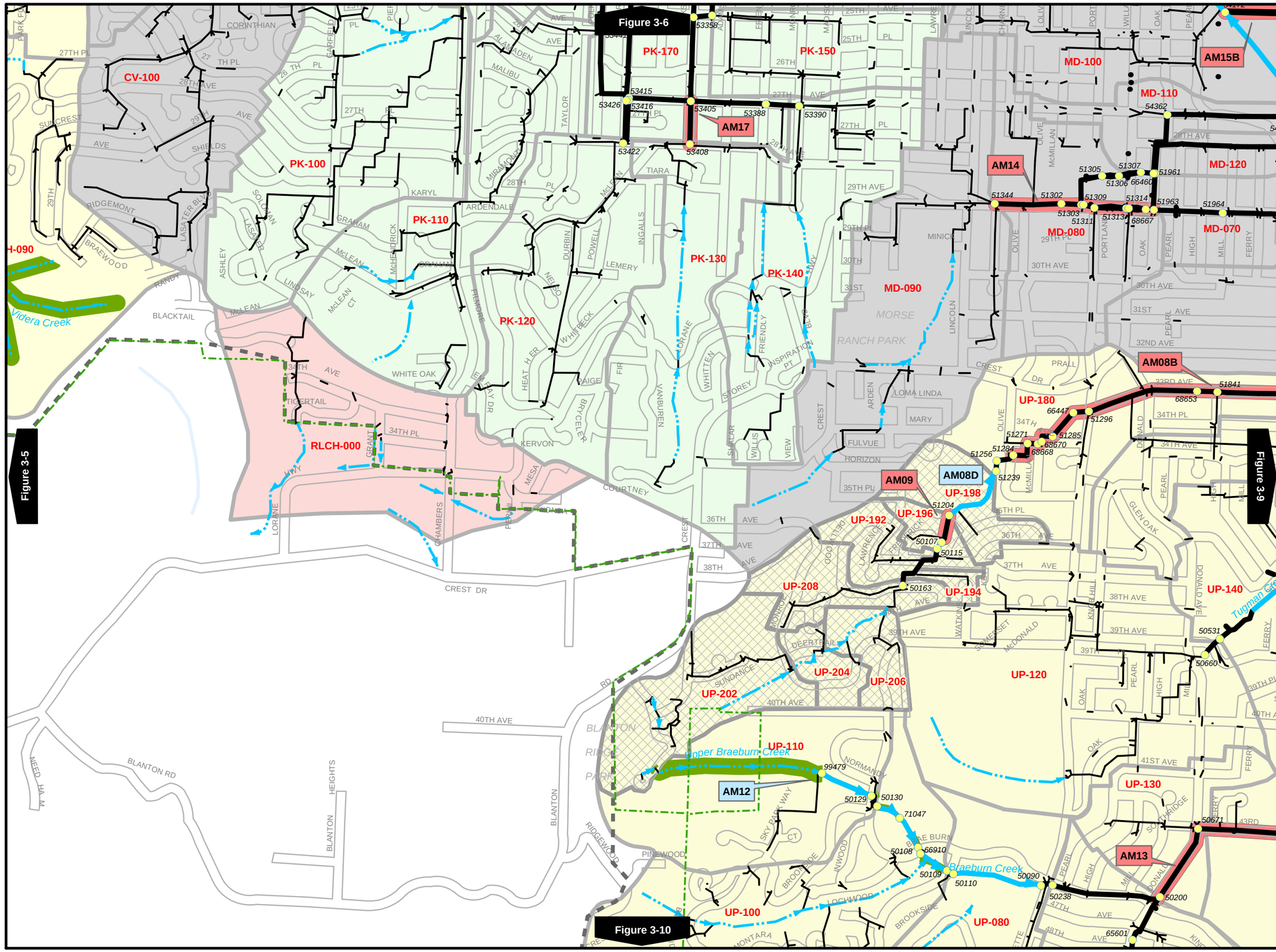


Figure 3-7



Amazon Basin Drainage System

Legend

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

Major Subbasins on this map

- BH = Bailey Hill
- CV = City View
- PK = Polk Street
- RLCH = Ridge Line - Chambers
- MD = Middle Amazon
- UP = Upper Amazon

AB-123 Subbasin ID's within Major Subbasins

Subbasins have been refined in this area and updated hydrologic information is available by contacting the City of Eugene Public Works Department Engineering Division.

Modeled Point

12345 Modeled Reference Numbers

Capital Projects

- AMxx Water Quality
- AMxx Natural Resources
- AMxx 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.

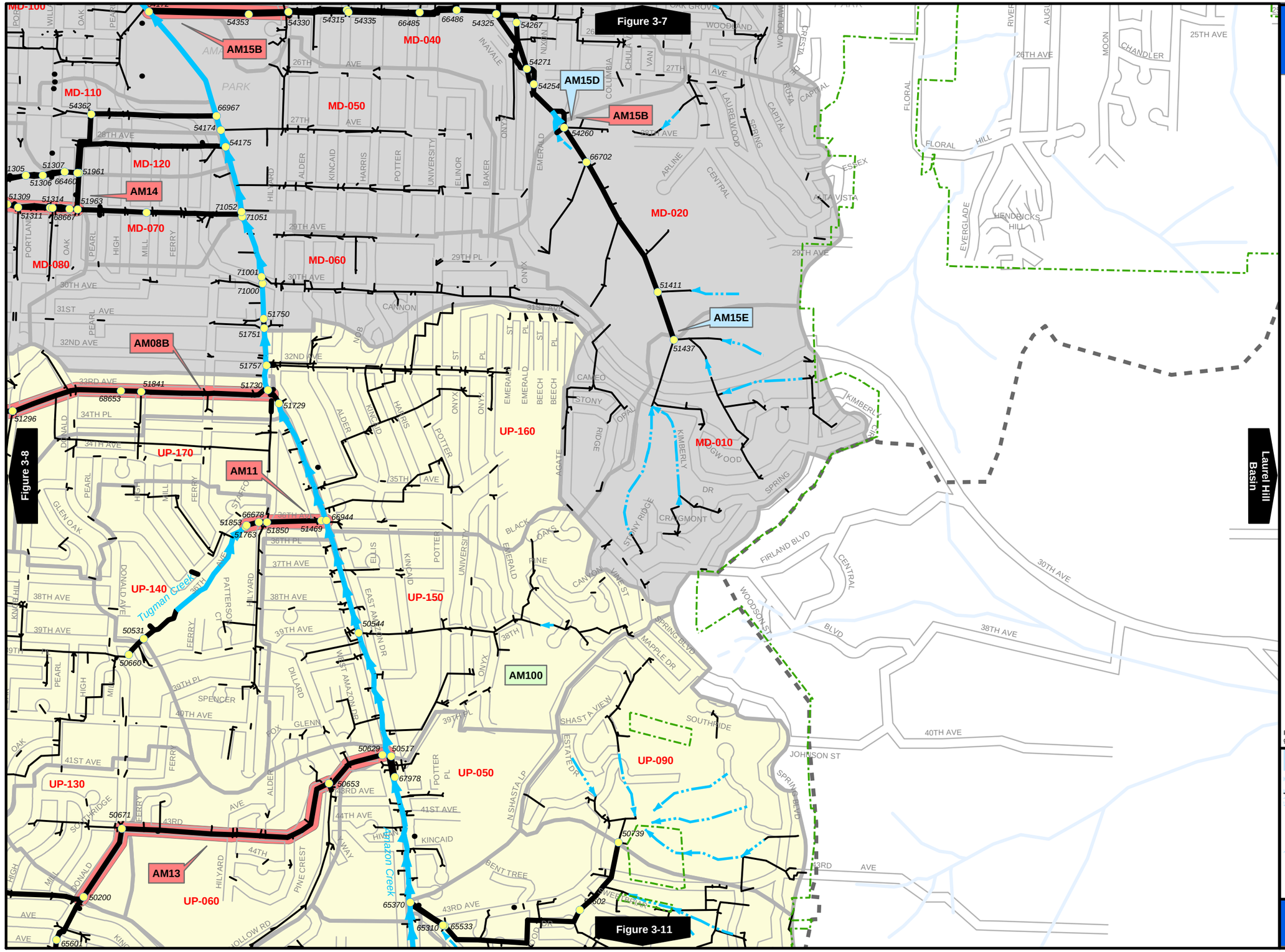
N W E S

1 inch equals 1,000 feet

500 0 500 1,000 Feet

Produced by LCOG - July 2002
g:\projects\basins\drainage_maps\Amazon\AM_subarea07.mxd

Figure 3-8



Amazon Basin Drainage System

Legend

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

Major Subbasins on this map

- MD = Middle Amazon
- UP = Upper Amazon

AB-123 Subbasin ID's within Major Subbasins

- Modeled Point
- 12345 Modeled Reference Numbers

Capital Projects

- AMxx Water Quality
- AMxx Natural Resources
- AMxx 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.

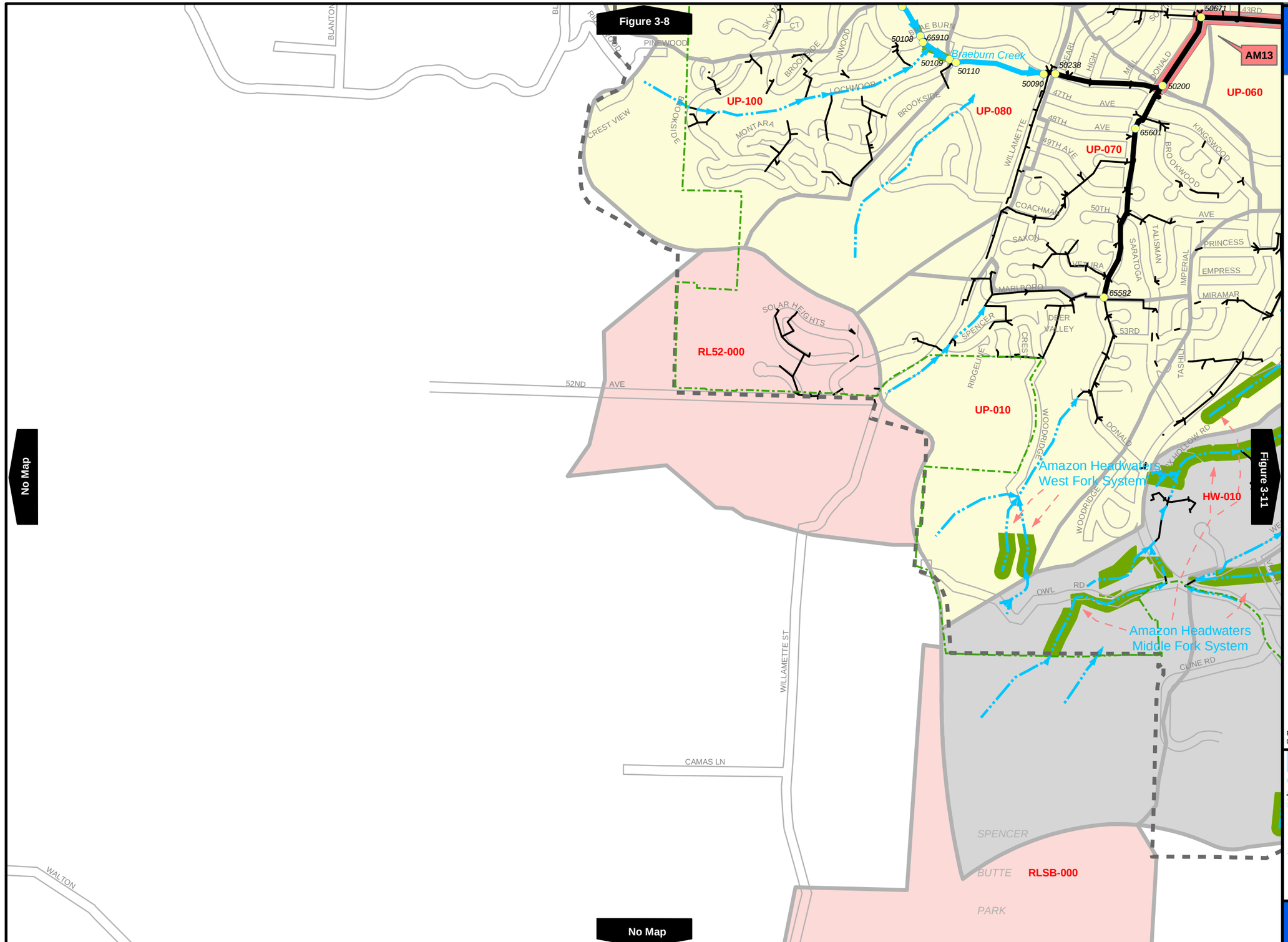
N W E S

1 inch equals 1,000 feet

500 0 500 1,000 Feet

Produced by LCOG - July 2002
g:\projects\basins\drainage_maps\Amazon\AM_subarea08.mxd

Figure 3-9



Amazon Basin Drainage System

Legend

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

Major Subbasins on this map

- UP = Upper Amazon
- RL52 = Ridge Line - 52nd Ave
- HW = Amazon Headwaters
- RLSB = Ridge Line - Spencer Butte

AB-123 Subbasin ID's within Major Subbasins

Modeled Point

12345 Modeled Reference Numbers

Capital Projects

- AMxx Water Quality
- AMxx Natural Resources
- AMxx 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.

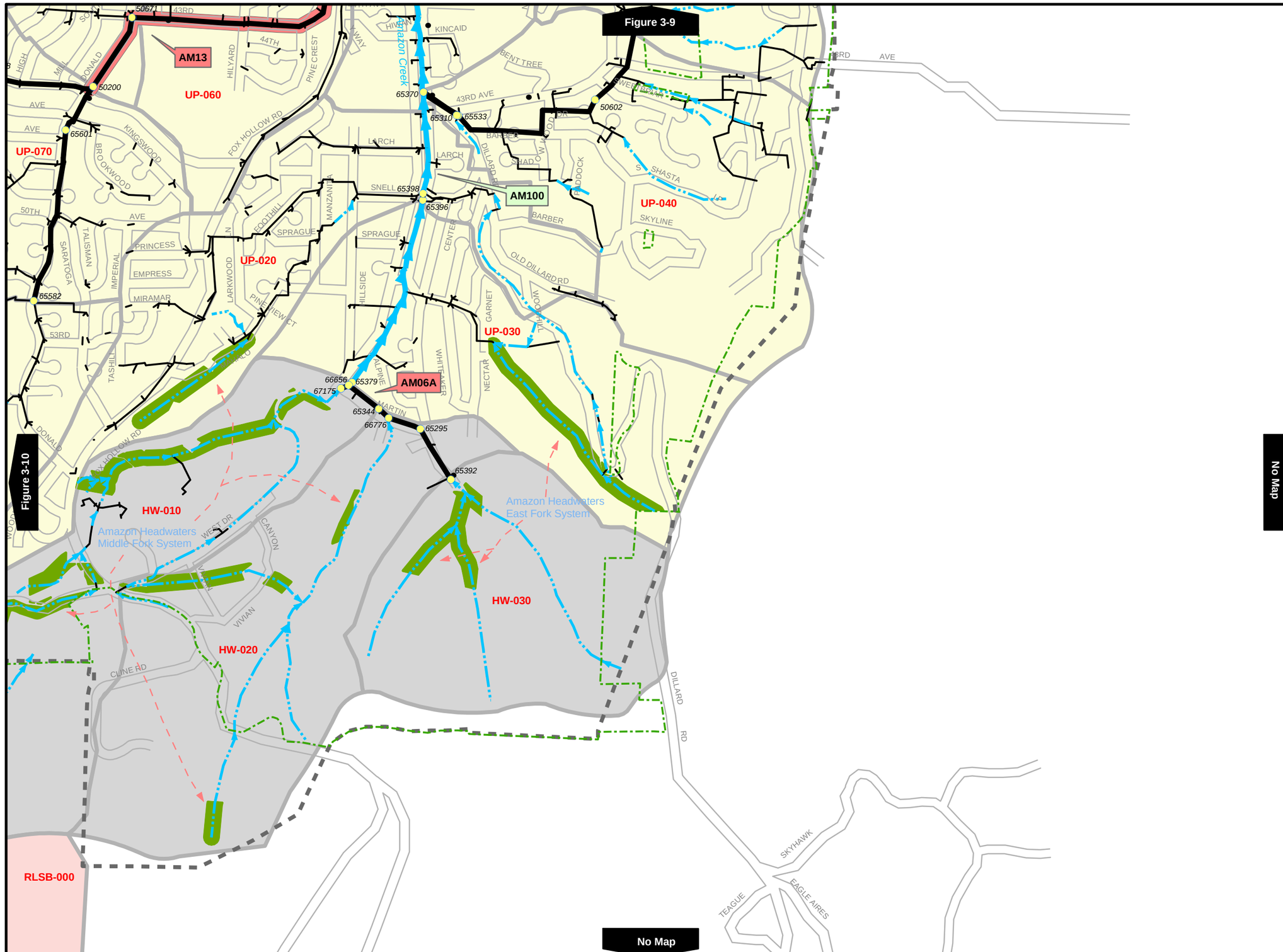
N W E S

1 inch equals 1,000 feet

500 0 500 1,000 Feet

Produced by LCOG - July 2002
g:\projects\basins\drainage_maps\Amazon\AM_subarea09.mxd

Figure 3-10



Amazon Basin Drainage System

Legend

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

Major Subbasins on this map

- UP = Upper Amazon
- HW = Amazon Headwaters
- RLSB = Ridge Line - Spencer Butte

AB-123 Subbasin ID's within Major Subbasins

Modeled Point

12345 Modeled Reference Numbers

Capital Projects

- AMxx Water Quality
- AMxx Natural Resources
- AMxx 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 1,000 feet

500 0 500 1,000 Feet

Produced by LCOG - July 2002
g:\projects\basins\drainage_maps\Amazon\AM_subarea10.mxd

Figure 3-11

A general characterization of water quality in this 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 Amazon 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 one of the stormwater monitoring stations was located in the Amazon Creek, all of the City-wide data were also used to provide general information regarding stormwater quality in Eugene and to identify a stormwater management strategy for this basin. In general, the Amazon basin pollutant load is 2,578,000 pounds per year under existing condition and pollutant load is expected to increase by 27% 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 Amazon Creek Basin (UGB)

Estimated TSS Pounds Per Year in the Amazon basin	1,000 Pounds	Amazon Creek Basin Relative to the Range of TSS Pounds Per Year in Other Eugene Basins
From Existing Development	2,578	
From Development of Vacant Land	694	
Total Buildout	3,273	

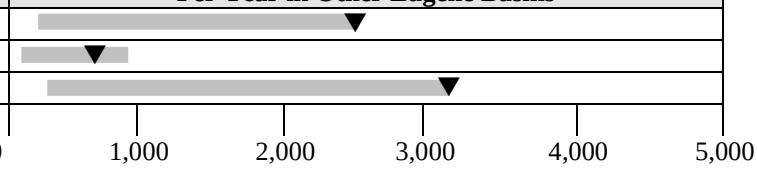


Figure 4-2
Estimated Increases in Total Suspended Solids Loads Associated with Future Buildout in the Amazon Creek Basin (UGB)

Estimated Increase in TSS Loads	Percent	Amazon Creek Basin Relative to the Range of Increase in TSS Loading in Other Eugene Basins
From Future Development	27	

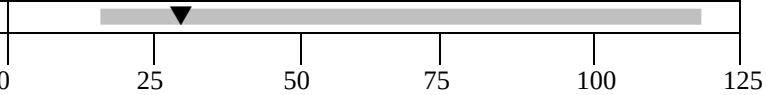
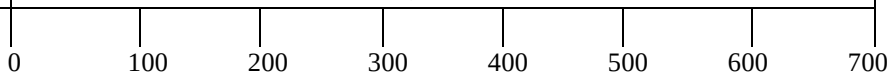


Figure 4-3
Estimated Total Suspended Solids Loads Per Acre - Per Year in the Amazon Creek Basin (UGB)

Estimated TSS Pounds Per Acre Per Year in the Amazon basin	Pounds per Acre per Year	Amazon Creek Basin Relative to the Range of TSS Pounds Per Acre Per Year in Other Eugene Basins
Existing Development	246	
Development of Vacant Land	66	
Total Buildout	312	



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 4.3.

4.2 Development of Water Quality 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 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 water quality 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 Amazon Creek 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 and bank stability 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 – High Source Areas – This capital project would include retrofitting the piped stormwater drainage systems in high source areas with structural water quality facilities such as sedimentation manholes and select proprietary stormwater treatment devices to reduce the pollutant load. Single or multiple facilities may be appropriate for these high source areas and the facilities will be selected and designed to treat the particular pollutant of concern based on specific site conditions. The following twenty-two drainage areas (identified by most downstream nodes) draining urban runoff into the Amazon Creek were identified as potential locations for retrofits:

1) 18” from node 51823 to 51739
   Located at intersection of Hilyard and 31st Avenue
2) 12” from node 53299 to 54362
   Located on 27th Ave. between Willamette and Oak Street
3) 18” from node 54351 to 54358
   Located at intersection of 25th Avenue and Oak Street
4) 15” from node 68066 to 54378
   Located on 24th just west of Amazon Parkway
5) 27” from node 57436 to 57434
   Located on 19th east of Pearl Street
6) 24” from node 56265 to 56033
   Located on Willamette between 17th and 16th
7) 48” from node 57410 to 57411
   Located on 18th just west of High Street
8) 24” from node 57265 to 57186
   Located on Pearl Street between 16th and 17th
9) 27” from Node 56269 to 56268
   Located on Willamette between 15th and 16th
10) 18” from node 56108 to 56059
    Located on 15th just west of Olive Street
11) 24” from node 55405 to 55404
    Located at north of 18th and east of Chambers
12) 42” from node 55464 to 55465
    Located at intersection of 11th and McKinley Street
13) 24” from node 55484 to 55483
    Located on Oak Patch south of 11th
14) 21” from node 54881 to 66495
    Located on Acorn Park St. just south of 11th
15) 18” from node 54873 to 54872
    Located on Buck Street just south of West 11th
16) 24” from node 54870 to 54871
    Located on Quaker Street just south of 11th
17) 27” from node 54883 to 54884

Located on Bailey Hill north of Amazon Creek.

18) 36” from node 68588 to 54749
Located between Wallis and Bailey Hill.

19) 36” from node 54791 to 54726
Located on Wallis just south of Amazon Creek

20) 36” from node 54294 to 54761
Located on Wallis south of 11th

21) 36” from node 63173 to 63128
Located at intersection of Stewart and Bertelsen Road

22) 30” from node 56157 to 66991
Located adjacent to Fairgrounds

Citywide Annual Budget Line Item – Stormwater Outfall Stabilization – Erosion, bank stabilization, and maintenance access problems have been noted at stormwater outfall discharge points to the Amazon Creek. This proposed project alternative includes retrofitting storm system outfalls that create bank stabilization problems in the Amazon Creek. The following two outfalls have specifically been identified:

1) Node 55294
48” outfall in the Berkeley Park drainage area.

2) Nodes 54172 and 54171
Two 60” parallel outfalls located at the east side of the Amazon Creek at 25th Ave, west of Hilyard Street.

Citywide Annual Budget Line Item - Tip-ups – Tip ups were considered to be opportunity areas for addressing multiple objectives. In addition to localized flooding problems caused by sediment and debris buildup in tip-ups, the accumulated sediment and debris may be flushed into the downstream open waterway when large storms occur. Typically, the existing tip-ups do not have adequate access for maintenance. Tip-up retrofits were proposed to address potential maintenance-related flooding issues as described in Section 3.2 above. To address multiple objectives, the tip-up retrofits that were proposed include manhole or vault-like structures for water quality benefits. These structures would allow for the capture and removal of sediments/debris and would also allow for maintenance access. There are five tip-up locations that have been identified in this basin. There are also five additional potential tip-up locations where invert information was not readily available. Each of these locations are listed below:

1) AMUP140A – drains east on 36th Ave. into Amazon Creek
Node 51469 – 66944 (54”)
Page 69 of 97
Segment length = 50 feet
Tip-up offset = 0.5 feet

2) AMBH015A – located to the north of 13th Ave. and along Buck Street
Node 54776 to 54745 (36”)
Page 43 of 97
Segment length =13 feet
Tip-up offset = 1.26 feet

3) AMBT040C – drains north to an open waterway along Sam Road
Node 54813 to 66976 (54”)
Page 32 of 97

Segment Length = 50 feet
Tip-up offset = 3.27 feet

4) Node 66857 to 54746 (30")
Page 32 of 97
Located along Quaker St. and drains north into Amazon Creek
Segment Length = 25 feet
Tip-up offset = 1.4 feet

5) Node 66942 to 66056 (30")
Page 21 of 97
Located to the west of Bertelsen Road and drains north into an open waterway which is located to the west of Bertelsen Road
Segment Length = 25 feet
Tip-up offset = 1.8 feet

6) Potential tip-ups (inverts are not listed in the City's GIS)
Node 53793 to 66966 (page 68 of 97)
Node 56051 to 54049 (page 55 of 97)
Node 54181 to 54174 (page 68 of 97)
Node 51772 to 51779 (page 69 of 97)
Node 50561 to 50568 (page 70 of 97)

Note: Page numbers listed above refer to the page number in the City of Eugene Wastewater and Stormwater Index Map Books.

Citywide Annual Budget Line Item – Stream Bank Stabilization –This proposed capital 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.

AM06A- Kinney Park Water Quality Facility – Kinney Park is an undeveloped parcel located just north of Martin Drive at the base of one of Amazon Creek's headwater tributaries. Its location provides management opportunities for meeting multiple stormwater objectives including water quality enhancement, flood control and enhancement of stormwater related natural resources. This capital project involves restoring flow to the historical channel and constructing a water quality facility in Kinney Park.

AM08D- Mt. Cavalry Water Quality Facility – Existing open space adjacent to the open waterway at Mt. Cavalry provides an opportunity for a surface water quality project. This capital project includes constructing a water quality facility at Mt. Cavalry Cemetery.

AM012- Pine View Water Quality Facility – A stormwater outfall from a development on Pine View discharges to Braeburn Creek. Erosion and down-cutting problems have been observed in the open waterway segment downstream from this discharge point. Existing open space at the outfall location provides an opportunity for a surface water quality project. This capital project includes constructing a water quality facility to reduce pollutants in stormwater discharges from this outfall.

AM15D- North Laurelwood Water Quality Facility – Existing open space at the Laurelwood Golf Course provides an opportunity for a surface water quality project. This capital project

includes constructing a water quality facility at the northwest end of the golf course, just north of 28th Avenue to reduce pollutant discharges from the golf course.

AM15E- South Laurelwood Water Quality Facility – Existing open space at the Laurelwood Golf Course provides an opportunity for a surface water quality project. This capital project includes constructing a water quality facility at the south end of the golf course, just north of 30th Avenue to reduce pollutant discharges from the golf course.

AM27C- Water Quality Facility West of Hawkins Lane – Existing open space west of Hawkins Lane, south of 25th Avenue provides an opportunity for a surface water quality project. This capital project includes constructing a water quality facility on the west side of Hawkins Lane.

AM29- Water Quality Facility at Sam R Street – Existing open space associated with the open drainage system at Sam R Street provides an opportunity for a surface water quality project. This capital project includes constructing a water quality facility at Sam R Street.

AM30- Water Quality Facility at Interior Street – The existing open space associated with the open drainage system at Interior Street provides an opportunity for a surface water quality project. This capital project includes constructing a water quality facility at Interior Street.

In addition to the above proposed capital projects, the following related federal priority capital projects are currently planned or underway for the main stem of Amazon Creek. These projects are described here as they will also provide some water quality benefits to Amazon Creek.

AM100- Upper Amazon Creek Enhancement Project – This federal priority project involves the Amazon Creek main stem from Martin Drive downstream to 19th Avenue. Enhancements will likely include a low flow channel, an area for overbank flows, replanting with native vegetation, and potentially some settling basins for treating the discharges from outfalls.

AM101- Central Amazon Creek Restoration Project – This federal priority project involves enhancement of the main stem of Amazon Creek from Oak Patch Road downstream to Acorn Park Street. Other enhancements include planting vegetation for habitat and erosion control; and realigning the bike path to provide additional space for the creek and increased rideability for bikers.

4.2.2 Development Standard Alternatives

Potential development standards were considered for addressing the identified water quality problems in the Amazon 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. For existing development, the focus was on opportunity areas for siting surface water quality capital projects. Where space is limited, underground water quality structures are recommended for high source areas. A significant portion of the Amazon Creek basin remains to be developed (i.e., 23%). 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 Amazon Creek 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 – Water Quality Facilities in High Source Areas:** Retrofit the piped stormwater drainage systems in high source areas (e.g., commercial and industrial areas) with structural water quality facilities such as sedimentation manholes and other proprietary stormwater treatment devices to reduce the pollutant load. Single or multiple facilities may be appropriate for these high source areas and the facilities will be selected and designed to treat the particular pollutant of concern based on specific site conditions.
- **Capital Project Citywide Annual Budget Line Item – Storm Outfall Stabilization:** Retrofit storm system outfalls that create bank stabilization problems in the Amazon Creek.
- **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 Citywide Annual Budget Line Item – Retrofit of Tip-ups:** Retrofit the existing tip-ups located throughout the basin with a manhole or vault-like structure to allow for the capture and removal of sediments/debris and to allow for maintenance access.
- ***Capital Project AM06A- Kinney Park Neighborhood Facility:** Construct a water quality facility in Kinney Park.
- **Capital Project AM08D- Mt. Cavalry Water Quality Facility:** Construct a water quality facility at Mt. Cavalry Cemetery.

- **Capital Project AM12- Pine View Water Quality Facility:** Construct a water quality facility to reduce pollutants in stormwater discharges from the Pine View development outfall.

- **Capital Project AM15D- North Laurelwood Water Quality Facility:** Construct a water quality facility at the northwest end of the golf course, just north of 28th Avenue to reduce pollutant discharges from the golf course.

- **Capital Project AM15E- South Laurelwood Water Quality Facility:** Construct a water quality facility at the south end of the golf course, just north of 30th Avenue to reduce pollutant discharges from the golf course.

- **Capital Project AM27C- Water Quality Facility West of Hawkins Lane:** Construct a water quality facility on the west side of Hawkins Lane.

- **Capital Project AM29- Water Quality Facility at Sam R Street:** Construct a water quality facility at Sam R Street.

- **Capital Project AM30- Water Quality Facility at Interior Street:** Construct a water quality facility at Interior Street.

- ***Capital Project AM100- Upper Amazon Creek Enhancement Project:** Enhance the Amazon Creek main stem from Martin Drive downstream to 19th Avenue.

- **Capital Project AM101- Central Amazon Creek Restoration Project:** Enhance the main stem of Amazon Creek from Oak Patch Road downstream to Acorn Park 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.

* Also listed under the flood control strategy in Section 3.0.

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

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 Amazon Creek 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 Amazon Creek 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 Amazon Creek 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 Amazon Creek 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:
- The highly urbanized condition of the Amazon Creek basin has caused significant changes to the open waterway system.
- There are about 38 miles of open waterways in the basin with Amazon Creek comprising over a third of those miles, and the rest being the headwater tributaries in the South Hills.
- The headwater tributaries have been segmented from Amazon Creek by stormwater pipes and, while their overall condition appears good, each exhibits some level of hydrological impacts due to upstream urbanization.
- Most of the remaining waterways also provide riparian function.
- About one-third of the remaining system is maintained by the City of Eugene.
- Amazon Creek is the only remaining non-headwater waterway in the basin.
- Efforts to rehabilitate and/or restore the Amazon Creek waterway and floodplain functions have occurred in the lower reaches of the basin.
- About 10 miles of waterways in this basin are protected through either FEMA Floodway restrictions or the City's Waterside Protection Overlay Zone.

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 Waterside Protection Overlay Zone (EC 9.4700) applies within the West Eugene Wetlands Plan boundary and provides protection for channels, setbacks and contiguous riparian areas.
- 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 is little data as to existing aquatic habitat and species condition in the Amazon Creek basin waterways. This 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. The following corridors (shown on Figures 3-2 through 3-11) were identified for acquisition in the Amazon Creek Basin:

- Amazon Creek Headwaters East Fork
- Amazon Creek Headwaters Middle Fork
- Amazon Creek Headwaters West Fork
- Braeburn Creek
- Videra Creek
- Timberline 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.

With respect to the main stem of Amazon Creek, four federal priority projects were either planned or already underway that would address stormwater related natural resource issues. Therefore, in order to eliminate any duplication of effort, this study relied on those projects to address stormwater related natural resource issues associated with the main stem of the creek. Two of the four projects were underway during the planning process for these basin master plans. For the lower portion of Amazon Creek, downstream of Terry Street, a project was implemented in 1999 to improve a 400-acre portion of the lower creek. Existing levees were relocated farther from the creek to restore wetlands adjacent to the creek. This project is referred to as the 1135 project based on the source of funding (Water Resources Development Act Section 1135).

Just upstream of the 1135 project, the Amazon Creek Enhancement (ACE) project was implemented in 1996-97. This project included restoration of a two-mile segment of Amazon Creek from Terry St. upstream to Bailey Hill Rd. This project included widening of the existing

trapezoidal channel configuration of the creek to provide shallower bank slopes. Riparian and wetland plants were seeded and planted to improve habitat and bank stability.

Two additional projects that address the central and upper portions of the creek are currently planned and are included in the capital project list for this basin. These two projects are as follows:

AM100- Upper Amazon Creek Enhancement Project – This federal priority project involves the Amazon Creek main stem from Martin Drive downstream to 19th Avenue. Enhancements will likely include a low flow channel, an area for overbank flows, replanting with native vegetation, and potentially some settling basins for treating the discharges from outfalls.

AM101- Central Amazon Creek Restoration Project – This federal priority project involves enhancement of the main stem of Amazon Creek from Oak Patch Road downstream to Acorn Park Street. Other enhancements include planting vegetation for habitat and erosion control; and realigning the bike path to provide additional space for the creek and increased rideability for bikers.

5.2.2 Development Standard Alternatives

Potential development standards were considered for addressing identified stormwater related natural resources problems and opportunities in the Amazon Creek 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 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 includes a combination of capital projects, development standards, and other items to address existing and future stormwater related natural resources problems and opportunities, 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 Amazon Creek Headwaters East Fork, Amazon Creek Headwaters Middle Fork, Amazon Creek Headwaters West Fork, Braeburn Creek, Videra Creek, Timberline 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.

- ***Capital Project AM100- Upper Amazon Creek Enhancement Project:** Enhance the Amazon Creek main stem from Martin Street downstream to 19th Avenue.

- ***Capital Project AM101- Central Amazon Creek Restoration Project:** Enhance the main stem of Amazon Creek from Oak Patch Road downstream to Acorn Park Street.

- **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 Amazon Creek 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:

- **Citywide Annual Budget Line Item – Tip-Ups:** Retrofit the existing tip-ups located throughout the basin with a sedimentation manhole that provides maintenance access.
- **Capital Project AM06A – Kinney Park Neighborhood Facility:** Divert some of the flow from the pipe system under Martin Street and route it through the historical channel in Kinney Park.
- **Capital Project AM08B – Mt. Cavalry Pipe Improvements:** Construct pipe improvements to address flooding problems that are expected to occur in pipe segments downstream of Mt. Cavalry Cemetery.
- **Capital Project AM09 – Frederick Court Pipe Daylight:** Replace the undersized pipe segments, modify the open waterway and daylight a pipe segment to eliminate the expected flooding problems.
- **Capital Project AM11 – Hilyard Street Pipe Improvements:** Replace pipe segments and regrade/replace pipe segments to eliminate the expected flooding problems.
- **Capital Project AM13 – 43rd Avenue Pipe Improvements:** Replace the undersized pipe segments and replace the culvert crossing at Willamette Street to eliminate the expected flooding problems.
- **Capital Project AM14 – Morse Ranch Park Pipe Improvements:** Replace pipe segments in the Morse Ranch Park to eliminate expected flooding problems.
- **Capital Project AM15B – Laurelwood Flood Control Facility and Pipe Improvements:** Construct pipe improvements and detention facilities to eliminate expected flooding problems in pipe segments downstream of the Laurelwood Golf Course.
- **Capital Project AM17 – Jackson Street Pipe Improvements:** Replace the pipe segment along Jackson Street with a larger stormwater pipe to eliminate the expected flooding problems.
- **Capital Project AM27B – Windsor Circle Pipe Improvements:** Replace the undersized pipes with larger pipes to eliminate the expected flooding problems.
- **Capital Project AM100 – Upper Amazon Creek Enhancement:** This federal priority project involves the Amazon Creek main stem from Martin Street downstream to 19th Ave. Enhancements will likely include a low flow channel, an area for overbank flows, replanting

with native vegetation, and potentially some settling basins for treating the discharges from outfalls.

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:

- **Citywide Annual Budget Line Item – Water Quality Facilities in High Source Areas:** Retrofit the piped stormwater drainage systems in high source areas (e.g., commercial and industrial areas) with structural water quality facilities to reduce the pollutant load.
- **Citywide Annual Budget Line Item – Storm Outfall Stabilization:** Retrofit storm system outfalls that create bank stabilization problems into the Amazon Creek.
- **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 AM08D- Mt. Cavalry Water Quality Facility:** Construct a water quality facility at Mt. Cavalry Cemetery.
- **Capital Project AM012- Pine View Water Quality Facility:** Construct a water quality facility to reduce pollutants in stormwater discharges from the Pine View development.
- **Capital Project AM15D- North Laurelwood Water Quality Facility:** Construct a water quality facility at the northwest end of the golf course, just north of 28th Avenue to reduce pollutant discharges from the golf course.
- **Capital Project AM15E- South Laurelwood Water Quality Facility:** Construct a water quality facility at the south end of the golf course, just north of 30th Avenue to reduce pollutant discharges from the golf course.
- **Capital Project AM27C- Water Quality Facility West of Hawkins Lane:** Construct a water quality facility on the west side of Hawkins Lane.
- **Capital Project AM29- Water Quality Facility at Sam R Street:** Construct a water quality facility at Sam R Street.
- **Capital Project AM30- Water Quality Facility at Interior Street:** Construct a water quality facility at Interior Street.

- **Capital Project AM100- Upper Amazon Creek Enhancement Project:** Enhance the Amazon Creek main stem from Martin Street downstream to 19th Avenue.
- **Capital Project AM101- Central Amazon Creek Restoration Project:** Enhance the main stem of Amazon Creek from Oak Patch Road downstream to Acorn Park Street.
- ***Capital Project AM06A- Kinney Park Neighborhood Facility:** Construct a water quality facility in Kinney Park.
- ***Citywide Annual Budget Line Item – Retrofit of Tip-ups:** Retrofit the existing tip-ups located throughout the basin with a sedimentation manhole that provides maintenance access.

*Provide flood control benefits as well and are included in the list of flood control capital projects provided above.

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 Development 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 Amazon Creek Headwaters East Fork, Amazon Creek Headwaters Middle Fork, Amazon Creek Headwaters West Fork, Braeburn Creek, Videra Creek and Timberline 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.
- ***Capital Project AM100- Upper Amazon Creek Enhancement Project:** Enhance the Amazon Creek main stem from Martin Drive downstream to 19th Avenue.
- ***Capital Project AM101- Central Amazon Creek Restoration Project:** Enhance the main stem of Amazon Creek from Oak Patch Road downstream to Acorn Park Street.

*Also listed under either the flood control strategy and/or 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 Amazon Creek basin. It also provides estimated costs and expected funding sources for each of the capital projects.

Eighteen specific projects were selected and prioritized for implementation over a 35-year time period (2001-2035). Eight generic capital project categories were also identified for construction city-wide on an on-going yearly basis over the same 35-year period. These generic capital project categories include retrofit of tip-ups, water quality facilities in high source areas, stream bank stabilization, and outfall stabilization as identified for the flood control and pollution prevention strategies above. In addition, 5.8 miles of stream corridors representing 97.0 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 Amazon Creek basin. Refer to Figures 3-1 through 3-6 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 eighteen specific capital projects and the yearly line item projects.

A separate prioritization scheme was developed for prioritizing open waterway sites for acquisition. There are portions of six stream corridors identified for acquisition in the Amazon basin: Amazon Creek Headwaters (East Fork, Middle Fork, West Fork); Braeburn Creek; Timberline Creek; and Videra Creek. Within these corridors, seven sites have been prioritized for immediate acquisition. The remaining portions of the corridors have yet to be evaluated and prioritized for acquisition. Table 6-2 indicates the acquisition corridors and estimated costs. 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
AM 06A – Kinney Park Water Quality Facility	2001 - 2005	$486,800	$360,232 [74%]	$126,568 [26%]	$0
AM 09 –Frederick Court Pipe Daylight	2001 - 2005	$118,300	$54,418 [46%]	$63,882 [54%]	$0
AM 11 – Hilyard Street Pipe Improvements	2001 - 2005	$290,200	$66,746 [23%]	$223,454 [77%]	$0
AM 100 – Upper Amazon Creek Restoration	2001 - 2005	$3,300,000	$0	$1,155,000 [35%]	$2,145,000 [65%]
AM 12 – Pine View Water Quality Facility	2006 - 2010	$309,100	$0	$309,100 [100%]	$0
AM 15D – North Laurelwood Water Quality Facility	2006 - 2010	$445,600	$0	$445,600 [100%]	$0
AM 15E – South Laurelwood Water Quality Facility	2006 - 2010	$371,400	$0	$371,400 [100%]	$0
AM 17 – Jackson Street Pipe Improvements	2006 - 2010	$77,400	$19,350 [25%]	$58,050 [75%]	$0
AM 101 – Central Amazon Creek Restoration	2006 - 2010	$3,504,000	$0	$1,226,400 [35%]	$2,277,600 [65%]
AM 08B – Mt. Cavalry Pipe Improvements	2011 - 2035	763,200	$183,168 [24%]	$580,032 [76%]	$0
AM 08D – Mt. Cavalry Water Quality Facility	2011 - 2035	$469,600	$0	$469,600 [100%]	$0
AM 13 – 43rd Avenue Pipe Improvements	2011 - 2035	$2,155,500	$689,760 [32%]	$1,465,740 [68%]	$0
AM 14 – Morse Ranch Park Pipe Improvements	2011 - 2035	$1,054,500	$115,995 [11%]	$938,505 [89%]	$0
AM 15B – Laurelwood Flood Control/Pipe Improvements	2011 - 2035	$2,008,400	$301,260 [15%)	$1,707,140 [85%]	$0
AM 27B – Windsor Circle Pipe Improvements	2011 - 2035	$919,000	$588,160 [64%]	$330,840 [36%]	$0
AM 27C – Water Quality Facility West Hawkins	2011 - 2035	$625,300	$506,493 [81%]	$118,807 [19%]	$0
AM 29 – Water Quality Facility at Sam R. Street	2011 - 2035	$486,400	$0	$486,400 [100%]	$0
AM 30 – Water Quality Facility at Interior Street	2011 - 2035	$328,200	$0	$328,200 [100%]	$0
Subtotal:		**$17,712,900**	**$2,885,582**	**$10,404,718**	**$4,422,600**

* See Introduction section for information updates related to capital projects AM100 and AM101.

Table 6-1 (continued)

Capital Project Identification	Priority	Total Estimated Cost	Estimated Funding Source and Allocation		
			SDCs	User Fees	Federal Priority Funds
Yearly Capital Program Line Items Citywide: • Water Quality Facilities in High Source Areas • Stormwater Outfall Stabilization • Streambank Stabilization • Retrofit Tip-ups • 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.			

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

Priority Stream Corridor	Area Miles/Acres	Estimated Cost
Amazon Creek Headwaters – East Fork	1.3 miles / 24.0 acres	$480,000
Amazon Creek Headwaters – Middle Fork	1.8 miles / 30.0 acres	$600,000
Amazon Creek Headwaters – West Fork	0.6 miles / 5.0 acres	$100,000
Braeburn Creek	0.4 miles / 7.0 acres	$210,000
Timberline Creek	0.7 miles / 13.0 acres	$390,000
Videra Creek	1.0 miles / 18.0 acres	$540,000
Total	**5.8 miles / 97.0 ac**	**$2,320,000**

APPENDIX

CAPITAL PROJECT FACT SHEETS

Maintenance Requirements

Facility Type	*Annual Maintenance Activities*
Underground structural water quality facility	Depending on the facility type, maintenance may be required once every month to once every two years.

CSWMP Objectives and Policies Addressed by the Capital Project

Flood Control

N/A

Water Quality

This CP provides treatment of stormwater runoff from various sized high pollutant source drainage areas. Pollutant load reductions will depend on the type of facilities used and the locations of the facilities.

Natural Resources

N/A

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 water quality facilities for high source areas on a city-wide basis.

Annual Maintenance Costs	

Capital Project Fact Sheet

Basin Name: Citywide Projects

Project Identifier	**AM01 - Citywide Annual Budget Line Item**
Project Title	**Amazon Creek Streambank Stabilization**
Project Location	Open Waterways throughout the Amazon Creek 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 Identifier	**AM02 - Citywide Annual Budget Line Item**
Project Title	**Water quality facilities for high source areas**
Project Location	Piped storm drainage systems located throughout the City of Eugene that convey stormwater runoff from mostly developed (i.e. no space for above ground water quality facilities) high pollutant source areas (i.e. commercial and industrial areas).
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

Construct offline, underground structural water quality facilities in developed, high pollutant source areas. Types of facilities include sedimentation manholes and proprietary stormwater treatment devices. Depending on flow rate, costs vary from $2000 for a small sedimentation manhole to $60,000 for a large Storm Filter.

Project Elements

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 help 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**

Capital Project Fact Sheet

Basin Name: Citywide Projects

Project Identifier	**AM01 - Citywide Annual Budget Line Item**
Project Title	**Amazon Creek Streambank Stabilization**
Project Location	
Open Waterways throughout the Amazon Creek 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 help 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	**AM02 - Citywide Annual Budget Line Item**
Project Title	**Water quality facilities for high source areas**

Project Location

Piped storm drainage systems located throughout the City of Eugene that convey stormwater runoff from mostly developed (i.e. no space for above ground water quality facilities) high pollutant source areas (i.e. commercial and industrial areas).

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

Construct offline, underground structural water quality facilities in developed, high pollutant source areas. Types of facilities include sedimentation manholes and proprietary stormwater treatment devices. Depending on flow rate, costs vary from $2000 for a small sedimentation manhole to $60,000 for a large Storm Filter.

Project Elements

1 EA – Underground structural water quality facility

Problems and/or Opportunities Addressed by the Capital Projects

Problems

Based on monitoring data collected within the City of Eugene, stormwater from high pollutant source areas is a significant source of pollutant loads to receiving waters.

Opportunities

Opportunity to reduce pollutant discharges in stormwater runoff from high pollutant sources in developed areas.

Maintenance Requirements

Facility Type	*Annual Maintenance Activities*
Underground structural water quality facility	Depending on the facility type, maintenance may be required once every month to once every two years.

CSWMP Objectives and Policies Addressed by the Capital Project

Flood Control

N/A

Water Quality

This CP provides treatment of stormwater runoff from various sized high pollutant source drainage areas. Pollutant load reductions will depend on the type of facilities used and the locations of the facilities.

Natural Resources

N/A

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 water quality facilities for high source areas on a city-wide basis.

Annual Maintenance Costs	

Design Assumptions

Possible high source retrofit locations:

1) Node 54120 - Approximate drainage area = 15.8 acres
2) Node 54358 - Approximate drainage area = 38.2 acres
3) Node 54169 - Approximate drainage area = 14.2 acres
4) Node 56007 - Approximate drainage area = 15.4 acres
5) Node 56268 - Approximate drainage area = 15.6 acres
6) Node 10066 - Approximate drainage area = 8.4 acres
7) Node 55269 - Approximate drainage area = 6 acres
8) Node 55465 - Approximate drainage area = 30 acres
9) Node 55483 - Approximate drainage area = 25 acres
10) Node 56495 - Approximate drainage area = 5.2 acres
11) Node 54872 - Approximate drainage area = 18.1 acres
12) Node 54741 - Approximate drainage area = 23.2 acres
13) Node 54714 - Approximate drainage area = 15.2 acres
14) Node 54754- Approximate drainage area = 23 acres
15) Node 54749 - Approximate drainage area = 29.4 acres
16) Node 54761 - Approximate drainage area = 51.2 acres
17) Node 54726 - Approximate drainage area = 26.2 acres
18) Node 63128 - Approximate drainage area = 54.4 acres
19) Node 63199 - Approximate drainage area = 6.9 acres
20) Node 63152 - Approximate drainage area = 6.5 acres
21) Node 66338 - Approximate drainage area = 10.3 acres
22) Node 63181 - Approximate drainage area = 21.8 acres
23) Node 63134 - Approximate drainage area = 42.4 acres
24) Node 63037 - Approximate drainage area = 6.4 acres
25) Node 63025 - Approximate drainage area = 24.6 acres

Project Identifier	**AM03 - Citywide Annual Budget Line Item**
Project Title	**Outfall stabilization**

Project Location

All storm drainage system outfalls draining directly to the Amazon Creek within the City of Eugene that are causing erosion and bank stabilization problems. Existing problems have been observed at outfalls 55294, 54172, and 54171 on Amazon Creek.

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 Amazon 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 Amazon Creek (especially, nodes 55294, 54172, and 54171).

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 Amazon 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**

Project Identifier	**AM04 - Citywide Annual Budget Line Item**
Project Title	**Retrofit of Tip-ups**
Project Location	

Tip-ups located throughout the Amazon Creek Basin

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

Retrofit the tip-ups with manholes that provide sedimentation storage and maintenance access. Re-install outlet pipe at a positive grade.

Project Elements

1 EA – Retrofit of Tip-up

Problems and/or Opportunities Addressed by the Capital Projects

Problems

Surcharging, build up of sediment and debris, and limited access for maintenance are all problems associated with the existing tip-ups.

Opportunities

This CP provides an opportunity to reduce sedimentation problems and to facilitate maintenance.

Maintenance Requirements

Facility Type	*Annual Maintenance Activities*
Retrofit of Tip-up	Inspect sediment loading and debris accumulation, remove debris and sediment.

CSWMP Objectives and Policies Addressed by the Capital Project

Flood Control

This CP is expected to reduce capacity problems due to sediment buildup.

Water Quality

The new manhole will provide storage of sediment and debris which can be periodically removed.

Natural Resources

N/A

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 tip-up retrofit projects on a city-wide basis.

Annual Maintenance Costs

Design Assumptions

The following tip-ups within the Amazon Creek Basin were identified for retrofit:

1) AMUP140A - drains east on 36th Ave. into Amazon Creek
Node 51469 - 66944, Page 69 of 97
Tip-up offset = 0.5 feet
2) AMBH015A - located to the north of 13th Ave. and along Buck St.
Node 54776 to 54745, Page 43 of 97
Tip-up offset = 1.26 feet
3) AMBT040C - drains north to an open waterway along Sam Rd.
Node 54813 to 66976, Page 32 of 97
Tip-up offset = 3.27 feet
4) Located along Quaker St. and drains north into Amazon Creek
Node 66857 to 54746, Page 32 of 97
Tip-up offset = 1.4 feet
5) Located to the west of Bertlesen Rd. and drains north into an open waterway which is located to the west of Bertlesen Rd.
Node 66492 to 66056, Page 21 of 97
Tip-up offset = 1.8 feet
6) Potential tip-ups (inverts are not listed in the City's GIS)
Node 53793 to 66966 (page 68 of 97)
Node 56051 to 54049 (page 55 of 97)
Node 54181 to 54174 (page 68 of 97)
Node 51772 to 51779 (page 69 of 97)
Node 50561 to 50568 (page 70 of 97)

Project Identifier	**AM06A**
Project Title	**Kinney Park Water Quality Facility**
Project Location	

This CP is located just north of Martin Dr. in Kinney Park between W. Amazon Parkway and Center Way . The location can be found on sewer index map page 71.

Subbasin	**AMHW**	
GIS U/S Node Location	**65387**	
GIS D/S Node Location	**65382**	
Drainage Area Served by Capital Project	**214**	Acres
% Impervious (1994 Existing Land Use)	**14**	
% Impervious (Future)	**35**	
Design Flow (Future Conditions	**N/A**	cfs

Project Description

Restore flow to the historical channel through a newly constructed culvert and construct a 7 ac-ft neighborhood water quality facility in Kinney Park.

Project Elements

7 Ac-Ft – Water Quality Pond
50 Ft – 42" CSP (2-5 ft. cover)
1 EA – AM06A Open Waterway Improvement

Problems and/or Opportunities Addressed by the Capital Projects

Problems

Segment AMHW010B in the piped storm system which runs west beneath Martin Dr. and discharges into the Amazon Creek is expected to be deficient for a 10-year storm under future land use conditions.

Opportunities

Open space adjacent to the historic channel in Kinney Park provides an opportunity to construct a neighborhood 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.
42" CSP (2-5 ft. cover)	N/A
AM06A Open Waterway Improvement	Inspect vegetation and banks for erosion.

CSWMP Objectives and Policies Addressed by the Capital Project

Flood Control

This capital project is expected to eliminate the predicted capacity problem for the 10-year design storm under future land use conditions identified for pipe segment AMHW010B. Segment AMHW010B is a 352 ft long 48" CSP which runs west beneath Martin Dr. and discharges into the Amazon Creek.

Water Quality

This neighborhood water quality facility will provide treatment of stormwater runoff from a 214-acre drainage area with an estimated annual discharge of 37,000 lbs of TSS under future land use conditions (60% low-density residential, 40% parks and open space). This CP is expected to remove 18,000 of the 37,000 lbs/yr of TSS.

Natural Resources

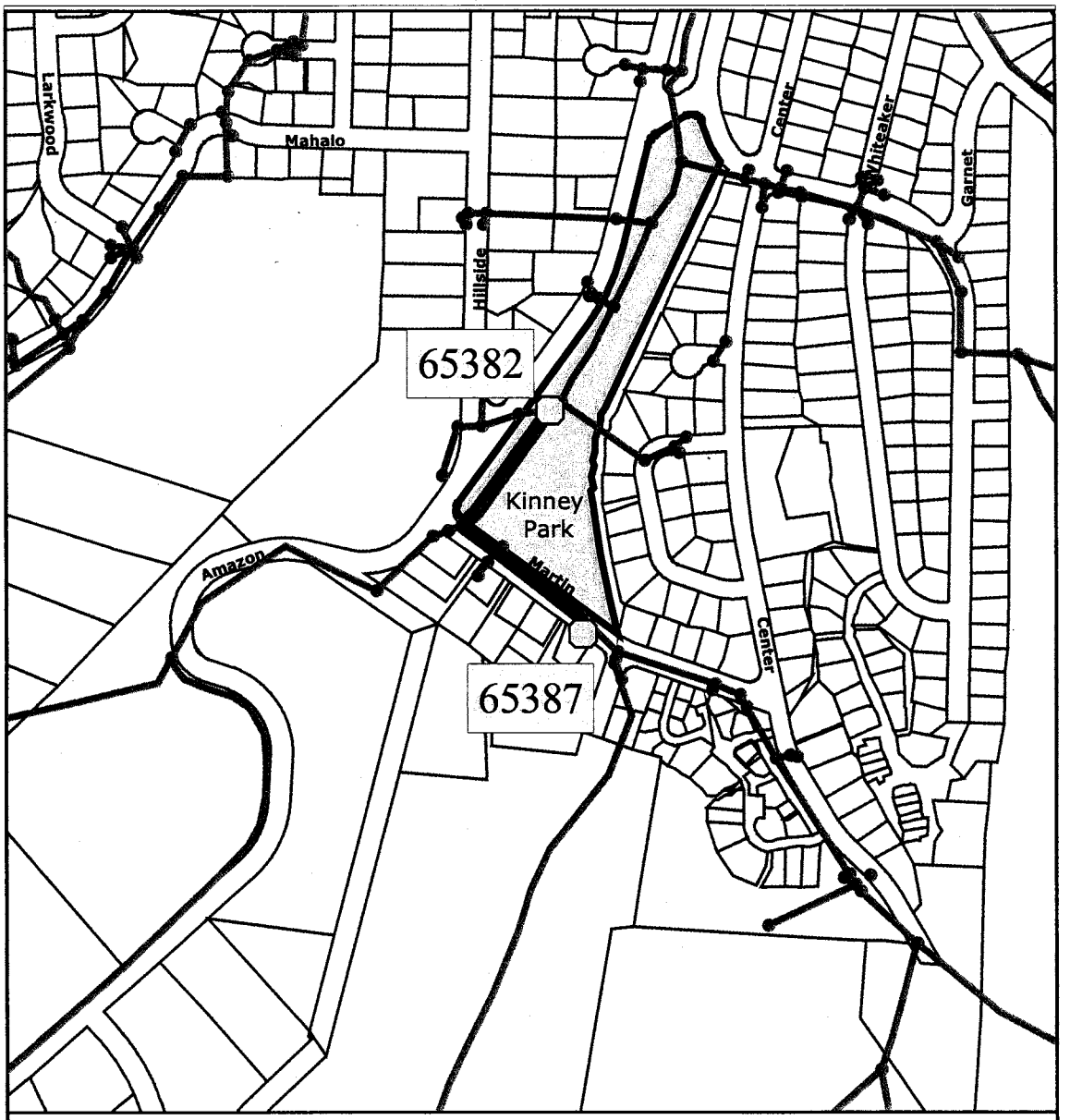
This capital project will provide natural resource enhancement of approximately 0.72 acres.

Other City Objectives Addressed by the Capital Project

To be completed by the City

Costs

Construction Costs:	$405,700
Site Acquisition:	$0
Engineering / Administration:	$81,100
Capital Project Implementation Costs	**$486,800**
Annual Maintenance Costs	**$7,300**



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

200 0 200 400 Feet

N

Site Map for CIP # AM06A

Kinney Park Water Quality Facility
Amazon Basin
City of Eugene
Capital Project

April 2001
I:\945042na\GISDATA\cip_amazon.apr

URS

AM06A

Design Assumptions

Flow from the tributary in subbasin AMHW-020 that enters the Martin Dr. pipe system at node 65344 along Martin Dr. will be diverted through a newly constructed culvert and discharged to the historical open waterway at the southeast corner of Kinney Park. The flow will then be routed in a northwest direction through an enhanced riparian corridor and into Amazon Creek.

A trapezoidal shape was assumed for the open channel, with a bottom width of 2 ft, side slopes 1 to 1 and a depth of 5 ft. The total length of the open channel was assumed to be 600 ft (measured from the aerial map). The new 42" CSP culvert has a design capacity of 116 cfs.

This CP would provide treatment of runoff from subbasin AMHW020 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.)

Project Identifier	**AM08B**
Project Title	**Mt. Cavalry Pipe Improvements**

Project Location

Pipe segments AMUP180A, 180B and 180C along 33rd Ave. between Willamette St. and Amazon Creek on page 69 of the sewer index map. Pipe segments AMUP180E and 180I north of 34th Ave. between Olive St. and Willamette St. on pages 57 and 69 of the sewer index map.

Subbasin	**AMUP**	
GIS U/S Node Location	**51284**	
GIS D/S Node Location	**51730**	
Drainage Area Served by Capital Project	**236**	Acres
% Impervious (1994 Existing Land Use)	**28**	
% Impervious (Future)	**37**	
Design Flow (Future Conditions	**110**	cfs

Project Description

This CP includes the following pipe replacements: AMUP180A (1314 ft 36" along 33rd from High St. to Amazon Creek replaced by 48" CSP); AMUP180B (215 ft 36" replaced by 48" CSP); AMUP180C (1254 ft 30" along 33rd from Willamette to east of High St replaced by 36").

Project Elements

1254 Ft – 36" CSP (2-5 ft. cover)

1530 Ft – 48" CSP (2-5 ft. cover)

Problems and/or Opportunities Addressed by the Capital Projects

Problems

The capacity of pipe segments AMUP180A and 180B is expected to be deficient under existing land use conditions for a 10-yr event. The capacity of pipe segments AMUP180C is expected to be deficient under future land use conditions for a 10-yr event. Flooding at AMUP180C is caused by the capacity deficiency of the downstream pipes AMUP180A and AMUP180B.

Opportunities

N/A

Maintenance Requirements

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

CSWMP Objectives and Policies Addressed by the Capital Project

Flood Control

This capital project is expected to eliminate the predicted surface flooding problems for the 10-year design storm under existing land use conditions identified in pipe segments AMUP180A, 180B; and predicted surface flooding problems for the 10-year design storm under future land use conditions in pipe segment AMUP180C

Water Quality

N/A

Natural Resources

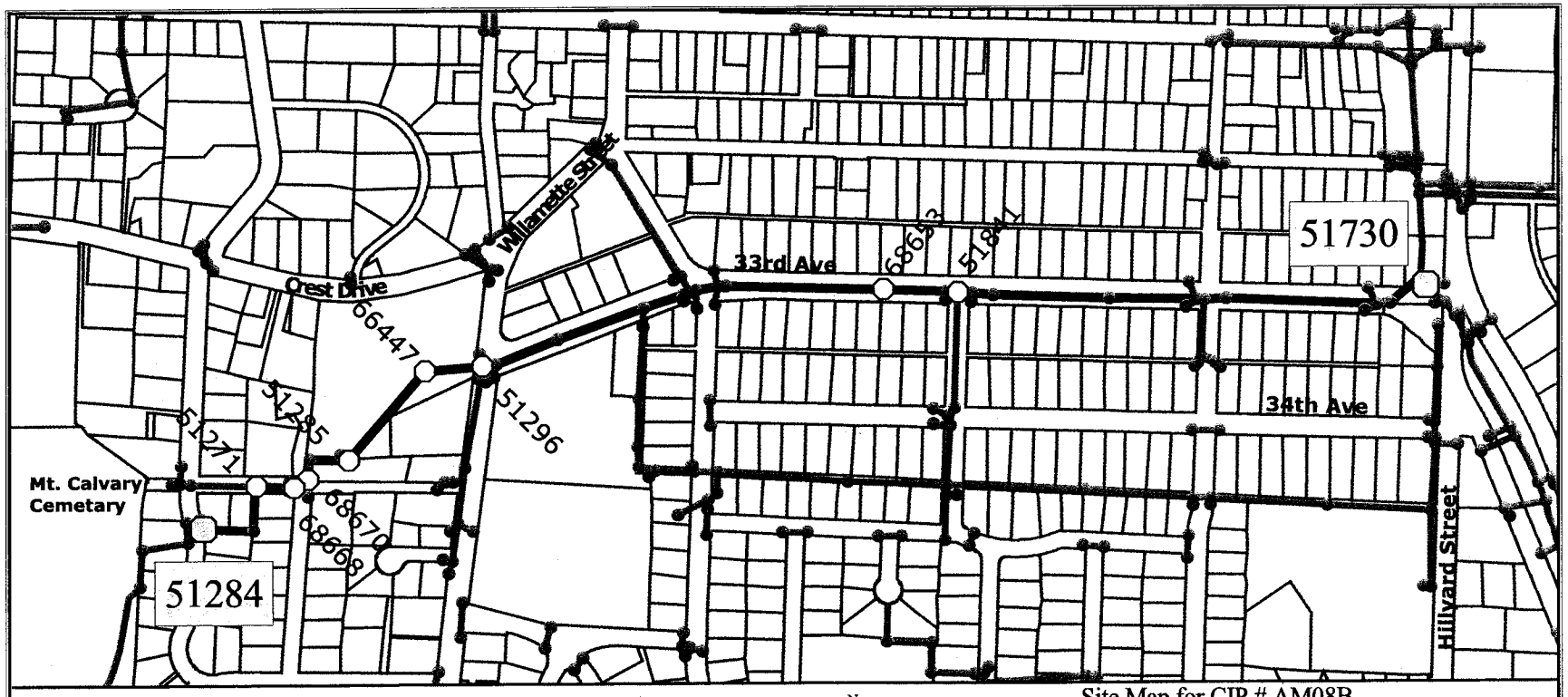
N/A

Other City Objectives Addressed by the Capital Project

To be completed by the City

Costs

Construction Costs:	$636,000
Site Acquisition:	$0
Engineering / Administration:	$127,200
Capital Project Implementation Costs	**$763,200**
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 # AM08B

Mt. Calvary Pipe Improvements
Amazon Basin
City of Eugene
Capital Project

April 2001
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URS

AM08B

Design Assumptions

The slope of the pipes was altered from the existing system in order to match upstream and/or downstream pipe inverts, or maximize top cover depth. Some pipe segments (AMUP180A, 180B and 180C) of the system are still surcharged, but the HGLs are more than 1 foot below the rim elevations.
The design capacities of the new pipe segments are as follows:
AMUP180A: 48" CSP, 1314 LF (0-5' of cover), design capacity = 133 cfs
AMUP180B: 48" CSP, 215 LF (0-5' of cover), design capacity = 122 cfs
AMUP180C: 36" CSP, 1254 LF (0-5' of cover), design capacity = 103 cfs

Project Identifier	AM08D
Project Title	Mt. Cavalry Water Quality Facility

Project Location

Open waterway (AMUP190A, from node 51204 to node 51239) in Mt. Cavalry Cemetery, page 57 of the sewer index map. This CP is in Amazon Upper Sub-basin.

Subbasin	AMUP	
GIS U/S Node Location	51204	
GIS D/S Node Location	51239	
Drainage Area Served by Capital Project	142	Acres
% Impervious (1994 Existing Land Use)	20	
% Impervious (Future)	37	
Design Flow (Future Conditions	N/A	cfs

Project Description

Construct a 6 ac-ft water quality facility at Mt. Cavalry Cemetery. The CP also requires residential land acquisition of approximately 2 acres.

Project Elements

6 Ac-Ft – Water Quality Pond

2 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

Opportunity to utilize existing open space adjacent to the open waterway at Mt. Cavalry to construct a neighborhood 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 separation berm.
Residential Property Acquisition	N/A

CSWMP Objectives and Policies Addressed by the Capital Project

Flood Control

N/A

Water Quality

This water quality facility will provide treatment of stormwater runoff from a 142-acre drainage area with an estimated annual discharge of 40,000 lbs of TSS under future land use conditions (100% low-density residential). This CP is expected to remove 19,000 of the 40,000 lbs/yr of TSS.

Natural Resources

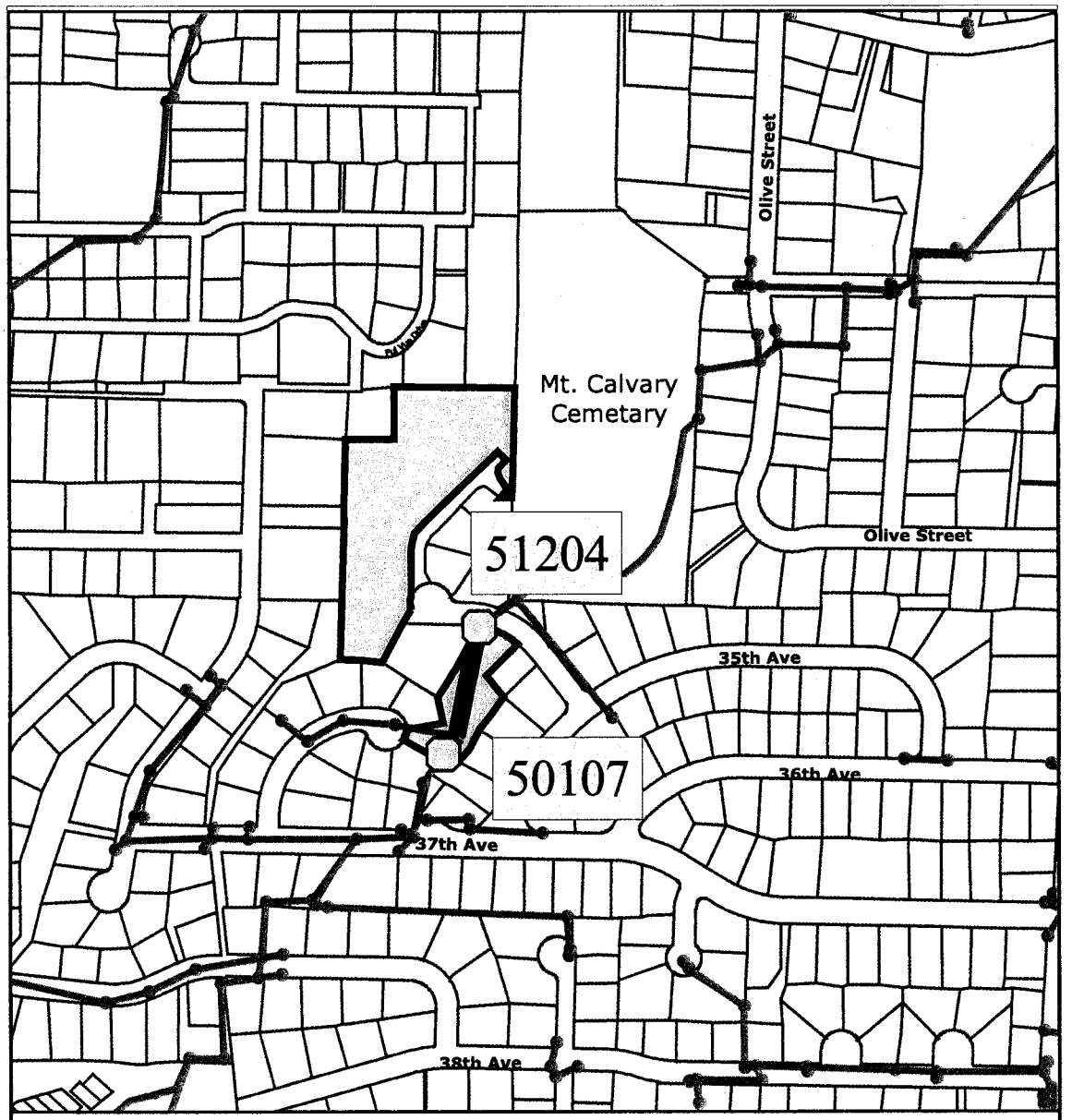
The water quality facility will provide natural resource enhancement of approximately 2 acres.

Other City Objectives Addressed by the Capital Project

To be completed by the City

Costs

Construction Costs:	$311,400
Site Acquisition:	$80,000
Engineering / Administration:	$78,200
Capital Project Implementation Costs	**$469,600**
Annual Maintenance Costs	**$6,700**



Property Parcel Boundary
Capital Project Location
Storm Pipe
Capital Improvement Project Element
Upstream/Downstream Node
Upstream/Downstream Subnode
Manholes or Catch Basins

200 0 200 400 Feet

N

Site Map for CIP # AM09

Frederick Court Pipe Daylight
Amazon Basin
City of Eugene
Capital Project

March 2001
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AM09

URS

Design Assumptions

This CP would provide treatment of runoff from subbasins AMUP190-200 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.)

Project Identifier	AM09
Project Title	Frederick Court Pipe Daylight
Project Location	

Pipe segment AMUP190B, just south of Frederick Ct, west of 35th Pl. on page 57 of the sewer index map.

Subbasin	AMUP	
GIS U/S Node Location	50107	
GIS D/S Node Location	51204	
Drainage Area Served by Capital Project	93	Acres
% Impervious (1994 Existing Land Use)	20	
% Impervious (Future)	37	
Design Flow (Future Conditions	45	cfs

Project Description

This CP includes the following pipe improvements: replacing the 24" CSP along Delwood Drive with a 36" CSP. Open waterway improvements between West 37th Ave and Frederick Court include abandoning/removing the existing 24" pipe between West 37th and Frederick Court and re-establishing an open waterway. Replacing 24" CSP crossing at Frederick Court with a 36" CSP.

Project Elements

135 Ft – 36" CSP (2-5 ft. cover)

45 Ft – 36" CSP (2-5 ft. cover)

1 EA – AM09 Open Waterway Improvement

Problems and/or Opportunities Addressed by the Capital Projects

Problems

Flooding problems under future land use conditions were identified in the pipe along Delwood Drive, the open waterway and pipe downstream of West 37th Ave, open waterway upstream Frederick Court and the culvert crossing at Frederick Court.

Opportunities

Opportunity to utilize the existing open space in the vicinity of the pipe segment area to daylight the existing pipe.

Maintenance Requirements

Facility Type	*Annual Maintenance Activities*
36" CSP (2-5 ft. cover)	N/A
36" CSP (2-5 ft. cover)	N/A
AM09 Open Waterway Improvement	Inspect vegetation and banks for erosion.

CSWMP Objectives and Policies Addressed by the Capital Project

Flood Control

This capital project is expected to eliminate the predicted surface flooding problem for the 10-year design storm under future land use conditions.

Water Quality

This CP would help to filter sediments from flow, and stabilize the open waterway banks to minimize erosion. The open channel improvements also provide shading and create a low flow channel that will help reduce water temperatures.

Natural Resources

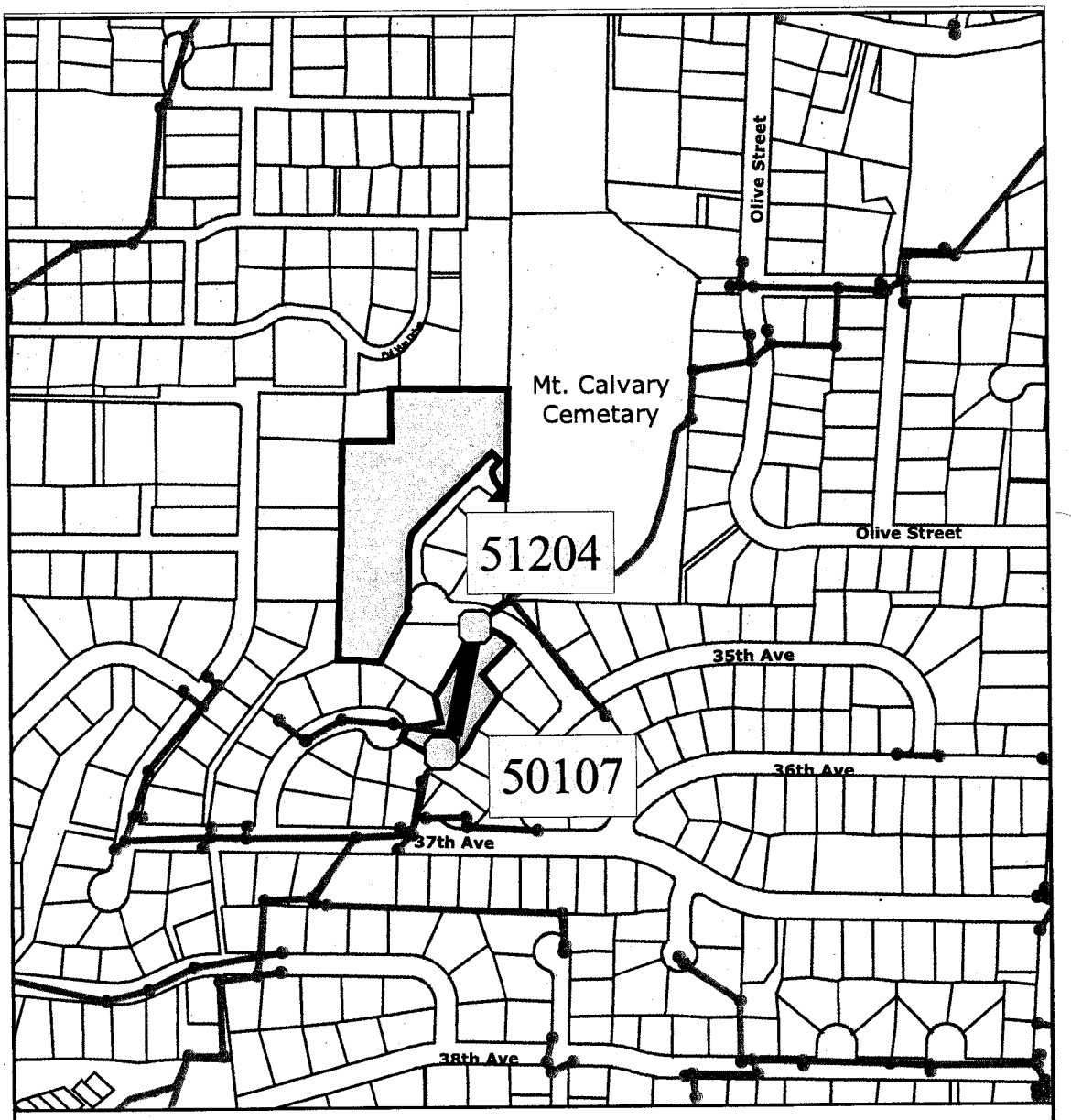
This CP will increase natural resources values by removing a pipe system and recreating the open waterway.

Other City Objectives Addressed by the Capital Project

To be completed by the City

Costs

Construction Costs:	$82,600
Site Acquisition:	$16,000
Engineering / Administration:	$19,700
Capital Project Implementation Costs	**$118,300**
Annual Maintenance Costs	**$0**



Property Parcel Boundary
Capital Project Location
Storm Pipe
Capital Improvement Project Element
Upstream/Downstream Node
Upstream/Downstream Subnode
Manholes or Catch Basins

200 0 200 400 Feet

N

Site Map for CIP # AM09

Frederick Court Pipe Daylight
Amazon Basin
City of Eugene
Capital Project

March 2001
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AM09

URS

Design Assumptions

The open waterways will have the following configuration:

From station 0+00 to 1+15 the proposed channel banks would be graded to the existing side slope or to side slopes 1:1, wichever is flatter. It would have a minimum 4 foot bottom width.

From station 1+15 to 4+80 the proposed open waterway would be constructed with a 4 foot bottom width and 3:1 side slopes.

Project Identifier	**AM11**
Project Title	**Hilyard St. Pipe Improvements**
Project Location	

Pipe segments located west of Amazon Drive West and south of 36th Ave. Segments AMUP140E (node 51763 to 51853), AMUP140D (node 51853 to 66678), AMUP140C (node 66678 to 51850), AMUP140B (node 51850 to 51469) and AMUP140A (node 51469 to 66944) can be found on sewer index map page 69.

Subbasin	**AMUP**	
GIS U/S Node Location	**51763**	
GIS D/S Node Location	**66944**	
Drainage Area Served by Capital Project	**283**	Acres
% Impervious (1994 Existing Land Use)	**33**	
% Impervious (Future)	**43**	
Design Flow (Future Conditions	**110**	cfs

Project Description

This CP includes the following pipe improvements: Segments AMUP140C, 140D and 140E which run parallel to 36th Ave just west of Hilyard are replaced by 42" CSPs (design capacity is 173 cfs); tip-up AMUP140A and pipe segments 140B which run from Hilyard St. to Amazon Creek are re-graded (design capacity is 134 cfs) and replaced by 54" CSPs.

Project Elements

220 Ft – 42" CSP (2-5 ft. cover)

645 Ft – 54" CSP (2-5 ft. cover)

Problems and/or Opportunities Addressed by the Capital Projects

Problems

The capacity of pipe segments AMUP140C, AMUP140D and AMUP140E is expected to be deficient for a 10-year storm under existing land use conditions.

Opportunities

N/A

Maintenance Requirements

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

CSWMP Objectives and Policies Addressed by the Capital Project

Flood Control

The installation of new pipes at these locations is expected to eliminate the capacity problems identified for pipe segments AMUP140C, AMUP140D and AMUP140E. The CP is also expected to eliminate the flooding problem for the upstream open waterway segment AMUP140F.

Water Quality

N/A

Natural Resources

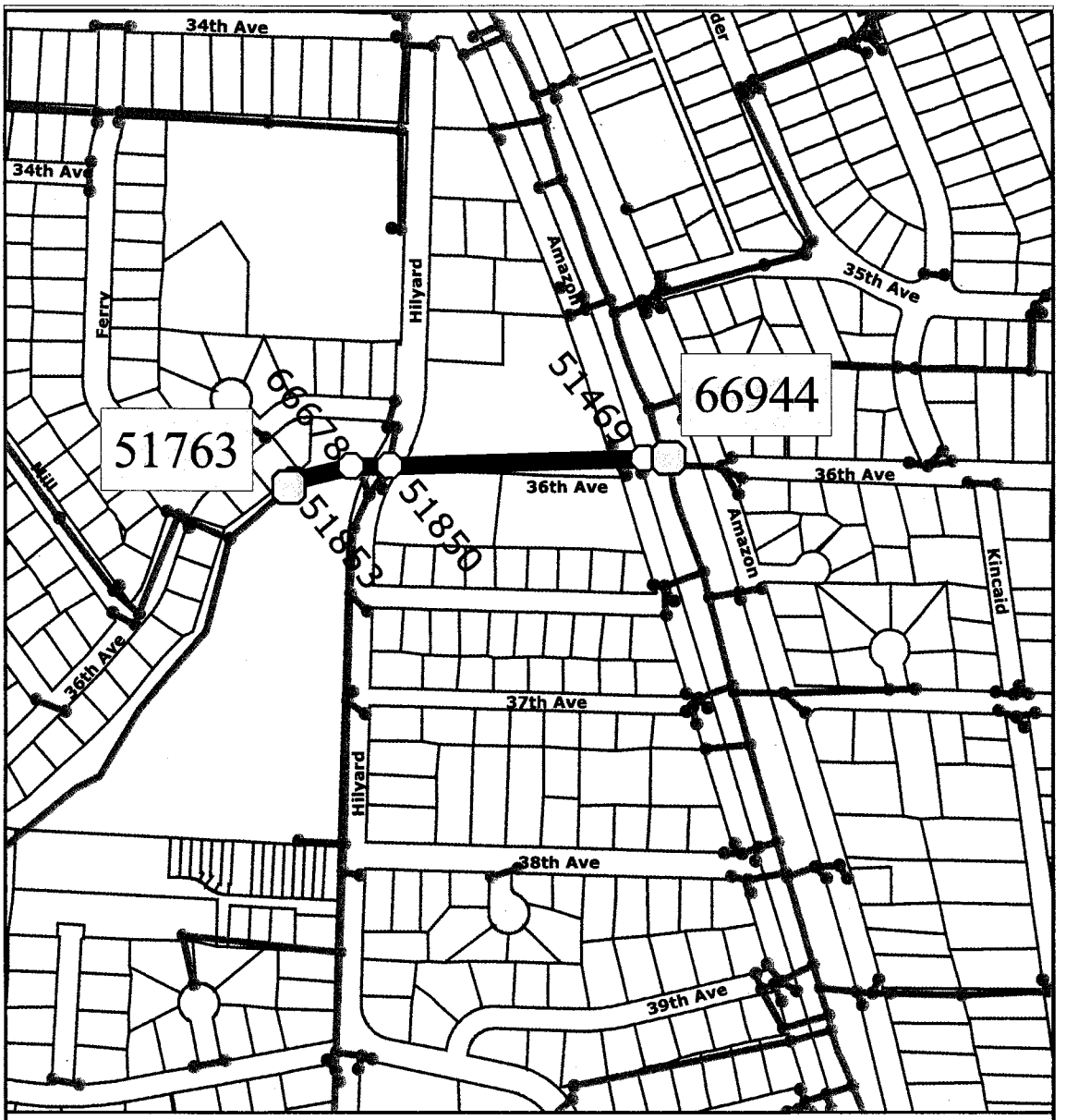
N/A

Other City Objectives Addressed by the Capital Project

To be completed by the City

Costs

Construction Costs:	$241,900
Site Acquisition:	$0
Engineering / Administration:	$48,300
Capital Project Implementation Costs	**$290,200**
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

200 0 200 400 Feet

N

Site Map for CIP # AM11

Hilyard St. Pipe Improvements
Amazon Basin
City of Eugene
Capital Project

April 2001
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AM11

Design Assumptions

The ground surface elevation at node 51850 is incorrect (below the crown elevation), so a ground surface elevation was estimated from ground levels of nearby nodes. Assuming installation of a larger pipe at this location is appropriate with regards to the minimum cover fill required.

The inverts of the proposed pipes were altered in order to increase the capacity. The existing 582 ft long 54" pipe segments (AMUP140B) need to be re-graded to accommodate the installation of new pipes. The upstream and downstream inverts for the 42" CSP are 446 ft and 438.4 ft respectively; and the upstream and downstream inverts for the 54" CSP are 438.4 ft and 434.9 ft, respectively.

From the model output, with the CP in place, the 54" pipe is still surcharged due to high water levels in the main stem of the Amazon Channel.

Project Identifier	AM12
Project Title	Pine View Water Quality Facility

Project Location

Outfall from development on Pine View that discharges to Breaburn Creek. This CP is in Amazon Upper Sub-basin and can be found on page 58 of the sewer index map.

Subbasin	AMUP	
GIS U/S Node Location	N/A	
GIS D/S Node Location	99479	
Drainage Area Served by Capital Project	93	Acres
% Impervious (1994 Existing Land Use)	19	
% Impervious (Future)	42	
Design Flow (Future Conditions	N/A	cfs

Project Description

Construct a 4 ac-ft neighborhood water quality facility on Braeburn creek at the Pine View development outfall. The CP also requires residential land acquisition of approximately 1 acre.

Project Elements

4 Ac-Ft – Water Quality Pond

1 Ac – Residential Property Acquisition

Problems and/or Opportunities Addressed by the Capital Projects

Problems

Erosion and down-cutting problems are occurring in the open waterway segment downstream from this discharge point at Pine View.

Opportunities

Opportunity to utilize existing open space to construct a neighborhood water quality facility to reduce pollutants in stormwater runoff and address impacts from increased runoff volumes and rates from this outfall.

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 separation berm.
Residential Property Acquisition	N/A

CSWMP Objectives and Policies Addressed by the Capital Project

Flood Control

N/A

Water Quality

This neighborhood water quality facility will provide treatment of stormwater runoff from a 93-acre drainage area with an estimated annual discharge of 26,000 lbs of TSS under future land use conditions (100% low-density residential). This CP is expected to remove 13,000 of the 26,000 lbs/yr of TSS. This capital project will also reduce runoff rates during frequent storm events to alleviate downstream erosion and channel downcutting problems.

Natural Resources

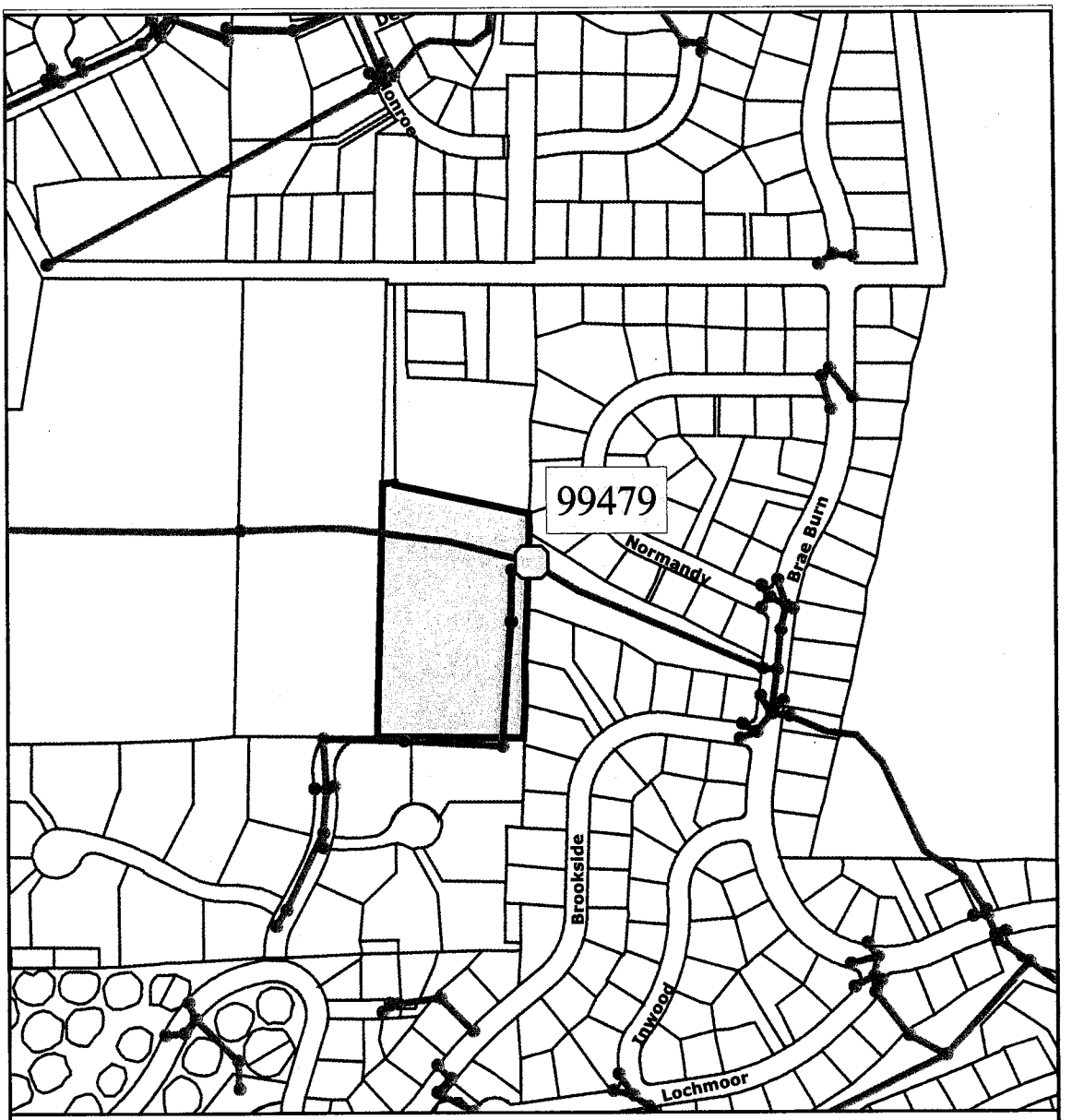
This neighborhood water quality facility will provide natural resource enhancement of approximately 1 acre.

Other City Objectives Addressed by the Capital Project

To be completed by the City

Costs

Construction Costs:	$207,600
Site Acquisition:	$50,000
Engineering / Administration:	$51,500
Capital Project Implementation Costs	**$309,100**
Annual Maintenance Costs	**$5,600**



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

200 0 200 400 Feet

N

Site Map for CIP # AM12

Pine View Water Quality Facility
Amazon Basin
City of Eugene
Capital Project

April 2001
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AM12

URS

Design Assumptions

The required size of this neighborhood water quality pond was estimated based on the total runoff volume from the 93 ac drainage area for the water quality design storm.
This CP would provide treatment of runoff from subbasin AMUP110 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.)

Project Identifier	AM13
Project Title	43rd Ave Pipe Improvements

Project Location

Pipe segments AMUP060A, 60B and 060C along 43rd Ave. from Donald St. to Amazon Creek. Pipe segment AMUP130A along Donald St. from 46th Ave. to 43rd Ave., and the culvert at Willamette St. These pipe segments are located in the Amazon Upper Sub-basin, and can be found on page 70 of the sewer index map.

Subbasin	AMUP	
GIS U/S Node Location	50090	
GIS D/S Node Location	50517	
Drainage Area Served by Capital Project	700	Acres
% Impervious (1994 Existing Land Use)	29	
% Impervious (Future)	42	
Design Flow (Future Conditions	N/A	cfs

Project Description

The CP includes the following pipe replacements: segment AMUP060A (64 ft 60" outfall to Amazon Creek) replaced by 72" CSP; segment AMUP060B (623 ft 54" from Fox Hollow Rd. to Amazon Dr. W) replaced by 72" CSP; segment AMUP060C (2580 ft 54" along 43rd Ave. from Donald St. to Fox Hollow Rd.) replaced by 66" CSP; segment AMUP130A (882 ft 54" CSP along Donald St. from 46th Ave. to 43rd Ave.) replaced by 66" CSP; and the culvert at Willamette St (128 ft 42" CSP) replaced by 48" CSP.

Project Elements

128 Ft – 48" CSP (2-5 ft. cover)
3462 Ft – 66" CSP (2-5 ft. cover)
687 Ft – 72" CSP (2-5 ft. cover)

Problems and/or Opportunities Addressed by the Capital Projects

Problems

The capacity of three pipe segments AMUP060A, 60C and 130A is expected to be deficient under existing land use conditions for a 10-yr event. The capacity of the culvert crossing Willamette St. is expected to be deficient under future land use conditions for a 10-yr storm event.

Opportunities

N/A

Maintenance Requirements

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

CSWMP Objectives and Policies Addressed by the Capital Project

Flood Control

This capital project is expected to eliminate the predicted surface flooding problems for the 10-year design storm under existing and future land use conditions identified in pipe segments AMUP060A, 60C, 130A and the culvert at Willamette St.

Water Quality

N/A

Natural Resources

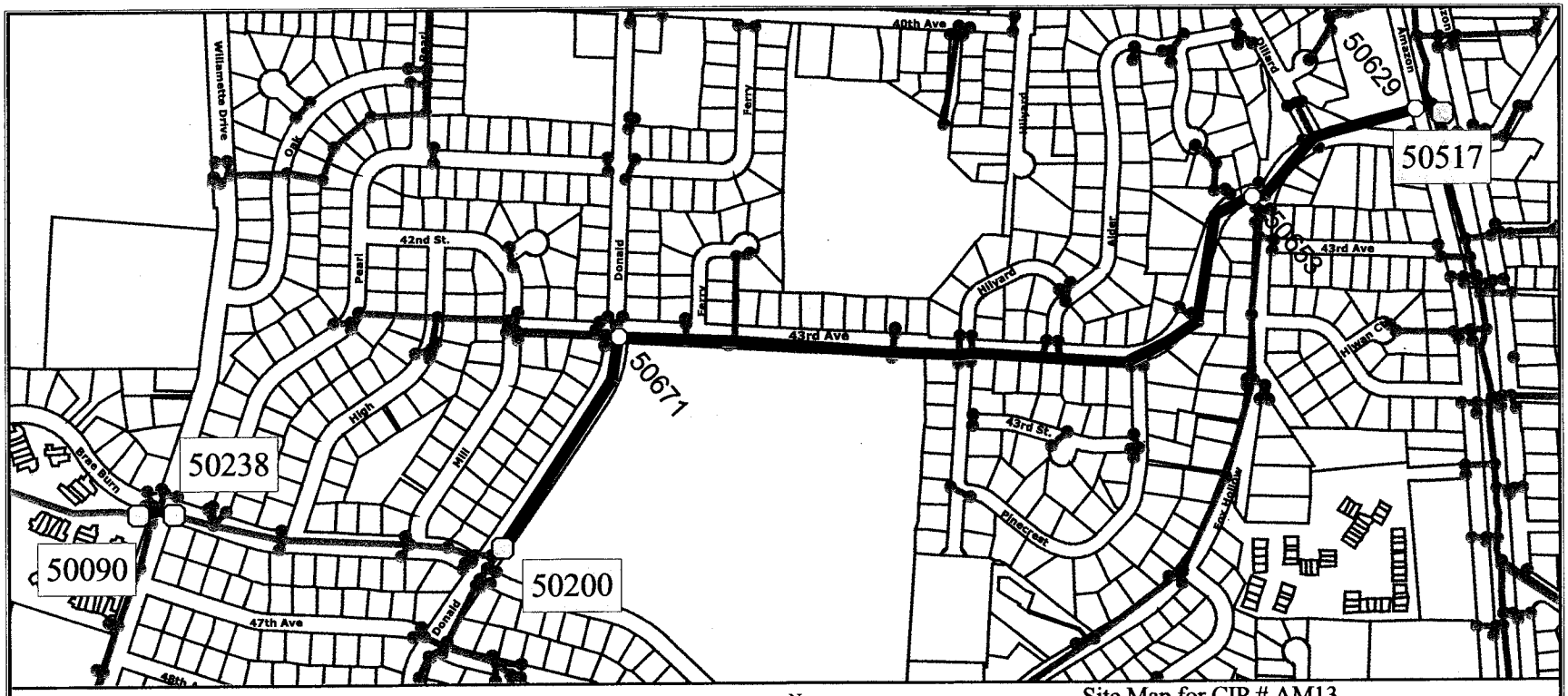
N/A

Other City Objectives Addressed by the Capital Project

To be completed by the City

Costs

Construction Costs:	$1,796,300
Site Acquisition:	$0
Engineering / Administration:	$359,200
Capital Project Implementation Costs	**$2,155,500**
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 0 200 400 600 800 1000 Feet

Site Map for CIP # AM13

43rd Ave Pipe Improvements
Amazon Basin
City of Eugene
Capital Project

April 2001
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URS

AM13

Design Assumptions

The slope of some of the pipes was altered from the existing system in order to either increase their capacity, or maximize top cover depth. It was assumed that lowering the inverts would not create problems for laterals which connect to the main pipe system.
Pipe segment AMUP060A and a portion of pipe segment AMUP060B are still surcharged due to high water levels in the Amazon main channel.
The design capacities of the new pipes are as follows:
AMUP060A: 72" CSP, 64 LF, design capacity = 347 cfs
AMUP060B: 72" CSP, 623 LF, design capacity = 834 cfs
AMUP060C: 66" CSP, 2580 LF, design capacity = 413 cfs
AMUP130A: 66" CSP, 882 LF, design capacity = 384 cfs
Willamte: 48" CSP, 128 LF, design capacity = 296 cfs

Project Identifier	AM14
Project Title	Morse Ranch Park Pipe Improvements
Project Location	

Pipe segments AMMD070A, 70B, AMMD080A through AMMD080M, AMMD110A and 110B downstream of Morse Ranch Park in Amazon Middle Sub-basin.
These pipe segments can be found on sewer index map pages 57, 68 and 69.

Subbasin	AMMD	
GIS U/S Node Location	51344	
GIS D/S Node Location	66967	
Drainage Area Served by Capital Project	251	Acres
% Impervious (1994 Existing Land Use)	39	
% Impervious (Future)	46	
Design Flow (Future Conditions	N/A	cfs

Project Description

This CP includes the following pipe replacements: AMMD080A to AMMD080H (18" to 36" CSPs along 29th Ave. from Charnelton St. to Oak); AMMD070B (27" along 29th Ave. from Oak to Amazon Creek). All of these pipe segments are replaced by 42" CSPs. AMMD070A (30" along 29th Ave. from Oak to Amazon Creek) is replaced by a 48" CSP.

Project Elements

2469 Ft – 42" CSP (2-5 ft. cover)
250 Ft – 42" CSP (5-10 ft. cover)
1051 Ft – 48" CSP (2-5 ft. cover)

Problems and/or Opportunities Addressed by the Capital Projects

Problems

Twelve pipe segments have expected capacity problems (AMMD080B to 80E, AMMD080G to 80L, AMMD110A and 110B), most of them are expected to occur under existing land use conditions, with the exception of AMMD080B, 80C and 80G.

Opportunities

N/A

Maintenance Requirements

Facility Type	*Annual Maintenance Activities*
42" CSP (2-5 ft. cover)	N/A
42" CSP (5-10 ft. cover)	N/A
48" CSP (2-5 ft. cover)	N/A

CSWMP Objectives and Policies Addressed by the Capital Project

Flood Control

This capital project is expected to eliminate the predicted capacity problems for the 10-year design storm under existing and/or future land use conditions identified for all 12 pipe segments in the pipe system downstream of Morse Ranch Park.

Water Quality

N/A

Natural Resources

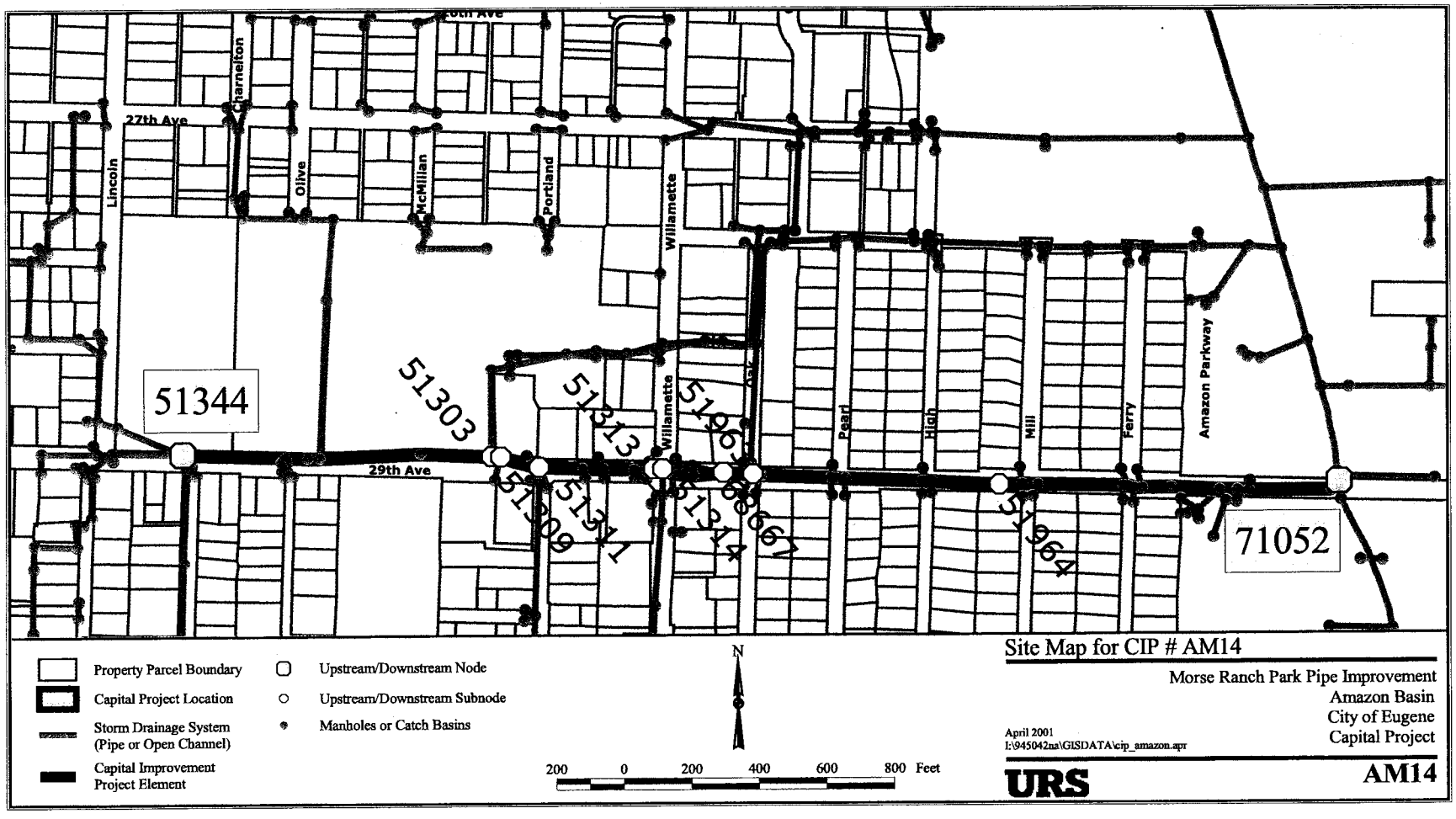
N/A

Other City Objectives Addressed by the Capital Project

To be completed by the City

Costs

Construction Costs:	$878,800
Site Acquisition:	$0
Engineering / Administration:	$175,700
Capital Project Implementation Costs	**$1,054,500**
Annual Maintenance Costs	**$0**



Site Map for CIP # AM14

Morse Ranch Park Pipe Improvement
Amazon Basin
City of Eugene
Capital Project

April 2001
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AM14

Design Assumptions

The slope of some of the pipes was altered from the existing system in order to either increase their capacity, or maximize top cover depth. It is assumed that lowering the inverts will not create problems for laterals which connect to the main pipe system.
Some improved pipe segments (AMMd070A, 70B and 80G) of the system are still surcharged, but the HGLs are more than 1 foot below the rim elevations in the model.
Design Capacities:
42" CSPs, design capacity = 59 - 100 cfs
48" CSP, design capacity = 93 cfs

Project Identifier	AM15B
Project Title	Laurelwood Flood Control Facility and Pipe Improvements

Project Location

Pipe segments downstream of the Laurelwood Golf Course. Segments AMMD040A through 40C; and segments AMMD040G, and 40K can be found on sewer index map pages 68, 80 and 81.

Subbasin	AMMD	
GIS U/S Node Location	54260	
GIS D/S Node Location	54172	
Drainage Area Served by Capital Project	582	Acres
% Impervious (1994 Existing Land Use)	34	
% Impervious (Future)	40	
Design Flow (Future Conditions	N/A	cfs

Project Description

Construct a 6 ac-ft flood control facility at node 54260 (northwest end of the Golf Course). The construction of this facility requires about 1.5 acres of commercial land acquisition.
This CP also includes the following pipe replacements: AMMD040A (961 ft long parallel 60" CSPs) and AMMD040B (486 ft long 42" and 72" elliptical) replaced by 2894 ft long parallel 72" CSPs.

Project Elements

6 Ac-Ft – Flood Control Facility
2894 Ft – 72" CSP (2-5 ft. cover)
1.5 Ac – Commercial Property Acquisition

Problems and/or Opportunities Addressed by the Capital Projects

Problems

The capacities of the pipe segments AMMD040A, 40B, and 40G are expected to be deficient for a 10-yr storm under existing land use conditions; the capacities of the pipe segments AMMD040C, and 40K are expected to be deficient for a 10-yr storm under future land use conditions.

Opportunities

The existing open space at the Golf Course provides opportunities for constructing neighborhood flood control facilities to alleviate downstream capacity problems.

Maintenance Requirements

Facility Type	*Annual Maintenance Activities*
Flood Control Facility	Inspect and clean inlet and outlet, maintain vegetation, inspect sediment loading, remove sediment, remove debris, inspect and repair separation berm.
72" CSP (2-5 ft. cover)	N/A
Commercial Property Acquisition	N/A

CSWMP Objectives and Policies Addressed by the Capital Project

Flood Control

This capital project is expected to eliminate the predicted capacity problems for the 10-year design storm under existing and/or future land use conditions identified for all pipe segments in the pipe system downstream of the Laurelwood Golf Course.

Water Quality

N/A

Natural Resources

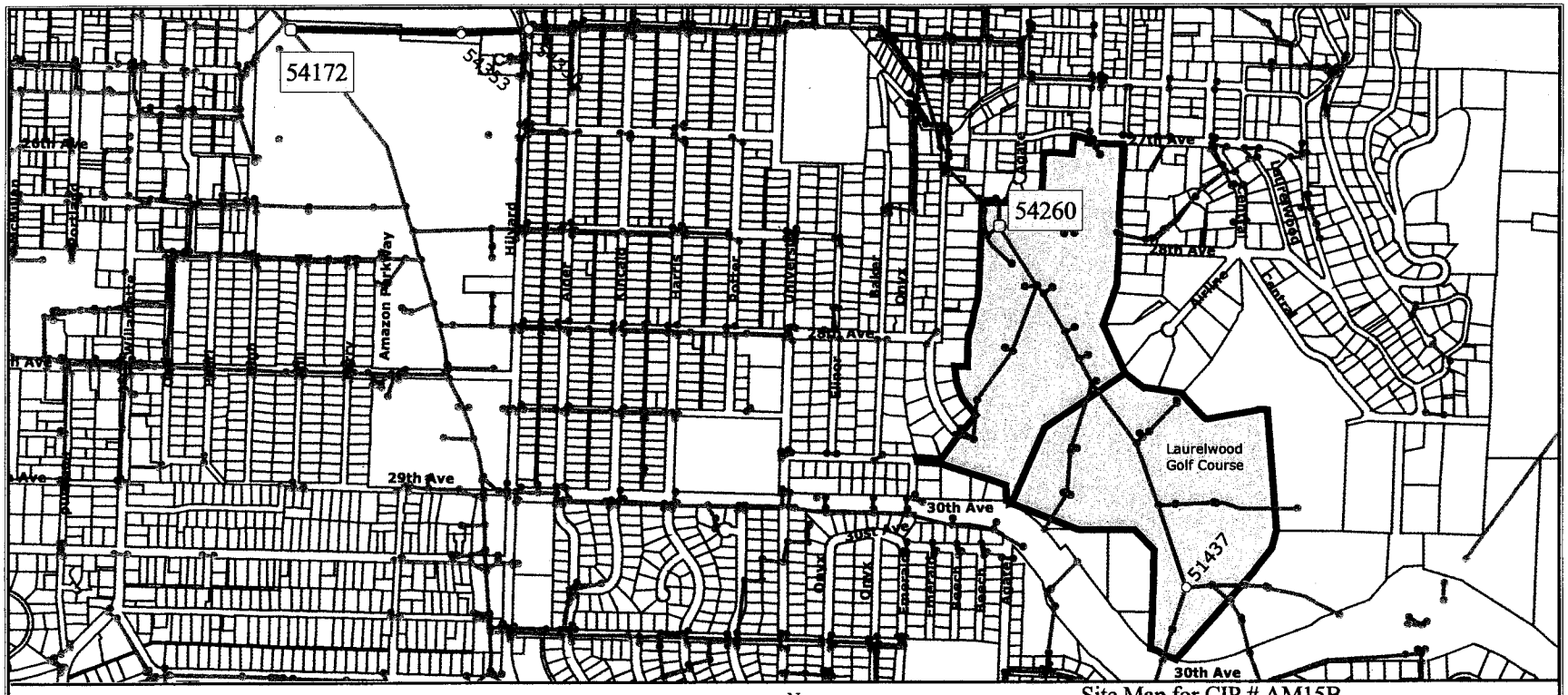
N/A

Other City Objectives Addressed by the Capital Project

To be completed by the City

Costs

Construction Costs:	$1,613,700
Site Acquisition:	$60,000
Engineering / Administration:	$334,700
Capital Project Implementation Costs	**$2,008,400**
Annual Maintenance Costs	**$5,000**



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 0 200 400 600 800 1000 1200 1400 1600 1800 2000 Feet

Site Map for CIP # AM15B

Laurelwood Flood Control Facility
and Pipe Improvements
Amazon Basin
City of Eugene
Capital Project

March 2001
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AM15B

Design Assumptions

Modeling of the flood control facilities is achieved by using a constant storage node at node 54260. The flow restriction was achieved with a side outlet orifice with an orifice area of 8 sq-ft. The side orifice has a discharge coefficient of 0.65. Pipe segments at the downstream end of the system (AMMD040A and 40B) are still surcharged due to high water levels in Amazon Creek.

Design capacities for the new pipes are as follows:

AMMD040A: 2-72" CSPs, 961 LF, design capacity = 155 cfs each

AMMD040B: 2-72" CSPs, 486 LF, design capacity = 169 cfs each

Project Identifier	**AM15D**
Project Title	**North Laurelwood Water Quality Facility**

Project Location

This CP is in the Amazon Middle Sub-basin, in the northwest portion of Laurelwood Golf Course at node 54260. The location is shown on sewer index map pages 80 and 71.

Subbasin	**AMMD**	
GIS U/S Node Location	**N/A**	
GIS D/S Node Location	**54260**	
Drainage Area Served by Capital Project	**197**	Acres
% Impervious (1994 Existing Land Use)	**26**	
% Impervious (Future)	**32**	
Design Flow (Future Conditions	**N/A**	cfs

Project Description

Construct a 6 ac-ft neighborhood water quality facility at node 54260 (northwest end of the Golf Course, just north of 28th Ave). This CP requires about 1.5 acres of commercial land acquisition.

Project Elements

6 Ac-Ft – Water Quality Pond

1.5 Ac – Commercial 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

The existing open space at the Golf Course provides an opportunity for constructing a neighborhood 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 separation berm.
Commercial Property Acquisition	N/A

CSWMP Objectives and Policies Addressed by the Capital Project

Flood Control

N/A

Water Quality

This neighborhood water quality facility will provide treatment of stormwater runoff from a 197-acre drainage area with an estimated annual discharge of 29,000 lbs of TSS under future land use conditions (50% low-density residential, 50% parks and open space). This CP is expected to remove 14,000 of the 29,000 lbs/yr of TSS.

Natural Resources

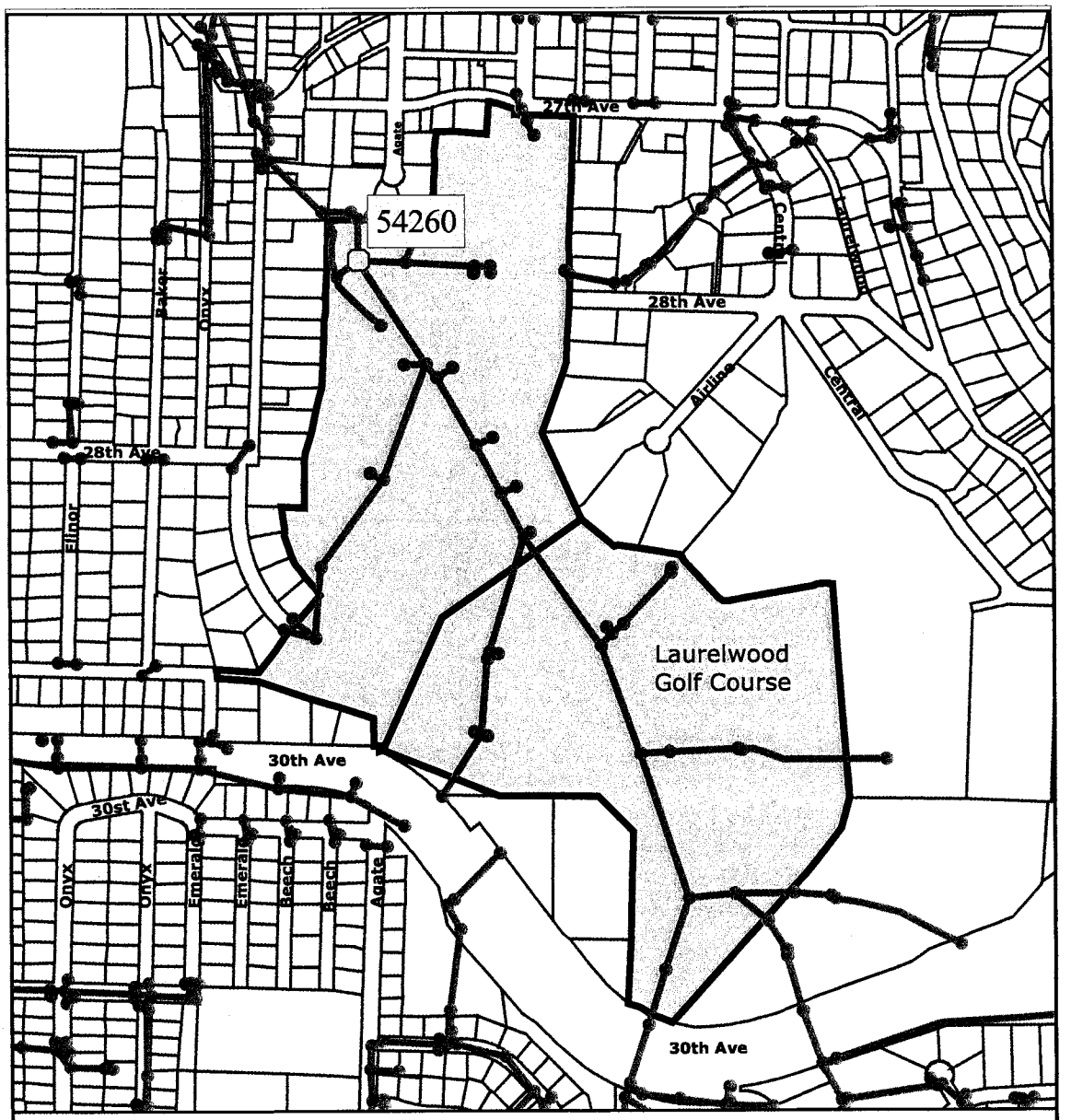
The water quality facility will provide natural resource enhancement of approximately 1.5 acres.

Other City Objectives Addressed by the Capital Project

To be completed by the City

Costs

Construction Costs:	$311,400
Site Acquisition:	$60,000
Engineering / Administration:	$74,200
Capital Project Implementation Costs	**$445,600**
Annual Maintenance Costs	**$6,700**



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

100 0 100 200 Feet

N

Site Map for CIP # AM15D

North Laurelwood Water Quality Facility
Amazon Basin
City of Eugene
Capital Project

April 2001
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AM15D

URS

Design Assumptions

This CP would provide treatment of runoff from subbasins AMMD020 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.)

Project Identifier	**AM15E**
Project Title	**South Laurelwood Water Quality Facility**

Project Location

This CP is in the Amazon Middle Sub-basin, in the south end of Laurelwood Golf Course at node 51437. The location is shown on sewer index map pages 80 and 71.

Subbasin	**AMMD**	
GIS U/S Node Location	**N/A**	
GIS D/S Node Location	**51437**	
Drainage Area Served by Capital Project	**122**	Acres
% Impervious (1994 Existing Land Use)	**32**	
% Impervious (Future)	**42**	
Design Flow (Future Conditions	**N/A**	cfs

Project Description

Construct a 5 ac-ft neighborhood water quality facility at node 51437 (south end of the Golf Course, just north of 30th Ave). This CP requires about 1.25 acres of commercial land acquisition.

Project Elements

5 Ac-Ft – Water Quality Pond

1.25 Ac – Commercial 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

The existing open space at the Golf Course provides an opportunity for constructing a neighborhood 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 separation berm.
Commercial Property Acquisition	N/A

CSWMP Objectives and Policies Addressed by the Capital Project

Flood Control

N/A

Water Quality

This neighborhood water quality facility will provide treatment of stormwater runoff from a 122-acre drainage area with an estimated annual discharge of 28,000 lbs of TSS under future land use conditions (80% low-density residential, 20% parks and open space). This CP is expected to remove 13,000 of the 28,000 lbs/yr of TSS.

Natural Resources

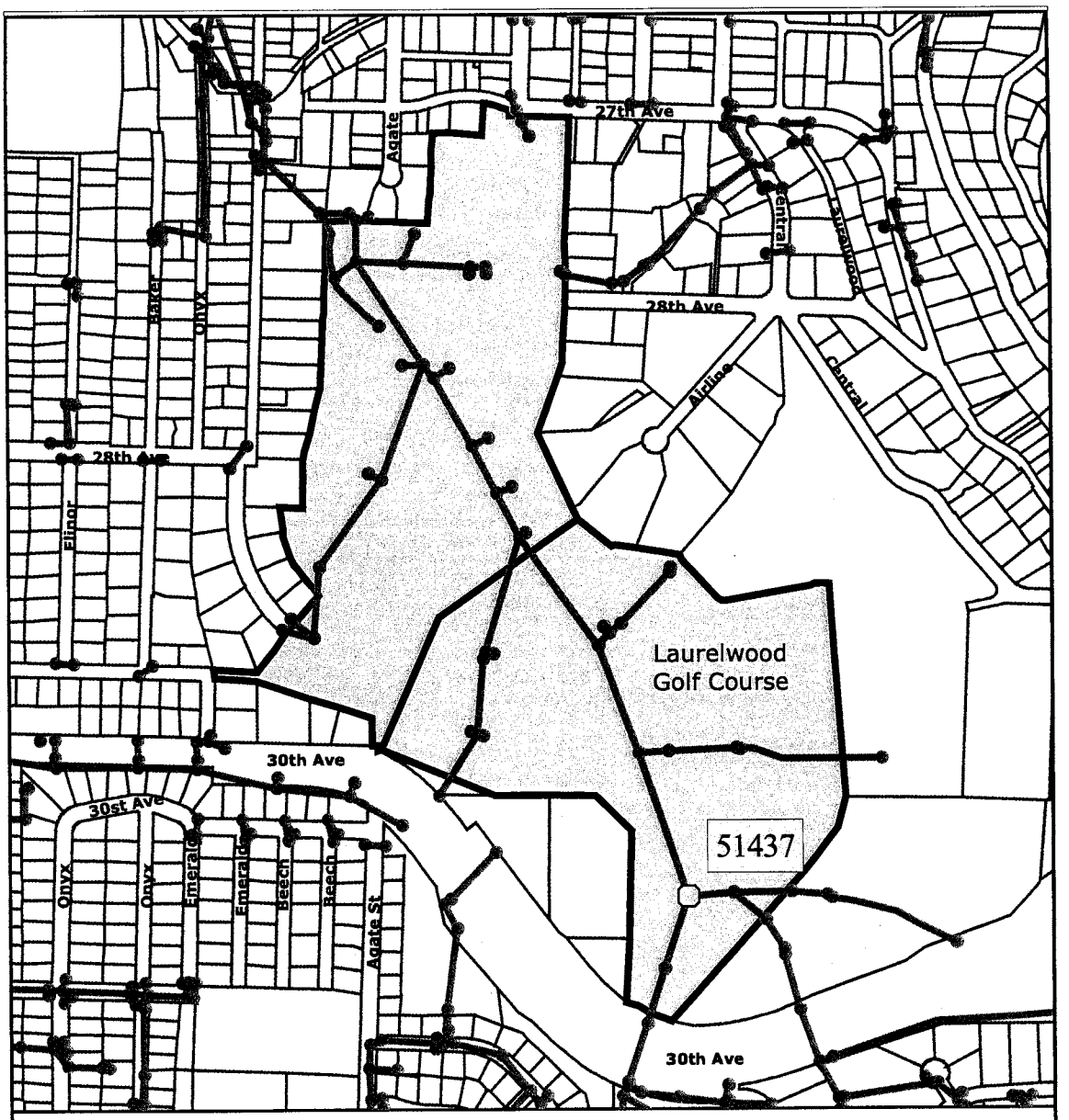
The water quality facility will provide natural resource enhancement of approximately 1.25 acres.

Other City Objectives Addressed by the Capital Project

To be completed by the City

Costs

Construction Costs:	$259,500
Site Acquisition:	$50,000
Engineering / Administration:	$61,900
Capital Project Implementation Costs	**$371,400**
Annual Maintenance Costs	**$5,600**



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

200 0 200 400 Feet

N

Site Map for CIP # AM15E

South Laurelwood Water Quality Facility
Amazon Basin
City of Eugene
Capital Project

April 2001
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AM15E

URS

Design Assumptions

This CP would provide treatment of runoff from subbasins AMMD010 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.)

Project Identifier	**AM17**
Project Title	**Jackson Street Pipe Improvements**

Project Location

Pipe segment AMPK170R along Jackson St. from 28th Ave. to 27th Ave in the Amazon Polk Street Sub-basin, on page 57 of the sewer index map.

Subbasin	**AMPK**	
GIS U/S Node Location	**53408**	
GIS D/S Node Location	**53405**	
Drainage Area Served by Capital Project	**106**	Acres
% Impervious (1994 Existing Land Use)	**27**	
% Impervious (Future)	**36**	
Design Flow (Future Conditions	**43**	cfs

Project Description

Remove the 24" CSP along Jackson St. from 28th Ave. to 27th Ave. and replace with a 30" CSP with a design capacity of 70 cfs.

Project Elements

430 Ft – 30" CSP (2-5 ft. cover)

Problems and/or Opportunities Addressed by the Capital Projects

Problems

The capacity of pipe segment AMPK170R is expected to be deficient under future land use conditions for a 10-yr event.

Opportunities

N/A

Maintenance Requirements

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

CSWMP Objectives and Policies Addressed by the Capital Project

Flood Control

This capital project is expected to eliminate the predicted surface flooding problem for the 10-year design storm under future land use conditions identified in pipe segment AMPK170R.

Water Quality

N/A

Natural Resources

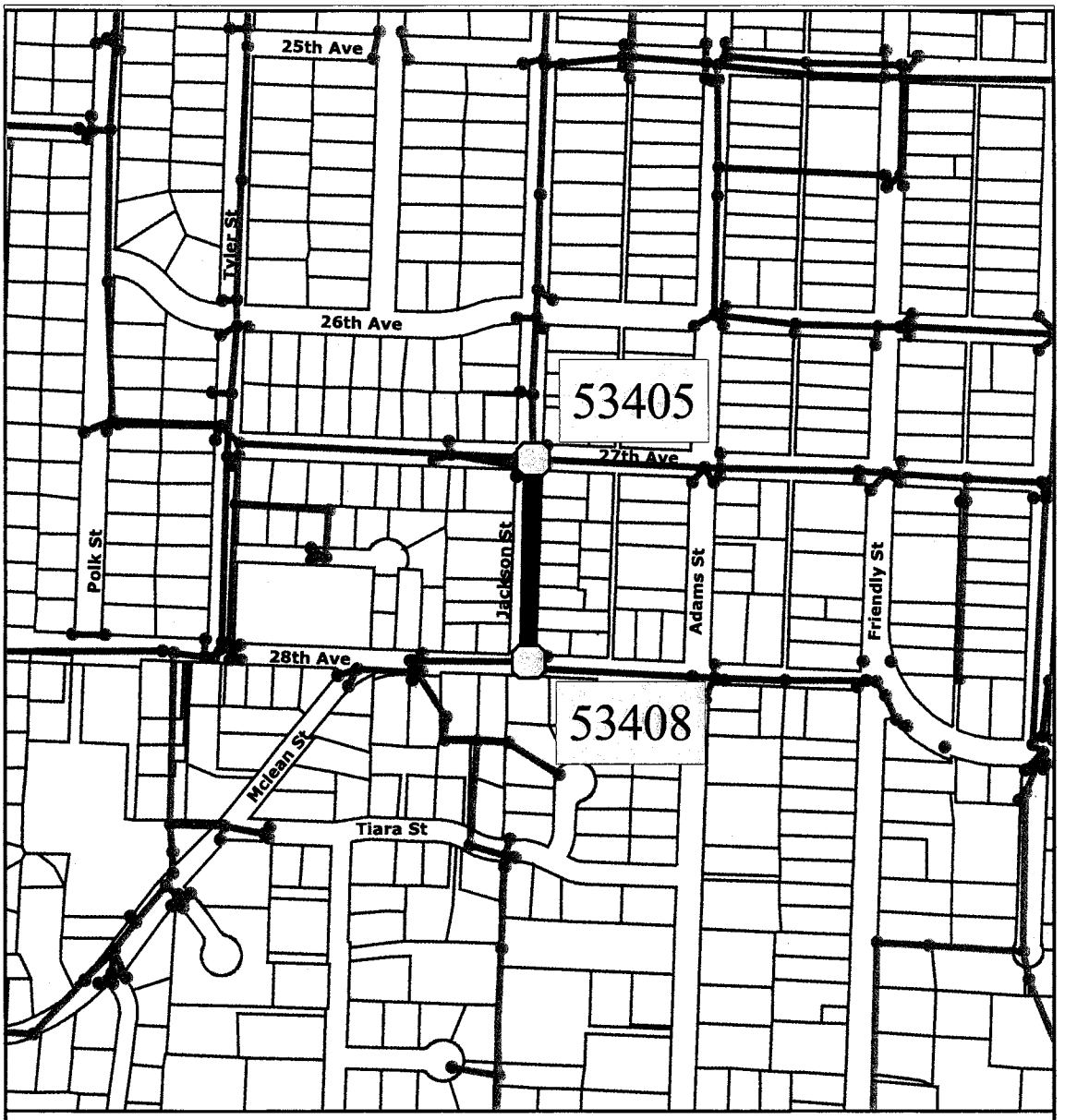
N/A

Other City Objectives Addressed by the Capital Project

To be completed by the City

Costs

Construction Costs:	$64,500
Site Acquisition:	$0
Engineering / Administration:	$12,900
Capital Project Implementation Costs	**$77,400**
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

200 0 200 400 Feet

N

Site Map for CIP # AM17

Jackson Street Pipe Improvements
Amazon Basin
City of Eugene
Capital Project

April 2001
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AM17

URS

Design Assumptions

The slope of the pipe segment was altered from the existing system in order to increase the capacity. The pipe is not surcharged after replacement for the 10-yr storm events.

Project Identifier	**AM27B**
Project Title	**Windsor Circle Pipe Improvements**

Project Location

Pipe segments AMBH070A (54" CSP) and AMBH070B (66" CSP) that run north from 25th Ave. to north of Kevington Ave., on page 33 of the sewer index map.

Subbasin	**AMBH**	
GIS U/S Node Location	**67805**	
GIS D/S Node Location	**52255**	
Drainage Area Served by Capital Project	**602**	Acres
% Impervious (1994 Existing Land Use)	**15**	
% Impervious (Future)	**42**	
Design Flow (Future Conditions	**N/A**	cfs

Project Description

This CP includes the following pipe replacements: Segment AMBH070A (515 ft 66" CSP) replaced by 72" CSP; and segment AMBH070B (1272 ft 54" CSP) replaced by 66" CSP.

Project Elements

1272 Ft – 66" CSP (2-5 ft. cover)

515 Ft – 72" CSP (2-5 ft. cover)

Problems and/or Opportunities Addressed by the Capital Projects

Problems

The capacity of pipe segment AMBH070B is expected to be deficient under future land use conditions for a 10-yr event.

Opportunities

N/A

Maintenance Requirements

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

CSWMP Objectives and Policies Addressed by the Capital Project

Flood Control

This capital project is expected to eliminate the predicted surface flooding problems for the 10-yr design storm under future land use conditions identified in pipe segment AMBH070B.

Water Quality

N/A

Natural Resources

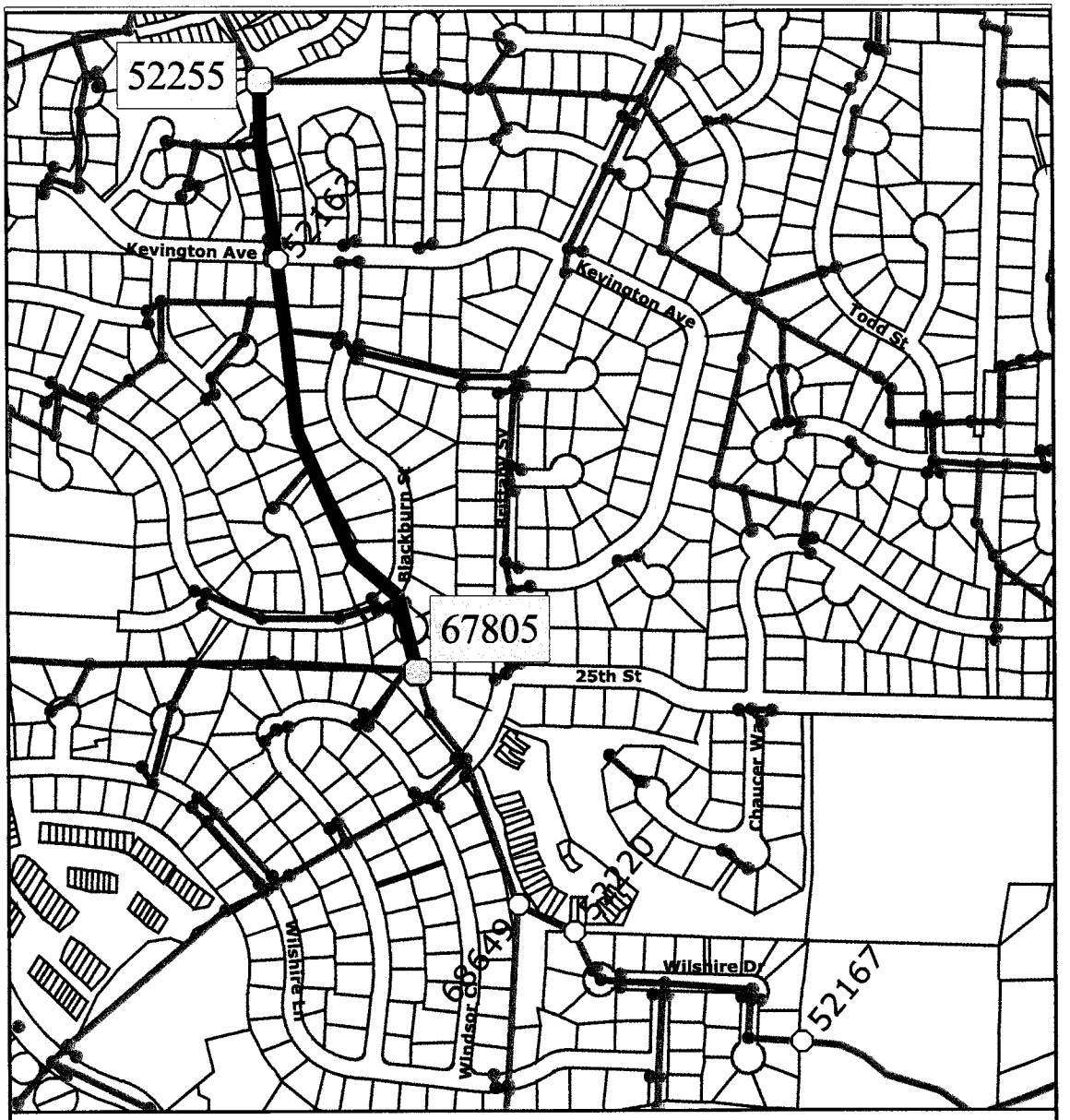
N/A

Other City Objectives Addressed by the Capital Project

To be completed by the City

Costs

Construction Costs:	$765,900
Site Acquisition:	$0
Engineering / Administration:	$153,100
Capital Project Implementation Costs	**$919,000**
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

200 0 200 400 600 Feet

N

Site Map for CIP # AM27B

Windsor Circle Pipe Improvements
Amazon Basin
City of Eugene
Capital Project

April 2001
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AM27B

URS

Design Assumptions

AMBH070B is not surcharged after the installation of this CP. AMBH070A is still slightly surcharged at the downstream end after the improvements.

Design Capacities are as follows:
AMBH070A: 72" CSP, 515 LF, design capacity = 300 cfs
AMLW070B: 66" CSP, 1272 LF, design capacity = 350 cfs

Project Identifier	**AM27C**
Project Title	**Hawkins Lane Water Quality Facility**

Project Location

This capital project is located on the west side of Hawkins Ln, south of 25th Ave. in the Amazon Bailey Hill Sub-basin. The project area is shown pages 33 and 44 of the sewer index map.

Subbasin	**AMBH**	
GIS U/S Node Location	**N/A**	
GIS D/S Node Location	**52167**	
Drainage Area Served by Capital Project	**214**	Acres
% Impervious (1994 Existing Land Use)	**8**	
% Impervious (Future)	**42**	
Design Flow (Future Conditions	**N/A**	cfs

Project Description

Construct an 8.5 ac-ft water quality facility on the west side of Hawkins Lane, south of 25th Ave., at the upstream end of segment AMBH120C. This CP also requires about 2 acres of residential land acquisition.

Project Elements

8.5 Ac-Ft – Water Quality Pond

2 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

Open space west of Hawkins Lane, south of 25th Ave. provides an opportunity to construct a neighborhood 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 separation berm.
Residential Property Acquisition	N/A

CSWMP Objectives and Policies Addressed by the Capital Project

Flood Control

N/A

Water Quality

This neighborhood water quality facility will provide treatment of stormwater runoff from a 214-acre drainage area with an estimated annual discharge of 60,000 lbs of TSS under future land use conditions (100% low-density residential). This CP is expected to remove 29,000 of the 60,000 lbs/yr of TSS.

Natural Resources

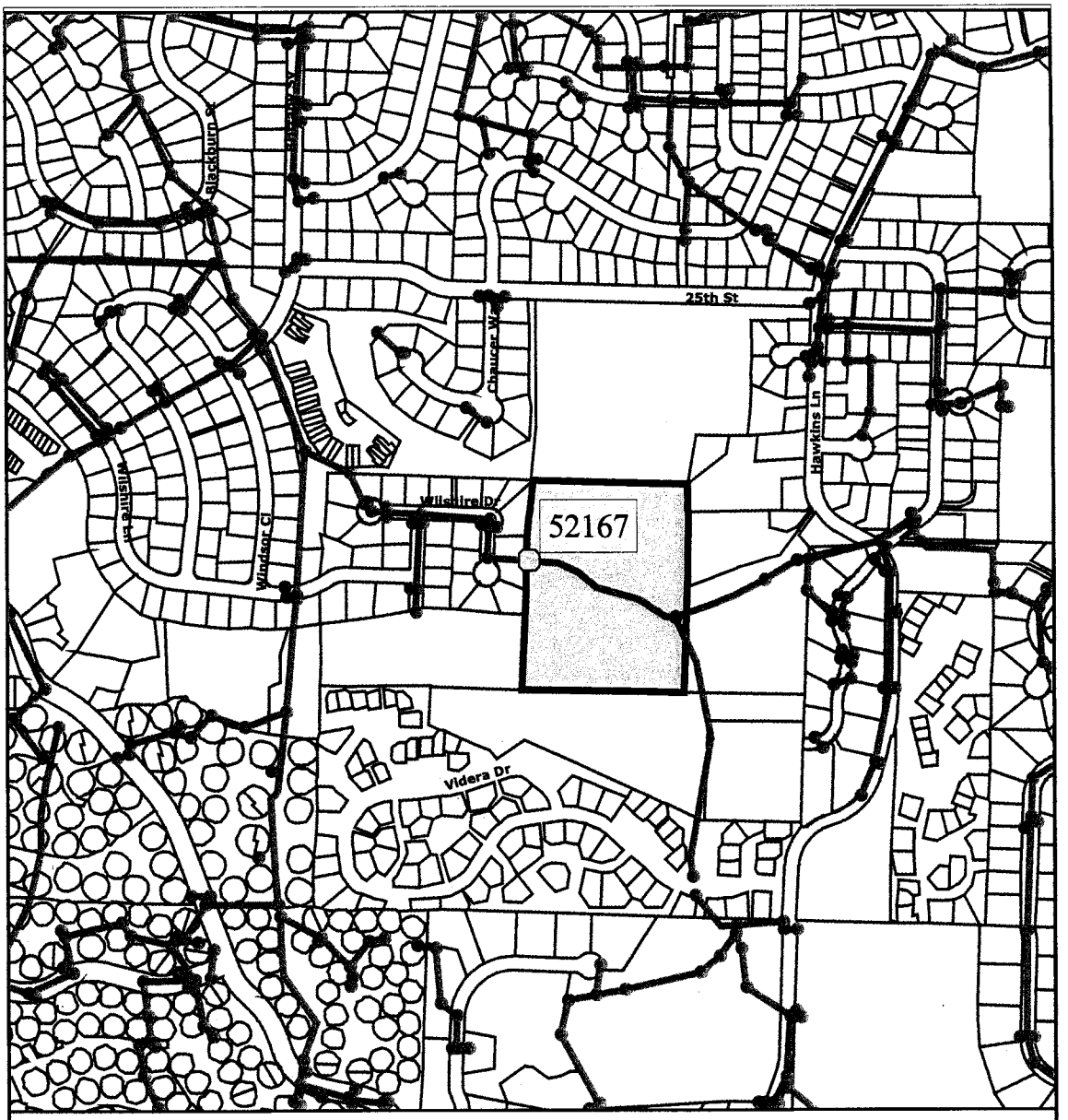
The neighborhood water quality facility will provide natural resource enhancement of approximately 2 acres.

Other City Objectives Addressed by the Capital Project

To be completed by the City

Costs

Construction Costs:	$441,100
Site Acquisition:	$80,000
Engineering / Administration:	$104,200
Capital Project Implementation Costs	**$625,300**
Annual Maintenance Costs	**$9,500**



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

200 0 200 400 Feet

N

Site Map for CIP # AM27C

Hawkins Lane Water Quality Facility
Amazon Basin
City of Eugene
Capital Project

April 2001
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AM27C

URS

Design Assumptions

This CP would provide treatment of runoff from sub-basin AMBH090 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.)

Project Identifier	AM29
Project Title	Sam R St. Water Quality Facility

Project Location

Open waterway segment (AMBT040B, from node 66976 to 54747) along Sam R St. south of 12th Ave., page 32 of the sewer index map.

Subbasin	AMBT	
GIS U/S Node Location	66976	
GIS D/S Node Location	54747	
Drainage Area Served by Capital Project	126	Acres
% Impervious (1994 Existing Land Use)	45	
% Impervious (Future)	46	
Design Flow (Future Conditions	N/A	cfs

Project Description

Construct a 5.5 acre-ft neighborhood water quality facility on the east side of Sam R. Street. This CP also requires acquisition of approximately 1.5 acres of industrial property.

Project Elements

5.5 Ac-Ft – Water Quality Pond

1.5 Ac – Industrial 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 open space associated with this open waterway provides an opportunity to construct a neighborhood water quality facility at this location.

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 separation berm.
Industrial Property Acquisition	N/A

CSWMP Objectives and Policies Addressed by the Capital Project

Flood Control

N/A

Water Quality

This neighborhood water quality facility will provide treatment of stormwater runoff from a 126-acre drainage area with an estimated annual discharge of 56,000 lbs of TSS under future land use conditions (50% low-density residential, 50% commercial). This CP is expected to remove 27,000 of the 56,000 lbs/yr of TSS.

Natural Resources

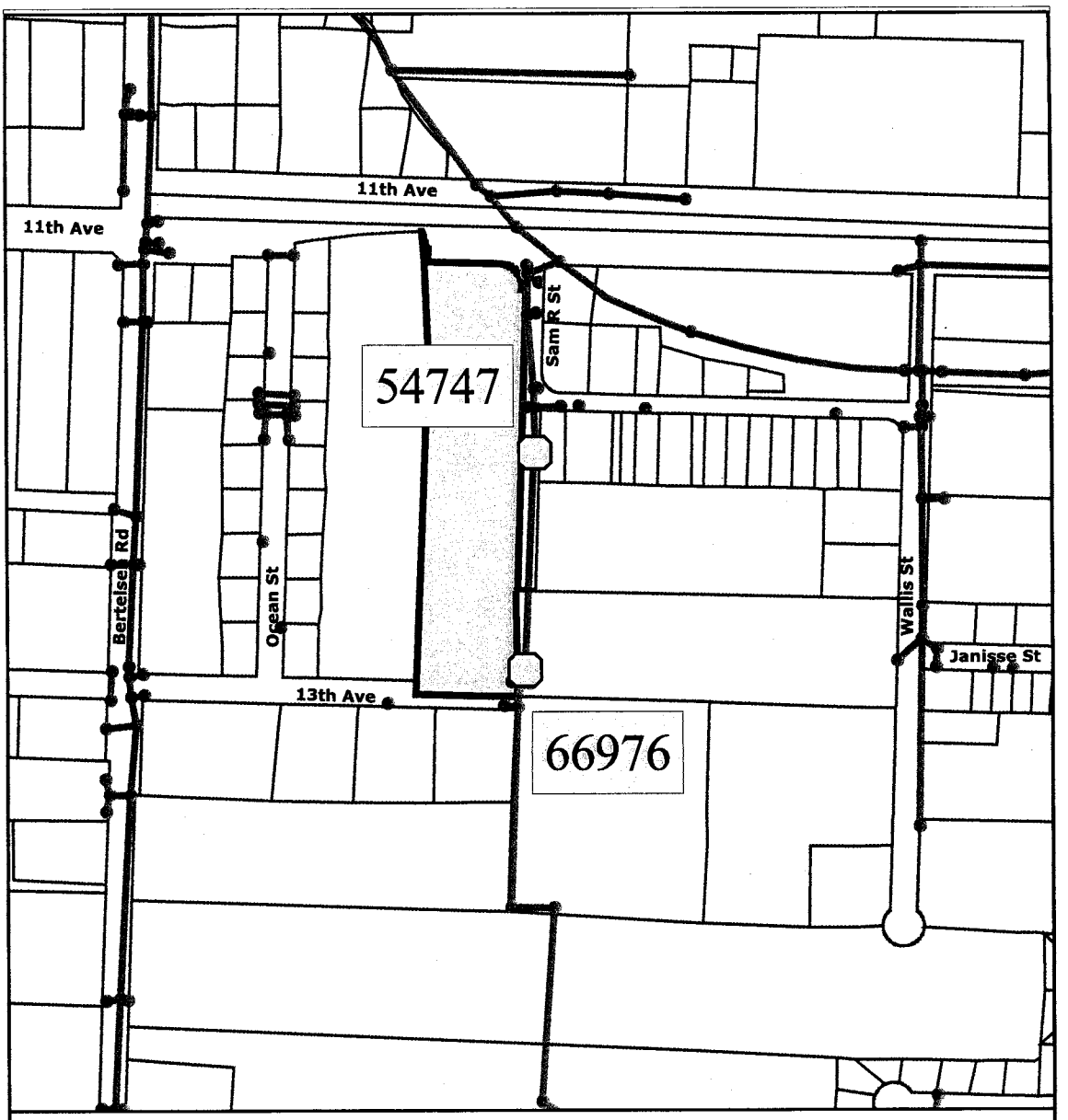
The neighborhood water quality facility will provide natural resource enhancement of approximately 1.5 acres.

Other City Objectives Addressed by the Capital Project

To be completed by the City

Costs

Construction Costs:	$285,400
Site Acquisition:	$120,000
Engineering / Administration:	$81,000
Capital Project Implementation Costs	**$486,400**
Annual Maintenance Costs	**$6,200**



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 # AM29

Sam R St. Water Quality Facility
Amazon Basin
City of Eugene
Capital Project

April 2001
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AM29

URS

Design Assumptions

This CP would provide treatment of runoff from subbasins AMBT060-070 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.)

Project Identifier	AM30
Project Title	Interior St. Water Quality Facility

Project Location

Open waterway segment (not modeled, from node 66056 to 66971) upstream of AMBT020B, southwest of Interior St., page 21 of the sewer index map.

Subbasin	AMBT	
GIS U/S Node Location	66056	
GIS D/S Node Location	66971	
Drainage Area Served by Capital Project	91	Acres
% Impervious (1994 Existing Land Use)	12	
% Impervious (Future)	52	
Design Flow (Future Conditions	N/A	cfs

Project Description

Construct a 4.5 acre-ft neighborhood water quality facility on the west side of Interior St. This Cp also requires acquisition of approximately 1 acre of industrial property.

Project Elements

4.5 Ac-Ft – Water Quality Pond

1 Ac – Industrial 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 open space associated with this open drainage system provides opportunities to construct a neighborhood water quality facility at this location.

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 separation berm.
Industrial Property Acquisition	N/A

CSWMP Objectives and Policies Addressed by the Capital Project

Flood Control

N/A

Water Quality

This neighborhood water quality facility will provide treatment of stormwater runoff from a 91-acre drainage area with an estimated annual discharge of 39,000 lbs of TSS under future land use conditions (10% low-density residential, 20% medium/high-density residential, 30% commercial, 20% industrial, 20% parks and open space). This CP is expected to remove 19,000 of the 39,000 lbs/yr of TSS.

Natural Resources

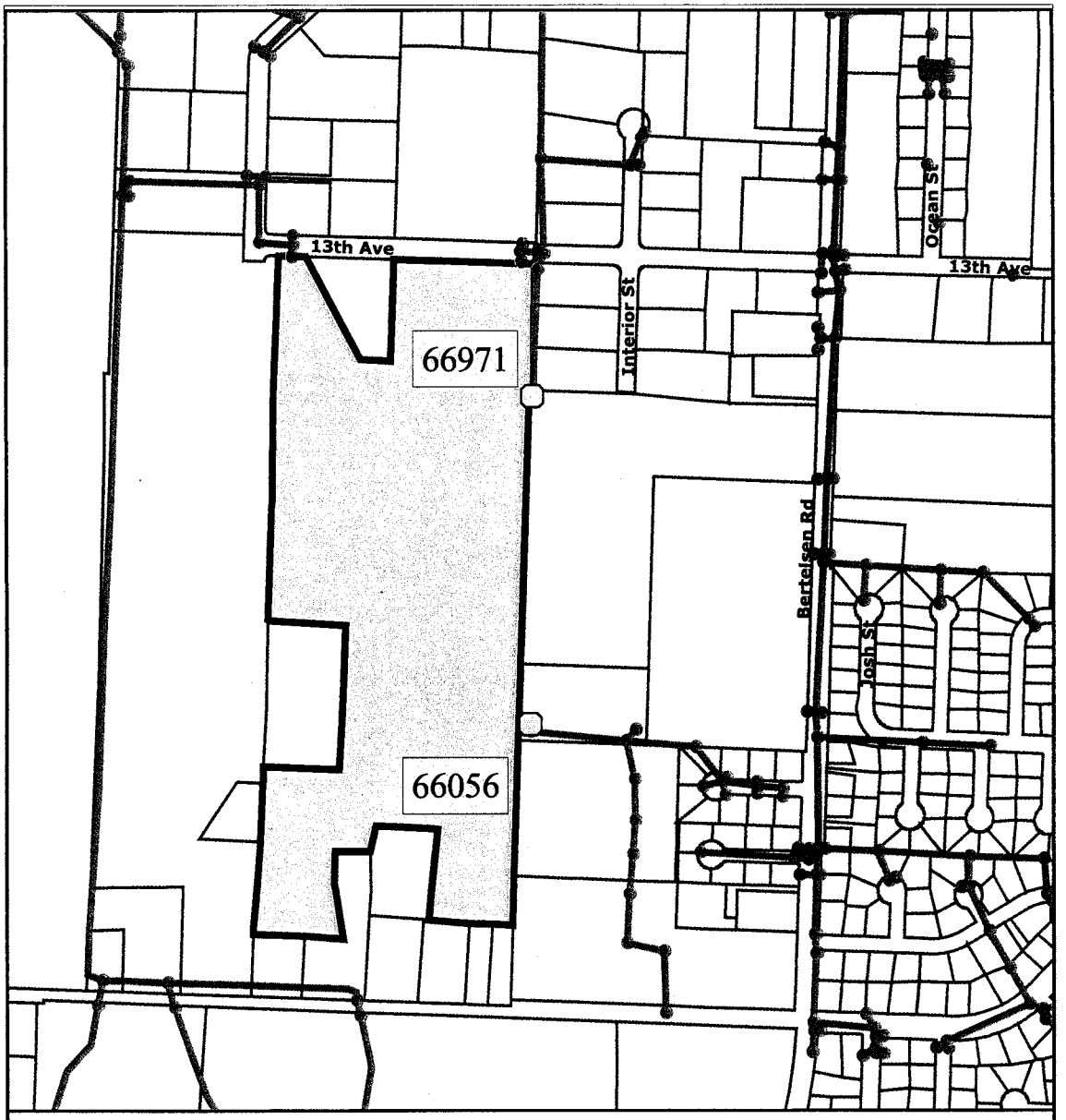
The neighborhood water quality facility will provide natural resource enhancement of approximately 1 acre.

Other City Objectives Addressed by the Capital Project

To be completed by the City

Costs

Construction Costs:	$233,500
Site Acquisition:	$40,000
Engineering / Administration:	$54,700
Capital Project Implementation Costs	**$328,200**
Annual Maintenance Costs	**$5,600**



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

200 0 200 400 Feet

N

Site Map for CIP # AM30

Interior St. Water Quality Facility
Amazon Basin
City of Eugene
Capital Project

April 2001
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AM30

URS

Design Assumptions

This CP would provide treatment of runoff from subbasin AMBT100 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.)

Project Identifier	**AM100**
Project Title	**Upper Amazon Creek Restoration**
Project Location	

Amazon Creek main stem from 19th Ave. upstream to Snell Ave.

Subbasin		
GIS U/S Node Location	**65396**	
GIS D/S Node Location	**57188**	
Drainage Area Served by Capital Project	**4603**	Acres
% Impervious (1994 Existing Land Use)	**34**	
% Impervious (Future)	**43**	
Design Flow (Future Conditions	**1763**	cfs

Project Description

Restore the segment of Amazon Creek from Snell Avenue to 19th Avenue. Widen the stream corridor and enhance the stream ecosystem of a portion of this existing channelized creek. Widening will allow for maintaining and improving flood conveyance and capacity while establishing a vegatated floodplain within the creek banks.

Project Elements

1 LS – Environmental restoration CP AM100

Problems and/or Opportunities Addressed by the Capital Projects

Problems

Portions of the existing creek are heavily channelized, with low quality aquatic and riparian habitat.

Opportunities

Amazon Creek flows from the hills in south Eugene in a northern and westward direction through the City of Eugene. Near its southern headwaters, within the boundaries of this project, Amazon Creek flows through City park land that is suitable for floodplain improvement and aquatic and riparian restorationand enhancement.

Maintenance Requirements

Facility Type	*Annual Maintenance Activities*
Environmental restoration CP AM100	

CSWMP Objectives and Policies Addressed by the Capital Project

Flood Control

Will enhance flood conveyance and capacity by widening the existing creek.

Water Quality

Will improve water quality functions of the creek by providing a vegetated floodplain bench within the creek banks

Natural Resources

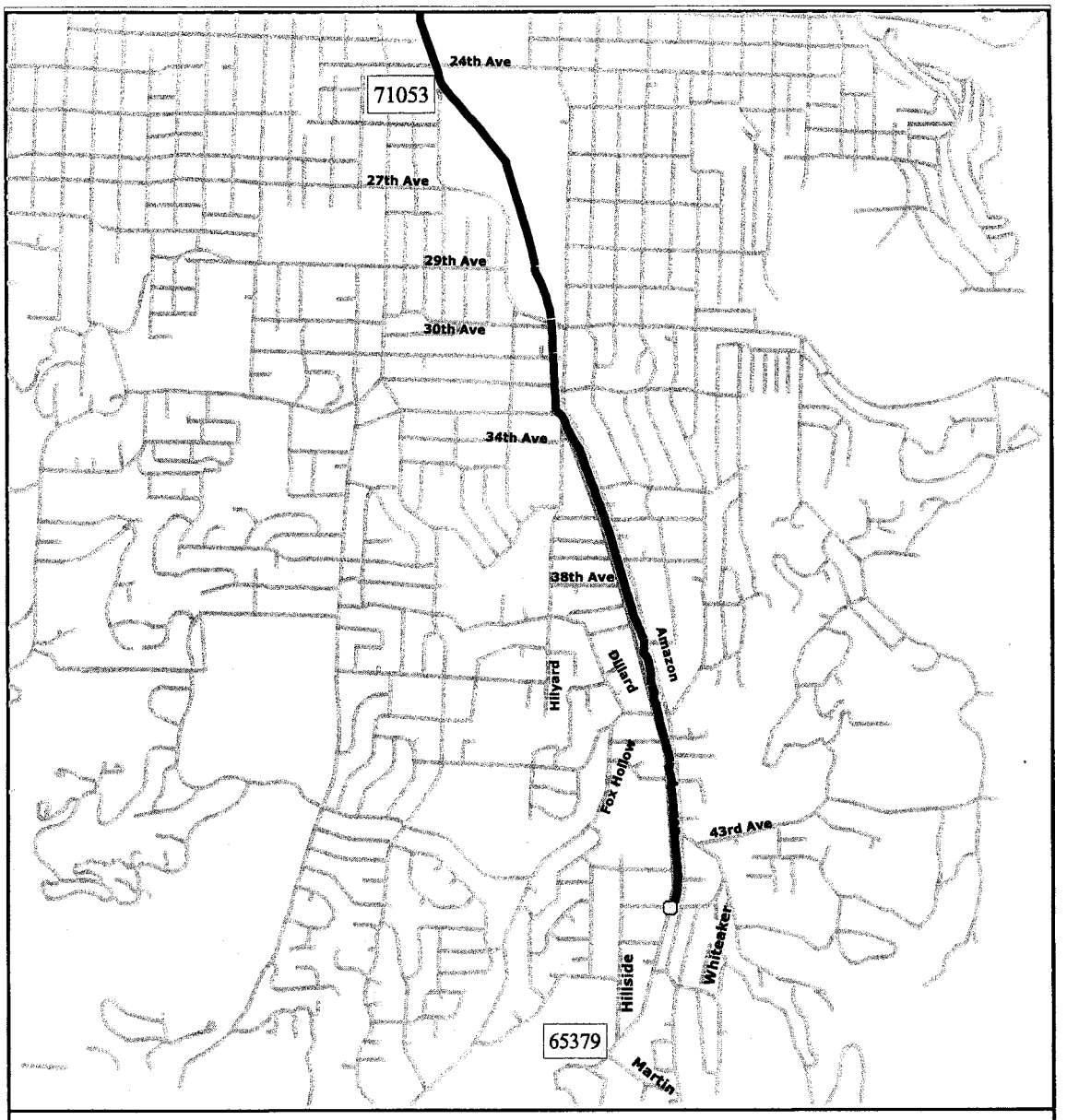
Will improve aquatic and riparian habitat by creating a flood plain bench within the creek banks and vegetating the banks with native vegetation.

Other City Objectives Addressed by the Capital Project

To be Completed by the City

Costs

Construction Costs:	$2,750,000
Site Acquisition:	$0
Engineering / Administration:	$550,000
Capital Project Implementation Costs	**$3,300,000**
Annual Maintenance Costs	



Capital Improvement Project Element

Upstream/Downstream Node

Streets

N

500 0 500 1000 1500 2000 2500 Feet

Site Map for CIP # AM100

Upper Amazon Creek Restoration
Amazon Basin
City of Eugene
Capital Project

April 2001
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AM100

URS

Project Identifier	**AM101**
Project Title	**Central Amazon Creek Restoration**
Project Location	

Amazon Creek main stem from Bailey Hill Rd. upstream to Jefferson St.

Subbasin		
GIS U/S Node Location	**71078**	
GIS D/S Node Location	**71085**	
Drainage Area Served by Capital Project	**7242**	Acres
% Impervious (1994 Existing Land Use)	**43**	
% Impervious (Future)	**48**	
Design Flow (Future Conditions	**2281**	cfs

Project Description

Seek opportunities to restore the segment of Amazon Creek from the Fairgrounds to Bailey Hill Road. Where opportunities exist, widen the stream corridor and enhance the stream ecosystem of this existing channelized creek. Widening and creating a floodplain bench where opportunities exist will enhance flood conveyance and improve aquatic and riparian habitat.

Project Elements

1 LS – Environmentla restoration CP AM101

Problems and/or Opportunities Addressed by the Capital Projects

Problems

Portions of the existing creek are heavily channelized, with low quality aquatic and riparian habitat

Opportunities

This section of Amazon Creek runs through a heavily urbanized area and is highly channelized, however opportunities exist along the creek to widen it, create a floodplain bench, and enhance the aquatic and riparian habitat

Maintenance Requirements

Facility Type	*Annual Maintenance Activities*
Environmentla restoration CP AM101	

CSWMP Objectives and Policies Addressed by the Capital Project

Flood Control

May enhance flood conveyance by widening the existing creek

Water Quality

Will improve water quality functions of the creek by providing a vegetated floodplain bench within the creek banks.

Natural Resources

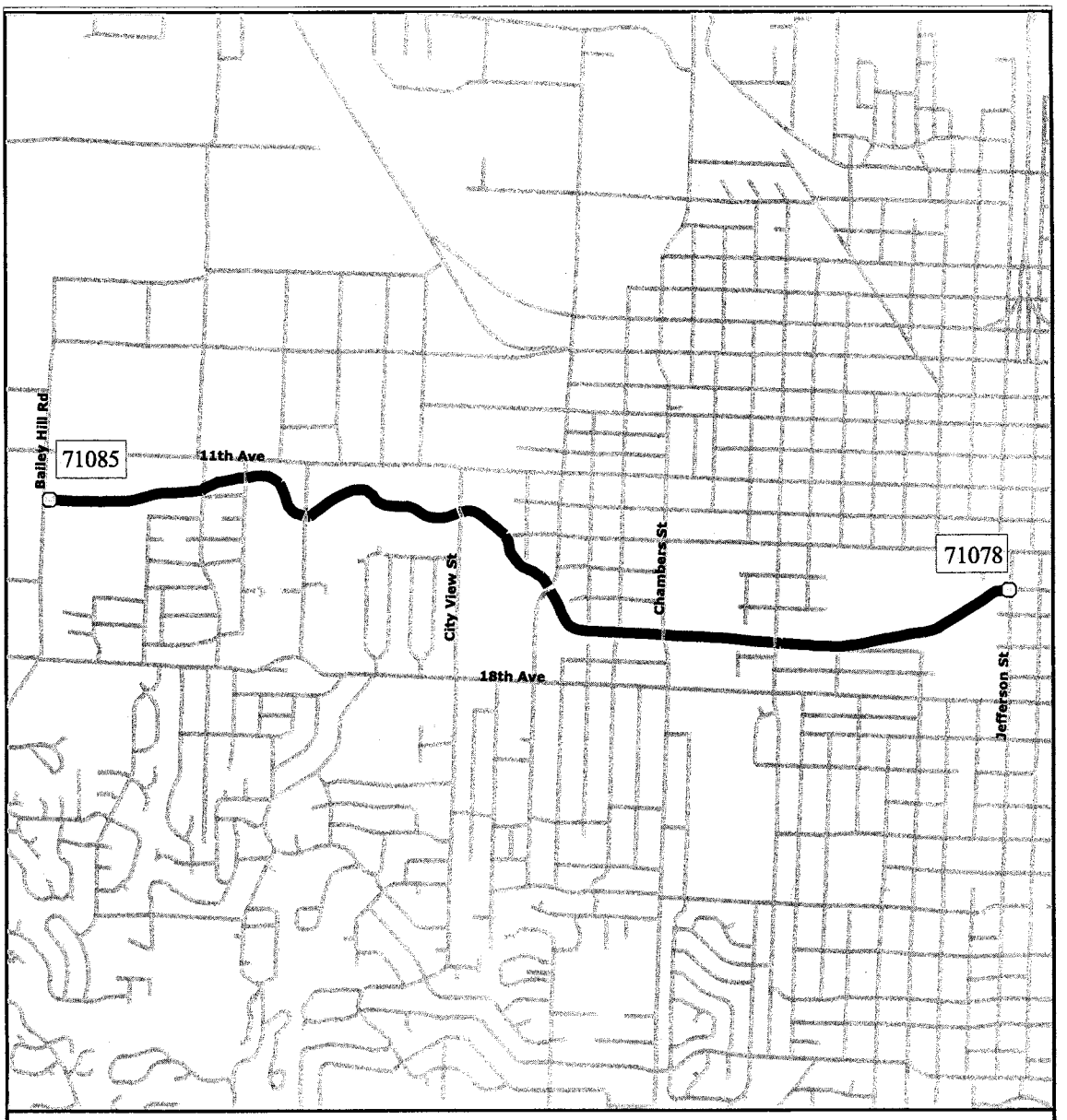
Will improve aquatic and riparian habitat by creating a vegetated floodplain bench.

Other City Objectives Addressed by the Capital Project

To be Completed by the City

Costs

Construction Costs:	$2,920,000
Site Acquisition:	$0
Engineering / Administration:	$584,000
Capital Project Implementation Costs	**$3,504,000**
Annual Maintenance Costs	



Capital Improvement Project Element

Upstream/Downstream Node

Streets

N

500 0 500 1000 1500 2000 Feet

Site Map for CIP # AM101

Central Amazon Creek Restoration
Amazon Basin
City of Eugene
Capital Project

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AM101

URS