City of Eugene

River Road-Santa Clara

Initial Study Towards Development of a Stormwater Basin Master Plan

CITY OF EUGENE
STORMWATER
MANAGEMENT PROGRAM

August 2002
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City of Eugene
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Local Stormwater Planning Can Make a World of Difference

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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 initial study towards the development of an integrated stormwater management strategy for the River Road Santa Clara basin. A final Stormwater Basin Master Plan has not been produced for River Road Santa Clara, pending resolution of inter-jurisdictional issues as well as additional information gathering and analysis.

The City has generated a separate seven-volume Stormwater Basin Master Plan to summarize and document integrated strategies for each of the other basins in Eugene. 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 the six companion volumes covers a specific drainage basin as follows: *Volume II - Amazon Creek, Volume III - Bethel-Danebo, Volume IV – Laurel Hill, Volume V - Willakenzie, Volume VI - Willamette River, Volume VII - Willow Creek.*

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 in the Stormwater Basin Master Plans consisted of the following thirteen steps. The details regarding each of these steps are provided in Volume I of the City's Stormwater Basin Master Plans.

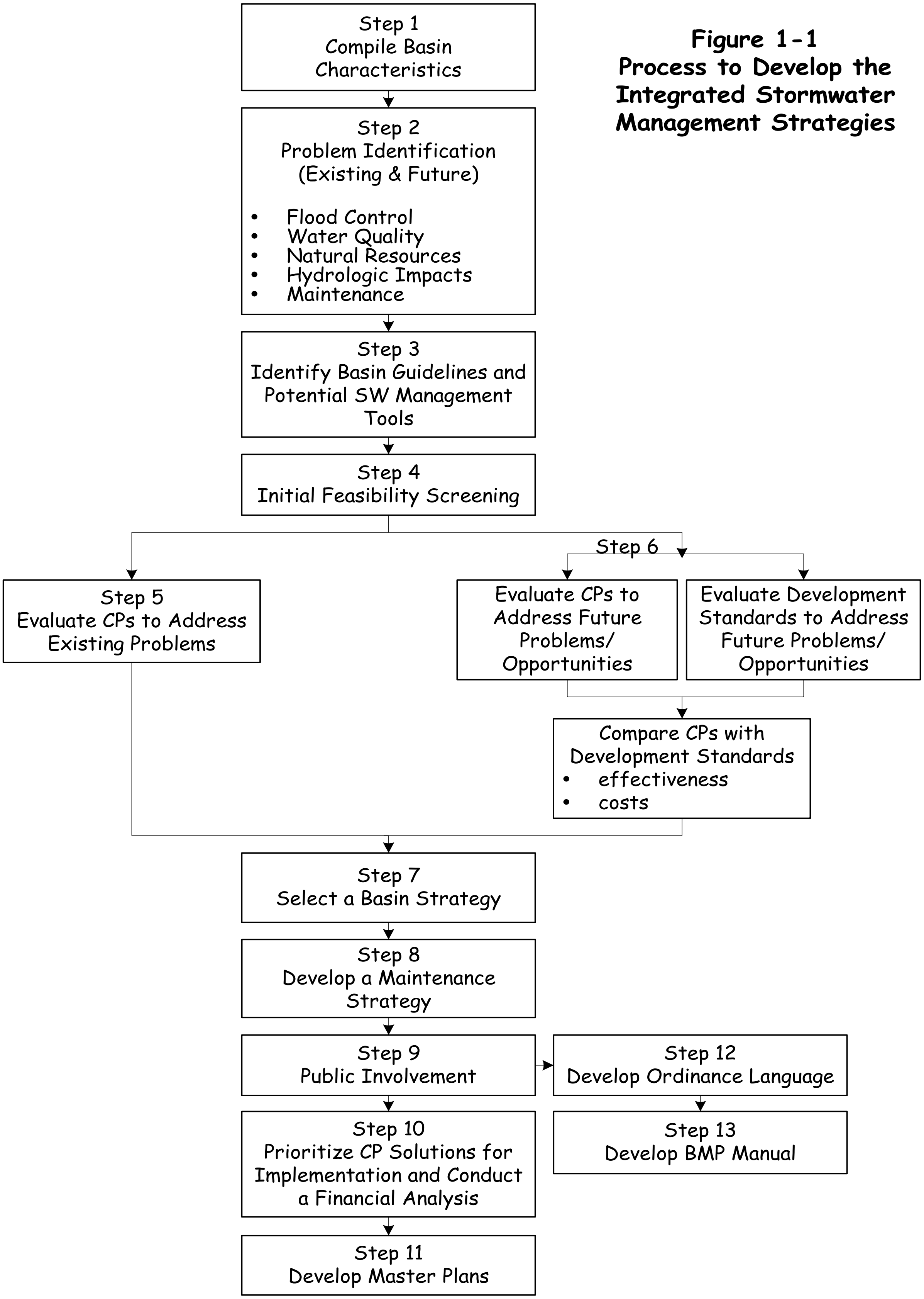
Step 1) Compile information regarding the unique characteristics of each basin that are related to the stormwater drainage system.
Step 2) Identify problems and opportunities associated with the stormwater drainage system with respect to flood control, water quality, natural resources, and maintenance.
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.

The Initial Study for the River Road Santa Clara basin completed steps 1 through 3 listed above, the results of which are presented in this report. Section 2.0 provides a summary of the specific characteristics in the River Road Santa Clara basin (from Step 1). Sections 3.0, 4.0, and 5.0 provide summaries of the flood control, water quality and natural resources evaluations, respectively, (from Steps 2 and 3). These evaluations provide a list of problems identified, potential solutions in the form of capital projects and development standards, and a summary of the work to be done to finalize this Initial Study. Section 6.0 describes the elements of the initial strategy that were identified for implementation in the River Road Santa Clara basin.

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



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

2.1 Location and Area

2.1.1 Regional Drainage Context

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

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

2.1.2 City of Eugene

The City of Eugene is currently responsible for managing the stormwater quantity, quality, and related natural resources for the drainage area within its city limits. The area outside of the City limits but within the urban growth boundary (UGB) is expected to be annexed into the city as urban development occurs. Therefore, this Initial Study 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.

Figure 2-1 – Willamette Region Location Map

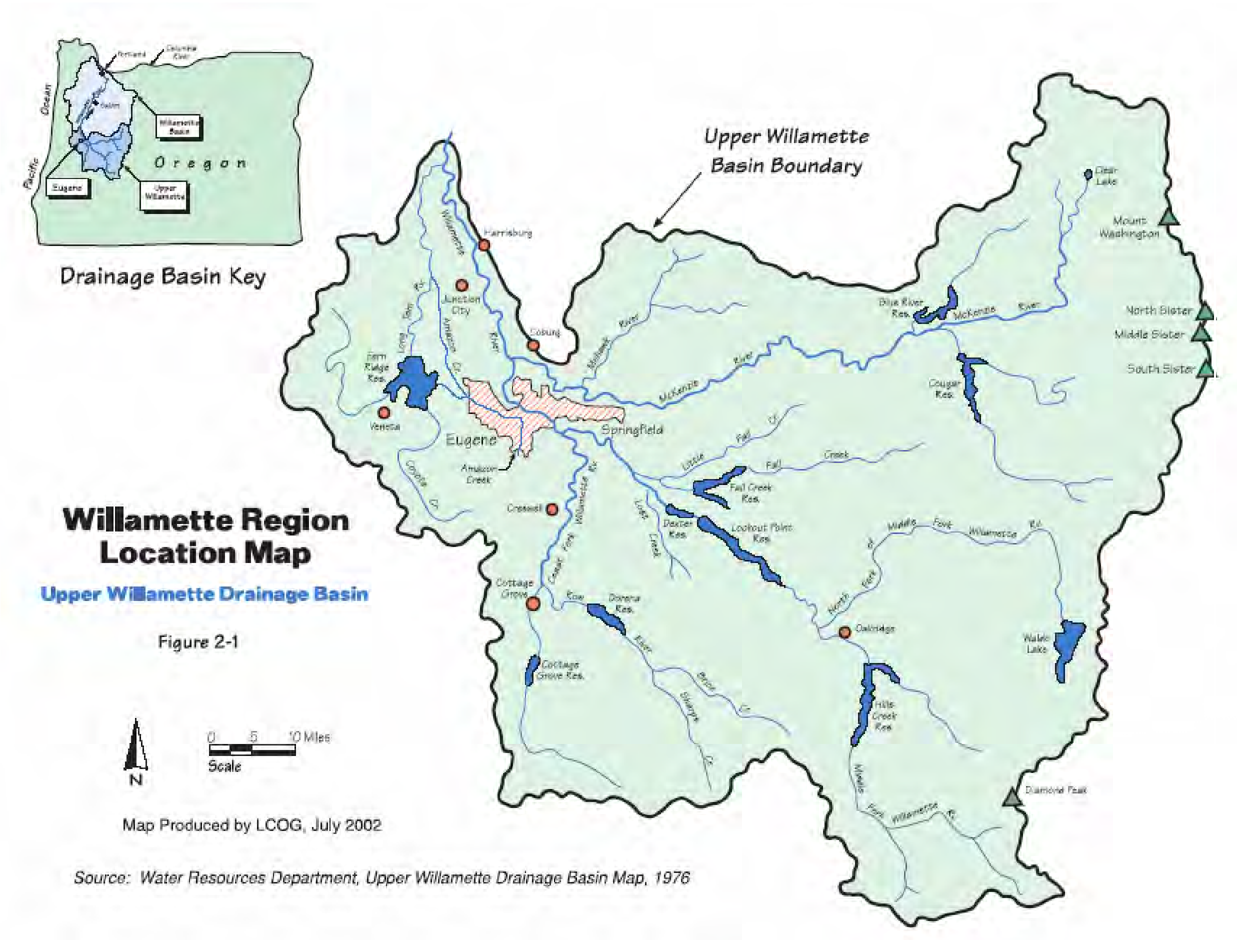
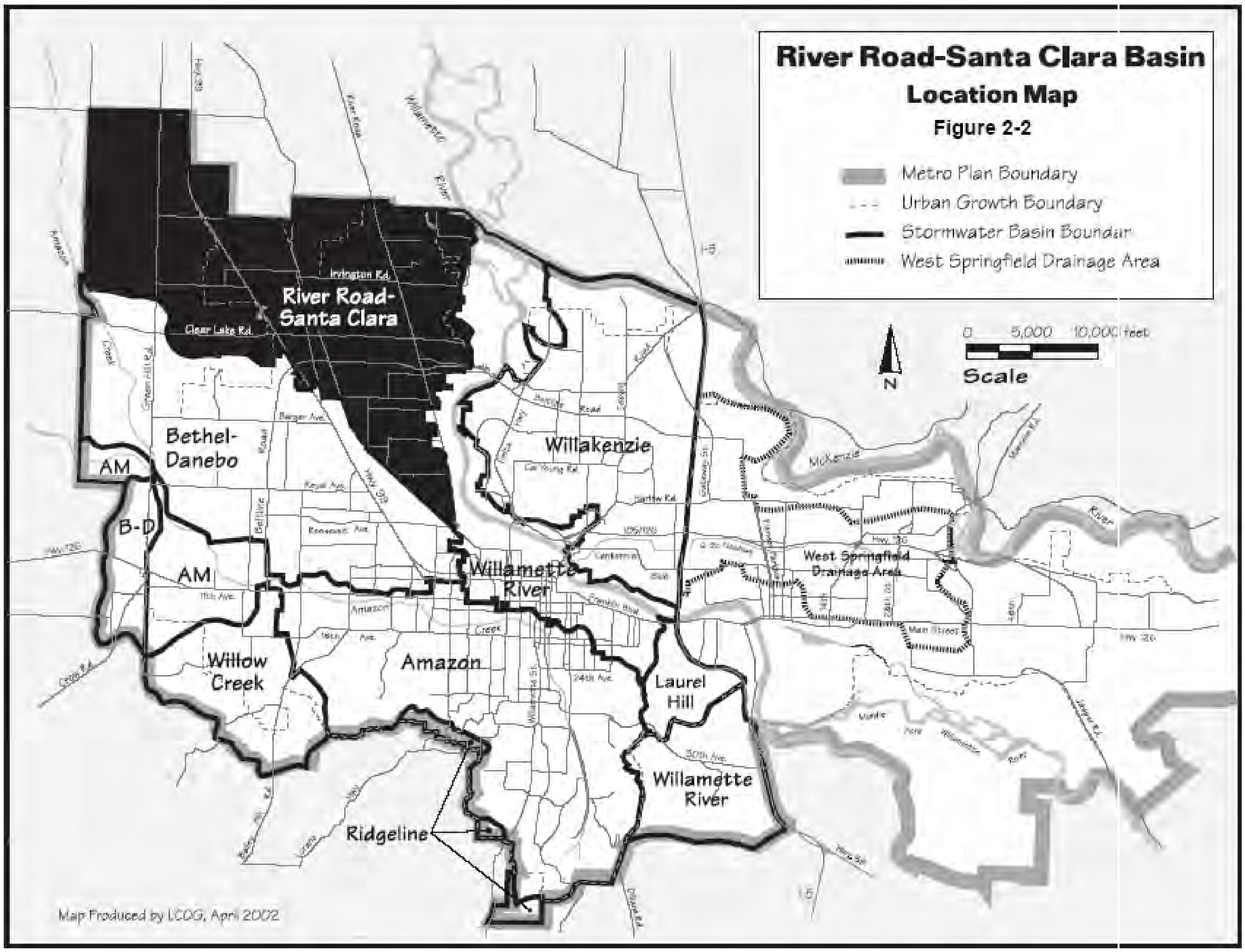


Figure 2-2 – Basin Location Map



2.1.3 River Road Santa Clara basin

As shown on Figure 2-2, the River Road Santa Clara basin forms the northwest corner of the Eugene-Springfield metropolitan area, and is generally bounded by the Willamette River on the east, the Bethel-Danebo drainage basin on the south and the *Metro Plan* boundary on the west and north. The basin is 10,432 acres in size with about 58 percent (6,063 acres) located within the Eugene urban growth boundary (UGB).

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

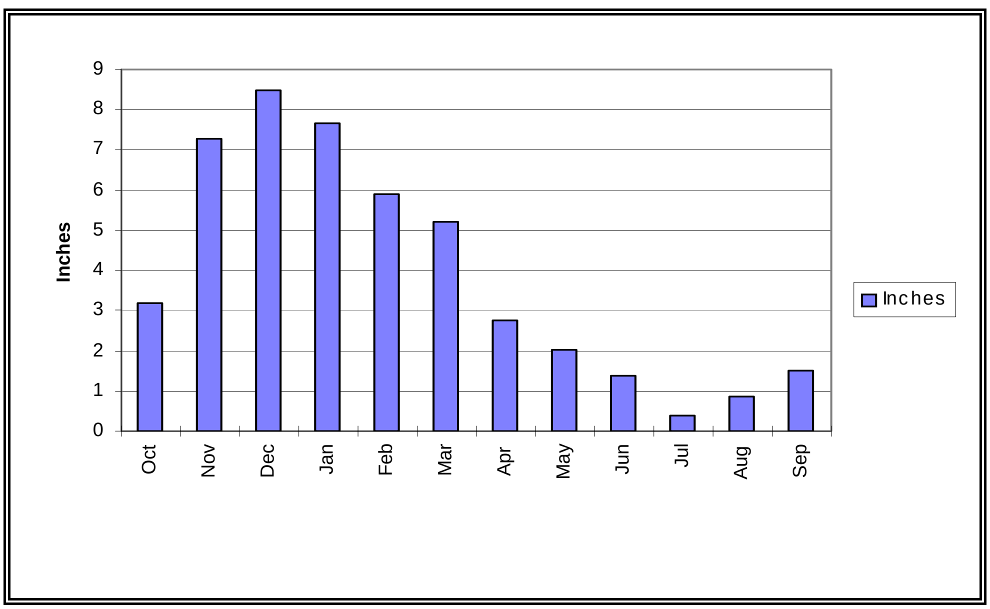


Table 2-1 characterizes a typical storm event for the Eugene area based on the historic 48-year precipitation record measured at the Eugene Airport:

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 that 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 Section 3.1.2 and Appendix A of Volume I.

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

2.3 Land Use and Surface Cover

The conversion from undisturbed to developed land uses can significantly affect the quantity and quality of stormwater runoff. Runoff volumes and velocities increase as impervious surface areas increase. Likewise, stormwater quality decreases due to nonpoint source pollution from highways and urban land uses such as commercial, industrial, and residential. The purpose of this section is to describe existing land use and impervious surface conditions within the basin and to forecast changes in these conditions due to buildout of remaining vacant lands within the UGB 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 land uses in the basin are: agriculture (3,001 acres); low-medium density residential (2,396 acres); other undeveloped land (1,636 acres); street rights-of-way (1,443 acres); industrial/airport (1,262 acres); commercial (268 acres); and schools/churches/cemeteries (182 acres).

Table 2-2
Existing Land Use – River Road Santa Clara Basin

Land Use Categories	Acres	Percent of Area
Inside UGB		
Low-Med. Density Residential	2,281	21.9%
Med.-High Density Residential	40	0.4%
Commercial	251	2.4%
Industrial	366	3.5%
Communication, Utilities	34	0.3%
Parks, Open Space, & Recreation	23	0.2%
Golf Courses	16	0.2%
Schools, Churches, & Cemeteries	182	1.7%
Other Government	19	0.2%
Agriculture	597	5.7%
Other Undeveloped Land	1,147	11.0%
Railroad	31	0.3%
Streets (R.O.W.)	1,076	10.3%
Subtotal	6,063	58.1%
Urban Reserve		
Agriculture	374	3.6%
Commercial	5	0.0%
Industrial	7	0.1%
Low-Med. Density Residential	22	0.2%
Other Government	6	0.1%
Parks, Open Space, & Recreation	6	0.1%
Streets (R.O.W.)	8	0.1%
Undeveloped	75	0.7%
Subtotal	503	4.8%
Outside UGB		
Low-Med. Density Residential	93	0.9%
Med.-High Density Residential	4	0.0%
Commercial	12	0.1%
Industrial (includes airport)	889	8.5%
Communication, Utilities	5	0.0%
Parks, Open Space, & Recreation	10	0.1%
Golf Courses	34	0.3%
Other Government	17	0.2%
Agriculture	2,030	19.5%
Other Undeveloped Land	414	4.0%
Streets (R.O.W.)	359	3.4%
Subtotal	3,867	37.1%
Grand Total	**10,433**	**100.0%**

Source: LCOG 1998 Parcel File

2.3.2 Buildout Land Use

The primary land use policies pertaining to the River Road Santa Clara basin are contained in the following locally adopted policy documents:

- *Eugene-Springfield Metro Area General Plan (1987)*
- *River Road Santa Clara Urban Facilities Plan (1988)*
- *Annexation and Urban Services Policy Agreement, City of Eugene and the Industrial Corridor Community Organization [ICCO], (April 1991)*

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 River Road Santa Clara basin.

2.3.2.1 Buildout Land Use Within the UGB

This area includes both the current city limits and the unincorporated UGB, totaling 6,063 acres (58% of basin). 1,744 acres are vacant and considered available for development. For the purposes of this report, the term “vacant acres” refers to lands within the UGB that are expected to develop to urban uses. As shown in Table 2-3, land use categories with significant remaining vacant acres include: industrial and commercial-industrial mixed (744 acres), low-density residential (613 acres), medium-density residential (92 acres), and commercial and residential-commercial mixed (31 acres).

2.3.2.2 Projected Land Use Outside the UGB

Forty-two percent of the River Road Santa Clara basin (4,370 acres) is located outside the UGB and, of this area, approximately 503 acres are designated “Urban Reserve.” Urban Reserve designation means at the time of Metro Plan adoption (1982), these 503 acres were identified for potential annexation to the UGB in order to meet future urban land use needs. A recent metro-wide study concluded the existing urban reserve areas do not meet current state criteria and the three metro jurisdictions have directed these are to be removed from urban reserve designation. When this policy is implemented, all of the area outside the UGB in this basin will remain rural and land uses will be restricted to the Metro Plan designations as shown in Table 2-3. 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) for Future Urban Development
Inside UGB		
Low-Density Residential	3,005	613
Medium-Density Residential	191	92
Commercial and Residential-Commercial Mixed	99	31
Industrial and Commercial-Industrial Mixed	1,447	744
Parks and Open Space	6	0
Government, Education, and Research	44	0
Agriculture and Agriculture/Airport Reserve	5	3

Table 2-3 (continued)

Generalized Plan Designation	Designated Acres	
	Total	Vacant* (1998) for Future Urban Development
Streets (R.O.W.)**	1,266	261
Subtotal	6,063	1,744
Outside UGB and within Urban Reserve		
Rural Residential	14	**0**
Low-Density Residential	1	**0**
Commercial and Residential-Commercial Mixed	1	**0**
Industrial and Commercial-Industrial Mixed	16	**0**
Agriculture and Agriculture-Airport Reserve	398	**0**
Streets (R.O.W.)**	73	**0**
Subtotal	503	**0**
Outside UGB and Urban Reserve		
Rural Residential	77	**0**
Low-Density Residential	1	**0**
Commercial and Residential-Commercial Mixed	10	**0**
Industrial and Commercial-Industrial Mixed	3	**0**
Government, Education, and Research	1,133	**0**
Parks and Open Space	7	**0**
Agriculture and Agriculture-Airport Reserve	1,925	**0**
Streets (R.O.W)**	711	**0**
	3,867	**0**
Grand Total	**10,433**	**1,744**

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

*For purposes of this report, vacant acres 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 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 exist in 1998 and as they are projected to exist at buildout of the River Road Santa Clara basin urban growth boundary (UGB).

2.3.3.1 Impervious Surfaces

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

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

The amount of existing impervious surface area in the UGB portion of the River Road Santa Clara basin is estimated to be 2,056 acres or 34 percent of the basin's UGB area. [Note: calculations for this data are available from the City of Eugene.] The majority of this impervious surface area is concentrated between Highway 99 (west) and the east boundary of the basin. Map 3 depicts the existing generalized impervious surface area in pink. Due to the map scale and data restrictions, developed lots are shown entirely in pink. These pink areas are a mix of impervious surface and pervious surfaces associated with the land use such as lawns, streetscapes, parking lot planting, and other landscaped areas.

Assuming that future growth in the basin will follow conventional stormwater management drainage practices and will develop according to the land use categories depicted on the Eugene-Springfield Metro Plan designations (see Map 2), the amount of impervious acres in the UGB portion of the basin is projected to increase to 3,063 acres, or 51 percent of the basin's UGB area at buildout. [Note: calculations for this data are available from the City of Eugene.]

2.3.3.2 Pervious Surfaces

Except for the impervious surface areas noted above, the rest of the basin remains in a pervious condition, consisting mostly in the form of prairie wetlands, forest, agriculture and lawns.

Overall, pervious area cover is expected to decrease from the current 66 percent of the UGB portion of the basin (4,007 acres) to 49 percent (2,990 acres) 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:

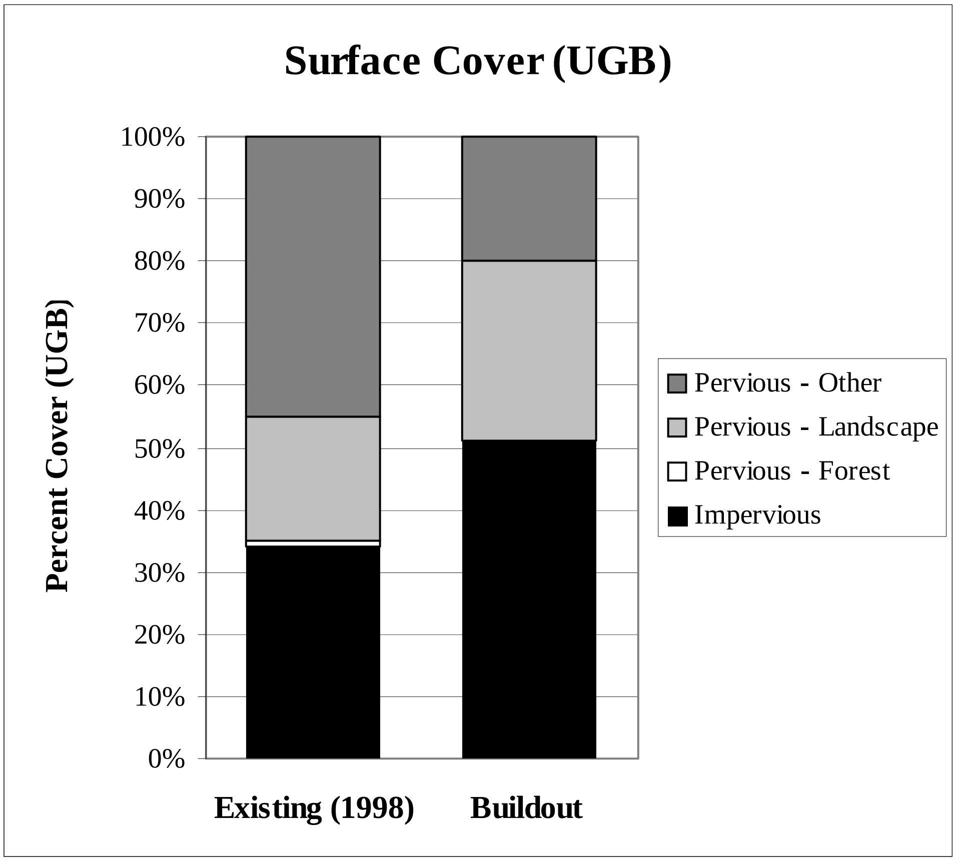
- Forest Cover is highly effective in reducing runoff volumes, and in preventing erosion (e.g., reduces soil impact by slowing down the velocity of precipitation and by intercepting up to 35 percent of it before hitting the ground) and stabilizing steep slopes (established root zones). Areas were included in this category if the forested area exceeded one acre in size. 1 percent of the River Road Santa Clara basin is currently in forest cover and at UGB buildout, forest cover would decrease to 0 percent.

- Landscaping areas, including lawns, streetscape and parking lot landscaping are associated with site improvements due to urban development. This category was distinguished to highlight both its positive and potential negative impacts on stormwater resources and is included in the area shaded pink on Map 3. Positive impacts include protection of surface soils, filtration of sediments, and some infiltration (although this is reduced from pre-development conditions). The use of chemical fertilizers, pesticides, and herbicides can cause negative impacts to water quality. The amount of landscaped area in the UGB is projected to increase from the existing 20 percent to 29 percent at UGB buildout.

- Other Vegetated Areas are pervious surfaces 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 45 percent of the UGB to 20 percent at UGB buildout.

Figure 2-4 compares the percentage of existing and projected surface cover for the UGB portion of the River Road Santa Clara basin.

Figure 2-4
Surface Cover in the River Road Santa Clara basin UGB



2.4 Landform, Topography, Slopes

Ninety-nine percent of the basin has slope in the 0%-5% category. The following table is keyed to Map 4, Slope and Topography, and indicates the amount of acres affected by varying categories of slope steepness.

Table 2-4
River Road Santa Clara Basin Slope Distribution

Location	Slope Distribution (percent)					
	Slopes 0-5%	Slopes 6-10%	Slopes 11-15%	Slopes 16-25%	Slopes >25%	Total
Within UGB	99%	1%	0%	0%	0%	100%
Outside UGB	99%	1%	0%	0%	0%	100%
Total Basin	99%	1%	0%	0%	0%	100%

2.5 Surface Water Features and Drainage System

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

2.5.1 Waterways

Pre-settlement (prior to 1855) morphological conditions in the Willamette Valley reflected a network of shallow, broad swales that would often over-bank during storm events creating ponded conditions. Today, most of the drainages have been altered into narrow, deep and well-defined channels where the management objective of preventing over banking conditions has been accomplished for most small storm events.

Five major drainage systems are found in this basin including: the A-1 Channel, Flat Creek, Spring Creek, Highway 99 and the Willamette Overflow (also referred to as the East Santa Clara Waterway). Generally, these open waterways run in a northerly or northwesterly direction. Historically, most of these features meandered along the valley floor before reaching the Willamette River or Long Tom River. Some of these have been altered into narrow, deep and well defined channels designed to collect and convey runoff while others remain relatively undisturbed.

2.5.1.1 A-1 Channel

The A-1 Channel originates at the junction of Beltline Highway and the Northwest Expressway. It is the largest waterway in this basin flowing northwesterly about three miles through the Highway 99 Industrial Corridor. The channel is surrounded by residential use in the Santa Clara neighborhood changing to adjacent agricultural use as it leaves the UGB. The channel drains into Amazon Creek outside of the *Metro Plan* boundary. This channel was constructed by the Soil Conservation Service as part of the Lower Amazon and Flat Creek Watershed Improvement Projects primarily for flood control purposes. Vegetation lacks diversity along the channel contributing to poor wildlife habitat. The channel has high enhancement potential however, due to its connectivity with other waterways. The Draft Eugene-Springfield *Natural Resources Study* (Draft NR Study), lists this waterway as a riparian resource site (refer to E60: A-1 Channel) and states that stream restoration and plantings could improve the channel’s open space values without damaging its storm and flood functions.

2.5.1.2 Flat Creek

The southern portion of Flat Creek begins near the Northwest Expressway and Park Avenue and flows north towards Beltline Road. With development of Beltline Road and the Northwest Expressway, the natural Flat Creek drainage area south of Beltline Road was diverted into the A-1 Channel. The diversion changes the flow contributions for the northern section of the creek. Although not hydrologically linked with the southern portion, the northern portion of Flat Creek extends from Beltline Road and continues north where it exits the *Metro Plan* boundary near Beacon Drive. Eventually the creek joins the Willamette River by way of Ingram Slough near the community of Monroe. Unlike the A1 Channel, Flat Creek is a natural drainage feature and is listed as a riparian resource site (refer to E59a: Flat Creek, E6: Middle Flat Creek) on the Draft NR Study inventory. The condition and function of Flat Creek within the UGB varies significantly with some segments relatively undisturbed and others significantly altered due to urban development property owner impacts.

2.5.1.3 Spring Creek

This waterway is about two miles long (within the UGB) and flows south-to-north beginning just north of Greenfield. It crosses River Road near Spring Creek Drive and continues north where it eventually joins the Willamette River nearly 3 miles north of the UGB. The creek flows through Awbrey Park and is adjacent to Spring Creek Elementary School serving both a stormwater and open space function. The creek is bordered by riparian vegetation, predominately Oregon ash and Bigleaf maple. Spring Creek is listed as a riparian resource site (refer to E58: Spring Creek) on the Draft NR Study inventory. Spring creek is identified for possible protection in the River Road Santa Clara Urban Facilities Plan, Environmental Design Element.

2.5.1.4 Willamette Overflow

This two mile waterway, also referred to as the “East Santa Clara Waterway” is located in the northeast portion of the basin and straddles the UGB. It is listed as a riparian resource site (refer to E57: East Santa Clara Waterway) on the Draft NR Study and has a relatively high wildlife value. In the River Road Santa Clara Urban Facilities Plan, Environmental Design Element, it is one of a few vegetated sloughs identified for potential protection.

2.5.1.5 Highway 99

This drainage system mainly consists of a long roadside ditch along highway 99. This ditch drains in a northwesterly direction and into the A-1 channel. The ditch is owned and maintained by the Oregon Department of Transportation.

2.5.2 Wetlands

A comprehensive local inventory and evaluation of wetlands has not been conducted for the River Road Santa Clara basin. Wetland features and characteristics for this report are based on the *National Wetlands Inventory* (NWI) and sites characterized in the NR Study. The NWI provides basic data about the general characteristics and extent of wetlands in the nation. The NWI identifies the general boundaries of wetlands; however, in many instances actual wetland boundaries are more extensive than what is identified. The NR Study includes only one wetland site in the basin and the emphasis is on habitat values rather than stormwater functions and values.

About 281 acres of wetlands are identified in the basin in the NWI. About 55 percent of these wetlands are located outside the UGB, although this area represents about 41 percent of the total basin area. Most wetland features within the basin are associated with riparian areas adjacent to creeks and open waterways. There are also a few wetland sites located primarily near the relatively undeveloped northern and western portions of the basin.

The River Road Santa Clara basin also includes several open water ponds, all located in the general vicinity of the Northwest Expressway and/or Highway 99 North. These ponds are part of the NWI although only one of them is identified in the Draft NR Study (E62). The Northwest Expressway ponds are located just south of Maxwell Road and on both the east and west sides of the Northwest Expressway. The eastern pond (Dianna's Pond) is within the River Road Santa Clara basin and is hydrologically connected with Flat Creek. The pond is a former borrow pit that currently supports willow, black cottonwood, reed canary grass, rush and sedge as the predominant plant species. The southern and eastern arms of the pond have healthy riparian strips, while much of the rest of the banks are bare and eroding.

2.5.3 Public Piped System

Most of the existing development in this basin occurred prior to the City of Eugene having jurisdiction over urban land use requirements and, as a consequence, this basin lacks a stormwater pipe system found in the other basins. Only 30 miles of stormwater pipes exist in this basin and most of these miles (23) are located outside the UGB serving Mahlon Sweet Airport. The piped system located within the UGB was constructed to serve more recent development that was required to annex and develop to City of Eugene standards.

2.5.4 Maintaining the Drainage System

The River Road Water District, Santa Clara Water District, Lane County Public Works Department, and the City of Eugene share limited maintenance responsibilities in this basin. The River Road Water District has prior agreements with the National Resource Conservation Service (NRCS) to maintain the A-1 Channel. The Santa Clara Water District also has similar agreements with the NRCS to maintain portions of Flat Creek and the A-1 Channel. Lane County Public Works Department is responsible for stormwater facility maintenance in the unincorporated portions of this basin. This maintenance activity is limited to drainage problems that directly affect County right-of-way, such as roadside ditches, culverts, and bridge crossings. The City is responsible for maintaining areas that have been annexed to the City. The City and County share maintenance responsibilities in this basin which results in greater efficiencies for both jurisdictions.

2.5.5 Floodplain

A flood insurance study for the Federal Emergency Management Agency (FEMA) has been conducted within the River Road Santa Clara basin. As part of this study, areas subject to the 100-year flood event have been identified. One thousand two hundred seventy acres of floodplain have been mapped within the basin. There are approximately equal acres of floodplain within and outside the UGB. Most of the broad floodplain area is associated with the Willamette River in the northeast portion of the basin just outside the UGB. Ribbons of floodplain are also located adjacent to the five primary waterways that flow through the basin.

More detailed floodplain studies necessary to map floodway boundaries have not been conducted for this basin.

2.6 Water Quality

This section provides a description of water quality conditions in the River Road Santa Clara basin. Water quality conditions can vary dramatically 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 was reviewed in an attempt to provide a general picture of water quality conditions in the basin. The following sources of information were reviewed and are described below:

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

2.6.1 Documented Water Quality Problems

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

2.6.1.1 Chemical Stormwater Monitoring Data

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

The following table provides a summary of the results collected during 1992 to 1997 from the 6 sampling stations. Table 2-5 includes a description of the problem pollutants, typical sources of the pollutants, specific results from Eugene, and potential problems associated with the pollutants. Although none of these data were collected from within the River Road Santa Clara basin, they provide general information regarding stormwater quality in Eugene and were used in this initial study towards the development of a stormwater basin master plan.

Figure 2-5 Water Quality Monitoring Sites

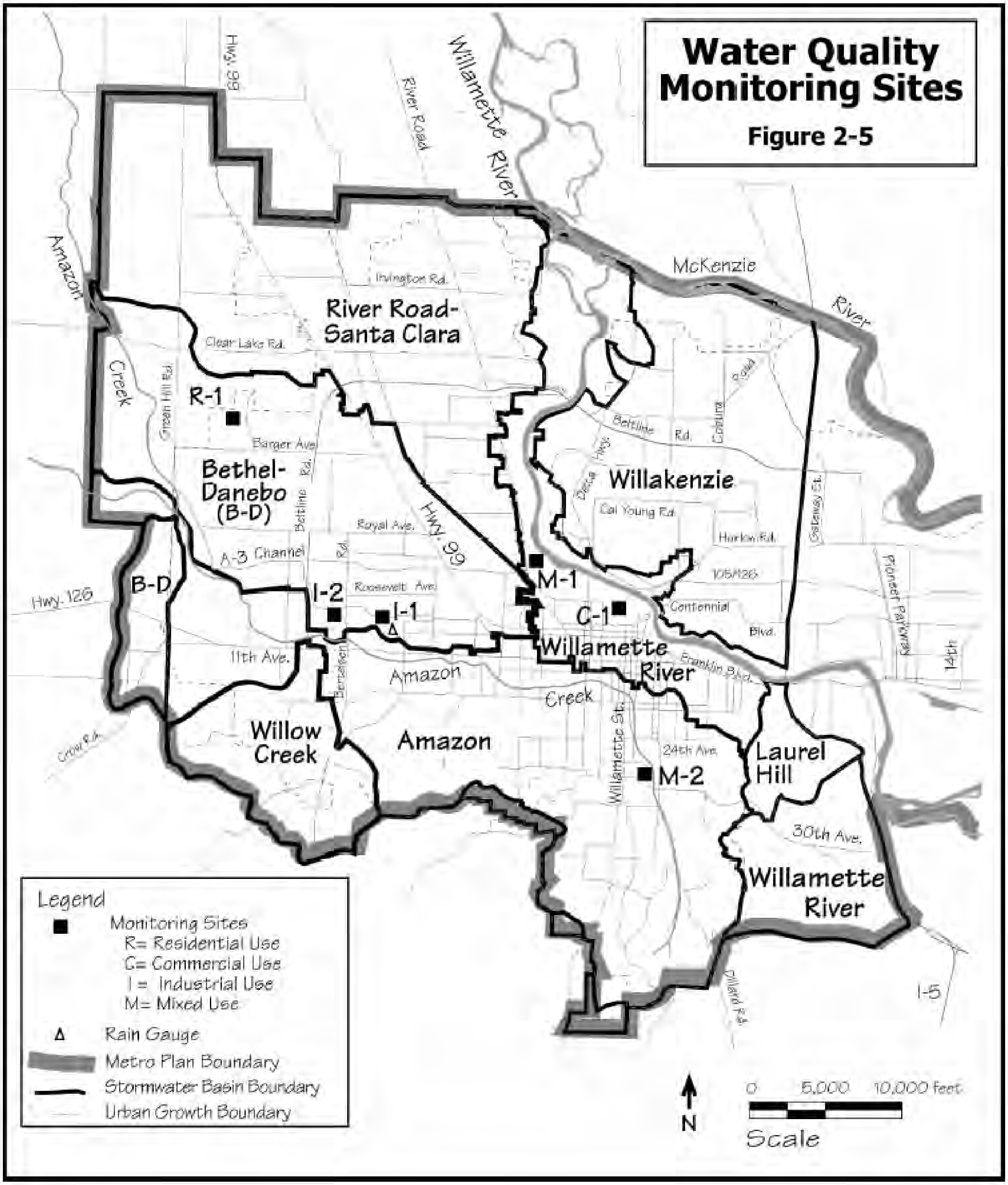


Table 2-5

Summary of Stormwater Quality Monitoring in Eugene

Pollutant	Description	Sources	Eugene's Results	Potential Problems
Bacteria	- Enterococcus, - Fecal coliform, and - Fecal streptococcus	- Animal Wastes (droppings from wild/domestic animals), - Human Wastes (leaking sanitary sewer pipes, and seepage from septic tanks).	**Results from almost all of the samples significantly exceeded the DEQ standard for water quality**.	These are commonly used indicators of human pathogens. Water contact may cause eye and skin irritations and gastro-intestinal diseases if swallowed.
Heavy Metals	Antimony Arsenic Beryllium Cadmium Chromium Copper Lead Mercury Nickel Selenium Silver Thallium Zinc	- Vehicles (combustion of fossil fuels, improper disposal of car batteries, wear/tear of tires and brake pads), - Metal Corrosion, - Pigments for Paints, - Solder, - Fungicides, - Pesticides, - Wood Preservatives	Cadmium, chromium, copper, lead, nickel, and zinc were typically present in samples. **Copper, lead, and zinc in stormwater samples frequently exceeded DEQ standards for the protection of aquatic life.**	Heavy metals are toxic to freshwater aquatic ecosystems. These metals are considered to be the most significant toxic substances which are commonly found in urban stormwater runoff.
Oil & Grease	A broad group of pollutants including: - Animal fats, and - Petroleum products.	- Food Wastes (animal and vegetable fats from garbage), - Petroleum Products (gas, engine oil, lubricants, etc.).	**Two of fifty-three samples had concentrations which exceeded discharge limitations specified for industrial stormwater discharges (i.e., > 10 mg/L).**	These compounds can coat the surface of the water limiting oxygen exchange, clog fish gills, and cling to waterfowl feathers. When ingested these compounds can be toxic to birds, animals and other aquatic life.
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 2-5 (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 River Road Santa Clara basin, the commercial and industrial areas are in the following locations:

- Along Highway 99.
- Along the Northwest Expressway.
- Along Prairie Rd.
- In the vicinity of the Beltline, River Road intersection.

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.

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:

- *Excessive Sediment:* Elevated levels of sediment have been observed in Spring Creek, potentially due to poor erosion control practices at construction sites.

- *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.

- *Debris in the Open Waterways:* Significant amounts of trash and debris are dumped into the open waterways in this basin and maintenance access is often limited for removing debris.

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.

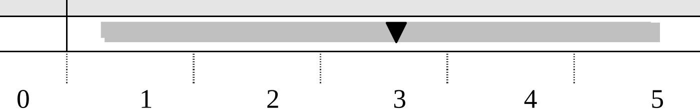
States must monitor water quality and review available data and information to determine if the standards are being met. In Oregon, this responsibility is carried out by the Department of Environmental Quality (DEQ). If available data indicate a water body is not meeting water quality standards, and 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.

No water bodies in the River Road Santa Clara basin appear on the 303(d) list.

2.6.3 Natural and Built Conditions

Evaluating the natural and built conditions that influence water quality can be useful in indirectly assessing water quality conditions in the basin. As urbanization occurs, negative impact to the health of receiving waters result from changes in the quality of stormwater runoff. Natural features such as riparian areas, wetlands, and open drainage systems have the ability to treat stormwater pollutants, prevent waterway scour by slowing down runoff rates, settle out sediments, and protect stream banks from erosion. However, with research showing that water quality degradation occurs at relatively low levels of imperviousness (10-20 percent), the implications of development on water quality is significant.[1] Figures 2-6, 2-7, and 2-8 examine natural and built conditions relative to the other Eugene drainage basins.

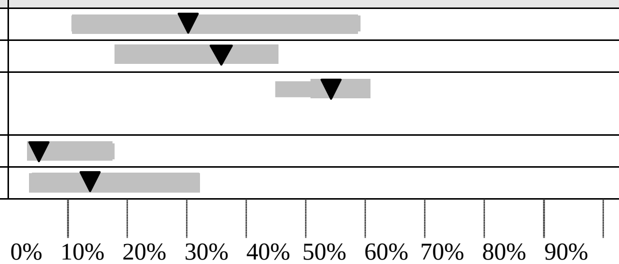
Figure 2-6
Extent of Open Drainage System in the River Road Santa Clara Basin (UGB)

Miles per Square Mile of Open Drainage System in the River Road Santa Clara Basin	River Road Santa Clara Basin [□] Relative to the Range in Other Eugene Basins (miles/sq mile)
3.0*	

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

Figure 2-7
Extent of Area as a Percentage of the River Road Santa Clara Basin (UGB)

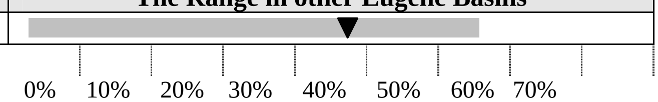
Factors	Percent in River Road Santa Clara Basin	River Road Santa Clara Basin [□] Relative to The Range in other Eugene Basins
Remaining Vacant Lands*	**29%**	
Existing Impervious Surface Area	**34%**	
Projected Impervious Surface Area	**51%**	
Wetlands	**3%**	
100-Year Floodplain	**12%**	



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

Figure 2-8
Extent of 100-Year Floodway Fringe that is Vacant in the River Road Santa Clara Basin

Percent of 100-Yr. Floodway Fringe Vacant* in the River Road Santa Clara Basin	River Road Santa Clara Basin [□] Relative to The Range in other Eugene Basins
44%	



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

2.6.4 Conclusions

A summary of the above findings suggest that degraded water quality conditions exist in the River Road Santa Clara 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 mid-range when compared with other Eugene drainage basins.
- At 34 percent, the basin currently has levels of imperviousness that are expected to degrade water quality. Projections at UGB buildout indicate that the impervious surface area will increase to 51 percent, which is the highest for all of the basins.

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 chapter is to describe the known rare species and communities located in the River Road Santa Clara basin so that the details of these resources can be consulted prior to any final decisions. Review of the Oregon Natural Heritage Program database reveals no records of rare plant, animal, or community observations.

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.

2.8 Soils

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

2.8.1 Permeability

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

Compared with other Eugene basins, soil permeability in the River Road Santa Clara basin UGB is relatively high with 81% being moderately slow and 17% being moderate to very rapid. The following table displays the distribution of soil permeability for the basin.

Table 2-6
Soil Permeability in the River Road Santa Clara Basin

Location	Permeability (percent)							
	Very Rapid	Moderately Rapid	Moderate	Moderately Slow	Slow	Very Slow	No Data*	Total
Within UGB	4%	3%	10%	81%	0%	1%	1%	100%
Outside UGB	8%	2%	3%	74%	3%	8%	2%	100%
Total Basin	7%	3%	7%	78%	1%	3%	1%	100%

**Includes borrow pits and water features such as ponds Source: USDA Soil Survey of Lane County Area, Oregon, 1987.*

2.8.2 Runoff Potential

Soil groups have been rated according to their runoff potential under nonvegetated and saturated conditions without consideration of topographic conditions. Runoff potential measures a soil's capacity to permit infiltration and can be used to describe the degree of runoff expected during storm events. For example, soils rated with a low runoff potential are more likely to have high infiltration rates and, conversely, soils with a high runoff potential are more likely to have low infiltration rates. Hydrologic stormwater models often use this parameter in conjunction with slope and surface cover factors for estimating surface flows under undeveloped conditions.

As shown on Map 7, the River Road Santa Clara basin UGB contains soil groups with runoff ratings ranging from moderately low (16%), moderately high (71%) to "high" (11%). The following table displays the distribution of potential runoff qualities of the basin:

Table 2-7
Runoff Potential in the River Road Santa Clara Basin

Location	Runoff Potential (percent)				
	High	Moderately High	Moderately Low	Low	No Data*	Total
Within UGB	11%	71%	16%	1%	1%	100%
Outside UGB	42%	40%	16%	1%	1%	100%
Total Basin	22%	60%	16%	1%	1%	100%

**Includes borrow pits and water features such as ponds*
Source:USDA Soil Survey of Lane County Area, Oregon, 1987.

2.8.3 Erodible Soils

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

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

The *Soil Survey of Lane County* indicates soils in this basin are generally not susceptible to erosion.

2.8.4 Unstable Slopes

Soils that are subject to slumping can present structural problems especially where extensive grading is made for roads and building pads.

The *Soil Survey of Lane County* indicates there are no soils in this basin subject to slumping.

2.8.5 Hydric Soils

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

The following table displays the percentage of hydric soils found in the basin. Hydric soils areas are located almost entirely west of the Northwest Expressway corresponding to historic low lying drainage areas.

Table 2-8
Hydric Soils in River Road Santa Clara Basin

Location	Hydric Soils (percent)
Within UGB	11%
Outside UGB	37%
Total Basin	22%

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

2.9 Groundwater

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

The second issue relates to the depth to the water table. Map 11 shows the depth to high water table during the wet season. This information is linked to soil type and comes from the *USDA Soil Survey of Lane County*. During the course of the year, these elevations respond to rainfall amounts and, therefore, vary accordingly.

As shown, the groundwater table is either relatively deep (greater than six feet) or very shallow (less than two feet). As with hydric soil location, the Northwest Expressway is a definitive boundary where deeper water table elevations are found to the east and shallower depths to the west.

2.10 Existing and Planned Educational Facilities

The River Road Santa Clara basin currently has ten public schools (including two middle schools and one high school) and one private school. No additional schools are currently planned in the basin.

2.11 Existing and Planned Park and Recreational Facilities

The River Road Santa Clara basin contains the second smallest amount of public park land of any of the seven stormwater planning basins, totaling only 40 acres, with the only park of significant size being Emerald Park (10 acres).

In November, 1998, voters in Eugene passed a $25.3 million general obligation bond measure for purposes of purchasing new parkland and building parks, youth sports, fields. In the River Road Santa Clara basin, these funds will be used to develop 6 new neighborhood parks, one new community park, and improvements to three existing parks.

River Road Santa Clara basin is currently served with limited on-street bicycle lanes.

To identify flood control problems and opportunities, a flood control evaluation was completed for the drainage system in the River Road Santa Clara 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, along with a description of the limitations of this information and work needed to complete the flood control problem identification. Section 3.2 describes the capital project alternatives and development standard alternatives that were considered to address the flooding problems. Section 3.3 describes the general guidelines used for Eugene's other six basins to select the preferred flood control alternatives, and the effort remaining to finalize the flood control strategy for River Road Santa Clara.

3.1 Flood Control Problem Identification

To develop a flood control strategy for the River Road Santa Clara 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. The City of Eugene selected the XP-SWMM model software to conduct these analyses. In general, the evaluation concentrated on the significant components of the public drainage system; typically, all storm sewer pipes with a diameter equal to or greater than 36" and the associated open waterways on the Willamette Overflow (also referred to as the East Santa Clara Waterway), Spring Creek, Flat Creek, and the A-1 Channel.

The River Road Santa Clara basin drainage system is shown on Figures 3-2 through 3-8. Figure 3-1 is an index map that illustrates the relative locations of Figures 3-2 through 3-8. Modeled drainage segments and locations of the proposed capital projects are also illustrated on Figures 3-2 through 3-8.

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 Initial Study 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 River Road Santa Clara Basin Hydrologic Data

The River Road Santa Clara basin was subdivided into 5 major subbasins. The major basin boundaries are presented on Figure 3-1. The 5 major subbasins were further divided into 76 subbasins for modeling purposes. The subbasin boundaries presented on Figures 3-2 through 3-8 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 RS for River Road Santa Clara. The second two characters represent a two-letter abbreviation for the major subbasin. The 5 major subbasins in the River Road Santa Clara basin are as follows:

A1 = A-1 Channel Drainage System
FC = Flat Creek Drainage System
SC = Spring Creek Drainage System
WO = Willamette Overflow Drainage System (also referred to as the East Santa Clara Waterway)
99 = Highway 99

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 Willamette Overflow major subbasin of the River Road Santa Clara basin are RSWO010 and RSWO020. In addition, each subbasin has an associated inlet node number. The hydrologic component (i.e., RUNOFF block) of XP-SWMM was used to generate a stormwater runoff hydrograph for each subbasin. This hydrograph was routed by the hydraulic component (i.e., the EXTRAN block) of XP-SWMM to model the storm drainage system. The subbasin inlet node is the point where the subbasin hydrograph enters the storm drainage system for routing.

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

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

Table 3-2 (provided at the back of this section) includes the major hydrologic information for each of the River Road Santa Clara subbasins. Specifically, the tables provide 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 B.

The following subbasins were not included in the model:

- The A-1 Channel subbasins A1-000 and A1-005 were excluded from the model since they are located outside the City limits and the Urban Growth Boundary.
- The Highway 99 major subbasin (including subbasins 99-010 and 99-020) were excluded since they drain to a roadside ditch along Highway 99N that is owned and maintained by the Oregon Department of Transportation.
- Flat Creek subbasin FC-000 was excluded from the model since it is located outside the City limits and the Urban Growth Boundary.
- Willamette Overflow subbasin WO-000 was excluded from the model since it is located outside the City limits and the Urban Growth Boundary.

3.1.2 River Road Santa Clara Basin Hydraulic Data

The primary purpose of the modeling was to evaluate 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 and Lane County. 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 River Road Santa Clara basin, the model was used to evaluate the capacity of approximately 129 open waterway and pipe segments under existing and future land use conditions. Table 3-3 (provided at the back of this section) provides the major hydraulic information for each of the modeled conduits in the 4 major subbasins evaluated within the River Road Santa Clara basin (the Highway 99 major subbasin was not included in the model). 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 Appendix B.

The results presented in Table 3-3 are influenced by the quality and accuracy of the input data provided in the model. Due to the multi-jurisdiction ownership of the drainage system, the City does not have a comprehensive data set on the drainage system in this basin. Therefore, the results in several areas of the River Road Santa Clara basin should be considered preliminary. The City will need to update or verify the hydrologic and hydraulic data in the following areas before applying the model results for design purposes or prior to implementation of the capital projects described in Section 3.2.1:

- The following three areas in the Willamette Overflow major subbasin will need to be verified and updated:
  - There is a large offset of the pipes in the manhole at node 58287, located east of River Road and north of Division on Figure 3-7. The inlet pipe is more than 7 feet lower than the outlet pipe, which creates a significant surcharging effect in the pipe system before flow exits the manhole. The hydraulic conditions at this location are not well known. Since the upstream drainage area at this point in the Willamette Overflow drainage system is fully developed, the flows discharged from this manhole could significantly effect the flooding problems identified in the open waterways and culverts located downstream of this manhole.
  - The pipe system that conveys stormwater from Beltline Road to the Willamette Overflow drainage system, as shown on Figure 3-7, appears to include pipes with a diameter equal to or greater than 36 inches. Pipes of this size were typically included in the model, however in this case there were insufficient data readily available for these pipes.
  - Fill has been placed in the open waterway between Division and Hunsaker that blocks the waterway except under high flow conditions. The effect of this fill on the flow through the Willamette Overflow will need to be verified and updated in the model.
- Flat Creek major subbasin: Lane County constructed a major pipe system shown on Figure 3-7 along Irving Road that conveys stormwater to the A-1 Channel. This pipe system was installed after the basin model was initially developed. The subbasin boundaries were modified in the Flat Creek and A-1 Channel major subbasins to reflect this new component of the drainage system, however the assumptions used to make the modifications were not field verified. In addition, there does not appear to be a connection between this pipe system and Flat Creek at Irving Road, which allows subbasin FC-070 located to the south of Irving Road to flow north into Flat Creek. This will also need to be verified.
- Three areas in the A-1 Channel major subbasin will need to be verified and updated:
  - Drainage patterns in the A-1 Channel major basin south of Beltline Road are not well known. Currently, the model is based on the assumption that subbasins A1-180 through A1-245 on Figures 3-7 and 3-8 are hydraulically connected to A-1 Channel. However, there appears to be a number of dry wells installed throughout these subbasins that would infiltrate stormwater and reduce stormwater discharge into the A-1 Channel. The extent of these dry wells, their effectiveness, and their effect on the results for the A-1 Channel will need to be investigated.
  - The open waterway profile of the A-1 Channel between Bushnell Lane East and Irving Road (node 72730 to node 72797 on Figure 3-7) is not well documented. This portion of the open waterway will need to be surveyed and the hydraulic data should be updated as necessary.

– The hydraulic data and subbasin boundaries for a western tributary of the A-1 Channel shown on Figure 3-5, from node 72102 to 71215, is poorly known. For example, Lane County has installed a pipe system along Prairie Road that is missing, and the drainage characteristics through the multiple branches of the open waterway between Kaiser and Kelso are not well understood. The current model representation of this portion of the basin does not represent existing conditions. A complete survey and verification of the hydrologic and hydraulic data for this portion of the drainage system will be needed.

3.1.3 Flooding Problems Identified by the Model

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

In general, very few flooding problems were identified in the River Road Santa Clara basin, however, these results are impacted by the hydrologic and hydraulic data deficiencies listed above in Section 3.1.2. Specifically, no flooding problems are expected to occur in the Flat Creek drainage system. Twenty-two open channel and eleven pipe segments were identified as deficient for their respective design storms in the remaining three drainage systems (i.e., A-1 Channel, Spring Creek, and Willamette Overflow). Twenty-one of these twenty-two open channel segments and seven of these eleven pipe segments are expected to be deficient under existing land use conditions. One open channel and four pipe segments are expected to be deficient 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.

3.2 Development of the Flood Management 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, focusing on the major components of the public drainage system. 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 project and development standard alternatives that were considered to address the identified flooding problems.

3.2.1 Capital Project Alternatives

All flooding problems identified through modeling and proposed capital projects to address these problems are presented in Table 3-1. Ten capital projects, identified as RS01, RS02, RS04, RS05, RS11, RS12, RS13, RS14, RS15, and RS22, were proposed to address the expected flooding problems identified based on modeling results in the River Road Santa Clara basin. Of these potential projects, RS12, RS13, and RS14 were identified for implementation in the FY02 through FY06 time period (these three projects are collectively referred to as RS12 in Volume I). Two additional projects were also identified for implementation in the FY01 through FY06 time period in coordination with Lane County's Capital Improvement Plan: Irvington Drive Stormwater Improvements (RS24) and River Road Stormwater Improvements (RS25). Screening and prioritization of the remaining capital projects will be done as the final study for River Road Santa Clara is developed.

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

Expected Flooding Problems		Proposed Options for Flood Control Capital Projects	Selected Flood Control Capital Project*
Conduit Name	When Deficient		
A-1 Channel Major Subbasin			
RSA1160B RSA1170C	10-yr existing	RS01 – A-1 Main Channel and Open Waterway Improvements; RS02 – A-1 Channel West Tributary Preliminary Design; RS22 – St. Peter School Culvert Replacement	
RSA1160C RSA1160D RSA1160F RSA1160H RSA1200B	25-yr existing		
RSA1230A RSA1230B RSA1230C	25-yr future		
Flat Creek Major Subbasin			
None			
Spring Creek Major Subbasin			
RSSC040B RSSC090B	10-yr existing	RS04 –Lynnbrook Drive Open Waterway and Culvert Improvements; RS05 – Pedestrian Bridge in County Park	

Table 3-1 (continued)

Expected Flooding Problems		Proposed Options for Flood Control Capital Projects	Selected Flood Control Capital Project*
Conduit Name	**When Deficient**		
Willamette Overflow Major Subbasin (also referred to as the East Santa Clara Waterway)			
RSWO045A RSWO045B RSWO045C RSWO050B RSWO050C RSWO060A RSWO060B RSWO070A RSWO070E RSWO070G RSWO070H RSWO080A RSWO090A RSWO090B RSWO090C RSWO090D RSWO090F RSWO090H RSWO110C	10-yr existing	RS11 – Kirsten Street Pipe Improvements; RS12 – Willamette Overflow Improvements; RS13 – Willamette Overflow Culvert Replacement; RS14 – Hunsaker Lane Culvert Replacement; RS15 – Division Avenue Tip-Up Pipe Replacement	RS12 consists of 2807 LF of open waterway improvements; RS13 consists of a culvert replacement south of Lenox Rd. and west of Salty Way (14" diameter pipe replaced with a 66" diameter pipe); RS14 consists of a culvert replacement at Hunsaker Lane (4 ft. diameter circular pipe replaced with a 5 ft. by 8 ft. box culvert). The location of these capital projects is illustrated on Figure 3-7.
RSWO040C RSWO110B	10-yr future		

* With the exception of capital projects RS12, RS13, and RS14, screening, prioritization, and selection of the capital projects will be done as the final study for River Road Santa Clara is developed.

In addition to the flooding problems identified as a result of basin modeling, culvert crossing RSSC100A, 2-48" circular CMP culverts under Lynnbrook Drive directly upstream of open waterway segment RSSC090B (page 36 of the sewer index map book) appear to be deteriorated and partly full of sediment. Although no surface flooding is expected to occur during the 10-year recurrence interval design storm, it is likely that because of the physical condition of the culverts that they will need to be replaced. This segment is required to provide a 10-year level of flood protection.

For more detail regarding each of these projects, draft capital project fact sheets are provided in Appendix A.

3.2.2 Development Standard Alternatives

In addition to capital project alternatives, development standard alternatives were considered for addressing those problems that are expected to occur as a result of future buildout conditions. The two flood control development standards that were considered for the River Road Santa Clara 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 modeled results and capital projects are not proposed.

3.3 Selected Alternatives

This Initial Study does not include a comparison, in terms of feasibility, costs, and effectiveness, of the potential solutions described in Section 3-2 (Step 4 from Figure 1-1). A comparison of these factors has been done, however, for the other six stormwater basins in Eugene. The results for all other Eugene basins has been to implement the capital project alternatives and not implement flood control development standards (see Section 3.3 of Eugene Stormwater Basin Master Plan, Volumes II-VII for more information). The analysis completed for the other six basins applied the following general guidelines:

- For flooding problems that are expected to occur under existing land use conditions, capital projects would be required at these locations since development standards are not effective at solving existing problems.
- For addressing flooding problems expected to occur under future buildout conditions, the capital project and development standards alternatives were compared in terms of both cost and effectiveness.
- When several capital project options are 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 the other major basins in this project (see Section 4.0 and Appendix J of Volume I).

Note: Stormwater system improvements are currently required to be designed to meet conveyance design criteria, based upon size of the drainage area and type of system (closed or open) being improved. Conveyance design criteria will still apply to new development and re-development, to provide the appropriate level of protection from the risk of flooding and a consistent level of service city-wide. See Eugene Stormwater Basin Master Plan, Volume I, Sections 3.1.4 and 4.3.2 for more information.

Five flood control capital projects will be implemented in River Road Santa Clara in the FY01 through FY06 time period as follows:

- **Capital Project RS12 – Willamette Overflow Improvements:** Construct approximately 2,800 lineal feet of open channel improvements (this project includes the removal of a 15" diameter culvert).
- **Capital Project RS13 – Willamette Overflow Culvert Replacement:** Replace a 14" culvert with a 66" culvert in the Willamette Overflow south of Lenox Road and west of Salty Way.
- **Capital Project RS14 – Hunsaker Lane Culvert Replacement:** Replace a 4' diameter culvert with a 5' x 8' box culvert in the Willamette Overflow at Hunsaker Lane.
- **Capital Project RS24 – Irvington Drive Stormwater Improvements:** Construct storm system improvements associated with the County road project.
- **Capital Project RS25 - River Road Stormwater Improvements:** Construct storm system improvements associated with the County road project.

Selection and prioritization of remaining flood control capital projects will be done as part of the effort to finalize the flood control strategy for the River Road Santa Clara basin.

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 considered to address the water quality problems. Section 4.3 describes the selected water quality alternatives, and the effort remaining to finalize the water quality strategy for River Road Santa Clara.

4.1 Evaluation of Existing and Expected Future Water Quality 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 River Road Santa Clara basin are provided in Figures 4-1 through 4-3 below. As mentioned in Section 2.6, these results are based on stormwater quality monitoring conducted in the City of Eugene. Although none of these data were collected from within the River Road Santa Clara Basin, they provide general information regarding stormwater quality in Eugene and were used in identifying a stormwater management strategy for this basin. In general, pollutant loads in the River Road Santa Clara basin are expected to increase by 58% 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 River Road Santa Clara Basin (UGB)

Estimated TSS Pounds Per Year in the River Road Santa Clara Basin	1,000 Pounds	River Road Santa Clara Basin Relative to the Range of TSS Pounds Per Year in Other Eugene Basins
From Existing Development	1,634	
From Development of Vacant Land	947	
Total Buildout	2,581	

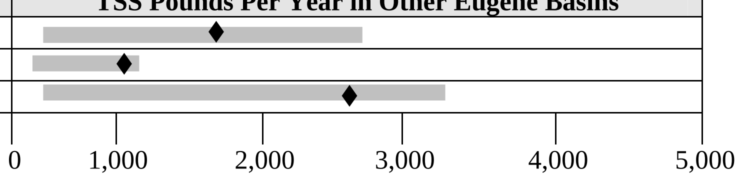


Figure 4-2
Estimated Increases in Total Suspended Solids Loads Associated with Future Buildout in the River Road Santa Clara Basin (UGB)

Estimated Increase in TSS Loads	Percent	River Road Santa Clara Basin Relative to the Range of Increase in TSS Loading in Other Eugene Basins
From Future Development	58	

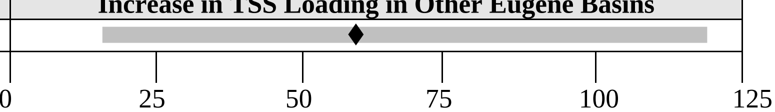


Figure 4-3
Estimated Total Suspended Solids Loads Per Acre - Per Year
in the River Road Santa Clara Basin (UGB)

Estimated TSS Pounds Per Acre Per Year in the River Road Santa Clara Basin	Pounds per Acre per Year	River Road Santa Clara Basin Relative to the Range of TSS Pounds Per Acre Per Year in Other Eugene Basins
Existing Development	270	
Development of Vacant Land	156	
Total Buildout	426	
100 Pounds		0 100 200 300 400 500 600 700

4.2 Development of the 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 considered 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 River Road Santa Clara basin, there were limited opportunities for larger-scale surface water quality projects. Five opportunity areas were identified for potential surface water quality capital project alternatives. These are listed below. In addition, two capital projects to address specific city-wide water quality related problems are included.

RS03 - Water Quality Retrofit of Diana's Pond – This CP includes retrofitting Diana's Pond to function as a constructed stormwater wetland water quality facility. Diana's Pond is located south of Maxwell Road and to the east of the Northwest Expressway, within the A-1 drainage system.

RS06 - Sanders Street Water Quality Facility – This CP includes constructing a 12 ac-ft neighborhood water quality facility on a vacant parcel upstream of Lynnbrook Drive and at the end of Sanders Street (within the Spring Creek drainage system).

RS07 - Spring Creek Drive Water Quality Facility – This CP includes constructing a 3.8 ac-ft neighborhood water quality facility on a vacant lot located to the east of River Road between Spring Creek Drive and Oroyan Avenue, within the Spring Creek drainage system.

RS16 - Water Quality Retrofit South of Beltline – This CP consists of reconstructing an existing open waterway to function as a water quality swale. The open waterway is located south of Beltline Road (within the Willamette Overflow drainage system).

RS20 - Irvington Drive Water Quality Facility – This CP includes constructing a 10.5 ac-ft neighborhood water quality facility on a vacant parcel north of Irvington Drive, west of Honolulu Avenue, and east of the Northwest Expressway, within the Flat Creek drainage system.

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 nine potential locations for these retrofits were identified:

- Willamette Overflow major subbasin
  1) Node 68485
     18" diameter pipe that runs south along River Road
  2) Nodes 58315, 58314, 58313 and 58312
     27" diameter pipe that runs east along Division Avenue
  3) Nodes 72406 and 66531
     24" diameter pipe that runs east along Division Avenue
  4) Node 58319
     12" diameter pipe along Division Avenue
  5) Node 67014
     15" diameter pipe south of Beltline Road

- Spring Creek major subbasin
  1) 48" pipe east of River Road, north of River Loop 2, south of Swain Lane

- Flat Creek major subbasin
  1) Nodes 72206, 72210, 72215, 72218, 72223

24” diameter pipe south of Irvington Drive
2) Node 72321
18” diameter pipe along Zinfandel Lane
3) Node 72326
10” diameter pipe along Napa Valley Lane

Citywide Annual Budget Line Item – Stream Bank Stabilization – This proposed project alternative includes using 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.

For more detail regarding each of these projects, capital project fact sheets are provided in Appendix A.

4.2.2 Development Standard Alternatives

Potential development standards were considered for addressing water quality problems in the River Road Santa Clara 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 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

This Initial Study does not include a comparison, in terms of feasibility, costs, and effectiveness, of the potential solutions described in Section 4-2 (Step 4 from Figure 1-1). A comparison of alternatives has been done for the other six basins in Eugene (see Section 4.3 of Eugene's Stormwater Basin Master Plan, Volumes II – VII for more information). The result of these analyses is to implement water quality development standards city-wide to most cost effectively address the water quality impacts associated with future development. The development standard would also apply 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.

Capital projects were selected in the other six basins to address the existing water quality condition, and it is expected that, as the water quality strategy is finalized, capital projects will also be selected in the River Road Santa Clara basin to address the existing water quality condition. The resulting water quality management strategy for the River Road Santa Clara basin consists of the following elements:

- **Water Quality Development Standards (would apply within city limits only):**
  - ❑ 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).
  - ❑ 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.
- **Water Quality Capital Projects:** Water quality capital project selection and prioritization will be done as part of the effort to finalize the water quality strategy for River Road Santa Clara.

Note: It should be noted that this basin stormwater management strategy was intended to focus on water quality management tools in the form of development standards and capital projects.

To comply with the National Pollutant Discharge Elimination System (NPDES) permit for stormwater discharges, the City is or has been also implementing a significant number of other stormwater quality management practices that will supplement this strategy and help to reduce the discharge of pollutants in stormwater. These include the following:

Inspection, Enforcement, and Monitoring

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

Operations and Maintenance

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

Planning and Administration

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

Public Education

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

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 for the other six stormwater basins in Eugene, and partially completed for the River Road Santa Clara basin. Section 5.1 also describes 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. Section 5.3 describes the selected alternatives, and the effort remaining to finalize the natural resources strategy for River Road Santa Clara.

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 River Road Santa Clara 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 for the River Road Santa Clara basin including the following:

- The following information was compiled and reviewed to assess the location, condition, and function of the River Road Santa Clara 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 River Road Santa Clara 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 River Road Santa Clara 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.

<u>Results of the evaluation</u>

The results of the natural resources evaluation for River Road Santa Clara are still under development at the time of printing of this document.

The following information provides some context for the further development of the stormwater related natural resources strategy:

<u>Existing Protection Measures</u>

- 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 West Eugene Wetlands boundary does not extend into the River Road Santa Clara basin.
- 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 River Road Santa Clara 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 still under development for River Road Santa Clara. 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 considered 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 corridor (shown on Figure 3-6) was identified for acquisition in the River Road Santa Clara Basin:

- Willamette Overflow, also referred to as the East Santa Clara Waterway.

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

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

5.2.2 Development Standard Alternatives

Potential development standards were considered for addressing identified stormwater related natural resources problems and opportunities in the River Road Santa Clara 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 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 natural resources management strategy for River Road Santa Clara is still under development as of the time of printing of this Initial Study. It is anticipated that other elements of the natural resources management strategy will be similar to the strategy for other six Eugene stormwater basins, but customized to the unique characteristics of the River Road Santa Clara basin. The selected natural resources management strategy for the other six basins 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 and additional BMPs for specific land use activities of concern 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 (Specific to River Road Santa Clara):** Acquire the Willamette Overflow, also referred to as the East Santa Clara Waterway corridor.

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

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

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

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

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

6.1 Integrated Stormwater Management Strategy

The stormwater management strategy for the River Road Santa Clara Basin is still under development. This section summarizes the elements of the initial strategy that have been selected for implementation, including a combination 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. The elements of the stormwater management strategy are presented below:

Flood Control Strategy

The following flood control capital projects have been identified for implementation:

- **Capital Project RS12 – Willamette Overflow Improvements:** Construct approximately 2,800 lineal feet of open channel improvements (this project includes the removal of a 15" diameter culvert).
- **Capital Project RS13 – Willamette Overflow Culvert Replacement:** Replace a 14" culvert with a 66" culvert in the Willamette Overflow south of Lenox Road and west of Salty Way.
- **Capital Project RS14 – Hunsaker Lane Culvert Replacement:** Replace a 4' diameter culvert with a 5' x 8' box culvert in the Willamette Overflow at Hunsaker Lane.

Two additional capital projects were identified for implementation in coordination with Lane County road improvement projects:

- **Capital Project RS24 – Irvington Drive Stormwater Improvements** – Construct storm system improvements associated with the County road project.
- **Capital Project RS25 – River Road Stormwater Improvements** – Construct storm system improvements associated with the County road project.

Before additional flood control capital projects are implemented, the River Road Santa Clara XP-SWMM model will be refined as described in Section 3.1.2. Subsequently, additional flood control capital projects will be selected and prioritized for implementation.

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 city including the incorporated areas of River Road Santa Clara. 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).

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.

Several water quality capital projects have been considered for River Road Santa Clara as described in Section 4.2.1, but final selection and prioritization will be done as part of the effort to finalize the water quality strategy for this basin.

Natural Resources Management Strategy

The natural resources strategy for River Road Santa Clara is still under development. The current proposed strategy, similar to the strategy for the six other stormwater basins in Eugene, is focused on the protection and enhancement of open waterways for their stormwater functions and benefits. Part of the strategy includes 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.

Stormwater-related natural resources capital projects will be selected and prioritized as part of the effort to finalize this study. One capital project has been identified for implementation in River Road Santa Clara as follows:

- **Stream Corridor Acquisitions:** Acquire the Willamette Overflow, also referred to as the East Santa Clara Waterway Corridor.

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

The River Road Santa Clara integrated strategy, when finalized and implemented, 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.
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 River Road Santa Clara Basin. It also provides estimated costs and expected funding sources for each of the capital projects.

Three specific projects were selected and prioritized for implementation over a 6-year time period (2001-2007). Seven 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, 1.44 miles of stream corridors representing 24 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 River Road Santa Clara Basin. Refer to Figures 3-1 through 3-8 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 three specific capital projects and the yearly line item projects.

A separate prioritization scheme was developed for prioritizing open waterway sites for acquisition. One stream corridors was identified for acquisition in the River Road Santa Clara Basin: the Willamette Overflow, also referred to as the East Santa Clara Waterway. Table 6-2 indicates the acquisition corridor, costs, and priority for acquisition.

Table 6-1
Implementation Schedule Years 2001 – 2007

Capital Project Identification	Priority	Total Estimated Cost	Estimated Funding Source and Allocation		
			SDCs	User Fees	Federal Priority Funds
RS12* – Kinney Park Water Quality Facility	2001 - 2006	$486,800	$360,232 [74%]	$126,568 [26%]	$0
RS13* -Frederick Court Pipe Daylight	2001 - 2006	$118,300	$54,418 [46%]	$63,882 [54%]	$0
RS14* – Hilyard Street Pipe Improvements	2001 - 2006	$290,200	$66,746 [23%]	$223,454 [77%]	$0
RS24 – Irvington Drive Stormwater Improvements	2001 - 2006				
RS25 – River Road Stormwater Improvements	2007-2011				
Subtotal:		**$17,709,000**	**$2,885,582**	**$10,403,418**	**$4,420,000**

* These three capital projects are referred to collectively as "**RS12 – East Santa Clara Waterway Improvements**" in Volume I

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 • Channel Easement 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
East Santa Clara Waterway	1.44 miles / 24 acres	$1,280,000

APPENDIX A

CAPITAL PROJECT FACT SHEETS

APPENDIX B

HYDROLOGIC/HYDRAULIC MODEL OUTPUT TABLES