# Stormwater Annual Report
## *for the* City of Eugene, Oregon

*Permit Year 2015* *July 1, 2014–June 30, 2015*

Submitted by: City of Eugene

Submitted to: Oregon Department of Environmental Quality

December 1, 2015

National Pollutant Discharge
Elimination System (NPDES)
Permit 101244

# Year 2015 Stormwater Annual Report

## Status Report for Permit Year 2015
## (July 1, 2014 – June 30, 2015)

**Submitted to:**
Oregon Department of Environmental Quality

**Submitted by:**
City of Eugene

Submitted in Accordance with the
Requirements of National Pollutant
Discharge Elimination System (NPDES) Permit
Number 101244, File Number 107989

December 1, 2015

**CITY OF EUGENE, OREGON**
**NATIONAL POLLUTANT DISCHARGE ELIMINATION SYSTEM**
**MUNICIPAL STORMWATER ANNUAL REPORT**

The City hereby submits this Year 2015 Stormwater Annual Report in accordance with National Pollutant Discharge Elimination System (NPDES) Municipal Separate Storm Sewer System (MS4) Discharge Permit number 101244, File Number 107989, issued December 30, 2010. I certify under penalty of law that this document and all attachments were prepared under my direction or supervision in accordance with a system designed to assure that qualified personnel properly gather and evaluate the information submitted. Based on my inquiry of the person or persons who manage the system, or those persons directly responsible for gathering the information, the information submitted is, to the best of my knowledge and belief, true, accurate, and complete. I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment for knowing violations.

Kurt Corey, P.E., Public Works Director
Public Works Department
101 E. Broadway, Suite 400
Eugene, OR, 97401

November 30, 2015

Contact Person for MS4 Permit:

Therese Walch, P.E., Water Resources Manager
Public Works Department
Eugene, OR 97401
(541) 682-5549

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# 1 INTRODUCTION

Discharges from municipal stormwater systems into waters of the United States are regulated by the federal Clean Water Act and National Pollution Discharge Elimination System (NPDES) permit program. The City of Eugene has operated its stormwater program under a NPDES permit since it was first issued in November 1994. Annual reporting is a requirement of the NPDES permits. This document, called the "Year 2015 Stormwater Annual Report" is Eugene's twentieth annual report under its NPDES permit. This report fulfills Schedule B, Item 5, of NPDES Permit Number 101244, File Number 107989, issued December 30, 2010.

Section 1 of this report includes background information and a history of Eugene's stormwater MS4 permit (Section 1.1), a brief summary of the MS4 permit requirements (Section 1.2) and an overview of the contents of this report including relevant permit conditions (Section 1.3).

## 1.1 Background and Eugene's NPDES Permit History

Discharge of industrial wastewater, municipal wastewater, and stormwater into waters of the United States are all regulated through the NPDES permit program which is authorized by Section 402 of the federal Clean Water Act. In the state of Oregon, the NPDES permit program is administered by the Oregon Department of Environmental Quality (DEQ) on behalf of the U.S. Environmental Protection Agency (EPA). With regards to stormwater specifically, NPDES permits are issued for discharges from municipal separate storm sewer systems (MS4s) which are publicly owned or operated facilities including streets, curbs, gutters, catch basins, ditches, manmade channels and storm drains that are used for collecting or conveying stormwater.

Sources that need to obtain a MS4 permit are classified as either "Phase I" or "Phase II." Phase I MS4s are those with populations greater than 100,000, while regulated Phase II (or "small") MS4s serve populations less than 100,000 and are located within Census Bureau-defined Urbanized Areas. Federal regulations also provide EPA and the states the discretion to require other MS4s outside of Urbanized Areas to apply for a permit. In 1990, the EPA published its "Phase I" regulations governing stormwater discharges from larger municipal systems, and these municipalities, including Eugene, were required to apply for a NPDES permit for their stormwater discharges.

The City of Eugene and Oregon Department of Transportation were co-permittees on the City's first term individual MS4 permit which was issued in November 1994. ODOT ceased to be a co-permittee with Eugene in April 1998, following a request to DEQ that the organization be able to submit one state-wide annual report. The City's first-term MS4 permit, scheduled to expire November 1999, was administratively by DEQ until the second-term MS4 permit was issued in March 2004. The second-term permit, scheduled to expire in February 2009, was administratively extended by DEQ until the third-term permit was issued in December 2010. Accompanying each permit and incorporated by reference is a Stormwater Management Plan (SWMP) which is the set of best management practices the City implements to meet the requirements of its permit and the Clean Water Act. Occasionally, as a result of program adaptive management, revisions are made to the SWMP and submitted to DEQ for approval.

The City is currently operating its stormwater system under the December 2010 MS4 Permit (Appendix D of this report) and December 2012 SWMP (Appendix E of this report). The 2010 permit is scheduled to expire on December 29, 2015 by which time the City will submit its permit renewal application package. It is anticipated that DEQ will administratively extend the current permit pending future action on the City's next, fourth-term, MS4 permit.

## 1.2 2010 NPDES Permit

Eugene's 2010 NPDES permit consists of Schedule A, B, D, and a set of General Conditions, summarized as follows:

Schedule A lists controls and limitations for stormwater discharges. Specifically the City of Eugene must:

- Prohibit non-stormwater discharges into the MS4.
- Reduce the discharge of the pollutants from the municipal stormwater system to the maximum extent practicable.
- Implement and assess the effectiveness of the DEQ-approved SWMP which must include following program elements:
    - Illicit discharge detection and elimination
    - Industrial and commercial facilities
    - Construction site runoff control
    - Education and outreach
    - Public involvement and participation
    - Post-construction site runoff
    - Pollution prevention for municipal operations
    - Structural stormwater controls operations and maintenance activities
- Conduct a hydromodification assessment.
- Develop a stormwater quality retrofit strategy for developed and underserved areas.

Schedule B outlines monitoring and reporting requirements:

- Implement a monitoring program to support adaptive management and the evaluation of SWMP effectiveness in reducing pollutants.
- Develop and implement an approved Monitoring Plan, incorporating specific monitoring types, locations, frequencies, and pollutant parameters to be analyzed.
- Submit an annual report by December 1st of each year.
- Submit a permit renewal application package 180 days prior to the scheduled expiration of the current permit.

Schedule D outlines Special Conditions:

- Maintain adequate legal authority to implement and enforce the permit conditions.
- Conduct an evaluation of 303(d) listed pollutants applicable to Eugene's MS4 discharges.
- Complete an assessment of applicable Total Maximum Daily Load (TMDL) wasteload allocation attainment.
- Evaluate progress towards reducing applicable TMDL pollutant loads.
- Establish TMDL pollutant load reduction benchmarks for the next (fourth) permit term.

- Follow and document an adaptive management process.
- Revise SWMP to incorporate specific changes to five BMPs.
- Definitions related to the NPDES permit.

Schedule F outlines the General Conditions of the permit including penalties for violations of the permit, operations and maintenance of pollution controls, procedures for conducting monitoring and managing data and records, general reporting requirements, and definitions of generally used terms.

## 1.3 Annual Report Contents and Relevant Permit Conditions

This Year 2015 Stormwater Annual Report provides information on the progress of the permit activities from July 1, 2014 through June 30, 2015, which coincides with the City's 2015 fiscal year, and is herein referred to as the "2015 Report." The report includes: this Introduction (Section 1); Overall Program Management, including program structure, the relationship of the MS4 permit to local policy and other local jurisdictions, financial summary, legal authority, summary of concept planning, land use changes and annexations, and adaptive management (Section 2); Status of SWMP Implementation (Section 3); and Monitoring Program Results (Section 4). Table 1-1 includes each annual report requirement outlined in Schedule B.5 of the NPDES permit, and where the information is located within this report.

The 2015 report and previous annual reports to Year 2011 are posted on the City's stormwater web site at: www.eugene-or.gov/stormwater (see "Planning, Permits and Regulations" and select "NPDES Municipal Stormwater Permit"). Prior years' reports are also available, upon request (see web site for contact information).

**Table 1-1. Annual Reporting Requirements and Location within this Report**

| Schedule B.5 Requirement | Report Section |
|---|---|
| a. The status of implementing the stormwater management program and each SWMP program element, including progress in meeting the measurable goals identified in the SWMP. | Section 3 |
| b. Status or results, or both, of any public education program effectiveness evaluation conducted during the reporting year and a summary of how the results were or will be used for adaptive management. | Section 3.1.1 |
| c. A summary of the adaptive management process implementation during the reporting year, including any proposed changes to the stormwater management program (e.g., new BMPs) identified through implementation of the adaptive management process. | Section 2.8 and Appendix G |
| d. Any proposed changes to SWMP program elements that are designed to reduce TMDL pollutants. | No proposed changes |
| e. A summary of total stormwater program expenditures and funding sources over the reporting fiscal year, and those anticipated in the next fiscal year. | Section 2.5 |
| f. A summary of monitoring program results, including monitoring data that are accumulated throughout the reporting year and/or assessments or evaluations. | Section 4 |
| g. Any proposed modifications to the monitoring plan that are necessary to ensure that adequate data and information are collected to conduct stormwater program assessments. | No proposed modifications |
| h. A summary describing the number and nature of enforcement actions, inspections, and public education programs, including results of ongoing field screening and follow-up activities related to illicit discharges. | Sections 3.3.1, 3.5.1, 3.5.3, 3.5.4, 3.7.1. |
| i. An overview, as related to MS4 discharges, of concept planning, land use changes and new development activities that occurred within the Urban Growth Boundary (UGB) expansion areas during the reporting year, and those forecast for the following year, including the number of new post-construction permits issued, and the estimate of the total new or replaced impervious surface area related to new development and redevelopment projects commenced during the reporting year. | Section 2.7 |
| j. Results of ongoing field screening and follow-up activities related to illicit discharges. | Sections 3.3.1,3.3.3 |
| k. In addition to the elements listed under Schedule B.5.a. through B.5.j., the annual report submitted by December 1, 2014 must include:<br>i. The TMDL Pollutant Load Reduction Evaluation as described in Schedule D.3.c.<br>ii. The Wasteload Allocation Attainment Assessment as described in Schedule D.3.b.<br>iii. The 303(d) evaluation as described in Schedule D.2. | Not applicable to Year 2015 Report |

# 2 OVERALL PROGRAM MANAGEMENT

This section of the report provides information about how Eugene's stormwater program is managed (Section 2.1), an explanation of SWMP BMP coding and general BMP categories (Section 2.2), the relationship to local stormwater program policy (Section 2.3), the relationship to other local jurisdictions (Section 2.4), a financial summary (Section 2.5), a summary of the City's legal authority to implement the program (Section 2.6), a summary of concept planning, land use changes, and annexations within the urban growth boundary (Section 2.7), and a summary of the City's adaptive management process and results (Section 2.8).

## 2.1 Program Structure

The Eugene Public Works Department has overall responsibility to implement the NPDES permit and SWMP. The SWMP elements are managed by five divisions in the department: Administration, Engineering, Maintenance, Parks & Open Space, and Wastewater, with two elements managed by the Planning & Development Department. Table 2-1 provides a summary of the general areas of responsibilities within the stormwater program.

**Table 2-1. General Areas of Responsibility within the Stormwater Program**

| Department/Division | Areas of Responsibility |
|---|---|
| Public Works Administration Division | Stormwater outreach and education, graphics<br>Financial management |
| Public Works Engineering Division | Standards for new development<br>Erosion control and construction site management<br>Capital improvement projects<br>Storm system mapping & data management<br>Stormwater planning<br>NPDES permit management |
| Public Works Maintenance Division | Illicit connections/Illegal discharges<br>Spill response<br>Street sweeping<br>Leaf pick-up<br>Constructed system maintenance<br>Regulation of private underground facilities |
| Public Works Parks & Open Space Division | Open channel and vegetated facility maintenance<br>Vegetation management<br>Litter pick up<br>Volunteer programs<br>Regulation of private vegetated facilities<br>Bacteria pilot study coordination |
| Public Works Wastewater Division | Water quality sampling and data analysis<br>Industrial stormwater program |
| Planning and Development Department | Recycling and waste prevention education<br>Yard debris recovery program |

Coordination of the various activities occurs through routine staff communication, and via several staff teams as shown in Table 2-2.

**Table 2-2. Stormwater Program Policy, Management and Coordination Teams**

| Stormwater Program Team | Team Purpose |
|---|---|
| Stormwater Policy Team | Provides policy direction for the Stormwater Program. |
| Stormwater Management Team | Provides overall management for Stormwater Program. Oversees development of new policy for approval by Policy Team. Implements Policy Team direction. |
| Stormwater Operations Team | Shares information for on-going program coordination. Resource pool of key staff for specific tasks. |
| Stormwater Enforcement Coordination Team | Coordinates on code compliance incidents. Shares information on enforcement actions. |
| Stormwater Penalty Review Team | Reviews administrative civil penalties and makes determination. Provides inter-divisional coordination. |

## 2.2 Stormwater Management Plan BMP Categories

Eugene's SWMP includes 24 best management practices (BMPs) designed to reduce the discharge of stormwater pollutants to the maximum extent practicable. Each BMP is given a code (for example, A1) for tracking and reporting purposes; the coding is based on the division within the Public Works Department or Planning & Development Department that has lead responsibility, as follows:

A = Administration Division of Public Works
B = Building Division of Planning and Development
E = Engineering Division of Public Works
M = Maintenance Division of Public Works
P = Parks and Open Space Division of Public Works
W = Wastewater Division of Public Works

The 24 BMPs fall into eight general categories: Public Education; Operations and Maintenance; Illicit Discharge Controls; Waste Management; Construction and Design New Development; Planning, Capital Improvements, and Data Management; Industrial Controls; and Permit Management. The grouping of BMPs and a general description of each category are described below. Table 2-3 includes the full list of BMPs by BMP number, title and category.

### 2.2.1 Public Education

The purpose of public education BMPs is to inform the public, the commercial/industrial sector, and in-house personnel about the sources and causes of stormwater pollution, its effect on the local receiving waters, and to encourage active involvement (e.g. behavioral changes,

volunteerism, etc.) in the effort to reduce pollution. The following BMPs represent the public education elements of the SWMP:

A1 Stormwater Education
P1 Educational Volunteer Program

### 2.2.2 Operations and Maintenance

The purpose of operations and maintenance BMPs is to maintain the publicly managed stormwater system (e.g. pipes, culverts, open waterways, water quality facilities), balancing flood control, drainage services, water quality, and natural resource protection needs, and to adaptively manage for continuous improvement of current operations and maintenance practices. Operations and maintenance BMPs are also focused on planning and performing other City services, such as landscape maintenance or road repair projects for example, in a manner that minimizes the potential for stormwater pollution from these activities. The following BMPs represent the operations and maintenance element of the SWMP:

M3 Street Sweeping Program and Leaf Pick-up
M4 Prevent Leaks and Spills from Municipal Vehicles and Equipment
M5 Public Stormwater System Cleaning Program – Piped System
M8 Winter Road Sanding and De-Icing Program
P3 Tree Planting and Information Programs
P4 Public Stormwater System Maintenance – Developed Parks and Rights-of-Way
P5 Public Stormwater System Maintenance – Open Waterways

### 2.2.3 Illicit Discharge Controls

The purpose of illicit discharge control BMPs is to become aware of, investigate, detect, mitigate, and enforce the elimination of illicit (non-stormwater) discharges and illegal dumping to the stormwater system. The following BMPs represent the illicit discharge control element of the SWMP:

M1 Management of Illicit Discharges to the Municipal Stormwater System
M2 Spill Response
M7 Systematic Stormwater Field Screening and Investigation
P7 Litter and Illegal Dumping Control

### 2.2.4 Waste Management

The purpose of the waste management BMPs is to educate the public, regulate waste management services, and to ensure that proper facilities are available in order to minimize the potential of negative stormwater impacts from solid waste collection, improper disposal of toxic materials, and illegal dumping of garbage and debris. The following BMPs represent the waste management element of the SWMP:

B1 Household Hazardous Waste Disposal
B2 Solid Waste Management

### 2.2.5 Construction and New Development

The purpose of the construction and new development BMPs is to ensure that appropriate control measures are considered, implemented, and maintained during and after the planning, design, and construction phases for new public and private development and significant re-development projects. The following BMPs represent the new construction and new development related elements of the SWMP:

- E2 Erosion Prevention and Construction Site Management Program
- E4 Stormwater Development Standards
- P6 Compliance Program for Maintenance of Privately Owned Vegetated Stormwater Facilities
- M6 Regulation of Inspection, Maintenance and Reporting of Private Underground Stormwater Structures

### 2.2.6 Planning, Capital Improvements and Data Management

The purpose of planning, capital improvements and data management is to develop and implement comprehensive stormwater basin plans, evaluate potential sources of specific pollutants and related BMPs to address them, and maintain up to date data on the stormwater system. The following BMPs represent the planning, capital improvements and data management elements of the SWMP:

- E1 Stormwater Capital Improvement Projects
- E3 Stormwater System Mapping and Data Management
- P2 Bacteria Pilot Study

### 2.2.7 Industrial Controls

The purpose of industrial controls is to provide oversight of stormwater discharges from industrial facilities, including screening, inspections, technical assistance, and response to spills at permitted facilities. The following BMP represents the industrial element of the SWMP:

- W1 Industrial Stormwater Management Program

### 2.2.8 Permit Management

The purpose of permit management is to ensure effective permit management, coordination, and reporting. The following BMP represents the administrative element of the SWMP:

- E5 Permit Management and Reporting

**Table 2-3. December 2012 SWMP Best Management Practices**

| BMP ID | BMP Title | BMP Category |
|---|---|---|
| **A1** | Stormwater Education | Public Education |
| **E1** | Stormwater Capital Improvement Projects | Planning, Capital Improvements, Data Mgt. |
| **E2** | Erosion Prevention & Construction Site Management Program | Construction and New Development |
| **E3** | Stormwater System Mapping and Data Management | Planning, Capital Improvements, Data Mgt. |
| **E4** | Stormwater Development Standards | Construction and New Development |
| **E5** | Permit Management & Reporting | Permit Management |
| **M1** | Management of Illicit Discharges to the Municipal Stormwater System | Illicit Discharge Controls |
| **M2** | Spill Response | Illicit Discharge Controls |
| **M3** | Street Sweeping Program and Leaf Pick-up | Operations & Maintenance |
| **M4** | Prevent Leaks and Spills from Municipal Vehicles and Equipment | Operations & Maintenance |
| **M5** | Public Stormwater System Cleaning Program – Piped System | Operations & Maintenance |
| **M6** | Regulation of Inspection, Maintenance and Reporting of Private Underground Stormwater Structures | Construction and New Development |
| **M7** | Systematic Stormwater Field Screening and Investigation | Illicit Discharge Controls |
| **M8** | Winter Road Sanding and De-Icing Program | Operations & Maintenance |
| **P1** | Educational Volunteer Program | Public Education |
| **P2** | Bacteria Pilot Study | Planning, Capital Improvements, Data Mgt. |
| **P3** | Tree Planting and Information Programs | Operations & Maintenance |
| **P4** | Public Stormwater System Maintenance – Developed Parks and Rights-of-Way | Operations & Maintenance |

| BMP ID | BMP Title | BMP Category |
|---|---|---|
| **P5** | Public Stormwater System Maintenance – Open Waterways | Operations & Maintenance |
| **P6** | Compliance Program for Maintenance of Privately Owned Vegetated Stormwater Facilities | Construction and New Development |
| **P7** | Litter and Illegal Dumping Control | Illicit Discharge Controls |
| **B1** | Household Hazardous Waste Disposal | Waste Management |
| **B2** | Solid Waste Management | Waste Management |
| **W1** | Industrial Stormwater Management Program | Industrial Facilities |

## 2.3 Relationship to Comprehensive Stormwater Management Plan (CSWMP)

In 1993, the Eugene City Council adopted as a refinement to the Eugene-Springfield Metro Plan, the Comprehensive Stormwater Management Plan (CSWMP) which provides the policy framework for the City's stormwater program. The impetus for adopting CSWMP was in part the anticipated federal requirements of the NPDES permit, but it was also necessitated by concerns over open waterway management and the discovery, in the early 1990's, of an extensive concentration of wetlands in west Eugene. A major goal of adopting CSWMP was to address a variety of stormwater issues within a comprehensive management framework -- to manage each of the program areas so that they are coordinated and consistent, meet the requirements of federal law, meet the needs of the community, and meet multiple objectives. CSWMP policies cover four general areas:

- **Flood control** efforts are to be modified to maintain current levels of service while improving water quality and protecting natural resources.
- **Water quality** efforts are to be employed to reduce the discharge of pollutants to the maximum extent practicable.
- **Natural resources** that are related to the stormwater drainage and flood control system, such as conveyance corridors and adjoining wetland and riparian zones, are to be managed to benefit water quality and wildlife habitat.
- **Operations and maintenance** practices are to be modified to meet the objectives of flood control, water quality improvement, and related natural resources protection.

CSWMP incorporates the City's original (1994) NPDES permit SWMP BMPs, as well as other implementation measures to achieve CSWMP goals and objectives. Many of the NPDES-related BMPs overlap with other CSWMP objectives such as the use of native plants along water corridors for bio-filtration purposes and for wildlife habitat, and the restoration of local waterways for increased capacity, water quality improvement, and habitat enhancement.

As part of a stormwater program review in 2013, the Public Works Stormwater Policy Team reviewed CSWMP and concluded that it still represents the appropriate policy basis for Eugene's stormwater program. CSWMP is available on the internet at: www.eugene-or.gov/stormwater (and following links to: Planning, Permits and Regulations > NPDES Municipal Stormwater Permit > CSWMP).

## 2.4 Relationship to Other Local Jurisdictions

EPA adopted rules to implement Phase II of the NPDES permit program in December 1999. Phase II expanded the MS4 permit program to include smaller communities located in United States census-defined Urbanized Areas, including Eugene's metro area partners: the City of Springfield and Lane County. Phase II rules require communities to develop, implement and enforce stormwater management programs that address six minimum measures:

- Public education and outreach
- Public participation/involvement
- Unlawful discharge detention and elimination
- Construction site runoff control
- Post-construction site runoff control
- Pollution prevention/good housekeeping

NPDES MS4 individual Phase II permits, including for the City of Springfield and Lane County were first issued in January 2007. NPDES Phase II permits, scheduled to expire on December 31, 2011, were administratively extended by DEQ pending action on new (second-term) permits. As of the date of this report, Phase II permit renewal discussions are underway, led by DEQ and involving an advisory group and other stakeholders. The current plan is to issue a Phase II General Permit for existing and new Phase IIs by mid-2016.

In April 2004, in anticipation of Lane County's NPDES permit, and for the mutual benefit of both agencies and the customers they serve, Lane County and the City of Eugene initiated an intergovernmental agreement ("Stormwater IGA") to collaborate on certain stormwater services within the County's jurisdictional area outside of the Eugene city limits and within the Eugene urban growth boundary. Specific areas of collaboration include: long-term stormwater planning; education and outreach; erosion prevention and construction site management; illicit discharge detection and elimination; and stormwater development standards. The Stormwater IGA has been amended and extended twice, and currently runs through December 2017.

On an on-going basis, formally through the Stormwater IGA with Lane County and informally through participation in multi-agency efforts such as the Pollution Prevention Coalition, the cities of Eugene and Springfield and Lane County often collaborate on pollution prevention and stormwater education activities. Examples of collaborative efforts include working together on topical articles for the City of Eugene's Stormwater Connections newsletter and collectively hosting a booth at the Lane County Home Show. The focus of the 2015 spring home show booth was "Know what's safe: toxic hazards or safe solutions." The City actively participates in

collaborative stormwater-related efforts with other agencies across Oregon, including under the auspices of the Oregon Association of Clean Water Agencies (ACWA).

## 2.5 Financial Summary - Actual (FY2015) and Projected (FY2016) Expenditures

Stormwater program activities are funded by a combination of public and private financing: stormwater user fees, stormwater systems development charges; assessments; state and federal funds; volunteer services; and partnerships (Youth Corps/Bureau of Land Management/The Nature Conservancy).

The two primary on-going funding sources for stormwater program activities are stormwater user fees and stormwater systems development charges:

- Stormwater user fees are monthly fees paid by all existing and new residents and businesses. User fees fund on-going operations and maintenance (including street sweeping, catch basin cleaning, litter pick-up, spill response, stormwater education and volunteer activities) and capital construction (including major system rehabilitation projects, retrofits of the existing system to address water quality, wetland and waterway restoration projects, and stormwater system components such as pipes, culverts, constructed wetlands, ponds, and swales). The amount of the fee is generally proportional to the amount of impervious surface area on the site. A flat rate is charged for small and medium residential users (less than 3,000 square feet of impervious area), based on an estimated average amount of impervious surface area. Large residential users (over 3,000 square feet of impervious area) and commercial / industrial users pay a fee proportional to the amount of impervious area on the site. Users can qualify for a reduced fee if the quantity of stormwater discharge to the public system is reduced through disconnecting impervious surfaces, or providing on-site retention or infiltration. Users can also quality for reduced fees if the applicant goes beyond the minimum required level of water quality management, essentially retrofitting the system to incorporate stormwater treatment for existing developed portions of a site.

- Systems development charges (SDCs) are one-time impact fees that are generally collected when expansion, new development, or an intensification of use occurs on property served by City infrastructure. These fees are used to fund the non-assessable portion of the infrastructure costs needed to support growth in the community and to recoup a portion of the community's investment in the infrastructure already in place. Small and medium residential development pay a flat rate based upon an estimated average impervious surface area specific to each category. All other development pays an amount proportional to the impervious surface area of the site. SDC credits (reductions) are given if the quantity of stormwater discharged to the public system is reduced or if the water quality treatment exceeds the minimum standards. An additional low impact development (LID) component to the SDC fee is charged when a development is unable to accommodate on-site post-construction LID stormwater management per Eugene Code. The LID component reflects the capital costs to provide off-site LID mitigation.

The City of Eugene's stormwater user fee and SDC rate structures thus have built-in financial incentives to reduce impervious area, reduce the quantity of stormwater runoff, and go beyond the minimum in terms of water quality management. More information about the City's stormwater charges is available on the web site at: http://www.eugene-or.gov and follow links to: Services > Stormwater > Fees and Charges.

The stormwater program-wide actual expenditures for Fiscal Year 2015 and projected expenditures for FY2016 are shown in Table 2-4. The MS4 permit reporting year aligns with the City's fiscal year. Expenditures reported include funding for MS4 permit related activities and for stormwater program activities which are not required by the MS4 permit, such as: system maintenance for conveyance and flood control and wetland program management.

**Table 2-4**

**City of Eugene**
**Public Works Department - Stormwater Funds (335, 531, 535)**
**Actual expenditures FY15, Projected (Budget) Expenditures FY16**
(fiscal year is July 1 - June 30)
October 18, 2015

| Fund | | Division | FY15 Actuals | FY16 Budget | |
|---|---|---|---|---|---|
| **335** | **Stormwater SDC** | 93 - Engineering | $217,945 | $534,518 | a. |
| | | 99 - Non Departmental | $2,000 | $0 | b. |
| ***335 Total*** | | | ***$219,945*** | ***$534,518*** | |
| **531** | **Stormwater Utility - Capital** | 93 - Engineering | $3,667,824 | $7,104,872 | c. |
| ***531 Total*** | | | ***$3,667,824*** | ***$7,104,872*** | |
| **535** | **Stormwater Utility - Operation** | 87 - WWTP | $445,832 | $539,039 | |
| | | 89 - Administration | $1,659,412 | $1,873,894 | |
| | | 93 - Engineering | $1,653,791 | $2,064,093 | |
| | | 94 - Maintenance | $4,448,408 | $4,747,122 | |
| | | 96 - Parks and Open Space | $4,736,960 | $5,393,923 | |
| | | 99 - Non Departmental | $994,000 | $1,080,000 | |
| ***535 Total*** | | | ***$13,938,403*** | ***$15,698,071*** | |
| **Grand Total** | | | **$17,826,172** | **$23,337,461** | |

a. FY16 budget includes $134k carryover from FY15.
b. Effective FY16 budget, Central Services Allocation no longer being charged to Fund 335, it is being charged to SDC Admin Fund).
c. FY16 budget includes $4.3 million carryover from FY15.

## 2.6 Continued Legal Authority

Schedule D.1 of the NPDES permit requires that the City of Eugene maintain adequate legal authority, through ordinance(s), interagency agreement(s) or other means to implement and enforce the provisions of the permit. Appendix F contains an updated summary of the legal authority, including Eugene Code sections and related Administrative Orders, that the City of Eugene relies on to apply and enforce stormwater related regulations.

## 2.7 Planning, Land Use Changes, and Annexations within the UGB

For the reporting year, 78.25 acres of land was annexed to the City of Eugene from Lane County, the majority (approximately 73 acres) for low density residential use. Envision Eugene, the

community's long range visioning and planning process initiated in 2010, continued to work toward decisions regarding the best way to accommodate projected population and job growth for the next twenty years. Preliminary recommendations as of mid-2015 include focusing multi-family and commercial development along key corridors and core commercial areas within the existing urban growth boundary (UGB) and expanding the UGB in two areas north of Eugene for industrial development, park development, and school use. Final decisions have not yet been made and depend upon the outcome of on-going Planning Commission and City Council discussions and refinement. The status of the Envision Eugene process and recommendations can be found on the City's web site at: www.envisioneugene.org.

## 2.8 Adaptive Management Process

Schedule D.4 of the NPDES permit requires that the City of Eugene follow an adaptive management approach to assess and modify its SWMP to achieve reductions in stormwater pollution to the maximum extent practicable. This section describes the City of Eugene's adaptive management process and summarizes the results from the 2015 reporting period adaptive management assessment.

### 2.8.1 Introduction

Consistent with Schedule A.2 of its MS4 permit, the City of Eugene must reduce the discharge of pollutants from the stormwater system to the maximum extent practicable (MEP). The MEP requirement is met through compliance with the MS4 permit, specifically through implementation of a stormwater management program and associated Stormwater Management Plan (SWMP). Assessment and modification of the SWMP must follow an adaptive management approach, which is defined in Schedule D as:

> *A structured, iterative process designed to refine and improve stormwater programs over time by evaluating results and adjusting actions on the basis of what has been learned.*

The stormwater management program that is described in the City's current SWMP is the result of adaptively managing (e.g., implementing, evaluating, and adjusting) program activities since first being issued a MS4 permit in 1994. The history of this adaptive management approach may be found in Section 3.3 of the City's September 2008 NPDES MS4 Permit Renewal document which describes how the current Oregon Department of Environmental Quality (DEQ) approved SWMP meets the MEP requirement.

The purpose of this section is to describe the adaptive management approach that the City has committed to following through expiration of its current permit to routinely assess the stormwater program's effectiveness in addressing water quality and protection of beneficial uses. Ongoing adaptive management of the SWMP as discussed in the MS4 annual reports demonstrates that City is meeting the MEP requirement.

The adaptive management approach is divided into two distinct processes, as described below:

> 1) An *annual* adaptive management process to assist with best management practice (BMP) assessment and/or evaluation, in order to determine whether

adjustments to BMPs are warranted and/or practicable to achieve reductions in stormwater pollutants to the MEP.

2) An MS4 *permit cycle* (5-year) adaptive management process to evaluate water quality monitoring results, assess the stormwater management program and overall effectiveness of the SWMP, in order to update the SWMP and associated measurable goals to achieve reductions in stormwater pollutants to the MEP.

### 2.8.2 Annual Adaptive Management Process

Following guidance in DEQ's Permit Evaluation Report and Fact Sheet for the City's NPDES MS4 permit, the annual adaptive management process involves an operational cycle for assessing BMPs, including the steps of: 1) BMP implementation, 2) data collection, 3) assessment, 4) identifying needs, and 5) BMP modification.

Throughout the duration of the current NPDES MS4 permit cycle, the City will *implement* BMPs identified in the DEQ-approved SWMP as part of its stormwater management program. Tracking measures are identified for each of the BMPs to assess progress toward achieving measurable goals outlined in the SWMP. *Data collected* during implementation of BMPs will be consistent with documented tracking measures (e.g., miles of streets swept, number of catch basins cleaned, etc.) and will allow for the assessment of BMP measurable goal attainment. Data collected as part of the environmental monitoring plan will also be reviewed and utilized, as applicable, during the assessment phase of the adaptive management process (e.g., identification of data anomalies or water quality standards exceedances).

The assessment *of BMPs* will occur annually during preparation of the City's MS4 annual report, to be submitted to DEQ by December 1 of each permit year. Among other reporting requirements, the MS4 annual report must contain (Schedule B.5) the following:

> *The status of implementing the stormwater management program and each SWMP program element, including progress in meeting the measurable goals identified in the SWMP.*

By providing a summary in the MS4 annual report of progress toward attaining BMP measurable goals (through data collection and tracking measures), the City both: 1) meets the aforementioned reporting requirement, and 2) facilitates a critical step in adaptively managing its stormwater program by assessing each BMP.

While preparing the MS4 annual report, the City will collect data and feedback from staff responsible for implementing/reporting on each BMP to facilitate the BMP assessment process. Factors considered during the assessment phase are reflected in the Adaptive Management BMP Evaluation Tool template provided in Appendix G. Key factors considered in the annual evaluation include but are not limited to:

- Was the BMP measurable goal attained? If not, describe circumstances why, and how progress will be made toward future attainment.
- For multi-year BMPs, were milestones or timelines met?

- Can we feasibly refine or improve the BMP to gain efficiency or effectiveness in removing stormwater pollutants?
- Are staffing/financial resources available to support such a BMP improvement or refinement?

In addition to assessing the implementation of each BMP, staff will weigh *resource availability and needs* related to the overall stormwater program, including consideration of budget/funding, training needs, new technology, or available equipment.

The aforementioned assessment phase will inform any alterations to the stormwater program or *modifications* to the SWMP. A summary of the adaptive management process including any proposed revisions to the SWMP will follow the requirements of Schedule B. 5 and Schedule D.5 of the NPDES MS4 permit.

Subsequent to implementing modifications, the annual adaptive management process will continue to include an assessment of whether the modifications are resulting in the predicted outcomes/efficiencies through an iterative feedback loop. Annual adaptive management will, therefore, ultimately contribute to the City's SWMP updates required by Schedule B. 6. of the NPDES MS4 permit for the permit renewal application package, including the modification, addition, and removal of BMPs, and associated measureable goals.

### 2.8.3 Permit Cycle Adaptive Management Process

In preparation of the NPDES MS4 permit renewal application as required by Schedule B. 6 of the permit, the City will assess each BMP described in its SWMP, its environmental monitoring program, environmental monitoring data, and results from the additional assessments or studies conducted in support of their MS4 permit compliance to evaluate the overall effectiveness of its stormwater management program in reducing pollutants to the MEP.

As described in Section 2, BMP implementation data collected and evaluated over the course of the permit cycle, as well as historical data (if applicable), will be reviewed during preparation of the NPDES MS4 permit renewal package. This review will help determine BMP refinements and improvements that should be proposed as part of the program modifications at the end of the permit cycle. This process supports the examination of factors including but not limited to:

- Do we have information about new technology or other information to improve or refine existing BMPs, identify alternative BMPs, or include additional BMPs?
- Have we set the appropriate measurable goals for existing BMPs or should they be changed?
- Are resources (funding, staff, equipment, etc.) available to change the BMP measurable goal, and does it make sense to change the goal?

Where applicable, the effectiveness of individual BMPs may also be evaluated by use of data collected through the City's environmental monitoring program. For example, pesticide monitoring data may be of use in identifying targeted outreach activities related to pesticide use, and possible refinement of appropriate outreach/education BMPs. Data collected through the

environmental monitoring program will also contribute to the assessment of the overall stormwater management program.

In addition to BMP implementation data and environmental monitoring data analyses, specific deliverables in the MS4 permit will also facilitate the adaptive management process. Other required permit elements that will aid the SWMP evaluation include:

- Hydromodification assessment (Schedule A.5),
- Stormwater retrofit strategy (Schedule A.6),
- 303(d) list evaluation (Schedule D.2),
- Total Maximum Daily Load (TMDL) Wasteload Allocation Attainment Assessment
- TMDL Pollutant Load Reduction Evaluation and establishment of benchmarks.
- Public education program effectiveness evaluation (Schedule A. 4. d.), and
- Public involvement and participation (Schedule A. 4. e.)

Cumulatively, these deliverables will require the City to identify strategies to reduce the impact of stormwater discharges on receiving water bodies. Some of these deliverables will also require identification of priorities for stormwater control facility implementation (i.e., the hydromodification assessment and the stormwater retrofit strategy). Others will help identify opportunities for further refinement and improvement of its stormwater management program, particularly as related to 303(d) parameters and TMDL benchmarks. Objectives and strategies identified in these deliverables will be considered in context of existing BMPs, and be used to revise appropriate BMPs (and associated measurable goals) during the NPDES MS4 permit renewal process. Finally, the City will utilize all of the above described analysis to evaluate the adequacy of the SWMP in reducing pollutants from the MS4 to the MEP according to the permit requirements in Schedule B. 6. b.

### 2.8.4 Summary of Adaptive Management Process

The adaptive management approach described in this section identifies both annual and end of the NPDES MS4 permit cycle processes that will facilitate continuous improvement of the City's stormwater management program. Each of the five steps identified in DEQ's Permit Evaluation Report and Fact Sheet for an adaptive management approach were addressed, including: 1) BMP implementation, 2) data collection, 3) assessment, 4) identifying needs, and 5) BMP modification. Implementation of these processes and the adaptive management approach, will assure that the City continues to improve its stormwater management programs and reduce the discharge of pollutants to the maximum extent practicable.

### 2.8.5 Summary of Adaptive Management for 2015

The annual adaptive management evaluation process described in Section 2.8.2 highlighted two main areas of adaptive management over the reporting year: improvements in the City's inspection programs for privately maintained stormwater facilities for program efficiency and effectiveness; and an evaluation of findings from the bacteria pilot study (BMP P2). The annual adaptive management process resulted in no proposed changes to the December 2012 SWMP although the findings will contribute to a more comprehensive permit-cycle adaptive management process leading up to submittal of the City's permit renewal application package including an updated SWMP.

## 2.9 Public Review and Comment

The draft 2015 Report was made available to the general public for review and comment. See Appendix H for a copy of the public notice published in the local newspaper and a screen print of the City's internet web page which included links to the draft report and instructions for submitting comments. No comments were received on the draft 2015 Report.

# 3 STATUS OF SWMP IMPLEMENTATION

This section summarizes the status of implementation of the SWMP in the form of measurable goals, tracking measures and accomplishments for each BMP during the reporting year. A historical account of the program accomplishments may be found in prior annual reports, beginning with the Year 1 Annual Report (November 1995). Also included with each BMP report is a list of planned activities or activities under consideration for reporting year 2016. No revisions to the SWMP BMPs are proposed at this time.

## 3.1 Status of Education BMPs

### 3.1.1 A1 – Stormwater Education

**Responsible Department/Division:**
Public Works / Administration

**BMP Contact:**
Administration Division Director

**BMP Description**
Plan, develop, implement and revise as necessary a program to provide stormwater information and education to homeowners, school children, City and other agency staff and the general public about the impacts to stormwater quality and natural resource values from both point and non-point sources of pollution.

In addition, educate professional, commercial, and industrial businesses about best management practices that can help prevent and reduce stormwater quality impacts to the public stormwater system and local receiving waters.

**Tasks**
1. Update and improve upon educational materials through assorted print material, videos, web, audio and visual media.
2. Prepare and staff booths at special events to reach community members.
3. Develop on-going campaigns as appropriate to support projects, programs, special opportunities and targeted pollutants.

| Measurable Goals | Status of Measurable Goals – FY15 |
|---|---|
| • Conduct surveys every two years with Eugene residents to determine attitudes and opinions of residents about the stormwater management program. | • Survey conducted in spring 2015. |
| • Provide SPLASH educational curriculum to teachers and administrators in local school districts. | • Work with teachers in 4J and Bethel School Districts to provide educational curriculum and supporting materials.<br>• 102 teachers provided instruction.<br>• 4,952 students received instruction – an overall increase of 22% from last year |
| • Develop and implement internal stormwater education to city staff through new employee orientation, "green team" presentations, work group presentations and audio/visual presentation. | • Our internal stormwater training video has been seen by 185 Public Works department employees. Tracking is documented through the city's internal training program system. The video is also posted on the city's website under the Public Works video category. |

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| • Increase catch basin markers with "dump no waste" messages and storm drain covers installed on public improvement projects. | | • 282 "fish-friendly" stormwater manhole lids were installed this year.<br>• 31 catch basin markers were installed with "drains to stream" message, in association with the 6th Annual Great Willamette River Clean Up volunteer project (see BMP P1). |
| • Work collaboratively on education campaigns with other local agencies. | | • Water wise demonstration garden project, with multiple partners, is completed and available as a community resource. Project includes SMART control irrigation system, drought tolerant plants, multiple stormwater features and informational signage and take-away materials for site visitors. Participants in the sustainable landscape program received guided tours.<br>• Provide educational support and handouts to the Lane County Extension Service for the Sustainable Landscape Program.<br>• We began a new partnership with the Long Tom Watershed Council and several other groups to reach out to the Latino community. The purpose is to inform and educate families and people who work outdoors with chemicals and other products about ways they can protect their health and river health. The program is modeled after a successful program in Nampa, Idaho.<br>• Through the Lane Pollution Prevention Coalition (P2C) and the Stormwater Special Operations Group we have worked on joint outreach projects that include: radio campaigns to promote fish-friendly car wash kits for fundraising groups, pressure wash booklets for mobile washers and for residents (English & Spanish) and informational postcards to property management companies. The P2C also has a website which lists agencies, links to their websites and upcoming events and pollution prevention tips.<br>• Our primary focus at the 2015 spring home show was "know what's safe: toxic hazards or safe solutions." Other pollution prevention information about air, water, land, waste and recycling was also on-hand.<br>• We continued to promote our car wash kit |

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| | | program to school fundraising groups and our website. In the fall of 2014, we mailed out postcards about our car wash kits to 17 middle schools and high schools in Eugene.<br>• At the Good Earth home show in January 2015, our booth focus was "raindrop to river - clean water begins with you". We provided information about healthy choices for yard care to protect children pets and out local environment. At a plant sale "earth day" celebration in April 2015, we gave out earth-friendly yard care booklets and handouts. |

| **Tracking Measures** | | **Tracking Data – FY15** |
|---|---|---|
| • Number of information materials (all media) prepared and distributed to the public. | | • Newsletters mailed to Eugene residents: 81,400 copies in Spring 2015<br>• 41 pressure wash brochures at rental /retail stores.<br>• 94 paint brochures in English/Spanish put in public display racks.<br>• Gave out 132 Grow Smart, Grow Safe booklets and 47 information cards with Grow Smart, Grow Safe website address.<br>• Provided 42 handouts of each of the following to the Sustainable Landscape Class participants: Make Clean Water Part of Your Life, Stormwater–friendly Lawn and Garden Care, Think Twice Before Using Pesticides.<br>• 30-second video spot run on TV and KEZI.com website. 16,326 impressions (views) occurred on the website.<br>• New handout: Amazon Creek: Clean Water, Habitat and Flood Control. Stormwater projects/improvements to Amazon Creek and surrounding area in the last 15 years. |
| • Number of students and teachers who use SPLASH curriculum annually. | | • 4,952 students received instruction.<br>• 102 teachers provided instruction |
| • Number of attendees at public outreach events. | | • 34,000 attendees at Good Earth Home Show.<br>• 42,000 attendees at the Spring Home Show.<br>• 1,300 attendees at plant sale event.<br>• 48 teachers attended info session for teachers about city programs that benefit students. |

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| • Number of employees attending stormwater education sessions. | • 185 employees attended<br>• 44 attendees at Sustainable Landscape Program |
| • Track quantity of installed catch basin markers and storm drain covers. | • 282 manhole covers installed<br>• 31 catch basin markers were installed |
| • Identify collaborative campaigns, target audience and summary of campaign. | • Continue fish-friendly car wash campaign to encourage fundraising groups to use kit that is designed to prevent runoff from vehicle washing from entering storm drain system. Instructive video's on the city's website show how to use the kit. Kits were checked out 7 times. Mailed out postcards promoting car wash kit to 17 middle schools and high schools.<br>• Staff an educational booth at the spring home show with P2C members. Target audience is area residents. Booth focus was "know what's safe: toxic hazards or safe solutions". Pollution prevention handouts on topics included stormwater, air quality, groundwater, waste prevention, water quality and hazardous waste.<br>• Eco-biz program is in its 11th year and now has 16 shops and4 government agencies. This "green" automotive program recognizes auto shop participants for taking extra pollution prevention steps in the way they run their businesses. |
| • Documentation of stormwater survey responses. | • Survey conducted in spring 2015.<br>• Survey document in report *(Stormwater Management Survey Conducted for the City of Eugene, May 2015)* and posted on City's web site: http://eugene-or.gov//DocumentCenter/Home/Index/295, *(2015 Stormwater Survey).* |

**FY15 Activities and Accomplishments**

- Spring issue of Stormwater Connections newsletter highlighted product choices you can live with, spring cleaning tips for leftover products, pet-friendly gardens, Safer Choice labeling standards, thoughtful steps to a healthy yard and the latest enhancements to Amazon Creek.
- Updated Public Works web pages have a dedicated location for videos including many stormwater/clean river topics.

- Lane County Home Show focus was on "Know what's safe: toxic hazards or safe solutions." Other handouts covered topics about water, air, waste and land pollution issues and positive actions that individuals can take.
- Booth at local event featured our Canines for Clean Water program. This pledge-based program addresses cleanup of pet waste and rewards pet owners for their help. Distributed 30 display stands and posters at local vet offices.
- Eco-biz automotive program is now in its 11th year. To date we have certified 16 shops and 4 government agencies. In addition, there are 4 private businesses and 1 government agency preparing for certification.
- New "Join the clean water team" video on the city's stormwater page: www.happyrivers.org The video uses a football commentator –style of narration to show the "right" way to wash a car, how to clean up after fertilizing, and where to direct runoff from pressure washing.
- Delta Ponds video completed for children in 5$^{th}$ grade. Purpose is to help children explore the natural world and appreciate the value of clean water for all.
- Wrote an article for a family-oriented publication about child and pet health and the use of yard chemicals.

**Planned or Considered FY16 Activities**

- Continue researching effective videos that portray stormwater information that we can link to our stormwater home page.
- Promote e-newsletter about stormwater-related issues. 10 issues planned.
- Continue to promote stormwater training video and stormwater information to city staff.
- Look for speaking opportunities or other venues to share information with community members.

**Proposed Revisions to BMP, Measurable Goals or Tracking Measures**

- None at this time. Revisions will be proposed as part of the MS4 permit renewal.

### 3.1.2 P1 – Educational Volunteer Program

**Responsible Department/Division:**
Public Works / Parks & Open Space

**BMP Contact:**
Parks and Open Space Division Director

**BMP Description**
Manage and support the City's Stream Team volunteer program and other community volunteer programs that promote stormwater education. Provide opportunities to involve citizens of all ages and socio-economic backgrounds in meaningful, hands-on and educationally oriented stormwater related projects. Such projects are aimed at providing both physical benefits and participant awareness related to protecting stormwater quality, fostering citizen stewardship of the City's water resources, promoting the use of native-vegetation, and enhancing fish and wildlife habitat within the local urban watershed.

**Tasks**
1. Recruit, support, and coordinate activities for groups or organizations to adopt portions of the City's stormwater system, such as creeks, ponds, and drainage channels.
2. Investigate inclusion of publicly owned vegetated stormwater facilities within developed parks and right of way into the volunteer program.
3. Advertise, coordinate and conduct periodic work parties for regular and drop-in volunteers aimed at waterway clean-up, invasive species removal, native vegetation salvage and native vegetation planting in riparian areas.
4. Partner with local agencies, organizations, businesses and/or corporate sponsors to plan, promote, coordinate and implement annual large scale waterway clean-up volunteer events.
5. Inform the public about the purpose of the volunteer program through public presentations, distribution of program information materials, event related press releases and news media articles and news stories. Include in the communication the challenges and benefits of managing stormwater properly.

| Measurable Goals | | Status of Measurable Goals – FY15 |
|---|---|---|
| • As attrition occurs continue to recruit replacement adoption groups to maintain current levels of participation. | | • On-going |
| • Conduct one volunteer work party annually that will address maintenance needs at publicly owned vegetated stormwater facilities with developed parks or the right of way. | | • Complete |
| • On average, conduct 12 volunteer work parties per year. | | • Complete |
| • Conduct at least one partnership based large-scale water resource clean-up or enhancement volunteer project per year. | | • Complete |

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| • Correspond with the city's stormwater education program coordinator on a regular basis to determine if there are opportunities to better inform the public regarding the challenges and benefits of stormwater management. | • On-going |

| **Tracking Measures** | **Tracking Data – FY15** |
|---|---|
| • Number of adoption groups that are retained and continue to participate in the volunteer program. Track number of new adoption groups brought into the program. | • On-going recruitment for more adoption groups. 49 adoption groups participating and four new partners. |
| • Number of volunteer work parties conducted that involve maintenance of publicly owned vegetated stormwater facilities and number of volunteer participants. | • A total of six work parties involving maintenance of publicly owned vegetated storm water facilities: (3) West University Park, (1) Ferndale Park, (1) Amazon Park and (1) Rosetta Park. A total of 136 volunteers participated in these work parties. |
| • Number of work parties conducted and number of volunteer participants. | • 363 events and work parties were conducted. 6,153 participants. |
| • Document annual large-scale project(s), participating partners and number of volunteer participants. | • On January 31, City of Eugene participated in University of Oregon Community Day of Service at Hendricks Park. 52 volunteers.<br>• On Feb. 28, 96 Alpha Chi Omega sorority members volunteered at Amazon Park.<br>• On March 3, 70 New Hope Christian College students and teachers volunteered at Golden Gardens.<br>• On April 7th, City of Eugene celebrated Arbor Day by planting 43 trees in February in Westmoreland Park with the 70 Arts and Technology Academy's 8th grade students.<br>• May 5th participate in NEHS Day of Caring for 70 students.<br>• June 11th, Celebrated Tandy Turn Park turning 50.<br>• June 13 was LDS Day of Service. 150 members provide over 500 hours.<br>• Partnered with Willamette Riverkeepers to coordinate the annual event on Oct. 4th. A total of 231 volunteers participated. |

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| • Document annually efforts to educate the public about the city's volunteer programs and the protection of water quality as it relates to stormwater. | | • Feb. 2nd participated in U of O Sustainability Fair.<br>• Feb. 12th, participated in U of O Volunteer Fair.<br>• Feb. 26th participated in STEM Kick-Off with Bethel, 4j and Springfield.<br>• April 4th, participated in City's Tree Walk as part of Arbor Week Celebration.<br>• On April 7th, City of Eugene celebrated Arbor Day by planting 43 trees in February in Westmoreland Park with the 70 Arts and Technology Academy's 8th grade students.<br>• June 6th Annual Ridgeline Celebration held on National Trails Day. Representatives from BLM, USFS, Eugene Springfield Fire, Eugene Parks Foundation, Disciples of Dirt and Obsidians.<br>• Provided article to Raindrops to Rivers e-newsletter – spring.<br>• Utilized Eugene Outdoors to promote ongoing stewardship of our parks and natural areas.<br>• EPS staff participated in a number Parks Pop-Up Tours in the community talking about clean water messaging.<br>• EPS staff participated in local STEM workshops.<br>• EPS program produced 2014 Annual Report.<br>• EPS staff participate in Annual Public Work Day.<br>• Bi-weekly work parties with Rachel Carson HS and Marist HS students Amazon Creek and Delta Ponds/Willamette River. |

**FY15 Activities and Accomplishments**

- As part of the 6th Annual Great Willamette River Clean Up volunteers also marked 31 catch basins with "No Dumping: Drains to Stream" placards on the immediately adjacent storm water inlets.
- Started introducing the new Clean Water Messaging strategies into Eugene Park Stewards program event overview.
- 2014 was the first calendar year that staff used iPad's for volunteer tracking and reporting in the Maintenance Management System (MMS).
- Annual 2014 Eugene Park Stewards Program Report was published.

**Planned or Considered FY16 Activities**

- Starting in November 2015 (FY16) the Eugene Park Steward program will be moved under a new Community Engagement Team within Parks and Open Space Division to allow continued community support, outreach and engagement strategies. The program will have a new supervisor and section manager.
- Continue to introduce mobile technology into Eugene Park Stewards program to help retain, recruit and promote stewardship activities.

**Proposed Revisions to BMP, Measurable Goals or Tracking Measures**

- None at this time. Revisions will be proposed as part of the MS4 permit renewal.

## 3.2 Status of Operations and Maintenance BMPs

### 3.2.1 M3 – Street Sweeping and Leaf Pick-up

**Responsible Department/Division:**
Public Works / Maintenance

**BMP Contact:**
Maintenance Division Director

**BMP Description**
Undertake both mechanical brush and vacuum sweeping of publicly maintained roads, bike paths, and parking lots in accordance with the Stormwater Operations and Maintenance Manual. Monitor and evaluate new technology and methods related to street sweeping, and make appropriate adjustments to the current sweeping program when feasible to maximize water quality benefits.

**Tasks**
1. Follow sweeping frequencies as outlined in the Stormwater Operation and Maintenance Manual.
2. Collect sweeping data such as amount of debris swept, curb miles swept, streets and/or areas swept.
3. Conduct annual curbside pickup of leaves on City streets.

| Measurable Goals | | Status of Measurable Goals – FY15 |
|---|---|---|
| Follow sweeping frequencies as outlined in the Stormwater Operation and Maintenance Manual, more specifically described as follows: | | |
| • Sweep downtown core twice per week. | | • Goal was met for FY15 |
| • Sweep university and industrial areas once per week. | | • Goal was met for FY15 |
| • Sweep arterial streets every 2 weeks. | | • Goal was met for FY15 |
| • Sweep residential streets every 6-8 weeks. | | • Goal was met for FY15 |
| • Sweep bike paths and improved alleys twice per year. | | • Goal was met for FY15 |
| • Coordinate and manage two seasonal opportunities for the citizen's leaves to be picked up and managed by the SW operations crew. | | • Goal was met for FY15 |

| Tracking Measures | Tracking Data – FY15 |
|---|---|
| • Lane miles swept. | • Swept 42,304 lane miles. |
| • Amount of debris collected. | • Collected over 15,500 cubic yards of debris. |
| • Amount of leaves picked up. | • Collected 14,146 cubic yards of leaves during the 2014-2015 leaf collection season. |

**FY15 Activities and Accomplishments**

- Swept off-street bike paths totaling more than 70 lane miles.
- Continued to respond to emergency requests, such as vehicle accidents and spills.
- Maintained the ability to respond 24/7 to emergency requests.
- Continued to review and update sweeping routes to maintain effectiveness and meet community needs.
- Replaced 2 sweepers with new models that reduce dust, and are quieter than models being replaced.
- Successfully completed the City of Eugene FY15 curbside Leaf Pick-up Program. This effort prevented over 15,000 cubic yards of leaf materials from potentially entering the public stormwater system.

**Planned or Considered FY16 Activities**

- Analyze street sweeping operations on a continual basis and make modifications as necessary to ensure maximum water quality benefits and meet community needs.
- Perform sweeping operations during eighteen of a possible twenty-one work shifts per week.
- Continue leaf pick-up program, with goals to protect stormwater system, prevent flooding, and keep bicycle lanes clear.
- Continue to evaluate street sweeping technologies and equipment.

**Proposed Revisions to BMP, Measurable Goals or Tracking Measures**

- None at this time. Revisions will be proposed as part of the MS4 permit renewal.

### 3.2.2 M4 – Prevent Leaks and Spills from Municipal Vehicles and Equipment

**Responsible Department/Division:**
Public Works / Maintenance

**BMP Contact:**
Maintenance Division Director

**BMP Description**
Undertake preventive maintenance program for all municipal vehicles and equipment in order to prevent or correct sources of vehicle fluid leaks. Implement employee education practices and field operations procedures to detect and report leaks and to prevent incidences of fluid and material spills from municipal vehicles. Equip municipal trucks and large mechanized equipment with renewable spill response kits.

**Tasks**
1. Maintain training competencies for Fleet Services employees.
2. Maintain a preventative maintenance schedule for all vehicles and equipment.
3. Maintain a supply of spill kit materials for designated vehicles and equipment.

| Measurable Goals | Status of Measurable Goals – FY15 |
|---|---|
| • Include a spill procedure card in all City vehicles and equipment by December 1, 2011. | • Spill procedure cards installed in all City vehicles and equipment by December 1, 2011. |
| • Perform preventative maintenance service on all City vehicles and equipment annually, at a minimum. | • Performed annual preventive maintenance services on 92% of City of Eugene vehicles and equipment in the reporting year. Preventative maintenance in accordance with preventative maintenance schedules, generally on a 12-month basis, results in some instances of preventative maintenance falling outside of the reporting year. |
| • During the repair/clean-up process, analyze the type and cause of the spills associated with the repairs conducted by Fleet staff, and evaluate whether operator training maybe helpful with spill minimization. | • Goal was met. |

| Tracking Measures | Tracking Data – FY15 |
|---|---|
| • Track the number of spill procedure cards issued annually. | • Vehicles are checked at time of service inspection to verify that spill procedure card is in vehicle and replaced if missing or damaged. |

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|---|---|---|
| • Track the number of vehicle related leaks repaired annually. | | • Fleet Services completed 1,349 scheduled preventative maintenance inspections in FY15 and a total of 1,176 17-point safety and operational inspections on scheduled and non-scheduled work. When preventative maintenance inspections find vehicles or equipment with fluid leaks or worn or frayed hoses, repairs are scheduled and performed, or the vehicle is taken out of service until necessary repairs can be made.<br>• During the reporting period, one vactor truck needed to be repaired in the field as a result of a blown radiator hose. Stormwater inlets were protected, the repair was made, and the area was cleaned up, with no discharge entering into the piped stormwater system. |
| • Track the percentage of vehicles which receive preventative maintenance service annually. | | • Performed annual preventive maintenance service of 92% of City of Eugene vehicles in the reporting year, in accordance with preventative maintenance schedules. 1,349 preventative maintenance inspections during FY15 on the City of Eugene's 683 pieces of equipment. |

**FY15 Activities and Accomplishments**

- The mechanical stormwater quality structure at the maintenance facility was cleaned once during the reporting period with no other maintenance required.

**Planned or Considered FY16 Activities**

- Fleet Services will be renewing its EcoBiz certification, continuing to be recognized for the implementation of best management practices and protection of the environment.
- All municipal vehicles and large equipment are inspected and serviced on a routine and frequent basis.
- Vehicles found with fluid leaks or with worn/frayed hydraulic lines are either repaired immediately or taken out of service until necessary repairs can be made.
- Staff will replenish materials in spill kits in the Fleet Services shop as necessary.
- The performance of the structural BMP will continue to be monitored.

**Proposed Revisions to BMP, Measurable Goals or Tracking Measures**

- None at this time. Revisions will be proposed as part of the MS4 permit renewal including to reference preventative maintenance schedules for vehicles and equipment.

### 3.2.3 M5 – Public Stormwater System Cleaning Program – Piped System

**Responsible Department/Division:**
Public Works / Maintenance

**BMP Contact:**
Maintenance Division Director

**BMP Description**
Undertake frequent, systematic cleaning of the components of the public stormwater system such as catch basins, pipes, culverts, inlets, and stormwater quality devices in accordance with the adopted Stormwater Operations and Maintenance (O&M) Manual. Document quantities of material removed from each structure. Using the maintenance management system, refine the regular cleaning schedule for pipes, catch basins and stormwater quality devices. Research and monitor developments in maintenance technology and operations and maintenance methods for the closed systems which will further increase the effectiveness of our cleaning practices and water quality improvement practices.

**Tasks**
1. Follow cleaning procedures as outlined in the Stormwater O&M Manual.
2. Collect loading information for individual structures and facilities.

| Measurable Goals | | Status of Measurable Goals – FY15 |
|---|---|---|
| • Clean 50% of the all of the public catch basins and inlet structures annually unless increased efficiencies are shown through adaptive management. | | • Goal was met.<br>• 8,439 catch basin and inlet structures were cleaned, approximately 56%. |
| • Clean all of the public underground stormwater quality structures as outlined in the Stormwater O&M Manual. | | • Goal was met. |

| Tracking Measures | | Tracking Data – FY15 |
|---|---|---|
| • Track the number of structures cleaned. | | • Cleaned 8,439 catch basin/curb inlet structures. |
| • Track the amount of debris recovered. | | • Removed 480 tons of debris from the piped stormwater system through a systematic catch basin and mainline cleaning program. |
| • Track the lineal footage of stormwater lines cleaned. | | • Cleaned 32,224 linear feet of piped stormwater lines. |

**FY15 Activities and Accomplishments**

- Continued to utilize operational crews across all 15 available weekday shifts. This includes 2 dedicated stormwater jet/vac trucks and 1 stormwater field lead worker. These crews provide O&M functions to the piped system, manholes, proprietary stormwater devices, sediment traps and inlets, as well as providing 24/7 response to service requests.
- Continue to track sump depth of catch basins/curb inlets, and sediment levels prior to cleaning. This information is used to help determine cleaning frequencies, and the need for catch basin/curb inlet repair or replacement.
- Continued stormwater line cleaning and performing Closed Circuit Television (CCTV) inspection and assessment of stormwater lines and inlets in advance of Pavement Preservation Projects. This work identifies conveyance problems and structural defects in advance of surface improvements and promotes proactive maintenance practices.
- Sedimentation manholes were cleaned 41 times and underground water quality structures were cleaned 27 times during FY15.

**Planned or Considered FY16 Activities**

- Clean catch basin/curb inlets and connecting pipes of accumulated sediment, debris, and other pollutants on a systematic basis.
- Record quantities of debris removed and identify structures requiring more frequent cleaning cycles.
- Seasonally inspect key inlets and outfalls to prevent flooding; remove any blocking vegetation or other obstructions.
- Evaluate system performance.

**Proposed Revisions to BMP, Measurable Goals or Tracking Measures**

- None at this time. Revisions will be proposed as part of the MS4 permit renewal.

### 3.2.4 M8 – Winter Road Sanding and De-icing Program

**Responsible Department/Division:**
Public Works / Maintenance

**BMP Contact:**
Maintenance Division Director

**BMP Description**
Apply and clean up winter traction sand on publicly maintained roads and parking areas in conjunction with the application of a pre-wetting agent designed to reduce the need for repeat sanding. Conduct research efforts to identify and evaluate new technology and strategies for application of environmentally friendly chemical anti-icing and de-icing agents. Conduct research into new methods, practices, and efficiencies which may further limit the runoff of sanding related pollutants to the storm system. Conduct preseason staff training on the proper application methods of sand and chemical agents.

**Tasks**
1. Apply sand to roadways in accordance with the Public Works Snow and Ice Plan.
2. Apply chemical agents in accordance to Guidelines for Anti-icing/Deicing included in the Public Works Snow and Ice Plan.
3. Respond to priority routes as outlined in Public Works Snow and Ice Plan.
4. Collect data such as streets plowed and sanded, material used, and other data related to snow/ice events.

| Measurable Goals | Status of Measurable Goals – FY15 |
|---|---|
| • Minimize the use of abrasive materials for snow and ice control through adaptive management practices. | • Goal was met. |
| • Begin cleanup of abrasive materials when streets become free of ice and snow, and the forecast does not call for more ice and snow within the next 24 hours. | • Goal was met. |

| Tracking Measures | Tracking Data – FY15 |
|---|---|
| • Document the quantities of sanding materials applied and collected during each storm event. | • No sanding materials were applied during the reporting period. |
| • Document the volume used for deicing/anti-icing operations. | • No deicing/anti-icing agents were applied during the reporting period. |

**FY15 Activities and Accomplishments**

- Due to an unusually warm winter, no sanding materials or deicing agents were applied during FY15.
- Performed annual snow and ice equipment inspection and training.

**Planned or Considered FY16 Activities**

- Conduct annual snow and ice equipment inspection and training.
- Continue to subscribe to Weather Net, and participate in Base Camp in order to make informed decisions regarding sanding, plowing, and /or de-icing activities.
- Continue to research alternative technologies which may be viable for snow and ice control.

**Proposed Revisions to BMP, Measurable Goals or Tracking Measures**

- None at this time.

### 3.2.5 P3 – Tree Planting and Information Programs

**Responsible Department/Division:**
Public Works / Parks & Open Space

**BMP Contact:**
Parks and Open Space Division Director

**BMP Description**
Manage and support both governmental and community tree planting programs. Provide information to the public about the multiple benefits that trees provide for protecting and enhancing stormwater quality.

**Tasks**
1. Manage and support the City's community focused Eugene Park Stewards (formerly Neighborwoods) volunteer tree planting program.
2. Manage and support the City's internally focused tree planting programs that regulate new development so they are fully planted with street trees and that ensure City-engineered street improvement projects include street trees in appropriate plantable areas.
3. Seek opportunities to provide and/or present information to the community regarding stormwater related benefits of trees.

| Measurable Goals | Status of Measurable Goals – FY15 |
|---|---|
| • On average, conduct 12 Neighborwoods volunteer program tree planting projects per year. | • Goal was met. |
| • Include the planting of street trees with all new private developments and with all new public street improvement projects as opportunities arise. | • Goal was met. |
| • Plant 600 trees per year through the Neighborwoods program and the City's regulatory tree planting program. | • Goal was met. A total of 703 trees were planted in FY15. |
| • Provide information about the stormwater benefits of trees at major publicly attended events at least 4 times per year. | • Goal was met. |

| Tracking Measures | Tracking Data – FY15 |
|---|---|
| • Track the number of Eugene Park Stewards volunteer program planting projects and the resulting number of trees planted. | • The total number of projects in FY15 was 23 resulting in the planting of 521 trees. More specifically, the Eugene Parks Stewards (EPS) volunteer program held 7 tree planting projects and planted 136 trees and the |

| | | |
|---|---|---|
| | | Friends of Trees (FOT), who is contracted by the City to assist with tree planting, held 16 projects totaling 385 trees. |
| • Track the number of trees planted through new development tree planting requirements and through City-engineered street improvements. | | • In total, 182 trees were planted to meet this goal: 147 street trees were planted in new development projects and City-engineered street improvement projects resulted in 23 new trees. An additional 12 trees were planted at the Public Works facility. |
| • Track the number and type of publicly attended events where stormwater related tree information was provided or where a presentation was made. | | • FOT held 24 community events and EPS participated in 10 publicly attended events including Neighborhood Associations meetings, community fairs and celebrations along with the Arbor Day Celebration and work party. |

**FY15 Activities and Accomplishments**

- A new model for Friends of Trees Eugene (FOT), the Urban Forestry and Natural Areas section, and the Eugene Parks Stewards (EPS) volunteer program was formalized in contract documents that saw expanded work this year to plant and prune public trees.
- FOT performed crucial structural pruning on 428 newly-established street trees, continuing the partnership established between the City's volunteer program and the Friends of Trees (FOT) to perform crucial structural pruning of newly-established trees.
- Urban Forestry hired seasonal staff to work at updating the City's tree inventory. State-of-the-art cloud-based ArcGIS software was developed in-house by Parks Planning staff to use ESRI's Collector mobile application to update existing street tree and park tree information. Thirteen of the City's 23 neighborhoods were covered in updating more than 15,000 trees and tree sites. The mobile application is currently being refined and geared to mesh with the existing work order tracking system, MMS (Maintenance Management System).
- Urban Forestry staff oversaw the contractual planting of 147 street trees in new developments and oversaw projects by FOT to plant 385 replacement trees.
- A planting of 40 climate-resilient trees was made in Westmoreland Park adjacent to the Arts and Technology Academy (ATA). The purpose was to replace trees that have died and, at the same time, to initiate an arboretum-style demonstration planting that will allow observation of the performance under tough environmental conditions of the species selected from northern California and other areas that are thought to be resilient to extreme weather patterns of high temperatures and drought periods predicted in the Upper Willamette Valley.
- Mayor Kitty Piercy helped kick off the City's Arbor Day celebration by accepting Eugene's 36th consecutive Tree City USA award from the Oregon Department of Forestry. Speeches by Mayor Piercy, the ATA School Principal, Link Smith, Western Lane District Forester, Eugene Parks Stewards and Urban Forestry staff, and FOT provided information to the public audience about the environment benefits of trees, including stormwater runoff reduction. City staff coordinated the purchase and planting of 43 new trees, including

climate-adaptable species such as California black oak, blue oak, ponderosa pine and big-leaf maple.

- Urban Forestry staff assisted Public Works Engineering staff in designing effective tree preservation for large canopy shade trees on several street and bike path construction and reconstruction projects. Projects included the preservation of several mature cottonwoods along the Willamette River as part of the South Bank Pedestrian Path Project and preservation of two mature giant sequoia during the reconstruction of a pedestrian ramp and a new ADA ramp for the Donald Street Project.
- Parks and Open Space staff conducted outreach to various stakeholder groups during an update to administrative regulations adopting a new tree species planting list for the City. Environmental benefits of trees were tracked and assessed in a newly-developed criteria and ranking system that evaluated attributes of trees that are thought to make them resilient to climate change and that contribute storm water runoff reduction and water quality improvement benefits.
- Several Urban Forestry staff members were invited speakers at community tree walks and local and regional neighborhood meetings and professional conferences, discussing the environmental and stormwater benefits of properly placed trees, and noting the performance attributes of several commonly planted street tree and park species.
- An example of one of publically attended event was a "Tree Walk" along the Ruth Bascom River Bank Path where Urban Forestry staff led 12 community members along the path, identifying trees, and sharing information about tree maintenance, habit and growth.
- Urban Forestry staff partnered with the City of Eugene's Office of Sustainability staff to write a grant and sponsor a multi-day workshop on urban forestry and climate change in Portland at the World Forestry Center (Oct 28th, 29th and 30th, 2014).
- On October 4, 2014, Friends of Trees partnered with Depave* (a nonprofit organization from Portland), Lane Transit District, several local businesses, and 45 volunteers to remove and recycle over 22 tons of concrete in the public right-of-way in the 700 block of Almaden Street to create 8 new planting sites for street trees. **Depave promotes the removal of unnecessary pavement from urban areas to create community green spaces and mitigate stormwater runoff. Through community partnerships and volunteer engagement, Depave strives to overcome the social and environmental impacts of pavement with the use of action-oriented educational events, community stewardship, and advocacy to reconnect people with nature and inspire others. Depave is a nonprofit organization based in Portland, Oregon.*

**Planned or Considered FY16 Activities**

- Tree inventory update work is planned for FY16 to complete the street tree inventory.
- Mobile applications for tree data collection will be beta tested and implemented that will merge with the City's existing MMS (Maintenance Management System) work request and work order tracking software.
- Eugene Park Stewards program will continue to seek out tree plantings for street rights of ways and developed parks in FY16.

**Proposed Revisions to BMP, Measurable Goals or Tracking Measures**

- None at this time. Revisions will be proposed as part of the MS4 permit renewal.

### 3.2.6 P4 – Public Stormwater System Maintenance – Developed Parks and Rights-of-Way

**Responsible Department/Division:**
Public Works / Parks & Open Space

**BMP Contact:**
Parks and Open Space Division Director

**BMP Description**
Evaluate and, as necessary, adapt or revise turf, landscape and natural area vegetation management programs for public lands under the City's jurisdiction. Such areas include developed parkland and public right-of-way.

The focus of this BMP is to minimize and further limit the discharge of pollutant laden runoff from these areas.

**Tasks**
1. Update and refine the Integrated Pest Management (IPM) policy document and operations manual as new techniques are researched and the results of implementation of these techniques are uncovered.
2. Research, evaluate and implement park and landscaped area design practices and new vegetation management techniques to minimize impervious surfaces; reduce pesticide and fertilizer use; and maximize the use of native vegetation, where appropriate.
3. Complete stormwater inspections utilizing inspection checklist for all publicly-maintained vegetated stormwater facilities within the right-of-way and developed parks. Update the new stormwater facility tracking system database with information gathered in field.
4. Evaluate the Pesticide Free Parks Program. Revise, adapt, and expand program as appropriate.
5. Utilize the IPM policy document to continue adding Pesticide Free Zones within Eugene's seven stormwater basins.

| Measurable Goals | Status of Measurable Goals – FY155 |
|---|---|
| • Review IPM manual at least once during the permit term, and update and refine the IPM policy document and operations manual in accordance with integrated pest management principles. | • Complete |
| • Conduct periodic inspection of each publicly maintained vegetated stormwater management facility within the right-of-way and developed parks. Populate the stormwater facility tracking system database with current information for each facility that is inspected. | • Complete |
| • Continue to provide services to existing Pesticide Free Parks. | • Complete |

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|---|---|
| • All newly developed playgrounds, pools, sprayplay features, recreational areas and other park areas will be evaluated during design or within one year of initial public use for addition into the Pesticide Free Zone program. | • Complete |

| **Tracking Measures** | **Tracking Data – FY15** |
|---|---|
| • Document updates of IPM policy document and operations manual. | • IPM Manual was reviewed and updated. It was published 4/16/15. |
| • Document new techniques and practices that are incorporated into park and landscape design. | • No new techniques or practices were in landscape design were incorporated during the reporting period. |
| • Document the number of publicly maintained vegetated stormwater facilities inspected and information entered into the stormwater facility tracking system database annually. | • 23 publicly maintained vegetated storm water facilities were inspected and the information was entered into the storm water facility tracking system database. |
| • Track the condition of existing parks that are currently maintained using the Pesticide Free Parks protocol. | • Maintenance was performed at nine pesticide free parks during the reporting period. Tasks included litter and garbage collection, weekly mowing during the first part of the growing season then a reduction in frequency to every two weeks, and weed and plant management throughout the year using alternative methods of weed control such as flame-weeding, hand weeding, and mulching. |
| • Calculate the total acreage that has been placed in the Pesticide Free Zone Program per year.<br>• Utilize Chem Track program to track how much chemical (pound per acre) were used each year and determine total reduction of chemicals used annually. | • A total of 201.25 acres of pesticide free zones exist in the park system.<br>• 30.6 lbs. of pesticides were applied in FY15. This is an increase of 7.6lbs over the previous year. Source of the increase is likely work done in median and shrub bed renovation. |

**FY15 Activities and Accomplishments**

- Maintenance methods and standards for vegetated stormwater facilities were reviewed and revised.

**Planned or Considered FY16 Activities**

- Formation of a work team specifically geared to stormwater management of vegetated facilities in the right-of-way.

**Proposed Revisions to BMP, Measurable Goals or Tracking Measures**

- None at this time. Revisions will be proposed as part of the MS4 permit renewal.

### 3.2.7 P5 – Public Stormwater System Maintenance – Open Waterways

**Responsible Department/Division:**
Public Works / Parks & Open Space

**BMP Contact:**
Parks and Open Space Division Director

**BMP Description**
Maintain and manage open waterways consistent with adopted Open Waterway Maintenance Plans. These plans are intended to protect and enhance stormwater quality and natural resources values while continuing to maintain sufficient conveyance capacity in the waterways.

**Tasks**
1. Follow written procedures for on-going maintenance of open waterways: Open Waterway Maintenance Plans (for all open waterways) and U.S. Army Corps of Engineers Levee Owner's Manual (for portions of Amazon Creek).
2. Establish native trees and shrubs along portions of open waterways that are lacking shade.
3. Repair channel banks as erosion or slumping issues occur.
4. Revise Open Waterways Maintenance Plans to incorporate new information and techniques to further advance the goal of maximizing water quality and habitat benefits while also maintaining sufficient conveyance.
5. Implement storm event monitoring at potential choke points in the open waterway system.
6. Complete stormwater inspections utilizing inspection checklist for all publicly-maintained vegetated stormwater facilities (e.g., detention ponds, wetlands, bioswales). Update the stormwater facility tracking system database with information gathered during inspection.

| Measurable Goals | | Status of Measurable Goals – FY15 |
|---|---|---|
| • Implement "green piping" (i.e., pruning woody vegetation within active channel zone) on 5 miles of open waterway annually to maintain conveyance. | | • Completed |
| • Establish native trees and shrubs on 5000 lineal feet of waterway annually to help shade streams, lower water temperatures, and increase slope stability. | | • Completed |
| • Revise all Open Waterway Maintenance Plans by December, 2012. | | • Completed |
| • Periodic inspections for publicly-maintained vegetated stormwater facilities (e.g., detention ponds, wetlands, bioswales). Populate the stormwater facility tracking system database with current information for each facility. | | • Completed |

| Tracking Measures | | Tracking Data – FY15 |
|---|---|---|
| • Miles of open waterways that are green-piped each year. | | • 10.7 miles of open waterway green piped. |
| • Track the number of riparian vegetation planting projects, including the number of lineal feet planted, and the number and general type of native species planted (i.e. trees, shrubs, grasses, etc.). | | • 30 native trees were planted along the Roosevelt Channel, near Elmira Street.<br>• 60 native trees were planted along the Roosevelt Channel, near Beltline.<br>• 160 native trees were planted along the Willamette River, in East Alton Baker Park.<br>• The following streams and linear distances were planted with native willow cuttings: Spring Creek near Springwood (800 linear feet); A-2 channel between Beltline and Golden Gardens Ponds (5400 linear feet); Roosevelt Channel near Beltline (750 linear feet). |
| • Number of channel bank repair projects (e.g., to reduce erosion or slumping) completed each year. | | • No channel banks failures occurred during this reporting period, therefore no bank repairs were required. |
| • Number of times each year that the storm event monitoring program for open waterways is activated. | | • No storm events occurred during the reporting period of sufficient severity to trigger monitoring. |
| • Number of publicly maintained vegetated stormwater facilities inspected and information entered into the stormwater facility tracking system database annually. | | • Staff conducted annual inspections of 33 facilities and entered the information into the MMS system. |

**FY15 Activities and Accomplishments**

- See above.

**Planned or Considered FY16 Activities**

- We will implement multiple projects (e.g. tree planting, green piping) that will address the measurable goals above.

**Proposed Revisions to BMP, Measurable Goals or Tracking Measures**

- None at this time. Revisions will be proposed as part of the MS4 permit renewal.

## 3.3 Status of Illicit Discharge Control BMPs

### 3.3.1 M1 – Management of Illicit Discharges to the Municipal Stormwater System

**Responsible Department/Division:**
Public Works / Maintenance

**BMP Contact:**
Maintenance Division Director

**BMP Description**
Discourage and reduce improper discharges into the stormwater system through operation of a stormwater discharge compliance enforcement program. The primary goals of this program are to protect the quality of the receiving waters of the City's stormwater system and to ensure that discharges to the City's stormwater system are in compliance with local, state, and federal regulations to the maximum extent practicable. The City will conduct periodic review of enforcement program practices and procedures and make revisions as deemed necessary.

**Tasks**
1. Use CCTV inspection, dye testing, smoke testing and field investigation to identify illegal connections, cross connections with the wastewater system and failures in the pipe system.
2. Inspect stormwater outfalls to identify illicit discharges, as well as track outfalls added or removed from the stormwater system.
3. Implement the City's Stormwater System Administrative Rule, 58-02-01-F, with the intent to prohibit improper connections and illegal discharges to the City's stormwater system utilizing an effective enforcement program.

| Measurable Goals | Status of Measurable Goals – FY15 |
|---|---|
| • Work to reduce the number of improper discharges into the municipal stormwater system through public outreach and a reasonable enforcement of regulations. | • Goal was met. |

| Tracking Measures | Tracking Data – FY15 |
|---|---|
| • Track the number of stormwater pollution complaints received by the City. | • 68 work orders for possible illicit discharges were created, and 43 were determined to be illicit discharges and eliminated. |
| • Track the number of outfalls inspected annually. | • 130 outfalls were inspected during the reporting period. |
| • Track the number of requests-for-service (RFS) related to illicit discharges to the municipal stormwater system which required enforcement. | • 10 written enforcement notices were issued during the FY15 reporting period. |

**FY15 Activities and Accomplishments**

- The third year of the Dry Weather Field Screening program took place in FY15, with 6 major outfalls being selected, with 3 outfalls having flow. Samples were collected from the 3 outfalls and analyzed by an outside laboratory. Results of the sampling showed no evidence of illicit discharge.
- The Public Works Maintenance Division's Spill Response Program Technical Specialist continues to work closely with staff from Public Works Engineering Division's Erosion Control Team and Public Works Wastewater Division's Industrial Source Control. The collective group comprises the Public Works Stormwater Enforcement Team and meets regularly to discuss illicit discharges, educational outreach, compliance/ penalty cases, and joint field investigation.
- The City's Maintenance Management System (MMS) is the primary mechanism for database management and tracking of spills and illicit discharges. Updates during FY15 include mobile capabilities, allowing work orders to be created, and completed in the field.
- Tenth year successfully administering the "Fish Friendly" Car Wash Kits program for local Non-Profit Fundraising.
- Six Fish Friendly Car Wash Kits were loaned to volunteer organizations during the reporting year.
- The Polk Street Stormwater Vault was cleaned 3 times during FY15 and over 26 tons of debris was removed.

**Planned or Considered FY16 Activities**

- Continue the Dry Weather Field Screening program to monitor for illicit discharge activities.
- Continue outfall inspections to look for illicit discharges, inspect conditions of infrastructure, and prevent flooding.
- Continue to manage the "Fish Friendly Car Wash Kit Program".
- Continue to partner with the Local Emergency Planning Commission on Hazardous Material trainings.

**Proposed Revisions to BMP, Measurable Goals or Tracking Measures**

- None at this time. Revisions will be proposed as part of the MS4 permit renewal.

### 3.3.2 M2 – Spill Response

**Responsible Department/Division:**
Public Works / Maintenance

**BMP Contact:**
Maintenance Division Director

**BMP Description**
Maintain an on-call team trained in spill response procedures involving environmentally hazardous materials and a vehicle equipped for such spill mitigation. Coordinate efforts with other local response teams such as the City of Eugene Fire and Police Departments, Lane County, and state agencies.

**Tasks**
1. Maintain an on-call list of personnel trained in spill response procedures.
2. Maintain an inventory of equipment and supplies necessary to mitigate improper discharges to the municipal stormwater system.
3. Coordinate in conjunction with Fire Department / Hazmat Team on mitigation efforts including hazardous material clean-up and disposal.
4. Update the City of Eugene's Public Works Maintenance Spill Response and Illicit Discharge Operations Plan.

| Measurable Goals | Status of Measurable Goals – FY15 |
|---|---|
| • Maintain a list of HAZWOPER trained personnel that are available for 24-hour emergency response. | • Goal was met.<br>• Public Works currently has 6 employees with 40hr. HAZWOPR training and 1 employee with 24hr. HAZWOPR training.<br>• Conducted annual refresher for 8hr., 24hr., and 40hr. HAZWOPR trained staff. |
| • Maintain and update, as necessary, the City's On-Call Emergency Roster for Environmental Spills. | • Goal was met. |

| Tracking Measures | Tracking Data – FY15 |
|---|---|
| • Up-to-date list of employees trained for spill response. | • Public Works maintains a staff of 70 employees with 8hr. HAZWOPR First Responder training.<br>• Public Works maintains a staff of 1 employee with 24hr. HAZWOPR technician training.<br>• Public Works maintains a staff of 6 employees with 40hr. HAZWOPR technician training. |

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|---|---|
| • Track number of spills and follow-up details. | • 68 work orders for possible illicit discharges were created, and 43 were identified as illicit discharges and eliminated. |

**FY15 Activities and Accomplishments**

- Spill Response staff continue to work closely with Stormwater and Wastewater Vacuum Truck Operators, Systematic Field Inspection staff, Street Sweeper Operators, the Stormwater Supervisor, Parks and Open Space Staff, Wastewater Industrial Source Control Technicians, Stream Team Coordinator and volunteers, Engineering Division Construction Erosion Control Technicians to identify, investigate and abate illicit discharges and spills through combined efforts.
- Continued response to spills and illicit discharges with City of Eugene Public Works Maintenance staff, Fire and Police Emergency Services personnel, and the use of Hazmat contractors for consultation, cleanup, and material disposal needs.
- Continued the cooperative relationship with IDDE staff from City of Springfield, working together on illicit discharge issues such as pressure washing and landscaping activities.
- The City's Maintenance Management System (MMS) is the primary mechanism for database management and tracking of spills and illicit discharges. Updates during FY15 include mobile capabilities, allowing work orders to be created, and completed in the field.

**Planned or Considered FY16 Activities**

- Consider merging the Spill Response BMP, M2, into the Illicit Discharge BMP, M1.
- Continue to manage the "Fish Friendly" Car Wash Kit program.
- Continue to monitor on-street homeless camping activities with a goal of reducing levels of pollutants entering the MS4.
- Continue to partner with the Local Emergency Planning Commission on Hazardous Material trainings.

**Proposed Revisions to BMP, Measurable Goals or Tracking Measures**

None at this time. Revisions will be proposed as part of the MS4 permit renewal.

### 3.3.3 M7 – Systematic Stormwater Field Screening and Investigation

**Responsible Department/Division:**
Public Works / Maintenance

**BMP Contact:**
Maintenance Division Director

**BMP Description**
The Stormwater Field Screening and Investigation program inspects the public stormwater system for condition assessment and the private stormwater system to assess water quality impacts to the municipal stormwater system. Where illicit discharges are found, attempt to identify the source and eliminate the discharge.

**Tasks**
1. Work with the Sub Surface Maintenance Crew to assess, inspect and map the details of the public and private stormwater system.
2. Conduct annual dry-weather field screening inspections per the City of Eugene Field Screening manual.
3. Work with the inspection and enforcement staff to continue to educate and regulate the users on the proper use of the stormwater system.

| Measurable Goals | Status of Measurable Goals – FY15 |
|---|---|
| • Improve accuracy of the Stormwater System layer in our Geographic Information Systems (GIS) through map update requests. | • Goal was met. |
| • Identify and remove illicit discharges to the municipal stormwater system through the dry-weather field screening process. | • Goal was met. |
| • Utilize interaction with the public as an educational opportunity to increase stormwater user awareness. | • Goal was met. |
| • Develop "map update" requests based on field inspections and forward this information to the GIS manager for inclusion into the citywide GIS system. | • Goal was met. |

| Tracking Measures | Tracking Data – FY15 |
|---|---|
| • Track the number of map update requests forwarded to the GIS team. | • 31 map update requests were forwarded to the GIS team. |
| • Track and create work orders for the system repairs discovered through the inspection process. | • 14 work orders were created for stormwater system repairs. |

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|---|---|---|
| • Track the number of dry-weather field screening inspections and follow-up details. | | • Dry Weather Field Screening took place in 2015 at 6 major stormwater outfalls and a 3rd party testing laboratory was used to collect and analyze the samples. 3 outfalls had flow, and results of sampling did not exceed the pollutant parameter action levels. |

**FY15 Activities and Accomplishments**

- Continued to inspect and investigate conveyance issues and system mapping irregularities in both the public and private stormwater systems.
- Scheduled and oversaw the cleaning of the Polk Street Stormwater Vault. The vault was cleaned 3 times during FY15 and over 26 tons of debris was removed.
- Continued to work in conjunction with Public Works Engineering staff on Pavement Preservation Projects to identify conveyance problems prior to new road surfacing.
- Continued investigating conveyance problems such as utility breaches, grout build-up, off-set joints, and structural deficiencies in the public stormwater system with CCTV inspections.

**Planned or Considered FY16 Activities**

- Will continue to partner with Public Works Engineering staff on Pavement Preservation Projects to identify defects to the stormwater system and prioritize and make recommendations for repairs prior to road surfacing.
- Work with spill response/illicit discharge staff to improve the mapping accuracy of the existing stormwater system.
- Continue to map both the public and private stormwater systems to increase information available through the GIS system.

**Proposed Revisions to BMP, Measurable Goals or Tracking Measures**

None at this time. Revisions will be proposed as part of the MS4 permit renewal.

### 3.3.4 P7 – Litter and Illegal Dumping Control

**Responsible Department/Division:**
Public Works / Parks & Open Space

**BMP Contact:**
Parks and Open Space Division Director

**BMP Description**
Manage and support efforts to reduce impacts to stormwater runoff and local receiving waters by controlling litter and debris in public spaces and by removing illegally dumped refuse and debris as well as garbage and trash from illegal camp sites.

There are two primary focal points of this BMP. The first is to provide opportunities for proper disposal of litter and trash at strategic publicly owned sites to prevent it from being washed into the public stormwater system. The second is to clean-up illegal dump sites and illegal camp sites prior to pollutants from the trash and debris being washed into the public storm system or the local receiving waters.

**Tasks**
1. Place trash receptacles in parks, public areas and at venues for public events which are likely to generate garbage, litter and other throw-away items. Provide frequent collection service to prevent over filling.
2. Require up-front clean-up deposits for large events in City parks, for rental of City park shelters, and for rental of other City owned and operated recreation or outdoor cultural facilities.
3. Conduct routine debris inspections of significant waterways under the City's jurisdiction and remove illegally dumped or discarded debris and other items as appropriate.
4. Conduct routine inspections along riverbanks and in other undeveloped lands under the City's jurisdiction to locate, dismantle, and clean-up illegal camp sites and their associated trash, garbage, debris and bio-hazardous materials.
5. Identify and monitor known historic dump sites in remote areas of the public right-of-way (such as undeveloped cul-de-sacs, dead-end streets, etc.), attempt to identify a responsible party for significant piles of dumped debris, and remove the dumped material as soon as possible to discourage additional dumping by others.

| Measurable Goals | Status of Measurable Goals – FY15 |
|---|---|
| • Ensure all parks, all public space areas managed by the City and all venues for outdoor public events on City lands have adequate trash receptacles. Empty trash receptacles frequently enough to prevent spillage due to being over filled. | • Adequate trash receptacles provided in all public spaces for use by the public. Receptacles emptied regularly.<br>• Staff continues to monitor for strategic locations to place litter receptacles due to high litter and debris activity. |
| • Ensure at least 75% of all rentals of parks, park shelters, and other City operated outdoor facilities will result in no loose litter and debris left behind. | • All park rentals during the reporting period were managed for litter removal. |

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|---|---|
| • Inspect all major waterways and riverbanks weekly for dumped or discarded debris and illegal campsites. When found, remove dumped materials within two working days. When found, dismantle illegal campsites and clean-up as soon as is physically and legally possible. | • Priority waterways including the Willamette River, Amazon Creek and Delta Ponds were checked weekly and illegal campsites were removed. |
| • Monitor all identified historic dumping sites in the public right-of-way and clean-up as necessary at least twice per month. | • Patrolled reoccurring dump sites and camp sites throughout the reporting period. |

| **Tracking Measures** | **Tracking Data – FY15** |
|---|---|
| • Track the collection frequency for trash receptacles in City parks and other public space areas managed by the City. | • Monitored 702 outdoor public events and provided trash and litter collection.<br>• All regional and high use neighborhood parks –trash collected daily, year round.<br>• Low use Neighborhood parks –trash collected 2-3 times per week during winter months, daily during summer.<br>• Dog waste cans at four dog off-leash areas dumped eight times per year for a total of approximately 60 cubic yards of dog waste disposed. |
| • Document the number or percentage of rentals of parks, park shelters, and other outdoor venues held on City managed land that forfeit all or part of their clean-up deposit due to excessive litter left behind. | • Of the 702 park rentals this year, one cleaning deposit was forfeited for excessive litter left behind in FY 15. Cleaning deposit amount of $150 is collected to maintain compliance with event cleanup requirements. |
| • Track the number of illegal campsites cleaned-up along riverbanks, waterways, or other public space areas managed by the City. | • There were 37 illegal campsites cleaned up in developed park areas in FY 2015.<br>• A total of 749 illegal campsites were cleaned up along riverbanks, waterways, and undeveloped parklands in FY 2015. |

| | | |
|---|---|---|
| • Track the frequency of collection and the amount of debris collected from waterways and from the public right-of-way. | | • Litter was collected from waterways weekly by staff and sheriff's work crew.<br>• Litter collected from developed parks daily.<br>• Litter collected from public rights of way as found or reported.<br>• Total amount collected in FY 2015 = 3,180 Cubic Yards. |

**FY15 Activities and Accomplishments**

- Continued satellite trash drop boxes in the North and South Park Operations service regions to increase efficiency of litter removal and disposal. In FY15, approximately 390 Cubic Yards of trash and litter was disposed of in these satellite trash drop boxes.
- Continued tracking the dumping of Roosevelt Yard drop box to capture total trash removed from park areas (excluding trash taken to Regional Satellite drop boxes), river banks and waterways (includes litter and debris picked up by staff and Sheriff's Work Crew), and public rights of way =2,790 Cubic Yards.
- The City sponsored and provided logistical support for the 6th Annual Great Willamette River Cleanup on October 4, 2014. This event was a partnership with Willamette Riverkeepers. Volunteers donated a collective 639 hours of stewardship in the land based efforts starting at Maurie Jacobs and Alton Baker Parks to remove 23 yards of trash and 35 needles as well as mark 31 catch basins with "No Dumping: Drains to Stream" placards. 213 volunteers participated in this event.

**Planned or Considered FY16 Activities**

- Willamette River Cleanup volunteer events in FY16.

**Proposed Revisions to BMP, Measurable Goals or Tracking Measures**

- None at this time.

## 3.4 Status of Waste Management BMPs

### 3.4.1 B1 – Household Hazardous Waste Disposal

**Responsible Department/Division:**
Planning and Development / Building and Permit Services

**BMP Contact:**
Building and Permit Services Division Director

**BMP Description**
Support existing efforts and programs within the Eugene metro area to inform citizens of local opportunities for the proper discard and disposal of their household hazardous waste materials. Support and promote facilities and programs that provide such opportunities.

The improper disposal of household hazardous waste poses a serious threat to local stormwater quality. Old paint, solvents and thinners, pesticides, bleach, drain cleaners, antifreeze, gasoline, used motor oil and other motor vehicle fluids can easily be flushed into the stormwater system if disposed of in yards, left uncovered in the rain, or poured down driveways or into the street. Supporting efforts to inform homeowners and tenants about where they can properly dispose of these products as well as supporting local household hazardous waste management facilities and efforts is an effective way to reduce the amount of these products that inadvertently make their way into the stormwater system and local receiving waters.

**Tasks**
1. Collaborate with Lane County Waste Management Division staff on educational outreach via the development and distribution of brochures, fact sheets, and community outreach events.
2. Require solid waste haulers to notify their customers of the Special Wastes Program offered through the Lane County Waste Management Division.
3. Develop information on a City website page that provides education on household hazardous waste and explains how to set up an appointment with Lane County Solid Waste to dispose of materials properly.
4. Collaborate with local metro area partners to public information in local phone books regarding waste prevention, recycling, composting, and disposal of household hazardous waste.

| Measurable Goals | Status of Measurable Goals – FY15 |
|---|---|
| • Work with Lane County and City of Springfield to annually update "Brown Pages" in the US Dex directory to include new electronics requirements. | • Completed. |
| • Update the City's web site periodically to direct residents to the latest information about recycling and waste prevention news, resources, and local events. | • Completed. |

| Tracking Measures | | Tracking Data – FY15 |
|---|---|---|
| • Document completion of "Brown Pages" update. | | • Brown pages published in the US Dex Directory. |
| • Document materials disbursed about household hazardous materials. | | • Lane County materials. |

**FY15 Activities and Accomplishments**

- The City's Waste Prevention and Recycling Program is primarily a regulation program focused on collection and rate regulation. Most of the Stormwater BMP's are handled by our County partners at Lane County Waste Management. We have links on our web site referring the public to their information.

**Planned or Considered FY16 Activities**

- The Cities of Eugene and Springfield, in partnership with Lane County, have continued work on a 20-year Solid Waste Management and Resource Recovery Plan that is expected to be completed in 2016, and will include elements related to improved household hazardous waste management.
- Track Lane County's consideration of alternatives to annually publishing "Brown Pages" in the US Dex directory given other, more effective means of providing the information to the public.

**Proposed Revisions to BMP, Measurable Goals or Tracking Measures**

- None at this time. Revisions will be proposed as part of the MS4 permit renewal.

### 3.4.2 B2 – Solid Waste Management

**Responsible Department/Division:**
Planning and Development / Building and Permit Services

**BMP Contact:**
Building and Permit Services Division Director

**BMP Description**
Evaluate and revise, as necessary, existing solid waste and recycling collection rules to address stormwater quality.

Improper and/or unregulated collection and recycling of solid waste has a serious potential for creating negative impacts to stormwater quality. High collection fees, infrequent or spotty collection service may lead to illegal dumping activity. Unregulated waste containers may be prone to leaking or spilling allowing pollutants to wash into the storm system. By continuing to monitor and evaluate local solid waste management collection efforts, the City will be better able to improve local regulations so that stormwater quality is taken into account.

**Tasks**
1. Regulate solid waste and recycling collection activities within the city limits to curb possible impacts to the stormwater systems from leachate of garbage, yard debris, and recycling materials.
2. Support a minimum of biweekly collection service for organic materials and provide backyard composting classes for residents with or without collection service.
3. Implement the nuisance abatement enforcement program that provides rapid response to illegal dumping of garbage, yard debris, or other solid waste materials.

| Measurable Goals | Status of Measurable Goals – FY15 |
|---|---|
| • Review Administrative Rule to ensure regulations are up to date and include requirements to support appropriate waste management and prevention. | • Administrative Rule was updated related to solid waste and recycling regulations. Rates reviewed but unchanged. |
| • Contract with Oregon DEQ for a waste composition study. | • Completed in FY11 (as indicated in FY11 report). |

| Tracking Measures | Tracking Data – FY15 |
|---|---|
| • Document total tons of yard debris collected through the curbside program. | • 18,634 tons of yard debris collected. |
| • Document the number of compost demonstration workshops and participants. | • Twelve compost demonstration workshops were held with a total of 85 participants. Additionally, two worm bin workshops were held with a total of 33 participants. |

| | | |
|---|---|---|
| • Document number of enforcement cases (i.e., received complaints) related to inappropriate garbage handling. | | • 236 cases of nuisance complaints received related to garbage. |
| • Compare waste composition study with prior one. | | • Completed in FY11. |

**FY15 Activities and Accomplishments**

- 1,930 tons of commercial food waste was collected as part of the Love Food not Waste commercial food waste program, a program implemented in FY12 to divert commercial food waste from the landfill.
- Total tonnage for the Love Food Not Waste program increased by 8 percent.

**Planned or Considered FY16 Activities**

- The Cities of Eugene and Springfield, in partnership with Lane County, continue to work on a 20-year Solid Waste Management and Resource Recovery plan that is expected to be completed for 2016.

**Proposed Revisions to BMP, Measurable Goals or Tracking Measures**

None at this time. Revisions will be proposed as part of the MS4 permit renewal.

## 3.5 Status of Construction and New Development BMPs

### 3.5.1 E2 – Erosion Prevention and Construction Site Management Program

**Responsible Department/Division:**
Public Works / Engineering

**BMP Contact:**
City Engineer

**BMP Description**
Administer and monitor an Erosion Prevention and Construction Site Management Program in compliance with Eugene Code 6.625-6.645, preventing and mitigating pollutant and sediment discharges into the city's stormwater system due to construction activities and land disturbance.

**Tasks**
1. Screen all development permits for sensitive area status, conduct plan reviews, issue erosion permits, conduct erosion inspections, and provide compliance enforcement as appropriate.
2. Issue Erosion Permits for activities which disturb an area one acre or greater in size or disturb an area 500 square feet or greater within a sensitive area (i.e. adjacent to a water feature or its buffer, ground slopes greater than 10%, having highly erodible soils).
3. Conduct education and outreach related to new erosion techniques/practices.
4. Act as 1200-C Agent for DEQ.

| Measurable Goals | Status of Measurable Goals – FY15 |
|---|---|
| • Conduct one inspection prior to the commencement of work for all erosion permitted sites. | • Measurable Goal was met. An initial inspection required prior to any ground disturbance and prior to issuance of building permits for erosion prevention permitted sites. |
| • Inspect non-erosion-permitted sites at least twice during the life of the building/construction permit or as necessary to assure compliance with the program. | • Measurable Goal was met. Non-erosion-permitted sites received inspections as necessary to assure compliance with the BMP requirements. |
| • Inspect permitted sites monthly or as necessary to assure compliance with the program. | • Measurable Goal was met. All erosion permitted sites inspected monthly or as necessary to assure compliance. |
| • Conduct one annual erosion prevention training event. | • Measurable Goal was met. Six erosion prevention training events were conducted in FY 15. |

| Tracking Measures | Tracking Data – FY15 |
|---|---|
| • Number of compliance orders issued. | • 2 Administrative Compliance Orders were issued in FY 15. |

| | |
|---|---|
| • Number of erosion permits issued. | • 123 Erosion Prevention permits were issued in FY 15 (42 Commercial, 77 Residential and 4 Annual). |
| • Number of inspections. | • 1,104 inspections at permitted sites were conducted and documented in FY 15. Additional support inspections were conducted regularly at capital projects, non-permitted sites, stormwater emergencies (e.g. water-line breaks) and in response to complaints. |
| • Number of training/outreach events. | • 9 erosion prevention training/outreach events were conducted in FY 15. |

**FY15 Activities and Accomplishments**

- All BMP inspection staff maintained Certified Erosion and Sediment Control Lead (CESCL) training.
- Program continued in its role as Agent for Department of Environmental Quality (DEQ) to administer NPDES 1200 C permitting within Eugene's jurisdictional boundary.
- Staff issued 11 new DEQ 1200-C permits in FY 15 and are currently administering 19 active DEQ 1200-C permits.
- Program continued to implement an intergovernmental agreement with Lane County to issue and administer Erosion Prevention permitting to properties outside City limits but within the urban growth boundary.
- Staff responded to 10 erosion prevention/stormwater complaints.
- Refined discharge tracking technology and smart-phone training to improve data/photo communications.
- Mailed over 200 postcards to Erosion Prevention permit holders reminding them about the City's wet-weather season and associated required measures.
- Worked with local vendors to improve availability of current BMP measures (e.g. dual inlet inserts).
- Continued to provide full-time assistance (on-call basis) to help customers and counter personnel answer questions about and issue Erosion Prevention permits.
- Incorporated alternative transportation means to perform local inspections (bicycle).
- Constructed an interactive Erosion Prevention display and participated in an all-day educational event for the public.
- Amended outreach/training presentations and as necessary to be relevant for each specific and diverse audience.
- Revised internal processes for Publicly Engineered Public Improvement (PEPI) plan review to have BMP facilitate land use, flood plain, and tree protection and erosion comments.
- Updated Standard Specifications and drawings to improve efficiencies and effectiveness of program.
- Enhanced inspection, documentation and tracking of capital projects.

- Consolidated all illicit discharge tracking to one electronic system.
- Implemented electronic permit review process.

**Planned or Considered FY16 Activities**

- Work through comprehensive review and update, as necessary, of City standard specifications and drawings for erosion and sediment control.
- Continue updating erosion control code and administrative order. Consider expanding applicability criteria to add types of ground-disturbing construction projects currently exempt.
- Consider creating standard drawings for consistency on Construction Site Management Plans
- Consider creating a design guideline to improve design direction and the consistency in review.
- Consider creating a residential guide to simplify construction stormwater management.
- Review, update and expand BMP outreach/training materials and audiences.

**Proposed Revisions to BMP, Measurable Goals or Tracking Measures**

- None at this time. Revisions will be proposed as part of the MS4 permit renewal.

### 3.5.2 E4 – Stormwater Development Standards

**Responsible Department/Division:**
Public Works / Engineering

**BMP Contact:**
City Engineer

**BMP Description**
Administer and monitor a program that implements the city's Stormwater Development Standards, Eugene Code 9.6790-9.6796, Eugene Code 7.143 (3), and associated Stormwater Management Manual. The Stormwater Development Standards regulate the location, design, construction and maintenance of private and public stormwater facilities for flood control, water quality, and natural resource protection.

**Tasks**
1. Screen development permits for post-construction stormwater management, conduct plan reviews, approve stormwater facilities, conduct inspections, and provide compliance enforcement as appropriate.
2. Maintain an up-to-date Stormwater Management Manual for new development.
3. Track, evaluate, and develop new technologies and practices for post-construction stormwater management.
4. Provide training and technical assistance on water quality facilities to city staff and the public.
5. Conduct a review of policies, practices and regulations to identify potential barriers to implementing low impact development techniques.

| Measurable Goals | Status of Measurable Goals – FY15 |
|---|---|
| • Review stormwater management proposals at the land use and/or development permit stage (i.e. earliest level of review). | • Measurable goal was met. Public Works staff reviewed all land use and permit applications for compliance with Stormwater Development Standards. Reviews occurred during first review and plan check stages. |
| • Review and approve construction plans for stormwater management facilities for all development sites which create 1,000 square feet or more impervious surface. | • Measurable goal was met. Public Works staff reviewed all construction plans that included 1,000 square feet of impervious surface or more. Staff ensured that BMP goals were met through the application of the stormwater development standards. |
| • Update Eugene's Stormwater Management Manual every two years or as needed to provide new information or practices for post-construction stormwater management. | • Measureable goal was met. City updated and adopted the Stormwater Management Manual in 2014. |

| Tracking Measures | | Tracking Data – FY15 |
|---|---|---|
| • Number of private water quality facilities permitted with building permits. | | • 49 Vegetated Facilities<br>• 31 Mechanical Facilities |
| • Number of land use applications reviewed. | | • 27 |
| • Number and type of public water quality facilities constructed. | | • 5 Mechanical<br>• 2 Vegetated |
| • Number of training/outreach events held. | | • One outreach event was held. |

**FY15 Activities and Accomplishments**

- Distributed handouts about sustainable stormwater management (i.e. rain gardens, swales, pervious pavements, etc.) at the Lane County Spring Home show booth.
- Built on and fostered good working relationships with people who share a role in the implementation of post-construction stormwater runoff management within the community (i.e. design professionals, contractors, and local agencies).
- Utilized the LID component of the City's stormwater SDC to construct capital projects to mitigate for certain private development unable to meet the on-site LID post-construction requirements (see BMP E1).

**Planned or Considered FY16 Activities**

- Continue to refine tracking and documentation related to new public and private stormwater facilities. Adoption of updates to Stormwater Development Standards in 2014 necessitates additional tracking which staff is working to refine and improve, thereby enabling future evaluation and adaptive management of this BMP.

**Proposed Revisions to BMP, Measurable Goals or Tracking Measures**

None at this time. Revisions will be proposed as part of the MS4 permit renewal.

### 3.5.3 P6 – Compliance Program for Maintenance of Privately Owned Vegetated Stormwater Facilities

**Responsible Department/Division:**
Public Works / Parks & Open Space

**BMP Contact:**
Parks and Open Space Division Director

**BMP Description**
Develop, implement and manage a program to ensure that privately owned and operated vegetated stormwater treatment facilities are maintained so that they function as designed and constructed. The program will employ a combination of rules, protocols and procedures to require: that each private vegetated facility is routinely inspected; that routine and corrective maintenance actions are performed in a timely manner; and that completion of both such activities are regularly reported to City staff. Based on Eugene Municipal Code requirements, penalties and/or other legal remedies will be employed to enforce compliance with these requirements when necessary.

**Tasks**
1. Continue to document pertinent information for new privately owned and operated vegetated stormwater facilities. This includes photo documentation of newly constructed facilities and populating the stormwater facility tracking system database with all new facility information.
2. Develop an administrative rule that details the policy guidelines, practices, procedures, specific authorities, permitted actions, and penalties to be used by City staff in managing the program.
3. Establish criteria for when maintenance audits, corrective actions, and/or enforcement actions are warranted.
4. Maintain mechanisms, processes and procedures to track BMP ownership, maintenance inspections, required reports, corrective maintenance activity and enforcement actions.
5. Develop templates for written correspondence to BMP owners, such as inspection notification, reporting reminder, notice of non-compliance, notice of violation, and enforcement documents.
6. Review required inspection and maintenance logs submitted by BMP owners.

| Measurable Goals | Status of Measurable Goals – FY15 |
|---|---|
| • Inspect all new vegetated private stormwater facilities at the time of construction and log pertinent information into the stormwater facility tracking database system. Adopt and implement an administrative rule to enforce the maintenance of private stormwater facilities by February 2011. | • All new vegetated private stormwater facilities were inspected at the time of construction. All information was recorded was recorded in the stormwater tracking database system.<br>• Administrative Rule has been implemented. |

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| • Ensure the inspection of each vegetated private stormwater facility is conducted at least once per year by the owner/operator and an inspection and maintenance log documenting the necessary corrective actions is submitted to City staff annually. | • Inspection logs were received for 85 out of the 138 facilities for which letters were sent out this reporting period.<br>• 53 formal inspections were conducted on the facilities for which logs were not received in the reporting period, with an emphasis on informing/educating owners rather than enforcement. |
| • Review annual reports for privately-owned vegetated stormwater facilities. | • All inspection logs submitted were reviewed by the stormwater inspector. Logs received were entered into the stormwater BMP tracking database. |

| **Tracking Measures** | **Tracking Data – FY15** |
|---|---|
| • Number of private vegetated stormwater facility inspections completed at time of construction. | • 34 privately maintained vegetated stormwater facilities were inspected at the time of construction and approved during the reporting period. |
| • Number of owner/operator inspection and maintenance logs received and reviewed annually. | • 85 inspection and maintenance logs were received and reviewed during the reporting period. |
| • Number of notices of non-compliance and subsequent enforcement. | • 11 certified letters of non-compliance were sent, followed up by 6 related on-site meetings during the reporting period. |

**FY15 Activities and Accomplishments**

- The process was begun for the improvement of private vegetated stormwater facility workflow.

**Planned or Considered FY16 Activities**

- Continue work on transitioning from an Access database to an MMS database, which will allow for easier data entry and access to queries that will help with tracking of log submittal and facility inspection frequency.

**Proposed Revisions to BMP, Measurable Goals or Tracking Measures**

- None at this time. Revisions will be proposed as part of the MS4 permit renewal.

### 3.5.4 M6 – Regulation of Inspection, Maintenance and Reporting of Private Underground Stormwater Structures

**Responsible Department/Division:**
Public Works / Maintenance

**BMP Contact:**
Maintenance Division Director

**BMP Description**
Develop, implement and manage a program to ensure that privately owned and operated underground stormwater treatment structures are properly maintained.

The program will employ the guidance provided by the required individual Operations and Maintenance (O&M) plan for each structure.

**Tasks**
1. Develop templates for written correspondence to the private operator, such as inspection notifications, reporting reminders, notices of non-compliance, notices of violation, and enforcement documents.
2. Establish criteria for when maintenance audits, corrective actions, and/or enforcement actions are warranted.
3. Develop and maintain mechanisms, processes and procedures to track structure type, ownership, maintenance inspections, required reports, corrective maintenance activity and enforcement actions.
4. Collect and file the required annual reports as provided by the private operator.

| Measurable Goals | Status of Measurable Goals – FY15 |
|---|---|
| • Inspect all new private underground stormwater structures at the time of construction and log pertinent information into a database. | • All new private underground stormwater structures were inspected at the time of construction and pertinent information was logged into database. |
| • Establish a correspondence file for each structure/operator. | • Goal was met. |
| • Ensure that each private underground stormwater structure is inspected, maintained and reported on as required by the O&M plan for the specific device. | • Goal was met |
| • Review annual reports for privately-owned underground stormwater facilities. | • Goal was met. All inspection logs submitted were reviewed and documented in the database. |

| Tracking Measures | | Tracking Data – FY15 |
|---|---|---|
| • Track the number of O&M plans obtained. | | • 29 Operations and Maintenance plans for mechanical facilities were received during the reporting period (2 of the 31 private mechanical facilities permitted this reporting year were destination-only facilities). |
| • Track the number of private inspection, maintenance and reporting activities conducted. | | • 14 private facilities were visually inspected during the last reporting period. |
| • Track any enforcement activities related to the individual structures. | | • No enforcement activities took place during the reporting period. |

**FY15 Activities and Accomplishments**

- Continued to track the number of private mechanical stormwater facilities installed, and document facility type, location, and all other pertinent information in a database.
- Sewer inspection staff continued to inspect stormwater treatment facilities at the time of construction, and map locations and connection points to the public stormwater system using a Private Stormwater SWF form.
- Continued to work with Public Works Engineering to ensure that all private mechanical stormwater facilities are accurately mapped and included in stormwater layer of GIS as well as field maps.

**Planned or Considered FY16 Activities**

- Begin using preventive maintenance schedule in MMS to track the number of mechanical private stormwater facilities, document pertinent data, and prioritize private stormwater facilities for inspection.
- Continue to work with private mechanical stormwater facility owners and maintenance contacts to provide information and education on operations and maintenance of facilities.
- Continue to work with proprietary stormwater facility manufacturers to stay current on emerging technologies and improvements in maintenance operations.

**Proposed Revisions to BMP, Measurable Goals or Tracking Measures**

None at this time. Revisions will be proposed as part of the MS4 permit renewal.

## 3.6 Status of Planning, Capital Improvements, and Data Management BMPs

### 3.6.1 E1 – Stormwater Capital Improvement Projects

**Responsible Department/Division:**
Public Works / Engineering

**BMP Contact:**
City Engineer

**BMP Description**
Implement the Stormwater capital improvement program (CIP), including projects identified in the City's Stormwater Basin Master Plans (Basin Plans) for Amazon, Willow Creek, Bethel-Danebo, Willakenzie, Laurel Hill, Willamette River and the River Road – Santa Clara basins.

The Basin Plans describe a multiple-objective strategy for managing stormwater that addresses water quality protection and improvement, conveyance and flood control, and waterway protection and restoration. The basin strategies reflect the unique characteristics, problems and opportunities in each basin. Volume I contains a prioritized city-wide capital projects list including: water quality facilities in high pollutant source areas, streambank stabilization, stream restoration, and capacity enhancement projects.

The Basin Plan capital projects are one of the main sources of capital projects that comprise the City's CIP. In addition to the Basin Plans, CIP projects also originate from a list of maintenance and rehabilitation needs, from focused planning studies such as the Metro Waterways Restoration Study, and other partnership opportunities. The prioritized Basin Plan capital projects are combined with projects from these other sources, re-ranked, and incorporated into the CIP in a timeframe in-line with available budget.

**Tasks**
1. Incorporate projects from the Basin Plans into the City's bi-annual Capital Improvement Program and annual budget processes.
2. Include water quality criteria in ranking of capital projects from multiple sources for the CIP.
3. Maintain a GIS coverage of capital improvement projects including such attributes as location, project or facility type, drainage area and cost.
4. Maintain up-to-date Basin Plans web site, make hard copies available to the public in key locations (Library, Public Works offices).

| Measurable Goals | | Status of Measurable Goals – FY14 |
|---|---|---|
| • Incorporate into the CIP projects list the projects identified in the recently completed 2010 River Road-Santa Clara Basin Plan, by September 2010. | | • This task is completed. Projects from the River Road-Santa Clara Basin Plan have been incorporated into the CIP projects list including underground injection control decommissioning projects. |

| | |
|---|---|
| • Implement Stormwater CIP projects including at least one "water quality facilities in high source areas" project over the five-year permit term, and other retrofits as opportunities arise. | • This task is completed with the implementation of the I-105/Jefferson water quality project reported in FY12 report. The City continues to implement water quality projects as funding is available. |
| **Tracking Measures** | **Tracking Data – FY14** |
| • Document completion of River Road-Santa Clara Basin Plan. | • Completed in 2010. |
| • Track the number, type, watershed location and total drainage area of capital improvement projects constructed for water quality. | • The City tracks information of all capital projects. The city is incorporating water quality facilities into the GIS system. |

**FY15 Activities and Accomplishments**

- In FY15 the City constructed four vegetated planter type water quality rain gardens on West 18th Avenue between Josh Street and Bertelsen and one planter and one swale type rain garden on Amazon Parkway at 29th Avenue. Both of these public projects provide water quality benefits and were constructed and funded as off-site low impact development (LID) mitigation for certain private developments unable to achieve on-site LID.
- Scoped and designed a pollution reduction manhole on a 60-inch outfall at the beginning of the East Santa Clara Waterway in the River Road Santa Clara Basin.

**Planned or Considered FY16 Activities**

- In FY16 the City plans to build a pollution reduction manhole on a 60-inch outfall at the beginning of the East Santa Clara Waterway in the River Road Santa Clara Basin.
- Continue to evaluate the best locations for and scope future public water quality capital improvements.
- Seek additional sources of funding including grant opportunities for future projects.
- Annual review of the CIP project list is conducted by staff from the Engineering, Maintenance and Parks Divisions of Public Works to update priorities for the CIP program.

**Proposed Revisions to BMP, Measurable Goals or Tracking Measures**

- None at this time. Revisions will be proposed as part of the MS4 permit renewal.

### 3.6.2 E3 – Stormwater System Mapping and Data Management

**Responsible Department/Division:**
Public Works / Engineering

**BMP Contact:**
City Engineer

**BMP Description**
Keep up-to-date inventories and maps of the public and private, natural and constructed, stormwater system. Include mapping of public and private water quality and flow control facilities such as grassy swales and detention basins. Develop and integrate asset inventory data and geographic information system (GIS) systems which describe the conveyance system, water quality attributes and related natural resource information. Integrate information generated through BMPs such as E1 (Capital Improvement Projects) and E4 (Development Standards) which create or modify system components and/or change the attributes of the stormwater system.

**Tasks**
1. Update stormwater system inventory and GIS on a weekly and monthly basis.
2. Develop, upgrade and maintain software applications which make system information available to staff.
3. Update stormwater infrastructure paper map sets annually.
4. Along with adoption of Stormwater Development Standards (E4), help to ensure that data management needs are identified and protocols established for documenting appropriate information to ensure that operations and maintenance, inspection and enforcement, and BMP effectiveness objectives are met.
5. In implementing the capital improvement projects outlined in the 2002 Stormwater Basin Master Plans, help to ensure documentation of location, type and other attributes of stormwater capital projects for purposes of evaluating their effectiveness and reporting progress under our permit.

| Measurable Goals | Status of Measurable Goals – FY14 |
|---|---|
| • Enter 95% of all newly constructed stormwater system features into inventory databases and GIS within six months of final construction approval. | • At least 95% of new stormwater system features added to inventory database and GIS during FY15. |
| • Ensure that 90% of GIS and data application users surveyed rate the GIS/data systems as satisfactory or better. | • Survey is conducted in even fiscal years, so no survey was conducted in FY15. |

| Tracking Measures | Tracking Data – FY14 |
|---|---|
| • Report on map and database update activities annually. | • See list below under "FY15 Activities and Accomplishments." |
| • Survey map and data system users bi-annually. | • Survey last conducted in FY14 (as reported in FY14 annual report). |

**FY15 Activities and Accomplishments**

- Continued to refine private stormwater facility data maintenance procedures to streamline and clarify process.
- Started mapping impervious areas of commercial and industrial properties in the UGB.

**Planned or Considered FY16 Activities**

- Continue with further refinement of public stormwater facility data maintenance procedures.
- Continue mapping impervious areas of commercial and industrial properties in the UGB.
- Consider developing field GIS application to identify and track potential illicit discharges.

**Proposed Revisions to BMP, Measurable Goals or Tracking Measures**

None at this time.

### 3.6.3 P2 – Bacteria Pilot Study

**Responsible Department/Division:**
Public Works / Parks & Open Space

**BMP Contact:**
Parks and Open Space Division Director

**BMP Description**
Amazon Creek is water quality limited for bacteria and load reductions of 84% are necessary as specified in the 2006 Willamette Basin Bacteria TMDL.

The Bacteria Pilot Study includes three phases: Phase I focuses on efforts to identify source(s) of bacteria, followed by Phase II which focuses on the application of Bacteria Pilot Study BMPs ("BMPs") aimed at reducing bacteria, and followed by Phase III which focuses on evaluating the effectiveness of BMPs that are implemented.

Based on monitoring and site assessment work initiated with the 2005 Stormwater Management Plan the overall strategy for continuation of the Bacteria Pilot Study will be a more targeted approach that will narrow down the number of probable sources for investigation of the root of bacterial pollution within a selected study area. This more targeted approach will lead the City towards implementing Phase II and Phase III of the study.

**Tasks**
1. Conduct storm sampling and data analysis efforts aimed at specific monitoring locations within the study area that are suspected high source areas.
2. Continue to assess field conditions to confirm or rule out potential bacteria sources.
3. Develop and implement appropriate strategies that will help further identify or rule out potential sources of bacteria to MS4 system. Such strategies may include, but are not limited to: strategies for reducing the use of local waterways by waterfowl and rodents, evaluating historical maintenance activities including street sweeping and catch basin cleaning at commercial properties and the public system, expanding the current study area to incorporate discrete sites outside of the sub-basin which may assist in meeting study objectives.
4. Evaluate alternative investigative methods, techniques or methodologies including microbial source tracking and sediment analysis.
5. Improve internal communication by creating an electronic case history file that contains all documents generated as a result of field condition assessments and data collection and analysis.
6. When enough information is acquired to logically conclude that a particular condition or activity is a significant contributing source of bacteria, develop and implement BMPs as appropriate to target the specific source. Such BMPs, in the context of this Bacteria Pilot Study, may include, but are not limited to: door-to-door contact with residents and business owners; direct informational mailings; modifications to catch basin cleaning priorities and frequencies in specific areas; modifications to parks rules associated with wildlife feeding; and habitat management and tolerance policies for targeted wildlife species.
7. Conduct follow up stormwater sampling and data analysis to evaluate effectiveness of selected BMPs.

| Measurable Goals | | Status of Measurable Goals – FY15 |
|---|---|---|
| • Collect and analyze stormwater samples within the study area during at least three (3) significant wet weather storm events per year for the duration of the permit cycle. | | • Stormwater samples were collected from 3 storm events over the reporting period and samples were analyzed. Results are documented in Section 4.4.3 of this report. |
| • Report on all field condition assessments completed during the permit year. Show how collected field data is used to confirm or eliminate bacteria sources. | | • Six field condition assessments were conducted during the reporting period. Results are documented in Section 4.4.3 of this report. |
| • Initiate at least two (2) new BMPs by December 2011 that will either identify or rule out specific sources of bacterial contributions to the MS4 within the study area. | | • Done, as previously reported. |
| • Starting in July 2012, initiate at least one new BMP per year that will address identified specific sources of bacteria within the study area. | | • One new BMP was initiated in FY15: Tree planting along the north side of the Roosevelt Channel, east of Beltline Rd. |
| • Develop an electronic case history file by February 2011 that contains documentation of findings and results that can be utilized by staff to evaluate overall success of study. | | • Electronic files kept up to date and organized. |
| • Report on results of stormwater sampling and analysis in association with implemented BMPs with emphasis on showing the effectiveness of the BMP selected. | | • Data and results are reported in Section 4.4.3 of this document. |
| **Tracking Measures** | | **Tracking Data – FY15** |
| • Track the number of sampling events, samples collected, and resulting bacteria analysis results. | | • A total of 9 samples were collected at 3 sites associated with the bacteria pilot study.<br>• See Section 4.4.3 of this report for monitoring results and analysis. |

| | | |
|---|---|---|
| • Track results of field condition assessments conducted and the corresponding outcome of the assessment. Attempt to correlate noted conditions with results of sampling analysis. | | • Six field condition assessments were conducted during the reporting period and results are documented in Section 4.4.3 of this report. Field evidence suggests that avian populations are likely a significant portion of the urban bacteria lead. |
| • Document additional strategies that will identify or rule out potential sources of bacteria. Report on any conclusions derived as a result of implementing these strategies. | | • Developed spreadsheet of potential sources of bacteria, applicability of each potential source to pilot study area, inferences to sources city-wide, existing strategies, and potential additional strategies.<br>• First and foremost, the evaluation validated the City's current set of stormwater best management practices and complimentary activities beyond the stormwater program. No program gaps were identified.<br>• Results of the evaluation will inform the City's upcoming MS4 permit renewal submittal including proposed changes to the City's SWMP. |
| • Document the use of alternative investigative approaches such as microbial source tracking and sediment sampling. | | • As an alternative to microbial source tracking, the multi-year field condition assessment data were evaluated and a semi-quantitative summary was produced (see Figure 4-5 of this report). The results of the field condition assessment are highly consistent with results of the MST studies. |
| • Document all follow up sampling and analysis and conclusions derived regarding BMP effectiveness. | | • Over the course of the study, all sampling results have been documented, stored electronically, and summarized in each annual report. Results of initial sampling up- and downstream of the Roosevelt Channel planting implemented in FY15 are included in Section 4.4.3 and Appendices A and B.<br>• Field assessment and sampling will continue at this site to monitor avian activity and bacteria counts. |

**FY15 Activities and Accomplishments**

- Riparian planting along the Roosevelt Channel, referenced above, was conducted with significant contribution from the Rachel Carson School associated with Churchill High School in Eugene. City staff provided the training, materials, and equipment and supported

the volunteers in their efforts. The high school instructor, with assistance from City staff, conveyed information about the purpose and goals of the project, and more generally about sources of stormwater pollution and strategies to address them. Following the volunteer's efforts, City staff returned to install wire cages to protect the trees from other urban wildlife as they become established.

- Review of the bacteria tracking spreadsheet was conducted internally by the Bacteria Pilot Study Team, Stormwater Management Team, and Stormwater Policy Team to ensure robust program representation, data/information analysis, and evaluation. Results of the evaluation will inform the City's upcoming MS4 permit renewal submittal including proposed changes to the City's SWMP.

**Planned or Considered FY16 Activities**

- Bacteria Pilot Study monitoring will continue in FY16, including field condition assessments and in-stream monitoring up- and downstream of the Roosevelt Channel tree planting project.
- The study team will consider potential pilot study BMPs for FY16, and select the most appropriate approach to implementing a BMP given what has been accomplished thus far.
- Results of the bacteria pilot study, implemented starting in 2006, will inform the City's upcoming MS4 permit renewal submittal including proposed changes to the City's SWMP.

**Proposed Revisions to BMP, Measurable Goals or Tracking Measures**

- None at this time. Revisions will be proposed as part of the MS4 permit renewal.

## 3.7 Status of Industrial Controls

### 3.7.1 W1 – Industrial Stormwater Management Program

**Responsible Department/Division:**
Public Works / Wastewater

**BMP Contact:**
Wastewater Division Director

**BMP Description**
Provide oversight of stormwater discharges and washing activities from industrial facilities, screening new businesses for those that may require NPDES Permits, conducting inspections and providing technical assistance to industries with NPDES Permits, and responding to spills at facilities with permits.

**Tasks**
1. Manage 1200Z and 1700A NPDES permit files.
2. Evaluate new and existing facilities for requiring NPDES permits.
3. Determine permit compliance with existing NPDES permitted facilities.
4. Issue Request for Corrective Action letters for permit noncompliance.
5. Conduct periodic monitoring for compliance determination.
6. Provide technical assistance to permitted facilities.
7. Retain copies of Stormwater Pollution Control Plans for each permitted industry.
8. Retain copies of facility inspections.

| Measurable Goals | Status of Measurable Goals – FY15 |
|---|---|
| • Conduct site inspections on 20% of permitted facilities annually. | • Completed. |

| Tracking Measures | Tracking Data – FY15 |
|---|---|
| • Percentage of permitted facilities inspected. | • 23% |
| • Number of corrective action letters sent and follow up responses. | • 25 corrective action letters were sent and all required responses were received. |
| • Number of Action Plans prepared by permit registrants. | • 59 Action Plans prepared by permit registrants were reviewed and accepted. |

**FY15 Activities and Accomplishments**
- Currently there are seventy-six active 1200Z NPDES general industrial stormwater discharge permits and four active 1700A NPDES wash water discharge permits. The City of Eugene acts 1200Z and 1700A agent for DEQ.
- During this reporting period, no new 1200Z or 1700A NPDES permits were issued though two 1700A permits were terminated and one 1200Z permit was renewed.
- One new 1200Z permit application was submitted, but the permit has not yet been issued.

- Six sites were evaluated and it was suggested to DEQ that No Exposure Certification status be granted. Currently twenty-four approved No Exposure Certifications are on file. One site was evaluated and is in the process of modifying site practices in an effort to meet the No Exposure Certification requirements.
- Five new sites and one existing site were evaluated for the need of a 1200-Z Permit or No Exposure Certification and it was determined that the businesses did not qualify for coverage.
- Three businesses were evaluated for the need of 1700-A permit coverage, but did not qualify.
- No new Stormwater Pollution Control Plans were submitted.
- Sixteen existing Stormwater Pollution Control Plans were modified and approved.
- One permittee was referred to DEQ for formal enforcement for causing pollution to waters of the State. Pacific Recycling did not follow approved spill response procedures, which resulted in the discharge of hydraulic fluid.
- Nine permittees were referred to DEQ for formal enforcement for failure to conduct required monitoring. These businesses are as follows; Zip-O-Log Mills - Waite, Zip-O-Log Mills – West 6th, Armur Coating, Mohawk Metal Company, Bulk Handling Systems – Danebo, Bulk Handling Systems – West 5tth, The Truss Company, Apex Machinery, Rolling Frito-Lay, Tyree Oil, and Al's Sheet Metal. Due to confusion regarding a qualified lab report, Al's Sheet Metal was later determined to have indeed conducted the required monitoring and the penalty was rescinded.

**Planned or Considered FY16 Activities**

- Formal inspections and informal site visits will continue be conducted at 1200Z and 1700A permitted facilities to assist with and assess permit compliance.
- Stormwater sampling will be conducted at industrial and commercial facilities if there is a particular concern that the stormwater discharge from a site is significantly increasing the pollutant load to the MS4 or if there is a need to verify the accuracy of self-monitoring data.
- New and existing businesses will continue to be evaluated to determine the need for NPDES permitting and compliance with stormwater pollution related local ordinances.
- Thirty-one 1200Z permittees will be required to perform a geometric mean evaluation for statewide benchmarks (pH, TSS, Oil & Grease, copper, lead, and zinc). If the geometric mean of the samples is above the benchmark for any parameter, the business will be required to compose a plan (stamped by a professional engineer or certified engineering geologist) to install treatment measures or reduce the volume of stormwater discharge from the site.

**Proposed Revisions to BMP, Measurable Goals or Tracking Measures**

- None at this time.

## 3.8 Status of Permit Management

### 3.8.1 E5 – Permit Management & Reporting

**Responsible Department/Division:**
Public Works / Engineering

**BMP Contact:**
City Engineer

**BMP Description**
Administration of the overall NPDES permit compliance effort, including permit renewals, annual reports, program evaluations and documentation of the City's adaptive management processes, and updates to the City's TMDL benchmark assessment.

**Tasks**
1. Coordinate with all City divisions and groups that administer BMPs described within the SWMP to review program commitments, gather tracking data, and where appropriate, assist with program evaluation and additional goal setting or BMP enhancements.
2. Evaluate programs and BMPs as described in the SWMP to ensure that the overall NPDES permit objectives are being met, including reduction of pollutants on the DEQ 2004/2006 303(d) list and established TMDLs as compared to the pollutant load reduction benchmarks.
3. Conduct appropriate public involvement efforts related to various NPDES permit elements such as SWMP/Monitoring plan updates or proposed adaptive management. May include presentations to advisory groups, elected officials, and public notices.

| Measurable Goals | | Status of Measurable Goals – FY15 |
|---|---|---|
| • Submit Annual Reports to DEQ, that summarize implementation of the requirements as described in the City's MS4 permit, Schedule B. | | • Year 2014 Stormwater Annual Report submitted to DEQ on December 1, 2014. |
| • Evaluate progress towards meeting TMDL pollution reduction benchmarks for each five year renewal submittal. | | • TMDL Pollutant Load Reduction Evaluation and TMDL Wasteload Allocation Attainment Assessment completed and submitted to DEQ on December 1, 2014 *(Supplement to Stormwater Annual Report).*<br>• Process to update TMDL benchmarks was initiated during the 2015 reporting period, and will be finalized and submitted with the City's MS4 permit renewal application package in December 2015. |

| | |
|---|---|
| • Conduct public involvement within an appropriate time to meet legal requirements for the five year renewal submittals, and for on-going adaptive management as appropriate. | • Published notice in the Register Guard on of the opportunity to review the City's draft 2014 Stormwater Annual Report. Posted draft report on the City's web site and made printed copy available at PWE offices.<br>• Kept MS4 web page up to date and included staff contact information for additional information, comments or questions. |

| **Tracking Measures** | **Tracking Data – FY15** |
|---|---|
| • Track public involvement events and number of people reached. | • No comments were received on the draft 2014 Stormwater Annual Report. |
| • Post Annual Reports on City's web site. | • Final 2014 Annual Report posted on City's web site. |

**FY15 Activities and Accomplishments**

- Included description of City's adaptive management process and results for prior reporting year in the Year 2014 Annual Report.
- Completed an updated 303(d) Evaluation, as required by Schedule D.2.a of the City's permit, and submitted it to DEQ December 1, 2014 *(Supplement to Stormwater Annual Report)*
- Kept Stormwater Policy team and Stormwater Management team apprised of permit discussions with DEQ and Association of Clean Water Agency peers.

**Planned or Considered FY16 Activities**

- Finalize and submit 2015 Stormwater Annual Report by December 1, 2015.
- Work with other City stormwater managers to ensure that permit due dates continue to be met and, for multi-year efforts, that we stay on track to meet permit due dates.
- Coordinate with City stormwater managers and staff to continue implementing the adaptive management process of "develop – implement – collect data & information – evaluate – assess needs – modify."

**Proposed Revisions to BMP, Measurable Goals or Tracking Measures**

- None at this time. Revisions will be proposed as part of the MS4 permit renewal.

# 4 MONITORING PROGRAM

## 4.1 Monitoring Results Summary

Water quality results for surface water samples collected from Amazon Basin ambient monitoring locations in Eugene, Oregon indicate statistically significant long-term decreasing concentration trends occur at specific sites for arsenic, cadmium, chromium, lead, mercury, molybdenum, nickel, silver, phosphorus, nitrogen, suspended solids, temperature, and turbidity; decreasing dissolved oxygen was also observed. Statistically significant long-term increasing concentration trends occur at specific sites for lead, zinc and chemical oxygen demand.

Significant decreasing and increasing concentration trends for pollutants in the Amazon Basin occur at monitoring locations downstream of the urban environment, and serve as an indicator of the effectiveness of the sum of stormwater program elements as described in the previous sections of this report.

While significant water quality improvements have occurred at downstream monitoring locations, activities within the permit area continue to have a measurable impact on levels of pollutants observed in Amazon Basin streams and channels. Intra-basin upstream and downstream water quality comparisons indicate the concentration of metals, temperature, chemical oxygen demand, occasionally nitrogen, suspended solids, turbidity, and fecal Coliform increase as Amazon Creek flows through the urban environment. *E. coli* counts, dissolved oxygen, pH, water hardness, dissolved solids, nutrients (nitrogen and phosphorus), and dissolved zinc decrease. Analytes for the A3 Channel are greater than those measured for Amazon Creek; dissolved arsenic, chromium and mercury are exceptions. Amazon Creek analyte concentrations are greater than those measured for Willow Creek; total arsenic is an exception. The Willow Creek drainage basin serves as a background water quality site because of its relatively low development compared to the urbanized permit area, although recent trends indicate some degradation of water quality.

Statistical tests also indicate Amazon Basin water samples collected during the 2014/2015 permit year at specific sites had significantly lower analyte concentrations when compared to historical data, including , calcium, chemical oxygen demand and turbidity; however, chemical oxygen demand, turbidity, copper, and zinc concentrations were found to increase at other monitoring sites; average zinc concentrations increased substantially.

Within the Willow Creek drainage basin, a statistically significantly concentration increase was observed for dissolved and total zinc during the most recent monitoring period.

Water quality results for ambient samples collected from the Willamette River indicate statistically significant long-term decreasing concentration trends occur at two sites for phosphorus and chromium, and one for either bacteria, pH, or mercury; an increasing trend is

observed at one site for copper and at two for conductivity. An increasing dissolved oxygen trend is also observed for Delta Ponds.

As the Willamette River flows through the Eugene urban environment, analyte concentrations increase for arsenic, copper, lead, mercury, nickel, silver, and zinc metals; nutrients (nitrogen and phosphorus), dissolved and suspended solids, turbidity, hardness (calcium and magnesium), conductance, and bacteria (*E. coli* and fecal Coliform) also increase. Field pH decreases across the river reach through the urban environment.

A comparison of water quality for Delta Ponds, whose riparian habitat has been restored, to the Willamette River at Owosso Bridge indicates the ponds have higher metal concentrations for arsenic, copper, lead, nickel, and zinc; chromium and mercury concentrations are higher in the Willamette River at Owosso Bridge. Other analytes with statistically significant concentrations that are higher in Delta Ponds include hardness (calcium and magnesium), conductance, total phosphorus, nitrogen, and dissolved solids; pH values and dissolved oxygen concentrations are higher in the Willamette River at Owosso Bridge. Long-term water quality characteristics for Delta Ponds will continue to change under flow management to restore the hydraulic connectivity of Delta Ponds to the Willamette River in an effort to enhance riparian habitat.

In some instances the concentration of pollutants measured at Amazon Basin and Willamette River sites exceed Oregon water quality standards and beneficial uses for surface waters defined in Chapter 340, Division 41 of the Oregon Administrative Rules (OAR). For example, arsenic concentrations and bacteria counts in Amazon Basin streams and channels periodically exceed the human health criterion established for drinking water or recreational use. Toxicity criteria applicable to aquatic species are periodically exceeded for cadmium, copper, lead, mercury, silver, zinc, dissolved oxygen, pH, and temperature at Amazon Basin sites, and less frequently at Willamette River sites. Note, however, that exceedances of some of these pollutants in the Willamette River also occur at the monitoring location upstream of the Eugene urban area, indicating some analytes either occur naturally in the waterbody, or are affected by human activities upstream and outside of the permit boundary.

Water quality trends and comparisons indicate measurable progress is being made toward improving the water quality of channels, streams and rivers receiving stormwater runoff from the City of Eugene. Continued improvements are anticipated through adaptive management and refinement of stormwater program BMPs as needed.

## 4.2 Objectives of the Monitoring Program

Permits issued under the MS4 permit require ongoing water-quality monitoring to assess the chemical, biological, and physical effects of stormwater on receiving water bodies. The monitoring described in this report was conducted under the City's MS4 Permit Number 101244 issued on 30 December 2010, and the City's Stormwater Monitoring Plan (Monitoring Plan), incorporated by permit reference. For purposes of the Monitoring Plan, the term "monitoring" includes water quality monitoring (sample collection), monitoring activities (such as construction) in a watershed, monitoring changes in a watershed, or monitoring the success of

BMPs. This section describes the overall program effectiveness by means of analysis of water quality data and assessment of water quality trends for representative major surface water bodies receiving stormwater discharges from the City's MS4.

In addition to the regulatory requirements specified in the permit, the objectives of the Stormwater Monitoring Plan have been to:

- Identify pollutants of concern and their source;
- Identify the degree to which stormwater discharges may be contributing to water quality criteria exceedances in receiving waters;
- Identify, to the best practical extent, the impact of stormwater discharges to the aquatic environment of receiving waters;
- Identify the most effective best management practices (control measures);
- Refine estimates of annual and seasonal pollutant loads;
- Determine the frequency of monitoring required to reveal water quality trends and assess the effectiveness of control measures; and
- Maintain efficient and effective tools for storage, retrieval, and analysis of data collected, and assure data quality.

The monitoring plan was designed to provide technical information to assist in meeting the stated objectives to the maximum extent practical given available resources.

## 4.3 Organization of the Water Quality Monitoring Program

Water quality monitoring for the annual period covered by this report, includes five program elements:

- Storm event water quality monitoring;
- Ambient water quality monitoring of waterbodies receiving MS4 discharges;
- Macroinvertebrate survey of MS4 receiving waterbodies;
- Physical field condition assessments; and
- Data management, analysis, and reporting.

Every third year biological assessments through macroinvertebrate surveys of the MS4 receiving waterbodies, as well as physical field condition assessments are performed and results summarized in this report section. These field monitoring program elements were performed in 2014; biological and physical assessments, as well as macroinvertebrate results are reported here.

The following sections will focus on analysis of monitoring activities to assess overall stormwater program effectiveness by reviewing historical water quality trends for those water bodies receiving stormwater. Sampling sites are located in or near the permit boundary for the City of Eugene. Maps of the sampling locations to assess ambient and stormwater quality are referenced in the following paragraphs and included at the end of Section 4. All sampling follows the protocol established in the Monitoring Plan, including appropriate sampling, handling, and analysis methods described by the EPA and in the guidelines of 40CFR136

establishing test procedures for the analysis of pollutants. Quality assurance and controls were applied to all elements of the monitoring program, including sample collection, handling, laboratory analysis, and reporting. The Eugene/Springfield Environmental Laboratory performed analytical services under a DEQ-approved Quality Assurance Plan. Documentation and data management activities follow environmental management systems described in ISO 14001:2004(E); the Eugene/Springfield Wastewater Management Facility is registered as conforming to the ISO 14001 standard.

## 4.4 Program Activities

Program activities for the permit period primarily consisted of storm event monitoring, ambient water quality monitoring, bacteria monitoring in the MS4 as well as receiving water bodies, macroinvertebrate surveys within the Amazon and Willamette Basins, and physical field condition assessments. Figure 4-4 is a small-scale map showing the overall locations of surface water and piped system sampling sites, as well as drainage basin areas. Larger-scale maps are provided and referenced in report discussions below.

### 4.4.1. Underground Injection Control Monitoring

Stormwater flow into a sedimentation manhole just upstream of underground injection control (UIC) facilities were sampled during two storm events over the most recent reporting period. Table 4-1 presents a summary of laboratory results for the four UIC sites monitored under the City's Water Pollution Control Facility (WPCF) UIC Permit issued 22 January 2013 (Permit Number 103047); their location is shown in Figure 4-4a. Storm event samples were not collected from the Andersen at Briana (MH 75938) site during the 2014/2015 monitoring period because the UIC was decommissioned; that monitoring site was substituted with the Corliss Lane UIC (MH 73092). Tables A.1 through A.3 in Appendix A present a detailed summary of the data and comparisons to historical values. Boxplots for the data are presented in Appendix B, Figures B.1 through B.3. As reported in the Year 3 UIC Annual Report (December 2015), the concentrations reported for all analytes for the current 2014/2015 monitoring period, as well as the historical data set, are less than the UIC Permit Action Levels.

| Table 4-1<br>UIC Storm Event Monitoring Summary | | | | | | |
|---|---|---|---|---|---|---|
| **Location** | **Analyte** | **Permit Year 2015 GeoMean** | **Historical Data GeoMean** | **Data Maximum** | **Permit Action Level** | **Units** |
| Andersen at Briana: MH 75938 | Copper, Total | UIC Decommissioned | 2.09 | 2.34 | 1,300 | µg/L |
| | Lead, Total | | 0.385 | 2.00 | 500 | µg/L |
| | Zinc, Total | | 19.8 | 77.7 | 50,000 | µg/L |
| | Benzo(a)pyrene | | < 0.038 | < 0.10 | 2 | µg/L |
| | Pentachlorophenol | | 0.54 | 0.61 | 10 | µg/L |
| Corliss Lane: MH 73092 | Copper, Total | 3.97 | | 7.44 | 1,300 | µg/L |
| | Lead, Total | 1.44 | | 3.85 | 500 | µg/L |
| | Zinc, Total | 53.4 | | 77.0 | 50,000 | µg/L |
| | Benzo(a)pyrene | < 0.10 | | < 0.11 | 2 | µg/L |
| | Pentachlorophenol | < 0.52 | | < 0.55 | 10 | µg/L |
| Marjorie & Downing: MH 99302 | Copper, Total | 1.49 | 1.64 | 2.03 | 1,300 | µg/L |
| | Lead, Total | 0.144 | 0.233 | 0.290 | 500 | µg/L |
| | Zinc, Total | 56.2 | 60.7 | 85.6 | 50,000 | µg/L |
| | Benzo(a)pyrene | < 0.11 | < 0.039 | < 0.12 | 2 | µg/L |
| | Pentachlorophenol | < 0.57 | 0.29 | 0.61 | 10 | µg/L |
| Shenstone & Tyson: MH 73919 | Copper, Total | 2.07 | 1.12 | 2.87 | 1,300 | µg/L |
| | Lead, Total | 0.107 | 0.205 | 0.230 | 500 | µg/L |
| | Zinc, Total | 71.7 | 688 | 2490 | 50,000 | µg/L |
| | Benzo(a)pyrene | <0.11 | < 0.038 | < 0.12 | 2 | µg/L |
| | Pentachlorophenol | < 0.54 | 0.52 | 0.56 | 10 | µg/L |
| No analyte concentrations exceed the Permit Action Level.<br>Sampled Storm Events: 1/28/2014; 2/14/2014; 10/22/2014; 12/1/2014 | | | | | | |

### 4.4.2. Storm Event Water Quality Monitoring

Storm event monitoring was conducted at multiple sites to assess stormwater quality; Table 4-2 below summarizes the sampling locations and types of samples collected for the analytes indicated (see Figures 4-4a through 4-4g for monitoring locations). Table 4-2 also indicates whether the sampling locations are from the MS4 (piped system) or surface water, and the respective receiving waterbody, located either within the Amazon Creek basin or the Willamette River. Other storm event sampling locations include a Contech structural facility located in the Owen Rose Garden adjacent the Willamette River, Spring Creek in north Eugene for pesticides screening, and the Roosevelt Channel to assess a Bacteria Pilot Study (BMP P2) BMP installation to control bacteria. Willow Creek is included among storm event monitoring sites for use as a baseline to represent background conditions because its drainage basin is relatively undeveloped; this site is used to compare relative pollutant loads at other storm event monitoring sites.

Water quality is characterized through a variety of analytical tests, including field measures of dissolved oxygen, pH, and temperature, and a suite of conventional water quality tests including bacteria, hardness, solids, oxygen demand, nitrogen and phosphorus nutrients, and metals. The sample type – either grab or flow proportional – is also shown in Table 4-2 for each sampling location. In addition, a few surface water and piped-system MS4 sites were tested for dioxin, chlorinated hydrocarbons, and methyl mercury.

Flow-proportional stormwater samples collected from the 5$^{th}$ Avenue/Seneca monitoring site, which receives runoff from a combination of wholesale (12%), general services (15%), retail (15%), and industrial (15%) properties; other significant uses include roads (17%) and vacant lots (12). Samples from the Chambers at 18$^{th}$ Avenue monitoring site are primarily from parks (65%, retail (27%), and roads (8%); the Altura site is comprised of single family residential properties (78%) and roads (22%); the Copping site is a combination of single family residential (64%), roads (17%, parks (12%), and vacant (6%) properties. Within the Willow Creek drainage basin, primarily parks (25%), timber (17%), single family residential (6%), roads (4%), general services (5%), and vacant lands (44%) comprise the land use categories.

Laboratory data for stormwater samples collected from these five locations are presented in Appendix A, Tables A.4 through A.8 and color coded to indicate percent change of geomeans of the 2014/2015 samples compared to historical data. Boxplots of all data are shown in Appendix B, Figures B.4 through B.23. The boxplots also include a comparison to an Oregon water quality standard when available. While the water quality standard is not directly applicable to stormwater data, these comparisons are helpful in assessing whether stormwater pollutants contribute toward exceedance of a water quality standard for an impaired waterbody, or has potential to cause acute or chronic aquatic toxicity. Boxplots consist of a horizontal line in the middle of the box, which marks the median of the sample set; the median splits the ordered sample set in half. The box represents the central 50 percent of data values; the outer edge of each box mark the 25$^{th}$ and 75$^{th}$ percentiles. Whiskers extending from the box mark the range of values that fall within 1.5 box-lengths from the 25$^{th}$ or 75$^{th}$ percentile. Outliers and extreme values are also depicted in the figures, values that are more than 1.5 box-lengths from the 25$^{th}$ or

75th percentiles are identified as outliers and are denoted by an open circle; extreme values are more than 3 box-lengths and are denoted by an asterisk.

In general, water quality comparisons of storm-event data shown in the tables are for a small number of sampling events for the 2014/2015 sampling period; the historical data set for the Chambers at 18th and W. 5th at Seneca sites consists of 18 and 17 events respectively for the full suite of water quality parameters. Thus, the observed water quality changes may appear to exhibit large changes over short time periods; however, when these data are compared to historical data, the storm-event data tend to be within the observed range of historical water quality. Exceptions will be described in the sections below. Note that Willow Creek is an exception – surface water samples collected are indicative of storm-event stream water quality, which is compared to the ambient historical data to assess relative pollutant contributions. Historical data from storm event monitoring will be used to assess implementation of the City's SWMP BMPs and will inform adaptive management measures to reduce pollutant contributions from the MS4 to downstream waterbodies. Further discussion of storm event monitoring is presented in the sections below.

**Table 4-2**
**2014/2015 Storm Event**
**Water Quality Monitoring Sites**

| Location | MS4 System Type | Sample Type | Analyte Type |
|---|---|---|---|
| **Amazon Basin Sampling Sites:** | | | |
| A3 Channel:<br>at Bertelsen<br>at Seneca | Surface Water | Grab | Pesticides |
| Chambers at 18th Avenue, NE;<br>MH 55402<br>NE Loading Dock Catch Basin | Piped System | Grab | Field, Bacteria |
| Chambers at 18th Avenue, NE; MH 55404 | Piped System | Grab & Flow Proportional | Field, Metals, MeHg, Conventional, Nutrients, and Chlorinated Organics |
| Roosevelt Channel<br>Upstream; MH 79222<br>Downstream; MH 79206 | | Grab | Field, Bacteria |
| West 5th at Seneca; MH 63693 | Piped System | Grab & Flow Proportional | Field, Metals, MeHg, Conventional, Nutrients, Chlorinated Organics |
| Willow Creek at 18th Avenue | Surface Water | Grab & Flow Proportional | Field, Metals, Conventional, Nutrients |
| **Willamette River Basin Sampling Sites:** | | | |
| Altura; MH 99365<br>Copping; MH 77793 | Piped System | Grab & Flow Proportional | Metals, Conventional, Nutrients, Dioxin |
| Spring Creek<br>at Naismith (Upstream)<br>at Beacon Drive East (Downstream) | Surface Water | Grab | Pesticides |
| Contech Structural MMP<br>Downstream Structure 85867<br>Upstream Structure 85866 | Piped System | Grab | Field, Metals, Conventional, Nutrients |

Storm event monitoring for the Contech structural facility located in the Owen Rose Garden included three pairs of grab samples during storm events, both upstream and downstream of the structure. At this time there are insufficient data to draw any conclusions as to the effectiveness of the Contech device. Data are presented in Tables A.12 and A.13.

#### *4.4.2.1.* Willow Creek – Background Location – Surface Water

One storm event was sampled for water quality analytes during the 2014/2015 monitoring period (see Figure 4-4b for the sampling location); unusually dry conditions in the Willamette Valley resulted in no stream flow for about half the year as well as during storm events. For the most part, water quality results for the single sampling event are comparable to the historical data set with a few exceptions. Concentrations increased for 43% and decreased 57% for the total number of analytes. Dissolved chromium and total selenium are about two to three times higher than the geometric mean (geomean) historical values (see Appendix A, Table A.4). The concentration of dissolved cadmium and mercury also indicate a significant change from historical geomean values; however, the results for these metals are reported at just above the reporting limits, which here are calculated as one-half the practical quantitation level (PQL). Other water quality parameters vary considerably less than the previously mentioned metals. The values observed for the recent storm-event data compared to the historical data set are within range of the observed historical water quality values.

Comparisons of the Willow Creek stormwater data to state water quality standards indicate copper and lead values (Figures B.7 and B.8) exceed the State's chronic criterion for fish; TDS and bacteria values (Figures B.16 and B.19) also exceed the indicated water quality standard; occasionally dissolved oxygen (Figure B.14) is lower than the minimum standard of 6.5 mg/L. For pH, multiple values are below the minimum freshwater criterion of 6.5 and one outlier at the maximum criterion of 8.5 (Figure B.18). Flow data are not available for Willow Creek so turbidity (Figure B.16) values are compared to an estimated flow-based turbidity target defined in the Willamette Basin TMDL, which is derived for Amazon Creek using Long Tom River flows near Noti as a reference river discharge. Stormwater data for Willow Creek in this instance periodically exceed the highest turbidity standard of 27 NTU for Amazon Creek during high stream flows, and would likely exceed the derived turbidity standard during low stream flows.

#### *4.4.2.2.* Chambers & West 18th Avenue, NE Lot: MH 55404 – MS4 Piped System

This drainage basin includes commercial properties, portions of Westmoreland Park, and Jefferson Middle and Magnet Arts schools (see Figure 4-4c). Impervious surfaces, including rooftops and paved parking areas at these properties, as well as a section of West 18$^{th}$ Avenue, a minor arterial roadway, are sources of stormwater runoff influencing water quality characteristics at this MS4 piped system monitoring location (MH 55404). Four flow-proportional storm events were sampled for the full suite of water quality analytes, 62% of which had geomean concentrations modestly lower than or equal to historical values. Geomeans for total arsenic, cadmium, chromium, copper, mercury, silver, dissolved selenium, and total and dissolved lead, molybdenum, nickel, *E. coli*, fecal coliform, dissolved oxygen, chemical oxygen demand, Kjeldahl nitrogen, total phosphorus, magnesium, suspended solids, turbidity, and oil and grease (silica gel treated hexane extractable material – SGT-HEM), are modestly lower than historical geomeans. Nearly 38% of the analyte values were higher than historical data values. Geomeans

for dissolved arsenic, cadmium, chromium, copper, mercury, silver, total selenium, and total and dissolved zinc, as well as biochemical oxygen demand, specific conductance, calcium, nitrogen (ammonia and $NO_3$+$NO_2$-N), ortho phosphorus, temperature, dissolved solids, were modestly greater than historical geomean values. Concentration decreases were observed for chlorinated hydrocarbons but the differences are less statistically significant; while the analytes were detected they were below the method reporting limit. Table A.5 summarizes these stormwater quality results.

Comparison of stormwater quality values for this piped system location to state water quality standards indicate concentrations of arsenic, cadmium, copper, lead, mercury, zinc, and dissolved solids, bacteria, and turbidity (see Section 4.4.4.5 for a discussion of stream-flow derived turbidity standards) in stormwater are greater than the lowest listed acute, chronic or human health criterion, or other water quality standard (see Figures B.4 through B.22). Amazon Creek, which is the receiving waterbody for stormwater from this location, frequently exceeds applicable state water quality standards for the same pollutants both upstream and downstream of the outfall to which this stormwater monitoring site discharges. In addition, statistically significant concentration increases occur for most of these pollutants in the reach of Amazon Creek 2.5 miles upstream of the 29$^{th}$ Avenue monitoring site and 4.5 miles downstream to the Railroad Track Crossing monitoring site with respect to the location of this MS4 outfall. Later sections of this report discuss significant water quality trends for stormwater receiving waterbodies in the ambient monitoring program.

Two storm events were sampled at this location for dissolved and total methyl mercury; the maximum observed dissolved methyl mercury concentration was reported at 0.0585 ng/L with a reporting limit of 0.0250 ng/L. The maximum total methyl mercury was reported at 0.135 ng/L, also with a reporting limit of 0.0250 ng/L.

Chlorinated hydrocarbons were also analyzed for the four storm events at this piped system location, including 1,1-dichloroethene, trans-1,2-dichloroethene, trichloroethene (TCE), and tetrachloroethene (PCE); dichloroethene is a degradate of TCE. Amazon Creek is impaired for these pollutants (2004 303(d) listed). Three values for PCE were J-flagged, that is, analysis indicated the possible presence of these compounds; the detected concentration was less than the reporting limit of 5 µg/L. While J-flagged values are lower than the criteria and the waterbody is not presently used for fish and water consumption by humans, the presence of these pollutants in stormwater may contribute to degradation of Amazon Creek. The J-flagged values range from 0.10 µg/L to 0.33 µg/L; the human health criterion is 0.24 µg/L. Trichloroethene J-flagged values were 0.07 µg/L and 0.10 µg/L; the human health criterion is 1.4 µg/L. Note that the human health criterion for both pollutants is for fish and water consumption; these pollutants have no toxics criteria for fish.

No land use activities typically associated with these types of pollutants are located within the drainage basin area. However, consumer products such as cleaners and solvents containing small amounts of these chlorinated hydrocarbons may be available to the public from commercial businesses within the basin. Businesses within the basin also may utilize these consumer products for operations/maintenance purposes.

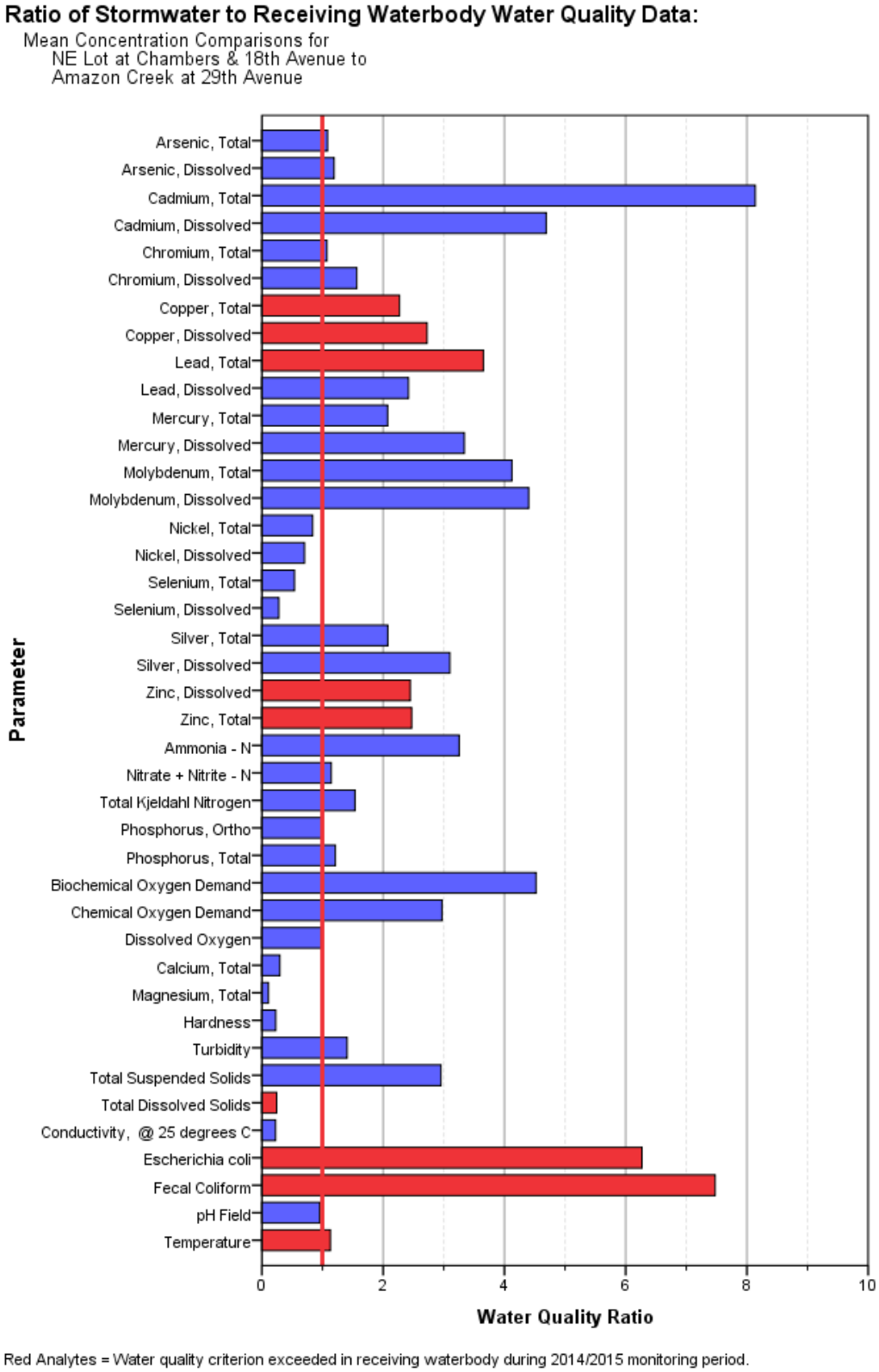
Comparison of MS4 stormwater quality to ambient receiving waterbody quality is useful in assessing relative concentrations of pollutants. Figure 4-1 compares mean stormwater quality data for the site to the historical means at the nearest upstream ambient monitoring site, in this case Amazon Creek at 29th Avenue. Multiple analytes exceed an equivalence ratio of one, that is, the concentration of the stormwater analyte value is greater than that of the receiving water body value.

Red bars represent analytes measured in the respective receiving waterbody that exceed applicable Oregon water quality standards for ambient monitoring samples collected during the monitoring period. Given the magnitude of the concentration ratios, it can be presumed a ratio greater than one indicates stormwater pollutant loads contribute toward exceedance of water quality standards.

The equivalent ratio is useful in terms of assessing which pollutants are of potential concern in stormwater runoff when compared to receiving waterbody quality. Water quality ratios obviously depend on the relative analyte concentrations in the waterbodies being compared. Analyte concentrations were used to estimate pollutant loads for the drainage basin areas as defined by the stormwater sampling locations within the MS4 (see Figure 4-4c through 4f). Pollutant load estimates were calculated utilizing the Peak Runoff Rate method developed by the U.S. Soil Conservation Service for various land use and soil types, data that are readily available in the City's GIS database. Additional data inputs include pervious surface area, topography, and storm event characteristics. Charts in Figures B.26 through B.33 present boxplots for estimated pollutant loads for the NE lot at Chambers & 18th sampling location, in units per acre, for all storm event sampling performed since 2010. Bacteria and turbidity pollutant load contributions to Amazon Creek appear to be significant given the stream is water-quality impaired for these two parameters; the median bacteria loading is about one-billion per acre for *E. coli*, and turbidity loading is nearly 130,000 NTU per acre. Pollutant loads for the remaining analytes at this site are below estimates documented in the City's September 2008, Permit Renewal Report. Additional sampling events conducted over the course of the permit term will be evaluated to refine pollutant mass loading estimates and BMP strategies that target activities and/or sources for these and other pollutants of concern.

Four storm event hydrographs for the MS4 piped system were collected for flow proportional sampling at this site and is shown in Figures B.195 through B.198. Two storm events were sampled in 2014, one on October 14th, the second beginning December 18th; two storm events in 2015 included one on March 20th and the second beginning May 11th.

**Figure 4-1**




Red Analytes = Water quality criterion exceeded in receiving waterbody during 2014/2015 monitoring period.

### *4.4.2.3.* Copping Street – MS4 Piped System

Two storm events were sampled at this residential MS4 site during the 2014/2015 monitoring season; however, only one was successful for analysis of the full suite of water quality parameters, the sampler failed for the second event but a grab sample was collected for field parameters and dioxin, (see Figure 4-4d for the location and areal extent of this drainage basin). Modest analyte concentration decreases were observed for 73% of analytes; concentrations increased for 27%.

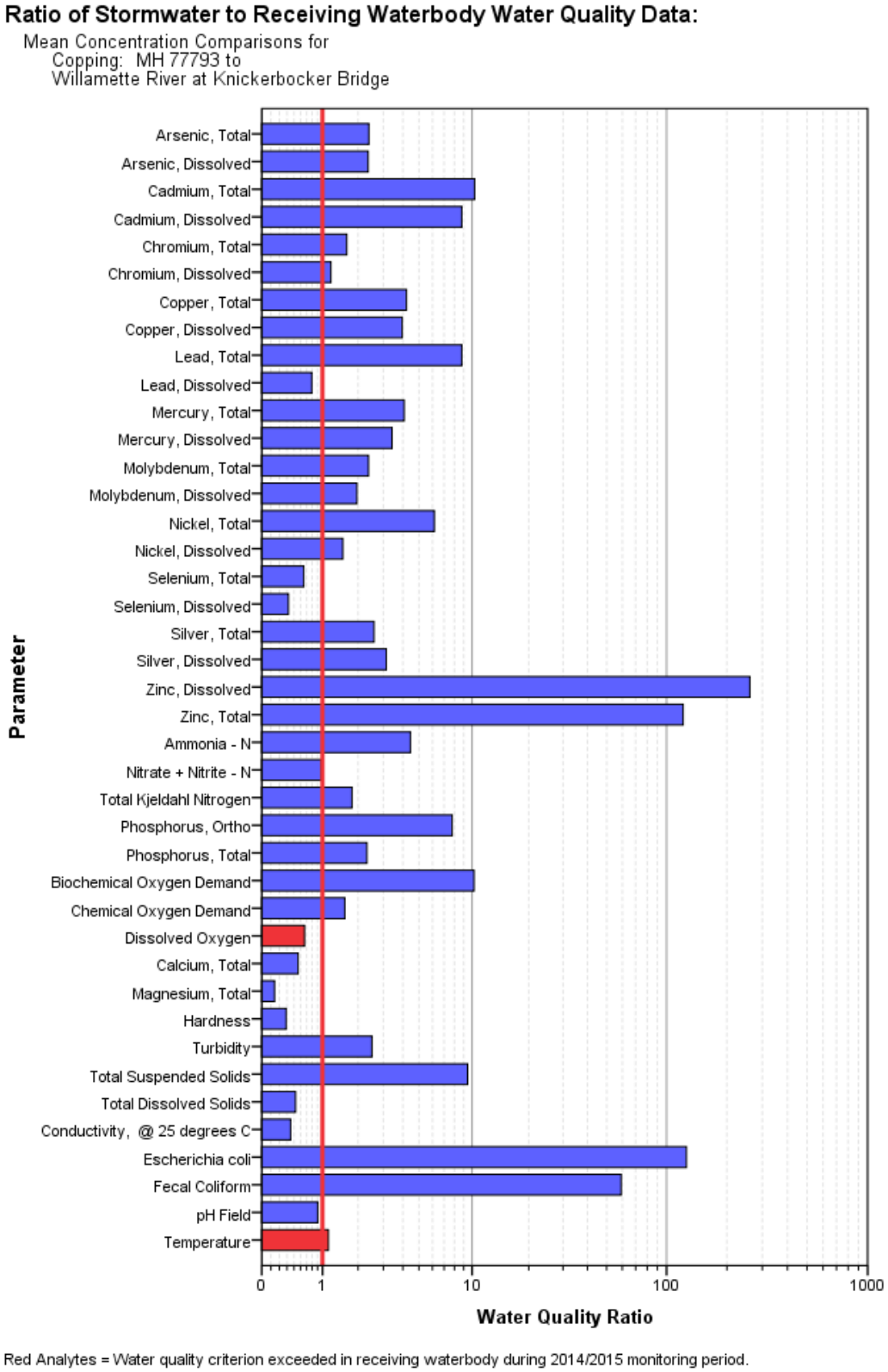
Total and dissolved arsenic, cadmium and zinc, as well as dissolved mercury and silver, and total nickel were among the metals with higher concentrations for the storm event sampled. In the case of cadmium, both the total and dissolved fraction are greater than values observed for the historical data set. *E. coli* and temperature also were higher than the historical geomean. Total and dissolved chromium, copper, lead, total mercury, molybdenum, selenium and silver concentrations are modestly lower than respective historical geomeans. Other parameters with lower storm event concentrations include nitrogen (ammonia, $NO_3$+$NO_2$-N, Kjeldahl nitrogen), phosphorus (ortho and total), oxygen demand (biochemical and chemical; dissolved oxygen decreased, however), fecal coliform, hardness (calcium and magnesium), pH, oil and grease (SGT-HEM), solids (dissolved and suspended), and turbidity (see Section 4.4.4.5 for a discussion of stream-flow derived turbidity standards). Table A.6 summarizes stormwater quality data for this sampling site.

While state water quality standards are not directly applicable to stormwater data, comparisons here are helpful in assessing whether stormwater pollutants contribute toward exceedance of a water quality standard for an impaired waterbody (see Figures B.4 through B.22). The Willamette River was listed in the 2004/2006 303(d) as impaired for dioxin, and currently as water quality limited for mercury, bacteria, and temperature. Pollutant load calculations for the sampling event suggest that the Copping drainage basin area is not a significant source of listed pollutants, nor a source of significant pollutant loads to the Willamette River, as estimated in Figures B.26 through B.33.

Cadmium, lead, suspended solids, total phosphorus, and biochemical oxygen demand are about 10 times greater than those measured in the Willamette River at the Knickerbocker Bridge as indicated in Figure 4-2; fecal Coliform and *E. coli* counts in the stormwater are 60 to over 100 times greater, respectively. Statistical tests described later in this report indicate an increase in lead and bacteria concentrations in the Willamette River between the Knickerbocker Bridge and the next downstream ambient monitoring location at the Owosso Bridge. Tire weights fallen from vehicle tires and subsequently pulverized on roadways are a primary source of particulate lead in stormwater (EPA); lead-acid batteries are also a significant source of lead is MS4 runoff, although this residential MS4 drainage basin likely contributes only a fraction of the total lead concentration leading to the observed increase between the two Willamette River monitoring sites.

The storm event hydrograph for this MS4 piped system sample is shown in Figure B.199, which was sampled on 30 March 2015.

**Figure 4-2**




Red Analytes = Water quality criterion exceeded in receiving waterbody during 2014/2015 monitoring period.

### *4.4.2.4.* Altura: MH99365 – MS4 Piped System

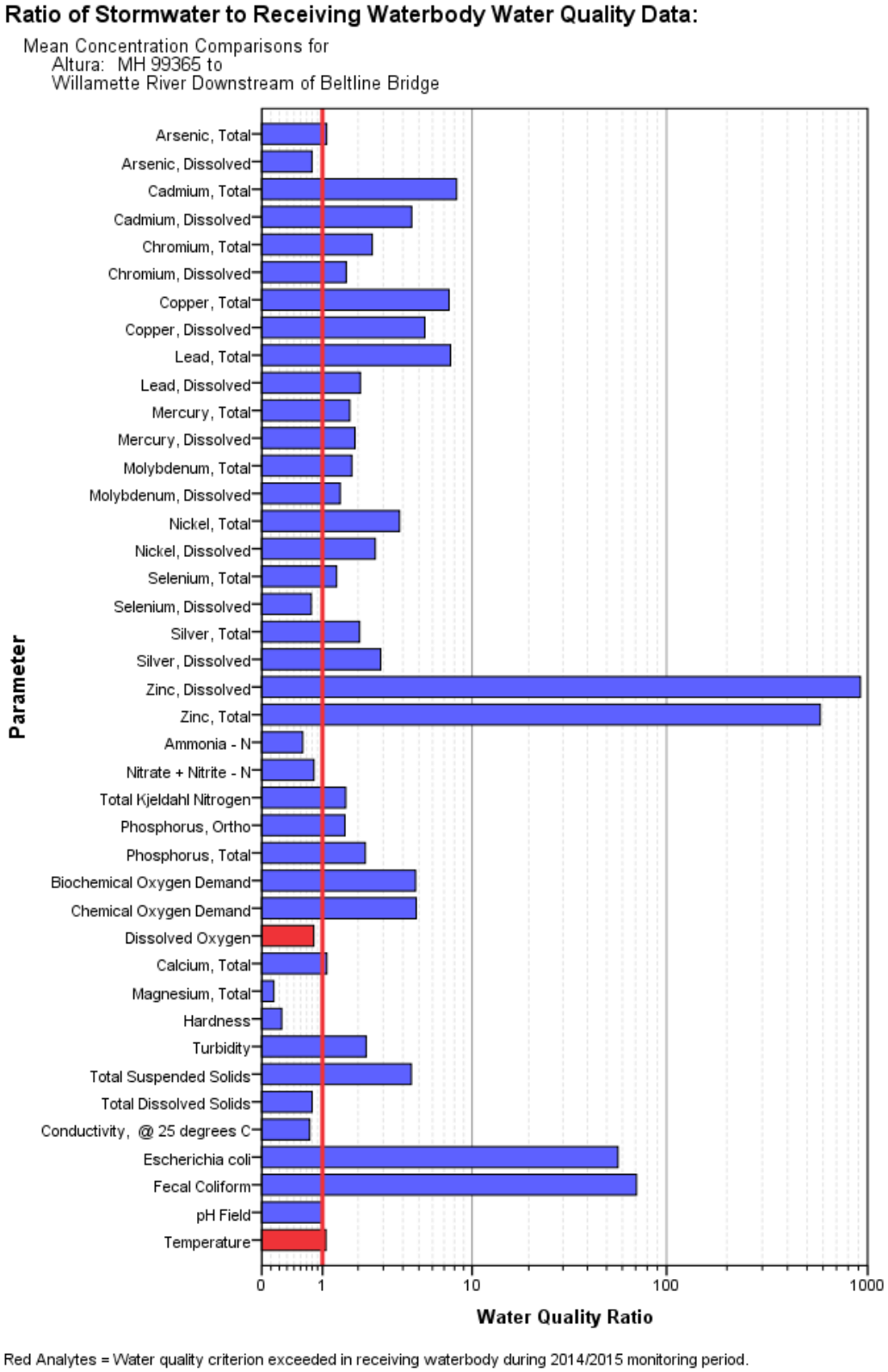
Two storm events were sampled at this residential MS4 site during the 2014/2015 monitoring season for the full suite of metals and conventional pollutants (see Figure 4-4e for the location and areal extent of this drainage basin). This location was intended to replace the Copping site described above because of its tendency toward being flashy during storm runoff; however, after reviewing anomalous flow data for Altura sampling events it was discovered flow through this MS4 site was to a tip-up farther downstream, which caused flow to back up into the pipe where sampling occurred. This site will not be sampled in the future; an alternative sampling site has not been identified at this time. While mass loads cannot be calculated, the water quality data is nonetheless informative in terms of relative concentrations and potential pollutants of concern. Table A.7 summarizes stormwater quality data for this sampling site.

While state water quality standards are not directly applicable to stormwater data, comparisons here are helpful in assessing whether stormwater pollutants contribute toward exceedance of a water quality standard for an impaired waterbody (see Figures B.4 through B.21). The Willamette River was listed in the 2004/2006 303(d) as impaired for dioxin, and currently as water quality limited for mercury, bacteria, and temperature. Storm event data suggest that the Altura drainage basin area is not a significant source of listed pollutants. Loading could not be determined because of anomalous MS4 flow characteristics.

While the Altura drainage basin area flows into Spring Creek, the receiving waterbody is eventually the Willamette River. Figure 4-3 is a comparison of the water quality ratio between stormwater samples from the Altura site to the Willamette River downstream of Beltline Bridge. The maximum concentration of total zinc at 1970 µg/L is nearly 1000 times higher than those measured in the Willamette River and is nearly 50 times the average concentration observed in Spring Creek at Beacon Drive East (see Table A.21). Zinc is commonly used as a moss control agent in the Willamette valley and concentrations at several ambient monitoring locations are trending upward, as discussed in the trends section below.

*E. coli* and fecal Coliform counts are 60 to 70 times higher than the Willamette River and 19 and 5 times greater than Spring Creek, respectively. These storm event results will be used to assess development and implementation of appropriate BMPs focusing on pollutant contributions from the MS4 identified as potentially effecting impairment of waterbodies within the NPDES permit area.

**Figure 4-3**




Red Analytes = Water quality criterion exceeded in receiving waterbody during 2014/2015 monitoring period.

### *4.4.2.5.* W 5th Avenue at Seneca: MH 63693 – MS4 Piped System

Two storm events were sampled at this monitoring location for the full suite of metals, field measurements, conventional analytes, and chlorinated hydrocarbons; additionally, one storm event was sampled for dissolved and total mercury and methyl mercury (see Table A.8 for a summary of stormwater quality results). The W 5th Avenue at Seneca site (see Figure 4-4f) was selected to assess pollutant sources of 1,1-dichloroethene (DCE), trans-1,2-dichloroethene and tetrachloroethene (PCE) to the A3 Channel because it is on Oregon's 303(d) list of impaired waterbodies for these pollutants. Dichloroethene is a degradate of trichloroethene. One value for DCE and two for PCE were J-flagged, that is, analysis indicated the possible presence of these compounds; the concentrations were 0.07 µg/L for DCE, and 0.08 µg/L and 0.72 µg/L for PCE, less than the reporting limit of 2.5 µg/L (one-half the PQL). As stated in the section above, the human health criterion for PCE is 0.24 µg/L for fish and water consumption; the estimated concentration of PCE in stormwater is three times greater than the criterion. While the waterbody is not presently used for fish and water consumption by humans, the presence of these pollutants in stormwater may contribute to degradation of the A3 Channel, as well as Amazon Creek immediately downstream.

Potential sources of chlorinated hydrocarbons within this industrial and commercial drainage basin area include multiple businesses. Recent revisions to General 1200 Z stormwater discharge permits require permittees to monitor for chlorinated hydrocarbons and institute compliance benchmarks. The combination of industrial, stormwater, and ambient monitoring efforts will greatly assist in minimizing release of these pollutants to Oregon's waterbodies.

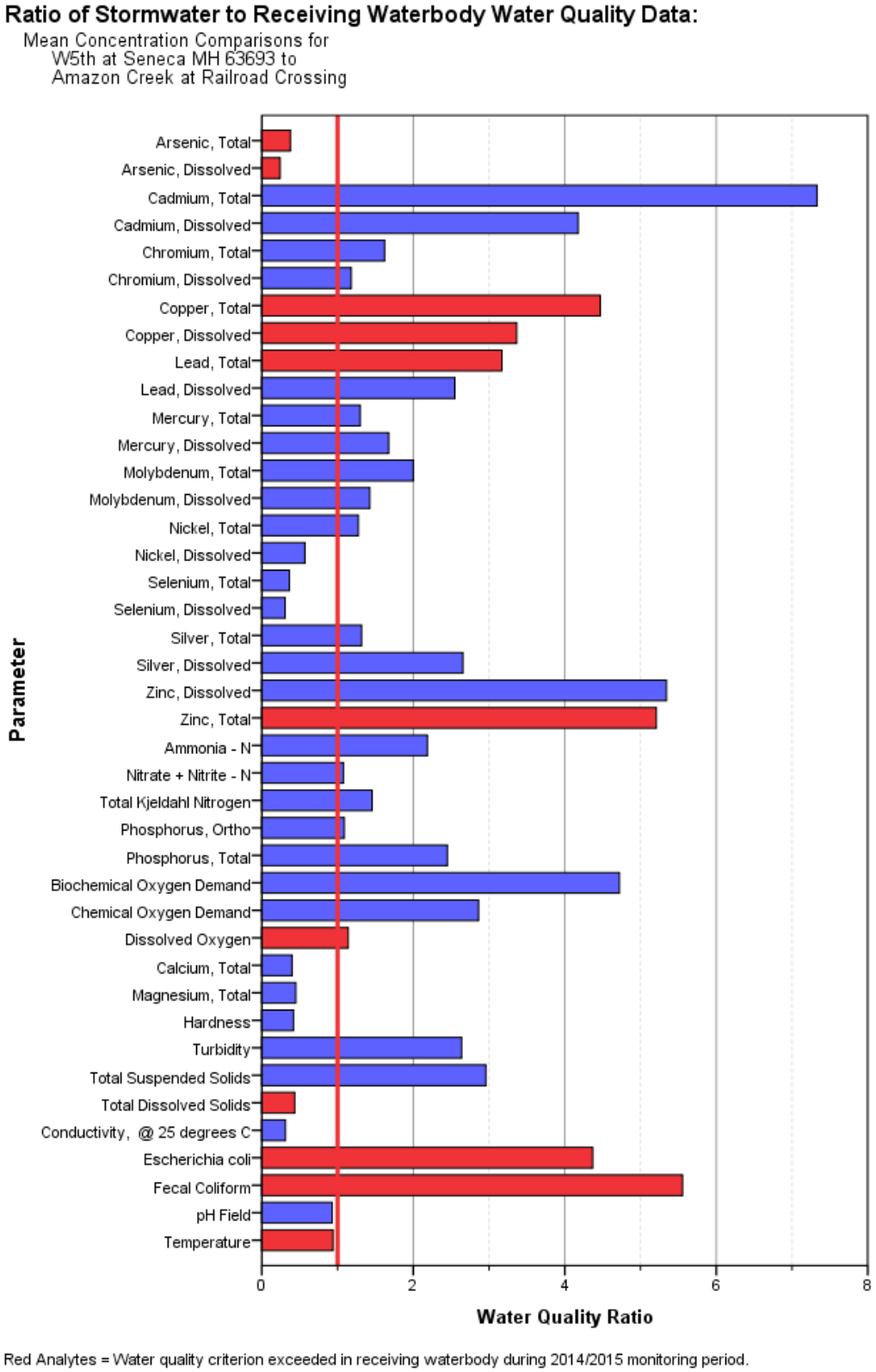
Of the analytes tested on the four sets of stormwater samples, 66 percent of results had geomean concentrations that were equal to or lower than historical data for this site; overall, changes were mostly modest. Analytes whose values increased (34%), include a two-fold increase in fecal Coliform and total zinc.

Two storm events were sampled at this site for dissolved and total methyl mercury; the maximum observed concentration for dissolved methyl mercury was 0.0585 ng/L with a reporting limit of 0.0250 ng/L (one-half the PQL of 0.050 ng/L). The maximum observed concentration for total methyl mercury was 0.135 ng/L, also with a reporting limit of 0.0250 ng/L.

Comparison of stormwater runoff from this MS4 site to state water quality standards indicates concentrations of cadmium, copper, zinc, turbidity (see Section 4.4.4.5 for a discussion of stream-flow derived turbidity standards), pH, and bacteria in stormwater are greater than state water quality criteria (see Figures B.4 through B.23).

The nearest ambient monitoring location on the A3 Channel at Terry Street is downstream of the W 5th and Seneca MS4 monitoring site so a comparison would include the pollutant contributions from this MS4 site. A comparison of stormwater quality from this site is instead made to ambient water quality as measured on Amazon Creek at the Railroad Crossing, which is upstream of the confluence with the A3 Channel. Figure 4-4 indicates that the geomean stormwater concentration of metals lead, copper, zinc, and cadmium range from 3 to 7 times higher than the ambient concentration in Amazon Creek; biochemical oxygen demand and

**Figure 4-4**




Red Analytes = Water quality criterion exceeded in receiving waterbody during 2014/2015 monitoring period.

bacteria are about 5 times higher. Additionally, stormwater from this site is interpreted as contributing toward exceedance of copper, lead, zinc, and bacteria water quality standards applicable to Amazon Creek. Stormwater hydrographs for this site are shown in Figures B.200 through B.203.

Currently, stormwater runoff from the W 5th and Seneca location likely contributes toward exceedance of water quality standards in the Amazon Creek for arsenic, cadmium, copper, lead, mercury, silver, zinc, bacteria, dissolved solids, dissolved oxygen, and turbidity as shown in Figures B.4 through B.23. Analyte concentrations were used to estimate pollutant loads for the drainage basin areas as defined by the sampling location within the MS4 (see Figure 4-4f). Charts in Figures B.26 through B.33 present boxplots for estimated pollutant loads at the W 5th and Seneca sampling location, in units per acre, for all storm events sampled since 2010. Bacteria and turbidity pollutant load contributions to the A3 Channel appear to be significant given Amazon Creek, to which the A3 Channel discharges, is water-quality impaired for these two parameters. Median fecal Coliform and *E. coli* loading is about 60 billion per acre; turbidity is about 600,000 NTU per acre. Pollutant loads for the remaining analytes at this site are below estimates documented in the City's Permit Renewal Report.

#### *4.4.2.6.* Pesticides in Storm Event Samples

The City's MS4 permit requires three stormwater sampling events be performed at a minimum of two sites for pesticides during the permit period, which began upon permit issuance in December 2010. The 2014/2015 sampling event completes this permit monitoring requirement. Pesticide sampling was done at four sites to assess upstream and downstream water quality changes in two waterbodies, the A3 Channel at Seneca (upstream) and Bertelsen (downstream), and in Spring Creek at Naismith (upstream) and Beacon Drive East (downstream). Table 4-3 is a summary of those pesticide values for which concentrations were detected above the reporting limit (in this instance is one-half the practical quantitation limit, PQL), for all three sampling events collected over the permit period. Pesticide data for the single 2014/2015 sampling event is compared to historical data from the two previous sampling events following the City's stormwater monitoring plan. In addition, pesticide results are compared to water quality standards where available, including the U.S. EPA human health drinking water quality standards, the U.S. EPA aquatic life benchmarks for fish and invertebrates, and Oregon's human health criteria in Table 40, and aquatic life criteria in Tables 30 and 31, which are shown in the rightmost column of Table 4-3. Note that human health criteria are only available for two of the pesticides detected; the remainder are benchmarks established by the U.S. EPA and consist of the lowest concentrations listed for the protection of aquatic life. The entire data set, which includes laboratory results for about 190 different pesticides, is included in Tables A.16 and A.17.

One pesticide, fipronil, was found to exceed EPA's benchmark for invertebrate chronic toxicity and is shaded in the table. These data will be reviewed to evaluate current BMPs and potential adaptive management to further address pesticides in Eugene's waterways. The following entries briefly describe the pesticides detected and their common uses:

- **2,4-D:** 2,4-Dichlorophenoxyacetic acid is a common systemic herbicide used in the control of broadleaf weeds. It is a synthetic auxin and one of the most widely used

herbicides in the world. 2,4-D is toxic to fish and other aquatic life. Oregon's water quality standard for the consumption of fish and water is 100 µg/L; the federal drinking water criterion, maximum contaminant level (MCL) for 2,4-D is 70 µg/L.

- **Dicamba:** Dicamba (3,6-dichloro-2-methoxybenzoic acid) is an herbicide used for broadleaf control before and after they sprout. In combination with a phenoxy herbicide or with other herbicides, dicamba is used in also used along fencerows and roadways to control weeds. Dicamba functions by increasing plant growth rate to outgrow its nutrient supply and die.

- **Diuron:** Diuron is a substituted urea herbicide used to control a wide variety of annual and perennial broadleaf and grassy weeds, as well as mosses. It is used on non-crop areas and many agricultural crops. Diuron works by inhibiting photosynthesis.

- **Fipronil:** Fipronil is a broadly used insecticide that disrupts the insect central nervous system resulting in CNS toxicity. Fipronil is highly toxic to fish and aquatic invertebrates, although its tendency to bind to sediments and its low water solubility may reduce the potential hazard to aquatic wildlife.

- **MCPP:** Mecoprop, or methylchlorophenoxypropionic acid, is a common general use herbicide found in many household weed killers and "weed-and-feed" type lawn fertilizers. It is primarily used to control broadleaf weeds and is often used in combination with other chemically related herbicides such as 2,4-D, dicamba, and MCPA.

- **Propiconazole:** Propiconazole is a triazole fungicide, also known as a DMI, or demethylation inhibiting. Propiconazole is used agriculturally as a systemic fungicide on turf grasses. It is also used in combination with permethrin in formulations for wood preservation.

- **Pyrimethanil:** Pyrimethanil is a broad-spectrum fungicide used to control gray mold and blight, often used on fruits and vegetables (tomato, cucumber, strawberry, chives, etc.), and to inhibit black spot on fruit tree leaves.

- **Quinclorac:** Quinclorac is a selective herbicide used primarily to control weeds in agricultural crops, and is also found in some household herbicides for lawn use. Most lawn maintenance companies use the product for the control of annual grass weeds like crabgrass.

- **Simazine:** Simazine is an herbicide used to control broad-leaved weeds and annual grasses. The federal drinking water standard, MCL, for simazine is 4 µg/L.

- **Triclopyr:** Triclopyr is a systemic foliar herbicide used to control broadleaf weeds while leaving grasses and conifers unaffected. Triclopyr is effective on woody plants and is used for brush control in rights of way and defoliation of wooded areas.

**Table 4-3**
**Summary of Pesticides Detected in Storm-Event Samples**

| Parameter | 2014/2015 Value µg/L | RL µg/L | Historical | | | | | WQ Standard or Benchmark µg/L |
|---|---|---|---|---|---|---|---|---|
| | | | N | Mean | SD | Min | Max | |
| **A3 Channel at Seneca (Upstream)** | | | | | | | | |
| 2,4-D | 1.80 | 0.04 | 2 | 0.15 | 0.16 | <0.04 | 0.26 | 70[a]<br>100[b] |
| Dicamba | 0.16 | 0.04 | 2 | <0.04 | 0.00 | <0.04 | <0.04 | 14000[c]<br>17300[e] |
| Diuron | 0.099 | 0.03 | 2 | 0.40 | 0.23 | 0.23 | 0.56 | 26[c]<br>80[f] |
| MCPP | 0.29 | 0.04 | 2 | <0.04 | 0.00 | <0.04 | <0.04 | 50000[f] |
| Propiconazole | 3.20 | 0.15 | 2 | 0.46 | 0.09 | 0.39 | 0.52 | 95[d]<br>260[f] |
| Triclopyr | 0.25 | 0.04 | 2 | 0.090 | 0.07 | 0.04 | 0.14 | 950[c]<br>6700[e] |
| **A3 Channel at Bertelsen (Downstream)** | | | | | | | | |
| 2,4-D | 0.33 | 0.04 | 2 | 0.21 | 0.24 | <0.04 | 0.38 | 70[a]<br>100[b] |
| Propiconazole | 4.10 | 0.15 | 2 | 0.80 | 0.16 | 0.69 | 0.91 | 95[d]<br>260[f] |
| **Spring Creek at Naismith (Upstream)** | | | | | | | | |
| 2,4-D | 1.80 | 0.04 | 2 | 0.064 | 0.03 | <0.04 | 0.087 | 70[a]<br>100[b] |
| Dicamba | 0.65 | 0.04 | 2 | <0.04 | 0.00 | <0.04 | <0.04 | 14000[c]<br>17300[e] |
| Fipronil | 0.24 | 0.06 | 2 | <0.30 | 0.00 | <0.30 | <0.30 | 6.6[d]<br>0.011[f] |
| MCPP | 2.00 | 0.04 | 2 | <0.04 | 0.00 | <0.04 | <0.04 | 50000[f] |
| Pyrimethanil | 0.15 | 0.03 | 2 | <0.06 | 0.00 | <0.06 | <0.06 | 20[d]<br>1000[f] |
| Quinclorac | 0.27 | 0.04 | 2 | <0.04 | 0.00 | <0.04 | <0.04 | 15800[c]<br>14900[e] |
| Simazine | 0.44 | 0.03 | 2 | <0.30 | 0.00 | <0.30 | <0.30 | 3200[c]<br>500[e] |
| Triclopyr | 0.13 | 0.04 | 2 | <0.04 | 0.00 | <0.04 | <0.04 | 950[c]<br>6700[e] |
| **Spring Creek at Beacon Drive East (Downstream)** | | | | | | | | |
| 2,4-D | 0.46 | 0.04 | 2 | 0.065 | 0.04 | <0.04 | 0.090 | 70[a]<br>100[b] |
| MCPP | 0.18 | 0.04 | 2 | <0.04 | 0.00 | <0.04 | <0.04 | 50000[f] |

[a] EPA Drinking Water Maximum Contaminant Level (MCL)
[b] Oregon Human Health Water Quality Criterion for Toxic Pollutants, Table 40
[c] EPA Aquatic Life Benchmark, Fish Acute
[d] EPA Aquatic Life Benchmark, Fish Chronic
[e] EPA Aquatic Life Benchmark, Invertebrates Acute
[f] EPA Aquatic Life Benchmark, Invertebrates Chronic

### 4.4.3. Bacteria Study – Westmoreland Park, Polk Sub-Basin

The A3 Channel, Amazon Diversion Channel, and Amazon Creek are water quality limited for bacteria and in 2006 the State of Oregon issued the Willamette Basin TMDL for Bacteria. It specifies bacteria load reductions for these waterbodies which range from 33% in the A3 Channel to 84% in Amazon Creek. In addition, a 65% reduction in bacteria applies to the remaining Eugene MS4 permit area within the Willamette River basin. Stormwater monitoring data analysis suggests bacteria concentrations in Eugene's stormwater contribute toward exceedance of the state water quality criterion; hence the City has implemented a number of measures focused on identifying bacteria sources and reducing bacteria loads.

Under ideal conditions a multitude of variables would be measured to enable assessment of bacteria source contributions adequately, including stream flow, stormwater runoff flow from various land use types, storm event magnitude and duration, MS4 basin characteristics, focused land use sampling, and, among others, an ability to predict precisely storm event properties to enable collection of representative stormwater samples. Recognizing resource constraints and the complexity of collecting this information, the City of Eugene has focused on specific drainage basin areas with known characteristic from which information can be acquired while minimizing project complexity.

The City's bacteria pilot study was first outlined in the December 2005, Second Annual Report. Goals of the study include: 1) to better understand bacteria source contribution areas through observation and monitoring; 2) design and implement pilot study BMPs to reduce bacteria loads to stormwater; and 3) assess through additional monitoring BMP effectiveness in reducing bacteria loads to stormwater and, ultimately, to Amazon Creek. Lessons learned from the study would be considered for applicability and effectiveness in reducing bacteria from other areas within the Amazon basin and in Eugene city-wide. During the 2014/2015 permit year the City's investigations continued with sampling and analysis of bacteria limited to a select group of MS4 sites from piped and open channel systems, specifically, Chambers & 18$^{th}$, and Roosevelt Blvd. upstream and downstream of new riparian planting. Field surveys were also performed to characterize field conditions that might provide insights of potential bacteria sources; a summary of these data are presented here.

Figures 4-4c and 4-4g show the bacteria sampling sites, which include a catch basin with limited areal extent in a commercial business parking lot located at NE Chambers & 18$^{th}$ Avenue, the second site is within the Roosevelt Channel, which parallels Roosevelt Blvd., and due east of Beltline Road.

The NE Chambers & 18$^{th}$ site includes the drainage area indicated in Figure 4-4c; it extends south into Westmoreland Park. This monitoring site was among multiple chosen in the Westmoreland area, and numerous storm events have been sampled and the data assessed for insights on bacteria sources within the basin. Bacteria data for storm events for the recent monitoring period are summarized in Table A.9; data are coded to indicate percent change of the 2014/2015 geometric mean compared to historical data, which includes 27 and 29 sampling events for fecal Coliform and *E. coli*, respectively. Boxplots of all bacteria data are presented in Figure B.24, including previously monitored locations within the Westmoreland Park study area,

for comparison purposes; the vertical green line denotes Oregon's water quality standard for the protection of human health field. Measures of dissolved oxygen, pH and temperature associated with the bacteria sampling events are presented in Figure B.25. The vertical line in the box marks the median of the sample set; the median splits the ordered sample set in half. Each box represents the central 50 percent of data values; the outer edges of the box mark the 25$^{th}$ and 75$^{th}$ percentiles. Whiskers extending from the box mark the range of values that fall within 1.5 box-lengths from the 25$^{th}$ or 75$^{th}$ percentile. Values that are more than 1.5 box-lengths from the 25$^{th}$ or 75$^{th}$ percentiles are identified as outliers and are denoted by an open circle; extreme values are more than 3 box-lengths and are denoted by an asterisk.

*Escherichia coli* and/or fecal Coliform data for the 2014/2015 monitoring period (see Table A.9 and Figure B.24) exceed the bacteria human health water quality criterion of 406 colonies per 100 mL, and were nearly three times higher than historical geomeans for the site. The significance of this small addition to the drainage basin area being monitored is apparent when comparing the amassed data set for this site, MH 55402, with those for the monitoring site immediately hydraulically upgradient at MH 55404, which include 20 and 21 sampling events for fecal Coliform and *E. coli*, respectively. Note that MH 55402 and MH 55404 were not sampled during the same storm events so the comparison of two different storm event data sets; however, the sample size is sufficient in both data sets for statistically legitimate comparison. The median of fecal Coliform count at MH 55402 is about 1600/100 mL; at MH 55404 the median is 800/100 mL; the median of *E. coli* counts are more similar at 2200/100 mL at MH55402 and 1700/100 mL at MH 55404. These values are above Oregon's human health criterion of 406 organisms/100 mL but the difference is within an order of magnitude, not multiple orders of magnitude as can frequently occur for bacteria monitoring.

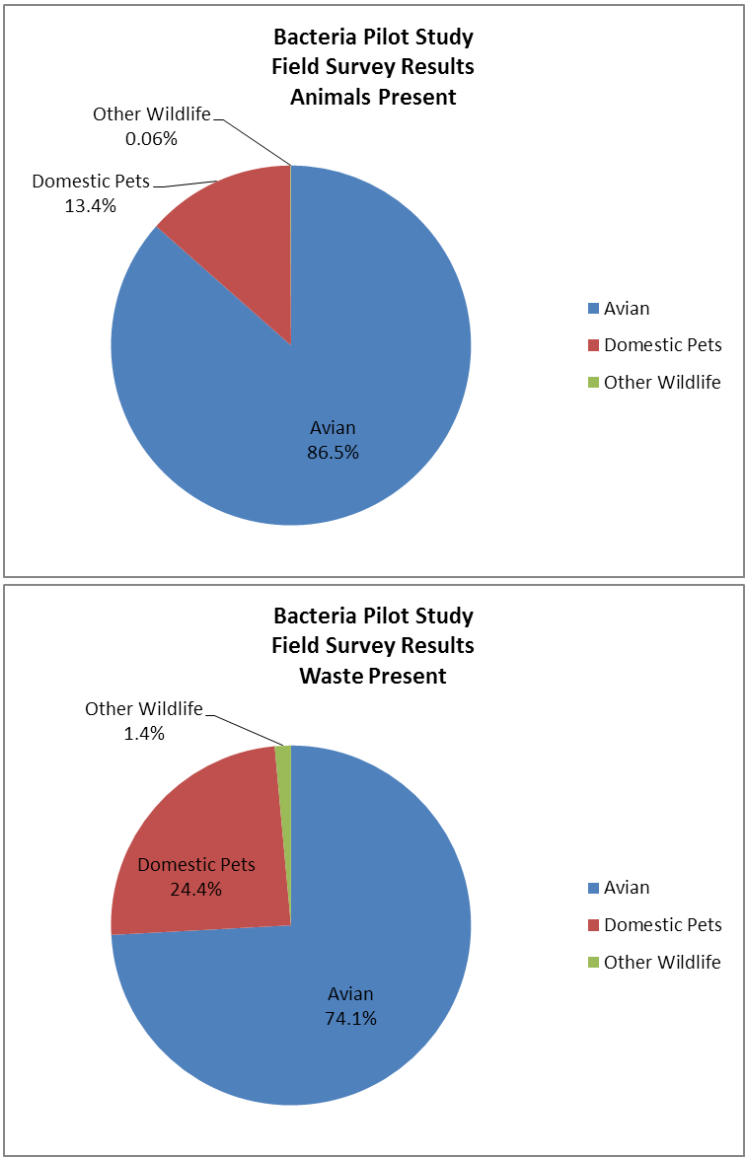
Property managers were contacted and informed of the purpose of the bacteria study midway through the project, about January 2014, which allowed for the collection of samples to establish a baseline prior to outreach made whose focus was better management of on-site waste for vector control, primarily avian and rodent, which were identified as a likely bacteria source. Six storm events have since been sampled at MH 55402 and seven at MH 55404; the data set are insufficient to assess the effectiveness of the observed site management improvements on water quality. However, field inspections of site conditions at one commercial property showed significant improvements in waste management; no site management practice improvements were needed at the other commercial business.

Six field condition assessment surveys for bacteria were done during the 2014/2015 monitoring period. Field condition assessment surveys were started in February 2007, to document basin conditions such as amount, type, and location of wildlife and domestic pets; human behaviors; location and number of wildlife and domestic animal waste; conditions within commercial loading areas, recycling areas, and garbage dumpster areas, etc. Bacteria field surveys have been focused within a portion of the Polk Street sub-basin and the Morse Ranch dog park. Figure 4-5 presents a semi-quantitative summary of all the field survey observations. Populations of animals and waste present are summarized as percentages of the total animal and waste data sets. Survey results suggest a strong avian prevalence among the information collected in the surveys. From this we postulate bacteria in stormwater runoff is principally avian, consistent with recent

studies conducted by other municipalities who have performed costly genomic ribotyping of aquatic samples.

**Figure 4-5**

**Semi-Quantitative Summary of Bacteria Field Survey Results**




Restoration of riparian habitat along sections of Amazon Creek and grassy parklands adjacent to the waterbody has temporarily attracted populations of nesting ducks and geese. Field surveys suggest areas along Amazon Creek have significant amounts of avian waste directly contributing to bacteria loads in the waterbody. However, as restorations mature development of canopy cover should sufficiently reduce field of sight for migrating avian species to make these restored

areas less attractive to large populations for prolonged habitation. This approach is being used for the riparian restoration project along Roosevelt Channel; field condition assessment surveys suggest geese are less inclined to occupy the northern channel bank due to the recent plants, which are protected by wire cages that may also act as a deterrent to avian habitation. Table A.10 and A.11 summarize bacteria and field data collected over the monitoring period. Field assessment and sampling will continue at this site to monitor avian activity and bacteria counts. At this time there are insufficient data to draw any conclusions regarding the effectiveness of the riparian planting; however, upon maturity the plantings should prove an effective deterrent as demonstrated in other riparian buffer areas.

Other sources of avian waste bacteria noted during field surveys include populations of swallows, starlings, gulls, crows, and sparrows, and large numbers of their waste deposits observed on sidewalks and parking lots, as well as rooftops. These impervious surfaces within the bacteria study area are easily flushed by seasonal rains and directly transported via the MS4 to Amazon Creek. Over time, outreach to commercial businesses such as that done at Chambers & W 18$^{th}$ Avenue to improve waste handling and disposal to reduce food waste vectors should help reduce bacteria loads. Nutria have also been observed within urban riparian areas, and evidence of beaver activity was recently noted; within the Tiara drainage basin wild turkey, deer, and domestic fowl have been observed along the small urban stream – although these wildlife are believed to contribute only a small portion of the total bacteria load within the urban area.

Domestic animal waste accounts for the next largest percentages of animals and waste present within the study area, and is perhaps one that is more easily controllable. Educational outreach is done on nearly a continuous basis to bring awareness to pet owners the importance of picking up after their animals; transcending the 'ick' factor is challenging, one that many communities difficult to achieve. While some have implemented innovative methods to incentivize pet owner participation these are often punitive involving fines. The City continues to explore other methods to gain pet owner participation to address this source of bacteria to Eugene's waterbodies.

The significance of illegal camping on bacteria loads in urban streams is difficult to estimate and is perhaps not negligible. Like other communities in the northwest along the I-5 corridor, Eugene has expended considerable resources to address illegal camping, some of which was observed during field surveys in areas with dense woods and shrubs along Amazon Creek.

In summary, field surveys suggest sources of bacteria to Amazon Creek within the study area are predominantly avian, followed by domestic animals, other wildlife, and potentially some human contributions. Field surveys, in combination with ambient and stormwater monitoring, will prove helpful in assessing and adaptively managing Eugene's existing BMPs to improve their effectiveness in reducing bacteria. One such program is the city's Canines for Clean Water outreach program implemented citywide several years ago. A description of this educational outreach BMP can be found under the BMP section of this report.

### 4.4.4. Ambient Water Quality Monitoring

Ambient water quality monitoring has continued at twelve monitoring locations, including six within the Willamette River basin; four sites on the Willamette River, one near the Delta Ponds outlet, one on Spring Creek; and six in the Amazon Basin, three on Amazon Creek, and one each on Willow Creek, the A3 Channel, and the Amazon Diversion Channel. Surface flows through the Delta Ponds, which consists of sloughs and former aggregate excavation sites, are to the Willamette River. Extensive riparian restoration was made several years ago by the U.S. ACOE and the City of Eugene to create and enhance riparian habitat for fish spawning and rearing. The Delta Ponds also receives stormwater discharges from surrounding commercial and residential development; thus assessment of water quality from this area is important in evaluating the effects of stormwater runoff to Delta Ponds and creation of riparian habitat that is conducive to fish spawning and rearing objectives. The ambient sampling sites are listed in Table 4-4 below and locations shown in Figures 4-6 and 4-7. Sampling is generally conducted at each site every other month such that sampling events are representative of both the rainy season (October through April), and drier months (May through September). All ambient sampling is conducted utilizing clean sampling techniques; both total and dissolved metals are analyzed as well as conventional water quality parameters.

Analytical results and statistical analyses characterizing water quality at the monitored sites are described here. For the most part grab samples collected every other month represent snapshots of ambient water quality – analytical results may not necessarily represent average water quality, or the full range of water quality variability; however, the City has monitored water quality at most of these sites since 1997 and median water quality values have shown little variability. Six additional sampling events were done since the last annual reporting period, although a few locations could not be sampled because of dry streambeds. Data generated for these latest sampling events have been added to the historical data set that begins in January 1997. For the current permit year sampling events occurred between July 2014, and June 2015.

**Table 4-4**
**Ambient Water Quality Monitoring Sites**

| **Amazon Creek Basin Sampling Sites:** | **Willamette River Basin Sampling Sites:** |
|---|---|
| • Amazon Creek at 29th Avenue<br>• Willow Creek 450 feet north of 18th Avenue<br>• Amazon Creek at Railroad Track Crossing<br>• Amazon Diversion Channel at Royal Avenue<br>• A3 Channel at Terry Street<br>• Amazon Creek at Royal Avenue | • Upstream of Urban Growth Boundary (River Mile 186.9)<br>• At Knickerbocker Bridge (RM 183.9)<br>• At Owosso Bridge (RM 178.6)<br>• Delta Ponds North of Beltline Bridge & Upstream of Willamette River Confluence<br>• Downstream of Beltline Bridge (RM 176.8)<br>• Spring Creek at Beacon Drive East |

### *4.4.4.1.* Results

Ambient water quality data were screened for outliers before applying statistics tests. In general, outliers are anomalous measurements that do not appear to be within the bounds of an historical data set. Outliers may result from any number of factors, including sample collection and handling procedures, analytical methodologies, transcription error, etc. Inclusion of anomalous measurements in statistical tests used to assess water quality characteristics can skew results and lead to erroneous conclusions. However, distinguishing anomalous measurements from an actual elevated pollutant concentration due to some site disturbance can be difficult if methodical evaluation of all probable factors is not performed. The methods commonly used to test for outliers include skewness, kurtosis, and Shapiro-Wilk assume normal distribution of water quality measurements; it was found, however, that most of the analytes did not follow a normal distribution. Identification of an outlier using these methods does not preclude investigation into the anomaly and its possible cause. Outliers were investigated and corrected if possible, including traceable error such as transcription, dilution error and the like.

For data sets whose distributions are not normal, best professional judgment was applied when selecting outliers to exclude from further statistical analysis. Best professional judgment may include reanalysis of the sample provided the holding time has not been exceeded.

Multiple outliers were identified in the 2014/2015 ambient dataset; multiple values for dissolved oxygen were identified as outliers and attributed to instrument malfunction. Additionally, multiple total dissolved solids were identified as outliers and attributed to sample labelling errors. Excluded values from statistical analysis are denoted "EV" following the reported value in report tables. Outliers were also identified in the historical data set, and while these are ultimately excluded from final statistical analysis results, the outliers are only temporarily excluded; they are added to the data pool at the beginning of each annual data analysis for distribution tests as applicable. Analytical data for the most recent monitoring period are presented in Tables A.18 through A.20. Note there are no data for one or two sampling dates at the A3 Channel at Royal, A3 Channel at Terry Street, Willow Creek, Delta Ponds, and Spring Creek because these sites were dry or had insufficient flow at the time of sample collection.

Censored data, those values reported as less than the reporting limit, are included in the summaries utilizing the restricted maximum likelihood estimation technique for miscellaneous parameters, and the delta distribution estimator for the metals data. These estimators reduce the problems associated with censored data when calculating mean and standard deviation, and are superior to substitution of censored data with one-half the reporting limit. Means and standard deviations for the ambient historical data set are summarized in Tables A.21 and A.22.

### *4.4.4.2.* Seasonal Trends

The Seasonal Kendall statistic, Z, is used here to describe long-term analyte trend with consideration given to seasonal variation. This trend estimator is free of distributional assumptions. Developed by the U.S. Geological Survey[1], the Seasonal Kendall statistic is the

[1] Dennis R. Helsel, Mueller, David K., and Slack, James R., Computer Program for the Kendall Family of Trend Tests: U.S. Geological Survey

most frequently used test to assess trend in environmental data. In assessing analyte trends, we presume in-stream flow is the result of multiple water pathways in the hydrologic cycle, including overland flow, ground-water discharge, and precipitation; precipitation directly and indirectly influences the concentration of analytes as measured in samples collected from the Amazon and Willamette basins, and may also contribute trace amounts of pollutants through atmospheric deposition, such as mercury. The temporal distribution of the precipitation events, including intensity and duration, influences analyte concentration; however, data for these factors are not available, are not easily obtained, and their effects on seasonal pollutant concentration difficult to assess.

Our simplified approach assumes these factors are intrinsic to the period during which the sampling event occurs. Average monthly precipitation for Eugene was divided into four "seasons," or periods, based on average monthly precipitation and trend increase or decrease. The periods should help to identify seasonal variations in analyte concentration. The wet season (Period 1: November, December, January) is followed by a drying trend extending into July. The drying trend is subdivided into Period 2 (February, March, April) and Period 3 (May, June, July), the latter being the driest period. Months leading to the wet season comprise Period 4 (August, September, October) and are progressively wetter. Precipitation data is from the Eugene, Oregon airport weather station (#352709) with a period of coverage from 1939 to 2011. Each sampling event for the entire data set (historical and current year data) is assigned to a period based on the sampling date.

The USGS has developed a DOS-executable program to run the Seasonal Kendall test statistic. In this application, rejection of the null hypothesis of no trend is calculated at $2\rho = 1\%$, that is, a $2\rho$ value of 0.01 indicates there is a 1% probability of the observed trend due to random sample variability. Program output includes slope estimator, *m*, to describe the overall analyte trend.

Results of trend analysis using the Seasonal Kendall test statistic indicate significant trends at all 12 monitoring locations listed in Table 4-4. Water quality trends for the waterbodies tend to be subtle; hence, those noted in previous reports but not observed here and vice versa are commonly influenced by the most recent water quality data such that statistical significance of the trend changes upon addition of new analyte results.

Figures B.34 through B.89 (Appendix B) show the historical data sets plotted against time with trend lines, which are averages of the four differentiated seasons based on precipitation; a summary of the program output is presented in Table A.23 in Appendix A. All significant long-term concentration trends are summarized in Table 4-5 below. A number of pollutants listed are on Oregon's 2004 303(d) list and several have approved TMDLs. Results of the Seasonal Kendall test statistic indicate significant progress is being made to reduce pollutants in the listed impaired waterbodies.

SIR 2005-5275.

| Table 4-5<br>Summary of Seasonal Kendall<br>Water Quality Analyte Trend Analysis [1] | | |
|---|---|---|
| **Monitoring Location** | **Trend of Water Quality Analyte** | |
| | **Decreasing Concentration Trends** | **Increasing Concentration Trend** |
| **Amazon Creek Basin Sites:** | | |
| Willow Creek | Dissolved Oxygen<br>Total Kjeldahl Nitrogen | Lead, Dissolved<br>Zinc, Dissolved & Total |
| Amazon Creek at 29th Avenue | [2]Lead, Total | Zinc, Dissolved & Total<br>Chemical Oxygen Demand |
| Amazon Creek at Railroad Tracks | Chromium, Dissolved<br>[2]Lead, Total<br>Mercury, Dissolved & Total | Zinc, Dissolved & Total |
| Amazon Diversion Channel at Royal Avenue | [2] Arsenic, Dissolved & Total<br>Molybdenum, Dissolved<br>Nickel, Dissolved & Total | Zinc, Total |
| A3 Channel at Terry Street | [2]Arsenic, Dissolved & Total<br>Cadmium, Total<br>Chromium, Dissolved & Total<br>[2]Lead, Total<br>[2]Mercury, Total<br>Nickel, Dissolved & Total<br>Phosphorus, Total<br>[2]Temperature<br>Total Kjeldahl Nitrogen | None |
| Amazon Creek at Royal Avenue | Cadmium, Total<br>Chromium, Dissolved & Total<br>[2]Lead, Total<br>Mercury, Total<br>Nickel, Total<br>Silver, Total<br>Temperature<br>Total Suspended Solids<br>Turbidity | Zinc, Dissolved & Total |
| **Willamette River Basin Sites:** | | |
| Upstream of Urban Growth Boundary | Chromium, Total<br>[2]Mercury, Dissolved & Total | |
| Knickerbocker Bridge | [2]Fecal Coliform | Copper, Dissolved<br>Specific Conductance |
| Owosso Bridge | Chromium, Total | Specific Conductance |
| Downstream of Beltline Bridge | Ortho Phosphorus | None |
| Delta Ponds | None | [2]Dissolved Oxygen |
| Spring Creek at Beacon Drive East | Phosphorus, Total<br>Field pH | None |

[1] Significant at 2ρ = 0.01
[2] On Oregon 2004/2006 303(d) list.

We noted long-term decreasing concentration trends for at least some analytes at most monitoring locations; these sites are located upstream, downstream or within the urban

environment and are influenced by human activities that occur within respective drainage basin areas. We attribute the decreasing pollutant trend to the sum of stormwater program BMPs applied within these drainage basins to control stormwater pollutants caused by human activities within the urban environment. Decreasing trends in the Amazon and Willamette basins are primarily observed for metals, including arsenic, cadmium, chromium, lead, mercury, molybdenum, nickel, and silver. Nutrients (nitrogen and phosphorus), suspended solids, turbidity, and temperature also showed decreasing trends at a few monitoring sites.

Arsenic is naturally occurring in Willamette valley soils due to their volcanic origin, and is commonly mobilized through soil disturbance and other anthropogenic activities. Decreasing concentration trends in Amazon Diversion Channel at Royal Avenue, which encompasses the entire Amazon basin upstream of this site, and the A3 Channel site, whose drainage basin primarily consists of industrial and commercial properties, is positive progress; however, observed concentrations (see Table A.18) tend to exceed the human health water quality criterion of 2.1 µg/L. The decreasing arsenic trends observed at these two sites is perhaps indicative of the effectiveness of the West Eugene Wetlands in trapping suspended particulate; dissolved arsenic concentrations, however, also tend to exceed the water quality criterion and emphasize the need for continued progress applying sediment control BMPs.

Mercury also occurs naturally in Willamette valley soils and accounts for about 48% of the mercury load to Willamette basin waterbodies. The next largest source of mercury in the Willamette valley is atmospheric deposition to land; at 42%, a significant portion of this load originates in China, but also originates locally from the combustion of fossil fuels, forest fires, and anthropogenic activities. Mobilization of land-deposited atmospheric mercury occurs readily during precipitation events. About 5.9% of atmospheric mercury is deposited directly into waterbodies. Sources of mercury are described and assessed in the 2006 Willamette Basin TMDL for Mercury. As with arsenic, effectual sediment control BMPs are perhaps the best tools to achieve mercury reduction in Eugene's urban waterways.

Other trace metals with significant decreasing concentration trends in Eugene's waterways such as cadmium, chromium, lead, molybdenum, nickel, and silver, are commonly associated with automobiles, as well as some industrial and commercial activities. Of these metals cadmium and lead have been found to exceed the chronic toxicity criterion for samples collected from nearly all Amazon Basin ambient monitoring locations (see Figures B.110 and B.120). Samples collected for total lead analysis during the 2014/2015 monitoring period from all Amazon basin sites with the exception of Willow Creek, exceeded the chronic toxicity for lead (see Table A.18); however, Willow Creek has an increasing trend for dissolved lead, the cause of which is unknown at this time. Fewer historical water quality exceedances and no current data were observed to exceed the chronic criterion for the more bioavailable dissolved lead fraction. Current BMPs minimizing road grit from the MS4 and maintenance of the MS4, and industrial source control establishing pollutant benchmarks and permit-required monitoring, have proven effective mechanisms in reducing these metals in waterbodies receiving stormwater flow.

An increasing trend is observed for zinc at multiple locations, including Willow Creek, Amazon Creek at 29$^{th}$ Avenue, the Railroad Crossing, and Royal Avenue, and the Amazon Diversion Channel at Royal Avenue. Zinc concentrations at all Amazon Basin monitoring sites as well as

Delta Ponds and Spring Creek, have exceeded the acute or chronic water quality criteria (see Figures B.127, B.128, B.167, and B.168). Data for the 2014/2015 for all locations except Willow Creek, also had reported concentrations above the water quality criteria (see Table A.18). Powdered zinc sulfate and zinc metal strips are widely used for moss control in the Pacific Northwest and increasing concentration trends for this metal in local waterbodies is being actively addressed through educational BMPs that provide property owners with information on alternative products for moss control. Chemical oxygen demand in Amazon Creek at 29$^{th}$ Avenue also is trending upward; this analyte measures oxygen depletion due to chemical oxidation processes.

A slight increasing trend for dissolved copper is observed in the Willamette River at the Knickerbocker Bridge. While copper is naturally occurring in soils, copper is also used prevalently in automobile brake pads, electrical equipment, roof cladding and rain gutters, in some pesticides, and other manufactured products. A slight increasing trend is also observed for conductance in the Willamette River at the Knickerbocker and Owosso Bridges could be related to a combination of factors, such as weathering and dissolution processes of soils; trace dissolved metals such as copper from anthropogenic sources also contribute toward increased conductance but this would be a minute fraction of the overall conductance value. An increasing trend is also noted for dissolved oxygen in Delta Ponds and is likely due to regulated Willamette River diversions of flow through the ponds.

In the Willamette River, decreasing trends are also observed for total chromium upstream of the urban growth boundary and at the Owosso Bridge site; both mercury fractions, dissolved and total, also show a decreasing trend upstream of the UGB. Downstream of Beltline Bridge, a slight decreasing trend occurs for ortho phosphorus. We also noted a decreasing trend for fecal Coliform at the Knickerbocker Bridge site, and for field pH in Spring Creek at Beacon Drive East.

Water quality trends are often associated with anthropogenic activities; however, in some instances measurement technique and/or instrumentation can influence trends. For example, instrument sensitivity for the testing of trace metals and other analytes has increased significantly over the years since monitoring was begun in 1997. This instrument sensitivity evolution may in part explain a discernible change in data variability, which is noticeably more pronounced in early sampling events when compared with those taken later.

There is a small probability that some decreasing or increasing metals trends may not have been identified by the Seasonal Kendall test because the laboratory used to perform the metals analysis was changed in February 2007, though after careful review of the data it is believed all likely and significant trends have been summarized. Beginning with the February 2007 sampling event, the Eugene/Springfield Water Pollution Control Facility (E/S WPCF) Laboratory performed all metals analysis. While the laboratory uses the same analytical methodology, specifically, EPA 200.8, the reporting limits were somewhat greater than those observed prior to February 2007, when a contract laboratory performed the analyses. Analytical results reported since early 2008 indicate that the E/S WPCF laboratory was able to achieve lower reporting limits for nearly all metals when compared to the first few sampling events in 2007. The facility continues to review its analytical procedures to ensure optimum instrumentation performance is

attained so that continuity of historical trends observed in previous years is maintained to the fullest extent possible.

### *4.4.4.3.* Water Quality Changes: 2014/2015 Permit Year vs. Historical Data Set

The Mann-Whitney test statistic is used here to assess whether any water quality changes have occurred over the most recent monitoring period compared to the historical data compiled for each sampling location. Mann-Whitney is a nonparametric calculation based on the sums of ranks for independent samples and is suitable for censored data sets. Table A.24 in Appendix A summarizes significant water quality changes, which consists of comparing sampling events for the 2014/2015 period to historical data. For comparison purposes, averages are reported for the recent monitoring data and the historical data set; data comparisons are statistically significant at $\alpha = 0.05$. The full program output for the statistic is shown in Tables A.25 and A.26.

Note that some analytes in Table A.24 are annotated, indicating that the data set includes some censored values which have been set at one-half the reporting limit (either the PQL or MDL depending on the analyte and method). In general, mean corrected averages cannot be reasonably estimated on small data sets with a large number of censored values. For example, with few exceptions cadmium and selenium values for Amazon Basin and Willamette River sites consist of censored values, hence the statistical significance of annotated means if the population of censored values is greater than 50 percent is somewhat questionable and therefore generally excluded from tables summarizing statistically significant comparisons. Consult Tables A.21 and A.22 for all analytes for those reported as INS, that is, insufficient uncensored data available to compute the statistic.

Examination of water-quality changes that have occurred during the most recent monitoring period are helpful in identifying those drainage basin areas where land use activities have had, either directly or indirectly, a significant influence on water quality – either resulting in water quality improvements or degradation. A third outcome of this examination is that no water quality change occurs.

The city's ambient monitoring program includes 41 regular analytes plus a few special organics at select sites. An ideal outcome of the statistical tests would be that, for all those analytes present above natural or background conditions, an improvement occurs for the recent monitoring year when compared to the historical water quality data – a somewhat unrealistic scenario given urban areas – anthropogenic activities often influence water quality characteristics. In general, water quality improvement of urban streams is achieved gradationally over an extended period of time as is shown by the trends described in the previous section. The following sections assess ambient water quality data.

**Amazon Basin Sites**

Three samples were collected from Willow Creek, four from the A3 Channel at Terry Street, and six each from the remaining sites. An extended dry period has been observed in Willamette valley during the fall and winter of 2014/2015, and spring of 2015; similarly dry conditions occurred on multiple other occasions since ambient monitoring began in 1997, precluding

sample collection due to either lack of stream flow or very low flow such that sampling equipment could not collect water without disturbing stream sediments.

Willow Creek originates just south of a preserve held by The Nature Conservancy and has similar geomorphologic characteristics to the upper reaches of Amazon Creek; its headwaters flow through some rural residential properties and the creek receives some stormwater from the former Hynix facility (a silicon chip manufacturer whose operations ceased during the 2007/2008 period although maintenance of stormwater facilities and monitoring continue). The water quality characteristics of Willow Creek, which is for the most part a local, minimally-urbanized stream, has served as a reasonably good baseline for comparing the water quality characteristics observed for Amazon Creek; however, recent water quality trends indicate some degradation, specifically dissolved lead, and total and dissolved zinc.

Referring to Table A.24 in Appendix A, all six Amazon basin monitoring sites, including Willow Creek have recent analyte averages that differ from historical means. Overall 11 of 22 analytes, or about 52%, show statistically significant concentration decreases. Four of six sites had statistically significant analyte values that are higher in 2014/2015 than observed historical means. Total and/or dissolved zinc concentrations are higher at these four sites. Zinc concentration differences are the most pronounced in this comparison. The statistically significant two to three-fold increase in zinc concentrations in Amazon and Willow Creeks, in addition to increasing concentration trends, indicates mobilization of soluble zinc within the urban area during the 2014/2015 monitoring period was greater than the historical average concentration.

Modest concentration decreases occur for calcium at all Amazon basin sites. A few other analytes also showed statistically significant change, including turbidity, which increased at slightly at Willow Creek and Amazon Creek at Royal Avenue, and decreased at Amazon Creek at 29$^{th}$ Avenue and A3 Channel at Terry Street. Chemical oxygen demand was lower at Willow Creek and higher at Amazon Creek at Royal Avenue.

**Willamette River Sites**

Analyte comparisons summarized in Table A.24 show that all four sites on the Willamette River, Delta Ponds, and Spring Creek had recent analyte averages differing significantly from historical means. Overall, 20 of 34 analyte values show statistically significant decreases during the 2014/2015 monitoring period compared to historical averages.

Total suspended solids and turbidity showed modest decreases at Willamette River sites; ortho phosphorus average concentrations were higher and total phosphorus lower than historical averages. Additionally, lead, zinc, and molybdenum concentrations were lower above the UGB; in the case of molybdenum, values were also lower at Knickerbocker and Owosso Bridges. Downstream at Beltline Bridge, selenium was slightly lower during the 2014/15 monitoring period.

At the Delta Ponds site, calcium and specific conductance decreased slightly but increased for turbidity and dissolved chromium, which was over two times higher. At Spring Creek dissolved and total zinc values were two times higher than the historical data set, while calcium and

magnesium decreased slightly. The range of water quality variability is developing as the database for the Spring Creek site becomes established.

The improving water quality trends described above for the Amazon and Willamette basin sites, and to some extent the improvements of recent water quality data when compared to historical data, are positive indicators that BMPs applied within the permit area are effective, resulting in measurable pollutant decreases in receiving waterbodies that have approved TMDLs or that are on the state's 303(d) list. Full program output for the 2014/2015 to Historical data set comparison is shown in Tables A.25 and A.26.

#### *4.4.4.4.* Intra-Basin Water Quality Differences

In addition to temporal changes in water quality, intra-basin differences are of interest because water quality comparisons are made between an upstream and downstream monitoring site, which provides a means of assessing whether urban activities affect a waterbody as the water flows through the urban area. The Mann-Whitney test statistic is used here to assess water quality differences between any two sites within the same stream basin or between drainage basin areas. Mann-Whitney is a nonparametric calculation based on the sums of ranks for independent samples and is suitable for censored data sets. Comparisons described utilize the all data for each monitoring location, including the data recently acquired in 2014/2015. Table A.27 and A.28 in Appendix A summarize significant average analyte values; comparisons are significant at $\alpha = 0.05$. The full program output for the statistic is shown in Tables A.29 and A.30.

**Amazon Basin Monitoring Locations**

Intra-basin comparisons include the analysis of the 29th Avenue site on Amazon Creek compared to the site on Willow Creek (see Figure 4-6 for sampling locations and basin extent), streams that originate in the same low hills south of Eugene but drain different sub-basins. In addition, the 29th Avenue site, comprised predominately of residential land use, is compared to Spring Creek at Beacon Drive East, also comprised of mostly residential land use but originating within the urbanized Santa Clara – River Road stormwater basin.

The concentration of metals, nutrients and bacteria are higher in Amazon Creek at the 29th Avenue site in comparison to Willow Creek. Of the 41 water quality analytes monitored, the concentrations of 17 analytes were found to be statistically higher in Amazon Creek at the 29th Avenue site, dissolved and total chromium, copper, lead, molybdenum, and zinc, as well as *E. coli*, fecal Coliform, nitrate+nitrite as nitrogen ($NO_3$+$NO_2$-N), ortho and total phosphorus, total magnesium, and field pH. Total arsenic is higher at the Willow Creek site.

Relative percent concentration differences (the absolute difference divided by the mean of the two values) range from 36% for dissolved copper, to 100% for total zinc; for non-metal parameters the relative percent difference ranges from 1.4% for total suspended solids to 144% for *E. coli*.

Comparing metals across the two basins; total copper is 38% higher in Amazon Creek at 29th Avenue, dissolved and total chromium are 44% and 53% higher, dissolved and total lead are 30

and 80% higher, dissolved and total molybdenum 72 and 73% higher, and dissolved and total zinc 91 and 100% higher, respectively, at the Amazon Creek at 29th Avenue site. Total arsenic is higher in Willow creek by 27%.

Comparing non-metals across the two basins; fecal Coliform and *Escherichia coli* averages are 119% and 144% higher, respectively, at the Amazon Creek at 29th Avenue site compared to bacteria counts observed at Willow Creek. These bacteria ratios have decreased from previous reporting periods; as mentioned above, bacteria counts in Willow Creek have been noticeably higher over the last few years. Ortho and total phosphorus, $NO_3$+$NO_2$-N, and pH are also higher at the Amazon Creek site. The higher metal, nutrient and bacteria concentrations observed in Amazon Creek are pollutants commonly associated with urbanized environments. These comparisons are summarized in Table 4-6 below.

Intra-basin comparisons are also shown for the 29th Avenue site and Spring Creek at Beacon Drive East; statistically significant differences were found for 23 of 41 analytes, including metals, nutrients, hardness (calcium and magnesium), specific conductance, and pH. For the 14 metal fractions, all values except zinc are higher in Amazon Creek at 29th Avenue, including dissolved and total fractions for arsenic, chromium, copper, lead, mercury, and nickel. Relative percent differences range from 42% for dissolved lead to 144% for total chromium. The average dissolved zinc concentration in Spring Creek is nearly twice that of Amazon Creek at 29th, the total fraction is 50% higher. Amazon Creek has a slightly higher pH, higher concentrations of hardness (calcium and magnesium), and twice the *E. coli* count than Spring Creek. Spring Creek has higher nutrient concentrations than Amazon Creek at 29th, including $NO_3$+$NO_2$-N (145%), ortho phosphorus (44%), and total phosphorus (36%).

Comparing water quality data for at Amazon basin monitoring sites we generally find that as stream flow passes through the urban environment the concentrations of metals, oxygen demand, suspended solids, turbidity, fecal Coliform, and temperature increase at respective downstream monitoring sites; dissolved oxygen, *E. coli*, hardness (calcium and magnesium), $NO_3$+$NO_2$-N, ortho phosphorus, dissolved solids, pH, and dissolved zinc concentrations tend to decrease at respective downstream monitoring sites. The 29th Avenue site is the uppermost monitoring location on Amazon Creek, followed by Amazon Creek at the Railroad Crossing; the Amazon Diversion Channel at Royal Avenue and Amazon Creek at Royal Avenue are farthest downstream monitoring sites. The A3 Channel at Terry Street drains into the lower Amazon Creek (see Figure 4-6).

**Table 4-6**
**Intra-Basin Water Quality Comparison of Willow, Amazon, and Spring Creeks [1] Using Mann-Whitney Statistic [2]**

| Analyte | Units | Willow Creek | Amazon Creek at 29th Avenue | Spring Creek at Beacon Drive East |
|---|---|---|---|---|
| Arsenic – Total | (*µg/L*) | 1.40 | 1.10 | 0.398 |
| Arsenic - Dissolved | | | 0.892 | 0.343 |
| Chromium – Total | | 0.887 | 1.54 | 0.241 |
| Chromium – Dissolved | | 0.348 | 0.585 | 0.185 |
| Copper – Total | | 2.33 | 3.40 | 1.10 |
| Copper – Dissolved | | 1.23 | 1.79 | 0.774 |
| Lead – Total | | 0.271 | 0.586 | 0.265 |
| Lead – Dissolved | | 0.0282 | 0.0407 | 0.0227 |
| Mercury - Total | | | 0.00254 | 0.00091 |
| Mercury – Dissolved | | | 0.00102 | 0.00017 |
| Molybdenum – Total | | 0.112 | 0.295 | |
| Molybdenum – Dissolved | | 0.112 | 0.278 | |
| Nickel – Total | | | 2.06 | 0.837 |
| Nickel - Dissolved | | | 1.44 | 0.742 |
| Zinc – Total | | 7.25 | 23.1 | 39.5 |
| Zinc – Dissolved | | 4.74 | 13.5 | 37.7 |
| *Escherichia coli* | (*Col./100 mL*) | 144 | 814 | 263 |
| Fecal Coliform | | 111 | 386 | |
| Calcium - Total | (*mg/L*) | | 24 | 17 |
| Magnesium - Total | | 8.1 | 8.3 | 9.1 |
| Hardness | mg eq $CaCO_3$/L | | 93 | 80 |
| Nitrate+Nitrite – as Nitrogen | (*mg/L*) | < 0.05 | 0.32 | 2.05 |
| Phosphorus – Ortho | | 0.03 | 0.05 | 0.09 |
| Phosphorus – Total | | 0.06 | 0.10 | 0.15 |
| Field pH | (*Units*) | 7.2 | 7.6 | 6.8 |
| Specific Conductance | (µmhos/cm) | | 229 | 193 |

[1] Comparisons made: Willow Creek ↔ Amazon Creek; Amazon Creek ↔ Spring Creek
[2] Mann-Whitney test statistic comparisons significant at α = 0.05.
Shaded cells indicate the higher analyte concentration in the comparison.

There are a few notable exceptions to the intra-basin water quality comparison characteristics described above:

- A3 Channel at Terry Street (upstream) compared to Amazon Creek at Royal Avenue (downstream)

  - 22 of 25 analytes having statistically significant differences have historical averages that are greatest upstream at the Terry Street site, including BOD, COD, hardness (calcium and magnesium), specific conductance, TDS, and nutrients ($NO_3$+$NO_2$-N, Kjeldahl nitrogen, and ortho and total phosphorus); metals include total and dissolved cadmium, molybdenum, nickel and zinc, and total copper, lead and mercury.

  - Dissolved mercury and arsenic averages are greater downstream at the Amazon Creek Royal Avenue site.

- Amazon Creek at 29th Avenue (upstream) compared to Amazon Creek at Railroad Track Crossing (downstream)

  - 11 of 30 analytes having statistically significant difference have historical averages that are greatest upstream at the Amazon Creek at 29th Avenue. Dissolved zinc is greatest upstream, as are chemical oxygen demand, DO, hardness (calcium and magnesium), dissolved solids, pH, nutrients ($NO_3$+$NO_2$-N and ortho phosphorus), and *E. coli*.

  - Fecal Coliform, temperature, TSS, and turbidity, as well as total and dissolved arsenic, lead, mercury, molybdenum, and nickel, as well as total cadmium, copper, selenium, silver, and zinc average concentrations are greatest downstream at the Railroad Track Crossing monitoring site.

- Amazon Creek at 29th Avenue (upstream) compared to Amazon Diversion Channel at Royal Avenue (downstream)

  - 7 of 32 analytes having statistically significant differences have historical averages that are greatest upstream at the Amazon Creek at 29th Avenue site. Dissolved zinc is greatest upstream, as are dissolved oxygen, bacteria (*E. coli* and fecal Coliform), nutrients ($NO_3$+$NO_2$-N and ortho phosphorus), and pH.

  - Total and dissolved arsenic, cadmium, copper, lead, molybdenum, nickel, and total chromium, mercury, selenium, silver, and zinc have higher average concentrations at the downstream monitoring location. Oxygen demand (BOD and COD), magnesium, total phosphorus, temperature, Kjeldahl nitrogen, TSS, and turbidity are also greater downstream.

- Amazon Creek at Railroad Track Crossing (upstream) compared to Amazon Diversion Channel at Royal Avenue (downstream)

- 6 of 20 analytes having statistically significant difference have historical averages that are greatest upstream at the Amazon Creek at Railroad Track Crossing, including total and dissolved mercury, total arsenic, and bacteria (*E. coli* and fecal Coliform).

- Total and dissolved copper, molybdenum, nickel, and total cadmium, as well as BOD, hardness (magnesium), total phosphorus, Kjeldahl nitrogen, TSS, and turbidity are greater downstream.

Tables A.27 and A.28 in Appendix A includes a summary of all Amazon Basin monitoring sites whose analytes have statistically significant differences using the Mann-Whitney test statistic; Tables A.29 and A.30 present the full program output.

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**Willamette River Monitoring Locations**

Results of the Mann-Whitney test statistic applied to historical data for the Willamette River monitoring locations indicate that analytes statistically significant at $\alpha = 0.05$, had concentrations that were greater at downstream sites than at corresponding upstream sites. Most of these water quality differences occur at two monitoring locations, upstream of the Urban Growth Boundary and downstream of Beltline Bridge (see Figure 4-7). Of the 41 analytes compared between these two sites, 26 are statistically different, 25 of which have higher average concentrations downstream of Beltline Bridge. Table 4-7 below summarizes those pollutants whose concentrations increase as the Willamette River flows through the urban growth area. Increases include total and dissolved arsenic, copper, lead, mercury, nickel, and zinc. Bacteria counts (*E. coli* and fecal Coliform), as well as hardness (calcium and magnesium), dissolved solids, specific conductance, nutrients ($NO_3$+$NO_2$-N, Kjeldahl nitrogen, and ortho and total phosphorus), and turbidity values also increase as the Willamette River courses through the urban area. The pH decreases slightly.

An examination of water quality changes over shorter stream reaches indicates fewer statistically significant differences in analyte concentrations. Comparing data sets for the uppermost site above the Urban Growth Boundary to the Knickerbocker Bridge resulted in ten statistically significant differences among the analytes tested, including total and dissolved arsenic and copper, dissolved nickel, specific conductance, calcium (hardness), and bacteria (*E. coli* and fecal Coliform), all of which have higher values downstream.

Between the Knickerbocker Bridge and the Owosso Bridge, the concentration of total lead, and *E. coli* and fecal Coliform increase over the stream reach.

Between the Owosso Bridge and the site downstream of Beltline Bridge above the McKenzie River confluence, ten analytes have statistically significant values, all of which are greater at the downstream monitoring location, including total and dissolved copper and zinc, conductivity, dissolved lead, specific conductance, and nutrients (Kjeldahl nitrogen, $NO_3$+$NO_2$-N, and ortho and total phosphorus).

**Table 4-7**
**Comparison of Willamette River Average Analyte Concentrations**
**Upstream and Downstream of the Urban Growth Boundary**
**Using Mann-Whitney Statistic [1]**

| Analyte | Units | Upstream of Urban Growth Boundary (RM 186.9) | Downstream of Beltline Bridge (RM 176.8) |
|---|---|---|---|
| Arsenic – Total | (*µg/L*) | 0.268 | 0.333 |
| Arsenic – Dissolved | | 0.203 | 0.248 |
| Copper – Total | | 0.563 | 0.791 |
| Copper – Dissolved | | 0.303 | 0.442 |
| Lead – Total | | 0.0788 | 0.106 |
| Lead – Dissolved | | 0.00757 | 0.0181 |
| Mercury – Total | | 0.00161 | 0.00189 |
| Mercury - Dissolved | | 0.00073 | 0.00087 |
| Nickel – Total | | 0.306 | 0.361 |
| Nickel - Dissolved | | 0.192 | 0.232 |
| Silver – Total | | 0.00190 | 0.00496 |
| Zinc – Total | | 1.29 | 1.87 |
| Zinc – Dissolved | | 0.407 | 0.996 |
| *Escherichia coli* | (co*l./100 mL*) | 20 | 44 |
| Fecal Coliform | | 15 | 38 |
| Nitrate+Nitrite – as Nitrogen | (*mg/L*) | < 0.05 | 0.11 |
| Total Kjeldahl Nitrogen | | < 0.2 | 0.2 |
| Phosphorus – Ortho | | 0.02 | 0.05 |
| Phosphorus – Total | | 0.04 | 0.08 |
| Total Dissolved Solids | | 40 | 42 |
| Total Suspended Solids | | 4.2 | 5.0 |
| Turbidity | NTU | 6.7 | 7.2 |
| Calcium - Total | (*mg/L*) | 4.6 | 5.1 |
| Magnesium – Total | | 1.5 | 1.7 |
| Hardness | (*mg eq $CaCO_3$/L*) | 18 | 20 |
| Specific Conductance | (*µmhos/cm*) | 47 | 54 |
| pH | Standard Units | 7.4 | 7.2 |

[1] Mann-Whitney test statistic comparisons significant at α = 0.05.
Shaded cells indicate analyte value at downstream monitoring site greater than upstream site.

A final comparison is between Delta Ponds and the Willamette River at the Owosso Bridge; 16 of 21 analytes having statistically significant differences are associated with higher concentrations at the Delta Ponds site. Average values for total and dissolved arsenic, lead, nickel and zinc, dissolved copper, as well as total phosphorus, Kjeldahl nitrogen, dissolved solids, hardness (calcium and magnesium), and specific conductance values, are higher for the Delta Pond site. Average dissolved oxygen, pH, and interestingly, total chromium and total and dissolved mercury values were higher in the Willamette River at the Owosso Bridge site. As mentioned in a previous section, flow management of the Delta Ponds along with extensive restoration of riparian habitat has been conducted by the City of Eugene and the U.S. Army Corps of Engineers. The effect of these activities has been to alter the water quality characteristics of Delta Ponds, particularly during periods when flow management through Delta Ponds provides for higher flows to simulate more closely seasonal changes.

Tables A.27 and A.28 in Appendix A includes a summary of all Willamette River monitoring sites whose analytes have statistically significant differences using the Mann-Whitney test statistic; Tables A.29 and A.30 present the full program output.

The Willamette River was 303(d) listed in 2004 for dioxin (2,3,7,8-TCDD) and ambient samples were collected upstream of the urban growth boundary and downstream of Beltline Bridge during the 2014/2015 monitoring period; all results were reported as not detected (see Table A.19) with reporting limits ranging from 2.4 to 5.8 pg/L.

#### *4.4.4.5.* Comparison of Ambient Water Quality Data to Oregon Standards

Water quality standards and beneficial uses for surface waters are defined in Chapter 340, Division 41 of the Oregon Administrative Rules (OAR). Analytical results for surface water samples collected from Amazon Basin and Willamette River sites are assessed in this section for overall conformance to Oregon water quality standards.

Boxplot charts are shown in Appendix B Figures B.90 through B.106 of water quality data from the Amazon Basin and Willamette River monitoring sites and compared to Oregon standards. The horizontal line in the middle of the box for each analyte marks the median of the sample set; the median splits the ordered sample set in half. The box represents the central 50 percent of data values; the outer edge of each box mark the $25^{th}$ and $75^{th}$ percentiles. Whiskers extending from the box mark the range of values that fall within 1.5 box-lengths from the $25^{th}$ or $75^{th}$ percentile. Outliers and extreme values are also depicted in the figures and are defined using different criteria than those used to identify anomalous measurements. Values that are more than 1.5 box-lengths from the $25^{th}$ or $75^{th}$ percentiles are identified as outliers and are denoted by an open circle; extreme values are more than 3 box-lengths and are denoted by an asterisk.

All six monitoring stations in the Amazon Basin are grouped together to obtain a visual synopsis of the analytical data, as are the data for the Willamette River, Spring Creek, and Delta Ponds. Note that all total and dissolved metals values are grouped together for each analyte. The boxplots provide a means of quickly characterizing the data sets graphically in terms of the types of analytes and percentile of sampling events exceeding the applicable water quality standard. Appendix B (Figures B.107 through B.194) presents boxplots for each water quality parameter

by individual monitoring location. Boxplots also depict applicable Oregon water quality standard for each analyte when available. The water quality standard is defined by a vertical line through the concentration axis with the applicable criterion listed at the top of the chart. Metals toxicity criteria are adjusted for hardness using the equations of Table 20 in OAR 340-041. In all instances the lowest criterion is indicated.

In the case of arsenic (Figure B.90), for Amazon Basin monitoring locations, about 40 percent of the values exceed the human health criterion, which is 2.1 µg/L; the highest observed concentrations from Amazon basin sites exceed the standard by about seven times, while data for Willamette basin sites exceeded the standard in one instance, an extreme value from Delta Ponds where the concentration was about 2.5 µg/L. Willamette valley soils are volcanic in origin and contain relatively high concentrations of naturally occurring arsenic; in some locations total arsenic concentrations in soil can be as high as 20 mg/kg.

Cadmium concentrations exceeded the chronic toxicity criterion in both Amazon and Willamette basin monitoring sites, all of which are identified as extreme values. Most of the Amazon basin exceedances are associated with total values from the A3 Channel at Terry Street, while a handful of values scattered at the Knickerbocker and Owosso Bridge sites on the Willamette River within the urban area accounted for exceedances in the Willamette basin. Extreme values in the cadmium data set for Amazon basin sites are nearly three times greater than the chronic criterion; the majority of exceedances are less than two times the chronic criterion. Unlike previous reports where cadmium data were evaluated against a higher toxicity standard effective at that time, no water quality exceedances were observed. The cadmium toxicity criterion was recently updated by the Oregon DEQ, which has resulted in multiple exceedances (see Figure B.91).

Copper concentrations measured at monitoring sites from the Willamette Basin (Figure B.93) are for the most part less than the acute and chronic criteria with the exception of a few extreme values. In the Amazon Basin about 30% of values in the data set exceed the chronic criteria by up to seven times the 3.5 µg/L chronic criterion; values within 1.5 times the 75$^{th}$ percentile as defined by the extent of the whisker (about 7.0 µg/L) exceed both the chronic and acute toxicity criteria.

Nearly 50% of the stream samples collected from the Amazon Basin exceed the chronic criterion for lead at 0.54 µg/L (Figure B.94); none exceed the acute criterion. For the Willamette Basin monitoring sites the values for a few extreme values slightly exceed the chronic criterion.

Multiple extreme values and outliers at Amazon Basin sites exceed the mercury criterion of 0.012 µg/L (see Figure B.95); the extent of the whisker at 1.5 times the 75$^{th}$ percentile is near the mercury criterion. At the Willamette Basin sites a couple of extreme values slightly exceed the chronic criterion for mercury.

The chronic criterion for silver is 0.085 µg/L and is exceeded by a few extreme values in the Amazon Basin; one value exceeded the acute criterion. No Willamette Basin values exceed the water quality standard (Figure B.99).

Amazon Basin samples occasionally exceed both the acute and chronic criteria for zinc (Figure B.100), which are 36.2 µg/L and 37.0 µg/L, respectively (collectively shown as 36 µg/L on the chart). The extent of the whisker exceeds both criteria. About a dozen samples collected from the Willamette Basin sites exceed both water quality criteria for zinc.

Exceedances of non-metal water quality standards are also observed for samples collected from the Amazon and Willamette Basins. These included DO, bacteria, pH, temperature, and turbidity. Minimum DO criteria are not met at either the Amazon or Willamette Basin sites for at least some periods of the year. For the Amazon Basin samples this would typically occur during summer months when water temperatures are warmer and stream flows are lower. Boxplots in Figure B.101 indicate that over a quarter of samples from the Amazon Basin may not meet the 6.5 mg/L minimum DO criterion. Sampling protocol does not strictly meet the 30-day mean definition of the criterion given a sampling frequency of six times per year; however, the values are strong evidence that depleted oxygen conditions may persist in the waterbody. The DO criterion for the Willamette River is for the period extending from October 15 to May 15 (the spawning period for salmonids); about 60% of the samples measured at Willamette Basin sites did not meet the 11.0 mg/L minimum DO criterion, though this is somewhat skewed by inclusion of the Delta Ponds and Spring Creek samples which, on average, have 6.1 and 7.7 mg/L DO, respectively. Boxplots in Figure B.176 indicate that only about half of the samples collected from Willamette Basin sites met the 11.0 mg/L DO criterion during the spawning period. Note that half of the samples did not meet the DO criterion at the site upstream of the urban growth boundary, thus the Willamette River was found to be oxygen depleted even before passing through Eugene urban area. Median DO concentrations are lowest near the Owosso Bridge monitoring site but improve somewhat downstream of Beltline Bridge. Pollutants transported by stormwater likely contribute to oxygen depletion of the river through biological and chemical processes.

*Escherichia coli* counts exceed the criterion of 406 organisms per 100 mL in about 30 percent of samples collected from the Amazon Basin sites (Figure B.102); a few outliers exceeded the criterion from Willamette Basin sites, primarily from the Spring Creek and Delta Ponds sites (see Figure B.184). The magnitude of exceedance for outliers and extreme values at the Amazon Basin sites is nearly two orders greater than the criterion. Unlike the Amazon Basin sites where *E. coli* counts tend to decrease downstream, *E. coli* counts in samples from the Willamette River increase slightly as the river flows through the urban growth area (see Table 4-7 above); however, values for monitoring sites on the main-stem Willamette River did not exceed the water quality criterion for bacteria. Fecal Coliform values exceed the criterion less frequently as shown in Figure B.103; the few outliers for the Willamette Basin are associated with the Spring Creek site (see Figure B.185), samples from the Willamette River did not exceed the bacteria criterion.

Field pH measurements from Amazon Basin sites sometimes exceed both the minimum and maximum pH criteria of 6.5 and 8.5 pH units respectively; some samples from the Willamette River sites exceed the minimum pH criterion (Figure B.104). Most of these exceedances are associated with field measurements performed during the early years of the monitoring program where greater pH variability is observed; however, recent measurements indicate exceedances do occur as seen for Delta Ponds and Spring Creek at Beacon Drive East (see Table A.19).

Nearly 60% of the samples collected from the Amazon Basin exceed the salmon and trout rearing and migration temperature criterion of 18 ˚C (Figure B.106), effective from May 16th through October 14th; a few samples from the Willamette Basin also exceed this criterion. The salmon and steelhead spawning temperature criterion of 13 ˚C (Figure B.105) is applicable to the Willamette River and is effective from October 15th through May 15th; samples collected from the four main-stem monitoring sites occasionally exceed this criterion.

Figures B.189 through B.194 in Appendix B are boxplots of turbidity measurements compared to the applicable flow-based turbidity target defined in Chapter 10 on page 212 of the Willamette Basin TMDL; boxplots in Figure B.189 summarize the data by criterion. DEQ derived the Amazon Creek turbidity targets using Long Tom River flows near Noti as a reference river discharge. Collection dates for historical turbidity values measured under the ambient monitoring program were correlated to river flows on the Long Tom recorded by the USGS. The applicable turbidity target was then derived for each turbidity value; boxplots of the data sets are grouped by the applicable turbidity target, as defined on each chart. Most of the turbidity values exceed the applicable criterion, though it is instructive to note that the median of turbidity values for Willow Creek tends to center on the target at higher turbidity values. Turbidity values for Amazon Creek at 29th Avenue are comparable to – and often times less turbid than – Willow Creek, suggesting the upper reach of Amazon Creek may already exhibit turbidity levels that are similar to Willow Creek, a relatively undisturbed stream originating within this basin. Efforts will continue on downstream sites including through creek restoration projects to further improve water quality and reduce turbidity.

OAR 340-041-0036 describes the turbidity criterion applicable to the Willamette River, which states that no more than a ten percent cumulative increase in natural stream turbidities may be allowed as measured relative to a control point immediately upstream. A statistically significant difference was observed for turbidity between the uppermost monitoring site on the Willamette River upstream of the urban growth boundary, and the lowermost site downstream of the Beltline Bridge (see Tables 4-7 above). Figure B.181 presents turbidity boxplots for the Willamette River sites.

Figures 4-6a through 6c and 4-7a through 7c, graphically summarize trends and water quality criteria for each monitoring location within the Amazon and Willamette Basins. Figures 4-6a and 4-7a summarize the Seasonal Kendal trends; green text analytes indicate decreasing trends while analytes in red text indicate an increasing trend. Green may be presumed to be a "good" indicator, while red a "poor" indicator, with the exception of Dissolved Oxygen in Figures 4-6a, 4-7a and 7b; in this instance decreasing trends are not desired and are indicative of water quality degradation, while increasing trend is desirable and indicative of improving water quality.

Figures 4-6b and 4-7b compares water quality data for the most recent monitoring period (2014/2015) to Oregon water quality standard; all analytes listed indicate an exceedance of a water quality standard, green text analytes indicate the analyte has a decreasing concentration trend for the entire data set, red text indicates an increasing trend, and black text indicates no trend in the data set.

Finally, Figures 4-6c and 4-7c compare statistically significant water quality changes across the Amazon and Willamette drainage basins. Each analyte is color coded to its respective drainage basin area; for example, in the comparison of Amazon Creek at 29th Avenue to Amazon Creek at the Railroad Crossing, analytes in red text indicate concentrations are greater at the 29th Avenue site, while those analytes in blue text indicate concentrations are greater at the Railroad Crossing site. Comparisons are for the entire water quality data set.

### *4.4.4.6.* Water Quality Correlations

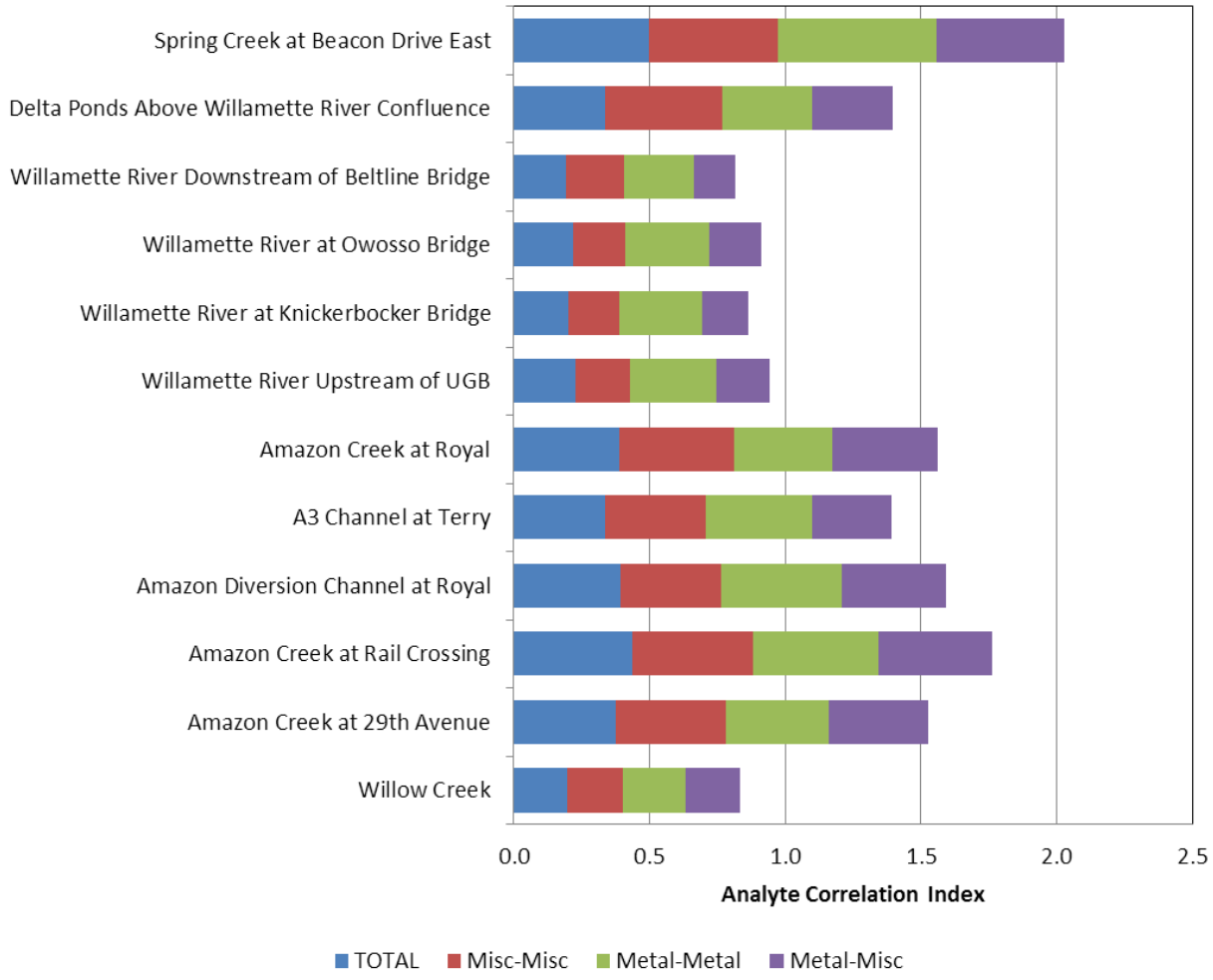
Factor analysis of the ambient water quality data was done to study the interrelated water quality analytes at each monitoring location. This concept is important because it may provide important characteristics of the water body and the types of pollutants detected both during dry and wet seasons. For example, suspended solid and turbidity increases in a waterbody may be associated with increases of other pollutants, hence application of specific BMPs to control solids and turbidity would prove beneficial in controlling other pollutants that are problematic in the same waterbody.

Our analysis consisted of reviewing the entire water quality data set using commercially available software to perform factor analysis. In addition to the 41 water quality analytes, three additional variables were added to the analysis; precipitation, river flow, and seasonality. River flow for sites other than the Willamette River utilizes flow measurements in the Long Tom River near Noti, and seasonality is as defined in the Seasonal Trends section above. While derivation of a model summarizing the many analytes into a few factors is possible, our interest at this initial stage of review was generation of a correlation matrix of all analytes and their interrelationships. Correlations, or r values, measure the strength of linear associations between each analyte. Upon obtaining the correlations, all analyte pairs exceeding an r value of 0.3 and whose comparison was significant at $\alpha = 0.05$, were selected as "significant" analytes. A simple correlation index was developed whereby the sum of significant analyte pairs is divided by the total number of possible significant pairs. The index was calculated for four analyte groupings including; all analytes, metals, nonmetals, and metal-nonmetal correlations. If all analytes are linearly correlated within their respective group, an index of 1 (one) would be observed.

Figure 4-8 summarizes the correlation indexes for each ambient monitoring location. In general, the lowest correlation indexes are located at Willow Creek and Willamette River sites; by comparison, Amazon Creek, the A3 and Diversion Channels, Spring Creek, and Delta Ponds had significantly higher indexes. Overall, the highest correlation index observed for all analytes was 0.50 for Spring Creek at Beacon Drive East followed by Amazon Creek at the Railroad Crossing with a 0.44 correlation index.

Spring Creek had the highest metals correction index at 0.59, followed by Amazon Creek at the Railroad Crossing at 0.46. At Spring Creek, molybdenum, zinc, copper, mercury, arsenic, and lead had the greatest number of metal-metal correlations. For the non-metals, chemical oxygen demand, suspended solids, fecal Coliform, $NO_3$+$NO_2$-N, and hardness (calcium and magnesium) had the greatest number of correlations.

**Figure 4-8**
**Analyte Correlation Index**




Amazon Creek at the Railroad Crossing had the highest non-metal correlation index at 0.45, including dissolved oxygen, temperature, seasonality, specific conductance, hardness (calcium and magnesium), and dissolved solids. For metals, the greatest number of correlations occur for arsenic, selenium, nickel, molybdenum, lead, mercury, copper, and zinc. Total lead had the highest number of significant correlations at 31 analyte pairs, followed by total arsenic at 30, and total nickel at 29 analyte pairs; dissolved oxygen had 29 analyte pairs, temperature 28 pairs and suspended solids 25 pairs.

The Willamette River at upstream of the urban growth boundary had the highest correlation index at 0.33 for the metal group. The correlation matrix for this group indicates copper, nickel, and mercury had the highest number of significant correlations.

A final comparison was made to evaluate the metal-nonmetal relationships. Once again, the Spring Creek at Beacon Drive East had the highest correlation index at 0.47, followed by

Amazon Creek at the Railroad Crossing 0.42. Analyte pair combinations in this group with the highest number of correlations include arsenic, lead, mercury, copper, molybdenum, selenium, zinc, bacteria, phosphorus, temperature, suspended solids, dissolved oxygen, hardness (calcium and magnesium), and conductivity.

Table 4-8 below lists analyte correlations with turbidity and suspended solids for the Amazon and Willamette River basins. These data suggest BMPs that control total suspended solids and turbidity may also be effective in reducing multiple other pollutants in waterbodies receiving stormwater flow.

**Table 4-8**
**Analyte Correlation with TSS and Turbidity**

| **Amazon Basin Monitoring Sites** | | **Willamette Basin Monitoring Sites** | |
|---|---|---|---|
| **Non-Metals** | **Metals** | **Non-Metals** | **Metals** |
| Seasonality | Arsenic – D & T | Seasonality | Arsenic – D & T |
| River Flow | Cadmium – T | River Flow | Cadmium – T |
| Precipitation | Chromium – T | COD | Chromium – T |
| BOD | Copper – D & T | Hardness (Mg) | Copper – D & T |
| COD | Lead – T | TDS | Lead – T |
| DO | Mercury – D & T | *E. coli* | Mercury – D & T |
| Hardness (Ca & Mg) | Molybdenum – D & T | Total Phosphorus | Nickel – T |
| TDS | Nickel – T | Kjeldahl Nitrogen | Zinc – T |
| Specific Conductance | Selenium – T | Temperature | |
| Fecal Coliform | Silver – T | | |
| Total Phosphorus | Zinc – D & T | | |
| Kjeldahl Nitrogen | | | |
| Temperature | | | |

D – Dissolved
T - Total

### 4.4.5. Macroinvertebrate Surveys

During the fall of 2014, Cole Ecological, Inc. of Portland, OR, was retained to conduct a macroinvertebrate study at select locations in the Amazon Creek and Willamette River drainage basins, including a reference site in the Spencer Creek drainage basin south of Eugene. Amazon Basin sites were selected such that most coincided with those previously studied by the Long Tom Watershed Council to enable monitoring of long-term macroinvertebrate trends, and the city's ambient water quality monitoring. Willamette Basin sites were selected to coincide with the ambient monitoring program.

A total of eleven stream reaches were sampled, one reach each on the Amazon Diversion Channel and A3 Channel, three reaches on Amazon Creek, and one on the Middle Fork of

Spencer Creek. Within the Willamette Basin, Delta Ponds, three reaches on the Willamette River, plus a reach on the Coast Fork Willamette River upstream of the urban growth boundary, were surveyed; Spring Creek, which eventually flows to the Willamette River north and downstream of the urban growth boundary, was not sampled due to lack of streamflow.

Field data were collected on September 30 through October 2, 2014. Each reach was measured 20 times the average wetted width or 75-m, whichever length was greater. Macroinvertebrate communities, physical habitat, and water chemistry were sampled during the field survey.

Habitat surveys following modified Rapid Stream Assessment Protocols (RSAT) included data collection from surveys of channel habitat units, three channel cross sections, and adjacent riparian zones. The number, length, width, and maximum water depth of pools, glides, riffles, and rapids were documented, as well as channel cross sections establishing wetted and bankfull widths, maximum bankfull height (as well as 25%, 50%, and 75%) across the distance of the bankfull channel, and the flood-prone width. Riparian conditions were also characterized by dominant plant community types. Water temperature, dissolved oxygen, pH, and conductivity were also measured.

Macroinvertebrates were collected using the Oregon DEQ Benthic Macroinvertebrate Protocol for Wadeable Rivers and Streams. Composite samples from the best available habitat occurring in each reach were taken using a D-frame kicknet, placed in sample containers and preserved for later sorting and identification at the laboratory. Details of laboratory methods and data analysis are contained in the report.

Given the large size and non-wadeable characteristics of the Willamette River, a visual-estimate-based Rapid Habitat Assessment was used to semi-quantitatively characterize physical habitat at these reaches.

Results of the surveys indicate that the macroinvertebrate communities in the Amazon Basin test sites are largely comprised of organisms able to tolerate elevated sediment loads, higher water temperatures, periods of sustained high or low flows, and other perturbations. Total taxa richness was found to have decreased in 2014 from the 2011 survey at all Amazon Basin sites, including the Middle Fork Spencer Creek site, which is likely the result of prolonged drought conditions observed throughout the Pacific Northwest. Rating scores for all Amazon Basin sites indicated heavily degraded benthic communities, while that of the Spencer Creek site indicated a community that was less tolerant to pollution. While the overall taxa richness decreased for these sites compared to the previous survey, nine EPT taxa occurred in the 2014 survey, compared to 12 in 2011, suggesting conditions may not have changed as much as the O/E scores alone would suggest..

Multimetric scores for the Coast Fork and Willamette River sites indicated moderate to slight degradation with no sensitive taxon observed. Delta Ponds contained low percentages of sediment-tolerant and disturbance-tolerant organisms but overall scored low compared to the Willamette River sites.

Details of the assessment can be found in the report, included in Appendix C. The findings for Amazon Creek were similar to those of the Long Tom Watershed Council study done in April 2007. In addition, the health of macroinvertebrate communities in Amazon Creek is consistent with the overall water quality characteristics, and common for streams in urban areas in the Pacific Northwest.

Macroinvertebrate monitoring and habitat surveys will continue in accordance with the City's Stormwater Monitoring Plan. This information will be used to assess the effectiveness of restoration projects completed and planned for the Amazon Basin and potentially be used to characterize broadly the effectiveness of BMPs in reducing pollutants associated with stormwater flow through the permit area.

### 4.4.6. Physical Monitoring

Physical monitoring was done at select locations to characterize the current physical condition of receiving waterbodies, and assess the effects of stormwater runoff on receiving waters. Monitoring followed the methodology used in the Eugene-Springfield Metro Waterways Study, which was done to assess existing problems and opportunities related to area waterways, and to identify solutions to improve their function. The U.S. Army Corps of Engineers, in partnership with the cities of Eugene and Springfield, Eugene Water & Electric Board, and Lane County, and the Bureau of Land Management as a Cooperating Agency partnered on this multi-year study in the Eugene-Springfield metropolitan area and surrounding rural lands. The first phase of the study was focused on the Amazon Creek watershed. The study is no longer being conducted, however, valuable reports and plans were completed that will be utilized for potential implementation of restoration projects in the future.

The physical monitoring methodology consists of condition assessment ranking protocol for classifying stream and channel segments in terms of their water quality, natural resource, conveyance functions, and maintenance considerations. Table A.31 presents the entire physical assessment survey results. Summaries of total assessment scores are shown in Table 4-9. Overall, scores range from 18 to 73% of the total points possible. Table 4-10 describes restoration activities within riparian areas and incremental assessment score changes from 2011 to 2014.

Key aquatic and riparian characteristics of select waterways were digitally photographed and annotated with appropriate contextual information to assist development of a visual record to accompany the physical assessment.

Physical assessment surveys and photographs taken thus far establish a baseline from which to compare future assessments, which are done concurrently with macroinvertebrate surveys. As additional surveys are done in the future more rigorous analyses can be done to evaluate progress toward improving physical assessment scores.

| Table 4-9<br>Summary of Physical Assessment Survey Scores | | | | |
|---|---|---|---|---|
| **Assessment Number** | **Waterway** | **Reach** | **Waterway Assessment Total Score** | **% Total Points (160 Possible)** |
| 1 | Amazon Creek | Martin Street - Snell Street (2005) | **110** | 69% |
| 1 | Amazon Creek | Martin Street - Snell Street (2011) | **116** | 73% |
| 1 | Amazon Creek | Martin Street - Snell Street (2014) | **116** | 73% |
| 2 | Amazon Creek | Snell - Fox Hollow (2005) | **93** | 58% |
| 2 | Amazon Creek | Snell - Fox Hollow (2011) | **94** | 59% |
| 2 | Amazon Creek | Snell - Fox Hollow (2014) | **94** | 59% |
| 3 | Amazon Creek | Fox Hollow - 30th Ave (2005) | **83** | 52% |
| 3 | Amazon Creek | Fox Hollow - 30th Ave (2011) | **86** | 54% |
| 3 | Amazon Creek | Fox Hollow - 30th Ave (2014) | **86** | 54% |
| 4 | Amazon Creek | 30th Av. - 24th av. (2005) | **103** | 64% |
| 4 | Amazon Creek | 30th Av. - 24th av. (2011) | **107** | 67% |
| 4 | Amazon Creek | 30th Av. - 24th av. (2014) | **112** | 70% |
| 5 | Amazon Creek | 24th Ave. - Fairgrounds (2005) | **29** | 18% |
| 5 | Amazon Creek | 24th Ave. - Fairgrounds (2011) | **29** | 18% |
| 5 | Amazon Creek | 24th Ave. - Fairgrounds (2014) | **29** | 18% |
| 6 | Amazon Creek | Fairgrounds - Chambers St. (2005) | **71** | 44% |
| 6 | Amazon Creek | Fairgrounds - Chambers St. (2011) | **74** | 46% |
| 6 | Amazon Creek | Fairgrounds - Chambers St. (2014) | **78** | 49% |
| 7 | Amazon Creek | Chambers St. - Oak Patch (2005) | **56** | 35% |
| 7 | Amazon Creek | Chambers St. - Oak Patch (2011) | **59** | 37% |
| 7 | Amazon Creek | Chambers St. - Oak Patch (2014) | **70** | 44% |
| 8 | Amazon Creek | Oak Patch - Bailey Hill (2005) | **77** | 48% |
| 8 | Amazon Creek | Oak Patch - Bailey Hill (2011) | **80** | 50% |
| 8 | Amazon Creek | Oak Patch - Bailey Hill (2014) | **81** | 51% |
| 9 | Amazon Creek | Bailey Hill Rd. - Railroad Bridge (2005) | **94** | 59% |
| 9 | Amazon Creek | Bailey Hill Rd. - Railroad Bridge (2011) | **96** | 60% |
| 9 | Amazon Creek | Bailey Hill Rd. - Railroad Bridge (2014) | **100** | 63% |
| 10 | Amazon Creek | Railroad Bridge - Royal Ave. (2005) | **116** | 73% |
| 10 | Amazon Creek | Railroad Bridge - Royal Ave. (2011) | **117** | 73% |
| 10 | Amazon Creek | Railroad Bridge - Royal Ave. (2014) | **117** | 73% |
| 11 | Amazon Creek | Royal Ave. - Fern Ridge Reservoir (2005) | **56** | 35% |
| 11 | Amazon Creek | Royal Ave. - Fern Ridge Reservoir (2011) | **66** | 41% |
| 11 | Amazon Creek | Royal Ave. - Fern Ridge Reservoir (2014) | **66** | 41% |
| 12 | Amazon Creek | Royal Ave. - Greenhill Ave. (2005) | **102** | 64% |
| 12 | Amazon Creek | Royal Ave. - Greenhill Ave. (2011) | **105** | 66% |
| 12 | Amazon Creek | Royal Ave. - Greenhill Ave. (2014) | **105** | 66% |
| 13 | Spring Creek | Awbrey Park (2005)**not assessed | | |
| 13 | Spring Creek | Awbrey Park (2011) | **102** | 64% |
| 13 | Spring Creek | Awbrey Park (2014) | **104** | 65% |

| Table 4-10<br>Summary of Riparian Changes in Amazon Creek<br>2011 to 2014 | | |
|---|---|---|
| **Stretch** | **Explanation: physical, water quality, natural resource and/or recreation values** | **Assessment Score Change** |
| Martin Street - Snell Street | Slight increase in shade due to maturing willow plantings in East Fork Amazon headwaters (2005 project) | 0 |
| Snell - Fox Hollow | No significant changes in channel; Rexius Trail slowly declining in quality due to poor construction, lack of maintenance | 0 |
| Fox Hollow - 30th Ave | One small bank repair (2013); maturing tree and shrub cover (especially 33rd to 30th); Rexius Trail declining | 0 |
| 30th Ave. - 24th Ave. | Increased shade and slope stability due to ash & willow maturation; concrete pedestrian path reconstructed/improved | +3 |
| 24th Ave. - Fairgrounds | No significant change in this stretch | 0 |
| Fairgrounds - Chambers St. | Increased shade and slope stability due to willow maturation; many new trees planted; concrete pedestrian path reconstructed/improved | +3 |
| Chambers St. - Oak Patch | Capital improvement 2014 (Chambers - Arthur) increased slope stability, native plant cover; willow maturation & tree planting elsewhere | +7 |
| Oak Patch - Bailey Hill | Increased shade and slope stability due to willow plantings and maturation | +1 |
| Bailey Hill Rd. - Railroad Bridge | Capital improvement project (rock placement); City acquisition of Rexius property; willow maturation | +3 |
| Railroad Bridge - Royal Ave. | No significant change in this stretch | 0 |
| Royal Ave. - Fern Ridge Reservoir | No significant change in this stretch | 0 |
| Royal Ave. - Greenhill Ave. | No significant change in this stretch | 0 |
| Spring Creek - Awbrey Park | Active volunteer group has removed blackberries, established native shrubs & forbs along most of this reach | +1 |

### 4.4.7. Data Management, Documentation and Record-Keeping

Laboratory analysis performed at the Eugene/Springfield Water Pollution Control Facility is performed under an Environmental Management System (EMS) for which the facility has earned certification under the International Organization for Standardization (ISO). Organizations that earn ISO certification under the 14001:2004(E) standard commit to develop an environmental policy, establish objectives and processes to achieve policy commitments, take action as needed to improve its performance and demonstrate the conformity of the system to the requirements of the ISO standard. ISO 14001 elements include establishing, implementing and maintaining procedures applicable to legal requirements, documentation and records determined to be necessary to ensure effective planning, operation and control of processes, control of records and documents, evaluation of legal compliance, defining roles, responsibilities and authority of staff, competence and training requirements, and management review. In addition, the E/S WPCF's EMS is audited by internal and external auditors on a frequent basis to ensure conformance and compliance to the policies and objectives established by and applicable to the E/S WPCF.

As such, all sampling and analysis of stormwater, stream, and MS4 samples performed by staff at the E/S WPCF falls under the umbrella of the EMS program. Documents and records associated with stormwater monitoring elements are readily available through the E/S WPCF electronic document control system, including the facility's QAP and all SOPs associated with sample collection, handling, analysis, and reporting. All laboratory and field measurements collected to meet the stormwater NPDES monitoring requirements is controlled through the E/S WPCF's Laboratory Information Management System (LIMS), which has strict controlled data entry requirements and access restrictions.

The Stormwater Monitoring Plan documents the sampling and analysis protocol which follows the requirements specified in Schedule B of the City's MS4 permit. At this time no substantive revisions to the Monitoring Plan are proposed. All revisions to the Monitoring Plan are documented under revision history at the front of the document. Revision 1.0 is the latest and current Monitoring Plan version and is available to the public at any time via the City of Eugene's Municipal Stormwater Permit web site.

All water quality data collected during this monitoring period as well as historical data, are also posted to the City's Municipal Stormwater Permit internet web site at http://www.eugene-or.gov/index.aspx?nid=476 .

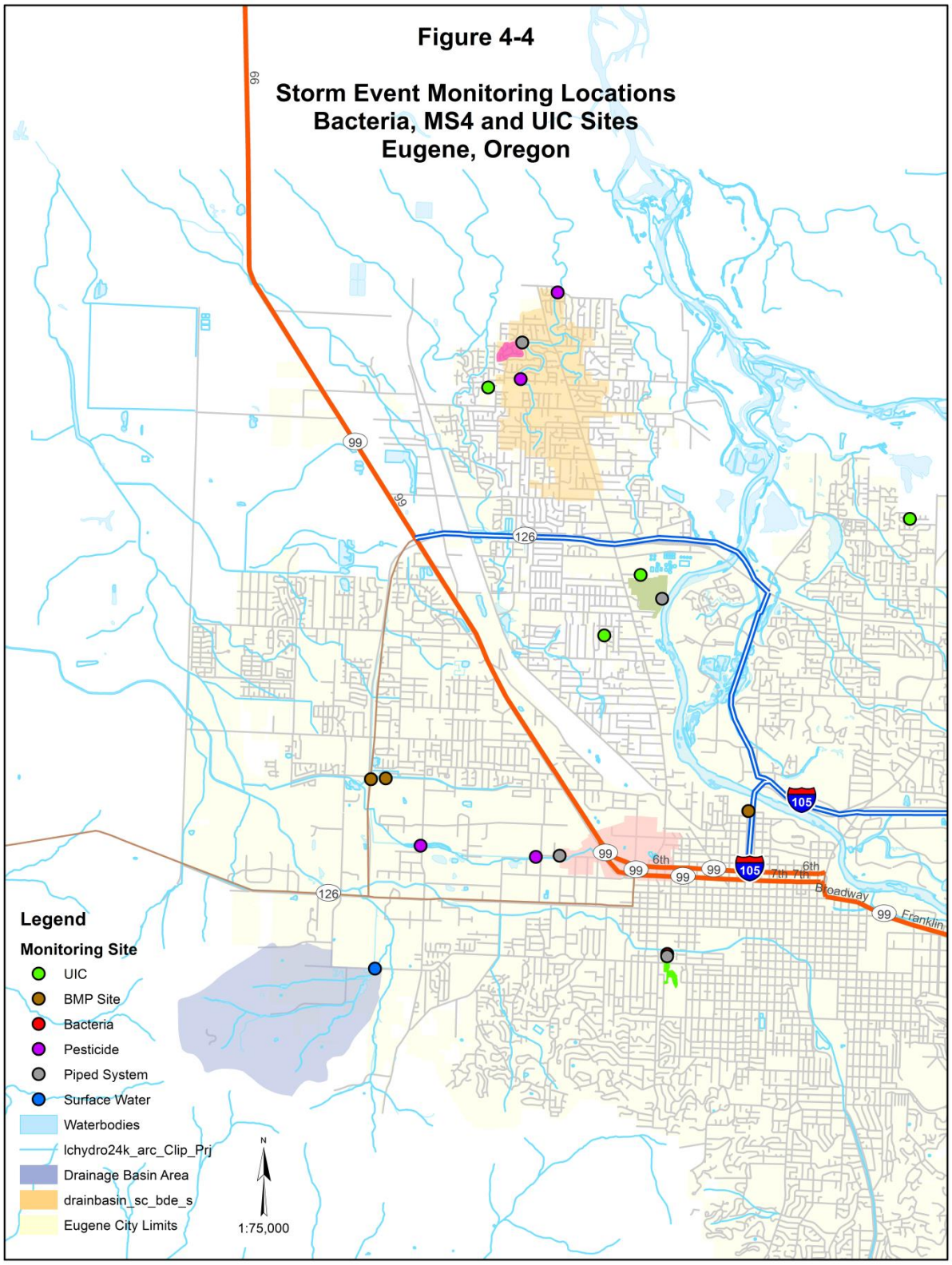


Figure 4-4
Storm Event Monitoring Locations
Bacteria, MS4 and UIC Sites
Eugene, Oregon
Legend
Monitoring Site
UIC
BMP Site
Bacteria
Pesticide
Piped System
Surface Water
Waterbodies
lchydro24k_arc_Clip_Prj
Drainage Basin Area
drainbasin_sc_bde_s
Eugene City Limits
N
1:75,000
99
126
105
6th
7th
Broadway
Franklin

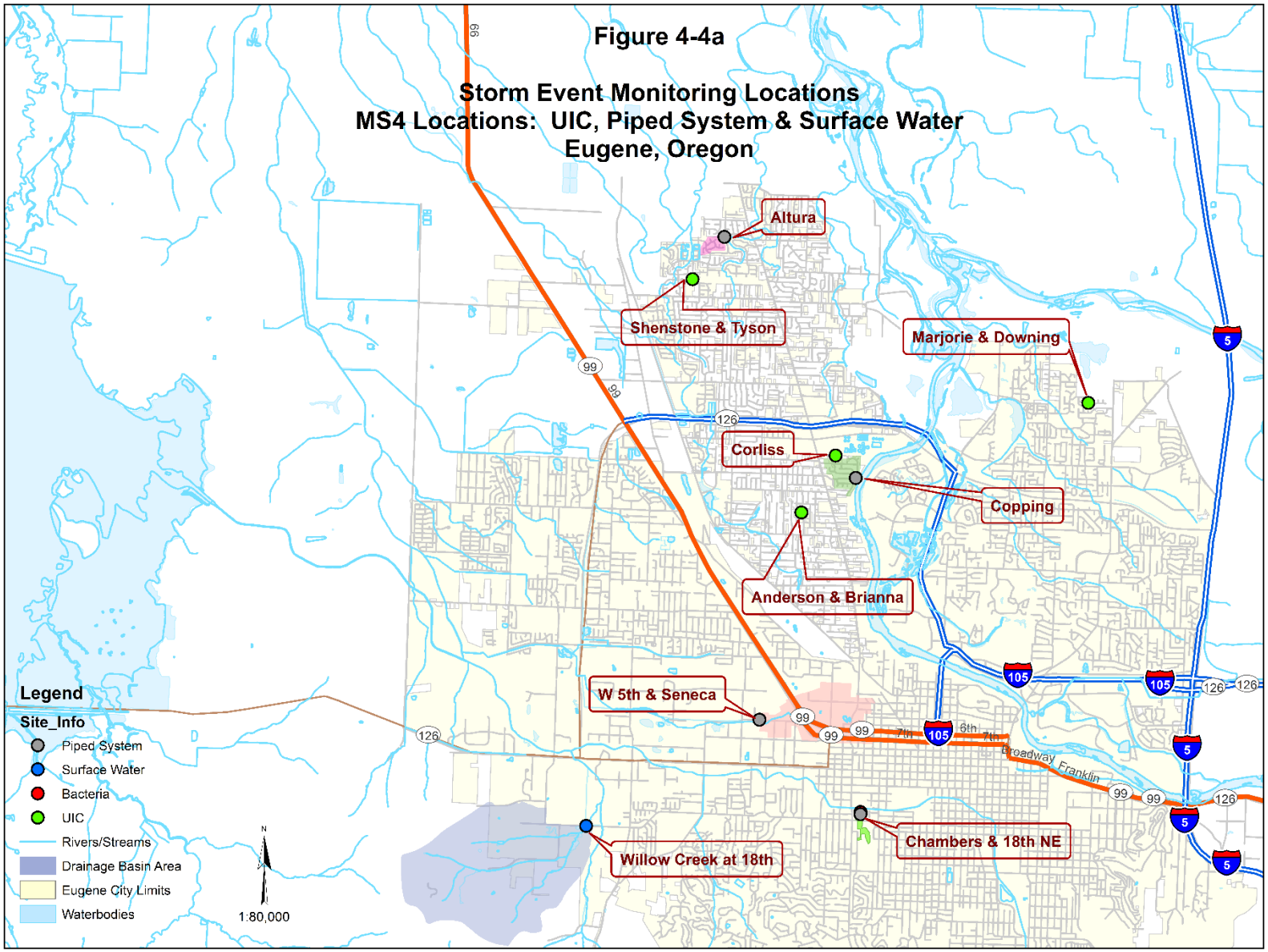


Figure 4-4a
Storm Event Monitoring Locations
MS4 Locations: UIC, Piped System & Surface Water
Eugene, Oregon
Altura
Shenstone & Tyson
Marjorie & Downing
Corliss
Copping
Anderson & Brianna
W 5th & Seneca
Willow Creek at 18th
Chambers & 18th NE
Legend
Site_Info
Piped System
Surface Water
Bacteria
UIC
Rivers/Streams
Drainage Basin Area
Eugene City Limits
Waterbodies
1:80,000
99
126
105
5
Broadway
Franklin
6th
7th

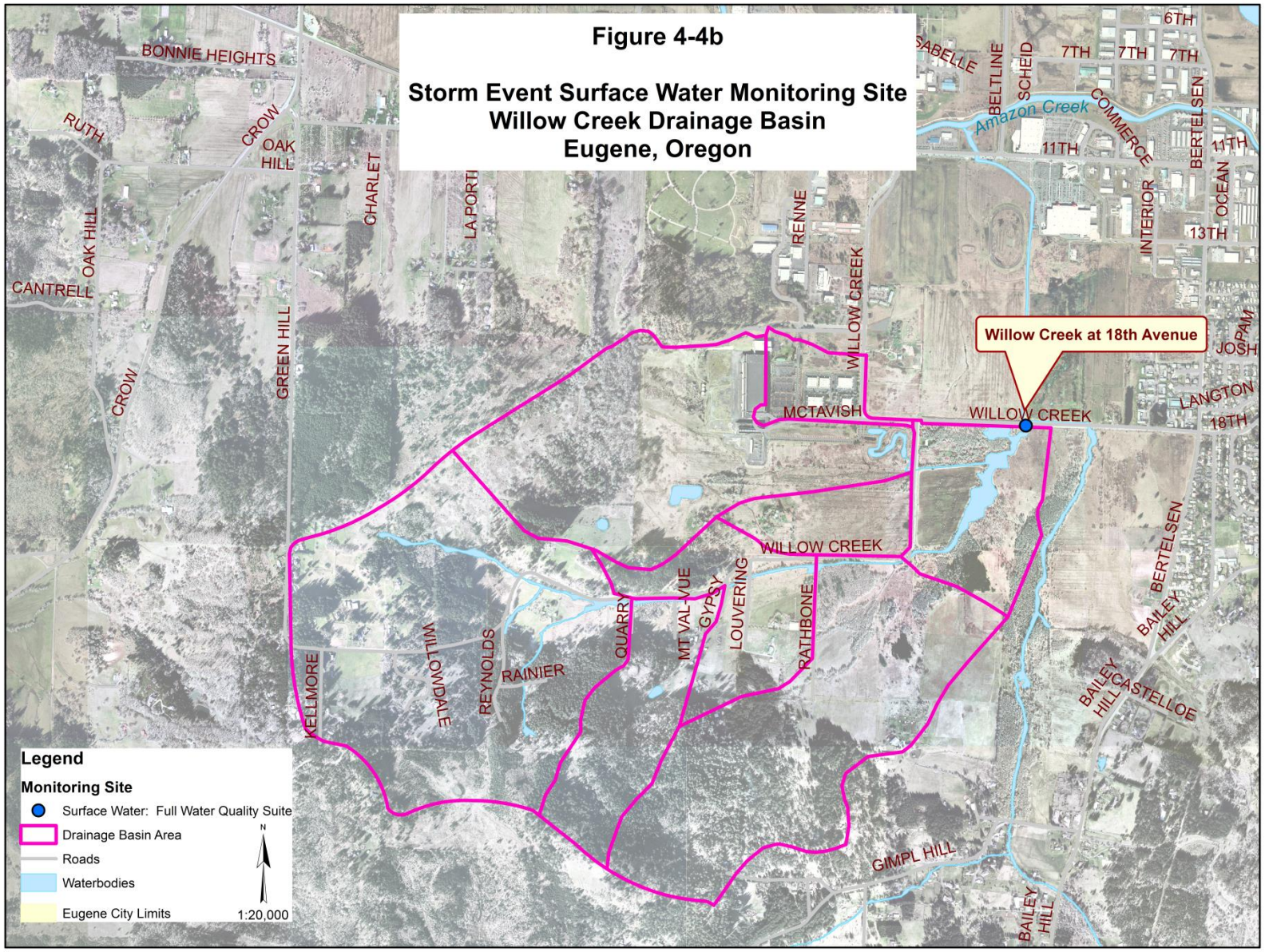


Figure 4-4b
Storm Event Surface Water Monitoring Site
Willow Creek Drainage Basin
Eugene, Oregon
Willow Creek at 18th Avenue
WILLOW CREEK
MCTAVISH
WILLOW CREEK
Amazon Creek
BONNIE HEIGHTS
RUTH
CROW
OAK HILL
CHARLET
LA PORTE
RENNE
CANTRELL
GREEN HILL
KELLMORE
WILLOWDALE
REYNOLDS
RAINIER
QUARRY
MT VAL VUE
GYPSY
LOUVERING
RATHBONE
BELTLINE
SCHEID
COMMERCE
INTERIOR
BERTELSEN
OCEAN
JOSH
PAM
LANGTON
6TH
7TH
11TH
13TH
18TH
BAILEY HILL
CASTELLOE
GIMPL HILL
Legend
Monitoring Site
Surface Water: Full Water Quality Suite
Drainage Basin Area
Roads
Waterbodies
Eugene City Limits
N
1:20,000

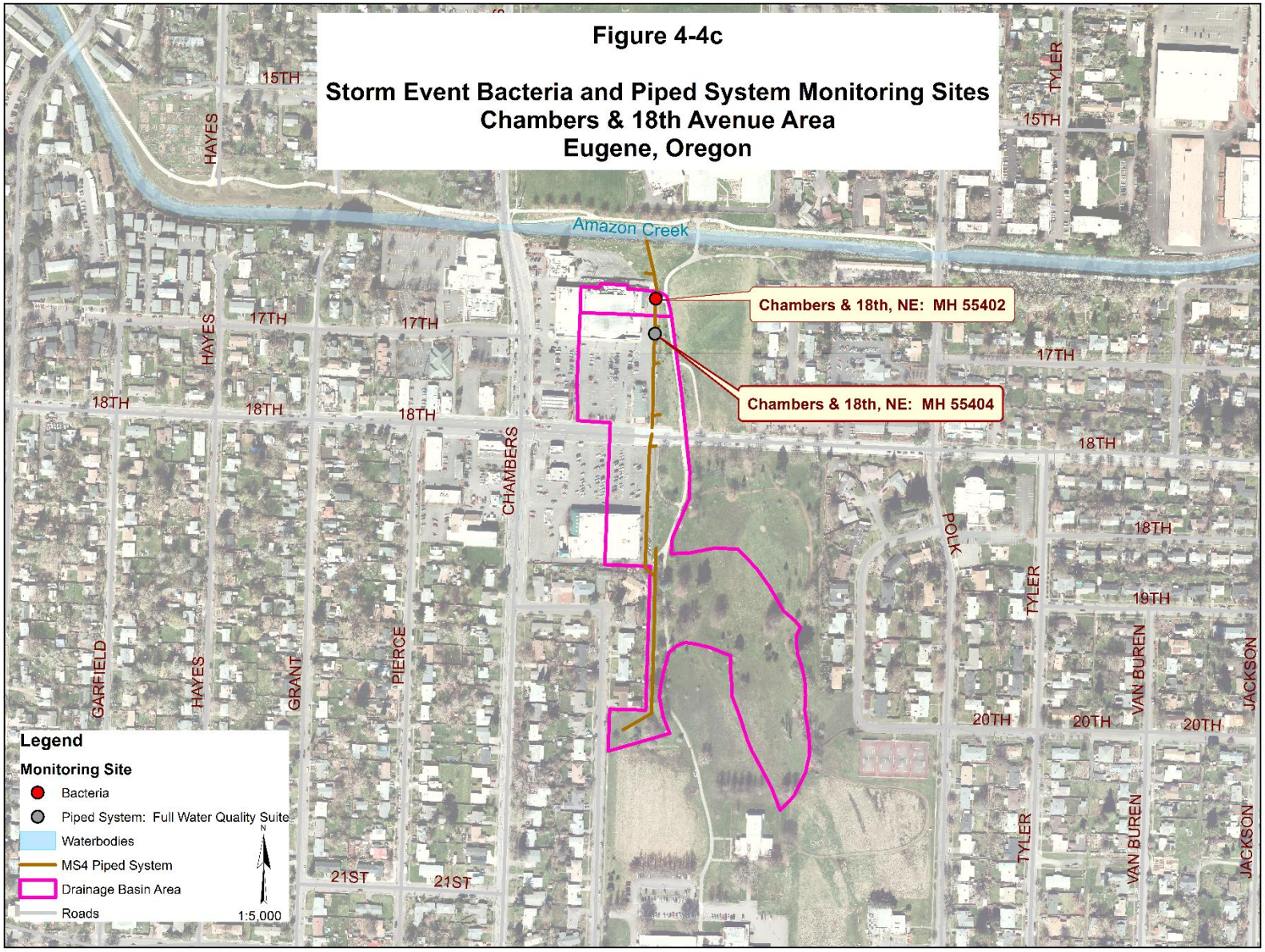


Figure 4-4c
Storm Event Bacteria and Piped System Monitoring Sites
Chambers & 18th Avenue Area
Eugene, Oregon
Amazon Creek
Chambers & 18th, NE: MH 55402
Chambers & 18th, NE: MH 55404
15TH
HAYES
TYLER
17TH
18TH
CHAMBERS
POLK
19TH
20TH
VAN BUREN
JACKSON
GARFIELD
GRANT
PIERCE
21ST
Legend
Monitoring Site
Bacteria
Piped System: Full Water Quality Suite
Waterbodies
MS4 Piped System
Drainage Basin Area
Roads
N
1:5,000

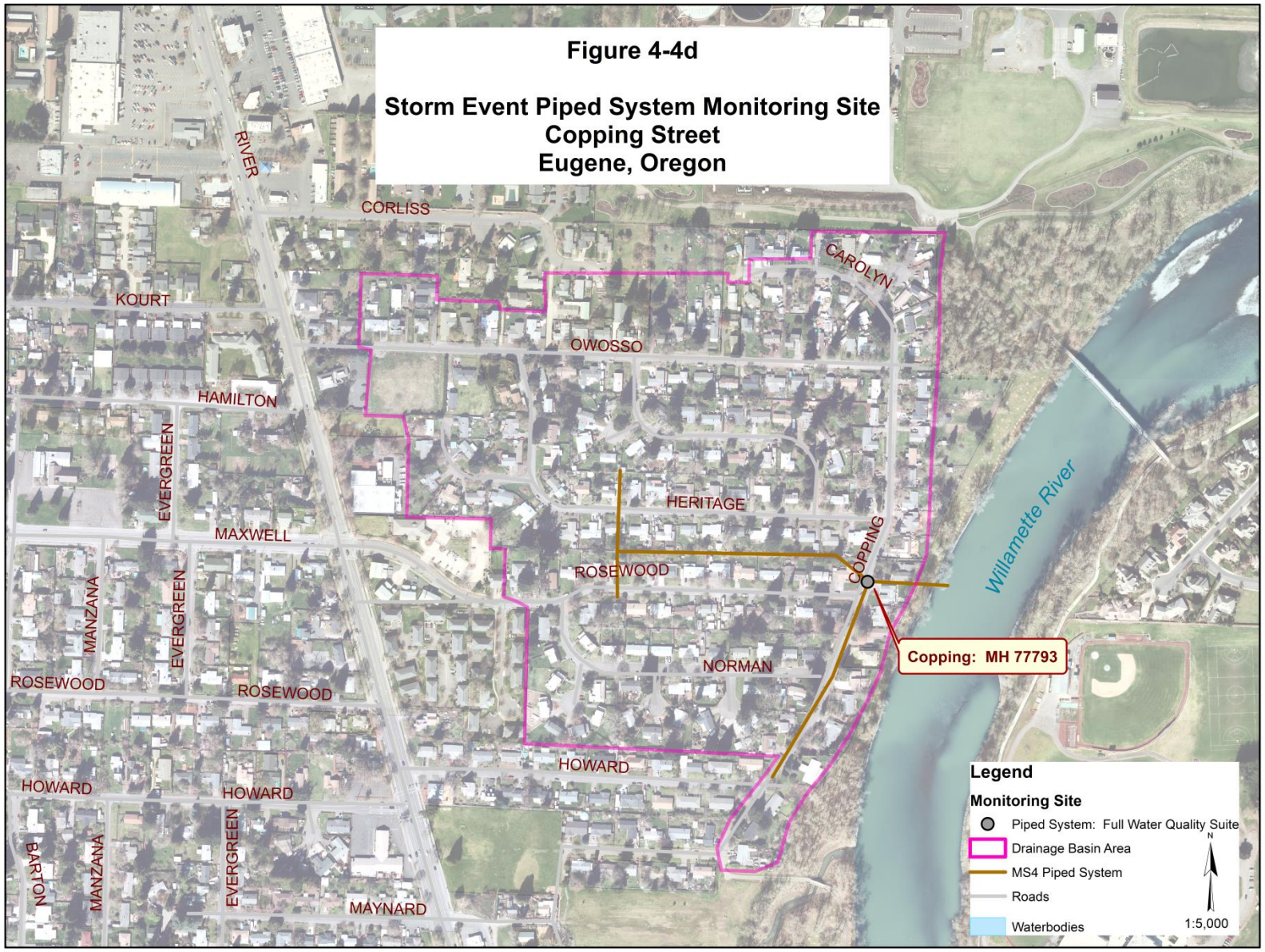


Figure 4-4d
Storm Event Piped System Monitoring Site
Copping Street
Eugene, Oregon
RIVER
CORLISS
CAROLYN
KOURT
OWOSSO
HAMILTON
EVERGREEN
HERITAGE
MAXWELL
COPPING
ROSEWOOD
Willamette River
MANZANA
EVERGREEN
NORMAN
ROSEWOOD
ROSEWOOD
HOWARD
HOWARD
HOWARD
BARTON
MANZANA
EVERGREEN
MAYNARD
Copping: MH 77793
Legend
Monitoring Site
Piped System: Full Water Quality Suite
Drainage Basin Area
MS4 Piped System
Roads
Waterbodies
N
1:5,000

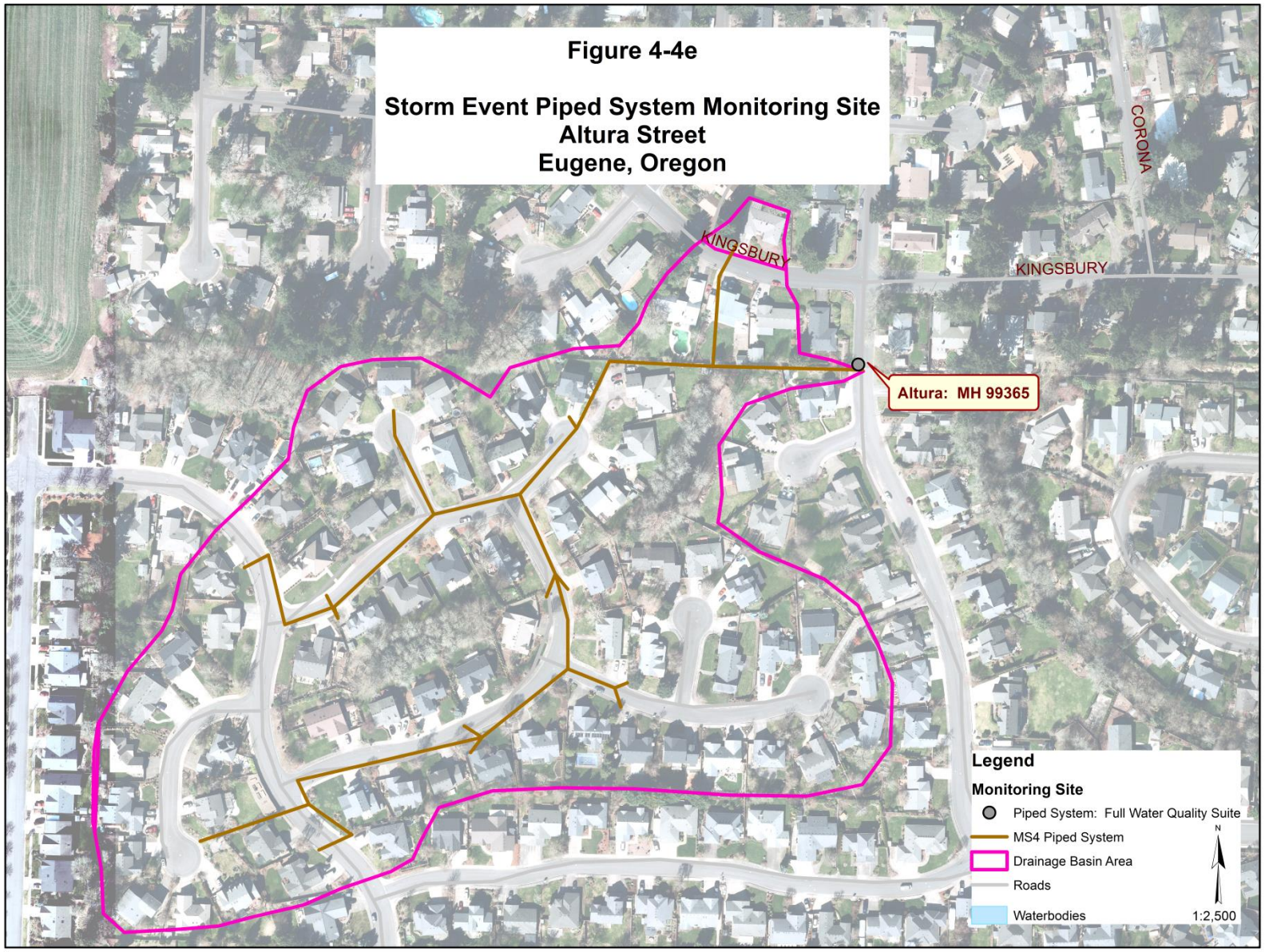


Figure 4-4e
Storm Event Piped System Monitoring Site
Altura Street
Eugene, Oregon
KINGSBURY
KINGSBURY
CORONA
Altura: MH 99365
Legend
Monitoring Site
Piped System: Full Water Quality Suite
MS4 Piped System
Drainage Basin Area
Roads
Waterbodies
N
1:2,500

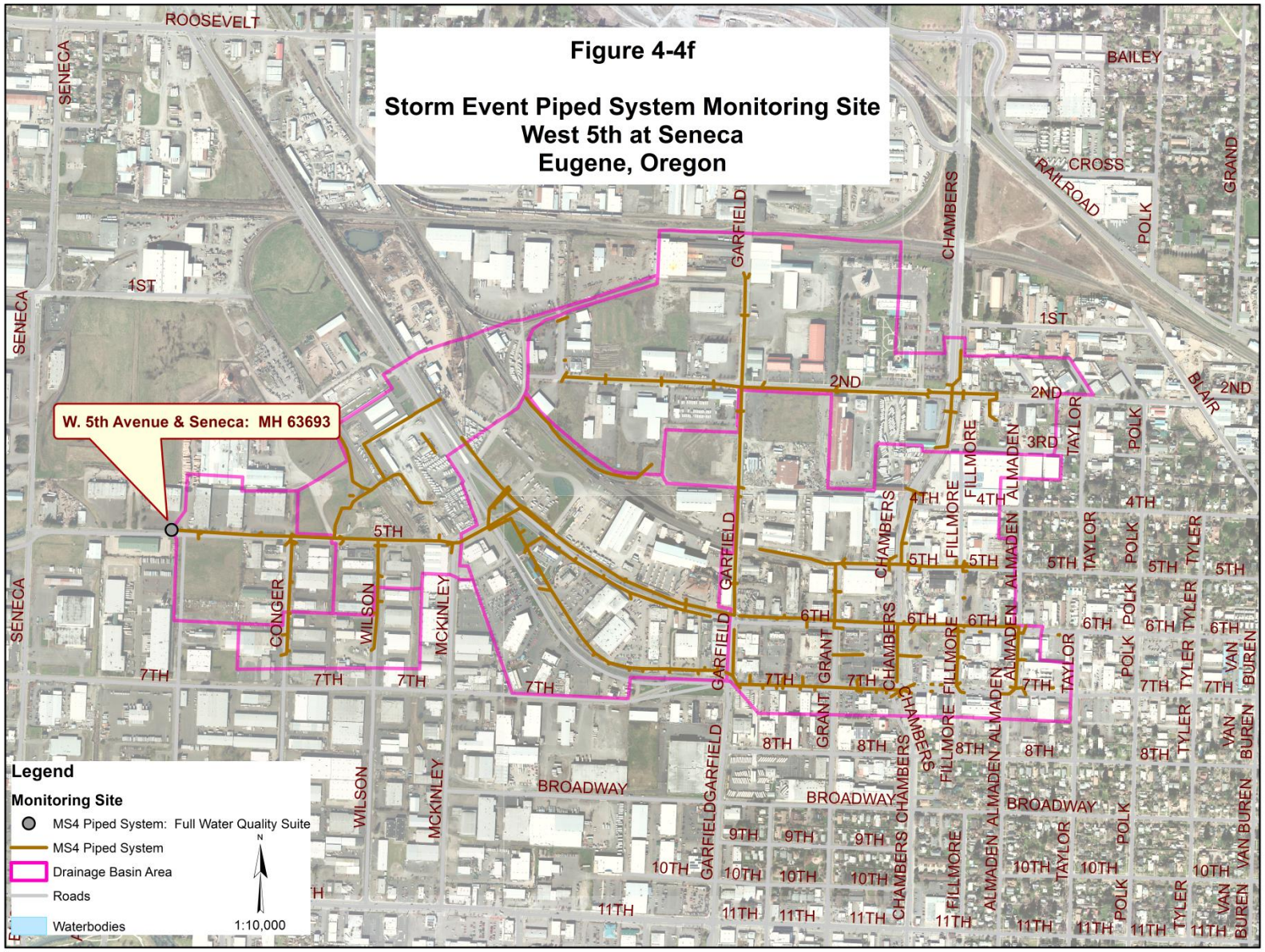


Figure 4-4f
Storm Event Piped System Monitoring Site
West 5th at Seneca
Eugene, Oregon
W. 5th Avenue & Seneca: MH 63693
Legend
Monitoring Site
MS4 Piped System: Full Water Quality Suite
MS4 Piped System
Drainage Basin Area
Roads
Waterbodies
N
1:10,000
ROOSEVELT
SENECA
1ST
2ND
3RD
4TH
5TH
6TH
7TH
8TH
9TH
10TH
11TH
BROADWAY
CONGER
WILSON
MCKINLEY
GARFIELD
CHAMBERS
GRANT
FILLMORE
ALMADEN
TAYLOR
POLK
TYLER
VAN BUREN
BLAIR
RAILROAD
CROSS
GRAND
BAILEY

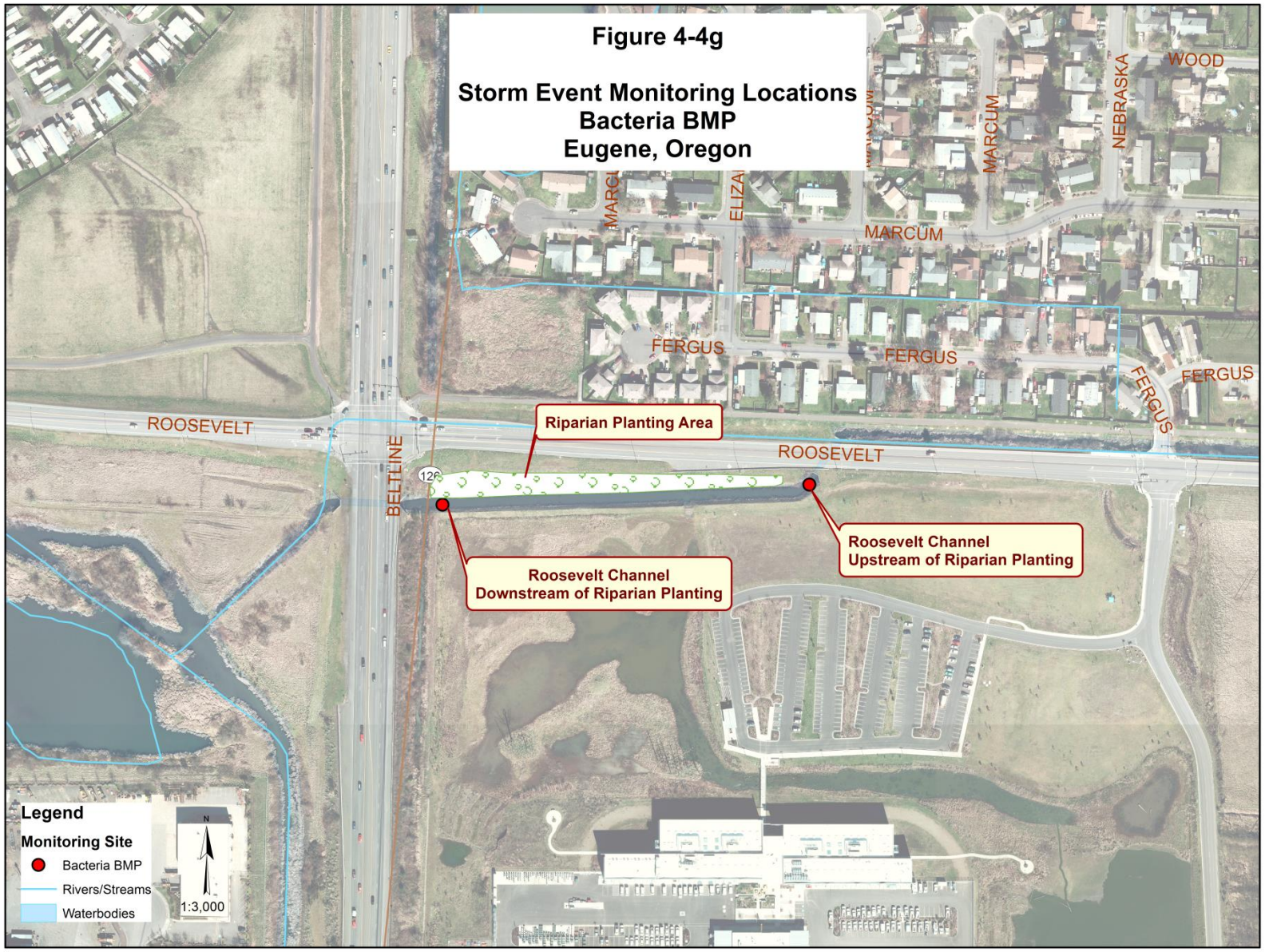


Figure 4-4g
Storm Event Monitoring Locations
Bacteria BMP
Eugene, Oregon
MARCUM
NEBRASKA
WOOD
FERGUS
ROOSEVELT
BELTLINE
126
Riparian Planting Area
Roosevelt Channel
Upstream of Riparian Planting
Roosevelt Channel
Downstream of Riparian Planting
Legend
Monitoring Site
Bacteria BMP
Rivers/Streams
Waterbodies
N
1:3,000

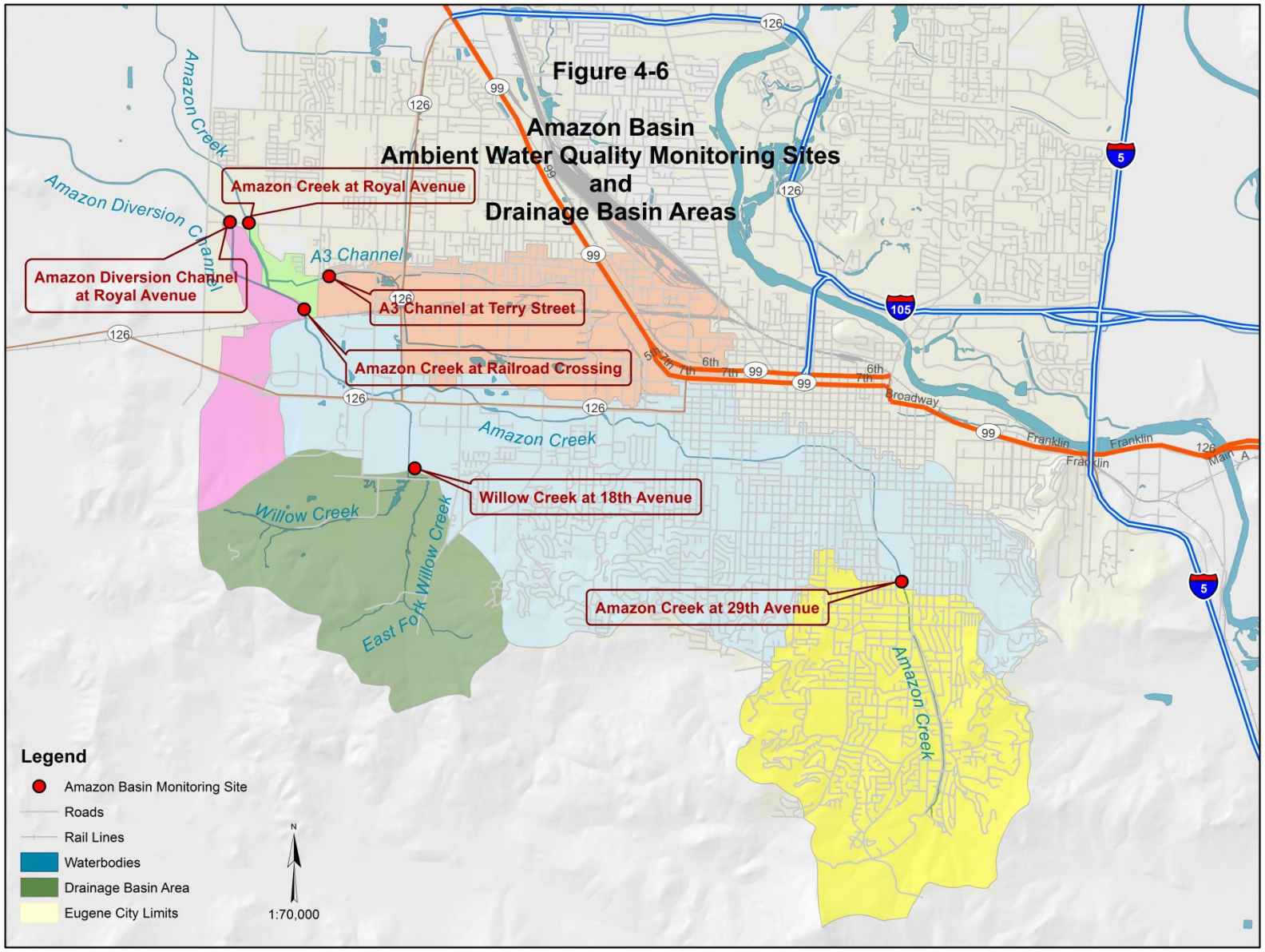


Figure 4-6
Amazon Basin
Ambient Water Quality Monitoring Sites
and
Drainage Basin Areas
Amazon Creek at Royal Avenue
Amazon Diversion Channel at Royal Avenue
A3 Channel at Terry Street
Amazon Creek at Railroad Crossing
Willow Creek at 18th Avenue
Amazon Creek at 29th Avenue
Amazon Creek
Amazon Diversion Channel
A3 Channel
Willow Creek
East Fork Willow Creek
Broadway
Franklin
Main A
Legend
Amazon Basin Monitoring Site
Roads
Rail Lines
Waterbodies
Drainage Basin Area
Eugene City Limits
N
1:70,000

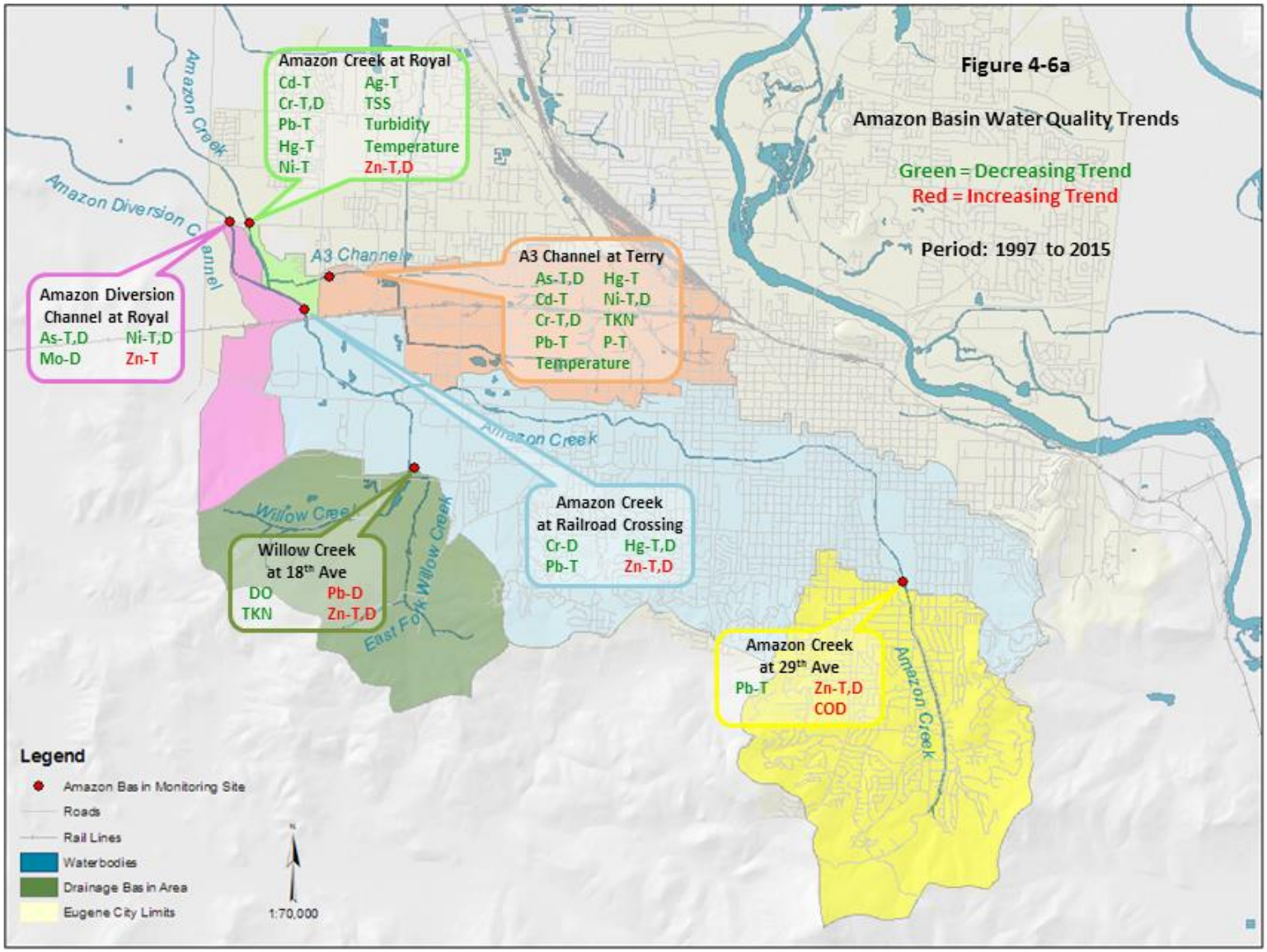


Figure 4-6a
Amazon Basin Water Quality Trends
Green = Decreasing Trend
Red = Increasing Trend
Period: 1997 to 2015
Amazon Creek at Royal
Cd-T Ag-T
Cr-T,D TSS
Pb-T Turbidity
Hg-T Temperature
Ni-T Zn-T,D
Amazon Diversion Channel at Royal
As-T,D Ni-T,D
Mo-D Zn-T
A3 Channel at Terry
As-T,D Hg-T
Cd-T Ni-T,D
Cr-T,D TKN
Pb-T P-T
Temperature
Amazon Creek at Railroad Crossing
Cr-D Hg-T,D
Pb-T Zn-T,D
Willow Creek at 18th Ave
DO Pb-D
TKN Zn-T,D
Amazon Creek at 29th Ave
Pb-T Zn-T,D
COD
Amazon Creek
Amazon Diversion Channel
A3 Channel
Willow Creek
East Fork Willow Creek
Legend
Amazon Basin Monitoring Site
Roads
Rail Lines
Waterbodies
Drainage Basin Area
Eugene City Limits
1:70,000

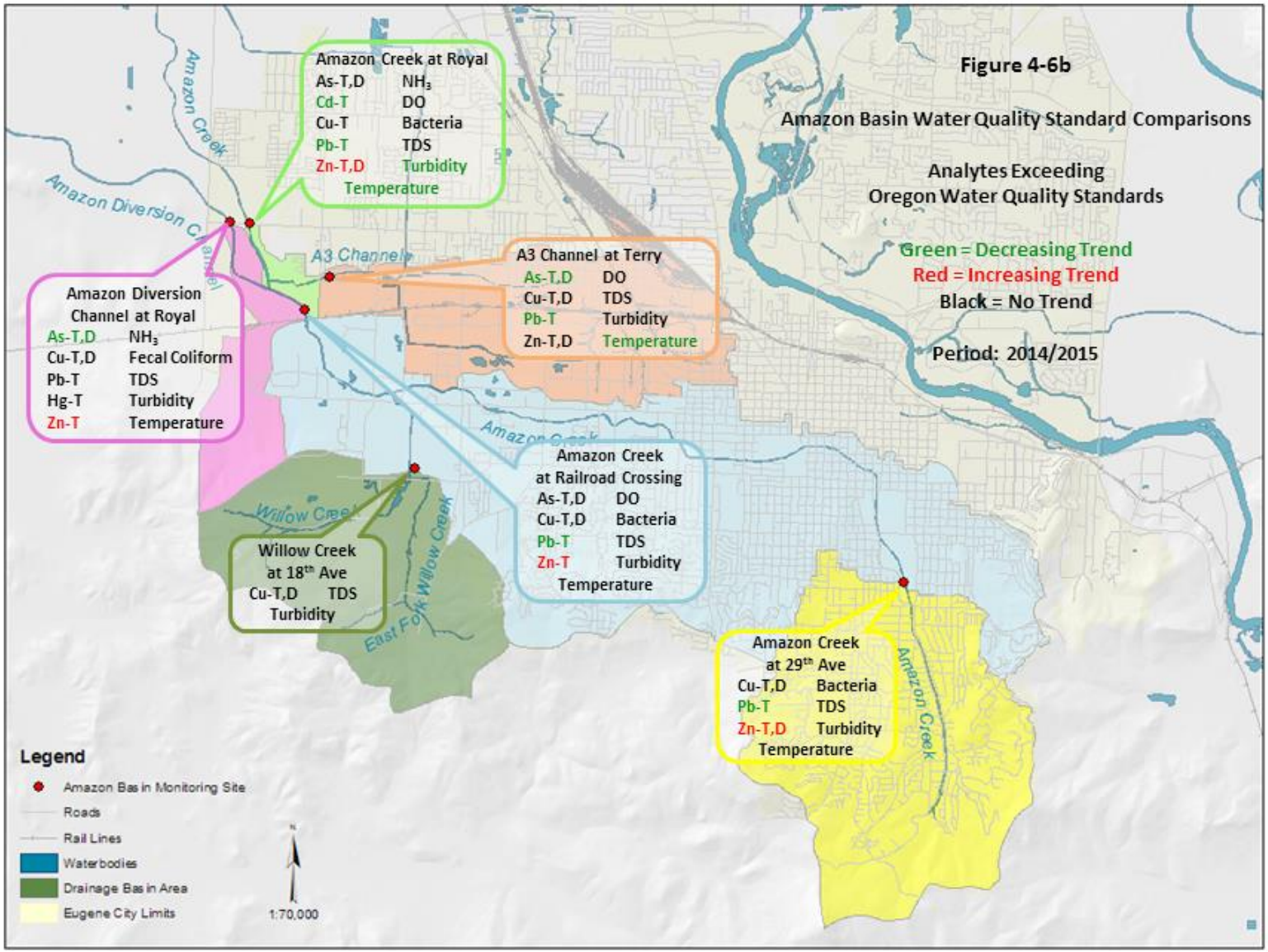


Figure 4-6b
Amazon Basin Water Quality Standard Comparisons
Analytes Exceeding
Oregon Water Quality Standards
Green = Decreasing Trend
Red = Increasing Trend
Black = No Trend
Period: 2014/2015
Amazon Creek at Royal
As-T,D NH3
Cd-T DO
Cu-T Bacteria
Pb-T TDS
Zn-T,D Turbidity
Temperature
A3 Channel at Terry
As-T,D DO
Cu-T,D TDS
Pb-T Turbidity
Zn-T,D Temperature
Amazon Diversion Channel at Royal
As-T,D NH3
Cu-T,D Fecal Coliform
Pb-T TDS
Hg-T Turbidity
Zn-T Temperature
Amazon Creek at Railroad Crossing
As-T,D DO
Cu-T,D Bacteria
Pb-T TDS
Zn-T Turbidity
Temperature
Willow Creek at 18th Ave
Cu-T,D TDS
Turbidity
Amazon Creek at 29th Ave
Cu-T,D Bacteria
Pb-T TDS
Zn-T,D Turbidity
Temperature
Amazon Creek
Amazon Diversion Channel
A3 Channel
Willow Creek
East Fork Willow Creek
Legend
Amazon Basin Monitoring Site
Roads
Rail Lines
Waterbodies
Drainage Basin Area
Eugene City Limits
1:70,000

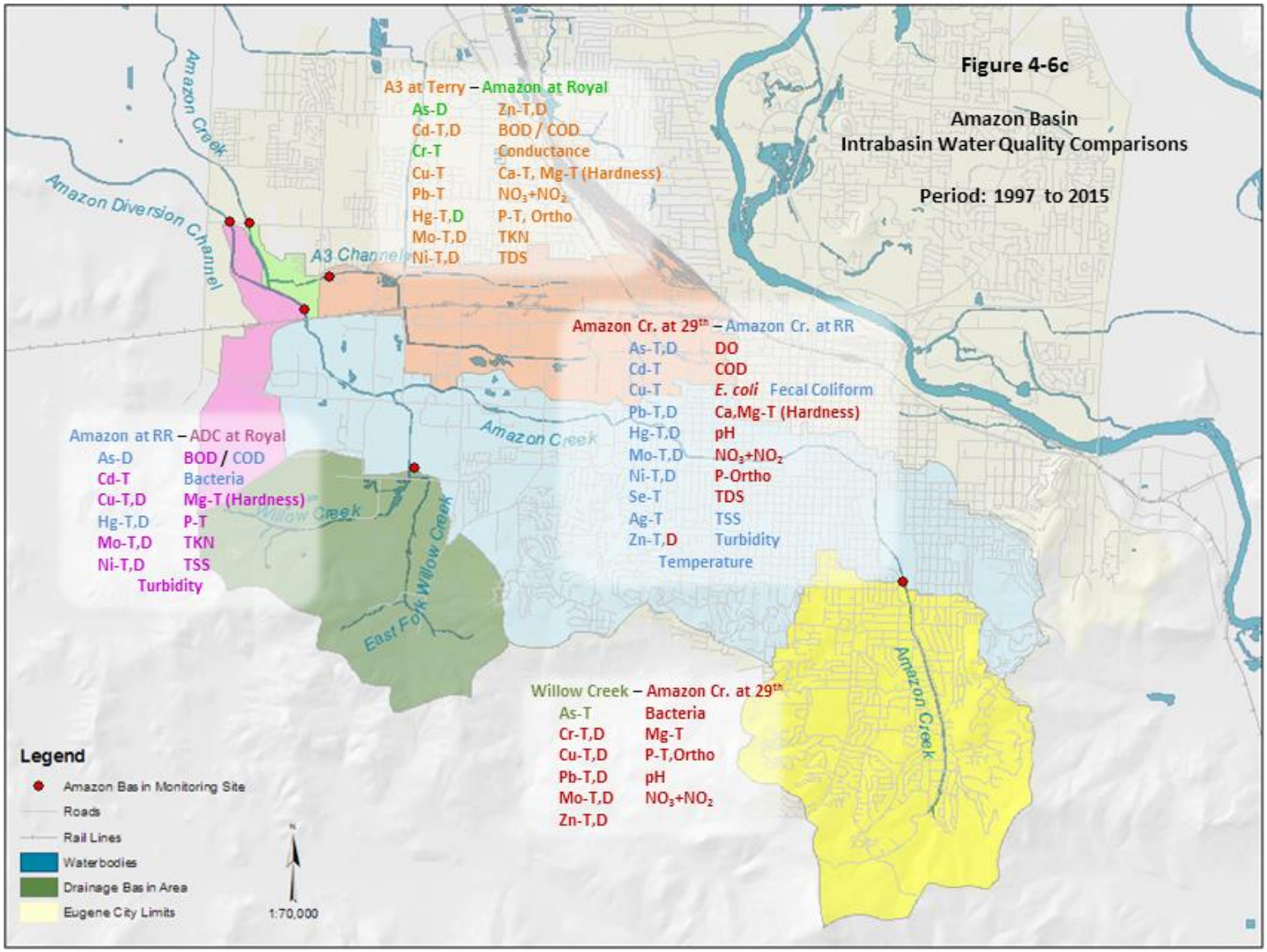


Figure 4-6c
Amazon Basin
Intrabasin Water Quality Comparisons
Period: 1997 to 2015
A3 at Terry – Amazon at Royal
As-D
Cd-T,D
Cr-T
Cu-T
Pb-T
Hg-T,D
Mo-T,D
Ni-T,D
Zn-T,D
BOD / COD
Conductance
Ca-T, Mg-T (Hardness)
NO3+NO2
P-T, Ortho
TKN
TDS
Amazon Cr. at 29th – Amazon Cr. at RR
As-T,D
Cd-T
Cu-T
Pb-T,D
Hg-T,D
Mo-T,D
Ni-T,D
Se-T
Ag-T
Zn-T,D
DO
COD
E. coli Fecal Coliform
Ca,Mg-T (Hardness)
pH
NO3+NO2
P-Ortho
TDS
TSS
Turbidity
Temperature
Amazon at RR – ADC at Royal
As-D
Cd-T
Cu-T,D
Hg-T,D
Mo-T,D
Ni-T,D
BOD / COD
Bacteria
Mg-T (Hardness)
P-T
TKN
TSS
Turbidity
Willow Creek – Amazon Cr. at 29th
As-T
Cr-T,D
Cu-T,D
Pb-T,D
Mo-T,D
Zn-T,D
Bacteria
Mg-T
P-T,Ortho
pH
NO3+NO2
Amazon Creek
Amazon Diversion Channel
A3 Channel
Willow Creek
East Fork Willow Creek
Legend
Amazon Basin Monitoring Site
Roads
Rail Lines
Waterbodies
Drainage Basin Area
Eugene City Limits
1:70,000

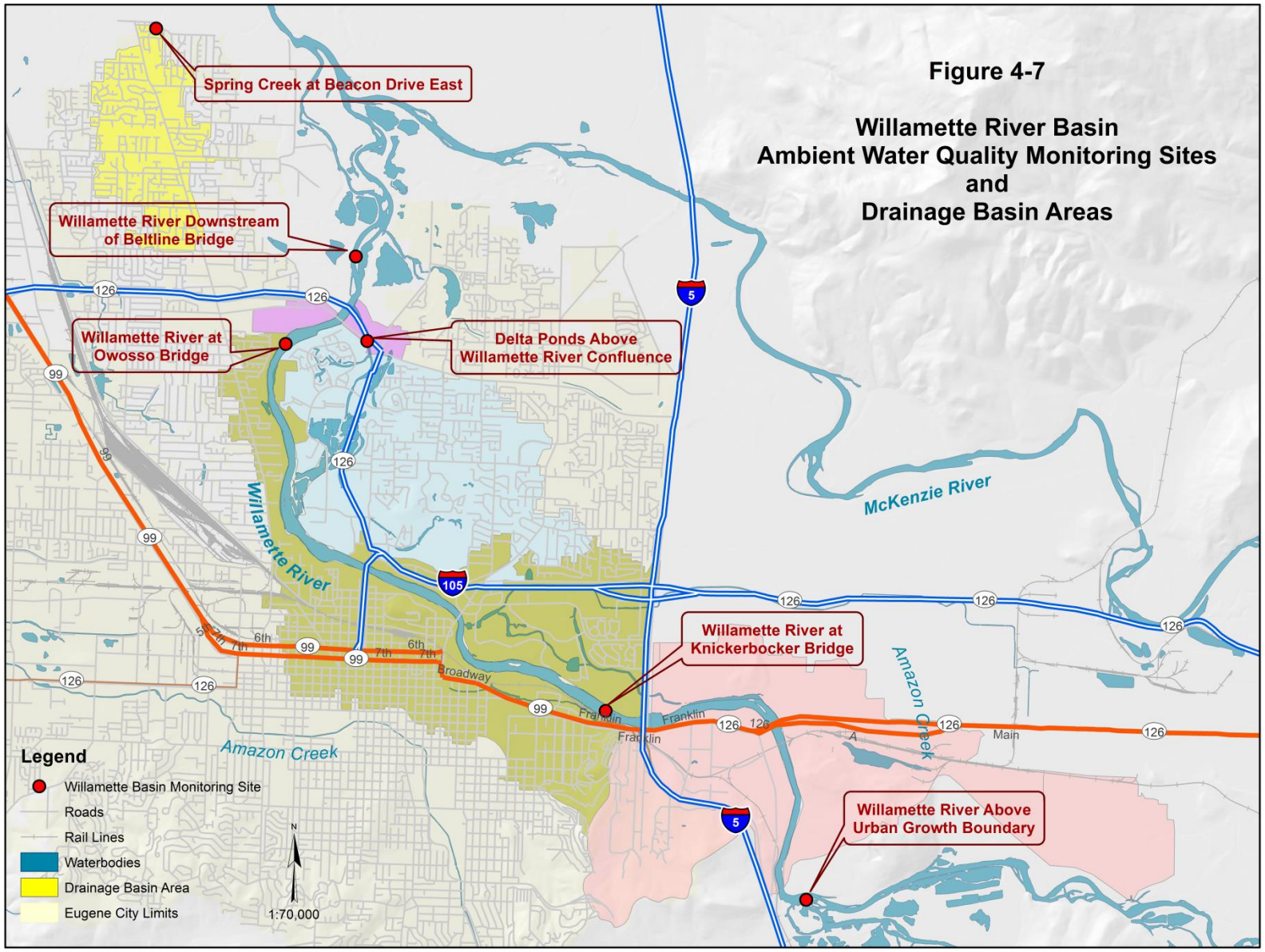


Figure 4-7
Willamette River Basin
Ambient Water Quality Monitoring Sites
and
Drainage Basin Areas
Spring Creek at Beacon Drive East
Willamette River Downstream of Beltline Bridge
Willamette River at Owosso Bridge
Delta Ponds Above Willamette River Confluence
Willamette River at Knickerbocker Bridge
Willamette River Above Urban Growth Boundary
McKenzie River
Willamette River
Amazon Creek
Amazon Creek
Broadway
Franklin
Main
Legend
Willamette Basin Monitoring Site
Roads
Rail Lines
Waterbodies
Drainage Basin Area
Eugene City Limits
1:70,000

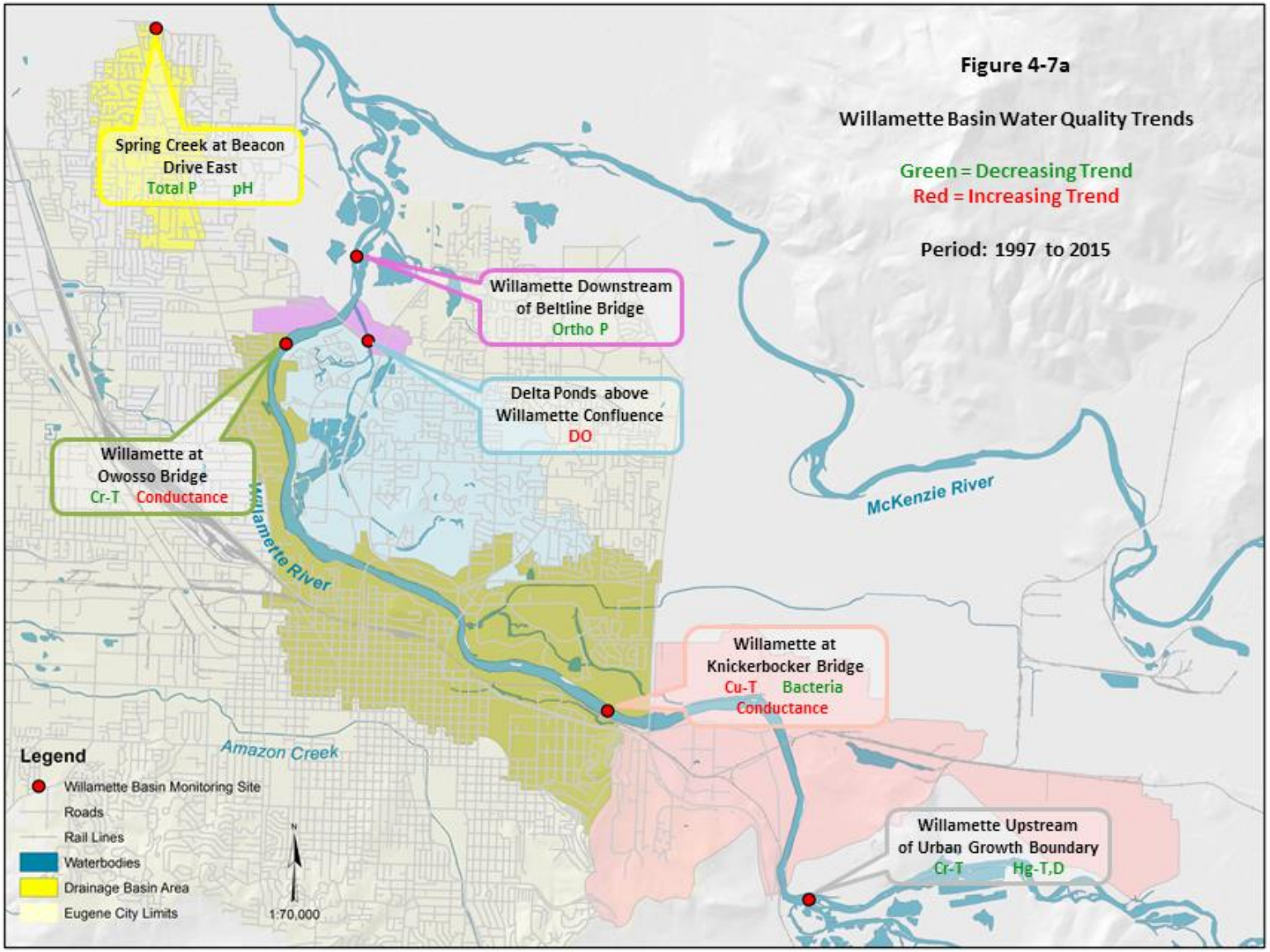


Figure 4-7a
Willamette Basin Water Quality Trends
Green = Decreasing Trend
Red = Increasing Trend
Period: 1997 to 2015
Spring Creek at Beacon Drive East
Total P pH
Willamette Downstream of Beltline Bridge
Ortho P
Delta Ponds above Willamette Confluence
DO
Willamette at Owosso Bridge
Cr-T Conductance
Willamette River
McKenzie River
Willamette at Knickerbocker Bridge
Cu-T Bacteria
Conductance
Amazon Creek
Willamette Upstream of Urban Growth Boundary
Cr-T Hg-T,D
Legend
Willamette Basin Monitoring Site
Roads
Rail Lines
Waterbodies
Drainage Basin Area
Eugene City Limits
N
1:70,000

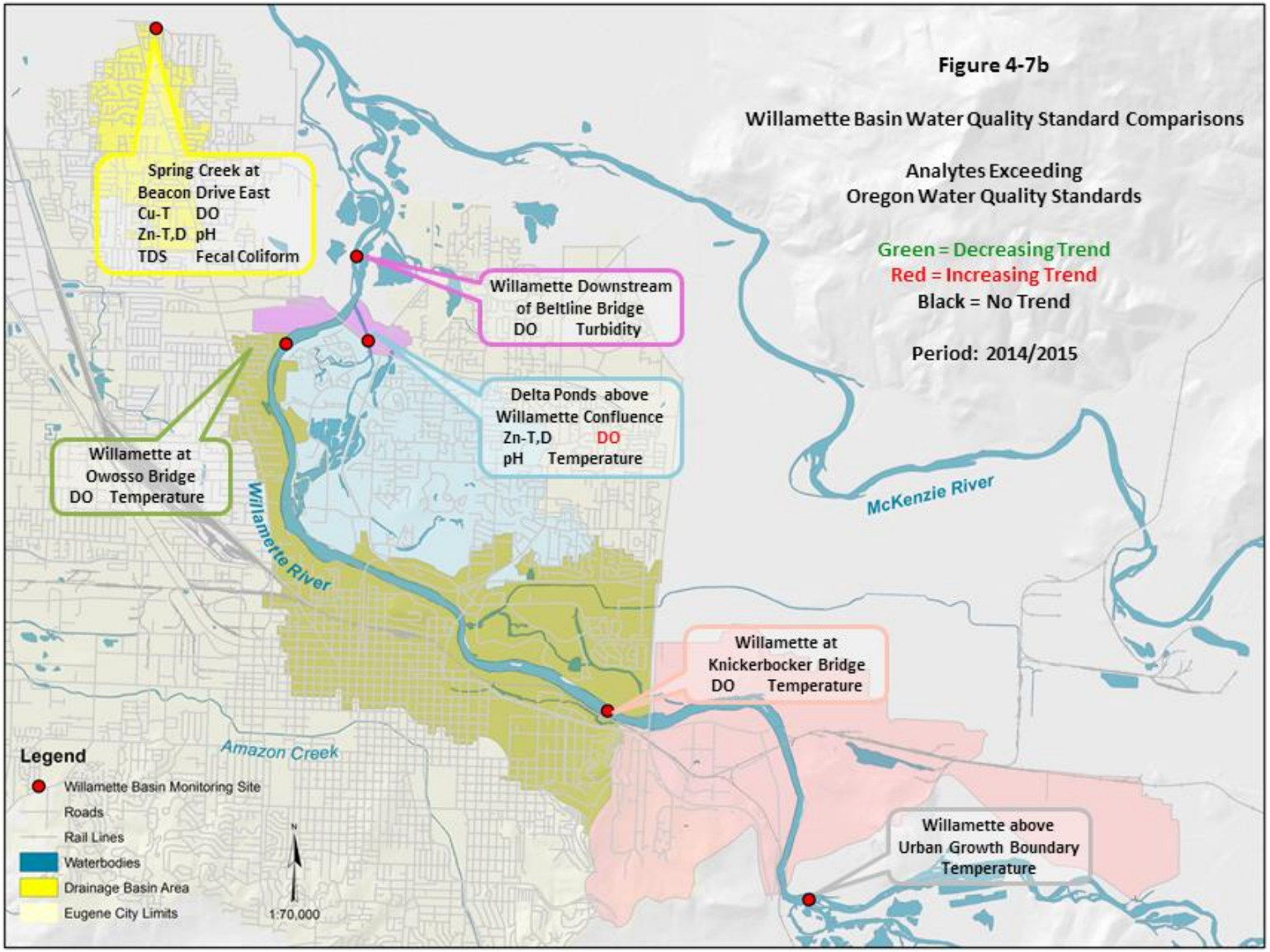


Figure 4-7b
Willamette Basin Water Quality Standard Comparisons
Analytes Exceeding
Oregon Water Quality Standards
Green = Decreasing Trend
Red = Increasing Trend
Black = No Trend
Period: 2014/2015
Spring Creek at
Beacon Drive East
Cu-T DO
Zn-T,D pH
TDS Fecal Coliform
Willamette Downstream
of Beltline Bridge
DO Turbidity
Delta Ponds above
Willamette Confluence
Zn-T,D DO
pH Temperature
Willamette at
Owosso Bridge
DO Temperature
Willamette River
McKenzie River
Willamette at
Knickerbocker Bridge
DO Temperature
Willamette above
Urban Growth Boundary
Temperature
Amazon Creek
Legend
Willamette Basin Monitoring Site
Roads
Rail Lines
Waterbodies
Drainage Basin Area
Eugene City Limits
N
1:70,000

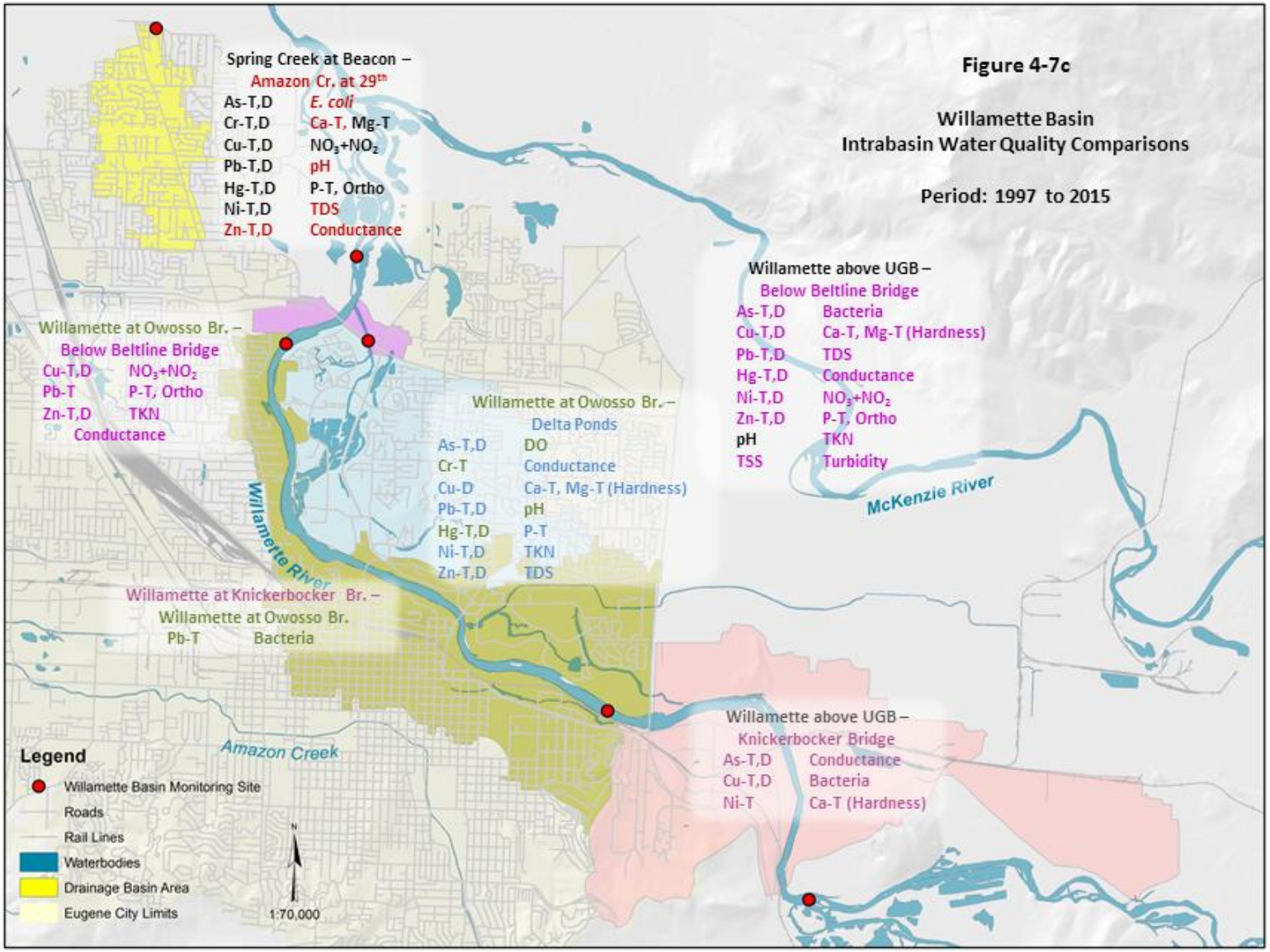


Figure 4-7c
Willamette Basin
Intrabasin Water Quality Comparisons
Period: 1997 to 2015
Spring Creek at Beacon –
Amazon Cr. at 29th
As-T,D
Cr-T,D
Cu-T,D
Pb-T,D
Hg-T,D
Ni-T,D
Zn-T,D
E. coli
Ca-T, Mg-T
NO3+NO2
pH
P-T, Ortho
TDS
Conductance
Willamette above UGB –
Below Beltline Bridge
As-T,D
Cu-T,D
Pb-T,D
Hg-T,D
Ni-T,D
Zn-T,D
pH
TSS
Bacteria
Ca-T, Mg-T (Hardness)
TDS
Conductance
NO3+NO2
P-T, Ortho
TKN
Turbidity
Willamette at Owosso Br. –
Below Beltline Bridge
Cu-T,D
Pb-T
Zn-T,D
NO3+NO2
P-T, Ortho
TKN
Conductance
Willamette at Owosso Br. –
Delta Ponds
As-T,D
Cr-T
Cu-D
Pb-T,D
Hg-T,D
Ni-T,D
Zn-T,D
DO
Conductance
Ca-T, Mg-T (Hardness)
pH
P-T
TKN
TDS
McKenzie River
Willamette River
Willamette at Knickerbocker Br. –
Willamette at Owosso Br.
Pb-T
Bacteria
Amazon Creek
Willamette above UGB –
Knickerbocker Bridge
As-T,D
Cu-T,D
Ni-T
Conductance
Bacteria
Ca-T (Hardness)
Legend
Willamette Basin Monitoring Site
Roads
Rail Lines
Waterbodies
Drainage Basin Area
Eugene City Limits
N
1:70,000