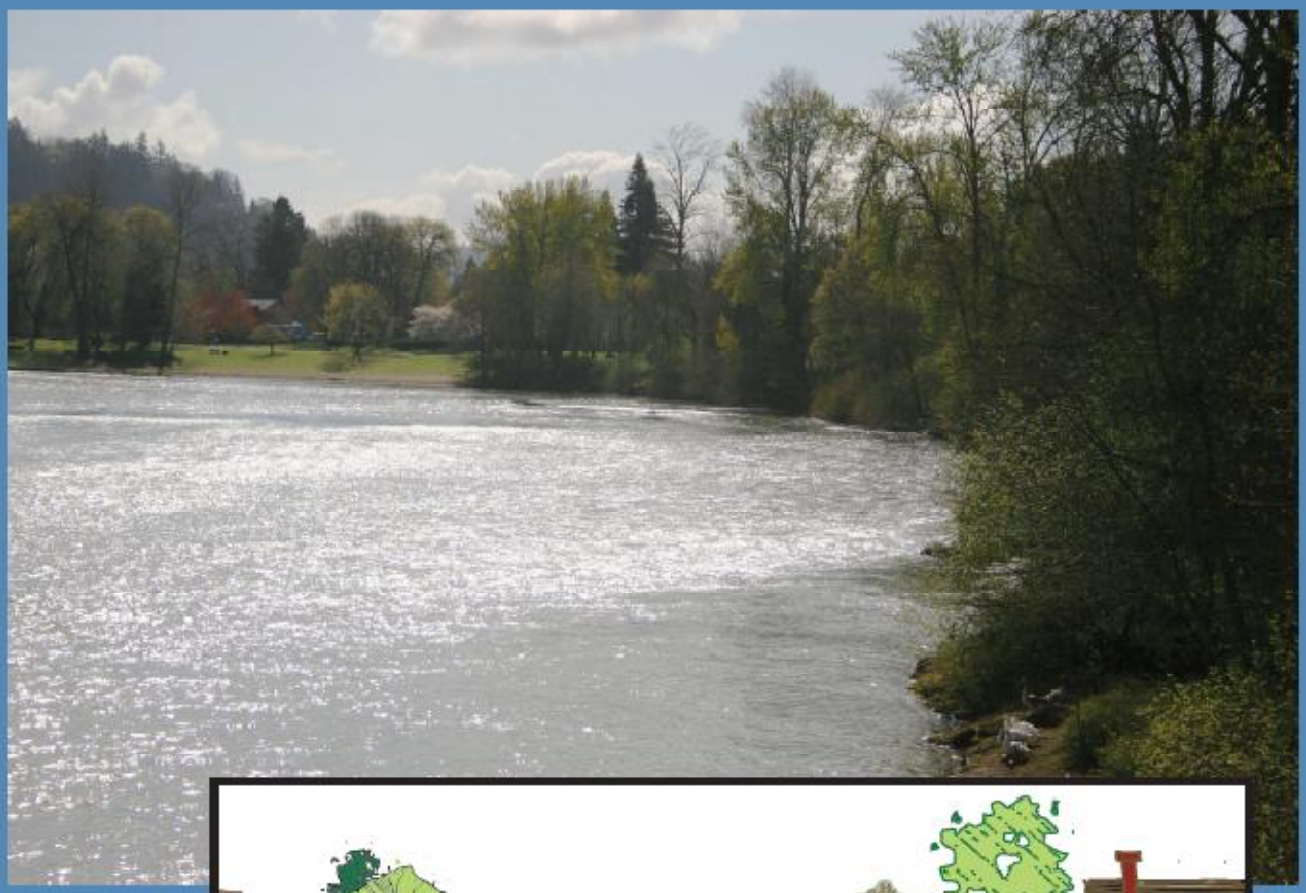

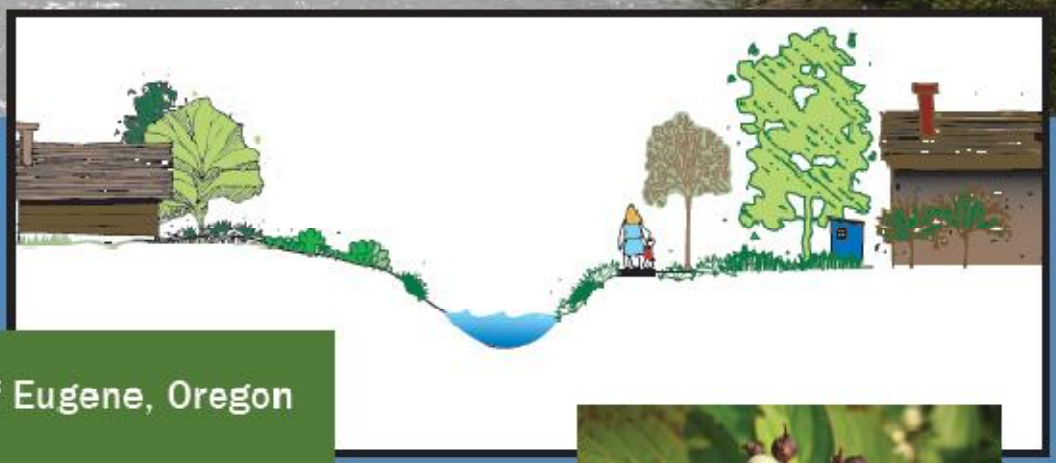

City of Eugene, Oregon

Total Maximum Daily Load (TMDL) Second Annual Report

Submitted to Oregon Department of Environmental Quality

December 17, 2010

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1. INTRODUCTION

This report summarizes the progress of Total Maximum Daily Load (TMDL) associated implementation activities conducted by the City of Eugene from July 1, 2009 through June 30, 2010 in response to the Willamette Basin TMDLs and as described in the City's TMDL Implementation Plan ("TMDL Plan"). In the case of activities related to discharges covered under another regulatory permit program, the TMDL implementation status is provided indirectly by reference to the other permit program. The City's TMDL Plan, as submitted on October 15, 2008, was approved by the State of Oregon Department of Environmental Quality (DEQ) on December 23, 2008. This is the City of Eugene's second annual TMDL report summarizing implementation activities.

Section 2 of this report provides some background leading up to this report. Section 3 provides information about which local area waterbodies are addressed by the Willamette TMDL, and references the TMDL Plan for strategy development. Section 4 includes an updated status for each City of Eugene TMDL activity, and an update on the other permits and programs that are relevant to the TMDL. Section 5 references water quality monitoring data and analysis included in the City's annual municipal stormwater report.

2. BACKGROUND

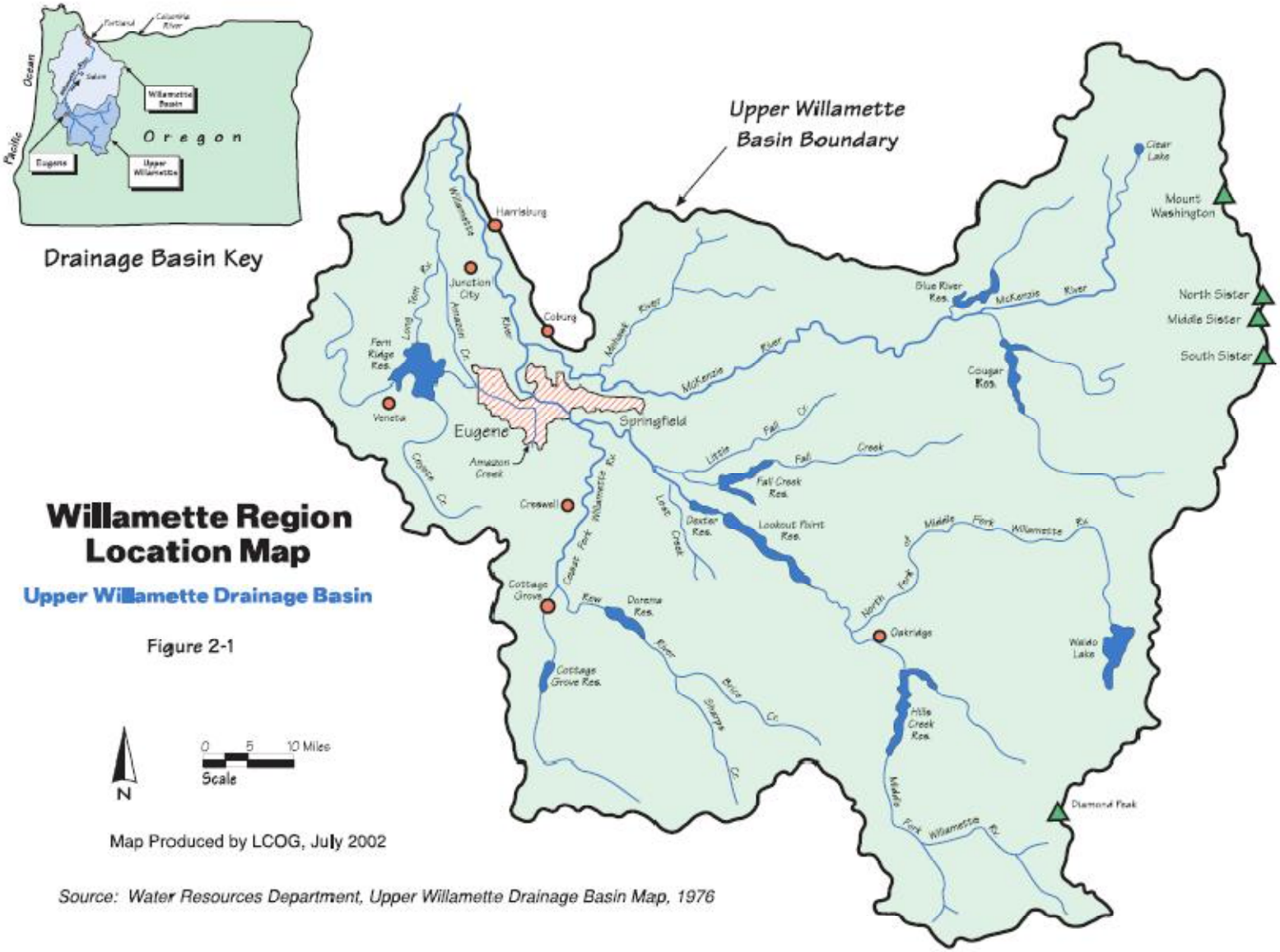
Eugene lies at the upper end of the Willamette watershed, as shown in Figure 2-1. The Willamette River flows for about 6 miles, from River Mile 184 to River Mile 178 through the City, as shown in Figure 2-2[1]. The Willamette River is currently listed by the State of Oregon DEQ as a water quality limited river due to elevated water temperatures, elevated mercury concentration in fish tissues, and elevated bacteria levels all of which at various points on the River may exceed State water quality standards. Other water bodies in the Eugene area that are tributary to the Willamette are water quality limited due to elevated bacteria levels, low dissolved oxygen levels, and elevated turbidity. These waterbodies include Amazon Creek, Amazon Diversion Channel and Fern Ridge Reservoir. When water quality standards are not met, the federal Clean Water Act requires that a TMDL to be established. A TMDL determines how much pollution can be added to the river without exceeding water quality standards. On September 21, 2006, the DEQ issued the Willamette Basin TMDL as an Order, and submitted

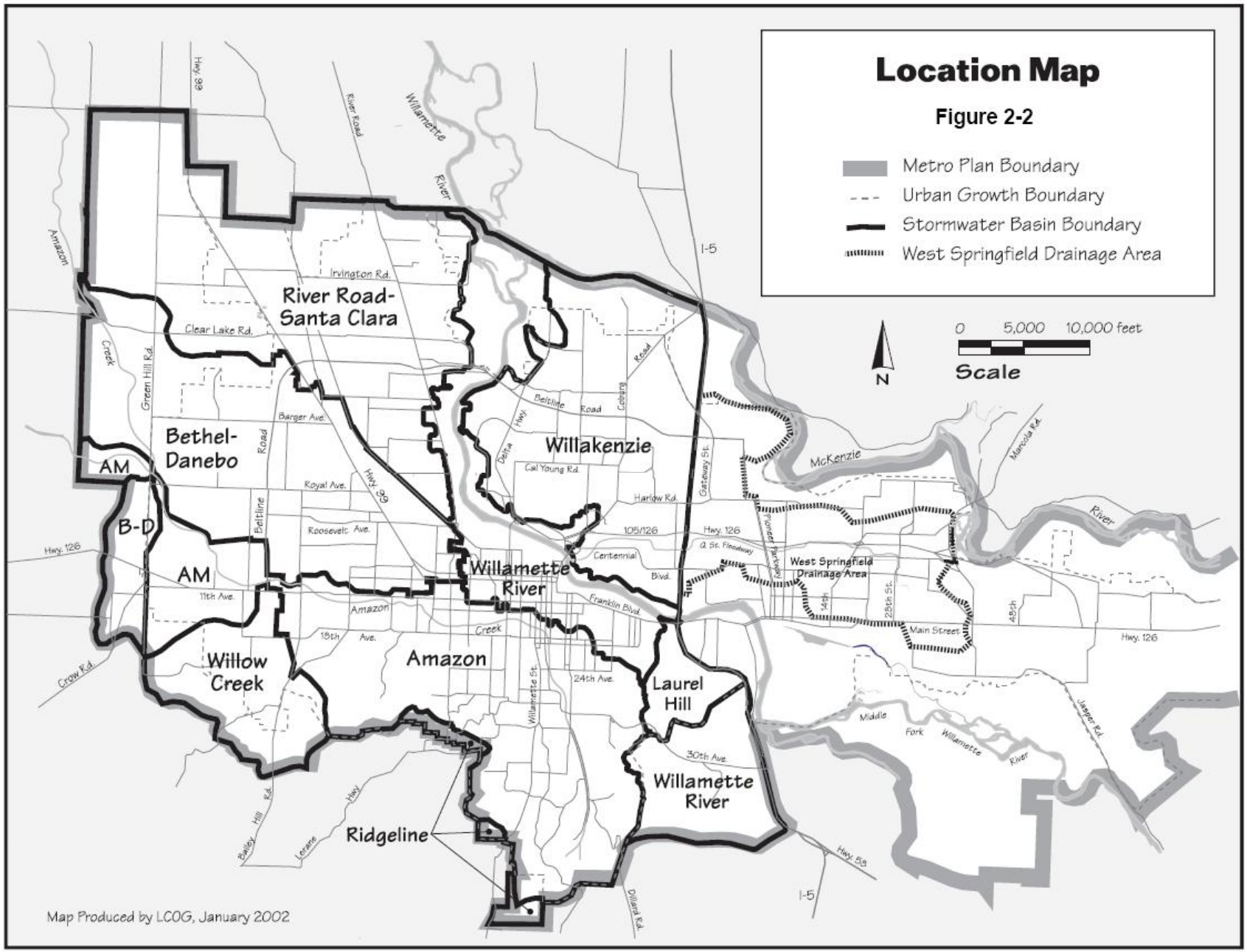
[1] Figure 2-2 illustrates the seven major stormwater drainage basins that have been delineated in Eugene: *1) Amazon Creek, 2) Bethel-Danebo, 3) Laurel Hill, 4) River Road-Santa Clara, 5) Willakenzie, 6) Willamette River, and 7) Willow Creek.* Note that the area depicted on Figure 2-2 is the 2002 stormwater basin planning study area which includes the Eugene city limits and the unincorporated area west of Interstate Highway 5 (I-5), and within the metropolitan plan boundary. The unincorporated portion includes land both within and outside the UGB. The City's responsibilities as a DMA apply only to the limits of its jurisdictional authority.

the TMDL to the Environmental Protection Agency (EPA) for approval. EPA approved the Willamette Basin TMDL on September 29, 2006.

Along with other cities and agencies in the Willamette Basin, the City of Eugene was named by DEQ as a "designated management agency" (DMA) in that it has legal authority over sectors or sources contributing pollutants on the approximately 27,800 acres within the City's limits, in that it operates the regional Eugene-Springfield Water Pollution Control Facility, a sewage treatment plant with permits to discharge stormwater and treated effluent into the Willamette River, and other regional facilities including the Eugene Airport. As such, the City of Eugene was required to develop a TMDL Implementation Plan, to describe ongoing and planned activities that will be undertaken to achieve the TMDL pollutant reductions.

TMDL implementation plan rules, described in OAR 340-042-0080(3), include a requirement to "*Implement and revise the plan as needed"* which according to the DEQ TMDL Implementation Plan Guidance (May 2007), includes an annual report of progress on the implementation of each management strategy. This report summarizes the progress of TMDL implementation related activities for the period of time from July 1, 2009 through June 30, 2010, which coincides with the City's fiscal year 2010. The fiscal year timeframe coincides with several other permits essential to TMDL implementation and referenced herein.


Drainage Basin Key
Pacific Ocean
Portland
Columbia River
Salem
Willamette Basin
Oregon
Eugene
Upper Willamette
Upper Willamette Basin Boundary
Harrisburg
Junction City
Coburg
Fern Ridge Res.
Veneta
Eugene
Amazon Creek
Springfield
Creswell
Cottage Grove
Cottage Grove Res.
Dorena Res.
Dexter Res.
Lookout Point Res.
Fall Creek Res.
Blue River Res.
Cougar Res.
Oakridge
Hills Creek Res.
Waldo Lake
Cliff Lake
Mount Washington
North Sister
Middle Sister
South Sister
Diamond Peak
Willamette River
McKenzie River
Mohawk River
Long Tom R.
Amazon Cr.
Coast Fork Willamette R.
Little Fall Creek
Lost Creek
Middle Fork Willamette R.
North Fork of Middle Fork Willamette R.
Row River
Sharps Cr.
Brice Cr.
Willamette Region Location Map
Upper Willamette Drainage Basin
Figure 2-1
N
0 5 10 Miles
Scale
Map Produced by LCOG, July 2002
Source: Water Resources Department, Upper Willamette Drainage Basin Map, 1976


Location Map
Figure 2-2
Metro Plan Boundary
Urban Growth Boundary
Stormwater Basin Boundary
West Springfield Drainage Area
N
0 5,000 10,000 feet
Scale
River Road-Santa Clara
Bethel-Danebo
AM
B-D
AM
Willakenzie
Willamette River
Willow Creek
Amazon
Laurel Hill
Willamette River
Ridgeline
West Springfield Drainage Area
Map Produced by LCOG, January 2002

3. LOCAL AREA TMDL WATERBODIES & STRATEGY DEVELOPMENT

Table 3-1 identifies waterbodies addressed by the 2006 Willamette TMDL that lie within or near the City of Eugene and may be affected by activities within the City of Eugene's jurisdiction. The table includes the river miles affected, the TMDL parameter, and the season affected by the listing.

Table 3-1. Water Bodies and TMDL Pollutants[2]

Subbasin	Waterbody Name	River Miles	Parameter	Season
Upper Willamette	Willamette River	50.6 to 186.5	Temperature	Year Round
Upper Willamette	Willamette River	0 to 149	Bacteria	Fall/Winter/ Spring
Upper Willamette	Willamette River	174.5 to 186.4	Mercury	Year Round
Upper Willamette	A3 Channel	mouth to headwaters	Bacteria	Year Round
Upper Willamette	A3 Channel	mouth to headwaters	Mercury	Year Round
Upper Willamette	Amazon Creek	0 to 22.6	Bacteria	Year Round
Upper Willamette	Amazon Diversion Channel	0 to 1.8	Bacteria	Year Round
Upper Willamette	Amazon Diversion Channel	0 to 1.8	Dissolved Oxygen	Spring/Summer/ Fall
Upper Willamette	Long Tom River	0 to 24.2	Bacteria	Fall/Winter/ Spring
Upper Willamette	Fern Ridge Reservoir	24.2 to 31.8	Bacteria	Fall/Winter/ Spring
Upper Willamette	Fern Ridge Reservoir /Long Tom River	24.2 to 31.8	Turbidity	Year Round
Upper Willamette	Long Tom River	0 to 24.2	Temperature	Summer

[2] Table 3-1 has been updated (as compared to Table 3-1 in the City's TMDL Plan), to exactly math the listings in Tables 2-6 and Table 10-6 of the Willamette Basin TMDL.

In developing TMDL reduction strategies, outlined in the TMDL Plan, the City considered the list of affected waterbodies in Table 3-1, potential sources of TMDL pollutants, and existing and planned programs and activities which address TMDL pollutants. From that analysis the City developed reduction strategies for each TMDL pollutant. These reduction strategies are outlined in the City's TMDL Plan. A matrix (TMDL Plan, Appendix A – City of Eugene TMDL Implementation Plan Matrix) was then developed which includes all of the City's activities implemented or planned to carry out the strategies.

4. RELEVANT WATER QUALITY PERMITS AND PROGRAMS

This section includes an updated status for each City of Eugene TMDL activity (Section 4.a), an update on the other water quality permits relevant to the TMDL (Section 4.b), and an update and accomplishments for other programs relevant to the TMDL (Section 4.c).

a. TMDL Implementation Activities

Appendix A of this report includes the detailed list of activities implemented or planned by the City of Eugene for each TMDL pollutant to carry out the pollutant reduction strategies, updated to include status of each activity and progress made over the reporting period. For those activities covered under an existing permit program, Appendix A includes a reference to the permit, and Section 4.b includes references to specific reports within which additional information is available.

With regards to the first two activities in the matrix (Stream buffers/ riparian protection to meet Statewide Planning Goal 5 and Statewide Planning Goal 6 requirements), an update is provided in this section.

Statewide Planning Goal 5
Oregon's Statewide Planning Goal 5 requires all Oregon cities and counties "to conserve open space and protect natural and scenic resources." Land Use Code regulations that apply to the designated Goal 5 sites, in the form of the /WR Water Resources Conservation Overlay Zone, were adopted in 2005 and 2006, and can be found in Chapter 9 of the Eugene City Code (go to City's web site: http://www.eugene-or.gov, select "City Code" and see Sections 9.4900-9.4980).

- During the Year 2 TMDL reporting period, two land use applications were submitted and reviewed (standards reviews), related to the /WR Water Resources Conservation Overlay Zone.

Statewide Planning Goal 6
Oregon Statewide Planning Goal 6 requires the City to, among other things, "maintain and improve water quality." Land Use Code regulations establishing a /WQ Water Quality Overlay Zone, were adopted in March 2009, and can be found in Chapter 9 of the Eugene City Code (go to City's web site: http://www.eugene-or.gov, select "City Code," and see Sections 9.4770-9.4790). An Administrative Order was adopted on June 9, 2009, related to implementation of

the /WQ Water Quality Overlay Zone code requirements. These regulations provide protection for waterways with a significant relationship to 303(d)-listed streams that do not already fall within the Goal 5 (/WR Overlay Zone) protections.

- Subsequent to the implementation of the /WQ Overlay Zone, and in recognition of the complexity of the local waterway protection regulations, the City developed a fact sheet describing the City's overall efforts to protect waterway protection through land use regulations. The fact sheet, entitled "Protecting Water Quality and Wildlife Habitat Within and Along Eugene's Waterways through Overlay Zoning Regulations," was distributed internally, and made available in printed form in locations accessible to the public, and in electronic form on the City's web site. See Appendix B for printed copy.
- During the Year 2 TMDL reporting period, no land use applications were submitted related to the /WQ Water Quality Overlay Zone.

b. Water Quality Permits

This Section of the report provides information about the status of water quality permits that cover certain discharges but have their own separate review and reporting processes, and the status of water quality permit programs that the City administers on behalf of DEQ.

As explained in the City's TMDL Plan, discharges of surface water pollutants come from both "point" and "nonpoint" sources. Generally speaking, point sources enter surface waters via a pipe or other conveyances, whereas nonpoint sources discharge to surface waters directly or through overland flow (not via pipes or other conveyances). Discharge of industrial wastewater, municipal wastewater, and stormwater into waters of the United States are all regulated through the National Pollution Discharge Elimination System (NPDES) permitting program. The NPDES permitting program is authorized by Section 402 of the Clean Water Act and, in Oregon, the program is administered by the DEQ. The City of Eugene has obtained permits from DEQ under the NPDES program for its point source discharges to surface waters, including:

- **National Pollutant Discharge Elimination System (NPDES) Municipal Separate Storm Sewer System (MS4) Permit #101244** (a permit issued to the City of Eugene for the municipal stormwater system discharges)
- **NPDES Wastewater Discharge Permit #102486** (a permit issued to the Metropolitan Wastewater Commission (MWMC) and the cities of Eugene and Springfield for the regional wastewater treatment plant discharges)
- **NPDES General 1200Z Industrial Stormwater Permit for the Eugene-Springfield Water Pollution Control Facility (WPCF) sites** (a permit issued to the MWMC for the wastewater treatment facility stormwater discharges)
- **NPDES General 1200Z Industrial Stormwater Permit for Eugene Airport** (a permit issued to the City of Eugene for the stormwater discharges from the regional airport facility located outside of the Eugene UGB but operated by the City of Eugene)

These permits serve as the TMDL Implementation Plans for the discharges they cover, and the annual reports associated with each permit serve as the report of progress required for TMDL

implementation, for the discharges they cover. Following is a summary of the status of the reporting for each of these permits. For more explanation about the permits themselves, see the City's TMDL Plan.

NPDES MS4 Permit #101244

The MS4 permit covers the discharges from the municipal stormwater system. The City is currently in its second permit term, which was scheduled to expire in February 2009 but was administratively extended pending action by DEQ on the City's permit renewal application. The City submitted a proposed Stormwater Management Plan (SWMP) for its third permit term as part of its permit renewal submittal in September 2008. In August 2010, the City submitted an updated proposed SWMP reflecting changes in the status of programs since the September 2008 submittal and in anticipation of future program adaptive management.

At the time that the City submitted its proposed TMDL Plan (October 2008), it was assumed that the City's third-term MS4 permit would be issued within a year or so. Therefore, the TMDL Plan, including Appendix A, references the proposed SWMP best management practices (BMP) codes, descriptions, tasks, measurable goals and tracking measures reflected in the September 2008 MS4 permit renewal submittal. Since, at the time of drafting this Year 2 TMDL Report, the new MS4 permit has not yet been issued and the City is still operating under its current SWMP, the Year 7 annual MS4 report reflects the existing BMP codes (not proposed), and includes "assessment methods" (not measurable goals and tracking measures, as reflected in the TMDL Plan and in the proposed SWMP). A table is provided in Appendix C for the reader of this report, to correlate the TMDL BMP codes reflected in the TMDL Plan (corresponding with the proposed SWMP) with the Year 7 Annual Report BMP codes (corresponding with the current SWMP). With respect to MS4 permit-related activities, the matrix in Appendix A refers to the Year 7 Annual Report. Additional modifications will be reflected in the third annual TMDL Report to DEQ in December 2011 once the third-term MS4 permit and SWMP are finalized. Then the BMP codes, measurable goals and tracking measures will all be consistent between the MS4 permit and the TMDL Plan, resolving this issue of inconsistency.

- The most recent annual MS4 report (Year 7 Annual Report), covering the reporting period from July 1, 2009 through June 30, 2010, was submitted to DEQ on December 1, 2010. Since the MS4 SWMP encompasses a significant component of the City's TMDL strategies, the Year 7 Annual Report is included herein as Appendix D. The Year 7 Report includes the status of SWMP best management practices, and water quality monitoring data analysis and trends including for Willamette River and Amazon Creek.

NPDES Wastewater Discharge Permit #102486 and NPDES General 1200Z Industrial Stormwater Permit for WPCF sites

The Metropolitan Wastewater Management Commission (MWMC) and the cities of Eugene and Springfield hold a NPDES permit for the discharge of treated wastewater to the Willamette River from the Eugene-Springfield Water Pollution Control Facility (WPCF). The MWMC also holds a permit for stormwater discharges from the WPCF and related Biosolids Management Facility (BMF) site.

- A Discharge Monitoring Report (DMR) for the WPCF is submitted to DEQ monthly, by 15th day of each month.
- A Pre-treatment Annual Report is submitted to DEQ each year by March 1, covering the entire previous calendar year.
- The 1200-Z report for the WPCF and BMF is completed by July 31st each year, and covers the previous fiscal year (July 1 through June 30). The most recent 1200-Z report for the WPCF and BMF sites was submitted to the DEQ on September 13, 2010 as a part of the 1200-Z data submittal referenced below under "Administration of NPDES 1200-Z and 1700-A General Permits."

NPDES General 1200Z Industrial Stormwater Permit for Eugene Airport
The City of Eugene also holds a General 1200Z permit for discharges of stormwater runoff from the Eugene Airport site to Amazon Creek and the A1 Channel, both of which eventually flow into the Long Tom River.

- The 1200-Z DMR for the Eugene Airport is completed each year, covering the previous fiscal year (July 1 through June 30). The most recent 1200-Z report for the Eugene Airport site was submitted to the DEQ on June 4, 2010.

In addition to the point source permits held by the City of Eugene (and MWMC), the City acts as an agent for DEQ for three general permit programs of relevance to the TMDL: administration of the 1200-Z and 1700-A general permits (industrial stormwater permits and wash water permits, respectively), and administration of the 1200-C general permits (construction activities).

Administration of NPDES 1200-Z and 1700-A General Permits
The City currently acts as an agent for DEQ in the administration of 1200-Z (Industrial Stormwater) and 1700-A (Vehicle and Equipment Wash Water) General Permits inside the Eugene UGB[3].

- Yearly reports are submitted to the DEQ via email as a Microsoft Excel database. The most recent data submittal for the 1700-A permits and 1200-Z permits occurred on September 13, 2010 and was entitled "Eugene DMR Review 2010."

Administration of NPDES 1200-C General Permits
The City currently acts as an agent for DEQ in the administration of 1200-C (Construction Activities) General Permits inside city limits and outside city limits, inside the Eugene UGB on behalf of Lane County under the City of Eugene/Lane County Stormwater Intergovernmental Agreement described in Section 2(e) of the TMDL Plan.

- The City's activities related to the erosion program are included in the MS4 Year 7 Annual Report, referenced under "Municipal Separate Storm Sewer System (MS4) permit."

[3] The description of the City's responsibilities has been updated from the TMDL Plan, to indicate that the City administers the 1200-Z and 1700-A permits inside the Eugene UGB.

c. Other Relevant Programs

This section provides information about the status and accomplishments of three other program areas or activities relevant to the TMDL, however indirectly: 1) Sustainability, 2) Low Impact Development, and 3) Climate and Energy.

Sustainability
Up-to-date information on the City's Sustainability Program can be found on the City's web site at: http://www.eugene-or.gov, go to Quick Links and select "Sustainable Eugene."

- The Sustainability Commission produced its Fiscal Year 2011 (FY11) Workplan, covering the period of time from July 1, 2010 - 30, 2011 with specific tasks identified under the broad themes of 1) land use and transportation; 2) outreach and education; and 3) ongoing initiatives. The FY11 Workplan is available from the Sustainable Eugene web site, and is provided in this report for convenience as Appendix E.

Low Impact Development
Staff has continued its efforts to increase the implementation of low impact development (LID) practices, following Eugene City Council direction in September 2008. Staff is exploring multiple avenues of opportunity to increase LID including administrative adjustments, additional integration of LID practices with other initiatives, development of proposals for land use code amendments, and development of proposals for other program enhancements.

- City staff enhanced the interrelationships between City programs to implement incentives for Green Buildings and LID, including an expedited permit review process and over-the-counter permits for qualifying private construction projects that incorporate energy efficiencies, LID strategies, and other green building practices.
- City staff updated the City's Stormwater Management Manual (adoption pending at the time of drafting of this report). The manual revisions remove some barriers to LID and also incorporate a section for retrofitting existing stormwater facilities to provide stormwater treatment of runoff from existing impervious surfaces.
- City staff continues to look for ways to incorporate Leadership in Energy & Environmental Design (LEED) practices into the City's Stormwater Management Manual.
- City staff designed and constructed multiple capital transportation improvement projects which incorporated LID strategies.

Climate and Energy
The Eugene City Council endorsed the City's first Climate Energy and Action Plan (CEAP) in September 2010. Staff included and listed as a high priority LID strategies within the CEAP. The report is available on the City's web site at: http://www.eugene-or.gov. Go to Quick Links and select "Sustainable Eugene," then select "The Climate & Energy Action Plan."

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5. WATER QUALITY MONITORING

The City has conducted ambient and stormwater monitoring at several locations for over 13 years. The monitoring data, analysis and trend information are provided to DEQ annually as part of the MS4 permit reporting. For the latest assessment of water quality conditions through monitoring, please see the Year 7 Stormwater (MS4) Annual Report, dated December 1, 2010, provided in Appendix D.

APPENDIX A

TMDL IMPLEMENTATION PLAN MATRIX
UPDATED DECEMBER 2010

Appendix A - City of Eugene TMDL Implementation Plan Matrix (Updated December 2010)

MS4 SWMP BMP ID (if applicable) (1)	BMP or Activity	Description of BMP or Activity	Measurable Goals & Timeline	Tracking Measures What is being tracked to show progress towards meeting measurable goals	Milestone Intermediate goals to know progress is being made	Progress Reporting Period (7-1-09 through 6-30-10)	TMDL Pollutants Addressed(2)					Water-shed(3)		Regulatory Program(s)(4)							
							Bacteria	Temperature	Hg	DO	Turbidity	Amazon	Willamette	NPDES MS4	NPDES 1200Z - WPCF	NPDES 1200Z - Airport	NPDES - Wastewater	Underground Injection Con	Goal 5	Goal 6	Willamette TMDLs
WATERWAY PROTECTION, RESTORATION & SHADING																					
	Stream buffers/riparian protection	Consider adoption of an ordinance to establish setback buffers by means of a Water Quality Overlay Zone on waterways with a significant relationship to 303(d) listed streams, and which are not already protected by some other means (namely, Goal 5 and other protective zoning regulations).	/WQ Overlay Zone ordinance adopted and implemented (or alternative protections implemented) by June 2009.	• Applications involving /WQ Overlay Zone (New tracking measure, now that the adoption process is complete and the ordinance remains in effect).	The /WQ ordinance was adopted June 10, 2009 and remains in effect.	• "Protecting Water Quality and Wildlife Habitat" fact sheet was completed, describing how Eugene employs overlay zoning regulations along certain waterways, was completed. Copies were distributed to City staff in Public Works and Planning Departments, and made available to the general public. • No /WQ Overlay Zone standards review applications were received during the reporting period.	√	√	√	√	√								X	X
	Stream buffers/riparian protection	Track and support the implementation of Goal 5 natural resource waterway protections.	Track implementation of /WR Overlay Zone	• Applications involving /WR Overlay Zone	NA	• 2 /WR standards review applications were received during the reporting period.	√	√	√	√	√								X		x
	Temperature trading feasibility	Explore options and partnership opportunities for ecosystem restoration to off-set temperature impacts, for example the regional wastewater treatment facility.	Identify follow up actions from March 2008 Preliminary Findings prepared by the Long Tom Watershed Council by June 2009.	• Document discussions and intermediate decisions	Discussions with City of Springfield by March 2009.	• During the previous (TMDL year 1) reporting period the City received a report from the Long Tom Watershed Council on potential trading opportunities (and a very preliminary focus group effort to explore the willingness of private landowners to trade, for riparian shade). No further discussions ensued in the Year 2 reporting period.	P	√	P	P	P						X				X
	Enhance streamside shading, with an emphasis on Amazon Creek	Document existing planting plans and programs that relate to tree and shrub planting including: Amazon Creek plant community restoration plan (P3); tree planting code requirements; Neighborwoods; Stream Team (P1); Natural Resource Maintenance planting efforts (P4); Stormwater Management Manual (E4). Include in program adaptive management activities an evaluation of opportunities to enhance streamside shading.	Plant trees (goal=400/yr) along south and west side of Amazon Creek; Plant willow plantings (goal=4,000 lineal ft/year) of willow plantings along Amazon Creek	• Number/type of trees planted along Amazon Creek annually • Number of willow plantings along Amazon Creek annually • Number/type of trees planted along other waterways annually • Number of willow plantings along other waterways annually	NA	• 615 trees* planted along Amazon Creek • Approximately 3,650 willows planted along Amazon Creek (along 10,950 LF) • 1,601 trees* planted along other waterways • 2,264 willows planted along other waterways *All tree listed above are native, overstory trees that will provide shade on the water's surface at maturity. There is a mixture of both native broad leaf species (approx 80%) and native conifers (approx 20%).	P	√	P	√	P			X							X
	TMDL web page	Develop TMDL web page, including links to related web sites, the City's TMDL Implementation Plan, and staff contact information.	Develop and populate web page by December 2008.	• Confirm web page information is current once/month	NA	• Links to TMDL information provided from City's /WQ Overlay Zone web page at www.ci.eugene-or.gov, Go to Quick Links and select Stormwater, then go to Permits & Regulations and select "Water Quality Protected Waterways." • MS4 permit and annual reports posted to the City's web site at www.ci.eugene-or.gov, go to Quick Links and select "Stormwater," then go to Stormwater Permits & Regulations and select "National Pollutant Discharge Elimination System Permit." • TMDL web page in draft form.	√	√	√	√	√										X

Appendix A - City of Eugene TMDL Implementation Plan Matrix (Updated December 2010)

MS4 SWMP BMP ID (if applicable) (1)	BMP or Activity	Description of BMP or Activity	Measurable Goals & Timeline	Tracking Measures What is being tracked to show progress towards meeting measurable goals	Milestone Intermediate goals to know progress is being made	Progress Reporting Period (7-1-09 through 6-30-10)	TMDL Pollutants Addressed(2)					Water-shed(3)		Regulatory Program(s)(4)							
							Bacteria	Temperature	Hg	DO	Turbidity	Amazon	Willamette	NPDES MS4	NPDES 1200Z - WPCF	NPDES 1200Z - Airport	NPDES - Wastewater	Underground Injection Con	Goal 5	Goal 6	Willamette TMDLs
MERCURY REDUCTION STRATEGIES (NOT ASSOCIATED WITH EXISTING PERMITS)																					
	Dental Waste MOA	Participate in the implementation of activities as outlined in the 2006 Memorandum of Agreement (MOA) between the Oregon Dental Association (ODA), Metropolitan Wastewater Management Commission (MWMC), and the cities of Eugene and Springfield to limit the discharge of mercury and mercury bearing dental wastes into the regional wastewater collection system.	Provide services in the ten areas outlined in the MOA between ODA, MWMC and the cities of Eugene and Springfield.	• Track certifications of compliance with ODA BMPs, for dental offices in Eugene.	Monitor implementation of 2006 MOA ten specific services.	• Of the 127 dental BMP certifications granted over the previous (TMDL Year 1) reporting period, 25 dental offices were inspected during Year 2 as to their compliance with the Dental Waste MOA.			√												X
	School Cleanout Campaign	Participate in the School Cleanout campaign, led by Lane County with funding from DEQ, including (but not limited to) the disposal of chemicals and equipment containing mercury (barometers, manometers, thermometers).	Commence with efforts once intergovernmental agreement is signed by DEQ and Lane County. Timing of Clean Out campaign is dependent upon receipt of grant funding.	• Track quantities of chemicals and equipment identified for disposal.	Participate in stakeholder meeting to commence with Campaign by end of December 2008.	• City of Eugene staff were unable to participate during the Year 2 reporting period.			√												X
MUNICIPAL SEPARATE STORWMATER SEWER SYSTEM (MS4) NPDES PERMIT																					
Public Education																					
A1	Stormwater Education	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.	• Conduct bi-annual surveys (i.e. one survey every other year) with Eugene residents to determine attitudes and opinions of residents about the stormwater management program. • Provide SPLASH educational curriculum to teachers and administrators in local school districts. • Develop and implement internal stormwater education to city staff through new employee orientation, "green team" presentations, work group presentations and audio/visual presentation. • Increase catch basin markers with "dump no waste" messages and storm drain covers installed on public improvement projects. • Work collaboratively on education campaigns with other local agencies.	• Quantity of newsletters (Stormwater Connections) and rate brochures mailed to Eugene residents. • Number of students and teachers that use SPLASH curriculum annually. • Number of attendees at public outreach events. • Number of employees attending stormwater education sessions. • Track quantity of installed catch basin markers and storm drain covers. • Identify collaborative campaigns, target audience and summary of campaign. • Documentation of stormwater survey responses.	Spring Stormwater Connections newsletter published by May each year; Fall Stormwater Connections newsletter published by November each year.	• See Year 7 Stormwater Annual Report	√	√	√	√	√			X				X			x
P1	Educational Volunteer Program	Manage and support the City's Stream Team stormwater volunteer program. 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.	• On average, recruit and sustain three new adoption groups per year. • On average, conduct 12 volunteer work parties per year. • Conduct at least one partnership based large-scale water resource clean-up or enhancement volunteer project per year.	• Number of new adoption groups brought into the program. • Number of work parties conducted and number of volunteer participants. • Document annual large-scale project(s), participating partners and number of volunteer participants.	On-going program	• See Year 7 Stormwater Annual Report	√	√	P	P	√			X							x

Appendix A - City of Eugene TMDL Implementation Plan Matrix (Updated December 2010)

MS4 SWMP BMP ID (if applicable) (1)	BMP or Activity	Description of BMP or Activity	Measurable Goals & Timeline	Tracking Measures What is being tracked to show progress towards meeting measurable goals	Milestone Intermediate goals to know progress is being made	Progress Reporting Period (7-1-09 through 6-30-10)	TMDL Pollutants Addressed(2)					Water-shed(3)		Regulatory Program(s)(4)							
							Bacteria	Temperature	Hg	DO	Turbidity	Amazon	Willamette	NPDES MS4	NPDES 1200Z - WPCF	NPDES 1200Z - Airport	NPDES - Wastewater	Underground Injection Con	Goal 5	Goal 6	Willamette TMDLs
Planning, Capital Improvements, and Data Management																					
E1	Stormwater Capital Improvement Projects	Implement the Stormwater CIP including projects identified in the City's 2002 Stormwater Basin Master Plans (Basin Plans) for Amazon, Willow Creek, Bethel-Danebo, Willakenzie, Laurel Hill, and Willamette River basins. Finalize the River Road – Santa Clara Basin Master Plan. 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 Capital Improvement Program (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	• Complete River Road-Santa Clara Basin Plan by February 2009. • 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.	• Document completion of River Road-Santa Clara Basin Plan. • Track the number, type, watershed location and total drainage area of capital improvement projects constructed for water quality.	Public draft RR-SC plan by October 2008.	• See Year 7 Stormwater Annual Report	√	√	P	√	√			X				X			x
E3	Stormwater System Mapping and Data Management	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.	• Enter 95% of all newly constructed stormwater system features into inventory databases and GIS within six months of final construction approval. • Ensure that 90% of GIS and data application users surveyed rate the GIS/data systems as satisfactory or better.	• Report on map and database update activities annually. • Survey map and data system users bi-annually.	NA	• See Year 7 Stormwater Annual Report	Pollutants are not directly addressed by this BMP, but it is an essential support function for the other program activities							X				X			x
P2	Bacteria Pilot Study	Amazon Creek is water quality limited for bacteria and load reductions of 84% are necessary as specified in the 2006 Willamette Basin Bacteria TMDL. Conduct pilot study within a portion of the Amazon Creek stormwater basin to identify localized sources and types of bacteria contributions to Eugene's MS4 system. Where feasible, apply appropriate and specific BMPs to address these source types and measure BMP effectiveness using quantitative and qualitative methods.	• Collect and analyze stormwater samples within the study area during at least 3 significant wet weather storm events per year for the duration of the permit cycle. • Conduct field condition surveys within the study area at least 4 times per year through the end of new Permit Year 2. • Implement at least 2 new BMPs by February 2010 that will either identify or rule out specific sources of bacterial contributions to the MS4 within the study area. • Starting in new March 2010, implement at least one new BMP per year that will address identified specific sources of bacteria with the study area.	• Track the number of sampling events, samples collected, and resulting bacteria analysis results. • Track the number of field condition surveys conducted, the weather and antecedent weather patterns, and correlate noted conditions with results of sampling analysis. • Document additional source identification BMPs, BMP activity and any conclusions derived as a result of conducting the BMP. • Document additional bacteria reduction BMPs and BMP activity. • Document all follow up sampling and analysis and conclusions derived regarding BMP effectiveness.	Document pre-BMP implementation observations and water quality data from Phase I of the study by October 08.	• See Year 7 Stormwater Annual Report	√							X							X

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MS4 SWMP BMP ID (if applicable) (1)	BMP or Activity	Description of BMP or Activity	Measurable Goals & Timeline	Tracking Measures What is being tracked to show progress towards meeting measurable goals	Milestone Intermediate goals to know progress is being made	Progress Reporting Period (7-1-09 through 6-30-10)	TMDL Pollutants Addressed(2)					Water-shed(3)		Regulatory Program(s)(4)							
							Bacteria	Temperature	Hg	DO	Turbidity	Amazon	Willamette	NPDES MS4	NPDES 1200Z - WPCF	NPDES 1200Z - Airport	NPDES - Wastewater	Underground Injection Con	Goal 5	Goal 6	Willamette TMDLs
Construction and New Development																					
E2	Erosion Prevention and Construction Site Management Program	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. *NOTE: Projects that disturb one or more acres or are located in a sensitive area must have a permit based on a construction site management plan (CSMP) which shows the measures to be taken to comply with the mandated outcomes. In addition, even smaller construction projects which do not require a permit must meet the objectives of the ordinance. All public improvement projects must include a CSMP. See Appendix D-2 and D-3 of this Report for copies of the Ordinance and Administrative Rule, provided herein for information.*	• Inspect all construction sites prior to issuing an erosion permit. • Inspect all non-erosion-permitted sites at least twice during the life of the building/construction permit. • Inspect permitted sites monthly. • Conduct one annual erosion prevention training event.	• Number of compliance orders issued. • Number of permits issued. • Number of inspections. • Number of training/outreach events.	NA	• See Year 7 Stormwater Annual Report	√		√	√	√			X							x
E4	Stormwater Development Standards	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. (Note: Stormwater development standards are controls for post-construction water quality. Standards for erosion control during construction related to new development are covered under BMP E2).	• Review stormwater management proposals for land use applications. • Review and approve construction plans for stormwater management facilities for all development sites which create 1000 square feet or more impervious surface. • Update Eugene's Stormwater Management Manual bi-annually.	• Number of water quality facilities permitted with building permits. • Number of land use applications reviewed. • Number and type of public water quality facilities constructed. • Number of training/outreach events held.	NA	• See Year 7 Stormwater Annual Report	√	P	√	√	√			X				X			x
P6	Compliance Program for Maintenance of Privately Owned Vegetated Stormwater Facilities	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.	• Inspect all new vegetated private stormwater facilities at the time of construction and log pertinent information into a maintenance tracking and enforcement database. • Adopt and implement an administrative rule to enforce the maintenance of private stormwater facilities by February 2010. • Ensure the inspection of each vegetated private stormwater facility is conducted at least once per year by the owner/operator and an annual report documenting the necessary corrective actions filed with City staff.	• Number of private facility inspections. • Number of owner/operator annual reports received. • Number of notices of non-compliance and subsequent enforcement.	NA	• See Year 7 Stormwater Annual Report	√	P	√	√	√			X							x
M6	Regulation of Inspection, Maintenance and Reporting of Private Underground Stormwater Structures	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.	• Inspect all new private underground stormwater structures at the time of construction and log pertinent information into a database. • Establish a correspondence file for each structure/operator. • Ensure that each private underground stormwater structure is inspected, maintained and reported on as required by the O&M plan for the specific device.	• Track the number of O&M plans obtained. • Track the number of private inspection, maintenance and reporting activities conducted. • Track any enforcement activities related to the individual structures.	NA	• See Year 7 Stormwater Annual Report	√	P	√	√	√			X							x

MS4 SWMP BMP ID (if applicable) (1)	BMP or Activity	Appendix A - City of Eugene TMDL Implementation Plan Matrix (Updated December 2010)					TMDL Pollutants Addressed(2)					Water-shed(3)		Regulatory Program(s)(4)							
		Description of BMP or Activity	Measurable Goals & Timeline	Tracking Measures What is being tracked to show progress towards meeting measurable goals	Milestone Intermediate goals to know progress is being made	Progress Reporting Period (7-1-09 through 6-30-10)	Bacteria	Temperature	Hg	DO	Turbidity	Amazon	Willamette	NPDES MS4	NPDES 1200Z - WPCF	NPDES 1200Z - Airport	NPDES - Wastewater	Underground Injection Con	Goal 5	Goal 6	Willamette TMDLs
Operations and Maintenance																					
M3	Street Sweeping Program and Leaf Pick-up	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. Perform on-going review of the revised sweeping practices and schedules implemented as part of the City's previous stormwater discharge permit. 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.	• Sweep downtown core twice per week. • Sweep university and industrial areas once per week. • Sweep arterial streets every 2 weeks. • Sweep residential streets every 6-8 weeks. • Sweep bike paths and improved alleys twice per year. • Coordinate and manage two seasonal opportunities for the citizen's leaves to be picked up and managed by the SW operations crew.	• Lane miles swept. • Amount of debris collected. • Amount of leaves picked up.	NA	• See Year 7 Stormwater Annual Report	√		√	√	√			X							x
M5	Public Stormwater System Cleaning Programs - Piped System	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) Plan. Document quantities of material removed from each structure. Using the maintenance management system, refine the regular cleaning schedule for conduits, 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.	• Clean 50% of the all of the public catch basins and inlet structures annually. • Clean the inlet conduits associated with the individual structures. • Clean 50% of all of the public underground stormwater quality structures annually.	• Track the number of structures cleaned. • Track the amount of debris recovered.	NA	• See Year 7 Stormwater Annual Report	√		√	√	√			X				X			x
P3	Tree Planting and Information Programs	Manage and support both governmental and community tree planting programs. Provide information to the public about the multiple benefits that trees provide for protecting an enhancing stormwater quality.	• On average, conduct 12 Neighborwoods volunteer program tree planting projects per year. Plant 600 trees per year through this program. • Include the planting of street trees with all new private developments and with all new public street improvement projects as opportunities arise. • Provide information about the stormwater benefits of trees at major publicly attended events at least 4 times per year.	• Track the number of Neighborwoods volunteer program planting projects and the resulting number of trees planted. • Track the number of trees planted through new development tree planting requirements and through City-engineered street improvements. • Track the number and type of publicly attended events where stormwater related tree information was provided or where a presentation was made	NA	• See Year 7 Stormwater Annual Report		√	√	√	√			X							x
P4	Public Landscape and Natural Vegetation Management	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 both developed and undeveloped parkland, public right-of-way, wetland, drainage channels, natural creeks, ponds and other water resources. The focus of this BMP is to minimize and further limit the discharge of pollutant laden runoff from these sites, enhance the shading potential of waterway and pond riparian areas, and to promote wildlife habitat where appropriate.	• Complete Integrated Pest Management policy document and operations manual by February 2009. • On average, plant 5000 lineal feet of riparian area each year with native trees and shrubs. • On average, add one additional park to the Pesticide Free Parks Program every other year for the next six years.	• Document completion of IPM policy document and operations manual. • 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.). • Track the number of parks added to the Pesticide Free Parks Program.	NA	• See Year 7 Stormwater Annual Report	√	√	√	√	√			X							x

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MS4 SWMP BMP ID (if applicable) (1)	BMP or Activity	Description of BMP or Activity	Measurable Goals & Timeline	Tracking Measures What is being tracked to show progress towards meeting measurable goals	Milestone Intermediate goals to know progress is being made	Progress Reporting Period (7-1-09 through 6-30-10)	TMDL Pollutants Addressed(2)					Water-shed(3)		Regulatory Program(s)(4)							
							Bacteria	Temperature	Hg	DO	Turbidity	Amazon	Willamette	NPDES MS4	NPDES 1200Z - WPCF	NPDES 1200Z - Airport	NPDES - Wastewater	Underground Injection Con	Goal 5	Goal 6	Willamette TMDLs
P5	Public Stormwater System Maintenance – Open Waterways	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 both developed and undeveloped parkland, public right-of-way, wetland, drainage channels, natural creeks, ponds and other water resources. The focus of this BMP is to minimize and further limit the discharge of pollutant laden runoff from these sites, enhance the shading potential of waterway and pond riparian areas, promote wildlife habitat where appropriate.	• Complete Integrated Pest Management policy document and operations manual by February 2009. • On average, plant 5000 lineal feet of riparian area each year with native trees and shrubs. • On average, add one additional park to the Pesticide Free Parks Program every other year for the next six years.	• Document completion of IPM policy document and operations manual. • 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.). • Track the number of parks added to the Pesticide Free Parks Program.	NA	• See Year 7 Stormwater Annual Report	√	√	P	√	√			X							x
Illicit Discharge Controls																					
M1	Enforcement of Illicit Discharges to the Stormwater System	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.	• Work to reduce the number of stormwater pollution complaints received by the City through public outreach and a reasonable enforcement of regulations.	• Track the number of stormwater pollution complaints received by the City. • Track the number of formal communications sent to stormwater system users. • Track the number of incidents which required enforcement.	NA	• See Year 7 Stormwater Annual Report	P	P	P	P	P			X				X			x
M2	Spill Response	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.	• Maintain a fully trained team of staff that will respond to spills in a timely fashion. • Maintain an up to date list of trained personnel and the proper notification procedures for the on-call guide.	• Up-to-date list of employees trained for spill response. • Track number of spills and follow-up details.	NA	• See Year 7 Stormwater Annual Report	P	P	P	P	P			X				X			x
M7	Systematic Field Investigation of System Condition and Improper Discharges	Using a watershed basin approach, systematically inspect all commercial/industrial private stormwater systems that connect to the public drainage system. The purpose of this is to map private systems where no records currently exist and to assess the impacts of the private system on the public system. Where evidence is found that significant levels of pollutants are being introduced to the public system, work with property owners to correct the problems causing the discharge of pollutants. In addition to inspection of the private stormwater system, the SFI program will be inspecting the public system for condition assessment.	• Develop "map update" requests based on field inspections and forward this information to the Geographic Information Systems (GIS) manager for inclusion into the citywide GIS system. • Work with the stormwater operations crew to assess, inspect and map the public and private stormwater system. • Work with the inspection and enforcement staff to continue to educate and regulate the users on the proper use of the stormwater system.	• Track the number of map update requests forwarded to the GIS team. • Track and create work orders for the system repairs discovered through the inspection process. • Record and track all written communication with the stormwater system users prompted by the results of the field investigation.	NA	• See Year 7 Stormwater Annual Report	√		P	P	√			X							x
P7	Litter and Illegal Dumping Control	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.	• Ensure all parks, all public space areas managed by the City and all venues for outdoor public events on City lands have adequate rash receptacles and are emptied frequently enough to prevent spillage due to being over filled. • 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. • 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. • Monitor all identified historic dumping sites in the public right-of-way and clean-up as necessary at least twice per month.	• Track the collection frequency for trash receptacles in City parks and other public space areas managed by the City. • 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. • Track the number of illegal campsites cleaned-up along riverbanks, waterways, or other public space areas managed by the City. • Track the frequency of collection and amount of debris collected from waterways and from the public ROW.	NA	• See Year 7 Stormwater Annual Report	√		P	P	√			X							x

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MS4 SWMP BMP ID (if applicable) (1)	BMP or Activity	Description of BMP or Activity	Measurable Goals & Timeline	Tracking Measures What is being tracked to show progress towards meeting measurable goals	Milestone Intermediate goals to know progress is being made	Progress Reporting Period (7-1-09 through 6-30-10)	TMDL Pollutants Addressed(2)					Water-shed(3)		Regulatory Program(s)(4)							
							Bacteria	Temperature	Hg	DO	Turbidity	Amazon	Willamette	NPDES MS4	NPDES 1200Z - WPCF	NPDES 1200Z - Airport	NPDES - Wastewater	Underground Injection Con	Goal 5	Goal 6	Willamette TMDLs
Waste Management																					
B1	Household Hazardous Waste Disposal	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.	• Update "Brown Pages" in the US Dex directory to include new electronics requirements for the 2009-10 edition. • Update the City's website by Spring 2009.	• Document completion of "Brown Pages" update. • Document materials disbursed about household hazardous materials	NA	• See Year 7 Stormwater Annual Report			√	P				X							x
B2	Solid Waste Management	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.	• Review Administrative Rule to ensure regulations are up to date and include requirements to support appropriate waste management and prevention. • Contract with Oregon DEQ for a waste composition study.	• Document total tons of yard debris collected through the curbside program. • Document the number of compost demonstration workshops and participants. • Document number of enforcement cases related to inappropriate garbage handling. • Compare waste composition study with the prior one.	NA	• See Year 7 Stormwater Annual Report	√		√	√	P			X							x
Industrial Controls																					
W2	Industrial Stormwater Management Program	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.	• Conduct site inspections on 20% of permitted facilities annually.	• Percentage of permitted facilities inspected. • Number of corrective action letters sent and follow up responses. • Number of Action Plans prepared by permit registrants.	NA	• See Year 7 Stormwater Annual Report	P		P	P	√			X							x
Monitoring & Reporting																					
	Stormwater & Receiving Water Quality Monitoring	Conduct stormwater and receiving water (ambient) monitoring in accordance with Monitoring Plan. Continue to update TMDL management strategies based upon new stormwater and ambient monitoring data.	Analyze and report results to DEQ	Submit Monitoring Report Annually	NA	• See Year 7 Stormwater Annual Report	Pollutants are not directly addressed by this BMP, but it is an essential support function for the other program activities							X							X

Appendix A - City of Eugene TMDL Implementation Plan Matrix (Updated December 2010)

MS4 SWMP BMP ID (if applicable) [1]	BMP or Activity	Description of BMP or Activity	Measurable Goals & Timeline	Tracking Measures What is being tracked to show progress towards meeting measurable goals	Milestone Intermediate goals to know progress is being made	Progress Reporting Period (7-1-09 through 6-30-10)	TMDL Pollutants Addressed[2]					Water-shed[3]		Regulatory Program(s)[4]							
							Bacteria	Temperature	Hg	DO	Turbidity	Amazon	Willamette	NPDES MS4	NPDES 1200Z - WPCF	NPDES 1200Z - Airport	NPDES - Wastewater	Underground Injection Con	Goal 5	Goal 6	Willamette TMDLs
WATER POLLUTION CONTROL FACILITY (WPCF) NPDES WASTEWATER DISCHARGE PERMIT																					
		Meet WPCF NPDES permit effluent limits as they relate to TMDL pollutants	Meet permit effluent limits, as required under NPDES permit	on-going under existing permit; permit renewal in progress	NA	NA	√	√	√								X				x
		Conduct pretreatment program as required under WPCF NPDES permit	Meet permit requirements to track number of inspections and outcomes	on-going under existing permit; permit renewal in progress	NA	NA	√	√	√								X				x
		Prevent overflows, as required under WPCF NPDES permit	Document and report to DEQ overflow-related information (e.g. number of emergency overflows from pump stations and reason for overflow; number of plant upsets and reason), as required under WPCF NPDES permit.	on-going under existing permit; permit renewal in progress	NA	NA	√	√	√								X				x
		Conduct monitoring as required under WPCF NPDES permit	Number of samples taken and parameters analyzed; report results to DEQ	on-going under existing permit; permit renewal in progress	NA	NA	Pollutants are not directly addressed by this BMP, but it is an essential support function for the other program activities										X				x
STORMWATER PERMIT (1200Z) FOR WASTEWATER TREATMENT PLANT																					
		Implement best management practices for wastewater treatment facility under its 1200Z, as they relate to TMDL pollutants.	As required under WPCF NPDES 1200Z permit	on-going	NA	NA	√				√				X						x
		Conduct annual stormwater pollution control training for wastewater treatment plant staff.	As required under WPCF NPDES 1200Z permit	on-going	NA	NA	√				√				X						x
		Conduct monitoring as required under WPCF's NPDES 1200Z permit as it relates to TMDL pollutants.	As required under WPCF NPDES 1200Z permit	on-going	NA	NA	Pollutants are not directly addressed by this BMP, but it is an essential support function for the other program activities								X						x
STORMWATER PERMIT (1200Z) FOR EUGENE AIRPORT																					
		Implement best management practices for Eugene Airport as required under its NPDES 1200Z permit, as they relate to TMDL pollutants.	As required under Airports' NPDES 1200Z permit	on-going	NA	NA	√				√	por.				X					x
		Conduct annual stormwater pollution control training for airport employees.	As required under Airports' NPDES 1200Z permit	on-going	NA	NA	√				√	por.				X					x
		Conduct monitoring as required under Eugene Airports' NPDES 1200Z permit as it relates to TMDL pollutants	As required under Airports' NPDES 1200Z permit	on-going	NA	NA	Pollutants are not directly addressed by this BMP, but it is an essential support function for the other program activities					por.				X					x

[1] "MS4 SWMP BMP ID" refers to the MS4 Stormwater Management Plan best management practice identification number as shown in the Proposed SWMP 2008, submitted with the permit renewal dated September 2, 2008

[2] √ = Clearly addresses pollutant; P = Possibly addresses pollutant

[3] Shading indicates that BMP/Program applies within the watershed; no shading indicates that it does not apply within the watershed

[4] X = the TMDL is the primary driver for the management strategy; x = another permit or program is the primary driver, however the strategy addresses one or more TMDL pollutants.

APPENDIX B

FACT SHEET: PROTECTING WATER QUALITY AND WILDLIFE HABITAT WITHIN AND ALONG EUGENE'S WATERWAYS

How to Get More Information

If you have questions about these regulations or would like further information, contact the following:

- Eugene Permit and Information Center; 99 West 10th Avenue, Eugene, 97401; 682-5086
- Eugene's Websites:
  - *For West Eugene Wetland Protections: www.eugene-or.gov/wetlandsplan*
  - *For WR Water Resources Conservation Overlay Zone: www.eugene-or.gov/goal5*
  - *For WQ Water Quality Overlay: www.eugene-or.gov/wqpw*

Protected waterways provide...

filtration of runoff

wildlife habitat

flood control

shade

Protecting Water Quality and Wildlife Habitat

Within and Along Eugene's Waterways through Overlay Zoning Regulations

Purpose of Fact Sheet

This fact sheet provides general information as to where and how the City of Eugene employs overlay zoning regulations to protect water quality and wildlife habitat within and along its waterways. For those seeking more detailed information about the overlay zones or other tools used to protect or restore Eugene's waterways, please refer to "How to Get More Information" on the reverse side of this fact sheet.

Introduction – Protecting Waterways for their Beneficial Functions

Waterways perform a wide variety of functions that benefit both humans and wildlife, such as:

- Drainage and flood protection during storms
- Habitat for wildlife
- Filtration of pollutants from stormwater runoff
- Shade for moderating water temperature
- Source of water and food supply
- Recreation corridors for hikers and cyclists
- Open space and aesthetics

Without protection, waterways are more vulnerable to impacts from urban activities like filling & piping, vegetation removal, streamside development, and chemicals in runoff from yards and landscaped areas. Protecting waterways and carefully managing activities that affect them is a federal, state and local priority.

Historic Protection of Important Landscape Features

In the early to mid 20th Century, most of the City's initial efforts to preserve landscape features were related to cultural and historical values (such as Skinner Butte), recreational and aesthetic values (such as Spencer Butte), or flood control and drainage values (such as Amazon Creek). While not stated values at the time, protecting these features also provided incidental benefits for wild water quality and wildlife habitat.

Over the last two decades, the City of Eugene has explicitly incorporated water quality and natural resources management objectives into its programs. Results are evident in the Willamette River waterfront parks and trails, the West Eugene Wetlands, acquisition of priority stream corridors, capital improvement projects to repair and restore waterway functions, and volunteer Stream Team activities to name a few. The majority of the City's parks and open space system we see today was primarily secured through acquisitions, land dedication as part of development projects, and by donations from private property owners, as opposed to land use regulations.

Evolving Role of Zoning and Land Use Regulations

Beginning in the 1970s, land use and zoning regulation as a natural resource protection measure began to emerge as a prominent tool due, in part, to the adoption of Oregon's Statewide Planning Goals (1975), specifically Goal 5 (natural resources) and Goal 6 (water quality), and the adoption of the Federal Clean Water Act (1972). Eugene's response to these requirements has occurred over time through its policies, programs and local zoning regulations. Today, approximately 100 miles of waterways are protected by zoning regulations. Page 2 includes a brief description of these regulations.

Willamette River in Eugene

Waterway Protections in Eugene

West Eugene Wetlands Protections

The discovery of significant wetlands in west Eugene in the late 1980s resulted in adoption of the West Eugene Wetlands Plan (WEWP, 1992). WEWP provides policy direction for protecting wetlands in west Eugene in order to meet Clean Water Act and Statewide Planning Goal 5 requirements. The following is a brief description of City zoning regulations that were adopted and applied to affected parcels (1995) that protect certain waterways in west Eugene. See included map for WEWP boundary.

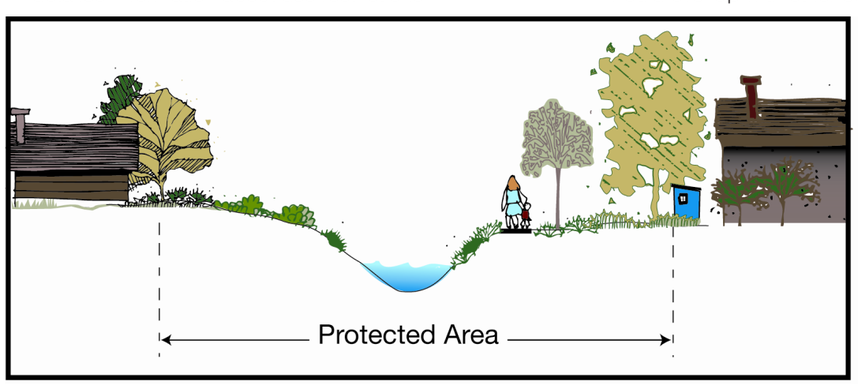
- Waterside Protection Overlay Zone, or /WP, applies to waterways that may also contain wetlands. Depending on classification, setbacks are measured from top-of-bank ranging from 20 feet (seasonal), 40 feet (perennial no floodway), to 60 feet (perennial with floodway). See included map for general location of /WP; see Eugene Code 9.4700 for more detailed information about use restrictions.
- Wetland Buffer, or /WB, applies to wetlands that are not necessarily associated with a waterway. Depending on category, setbacks are measured from wetland boundaries and range from 25 feet, 50 feet, to 100 feet. See included map for general location of /WB; see Eugene Code 9.4800 for more detailed information about use restrictions.
- Natural Resources Zone, or NR, applies to parcels that have been purchased in their entirety for wetlands protection in the WEWP by a governmental agency. While NR does apply to certain parcels within the WEWP boundary, it is not shown on the accompanying map as its regulatory scope is not waterway specific. It is listed here to provide a complete description of all WEWP adopted protection measures. See Eugene Code 9.2500 for more detailed information about use restrictions.

Water Resources Overlay Zone

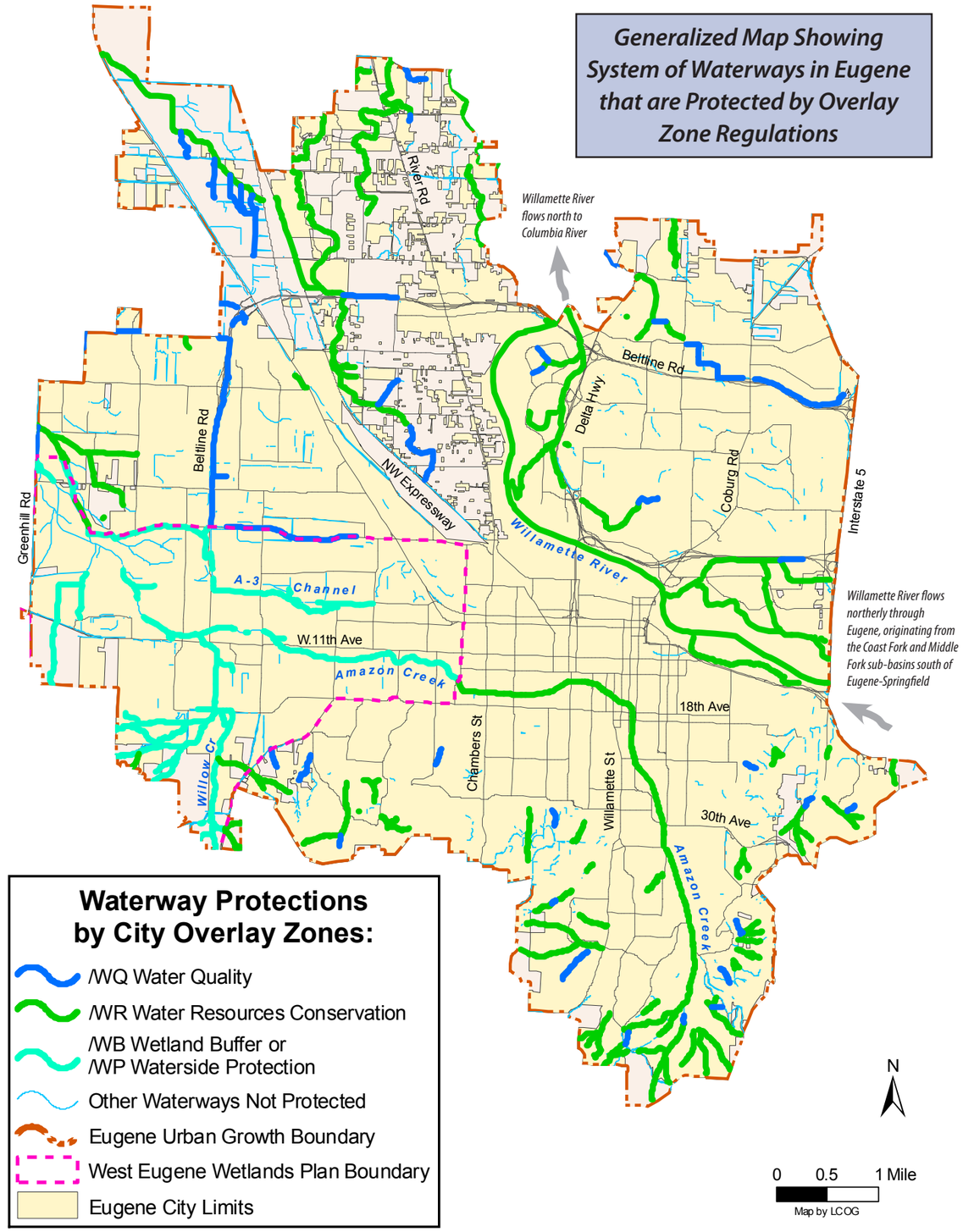
The Water Resources Conservation Overlay Zone, or /WR, is Eugene's response to Statewide Planning Goal 5 for areas outside of WEWP but within the Urban Growth Boundary and city limits. /WR was adopted by the City Council and applied to affected parcels within the city limits in 2005, and /WR was adopted by Lane County and applied to affected parcels outside of city limits within the Urban Growth Boundary in 2006. The land use regulations that were adopted to implement /WR are the same for the city limits and UGB. The City of Eugene is responsible for administering these regulations. The /WR regulations include protection requirements for riparian and wetland areas based on wildlife habitat values. Depending on habitat rating, setbacks can range from zero feet, 20 feet, 40 feet, 60 feet, to 100 feet. See included map for general location of /WR. For more detailed information about the /WR regulations see Eugene Code 9.4900.

Water Quality Overlay Zone

The Water Quality Overlay Zone, or /WQ, is Eugene's response to federal Clean Water Act requirements, Statewide Planning Goal 6, and local policy in the form of the Comprehensive Stormwater Management Plan. /WQ was adopted and applied to affected parcels within the city limits in June 2009, and will be applied to parcels that are currently located outside the city limits and within the Urban Growth Boundary upon annexation to the City. Waterways were identified for protection if they were: a) identified by the State of Oregon as not meeting state water quality standards; or b) a tributary to a waterway not meeting state water quality standards; or c) a headwater stream. If /WQ would overlap with other existing protections, i.e. /WR, /WP, /WB, NR, it was not applied. Setback requirements vary depending on location of the waterway: 40 feet from centerline of headwater streams; 25 feet from top-of-bank for valley bottom streams. See included map for general location of /WQ; see Eugene Code 9.4770 for more detailed information.



Protected area dimensions vary by Overlay Zone, and include building setbacks and certain use restrictions. Restoration activities are encouraged, but see specific Overlay Zone requirements.



APPENDIX C

RELATIONSHIP BETWEEN MS4 PERMIT RENEWAL SWMP BMP CODES AND CURRENT PERMIT SWMP BMP CODES

Appendix C

Relationship Between MS4 Permit Renewal SWMP BMP codes and Current Permit SWMP BMP Codes

2008, 2010 (Proposed)[1]	Proposed BMP Title	2010 (Current)[2]	Current BMP Title
A1	Stormwater Education	A1	Best Management Practices for Businesses
		A2	Stormwater Education
E1	Stormwater Capital Improvement Projects	E1	Stormwater Basin Master Plans
E2	Erosion Prevention & Construction Site Management Program	E2	Erosion Prevention & Construction Site Management Program
E3	Stormwater System Mapping and Data Management	E3	Stormwater System Mapping and Data Management
E4	Stormwater Development Standards	E4	Stormwater Development Standards
M1	Enforcement of Illicit Discharges to the Stormwater System	M1	Enforcement for Illicit Discharges
M2	Spill Response	M2	Environmental Spill Response Team
M3	Street Sweeping Program and Leaf Pick-up	M6	Street Sweeping Program
M4	Prevent Leaks and Spills from Municipal Vehicles and Equipment	M4	Prevent Leaks and Spills from Municipal Vehicles and Equipment
M5	Public Stormwater System Cleaning Program – Piped System	M5	Public Stormwater System Cleaning Programs
P5 (new)	Public Stormwater System Maintenance – Open Waterways		
M6 (new)	Regulation of Inspection, Maintenance and Reporting of Private Underground Stormwater Structures	n/a	n/a
P6 (new)	Compliance Program for Maintenance of Privately Owned Vegetated Stormwater Facilities	n/a	n/a
M7	Systematic Field Investigation of System Condition and Improper Discharges	M7	Systematic Field Investigation for Improper Discharges
M8	Winter Road Sanding and De-Icing Program	M8	Winter Road Sanding and De-Icing Program
P1	Educational Volunteer Program	P1	Educational Volunteer Activities
P2	Bacteria Pilot Study	W3	Bacteria Pilot Study
P3	Tree Planting and Information Programs	P3	Tree Planting and Urban Forest Enhancement
P4	Public Landscape and Natural Vegetation Management	P4	Public Landscape and Vegetation Management
P7	Litter and Illegal Dumping Control	M3	Litter & Illegal Dumping Programs
B1	Household Hazardous Waste Disposal	B1	Household Hazardous Waste Disposal
B2	Solid Waste Management	B2	Solid Waste Management
---	[integrated into on-going City processes]	W1	Address Impact of City Activities on Water Quality
W1 (new)	Permit Management and Reporting	n/a	n/a
W2	Industrial Stormwater Management Program	W2	Industrial Stormwater Management Program

[1] As reflected in MS4 Permit Renewal Application Proposed Stormwater Management Plan, September 2008 and updated August 2010. These BMP codes were used in the City of Eugene's TMDL Implementation Plan.

[2] Current MS4 Permit/SWMP BMP Code.

APPENDIX D

YEAR 7 ANNUAL STORMWATER REPORT (DECEMBER 1, 2010)

Stormwater Annual Report
for the City of Eugene, Oregon

Permit Year Seven *July 1, 2009–June 30, 2010*

Submitted by: City of Eugene

Submitted to: Oregon Department of Environmental Quality

December 1, 2010

National Pollution Discharge Elimination System (NPDES) Permit 101244

CITY OF EUGENE STORMWATER MANAGEMENT PROGRAM

EUGENE

Seventh Annual Report

Status Report for Permit Year Seven
(July 1, 2009 – June 30, 2010)

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, 2010

CITY OF EUGENE, OREGON
NATIONAL POLLUTANT DISCHARGE ELIMINATION SYSTEM (NPDES)
MUNICIPAL STORMWATER SYSTEM ANNUAL REPORT

The City hereby submits this National Pollutant Discharge Elimination System (NPDES) Municipal Stormwater System Seventh Annual Report and Stormwater Management Plan Evaluation in accordance with NPDES Permit Number 101244, File Number 107989. We certify under penalty of law that this document and all attachments were prepared under our direction or supervision in accordance with a system designed to assure that qualified personnel properly gather and evaluate the information submitted. Based on our 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 our knowledge and belief, true, accurate and complete. We are aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment for knowing violations.

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December 1, 2010

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1. Introduction

1 INTRODUCTION

Discharges from Eugene's municipal stormwater system into waters of the state are regulated by the Oregon Department of Environmental Quality under the National Pollution Discharge Elimination System (NPDES) permitting program. The City of Eugene received its first NPDES municipal separate storm sewer system (MS4) permit in November 1994. DEQ issued Eugene its second NPDES stormwater permit in March 2004. Under each permit, annual reporting is a required element.

This section of the report includes background information and a history of Eugene's stormwater NPDES permit (Section 1.1), a summary of relevant conditions from the City's 2004 NPDES permit (Section 1.2) and an overview of the contents of this report (Section 1.3).

1.1 Background and Eugene's NPDES Permit History

The National Pollution Discharge Elimination System (NPDES) permitting program is authorized by Section 402 of the Clean Water Act. In Oregon, the NPDES program is administered by the Department of Environmental Quality. Discharge of industrial wastewater, municipal wastewater, and stormwater into waters of the United States are all regulated through the NPDES program. For stormwater, NPDES permits are issued for discharges from municipal separate stormwater sewer systems (MS4s). Eugene is an MS4 and operates its stormwater system under a MS4 permit.

In 1990, the U.S. Environmental Protection Agency (EPA) published its Phase I regulations governing stormwater discharges under the NPDES program of the Clean Water Act. Phase I regulations required that municipalities with a population of 100,000 or more obtain a NPDES permit for their stormwater discharges to waters of the state. Subsequently, the City of Eugene applied for an NPDES permit for stormwater discharges within the City of Eugene. Part one of the original application was submitted to the DEQ in May 1992. Part two of the original application was submitted in May 1993 and included a proposed Stormwater Management Plan (SWMP), describing the agency's plan for reducing the discharge of pollutants to the "maximum extent practicable." A SWMP is comprised of a set of best management practices, or BMPs, and a Monitoring Plan. Eugene's original Stormwater Management Plan was approved by the Department of Environmental Quality (DEQ) and incorporated into its first NPDES permit which was then issued on November 10, 1994.

Eugene's first NPDES stormwater permit was scheduled to expire on September 30, 1999. The City applied for renewal of the NPDES permit in March 1999 and submitted a revised Stormwater Management Plan in March 2000. The permit was administratively extended by DEQ and the City continued implementation of the program described in the original Stormwater Management Plan. DEQ issued the City of Eugene its second permit in March 2004, which incorporated by reference the revised 2000 Stormwater Management Plan. The City's Second Annual Report under the new permit was submitted to DEQ on December 1, 2005. In response to conditions in the 2004 permit, the City's Second Annual Report included a summary of its evaluation of the City's SWMP and some proposed modifications to meet the new (second)

permit conditions. DEQ in a letter dated November 2, 2006 indicated that the Second Annual Report satisfied all the requirements of the permit. DEQ indicated in conversation that the City could move forward with implementing revisions to its SWMP as proposed in the Second Annual Report.

Eugene's second NPDES stormwater permit was scheduled to expire on February 28, 2008. The City applied for renewal of the NPDES permit in September 2008 including a revised Stormwater Management Plan. The permit was administratively extended by DEQ pending DEQ's action on the Oregon Phase I permit renewal submittals, including Eugene's. The City submitted an updated proposed SWMP in August 2010, reflecting program adaptive management and program improvements since the September 2008 submittal. As of the drafting of this Year 7 annual report, Eugene's third NPDES stormwater permit has been made available by DEQ for public review and comment, and a public hearing has been scheduled for November 17, 2010. The DEQ public comment period will end on November 19, 2010. It is anticipated that the City's third permit will be issued by the end of calendar year 2010, and will incorporate the City's updated SWMP by reference.

This document is the Seventh Annual Report under the City's 2004 permit, covering the period of time from July 1, 2009 through June 30, 2010. This report, and previous annual reports submitted to the DEQ, are posted on the City's stormwater web site at: www.eugene-or.gov/stormwater (see "Permits & Regulations" and select "National Pollutant Discharge Elimination System").

Public Comments were solicited on a Public Review Draft Year 7 Report in November 2010. One set of comments was received and as a result some suggested edits have been incorporated into the final report. See Appendix D for a copy of the November 2010 Public Notice, a screen print of the City's NPDES web site showing how the public could access the draft report, public comments and City responses, and a reference copy of a July 2008 fact sheet related to the City's permit renewal process and related SWMP update.

1.2 NPDES Permit Conditions

Eugene's NPDES stormwater permit consists of Schedule A, B and D, and a set of General Conditions. The permit conditions most relevant to this report are as follows:

Schedule A lists stormwater discharge and control limitations. Specifically the City of Eugene must:

- Implement all applicable provisions in the currently approved Stormwater Management Plan (SWMP).
- Reduce the discharge of the pollutants from the municipal stormwater system to the "maximum extent practicable."
- Effectively prohibit non-stormwater discharges into the municipal stormwater system unless such discharges are otherwise permitted by an existing NPDES permit.

Schedule B outlines the monitoring and reporting requirements. An annual report is required to

be submitted to DEQ each year by December 1st. Additional reporting requirements are included for the Second Annual Report and for the permit renewal application.

Schedule D outlines Special Conditions, including:

- The City must maintain adequate legal authority to effectively implement and enforce the permit conditions.
- The City's SWMP must include a public involvement component.

The last section of the permit is the General Conditions section which includes specific procedures for managing data and records, definitions of terms, and penalties for violations of the permit.

1.3 Report Contents

This report provides information on the progress of the permit activities from July 1, 2009 through June 30, 2010 herein referred to as Permit Year 7. It includes: this Introduction (Section 1), Overall Program Management (Section 2), Status of Implementation (Section 3), Monitoring Program (Section 4), Appendix A (Tabulated Data and Summaries), Appendix B (Boxplots for Water Quality Parameters), Appendix C (Eugene Code Table of Contents), and Appendix D (Public Comments on Year 7 Report).

As required by The Department of Environmental Quality, this report fulfills Item 2(a) of Schedule B of NPDES permit number 101244, file number 107989, issued March 2, 2004.

2. Overall Program Management

2 OVERALL PROGRAM MANAGEMENT

This section of the report provides information about how Eugene's stormwater program is managed (Section 2.1), the relationship between the City's NPDES permit and its stormwater policy guiding document, the Comprehensive Stormwater Management Plan (Section 2.2) and the relationship of the City's NPDES permit and stormwater program to other local jurisdictions, the City of Springfield and Lane County (Section 2.3).

2.1 Program Structure

The Eugene Public Works Department has overall responsibility to implement the elements of the Stormwater Management Plan (SWMP). The SWMP elements are managed by five divisions in the department: Administration, Engineering, Maintenance, Parks & Open Space, and Wastewater. The Eugene Planning & Development Department has responsibility for two elements as indicated in the table below. Table 2-1 provides a summary of the general areas of responsibilities within the stormwater program.

Table 2-1. General Areas of Responsibility for Stormwater Program

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

- **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 NPDES permit Stormwater Management Plan best management practices (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 use of retention basins for both water quality treatment and flood control.

As part of a stormwater program review in 2002, the Eugene Public Works Stormwater Policy Team reviewed CSWMP and concluded that it still represents the appropriate policy basis for Eugene's stormwater program.

2.3 Relationship to Other Local Jurisdictions

EPA adopted rules to implement "Phase II" of the municipal stormwater permitting program in December 1999. Phase II expanded the MS4 permitting program to include smaller communities located in United States census-defined urban areas, including Springfield and Lane County Oregon. 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 detection and elimination
- Construction site runoff control
- Post-construction site runoff control
- Pollution prevention/good housekeeping

The City of Springfield and Lane County have developed their respective Stormwater Management Plans and were issued Phase II MS4 permits in 2007. In anticipation of obtaining their Phase II stormwater permit, and for the mutual benefit of both agencies, Lane County and the City of Eugene entered into an intergovernmental agreement (IGA) in April 2004 to collaborate on stormwater program activities in the jurisdictional area outside of the Eugene city limits and within the Eugene urban growth boundary including stormwater planning, education, and illicit discharge detection and elimination. The IGA has been amended three times between 2004 and 2008, to update the description of services provided, to increase the County's reimbursement limit, and to extend the timeframe of the IGA to enable the continuation of the collaborative efforts outlined in the agreement such as the River Road-Santa Clara basin planning work (see BMP E1).

On an on-going basis, formally through the IGA and informally through participation in group efforts such as through the Pollution Prevention Coalition, the cities of Eugene and Springfield and Lane County often collaborate on stormwater education activities such as defining topics for the City of Eugene's Stormwater Connections newsletter, and topic-specific outreach and education efforts.

3. Status of Implementation

3 STATUS OF IMPLEMENTATION

This section provides: an explanation of SWMP best management practices (BMP) coding and general BMP categories (Section 3.1); a summary of financial expenditures over the reporting year and projections for the following reporting year (Section 3.2); assurances of continued legal authority (Section 3.3); and a status report on the implementation of each BMP (Section 3.4). Table 3-1 following Section 3.1.7 includes the full list of BMPs by code number.

3.1 NPDES Stormwater Management Plan BMP Categories

Eugene's NPDES Stormwater Management Plan includes 23 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 23 BMPs fall into seven general categories: Public Education; Planning, Capital Improvements, and Data Management; Construction Site Management and Design Standards for New Development; Operations and Maintenance; Illicit Discharge Controls; Waste Management; and Industrial Controls.

3.1.1 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.

- A1 Best Management Practices for Businesses
- A2 Stormwater Education
- P1 Educational Volunteer Activities

3.1.2 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, evaluate the impact of city activities on water quality, maintain up to date data on the stormwater system, and coordinate system information between departments and agencies for multiple applications.

E1 Stormwater Basin Master Plans
E3 Stormwater System Mapping and Data Management
W1 Address Impact of City Activities on Water Quality
W3 Bacteria Pilot Study

3.1.3 Construction Site Management and New Development Standards

The purpose of the construction site management and design standards for 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.

E2 Erosion Prevention and Construction Site Management Program
E4 Stormwater Development Standards

3.1.4 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.

M4 Prevent Leaks and Spills from Municipal Vehicles and Equipment
M5 Public Stormwater System Cleaning Programs
M6 Street Sweeping Program
M8 Winter Road Sanding and De-Icing Program
P2 Revise Comprehensive O&M Plans
P3 Tree Planting and Urban Forest Enhancement
P4 Public Landscape and Vegetation Management Program

3.1.5 Illicit Discharge Controls

The purpose of illicit discharge 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.

M1 Enforcement for Illicit Discharges
M2 Environmental Spill Response Team
M3 Litter and Illegal Dumping Programs
M7 Systematic Field Investigation for Improper Discharges

3.1.6 Waste Management

The purpose of the waste management BMPs is to educate the public, regulate waste management services, and to ensure 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.

B1 Household Hazardous Waste Disposal
B2 Solid Waste Management

3.1.7 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.

W2 Industrial Stormwater Management Program

Table 3-1
Stormwater Best Management Practices

2004 BMP#	BMP Title
A1	Best Management Practices for Businesses
A2	Stormwater Education
E1	Stormwater Basin Master Plans
E2	Erosion Prevention & Construction Site Management Program
E3	Stormwater system Mapping and Data Management
E4	Stormwater Development Standards
M1	Enforcement for Illicit Discharges
M2	Environmental Spill Response Team
M3	Litter & Illegal Dumping Programs
M4	Prevent Leaks and Spills from Municipal Vehicles and Equipment
M5	Public Stormwater System Cleaning Programs
M6	Street Sweeping Program
M7	Systematic Field Investigation for Improper Discharges
M8	Winter Road Sanding and De-Icing Program
P1	Educational Volunteer Activities
P2	Revise Comprehensive O&M Plans
P3	Tree Planting and Urban Forest Enhancement
P4	Public Landscape and Vegetation Management
B1	Household Hazardous Waste Disposal
B2	Solid Waste Management
W1	Address Impact of City Activities on Water Quality
W2	Industrial Stormwater Management Program
W3	Bacteria Pilot Study

3.2 Financial Summary - Actual (PY7) and Projected (PY8) Expenditures

The stormwater program-wide actual expenditures over the reporting period for Permit Year 7 and projected expenditures (budget) for the following year (Permit Year 8) are shown in Table 3-2. Permit Year 7 corresponds with the City's Fiscal Year 2010, and Permit Year 8 corresponds with the City's Fiscal Year 2011. Expenditures reported include funding for NPDES permit related activities and for stormwater program activities which are outside of the NPDES permit, such as: system maintenance for conveyance and flood control and wetland program management.

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. User fees are paid by all existing and new residents and businesses. User fees are impervious surface area-based and are reduced if the site is not connected to the public system or if the site contains retention or pollution reduction facilities. Stormwater 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 new capital (including major system rehabilitation projects, retrofits of the existing system to address water quality, wetland and waterway restoration projects, and new stormwater facilities such as pipes, culverts, constructed wetlands, ponds, and filters). Stormwater program activities funded primarily by stormwater user fees are represented by Funds 531 (Stormwater Capital Fund) and 535 (Stormwater Operating Fund) in Table 3-2.

- Stormwater System's Development Charges (SDCs). SDCs are paid by new and expanding development. The fees are based on impervious surface area, number of dwelling units, or footprint. SDC's typically fund construction or expansion of large pipes, drainage ways, catch basins and culverts. Stormwater program activities funded primarily by SDCs are represented by Fund 335 (Stormwater SDC Fund).

Table 3-2
City of Eugene
Public Works Department - Stormwater Funds (335, 531, 535)
Actual expenditures FY10, Projected Expenditures FY11
(fiscal year is July 1 - June 30)

Fund	Division	FY10 Actual	FY11 Budget	
335	93 - Engineering	$1,060,462	$374,993	a
	99 - Non Departmental	$3,000	$1,800	
335 Total		***$1,063,462***	***$376,793***	
531	93 - Engineering	$1,275,879	$7,278,666	b
531 Total		***$1,275,879***	***$7,278,666***	
535	87 - WWTP	$594,939	$502,759	
	89 - Administration	$726,285	$1,532,215	c
	93 - Engineering	$1,380,139	$1,836,602	
	94 - Maintenance	$3,697,357	$4,028,641	
	96 - POS	$3,024,828	$3,904,170	
	99 - Non Departmental	$1,332,000	$857,000	c
535 Total		***$10,755,548***	***$12,661,387***	
		Grand Total	***$20,316,846***	

[a] 100% of the FY11 budget is carryover from FY10.
[b] FY11 budget includes $5.6+ million carryover from FY10.
[c] Accounting change between FY10 and FY11 shifted costs within divisions.

3.3 Continued Legal Authority

Schedule D(1) requires that each NPDES permittee be able to maintain adequate legal authority, through ordinance(s), interagency agreement(s) or other means, to effectively implement and enforce the provisions of this permit. The legal authority must enable the permittee to:

A. Control through ordinance, permit, contract, order or similar means, the contribution of pollutants to the municipal separate storm sewer system by storm water discharges associated with industrial activity and the quality of storm water discharged from sites of industrial activity.
B. Prohibit through ordinance, order or similar means, illicit discharges to the municipal separate storm sewer system.
C. Control through ordinance, order or similar means the discharge to a municipal separate storm sewer system of spills, dumping or disposal of materials other than storm water.
D. Control through interagency agreements among the future co-permittee's the contribution of pollutants from one portion of the municipal system to another portion of the municipal system.
E. Require compliance with conditions in ordinances, permits, contracts or orders.

F. Carry out all inspection, surveillance and monitoring procedures necessary to determine compliance and noncompliance with permit conditions including the prohibition on illicit discharges to the municipal separate storm sewer system.

In Section 2.0 of the City's original Phase I permit application *(Part I of the NPDES Permit Application for Discharges from Municipal Separate Storm Sewer Systems, May 1992*), the City provided a detailed summary of relevant local ordinances which were in effect at the time, and thereby demonstrated that the City of Eugene had the required legal authority.

Although specific code sections referenced in 1992 may have changed, the authority required by 40 CFR 122.26 (d)(2)(i) still exists and the City has actually increased its level of authority and enforcement capabilities over time. Appendix C contains the current version of the Table of Contents for Chapter 6 - "Environment," Chapter 7 – "Public Improvements," and Chapter 9 - "Land Use" of the Eugene Municipal Code. Chapter 6 contains most, but not all, of the code provisions Eugene relies on to apply and enforce stormwater related regulations including those required per Schedule D(1). Chapter 7 includes the City's requirements for public improvements, including stormwater management facilities. The Chapter 9 code provisions include Stormwater Development Standards adopted by the Eugene City Council in June 2006, and waterway protections for water quality including the /WQ Water Quality Overlay Zone adopted by Council in March 2009.

3.4 Summary of Permit Year 7 BMP Activities

This section summarizes the status of implementation of the Stormwater Management Plan in the form of accomplishments for each BMP during Permit Year 7. The historical record of accomplishments for each BMP was last reported in the Second Annual Report. With the exception of BMP W3 (Bacteria Pilot Study, initiated in permit year 3), beginning with the Permit Year 3 report, a historical record of accomplishments is no longer being provided since the information is readily available under separate cover.

Public Education

A1 Best Management Practices for Businesses
A2 Stormwater Education
P1 Educational Volunteer Activities

Planning, Capital Improvements, and Data Management

E1 Stormwater Basin Master Plans
E3 Stormwater System Mapping and Data Management
W1 Address Impact of City Activities on Water Quality
W3 Bacteria Pilot Study

Construction Site Management and New Development Standards

E2 Erosion Prevention and Construction Site Management Program
E4 Stormwater Development Standards

Operations and Maintenance

M4 Prevent Leaks and Spills from Municipal Vehicles and Equipment
M5 Public Stormwater System Cleaning Programs
M6 Street Sweeping Program
M8 Winter Road Sanding and De-Icing Program
P2 Revise Comprehensive O&M Plans
P3 Tree Planting and Urban Forest Enhancement
P4 Public Landscape and Vegetation Management Program

Illicit Discharge Controls

M1 Enforcement for Illicit Discharges
M2 Environmental Spill Response Team
M3 Litter and Illegal Dumping Programs
M7 Systematic Field Investigation for Improper Discharges

Waste Management

B1 Household Hazardous Waste Disposal
B2 Solid Waste Management

Industrial Controls

W2 Industrial Stormwater Management Program

3.4.1 Status of Education BMPs

A1 Best Management Practices for Businesses
A2 Stormwater Education
P1 Educational Volunteer Activities

3.4.1 Status of Education BMPs

3.4.1.1 A1 - Best Management Practice for Businesses

Responsible Department/Division:
Public Works / Administration Division

BMP Contact:
Administration Division Director

BMP Description:
Continue efforts to plan, develop and implement a comprehensive program to educate 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.

Year 7 Accomplishments (July 1, 2009 – June 30, 2010):

- Fall 2009 issue of Stormwater Connections promoted wet weather best management practices for erosion prevention and construction site management to inform and remind contractors and homeowners about maintaining construction site compliance from October 15 – April 30. The Spring 2010 issue of Stormwater Connections highlighted a local demonstration garden in the works that focuses on plants, design, water-efficiency and stormwater features for residential use. Residents and landscape professionals are encouraged to visit the garden and see how they might apply what they see in their own gardens or landscapes.
- Collaboration continues with member agencies in the Lane Pollution Prevention Coalition (P2C) to create and promote educational outreach to businesses and general public. The Ecobiz program, a certification program for automotive shops that follow local regulations and requirements and take advanced steps to use more sustainable businesses practices, is still promoted and supported locally. Two more businesses signed on this year.
- Continued to use investigation of illicit discharges and industrial and construction site inspections as opportunities to distribute educational materials.
- City of Eugene and Springfield stormwater and wastewater staff continued to collaborate on a new education campaign for businesses that use pressure washing either on-site or for mobile pressure washing businesses. Best Management Practices for Pressure Washing Businesses guidebook is complete and will be distributed. Site visits were made to 4 equipment rental companies to distribute informational brochures for business and residential customers. Left display holders and 20 brochures at each business. Also 46 informational tags with best management practices for equipment operation were provided to these companies for all pressure washing equipment.
- Eugene continues to work with multiple agencies to educate local community and landscape professionals. Industry support of environmentally-friendly maintenance practices has been limited because consumers preference is dictated by the cost of services, with the use of chemical products perceived to be more cost-effective compared to environmentally focused products and services. A consumer-driven education was launched in spring 2009 with Oregon State Extension Service to lead instructional classes for citizens first, then professionals. Although several meetings with a planning group that included landscape contractors were held to talk about training sessions for landscapers, the proposed education session for early 2010 was delayed because of

budget issues for Oregon State Extension Service. Despite closure of the Extension Service office, the volunteer Master Gardener Program will continue the training program for residents and eventually landscape professionals. Eugene stormwater staff will help step up efforts to start an initial training program in 2011-2012.

Background:
Many businesses, be they industrial sites, commercial sites or mobile service delivery enterprises have the potential to create negative impacts to stormwater quality through both their site management and operational practices. These include but are not limited to: housekeeping practices for outdoor storage and operations areas; uncovered storage and movement of business products that are a potential pollutant source, trash and waste product site management, vehicle maintenance and washing practices, discharge and disposal practices for liquid business waste products, use of chemicals or other products outdoors, and the care and cleanliness of field operations and service delivery practices. A program to educate business owners and employees about the potential impacts to stormwater quality from their business practices and to provide them with more environmentally friendly alternatives is critical to helping eliminate business related pollutants at the source.

BMP Activities:

- Research business programs offered in other communities and determine which programs could be implemented in Eugene. Where feasible, use an "environmentally friendly" business program model which recognizes businesses that contribute to improved stormwater quality through good business practices.
- Develop an educational outreach for new businesses that gives them general information about stormwater pollution and the potential impacts their business may have on stormwater quality. Provide follow-up in the form of additional educational information (brochures, fact sheets, videos) specific to their business, on-site educational visit and/or technical assistance.
- Identify existing businesses to inform and educate about stormwater pollution issues. Target specific groups through mailouts or other means of outreach.
- Conduct a business awareness effort targeted at landscape maintenance enterprises, local nurseries, University of Oregon, large corporations with their own grounds maintenance staff, property management companies, and local school districts on the proper use of pesticides, herbicides, etc.
- Include information in educational materials about the sources of problem pollutants in stormwater including lead, mercury, and bacteria, and actions private landowners and business owners can take to eliminate these pollutants from stormwater runoff.
- Include information in educational brochures and newsletters about the causes of low dissolved oxygen in receiving waters, and the actions private landowners and businesses can take to minimize depletion of stream water dissolved oxygen.
- Continue to work collaboratively with Public Works Enforcement Group to target business/industry groups most prone to pollution enforcement violations and develop specific educational outreach campaigns designed to improve pollution awareness. Outreach may include industry specific workshops, development of fact sheets, newsletters, training manuals and/or mail-outs, or media campaigns.

- In conjunction with BMP M1 (Enforcement for Improper Discharges), W2 (Industrial Monitoring Program), and E2 (Erosion Prevention and Construction Site Management Program), use investigation of illicit discharges and industrial and construction site inspections as opportunities to distribute educational materials.
- Continue participation with inter-agency pollution prevention group designed to share information and improve educational outreach to businesses and community members.

Assessment Methods:

- Maintain records of materials distributed, audiences targeted and number of people participating in outreach presentations/on-site educational visits.
- Request feedback on usefulness of educational materials, and obtain suggestions for future activities and materials.
- Track number of businesses participating in “clean business” programs for specific service types.

3.4.1.2 A2 - Stormwater Education

Responsible Department/Division:
Public Works Administration Division

BMP Contact:
Administration Division Director

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

Year 7 Accomplishments (July 1, 2009 – June 30, 2010):

- Canines for Clean Water, a pledge program for dog owners to clean up after their pets continues to recruit program participants. Over 320 dogs are registered in the program which offers free bandanas to dog owners who sign the pledge. Seventy three dogs have been added to the program this year.
- Produced twice-yearly newsletter, Stormwater Connections, with articles about projects, activities, and information about improving stormwater quality. Distribution method is direct mail to Lane County residents within the Eugene Urban Growth Boundary. Total number distributed for was approximately 76,000. Other distribution includes city offices, library and community facilities. The newsletter is also available on the city's website . Topics covered in the two newsletters included proper disposal of hazardous waste, erosion prevention, flood hazard information, allowable landscape changes along streams, pond restoration(to address bacteria and water quality issues) and the benefits of street sweeping for water quality.
- The stormwater program continues to work collaboratively with other agencies to educate area residents about reducing pollutants to our local waterways. A consumer-driven education program launched in spring 2009 with Oregon State Extension Service on sustainable landscaping practices was continued through June 2010. The program provided classroom instruction about water efficiency, mulch, pest management, right plant- right place, use of fertilizer and stormwater management. Participants wanting program recognition were required to meet a 50 point rating scale. As of June 2010, 169 people have attended the training program. To date, 45 people have been certified through the sustainable landscape program.
- Community education and outreach are provided through special events, including the Good Earth Home & Garden Show (attendance estimated at 35,000), the Lane County Spring Home & Garden Show (attendance estimated at 50,000) and Earth Day 2009 (estimated attendance at 2,200). For the spring home show in March 2010, the Pollution Prevention Coalition, a multi-agency collaboration, worked together to create an interactive booth that featured stormwater, air quality and home care tips with a focus on healthy choices. 501 visitors signed a pledge card to make behavior changes.
- Continued information and resource sharing with participating agencies in the Pollution Prevention Coalition (6 meetings per year).
- We continue to promote environmental stewardship for youth in grades K-12 through the SPLASH (stormwater pollution learn and share) curriculum at area schools. Teachers in

Eugene 4J and Bethel school districts reported that 2,810 students received instruction through this program in the 2009-2010 school year. A workshop for teachers in the fall provided an overview of curriculum, handouts and activities. An educational page for children, parents and teachers is a regular feature in the bi-annual newsletter, Stormwater Connections and is available on the city's website. In addition, other handouts & activities are posted on the education page of the stormwater website for easy public access.

- Kept program materials such as brochures, fact sheets, posters, school materials and booklets up-to-date and available to area residents.
- Continued fish-friendly car wash kit program for fundraising groups in partnership with City of Springfield staff. Placed kits in Eugene at a community center and two retail businesses where groups can hold car washes. Twenty-two groups borrowed the car wash kits in Eugene. Used radio advertising and article in Stormwater Connections newsletter to promote program.
- New public stormwater manhole covers are cast with "dump no waste, drains to stream" message and fish design. 94 covers were installed on capital improvement and privately engineered public improvement projects during fiscal year 2010.

Background:
Stormwater pollution from direct and indirect sources continues to have an impact on water quality in local waterways. In particular, the connection to non-point source pollution and associated activities is not readily apparent to many. To raise awareness, offer alternative solutions and generate support for protecting our local waterways, an ongoing education program designed to reach all ages is essential. Stormwater education activities support many of the stormwater program activities by developing education and outreach materials, and providing the means to inform and involve the public in developing or changing areas of the program. (Note: educational BMPs outlined in this BMP will be coordinated with other BMPs when possible.)

BMP Activities:

- Continue to improve, update and expand on educational materials such as videos, web sites, brochures, fact sheets, posters, book marks and booklets to increase awareness of pollution impacts to Eugene's water quality.
- Continue bi-annual newsletter for Citywide distribution with information on methods for improving stormwater quality.
- Develop public education programs to support activities outlined in the Comprehensive Stormwater Management Program.
- Develop on-going campaigns as appropriate to support projects, programs, special opportunities, and targeted pollutants including lead, mercury, and bacteria.
- Include information in educational brochures and newsletters about the causes of low dissolved oxygen in receiving waters, and the actions private landowners and businesses can take to minimize depletion of stream water dissolved oxygen.
- Continue to develop educational materials to support volunteer activities and natural resource protection.
- Continue promotion of SPLASH curriculum for area schools. Explore options to improve upon and expand educational outreach to teachers and students. In addition to classroom

presentations and outdoor field trips, pursue other means to get students and teachers involved in hands-on learning opportunities.

- Work collaboratively with other City departments and local agencies to pool resources and continue educational outreach to local community.
- Prepare and staff booths at special events that reach community members such as the Lane County Home Show and Earth Day Celebration.
- Assist in the development of information and outreach materials related to Stormwater Development Standards (BMP E4) Basin Master Plans (BMP E1), and new Bacteria Pilot Study (BMP W3).

Assessment Methods:

- Track quantity of materials distributed, audiences targeted, number of people participating in events etc. Utilize records to plan future development and distribution of educational materials.
- Conduct evaluations at workshops, presentations and seminars offered. Utilize results to plan for future activities and events and to improve upon existing presentation formats.
- Conduct community surveys at 2-year intervals. Compare results to previous surveys to measure increases in level of awareness of stormwater pollution and solutions that public may participate in.
- Research stormwater programs at other agencies for education strategies that might be applied to Eugene's program.
- Monitor phone calls, correspondence and e-mail.

3.4.1.3 P1 - Educational Volunteer Activities

Responsible Department/Division:
Public Works / Parks and Open Space Division

BMP Contact:
Parks & Open Space Division Director

BMP Description:
Continue to refine the City's existing Stream Team volunteer program to involve citizens of all ages and socio-economic backgrounds in meaningful, hands-on and educationally oriented projects and activities related to protecting stormwater quality, promoting the use of native vegetation, and enhancing fish and wildlife habitat within the local urban related watershed.

Year 7 Accomplishments (July 1, 2009 – June 30, 2010):

- During this reporting year, more than 1,436 volunteers contributed a total of 3,527 hours working for the Eugene Stream Team to protect and enhance water quality and natural resource values within our local watershed. Volunteers of all ages and socioeconomic backgrounds participated. Refer to Year 7 project list for descriptions of the various volunteer efforts.
- Stream Team recruited, educated and put to work many volunteers this year through partnerships with the University of Oregon, Lane Community College, 4J school district, Bethel School district, Lane Schools, César Chavez Elementary, Lane Metro Youth Corps, Northwest Youth Corps, and Lane County Division of Youth Services.
- More than 5 different schools volunteered with Stream Team during the reporting period. The educational components included visits to the classroom, exploration of various waterways, discussion of daily activities that affect water quality and hands-on improvement to our riparian areas including litter removal, planting, and mulching. In all, the program involved over 200 middle and highs school students.
- The total number of trees and willow plugs planted during Stream Team projects for the reporting period was in excess of 1,000.
- Stream Team volunteers participated in seed collection, salvage and propagation from cuttings to supply the vegetation grown and tended at the nursery. Other volunteers are planting out the vegetation along rivers, streams and ponds throughout the City.
- Weekly work parties at the Native Plant Nursery are exceptionally good opportunities for in depth education about our local water systems and our role in protecting water quality. Over 60 volunteers have contributed more than 760 hours at the Native Plant Nursery this year. Native plant seeds collected this year and last year are being utilized in restoration projects across town including the Whilamut Natural Area, Delta Ponds, the Ridgeline Trail system, Tugman Creek, and several sites in the West Eugene Wetlands.
- Over the past year's reporting period, Stream Team volunteers, Volunteers in Parks, and Parks and Open Space Division staff planted out close to 1,700 native trees, shrubs, forbs and grasses that were grown at the Native Plant Nursery. In addition, over 18 pounds of native seed from 29 different species were spread in natural areas throughout Eugene to increase native plant diversity.

Year 7 Project List:

- On July 10th, 5 volunteers worked 2 hours removing invasive weeds around native shrubs in the Whilamut Natural Area of Alton Baker Park.
- On July 11th, 9 volunteers worked 3 hours removing invasive weeds around native shrubs in the Whilamut Natural Area of Alton Baker Park.
- On July 16th, 12 volunteers worked 2 hours along the Willamette River removing trash and debris.
- On July 25th 12 volunteers worked 3 hours removing invasive species around the ponds at SALAWA Meadows.
- On July 25th, 9 volunteers worked 3 hours removing invasive weeds around Delta Ponds.
- On July 25th, 5 volunteers spent 2.25 hours picking up litter from the banks of the Willamette River around the Greenway Bridge.
- On July 27th 14 volunteers worked 3 hours preparing planting beds at the City's Native Plant Nursery.
- On August 5th, 11 volunteers spent 1.5 hours removing invasive weeds and mulching around native trees and shrubs at Greenway Knoll, along the Willamette River.
- On September 16th, 67 volunteers spent 3 hours cleaning up trash and debris in the Whilamut Natural Area of Alton Baker Park
- September 26th, 19 volunteers worked 2 hours removing invasive species around the ponds at SALAWA Meadows.
- On September 28th, 6 Lane School students spent 1 hour mulching native trees and shrubs along Amazon Creek upstream of City View Street.
- On October 4th, 53 Stream Team volunteers joined forces with WREN and the BLM to celebrate National Public Lands Day at Stewart Pond. Over 7 yards of trash and debris were removed. In addition, volunteers spread native seed, and distributed mulch during the 3 hour event.
- On October 5th, 23 Rachel Carson High School students spent 1.5 hours removing invasive weeds on upper Amazon Creek.
- On October 6th, 7 Lane School students spent 1 hour mulching native trees and shrubs along Amazon Creek upstream of City View Street.
- On October 10th, 5 volunteers spent 2.25 hours removing litter along the Willamette River between the Greenway and Jefferson Street bridges.
- October 11th, 5 volunteers worked 2 hours removing trash and debris from the banks of the Alton Baker Park canal.
- On October 13th, 5 Lane School students spent 1 hour mulching native trees and shrubs along Amazon Creek upstream of City View Street.
- On October 17th, 7 Heron Ponds volunteers spent 2 hours removing invasive weeds along the Willamette River downstream of Arbor Drive.
- On October 20th, 46 North Eugene Pathfinder High School students spent 3 hours removing invasive weeds and mulching around native trees and shrubs in the Whilamut Area of Alton Baker Park.
- On October 20th, 20 Rachel Carson students spent 1.5 hours planting native trees and shrubs, weeding and mulching along upper Amazon Creek.

- On October 20th, 7 Lane School students spent 1 hour mulching native trees and shrubs along Amazon Creek upstream of City View Street.
- On October 24th 10 Eugene Lions Club members spent 3 hours removing invasive weeds and gathering trash and debris around Delta Ponds.
- On October 24th, Stream Team volunteers working with WALAMA Restoration Project planted over 100 new trees and shrubs along the creek at Morse Family Farm.
- On November 3rd, 21 Rachel Carson students spent 1.5 hours planting native trees and shrubs, weeding and mulching along upper Amazon Creek.
- On November 3rd, 3 Lane School students spent 1 hour mulching native trees and shrubs along Amazon Creek upstream of City View Street.
- On November 7th, 15 volunteers spent 3.5 hours planting native shrubs around the pond at Alton Baker Park.
- On November 10th, 6 Lane School students spent 1 hour mulching native trees and shrubs along Amazon Creek upstream of City View Street.
- On November 11th, 22 Rachel Carson students spent 1.5 hours planting native trees and shrubs, weeding and mulching along upper Amazon Creek.
- On December 1, 18 Rachel Carson students spent 1.5 hours planting native trees and shrubs, weeding and mulching along upper Amazon Creek.
- On December 3rd, 6 Lane School students spent 1 hour mulching native trees and shrubs along Amazon Creek upstream of City View Street.
- On December 12th 4 Heron Ponds volunteers spent 2.5 hours removing invasive weeds along the Willamette River downstream of Arbor Drive.
- On December 16th, 18 Rachel Carson students spent 1.5 hours planting native trees and shrubs, weeding and mulching along upper Amazon Creek.
- On December 19th, 14 Stream Team volunteers joined Eugene Tree Foundation volunteers for 2.5 hours to remove invasive weeds and plant native trees along Amazon Creek between Polk and Chambers.
- On January 7th, 7 Lane School students spent 1 hour mulching native trees and shrubs along Amazon Creek upstream of City View Street.
- On January 16th, 29 Stream Team volunteers working with WALAMA continued to convert turf area into riparian habitat along the Willamette River downstream from the Greenway Bridge. Volunteers spent 3 hours planting native trees and shrubs.
- On January 20th 20 Rachel Carson students spent 1.5 hours removing invasive weeds and spreading native seed along the creek in a natural area off North Terry Street.
- On January 24th 19 volunteers spent 3.5 hours at Edgewood Park removing invasive weeds and maintaining native trees.
- On January 28th, 8 Lane School students spent 1 hour mulching native trees and shrubs along Amazon Creek upstream of City View Street.
- On February 5th 14 volunteers from the University of Oregon and Lane Community College joined forces for 3 hours to weed and mulch 70 native trees planted by volunteers in previous years, along the Alton Baker Canal.
- On February 6th, 6 volunteers spent 2 hours removing trash and debris along the north bank of the Willamette River between the Greenway and Washington Jefferson Bridges.
- Walama Restoration Project volunteers planted 220 trees and shrubs next to the Greenway Bridge in February/March 2010.

- On February 13th, 45 Stream Team volunteers joined Eugene Tree Foundation volunteers for 3 hours to remove invasive weeds and plant native trees along Amazon Creek between Polk and Chambers.
- On February18th, 13 Lane School students spent 1 hour mulching native trees and shrubs along Amazon Creek upstream of City View Street.
- On February 18th, 19 Rachel Carson students spent 1 hour planting and mulching native trees and shrubs along Amazon Creek between Chambers and Polk streets.
- On February 20th 56 Stream Team volunteers working with WALAMA continued to convert turf area into riparian habitat along the Willamette River downstream from the Greenway Bridge. Volunteers spent 3 hours planting native trees and shrubs.
- On February 21st, 13 Stream Team volunteers joined Trout Unlimited members to plant 87 new trees and shrubs along the Willamette River in the Whilamut Natural Area of Alton Baker Park.
- On February 23rd, 25 Rachel Carson students spent 1 hour planting and mulching native trees and shrubs along Amazon Creek between Chambers and Polk streets.
- On February25th, 6 Lane School students spent 1 hour mulching native trees and shrubs along Amazon Creek upstream of City View Street.
- On February 27th, 173 from the University of Oregon, Lane Community College, Cub scouts, Girl Scouts, ETF and others joined forces for 3 hours to plant and mulch 400 new native trees along Amazon Creek between Bertelsen and Beltline.
- On March 8th, 41 Rachel Carson students spent 1 hour installing willow plugs along Amazon Creek between Chambers and Polk streets.
- On March 13th, 11 Stream Team volunteers working with WALAMA continued to convert turf area into riparian habitat along the Willamette River downstream from the Greenway Bridge. Volunteers spent 3 hours planting native trees and shrubs.
- On March 13th 9 Eugene Lions Club members spent 3 hours removing invasive weeds and gathering trash and debris around Delta Ponds.
- On March 15th, 10 Stream Team volunteers spent 1 hour planting Sidalcea on upland mounds at Dragonfly Bend.
- On March 20, 15 volunteers spent 2 hours removing trash along the bike path near Garden Way.
- On March 27th, 11 Stream Team volunteers joined Eugene Tree Foundation volunteers for 3 hours to remove invasive weeds and plant native trees along Amazon Creek between Polk and Chambers.
- On March16th, 22 Rachel Carson students spent 1.5 hours planting native trees and shrubs, weeding and mulching along upper Amazon Creek.
- April 1st, 6 Lane School students spent 1 hour mulching native trees and shrubs along Amazon Creek upstream of City View Street.
- On April 1st, 13 volunteers spent 2 hours gathering trash and debris along the river and canal between Walnut Street and Autzen Bridge.
- On April 8th, 16 volunteers worked 2 hours to gather trash and debris upriver of the DeFazio Bridge.
- On April 9th, McClure neighbors spent 2 hours planting and mulching native trees.
- On April 10th, 4 volunteers spent 2 hours picking up litter along the Fern Ridge Bike Path.

- On April 11th, 36 volunteers spent 3 hours planting, weeding, and mulching at SALAWA Meadows.
- April 20th, 29 Eugene Montessori students spent 4.5 hours mulching and weeding at SALAWA Meadows.
- On April 24th, 13 Stream Team volunteers joined WALAMA for a 1 hour work party at the butterfly Meadow in the Whilamut Natural Area of Alton Baker Park.
- On April 27th, 20 Rachel Carson students spent 1.5 hours weeding and mulching native trees and shrubs at the Greenway Knoll, next to the Willamette River.
- April 29th, 6 Lane School students spent 1 hour mulching native trees and shrubs along Amazon Creek upstream of City View Street.
- May 6th, 6 Lane School students spent 1 hour mulching native trees and shrubs along Amazon Creek upstream of City View Street.
- On May 8th, 6 Stream Team volunteers joined WALAMA for a 3 hour work party at the butterfly Meadow in the Whilamut Natural Area of Alton Baker Park.
- On May 11th, 23 Rachel Carson students worked 1.5 hours spreading mulch at SALAWA Meadows.
- May 13th, 11 Lane School students spent 1 hour mulching native trees and shrubs along Amazon Creek upstream of City View Street.
- On April 18th, 23 North Eugene Pathfinder High School students spent 5 hours removing invasive weeds and mulching around native trees and shrubs in the Whilamut Area of Alton Baker Park.
- On May 22nd, 7 Stream Team volunteers joined Eugene Tree Foundation volunteers for 2 hours to remove invasive weeds and plant native trees along Amazon Creek between Polk and Chambers.
- On May 22nd, 22 Stream Team volunteers joined WALAMA for a 3 hour work party at the butterfly Meadow in the Whilamut Natural Area of Alton Baker Park.
- On June 5th, 6 volunteers spent 2.25 hours gathering litter around the DeFazio Bridge.
- On June 19th, 6 Stream Team volunteers joined WALAMA for a 3 hour work party at the butterfly Meadow in the Whilamut Natural Area of Alton Baker Park.
- On June 26th, 8 Stream Team volunteers joined Eugene Tree Foundation volunteers for 2 hours to remove invasive weeds and plant native trees along Amazon Creek between Polk and Chambers.

Background:
In conjunction with other, more formal, stormwater education programs, an aggressive, hands-on stormwater and natural resource enhancement volunteer program is an effective way to educate a wide segment of the populace about the impacts of non-point stormwater pollution. By providing both educational presentations to help promote the program and in-the-field activities such as work parties, interpretive tours and water quality and wildlife monitoring to name just a few, the City's Stream Team program can both teach the value of urban natural resource area as well as foster citizen stewardship of local streams, ponds and wetlands.

BMP Activities:
- Recruit, coordinate, support, and provide the educational focus for Stream Team volunteers involved in the following ways: group adoption of natural areas associated

with the stormwater system (such as Amazon Creek, local ponds, streams and wetlands); ad hoc volunteer projects; and site monitoring.

- Provide volunteers with the necessary tools and guidance in the following areas: remove debris and invasive vegetation, plant and maintain native vegetation, collect native plant seeds, salvage native plants, operate and maintain a native plant nursery; monitor portions of the stormwater system; conduct fish and wildlife monitoring and perform other education water related activities.
- Provide support for on-going educational campaigns (BMPs A1 and A2) for certain problem pollutants in Eugene's stormwater runoff including lead, mercury and bacteria.
- Provide support for educational campaigns (BMPs A1 and A2) about the causes of low dissolved oxygen in receiving waters, and the actions private landowners and businesses can take to minimize depletion of stream water dissolved oxygen.
- Contribute articles and Stream Team information to the City's Stormwater Connections and Eugene Outdoors newsletters which are distributed bi-annually in local newspaper.
- Develop news releases and City Council newsletter articles to promote significant Stream Team Volunteer activities.
- Provide educational materials (such as videos focused on local stormwater and wetland issues) and make presentations to interested groups and school classes upon request.
- Produce a regularly scheduled Stream Team newsletter and distribute to program volunteers and others upon request.
- Hold semi-annual celebrations for volunteers to meet each other and become familiar with diverse components of the Stream Team program.

Assessment Methods:

- Solicit feedback on the program and effectiveness of outreach efforts.
- Track the number of schools and youth groups who participate in projects related to water quality and natural resource enhancements.
- Document the total number of volunteers who participate each year with Stream Team and the number of hours of volunteer time contributed.
- Track the number of new native plants that have been planted as part of Stream Team activities.
- Track the number of people who attend Stream Team related presentations and field tours.

3.4.2 Status of Planning, Capital Improvements, and Data Management BMPs

E1 Stormwater Basin Master Plans
E3 Stormwater System Mapping and Data Management
W1 Address Impact of City Activities on Water Quality
W3 Bacteria Pilot Study

3.4.2 Status of Planning, Capital, and Data Management BMPs

3.4.2.1 E1 - Stormwater Basin Master Plans

Responsible Department/Divisions:
Public Works / Engineering

BMP Contacts:
Engineering Division Director

BMP Description:
Implement and periodically update the City's 2002 *Stormwater Basin Master Plans* for the Amazon, Willow Creek, Bethel-Danebo, Willakenzie, Laurel Hill and Willamette River basins. Complete and implement the basin master plan for River Road – Santa Clara, in collaboration with Lane County. The basin plans convey a multiple-objective strategy for managing stormwater, and include: basin characteristics under existing and projected future conditions; a prioritized list of capital projects including waterway restoration, piped system upgrades, neighborhood water quality facilities, system rehabilitation, and retrofits of existing stormwater facilities; and other recommended implementation measures such as water quality standards for new development.

Year 7 Accomplishments (July 1, 2009 – June 30, 2010):
Continuation of stormwater capital project prioritization and selection process included presentations to and final approval of process from the Stormwater policy team. Implementation begins as we start to define next stormwater capital improvement program (CIP) details. CIP prioritization and selection process now includes a diverse representation from other Public Works divisions and incorporates the City's policies and goals related to sustainability and multiple-objective stormwater management.

- Included final list of River road – Santa Clara Basin plan capital improvement projects into the body of CIP project list with prioritization selection process completed.
- Continued to use and update web portal site which was established in 2005. The 2002 Stormwater Basin Master Plans for Amazon, Willakenzie, Bethel Danebo, Laurel Hill, Willamette River, River Road and Santa Clara and Willow Creek can be viewed or downloaded from the new web address: http://www.eugene-or.gov/portal/server.pt (follow links to Public Works > PW Engineering > Basin Master Plans). Printed copies may be purchased through a local print shop. A printed copy of the Basin Plans is also available at the downtown branch of the Eugene Public Library.
- XP-SWMM models for the Amazon, Willakenzie, Bethel Danebo, Laurel Hill, Willamette River, River Road – Santa Clara and Willow Creek basins are in use by the City's engineering staff and the design/development community.
- Constructed and As-built multiple location stormwater rehabilitation projects associated to various Pavement Preservation Projects. This effort afforded efficiencies for multiple paving projects by grouping all storm water rehabilitations into one contract of similar work at various locations. The project provided better value and less disruption to the paving projects.
- Replaced and relocated failing storm line on 15th Ave between Moss and Agate and replaced non-standard and minimally functioning catch basins at 17th and Villard. This work decreased or eliminated street flooding and improved water quality. These projects

were associated to the stormwater basin plans CIP list. This project collaborated with the University of Oregon work occurring at the time.

- Completed construction of debris racks and maintenance access to the North Beltline floodway near Crescent and Gilham Rd. and the channel outfall to Ayres Pond. The outfall site previously was not safe to work around and was a danger to others. In response to reducing debris accumulation at the outfall, metal debris racks were manufactured and installed at two locations and maintenance access provided at one of the sites. This project was identified in the Basin Plan and prioritized by its safety concerns.
- Construction completed on all capital projects with formal protocol and observation for erosion and accidental spill containment.
- In implementing the stormwater Capital Improvement Program (including Basin Plans water quality projects), documented location, type and other attributes of stormwater capital projects for purposes of evaluating their effectiveness and reporting progress under the city's NPDES permit.
- Continue to maintain a GIS coverage of water quality facilities and projects including such attributes as location, facility type, drainage area, and cost for all new water quality capital projects implemented (see BMP E3).
- Continue to update and educate awareness of the stormwater program including the list of CIP project needs and the level of funding necessary to accomplish those needs.
- Continue to maintain a GIS coverage of water quality facilities and projects including such attributes as location, facility type, drainage area, and cost for all new water quality capital projects implemented (see BMP E3).
- Development of monitoring protocol of material removal from the Polk St. Outfall for quantity and refining of operational levels of the facility.

Background:
Eugene's updated *Stormwater Basin Master Plans* were completed in 2002 for six of seven identified study areas or basins: *Amazon Creek, Bethel Danebo, Laurel Hill, Willakenzie, Willamette River, and Willow Creek*. The new plans were adopted by Administrative Order in April 2003. A draft basin master plan was developed for *River Road – Santa Clara,* an area with a mix of City and Lane County jurisdiction.

The new plans replace the City's 1990 Area-wide Drainage Master Plans which were focused exclusively on drainage and flood control needs. The new draft plans are multiple-objective in nature (flood control, water quality, stormwater-related natural resources) and are consistent with the adopted policies of the Comprehensive Stormwater Management Plan (CSWMP), the West Eugene Wetlands Plan (WEWP), and the Natural Resources Functional Plan (NRFP). The plans document the basin planning process and outcome, and incorporate recommendations from the Stormwater Department Advisory Committee. They include a 35-year Capital Improvement Plan for each basin, and proposed development standards related to water quality.

In 2004 the City entered into a cooperative agreement with Lane County related to stormwater services. The agreement includes a commitment to collaborate on completing the River Road – Santa Clara Stormwater Basin Master Plan. In 2005, City and County staff developed a

workplan, schedule and public involvement plan for completing the River Road – Santa Clara plan.

Capital projects identified in the basin plans are implemented through the Capital Improvement Program, or CIP, process. Proposed development standards are being implemented through ordinance adoption process to modify Eugene City Code (see also BMP E4: Stormwater Development Standards).

BMP Activities:

- Complete the River Road – Santa Clara Basin Master Plan.
- Update the Project Managers Manual to ensure that processes are in place to evaluate the impact of new flood control projects on water quality.
- In implementing the stormwater Capital Improvement Program (i.e., Basin Plans water quality projects), ensure documentation of location, type and other attributes of stormwater capital projects for purposes of evaluating their effectiveness and reporting progress under our permit. Ensure structures and/or mechanisms are in place to enable sampling, testing and evaluating effectiveness of representative facilities.
- Implement Stormwater Basin Master Plan strategies, including capital projects and recommended development standards (BMP E4).
- Evaluate the effectiveness of selected water quality capital projects at removing specific pollutants.
- Update Stormwater Basin Master Plan set at least once every five years.

Assessment Methods:

- Provide a copy of the 2002 *Stormwater Basin Master Plans* to DEQ.
- Ensure that the 2002 *Stormwater Basin Master Plans* are made available for viewing and printing in a variety of ways for ease of use.
- Incorporate projects identified in the Stormwater Basin Master Plans in the City's Capital Improvement Program and budget.
- Maintain a GIS coverage of water quality facilities and projects including such attributes as location, facility type, drainage area, and cost for all new water quality capital projects implemented.
- Selectively monitor certain public water quality facilities to determine effectiveness at removing pollutants.
- Participate in and contribute to regional efforts to evaluate and document the effectiveness of water quality best management practices.

3.4.2.2 E3 - Stormwater System Mapping and Data Management

Responsible Department/Division:
Public Works / Engineering

BMP Contact:
Engineering Division Director

BMP Description:
Keep up-to-date inventories and maps of the public and private, natural and constructed, stormwater system. Include mapping of 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 and E4 which create or modify system components and/or change the attributes of the stormwater system.

Year 7 Accomplishments (July 1, 2009 – June 30, 2010):

- Conducted regular maintenance to add new public and private stormwater facilities, including BMPs, from as-construct drawings to asset management database management system (CWS) and GIS map layers.
- Developed and implemented plans to refine schemas of public line and point GIS stormwater layers to facilitate their recognition and use by City staff. This included the addition of BMP fields.
- Made corrections to public stormwater system in CWS and GIS that included:
    - Reviewed lines to drywells and updated, where appropriate
    - Reviewed drywell outfalls and updated, where appropriate
    - Added 250 missing structure numbers to annotation GIS layer
- Worked with Public Works Maintenance/Parks & Open Space to identify missing BMPs, then entered them in CWS database and GIS layers.
- Refined stormwater basin boundaries.
- Conducted annual review and revision of NPDES permit site GIS layer.
- Produced storm system reference maps for Public Works Maintenance in support of annual summer cleaning project and smoke testing of combined sewer overflow (CSO) systems.
- Added areas described in City Letters of Map Change (LOMCs), notifying FEMA of flood plain exceptions and corrections, to LOMC GIS layer.
- Produced semi-annual Storm & Wastewater Infrastructure Map books.

Background:
Mapping and data management provides valuable supporting information which allows the City to effectively accomplish many elements of the NPDES permit requirements. For example, an accurate inventory and mapping of open waterways is critical to implementation of water quality protection measures related to open waterways.

Stormwater infrastructure layers are updated on a weekly and monthly basis on the GIS and asset inventory systems. Sources of update information are stormwater drainage studies, as-construct drawing of capital projects, and observations in the field by engineers and maintenance crews.

Software applications utilizing this data are developed and maintained to provide on-line access to system information for staff involved in all aspects of system planning, administration, analysis, operations and maintenance. Paper map sets reflecting updated system information are produced annually for use by field personnel.

BMP Activities:

- Update stormwater system inventory and GIS on a weekly and monthly basis
- Develop, upgrade and maintain software applications which make system information available to staff.
- Update stormwater infrastructure paper map sets annually.
- 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.
- 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.

Assessment Methods:

- Report on map and database update activities annually.
- Survey map and data system users bi-annually.

3.4.2.3 W1 - Address Impacts of City Activities on Water Quality

Responsible Department/Division:
Public Works / Wastewater Division

BMP Contact:
Wastewater Division Director

BMP Description:
Implement the results of the City's environmental assessment of City activities that have the potential to impact the water quality of Eugene's stormwater and receiving waters.

Year 7 Accomplishments (July 1, 2009 – June 30, 2010):

- Continued Integrated Pest Management (IPM) training for Parks & Open Space and other Public Works staff.
- Parks and Open Space IPM policy, adopted for use within the Parks and Open Space Division, shared with other divisions for their use and consideration for adoption.
- Continued to experiment with non-mechanized techniques for invasive species removal (see P4).
- Further expanded availability and use of bicycles by City staff at various work locations.
- Continued to expand the use of native plants in City landscaping and park areas (see P4).
- Continued to incorporate water quality treatment facilities into the design of public transportation and facilities projects (see E1).

Background:
A city-wide environmental review was conducted to evaluate City activities that have the potential to positively or negatively impact the environment, including the water quality of Eugene's receiving waters. The assessment, completed in 2001, provided a list of all City activities with the potential for environmental affects, and a screening of these activities to determine whether they have the potential to affect water quality specifically. Information about City activities collected included: frequency of the activity; number of locations where that activity occurs; types of materials or equipment used to perform each activity; and type and amount of waste reclaimed, produced, or managed by each activity. Then each activity was evaluated for degree of impact (including water quality) and ranked according to degree of positive or negative impact. The assessment is being used to guide the development of new policies and procedures intended to further reduce the City's negative impact on water quality.

BMP Activities:

- Continue to work with Fire Department staff to identify and implement procedures to mitigate or otherwise manage runoff from fire suppression and clean-up activities.
- Continuing with the highest priority impacts on water quality, develop policies, programs and procedures to reduce the impacts of City activities on water quality.
- Implement programs and procedures

Assessment Methods:

- Develop report on identified significant water quality impacts
- Develop procedures and practices to reduce water quality impacts
- Provide training to affected staff

3.4.2.4 W3 - Bacteria Pilot Study

Responsible Department/Division:	**BMP Contact:**
Public Works / Parks & Open Space	Parks & Open Space Division Director
Public Works / Wastewater	Wastewater Division Director

BMP Description:
Conduct a pilot study in the Amazon Creek stormwater basin to confirm the existence of bacteria contributions from Eugene's MS4 system, and identify the sources of bacteria. If appropriate, apply specific BMPs to address these specific sources and measure BMP effectiveness using quantitative and qualitative methods.

Year 7 Accomplishments (July 1, 2009 – June 30, 2010):

- Sampling and analysis of water samples from Amazon Creek at four monitoring locations (Chambers St., Blue Heron pedestrian bridge, Polk St. and Jefferson St.) for E. coli and fecal coliform; three sampling events completed during the reporting period.
- Sampling and analysis of water samples from Westmoreland area stormwater conveyance system at four monitoring locations (MH55402 at Albertsons; MH56329 at Friendly & 16th; MH51267 at Tiara; MH80382 at SE Westmoreland Park) for E. coli and fecal coliform; three sampling events completed at different times for each location since July 2009. One monitoring location on Willow Creek at 18th (MH80382) has been sampled a total of three times as well during the past permit year for purposes of background water quality comparison.
- Investigatory field sampling for bacteria was extended to four sites upstream from the Tiara site for one storm event. Staff selected four monitoring sites located in an area that traditionally shows high bacteria level. The bacteria counts were very similar at all the locations that were selected going up the stream, and did not indicate a "hot spot" of high bacteria counts or a bacteria point source.
- Staff presented an update of the Bacteria Pilot Study to the Stormwater Policy Team on September 9th, 2009. The PowerPoint presentation included a historic look at the bacteria pilot study, summary of monitoring data and a series of recommendations for potential BMP's that could be implemented in the future.
- A BMP specific staff team continued to meet during this reporting period to develop strategies and accompanying measures that will focus on the primary areas of concern at a much higher degree of investigative scrutiny. Such efforts are expected to include revised and more intensive field investigation techniques as well as a public outreach and information gathering measures targeted specifically to residents and businesses within these areas.

Year 6 Accomplishments (July 1, 2008 – June 30, 2009):[1]

- Sampling and analysis of water samples from Amazon Creek at four monitoring locations (Chambers St., Blue Heron pedestrian bridge, Polk St. and Jefferson St.) for E. coli and fecal coliform; three sampling events completed during the reporting period.
- Sampling and analysis of water samples from Westmoreland area stormwater conveyance system at four monitoring locations (MH55402 at Albertsons; MH56329 at Friendly & 16th; MH51267 at Tiara; MH80382 at SE Westmoreland Park) for E. coli and fecal coliform; three sampling events completed at different times for each location since July 2008. One monitoring location on Willow Creek at 18th (MH80382) has been sampled a total of three times as well during the past permit year for purposes of background water quality comparison.
- Completed a review of all wastewater maintenance records for Tiara neighborhood and determined that there are no septic systems present and no sewer cross-connections.
- Reviewed wastewater records in Tiara neighborhood and identified one private sewer line for further investigation. This line was TV'd in July 2009 which revealed damage but not significant enough to cause leaks.
- Field investigations of chicken coops in the Tiara residential area were conducted. Initial assessment is that they do not appear to impact water quality.
- Windshield survey of Tiara Street, Adams Street and Ingalls Street. Noted any obvious issues with catchbasins, drainage, presence of dogs/chickens, and human behavior. No issues noted.
- PWM and POS staff reviewed all wastewater and stormwater maintenance records to understand the maintenance history of the piped system in the study area. Identified potential issues with private sewer line connections and main line conditions.
- Preliminary analysis and comparison of sampling data continue to show higher levels of bacteria within the study basin than what was sampled from the natural background sample site. Although the data has identified several areas within the study basin as relatively higher sources of bacteria, it is not conclusive enough to be able to identify either the contributing conditions or activities. As such, the timeline for developing and implementing effective bacterial control BMPs will be extended in order to conduct further sampling, field surveys and other investigation measures that can help locate, identify and target the primary sources of bacteria within these areas.
- A BMP specific staff team has had several meetings and will continue to meet with the goal of developing strategies and accompanying measures that will focus on these primary areas at a much higher degree of investigative scrutiny. Such efforts are expected to include revised and more intensive field investigation techniques as well as a public outreach and information gathering measures targeted specifically to residents and businesses within these areas.

[1] A historical record of accomplishments is included in this report for BMP W3, Bacteria Pilot Study which was initiated in 2005 as described in the City's Second Annual Report. The nature of this BMP is conducive to a historical record to describe status, in that is a pilot study, being conducted for a discrete period of time, and is progressive with each phase building upon the results of the previous phase.

Year 5 Accomplishments (July 1, 2007 – June 30, 2008):

- Sampling and analysis of water samples from Amazon Creek at four monitoring locations (Chambers St., Blue Heron pedestrian bridge, Polk St. and Jefferson St.) for E. coli and fecal coliform; three sampling events completed since August 2007.
- Sampling and analysis of water samples from Westmoreland area stormwater conveyance system at four monitoring locations (MH55402 at Albertsons; MH56329 at Friendly & 16th; MH51267 at Tiara; MH80382 at SE Westmoreland Park) for E. coli and fecal coliform; three sampling events completed at different times for each location since July 2007. One monitoring location on Willow Creek at 18th (MH80382) has been sampled three times as well during the past permit year for purposes of background water quality comparison.
- Three field surveys were conducted, one each in August and September 2007 and one in March 2008.
- Preliminary analysis and comparison of sampling data show higher levels of bacteria within the study basin than what was sampled from the natural background sample site. Although the data has identified several areas within the study basin as relatively higher sources of bacteria, it is not conclusive enough to be able to identify either the contributing conditions or activities. As such, the timeline for developing and implementing effective bacterial control BMPs will be extended in order to conduct further sampling, field surveys and other investigation measures that can help locate, identify and target the primary sources of bacteria within these areas. To aid in this effort, a BMP specific staff team will develop strategies and accompanying measures that will focus on these primary areas at a much higher degree of investigative scrutiny. Such efforts are expected to include revised and more intensive field investigation techniques as well as a public outreach and information gathering measures targeted specifically to residents and businesses within these areas. (Study Year 3, FY09)

Year 4 Accomplishments (July 1, 2006 – June 30, 2007):

- Sampling and analysis of water samples from Amazon Creek at four monitoring locations (Chambers, pedestrian bridge, Polk, and Jefferson) for E. coli and fecal coliform; five sampling events completed since November 2006.
- Sampling and analysis of water samples from Westmoreland area stormwater conveyance system at four monitoring locations (MH55402 at Albertsons; MH56329 at Friendly & 16th; MH51267 at Tiara; MH80382 at SE Westmoreland Park) for E. coli and fecal coliform; between four and five sampling events completed since November 2006. One monitoring location on Willow Creek at 18th (MH80382) has been sampled five times for purposes of background water quality comparison.
- Two field surveys conducted in February and May 2007.

Year 3 Accomplishments (July 1, 2005 – June 30, 2006):

- Generated maps of the stormwater system for use in selecting pilot study sub-basin, locating monitoring stations, informing BMP selection and design, and assessing BMP effectiveness. Selected Amazon Creek sub-basins for pilot study.
- Developed check sheet to assess conditions within the selected sub-basin, including for example the amount, type and location of wildlife and domestic pets; location and

number of domestic animal waste piles; conditions within commercial loading areas, recycling areas and garbage dumpster areas.

- Purchased flow monitoring and automated sampling equipment to enable staff to begin collecting stormwater samples beginning in fall 2006 to help determine potential sources of bacteria in the study area.

Background:
The A3 Channel, Amazon Diversion Channel, and Amazon Creek are on the state's 303(d) list as "water quality limited" for bacteria. Stormwater monitoring data indicates that bacteria concentrations in Eugene's stormwater are above the state water quality criterion and therefore likely contribute to the bacteria problem. A pilot study of the Polk Street sub-basin will be conducted to achieve the following goals: 1) confirm whether or not Eugene's MS4 is a contributor of bacteria to receiving waters; 2) to better understand bacteria source contribution areas through observation and monitoring; 3) design and implement BMPs to reduce bacteria loads to stormwater and Amazon Creek; 4) assess through additional monitoring BMP effectiveness in reducing bacteria loads to stormwater and, hence, Amazon Creek. Knowledge gained from BMP effectiveness in the Polk Street sub-basin will be assessed for application to other areas within the Amazon basin with the objective of reducing bacteria in the A3 Channel, Amazon Diversion Channel, and Amazon Creek.

Common sources that could potentially be an issue for Eugene's stormwater system include wildlife waste (e.g. birds, nutria, mice, squirrels), domestic pet waste, human activities and sediment (bacteria can accumulate and concentrate in deposited sediments).

Eugene's proposed bacteria reduction strategy is a combination of targeted education (BMP A2), existing systematic field investigation (BMP M7) and illicit discharge programs (BMP M1), existing maintenance practices (BMP M5), new water quality development standards (BMP E4), monitoring to determine natural background bacteria levels, and this new BMP W3: pilot study to confirm bacteria source(s) and to evaluate the effectiveness of BMPs. The bacteria pilot study includes three phases: 1) source identification, 2) BMP implementation, and 3) evaluation of BMP effectiveness.

While the study will be conducted primarily within one selected sub-basin of the Amazon Creek major basin (Polk Street sub-basin), discrete areas outside of the sub-basin may also be considered which would help to efficiently meet study objectives. The stormwater system for the Polk Street sub-basin serves an area of about 1009 acres. Land use consists of 58% single-family homes, duplexes and mobile homes; 21% roads; 6.7% vacant areas; 4.5% park area; 4.4% educational, and 2.6% multi-family.

See Monitoring Plan, Section 4, for more detailed information about monitoring for the Bacteria Pilot Study.

BMP Activities:

- Generate maps of the stormwater system for use in selecting pilot study sub-basin, locating monitoring stations, informing BMP selection and design, and assessing BMP effectiveness. (Study Year 1, City's Fiscal Year (FY) 07)

- Assess conditions within the selected sub-basin, including for example the amount, type and location of wildlife and domestic pets; location and number of domestic animal waste piles; conditions within commercial loading areas, recycling areas and garbage dumpster areas. Collect and test water quality samples for bacteria at selected locations in the sub-basin to help determine potential sources of bacteria. (Study Year 1, FY07)
- Based upon the results of the first phase of the study, select appropriate BMPs to specific identified or suspected bacteria sources. Design, construct, and implement BMPs as appropriate. BMPs selected may include: door-to-door contact with business owners and residents; direct informational mailings; modifications to catch basin cleaning frequencies; specialized (bacteria-related) storm drain stencils; doggy bags in parks; presentations to neighborhood groups and to school science teachers; modifications to park rules (e.g. "no feeding the wildlife"); and modification of waterway maintenance practices. (Study Years 2 & 3, FY08 & 09)
- Assess conditions within the selected sub-basin after BMPs have been implemented. Collect and test water quality samples for bacteria at selected locations in the sub-basin to help assess the effectiveness of BMPs implemented. Analyze data to assess the affect on bacteria levels from the application of selected BMPs. (Study Year 3, FY09)

Assessment Methods:

- Document (pre-BMP implementation) observations with check sheets, notes, and digital photos.
- Document (pre-BMP implementation) water quality monitoring data and analyses.
- Document type, location, design, and installation of selected BMPs.
- Document (post-BMP implementation) observations with check sheets, notes, and digital photos.
- Document (post-BMP implementation) water quality monitoring data and analyses.

3.4.3 Status of Construction Site Management and New Development Standards BMPs

E2 Erosion Prevention and Construction Site Management Program
E4 Stormwater Development Standards

3.4.3 Status of Construction Site Management and Development Standards BMPs

3.4.3.1 E2 - Erosion Prevention and Construction Site Management Program

Responsible Department/Division:
Public Works / Engineering

BMP Contact:
Engineering Division Director

BMP Description:
Administer and monitor the Erosion Prevention and Construction Site Management Program. Implement program elements which prevent and/or control erosion, sedimentation, and other construction related impacts to stormwater quality within the City limits. Continue education and outreach related to new techniques/practices. Screen projects for sensitive area status, conduct plan reviews, issue permits, conduct inspections, and provide compliance enforcement as appropriate.

Year 7 Accomplishments (July 1, 2009 – June 30, 2010):

- Reviewed and approved approximately 62 residential erosion permits (approximately 4 of the 62 permits were for properties outside city limits, inside the UGB)
- Reviewed and approved approximately 21 commercial erosion permits (approximately 4 of the 21 permits were for properties outside city limits, inside the UGB)
- Reviewed and approved 4 annual erosion permits
- Renewed approximately 29 permits
- Continued our role as DEQ agents for the NPDES1200-C permit.
- Participated in educational forums within the City and with the public
- Performed approximately 1,205 site inspections
- Actively involved in registering approximately 8 DEQ 1200-C permits
- Issued 9 Administrative Compliance Orders
- Responded to approximately 30 complaints (approximately 5 of the 30 complaints were related to properties outside city limits, inside the UGB)

Background:
Construction site erosion has the potential to be the most significant source of sediment in stormwater runoff. Sites are susceptible to erosion when vegetation is removed and soils exposed. Once eroded sediments enter waterways, they can block sunlight, limit plant growth, and harm aquatic life by removing oxygen from the water. Other pollutants, including nutrients, bacteria, metals, and some toxic substance, attach to sediments and can thereby also be carried into waterways. Properly managing construction site activities effectively prevents and/or minimizes erosion and sedimentation materials from leaving development sites.

The City adopted an Erosion Prevention Ordinance and an Administrative Order in 1996. All persons engaged in construction activities must implement construction site management practices designed to protect the city's stormwater system. Construction sites larger than one acre or within an identified sensitive area require an erosion permit before any ground disturbance activity. A development site is considered a sensitive area if it meets any one of the following criteria: a) the slope of the parcel is greater than 10%; b) the site contains highly erodible soils;

or c) the site has the potential to directly drain into a water feature or the water feature's designated buffer area.

Construction site management practices are the steps taken to prevent erosion, sedimentation, or discharge of contaminants from the construction site. Although there are a wide variety of options to choose from, mandatory practices are required during the wet weather season (October 15 through May 15). Fact sheets and standard drawings are provided for construction activity that does not require an erosion permit. Individual construction site management plans are required for construction activities that require an erosion permit.

BMP Activities:
Continue to monitor and enforce erosion prevention and construction site management practices within Eugene. Key program components include:

- Protect water quality from construction site impacts, by requiring permits and construction site management plans for sites that disturb an area greater than 500 square feet in a sensitive area or disturbs one acre or greater. Conduct outreach and educational activities for principal players (e.g., construction equipment operators, developers, and inspectors)
- Coordinate with BMP M1 (Management of Illicit Discharges to the Municipal Stormwater System) and A1 (Stormwater Education)
- Prepare an annual education program.
- Contract with local construction company for summary abatement of erosion violations.
- Maintain database for tracking permits, inspections, complaint violations and educational outreach.
- Enforce minimum wet weather erosion prevention BMPs.

Assessment Methods:

- Track the number of complaints received and violations cited.
- Track methods of educational outreach conducted, frequency of outreach, attendance at outreach events, and feedback from participants.
- Track annual number of erosion permits and inspections.
- Track annual permit renewals monthly.

3.4.3.2 E4 - Stormwater Development Standards

Responsible Department/Division:
Public Works / Engineering

BMP Contact:
Engineering Division Director

BMP Description:
Finalize, implement, and enforce stormwater development standards: regulations for locating, designing, constructing, and maintaining water quality facilities for new development and significant re-development. (Note: Stormwater development standards are controls for post-construction water quality. Standards for erosion control during construction related to new development are covered under BMP E2).

Other Year 7 Accomplishments (July 1, 2009 – June 30, 2010):
A development proposal going through the land use review process can take several years to complete. After an application is received, staff performs a completeness review to determine if all of the necessary components are included in the packet so that the application can be adequately reviewed. Missing items are noted and incomplete submittals are returned to the applicant. The applicant is then given the option of either providing all, some, or none of the incomplete materials and proceeding with the review, or allowing the application to expire. When the application is deemed complete the review period begins. Typically, an application is tentatively approved, approved with conditions, or denied. Generally, partition and subdivision plats must be recorded within 12 months of their submittal for final approval, through the City's codified processes.

During Permit Year 7, staff approved 35 land use applications for stormwater development standards purposes. The percentages of each land use application type choosing green infrastructure facilities vs. mechanical treatment facilities are provided below. In addition to the land use approvals, a total of 124 facilities were reviewed as part of a building permit process. Some of the building permit approvals include facilities which were approved at the land use review stage.

Land Use Application Type	# Approved, Final	% Required to Implement Water Quality Treatment	% Proposing Green Infrastructure treatment	% Proposing Mechanical treatment	% Privately Maintained	% Publicly Maintained
Partitions	23	63	22	78	100	0
Subdivisions	5	88	55	45	58	42
PUDs	0	n/a	n/a	n/a	n/a	n/a
Conditional Use Permits	2	100	100	0	100	0
Site Reviews	5	75	33	67	100	0

Building Permit Review Type	Water Quality Treatment	Provided Water Quality Treatment to Meet Destination Standards	Flow Control	Source Control	Total # Facilities Reviewed
Residential	32	30	0	n/a	62
Commercial (incl. Multi-family)	54	0	0	8	62

Other Year 7 Accomplishments (July 1, 2009 – June 30, 2010):

- One mechanical stormwater management facility was permitted and installed through privately engineered public improvement process.
- Staff continue to provide stormwater quality training and education sessions for the design and development community.
- Approximately 234 inspections were conducted on privately constructed stormwater management facilities.

Background:

There is a direct link between impervious surfaces associated with stormwater runoff from urban development and the quality of the City's surface and ground waters. As properties develop, the impervious surfaces that are created increase the amount of runoff during rainfall events, disrupting the natural hydrologic cycle. Without control, these conditions erode stream channels and limit groundwater recharge. New and expanded parking lots, roadways, and rooftops increase the pollution levels in stormwater runoff that is transported to streams, rivers, and groundwater resources. Protecting these waters is vital for a great number of uses, including fish and wildlife habitat, recreation, and drinking water.

The City's stormwater development standards address future water quality impacts from new development; address the existing water quality condition through re-development; ensure that sensitive headwater streams are not further impacted from new development; and address high pollutant land uses and activities.

Stormwater development standards are implemented by adoption of an ordinance and associated design manual. Implementation efforts include the establishment of an inspection/enforcement program, budgeting of resources, training, evaluation, and adaptive management.

BMP Activities:

- Review Street Design Standards for consistency with water quality standards; evaluate the need for any revisions to street design standards or related implementation processes.
- Provide education and training for City staff and the design and development community.
- Continue to develop an inspection and enforcement program to ensure compliance with construction, operations and maintenance requirements for water quality facilities.

- Develop a method for assessing the effectiveness of the stormwater development standards and associated facilities.
- Develop an on-going method for identifying proposed capital projects where water quality standards should be incorporated, and develop a method for incorporating the new standards.
- Review the design manual every two years and update as appropriate, to reflect changing conditions, evolving technology, and lessons learned.

Assessment Methods:

- Number of training workshops and workshop attendance.
- Number of private projects incorporating water quality facilities.
- Number of public projects incorporating water quality facilities.
- Number of facilities constructed or approved.
- Number of inspections and maintenance activities performed.
- Results of water quality monitoring, if any, for selected facilities.

3.4.4 Status of Operations and Maintenance BMPs

M4 Prevent Leaks and Spills from Municipal Vehicles and Equipment
M5 Public Stormwater System Cleaning Programs
M6 Street Sweeping Program
M8 Winter Road Sanding and De-Icing Program
P2 Revise Comprehensive O&M Plans
P3 Tree Planting and Urban Forest Enhancement
P4 Public Landscape and Vegetation Management Program

3.4.4 Status of Operations and Maintenance BMPs

3.4.4.1 M4 - Prevent Leaks and Spills from Municipal Vehicles and Equipment

Responsible Department/Division:
Public Works Maintenance Division

BMP Contact:
Maintenance Division Director

BMP Description:
Continue existing preventive maintenance program for all municipal vehicles and equipment in order to prevent or correct sources of vehicle fluid leaks. Continue to 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. Continue program of equipping municipal trucks and large mechanized equipment with renewable, spill response kits.

Year 7 Accomplishments (July 1, 2009 – June 30, 2010):

- Fleet Services completed 1,358 scheduled preventive maintenance inspections for this reporting period as part of the City's leak prevention program. Fleet Services performed a total of 2,460 17-point safety and operational inspections on scheduled and non-scheduled work for the reporting period as part of the leak prevention program.
- The Maintenance Division Tool Crib reported 2 spill kits issued during this reporting period.
- Fleet Services staff responded to one municipal vehicle-related spill, a vactor with a broken hydraulic hose. It was successfully cleaned up with minimal impact to the municipal storm-water and the environment.
- The Storm-water quality structure was cleaned once during the period with no structure failures or other related maintenance required.

Background:
An on-going preventative maintenance program has resulted in a reduction of possible vehicle fluid spills from municipal vehicles and equipment. Since 1997, custom-made spill kits have been issued for nearly every public works vehicle. Vehicle spill kits are now a standard issue item from the Maintenance Division Tool Crib. Spill kit effectiveness continues to be monitored.

This BMP includes application of structural BMPs when control measures are deemed necessary for municipal facilities with high potential for leaks and spills, such as service vehicle/heavy equipment yards.

BMP Activities:

- All municipal cars, service vehicles, fire apparatus, and large mechanized 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.
- All public works vehicles and equipment are issued custom, renewable, spill kits as a standard issue item from the Maintenance Division Tool Crib.
- Staff will replenish materials as the spill kits are used.

- Staff will issue kits to new Maintenance Division and Public Works vehicles and equipment as appropriate.
- The spill kit program will continue to be monitored for effectiveness.
- A stormwater quality structure was installed at the Public Works Roosevelt Yard to treat storm runoff for sediments, oil, grease, and floatables.
- The performance of the structural BMP will continue to be monitored.
- Service vehicle and equipment operators are both trained to conduct routine vehicle inspections and are periodically reminded to be especially careful of spilling while performing fueling or lubricating procedures.
- Fueling islands are stocked with absorbent material close at hand so small fuel spills can be cleaned up before they are tracked out into exposed areas.
- Staff will continue to evaluate new service vehicle and equipment purchases to look for opportunities to minimize the potential for materials spills.
- Fleet Services is currently evaluating the use of a new more environmentally friendly hydraulic oil for Parks and Open Space equipment which is used in the wetlands.

Assessment Methods:

- Document type, frequency, mileage interval, and leak related problems found for both scheduled and unscheduled vehicle maintenance service.
- Conduct ongoing tracking and logging spill kit issuance and usage.
- Document significant incidents of spills or fluid releases from City vehicles.
- Use Fleet Management System to track preventive maintenance inspections and track analysis for fuel, oil, coolant etc. consumption for all City-owned equipment

3.4.4.2 M5 - Public Stormwater System Cleaning Programs

Responsible Department/Division:
Public Works Maintenance Division

BMP Contact:
Maintenance Division Director

BMP Description:
Continue existing program which includes: frequent, systematic cleaning of the components of the public stormwater system such as catch basins, pipes, culverts, inlets, and stormwater quality devices; removal of sediment deposits and cleaning out of accumulated debris from open drainageways as-needed; annual curbside pickup of leaves on all City streets to prevent plugging catch basins or being discharged into local receiving waters and; documenting quantities of material removed from each structure and the type and quantity of stormwater pollutants found. Using the maintenance management system, develop methods to identify sites requiring more frequent cleaning or show a history of continuing pollution problems. Research and monitor developments in maintenance technology and methods for both piped systems and open channels that further minimize impacts to stormwater quality and natural resource values. Revise cleaning practices as necessary and appropriate.

Year 7 Accomplishments (July 1, 2009 – June 30, 2010):

- Continued to utilize operations crews across all 15 available weekday shifts. This includes two full-time stormwater jet/vac trucks and 1 storm field investigator. These crews provide O & M functions to the piped system, manholes, proprietary stormwater devices, sediment traps and inlets, as well as providing timely 24/7 response to service requests.
- Continued cleaning and performing Closed Circuit Television inspection and assessment of storm lines and inlets in advance of Pavement Preservation Projects. This work identifies conveyance problems in advance of surface improvements and promotes proactive maintenance practices. Four utility breaches were identified and repairs and numerous structural repairs made.
- Cleaned over 8,200 catch basins/curb inlets, 36,000 ft. of stormwater lines and removed over 960 tons of debris through the inlet cleaning program and in advance of Pavement Preservation Projects.
- Cleaned 33 sedimentation manholes and 11 underground water quality structures.
- Continued use of Maintenance Management System (MMS) to initiate and track stormwater cleaning request for service. Attributes of the system include increased tracking capability, expedited response time, & result documentation.
- Established on call standby coverage during winter storm months to enhance response time and minimize potential flooding issues.
- Continue to identify catch basins that need to be changed out to curb in-lets to reduce seasonal flooding.
- Successfully completed another season of City's curb side "Leaf Pick Program". This effort recovered over 17,000 cubic yards of leaf material from potentially entering the public stormwater collection system. This material is reused in the community's popular compost program.

- Successfully partnered with City of Eugene Parks and Open Space to remove sediment deposits and accumulated debris from open waterways.
- Continued low impact vegetation removal practices at inlets and outlets to increase the flow in open drainage ways.

Background:
Schedule A of the City of Eugene's NPDES permit requires the City to: "Reduce the discharge of pollutants from the municipal separate storm sewer system to the maximum extent practicable" and to "effectively prohibit non-stormwater discharges into the Municipal Separate Storm Sewer system unless such discharges are otherwise permitted by an existing…NPDES permit…" The term illicit discharge is defined in the City's NPDES permit as "…any discharge to a municipal separate storm sewer that is not composed entirely of storm water except discharges pursuant to an existing NPDES permit and discharges resulting from firefighting activities."

To assist with compliance of Schedule A requirements, City crews routinely remove accumulated sediments, debris, and other pollutants from the piped stormwater infrastructure and open waterways. All stormwater conveyance lines with a history of potential conveyance problems are tracked and each fall those lines are cleaned and sawed to ensure full conveyance capacity. Storm drainage system catch basins are inspected and cleaned to prevent localized flooding and to detect potential hazards. Key inlets and outfalls are inspected each fall prior to the rainy season to ensure they are operational and not blocked by vegetation or other debris. All maintenance is done in a way to protect water quality and other natural resources.

Open drainage channel maintenance practices are implemented according to provisions outlined in U.S. Army Corps of Engineers Flood Control Regulations and the Levee Encroachment Standards and Procedures. In addition, open drainage ways are maintained according to the Open Waterway Maintenance Plans. These plans are intended to protect and enhance both stormwater quality and natural resources values while continuing to maintaining sufficient conveyance capacity. City crews also annually undertake a systematic curb-side leaf pick-up program. This program is designed to prevent potentially harmful pollutants from entering public waterways, and to minimize localized flooding during heavy rain events.

BMP Activities:
- Maintain stormwater infrastructure database ("Cassworks").
- Generate "Cassworks" work orders for infrastructure maintenance.
- Seasonally inspect key inlets and outfalls; remove any blocking vegetation or other obstructions.
- Clean catch basins and connecting pipes of accumulated sediment, debris, and other pollutants on a systematic basis.
- Record quantity of debris removed and identify structures requiring more frequent cleaning cycles.
- Evaluate and update systematic cleaning schedules based on information gathered by field observations and analysis of individual loadings and capacity of the system.
- Evaluate system performance.

- Dispose of collected materials at a waste drainage pad at the Lane County Solid Waste Collection Facility.
- Inspect open drainage channels for obstructing vegetation and accumulated sediment and debris; remove obstructing materials in accordance with the Open Waterways Maintenance Plans.
- Place erosion control materials and re-seed exposed soils on channel banks and tops.
- Collect leaves from City streets two months of the year and deliver to requesting citizens, or dispose of at the City's leaf composting site.
- Research new developments in pipe and open channel cleaning equipment, methods, and techniques.
- Revise and adjust system cleaning practices and schedules as appropriate to increase the effectiveness of the program.

Assessment Methods:

- Document number of structures cleaned, quantities and type of materials collected and enter into the "Cassworks" database.
- Document lineal feet of vegetation maintenance performed on public open waterway system.
- Analyze materials collected from problem areas to determine if source can be identified.
- Analyze production data from vacuum trucks on a continual basis and make modifications as necessary to ensure maximum water quality benefits.
- Review weigh tickets from City vehicles disposing of collected materials at County facility.
- Continue periodic review and evaluation of data to identify trends in cleaning frequency, cleaning program efficiency, and system performance problems.
- Record number of Catch Basins cleaned.
- Record amount of debris cleaned from each catch basin.
- Record footage of stormwater lines cleaned, jet or saw.
- Record amount of debris cleared from lines and net tons dumped
- Complete inspection documentation of key inlets and outfalls.
- Complete inspection documentation of open drainage ways and records of debris removal.
- Record tons of leaves collected during curb-side pick-up program.

3.4.4.3 M6 - Street Sweeping Program

Responsible Department/Division:
Public Works Maintenance Division

BMP Contact:
Maintenance Division Director

BMP Description:
Continue the existing program of both mechanical brush and vacuum sweeping of publicly maintained roads, bike paths, and parking lots. Perform on-going review of the revised sweeping practices and schedules implemented as part of the City's previous stormwater discharge permit. Continue to monitor and evaluate new developments in sweeping technology and methods and revise the existing sweeping program as appropriate and feasible to maximize water quality benefits.

Year 7 Accomplishments (July 1, 2009 – June 30, 2010):

- Sweepers continue to follow best management practices related to the sweeper operations.
- Ability to respond 24/7 to emergency request such as vehicle accidents and spills.
- Swept 35,068 lane miles.
- Applied over 360,000 gallons of water during sweeping operations and collected over 16,000 cubic yards of debris such as soil, glass, leaves and rock.
- Removed over 85% of sanding rock and other debris after gravel was applied to streets during snow and ice events.
- Reviewed and updated sweeping routes. The purpose of the review is to gauge the effectiveness and efficiency of the sweeping program in meeting the community's need and producing equivalent workloads.
- Swept over 8600 lanes miles in support of leaf collection.
- Replaced 2 sweepers with new, more efficient sweepers.
- Swept off street bike paths totaling 70 lane miles.

Background:
The City's NPDES permit requires a proactive approach in preventing (to the extent practicable) the discharge into the public stormwater system any substances other than stormwater. Arterial, collector, residential streets, bike paths, and parking lots receive potential pollutants through daily use. If left alone, pollutants accumulated on such surfaces could affect the quality of receiving waters by being washed into the public stormwater system during rain events. These pollutants could include metals, hydrocarbons, other chemicals, dirt, and other unwanted debris.

Therefore, the City has in place a program for the systematic and comprehensive sweeping of publicly maintained streets, bike paths, and parking lots. The City maintains an aggressive seven-day-a-week, multi-shift sweeping schedule that utilizes a fleet of two mechanical broom sweepers, two regenerative air vacuum sweepers, and a smaller truck chassis-mounted vacuum sweeper. This street sweeping program complements the City's catch basin cleaning and leaf pick-up programs. In addition, City staff conducts ongoing research for new technologies, methods, and expertise related to street sweeping that improves water quality. The existing

sweeping program is continually evaluated for effectiveness; modifications in the program are made as necessary to ensure effectiveness in achieving maximum water quality benefits.

BMP Activities:

- Determine the type of sweeper to use in varying conditions.
- Establish sweeper routes and frequencies for optimum effectiveness and efficiency.
- Analyze street sweeping operations on a continual basis and make modifications as necessary to ensure maximum water quality benefits.
- Perform sweeping operations during eighteen of a possible twenty one workshifts per week.
- Establish sweeper debris drop boxes locations strategically throughout the City.
- Dump sweeper debris into drop boxes and have the debris disposed of through contract.
- Maintain records of streets swept and amount and types of material collected.
- Perform analysis of materials collected.
- Sweep behind City leaf pick-up crews to remove remaining debris.
- Evaluate street sweeping technologies and equipment.
- Determine methods and schedule for high pollutant load areas.

Assessment Methods:

- Document and track the type and frequency of sweeping in residential areas and in high pollutant source areas (downtown, commercial, and industrial areas), the amount of curb miles swept, and the amount of swept material recovered.
- Document any changes to practices or schedules to promote stormwater quality benefits.
- Record the amount of bike paths and alleys swept
- Record the amount of water used and yards of debris collected/dumped
- Record the amount of sweeping performed in support of the leaf pick-up program.

3.4.4.4 M8 - Winter Road Sanding and De-Icing Program

Responsible Department/Division:
Public Works Maintenance Division

BMP Contact:
Maintenance Division Director

BMP Description:
Continue existing program for the application and cleanup of 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 sanding. Continue with 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 O&M methods, practices, and efficiencies which may further limit the runoff of sanding related pollutants to the storm system.

Year 7 Accomplishments (July 1, 2009 – June 30, 2010):

- Continued to use sanding logs during snow and ice events. Operators track the date, operator, equipment ID, quantity of sand used, total hours, weather condition, total miles, and routes sanded.
- 312 hours of regular and overtime hours were recorded for sanding and clean up during snow and ice events.
- Removed over 85% of sanding rock and debris after sanding operations during snow and ice events. Removal of the sand began at the conclusion of the storm events when streets became free of ice and snow, and the forecast does not call for more snow or ice within the next 24 hours. Priorities for removing sand up were the same as for placement of sand. Special attention will be given to arterials with striped bike lanes to ensure they are clean.
- Continued to use sweeper log sheet which identifies the date, operator, hours, equipment ID, estimated yards recovered and date completed.
- During reporting period a total of 2095 gallons of Magnesium Chloride (MgCl) was applied to 107 lane miles of streets. Application of anti-icers took place on 13 separate days. MgCl was found to be more effective at lower temperatures than Calcium Magnesium Acetate (CMA). The use of anti-icers reduces the need to use abrasive material during snow & ice events.
- Utilized the Freezing Roadway Checklist which identifies bridges, overpasses and steep grades. This Checklist identifies locations that anti-icers shall be applied to during ice and snow events.
- Continue to use the Snow & Ice Control Plan. The Snow & Ice Control Plan identifies control measures that are established which specify level of service requirements for arterials, collectors, and residential streets. Procedures are established that detail the amount of time required completing the removal effort, and specifying personnel, equipment, and materials to meet prescribed service levels.
- Performed annual snow & ice equipment inspection and training.

Background:
The primary goal of this program is to respond to weather related hazards, specifically icy roadways, in a fashion which maintains travel along designated routes. The management of the

hazard could have an impact on water quality through the application of materials on a roadway surface. A key component of this program seeks to minimize the impact while meeting the program goals. In addition to applying traction sand during ice and snow events, the City has been authorized to conduct a small pilot program of applying calcium magnesium acetate (CMA). This anti-icing material is environmentally friendly and staff will apply limited quantities to evaluate effectiveness and pollutant potential.

BMP Activities:

- Develop sanding routes to be followed during ice and snow events, including frequencies and priority routes.
- Develop, review, and maintain an ice and snow removal plan manual.
- Designate bridges, overpasses, and streets to receive CMA under the pilot program.
- Inspect and pre-service the sanders in the fall.
- Stockpile traction sand at the Roosevelt Yard Maintenance facility.
- Ensure that a sufficient amount of trained sander operators are available.
- Activate the Emergency Command Center (ECC) at the Roosevelt Yard as necessary during ice and snow events.
- Apply sand to roadways in accordance with the ice and snow removal plan.
- Apply CMA to designated infrastructure in anticipation of ice events.
- Evaluate CMA effectiveness and pollutant potential.
- As soon as practicable after the ice or snow event, remove the traction sand by street sweeping with air and/or broom sweepers.
- Dispose of the recovered sand at the Roosevelt Yard facility for later use as backfill for sewer and street excavation projects.

Assessment Methods:

- Document the quantities of sanding material applied and collected during each storm event.
- Document the number of curb miles sanded and collected during each storm event.
- Document findings related to improved sanding application and cleanup practices as well as for evaluation of new chemical de-icing products and technology.
- Sanding: Date, operator, equipment ID, quantity of sand used, total hours, weather condition, total miles, routes sanded
- Sweeping: Date, operator, hours, equipment ID, estimated yards recovered, date completed

3.4.4.5 P2 - Revise Comprehensive O&M Plans

Responsible Department/Division:
Public Works Maintenance Division and
Parks and Open Space Division

BMP Contact:
Maintenance Division Director
Parks & Open Space Division Director

BMP Description:
The City will continue ongoing review and, as needed, revision of O&M plans and practices for both new and existing public stormwater facilities, including both open (above ground) and below ground stormwater quality facilities. Effort will include review of other Public Works related operations and maintenance practices that may cause negative impacts to stormwater runoff. Additionally, the City will continue on-going review and evaluation of maintenance plans and operational practices for open drainage channels to maximize water quality and habitat benefits, provide necessary capacity for conveyance, and emphasize erosion prevention measures.

Year 7 Accomplishments (July 1, 2009 – June 30, 2010):

- On-going review of the Public Works Maintenance Stormwater System O&M Manual continued this reporting year. A primary focus of this document is to bring current service level activities in line with present practices. Specifically, system size, the inclusion of operations and maintenance for proprietary stormwater treatment technologies, catchbasin cleaning practices, leaf collection practices, and the Stormwater Field Investigation program were some specific areas where updates and expansions were made.
- POS Division staff continues to implement water quality and natural resource sensitive channel maintenance practices as described in the Open Waterway Maintenance Plans. In conjunction with these efforts, staff pursued a program aimed at evaluating the effectiveness of these maintenance techniques. This program provides for the simultaneous inspection of key choke points and areas of special concern during major storm events in order to document conveyance issues and the effectiveness of any revised and/or experimental maintenance practices.
- POS Division staff continued to utilize a variety of bio-engineering techniques to repair and stabilize failing channel banks. Techniques included: using geo-textile socks filled with blown-in rock/soil mix to armor the deep toe cuts of eroded banks (replanted with willow and other native vegetation); laying back channel banks to reduce the possibility of bank sloughing and rotational slumping (replanted with native grasses and shrubs); and modified channel bank mowing practices to allow the growth of larger species of native vegetation whose root system will help hold banks in place and provide natural armoring against erosion.

Background:
The City's NPDES permit requires preventing to the maximum extent practicable the discharge of anything except stormwater into local receiving waters. Stormwater System Operations and Maintenance (O&M) plans are key to realizing this objective. Through continuing analyses, reviews, and updates, staff can ensure that the latest and best technologies, methods, design, and

equipment are employed in maximizing water quality and enhancing natural resources and habitats. The O&M plans are drafted utilizing input from all staff, including field operations personnel, and are then reviewed and approved by the O&M Review Team. The O&M plans address internal stormwater maintenance policies, erosion control practices, practices related to right-of-way, wastewater system, and utility management as well as procedures related to open channel maintenance and construction.

BMP Activities:

- Finalize draft of Public Works Maintenance Division Stormwater System O&M Manual.
- Continual research by staff of new stormwater treatment technology, products, and facilities.
- Continual review of stormwater BMPs to ensure maximum effectiveness and efficiency.
- O&M Review Team meetings on an as needed basis.
- Insure that regular review of plans is completed by operations staff.
- Review and update of the Stormwater System O&M Manual on an annual basis at minimum.
- Field monitoring of open waterway performance during significant storm events.
- Review and evaluation of Open Waterway Maintenance plans on an annual basis based on field observations and evaluation of effectiveness.
- Develop maintenance objectives and standards for publicly maintained stormwater quality facilities.
- Ensure that structures and/or mechanisms are in place to enable sampling, testing and evaluating effectiveness of representative water quality facilities.

Assessment Methods:

- Document changes to operations and maintenance practices and their effectiveness as they relate to specific stormwater facilities and BMPs.
- Finalize draft Stormwater System O&M Manual.
- Review the Stormwater System O&M Manual on an annual basis, revise as necessary, and track distribution of such revisions department-wide
- Document revisions to Open Waterway Maintenance Plans
- On-going review of all stormwater related operations and maintenance plans and procedures.

3.4.4.6 P3 - Tree Planting and Urban Forest Enhancement

Responsible Department/Division:
Public Works / Parks and Open Space Division

BMP Contact:
Parks & Open Space Division Director

BMP Description:
Continue to support government and community tree planting programs and to provide public information related to the multiple benefits trees provide for stormwater quality.

Year 7 Accomplishments (July 1, 2009 – June 30, 2010):

- The City's NeighborWoods Coordinator recorded 2650 volunteer hours logged by volunteers, at 4 planting projects, including the Arbor Day Trees for Concrete project, where concrete was replaced with trees and open planting beds that can help reduce storm water runoff. NeighborWoods volunteers planted 430 trees.
- In its fifth year, the Tree Stewards volunteer tree care project continued the partnership between the City's NeighborWoods program and ETF to perform crucial structural pruning of newly-established trees. Citizen volunteers are trained individually in a study-at-home program in the basics of tree biology and identification, pruning techniques and safety. Volunteers put in 550 hours in pruning work and training. Over 1137 trees were pruned during the reporting period. Tree Stewards pruned an additional 250 trees working on their own in their own neighborhoods.
- Urban Forestry continued its partnership with the Eugene Tree Foundation (ETF) in its Legacy Tree Program. Program web pages (www.eugenetreefoundation.org) provide street maps, maps with terrain, and satellite photos, with hot links to show all Legacy Trees, photos of each, and driving directions. The pages explain the mission of the program and, with photos and text, give descriptions of each tree designated as a Legacy Tree to date. The Urban Forester was interviewed for an article on Legacy Trees printed in the 2010 Fall issue of the quarterly publication, *The Eugene Magazine* (copy of article attached).
- Urban Forestry staff continued work on an ArcGIS-based tree inventory system using staff and temporary workers for collecting data using a GPS hand-held computer and PDAs. Inventory data have been collected in all new developments that were planted under the Developer Street Tree Program. The street tree inventory is now 95% complete, with full inventory expected in 2011. Urban Forestry staff oversaw the contractual planting of 102 street trees in new developments this year.
- Mayor Kitty Piercy helped kick off the City's Arbor Day celebration by accepting Eugene's 31st consecutive Tree City USA award from the Oregon Department of Forestry (ODF). Speeches by the Mayor, Dave Lorenz, Western Lane District Forester, and the Urban Forester provided information to the public audience about the myriad environment benefits of trees, including storm water runoff reduction. A volunteer team supplemented by REI volunteer promotions planted more than 20 trees adjacent to the office of the *Eugene Weekly* newspaper and the surrounding neighborhood, and City crews reduced local impervious surfaces as they removed over eight tons of concrete sidewalk, creating new planting pits for street trees. Tree pruning demonstrations by Tree Steward volunteers also provided citizen education.

- Parks and Open Space planning staff sponsor public workshops for community input on park development projects. Staff help educate neighborhood groups on the storm water benefits of trees and developing designs that protect existing trees in an effective way.
- Public Works Engineering Division landscape architects oversaw the contractual planting of 304 trees on park and street improvement projects.
- Urban Forestry staff assisted Public Works Engineering staff in designing effective tree preservation for a heritage-class American elm on Patterson Street.
- All Parks and Open Space supervisors attend various monthly neighborhood association meetings to represent the Division in answering questions about parks and trees, often presenting information in an informal way about the myriad environmental benefits of trees, including water quality enhancement. The Urban Forester gave a PowerPoint presentation to the West University Neighborhood on neighborhood street trees, giving results of the tree inventory that detailed species composition, age and size distribution and listed available planting spaces.
- The Urban Forester was an invited speaker at a monthly luncheon meeting of the Willamette Valley section of the American Society of Landscape Architects. He talked about preliminary results of the City's street tree inventory, discussed the benefits of properly placed trees, and noted the performance attributes of several commonly-planted street tree species.
- The Urban Forester, as Awards Chairman of Oregon Community Trees, detailed the benefits of trees for storm water quality at the group's annual conference, joining Oregon State Senate Majority Leader Richard Devlin in giving statewide awards to a group of citizens who preserved an Oregon white oak savannah near the Willamette River.

Background:
Trees are known to slow peak flow during storms and to absorb and hold large quantities of rain water, both in the above-ground mass and in the root systems. These characteristics can reduce erosive runoff and the first flush of oil contaminants from streets, stabilize soils, and buffer seasonal stream flows. Root systems have been found to effectively filter pollutants before reaching groundwater, especially related to landfills and bioswales. Trees offer many other environmental benefits such as air quality improvement, community ambiance, carbon sequestration, energy reduction, economic enhancement, and wildlife habitat. Additionally, tress in riparian areas along streams and open drainage channels provide shade, helping mitigate temperature increases in adjacent water.

BMP Activities:
- The City has several programs for tree planting, maintenance and education. Maintenance programs for the enhancement of the health of the urban forest include, where appropriate, offering one-for-one replacement of trees removed for health and hazard reasons. The City regulates new development to ensure that new subdivisions are fully planted with street trees. By policy, City-engineered street improvement projects require the addition of street trees in plantable spaces. The City supplies trees for NeighborWoods, a staff-coordinated volunteer program, which plants trees along streets, in parks and along streams and monitors the trees through establishment for three years.
- The City has received Tree City USA recognition for 27 consecutive years. The Tree City USA program, a national award given by the National Arbor Day Foundation, is

based on quantifiable measures of a city's commitment to tree care and includes an educational component built around Arbor Day celebrations in the community.

- Urban Forestry's educational efforts include several forms of citizen education, such as giving information in person, by phone, by e-mail, through newsletters and in group settings such as presentations to civic, neighborhood and professional groups locally and throughout the Pacific Northwest region.
- The Urban Forestry web page keeps citizenry informed and up-to-date about City programs and allows for electronic correspondence with City staff.
- Urban Forestry staff use CITYgreen software to provide public education about the quantifiable benefits of canopy cover related to stormwater runoff reduction as well as stormwater and air quality improvements.
- Collaborate with open waterway management staff to develop and implement tree planting plans for riparian areas along all waterways under City maintenance jurisdiction.

Assessment Methods:

- Document the number of trees planted through the City's Urban Forest Programs, Engineering Division projects, park development and improvement projects, and volunteer efforts.
- Maintain Tree City USA status, which requires quantifiable and verifiable measures, such as: per capita spending on tree planting; maintenance and management activities; as well as Arbor Day and other educational efforts.
- Document City-wide educational efforts related to urban forest best management practices that provide benefits to stormwater runoff quantity and quality.
- Track the progress on development and implementation of riparian tree planting plans.

3.4.4.7 P4 - Public Landscape and Vegetation Management

Responsible Department/Division:
Public Works / Parks and Open Space Division

BMP Contact:
Parks & Open Space Division Director

BMP Description:
Continue to evaluate and revise as necessary landscape and vegetation management programs for publicly maintained parkland, right-of-way, wetland, drainage channels and other natural areas to identify planting designs and O&M practices which will further limit the discharge of pollutant-laden runoff from these sites, will enhance the shade potential of waterway riparian areas, and will promote wildlife habitat where appropriate.

Year 7 Accomplishments (July 1, 2009 – June 30, 2010):

- Natural Resource Maintenance staff performed 40,100 linear feet of 'greenpiping' (removal of woody vegetation and pruning in perennial waterways to assure conveyance).
- Natural Resource staff planted willows along a total of 8,150 feet of waterways. These plantings help facilitate temperature reduction and slope stability.
- Natural Resource staff planted 868 large tree species planted along waterways, again for shade, slope stability, and habitat provision.
- Natural Resource staff contracted out the planting of 730 trees at Delta Ponds.
- Natural Resource staff watered during the summer months' 2617 "overstory" trees; all were planted in the past three years.
- Natural Resource staff mulched a total of 850 trees for weed control and water retention.
- Natural Resource staff inspected 22 vegetated stormwater quality BMPs during the reporting period. The structures that were inspected included grassy swales, vegetated swales, wet detention ponds and created wetlands.
- Both Natural Resource and Parks Operation staff conducted routine maintenance on a variety of public vegetated stormwater facilities throughout the reporting period.
- Natural Resource Maintenance staff utilized jail crews on several projects to cut back blackberry along many public waterways.
- Natural Resource Maintenance staff repaired an area of slumped bank on Amazon Creek, between Chambers and Garfield, which is a chronic area of slope instability. Repairing the bank prevented further erosion at that site and reduced the sediment loading into the waterway.
- Natural Resource Maintenance staff continued to implement practices set forth in the Parks and Open Space Division's internally adopted *Open Waterway Maintenance Plans.* These plans recommend reducing levels of channel bank vegetation removal, increasing invasive species control practices and promoting the growth of native species. Plans are in effect for 33 separate channel segments on 13 different waterways covering a distance of almost 29 miles.
- Natural Resource Maintenance staff expanded the practice of selective hand removal of obstructing vegetation along and within the City's major drainage channels. This is in lieu of using heavy mechanized equipment to mow and/or dig out channel bank vegetation. Water quality is better protected by not excavating herbaceous plants from the flow channel, by not stirring up sediments, and by not denuding channel slopes. This

management technique helps retain habitat and, with time, will allow the growth of larger woody vegetation on the upper slopes of excavated drainage channels that will provide much needed shade.

- Natural Resource section conducted 2 Integrated Pest Management trainings for staff in order to share best management practices, and learn about least the toxic methods to control invasive plants.
- Natural Resource section staff continued to manage a native plant nursery within one of the City parks. The native plant nursery is utilized primarily to produce native seed and potted plant material to be planted out in the City's natural areas. Most of the plants were grown from seed, while some of the shrub species were grown from cuttings. The native species grown and cared for at the nursery were planted locally by Parks and Natural Resource section staff, Stream Team volunteers, and local non-profit groups for a variety of natural area, stream, riverbank, and wetland restoration and enhancement projects.
- Both Parks Operations and Natural Resource Maintenance staff continued to modify our existing mowing, channel maintenance and horticultural practices to protect and promote rare or listed species in parks and along drainage channels and creeks. A new device is being trialed to control invasive plant species with steam.
- Parks and Open Space (POS) Division renewed the pesticide-free parks program. An additional park was incorporated into the program bringing the total to eight parks, which are maintained totally without the use of pesticides. Staff monitors the long term effectiveness of using only alternative pest control methods such as flame weeding, steam weeding, hand weeding, increasing plant density and mulching. Monitoring and evaluation of the program parks is performed at least quarterly. At the end of the calendar year, parks will be evaluated on the basis of aesthetics, safety, public response, and overall asset condition.
- Both Parks Operations and Natural Resource staff revised and updated the Integrated Pest Management Policy and Operations Manual. The purpose of this document is to describe the City of Eugene POS Division's program on Integrated Pest Management (IPM) and the operational procedures that staff uses to practice IPM on POS-managed lands. Pesticide free buffer zones were designated around certain sensitive park features included pools, picnic areas, playgrounds and catch basins. As such many acres of parkland are now pesticide free.
- POS Division staff continues to employ the IPM Policy in the maintenance of City park land which includes: sports fields, landscaped areas, vegetated public Right-Of-Way (ROW), landscaped street median islands, natural areas, and riparian corridors. The policy lays out guidelines for managing pests and emphasizes using control actions that have the least environmental impact. When the determination is made that a pesticide application is necessary and meets the criteria under the guidelines of the policy, POS staff and contractors are required to follow internally developed public notification guidelines for all City owned park land and in some cases ROW areas. Parks Operations staff continued a policy of minimizing the frequency and quantity of fertilizer applied to turf grass areas and shrub beds to meet minimum health requirements of the plants.

Background:

Creative and thoughtful design and maintenance of parkland turf and shrub beds, landscaped areas around buildings, planted roadway median strips, and other right-of-way planting strips or

areas can help reduce the volume of stormwater and irrigation runoff from these sites. It can also help eliminate the need for fertilizer and pesticide applications which can contribute pollutants to stormwater or irrigation runoff. Most often this can be accomplished by a combination of using native plants and incorporating Integrated Pest Management (IPM) principles into O&M practices.

Vegetation maintenance is necessary along many open drainage channels in order to provide adequate capacity for the conveyance of storm event runoff. However, bank side and top-of-slope vegetation also provides multiple benefits for stormwater quality, in stream temperature control and wildlife habitat. Developing and implementing O&M plans and practices that balance these objectives is an imprecise science that requires on-going monitoring and evaluation as well as the use of new, innovative and alternative field techniques and practices. As with developed landscaped sites, incorporating IPM principles into O&M practices will help reduce the possibility of local waters being contaminated with fertilizers and pesticides.

BMP Activities:

- Stormwater and natural resource concerns are primary criteria for staff from the City's Parks and Open Space, Facilities, and Engineering Divisions when developing designs for parks, shrub beds, street medians and planters, and other City maintained turf and landscape areas. Staff continue to research, evaluate and incorporate new stormwater and natural resource friendly landscape ideas into their designs in order to minimize impervious surface area runoff and maximize the benefits provided by native plants.
- The City of Eugene currently employs on-going IPM principles in all landscape and vegetation maintenance operations. This practice has proven very successful at reducing the use of pesticides and herbicides in developed parks, along roadsides, on undeveloped property, in wetland, and along open drainage channels. To formalize this, establish a policy for use by staff city-wide, regarding the City's use of fertilizers, pesticides and herbicides. Outreach to staff city-wide about the new policy.
- The City is continually looking for opportunities to use native and other "ecologically appropriate" vegetation in parks and other landscaped public areas. This also helps reduce the need for fertilizers and other chemicals that many horticultural varieties of landscape material frequently require.
- The City continues to research new technology and techniques in landscape and vegetation maintenance that minimize the need for fertilizer and pesticides. Additionally, the City will continue to monitor new techniques, practices, and products which will minimize impacts to water quality and natural resource values in wetland, undeveloped parkland, and along open drainage channels. Modifications to existing vegetation maintenance practices and/or experimentation with new practices will be implemented where appropriate.
- The City has developed and begun implementing Open Waterway Maintenance Plans for a large number of open waterways under their maintenance jurisdiction. These plans attempt to achieve a balance between conveyance, water quality, and natural resource protection objectives. They emphasize using a selective approach to vegetation removal with a greater use of manual methods and using "greener" bio-engineering methods to help repair erosion and channel bank failure problems.

Assessment Methods:

- Track the implementation of new landscape or natural resource enhancement design ideas.
- Document modifications to existing landscape maintenance practices or procedures as well as monitor and evaluate their effectiveness.
- Track the quantities of pesticides, herbicides, and fertilizers used each year and compare with quantities used prior to the implementation of alternative practices and procedures.
- Document landscape design workshops and/or IPM training sessions held or attended.
- Document the number of miles of open waterway maintained using selective manual vegetation control methods.
- Amount of leaf compost City makes and how much is reapplied to City planting areas.
- Inventory of Native Plant Nursery salvage and grow-out species.
- Varieties and extent of native species planted on public projects.

3.4.5 Status of Illicit Discharge Controls BMPs

M1 Enforcement for Illicit Discharges
M2 Environmental Spill Response Team
M3 Litter and Illegal Dumping Programs
M7 Systematic Field Investigation for Improper Discharges

3.4.5 Status of Illicit Discharge Control BMPs

3.4.5.1 M1 - Enforcement for Illicit Discharges

Responsible Department/Division:
Public Works Maintenance Division

BMP Contact:
Maintenance Division Director

BMP Description:
The City will attempt to effectively discourage and reduce improper discharges into the stormwater system through continued operation of the existing 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 comply with local, state, and federal regulations to the maximum extent practicable. The City will continue to conduct periodic review of enforcement program practices and procedures and make revisions as deemed necessary.

Year 7 Accomplishments (July 1, 2009 – June 30, 2010):

- Public Works Maintenance-Spill Response Program - Technical Specialist continues to work closely with staff of Public Works Engineering-Erosion Control Team and Public Works-Wastewater Industrial Source Control Technicians as an Enforcement Team with regular review meetings to discuss discharges, educational outreach, compliance/penalty cases and joint field investigation.
- Enforcement referrals were made to Erosion and Wastewater Industrial Source Control for IDDE discharges from Local Industry and Construction related practices.
- Program Technician is attending ongoing education in Water Quality, IDDE and Pollution Control training.
- Stormwater pollution educational Best Management Practices resource guides, stormwater system function and protection brochures, a copy of Illicit Discharge Regulations are provided to all violators as well as other businesses or citizens in a pro-active approach to educate members of the public and reduce the incidence of reoccurrence.
- The Polk Street Stormwater Vault, the recent focus of an extensive reconstruction project was cleaned 4 times last year and over 13 tons of debris were removed.
- The City's Maintenance Management System (MMS) is now the primary mechanism for database tracking of spills and illicit discharges. Future expansion of the MMS will include a direct link to photos and other discharge information, creation of work orders/service requests, and a link to enforcement documents.
- City Public Works staff have designed and built a consolidated, covered pollutant containment, disposal and recycling area.
- In most cases materials are identified and if not they are categorized as an unknown poison and disposed of either by Hazmat Contractor or Lane County Waste Management Special waste division.
- A total of 130 discharge concerns were investigated after being reported to City staff and logged into the City's Maintenance Management system.
- Fifth successful year of combined efforts, working with City of Springfield Environmental Services staff and City of Eugene Wastewater Industrial Source Control

personnel to administer the "Fish Friendly" Car Wash Kits for local Non-Profit Fundraising. This was done by researching other municipal programs, putting together user friendly kits and inspecting sites for suitability. This program was funded through donations from the Sierra Club-Many Rivers Program. Planning for sixth season is underway.

- 2 Sites have been issued permanent Car Wash kits and 22 kits were loaned to volunteer organizations last year.

Background:
Schedule A of the City's NPDES stormwater permit requires the City to: "Reduce the discharge of pollutants from the municipal separate storm sewer system to the maximum extent practicable" and to "effectively prohibit non-stormwater discharges into the Municipal Separate Storm Sewer system unless such discharges are otherwise permitted by an existing…NPDES permit…" The term illicit discharge is defined in the City's NPDES permit as "…any discharge to a municipal separate storm sewer that is not composed entirely of storm water except discharges pursuant to an existing NPDES permit and discharges resulting from emergency firefighting activities."

To comply with NPDES requirements, the City of Eugene currently has extensive municipal code language prohibiting the discharge of any material other than stormwater into the public stormwater system unless permitted by the state. In addition to the code language, the City has an Administrative Order which establishes mechanisms for issuing a civil penalty when a responsible party is in violation of the City code. To support the City code a Stormwater Investigation and Enforcement Program has been established.

The primary goals of the stormwater pollution enforcement program are to:

1) Protect the City's receiving waters quality;
2) Ensure that discharges to the City stormwater system are in compliance with local, state, and federal regulations; and
3) Comply with requirements of the City's NPDES permit.

The primary objectives of the enforcement program are to:

a) Discourage violations of stormwater regulations through enforcement action;
b) Provide an effective and safe stormwater system for the public and City staff;
c) Protect the City's stormwater infrastructure; and
d) Reduce flooding or infrastructure failure resulting from illicit discharges to the system.

BMP Activities:

- Follow the guidelines established in the Stormwater Investigation and Enforcement Manual (Updated August, 2002).
- Receive improper discharge complaint from property owner, concerned citizen, City staff, other agencies, etc.
- Respond to the complaint site and make initial assessment.
- Determine if the discharge material is hazardous, non-hazardous, or unknown. If the material is hazardous or unknown call for the Eugene Fire Department Hazmat Team or a hazardous material mitigation contractor.

- Complete information will be gathered by PWM response personnel, including photographs, and entered into the "Cassworks" database.
- The source of the prohibited discharge will be determined and eliminated if possible.
- A responsible party will be determined if possible.
- If a source and responsible party are identified, efforts will be made to obtain voluntary cooperation from the party by eliminating this, and any future, discharge occurrences, and to clean up the discharge material from private and public property.
- The responsible party will be given educational materials concerning the storm sewer system and discharge requirements.
- PWM staff will determine if a discharge violation has occurred.
- If a violation has occurred, the responsible party will be sent a courtesy letter or Notice of Violation providing more information on possible impacts of repeated violations, as well as suggestions for compliance with established stormwater discharge codes.
- If a point source is not identified or if a responsible party can not be established, PWM will commence clean-up actions on public property and isolate the discharging material from the public stormwater system.
- All actions, impacts, and results will be entered into the "Cassworks" MMI system.
- Any abatement cost recovery and/or penalty will be determined after a review of site-specific conditions, actions and past history.

Assessment Methods:

- For noted violations, the City will take appropriate enforcement actions to correct the problems and discourage repeat violations.
- To assess program effectiveness, total violations and repeat violations will be tracked over time. Program practices will be adjusted as necessary to achieve the desired results**.**
- Number of spills or discharge complaints reported or received
- Site visits conducted
- Investigation hours
- Discharged material identifications
- Responsible party tracking
- Tracking of information requests
- Notice of Violations issued
- Letters sent out (warnings, educational, code information)
- Abatement costs billings
- Civil penalties assessed

3.4.5.2 M2 - Environmental Spill Response Team

Responsible Department/Division:
Public Works Maintenance Division

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.

Year 7 Accomplishments (July 1, 2009 – June 30, 2010):

- 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, StreamTeam Coordinator and volunteers, Engineering Division Construction Erosion Control Technicians to identify, investigate and abate Illicit Discharges and Spills-through combined efforts.
- A total of 130 discharge concerns were investigated after being reported to City staff and logged into the City's Maintenance Management system.
- Continued response to spills by City Maintenance Staff, Fire and Police Emergency Services Personnel, and the use of Hazmat contractor NorthWest Hazmat Inc. for clean up, consultation and material disposal needs.
- Floating absorbent booms, hard booms, drain covers and granular absorbents are kept in inventory to respond to a larger scale event.
- Spill Response vehicle is stocked with a full set of spill mitigation devices and assessment tools to provide a prompt event response.
- City Public Works staff have designed and built a consolidated, covered pollutant containment, disposal and recycling area.
- Continued and expanding cooperative relationship, with regular meetings and networking with City of Springfield, Environmental Services staffers on IDDE, Non-Profit Car Washing kits, Landscaping businesses and Pressure Washing Contractors, Retailers and Equipment Rental outfits.
- The City's Maintenance Management System (MMS) is now the primary mechanism for database tracking of spills and illicit discharges. Future expansion of the MMS will include a direct link to photos and other discharge information, creation of work orders/service requests, and a link to enforcement documents.
- Spill program primary and back-up personnel have received ongoing training to maintain their 40 hour Hazwoper Certifications
- One Public Works employee successfully completed the 40 hour Hazwoper/General Site Worker training course and was added to the Public Works Emergency Spill Response Team.
- The Polk Street Stormwater Vault, the recent focus of an extensive reconstruction project was cleaned 4 times last year and over 13 tons of debris was removed.
- Program Technician is coordinating with volunteer groups to provide non painted storm

drain markers that will be applied to private stormwater structures that discharge to the City's stormwater system.

Background:
Schedule A of the City of Eugene's NPDES permit requires the City to: "Reduce the discharge of pollutants from the municipal separate storm sewer system to the maximum extent practicable" and to "effectively prohibit non-stormwater discharges into the Municipal Separate Storm Sewer system unless such discharges are otherwise permitted by an existing…NPDES permit…" The term illicit discharge is defined in the City's NPDES permit as "…any discharge to a municipal separate storm sewer that is not composed entirely of storm water except discharges pursuant to an existing NPDES permit and discharges resulting from firefighting activities."

The City's Public Works Department is responsible for protecting the City's infrastructure and drainage ways from environmentally harmful spills and discharges. Quite often, Public Works staff is the first to discover discharges of materials that present a threat to the environment. Frequently the discharged or dumped material has entered or has the immediate potential to enter the piped stormwater system or an open drainage way. Trained staff respond to spills of minor magnitude as a matter of routine operations and maintenance procedures.

To be prepared for a large, potentially damaging spill, the Department's Maintenance Division keeps a team of twenty to thirty staff members trained in emergency spill response and clean-up. All work teams within the Division are represented, providing the Department with a pool of trained and variously skilled staff that might prove necessary in the event of a major spill or other environmentally threatening situation. Trained on-call personnel include operators of equipment such as jet/vacuum machines, street sweepers, back-hoes, and hydraulic excavators as well as a team of Public Works supervisors trained in the Incident Command system.

The Public Works Department will continue to provide necessary and appropriate training to staff in both defensive hazardous materials response and in the mitigation of environmentally threatening spills. However, Public Works staff will not normally perform mitigation of spills where respiratory protection and/or self-contained breathing apparatus are required. The State Region 2 Hazmat Team, staffed by the Eugene Fire Department, will continue to take lead in these situations. Public Works will continue to equip, maintain, and periodically upgrade a vehicle for the express purpose of spill response in the urban area. Additionally, staff will continue to coordinate response procedures with other local agencies and participate in area emergency response drills when appropriate.

BMP Activities:
- Identify and provide training for those Public Works Maintenance positions which could be reasonably expected to encounter and/or participate in emergency spill response and/or clean-up activities.
- Maintain an employee listing of those trained in Hazmat First Response.
- Provide 16-hour First Responder training and 40-hour Hazmat Responder training for the appropriate positions.
- Provide Incident Command System training for all PWM Supervisors.

- Participate in table top exercises and drills with other local agencies.
- Equip all PWM vehicles with copies of the current version of the US DOT Emergency Response Guidebook.
- The PWM Spill Response Technical Specialist will maintain the spill response vehicle with an adequate supply of spill response materials and equipment.
- If the PWM employee is the first on the scene of a spill or discharge potentially hazardous to the environment, he/she will assume Incident Command until relieved by a higher authority. This will include isolating the area if possible, or keeping the public away from the area.
- Eugene Police and Fire dispatch will be notified in the event of a potential hazard and will assume Incident Command upon arrival at the site.
- PWM staff will assist in clean up at the direction of IC, or when IC has been transferred back to Public Works.
- Assist the Eugene Police Dept. (EPD) and the Eugene Fire Dept. (EPD) with vehicle accident clean-up.

Assessment Methods:

- Record number of spills or discharge complaints reported or received
- Track number of information requests
- Track number of site visits conducted
- Track discharged material information
- Track warning letters, notice of violations, abatement costs, and penalties assessed.
- To assess program effectiveness, total violations and repeat violations will be tracked over time. Program practices will be adjusted as necessary to achieve the desired results.
- For noted violations, the City will take appropriate enforcement actions to correct the problems and discourage repeat violations.

3.4.5.3 M3 - Litter and Illegal Dumping Programs

Responsible Department/Division:
Public Works Maintenance Division and
Parks and Open Space Division

BMP Contact:
Maintenance Division Director
Parks & Open Space Division Director

BMP Description:
Continue existing program of providing and maintaining trash receptacles in strategic publicly owned sites and in providing trash receptacles and collecting litter during major public events. Continue existing program of systematic inspection for and as-needed clean up of illegal dump sites. Conduct on-going evaluation of programs, monitor trends in litter and illegal dumping practices, and revise and/or expand programs as necessary and appropriate.

Year 7 Accomplishments (July 1, 2009 – June 30, 2010):

- Monitored 547 outdoor public events, provided trash and litter collection, and worked with event management staff to reduce the impacts of litter to the storm water system.
- Used the Public Works weekend supervisor position to investigate and mitigate litter and trash disposal problems during park and community events.
- Employed parks maintenance staff and seasonal employees to provide seven-day-a-week coverage for litter patrol and trash pickup, including a two-person crew to patrol the river corridor two or three times a week and to clean up illegal campsites.
- Used parks maintenance staff and seasonal employees to inspect the City's open waterways and to remove litter and trash.
- Dog waste cans are provided at each of the four dog off-leash parks. The dog waste cans hold 2 cubic yards and are dumped eight times per year. Total volume of dog waste collected is 64 cubic yards.
- The Stream Team and Volunteers in Parks volunteer coordinators conducted numerous work parties whose tasks included or consisted solely in removing litter and trash from the river corridor and from ponds, wetlands, and open drainage channels that are the City's maintenance responsibility. The City sponsored and provided logistical support for a Willamette River cleanup project in June 2009, in which 80 volunteers collected approximately 20 cubic yards of trash and litter and 70 hypodermic needles from the river and its banks. Stream Team volunteers gathered over 100 cubic yards of trash and debris along Eugene's Open Water Ways during the reporting period.
- Utilized a Sheriff's adult work crew on weekends to supplement the efforts of City parks maintenance staff in collecting litter and trash in the river corridor and in cleaning up illegal campsites along the river corridor and major drainage channels. The Sheriff's crew collected over 185 cubic yards of litter and trash, including 424 syringes. City staff collected over 141 cubic yards of litter and trash, including 142 syringes. City staff also removed 1,714 cubic yards of trash from general park sites.
- Utilized a Sheriff's adult work crew to remove litter, trash, and debris from minor drainage channels and ditches.
- Used both parks maintenance staff and the Sheriff's adult work crew to remove blackberry thickets in the river corridor and in areas along major drainage channels where illegal camping is popular. By eliminating the vegetation that illegal campers seek out

for concealment, we hope to reduce the amount of illegal camping near waterways as well as the amount of associated trash and pollutants.

- Parks and Open Space staff continuously monitor for high litter and debris activity and for strategic locations for public litter receptacles in parks and near open waterways.

Background:

Primary goals of the program are to keep litter and trash contaminants from entering the stormwater piped conveyance system, open waterways and wetlands areas of the community. In addition, this task is done to create a cleaner and healthier urban environment for the citizenry that uses the public areas of the community.

BMP Activities:

- Litter in City Parks is picked up and trash receptacles are emptied seven days a week.
- When reservations are made for park facilities, a clean-up deposit fee is collected in advance.
- Trash receptacles and collection are provided for all the City-sponsored outdoor public events in parks, on public streets, or on other public property.
- City currently picks up litter and empties trash receptacles from selected commercial areas, parking lots and garages, and the pedestrian mall on a daily basis.
- Litter on streets is removed by street sweeping activities and frequency is based on street designation and traffic use.
- All litter and trash swept from streets and alleys is sorted and recyclable material is removed with remaining debris disposed in a landfill.
- Major drainage channels are inspected weekly and illegally dumped debris and garbage is removed and recycled when possible with any remaining material being disposed in a landfill.
- Specific sites along open waterways or dead end streets that are frequently used for illegal dumping or homeless camping have been identified and are monitored and cleaned up on a regular schedule. The City attempts to identify the responsible party and then removes the debris as soon as possible so as to discourage additional dumping or camping.
- City streets, alleys, and bike paths are systematically inspected and cleaned on a routine schedule. Inspection frequency is determined by historic illegal dumping activity and by established sweeping routes.
- City responds to reports from the public, notification from sweeper operators or other City maintenance staff of debris dumped on sidewalks, alleys, open waterways and any other public areas.

Assessment Methods:

- Document the number and placement of new trash receptacles and litter picked up as well as the number of outdoor public events where trash receptacles and litter collection is provided.
- Document the location and quantity of illegally dumped debris picked up and removed from public rights-of-way, parks, drainage channels, roadside ditches, creeks and rivers by POS staff and by the County Sheriff's work crew. (This includes the number of syringes and other biohazards collected.)

- When available, data include the quantities of litter and dumped debris that is removed by volunteer program efforts.

3.4.5.4 M7 - Systematic Field Investigation for Improper Discharges

Responsible Department/Division:
Public Works Maintenance Division

BMP Contact:
Maintenance Division Director

BMP Description:
Using a watershed basin approach, the City will systematically inspect all private commercial/industrial stormwater systems that connect to the public drainage system. The purpose of this is to map private systems where no records currently exist and to assess the impacts of the private system on the public system. Where evidence is found that significant levels of pollutants are being introduced to the public system, City staff will work with property owners to correct the problems causing the discharge of pollutants.

Year 7 Accomplishments (July 1, 2009 – June 30, 2010):

- The Systematic Field Investigation (SFI) position continues to investigate and inspect both the public and private stormwater systems for conveyance issues and system mapping irregularities.
- The SFI position continues to document any mapping errors and investigates improper connections or any structural problems found during inspections by the stormwater operations crew.
- Recorded 107 stormwater map corrections.
- The SFI position worked in conjunction with Pavement Preservation projects to identify conveyance problems prior to new road surfacing.
- Assessed need for repairs to the piped stormwater system and works with stormwater operations crew to schedule repairs.
- Continuing inspections of public catch basin structures for deteriorated bottoms which need to be replaced. Implementation of a replacement program for bottomless catch basins is currently in place. These structures are placed on a capital improvement project list for replacement. Continuing investigating conveyance problems such as utility breaches, grout build up, off-set joints, cracks and roots that Closed Circuit Television inspections capture.
- Identified 26 locations where smoke was coming out of storm catch basins as a result of smoke being injected into the sanitary sewer system. Work to identify point source interconnections and ultimately pursue elimination.

Background:
The Systematic Field Investigation (SFI) program was developed to confirm the configuration of the municipal stormwater system and map private connections which have not previously been recorded. In addition, the SFI program identifies and removes sources of pollutants found to be entering the public stormwater system. Once identified significant sites are tracked which may adversely impact the municipal system. Furthermore, additional investigation and follow-up is conducted on systems where evidence exists that pollutants are entering the stormwater system. When a pollutant source is found, steps are taken to prevent further discharge to the system.

BMP Activities:

- City staff will continue a regular pipe system inspection program (systematic field investigation) for potentially high source land uses (i.e. commercial and industrial areas) to detect and identify sites that have obvious potential for illicit discharges.
- Re-evaluate the focus and emphasis of the Systematic Field Investigation program and follow up procedures based on lessons learned over the past 10 years, and new equipment available at Wastewater Treatment Plant lab. Refine program objectives.
- City staff will document the configuration of private systems where no records currently exist. These records will be entered into the City's Geographic Information System.
- During the inspection, City staff may contact a representative of the property and provide the current tenant of the property educational information on stormwater regulations and best management practices.
- If a significant source of pollutants is found, inspection staff will refer the site to the appropriate City staff for follow-up.
- Where problems can not be corrected through voluntary cooperation, code enforcement procedures will be employed which may include notices of violation, penalties, fines, abatement action, and/or referral to state agencies.

Assessment Methods

- Record number of sites inspected
- Record number of map corrections developed
- Assessment will be based on the number of sites inspected, the number of problems noted by staff, and the level of compliance achieved through voluntary means. Refinements and/or adjustments to the program will be made as needed.

3.4.6 Status of Waste Management BMPs

B1 Household Hazardous Waste Disposal
B2 Solid Waste Management

3.4.6 Status of Waste Management BMPs

3.4.6.1 B1 - Household Hazardous Waste Disposal

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

BMP Contact:
Building and Permit Services
Division Director

BMP Description:
Continue to 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. Continue efforts to support and promote facilities and programs that provide such opportunities.

Year 7 Accomplishments (July 1, 2009 – June 30, 2010):

- Renewed contract for "brown pages" in regional telephone directory to inform residents about proper disposal of household hazardous waste.
- Continuation of DEQ E-cycle program providing free collection of electronic discards.
- Staff continued to distribute copies of "builder's map" to guide builders to locations accepting hazardous waste for proper disposal.
- Distributed Healthy Home Guide for safe use and disposal of household products at the Spring Home Show, March 11,12, 13, & 14, 2010.
- Hazardous waste article in the Fall 2009 edition of Stormwater Connections (page 8).

Background:
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.

BMP Activities:

- Continue to collaborate with Lane County Waste Management Division staff on educational outreach via the development and distribution of brochures, fact sheets, and community outreach events.
- Work with Lane County to assess whether and how we can gather data on and report on what is done under the auspices of Lane County's Household Hazardous Waste Program.
- Continue participation in interagency pollution prevention group. Current grant application requests DEQ funding for a Household Hazardous Waste Educational Outreach Program. With approved funding, group will focus on hazardous waste prevention with painting, gardening and cleaning products and practices.
- Continue to require solid waste haulers to notify their customers of the Special Wastes Program offered through the Lane County Waste Management Division.

- In conjunction with ED1 (Stormwater Education), develop a paint outreach campaign that informs both professional painters and citizens about handling and care of paint and associated products.
- Work with local paint businesses to display and provide educational posters and fact sheets.
- Maintain 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.
- Continue collaboration with local metro area partners to publish information in local phone books regarding waste prevention, recycling, composting, and disposal of household hazardous waste.

Assessment Methods:

- Document materials disbursed about household hazardous materials.
- Document participating businesses in "paint outreach" campaign and publications produced and distributed.
- Conduct survey to assess community knowledge of household hazardous waste program**.**

3.4.6.2 B2 - Solid Waste Management

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

BMP Contact:
Building and Permit Services
Division Director

BMP Description:
Continue to evaluate and revise, as necessary, existing solid waste and recycling collection rules to address stormwater quality.

Year 7 Accomplishments (July 1, 2009 – June 30, 2010):

- City distributes "Builders Map" for construction and demolition debris recycling.
- Renews contract with Dex Media for informational "brown pages" in regional telephone directory.
- Eugene fulfills Oregon DEQ requirements related to "Opportunity to Recycle", which provides for educational and service standards.
- Article on proper disposal and beneficial uses of leaves and leaf composting appeared in Fall 2009 issue of Stormwater Connections, page 2
- Informational guide2Green Sheet created and made available to the public on managing garden and lawn care wastes in a responsible manner.
- Approximately 13,667 tons of yard debris were collected during calendar year 2009.

Background:
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.

BMP Activities:

- Continue to regulate solid waste and recycling collection activities within the city limits. Each collector is required to obtain a business license from the Planning and Development Department. The City also sets collection rates and standards but does not limit collection service providers to a specific geographic demarcation, or territory. Collection service providers are required to supply separate carts for garbage, yard debris and recycling which are designed and built to limit effluent impacts to the stormwater system.
- Eugene residents may contract with a provider for waste collection service or transport their own solid waste to a Lane County transfer station. The vast majority of residents and businesses subscribe to a collection service with only a small percentage utilizing a "self haul" approach.
- Continue to revise and enforce collection standards that reflect local goals and state of Oregon mandates, notably the 1991 Oregon Recycling Act. All solid waste collectors must transport waste and recyclables in a way that minimizes odor and keeps materials

from dropping, spilling, or blowing from the vehicle. Curbside residential recycling must be provided weekly, with a rigid container for recyclables, and haulers are required to provide recycling information to both residential and commercial customers.

- Continue to support a minimum of biweekly collection service for organic materials and to provide backyard composting classes for those residents without collection service.
- Continue to support pilot project efforts such as allowing food waste to be combined with other organic yard debris collection.
- Continue to implement a nuisance abatement enforcement program that provides rapid response to illegal dumping of garbage, yard debris, or other solid wastes materials.
- Continue to monitor state regulations relating to composting facilities and the proper management of stormwater runoff from these facilities.

Assessment Methods:

- Document planning and coordination activities.
- Report on implementation of commercial and residential recycling programs.
- Report on legal authority reviews and lobbying efforts.
- Document associated educational efforts.
- Track implementation and effectiveness of pilot programs and/or revised collection practices.
- Yard debris volumes.
- Garbage volumes.

3.4.7 Status of Industrial Controls BMP

W2 Industrial Stormwater Management Program

3.4.7 Status of Industrial Control BMP

3.4.7.1 W2 - Industrial Stormwater Management Program

Responsible Department/Division:
Public Works / Wastewater Division

BMP Contact:
Wastewater Division Director

BMP Description:
Continue providing 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.

Year 7 Accomplishments (July 1, 2009 – June 30, 2010):

- Currently there are seventy-two active 1200Z NPDES general stormwater permits and eight active 1700A NPDES (wash water) permits.
- During this reporting period, twelve new 1200Z NPDES permit were issued and no 1200Z NPDES permits were terminated. No new 1700A NPDES permits were issued and no 1700A permits were terminated.
- Three sites were evaluated and approved for No Exposure Certification status. Currently seventeen approved No Exposure Certifications are on file.
- Four sites were evaluated for the need of a 1200-Z Permit or No Exposure Certification and it was determined that a permit was not required.
- Fourteen new Stormwater Pollution Control Plans were reviewed and approved.
- Five existing Stormwater Pollution Control Plans were modified and approved.
- Eight formal inspections were conducted at 1200Z NPDES permitted facilities during the reporting period. One formal inspection was conducted at a 1700-A permitted mobile pressure washer.
- Sixty Five informal site visits were conducted at 1200Z NPDES facilities during the reporting period.
- Twenty-seven permitted 1200Z NPDES facilities exceeded one hundred and ten benchmark parameters. pH (2), Total Zinc (35), Lead (7), Total Suspended Solids (35), Total Copper (2), Oil and Grease (12), Oil and Grease Sheen (4), Floating Solids (13).
- Currently forty-five 1200Z NPDES permittees have initiated monitoring reduction waivers. Waivers are allowed for individual benchmarks once four consecutive monitoring results achieve compliance with benchmarks.
- No Notices of Non-Compliance were issued.
- One industry was referred to DEQ for formal enforcement. Sure Clean – Eugene submitted three consecutive discharge monitoring reports past the due date.
- Request For Corrective Action letters were issued to fifteen 1200Z NPDES and one 1700A NPDES permittees for the following permit violations:

  1200Z permittees
  8 ~ Failure to conduct required monitoring
  9 ~ Late submittal of Action Plan
  1 ~ Violation of monitoring schedule

2 ~ Late submittal of Discharge Monitoring Report
1 ~ Improper handling of waste materials

1700A permittees
1 ~ Exceeded Limit for Total Suspended Solids (TSS)

Background:
The Industrial Stormwater program objectives are to minimize to the maximum extent practicable the discharge of pollutants from industrial facilities with NPDES permits to the City stormwater drainage system. Program objectives are accomplished by ensuring that appropriate industries have obtained an NPDES permit and are complying with permit requirements. City staff continues to evaluate new and existing businesses to determine if an industry requires an NPDES permit. Inspections of these industries are conducted by the City to determine whether a permit is needed. Industries requiring an NPDES permit are notified by the City. The City reviews permit application for completeness and forwards appropriate documentation to DEQ who issues the permit. Stormwater Pollution Control Plans are submitted to the City for review. Plans are returned to the industry with comments when incomplete. Staff obtain, review and track industry self monitoring data and maintain a database of benchmark exceedances. Chronic problems may result in inspection which is coordinated with the DEQ. Failures to comply with NPDES permit conditions or to obtain a permit as required by the DEQ are referred to the DEQ for enforcement. Staff will notify industries of the requirement to review and modify their SWPCP plan when benchmark exceedances occur. Sampling of industries may be conducted in relation to chronic exceedances of benchmarks, complaints, or implementation of the reduction in monitoring option. The City responds to complaints concerning illegal discharges or spills at industries with NPDES stormwater permits and takes appropriate enforcement action under City code for the discharge of materials not authorized under a NPDES permit.

BMP Activities:
- Manage 1200Z and 1700A NPDES permit files
- Evaluate new and existing facilities for requiring NPDES permits
- Determine permit compliance with existing NPDES permitted facilities.
- Evaluate SWPCP completeness and update requirements.
- Review annual Discharge Monitoring Reports for permit compliance.
- Maintain database of Discharge Monitoring Report data.
- Issue Request for Corrective Action letters for permit noncompliance.
- Initiate enforcement referrals to DEQ for ongoing noncompliance issues.
- Conduct site inspections at existing and potential NPDES facilities.
- Conduct periodic monitoring for compliance determination.
- Provide technical assistance to permitted facilities.

Assessment Methods:
- Track current number of active and terminated 1200Z and 1700A NPDES permits.
- Track current revision of Stormwater Pollution Control Plans and industry self-monitoring data.
- Maintain lists of benchmark exceedances and identify chronic problems for follow-up activities or referral to DEQ.

- Track current number of monitoring reduction waivers and qualifying parameters.
- Maintain spreadsheet of Request for Corrective Action letter issued.
- Track number of site visits and inspections conducted at NPDES facilities.

3.4.8 Summary of Educational Products

3.4.8 Summary of Educational Products

PERMIT YEAR 7 (July 1, 2009 – June 30, 2010):

Activities:

- Created booth at Lane County Home & Garden Show. Theme: "It all comes back to you" (March 2010) 500 people made pledges to use more sustainable practices.
- Created booth at Good Earth Home Show. Theme: Tap into green wisdom (January 2010) 560 people pledged to use more earth-friendly practices.
- Earth Day Celebration Booth. Theme: Canines for Clean Water-pledge program for dog owners regarding pet waste (April 2010)

Brochures & handouts:

- Customer Notification, Stormwater and Wastewater, Residential & Commercial (July 2010)
-

Campaigns: Continue Canines for Clean Water, a pledge program for dog owners. Pledge program includes commitment from dog owners to clean up pet waste appropriately. Participating owners receive special bandana for their dogs and the option to have their dog's photo on the City's website under the canine gallery. To date, over 320 dog owners have made the pledge.

Collaborative projects: Staff from cities of Eugene and Springfield continues to put together car wash kits for non-profit fundraising groups with handouts, instructional information on how to use kits and signage board with "Fish-friendly car wash kit" wording along with city logos. Also work together on pressure washing outreach to Eugene and Springfield residents and produced "Protect our rivers while you wash" brochure.

Newsletters: 2 issues of Stormwater Connections (Spring 2010, November 2009)

School curriculum: Continue to promote SPLASH & salmon curriculum for area schools, for grades K - 12. Provide stormwater lessons, activities, handouts, posters and songs(on CD). Curriculum is also available on stormwater website.

All other educational materials from prior years continue to be available for children, teachers, citizens and businesses.

Activities:

- Created booth at Lane County Home & Garden Show. Theme: "It all comes back to you" (March 2009)
- Created booth at Good Earth Home Show. Theme: Greening your landscape: earth-friendly choices for yard care, landscapes and water management (January 2009)
- Earth Day Celebration Booth. Theme: Canines for Clean Water-pledge program for dog owners regarding pet waste (April 2009)

Brochures & handouts:

- Customer Notification, Stormwater and Wastewater, Residential & Commercial (July 2009)
- Continue to convert cover page articles from stormwater newsletter into handouts.

Campaigns: Canines for Clean Water, a pledge program for dog owners. Pledge program includes commitment from dog owners to clean up pet waste appropriately. Participating owners receive special bandana for their dogs and the option to have their dog's photo on the City's website under the canine gallery.

Collaborative projects: Staff from cities of Eugene and Springfield continues to put together car wash kits for non-profit fundraising groups with handouts, instructional information on how to use kits and signage board with "Fish-friendly car wash kit" wording along with city logos. A newer project includes pressure washing handouts for citizens. Brochures will be completed in the fall of 2009.

Newsletters: 2 issues of Stormwater Connections (May 2009, November 2008)

School curriculum: Continue to promote SPLASH & salmon curriculum for area schools, for grades K - 12. Notebooks provided to teachers with lessons, activities and handouts. Several teacher workshops were offered. Four new classroom posters have been created: Salmon, a keystone species; Our watershed; Stormwater, from raindrop to river; and Water and wildlife, we all live downstream.

SPLASH CD: Continue to include songs for children about clean rivers, pollution prevention and more.

All other educational materials from prior years continue to be available for children, teachers, citizens and businesses.

4. Monitoring Program

4 MONITORING PROGRAM

4.1 Ambient Monitoring Results Summary

Historical analytical results for surface water samples collected from Amazon Basin monitoring locations in Eugene, Oregon indicate statistically significant long-term decreasing concentration trends occur at specific sites for arsenic, cadmium, chromium, lead, magnesium, mercury, nickel, silver, fecal Coliform and ortho phosphorus. A decreasing trend is also observed for total suspended solids at Willow Creek, which serves as a baseline for water quality conditions.

Significant decreasing 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, phosphorus, nitrogen, suspended solids, turbidity, temperature, and oxygen demand increase as Amazon Creek flows through the urban environment. Counts of *E. coli* and fecal Coliform, and concentrations of nitrate+nitrite, ortho phosphorus, dissolved oxygen, and pH decrease. For those analytes with statistically significant differences, nearly all concentrations were greater for samples from the A3 Channel than those reported for Amazon Creek, and all concentrations were greater for Amazon Creek than for Willow Creek.

In addition, Amazon Basin water samples collected during the 2009/2010 permit year at specific sites had lower concentrations of arsenic, cadmium, chromium, lead, mercury, nickel, selenium, silver, field pH, Kjeldahl nitrogen, total phosphorus, suspended solids and biochemical oxygen demand than concentrations observed historically. Chemical oxygen demand increased slightly at one site.

Results for samples collected from the Willamette River indicate statistically significant long-term decreasing concentration trends occur at specific sites for arsenic, nickel, fecal Coliform, and total magnesium; an increasing trend is observed for conductivity at one monitoring site.

As the Willamette River flows through the Eugene urban environment, concentrations increase for arsenic, copper, lead, nickel, silver, and zinc metals; nitrogen and phosphorus nutrients, dissolved solids, conductivity, calcium and magnesium (hardness), *E. coli* and fecal Coliform also increase. A comparison of samples from the Owosso and Beltline Bridge sites indicate ammonia decreases slightly.

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 in Amazon Basin streams and channels, and the Willamette River commonly exceed the human health criterion established for drinking water. The acute toxicity criterion for silver applicable to fish species is also exceeded for both Amazon Basin and Willamette River sites. Note, however, that the criteria for these pollutants are also exceeded at the monitoring location upstream of the Eugene urban area, and in Willow Creek which serves as a relatively undeveloped baseline for water quality, indicating that a certain amount of these analytes occur naturally in aquatic environments or are affected by human activities upstream and outside of the permit boundary. Other pollutants not meeting an applicable state water quality criterion include copper, lead, mercury, zinc, bacteria, dissolved oxygen, and temperature.

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 continuation and refinement of existing BMPs, and implementation of new ones as needed.

4.2 Objectives of the Monitoring Program

Permits issued under the Stormwater National Pollutant Discharge Elimination System (NPDES) regulations for Municipal Separate Storm Sewer Systems (MS4) require ongoing water-quality monitoring to assess the chemical, biological, and physical effects of stormwater on receiving water bodies. The monitoring described in this and previous reports, has been conducted under the City's NPDES Stormwater Discharge Permit Number 101244 issued on 2 March 2004, and Chapter 8 of the Stormwater Monitoring Plan (SMP); the Oregon DEQ has administratively extended the City's permit pending renewal. Elements of the monitoring program described in this report are designed to satisfy permit requirements.

For the purposes of the SMP, 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 practical extent given available resources.

4.3 Organization of the Water Quality Monitoring Program

The storm-water monitoring plan includes three program elements:

- Stormwater quality monitoring
- Ambient receiving water quality monitoring; and
- Data management, analysis, and reporting.

The following sections will focus on analysis of ambient 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 water quality and referenced in the following paragraphs are included at the end of Section 4. All sampling follows the protocol established in the Stormwater 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 field surveys, storm event monitoring, ambient water quality monitoring, structural BMP performance, and bacteria monitoring in the MS4 as well as receiving water bodies.

<u>Underground Injection Control (UIC) Monitoring</u>

Stormwater flow to a sedimentation manhole UIC was sampled during two storm events over the most recent reporting period. Table 4-1 presents the results at the Anderson/Briana UIC device (MH75938) located in a north Eugene residential subdivision (see Figure 4-1). The concentrations reported for nearly all analytes were less than or similar to the Oregon numeric groundwater quality maximum contaminant levels and the median of mean effluent concentrations established by the EPA/ASCE International Stormwater Best Management Practices Database. Geometric mean count for *Escherichia coli* is 302 MPN (colonies per 100 mL), which is above the Oregon DEQ groundwater quality reference level of < 1 MPN; the

mineral matrix of the soil column should act as a filter to prevent infiltration of bacteria to subsurface aquifers when the UIC meets applicable federal and state design requirements. The geometric mean, or geomean, is used rather than the arithmetic mean to minimize the influence of extreme values; the central tendency of environmental data tends to be better represented by the geometric mean rather than the arithmetic mean. In general, the geomean values for bacteria, total lead, suspended solids and Kjeldahl nitrogen for the 2009/2010 monitoring period are greater than historical geomean values but within the range of concentrations observed in the historical data set; cadmium, chromium, dissolved lead, ammonia and nitrate+nitrite as nitrogen, and total phosphorus concentrations are lower than historical values.

Table 4-1
UIC Storm Event Monitoring Summary
Anderson at Briana

2009/2010 Sampling Dates	Analyte	2010 Data GeoMean	Historical Data GeoMean	Median EMC EPA ASCE Database	Oregon DEQ Groundwater Quality Reference Level	Units
10/26/2009 & 1/10/2010	Escherichia coli	302	23		< 1	MPN
	Cadmium, Dissolved	0.0254	0.0391	0.52		µg/L
	Cadmium, Total	0.0553	0.0685	0.93	10	µg/L
	Chromium, Dissolved	0.278	0.810	1.9		µg/L
	Chromium, Total	0.621	0.896	2.5	50	µg/L
	Lead, Dissolved	0.061	0.292	1.25		µg/L
	Lead, Total	0.509	0.312	8.1	50	µg/L
	Ammonia – N	0.10	0.17			mg/L
	Nitrate + Nitrite – N	0.050	0.076	0.09	10	mg/L
	Total Kjeldahl Nitrogen	0.49	0.10	1.6		mg/L
	Phosphorus, Total	0.102	0.569			mg/L
	Total Suspended Solids	9.8	5.7	24		mg/L

Shaded cells indicate the higher analyte concentration in the comparison.

Storm Event Stormwater Quality Monitoring

Storm event monitoring was conducted at four sites to assess stormwater quality, including West 5th Avenue at Seneca Road (MH63693) whose outfall is the A3 Channel (see Figure 4-1 for monitoring locations), Chambers at 18th Avenue (MH55404) whose outfall is the Amazon Creek, Copping Street (MH77793) with its outfall to the Willamette River, and Willow Creek at 18th Avenue site, which is relatively undeveloped and is used to represent background conditions for comparison purposes. Stormwater samples collected from the 5th Avenue/Seneca monitoring site receives runoff from industrial and commercial properties. Samples from the Chambers at 18th Avenue sampling site is primarily from commercial and recreational land uses, and that of the Copping Street site is residential. Within the Willow Creek drainage basin, primarily parks (25%), agriculture (22%), timber (17%), and vacant lands (17%) comprise the land use categories. About 16% of the basin is comprised of single family, industrial, and roadway land uses with the remainder in other categories.

Laboratory data for stormwater samples collected from these four locations are presented in Appendix A, Tables A-1 through A-4 with color codes, where appropriate, to indicate percent change of geomeans of the 2009/2010 and historical data. Boxplots of all data including the 2009/2010 and historical data sets are shown in Appendix A, Figures A.1 through A.16. In general, the storm event data have the following characteristics:

Willow Creek – Background Location

One storm event was sampled for the full suite of water quality analytes and three storm events for bacteria during the 2009/2010 monitoring period. In general, nearly all analyte values for the single storm event are lower than historical values, with the exception of total phosphorus, whose concentration is 24% above the geomean. Dissolved oxygen is also lower than the historical geomean by 11% while the field pH is 20% higher.

Modest decreases in *E. coli* and fecal Coliform counts of 23% and 59% respectively, are also observed for the monitoring period.

Comparisons of the Willow Creek metal data to state water quality standards indicate arsenic and lead values generally exceed the criterion; in the case of silver, the laboratory reporting limit is above the criterion so a comparison is problematic. Laboratory staff is assessing the analytical method to determine whether a lower reportable limit can be achieved in the future. Concentrations for all other metals in stormwater runoff are below the reference criteria.

NE Chambers & West 18th Avenue – Piped System

Three storm events were sampled for the full suite of water quality analytes. Stormwater data for this site is characterized as follows:

- Dissolved and total arsenic, cadmium, copper, lead, mercury, nickel and zinc, as well as dissolved silver, have lower concentration ranging from about 7 to 99% for the 2009/2010 monitoring period compared to historical values.

- Biochemical (BOD) and chemical oxygen demand (COD) are slightly lower (about 12 and 39% respectively), with a corresponding 26% increase in DO.

- Nitrogen, including total Kjeldahl (TKN) and NO_3+NO_2 geometric mean concentrations are about 54 and 85%, respectively, lower than historical values; TOC decreased 51%.

- Dissolved solids, including total calcium and magnesium (hardness), and conductivity means are lower, ranging from 94 to 117% less than historical values.

- Suspended solids increased 22% over historical values while turbidity decreased 51%.

- Ammonia and total phosphorus increased 23 and 21%, respectively, during the 2009/2010 monitoring period compared to historical means.

- The geometric means for *E. coli* and fecal Coliform decreased 130 and 156%, respectively, for the recent monitoring period.

Seneca Road at West 5th Avenue – Piped System

Two storm events were sampled, one for the full suite of analytes and one for specific chlorinated hydrocarbons listed on the 2004/2006 303(d) list for the A3 Channel. The 5th Avenue/Seneca site was selected to assess pollutant sources of dichloroethylene and tetrachloroethylene to the A3 Channel because it is on Oregon's 303(d) list of impaired waterbodies for both pollutants. Dichloroethylene is a degradation byproduct from trichloroethylene. Neither chlorinated compound was detected in stormwater samples collected during the 2009/2010 monitoring period at this location.

While stormwater quality is difficult to characterize based on a single sampling event from this site, the results are nonetheless informative when compared to historical geometric means. For example:

- Total and dissolved arsenic, mercury, and nickel, as well as dissolved chromium, copper, and lead have lower concentrations in 2009/2010, ranging from about 7 to 63% than historical geometric means.

- Nitrogen and phosphorus nutrients for the single sample are between 14 and 86% lower, respectively, than the historical mean.

- Stormwater dissolved solids, calcium and magnesium (hardness), and conductivity values are 24 to 56% less than historical means.

- *Escherichia coli* and fecal Coliform values are 47 and 115% lower, respectively, than historical means.

- Total and dissolved cadmium, and zinc, as well as total chromium, copper and lead increased between 1 and 160% compared to historical means.

- TSS and turbidity results are also slightly higher (1% and 26% respectively), than historical means.

Comparison of stormwater runoff from the piped MS4 system to state water quality standards indicate concentrations of arsenic, cadmium, copper, lead, mercury, silver, and zinc in stormwater would exceed the criteria (see Figures A-1 through A-9); concentrations for these pollutants in the receiving water body also frequently exceed applicable state water quality standards, as is described in subsequent sections of this report. In addition, the turbidity of stormwater in the piped system is often greater than the applicable receiving waterbody standard (see Figure A-13).

Bacteria Study – Westmoreland Park, Polk Sub-Basin

The A3 Channel, Amazon Diversion Channel, and Amazon Creek are on the state's 303(d) list as "water quality limited" for bacteria. Stormwater monitoring data suggest that bacteria concentrations in Eugene's stormwater contribute toward exceedance of the state water-quality criterion. 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 a specific drainage basin area with known characteristic and from which information can be acquired without undue complexity.

Our bacteria 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 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. The most effective BMPs would likely be considered for other areas within the Amazon basin with the objective of reducing bacteria in the A3 Channel, Amazon Diversion Channel, and Amazon Creek. During the 2009/2010 permit year our investigations continued with sampling and analysis of bacteria in stormwater from piped and open channel systems, including Amazon and Willow Creeks.

Figures 4-2 and 4-3 delineate drainage basin areas and sampling locations. The monitoring station on Amazon Creek at Jefferson represents stormwater runoff and stream flow from a large portion of the city, some 5100 acres total. The Willow Creek drainage comprises the next largest area at about 1200 acres; the smallest is the Westmoreland Park area at 5.4 acres.

Bacteria data for the three storm events sampled are summarized in Table 4-2 and coded to indicate percent change of the 2009/2010 geometric mean compared to historical data. Location order in the table is by flow direction – upstream to downstream – with piped system outfall locations inserted where they enter Amazon Creek; hence, Amazon Creek at Jefferson is the uppermost upstream monitoring station while Amazon Creek at Chambers is lowermost downstream. Willow Creek is placed at the top of the order for comparison purposes.

Boxplots of all bacteria data are presented in Figure 4-4 and are ordered similarly. 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 25th and 75th percentiles. Whiskers extending from the box mark the range of values that fall within 1.5 box-lengths from the 25th or 75th percentile. Values that are more than 1.5 box-lengths from the 25th 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. The total number of samples in each data set, n, is also shown.

Sampling for *Escherichia coli* and fecal Coliform was done at three piped-system locations within the study area and four locations along Amazon Creek, plus Willow Creek for background comparison purposes. Tiara (MH51267) is unique in that the sampling location is within the piped system but immediately downstream of a small urban stream that courses through the back yards of a residential neighborhood so it is categorized as a surface sample. The steep-gradient stream is deeply incised with steep banks near the south hills headwaters area of Eugene. Stormwater flow from Tiara eventually discharges immediately downstream of the Polk monitoring site.

With the exception of a few sites, the geometric means of *E. coli* and fecal Coliform for the 2009/2010 monitoring period are lower than historical values (values are expressed as MPN or colonies per 100 mL, hereinafter referred to as counts). *E. coli* counts decrease in Amazon Creek from 17% at the Jefferson Street site to 54% at the Chambers Street site; fecal Coliform, on the other hand, ranged from an increase of 84% at the Jefferson Street site to a decrease of 93% at Polk Street.

Stormwater bacteria counts from specific drainage basin areas ranges from increases of 12 and 29%, respectively, for *E. coli* and fecal Coliform, to decreases of 130 and 156% at the NE lot at Chambers and 18th Avenue site. Nearly all bacteria geometric means are above the state water quality criterion of 406 organisms per 100 mL, except that for Willow Creek at 18th Avenue, which consistently has lower bacteria counts than the criterion.

Geometric means for bacteria are greatest at the upstream site of Jefferson Avenue and decrease as stream flow passes through the urban area to Chambers Avenue; this phenomenon is also observed for ambient monitoring and was determined to be statistically significant.

Immediately downstream of the Amazon Creek at Jefferson Avenue site is the piped system-monitoring site at Friendly, which contributes counts nearly twice that of the water quality standard at 796 counts. This small sub-basin within the Polk drainage area is an established residential area.

The Tiara sampling site is located far from Amazon Creek but stormwater from this small drainage area contributes a significant amount of bacteria to the MS4 system, which eventually discharges to Amazon Creek between the Polk and Blue Heron Pedestrian Bridge monitoring locations (see Figures 4-2 and 4-3 for the extent of these drainage basins and monitoring locations).

Moving downstream in Amazon Creek to the next monitoring sites, we have two smaller sub-drainages that discharge before the Amazon Creek at Chambers site; one located in a commercial lot on the northeast corner of Chambers and West 18th Avenue, and one located in Westmoreland Park. Bacteria geometric mean counts from the Chambers and 18th site is 406 while that from the park site is 465. Amazon Creek at Chambers bacteria counts decrease slightly to 1813.

Interpretation of bacteria monitoring results is somewhat simplistic at this time pending refinement of a bacteria load model to enable better characterization of source contributions within these drainage basins. Additional inputs to the model may include additional monitoring at these and other sites within the basins, as well as precipitation data to better estimate stormwater flow runoff.

Geometric means summarized in Table 4-2 indicate that most of the storm event samples collected for the 2009/2010 monitoring period exceed the state's water quality criterion for bacteria of 406 organisms per 100 mL; only Willow Creek – the relatively undeveloped background site – has consistently had means that are less than the criterion. All bacteria data were used to generate the boxplots in Figure 4-4 and are compared to the state water quality criterion of 406 organisms per 100 mL, which is marked by the vertical green line. As can be seen the majority of storm event samples exceed this criterion.

Table 4-2
Bacteria Storm Event Data
2009/2010 Monitoring Period
Westmoreland Park, Polk Sub-Basin

Location	Parameter	N	GeoMean	Mean Std. Deviation	Median	Minimum	Maximum	% Change from Historical GeoMean
Willow Creek at W 18th Ave	Escherichia coli	3	29	27	47	9	60	-23
	Fecal Coliform	3	13	25	20	2	52	-59
Amazon Creek at Jefferson	Escherichia coli	3	3,148	13,109	2,000	650	24,000	-17
	Fecal Coliform	2	3,216	7,113	5,970	940	11,000	84
Friendly at W 16th Ave	Escherichia coli	3	796	3,757	730	100	6,900	12
	Fecal Coliform	3	324	2,163	290	30	3,900	29
Amazon Creek at Polk	Escherichia coli	3	3,017	14,225	2,400	440	26,000	-40
	Fecal Coliform	3	669	10,155	830	20	18,000	-93
Tiara	Escherichia coli	3	3,593	26,986	2,100	460	48,000	-5
	Fecal Coliform	3	1,682	15,667	1,700	100	28,000	-18
Blue Heron Pedestrian Bridge	Escherichia coli	3	2,145	17,569	650	490	31,000	-49
	Fecal Coliform	3	829	13,625	790	30	24,000	-58
NE Lot at Chambers & W 18th Ave	Escherichia coli	5	406	1,168	870	13	2,400	-130
	Fecal Coliform	4	181	598	140	52	1,300	-156
SE Westmoreland Park	Escherichia coli	3	465	1,731	650	47	3,300	-32
	Fecal Coliform	3	122	487	100	20	900	-119
Amazon Creek at Chambers	Escherichia coli	3	1,813	13,554	690	360	24,000	-54
	Fecal Coliform	3	737	5,077	550	80	9,100	-80

Escherichia coli units: MPN
Fecal Coliform units: col. / 100 mL

In addition to field sampling for bacteria, one ground survey of the area was done in August 2009, to document basin conditions such as amount, type and location of wildlife and domestic pets, human behaviors, location and number of domestic animal waste, conditions within commercial loading areas, recycling areas and garbage dumpster areas, etc. A total of seven field surveys have been done since the project start.

Field surveys frequently indicate large avian populations in and around Amazon Creek and are perhaps the strongest field evidence that may be associated with elevated bacteria levels. Smaller numbers of cats and dogs have also been observed. In contrast, few birds have been observed during field surveys in the Tiara drainage basin yet bacteria levels are well above counts observed at upper Amazon Creek locations, above those within the MS4 piped system,

and well above the Willow Creek monitoring site. As reported in another section of this document, one resident whose back yard borders the creek has described large numbers of deer congregating where the animals rub their antlers against trees and stripping bark off trunks. Deer droppings were prevalent near the trees; however, it could not be determined whether the animals traverse through the steeply banked stream, nor whether stormwater runoff from the residential yards have potential to affect bacteria results. Additional storm event sampling is planned for the next permit cycle to better characterize bacteria sources within the Tiara drainage area.

Ambient Water Quality Monitoring

Surface water quality monitoring has continued at eleven monitoring locations, including four sites on the Willamette River, one near the Delta Ponds outlet, and six in the Amazon Basin. Surface flows through the Delta Ponds, which consists of sloughs and former aggregate excavation sites, are to the Willamette River. Extensive rehabilitation efforts have been underway by the US 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 development; thus assessment of water quality from this area is important to determine the effects, if any, of stormwater on Delta Ponds and the Willamette River. The ambient sampling sites are listed in Table 4-3 below and locations shown in Figures 4-5 and 4-6. Sampling is generally conducted at each site every other month. All ambient sampling is conducted utilizing clean sampling techniques; both total and dissolved metals are analyzed as well as other water quality parameters.

Analytical results and statistical analyses characterizing receiving 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. Six additional sampling events were done since the last annual reporting period, the data of which have been added to the historical data set that begins in January 1997. For the current permit year sampling events occurred between July 2009, and June 2010.

Table 4-3 Ambient Water Quality Monitoring Sites
Amazon Basin Sampling Sites: Amazon Creek – Site M2 – at 29th Avenue Willow Creek 450 feet north of 18th Avenue Amazon Creek at Railroad Track Crossing Amazon Diversion Channel at Royal Avenue A3 Channel at Terry Street Amazon Creek at Royal Avenue
Willamette River Sampling Sites: Upstream of Urban Growth Boundary (River Mile 186.9) At Knickerbocker Bridge (RM 183.9) At Owosso Bridge (RM 178.6) Delta Ponds North of Beltline Bridge & Upstream of Willamette River Confluence Downstream of Beltline Bridge (RM 176.8)

4.5 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 result in incorrect 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 and dilution error.

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 2009-2010 ambient dataset; some dissolved oxygen measurements were found to be biased due to the measurement technique used and were excluded from the report tables. In addition, multiple zinc values were excluded from report tables due to a laboratory contamination issue. Excluded dissolved oxygen and zinc values are denoted as “outlier” 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 end of each monitoring period for distribution tests as applicable. Analytical data for the most recent monitoring period are presented in Tables A-5 and A-6. Note that there are no data for specific dates at Willow Creek and Delta Ponds above the Willamette River Confluence near Beltline Bridge because these sites were dry 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-7 and A-8.

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[2], the Seasonal Kendall statistic is the 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 basin streams and the Willamette River, 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, and October) and are progressively wetter. Precipitation data is from the Eugene, Oregon airport weather station (#352709) with a period of coverage from 1961 to 2000. 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] Dennis R. Helsel, Mueller, David K., and Slack, James R., Computer Program for the Kendall Family of Trend Tests: U.S. Geological Survey SIR 2005-5275.

2ρ 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 9 of 11 monitoring locations, including Willow Creek, Amazon Creek at 29th Avenue, Amazon Creek at the Railroad Crossing, the Amazon Diversion Channel at Royal Avenue, the A3 Channel at Terry Street, Amazon Creek at Royal Avenue, the Willamette River Upstream of the Urban Growth Boundary, and the Knickerbocker and Owosso Bridges. Water quality trends for these riverine systems 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 4-7 through 4-35 show the historical data sets plotted against time with trend lines; a summary of the program output is presented in Appendix A, Table A-9. All significant long-term concentration trends are summarized in Table 4-4 below. A number of pollutants listed are on Oregon's 2004 303(d) list of pollutants requiring a TMDL, or a TMDL is established with minimum pollutant reduction requirements. Results of the Seasonal Kendall test statistic indicate significant progress is being made to reduce pollutants in the listed impaired waterbodies.

We note for the Amazon Basin sites that long-term decreasing concentration trends were observed for at least some analytes at all monitoring locations; these are sites which are located downstream or within the urban environment and are influenced by the sum of human activities that occur within their 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 are primarily observed for metals, including arsenic, cadmium, chromium, lead, magnesium, mercury, nickel and silver. Ortho phosphorus and fecal Coliform also showed decreasing trends at a few monitored sites; a decreasing concentration trend for total suspended solids also occurred at the Willow Creek reference site.

A slight increasing trend for conductivity in the Willamette River at the Knickerbocker Bridge site could be related to a combination of factors, such as weathering and dissolution processes of soils. Interestingly, decreasing trends are observed for total magnesium upstream and downstream of the Knickerbocker Bridge site, somewhat conflicting with the conductivity trend.

There is a small probability that some decreasing 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 above. 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 are 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; silver, however, is still reported at a

detection level significantly above the hardness-adjusted chronic criterion of 0.0029 µg/L. The facility continues to review its analytical procedures to ensure optimum instrumentation performance is attained so that continuity of historical trends observed over the last ten years is maintained to the fullest extent possible.

Table 4-4
Summary of Seasonal Kendall
Water Quality Analyte Trend Analysis [1]

Monitoring Location	Trend of Water Quality Analyte	
	Decreasing Concentration Trends	**Increasing Concentration Trend**
Amazon Basin Sites:		
Amazon Creek at 29th Avenue – Site M2	Total Lead Total Nickel	None
Amazon Creek at Railroad Tracks	Total Cadmium Dissolved Nickel	None
Amazon Diversion Channel at Royal Avenue	Dissolved Arsenic [2] Total Arsenic [2] Dissolved Nickel Ortho Phosphorus	None
A3 Channel at Terry Street	Dissolved Arsenic [2] Total Arsenic [2] Total Cadmium Total Chromium Dissolved Nickel Total Nickel	None
Amazon Creek at Royal Avenue	Total Cadmium Total Chromium Total Lead [2] Total Mercury Total Nickel Total Silver Fecal Coliform [3, 4] Ortho Phosphorus	None
Willow Creek	Total Suspended Solids	None
Willamette River Sites:		
Upstream of Urban Growth Boundary	Total Arsenic [2] Total Magnesium Total Nickel	None

Knickerbocker Bridge	Fecal Coliform [3, 4]	Specific Conductance
Owosso Bridge	Total Magnesium	None

[1] Significant at $2\rho = 0.01$
[2] On Oregon 2004/2006 303(d) list.
[3] Oregon TMDL established for this pollutant.
[4] *E. coli*, listed on Oregon's 2004/2006 303(d) list, is a subspecies of fecal Coliform; reduction of fecal Coliform may have a concomitant reduction in *E. coli*.

Water Quality Changes: Seventh 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-10 in Appendix A summarizes significant average analyte values for the period, which consists of sampling events for the 2009/2010 period, and the average for the historical data set; comparisons are significant at $\alpha = 0.05$. The full program output for the statistic is shown in Tables A-11 and A-12.

Note that some analytes in Table A-10 are annotated, indicating that the data set includes some censored values which have been set at one-half the reporting limit. 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 whose population of censored values is greater than 50 percent is questionable and therefore generally excluded from tables summarizing statistically significant comparisons. Values reported as INS indicate insufficient uncensored data are available to compute the statistic.

Amazon Basin Sites

Referring to Table A-10 in Appendix A, all six Amazon basin monitoring sites have recent analyte averages that differ from historical means. Overall 23 of 24 analytes, or about 96%, show statistically significant concentration decreases. One analyte, chemical oxygen demand at the Amazon Creek at 29th Avenue M2 site, is significantly higher than the historical mean.

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 receive some stormwater from the Hynix facility (a silicon chip manufacturer whose operations ceased during the 2007/2008 period though maintenance of stormwater facilities continue). The water quality characteristics of Willow Creek, which is for the most part a local, minimally-urbanized stream, serves as a reasonably good baseline for comparing the water quality characteristics observed at Amazon Creek, specifically, the 29th Avenue M2 site. We noted significant concentration decreases for total suspended solids and total selenium during the 2009/2010 monitoring period. Four samples

were collected from Willow Creek because the stream was dry for two of the sampling events. The extended dry period for Willow Creek is unusual in that on only two other occasions since 1997 could samples not be collected due to lack of flow.

The chemical oxygen demand increased slightly at the Amazon Creek at 29th Avenue M2 site, from an historical average of 8 mg/L to 14 mg/L during the 2009/2010 monitoring period. A slight decrease was observed for total Kjeldahl nitrogen.

At the remaining downstream Amazon basin monitoring sites, including Amazon Creek at the railroad crossing, Amazon Diversion Channel, A3 Channel, and Amazon Creek at Royal Avenue, the concentrations for multiple metals in ambient samples collected during the 2009/2010 monitoring period are commonly a fraction of historical averages. Particularly noteworthy is the A3 Channel at Terry Street site where a large number of analyte concentrations are significantly less than historical averages. These include arsenic, cadmium, chromium, lead, mercury, nickel, silver biochemical oxygen demand, ortho phosphorus, and total suspended solids.

Other sites having lower concentrations of metals compared to historical averages include Amazon Creek at both the railroad crossing and at Terry Street, and the Amazon Diversion Channel at Royal Avenue. The reference site at Willow Creek also has statistically lower concentrations of selenium and suspended solids compared to historical data.

Willamette River Sites

Analyte comparisons summarized in Table A-10 in Appendix A show that all four Willamette River monitoring sites have recent analyte averages that differ from historical means. Overall, 15 of 18 analytes show statistically significant decreases.

Water quality results for monitoring sites on the Willamette River show a modest number of analytes whose concentrations were lower during the 2009/2010 monitoring period than historical averages. While this is in contrast to the large number of analytes showing concentration decreases for the previous permit year – 35 of 36 analytes – continued progress in reducing pollutant concentrations to MS4 receiving water bodies is being achieved. Fecal Coliform counts are lower at the three upstream Willamette River monitoring sites, and at Delta Ponds; likewise concentrations for a few metals, nutrients, and dissolved solids are lower than historical data. At the Delta Ponds monitoring site, a greater number of analytes were found to have concentrations that are statistically lower than historical averages. Concentrations of total and dissolved molybdenum and nickel, field pH, suspended solids, as well as fecal Coliform, decreased for the 2009/2010 monitoring period; a slight increase in total chromium is observed at Delta Ponds. Small increases in chemical oxygen demand and field pH are also observed upstream of the urban growth boundary.

The number of analytes showing lower concentrations for the monitoring period comprises a small portion of the overall number of analytes in the water quality monitoring program; however, the concentration trends described above and the comparison of recent water quality data to historical data are good indicators that BMPs applied in the permit area are effective and

have resulted in measurable pollutant decreases in receiving water bodies, including many pollutants on the state's 303(d) list.

Intra-Basin Water Quality Differences

In addition to temporal changes in water quality, intra-basin differences are of interest in that water quality comparisons are made between an upstream and downstream monitoring site. The Mann-Whitney test statistic is used here to assess water quality differences between any two sites within the same stream basin. 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 historical data set for each monitoring location, including the data recently acquired in 2009/2010. Table A-13 and A-14 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-15 and A-16.

Amazon Basin Monitoring Locations

Included in the analysis is a comparison of the 29th Avenue M2 site on Amazon Creek and the site on Willow Creek (see Figure 4-5), streams which originate in the same low hills south of Eugene but drain different sub-basins.

The concentration of metals, nutrients and bacteria were found to be higher in Amazon Creek at the 29th Avenue site in comparison to Willow Creek. Of the 41 water quality analytes monitored, the concentrations of 16 analytes were found to be statistically higher in Amazon Creek at the 29th Avenue site, including total and dissolved chromium, copper, lead, molybdenum, and zinc, E. coli, fecal Coliform, nitrate+nitrite as nitrogen, ortho and total phosphorus, and field pH.

Table 4-5 Intra-Basin Water Quality Comparison of Willow Creek and Amazon Creek Using Mann-Whitney Statistic [1]			
Analyte	**Units**	**Willow Creek**	**Amazon Creek at 29th Avenue**
Chromium – Total	(*µg/L*)	0.909	1.53
Chromium – Dissolved		0.364	0.721
Copper – Total		2.24	3.26
Copper – Dissolved		1.21	1.68
Lead – Total		0.276	0.628
Lead – Dissolved		0.0219	0.0359
Molybdenum – Total		0.128	0.282
Molybdenum – Dissolved		0.143	0.284
Zinc – Total		5.71	20.7
Zinc – Dissolved		3.28	11.1
Escherichia coli	(*Col./100 mL*)	109	929
Fecal Coliform		72	271
Nitrate+Nitrite – as Nitrogen	(*mg/L*)	<0.05	0.31
Phosphorus – Ortho		0.02	0.05
Phosphorus – Total		0.06	0.10
Field pH	(*Units*)	7.0	7.5

[1] Mann-Whitney test statistic comparisons significant at $\alpha = 0.05$.
Shaded cells indicate the higher analyte concentration in the comparison.

Relative percent differences for the average total lead concentration is 87% greater at the Amazon Creek site and 110% for both total and dissolved zinc. Mean concentrations for the other metals range from about 30 to 50% greater than that measured at the Willow Creek site. Nutrients and bacteria are also greater at the 29th Avenue site; fecal Coliform and *Escherichia coli* averages are 4 and 8 times greater than, respectively, bacteria counts observed at Willow Creek. Ortho and total phosphorus, NO_3+NO_2, and pH are also slightly greater 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 4-5 above.

Comparing water quality data for Amazon Creek at the Railroad Tracks and Amazon Diversion Channel – sites downstream of the Amazon Creek at 29th Avenue site – we find, in general, that metals, oxygen demand, temperature, total phosphorus, TKN, TSS and turbidity values increase downstream. Dissolved oxygen, E. coli, fecal Coliform, NO_3+NO_2, ortho phosphorus, and dissolved zinc values, tend to decrease at the respective downstream monitoring site. The 29th Avenue site is the uppermost monitoring location on Amazon Creek, followed by Amazon Creek at the Railroad Crossing and the Amazon Diversion Channel at Royal Avenue. The A3 Channel at Terry Street drains into the lower Amazon Creek (see Figure 4-5). There are a few notable exceptions:

- A3 Channel at Terry Street (upstream) compared to Amazon Creek at Royal Avenue (downstream)
    - 22 of 24 analytes having statistically significant difference have historical averages that are greatest upstream at the Terry Street site, including BOD, COD, hardness (calcium and magnesium), conductivity, TDS, ortho and total phosphorus, NO_3+NO_2, and TKN; metals include total and dissolved cadmium, molybdenum, nickel and zinc, and total copper, lead and mercury.
    - Ammonia and dissolved mercury concentrations were greater downstream at the Amazon Creek Royal Avenue site.
- Amazon Creek at 29th Avenue (upstream) compared to Amazon Creek at Railroad Track Crossing (downstream)
    - 10 of 29 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 DO, hardness (calcium and magnesium), pH, ortho phosphorus, NO_3+NO_2, and *E. coli* and fecal Coliform.
    - COD, temperature, TSS, 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 – Site M2 – at 29th Avenue (upstream) compared to Amazon Diversion Channel at Royal Avenue (downstream)
    - 24 of 30 analytes having statistically significant difference have historical averages that are greatest upstream at the Amazon Creek at 29th Avenue site. Dissolved zinc is greatest upstream, as are DO, NO_3+NO_2, ortho phosphorus, *E. coli* and fecal Coliform, and temperature.

- Total and dissolved arsenic, cadmium, copper, lead, molybdenum, nickel, and total chromium, mercury, selenium, and silver have higher average concentrations at the downstream monitoring location. Oxygen demand, magnesium, total phosphorus, TKN, TSS and turbidity are also greater downstream.

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

  - 4 of 18 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, and *E. coli* and fecal Coliform.

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

Average concentrations for analytes with statistically significant differences are summarized in Appendix A, Tables A-13 and A-14.

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 the water quality changes observed over the river reach extending from upstream of the urban growth boundary to downstream of the Beltline Bridge occur after flowing past the Owosso Bridge. Table 4-6 below summarizes these results and shows that 20 of 20 analytes having statistically significant difference have historical average concentrations that are greatest downstream; metal concentrations increase for total and dissolved arsenic, copper, lead, nickel, and zinc, and total silver. Bacteria counts for *E. coli* and fecal Coliform, as well as hardness (magnesium), dissolved solids and conductivity, NO_3+NO_2 and TKN, and total and ortho phosphorus concentrations also increase downstream.

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

Table 4-6
Comparison of Average Historical Analyte Concentrations
Willamette River
Upstream and Downstream of the Urban Growth Boundary
Using Mann-Whitney Statistic [1]

Analyte	Units	Upstream of UGB (RM 186.9)	Downstream of Beltline Bridge (RM 176.8)
Arsenic – Total	(*µg/L*)	0.266	0.315
Arsenic – Dissolved		0.204	0.253
Copper – Total		0.575	0.784
Copper – Dissolved		0.319	0.450
Lead – Total		0.0803	0.101
Lead – Dissolved		0.00634	0.0191
Nickel – Total		0.305	0.338
Nickel - Dissolved		0.200	0.236
Silver – Total		0.00280	0.00710
Zinc – Total		1.26	1.72
Zinc – Dissolved		0.362	0.971
Escherichia coli	(*col./100 mL*)	22	43
Fecal Coliform		17	37
Nitrate+Nitrite – as Nitrogen	(*mg/L*)	< 0.05	0.11
Total Kjeldahl Nitrogen		< 0.2	0.3
Phosphorus – Ortho		0.02	0.05
Phosphorus – Total		0.03	0.08
Total Dissolved Solids		43	46
Magnesium – Total	(*mg eq $CaCO_3$/L*)	1.5	1.6
Hardness		18	20
Specific Conductance	(*µmhos/cm*)	47	53

[1] Mann-Whitney test statistic comparisons significant at $\alpha = 0.05$.
Shaded cells indicate analyte value at downstream monitoring site > upstream site.

Between the Knickerbocker Bridge and the Owosso Bridge, the concentration of total lead is the only analyte to increase over the stream reach.

Between the Owosso Bridge and the site downstream of Beltline Bridge above the McKenzie River confluence, 10 of 11 analytes were found to have statistically significant values greater at the downstream monitoring location, including total and dissolved copper and zinc, dissolved lead, conductivity, NO_3+NO_2, TKN, and ortho and total phosphorus. Slightly higher concentrations of NH_3 are observed upstream at the Owosso Bridge site.

Tables A-13 and A-14 in Appendix A include a summary of all Willamette River monitoring site analytes having statistically significant differences using the Mann-Whitney test statistic; Tables A-15 and A-16 present the full program output.

A final comparison is between Delta Ponds and the Willamette River at the Owosso Bridge. Fifteen of 23 analytes having statistically significant differences are associated with higher concentrations at the Delta Ponds site. Average values for total and dissolved arsenic, nickel and zinc, and dissolved copper and lead, as well as total phosphorus, TKN, TDS, hardness (calcium and magnesium), and conductivity values are also higher for the Delta Pond site. Average DO, ortho phosphorus, TSS, turbidity, pH and, interestingly, total and dissolved mercury and total chromium values were higher in the Willamette River at the Owosso Bridge site.

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 below (Figures 4-36 through 4-52) 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 25th and 75th percentiles. Whiskers extending from the box mark the range of values that fall within 1.5 box-lengths from the 25th or 75th 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 25th 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. The total number of samples in each data set, n, is also indicated.

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. Note that all total and dissolved metals values are grouped together for each analyte. The boxplots provide a means of visually characterizing the data sets in terms of the number of sampling events exceeding the applicable water quality standard. Appendix B (Figures B.1 through B.82) presents boxplots for the entire

historical data set charting each water quality parameter by individual monitoring location. Boxplots also depict applicable Oregon water quality standard for each analyte. 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 the case of arsenic (Figure 4-36), all samples – both total and dissolved fractions – collected from the Amazon Basin and Willamette River monitoring locations exceed the human health criterion, which is 0.0022 μg/L; the highest observed concentrations from Amazon basin sites exceed the standard by almost four orders of magnitude, while data for Willamette River exceed the standard by about two orders of magnitude. 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.

Copper concentrations measured at monitoring sites from both the Amazon Basin and Willamette River (Figure 4-39) are mostly less than the chronic criterion; multiple outliers and extreme values are observed in the Amazon basin data set, exceeding the chronic criteria by up to five times the 4.3 μg/L criterion; values within 1.5 times the 75th percentile as defined by the extent of the whisker also exceeds the criterion (about 7.0 μg/L). One value from the Delta Ponds site at 5.07 μg/L exceeds the criterion.

Most of the stream samples collected from the Amazon Basin also exceed the chronic criterion for lead at 0.15 μg/L (Figure 4-40). In addition, a few extreme values exceed the acute standard of 9.3 μg/L. Only a few outliers and extreme values from the Willamette River sites exceed the chronic criterion.

Mercury concentrations at Amazon Basin sites (Figure 4-41) on occasion exceed the chronic criterion of 0.012 μg/L, consisting primarily of outliers and extreme values, but also values within 1.5 times the 75th percentile as defined by the extent of the whisker (about 0.013 μg/L). At the Willamette River sites a couple of extreme values exceeded the chronic criterion for mercury.

The acute criterion for silver is 0.0029 μg/L and nearly all samples collected from both the Amazon Basin and Willamette River exceed this water quality standard (Figure 4-45) by about two orders of magnitude. A small percentage of the sample values are less than 1.5 times the 25th percentile. Note Figures B.59 and B.60, specifically the monitoring location upstream of the urban growth boundary, which shows that close to 70% of dissolved sample fractions exceed the silver criterion of 0.0034 μg/L, and nearly all samples analyzed for total silver exceed the criterion of 0.0029 μg/L.

Amazon Basin samples occasionally exceed both the chronic criterion for zinc (Figure 4-46), which is 29 μg/L (the acute criterion is 31 μg/L). Exceedances are primarily outliers and extreme values, and some samples at 1.5 times the 75th percentile (about 45 μg/L). No samples collected from the Willamette River sites exceed the criterion for zinc.

Exceedances of non-metal water quality standards are also observed for samples collected from the Amazon Basin and Willamette River. These included DO, bacteria, pH, temperature, and turbidity. Minimum DO criteria are not met at either the Amazon Basin or Willamette River 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 4-47 indicate that over a quarter of samples measured at the Amazon Basin sites 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; however, the values are strong evidence that depleted oxygen conditions 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); nearly half of the samples measured at the Willamette River sites did not meet the 11.0 mg/L minimum DO criterion, though this may be somewhat skewed by the Delta Ponds samples which, on average, have 6 mg/L DO. Boxplots in Figure B.70 indicate that over half of the samples collected from Willamette River sites met the 11.0 mg/L DO criterion during the spawning period but a significant percentage do not. Pollutants transported by stormwater are likely the cause of oxygen depletion through biological and chemical processes.

Escherichia coli counts exceed the criterion of 406 organisms per 100 mL in about 35 percent of samples collected from the Amazon Basin sites (Figure 4-48; see also fecal Coliform in Figure 4-49); no samples from Willamette River sites exceed the criterion although a few extreme values approach the limit. The magnitude of exceedance for outliers and extreme values at the Amazon Basin sites is nearly two orders of magnitude greater than the criterion; the majority of samples are within two times the criterion. Unlike the Amazon Basin sites where bacteria counts tend to decrease downstream, bacteria counts in samples from the Willamette River increase as the river flows through the urban growth area.

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 4-50).

Over half of the samples collected from the Amazon Basin exceed the salmon and trout rearing and migration temperature criterion of 18 ˚C (Figure 4-52), effective over the period of 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 4-51) is applicable to the Willamette River and is effective over the period of October 15th through May 15th; a few samples collected from the four main-stem monitoring sites exceed this criterion.

Figures B.83 through B.88 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; Figure B.83 summarizes subsequent boxplots by compiling the data for each 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. Given that Willow Creek represents baseline water quality conditions it would suggest the model used to develop the turbidity target is conservative. 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 would otherwise occur for an undisturbed stream originating within this basin. Additional efforts will be needed at downstream sites to improve water quality such that it meets the turbidity targets required by DEQ.

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. No statistically significant difference was observed between turbidity values measured at the four monitoring locations on the Willamette River, nor was there a statistically significant difference between the most distal sites compared, that is, upstream and downstream of the Eugene urban growth boundary (see table above). Figure B.76 presents turbidity boxplots for the Willamette River sites.

4.6 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 auditors 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.

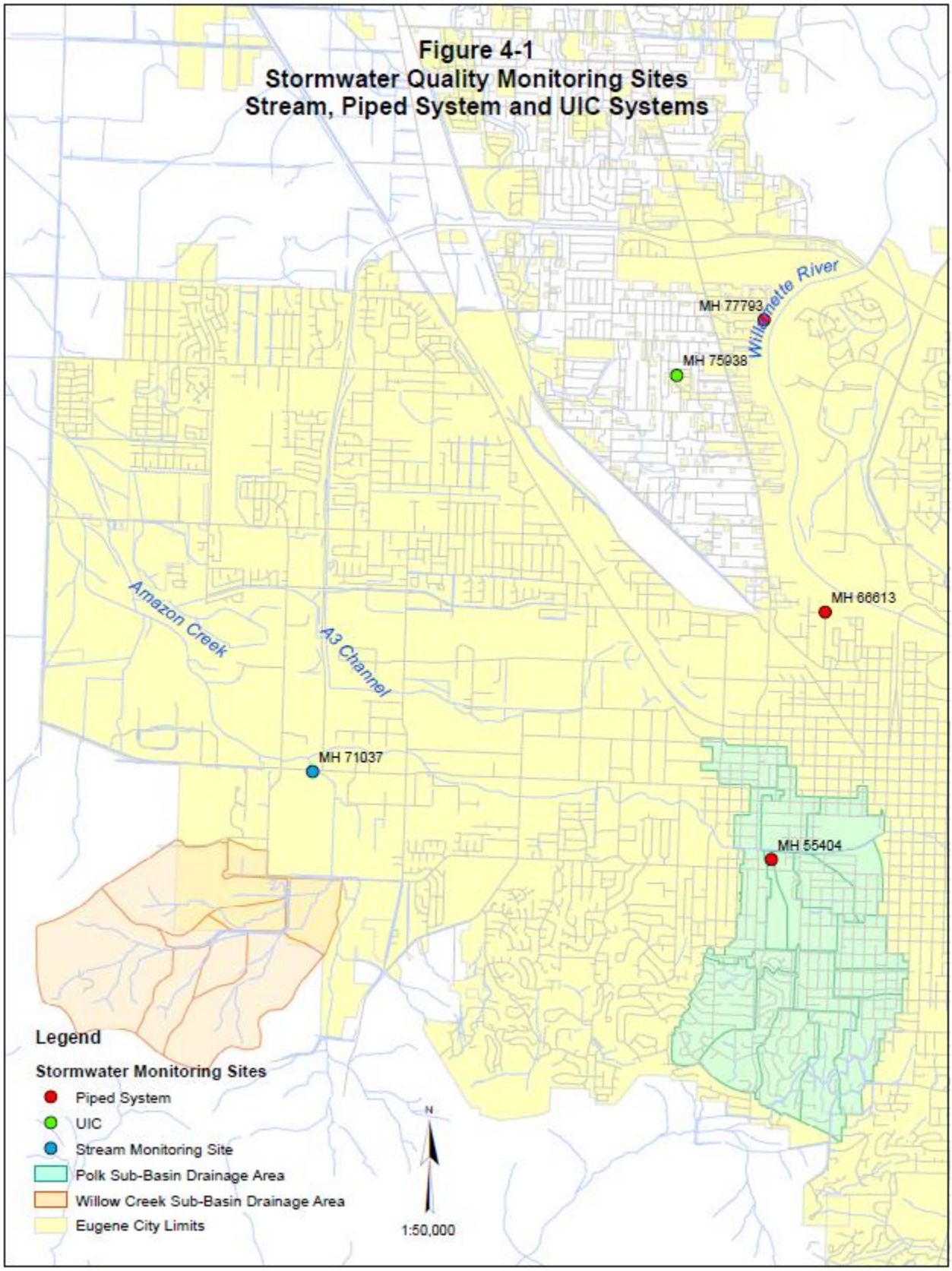


Figure 4-1
Stormwater Quality Monitoring Sites
Stream, Piped System and UIC Systems
Willamette River
MH 77793
MH 75938
MH 66613
Amazon Creek
A3 Channel
MH 71037
MH 55404
Legend
Stormwater Monitoring Sites
Piped System
UIC
Stream Monitoring Site
Polk Sub-Basin Drainage Area
Willow Creek Sub-Basin Drainage Area
Eugene City Limits
N
1:50,000

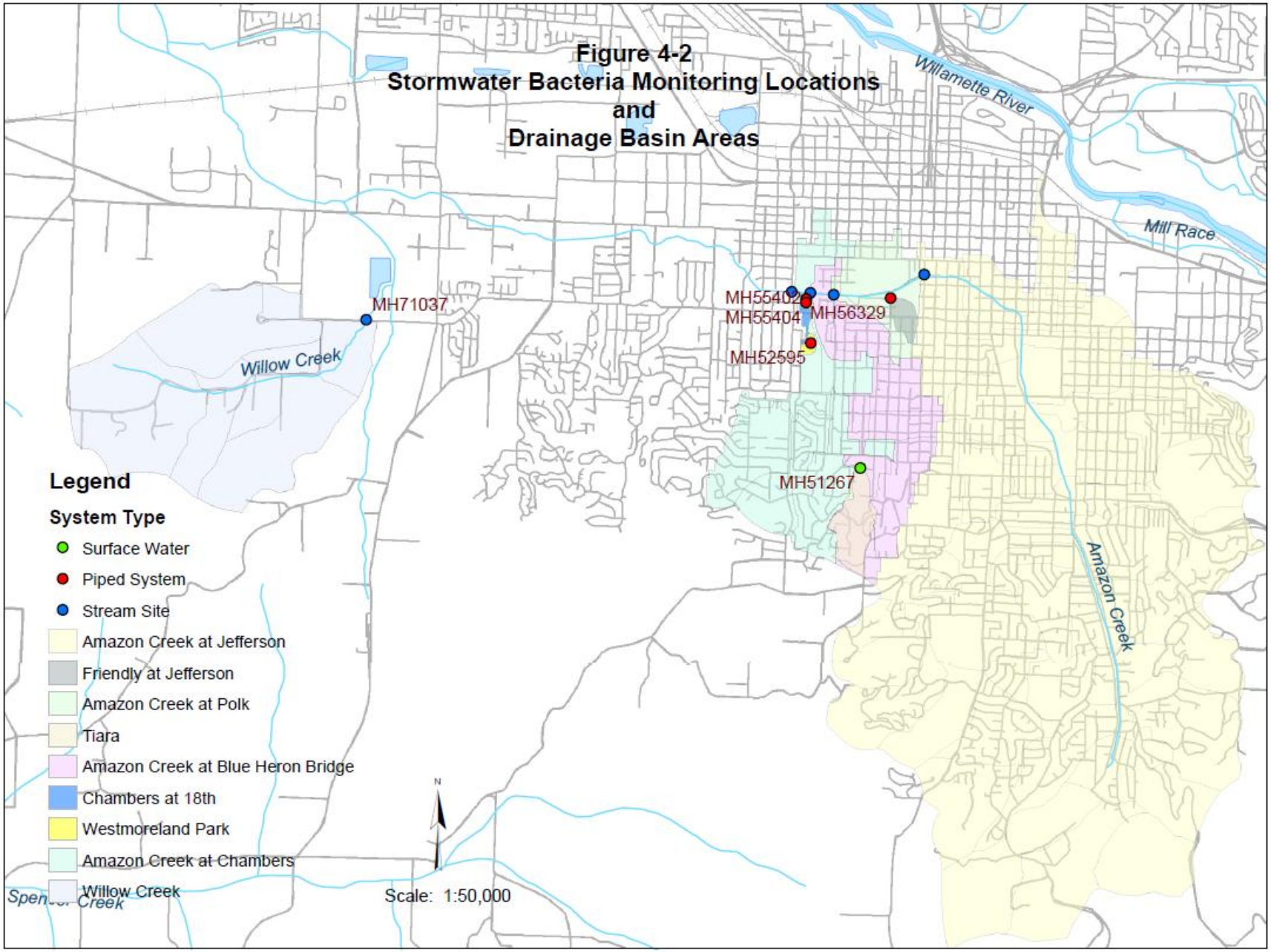


Figure 4-2
Stormwater Bacteria Monitoring Locations
and
Drainage Basin Areas
Willamette River
Mill Race
MH71037
Willow Creek
MH55402
MH55404
MH56329
MH52595
MH51267
Amazon Creek
Legend
System Type
Surface Water
Piped System
Stream Site
Amazon Creek at Jefferson
Friendly at Jefferson
Amazon Creek at Polk
Tiara
Amazon Creek at Blue Heron Bridge
Chambers at 18th
Westmoreland Park
Amazon Creek at Chambers
Willow Creek
N
Scale: 1:50,000

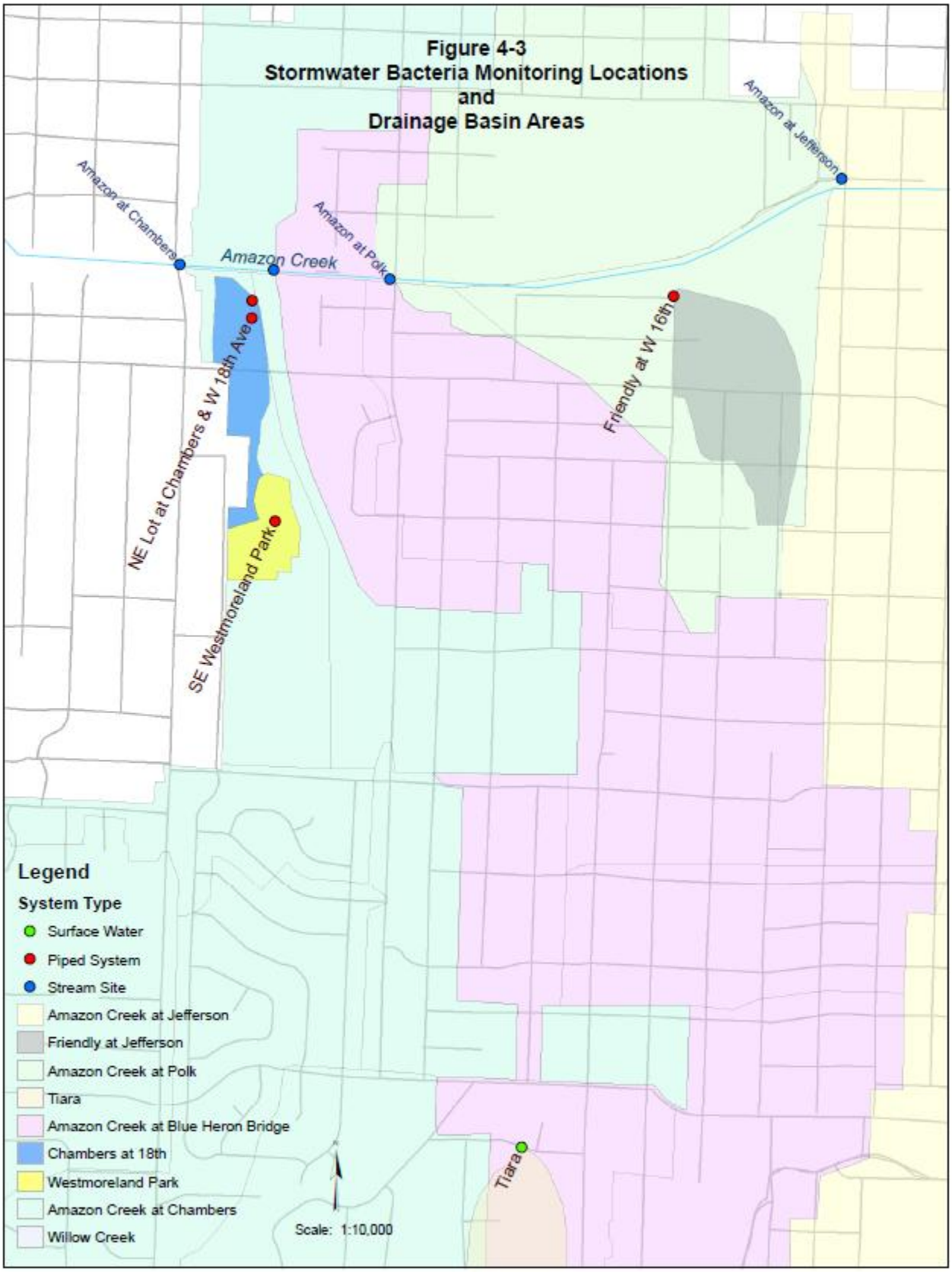
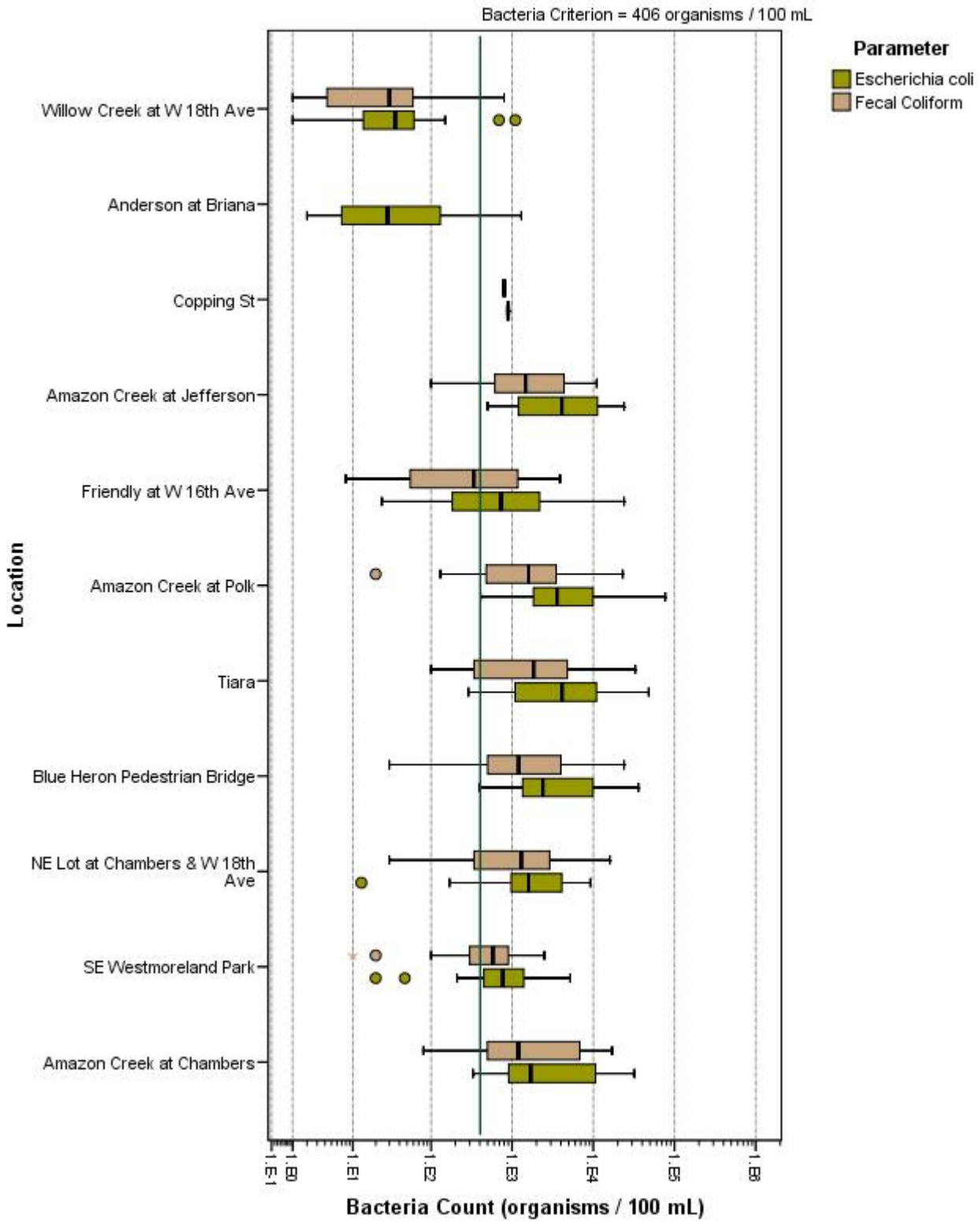


Figure 4-3
Stormwater Bacteria Monitoring Locations
and
Drainage Basin Areas
Amazon at Jefferson
Amazon at Chambers
Amazon at Polk
Amazon Creek
Friendly at W 16th
NE Lot at Chambers & W 18th Ave
SE Westmoreland Park
Tiara
Legend
System Type
Surface Water
Piped System
Stream Site
Amazon Creek at Jefferson
Friendly at Jefferson
Amazon Creek at Polk
Tiara
Amazon Creek at Blue Heron Bridge
Chambers at 18th
Westmoreland Park
Amazon Creek at Chambers
Willow Creek
Scale: 1:10,000

Figure 4-4

Boxplots for Bacteria in Stormwater and Surface Water



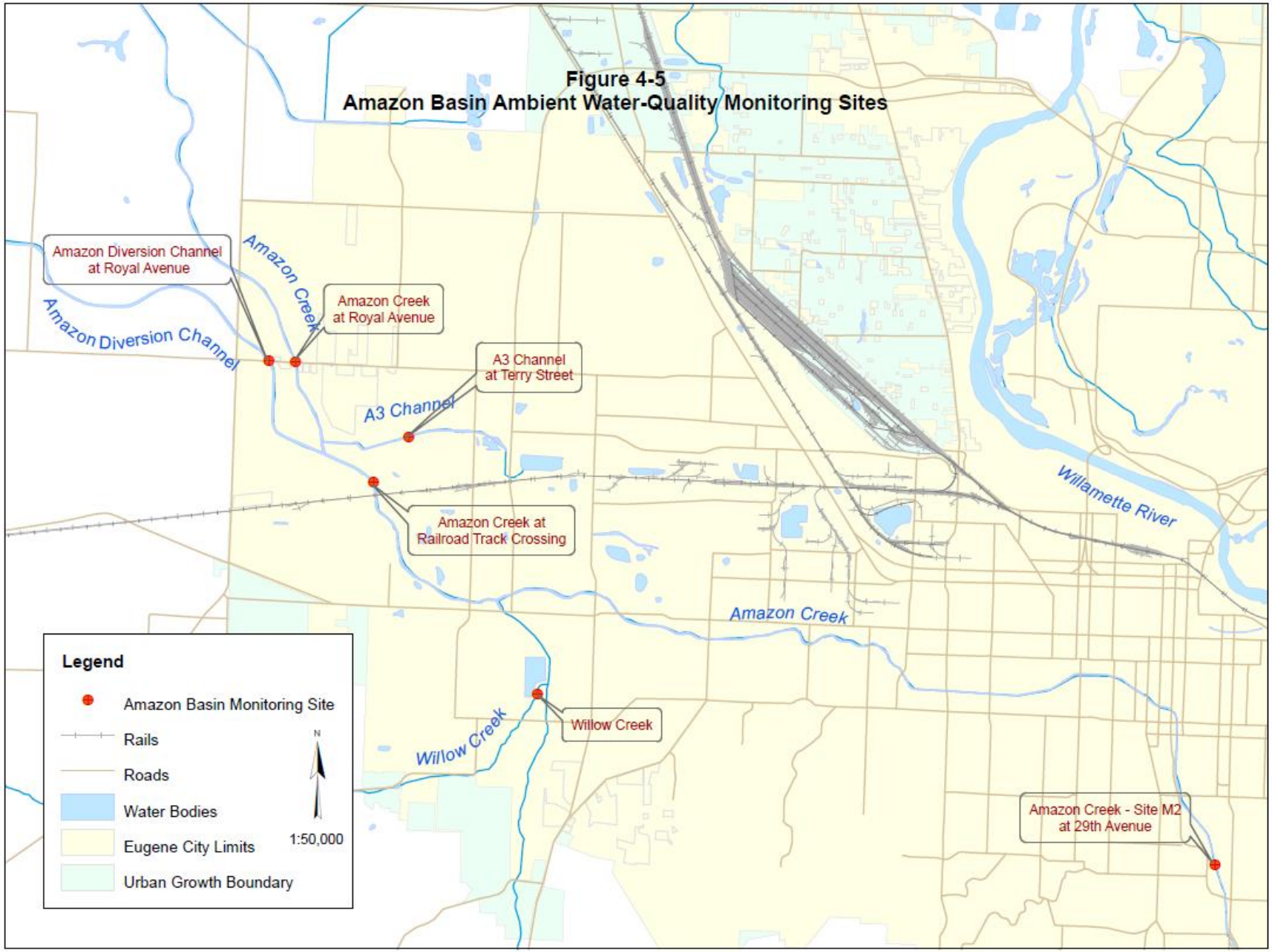


Figure 4-5
Amazon Basin Ambient Water-Quality Monitoring Sites

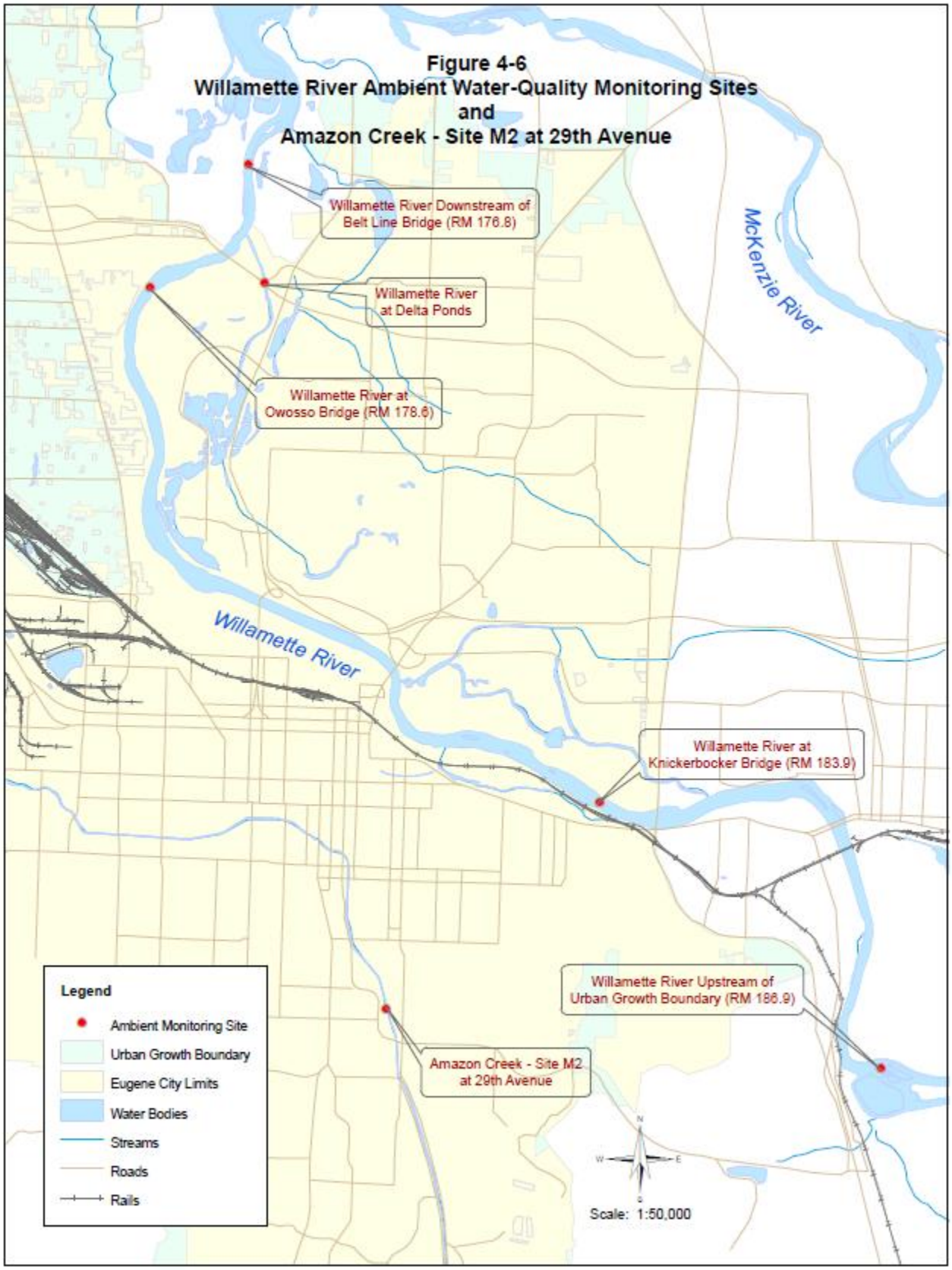


Figure 4-6
Willamette River Ambient Water-Quality Monitoring Sites
and
Amazon Creek - Site M2 at 29th Avenue
Willamette River Downstream of Belt Line Bridge (RM 176.8)
Willamette River at Delta Ponds
Willamette River at Owosso Bridge (RM 178.6)
McKenzie River
Willamette River
Willamette River at Knickerbocker Bridge (RM 183.9)
Willamette River Upstream of Urban Growth Boundary (RM 186.9)
Amazon Creek - Site M2 at 29th Avenue
Legend
Ambient Monitoring Site
Urban Growth Boundary
Eugene City Limits
Water Bodies
Streams
Roads
Rails
Scale: 1:50,000

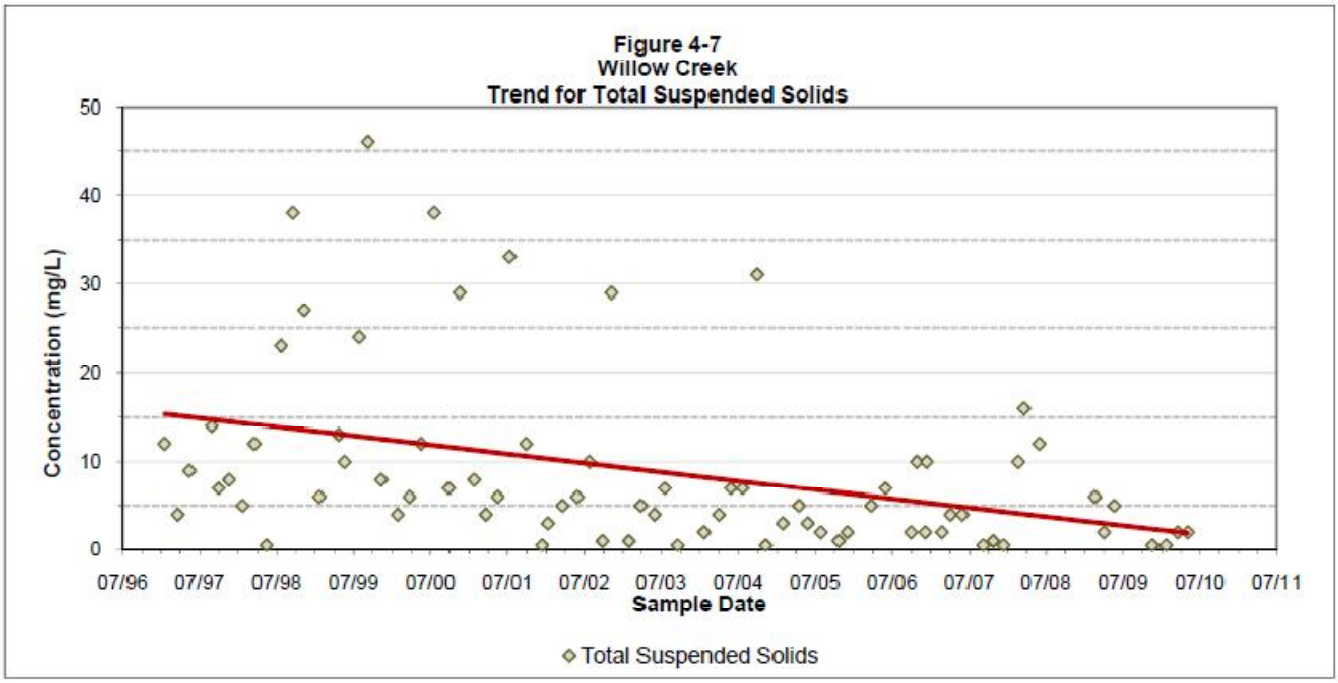


Figure 4-7
Willow Creek
Trend for Total Suspended Solids
Concentration (mg/L)
50
40
30
20
10
0
07/96
07/97
07/98
07/99
07/00
07/01
07/02
07/03
07/04
07/05
07/06
07/07
07/08
07/09
07/10
07/11
Sample Date
Total Suspended Solids

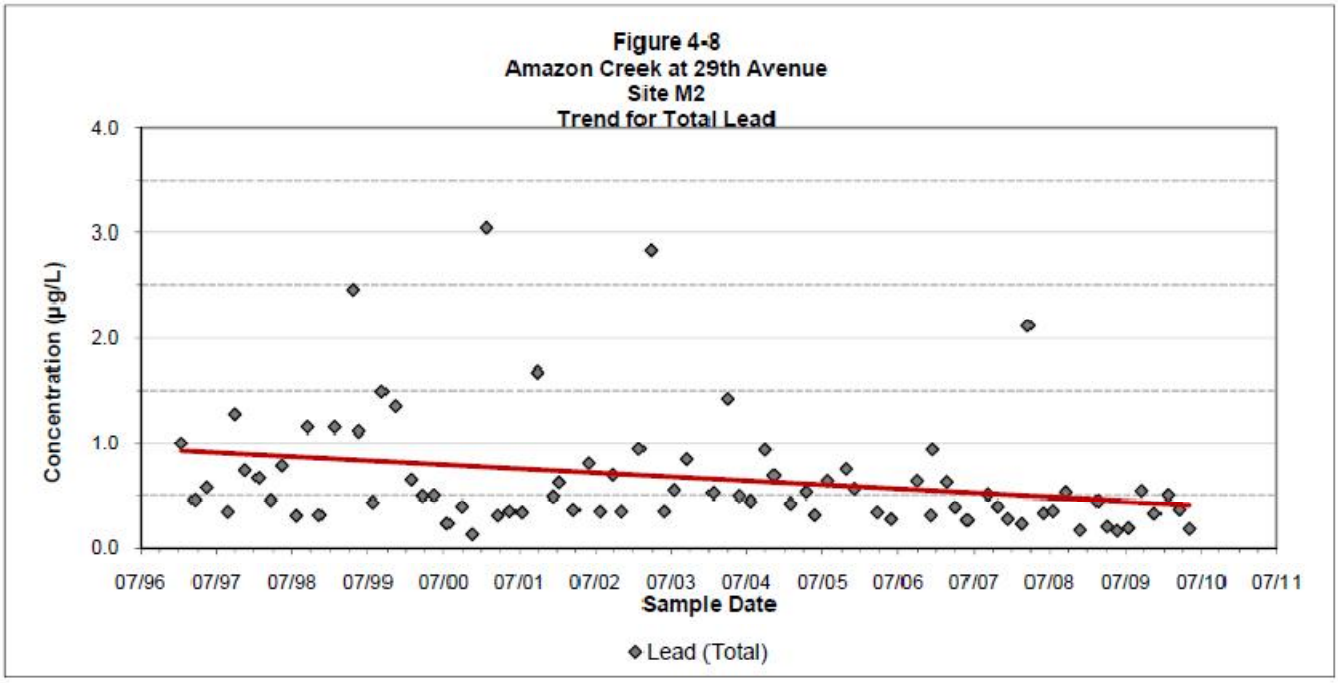


Figure 4-8
Amazon Creek at 29th Avenue
Site M2
Trend for Total Lead
Concentration (µg/L)
4.0
3.0
2.0
1.0
0.0
07/96
07/97
07/98
07/99
07/00
07/01
07/02
07/03
07/04
07/05
07/06
07/07
07/08
07/09
07/10
07/11
Sample Date
Lead (Total)

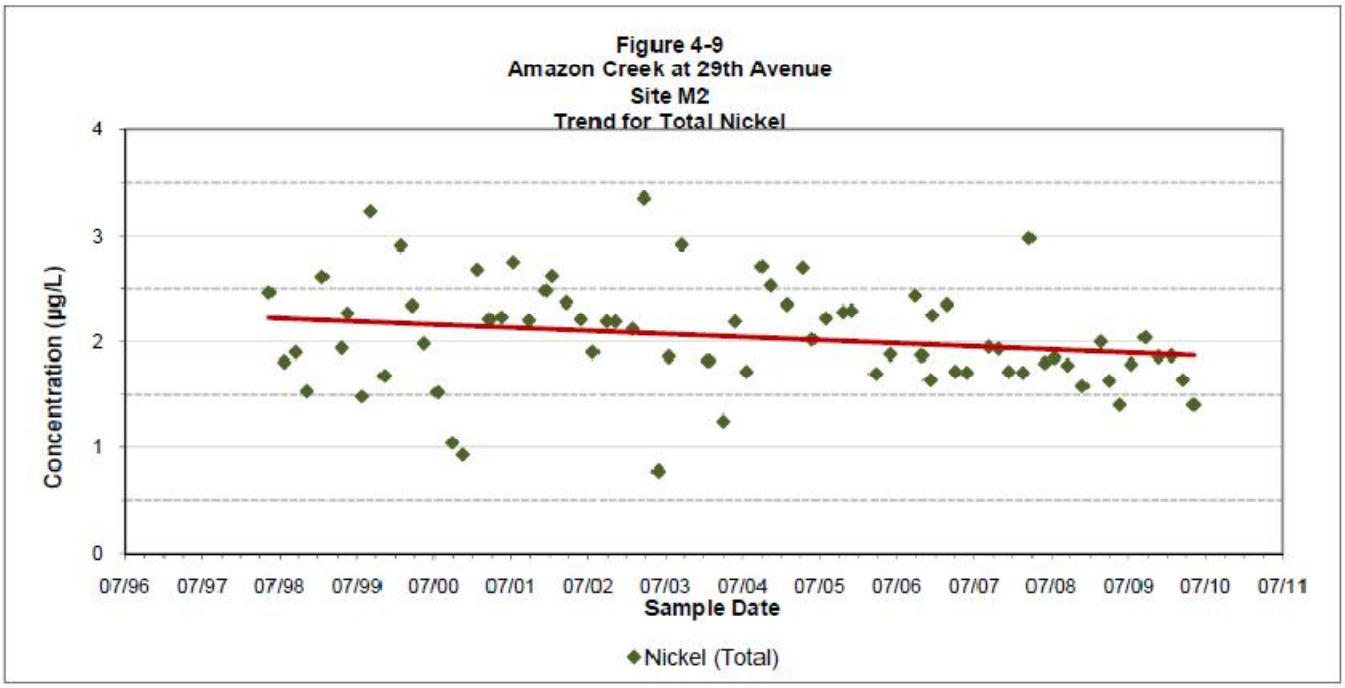


Figure 4-9
Amazon Creek at 29th Avenue
Site M2
Trend for Total Nickel
Concentration (µg/L)
0
1
2
3
4
07/96
07/97
07/98
07/99
07/00
07/01
07/02
07/03
07/04
07/05
07/06
07/07
07/08
07/09
07/10
07/11
Sample Date
Nickel (Total)

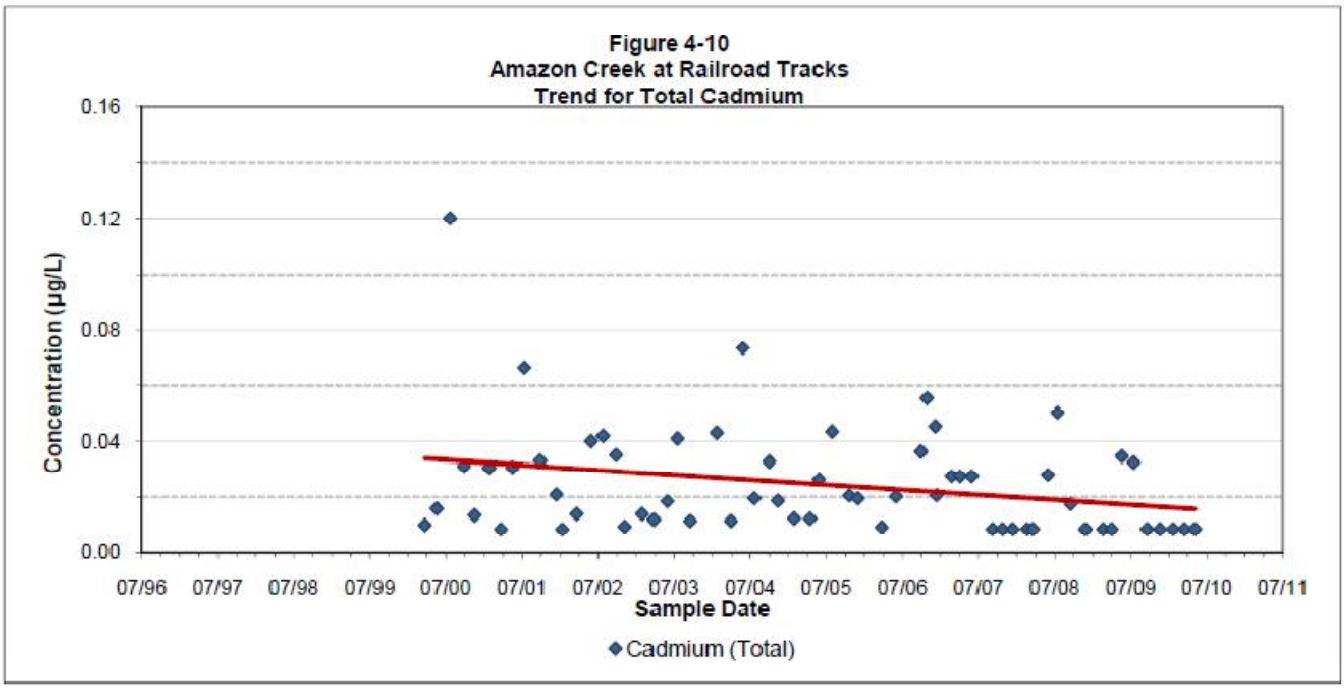


Figure 4-10
Amazon Creek at Railroad Tracks
Trend for Total Cadmium
Concentration (µg/L)
0.00
0.04
0.08
0.12
0.16
07/96
07/97
07/98
07/99
07/00
07/01
07/02
07/03
07/04
07/05
07/06
07/07
07/08
07/09
07/10
07/11
Sample Date
Cadmium (Total)

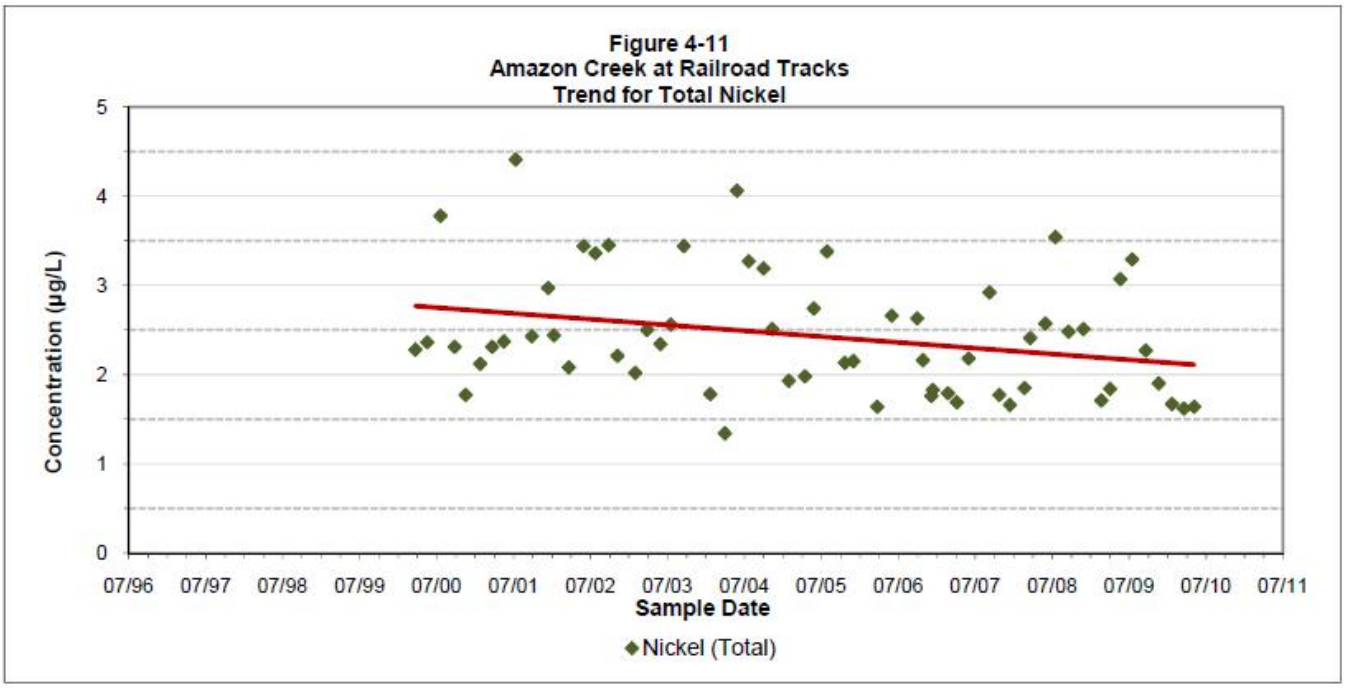


Figure 4-11
Amazon Creek at Railroad Tracks
Trend for Total Nickel
Concentration (µg/L)
0
1
2
3
4
5
07/96
07/97
07/98
07/99
07/00
07/01
07/02
07/03
07/04
07/05
07/06
07/07
07/08
07/09
07/10
07/11
Sample Date
Nickel (Total)

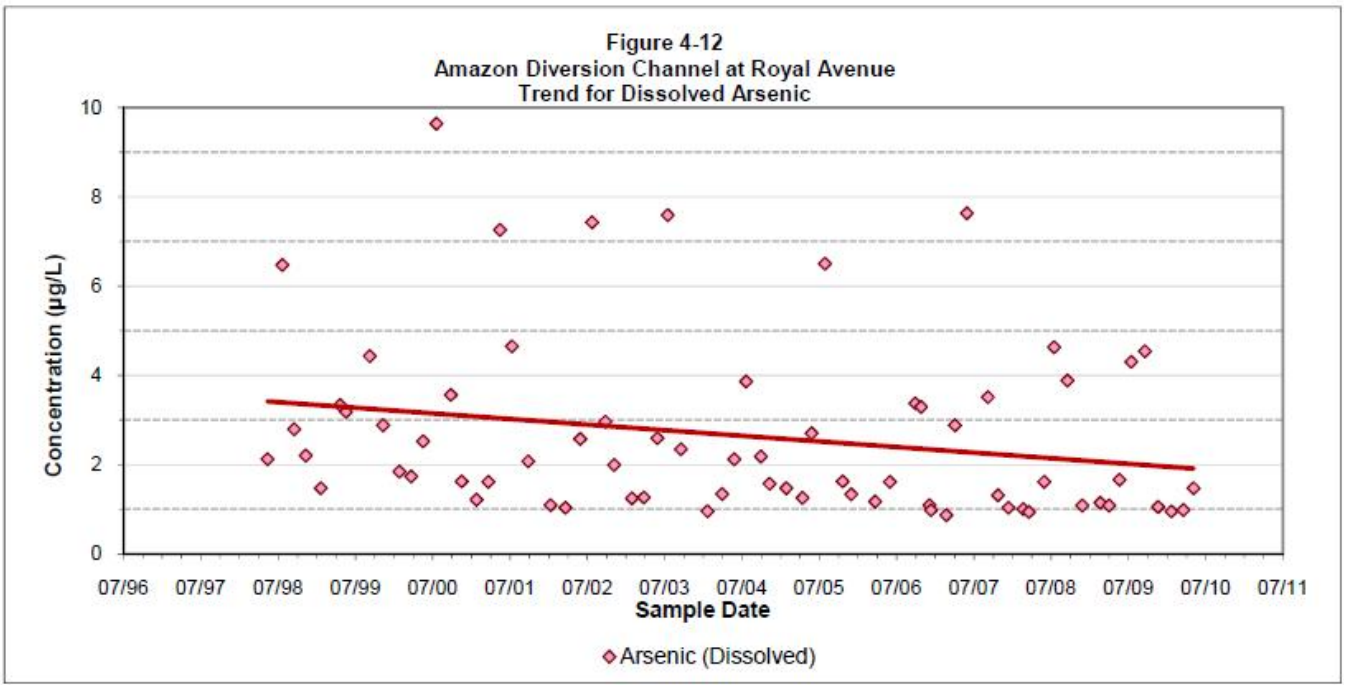


Figure 4-12
Amazon Diversion Channel at Royal Avenue
Trend for Dissolved Arsenic
Concentration (µg/L)
0
2
4
6
8
10
07/96
07/97
07/98
07/99
07/00
07/01
07/02
07/03
07/04
07/05
07/06
07/07
07/08
07/09
07/10
07/11
Sample Date
Arsenic (Dissolved)

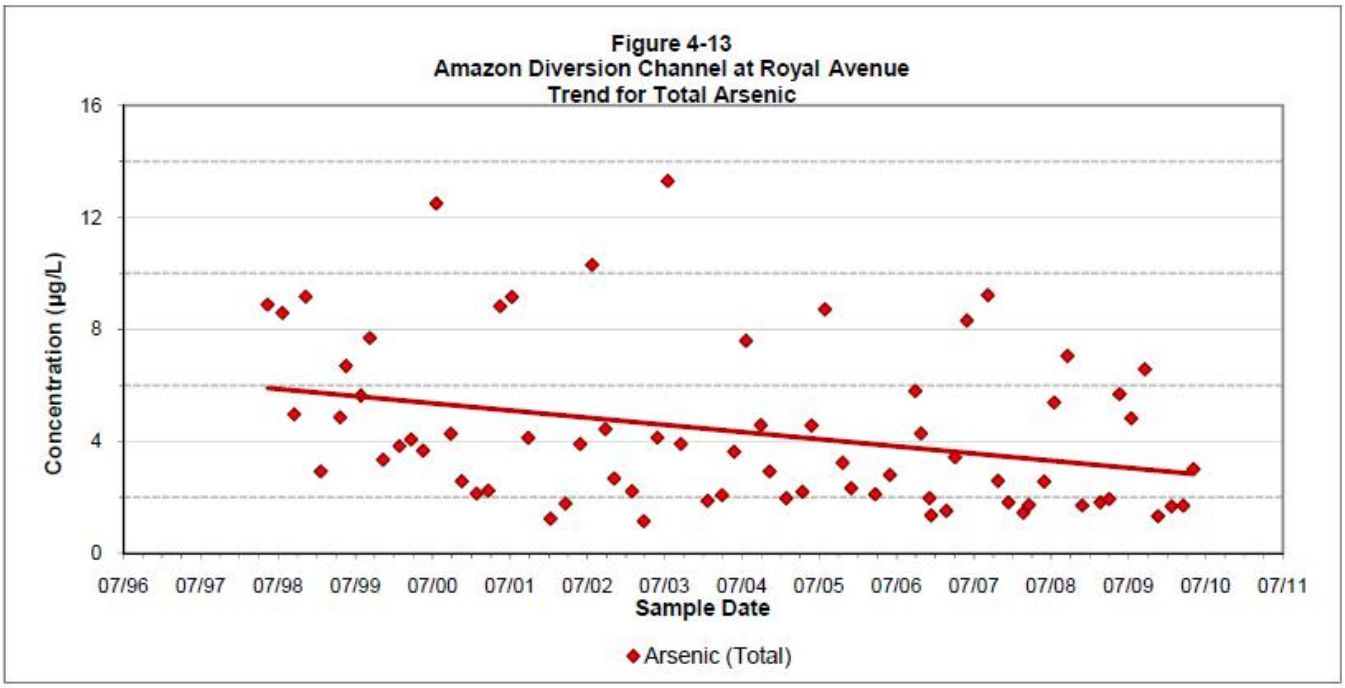


Figure 4-13
Amazon Diversion Channel at Royal Avenue
Trend for Total Arsenic
Concentration (µg/L)
16
12
8
4
0
07/96
07/97
07/98
07/99
07/00
07/01
07/02
07/03
07/04
07/05
07/06
07/07
07/08
07/09
07/10
07/11
Sample Date
Arsenic (Total)

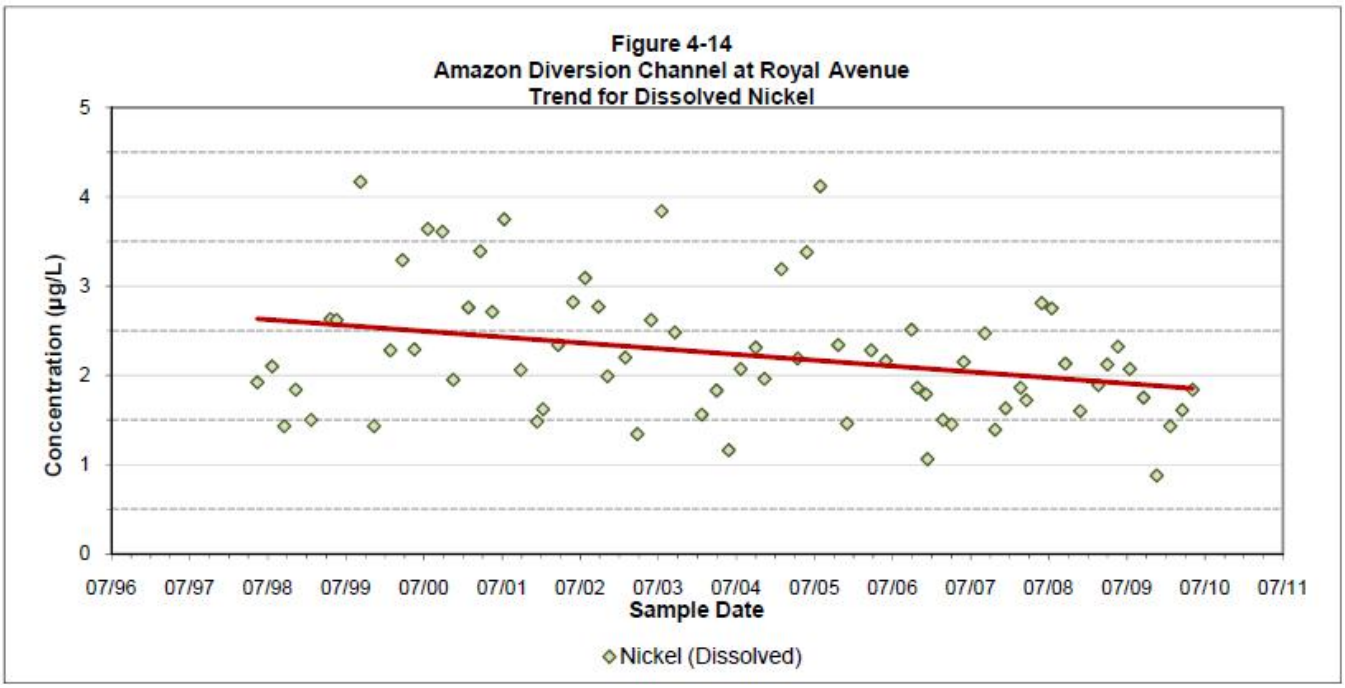


Figure 4-14
Amazon Diversion Channel at Royal Avenue
Trend for Dissolved Nickel
Concentration (µg/L)
5
4
3
2
1
0
07/96
07/97
07/98
07/99
07/00
07/01
07/02
07/03
07/04
07/05
07/06
07/07
07/08
07/09
07/10
07/11
Sample Date
Nickel (Dissolved)

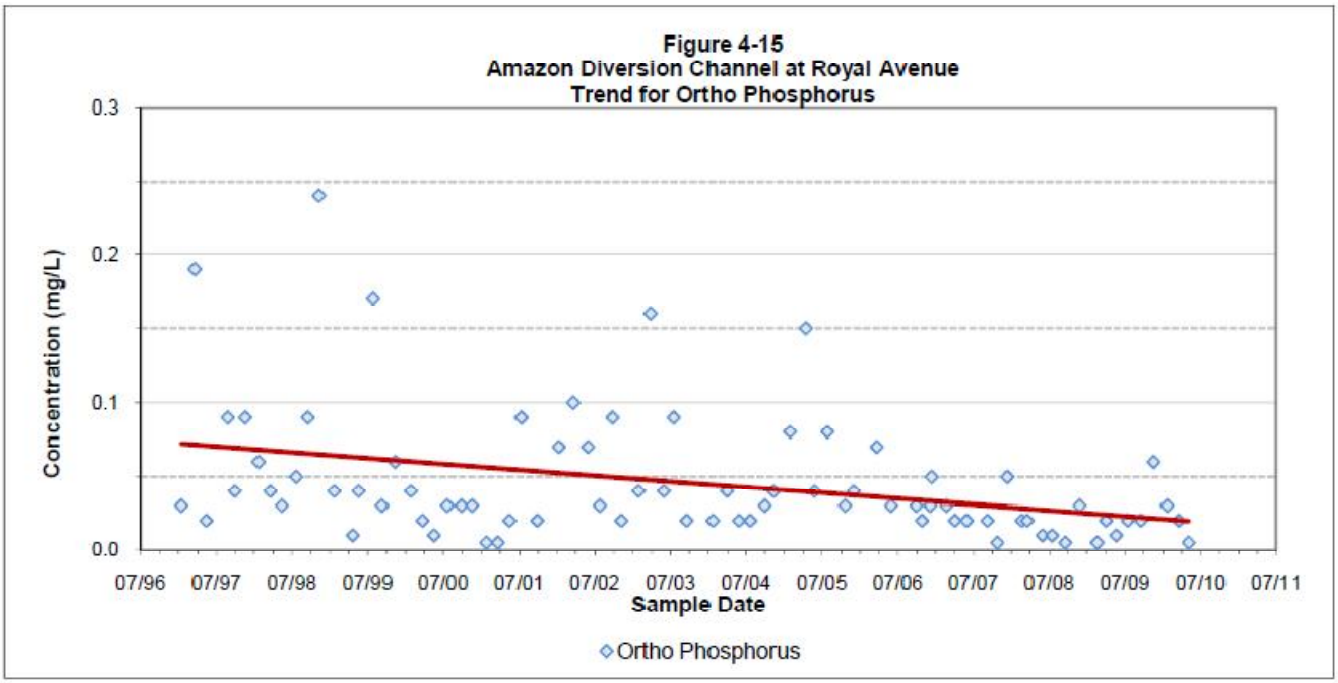


Figure 4-15
Amazon Diversion Channel at Royal Avenue
Trend for Ortho Phosphorus
Concentration (mg/L)
0.3
0.2
0.1
0.0
07/96
07/97
07/98
07/99
07/00
07/01
07/02
07/03
07/04
07/05
07/06
07/07
07/08
07/09
07/10
07/11
Sample Date
Ortho Phosphorus

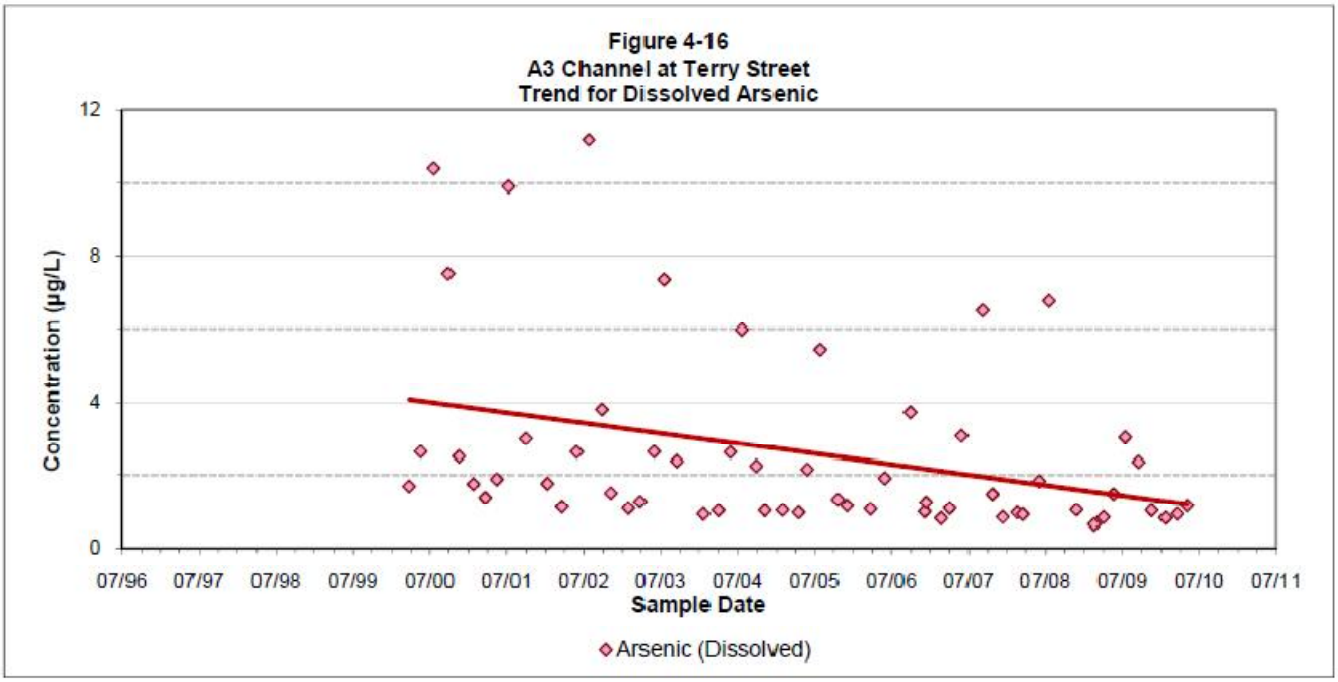


Figure 4-16
A3 Channel at Terry Street
Trend for Dissolved Arsenic
Concentration (µg/L)
12
8
4
0
07/96
07/97
07/98
07/99
07/00
07/01
07/02
07/03
07/04
07/05
07/06
07/07
07/08
07/09
07/10
07/11
Sample Date
Arsenic (Dissolved)

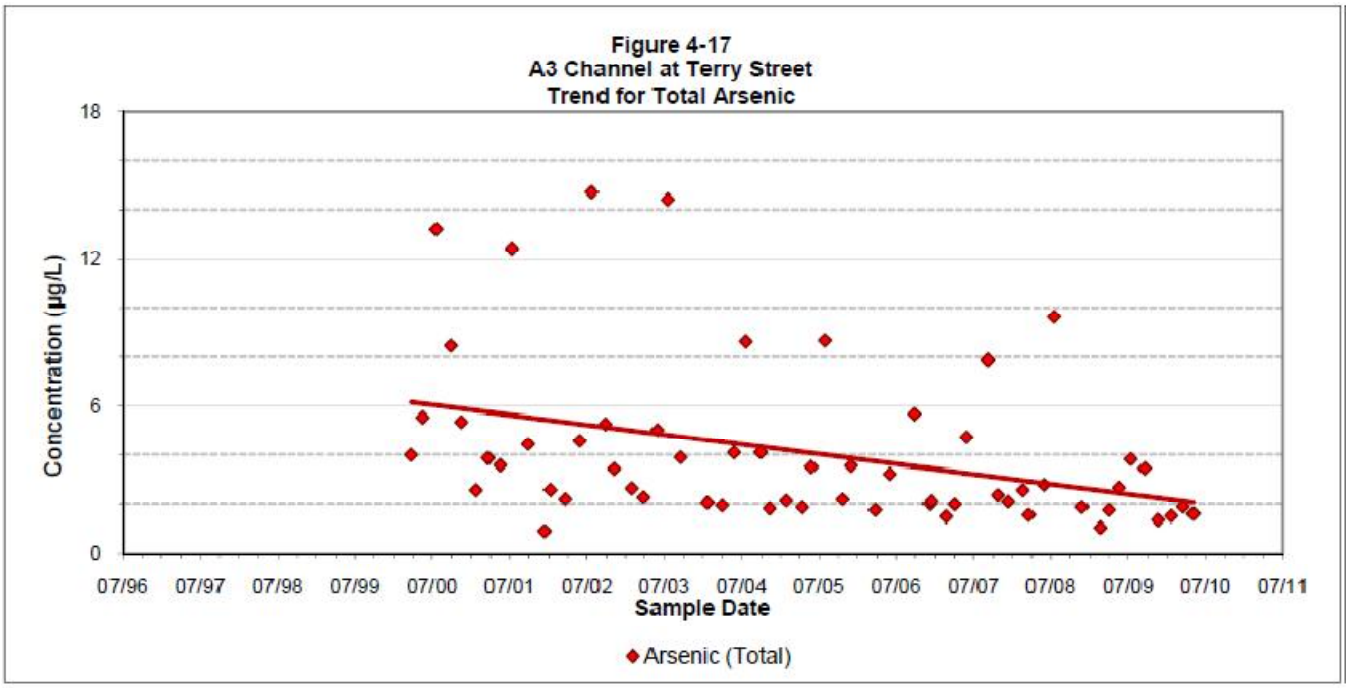


Figure 4-17
A3 Channel at Terry Street
Trend for Total Arsenic
Concentration (µg/L)
18
12
6
0
07/96
07/97
07/98
07/99
07/00
07/01
07/02
07/03
07/04
07/05
07/06
07/07
07/08
07/09
07/10
07/11
Sample Date
Arsenic (Total)

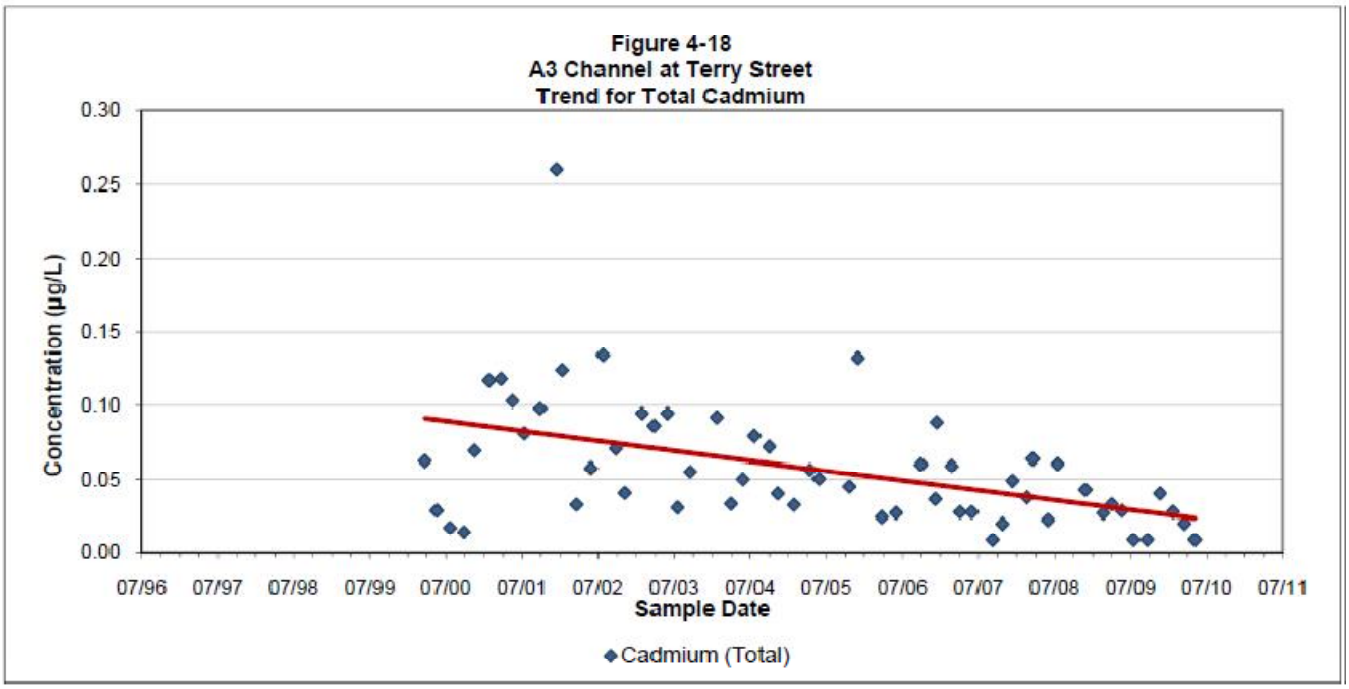


Figure 4-18
A3 Channel at Terry Street
Trend for Total Cadmium
Concentration (µg/L)
0.30
0.25
0.20
0.15
0.10
0.05
0.00
07/96
07/97
07/98
07/99
07/00
07/01
07/02
07/03
07/04
07/05
07/06
07/07
07/08
07/09
07/10
07/11
Sample Date
Cadmium (Total)

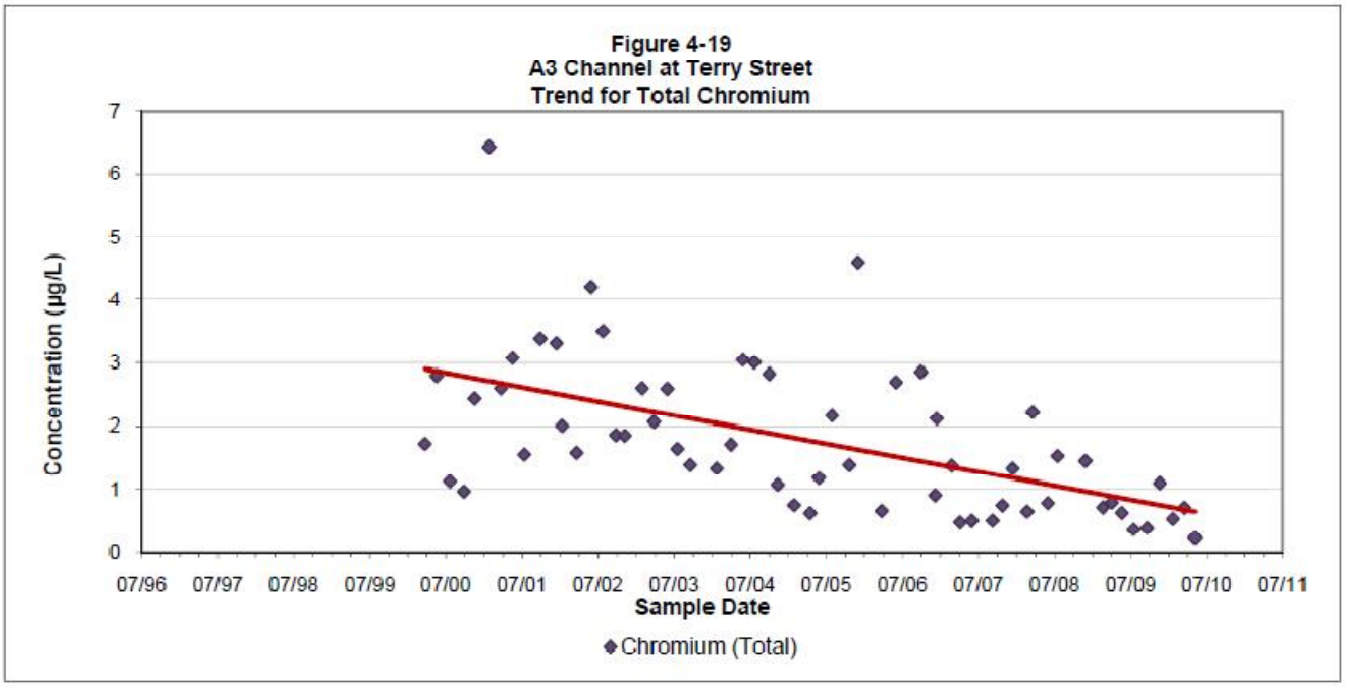


Figure 4-19
A3 Channel at Terry Street
Trend for Total Chromium
Concentration (µg/L)
0
1
2
3
4
5
6
7
07/96
07/97
07/98
07/99
07/00
07/01
07/02
07/03
07/04
07/05
07/06
07/07
07/08
07/09
07/10
07/11
Sample Date
Chromium (Total)

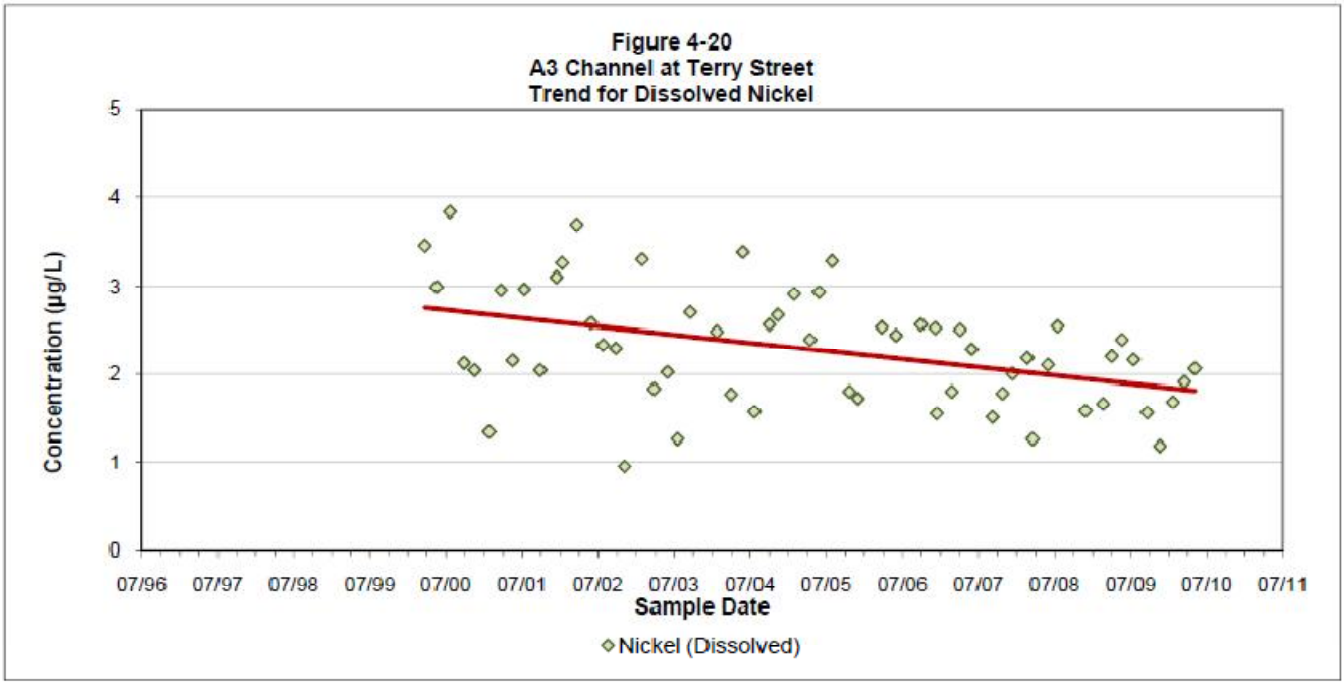


Figure 4-20
A3 Channel at Terry Street
Trend for Dissolved Nickel
Concentration (µg/L)
0
1
2
3
4
5
07/96
07/97
07/98
07/99
07/00
07/01
07/02
07/03
07/04
07/05
07/06
07/07
07/08
07/09
07/10
07/11
Sample Date
Nickel (Dissolved)

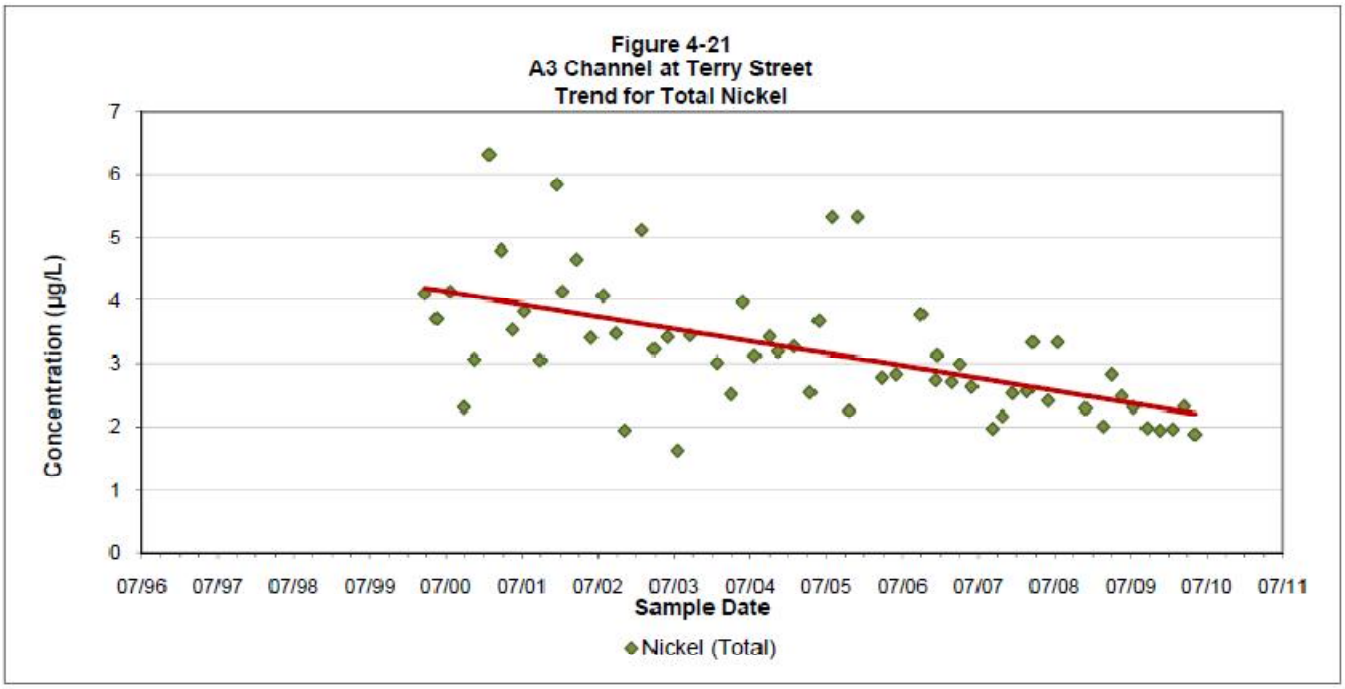


Figure 4-21
A3 Channel at Terry Street
Trend for Total Nickel
Concentration (µg/L)
0
1
2
3
4
5
6
7
07/96
07/97
07/98
07/99
07/00
07/01
07/02
07/03
07/04
07/05
07/06
07/07
07/08
07/09
07/10
07/11
Sample Date
Nickel (Total)

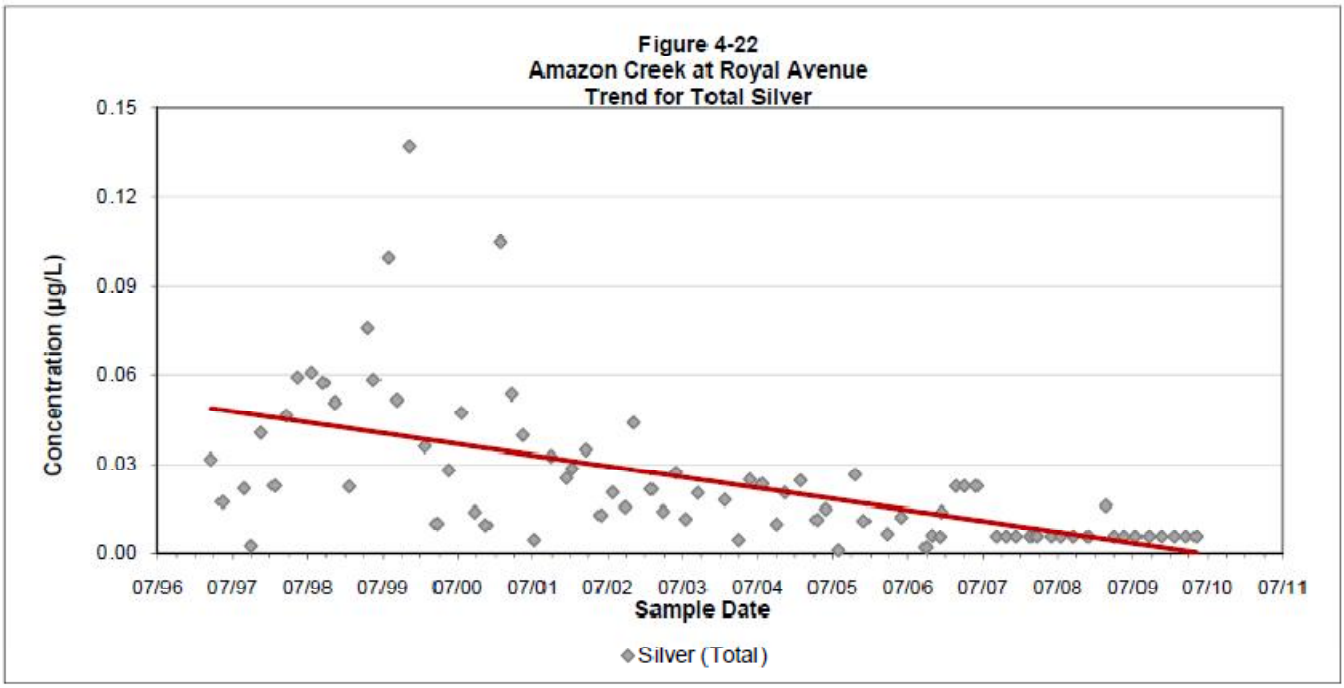


Figure 4-22
Amazon Creek at Royal Avenue
Trend for Total Silver
Concentration (µg/L)
0.00
0.03
0.06
0.09
0.12
0.15
07/96
07/97
07/98
07/99
07/00
07/01
07/02
07/03
07/04
07/05
07/06
07/07
07/08
07/09
07/10
07/11
Sample Date
Silver (Total)

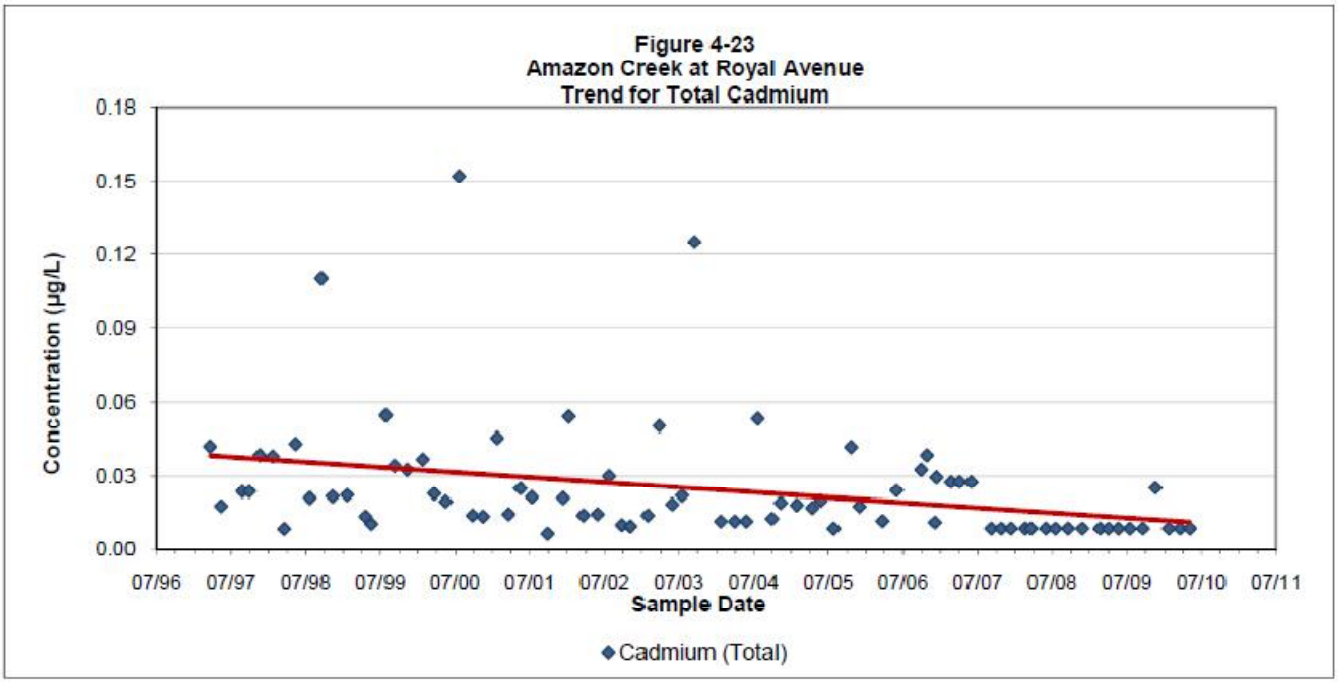


Figure 4-23
Amazon Creek at Royal Avenue
Trend for Total Cadmium
Concentration (µg/L)
0.18
0.15
0.12
0.09
0.06
0.03
0.00
07/96
07/97
07/98
07/99
07/00
07/01
07/02
07/03
07/04
07/05
07/06
07/07
07/08
07/09
07/10
07/11
Sample Date
Cadmium (Total)

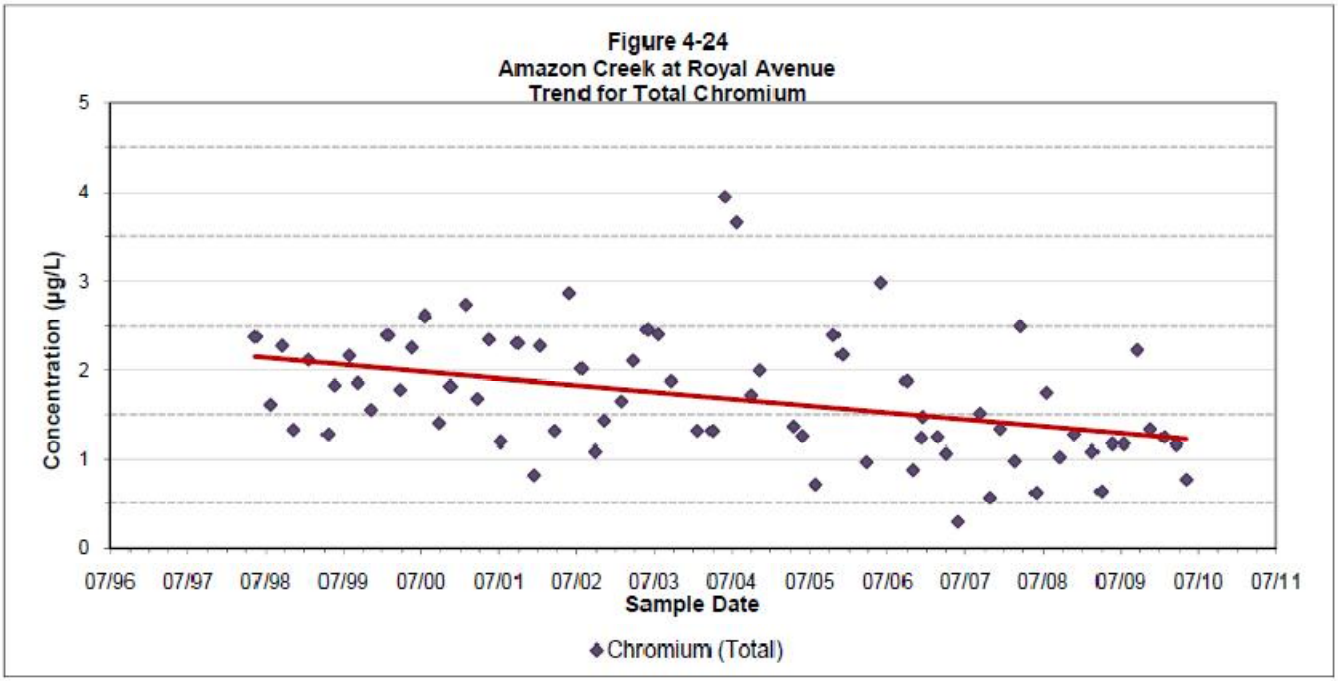


Figure 4-24
Amazon Creek at Royal Avenue
Trend for Total Chromium
Concentration (µg/L)
5
4
3
2
1
0
07/96
07/97
07/98
07/99
07/00
07/01
07/02
07/03
07/04
07/05
07/06
07/07
07/08
07/09
07/10
07/11
Sample Date
Chromium (Total)

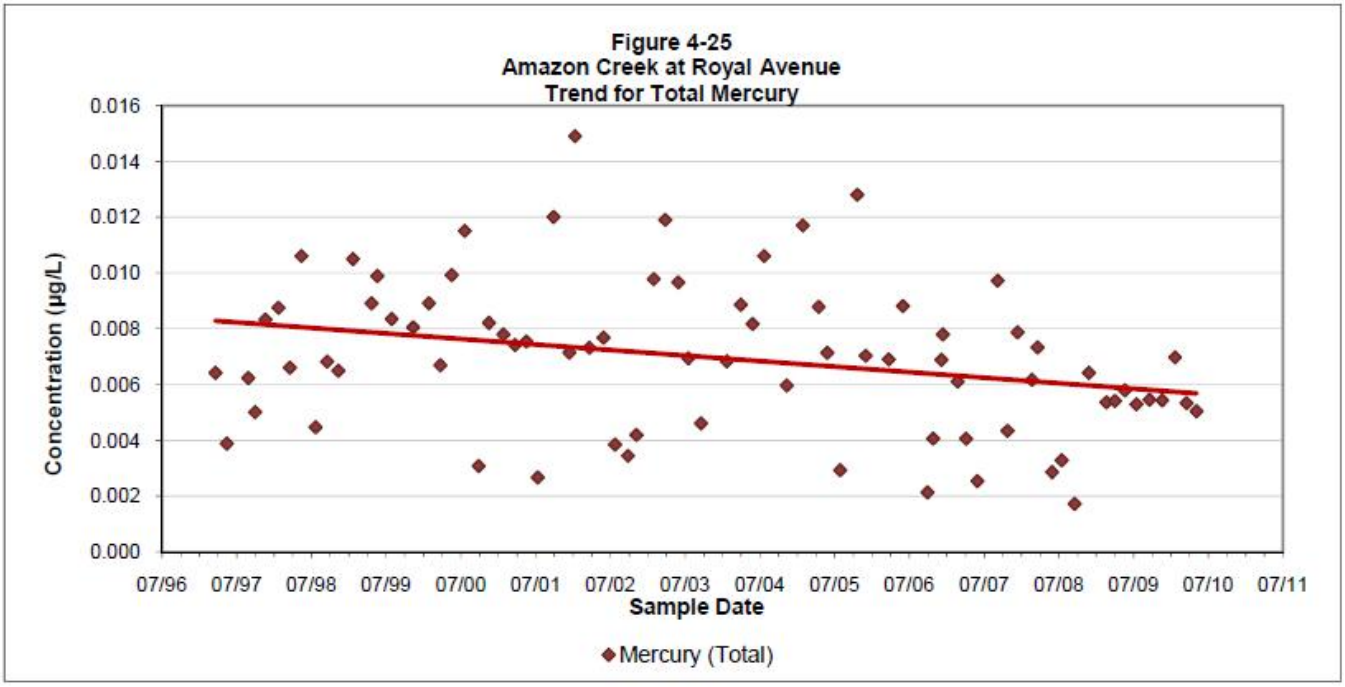


Figure 4-25
Amazon Creek at Royal Avenue
Trend for Total Mercury
Concentration (µg/L)
0.016
0.014
0.012
0.010
0.008
0.006
0.004
0.002
0.000
07/96 07/97 07/98 07/99 07/00 07/01 07/02 07/03 07/04 07/05 07/06 07/07 07/08 07/09 07/10 07/11
Sample Date
Mercury (Total)

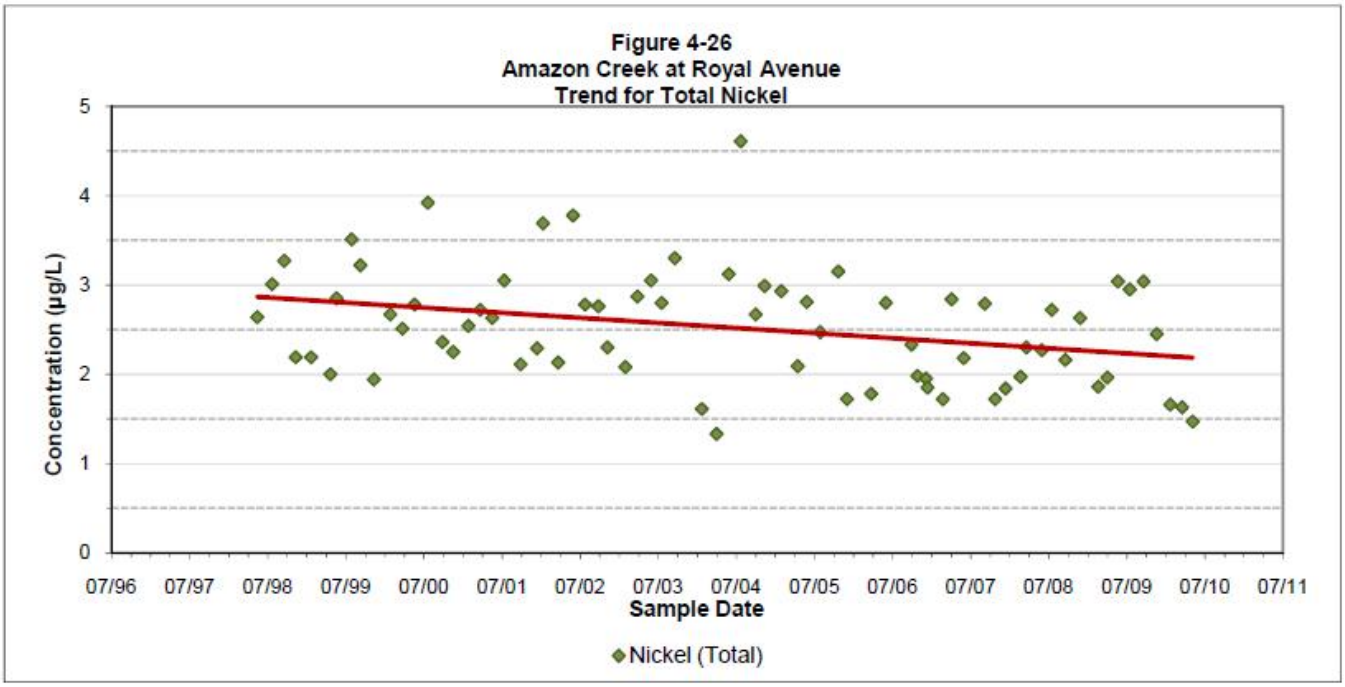


Figure 4-26
Amazon Creek at Royal Avenue
Trend for Total Nickel
Concentration (µg/L)
5
4
3
2
1
0
07/96 07/97 07/98 07/99 07/00 07/01 07/02 07/03 07/04 07/05 07/06 07/07 07/08 07/09 07/10 07/11
Sample Date
Nickel (Total)

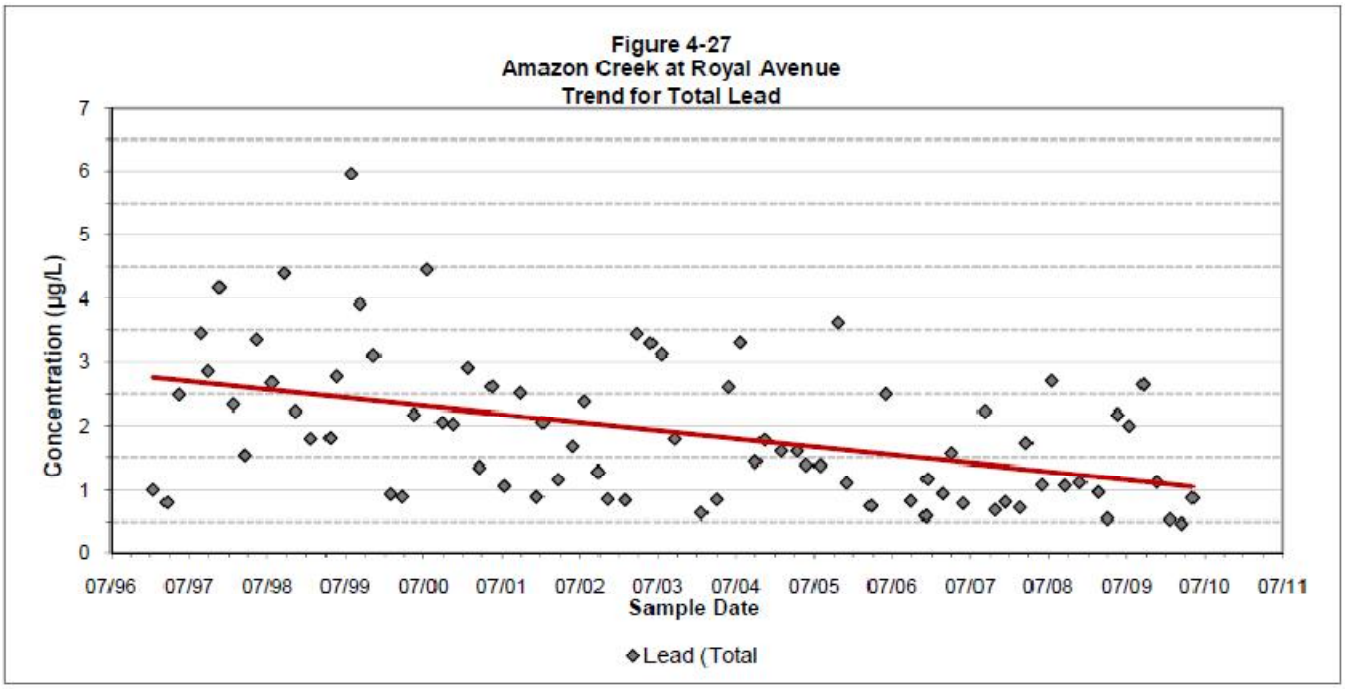


Figure 4-27
Amazon Creek at Royal Avenue
Trend for Total Lead
Concentration (µg/L)
0
1
2
3
4
5
6
7
07/96
07/97
07/98
07/99
07/00
07/01
07/02
07/03
07/04
07/05
07/06
07/07
07/08
07/09
07/10
07/11
Sample Date
Lead (Total

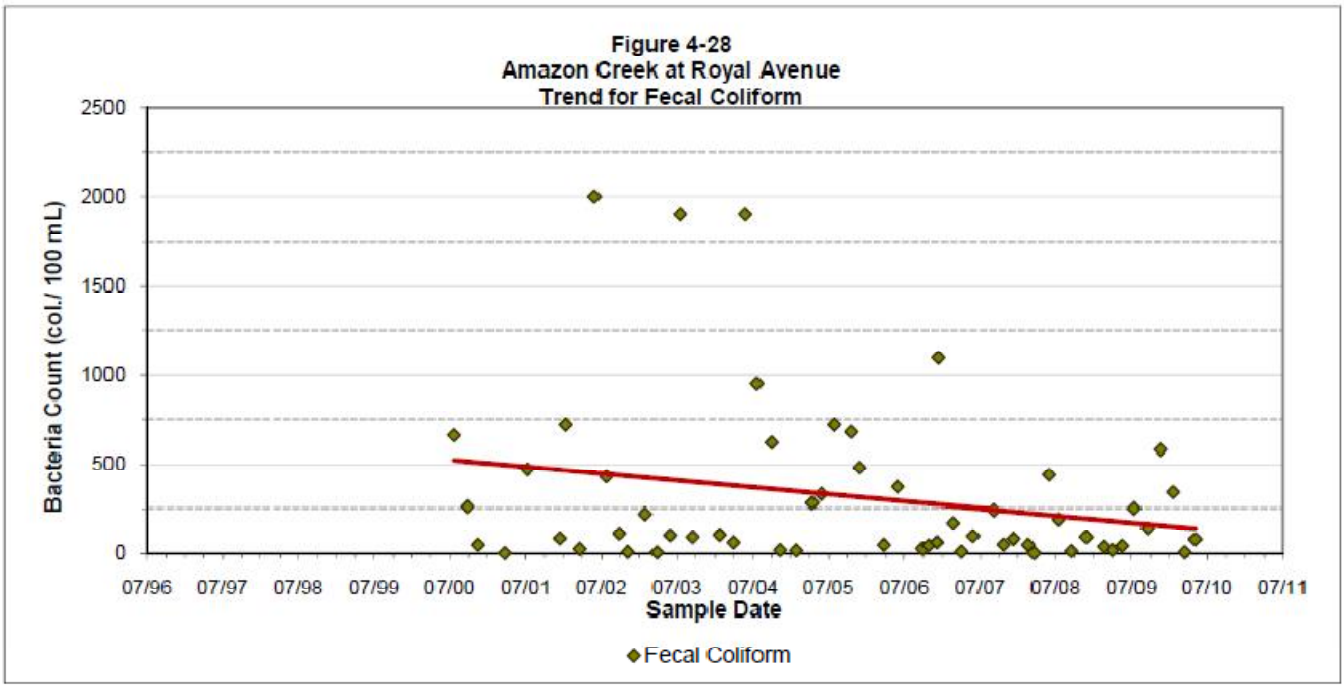


Figure 4-28
Amazon Creek at Royal Avenue
Trend for Fecal Coliform
Bacteria Count (col./ 100 mL)
0
500
1000
1500
2000
2500
07/96
07/97
07/98
07/99
07/00
07/01
07/02
07/03
07/04
07/05
07/06
07/07
07/08
07/09
07/10
07/11
Sample Date
Fecal Coliform

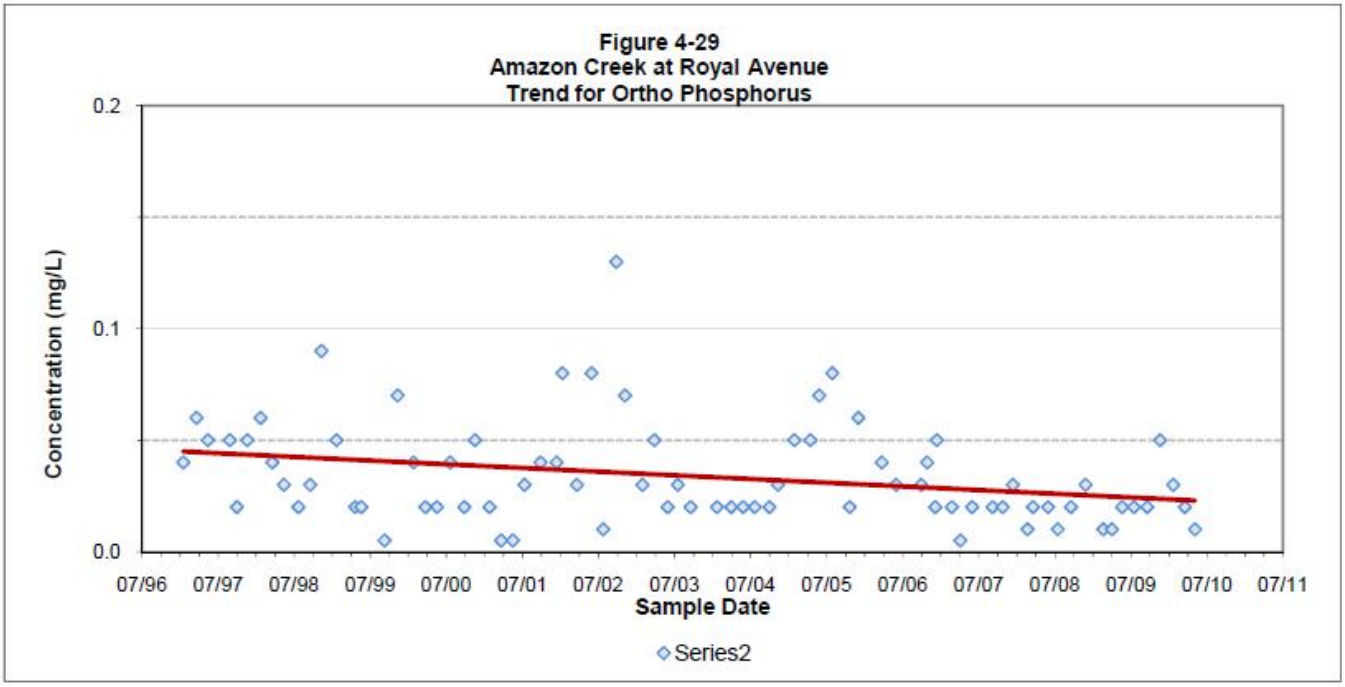


Figure 4-29
Amazon Creek at Royal Avenue
Trend for Ortho Phosphorus
Concentration (mg/L)
0.2
0.1
0.0
07/96
07/97
07/98
07/99
07/00
07/01
07/02
07/03
07/04
07/05
07/06
07/07
07/08
07/09
07/10
07/11
Sample Date
Series2

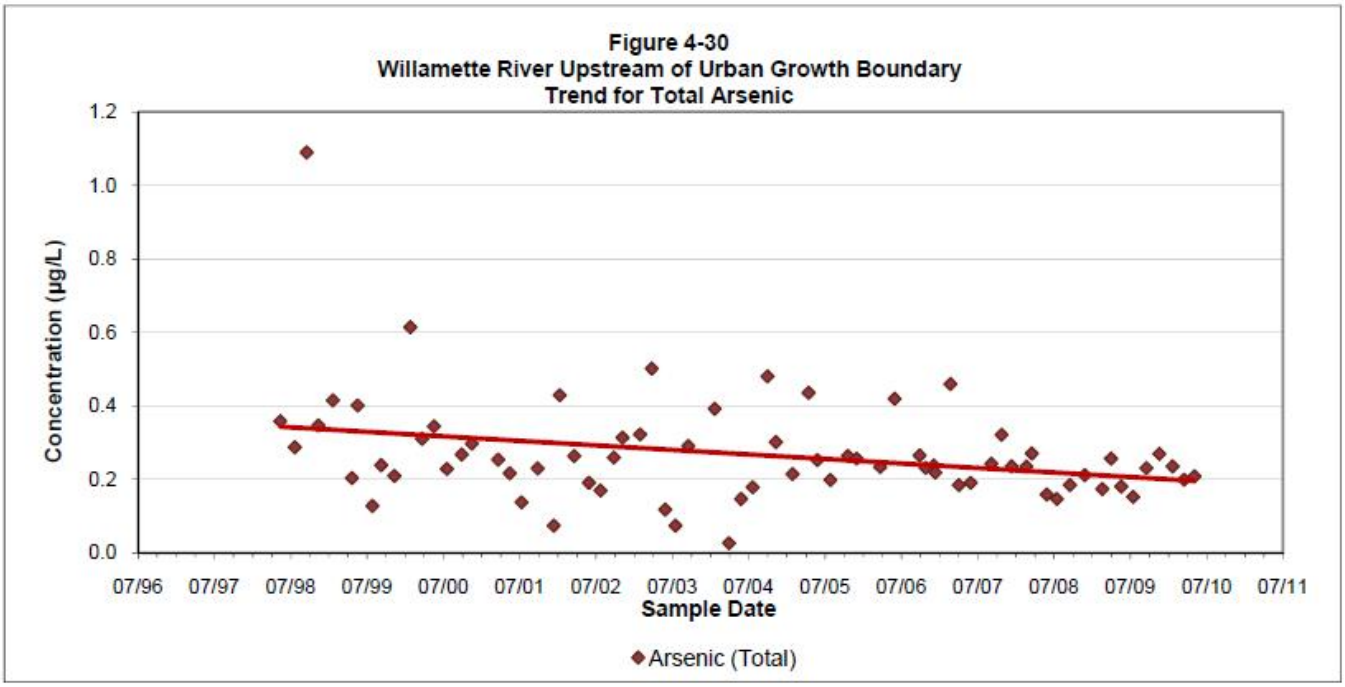


Figure 4-30
Willamette River Upstream of Urban Growth Boundary
Trend for Total Arsenic
Concentration (µg/L)
1.2
1.0
0.8
0.6
0.4
0.2
0.0
07/96
07/97
07/98
07/99
07/00
07/01
07/02
07/03
07/04
07/05
07/06
07/07
07/08
07/09
07/10
07/11
Sample Date
Arsenic (Total)

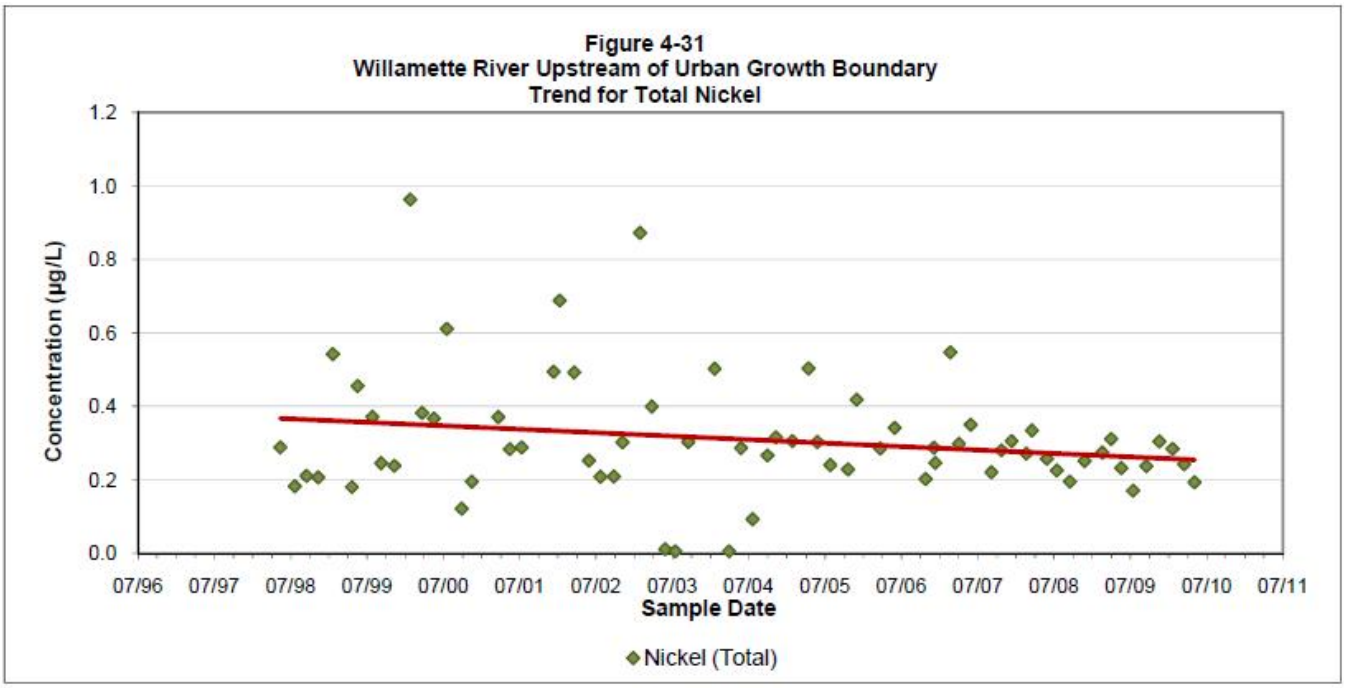


Figure 4-31
Willamette River Upstream of Urban Growth Boundary
Trend for Total Nickel
Concentration (µg/L)
1.2
1.0
0.8
0.6
0.4
0.2
0.0
07/96
07/97
07/98
07/99
07/00
07/01
07/02
07/03
07/04
07/05
07/06
07/07
07/08
07/09
07/10
07/11
Sample Date
Nickel (Total)

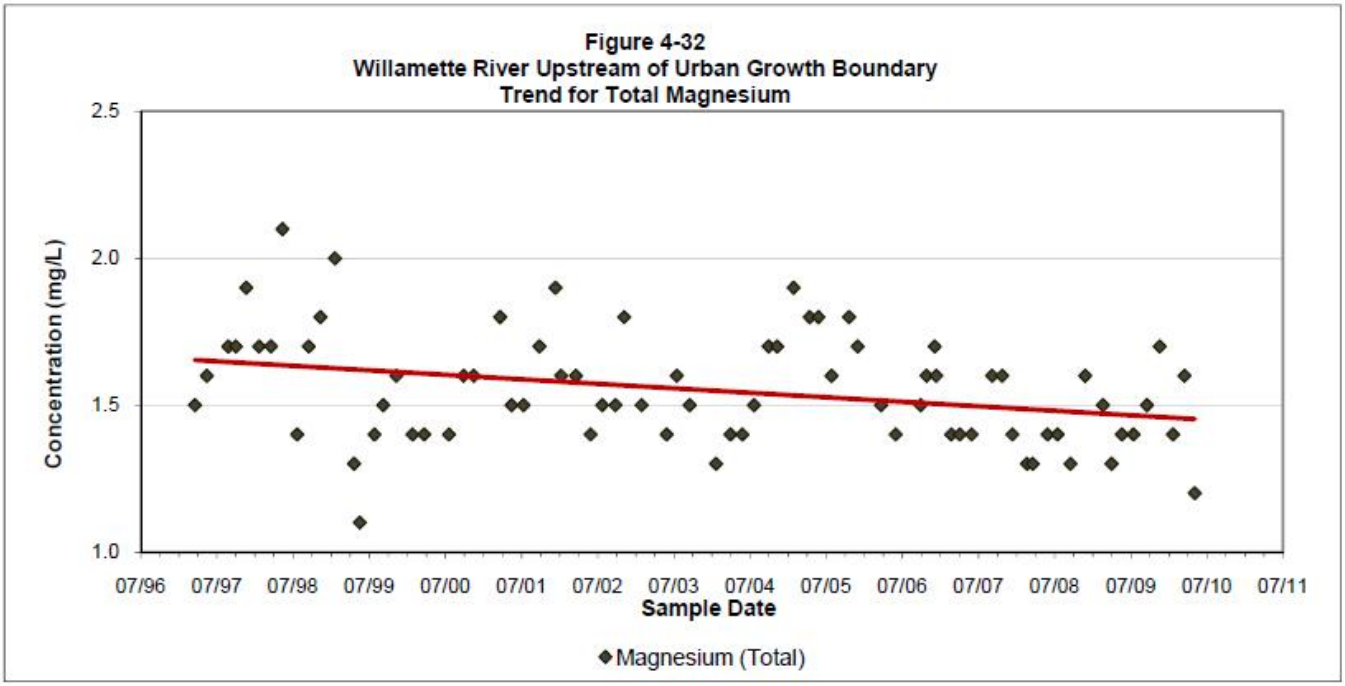


Figure 4-32
Willamette River Upstream of Urban Growth Boundary
Trend for Total Magnesium
Concentration (mg/L)
2.5
2.0
1.5
1.0
07/96
07/97
07/98
07/99
07/00
07/01
07/02
07/03
07/04
07/05
07/06
07/07
07/08
07/09
07/10
07/11
Sample Date
Magnesium (Total)

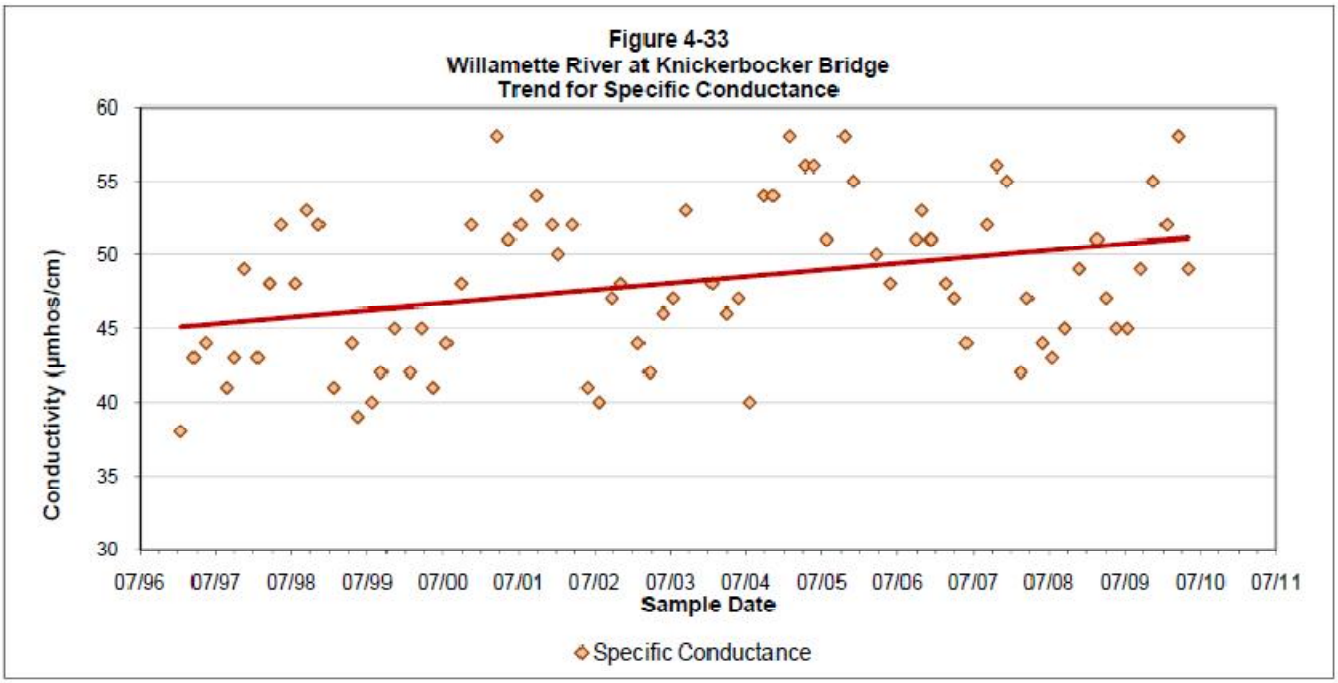


Figure 4-33
Willamette River at Knickerbocker Bridge
Trend for Specific Conductance
Conductivity (µmhos/cm)
60
55
50
45
40
35
30
07/96
07/97
07/98
07/99
07/00
07/01
07/02
07/03
07/04
07/05
07/06
07/07
07/08
07/09
07/10
07/11
Sample Date
Specific Conductance

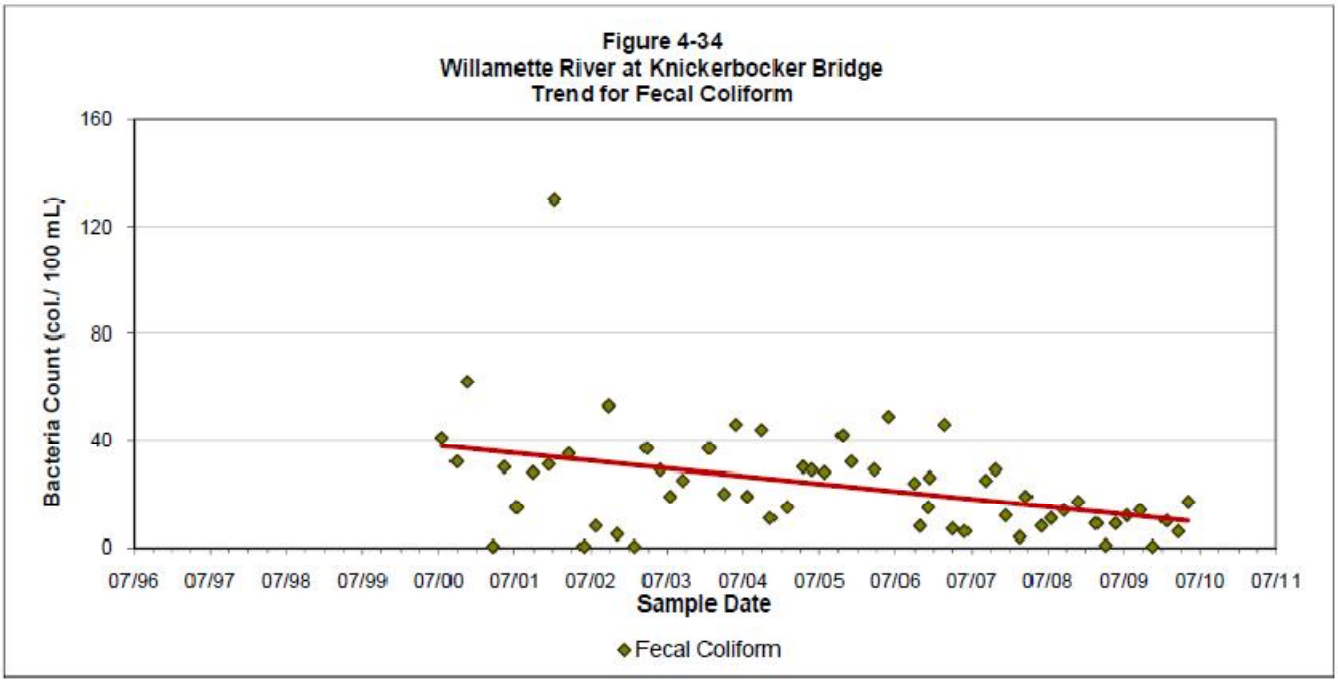


Figure 4-34
Willamette River at Knickerbocker Bridge
Trend for Fecal Coliform
Bacteria Count (col./ 100 mL)
160
120
80
40
0
07/96
07/97
07/98
07/99
07/00
07/01
07/02
07/03
07/04
07/05
07/06
07/07
07/08
07/09
07/10
07/11
Sample Date
Fecal Coliform

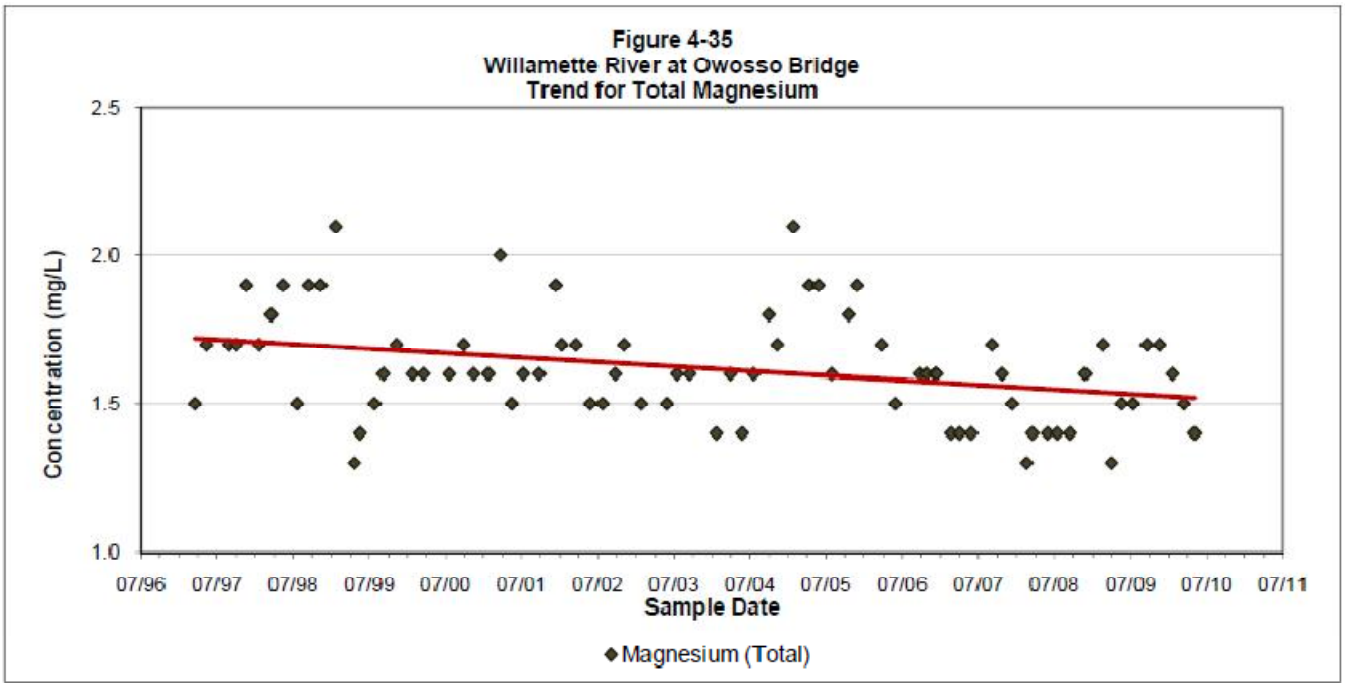


Figure 4-35
Willamette River at Owosso Bridge
Trend for Total Magnesium
Concentration (mg/L)
2.5
2.0
1.5
1.0
07/96
07/97
07/98
07/99
07/00
07/01
07/02
07/03
07/04
07/05
07/06
07/07
07/08
07/09
07/10
07/11
Sample Date
Magnesium (Total)

Figure 4-36

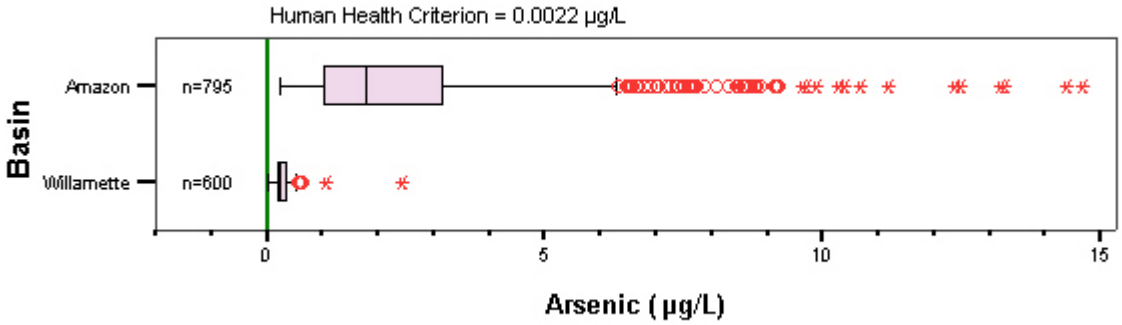


Figure 4-37

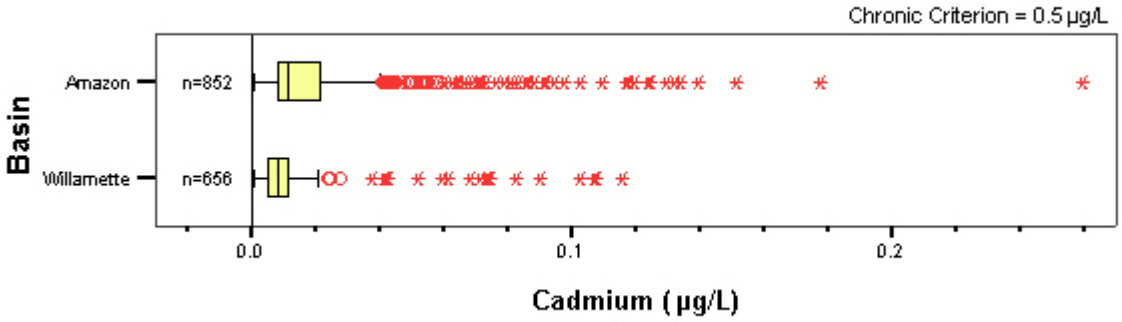


Figure 4-38

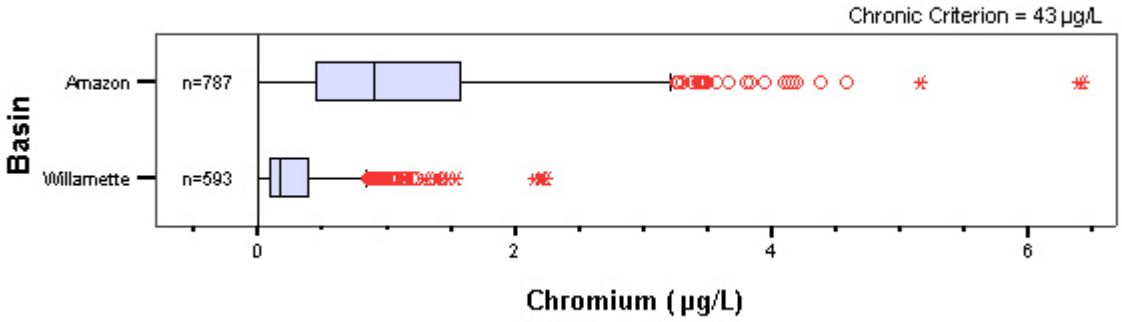


Figure 4-39

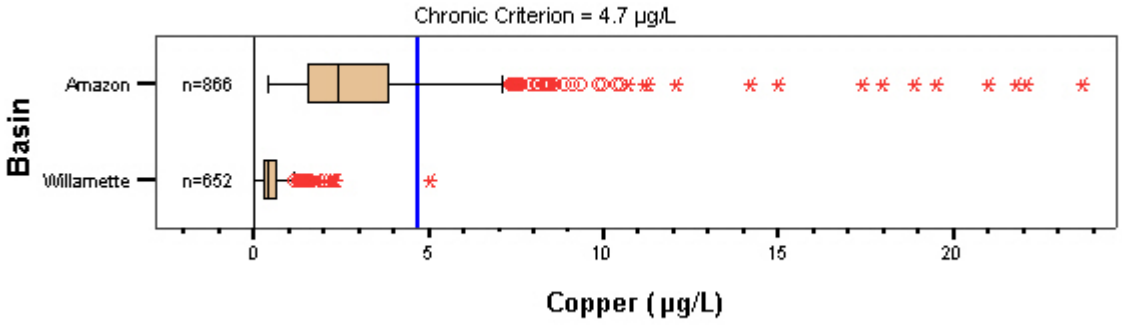


Figure 4-40

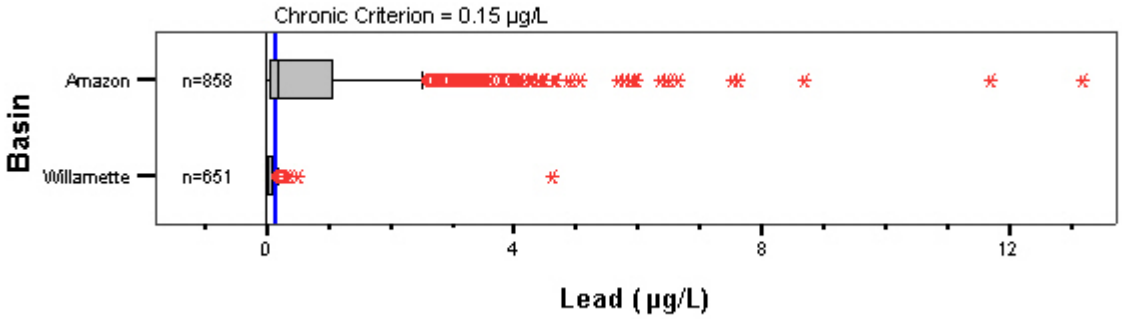


Figure 4-41

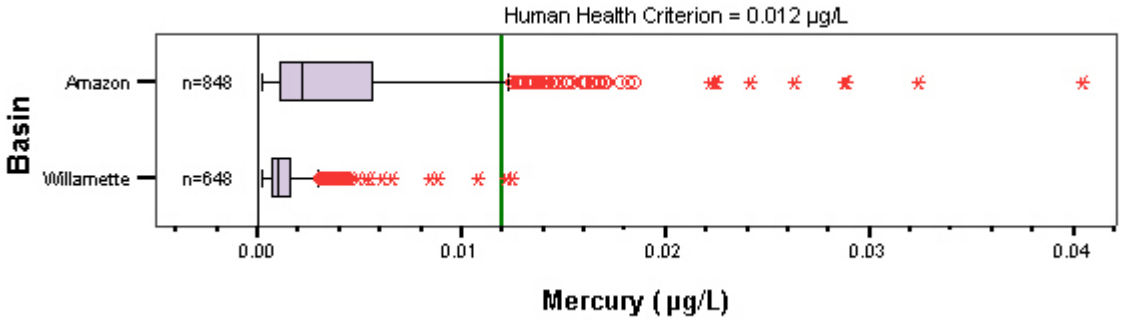


Figure 4-42

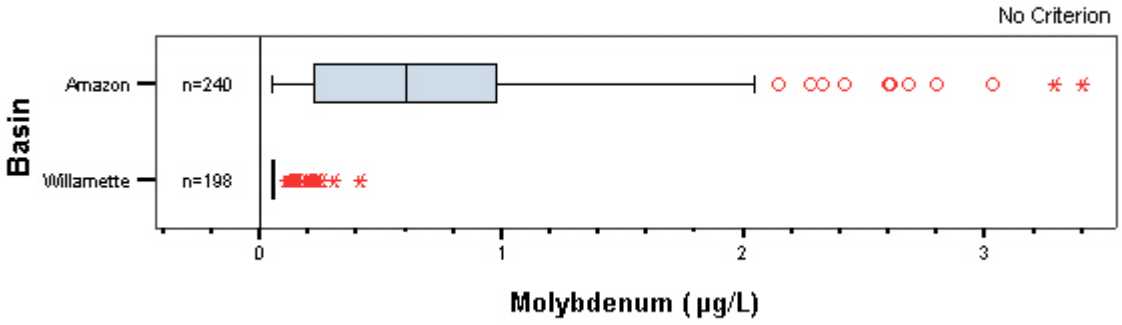


Figure 4-43

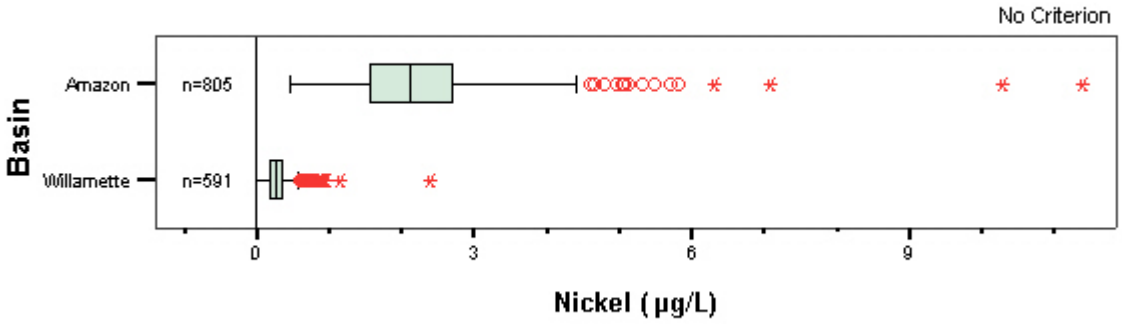


Figure 4-44

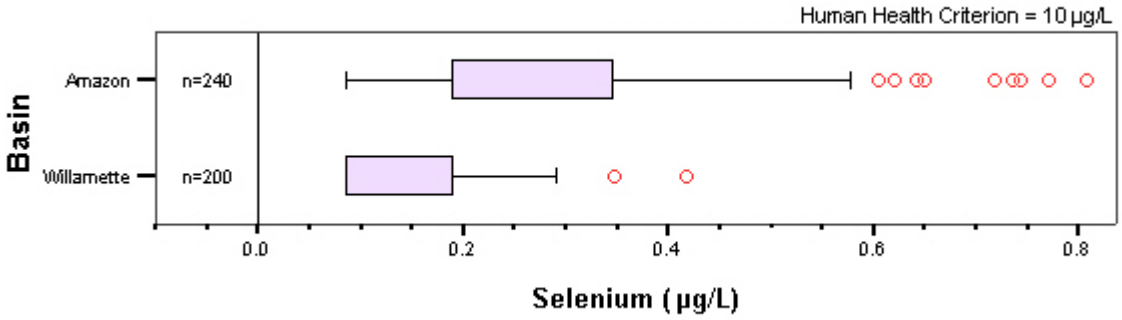


Figure 4-45

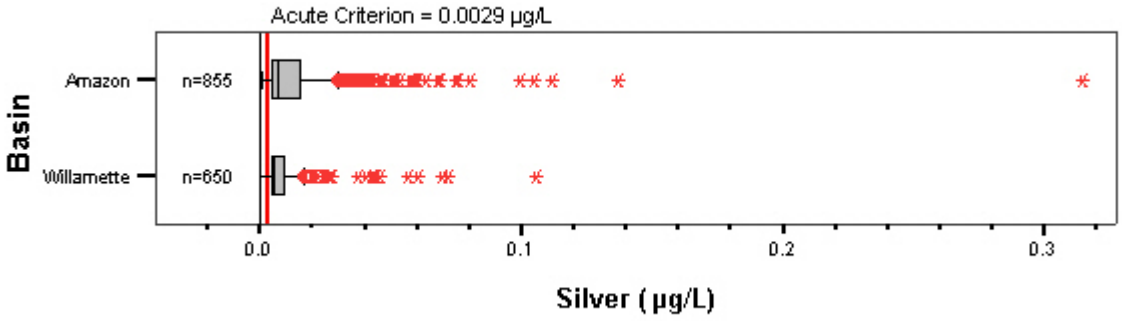


Figure 4-46

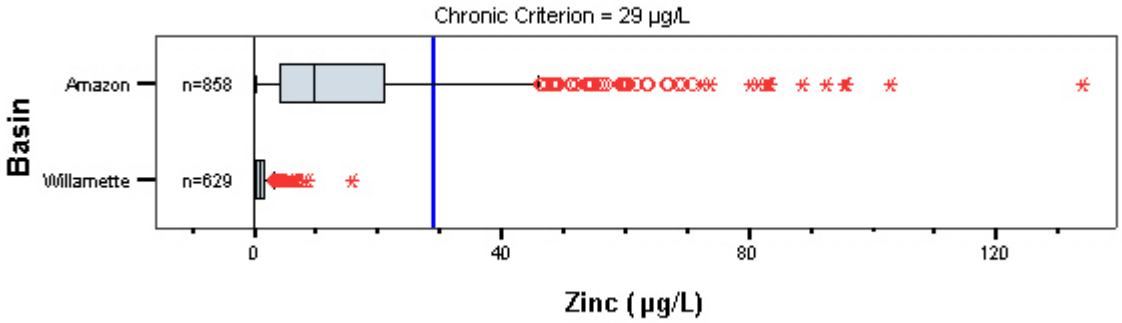


Figure 4-47

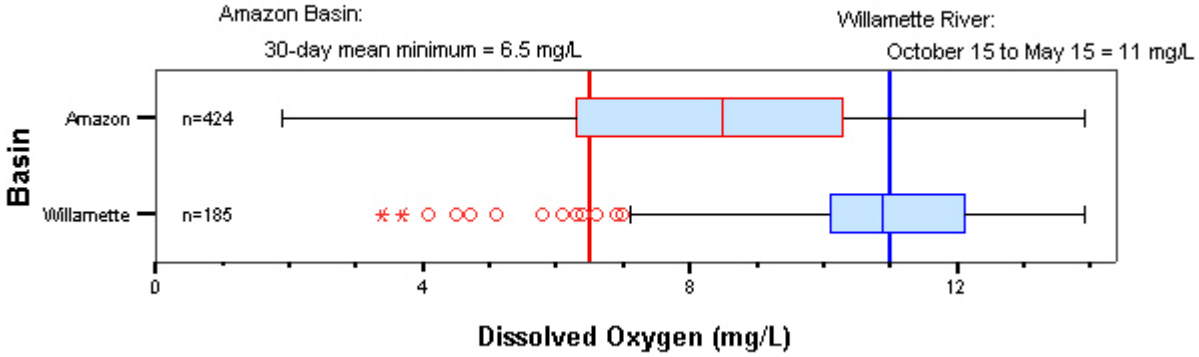


Figure 4-48

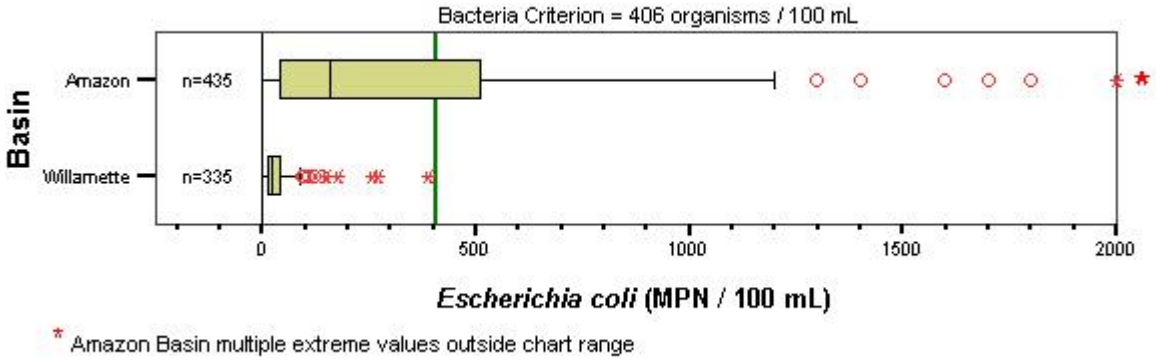


Figure 4-49

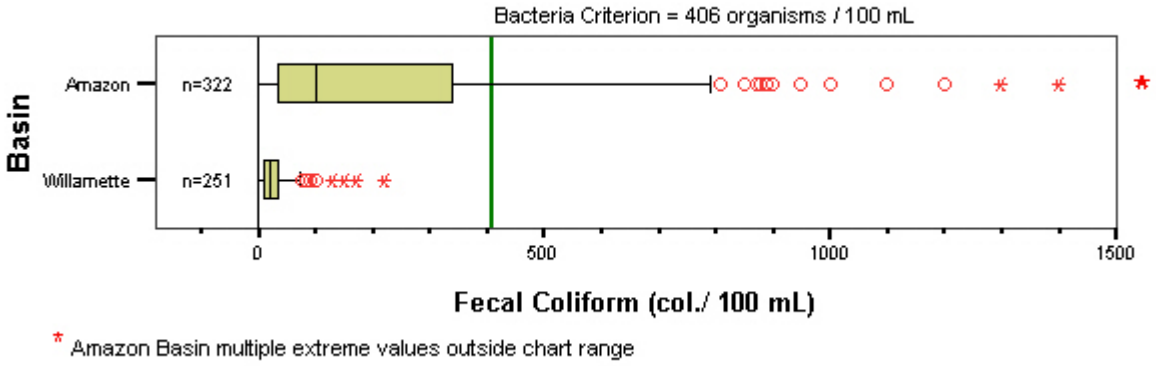


Figure 4-50

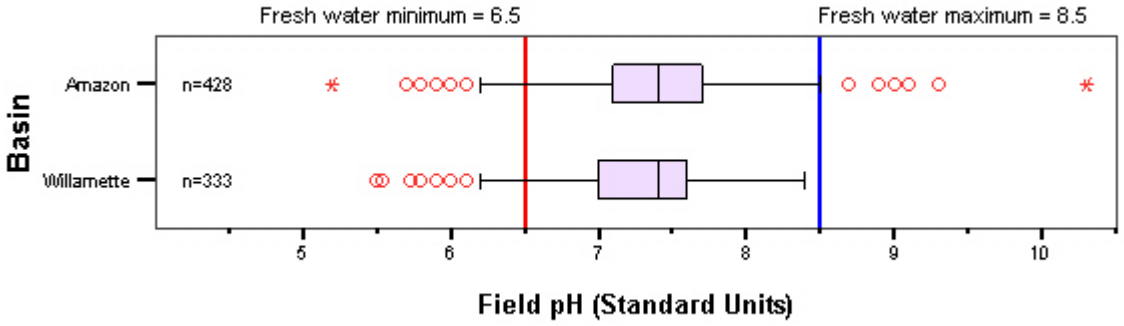


Figure 4-51

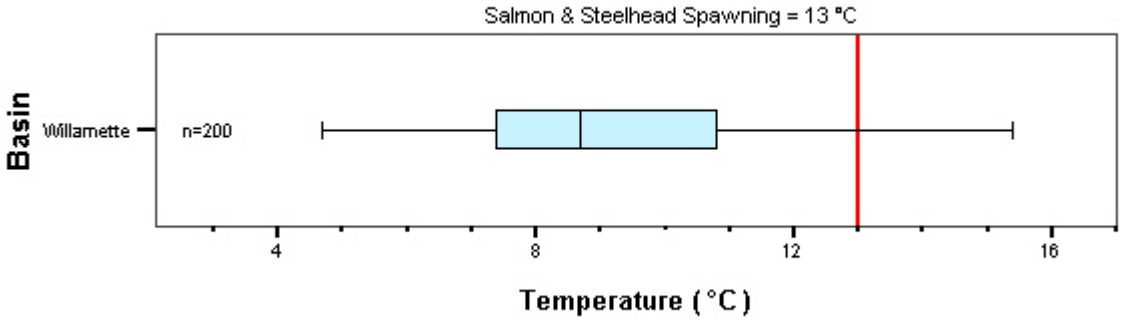
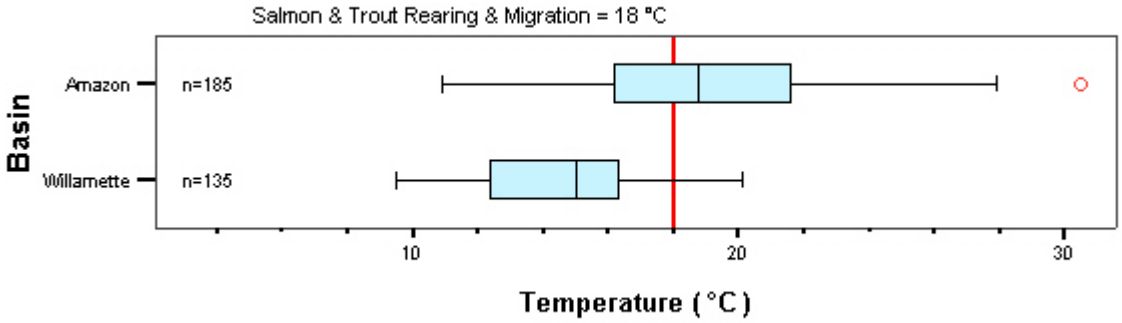


Figure 4-52



Appendices

APPENDIX A

Tabulated Data and Summaries
Tables A-1 through A-16
&
Figures A.1 through A.16

Storm Event Monitoring Data
Descriptive Statistics

Table A.1

Waterbody: Willow Creek
System Type: Surface Water
System Location: (MH 71037)

Location	Parameter	N	GeoMean	Mean Std. Deviation	Median	Minimum	Maximum	Units	% Change from Historical GeoMean	
Willow Creek at W 18th Ave	Ammonia - N	1	0.1000	0.1000	.	0.1000	0.10	mg/L		0
	Arsenic, Dissolved	1	0.3040	0.3040	.	0.3040	0.30	µg/L		-4
	Arsenic, Total	1	0.4450	0.4450	.	0.4450	0.45	µg/L		-9
	Biochemical Oxygen Demand	1	2.0000	2.0000	.	2.0000	2.00	mg/L		0
	Cadmium, Dissolved	1	0.0254	0.0254	.	0.0254	0.03	µg/L		0
	Cadmium, Total	1	0.0553	0.0553	.	0.0553	0.06	µg/L		0
	Calcium, Total	1	10.0000	10.0000	.	10.0000	10.00	mg/L		-46
	Chemical Oxygen Demand	1	10.0000	10.0000	.	10.0000	10.00	mg/L		-38
	Chromium, Dissolved	1	0.0691	0.0691	.	0.0691	0.07	µg/L		-105
	Chromium, Total	1	0.1770	0.1770	.	0.1770	0.18	µg/L		-90
	Conductivity, @ 25 degrees C	1	120.0000	120.0000	.	120.0000	120.00	µmhos/cm		-33
	Copper, Dissolved	1	1.4400	1.4400	.	1.4400	1.44	µg/L		-18
	Copper, Total	1	2.1000	2.1000	.	2.1000	2.10	µg/L		-36
	Dissolved Oxygen	1	7.2000	7.2000	.	7.2000	7.20	mg/L		-11
	Escherichia coli	3	29.3876	38.6667	26.50157	47.0000	9.00	MPN		-23
	Fecal Coliform	3	12.7650	24.6667	25.32456	20.0000	2.00	col. / 100 mL		-59
	Hardness	1	37.0000	37.0000	.	37.0000	37.00	mg eq $CaCO_3$/L		-46
	Lead, Dissolved	1	0.0606	0.0606	.	0.0606	0.06	µg/L		0
	Lead, Total	1	0.1560	0.1560	.	0.1560	0.16	µg/L		-79
	Magnesium, Total	1	2.9000	2.9000	.	2.9000	2.90	mg/L		-49
	Mercury, Dissolved	1	0.0012	0.0012	.	0.0012	0.00	µg/L		-5
	Mercury, Total	1	0.0024	0.0024	.	0.0024	0.00	µg/L		-40
	Nickel, Dissolved	1	0.6360	0.6360	.	0.6360	0.64	µg/L		-48
	Nickel, Total	1	0.8690	0.8690	.	0.8690	0.87	µg/L		-51
	Nitrate + Nitrite - N	1	0.0500	0.0500	.	0.0500	0.05	mg/L		-66
	pH Field	1	8.5000	8.5000	.	8.5000	8.50	Units		20
	Phosphorus, Ortho	1	0.0100	0.0100	.	0.0100	0.01	mg/L		0
	Phosphorus, Total	1	0.0400	0.0400	.	0.0400	0.04	mg/L		24
	Silica Gel Treated Hexane Ext. Material	1	5.0000	5.0000	.	5.0000	5.00	mg/L		0
	Silver, Dissolved	1	0.0342	0.0342	.	0.0342	0.03	µg/L		0
	Silver, Total	1	0.0452	0.0452	.	0.0452	0.05	µg/L		0
	Temperature	1	7.6000	7.6000	.	7.6000	7.60	°C		-7
	Total Dissolved Solids	1	91.0000	91.0000	.	91.0000	91.00	mg/L		-37
	Total Kjeldahl Nitrogen	1	0.2000	0.2000	.	0.2000	0.20	mg/L		-98
	Total Suspended Solids	1	4.0000	4.0000	.	4.0000	4.00	mg/L		-78
	Turbidity	1	11.0000	11.0000	.	11.0000	11.00	NTU		-44
	Zinc, Dissolved	1	2.5800	2.5800	.	2.5800	2.58	µg/L		-49
	Zinc, Total	1	4.6500	4.6500	.	4.6500	4.65	µg/L		-62

Storm Event Monitoring Data
Descriptive Statistics

Table A.2

Receiving Waterbody: Amazon Creek
System Type: Piped
System Location: (MH 55402/55404)

Location	Parameter	N	GeoMean	Mean Std. Deviation	Median	Minimum	Maximum	Units	% Change from Historical GeoMean	
NE Lot at Chambers & W 18th Ave	Ammonia - N	3	0.1260	0.1333	0.05774	0.1000	0.10	*mg/L*		23
	Arsenic, Dissolved	3	0.4717	0.4817	0.12159	0.4590	0.37	*µg/L*		-36
	Arsenic, Total	3	0.7150	0.7910	0.44345	0.6410	0.44	*µg/L*		-89
	Biochemical Oxygen Demand	3	3.9149	4.0000	1.00000	4.0000	3.00	*mg/L*		-12
	Cadmium, Dissolved	3	0.0254	0.0254	0.00000	0.0254	0.03	*µg/L*		-30
	Cadmium, Total	3	0.0579	0.0581	0.00479	0.0553	0.06	*µg/L*		-51
	Calcium, Total	3	3.3019	4.3333	4.04145	2.0000	2.00	*mg/L*		-94
	Chemical Oxygen Demand	3	26.3162	29.0000	15.09967	27.0000	15.00	*mg/L*		-39
	Chromium, Dissolved	3	0.4445	0.4710	0.20187	0.3990	0.32	*µg/L*		-54
	Chromium, Total	3	2.3277	2.6367	1.60032	2.2000	1.30	*µg/L*		-42
	Conductivity, @ 25 degrees C	3	28.4551	38.0000	36.38681	18.0000	16.00	*µmhos/cm*		-97
	Copper, Dissolved	3	3.3978	3.4233	0.52003	3.2800	2.99	*µg/L*		-53
	Copper, Total	3	7.8712	8.2367	2.94517	8.2000	5.31	*µg/L*		-39
	Dissolved Oxygen	2	10.7238	10.8500	2.33345	10.8500	9.20	*mg/L*		26
	Escherichia coli	2	2,400.0000	2,400.0000	0.00000	2,400.0000	2,400.00	*MPN*		-130
	Fecal Coliform	1	200.0000	200.0000 .		200.0000	200.00	*col. / 100 mL*		-156
	Hardness	3	9.4727	14.6667	16.74316	5.0000	5.00	*mg eq $CaCO_3$/L*		-117
	Lead, Dissolved	3	0.0922	0.0962	0.03162	0.1070	0.06	*µg/L*		-64
	Lead, Total	3	5.1701	5.6767	2.68653	6.2200	2.76	*µg/L*		-7
	Magnesium, Total	3	0.8984	1.3000	1.38564	0.5000	0.50	*mg/L*		-109
	Mercury, Dissolved	3	0.0022	0.0024	0.00119	0.0022	0.00	*µg/L*		-17
	Mercury, Total	3	0.0062	0.0062	0.00084	0.0059	0.01	*µg/L*		-30
	Nickel, Dissolved	3	0.6142	0.8673	0.89500	0.3860	0.32	*µg/L*		-99
	Nickel, Total	3	1.8044	2.1983	1.72536	1.4600	0.97	*µg/L*		-66
	Nitrate + Nitrite - N	3	0.1030	0.1067	0.03215	0.1200	0.07	*mg/L*		-85
	pH Field	2	6.9993	7.0000	0.14142	7.0000	6.90	Units		-5
	Phosphorus, Ortho	3	0.0311	0.0333	0.01528	0.0300	0.02	*mg/L*		0
	Phosphorus, Total	3	0.1527	0.1633	0.06658	0.1800	0.09	*mg/L*		21
	Silica Gel Treated Hexane Ext. Material	2	5.0000	5.0000	0.00000	5.0000	5.00	*mg/L*		0
	Silver, Dissolved	3	0.0342	0.0342	0.00000	0.0342	0.03	*µg/L*		-17
	Silver, Total	3	0.0452	0.0452	0.00000	0.0452	0.05	*µg/L*		34
	Temperature	2	8.9196	9.0000	1.69706	9.0000	7.80	°C		-8
	Total Dissolved Solids	3	22.4798	32.3333	33.62043	16.0000	10.00	*mg/L*		-100
	Total Kjeldahl Nitrogen	3	0.5518	0.6000	0.26458	0.7000	0.30	*mg/L*		-54
	Total Organic Carbon	3	4.1453	4.2333	1.05040	4.2000	3.20	*mg/L*		-51
	Total Suspended Solids	3	31.8219	35.6667	18.61003	38.0000	16.00	*mg/L*		22
	Turbidity	3	20.7823	30.3333	32.62412	12.0000	11.00	*NTU*		-51
	Zinc, Dissolved	3	12.8821	13.1467	3.07775	14.4000	9.64	*µg/L*		-10
	Zinc, Total	3	38.3966	39.2333	9.54219	41.7000	28.70	*µg/L*		-16

Storm Event Monitoring Data
Descriptive Statistics

Table A.3

Receiving Waterbody:
Willamette River
System Type: Piped
System Location: (MH 77793)

Location	Parameter	N	GeoMean	Mean Std. Deviation	Median	Minimum	Maximum	Units
Copping St.	Ammonia - N	1	0.1000	.	0.1000	0.10	0.10	*mg/L*
	Arsenic, Dissolved	1	0.1850	.	0.1850	0.19	0.19	*µg/L*
	Arsenic, Total	1	0.5260	.	0.5260	0.53	0.53	*µg/L*
	Biochemical Oxygen Demand	1	4.0000	.	4.0000	4.00	4.00	*mg/L*
	Cadmium, Dissolved	1	0.0536	.	0.0536	0.05	0.05	*µg/L*
	Cadmium, Total	1	0.0553	.	0.0553	0.06	0.06	*µg/L*
	Calcium, Total	1	2.0000	.	2.0000	2.00	2.00	*mg/L*
	Chemical Oxygen Demand	1	32.0000	.	32.0000	32.00	32.00	*mg/L*
	Chromium, Dissolved	1	0.0691	.	0.0691	0.07	0.07	*µg/L*
	Chromium, Total	1	0.9000	.	0.9000	0.90	0.90	*µg/L*
	Conductivity, @ 25 degrees C	1	92.0000	.	92.0000	92.00	92.00	*µmhos/cm*
	Copper, Dissolved	1	1.4000	.	1.4000	1.40	1.40	*µg/L*
	Copper, Total	1	5.0700	.	5.0700	5.07	5.07	*µg/L*
	Dissolved Oxygen	2	10.7079	2.47487	10.8500	9.10	12.60	*mg/L*
	Escherichia coli	2	894.6508	35.35534	895.0000	870.00	920.00	*MPN*
	Fecal Coliform	1	800.0000	.	800.0000	800.00	800.00	*col. / 100 mL*
	Hardness	1	5.0000	.	5.0000	5.00	5.00	*mg eq $CaCO_3$/L*
	Lead, Dissolved	1	0.5420	.	0.5420	0.54	0.54	*µg/L*
	Lead, Total	1	5.8200	.	5.8200	5.82	5.82	*µg/L*
	Magnesium, Total	1	0.5000	.	0.5000	0.50	0.50	*mg/L*
	Mercury, Dissolved	1	0.0006	.	0.0006	0.00	0.00	*µg/L*
	Mercury, Total	1	0.0058	.	0.0058	0.01	0.01	*µg/L*
	Nickel, Dissolved	1	0.3770	.	0.3770	0.38	0.38	*µg/L*
	Nickel, Total	1	1.3300	.	1.3300	1.33	1.33	*µg/L*
	Nitrate + Nitrite - N	1	0.0500	.	0.0500	0.05	0.05	*mg/L*
	pH Field	2	7.2484	0.21213	7.2500	7.10	7.40	Units
	Phosphorus, Ortho	1	0.0500	.	0.0500	0.05	0.05	*mg/L*
	Phosphorus, Total	1	0.2000	.	0.2000	0.20	0.20	*mg/L*
	Silica Gel Treated Hexane Ext. Material	2	5.0000	0.00000	5.0000	5.00	5.00	*mg/L*
	Silver, Dissolved	1	0.0342	.	0.0342	0.03	0.03	*µg/L*
	Silver, Total	1	0.0452	.	0.0452	0.05	0.05	*µg/L*
	Temperature	2	9.0344	2.05061	9.1500	7.70	10.60	°C
	Total Dissolved Solids	1	20.0000	.	20.0000	20.00	20.00	*mg/L*
	Total Kjeldahl Nitrogen	1	0.6000	.	0.6000	0.60	0.60	*mg/L*
	Total Suspended Solids	1	71.0000	.	71.0000	71.00	71.00	*mg/L*
	Turbidity	1	35.0000	.	35.0000	35.00	35.00	*NTU*
	Zinc, Dissolved	1	154.0000	.	154.0000	154.00	154.00	*µg/L*
	Zinc, Total	1	155.0000	.	155.0000	155.00	155.00	*µg/L*

Storm Event Monitoring Data
Descriptive Statistics

Table A.4

Receiving Waterbody: A3 Channel
System Type: Piped
System Location: (MH 63693)

Location	Parameter	N	GeoMean	Mean Std. Deviation	Median	Minimum	Maximum	Units	% Change from Historical GeoMean
Seneca at W 5th Ave	1,1-Dichloroethane	1	5.0000	.	5.00000	5.00000	5.00000	µg/L	0.00
	1,1-Dichloroethene	2	5.0000	0.0000	5.00000	5.00000	5.00000	µg/L	0.00
	1,1,1-Trichloroethane	1	5.0000	.	5.00000	5.00000	5.00000	µg/L	0.00
	1,1,2-Trichloroethane	1	5.0000	.	5.00000	5.00000	5.00000	µg/L	0.00
	1,1,2,2-Tetrachloroethane	1	5.0000	.	5.00000	5.00000	5.00000	µg/L	0.00
	1,2-Dichlorobenzene	1	5.0000	.	5.00000	5.00000	5.00000	µg/L	0.00
	1,2-Dichloroethane	1	5.0000	.	5.00000	5.00000	5.00000	µg/L	0.00
	1,2-Dichloropropane	1	5.0000	.	5.00000	5.00000	5.00000	µg/L	0.00
	1,3-Dichlorobenzene	1	5.0000	.	5.00000	5.00000	5.00000	µg/L	0.00
	1,4-Dichlorobenzene	1	5.0000	.	5.00000	5.00000	5.00000	µg/L	0.00
	2-Chloroethyl vinyl ether	1	10.0000	.	10.00000	10.00000	10.00000	µg/L	0.00
	Acrolein	1	50.0000	.	50.00000	50.00000	50.00000	µg/L	0.00
	Acrylonitrile	1	10.0000	.	10.00000	10.00000	10.00000	µg/L	0.00
	Ammonia - N	1	0.1000	.	0.10000	0.10000	0.10000	mg/L	-13.84
	Arsenic, Dissolved	1	0.6000	.	0.60000	0.60000	0.60000	µg/L	-38.26
	Arsenic, Total	1	1.1700	.	1.17000	1.17000	1.17000	µg/L	-59.37
	Benzene	1	5.0000	.	5.00000	5.00000	5.00000	µg/L	0.00
	Biochemical Oxygen Demand	1	5.0000	.	5.00000	5.00000	5.00000	mg/L	-18.18
	Bromodichloromethane	1	5.0000	.	5.00000	5.00000	5.00000	µg/L	0.00
	Bromoform	1	5.0000	.	5.00000	5.00000	5.00000	µg/L	0.00
	Bromomethane	1	5.0000	.	5.00000	5.00000	5.00000	µg/L	0.00
	Cadmium, Dissolved	1	0.1900	.	0.19000	0.19000	0.19000	µg/L	60.98
	Cadmium, Total	1	0.3260	.	0.32600	0.32600	0.32600	µg/L	45.30
	Calcium, Total	1	10.0000	.	10.00000	10.00000	10.00000	mg/L	-29.51
	Carbon Tetrachloride	1	5.0000	.	5.00000	5.00000	5.00000	µg/L	0.00
	Chemical Oxygen Demand	1	35.0000	.	35.00000	35.00000	35.00000	mg/L	23.82
	Chlorobenzene	1	5.0000	.	5.00000	5.00000	5.00000	µg/L	0.00
	Chloroethane	1	5.0000	.	5.00000	5.00000	5.00000	µg/L	0.00
	Chloroform	1	5.0000	.	5.00000	5.00000	5.00000	µg/L	0.00
	Chloromethane	1	5.0000	.	5.00000	5.00000	5.00000	µg/L	0.00
	Chromium, Dissolved	1	0.4210	.	0.42100	0.42100	0.42100	µg/L	-27.34
	Chromium, Total	1	2.9200	.	2.92000	2.92000	2.92000	µg/L	1.21
	cis-1,3-Dichloropropene	1	5.0000	.	5.00000	5.00000	5.00000	µg/L	0.00
	Conductivity, @ 25 degrees C	1	89.0000	.	89.00000	89.00000	89.00000	µmhos/cm	-36.45
	Copper, Dissolved	1	6.2700	.	6.27000	6.27000	6.27000	µg/L	-24.21
	Copper, Total	1	22.6000	.	22.60000	22.60000	22.60000	µg/L	19.89
	Dibromochloromethane	1	5.0000	.	5.00000	5.00000	5.00000	µg/L	0.00
	Dissolved Oxygen	2	9.6995	0.1414	9.70000	9.60000	9.80000	mg/L	38.13
	Escherichia coli	2	730.0685	120.2082	735.00000	650.00000	820.00000	MPN	-47.06
	Ethylbenzene	1	5.0000	.	5.00000	5.00000	5.00000	µg/L	0.00
	Fecal Coliform	2	257.6820	530.3301	455.00000	80.00000	830.00000	col. / 100 mL	-114.95
	Hardness	1	39.0000	.	39.00000	39.00000	39.00000	mg eq $CaCO_3$/L	-40.84
	Lead, Dissolved	1	0.3520	.	0.35200	0.35200	0.35200	µg/L	-63.04
	Lead, Total	1	12.9000	.	12.90000	12.90000	12.90000	µg/L	12.54
	Magnesium, Total	1	3.5000	.	3.50000	3.50000	3.50000	mg/L	-55.82
	Mercury, Dissolved	1	0.0017	.	0.00170	0.00170	0.00170	µg/L	-7.69
	Mercury, Total	1	0.0142	.	0.01420	0.01420	0.01420	µg/L	-12.98
	Methylene chloride	1	5.0000	.	5.00000	5.00000	5.00000	µg/L	0.00

Storm Event Monitoring Data
Descriptive Statistics

Table A.4 Continued

Receiving Waterbody: A3 Channel
System Type: Piped
System Location: (MH 63693)

Location	Parameter	N	Mean	Std. Deviation	Median	Minimum	Maximum	Units	% Change from Historical Mean
Seneca at W 5th Ave	Nickel, Dissolved	1	0.9580	.	0.95800	0.95800	0.95800	µg/L	-60.84
	Nickel, Total	1	3.6400	.	3.64000	3.64000	3.64000	µg/L	-3.42
	Nitrate + Nitrite - N	1	0.2100	.	0.21000	0.21000	0.21000	mg/L	-53.94
	pH Field	2	7.3485	0.2121	7.35000	7.20000	7.50000	Units	1.97
	Phosphorus, Ortho	1	0.0200	.	0.02000	0.02000	0.02000	mg/L	-86.10
	Phosphorus, Total	1	0.2600	.	0.26000	0.26000	0.26000	mg/L	-24.73
	Silica Gel Treated Hexane Ext. Material	2	5.0000	0.0000	5.00000	5.00000	5.00000	mg/L	-8.47
	Silver, Dissolved	1	0.0342	.	0.03420	0.03420	0.03420	µg/L	0.00
	Silver, Total	1	0.0452	.	0.04520	0.04520	0.04520	µg/L	0.00
	Temperature	2	9.0499	1.9092	9.15000	7.80000	10.50000	°C	-23.21
	Tetrachloroethene	2	5.0000	0.0000	5.00000	5.00000	5.00000	µg/L	-30.36
	Toluene	1	5.0000	.	5.00000	5.00000	5.00000	µg/L	0.00
	Total Dissolved Solids	1	61.0000	.	61.00000	61.00000	61.00000	mg/L	-24.09
	Total Kjeldahl Nitrogen	1	0.4000	.	0.40000	0.40000	0.40000	mg/L	-85.00
	Total Suspended Solids	1	53.0000	.	53.00000	53.00000	53.00000	mg/L	1.02
	trans-1,2-Dichloroethene	1	5.0000	.	5.00000	5.00000	5.00000	µg/L	0.00
	trans-1,3-Dichloropropene	1	5.0000	.	5.00000	5.00000	5.00000	µg/L	0.00
	Trichloroethene	1	5.0000	.	5.00000	5.00000	5.00000	µg/L	-6.44
	Trichlorofluoromethane	1	5.0000	.	5.00000	5.00000	5.00000	µg/L	0.00
	Turbidity	1	73.0000	.	73.00000	73.00000	73.00000	NTU	25.87
	Vinyl chloride	1	5.0000	.	5.00000	5.00000	5.00000	µg/L	0.00
	Zinc, Dissolved	1	67.4000	.	67.40000	67.40000	67.40000	µg/L	71.85
	Zinc, Total	1	126.0000	.	126.00000	126.00000	126.00000	µg/L	159.60

Table A-5
2008/2009 QA/QC Qualified Ambient Water Quality Data
Amazon Basin and Willamette River Monitoring Sites
Metals (µg/L)

Date / Site	As (D)	As (T)	Cd (D)	Cd (T)	Cr (D)	Cr (T)	Cu (D)	Cu (T)	Pb (D)	Pb (T)	Hg (D)	Hg (T)	Mo (D)	Mo (T)	Ni (D)	Ni (T)	Se (D)	Se (T)	Ag (D)	Ag (T)	Zn (D)	Zn (T)
Amazon Creek – Site M2 – at 29th Avenue																						
7/15/2009	1.43	1.56	<0.0173	<0.0173	1.15	0.144	1.04	2.39	0.0474	0.192	0.00056	0.00088	0.545	0.568	1.64	1.79	0.432	0.395	<0.0113	<0.0113	10.8	13.8
9/17/2009	1.25	1.55	<0.0173	<0.0173	0.022	1.21	0.924	2.45	0.0256	0.539	<0.00050	0.00130	0.572	0.567	1.35	2.04	<0.379	<0.171	<0.0113	<0.0113	5.99	14.6
11/18/2009	0.683	0.850	<0.0173	0.0513	0.386	1.29	4.23	4.19	0.0712	0.330	0.00157	0.00327	0.168	0.183	0.900	1.86	<0.379	<0.171	<0.0113	<0.0113	42.3	33.7
1/20/2010	0.516	0.709	<0.0173	<0.0173	0.710	1.97	2.24	4.62	0.0660	0.500	0.00148	0.00365	0.126	<0.128	1.16	1.87	<0.379	<0.171	<0.0113	<0.0113	15.2	22.9
3/17/2010	0.530	0.714	<0.0173	<0.0173	0.973	1.64	1.40	3.05	0.0308	0.366	0.00077	0.00210	0.148	0.136	1.04	1.64	<0.379	<0.171	<0.0113	<0.0113	11.0	20.4
5/5/2010	0.637	0.735	<0.0173	<0.0173	0.448	1.01	1.35	2.62	0.0246	0.185	0.00065	0.00174	0.136	0.156	1.16	1.40	<0.379	<0.171	<0.0113	<0.0113	13.2	19.6
Willow Creek - 450 ft north of 18th Avenue																						
7/15/2009*																						
9/17/2009*																						
11/18/2009	0.725	0.872	<0.0173	<0.0173	0.059	0.170	2.77	1.51	0.0240	0.0812	0.00069	0.00125	0.238	0.256	1.33	1.86	<0.379	0.177	<0.0113	<0.0113	Outlier	Outlier
1/20/2010	0.577	0.828	<0.0173	<0.0173	0.511	0.934	1.85	3.29	0.0683	0.243	0.00189	0.00416	<0.113	<0.128	0.950	1.29	<0.379	<0.171	<0.0113	<0.0113	3.24	5.08
3/17/2010	0.336	1.15	<0.0173	<0.0173	<0.0170	0.832	0.576	2.49	<0.0223	0.195	0.00114	0.00262	<0.113	<0.128	0.614	1.50	<0.379	<0.171	<0.0113	<0.0113	3.47	5.09
5/5/2010	0.848	1.29	<0.0173	<0.0173	0.319	0.367	0.948	1.75	0.0241	0.138	0.00082	0.00219	0.111	<0.128	1.12	1.23	<0.379	<0.171	<0.0113	<0.0113	4.03	4.67
Amazon Creek at Railroad Track Crossing																						
7/15/2009	4.04	7.03	<0.0173	0.0326	0.289	1.99	0.856	6.30	0.207	3.94	0.00135	0.0108	1.23	1.16	2.21	3.29	0.578	0.808	<0.0113	0.0140	1.71	37.1
9/17/2009	5.86	7.20	<0.0173	<0.0173	0.037	0.940	1.28	2.81	0.128	2.04	0.00065	0.00383	1.04	1.00	1.55	2.27	<0.379	0.488	<0.0113	<0.0113	2.11	19.0
11/18/2009	1.92	2.27	<0.0173	<0.0173	0.306	1.29	2.87	4.46	0.126	0.848	0.00229	0.00526	0.389	0.412	1.31	1.90	<0.379	<0.171	<0.0113	<0.0113	49.2	60.3
1/20/2010	1.27	1.73	<0.0173	<0.0173	0.400	1.23	2.19	4.26	0.0636	0.546	0.00239	0.00629	0.135	<0.128	1.16	1.67	<0.379	<0.171	<0.0113	<0.0113	10.8	15.4
3/17/2010	1.37	2.41	<0.0173	<0.0173	0.495	0.992	1.47	2.63	0.0385	0.434	0.00211	0.00482	0.192	0.181	1.18	1.62	<0.379	0.307	<0.0113	<0.0113	11.6	17.8
5/5/2010	1.80	2.52	<0.0173	<0.0173	0.465	0.925	1.39	3.09	0.0571	1.14	0.00187	0.00677	0.356	0.333	1.46	1.64	<0.379	0.192	<0.0113	<0.0113	5.87	20.3
Amazon Diversion Channel at Royal Avenue																						
7/15/2009	4.30	4.82	<0.0173	<0.0173	0.666	0.953	1.04	3.92	0.0757	1.46	<0.00050	0.00412	1.65	1.52	2.07	2.66	0.620	0.569	<0.0113	<0.0113	4.73	23.3
9/17/2009	4.54	6.57	<0.0173	0.0349	0.028	3.02	1.11	6.63	0.0437	3.82	<0.00050	0.00986	1.43	1.20	1.75	3.53	<0.379	0.389	<0.0113	0.0142	0.572	30.6
11/18/2009	1.05	1.32	<0.0173	0.0211	0.442	1.13	4.19	7.33	0.144	1.46	0.00270	0.00838	0.736	0.769	0.876	1.52	<0.379	<0.171	<0.0113	0.0151	Outlier	61.9
1/20/2010	0.949	1.67	<0.0173	0.0215	0.652	0.853	2.66	5.11	0.0742	0.677	0.00184	0.00596	0.611	0.605	1.43	1.89	<0.379	<0.171	<0.0113	<0.0113	30.7	33.0
3/17/2010	0.978	1.69	<0.0173	<0.0173	0.845	0.632	2.32	3.29	0.0341	0.535	0.00107	0.00368	0.816	0.766	1.61	1.88	<0.379	0.309	<0.0113	<0.0113	13.4	19.6
5/5/2010	1.47	3.00	<0.0173	0.0391	0.301	2.74	1.62	3.01	0.0786	3.60	0.00052	0.0121	0.888	0.667	1.84	3.01	<0.379	<0.171	<0.0113	0.0187	2.90	35.0

* No flow; no sample collected.

Table A-5
2008/2009 QA/QC Qualified Ambient Water Quality Data
Amazon Basin and Willamette River Monitoring Sites
Metals (µg/L)

Date / Site	As (D)	As (T)	Cd (D)	Cd (T)	Cr (D)	Cr (T)	Cu (D)	Cu (T)	Pb (D)	Pb (T)	Hg (D)	Hg (T)	Mo (D)	Mo (T)	Ni (D)	Ni (T)	Se (D)	Se (T)	Ag (D)	Ag (T)	Zn (D)	Zn (T)
A3 Channel at Terry Street																						
7/15/2009	3.04	3.81	<0.0173	<0.0173	Outlier	0.355	1.45	3.20	0.198	0.972	0.00113	0.00297	1.93	1.97	2.16	2.32	<0.379	0.382	<0.0113	<0.0113	13.4	20.3
9/17/2009	2.35	3.44	<0.0173	<0.0173	0.053	0.378	0.870	2.31	0.118	1.17	0.00052	0.00352	1.83	1.92	1.56	1.98	<0.379	0.472	<0.0113	<0.0113	67.1	95.8
11/18/2009	1.02	1.36	<0.0173	0.0403	0.390	1.09	4.46	8.44	0.184	2.08	0.00195	0.00772	1.18	1.22	1.18	1.94	<0.379	<0.171	<0.0113	0.0139	41.4	51.4
1/20/2010	0.817	1.52	0.0184	0.0277	0.645	0.527	2.15	4.58	0.0634	0.772	0.00119	0.00603	0.828	0.831	1.68	1.96	<0.379	<0.171	<0.0113	<0.0113	48.2	49.2
3/17/2010	0.924	1.89	<0.0173	0.0199	0.922	0.705	1.73	4.05	0.0453	1.31	0.00087	0.00822	0.939	0.905	1.91	2.33	<0.379	0.344	<0.0113	<0.0113	15.2	28.2
5/5/2010	1.15	1.60	<0.0173	<0.0173	0.272	0.225	1.68	2.44	0.0398	0.546	0.00069	0.00268	0.901	0.866	2.06	1.88	<0.379	<0.171	<0.0113	<0.0113	10.6	15.9
Amazon Creek at Royal Avenue																						
7/15/2009	3.22	4.90	<0.0173	<0.0173	0.519	1.17	1.30	4.24	0.227	2.00	0.00120	0.00529	1.42	1.39	2.41	2.95	0.557	0.743	<0.0113	<0.0113	15.2	32.1
9/17/2009	4.75	6.69	<0.0173	<0.0173	0.042	2.23	1.00	4.47	0.0483	2.65	<0.00050	0.00545	1.36	1.15	1.68	3.04	<0.379	0.428	<0.0113	<0.0113	3.92	Outlier
11/18/2009	1.72	2.26	<0.0173	0.0252	0.418	1.33	3.20	4.85	0.173	1.13	0.00255	0.00543	0.409	0.350	1.36	2.45	<0.379	0.172	<0.0113	<0.0113	Outlier	Outlier
1/20/2010	1.24	1.67	<0.0173	<0.0173	0.514	1.24	2.39	4.18	0.0923	0.535	0.00296	0.00697	0.141	<0.128	1.19	1.66	<0.379	<0.171	<0.0113	<0.0113	18.7	26.4
3/17/2010	1.35	1.87	<0.0173	<0.0173	0.572	1.16	1.53	2.80	0.0403	0.468	0.00198	0.00533	0.199	0.163	1.16	1.63	<0.379	<0.171	<0.0113	<0.0113	15.8	27.0
5/5/2010	2.32	2.86	<0.0173	<0.0173	0.388	0.765	1.59	2.83	0.0584	0.873	0.00133	0.00504	0.380	0.345	1.22	1.47	<0.379	<0.171	<0.0113	<0.0113	2.56	13.4

* No flow; no sample collected.

Table A-5
2008/2009 QA/QC Qualified Ambient Water Quality Data
Amazon Basin and Willamette River Monitoring Sites
Metals (µg/L)

Date / Site	As (D)	As (T)	Cd (D)	Cd (T)	Cr (D)	Cr (T)	Cu (D)	Cu (T)	Pb (D)	Pb (T)	Hg (D)	Hg (T)	Mo (D)	Mo (T)	Ni (D)	Ni (T)	Se (D)	Se (T)	Ag (D)	Ag (T)	Zn (D)	Zn (T)
Willamette River Upstream of Urban Growth Boundary (RM 186.9)																						
7/14/2009	0.143	0.152	<0.0173	<0.0173	0.347	<0.0170	<0.0421	0.277	<0.0223	<0.0223	<0.00050	0.00063	<0.113	<0.128	0.146	0.170	<0.379	0.182	<0.0113	<0.0113	<0.0700	1.25
9/16/2009	0.198	0.230	<0.0173	<0.0173	0.0458	0.0346	0.232	0.361	<0.0223	0.0226	<0.00050	0.00072	<0.113	<0.128	0.150	0.237	<0.379	<0.171	<0.0113	<0.0113	<0.0700	3.65
11/17/2009	0.206	0.269	<0.0173	<0.0173	<0.0170	0.115	0.274	0.519	<0.0223	0.0799	<0.00050	0.00090	<0.113	<0.128	0.167	0.304	<0.379	<0.171	<0.0113	<0.0113	2.86	Outlier
1/19/2010	0.209	0.235	<0.0173	<0.0173	0.0727	0.183	0.328	0.607	<0.0223	0.0740	0.00092	0.00164	<0.113	<0.128	0.194	0.284	<0.379	<0.171	<0.0113	<0.0113	1.62	Outlier
3/16/2010	0.116	0.199	<0.0173	<0.0173	0.125	0.193	0.288	0.515	<0.0223	0.0472	0.00064	0.00100	<0.113	<0.128	0.188	0.242	<0.379	<0.171	<0.0113	<0.0113	0.596	0.797
5/4/2010	0.197	0.208	<0.0173	<0.0173	0.138	0.139	0.262	0.551	<0.0223	0.0550	0.00080	0.00151	<0.113	<0.128	0.139	0.193	<0.379	<0.171	<0.0113	<0.0113	0.397	0.794
Willamette River at Knickerbocker Bridge (RM 183.9)																						
7/14/2009	0.198	0.208	<0.0173	<0.0173	0.284	0.0298	Outlier	0.299	<0.0223	0.0252	<0.00050	0.00078	<0.113	<0.128	0.150	0.179	<0.379	0.178	<0.0113	<0.0113	<0.0700	0.223
9/16/2009	0.282	0.335	<0.0173	<0.0173	0.0346	0.0609	0.242	0.329	<0.0223	0.0330	<0.00050	0.00076	<0.113	<0.128	0.158	0.222	<0.379	<0.171	<0.0113	<0.0113	<0.0700	1.51
11/17/2009	0.234	0.284	<0.0173	<0.0173	0.0181	0.125	0.331	0.545	<0.0223	0.0662	0.00058	0.00106	<0.113	<0.128	0.180	0.267	<0.379	<0.171	<0.0113	<0.0113	0.459	2.02
1/19/2010	0.258	0.352	<0.0173	<0.0173	0.156	0.338	0.636	1.26	<0.0223	0.0929	0.00129	0.00259	<0.113	<0.128	0.245	0.378	<0.379	<0.171	<0.0113	<0.0113	0.602	Outlier
3/16/2010	0.222	0.322	<0.0173	<0.0173	0.303	0.378	0.585	1.07	0.0229	0.0845	0.00102	0.00180	<0.113	<0.128	0.261	0.352	<0.379	<0.171	<0.0113	<0.0113	1.37	1.65
5/4/2010	0.218	0.310	<0.0173	<0.0173	0.155	0.254	0.442	0.852	<0.0223	0.0819	0.00121	0.00258	<0.113	<0.128	0.196	0.271	<0.379	<0.171	<0.0113	<0.0113	1.09	1.53
Willamette River at Owosso Bridge (RM 178.6)																						
7/14/2009	0.210	0.217	<0.0173	<0.0173	0.449	0.018	<0.0421	0.389	<0.0223	0.0583	<0.00050	0.00080	<0.113	<0.128	0.151	0.189	<0.379	<0.171	<0.0113	<0.0113	<0.0700	0.633
9/16/2009	0.273	0.324	<0.0173	<0.0173	0.0367	0.0620	0.250	0.354	<0.0223	0.0502	<0.00050	0.00078	<0.113	<0.128	0.159	0.217	<0.379	<0.171	<0.0113	<0.0113	0.142	1.00
11/17/2009	0.250	0.281	<0.0173	<0.0173	<0.0170	0.137	0.336	0.559	<0.0223	0.120	0.00051	0.00107	<0.113	<0.128	0.182	0.266	<0.379	<0.171	<0.0113	<0.0113	0.986	2.48
1/19/2010	0.260	0.340	<0.0173	<0.0173	0.118	0.329	0.590	1.18	<0.0223	0.0986	0.00120	0.00266	<0.113	<0.128	0.236	0.387	<0.379	<0.171	<0.0113	<0.0113	0.661	Outlier
3/16/2010	0.230	0.318	<0.0173	<0.0173	0.244	0.412	0.551	1.11	0.0228	0.108	0.00102	0.00186	<0.113	<0.128	0.284	0.399	<0.379	<0.171	<0.0113	<0.0113	1.55	1.93
5/4/2010	0.235	0.326	<0.0173	<0.0173	0.162	0.273	0.482	0.825	<0.0223	0.0935	0.00166	0.00252	<0.113	<0.128	0.209	0.292	<0.379	<0.171	<0.0113	<0.0113	0.897	1.20
Willamette River Downstream of Beltline Bridge (RM 176.8)																						
7/14/2009	0.220	0.234	<0.0173	<0.0173	0.401	0.0465	<0.0421	0.505	<0.0223	0.0620	<0.00050	0.00073	0.131	<0.128	0.191	0.214	<0.379	0.210	<0.0113	<0.0113	0.544	1.22
9/16/2009	0.283	0.327	<0.0173	<0.0173	0.0256	0.0558	0.277	0.430	<0.0223	0.0599	<0.00050	0.00087	0.137	0.143	0.169	0.244	<0.379	<0.171	<0.0113	<0.0113	0.416	0.900
11/17/2009	0.254	0.315	<0.0173	<0.0173	0.0278	0.109	0.405	0.680	0.0243	0.1320	0.00051	0.00107	0.113	<0.128	0.199	0.315	<0.379	<0.171	<0.0113	<0.0113	1.54	2.80
1/19/2010	0.274	0.354	<0.0173	<0.0173	0.108	0.363	0.648	1.34	<0.0223	0.1030	0.00118	0.00270	<0.113	<0.128	0.263	0.404	<0.379	<0.171	<0.0113	<0.0113	1.00	2.78
3/16/2010	0.228	0.345	<0.0173	<0.0173	0.304	0.391	0.588	1.08	<0.0223	0.1130	0.00085	0.00181	<0.113	<0.128	0.263	0.380	<0.379	<0.171	<0.0113	<0.0113	1.40	1.92
5/4/2010	0.248	0.314	<0.0173	<0.0173	0.182	0.264	0.460	0.795	<0.0223	0.0855	0.00118	0.00238	<0.113	<0.128	0.208	0.275	<0.379	<0.171	<0.0113	<0.0113	1.77	1.47
Delta Ponds above Willamette River Confluence near Beltline Bridge																						
7/14/2009*																						
9/16/2009*																						
11/17/2009	0.350	0.356	<0.0173	<0.0173	<0.0170	<0.0170	0.276	0.336	0.0402	0.0725	<0.00050	<0.00050	0.118	0.136	0.543	0.614	<0.379	<0.171	<0.0113	<0.0113	3.16	7.24
1/19/2010	0.270	0.335	<0.0173	<0.0173	0.0268	0.0333	0.467	0.666	0.0281	0.1030	<0.00050	0.00084	0.121	<0.128	0.573	0.648	<0.379	<0.171	<0.0113	<0.0113	3.20	3.63
3/16/2010	0.236	0.339	<0.0173	<0.0173	0.244	0.0249	0.638	0.493	<0.0223	0.0671	<0.00050	<0.00050	<0.113	0.159	0.267	0.672	<0.379	<0.171	<0.0113	<0.0113	1.16	3.14
5/4/2010	0.364	0.391	<0.0173	<0.0173	0.140	<0.0170	0.410	0.486	<0.0223	0.0514	<0.00050	0.00059	0.150	0.146	0.688	0.606	<0.379	<0.171	<0.0113	<0.0113	3.12	2.83

* No flow; no sample collected.

Table A-6
2008/2009 QA/QC Qualified Ambient Water Quality Data
Amazon Basin and Willamette River Monitoring Sites
Miscellaneous Parameters

Date / Site	NH_3 (*mg/L*)	BOD (*mg/L*)	Ca (T) (*mg/L*)	COD (*mg/L*)	Cond (*µmho/cm*)	DO (*mg/L*)	E. coli (*MPN*)	Fecal Coliform (*col./100 mL*)	Hardness (*mg eq/L*)	Mg (T) (*mg/L*)	NO_3+NO_2 (*mg/L*)	pH (*Units*)	P (Ortho) (*mg/L*)	P (T) (*mg/L*)	Temp (*°C*)	TDS (*mg/L*)	TKN (*mg/L*)	TSS (*mg/L*)	Turbidity (*NTU*)
Amazon Creek – Site M2 – at 29th Avenue																			
7/15/2009	<0.1	<2	29	18	290	7.6	260	260	110	9.7	0.15	7.6	Outlier	0.08	18.2	140	<0.2	1	3
9/17/2009	<0.1	<2	26	17	290	5.9	610	290	100	9.1	0.08	7.6	0.06	0.10	16.8	160	0.6	13	16
11/18/2009	<0.1	<2	19	14	200	13.9	650	810	75	6.6	0.79	7.5	0.05	0.11	11.6	140	<0.2	1	13
1/20/2010	<0.1	<2	15	22	161	7.7	120	120	60	5.5	0.53	7.6	0.04	0.07	8.5	120	0.3	7	21
3/17/2010	<0.1	<2	19	<10	190	13.8	190	46	76	7.0	0.32	8.0	0.04	0.06	9.1	130	<0.2	4	15
5/5/2010	<0.1	<2	22	<10	220	10.5	180	TNTC	88	8.0	0.22	8.0	0.03	0.05	10.0	140	<0.2	2	11
Willow Creek - 450 ft north of 18th Avenue																			
7/15/2009*																			
9/17/2009*																			
11/18/2009	<0.1	<2	32	<10	360	Outlier	34	31	120	9.5	<0.05	6.8	0.02	0.05	10.6	230	<0.2	<1	5
1/20/2010	<0.1	<2	9	17	110	3.5	12	40	35	3.1	0.13	6.8	0.02	0.06	6.8	96	0.3	<1	19
3/17/2010	<0.1	<2	15	<10	160	Outlier	12	10	56	4.6	<0.05	7.4	0.02	0.04	7.4	120	<0.2	2	14
5/5/2010	<0.1	<2	15	<10	180	9.7	15	9	58	4.9	<0.05	7.4	<0.01	0.04	10.7	120	<0.2	2	10
Amazon Creek at Railroad Track Crossing																			
7/15/2009	<0.1	3	22	38	240	4.4	550	230	87	7.7	0.08	7.1	0.02	0.12	21.5	160	0.6	44	34
9/17/2009	<0.1	2	24	24	280	9.8	10	18	94	8.3	<0.05	8.9	0.03	0.09	19.2	170	0.6	12	19
11/18/2009	<0.1	2	14	17	150	11.7	1200	740	55	4.9	Outlier	6.8	0.05	0.09	9.7	110	<0.2	8	17
1/20/2010	<0.1	<2	13	22	150	4.7	290	250	52	4.8	0.63	7.0	0.03	0.09	7.7	110	0.6	10	16
3/17/2010	<0.1	<2	19	<10	200	12.0	64	36	74	6.5	0.35	7.5	0.02	0.05	8.0	120	0.3	4	13
5/5/2010	<0.1	<2	20	<10	220	7.7	33	50	79	7.0	<0.05	7.5	0.01	0.06	11.5	130	0.3	15	17
Amazon Diversion Channel at Royal Avenue																			
7/15/2009	<0.1	3	27	32	320	7.2	30	48	120	13	<0.05	8.2	0.02	0.14	22.1	180	0.6	42	33
9/17/2009	<0.1	3	25	33	290	7.0	200	130	100	9.9	<0.05	8.2	0.02	0.19	19.3	170	0.8	67	65
11/18/2009	<0.1	2	7	16	82	12.2	550	250	31	3.2	0.23	7.3	0.06	0.10	8.9	57	<0.2	5	18
1/20/2010	<0.1	<2	18	48	210	7.5	170	76	79	8.3	0.99	6.9	0.03	0.09	8.2	140	0.6	3	16
3/17/2010	<0.1	<2	25	<10	270	12.6	4	6	110	12	0.40	7.6	0.02	0.08	10.0	170	0.4	5	12
5/5/2010	<0.1	2	22	11	220	7.4	61	50	96	10	0.16	7.3	<0.01	0.20	13.4	120	0.7	62	60

* No flow; no sample collected.
TNTC = Too numerous to count
ND = No Data; sample could not be analyzed.

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Amazon Basin and Willamette River Monitoring Sites
Miscellaneous Parameters

Date / Site	NH_3 (*mg/L*)	BOD (*mg/L*)	Ca (T) (*mg/L*)	COD (*mg/L*)	Cond (*µmho/cm*)	DO (*mg/L*)	E. coli (*MPN*)	Fecal Coliform (*col./100 mL*)	Hardness (*mg eq/L*)	Mg (T) (*mg/L*)	NO_3+NO_2 (*mg/L*)	pH (*Units*)	P (Ortho) (*mg/L*)	P (T) (*mg/L*)	Temp (*°C*)	TDS (*mg/L*)	TKN (*mg/L*)	TSS (*mg/L*)	Turbidity (*NTU*)
A3 Channel at Terry Street																			
7/15/2009	<0.1	2	23	32	250	6.0	650	310	110	12	<0.05	7.2	0.05	0.12	19.9	160	0.4	4	4
9/17/2009	<0.1	2	24	28	280	2.8	290	880	110	13	<0.05	7.5	0.05	0.19	17.6	170	0.8	22	18
11/18/2009	<0.1	2	12	19	130	9.9	210	210	51	5.1	0.43	6.6	0.04	0.10	8.9	96	<0.2	4	20
1/20/2010	<0.1	<2	26	22	290	5.8	20	12	110	12	1.4	6.8	0.03	0.10	8.5	180	0.8	4	12
3/17/2010	<0.1	<2	36	17	360	10.8	20	10	160	18	0.62	7.2	0.02	0.11	9.1	210	0.4	13	16
5/5/2010	<0.1	<2	31	16	330	10.4	300	270	140	16	0.32	7.3	0.02	0.09	12.5	190	0.4	9	14
Amazon Creek at Royal Avenue																			
7/15/2009	<0.1	4	19	42	210	4.0	320	250	76	6.9	0.07	7.1	0.02	0.10	21.6	120	0.8	43	31
9/17/2009	<0.1	3	24	17	280	5.8	280	140	95	8.6	<0.05	7.3	0.02	0.16	18.0	170	0.8	51	53
11/18/2009	<0.1	2	14	20	150	10.9	1400	580	54	4.7	0.80	7.2	0.05	0.08	8.9	97	0.3	4	18
1/20/2010	<0.1	<2	12	18	150	8.8	920	340	48	4.4	0.55	6.7	0.03	0.08	7.6	100	0.6	3	17
3/17/2010	<0.1	<2	18	12	190	11.3	53	6	71	6.3	0.32	7.0	0.02	0.05	8.5	120	<0.2	7	15
5/5/2010	<0.1	<2	16	12	180	9.8	91	78	64	5.8	<0.05	8.1	0.01	0.07	12.2	97	0.4	9	17

* No flow; no sample collected.
TNTC = Too numerous to count
ND = No Data; sample could not be analyzed.

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Amazon Basin and Willamette River Monitoring Sites
Miscellaneous Parameters

Date / Site	NH_3 (*mg/L*)	BOD (*mg/L*)	Ca (T) (*mg/L*)	COD (*mg/L*)	Cond (*µmho/cm*)	DO (*mg/L*)	E. coli (*MPN*)	Fecal Coliform (*col./100 mL*)	Hardness (*mg eq/L*)	Mg (T) (*mg/L*)	NO_3+NO_2 (*mg/L*)	pH (*Units*)	P (Ortho) (*mg/L*)	P (T) (*mg/L*)	Temp (*°C*)	TDS (*mg/L*)	TKN (*mg/L*)	TSS (*mg/L*)	Turbidity (*NTU*)
Willamette River Upstream of Urban Growth Boundary (RM 186.9)																			
7/14/2009	<0.1	<2	4	<10	42	11.0	12	6	16	1.4	<0.05	7.5	0.02	0.02	14.4	28	<0.2	1	2
9/16/2009	<0.1	<2	4	11	48	13.0	16	12	16	1.5	<0.05	8.3	0.01	0.02	16.1	47	<0.2	<1	2
11/17/2009	<0.1	<2	5	<10	53	Outlier	37	ND	19	1.7	<0.05	7.6	0.02	0.04	10.8	42	<0.2	3	6
1/19/2010	<0.1	<2	4	11	48	9.5	6	5	16	1.4	0.10	7.9	0.02	0.03	8.0	26	<0.2	2	6
3/16/2010	<0.1	<2	5	<10	52	Outlier	4	2	19	1.6	<0.05	7.6	0.02	0.03	7.8	48	<0.2	2	4
5/4/2010	<0.1	<2	4	<10	46	11.3	8	8	15	1.2	<0.05	7.6	0.02	0.03	9.4	27	<0.2	3	6
Willamette River at Knickerbocker Bridge (RM 183.9)																			
7/14/2009	<0.1	<2	4	<10	45	10.5	18	12	16	1.4	<0.05	7.1	0.01	0.02	14.4	33	<0.2	1	2
9/16/2009	<0.1	<2	4	<10	49	12.4	20	14	17	1.6	<0.05	8.2	0.01	0.02	16.2	43	<0.2	1	3
11/17/2009	<0.1	<2	5	<10	55	Outlier	32	ND	19	1.7	0.07	7.6	0.02	0.04	10.6	51	<0.2	3	6
1/19/2010	<0.1	<2	5	<10	52	9.3	16	10	19	1.6	0.22	6.9	0.02	0.04	7.8	29	<0.2	3	9
3/16/2010	<0.1	<2	6	<10	58	Outlier	12	6	22	1.6	0.14	7.5	0.01	0.03	8.2	58	<0.2	4	8
5/4/2010	<0.1	<2	5	<10	49	10.9	17	17	18	1.3	0.07	7.4	0.01	0.03	9.0	36	<0.2	3	7
Willamette River at Owosso Bridge (RM 178.6)																			
7/14/2009	<0.1	<2	4	<10	45	9.9	47	22	16	1.5	<0.05	7.2	0.02	0.05	14.5	26	<0.2	2	2
9/16/2009	<0.1	<2	5	<10	50	12.3	21	24	19	1.7	<0.05	8.3	0.01	0.02	16.0	45	<0.2	<1	2
11/17/2009	<0.1	<2	5	<10	55	Outlier	79	ND	19	1.7	0.08	7.6	0.02	0.04	10.5	40	<0.2	2	4
1/19/2010	<0.1	<2	5	<10	55	9.7	11	2	19	1.6	0.22	6.8	0.03	0.04	7.7	34	<0.2	2	9
3/16/2010	<0.1	<2	6	<10	60	Outlier	12	3	21	1.5	0.14	7.4	0.01	0.04	8.5	36	<0.2	4	7
5/4/2010	<0.1	<2	5	<10	50	10.8	21	28	18	1.4	0.10	7.3	0.01	0.03	9.1	20	<0.2	4	8
Willamette River Downstream of Beltline Bridge (RM 176.8)																			
7/14/2009	<0.1	<2	4	<10	51	9.8	69	35	16	1.5	0.11	7.2	0.06	0.07	14.8	35	0.28	2	2
9/16/2009	<0.1	<2	4	<10	52	12.1	76	57	17	1.7	<0.05	7.3	0.03	0.04	16.0	44	<0.2	1	2
11/17/2009	<0.1	<2	5	<10	59	Outlier	65	ND	19	1.7	0.18	7.3	0.04	0.08	10.8	52	<0.2	2	4
1/19/2010	<0.1	<2	5	<10	59	9.7	13	4	19	1.7	0.31	7.6	0.05	0.08	7.7	40	<0.2	2	11
3/16/2010	<0.1	<2	6	<10	64	Outlier	12	9	22	1.6	0.20	7.4	0.05	0.08	8.7	47	<0.2	4	8
5/4/2010	<0.1	<2	5	<10	55	9.7	24	29	18	1.4	0.20	7.3	0.05	0.07	9.3	32	0.3	4	9

* No flow; no sample collected.
TNTC = Too numerous to count
ND = No Data; sample could not be analyzed.

Table A-6
2008/2009 QA/QC Qualified Ambient Water Quality Data
Amazon Basin and Willamette River Monitoring Sites
Miscellaneous Parameters

Date / Site	NH_3 (*mg/L*)	BOD (*mg/L*)	Ca (T) (*mg/L*)	COD (*mg/L*)	Cond (*µmho/cm*)	DO (*mg/L*)	E. coli (*MPN*)	Fecal Coliform (*col./100 mL*)	Hardness (*mg eq/L*)	Mg (T) (*mg/L*)	NO_3+NO_2 (*mg/L*)	pH (*Units*)	P (Ortho) (*mg/L*)	P (T) (*mg/L*)	Temp (*°C*)	TDS (*mg/L*)	TKN (*mg/L*)	TSS (*mg/L*)	Turbidity (*NTU*)
Delta Ponds above Willamette River Confluence near Beltline Bridge																			
7/14/2009*																			
9/16/2009*																			
11/17/2009	<0.1	<2	15	<10	150	6.4	32	ND	64	6.4	<0.05	6.5	0.02	0.04	10.0	82	<0.2	<1	2
1/19/2010	<0.1	<2	14	13	160	4.5	12	5	63	6.8	0.32	6.5	0.02	0.04	9.5	92	0.3	1	3
3/16/2010	<0.1	<2	17	<10	180	7.0	6	10	76	8.1	<0.05	7.1	0.01	0.03	10.7	100	<0.2	<1	2
5/4/2010	<0.1	<2	16	11	160	3.7	26	<1	71	7.6	0.06	6.9	0.02	0.04	12.9	88	0.7	<1	2

* No flow; no sample collected.
TNTC = Too numerous to count
ND = No Data; sample could not be analyzed.

Table A-7
Summary Statistics for QA/QC Qualified Ambient Water Quality Data
Metals

Surface Water Sample Location:		Amazon Creek – Site M2 – at 29th Avenue	Willow Creek - 450 ft north of 18th Avenue	Amazon Creek at Railroad Track Crossing	Amazon Diversion Channel at Royal Avenue	A3 Channel at Terry Street	Amazon Creek at Royal Avenue	Willamette River Upstream of Urban Growth Boundary (RM 186.9)	Willamette River at Knickerbocker Bridge (RM 183.9)	Willamette River at Owosso Bridge (RM 178.6)	Willamette River Downstream of Beltline Bridge (RM 176.8)	Delta Ponds above Willamette River Confluence near Beltline Bridge
Metals (μg/L)	**Statistic**											
As (D)	$\mu^{\wedge}$	0.884	0.927	2.46	2.52	2.46	2.30	0.203	0.231	0.239	0.254	0.349
	$\sigma^{\wedge}$	0.349	0.477	1.03	1.36	1.43	1.09	0.0636	0.0601	0.0647	0.102	0.106
As (T)	$\mu^{\wedge}$	1.09	1.40	4.01	4.27	4.11	3.50	0.263	0.295	0.310	0.316	0.523
	$\sigma^{\wedge}$	0.356	0.680	1.86	2.27	3.29	1.81	0.100	0.0874	0.0931	0.0922	0.480
Cd (D)	$\mu^{\wedge}$	0.00114	0.00206	0.00385	0.00787	0.0162	0.00348	0.00082	0.00342	0.00190	0.00195	INS
	$\sigma^{\wedge}$	0.00201	0.00284	0.00441	0.0109	0.0144	0.00519	0.00281	0.0098	0.00543	0.00489	INS
Cd (T)	$\mu^{\wedge}$	0.00705	0.00298	0.0192	0.0256	0.0543	0.0180	0.00168	0.00442	0.00234	0.00277	0.00160
	$\sigma^{\wedge}$	0.00805	0.00361	0.0153	0.0180	0.0314	0.0156	0.00399	0.00772	0.00463	0.00614	0.00554
Cr (D)	$\mu^{\wedge}$	0.721	0.364	0.796	0.752	0.811	0.689	0.159	0.185	0.173	0.192	0.0986
	$\sigma^{\wedge}$	0.490	0.257	0.506	0.515	0.544	0.457	0.130	0.146	0.135	0.143	0.104
Cr (T)	$\mu^{\wedge}$	1.53	0.909	1.74	1.81	1.77	1.67	0.389	0.420	0.414	0.396	0.173
	$\sigma^{\wedge}$	0.823	0.520	0.973	0.84	1.20	0.711	0.266	0.279	0.284	0.258	0.169
Cu (D)	$\mu^{\wedge}$	1.68	1.21	1.75	2.29	2.24	1.84	0.316	0.382	0.375	0.452	0.515
	$\sigma^{\wedge}$	0.621	0.388	0.575	0.969	1.22	0.610	0.129	0.148	0.132	0.157	0.227
Cu (T)	$\mu^{\wedge}$	3.26	2.24	3.92	6.10	6.57	4.09	0.571	0.681	0.685	0.790	0.94
	$\sigma^{\wedge}$	1.25	0.840	1.26	4.29	4.43	1.37	0.279	0.326	0.303	0.332	1.09
Pb (D)	$\mu^{\wedge}$	0.0359	0.0219	0.0929	0.0976	0.142	0.103	0.00593	0.0101	0.0104	0.0182	0.0235
	$\sigma^{\wedge}$	0.0232	0.0156	0.0517	0.0512	0.0927	0.0490	0.00770	0.0112	0.00863	0.0110	0.0199
Pb (T)	$\mu^{\wedge}$	0.628	0.276	2.20	2.27	2.52	1.88	0.0787	0.0821	0.0949	0.101	0.214
	$\sigma^{\wedge}$	0.344	0.162	1.33	1.33	1.62	0.973	0.0422	0.0406	0.0395	0.0401	0.147
Hg (D)	$\mu^{\wedge}$	0.00104	0.00105	0.00225	0.00131	0.00141	0.00178	0.00085	0.00094	0.00093	0.00093	0.00008
	$\sigma^{\wedge}$	0.00052	0.00053	0.00101	0.00076	0.00066	0.00090	0.00042	0.00044	0.00042	0.00040	0.00004
Hg (T)	$\mu^{\wedge}$	0.00264	0.00265	0.00923	0.00740	0.0114	0.00677	0.00172	0.00177	0.00185	0.00195	0.00068
	$\sigma^{\wedge}$	0.00136	0.00143	0.00364	0.00403	0.00674	0.00282	0.00094	0.00087	0.00094	0.00099	0.00046
Mo (D)	$\mu^{\wedge}$	0.284	0.143	0.545	1.32	1.44	0.694	INS	INS	INS	0.049	0.156
	$\sigma^{\wedge}$	0.160	0.120	0.330	0.763	0.642	0.445	INS	INS	INS	0.027	0.052
Mo (T)	$\mu^{\wedge}$	0.282	0.128	0.512	1.24	1.49	0.680	INS	INS	INS	0.031	0.188
	$\sigma^{\wedge}$	0.160	0.131	0.282	0.708	0.673	0.397	INS	INS	INS	0.025	0.063
Ni (D)	$\mu^{\wedge}$	1.45	1.83	1.74	2.20	2.28	1.74	0.197	0.215	0.211	0.235	0.725
	$\sigma^{\wedge}$	0.414	1.35	0.447	0.701	0.659	0.462	0.0777	0.0803	0.0765	0.0914	0.1568
Ni (T)	$\mu^{\wedge}$	2.05	2.24	2.43	3.31	3.20	2.52	0.298	0.322	0.312	0.337	0.869
	$\sigma^{\wedge}$	0.501	1.41	0.680	1.07	1.04	0.624	0.122	0.140	0.120	0.125	0.387
Se (D)	$\mu^{\wedge}$	INS	0.072	0.101	0.074	INS	0.174	INS	INS	INS	INS	INS
	$\sigma^{\wedge}$	INS	0.019	0.039	0.050	INS	0.099	INS	INS	INS	INS	INS
Se (T)	$\mu^{\wedge}$	0.162	0.220	0.372	0.318	INS	0.312	0.045	0.033	0.041	0.057	0.085
	$\sigma^{\wedge}$	0.066	0.114	0.161	0.157	INS	0.134	0.040	0.028	0.025	0.021	0.067
Ag (D)	$\mu^{\wedge}$	0.00084	0.00033	0.00165	0.00173	0.00051	0.00133	0.00033	0.00126	0.00174	0.00177	INS
	$\sigma^{\wedge}$	0.00215	0.00081	0.00569	0.00442	0.00186	0.00282	0.00183	0.00426	0.00640	0.00348	INS
Ag (T)	$\mu^{\wedge}$	0.00467	0.00262	0.0207	0.0145	0.0118	0.0204	0.00262	0.00253	0.00408	0.00665	INS
	$\sigma^{\wedge}$	0.00726	0.00461	0.0193	0.00940	0.0101	0.0180	0.00553	0.00475	0.00771	0.00752	INS
Zn (D)	$\mu^{\wedge}$	11.1	3.28	9.71	8.38	19.5	6.80	0.403	0.570	0.514	0.991	3.11
	$\sigma^{\wedge}$	6.58	1.88	13.1	5.16	18.3	4.29	0.297	0.390	0.323	0.572	1.40
Zn (T)	$\mu^{\wedge}$	20.7	5.71	23.8	24.5	39.5	18.0	1.12	1.33	1.14	1.74	4.66
	$\sigma^{\wedge}$	17.2	2.52	15.1	18.5	24.8	9.2	0.698	0.833	0.643	0.935	2.09

μ_{μ} : Mean corrected for censored data
σ_{σ} : Standard deviation corrected for censored data
INS = Insufficient uncensored data to compute statistic.

Table A-8
Summary Statistics for QA/QC Qualified Ambient Water Quality Data
Miscellaneous Parameters

Surface Water Sample Location:		Amazon Creek – Site M2 – at 29th Avenue	Willow Creek - 450 ft north of 18th Avenue	Amazon Creek at Railroad Track Crossing	Amazon Diversion Channel at Royal Avenue	A3 Channel at Terry Street	Amazon Creek at Royal Avenue	Willamette River Upstream of Urban Growth Boundary (RM 186.9)	Willamette River at Knickerbocker Bridge (RM 183.9)	Willamette River at Owosso Bridge (RM 178.6)	Willamette River Downstream of Beltline Bridge (RM 176.8)	Delta Ponds above Willamette River Confluence near Beltline Bridge
Miscellaneous Parameters	**Statistic**											
NH_3 – as N (*mg/L*)	μ_μ	0.9	INS	0.8	0.2	< 0.1	0.1	INS	INS	0.2	< 0.1	INS
	σ_σ	1.9	INS	1.6	0.9	0.7	0.6	INS	INS	0.4	0.4	INS
$NO_3 + NO_2$ – as N (*mg/L*)	μ_μ	0.31	< 0.05	0.20	0.19	0.31	0.15	< 0.05	< 0.05	< 0.05	0.12	0.09
	σ_σ	0.23	0.18	0.27	0.38	0.35	0.32	0.08	0.10	0.09	0.08	0.20
TKN – as N (*mg/L*)	μ_μ	0.3	0.3	0.4	0.9	0.9	0.5	< 0.2	< 0.2	< 0.2	0.3	0.4
	σ_σ	0.4	0.4	0.4	0.8	0.9	0.4	0.4	0.4	0.4	0.3	0.4
P – Ortho (*mg/L*)	μ_μ	0.05	0.02	0.04	0.04	0.05	0.03	0.02	0.02	0.02	0.05	0.02
	σ_σ	0.03	0.03	0.04	0.05	0.04	0.02	0.02	0.01	0.01	0.03	0.01
P – Total (*mg/L*)	μ_μ	0.10	0.06	0.11	0.17	0.22	0.12	0.03	0.04	0.04	0.08	0.06
	σ_σ	0.08	0.02	0.06	0.11	0.11	0.10	0.02	0.02	0.03	0.05	0.06
BOD (*mg/L*)	μ_μ	< 2	< 2	< 2	2.5	2.8	< 2	13	INS	INS	17	< 2
	σ_σ	11.0	9.3	2.6	2.5	2.7	2.6	25	INS	INS	32	4.2
COD (*mg/L*)	μ_μ	< 10	< 10	13	23	24	14	INS	INS	INS	INS	6
	σ_σ	16	23	14	16	15	11	INS	INS	INS	INS	10
Dissolved Oxygen (*mg/L*)	μ_μ	9.0	8.4	7.5	7.9	7.4	8.1	10.3	10.3	10.2	10.0	5.4
	σ_σ	2.5	2.9	2.8	2.9	3.2	2.8	2.9	2.7	2.9	3.2	2.2
Calcium - Total (*mg/L*)	μ_μ	24	37	21	23	26	20	5	5	5	5	16
	σ_σ	7	79	7	8	8	7	1	1	1	1	2
Magnesium - Total (*mg/L*)	μ_μ	8.3	8.6	7.1	10.5	13.2	7.4	1.5	1.6	1.6	1.6	7.4
	σ_σ	2.3	8.3	2.4	4.3	4.6	2.9	0.3	0.2	0.3	0.3	0.8
Hardness (*mg/L*)	μ_μ	94	127	83	99	119	80	18	19	19	20	71
	σ_σ	27	231	26	36	39	30	2	2	2	2	9
Turbidity (*NU*)	μ_μ	15	16	23	36	26	28	6	6	7	7	4
	σ_σ	10	11	11	30	24	18	7	7	7	7	6
TSS (*mg/L*)	μ_μ	7	8	19	31	27	23	4	4	4	4	2
	σ_σ	9	11	16	31	38	21	6	5	6	6	14
TDS (*mg/L*)	μ_μ	157	242	142	159	181	139	42	44	43	44	95
	σ_σ	36	423	43	49	48	44	12	12	12	13	16
Specific Conductance (*µmos/cm*)	μ_μ	228	341	225	246	286	215	47	48	49	54	166
	σ_σ	65	619	70	85	84	76	5	5	8	7	18
Escherichia coli (*Col./100 mL*)	μ_μ	929	109	607	421	682	532	22	30	39	42	53
	σ_σ	2730	241	2056	1779	1282	1174	36	26	38	37	88
Fecal coliform (*Col./100 mL*)	μ_μ	271	72	247	124	386	282	17	23	31	36	27
	σ_σ	334	114	341	258	835	494	23	21	32	29	23
pH (*Units*)	μ_μ	7.5	7.0	7.3	7.4	7.3	7.5	7.3	7.3	7.3	7.0	7.1
	σ_σ	0.9	1.2	0.9	1.1	1.0	1.0	0.5	0.5	0.5	1.4	0.3
Temperature (°*C*)	μ_μ	11.7	12.6	14.0	15.3	15.4	14.9	11.2	11.4	11.5	11.5	10.8
	σ_σ	3.7	8.8	5.8	6.3	6.3	6.2	3.3	3.6	3.9	3.7	3.2

μ_μ : Mean corrected for censored data
σ_σ : Standard deviation corrected for censored data
INS = Insufficient uncensored data to compute statistic.

Table A-9
Analytes Showing Significant Seasonal Trend
Utilizing Seasonal Kendall Statistic[1]
Analysis of Water Quality Data Set

Monitoring Location	Analyte	Parameter				
		tau	***S***	***Z***	***2ρ***	***M***
Willow Creek	[2] Total Suspended Solids	-0.442	-144	-4.219	0.0000	-0.0900
Amazon Creek at 29th Avenue – Site M2	Lead, Total	-0.305	-107	-2.975	0.0058	-0.0308
	Nickel, Total	-0.360	-113	-3.423	0.0012	-0.5969
Amazon Creek at Railroad Track Crossing	Cadmium, Total	-0.362	-76	-3.045	0.0046	-0.0008
	Nickel, Dissolved	-0.371	-78	-3.092	0.0040	-0.0450
Amazon Diversion Channel at Royal Avenue	Arsenic, Dissolved	-0.503	-158	-4.750	0.0000	-0.1787
	Arsenic, Total	-0.466	-152	-4.455	0.0000	-0.2269
	Nickel, Dissolved	-0.481	-151	-4.540	0.0000	-0.1409
	Ortho Phosphorus	-0.373	-131	-3.691	0.0004	-0.0030
A3 Channel at Terry Street	Arsenic, Dissolved	-0.590	-118	-4.858	0.0000	-0.1220
	Arsenic, Total	-0.490	-98	-4.028	0.0002	-0.2353
	Cadmium, Total	-0.445	-85	-3.592	0.0006	-0.0067
	Chromium, Total	-0.445	-89	-3.657	0.0006	-0.1745
	Nickel, Dissolved	-0.405	-81	-3.325	0.0018	-0.0645
	Nickel, Total	-0.460	-92	-3.779	0.0004	-0.1617
Amazon Creek at Royal Avenue	[2] Silver, Total	-0.636	-215	-6.210	0.0000	-0.0036
	[2] Cadmium, Total	-0.379	-128	-3.682	0.0004	-0.0015
	Chromium, Total	-0.486	-153	-4.585	0.0000	-0.0975
	[2] Mercury, Total	-0.343	-116	-3.313	0.0018	-0.0003
	[2] Nickel, Total	-0.411	-134	-3.924	0.0002	-0.1011
	Lead, Total	-0.459	-161	-4.490	0.0000	-0.1244
	[2] Fecal Coliform	-0.489	-149	-4.544	0.0000	-141.9
	Ortho Phosphorus	-0.366	-124	-3.644	0.0006	-0.0017
Willamette River Upstream of Urban Growth Boundary	[2] Arsenic, Total	-0.359	-117	-3.428	0.0012	-0.0125
	Nickel, Total	-0.310	-97	-2.916	0.0070	-0.0162
	Magnesium, Total	-0.325	-110	-3.204	0.0028	-0.0185
Willamette River at Knickerbocker Bridge	Conductivity	0.288	101	2.821	0.0096	0.4500
	Fecal Coliform	-0.548	-167	-5.101	0.0000	-6.2500
Willamette River at Owosso Bridge	Magnesium, Total	-0.311	-105	-3.058	0.0044	-0.0182

[1] Significant at 2ρ = 0.01
[2] Assumes censored values in data set are one-half the reporting limit.

Table A-10
Comparison of Seventh Permit Year (2009/2010) Data to Historical Data
Analytes Showing Significant Change
Utilizing Mann-Whitney Statistic[1]
Amazon Basin Monitoring Sites

Monitoring Location	Analyte	Units	Average Analyte Value Monitoring Period	
			Historical	2009/2010
Willow Creek	Selenium, Total	µg/L	0.293	0.108
	Total Suspended Solids	mg/L	9	1
Amazon Creek – Site M2 – at 29th Avenue	Chemical Oxygen Demand	mg/L	8	14
	Total Kjeldahl Nitrogen	mg/L	0.4	0.2
Amazon Creek at Railroad Track Crossing	Cadmium, Total	µg/L	0.0260	0.0126
	[2]Chromium, Dissolved	µg/L	0.780	0.332
	Mercury, Total	µg/L	0.00955	0.00630
	Silver, Total	µg/L	0.0287	0.00704
Amazon Diversion Channel at Royal Avenue	Nickel, Dissolved	µg/L	2.29	1.60
	Nickel, Total	µg/L	3.39	2.42
A3 Channel at Terry Street	Arsenic, Total	µg/L	4.32	2.27
	[2]Cadmium, Total	µg/L	0.0618	0.0103
	Chromium, Total	µg/L	1.91	0.547
	Lead, Total	µg/L	2.67	1.14
	Mercury, Total	µg/L	0.0121	0.00519
	Nickel, Dissolved	µg/L	2.34	1.76
	Nickel, Total	µg/L	3.33	2.07
	Silver, Total	µg/L	0.0182	0.00703
	Biochemical Oxygen Demand	mg/L	3	2
	Field pH	mg/L	7.5	7.1
	Total Phosphorus	mg/L	0.23	0.12
	Total Suspended Solids	mg/L	30	9
Amazon Creek at Royal Avenue	Cadmium, Total	µg/L	0.0258	0.0114
	[2]Silver, Total	µg/L	0.0259	0.00565

[1] Significant at α = 0.05
[2] Assumes censored values in data set are one-half the reporting limit.
Shaded cells indicate the higher average.

Table A-10 Continued
Comparison of Seventh Permit Year (2009/2010) Data to Historical Data
Analytes Showing Significant Change
Utilizing Mann-Whitney Statistic[1]
Willamette River Monitoring Sites

Monitoring Location	Analyte	Units	Average Analyte Value Monitoring Period	
			Historical	2009/2010
Willamette River Upstream of Urban Growth Boundary	[2]Chromium, Total	µg/L	0.412	0.112
	Chemical Oxygen Demand	mg/L	6	7
	Fecal Coliform	col./100 mL	18	6
	Field pH	Units	7.3	7.8
Willamette River at Knickerbocker Bridge	[2]Fecal Coliform	col./100 mL	25	6
	Ortho Phosphorus	mg/L	0.024	0.018
Willamette River at Owosso Bridge	Fecal Coliform	col./100 mL	33	13
	Total Dissolved Solids	mg/L	46	34
Willamette River Downstream of Beltline Bridge	Lead, Dissolved	mg/L	0.0229	0.0133
	Total Kjeldahl Nitrogen	mg/L	0.3	0.2
Delta Ponds above Willamette River Confluence near Beltline Bridge	Chromium, Total	µg/L	0.0129	0.0188
	[2] Molybdenum, Dissolved	µg/L	0.191	0.111
	[2] Molybdenum, Total	µg/L	0.215	0.126
	Nickel, Dissolved	µg/L	0.781	0.518
	Nickel, Total	µg/L	0.931	0.635
	Fecal Coliform	col./100 mL	32	4
	Field pH	Units	7.2	6.8
	Total Suspended Solids	mg/L	6	< 1

[1] Significant at α = 0.05
[2] Assumes censored values in data set are one-half the reporting limit.
Shaded cells indicate the higher average.

Table A-11
Comparison of Metals Water Quality Data for Seventh Permit Year and Historical Data Set
Mann-Whitney Statistic

Monitoring Location	As (D)	As (T)	Cd (D)	Cd (T)	Cr (D)	Cr (T)	Cu (D)	Cu (T)	Pb (D)	Pb (T)	Hg (D)	Hg (T)	Mo (D)	Mo (T)	Ni (D)	Ni (T)	Se (D)	Se (T)	Ag (D)	Ag (T)	Zn (D)	Zn (T)
Amazon Creek - Site M2 - at 29th Avenue																						
Mann-Whitney U	172.5	141.5	186	186	184.5	162.5	202.5	209	165.5	122	175	179.5	39.5	36	112.5	116	37.5	21.5	210	162	128.5	149.5
Z	-0.47	-1.11	-0.61	-0.61	-0.10	-0.67	-0.31	-0.24	-0.99	-1.80	-0.77	-0.68	-0.43	-0.70	-1.74	-1.67	-1.58	-1.88	-0.11	-1.02	-1.71	-1.32
Asymp. Sig. (2-tailed)	0.642	0.269	0.539	0.539	0.924	0.502	0.760	0.812	0.322	0.073	0.442	0.494	0.668	0.483	0.081	0.095	0.114	0.060	0.910	0.308	0.088	0.185
Exact Sig. [2*(1-tailed Sig.)]	0.650	0.276			0.926	0.511							0.677	0.519	0.081	0.098	0.569	0.066				
Willow Creek																						
Mann-Whitney U	88	100.5	130	114	79	72	132	136.5	110.5	73	125.5	136	19	19	64	65	20	6	134	122	71	98
Z	-0.97	-0.63	-0.19	-0.50	-1.10	-1.43	-0.19	-0.08	-0.71	-1.58	-0.21	-0.05	-0.63	-0.67	-1.64	-1.61	-0.84	-2.22	-0.05	-0.43	-0.89	-0.19
Asymp. Sig. (2-tailed)	0.333	0.528	0.846	0.617	0.272	0.153	0.848	0.933	0.481	0.115	0.832	0.961	0.527	0.504	0.101	0.106	0.399	0.027	0.961	0.666	0.376	0.846
Exact Sig. [2*(1-tailed Sig.)]	0.354	0.542	0.861	0.639	0.290	0.163	0.863	0.936	0.495	0.121	0.838	0.972	0.599	0.599	0.105	0.112	0.684	0.030	0.972	0.687	0.401	0.865
Amazon Creek at Railroad Track Crossing																						
Mann-Whitney U	153.5	143	138	69	71	94	145.5	165	142	116	106	66	40	42.5	98.5	87.5	45	32	156	66.5	145.5	136
Z	-0.21	-0.47	-0.60	-2.34	-2.24	-1.72	-0.47	0.00	-0.49	-1.13	-1.38	-2.40	-0.39	-0.19	-1.61	-1.88	0.00	-1.01	-0.22	-2.40	-0.47	-0.70
Asymp. Sig. (2-tailed)	0.834	0.640	0.549	0.019	0.025	0.086	0.637	1.000	0.622	0.257	0.168	0.017	0.697	0.846	0.107	0.061	1.000	0.311	0.825	0.017	0.637	0.482
Exact Sig. [2*(1-tailed Sig.)]	0.838	0.656	0.572	0.018	0.023	0.088	0.645	1.000	0.639	0.270	0.176	0.014	0.733	0.850	0.109	0.059	1.000	0.340	0.841	0.014	0.645	0.500
Amazon Diversion Channel at Royal Avenue																						
Mann-Whitney U	143	134	183	179	169.5	144	181.5	201	172	201.5	160.5	197	30	24	80	96.5	42.5	30	192	126.5	161.5	127
Z	-1.03	-1.26	-0.57	-0.69	-0.47	-1.05	-0.69	-0.38	-0.83	-0.32	-1.00	-0.30	-1.17	-1.63	-2.38	-2.07	-0.32	-1.18	-0.45	-1.71	-0.38	-1.74
Asymp. Sig. (2-tailed)	0.304	0.207	0.566	0.488	0.637	0.292	0.488	0.701	0.409	0.746	0.318	0.761	0.243	0.102	0.017	0.039	0.749	0.240	0.650	0.087	0.702	0.083
Exact Sig. [2*(1-tailed Sig.)]	0.317	0.217			0.645	0.305							0.267	0.112	0.015	0.036	0.850	0.267			0.710	
A3 Channel at Terry Street																						
Mann-Whitney U	108.5	77	90	35	85	25	139	83	155	45	103	52	31	27	72	23	39	38	153	53.5	85	150.5
Z	-1.21	-2.06	-1.74	-3.09	-1.22	-3.36	-0.50	-1.91	-0.10	-2.86	-1.40	-2.68	-0.91	-1.24	-2.18	-3.41	-0.65	-0.33	-0.15	-2.62	-1.86	-0.21
Asymp. Sig. (2-tailed)	0.225	0.040	0.081	0.002	0.222	0.001	0.616	0.057	0.920	0.004	0.160	0.007	0.364	0.216	0.029	0.001	0.513	0.741	0.879	0.009	0.063	0.831
Exact Sig. [2*(1-tailed Sig.)]	0.232	0.039	0.086	0.001	0.235	0.000	0.633	0.057	0.932	0.003	0.168	0.005	0.397	0.239	0.027	0.000	0.841	0.779	0.893	0.006	0.064	0.835
Amazon Creek at Royal Avenue																						
Mann-Whitney U	177.5	184	198	95	147	120.5	196.5	215	202	133	213	129	37	33	129	139.5	35.5	27	180	69	102	75
Z	-0.36	-0.29	-0.34	-2.31	-0.89	-1.54	-0.47	-0.13	-0.31	-1.59	-0.06	-1.60	-0.62	-0.93	-1.41	-1.19	-0.88	-1.40	-0.68	-2.79	-1.67	-1.65
Asymp. Sig. (2-tailed)	0.718	0.775	0.734	0.021	0.371	0.123	0.641	0.898	0.753	0.111	0.955	0.110	0.533	0.350	0.160	0.233	0.378	0.161	0.497	0.005	0.095	0.098
Exact Sig. [2*(1-tailed Sig.)]	0.724	0.789			0.386	0.126							0.569	0.381	0.167	0.240	0.470	0.178			0.098	0.102

Note: Exact Sig. [2*(1-tailed Sig.)] Not corrected for ties.

Shaded cells significant at $\alpha = 0.05$

Table A-11
Comparison of Metals Water Quality Data for Seventh Permit Year and Historical Data Set
Mann-Whitney Statistic

Monitoring Location	As (D)	As (T)	Cd (D)	Cd (T)	Cr (D)	Cr (T)	Cu (D)	Cu (T)	Pb (D)	Pb (T)	Hg (D)	Hg (T)	Mo (D)	Mo (T)	Ni (D)	Ni (T)	Se (D)	Se (T)	Ag (D)	Ag (T)	Zn (D)	Zn (T)
Willamette River Upstream of Urban Growth Boundary																						
Mann-Whitney U	153	142.5	174	192	156	71	160.5	210	174	139	107	133.5	45	45	111.5	119	45	42	204	192	162	105
Z	-0.82	-1.09	-0.65	-0.45	-0.70	-2.56	-0.91	-0.11	-0.65	-1.44	-1.95	-1.51	0.00	0.00	-1.61	-1.49	0.00	-0.34	0.00	-0.45	-0.63	-0.87
Asymp. Sig. (2-tailed)	0.413	0.278	0.516	0.650	0.482	0.010	0.364	0.910	0.516	0.149	0.051	0.131	1.000	1.000	0.107	0.136	1.000	0.733	1.000	0.650	0.529	0.383
Exact Sig. [2*(1-tailed Sig.)]	0.429	0.286			0.498	0.008							1.000	1.000	0.109	0.142	1.000	0.850			0.545	0.404
Willamette River at Knickerbocker Bridge																						
Mann-Whitney U	166	186	192	204	188	104	131.5	201.5	194	197	169	183.5	45	45	157	146.5	45	44.5	204	198	201.5	148.5
Z	-0.49	-0.13	-0.40	-0.23	-0.08	-1.85	-0.96	-0.22	-0.31	-0.36	-0.79	-0.56	0.00	0.00	-0.73	-0.85	0.00	-0.06	-0.12	-0.34	-0.11	-0.61
Asymp. Sig. (2-tailed)	0.624	0.900	0.688	0.821	0.933	0.065	0.335	0.827	0.757	0.722	0.430	0.575	1.000	1.000	0.463	0.393	1.000	0.949	0.907	0.734	0.914	0.543
Exact Sig. [2*(1-tailed Sig.)]	0.640	0.910			0.943	0.066	0.346						1.000	1.000	0.479	0.403	1.000	0.970				0.554
Willamette River at Owosso Bridge																						
Mann-Whitney U	153.5	185	192	210	181	114	190	193	196.5	209	180.5	182.5	39	42	168	165.5	45	33	204	174	161.5	128.5
Z	-0.81	-0.21	-0.40	-0.11	-0.11	-1.64	-0.39	-0.43	-0.31	-0.08	-0.57	-0.58	-0.65	-0.63	-0.50	-0.50	0.00	-1.36	-0.12	-0.75	-0.89	-0.82
Asymp. Sig. (2-tailed)	0.419	0.836	0.688	0.910	0.914	0.102	0.700	0.666	0.753	0.939	0.570	0.562	0.513	0.527	0.615	0.617	1.000	0.173	0.907	0.456	0.374	0.412
Exact Sig. [2*(1-tailed Sig.)]	0.429	0.848			0.924	0.105							0.841	0.850	0.630	0.625	1.000	0.381				0.423
Willamette River Downstream of Beltline Bridge																						
Mann-Whitney U	156.5	189	183	189	177.5	111	195.5	206	102	186.5	134	172.5	38.5	44	149.5	153	45	38	192	138	166	172.5
Z	-0.74	-0.12	-0.57	-0.51	-0.24	-1.74	-0.28	-0.19	-2.11	-0.45	-1.43	-0.77	-0.60	-0.11	-0.89	-0.77	0.00	-0.68	-0.35	-1.43	-0.80	-0.67
Asymp. Sig. (2-tailed)	0.456	0.901	0.566	0.611	0.807	0.082	0.780	0.851	0.035	0.651	0.154	0.441	0.546	0.910	0.373	0.443	1.000	0.495	0.727	0.151	0.423	0.500
Exact Sig. [2*(1-tailed Sig.)]	0.466	0.912			0.811	0.084							0.622	0.970	0.382	0.459	1.000	0.622				
Delta Ponds above Willamette River Confluence near Beltline Bridge																						
Mann-Whitney U	22.5	15	26	26	22.5	6	23	13	25	15	24	22	4.5	6	3	0	24	14	30	28	21	24
Z	-0.75	-1.50	-0.49	-0.49	-0.18	-2.41	-0.70	-1.70	-0.50	-1.38	-0.94	-0.81	-2.29	-2.18	-2.70	-3.00	0.00	-1.47	0.00	-0.23	-0.90	-0.42
Asymp. Sig. (2-tailed)	0.453	0.133	0.627	0.627	0.855	0.016	0.484	0.089	0.614	0.167	0.345	0.419	0.022	0.029	0.007	0.003	1.000	0.140	1.000	0.816	0.368	0.671
Exact Sig. [2*(1-tailed Sig.)]	0.469	0.152	0.736	0.736	0.862	0.014	0.530	0.100	0.665	0.192	0.596	0.469	0.018	0.030	0.004	0.001	1.000	0.262	1.000	0.885	0.411	0.721

Note: Exact Sig. [2*(1-tailed Sig.)] Not corrected for ties.

Shaded cells significant at $\alpha = 0.05$

Table A-12
Comparison of Miscellaneous Water Quality Data for Seventh Permit Year and Historical Data Set
Mann-Whitney Statistic

Monitoring Location	NH_3	BOD	Ca (T)	COD	Cond	DO	E. coli	Fecal Coliform	Hardness	Mg (T)	NO_3+NO_2	Field pH	Ortho P	Total P	Temp	TDS	TKN	TSS	Turbidity
Amazon Creek - Site M2 - at 29th Avenue																			
Mann-Whitney U	153	198	168.5	121.5	213	194.5	169.5	103	167.5	175.5	216.5	181	133.5	192	187	143	114	143.5	214.5
Z	-0.48	-0.84	-0.98	-2.18	-0.16	-0.50	-0.96	-0.31	-0.96	-0.85	-0.05	-0.71	-0.97	-0.50	-0.64	-1.45	-1.98	-1.37	-0.14
Asymp. Sig. (2-tailed)	0.631	0.400	0.328	0.029	0.869	0.615	0.337	0.759	0.339	0.395	0.963	0.480	0.331	0.615	0.523	0.147	0.048	0.171	0.891
Exact Sig. [2*(1-tailed Sig.)]	0.893							0.778					0.347						
Willow Creek																			
Mann-Whitney U	100	120	91.5	114.5	105.5	45	74	62	94.5	101	122	108	92.5	112.5	87.5	99.5	62.5	33	109.5
Z	0.00	-0.84	-1.19	-0.70	-0.86	-0.86	-1.60	-1.21	-1.09	-0.97	-0.52	-0.73	-0.98	-0.71	-1.26	-1.00	-1.93	-2.58	-0.77
Asymp. Sig. (2-tailed)	1.000	0.399	0.233	0.484	0.389	0.392	0.109	0.225	0.276	0.333	0.601	0.465	0.325	0.480	0.209	0.315	0.054	0.010	0.443
Exact Sig. [2*(1-tailed Sig.)]	1.000	0.625	0.244	0.531	0.404	0.432	0.114	0.242	0.289	0.354	0.657	0.489	0.349	0.501	0.219	0.330	0.059	0.006	0.458
Amazon Creek at Railroad Track Crossing																			
Mann-Whitney U	153	147.5	117.5	139	135.5	131	146.5	127.5	121.5	123	122.5	137	148	140	149	124.5	156.5	147	139.5
Z	-0.48	-0.49	-1.15	-0.64	-0.72	-0.76	-0.45	-0.53	-1.06	-0.96	-0.40	-0.62	-0.35	-0.55	-0.39	-0.87	-0.21	-0.44	-0.62
Asymp. Sig. (2-tailed)	0.631	0.624	0.249	0.521	0.474	0.445	0.654	0.598	0.291	0.336	0.687	0.535	0.723	0.585	0.698	0.385	0.835	0.662	0.537
Exact Sig. [2*(1-tailed Sig.)]	0.893	0.679	0.257	0.546	0.485	0.462	0.662	0.607	0.300	0.352	0.697	0.555	0.746	0.605	0.714	0.396	0.841	0.679	0.546
Amazon Diversion Channel at Royal Avenue																			
Mann-Whitney U	147	159	188.5	217.5	202	167	217	147	185	200	211.5	207.5	144.5	170	188	171.5	124.5	202	210
Z	-0.69	-1.18	-0.61	-0.08	-0.37	-0.92	-0.09	-0.16	-0.63	-0.40	-0.14	-0.21	-1.40	-0.95	-0.62	-0.88	-1.76	-0.37	-0.17
Asymp. Sig. (2-tailed)	0.490	0.239	0.540	0.934	0.715	0.358	0.927	0.876	0.528	0.687	0.888	0.831	0.163	0.342	0.535	0.378	0.078	0.715	0.868
Exact Sig. [2*(1-tailed Sig.)]	0.779							0.889											
A3 Channel at Terry Street																			
Mann-Whitney U	105	66	150.5	153	143	144.5	132.5	118.5	145	152	145	79.5	104.5	48.5	111.5	117.5	86.5	50	98
Z	-1.58	-2.37	-0.21	-0.15	-0.40	-0.07	-0.66	-0.48	-0.35	-0.18	-0.35	-1.96	-1.38	-2.77	-1.19	-0.99	-1.83	-2.71	-1.48
Asymp. Sig. (2-tailed)	0.115	0.018	0.831	0.880	0.688	0.946	0.506	0.629	0.725	0.860	0.725	0.050	0.169	0.006	0.234	0.323	0.068	0.007	0.138
Exact Sig. [2*(1-tailed Sig.)]	0.223	0.017	0.835	0.893	0.705	0.948	0.516	0.638	0.741	0.874	0.741	0.049	0.176	0.003	0.240	0.334	0.068	0.005	0.145
Amazon Creek at Royal Avenue																			
Mann-Whitney U	144	212	162.5	177	189	200	172.5	142	162	160.5	194.5	128	168	192	169	140.5	214.5	161	209.5
Z	-0.78	-0.20	-1.09	-0.83	-0.60	-0.35	-0.90	-0.21	-1.06	-1.12	-0.51	-1.69	-0.97	-0.50	-0.97	-1.46	-0.14	-1.12	-0.23
Asymp. Sig. (2-tailed)	0.436	0.842	0.276	0.407	0.546	0.725	0.366	0.832	0.291	0.261	0.610	0.091	0.332	0.616	0.333	0.145	0.890	0.265	0.819
Exact Sig. [2*(1-tailed Sig.)]	0.723							0.846											

Note: Exact Sig. [2*(1-tailed Sig.)] Not corrected for ties.

Shaded cells significant at $\alpha = 0.05$

Table A-12
Comparison of Miscellaneous Water Quality Data for Seventh Permit Year and Historical Data Set
Mann-Whitney Statistic

Monitoring Location	NH_3	BOD	Ca (T)	COD	Cond	DO	E. coli	Fecal Coliform	Hardness	Mg (T)	NO_3+NO_2	Field pH	Ortho P	Total P	Temp	TDS	TKN	TSS	Turbidity
Willamette River Upstream of Urban Growth Boundary																			
Mann-Whitney U	156	213	148	154	177.5	121.5	195.5	72.5	142.5	158.5	152	99.5	128.5	205	215	148.5	162	169	204
Z	0.00	-0.41	-1.38	-3.17	-0.77	-0.48	-0.44	-2.13	-1.38	-1.01	-1.34	-2.22	-1.64	-0.27	-0.07	-1.27	-1.41	-0.96	-0.28
Asymp. Sig. (2-tailed)	1.000	0.683	0.167	0.002	0.441	0.629	0.663	0.033	0.169	0.314	0.181	0.026	0.102	0.787	0.941	0.205	0.158	0.337	0.779
Exact Sig. [2*(1-tailed Sig.)]	1.000					0.641		0.030											
Willamette River at Knickerbocker Bridge																			
Mann-Whitney U	153	216	206	207	134	137.5	149.5	73.5	197	191	167	212.5	90	198	207.5	182.5	156	194.5	191.5
Z	-0.34	-0.29	-0.14	-0.58	-1.58	-0.15	-1.25	-2.11	-0.26	-0.37	-1.03	-0.12	-2.40	-0.40	-0.21	-0.63	-1.50	-0.47	-0.51
Asymp. Sig. (2-tailed)	0.734	0.774	0.885	0.559	0.115	0.880	0.212	0.035	0.797	0.709	0.302	0.904	0.016	0.687	0.831	0.529	0.133	0.639	0.607
Exact Sig. [2*(1-tailed Sig.)]	0.950					0.884		0.033											
Willamette River at Owosso Bridge																			
Mann-Whitney U	150	219	211	210	134	134	191.5	78.5	199	180	161	215.5	150.5	179	213.5	81	156	177	212.5
Z	-0.59	-0.28	-0.16	-0.58	-1.58	-0.23	-0.56	-1.98	-0.33	-0.64	-1.19	-0.12	-1.30	-0.81	-0.10	-2.53	-1.54	-0.84	-0.18
Asymp. Sig. (2-tailed)	0.553	0.776	0.873	0.562	0.115	0.816	0.577	0.048	0.738	0.523	0.233	0.905	0.192	0.417	0.919	0.011	0.124	0.400	0.861
Exact Sig. [2*(1-tailed Sig.)]	0.835					0.831		0.046											
Willamette River Downstream of Beltline Bridge																			
Mann-Whitney U	120	213	166.5	210	144.5	107	201.5	107.5	145.5	171.5	141.5	209.5	204	199	215.5	143	94	175	218.5
Z	-1.30	-0.41	-0.99	-0.50	-1.38	-0.79	-0.32	-1.24	-1.31	-0.80	-1.36	-0.01	-0.06	-0.37	-0.06	-1.29	-2.36	-0.83	-0.01
Asymp. Sig. (2-tailed)	0.194	0.683	0.320	0.615	0.167	0.430	0.746	0.215	0.191	0.425	0.173	0.992	0.953	0.710	0.948	0.196	0.018	0.405	0.993
Exact Sig. [2*(1-tailed Sig.)]	0.374					0.452		0.222											
Delta Ponds above Willamette River Confluence near Beltline Bridge																			
Mann-Whitney U	30	20	23	29	24.5	27.5	20.5	4	22.5	27	25	6	26	15.5	26	25.5	21	9.5	24
Z	0.00	-1.29	-0.73	-0.11	-0.60	-0.25	-0.95	-2.60	-0.75	-0.30	-0.51	-2.44	-0.45	-1.62	-0.40	-0.45	-0.92	-2.10	-0.70
Asymp. Sig. (2-tailed)	1.000	0.196	0.465	0.911	0.550	0.803	0.341	0.009	0.450	0.763	0.608	0.015	0.652	0.106	0.689	0.652	0.358	0.035	0.486
Exact Sig. [2*(1-tailed Sig.)]	1.000	0.357	0.530	0.961	0.596	0.810	0.357	0.006	0.469	0.810	0.665	0.014	0.736	0.152	0.736	0.665	0.411	0.037	0.596

Note: Exact Sig. [2*(1-tailed Sig.)] Not corrected for ties.

Shaded cells significant at $\alpha = 0.05$

Table A-13
Intra-Basin Comparison of Historical Water Quality Data
Using Mann-Whitney Statistic[1]
Metals (*µg/L*)

Monitoring Locations	As (D)	As (T)	Cd (D)	Cd (T)	Cr (D)	Cr (T)	Cu (D)	Cu (T)	Pb (D)	Pb (T)	Hg (D)	Hg (T)	Mo (D)	Mo (T)	Ni (D)	Ni (T)	Se (D)	Se (T)	Ag (D)	Ag (T)	Zn (D)	Zn (T)
Amazon Basin Monitoring Sites																						
Amazon Creek – Site M2 – at 29th					0.721	1.53	1.68	3.26	0.0359	0.628			0.284	0.282							11.1	20.7
Willow Creek					0.364	0.909	1.21	2.24	0.0219	0.276			0.143	0.128							3.28	5.71
Amazon Creek – Site M2 – at 29th	0.884	1.09		0.00705				3.26	0.0359	0.628	0.00104	0.00264	0.284	0.282	1.45	2.05		0.162		0.00467	11.1	20.7
Amazon Creek at Railroad Crossing	2.46	4.01		0.0192				3.92	0.0929	2.20	0.00225	0.00923	0.545	0.512	1.74	2.43		0.372		0.0207	9.71	23.8
Amazon Creek – Site M2 – at 29th	0.884	1.09	0.00114	0.00705		1.53	1.68	3.26	0.0359	0.628		0.00264	0.284	0.282	1.45	2.05		0.162		0.00467	11.1	
Amazon Diversion Channel at Royal	2.52	4.27	0.00787	0.0256		1.81	2.29	6.10	0.0976	2.27		0.00740	1.32	1.24	2.20	3.31		0.318		0.0145	8.38	
Amazon Creek at Railroad Crossing							1.75	3.92			0.00225	0.00923	0.545	0.512	1.74	2.43						
Amazon Diversion Channel at Royal							2.29	6.10			0.00131	0.00740	1.32	1.24	2.20	3.31						
A3 Channel at Terry Street			0.0162	0.0543				6.57		2.52	0.00141	0.0114	1.44	1.49	2.28	3.20					19.5	39.5
Amazon Creek at Royal Avenue			0.00348	0.0180				4.09		1.88	0.00178	0.00677	0.694	0.680	1.74	2.52					6.80	18.0
Upstream of Urban Growth Boundary	0.203	0.263					0.316	0.571														
Knickerbocker Bridge	0.231	0.295					0.382	0.681														
Knickerbocker Bridge										0.0821												
Owosso Bridge										0.0949												
Owosso Bridge							0.375	0.685	0.0104												0.514	1.14
Downstream of Belt Line Bridge							0.452	0.790	0.0182												0.991	1.74
Upstream of Urban Growth Boundary	0.203	0.263					0.316	0.571	0.00593	0.0787					0.197	0.298				0.00262	0.403	1.12
Downstream of Beltline Bridge	0.254	0.316					0.452	0.790	0.0182	0.101					0.235	0.312				0.00665	0.991	1.74
Owosso Bridge	0.239	0.310				0.414	0.375		0.0104		0.00093	0.00185			0.211	0.312					0.514	1.14
Delta Ponds	0.349	0.523				0.173	0.515		0.0235		0.00008	0.00068			0.725	0.869					3.11	4.66

[1]Significant at α = 0.05; historical means reported.
Shaded cells indicate analyte value at downstream monitoring site greater than upstream site. Exception is comparison of analytes for Amazon Creek M2 at 29th Avenue with sub-basin Willow Creek site; greatest values are shaded.

Table A-14
Intra-Basin Comparison of Historical Water Quality Data
Using Mann-Whitney Statistic[1]
Miscellaneous Parameters

Monitoring Location	NH_3 (*mg/L*)	BOD (*mg/L*)	Ca (T) (*mg/L*)	COD (*mg/L*)	Cond (µmhos/cm)	DO (*mg/L*)	*E. coli* (MPN/*100 mL*)	Fecal Coliform (MPN/*100 mL*)	Hardness (*mg eq/L*)	Mg (T) (*mg/L*)	NO_3+NO_2 (*mg/L*)	pH (*Units*)	P (Ortho) (*mg/L*)	P (T) (*mg/L*)	Temp (°*C*)	TDS (*mg/L*)	TKN (*mg/L*)	TSS (*mg/L*)	Turbidity (*NU*)
Amazon Basin Monitoring Sites																			
Amazon Creek – Site M2 – at 29th Avenue							929	271			0.31	7.5	0.05	0.10					
Willow Creek							109	72			< 0.05	7.0	0.02	0.06					
Amazon Creek – Site M2 – at 29th Avenue			24	< 10		9.0	929	607	94	8.3	0.31	7.5	0.05		11.7			7	15
Amazon Creek at Railroad Track Crossing			21	13		7.5	607	247	83	7.1	0.20	7.3	0.04		14.0			19	23
Amazon Creek – Site M2 – at 29th Avenue		< 2		< 10		9.0	929	271		8.3	0.31		0.05	0.10	11.7		0.3	7	15
Amazon Diversion Channel at Royal Ave.		2.5		23		7.9	421	124		10	0.38		0.04	0.17	6.3		0.9	31	36
Amazon Creek at Railroad Track Crossing		< 2		13			607	247	83	7.1				0.11			0.4	19	23
Amazon Diversion Channel at Royal Ave.		2.5		23			421	124	99	10				0.17			0.9	31	36
A3 Channel at Terry Street	< 0.1	2.8	26	24	286				119	13	0.31		0.05	0.22		181	0.9		
Amazon Creek at Royal Avenue	0.1	< 2	20	14	215				80	7.4	0.15		0.03	0.12		139	0.5		
Willamette River Monitoring Sites																			
Upstream of Urban Growth Boundary			4.7				22	17											
Knickerbocker Bridge			4.9				30	23											
Knickerbocker Bridge																			
Owosso Bridge																			
Owosso Bridge	0.2				49						< 0.05		0.02	0.04			< 0.2		
Downstream of Belt Line Bridge	< 0.1				54						0.12		0.05	0.08			0.3		
Upstream of Urban Growth Boundary			4.7		47		22	17	18	1.5	< 0.05		0.02	0.03		42	< 0.2		
Downstream of Belt Line Bridge			5.0		54		42	36	20	1.6	0.12		0.05	0.08		44	0.3		
Owosso Bridge			5		49	10.2			19	1.6		7.3	0.021	0.04		43	< 0.2	4	7
Delta Ponds			16		166	5.4			71	7.4		7.1	0.016	0.06		95	0.4	2	4

[1]Significant at α = 0.05; historical means reported.
Shaded cells indicate analyte value at downstream monitoring site greater than upstream site. Exception is comparison of analytes for Amazon Creek M2 at 29th Avenue with sub-basin Willow Creek site; greatest values are shaded.

Table A-15
Mann-Whitney Statistic Output for
Intra-Basin Comparison of Historical Water Quality Data

Monitoring Location	As (D)	As (T)	Cd (D)	Cd (T)	Cr (D)	Cr (T)	Cu (D)	Cu (T)	Pb (D)	Pb (T)	Hg (D)	Hg (T)	Mo (D)	Mo (T)	Ni (D)	Ni (T)	Se (D)	Se (T)	Ag (D)	Ag (T)	Zn (D)	Zn (T)
Amazon Creek – Site M2 at 29th Avenue : Willow Creek																						
Mann-Whitney U	2212.5	1902.5	2684	2373	1519	1361.5	1608	1572	2030.5	985.5	2510	2817	91	85.5	2183.5	2337	154	142	2716.5	2636	797.5	332.5
Z	-0.56	-1.90	-0.74	-1.63	-2.98	-4.33	-4.80	-5.02	-3.26	-7.00	-0.98	-0.11	-2.38	-2.57	-0.96	-0.32	-0.91	-0.81	-0.35	-0.93	-7.61	-9.45
Asymp. Sig. (2-tailed)	0.574	0.058	0.460	0.103	0.003	0.000	0.000	0.000	0.001	0.000	0.325	0.911	0.017	0.010	0.335	0.752	0.365	0.415	0.729	0.354	0.000	0.000
Exact Sig. [2*(1-tailed Sig.)]													0.018	0.010			0.683	0.439				
Amazon Creek – Site M2 at 29th Avenue : Amazon Creek at Railroad Track Crossing																						
Mann-Whitney U	234.5	52.5	1955	1422.5	1861	1867.5	2177.5	1630	816.5	676	744.5	128	105.5	118	1401	1522.5	187	83	2369	1343.5	1804	1848
Z	-8.76	-9.60	-1.78	-4.17	-0.99	-1.36	-0.98	-3.37	-6.61	-7.20	-6.85	-9.55	-2.89	-2.58	-3.59	-3.04	-1.50	-3.48	-0.04	-4.42	-2.65	-2.46
Asymp. Sig. (2-tailed)	0.000	0.000	0.075	0.000	0.324	0.174	0.330	0.001	0.000	0.000	0.000	0.000	0.004	0.010	0.000	0.002	0.134	0.000	0.966	0.000	0.008	0.014
b. Grouping Variable: site_id																						
Amazon Creek – Site M2 at 29th Avenue : Amazon Diversion Channel at Royal Avenue																						
Mann-Whitney U	538	184	2372	1343	2370.5	2017.5	1965.5	1418.5	875.5	737	2500	735.5	5	6	857.5	612.5	199	127.5	2898	1575	1982	2886.5
Z	-8.03	-9.53	-2.39	-6.11	-0.19	-2.05	-4.02	-6.08	-7.74	-8.29	-1.80	-8.12	-5.42	-5.40	-6.86	-7.91	-1.06	-2.37	-0.51	-5.30	-3.86	-1.07
Asymp. Sig. (2-tailed)	0.000	0.000	0.017	0.000	0.851	0.040	0.000	0.000	0.000	0.000	0.072	0.000	0.000	0.000	0.000	0.000	0.288	0.018	0.607	0.000	0.000	0.285
b. Grouping Variable: site_id																						
Amazon Creek at Railroad Track Crossing : Amazon Diversion Channel at Royal Avenue																						
Mann-Whitney U	1842	2096.5	2159.5	2003	1938	2020	1654	1576.5	2196.5	2236	1118	1593	65	55	1265.5	1010.5	209	196	2272.5	2327.5	2009.5	2298.5
Z	-1.20	-0.15	-0.66	-1.60	-0.76	-0.66	-3.18	-3.59	-0.62	-0.57	-5.17	-3.24	-3.91	-4.16	-4.11	-5.35	-0.45	-0.62	-0.46	-0.35	-1.45	-0.59
Asymp. Sig. (2-tailed)	0.228	0.877	0.510	0.110	0.449	0.507	0.001	0.000	0.538	0.569	0.000	0.001	0.000	0.000	0.000	0.000	0.656	0.537	0.648	0.730	0.146	0.556
b. Grouping Variable: site_id																						
A3 Channel at Terry Street : Amazon Creek at Royal Avenue																						
Mann-Whitney U	1796	2099.5	1412	885	1744.5	2021	2052.5	1442.5	2265.5	1784.5	1682.5	1386	70	58	1094	1252.5	150	170	2063	2025	1179.5	833.5
Z	-1.25	-0.11	-3.89	-6.14	-0.93	-0.34	-1.31	-3.91	-0.28	-2.35	-2.69	-3.89	-3.65	-3.96	-4.77	-4.03	-2.26	-1.04	-1.04	-1.16	-4.95	-6.38
Asymp. Sig. (2-tailed)	0.213	0.910	0.000	0.000	0.352	0.731	0.190	0.000	0.780	0.019	0.007	0.000	0.000	0.000	0.000	0.000	0.024	0.296	0.296	0.245	0.000	0.000
b. Grouping Variable: site_id																						

Shaded cells significant at $\alpha = 0.05$

Table A-15
Mann-Whitney Statistic Output for
Intra-Basin Comparison of Historical Water Quality Data

Monitoring Location	As (D)	As (T)	Cd (D)	Cd (T)	Cr (D)	Cr (T)	Cu (D)	Cu (T)	Pb (D)	Pb (T)	Hg (D)	Hg (T)	Mo (D)	Mo (T)	Ni (D)	Ni (T)	Se (D)	Se (T)	Ag (D)	Ag (T)	Zn (D)	Zn (T)
Willamette River Upstream of Urban Growth Boundary (RM 186.9) to Knickerbocker Bridge (RM 183.9)																						
Mann-Whitney U	1657.5	1759	2773.5	2899.5	2216	2244	2018.5	2346.5	2442	2796	2483.5	2684.5	220.5	220.5	2045	2086	220.5	210	2738	3031	2205.5	2625.5
Z	-3.19	-2.99	-0.42	-0.51	-0.84	-0.99	-3.09	-2.35	-1.53	-0.87	-1.36	-1.01	0.00	0.00	-1.43	-1.12	0.00	-0.41	-0.28	-0.04	-1.66	-0.84
Asymp. Sig. (2-tailed)	0.001	0.003	0.672	0.611	0.402	0.320	0.002	0.019	0.127	0.383	0.172	0.312	1.000	1.000	0.154	0.263	1.000	0.684	0.779	0.969	0.097	0.403
b. Grouping Variable: site_id																						
Willamette River at Knickerbocker Bridge (RM 183.9) to Owosso Bridge (RM 178.6)																						
Mann-Whitney U	2317.5	2374	2962	2985	2350	2413	2847.5	2920	2663	2157.5	2822	2869	199.5	210	2426.5	2258.5	220.5	211	2874.5	2828	2785	2614.5
Z	-0.41	-0.46	-0.01	-0.20	-0.13	-0.15	-0.15	-0.30	-0.96	-3.03	-0.24	-0.35	-1.02	-1.00	-0.10	-0.38	0.00	-0.37	-0.05	-0.63	-0.10	-0.32
Asymp. Sig. (2-tailed)	0.681	0.647	0.993	0.839	0.898	0.877	0.881	0.766	0.336	0.002	0.808	0.730	0.306	0.317	0.922	0.706	1.000	0.713	0.960	0.528	0.918	0.746
b. Grouping Variable: site_id																						
Willamette River at Owosso Bridge (RM 178.6) to Downstream of Beltline Bridge (176.8)																						
Mann-Whitney U	2166.5	2378.5	2922.5	2830	2167	2465.5	2076.5	2476.5	2009	2429.5	2608.5	2812.5	150	187	2147	2055.5	220.5	201.5	2682.5	2489.5	1415.5	1826
Z	-1.18	-0.58	-0.15	-0.76	-0.77	-0.08	-2.99	-2.00	-3.46	-1.81	-0.90	-0.55	-2.26	-1.50	-1.26	-1.38	0.00	-0.64	-0.76	-1.73	-5.25	-3.28
Asymp. Sig. (2-tailed)	0.237	0.562	0.879	0.450	0.441	0.936	0.003	0.045	0.001	0.070	0.369	0.583	0.024	0.134	0.207	0.166	1.000	0.522	0.445	0.084	0.000	0.001
b. Grouping Variable: site_id																						
Willamette River Upstream of Urban Growth Boundary (RM 183.9) to Downstream of Belt Line Bridge (RM 176.8)																						
Mann-Whitney U	1461	1572.5	2800	3038.5	2048.5	2322	1292.5	1760	1414.5	1643.5	2310.5	2484.5	147	178.5	1759.5	1842	220.5	202.5	2528	2320.5	1042	1706
Z	-4.12	-3.87	-0.32	-0.01	-1.41	-0.81	-5.80	-4.54	-5.45	-4.77	-1.89	-1.73	-2.85	-2.07	-2.64	-2.29	0.00	-0.61	-1.08	-2.46	-6.26	-4.16
Asymp. Sig. (2-tailed)	0.000	0.000	0.745	0.990	0.157	0.418	0.000	0.000	0.000	0.000	0.059	0.083	0.004	0.038	0.008	0.022	1.000	0.544	0.282	0.014	0.000	0.000
b. Grouping Variable: site_id																						
Willamette River at Owosso Bridge (178.6) to Delta Ponds above Willamette River Confluence near Beltline Bridge																						
Mann-Whitney U	237.5	303.5	646.5	662.5	392.5	325.5	406	672	415.5	573	63	138.5	14.5	13	18	21.5	168	145.5	718.5	682	19.5	28
Z	-4.28	-3.67	-0.80	-0.73	-1.73	-3.40	-2.94	-0.63	-2.91	-1.14	-6.16	-5.45	-5.01	-5.26	-6.48	-6.43	0.00	-0.92	-0.03	-0.46	-6.52	-6.24
Asymp. Sig. (2-tailed)	0.000	0.000	0.426	0.468	0.084	0.001	0.003	0.531	0.004	0.254	0.000	0.000	0.000	0.000	0.000	0.000	1.000	0.360	0.974	0.644	0.000	0.000
Exact Sig. [2*(1-tailed Sig.)]													0.000	0.000			1.000	0.495				

Note: Exact Sig. [2*(1-tailed Sig.)] Not corrected for ties.

Shaded cells significant at $\alpha = 0.05$

Table A-16
Mann-Whitney Statistic Output for
Intra-Basin Comparison of Historical Water Quality Data

Monitoring Location	NH_3	BOD	Ca (T)	COD	Cond	DO	E. coli	Fecal Coliform	Hardness	Mg (T)	NO_3+NO_2	Field pH	Ortho P	Total P	Temp	TDS	TKN	TSS	Turbidity
Amazon Creek – Site M2 at 29th Avenue : Willow Creek																			
Mann-Whitney U	1539	2850.5	2916.5	2603	2874	2631.5	597.5	325	2694.5	2471.5	368	1445	843	1336.5	2874.5	2813.5	2648	2892.5	2892.5
Z	-1.36	-0.94	-0.30	-1.60	-0.45	-0.92	-8.60	-6.60	-0.84	-1.89	-9.49	-5.32	-7.16	-5.92	-0.31	-0.67	-1.16	-0.12	-0.12
Asymp. Sig. (2-tailed)	0.174	0.347	0.765	0.110	0.652	0.359	0.000	0.000	0.404	0.058	0.000	0.000	0.000	0.000	0.757	0.504	0.245	0.905	0.905
Amazon Creek – Site M2 at 29th Avenue : Amazon Creek at Railroad Track Crossing																			
Mann-Whitney U	1740.5	1766	1909.5	1409.5	2392	1673.5	1496.5	1035.5	1858.5	1775	1758	1554.5	1194.5	2248	1948.5	1936.5	2151.5	1121.5	1121.5
Z	0.00	-3.88	-2.21	-4.62	-0.20	-3.06	-3.93	-2.18	-2.32	-2.63	-2.60	-3.48	-4.88	-0.52	-2.05	-1.81	-1.10	-5.36	-5.36
Asymp. Sig. (2-tailed)	1.000	0.000	0.027	0.000	0.841	0.002	0.000	0.029	0.020	0.008	0.009	0.001	0.000	0.602	0.041	0.070	0.270	0.000	0.000
Amazon Creek – Site M2 at 29th Avenue : Amazon Diversion Channel at Royal Avenue																			
Mann-Whitney U	1681.5	1145.5	2890	883	2768	2455.5	1557	634	2862.5	2197	2284.5	2633	1926.5	1572	2109	3089.5	1167.5	781	781
Z	-0.83	-7.87	-1.06	-8.14	-1.48	-2.31	-5.61	-4.94	-0.90	-3.43	-2.91	-1.70	-3.98	-5.49	-3.72	-0.24	-6.85	-8.15	-8.15
Asymp. Sig. (2-tailed)	0.404	0.000	0.290	0.000	0.140	0.021	0.000	0.000	0.368	0.001	0.004	0.089	0.000	0.000	0.000	0.808	0.000	0.000	0.000
Amazon Creek at Railroad Track Crossing : Amazon Diversion Channel at Royal Avenue																			
Mann-Whitney U	1681.5	1355.5	2171.5	1592.5	2096	2189	1884.5	1043.5	1749	1247.5	2323	2161.5	2074	1294	2105	1925	1093.5	1751	1751
Z	-0.83	-4.74	-1.12	-3.54	-1.43	-0.65	-2.31	-3.05	-2.78	-4.86	-0.20	-0.89	-1.28	-4.67	-1.39	-1.75	-5.57	-2.87	-2.87
Asymp. Sig. (2-tailed)	0.404	0.000	0.263	0.000	0.152	0.517	0.021	0.002	0.005	0.000	0.840	0.374	0.201	0.000	0.163	0.080	0.000	0.004	0.004
A3 Channel at Terry Street : Amazon Creek at Royal Avenue																			
Mann-Whitney U	1343.5	1481	1387	1363	1253.5	1977.5	2273	1229.5	1013	692	1739	2044.5	1465.5	812	2258.5	1178	1544	2159	2159
Z	-2.78	-3.92	-4.15	-4.27	-4.72	-0.88	-0.37	-1.24	-5.68	-7.11	-2.67	-1.08	-3.78	-6.54	-0.43	-4.86	-3.50	-0.69	-0.69
Asymp. Sig. (2-tailed)	0.005	0.000	0.000	0.000	0.000	0.378	0.711	0.216	0.000	0.000	0.008	0.282	0.000	0.000	0.665	0.000	0.000	0.487	0.487

Shaded cells significant at a = 0.05

Table A-16
Mann-Whitney Statistic Output for
Intra-Basin Comparison of Historical Water Quality Data

Monitoring Location	NH_3	BOD	Ca (T)	COD	Cond	DO	E. coli	Fecal Coliform	Hardness	Mg (T)	NO_3+NO_2	Field pH	Ortho P	Total P	Temp	TDS	TKN	TSS	Turbidity
Willamette River Upstream of Urban Growth Boundary (RM 186.9) to Knickerbocker Bridge (RM 183.9)																			
Mann-Whitney U	1653	3082	2462	3117	2720	2736	1878.5	1148.5	2451	2679.5	2894.5	3075	2516	2827	3043	2646	3034.5	2729	2729
Z	-1.00	-0.57	-2.09	-0.03	-1.40	-0.42	-4.22	-2.95	-1.78	-0.78	-0.85	-0.16	-1.18	-1.06	-0.27	-1.40	-0.39	-1.41	-1.41
Asymp. Sig. (2-tailed)	0.317	0.571	0.036	0.974	0.163	0.671	0.000	0.003	0.076	0.435	0.398	0.874	0.239	0.290	0.788	0.160	0.695	0.159	0.159
Willamette River at Knickerbocker Bridge (RM 183.9) to Owosso Bridge (RM 178.6)																			
Mann-Whitney U	1653.5	3159	2795	3155.5	2775.5	2851	2576	1378	2683	2529.5	3107	2983	2689.5	2999	3099	2977.5	3135.5	3097	3097
Z	-1.00	-0.02	-0.95	-0.04	-1.20	-0.14	-1.89	-1.68	-1.05	-1.47	-0.20	-0.61	-0.78	-0.57	-0.07	-0.23	-0.11	-0.22	-0.22
Asymp. Sig. (2-tailed)	0.319	0.986	0.344	0.967	0.230	0.892	0.058	0.093	0.293	0.140	0.845	0.540	0.435	0.566	0.940	0.819	0.914	0.823	0.823
Willamette River at Owosso Bridge (RM 178.6) to Downstream of Beltline Bridge (176.8)																			
Mann-Whitney U	1432	3119.5	2708.5	3123.5	2006	2784.5	2896.5	1532	2566	2568	1436.5	2850.5	660	1161.5	3085	2628.5	1617.5	3116.5	3116.5
Z	-2.62	-0.59	-1.41	-0.35	-3.88	-0.10	-0.91	-0.83	-1.61	-1.45	-5.86	-0.67	-8.39	-6.95	-0.12	-1.21	-5.66	-0.15	-0.15
Asymp. Sig. (2-tailed)	0.009	0.554	0.160	0.724	0.000	0.918	0.364	0.407	0.107	0.147	0.000	0.500	0.000	0.000	0.902	0.225	0.000	0.878	0.878
Willamette River Upstream of Urban Growth Boundary (RM 183.9) to Downstream of Belt Line Bridge (RM 176.8)																			
Mann-Whitney U	1334	3120	1942	3084	1388.5	2610.5	1456.5	776	1845	2003	1137	2660.5	989	970	3043.5	2297.5	1494.5	2647	2647
Z	-3.64	-0.01	-4.17	-0.36	-6.03	-0.62	-5.79	-5.00	-4.13	-3.41	-6.86	-1.23	-6.98	-7.55	-0.27	-2.41	-6.08	-1.70	-1.70
Asymp. Sig. (2-tailed)	0.000	0.995	0.000	0.722	0.000	0.532	0.000	0.000	0.000	0.001	0.000	0.220	0.000	0.000	0.789	0.016	0.000	0.090	0.090
Willamette River at Owosso Bridge (178.6) to Delta Ponds above Willamette River Confluence near Beltline Bridge																			
Mann-Whitney U	532	570	0	481.5	0	51.5	706	497.5	0	0	569	449.5	525.5	399.5	707.5	1	336	486.5	486.5
Z	-1.00	-4.08	-7.02	-4.37	-6.76	-6.24	-0.48	-0.63	-6.90	-6.79	-1.80	-2.77	-2.09	-3.30	-0.39	-6.73	-4.39	-2.47	-2.47
Asymp. Sig. (2-tailed)	0.319	0.000	0.000	0.000	0.000	0.000	0.631	0.527	0.000	0.000	0.072	0.006	0.037	0.001	0.699	0.000	0.000	0.013	0.013
Exact Sig. [2*(1-tailed Sig.)]																			

Note: Exact Sig. [2*(1-tailed Sig.)] Not corrected for ties.

Shaded cells significant at a = 0.05

Figure A.1

Arsenic in Storm Event Runoff

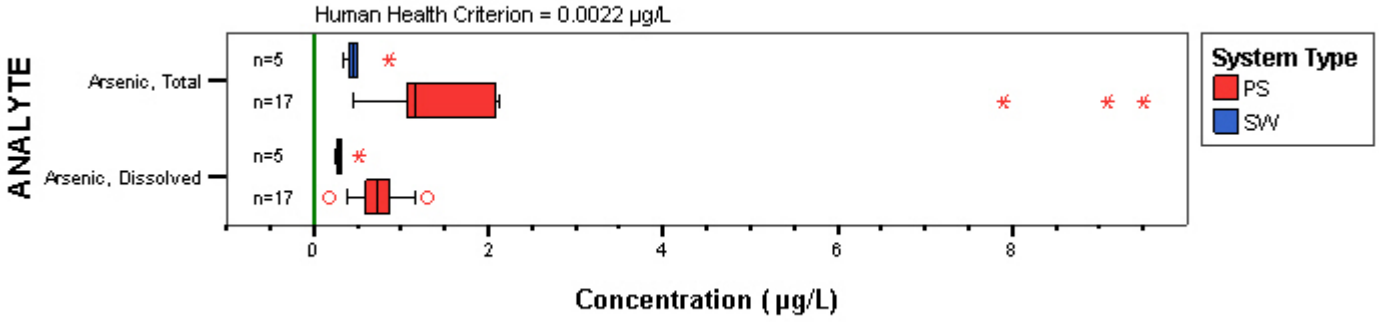


Figure A.2

Cadmium in Storm Event Runoff

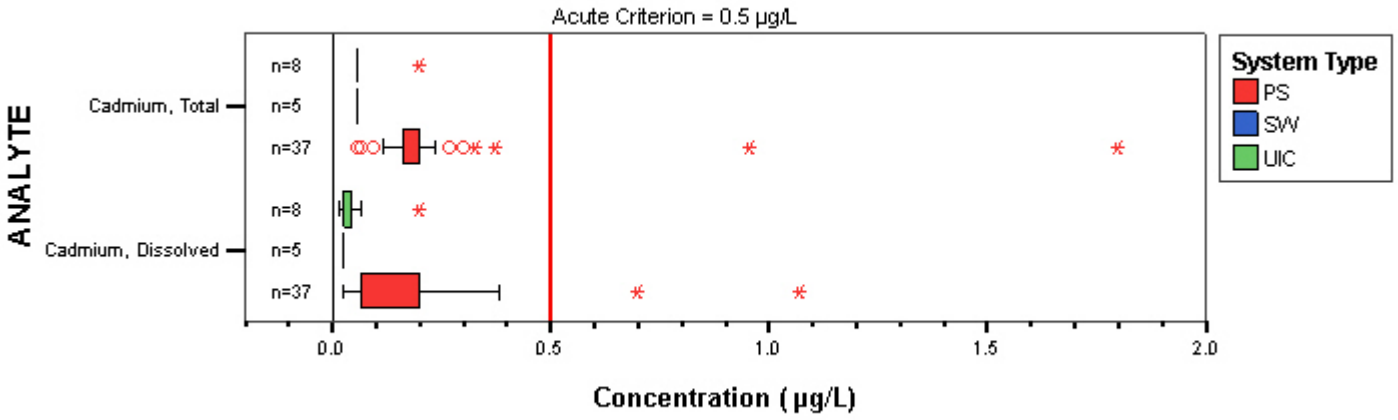


Figure A.3

Chromium in Storm Event Runoff

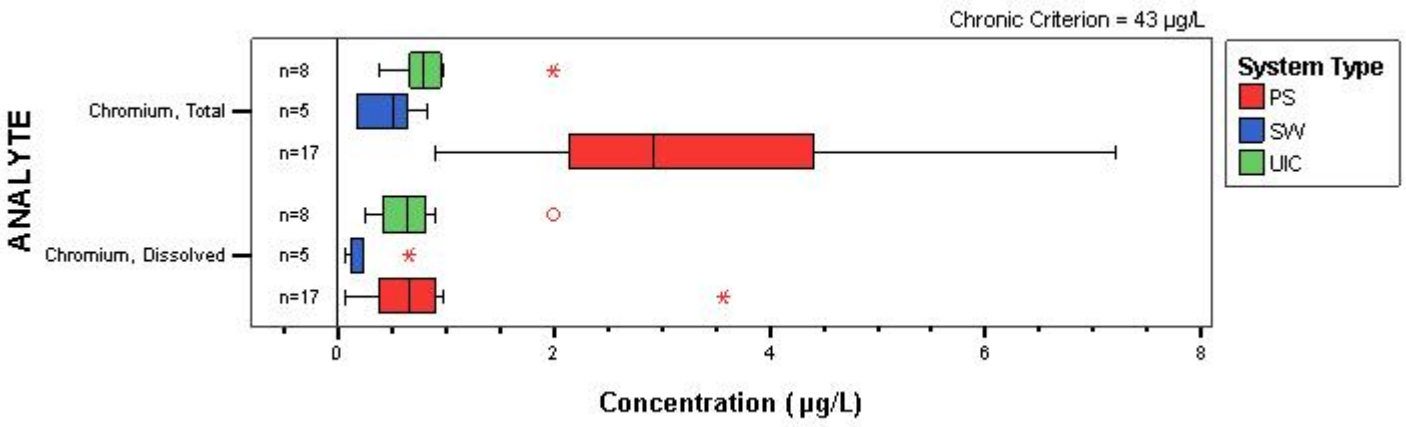


Figure A.4

Copper in Storm Event Runoff

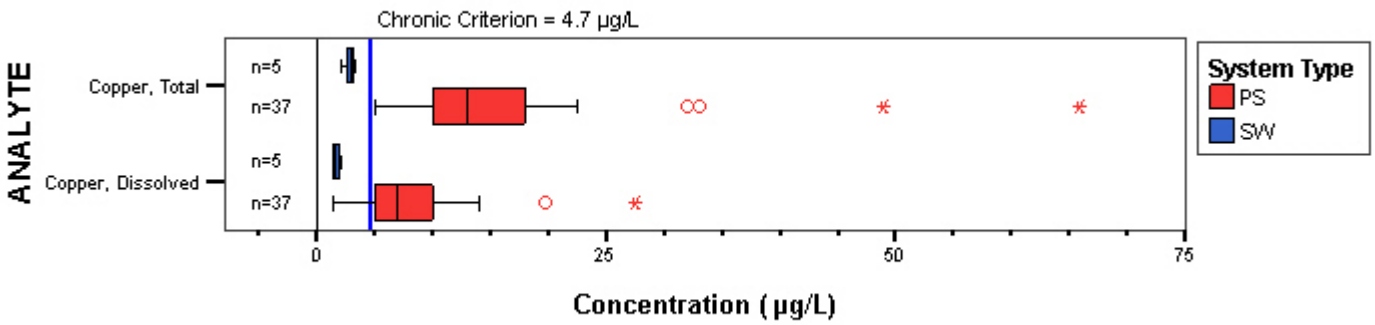


Figure A.5

Lead in Storm Event Runoff

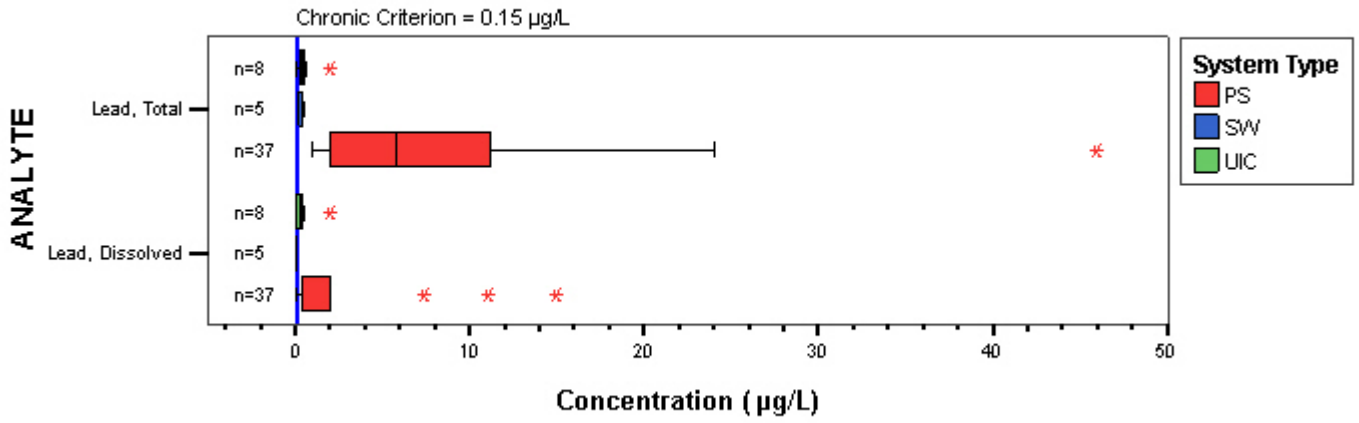


Figure A.6

Mercury in Storm Event Runoff

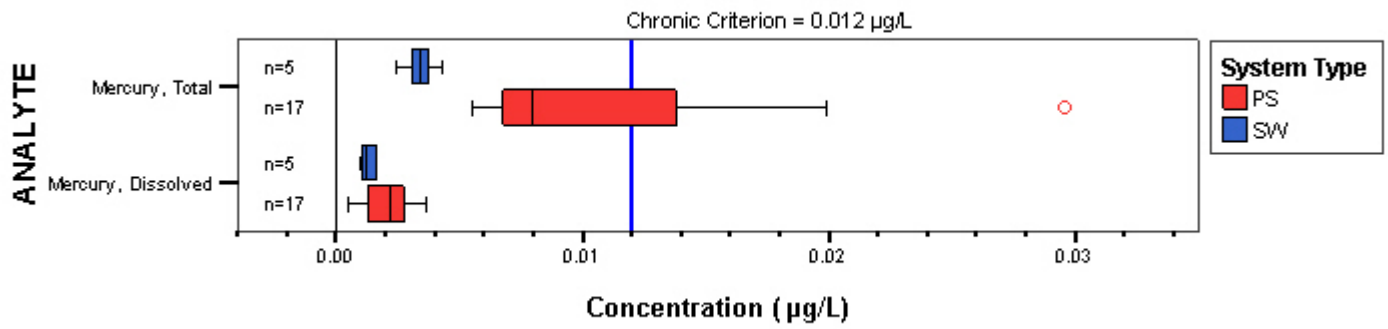


Figure A.7

Nickel in Storm Event Runoff

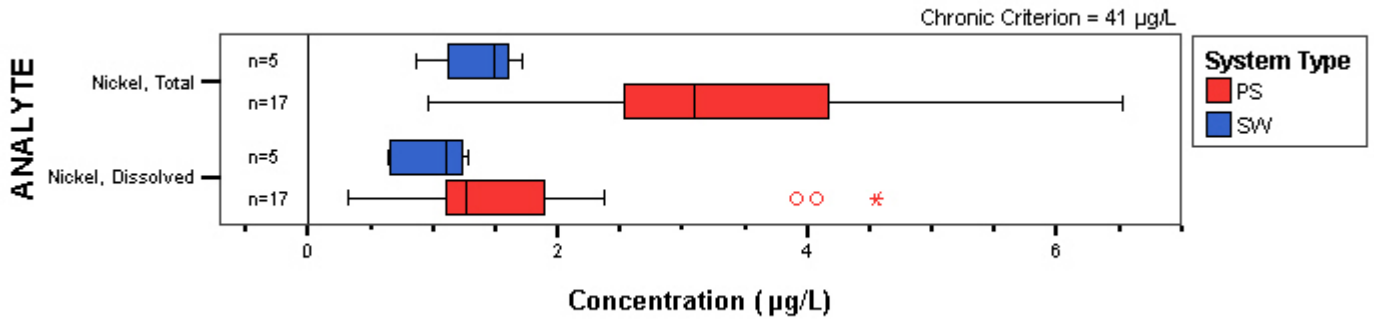


Figure A.8

Silver in Storm Event Runoff

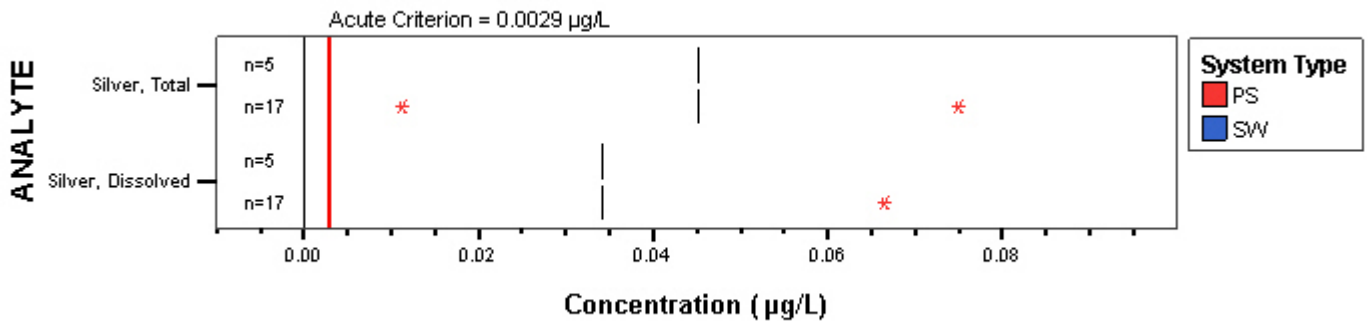


Figure A.9

Zinc in Storm Event Runoff

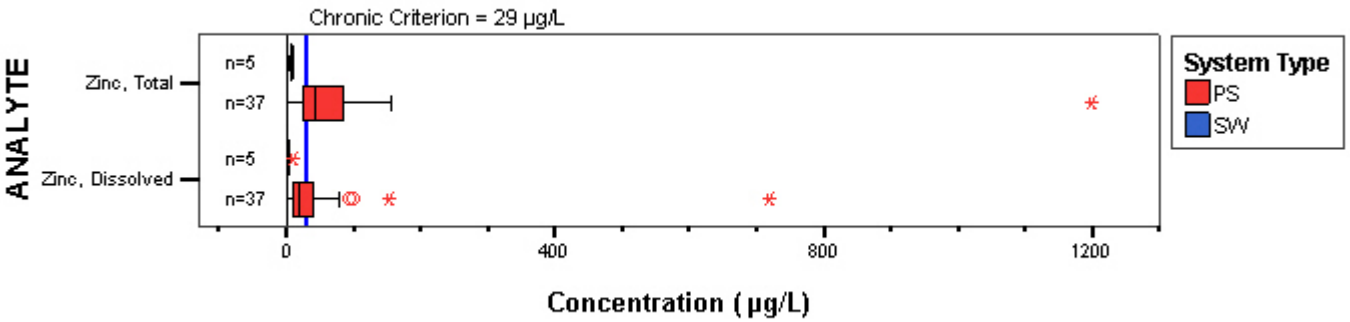


Figure A.10

Oxygen Demand of Storm Event Runoff

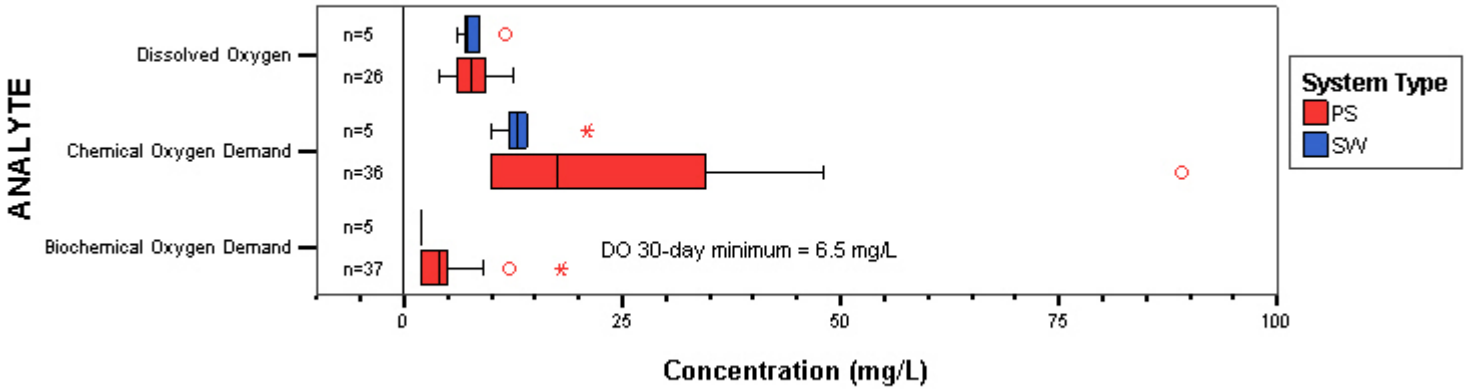


Figure A.11

Nutrients in Storm Event Runoff

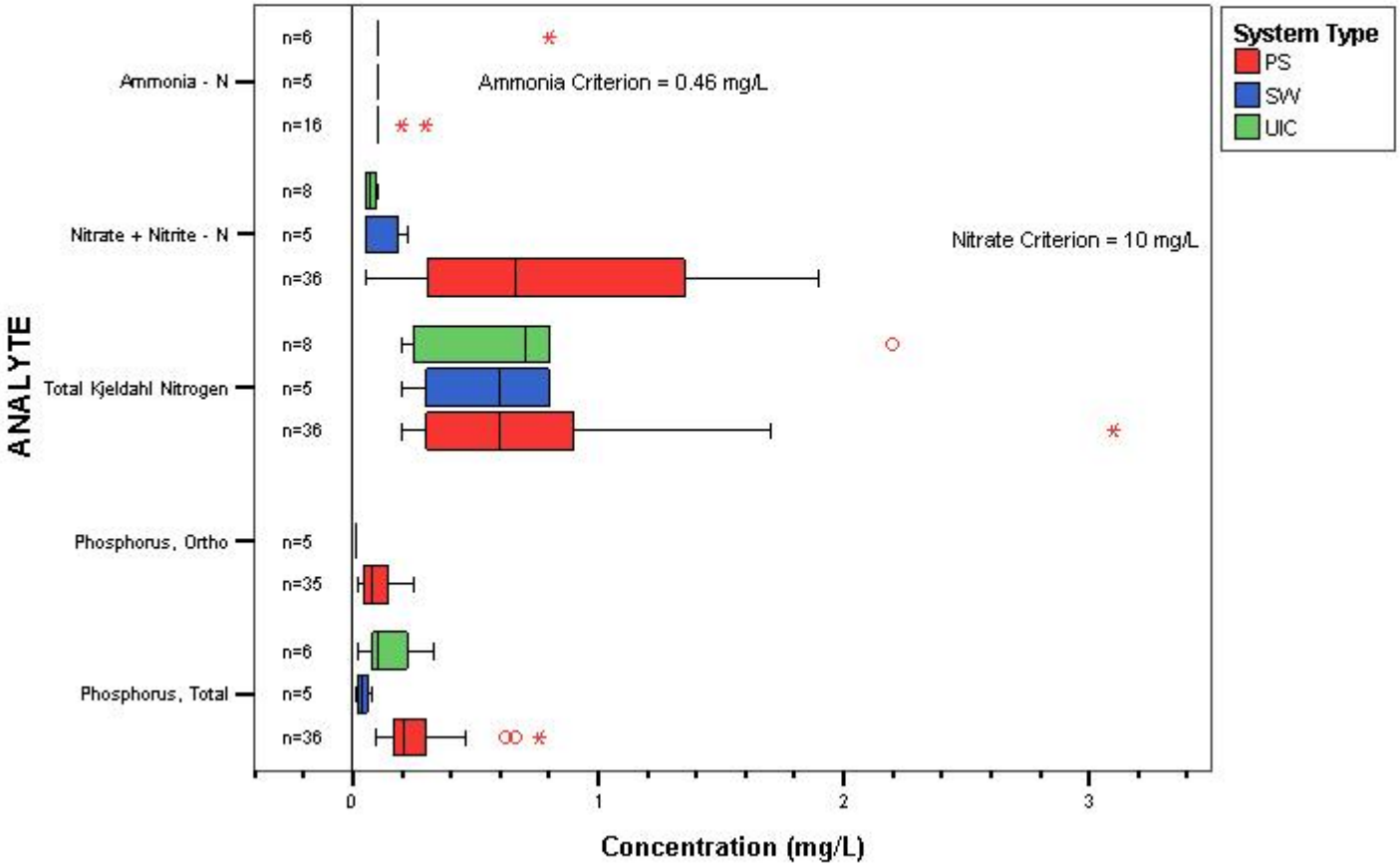


Figure A.12

Hardness of Storm Event Runoff

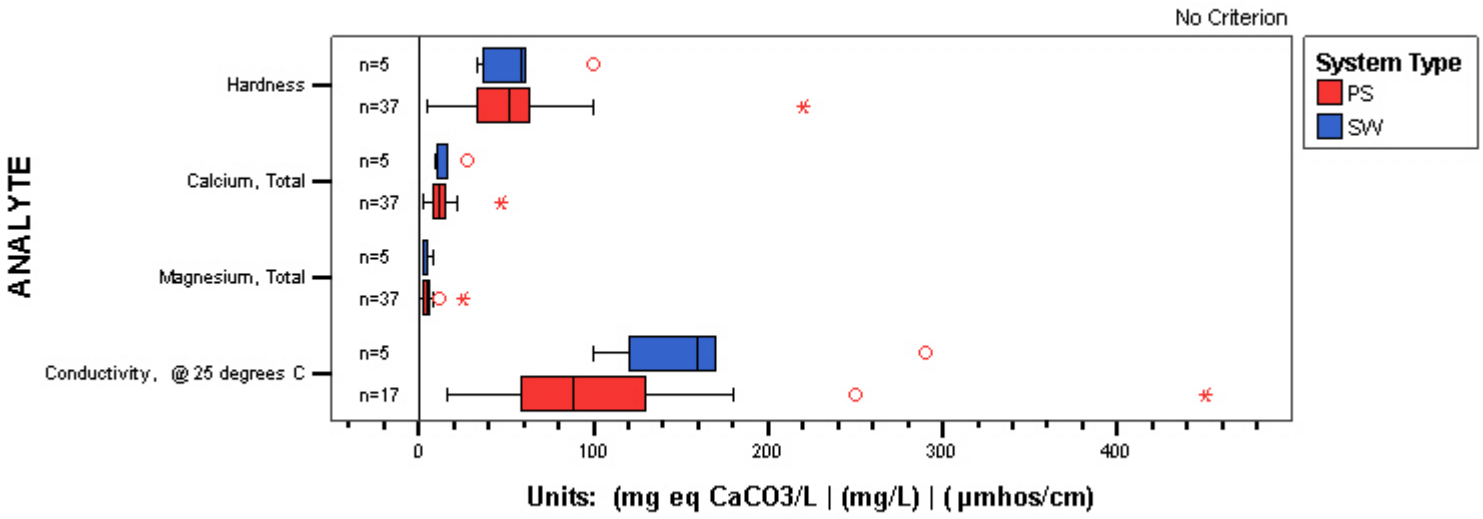


Figure A.13

Solids in Storm Event Runoff

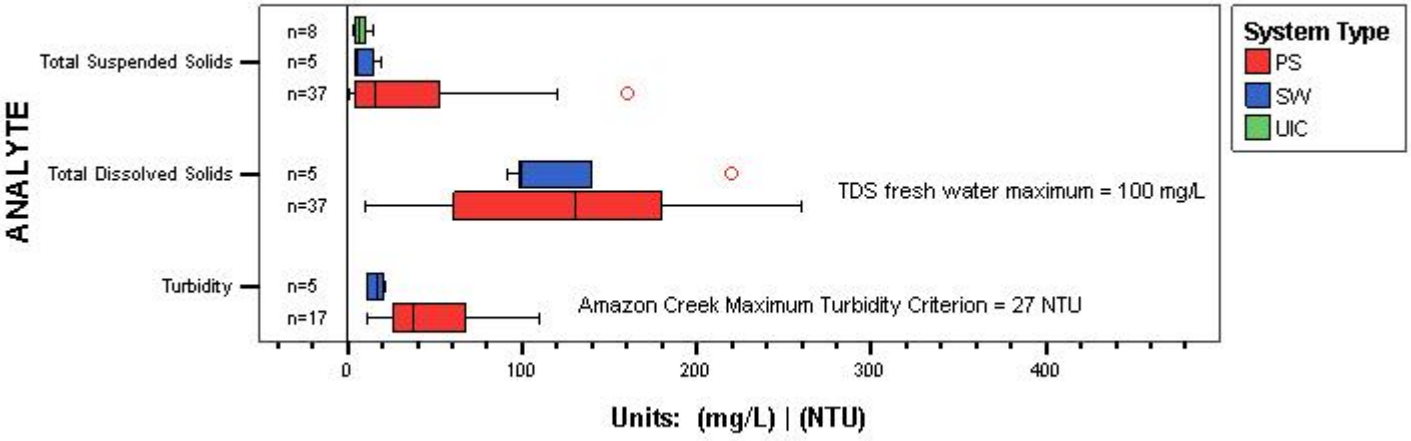


Figure A.14

Organic Carbon in Storm Event Runoff

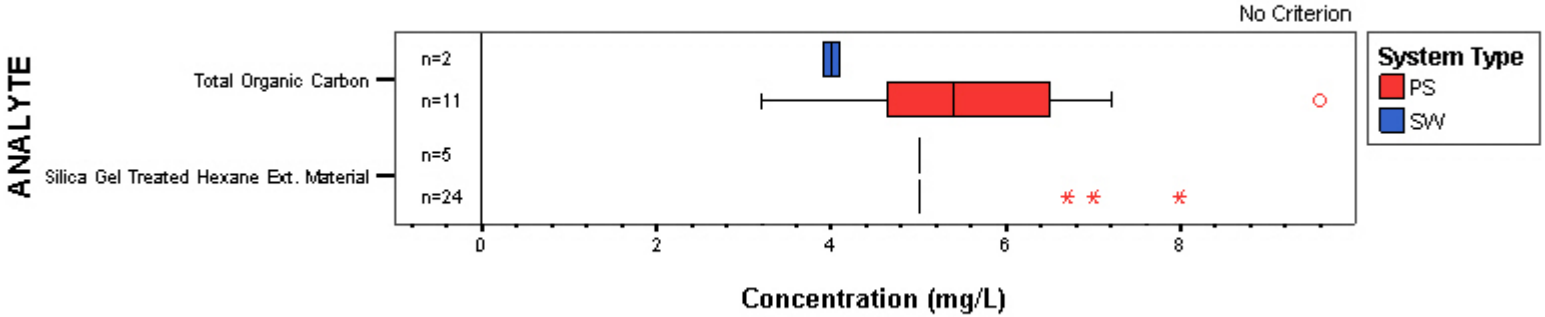


Figure A.15

pH of Storm Event Runoff

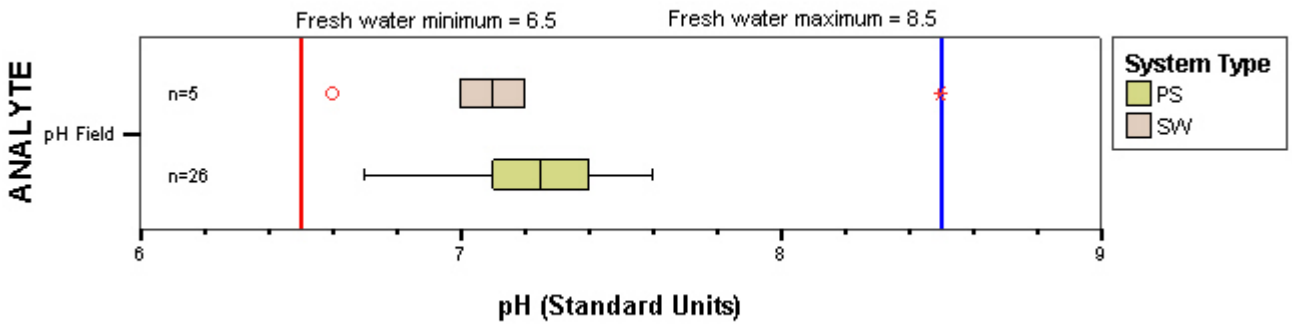
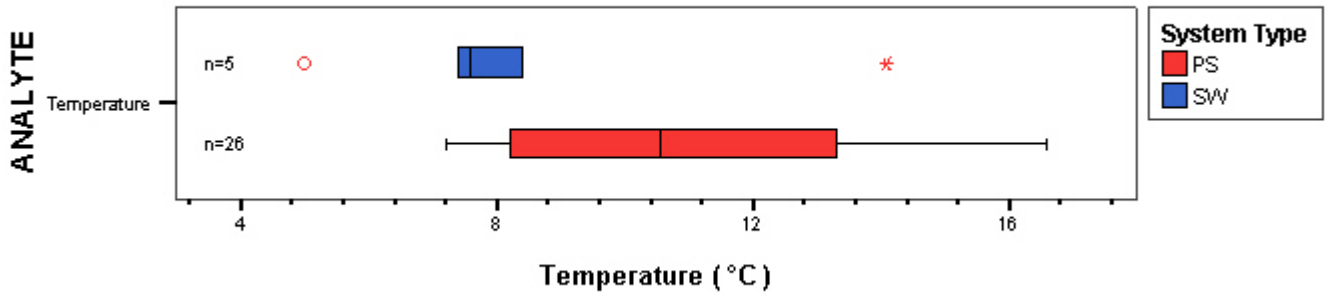


Figure A.16

Temperature of Storm Event Runoff



APPENDIX B

Boxplots for Water Quality Parameters
Figures B.1 through B.88

Figure B.1

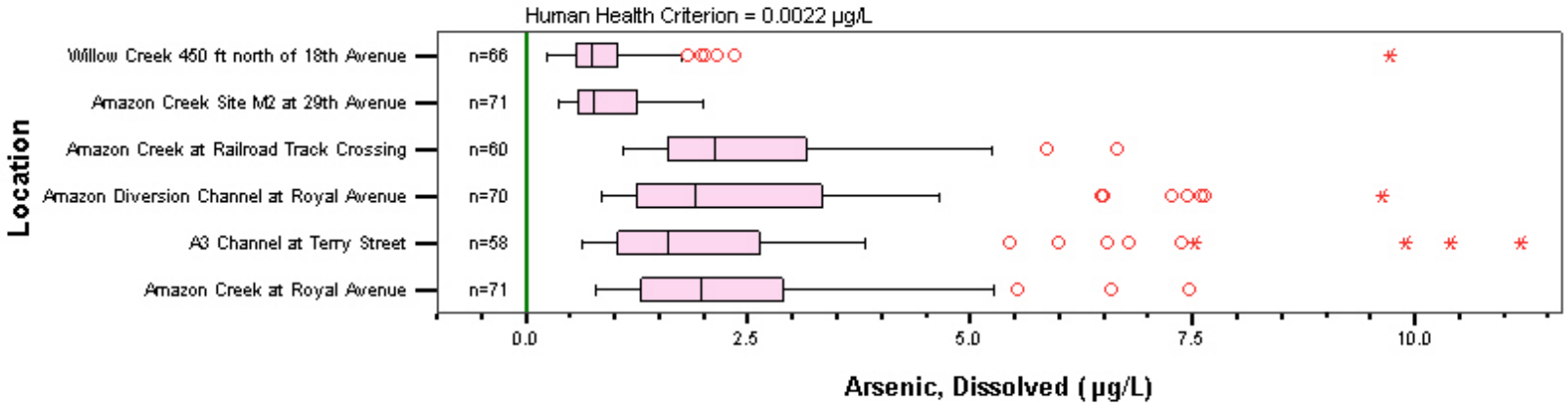


Figure B.2

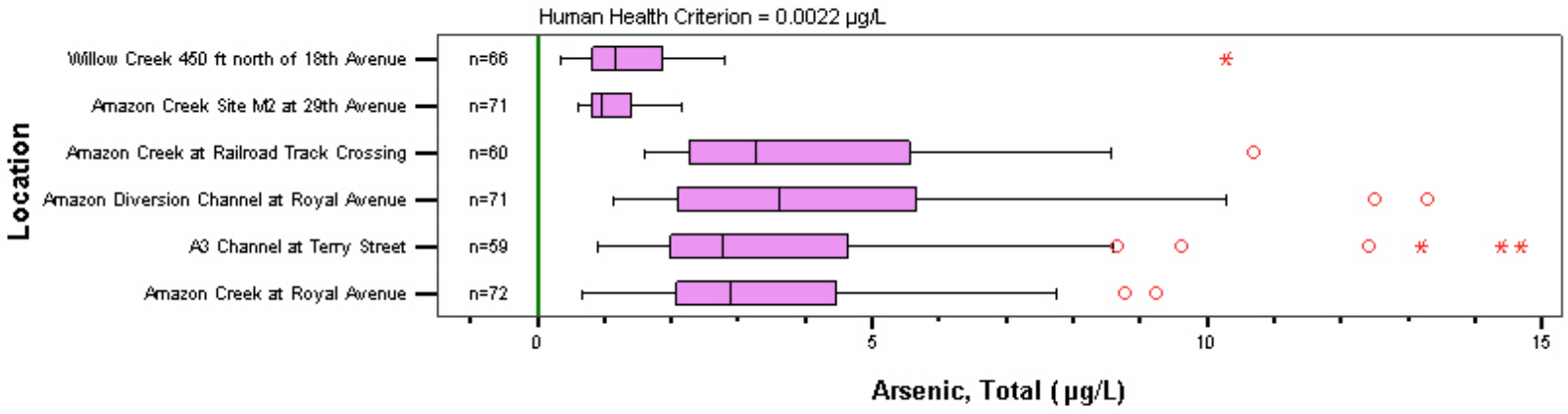


Figure B.3

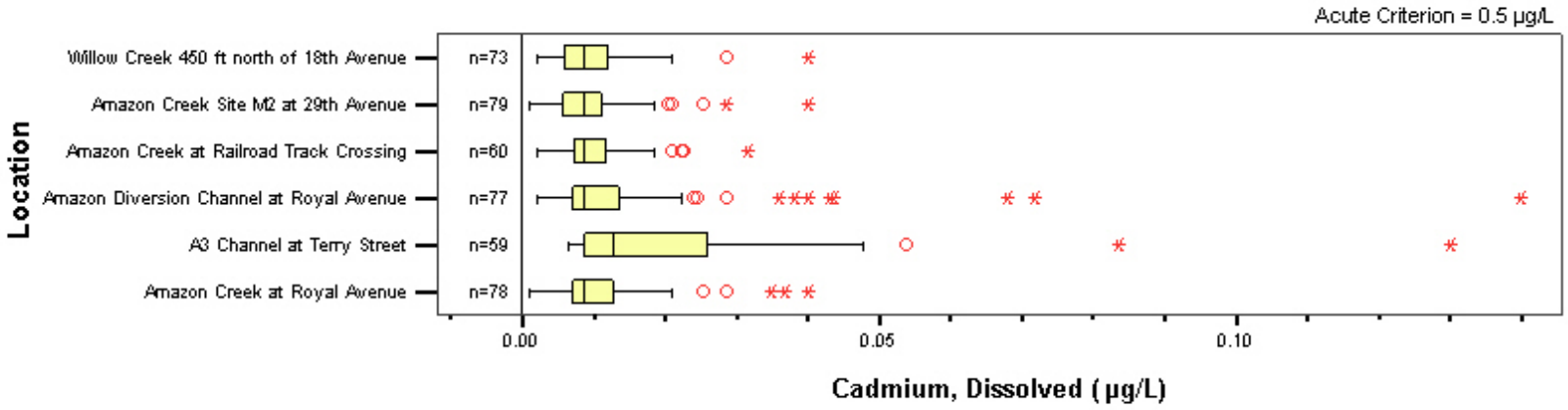


Figure B.4

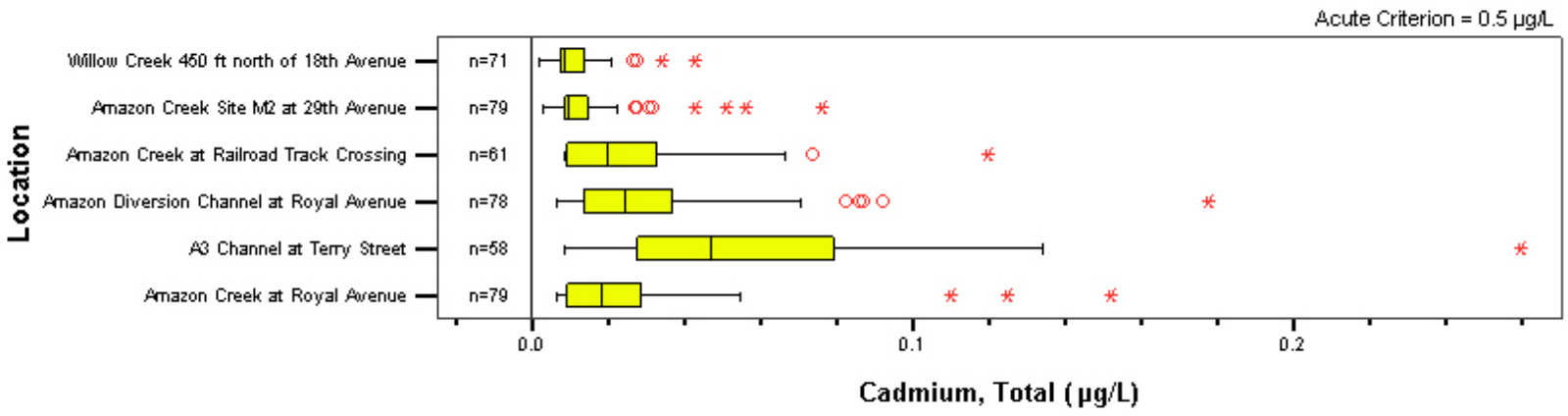


Figure B.5

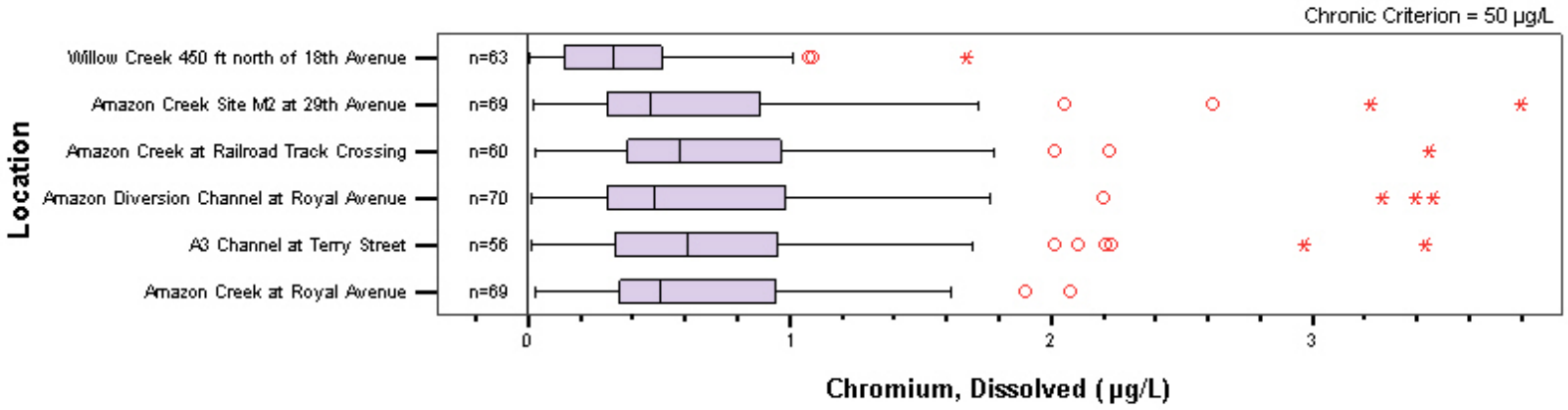


Figure B.6

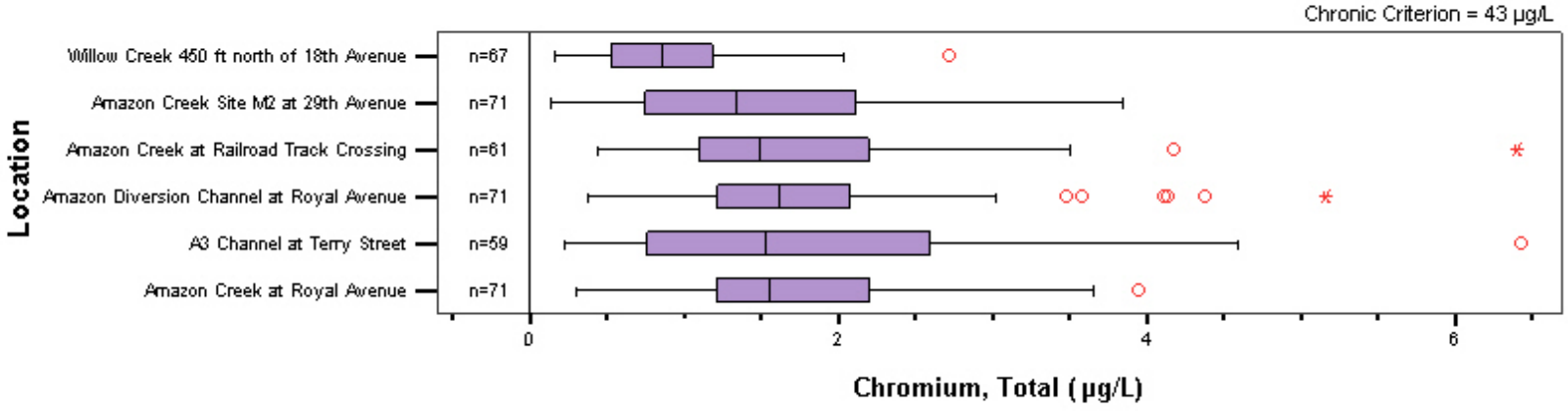


Figure B.7

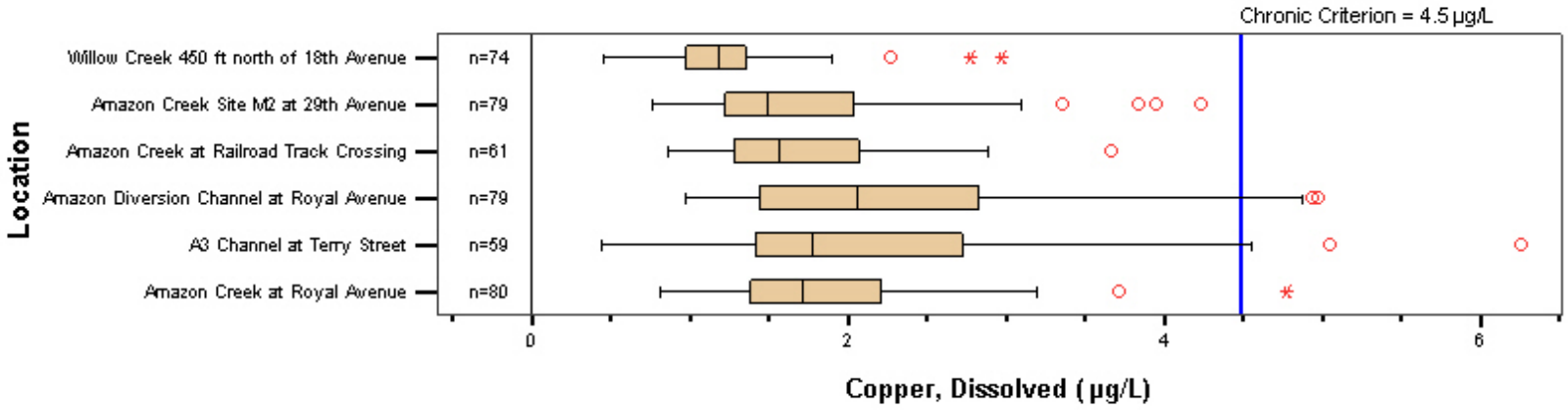


Figure B.8

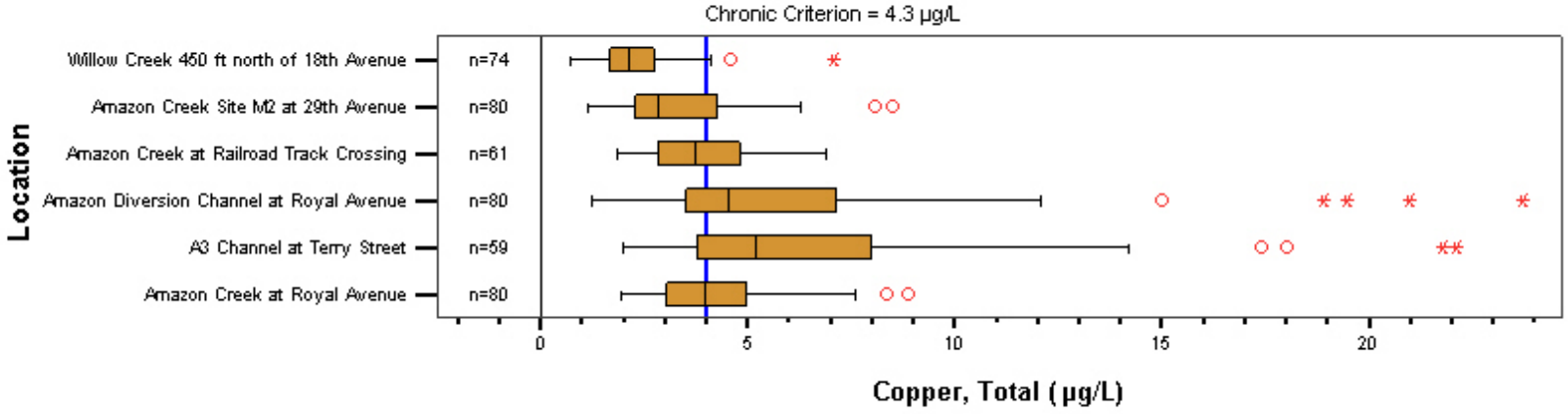


Figure B.9

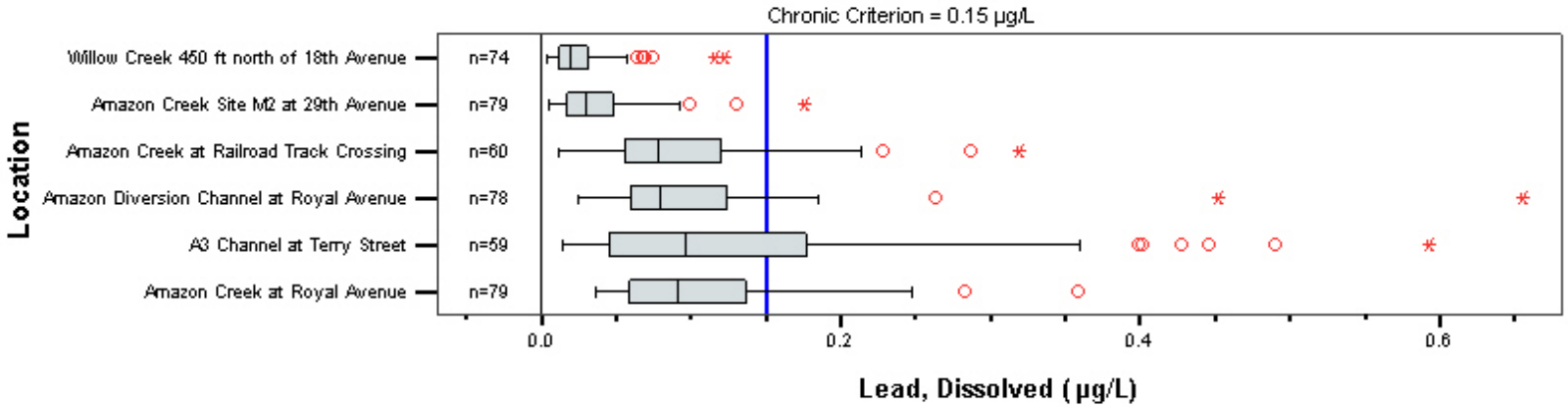


Figure B.10

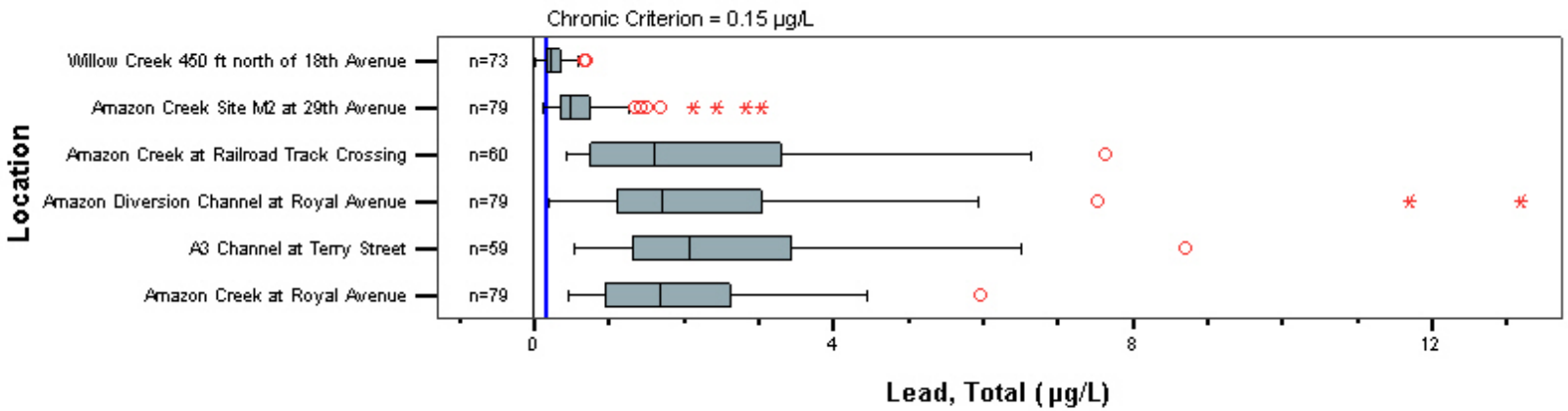


Figure B.11

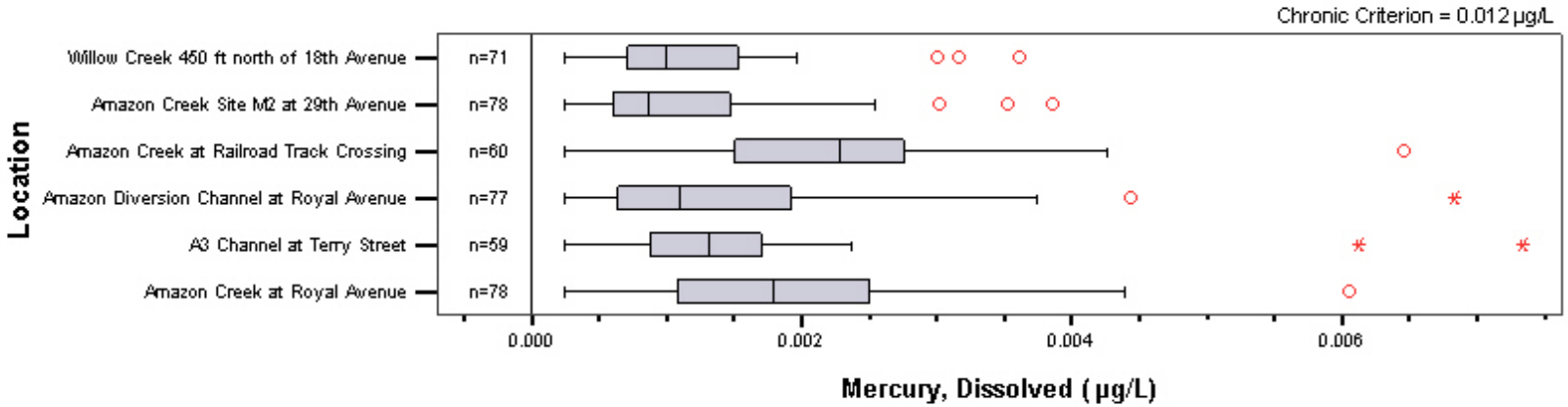


Figure B.12

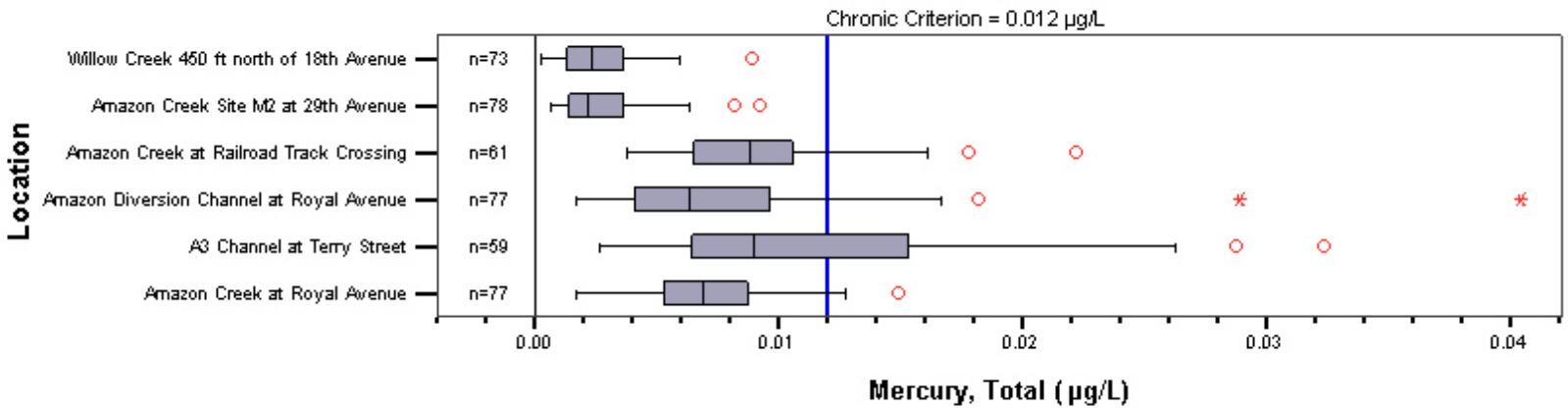


Figure B.13

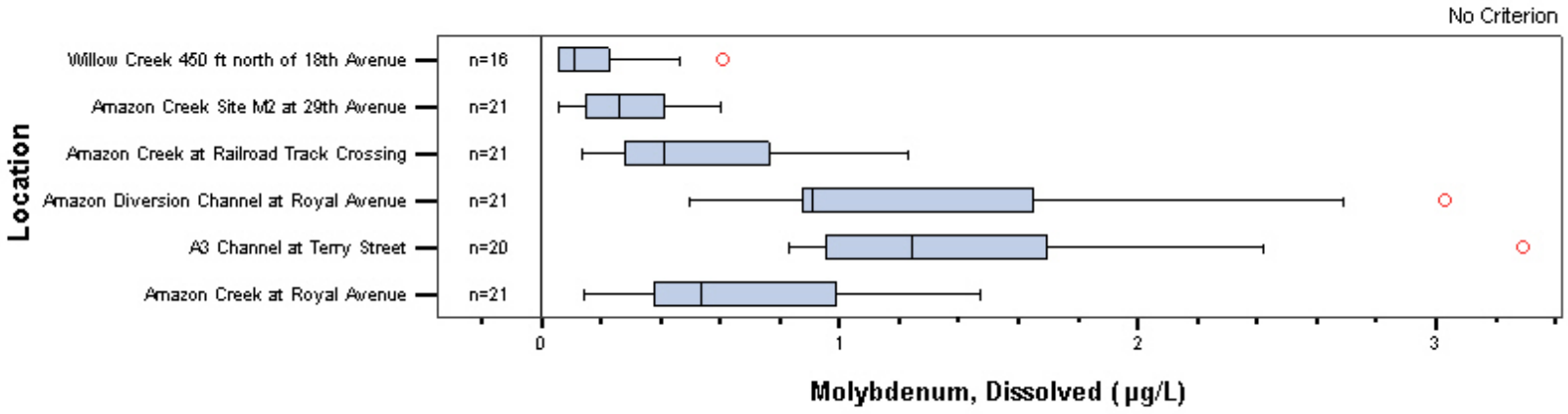


Figure B.14

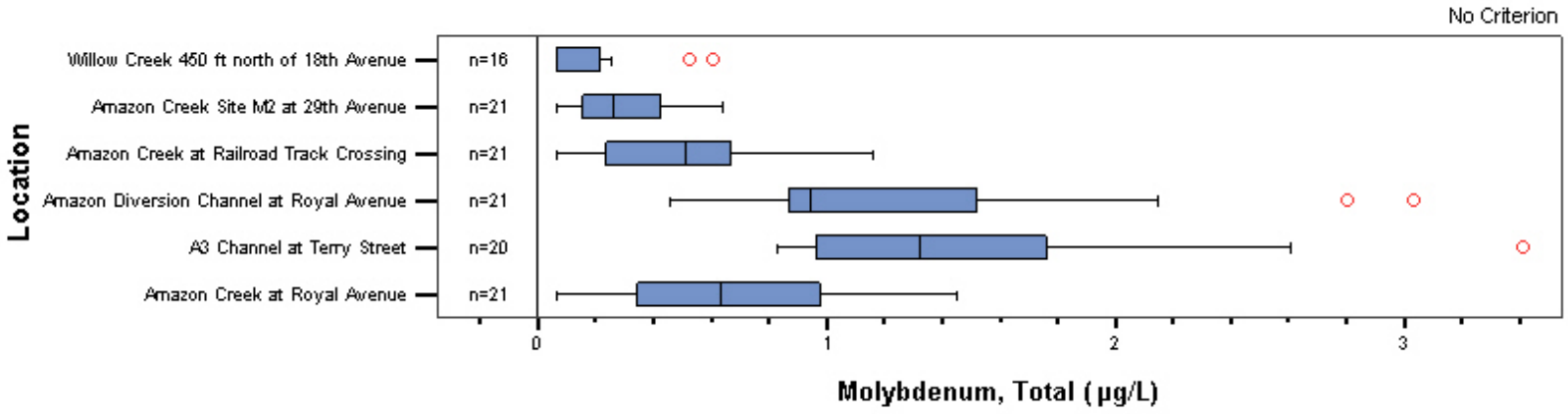


Figure B.15

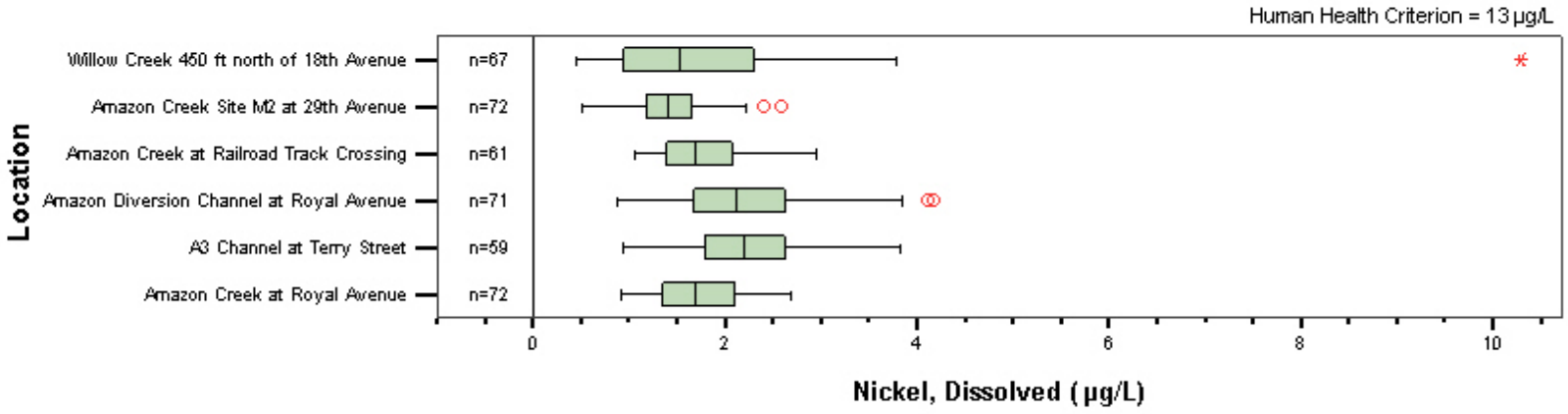


Figure B.16

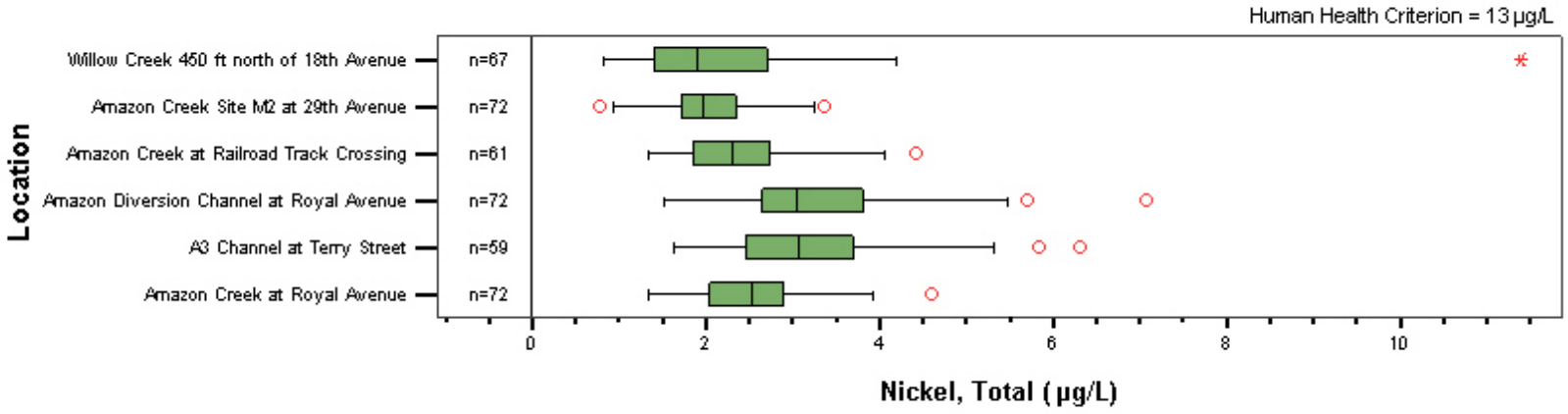


Figure B.17

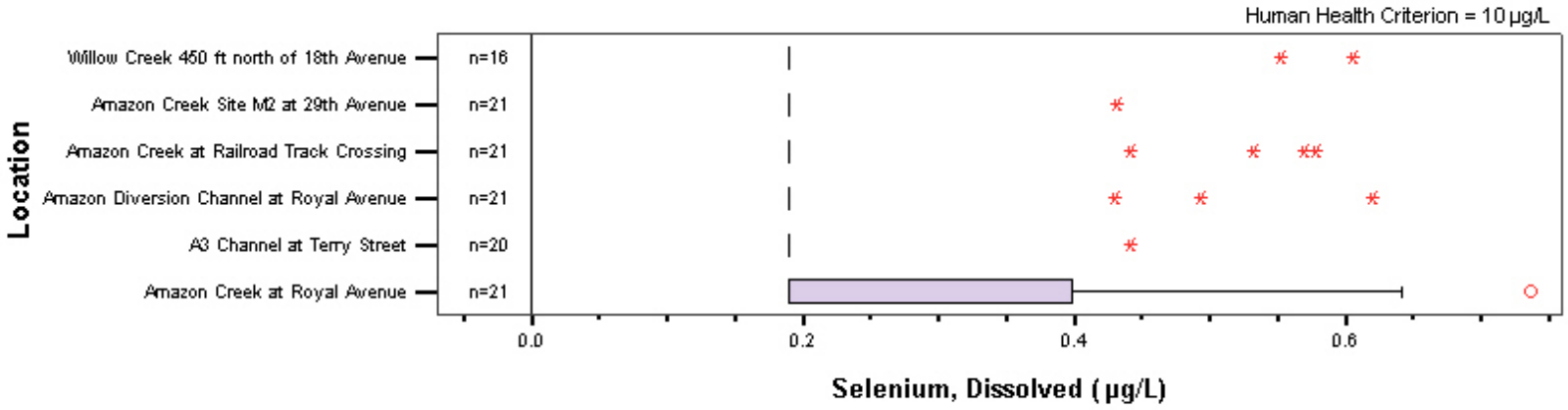


Figure B.18

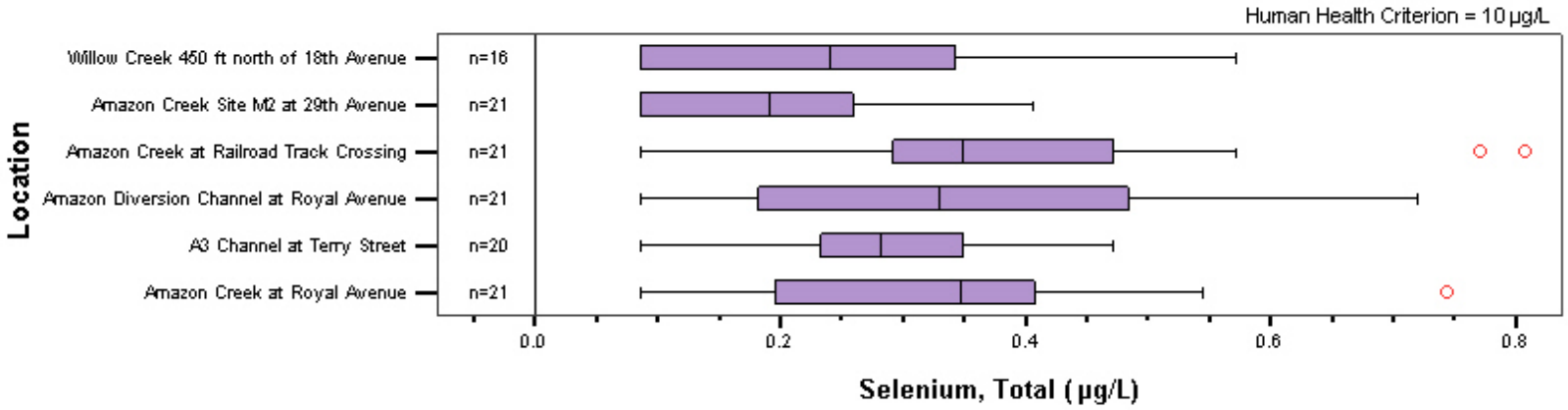


Figure B.19

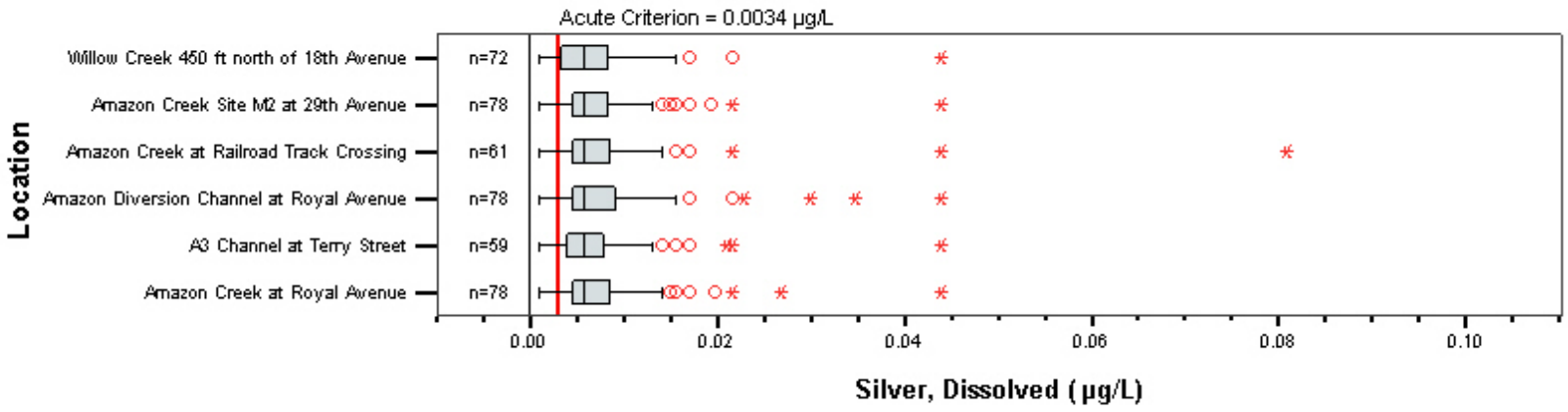
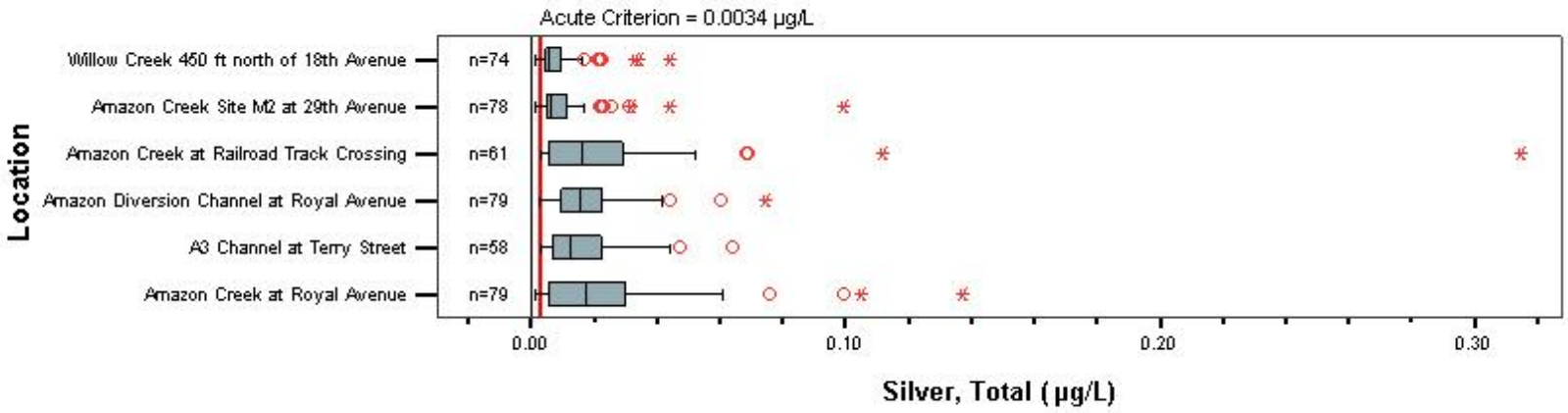


Figure B.20



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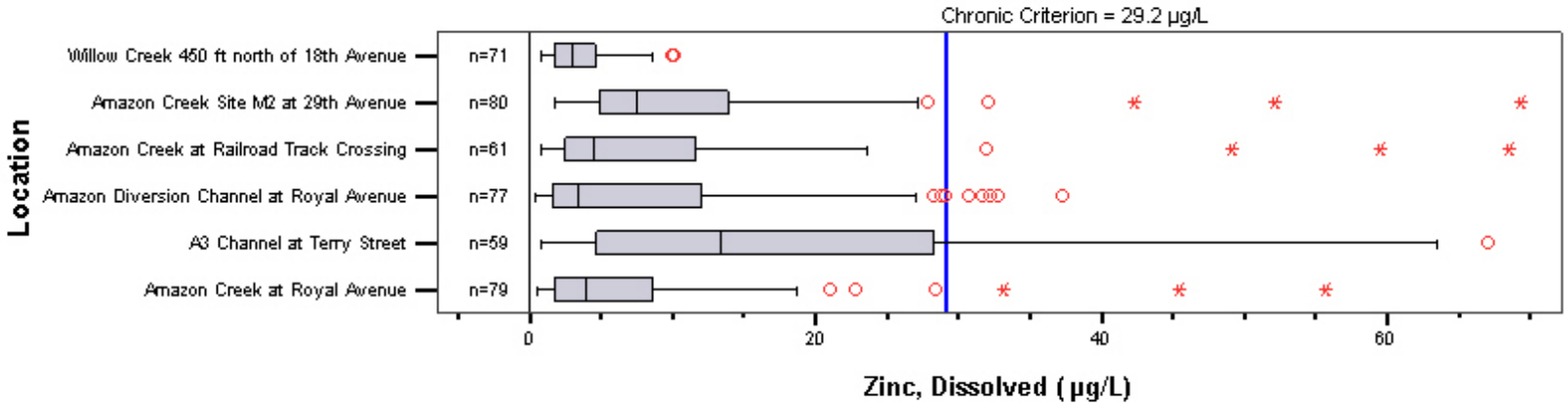

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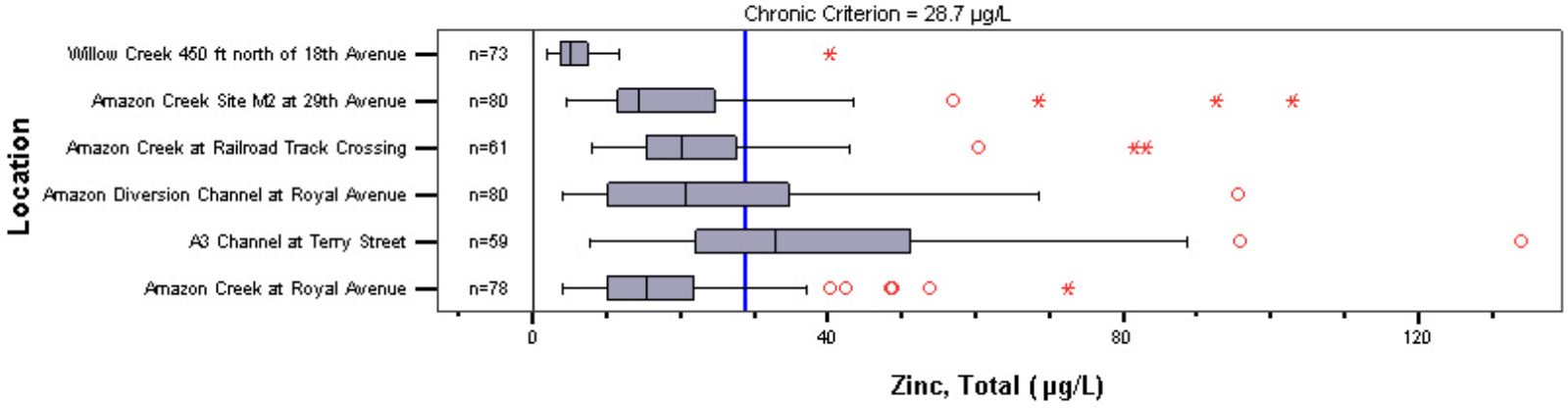

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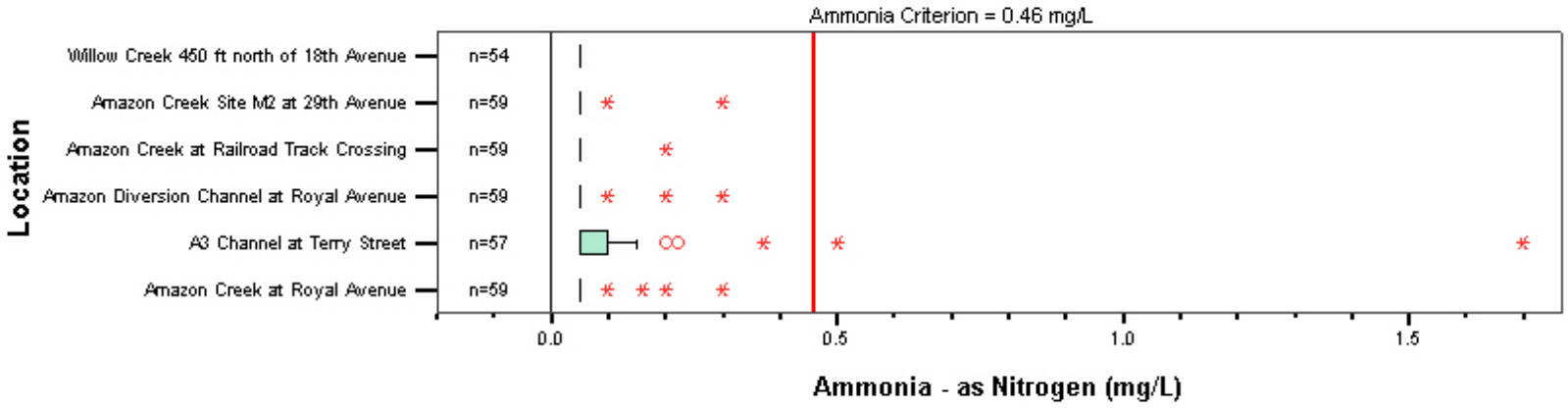
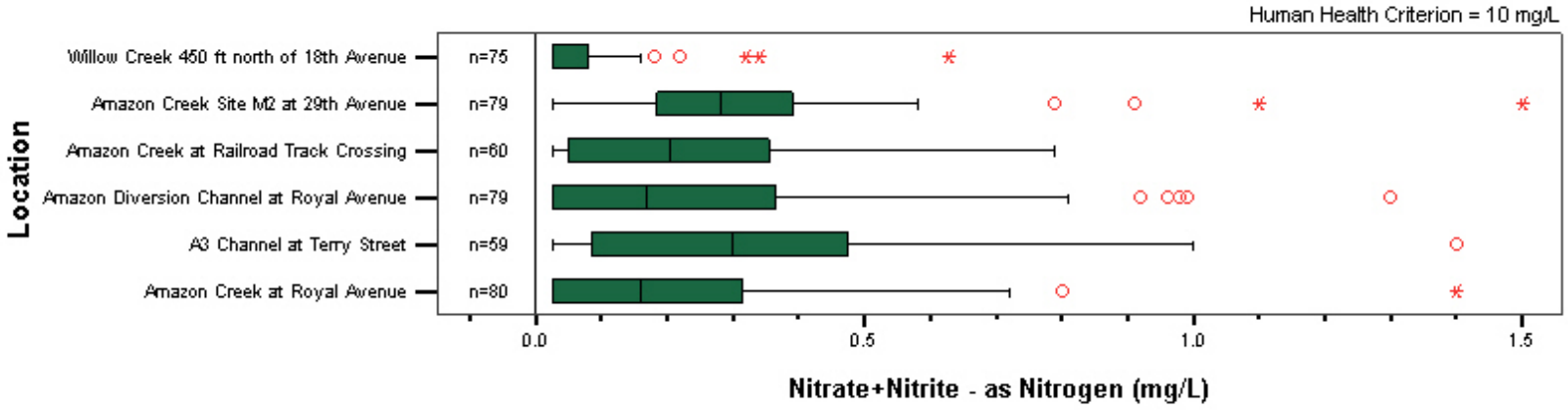


Figure B.24



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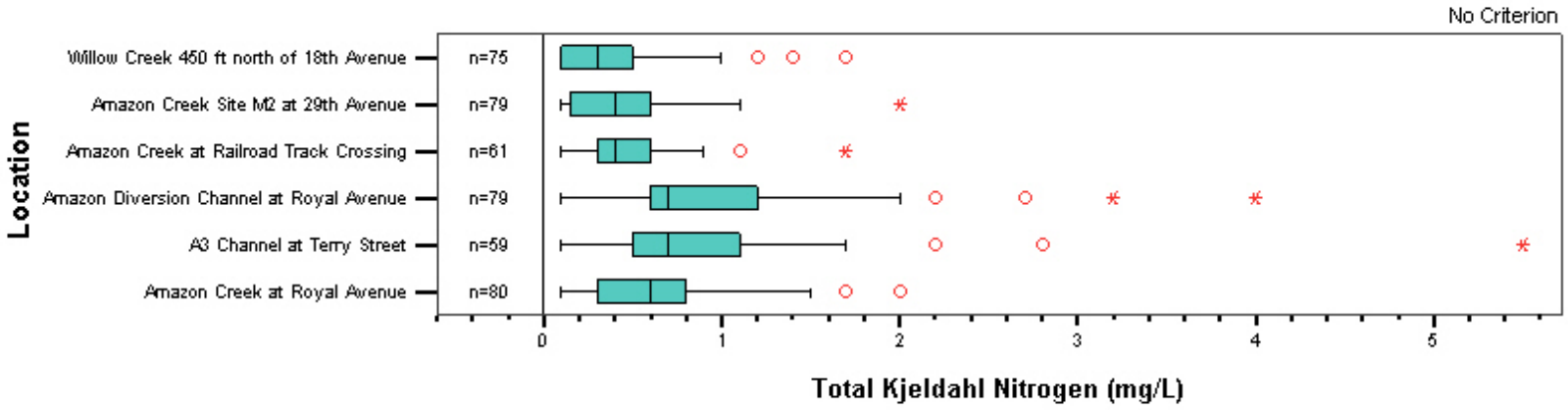


Figure B.26

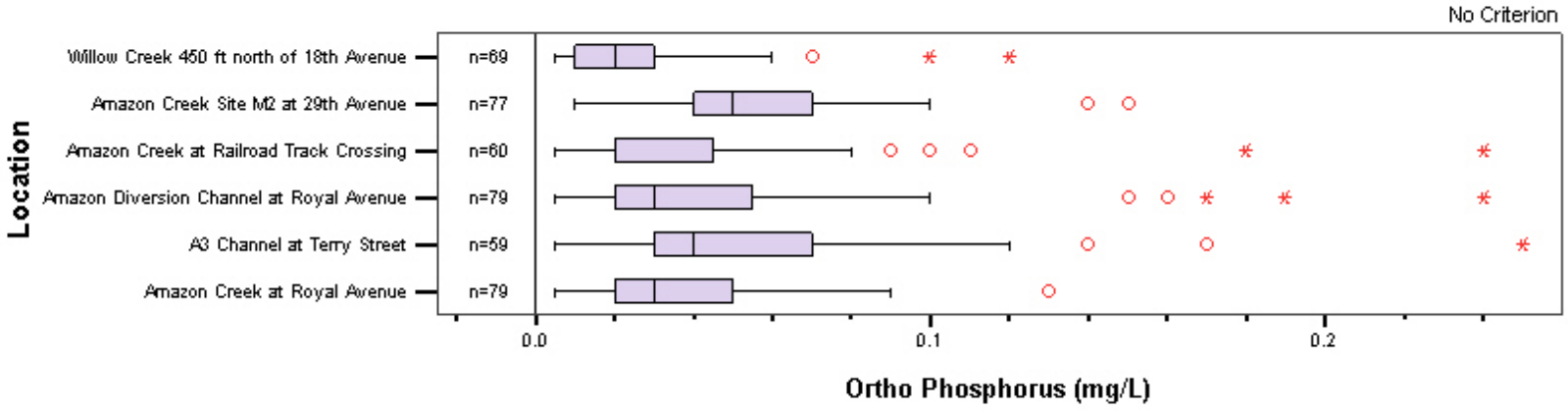


Figure B.27

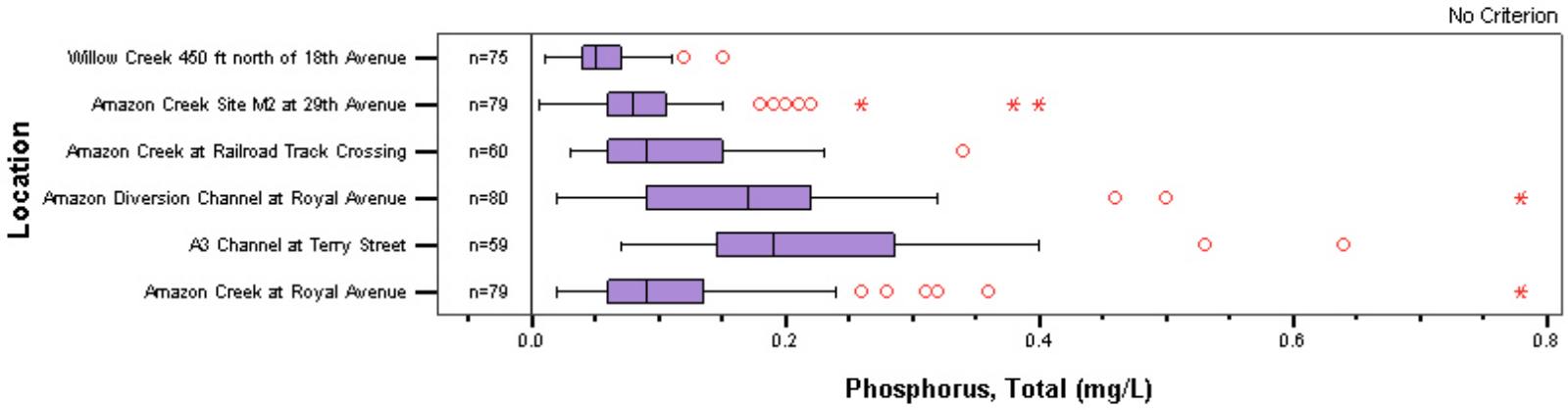


Figure B.28

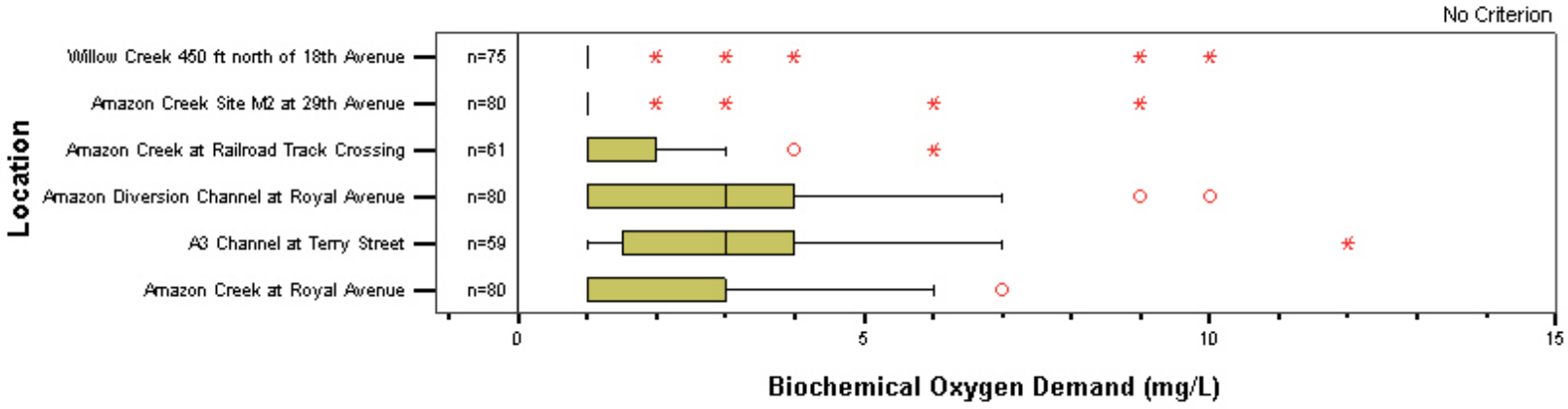


Figure B.29

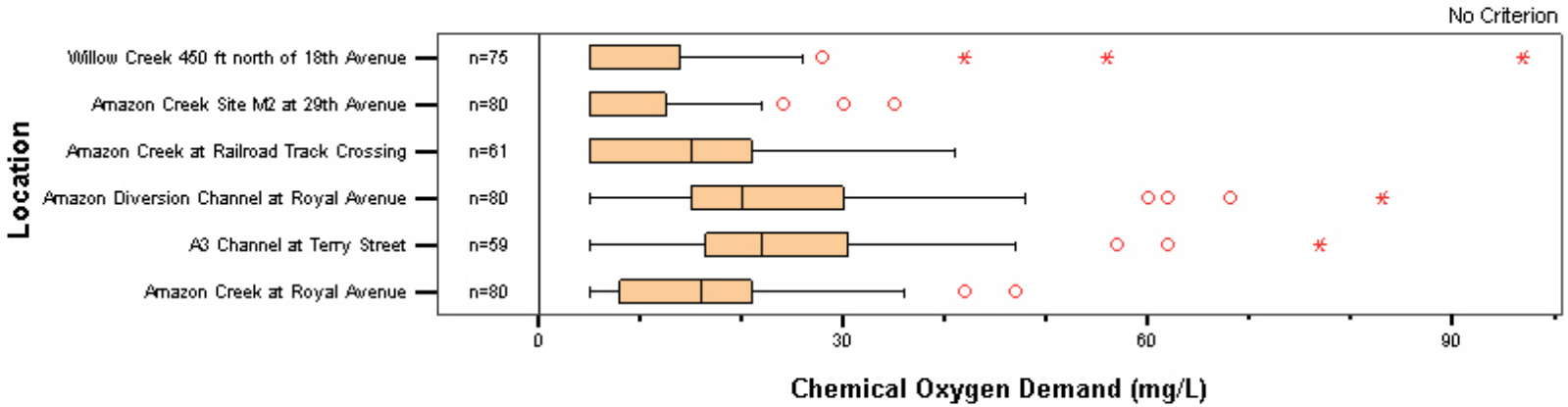


Figure B.30

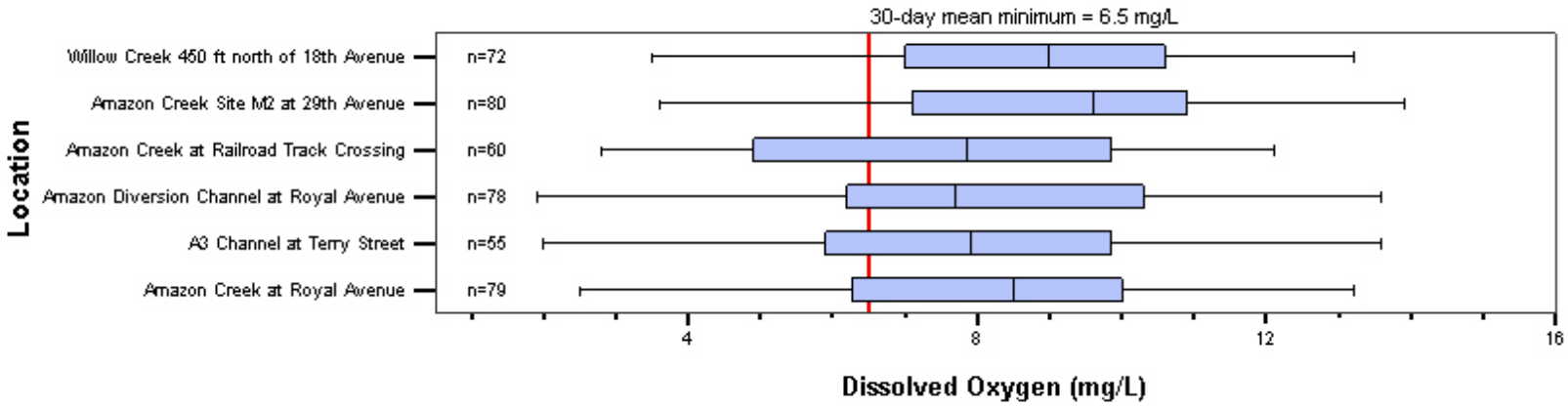
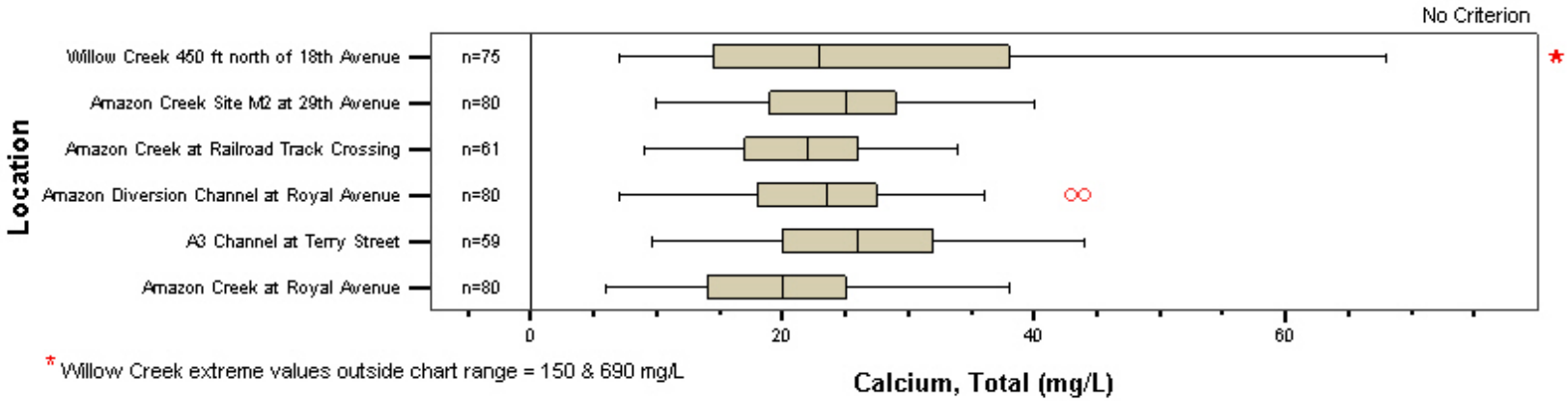


Figure B.31



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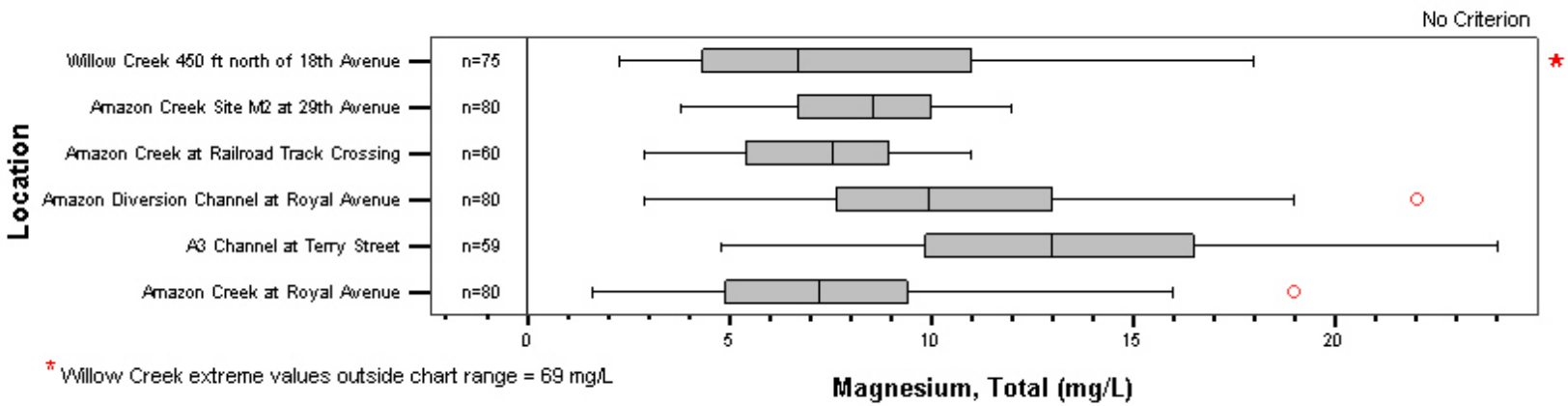

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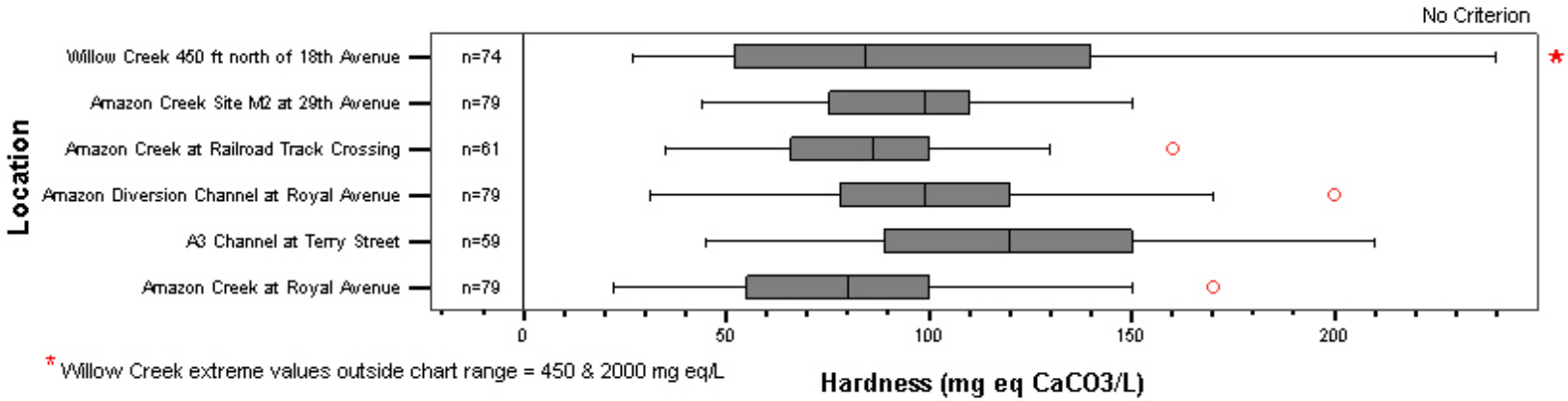

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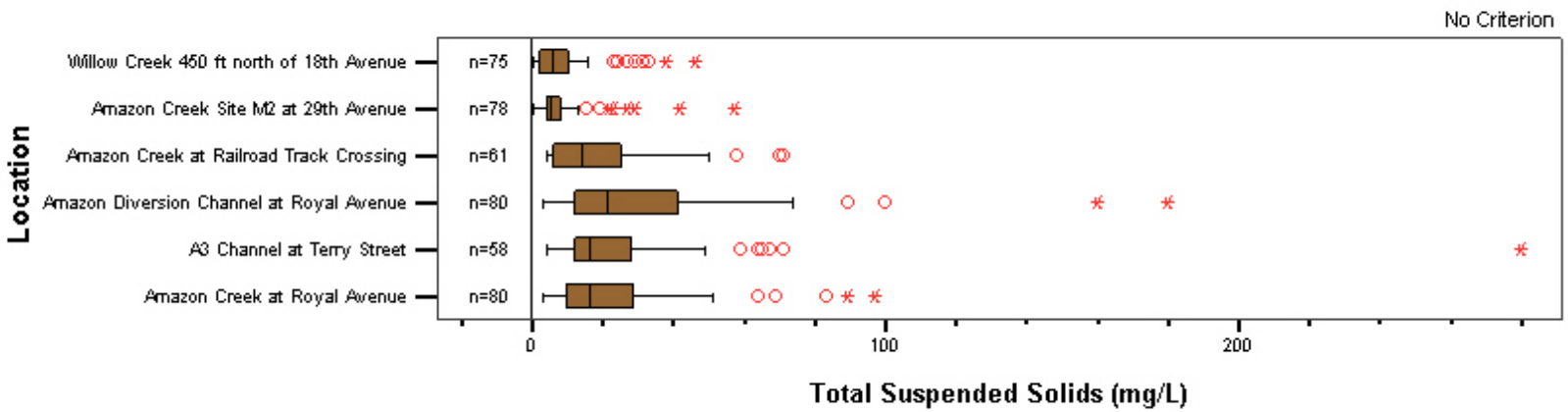

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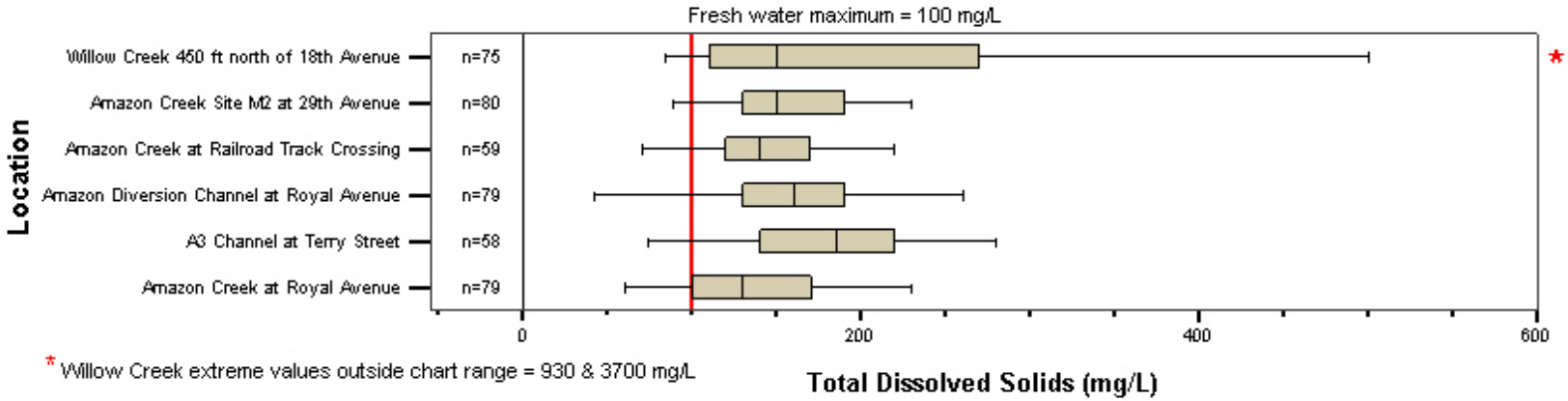

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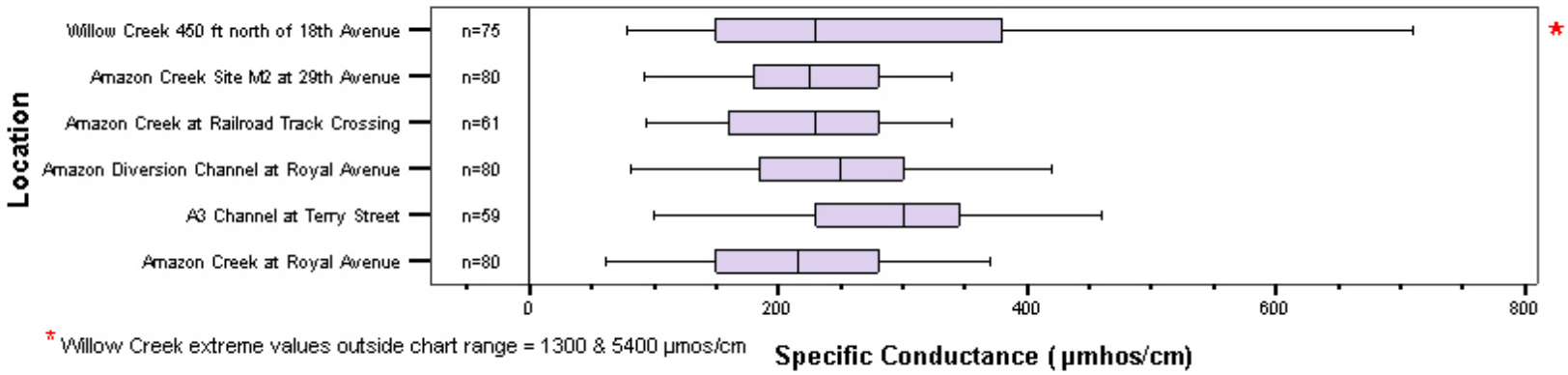

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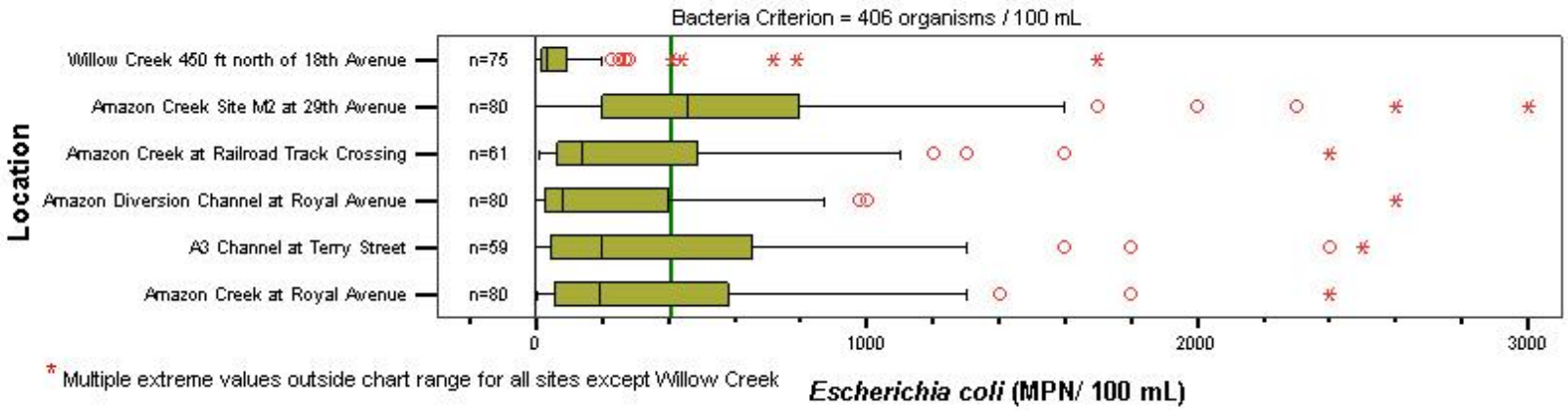

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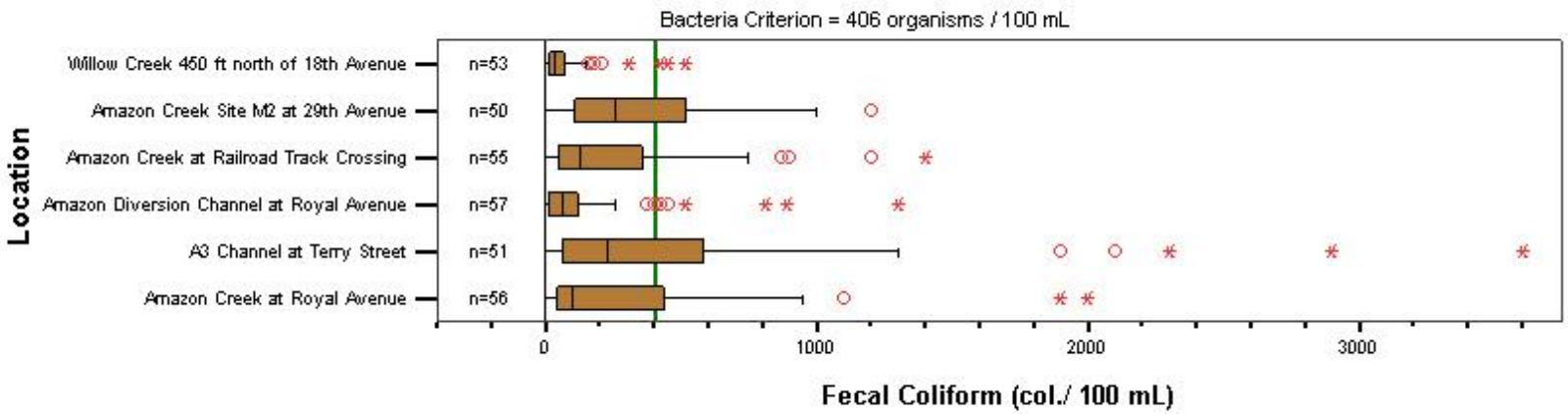

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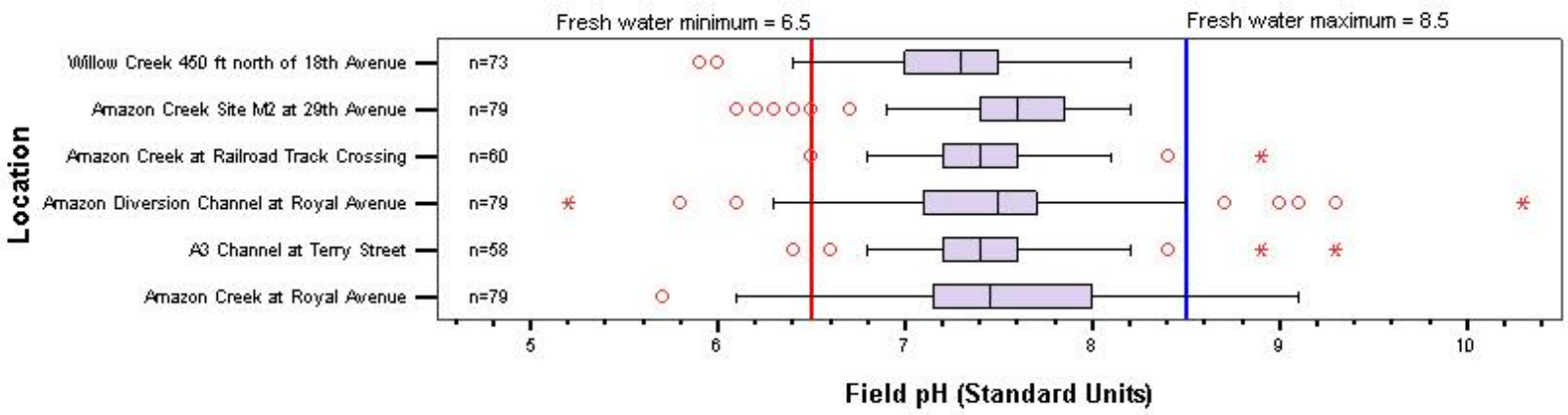

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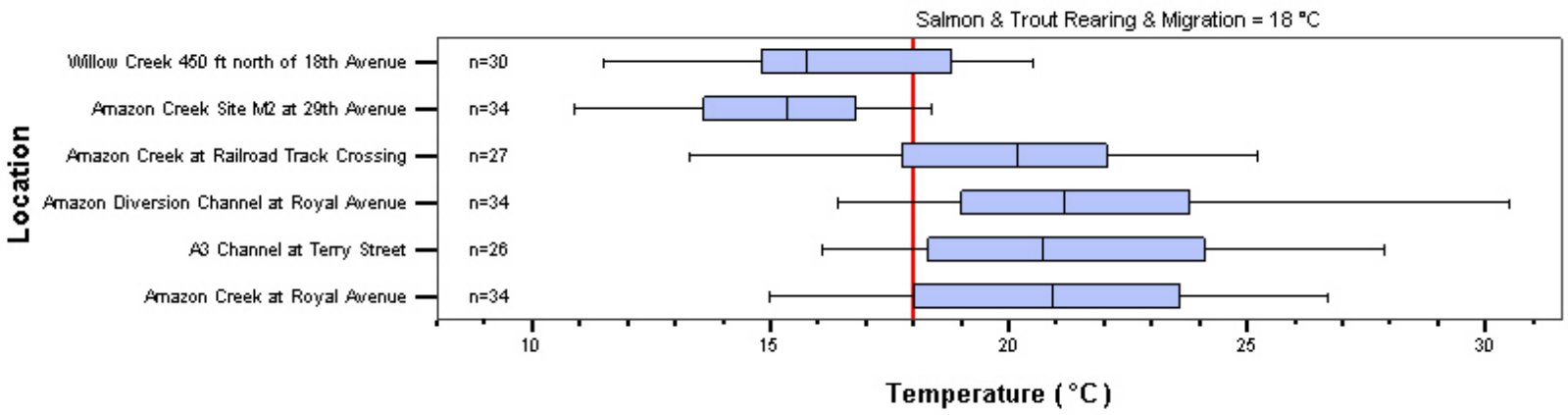

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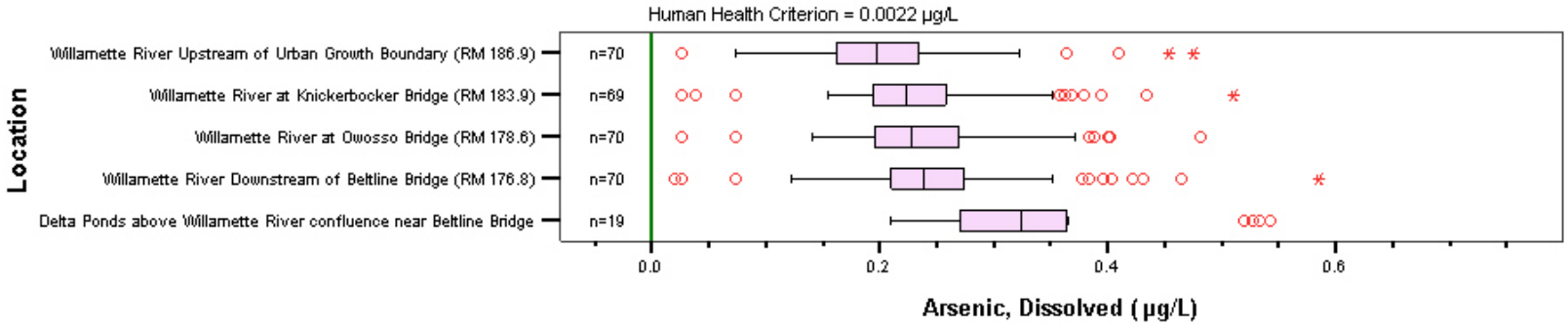

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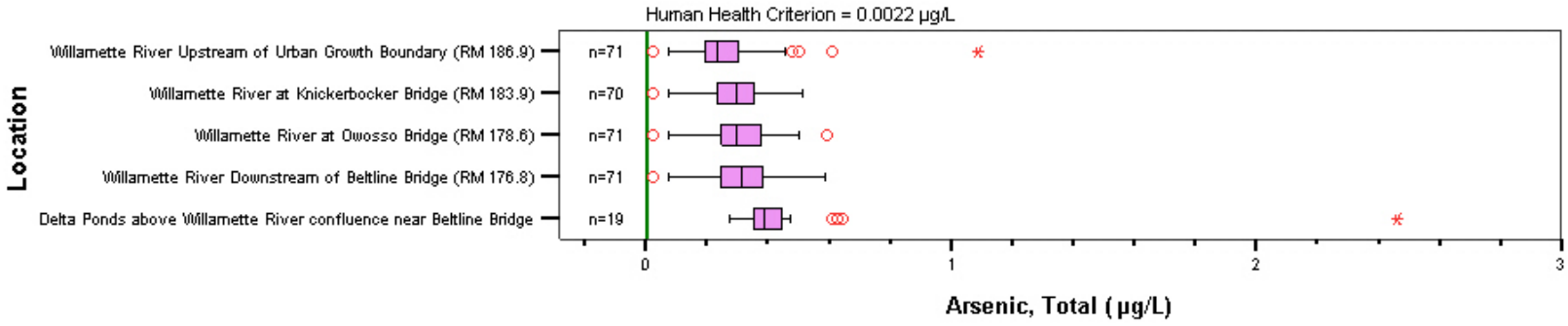

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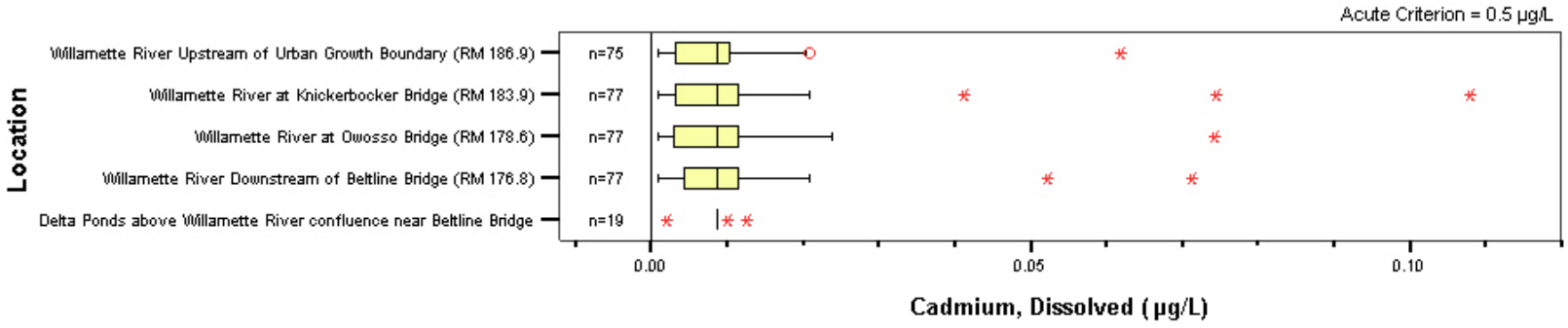

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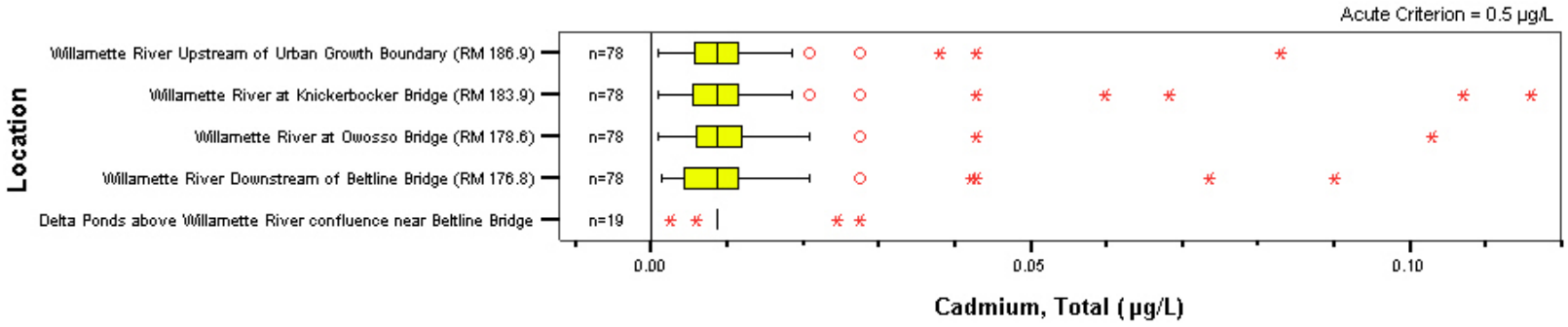

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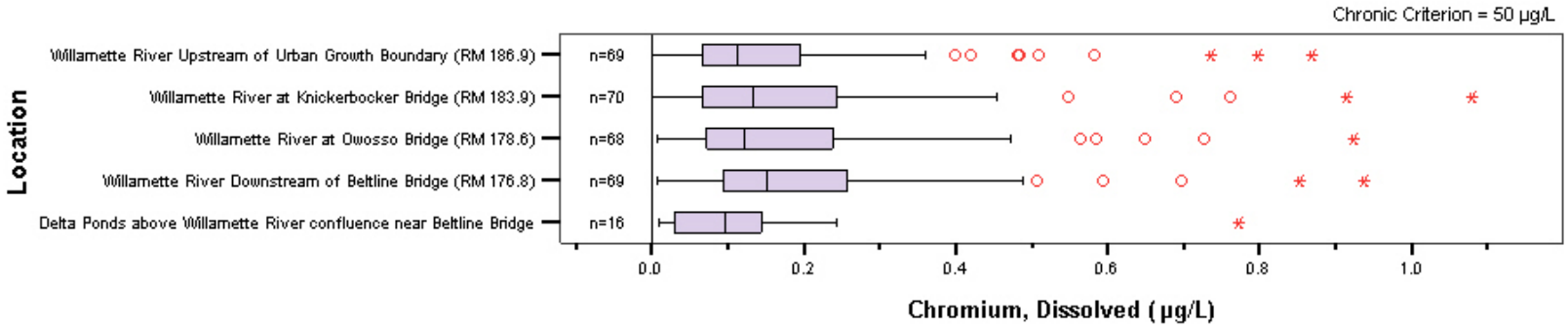

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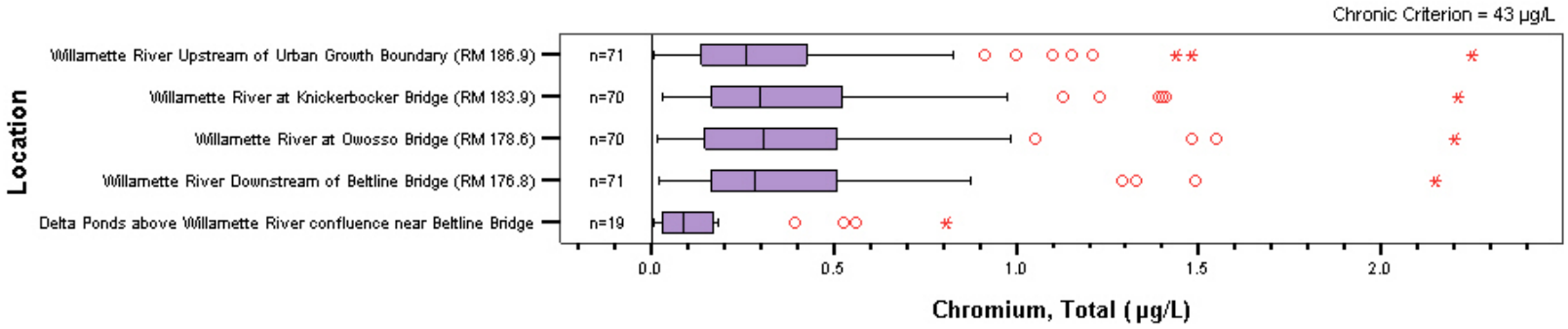

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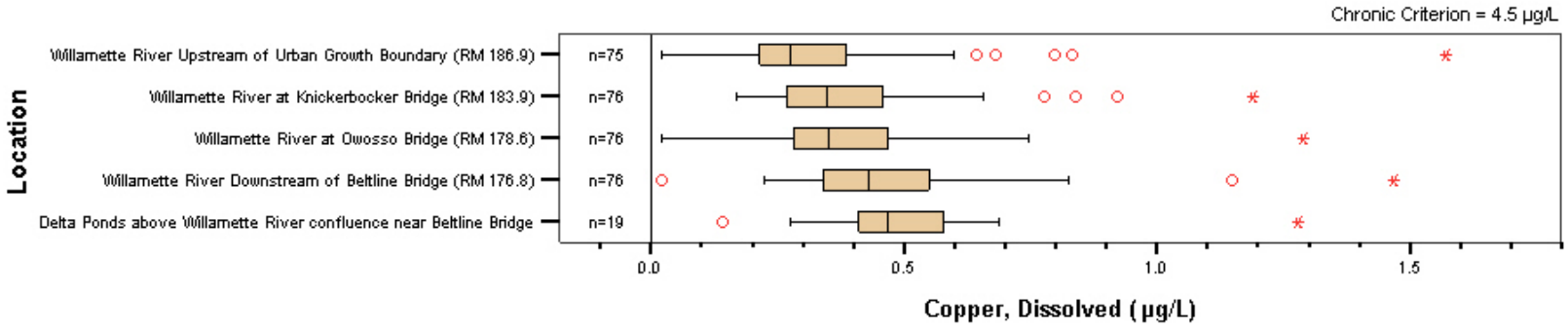

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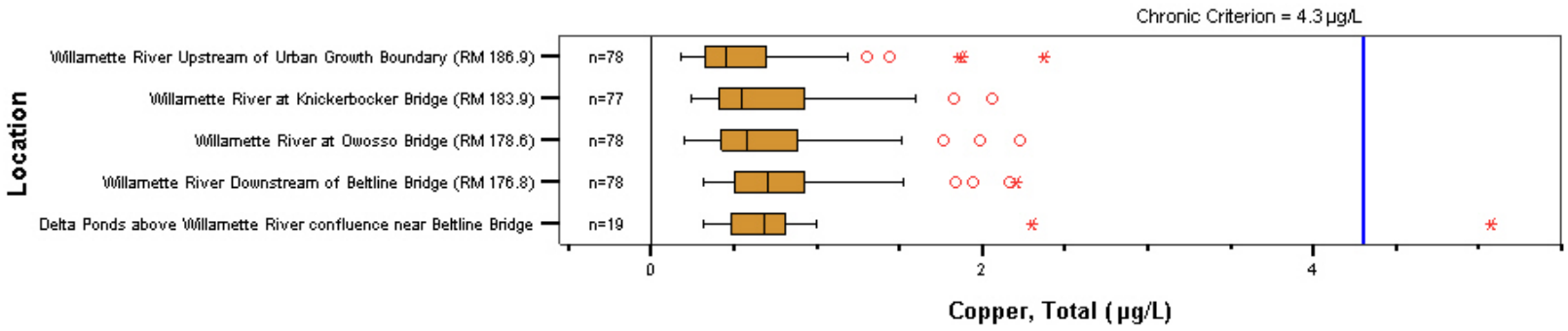

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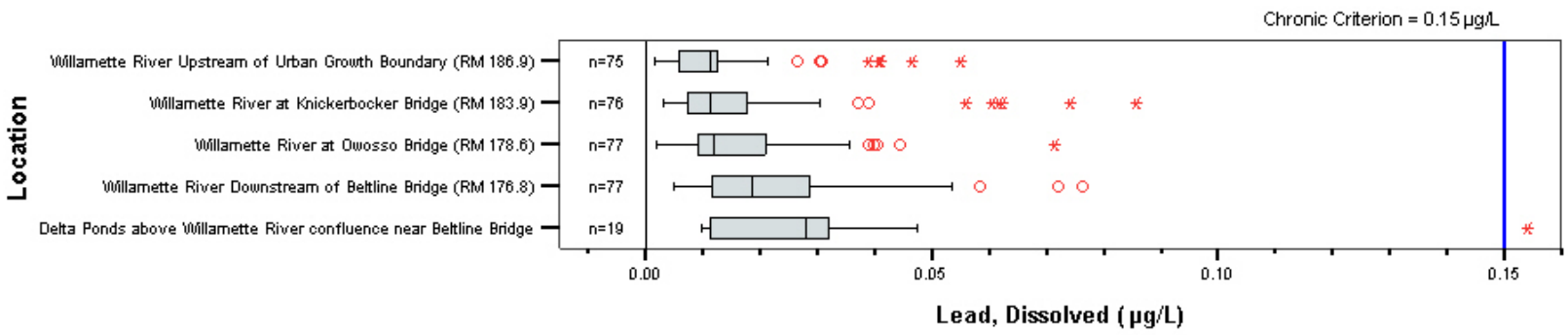

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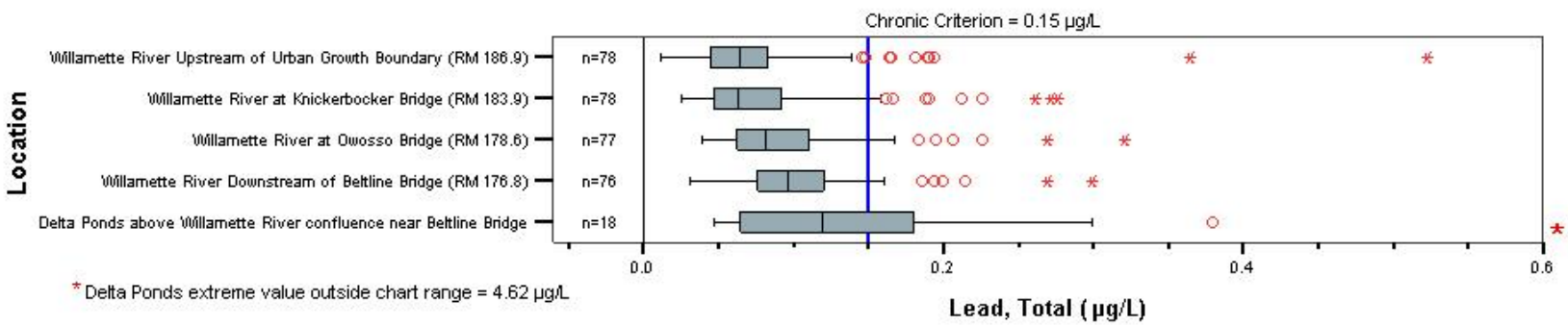

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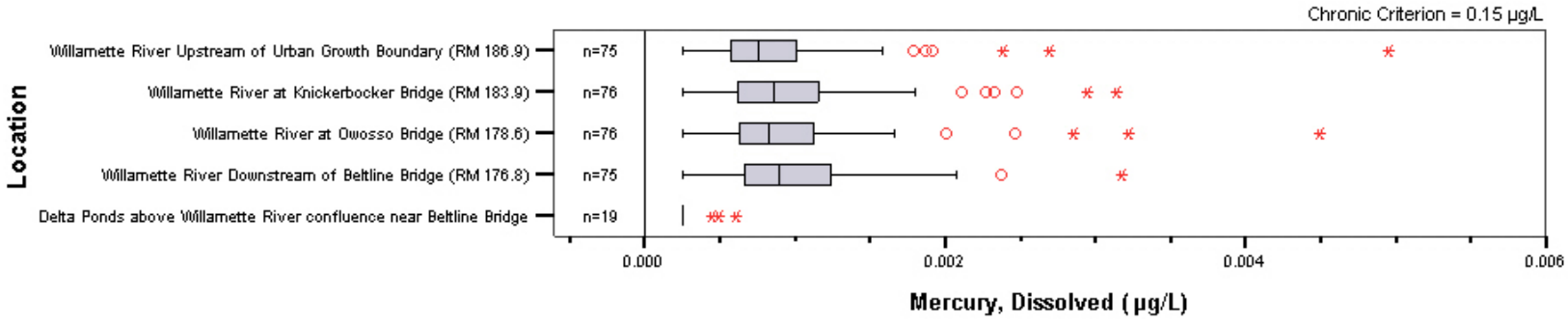

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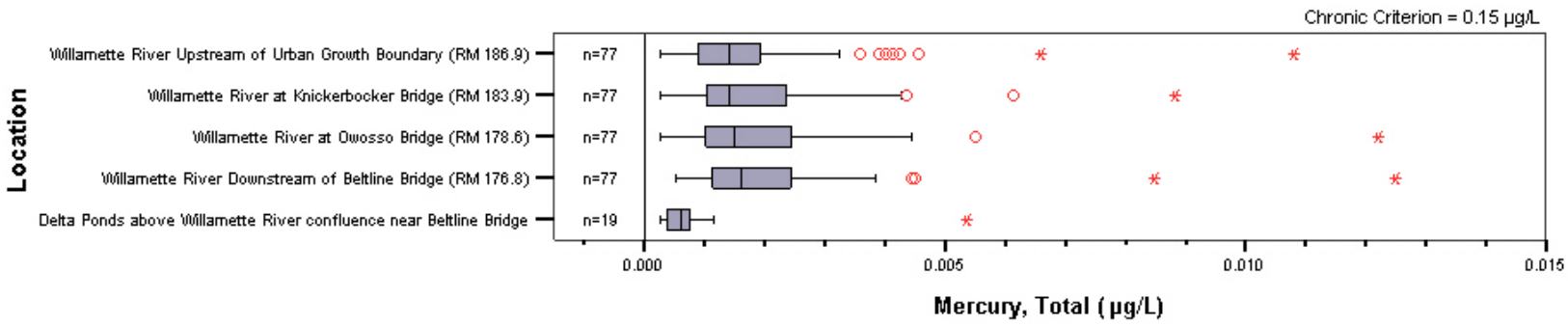

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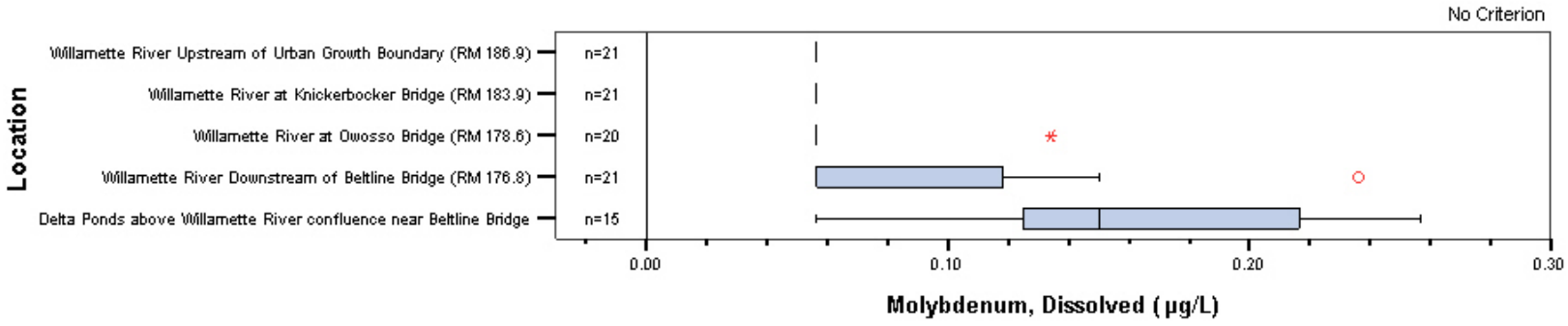

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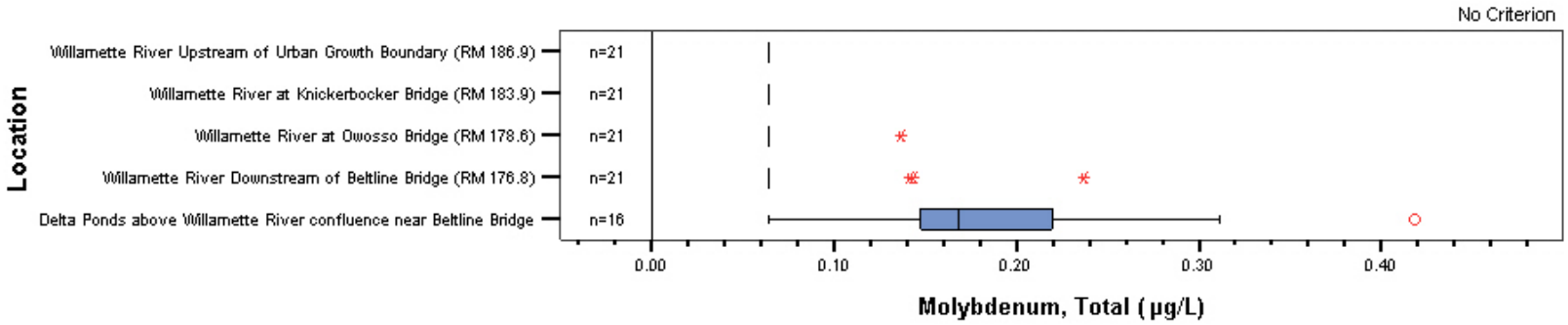

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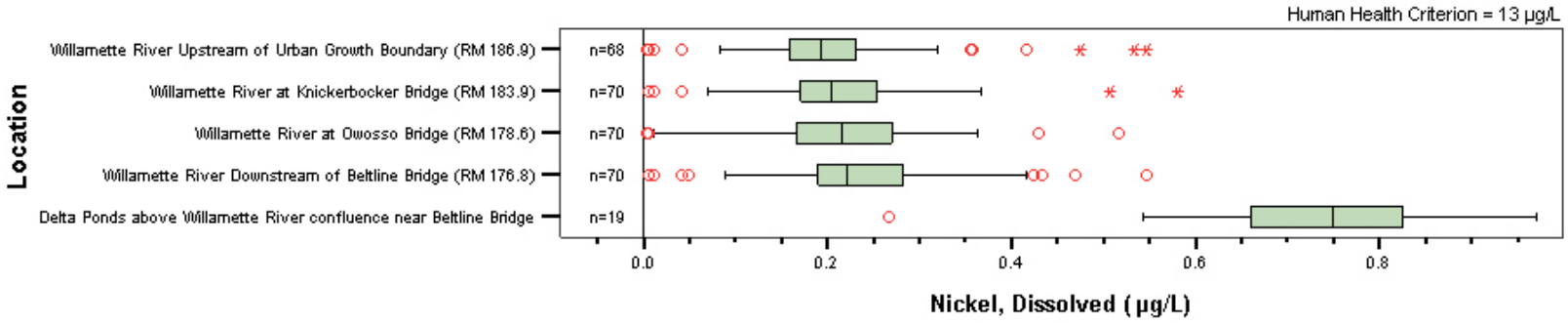

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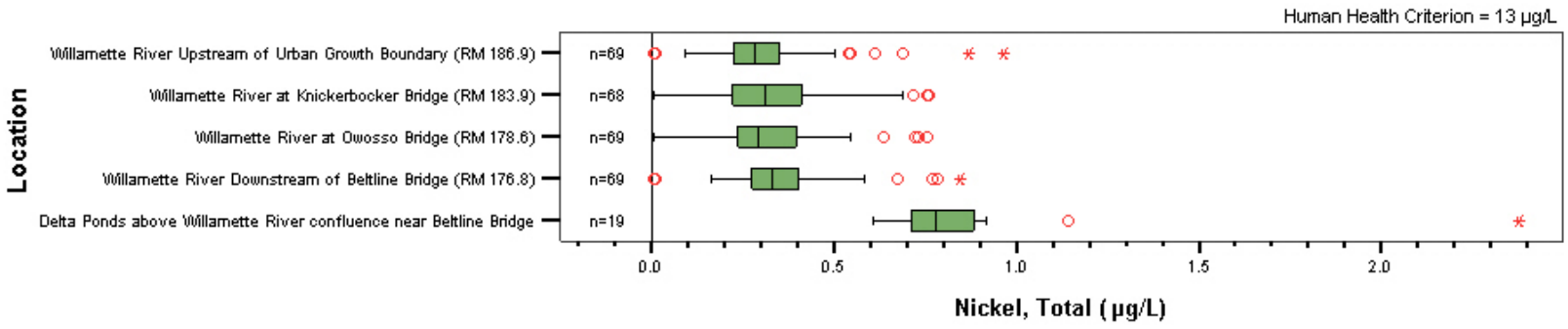

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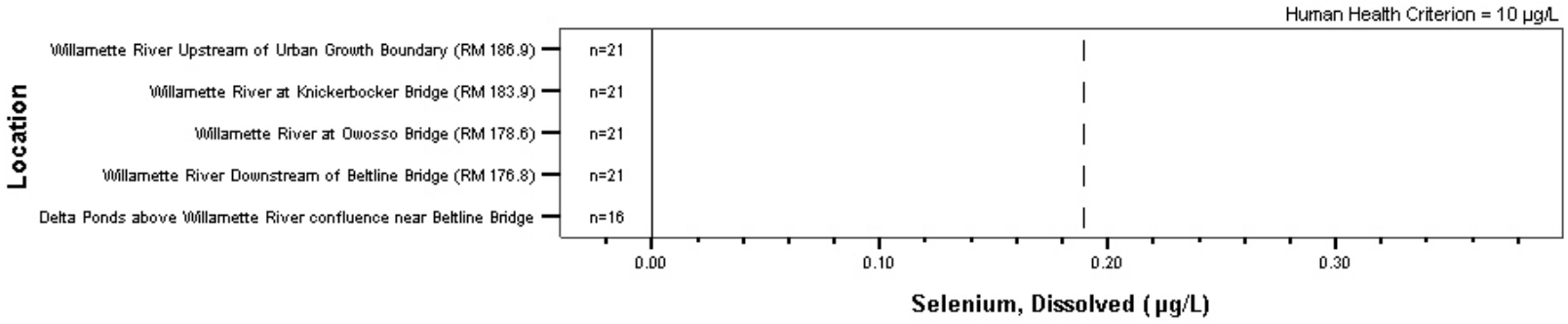

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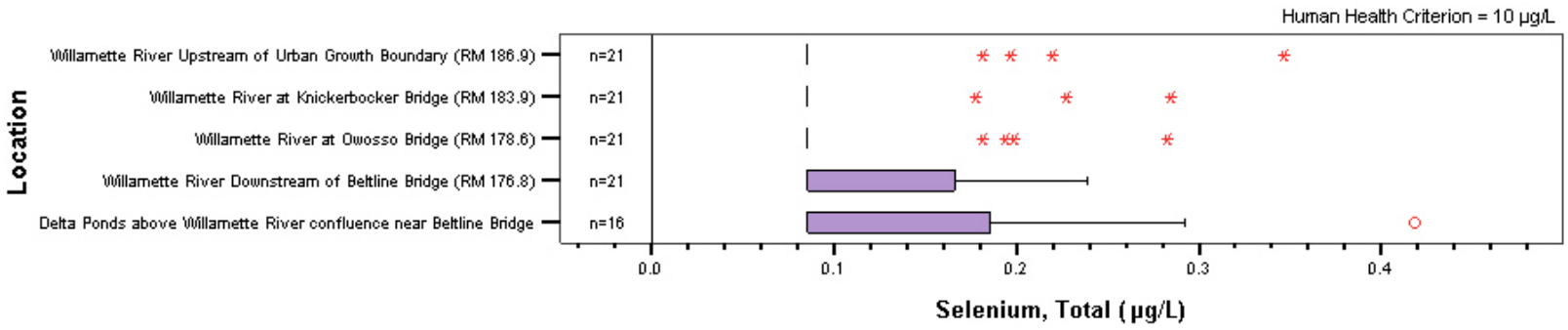

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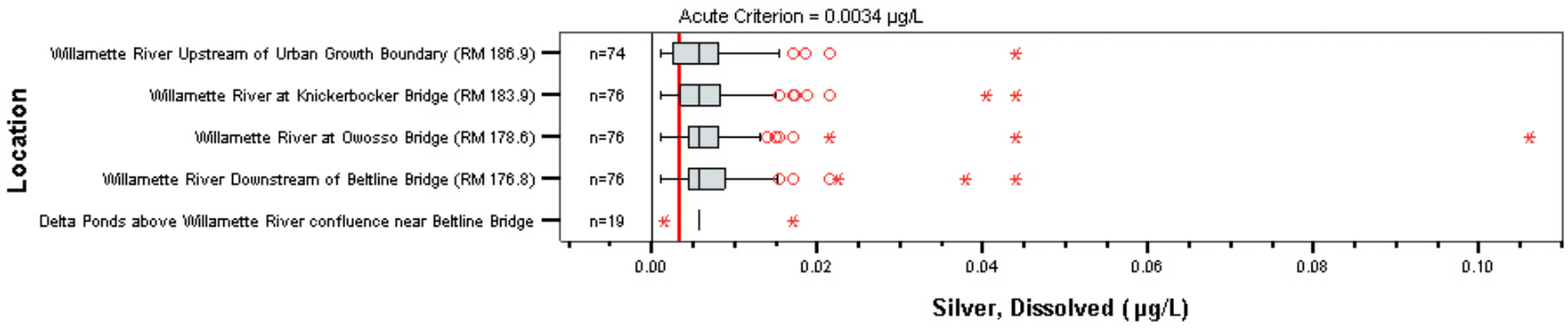

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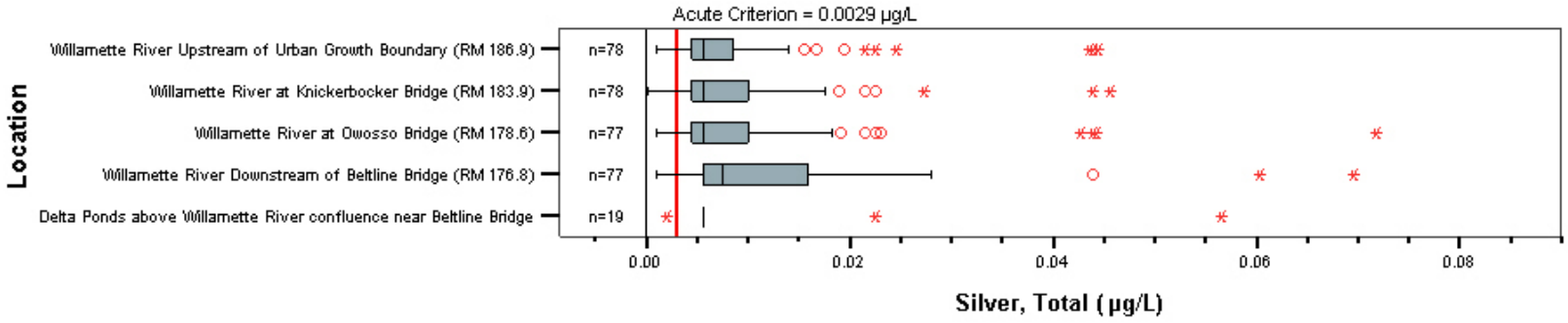

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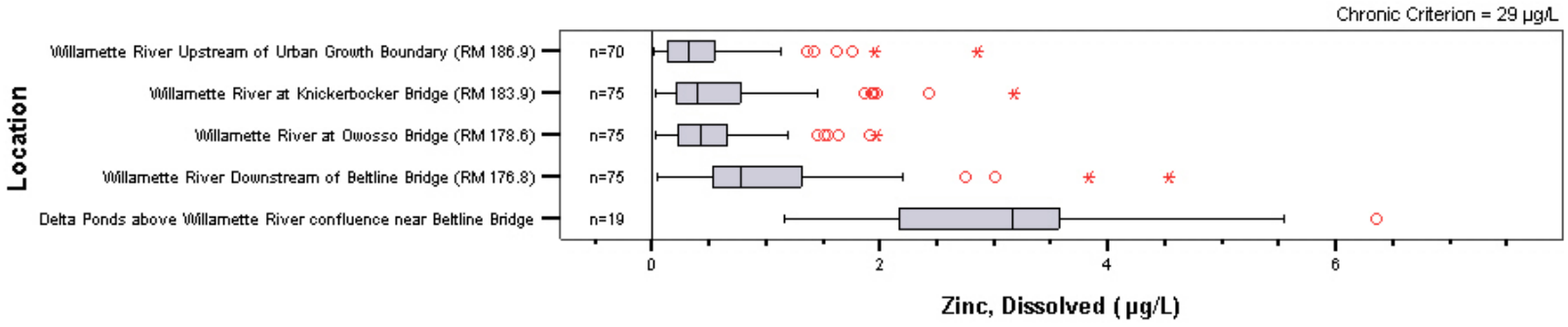

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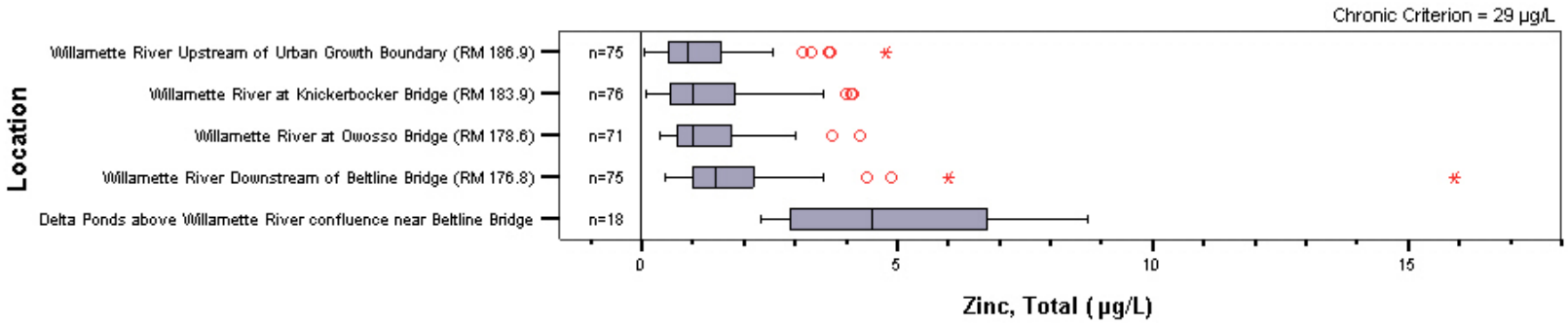

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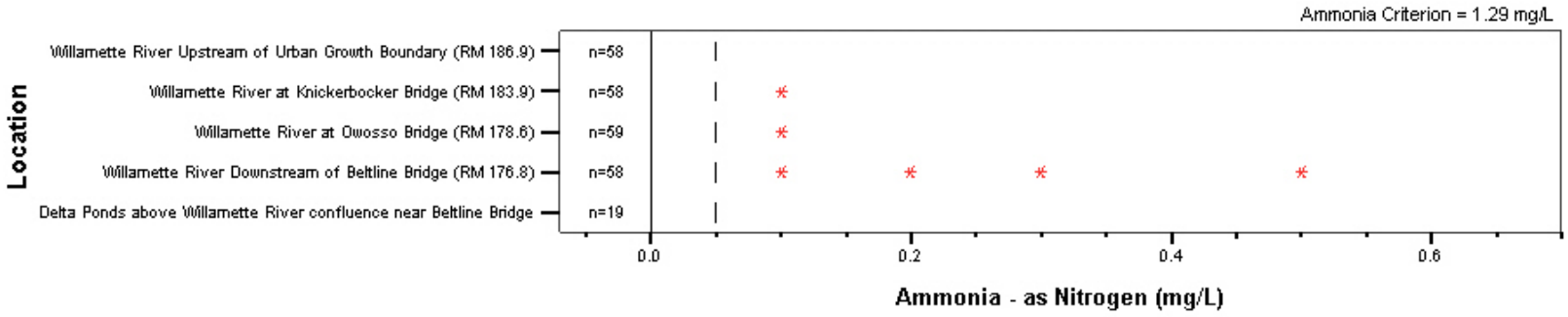

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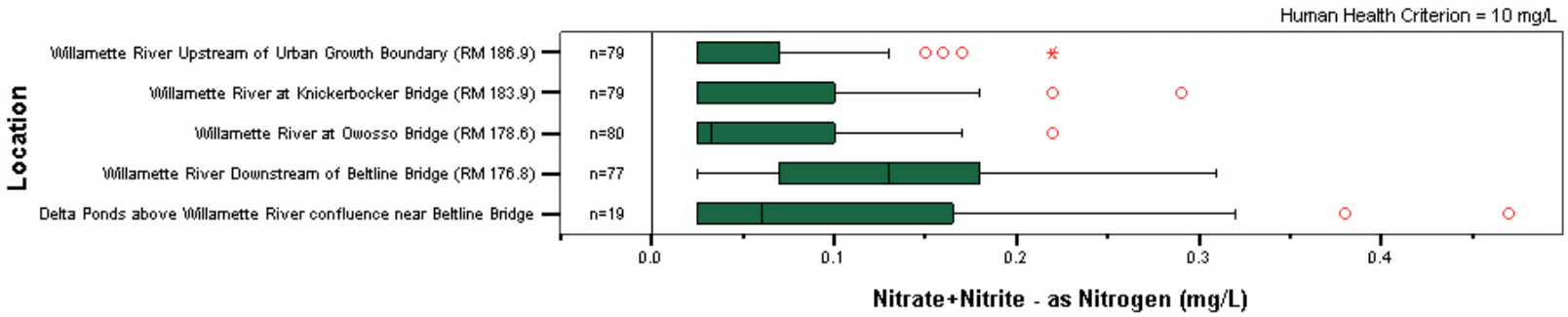

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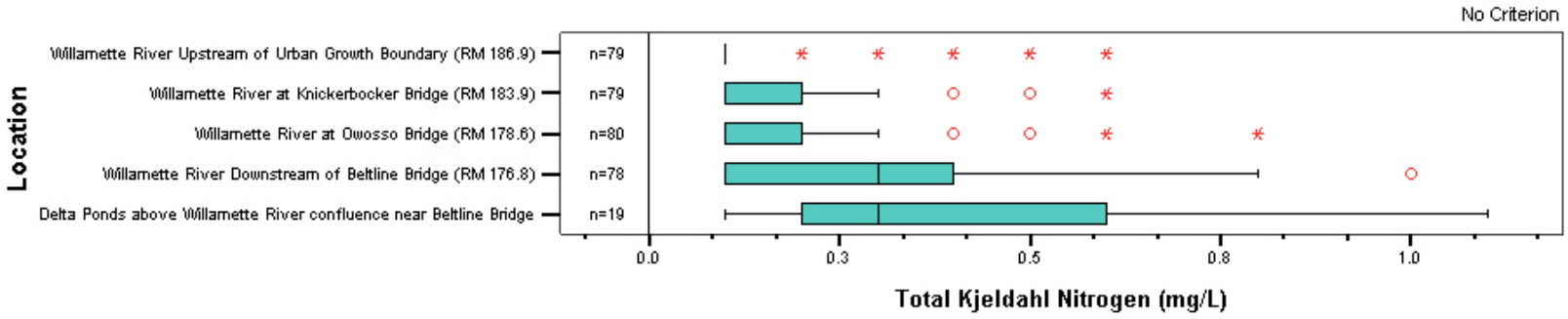

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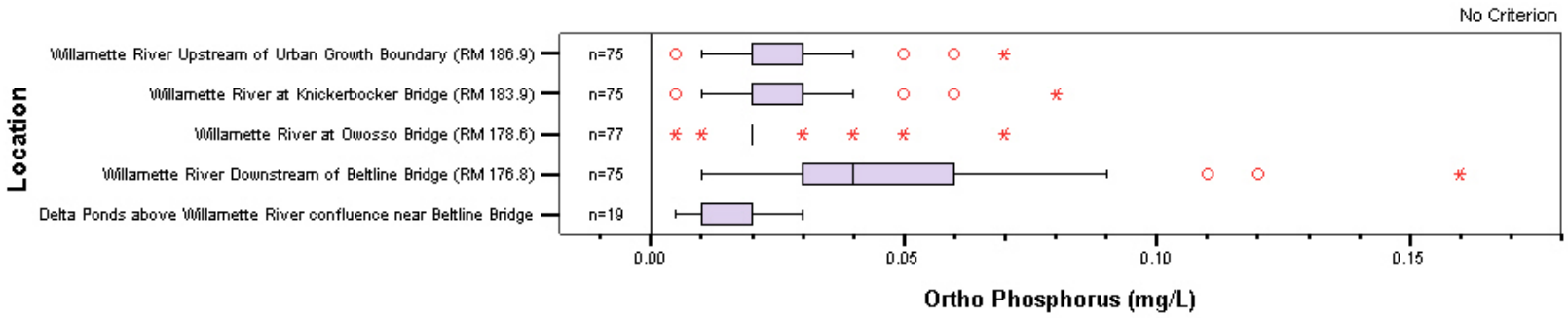

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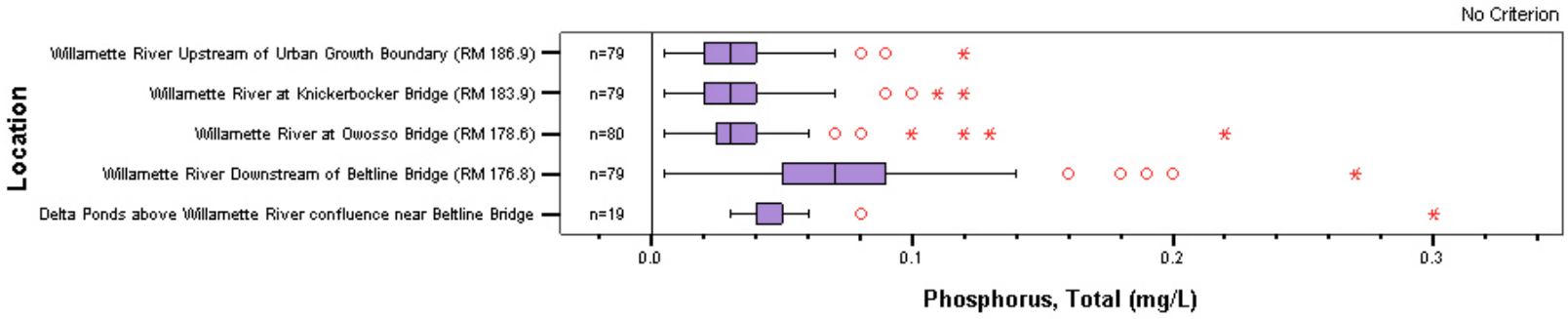

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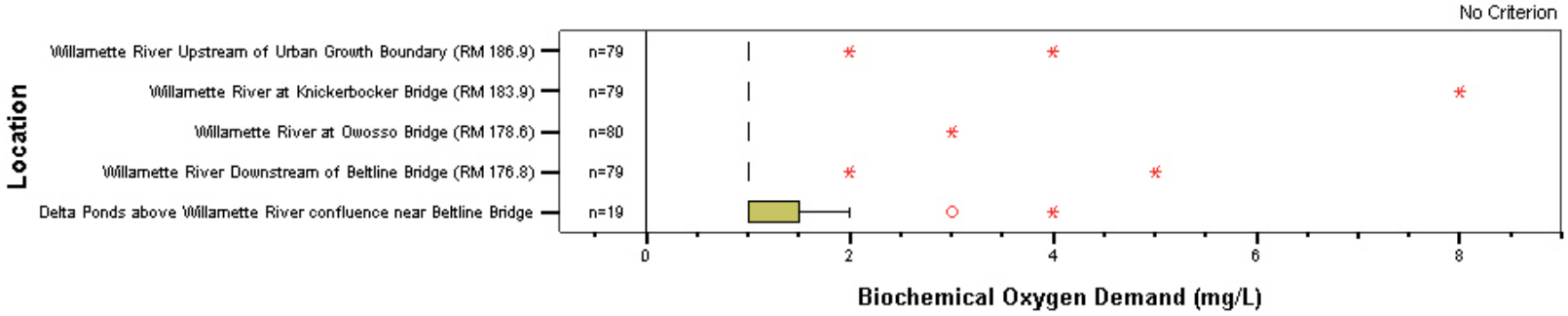

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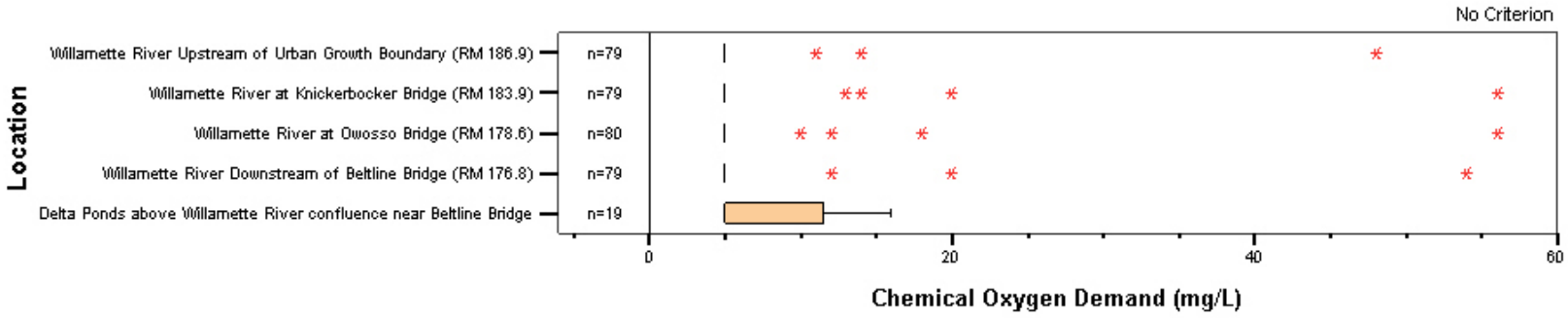

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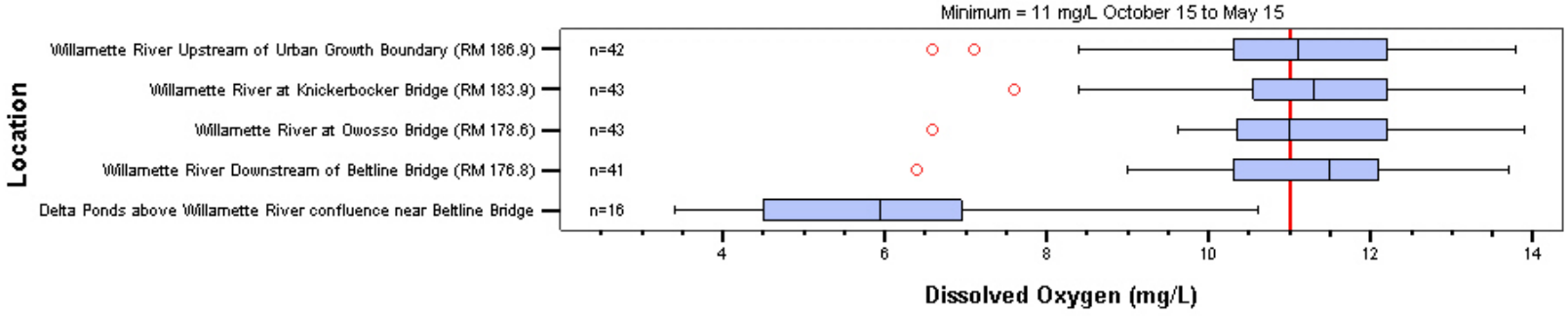

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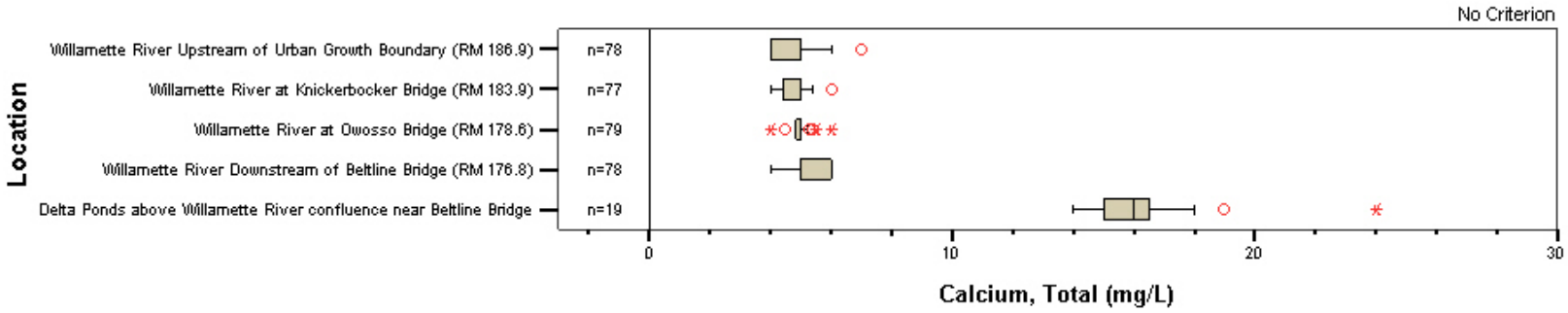

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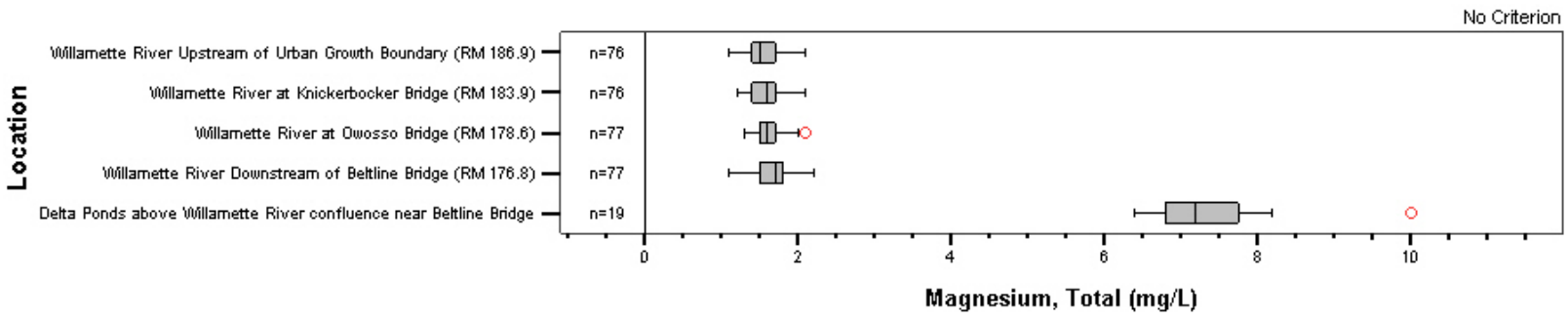

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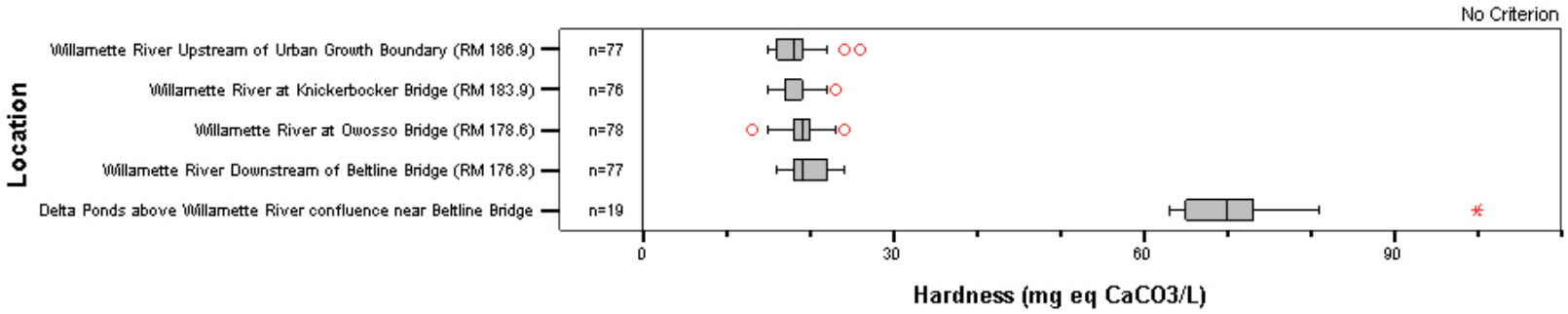

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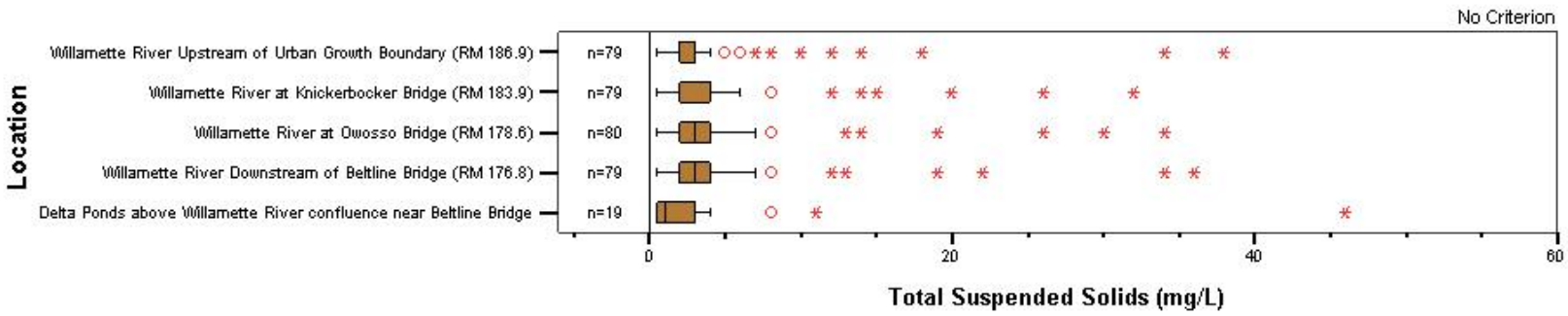

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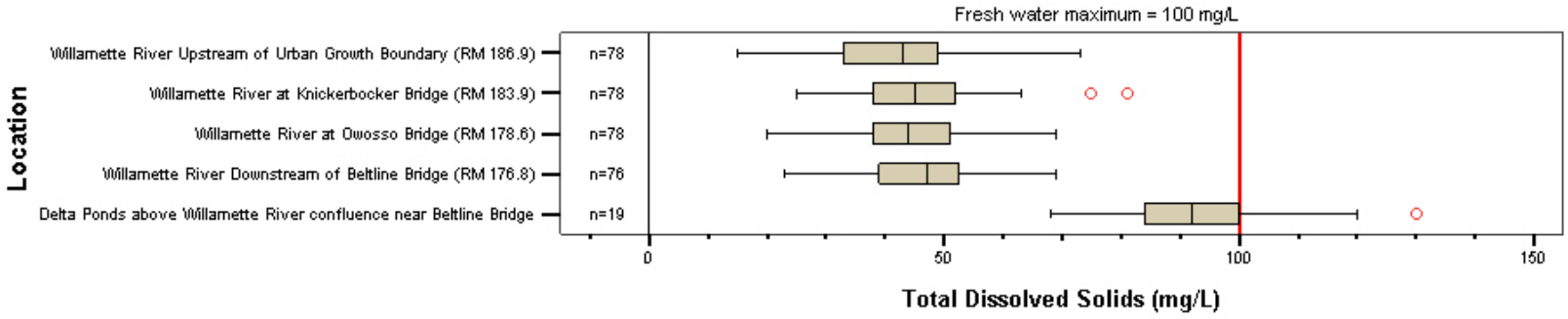

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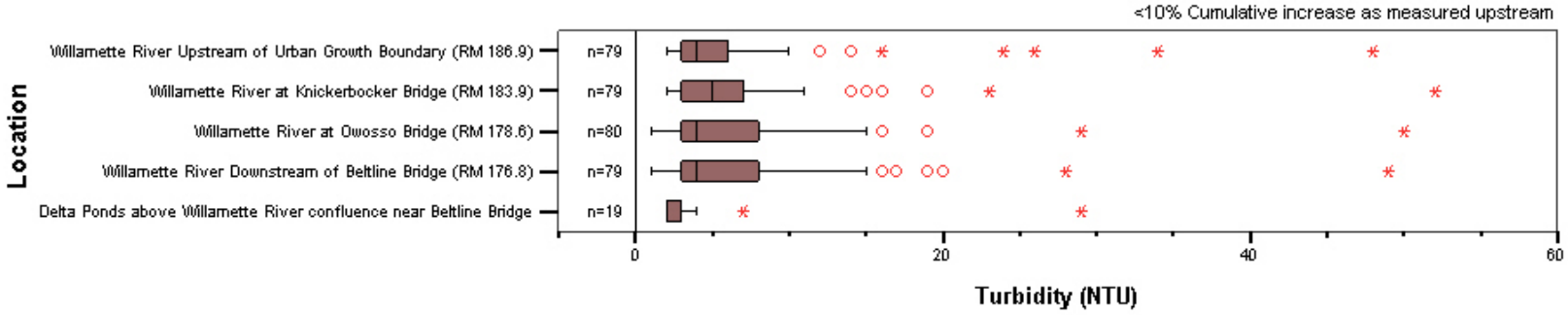

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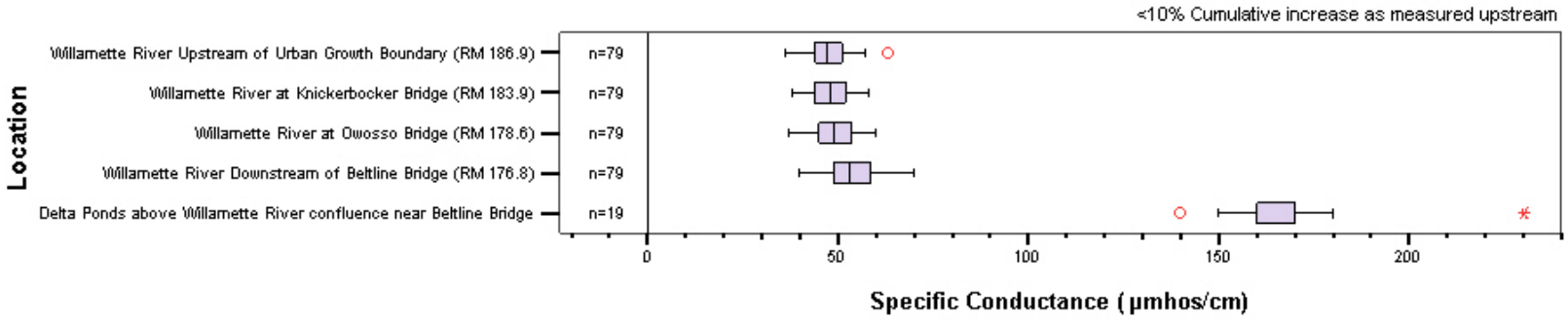

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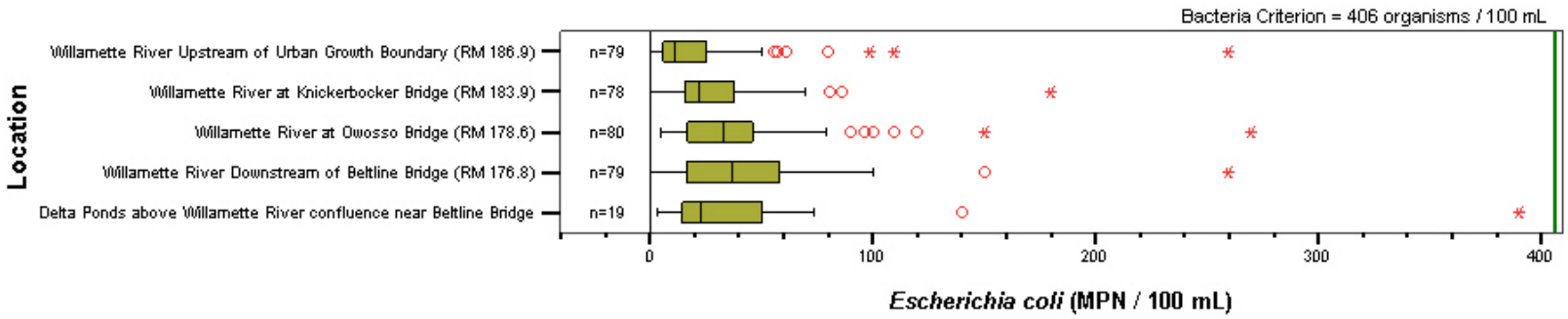

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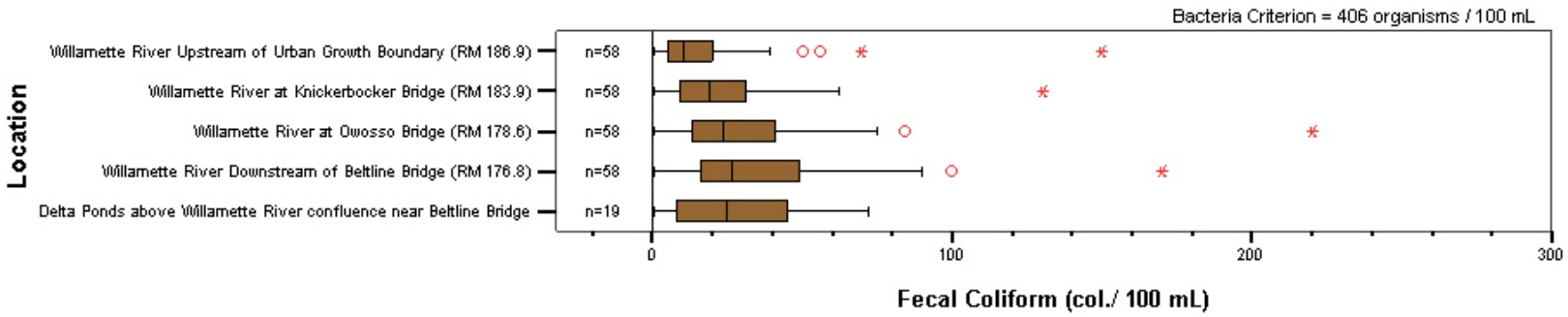

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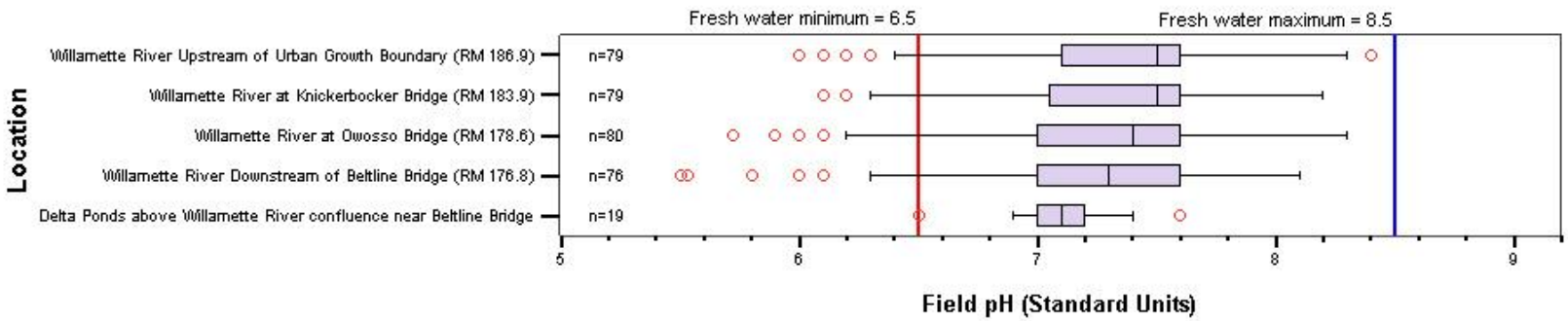

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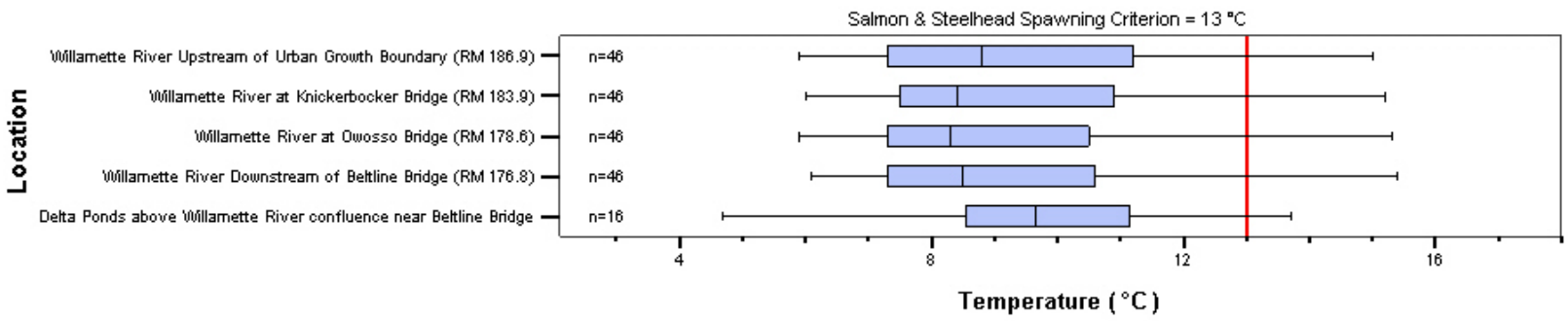

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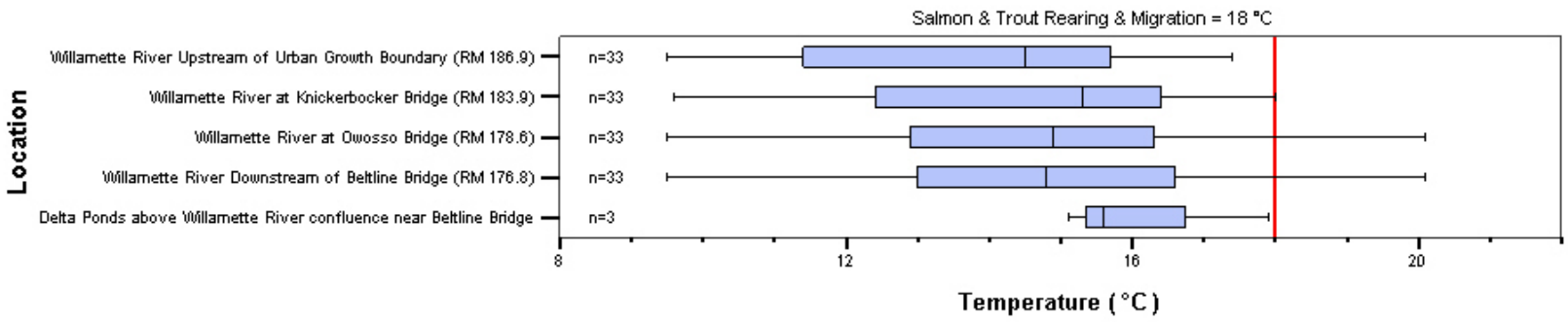

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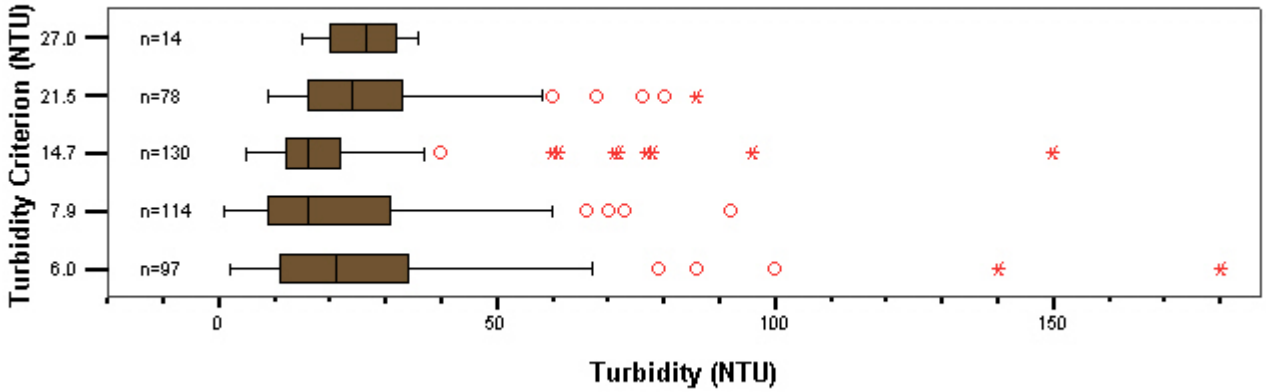

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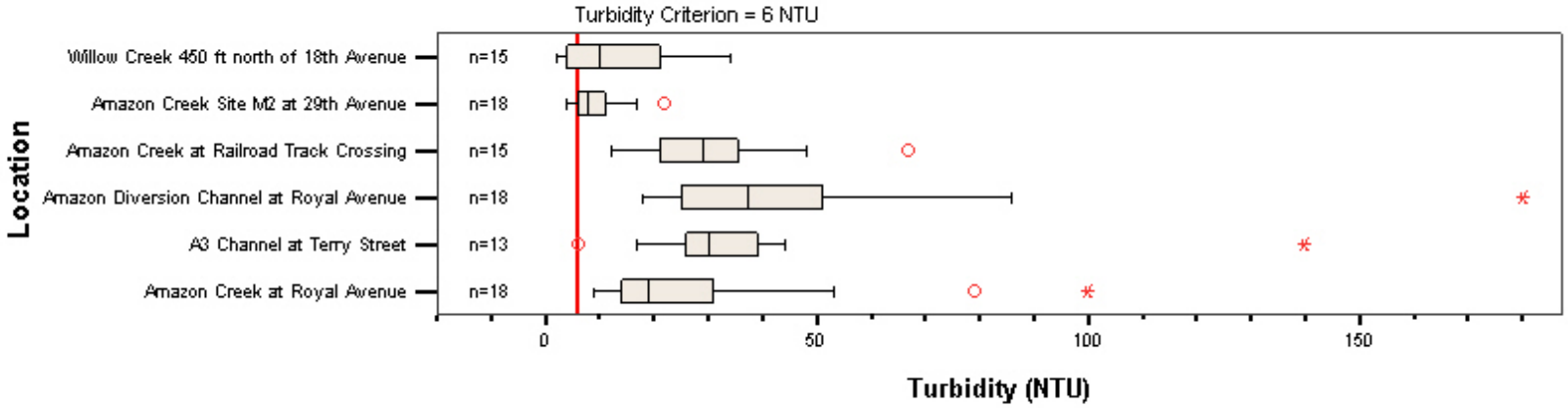

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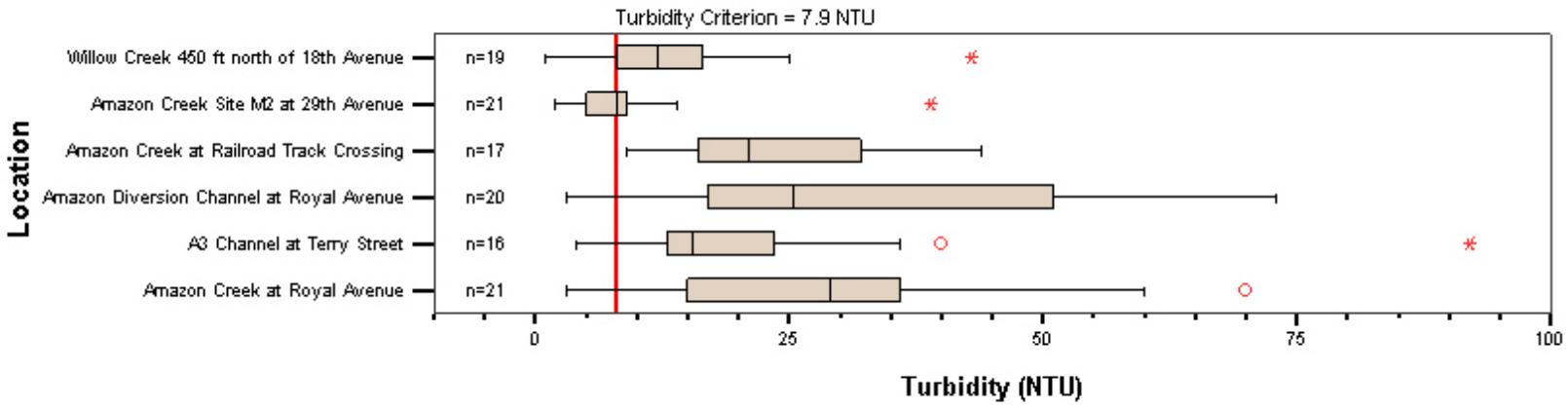

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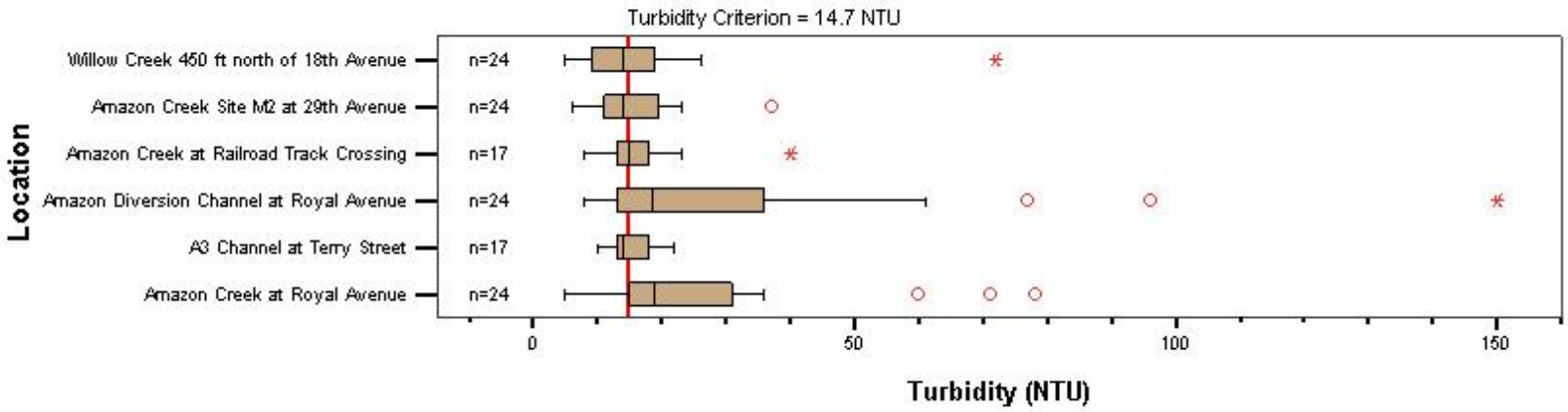

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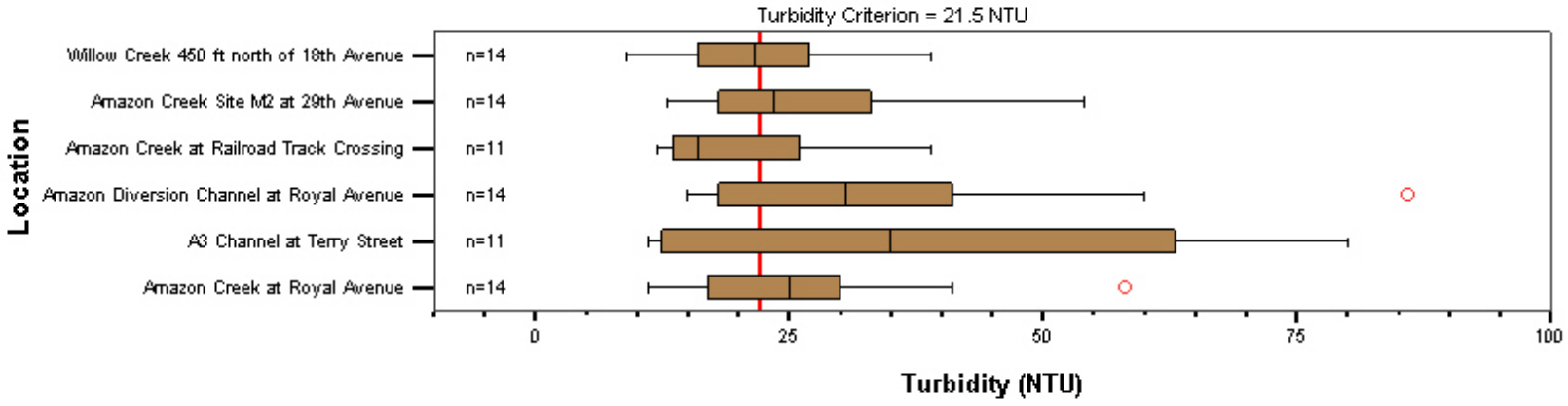

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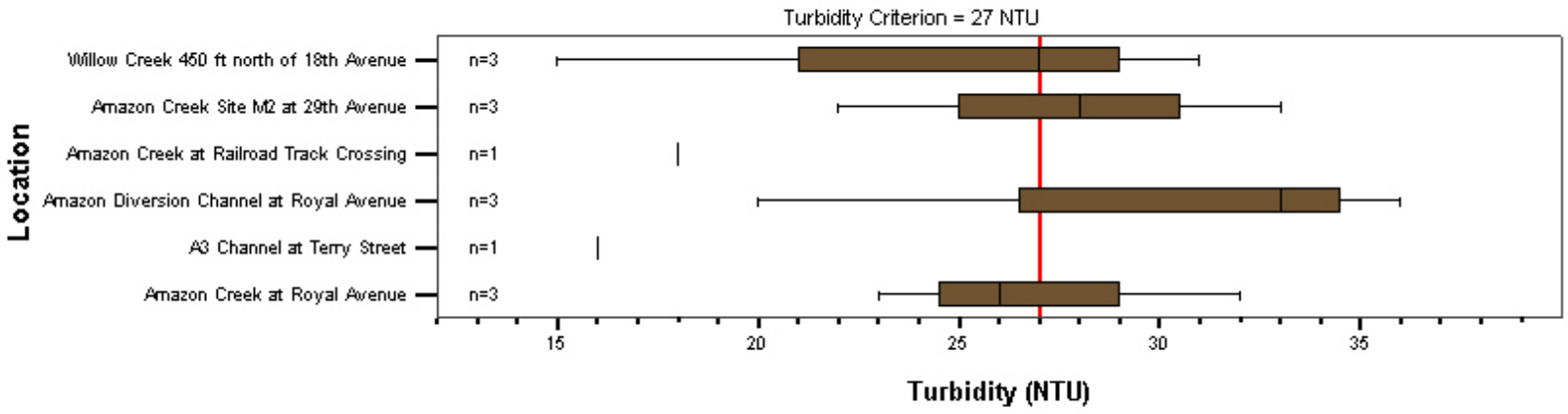

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Public Comments on Year 7 Report

- **Public Notice**
- **City's NPDES Web Site Screen Print**
- **Public Comments & Responses**
- **Copy of July 2008 Fact Sheet ("Stormwater Management Plan")**

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AFFIDAVIT OF PUBLICATION

STATE OF OREGON, }
COUNTY OF LANE, } ss.

I, **Wendy Raz**, being first duly affirmed, depose and say that I am the Advertising Manager, or his principal clerk, of The Register-Guard, a newspaper of general circulation as defined in ORS 193.010 and 193.020; published at Eugene in the aforesaid county and state; that the **Public Notice** printed copy of which is hereto annexed, was published in the entire issue of said newspaper for **one** successive and consecutive **Day(s)** in the following issues:

November 09, 2010

The City of Eugene has prepared a draft Stormwater Annual Report, in accordance with the requirements of its National Pollutant Discharge Elimination System (NPDES) Municipal Stormwater system permit, issued in March 2004. Discharges from Eugene's municipal stormwater system are regulated by the Oregon Department of Environmental Quality (DEQ) under the NPDES permitting program which is authorized by Section 402 of the Clean Water Act. Annual reporting is a required element of the City's permit.

The draft Stormwater Annual Report is being made available for public review and comment. The report provides information on the progress of permit activities during the reporting period (July 1, 2009 through June 30, 2010) including overall program management, status of program implementation, and water quality monitoring results.

The draft report is available on the Internet at: www.eugene-or.gov/stormwater (see "Permits & Regulations" and select "National Pollutant Discharge Elimination System") or by calling Therese Walch, Water Resources Manager, at 541-682-5549.

Comments received by 5 p.m. Tuesday, November 23 will be summarized in the City's Stormwater Annual Report to DEQ. Comments received after November 23 will be taken into consideration for possible future modifications to the City's stormwater program. Send written comments to NPDES Permit, Eugene Public Works, 99 East Broadway, Suite 400, Eugene, OR 97401. Send e-mail comments to: therese.walch@ci.eugene.or.us

No. 4795664 - November 9, 2010

OFFICIAL SEAL
TAMARA ANN CLARK
NOTARY PUBLIC-OREGON
COMMISSION NO. 435086
MY COMMISSION EXPIRES DEC. 15, 2012

Wendy Raz

Subscribed and affirmed to before me this November 09, 2010

Tamara A Clark
Notary Public of Oregon

My commission expires: December 15, 2012

Account #: **1000205**
INVOICE **4795664**
Case: **Stormwater Annual Report**
Ad Price: **$107.50**

City of Eugene NPDES Municipal Stormwater Permit Web Site Screen Print
November 30, 2010

City Home | Residents | Businesses | Visitors | Services | City Government | Contact Us

You are here: Home > Public Works > Stormwater > Stormwater Permits & Regulations > NPDES

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- Water Quality Protected Waterways
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- Stormwater Capital Projects
- Stormwater Planning

NPDES Permit Contact Information

Therese Walch
Public Works Department
99 East Broadway, Suite 400
Eugene, OR 97401
541-682-5549
Therese.Walch@ci.eugene.or.us

City Quick Links

Stormwater Permits & Regulati

NPDES Municipal Stormwater Permit

The City of Eugene holds a permit under the federal Clean Water Act for the municipal stormwater it discharges directly into the Willamette River and indirectly into the Willamette River through other local waterways, including Amazon Creek. The permit, formally called the Phase I National Pollutant Discharge Elimination System (NPDES) Municipal Separate Storm Sewer System (MS4) permit, requires that the City reduce the discharge of pollutants from the municipal system to the maximum extent practicable, and includes monitoring and reporting requirements, as well as a set of best management practices that define the City's Stormwater Management Plan (SWMP). First issued in 1994, the permit was renewed once, in 2004. The Department of Environmental Quality (DEQ) administers federal NPDES permits for municipalities and other local agencies in Oregon.

Annual Reports

Information on the progress of permit activities is summarized in annual reports which are submitted to DEQ each December. Each annual report provides information on the progress of permit activities during the reporting period, which is the previous fiscal year (July 1 through June 30). The report includes information about overall program management, status of program implementation, and a water quality monitoring report.

The Draft Year 7 Annual Report, a report on the status of activities and water quality monitoring data for the period of time from July 1, 2009 through June 30, 2010, will be available for public review and comment by the afternoon of Tuesday, November 9, 2010. See links provided at the right under "**NPDES Annual Reports**." Comments recieved by 5 p.m. **Tuesday, November 23** will be summarized in the City's Year 7 report to DEQ. Comments recieved after November 23 will be taking into consideration for possible future modifications to the City's stormwater program. Send written comments to NPDES Permit, Eugene Public Works, 99 East Broadway, Suite 400, Eugene, OR 97401. Send e-mail comments to: therese.walch@ci.eugene.or.us.

2010 Permit Renewal

The City's permit is up for renewal for the second time, and DEQ is inviting public comments on Eugene's draft third-term MS4 permit and SWMP by **Friday, November 19, 2010**. A Public hearing is scheduled in Eugene for **Wednesday, November 17, 2010**. See the DEQ web site for more information including how to submit comments and details of the public hearing:

NPDES Stormwater Discharge Permits - Phase I Municipalities (MS4)

In 2008, in preparation for the permit renewal, the City evaluated its SWMP and Monitoring Plan to ensure that they continue to meet the objectives of the Clean Water Act and proposed some modifications. The City submitted the revised proposed SWMP, Monitoring Plan, and other permit renewal materials to DEQ on September 2, 2008, including a summary of public comments on the SWMP and how the comments were addressed. A fact sheet describing the evaluation and revised SWMP is provided at the right under "Permit Renewal". In February 2009 the DEQ administratively extended the city's permit pending the state agency's action on the City's 2008 permit renewal submittal. It is anticipated that the City's next permit will be issued by December 2010.

Current Program

- Current Stormwater Management Plan
- Current Monitoring Plan

Permit Renewal

- SWMP Fact Sheet for Permit Renewal

NPDES Annual Reports

- Draft Year 7 Report
  - Year 7 Report
  - Appendix A
  - Appendix B
- Draft Year 6 NPDES Report
  - Draft YR6 Report 09
- Year 5 Final NPDES Report
  - Stormwater Annual Report-Year 5.pdf
  - Appendix A, Water Quality Data
  - Appendix B, Data Boxplots
  - Appendix C, Code Authority
- Year 4 Final NPDES Report
  - Stormwater Annual Report - Year 4
  - Appendix A, Water Quality Data
  - Appendix B, Data Boxplots
  - Appendix C, Code Authority
- Year 3 Final NPDES Report
  - Stormwater Annual Report - Year 3
  - Appendix A, Water Quality Data
  - Appendix B, Data Boxplots
  - Appendix C, Code Authority
  - Appendix D, SW Development Standards Ordinance
  - Appendix E, SW Management Manual
  - Appendix F, NPDES Permit
- Year 2 Final NPDES Report
  - Year 2 NPDES Final Report *Includes Part I & II and all appendices (9 MB)*
  - Part 1 - Status Report *Part 1 only (1.9 MB)*
  - Part 2 - Evaulation Report *Part 2 only (1 MB)*

Water Quality Data and Related Documents

- Water Quality Data
  - 2008 Ambient Monitoring Data *Download zip file (1 MB)*
  - 2008 Ambient Monitoring Data *Download xls file (5 MB)*
  - Ambient Monitoring Data Information

javascript:r('C,689,1737');

Internet 100%

WALCH Therese

From: WALCH Therese
Sent: Tuesday, November 30, 2010 9:38 AM
To: 'Doug Quirke'
Subject: RE: comments re Draft Year 7 Annual Report

Mr. Quirk,

Thank you for your comments on the City's Public Review Draft Year 7 Annual Stormwater Report, November 2010. Your comments and the City's responses have been included in the Year 7 Annual Report, which will be submitted to Oregon DEQ on December 1st and posted on the City's NPDES web site within one week: www.eugene-or.gov , go to Quick Links and select "Stormwater," and under Permits & Regulations select "National Pollutant Discharge Elimination System."

Responses to your comments are below, in italics. Please do not hesitate to contact me if you have any further comments or questions.

Sincerely,

Therese Walch

Therese Walch, P.E.
City of Eugene Public Works
99 E. Broadway, Suite 400
Eugene, OR 97401

Voice: (541) 682-5549
Fax: (541) 682-5032

From: Doug Quirke [mailto:doug@ocwap.org]
Sent: Tuesday, November 23, 2010 4:54 PM
To: WALCH Therese
Subject: comments re Draft Year 7 Annual Report

Page numbers below correspond to PDF page numbers.

Page 7: "will incorporate the City's updated SWMP be reference" -- "be" should be "by" *Agree, edit made.*

Page 11: "Unlawful discharge detention and elimination" -- should "detention" be "detection?" *Agree, edit made.*

Page 17: Some of Table 3-2 is rather cryptic, e.g., what's the difference between engineering expenditures in funds 335 and 531; why is there no grand total of the 3 funds? *Text has been added to Section 3.3 to clarify the differences between the funds: Fund 335 = Stormwater Systems Development Charges (source = SDCs); Fund 531 = Stormwater Capital (source = stormwater user fees); Fund 535 = Stormwater Operating (source = stormwater user fees). Grand totals for actual expenditures for the Year 7 reporting period, and budget amounts for the Year 8 reporting period have been added to Table 3-2.*

Page 22: "Topics covered in the two newsletter" -- "newsletter" should be plural *Agree, edit made.*

Page 33: BMP Actvity: Update Stormwater Basin Master Plan set at least once every five years-- When was the last time these were updated? I recently discovered a discrepancy between one of the basin plan maps and what the city GIS system showed re what channel stormwater flows to in the Roosevelt Boulevard/Waite Street area. *As part of the City's recent second-term National Pollutant Discharge Elimination System (NPDES) Phase I Municipal Separate Storm Sewer System (MS4) permit renewal efforts, the City's current (2008) Stormwater Management Plan (SWMP) was evaluated and several modifications were proposed. The proposed SWMP modifications, reflected in September 2008 and August 2010 submittals to Oregon Department of Environmental Quality (DEQ), include updates to BMP E1, to which this question refers. BMP E1 (currently titled Stormwater Basin Master Plans) will become BMP E1 - Stormwater Capital Improvement Projects, and the description will be modified to reflect the City's efforts to prioritize implementing the Basin Plan's capital improvement projects. The information reflected in the Basin Plans (e.g. basin physical characteristics, stormwater problems and opportunities) is not expected to change significantly within a five-to-ten year timeframe, and limited resources would be most effectively applied to implementing projects, including retrofit projects, that address the identified problems and opportunities.*

A list of errata for the Basin Plans is maintained by Public Works Engineering. Any corrections to information in the Basin Plans should be reported to the Water Resources Manager, Public Works Engineering (currently therese.walch@ci.eugene.or.us), and will be added to the list of errata. The City is working on improving the accessibility of Basin Plans errata via its web site. Check back soon to access this information and for contact information to add to the errata: www.eugene-or.gov , go to Quick Links and select "Stormwater," and under Stormwater Planning select "Basin Master Plans."

Public comments were solicited in July 2008 on the proposed changes to the City's SWMP via a public notice, newspaper display ad, web updates, and a fact sheet entitled "Stormwater Management Plan." The fact sheet is attached, for additional background information. DEQ is expected to issue the City's third-term MS4 permit by the end of the year (2010) at which time the updated SWMP would take effect.

Page 38: "identified one private sewer line with damaged" -- should "damaged" be "damage," or is there a word that's supposed to follow "damaged?" *Text edited to clarify, modified to read: "Reviewed wastewater records in Tiara neighborhood and identified one private sewer line for further investigation…."*

Page 38: "This line was TV" -- should "TV" be "TVed?" *Agree, edit made.*

Page 38, footnote: The second sentence seems to be either missing a word or words or to include an extra word or words. *Formatting problem has been corrected so that the entire footnote is visible.*

Pages 43 & 81 "data base" should be "database" *Agree, edit made.*

Page 44: "The applicant is then give" -- "give" should be "given" *Agree, edit made.*

Page 44: If 57 applications were received, how were 60 approved--were some from a prior year? *Yes, some applications could be approved that were submitted in the prior reporting year or, conversely, some applications could have been received but not yet approved within the reporting period. In order to clarify the information, the first two tables in the Accomplishments section for BMP E2 in the public review draft document have been combined into one table for the final document, and focus on the number of land use applications approved. The City is ultimately interested in tracking how many applications are approved, how the stormwater management requirements were addressed (e.g. type of facility utilized – green infrastructure facilities vs. mechanical treatment facilities), and other related information to ensure continued functionality and effectiveness of these post-construction stormwater management facilities.*

National Pollutant Discharge Elimination System

Stormwater Management Plan

July 2008

Submit Public Comment on Eugene's NPDES Permit

Send written comments to:

NPDES Permit
Eugene Public Works
410 River Ave.
Eugene, OR 97404

Send e-mail to:

Therese Walch
Water Resources Manager
therese.walch@ci.eugene.or.us

All comments must be received by the City of Eugene by 5 p.m Wednesday, August 27.

All persons who submit written comments will be identified as interested parties and will be notified of the City's response to their comments if they provide a current mailing address or a valid email address.

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Summary Of Eugene's Stormwater Best Management Practices ..... *Pages 3-4*

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Background

The City of Eugene holds a federal National Pollutant Discharge Elimination System (NPDES) permit for the municipal stormwater it discharges directly into the Willamette River and indirectly into the Willamette River through other local waterways, including Amazon Creek. The permit includes stormwater monitoring and reporting requirements, as well as a set of best management practices that define the City's Stormwater Management Plan (SWMP). The NPDES stormwater regulations do not prescribe specific limits; rather, they require permittees to implement best management practices (BMPs) to improve water quality to the "maximum extent practicable" based on local conditions, resources and priorities. The Oregon Department of Environmental Quality (DEQ) administers federal NPDES permits for municipalities and other local agencies in Oregon.

In preparation for an upcoming permit renewal the City has evaluated its SWMP to ensure that it continues to meet the objectives of the Clean Water Act and is proposing several modifications. The public is encouraged to learn more about Eugene's NPDES permit and to provide comments. Directions for obtaining additional information and providing comments are provided in this fact sheet.

Get more information about Eugene's Stormwater Permit/Program

- General and specific information about Eugene's NPDES permit and the City's stormwater program are available on the internet at **www.eugene-or.gov/pw** (click on the link to "Stormwater NPDES Permit")
- For specific information about Eugene's NPDES permit, call Therese Walch, Water Resources Manager, at 541-682-8647.
- For general information about Eugene's stormwater program, call Kathy Eva, Stormwater Information Specialist, at 541-682-2739.

History of Actions Related to Eugene's Stormwater Permit

Clean Water Act

The Clean Water Act of 1972 established the federal NPDES permitting program. The original purpose of the NPDES program was to control and eliminate pollutants from single identifiable sources, sometimes called point sources. The Clean Water Act was reauthorized by Congress in 1987. The reauthorized law was expanded to include non-point source pollution: overland runoff containing pollutants which do not originate from one specific location. The expanded law required municipalities over 100,000 in population to obtain NPDES permits for their stormwater discharges.

CSWMP and Eugene's First Permit Term

In response to the 1987 reauthorization of the Clean Water Act, the City Council adopted a Comprehensive Stormwater Management Plan (CSWMP) in 1993. Key elements of this policy document include:

- A multiple-objective approach to stormwater management that addresses drainage, water quality, and stormwater-related natural resources.
- A set of policies, goals and implementation actions to guide the City's stormwater program.
- Two types of implementation actions – best management practices (BMPs) to specifically comply with NDPES permit requirements, and "other actions" consistent with community expectations for stormwater management. Eugene's first NPDES permit was issued by the DEQ in 1994.

Eugene's Second Permit Term (current)

In March 2004, the DEQ issued a new NPDES permit to Eugene. In response to the new permit, in 2005 the City revised its SWMP in several significant ways including: to prioritize the adoption of stormwater development standards; to establish a consistent policy on the public use of herbicides and fertilizers, and to increase efforts to address specific pollutants of concern for Eugene's waterways, especially 303(d)-listed water bodies (see glossary). The revised SWMP anticipated that pollutant allocations would be established for certain watersheds within Eugene as Total Maximum Daily Load (TMDL) requirements.

Preparing for Permit Renewal

Eugene's current NPDES permit is scheduled to expire on February 28, 2009; a renewal application will be submitted to DEQ on September 2, 2008. In response to specific permit renewal requirements and routine adaptive management, the City has evaluated its SWMP, and is proposing several additional revisions, described generally below.

Results of the NPDES permit-related evaluation

City of Eugene staff conducted a review of Eugene's existing Stormwater Management Plan (SWMP), including existing best management practices (BMPs). In evaluating the plan, staff considered a variety of factors, including: specific federal statutes governing SWMP components; overall program effectiveness; how the program addresses specific stormwater pollutants of concern; local applicability of BMPs; and program resources. The results of this evaluation will be the basis for the permit renewal application to DEQ and the proposed revised SWMP.

One outcome of the evaluation was the validation of existing program activities considered essential to meeting permit conditions: These include:

- Stormwater system operations and maintenance (O&M)
- Stormwater education
- Erosion prevention
- Stormwater development standards
- Illicit discharge detection and spill response
- System retrofit projects for water quality
- Industrial stormwater program.

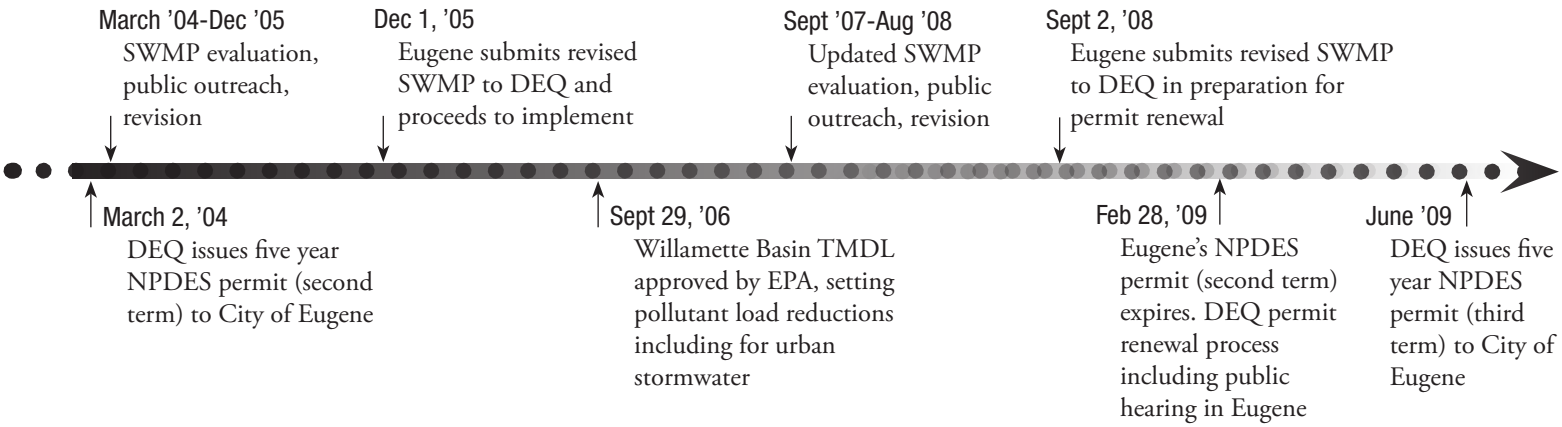
Proposed changes to the SWMP include:

- Two new BMPs to reflect the City's commitment to ensuring that new privately maintained stormwater facilities continue to function properly over the long-term.
- Modifications to reflect the transition from long-term planning to implementing capital projects, including retrofits to the existing stormwater system to address water quality.
- Modifications to reflect on-going efforts to identify barriers to implementing low impact development.
- Modifications to the Bacteria Pilot Study initiated in 2006, based upon initial monitoring to determine potential sources of bacteria in Eugene's waterways.
- Modifications to combine two education-related BMPs into one overall stormwater education BMP.
- Modifications to incorporate the periodic review and revision of O&M manuals into the O&M BMPs as adaptive management.
- One new BMP to reflect permit management activities including program review, renewal applications, and reporting.

The proposed 2009 SWMP is a set of 24 BMPs that meets the permit renewal requirements of the current NPDES permit and reduces the discharge of pollutants to the maximum extent practicable.

For more specific information on the proposed SWMP modifications, and to review the draft SMWP, see "Get More Information" on page 1 of this fact sheet.

TIMELINE *program implementation and adaptive management*



SUMMARY OF EUGENE'S STORMWATER BEST MANAGEMENT PRACTICES

Eugene's SWMP is comprised of 24 best management practices (BMPs) which fall into the eight general categories listed below. For each category, the general purpose of the category is provided, followed by a brief description of each BMP within the category. Detailed information on each BMP can be found on the on the internet at **www.eugene-or.gov/pw** (click on the link to "Stormwater NPDES Permit").

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.

A1 – Stormwater Education
P1 – Educational Volunteer Program

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.

M3 – Street Sweeping and Leaf Pick-up
M4 – Prevent Leaks and Spills from Municipal Vehicles and Equipment
M5 – Public Stormwater System Maintenance–Piped System

M8 – Winter Road Sanding and De-Icing Program
P3 – Tree Planting and Information Programs
P4 – Public Landscape and Vegetation Management Program
P5 – Public Stormwater System Maintenance–Open Waterways

ILLICIT DISCHARGE CONTROLS

The purpose of illicit discharge 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.

M1 – Enforcement of Illicit Discharges to the Stormwater System
M2 – Spill Response
M7 – Systematic Field Investigation of System Condition and Improper Discharges
P7 – Litter and Illegal Dumping Control

Eugene's SWMP includes 24 best management practices (BMPs) designed to collectively reduce the discharge of stormwater pollutants to the maximum extent practicable. Each BMP is given an ID (for example, A1) for tracking and reporting purposes; the coding is based on the City work section with 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

Waste Management

The purpose of the waste management BMPs is to educate the public, regulate waste management services, and 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.

B1 – Household Hazardous Waste Program

B2 – Solid Waste Management

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 redevelopment projects.

E2 – Erosion Prevention and Construction Site Management Program

E4 – Stormwater Development Standards

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

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

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.

E1 – Stormwater Capital Improvement Projects

E3 – Storm System Mapping and Data Management

P2 – Bacteria Pilot Study

Industrial Controls

The purpose of the industrial control BMP is to provide oversight of stormwater discharges from industrial facilities, including screening, inspections, technical assistance, and response to spills at permitted facilities.

W2 – Industrial Stormwater Management Program

Permit Management

The purpose of permit management is to ensure effective permit management, coordination, and reporting.

W1 – Permit Management and Reporting*

** New BMPs proposed for 2008 SWMP*

Glossary

303(d) listed water body – A water body that DEQ has determined does not meet state water quality standards for specific pollutants.

BMP – Best management practice, a practice or combination of practices that prevents or reduces storm water runoff and/or associated pollutants

CSWMP – Comprehensive Stormwater Management Plan, Eugene's adopted policy document which provides the framework for the integration of flood control and drainage services, water quality protection, and the protection of stormwater-related natural resources.

DEQ – Oregon Department of Environmental Quality, which is responsible for administering the NPDES program for cities, counties and other governmental entities in Oregon.

EPA – U.S. Environmental Protection Agency, which is responsible for administering the NPDES program for the federal government.

MS4 – Municipal separate storm sewer system, a system of conveyances including roads with drainage systems, catch basins, gutters, ditches, manmade channels, storm drains or other facilities used to collect and convey stormwater.

Phase I permittee – Agencies with populations over 100,000 required to obtain stormwater NPDES permits in the mid-1990s.

Phase II permittee – Smaller jurisdictions now required to obtain NPDES permits. In this area, phase II permittees include the City of Springfield and Lane County.

SWMP – Stormwater Management Plan, a set of best management practices that reflects Eugene's commitment under its NPDES permit to reduce pollutants to the maximum extent practicable.

TMDL – Total maximum daily load, the wasteload allocation for a specific pollutant, typically expressed as parts per volume.

APPENDIX E

SUSTAINABILITY COMMISSION
FY11 WORKPLAN

ATTACHMENT A

City of Eugene Sustainability Commission

FY '11 Work Plan

BACKGROUND

The Sustainability Commission was established in 2008 as a policy advisory body to the City Council and City Manager in the development or initiation of programs or actions that will enhance and create sustainable practices within the City and the community. The commission shall advise on policy matters related to:

a) sustainable practices
b) businesses that produce sustainable products and services
c) City building design and infrastructure
d) related issues that directly affect sustainability efforts considered by the council

The mission of the Sustainability Commission is:

> *The Sustainability Commission works to create a healthy community now and in the future by proposing measurable solutions to pressing environmental, social and economic concerns to the City of Eugene, its partners and its people.*

PROPOSED WORK PROGRAM

The City of Eugene Sustainability Commission proposes to complete a number of specific tasks under each of the following broad themes in Fiscal Year 2011: (1) Land Use and Transportation, (2) Outreach and Education and (3) Ongoing Initiatives - Monitoring and Support. This section is organized by theme, with specific tasks described under each.

THEME I – LAND USE AND TRANSPORTATION

The twin challenges of global climate change and long-term energy security come together in land use and transportation. Over the past year, the Sustainability Commission researched these issues and developed a set of broad recommendations for Council to consider when making decisions related to Land Use and/or Transportation (Outcome 2 – FY 10 Work Plan). With a number of key land use and transportation policy efforts underway or expected in the coming year, the Sustainability Commission will focus on reviewing and assessing the policy and investment recommendations coming before Council and will provide guidance and advice in an effort to ensure that sustainability issues are being considered and prioritized by Council.

Most of the following tasks will, we anticipate and hope, involve the Coordinated Land Use and Transportation Action Committee (CLUTAC), a joint committee of the Planning Commission and the Sustainability Commission.

Task 1.1: Envision Eugene

The City of Eugene is actively engaged in a process to determine how the city will accommodate commercial, residential, industrial and associated growth over the next 20 years. Over the past year, the Sustainability Commission has maintained commission member participation on the Eugene Comprehensive Lands Assessment. The Sustainability Commission will remain actively engaged in the Envision Eugene process with the following:

- Delegate members of the Sustainability Commission to serve on a joint land use and transportation subcommittee with members of the Planning Commission.
- Receive periodic reports from the joint SC/PC subcommittee regarding Envision Eugene.
- Receive regular updates from staff regarding the Envision Eugene process.
- Maintain individual commissioner involvement in Envision Eugene committee work.
- Review and comment on final Envision Eugene policy recommendations to council.

Product and timeline to be determined.

Task 1.2: EmX

Implementation of Lane Transit District's (LTD) Bus Rapid Transit (BRT) system, EmX, is fundamental to the City's long-term growth management strategy. With discussions and policy decisions related to corridor prioritization, route selection and land use policy expected in the coming year, in FY11 the Sustainability Commission will advise and engage the process generally and the council specifically in the following ways:

- Delegate members of the Sustainability Commission to serve on a joint land use and transportation subcommittee with members of the Planning Commission.
- Receive periodic reports from the joint SC/PC subcommittee regarding EmX.
- Maintain commission member participation in an LTD EmX steering committee.
- Review and comment on final EmX corridor prioritization, route selection and related land use policy recommendations to council.

Product(s):	Steering Committee Meeting #1 Draft Community Base Map
Timeline:	Summer 2010

Task 1.3: TransPlan

In the coming year, the City of Eugene will begin review and update of TransPlan, the metro area comprehensive transportation system plan. The commission will engage in the TransPlan process and:

- Ensure suitable representation of alternative modes (pedestrian, bicycles, transit) in the process.
- Receive periodic reports from the joint SC/PC subcommittee regarding TransPlan.
- Receive regular updates from staff regarding the TransPlan update process.
- Establish individual commissioner involvement in TransPlan committee work.
- Review and comment on final TransPlan policy recommendations to council.

Product and timeline TBD.

Task 1.4: Car-sharing

In December 2009, council requested a report from the Sustainability Commission on the opportunities and challenges associated with implementing a car-sharing program in Eugene. In particular, council seeks to understand the opportunities to address parking scarcity in certain neighborhoods. The commission has convened a subcommittee to study the issue. In FY 11, the Sustainability Commission will prepare a memo with findings and recommendations for council consideration.

Task 1.5: Electric Vehicles

The Sustainability Commission has received regular reports from EWEB and other groups on local efforts related to Electric Vehicle infrastructure, manufacturing and commercialization. In addition, individual members of the Sustainability Commission have been actively engaged in local and statewide electric vehicle initiatives. The commission will continue to participate actively on these issues and inform council whenever relevant.

THEME II – OUTREACH AND EDUCATION

In line with its charge, the Sustainability Commission will pursue increased outreach and education activities, to include:

Task 2.1: Refine Core Messages for Use in Outreach and Education

The commission will develop and refine a series of messages about City activities and initiatives, key sustainability and climate issues, and on-going community processes for communication in community forums, in other formal speaking engagements, and with community liaisons. The existing draft communications plan will inform this process. The commission will also seek to strengthen its web presence.

Task 2.2: Maintain Community Liaisons

The commission will track and provide guidance on the Joint Elected Officials (JEO) report implementation / economic development strategy . We will also monitor/collaborate with (and use as a partner/venue) the Chamber, GreenLane, JEO and Metro Partnership.

There may be additional community liaison opportunities, including but not limited to: partnering with the County on community solar; working with EWEB and others to foster a culture of energy efficiency; and working with the Neighborhood Leaders Council Committee on Sustainability (NLCCS), City leadership and internal City structures or teams that coordinate sustainability efforts.

Task 2.3: Community Forums

Working with community partners (e.g. City Club, Chamber, City Council, NLCCS), the Sustainability Commission will aim to develop and deliver two community forums/town hall style meetings. The meetings will be open to the public and will bring together people representing a variety of interests. The intent of the meetings will be to (1) share information related to the Sustainability Commission's work plan and mission, (2) provide a forum for input on community sustainability issues, and (3) solicit input on sustainability goals and priorities.

THEME III – ONGOING INITIATIVES - MONITORING AND SUPPORT

Tasks under Theme III monitor and follow up on activities begun in FY10.

Task 3.1: Community Climate and Energy Action Plan

In FY11, the Sustainability Commission will:

- Continue to assist in the implementation of the Community Climate and Energy Plan. The commission will receive periodic updates.
- Develop, in conjunction with City Staff, measures for tracking success in implementing internal climate and energy action plan.

Task 3.2: Food Security

In FY11, the Sustainability Commission will:

- Track and support staff efforts on food security.
- Review and comment on draft Food Security Plan if funded.

Task 3.3: Waste

In FY11, the Sustainability Commission will:

- Review and comment on draft internal Waste Reduction Action Plan to reduce City operations waste to landfill 90 percent by 2020.
- Develop, in conjunction with City Staff, measures for tracking success of Waste Reduction Plan.

Task 3.4: TBL Tool

In FY11, the Sustainability Commission will:

- Continue to advocate for use of the TBL tool by staff and council wherever relevant.
- Monitor the city's TBL implementation and integration process.
- Periodically review and comment on the TBL tool.
- Seek to make the TBL tool and framework increasingly transparent and available over time in order to strengthen both internal City decision making and community understanding of sustainability issues.

Task 3.5: Respond to time-sensitive and emerging issues and/or issues as requested by the City Council and/or City Manager

In FY11, the Sustainability Commission will:

- Investigate issues as appropriate.