Marion County

Stormwater Management Plan

August 26, 2011

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Marion County
OREGON

Stormwater Management Plan

Marion County Department of Public Works

Environmental Services Division

August 26, 2011

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Table of Contents

Executive Summary

The Marion County Stormwater Management Plan (SWMP) has been revised and updated in accordance with the National Pollutant Discharge Elimination System Permit # 102905, which is issued by the Oregon Department of Environmental Quality and is set to expire on February 28, 2012. The updated SWMP was a collaborative effort between Marion County Public Works, Marion County's Public Officials and citizen stakeholders. The content of the SWMP is organized into sections as described below.

Introduction

Marion County Department of Public Works (MCPW) must modify its 2004 Stormwater Management Plan (SWMP) to meet the requirements of the National Pollutant Discharge Elimination System (NPDES) Phase II permit. Under Phase II requirements the county must determine the appropriate BMPs and program elements needed to meet the six minimum control measures to the maximum extent practicable outlined by the permit. The six minimum control measures, or MCMs, are as follows: Public Education and Outreach, Public Participation and Involvement, Illicit Discharge Detection and Elimination, Construction Site Runoff Control, Post Construction Runoff Control, Pollution Prevention and Good Housekeeping.

MCPW 2011 SWMP Goals:

- Reduce the discharge of pollutants to the "maximum extent practicable" (MEP)
- Protect water quality
- Satisfy the appropriate water quality requirements of the Clean Water Act
- Promote regional coordination

Marion County SWMP Programs & Practices:

Public Education and Outreach (MCM 1)

Distributing educational materials and performing outreach to inform citizens about the impacts polluted storm water runoff discharges can have on water quality. The Public Education and Outreach MCM highlights Marion County's Waste Reduction Program, which is performing at a very high level comparatively statewide. Marion County is a member of the regional Mid-Willamette Outreach Group which focuses specific local issues. The focus of the program over the next 5-year permit cycle will be to identify specific issues and create outreach and educational opportunities. All programs within the MS4 permit program are, and will continue to be, updated on the Stormwater Website.

Public Participation/Involvement (MCM 2)

Providing opportunities for citizens to participate in program development and implementation, including effectively publicizing public hearings and/or encouraging citizen representatives on a storm water management panel. MCPW has several programs and practices designed to encourage public participation and promote direct involvement in the implementation of the stormwater management plan including the stormwater website, complaint hotline, watershed councils and community meetings, storm drain marking, stream clean-up, the free tree program, and volunteer coordination. The Marion Water Quality Advisory Committee provides citizens and stakeholder groups the opportunity to help steer the development and implementation of the SWMP and to provide updates to the water quality program and related ordinances.

Illicit Discharge Detection and Elimination (MCM 3)

The Illicit Discharge Detection and Elimination (MCM 3) will build upon the 1st 5-year permit cycle; with increased emphasis on the Stormwater Discharge Quality Control ordinance adopted in 2011. The program will focus

primarily on education and outreach assuming that providing the public and county staff with the most up to date information that illicit discharges will decrease. Outside of education and enforcement MCPW will develop an outfall inspection program which will focus on high priority outfalls and completing annual dry-weather monitoring. Also when a spill occurs a modified spill response plan will be developed to track that spill upstream to the potential sources and downstream to the receiving stream.

Construction Site Runoff Control (MCM 4)
In July of 2010 the Marion County Board of Commissioners approved the Construction Erosion and Sediment Control ordinance. The Construction Site Runoff Control program will be directly working within the structure of that ordinance. MCPW will be conducting plan review, inspection, and enforcement activities along with updating the program with informational and technical advances. The County will promote advancing the knowledge base of both community contractors and program staff.

Post Construction Runoff Control (MCM 5)
Modifying, implementing, and enforcing a program to address discharges of post-construction storm water runoff from new development and redevelopment areas. Building off a late 2011 Post-Construction runoff control ordinance, adoption the program will be under the developing stage at the start of the 2nd permit. Therefore modifications to the program are expected during the next 5-year permit cycle. These changes could include engineering design standards, minimum thresholds and acceptable Low Impact Development BMPs. The Post Construction program will use education and outreach as a promotional tool for Low Impact Development.

Pollution Prevention/Good Housekeeping (MCM 6)
The Pollution Prevention and Good Housekeeping minimum control measure capitalizes on the success of the Best Management Practices for Clean Water Program. The BMP program has been in place for about ten years and in 2009 the National Oceanic and Atmospheric Administration – Nation Marine Fisheries Services for inclusion in the limit 10(d) incidental take. The program relies heavily on internal education and providing technical expertise onsite when needed. A key upgrade to this program is aimed at reducing e-coli through increased street sweeping along the higher Average Daily Traffic roads in the MS4 area.

Acronyms & Abbreviations

- 1200-C (& CA) DEQ Erosion Control Permits for Land Disturbing Activities
- 303(d) list DEQ list of waterbodies not meeting water quality standards
- ACWA Association of Clean Water Agencies
- BMP's Best Management Practices
- BOC Marion County Board of Commissioners
- CWA Clean Water Act
- DEQ Department of Environmental Quality
- DMA Designated Management Agency
- EPA Environmental Protection Agency
- ESA Endangered Species Act
- ESSD East Salem Service District
- FTE Full Time Equivalent
- MCM Minimum Control Measures
- MCPW Marion County Public Works
- MEP Maximum Extent Practicable
- MOA Memo of Agreement
- MOU Memo of Understanding
- MS4s Municipal Separate Storm Sewer Systems
- NPDES Ph II National Pollutant Discharge Elimination System Phase II
- O & M Operation & Maintenance
- PCRC Post-construction runoff control
- SWCD Soil & Water Conservation District
- SWMP Stormwater Management Plan
- SWMA Stormwater Management Area
- TMDL's Total Maximum Daily Load
- UA's Urbanized Areas
- UGB Urban Growth Boundary

Stormwater Management Plan

Introduction

Background
Oregon 303(d) List of Impaired Waters

This document outlines the different components of Marion County's Stormwater Management Plan (SWMP). The plan is intended meet the requirements of the National Pollutant Discharge Elimination System (NPDES) Program as developed under the federal Clean Water Act. The Stormwater Management Area (SWMA) includes the urban fringe just outside the cities of Salem and Keizer. Following the regulatory requirements, this plan focuses on seven primary areas (six NPDES Minimum Control Measures and the Oregon TMDL benchmarks):

1) Public Education and Outreach
2) Public Participation and Involvement
3) Illicit Discharge Detection and Elimination
4) Construction Site Runoff Control
5) Post Construction Runoff Control
6) Pollution Prevention and Good Housekeeping
7) TMDL Benchmarks

The typical resident or business in the stormwater management area can expect to receive educational materials on how to reduce their impacts to water quality. These materials address a variety of topics such as erosion control, household hazardous waste disposal and proper application of fertilizers and pesticides. Educational materials include, but are not limited to, direct mailings, presentations and visits to local classrooms. With Public Works stormwater programs firmly in place, residents in the area have experienced an increase in maintenance activities including detention basin inspection, litter removal and street sweeping. Maintenance of stormwater drainage facilities is important for keeping contaminants out of our streams and rivers.

In the first NPDES MS4 Phase II permit cycle (2007-2012) Marion County Department of Public Works (MCPW) was charged with developing, implementing and evaluating a stormwater plan. To accomplish these tasks MCPW initially worked with a task force, later with an advisory committee, that represented environmental, agricultural, residential, and building/development interests. The advisory committee worked closely with MCPW staff to develop specific programs to meet the six minimum control measures and the program's supplemental text. Opportunity was also provided for public input at the beginning of each advisory committee meeting.

Currently, the SWMP consists of two permitting programs, the Construction Erosion and Sediment Control Program and the Post Construction Runoff Control Program. The Post Construction Runoff Control Program is currently being developed with standards and plan review nearing implementation. Illicit Discharges are prohibited with code enforcement officers enforcing the ordinance and dry weather monitoring occurring. The Marion County Best Management Practices for Clean Water were updated in 2009 and subsequently approved by the National Oceanic Atmospheric Association – Nation Marine Fisheries Services.

Funding for the programs will come from a mixture of existing funds permit fees, and additional fees. The programs will be applied in a way that is appropriate to the land use for a given area. For example, in agricultural areas the program will primarily rely on the local Agricultural Water Quality Plan. In rural residential areas, the program will focus on education, erosion control, and maintenance of drainage systems. In the urbanized areas, the program will include more components like erosion control, direct mailings, pollution detection, business education, and reduction of illegal dumping. This approach reflects the potential impact of different land uses on water quality and builds off of existing programs that support water quality goals.

Background

Physical Setting

The Stormwater Management Area (SWMA) for Marion County corresponds with the U.S. Census Bureau-designated "Urbanized Area" and is depicted on the SWMA map in Appendix A-1. These areas are developed from census data relating to population densities and census blocks. Within this "Urbanized Area" Marion County is responsible for an urbanized fringe around Keizer, Turner, and Salem. Though it is designated as an urbanized area, land uses within the area include agricultural, commercial, multifamily residential, single family residential, and rural residential. Since different land uses can have a significantly different impact on stormwater quality, the SWMP will contain components that address actual land uses *(See Appendix A-2: County Land Use Zoning in Stormwater Management Area).*

SWMA Vital Statistics

SWMA Area	Acres	Properties
Inside ESSD	3,407	9,344
Outside ESSD	5,182	2,068
Totals	*8,589*	*11,412*

(ESSD – East Salem Service District)

The SWMA includes portions of the following watersheds:

- Claggett Creek
- Little Pudding River
- Mill Creek (including Battle Creek)
- Croisan Creek

(See Appendix A-3: Watersheds in Stormwater Management Area)

Federal Regulations

Introduction to the Clean Water Act

The Clean Water Act (CWA) is the cornerstone of surface water quality protection in the United States (The Act does not deal directly with ground water or with water quantity issues). The statute employs a variety of regulatory and non-regulatory tools to sharply reduce direct pollutant discharges into waterways, finance municipal wastewater treatment facilities, and manage polluted runoff. These tools are employed to achieve the broader goal of restoring and maintaining the chemical, physical, and biological integrity of the nation's waters so that they can support "the protection and propagation of fish, shellfish, and wildlife and recreation in and on the water."

For many years following the passage of the CWA in 1972, EPA, states, and Indian tribes focused mainly on the chemical aspects of the "integrity" goal. During the last decade, however, more attention has been given to physical and biological integrity. Also, in the early decades of the Act's implementation, efforts focused on regulating discharges from traditional "point source" facilities, such as municipal sewage treatment plants and industrial facilities, with little attention paid to runoff from streets, construction sites, farms, and other "wet-weather" sources.

Starting in the late 1980s, efforts to address polluted runoff have increased significantly. For "nonpoint" runoff, voluntary programs, including cost-sharing with landowners, are the key tool. For "wet weather point sources" like urban storm sewer systems and construction sites, a regulatory approach is being employed.

Evolution of CWA programs over the last decade has also included something of a shift from a program-by-program, source-by-source, pollutant-by-pollutant approach to more holistic watershed-based strategies. Under the watershed approach equal emphasis is placed on protecting healthy waters and restoring impaired ones. A full array of issues are addressed, not just those subject to CWA regulatory authority. Involvement of stakeholder groups in the development and implementation of strategies for achieving and maintaining state water quality and other environmental goals is another hallmark of this approach (EPA, Website: http://www.epa.gov/owow/watershed/wacademy/acad2000/cwa/).

National Pollutant Discharge Elimination System Phase II

In 1990, EPA promulgated rules establishing Phase I of the National Pollutant Discharge Elimination System (NPDES) stormwater program. The Phase I program for MS4s requires operators of "medium" and "large" MS4s, that is, those that generally serve populations of 100,000 or greater, to implement a storm water management plan as a means to control polluted discharges from these MS4s. The Storm Water Phase II Rule extends coverage of the NPDES stormwater program to certain "small" MS4s but takes a slightly different approach to how the storm water management plan is developed and implemented.

- What Is a Phase II Small MS4?
  A small MS4 is any MS4 not already covered by the Phase I program as a medium or large MS4. The Phase II Rule automatically covers, on a nationwide basis, all small MS4s located in "urbanized areas" (UAs) as defined by the Bureau of the Census (unless waived by the NPDES permitting authority) and, on a case-by-case basis, those small MS4s located outside of UAs that the NPDES permitting authority designates.

- What Are the Phase II Small MS4 Program Requirements?
  Operators of regulated small MS4s are required to design their programs to:
  -Reduce the discharge of pollutants to the "maximum extent practicable" (MEP);
  -Protect water quality; and
  -Satisfy the appropriate water quality requirements of the Clean Water Act.

  Implementation of the MEP standard will typically require the development and implementation of BMPs and the achievement of measurable goals to satisfy each of the six minimum control measures.

  The Phase II Rule defines a small MS4 storm water management program as a program comprising six elements that, when implemented in concert, are expected to result in significant reductions of pollutants discharged into receiving waterbodies. The six MS4 program elements, termed "minimum control measures," are outlined below.

  Public Education and Outreach

  Distributing educational materials and performing outreach to inform citizens about the impacts polluted storm water runoff discharges can have on water quality.

  Public Participation/Involvement

Providing opportunities for citizens to participate in program development and implementation, including effectively publicizing public hearings and/or encouraging citizen representatives on a storm water management panel.

Illicit Discharge Detection and Elimination

Developing and implementing a plan to detect and eliminate illicit discharges to the storm sewer system (includes developing a system map and informing the community about hazards associated with illegal discharges and improper disposal of waste).

Construction Site Runoff Control

Developing, implementing, and enforcing an erosion and sediment control program for construction activities that disturb one (1) or more acres of land (controls could include silt fences and temporary storm water detention ponds).

Post-Construction Runoff Control

Developing, implementing, and enforcing a program to address discharges of post-construction storm water runoff from new development and redevelopment areas. Applicable controls could include preventative actions such as protecting sensitive areas (e.g., wetlands) or the use of structural BMPs such as grassed swales or porous pavement.

Pollution Prevention/Good Housekeeping

Developing and implementing a program with the goal of preventing or reducing pollutant runoff from municipal operations. The program must include municipal staff training on pollution prevention measures and techniques (e.g., regular street sweeping, reduction in the use of pesticides or street salt, or frequent catch-basin cleaning).

- What Information Must the NPDES Permit Application Include?
  The Phase II program for MS4s is designed to accommodate a general permit approach using a Notice of Intent (NOI) as the permit application. The operator of a regulated small MS4 must include in its permit application, or NOI, its chosen BMPs and measurable goals for each minimum control measure. To help permittees identify the most appropriate BMPs for their programs, EPA will issue a "menu," of BMPs to serve as guidance. NPDES permitting authorities can modify the EPA menu or develop their own list.

- What Are the Implementation Options?
  The rule identifies a number of implementation options for regulated small MS4 operators. These include sharing responsibility for program development with a nearby regulated small MS4, taking advantage of existing local or State programs, or participating in the implementation of an existing Phase I MS4's storm water program as a co-permittee. These options are intended to promote a regional approach to storm water management coordinated on a watershed basis.

- What Kind of Program Evaluation/Assessment Is Required?
  Permittees need to evaluate the effectiveness of their chosen BMPs to determine whether the BMPs are reducing the discharge of pollutants from their systems to the "maximum extent practicable" and to determine if the BMP mix is satisfying the water quality requirements of the Clean Water Act. Permittees are also required to assess their progress in achieving their program's measurable goals. While monitoring is not required under the rule, the NPDES permitting authority (DEQ in Oregon) has the discretion to require monitoring if deemed necessary. If there is an indication of a need for improved controls, permittees can revise their mix of BMPs to create a more effective program.

State Regulations

The US Environmental Protection Agency has delegated some responsibilities of the NPDES program to the Oregon Department of Environmental Quality (DEQ).

Oregon's Phase II Municipal Storm Water Program

Background

In December of 1999, the U.S. Environmental Protection Agency (EPA) adopted rules to implement "Phase II" of the storm water program mandated by the federal Clean Water Act. A major element of Phase II regulations addresses the development and issuance of NPDES permits for storm water discharges to surface water from "small" municipal separate storm sewer systems (MS4s). These permits would require some jurisdictions to implement measures to reduce the impacts of storm water pollution discharged through their storm sewer systems.

- Who's regulated under the Phase II program?
  The federal rules divide potential Phase II communities into four categories:
  - *Automatically designated* for permit because of their location within designated Urbanized Areas or "UAs" (defined by the 2000 U.S. Census Bureau). In Oregon, there are 25 cities and counties that fall within UAs, but aren't already covered by a Phase I permit. Some of these entities have the option of becoming a co-permittee with an adjacent Phase I community.
  - *Required evaluation to determine if permit needed* for communities that are outside of UAs, but with populations greater than 10,000. In Oregon, 18 cities fall within this category.
  - *Designated by DEQ* using its discretionary authority. If DEQ determines a community's storm water discharges violate water quality standards, DEQ can require a permit, even if its population is under 10,000 and it's located outside of an UA.
  - *Petitioned for inclusion in the program.* Any interested person can petition DEQ to evaluate MS4s that are not on the original list or not designated as a result of the initial evaluation process.

- What criteria will DEQ use to evaluate MS4 communities?
  Using EPA guidance, DEQ's criteria includes population characteristics, such as high population growth and high population densities. However, more weight would be given to local water quality considerations for potential contribution of polluted urban storm water discharges to not only water quality limited streams, but also sensitive waters including those with threatened and endangered species, designated-use (e.g., recreational) impairments, National Marine Sanctuaries, and drinking water sources.

- What will the permits require?
  The permit conditions will primarily focus on requirements related to the six "minimum control measures":
  1. Pollution Prevention in Municipal Operations
  2. Public Education and Outreach
  3. Public Involvement/Participation
  4. Illicit Discharge Detection and Elimination
  5. Construction Site Runoff Control
  6. Post-Construction Runoff Control

Currently, the proposed draft permit does not contain a requirement to conduct storm water effluent or stream monitoring. However, these MS4 discharging to water quality limited streams or to streams for which Total Maximum Daily Loads (TMDLs) have been established may see a monitoring requirement (ODEQ Fact Sheet, "Oregon's Phase II Municipal Storm Water Program", 2002).

Oregon 303(d) List of Impaired Waters

The Clean Water Act and the "303(d)" List

The Oregon Department of Environmental Quality (DEQ) has the responsibility for developing water quality standards that protect *beneficial uses* of rivers, streams, lakes and estuaries. Beneficial uses include drinking water, cold water fisheries, industrial water supply, recreation and agricultural uses. Once standards are established, the state monitors surface water quality and reviews available data and information to determine if these standards are being met and water is protected.

Section 303(d) of the federal Clean Water Act requires each state to develop a list of water bodies that do not meet standards, and to submit this list to the U.S. Environmental Protection Agency (EPA) every two years. The "303(d) list" provides a way for Oregonians to identify and prioritize water quality problems. The list also serves as a guide for developing and implementing watershed pollution reduction plans to achieve water quality standards and protect beneficial uses.

303(d) Streams in the Marion County Stormwater Management Area

Waterbody	River mile	Contaminant	Season	Year Listed
Battle Creek	0 to 9.1	Dissolved Oxygen	Year Around	2004
Battle Creek	0 to 9.1	E Coli	Year Around	2004
Claggett Creek	0 to 5.2	Biological Criteria	Year Around	2010
Claggett Creek	0 to 5.2	Dissolved Oxygen	Year Around	2004
Claggett Creek	0 to 5.2	E Coli	Year Around	2004
Croison Creek	0 to 6.5	Biological Criteria	Year Around	2010
Croison Creek	0 to 6.5	Dissolved Oxygen	Year Around	2004
Croison Creek	0 to 6.5	E Coli	Year Around	2004
Mill Creek	0 to 25.7	E Coli	Year Around	2004
Mill Creek	0 to 25.7	Fecal Coliform	Year Around	1998
Mill Creek	0 to 25.7	Temperature	Year Around	2004
Pringle Creek	0 to 6.2	E Coli	Year Around	1998
Pringle Creek	0 to 6.2	Dieldrin	Year Around	1998
Pringle Creek	0 to 6.2	Dissolved Oxygen	Year Around	2004
Pringle Creek	0 to 6.2	Temperature	Summer	1998
Pringle Creek	0 to 6.2	Copper	Year Around	2002
Pringle Creek	0 to 6.2	Lead	Year Around	2002
Pringle Creek	0 to 6.2	Zinc	Year Around	2002
Willamette River	54.8 to 108	Biological Criteria	Year Around	2004
Willamette River	54.8 to 108	Chlorophyll a	Summer	2004
Willamette River	54.8 to 72	DDT	Year Around	2002
Willamette River	54.8 to 72	Dieldrin	Year Around	2002
Willamette River	54.8 to 72	Dioxin	Year Around	1998
Willamette River	54.8 to 108	Dissolved Oxygen	Winter	2004
Willamette River	54.8 to 108	Iron	Year Around	2004
Willamette River	54.8 to 108	Mercury	Year Around	1998
Willamette River	54.8 to 72	PCBs	Year Around	2002

Note: Includes only Willamette River listings near Salem/Keizer. See Map "303(d) Streams in Stormwater Management Area". Although the Little Pudding River is not yet a listed stream, the Pudding River is listed and it does receive discharge from the MS4 via the Little Pudding.

Potential Health Effects of Contaminants

The environmental and human health effects of certain contaminants varies depends on a number of factors such as concentration of contaminant, length of exposure, organism's immune system, timing of exposure with organism's lifecycle, and repetition of exposures. Following is some general information about water quality standards and the potential effect of contaminants on human and environmental health. See Appendix B. for more discussion on the potential effects of these contaminants.

Beneficial Uses of the State's Waters

Water quality standards are established to protect beneficial uses of the State's waters. Beneficial uses are assigned by basin in the Oregon Administrative Rules for water quality *(ODEQ, Website 2004*).

Beneficial Uses of State Waters

domestic water supply	resident fish & aquatic life
industrial water supply	wildlife & hunting
irrigation	fishing
livestock watering	boating
anadromous fish passage	water contact recreation
salmonid fish passage	aesthetic quality
salmonid fish rearing	hydropower
salmonid fish spawning	commercial navigation & transportation

When a water quality standard is established, the first step is to identify the beneficial uses sensitive to the parameter. Criteria are then established based on the levels needed to protect the sensitive uses. For example, the uses typically most sensitive to dissolved oxygen are fish and aquatic life. Fish and other aquatic organisms need an adequate supply of oxygen in the water to be healthy and productive. In this case, the criteria identify minimal amounts of dissolved oxygen that need to be in the water to protect the fish. In other cases, as with many of the toxic pollutants, the criteria may identify the maximum amount that may be in the water without risk to the aquatic biota or to human health. For other parameters, such as bacteria or some toxic compounds, human health is the most sensitive beneficial use.

Water quality exceedences in the Stormwater Management Area (2002)	**Potential environmental and health concerns from contaminants.** *(See Appendix B. for more information. The Marion County Health Department and Oregon Department of Environmental Quality can also be consulted regarding specific concerns.)*
Biological Criteria	Indicates that certain biological elements are missing from the aquatic ecosystem of the listed water body.
Copper	At elevated levels, this metal is toxic to aquatic organisms.
Dieldrin	A banned pesticide that persists in the environment; can cause health problems.
Dissolved Oxygen	The measure of oxygen in water. Too little can suffocate aquatic life.
E Coli	Can be harmful to humans, indicates other pathogens may be present.
Fecal Coliform	Can be harmful to humans, indicates other pathogens may be present.
Iron	Excessive iron can reduce dissolved oxygen available to aquatic organisms.
Lead	Can be harmful to humans.
Mercury	Mercury (methyl-) can accumulate in fish, resulting in consumption advisories as exist for the Willamette River.
Temperature	One of the biggest water quality problems in Oregon. Reduces the ability of cold-water species to survive pathogens and inhibits normal life functions. Higher stream temperatures also lower dissolved oxygen levels.
Zinc	At elevated levels, this metal is toxic to aquatic organisms.

The Marion County SWMP does not directly address wetland regulations. Regulatory responsibility for wetlands lies with the Oregon Division of State Lands and the U.S. Army Corps of Engineers. However, the important role of wetlands in the detention and cleaning of stormwater will be included in educational materials where appropriate.

Stormwater Management Plan

Overview

Goals
Implementation Timeline
Administration & Evaluation
Costs & Financing
Implications for Stormwater Users
Public Participation Process

Goals

The Marion County SWMP consists of numerous programs designed to meet the following goals:

- **Reduce the discharge of pollutants to the "maximum extent practicable" (MEP);**
  MEP is a Clean Water Act standard that establishes the level of pollutant reductions that MS4 operators must achieve through implementation of a storm water management program. The strategies used to reduce pollutants to the MEP may be different for each small MS4 because of unique local hydrologic, geologic, and water quality concerns in different areas. EPA envisions that permittees will determine what the MEP is on a location-by-location basis and consider such factors as conditions of receiving waters, specific local concerns, and other aspects of a comprehensive watershed plan.
  (US EPA, Website: http://cfpub2.epa.gov/npdes/stormwater/measurablegoals/part1.cfm, 2004)

- **Protect water quality**
  Protection of water quality includes efforts to improve water quality in polluted water bodies listed by the state and also to protect those waterbodies that currently meet state standards.

- **Satisfy the appropriate water quality requirements of the Clean Water Act**
  Marion County is complying with the Clean Water Act through the development of an NPDES permit and through response to TMDL requirements as they are established (*see Background: Federal and State Regulations).*

- **Promote regional coordination**
  Wherever practical, Marion County will work to integrate the SWMP with existing water quality enhancement activities. This includes coordination with the cities of Keizer, Salem, and Turner, the Marion Soil and Water Conservation District, and local watershed councils. This integration also includes close coordination with existing county programs, such as the Environmental Services education program for solid waste and land use planning activities. Approaching water quality issues through a coordinated effort will increase the effectiveness of the Marion County SWMP and also lower the costs of program implementation.

Related programs underway at Marion County Department of Public Works include:

Best Management Practices for Salmon Recovery (ESA program)

Stormwater detention study (Study of regional detention needs in east Salem)

Title III funding for water quality education projects (Land Use Planning project)

Goal 5 planning (Land Use Planning project)

Implementation Timeline

Specific elements of the SWMP will be implemented over the course of the next permit cycle. A summarized timeline of the major program elements is located on the following page. See Minimum Control Measures 1-6 for additional detail on the implementation schedule.

Implementation Timeline

Program Component	Implementation Schedule
1. Public Education & Outreach	Permit Years 1-5; continuous
2. Public Participation and Involvement	Permit Years 1-5; continuous
3. Illicit Discharge Detection and Elimination	Permit Year 1
4. Construction Site Runoff Control	Permit Year 1
5. Post-Construction Runoff Control	Permit Year 1
6. Pollution Prevention - Good Housekeeping.	Permit Years 1-5; continuous

Note: Most education programs were implemented during the 1st permit cycle. These programs will be updated and maintained during the 2nd permit cycle with new programs being implemented during Permit Year 1.

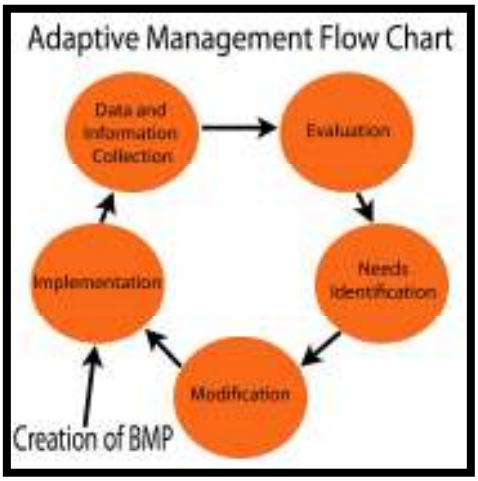
Administration & Evaluation

Marion County Department of Public Works is responsible for the development, implementation, and monitoring of this Stormwater Management Plan. The Public Works Department consists of 194 full-time and 16 part-time employees. It includes operations, engineering, dog control, building inspections, land use planning, environmental services (solid waste and parks), and administration. Staff involved in the implementation of various elements of the program will include: environmental specialists, field operations staff, planners, and engineers. The director of Public Works and the County Board of Commissioners will provide program oversight. MCPW will work closely with surrounding municipalities, watershed councils, the Marion Soil and Water Conservation District, and other stakeholder groups to provide complete program delivery. Through close collaboration with internal divisions and these stakeholder groups, MCPW will be able to meet the requirements of NPDES Phase II.

Evaluation & Adaptive Management

Permittees need to evaluate the effectiveness of their chosen BMPs to determine whether the BMPs are reducing the discharge of pollutants from their systems to the "maximum extent practicable" and to determine if the BMP mix is satisfying the water quality requirements of the Clean Water Act. Permittees are also required to assess their progress in achieving their program's measurable goals. While monitoring is not required under the rule, the NPDES permitting authority has the discretion to require monitoring if deemed necessary. If there is an indication of a need for improved controls, permittees can revise their mix of BMPs to create a more effective program.

The SWMP outlines measurable goals for each of the best management practices. These measurable goals do not require collection of water quality data, but instead focus on measuring the successful implementation of the BMPs. Marion County will collect data on program implementation during the course of the year and evaluate the program annually. The program will also track new TMDL listings and 303(d) listings. When new information of this type is available for local watersheds, the County will adjust its program to address the new listings. Additionally, Marion County will use the 5 adaptive management phases outlined by the DEQ in the May 13, 2011 renewal letter.



**Phases of Adaptive Management*

Costs & Financing

Costs of Program – Once Marion County's response to the six minimum control measures were prepared, estimates of staff time and expenses in executing the program were generated. These estimates were shared with management and staff responsible for executing the program, as well as the advisory committee and the public through public meetings and the county's website. The NPDES Phase II program components are listed essentially in a sequential order similar to how an agency would carry out implementation. Logically, the staffing and expenses follow this sequencing as the county carries out implementation over the five-year permit duration. Early public education, participation and outreach and staff training are replaced by full implementation activities of the newly established programs. The early development efforts were balanced with later implementation in a way that leveled staffing and program costs.

Allocation of Costs – After determining staffing needs and program expenses for the six minimum control measures, the total costs were distributed to seven potential funding sources; permit fees, East Salem Service District (ESSD), fees, Road Funds, Solid Waste Funds, Land Use Planning Division and external sources. Permit fees will directly offset the cost of program activities that require permits, such as land development and redevelopment. The most densely populated area within the MS4 boundary is also within the East Salem Service District, a special district that provides sanitary sewer and stormwater system maintenance services. The maintenance of public right-of-ways within the MS4 are funded by Gas Taxes and includes the maintenance of stormwater facilities along side and crossing roadways. Both Solid Waste and Planning Division involvement represents a very small portion of program expenses and is limited to staff time involved in coordinating program administration. External sources are outside agencies that are currently conducting activities similar to the requirements of the program.

The MS4 area is comprised of the densely populated area of the ESSD bounded by Hazelgreen Road to the north, Cordon Road to the east, Highway 22 to the south and Salem city limits to the west. The remaining area of the MS4 is comprised of more sparsely populated areas with agricultural, rural residential and urban transition properties. Due to the distinct differences in these two areas, program implementation efforts will be commensurate with population densities. These differences in implementation will provide more efficient distribution of program services.

Implications for Stormwater Users

Residents – Residents can expect to see increased activity by county staff in the stormwater area. There will likely be increased street sweeping, catch basin cleaning and litter clean-up. Additionally, homeowners can expect an increase in opportunities to learn more about the action items they can do to protect water quality. This will include information on tree planting, proper disposal of household hazardous waste and general information on local water quality issues. Homeowners will also have a hotline to call to report illegal dumping or other non-compliance issues. Residents in the ESSD, the area of the SWMA that is most intensely developed, will be part of a more intensive education and maintenance program to address the needs of that area.

Businesses - Like SWMP area residents, business owners in this area will see an increase in county maintenance activity. Business owners can expect to receive information on water quality during the implementation of this plan. This information will provide suggestions on how their activities can have an effect on water quality. Businesses in the ESSD will be part of a more intensive education and maintenance program to address the needs of that area. This program will incur additional costs that will be covered through a fee increase in ESSD stormwater charges. During development of the fee schedule, the county will analyze the relative impact of businesses (as compared to. residences) by considering criteria such as the typical amount of impervious surface (roofs, parking lots, etc.) that increase stormwater runoff quantities and reduce quality.

Agriculture – Agricultural producers in the stormwater management area will primarily be approached through existing programs offered by the Oregon Department of Agriculture, the Cooperative Extension Service (CES), and the Marion Soil and Water Conservation Service (SWCD). These agriculturally-oriented programs were developed, in part, through Senate Bill 1010 and the subsequent development of the "Molalla-Pudding-French Prairie-North Santiam Sub-basins Agricultural Water Quality Management Plan." Additionally, federal and state laws already prohibit the pollution of waters of the state as outlined in ORS 468B.025, ORS 468B.050, and the federal Clean Water Act. Marion County will work with SWCD and CES to ensure that their educational programs are reaching agricultural producers in the SWMA. The SWMP will not expand on regulations already addressing agricultural water quality.

Builders / New Construction – Builders, general contractors and excavators in the stormwater management area will be provided with information regarding MCPW's two construction programs (Erosion and Sediment Control and Post Construction Runoff Control). New construction is required to have a Construction Erosion and Sediment Control permit to minimize off-site sediment impacts. Thus, in addition to installing water quantity controls, new construction will also be required to install water quality controls. Water quality controls may include perimeter controls and inlet/outlet protection, as well as Low-Impact Development Best Management Practices such as porous pavement, bio-swales, etc.

Public Participation Process

In order to provide a fair and open public participation process, Marion County requested input from the Marion Water Quality Advisory Committee. This thirteen-member panel worked with county staff to design a public participation program for the development, implementation, and evaluation of the SWMP.

Committee Participants:

Marion Soil and Water Conservation District:
Douglas Krahmer

Farm Bureau:
Dan Goffin

Land Developer:
Richard Massey

Home Builders Association:
Mark Grenz

At-Large Residents:
Eugene Doll
Zachary Diehl
Jim Heltzel
Andrew Schmidt

Support Staff
Matt Knudsen
503-365-3187
Marion County Public Works
mthorburn@co.marion.or.us

Marion Water Quality Advisory Committee meetings were publicly noticed and provided a time period for public comment before each session.

- June 7, 2011, 3:00 p.m. - MWQAC
- July 5, 2011, 3:00 p.m. - MWQAC
- August 2, 2011, 3:00 p.m. - MWQAC

Stormwater Management Plan

Programs

Public Education & Outreach
Public Participation & Involvement
Illicit Discharge Detection & Elimination
Construction Site Runoff Control
Post Construction Runoff Control
Pollution Prevention & Good Housekeeping

Programs & Best Management Practices:

The following programs have been established and implemented in accordance with the NPDES Phase II Permit program requirements to address stormwater pollution concerns as outlined under the six minimum control measures. Stormwater concerns are addressed through various educational programs and best management practices that target specific audiences. **Table A** provides an overview of the primary stormwater pollution concerns in the SWMA, the programs that are intended to address those concerns and the audiences that the programs are designed to reach (*Note: The icons provided to the left of the table will be used throughout this section to indicate which stormwater concerns are addressed by each program*).

Table A. Programs and best management practices are tailored to each audience to address specific stormwater concerns.

Stormwater Concern	Target Audience	Programs & Practices
 Nutrients: Fertilizers / Pesticides	Business Community, Ag Community, Home Owners & Residents	Household Hazardous Waste, Waste Reduction Programs, M-WOG Campaigns, Stormwater Website, Stream Clean-up, Free Tree Program, Stormdrain Marking Program, Illicit Discharge Ordinance, Construction Site Runoff Control Ordinance, Post Construction Runoff Control Ordinance and MCPW-BMPs
 Sediment / Turbidity	Construction/Development Industry, Ag Community, Home Owners & Residents, Landowners, MCPW Crews	M-WOG Campaigns, Stormwater Website, Free Tree Program, Construction Site Runoff Control Ordinance, Post Construction Runoff Control Ordinance and MCPW-BMPs
 Metals &Toxins	Business Community, Ag Community, Home Owners & Residents, Students, MCPW Crews	Household Hazardous Waste, Waste Reduction Programs, M-WOG Campaigns, Stormwater Website, Stream Clean-up, Free Tree Program, Storm Drain Marking Program, Illicit Discharge Ordinance, Construction Site Runoff Control Ordinance, Post Construction Runoff Control Ordinance and MCPW-BMPs
 Temperature	Const/Dev Industry, Ag Community, Businesses, Home Owners & Residents, Landowners, MCPW Crews	M-WOG Campaigns, Stormwater Website, Free Tree Program, Construction Site Runoff Control Ordinance, Post Construction Runoff Control Ordinance and MCPW-BMPs
 Bacteria	Ag Community, Dog Owners, Students, Residents, MCPW Crews	Dog Control Education, Waste Reduction Programs, M-WOG Campaigns, Stormwater Website, Stream Clean-up, Stormdrain Marking Program, Illicit Discharge Ordinance, Post Construction Runoff Control Ordinance and MCPW-BMPs

Audience(s)

Audience selections are based upon known and suspected contributions to water pollution. Because land management plays a critical role in water quality issues, land owners (residential, commercial and agricultural) represent the largest target audience. **Table B** shows the approximate size of each of the target audiences within the SWMA

Table B. Target audiences represented in the Stormwater Management Area.

Target Audience(s)	Approximate Size
Residents/Homeowners	7,010 Single family tax lots 770 Multifamily tax lots
Public Landowners	259 Acres (including State of Oregon, Marion County and Cities of Salem, Keizer & Turner)
Dog Owners	4,769 within the SWMA
Students	Not available--cross jurisdictional
Business Community (Commercial/Industrial/Retail)	800 Business tax lots
Agricultural Community	700 Agriculturally zoned tax lots (actual number of farmers is considerably less)
Construction/Development Industry	Varies with construction volume

Measurable goals

Measurable goals have been developed and evaluated by Marion County staff, in collaboration with the Marion Water Quality Advisory Committee, to address the county's stormwater quality issues. Typically, they are intended to provide an evaluation method for BMP implementation. In cases where quantification is impractical, surrogate measures will be used (i.e. student/teacher contact hours, brochures distributed, direct mailings sent, etc.)

Evaluation

To quantify, where possible, the effectiveness of our efforts each program and practice will be evaluated annually by Marion County Staff in collaboration with the Marion Water Quality Advisory Committee. See the accompanying Evaluations & Assessments document for a complete quantitative analysis of the programs.

Public Education & Outreach

Minimum Control Measure 1

Goal

To maintain an effective, multifaceted public education program for disseminating information about the impacts of stormwater discharges on water bodies and the steps the public can take to reduce pollutants in stormwater runoff. Information is to be provided to people of all ethnicities and economies through new and existing programs and practices. Educational materials and outreach activities are targeted to specific audiences in order to invoke behavioral changes that will reduce the amount of pollution generated from stormwater sources.

Programs & Practices

The following programs and best management practices have been implemented to meet the specific objectives of Marion County's education and outreach plan. A summary of these programs, along with implementation and objective information, can be found in **Table 1**.

Table 1 Programs and practices implemented to meet specific objectives of the county's education and outreach plan.

	Programs & Practices (BMPs)	Implementation	Objective
1.1	Household Hazardous Waste (HHW) Program	Permit Years 1-5; existing program-continuous	Reduce the potential for illicit dumping into storm drains and increase awareness about the impacts that household chemicals have on the environment
1.2	Marion County Waste Reduction Program	Permit Years 1-5; existing programs	Prevent potential pollutants from entering the waterways…
	A. Recycling Programs	Continuous	…divert materials such as motor oil, mercury, paint, batteries and refuse from storm drain systems and local waterways
	B. "Waste Matters" Newsletter	Continuous	…provide water quality information to all county residents through the county's semiannual publication
	C. "EarthWISE" Certification Program	Continuous	…assist the business community with waste reduction & environmentally friendly practices including water pollution reduction
1.3	Mid-Willamette Outreach Group (M-WOG)	Permit Years 1-5; New program-continuous	Collaborate with local groups to develop and disseminate a consistent message about stormwater pollution
1.4	MCPW Pet Waste Education Program	Permit Years 1-5; existing program	Reduce bacteria levels in surface water…
	A. Dog Control Program	Continuous	…provide information to dog owners about the impacts of pet waste on water quality
	B. Pet Waste Stations	Continuous	…encourage proper disposal of pet waste and increase awareness through signage.
1.5	MCPW Stormwater Website	Permit Years 1-5; existing program-continuous	Provide open access to the SWMP and related stormwater resources, including educational materials
1.6	MCM Associated Education Programs (education related to minimum control measures 3-6)	Permit Years 1-5; expanding program-continuous	Educates target audiences on the effects of stormwater pollution and on Marion County's prevention programs and ordinances (including implementation and enforcement)

1.1 Marion County Household Hazardous Waste Program 

Marion County will continue to provide a Household Hazardous Waste program and expand the program to include a new handling/disposal facility for residents and business. This program has an educational component through Waste Matters newsletter, brochures, exhibits, staff contact with citizens, and advertisements with local newspapers, television stations, and radio stations.

Rationale:

The amount of hazardous materials pulled from the waste stream can have an important impact on water quality. Improper disposal of solid waste can contribute to water quality problems. Providing education on the impacts of hazardous waste on water quality and information on an alternative disposal method could reduce the amount of contaminants entering the surface water through illegal dumping. This is an existing program that fills this program need without much additional cost to the county.

Measurable Goal:

- Reduce stormwater pollution from HHW. The county will track the amount of materials collected and monitor trends in collection data.

1.2 Marion County Waste Reduction Program 

The Mission of the Department of Public Works - Environmental Services Division is to provide the customers of Marion County with an environmentally responsible and cost effective system for reduction and disposal of solid waste through quality service, education, and public involvement. Through these programs, the division helps reduce pollutants entering the waterways in the Salem urbanized area.

A. Recycling Programs

Motor oil recycling

Motor oil recycling helps reduce the likelihood of illegal dumping in the storm drains and ditches of the urbanized area. This program is available with curbside service and also a drop off (transfer) station.

Rationale:

Drivers who change their oil at their place of residence rather than hiring a mechanic to service their vehicle need a place to dispose of the used motor oil. Illegal dumping of motor oil can create significant water quality problems. Providing education and an alternative disposal method could reduce the amount of contaminants entering the surface water through illegal dumping. This is an existing program that fills this program need without much additional cost to the county.

Measurable Goal:

- Reduce the likelihood of residents dumping unused motor oil into the storm drains and ditches by providing a recycling option. The county will track the amount of oil collected and monitor trends in collection data.

Mercury recycling

Residents may bring mercury containing thermometers to our transfer station for free recycling. Residents receive one free mercury-free, digital thermometer for each mercury thermometer they surrender. Residents of Marion County may also bring fluorescent lights or mercury-containing thermostats to the transfer station for free recycling. Old fluorescent lamps containing PCB ballasts are also collected in order to protect our watershed.

Rationale:
Solid waste-containing mercury components can contribute to water quality problems. Providing education and an alternative disposal method could reduce the amount of contaminants entering the surface water. This is an existing program that fills this program need without much additional cost to the county.

Measurable Goal:

- Reduce the likelihood of mercury entering the surface waters via storm drains and ditches by providing a recycling option. The county will track the amount of mercury-containing products collected and monitor trends in collection data.

Battery recycling
Battery recycling helps reduce the possibility that batteries are burned in the county's Waste-to-Energy Facility. Car and marine batteries may be taken to the transfer station or dropped off at a local battery store, where they will be collected and refurbished. Virtually any type of household battery, including batteries containing mercury, can be recycled in the county's curbside program or taken to any of the ten drop-off locations throughout the county. This service is provided at no cost to residents or businesses.

Rationale:
Batteries contain chemicals that may degrade water quality and are harmful to aquatic life. Providing education and a convenient disposal method could reduce the amount of contaminants entering the surface water through illegal dumping. This is an existing program that fills this program need without much additional cost to the county.

Measurable Goal:

- Reduce the introduction of mercury, lead, and other battery-related contaminants to surface water by providing recycling options. The county will track the amount of materials collected and monitor trends in collection data.

Paint recycling
Paint recycling helps reduce the likelihood of illegal dumping in the storm drains and ditches of the urbanized area. It offers an easy alternative that also provides recycled paint to other users. This program is available with curbside service and also a drop off (transfer) station. The service is also provided at no cost to local paint manufacturers.

Rationale:
Solid waste can contribute to water quality problems. Providing education and an alternative disposal method could reduce the amount of contaminants entering the surface water through illegal dumping. This is an existing program that fills this program need without much additional cost to the county.

Measurable Goal:

- Reduce the likelihood of residents dumping unused paint into the storm drains and ditches by providing a recycling option. The county will track the amount of materials collected and monitor trends in collection data.

Roadside litter collection
Marion County works throughout the year to reduce the amount of roadside litter affiliated with the transfer stations. Work crews target roads that lead to the county transfer stations. The county has also implemented a fine for failing to cover loads brought to the

transfer stations. This has helped to reduce the amount of roadside garbage in ditches and waterways.

Rationale:
Solid waste can contribute to water quality problems. Cleaning up roadside litter could reduce the amount of contaminants entering the surface water. This is an existing program that fills this program need without much additional cost to the county.

Measurable Goal:

- Reduce the incidence of litter in roadside ditches. The county will track the amount of time spent on this activity and track the volume of fines assessed.

B. Waste Matters Newsletter

This publication is produced twice annually and is mailed to every household in Marion County. It includes articles on waste reduction, recycling, yard waste disposal, hazardous waste disposal, and other items that relate to water quality. Environmental Services will continue to produce and distribute this publication, with an increased focus on water quality issues as they relate to solid waste. This provides a direct path for reaching county residents with water quality information. Additionally, Marion County will continue to advocate responsible disposal of and alternatives to household hazardous waste in its media advertising. These themes will also be covered in detail in the annual Master Recycler Class.

Rationale:
Solid waste can contribute to water quality problems. Providing education could reduce the amount of contaminants entering the surface water. This is an existing program that fills this program need without much additional cost to the county.

Measurable Goal:

- Reach a broad audience with information about water quality issues relating to recycling and household hazardous waste. The county will track the number of publications mailed in each permit year.

C. EarthWISE Certification Program

This program assists the business community with waste reduction & environmentally friendly practices including water conservation and pollution reduction. Environmental Services continues to certify and re-certify businesses within Marion County who demonstrate successful implementation of sustainable environmental practices, which includes water conservation practices, the use of non-toxic cleaning alternatives and installing storm drain markers in parking lots. The program encourages the business community to find cost-effective solutions to waste reduction and promotes stewardship among business owners and customers.

Rationale:
The adoption of sustainable business practices can have a positive influence on water quality and quantity. Leading by example is one way for businesses to connect with their customers and their community while promoting positive behavior. This is an existing program that fills this program need without much additional cost to the county.

Measurable Goal:

- Increase the business community's participation in stormwater best management practices. The county will track the number of certifications and re-certifications and monitor trends in program participation.

1.3 The Mid-Willamette Outreach Group (M-WOG) 

New to Marion County's programs is an assemblage of local agencies and organizations whose common task is to provide stormwater education to the public. In an effort to combine resources to develop and disseminate a consistent message about stormwater pollution prevention, Marion County has formed a partnership to work in collaboration with staff members from the City of Salem, the City of Keizer, the Marion Soil and Water Conservation District and the Oregon State University Extension Service. M-WOG members monthly to plan, coordinate, and execute shared activities such as developing workshops, generating promotional advertisements and planning restoration projects. The group maximizes the skills and resources of each agency member, allowing all parties to accomplish more tasks while minimizing redundancy and/or mixed messaging.

Rationale:

Due to the interconnectedness of our communities and overlap among target audiences, it's reasonable to believe that a single, unified message disseminated across the region will be more effective than several competing messages. Additionally, collaborative efforts will help reduce the amount of time and resources that each agency will spend on educational program development, while improving the quality of the educational materials. This program was established in January 2011 and is expected to exist throughout the next permit cycle.

Measurable goal:

- Collaborate with nearby municipalities and non-governmental organizations to promote community-wide stormwater education. The county will track the progress of the group through meeting participation and project completion.

1.4 MCPW Pet Waste Education Program 

Pet waste can be a significant contributor of bacteria and nutrient loading in stormwater. To reduce nutrient and bacteria loading Marion County utilizes the MC Dog Control and Pet Waste Stations for educating citizens on proper disposal of pet waste.

A. Marion County Dog Control provides educational booths at various functions (i.e. Dog Fest, fairs, and dog-related events). These educational exhibits include information on the impacts of pet waste on water quality and proper pet waste disposal. Citizens will be encouraged to flush, trash, or bury their pet waste so that it does not adversely impact stormwater quality.

Rationale:

Dog Control staff already provides educational materials to residents when they apply for a dog license. Staff also attends pet-related events to inform pet owners about ways to reduce bacteria in surface water.

Measurable Goal:

- Reduce nutrient and bacteria loading in stormwater by educating citizens on the impacts of pet waste on water quality. Track number of educational events where information was distributed. This measure will provide an estimate of the amount of people reached by educational messages.

B. Pet Waste Stations installed at Marion County parks (both inside and outside the SWMA) encourage proper disposal of pet waste and increase awareness through signage. Citizens are provided free bags to pick up pet waste and encouraged use park trash cans to dispose of the waste so that it does not adversely impact stormwater quality.

Rationale:
Dog owners will have access to free pick-up bags and trash cans at convenient locations in Marion County parks. The easy to use stations will encourage proper disposal and increase awareness about the impacts of pet waste on water quality. Staff will routinely maintain the stations (refill bags and empty trash receptacles) to ensure reliable use.

Measurable Goal:

- Reduce nutrient and bacteria loading in stormwater by encouraging proper disposal of pet waste. The county will track the number of bags used and monitor trends in program participation.

1.5 MCPW Stormwater Website 

Marion County has established a stormwater website that provides information on the county's SWMP, stormwater quality/quantity issues, actions that citizens can take to improve stormwater quality, and links to relevant stormwater information. The site also provides contact information for questions and comments. The site features up-to-date information on the SWMP and instructs citizens on how they can get involved.

Rationale:
The stormwater website provides the public with open access to the SWMP and the accompanying documents including maps, educational materials and links to other resources.

Measurable Goal:

- Provide information to citizens about stormwater issues, actions they can take, and how they can get involved with the county's SWMP. The county already maintains a web presence and this will build off existing web support resources.

1.6 MCM Associated Education Programs 

- Minimum Control Measure 3: Illicit Discharge Detection & Elimination
  Marion County, in collaboration with DEQ and M-WOG, will provide training both internally to staff and crews regarding detection of illicit discharges and externally to the general public regarding the impacts of illicit discharges, information about what constitutes an illegal discharge, and the legal implications of illegal dumping. The details of this effort are outlined in the Illicit Discharge Detection & Elimination section *(MCM 3) on page 39.*

- Minimum Control Measure 4: Construction Site Runoff Control
  Marion County will provide educational materials to the public and industry professionals regarding the impacts of construction activities on water quality as well as information about Marion County's Erosion Prevention and Sediment Control ordinance. Specifically, Marion County will provide training to inspectors, builders, and developers. The details of this effort are outlined in the Construction Site Runoff Control section *(MCM 4) on page 43.*

- Minimum Control Measure 5: Post Construction Runoff Control
  MCPW will provide program staff the opportunities to further their knowledge base and learn current techniques. The county will also provide training to affected audiences prior to implementation of the program. The details of this effort are outlined in Post Construction Runoff Control section *(MCM 5) on page 46.*

- Minimum Control Measure 6: Pollution Prevention & Good Housekeeping
  Marion County will integrate NPDES PH2 Pollution Prevention objectives with Limit 10 and 303(d) TMDL objectives in order to better address water quality issues that also relate to salmon recovery. Regular training will be provided to staff and crew on best management practices that emphasize the importance of

water quality (especially to threatened salmonids) and the ways that BMPs can be implemented, monitored, and reported. The details of this effort are outlined in Pollution Prevention & Good Housekeeping section *(MCM 6) on page 49.*

Public Participation & Involvement

Minimum Control Measure 2

Goal

Enhance the quality of and participation in the Stormwater Management Plan (SWMP) by including the public in implementing, reviewing and updating the Marion County SWMP. This effort strives to engage all ethnic and economic groups.

Target Audiences

Target audiences for program participation are the same as those identified in MCM1 Public Education. These audiences were involved in development of the plan through the use of the water quality advisory committee (stakeholder groups) and through open advertisements posted at numerous retail and public building locations and advertised on English and Spanish-speaking media networks.

Programs & Practices

The following programs and best management practices have been implemented to meet the specific objectives of Marion County's public participation plan. A summary of these programs, along with implementation information, can be found in **Table 2**.

Table 2 Programs and practices implemented to meet specific objectives of the county's public participation plan.

Programs & Practices (BMPs)		Oversight	Implementation Schedule
2.1	Implementation of the SWMP	MCPW	
	A. Website	MCPW	Permit Year 1-5; continuous updates
	B. Complaint/Contaminant Reporting Forms	MCPW	Permit Year 1-5; continuous
	C. Watershed Council & Community Meetings	MCPW	Permit Year 1-5; continuous
	D. Storm Drain Marker Program	MCPW	Permit Year 1; annual maintenance
	E. Stream Clean-Up Programs	MCPW	Permit Year 1-5; continuous
	G. Free Tree Program	MCPW	Permit Year 1-5 continue annually
	H. Volunteer Coordinator	MCPW	Permit Year 1-5; continuous
2.2	Review of the SWMP	MCPW	
	A. Public Presentation and Comment for Annual Review	MCPW	Permit Year 1 & 5
	B. Collect Public Comment and Complaint	MCPW	Permit Year 1-5; annually
2.3	Adapting & Updating the SWMP	MCPW	
	A. Water Quality Advisory Committee	MCPW	Permit Year 1-5; continuous
	B. Press Releases & Public Notices	MCPW	Various (w/ advisory committee meetings and open houses)
	C. Program Summary	MCPW	Permit Year 1,
	D. Meetings with Elected Officials	MCPW	Permit Year 1,3 & 5
	E. Website	MCPW	Permit Year 1-5; continuous updates
	F. Citizen Input at Advisory Committee Meetings	MCPW	Permit Year 1-5; continuous

2.1 Implementation of the Stormwater Management Plan: 

MCPW has several programs and practices designed to encourage public participation and promote direct involvement in the implementation of the stormwater management plan.

A. Website

Citizens can stay informed of opportunities for participation via the SWMP website maintained by Marion County. At this site citizens will find staff contact information, learn what they can do at home and read the county's current SWMP.

Target audience: Community members with Internet access.

Rationale:
An increasing number of citizens and businesses have access to the Internet. Providing a website allows those groups and individuals access to materials about stormwater issues and the SWMP.

Measurable Goal:
The county will provide constant access to information regarding the SWMP.

- Marion County will create and maintain a stormwater website with useful information for citizens. It will include: fact sheets, guides for at-home activities, links to water quality resources, and the county's SWMP.

B. Complaint/Contaminant Hotline

The county will provide a complaint hotline that citizens can use to report contamination or stormwater conveyance issues. The hotline number will be available on the website and in stormwater literature. Operators will request information on the problem, location, and contact information for follow-up. Once submitted, the comment or complaint will be entered into a database as will the action taken by county staff. If citizen contact information is provided, staff will also notify the person who submitted the complaint. These submittals will be included in an appendix in the annual report and generalized in its text.

Target audience: All community members conducting business with Marion County Department of Public Works and those with Internet access.

Rationale:
A complaint hotline allows citizens to call one number for their concerns about stormwater contaminants. This helps avoid public confusion about who to call and ensures that the information is processed correctly (and issue addressed) at Public Works.

Measurable Goals:
Citizens will have a means to report stormwater complaints, comments, or contamination issues.

- The county will provide a hotline for citizens to call, even after hours, and report problems. After hours calls will be routed to the on-call supervisor to determine if immediate response is required.

Marion County will respond to all complaints and comments submitted by the public.

- The citizen reports will be responded to within 5 business days. The number and type of reports will be tracked, as will the responses. Any trends identified in the responses will be used to adapt the SWMP to the identified need (e.g. Numerous responses regarding litter in the drainage system will trigger an increase in litter removal activities and litter reduction programs).

C. Watershed Councils & Community Meetings

County staff will attend neighborhood association meetings and watershed council meetings at least once a year to discuss stormwater issues and opportunities for collaboration. Comments

collected at these meetings will be entered into the database as will any follow up action taken by county staff. Opportunities for collaboration (such as identifying and cleaning up illegal dump sites) will be pursued to the extent practical.

Target audience: Citizen-led groups with an interest in water quality and quantity issues in Marion County's MS4.

Rationale:
By attending specific meetings of these stakeholder groups, the county can more effectively gauge public knowledge and interest of stormwater issues as well as program needs specified by the stakeholder groups.

Measurable Goal:
County staff will stay in contact with neighborhood associations and watershed councils to solicit ideas regarding stormwater management and to provide updates on the county's SWMP implementation.

- County staff will attend each of the following group meetings, at least annually:
  - *East Salem Service District Board*
  - *Salem Watershed Alliance (Mill, Claggett, Pringle)*
  - *Pudding River Watershed Council*

D. Storm Drain Marker Program

Already, a number of storm drain inlets in the SWMA are identified with "Dump No Waste, Drains to Stream" markers. As part of the SWMP, all inlets will be surveyed to determine the extent and condition of existing markers. In those areas where markers are missing or illegible, the county will work with its volunteer coordinator and local watershed councils to see that the inlets are marked. The county will supply stormdrain marking kits to the volunteer groups – including instructions, a map, gloves, adhesive and a box of stormdrain markers.

Target audience: Citizen volunteers, area residents and juvenile crews.

Measurable Goal:
All storm drains will be marked and maintained within the second permit cycle of the SWMP.

- Volunteers and youth crews associated with Marion County's Alternative Program will complete the stormdrain marking process in PY 1; markers will be maintained and replaced over the remaining permit years.

E. Stream Clean-up Program

Marion County will continue working with its Alternative Program (juvenile offender work program) to maintain the ditch/stream system in East Salem's urban areas. These areas are hand-mowed in the summer to ensure conveyance, and litter is removed. If necessary, this program will be expanded to include other portions of the MS4 that fall outside the East Salem Service District. This need will be determined by the amount of litter present in those other areas. The goal of Alternative Programs is to provide cost-effective and labor-intensive programs as a consequence for delinquent youth and the education of parents and youth, for the benefit and safety of the community.

Target audience: At-risk youth in Marion County.

Rationale:
This builds on an existing program. This is a cost-effective approach to litter and maintenance needs that also provides youth offenders the opportunity to invest their time in their community.

Measurable Goal:
Youth in Marion County will have the opportunity to improve the water quality of their community.

- Marion County Alternative Programs will provide community service labor to clean ditches and hand mow. The county will track the number of crew hours and monitor trends in hours spent.

F. Free Tree Program

In appropriate areas, the county will work with landowners to plant shade trees near ditches that hold water later in the season. The intent with these plantings is to reduce water temperatures and provide nutrient uptake where possible. Marion County will identify the areas for planting through collaboration with the watershed councils, Marion Soil and Water Conservation District, GIS analysis and discussions with landowners.

Target audience: Property owners in the Marion County MS4.

Rationale:
Temperature is a leading contaminant of surface waters in Oregon. Streams within the MS4 are listed for temperature exceedences. Where practical, the county will work with landowners to provide canopy cover over late season water.

Measurable Goal:

- Plant trees or other vegetation (where appropriate) to provide shade to ditches and streams in the Urban Area during periods when temperature loading is an issue.

G. Volunteer coordinator

Marion County employs a full-time volunteer coordinator to help recruit and organize volunteers for various Marion County programs. This coordinator is on staff in the Board of Commissioners office and has provided support for Public Works programs in the past.

Rationale:
Marion County has on staff a volunteer coordinator who can staff certain elements of the SWMP using volunteers (i.e. storm drain marking.) This is an existing position and has proven effective for other programs.

Measurable Goal:
Use the resources of the Marion County volunteer coordinator to help plan and execute the elements of the SWMP that rely on volunteer labor.

- Recruit sufficient numbers of volunteers to implement the volunteer elements outlined in this SWMP. Volunteer contributions (hours) to the SWMP implementation will be tracked over time.

2.2 Review of the SWMP

A. Public Presentation and Comment for Annual Review

The outcomes of the Minimum Control Measures (MCMs) will be assessed and reported annually to DEQ as required by the NPDES MS4 Permit. Prior to the submittal to DEQ, preliminary results from the assessment will be presented to the public for comment and questions. Public comments

from this event (as well as public comments submitted throughout the year) will be used as an assessment tool in evaluating the program. Findings from the public review will be included in the annual report submitted to DEQ. Written and verbal comments will be accepted.

Target audience: All community members in the Marion County MS4 with an interest in the SWMP process.

Rationale:
A public forum for evaluating the SWMP is an important part of adapting to the needs residents and business owners in the MS4. This forum will provide education and participation opportunities to attendees.

Measurable Goals:
Citizens will have an opportunity to hear about, and provide comment on, the SWMP annually.

- Marion County will advertise and host a public forum to discuss outcomes from the SWMP MCMs prior to submitting the annual report to DEQ.

Public comments will be incorporated into the annual report and used to adjust the SWMP.

- Marion County will record and respond to 100% of the public comments that are submitted.
- Responses to the comments will be recorded in the database as well.

B. Collection of Public Comment and Complaints

Citizens will be able to use multiple methods for communicating their comments regarding the SWMP or stormwater issues. A phone number, email address, website, and mailing address will be listed on information that is provided to the public. Citizen input submitted via these channels will be recorded in a database as will the county's response to the input. This feedback will be incorporated into the annual report with an appendix listing all comments and the responses. The comments will be generalized within the text of the annual review to show any trends.

Target audience: All community members in the Marion County MS4 with an interest in stormwater quality and quantity issues.

Rationale:
Having a variety of choices for comments and complaints allows citizens to contact the county in whatever way is most convenient for them. Tracking the comments for the evaluation will allow staff to adjust the program according to needs identified through this process.

Measurable Goal:
Citizens have an opportunity to provide comments throughout the review process of the SWMP. Marion County will collect, record, and act on public comments submitted during this review process.

- Marion County will provide contact information in 100% of its SWMP materials.
- Marion County will develop and maintain a database of public comments.
- Marion County will respond to 100% of the comments received during the year.
- Marion County will analyze 100% of the public comments during the annual review process.

2.3 Adapting & Updating the SWMP

A. Marion Water Quality Advisory Committee

Marion County works with an advisory committee to provide technical and policy advice during the development of the SWMP. This committee includes representatives from the following stakeholder groups:

- Home/land owners & residents (citizens-at-large)
- Agriculture
- Business/Development
- Watershed Councils
- Adjacent municipalities
- Educators

The committee meets monthly during the development of the SWMP and has completed the following tasks:

1. Elected a chair and vice chair,
2. Developed a process for commenting on the SWMP,
3. Developed a process for communicating between the group and Marion County,
4. Developed a decision-making and consensus-building process,
5. Provided comments on technical and policy aspects of the SWMP,
6. Made recommendations regarding public participation during the SWMP development process; and
7. Made recommendation to Board of Commissioners to adopt SWMP.

Target audience: Various stakeholder groups (as listed above).

Rationale:
The use of an advisory committee to develop the SWMP was chosen as a way to deliberately involve different stakeholder groups in a close collaborative process. Through the committee, different groups are able to express their specific ideas and concerns regarding the SWMP. The measurable goals will primarily be addressed through a direct survey of the group.

Measurable Goals:
Committee remains actively attended by stakeholder representatives.

- The committee will try to maintain a quorum at each of the meetings.

Each stakeholder representative has a chance to help develop and review the SWMP.

- Committee members will be surveyed upon project completion.

Task force members felt the public participation process was fair and open.

- Committee members will be surveyed upon project completion.

Task force members felt they had a significant role in shaping the public participation process.

- Committee members will be surveyed upon project completion.

Interested citizens were given the chance to comment on the plan at the meetings.

- Each meeting agenda will provide a chance for public comment.

B. Press Releases & Public Notices

Each of the Committee meetings will be publicly noticed in the Statesman Journal and the Keizer Times. Additionally, a press release will be sent to these newspapers regarding the program.

Target audience: All community members in the Marion County MS4.

Rationale:
As the largest local newspapers, the Keizer Times and Statesman Journal are distributed throughout the MS4. Articles and public notices in these newspapers will reach a diverse audience.

Measurable Goals:
Public will have sufficient notice for committee meetings and open houses.

- Each meeting and open house will be publicly noticed in the Statesman Journal and the Keizer Times newspapers.

Public will be made aware that the SWMP development process is underway.

- A press release will be sent to the Statesman Journal and Keizer Times.
- A notice (PSA) will run on CCTV, the local community television station.
- An invitation to open houses (with basic program facts) will be posted at MCPW offices and at retail locations around town.

C. Program Summary

A fact sheet will be developed to inform citizens of stormwater issues, the SWMP development process, and how they can get involved. The fact sheet will be available to open house participants and interested citizens. Relevant facts will also be included in the open house invitation.

Target audience: Community members conducting business with Marion County Public Works. Community members invited to, and attending, the stormwater open houses will also receive handouts on the plan.

Rationale:
A fact sheet and open house flyer will provide stakeholders with an overview of the SWMP contents and process in a succinct way.

Measurable Goal:
Citizens will be informed of the SWMP development process during visits to county offices and at the open houses.

- Attendees to the stormwater open houses will receive a summary of the stormwater program.
- Visitors to county offices (or the county website) will be able to view flyers on the program.

D. Meetings with Elected Officials

The SWMP will be formally presented to the Marion County Board of Commissioners on at least two occasions. This will include a work session and/or management update to discuss the status of the SWMP process, key elements for its completion, and potentially controversial issues. There will also be an opportunity for the Board to review and approve the final draft of the SWMP before its submittal to DEQ.

Target audience: Elected officials and interested public.

Rationale:
Support from the Board of Commissioners is critical to the successful development of this SWMP. Briefings and work sessions will allow the Board to provide guidance to the project team.

Measurable Goal:
The county's elected officials were informed of the process and had a chance to shape the SWMP.

- County staff will hold meetings with the Board of Commissioners to discuss plan development and implementation.

E. Website

Marion County will maintain a website during the development of the SWMP. This website will provide citizens an opportunity to review current drafts of the SWMP, view the calendar of open houses and task force meetings, download fact sheets, MC staff contact information, and link to EPA and DEQ stormwater websites.

Target audience: Community members with Internet access.

Rationale:
An increasing number of citizens and businesses have access to the Internet. Providing a website allows those groups and individuals access to materials about stormwater issues and the SWMP.

Measurable Goal:
Citizens can access SWMP information and download documents related to SWMP development and involvement during both development and implementation.

- County staff created and maintained a website with relevant SWMP materials. Following plan submittal, the county will begin tracking the number of visitors to the website and monitor the trends.

F. Citizen input at Advisory Committee meetings

Time will be provided at the start of every Committee meeting for public comment. The minute taker will record the citizen's name along with any comments provided. These comments will be recorded in a database, as will the county's (or Committee's) response to them.

Target audience: Interested citizens.

Rationale:
This provides a publicly noticed, monthly forum for citizen input on the SWMP.

Measurable Goal:
Citizens have an opportunity to comment of the development of the SWMP.

- Time is provided at the start of each committee meeting for comments from interested citizens.
- Citizens have an opportunity to provide written comments.

Illicit Discharge Detection & Elimination

Minimum Control Measure 3

Goal

Gain a thorough awareness of the stormwater drainage system, determine the types and sources of discharges entering the system; continue response, enforcement, technical, and educational means to eliminate the discharges. Further proactive efforts using GIS and technical analysis include stormwater system inspection for dry weather discharges and a more technical response in determining source and destination.

Programs & Practices

The following programs and best management practices have been implemented to meet the specific objectives of Marion County's illicit discharge detection and elimination plan. A summary of these programs, along with implementation information, can be found in **Table 3**.

Table 3 Programs and practices implemented to meet the objectives of the illicit discharge detection and elimination plan.

Programs & Practices (BMPs)		Oversight	Implementation Schedule
3.1	Illicit Discharge Program Education	MCPW	Permit Year 1-5; continuous
	A. Internal Education	MCPW	
	B. External Education	MCPW	
3.2	Complaint Response	MCPW	Permit Year 1-5; continuous
3.3	Salem & Keizer WQ Testing	City of Salem City of Keizer	Permit Year 1-5; continuous
3.4	MCPW WQ Testing	MCPW	Permit Year 1-5; continuous
3.5	Create/Implement Outfall Inspection Schedule	MCPW	Permit Year 3
3.6	Sub-basin Based Spill Response Plan	MCPW	Permit Year 2

Best Management Practices:

3.1 Illicit Discharge Program Education 

A. Internal Education

Marion County will maintain and improve an educational program for county staff in order to heighten awareness of illegal discharges in the MS4. Crews will be trained on the detection of illegal connections and dumping in the MS4. This training will be integrated into the training crews already receive on best management practices for salmon recovery. This will be annual training for all field crew members, supervisors, and crew leaders. Additionally, all new employees (road crews) will be provided with orientation information on the purpose and use of best management practices. Training will also be provided to appropriate employees on the use of the field data management systems that support the reporting and tracking processes.

Rationale:

This BMP will help provide county staff the knowledge necessary to recognize pollutants in the waterways (i.e. oil sheens, litter, sediments, illicit hookups).

Measurable Goals:

Crew members know how to recognize illegal connections and dumping in the MS4.

- Illegal dumping recognition training will be included in the annual BMP training for crewmembers and other appropriate MCPW staff beginning in Permit Year 1.

Crew members will know how to use the illegal dumping reporting system.

- Crews will be annually updated on the use of the reporting system.

B. External Education

Marion County will maintain an educational program for citizens to heighten awareness and recognition of illegal discharges in the MS4. Educational materials will describe illegal connections and dumping and will also describe the consequences, both legal and environmental, of that dumping. This information will be included in fact sheets, in the Waste Matters Newsletter and on door-hangers. If there are multiple reports of illegal dumping in a particular section of the MS4, then the surrounding area will receive increased educational resources (i.e. informational door-hangers).

Rationale:

This BMP will help provide citizens the knowledge necessary to recognize pollutants in the waterways (i.e. oil sheens, litter, sediments and illicit hookups).

Measurable Goals:

Citizens know how to recognize illegal connections and dumping.

- Educational materials will be provided to citizens via Waste Matters, door hangers, and/or fact sheets. These materials will provide citizens with information on how to recognize illegal discharges and their potential consequences. This effort will continue in Permit Year 1.

Citizens know how to report illegal connections and dumping.

- The 24-hour hotline number will be published in educational materials beginning in Permit Year 1.

3.2 Complaint Response 

Marion County will maintain a system to manage information on illegal dumping.

Rationale:

Reporting and tracking illegal dumping and other contaminant concerns will generate considerable data. This information must be managed in a way that meets county data standards and is integrated into other county information systems.

Measurable Goal:

Marion County will maintain information on illegal discharges and connections.

- Marion County will develop and maintain a database system that can accommodate reports of illegal dumping. This data management system will continue starting Permit Year 1.

3.3 Salem & Keizer - WQ Testing 

Marion County will work with the cities of Salem and Keizer to ensure that water quality data collected by the cities, but relevant to the Marion County MS4, is available for use during the implementation of NPDES Phase II. This data will be used by Marion County to help direct discharge detection, education, and infrastructure improvement. If practical, the Salem data will be integrated into Marion County's broader data collection and management efforts. Any water quality data collected by Marion County will be made available to the cities of Salem, Turner, and Keizer.

Rationale:

Collaboration with other organizations on the collection of water quality data will reduce the county's need to collect its own data. This process will also encourage collaboration between jurisdictions and organizations on water quality issues.

Measurable Goal:

Share water quality information with Keizer and Salem and use this data in the SWMP reviews to develop appropriate responses to evident trends.

- Marion County will continue to collaborate with local municipalities on the collection and distribution of water quality data in Permit Year 1.
- Marion County will integrate water quality data into its stormwater management program to develop appropriate responses beginning in Permit Year 1.

3.4 MCPW WQ Testing 

Any water quality testing results associated with TMDL or ESA program development or implementation will be integrated into the SWMP. These findings will be used to help direct that program's emphasis toward addressing water quality limited streams. Additionally, the water quality testing may provide information on illegal connections and dumping. Reports of illegal connections or dumping will require follow-up from MCPW staff. If these discharges are not readily identifiable, MCPW will perform the necessary water quality sampling and analysis to characterize the contaminant and, if possible, determine its source. (See MCM 3.3) The county will employ acceptable standards for collection, handling, preservation, and analytical methods.

Rationale:

Data collected through other water quality initiatives should be integrated into the SWMP to provide a more accurate assessment of water quality issues.

Measurable Goal:

MCPW will ensure that data from its other water quality programs are integrated into the SWMP where appropriate.

- MCPW will integrate TMDL and ESA water quality data into its SWMP beginning in Permit Year 1.

3.5 Create / Implement an Outfall Inspection Program 

To ensure there are no continual violations of the Illicit Discharge ordinance, Marion County will create a qualitative dry weather outfall inspection program. During dry weather, many outfalls within the stormwater management area have little to no flow. If they do have flow this may indicate an illicit discharge. MCPW staff will create prioritization criteria to identify critical outfalls within the stormwater system. They will use these prioritization criteria to create an inspection checklist and schedule and implement accordingly. Follow up activities will be conducted as indicated by the inspection results.

Rationale:

Dry weather outfall inspections provide the opportunity to observe and resolve illicit discharges.

Measurable Goals:

MCPW will create a comprehensive dry weather outfall inspection schedule.

- MCPW will create a comprehensive dry weather outfall inspection schedule by Permit Year 3.
- MCPW will begin inspection in the year following the schedule creation

3.6 Sub-basin Based Spill Response Plan 

In the first NPDES MS4 permit cycle MCPW created GIS map data including critical stormwater infrastructure such as storm drains and pipes. MCPW and Marion County Information Technology will create a sub-basin based spill response system. This will allow MCPW to both look back up the stormwater system to determine the most probable source and down the system to hasten response to the spill.

Rationale:
A sub-basin spill response plan will reduce reaction time to both the contaminated area and the source.

Measurable Goal:
MCPW will create a sub-basin based spill response plan that results in discharges to the Stormwater Management Area system using GIS data.

- MCPW will create sub-basin based spill response plan by Permit Year 2.

Construction Site Runoff Control

Minimum Control Measure 4

Goal

Construction sites contribute sediment and other contaminants to drainage facilities and water bodies. Marion County will continue implementing the program, updating BMPs, inventorying active sites, and providing training opportunities.

Background

Marion County developed a Construction Erosion and Sediment Control program which reduces pollutants from construction activities within the SWMA. The program includes an ordinance and a permitting process that requires appropriate erosion and sediment (E & S) controls. Procedures include erosion prevention and sediment control plan review / approval, permit tracking, site inspection enforcement and public education.

Programs & Practices

The following programs and best management practices have been implemented to meet the specific objectives of Marion County's construction site runoff control plan. A summary of these programs, along with implementation information, are shown in **Table 4** below.

Table 4 Programs and practices implemented to meet specific objectives of the county's construction site runoff control plan.

Best Management Practice (BMP)	Oversight	Implementation Schedule
4.1 Construction Erosion Program Education	MCPW	Permit Year 1-5 continuous
A. Internal Education		
B. External Education		
4.2 Develop Inventory of Active Permitted Sites	MCPW	Permit Year 2-5 continuous
4.3 Street Sweeping Follow-up	MCPW	Permit Year 1
4.4 Complaint Response Program	MCPW	Permit Year 1-5 continuous

4.1 Construction Erosion Program Education 

A. Internal Education

To ensure up to date practices and quality controls are followed it is important to keep MCPW staff informed. MCPW will provide the construction site erosion and sediment control program staff the opportunities to further their knowledge base and learn current techniques.

Rationale:

Developing a successful Construction Erosion and Sediment Control program requires continual knowledge-building of staff.

Measurable Goals:

Marion County Public Works Construction Erosion and Sediment Control program inspection staff will attend training every two years (at minimum).

- Number of construction erosion trainings attended by MCPW staff.

B. External Education

Marion County currently promotes high standards in construction erosion prevention and sediment control. A regional focus with the Cities of Salem and Keizer will allow predictability for permittees

and the ability for regional jurisdictions to promote improvements in industry standards. These educational opportunities can include events, conferences and educational materials.

Rationale:
To increase regional industry standards for Construction Erosion and Sediment Control, Marion County will host or promote educational opportunities for Construction Industry professionals

Measurable Goals:
Marion County will provide educational materials or electronic links or reference to such materials to the public and industry professionals.

- Marion County will provide educational materials to the public and industry professionals by Year 2

Marion County will work with regional partners to provide consistent information to the

- Educational meetings with Salem, Keizer and the Soil and Water Conservation District public meetings and conferences either separately or jointly.

4.2 Develop Inventory of Active Permitted Sites 

MCPW has created a Construction Erosion and Sediment Control program with active sites at any given time throughout the year. One of the complications with creating a construction erosion and sediment control program is tracking and monitoring all active sites.

Rationale:
With scattered properties, that constitute the SWMA that MCPW operates the NPDES MS4 phase II permit within, having a comprehensive and easy to use tracking system will improve efficiency and quality of work.

Measurable Goals:
Develop an inventory system for active permitted Construction Erosion and Sediment Control sites.

- MCPW will have completed the inventory system for active permitted Construction Erosion and Sediment Control sites by Permit Year 2.

4.3 Street Sweeping Follow-up 

The county currently inspects all construction sites to review compliance with county ordinances and building and zoning codes. Any conditions found not in compliance are required to be corrected. If, during inspections on properties (either for construction or other issues) the street has enough dirt or other potential pollutants on its surface, and site operators do not conduct the required sweeping in a timely manner, then the MCPW street sweeper will be used.

Rationale:
Street sweeping follow-up will assure the requirements of permits are being followed.

Measurable Goals:
The number of times a street sweeper is called out

- Street sweepers will begin on-call operations in Permit Year 1

4.4 Complaint Response Program 

The county will modify the current complaint response program to further distinguish stormwater complaints concerning construction activities. The county currently operates a 24-hour "Road and Drainage Complaints"

line through its Operations Division. Use of this line has been expanded to include construction site stormwater runoff and illicit discharges complaints.

Rationale:
The complaint response program will provide a means for the public and development community to report polluted stormwater runoff problems observed at construction sites. The further breakdown of issues will allow County staff to determine common issues or areas of concern.

Measurable Goal:
Complaint response program developed:

- Number of complaints and follow-up inspections tracked.

Post Construction Runoff Control

Minimum Control Measure 5

Goal

Develop a program that reduces pollutants and quantity of stormwater runoff from developed and redeveloped property within MS4. The program includes an ordinance that addresses the treatment of post-construction runoff. The program addresses site plan review for structural BMPs, post-construction review of development's utilization and maintenance of structural BMPs and provision for enforcement of ordinance regulations.

Background

Marion County requires stormwater detention for development of one half acre or more. This development requirement was implemented to address increases in stormwater quantity from developed property and the subsequent Post-Construction Runoff Control ordinance was intended to improve water quality. Post Construction Runoff Control (PCRC) engineering design standards are needed to improve water quality (reduce temperature, chemical and biological pollutants) and minimize the quantity of stormwater runoff from developed property.

Programs & Practices

The following programs and best management practices have been implemented to meet the specific objectives of Marion County's post construction site runoff control plan. A summary of these programs, along with implementation information, can be found in **Table 5**.

Table 5 Programs and practices implemented to meet specific objectives of the county's post construction site runoff control plan.

Best Management Practice (BMP)	Oversight	Implementation Schedule
5.1 Post Construction Runoff Control Program Education	MCPW	Permit Year 1-5; continuous
A. Internal Education		
B. External Education		
5.2 Modify Post Construction Runoff Control Monitoring Program	MCPW	Permit Year 4
5.3 Program Revision: Limit Impervious Area on Development	MCPW	Permit Year 3

5.1 Post Construction Runoff Control Program Education 

A. Internal Education

To ensure up to date practices and quality controls are followed it is important to keep MCPW staff informed. MCPW will provide the Post Construction Runoff Control program staff the opportunities to further their knowledge base and learn current techniques.

Rationale:

Developing a successful Post Construction Runoff Control program requires continual knowledge-building of staff.

Measurable Goals:

Marion County Public Works Post-Construction Runoff Control program staff will attend training at least once every two years.

- Number of Post Construction Runoff Control trainings attended by MCPW staff.

B. External Education

Marion County currently has few opportunities to promote Low Impact Development or Post Construction Runoff Control. A regional focus with the cities of Salem and Keizer will allow consistency for permittees and interested property owners. It will also provide the ability for regional jurisdictions to promote improvements in industry standards. These educational opportunities can include events, conferences, and educational materials.

Rationale:

To increase regional industry standards for Post Construction Runoff Control, Marion County will host or promote educational opportunities for Construction Industry professionals

Measurable Goals:

Marion County will provide educational materials for the public and industry professionals.

- Marion County will provide educational materials for the public and industry professionals by Permit Year 2

Marion County will work with regional partners to provide consistent information to the public.

- Educational meetings held with Salem, Keizer, and the Soil and Water Conservation District, in addition to public meetings and conferences.

5.2 Modify Post-Construction Runoff Control Monitoring Program 

Once PCRC measures have been constructed, long-term evaluation of the operation and maintenance (O & M) of these devices and features needs to be performed. A program of periodic inspection of PCRC measures will be developed and implemented to assure the effective operation of these features. Sites not in compliance with the requirements will be encouraged to correct deficiencies to bring the facilities into compliance. Enforcement action outlined in the PCRC ordinance will be utilized to bring non-cooperative properties into compliance.

A long-term PCRC monitoring program will contain the following elements:

1. Map showing location of properties with PCRC systems
2. Develop inspection and reporting procedures to monitor PCRC's
3. Train staff in inspection and reporting procedures
4. Annually compile PCRC monitoring program results

Rationale:

Modification of the post-construction runoff control monitoring program will provide follow-up to assure post-construction runoff controls are in place and functioning properly. Post construction runoff control monitoring will reduce stormwater pollutants from developed and re-developed projects of one acre or more.

Measurable Goals:

1. PCRC sites mapped
2. Inspection and reporting procedures developed
3. Staff trained in inspection and reporting procedures
4. Annual PCRC report prepared

5.3 Program Revision: Limit Directly Connected Impervious Area on Development 

In most cases, when an undeveloped property is developed more runoff is generated. When a developed property is re-developed or improved, the opportunity to reduce or limit flows to the stormwater system exists.

Current practice requires the property developer of new or redeveloped sites to limit peak discharges to the MS4 or receiving water system. This approach does not consider groundwater recharge or the effect of increased total volumes of water discharged to the MS4 and receiving water system. It also results in more pollutants, such as bacteria, reaching surface water that could otherwise be treated owner to limit volume to the system initially.

Rationale:
A method to reduce pollutants from entering the MS4 is to reduce the amount of directly connected impervious surface.

Measurable Goal:
Impervious surface limiting or reduction requirements within the PCRC program

Pollution Prevention & Good Housekeeping

Minimum Control Measure 6

Goal

Structure Marion County's operation and maintenance activities in the MS4 to prevent or reduce polluted runoff caused by county activities.

Measurable goals / Rationale for selection

These best management practices have been approved by the National Oceanic and Atmospheric Administration – Fisheries Division as they relate to routine road maintenance. The BMPs were re-submitted and subsequently approved in 2009. The evaluation of this minimum control measure will follow the evaluation process approved by NOAA-Fisheries. The evaluation tools include field inspections, map data analysis, and adaptive management techniques.

Programs & Practices

The following programs and best management practices have been implemented to meet the specific objectives of Marion County's pollution prevention plan. A summary of these programs, along with implementation information, can be found in **Table 6**.

Table 6 Programs and practices implemented to meet specific objectives of the county's pollution prevention plan.

Programs & Practices (BMPs)	Oversight	Implementation Schedule
6.1 Pollution Prevention / Good Housekeeping Program	MCPW	Permit Year 1-5; continuous
A. Pollution Prevention	MCPW	
B. Training Program	MCPW	See BMP 6.3
C. 1200 Z Facilities	MCPW	
D. Maintenance Schedules	MCPW	
E. Best Management Practices	MCPW	
6.2 Integrated Fish Passage Program	MCPW	Permit Year 1-5; as needed
A. Culvert Remediation	MCPW	
B. Stream-Crossing Culverts	MCPW	
C. Culvert Designs & Retrofits	MCPW	
6.3 BMP Training Program	MCPW	Permit Year 1-5; continuous

Best Management Practices:

6.1 Pollution Prevention / Good Housekeeping Program

A. Pollution Prevention Program

The Pollution Prevention Program is administered through MCPW Operations Division. The MCPW Environmental Specialist will work closely with MCPW staff to ensure that the Best Management Practices are properly applied and monitored.

B. Training Program

The training program described in the Best Management Practices section of this minimum control measure will use many of the same materials that will be used for outreach and education of the public. Stormwater training for crews will consist primarily of the training they receive on salmon

recovery BMPs, with some additional material relating directly to stormwater quality. Inspectors will attend erosion control training sessions when available.

C. 1200-Z Facilities
Marion County owns no 1200-Z permitted industrial facilities that are in the census-designated urban area or ultimately discharging to the MS4.

D. Maintenance Schedules
MCPW maintenance activities that have the potential to cause water quality problems (i.e. ditching, pesticide application, etc.) are typically done on an as-needed basis. This helps ensure that these activities are limited to only the amount necessary. Those activities intended to improve water quality (i.e. street sweeping, catch basin cleaning, etc.) will have a regular schedule for maintenance activities.

E. Best Management Practices
Best Management Practices will be used by MCPW Operations and Maintenance staff to prevent or reduce polluted runoff caused by county activities. These Best Management Practices are drawn from Marion County's Routine Road Maintenance manual, which has been reviewed by National Oceanic and Atmospheric Administration – Fisheries (NOAA-F) as part of the Limit 10 coverage under Section 4(d) of the Federal Endangered Species Act. Portions of the maintenance manual that were not relevant to the SWMP were deleted, but the original document format was preserved for the sake of continuity between Marion County's Clean Water Act and Endangered Species Act compliance efforts.

Rationale:
Integrate NPDES PH2 Pollution Prevention objectives with Limit 10 and 303(d) TMDL objectives in order to better address water quality issues that also relate to salmon recovery

Measurable goal:
- Train Marion County staff and crews on best management practices for clean water. The County will track the number of training sessions and monitor participation in the program.

6.2 Integrated Fish Passage Program

A. Culvert Remediation
Design new culverts and retrofit existing culverts to perform within the specifications described in ODFW standards, "Culvert Fish Passage Improvement: How to Retrofit/Remediate Existing Culverts That Don't Pass Fish."

B. Stream-Crossing Culverts
Culverts that cross streams must:

1. Pass the peak flow required by regulations in a manner that protects the road and culvert.
2. Have water velocities during all periods when listed fish move upstream in the system that is below that allowed for the juvenile fish species present during that period.
3. Have water depths during all periods when listed fish move upstream or downstream that are greater than the minimum allowable for the largest fish for that period.
4. Have entrance (for upstream migrating fish) jump heights during all periods when listed fish move upstream in the system that are less than the feasible entrance jump for the weakest fish species present during that period.

5. Have adequate durability so as to require maintenance at an economically feasible frequency (Culvert Hydraulics for Fish Passage, Marvin Pyles, 1998).

C. Culvert Designs & Retrofits:

Elements to be considered in the design or retrofit of culverts include

Fish species:	What are the passage requirements for the affected species?
Life stages:	Does this area provide habitat or passage for adults, juveniles, smolt, fry, or eggs?
Run timing:	When are the affected species present in the stream?
Hydrology:	What is the peak flow and low flow limits?
Hydraulics:	How will the water behave in the culvert and stream (velocity, direction, drops, pooling, etc.)?
Morphology:	How will the culvert type work with the stream flow, shape, and composition?
Construction:	Which type of culvert is most appropriate? How and when should it be placed? What sort of remediation is needed in the construction area?

6.3 BMP Training Program

Employees will be instructed on the elements of this plan, dependent upon their responsibilities with MCPW. The goals of the training program are:

1. To educate our staff on Best Management Practices (BMPs) to restore fish runs.
2. To educate our staff on the requirements of the Salmon Recovery Act.
3. To interest our staff so they take ownership.
4. To modify our practices to enhance fish runs.
5. To develop our standards to do so, and to establish what resources we need to stockpile.
6. To establish consistency throughout the County.
7. To provide sufficient training and information that staff members can suggest improvements to the recommended BMPs and other salmon recovery efforts.

Training on Best Management Practices has been divided in to six sections:

Course Contents	Crews to be instructed	Instructor
Overview, Road Maintenance, and Erosion Control	All Operations except for the Sign Shop, and Engineering	Operations Road Supervisors
Vegetation Management	All Operations Crews except for Fleet and the Sign Shop	Vegetation Supervisor
Bridge Maintenance	All Operations Crews except for Fleet and the Sign Shop	Bridges and Ferries Supervisor
Ferry Operations and Maintenance	Bridge Crew and Fleet	
Fleet Maintenance	All Operations	Fleet Supervisor
Park Operations and Maintenance	Juvenile Crew leaders	Parks Coordinator

Note: *All employees will be instructed to monitor their work activities and observe their work environment for any issues that may potentially threaten salmonids or cause a take. If any issues arise, employees are directed to immediately contact their supervisor or the Environmental Specialist. In emergency situations, where work stoppage is impractical, employees are directed to also determine any short-term remedies for the immediate*

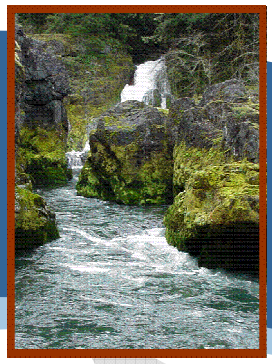
situation. In non-emergency situations, employees are directed to stop any activities directly threatening salmonids and work with their supervisor or the Environmental Specialist to address the issues.

The training program will be implemented as follows:

- Training will be documented in the existing training database. (Microsoft Access database, built by MCPW Information Technology staff, updated regularly upon receipt of new information, housed on the internal network.) This database provides a record of all formal training and professional development received by each staff member. These training sessions, performed by supervisory staff and consultants, will ensure that staff understands the intent and language of the best management practices.
- All field and engineering staff will be provided an overview of fish habitat needs, to encourage awareness and provide motivation to staff.
- New Operations field staff (maintenance staff) will receive instruction on the plan, with an emphasis on Best Management Practices, during departmental new-employee orientations.
- Engineering staff will be responsible for instructing contractors on appropriate BMPs.
- Appropriate staff members will attend training (seminars, conferences, workshops) around the state to increase their knowledge of fish passage, erosion control, hazardous materials spill response and handling, and the National Pollutant Discharge Elimination System Phase II. These staff members will integrate relevant material into CIPs, maintenance activities, and training of other staff.
- As new information, tools, activities, and educational materials are developed, they will be integrated into the training program. Marion County will actively look for and, when appropriate, develop these new resources.
- New information and improved practices will be covered at quarterly departmental meetings.
- Management, supervisory, and appropriate field staff will have direct access to this manual.

Stormwater Management Plan

Benchmarks



Benchmarking

Monitoring Process

Field Inspections

During BMP implementation, there will be field inspections of each major construction project to ensure compliance with BMPs and relevant environmental regulations. Additionally, the implementation of each category of BMPs will be inspected annually in the field. Any compliance problems observed during inspection will be resolved during, or shortly after, the inspection. The results of these inspections will be incorporated into the annual report. Complaints regarding PW activities - whether from PW staff, agency personnel or the public, will be investigated immediately, addressed appropriately, and incorporated in the annual report.

Staff allocations

Oversight for monitoring the implementation of BMPs in this report will be the responsibility of MCPW's Environmental Specialist. This individual, with appropriate staff support, will produce the biannual updates and work with the managers and supervisors to ensure that the annual reports are completed and outstanding issues resolved during the course of the year. The Environmental Specialist will also complete the comprehensive annual evaluations of BMP implementation and provide that document to NOAA-F upon request. Supervisory staff and management staff will be responsible for implementation of the BMPs in the field.

Documentation & Reporting

Biannual Updates

As part of the BMP implementation, there will be a biannual memorandum sent to all Public Works managers. This document will update those employees on developments in species listings, adjustment to BMPs and training programs, and provide a reminder of the implementation process.

Annual Reports and Program Evaluation

Division-specific, annual reports on BMP implementation will be produced by the heads of operations and engineering sections. This document will outline any unresolved problems that occurred during the course of the year and describe implementation problems that occurred on a regular basis. These reports will address each of the BMPs individually. In addition to supplying the annual BMP reports, management staff will meet annually to discuss the relevant implementation issues and ways to address potential problems. New technologies, techniques, and design standards will be presented at these meetings. This plan will be updated, as needed, at this time.

These meetings and division-specific reports will be summarized in a master document. This document will discuss the particular implementation problems and suggest changes in training and implementation strategies. This document will also evaluate relevant permit applications and progress in the overall salmon recovery program (including restoration efforts). It will provide a reference point for subsequent reports. This document will be provided to DEQ and NOAA-F annually, with the reporting cycle beginning upon acceptance of MCPW Limit 10 submittal and the March deadline for DEQ. These reports will be submitted to the Branch Chief of the Oregon State Branch of the Habitat Conservation Division, NOAA-F.

Process for Review

BMPs relating to stormwater quality in Marion County's MS4 are subject to change based on the annual review. Every five years, Marion County will evaluate the need to rewrite the salmon recovery manual. The decision will be made on the number of substantive changes needed and new technologies to be incorporated. This decision will be, in part, based on new information from NOAA-F, Marion County's annual salmon recover

reports, and new information from other sources regarding salmon recovery and BMPs. If management staff feels that substantial changes are required prior to that review process, those changes will be negotiated with NOAA-F.

Stormwater Management Plan

Appendices

A - Maps

Stormwater Management Area, SWMA

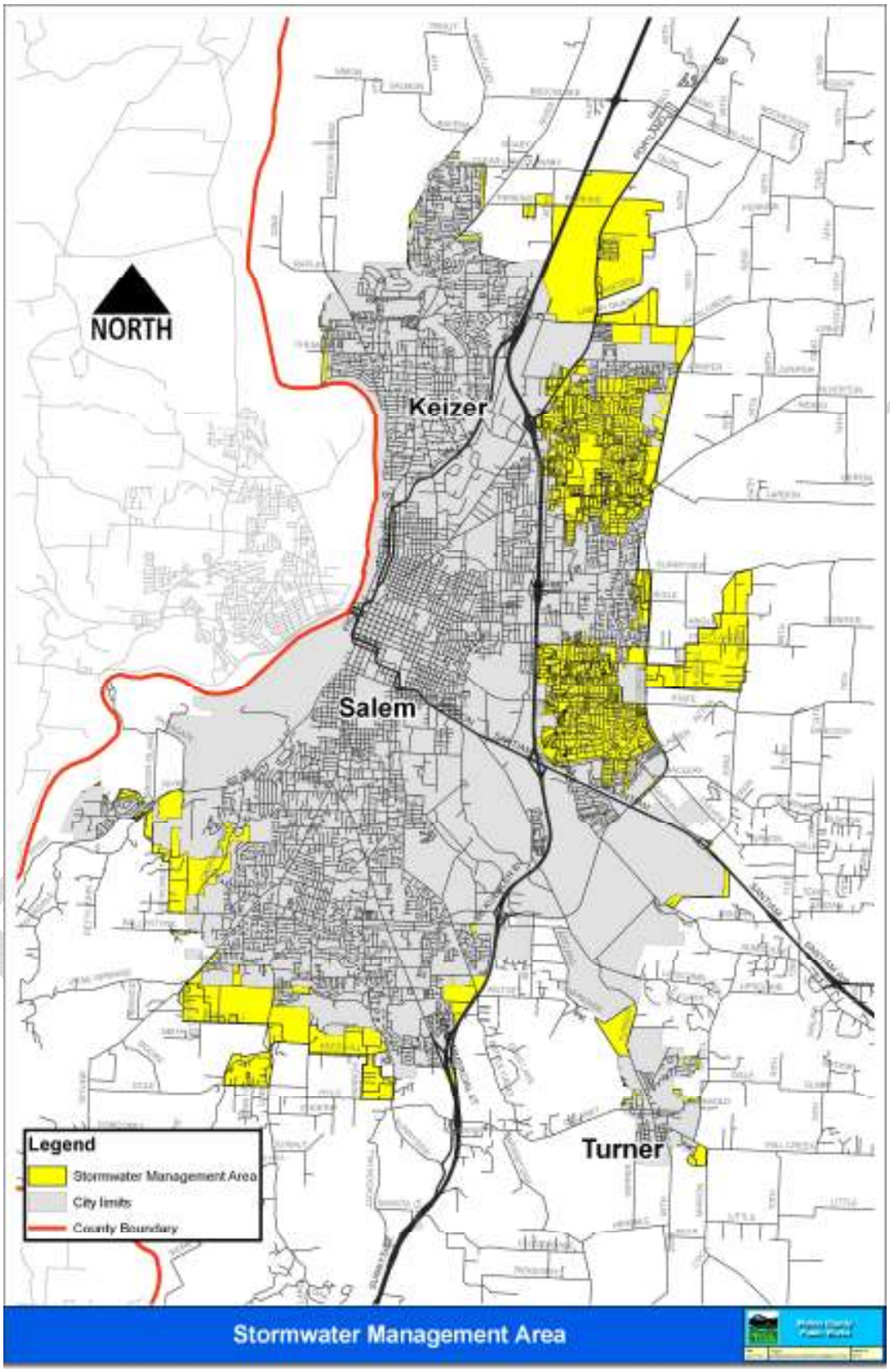
Land Use in the SWMA

Watersheds in the SWMA

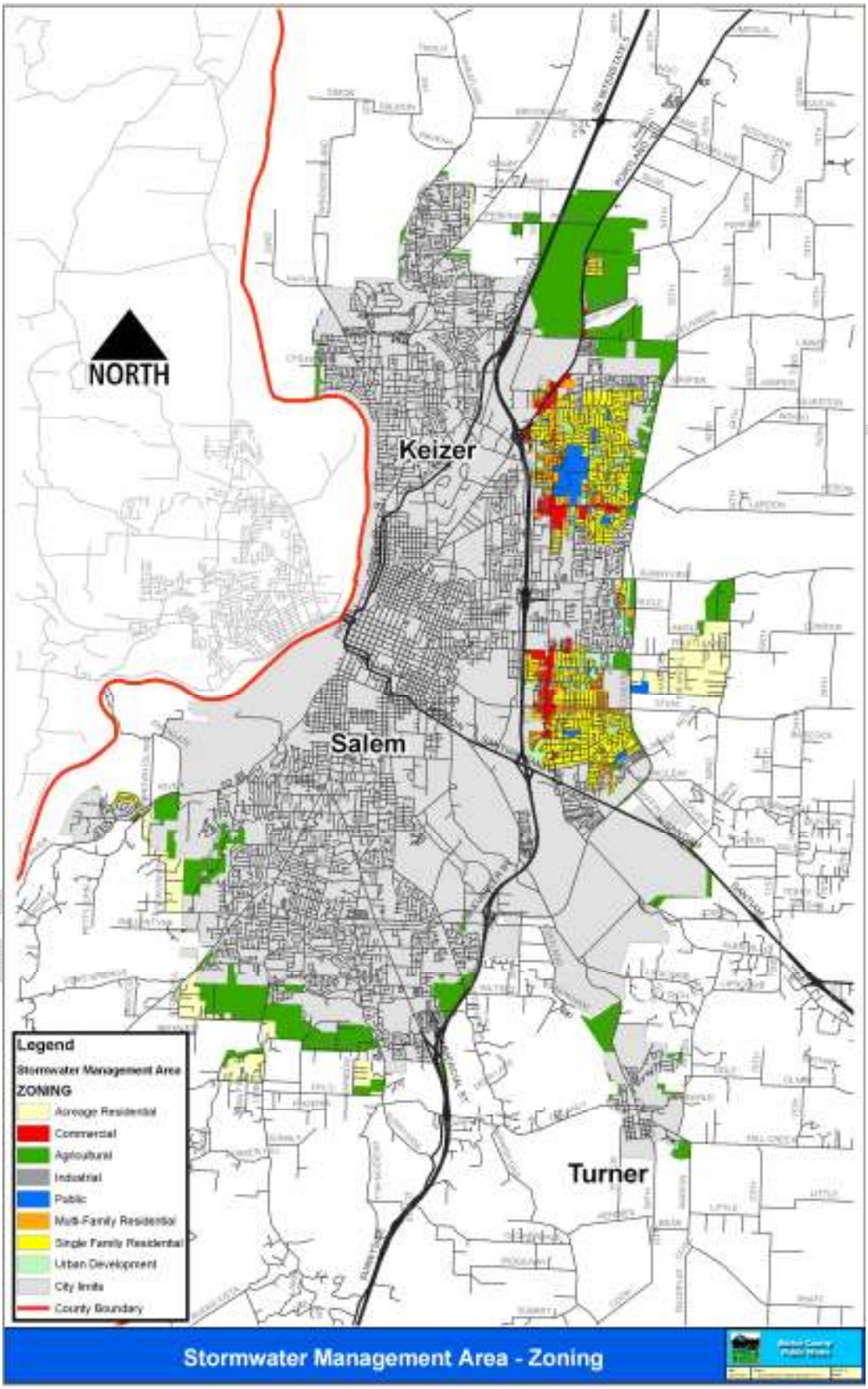
B - Water Quality Exceedences & Effects from Contaminants

Appendix A. Maps

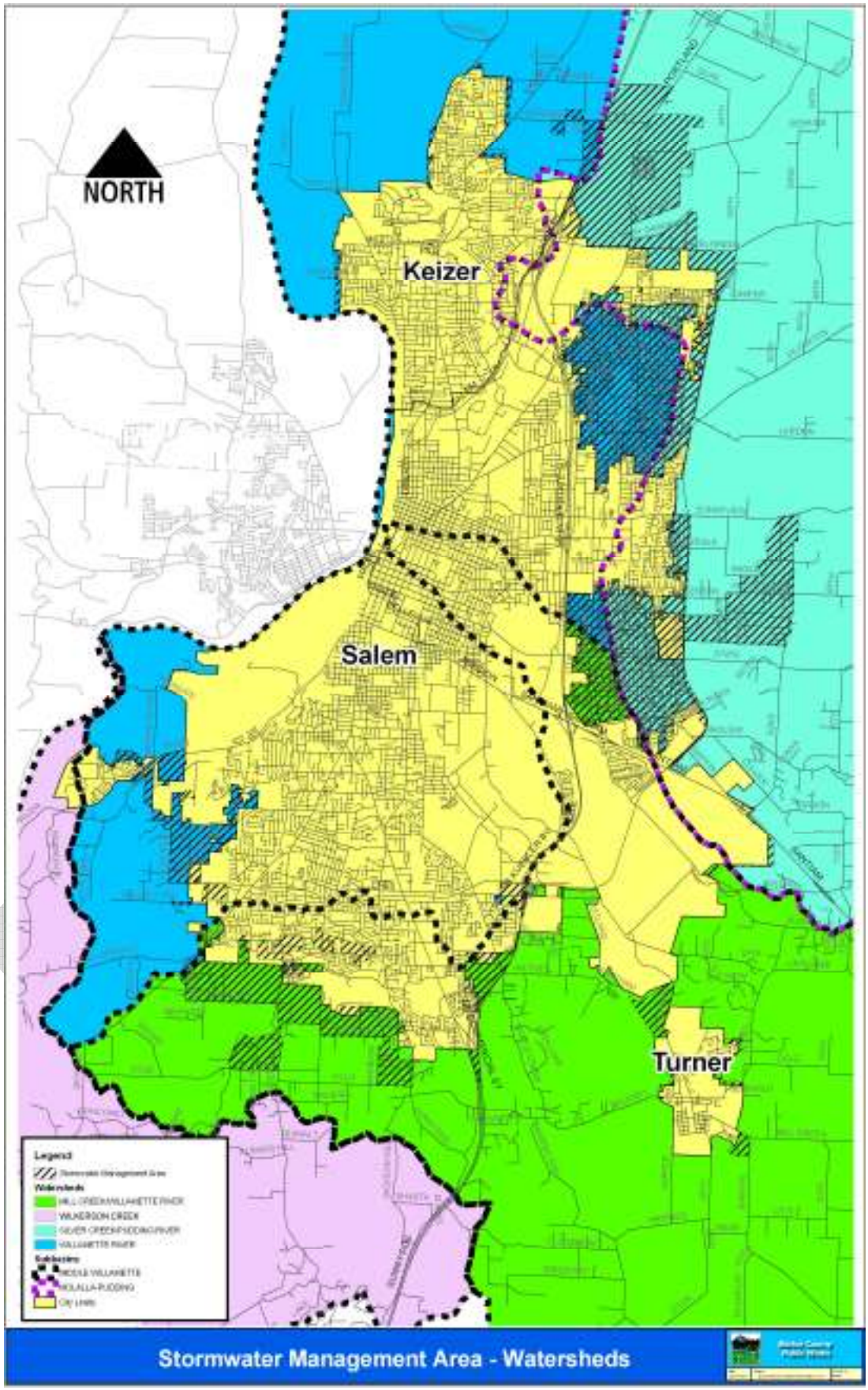
1. Marion County Stormwater Management Area (SWMA)



2. Marion County Land Use Zoning in the Stormwater Management Area



3. Watersheds in the Stormwater Management Area



Appendix B. Water Quality Exceedences & Effects from Contaminants

Materials for the following section are drawn from the following sources (formal citations follow each section).

- Oregon DEQ
- Agency for Toxic Substance and Disease Registry
- NASA Glenn Research Center
- Great Lakes Water Institute

Biological Criteria

Definition: "Biological Criteria" means numerical values or narrative expressions that describe the biological integrity of aquatic communities inhabiting waters of a given designated aquatic life use.

340-041-0027 Biological Criteria

Waters of the state shall be of sufficient quality to support aquatic species without detrimental changes in the resident biological communities.

(**SOURCE:** Oregon Administrative Rules: Chapter 340 Department of Environmental Quality, Water Pollution, Division 41 State-Wide Water Quality Management Plan; Beneficial Uses, Policies, Standards, and Treatment Criteria for Oregon, amended February 15, 2001)

Copper

What is copper?

What is copper? Copper is a reddish metal that occurs naturally in rocks, soil, water, and air. Copper also occurs naturally in plants and animals.

Metallic copper can be easily molded or shaped. Metallic copper can be found in the U.S. penny, electrical wiring, and some water pipes. Metallic copper is also found in mixtures (called alloys) with other metals such as brass and bronze. Copper is also found as part of other compounds forming salts. Copper salts occur naturally, but are also manufactured. The most common copper salt is copper sulfate. Most copper compounds are blue-green in color.

Copper compounds are commonly used in agriculture to treat plant diseases like mildew, for water treatment and, as preservatives for wood, leather, and fabrics.

What happens to copper when it enters the environment?

- Copper can enter the environment from the mining of copper and other metals and from factories that make or use metallic copper or copper compounds.
- It can also enter the environment through domestic waste water, combustion of fossil fuels and wastes, wood production, phosphate fertilizer production, and natural sources (e.g., windblown dust from soils, volcanoes, decaying vegetation, forest fires, and sea spray).
- Copper in soil strongly attaches to organic material and minerals.
- Copper that dissolves in water becomes rapidly bound to particles suspended in the water.
- Copper does not typically enter groundwater.
- Copper carried by particles emitted from smelters and ore processing plants is carried back to the ground by gravity or in rain or snow.
- Copper does not break down in the environment.

How might I be exposed to copper?

- Breathing air, drinking water, eating food, and by skin contact with soil, water, or other copper-containing substances.
- Some copper in the environment can be taken up by plants and animals.
- Higher exposure may occur if your water is corrosive and you have copper plumbing and brass water fixtures.
- You may be exposed to higher amounts of copper if you drink water or swim in lakes or reservoirs recently treated with copper to control algae or receive cooling water from a power plant that may have high amounts of dissolved copper.
- Using some garden products (e.g., fungicides) to control plant diseases.
- Living near bronze and brass production facilities may expose you to higher copper levels in soil.
- You may breathe copper-containing dust or have skin contact if you work in the industry of mining copper or processing the ore. You may breathe high levels if you grind or weld copper metal.

How can copper affect my health?

Copper is essential for good health, but high amounts can be harmful. Long-term exposure to copper dust can irritate your nose, mouth, and eyes, and cause headaches, dizziness, nausea, and diarrhea.

Drinking water with higher than normal levels of copper may cause vomiting, diarrhea, stomach cramps, and nausea. Intentionally high intakes of copper can cause liver and kidney damage and even death.

How likely is copper to cause cancer?

We do not know whether copper can cause cancer in humans. The EPA has determined that copper is not classifiable as to carcinogenicity.

How can copper affect children?

Exposure to high levels of copper will result in the same type of effects in children and adults. Studies in animals suggest that the young children may have more severe effects than adults; we do not know if this would also be true in humans. There is a very small percentage of infants and children who are unusually sensitive to copper.

We do not know if copper can cause birth defects or other developmental effects in humans. Studies in animals suggest that ingestion of high levels of copper may cause a decrease in fetal growth.

How can families reduce the risk of exposure to copper?

- The greatest potential source of copper exposure is through drinking water, especially in water that is first drawn in the morning after sitting in copper pipes and brass faucets overnight.
- To reduce exposure, run the water for at least 15-30 seconds before using it.
- If you are exposed to copper at work, you may carry copper home on your skin, clothes, or tools. You can avoid this by showering, and changing clothing before leaving work, and your work clothes should be kept separate from other clothes and laundered separately.

Is there a medical test to show whether I've been exposed to copper?

Copper is normally found in all tissues of the body, blood, urine, feces, hair, and nails. High levels of copper in these samples can show that you have been exposed to higher than normal levels of copper. Tests to measure copper levels in the body are not routinely available at the doctor's office because they require special equipment. These tests cannot tell the extent of exposure or whether you will experience harmful effects.

Has the federal government made recommendations to protect human health?

The EPA has determined that drinking water should not contain more than 1.3 milligrams of copper per liter of water (1.3 mg/L).
The Occupational Safety and Health Administration (OSHA) has set a limit of 0.1 mg per cubic meter (0.1 mg/m^3) of copper fumes (vapor generated from heating copper) and 1 mg/m^3 of copper dusts (fine metallic copper particles) and mists (aerosol of soluble copper) in workroom air during an 8-hour work shift, 40-hour workweek.

The Food and Nutrition Board of the Institute of Medicine recommends dietary allowances (RDAs) of 340 micrograms (340 µg) of copper per day for children aged 1-3 years, 440 g/day for children aged 4-8 years, 700 µg/day for children aged 9-13 years, 890 µg/day for children aged 14-18 years, and 900 g/day for adults.

References

Agency for Toxic Substances and Disease Registry (ATSDR). 2002. Toxicological Profile for copper. *Draft for Public Comment*. Atlanta, GA: U.S. Department of Health and Human Services, Public Health Service.

Oregon Water Quality Standards for Copper

	Current	Proposed
DEQ Acute:	18	14
DEQ Chronic:	12	9.3

(Total recoverable concentration; function of hardness; assumes hardness is 100mg/L)

Dieldrin

What are aldrin and dieldrin?

Aldrin and dieldrin are insecticides with similar chemical structures. They are discussed together in this fact sheet because aldrin quickly breaks down to dieldrin in the body and in the environment. Pure aldrin and dieldrin are white powders with a mild chemical odor. The less pure commercial powders have a tan color. Neither substance occurs naturally in the environment

From the 1950s until 1970, aldrin and dieldrin were widely used pesticides for crops like corn and cotton. Because of concerns about damage to the environment and potentially to human health, EPA banned all uses of aldrin and dieldrin in 1974, except to control termites. In 1987, EPA banned all uses.

What happens to aldrin and dieldrin when they enter the environment?

- Sunlight and bacteria change aldrin to dieldrin so that we mostly find dieldrin in the environment.
- They bind tightly to soil and slowly evaporate to the air.
- Dieldrin in soil and water breaks down very slowly.
- Plants take in and store aldrin and dieldrin from the soil.
- Aldrin rapidly changes to dieldrin in plants and animals.
- Dieldrin is stored in the fat and leaves the body very slowly.

How might I be exposed to aldrin and dieldrin?

- Dieldrin is everywhere in the environment, but at very low levels.
- Eating food like fish or shellfish from lakes or streams contaminated with either chemical, or contaminated root crops, dairy products, or meats.
- Air, surface water, or soil near waste sites may contain higher levels.
- Living in homes that were once treated with aldrin or dieldrin to control termites.

How can aldrin and dieldrin affect my health?
People who intentionally or accidentally ingested large amounts of aldrin or dieldrin suffered convulsions and some died. Health effects may also occur after a longer period of exposure to smaller amounts because these chemicals build up in the body.

Some workers exposed to moderate levels in the air for a long time had headaches, dizziness, irritability, vomiting, and uncontrolled muscle movements. Workers removed from the source of exposure rapidly recovered from most of these effects.

Animals exposed to high amounts of aldrin or dieldrin also had nervous system effects. In animals, oral exposure to lower levels for a long period also affected the liver and decreased their ability to fight infections. We do not know whether aldrin or dieldrin affect the ability of people to fight disease.

Studies in animals have given conflicting results about whether aldrin and dieldrin affect reproduction in male animals and whether these chemicals may damage the sperm. We do not know whether aldrin or dieldrin affect reproduction in humans.

How likely are aldrin and dieldrin to cause cancer?
There is no conclusive evidence that aldrin or dieldrin cause cancer in humans. Aldrin and dieldrin have shown to cause liver cancer in mice. The International Agency for Research on Cancer (IARC) has determined that aldrin and dieldrin are not classifiable as to human carcinogenicity. The EPA has determined that aldrin and dieldrin are probable human carcinogens.

How can aldrin and dieldrin affect children?
Children can be exposed to aldrin and dieldrin in the same way as adults. There are no known unique exposure pathways for children. Children who swallowed amounts of aldrin or dieldrin much larger than those found in the environment suffered convulsions and some died, as occurred in adults. However, we do not know whether children are more susceptible than adults to the effects of aldrin or dieldrin.

We do not know whether aldrin or dieldrin cause birth defects in humans. Pregnant animals that ingested aldrin or dieldrin had some babies with low birth weight and some with alterations in the skeleton. Dieldrin has been found in human breast milk, therefore, it can be passed to suckling infants.

How can families reduce their risk for exposure to aldrin and dieldrin?
- Since aldrin and dieldrin are no longer produced or used, exposure to these compounds will occur only from past usage.
- Because aldrin and dieldrin were applied to the basement of some homes for termite protection, before buying a home, families should investigate what, if any, pesticides have been used within the home.

Is there a medical test to show whether I've been exposed to aldrin and dieldrin?
There are laboratory tests that can measure aldrin and dieldrin in your blood, urine, and body tissues. Because aldrin changes to dieldrin fairly quickly in the body, the test has to be done shortly after you are exposed to aldrin. Since dieldrin can stay in the body for months, measurements of dieldrin can be made much longer after exposure to either aldrin or dieldrin. The tests cannot tell you whether harmful health effects will occur. These tests are not routinely available at the doctor's office because they require special equipment.

Has the federal government made recommendations to protect human health?
The EPA limits the amount of aldrin and dieldrin that may be present in drinking water to 0.001 and 0.002 milligrams per liter (mg/L) of water, respectively, for protection against health effects other than cancer. The

EPA has determined that a concentration of aldrin and dieldrin of 0.0002 mg/L in drinking water limits the lifetime risk of developing cancer from exposure to each compound to 1 in 10,000.

The Occupational Safety and Health Administration (OSHA) sets a maximum average of 0.25 milligrams of aldrin and dieldrin per cubic meter of air (0.25 mg/m³) in the workplace during an 8-hour shift, 40 hour week. The National Institute for Occupational Safety and Health (NIOSH) also recommends a limit of 0.25 mg/m³ for both compounds for up to a 10-hour work day, 40-hour week.

The Food and Drug Administration (FDA) regulates the residues of aldrin and dieldrin in raw foods. The allowable range is from 0 to 0.1 ppm, depending on the type of food product.

References

Agency for Toxic Substances and Disease Registry (ATSDR). 2002. Toxicological Profile for aldrin and dieldrin. Atlanta, GA: U.S. Department of Health and Human Services, Public Health Service.

	Current	Proposed
DEQ Acute:	2.5	0.24
DEQ Chronic:	0.0019	0.056
(mg/L)		

Dissolved Oxygen

An adequate supply of dissolved oxygen gas is essential for the survival of aquatic organisms. A deficiency in this area is a sign of an unhealthy river. There are a variety of factors affecting levels of dissolved oxygen. The atmosphere is a major source of dissolved oxygen in river water. Waves and tumbling water mix atmospheric oxygen with river water. Oxygen is also produced by rooted aquatic plants and algae as a product of photosynthesis.

There are physical factors that can lessen the amount of oxygen dissolved… High temperatures, which may result from high turbidity, from the return of industrially used water to the river (the phenomenon of thermal pollution), or from dry periods, decrease the amount of gases that can be dissolved in water. Dry periods also decrease flow which reduces the amount of oxygen churned into the water.

Bacteria which decompose plant material and animal waste consume dissolved oxygen, thus decreasing the quantity available to support life. Ironically, it is life in the form of plants and algae that grow uncontrolled due to fertilizer that leads to the masses of decaying plant matter.

Too much dissolved oxygen is not healthy, either. Extremely high levels of dissolved oxygen usually result from photosynthesis by a large amount of plants. Great uncontrolled plant growth, especially algal blooms, is often the result of fertilizer runoff. This phenomenon is called cultural eutrophication.

Dissolved oxygen levels in sections of … river(s) in which plants are the major contributor of oxygen fall sharply at night because photosynthesis ceases (NASA Glenn Research Center, Website: http://www.grc.nasa.gov/WWW/K-12/fenlewis/Waterquality.html, 2004).

E Coli Bacteria and Fecal Coliform Bacteria

Sources of *E. coli* (and Fecal Coliform bacteria) in Surface Waters

Agricultural runoff, urban stormwater and sewage overflows are all potential sources of contamination in waterways. Detecting contamination is relatively simple compared to the challenge of identifying where such contamination may originate. Fecal coliforms and *E. coli* are bacteria commonly used in water quality testing to detect fecal pollution. These organisms are present in high numbers in the gastrointestinal tract of almost all warm-blooded animals, and are therefore easy to detect in feces-contaminated water. Fecal coliforms and *E. coli* generally do not pose the actual health risk, but rather demonstrate the presence of fecal matter, which may carry numerous pathogenic (disease causing) organisms. The USEPA has determined that if levels of *E. coli* exceed 235 organisms (Colony Forming Unit or CFU) per 100 mL of water, a health risk to humans may exist and recreational waters should be closed to the public.

Sewage Overflows

Human fecal pollution in urban areas is largely attributed to sewage overflows *(Failed septic systems and illegal septic hookups can also contribute).* There are two types of sewage overflows; sanitary sewer overflows (SSOs), and combined sewer overflows (CSOs). SSOs are the release of untreated sewage from municipal sanitary sewers directly into surface water bodies. There are numerous causes of SSOs including extreme weather, system failure, incorrect system operation and maintenance, and vandalism. Combined sewer systems carry both sanitary sewage and stormwater to a treatment plant. During wet-weather periods these combined systems may exceed their holding capacity due to the increased amount of stormwater entering the system, and, as a result, this combined sewage is discharged directly into the nearby surface waters. *E. coli* levels in sewage discharge have been found to reach 500,000 CFU/ 100 mL for an SSO, and 250,000 CFU/ 100 mL from a CSO.

Stormwater Runoff

Stormwater is a major contributor of bacterial and chemical non-point source pollution in watersheds. Urban and suburban areas generate higher volumes and more highly polluted stormwater runoff than land covered in natural vegetation due to the amount of pavement and rooftops (impervious surfaces) in developed areas. *E. coli* levels in urban stormwater can reach as high as 100,000 CFU/ 100 mL.

Agricultural Runoff

Fecal contamination from agricultural animal runoff poses an additional threat to water quality. *E. coli* levels from feedlot runoff typically ranges from 10,000 to 100,000 CFU/ 100mL and is accompanied by nutrient and sediment contaminants.

Wildlife

Localized inputs of fecal bacteria from wildlife, such as waterfowl roosting on shorelines, can negatively impact water quality. According to a study conducted by our laboratory at a Milwaukee beach on Lake Michigan, *E. coli* levels reaching over 27,000 CFU/ 100 mL were found in an area where gulls routinely roost (Great Lakes Water Institute, Website: http://www.uwm.edu/Dept/GLWI/ecoli/sources%20of%20ecoli%20in%20water.htm, 2004).

Iron

Excessive iron in surface water can exacerbate dissolved oxygen problems in water quality limited streams. Reduction of iron in surface water can increase the amount of dissolved oxygen available to aquatic organisms. Iron exceedences can often be traced to sedimentation from erosion.

	Current	Proposed
DEQ Acute:	na	na
DEQ Chronic:	1000	1000
(mg/L)		

Lead

What is lead?

Lead is a naturally occurring bluish-gray metal found in small amounts in the earth's crust. Lead can be found in all parts of our environment. Much of it comes from human activities including burning fossil fuels, mining, and manufacturing.

Lead has many different uses. It is used in the production of batteries, ammunition, metal products (solder and pipes), and devices to shield X-rays.

Because of health concerns, lead from gasoline, paints and ceramic products, caulking, and pipe solder has been dramatically reduced in recent years.

What happens to lead when it enters the environment?

- Lead itself does not break down, but lead compounds are changed by sunlight, air, and water.
- When lead is released to the air, it may travel long distances before settling to the ground.
- Once lead falls onto soil, it usually sticks to soil particles.
- Movement of lead from soil into groundwater will depend on the type of lead compound and the characteristics of the soil.
- Much of the lead in inner-city soils comes from old houses painted with lead-based paint.

How might I be exposed to lead?

- Eating food or drinking water that contains lead.
- Spending time in areas where lead-based paints have been used and are deteriorating.
- Working in a job where lead is used.
- Using health-care products or folk remedies that contain lead.
- Engaging in certain hobbies in which lead is used (for example, stained glass).

How can lead affect my health?

Lead can affect almost every organ and system in your body. The most sensitive is the central nervous system, particularly in children. Lead also damages kidneys and the reproductive system. The effects are the same whether it is breathed or swallowed.

At high levels, lead may decrease reaction time, cause weakness in fingers, wrists, or ankles, and possibly affect the memory. Lead may cause anemia, a disorder of the blood. It can also damage the male reproductive system. The connection between these effects and exposure to low levels of lead is uncertain.

How likely is lead to cause cancer?

The Department of Health and Human Services has determined that lead acetate and lead phosphate may reasonably be anticipated to be carcinogens based on studies in animals.

There is inadequate evidence to clearly determine lead's carcinogenicity in people.

How does lead affect children?
Small children can be exposed by eating lead-based paint chips, chewing on objects painted with lead-based paint or swallowing house dust or soil that contains lead. Children are more vulnerable to lead poisoning than adults. A child who swallows large amounts of lead may develop blood anemia, severe stomachache, muscle weakness, and brain damage. A large amount of lead might get into a child's body if the child ate small pieces of old paint that contained large amounts of lead. If a child swallows smaller amounts of lead, much less severe effects on blood and brain function may occur. Even at much lower levels of exposure, lead can affect a child's mental and physical growth.

Exposure to lead is more dangerous for young and unborn children. Unborn children can be exposed to lead through their mothers. Harmful effects include premature births, smaller babies, decreased mental ability in the infant, learning difficulties, and reduced growth in young children. These effects are more common if the mother or baby was exposed to high levels of lead.

How can families reduce the risk of exposure to lead?
- Avoid exposure to sources of lead.
- Do not allow children to chew or mouth painted surfaces that may have been painted with lead-based paint (homes built before 1978).
- Run your water for 15 to 30 seconds before drinking or cooking with it. This will get rid of lead that may have leached out of pipes.
- Some types of paints and pigments that are used as make-up or hair coloring contain lead.
- Keep these kinds of products away from children.
- Wash children's hands and faces often to remove lead dusts and soil, and regularly clean the house of dust and tracked in soil.

Is there a medical test to show whether I've been exposed to lead?
A blood test is available to measure the amount of lead in your blood and to estimate the amount of your exposure to lead. Blood tests are commonly used to screen children for lead poisoning. Lead in teeth and bones can be measured with X-rays, but this test is not as readily available. Medical treatment may be necessary in children if the lead concentration in blood is higher than 45 micrograms per deciliter (45 µg/dL).

Has the federal government made recommendations to protect human health?
The Centers for Disease Control and Prevention (CDC) recommends that children ages 1 and 2 be screened for lead poisoning. Children who are 3 to 6 years old should be tested for lead if they have never been tested for lead before and if they receive services from public assistance programs; if they live in or regularly visit a building built before 1950; if they live in or visit a home built before 1978 that is being remodeled; or if they have a brother, sister, or playmate who has had lead poisoning. CDC considers children to have an elevated level of lead if the amount in the blood is 10 µg/dL. The EPA requires lead in air not to exceed 1.5 micrograms per cubic meter (1.5 µg/m^3) averaged over 3 months. EPA limits lead in drinking water to 15 µg per liter.

The Occupational Health and Safety Administration (OSHA) develops regulations for workers exposed to lead. The Clean Air Act Amendments of 1990 banned the sale of leaded gasoline. The Federal Hazardous Substance Act bans children's products that contain hazardous amounts of lead.

References
Agency for Toxic Substances and Disease Registry (ATSDR). 1999. Toxicological Profile for lead. Atlanta, GA: U.S. Department of Health and Human Services, Public Health Service.

Oregon Water Quality Standards for Lead

	Current	Proposed
DEQ Acute:	82	82
DEQ Chronic:	82	82
(mg/L)		

Mercury

What is mercury?

Mercury is a naturally occurring metal, which has several forms. The metallic mercury is a shiny, silver-white, odorless liquid. If heated, it is a colorless, odorless gas.

Mercury combines with other elements, such as chlorine, sulfur, or oxygen, to form inorganic mercury compounds or "salts," which are usually white powders or crystals. Mercury also combines with carbon to make organic mercury compounds. The most common one, methylmercury, is produced mainly by microscopic organisms in the water and soil. More mercury in the environment can increase the amounts of methylmercury that these small organisms make.

Metallic mercury is used to produce chlorine gas and caustic soda, and is also used in thermometers, dental fillings, and batteries. Mercury salts are sometimes used in skin lightening creams and as antiseptic creams and ointments.

What happens to mercury when it enters the environment?

- Inorganic mercury (metallic mercury and inorganic mercury compounds) enters the air from mining ore deposits, burning coal and waste, and from manufacturing plants.
- It enters the water or soil from natural deposits, disposal of wastes, and volcanic activity.
- Methylmercury may be formed in water and soil by small organisms called bacteria.
- Methylmercury builds up in the tissues of fish. Larger and older fish tend to have the highest levels of mercury.

How might I be exposed to mercury?

- Eating fish or shellfish contaminated with methylmercury.
- Breathing vapors in air from spills, incinerators, and industries that burn mercury-containing fuels.
- Release of mercury from dental work and medical treatments.
- Breathing contaminated workplace air or skin contact during use in the workplace (dental, health services, chemical, and other industries that use mercury).
- Practicing rituals that include mercury.

How can mercury affect my health?

The nervous system is very sensitive to all forms of mercury. Methylmercury and metallic mercury vapors are more harmful than other forms, because more mercury in these forms reaches the brain. Exposure to high levels of metallic, inorganic, or organic mercury can permanently damage the brain, kidneys, and developing fetus. Effects on brain functioning may result in irritability, shyness, tremors, changes in vision or hearing, and memory problems.

Short-term exposure to high levels of metallic mercury vapors may cause effects including lung damage, nausea, vomiting, diarrhea, increases in blood pressure or heart rate, skin rashes, and eye irritation.

How likely is mercury to cause cancer?
There are inadequate human cancer data available for all forms of mercury. Mercuric chloride has caused increases in several types of tumors in rats and mice, and methylmercury has caused kidney tumors in male mice. The EPA has determined that mercuric chloride and methylmercury are possible human carcinogens.

How does mercury affect children?
Very young children are more sensitive to mercury than adults. Mercury in the mother's body passes to the fetus and may accumulate there. It can also pass to a nursing infant through breast milk. However, the benefits of breast feeding may be greater than the possible adverse effects of mercury in breast milk.

Mercury's harmful effects that may be passed from the mother to the fetus include brain damage, mental retardation, incoordination, blindness, seizures, and inability to speak. Children poisoned by mercury may develop problems of their nervous and digestive systems, and kidney damage.

How can families reduce the risk of exposure to mercury?
Carefully handle and dispose of products that contain mercury, such as thermometers or fluorescent light bulbs. Do not vacuum up spilled mercury, because it will vaporize and increase exposure. If a large amount of mercury has been spilled, contact your health department. Teach children not to play with shiny, silver liquids.

Properly dispose of older medicines that contain mercury. Keep all mercury-containing medicines away from children. Pregnant women and children should keep away from rooms where liquid mercury has been used.

Learn about wildlife and fish advisories in your area from your public health or natural resources department.

Is there a medical test to show whether I've been exposed to mercury?
Tests are available to measure mercury levels in the body. Blood or urine samples are used to test for exposure to metallic mercury and to inorganic forms of mercury. Mercury in whole blood or in scalp hair is measured to determine exposure to methylmercury. Your doctor can take samples and send them to a testing laboratory.

Has the federal government made recommendations to protect human health?
The EPA has set a limit of 2 parts of mercury per billion parts of drinking water (2 ppb).
The Food and Drug Administration (FDA) has set a maximum permissible level of 1 part of methylmercury in a million parts of seafood (1 ppm).

The Occupational Safety and Health Administration (OSHA) has set limits of 0.1 milligram of organic mercury per cubic meter of workplace air (0.1 mg/m^3) and 0.05 mg/m^3 of metallic mercury vapor for 8-hour shifts and 40-hour work weeks.

References
Agency for Toxic Substances and Disease Registry (ATSDR). 1999. Managing Hazardous Materials Incidents. Volume III – Medical Management Guidelines for Acute Chemical Exposures: Mercury. Atlanta, GA: U.S. Department of Health and Human Services, Public Health Service.

Oregon Water Quality Standards for Mercury

	Current	Proposed
DEQ Acute:	2.4	1.6
DEQ Chronic:	0.012	0.91
(mg/L)		

Temperature

OREGON's EXISTING WATER QUALITY CRITERIA FOR STREAM TEMPERATURE

(ODEQ, Website:
http://www.deq.state.or.us/wq/standards/TempCriteriaGuide.pdf, 2004)

June 4, 2003

Introduction

Over 30 years ago, Oregon designated "cold water salmonid habitat" as the applicable beneficial use for most of its state surface waters. The current Oregon water quality criteria, adopted by the Environmental Quality Commission on January 11, 1996, are primarily intended to protect this beneficial use. Thus portions of the criteria are directly tied to the cold water biological needs of salmonids at their different life stages.

The criteria are consistent with the goals and objectives of the Oregon Plan for Salmon and Watersheds and apply to both point and nonpoint sources. In addition, the criteria are uniquely intended to be applied on a watershed or subbasin basis. In adopting the criteria, DEQ and the Environmental Quality Commission intended to minimize risk of anthropogenic warming on cold water aquatic ecosystems, encourage restoration of these ecosystems by reversing the warming trend and cooling many of the State's waters, and control extremes in temperature fluctuations from human activities. Extreme fluctuations in stream temperatures can result in thermal shock to exposed fish.

The Temperature Criteria

Oregon has six independent narrative and numeric temperature criteria that protect cold water important to salmonids.

First, human (point and nonpoint source) activities that cause a "measurable increase" in ambient stream temperature are prohibited in waters identified by DEQ as cold water refugia for temperature-sensitive fish [see OAR 340-041-subbasin(2)(b)(A)(vi), and see the cold water refugia definition at OAR 340-041-006(57)]. In addition these areas supply cold water to downstream reaches that might otherwise be warmer.

Second, proposed new or increased discharges from point sources, and discharges from dams that may warm waters that meet or are colder than the numeric triggers in item six below, can only be authorized if DEQ (or in the case of agriculture and forestry, the Oregon Department of Agriculture and the Oregon Department of Forestry respectively), through an antidegradation analysis, determines that the benefits of this warming outweigh the adverse water quality consequences of warming the waters [see OAR 340-041-120(11)(g)].

Third, all dischargers to all State waters must use the highest and best practicable treatment or controls to minimize their heat load to the river [see OAR 340-041-subbasin(1)].

Fourth, human (point and nonpoint source) activities are prohibited from causing a "measurable increase" in ambient temperatures in a natural lake [see OAR 340-041-subbasin(2)(b)(A)(ix)].

Fifth, human (point and nonpoint source) activities that cause a "measurable increase" above background stream temperatures are prohibited if any federal threatened or endangered species (including listed salmonids) are present in the stream unless the source can demonstrate that the temperature increase will not impair the biological integrity of the threatened or endangered species' stream population [see OAR 340-041-subbasin(2)(b)(A)(vii)].

Sixth, human (point and nonpoint source) activities are prohibited from causing a "measurable increase" in stream temperature if **ANY ONE** of the following numeric triggers is exceeded [see OAR 340-041-subbasin(2)(b)(A)(i-v)]:.

- Salmonids are spawning, or eggs are incubating, or juvenile (fry) are emerging and the stream temperature rises above a 7 day average of daily maximum water temperatures of 55 degrees F (12.8 C).
- Salmonid juveniles are rearing (growing) in the subbasin, and the stream temperature rises above a 7 day average of daily maximum water temperatures of 64 degrees F (17.8 C) at the mouth of the subbasin.
- Bull trout are spawning or rearing (regardless of time of year) and the stream temperature rises above a 7 day average of daily maximum water temperatures of 50 degrees F (10 C). However, this provision does not apply to adult bull trout migrating and feeding in lower river reaches.
- The dissolved oxygen levels in streams or spawning gravels are within 0.5 mg/l of 6 mg/l, or less than 10% of saturation, whichever occurs first.
- The lower portions of the Willamette (first 50 miles) and Columbia (first 309 miles) Rivers have special provisions regardless of salmonid activities. The "no measurable increase" is triggered in these waters when stream temperatures rise above a 7-day average of daily maximum water temperatures of 68 degrees F (20C).

Note that in practice, these bulleted criteria are trumped by the fifth criteria above since most of the State's waters are threatened or endangered salmonid's habitat. DEQ assumes that any increase of anthropogenic heat will adversely impair the biological integrity of the species present.

DEQ and the Commission recognize that stream temperatures may naturally exceed the numeric triggers due to exposure to solar radiation, natural low flow conditions, or other similar natural influences. These circumstances are addressed in the criteria by the following:

The "no measurable increase" criteria are NOT violated if the warming is attributed to natural (non-anthropogenic) sources. State waters will neither be listed as "impaired," nor have a TMDL performed if the temperature exceedance is known to be solely due to one or more of these "natural conditions." Further, if a water body is listed and a TMDL analysis determines that the cause of the impairment is "natural," the TMDL process will conclude and the water body will be de-listed.
Similarly, the criteria are not violated if a water body only exceeds the numeric triggers during the warmest ten (10) percent of the historic maximum weekly maximum air temperatures.

Sources may petition DEQ for a 1 degree F increase, or alternatively may petition the Environmental Quality Commission for a greater variance to allow an increase of > 1 degree F if the source can demonstrate that all of the following are true [see OAR 340-041-subbasin(2)(b)(C)]:

- The source is doing all it can reasonably do to reduce temperatures,

- The salmonid use of the stream will not be significantly impacted, and
- The environmental costs of further temperature reductions outweigh the benefits of those reductions.

These variances also require EPA approval prior to implementation and must be re-approved by both DEQ or Environmental Quality Commission, and EPA every five (5) years.

Determining Temperature Impairment, Preparing TMDLs and Implementation Mechanisms
DEQ uses the biologically-based, numeric temperature triggers to list State waters as impaired or "water quality limited" for temperature. Once a TMDL has been completed for the listed water, it will be de-listed.

DEQ performs a TMDL analysis, currently including stream temperature modeling, to determine the thermal potential of the watershed. Thermal potential is the estimated stream temperatures that are expected after removing all reversible sources of heat, and accounting for local weather and other environmental factors in a specific watershed. DEQ frequently uses "effective shade" and geomorphology improvements as surrogates in lieu of heat (e.g., temperature or BTUs) in its TMDLs. DEQ will also use these surrogates for periodically measuring progress toward the TMDL goals.

If DEQ determines that the watershed's thermal potential (measured at the mouth of the watershed) is or could be colder than the numeric triggers, DEQ may, after establishing an adequate margin of safety, allocate this available heat load between point and nonpoint sources throughout the subbasin. In the case of point sources, the no measurable increase applies at the edge of a properly calculated mixing zone.

Thermal potential is not intended to return the stream to pre-settlement conditions. Therefore, if DEQ determines that the watershed's thermal potential is warmer than the numeric temperature triggers, the thermal potential determination supersedes the numeric triggers for all future purposes. Point and nonpoint sources are expected to achieve the assessed thermal potential rather than the original numeric trigger(s).

When the numeric triggers are exceeded, all sources in the subbasin needing to reduce their heat loading must prepare and submit a temperature management plan. The temperature management plan must contain the steps to be taken and a specific schedule for these steps to reduce the source's heat contributions.

Permits for point sources, including urban stormwater sources, should incorporate temperature management plans as an enforceable condition of the source's NPDES permit. Non-NPDES urban communities must also develop a temperature management plan to address stormwater discharges that contribute to stream temperature increases.

In the case of agriculture and forestry, the agricultural water quality management plans (SB 1010 plans) and the implementation of the Forest Practices Act and its rules satisfies the need for a temperature management plan. However, DEQ will look to the Oregon Department of Agriculture and the Oregon Department of Forestry to periodically revise
its rules and policies to ensure these control mechanisms are effective at reducing stream temperature. For all sources, compliance with the applicable and approved temperature management plan is deemed compliance with water quality criteria.

Although all anthropogenic sources of heat contribute to the overall subbasin warming, each source is only responsible for ensuring that its discharge meets the temperature requirements in their approved temperature management plans, consistent with the allocation in the completed TMDL. If each source reduces or eliminates its contribution, the subbasin stream temperatures will cool. (Oregon DEQ)

Zinc

What is zinc?

Zinc is one of the most common elements in the earth's crust. It's found in air, soil, and water, and is present in all foods. Pure zinc is a bluish-white shiny metal.

Zinc has many commercial uses as coatings to prevent rust, in dry cell batteries, and mixed with other metals to make alloys like brass and bronze. A zinc and copper alloy is used to make pennies in the United States.

Zinc combines with other elements to form zinc compounds. Common zinc compounds found at hazardous waste sites include zinc chloride, zinc oxide, zinc sulfate, and zinc sulfide. Zinc compounds are widely used in industry to make paint, rubber, dye, wood preservatives, and ointments.

What happens to zinc when it enters the environment?

- Some is released into the environment by natural processes, but most comes from activities of people like mining, steel production, coal burning, and burning of waste.
- It attaches to soil, sediments, and dust particles in the air.
- Rain and snow remove zinc dust particles from the air.
- Zinc compounds can move into the groundwater and into lakes, streams, and rivers.
- Most of the zinc in soil stays bound to soil particles.
- It builds up in fish and other organisms, but it doesn't build up in plants.

How might I be exposed to zinc?

- Ingesting small amounts present in your food and water.
- Drinking contaminated water near manufacturing or waste sites.
- Drinking contaminated water or a beverage that has been stored in metal containers or flows through pipes that have been coated with zinc to resist rust.
- Eating too many dietary supplements that contain zinc.
- Breathing zinc particles in the air at manufacturing sites.

How can zinc affect my health?

Zinc is an essential element in our diet. Too little zinc can cause health problems, but too much zinc is also harmful. The recommended dietary allowance (RDA) for zinc is 15 milligrams a day for men (15 mg/day); 12 mg/day for women; 10 mg/day for children; and 5 mg/day for infants. Not enough zinc in your diet can result in a loss of appetite, a decreased sense of taste and smell, slow wound healing and skin sores, or a damaged immune system. Young men who don't get enough zinc may have poorly developed sex organs and slow growth. If a pregnant woman doesn't get enough zinc, her babies may have growth retardation.

Too much zinc, however, can also be damaging to your health. Harmful health effects generally begin at levels from 10-15 times the RDA (in the 100 to 250 mg/day range). Eating large amounts of zinc, even for a short time, can cause stomach cramps, nausea, and vomiting. Taken longer, it can cause anemia, pancreas damage, and lower levels of high density lipoprotein cholesterol (the good form of cholesterol).

Breathing large amounts of zinc (as dust or fumes) can cause a specific short-term disease called metal fume fever. This is believed to be an immune response affecting the lungs and body temperature. We do not know the long-term effects of breathing high levels of zinc.

It is not known if high levels of zinc affect human reproduction or cause birth defects. Rats that were fed large amounts of zinc became infertile or had smaller babies. Irritation was also observed on the skin of rabbits, guinea pigs, and mice when exposed to some zinc compounds. Skin irritation will probably occur in people.

How likely is zinc to cause cancer?
The Department of Health and Human Services, the International Agency for Research on Cancer, and the Environmental Protection Agency (EPA) have not classified zinc for carcinogenicity.

Is there a medical test to show whether I've been exposed to zinc?
Zinc can be measured in your blood or feces. This can tell you how much zinc you have been exposed to. Zinc can also be measured in urine, saliva, and hair. The amount of zinc in your hair tells us something about long-term exposure, but the relationship between levels in your hair and the amount that you were exposed to is not clear. These tests are not routinely performed at doctors' offices, but your doctor can take samples and send them to a testing laboratory.

Has the federal government made recommendations to protect human health?
EPA recommends that there be no more than 5 parts of zinc in 1 million parts of drinking water (5 ppm) because of taste. EPA also requires that releases of more than 1,000 (or in some cases 5,000) pounds of zinc or its compounds into the environment be reported.

The Occupational Safety and Health Administration (OSHA) has set a maximum concentration limit for zinc chloride fumes in workplace air of 1 milligram of zinc per cubic meter of air (1 mg/m³) for an 8-hour workday over a 40-hour work week and 5 mg/m³ for zinc oxide fumes. The National Institute for Occupational Safety and Health (NIOSH) has set the same standards for up to a 10-hour workday over a 40-hour workweek.

Glossary
Anemia: A decreased ability of the blood to transport oxygen.
Carcinogenicity: Ability to cause cancer.
Milligram (mg): One thousandth of a gram.

References
Agency for Toxic Substances and Disease Registry (ATSDR). 1994. Toxicological Profile for zinc. Atlanta, GA: U.S. Department of Health and Human Services, Public Health Service.

Oregon Water Quality Standards for Zinc

	Current	Proposed
DEQ Acute:	120	120
DEQ Chronic:	110	120
(mg/L)		

Stormwater Management Plan

Glossary

Glossary of Stormwater & Water Quality Terms

--A--

Alluvial Deposits: Within a soil's profile, the layers of clay, silt, sand, gravel or similar, material deposited by running water.

Anadromous Fish: Fish (particularly salmon, steelhead and cutthroat trout) that swim upstream from the ocean to breed.

Anaerobic: Living or active in the absence of oxygen.

Aquifer: An underground area that contains water in sufficient amounts to yield useful quantities to wells and springs.

Aquifer Storage and Recovery (ASR): The process of storing treated drinking water in an aquifer when water supply exceeds demand and withdrawing the water when supplies are low and/or demands are high.

--B--

Backwater: The water retarded (backed-up) above an impediment or into a tributary by a flood in the main stream.

Backwater Effects: The hydraulic effects within an upstream waterway or stormwater conveyance system that is experiencing backwater caused by a downstream restriction or flooded receiving stream.

Bank: The margins of a stream channel, called right or left as viewed facing the direction of flow.

Base Flood: Flood having a one percent (1%) chance of being equaled or exceeded in any given year (a.k.a. the "100 year flood").

Basin: A hydrologic land area in which all surface water flows toward a particular stream, river, other body of water, or common point of discharge. May be the same as the watershed, or may be a smaller distinct drainage area within a larger watershed.

Bed Load Transport: Sediment transport along the bottom of a waterbody due to its currents.

Berm: An earthen mound used to direct the flow of runoff around or through a structure.

Best Management Practices (BMPs): Activities or structural improvements that help reduce the quantity and/or improve the quality of stormwater runoff and receiving stream water quality. BMPs include treatment requirements, operating procedures, and practices to control site runoff, spillage or leaks, sludge or waste disposal, or drainage from raw material storage.

Biochemical Oxygen Demand, BOD: The quantity of dissolved oxygen used by microorganisms in the biochemical oxidation of organic matter and oxidizable inorganic matter by aerobic biological action.

Bioengineering: The use of natural, non-structural solutions to provide streambank stabilization and water quality treatment within drainage/flood control and stormwater management systems.

Buffer Strips, Zones or Setbacks: Strips of grass or other erosion resistant native vegetation located between a waterway and an area of more intensive land use. They are typically of sufficient width to minimize entrance of sediment or chemicals (fertilizers, herbicides, and pesticides) into the waterbody.

--C--

Calibration: A process by which a computer-based hydrologic/hydraulic model is checked for its accuracy and authenticity using field collected data from within the modeled system during storm events.

Catch Basin: An entryway to the storm drain system, usually located at street corners.

Catchment: A small sub-basin, typically ranging from 20 to 250 acres in size, that is used to provide more detailed hydrologic information for the development of a hydrologic/hydraulic model.

cfs: A measure of water flow, cubic feet per second.

Channel: A natural or artificial watercourse of perceptible extent which periodically or continuously contains moving water. It has a definite bed and banks which serve to confine the water.

Channelization and channel modification: River and stream channel engineering for the purpose of flood control, navigation, drainage improvement, and reduction of channel migration potential. Channelization projects increasingly incorporate natural streambank stabilization methods (bioengineering) and restored/enhanced habitat.

Check Dam: A small dam constructed in a channel to decrease the stream's flow velocity, minimize channel scour and promote the controlled deposition of sediment.

Clay Blanket: A natural or constructed layer of clay within the soil that impedes the downward migration of water and prevents or minimizes infiltration into the groundwater.

Concentration: A measurement of the amount of a constituent or contaminant in a given volume of water; often expressed in terms of milligrams per liter, pounds per million gallons, or parts per million.

Conduit: Any channel or pipe used to transport flowing water.

Confluence: The place where two or more streams or open waterways flow together.

Conjunctive Use: A stormwater facility that is designed and used to serve multiple uses, such as a regional detention basin that is used as a park or playground during non-storm periods.

Constructed Wetland: Engineered system designed and constructed to simulate natural wetlands to utilize the stormwater or wastewater treatment functional value for human use, environmental benefits, aesthetic values, mitigation for disturbed natural wetlands, or creation of new wetlands to achieve the benefits associated with natural wetlands.

Conveyance: The process of moving water from one place to another.

Conveyance System: Physical system that carries stormwater or wastewater. Every basin or sub-basin has a stormwater conveyance system, whether it is natural or manmade, planned or unplanned.

Culvert: A short, closed (covered) conduit that passes stormwater runoff under an embankment, usually a roadway. A rectangular or square concrete culvert is referred to as a box culvert.

Cumulative: Term refers to the combined environmental impacts that accrue from a series of similar or related individual actions, contaminants or projects. Although each action may seem to have an acceptable impact, the combined effect can be severe.

CWA: The Clean Water Act (formerly the Federal Water Pollution Control Act or Federal Water Pollution Control Act Amendments of 1972).

--D--

DEQ: Oregon Department of Environmental Quality.

Design Storm: A rainfall event that statistically has a specified probability of occurring in any given year (expressed either in years or as a percentage). For example, a 100-year storm has the statistical probability of occurring once in 100 years, or 1% (0.01). The selected design storm serves as the basis for predicting the amount of rainfall and resulting stormwater runoff flow that a particular component of the stormwater drainage system must accommodate.

Detention: A stormwater facility that delays the downstream progress of stormwater runoff in a controlled manner. This is typically accomplished using temporary storage areas and a controlling outlet device.

Detention Basin: A facility that is capable of detaining stormwater runoff until it can be released without causing damage (or reduces damage) downstream.

Dewatering: The process of lowering the groundwater table, or the water level in an excavation, through the use of pumps which discharge to a conveyance system or waterway.

Dike: An engineered embankment used to confine or control water. Dikes are often constructed along the banks of a river to prevent overflow; a levee.

Discharge: The volume of water (and suspended sediment if surface water) that passes a given location within a given period of time.

Dissolved Oxygen, DO: The concentration of free molecular oxygen in the water column. DO is one of several common measurements/indicators of a stream's or waterbody's health.

Diversion: The taking of water from a stream or other body of water into a canal, pipe or other conduit. The term is also used when water is directed from one drainage basin into another.

Drainage: A general term applied to the removal of surface or subsurface water from a given area, either by gravity or by pumping. The term is commonly applied to surface water.

Drainage Area: The contributing area of a single drainage basin, expressed in acres, square miles or other unit of area. Also called catchment, basin, or watershed.

Drainage Basin: Geographic region in which all surface water flows toward a particular receiving stream or other body of water.

DSL: Oregon Division of State Lands.

--E--

E-coli (*Escherichia coli*) bacteria: A type of coliform bacteria that is entirely of fecal origin, used as an indicator of fecal pollution in surface water.

Effective Impervious Area: That impervious area, expressed as a percentage of the total drainage area, having a direct hydraulic link to a formal drainage system.

Effluent: Liquid leaving a facility or household into a water body or sewer system (e.g., treated liquid discharged from a wastewater treatment plant is the plant's effluent).

Embankment: An artificial bank such as a mound or dike, generally built to hold back water or carry a roadway.

Enhancement: Efforts undertaken to increase the quantity and/or improve the quality of habitat and aesthetic characteristics of a waterway and its associated riparian area.

EPA: U.S. Environmental Protection Agency.

Equivalent Dwelling Unit (EDU): A unit of measurement or consumption that represents the average use of a utility system by a typical dwelling unit (single family residence). For stormwater, an EDU is often based on impervious area, expressed in terms of square feet. For water and sanitary sewer, an EDU is often expressed in terms of cubic feet or gallons (per day or month). The charges to other users are then measured relative to the demands of the typical dwelling unit. Instead of using "EDU", some jurisdictions use "Equivalent Residential Unit, ERU" or "Equivalent Service Unit, ESU". The basic concept is the same.

Erosion: When land is diminished or worn away due to wind, water, or glacial ice. Often the eroded debris (silt or sediment) becomes a pollutant via stormwater runoff. Erosion occurs naturally but can be intensified by land clearing activities such as farming, development, road-building, and timber harvesting.

ESA: Endangered Species Act.

Eutrophication: Excessive levels of organic material and nutrients in surface water which lead to a decrease in dissolved oxygen levels. Often characterized by excessive growth of algae and aquatic vegetation (such as algae blooms), which in turn often result in deteriorated water quality.

Excavation: The process of removing earth, stone, or other materials from land.

Exotic Plants: Non-native plants that grow quickly, out-compete native plants, and are a threat to the natural ecosystem when they "escape" from home gardens.

--F--

Fecal Coliform: Bacteria present in mammalian feces used as an indicator of the presence of human, animal or waterfowl feces, bacteria, viruses and pathogens in surface or ground water.

FEMA: Federal Emergency Management Agency.

FEMA Stream: A stream that is subject to significant flooding, has been studied/hydraulically modeled by FEMA, and for which a floodway and floodplain have been formally established under FEMA's National Flood Insurance Program.

Fertilizer: Any organic or inorganic material of natural or synthetic origin that is added to the soil or soils' surface to supply elements (especially nitrogen and phosphorous) essential for plant growth. Excess or inappropriate applications can runoff or infiltrate into the groundwater, degrading water quality and threatening fish and other aquatic life.

Filter Fabric: A textile of relatively small mesh that is used to allow water to pass through while keeping sediment out (permeable); or prevent both runoff and sediment from passing through (impermeable).

Filter Strip: A long, narrow portion of vegetation used to retard water flow and collect sediment and other water-borne pollutants for the protection of watercourses, reservoirs, or adjacent properties.

Flood: A temporary rise in flow or stage of any watercourse or stormwater conveyance system that results in stormwater runoff exceeding its normal flow boundaries and inundating adjacent, normally dry areas.

Flood Control: The elimination or reduction of flood losses by the construction of flood storage reservoirs, channel improvements, dikes and levees, bypass channels, or other engineering works.

Flood Management: The elimination or reduction of flood losses by the control or use of land subject to flooding and/or the construction of flood storage reservoirs, channel improvements, dikes and levees, bypass channels, or other engineering works.

Floodplain: Any land area susceptible to temporary inundation by stormwater or floodwater from an adjacent watercourse.

Floodway: Actively flowing channel of a stream, river or other watercourse that must be reserved for passage of the base flood.

Flow Channel Liner: A covering or coating used on the inside surface of a flow channel to prevent the infiltration of water to the ground; also lowers the channel's roughness factor to improve hydraulic conveyance.

Flow Meter: A gauge that shows the speed or rate of water moving through a conveyance.

Freeboard: The vertical distance between the normal high water surface of a detention basin or open channel and the top of the berm/dike or channel. It serves as a margin of safety to accommodate extraordinarily large storms and provides a safety factor for a berm/dike's structural integrity.

Free Groundwater: Unconfined groundwater whose upper surface is the water table that does not have an impermeable/restrictive soil layer above it.

--G--

Gabion: A rectangular steel or PVC-coated steel wire basket or mattress, filled with rock, and placed integral with or next to a streambank to form a heavy mass for erosion protection.

Gaging/Gauging Station: A station within a stormwater conveyance facility or stream where a continuous record of flow is measured.

GIS, Geographic Information System: An electronic, computer-based system for storing, retrieving and displaying geographical, physical and infrastructure system information.

Goal 5: Entitled "Open Spaces, Seismic and Historic Areas and Natural Resources", one of Oregon's Statewide Planning Goals, with the expressed goal being "to conserve open space and protect natural and scenic resources."

Grade: The inclination or slope of a channel, canal, conduit, pipe, or natural ground surface, usually expressed in terms of the percentage of the number of feet of vertical rise or fall per foot of horizontal distance. (e.g., a one foot vertical drop in 100 feet of horizontal distance, or 1:100, or 0.01 grade, or 1% grade).

Grading: The cutting and/or filling of the land surface to a desired slope or elevation.

Groundwater: That portion of the water beneath the surface of the earth that can be collected with wells, tunnels, or drainage galleries, or that flows naturally to the earth's surface via seeps or springs.

--H--

Habitat: Specific area or environment in which a particular type of plant or animal lives. An organism's habitat must provide all of the basic requirements for life and should be free of harmful contaminants.

Head: The vertical height of water within a pipe, water conveyance component, or detention basin.

Head/Wingwall: The structural features at the inlet and outlet of a culvert installation. Often constructed of concrete or rock riprap/gabions, they serve to dissipate a stream's erosive force and protect the streambank and roadway embankment.

Holding Pond: A pond or reservoir, usually made of earth, built to store water runoff for a limited time.

Hydraulics: A branch of science that deals with the practical applications of the mechanics of water movement.

Hydric: Characterized by, relating to, or requiring an abundance of moisture. Often associated with soils and one of the criteria used for determining the presence of a wetland (i.e. hydric soils).

Hydrograph: A curve obtained by plotting water flow versus time that results from a particular rain storm.

Hydrology: A branch of science that is concerned with the origin, distribution and properties of the waters of the earth.

Hydrostatic Pressure: Pressure in a liquid while at rest, or that exerted by a liquid on an immersed body.

Hyetograph: A graph showing the rainfall distribution of a 24-hour storm, volume versus time.

--I--

Illicit Connection/Discharge: Any discharge to a municipal separate storm sewer that is not composed entirely of stormwater, and is not authorized by an NPDES Municipal Stormwater Permit or other NPDES Permit.

Impervious Surfaces: Surfaces that water does not penetrate such as concrete, asphalt or roofs.

Infiltration: The penetration of water through the ground surface into sub-surface soil or the penetration of water from the soil into sewers or other pipes through defective joints, connections, or manhole walls. Also, a technique where large volumes of stormwater are applied to land or its subsurface and allowed to percolate through the underlying soil.

Inlet: An entrance into a ditch, storm sewer, or other waterway.

In-stream Storage/Detention: Storage/detention ponds which are physically built in the channel area. This is in contrast to off-stream storage/detention which is not physically in the main channel of a drainage system.

Invert: The bottom of the lowest portion of the internal cross-section of a conduit, used particularly with reference to sewers and culverts.

Isopluvial Maps: Also known as isohyetal maps, these maps are plots of the 24-hour rainfall volume (as contours) over a given geographical area.

--L--

Large Municipal Separate Storm Sewer System (MS4): An MS4 located in an incorporated area with a population of 250,000 or more, as determined by the latest U.S. Census. (e.g. Portland, Seattle, etc.)

Leaching: The process by which soluble materials are dissolved in a solvent, such as water, and carried down through the soil.

Lithic Formation: Geologic rock formations or deposits that are often alkali (base) in characteristics.

Local Wetland Inventory, LWI: A scentifically-based study, within a community or similar geographical area, to identify lands that meet the established regulatory definition of a jurisdictional wetland.

Locally Significant Wetland: A wetland, identified through a Local Wetland Inventory or other means, that has been determined to be significant to the community or governing agency and therefore warrants special protection.

--M--

Manning's "n" Value: An empirical measure of the roughness of a conveyance surface that is used to calculate runoff flow rates.

Medium Municipal Separate Storm Sewer System (MS4): MS4 located in an incorporated area with a population of 100,000 or more but less than 250,000, as determined by the latest U.S. Census.

Metals: Elements such as mercury, lead, nickel, zinc, copper, chromium and cadmium that are of environmental concern. They are sometimes accumulated in the food chain and can be toxic to life in high enough concentrations. Many are also necessary nutrients, but in very low concentrations. Also called heavy metals, they are often found in urban stormwater runoff from streets and highways.

Mgd: Million gallons per day.

Minimum Control Measures (MCM): The six elements required for a NPDES Phase II permit (includes: 1) Education and Outreach, 2) Public Involvement and Participation, 3) Illicit Discharge Detection and Elimination, 4) Construction Site Stormwater Runoff Control, 5) Post-Construction Stormwater management in New Development and Redevelopment, 6) Good Housekeeping for Municipal Operations.)

Monitor: To systematically and repeatedly measure and/or inspect something in order to track changes.

Monitoring Well: A non-pumping well used for drawing groundwater quality samples or measuring the depth of the groundwater.

MS4, Municipal Separate Storm Sewer System: A stormwater collection and conveyance system that is designed and constructed to carry only stormwater and drainage water, as opposed to a combined sewer system that intentionally conveys both stormwater and wastewater.

Mulch: A natural or artificial layer of plant residue or other material(s) covering the land surface to conserve moisture, hold soil in place, help establish plant cover, and minimize temperature fluctuations.

--N--

Native Plants: Plants that are found by nature in a geographic location. Generally it is preferable to use native plants vs. exotic plants, as introducing exotic plants can disturb the natural ecosystem.

NOAA-F: National Oceanic and Atmospheric Administration - Fisheries, Federal agency responsible for implementation of the Endangered Species Act listing for salmon and steelhead.

Non-point Source (NPS) Pollutants: Pollutants from many diffuse sources. NPS pollution is caused by rainfall or snowmelt moving over and through the ground. As the runoff moves, it picks up and carries away natural and human-made pollutants, finally depositing them into lakes, rivers, wetlands, coastal waters, and even our underground sources of drinking water.

NPDES, National Pollutant Discharge Elimination System: The name of the surface water quality program authorized by Congress as part of the 1987 Amendments to the Clean Water Act. This is EPA's and DEQ's program to control the discharge of pollutants to waters of the United States (see 40 CFR 122.2).

Nutrients: Essential chemicals (e.g., nitrogen, phosphorus) needed by plants or animals for growth. Excessive amounts of nutrients can lead to degradation of water quality (e.g., reduced levels of dissolved oxygen) and growth of excessive amounts of algae. Some nutrients can be toxic to fish and other aquatic species at low concentrations and to humans at high concentrations.

--O--

ODFW: Oregon Department of Fish and Wildlife.

Oil and Grease Traps: Devices that collect oil and grease, removing them from water flows.

Oil Sheen: A thin, glistening layer of oil on the surface of water.

Oil/Water Separator: A device installed (usually at the entrance to a storm drain) to remove oil and grease from water entering the drain.

On-Site Detention Facility: A relatively small facility (typically privately owned) that is adjacent to the area directly contributing stormwater to it (subdivision, commercial/industrial facility, etc.). It may be an open basin/dry pond, oversized buried pipe or series of pipes, or a parking lot that temporarily detains large storm flows to reduce downstream flows.

Organic Pollutants: Substances containing carbon which may cause pollution problems in receiving bodies of water because they biologically (biochemically) decompose depleting the water's dissolved oxygen.

Organic Solvents: Liquid organic compounds capable of dissolving solids, liquids or gases.

Orifice: An engineered piping or structure opening that is configured to limit the rate of flow discharged to a downstream stormwater conveyance system; most commonly associated with stormwater detention facilities.

Outfall: The point where treated wastewater or stormwater/drainage discharges from a sewer pipe, ditch, or other conveyance to a receiving body of water.

--P--

Percolate: To trickle through a permeable substance, such as water through gravels or sandstone.

Permeability: The characteristic of soil that allows water or air to move through it. Described as a rate in terms of inches/hour or inches/day. Water moves more quickly through sand than clay. Therefore, sand has a higher permeability (is more permeable) than clay.

Pervious Surfaces: Surface conditions that permit rainfall to soak into the ground.

Phyto-Filtration: Using plants and trees to filter impurities or excessive levels of nutrients or other pollutants from water.

Plunge Pool: A basin used to slow flowing water. The pool may be protected from erosion by various lining materials.

Point Source Pollutant: Pollutants from a single identifiable source such as a factory or refinery.

Pollutant: Contaminant in a concentration or amount that adversely alters physical, chemical or biological properties of the environment. The term includes pathogens, toxic metals, carcinogens, oxygen-demanding materials, and all other harmful substances.

Pollutant Loading: The total quantity of pollutants in stormwater runoff, typically expressed in terms of pounds/day.

Porous Pavement: A man-made surface that allows water to penetrate through and percolate into soil. Porous asphalt, for example, is made of irregularly shaped crush rock pre-coated with asphalt binder. Water is able to seep through into lower layers of gravel, then to the soil. Porous concrete is also made.

--Q--

Qualified Public Improvement: As used in utility system development charge (SDC) methodologies, an improvement that is required as a condition of development approval, identified in the community's capital improvement plan or utility-specific master plan, and is either:

1. not located on or contiguous to property that is the subject of development approval, or
2. located in whole or in part on or contiguous to property that is the subject of development approval and required to be built larger or with greater capacity than is necessary for the particular development project to which the improvement fee (SDCi) is related.

--R--

Rainfall Intensity Duration Frequency Curves: A series of curves showing rainfall intensity used in the Rational Method of peak flow calculations, based upon frequency of storm and measure of time.

Rate of Runoff: Runoff volume and rate expressed in cubic feet per second, gallons per minute, etc.

Rational Method: A widely used design equation for determining the rate of runoff from small drainage basins. Expressed as $q_p = CiA$, where q_p is the volume runoff in acres-inches per hour; C is a runoff coefficient reflecting the

basin's percent of impervious surface area, soils and topography; *i* is the average rainfall intensity in inches/hour; and A is the basin's area in acres.

Reach: Any length or section of river, stream or channel.

Receiving Waters: Body of water that receives drainage or effluent from a particular location.

Recharge: Re-supplying of water to an aquifer. Recharge generally comes from snowmelt and stormwater runoff.

Regional Detention Facility: A relatively large facility, typically publicly owned, that delays the downstream progress of stormwater runoff in a controlled manner. This is typically accomplished using temporary storage areas and a metered outlet device or orifice.

Residual: The amount of pollutant that remains in the environment after a natural or treatment process has taken place, such as the suspended solids remaining in water after a period of quiescent settling.

Retention: A process that halts the downstream progress of stormwater runoff. This is typically accomplished using total containment involving the creation of storage areas that use infiltration devices (such as dry wells) to dispose of stored stormwater via percolation over a specified period of time.

Retrofit: The modification of stormwater management facilities through the construction and/or enhancement of wet ponds, wetland plantings, or other BMPs designed to improve water quality or quantity.

Return Interval: As related to storms, the time period between storms of a particular magnitude that can statistically be expected to occur (i.e. 100-year storm).

Reuse: The application of reclaimed water for a beneficial purpose.

Rill Erosion: The formation of several closely spread streamlets caused by uneven removal of surface soils by stormwater or other water.

Riparian Corridor: Perennial or intermittent water body, its lower banks and upper banks, and associated vegetation that stabilizes the slopes, protects the waterways from erosion and sedimentation, provides cover and shade, and maintains fish and wildlife habitat.

Riprap: Armor-plating materials usually consisting of large rock to prevent erosion along the banks of a channel, stream or river.

Runoff: Drainage, stormwater or flood discharge that leaves an area as surface flow or as pipeline flow.

Runoff Control: Physical devices that are used to release runoff from an area at a prescribed rate.

--S--

Sanitary Sewer System: A system of underground pipes that carries sanitary waste or process wastewater to a treatment plant.

Scour: Clearing and digging of a stream channel's bottom or side walls caused by the flow of water, such as the downward erosion that results when stream water sweeps away mud and silt from the stream bed and banks of a channel or stream.

Secondary Containment: Structures, usually dikes or berms, surrounding tanks or other storage containers to catch spilled material.

Sediment: Soil, sand, and minerals washed from land into water, usually after rain. Sediment can smother and destroy fish-nesting areas, clog animal habitats, cloud waters so that sunlight does not reach aquatic plants, and reduce conveyance system capacity and thereby causing flooding.
Sediment Trap: A device for removing sediment from water flows, usually installed at points of outflow.

Sedimentation: The process of depositing or settling soil, clay, sand, gravel or other sediments that were moved by the flow of water.

Settleable Solids: Solids in a liquid that can be removed by allowing the water to be still and the particles to settle over a given period of time (typically one hour).

Sheet Erosion: Erosion of thin layers of surface materials caused by continuous sheets (thin, even layers) of running water.

Siltation: The accumulation of eroded soil particles (typically fine grained materials) on the bottom of a stream bed. Silt can clog gravel beds and prevent successful fish spawning. Over time, the accumulated materials reduce the capacity of the pipe, channel or stream to pass water.

Slide Gate: A device to control the flow of water through stormwater conveyances.

Slumping: A sudden drop, collapse or droop of the land's surface, often caused by saturated soils and subsurface water flows.

Small Municipal Separate Storm Sewer System (MS4): MS4 located in an area serving a population less than 100,000, as determined by the latest U.S. Census.

Soil Conservation Service, SCS: A division of the U.S. Department of Agriculture, now known as the Natural Resources Conservation Service (NRCS).

Source Control: Control of runoff waters and/or wastes before they enter public stormwater or wastewater conveyance systems.

Spill Prevention Control and Countermeasures (SPCC) Plan: Plans to prevent or respond to spills of petroleum products or hazardous substances as defined in the Clean Water Act.

Storm, 10-year: A rainfall storm that statistically occurs once every 10 years, or a 10 percent recurrence interval (0.10).

Storm, 25-year: A rainfall storm that statistically occurs once every 25 years, or a 4 percent recurrence interval (0.04).

Storm, 100-year: A rainfall storm that statistically occurs once every 100 years, or a 1 percent recurrence interval (0.01).

Storm Drain: A slotted opening leading to an underground pipe or an open drainageway for carrying surface runoff.

Stormwater: Precipitation that accumulates in natural and/or constructed storage and stormwater systems during and immediately following a storm event.

Stormwater Charge: A means of establishing a dedicated and reliable source of revenue based on user fees rather than taxes to help solve stormwater management problems. This steady revenue source ensures that funds will be available to support a local stormwater management program.

Stormwater Diversion: The engineered redirection of stormwater flows to another point located within or outside of the watershed to reduce downstream flooding.

Stormwater Facilities: Systems such as watercourses, constructed channels, storm drains, culverts, and detention/retention facilities that are used for the conveyance and/or storage of stormwater runoff.

Stormwater Management: Functions associated with planning, designing, constructing, operating, maintaining, financing, and regulating the infrastructure facilities (both constructed and natural) that collect, store, control, and/or convey stormwater.

Stormwater System: The entire assemblage of stormwater facilities located within a watershed.

Stormwater Utility: A governmental management structure/agency designated to manage, operate and maintain the public stormwater system.

Stormwater Wetlands: Those wetlands that are intentionally created for the primary purpose of runoff treatment (water quality facilities) and are managed as such. They are normally considered as part of the stormwater runoff collection and treatment system.

Stream Enhancement: Efforts undertaken to increase the quantity or improve the quality of habitat and aesthetic characteristics of a waterway and its associated riparian area.

Stream Habitat: The naturally occurring environment within or adjacent to a stream that supports aquatic species and wildlife.

Stream Stabilization: Engineered or "constructed" efforts to structurally or naturally (bioengineered) preserve and improve a stream's structural integrity and minimize erosion.

Structural Control Measures: Includes the placement of pipes, channel resizing, streambank protection, and detention facilities to control runoff from a drainage basin or catchment area.

Subsoil: The bed of earth lying below the surface soil.

Sump: A pit or tank that catches liquid runoff or groundwater seepage for drainage or disposal. Also, the bottom volume of a catch basin that accumulates solids that settle out within the catch basin.

Surcharge/Surcharging: A condition within a storm sewer or culvert in which the generated stormwater flow exceeds the hydraulic capacity of the pipe, resulting in backwater conditions upstream from the specific conduit, and/or flooding within and/or overflows from associated manholes.

Surface Impoundment: Treatment, storage, or disposal of liquid wastes in ponds.

Surface Runoff: That part of runoff that travels over the land surface to the nearest conveyance system element or stream channel.

Surface Water: Water that remains on the surface of the ground, including rivers, lakes, reservoirs, streams, wetlands, impoundments, seas, estuaries, etc.

Suspended Solids: Particles of organic or inorganic matter suspended in water. Toxicants may adhere to these solid particles which can intensify chemical pollution problems.

Swale/Bioswale: A low-lying or depressed seasonally wet stretch of land; often lined with grass (grassy swale) or native plants and used as a conveyance and/or treatment facility for stormwater.

System Development Charge (SDC): A charge imposed on a development by a municipality or utility provider to fund (at least in part) construction of capacity-increasing capital improvements necessary for new development. SDC expenditures are limited to capital-related costs. They cannot be used for annual operations and maintenance. In Oregon, SDCs may consist of an improvement fee (**SDCi**), a reimbursement fee (**SDCr**), or a combination of the two.

1. An **SDCi** (improvement fee) is based on planned future capacity-increasing capital improvements as identified in the jurisdiction's capital improvement plan or utility-specific master plan. SDCi revenue must be used only for capacity-increasing improvements needed to serve new development, or the repayment of debt on such improvements. An increase in capacity is established if an improvement increases the level of service provided by existing facilities or provides new facilities. The portion of such improvements funded by an SDCi must be related to current or projected development.
2. An **SDCr** (reimbursement fee) is based on the jurisdiction's incurred costs for facilities that have already been constructed that provide capacity for new development. SDCr revenue may be spent on capital projects related to the utility system, including rehabilitation, replacement and expansion. The methodology used to establish an SDCr must be such that future system users contribute no more than an equitable share of the capital costs of existing facilities.

--T--

Topography: The physical features of a surface area including relative elevations and the position of natural and human-made features.

Toxic: Poisonous, carcinogenic or otherwise directly harmful to life.

Toxic Substances and Toxicants: Chemical substances such as pesticides, detergents, herbicides, chlorine, industrial wastes, and oil/grease that are poisonous, carcinogenic or otherwise directly harmful to life.

Treatment: Chemical, biological or physical procedures applied to industrial or municipal stormwater, wastewater or other sources of contamination to remove, reduce or neutralize contaminants.

Tributary: A drainageway, stream or river that flows into a larger river or other waterbody.

Turbidity: Measure of amount of material suspended in water. Increasing turbidity of water decreases one's ability to see through it. High levels of turbidity over extended periods are harmful to aquatic life.

--U--

Undercutting: The action of a stream cutting into its banks because of unusually high or increasingly high flows; usually digging out the bottom of a slope causing the upper portion of soil to fall into the channel.

Upland: Ground elevated above the wetlands along streams/rivers or between hills.

Urban Runoff: Stormwater from urban areas which tends to contain heavy concentrations of pollutants from vehicles and urban land uses.

--V--

Vegetated Buffer: Strips of vegetation separating a waterbody from a land use that could act as a non-point pollution source. Vegetated buffers or filter strips are variable in width and can range in function from vegetated filter strips to wetlands or riparian areas.

Vegetated Filter Strip: Created areas of vegetation designed to remove sediment and other pollutants from surface water runoff. Removal mechanisms include filtration, deposition, infiltration, adsorption, decomposition and volitization.

--W--

Watercourse: A ditch, channel, creek, stream, stormwater conveyance system, or other topographic feature in or over which stormwater flows, at least periodically.

Water Quality Facility: An engineered facility designed and constructed to reduce contaminant levels in stormwater runoff before it is discharged into the stormwater conveyance system or receiving stream. Such facilities may be mechanical or "natural" in nature, and must be carefully designed, constructed ,operated and maintained to achieve the desired reduction in the pollutants of concern.

Watershed: Geographic region in which all surface water flows toward a particular stream, river or other body of water.

Waters of the State: As defined by the Oregon Division of State Lands (DSL), natural waterways including all tidal and non-tidal bays, intermittent streams, constantly flowing streams, lakes, wetlands and other bodies of water in Oregon, navigable and non-navigable, including that portion of the Pacific Ocean which is within the boundaroies of the state of Oregon.

Water table: The upper boundary of a free groundwater body at atmospheric pressure; the level below which the ground is saturated with water.

Waterway: Any perennial river, stream or creek within the County designated by the Director of Public Works.

Wetlands: Land with a wet, spongy soil, where the water table is at or above the land surface for at least part of the year. Wetlands are characterized by a prevalence of vegetation that is adapted for life in saturated soil conditions. Examples include swamps, bogs, fens, marshes, and estuaries.

Wet Pond: A constructed, generally naturally appearing, water quality facility that employs a permanent pool of water for treating incoming stormwater runoff. A wet pond may be used in conjunction with a stormwater detention facility. In an enhanced wet pond design, a forebay is installed to trap incoming sediments where that can be easily removed; and a fringe wetland is also established around the perimeter of the pond.

Wet Weather Flows: Water entering a storm drainage system during rainstorms.